3GPP FDD incl. enh. MS/BS tests, HSDPA, HSUPA, HSPA+ Digital Standard for R&S®Signal Generators

Operating Manual

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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This document describes the following software options:

- R&S®SMBV-K42/-K43/-K45/-K59
  1415.8048.xx, 1415.8054.xx, 1415.8077.xx, 1415.8219.xx
- R&S®SMU-K42/-K43/-K45/-K59
  1160.7909.02, 1160.9660.02, 1161.0666.02, 1415.0001.02
- R&S®AMU-K42/-K43/-K45/-K59
  1402.6206.02, 1402.6306.02, 1402.8909.02, 1403.0053.02
- R&S®SMATE-K42/-K43/-K45/-K59
  1404.5207.02, 1404.5307.02, 1404.7300.02, 1415.1320.02
- R&S®SMJ-K42/-K43/-K45/-K59
  1404.0405.02, 1404.0505.02, 1404.1816.02, 1415.1508.02

This manual version corresponds to firmware version:
FW 3.20.281.xx and later of the R&S®SMBV100A
FW 2.20.360.142 and later of the R&S®SMU200A, R&S®SMATE200A, R&S®SMJ100A and R&S®AMU200A

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The following abbreviations are used throughout this manual: R&S®SMBV100A is abbreviated as R&S SMBV, R&S®SMU200A is abbreviated as R&S SMU, R&S®AMU200A is abbreviated as R&S AMU, R&S®SMATE200A is abbreviated as R&S SMATE, R&S®SMJ100A is abbreviated as R&S SMJ, R&S®WinIQSIM2™ is abbreviated as R&S WinIQSIM2; the license types 02/03/07/11/13/16/12 are abbreviated as xx.

Contents

1 Preface

1.1 Documentation Overview

The user documentation for the R&S Signal Generator consists of the following parts:

- Online Help system on the instrument,
- "Quick Start Guide" printed manual,
- Documentation CD-ROM with:
  - Online help system (*.chm) as a standalone help,
  - Operating Manuals for base unit and options,
  - Service Manual,
  - Data sheet and specifications,
  - Links to useful sites on the R&S internet.

Online Help

The Online Help is embedded in the instrument's firmware. It offers quick, context-sensitive access to the complete information needed for operation and programming. The online help contains help on operating the R&S Signal Generator and all available options.

Quick Start Guide

The Quick Start Guide is delivered with the instrument in printed form and in PDF format on the Documentation CD-ROM. It provides the information needed to set up and start working with the instrument. Basic operations and an example of setup are described. The manual includes also general information, e.g., Safety Instructions.

Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

These manuals are available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. In the Operating Manual for the base unit, all instrument functions are described in detail. Furthermore, it provides an introduction to remote control and a complete description of the remote control commands with programming examples. Information on maintenance, instrument interfaces and error messages is also given.

In the individual option manuals, the specific functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the R&S Signal Generator is not included in the option manuals.

Service Manual

The Service Manual is available in PDF format - in printable form - on the Documentation CD-ROM delivered with the instrument. It describes how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the instrument by the replacement of modules.

This manual can also be orderd in printed form (see ordering information in the data sheet).

Release Notes

The release notes describe new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

Web Help

The web help provides online access to the complete information on operating the R&S Signal Generator and all available options, without downloading. The content of the web help corresponds to the user manuals for the latest product version.

The web help is available on the R&S Signal Generator product page at the Downloads > Web Help area.

Application Notes

Application notes, application cards, white papers and educational notes are further publications that provide more comprehensive descriptions and background information.

The latest versions are available for download from the Rohde & Schwarz website, at http://www.rohde-schwarz.com/appnotes.

1.2 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.

Convention	Description
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quota-tion marks.

2 Introduction

The R&S Signal Generator provides you with the ability to generate signals in accordance with the WCDMA standard 3GPP FDD.

To playback a signal from a waveform file created by the simulation software R&S WinIQSIM2, the corresponding R&S WinIQSIM2 digital standard option must be installed.

Option R&S SMx/AMU-K43 3GPP FDD enhanced MS/BS tests incl. HSDPA extends the 3GPP FDD signal generation with simulation of high speed channels in the downlink (HS-SCCH, HS-PDSCH) and the uplink (HS-DPCCH) and with dynamic power control in real time. HSDPA (high speed downlink packet access) mode enhances the 3GPP FDD standard by data channels with high data rates especially for multi media applications.

Option R&S SMx/AMU-K45 3GPP HSUPA extends the 3GPP FDD signal generation with full HSUPA (high speed uplink packet access) support. Option R&S SMx/AMU-K59 3GPP FDD HSPA+ extends the HSDPA and/or HSUPA signal generation with HSPA+ features in the downlink and uplink.

WCDMA (Wideband CDMA) describes a group of mobile radio communication technologies, the details of which differ greatly. The R&S Signal Generator supports the 3GPP FDD standard developed by the 3GPP ("3rd Generation Partnership Project") standardization committee. The standard is implemented in accordance with Release 9. The signals can also be set to be compatible with previous releases, by not using the new functions of later releases (e.g. no HSDPA channels). Details can be found in the relevant releases of the standard.

The R&S Signal Generator generates the 3GPP FDD signals in a combination of realtime mode (enhanced channels) and arbitrary waveform mode. Channel coding and simulation of bit and block errors can be activated for the enhanced channels of Release 99 and for H-Sets 1-5 generated in realtime. Channel coding can also be activated for HSDPA/HSPA+ H-Sets and all HSUPA/HSPA+ FRC channels which are generated in arbitrary wave mode. Data lists can also be used for the data and TPC fields. The enhanced state of realtime channels can be switched off to generate specific test scenarios. In arbitrary waveform mode, the signal is first calculated and then output.

The R&S Signal Generator simulates 3GPP FDD at the physical channel level and also at the transport layer level for all channels for which channel coding can be activated.

The following list gives an overview of the functions provided by the R&S Signal Generator for generating a 3GPP FDD signal (Option R&S SMx/AMU-K42):

- Configuration of up to 4 base stations and 4 user equipment.
- Combination of realtime mode (enhanced channels) and arbitrary waveform mode
- All special channels and up to 512 channels on the downlink, except HSDPA, HSUPA and HSPA+
- Various test models and pre-defined settings for the uplink and the downlink

- Modulation 16QAM and 64QAM (downlink) for configuring high-speed channels in continuous mode (test model 5&6, HSDPA)
- Clipping for reducing the crest factor
- Misuse TPC" parameter for varying the original normal transmit power over time
- Simulation of up to 128 additional user equipment

The following functions are provided specifically for the receiver test:

- Realtime generation of up to 4 code channels with the option of using data lists for the data and TPC fields
- Channel coding of the reference measurement channels, AMR and BCH in real-time
- Feeding through of bit errors (to test a BER tester) and block errors (to test a BLER tester)
- Simulation of orthogonal channel noise (OCNS in accordance with TS 25.101)
- Presettings in accordance with 3GPP specifications
- HSDPA Downlink in continuous mode (test model 5&6 for TX tests)

The following functions are provided by extension K43 Enhanced BS/MS Tests Including HSDPA:

- HSDPA uplink
- HSDPA downlink (packet mode and H-Set mode without CPC, 64QAM and MIMO)
- Dynamic Power Control
- Predefined and user-definable H-Sets
- Assistance in the setting of the appropriate sequence length for arbitrary waveform mode

The following functions are provided by extension K45 3GPP FDD HSUPA:

- HSUPA Downlink (RX measurements on 3GPP FDD UEs with correct timing)
- HSUPA Uplink (RX measurements on 3GPP FDD Node BS supporting HSUPA)
- HSUPA HARQ Feedback support

The following functions are provided by extension K59 3GPP FDD HSPA+:

- Downlink 64QAM with channel coding
- Uplink 16QAM (4PAM)
- Downlink MIMO
- Uplink ACK/PCI/CQI feedback for downlink MIMO and/or Dual Cell HSDPA
- CPC in downlink (HS-SCCH less operation, Enhanced F-DPCH) and uplink (UL-DTX, Uplink DPCCH slot format 4)
- Support for the generation of 3i OCNS and for randomly varying modulation and the number of HS-PDSCH channels in H-Set over time (type 3i enhanced performance requirements tests).

Parameter	Value
Chip rate	3.84 Mcps
Channel types	Downlink: • Primary Common Pilot Channel (P-CPICH) • Secondary Common Pilot Channel (S-CPICH) • Primary Sync Channel (P-SCH) • Secondary Sync Channel (S-SCH) • Primary Common Control Phys. Channel (P-CCPCH) • Secondary Common Control Phys. Channel (S-CCPCH) • Page Indication Channel (PICH) • Acquisition Indication Channel (AICH) • Access Preamble Acquisition Indication Channel (AP-AICH) • Collision Detection Acquisition Indication Channel (CD-AICH) • Phys. Downlink Shared Channel (PDSCH) • Dedicated Physical Control Channel (DL-DPCCH) • Dedicated Phys. Channel (DPCH) • High Speed Shared Control Channel (HS-SCCH) • High Speed Physical Downlink Shared Channel (HS-PDSCH), Modulation QPSK, 16 QAM or 64QAM • HSUPA channels (E-AGCH, E-RGCH, E-HICH, F-DPCH) Uplink: • Phys. Random Access Channel (PRACH) • Phys. Common Packet Channel (PCPCH) • Dedicated Physical Control Channel (DPCCH) • Dedicated Physical Data Channel (DPDCH) • High Speed Dedicated Physical Control Channel (HS-DPCCH) • E-DCH Dedicated Physical Control Channel (E-DPCCH) • E-DCH dedicated physical data channel (E-DPDCH)
Symbol rates	7.5 ksps, 15 ksps, 30 ksps to 960 ksps depending on the channel type (downlink) 15 ksps, 30 ksps, 60 ksps to 1920 ksps depending on the channel type (uplink)
Channel count	In downlink 4 base stations each with up to 128 DPCHs and 11 special channels. In uplink 4 user equipment either with PRACH or PCPCH or a combination of DPCCH, up to 6 DPDCH, HS-DPCCH, E-DPCCH and up to 4 E-DPDCH channels.
Frame structure	Timeslot: 0.667 ms, Subframe: 3 timeslots = 2 ms Radio frame: 15 timeslots = 10 ms The frame structure in symbols depends on the symbol rate.
Scrambling code	Downlink: 18 bit M sequence Uplink: 25 bit M sequence in long mode and 8 bit M sequence in short mode
Channelization code for most of the channel types	"Orthogonal Variable Spreading Factor Code (OVSF)" square matrix of dimension chip rate/symbol rate

3 About the 3GPP FDD Options

Some background knowledge on basic terms and principles used in the 3GPP FDD modulation system is provided here for better understanding of the required configuration settings.

3.1 Modulation System 3GPP FDD

The following block diagram shows the components of the 3GPP FDD transmission system.

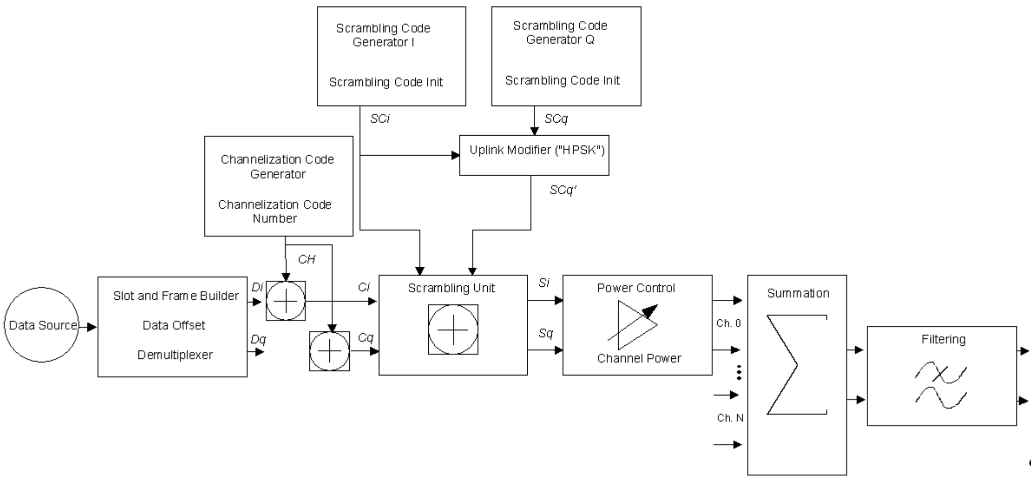


Fig. 3-1: Components of the 3GPP FDD transmission system

3.1.1 Scrambling Code Generator

The scrambling code generator (previously called long code generator) is used to scramble the chip sequence as a function of the transmitter.

Depending on the link direction and mode (long or short), the structure and initialization regulation of the generator are different.

3.1.1.1 Downlink Scrambling Code Generator

This generator consists of a pair of shift registers from which the binary sequences for inphase and orthogonal component of the scrambling code are determined. The figure 3-2 shows that the I component is produced as EXOR operation of the LSB outputs, whereas the register contents are first masked and read out for the Q component and then EXORed.

Table 3-1: Generator polynomials of the downlink scrambling code generators

Shift register 1	$x^{18}+x^{7}+1$
Shift register 2	$x^{18}+x^{10}+x^{7}+x^{5}+1$

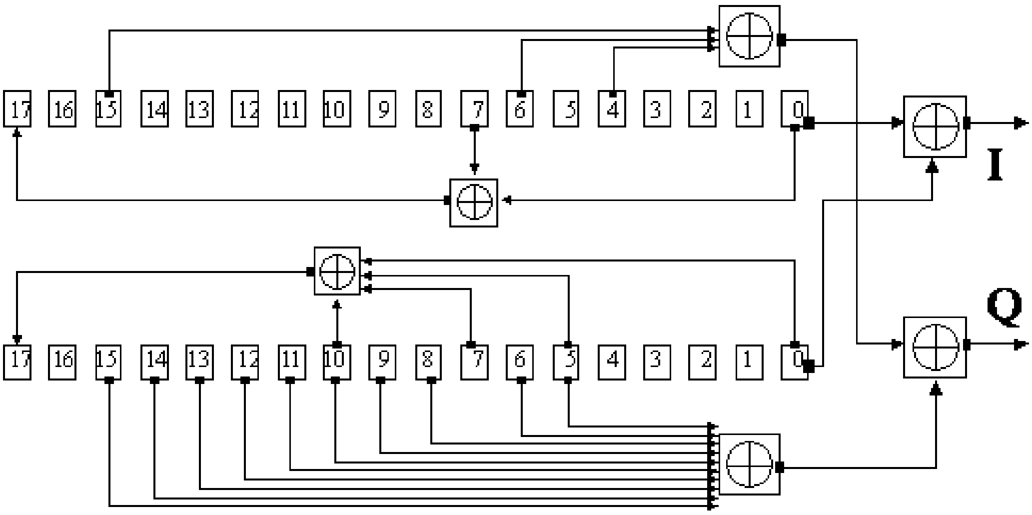


Fig. 3-2: Structure of downlink scrambling code generator

The shift registers are initialized by loading shift register 1 with "0...01" and shift register 2 completely with "1". In addition, shift register 1 is wound forward by n cycles, n being the scrambling code number or Scrambling Code (SC) for short.

After a cycle time of one radio frame the generators are reset, i.e. the above initialization is carried out again.

3.1.1.2 Uplink Scrambling Code Generator

In the uplink, a differentiation is made between two SC modes. The long SC, on the one hand, can be used for all types of channel. The short SC, on the other hand, can be used as an alternative to the long SC for all channels except PRACH and PCPCH.

Uplink long scrambling code

Principally, the code generator of the long SC in the uplink is of the same structure as the SC in the downlink. However, the generator polynomials of the shift registers and the type of initialization are different.

Table 3-2: Generator polynomials of the uplink long scrambling code generator

Shift register 1	$x^{25}+x^{3}+1$
Shift register 2	$x^{25}+x^{3}+x^{2}+x+1$

The shift registers are initialized by allocating 1 to shift register 1 bit number 24 and the binary form of the scrambling code number n to bits 23 to 0. Shift register 2 is completely loaded with "1".

The read-out positions for the Q component are defined such that they correspond to an IQ offset of 16.777.232 cycles.

After a cycle time of one radio frame the generators are reset, i.e. the above initialization is carried out again.

Uplink short scrambling code

The code generator of the short SC in the uplink consists of a total of 3 coupled shift registers.

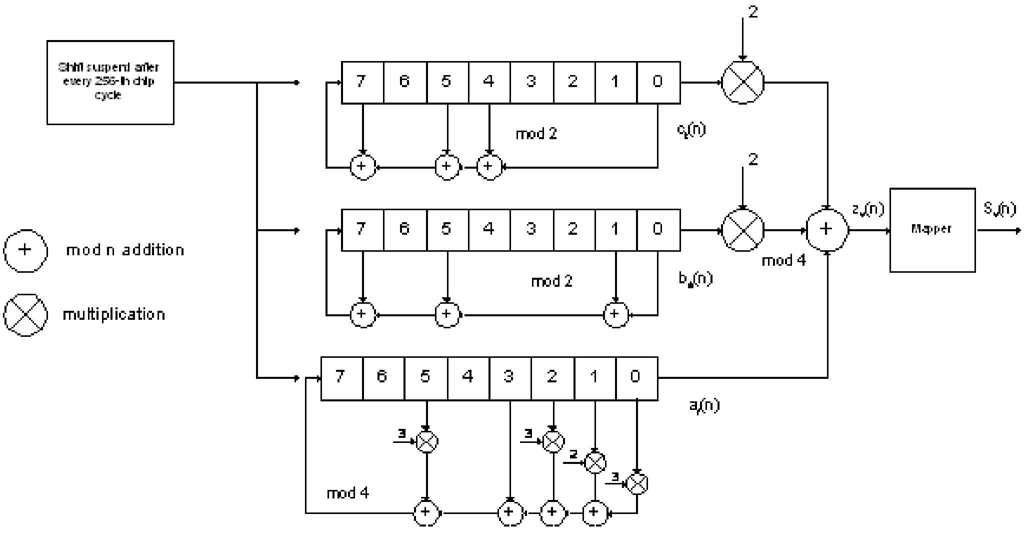


Fig. 3-3: Structure of uplink short scrambling code generator

Table 3-3: Generator polynomials of uplink short scrambling code generator

Shift register 1 (binary)	$x^8+x^7+x^5+x^4+1$
Shift register 2 (binary)	$x^8+x^7+x^5+x+1$
Shift register 3 (quaternary)	$x^8+x^5+3x^3+x^2+2x+1$

The output sequences of the two binary shift registers are weighted with factor 2 and added to the output sequence of the quaternary shift register (Modulo 4 addition). The resulting quaternary output sequence is mapped into the binary complex level by the mapper block.

For initialization of the three 8-bit shift registers (in a modified way) the binary form of the 24-bit short SC number n is used, for details see 3GPP TS 25 213, Spreading and Modulation.

Table 3-4: Mapping of the quaternary output sequence into the binary IQ level

zv(n)	Sv(n)
0	+1 + j1
1	-1 + j1

zv(n)	Sv(n)
2	-1 - j1
3	+1 - j1

Preamble scrambling code generator

When generating the preambles of the PRACH and PCPCH a special SC is used. It is based on the Long SC described under a), however only the I component is taken and subsequently a pointer ($e^{j(PI/4 + PI/4 * k)}$, k=0 to 4095) modulated upon it.

Modification of the long and short scrambling code output sequence

The scrambling code sequence of the Q component is modified as standard to reduce the crest factor of the signal. Zero-crossings can thus be avoided for every second cycle. (This method is often called "HPSK").

For details see 3GPP TS 25 213, Spreading and Modulation. The R&S Signal Generator makes use of a decimation factor of 2.

3.1.2 Scrambling Unit

In the scrambling unit, the output of the scrambling code generator is linked with spread symbols. If the input signal and the scrambling code signal are interpreted as complex signal (C_i , C_q , SC_i , $SC_q' \in \{ -1, +1 \}$), the output signal is a complex multiplication of the two signals:

$S_i + j S_q = (C_i + j C_q) * (SC_i + j SC_q')$

and the following equations apply

$S_i = C_iSC_i – C_qSC_q'$

$S_q = C_iSC_q' + C_qSC_i$

The signal thus obtained can be interpreted as a QPSK signal with the following constellation diagram:

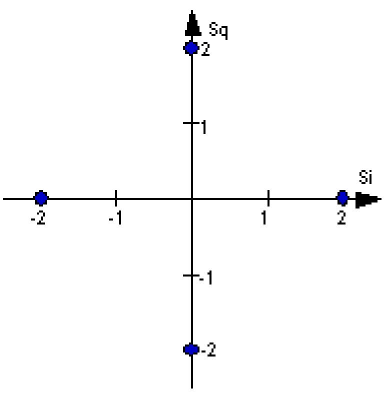


Fig. 3-4: Constellation diagram of a channel with 0 dB power

There are auxiliary conditions for some types of channels that may result in different constellation diagrams. If, for instance, symbols of the SCH are coded, a BPSK constellation is obtained without the scrambling unit.

Furthermore, with HSDPA and HSPA+, the higher order modulations 4PAM, 16QAM and 64QAM were introduced.

3.1.3 Channelization Code Generator

The channelization code generator cyclically outputs a channel-specific bit pattern. The length of the cycle corresponds to the period of the source symbol to be spread, i.e. the number of bits corresponds to the spread factor. The spreading sequence for the I and Q branch is identical (real value). Spreading is a simple EXOR operation.

Two different channelization code generators are used depending on the type of channel:

Channelization code generator for all channels except SCH

Due to this channelization code the channel separation takes place in the sum signal. The channelization code number is the line of an orthogonal spreading matrix which is generated according to an iterative scheme ("OVSF").

Channelization code generator SCH

This generator replaces the one described above if the synchronization code symbol of the SCH channels is spread.

The spreading matrix is replaced by a method that forms the spreading sequence from a Hadamard sequence and a statistical sequence. For details see 3GPP TS 25 213.

3.1.4 Data Source

The data and TPC fields of the enhanced channels (realtime channels) can be filled from data lists containing data defined by the user. This allows user information from the physical layer or from higher layers such as the transport layer to be introduced into the signal generation process.

The choice of data sources is crucially important for the signal characteristics. The constellation diagram and the crest factor in particular are modeled to a great extent by a suitable choice of data.

3.1.5 Slot and Frame Builder

The bits from the data source are first entered into a frame structure. The frames are made up of three hierarchical levels:

Table 3-5: Hierarchical structure of 3GPP FDD frames

Hierarchy	Length in ms	Remarks
Timeslot	0,667	
Subframe	2 ms	One subframe consists of 3 timeslots.
Radio frame	10	After a radio frame, pilot symbols are repeated. One radio frame consists of 15 timeslots. A frame is also the length of a scrambling code cycle. Frames are the basic unit. The sequence length is stated in radio frames.

The configuration of the timeslots depends on the channel type and symbol rate. The following components are distinguished:

- **Pilot sequence**
  The pilot sequence characterizes the timeslot position within the radio frame and also depends on the symbol rate, transmit diversity and the pilot length parameter.Channel types DPCH, S-CCPCH, DL-DPCCH, DPCCH, PRACH and PCPCH have a pilot sequence.
  The pilot sequence cannot be changed by the user.
- **Synchronization code symbol**
  The synchronization code symbol is the only symbol of the SCH.
- **TPC symbol**
  This symbol is used to control the transmit power. It is used in DPCH, DL-DPCCH and DPCCH.
  A bit pattern for the sequence of TPC symbols can be indicated as a channel-specific pattern.
- **Data symbols**
  These symbols carry the user information and are fed from the data source. They are used in DPCH, P-CCPCH, S-CCPCH, PDSCH, E-AGCH, E-RGCH, E-HICH, DPDCH, PRACH, PCPCH, HS-PDSCH and E-DPDCH.
- **Signature**
  The signature is used in PRACH and PCPCH. 16 fixed bit patterns are defined of which the user may select one.
- **TFCI**
  The "Transport Format Combination Indicator" is used in DPCH/DPCCH if the state is set to On. In this case, a code sequence with the length of 30 is defined using this value and distributed among 15 subsequent timeslots. In PRACH and PCPCH, the TFCI field is provided as standard.
- **FBI**
  Feedback indication bits are only used in DPCCH and PCPCH.

3.1.6 Timing Offset

The symbol stream can be shifted in time relative to the other channels. For this purpose a timing offset can be entered into the channel table, stating the range of shifting in multiples of 256 chips. Since the generator does not generate infinite symbol streams like a real-time system, this offset is implemented as a rotation.

Example:

DPCH 30 ksps, 1 timeslot, timing offset = 2;

2 x 256 chips = 512 chip offset;

4 data symbols shifting at a symbol rate of 30 ksps (1 symbol corresponds to 3.84 Mcps / 30 ksps = 128 chips).

previously:

11	11	11	11	00	01	10	11	00	10	01	11	11	01	00	01	10	11	01	00

afterwards:

10	11	01	00	11	11	11	11	00	01	10	11	00	10	01	11	11	01	00	01

The use of the timing offset usually causes a reduction of the crest factor of the total signal, since it is not always the same spreading chips (channelization chips) CH and scramble chips SC_i/SC_q' that are applied to the pilot sequences of the channels.

3.1.7 Demultiplexer

In the downlink, the symbol stream is divided into two bit streams Di and Dq prior to processing in the spreading unit. For example, if QPSK modulation is used for a channel, the symbol stream is divided by allocating bits 1, 3, 5, to 2n-1 to the in-phase bit stream Di, and bits 2, 4, 6, 2n to the quadrature bit stream Dq.

For the above example with timing offset:

D_i = 1 1 0 0 1 1 1 1 0 0 1 1 0 1 0 1 1 0 0 0

D_q = 0 1 1 0 1 1 1 1 0 1 0 1 0 0 1 1 1 1 0 1

(left-hand bit is always the first one in the time sequence)

In the uplink, independent data are used for the two paths.

PRACH/PCPCH:	Preamble : signature parallel to I and Q
	Message part : data to I, pilot, TPC and TFCI to Q
DPCCH/E-DPCCH:	all bits to I, Q always unused
DPDCH/HS-DPCCH/E-DPDCH:	all bits are always to I or Q (dependent on channel number), the other path is unused.

3.1.8 Power Control

After spreading and scrambling, a channel-specific power factor p is applied to the signal. A value of -6 dB therefore results in half the level (or ¼ power) and the following diagram (DPCH):

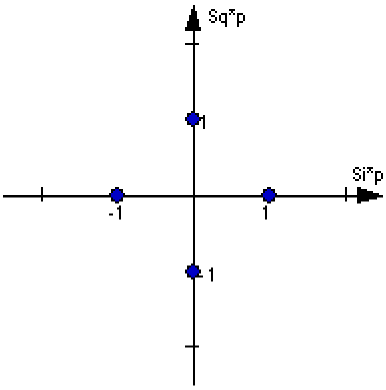


Fig. 3-5: Constellation diagram of a channel with –6 dB power

3.1.9 Summation and Filtering

After application of the channel power, the components of the individual channels are summed up.

The constellation diagram of the sum signal is obtained by superposition of the diagrams of the individual channels. If the signal consists of two channels with a power of -6 dB and -12 dB and each channel contains independent source data (DPCH), the following constellation diagram is obtained:

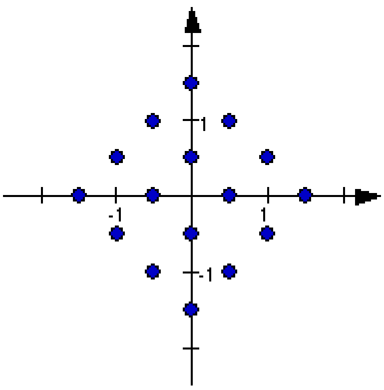


Fig. 3-6: Constellation diagram of a 3GPP W-CDMA signal with two DPCH channels

3.1.10 Multicode

3GPP FDD supports multicode transmission for downlink-dedicated physical channels (DPCH).

This form of transmission is used for channels intended for the same receiver, i.e. those receivers that belong to a radio link. The first channel of this group is used as a master channel.

Shared parts (pilot, TPC and TCFI) are spread for all channels using the spreading code of the master channel.

Instead of changing the spreading code within a slot several times, the master code rather than the shared parts can be sent at higher power. The other channels then have to be blanked out correspondingly.

3.1.11 Orthogonal Channel Noise (OCNS)

With Orthogonal Channel Noise, a practical downlink signal is generated to test the maximum input levels of user equipment in accordance with standard specifications. This simulates the data and control signals of the other orthogonal channels in the downlink. 3GPP TS 25.101 contains a precise definition of the required appearance of the OCNS signal.

Four different OCNS scenarios are defined in the standard; one "standard" scenario, two scenarios for HSDPA test cases and one scenario for type 3i enhanced performance requirements tests according to 3GPP TS34.121-1 ("other user's channels").

When activating OCNS and depending on the selected OCNS mode, different channel groups with different presetting are assigned as in the following tables. These channels cannot be edited in the channel table.

3.1.11.1 Standard, HSDPA and HSDPA2 modes

For the "Standard", "HSDPA" and "HSDPA2" modes, the OCNS channels are all normal DPCHs. The symbol rate is set at 30 kps and the pilot length to 8 bits.

The powers of the OCNS channel outputs are relative. In the R&S Signal Generator, the power of the OCNS component is automatically set so that OCNS channels supplement the remaining channels in base station 1 to make a total power of 0 dB (linear 1).

It is not possible to adapt the OCNS power if the linear power of the remaining channels is >1, this will produce an error message. The OCNS channels are then given the maximum power (all -80 dB).

The "Total Power" display is updated after automatic calculation of the output; it is not possible to use "Adjust Total Power" to make the setting.

Table 3-6: Defined settings for the OCNS signal in base station 1 in Standard mode

Chan. code	Timing offset (x256Tchip)	Level setting (dB)	Channel type	Symbol rate	Pilot length
2	86	-1	DPCH	30 ksps	8 bit
11	134	-3	DPCH	30 ksps	8 bit
17	52	-3	DPCH	30 ksps	8 bit
23	45	-5	DPCH	30 ksps	8 bit
31	143	-2	DPCH	30 ksps	8 bit
38	112	-4	DPCH	30 ksps	8 bit
47	59	-8	DPCH	30 ksps	8 bit

Chan. code	Timing offset (x256Tchip)	Level setting (dB)	Channel type	Symbol rate	Pilot length
55	23	-7	DPCH	30 ksps	8 bit
62	1	-4	DPCH	30 ksps	8 bit
69	88	-6	DPCH	30 ksps	8 bit
78	30	-5	DPCH	30 ksps	8 bit
85	18	-9	DPCH	30 ksps	8 bit
94	30	-10	DPCH	30 ksps	8 bit
125	61	-8	DPCH	30 ksps	8 bit
113	128	-6	DPCH	30 ksps	8 bit
119	143	0	DPCH	30 ksps	8 bit

Table 3-7: Defined settings for the OCNS signal in base station 1 in HSDPA mode

Channelization code at SF=128	Relative Level setting (dB)	Channel type	Symbol rate	Pilot length
122	0	DPCH	30 ksps	8 bit
123	-2	DPCH	30 ksps	8 bit
124	-2	DPCH	30 ksps	8 bit
125	-4	DPCH	30 ksps	8 bit
126	-1	DPCH	30 ksps	8 bit
127	-3	DPCH	30 ksps	8 bit

Table 3-8: Defined settings for the OCNS signal in base station 1 in HSDPA2 mode

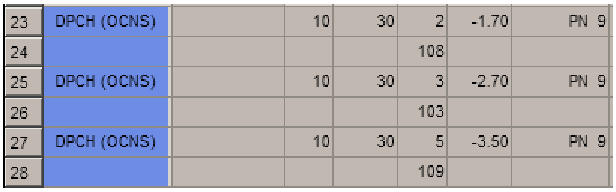
Channelization code at SF=128	Relative Level setting (dB)	Channel type	Symbol rate	Pilot length
4	0	DPCH	30 ksps	8 bit
5	-2	DPCH	30 ksps	8 bit
6	-4	DPCH	30 ksps	8 bit
7	-1	DPCH	30 ksps	8 bit

3.1.11.2 3i OCNS mode

(Requires options R&S SMx/AMU-K43 and -K59)

In the "3i" OCNS mode, 16 DPCH channels are inserted in the BS 1 channel according to 3GPP TS34.121-1, chapter E.5E.

According to 3GPP TS34.121-1, table E.5E.1.3, the channelization code of each of these channels changes randomly on a symbol-by-symbol basis between two possible values.



23	DPCH (OCNS)		10	30	2	-1.70	PN 9
24					108		
25	DPCH (OCNS)		10	30	3	-2.70	PN 9
26					103		
27	DPCH (OCNS)		10	30	5	-3.50	PN 9
28					109		

Fig. 3-7: Channel table (first three DPCHs only)

The power control sequence modeling according to 3GPP TS34.121-1, chapter E.5E.3 is applied to these channels; the power relationship between these channels is according to 3GPP TS34.121-1, table E.5E.1.3 only during the very first slot, and can deviate in the subsequent slots up to a certain range, but the total power of these channels is maintained constant (by normalization).

If the "3i" OCNS mode is activated (and the "3GPP FDD > State > On"), the OCNS channels are automatically leveled in order to have a total power of 0 dB for all channels of BS 1.

Table 3-9: Defined settings for the OCNS signal in base station 1 in 3i mode

Slot format	**Symbol Rate, kbps**	**First Ch. Code of the channel**	**Second Ch. Code of the channel**	**Relative Power, dB (prior to the 0 dB adjustment)**
10	30	2	108	-1.7
10	30	3	103	-2.7
10	30	5	109	-3.5
10	30	6	118	-0.8
10	30	90	4	-6.2
10	30	94	123	-4.6
10	30	96	111	-2.3
10	30	98	106	-4.1
10	30	99	100	-3.1
10	30	101	113	-5.1
12	60	52	44	0.0
10	30	110	124	-4.6
10	30	114	115	-4.8
10	30	116	126	-4.8
12	60	60	46	-1.1
10	30	125	95	-4.1

Refer to chapter 4.13.9, "Randomly Varying Modulation And Number Of Codes (Type 3i) Settings", on page 124 for description of the further settings required for the 3i Enhanced Performance Requirements tests according to 3GPP TS34.121-1.

3.1.12 HARQ Feedback

R&S SMBV instruments do not support HARQ Feedback.

The HARQ Feedback functionality extends the basic 3GPP FDD option in order to meet the requirements defined in 3GPP TS 25.141, chapter 8.12 and 8.13.

This allows the user to dynamically control the transmission of the HSUPA fixed reference channels (FRC 1-7), the HSPA+ fixed reference channel (FPC 8) and the user defined fixed reference channels. An ACK from the base station leads to the transmission of a new packet while a NACK forces the instrument to retransmit the packet with a new channel coding configuration (i.e. new redundancy version RV) of the concerned HARQ process.

3.1.12.1 Limitations

Although an arbitrary data source can be selected, the same user data is used for all HARQ processes and for all retransmissions.

Example:
If FRC4 is configured and the data source is set to PN9, then the first 5076 bits of the PN9 are used as input for all four HARQ processes, regardless of which retransmission is performed. Note that the bitstream after channel coding of course is different for different retransmissions due to different redundancy versions.

Furthermore, "DTX-Mode" and "Bit-Error-Insertion/Block-Error-Insertion" are not available in this mode.

3.1.12.2 Setup

If an instrument with fading simulation is available, no more test equipment is needed in order to fulfill the test setup described in 3GPP TS 25.141, Annex B.3.4.

As the instrument has no RF input available, the HARQ feedback from the base station is expected as a TTL signal. The instrument provides two input connectors for this signal, the LEVATT connector on the external AUX I/O BNC adapter board R&S SMx-Z5 and the USER 1 connector on the instrument. Use the parameter Connector (HARQ) to enable the currently used in each baseband.

A high level (TTL) is interpreted as an ACK, while a low level corresponds to a NACK. Use the parameter ACK Definition (HARQ) to re-defined it.

3.1.12.3 Timing

In general, the ACK/NACK feedback from the base station should be available at the selected instruments connector (LEVATT or the USER 1) with the same timing the E-HICH is transmitted. The instrument will read out this port at time T_{SMx} after the start of the HARQ process the feedback is related to (see figure 3-8). The user is able to adjust this time via the parameter Additional User Delay parameter. The signal should be constant on this instrument's input for 0.5 ms before and after the defined point in time.

As it probably takes some time for the base station to be synchronized to the signal transmitted from the instrument, the ACK/NACK feedback should be NACK during this period, in order to force the instrument to retransmit the packets, until the first packet is read out correctly from the base station.

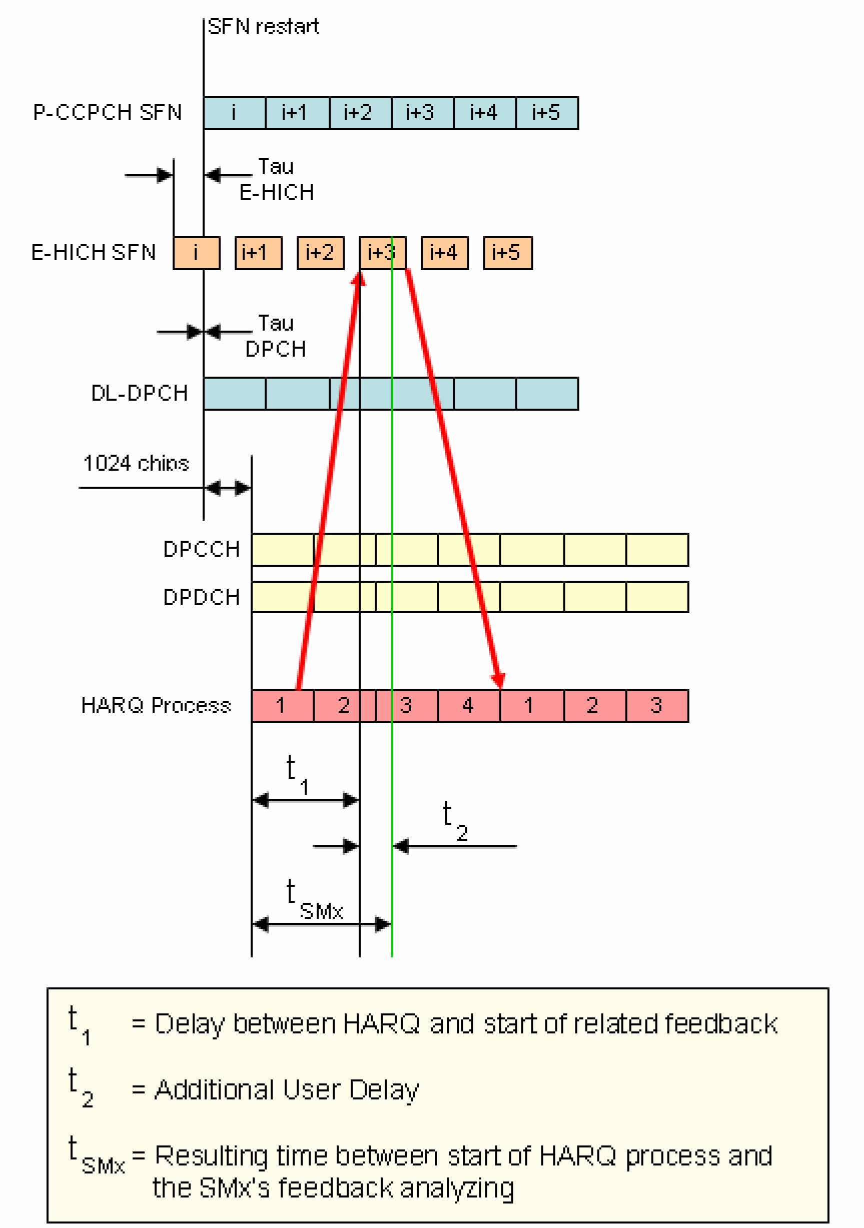


Fig. 3-8: Timing diagram for TTI 10ms, tau_dpch = 0, tau_E-HICH = -7slots

3.1.13 HS-SCCH less operation

HS-SCCH less operation is a special HSDPA mode of operation which reduces the HS-SCCH overhead and reduces UE battery consumption. It changes the conventional structure of HSDPA data reception. In HSDPA as defined from 3GPP release 5 onwards, UE is supposed to read continuously HS-SCCH where data allocations are being signaled. The UE is being addressed via a UE specific identity (16 bit H-RNTI / HSDPA Radio Network Temporary Identifier) on HS-SCCH. As soon as the UE detects relevant control information on HS-SCCH it switches to the associated HS-PDSCH resources and receives the data packet.

This scheme is fundamentally changed in HS-SCCH less operation and HS-SCCH less operation is optimized for services with relatively small packets, e.g. VoIP.

In HS-SCCH less operation mode, the base station can decide for each packet again whether to apply HS-SCCH less operation or not, i.e. conventional operation is always possible.

The first transmission of a data packet on HS-DSCH is done without an associated HS-SCCH. The first transmission always uses QPSK and redundancy version Xrv = 0. Only four pre-defined transport formats can be used so the UE can blindly detect the correct format. The four possible transport formats are configured by higher layers. Only predefined channelization codes can be used for this operation mode and are configured per UE by higher layers: the parameter HS-PDSCH code index provides the index of the first HS-PDSCH code to use. For each of the transport formats, it is configured whether one or two channelization codes are required.

In order to allow detection of the packets on HS-DSCH, the HS-DSCH CRC (Cyclic Redundancy Check) becomes UE specific based on the 16 bit HRNTI. This is called CRC attachment method 2 (CRC attachment method 1 is conventional as of 3GPP release 5).

In case of successful reception of the packet, the UE will send an ACK on HS-DPCCH. If the packet was not received correctly, the UE will send nothing.

If the packet is not received in the initial transmission, the base station may retransmit it. The number of retransmissions is limited to two in HS-SCCH less operation.

In contrast to the initial transmission, the retransmissions are using HS-SCCH signaling. However, the coding of the HS-SCCH deviates from release 5, since the bits on HS-SCCH are re-interpreted. This is called HS-SCCH type 2. The conventional HS-SCCH as of 3GPP release 5 is called HS-SCCH type 1.

3.1.13.1 HS-SCCH Type 2

The table below gives a comparison of the HS-SCCH Type 1 (normal operation) and HS-SCCH Type 2 (Less Operation) formats.

Table 3-10: Comparison of HS-SCCH Type 1 and Type 2

HS-SCCH Type 1 (normal operation)	HS-SCCH Type 2 (less operation)
Channelization code set information (7 bits) Modulation scheme information (1 bit) Transport block size information (6 bits) HARQ process information (3 bits) Redundancy and constellation version (3 bits) New data indicator (1 bit) UE identity (16 bits)	Channelization code set information (7 bits) Modulation scheme information (1 bit) Special Information type (6 bits) Special Information (7 bits) UE identity (16 bits)

The Special Information type on HS-SCCH type 2 must be set to 111110 to indicate HS-SCCH less operation. The 7 bits Special information then contains:

- 2 bit transport block size information (one of the four possible transport block sizes as configured by higher layers)
- 3 bit pointer to the previous transmission of the same transport block (to allow soft combining with the initial transmission)
- 1 bit indicator for the second or third transmission
- 1 bit reserved.

QPSK is also used for the retransmissions. The redundancy version Xrv for the second and third transmissions shall be equal to 3 and 4, respectively.

For the retransmissions, also HS-DSCH CRC attachment method 2 is used.

ACK or NACK are reported by the UE for the retransmitted packets.

3.1.13.2 HS-SCCH Type 2 Fixed Reference Channel: H-Set 7

In order to support HS-SCCH Type 2 (Less Operation) testing, a fixed reference channel has been introduced. H-Set 7 is specified as reference test channel for HSDPA test cases.

The H-Set 7 consists of one HS-PDSCH and its parameterization and coding chain is based on 1 code with QPSK modulation and one HARQ process.

3.1.14 Higher Order Modulation

3.1.14.1 64QAM in downlink

With the possibility to use 64QAM in downlink, HSPA+ can achieve downlink data rates of 21 Mbps. This theoretical peak data rate (physical channel bit rate) with 64QAM is calculated as follow:

Peak data rate (64QAM) = 15 [codes] * 2880 bits/ 2 ms [subframe] = 21.6 MBps

3.1.14.2 64QAM Fixed Reference Channel: H-Set 8

In order to support 64QAM testing, a fixed reference channel has been introduced. H-Set 8 is specified as reference test channel for HSPA+ test cases.

The H-Set 8 parameterization and coding chain is based on 15 codes with 64QAM modulation. Six Hybrid ARQ processes are used, and HS-DSCH is continuously transmitted.

3.1.14.3 16QAM in uplink

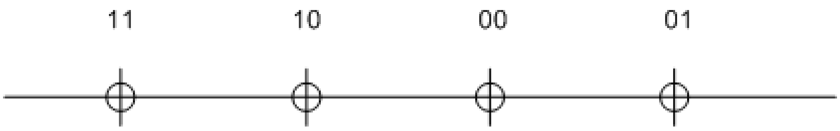
With the possibility to use 16QAM on E-DCH (Enhanced Dedicated Channel) in uplink, HSPA+ can achieve uplink peak data rates of 11.5 Mbps. A new uplink UE category 7 has been introduced which supports 16QAM in addition to BSPK.

Uplink transmission in HSPA+ is based on IQ multiplexing of E-DPDCH (Enhanced Dedicated Physical Data Channel) physical channels as in HSUPA of 3GPP release 6. In fact, the 16QAM constellation is made up of two orthogonal 4PAM (pulse amplitude modulation) constellations. In case of 4PAM modulation, a set of two consecutive binary symbols n_k, n_{k+1} is converted to a real valued sequence following the mapping described in the table below.

Table 3-11: Mapping of E-DPDCH with 4PAM modulation

n_k, n_{k+1}	00	01	10	11
Mapped real value	0.4472	1.3416	-0.4477	-1.3416

This results in the following symbol mapping:



An E-DPDCH may use BPSK or 4PAM modulation symbols.

3.1.14.4 16QAM Fixed Reference Channel: FRC 8

To support 16QAM (4PAM) testing in the uplink, a E-DPDCH fixed reference channel (FRC 8) has been introduced.

The FRC 8 parameterization and channel coding is based on four Physical Channel Codes (2xSF2 and 2xSF4) with overall symbol rate of 2x960 + 2x1920 ksps, 4PAM modulation and E-DCH TTI of 2 ms. Eight Hybrid ARQ processes are used.

3.1.15 MIMO in HSPA+

HSPA+ uses full MIMO approach including spatial multiplexing. The approach is called D-TxAA (Double Transmit Antenna Array). It is only applicable for the High Speed Downlink Shared Channel, the HS-DSCH.

The figure below shows the basic principle of the 2x2 approach. The figure is taken from 3GPP TS 25.214.

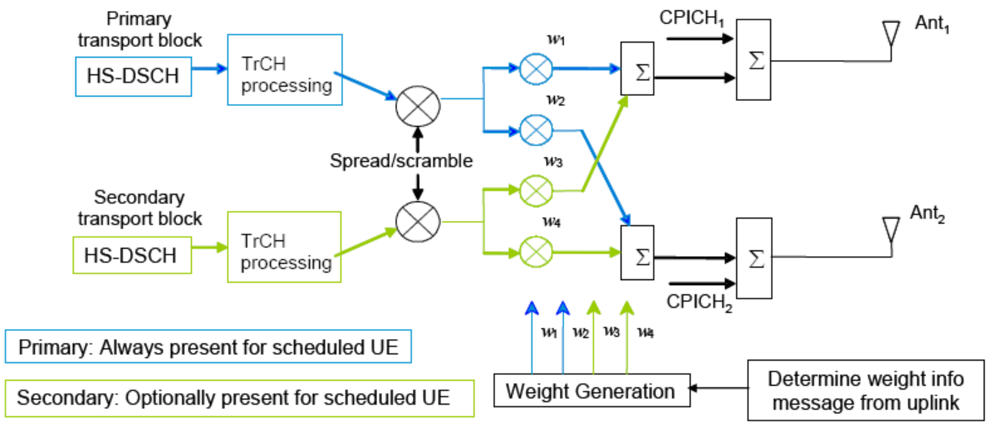


Fig. 3-9: MIMO for HSPA+

With D-TxAA, two independent data streams (transport blocks) can be transmitted simultaneously over the radio channel over the same WCDMA channelization codes. Each transport block is processed and channel coded separately. After spreading and scrambling, **precoding** based on weight factors is applied to optimize the signal for transmission over the mobile radio channel.

Four precoding weights w1- w4 are available. The first stream is multiplied with w1 and w2, the second stream is multiplied with w3 and w4. The weights can take the following values:

$$w_3 = w_1 = 1/\sqrt{2},$$

$$w_4 = -w_2,$$

$$w_2 \in \left\{ \frac{1+j}{2}, \frac{1-j}{2}, \frac{-1+j}{2}, \frac{-1-j}{2} \right\}$$

Precoding weight w1 is always fixed, and only w2 can be selected by the base station. Weights w3 and w4 are automatically derived from w1 and w2, because they have to be orthogonal.

3.1.15.1 D-TxAA Feedback signaling: PCI and CQI

D-TxAA requires a **feedback signaling** from the UE to assist the base station in taking the right decision in terms of modulation and coding scheme and precoding weight selection. The UE has to determine the preferred primary precoding vector for transport block 1 consisting of w1 and w2. Since w1 is fixed, the feedback message only consists of a proposed value for w2. This feedback is called **precoding control information (PCI)**. The UE also recommends whether one or two streams can be supported in the current channel situation. In case dual stream transmission is possible, the secondary precoding vector consisting of weights w3 and w4 is inferred in the base station, because it has to be orthogonal to the first precoding vector with w1 and w2. Thus, the UE does not have to report it explicitly. The UE also indicates the optimum modulation and coding scheme for each stream. This report is called **channel quality indicator (CQI)**.

Based on the composite PCI/CQI reports, the base station scheduler decides whether to schedule one or two data streams to the UE and what packet sizes (transport block sizes) and modulation schemes to use for each stream.

3.1.15.2 MIMO downlink control channel support

In order to support MIMO operation, changes to the HSDPA downlink control channel have become necessary, i.e. the HS-SCCH.

There is a new **HS-SCCH Type 3** for MIMO operation defined. The table below gives a comparison of the HS-SCCH Type 1 and Type 3 formats.

HS-SCCH Type 1	HS-SCCH Type 3	MIMO
(normal operation)	**One transport block**	**Two transports blocks**
Channelization code set information (7 bits) Modulation scheme information (1 bit) Transport block size information (6 bits) HARQ process information (3 bits) Redundancy and constellation version(3 bits) New data indicator (1 bit) UE identity (16 bits)	Channelization code set information (7 bits) Modulation scheme and number of transport blocks information (3 bits) Precoding weight information (2 bits) Transport block size information(6 bits) HARQ process information (4 bits) Redundancy and constellation version (2 bits) UE identity (16 bits)	Channelization code set information (7 bits) Modulation scheme and number of transport blocks information (3 bits) Precoding weight information for primary transport block (2 bits) Transport block size information for primary transport block (6 bits) Transport block size information for secondary transport block (6 bits) HARQ process information (4 bits) Redundancy and constellation version for primary transport block (2 bits) Redundancy and constellation version for secondary transport block (2 bits) UE identity (16 bits)

The "Precoding weight info for the primary transport block" contains the information on weight factor w2 as described above. Weight factors w1, w3, and w4 are derived accordingly. The number of transport blocks transmitted and the modulation scheme information are jointly coded as shown in table 3-12.

Table 3-12: Interpretation of "Modulation scheme and number of transport blocks info" sent on HS-SCCH

Modulation scheme + number of transport blocks info (3 bits)	Modulation for primary transport block	Modulation for secondary transport block	Number of transport blocks
111	16QAM	16QAM	2
110	16QAM	QPSK	2
101	64QAM 64QAM	n/a QPSK	1 2
100	16QAM	n.a.	1
011	QPSK	QPSK	2
010	64QAM	64QAM	2

Modulation scheme + number of transport blocks info (3 bits)	Modulation for primary transport block	Modulation for secondary transport block	Number of transport blocks
001	64QAM	16QAM	2
000	QPSK	n.a.	1

3.1.15.3 Redundancy Version

Redundancy versions for the primary transport block and for the secondary transport block are signaled. Four redundancy version values are possible (unlike HSDPA in 3GPP release 5 where eight values for the redundancy version could be signaled).

3.1.15.4 HARQ Processes

Also the signaling of the HARQ processes differs from HSDPA in 3GPP release 5. In 3GPP release 5, up to eight HARQ processes can be signaled. A minimum of six HARQ processes needs to be configured to achieve continuous data transmission. Similarly, in MIMO with dual stream transmission, a minimum of twelve HARQ processes would be needed to achieve continuous data transmission.

Each HARQ process has independent acknowledgements and retransmissions. In theory, HARQ processes on both streams could run completely independently from one another. This would however increase the signaling overhead quite significantly (to 8 bits), since each possible combination of HARQ processes would need to be addressed.

To save signaling overhead, a restriction is introduced: HARQ processes are only signaled for the primary transport block within 4 bits, the HARQ process for the secondary transport block is derived from that according to a fixed rule; according to 3GPP TS 25.212. Thus, there is a one-to-one mapping between the HARQ process used for the primary transport block and the HARQ process used for the secondary transport block. The relation is shown in the table below for the example of 12 HARQ processes configured.

Table 3-13: Combinations of HARQ process numbers for dual stream transmission (12 HARQ processes configured)

HARQ process number on primary stream	0	1	2	3	4	5	6	7	8	9	10	11
HARQ process number on secondary stream	6	7	8	9	10	11	0	1	2	3	4	5

Only an even number of HARQ processes is allowed to be configured with MIMO operation.

3.1.15.5 MIMO uplink control channel support

Also the uplink control channel for HSDPA operation is affected by MIMO, i.e. the HS-DPCCH (High Speed Dedicated Physical Control Channel). In addition to CQI reporting as already defined from 3GPP release 5 onwards, PCI reporting for precoding feedback is introduced. Channel coding is done separately for the composite precoding control indication (PCI) / channel quality indication (CQI) and for HARQ-ACK (acknowledgement or negative acknowledgement information). The figure below shows the principle.

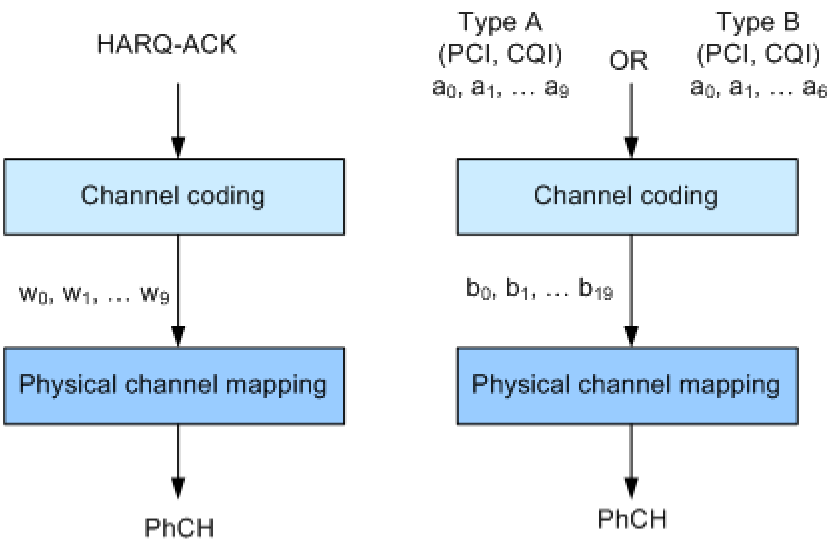


Fig. 3-10: Channel coding for HS-DPCCH (MIMO mode)

The 10 bits of the HARQ-ACK messages are interpreted according to 3GPP TS 25.212 (see table below). ACK/NACK information is provided for the primary and for the secondary transport block.

Table 3-14: Interpretation of HARQ-ACK in MIMO operation (non DC-HSDPA case)

HARQ-ACK message to be transmitted		w_0	w_1	w_2	w_3	w_4	w_5	w_6	w_7	w_8	w_9
HARQ-ACK in response to a single scheduled transport block											
ACK		1	1	1	1	1	1	1	1	1	1
NACK		0	0	0	0	0	0	0	0	0	0
HARQ-ACK in response to two scheduled transport blocks											
Response to primary transport block	Response to secondary transport block										
ACK	ACK	1	0	1	0	1	1	1	1	0	1
ACK	NACK	1	1	0	1	0	1	0	1	1	1
NACK	ACK	0	1	1	1	1	0	1	0	1	1
NACK	NACK	1	0	0	1	0	0	1	0	0	0
PRE/POST indication											
PRE		0	0	1	0	0	1	0	0	1	0
POST		0	1	0	0	1	0	0	1	0	0

3.1.15.6 CQI Reports: Type A and Type B

In MIMO case, two types of CQI reports shall be supported:

- **Type A CQI reports** can indicate the supported transport format(s) for the number of transport block(s) that the UE prefers. Single and dual stream transmissions are supported.
- **Type B CQI reports** are used for single stream transmission according to what has been defined from 3GPP release 5 onwards.

For type A CQI reports, the UE selects the appropriate CQI1 and CQI2 values for each transport block in dual stream transmission, or the appropriate CQIS value in single stream transmission, and then creates the CQI value to report on HS-DPCCH as follows:

$$CQI = \begin{cases} 15 * CQI_1 + CQI_2 + 31 & \text{when 2 transport blocks are preferred by the UE} \\ CQI_S & \text{when 1 transport block is preferred by the UE} \end{cases}$$

For dual stream transmission, new CQI tables are specified in 3GPP TS25.214 for correct interpretation of transport formats based on CQI1 and CQI2.

3.1.15.7 PCI reports

The PCI value to report in the uplink is created in the UE according to the preferred precoding weight w_2 according to the table below.

Table 3-15: Mapping of preferred precoding weight to PCI values

w_2^{pref}	$\frac{1+j}{2}$	$\frac{1-j}{2}$	$\frac{-1+j}{2}$	$\frac{-1-j}{2}$
PCI value	0	1	2	3

The PCI value shall be transmitted together with the CQI value as a composite PCI/CQI value. The figure below shows how the composite PCI/CQI report is created.

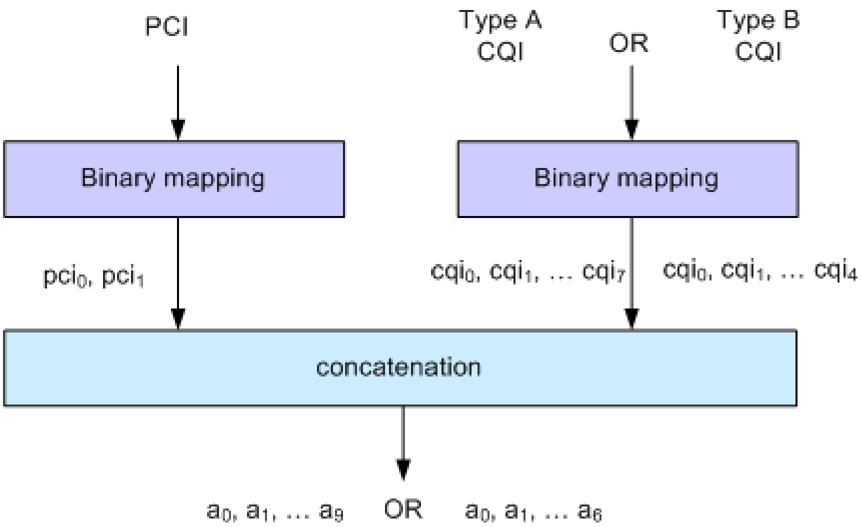


Fig. 3-11: Composite PCI/CQI information (MIMO mode)

3.1.15.8 MIMO Fixed Reference Channels: H-Set 9 and H-Set 11

In order to support MIMO testing, two fixed reference channels have been introduced. H-Set 9 and H-Set 11 are specified as reference test channel for HSPA+ test cases.

The H-Set 9 parameterization and coding chain is based on 15 codes with two different modulations, 16QAM and QPSK, for the primary and secondary transport blocks respectively. Six HARQ processes are used, and HS-DSCH is continuously transmitted.

The H-Set 11 parameterization and coding chain is also based on 15 codes and uses two different modulations, six HARQ processes and HS-DSCH is continuously transmitted. The modulation schemes specified for the H-Set 11 are however **64QAM** and **16QAM** for the primary and secondary transport blocks respectively.

3.1.16 Dual Cell HSDPA (DC-HSDPA)

Within 3GPP Release 7 the peak user throughout was significantly enhanced (MIMO, Higher Order Modulation). In order to fulfill the desire for even better and more consistent user experience across the cell the deployment of a second HSDPA carrier creates an opportunity for network resource pooling as a way to enhance the user experience, in particular when the radio conditions are such that existing techniques (e.g. MIMO) can not be used.

In DC-HSDPA operation the UE is configured with secondary serving HS-DSCH cell. With one HS-SCCH in each of the two cells scheduling flexibility to have different transport formats depending on CQI feedback on each carrier is maintained.

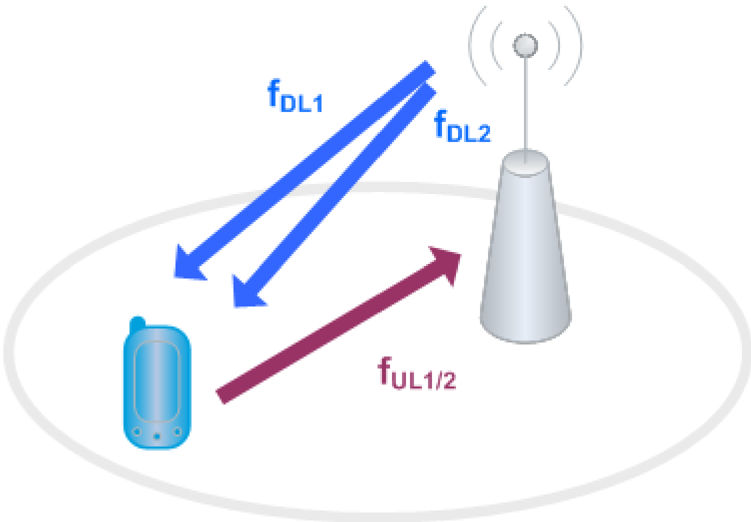


Fig. 3-12: Dual Cell HSDPA Operation

The following restrictions apply in case of DC-HSDPA operation:

- The dual cell transmission only applies to HSDPA physical channels
- The two cells belong to the same Node-B
- In Release 8 it is required that the two cells are on adjacent carriers; from Release 9 onwards the paired cells can operate on two different frequency bands.
- The two cells may use MIMO to serve UEs configured for dual cell operation

3.1.16.1 DC-HSDPA Data Acknowledgement (non MIMO mode)

When the UE is configured to work in DC-HSDPA non MIMO mode, the coding of the HS-DPCCH is performed according to the general coding flow, i.e. parallel coding of the HARQ-ACK and the CQI is performed. The figure below shows the principle.

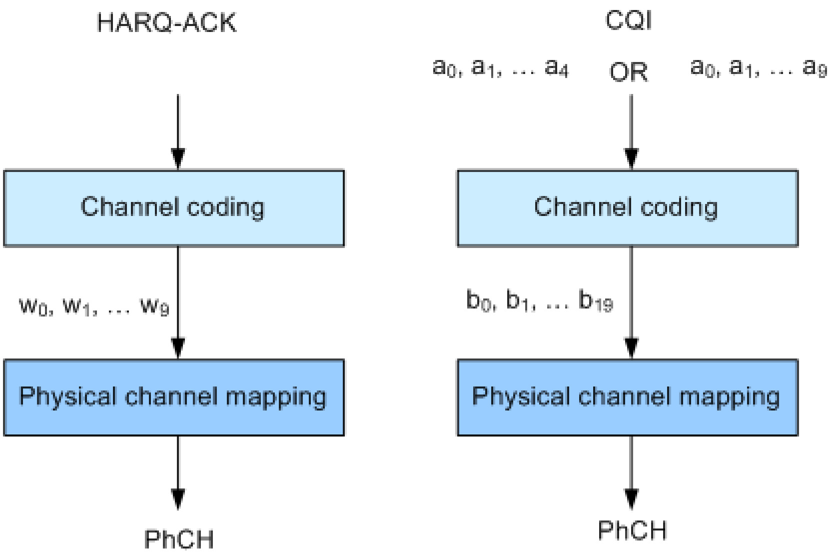


Fig. 3-13: Channel coding for HS-DPCCH (non MIMO mode)

The 10 bits of the HARQ-ACK messages are interpreted according to 3GPP TS 25.212 (see the table below). ACK/NACK information is provided for the transport block of the serving and secondary serving HS-DSCH cells.

Table 3-16: Interpretation of HARQ-ACK in DC-HSDPA non MIMO operation

HARQ-ACK message to be transmitted		w_0	w_1	w_2	w_3	w_4	w_5	w_6	w_7	w_8	w_9
HARQ-ACK in response to a single scheduled transport block, detected on the serving HS-DSCH cell											
ACK		1	1	1	1	1	1	1	1	1	1
NACK		0	0	0	0	0	0	0	0	0	0
HARQ-ACK in response to a single scheduled transport block, detected on the secondary serving HS-DSCH cell											
ACK		1	1	1	1	1	0	0	0	0	0
NACK		0	0	0	0	0	1	1	1	1	1
HARQ-ACK in response to a single scheduled transport block, detected on each of the serving and secondary serving HS-DSCH cells											
Response to transport block from setving HS-DSCH cell	Response to transport block from secondary serving HS-DSCH cell										
ACK	ACK	1	0	1	0	1	0	1	0	1	0
ACK	NACK	1	1	0	0	1	1	0	0	1	1
NACK	ACK	0	0	1	1	0	0	1	1	0	0
NACK	NACK	0	1	0	1	0	1	0	1	0	1
PRE/POST indication											

PRE		0	0	1	0	0	1	0	0	1	0
POST		0	1	0	0	1	0	0	1	0	0

CQI reports: CQI1 and CQI2

Two individual CQI reports CQI1 and CQI2 are concatenated to form the composite channel quality information. CQI1 corresponds to the serving HS-DSCH cell and CQI2 to the secondary serving cell respectively. The figure below show how the CQI report is constructed.

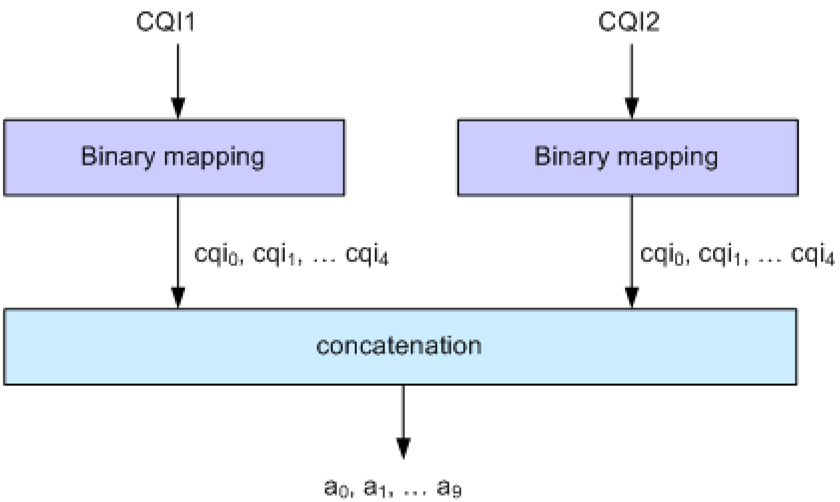


Fig. 3-14: Composite CQI information (DC-HSDPA operation, non MIMO mode)

3.1.16.2 DC-HSDPA + MIMO

Channel coding is done separately for the composite PCI/CQI and for HARQ-ACK information.

The principle is shown on figure figure 3-10.

The composite PCI/CQI report is created as illustrated on figure figure 3-11.

The HARQ-ACK message is coded to 10 bits according to 3GPP TS 25.212. The standard defines the HARQ-ACK coding for the feedback of the serving and secondary serving HS-DSCH cells for normal and dual stream transmission.

3.1.16.3 Dual Cell HSDPA (DC-HSDPA) Fixed Reference Channel: H-Set 12

In order to support DC-HSDPA testing, a fixed reference channel has been introduced. H-Set 12 is specified as reference test channel for HSDPA test cases.

The H-Set 12 parameterization and coding chain is based on 1 code with QPSK modulation. Six Hybrid ARQ processes are used, and HS-DSCH is continuously transmitted.

3.1.17 HS-DPCCH Extension for 4C-HSDPA and 8C-HSDPA

The 3GPP Release 11 extends the dual cell HSDPA (DC-HSDPA) transmission up to 8 cells HSDPA (8C-HSDPA). This extension basically enables the simultaneous scheduling of HSDPA transmission over 4 or 8 cells, one serving and up to three respectively up to seven secondary serving cells. The transmission on the serving cells are independent and are dynamically activated and deactivated.

For each of the cells, MIMO can be enabled. The channel coding of the feedback data transmitted via the HS-DPCCH is based on the same principle as in MIMO single cell transmission.

For detailed description on the channel coding, refer to the 3GPP specification TS 25.212.

The related instrument settings are described in chapter 4.32, "HS-DPCCH Settings - UE", on page 202.

3.1.18 Dual Cell HSUPA (Dual Cell E-DCH)

The Dual Cell HSUPA employs carrier aggregation in the uplink. The DC-HSUPA operation is available only in combination with the DC-HSDPA. This operation uses two independent carriers, each assigned to one of the DC-HSDPA "cells".

3.1.19 UE Capabilities

MIMO, 64QAM and DC-HSDPA operation in downlink as well as 16QAM in uplink are UE capability, i.e. not all UEs will have to support them.

Several UE categories have been introduced to provide:

- DL MIMO support and support of 64QAM in addition to 16QAM and QPSK in dowlink
- 16QAM support in uplink
- Support of dual cell operation and MIMO

The R&S Signal Generator supports all UE categories.

3.1.19.1 MIMO and 64QAM UE Capabilities

According to 3GPP TS25.306 V8.4.0, the following release 8 HS-DSCH categories with MIMO and 64QAM support are defined:

- Categories 13 and 14:
  Support of 64QAM
  No support of MIMO
  Maximum data rate of category 14 is 21 Mbps
- Categories 15 and 16:
  Support of MIMO with modulation schemes QPSK and 16QAM
  No support of 64QAM
  Maximum data rate of category 16 is 27.6 Mbps

- Categories 17 and 18:
  Support of MIMO with modulation schemes QPSK and 16QAM
  Support of 64QAM and MIMO, but not simultaneously
  Maximum data rate of category 18 is 27.6 Mbps when MIMO is used and 21 Mbps when 64QAM is used
- Categories 19 and 20:
  Simultaneous support of MIMO and all modulation schemes (QPSK, 16QAM and 64QAM)
  Maximum data rate of category 20 is 42.1 Mbps

3.1.19.2 UL 16QAM UE Capabilities

According to 3GPP TS25.306 V9.5.0, the following release 8 E-DCH categories with 16QAM uplink support are defined:

- Category 7 and 9:
  Support of 16QAM in addition to BPSK

3.1.19.3 MIMO and DC-HSDPA Operation UE Capabilities

According to 3GPP TS25.306 V9.0.0, the following release 9 HS-DSCH categories with MIMO and dual cell operation support are defined:

- Categories 21, 22, 23 and 24:
  Support of QPSK, 16QAM and for categories 23 and 24 also 64QAM
  Support of dual cell operation, but without MIMO
- Categories 25, 26, 27 and 28:
  Support of QPSK, 16QAM and for categories 27 and 28 also 64QAM
  Simultaneous support of MIMO and dual cell operation

3.1.19.4 Dual Cell E-DCH Operation UE Capabilities

According to 3GPP TS25.306 V9.5.0, the following release 9 E-DCH categories with Dual Cell E-DCH support are defined:

- Category 8:
  Supports only QPSK in Dual Cell E-DCH operation
- Category 9:
  Supports QPSK and 16QAM in Dual Cell E-DCH operation

3.1.20 Uplink discontinuous transmission (UL DTX)

Uplink discontinuous transmission (UL DTX) is one of the features of the Continuous Packet Connectivity (CPC) provided to reduce the uplink control channel overhead. UL DTX allows the UE to stop transmission of uplink DPCCH in case there is no transmission activity on E-DCH or HS-DPCCH. This is sometimes also called uplink DPCCH gating.

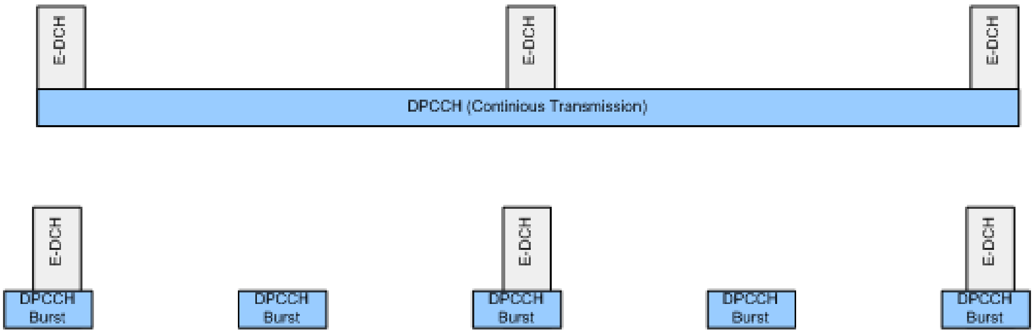


Fig. 3-15: Principle of UL-DTX

Uplink DPCCH is not transmitted continuously any more, but it is transmitted from time to time according to a known activity pattern (UE-DTX cycle). This regular activity is needed in order to maintain synchronization and power control loop. Gating is only active if there is no uplink data transmission on E-DCH or HS-DPCCH transmission ongoing. In case E-DCH or HS-DPCCH is used, the uplink DPCCH is transmitted in parallel.

The 3GPP specifications defines two patterns that can be applied to adapt the DTX cycle to the traffic conditions, the UE-DTX cycle 1 and the UE-DTX cycle 2 (see also chapter 5.3, "Configuring UL-DTX Transmission and Visualizing the Scheduling", on page 257). The UE-DTX cycle 1 is applied depending on the duration of E-DCH inactivity; the UE-DTX cycle 2 has less frequent DPCCH transmission instants and is applied whenever there is no uplink data transmission. The switching from UE-DTX cycle 1 to UE-DTX cycle 2 is determined by a configurable period of inactivity.

The transmission of control signaling on the HS-DPCCH is not affected by the UL-DTX pattern. With enabled UL-DTX, the HARQ-ACK messages and the CQI reporting remains unchanged and the UE transmits acknowledgment according to the HARQ-ACK pattern, regardless of the UL-DTX cycle. Transmission of control signals does not cause switching from UE-DTX cycle 2 to UE-DTX cycle 1.

A preamble and postamble are added to the DPCCH burst for synchronisation reasons. The length of the uplink DPCCH preamble and postamble depend whether the DPCCH burst transmission is caused by user-data transmission on the E-DCH or control signaling on the HS-DPCCH.

- for the E-DCH transmission
  During the UE-DTX cycle 1, the DPCCH transmission starts two slots prior to the start of E-DPDCH and terminates one slot after it. For the UE-DTX cycle 2, an extended preamble of up to 15 slots is applied.
- for the HS-DPCCH transmission
  The preamble length depends whether an HARQ-ACK or CQI report is transmitted. Two slots are applied for the HARQ-ACK case (unless an HARQ preamble PRE is transmitted) and three in case of CQI reporting. For the latter case, an extended preamble may be applied too.
  The DPCCH transmission terminates at the end of the first full DPCCH slot after the end of the HARQ-ACK/CQI field.

An instrument equipped with the required options provided an UL-DTX functionality, that is fully compliant with 3GPP TS 25.214. All dependencies from E-DCH transmissions, HARQ-ACK transmissions or CQI transmissions on the DPCCH are respected. The corresponding settings are described in chapter 4.27, "UL-DTX/User Scheduling - UE", on page 169.

Use the Scheduling List to display the UL-DTX burst pattern and transmissions of E-DCH and HS-DPCCH, as well as the impact on the UL-DPCCH transmissions or the configured uplink user scheduling.

Refer to chapter 5.3, "Configuring UL-DTX Transmission and Visualizing the Scheduling", on page 257 for an example on how to use the UL-DTX function.

3.1.21 Uplink User Scheduling

R&S WinIQSIM2 does not support user scheduling.

The uplink user scheduling is a function that enables you to flexible configure the scheduling of the uplink transmission. The instrument provides an interfaces for loading of externally created XML-like files with predefined file structure. The corresponding settings are described in chapter 4.27, "UL-DTX/User Scheduling - UE", on page 169

Inter-dependencies

- The UL-DTX and the User Scheduling functions excludes each other and cannot be activated simultaneously.
- The uplink scheduling information is processed in real time and this feature can be enabled together with the "Dynamic Power Control". All UE1 channels can be power controlled.
- With enabled "User Scheduling", the value of the parameter Power Reference is fixed to "First DPCCH".
- Activated "User Scheduling" limits the number of E-DPDCH physical channel configurations. The "Overall Symbol Rates = 2x960 ksps, 2x1920 ksps and 2x960 + 2x1920 ksps" are not allowed. [1)]
- The features uplink user schedulung and the internal E-DCH channel codding excludes each other. [2)]
- A PRACH preamble cannot be directly scheduled in the user schedulung file, because the user scheduling is enabled in the "DPCCH+DPDCH" mode. [3)]

Some possible workaround approaches

- 1) To generate a signal with "Overall Symbol Rates = 2x960 ksps, 2x1920 ksps and 2x960 + 2x1920 ksps", enable two Baseband blocks to generate the corresponding "I only" and "Q only" channels and combine the outputs of the two Basebands. The resulting composite signal comprises the physical channel configuration according to the specifications.
- 2) If channel coded data in the E-DCH is required, consider the use of pre-channel-coded data lists as data source for the physical E-DPDCH channel.
- 3) Enable a PRACH preamble for UE2, configure the required user scheduling for UE1 and "delay" the beginning of the UE1 transmission (use the commands with parameters `slot="0"` and `action="DPCCH_OFF", "DPDCH_OFF" and "EDCH_OFF"`)

File Structure

Files with user scheduling information use the predefined file extension `*.3g_sch` and follow a predefined file structure. To explain the file structure, the following simple scheduling example is used:

```
<?xml version="1.0"?>
<SMxScheduling>
<head type="3GPP FDD" subtype="Uplink User Scheduling" Version="1" />
   <!-- Comment -->
   <command slot="0" action="DPCCH_OFF" />
   <command slot="15" action="DPCCH_ON" />
</SMxScheduling>
```

The highlighted lines are mandatory and must not be changed. The user scheduling is performed with the `<command>` tag. The table 3-17 describes the tag structure. All parameters of this tag are mandatory.

Table 3-17: Structure of tag <command>

Parameter name	Value Range	Description
`<slot>`	0 to 3749	Value range deviates in the following cases: • for `<action="EDCH_TTIS">` the `<slot>` must be a multiple of 15 (changes in the E-DCH TTI size are allowed only at the beginning of a 3GPP frame) • for `<action="REPEAT">` the `<slot>` must be a multiple of 15 and within the value range 15 to 3750.
`<action>`	`DPCCH_OFF`	Disables DPCCH transmission starting from the beginning of the specified slot
	`DPCCH_ON` *	Enables DPCCH transmission starting from the beginning of the specified slot
	`DPDCH_OFF`	Disables DPDCH transmission starting from the beginning of the specified slot

Parameter name	Value Range	Description
	DPDCH_ON *	Enables DPDCH transmission starting from the beginning of the specified slot. The DPDCH must be activated with the corresponding settings in the instrument's user interface, see State (DPDCH).
	EDCH_OFF	Disables E-DCH transmission (i.e. the transmission in the E-DPCCH and E-DPDCH physical channels) starting from the beginning of the specified slot.
	EDCH_ON *	Enables E-DCH transmission starting from the beginning of the specified slot. The E-DPCCH and/or the E-DPDCH must be activated in the instrument's user interface, see State (E-DPCCH) and State (E-DPDCH). This <action> affects only the currently active channels (E-DPCCH and/or E-DPDCH).
	EDCH_TTIS	Determines the TTI size of all E-DCH transmissions starting from the beginning of the specified slot.
	EDCH_ETFCI	Determines the E-TFCI (Transport Block Size Index) of all subsequent E-DCH transmissions. The change of the E-TFCI applies always at the beginning of the next E-DCH TTI, i.e. the E-TFCI cannot be changed during an ongoing E-DCH TTI.
	DYNPC_OFF	Disables the dynamic power control starting from the beginning of the specified slot.
	DYNPC_ON **	Enables the dynamic power control starting from the beginning of the specified slot, i.e. the instrument applies changes in the channel transmit powers starting from the specified slot. The dynamic power control must be activated with the corresponding settings in the instrument's user interface, see Dynamic Power Control State.
	REPEAT	Performs a loop in the action's sequence and repeats all prior defined actions starting from the beginning of the specified slot. The repetition periodicity of the user scheduling is determined by the <slot> value. If <action="REPEAT"> is omitted, the instrument follows the defined user scheduling sequence once. **Note:** The <action="REPEAT"> causes a repetition of the scheduling commands, but not necessarily guarantee an identical signal. For example, long data lists are not restarted and the effects of former dynamic power control commands still persist, even after the sequence is looped.
ttis	2 | 10	For <action="EDCH_TTIS">, determines the TTI size (2 ms or 10 ms)
etfci	0 to 127	For <action="EDCH_ETFCI">, determines the E-TFCI

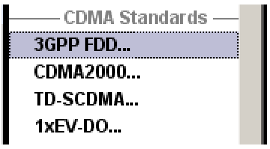
*) The instrument schedules DPCCH/DPDCH/E-DCH transmissions by default, unless an <action="DPCCH_OFF">, <action="DPDCH_OFF"> and/or <action="EDCH_OFF"> is scheduled.

**) If dynamic power control is activated in the user interface, the instrument applies the power control by default, unless an <action="DYNPC_OFF"> is scheduled.

Scheduling Example

Refer to chapter 5.4, "Configuring and Visualizing the Uplink User Scheduling", on page 259 for an example on how to use the user scheduling function.

4 User Interface

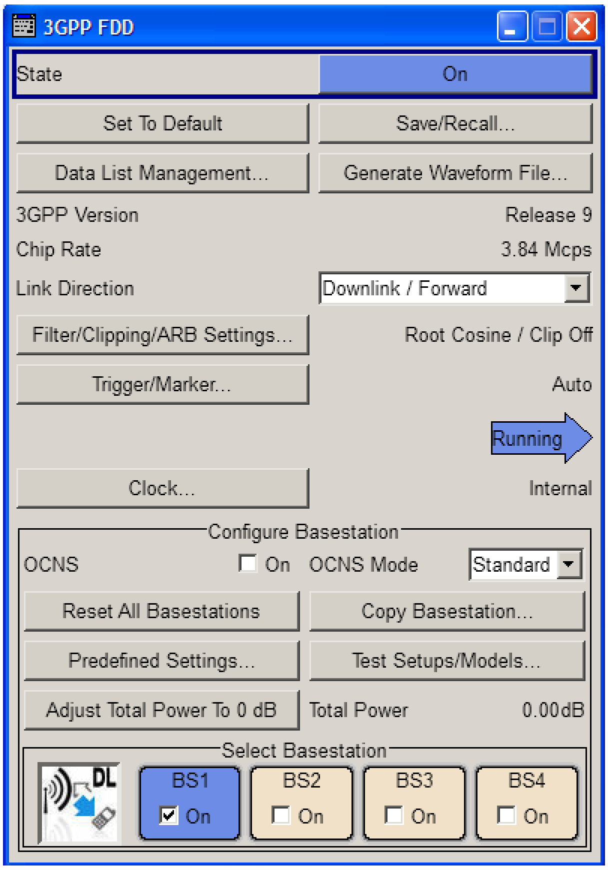


► To access the dialog for setting the 3GPP FDD digital standard, select "Baseband > 3GPP FDD".

The dialog is split into several sections for configuring the standard. The choice of transmission direction determines which displays and parameters are made available in the lower section.

The upper section of the dialog is where the 3GPP FDD digital standard is enabled, the default settings are called and the transmission direction selected. Button "Test Case Wizard" opens a configuration menu with a selection of predefined settings according to Test Cases in TS 25.141. The valid 3GPP version and the chip rate in use are displayed. Many of the buttons lead to submenus for loading and saving the 3GPP FDD configuration and for setting the filter, trigger and clock parameters.

The lower dialog section is where either the base station signal or the user equipment signal is configured, depending on the transmission direction selected.



The dialog is extremely comprehensive, so a small list of contents is added here to make orientation easier.

The headings are always given a short form of the "dialog path" and the header also shows you your current location in the dialog.

4.1 General Settings for 3GPP FDD Signals

The upper menu section is where the 3GPP FDD digital standard is enabled and reset and where all the settings valid for the signal in both transmission directions are made.

State

Activates the standard and deactivates all the other digital standards and digital modulation modes in the same path.

The instrument generates the 3GPP FDD signal as a combination of realtime mode (enhanced channels) and arbitrary waveform mode (all the other channels). The follwoing is a more datailed list of the channels generated in **realtime**:

- *Downlink channels:* P-CCPCH and up to three DPCHs of base station 1 as well as H-Sets 1 to 5.
- *Uplink channels:* DPCCH and one DPDCH of user equipment 1.
  Depending on the actual configurations, other channels of user equipment 1 may also be generated in realtime.

Generated in **arbitrary waveform mode** and added to the realtime signal are: PRACH and PCPCH channels and the channels of the other user equipments.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:STATe` on page 353

Set to default

Calls the default settings. Test Model 1 (64 channels) is preset.

The parameter "State" is not affected.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:PRESet` on page 351

Save/Recall

Calls the "Save/Recall" menu.

From the "Save/Recall" menu the "File Select" windows for saving and recalling 3GPP FDD configurations and the "File Manager" can be called.

3GPP FDD configurations are stored as files with the predefined file extension `*.3g`. The file name and the directory they are stored in are user-definable.

The complete settings in the "3GPP FDD" dialog and all sub-dialogs are saved and recalled.

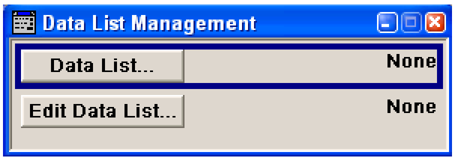
"Recall 3GPP FDD setting"
: Opens the "File Select"window for loading a saved 3GPP FDD configuration.
The configuration of the selected (highlighted) file is loaded by pressing the "Select" button.

"Save 3GPP FDD setting"
: Opens the "File Select" window for saving the current 3GPP FDD signal configuration.
The name of the file is specified in the "File name" entry field, the directory selected in the "save into" field. The file is saved by pressing the "Save" button.
The "Fast Save" function determines whether the instrument performs an absolute or a differential storing of the settings. Enable this function to accelerate the saving process by saving only the settings with values different to the default ones. "Fast Save" is not affected by the "Preset" function.

"File Manager" Calls the "File Manager".
The "File Manager" is used to copy, delete and rename files and to create new directories.

Remote command:
[:SOURce<hw>]:BB:W3GPp:SETTing:CATalog? on page 351
[:SOURce<hw>]:BB:W3GPp:SETTing:LOAD on page 352
[:SOURce<hw>]:BB:W3GPp:SETTing:STORe on page 352
[:SOURce<hw>]:BB:W3GPp:SETTing:STORe:FAST on page 352
[:SOURce<hw>]:BB:W3GPp:SETTing:DELete on page 351

Data List Management
Calls the "Data List Management" menu. This menu is used to create and edit a data list.



All data lists are stored as files with the predefined file extension `*.dm_iqd`. The file name and the directory they are stored in are user-definable.

The data lists must be selected as a data source for the corresponding individual function, e.g. in the channel table of the base stations.

Note: All data lists are generated and edited by means of the `SOURce:BB:DM` subsystem commands. Files containing data lists are recognized by the file extenssion `*.dm_iqd`. The data lists are selected as a data source for a specific function in the individual subsystems of the digital standard.
Creating and editing the data list

```
SOUR:BB:DM:DLIS:SEL "3gpp"
SOUR:BB:DM:DLIS:DATA 1,1,0,1,0,1,0,1,1,1,1,0,0,0
```

SOUR:BB:DM:DLIS:DATA:APP 1,1,0,1,0,1,0,1,1,1,1,0,0

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA on page 383
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA:DSELect on page 383
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA on page 387
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA:DSELect on page 388
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA on page 434
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA:DSELect on page 434
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA on page 479
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA:DSELect on page 480
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA on page 541
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:DSELect on page 541
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA on page 457
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:DSELect on page 458
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA on page 484
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:DSELect on page 485
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA on page 492
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:DSELect on page 492
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA on page 495
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:DSELect on page 496

Generate Waveform

With enabled signal generation, triggers the instrument to store the current settings as an ARB signal in a waveform file. Waveform files can be further processed by the ARB and/or as a multi carrier or a multi segment signal.

The file name and the directory it is stored in are user-definable; the predefined file extension for waveform files is *.wv.

Remote command:
[:SOURce<hw>]:BB:W3GPp:WAVeform:CREate on page 353

Test Case Wizard

R&S SMU and R&S SMATE instruments only

Access configuration dialog with a selection of predefined settings according to Test Cases in TS 25.141.

The provided test cases are described in chapter 7.1, "Introduction", on page 279.

Remote command:
n.a.

3GPP Version

Displays the current implemented version of the 3GPP FDD standard.

The default settings and parameters provided are oriented towards the specifications of the version displayed.

Remote command:
`[:SOURce]:BB:W3GPp:GPP3:VERSion?` on page 354

Chip Rate

Displays the system chip rate. This is fixed at 3.84 Mcps.

To vary the output chip rate, use the parameters in the "Filter/Clipping/ARB Settings" dialog (see chapter 4.3, "Filtering, Clipping, ARB Settings", on page 68).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:CRATe?` on page 358

Link Direction

Selects the transmission direction. Further provided settings are in accordance with this selection.

"Downlink/ Forward Link"	The transmission direction selected is base station to user equipment. The signal corresponds to that of a base station.
"Uplink/ Reverse Link"	The transmission direction selected is user equipment to base station. The signal corresponds to that of user equipment.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:LINK` on page 356

Filtering/Clipping/ARB Settings

Access a dilaog for setting baseband filtering, clipping and the sequence length of the arbitrary waveform component. An indication of the key parameters values is provided.

See chapter 4.3, "Filtering, Clipping, ARB Settings", on page 68 for detailed description.

Remote command:
n.a.

Trigger/Marker

Calls the menu for selecting the trigger source, for configuring the marker signals and for setting the time delay of an external trigger signal (see chapter 4.4, "Trigger/Marker/ Clock Settings", on page 71.

The currently selected trigger source is displayed to the right of the button.

Remote command:
n.a.

Execute Trigger

Executes trigger manually.

A manual trigger can be executed only when an internal trigger source and a trigger mode other than "Auto" have been selected.

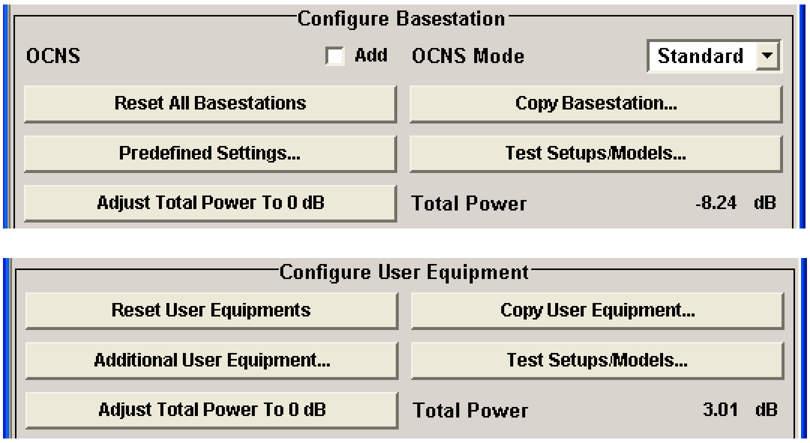
Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:EXECute` on page 362

Clock
Calls the menu for selecting the clock source and for setting a delay (see chapter 4.4.4, "Clock Settings", on page 78).

Remote command:
n.a.

4.2 Configure Basestations or UE

Depending on the transmission direction selection, the central section of the menu provides either the "Configure Base Station" section (selection "Downlink/Forward Link") or the "Configure User Equipment" section (selection "Uplink/Reverse Link").



4.2.1 Orthogonal Channel Noise (OCNS) Settings

With Orthogonal Channel Noise, a practical downlink signal is generated to test the maximum input levels of user equipment in accordance with standard specifications. This simulates the data and control signals of the other orthogonal channels in the downlink. 3GPP TS 25.101 contains a precise definition of the required appearance of the OCNS signal.

This section describes the provided settings. For detailed information, see chapter 3.1.11, "Orthogonal Channel Noise (OCNS)", on page 29.

OCNS On
Activates OCNS channels according to the definition in the 3GPP standard, in BS 1.

Different OCNS scenarios are defined in the 3GPP standard. Set the scenario by means of the parameter OCNS Mode.

When activating OCNS and depending on the selected OCNS mode, different channel groups with different presetting are assigned, see tables in chapter 3.1.11, "Orthogonal Channel Noise (OCNS)", on page 29. These channels cannot be edited in the channel table.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:STATe` on page 379

OCNS Mode
Chooses the scenario for activating OCNS channels.

Four different OCNS scenarios are defined in the standard; one "standard" scenario, two scenarios for HSDPA test cases and one scenario for type 3i enhanced performance requirements tests according to 3GPP TS34.121-1 ("other user's channels"). For an overview of the provided scenarios and their settings, refer to chapter 3.1.11, "Orthogonal Channel Noise (OCNS)", on page 29.

Note: If the "3i" OCNS mode is activated (and the "3GPP FDD > State > On"), the OCNS channels are automatically leveled in order to have a total power of 0 dB for all channels of BS 1.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:MODE` on page 379

OCNS Seed
In "OCNS mode > 3i", sets the seed for both the random processes, the power control simulation process and the process controling the switch over of the channelization codes.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:SEED` on page 380

4.2.2 Common Configuration Settings

The central "Configure Basestations / User Equipments" section in the lower part of the dialog, covers the general parameters for configuring the respective transmisssion direction.

Reset all Base Stations
Resets all base stations to the predefined settings.The preset value for each parameter is specified in the description of the remote-control commands.

Table 4-1: Overview of the base station predefined settings

Parameter	Value
State	Off
State (all channels)	Off
Scrambling Code	0
Slot Format DPCH	8
Symbol Rate DPCH	30 ksps
Channelization Code (all channels)	0

Parameter	Value
Data Source (all channels)	PN9
Timing Offset (all channels)	0
Multi Code State (all channels)	Off

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:PRESet on page 354

Reset User Equipment

Resets all user equipment to the predefined settings. The preset value for each parameter is specified in the description of the remote-control commands.

Table 4-2: Overview of the user equipment predefined settings

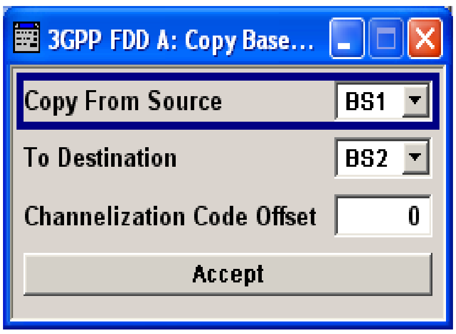
Parameter	Value
State	Off
Mode	DPCCH + DPDCH
Scrambling Code (hex)	0
DPCCH Settings	
Power	0 dB
DPDCH Settings	
DPDCH State	On
HS-DPCCH, E-DPCCH and E-DPDCH State	Off
Channel Power	0 dB
Overall Symbol Rate	60 ksps

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:PRESet on page 449

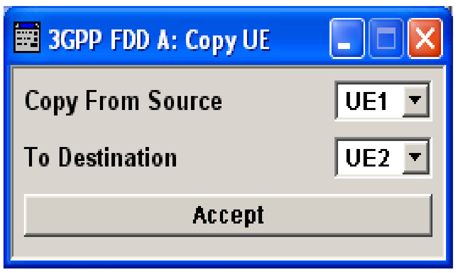
Copy Basestation/Copy User Equipment...

Copies the settings of a base station or user equipment to a second base or user equipment. A dialog opens for creating the destination station.

Downlink / Forward link direction



Uplink / Reverse link direction



"Copy from Source"
Selects the base station or user equipment whose settings are to be copied.

Remote command:
[:SOURce<hw>]:BB:W3GPp:COPY:SOURce on page 355

"To Destination"
Selects the base station or user equipment whose settings are to be overwritten.

Remote command:
[:SOURce<hw>]:BB:W3GPp:COPY:DESTination on page 354

"Channelization Code Offset (Base Station only)"
Enters the offset to be applied when copying the base station to the channelization codes of the destination base station. The minimum value is 0 (channelization codes are identical), the maximum value is 511.

Remote command:
[:SOURce<hw>]:BB:W3GPp:COPY:COFFset on page 354

"Accept" Starts the copy process.

Remote command:
[:SOURce<hw>]:BB:W3GPp:COPY:EXECute on page 355

Test Setups/Models
Provides an access to the test models defined in the 3GPP standard and further test setups, see chapter 4.5, "Test Setups/Models", on page 80.

Remote command:
n.a.

Predefined Settings
Access a dialog for setting predefined configurations, see chapter 4.6, "Predefined Settings - Downlink", on page 84.

Remote command:
n.a.

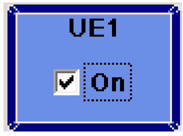
Additional User Equipment
Access a dialog for simulating up to 128 additional user equipments, see chapter 4.7, "Additional User Equipment - Uplink", on page 85.

Remote command:
n.a.

Select Basestation/User Equipment
Selects the base station or user equipment by pressing the accompanying block.

A dialog for editing the selected basestation or user equipment opens (see chapter 4.8, "Base Station Settings", on page 86 and chapter 4.24, "User Equipment Configuration (UE)", on page 160).

To activate a base station or user equipment, enable its state.



Remote command:
(the base station or user equipment is selected by the keyword index `BSTation<[1]|2|3|4>` or `MSTation<i>`)
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:STATe` on page 425
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:STATe` on page 451

4.2.3 General Power Settings

The power settings are enabled for "3GPP FDD > State = On".

Adjust Total Power to 0dB
Sets the power of the enabled channels so that the total power of all the active channels is 0 dB. This will not change the power ratio among the individual channels.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:POWer:ADJust` on page 356

Total Power
Displays the total power of the active channels.

The total power is calculated from the power ratio of the powered up code channels with modulation on. If the value is not equal to 0 dB, the individual code channels (whilst still retaining the power ratios) are internally adapted so that the "Total Power" for achieving the set output level is 0 dB.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:POWer[:TOTal]?` on page 356

Power Reference
Determines the power reference for the leveling of the output signal in uplink direction.

Parameter	Power leveling performed during	Power in "Level" display equal to	"Mode" of the first active UE
"RMS Power"	Complete signal	Output signal's mean power	• PRACH Standard • PRACH Preamble Only • DPCCH+DPDCH and UL-DTX Off • PCPCH Standard • PCPCH Preamble Only
"First DPCCH" "First E-DCH" "First HARQ-ACK" "First PCI/CQI"	First slot in which a DPCCH, an E-DCH, a HARQ-ACK or a PCI/CQI is transmitted in the first active UE	Output signal's mean power during the first active DPCCH **Note:** if there are other UEs or channels active during the reference slot, the total power is used as a reference, not only the DPCCH power. This mode is required if the UL-DTX is enabled, due to the long signal parts of inactivity.	• DPCCH+DPDCH and UL-DTX On • DPCCH+DPDCH and UL-DTX Off
"PRACH Message Part"	PRACH Message Part of the first active UE	Output signal's mean power during the PRACH Message Part	PRACH Standard
"Last PRACH Preamble"	Last PRACH preamble of the first active UE	Output signal's mean power during the last PRACH preamble	• PRACH Standard • PRACH Preamble Only

Example:

- "RF Level" = -10 dBm (value displayed in the status bar of the instrument)
- DPCCH is activated
- E-DPCCH and one E-DPDCH are activated in the first subframe of each frame

The figure 4-1 displays the power versus time for "Power Reference = First DPCCH": the signal level in the first subframe is -10 dBm; the RMS power of the signal is -13.3 dBm.

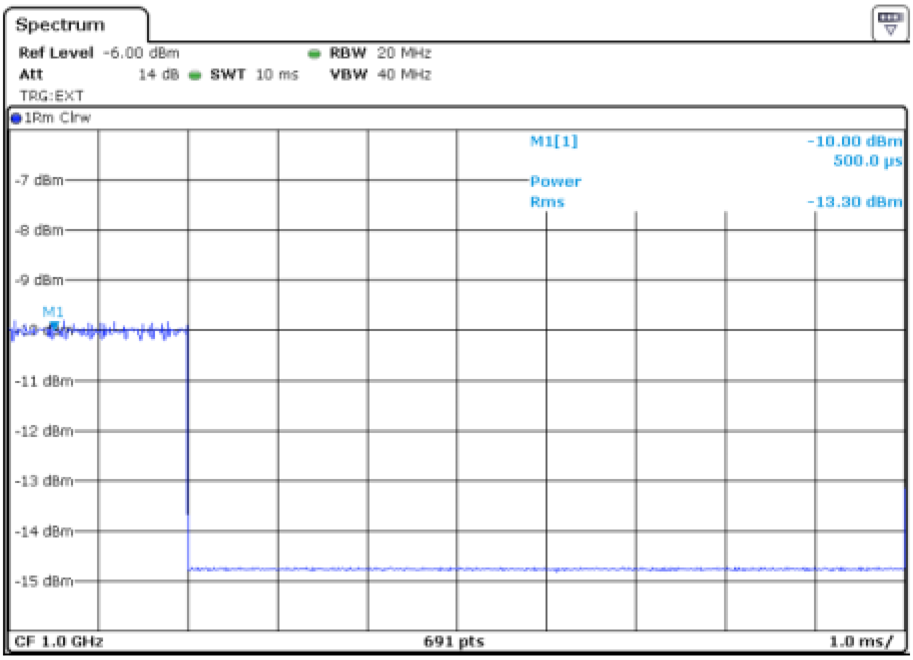


Fig. 4-1: Example: Power Reference = First DPCCH

The figure 4-2 displays the power versus time for "Power Reference = RMS": the RMS power of the signal is -10 dBm; the signal level in the first subframe is -6.7 dBm

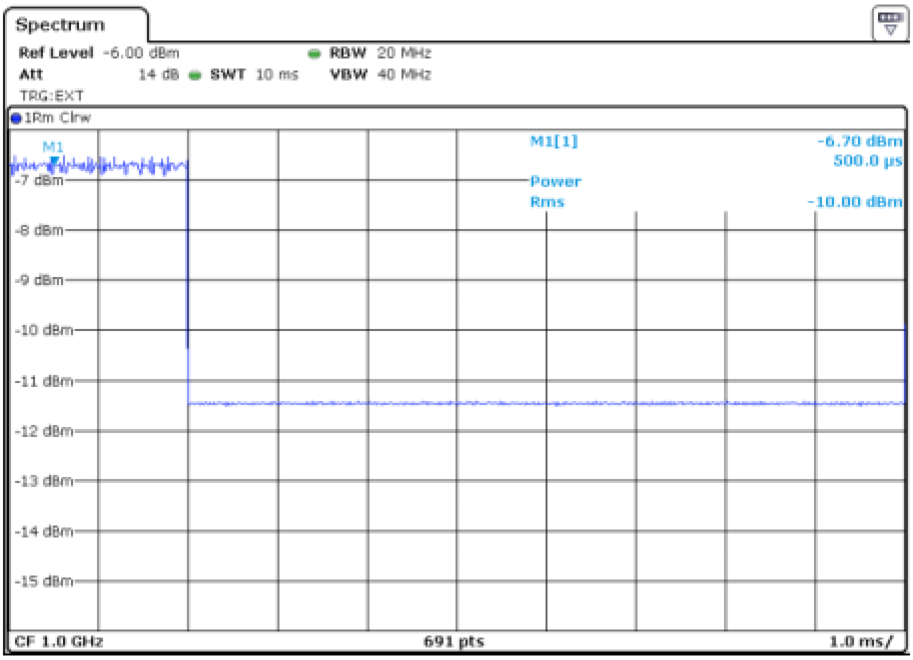
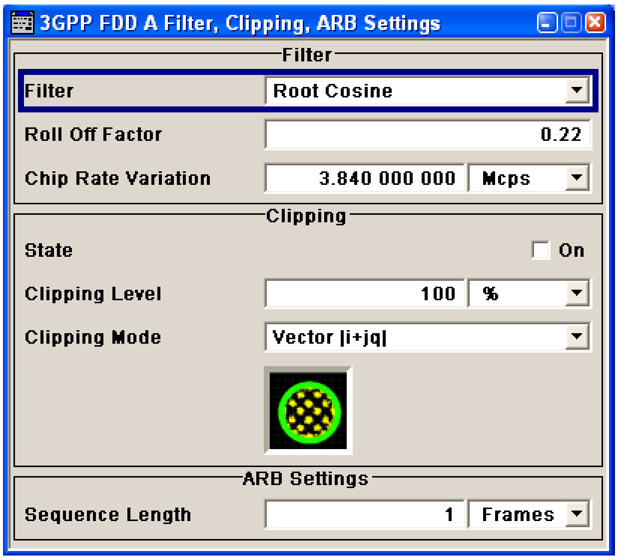


Fig. 4-2: Example: Level Reference = RMS

Remote command:
`[:SOURce<hw>]:BB:W3GPp:LREFerence` on page 452

4.3 Filtering, Clipping, ARB Settings

► To access this dialog, select "3GPP FDD > Main dialog > Filter/Clipping/ARB Settings".



The dialog comprises the settings, necessary to configure the baseband filter, to enable clipping and adjust the sequence length of the arbitrary waveform component.

4.3.1 Filter Settings

Provided are the follwoing settings for configuring the baseband filter:

Filter

Selects the baseband filter.

Remote command:
[:SOURce<hw>]:BB:W3GPp:FILTer:TYPE on page 361

Roll Off Factor or BxT

Sets the filter parameter.

The filter parameter offered ("Roll Off Factor" or "BxT") depends on the currently selected filter type. This parameter is preset to the default for each of the predefined filters.

Remote command:
[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:APCO25 on page 359
[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:COSine on page 359
[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:GAUSs on page 359
[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:RCOSine on page 360
[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:SPHase on page 361

Cut Off Frequency Factor

Sets the value for the cut off frequency factor. The cut off frequency of the filter can be adjusted to reach spectrum mask requirements.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:LPASs` on page 360

`[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:LPASSEVM` on page 360

Chip Rate Variation

Enters the chip rate. The default settings for the chip rate is 3.84 Mcps.

The chip rate entry changes the output clock and the modulation bandwidth, as well as the synchronization signals that are output. It does not affect the calculated chip sequence.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:CRATe:VARiation` on page 359

4.3.2 Clipping Settings

Provided are the follwoing settings:

Clipping State

Switches baseband clipping on and off.

Baseband clipping is a very simple and effective way of reducing the crest factor of the WCDMA signal.

WCDMA signals may have very high crest factors particularly with many channels and unfavorable timing offsets. High crest factors entail two basic problems:

- The nonlinearity of the power amplifier (compression) causes intermodulation which expands the spectrum (spectral regrowth).
- Since the level in the D/A converter is relative to the maximum value, the average value is converted with a relatively low resolution. This results in a high quantization noise.

Both effects increase the adjacent-channel power.

With baseband clipping, all the levels are limited to a settable value ("Clipping Level"). This level is specified as a percentage of the highest peak value. Since clipping is done prior to filtering, the procedure does not influence the spectrum. The EVM however increases.

Since clipping the signal not only changes the peak value but also the average value, the effect on the crest factor is unpredictable. The following example shows the effect of the "Clipping" on the crest factor for typical scenarios.

Example: Clipping effect on the crest factor

The table 4-3 shows changing the crest factor by clipping (vector mode |I+q|) for signal configurations with different output crest factors.

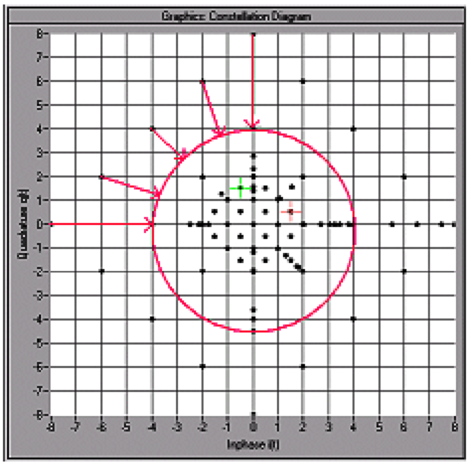
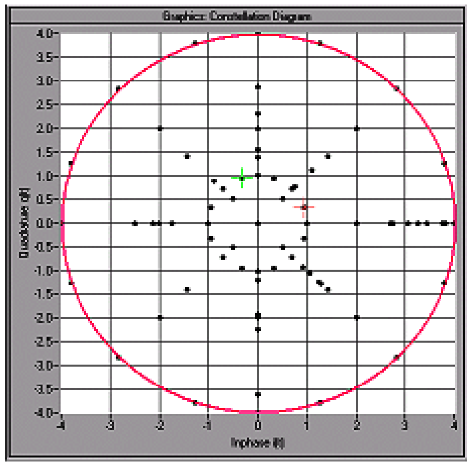
100% clipping levels mean that clipping does not take place.

Table 4-3: Crest factor values as function of the vector clipping

Clipping level	Downlink: 10 DPCHs "Minimum Crest" 30 ksps	Downlink: 10 DPCHs "Worst Crest" 30 ksps	Downlink: 10 DPCHs "Average Crest" 30 ksps	Downlink: 128 DPCHs "Average Crest" 30 ksps
100%	9.89 dB	14.7 dB	10.9 dB	21.7 dB
80%	8.86 dB	12.9 dB	9.39 dB	20.2 dB
50%	7.50 dB	10.1 dB	8.29 dB	16.9 dB
20%	5.50 dB	6.47 dB	6.23 dB	12.5 dB
10%	5.34 dB	6.06 dB	5.80 dB	9.57 dB
5%	5.34 dB	6.06 dB	5.80 dB	8.17 dB

The pictures in the following table demonstrate the effect of clipping with vector mode (|I+q|), using a signal configuration with 4 DPCH as an example.

The arrows and the circle in the upper illustration show how the levels are mapped during subsequent clipping in vector mode (|I+q|).

Constellation diagram of the signal without clipping, shows the level mapping for vector mode	Constellation diagram with clipping level 50 %, vector mode (|I+q|)
	

Remote command:
[:SOURce<hw>]:BB:W3GPp:CLIPping:STATe on page 358

Clipping Level

Sets the limit for clipping.

This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Remote command:
[:SOURce<hw>]:BB:W3GPp:CLIPping:LEVel on page 357

Clipping Mode

Selects the clipping method. A graphic illustration of the way in which these two methods work is given in the dialog.

- "Vector | i + jq |"
  The limit is related to the amplitude | i + q |. The I and Q components are mapped together, the angle is retained.
- "Scalar | i | , | q |"
  The limit is related to the absolute maximum of all the I and Q values | i | + | q |. The I and Q components are mapped separately, the angle changes.

Remote command:
[:SOURce<hw>]:BB:W3GPp:CLIPping:MODE on page 357

4.3.3 ARB Settings

Provided are the follwoing settings:

Sequence Length ARB
Changes the sequence length of the arbitrary waveform component of the signal. This component is calculated in advance and output in the arbitrary waveform generator. It is added to the realtime signal components.

The maximum number of frames is calculated as follows:

Max. No. of Frames = Arbitrary waveform memory size/(3.84 Mcps x 10 ms).

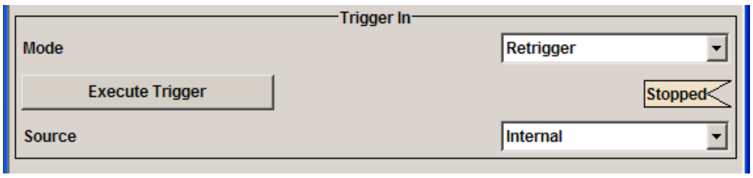
Tip: In pure amplifier tests with several channels and no enhanced channels, it is possible to improve the statistical properties of the signal by increasing the sequence length.

Remote command:
[:SOURce<hw>]:BB:W3GPp:SLENgth on page 353

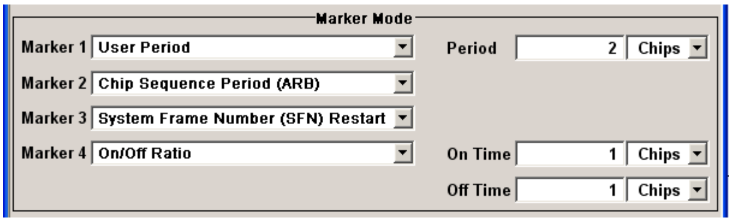
4.4 Trigger/Marker/Clock Settings

To access this dialog, select "Main Menu > Trigger/Marker".

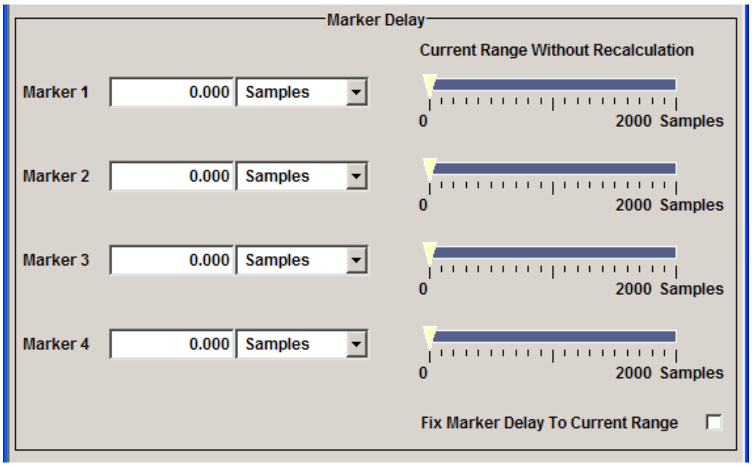
The "Trigger In" section is where the trigger for the signal is set. Various parameters will be provided for the settings, depending on which trigger source - internal or external - is selected. The current status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.



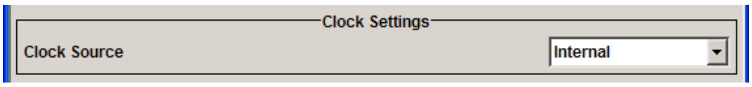
The "Marker Mode" section is where the marker signals at the MARKER output connectors are configured.



The "Marker Delay" section is where a marker signal delay can be defined, either without restriction or restricted to the dynamic section, i.e., the section in which it is possible to make settings without restarting signal and marker generation.



The "Clock Settings" section is where the clock source is selected and - in the case of an external source - the clock type.



The buttons in the last section lead to submenu for general trigger, clock and mapping settings.

4.4.1 Trigger In

The trigger functions are available for R&S SMx and R&S AMU instruments only.

The "Trigger In" section is where the trigger for the signal is set. Various parameters will be provided for the settings, depending on which trigger source - internal or external - is selected. The current status of signal generation ("Running" or "Stopped") is indicated for all trigger modes.

Trigger Mode
Selects trigger mode, i.e. determines the effect of a trigger event on the signal generation.

- "Auto"
  The signal is generated continuously.
- "Retrigger"
  The signal is generated continuously. A trigger event (internal or external) causes a restart.
- "Armed_Auto"
  The signal is generated only when a trigger event occurs. Then the signal is generated continuously.
  An "Arm" stops the signal generation. A subsequent trigger event (internal with or external) causes a restart.
- "Armed_Retrigger"
  The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart.
  An "Arm" stops signal generation. A subsequent trigger event (internal with or external) causes a restart.
- "Single"
  The signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified at "Signal Duration".
  Every subsequent trigger event (internal or external) causes a restart.

Remote command:
`[:SOURce<hw>]:BB:W3GPp[:TRIGger]:SEQuence` on page 366

Signal Duration Unit
Defines the unit for describing the length of the signal sequence to be output in the "Single" trigger mode.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:SLUNit` on page 365

Signal Duration
Enters the length of the signal sequence to be output in the "Single" trigger mode.

Use this parameter to deliberately output part of the signal, an exact sequence of the signal, or a defined number of repetitions of the signal.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:SLENgth` on page 364

Running/Stopped
For enabled modulation, displays the status of signal generation for all trigger modes.

- "Running"
  The signal is generated; a trigger was (internally or externally) initiated in triggered mode.
- "Stopped"
  The signal is not generated and the instrument waits for a trigger event.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:RMODe?` on page 364

Arm

For trigger modes "Armed Auto" and "Armed Retrigger", stops the signal generation until subsequent trigger event occurs.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:ARM:EXECute` on page 362

Execute Trigger

Executes trigger manually.

A manual trigger can be executed only when an internal trigger source and a trigger mode other than "Auto" have been selected.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:EXECute` on page 362

Trigger Source

Selects trigger source. This setting is effective when a trigger mode other than "Auto" has been selected.

- "Internal"
  The trigger event is executed by "Execute Trigger".
- "Internal (Baseband A/B)"
  (two-path instruments)
  The trigger event is the trigger signal from the second path
- "External (Trigger 1/2)"
  The trigger event is the active edge of an external trigger signal, supplied at the TRIGGER 1/2 connector.
  Use the "Global Trigger/Clock Settings" dialog to define the polarity, the trigger threshold and the input impedance of the trigger signal.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:TRIGger:SOURce` on page 365

Sync. Output to External Trigger

(enabled for Trigger Source External)

Enables/disables output of the signal synchronous to the external trigger event.

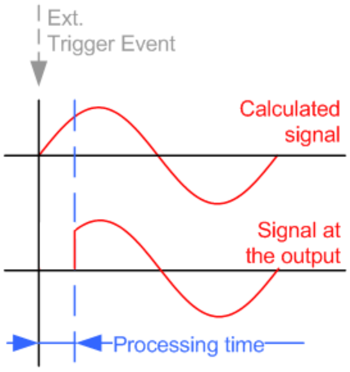
For R&S SMBV instruments:

For two or more R&S SMBVs configured to work in a master-slave mode for synchronous signal generation, configure this parameter depending on the provided system trigger event and the properties of the output signal. See the table below for an overview of the required settings.

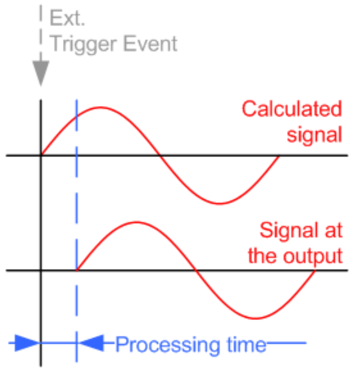
Table 4-4: Typical Applications

System Trigger	Application	"Sync. Output to External Trigger"
Common External Trigger event for the master and the slave instruments	All instruments are synchronous to the external trigger event	ON
	All instruments are synchronous among themselves but starting the signal from first symbol is more important than synchronicity with external trigger event	OFF
Internal trigger signal of the master R&S SMBV for the slave instruments	All instruments are synchronous among themselves	OFF

"On" Corresponds to the default state of this parameter.
The signal calculation starts simultaneously with the external trigger event but because of the instrument's processing time the first samples are cut off and no signal is outputted. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.



"Off" The signal output begins after elapsing of the processing time and starts with sample 0, i.e. the complete signal is output.
This mode is recommended for triggering of short signal sequences with signal duration comparable with the processing time of the instrument.



Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:EXTernal:SYNChronize:OUTPut on page 362

Trigger Delay

Delays the trigger event of the signal from:

- the external trigger source
- the other path

Use this setting to:

- synchronize the instrument with the device under test (DUT) or other external devices

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger[:EXTernal<ch>]:DELay on page 365
[:SOURce<hw>]:BB:W3GPp:TRIGger:OBASeband:DELay on page 363

Trigger Inhibit

Sets the duration for inhibiting a new trigger event subsequent to triggering. The input is to be expressed in samples.

In the "Retrigger" mode, every trigger signal causes signal generation to restart. This restart is inhibited for the specified number of samples.

This parameter is only available on external triggering or on internal triggering via the second path.

For two-path instruments, the trigger inhibit can be set separately for each of the two paths.

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger[:EXTernal<ch>]:INHibit on page 366
[:SOURce<hw>]:BB:W3GPp:TRIGger:OBASeband:INHibit on page 363

4.4.2 Marker Mode

The marker output signal for synchronizing external instruments is configured in the marker settings section "Marker Mode".

The R&S SMBV supports only two markers.

Marker Mode

Selects a marker signal for the associated MARKER output.

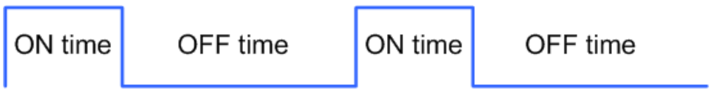
"Slot" A marker signal is generated at the start of each slot (every 2560 chips or 0.667 ms).

"Radio Frame" A marker signal is generated at the start of each frame (every 38400 chips or 10 ms).

"Chip Sequence Period (ARB)"
A marker signal is generated at the start of every arbitrary waveform sequence (depending on the setting for the arbitrary waveform sequence length). If the signal does not contain an arbitrary waveform component, a radio frame trigger is generated.

"System Frame Number (SFN) Restart"
A marker signal is generated at the start of every SFN period (every 4096 frames).

"ON/OFF Ratio" A regular marker signal that is defined by an ON/OFF ratio is generated. A period lasts one ON and OFF cycle.



The ON time and OFF time are each expressed as a number of chips and are set in an input field which opens when ON/OFF ratio is selected.

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:ONTime on page 371
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:OFFTime on page 371

"User Period" A marker signal is generated at the beginning of every user-defined period. The period is defined in Period.
This can be used, for instance, to generate a pulse at the start of each transport block (e.g. TTI 20 ms or 40 ms).

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:PERiod on page 371

"Dynamic Power Control"
the parameter is not available for R&S SMBV
This marker is used internally. Marker 4 is set automatically to this value if Dynamic Power Control is enabled.

"HARQ Feedback"
the parameter is not available for R&S SMBV
This marker is used internally. Marker 4 is set automatically to this value if HARQ Feedback is enabled.
Remote-control command: n.a.

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:MODE on page 369

4.4.3 Marker Delay

The delay of the signals on the MARKER outputs is set in the"Marker Delay" section.

The R&S SMBV supports only two markers.

Marker x Delay
Enters the delay between the marker signal at the marker outputs and the start of the frame or slot.

The input is expressed as a number of symbols/samples. If the setting "Fix marker delay to dynamic range" is enabled, the setting range is restricted to the dynamic range. In this range the delay of the marker signals can be set without restarting the marker and signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:DELay on page 368

Current Range without Recalculation
Displays the dynamic range within which the delay of the marker signals can be set without restarting the marker and signal.

The delay can be defined by moving the setting mark.

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:DELay:MAXimum?
on page 368
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:DELay:MINimum?
on page 369

Fix marker delay to current range
Restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut:DELay:FIXed on page 368

4.4.4 Clock Settings

The Clock Settings is used to set the clock source and a delay if required.

Sync. Mode
(for R&S SMBV only)

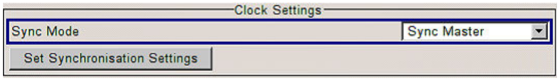
Selects the synchronization mode.

This parameter is used to enable generation of very precise synchronous signal of several connected R&S SMBVs.

Note: If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type.
Avoid unnecessary cable length and branching points.

"None" The instrument is working in stand-alone mode.

"Sync. Master" The instrument provides all connected instrument with its synchronisation (including the trigger signal) and reference clock signal.



"Sync. Slave" The instrument receives the synchronisation and reference clock signal from another instrument working in a master mode.

Remote command:
[:SOURce<hw>]:BB:W3GPp:CLOCk:SYNChronization:MODE on page 373

Set Synchronization Settings
(for R&S SMBV only)

Performs automatically adjustment of the instrument's settings required for the synchronization mode, selected with the parameter Sync. Mode.

Remote command:
[:SOURce<hw>]:BB:W3GPp:CLOCk:SYNChronization:EXECute on page 373

Clock Source
Selects the clock source.

"Internal" The internal clock reference is used to generate the chip clock.

"External" The external clock reference is fed in as the chip clock or multiple thereof via the CLOCK connector.
The chip rate must be correctly set to an accuracy of (2 % (see data sheet).
The polarity of the clock input can be changed with the aid of "Global Trigger/Clock Settings".
In the case of two-path instruments, this selection applies to path A

Remote command:
[:SOURce<hw>]:BB:W3GPp:CLOCk:SOURce on page 372

Clock Mode
Enters the type of externally supplied clock.

"Chip" A chip clock is supplied via the CLOCK connector.

"Multiple Chip" A multiple of the chip clock is supplied via the CLOCK connector; the chip clock is derived internally from this.
The Multiplier window provided allows the multiplication factor to be entered.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:CLOCk:MODE` on page 372

Chip Clock Multiplier
Enters the multiplication factor for clock type Multiple.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:CLOCk:MULTiplier` on page 372

Measured External Clock
Provided for permanent monitoring of the enabled and externally supplied clock signal.

Remote command:
`CLOCk:INPut:FREQuency?`

4.4.5 Global Settings

The buttons in this section lead to dialogs for general trigger, clock and mapping settings.

Global Trigger/Clock Settings
Calls the "Global Trigger/Clock/Input Settings" dialog.

This dialog is used among other things for setting the trigger threshold, the input impedance and the polarity of the clock and trigger inputs.

The parameters in this dialog affect all digital modulations and standards, and are described in chapter "Global Trigger/Clock/Input Settings" in the Operating Manual.

User Marker / AUX I/O Settings
Calls the "User Marker AUX I/O Settings" dialog, used to map the connector on the rear of the instruments.

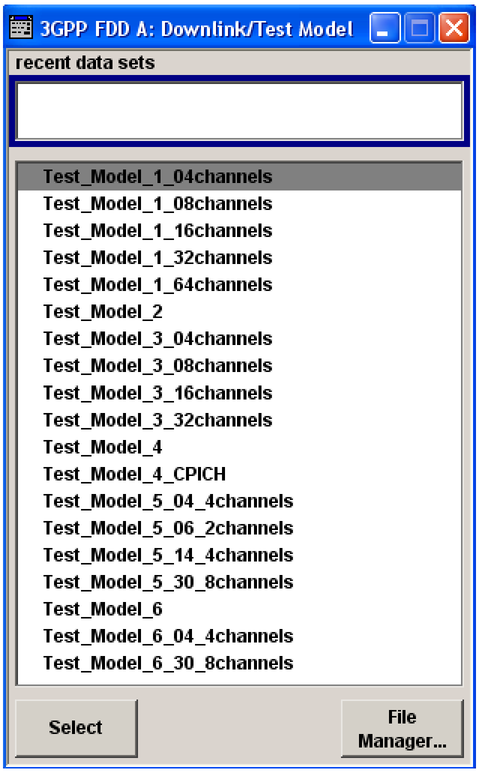
See also "User Marker / AUX I/O Settings" in the Operating Manual.

4.5 Test Setups/Models

► To access the dialog, select "3GPP FFD > Basestation/User Equipment > Test Setup/Models"

The dialog offers various test models, depending on the selected transmission direction. The presetting is defined in the 3GPP standard TS 25.141.

Test Models Downlink
Access a list of test models in accordance with the 3GPP standard TS 25.141.



Selecting a test model for an active base station immediately generates the selected signal configuration.

The table 4-5 gives an overview of the available test models.

Table 4-5: Test Models Downlink

Test Model	Description
"Test Model 1 (4/8 channels)"	Test models for Home BS • Spectrum emission mask • ACLR • Spurious emissions • Transmit intermodulation • Modulation accuracy • Peak code domain error
"Test Model 1 (16/32/64 channels)"	• Spectrum emission mask • ACLR • Spurious emissions • Transmit intermodulation • Modulation accuracy • Peak code domain error
"Test Model 2"	Output power dynamics
"Test Model 3 (4/8 channels)"	Peak code domain error test models for Home BS
"Test Model 3 (16/32 channels)"	Peak code domain error
"Test Model 4"	Error Vector Magnitude, optional P-CPICH is not active
"Test Model 4 (CPICH)"	Error Vector Magnitude, optional P-CPICH is active.

Test Model	Description
"Test Model 5 (4 HS-PDSCH + 4 DPCH)"	Error Vector Magnitude test models for Home BS at base stations that support high speed physical down-link shared channels with 16 QAM
"Test Model 5 (8 HS-PDSCH + 30 DPCH)" "Test Model 5 (4 HS-PDSCH + 14 DPCH)" "Test Model 5 (2 HS-PDSCH + 6 DPCH)"	Error Vector Magnitude at base stations that support high speed physical down-link shared channels with 16 QAM
"Test Model 6_04_4channels"	Relative Code Domain Error test models for Home BS only applicable for 64QAM modulated codes.
"Test Model 6_30_8channels"	Relative Code Domain Error only applicable for 64QAM modulated codes.

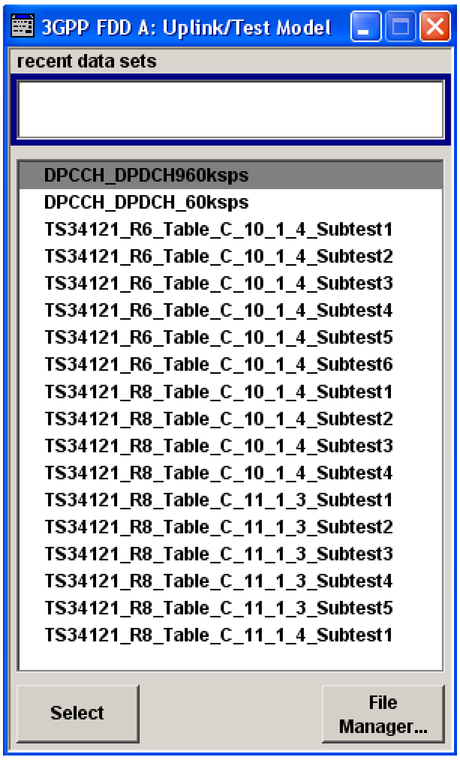
Remote command:
[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:BSTation:CATalog? on page 377
[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:BSTation on page 377

Test Models Uplink

Access the predefined test signals.

The 3GPP has not defined any test models for the Uplink transmission direction. This implementation however, provides a list of useful test signals and enables you to quickly generate an uplink signal.

This instrument generaters the Uplink test models in the enhanced state of user equipment 1. An exception are the test models for the E-DPCCH and E-DPDCH, these channels are not calculated in realtime. The sequence length is not changed.



The following table lists some examples of configurations available for selection.

Table 4-6: Test Models Uplink

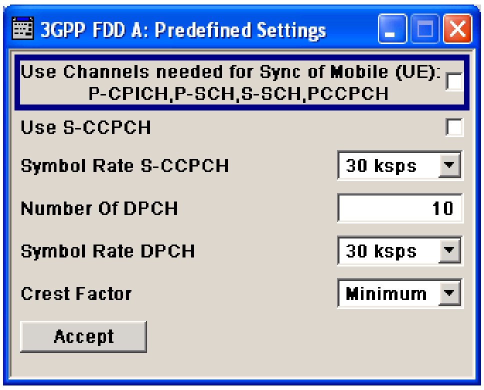
Test Model	Description
"DPCCH + DPDCH 60 ksps"	User equipment 1 is activated in DPCCH + DPDCH mode. 60 ksps is selected as the overall symbol rate. All the other settings correspond to the preset setting.
"DPCCH + DPDCH 960 ksps"	User equipment 1 is activated in DPCCH + DPDCH mode. 960 ksps is selected as the overall symbol rate. All the other settings correspond to the preset setting.
"TS34121_R6_Table_C_10_1_4_Subset1 .. 6"	Uplink test model according to 3GPP TS 34.121 Release 6, Table C.10.1.4.
"TS34121_R8_Table_C_10_1_4_Subset1 .. 4"	Uplink test models for transmitter characteristics tests with HS-DPCCH according to 3GPP TS 34.121 Release 8, Table C.10.1.4.
"TS34121_R8_Table_C_11_1_3_Subset1 .. 5"	Uplink test models for transmitter characteristics tests with HS-DPCCH and E-DCH according to 3GPP TS 34.121 Release 8, Table C.11.1.3.
"TS34121_R8_Table_C_11_1_4_Subset1"	Uplink test model for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM according to 3GPP TS 34.121 Release 8, Table C.11.1.4.

Remote command:
[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:MSTation:CATalog?
on page 378
[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:MSTation on page 378

4.6 Predefined Settings - Downlink

With the "Predefined Settings" function, it is possible to create highly complex scenarios with just a few modifications. This function is of use if, say, just the envelope of the signal is of interest.

1. To access this dialog, enable "3GPP FDD > Link Direction > Downlink"
2. Select "Basestation > Predefined Settings"



The channel table of base station 1 is filled (preset) with the set parameters. The sequence length of the generated signal is 1 frame.

Use Channels
Selects if P-CPICH, P-SCH, S-SCH and PCCPCH are used in the scenario or not. These "special channels" are required by user equipment for synchronization.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:PPARameter:SCHannels` on page 377

Use S-CCPCH
Selects if S-CCPCH is used in the scenario or not.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:PPARameter:SCCPch:STATe` on page 376

Symbol Rate S-CCPCH
Sets the symbol rate of S-CCPCH.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:PPARameter:SCCPch:SRATe` on page 376

Number of DPCH
Sets the number of activated DPCHs.

The maximum number is the ratio of the chip rate and the symbol rate (maximum 512 at the lowest symbol rate of 7.5 ksps).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:PPARameter:DPCH:COUNt` on page 375

Symbol Rate DPCH

Sets the symbol rate of all DPCHs.

Remote command:
[:SOURce<hw>]:BB:W3GPp:PPARameter:DPCH:SRATe on page 376

Crest Factor

Selects desired range for the crest factor of the test scenario. The crest factor of the signal is kept in the desired range by automatically setting appropriate channelization codes and timing offsets.

"Minimum" The crest factor is minimized. The channelization codes are distributed uniformly over the code domain. The timing offsets are increased by 3 per channel.

"Average" An average crest factor is set. The channelization codes are distributed uniformly over the code domain. The timing offsets are all set to 0.

"Worst" The crest factor is set to an unfavorable value (i.e. maximum). The channelization codes are assigned in ascending order. The timing offsets are all set to 0.

Remote command:
[:SOURce<hw>]:BB:W3GPp:PPARameter:CRESt on page 375

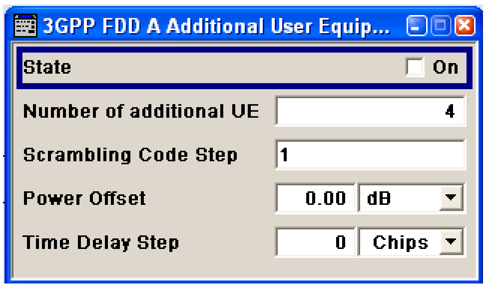
Accept

Presets the channel table of basestation 1 with the parameters defined in the Predefined Settings menu. Scrambling Code 0 is automatically selected (as defined in the 3GPP test models).

Remote command:
[:SOURce<hw>]:BB:W3GPp:PPARameter:EXECute on page 376

4.7 Additional User Equipment - Uplink

1. To access this dialog, enable "3GPP FDD > Link Direction > Uplink"
2. In the "User Equipment" tab , select "Additional User Equipment"



The dialog allows you to simulate up to 128 additional user equipment and thus to generate a signal that corresponds to the received signal for a base station with high capacity utilization.

The fourth user equipment (UE4) serves as a template for all other stations.

The following parameters are the only ones modified for the additional user equipment:

- Scrambling code (different for all stations)
- Power (different to UE4, but identical among themselves)

State
Emables/disables all additional user equipment.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:STATe` on page 448

Number of Additional UE
Sets the number of additional user equipment. As many as 128 additional user equipments can be simulated.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:COUNt` on page 447

Scrambling Code Step
Enters the step width for increasing the scrambling code of the additional user equipment. The start value is the scrambling code of UE4.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:SCODe:STEP` on page 448

Power Offset
Sets the power offset of the active channels of the additional user equipment to the power outputs of the active channels of UE4.

The resultant power must fall within the range 0 dB to - 80 dB. If the value is above or below this range, it is limited automatically.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:POWer:OFFSet`
on page 448

Time Delay Step
Enters the step width for the time delay of the additional user equipment to one another. The start value returns the time delay of UE4. Entry is made in chips and can be a maximum of 1 frame.

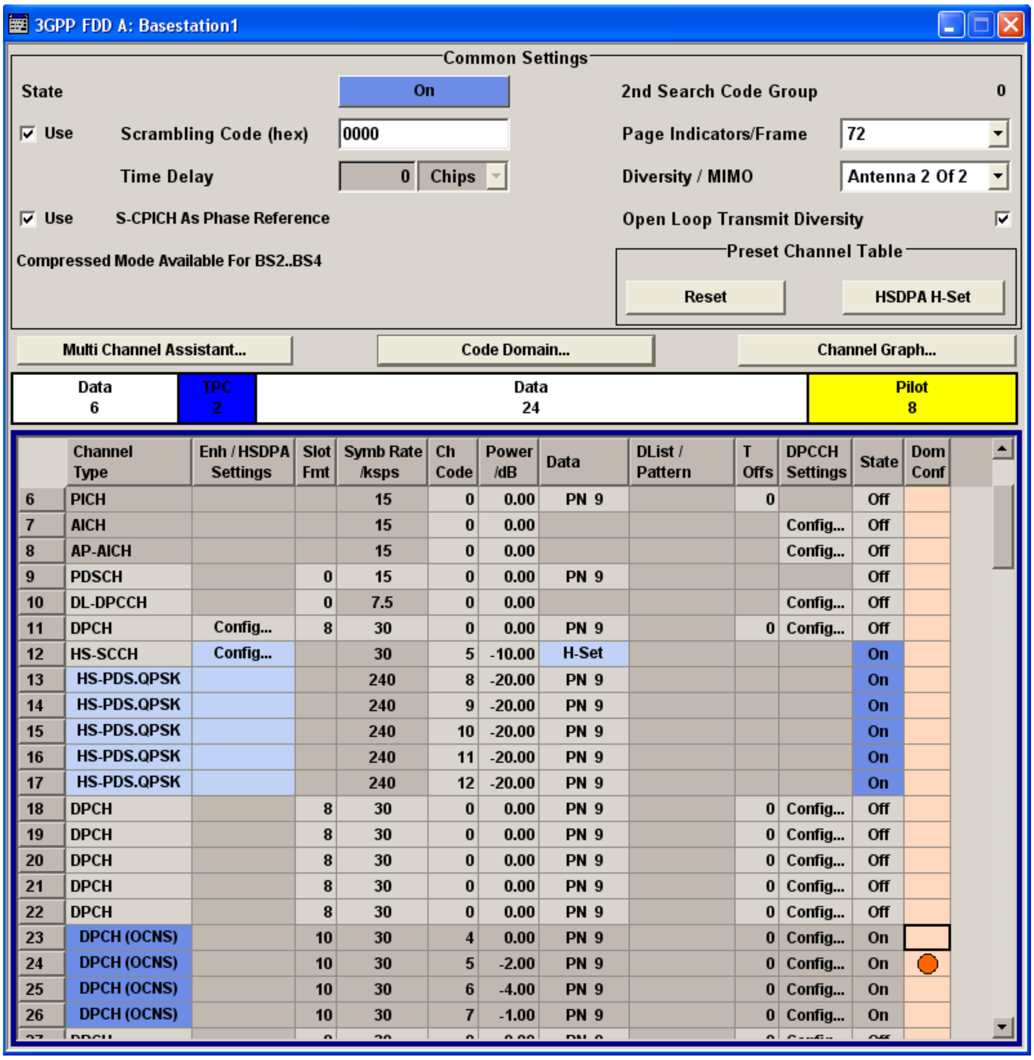
The time delay allows user equipment to be simulated even if the arrival of their signals is not synchronized at the base station.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:TDELay:STEP` on page 448

4.8 Base Station Settings

Base stations can be configured independently of one another. Base station 1 (BS1) also includes enhanced channels (Enhanced Channels, Realtime).

1. To access the base station settings, select "3GPP FDD > Link Direction > Down-link / Forward".
2. Select "Basestation > BS 1/2/3/4".



The dialog comprises the "Common Settings" section, in which the general parameters of the base station are set, a row containing the buttons "Multi Channel Assistant", "Code Domain" and "Channel Graph", which call the appropriate submenus and graphics and the most important part, the channel table with graphical display of the structure of the channel being edited.

4.8.1 Common Settings

The following general parameters of the base station are provided:

State

Activates or deactivates the selected base station.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:STATe on page 425

2nd Search Code Group

Displays the 2nd search code group.

This parameter is specified in the table defined by the 3GPP standard "Allocation of SSCs for secondary SCH". This table assigns a specific spreading code to the synchronization code symbol for every slot in the frame. The value is calculated from the scrambling code.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SSCG? on page 424

Scrambling Code

Activates the scrambling code and sets the base station identification.

This value is also the initial value of the scrambling code generator (see chapter 3.1.1, "Scrambling Code Generator", on page 21).

The scrambling code can be deactivated for test purposes.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SCODe:STATe on page 424
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SCODe on page 424

Page Indicators/Frame

Enters the number of page indicators (PI) per frame in the page indicator channel (PICH).

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:PINDicator:COUNt on page 423

Time Delay

(This feature is enabled for BS 2...4 only.)

Sets the time delay of the signal of the selected base station compared to the signal of base station 1.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:TDELay on page 425

Diversity / MIMO

Selects the antenna and the antenna configuration to be simulated.

The R&S Signal Generator supports two antenna configurations: a single-antenna system and a two-antenna system. Thus, an instrument equipped with two paths can simulate simultaneously the signals of both antennas of one two-antenna system. Moreover, for this two-antenna system, transmit diversity can be additionally activated or deactivated.

To simulate transmit diversity, a two-antenna system has to be selected and "Open Loop Transmit Diversity" has to be activated.

To configure HS-PDSCH MIMO channels, a two-antenna system has to be selected.

"Single Antenna"
The signal of single-antenna system is calculated and applied.

"Antenna 1 of 2"
Calculates and applies the output signal for antenna 1 of a two-antenna system.

"Antenna 2 of 2"
Calculates and applies the output signal for antenna 2 of a two-antenna system.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:TDIVersity` on page 425

S-CPICH as Phase Reference

Activates or deactivates the use of S-CPICH as reference phase.

If activated the phase of S-CPICH and the phase of all DPCHs is 180 degrees offset from the phase of P-CPICH.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SCPich:PREFerence[:STATe]` on page 424

Open Loop Transmit Diversity

(Enabled for two-antenna system only)

Activates/deactivates open loop transmit diversity. The antenna whose signal is to be simulated is selected with the parameter "Diversity/MIMO".

Various forms of transmit diversity are described in the 3GPP standard. Different coding is used to divide the signal between the two antennas. As a result, the receiver can decode the traffic signal from the two input signals and is less liable to fading and other interferences.

A fixed diversity scheme is assigned to each channel type:

- TSTD (time switched transmit diversity for SCH) for P-SCH, S-SCH
- STTD (space time block coding transmit antenna diversity) for all other channels, except HS-PDSCH MIMO.
  The HS-PDSCH MIMO channels are precoded as described in chapter 3.1.15, "MIMO in HSPA+", on page 37.

These two schemes are described in detail in TS 25.211.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:TDIVersity` on page 425
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:OLTDiversity` on page 423

Compressed Mode State

Activates compressed mode.

The compressed mode is configured in chapter 4.9, "Compressed Mode", on page 96.

To access the dialog, use the "Compressed Mode" button.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:STATe` on page 422
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:STATe` on page 454

Compressed Mode…
(This feature is enabled for BS 2...4 only.)

Calls the menu for configuring the compressed mode, see chapter 4.9, "Compressed Mode", on page 96.

Remote command:
n.a.

Reset All Channels
Calls the default settings for the channel table.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel:PRESet` on page 381

Preset HSDPA H-Set
(This feature is available for BS 1 only.)

Calls the default settings of the channel table for the HSDPA H-Set mode.

Channels 12 to 17 are preset for HSDPA H-Set 1.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel:HSDPa:HSET:PRESet`
on page 380

Multi Channel Assistant
Accesses a dialog for configuring several DPCH channels simultaneously, see chapter 4.23, "Multi Channel Assistant - BS", on page 156.

Remote command:
n.a.

Code Domain…
Accesses a graphical display of the assigned code domain, see chapter 4.10, "Code Domain Graph - BS", on page 102.

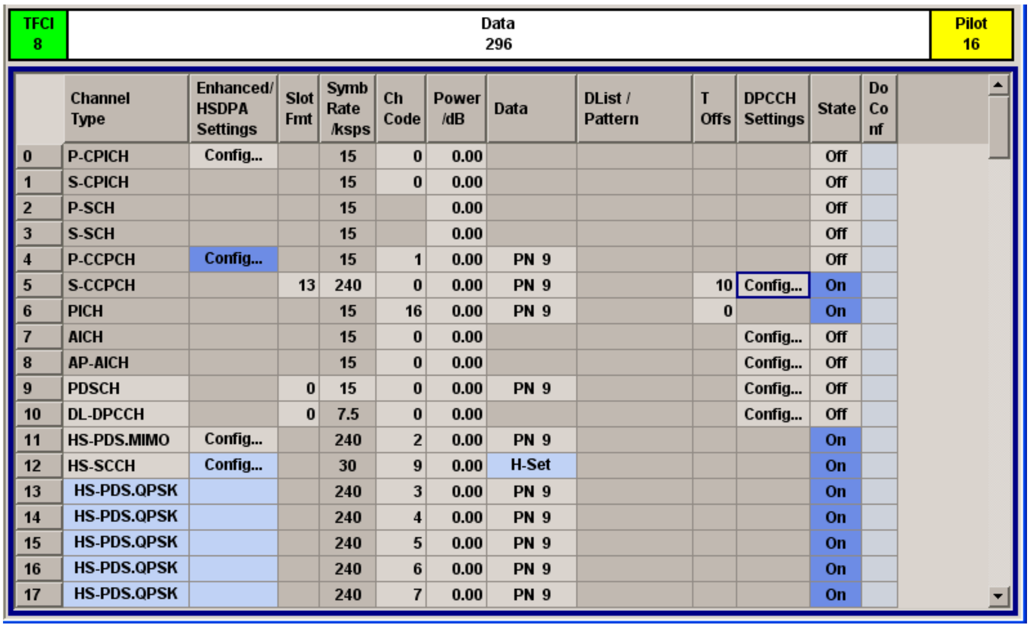
Remote command:
n.a.

Channel Graph…
Access a channel graph display to visually check the configured signal, see chapter 4.11, "Channel Graph - BS", on page 105.

Remote command:
n.a.

4.8.2 Channel Table

The channel table allows you to configure the individual channel parameters. The structure of the currently selected channel is displayed graphically in the table header.



	Channel Type	Enhanced/ HSDPA Settings	Slot Fmt	Symb Rate /ksps	Ch Code	Power /dB	Data	DList / Pattern	T Offs	DPCCH Settings	State	Do Co nf
0	P-CPICH	Config...		15	0	0.00					Off	
1	S-CPICH			15	0	0.00					Off	
2	P-SCH			15		0.00					Off	
3	S-SCH			15		0.00					Off	
4	P-CCPCH	Config...		15	1	0.00	PN 9				Off	
5	S-CCPCH		13	240	0	0.00	PN 9		10	Config...	On	
6	PICH			15	16	0.00	PN 9		0		On	
7	AICH			15	0	0.00				Config...	Off	
8	AP-AICH			15	0	0.00				Config...	Off	
9	PDSCH		0	15	0	0.00	PN 9			Config...	Off	
10	DL-DPCCH		0	7.5	0	0.00				Config...	Off	
11	HS-PDS.MIMO	Config...		240	2	0.00	PN 9				On	
12	HS-SCCH	Config...		30	9	0.00	H-Set				On	
13	HS-PDS.QPSK			240	3	0.00	PN 9				On	
14	HS-PDS.QPSK			240	4	0.00	PN 9				On	
15	HS-PDS.QPSK			240	5	0.00	PN 9				On	
16	HS-PDS.QPSK			240	6	0.00	PN 9				On	
17	HS-PDS.QPSK			240	7	0.00	PN 9				On	

The "Channel table" is located in the lower part of the menu.

139 channels are available for each base station. Channels 0 to 10 are assigned to the special channels, with the allocation of channels 0 to 8 being fixed. Channels 9 and 10 can be assigned a PDSCH, a DL-DPCCH, an HS-SCCH, an E-AGCH, an E-RGCH, or an E-HICH.

Code channels 11 to 138 can either be assigned a DPCH, an HS-SCCH, an HS-PDSCH (QPSK), an HS-PDSCH (16QAM), an HS-PDSCH (64QAM), an HS-PDSCH (MIMO), an E-AGCH, an E-RGCH, an E-HICH, or an F-DPCH (see also table 1-1). This makes it possible to simulate the signal of a base station that supports high-speed channels.

Channels 4 and 11 to 13 of base station 1 can be generated in realtime (enhanced channels) and are highlighted in color. User-definable channel coding can be activated for these channels. Bit and block errors can be simulated and data can be added to the data and TPC fields from data lists either at the physical level or in the transport layer.

At the physical level, a downlink DPCH consists of the DPDCH (Dedicated Physical Data Channel) and the DPCCH (Dedicated Physical Control Channel); the channel characteristics are defined by the symbol rate. The DPDCH transports the user data that is fed directly into the data field.

The DPCCH transports the control fields, i.e. TFCI (Transport Format Combination Indicator), TPC (Transmit Power Control) and Pilot field. DPDCH is grouped with DPCCH using time division multiplexing in accordance with 3GPP TS 25.211 (see figure 4-3). The formation of a downlink reference measurement channel is described in chapter 4.16, "Enhanced Settings for DPCHs - BS1", on page 128.

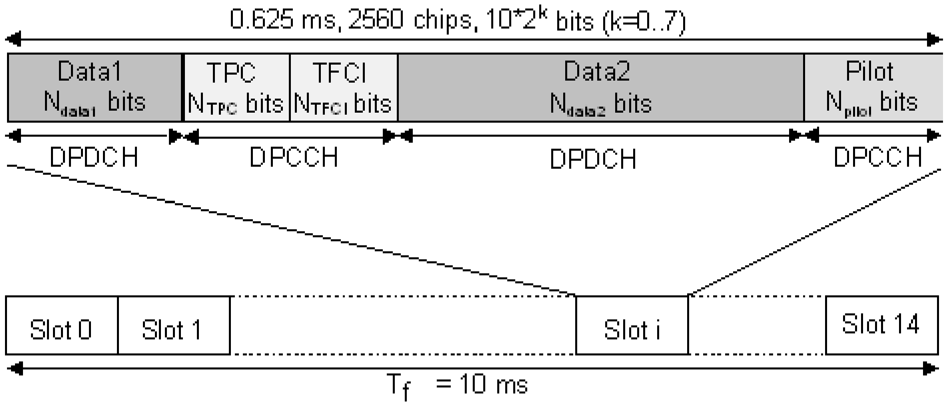


Fig. 4-3: Structure of a downlink DPCH in the time domain

Channel Number

Displays the consecutive channel numbers from 0 to 138.

All the rows are always displayed, even if the channels are inactive. They are switched on and off by the "On/Off" button in the "State" column.

Remote command:
n.a.
(selected via the suffix to the keyword `:CHANnel<n>`)

Channel Type

Selects channel type.

The channel type is fixed for channel numbers 0...8; for the remaining channel numbers, the choice lays between the relevant standard channels and the high-speed channels.

The first 11 channels are reserved for special channels.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:TYPE` on page 413

Enhanced Settings / HSDPA Settings

(Enhanced Settings are available for BS1 only.)

Accesses the dialog for configuring the enhanced channels of BS1 or the dialog for configuring the high-speed channels for all base stations.

- **Enhanced Settings**
  The channel state, "Enhanced On/Off", is displayed in different colors.
  Enhanced channels are generated in realtime. Channel coding in accordance with the 'Reference Measurement Channels' definition in TS25.101, TS25.104 and TS25.141 can be activated. Any other user-defined coding can also be configured and stored.
  If data lists are used as the data sources for data fields and TPC fields, it is possible to load external data, for example, user information from a higher layer, to the instrument. For example, this allows externally generated data with user information to be applied, or TPC lists to be used to generate longer, non-repetitive power profiles.

To test the BER/BLER testers (e.g. integrated in the base station), it is possible to feed through artificial bit errors to all the data sources (and block errors to the CRC checksum).
The enhanced settings dialog is different for the P-CCPCH and the DPCHs (see chapter 4.16, "Enhanced Settings for DPCHs - BS1", on page 128 and chapter 4.15, "Enhanced Settings for P-CCPCH - BS1", on page 126).

- **HSDPA Settings**
  The available settings and indications of the HSDPA settings dialog depend on the selected high-speed channel type HS-SCCH, HS-PDSCH (QPSK), HS-PDSCH (QAM) or HS-PDSCH (MIMO).
  See chapter 4.12, "HSDPA Settings - BS", on page 106.

Remote command:
n.a.

Slot Format
Enters the slot formats for the selected channel.

The range of values depends on the channel selected. For DPCH channels, for example, the slot formats are 0 to 16.

For F-DPCH channels, the slot Formats 1 to 9 are enabled only for instruments equipped with additional option R&S SMx/AMU-K59. The difference between the F-DPCH slot formats is the position of the 2 bits TPC field.

A slot format defines the complete structure of a slot made of data and control fields and includes the symbol rate.

Parameters set via the slot format can subsequently be changed individually.

The structure of the channel currently selected is displayed in a graphic above the channel table (slot structure).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:SFORmat`
on page 411

Symbol Rate
Sets the symbol rate of the selected channel. The range of values depends on the channel selected.

A change in the symbol rate may lead to a change in the slot format and vice versa.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:SRATe` on page 412

Channelization Code
Enters the channelization code (formerly the spreading code number).

The code channel is spread with the set channelization code (spreading code). The range of values of the channelization code depends on the symbol rate of the channel.

The standard assigns a fixed channelization code to some channels (P-CPICH, for example, always uses channelization code 0).

The range of values runs from `0 to ((Chip Rate/Symbol Rate) - 1)`, where the Chip Rate is 3.84Mcps.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:CCODe` on page 382

Power
Sets the channel power in dB.

The power entered is relative to the powers of the other channels. If "3GPP > Adjust Total Power to 0 dB" is executed, all the power data is relative to 0 dB.

The set "Power" value is also the start power of the channel for "Misuse TPC", "Dynamic Power Control" (enhanced channels of basestation 1) and the power control sequence simulation of the OCNS mode 3i channels.

Note: The maximum channel power of 0 dB applies to non-blanked channels (duty cycle 100%), with blanked channels, the maximum value can be increased (by "Adjust Total Power") to values greater than 0 dB (to $10*\log_{10}1/duty\_cycle$).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:POWer` on page 411

Data
Selects data source.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA` on page 383
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA:PATTern` on page 384
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA:DSELect` on page 383

Data Config
(This feature is available for BS1 with active channel coding only.)

Accesses a dialog for configuring the data sources of subchannels in the transport layer, see chapter 4.16, "Enhanced Settings for DPCHs - BS1", on page 128.

Remote command:
n.a.

Timing Offset

Sets the timing offset (T_{Offset}).

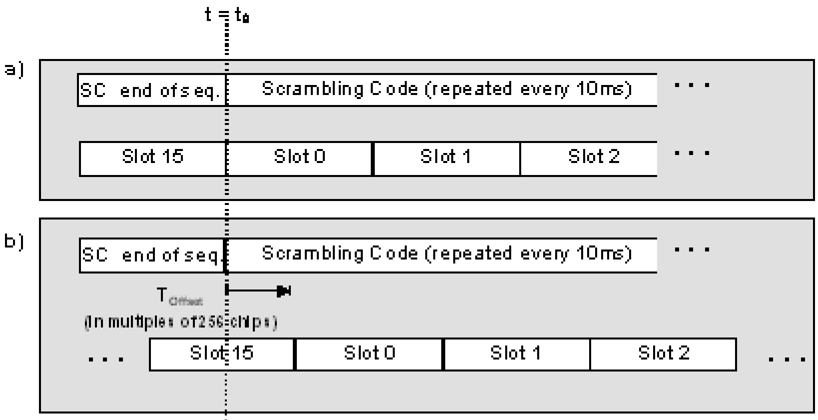
The timing offset determines the shift of the source symbols before interleaving.

The absolute starting time of the frame (slot 0) is shifted relative to the start of the scrambling code sequence by the `timing offset * 256 chips`. This means that whatever the symbol rate, the resolution of the timing offset is always 256 chips.

This procedure is used to reduce the crest factor. To obtain a lower crest factor, for example, a good offset from channel to channel is 1, e.g. for DPCH11 a timing offset 0, for DPCH12 a timing offset 1, for DPCH13 a timing offset 2, etc.

The illustration below shows the effect of the timing offset parameter. For various scenarios, the scrambling code sequence is shown in time relation to the data slots and to a reference time t0 (starting from t0 the signal is calculated in the instrument).

- Timing offset is not used (T_{Offset} = 0).
  The beginning of the frame (slot 0) and the beginning of the scrambling code period are synchronous with starting point t0.
- Timing offset is used (T_{Offset} > 0).
  The absolute starting time of the frames (slot 0) is shifted relative to the reference time t0 by `TOffset * 256 chips`. The beginning of the scrambling code sequence is still synchronous with reference time t0. The beginning of the scrambling code period and the frame (slot 0) are no longer synchronous.



Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:TOFFset
on page 412

DPCCH Settings

Access a dialog for configuring the control fields of the selected channel, see chapter 4.19, "DPCCH Settings - BS Channel Table", on page 144

The selected slot format predetermines the setting of the control fields. So a change is also made to the control fields by changing the slot format and vice versa.

Remote command:
n.a.

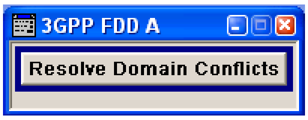
Channel State
Activates or deactivates the channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:STATe on page 412

Domain Conflict, Resolving Domain Conflicts
Displays whether the channel has a code domain conflict with one of the channels lying above it (with a lower channel number). A special symbol marks a conflict and the column is colored soft orange. If there is no conflict, the column is colored soft blue.

The instrument helps you to resolve code domain conflicts by automatically adapting the channelization code of the channels involved.

To access the required function, in the "3GPP FDD > Basestation > Channel Table" select the conflict symbol and trigger "Resolve Domain Conflicts".



Tip: Use the "Code Domain" to visualize the graphical display of code domain assignment by all the active code channels (see chapter 4.10, "Code Domain Graph - BS", on page 102.

Refer to chapter 5, "How to Work with the 3GPP FDD Option", on page 255 for step-by-step description.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:DCONflict[:STATe]? on page 423
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:DCONflict:RESolve on page 422

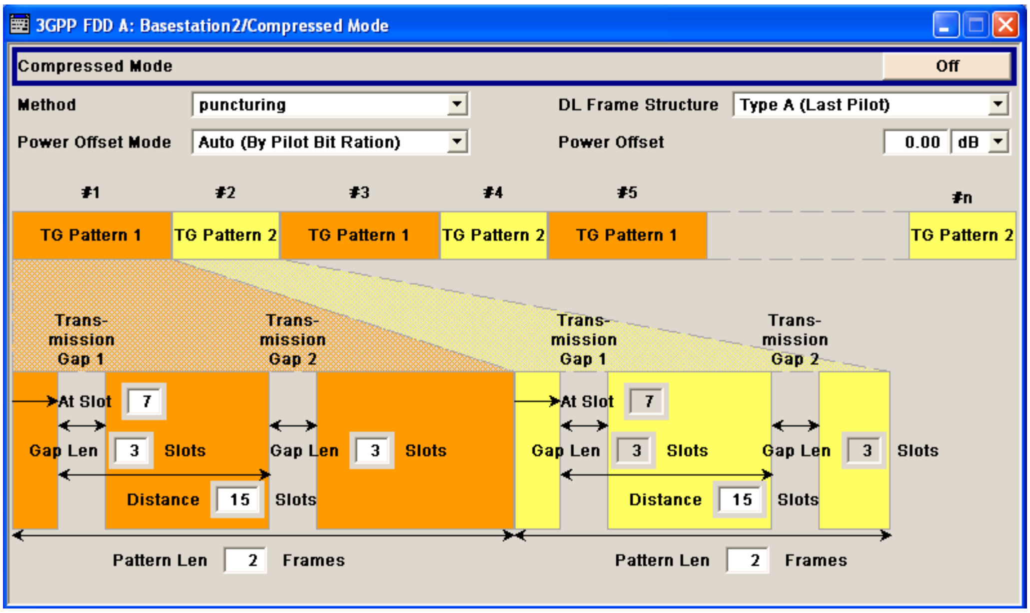
4.9 Compressed Mode

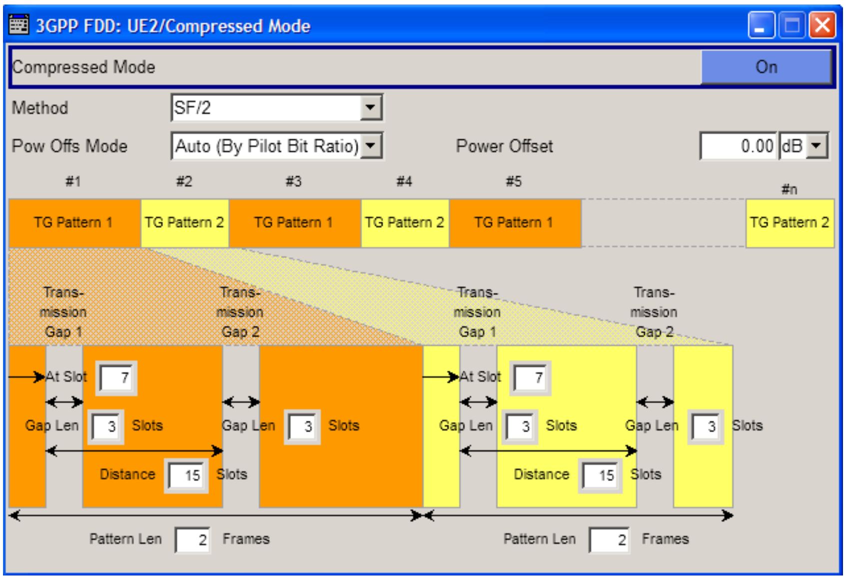
(This feature is available for BS 2...4 and UE 2...4 only.)

To enable handover of a mobile station from a 3GPP FDD base station/user equipment to another base station/user equipment, (3GPP FDD, 3GPP TDD, GSM or E-UTRA) at a different frequency, transmission and reception of the 3GPP FDD signal must be interrupted for a short time. During this time, the mobile station changes to the frequency of the new base station, for example to measure the receive level of this station or read system information.

To transmit a consistently high data volume also in the remaining (shorter) period of time, the data is compressed. This can be done by halving the spreading factor (SF/2 method) or reducing error protection (puncturing method). In both cases, transmit power in the ranges concerned is increased to maintain adequate signal quality.

Apart from these two methods, there is also the method of "higher layer scheduling". With this method, transmission of the data stream is stopped during the transmission gap. This method is suitable for packet-oriented services; it involves no power increase (power offset) in the active ranges.





4.9.1 Compressed Mode General Settings

Compressed Mode State

Activates compressed mode.

The compressed mode is configured in chapter 4.9, "Compressed Mode", on page 96.

To access the dialog, use the "Compressed Mode" button.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:STATe on page 422
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:STATe on page 454

Compressed Mode Method - UE

Selects compressed mode method.

"Higher layer scheduling"	The data is compressed by stopping the transmission of the data stream during the transmission gap.
"SF/2"	The data is compressed by halving the spreading factor.

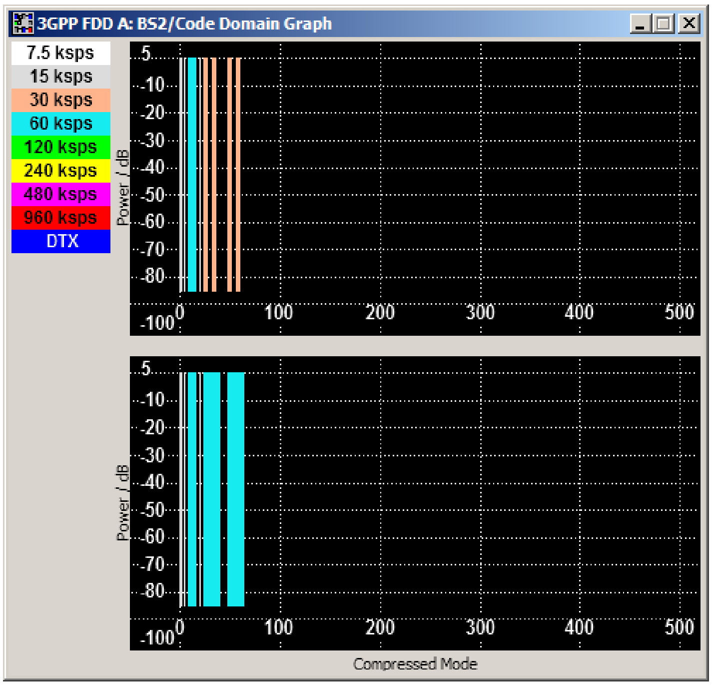
Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:METHod on page 452

Compressed Mode Method - BS

Selects compressed mode method.

"Puncturing"	The data is compressed by reducing error protection.
"Higher layer scheduling"	The data is compressed by stopping the transmission of the data stream during the transmission gap.

"SF/2" The data is compressed by halving the spreading factor.
This method can be demonstrated in the code domain graph. The graph is split into two windows. The upper window shows the code domain assignment with non-compressed slots, the lower window with compressed slots. It can be recognized clearly that the DPCH bars in the lower window are wider, which is due to the reduction of the spreading factor of these channels. The other channels (e.g. CPICH) have the same width in both halves.



Remote command:
[:SOURce<hw>]:BB:W3GPp:BStation<st>:CMODe:METHod on page 419

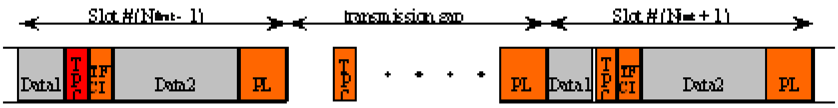
DL Frame Structure - BS

Selects frame structure. The frame structure determines the transmission of TPC and pilot field in the transmission gaps.

For 3GPP FDD radio communication to operate, the mobile station receiver requires information in the pilot field for synchronization and channel estimation and in the power control field TPC for control of the mobile station transmit power.

To keep the period during which no channel estimation takes place as short as possible, the pilot is sent in the last slot of each transmission gap.

Optionally, the first TPC field of the transmission gap can be sent in addition.



"Type A (Last Pilot)" The pilot field is sent in the last slot of each transmission gap.

"Type B (First TPC, Last Pilot)" The pilot field is sent in the last slot of each transmission gap. The first TPC field of the transmission gap is sent in addition.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:DLFStructure` on page 419

Power Offset Mode
Selects power offset mode.

The compressed slots can be sent with a power offset, i.e. at an increased power level.

"Auto (By Pilot Bit Ratio)" The power offset is obtained as the relation between the Number of pilots bits of non-compressed slots and the Number of pilot bits by compressed slots.

"User" The power offset is defined manually. The value is input in entry field Power offset.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>|MSTation<st>:CMODe:POMode` on page 421

Power Offset
Defines power offset. The entered value is only valid for "Power Offset Mode User".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>|MSTation<st>:CMODe:POFFset` on page 421

4.9.2 Compressed Mode Configuration Graph

The remaining parameters of the compressed mode are set in the configuration graph. The graph displays the distribution of transmission gaps in a compressed mode signal.

The signal generated can be divided into three subranges.

4.9.2.1 Transmission Gaps

A transmission gap has a maximum length of 14 slots. Since at least eight active slots must be sent per frame, gaps comprising seven slots and more have to be distributed over two neighboring frames.

The transmitted signal consists of max. two patterns that are sent alternately. Each pattern comprises two transmission gaps.

The graph includes all parameters necessary to define the transmission gaps in the signal.

The settings in the graph are also valid for the compressed mode graph of the user equipment with the same number. For example, setting a distance of 9 slots for base station 4 also sets the distance to 9 slots for user equipment 4.

The parameters below are interrelated in many ways. For example, the transmission gap distance must be selected so that no frame contains more than one gap. In the event of an invalid entry, the next valid value is automatically set. If the entry is valid but changes the valid range for another parameter, the setting of the parameter is adapted.

At Slot:
Transmission gap slot number.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGSN
on page 421
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGSN
on page 453

Gap Len:
Transmission gap lengths.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGL<di>
on page 420
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGL<di>
on page 453

Distance
Transmission gap distance.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGD
on page 420
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGD
on page 452

Pattern Len:
Transmission gap pattern length. The input range is 1 ... 100 frames for pattern 1 and 0 ... 100 frames for pattern 2. Thus, it is possible to configure transmission gap pattern with only one pattern.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGPL
on page 420
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGPL
on page 453

4.9.2.2 Compressed Ranges

All slots of a frame that are not blanked are compressed. If the transmission gap is transmitted within one frame (single-frame method), an envelope as shown by the diagram on figure 4-4 is obtained:

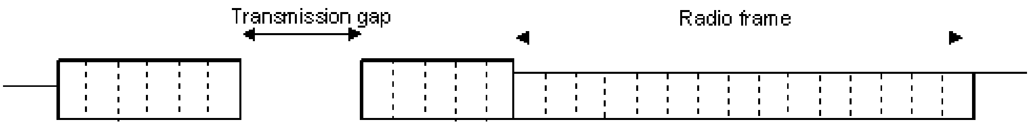


Fig. 4-4: Envelope of compressed mode signal with single-frame method

If the transmission gap is distributed over two neighboring frames, all slots of the two frames that are not blanked are compressed (see figure 4-5):

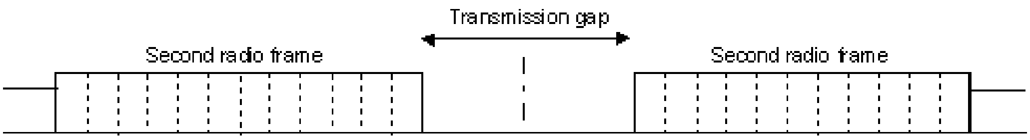


Fig. 4-5: Envelope of compressed mode signal with double-frame method

A different slot format, usually with a higher number of pilot bits, is used in the compressed ranges.

The transmit power can be increased ("Power Offset Mode") automatically or manually by defining a power offset.

4.9.2.3 Non-compressed ranges

Frames containing no transmission gaps are sent with the same slot format and the same power as in the non-compressed mode.

4.10 Code Domain Graph - BS

The channelization codes are taken from a code tree of hierarchical structure (see figure 4-6).

The higher the spreading factor, the smaller the symbol rate and vice versa. The product of the spreading factor and symbol rate is constant and always yields the chip rate.

The outer branches of the tree (right-most position in the figure) indicate the channelization codes for the smallest symbol rate (and thus the highest spreading factor). The use of a channelization code of the level with spreading factor N blocks the use of all other channelization codes of levels with spreading factor >N available in the same branch of the code tree. Channelization codes with smaller spreading factor are contained in the codes with larger spreading factor in the same code branch. When using such competitive channelization codes at the same time, the signals of associated code channels are mixed such that they can no longer be separated in the receiver. Orthogonality will then be lost.

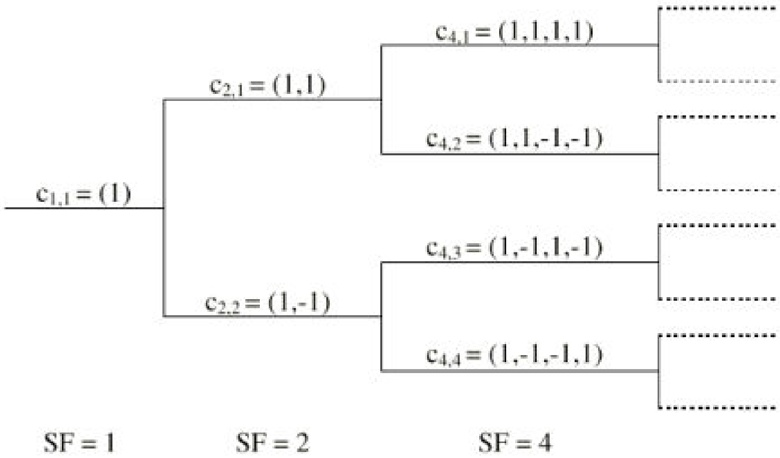


Fig. 4-6: Code tree of channelization codes

The outer branches of the tree (right-most position in the figure) indicate the channelization codes for the smallest symbol rate (and thus the highest spreading factor). The use of a channelization code of the level with spreading factor N blocks the use of all other channelization codes of levels with spreading factor >N available in the same branch of the code tree.

Example:

If code $c_{2,1}$ is being used, the remaining branch with $c_{4,1}$ and c4,2 is blocked.

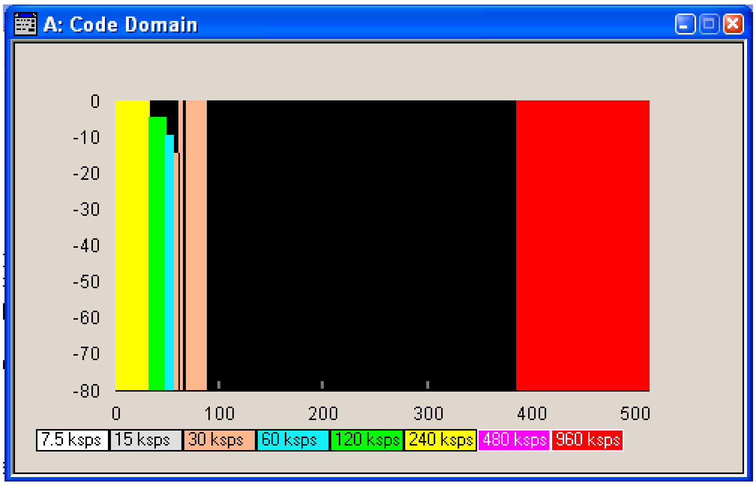
The domain of a certain channelization code is the outer branch range (with minimum symbol rate and max. spreading factor) which is based on the channelization code selected in the code tree. Using a spreading code means that its entire domain is used.

At a chip rate of 3.84 Mcps, the domain ranges from 0 to 511

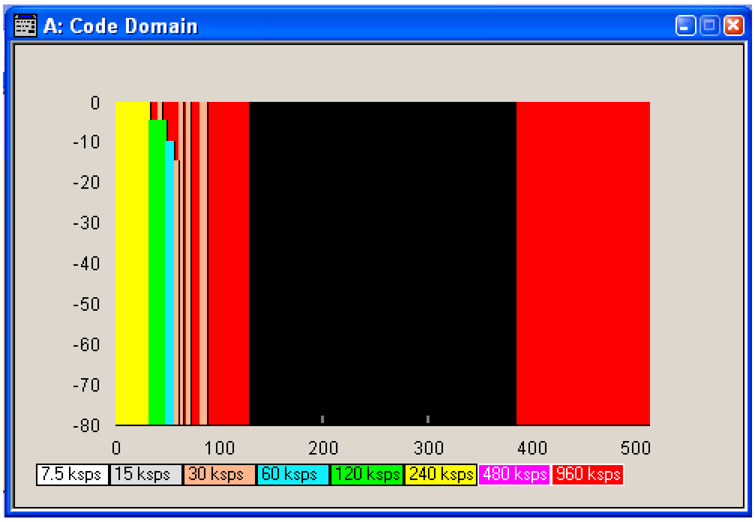
$$= \frac{Chip\_rate}{min\_Symbol\_rate} - 1 = \frac{3.84Mcps}{7.5ksps} - 1$$

Understanding the displayed information

The "Code Domain" display indicates the assigned code domain. The channelization code is plotted at the X-axis, the colored bars indicate coherent code channels. The colors are assigned to fixed symbol rates, the allocation is shown below the graph. The relative power can be taken from the height of the bar.



It is possible to determine from this display whether the settings made have resulted in a code domain conflict, that is to say, whether the code domains of the active channels intersect. A code domain conflict is indicated by overlapping bars.



The occupied code domain of a channel is calculated from the symbol rate of the channel, the minimum symbol rate (for 3GPP FDD 7.5 ksps), the chip rate (3.84 Mcps) and the channelization code number with

$$Domain\_Factor = \frac{current\_symbol\_rate}{\min\_symbol\_rate(=7.5ksps)}$$

as follows:

"Lower domain limit" = current `channelization code number * domain factor`

"Upper domain limit" = `lower domain limit + domain_factor - 1.`

Example:

Channel with symbol rate 30 ksps and channelization code 10:

Domain factor = 30/7.5 = 4,

Lower domain limit = 10 x 4 = 40,

Upper domain limit = 40 + 4 - 1 = 43.

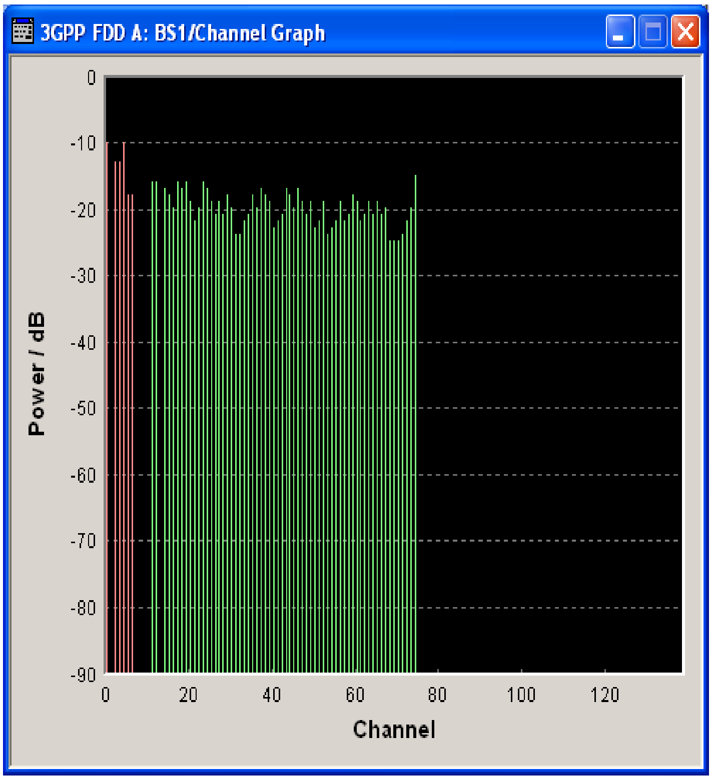
The channel occupies the code domain 40 to 43.

Refer to chapter 5.1, "Resolving Domain Conflicts", on page 255 for step-by-step description.

4.11 Channel Graph - BS

The channel graph display shows the active code channels.

1. To access the base station channel graph, select "3GPP FDD > Link Direction > Downlink / Forward".
2. Select "Basestation > BS 1/2/3/4".
3. Select "Channel Graph".



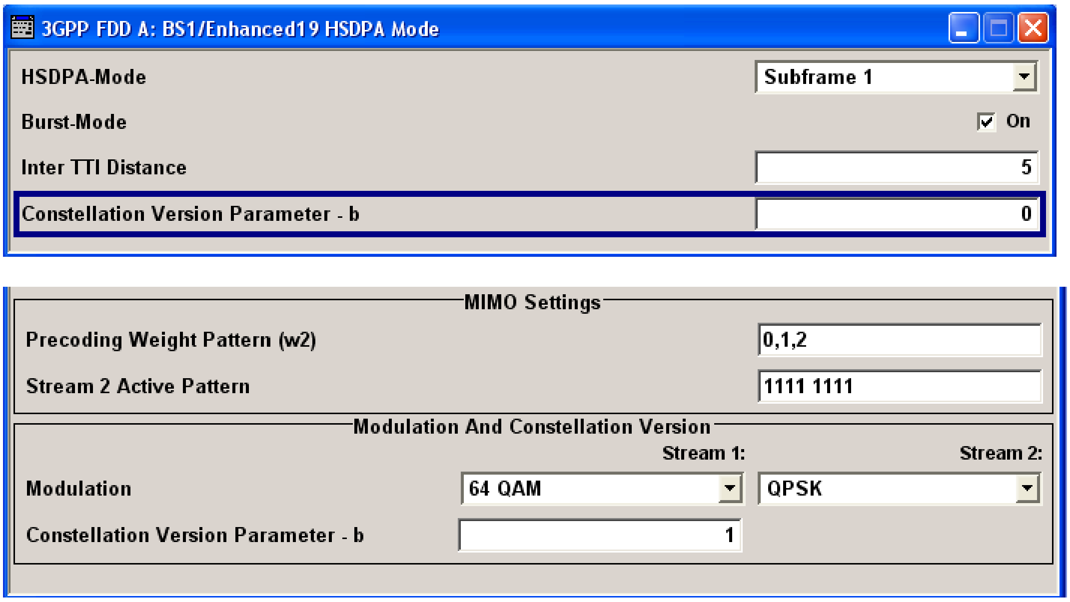
The channel number is plotted on the X-axis. The red bars represent the special channels (P-CPICH to DL-DPCCH), the green bars the other channels. The height of the bars shows the relative power of the channel
The graph is calculated from the settings that have been made.

4.12 HSDPA Settings - BS

The "MIMO Settings" are only available for enabled two-antenna system (see "Diversity / MIMO" on page 88) and selected HS-PDSCH MIMO channel.

► To access "Enhanced HSDPA Mode" dialog, select "Baseband > 3GPP FDD > BS > Channel Table > HSDPA Settings > Config".

The available settings and indications in this dialog depend on the selected HSDPA mode and channel type.



Generation modes of the high speed channels

The high speed channels can be generated either *continuously* as defined in test model 5, in packet mode or in H-Set mode according to TS 25.101 Annex A.7.

In *packet mode*, the start of the channel and the distance between the HSDPA packets can be set. The packet transmissions can start in one of the first five sub-frames (0 to 4). A sub-frame has the same length as a packet and is 3 slots long. A HS-SCCH starts at the beginning of the selected sub-frame, a HS-PDSCH starts with an offset of two slots to the selected sub-frame. The active parts of the HS-SCCH and the HS-PDSCH for a specific sub-frame setting differ by the slot offset of the HS-PDSCH.

Example:

Setting Sub-frame 1

HS-SCCH: slot 3 to 5 active

HS-PDSCH: slot 5 to 7 active.

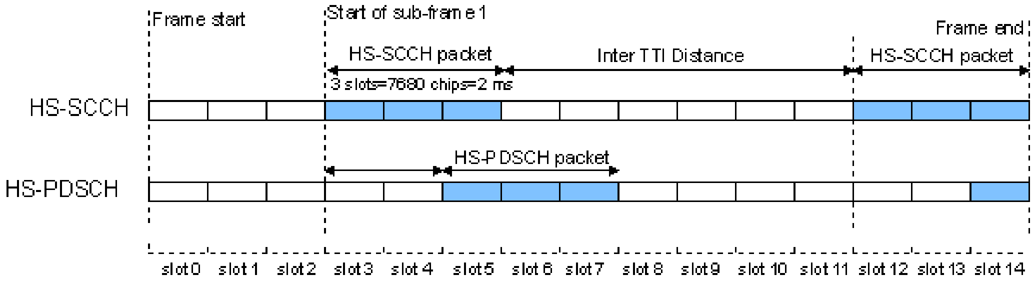


Fig. 4-7: Timing diagram for the HS-SCCH and the associated HS-PDSCH, Packet Subframe 1 mode and Inter TTI Distance = 3

In *H-Set mode*, the first packet is sent in the HS-SCCH subframe 0. Up to 15 HSDPA channels are coupled to be used in the fixed reference channels. The number of coupled channels depends on the selected H-Set. Channel coding is always performed over a certain number of bits. The resulting packets are distributed evenly over one subframe of all HS-PDSCH channelization codes. Therefore, the data stream is not assigned to a defined channel but to all coupled channels.

4.12.1 Enhanced HSDPA Mode Settings

Provided are the following settings:

HSDPA Mode

Selects the HSDPA mode.

"Continuous"	The high-speed channel is generated continuously. This mode is used in test model 5 and 6.
"Subframe 0 | 1 | 2 | 3 | 4"	The high-speed channel is generated in packet mode. The start of the channel is set by selecting the subframe in which the first packet is sent. The distance between subsequent packets is set with parameter "Inter TTI Distance".
"H-Set"	(Available for BS1 and HS-SCCH only.) The high-speed channel is generated in packet mode. The first packet is sent in the HS-SCCH subframe 0. The number of the coupled channel in the H-Set can be changed with the parameter "Number of HS-PDSCH Channel Codes".

Remote command:

`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MODE`
on page 410

Burst Mode

Activates/deactivates burst mode. The signal is bursted when on, otherwise dummy data are sent during transmission brakes.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:BMODe[:STATe]` on page 393

Inter TTI Distance (H-Set)

(Available for "subframe x")

Selects the distance between two packets in HSDPA packet mode.

The distance is set in number of sub-frames (3 slots = 2 ms). An "Inter TTI Distance" of 1 means continuous generation.

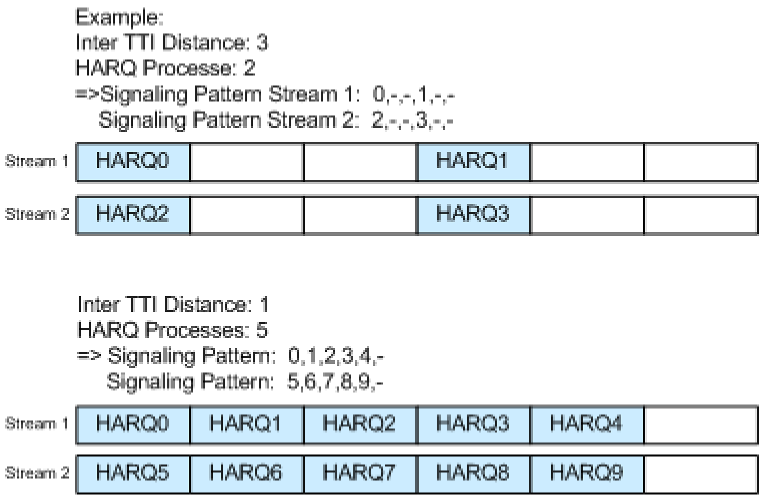


Fig. 4-8: Example: Inter TTI Distance in HSDPA H-Set Mode

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:TTIDistance` on page 410

Constellation Version Parameter b - BS

(Available for "HS-PDSCH 16QAM" and "64QAM" only)

Switches the order of the constellation points of the 16QAM or 64QAM mapping.

The re-arrangement is done according to 3GPP TS25.212.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:CVPB` on page 393

4.12.2 MIMO Configuration

The parameters in this section are available for instruments equipped with option R&S SMx/AMU-K59, BS1 and Channel Type HS-PDSCH (MIMO) only (see "Diversity / MIMO" on page 88).

Precoding Weight Pattern (w2)

Sets the precoding weight parameter w2 for MIMO precoding.

The values of the weight parameters w1, w3 and w4 are calculated based on the value for w2 (see chapter 3.1.15, "MIMO in HSPA+", on page 37.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:PWPattern` on page 409

Stream 2 Active Pattern

Enables/disables a temporal deactivation of Stream 2 per TTI in form of sending pattern.

The stream 2 sending pattern is a sequence of max 16 values of "1" (enables Stream 2 for that TTI) and "-" (disabled Stream 2 for that TTI).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:STAPattern` on page 410

Modulation Stream 1/2 (HS-PDSCH MIMO)

Sets the modulation for stream 1 and respectively stream 2 to QPSK, 16QAM or 64QAM.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:MODulation<di>` on page 409

Constellation Version Parameter b Stream 1/2 - BS

Switches the order of the constellation points of the 16QAM or 64QAM mapping.

The re-arrangement is done according to 3GPP TS25.212.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:CVPB<di>` on page 409

4.13 HSDPA H-Set Mode Settings - BS

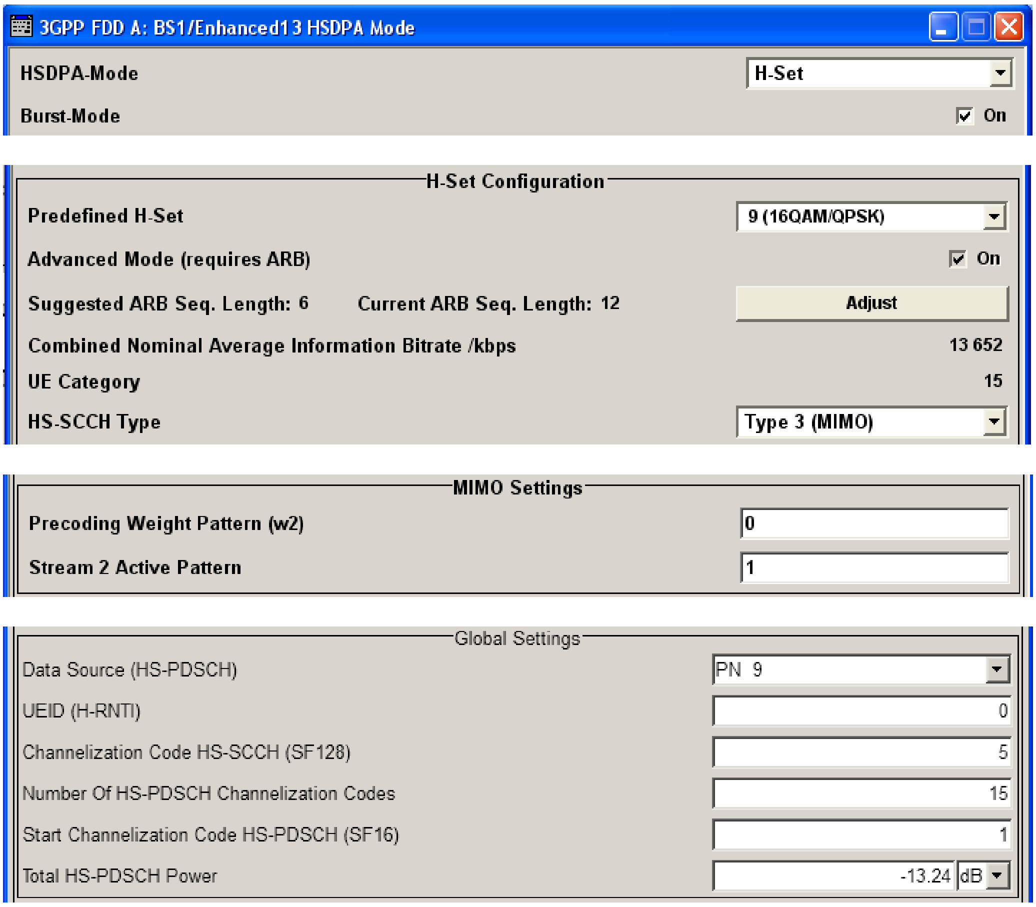
The Enhanced HSDPA H-Set Mode settings are available for BS1, HS-SCCH and HSDPA Mode set to H-Set only.

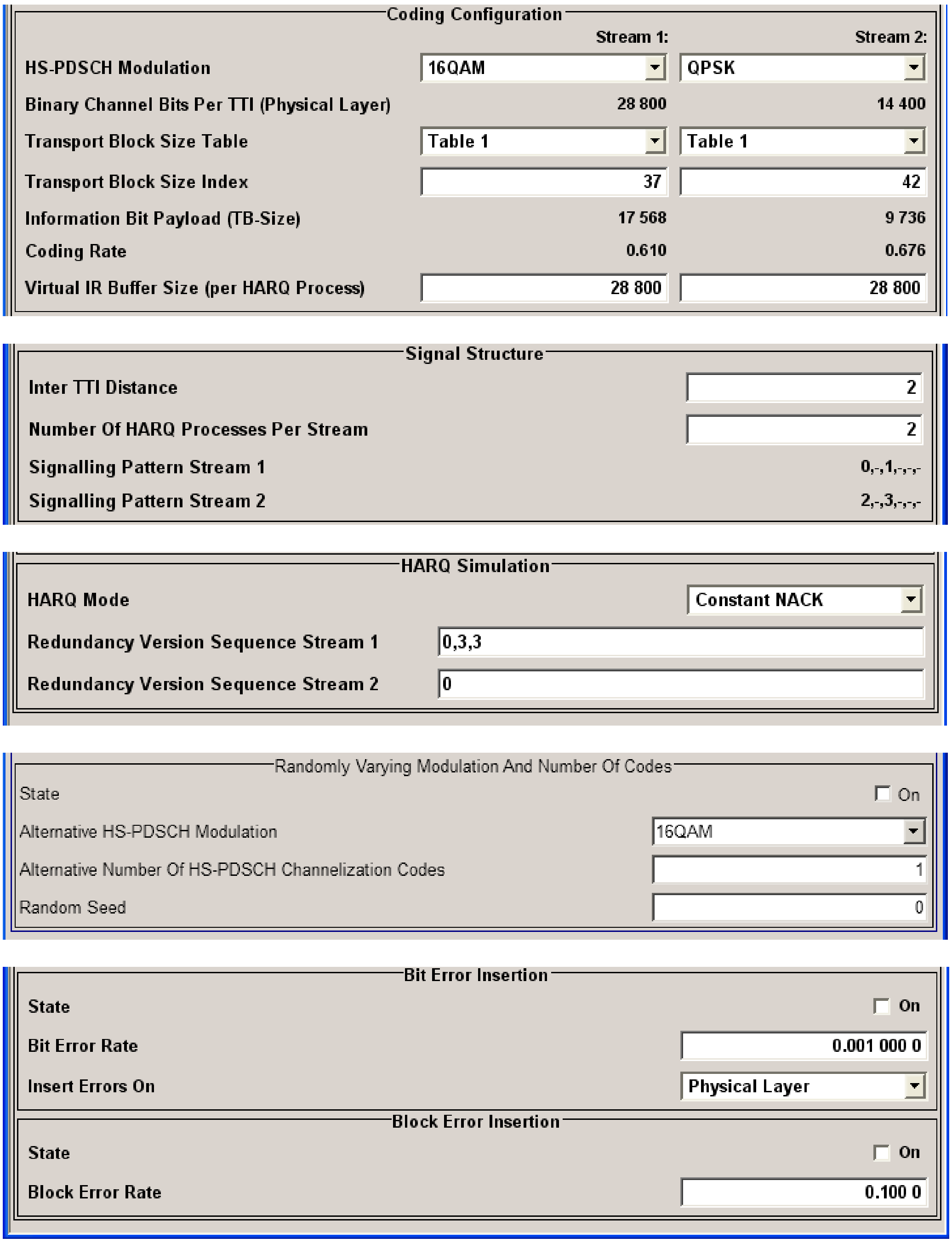
Compared to previous releases of the instrument's firmware, much more flexibility in the configuration of H-Sets is provided now. Several former fixed parameters are now configurable, e.g.:

- The channelization codes used for the physical channels are not any more fixed
- A redundancy version sequence can be selected, i.e. varying the RV is possible in case HARQ Mode Constant NACK is configured.

To let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware, set the same "Channelization Codes" as the codes used for your physical channels and set the "HARQ Mode" to "Constant ACK".

A configuration according to an H-Set defined in TS 25.101 can be easily accomplished by selecting one of the predefined H-Sets in the "Enhanced HSDPA H-Set Mode" dialog.





4.13.1 HSDPA H-Set General Setting

Provided are the following settings:

HSDPA Mode

Selects the HSDPA mode.

"Continuous" The high-speed channel is generated continuously. This mode is used in test model 5 and 6.

"Subframe 0 | 1 | 2 | 3 | 4"	The high-speed channel is generated in packet mode. The start of the channel is set by selecting the subframe in which the first packet is sent. The distance between subsequent packets is set with parameter "Inter TTI Distance".
"H-Set"	(Available for BS1 and HS-SCCH only.) The high-speed channel is generated in packet mode. The first packet is sent in the HS-SCCH subframe 0. The number of the coupled channel in the H-Set can be changed with the parameter "Number of HS-PDSCH Channel Codes".

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MODE
on page 410

Burst Mode
Activates/deactivates burst mode. The signal is bursted when on, otherwise dummy data are sent during transmission brakes.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:BMODe[:STATe] on page 393

4.13.2 H-Set Configuration Common Settings

The parameters in this section are available for BS1 and HSDPA H-Set Mode only.

Predefined H-Set
Selects the H-Set and the modulation according to TS 25.101 Annex A.7 .

Table 4-7: Following combinations are possible:

H-Set	Modulation
1, 2, 3, 6, 10	QPSK 16QAM
4, 5, 7, 12	QPSK
8	64QAM
9	16QAM (Stream 1) QPSK (Stream 2)
11	64QAM (Stream 1) 16QAM (Stream 2)
User	-

Note: H-Sets 7 - 9 and H-Set 11 are enabled for instruments equipped with option R&S SMx/AMU-K59 only. H-Set 9 and H-Set 11 are available only for enabled two-antenna system (see "Diversity / MIMO" on page 88).

Several parameters are automatically set, depending on the selection made for the parameter "H-Set". However, it is also possible to change these parameters. In this case, the value of the parameter "H-Set" is automatically set to User.

Note: Use the predefined settings to let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:PREDefined on page 399

Advanced Mode (requires ARB)
Activates/deactivates the advanced mode in which the H-Set will be generated by the ARB. The parameter can be configured only for H-Sets 1 - 5. For H-Sets 6 - 12 and User, it is always enabled.

For an H-Set calculated in arbitrary waveform mode (enabled "Advanced Mode") it is critical to set an appropriate "Current ARB Sequence Length" in order to generate a signal without unwanted artefacts when the pre-calculated sequence is repeated cyclically. In particular, the HARQ cycles have to terminate completely before restarting the signal.

Assistance in setting an appropriate sequence length is provided by the parameter "Suggested ARB Sequence Length" and the "Adjust" button. When working in Advanced Mode, it is recommended to adjust the current ARB sequence length to the suggested one.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:AMODe on page 393
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SLENgth? on page 403

Suggested ARB sequence length
Displays the suggested ARB sequence length.

The "Suggested ARB Sequence Length" is the calculated minimum length that depends on several parameters, like TTI distance, Number of HARQ Processes, HARQ cycles, HARQ Mode, RV Parameter Sequence, HS-SCCH Type, Precoding Weight Pattern and Stream 2 Active Pattern.

When working in "Advanced Mode", it is recommended to adjust the current ARB sequence length to the suggested one.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SLENgth? on page 403

Current ARB sequence length
Displays the current ARB sequence length or the adjusted ARB sequence length, set after pressing the button "Adjust".

When working in "Advanced Mode", it is recommended to adjust the current ARB sequence length to the suggested one.

Remote command:
[:SOURce<hw>]:BB:W3GPp:SLENgth on page 353

Adjust
Sets the current ARB sequence length to the suggested value.

When working in "Advanced Mode", it is recommended to adjust the current ARB sequence length to the suggested one.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SLENgth:ADJust on page 404

Nominal Average Information Bitrate
Indicates the average data rate on the transport layer. In case of MIMO, the parameter indicates the Combined Nominal Average Information Bitrate.

The "Nominal Average Information Bitrate" is calculated for the ideal case of infinite sequence and with regard of the Stream 2 Active Pattern.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:NAIBitrate? on page 399

UE Category
Displays the UE category that is minimum required to receive the selected H-Set (see also chapter 3.1.19, "UE Capabilities", on page 47).

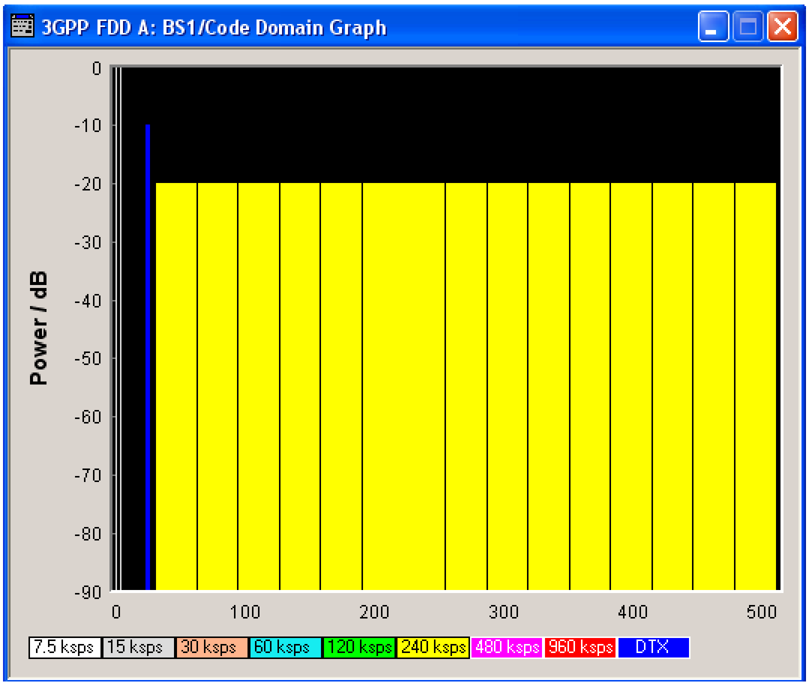
Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:UECategory? on page 407

HS-SCCH Type
Sets the HS-SCCH type.

"Type 1 (normal)"	Normal operation mode.
"Type 2 (HS-SCCH less)"	(Available for instruments equipped with option R&S SMx/AMU-K59 only) HS-SCCH Less operation mode (see also chapter 3.1.13, "HS-SCCH less operation", on page 34.

"Type 3 (MIMO)"

(Available for instruments equipped with option R&S SMx/AMU-K59 and enabled two-antenna system only)
HS-SCCH Type 3 mode is defined for MIMO operation (see also chapter 3.1.15.2, "MIMO downlink control channel support", on page 39.
Enabling this operation mode, enables the parameters in section "MIMO Settings" and the Stream 2 parameters in sections "HARQ Simulation, Signal Structure" and "Coding Configuration".
While working in HS-SCCH Type 3 mode and simulating Antenna 2 of one two-antenna system without transmit diversity, no control channel is sent although the HS-SCCH channel is displayed as active in the channel table. To prove that there is no control channel transmission consult the "Code Domain Graph".



The HS-SCCH channel is displayed as DTX.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TYPE on page 407

4.13.3 MIMO Settings

The parameters in this section are available for instruments equipped with option R&S SMx/AMU-K59, BS1, HSDPA H-Set Mode, and for HS-SCCH Type 3 (MIMO) only.

Precoding Weight Pattern (w2)

Selects the sequence for the MIMO precoding weight parameter w2.

The values of the weight parameters w1, w3 and w4 are calculated based on the value for w2 (see chapter 3.1.15, "MIMO in HSPA+", on page 37.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:PWPattern` on page 400

Stream 2 Active Pattern
Enables/disables a temporal deactivation of Stream 2 per TTI in form of sending pattern.

The stream 2 sending pattern is a sequence of max 16 values of "1" (enables Stream 2 for that TTI) and "-" (disabled Stream 2 for that TTI).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:STAPattern` on page 404

4.13.4 Global Settings

The parameters in this section are available for BS1 and HSDPA H-Set Mode only.

Data Source (HS-DSCH)
Selects the data source for the transport channel.

New data is retrieved from the data source each time an initial transmission is performed within one TTI. An initial transmission is performed in case of "HARQ Mode" set to Constant ACK or by each new beginning of the "Redundancy Version Sequence".

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

See also "Main Dialog > Data List Management".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA` on page 396
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA:PATTern` on page 397
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA:DSELect` on page 397

UEID (H-RNTI)
Enters the UE identity which is the HS-DSCH Radio Network Identifier (H-RNTI) defined in 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol Specification".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:UEID` on page 408

Channelization Code HS-SCCH (SF128)
Sets the channelization code of the HS-SCCH.

Note: To let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware, set the same "Channelization Codes" as the codes used for your physical channels.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HSCCode` on page 398

Number of HS-PDSCH Channelization Codes
Sets the number of physical HS-PDSCH data channels assigned to the HS-SCCH.

The maximum number of channels assigned to the H-Set depends on the "HS-SCCH Type" and the channel number of the first HS-PDSCH channel in the H-Set.

For HS-SCCH Type 2 (less operation) maximum of two channels can be assigned.

For HS-SCCH Type 1 (normal operation) and Type 3 (MIMO) the maximum number of assigned channels is 15.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:CLENgth` on page 395

Start Channelization Code HS-PDSCH (SF16)
Sets the channelization code of the first HS-PDSCH channel in the H-Set.

The channelization codes of the rest of the HS-PDSCHs in this H-Set are set automatically.

Note: To let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware, set the same "Channelization Codes" as the codes used for your physical channels.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SCCode` on page 403

Total HS-PDSCH Power
Sets the total HS-PDSCH power, i.e. sets the total power of all HS-DPSCH channels in the H-Set.

Note: In the 3GPP test specification, e.g. 3GPP TS34.121-1, the HS-PDSCH power is typically given as a total power of all HS-PDSCH channels.
Use this parameter to set the HS-PDSCH power level directly as given in the 3GPP test specification.

There are two possibilities to set the power of a H-Set:

- select "BS1 > Channel Table > HS-PDSCH Channel > Power" and set the power of the individual channels.
  The total power of all HS-PDSCH channels of the H-Set depends on the Number of HS-PDSCH Channelization Codes and is calculated as follow:
  $TotalPower_{All\ HS\text{-}PDSCHs} = Power_{HS\text{-}PDSCH\ Channel} + 10*Log_{10}(NumberOfHS\text{-}PDSCHChannelizationCodes)$
  The calculated total power is displayed with the parameter "Total HS-PDSCH Power"
- set directly the total power of the H-Set, i.e set the parameter "Total HS-PDSCH Power"
  The individual power levels of the HS-PDSCHs are calculated automatically and displayed in the "BS1 > Channel Table > HS-PDSCH Channel > Power".

Example:

Select "BS1 > HSDPA H-Set".

The default H-Set with 5 Channelization Codes ("BS1 > Channel table > HSDPA Settings > Config > Enhanced HSDPA Mode > Number of HS-PDSCH Channelization Codes") is configured.

The default individual power levels of the HS-PDSCH channels are -20 dB. The "Total HS-PDSCH Power" is -13.01 dB.

Set the "Total HS-PDSCH Power" to -10 dB. The individual power levels of the HS-PDSCH channels are -16.99 dB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TPOWer on page 405

4.13.5 Coding Configuration

The parameters in this section are available for BS1 and HSDPA H-Set Mode only.
The parameters for stream 2 are available for instruments equipped with option R&S SMx/AMU-K59 and for HS-SCCH Type 3 only.

HS-PDSCH Modulation Stream1/2
Sets the HS-PDSCH modulation for stream 1 and stream 2 to QPSK, 16QAM or 64QAM.

Note: The modulation 64QAM is available for instruments equipped with option R&S SMx/AMU-K59 only.

For HS-SCCH Type 2, the available modulation scheme is QPSK only.

For HS-SCCH Type 3 (MIMO), the modulation selected for stream 1 has to be the higher order one, i.e. combination 16QAM/64QAM is not allowed.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:MODulation<di>` on page 399

UE Supports 64QAM
(Available for BS1, "HSDPA H-Set Mode", "HS-SCCH Type 1" and "16QAM" only)

Enables/disables UE support of 64QAM.

In case this parameter is disabled, i.e. the UE does not support 64QAM, the xccs,7 bit is used for channelization information.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:S64Qam` on page 402

Binary Channel Bits per TTI (Physical Layer) Stream1/2
Displays the coded binary channel bits per TTI and per stream.

The value displayed is calculated upon the values and selections for the parameters "HS-PDSCH Modulation", "Symbol Rate" and "Number of HS-PDSCH Channel Codes".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:BCBTti<di>?` on page 394

Transport Block Size Table Stream1/2
Selects Table 0 or Table 1 as described in 3GPP TS 25.321.

For "HS-PDSCH Modulation" set to 64QAM, only Table 1 is available.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TBS:TABLe<di>` on page 406

Transport Block Size Index Stream1/2
Selects the Index ki for the corresponding table and stream, as described in 3GPP TS 25.321.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TBS:INDex<di>` on page 406

Transport Block Size Reference Stream1/2
(Available for BS1, HSDPA H-Set Mode and HS-SCCH Type 2 only)

While working in less operation mode, this parameter is signaled instead of the parameter Transport Block Size Index.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TBS:REFerence on page 406

Information Bit Payload (TB-Size) Stream 1/2
Displays the payload of the information bit. This value determines the number of transport layer bits sent in each TTI before coding.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:BPAYload<di>? on page 395

Coding Rate Stream 1/2
Displays the resulting coding rate per stream.

The coding rate is calculated as a relation between the "Information Bit Payload" and "Binary Channel Bits per TTI".

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:CRATe<di>? on page 396

Virtual IR Buffer Size (per HARQ Process) Stream1/2
Sets the size of the Virtual IR Buffer (Number of SMLs per HARQ-Process) per stream.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:VIBSize<di> on page 408

4.13.6 Signal Structure

The parameters in this section are available for BS1 and HSDPA H-Set Mode only. The parameters for stream 2 are available for instruments equipped with option R&S SMx/AMU-K59 and for HS-SCCH Type 3 only.

Inter TTI Distance (H-Set)
(Available for "subframe x")

Selects the distance between two packets in HSDPA packet mode.

The distance is set in number of sub-frames (3 slots = 2 ms). An "Inter TTI Distance" of 1 means continuous generation.

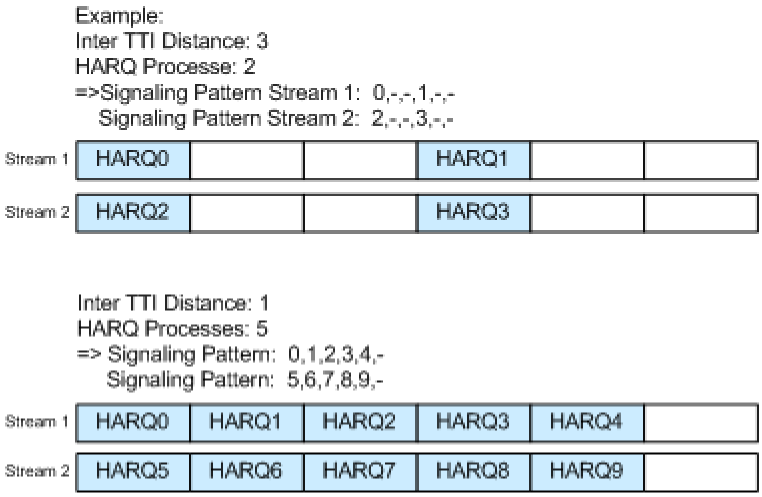


Fig. 4-9: Example: Inter TTI Distance in HSDPA H-Set Mode

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:TTIDistance` on page 410

Number of HARQ Processes per Stream
Sets the number of HARQ processes. This value determines the distribution of the payload in the subframes and depends on the Inter "TTI Distance" (see figure).

A minimum of 6 HARQ Processes are required to achieve continuous data transmission.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HARQ:LENGth` on page 397

Signaling Pattern Stream1/2
Displays the distribution of packets over time. The Signaling Pattern displays a HARQ-Process cycle and is a sequence of HARQ-IDs and "-". A HARQ-ID indicates a packet, a "-" indicates no packet (see figure). The Signaling Pattern is cyclically repeated.

Long signaling patterns with regular repeating groups of HARQ-ID and "-" are not displayed completely. The signaling pattern is shortened and ". . ." is displayed but the scheduling is performed according to the selected "Inter TTI Distance". Long signaling patterns with irregularity in the HARQ-ID and "-" groups are displayed completely.

Depending on the selected "Burst Mode", a Dummy - TTI will be sent within the no packet subframes.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SPATtern<di>?` on page 404

4.13.7 HARQ Simulation

The parameters in this section are available for BS1 and HSDPA H-Set Mode only. The parameters for stream 2 are available for instruments equipped with option R&S SMx/AMU-K59 and for HS-SCCH Type 3 only.

Mode (HARQ Simulation)
Sets the HARQ Simulation Mode.

Note: To let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware, set the "HARQ Mode" to "Constant ACK".

"Constant ACK"
New data is used for each new TTI. This mode is used to simulate maximum throughput transmission.

"Constant NACK"
(enabled in "Advanced Mode" only)
Enables NACK simulation, i.e. depending on the sequence selected with parameter "Redundancy Version Parameter Sequence" packets are retransmitted. This mode is used for testing with varying redundancy version.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HARQ:MODE` on page 398

Redundancy Version Stream1/2
The parameter is enabled for "HARQ Simulation Mode" set to Constant ACK.

Enters the Redundancy Version Parameter per stream. This value determines the processing of the Forward Error Correction and Constellation Arrangement (16/64QAM modulation), see TS 25.212 4.6.2.

For HS-SCCH Type 2 (less operation), the Redundancy Version Parameter is always 0.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:RVParameter<di>` on page 400

Redundancy Version Sequence Stream 1/2
The parameter is enabled for "HARQ Simulation Mode" set to Constant NACK.

Enters a sequence of Redundancy Version Parameters per stream. The value of the RV parameter determines the processing of the Forward Error Correction and Constellation Arrangement (16/64QAM modulation), see TS 25.212 4.6.2.

The sequence has a length of maximum 30 values. The sequence length determines the maximum number of retransmissions. New data is retrieved from the data source after reaching the end of the sequence.

For HS-SCCH Type 2 (less operation), the Redundancy Version Parameter Sequence is always "0,3,4".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:RVPSequence<di>` on page 401

4.13.8 Error Insertion

The parameters in this section are available for BS1, HSDPA H-Set Mode and disabled Advanced Mode only.

In the "Bit Error Insertion" and "Block Error Insertion" sections, errors can be inserted into the data source and into the CRC checksum, in order, for example, to check the bit and block error rate testers.

Bit Error State (HSDPA H-Set)
Activates or deactivates bit error generation.

Bit errors are inserted into the data stream of the coupled HS-PDSCHs. It is possible to select the layer in which the errors are inserted (physical or transport layer).

When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BIT:STATe` on page 445

Bit Error Rate (HSDPA H-Set)
Sets the bit error rate.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BIT:RATE` on page 445

Insert Errors On (HSDPA H-Set)
Selects the layer at which bit errors are inserted.

"Transport layer"
Bit errors are inserted in the transport layer.

"Physical layer"
Bit errors are inserted in the physical layer.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BIT:LAYer` on page 445

Block Error State (HSDPA H-Set)
Activates or deactivates block error generation.

The CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate an invalid signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BLOCk:STATe on page 446

Block Error Rate (HSDPA H-Set)
Sets the block error rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BLOCk:RATE on page 446

4.13.9 Randomly Varying Modulation And Number Of Codes (Type 3i) Settings

(Available for enabled Advanced Mode, HS-SCCH Type 1 and for instruments equipped with option R&S SMx/AMU-K59)

The used modulation and number of HS-PDSCH codes in an H-Set is randomly selected every HSDPA TTI among four options with equal probability (see table 4-8).

Table 4-8: Used modulation and number of HS-PDSCH codes

Option	Modulation	Number of HS-PDSCH Codes
1	HS-PDSCH Modulation	Alternative Number of HS-PDSCH Channelization Codes
2	"Alternative HS-PDSCH Modulation" on page 125	Alternative Number of HS-PDSCH Channelization Codes
3	HS-PDSCH Modulation	Number of HS-PDSCH Channelization Codes
4	"Alternative HS-PDSCH Modulation" on page 125	Number of HS-PDSCH Channelization Codes

Although the number of active HS-PDSCH channels varies over time, the overall power of the HS-PDSCH channels in the H-Set stays constant, as the power of the individual HS-PDSCH channels is raised when the number is reduced.

The channel powers displayed in the "BS > Channel Table" are the channel powers during the TTIs in which the Number of HS-PDSCH Channelization Codes is applied.

The ARB sequence length suggestion (see Suggested ARB sequence length) does not consider the statistical process of the selection among the four options, it may be necessary to further increase the ARB sequence length to achieve the desired statistical properties.

To generate a signal without unwanted artefacts, select "3GPP FDD > Filter/Clipping/ARB Settings" and set the parameter Sequence Length ARB to a multiple of the suggested length.

The configured Transport Block Size Table and Transport Block Size Index are used in all TTIs, no matter which of the four options is used. The payload size can vary over time and can deviate from the value displayed with the parameter Information Bit Payload (TB-Size) Stream 1/2.

Randomly Varying Modulation And Number Of Codes
Enables/disables the random variation of the modulation and codes.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:RVSTate` on page 402

Alternative HS-PDSCH Modulation
Sets the alternative modulation (see table 4-8).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:ALTModulation` on page 394

Alternative Number of HS-PDSCH Channelization Codes
Sets the alternative number of HS-PDSCH channelization codes (see table 4-8).

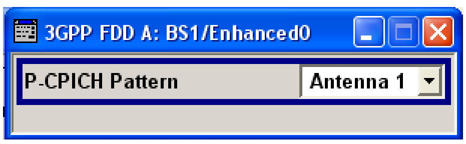
Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:ACLength` on page 394

Random Seed
Sets the seed for the random process deciding between the four option (see table 4-8).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SEED` on page 402

4.14 Enhanced Settings for P-CPICH - BS1

► To access this dialog, select "3GPP FDD > BS > Channel Table > P-CPICH > Enhanced Settings > Config".

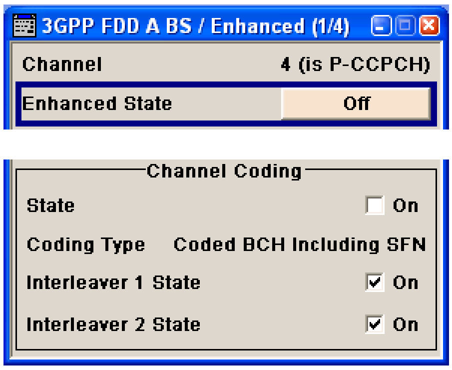


P-CPICH Pattern
Sets the P-CPICH pattern (channel 0).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:ENHanced:PCPich:PATTern` on page 427

4.15 Enhanced Settings for P-CCPCH - BS1

► To access this dialog, select "3GPP FDD > BS1 > Channel Table > P-CCPCH > Enhanced Settings > Config".



The dialog comprises the settings for configuring the enhanced state of this displayed channel and the channel coding settings. Interleaver states 1 and 2 can be activated separately.
The settings for the enhanced P-CCPCH channel and the enhanced DPCH channels are different (see chapter 4.16, "Enhanced Settings for DPCHs - BS1", on page 128.

4.15.1 Channel Number and State

Channel Number (Enhanced P-CCPCH)
Displays the channel number and the channel type.

Remote command:
n.a.

State (Enhanced P-CCPCH)
Switches the P-CCPCH (Primary Common Control Phys. Channel) to the enhanced state. The channel signal is generated in realtime.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:STATe` on page 427

4.15.2 Channel Coding - Enhanced P-CCPCH BS1

The "Channel Coding" section is where the channel coding settings are made.

The channel-coded P-CCPCH (Broadcast Channel BCH) with System Frame Number is generated according to the following principle.

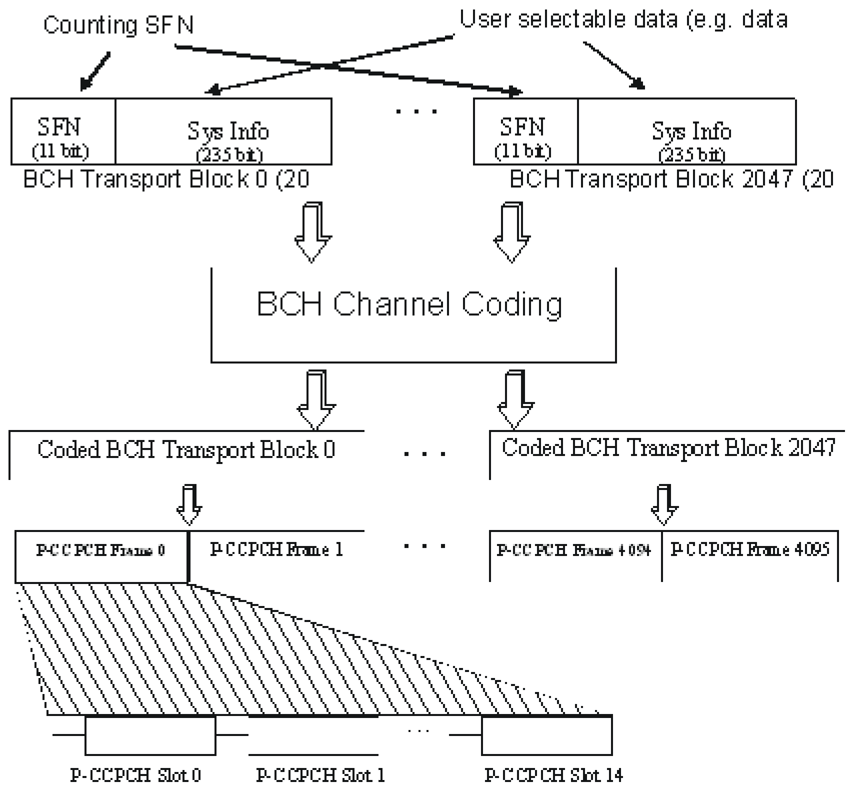


Fig. 4-10: Generation of a channel coded P-CCPCH/BCH

The data blocks of the BCH at transport-channel level comprise data determined for 20 ms of the PCCPCH (i.e. 2 frames) after channel coding. The first field of such a data block is an 11bit long field for the system frame number (SFN). The SFN is automatically incremented by 1 (as stipulated in the standard) from transport block to transport block (equivalent to a step width of 2 frames due to the transport time interval length of 20 ms). After 2048 transport blocks (equivalent to 4096 frames) the SFN is reset and starts again at 0 (SFN restart). An output trigger indicating the SFN restart can be generated.

The SFN format is defined in the standard; it is MSB-first coded.

The remaining system information (a 235-bit long field per block) is filled from the data source selected for the P-CCPCH.

A data list can be used to transmit further specific system information in addition to the SFN. If only the SFN is required, "ALL 0" is recommended as data source for P-CCPCH.

The BCH transport blocks are then channel-coded. A coded transport block comprises the data sequence for two P-CCPCH frames.

Channel Coding State
Activates or deactivates channel coding.

The coding scheme is displayed in the field below.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:CCODing:STATe on page 438

Channel Coding Type
Displays the coding scheme.

The coding scheme of P-CCPCH (BCH) is specified in the standard. The channel is generated automatically with the counting system frame number (SFN). The system information after the SFN field is completed from the selected data source.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:CCODing:TYPE? on page 438

Interleaver
Activates or deactivates channel coding interleaver states 1 and 2.

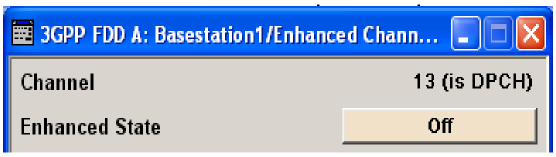
Note: The interleaver states do not cause the symbol rate to change

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:CCODing:INTerleaver<di> on page 438

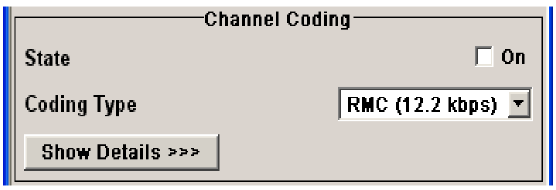
4.16 Enhanced Settings for DPCHs - BS1

► To access these settings, select "3GPP FDD > BS1 > Channel Table > DPCH > Enhanced/HSDPA Settings > Config...".

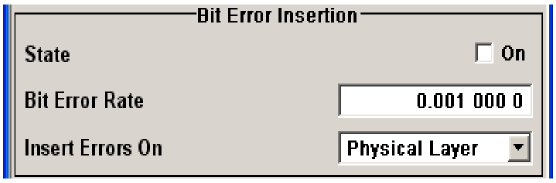
The "Enhanced Channel" dialog comprises information on the selected channel and settings for activating the enhanced state of this channel.

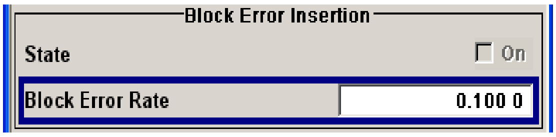


The "Channel Coding" section comprises the settings to enable the channel coding, select the coding type or display more information, like detailes on the transport channel.

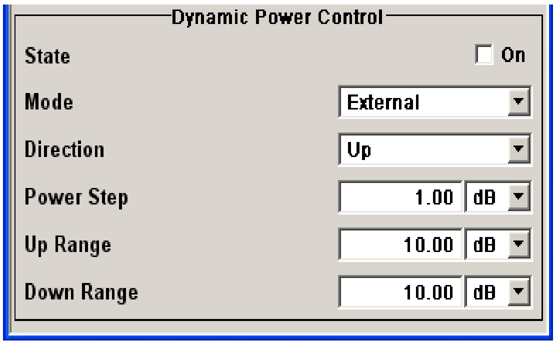


Available are settings to enable and configure "Bit/Block Error Insertion".





The "Dynamic Power Control" section comproises the settings necessary to configure the power of the selected Enhanced Channel and to increase or decrease it within the predefined dynamic range ("Up Range + Down Range") and with the predefined step size ("Power Step").



The settings for the enhanced P-CCPCH channel (see chapter 4.15, "Enhanced Settings for P-CCPCH - BS1", on page 126) and the enhanced DPCH channels are different. This section describes the settings for the enhanced DPCH channels (channels#11/12/13). The channels can be configured independently.

Use the HSDPA Settings - BS dialog to configure the high-speed channels.

4.16.1 Channel Number and State

Provided are the following settings:

Enhanced State

Switches the DPCH channel to the enhanced state.

In the enhanced state, the modulation signal of the selected channel is generated in realtime. It is possible to activate channel coding and simulate bit and block errors or use dynamic power control. Data lists, for example with user data for the transport layer, can be used as the data source.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:STATe` on page 426

4.16.2 Channel Coding

The "Channel Coding" section is where the channel coding settings are made. You can choose between a reduced display and the detailed setting options display. With the reduced display, it is only possible to select the coding scheme and this selection sets the associated parameters to the presetting prescribed in the standard. The "Transport Channel" section for detailed setting and for defining a user coding can be revealed with the "Show Details" button and hidden with the "Hide Details" button.

A downlink reference measurement channel according to 3GPP TS 25.101 is generated when the transport channels DTCH (Dedicated Traffic Channel) and DCCH (Dedicated Control Channel) , which contain the user data, are mapped to a DPCH (Dedicated Physical Channel) with a different data rate after channel coding and multiplexing. The display below is taken from the standard (TS 25.101) and shows in diagrammatic form the generation of a 12.2 kbps reference measurement channel from the DTCH and DCCH transport channels (see standard for figures and tables of other reference measurement channels).

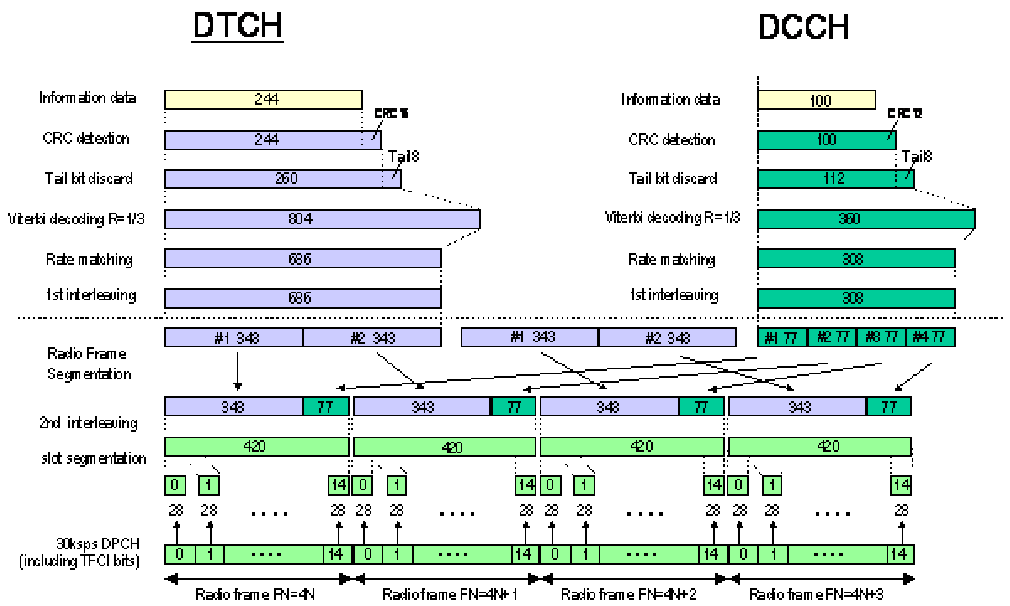


Fig. 4-11: Channel coding of the 12.2 kbps reference measurement channel (downlink)

The table 4-9 shows a summary of the transport channel parameters of the 12.2 kpbs reference measurement channel

Table 4-9: Transport channel parameters (12.2 kpbs reference measurement channel)

Parameter	DCCH	DTCH
Data Source	All 0	All 0
Transport Block Size	100	244
Transmission Time Interval	40 ms	20 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3

Parameter	DCCH	DTCH
Rate Matching attribute	256	256
Size of CRC	12	16
Interleaver 1/2	On	On

Channel Coding State

Activates or deactivates channel coding.

Channel-coded measurement channels - so-called "reference measurement channels" - are required for many test procedures specified by the standard.

When channel coding is activated, (depending on the coding type) the slot format (and thus the symbol rate, the pilot length and the TFCI state) are predetermined. The corresponding parameters in the channel table are disabled.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:STATe on page 430

Channel Coding Type

Selects channel coding.

The 3GPP specification defines 4 reference measurement channel coding types, which differ in the input data bit rate bit to be processed (12.2, 64, 144 and 384 ksps). The additional AMR CODER coding scheme generates the coding of a voice channel.

The BTFD coding types with different data rates are also defined in the 3GPP specification (TS 34.121). They are used for the receiver quality test Blind Transport Format Detection. DTX (Discontinuous Transmission) bits are included in the data stream between rate matching and interleaving 1.

User coding can be defined as required in the detailed coding settings menu section revealed with button "Show Details". They can be stored and loaded in the "User Coding" submenu. Selection User is indicated as soon as a coding parameter is modified after selecting a predefined coding type.

The input data bits are taken for channel coding from the data source specified in the "Transport Channel" dialog section. The bits are available with a higher rate at the channel coding output. The allocations between the measurement input data bit rate and the output symbol rate are fixed, that is to say, the symbol rate is adjusted automatically.

The following are available for selection:

"RMC 12.2 kbps" 12.2 kbps measurement channel

"RMC 64 kbps" 64 kbps measurement channel

"RMC 144 kbps" 144 kbps measurement channel

"RMC 384 kbps" 384 kbps measurement channel

"AMR 12.2 kbps" Channel coding for the AMR coder

"BTFD Rate 1 12.2ksps"	Blind Transport Format Detection Rate 1 (12.2 kbps)
"BTFD Rate 2 7.95ksps"	Blind Transport Format Detection Rate 2 (7.95 kbps)
"BTFD Rate 3 1.95ksps"	Blind Transport Format Detection Rate 3 (1.95 kbps)

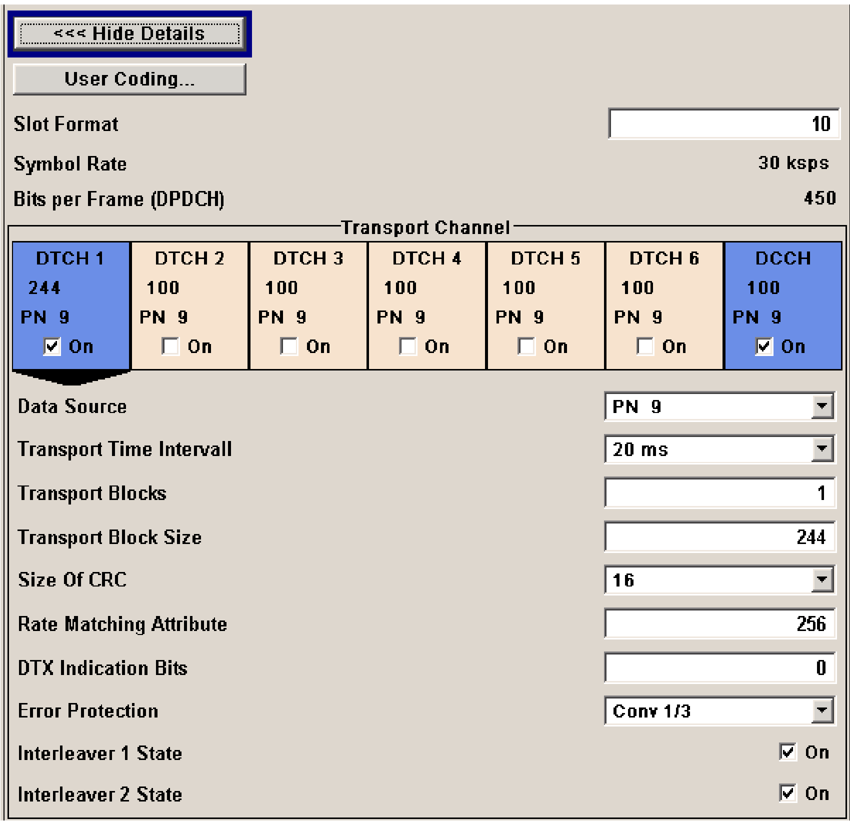
Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:TYPE on page 430

Show Details

Reveals the detailed setting options for channel coding.

Available as well as the "Transport Channel" section are the "Bits per Frame" parameter and the "User Coding" button.

Once the details are revealed, the labeling on the button changes to "Hide Details". Use this to hide the detailed setting options display again.



Remote command:
n.a.

User Coding

Calls the "User Coding" menu.

From the "User Coding" menu, the "File Select" windows for saving and recalling user-defined channel coding and the "File Manager" can be called.

User coding of BST1 are files with the predefined file extension `*.3g_ccod_dl`. The file name and the directory they are stored in are user-definable; the file extension is assigned automatically.

The complete channel coding settings are saved and recalled.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel:DPCH:CCODing:USER:CATalog?` on page 432
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:USER:STORe` on page 432
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:USER:LOAD` on page 432

Slot Format (DPDCH)
Enters the slot format. The slot format (and thus the symbol rate, the pilot length and the TFCI state) depends on the coding type selected. The User Coding selection appears as soon as the slot format is changed.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:SFORmat` on page 429

Symbol Rate (DPDCH)
Displays the symbol rate.

The symbol rate is determined by the slot format set.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:SRATe?` on page 429

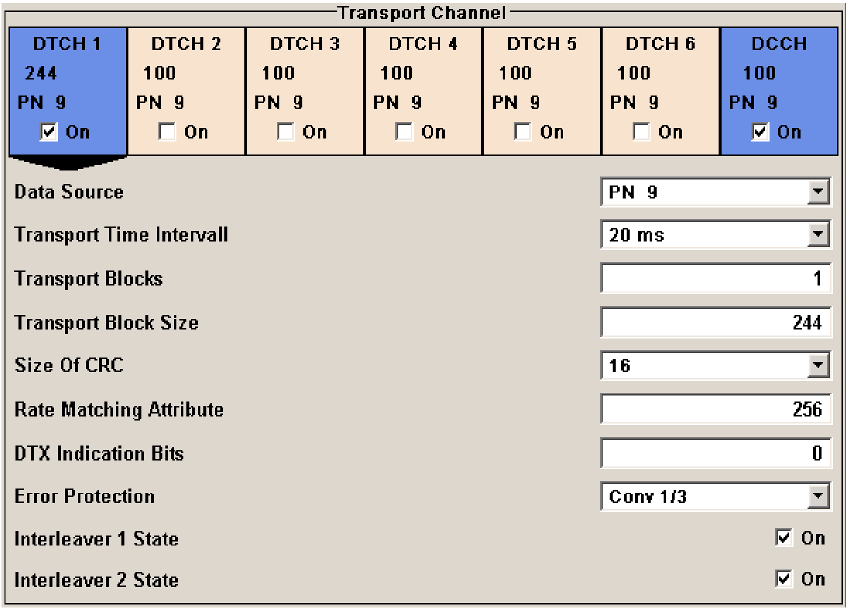
Bits per Frame (DPDCH)
Displays the data bits in the DPDCH component of the DPCH frame at physical level. The value depends on the slot format.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:BPFRame?` on page 428

4.16.3 Transport Channel - Enhanced DPCHs BS1

In the "Transport Channel" section, up to 7 transport channels (TCHs) can be configured. The first one is always a DCCH; the other six are DTCHs (DTCH1 to 6). The most important parameters of the TCH are displayed (data source and transport block size). The associated parameters shown in the section below depend on which TCH is currently selected.

A wide arrow beneath the block indicates which TCH is currently selected.



Transport Channel State

Activates or deactivates the transport channel.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:STATe` on page 437

In case of remote control, DCCH corresponds to `:TCHannel0`, DTCH1 to `:TCHannel1`, etc.

Data Source

Selects the data source for the transport channel.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  - Use the standard "File Manager" function to transfer external data lists to the instrument.

See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA on page 434
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA:PATTern on page 435
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA:DSELect on page 434

Transport Time Interval
Sets the number of frames into which a TCH is divided. This setting also defines the interleaver depth.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:TTINterval on page 438

Transport Block
Sets the number of transport blocks for the TCH.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:TBCount on page 437

Transport Block Size
Sets the size of the transport block at the channel coding input.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:TBSize on page 437

Size of CRC
Defines the type (length) of the CRC. Checksum determination can also be deactivated (setting None).

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:CRCSize on page 433

Rate Matching Attribute
Sets data rate matching (Rate Matching).

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:RMATtribute on page 436

DTX Indication Bits
Sets the number of DTX (Discontinuous Transmission) bits. These bits are entered in the data stream between rate matching and interleaver 1. Channel coding of BTFD reference measurement channels Rate 2 and Rate 3 includes DTX267 and DTX644, respectively (see 3GPP TS 34.121).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DTX` on page 435

Error Protection
Selects error protection.

"None"	No error protection
"Turbo 1/3"	Turbo Coder of rate 1/3 in accordance with the 3GPP specifications.
"Conv 1/2 | 1/3"	Convolution Coder of rate 1/2 or 1/3 with generator polynomials defined by 3GPP.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:EPRotection` on page 435

Interleaver 1 State
Activates or deactivates channel coding interleaver state 1 of the transport channel. Interleaver state 1 can be set independently in each TCH. Activation does not change the symbol rate.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:INTerleaver` on page 436

Interleaver 2 State
Activates or deactivates channel coding interleaver state 2 of all the transport channels. Interleaver state 2 can only be set for all the TCHs together. Activation does not change the symbol rate.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:INTerleaver2` on page 433

4.16.4 Error Insertion - Enhanced DPCHs BS1

In the "Bit Error Insertion" and "Block Error Insertion" sections, errors can be inserted into the data source and into the CRC checksum, in order, for example, to check the bit and block error rate testers.

Bit Error State (Enhanced DPCHs)
Activates or deactivates bit error generation.

Bit errors are inserted into the data fields of the enhanced channels. When channel coding is active, it is possible to select the layer in which the errors are inserted (physical or transport layer).

When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:STATe on page 443

Bit Error Rate
Sets the bit error rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:RATE on page 443

Insert Errors On
Selects the layer in the coding process at which bit errors are inserted.

"Transport layer" Bit errors are inserted in the transport layer.
This selection is only available when channel coding is active.

"Physical layer" Bit errors are inserted in the physical layer.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:LAYer on page 443

Block Error State
Activates or deactivates block error generation.

The CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate an invalid signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BLOCk:STATe on page 444

Block Error Rate
Sets block error rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BLOCk:RATE on page 444

4.16.5 Dynamic Power Control - Enhanced DPCHs BS1

The R&S WinIQSIM2 does not support Dynamic Power Control.

The "Dynamic Power Control" section comprises the settings necessary to configure the power of the selected enhanced channel and to increase or decrease it within the predefined dynamic range ("Up Range + Down Range") and with the predefined step size ("Power Step") depending on a control signal.

The control signal can be provided either externally, internally (TPC pattern) or manually (see Mode).

The R&S SMx/AMU provides two connectors for the external control signal, the LEVATT connector and the USER1 connector.

The R&S SMBV does not support externally provided control signals.

The "Dynamic Power Control" is suitable for testing of Closed (Inner) Loop Power Control in two test constellations:

- To test whether the DUT (receiver) correctly performs the SIR (Signal to Interference Ratio) measurement and inserts the corresponding bits into the TPC field of its transmitting signal.
  The TPC control information is provided by an external "Dynamic Power Control" signal.
- To test whether the DUT (transmitter) responds with the correct output power to received TPC bits.
  To perform this test, use a data list adapted to the test condition as TPC data source. The TPC pattern is defined in the channel table.

The power change of the channels is performed by a switchover of a mapping table, controlled by the "Dynamic Power Control" signal which is queried at the beginning of the pilot field. The limited number of mappings restricts the maximum dynamic range to 30 dB and the step width to min. 0.5 dB. The output power of each channel is thus limited to the dynamic range around the channel-specific start power.

Optaining optimum signal quality

The "Power Up Range" should not be set higher than necessary because the mapping of the I/Q level in this range must be maintained as a level margin.

Example: Principle of the downlink dynamic power control

"Power Up Range = Power Down Range"

Channel#11/13, "Direction > Up"

Channel#12, "Direction > Down"

External control signal is provided

The figure 4-12 illustrates the adjustment in the channel power of these 3 enhanced channels.

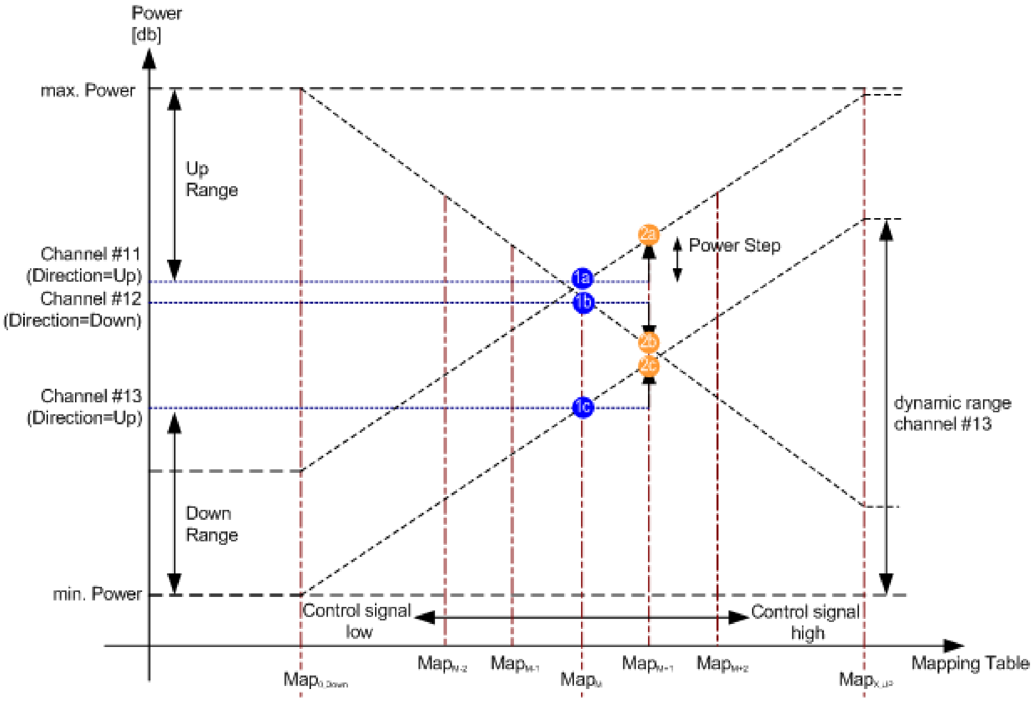


Fig. 4-12: Dynamic Power Control (Down Link)

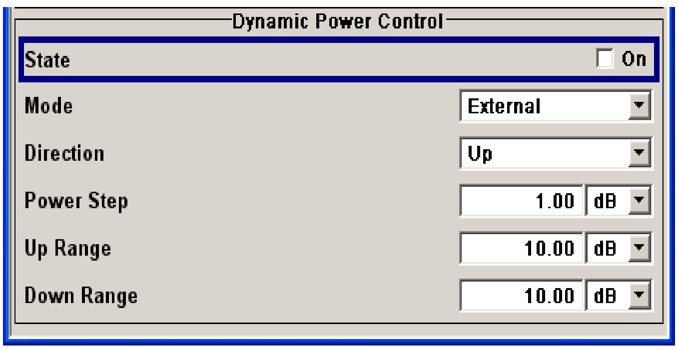
1a, 1b, 1c = Start power of the corresponding channel#11/12/13
2a, 2b, 2c = Resulting channel power of channel#11/12/13 at high level of the control signal at the begining of the pilot field.

The available mappings are shown on the X-axis with Map_M being the starting point. In this point, all channels have the start power as selected in the channel table.

At the beginning of the pilot field, the provided control signal is queried in each time-slot. Receiving of a logical "1" results in a switchover to the right mapping Map_{M+1}. This means an increase of the output power by "Power Step" for all channels with "Power Control Mode Up". In this example, the power of channel 12 is decreased by the same value (see figure 4-12).

Receiving of a logical "0" results in a switchover to the left mapping Map_{M-1}. This means a reduction of the output power by "Power Step" for all channels with "Power Control Mode Down". The power of channel 12 is increased by the same value.

The "Dynamic Power Control" settings are performed in the "Enhanced Settings" menu of the channel table.



Dynamic Power Control State

Activates or deactivates the "Dynamic Power Control" for the selected enhanced channel.

With activated Dynamic Power Control, the power of the enhanced channel can be increased or decreased within the predefined dynamic range ("Up Range" + "Down Range") and with the predefined step size ("Power Step") with an external control signal.

The external control signal has to be supplied via the LEVATT input of the AUX I/O connector.

The "Direction" settings determine if the channel power is increased or decreased by a high level of the control signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:STATe on page 441

Mode

Selects the control signal for Dynamic Power Control.

"External" (the parameter is not available for R&S SMBV)
The instrument expects an external control signal at the selected "Connector" on page 140.

"TPC" The TPC pattern is used for Dynamic Power Control. This selection corresponds to selection (Mis) Use TPC for not enhanced DPCHs.

"Manual" The control signal is manually produced by selecting one of the buttons 0 or 1. Button 1 corresponds to a positive control signal, button 0 to a negative control signal.
The channel power is increased or decreased depending on the "Direction" setting by the selected power step.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:MODE on page 440
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:STEP:MANual on page 441

Connector

Determines the input connector the external control signal is supplied at.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:CONNector on page 440

Direction

Determines whether the channel power is increased or decreased by a high level of the control signal (see figure 4-12).

"Up" A high level of the control signal leads to an increase of channel power.

"Down" A high level of the control signal leads to a decrease of channel power.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:DIRection on page 440

Power Step

Sets step width by which – with "Dynamic Power Control" being switched on - the channel power of the selected enhanced channel in the timeslot grid (= 0,667 ms) is increased or decreased within the set dynamic range ("Up Range + Down Range").

The start power of the channel is set in the "Power" column of the channel table.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:STEP[:EXTernal] on page 442

Up Range/Down Range

Sets dynamic range by which – with "Dynamic Power Control" switched on – the channel powers of the enhanced channels can be increased. The resulting "Dynamic Power Control" dynamic range ("Up Range" + "Down Range") depends on the selected "Power Step" and is as follow:

- For "Power Step" < 1 dB, the dynamic range ("Up Range" + "Down Range") <= 30 dB
- For "Power Step" => 1 dB, the dynamic range ("Up Range" + "Down Range") <= 60 dB

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:ENHanced:CHANnel<ch0>:DPCH:DPControl:RANGe:UP on page 441
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:RANGe:DOWN on page 441

Power Control Graph

Indicates the deviation of the channel power (delta POW) from the set power start value of the corresponding enhanced channels.

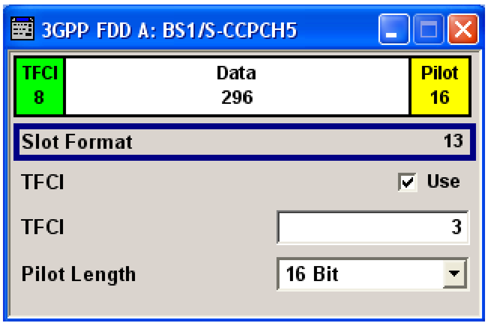
The graph is automatically displayed with "Dynamic Power Control" switched on.

Note: A realtime update of the display in the timeslot (= 0.667 ms) is not possible and is performed in a more coarse time interval. The power control graph does not display fast channel power changes. The settled state of the control loop is however easy to recognize.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl[:POWer]? on page 442

4.17 S-CCPCH Settings - BS Channel Table

► To access the "S-CCPCH" settings, select "3GPP FDD > BS > Channel Table > Channel type > S-CCPCH > DPCCH Settings > Config...".



The selected slot format determines the provided settings. Whenever the "TFCI State" and PILOT LENGTH settings are changed, the slot format is adjusted accordingly.

Slot Structure (S-CCPCH)
Displays the slot structure.

The structure of the slot depends on the selected slot format (see also 3GPP TS 25.211, Table 18: Secondary CCPCH fields)

Slot Format (S-CCPCH)
Displays the slot format.

The slot format displayed changes when a change is made to the TFCI and Pilot control field settings.

Remote command:
n.a.

Use TFCI
Activates TFCI field usage.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TFCI:STATe` on page 386
The remote-control command is not valid for multi channel mode.

TFCI Value
Enters the value of the TFCI field (Transport Format Combination Indicator) . This value is used to select a combination of 30 bits, which is divided into two groups of 15 successive slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TFCI
on page 386
The remote-control command is not valid for multi channel mode.

Pilot Length
Sets the length of the pilot fields.

The range of values for this parameter depends on the channel type and the symbol rate.

To achieve a constant slot length, the data fields are lengthened or shortened depending on the pilot length, as defined in the standard.

Note: The pilot fields of all active power-contrilled DPCHs must be of the same length if Dynamic Power Control State with external control signal is active.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:PLENgth
on page 385
The remote-control command is not valid for multi channel mode.

4.18 Config AICH/AP-AICH - BS Channel Table

► To access the dialog for configuring the fields of the dedicated physical control channel, select "3GPP FDD > BS > Channel Table > AICH/AP-AICH > DPCCH Sett > Config...".

The dialog comproises the parameters for configuring the signature pattern and selecting the slot.

Signature ACK/NACK Pattern
Enters the 16 bit pattern for the ACK/NACK field.

This field is used by the base station to acknowledge, refuse or ignore requests of up to 16 user equipments.

Note: Pattern + is entered using the numeric key 1. Pattern - is entered via the numeric key +/-.

""+" = ACK"	The ACK is sent. Transmission was successful and correct.
""-" = NACK"	The NACK is sent. Transmission was not correct.

""0" = DTX" Nothing is sent. Transmission is interrupted (Discontinuous Transmission (DTX)).

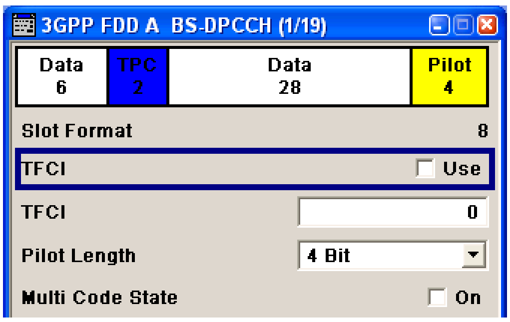
Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:AICH:SAPattern on page 381
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:APAIch:SAPattern on page 382

Access Slot
Selects the slot in which the burst is transmitted.

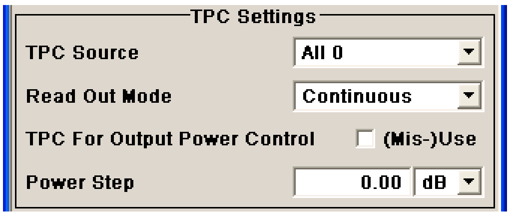
Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:AICH:ASLOt on page 381
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:APAIch:ASLOt on page 381

4.19 DPCCH Settings - BS Channel Table

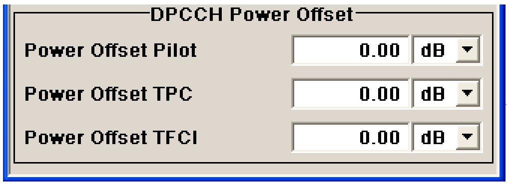
► To access the dialog for configuring the fields of the dedicated physical control channel, select "3GPP FDD > BS > Channel Table > DPCH > DPCCH Settings > Config...".



The selected slot format determines the provided settings. Whenever the "TFCI State" and "Pilot Length" settings are changed, the slot format is adjusted accordingly.



The "TPC Settings" section is where the TPC field is set.



The "DPCCH Power Offset" section is where the power offset of the control fields to the set channel power is set.

4.19.1 Common Slot Structure (DPCCH)

The upper section of the dialog shows the structure. It depends on the slot format selected (see also 3GPP TS 25.211, Table 11: DPDCH and DPCCH fields)

Slot Format (DPCCH)
Displays the slot format.

The slot format displayed changes when a change is made to the TFCI and Pilot control field settings.

Remote command:
n.a.

Use TFCI
Activates TFCI field usage.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TFCI:STATe` on page 386
The remote-control command is not valid for multi channel mode.

TFCI Value
Enters the value of the TFCI field (Transport Format Combination Indicator) . This value is used to select a combination of 30 bits, which is divided into two groups of 15 successive slots.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TFCI`
on page 386
The remote-control command is not valid for multi channel mode.

Pilot Length
Sets the length of the pilot fields.

The range of values for this parameter depends on the channel type and the symbol rate.

To achieve a constant slot length, the data fields are lengthened or shortened depending on the pilot length, as defined in the standard.

Note: The pilot fields of all active power-contrilled DPCHs must be of the same length if Dynamic Power Control State with external control signal is active.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:PLENgth
on page 385
The remote-control command is not valid for multi channel mode.

Multicode State (DPCCH)
Activates multicode transmission.

Multicode transmission can be activated for a group of channels destined for the same receiver that is to say, belonging to a radio link. The first channel of this group is used as the master channel.

With multicode transmission, the common components (Pilot, TPC and TCFI) for all the channels are spread using the spreading code of the master channel.

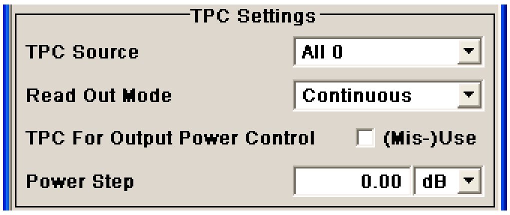
This parameter is only available for the DPCHs.

Note: The remote-control command is not valid for multi channel mode.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:MCODe
on page 384

4.19.2 TPC Settings

1. To access these settings dialog, select "3GPP FDD > BS > Channel Table > DPCH > DPCCH Settings > Config...".
2. Select "TPC Settings".



The "TPC Settings" section is where the TPC data source and read out mode are set.

TPC Data Source (DPCCH)
Selects the data source for the TPC field (Transmit Power Control). This field is used to control the transmit power.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.

- "Data List / Select TPC List"
  A binary data from a data list, internally or externally generated.
  Select "Select TPC List" to access the standard "Select List" dialog.
  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA on page 387
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA:PATTern on page 388
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA:DSELect on page 388
The remote-control command is not valid for multi channel mode.

TPC Read Out Mode (DPCCH)
Defines TPC data usage.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. With all read out modes, one bit is taken from the data stream for the TPC field for each slot and entered into the bit stream several times (depending on the symbol rate). The difference between the modes lies in the usage of the TPC bits.

These different modes can be used, for example, to deliberately set a base station to a specific output power (e.g. with the pattern 11111) and then let it oscillate around this power (with Single + alt. 01 and Single + alt. 10). This then allows power measurements to be carried out at the base station (at a quasi-constant power). Together with the option (Mis-) Use TPC for output power control (see below), TPC Read Out Mode can also be used to generate various output power profiles.

"Continuous:"	The TPC bits are used cyclically.
"Single + All 0"	The TPC bits are used once, and then the TPC sequence is continued with 0 bits.
"Single + All 1"	The TPC bits are used once, and then the TPC sequence is continued with 1 bit.
"Single + alt. 01"	The TPC bits are used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).
"Single + alt. 10"	The TPC bits are used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:READ on page 389
The remote-control commands are not valid for multi channel mode.

Misuse TPC for Output Power Control (DPCCH)
Defines "mis-" use of the TPC data.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. If ("Mis-) use TPC for output power control" is activated, the specified pattern is misused; in order to vary the intrinsic transmit power over time. A bit of this pattern is removed for each slot in order to increase (bit = "1") or reduce (bit = "0") the channel power by the specified power step ("Power Step"). The upper limit for this is 0 dB and the lower limit -60 dB. The following envelope is produced at a channel power of 0 dB, power step 1.0 dB and pattern "001110100000011" and TPC Pattern ReadOut Mode "Continuous".

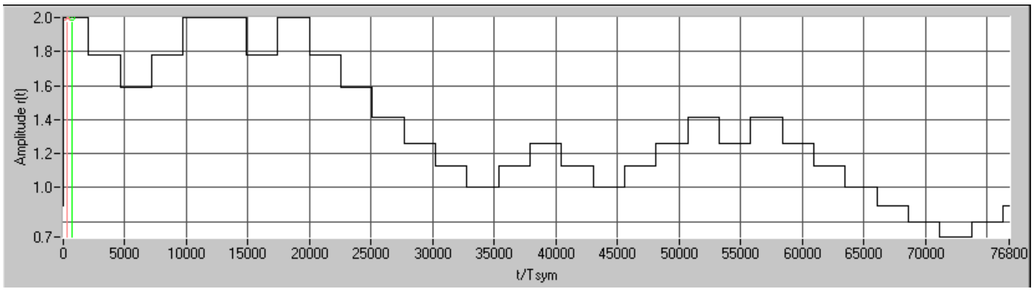


Fig. 4-13: Dynamic change of channel power (continuous)

Note: The change in power is always carried out (as stipulated in the standard) at the start of the slot pilot field. Misuse TPC for Output Power Control is not available for enhanced DPCHs. Power Control via TPC pattern for enhanced channels can be selected for active Dynamic Power Control (see chapter 4.16.5, "Dynamic Power Control - Enhanced DPCHs BS1", on page 137).

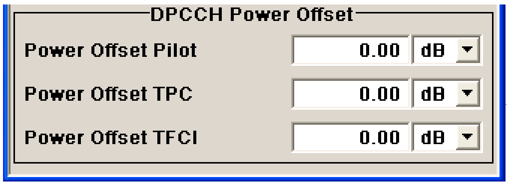
Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:MISuse` on page 388
The remote-control command is not valid for multi channel mode.

TPC Power Step (DPCCH)
Sets the step width of the power change in dB for (Mis-) use TPC for output power control.

Note: Misuse TPC for Output Power Control is not available for enhanced DPCHs. Power Control via TPC pattern for enhanced channels can be selected for active Dynamic Power Control (see chapter 4.16.5, "Dynamic Power Control - Enhanced DPCHs BS1", on page 137).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:PSTep` on page 389
The remote-control command is not valid for multi channel mode.

4.19.3 DPCCH Power Offset



This section provides the parameters for configuring power offsets of the control fields to the channel power.

Power Offset Pilot (DPCCH)
Sets the power offset of the pilot field to the channel power in dB.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:POFFset:PILot` on page 385
The remote-control command is not valid for multi channel mode.

Power Offset TPC (DPCCH)
Sets the power offset of the TPC field to the channel power in dB.

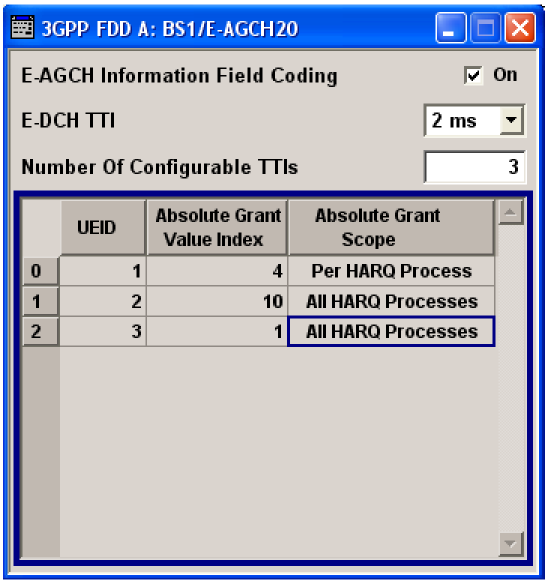
Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:POFFset:TPC` on page 386
The remote-control command is not valid for multi channel mode.

Power Offset TFCI (DPCCH)
Sets the power offset of the TFCI field to the channel power in dB.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:POFFset:TFCI` on page 385
The remote-control command is not valid for multi channel mode.

4.20 Config E-AGCH - BS Channel Table

► To access the dialog for configuring the fields of the HSUPA control channels, select "3GPP FDD > BS > Channel Table > E-AGCH > DPCCH Settings > Config...".



The dialog provides the parameter required to configure the HSUPA control channels.

E-AGCH Information Field Coding
Enables/disables the information coding. Disabling this parameter corresponds to a standard operation, i.e. no coding is performed and the data is sent uncoded. Enabling this parameter allows you to configure the way the data is coded.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:IFCoding` on page 413

E-DCH TTI
Switches between 2 ms and 10 ms. The processing duration also influences the number of used slots.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTIEdch` on page 415

Number of Configurable TTIs
Sets the number of configurable TTIs.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTICount` on page 414

UEID (A-GCH)
Sets the UE Id for the selected TTI.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTI<di0>:UEID on page 414

Absolute Grant Value Index
Sets the Index for the selected TTI. According to the TS 25.212 (4.10.1 A.1), there is a cross-reference between the grant index and the grant value. The TTI configuration of the table is used cyclically. Depending on the selection made for the parameter "E-DCH TTI", each table row corresponds to a 2ms TTI or to a 10ms TTI.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTI<di0>:AGVIndex on page 414

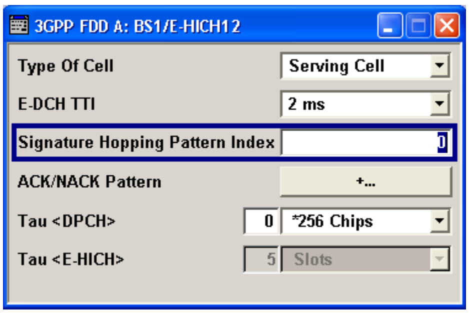
Absolute Grant Scope
Sets the scope of the selected grant. According to the TS 25.321, the impact of each grant on the UE depends on this parameter.

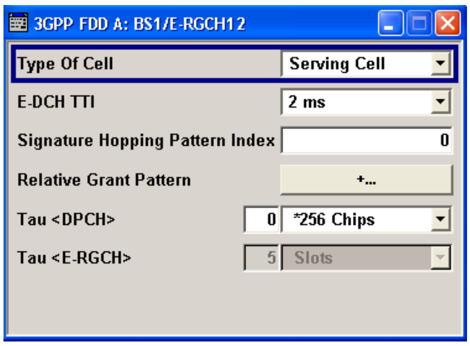
For E-DCH TTI = 10ms, the "Absolute Grant Scope" is always All HARQ Processes.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTI<di0>:AGSCope on page 414

4.21 Config E-RGCH/E-HICH - BS Channel Table

► To access the "Config E-RGCH" or "Config E-HICH" dialog for configuring the fields of the HSUPA control channels, select "3GPP FDD > BS > Channel Table > E-RGCH/E-HICH > DPCCH Settings > Config...".





The dialogs provide the parameters for configuring the correpsonding HSUPA control channels.

Type of Cell
Switches between Serving Cell and Non Serving Cell. The cell type determines the number of used slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:CTYPe on page 417
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe on page 415

E-DCH TTI
Switches between 2 ms and 10 ms. The processing duration also influences the number of used slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:TTIEdch on page 419
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:TTIEdch on page 417

Signature Hopping Pattern Index – HSUPA BS
Enters a value that identifies the user equipment. The values are defined in TS 25.211.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:SSINdex on page 418
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:SSINdex on page 417

Relative Grant Pattern
(This feature is available for E-RGCH only.)

Enters a pattern: 0 = Hold, + = Up, - = Down.

Note: Pattern + is entered using the numeric key 1. Pattern - is entered via the numeric key +/-.

For Non Serving Cell "1" is not allowed.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:RGPAttern on page 418

ACK/NACK Pattern
(This feature is available for E-HICH only.)

Enters the pattern for the ACK/NACK field.

For Non Serving Cell only "+" (ACK) and "0" (no signal) is allowed. For Serving Cells only "+" (ACK) and "-" (NACK) is allowed.

Note: Pattern + is entered using the numeric key 1. Pattern - is entered via the numeric key +/-.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:RGPAttern on page 416

Tau DPCH
Enters the offset of the downlink dedicated offset channels.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:DTAU on page 416
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:DTAU on page 418

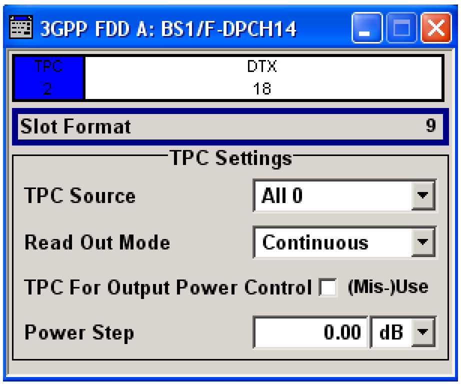
Tau E-RGCH/E-HICH
Displays the offset of the P-CCPCH frame boundary.

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:ETAU? on page 416
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:ETAU? on page 418

4.22 Config F-DPCH - BS Channel Table

This section provides the description of the setting parameters for the fractional dedicated physical control channel.

► To access the dialog, select "3GPP FDD > BS > Channel Table > F-DPCCH > DPCCH Settings > Config".



4.22.1 Common Settings

The upper section of the dialog shows the slot structure and format.

Slot Format (F-DPCH)
Displays the slot format as selected with the parameter "Slot Format" in the Channel Table.

The corresponding slot structure is displayed above the parameter.

Slot Formats 1 .. 9 are enabled only for instruments equipped with option R&S SMx/AMU-K59.

The difference between the F-DPCH slot formats is the position of the 2 bits TPC field.

Remote command:
n.a.

4.22.2 TPC Settings

The TPC settings in the lower section contain the parameters for configuring TPC data source and read out mode.

TPC Source
Selects the data source for the F-DPCH channel.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA` on page 390
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:DSELect` on page 390
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:PATTern` on page 391

TPC Read Out Mode (F-DPCH)
Defines TPC data usage.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. With all read out modes, one bit is taken from the data stream for the TPC field for each slot and entered into the bit stream several times (depending on the symbol rate). The difference between the modes lies in the usage of the TPC bits.

These different modes can be used, for example, to deliberately set a base station to a specific output power (e.g. with the pattern 11111) and then let it oscillate around this power (with Single + alt. 01 and Single + alt. 10). This then allows power measurements to be carried out at the base station (at a quasi-constant power). Together with the option (Mis-) Use TPC for output power control TPC Read Out Mode can also be used to generate various output power profiles.

"Continuous:" The TPC bits are used cyclically.
Note that, the remote-control commands are not valid for multi channel mode.

"Single + All 0" The TPC bits are used once, and then the TPC sequence is continued with 0 bits.

"Single + All 1" The TPC bits are used once, and then the TPC sequence is continued with 1 bit.

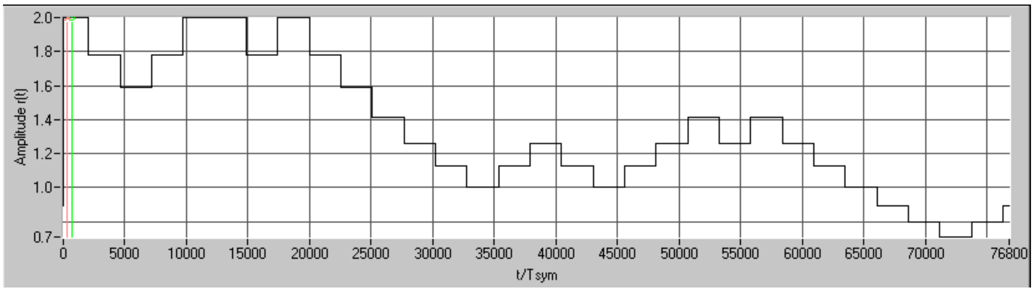
"Single + alt. 01" The TPC bits are used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

"Single + alt. 10" The TPC bits are used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:READ` on page 392

TPC For Output Power Control (Mis-) Use
Defines "mis-" use of the TPC data.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. If "(Mis-) use TPC for output power control" is activated, the specified pattern is misused; in order to vary the intrinsic transmit power over time. A bit of this pattern is removed for each slot in order to increase (bit = "1") or reduce (bit = "0") the channel power by the specified power step ("Power Step"). The upper limit for this is 0 dB and the lower limit -60 dB. The following envelope is produced at a channel power of 0 dB, power step 1.0 dB and pattern "001110100000011" and TPC Pattern ReadOut Mode "Continuous":



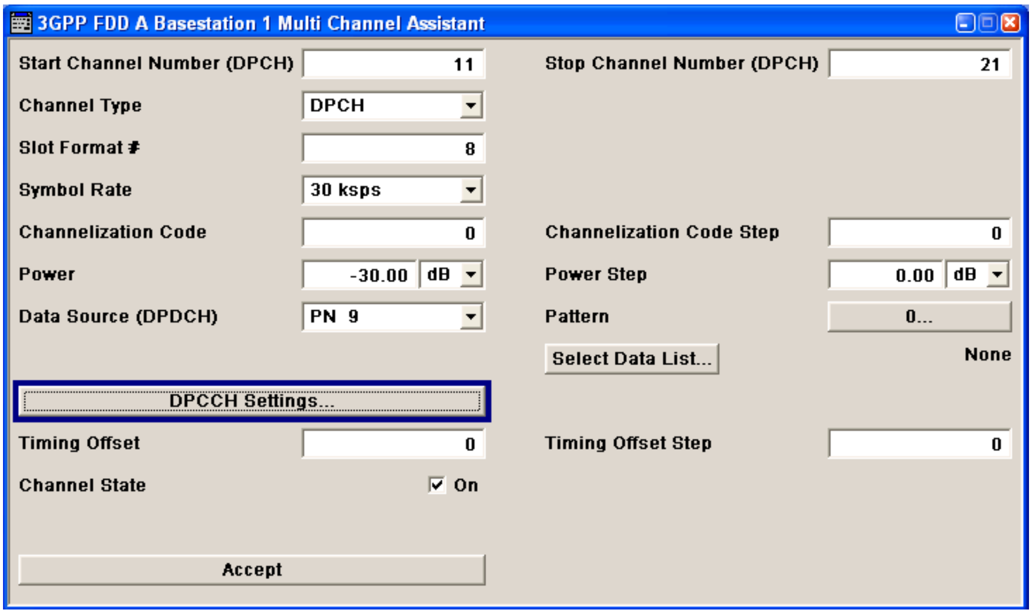
Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:MISuse on page 391

TPC Power Step (F-DPCH)
Sets the step width of the power change in dB for "(Mis-) use TPC for output power control".

Remote command:
[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:PSTep on page 391

4.23 Multi Channel Assistant - BS

► To access this dialog, select "3GPP FDD > BS > Channel Table > Multi Channel Assistant".



The "Multi Channel Assistant" allows several channels to be set simultaneously and is only available for the channel types DPCH, HS-SCCH, HS QPSK, HS 16QAM and HS 64QAM.

Enhanced state is automatically deactivated. The channel table is only filled with new values when the "Accept" button is pressed.

Start Channel Number

Enters the index for the start channel of the channel range that is set jointly.

Remote command:
n.a.

Stop Channel Number

Enters the index for the stop channel of the channel range that is set jointly.

Remote command:
n.a.

Channel Type

Enters the channel type for the channel range that is set jointly. Available for selection are DPCH, HS-SCCH, HS QPSK, HS 16QAM, or HS 64QAM.

Remote command:
n.a.

Slot Format

Enters the slot format.

For DPCH channels, the slot formats are 0 to 16.

A slot format defines the structure of a slot made of data and control fields and includes the symbol rate.

The individual parameters of a slot can later be changed, with the slot format being adjusted, if necessary.

This parameter is not available for high-speed channels.

Note: For the "DPCCH Settings", this value is read-only.

Remote command:
n.a.

Symbol Rate

Sets the symbol rate. The range of values depends on the channel selected.

The symbol rate is determined by the slot format set. A change in the symbol rate leads automatically to an adjustment of the slot format.

Remote command:
n.a.

Channelization Code

Sets the channelization code for the start channel.

The channel is spread with the specified channelization code (spreading code).

The range of values of the channelization code depends on the symbol rate of the channel.

The range of values runs from 0 to (chip_rate/symbol_rate) - 1

Remote command:
n.a.

Channelization Code Step
Sets the step width for the channelization code from channel to channel.

The valid range of values for the channelization code of an individual channel must not be exceeded. If the range of values is exceeded, the channelization code is limited automatically.

Remote command:
n.a.

Power
Sets the channel power of the start channel in dB.

The power entered is relative to the powers of the other channels and does not initially relate to the "Level" power display. If Adjust Total Power to 0dB is executed (top level of the 3GPP dialog), all the power data is relative to 0 dB.

Note: The maximum channel power of 0 dB applies to non-blanked channels (duty cycle 100%), with blanked channels, the maximum value can be increased (by "Adjust Total Power") to values greater than 0 dB (to $10*\log_{10}(1/duty\_cycle)$). The Power value is also the starting power of the channel for Misuse TPC and Dynamic Power Control
.

Remote command:
n.a.

Power Step
Enters the step width for the change of channel power from channel to channel.

The valid range of values must not be exceeded. If the range of values is exceeded, the power is automatically limited to the permissible of -80 dB to 0 dB.

Remote command:
n.a.

Data Source
Selects data source.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.

– Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
– Use the standard "File Manager" function to transfer external data lists to the instrument.

See also "Main Dialog > Data List Management".

Remote command:
n.a.

DPCCH Settings
Accesses the dialog for configuring DPCCH channels, see chapter 4.19, "DPCCH Settings - BS Channel Table", on page 144.

Remote command:
n.a.
In contrast to setting a single channel, the remote control commands are not available.

Timing Offset
Sets the timing offset for the start channel.

The timing offset determines the shift of the source symbols before interleaving.

The absolute starting time of the frame (slot 0) is shifted relative to the start of the scrambling code sequence by the `timing offset * 256 chips`. This means that whatever the symbol rate, the resolution of the timing offset is always 256 chips.

This procedure is used to reduce the crest factor. A good way to obtain a lower crest factor is to use an offset of 1 from channel to channel, for example.

Remote command:
n.a.

Timing Offset Step
Sets the step width for the timing offset from channel to channel.

The valid range of values must not be exceeded. If the range of values is exceeded, the timing offset is automatically limited to the permissible range.

Remote command:
n.a.

Channel State
Activates or deactivates all the channels in the set channel range.

Remote command:
n.a.

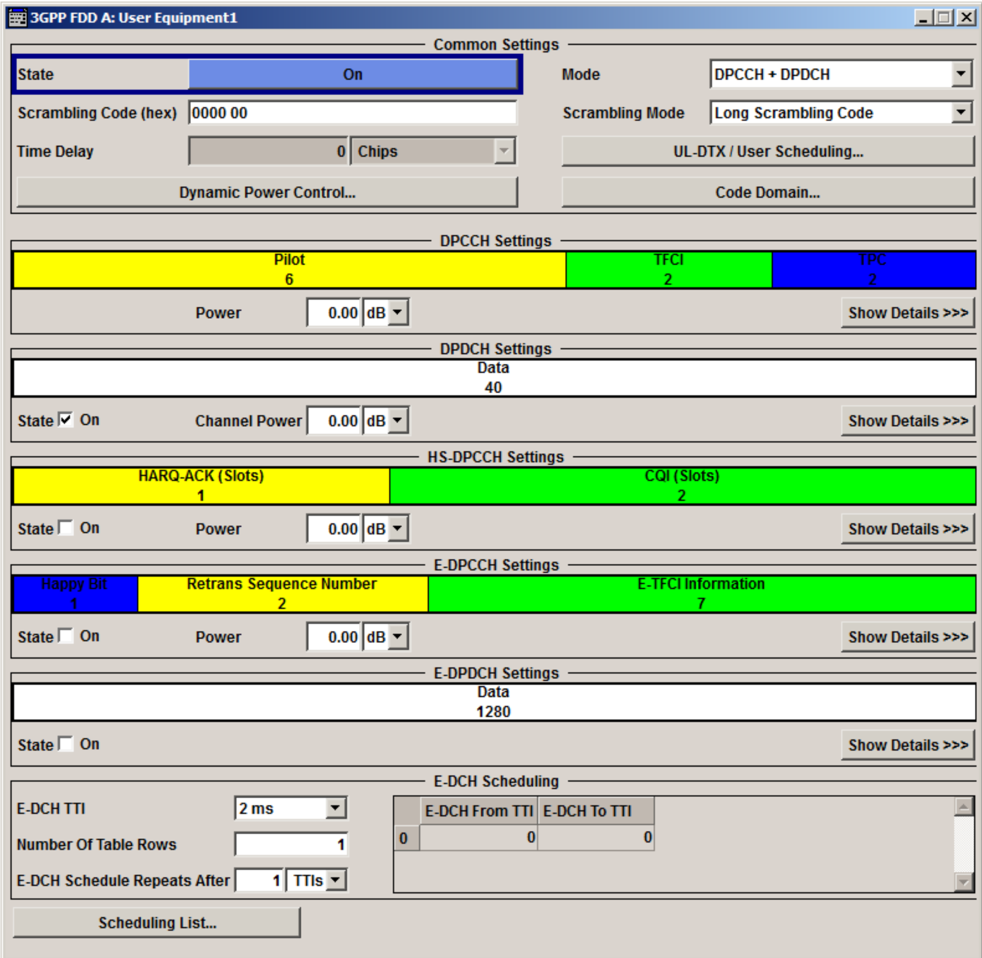
Accept
Executes automatic completion of the channel table in accordance with the parameters set.

Remote command:
n.a.

4.24 User Equipment Configuration (UE)

In the standard, the term "Mobile Station" has been replaced by the term "User Equipment", to take into account the fact that there is a great variety of mobile terminal equipment available to users, with functionality that is constantly being enhanced.

1. To access the user equipment settings, select "3GPP FFD > Link Direction > Uplink".
2. Select "3GPP FDD > User Equipment > UE 1/2/3/4".



A user equipment has a maximum of 6 DPDCHs, with parameters largely prescribed by the 3GPP specification TS 25.211. To simplify operation, the settings are groupped into three modes with follwoing main differences:

- With the "DPCCH + DPDCH" mode, the HSDPA channel HS-DPCCH and the HSUPA channels E-DPCCH and E-DPDCH can be activated.

- With the "PRACH only" and"PCPCH only" modes, there is also a choice between "Standard" (all parameters can be set) and "Preamble only" (only the preamble can be set).
  The dialog of each particular mode only displays the parameters that are relevant.

The DPCCH and one DPDCH of user equipment 1 are generated in realtime (enhanced mode). Depending on the actual configurations, other channels of user equipment 1 may also be generated in realtime. The PRACH and PCPCH channels are not generated in realtime.

The dialog comprises an upper section "Common Settings", with central sections depending on the set mode, e.g. "PRACH Settings" or "DPCCH Settings". When "DPCCH + DPDCH" modes are selected, only the channel structure, the state and the channel power are indicated. The "E-DCH Scheduling" section also appears below. The section for detailed setting and the channel tables (for DPDCH and E-DPDCH channels) can be revealed with the "Show Details" button and hidden with the "Hide Details" button.

In the menu for user equipment 1, under "DPDCH settings", there is a button for accessing the dialog for setting the enhanced channel parameters. When "PRACH Standard" or "PCPCH Standard" mode is selected, the "Channel Coding" section also appears below.

In the menus for user equipment 2, 3 and 4, the compressed mode can be activated and configured ("Compressed Mode").

4.24.1 General and Common Settings

The "Common Settings" section is where the general settings for the selected user equipment are made.

State

Activates or deactivates the selected user equipment. The number of the selected user equipment is specified in the menu header.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:STATe` on page 451

Mode

Selects the mode in which the user equipment is to work. The lower part of the menu will change in accordance with the mode. The following modes are available:

"PRACH only - Standard"
In this mode, the instrument generates a single physical random access channel (PRACH). This channel is needed to set up the connection between the user equipment and the base station. All the PRACH parameters can be set in the PRACH Settings section (see chapter 4.28, "PRACH Settings - UE", on page 173).

"PRACH only - Preamble only"
: In this mode, the instrument only generates the preamble of a physical random access channel (PRACH). Only the PRACH preamble parameters can be set in the PRACH Settings section. This mode is needed for Test Case 8.8 TS 25.141.

"PCPCH only - Standard"
: In this mode the instrument generates a single physical common packet channel (PCPCH). This channel is used to transmit packet-oriented services (e.g. SMS). The specific PCPCH parameters can be set in the PCPCH Settings section (see chapter 4.29, "PCPCH Settings - UE", on page 183).

"PCPCH only - Preamble only"
: In this mode, the instrument only generates the preamble of a physical common packet channel (PCPCH). Only the PRACH preamble parameters can be set in the PCPCH Settings section. This mode is needed for Test Case 8.9 TS 25.141.

"DPCCH + DPDCH"
: In this mode the instrument generates a control channel (DPCCH) and up to 6 data channels (DPDCH). This mode corresponds to the standard mode of user equipment during voice and data transmission.
In addition, the HS-DPCCH, E-DPCCH and E-DPDCH channels can be activated.
Channel-specific parameters can be set in the section of the individual channels.
The DPCCH and one DPDCH of user equipment 1 are generated in realtime (enhanced mode). Depending on the actual configurations, other channels of user equipment 1 may also be generated in realtime.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:MODE` on page 449

Scrambling Code (hex)
Sets the scrambling code.

The scrambling code is used to distinguish the transmitter (UE) by transmitter-dependent scrambling. Hexadecimal values are entered. Long or short scrambling codes can be generated (see also chapter 3.1.1, "Scrambling Code Generator", on page 21).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:SCODe` on page 450

Scrambling Mode
Sets the type of scrambling code.

With scrambling code, a distinction is made between Long and Short Scrambling Code (see also Section Scrambling Code Generator).

"Off" Disables scrambling code for test purposes.

"Long Scrambling Code" Sets the long scrambling code.

"Short Scrambling Code" (only modes "DPCCH + DPDCH" and "PCPCH only")
Sets short scrambling code.
The short scrambling code is only standardized for DPCCH and DPDCH channels. But it can also be generated for the PCPCH channel for test purposes.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:SCODe:MODE` on page 451

Time Delay
Enters the time delay of the signal of the selected user equipment compared to the signal of user equipment 1.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:TDELay` on page 451

Compressed Mode
(This feature is available for UE 2...4 and "DPCCH+DPDCH" Mode only.)

Opens the "Compressed Mode" dialog, see chapter 4.9, "Compressed Mode", on page 96.

Remote command:
n.a.

UL-DTX .../ User Scheduling
(for instruments equipped with option R&S SMx/AMU-K45 and R&S SMx/AMU-K59, UE 1 and DPCCH+DPDCH mode only)

Accesses the dialog for configuring an uplink discontinuous transmission (UL-DTX) or applying user scheduling, see chapter 4.27, "UL-DTX/User Scheduling - UE", on page 169.

Remote command:
n.a.

Dynamic Power Control
(for UE 1 and DPCCH+DPDCH mode only)

Accesses the dialog for configuring the "Dynamic Power Control" settings, see chapter 4.26, "Dynamic Power Control - UE", on page 164.

Remote command:
n.a.

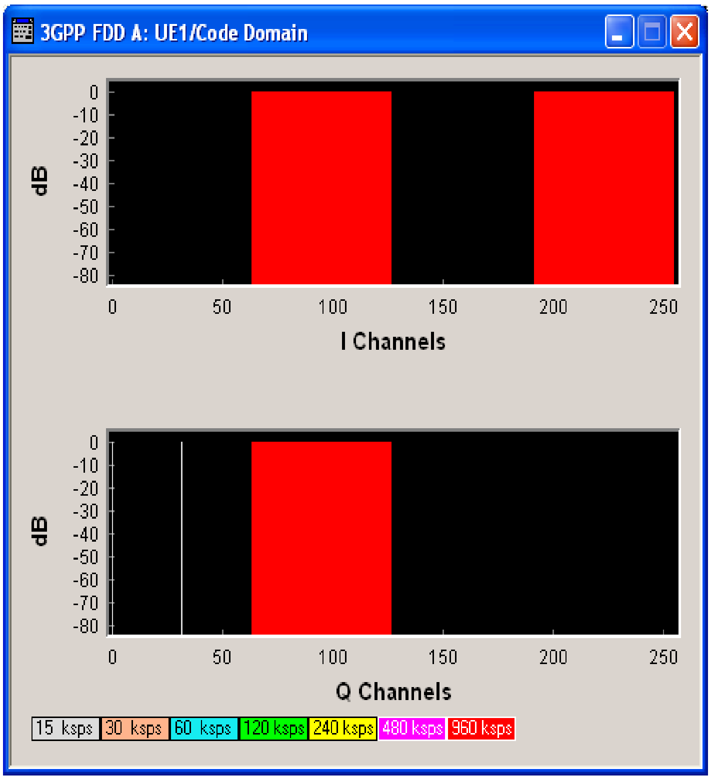
4.25 Code Domain Graph - UE

► To access the graphical display, select "3GPP FDD > User Equipment > UE > Code Domain"

The "Code Domain" dialog enables you to visually check the uplink signal.

Understanding the display information

The "Code Domain" display indicates the assigned code domain. The channelization code is plotted at the X axis; the colored bars indicate coherent code channels. The colors are assigned to fixed symbol rates; the allocation is shown below the graph. The relative power can be taken from the height of the bar. The symbols on so-called I- and Q-branches are spread independently. The channelization codes are fixed for the channels.

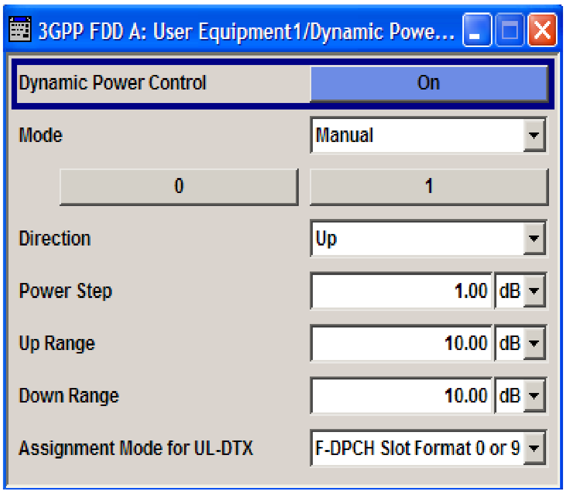


Use the Code Domain Graph to evaluate whether there is a code domain conflict or not; a domain conflict arises when the code domains of the active channels intersect. A code domain conflict is indicated by overlapping bars.

A conflict may occur only when the parameter "Force Channelization Code to I/Q" is activated.

4.26 Dynamic Power Control - UE

In the "Dynamic Power Control" dialog, the power of the enhanced channels can be increased or decreased within the predefined dynamic range ("Up Range" + "Down Range") and with the predefined step size ("Power Step") with an external, internal or manual control signal.



Dynamic Power Control State

Activates or deactivates the "Dynamic Power Control".

With activated "Dynamic Power Control" the power of the enhanced channels can be increased or decreased within the predefined dynamic range ("Up Range" + "Down Range") and with the predefined step size ("Power Step") with an external, internal or manual control signal.

The external control signal has to be supplied via the LEVATT input of the AUX I/O connector.

Note: The R&S SMBV does not support externally provided control signals.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:STATe on page 531

Mode

Selects the control signal for "Dynamic Power Control".

"External" (the parameter is not available for R&S SMBV)
An external control signal is used for Dynamic Power Control.
The external control signal has to be supplied via the LEVATT input of the AUX I/O connector.

"By TPC Pattern"
The TPC pattern is used for "Dynamic Power Control". This selection corresponds to selection "(Mis)Use TPC" for not enhanced channels.

"Manual" The control signal is manually produced by pushing one of the buttons 0 or 1.
The channel power is increased or decreased depending on the "Direction" setting by the set power step.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:MODE on page 530
[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:STEP:MANual on page 531

Connector

Determines the input connector the external control signal is supplied at.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:CONNector on page 530

Direction

Selects the Dynamic Power Control mode.

"Up" A high level of the control signal leads to an increase of channel power.

"Down" A high level of the control signal leads to a decrease of channel power.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:DIRection on page 529

Power Step

Sets step width by which – with the "Dynamic Power Control" being switched on - the channel powers of the enhanced channels in the timeslot grid are increased or decreased within the set dynamic range ("Up Range" + "Down Range").

The start power of the channel is set in the "Channel Power" entry field of the menu.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:STEP[:EXTernal] on page 531

Up Range/Down Range

Sets dynamic range by which – with "Dynamic Power Control" switched on – the channel powers of the enhanced channels can be increased. The resulting "Dynamic Power Control" dynamic range ("Up Range" + "Down Range") depends on the selected "Power Step" and is as follow:

- For "Power Step" < 1 dB, the dynamic range ("Up Range" + "Down Range") <= 30 dB
- For "Power Step" => 1 dB, the dynamic range ("Up Range" + "Down Range") <= 60 dB

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:RANGe:UP on page 530

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:RANGe:DOWN on page 530

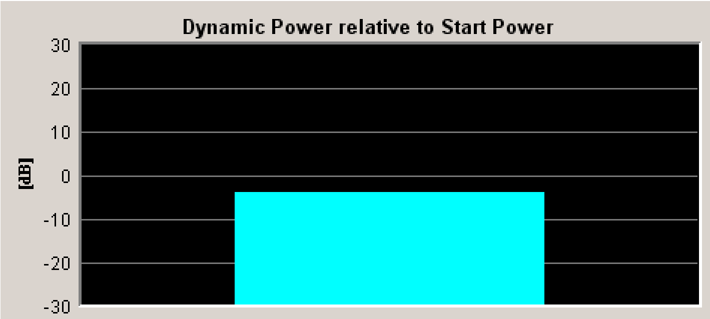
Power Control Graph

Indicates the deviation of the channel power (delta POW) from the set power start value of the enhanced channels.

The graph is automatically displayed if "Dynamic Power Control > State > On".

Note: Since a realtime update of the window in the timeslot (= 0.667 ms) is not possible for reasons of speed, an update can be performed in a more coarse time interval.

Fast channel power changes are not displayed but the settled state of the control loop can be recognized very easily.



Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl[:POWer]? on page 530

Assignment Mode for UL-DTX

The parameter is enabled only for activated UL-DTX... / User Scheduling State.

The power control recognizes the UL-DPCCH gaps according to 3GPP TS 25.214. Some of the TPC commands sent to the instrument over the external line or by the TPC pattern are ignored, whereas others are summed up and applied later. The processing of the TPC commands depends only on whether the BS sends the TPC bits on the F-DPCH with slot format 0/ slot format 9 (i.e. during the first 512 chips of the downlink slot) or not. It is not necessary to distinguish between the cases „DL-DPCH“ and „F-DPCH Slot Format different than 9 and 0“, as in both of these cases the downlink TPC commands would be sent (to a real UE via the air interface) later than in the first 512 chips of the downlink slot, and thus the treatment of the TPC commands by the UE is identical.

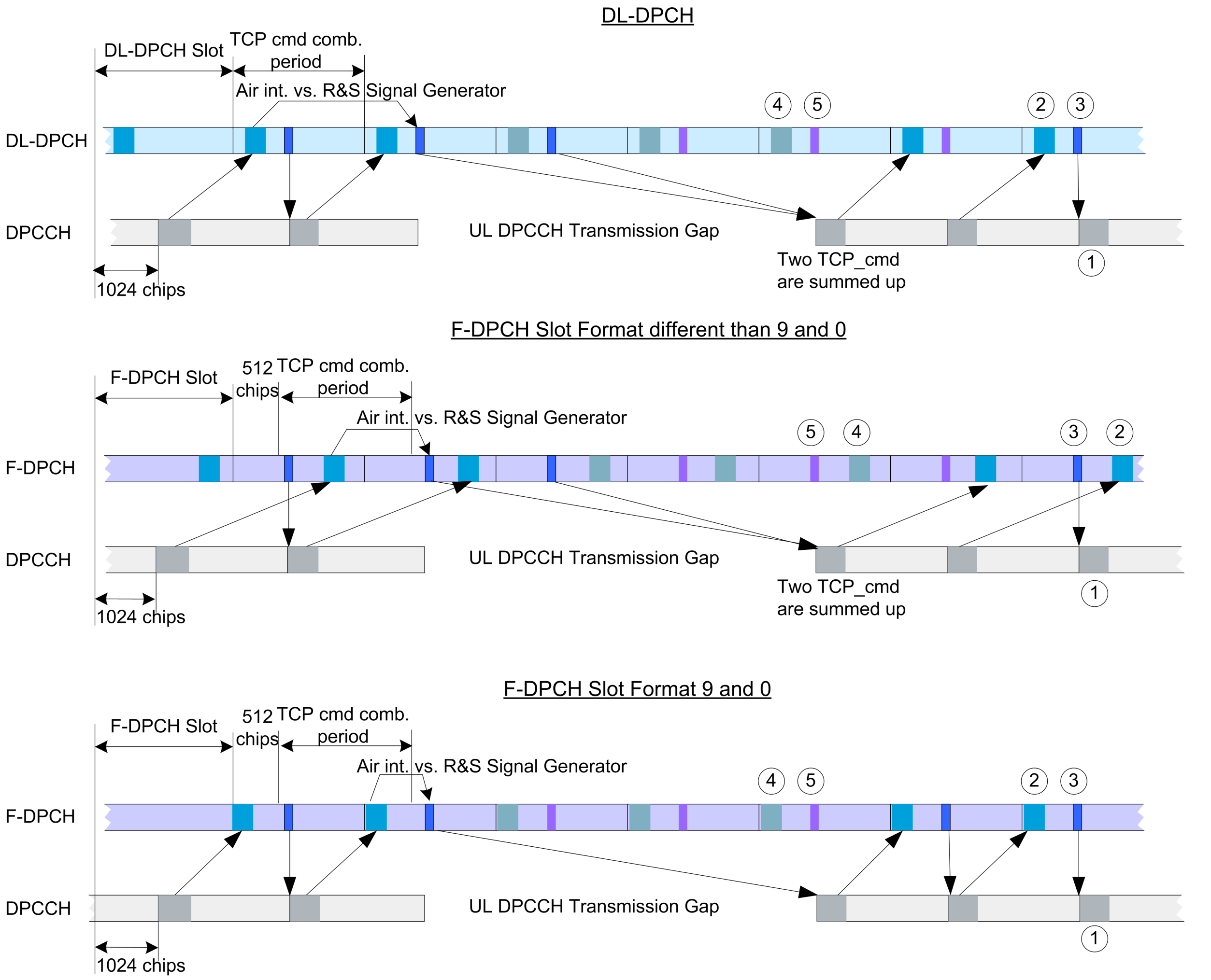


Fig. 4-14: Timing Diagram - Power Control with UL-DTX

1 = Uplink Pilot
2 = TPC bits via air interface
3 = TPC command via binary feedback
4 = No need to send TPC bits via air interface; UE ignores any TPC bits
5 = No need to send TPC commands via binary feedback line; R&S Signal Generator ignores any TPC commands

The feedback sent to the instrument corresponds to the parameter „TPC_cmd“ defined in the 3GPP standard. It represents the TPC information of the last (already completed) „TPC command combining period“, even if the TPC information of the ongoing „TPC command combining period“ is already known by the BS prior to the feedback transmission over the binary feedback line (see figure).

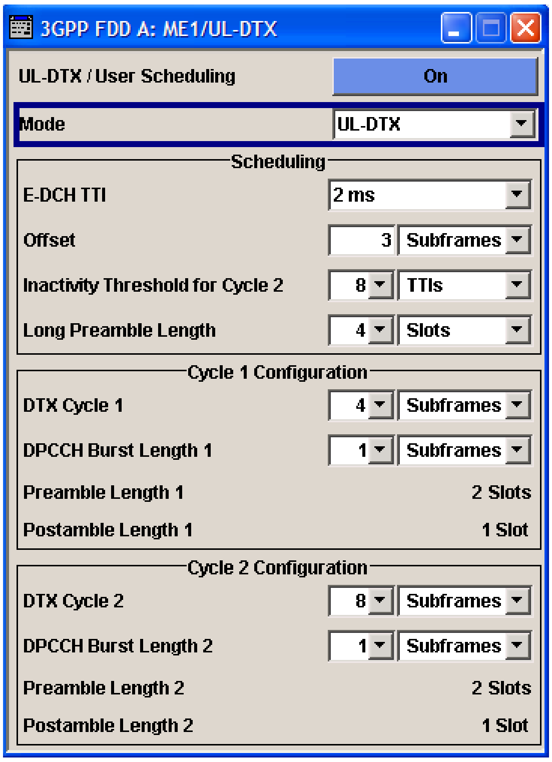
Note: The provided external binary feedback has to be stable at least between 0.1 ms before and after the UL DPCCH slot boundary.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:ASSignment` on page 529

4.27 UL-DTX/User Scheduling - UE

UL-DTX and User Scheduling settings are available for instruments equipped with option R&S SMx/AMU-K45 and -K59.

1. To access the **"UL-DTX"** settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE".
2. Select "Mode > DPCCH + DPDCH".
3. Select "UL-DTX / User Scheduling..."
4. Select "Mode > UL-DTX".



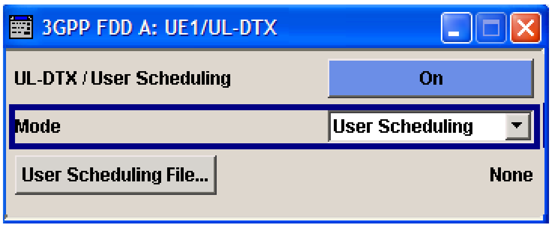
The "UE /UL-DTX" contains the parameters for adjusting the UL-DTX settings and selecting a file containing user scheduling information.
The provided UL-DTX functionality is fully compliant with 3GPP TS 25.214. All dependencies from E-DCH transmissions, HARQ-ACK transmissions or CQI transmissions on the DPCCH are respected.
For the UL-DTX functionality, the dialog provides the settings necessary to configure the start offset, the threshold time for switching to UE-DTX cycle 2 and the DPCCH activity patterns for both UE-DTX cycle 1 and 2. It is possible to determine the frequentness of the DPCCH bursts, the DPCCH bursts length (without pre- and postamble) and to configure the length of the longer preamble for the UE-DTX cycle 2.

In this instrument, the signal generation starts with UE-DTX cycle 2. To trigger a switching to a UE-DTX cycle 1, activate the channel(s) E-DPCCH/E-DPDCH and configure the "E-DCH Scheduling" parameters.

To access the User Scheduling settings

The uplink user scheduling is a function that enables you to flexible configure the scheduling of the uplink transmission.

1. To access the **"User Scheduling"** dialog, select "3GPP FDD > User Equipment > UE1 > Mode > DPCCH + DPDCH" and select "UL-DTX/User Scheduling"
2. In the "UL-DTX/User Scheduling", enable "Mode > User Scheduling".

   The instrument provides an interface for loading of externally created XML-like files with predefined file structure.

Use the Scheduling List to display the UL-DTX burst pattern and transmissions of E-DCH and HS-DPCCH, as well as the impact on the UL-DPCCH transmissions or the configured uplink user scheduling.

Detailed Information

For detailed information on the provided functions, like explanation of the UL-DTX principle, description of the user scheduling file format, possible interdependencies, refer to:

- chapter 3.1.20, "Uplink discontinuous transmission (UL DTX)", on page 48
- chapter 3.1.21, "Uplink User Scheduling", on page 50

For an example on how to use these functions, refer to:

- chapter 5.3, "Configuring UL-DTX Transmission and Visualizing the Scheduling", on page 257
- chapter 5.4, "Configuring and Visualizing the Uplink User Scheduling", on page 259

UL-DTX... / User Scheduling State

Depending on the selected "Mode", enables/disables:

- uplink discontinuous transmission (UL-DTX), i.e. uplink DPCCH gating
  Enabling the UL-DTX deactivates the DPDCH and the HSUPA FRC.
- using the user scheduling settings defined in the selected file.

Enabling the Uplink Scheduling deactivates the HSUPA FRC.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:STATe` on page 524

Mode
Selects the UL-DTX or User Scheduling function.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:MODE` on page 524

User Scheduling File
Accesses the standard "File Select" function for selecting of a file containing user scheduling information. To perform standard file handling functions, e.g. to transfer externally created files to the instrument, use the "File Manager".

Files with user scheduling information use the predefined file extension `*.3g_sch` and follow a predefined file structure, see "File Structure" on page 51.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:USCH:CATalog?` on page 527
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:USCH:FSELect` on page 528
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:USCH:DELete` on page 527

Scheduling
This section comprises the common settings for both UL-DTX cycles.

E-DCH TTI ← Scheduling
Sets the duration of a E-DCH TTI.

By enabled UL-DTX, the value configured with this parameter sets the value for the parameter "E-DCH TTI" in the "UE1 > E-DCH Scheduling" dialog.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:TTIEdch` on page 524

UL-DTX Offset ← Scheduling
Sets the parameter UE_DTX_DRX_Offset and determines the start offset in subframes of the first uplink DPCCH burst (after the preamble). The offset is applied only for bursts belonging to the DPCCH burst pattern; HS-DPCCH or E-DCH transmissions are not affected.

The parameter UE_DTX_DRX_Offset is used to calculate the first subframe in each UL DPCCH burst pattern.
- for DTX Cycle 1:
  (5*CFN-UE_DTX_DRX_Offset+Subframe#) MOD UE_DTX_Cycle_1 = 0
- for DTX Cycle 2:
  (5*CFN-UE_DTX_DRX_Offset+Subframe#) MOD UE_DTX_Cycle_2 = 0

The offset is used to shift the DPCCH burst pattern of the different UEs so that they have the DPCCH transmission phase in their DTX cycles at different times.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:OFFSet` on page 525

Inactivity Threshold for Cycle 2 ← Scheduling
Defines the number of consecutive E-DCH TTIs without an E-DCH transmission, after which the UE shall immediately move from UE-DTX cycle 1 to using UE-DTX cycle 2 (see figure 5-2).

Note: In this implementation, the signal generation starts with UE-DTX cycle 2. To trigger a switching to a UE-DTX cycle 1, activate the channel(s) E-DPCCH/E-DPDCH and configure the "E-DCH Scheduling" parameters.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:ITHReshold` on page 525

Long Preamble Length ← Scheduling
Determines the length in slots of the preamble associated with the UE-DTX cycle 2.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:LPLength` on page 525

Cycle 1 / Cycle 2 Configuration
Comprises the settings for configuring the frequentness of the DPCCH bursts and the DPCCH bursts length (without pre- and postamble).

DTX Cycle 1 / DTX Cycle 2 ← Cycle 1 / Cycle 2 Configuration
Sets the offset in subframe between two consecutive DPCCH bursts within the corresponding UE-DTX cycle, i.e. determines how often the DPCCH bursts are transmitted (see figure 5-2).

The UE-DTX cycle 2 is an integer multiple of the UE-DTX cycle 1, i.e. has less frequent DPCCH transmission instants.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:CYCLe<ch>` on page 526

DPCCH Burst Length 1 / DPCCH Burst Length 2 ← Cycle 1 / Cycle 2 Configuration
Determines the uplink DPCCH burst length in subframes without the preamble and postamble, when the corresponding UE-DTX cycle is applied.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:BURSt<ch>` on page 526

Preamble Length 1 / Preamble Length 2 ← Cycle 1 / Cycle 2 Configuration
Displays the preamble length in slots, when the corresponding UE-DTX cycle is applied.

The preamble length is fixed to 2 slots.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:PREamble<ch>?` on page 526

Postamble Length 1 / Postamble Length 2 ← Cycle 1 / Cycle 2 Configuration
Displays the postamble length in slots, when the corresponding UE-DTX cycle is applied.

The postamble length is fixed to 1 slot.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:POSTamble<ch>?` on page 527

4.28 PRACH Settings - UE

1. To access the PRACH settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PRACH Standard/PRACH Preamble Only".

   The PRACH settings are available in two modes:

   - In "Standard" mode, the instrument generates a single physical random access channel (PRACH). This channel is needed to set up the connection between the user equipment and the base station.
   - In "Preamble only" mode, the instrument only generates the preamble of a physical random access channel (PRACH). This mode is needed for Test Case 8.8 TS 25.141.

In this mode, only the preamble parameters are available.

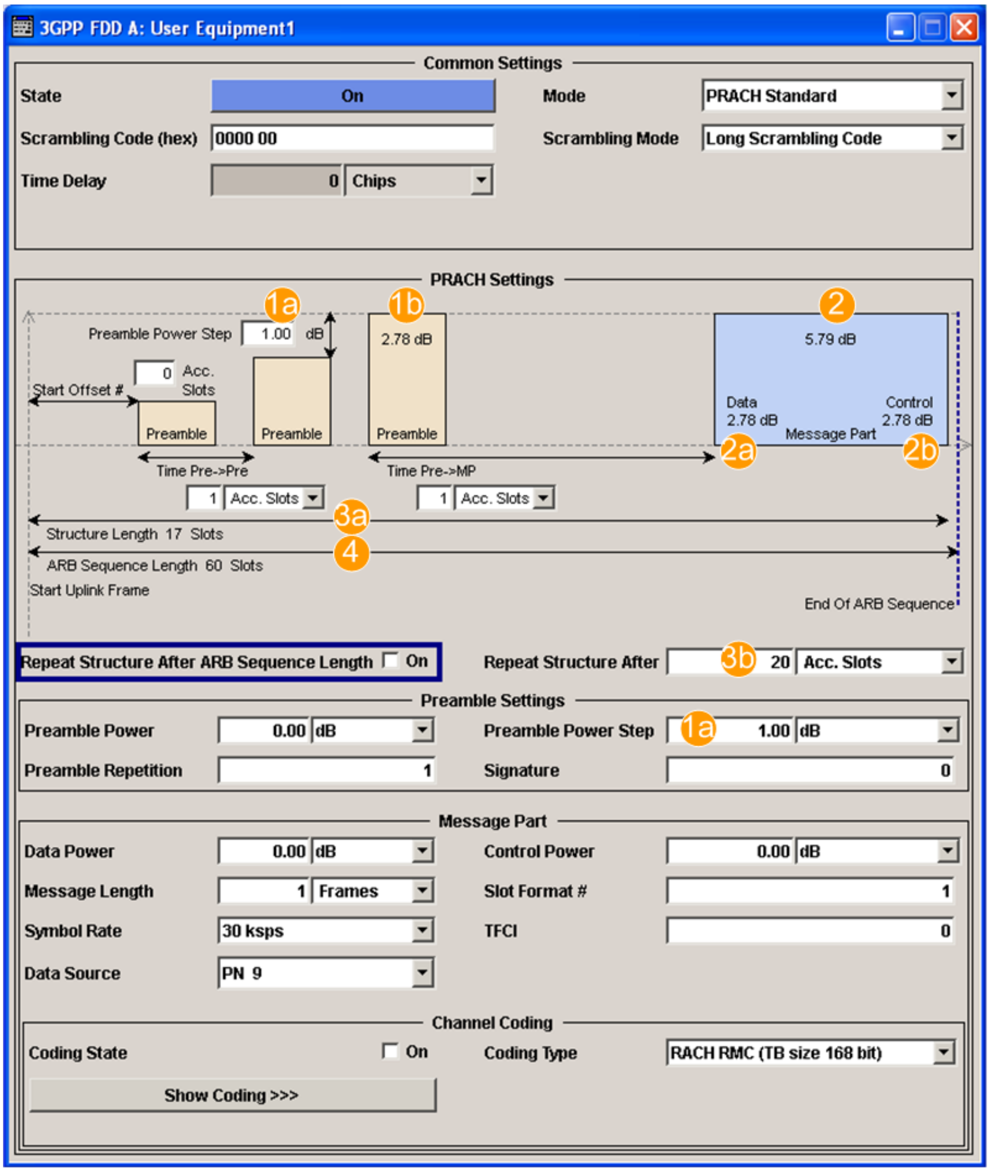


Fig. 4-15: Standard PRACH Structure: Understanding the displayed information

1a	= "Preamble Power Step"; subtract this value from 1b to calculate the power of the other preambles
1b	= "Delta Power (Preamble)", i.e. correction value for the last preamble before the message part
2	= "Delta Power (Message Part)", i.e. correction value for the message part overall
2a, 2b	= correction values for the data and control part of the message part
3a	= current "Structure Length"
3b	= user-defined repetition of the PRACH structure, i.e. the smae structure is repeated 3 times withing the current ARB sequence length
4	= current ARB sequence length (in slots); set with the parameter Sequence Length ARB

The dialog comprises a graphical representation of the PRACH structure, including the timing parameters, the "Preamble Settings" and "Message Part" sections, comprising respectively the preamble settings for the parameters of the data part of the channel. Some settings are made directly in the input fields of the graphical display.
In the "Channel Coding" section channel coding can be activated.

Power settings and power calculation

- Calculating the power of the preamble
  The correction value for the last preamble before the message part (indication in the preamble block) are indicated in the graphical display of the PRACH structure. The power of the other preambles are calculated by subtracting the selected "Preamble Power Step".
- Calculating the power of the message part
  The correction values for the message part overall and separately for data and control part (indications in the message part block) are also indicated.
  For one active UE and if the "Level Reference" is set to "RMS Power", the RF power of the message part is calculated as:
  Message Part Power = "RF Level" + Delta Power Message Part

Example: Calculating the power of the message part

- "3GPP > User Equipment > Level Reference > RMS Power"
- "Level = 5 dBm"
- "Delta Power Message Part = 5.79 dB"

The resulting Message Part Power = 5 + 5.79 = 10.79 dBm

4.28.1 Graphical Display

The graphical display shows either the complete PRACH including the message part or only the preamble depending on the selected mode.

PRACH Standard

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PRACH Standard".

PRACH Preamble-only

► Select "Mode > PRACH Preamble Only".

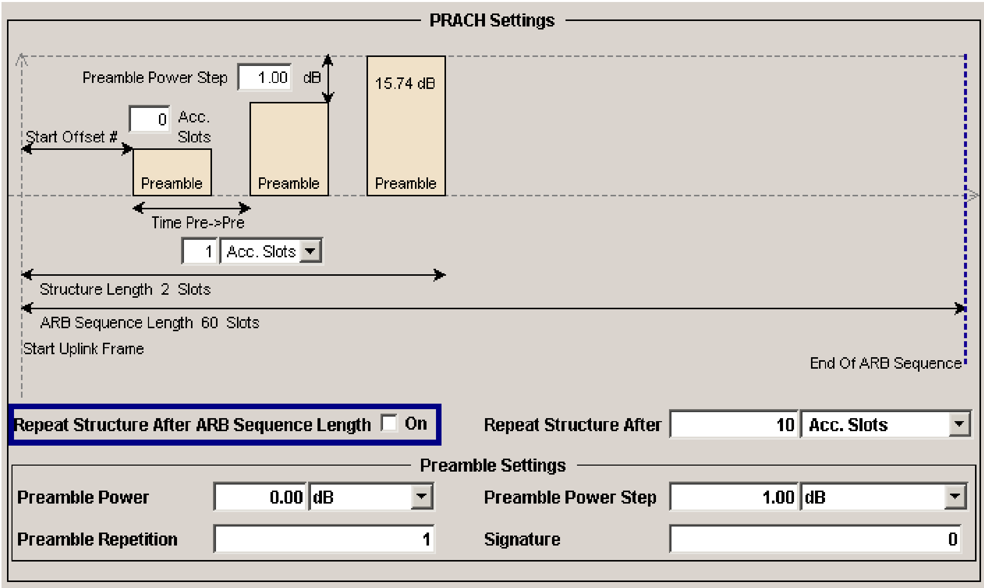


Fig. 4-16: PRACH Mode Preamble Only

Some of the parameter values can be input directly in the input fields of the graphical display. The indicated structure length and the power correction values match the real settings; the number of preambles, however, is shown as an example, to explain the parameter function.
Use the power correction values to calculate the correct settings for the desired RF level, see "Power settings and power calculation" on page 175.

Delta Power (Preamble)
Indicates the level correction value for the last preamble before the message part.

The level of the other preambles can be calculated by subtracting the set "Preamble Power Step".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:PREamble?` on page 502

Delta Power (Message Part)
Indicates the level correction value for the message part, together with the power offsets of the data and control part.

The indication of the total value is important for measurements where just the envelope of the signal is of interest whereas the separate indication is useful for receiver tests.

See also "Power settings and power calculation" on page 175.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:MPARt?
on page 500
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:MPARt:DATA? on page 501
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:MPARt:CONTrol? on page 501

Start Offset #

Enters the start offset of the PRACH in access slots or slots.

The starting time delay in timeslots is then equal to 2*"Start Offset #"

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:SOFFset
on page 502

Time Pre->Pre

Enters the time difference between two successive preambles in access slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:TIME:PREPre
on page 503

Time Pre->MP

Enters the time difference between the last preamble and the message part in access slots.

Two modes are defined in the standard. In mode 0, the preamble to message part difference is 3 access slots, in mode 1 it is 4 access slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:TIME:PREMp
on page 503

Structure Length

Indicates the structure length:

- In "PRACH only - Preamble" mode, the structure length is defined as:
  "Structure Length" = "Start Offset (Slots)" + "Preamble Repetition"*"Time Pre->Pre"

Example: Calculating the structure length in PRACH Preamble Only mode

"Start Offset # = 1 Access Slots", i.e. 2 Slots

"Preamble Repetition = 2"

"Time Pre->Pre = 2 Access Slots", i.e. 4 Slots

"Structure Length" = 2 Slots + 2 x 4 Slots = 10 Slots

- In "PRACH only - Standard" mode, the structure length is defined as:
  "Structure Length" = "Start Offset (Slots)" + "Preamble Repetition"*"Time Pre->Pre" + "Time Pre->MP" + 15*"Message Part Length (Frames)"

Example: Calculating the structure length in PRACH Standard mode

"Start Offset # = 2 Access Slots", i.e. 4 Slots

"Preamble Repetition = 3"

"Time Pre->Pre = Time Pre->MP = 3 Access Slots", i.e. 6 Slots

"Message Part Length = 2 Frames"

"Structure Length" = 4 Slots + 2 x 6 Slots + 6 Slots + 15 x 2 = 52 Slots

See also "Repeat Structure After ARB Sequence Length" on page 178.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:SPERiod?
on page 502

ARB Sequence Length

Indicates the ARB sequence length.

Note: A caution message is displayed, if the structure length is longer than the selected ARB sequence length.
The change the ARB sequence length, use the parameter Sequence Length ARB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:SLENgth on page 353

Repeat Structure After ARB Sequence Length

Enables/disables repeating the selected PRACH structure during one ARB sequence.

"On" Within one ARB sequence, the selected PRACH structure is repeated once.

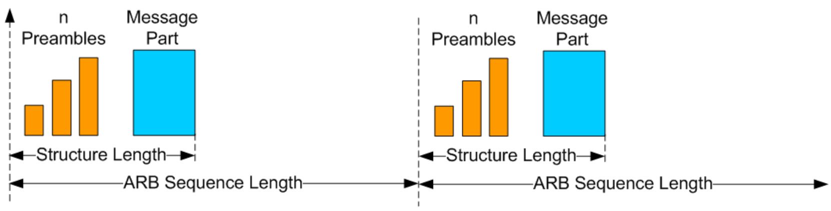


Fig. 4-17: "Repeat Structure After ARB Sequence Length = On"

"Off" The selected PRACH structure can be repeated several time, depending on the structure length and the Repeat Structure After (x Acc. Slots).

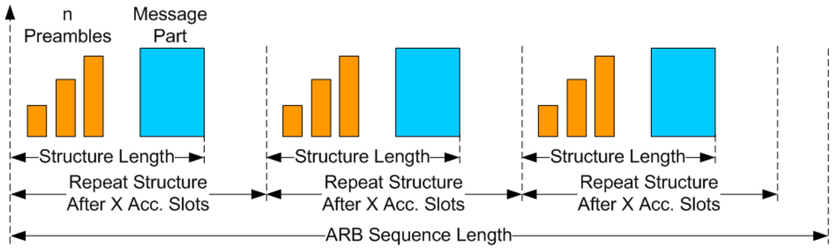


Fig. 4-18: "Repeat Structure After ARB Sequence Length = Off"

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RARB on page 499

Repeat Structure After (x Acc. Slots)
If "Repeat Structure After ARB Sequence Length > Off", sets the number of access slots after that the selected PRACH structure will be repeated, see figure 4-18.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RAFTer on page 498

4.28.2 Preamble Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PRACH Standard/PRACH Preamble Only".

   The "Preamble Settings" section provides the parameters for configuring the PRACH preamble.

Preamble Power
Sets the power of the preamble component of the PRACH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PPOWer on page 497

Preamble Power Step
Sets the power by which the preamble is increased from repetition to repetition. The power set with the parameter Preamble Power is the "target power", used during the last repetition of the preamble.

Example:

"Preamble Power = 0 dB"

"Preamble Repetition = 3"

"Preamble Power Step = 3 dB"

Fig. 4-19: Generated power sequence

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PPOWer:STEP on page 498

Preamble Repetition
Sets the preamble count.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PREPetition on page 498

Signature
Selects the signature to be used for the PRACH channel.

The signature defines the code domain for the channelization code being used. 16 fixed bit patterns are defined.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SIGNature on page 500

4.28.3 Message Part Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PRACH Standard".

   The "Message Part" section comprises the settings for the data part of the PRACH.

Data Power
Sets the power of the data component of the PRACH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DPOWer on page 497

Control Power
Sets the power of the control component of the PRACH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:CPOWer on page 495

Message Length
Sets the length of the message component of the PRACH channel in frames.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:MLENgth on page 497

Slot Format
Selects the slot format.

Slot formats 0 to 3 are available for the PRACH channel. The slot format defines the symbol rate of the message component.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SFORmat on page 499

Symbol Rate
Sets the symbol rate of the PRACH channel.

The symbol rate is determined by the slot format set. A change in the symbol rate leads automatically to an adjustment of the slot format.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SRATe on page 500

TFCI
Enters the value of the TFCI field (Transport Format Combination Indicator) in the control component of the PRACH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TFCI on page 500

Data Source
Selects the data source for the data component of the PRACH channel.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

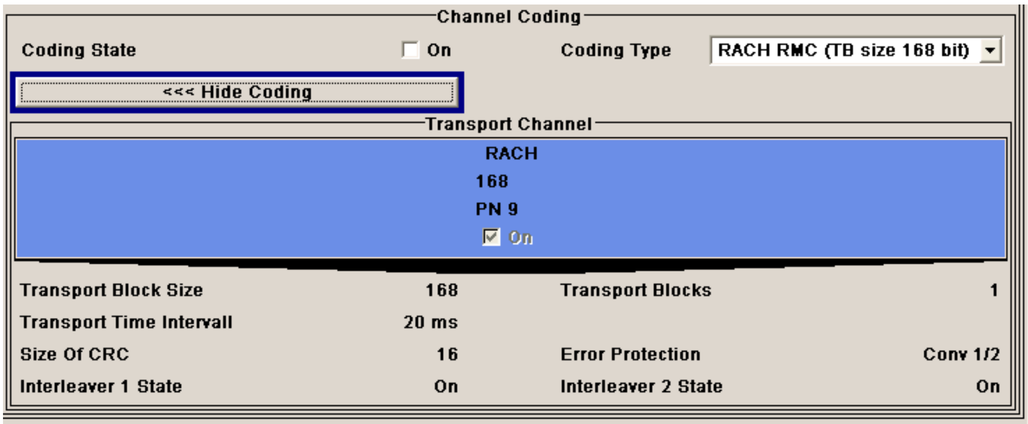
  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA on page 495
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:PATTern on page 496
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:DSELect on page 496

4.28.4 Channel Coding State

Channel coding of PRACH is possible for all UEs.

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PRACH Standard".



The "Channel Coding" section is where the channel coding for the PRACH channel is activated and deactivated and the coding type is defined. The fixed settings for the channel coding parameters are displayed.

Channel Coding State

Activates or deactivates channel coding for the PRACH channel.

When On, the "Message Part Length" automatically is set to 2. It cannot be changed.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:ENHanced:PRACh:CCODing:STATe on page 544

Channel Coding Type

Selects the predefined reference measurement channel coding types for the PRACH channel.

"RACH RMC (TB size 168 bit)"
Reference Measurements Channel Coding with transport block size of 168 bit.

"RACH RMC (TB size 360 bit)"
Reference Measurements Channel Coding with transport block size of 360 bit.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:ENHanced:PRACh:CCODing:TYPE on page 544

Show Coding

Calls the menu for displaying the channel coding settings. The reference measurement channel parameters are set to fixed values.

The following parameters are displayed:

"Data Source" The data source is displayed in the transport channel graphical display.

"Transport Block Size"
Size of the transport block at the channel coding input.

"Transport Block"
Transport block count.

"Transport Time Interval"
Number of frames into which a TCH is divided.

"Size of CRC"
CRC type (length).

"Error Protection"
Error protection.

"Interleaver 1 / 2 State"
Channel coding interleaver state

Remote command:
n.a.

4.29 PCPCH Settings - UE

1. To access the PCPCH settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PCPCH Standard/PCPCH Preamble Only".

   The PCPCH settings are available in two modes:

   - In "PCPCH Standard" mode, the instrument generates a single physical common packet channel (PCPCH). This channel is used to transmit packet-oriented services (e.g. SMS).
   - In "PCPCH Preamble only" mode, the instrument only generates the preamble of a physical common packet channel (PCPCH). This mode is needed for Test Case 8.9 TS 25.141.

In this mode, only the preamble parameters are available.

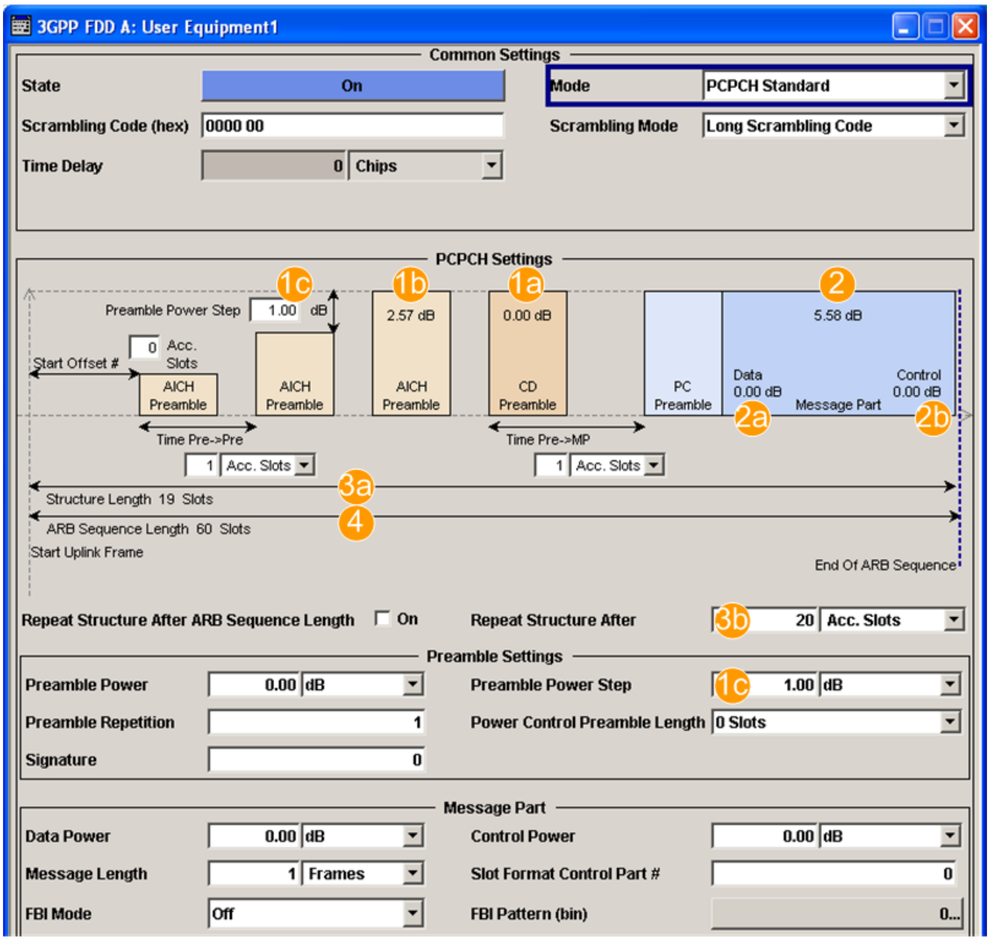


Fig. 4-20: Standard PCPCH Structure: Understanding the displayed information

1a, 1b = "Delta Power (Preamble)", i.e. correction values for the last AICH preamble before the message part and the CD Preamble

1c = "Preamble Power Step"; subtract this value from 1b to calculate the power of the other preambles

2 = "Delta Power (Message Part)", i.e. correction value for the message part overall

2a, 2b = correction values for the data and control part of the message part

3a = current "Structure Length = 19 slots"

3b = user-defined repetition of the PCPCH structure, i.e. the smae structure is repeated 3 times withing the current ARB sequence length

4 = current ARB sequence length (in slots); set with the parameter Sequence Length ARB

The dialog comprises a graphical display of the PCPCH structure including the timing parameters, the "Preamble Settings" and "Message Part" sections, comprising respectively the preamble settings and the parameters for the data part of the channel. Some settings are made directly in the input fields of the graphical display.
The "Channel Coding" settings for activating channel coding are available for UE1.

Power settings and power calculation

- Calculating the power of the preamble

The correction value for the last AICH preamble before the message part and the CD Preamble (indication in the AICH and CD Preamble block) are indicated in the graphical display of the PCPCH structure. These two values are identical.
The power of the other preambles are calculated by subtracting the selected "Preamble Power Step".

- Calculating the power of the message part
  The power correction value of the message part is indicated in the message part settings.
  For one active UE, the RF power of the message part is calculated as:
  Message Part Power = "RF Level" + Delta Power Message Part
  For PCPCH, the parameter "Level Reference" is always "RMS Power".

Example: Calculating the power of the message part

- "Level = 5 dBm"
- "Delta Power Message Part = 5.58 dB"

The resulting Message Part Power = 5 + 5.58 = 10.58 dBm

4.29.1 Graphical Display

The graphical display shows either the complete PCPCH including the message part or only the preamble depending on the selected mode.

PCPCH Standard

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PCPCH Standard"

PCPCH Preamble-only

► Select "Mode > PCPCH Preamble Only".

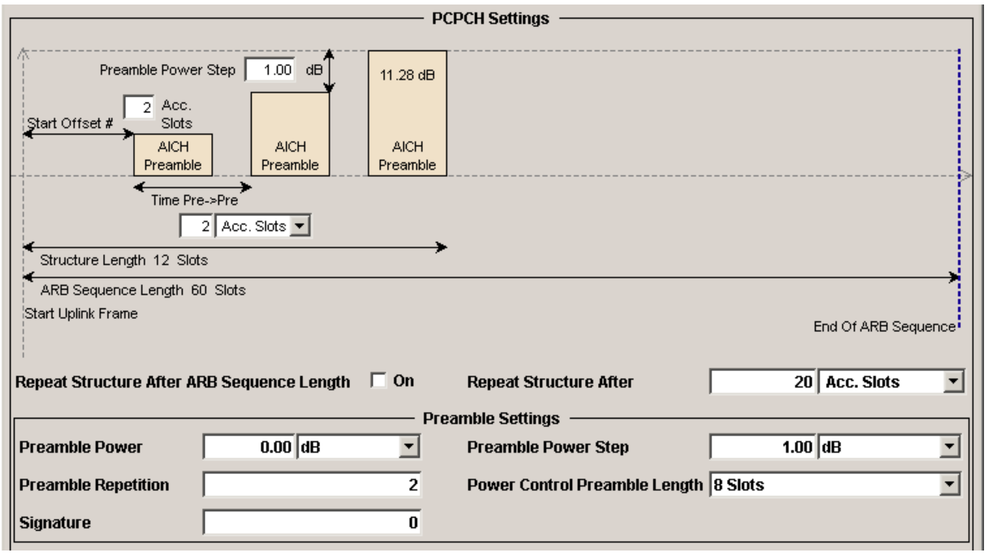


Fig. 4-21: PCPCH Structure in "Mode > PCPCH Preamble-only"

Some of the parameter values can be input directly in the input fields of the graphical display. The indicated structure length and the power correction values match the real settings; the number of preambles, however, is shown as an example, to explain the parameter function.
Use the power correction values to calculate the correct settings for the desired RF level (see "Power settings and power calculation" on page 184).

Delta Power (Preamble)
Indication of the level correction value for the last AICH preamble before the message part. This value is identical to the correction value for the CD preamble.

The level of the other preambles can be calculated by subtracting the set "Preamble Power Step".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:DPOWer:PREamble?` on page 490

Delta Power (Message Part)
Indicates the level correction value for the message part, together with the power offsets of the data and control part.

See also example "Calculating the power of the message part" on page 185.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:DPOWer:MPARt?` on page 490

Start Offset #
Enters the start offset of the PCPCH in access slots.

Note: The PCPCH only transmitted once, at the start of the sequence.

The starting time delay in time slots is calculated according to TS 25 211, Chapter 7.3 PCPCH/AICH timing relation and is 2*"Start Offset #".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:SOFFset
on page 491

Transmission Timing (Preamble)
Enters the time difference between two successive preambles in access slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:TIME:PREPre
on page 492

Transmission Timing (Message Part)
Enters the time difference between the last preamble and the message part in access slots.

Two modes are defined in the standard. In mode AICH transmission timing 0, the preamble to message part difference is 3 access slots, in mode AICH transmission timing 1 it is 4 access slots.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:TIME:PREMp
on page 491

Structure Length
Indicates the structure length:

- In "PCPCH only - Preamble" mode, the structure length is defined as:
  "Structure Length" = "Start Offset (Slots)" + "Preamble Repetition"*"Time Pre->Pre"

Example: Calculating the structure length in PCPCH Preamble Only mode

"Start Offset # = 2 access slots", i.e. = 4 slots

"Preamble Repetition = 2"

"Time Pre->Pre = 2 access slots", i.e. = 4 slots

"Structure Length" = 4 slots + 2 x 4 slots = 12 slots

- In "PCPCH only - Standard" mode, the structure length is defined as:
  "Structure Length" = "Start Offset (Slots)" + "Preamble Repetition"*"Time Pre->Pre" + "Time Pre->MP" + "Power Control Preamble Length" + 15*"Message Part Length (Frames)"
  In PCPCH mode the CD preamble has to be taken into account. Therefore, Preamble Repetition instead of (Preamble Repetition - 1) is used.

Example: Calculating the structure length in PCPCH Standard mode

"Start Offset = 2 access slots", i.e. 4 slots

"Preamble Repetition = 3"

"Time Pre - Pre = Time Pre - MP = 3 access slots", i.e. 6 slots

"Power Control Preamble Length = 8 slots"

"Message Part Length = 2 frames"

"Structure Length" = 4 slots + 3 x 6 slots + 6 slots + 8 + 15 x 2 = 66 slots

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:SPERiod?`
on page 491

ARB Sequence Length
Indication of the ARB sequence length.

Note: A caution message is displayed, if the structure length is longer than the selected ARB sequence length.
The change the ARB sequence length, use the parameter Sequence Length ARB.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:SLENgth` on page 353

Repeat Structure After ARB Sequence Length
Enables/disables repeating the selected PCPCH structure during one ARB sequence.

"On" Within one ARB sequence, the selected PCPCH structure is repeated once.
See figure 4-17 for illustration of the principle.

"Off" The selected PCPCH structure can be repeated several time, depending on the structure length and the Repeat Structure After (x Acc. Slots).
See figure 4-18 for illustration of the principle.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RARB` on page 488

Repeat Structure After (x Acc. Slots)
If "Repeat Structure After ARB Sequence Length > Off", sets the number of access slots after that the selected PCPCH structure will be repeated, see figure 4-18.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RAFTer` on page 488

4.29.2 Preamble Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".

2. Select "Mode > PCPCH Standard/PCPCH Preamble Only".

   The "Preamble Settings" section provides the parameters for configuring the PCPCH preamble.

Preamble Power
Sets the power of the preamble component of the PCPCH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PPOWer on page 487

Preamble Repetition
Sets the preamble count.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PREPetition on page 488

Preamble Power Step
Sets the power by which the preamble is increased from repetition to repetition. The power set under Preamble Power is the "target power", used during the last repetition of the preamble.

Example:

"Preamble Power" = 0 dB

"Preamble Repetition" = 3

"Preamble Power Step" = 3 dB

Fig. 4-22: Generated power sequence

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PPOWer:STEP on page 487

Power Control Preamble Length
Sets the length of the power control preamble in slots.

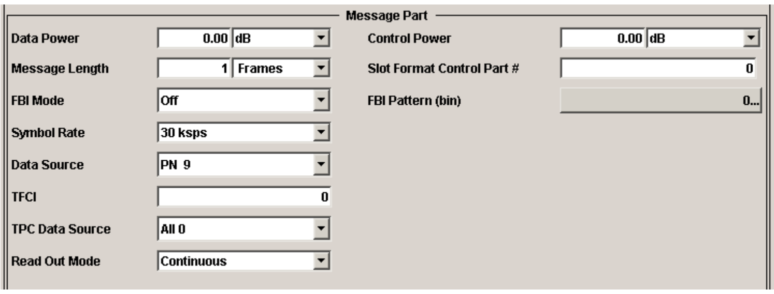
Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PLENgth on page 487

Signature
Selects the signature to be used for the PCPCH channel. The signature defines the code domain for the channelization code being used.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:SIGNature on page 489

4.29.3 Message Part Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PCPCH Standard".



The "Message Part" section comprises the settings for the data part of the PCPCH.

Data Power
Sets the power of the data component of the PCPCH channel.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DPOWer` on page 485

Control Power
Sets the power of the control component of the PCPCH channel.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:CPOWer` on page 483

Message Length
Sets the length of the message component of the PCPCH channel in frames.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:MLENgth` on page 486

Slot Format
Selects the slot format of the control component of the PCPCH channel.

Slot formats 0 to 2 are available for the PCPCH channel. The slot format defines the structure of the control component, the FBI mode.

When channel coding is active, the FBI mode and the slot format are prescribed.

"Slot format 0"	no FBI field
"Slot format 1"	1 FBI field
"Slot format 2"	2 FBI fields

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:CPSFormat` on page 484

FBI Mode
Selects the FBI (Feed Back Information) mode.

The FBI mode is determined by the slot format set. A change in the FBI mode leads automatically to an adjustment of the slot format.

"FBI Off" The FBI field is not in use.

"FBI On 1 Bit" The FBI field is used with a length of 1 bit.

"FBI On 2 Bits" The FBI field is used with a length of 2 bits.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:FBI:MODE on page 486

FBI Pattern
Enters the bit pattern for the FBI field in the control part (of the message part) of the PCPCH.

The FBI field is filled cyclically with a pattern of up to 32 bits in length.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:FBI:PATTern on page 486

Symbol Rate
Sets the symbol rate of the PCPCH channel.

The symbol rate is determined by the slot format set. A change in the symbol rate leads automatically to an adjustment of the slot format.

When channel coding is active, the symbol rate is prescribed.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:SRATe on page 489

Data Source
Selects the data source for the data component of the PCPCH channel.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA on page 484
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:PATTern on page 485
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:DSELect on page 485

TFCI

Enters the value of the TFCI field (Transport Format Combination Indicator) in the control component of the PCPCH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TFCI on page 489

TPC Data Source

Defines the data source for the TPC field of the PCPCH channel.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select TPC Data List"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA on page 492
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:DSELect
on page 492
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:PATTern
on page 493

Read Out Mode

Defines the TPC data usage.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. With all read out modes, one bit is taken from the data stream for the TPC field for each slot and entered into the bit stream several times (depending on the symbol rate). The difference between the modes lies in the usage of the TPC bits.

"Continuous" The TPC bits are used cyclically.

"Single + All 0" The TPC bits are used once, and then the TPC sequence is continued with 0 bits.

"Single + All 1" The TPC bits are used once, and then the TPC sequence is continued with 1 bits.

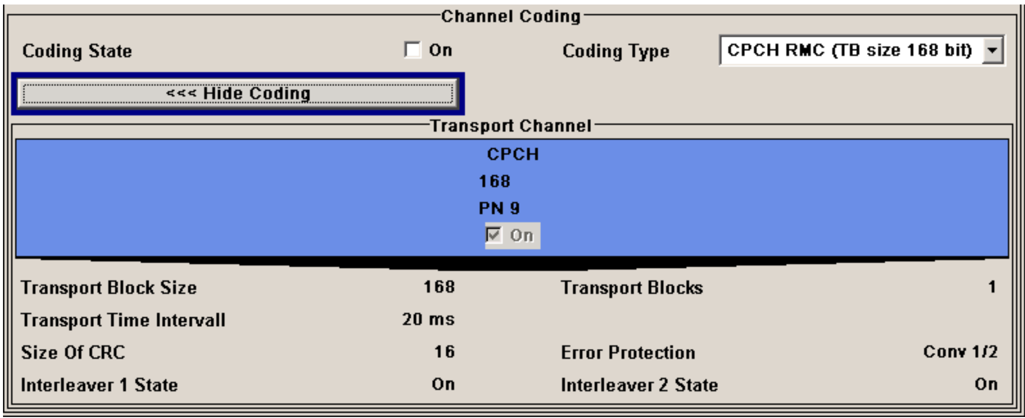
"Single + alt. 01"
The TPC bits are used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

"Single + alt. 10"
The TPC bits are used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:READ on page 493

4.29.4 Channel Coding Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "Mode > PCPCH Standard".



The "Channel Coding" section is where the channel coding for the PCPCH channel is activated and deactivated and the coding type is defined. The fixed settings for the channel coding parameters are displayed.

Channel Coding State
Activates or deactivates channel coding for the PCPCH channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:PCPCh:CCODing:STATe on page 543

Channel Coding Type
Selects the predefined reference measurement channel coding types for the PCPCH channel.

"CPCH RMC (TB size 168 bit)"
Reference Measurements Channel Coding with transport block size of 168 bit.

"CPCH RMC (TB size 360 bit)"
Reference Measurements Channel Coding with transport block size of 360 bit.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:PCPCh:CCODing:TYPE
on page 543

Show Coding
Calls the menu for displaying channel coding. The reference measurement channel parameters are set to fixed values.

The following parameters are displayed:

"Data Source" The data source is displayed in the transport channel graphical display.

"Transport Block Size"
Size of the transport block at the channel coding input.

"Transport Block"
Transport blocks count.

"Transport Time Interval"
Number of frames into which a TCH is divided.

"Size of CRC" CRC type (length).

"Error Protection"
Error protection.

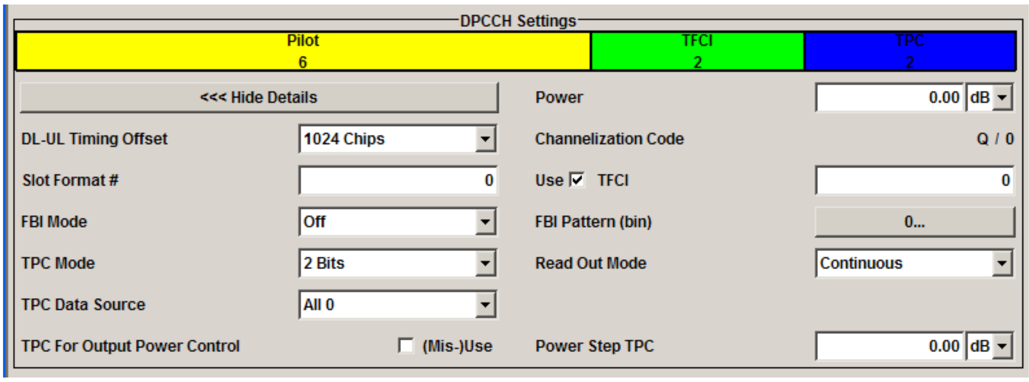
"Interleaver 1 / 2 State"
Channel coding interleaver state

Remote command:
n.a.

4.30 DPCCH Settings - UE

The DPCCH settings section is where the settings are made for the DPCCH channel. This section is only available if DPCCH + DPDCH mode is activated (see also chapter 4.33, "DPDCH Settings - UE", on page 223).

In the upper section, the settings of the DPCCH parameters are made. The channel structure is displayed.



In UE1, the DPCCH is generated in realtime (enhanced).

About the Dedicated Physical Channels

At the physical level, an uplink DPCH consists of the DPDCH (Dedicated Physical Data Channel) and the DPCCH (Dedicated Physical Control Channel); the channel characteristics are defined by the symbol rate.

The DPDCH transports the user data that is fed directly into the data field. The DPCCH carries the control fields (Pilot field; TPC = Transmit Power Control, FBI (Feedback Information) and TFCI = Transport Format Combination Indicator). DPDCH is grouped with DPCCH I/Q code multiplexing in accordance with 3GPP TS 25.211, see diagram below. The generation of an uplink reference measurement channel is described in chapter 4.38, "Global Enhanced Channel Settings - UE1", on page 246.

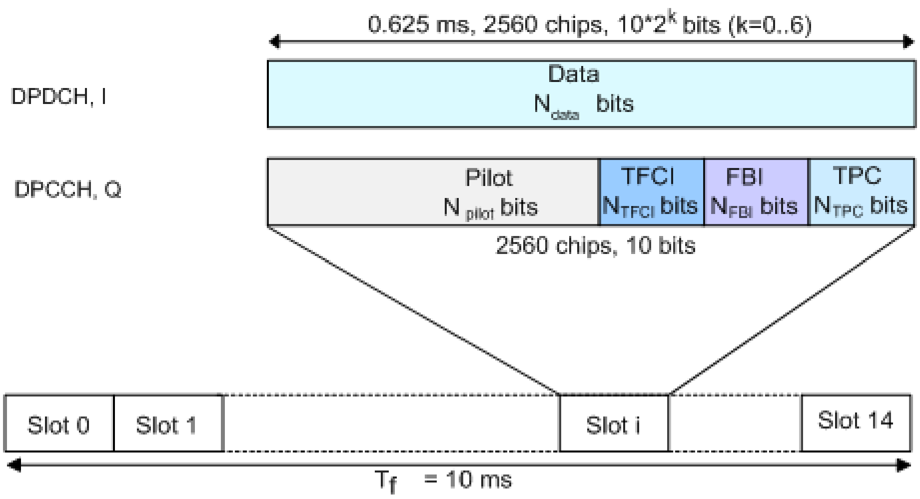


Fig. 4-23: Structure of an uplink DPCH in the time domain

Channelization Code

Displays the channelization code and the modulation branch (I or Q) of the DPCCH. The code channel is spread with the set channelization code (spreading code). The standard assigns a fixed channelization code to the DPCCH.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CCODe?` on page 462

Power

Sets the power of the DPCCH channel.

Test cases defined in the 3GPP standard often use notation "Signaling values for βc and βd". The quantization of the gain parameters is shown in the following table which is taken from 3GPP Spec 25.213 (left columns) and supplemented by the instrument-specific values (right column).

Signaling values for βc and βd	Quantized amplitude ratios βc and βd	Power to be set / dB
15	1.0	0.0
14	14/15	-0.60
13	13/15	-1.24
12	12/15	-1.94
11	11/15	-2.69
10	10/15	-3.52
9	9/15	-4.44
8	8/15	-5.46
7	7/15	-6.62
6	6/15	-7.96
5	5/15	-9.54
4	4/15	-11.48
3	3/15	-13.99
2	2/15	-17.52
1	1/15	-23.52
0	Switch off	Switch channel off or -80 dB

Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:POWer` on page 455

DL-UL Timing Offset

Sets the timing offset between the downlink and the uplink.

The timing offset determines the time delay in chips between the downlink signal timing and transmission of the uplink signal.

Note: The signals of all UEs have the same uplink slot timing. The parameters "DL-UL Timing Offset" are coupled and by changing this parameter for one of the UEs, the values for the other UEs are automatically adjusted.

"1024 Chips" The uplink signal is generated according to the 3GPP specification. The signal is calculated synchronously to the downlink reference timing, i.e. the first uplink frame starts at chip position 1024 of the simulated signal.

"0 Chips" No timing offset is applied, i.e. there is no timing delay between receipt of the downlink signal and transmission of the uplink signal. See also "To generate a continuos uplink signal composed of multiple separately generated uplink frames" on page 256.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TOFFset` on page 457

Slot Format #

Selects the slot format.

The slot format defines the structure of the DPCCH slots and the control fields. Depending on the selected slot format, the slot structure is displayed.

Slot formats 0 to 4 are available for the DPCCH channel as defined in the 3GPP Release 7 specification TS 25.211.

Note: The former slot formats 4 and 5 according to 3GPP Release 4 specification TS 25.211 are not supported.

The slot format selection adjusts the DPCCH slot structure according to the 3GPP specification. However, it is also possible to adjust this structure by configuration of each of the control fields separately.

The table below gives an overview of the cross-reference between the slot format and the structure of the DPCCH slot.

Slot Format #	NPilot, bits	NTPC, bits (TPC Mode)	NTFCI, bits (Use TFCI)	NFBI, bits (FBI Mode)
0	6	2	2	0
1	8	2	0	0
2	5	2	2	1
3	7	2	0	1
4	6	4	0	0

"Slot format 0"

"FBI Mode" = Off, i.e. no FBI field
"TFCI Mode" = 2 bits
"Use TFCI" = On, i.e. TFCI field = 2 bits

"Slot format 1"

"FBI Mode" = Off, i.e. no FBI field
"TFCI Mode" = 2 bits
"Use TFCI" = Off, i.e. no TFCI field

"Slot format 2"

"FBI Mode" = 1 bit
"TFCI Mode" = 2 bits
"Use TFCI" = On, i.e. TFCI field = 2 bits

"Slot format 3"

"FBI Mode" = 1 bit
"TFCI Mode" = 2 bits
"Use TFCI" = Off, i.e. no TFCI field

"Slot format 4"

(enabled only for instruments equipped with R&S SMx/AMU-K59)
"FBI Mode" = Off, i.e. no FBI field
"TFCI Mode" = 4 bits
"Use TFCI" = Off, i.e. no TFCI field

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:SFORmat` on page 456

Use TFCI

Activates the TFCI (Transport Format Combination Indicator) field.

The status of the TFCI field is determined by the "Slot Format" set. A change leads automatically to an adjustment of the slot format.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI:STATe` on page 456

TFCI

Enters the value of the TFCI field (Transport Format Combination Indicator) of the DPCCH channel.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI` on page 456

FBI Mode

Selects the FBI (Feed Back Information) mode.

The FBI mode is determined by the "Slot Format" set. A change in the FBI mode leads automatically to an adjustment of the slot format.

Note: The former 2-bits long FBI Mode according to 3GPP Release 4 specification TS 25.211 is not supported.

"Off" The FBI field is not in use.

"1 Bit" The FBI field with a length of 1 bit is used.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:MODE on page 455

FBI Pattern (bin)
Enters the bit pattern for the FBI field.

The FBI field is filled cyclically with a pattern of up to 32 bits in length.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:PATTern on page 455

TPC Mode
Selects the TPC (Transmit Power Control) mode.

The TPC mode is determined by the "Slot Format" set. A change in the TPC mode leads automatically to an adjustment of the slot format.

"2 Bits" A TPC field with a length of 2 bits is used.

"4 Bits" (enabled only for instruments equipped with R&S SMx/AMU-K59)
A TPC field with a length of 4 bits is used.
A 4 bits long TPC field can be selected, only for Slot Format 4 and disabled FBI and TFCI fields.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MODE on page 459

TPC Data Source
Defines the data source for the TPC field of the DPCCH channel.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List / Select TPC Data List"
  A binary data from a data list, internally or externally generated.
  Select "Select TPC Data List" to access the standard "Select List" dialog.
  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA on page 457
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:PATTern
on page 458
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:DSELect
on page 458

TPC Read Out Mode
Defines the TPC data usage.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. With all read out modes, one bit is taken from the data stream for the TPC field for each slot and entered into the bit stream several times (depending on the symbol rate). The difference between the modes lies in the usage of the TPC bits.

These different modes can be used, for example, to deliberately set a DPCH of a base station to a specific output power (e.g. with the pattern 11111) and then let it oscillate around this power (with Single + alt. 01 and Single + alt. 10). This then allows power measurements to be carried out at the base station (at a quasi-constant power). Together with the function "(Mis-)Use TPC for output power control" (see below), "TPC Read Out Mode" can also be used to generate various output power profiles.

"Continuous:" The TPC bits are used cyclically.

"Single + All 0" The TPC bits are used once, and then the TPC sequence is continued with 0 bits.

"Single + All 1" The TPC bits are used once, and then the TPC sequence is continued with 1 bits.

"Single + alt. 01" The TPC bits are used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

"Single + alt. 10" The TPC bits are used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:READ on page 460

Misuse TPC for Output Power Control
(available for UE2, UE3 and UE4 only)

Defines "mis-" use of the TPC data.

With 3GPP, the TPC bits are used to signal the increase or reduction in transmit power to the called station. If "(Mis-) use TPC for output power control" is activated, the specified pattern is misused, in order to vary the intrinsic transmit power over time. A bit of this pattern is removed for each slot in order to increase (bit = "1") or reduce (bit = "0") the channel power by the specified power step ("Power Step"). The upper limit for this is 0 dB and the lower limit -60 dB. The following envelope is produced at a channel power of 0 dB, power step 1.0 dB and pattern "001110100000011" and TPC Pattern Read Out Mode Continuous:

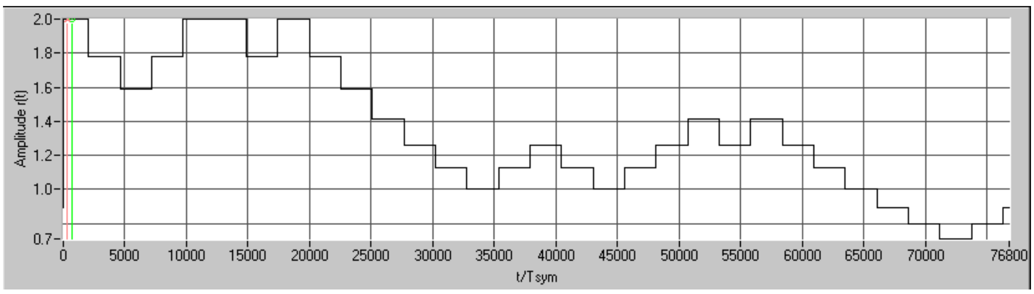


Fig. 4-24: Dynamic change of channel power (continuous)

Note: Power control works both on the DPCCH and all the active DPDCHs. The change in power is always carried out (as stipulated in the standard) at the start of the slot pilot field

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MISuse` on page 458

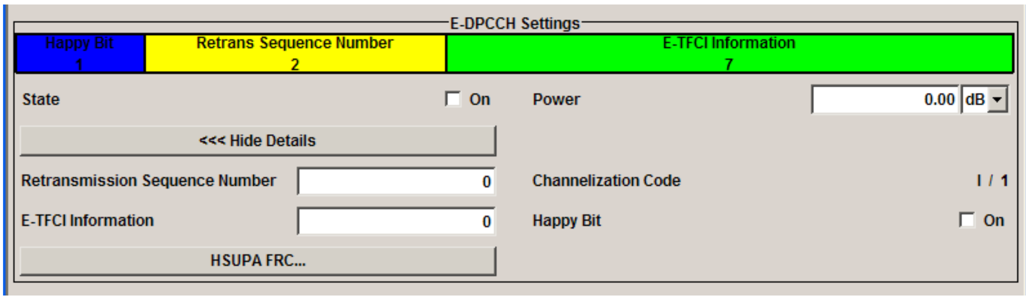
TPC Power Step
(available for UE2, UE3 and UE4 only)

Sets the step width of the power change in dB for "(Mis-) use TPC for output power control".

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:PSTep` on page 459

4.31 E-DPCCH Settings - UE

1. To access the E-DPCCH channel settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE".
2. Select "Mode > DPCCH + DPDCH".
3. Select "E-DPCCH Settings > Show Details".



The dialog displays the channel structure and the available parameters.

State (E-DPCCH)
Activates or deactivates the E-DPCCH channel.

If an FRC is set for the channel, this field is activated automatically.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:STATe`
on page 519

Power
Sets the power of the E-DPCCH channel.

The value range is -80 dB to 0 dB.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:POWer`
on page 519

Retransmission Sequence Number
Sets the retransmission sequence number.

The value range is 0 to 3.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:RSNumber`
on page 519

Channelization Code
Displays the channelization code and the modulation branch (always I) of the E-DPCCH. The code channel is spread with the set channelization code (spreading code). The standard assigns a fixed channelization code to the E-DPCCH.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:CCODe?`
on page 518

E-TFCI Information
Sets the value for the TFCI (Transport Format Combination Indicator) field.

The value range is 0 to 127.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:TFCI`
on page 519

Happy Bit
Activating the happy bit. This bit is indicating whether the UE could use more resources (Not Happy/deactivated) or not (Happy/activated).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:HBIT`
on page 518

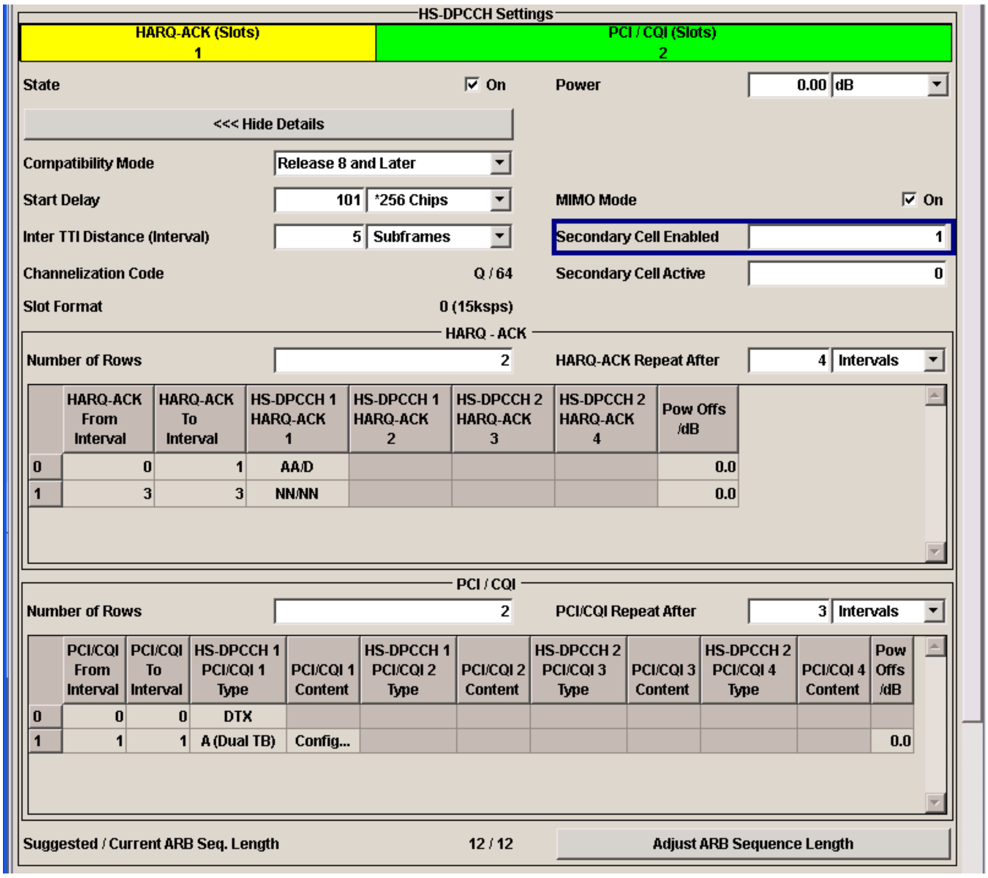
HSUPA FRC…
For UE1, accesses the dialog for configuring the FRC (Fixed Reference Channel), see chapter 4.37, "HSUPA FRC Settings - UE", on page 236.

Remote command:
n.a.

4.32 HS-DPCCH Settings - UE

1. To access the HS-DPCCH channels settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"

2. Select "HS-DPCCH"



The dialog contains the general parameters required for configuring the channel, and displays the channel structure.

Real time signal generation

To enable real time signal generation for UE1, select "3GPP FDD > User Equipment > UE1> HS-DPCCH" and select "Compatibility Mode > Up to Release 7" or "Compatibility Mode > Release 8 and Later RT"

4.32.1 About HS-DPCCH

HS-DPCCH Structure

The HS-DPCCH carries uplink feedback signaling related to the accuracy and quality of downlink HS-DSCH transmission. Hybrid-ARQ Acknowledgment (HARQ-ACK) is transmitted in the first subframe slot, Channel-Quality Indication (CQI) and in case of UE configured in MIMO mode also Precoding Control Indication (PCI) are transmitted in the second and third subframe slot. Only one HS-DPCCH may be transmitted on each radio link. The HS-DPCCH can only exist together with an uplink DPCCH.

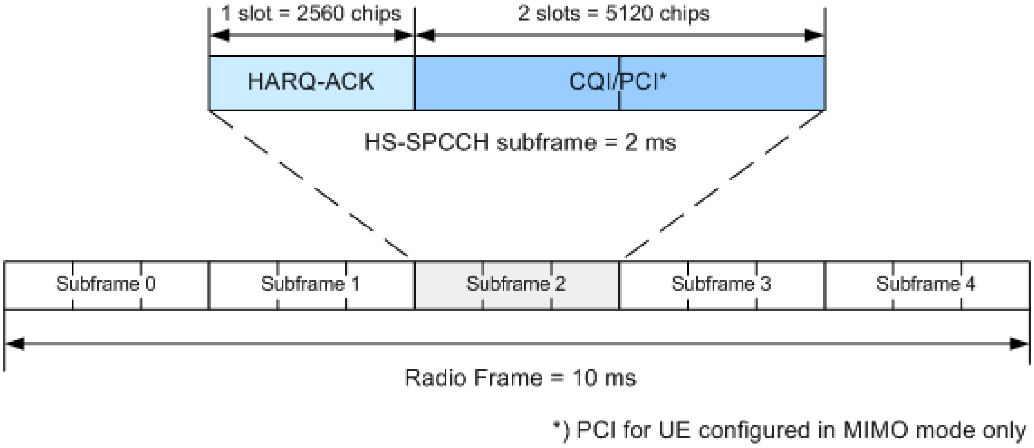


Fig. 4-25: Structure of an uplink HS-DPCCH in the time domain

The HS-DPCCH subframe starts *256 ×m chips* after the start of an uplink DPCCH slot with *m* selected such that the subframe transmission starts within the first 0-255 chips after 7.5 slots following the end of the received HS-PDSCH sub-frame.

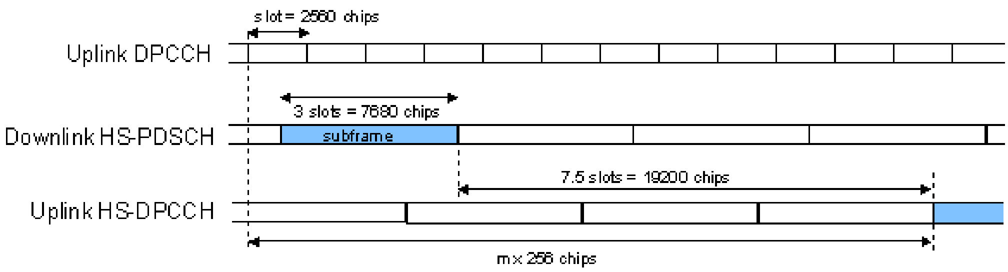


Fig. 4-26: Timing offset between the uplink DPCCH, the HS-PDSCH and the HS-DPCCH at the UE

HS-DPCCH Power

According to 3GPP TS 25.214, the uplink HS-DPCCH power shall be estimated for each HS-DPCCH slot.

In this implementation, the channel power can be set individually for each case of feed-back signaling and UE mode as a combination of the CQI Power (parameter "Power") and the corresponding "Power Offset" (see the tables below). Since the feedback sig-naling can be configured per slot of TTI that carries HS-DPCCH, the channel power is also calculated on a slot basis.

Table 4-10: Calculating of the HARQ-ACK power

Mode	HARQ-ACK	Offset Parameter	Resulting Power
Compatibility Mode = Up to Release 7			
Normal	ACK/NACK Pattern	Power Offset ACK	Power + Power Offset ACK
		Power Offset NACK	Power + Power Offset NACK
	Single ACK	Power Offset ACK	Power + Power Offset ACK

Mode	HARQ-ACK	Offset Parameter	Resulting Power
	Single NACK	Power Offset NACK	Power + Power Offset NACK
MIMO	TB1: ACK, TB2: ACK	Power Offset ACK/ACK	Power + Power Offset ACK/ACK
	TB1: ACK, TB2: NACK	Power Offset ACK/NACK	Power + Power Offset ACK/NACK
	TB1: NACK, TB2: ACK	Power Offset NACK/ACK	Power + Power Offset NACK/ACK
	TB1: NACK, TB2: NACK	Power Offset NACK/NACK	Power + Power Offset NACK/NACK
Compatibility Mode = Release 8 and Later (RT)			
all	HARQ-ACK	Power Offset HARQ-ACK	Power + Power Offset HARQ-ACK

Table 4-11: Calculating the PCI/CQI power

Mode	CQI	Type	CQI Parameter	Offset Parameter	Resulting Power
			Compatib. Mode=	**Up to Release 7**	
Normal	-		CQI	-	Power
MIMO	CQI Type A	Single TB	CQIs	Power Offset CQI Type A	Power + Power Offset CQI Type A
		Double TB	CQI1 and CQI2		
			Compatib. Mode=	**Rel. 8 and Later (RT)**	
Normal	CQI		CQI	Power Offset PCI/CQI	Power + Power Offset PCI/CQI
DC-HSDPA non MIMO	Comp. CQI		CQI1 and CQI2		
MIMO	CQI Type A	Single TB	CQIs		
		Double TB	CQI1 and CQI2		

4.32.2 HS-DPCCH Common Settings

The displayed channel structure depends on whether the UE is working in MIMO mode or not.

State (HS-DPCCH)

Activates or deactivates the HS-DPCCH channel.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:STATe` on page 461

Power (HS-DPCCH)

Sets the power in dB.

- In case of "Compatibility Mode > Release 8 and Later"/"Compatibility Mode > Release 8 and Later RT", this parameter represents the reference power, relative to that the power used during the HARQ-ACK slot and the power used during the PCI/CQI slots are calculated.
- While working in a "Compatibility Mode > Up to Release 7", this parameter represents the CQI Power of a UE configured in a normal mode or of a UE configured in MIMO mode and sending CQI Type B report. The CQI Power is the reference power, relative to that the power used during the HARQ-ACK slot and the power used during the PCI/CQI slots of a UE configured in MIMO mode and sending CQI Type A reports are calculated.

The power entered is relative to the powers of the other channels and does not initially relate to the "Level" power display. If Adjust Total Power to 0dB is executed, all the power data is relative to the "Level" display.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer` on page 461

Compatibility Mode (HS-DPCCH)
Switches between the following modes:

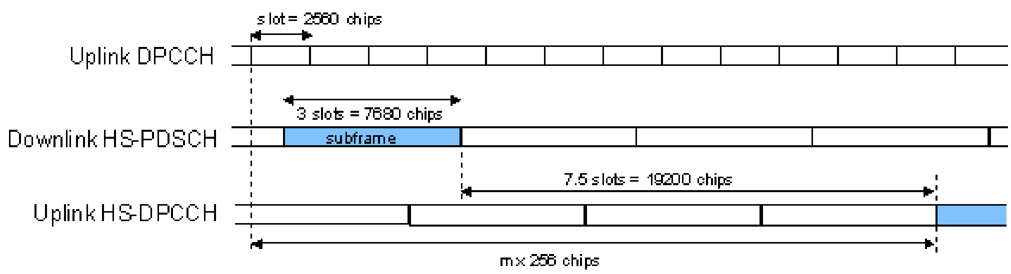
"Up to Release 7"
Switches to the display of the HS-DPCCH settings provided for backwards compatibility.

"Release 8 and Later"
The concept of the graphical user interface for the configuration of HS-DPCCH has been adapted to support simultaneous DC-HSDPA and MIMO operation, as required in 3GPP Release 9 onwards.
This mode is disabled, if Dynamic Power Control State is On.

"Release 8 and Later RT"
Enables generation of the HS-DPCCH in real-time even for Release 8/9 content. Real-time signals are useful for complex HS-DPCCH scheduling and are required while using dynamic power control with the HS-DPCCH.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:COMPatibility`
on page 461

Start Delay
Sets the delay between the uplink HS-DPCCH and the frame of uplink DPCH.



Thus, the channel can be synchronized with the associated downlink HS-PDSCH.

The delay is entered as a multiple m of 256 chips according to TS 25.211 7.7:

$m = (T_{TX\_diff}/256) + 101$

where T_{TX_diff} is the difference in chips (T_{TX_diff} = 0, 256, ..., 38144).

The value range of m is 0 to 250 (2 frames +1024 chips)

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SDELay on page 462

Inter TTI Distance (Interval)
Selects the distance between two HSDPA packets. The distance is set in number of subframes (3 slots = 2 ms). An "Inter TTI Distance" of 1 means continuous generation.

Regarding the HS-DPCCH uplink transmission, this parameter determines where HS-DPCCH transmissions are possible in principle. In order to have actual HS-DPCCH transmissions, HARQ-ACK and/or PCI/CQI transmissions have to be scheduled as described in 4.32.3, 4.32.4 and 4.32.5

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:TTIDistance
on page 462

Channelization Code (HS-DPCCH)
Displays the channelization code and the modulation branch (I or Q) of the HS-DPCCH.

The code channel is spread with the set channelization code (spreading code). The channelization code of the high speed channel depends on the number of activated DPDCHs, i.e. on the overall symbol rate.

For "Secondary Cell Enabled ≥ 4", two HS-DPCCHs, i.e. two channelization codes are used.

Example:

Enable the following settings:
- "DPDCH State = On"
- "DPDCH Overall Symbol Rate = 60 ksps"
- "HS-DPCCH State = On"
- "Secondary Cell Enabled = 0"
  The used "HS-DPCCH > Channelization Code" is Q / 64. Open the "User Equipment > Code Domain" dialog
- Enable "Secondary Cell Enabled = 4"

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CCODe? on page 462

Slot Format
Displays the used slot format.

The specified slot format for "Secondary Cell Enabled < 2" is "Slot Format 0 (15 ksps)". With more than 2 secondary cells or with 2 seconrady cells and "MIMO Mode = On", the "Slot Format 1 (30 ksps)" is required, i.e. slot format with higher symbol rate.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SFORmat?` on page 472

4.32.3 HS-DPCCH Scheduling Table (Release 8 and Later/Release 8 and Later RT)

This settings are available for "Compatibility Mode > Release 8 and Later/Release 8 and Later RT".

MIMO settings and DC-HSDPA/4C-HSDPA/8C-HSDPA settings are available for configuration only for instruments equipped with option R&S SMx/AMU-K59.

The settings available in this dialog allow you to adjust the HS-DPCCH signal of a UE configured for normal operation, DC-HSDPA or 4C/8C-HSDPA operation, MIMO mode or for a simultaneous secondary cells + MIMO operation.

The HS-DPCCH structure can be configured with the parameters "Inter TTI Distance", "Number of Table Rows", "From/To" and "Repeat After", as well as by configuring the HARQ-ACK and CQI/PCI information by means of the parameters of the HS-DPCCH scheduling tables. The scheduling for the HARQ-ACK and PCI/CQI reports can be performed independently; different repetition cycles can be specified.

Example: HS-DPCCH Scheduling

The following is a simple example intended to explain the principle. Configured is an HS-DPCCH scheduling in "MIMO Mode = Off" and with "Secondary Cell Enabled = 0".

Parameter	Value
Start Delay	101 * 256 Chips
Compatibility Mode (HS-DPCCH)	Release 8 and Later RT
Inter TTI Distance (Interval)	5 Subframes
HARQ-ACK Scheduling	
Number of Rows	2
HARQ-ACK Repeat After	4 Intervals
Row#0	
HARQ-ACK From Interval/ HARQ-ACK To Interval	from HARQ-ACK Interval 0 to 1
HS-DPCCH 1/2, HARQ-ACK 1/2/3/4	A
Row#1	
HARQ-ACK From Interval/ HARQ-ACK To Interval	from HARQ-ACK Interval 3 to 3
HS-DPCCH 1/2, HARQ-ACK 1/2/3/4	N

Parameter	Value
PCI/CQI Scheduling	
Number of Rows	2
PCI/CQI Repeat After	3 Intervals
Row#0	
PCI-CQI From Interval/ PCI-CQI To Interval	from PCI/CQI Interval 0 to 0
HS-DPCCH 1/2, PCI/CQI 1/2/3/4 Type	DTX
Row#1	
PCI-CQI From Interval/ PCI-CQI To Interval	from PCI/CQI Interval 1 to 1
HS-DPCCH 1/2, PCI/CQI 1/2/3/4 Type	CQI
CQI/CQI$_S$/CQI$_1$/CQI$_2$	5

Use the Scheduling List to display the configured scheduling.

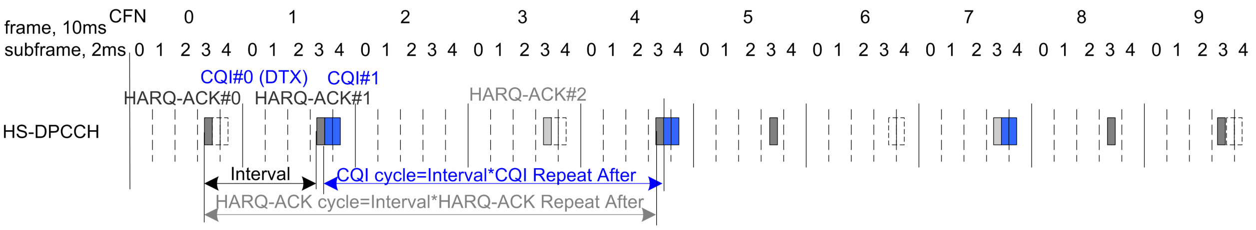


Fig. 4-27: Example of HS-DPCCH Scheduling

"Inter TTI Distance (Interval)" = 5 subframes
"HARQ-ACK Cycle" = "Inter TTI Distance (Interval)"*"HARQ-ACK Repeat After = 5*4=20 Intervals"
"CQI Cycle" = "Inter TTI Distance (Interval)"*"CQI Repeat After = 5*3=15 Intervals"

MIMO Mode

Enables/disables working in MIMO mode for the selected UE.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MMODe on page 472

Secondary Cell Enabled

Enables the selected number of secondary cells for the selected UE. Secondary cells are used for working in DC-/4C/8C-HSDPA mode.

See also chapter 3.1.16, "Dual Cell HSDPA (DC-HSDPA)", on page 43, chapter 3.1.17, "HS-DPCCH Extension for 4C-HSDPA and 8C-HSDPA", on page 47 and chapter 5.5, "How to Configure the HS-DPCCH Settings for 4C-HSDPA Tests", on page 261.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SC:ENABled
on page 473

Secondary Cell Active

Sets the number of active secondary cells for the selected UE.

See also chapter 3.1.16, "Dual Cell HSDPA (DC-HSDPA)", on page 43, chapter 3.1.17, "HS-DPCCH Extension for 4C-HSDPA and 8C-HSDPA", on page 47 and chapter 5.5, "How to Configure the HS-DPCCH Settings for 4C-HSDPA Tests", on page 261.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SC:ACTive` on page 473

HARQ-ACK

Comprises the parameters provided for the independent configuration of the HARQ-ACK scheduling.

Number of Rows ← HARQ-ACK

Determines the number of the rows in the HARQ-ACK scheduling table.

Each row represents one TTI interval, as configured with the parameter Inter TTI Distance (Interval). The parameters set in the table are read out cyclically.

See also figure 4-27.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:HACK:ROWS` on page 473

HARQ-ACK Repeat After ← HARQ-ACK

Defines the cycle length after that the information in the HS-DPCCH scheduling table is read out again from the beginning.

The parameter together with the parameter Inter TTI Distance (Interval) defines the repetition cycle of the HARQ-ACK pattern:

HARQ-ACK cycle = Inter TTI Distance (Interval) * HARQ-ACK Repeat After

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:HACK:REPeat`
on page 478

HARQ-ACK From Interval/ HARQ-ACK To Interval ← HARQ-ACK

Defines the beginning/end of the HARQ-ACK transmissions inside the HARQ-ACK cycle (specified by HARQ-ACK Repeat After). The range is specified in multiples of intervals, determined by Inter TTI Distance (Interval).

See also figure 4-27.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:HACK:FROM`
on page 474
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:HACK:TO`
on page 474

HS-DPCCH 1/2, HARQ-ACK 1/2/3/4 ← HARQ-ACK

Per HS-DPCCHs, sets the information transmitted during the HARQ-ACK slots of the TTIs during the corresponding specified "HARQ-ACK From/To" range.

Two HS-DPCCHs are transmitted, if "Secondary Cell Enabled > 3".

The number of enabled HARQ-ACKs depends on the combination of enabled and active secondary cells. In this implementation, the activated cells are mapped from left to right.

The processing of HS-DPCCH is defined for four different main cases (see table 4-12).

Table 4-12: HS-DPCCH processing

Mode	"MIMO Mode"	"Secondary Cell Enabled"	"Secondary Cell Active"	Comment
Normal operation	Off	0	0	-
MIMO only	On	0	0	see chapter 3.1.15.5, "MIMO uplink control channel support", on page 40
DC-HSDPA only 4C/8C-HSDPA only	Off	1 2 .. 7	0, 1 2 .. 7	see chapter 3.1.16.1, "DC-HSDPA Data Acknowledgement (non MIMO mode)", on page 44 see chapter 3.1.17, "HS-DPCCH Extension for 4C-HSDPA and 8C-HSDPA", on page 47
DC-HSDPA +MIMO 4C/8C-HSDPA +MIMO	On	1 2 .. 7	1 2 .. 7	see chapter 3.1.16.2, "DC-HSDPA + MIMO", on page 46 see chapter 3.1.17, "HS-DPCCH Extension for 4C-HSDPA and 8C-HSDPA", on page 47

Meaning of the used abbreviations:

- **A** indicates an ACK response; **N** - an NACK
- **D** means no transmission (DTX), i.e. no transport block was sent on the corresponding HS-DSCH downlink transmission.
- Single letter, e.g. an **A** stands for a response to a single scheduled transport block (TB)
- A letter's couple, e.g. an **AA** indicates two MIMO streams, i.e. the response on two TBs
- **/** is a separation mark between the response to the serving and secondary cells, where the feedback related to the serving HS-DSCH cell is the one before the divider sign.

Example: Understanding the syntax

For better representation of the principle, the sending of ACK only messages is assumed.

HARQ-ACK value	Description
A/A/A	MIMO Mode = Off (single letters only) Three active cells, one serving and two secondary serving cells; one single TB transmission per cell
AA/A	MIMO Mode = On Two active cells, one seving with two MIMO streams and one secondary serving cell with single TB transmission
AA/AA	MIMO Mode = On Two active cells, each transmitting two MIMO streams

HARQ-ACK value	Description
AA/AA, AA/D	MIMO Mode = On Three active cells, each transmitting two MIMO streams
AA/AA, AA/AA	MIMO Mode = On Four active cells, each transmitting two MIMO streams

"DTX" No HARQ-ACK feedback information is sent.

"A, N" Selects an ACK or NACK response to a single scheduled transport block.

"AA, AN, NA, NN"
(MIMO Mode On, Secondary Cell Enabled/Active = 0)
Selects the response to two scheduled transport blocks, i.e. feedback on the primary and secondary stream in a dual stream transmission.

"A/D, N/A, … (different combinations possible)"
(MIMO Mode Off, "Secondary Cell Enabled < 2")
Selects the response to a single scheduled transport block on each of the serving and secondary serving HS-DSCH cells.

"A/D/D, N/D/D, … (different combinations possible)"
(MIMO Mode Off, "Secondary Cell Enabled = 2")
Selects the response to a single scheduled transport block on each of the serving and the two secondary serving HS-DSCH cells.

"AN/NN, D/AA, … (different combinations possible)"
(MIMO Mode On, Secondary Cell Active On)
Selects the response to two scheduled transport blocks on each of the serving and secondary serving HS-DSCH cells.

"PRE, POST" PRE or POST is sent in the HARQ-ACK slots of the corresponding TTI.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:HACK<di> on page 474

Power Offset HARQ-ACK ← HARQ-ACK

Sets the power offset of a HARQ-ACK response relative to the "Power".

The power used during all HARQ-ACK slots during the corresponding specified "HARQ-ACK From/To" range is calculated as:

$P_{HARQ-ACK} = Power + P_{off\_HARQ-ACK}$

The value range is -10 dB to 10 dB.

The parameter is enabled for HARQ-ACK different than DTX.

While generating the HS-DPCCH signal in real-time, the HARQ-ACK power offsets of all configured HARQ-ACK responses are set to the same value.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:POHAck on page 475

PCI / CQI
Comprises the parameters provided for the independent configuration of the PCI/CQI reports scheduling.

Number of Rows ← PCI / CQI
This parameter determines the number of the rows in the PCI / CQI scheduling table.

Each row represents one TTI interval, as configured with the parameter Inter TTI Distance (Interval). The parameters set in the table are read out cyclically.

See also figure 4-27.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:PCQI:ROWS` on page 473

PCI/CQI Repeat After ← PCI / CQI
Defines the cycle length after that the information in the HS-DPCCH scheduling table is read out again from the beginning.

The parameter together with the parameter Inter TTI Distance (Interval) defines the repetition cycle of the PCI/CQI pattern:

PCI/CQI cycle = Inter TTI Distance (Interval) * PCI/CQI Repeat After

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:PCQI:REPeat`
on page 478

PCI-CQI From Interval/ PCI-CQI To Interval ← PCI / CQI
Defines the beginning/ end of the PCI/CQI transmissions inside the PCI/CQI cycle (specified by PCI/CQI Repeat After). The range is specified in multiples of intervals, defined by Inter TTI Distance (Interval).

See also figure 4-27.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI:FROM`
on page 476
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI:TO`
on page 476

HS-DPCCH 1/2, PCI/CQI 1/2/3/4 Type ← PCI / CQI
Per HS-DPCCH, selects the type of the PCI/CQI report (see CQI Reports: Type A and Type B and CQI reports: CQI1 and CQI2).

Two HS-DPCCHs are required, if "Secondary Cell Enabled > 3".

The number of enabled PCI/CQIs depends on the number of required HS-DPCCHs and the "Slot Format". In this implementation, the activated cells are mapped from left to right.

The available values depend on the state of the parameters "MIMO Mode", "Secondary Cell Emabled" and "Secondary Cell Active".

"DTX"	No PCI/CQI feedback information is sent.
"CQI"	Selects CQI report for the normal operation.

"Type A Single TB"
(MIMO Mode On)
Selects CQI Type A report with information that 1 transport block is preferred.

"Type A Double TB"
(MIMO Mode On)
Selects CQI Type A report with information that 2 transport blocks are preferred.

"Type B" (MIMO Mode On)
Selects CQI Type B report.

"Composite CQI"
(MIMO Mode Off, "Secondary Cell Enabled = Secondary Cell Active ≤ 2")
Selects a Composite CQI, constructed from the two individual reports CQI1 and CQI2 of the serving and secondary serving HS-DSCH cell.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI<di>:TYPE on page 476

Power Offset PCI/CQI ← PCI / CQI

Sets the power offset $P_{off\_PCI/CQI}$ of all PCI/CQI slots during the corresponding specified PCI/CQI From/To range relative to the Power.

The power $P_{PCI/CQI}$ used during the PCI/CQI slots is calculated as:

$P_{PCI/CQI}$ = Power + $P_{off\_PCI/CQI}$

The value range is -10 dB to 10 dB.

While generating the HS-DPCCH signal in real-time, the PCI/CQI power offsets of all configured PCI/CQI slots are set to the same value.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:POPCqi on page 477

PCI/CQI 1/2/3/4 Content ← PCI / CQI

Accesses a dialog for configuring the PCI and CQI report. The provided settings depend on the selected "PCI/CQI Type".

$CQI/CQI_S/CQI_1/CQI_2$ ← PCI/CQI 1/2/3/4 Content ← PCI / CQI

Sets the CQI report transmitted during the PCI/CQI slots of the TTIs during the corresponding specified PCI/CQI From/To range (see chapter 3.1.15.6, "CQI Reports: Type A and Type B", on page 42 and "CQI reports: CQI1 and CQI2" on page 46).

"CQI" Sets the CQI value for CQI Type B report and the CQI in normal operation.

"CQI_S" Sets the CQI value in case a CQI Type A report when one transport block is preferred.

"CQI_1" Sets the CQI_1 value of CQI Type A report when 2 transport blocks are preferred or the CQI_1 value of a composite CQI report of a dual cell only operation.

"CQI_2" Sets the CQI_2 value of CQI Type A report when 2 transport blocks are preferred or the CQI_2 value of a composite CQI report of a dual cell only operation.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI<di>:CQI<us> on page 477

PCI ← PCI/CQI 1/2/3/4 Content ← PCI / CQI

Selects the PCI value transmitted during the PCI/CQI slots of the TTIs during the corresponding specified PCI/CQI From/To range (see PCI reports).

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI<di>:PCI on page 477

Suggested / Current ARB Seq. Length (HS-DPCCH)

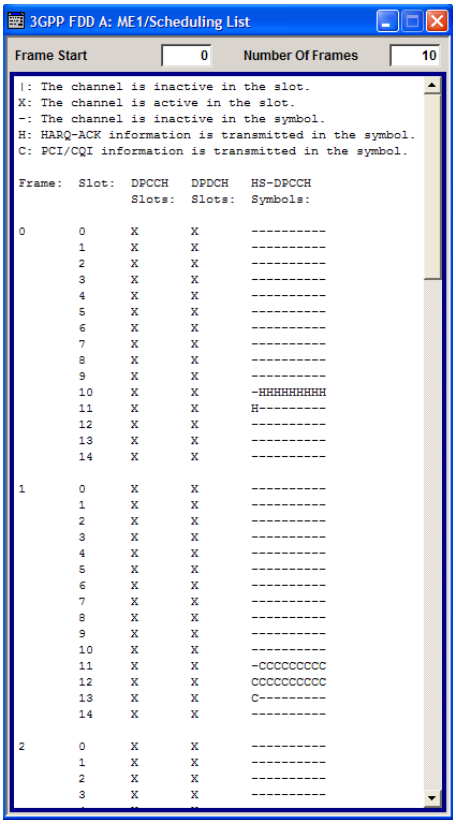
Displays the suggested and current ARB sequence length, in case the signal is not generated in real-time.

The "Suggested ARB Sequence Length" is the calculated minimum length that depends on the Inter TTI Distance (Interval), the Number of Rows/Number of Rows, the HARQ-ACK Repeat After and the PCI/CQI Repeat After. The current ARB sequence length is adjusted by pressing the button "Adjust ARB Sequence Length".

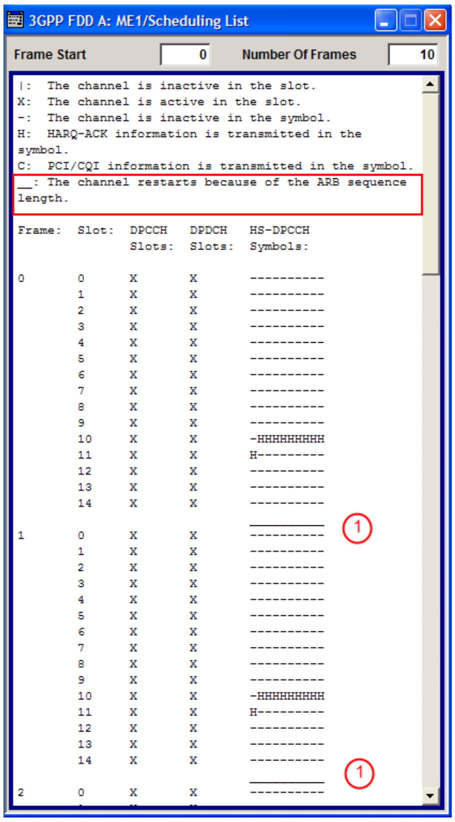
Example: Effect of the ARB Sequence Length

- Preset the instruments and adjust the settings as described in example "HS-DPCCH Scheduling" on page 208.
  Use the Scheduling List to show the HS-DPCCH scheduling (see also figure 4-27).
- Change the Compatibility Mode (HS-DPCCH) to "Release 8 and Later" and compare the displayed HS-DPCCH scheduling in the "Scheduling List".

Real-time signal generation



ARB signal generation with "Current ARB Seq. Length" < "Suggested ARB Seq. Length"



The channel restarts after 1 frame ("Current ARB Seq. Length = 1 Frame")

- The "Suggested / Current ARB Sequence Length" is 12 / 1. Press the Adjust ARB Sequence Length (HS-DPCCH).
  The "Current ARB Seq. Length" is adjusted, the channel restarts after 12 frames and the "Scheduling List" shows the HS-DPCCH scheduling in all frames as in the real-time mode.

Tip: To ensure a long enough ARB sequence, select "3GPP FDD > Filter/Clipping/ARB Settings" and adjust the Sequence Length ARB so that the ARB sequence length is multiple or equal the scheduling repetition.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SLENgth?` on page 478

Adjust ARB Sequence Length (HS-DPCCH)

Sets the current ARB sequence length to the suggested value (see also example "Effect of the ARB Sequence Length" on page 216).

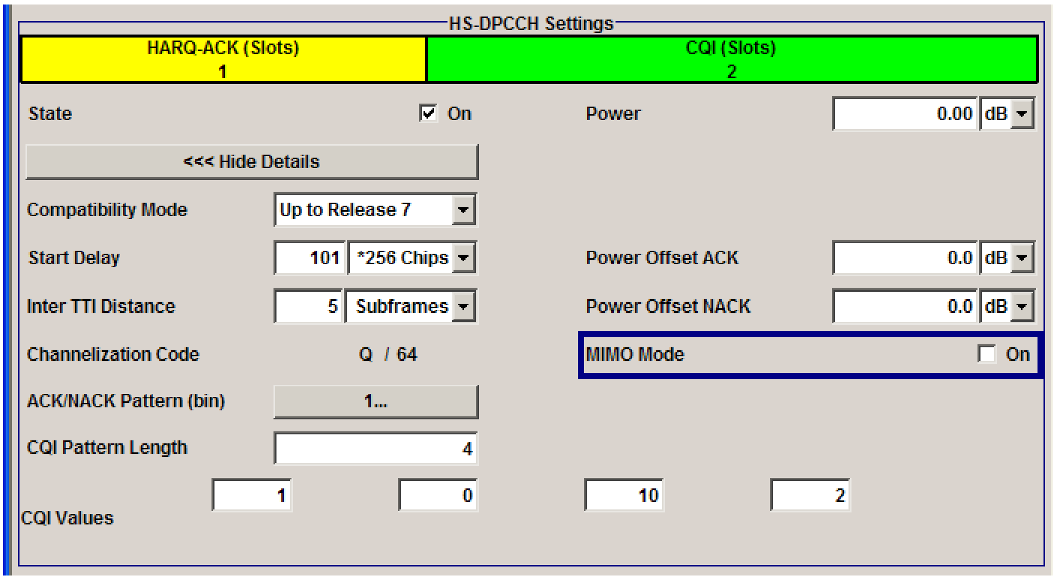
Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SLENgth:ADJust` on page 479

4.32.4 HS-DPCCH Settings for Normal Operation (Up to Release 7)

The R&S Signal Generator supports also the parameters for backward compatibility.

1. To enable these parameters, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"
2. Select "HS-DPCCH".
3. Select "Compatibility Mode > Up to Release 7".



The dialog contains the parameters that were available up to the selected release.

Power Offset ACK

Sets the power offset P_{off_ACK} of an ACK response to a single scheduled transport block relative to the CQI Power P_{CQI}.

The power PACK used during the HARQ-ACK slot is calculated as:

$P_{ACK} = P_{CQI} + P_{off\_ACK}$

The value range is -10 dB to 10 dB.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POACk` on page 463

Power Offset NACK

Sets the power offset P_{off_NACK} of an NACK response to a single scheduled transport block relative to the CQI Power P_{CQI}.

The power P_{NACK} used during the HARQ-ACK slot is calculated as:

$P_{NACK} = P_{CQI} + P_{off\_NACK}$

The value range is -10 dB to 10 dB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:PONAck on page 463

ACK/NACK Pattern

(available for "MIMO Mode" set to Off only)

Enters the pattern for the HARQ-ACK field (Hybrid-ARQ Acknowledgment).

After receiving a transmission packet, the user equipment returns feedback information in the HARQ-ACK field that is related to the accuracy of downlink HS-DSCH transmission.

One bit is used per HS-DPCCH packet. The maximum length of the pattern is 32 bits.

""1" = ACK"	The HARQ ACK is sent. Transmission was successful and correct.
""0" = NACK"	The NACK is sent. Transmission was not correct. With an NACK, the UE requests retransmission of the incorrect data.
""-" = DTX"	Nothing is sent. Transmission is interrupted (Discontinuous Transmission (DTX)).

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:HAPattern on page 464

CQI Pattern Length

(available for "MIMO Mode" set to Off only)

Sets the length of the CQI sequence. The values of the CQI sequence are entered in input fields "CQI Values". The pattern is generated cyclically.

With the CQI (Channel Quality Indicator), the user equipment informs the base station about the receive quality of the downlink HS-PDSCH.

Thus, the base station can adapt the modulation and coding scheme to improve the signal quality. The instrument supports the control of the base station HS-PDSCH by CQI sequences with a length of 1 to 10 values.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CQI:PLENgth on page 464

CQI Values

(available for MIMO Mode set to Off only)

Enters the values of the CQI sequence. Value -1 means that no CQI is sent (DTX).

The length of the CQI sequence is set at input field CQI Length. The pattern is generated cyclically.

With the CQI (Channel Quality Indicator), the user equipment informs the base station about the receive quality of the downlink HS-PDSCH. Thus, the base station can adapt the modulation and coding scheme to improve the signal quality. The instrument supports the control of the base station HS-PDSCH by CQI sequences with a length of 1 to 10 values.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CQI<ch>[:VALues]
on page 465

MIMO Mode (Up to Release 7)
(enabled for configuration for instruments equipped with option R&S SMx/AMU-K59 only)

Enables/disables working in MIMO mode for the selected UE.

When MIMO mode is enabled, the parameters ACK/NACK Pattern, CQI Pattern Length and CQI Values are not available. Several MIMO specific parameters are enabled for configuration (see chapter 4.32.5, "MIMO Settings HS-DPCCH (Up to Release 7)", on page 219s).

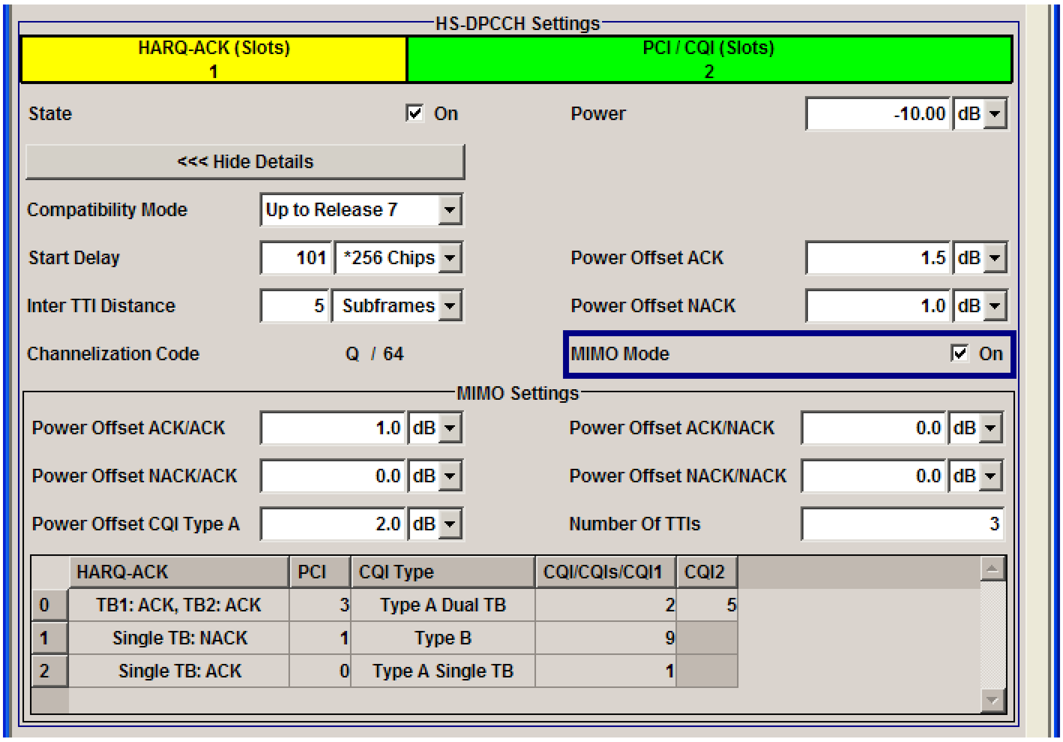
Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO[:MODE]
on page 465

4.32.5 MIMO Settings HS-DPCCH (Up to Release 7)

MIMO settings are available for configuration only for instruments equipped with option R&S SMx/AMU-K59 and enabled parameter "MIMO Mode".

1. To access these parameters, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"
2. Select "HS-DPCCH".
3. Select "Compatibility Mode > Up to Release 7".

4. Select "MIMO Mode > On".



The available settings allow you to adjust the HS-DPCCH configuration for UE configured in MIMO mode.

The HS-DPCCH structure can be configured with the parameters Inter TTI Distance and Number of TTIs, as well as by configuring the HARQ-ACK and CQI/PCI information per TTI by means of the parameters of the HS-DPCCH scheduling table. Any combination of single or dual transport block HARQ-ACK, PCI value, CQI Type and corresponding CQI value(s), as well as channel power can be configured.

Power Offset ACK/ACK

Sets the power offset $P_{off\_ACK/ACK}$ of an ACK/ACK response to two scheduled transport blocks relative to the CQI Power P_{CQI}.

The power $P_{ACK/ACK}$ used during the HARQ-ACK slots is calculated as:

$P_{ACK/ACK} = P_{CQI} + P_{off\_ACK/ACK}$

The value range is -10 dB to 10 dB.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:POAAck`
on page 465

Power Offset ACK/NACK

Sets the power offset $P_{off\_ACK/NACK}$ of an ACK/NACK response to two scheduled transport blocks relative to the CQI Power P_{CQI}.

The power $P_{ACK/NACK}$ used during the HARQ-ACK slots is calculated as:

$P_{ACK/NACK} = P_{CQI} + P_{off\_ACK/NACK}$

The value range is -10 dB to 10 dB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:POANack
on page 466

Power Offset NACK/ACK

Sets the power offset $P_{off\_NACK/ACK}$ of an NACK/ACK response to two scheduled transport blocks relative to the CQI Power P_{CQI}.

The power $P_{NACK/ACK}$ used during the HARQ-ACK slots is calculated as:

$P_{NACK/ACK} = P_{CQI} + P_{off\_NACK/ACK}$

The value range is -10 dB to 10 dB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:PONAck
on page 467

Power Offset NACK/NACK

Sets the power offset $P_{off\_NACK/NACK}$ of an NACK/NACK response to two scheduled transport blocks relative to the CQI Power P_{CQI}.

The power $P_{NACK/NACK}$ used during the HARQ-ACK slots is calculated as:

$P_{NACK/NACK} = P_{CQI} + P_{off\_NACK/NACK}$

The value range is -10 dB to 10 dB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:PONNack
on page 467

Power Offset CQI Type A

Sets the power offset $P_{off\_CQI\ Type\ A}$ of the PCI/CQI slots in case a CQI Type A report is sent relative to the CQI Power P_{CQI}.

The power $P_{CQI\ Type\ A}$ used during the PCI/CQI slots is calculated as:

$P_{CQI\ Type\ A} = P_{CQI} + P_{off\_CQI\ Type\ A}$

Since the CQI Type B reports are used in a single stream transmission (see chapter 3.1.15.6, "CQI Reports: Type A and Type B", on page 42), the power $P_{CQI\ Type\ B} = P_{CQI}$.

The value range is -10 dB to 10 dB.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:POCA on page 468

Number of TTIs (Up to Release 7)

Selects the number of configurable TTIs.

This parameter determines the number of the rows in the HS-DPCCH scheduling table. Each row represents one TTI. The parameters set in the table are read out cyclically.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTICount on page 468

HARQ-ACK (Up to Release 7)

Selects the information transmitted during the HARQ-ACK slot of the corresponding TTI (see chapter 3.1.15.5, "MIMO uplink control channel support", on page 40).

"DTX" Selects Discontinuous Transmission (DTX) for the corresponding TTI. During that TTI no feedback information is sent, i.e. all other parameters in the feedback signaling table are disabled.

"Single TB: ACK/Single TB: NACK"
Selects an ACK or NACK response to a single scheduled transport block.

"TB1:ACK,TB2:ACK / TB1:ACK,TB2:NACK / TB1:NACK,TB2:ACK / TB1:NACK,TB2:NACK"
Selects the response to two scheduled transport blocks.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:HACK on page 469

PCI (Up to Release 7)

Selects the PCI value transmitted during the PCI/CQI slots of the corresponding TTI (see chapter 3.1.15.7, "PCI reports", on page 42).

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:PCI on page 469

CQI Type (Up to Release 7)

Selects the type of the CQI report (see chapter 3.1.15.6, "CQI Reports: Type A and Type B", on page 42).

"Type A Single TB"
Selects CQI Type A report with information that 1 transport block is preferred.

"Type A Double TB"
Selects CQI Type A report with information that 2 transport blocks are preferred.

"Type B" Selects CQI Type B report.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:CQIType on page 469

CQI/CQI$_S$/CQI$_1$/CQI$_2$ (Up to Release 7)

Selects the CQI report transmitted during the PCI/CQI slots of the corresponding TTI (see chapter 3.1.15.6, "CQI Reports: Type A and Type B", on page 42).

"CQI" Sets the CQI value for CQI Type B report.

"CQI_S" Sets the CQI value in case a CQI Type A report when 1 transport block is preferred.

"CQI_1" Sets the CQI_1 value of CQI Type A report when 2 transport blocks are preferred.

"CQI_2" Sets the CQI_2 value of CQI Type A report when 2 transport blocks are preferred.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:CQI<di> on page 470

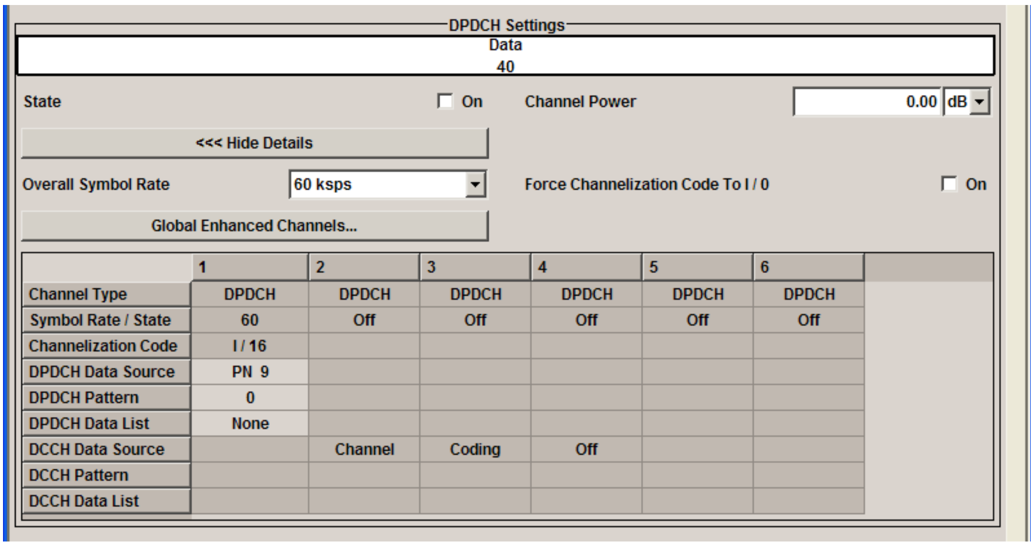
4.33 DPDCH Settings - UE

The "DPDCH Settings" section is where the settings are made for the DPDCH channels. This section is only available if "DPCCH + DPDCH" mode is activated (see also chapter 4.30, "DPCCH Settings - UE", on page 194).

The DPDCH is configured in form of "Channel Table". The number of active channels depends on the overall symbol rate set. The data sources for the data part of the individual channels can be selected in the channel table. The remaining parameters are only displayed and their value depends on the overall symbol rate set.

In UE1, the DPDCH is generated in realtime (enhanced), if only one DPDCH is selected by the overall symbol rate setting.

The "Global Enhanced Channels" accesses a dialog for configuring the enhanced parameters.



4.33.1 DPDCH Common Settings

State (DPDCH)
Activates or deactivates all the DPDCH channels.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:STATe on page 482

Channel Power
Sets the channel power in dB.

The power entered is relative to the powers of the other channels and does not initially relate to the "Level" power display. If Adjust Total Power to 0dB is executed, all the power data is relative to "Level".

Note: The uplink channels are not blanked in this mode (duty cycle 100%).

Test cases defined in the 3GPP standard often use notation "Signaling values for βc and βd". The quantization of the gain parameters is shown in the following table which is taken from 3GPP Spec 25.213 (left columns) and supplemented by the instrument-specific values (right column).

Signaling values for βc and βd	Quantized amplitude ratios βc and βd	Power to be set / dB
15	1.0	0.0
14	14/15	-0.60
13	13/15	-1.24
12	12/15	-1.94
11	11/15	-2.69
10	10/15	-3.52
9	9/15	-4.44
8	8/15	-5.46
7	7/15	-6.62
6	6/15	-7.96
5	5/15	-9.54
4	4/15	-11.48
3	3/15	-13.99
2	2/15	-17.52
1	1/15	-23.52
0	Switch off	Switch channel off or -80 dB

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:POWer on page 482

Force Channelization Code To I/0
Sets the channelization code to I/0.

This mode can only be activated if the "Overall Symbol Rate < 2 x 960 kbps".

It is provided for test purposes. Using an oscilloscope, the data bits of the DPDCH are visible on the I/Q signal for the follwoing settings:
- "Force Channelization Code to I/Q > On"
- "Scrambling Code Mode > Off"
- "DPCCH Channel Power = - 80 dB"

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:FCIO` on page 481

Overall Symbol Rate
Sets the overall symbol rate of all the DPDCH channels.

The structure of the DPDCH channel table depends on this parameter. The overall symbol rate determines which DPDCHs are active, which symbol rate they have and which channelization codes they use (see table 1-2).

DPDCHs that are not active by virtue of the overall rate are also disabled for operation.

Note: Up to an overall rate of 960 ksps, only DPDCH 1 is active, its symbol rate is the same as the overall symbol rate and the channelization code is the same as spreading factor/4 (spreading factor = chip rate / symbol rate).
With an overall symbol rate greater than 960 ksps, all the active DPDCH channels have the symbol rate 960 ksps.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:ORATe` on page 482

Global Enhanced Channels
Accesses the dialog for configuring all the enhanced channel settings of user equipment UE1, see chapter 4.38, "Global Enhanced Channel Settings - UE1", on page 246.

Remote command:
n.a.

4.33.2 Channel Table

The channel table allows you to configure the individual parameters for the DPDCH channels. The structure of the currently selected channel is displayed graphically in the table header.

The number of active channels depends on the selected overall symbol rate. You can select the data sources for the individual channels. The remaining parameters are only displayed and their values depend also on the overall symbol rate. See also table 1-2.

Channel Number
Displays the channel number.

Remote command:
n.a.
(the channel is selected by the suffix at keyword `CHANnel<n>`)

Channel Type
Displays the channel type.

Remote command:
n.a.

Symbol Rate / State
Displays the symbol rate and the state of the DCDCH channel.

The symbol rate and the state of channel 2 to 6 are dependent on the overall symbol rate set and cannot be modified.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:SRATe?`
on page 481

Channelization Code
Displays the channelization code and the modulation branch (I or Q) of the DPDCH channel.

The channelization code is dependent on the overall symbol rate set and cannot be modified.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:CCODe?`
on page 479

DPDCH Data Source
For UE2, UE3 and UE4 and UE1 without channel coding, selects the data source for the DPDCH channel.

When channel coding is active, the data source for the DTCH1 component in the transport layer is selected here. In this situation, the display reads "DTCH data Source" and the "DCCH Data" entry field is enabled for selecting the data source of the DCCH channel. The data sources of the other DTCH channels can be set in the "Global Enhanced Channel Settings > Transport Channel" dialog, see chapter 4.38, "Global Enhanced Channel Settings - UE1", on page 246.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.

Select "Select DList" to access the standard "Select List" dialog.
– Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
– Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
– Use the standard "File Manager" function to transfer external data lists to the instrument.

See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA on page 479
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA:PATTern on page 481
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA:DSELect on page 506

DCCH Data Source

For UE1 for enhanced channels with active channel coding, selects the data source for the DCCH component.

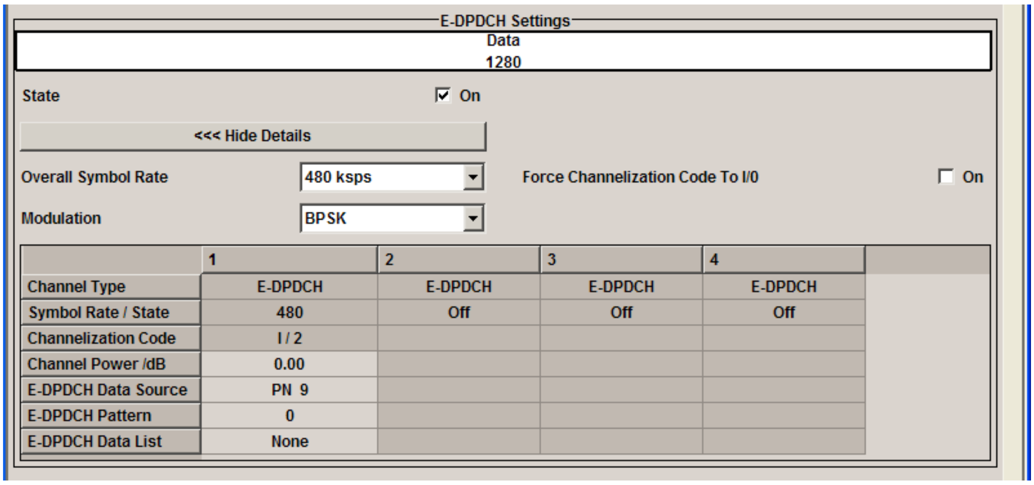
The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

4.34 E-DPDCH Settings - UE

1. To access the E-DPDCH channel settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE".
2. Select "Mode > DPCCH + DPDCH".

3. Select "E-DPDCH Settings > Show Details".



The dialog displays the channel structure and the available parameters.

The E-DPDCH channels are defined in form of a "Channel Table". The number of active channels depends on the overall symbol rate. The data sources for the data part of the individual channels can be selected in the channel table. The remaining parameters are only displayed and their value depends on the overall symbol rate.

4.34.1 E-DPDCH Common Settings

State (E-DPDCH)

Activates or deactivates all the E-DPDCH channels.

If an FRC is set for the channel, this field is activated automatically.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:STATe
on page 521

Force Channelization Code To I/0

Sets the channelization code to I/0.

This mode can only be activated if the overall symbol rate is less than 2 x 960 kbps.

It is provided for test purposes. Using an oscilloscope, the data bits of the E-DPDCH are visible on the I/Q signal if:

- Force Channelization Code to I/0 is On
- Scrambling Code Mode is set to Off.
- DPDCH power is - 80 dB

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:FCIO
on page 520

Overall Symbol Rate

Sets the overall symbol rate of all the E-DPDCH channels.

The structure of the E-DPDCH channel table depends on this parameter. The overall symbol rate determines which E-DPDCHs are active, which symbol rate they have and which channelization codes they use.

E-DPDCHs that are not active by virtue of the overall rate are also disabled for operation.

If an FRC is set for the channel, this field is read-only.

Note: If the Dynamic Power Control State and/or the UL-DTX... / User Scheduling State is enabled, the E-DPDCH is generated in realtime. Then only the overall symbol rates with one E-DPDCH channel or those that restrict the E-DPDCHs to the I or Q branch are enabled for configuration.

To send simultaneously multiple physical E-DPDCH, set the Overall Rate to one of the predefined two-channel configurations. For some special applications it might be necessary to split up the generation of this channels to two baseband blocks. The instrument provides additionally special non-standard overall symbol rates, that enable the instrument to generate only the E-DPDCH channels of the I branch or of the Q branch per baseband block.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:ORATe`
on page 521

Modulation
Sets the modulation of the E-DPDCH.

There are two possible modulation schemes specified for this channel, BPSK and 4PAM (4 Pulse-Amplitude Modulation). The latter one is available only for Overall Symbol Rates using two channels, e.g 2x960 ksps and/or 2x1920 ksps.

Note: Modulation scheme 4PAM is available only for instruments equipped with the HSPA+ option R&S SMx/AMU-K59.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:MODulation`
on page 520

4.34.2 Channel Table

The channel table allows you to configure the individual parameters for the E-DPDCH channels. The structure of the currently selected channel is displayed graphically in the table header.

The number of active channels depends on the selected overall symbol rate. You can select the data sources for the individual channels. The remaining parameters are only displayed and their values depend also on the overall symbol rate. See also table 1-3 and table 1-4.

Channel Number
Displays the channel number.

Remote command:
n.a.
(the channel is selected by the suffix at keyword `CHANnel<n>`)

Channel Type
Displays the channel type.

Remote command:
n.a.

Symbol Rate / State
Displays the symbol rate and the state of the E-DPDCH channel.

The symbol rate and the state of the channels are dependent on the overall symbol rate set and cannot be modified.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:SRATe?` on page 507

Channelization Code
Displays the channelization code and the modulation branch (I or Q) of the DPDCH channel.

The channelization code is dependent on the overall symbol rate set and cannot be modified.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:CCODe?` on page 505

Channel Power
Sets the power of the selected E-DPDCH channel.

The power entered is relative to the powers of the other channels and does not initially relate to the "Level" power display. If Adjust Total Power to 0dB is executed, all the power data is relative to "Level"

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:POWer` on page 506

E-DPDCH Data Source
Selects the data source for the E-DPDCH channel.

The data source for the DPDCH is also entered here for the enhanced channels of UE1 without channel coding.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.

- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

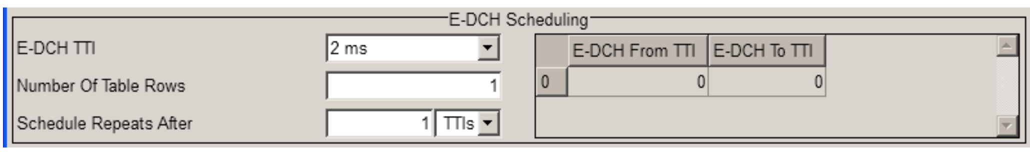
  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA on page 505
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA:PATTern on page 506
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA:DSELect on page 506

4.35 E-DCH Scheduling - UE

(requires option R&S SMx/AMU-K45)

1. To access the E-DCH settings, select "3GPP FDD > User Equipment > link Direction > Uplink / Reverse > User Equipments > UE"
2. Select "E-DCH Settings > Show Details".



This dialog comprises the settings necessary to configure the common time schedule of the E-DPDCH and E-DPCCH. The settings enable you to configure single E-DCH packets or "bursts" of variable length consisting of several successive E-DCH packets and to decide upon the E-DCH packets distribution.

Use the Scheduling List to display and verify the configured uplink scheduling for every UE.

Real-time vs. ARB signal generation

The E-DCH channels are generated in real-time or as an ARB signal.

- If the E-DCH channels are generated as ARB signal, the ARB sequence length has to be long enough and a multiple or equal the scheduling repetition.
- The instrument generate the channels in real-time if UL-DTX... / User Scheduling State and/or Dynamic Power Control State is activated.
  - During generation of E-DCH channels in real-time, channel coding (i.e. activation of FRCs) is disabled. Use pre-channel-coded data list as "Data Source" if channel coded data on the E-DCH is required.
  - The E-DPDCH can be generated in realtime only for overall symbol rates with one E-DPDCH channel or those that restrict the E-DPDCHs to the I or Q branch.

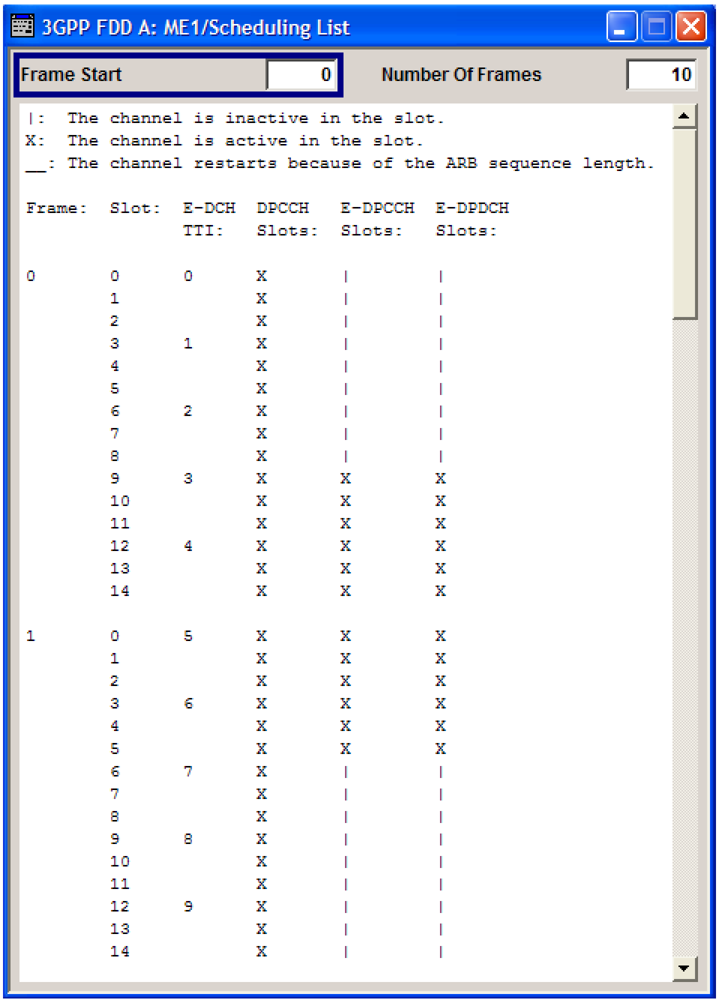
Example: E-DCH Scheduling

To configure an E-DCH transmission in TTIs 3-6, 128-156, 1003-1006, 1128-1156, etc. perform the settings listed in table 4-13.

Table 4-13: E-DCH scheduling example

Parameter	Value	Comment
Select "3GPP FDD > Filter/Clipping/ARB Settings" and adjust the Sequence Length ARB	200 frames	If the E-DCH channels are generated as ARB signal, the ARB sequence length has to be long enough and a multiple or equal the scheduling repetition.
E-DCH TTI	2 ms	
Number of Table Rows	2	two scheduled E-DCH bursts
E-DCH Schedule Repeats After	1000 TTIs	each E-DCH burst is repeated every 1000 TTIs
Row#0		E-DCH burst (4 E-DCH packets)
"E-DCH TTI From"	3	
"E-DCH TTI To"	6	
Row#1		E-DCH burst (29 E-DCH packets)
"E-DCH TTI From"	128	
"E-DCH TTI To"	156	
E-DPCCH State	On	Enables E-DPCCH
E-DPDCH State	On	Enables E-DPDCH

Open the Scheduling List to display the E-DCH scheduling.



E-DCH TTI

Sets the size for the TTI (Transmission Time Interval).

If an FRC is set for the E-DPCCH or UL-DTX... / User Scheduling State is enabled, this field is read-only.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:TTIEdch`
on page 521

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:TTIEdch`
on page 521

Number of Table Rows

Sets the number of the rows in the scheduling table, i.e. determines the number of the E-DCH "bursts" enabled for configuration. An E-DCH "burst" is build of several successive E-DCH packets.

Remote command:

`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROWCount`
on page 522

E-DCH Schedule Repeats After
Determine the number of TTIs after that the E-DCH scheduling is repeated.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:REPeat
on page 522

E-DCH Scheduling Table
Enables the user to flexible configure single E-DCH packets or E-DCH "bursts" of variable length consisting of several successive E-DCH packets

E-DCH TTI From ← E-DCH Scheduling Table
Determines the start TTI of the corresponding E-DCH burst.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROW<ch0>:FROM
on page 522

E-DCH TTI To ← E-DCH Scheduling Table
Determines the end TTI of the corresponding E-DCH burst.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROW<ch0>:TO
on page 522

4.36 Scheduling List

Opens a display of the current uplink scheduling per UE.

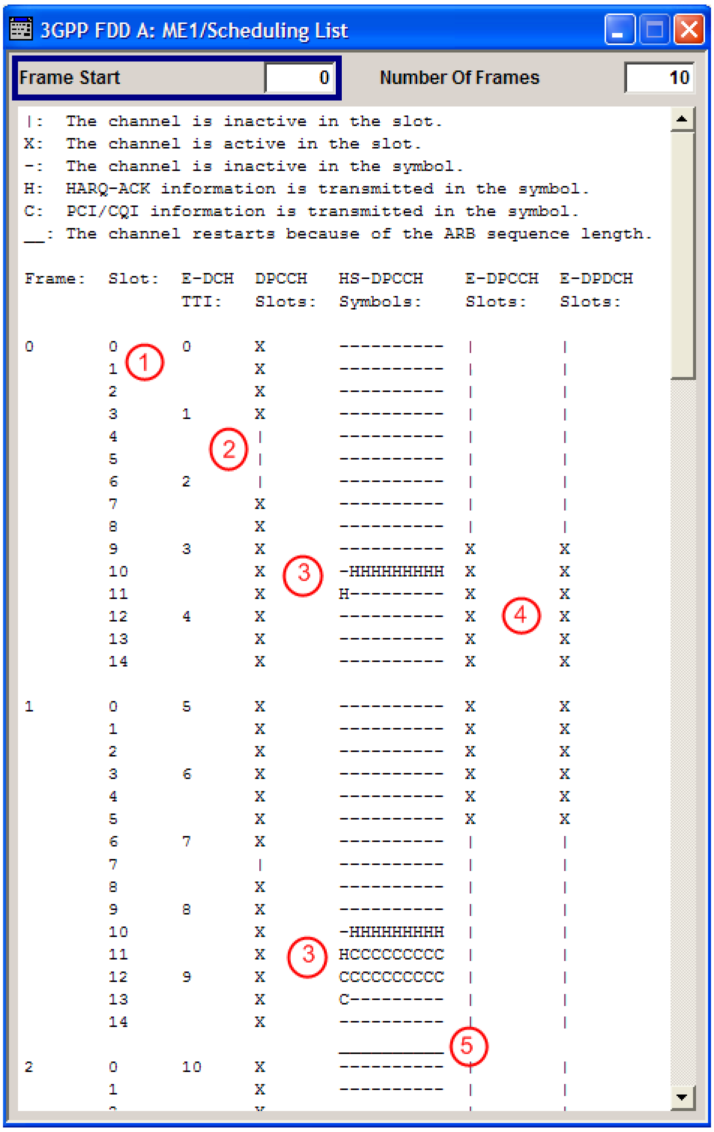


Fig. 4-28: Example of Scheduling List (UE1)

1 = E-DCH TTI is three slots long, i.e. E-DCH TTI = 2ms
2 = DPCCH shows busts pattern, i.e. UL-DTX is activated
3 = HS-DPCCH is active and the scheduled HARQ-ACK and PCI/CQI messages have different patterns
4 = E-DPCCH and E-DPDCH are active; both channels have the same E-DCH scheduling
5 = ARB Sequence Length = 2 frames

Frame Start

Defines the start frame of the displayed UL scheduling.

Number of Frames

Defines number of frames for that the UL scheduling is displayed.

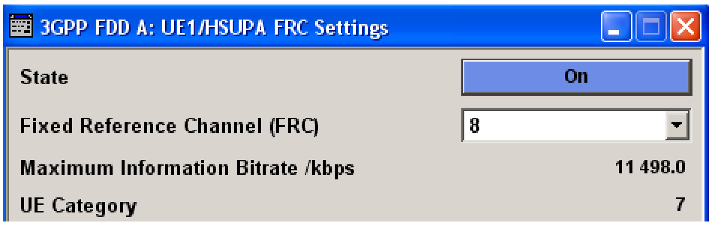
4.37 HSUPA FRC Settings - UE

The "UE HSUPA FRC" dialog provides the parameters for configuring the fixed reference channel (FRC) and the settings for the HARQ simulation.

For more information, see also chapter 3.1.12, "HARQ Feedback", on page 32 and chapter 3.1.14.4, "16QAM Fixed Reference Channel: FRC 8", on page 37.

4.37.1 FRC General Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"
2. Select "E-DPCCH Settings > Show Details > HSUPA FRC...".



The dialog comprises the common settings for the fixed reference channel (FRC).

State (HSUPA FRC)
Activates or deactivates the FRC state for the E-DCH channels.

If FRC is activated, the channels E-DPCCH and E-DPDCH are automatically activated.

The following parameters of these channels are set automatically, depending on the configured FRC:

- for E-DPCCH:
  - "Retransmission Sequence Number" is set to 0
    "E-TFCI"
- For E-DPDCH:
  - Overall Symbol Rate is set according to the correspondent parameter of FRC.
    The "Modulation" is set according to the "Modulation" used for the selected FRC.
    The E-DPDCH Data Source is set according to the Data Source (E-DCH) used for the selected FRC.
- For E-DCH Scheduling:
  - E-DCH TTI is set according to the E-DCH TTI of the selected FRC
    If the "HARQ Simulation" is disabled and the state in the DTX mode section is activated, the "E-DCH Scheduling Table" is configured according to the "DTX Pattern" specified.
    By enabled "HARQ Simulation", the settings in the "E-DCH Scheduling Table" are configured to ensure a continious E-DCH transmission.

Note: HSUPA FRCs are disabled, if UL-DTX... / User Scheduling State or Dynamic Power Control State are activated.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:STATe`
on page 516

Fixed Reference Channel (FRC)
Selects the FRC according to TS 25.141 Annex A.10.

Additionally, user defined FRC can be configured.

FRC8 is available only for instruments equipped with R&S SMx/AMU-K59.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:CHANnel`
on page 507

Maximum Information Bitrate/kbps
Displays the maximum information bit rate.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:MIBRate?`
on page 515

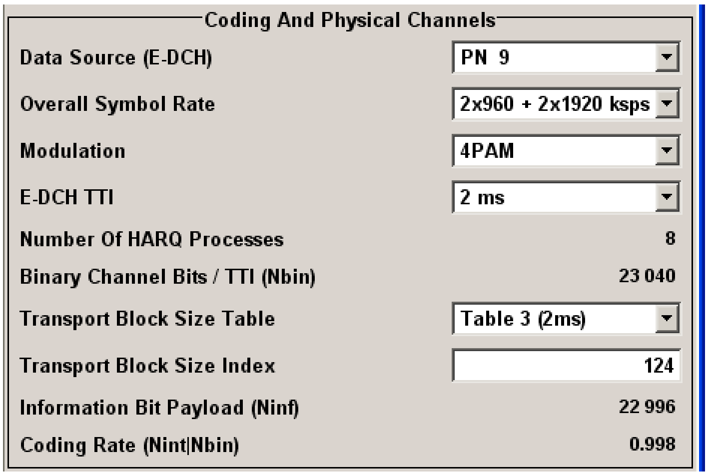
UE Category
Displays the UE category that is minimum required for the selected FRC (see also chapter 3.1.19.2, "UL 16QAM UE Capabilities", on page 48).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:UECategory?` on page 518

4.37.2 Coding And Physical Channels Settings

1. To access the coding and physical channel settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"

2. Select "E-DPCCH Settings > Show Details > HSUPA FRC... > Coding And Physical Channels".



This dialog comprises the parameters required for configuring the physical channel settings and coding.

Data Source (E-DCH)

Selects the data source for the E-DCH channels, i.e. this paramter affects the corresponding paramter of the E-DPDCH.

The following standard data sources are available:

- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DATA on page 508
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DATA:PATTern on page 509
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DATA:DSELect on page 508

Overall Symbol Rate
Sets the overall symbol rate for the E-DCH channels, i.e. this parameter affects the corresponding parameter of the E-DPDCH.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:ORATe` on page 515

Modulation
Sets the modulation of the FRC, i.e. this parameter affects the corresponding parameter of the E-DPDCH.

There are two possible modulation schemes specified, BPSK and 4PAM (4 Pulse-Amplitude Modulation). The latter one is available only for the following Overall Symbol Rates:
- 2x960 ksps
- 2x1920 ksps
- 2x960 + 2x1920 ksps.

Note: Modulation scheme 4PAM is available only for instruments equipped with the HSPA+ option R&S SMx/AMU-K59.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:MODulation` on page 515

E-DCH TTI
Sets the size of the TTI (Transmission Time Interval) for the E-DCH channels, i.e. this parameter affects the corresponding parameter of the E-DCH scheduling configuration.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TTIEdch` on page 518

Number Of HARQ Processes
Displays the number of HARQ (Hybrid-ARQ Acknowledgement) processes. This value determines the distribution of the payload in the subframes.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HPROcesses?` on page 514

Binary Channel Bits / TTI (Nbin)
Displays the number of binary bits per TTI.

Transport Block Size Table
Selects the Transport Block Size Table from 3GPP TS 25.321, Annex B according to that the transport block size is configured.

The transport block size is determined also by the parameter "Transport Block Size Index".

The allowed values of this parameter depend on the selected "E-DCH TTI" and "Modulation" scheme.

E-DCH TTI	Modulation	Transport Block Size Table	Transport Block Size Index (E-TFCI)
2 ms	BPSK	Table 0	0 .. 127
		Table 1	0 .. 125
	4PAM	Table 2	0 .. 127
		Table 3	0 .. 124
10 ms	-	Table 0	0 .. 127
		Table 1	0 .. 120

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TBS:TABLe on page 517

Transport Block Size Index (E-TFCI)
Selects the Transport Block Size Index (E-TFCI) for the corresponding table, as described in in 3GPP TS 25.321, Annex B.

The value range of this parameter depends on the selected "Transport Block Size Table".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TBS:INDex on page 516

Information Bit Payload (Ninf)
Displays the payload of the information bit. This value determines the number of transport layer bits sent in each HARQ process.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:PAYBits?
on page 516

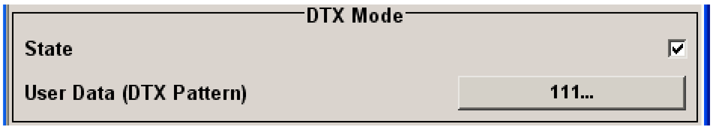
Coding Rate (Ninf/Nbin)
Displays the relation between the information bits to binary channel bits.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:CRATe?
on page 507

4.37.3 DTX Mode Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"

2. Select "E-DPCCH Settings > Show Details > HSUPA FRC...> DTX Mode".



This dialog comprises the parameters required for enabling and defining user data.

State (DTX)
Activates or deactivates the DTX (Discontinuous Transmission) mode.

Note: If activated, the "E-DCH Scheduling Table" in the "E-DPCCH Settings" dialog is configured according to the "DTX Pattern" specified.

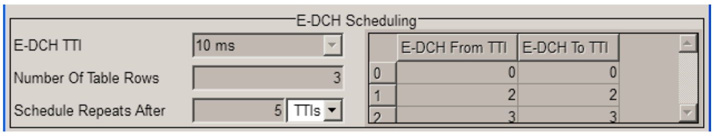
Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DTX:STATe` on page 511

User Data (DTX Pattern)
Sets the user-definable the bit pattern for the DTX. The maximum length is 64 bits.

The following values are allowed:
- 1: Data transmission
- -: DTX

Note: If activated, this setting will overwrite the "E-DCH Scheduling Table" in the "E-DPCCH Settings" dialog.

Example:
"User Data (DTX Pattern) = 1-11-" sets the E-DCH Scheduling settings as follow:



Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DTX:PATTern` on page 511

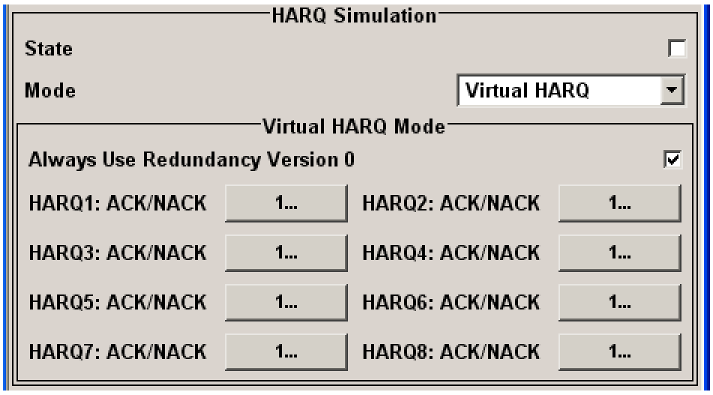
4.37.4 HARQ Simulation Settings

This section describes the HARQ settings. The provided settings depend on the selected "HARQ Simulation > Mode".

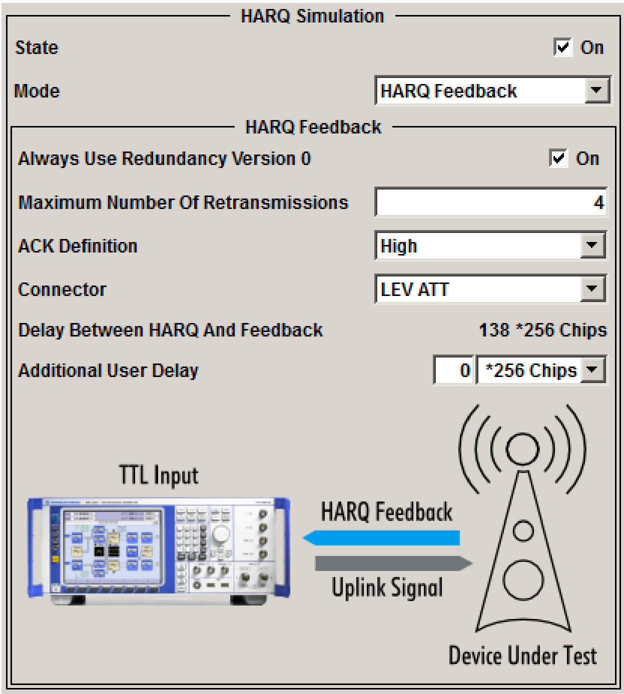
R&S SMBV instruments do not support "HARQ Simulation > Mode > HARQ Feedback".

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"

2. Select "E-DPCCH Settings > Show Details > HSUPA FRC...> HARQ Simulation".
3. Select "Mode > Virtual HARQ".



4. Select "Mode > HARQ Feedback".



For background information, refer to chapter 3.1.12, "HARQ Feedback", on page 32.

State (HARQ)

Activates or deactivates the HARQ simulation mode.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation[:STATe] on page 514

Mode (HARQ)

Selects the HARQ simulation mode.

"Virtual HARQ"	This mode simulates basestation feedback. For every HARQ process (either 4 or 8), a bit pattern can be defined to simulate ACKs and NACKs.
"HARQ Feed-back"	This mode allows you to dynamically control the transmission of the HSUPA fixed reference channels. An "ACK" from the base station leads to the transmission of a new packet while a "NACK" forces the instrument to retransmit the packet with a new channel coding configuration (i.e. new "redundancy version") of the concerned HARQ process. For further information, see chapter 3.1.12, "HARQ Feedback", on page 32.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:MODE` on page 512

Virtual HARQ Mode

Simulates a basestation feedback with the follwoing settings:

Always Use Redundancy Version 0 (HARQ) ← Virtual HARQ Mode

If activated, the same redundancy version is sent, that is, the redundancy version is not adjusted for the next retransmission in case of a received NACK.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:RVZero` on page 513

HARQ1..8: ACK/NACK ← Virtual HARQ Mode

(HARQ mode Virtual HARQ only)

Enters the pattern for the HARQ (Hybrid-ARQ Acknowledgement).

The maximum length of the pattern is 32 bits.

""1" = ACK"	New data is transmitted and the RSN (Retransmission Sequences Number) is set to 0.
""0" = NACK"	The data is retransmitted and the RSN is increased with 1. The maximum value of RSN is 3, i.e. even if more than 3 retransmissions are configured, the RSN remains 3.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ[:SIMulation]:PATTern<ch>` on page 514

HARQ mode HARQ Feedback

Note: R&S SMBV instruments and the R&S WinIQSIM2 do not support HARQ Mode HARQ Feedback.

Dynamically control the transmission of the HSUPA fixed reference channels wit hthe following settings:

Always Use Redundancy Version 0 (HARQ) ← HARQ mode HARQ Feedback

If activated, the same redundancy version is sent, that is, the redundancy version is not adjusted for the next retransmission in case of a received NACK.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:RVZero on page 513

Maximum Number Of Retransmissions (HARQ) ← HARQ mode HARQ Feedback

Sets the maximum number of retransmissions. After the expiration of this value, the next packet is sent, regardless of the received feedback.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:MRETransmissions on page 513

ACK Definition (HARQ) ← HARQ mode HARQ Feedback

Selects whether a high level (TTL) is interpreted as an ACK or a low level.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:ADEFinition on page 511

Connector (HARQ) ← HARQ mode HARQ Feedback

Selects the connector used by the HARQ Feedback line.

Tip: Assign different connectors to the two basebands to enable two HARQ feedback lines with different configuration.

"LEV ATT"	Requieres an additional equippment. Connect the feedback line to the LEVATT connector on the external AUX I/O BNC adapter board R&S SMx-Z5.
"USER 1"	No additional equippment is required. Connect the feedback line direct to the USER 1 connector of the instrument.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:CONNector on page 511

Delay Between HARQ And Feedback (HARQ) ← HARQ mode HARQ Feedback

Displays the time between the start of the HARQ process and the start of the related feedback.

For further information, see chapter 3.1.12, "HARQ Feedback", on page 32.

Remote command:

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:DELay:FEEDback? on page 512

Additional User Delay ← HARQ mode HARQ Feedback

Sets an additional delay to adjust the delay between the HARQ and the feedback.

For further information, see chapter 3.1.12, "HARQ Feedback", on page 32.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:DELay:AUSer` on page 512

4.37.5 Bit and Block Error Insertion Settings

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE"
2. Select "E-DPCCH Settings > Show Details > HSUPA FRC...> Bit/Block Error Insertion".

   The dialogs provide the parameters for inserting errors into the data source and into the CRC checksum.

Bit Error State
Activates or deactivates bit error generation.

Bit errors are inserted into the data fields of the enhanced channels. It is possible to select the layer in which the errors are inserted (physical or transport layer).

When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BIT:STATe` on page 510

Bit Error Rate
Sets the bit error rate. The value range is 10E-1 to 10E-7.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BIT:RATE` on page 509

Insert Errors On
Selects the layer in the coding process at which bit errors are inserted.

"Transport layer"
Bit errors are inserted in the transport layer.

"Physical layer"
Bit errors are inserted in the physical layer.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BIT:LAYer` on page 509

Block Error State
Activates or deactivates block error generation.

The CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate an invalid signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BLOCk:STATe on page 510

Block Error Rate
Sets block error rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BLOCk:RATE on page 510

4.38 Global Enhanced Channel Settings - UE1

The "Global Enhanced Channel" settings are only available for user equipment 1 (UE1).

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "DPDCH Settings > Show Details > Global Enhanced Channels...".

4.38.1 Enhanced Channels State

On top of the dialog, you can activate the global enhanced settings.

Enhanced Channels State
Displays the enhanced state of the station. As at least the DPCCH of UE1 is always calculated in realtime, the enhanced state is always on for UE1.

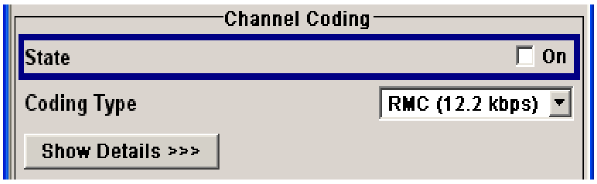
The DPCCH and one DPDCH of user equipment 1 are generated in realtime. Depending on the actual configurations, other channels of user equipment 1 may also be generated in realtime.

It is possible to activate channel coding and simulate bit and block errors. Data lists, for example with user data for the transport layer, can be used as the data source.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:STATe on page 539

4.38.2 Channel Coding

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "DPDCH Settings > Show Details > Global Enhanced Channels... > Show Details".



The "Channel Coding" section is where the channel coding settings are made. You can choose between a reduced display and the detailed setting options display. With the reduced display, it is only possible to select the coding scheme and this selection sets the associated parameters to the presetting prescribed in the standard. The "Transport Channel" section for detailed setting and for defining a user coding can be revealed with the "Show Details" button and hidden with the "Hide Details" button.

An uplink reference measurement channel according to 3GPP TS 25.141 is generated when the transport channels DTCH (Dedicated Traffic Channel) and DCCH (Dedicated Control Channel) , which contain the user data, are mapped to a DPDCH (Dedicated Physical Data Channel) with a different data rate after channel coding and multiplexing. The display below is taken from the standard (TS 25.141) and shows in diagrammatic form the generation of a 12.2 kbps reference measurement channel from the DTCH and DCCH transport channels.

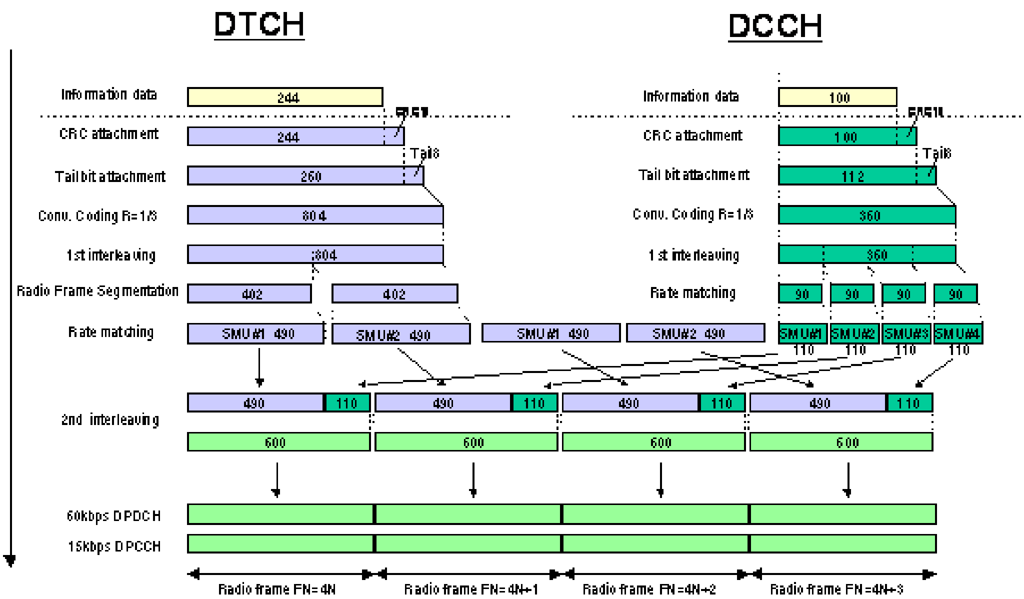


Fig. 4-29: Channel coding of the 12.2 kbps reference measurement channels (uplink)

Channel Coding State

Activates or deactivates channel coding.

Note: Annex A.1, 3GPP TS 25.141, lists the recommended DPCCH-settings.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:STATe`
on page 533

Coding Type

Selects channel coding.

The 3GPP specification defines 4 reference measurement channel coding types, which differ in the input data bit rate bit to be processed (12.2, 64, 144 and 384 ksps). The additional AMR CODER coding scheme generates the coding of a voice channel.

"User" coding can be defined as required in the detailed coding settings menu section revealed with button "Show Details". They can be stored and loaded in the "User Coding" submenu. Selection "User" is indicated as soon as a coding parameter is modified after selecting a predefined coding type.

The input data bits are taken from the data source specified for the "Transport Channels" for channel coding. The bits are available with a higher rate at the channel coding output. The allocations between the measurement input data bit rate and the output symbol rate are fixed, that is to say, the overall symbol rate is adjusted automatically.

The following are available for selection:

"RMC 12.2 kbps"	12.2 kbps measurement channel
"RMC 64 kbps"	64 kbps measurement channel
"RMC 144 kbps"	144 kbps measurement channel
"RMC 384 kbps"	384 kbps measurement channel
"AMR 12.2 kbps"	Channel coding for the AMR coder

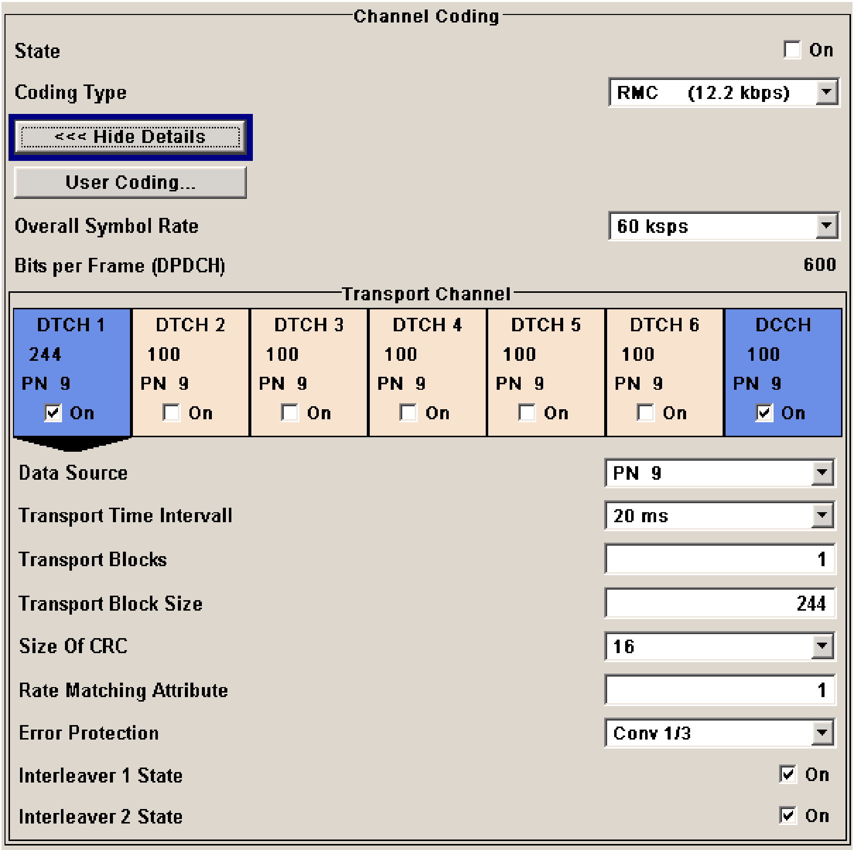
Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:TYPE`
on page 534

Show Details

Reveals the detailed setting options for channel coding.

Available as well as the "Transport Channel" section are the "Overall Symbol Rate" and Bits "per Frame" parameters as well as the "User Coding" button.

Once the details are revealed, the labeling on the button changes to "Hide Details". Use this to hide the detailed setting options display again.



Remote command:
n.a.

User Coding ...

Accesses files with user codings and the standard "File Select" function.

User coding of UE1 are stored as files with the predefined file extension `*.3g_ccod_ul`. The file name and the directory they are stored in are user-definable; the file extension is assigned automatically.

The complete channel coding settings are saved and recalled.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:CATalog?` on page 534
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:DELete` on page 535
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:LOAD` on page 535
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:STORe` on page 536

Overall Symbol Rate

Sets the overall symbol rate of the DPDCH.

The structure of the DPDCH channel table depends on this parameter. The overall symbol rate determines which DPDCHs are active, which symbol rate they have and which channelization codes they use.

DPDCHs that are not active by virtue of the overall rate, are also disabled for operation.

Note: Up to an overall rate of 960 ksps, only DPDCH 1 is active, its symbol rate is the same as the overall rate and the channelization code is the same as spreading factor/4 (spreading factor = chip rate / symbol rate). With an overall symbol rate greater than 960 ksps, all the active DPDCHs have the symbol rate 960 ksps.

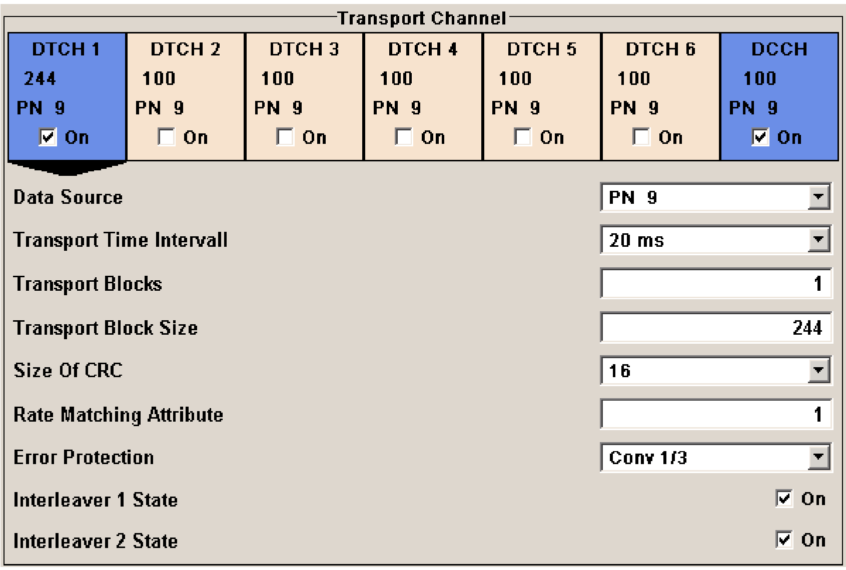
Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:ORATe` on page 538

Bits per Frame (DPDCH)
Displays the data bits in the DPDCH component of the frame at physical level. The value depends on the overall symbol rate.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:BPFRame?`
on page 533

4.38.3 Transport Channel

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. In the "DPDCH Settings" section, select "Show Details > Transport Channel".
3. Select one of the transport channels, for example "DTCH1".



The dialog provides an access to the settings of up to 7 transport channels (TCHs), the DTCHs (DTCH1 to 6) and the DCCH.

A wide arrow beneath the block indicates which TCH is currently selected.

Transport Channel State
Activates or deactivates the transport channel.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:STATe on page 539
In case of remote control, DCCH corresponds to :TCHannel0, DTCH1 to :TCHannel1, etc.

Data Source
Selects the data source for the transport channel.

The data source for the DCCH and DTCH1 can also be selected in the main dialog in the channel table.

The following standard data sources are available:
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  A binary data from a data list, internally or externally generated.
  Select "Select DList" to access the standard "Select List" dialog.
  – Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
  – Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
  – Use the standard "File Manager" function to transfer external data lists to the instrument.

  See also "Main Dialog > Data List Management".

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA on page 541
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:PATTern on page 542
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:DSELect on page 541

Transport Time Interval
Sets the number of frames into which a TCH is divided. This setting also defines the interleaver depth.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:TTINterval on page 540

Number of Transport Blocks

Sets the number of transport blocks for the TCH.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:TBCount` on page 540

Transport Block Size

Sets the size of the transport block at the channel coding input.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:TBSize` on page 540

Size of CRC

Defines the type (length) of the CRC. Checksum determination can also be deactivated (setting None).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:CRCSize` on page 540

Rate Matching Attribute

Sets data rate matching (Rate Matching).

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:RMATtribute` on page 539

Error Protection

Selects error protection.

"None" No error protection

"Turbo 1/3" Turbo Coder of rate 1/3 in accordance with the 3GPP specifications.

"Conv 1/2 | 1/3"
Convolution Coder of rate 1/2 or 1/3 with generator polynomials defined by 3GPP.

Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:EPRotection` on page 542

Interleaver 1 State

Activates or deactivates channel coding interleaver state 1 of the transport channel. Interleaver state 1 can be set independently in each TCH. Activation does not change the symbol rate.

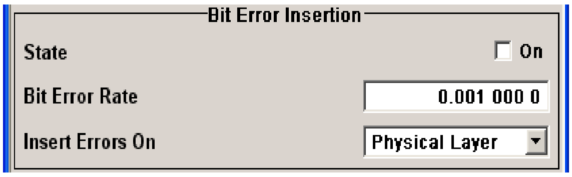
Remote command:
`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:INTerleaver` on page 543

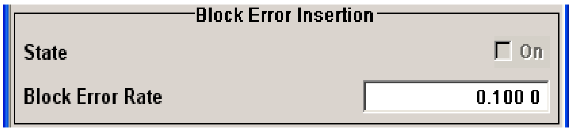
Interleaver 2 State
Activates or deactivates channel coding interleaver state 2 of all the transport channels. Interleaver state 2 can only be set for all the TCHs together. Activation does not change the symbol rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:INTerleaver2
on page 538

4.38.4 Error Insertion

1. To access these settings, select "3GPP FDD > Link Direction > Uplink / Reverse > User Equipments > UE 1".
2. Select "DPDCH Settings > Show Details > Global Enhanced Channels...".
3. Select "Bit Error Insertion / Block Error Insertion"





In the "Bit Error Insertion" and "Block Error Insertion" sections, errors can be inserted into the data source and into the CRC checksum, in order, for example, to check the bit and block error rate testers.

Bit Error State
Activates or deactivates bit error generation.

Bit errors are inserted into the data fields of the enhanced channels. When channel coding is active, it is possible to select the layer in which the errors are inserted (physical or transport layer).

When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:STATe
on page 537

Bit Error Rate TCH1
Sets the bit error rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:RATE
on page 536

Insert Errors On
Selects the layer at which bit errors are inserted.

"Transport layer"	Bit errors are inserted in the transport layer. This layer is only available when channel coding is active.
"Physical layer"	Bit errors are inserted in the physical layer.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:LAYer
on page 536

Block Error State
Activates or deactivates block error generation.

The CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate an invalid signal.

Block error generation is only available when channel coding is active.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:STATe
on page 537

Block Error Rate
Sets the block error rate.

Remote command:
[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BLOCk:RATE
on page 537

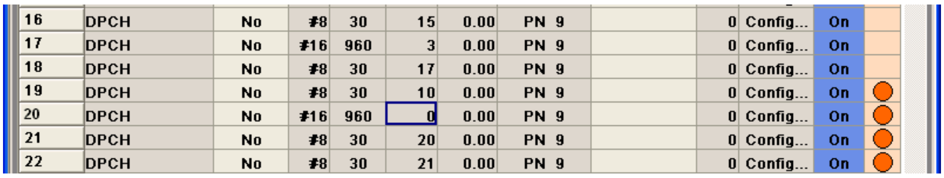
5 How to Work with the 3GPP FDD Option

The following step-by-step instructions demonstrate how to perform some signal generation tasks with the 3GPP FDD option.

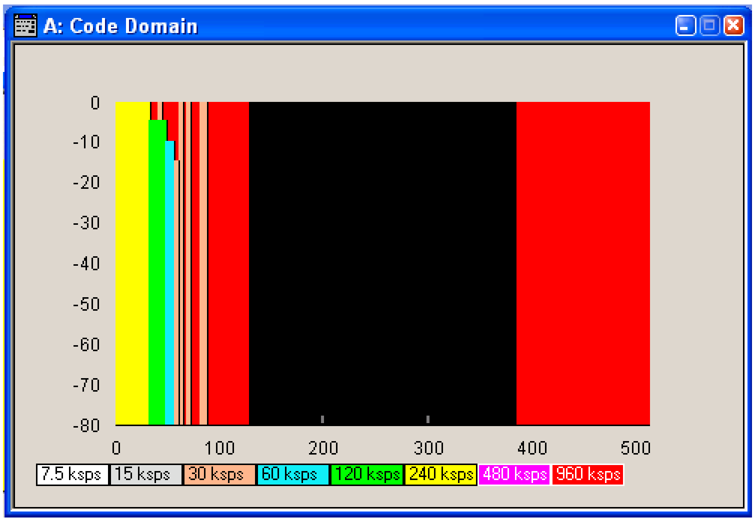
5.1 Resolving Domain Conflicts

To resolve code domain conflicts

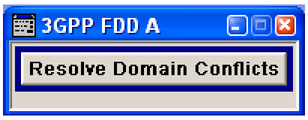
1. A downlink domain conflict can be recognized by one of the following methods:
   a) Select "3GPP FDD > Basestation > Channel Table"
   In the channel table, a code domain conflict with an overlying channel (with a lower index) is indicated in column "Dom Conf" on the far right of the table by a conflict symbol and an orange-colored column.



   b) Select "3GPP FDD > Basestation > Code Domain"
   A code domain conflict is indicated by overlapping bars.



2. The instrument helps you to resolve code domain conflicts by automatically adapting the channelization code of the channels involved.
   To access the required function, in the "3GPP FDD > Basestation > Channel Table" select the conflict symbol and trigger "Resolve Domain Conflicts".

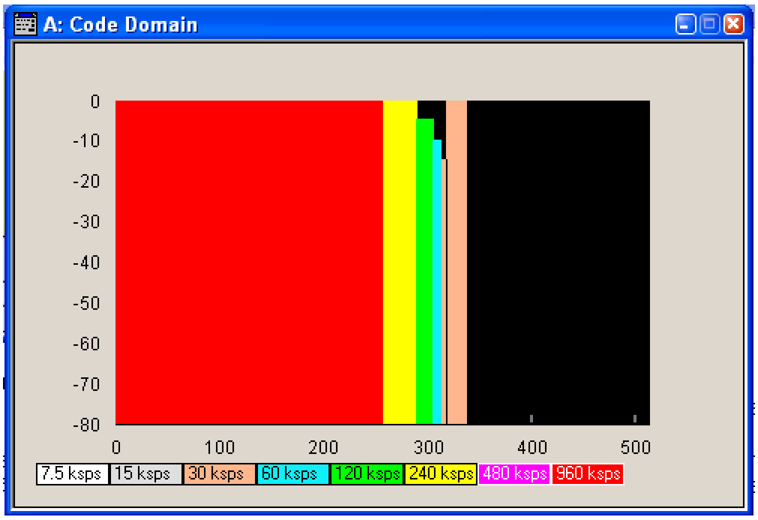


Note: The HSUPA control channels E-RGCH and E-HICH may use the same channelization code as long as they use different signature sequence hopping index that identifies the user equipment. The F-DPCH channels may also use the same channelization code as long as they use a different timing offset (TOffs) or slot format.

The code domain conflict is resolved by changing the channelization codes of the affected channels.

16	DPCH	No	#8	30	79	0.00	PN 9		0	Config...	On
17	DPCH	No	#16	960	0	0.00	PN 9		0	Config...	On
18	DPCH	No	#8	30	80	0.00	PN 9		0	Config...	On
19	DPCH	No	#8	30	81	0.00	PN 9		0	Config...	On
20	DPCH	No	#16	960	1	0.00	PN 9		0	Config...	On
21	DPCH	No	#8	30	82	0.00	PN 9		0	Config...	On
22	DPCH	No	#8	30	83	0.00	PN 9		0	Config...	On

The graphs immediately display the change



5.2 Using the DL-UL Timing Offset Settings

To generate a continuos uplink signal composed of multiple separately generated uplink frames

1. Adjust the uplink settings as required and set "User Equipment > UE > DPCCH > DL-UL Timing Offset = 0 Chips".
2. Enable generation of the 3GPP FDD signal, i.e "3GPP FDD > State > On"
3. Use the Generate Waveform function to save the current signal as an ARB signal in a waveform file.

4. Re-configure the uplink settings and save the signal as an ARB file.
5. Use the "Baseband > ARB > Multi Segment" function to assemble a common signal from the several uplink signals.
6. If required, re-adjust the "Marker" settings. A sequence list can be additionally applied to configure the order the waveforms are processed and how many times each of them is repeated.

5.3 Configuring UL-DTX Transmission and Visualizing the Scheduling

To configure the instrument to generate an UL DPCCH DTX signal

1. Enable "Baseband > 3GPP FDD > Transmission Direction > Uplink".
2. Select "User Equipment > UE1 > UL-DTX", enable "Mode > UL-DTX" and configure the following settings:

Table 5-1: UL-DTX Settings

Parameter	Value
E-DCH TTI	2 ms
UL-DTX Offset	2 Subframes
Inactivity Threshold for Cycle 2	8 TTIs
Long Preamble Length	4 Slots
DTX Cycle 1 / DTX Cycle 2	4 Subframes and 8 Subframes respectively
DPCCH Burst Length 1 / DPCCH Burst Length 2	1 Subframes (3 Slots)
UL-DTX... / User Scheduling State	On

The figure below shows the generated UL DPCCH DTX bursts pattern.

3. Use the Scheduling List to display the configured bust pattern.

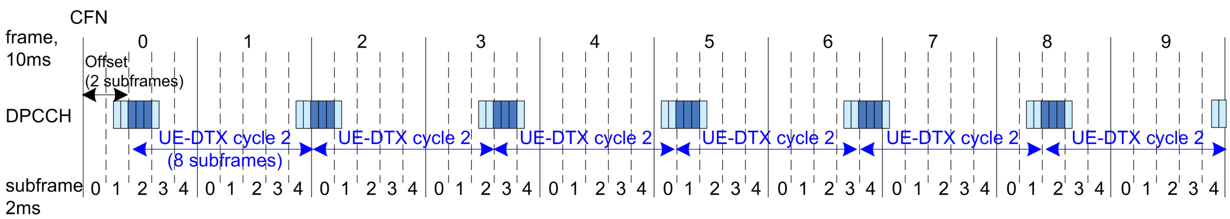


Fig. 5-1: Example for UL DPCCH DTX burst pattern as generated by the R&S Signal Generator (E-DCH TTI=2ms, beginning at CFN0, UE_DTX_DRX_Offset=2, DTX Cycle 2=8 subframes)

Note: In this implementation the signal generation starts with UE-DTX cycle 2. The UL DPCCH DTX burst pattern is offset with 2 subframes, the burst are 6 slots long

(2 slots Preamble + 3 slots DPCCH Burst Length 2 + 1 slot postamble) and are generated every 8 subframe.

4. Select "User Equipment > UE1 > E-DCH Scheduling Settings" and configure the settings as follow:

Table 5-2: E-DCH Scheduling Settings

Parameter	Value
Number of Table Rows	1
E-DCH Schedule Repeats After	24 TTIs
E-DCH TTI From	10
E-DCH TTI To	10

5. Select "UE1 > E-DPDCH Settings > State > On" to enable the generation of E-DPDCH.

   The "UE1 > Scheduling List" shows the updated UL DPCCH DTX bursts pattern (see also figure below).

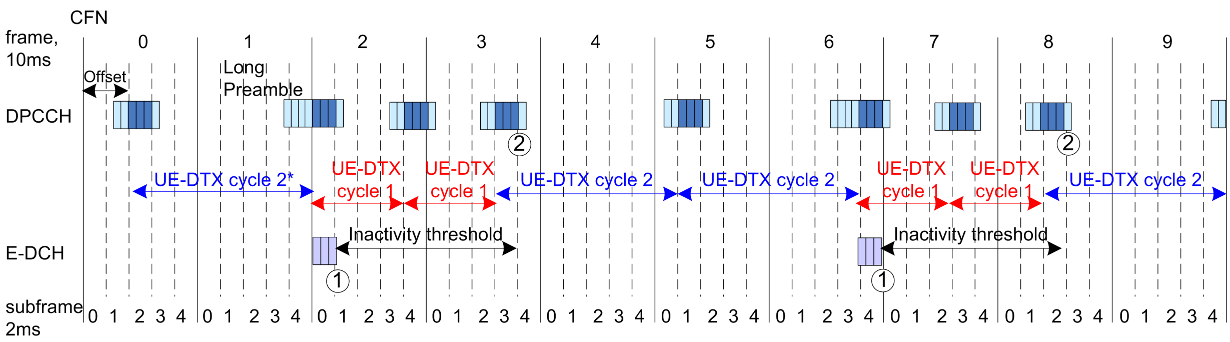


Fig. 5-2: Example for UL DPCCH DTX burst pattern in case of E-DCH transmission

1 = Cycle 2 to Cycle 1 switch after E-DCH transmission
2 = Cycle 1 to Cycle 2 switch when the inactivity timer expires
*) = In the R&S Signal Generator, the signal generation starts with UE-DTX cycle 2.

6. Configure the "UE1 > HS-DPCCH Settings" as follow:

Table 5-3: HS-DPCCH Settings

Parameter	Value
Compatibility Mode (HS-DPCCH)	Release 8 and Later RT
Inter TTI Distance (Interval)	1 subframe
Number of Rows	1
HARQ-ACK Repeat After	40 intervals
HARQ-ACK From Interval/ HARQ-ACK To Interval	20 / 20
HS-DPCCH 1/2, HARQ-ACK 1/2/3/4	A
Number of Rows	1
PCI/CQI Repeat After	40 intervals

Parameter	Value
PCI-CQI From Interval/ PCI-CQI To Interval	2 /2
HS-DPCCH 1/2, PCI/CQI 1/2/3/4 Type	CQI
CQI/CQI_S/CQI_1/CQI_2	5

7. Select "UE1 > HS-DPCCH Settings > State > On" to enable the transmission of control signaling.

   The figure below shows the generated UL DPCCH DTX bursts pattern.

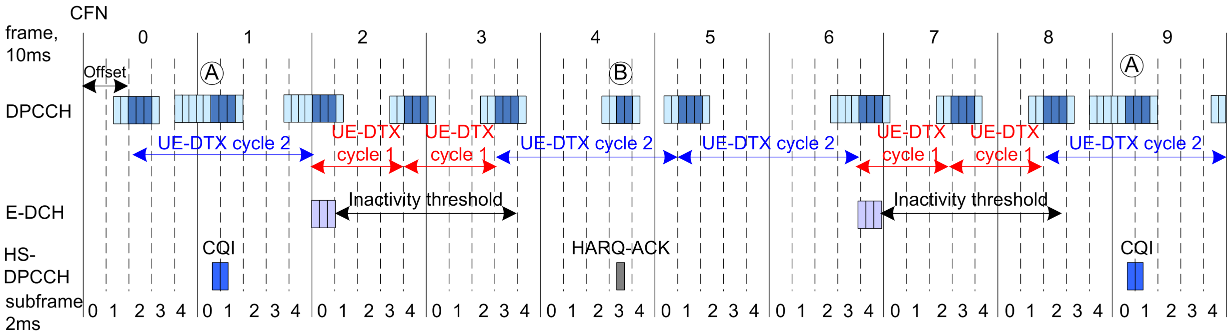


Fig. 5-3: Example for UL DPCCH DTX burst pattern in case of E-DCH and HS-DPCCH transmissions

A = DPCCH burst caused by the transmission of a CQI report
B = DPCCH burst caused by the transmission of a HARQ-ACK message

Although there is an HS-DPCCH transmission, the UE does not switch from UE-DTX cycle 2 to UE-DTX cycle 1.

5.4 Configuring and Visualizing the Uplink User Scheduling

To configure an uplink user scheduling

Consider the exemplary scheduling file. The file content is suitable as a basis for further customization.

1. Enable "Baseband > 3GPP FDD > Transmission Direction > Uplink".
2. Select "User Equipment > UE1" and enable the channels DPDCH and E-DCH; enable "Dynamic Power Control".
3. Select "User Equipment > UE1 > UL-DTX/User Scheduling", enable "Mode > User Scheduling".
4. Use the example scheduling file to generate an user scheduling according to your testing needs.
5. Open the "UE1 > Scheduling List" to visualize the configured transmission.

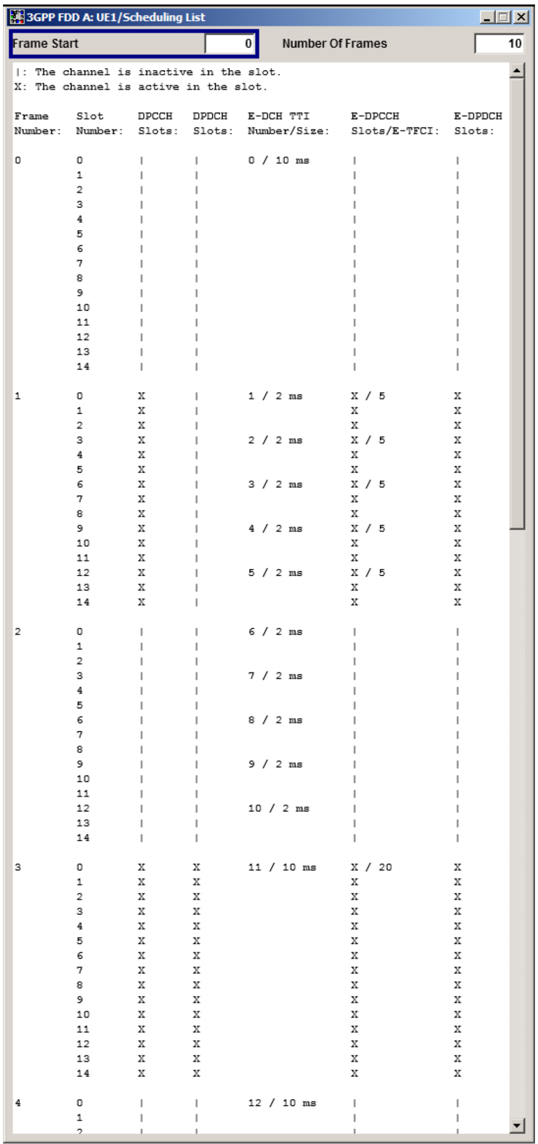


Fig. 5-4: Example: Scheduling List display of the User Scheduling configuration

```
<?xml version="1.0"?>
<SMxScheduling>
  <head type="3GPP FDD" subtype="Uplink User Scheduling" version="1" />
  <command slot="0" action="DPCCH_OFF" />
  <command slot="0" action="DPDCH_OFF" />
  <command slot="0" action="EDCH_OFF" />
  <command slot="0" action="DYNPC_OFF" />

  <command slot="15" action="DPCCH_ON" />
  <command slot="15" action="EDCH_ON" />
  <command slot="15" action="EDCH_TTIS" ttis="2" />
  <command slot="15" action="EDCH_ETFCI" etfci="5" />
  <command slot="15" action="DPCCH_OFF" />
```

```
  <command slot="15" action="EDCH_OFF" />

  <command slot="45" action="DYNPC_ON" />
  <command slot="45" action="DPCCH_ON" />
  <command slot="45" action="DPDCH_ON" />
  <command slot="45" action="EDCH_ON" />
  <command slot="45" action="EDCH_TTIS" ttis="10" />
  <command slot="45" action="EDCH_ETFCI" etfci="20" />
  <command slot="60" action="DPCCH_OFF" />
  <command slot="60" action="DPDCH_OFF" />
  <command slot="60" action="EDCH_OFF" />
  <command slot="60" action="DYNPC_OFF" />

  <command slot="150" action="REPEAT" />
</SMxScheduling>
```

Interpretation of the scheduling

- The instrument will transmit the following channels:
  – DPCCH and E-DCH during the second frame (frame # 1, from slot # 15 to slot # 29), where a TTI size of 2 ms and an E-TFCI of 5 is used for the E-DCH
  – DPCCH, DPDCH and E-DCH during the fourth frame (frame # 3, from slot # 45 to slot # 59), where a TTI size of 10 ms and an E-TFCI of 20 is used for the E-DCH.
- External dynamic power control commands are considered during the second transmission block of the example. The instrument ignores any power control commands during the first transmission block and during all prior signal gaps, between and after the two transmission blocks.
- The scheduling is looped at slot 150, i.e a transmission of DPCCH and E-DCH starts from slot 165 on, a (power controlled) transmission of DPCCH/DPDCH/E-DCH starts from slot 195 on, etc.

The displayed information in the "Scheduling List" confirms the expected scheduling of the channels as well as the changes in the E-DCH E-TFCI and TTI size. Refer to chapter 4.36, "Scheduling List", on page 234 for detailed explanation on how to understand the displayed information.

5.5 How to Configure the HS-DPCCH Settings for 4C-HSDPA Tests

The following is an example on how to use the provided settings to configure the instrument to send ACK only messages, as required in the ACK mis-detection test for 4C-HSDPA, according to 3GPP TS 25.141, section 8.11A.3 and 8.11A.4.

The example is based on the test configuration specified in 3GPP TS 25.141, Annex A. 9A.

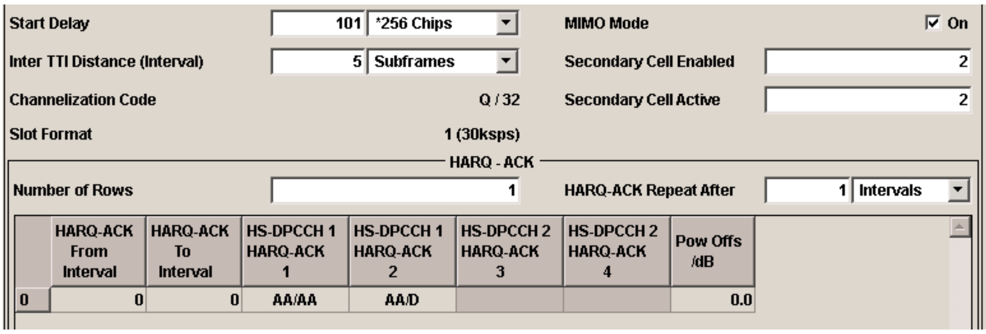
Table 5-4: Required test configurations (excerpt)

Test Configuration	4/4/4	4/2/2	3/3/3	3/2/1	3/3/0
HS-DPCCH Spreading Factor	128	128	128	128	256
Secondary Cell Enabled	3	3	**2**	2	2
Secondary Cell Active	3	1	**2**	1	2
Number of MIMO carriers	4	2	**3**	1	0

To configure the 4C-HSDPA HS-DPCCH Reference Measurement Channel

The example lists only the related setting and is based on Test Configuration = 3/3/3, see table 5-4.

1. Enable "Baseband > 3GPP FDD > Link Direction > Uplink".
2. Select "User Equipment > UE1" and enable the "HS-DPCCH > State > On".
3. Select "HS-DPCCH > MIMO Mode > On".
4. Select "HS-DPCCH > Secondary Cell Enabled > 2".
5. Select "HS-DPCCH > Secondary Cell Active > 2".
6. Use the default values "HS-DPCCH > HARQ-ACK Scheduling > Number of Rows > 1" and "HS-DPCCH > HARQ-ACK Scheduling > HARQ-ACK Repeat After > 1".
7. Select "HS-DPCCH > HARQ-ACK Scheduling > HS-DPCCH 1 HARQ-ACK 1 > AA/AA".
8. Select "HS-DPCCH > HARQ-ACK Scheduling > HS-DPCCH 1 HARQ-ACK 2 > AA/D".



6 Application Sheets

Application sheets describe short application examples for selected issues and provide related background information.

6.1 Uplink Dual Cell HSDPA Test Signal Generation

The R&S SMx/AMU supports the generation of feedback messages for HSDPA data acknowledgment and channel quality indication as defined in the 3GPP TS 25.212 release 8 and release 9.

This application sheet describes how to configure the R&S SMx/AMU to generate an uplink test signal for basic tests on Dual Cell HSDPA (DC-HSDPA) operation.

6.1.1 Options and Equipment Required

The following equipment is required:

- Vector Signal Generator R&S SMU, R&S AMU, R&S SMJ, R&S SMATE or R&S SMBV, equipped with:
  – Firmware version 2.15.085.47 (R&S SMBV) and 2.10.111.53 (other instruments) or later. Latest firmware version recommended.
  – one of the baseband options, e.g. R&S SMx/AMU-B10
  – one of the frequency options, e.g. R&S SMx-B103
- Option R&S SMx/AMU-K42, "Digital Standard 3GPP FDD"
- Option R&S SMx/AMU-K43, "3GPP FDD enhanced MS/BS tests incl. HSDPA"
- Option R&S SMx/AMU-K59, "Digital Standard HSPA+"

6.1.2 Test Setup

Fig. 6-1: Test Setup (example with R&S SMU)

6.1.3 Generating an uplink DC-HSDPA Test Signal (Non MIMO Mode)

To generate an uplink test signal corresponding to the signal of a UE configured to work in DC-HSDPA non MIMO mode, configure the uplink HS-DPCCH as follows:

1. Preset the R&S SMx/AMU to ensure a defined instrument state.
2. Open the 3GPP FDD dialog (e.g. "Baseband Block > 3GPP FDD") and select "Link Direction > Uplink".
3. Select "UE1" and open the corresponding "User Equipment" dialog.
4. Set the "Scrambling Code" as required.
5. Navigate to the "HS-DPCCH Settings" section and expand the display of detailed settings.
   a) Ensure that the "Compatibility Mode" is set to "Release 8 and Later".
   b) Select the "Secondary Cell Enabled = 1" and "Secondary Cell Active = 1" to configure dual cell HSDPA mode for the selected UE.
   c) Configure the HS-DPCCH structure with the parameters "Inter TTI Distance" and "Number of HARQ-ACK or PCI/CQI Rows", as well as by configuring the HARQ-ACK and CQI/PCI information per interval by means of the parameters in the table.
   d) Set the parameter "HS-DPCCH 1 HARQ-ACK 1" as required to adjust the information transmitted during the HARQ-ACK slot of the corresponding TTI.
   For example, an *A/N* feedback means that an ACK is sent to the serving cell and a NACK to the secondary serving cell.
   e) To include composite CQI messages in the signal as specified in 3GPP TS 25.212:
      - Select "HS-DPCCH 1 PCI/CQI Type > Composite CQI"
      - Select "PCI/CQI 1 Content > Config" and adjust the values of the parameters "CQI1" and "CQI2"
   f) Adjust the power settings as required.
   g) Execute "Adjust ARB Sequence Length".
   h) Set the "HS-DPCCH > State > On" and close the dialog.

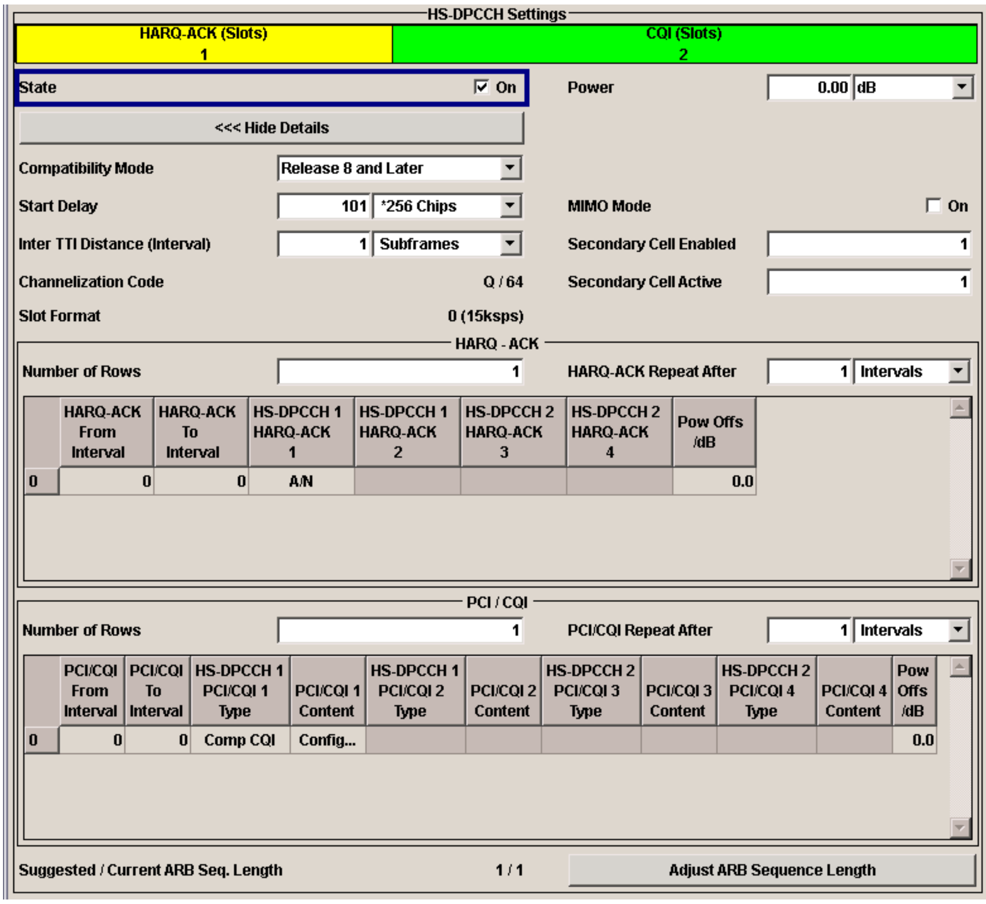


Fig. 6-2: Example: R&S SMU with frimware version 2.20.360.xx

6. In the "3GPP FDD > Trigger/Marker/Clock" dialog, adjust the settings as required. For example, to synchronize the R&S SMx/AMU to the frame timing of the DUT, feed the frame marker signal of the DUT (if available) to the instrument, enable trigger mode "Armed Auto" and select an "External Source".
7. In the "3GPP FDD" dialog, set the "State > On" to enable the generation of the 3GPP FDD uplink (UL) signal.
8. In the "RF > RF Frequency > Reference Frequency" dialog, adjust the settings as required.
   For example, if a common reference signal is used or if the DUT provides the reference frequency, connect the reference signal source to the R&S SMx/AMU, select "Source External" and adjust the "External Reference Frequency".
9. Press the FREQ key and select the desired RF frequency, e.g. 1950 MHz.
10. Adjust the output signal level as required and press the RF ON/OFF key to activate the RF output.

6.1.4 Generating an Uplink Test Signal for Simultaneous Dual Cell and MIMO Operation

► Perform the steps described above and enable the parameter "3GPP FDD > UE1 > HS-DPCCH Settings > MIMO Mode".

You are enabled to configure the HARQ-ACK feedback messages for up to four simultaneously transmitted downlink transport blocks.

For background information about the dual cell operation and processing of HARQ-ACK feedback messages, refer to chapter 3.1.16, "Dual Cell HSDPA (DC-HSDPA)", on page 43.

6.2 Downlink Dual Cell HSDPA Test Signal Generation

This application sheet describes how to configure the R&S SMU to generate a down-link signal for HSDPA performance tests for user equipment (UE) supporting Dual Cell HSDPA (DC-HSDPA) operation. A typical example is the "Demodulation of HS-DSCH" test described in clause 9.2. of the 3GPP TS 34.121 [1].

The technical specification 3GPP TS 34.121 [1] is used as guideline for this description and some of the values/methods proposed in this document may differ from the values/methods defined in the standard.

Please note that at the time of the release of this document a discussion is ongoing in the 3GPP body about whether or not there should be OCNS configured in the secon-dary serving cell in case of DC-HSDPA tests. In this document it is presumed that OCNS should be used in the secondary serving cell.

6.2.1 Options and Equipment Required

The following equipment is required:

- Two-path Vector Signal Generator R&S SMU equipped with:
  – Firmware version 2.10.111.53 or later. Latest firmware version recommended.
  – one of the baseband options per path, e.g. R&S SMU-B10
  – one of the frequency options, e.g. R&S SMU-B103
- 2 x Option R&S SMU-K42, "Digital Standard 3GPP FDD"
- 2 x Option R&S SMU-K43, "3GPP FDD enhanced MS/BS tests incl. HSDPA"
- 2 x Option R&S SMU-B14/B15, "Fading Simulator/Fading Simulator Extensions"
- 1 x Option R&S SMU-K62, "Additive White Gaussian Noise (AWGN)"

6.2.2 Test Setup

Fig. 6-3: Test Setup

Path A of the R&S SMU generates the DL signal of the serving cell, and path B the signal of the secondary serving cell.

6.2.3 Assumptions

The DC-HSDPA performance requirements for HS-DSCH demodulation tests are defined as minimum performance requirements for the UEs supporting one of the HS-DSCH categories 21-24. The 3GPP TS 34.121 [1] defines tests with several H-Sets per UE category, as well as different propagation conditions and power levels.

The example in this document does not cover all possible cases but focuses on one particular example. An overview of the used settings is provided in table 6-1.

Table 6-1: DC-HSDPA test parameters for testing Single Link Performance - Enhanced Performance Requirements Type 2 - QPSK FRC H-Set 6A (example)

Parameter	Value	Remark
Performance Requirements	Enhanced Performance Require-ments Type 2	according to Table 9.2.3C, [1]
HS-DSCH UE Category	Category 21	according to Table 5.1a, [2]
Fixed Reference Channel	H-Set 6A	according to Table 9.2.3C, [1]
$\hat{I}_{or}/I_{oc}$	10.6 dB	according to Table 9.2.1FA.8, [1]
Modulation	QPSK	determines that test parameters for testing QPSK FRC H-Set 6A are used
I_{oc}	-60 dBm/3.84 MHz	according to Table 9.2.1FA.1, [1]
Redundancy and Constellation Version Coding Sequence	{0,2,5,6}	according to Table 9.2.1FA.1, [1]
Maximum Number of HARQ Transmissions	4	according to Table 9.2.1FA.1, [1]
Propagation Conditions	PA3	according to Table 9.2.1FA.8, [1]
HS-PDSCH E_c/I_{or}	-2.9 dB	according to Table 9.2.1FA.8, [1]

Parameter	Value	Remark
Level Set for HSDPA Measurements	Level Set 3	according to Table E.5.9, [1]
P-CPICH Ec/Ior	-9.9 dB	according to Table E.5.8, [1]
P-CCPCH Ec/Ior	-11.9 dB	according to Table E.5.8, [1]
SCH Ec/Ior	-11.9 dB	according to Table E.5.8, [1]
PICH Ec/Ior	-14.9 dB	according to Table E.5.8, [1]
HS-PDSCH Ec/Ior	-2.9 dB	according to Table E.5.8, [1]
HS-SCCH1 Ec/Ior	-8.4 dB	according to Table E.5.8, [1]
DPCH Ec/Ior	-8.4 dB	according to Table E.5.8, [1]
OCNS for the serving cell	off	according to Table E.5.8, [1]
OCNS for the secondary serving cell	on	
OCNS Channelization Codes	122 to 127 (SF 128)	according to Table E.6.2.1, [1]
DPCH Channelization Code	96 (SF 128)	according to Table E.6.2.1, [1]
HS-SCCH Channelization Code	2 (SF 128)	according to Table E.6.2.1, [1]
Mid Range Frequency	2140 MHz (serving cell) 2145 MHz (secondary serving cell)	according to the table for DC-HSDPA mode in chapter 5.1.1.1, [3]

6.2.4 Generating a DL DC-HSDPA Test Signal

Adjust the settings of the R&S SMU to generate a test signal suitable for the verification of the ability of the UE to receive a predefined test signal in multi-path fading conditions as follows:

General Workflow

1. Connect the test equipment, see figure 6-3.
2. Preset the R&S SMU to ensure a defined instrument state.
3. Set the noise level and adjust the propagation conditions, see "Configuring the AWGN Noise Source and the Fading Simulator" on page 269.
4. Adjust the frequency of RF output A to the center of the frequencies of both cells, e.g. 2142.5 MHz and activate the RF A output.
5. Select "Baseband A/B > Frequency Offset" and set the frequency offsets to -2.5 MHz and +2.5 MHz respectively.
6. Perform the steps required to establish a connection setup.
7. Adjust the 3GPP FDD settings of the serving and the secondary serving cell, see "Configuring the 3GPP FDD signal of the serving cell (Baseband A)" on page 269

and "Configuring the 3GPP FDD signal of the secondary serving cell (Baseband B)" on page 270.

8. Enable the generation of the 3GPP FDD downlink (DL) signal:
   a) In the path B, set the "3GPP FDD > State" to On
   b) In the path A, set the "3GPP FDD > State" to On.

   HSDPA data is transmitted on both the serving cells.
9. Measure the information bit **Throughput** per cell to verify the receiver's ability to meet the desired performance requirements.

Configuring the AWGN Noise Source and the Fading Simulator

1. Select "Fading A > Signal Routing > A->A|B->A" to enable the routing of the signal of path B to path A.
2. Open the "Fading Settings" dialog in path A (e.g. "Fading > Fading Settings") and perform the following settings:

   Table 6-2: Fading Settings (Path A and Path B)

R&S SMU Dialog	Parameter Name	Value
Fading Settings	Set to Default	
	Standard > 3GPP	3GPP PA3 (UE)
	State	On

   Perform the same fading settings in path B.
3. Open the "AWGN Settings" dialog in path A (e.g. "AWGN/IMP A > AWGN") and perform the following settings:

   Table 6-3: AWGN Settings

R&S SMU Dialog	Parameter Name	Value
AWGN Settings	Mode	Additive Noise
	System Bandwidth	3.84 MHz
	Minimum Noise/System Bandwidth Ratio	3.5
	Reference Mode	Noise
	Noise Level (System Bandwidth)	-60 dBm
	Carrier/Noise Ratio	13.61 dB
	State	On

Configuring the 3GPP FDD signal of the serving cell (Baseband A)

1. Open the "3GPP FDD" main dialog in path A (e.g. "Baseband Block > 3GPP FDD") and perform the following settings:

Table 6-4: Configuration Settings for R&S SMU Path A

R&S SMU Dialog	Parameter Name	Value
3GPP FDD A Main Dialog	Link Direction	Downlink
Basestation BS1	Preset Channel Table	Reset
		HSDPA H-Set
Basestation BS1 > Channel Table > HS-SCCH Enhanced Channel Config > Enhanced HSDPA Mode	Predefined H-Set	6 (QPSK)
	HARQ Mode	Constant NACK
	Redundancy Version Sequence	0,2,5,6
	Current ARB Seq. Length	Adjust
Basestation BS1	P-CPICH Power	-9.9 dB
	P-CCPCH Power	-11.9 dB
	P-SCH Power	-14.91 dB
	S-SCH Power	-14.91 dB
	PICH Power	-14.9 dB
	DPCH Power (Channel#11)	-8.4 dB
	HS-PDSCH Power	-12.9 dB
	HS-SCCH1 Power	-8.4 dB
	P-CPICH/P-CCPCH/P-SCH/S-SCH/PICH/ DPCH (Channel#11) State	On
	Domain Conflict	Resolve Domain Conflicts
	DPCH Channelization Code	96
	HS-SCCH Channelization Code	2
Basestation BS1 > Channel Table > DPCH Enhanced Channel Configuration	Channel Coding State	On
	Enhanced State	On
Trigger/Marker/Clock	Mode	Auto

2. Use the "Save/Recall" function to save the settings made for path A.

Configuring the 3GPP FDD signal of the secondary serving cell (Baseband B)

1. Use the "Save/Recall" function to load the settings made for path A into path B.
2. In the "Baseband B > 3GPP FDD B > Basestation BS1" dialog, disable the channels P-CCPCH, P-SCH, S-SCH, PICH and DPCH.
3. In the "Baseband B > 3GPP FDD B" dialog, select the "OCNS Mode" HSDPA and set the "OCNS State" to On.

4. In the "3GPP FDD B > Trigger/Marker" dialog, enable trigger mode "Armed Retrigger" and trigger source "Internal (Baseband A)".

6.2.5 Possible Extensions

The test configuration can be extended for testing DUTs with two antennas in several multi-path fading environments.

The following additional options are necessary:

- 1 x Option R&S SMU-K62, "Additive White Gaussian Noise (AWGN)"
- 1 x Option R&S SMU-K74, "MIMO Fading"
- one of the frequency options, e.g. R&S SMU-B203

6.2.6 References

- [1] 3GPP TS 34.121 "User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 1: Conformance specification (Release 9)"
- [2] 3GPP TS 25.306 "UE Radio Access capabilities (Release 9)"
- [3] 3GPP TS 34.108 "Common test environments for User Equipment (UE); Conformance testing (Release 9)"

6.3 Generating a test signal for 3i Enhanced Performance Requirements Tests

This application sheet describes how to configure the R&S SMU to generate the downlink signals for Enhanced Performance Type 3i tests. Typical examples are the Type 3i subclauses of the "Demodulation of HS-DSCH" tests described in clause 9.2. of the 3GPP TS 34.121 [1].

The technical specification 3GPP TS 34.121 [1] is used as guideline for this description and some of the values/methods proposed in this document may differ from the values/methods defined in the standard.

6.3.1 Options and Equipment Required

The following equipment is required:

- 2 x two-path Vector Signal Generator R&S SMU equipped with:
  - Firmware version 2.15.303.xx or later. Latest firmware version recommended.
  - one of the baseband options per path, e.g. R&S SMU-B10
  - one of the frequency options, e.g. R&S SMU-B103
- 3 x Option R&S SMU-K42, "Digital Standard 3GPP FDD"

- 3 x Option R&S SMU-K43, "3GPP FDD enhanced MS/BS tests incl. HSDPA"
- 3 x Option R&S SMU-K59, "Digital Standard HSPA+"
- 4 x Option R&S SMU-B14/B15, "Fading Simulator/Fading Simulator Extensions"
- 2 x Option R&S SMU-K62, "Additive White Gaussian Noise (AWGN)"

If the wanted signal is generated by a Radio Communication Tester instead (see chapter 6.3.5, "Possible Extensions", on page 277), one R&S SMU is enough for the two interfering signals. If, however, the radio communication tester does not support fading itself, a second R&S SMU might be required as fading simulator.

6.3.2 Test Setup

The following figure shows an example of a possible test setup.

The proposed test method is not fully compliant to the test requirements, because there is no HARQ feedback from the device under test (DUT) to the serving cell (the first R&S SMU).

For an example on how to extend the test case to be compliant to the test requirements, see chapter 6.3.5, "Possible Extensions", on page 277.

However, this test configuration is sufficient for tests during the development phase of the DUTs.

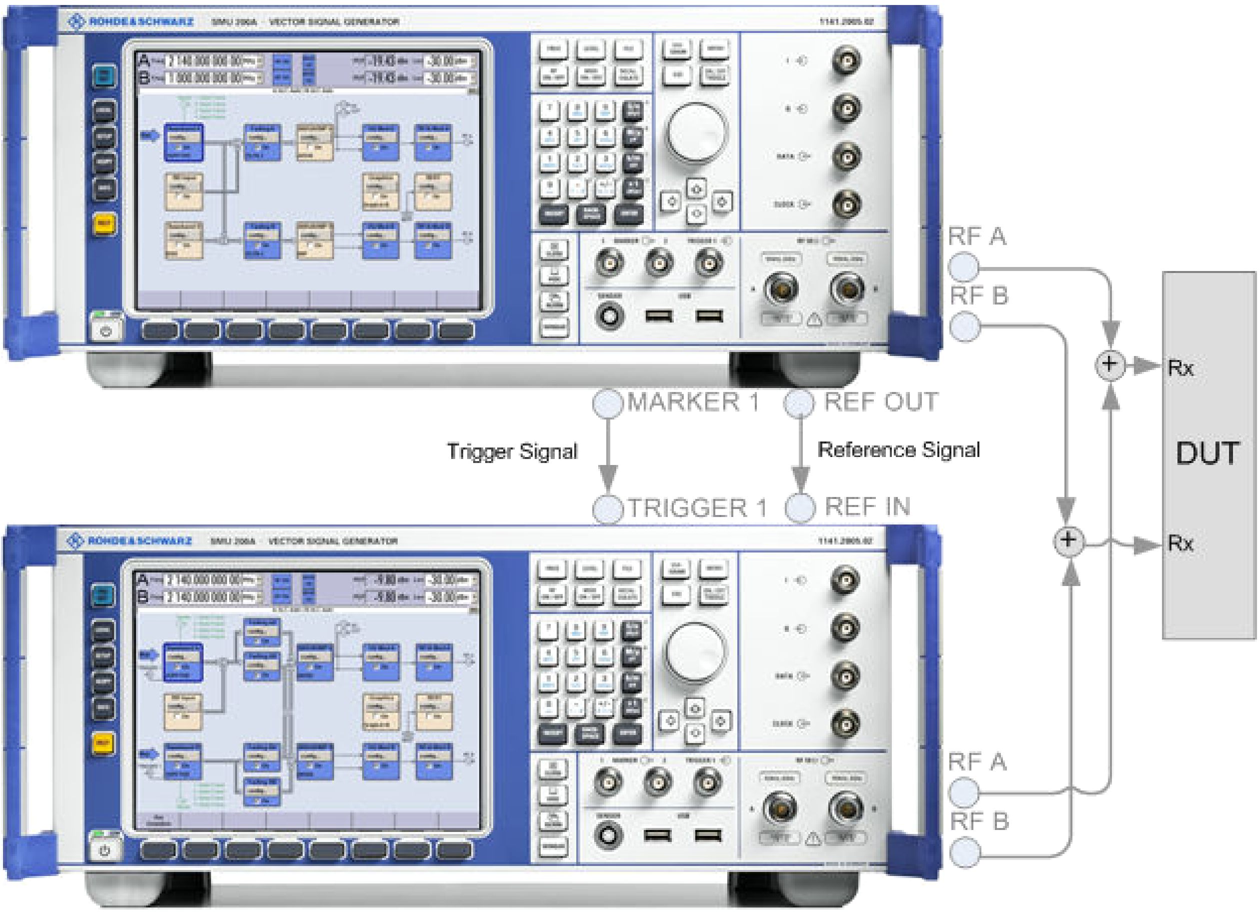


Fig. 6-4: Example of Test Setup

First R&S SMU = Serving cell; The signal of both diversity paths is faded
Second R&S SMU = Two interfering cells; The signal of both diversity paths is faded and AWGN is applied.

6.3.3 Assumptions

The performance requirements for HS-DSCH demodulation tests are defined as minimum performance requirements for the UEs supporting one of the HS-DSCH categories 7-24. The 3GPP TS 34.121 [1] defines tests with several H-Sets per UE category, as well as different propagation conditions and power levels.

The example in this document does not cover all possible cases but focuses on one particular example. An overview of the possible settings is provided in table 6-5.

The HSDPA test parameters for testing Single Link Performance (Enhanced Performance Requirements Type 3i - QPSK FRC H-Set 6) are defined in Table 9.2.3B, [1], Table 9.2.1L.4, [1], , Table 9.2.1L.1, [1], Table E.5.9, [1], Table E.5.8, [1], and chapter E.5E, [1]

Table 6-5: HSDPA test parameters for testing Single Link Performance - Enhanced Performance Requirements Type 3i - QPSK FRC H-Set 6 (example)

Parameter	Value	Remark
Performance Requirements	Enhanced Performance Requirements Type 3i	according to Table 9.2.3B, [1]
HS-DSCH UE Category	Category 7	according to Table 9.2.3B, [1]
Fixed Reference Channel	H-Set 6	according to Table 9.2.3B, [1]
$\hat{I}_{or}/I_{oc}$	0.76 dB	according to Table 9.2.1L.4, [1]
Modulation	QPSK	determines that test parameters for testing QPSK FRC H-Set 6 are used
I_{oc}	-60 dBm/3.84 MHz	according to Table 9.2.1L.1, [1]
Redundancy and Constellation Version Coding Sequence	{0,2,5,6}	according to Table 9.2.1L.1, [1]
Maximum Number of HARQ Transmissions	4	according to Table 9.2.1L.1, [1]
Propagation Conditions	PB3	according to Table 9.2.1L.4, [1]
HS-PDSCH E_c/I_{or}	-2.9 dB	according to Table 9.2.1L.4, [1]
Level Set for HSDPA Measurements	Level Set 3	according to Table E.5.9, [1]
P-CPICH E_c/I_{or}	-9.9 dB	according to Table E.5.8, [1]
P-CCPCH E_c/I_{or}	-11.9 dB	according to Table E.5.8, [1]
SCH E_c/I_{or} 1)	-11.9 dB	according to Table E.5.8, [1]
PICH E_c/I_{or}	-14.9 dB	according to Table E.5.8, [1]
HS-SCCH1 E_c/I_{or}	-8.4 dB	according to Table E.5.8, [1]
DPCH E_c/I_{or}	-8.4 dB	according to Table E.5.8, [1]
OCNS	ON	
OCNS Mode	3i	according to E.5E, [1]
Scrambling Code First Interferer	0x10	according to E.5E.2, [1]
Scrambling Code Second Interferer	0x20	according to E.5E.2, [1]
Frame Offset First Interferer	2576 chips	according to E.5E.2, [1]
Frame Offset Second Interferer	1296 chips	according to E.5E.2, [1]

1) The specification defines the common SCH power of both P-SCH and S-SCH. The power level of each of these two channels is then 3.01 dB less then the given level, i.e. -14.91 dB.

6.3.4 Example for Signal Configuration for Testing Type 3i

To generate a test signal of the interfering cells for typical 3i Enhanced Performance Requirement test, adjust the settings of the instruments as described in the following.

General Workflow

1. Connect the test equipment, see figure 6-4.
2. Preset the instruments to ensure a defined instrument state.
3. Adjust the RF Frequency.
4. Set "RF A > State > ON" and "RF B > State > ON".
5. Perform the steps required to establish a connection setup.
6. Adjust the 3GPP FDD settings of the serving and the interfering cells, see chapter 6.3.4.1, "Generating the Signal of the Serving Cell", on page 275 and chapter 6.3.4.2, "Generating the Signal of Two Interfering Cells", on page 276.
7. In the first instrument, enable the generation of the 3GPP FDD serving cell signal, i.e. set the "Baseband A > 3GPP FDD > State > ON".

   The marker output of the first instrument is connected to the trigger source of the second one to achieve correct frame offsets between the interfering cells and the serving cells.
8. Measure the information bit **Throughput** of the serving cell to verify the receiver's ability to meet the desired performance requirements.

6.3.4.1 Generating the Signal of the Serving Cell

Configuring the 3GPP FDD signal serving cell (first instrument)

1. Open the "3GPP FDD" main dialog in path A (e.g. "Baseband A > 3GPP FDD") and select "Link Direction > Downlink".
2. Select "Basestation BS1 > Reset All Channels" and "Preset to HSDPA H-Set"
3. In the "Basestation BS1" dialog, select "Channel Table > HS-SCCH Enh / HSDPA Settings > HS-SCCH Config..."
4. Select "Predefined H-Set > 6 (QPSK)"
5. Adjust the parameter "Total HS-PDSCH Power".
6. Perform "Current ARB Sequence Length > Adjust".
7. In the "Basestation BS1 > Channel Table", configure the power level of all required common channels (e.g. P-CPICH, P-SCH, S-SCH, P-CCPCH, PICH and HS-SCCH) and activate them.
8. Configure the "Channelization Code" of all active channels, e.g. P-CPICH: 0, P-CCPCH: 1, PICH: 2, HS-SCCH:7, first HS-PDSCH:1

Perform "Domain Conflict > Resolve Domain Conflicts" if conflicts occurred.

9. Configure the "Common Settings > Scrambling Code" to a value suitable for the DUT.
10. Select "3GPP FDD > OCNS > ON" and enable "OCNS Mode > 3i"

    Tip: The OCNS power levels in the channel table will be adjusted after the signal generation is enabled.
11. Select "3GPP FDD > Filter/Clipping/ARB Settings" and adjust the "ARB Sequence Length".

    Tip: A suitable value of the "Sequence Length" is a multiple of the "Suggested ARB Sequence Length". The sequence should be long enough for a realistic simulation of the power control procedures for the serving cell's other user's channels (OCNS channels).
    A multiple of the "Suggested ARB Sequence Length" also ensures a proper repetition of the HARQ processes in the generated signal.
12. Use the "Save/Recall" function to save the settings made in the first instrument.
13. Select "Baseband A > Signal Routing > Route to path A and to path B" to enable diversity.

Configuring the Fading Simulator

1. Open the "Fading Settings" dialog in path A (e.g. "Fading > Fading Settings") and perform the following settings:
    a) Select "Set to Default"
    b) Select "Standard > 3GPP > 3GPP PB3 (UE)"
    c) Set "State > ON"
2. Perform the same settings in path B.

6.3.4.2 Generating the Signal of Two Interfering Cells

Configuring the First Interfering Cell Signal

1. Use the "Save/Recall" function to load the settings made in the first instrument.
2. In the "Basestation BS1" dialog, select "Channel Table > HS-SCCH Enh / HSDPA Settings > HS-SCCH Config..."
3. Enable "Randomly Varying Modulation and Number of Codes > State > ON" and if required adjust the remaining parameters.
4. In the "Basestation BS1 > Channel Table", re-configure the power level of all required common channels.
5. To disable the HS-SCCH in the H-Set, set its power level to -80 dB.
6. Adjust the "Channelization Code" of all active channels.
    Perform "Domain Conflict > Resolve Domain Conflicts" if conflicts accrued.

7. Adjust the "Common Settings > Scrambling Code"
8. Select "3GPP FDD > Trigger/Marker" and select "Trigger Mode > Armed Auto", "Source > External (TRIGGER 1)" and set "External Delay > 2576 chips" to enable frame offset for the first interfering signal.
9. Select "3GPP FDD > Filter/Clipping/ARB Settings" and adjust the "ARB Sequence Length".
10. Use the "Save/Recall" function to save the settings made for path A.
11. Enable "3GPP FDD > State > On"

Configuring the Second Interfering Cell Signal

1. Open the "3GPP FDD" main dialog in path B (e.g. "Baseband B > 3GPP FDD") and use the "Save/Recall" function to load the settings made for path A into path B.
2. Adjust the "Basestation BS1 > Common Settings > Scrambling Code", "3GPP FDD > Filter/Clipping/ARB Settings > ARB Sequence Length" and the "3GPP FDD > Trigger/Marker > External Delay > 1296 chips"
3. Enable "Baseband B > 3GPP FDD > State > On"

Configuring the AWGN Noise Source and the Fading Simulator

1. Select "Fading A > Signal Routing > 2x2 MIMO" to enable the routing of both interfering signals to both RF outputs.
2. Open the "Fading Settings" dialog in path A (e.g. "Fading > Fading Settings") and perform the following settings:
   a) Select "Set to Default"
   b) Select "Standard > 3GPP > 3GPP PB3 (UE)"
   c) Set "State > ON"

   Tip: To simulate two interfering cells with unequal power levels, modify the MIMO Matrices: select "Fading MIMO > Path Table", adjust the "Matrix" settings for all fading paths and apply settings with "Accept".
   Refer to [3] for detailed information.
3. Open the "AWGN Settings" dialog in path A (e.g. "AWGN/IMP A > AWGN"), adjust the settings according to the test requirements and enable the AWGN.
   Perform the same AWGN settings in path B.

6.3.5 Possible Extensions

The test configuration can be extended to be compliant to the 3GPP TS 34.121 [1].

The following additional equipment is necessary:

- 1 x Radio Communication Tester, which supports 3i serving cell functionality.

Configure the radio communication tester to generate the signal of the serving cell and to receive the UL transmission of the DUT. If the radio communication tester does not support fading simulation itself, use the first R&S SMU to simulate the required fading conditions.

6.3.6 References

- [1] 3GPP TS 34.121 "User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 1: Conformance specification (Release 9)"
- [2] 3GPP TS 25.306 "UE Radio Access capabilities (Release 9)"
- [3] Rohde & Schwarz, Application Note 1GP80 "3GPP FDD and LTE Multicell and Multi-UE Scenarios with the R&S®SMU200A Signal Generator"

7 Test Case Wizard

This chapter describes the "Test Case Wizard", provided for tests on Base Stations in Conformance with the 3G Standard 3GPP FDD.

Test Case Wizard is supported only by R&S SMU and R&S SMATE.

The following chapters describe the full functionality of the Test Case Wizard. Some of them require a Fading Simulator and hence are not supported by the R&S SMATE.

Expect as noted otherwise, the screenshots, pictures and figures in this chapter show an R&S SMU.

7.1 Introduction

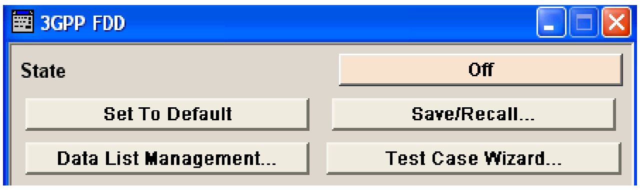
The Test Case Wizard supports tests on base stations in conformance with the 3G Standard 3GPP-FDD. It offers a selection of predefined settings according to Test Cases in TS 25.141.

The basic equipment layout for the test is the same as for the 3GPP FDD signal generation. It includes the options Baseband Main Module (B13), Baseband Generator (B10/B11) and Digital Standard 3GPP FDD (K42). However, some of the tests require further options. An overview of the available test cases is given is in "Test Case" on page 283.

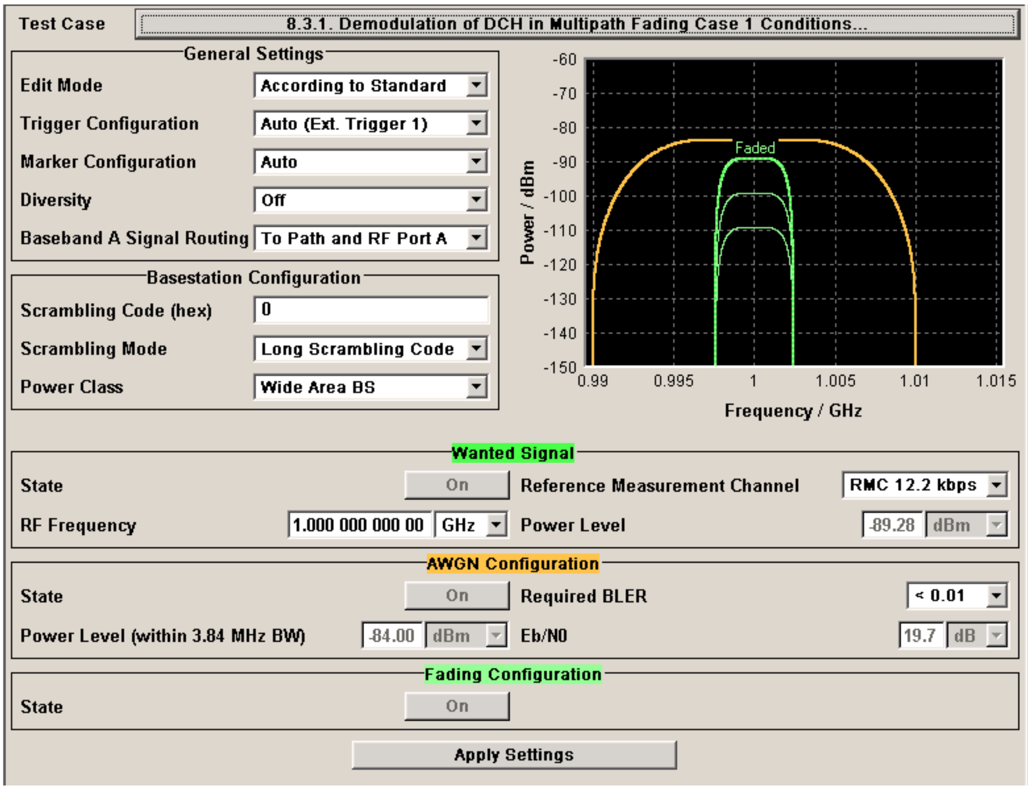
The Test Case Wizard has effect on frequency and level settings, link direction, trigger, baseband clock source, marker settings and base station or user equipment configuration. Besides the 3GPP required settings also interfering signals (AWGN, CW interferer, co-located modulation signals) or fading profiles are set.

The degree of freedom in setting the parameters can be determined. The "According to Standard" edit mode allows only settings in compliance with TS 25.141. The "User Definable" edit mode allows a wider range of settings.

The menu for selecting the 3GPP FDD test is either called in 3GPP FDD menu from the baseband block or from the menu tree under Baseband 3GPP FDD.



Button "Test Case Wizard" opens the menu.



The "Test Wizard" dialog is divided into several sections:

- At the top of the panel, the test case is selected. In the "General Settings" section the edit mode and the general signal generator parameters are set.
- The base station parameters are input in the "Basestation Configuration" section.
- The graph in the right upper section symbolizes the interference scenario defined by power level and frequency offset.
- The middle section depends on the selected test case. It displays the input/output parameters of the wanted and the interfering signals and further configuration entries besides the default settings.
- Button "Apply Settings" activates the preset settings for the selected test case. Further modification of the generator settings is still possible. Signal generation starts with the first trigger event.

General workflow for creating complex test scenarios

With the "Test Case Wizard", you can create highly complex test scenarios with just a few keystrokes, see the following example:

1. Preset the signal generator
2. Open the "Baseband > 3GPP FDD > Test Case Wizard" dialog
3. Select one of the provided test cases
4. Enter the specific settings for the selected test case , e.g. frequency, level, …
5. Execute "Apply Settings" to activate the selected configuration

6. Enable the RF output and further refine the generator settings if required
7. Start signal generation by a trigger from the base station at connector TRIGGER1.

7.1.1 General Considerations

Test Frequencies

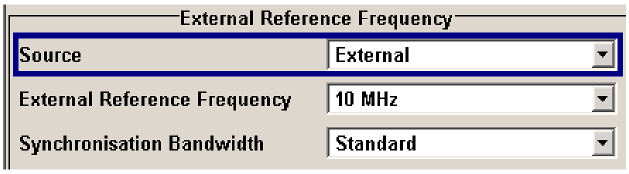
For 3GPP-FDD, several paired frequency bands are used. The following table shows start and stop frequencies of both uplink (UE transmit, node B receive) and downlink (node B transmit, UE receive) frequency bands according to 3GPP.

Operating band	Uplink frequencies UE transmit, node B receive	Downlink frequencies UE receive, node B transmit
I	1920 MHz to 1980 MHz	2110 MHz to 2170 MHz
II	1850 MHz to 1910 MHz	1930 MHz to 1990 MHz
III	1710 MHz to 1785 MHz	1805 MHz to 1880 MHz
IV	1710 MHz to 1755 MHz	2110 MHz to 2155 MHz
V	824 MHz to 849MHz	869 MHz to 894MHz
VI	830 MHz to 840 MHz	875 MHz to 885 MHz

The measurements that have to be performed according to 3GPP in order to verify proper operation of FDD systems apply to appropriate frequencies in the bottom, middle and top of the operating frequency band of the base station (BS). These frequencies are denoted as RF channels B (bottom), M (middle) and T (top).

Reference Frequency

When building up the measurement setups according to TS 25.141 it might be useful that all the instruments share a common reference clock. However, after "Preset" the signal generator uses its internal clock reference. In order to feed in the clock of an external clock the RF module configuration should be switched to external reference frequency.



In the external reference mode an external signal with selectable frequency and defined level must be input at the REF IN connector . This signal is output at the REF OUT connector. The reference frequency setting is effective for both paths. For very good reference sources of high spectral purity a wideband setting is provided.

Trigger Signal

For test cases with channel coded signal, e.g. an activated RMC, the base station that triggers the signal generation must emit an 'SFN (System Frame Number) mod 4' periodic trigger. A simple SFN periodic trigger probably will disturb the channel coding scheme.

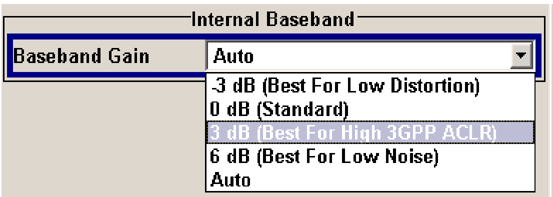
Baseband Clock

The clock source is automatically switched to internal when the test case settings are activated.

Improvement of signal quality

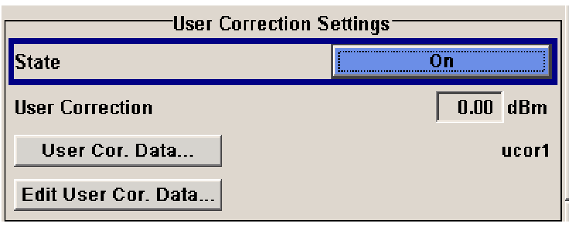
Improvement of signal quality is possible via several settings:

- In the "I/Q Settings" menu the internal baseband gain can be set to improved ACLR performance (3 dB or 6 dB)



- In the "Automatic Level Control Settings" menu the RF output level can be recalibrated with "Search Once" in "Sample&Hold" mode. This is recommended if in CW mode the signal/intermodulation ratio is to be improved for multi-transmitter measurements. With setting "Auto", the level control is automatically adapted to the operating conditions, it may cause increased intermodulations, however.

- In the "User Correction" menu a list of correction values can be created and subsequently activated. Thus, the frequency response of the test setup can be taken into account .



- In order to compensate cable loss and additionally inserted attenuators, the RF level can directly be adjusted in the "Level" input field.

- Additional settings in the impairments section of the AWGN block

7.1.2 General Settings

In the General Settings section the edit mode and the general signal generator parameters are set.

Test Case

Selects the test case.

The following table gives an overview of the available test cases, the type of signal transmitted by the signal generator and the required additional options besides the basic configuration. An equipment layout as required for 3GPP FDD signal generation for one-path instruments is assumed to be the basic configuration.

Table 7-1: Transmitter Tests

TS 25.141 chapter	Test case	Generator Signal	Additional options
6.4.2	Power control steps: Output power dynamics	Uplink	-
6.6	Transmit intermodulation	Interferer (downlink)	-

Table 7-2: Receiver Tests

TS 24.141 chapter	Test case	Generator Signal	Additional signal generator options
7.2	Reference sensitivity level	Uplink	-
7.3	Dynamic range	Uplink, AWGN	K62, AWGN
7.4	Adjacent Channel Selectivity (ACS)	Uplink, Interferer	B20x, RF path B 2nd B13, Baseband Main Module 2nd B10, Baseband Generator, 2nd K42, 3GPP FDD
7.5	Blocking characteristics	Uplink, Interferer	B20x, RF path B 2nd B13, Baseband Main Module 2nd B10, Baseband Generator, 2nd K42, 3GPP FDD
7.6	Intermodulation characteristics	Uplink, 2 x Interferer	B20x, RF path B 2nd B13, Baseband Main Module 2nd B10, Baseband Generator, 2nd K42, 3GPP FDD K62, AWGN
7.8	Verification of the internal BER calculation	Uplink	-

TS 24.141 chapter	Test case	Generator Signal	Additional signal generator options
8.2.1	Performance requirement - Demodulation in static propagation conditions: Demodulation of DCH	Uplink, AWGN	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN
8.3.1	Performance requirement - Demodulation of DCH in multipath fading conditions: Multipath fading case 1	Uplink, AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.3.2	Performance requirement - Demodulation of DCH in multipath fading conditions: Multipath fading case 2	Uplink, AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.3.3	Performance requirement - Demodulation of DCH in multipath fading conditions: Multipath fading case 3	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.3.4	Performance requirement - Demodulation of DCH in multipath fading conditions: Multipath fading case 4	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.4	Demodulation of DCH in moving propagation conditions	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.5	Demodulation of DCH in birth/death propagation conditions	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.6	Verification of the internal BLER calculation	Uplink	B20x, RF path B 2nd B13, Baseband Main Module

TS 24.141 chapter	Test case	Generator Signal	Additional signal generator options
8.8.1	RACH performance: RACH preamble detection in static propagation conditions	Uplink AWGN	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN
8.8.2	RACH performance: RACH preamble detection in multipath fading case 3	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.8.3	RACH performance: Demodulation of RACH message in static propagation conditions	Uplink AWGN	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN
8.8.4	RACH performance: Demodulation of RACH message in multipath fading case 3	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.9.1	CPCH performance: CPCH access preamble and collision detection, preamble detection in static propagation conditions	Uplink AWGN	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN
8.9.2	CPCH performance: CPCH access preamble and collision detection, preamble detection in multipath fading case 3	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options
8.9.3	CPCH performance: Demodulation of CPCH message in static propagation conditions	Uplink AWGN	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN
8.9.4	CPCH performance: Demodulation of CPCH message in multipath fading case 3	Uplink AWGN Fading	B20x, RF path B 2nd B13, Baseband Main Module 2x K62, AWGN B14, B15, K71, Fading Options

Remote command:
[:SOURce]:BB:W3GPp:TS25141:TCASe on page 559

Edit Mode
Selects the edit mode.

"According to Standard"
Only settings in compliance with TS 25.141 are possible in the wizard panel.

"User Definable"
A wider range of settings is possible in the wizard panel.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:EMODe on page 550

Trigger Configuration
Selects the trigger configuration. The trigger is used to synchronize the signal generator to the other equipment.

"Auto" The trigger settings are customized for the selected test case. In most cases trigger setting "Armed Auto" with external trigger source "External Trigger 1" is used. Unless otherwise noted the trigger delay is set equal to zero. Thus, the base station frame timing is able to synchronize the signal generator by a SFN (System Frame Number) periodic trigger. If the signal generator offers a channel coded signal (as all the Reference Measurements Channels require) the base station must emit a 'SFN mod 4' periodic trigger.

"Unchanged" The current trigger settings of the signal generator are retained unchanged.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:TRIGger on page 560

Marker Configuration
Selects the marker configuration. The marker can be used to synchronize the measuring equipment to the signal generator.

"Auto" The marker settings are customized for the selected test case. In most cases "Radio Frame" markers are output. Unless otherwise noted the marker delays are set equal to zero.

"Unchanged" The current marker settings of the signal generator are retained unchanged.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:TRIGger:OUTPut on page 560

Diversity
Selects the signal routing according to the base station's diversity processing capability.

"ON" The test signal is routed to both RF outputs.

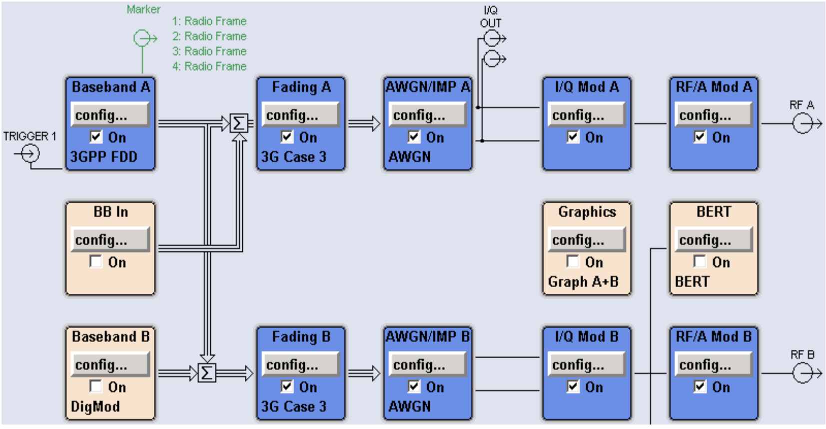


Fig. 7-1: Signal routing R&S SMU

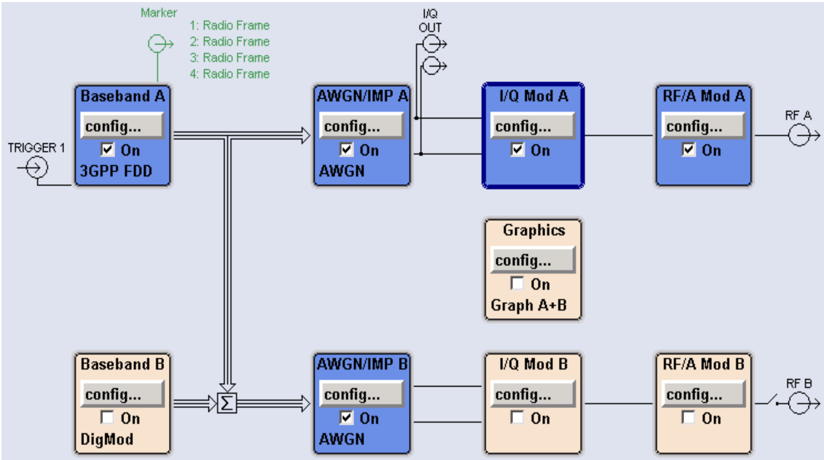


Fig. 7-2: Signal routing R&S SMATE

"Off" The test signal is routed to the selected RF output.

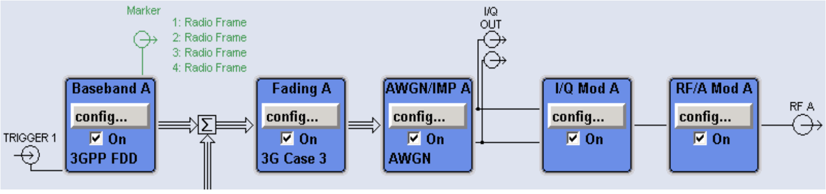


Fig. 7-3: Signal routing R&S SMU

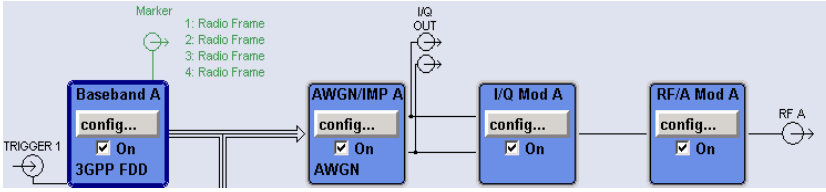


Fig. 7-4: Signal routing R&S SMATE

Remote command:
[:SOURce]:BB:W3GPp:TS25141:RXDiversity on page 558

Baseband A Signal Routing

Selects the signal routing for baseband A signal which in most test cases represents the wanted signal (exception test case 6.6).

"A" The baseband signal A is routed to RF output A.

"B" The baseband signal A is routed to RF output B.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:ROUTe on page 557

7.1.3 Basestation Configuration

The base station parameters are input in the "Basestation Configuration" section.

Scrambling Code (hex)

Enters the scrambling code.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:SCODe on page 558

Scrambling Mode

Sets the type of scrambling code.

With scrambling code, a distinction is made between "Long" and "Short Scrambling Code" for uplink signals. For downlink signals (test case 6.6) the scrambling code generator can be switched on and off.

"On " (downlink only)
Enables scrambling code generator.

"Off" Disables scrambling code generator for test purposes.

"Long Scrambling Code"
(uplink only)
Sets the long scrambling code.

"Short Scrambling Code"
(uplink only)
Sets short scrambling code.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:SCODe:MODE on page 558

Power Class
Enters the base station power class. The selected power class determines the output level of the signal generator. The output level is indicated in the "Wanted Signal" section of the Wizard panel.

For edit mode "User Definable", the output level can be set in the "Wanted Signal" section of the Wizard panel.

"Wide Area BS"
Enables power class wider area BS

"Medium Range BS"
Enables power class medium range BS

"Local Area BS"
Enables power class local area BS

Remote command:
[:SOURce]:BB:W3GPp:TS25141:BSPClass on page 549

7.1.4 Apply

Apply Settings
Activates the current settings of the test case wizard.

Initialization of the signal generator with the test case settings is performed by a partial reset that includes only the baseband, fading and AWGN module and the RF frequency and RF level settings. Other settings of the signal generator are not altered.

Before triggering the signal generator the user still can change these other settings. This is particularly useful when compensating for cable loss and additionally inserted attenuators by adjusting the RF power levels is required.

Signal generation is started at the first trigger received by the generator. The RF output is not activated /deactivated by the test case wizard, so care has to be taken that RF State is On at the beginning of the measurement.

Note: For safety reasons the RF is not active unless the button RF ON has been pressed.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:TCASe:EXECute on page 559

7.2 Receiver Tests

7.2.1 Overview

7.2.1.1 Basic Configuration

The test cases for receiver tests require at least the following equipment layout for the signal generator:

- Digital Standard 3GPP FDD (K42)
- Universal Coder / Arbitrary Waveform Generator (B10/B11),
- Baseband Main module (B13),
- Frequency option (B10x: RF 100 kHz - x GHz).

If the test case requires further options they are listed together with the description of the test case.

Receiver test can be performed with the signal generator only, i.e. without additional measuring equipment.

7.2.1.2 Test Setups - Receiver Tests

The tests can be performed using the standard test setup according to TS 25.141. Test setups beside the two standard test setups described below are specified at the Test Case description.

Standard Test Setup - One Path

In case of two-path instruments, signal routing to path A is assumed. RF port A outputs the wanted signal (with or without fading and/or interference) and is connected to the Rx port of the base station. The signal generator will start signal generation at the first received BS frame trigger.

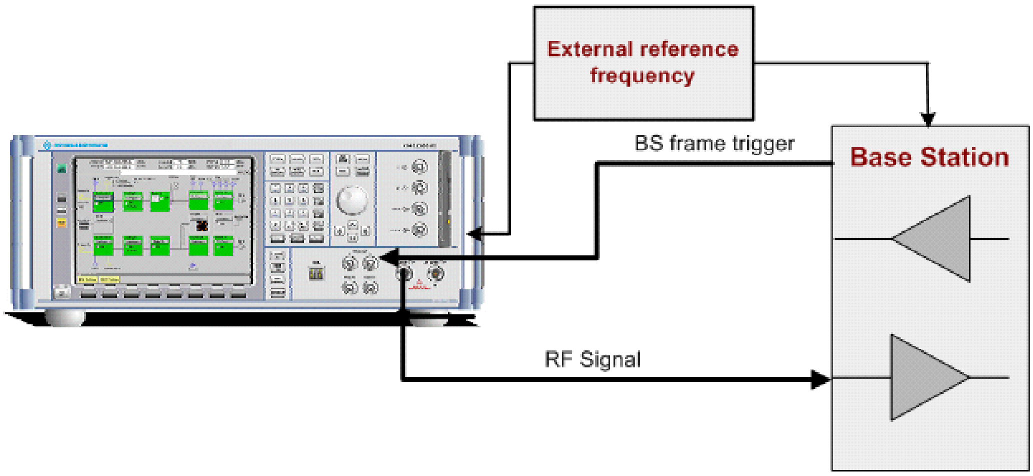


Fig. 7-5: Standard Test Setup (One Path) R&S SMU

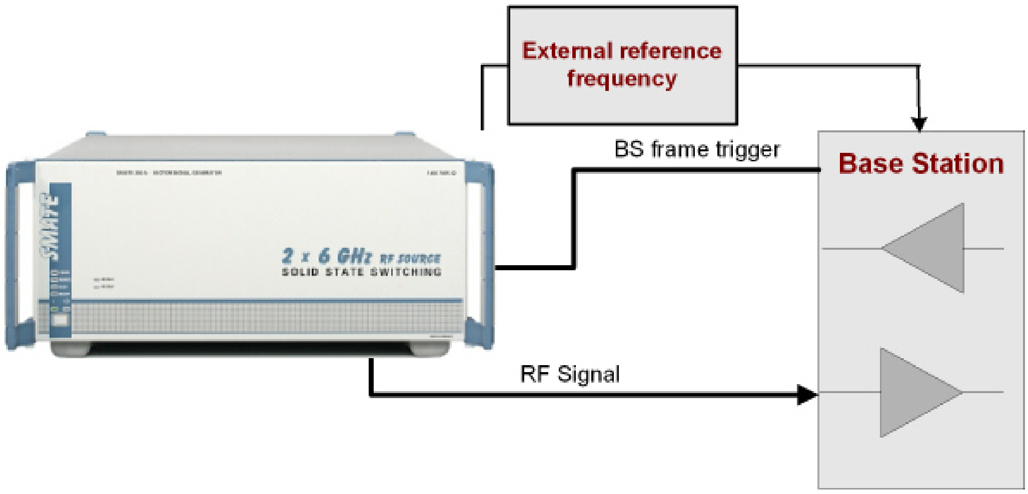


Fig. 7-6: Standard Test Setup (One Path) R&S SMATE

For two-path instruments it is also possible to route baseband signal A to RF output B and connect RF output B to the Rx port of the base station.

Example: Signal Routing "To Path and RF port A" for test case 6.3.2 Multipath Fading Case 2

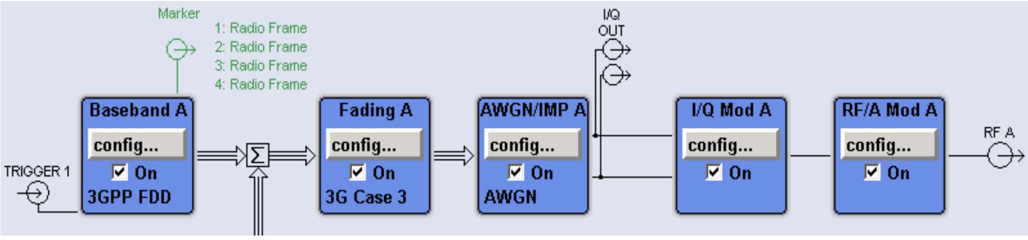


Fig. 7-7: Signal routing R&S SMU

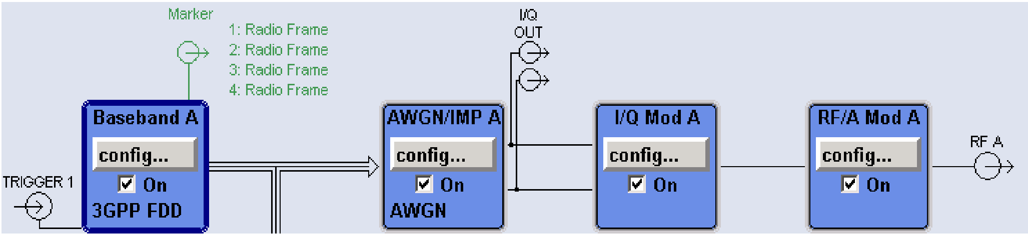


Fig. 7-8: Signal routing R&S SMATE

Standard Test Setup - Two Paths

For two-paths measurements, the test cases always require option second RF path, a second option Baseband Main Module (B13) and at least one option to generate the interfering signal in addition to the basic configuration. The signal routing can be selected, the wanted signal can be provided either at output RF A or at output RF B.

The signal generator outputs the reference measurement channel signal (= wanted signal) at output RF A and the interfering signal(s) at output RF B. After combining the two(three) signals the sum signal is fed into the base station Rx port. The signal generator will start signal generation at the first received BS frame trigger.

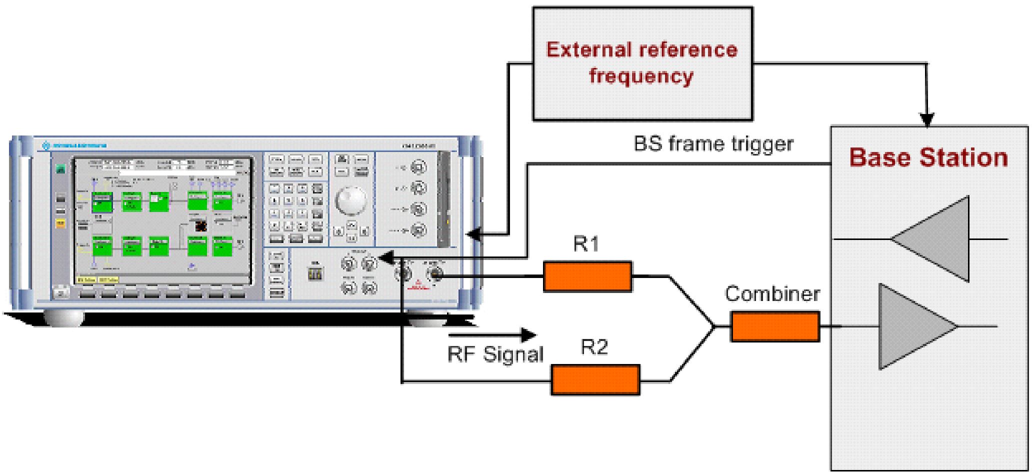


Fig. 7-9: Standard Test Setup (Two Paths) R&S SMU

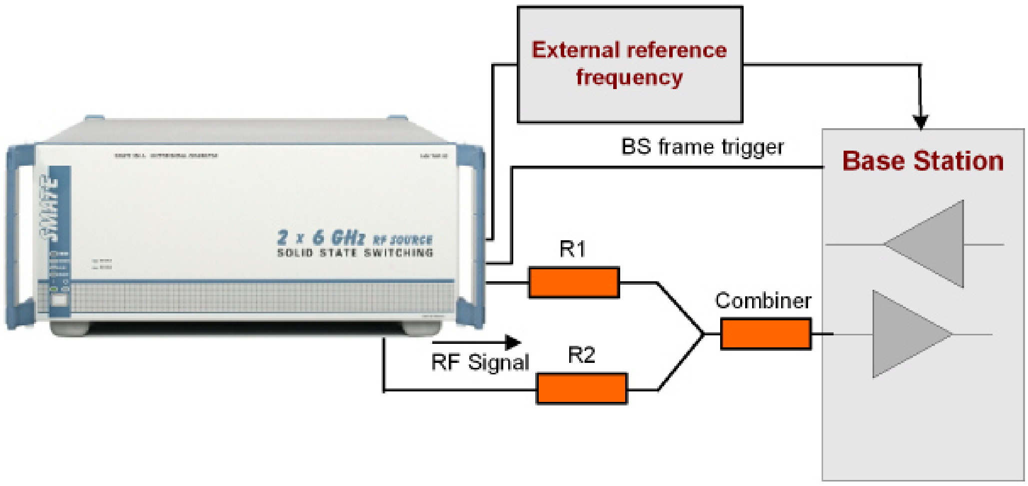


Fig. 7-10: Standard Test Setup (Two Paths) R&S SMATE

Example: Signal Routing To Path and RF port A for test case 7.6 Intermodulation Characteristics

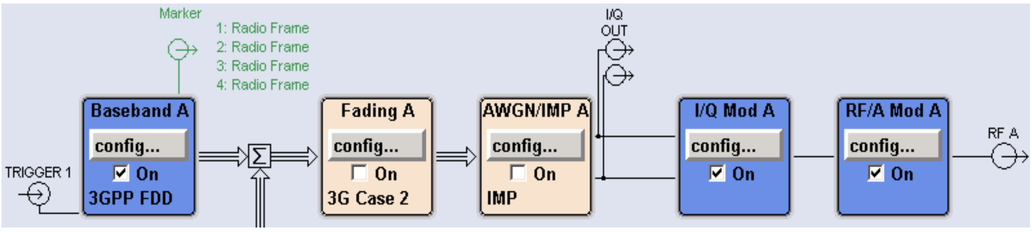


Fig. 7-11: Sigan Routing R&S SMU

Example: Signal Routing To Path and RF port B for test case 7.6 Intermodulation Characteristics

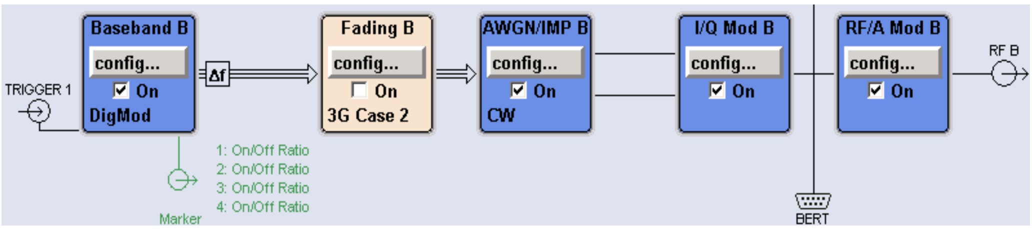


Fig. 7-12: Sigan Routing R&S SMU

Standard Test Setup - Diversity Measurements

For **diversity measurements**, the test cases always require at least option Second RF path (B20x) and a second option Baseband Main Module (B13) in addition to the basic configuration. The signal routing is fixed.

RF output A and RF output B transmit the corrupted reference measurement channel signal (wanted signal) and are connected to the Rx ports of the base station for diversity reception. The signal generator will start signal generation at the first received BS frame trigger.

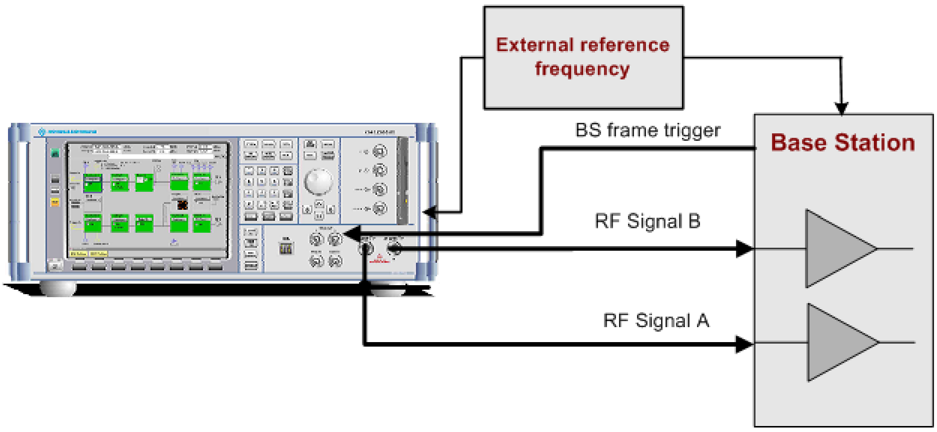


Fig. 7-13: Standard Test Setup (Diversity Measurements) R&S SMU

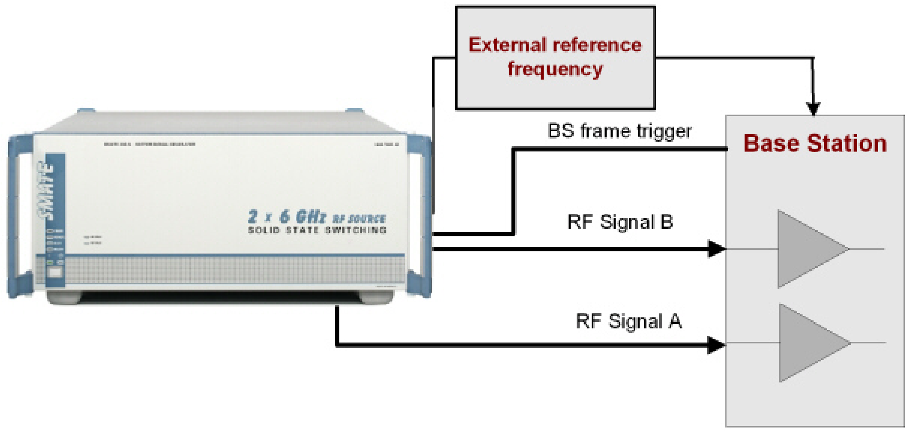


Fig. 7-14: Standard Test Setup (Diversity Measurements) R&S SMATE

Example: Signal Routing for test case 8.3.1 Multipath Fading Case 1

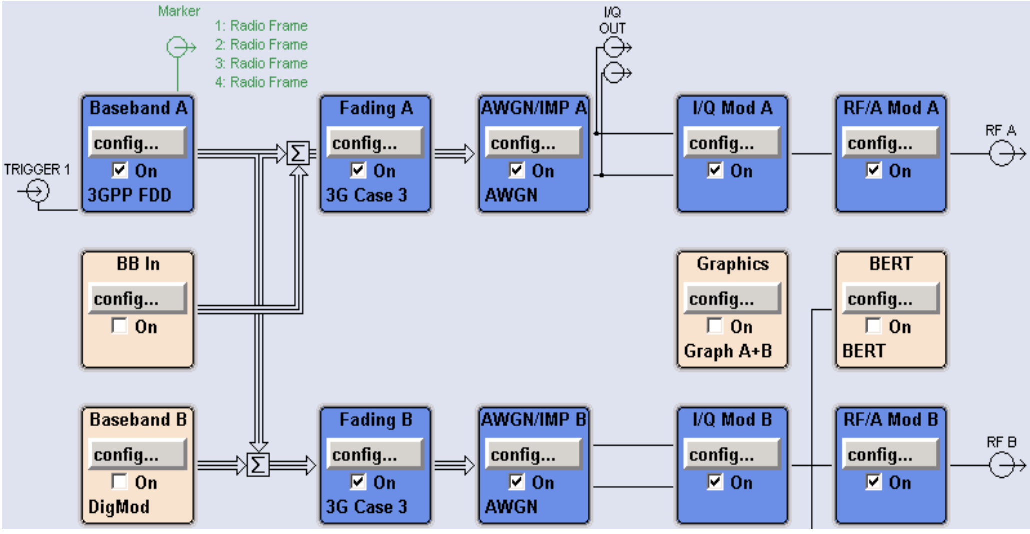


Fig. 7-15: Signal Routing R&S SMU

As signal routing takes place at the output of the baseband block, the interference settings of the two paths are identical for diversity measurments.

7.2.1.3 Carrying Out a Receiver Test Measurement

The following instructions lists the general steps for performing a receiver test. Specific requirements are described together with the individual test case.

1. Set the base station to the basic state
   a) Initialize the base station,
   b) Set the scrambling scheme,
   c) Set the frequency
   d) Set the base station to receive the Reference Measurement Channel (for most test cases),
2. Set the signal generator to the basic state
   a) reset the signal generator.
3. Set the test case wizard
   a) Open the 3GPP FDD dialog in the baseband block
   b) Open the Test Case Wizard and select Test Case
   The General Settings parameters are preset according to TS 25.141
   c) Enter scrambling code and scrambling mode according to the base station scrambling scheme.
   d) Enter additional required parameters, e.g. power class of base station.
   e) Enter the test frequency (e.g. M). It must be the same as the base station has been set to.

f) Activate the settings with the "Apply Settings" button.
The signal generator is now ready to start signal generation

4. Switch on RF output
5. If required, make additional settings (e.g. in the "I/Q Mod" or "RF" block) or change test case settings (e.g. in the "Fading" block)
6. Start the measurement
   a) Send a start trigger impulse (e.g. SFN modulo 4) from the base station to the signal generator.
   The signal generator will start signal generation.
7. Calculate the result
   The base station internally calculates the BER, BLER or Pd depending on the test case. This value is compared to the required value.

7.2.1.4 General Wanted Signal Parameters

The following parameters are available for all receiver tests. Specific parameters are listed together with the Test Case description.

Wanted Signal State - Receiver Tests
Enables/disables the signal generation of the wanted 3GPP signal.

In edit mode "According to Standard" the state is fixed to "On".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:STATe on page 568

RMC - Receiver Tests
Sets the reference measurement channel.

In edit mode "According to Standard" the selection of the reference measurement channel is restricted.

In edit mode "User definable", all following reference measurement channels are available for selection:

"RMC 12.2 kbps"
12.2 kbps measurement channel

"RMC 64 kbps" 64 kbps measurement channel

"RMC 144 kbps"
144 kbps measurement channel

"RMC 384 kbps"
384 kbps measurement channel

"AMR 12.2 kbps"
channel coding for the AMR coder

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:CCODing:TYPE on page 564

Wanted Signal Frequency - Receiver Tests
Sets the RF frequency of the wanted signal.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:FREQuency on page 566

Wanted Signal Level - Receiver Tests
Sets the RF level in edit mode "User Definable".

In edit mode "According to Standard" the RF level is determined by the selected "Power Class".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:POWer on page 567

7.2.2 Receiver Characteristics

7.2.2.1 Test Case 7.2 - Reference Sensitivity Level

The test case requires the basic configuration and is performed using the standard test setup for one path. The signal generator outputs a reference measurement channel signal.

Table 7-3: The following table lists the settings on the base station:

Parameter	Value
Frequency	B, M and T
RMC	12.2 kbps
Scrambling code	Any
TPC function	OFF

Test Purpose and Test Settings - Test Case 7.2

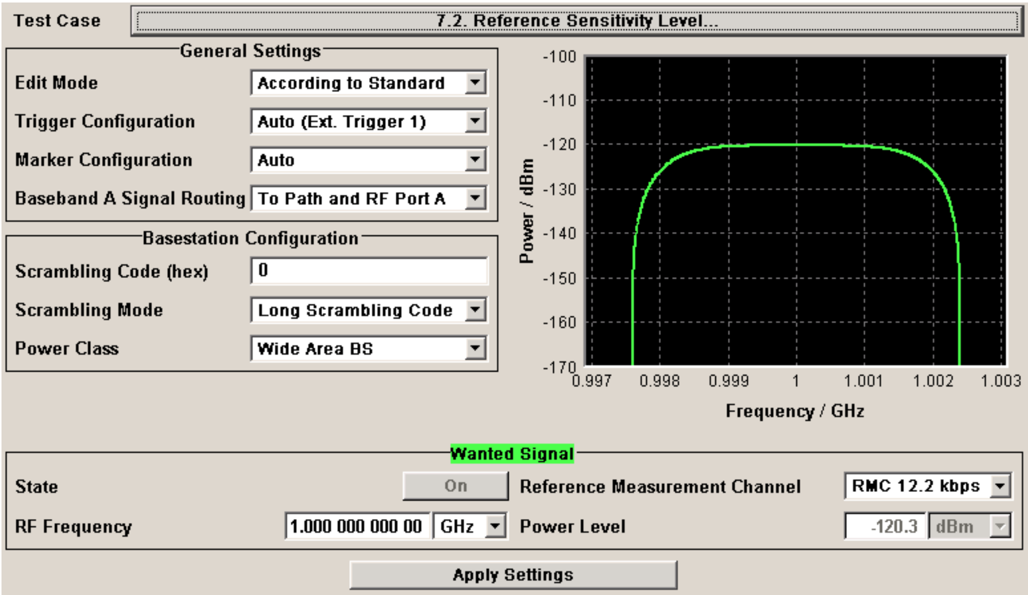
The test case verifies that a BS receiver has the capability to correctly demodulate the signal sent by the signal generator at the specified (low) reference sensitivity power level.

The test is passed when the resulting BER (calculated internally by the BS) is below a 0.001 at the test frequencies B, M, and T. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

The reference sensitivity level is the minimum mean power received at the antenna connector at which the BER shall not exceed the specific value indicated in subclause 7.2.2. The test is set up according to Figure B.7 and performed without interfering signal power applied to the BS antenna connector. For duplex operation, the measurement configuration principle is indicated for one duplex branch in Figure B.7. For internal BER calculation an example of the test connection is as shown in figure B.7. The reference point for signal power is at the input of the receiver (antenna connector).

The measurement must be made at the three frequencies B, M and T.



The settings of the wanted signal are described in chapter 7.2.1.4, "General Wanted Signal Parameters", on page 296.

7.2.2.2 Test Case 7.3 - Dynamic Range

The test case is performed using the standard test setup for one path.

It requires option K62 - Additional White Gaussian Noise (AWGN) in addition to the basic configuration.

The signal generator outputs a reference measurement channel signal disturbed by an interfering AWGN signal.

The following table lists the settings on the base station:

Parameter	Value
Frequency	B, M and T
RMC	12.2 kbps
Scrambling code	Any

Test Purpose and Test Settings - Test Case 7.3

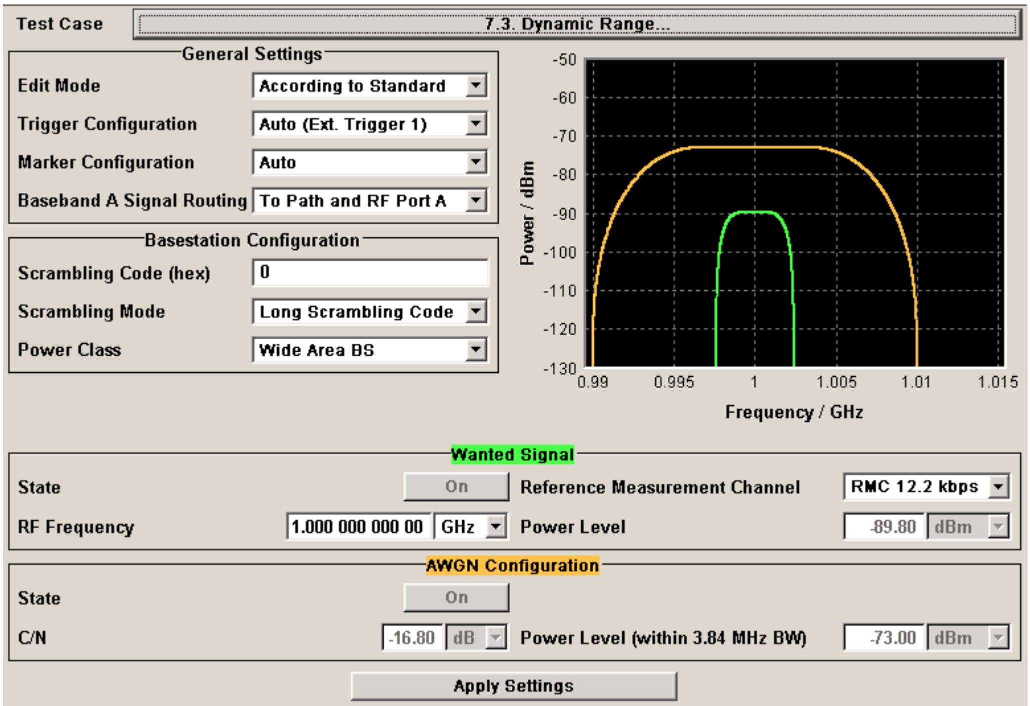
The test case verifies that a BS receiver has the capability to demodulate the useful signal sent by the signal generator even when it is superimposed by a heavy AWGN (Additive White Gaussian Noise) signal.

The test is passed when the resulting BER (calculated internally by the BS) is below 0.001 at the test frequencies B, M, and T. Note TS 25.141 Annex C: General Rules for

Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141

Receiver dynamic range is the receiver ability to handle a rise of interference in the reception frequency channel. The receiver shall fulfil a specified BER requirement for a specified sensitivity degradation of the wanted signal in the presence of an interfering AWGN signal in the same reception frequency channel.



Besides the settings described for all receiver tests, AWGN configuration is possible in edit mode "User Definable". In edit mode "According to Standard" the AWGN settings are preset:

AWGN State - Test Case 7.3

Enables/disables the generation of the AWGN signal.

In edit mode "According to Standard" the state is fixed to "On".

C/N - Test Case 7.3

Sets the carrier/noise ratio.

In edit mode "According to Standard" the state is fixed to -16.8 dB.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:AWGN:CNRatio` on page 546

Power Level - Test Case 7.3

Sets the AWGN level in edit mode "User Definable".

In edit mode "According to Standard" the AWGN level is determined by the selected "Power Class".

- -73 dB for Wide Area BS
- -63 dB for Medium Range BS
- -59 dB for Local Area BS

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:POWer:NOISe on page 547

7.2.2.3 Test Case 7.4 - Adjacent Channel Selectivity

The test case requires option Second RF path (B20x), a second option Baseband Main Module (13), a second option Baseband Generator (B10/B11) and a second option Digital Standard 3GPP FDD (K42) in addition to the standard configuration.

It is performed using the standard test setup for two paths.

The signal generator outputs the reference measurement channel signal (= wanted signal) at output RF A(B) and the adjacent channel interfering signal at output RF B(A). After combining the two signals the sum signal is fed into the base station Rx port. The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T.

The following table lists the settings on the base station:

Parameter	Value
Frequency	B, M and T
RMC	12.2 kbps
Scrambling code	Any

Test Purpose and Test Settings - Test Case 7.4

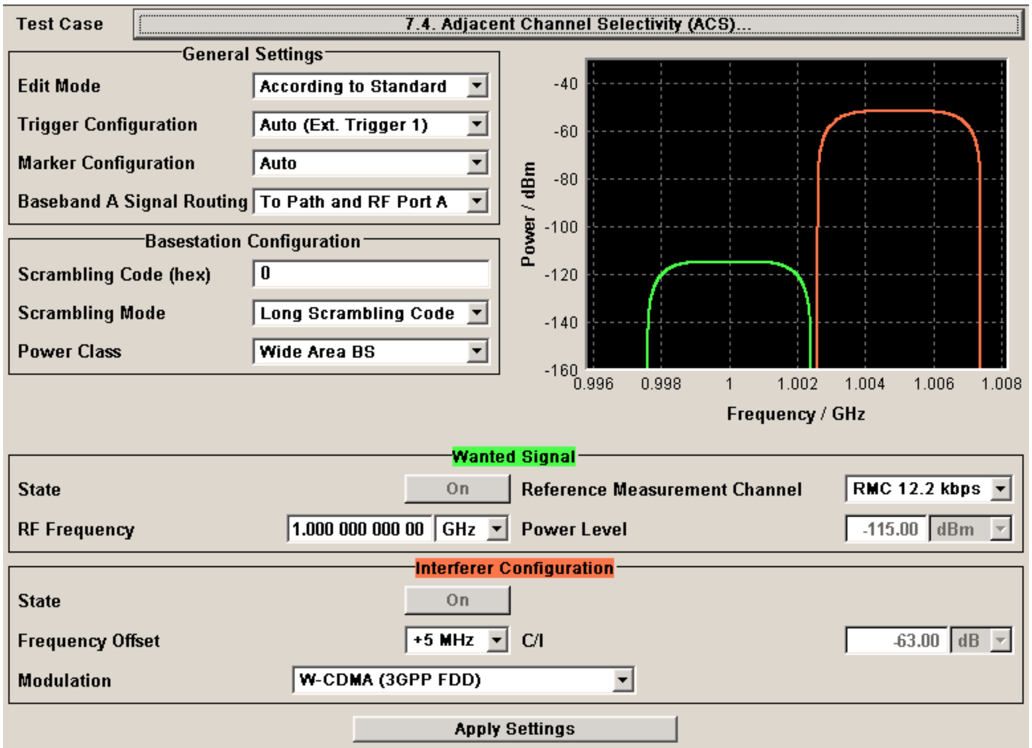
The test case verifies that a BS receiver has the capability to demodulate a signal that is sent by the signal generator but superimposed by a heavy WCDMA signal in the adjacent channel.

The test is passed when the resulting BER (calculated internally by the BS) is below 0.001 at the test frequencies B, M, and T. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

Adjacent channel selectivity (ACS) is a measure of the receiver ability to receive a wanted signal at is assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the center frequency of the assigned channel. ACS is the ratio of the receiver filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The interference signal is offset from the wanted signal by the frequency offset Fuw. The interference signal shall be a W-CDMA signal as specified in Annex I.



Besides the settings described for all receiver test, interferer configuration is possible in edit mode "User Definable". In edit mode "According to Standard" the settings are preset.

Interferer State - Test Case 7.4

Enables/disables the signal generation of the interfering uplink signal in the second path.

In edit mode "According to Standard" the state is fixed to "On".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:STATe on page 556

Frequency Offset - Test Case 7.4

Enters the frequency offset of the interfering signal versus the wanted signal.

In edit mode "According to Standard" the choice is limited to +/- 5 MHz.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:FOFFset on page 553

C to I - Test Case 7.4

Enters the ratio of wanted signal level to interfering signal level.

In edit mode "According to Standard" the value is fixed to - 63 dB:

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:CNRatio on page 551

Interferer Modulation - Test Case 7.4

Selects the type of modulation for the interfering uplink signal in the second path.

In edit mode "According to Standard" the modulation is fixed to "W-CDMA (3GPP FDD)".

"W-CDMA (3GPP FDD)"
A 3GPP FDD uplink signal with the following characteristic is generated for path B.

- DPCCH + DPDCH mode
- DPDCH with 240 ksps, 0 dB relative power, PRBS23 data source
- DPCCH with -5.46 dB relative power and slot format 2
- Same scrambling code as the wanted signal

("3GPP FDD" dialog)

"QPSK (3.84 MHz, Root Cosine 0.22)"
A QPSK signal (3.84 MHz bandwidth, root cosine filter 0.22, PRBS9 data source) is generated for path B ("Custom Dig Mod" dialog).

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:TYPE` on page 557

7.2.2.4 Test Case 7.5 - Blocking Characteristics

The test case requires option Second RF path (B20x), a second option Baseband Main Module (13), a second option Baseband Generator (B10/B11) and a second option Digital Standard 3GPP FDD (K42) in addition to the standard configuration.

It is performed using the standard test setup for two paths.

The signal generator provides the reference measurement channel signal (= wanted signal) at output RF A and the interfering signal with a selectable frequency offset at output RF B. After combining the two signals the sum signal is fed into the base station Rx port. The signal generator will start signal generation at the first received BS frame trigger sent.

The measurement must be made at the frequency M.

The following table lists the settings on the base station:

Parameter	Value
Frequency	M
RMC	12.2 kbps
Scrambling code	Any

In comparison with test case 7.4 this test case requires very large offset frequencies for the interfering signal. Therefore, a second RF output is always required. Due to the maximum frequency range of 6 GHz (option B106), the test case can not be performed at all frequency offsets required by the standard (1 MHz to 12.75 GHz).

Test Purpose and Test Settings - Test Case 7.5

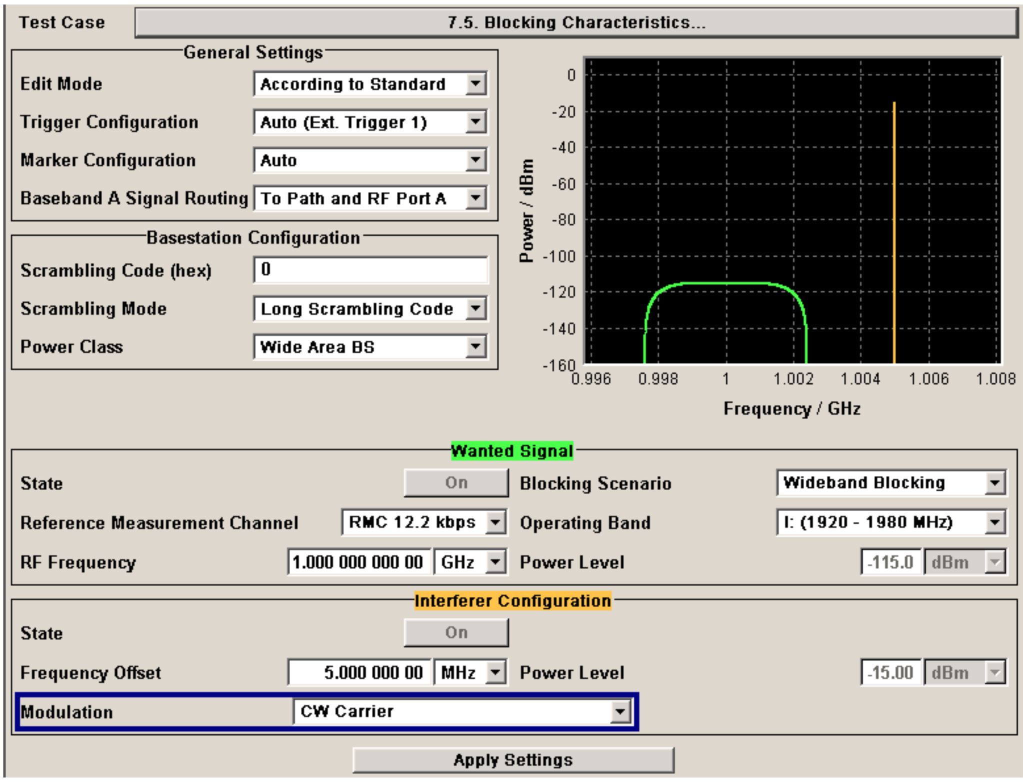
The test case verifies that a BS receiver has the capability to demodulate a signal that is sent by the signal generator but superimposed by a heavy interfering signal in the not adjacent channel.

The test is passed when the resulting BER (calculated internally by the BS) is below 0.001 at the test frequency M. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the adjacent channels. The blocking performance requirement applies as specified in tables 7.4A to 7.4J.

The requirements shall apply to the indicated base station class, depending on which frequency band is used. The requirements in Tables 7.4D to 7.4J may be applied for the protection of FDD BS receivers when GSM900, DCS1800, PCS1900, GSM850 and/or FDD BS operating in Bands I to VI are co-located with a UTRA FDD BS.



Besides the settings described for all receiver test, the following settings are possible in edit mode "User Definable". In edit mode "According to Standard" most settings are preset.

Additional settings in the "Wanted Signal" section:

Blocking Scenario - Test Case 7.5
Selects the type of blocking scenario in edit mode "According to Standard".

The type of blocking scenario presets the selected "Interferer Modulation" and the "Power Level".

"Wideband Blocking"
The interferer signal for wide band blocking depends on the set "Operating Band" and "RF Frequency":

- As long as the interferer "RF frequency" lies within or close to the selected "Operating Band", a "3GPP FDD" uplink signal with a defined power level (depending on the selected Power Class and RMC) is generated for path B.
- When the interferer "RF Frequency" lies outside the selected "Operating Band", a "CW carrier" interfering signal with a defined power level (depending on the selected Power Class and RMC) is generated for path B.

"Collocated BS Blocking"
A CW carrier interfering signal with a defined power level (depending on the selected Power Class and RMC) is generated for path B ("RF" block)

"Narrowband Blocking"
A GMSK (270.833 kHz) interfering signal with a defined power level (depending on the selected Power Class and RMC) is generated for path B ("Custom Dig Mod" dialog).

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:BTYPe` on page 560

Operating Band - Test Case 7.5
Selects the operating band of the base station for "Wideband Blocking". The operating band is required for the calculation of power levels and interferer modulation.

- Operating band I: (1920 – 1980 MHz)
- Operating band II: (1850 – 1910 MHz)
- Operating band III: (1710 – 1785 MHz)
- Operating band IV: (1710 – 1755 MHz)
- Operating band V: (824 – 849 MHz)
- Operating band VI: (830 – 840 MHz)

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:OBANd` on page 566

Interferer Signal

Settings in the "Interferer Signal" section:

Interferer State - Test Case 7.5
Enables/disables the signal generation of the interfering signal in the second path.

In edit mode "According to Standard" the state is fixed to "On".

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:STATe` on page 556

Frequency Offset - Test Case 7.5
Enters the frequency offset of the interfering signal versus the wanted signal.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:FOFFset on page 553

Power Level - Test Case 7.5
Enters the level of the interfering signal.

In edit mode "According to Standard" the value is fixed to a value determined by the selected "Blocking Scenario", the "RF frequency "and "Frequency Offset" and the base station "Power Class".

For blocking scenario "Colocated BS Blocking" several power settings are permitted by the standard. The following table show the blocking requirements for Medium Range and Local Area BS when co-located with BS in other bands.

For blocking performance requirement tables see "Blocking performance requirements" on page 305.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:POWer on page 556

Interferer Modulation - Test Case 7.5
Selects the type of modulation for the adjacent channel interfering signal at output RF B.

In edit mode "According to Standard" the modulation is determined by the selected "Blocking Scenario".

"W-CDMA (3GPP FDD)"
A 3GPP FDD uplink signal with the following characteristic is generated for path B.

- DPCCH + DPDCH mode
- DPDCH with 240 ksps, 0 dB relative power, PRBS23 data source
- DPCCH with -5.46 dB relative power and slot format 2
- Same scrambling code as the wanted signal ("3GPP FDD" dialog)

"QPSK (3.84 MHz, Root Cosine 0.22)"
A QPSK signal (3.84 MHz bandwidth, root cosine filter 0.22, PRBS9 data source) is generated for path B ("Custom Dig Mod" dialog).

"CW Carrier"
A carrier-only signal is generated for path B; the frequency and level of the CW signal are determined by the parameters "Frequency Offset" and "Power Level".

"GMSK (270.833 kHz)"
A GMSK signal (270.833 kHz bandwidth, PRBS9 data source) is generated for path B ("Custom Dig Mod" dialog).

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:TYPE on page 557

Blocking performance requirements

The following tables are taken from TS25141 (V6.6.0), chapter 7.5.5.

Blocking performance requirement for Medium Range BS when co-located with BS in other bands

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power
Micro GSM850	869 – 894 MHz	-3 dBm
MR UTRA-FDD Band V	869 – 894 MHz	+8 dBm
MR UTRA-FDD Band III	1805 – 1880 MHz	+8 dBm
Micro DCS1800	1805 – 1880 MHz	+5 dBm
Micro PCS1900	1930 – 1990 MHz	+5 dBm
MR UTRA-FDD Band II	1930 – 1990 MHz	+8 dBm

Blocking performance requirement for Local Area BS when co-located with BS in other bands

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power
LA UTRA-FDD Band V	869 – 894 MHz	-6 dBm
Pico GSM850	869 – 894 MHz	-7 dBm
LA UTRA-FDD Band III	1805 – 1880 MHz	-6 dBm
Pico DCS1800	1805 – 1880 MHz	-4 dBm
LA UTRA-FDD Band II	1930 – 1990 MHz	-6 dBm
Pico PCS1900	1930 – 1990 MHz	-4 dBm

Blocking characteristics for Wide Area BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
I	1920 - 1980 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1900 - 1920 MHz 1980 - 2000 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1 MHz -1900 MHz 2000 MHz - 12750 MHz	-15 dBm	-115 dBm		CW carrier
II	1850 - 1910 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1830 - 1850 MHz 1910 - 1930 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1 MHz - 1830 MHz 1930 MHz - 12750 MHz	-15 dBm	-115 dBm		CW carrier

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
III	1710- 1785 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1690 - 1710 MHz 1785- 1805 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1 MHz - 1690 MHz 1805 MHz - 12750 MHz	-15 dBm	-115 dBm		CW carrier
IV	1710- 1755 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1690 - 1710 MHz 1755- 1775 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1 MHz - 1690 MHz 1775 MHz - 12750 MHz	-15 dBm	-115 dBm		CW carrier
V	824-849 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	804-824 MHz 849-869 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1 MHz- 804 MHz 869 MHz - 12750 MHz	-15 dBm	-115 dBm		CW carrier
VI	810- 830 MHz 840- 860 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal *
	1 MHz- 810 MHz 860 MHz- 12750 MHz	-15 dBm	-115 dBm		CW carrier

*: The characteristics of the W-CDMA interference signal are specified in Annex I of TS 25.141.

Blocking performance requirement for Wide Area BS when co-located with BS in other bands.

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
Macro GSM900	921- 960 MHz	+16 dBm	-115 dBm	CW carrier
Macro DCS1800	1805- 1880 MHz	+16 dBm	-115 dBm	CW carrier
Macro PCS1900	1930- 1990 MHz	+16 dBm	-115 dBm	CW carrier
Macro GSM850	869- 894 MHz	+16 dBm	-115 dBm	CW carrier
WA UTRA-FDD Band I	2110- 2170 MHz	+16 dBm	-115 dBm	CW carrier
WA UTRA-FDD Band II	1930- 1990 MHz	+16 dBm	-115 dBm	CW carrier

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
WA UTRA-FDD Band III	1805- 1880 MHz	+16 dBm	-115 dBm	CW carrier
WA UTRA-FDD Band IV	2110- 2155 MHz	+16 dBm	-115 dBm	CW carrier
WA UTRA-FDD Band V	869- 894 MHz	+16 dBm	-115 dBm	CW carrier
WA UTRA-FDD Band VI	875- 885 MHz	+16 dBm	-115 dBm	CW carrier

Blocking performance requirement for Medium Range BS when co-located with BS in other bands.

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
Micro GSM900	921- 960 MHz	-3 dBm	-105 dBm	CW carrier
Micro DCS1800	1805- 1880 MHz	+5 dBm	-105 dBm	CW carrier
Micro PCS1900	1930- 1990 MHz	+5 dBm	-105 dBm	CW carrier
Micro GSM850	869- 894 MHz	-3 dBm	-105 dBm	CW carrier
MR UTRA-FDD Band I	2110- 2170 MHz	+8 dBm	-105 dBm	CW carrier
MR UTRA-FDD Band II	1930- 1990 MHz	+8 dBm	-105 dBm	CW carrier
MR UTRA-FDD Band III	1805- 1880 MHz	+8 dBm	-105 dBm	CW carrier
MR UTRA-FDD Band IV	2110- 2155 MHz	+8 dBm	-105 dBm	CW carrier
MR UTRA-FDD Band V	869- 894 MHz	+8 dBm	-105 dBm	CW carrier
MR UTRA-FDD Band VI	875- 885 MHz	+8 dBm	-105 dBm	CW carrier

Blocking performance requirement for Local Area BS when co-located with BS in other bands.

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
Pico GSM900	921- 960 MHz	-7 dBm	-101 dBm	CW carrier
Pico DCS1800	1805- 1880 MHz	-4 dBm	-101 dBm	CW carrier
Pico PCS1900	1930- 1990 MHz	-4 dBm	-101 dBm	CW carrier
Pico GSM850	869- 894 MHz	-7 dBm	-101 dBm	CW carrier

Co-located BS type	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Type of Interfering Signal
LA UTRA-FDD Band I	2110- 2170 MHz	-6 dBm	-101 dBm	CW carrier
LA UTRA-FDD Band II	1930- 1990 MHz	-6 dBm	-101 dBm	CW carrier
LA UTRA-FDD Band III	1805- 1880 MHz	-6 dBm	-101 dBm	CW carrier
LA UTRA-FDD Band IV	2110- 2155 MHz	-6 dBm	-101 dBm	CW carrier
LA UTRA-FDD Band V	869- 894 MHz	-6 dBm	-101 dBm	CW carrier
LA UTRA-FDD Band VI	875- 885 MHz	-6 dBm	-101 dBm	CW carrier

Blocking performance requirement (narrowband) for Wide Area BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
II	1850 - 1910 MHz	- 47 dBm	-115 dBm	2.7 MHz	GMSK modulated*
III	1710- 1785 MHz	- 47 dBm	-115 dBm	2.8 MHz	GMSK modulated*
IV	1710- 1755 MHz	- 47 dBm	-115 dBm	2.7 MHz	GMSK modulated*
V	824- 849 MHz	- 47 dBm	-115 dBm	2.7 MHz	GMSK modulated*

* GMSK modulation as defined in TS 45.004.

Blocking performance requirement (narrowband) for Medium Range BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
II	1850 - 1910 MHz	- 42 dBm	-105 dBm	2.7 MHz	GMSK modulated*
III	1710- 1785 MHz	- 42 dBm	-105 dBm	2.8 MHz	GMSK modulated*
IV	1710- 1755 MHz	- 42 dBm	-105 dBm	2.7 MHz	GMSK modulated*
V	824- 849 MHz	- 42 dBm	-105 dBm	2.7 MHz	GMSK modulated*

* GMSK modulation as defined in TS 45.004 [12]

Blocking performance requirement (narrowband) for Local Area BS

Operating Band	Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
II	1850 - 1910 MHz	- 37 dBm	-101 dBm	2.7 MHz	GMSK modulated*
III	1710- 1785 MHz	- 37 dBm	-101 dBm	2.8 MHz	GMSK modulated*
IV	1710- 1755 MHz	- 37 dBm	-101 dBm	2.7 MHz	GMSK modulated*
V	824- 849 MHz	- 37 dBm	-101 dBm	2.7 MHz	GMSK modulated*

* GMSK modulation as defined in TS 45.004.

7.2.2.5 Test Case 7.6 - Intermodulation Characteristics

The test case requires option Second RF path (B20x), a second option Baseband Main Module (13), a second option Baseband Generator (B10/B11), a second option Digital Standard 3GPP FDD (K42) and option AWGN (K62) in addition to the standard configuration.

It is performed using the standard test setup for two paths.

The signal generator outputs the reference measurement channel signal (= wanted signal) at output RF A and both interfering signals (CW interferer and the WCDMA or GMSK modulated interferer) at output RF B. After combining the signals the sum signal is fed into the base station Rx port. The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at frequency M.

In order to generate both interfering signals with the desired frequency offset, a frequency offset is introduced for baseband B. This baseband frequency offset has to be added to the RF frequency B.

The following table lists the settings on the base station:

Parameter	Value
Frequency	M
RMC	12.2 kbps
Scrambling code	Any

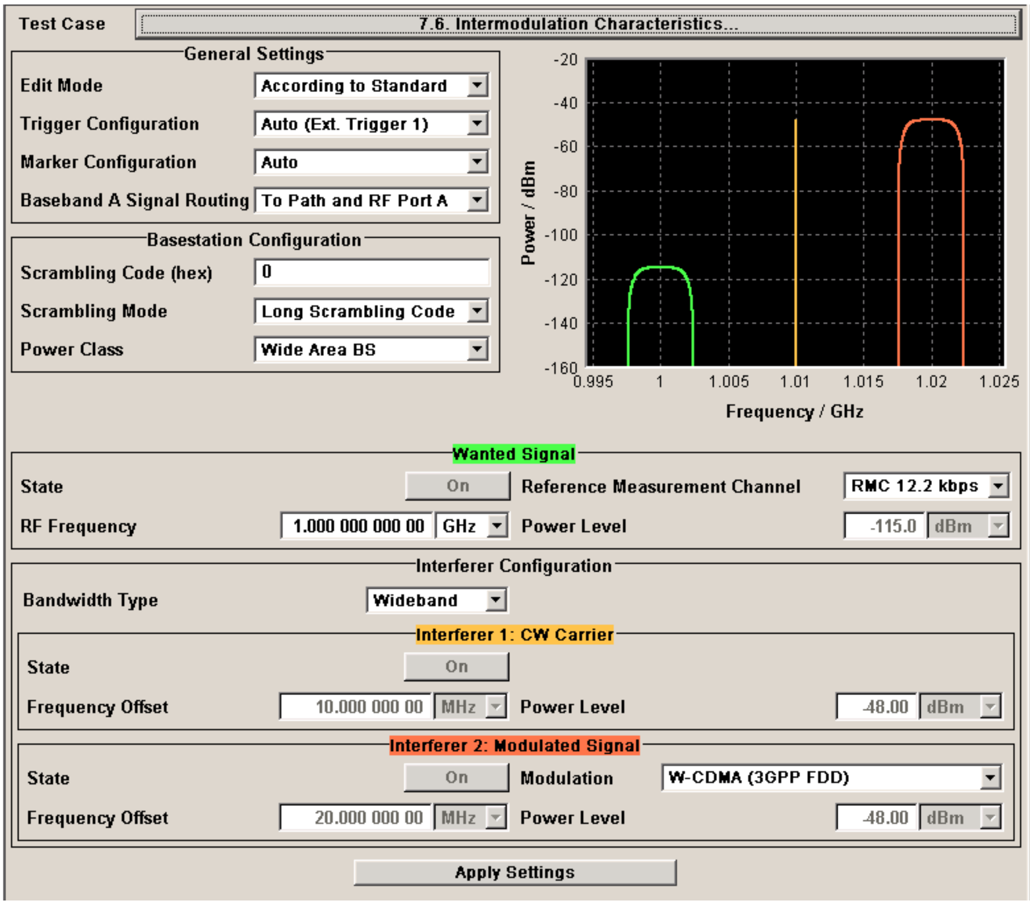
Test Purpose and Test Settings - Test Case 7.6

The test case verifies that a BS receiver has the capability to demodulate a signal that is sent by the signal generator but superimposed by two heavy interfering signals in the adjacent channels, where the receiver intermodulation products disturb the wanted signal.

The test is passed when the resulting BER (calculated internally by the BS) is below 0.001 at the test frequency M. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.



Besides the settings described for all receiver tests, interferer 1 and 2 configuration is possible in edit mode "User Definable". In edit mode "According to Standard" most of the settings are preset.

Interferer Bandwidth Type - Test Case 7.6
Selects the interferer scenario.

"Wideband" A 3GPP FDD uplink interfering signal with the following characteristic is generated for path B.

- DPCCH + DPDCH mode
- DPDCH with 240 ksps, 0 dB relative power, PRBS23 data source
- DPCCH with -5.46 dB relative power and slot format 2
- Same scrambling code as the wanted signal ("3GPP FDD" dialog)

The 3GPP FDD uplink interfering signal is superimposed by a CW interfering signal with a frequency of 10 MHz and a level of -48 dBm ("AWGN" dialog).

"Narrowband" GMSK interfering signal (270.833 kHz bandwidth, PRBS9 data source) is generated for path B ("Custom Dig Mod" dialog).
The GMSK interfering signal is superimposed by a CW interfering signal with a frequency of 3.5 MHz and a level of -47 dBm ("AWGN" dialog).

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:BWIDth` on page 551

Interferer 1 and 2 State - Test Case 7.6
Enables/disables the signal generation of the CW and modulation interfering signal in the second path.

In edit mode "According to Standard" both states are fixed to "On".

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:STATe` on page 552
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:STATe` on page 555

Interferer 1 and 2 Frequency Offset - Test Case 7.6
Enters the frequency offset of the interfering signals versus the wanted signal.

In edit mode "According to Standard" the value is fixed to a value determined by the selected "Interferer Bandwidth".

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:FOFFset` on page 551
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:FOFFset` on page 554

Interferer 1 and 2 Power Level - Test Case 7.6
Enters the level of the interfering signals..

In edit mode "According to Standard" the value is fixed to a value determined by the selected "Interferer Bandwidth Type".

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:POWer` on page 552
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:POWer` on page 554

Interferer 2 Modulation - Test Case 7.6
Selects the type of modulation for the interfering modulation signal in the second path.
In edit mode "According to Standard" the value is fixed to a value determined by the selected "Interferer Bandwidth".

"W-CDMA (3GPP FDD)"
A 3GPP FDD uplink signal with the following characteristic is generated for path B.

- DPCCH + DPDCH mode
- DPDCH with 240 ksps, 0 dB relative power, PRBS23 data source
- DPCCH with -5.46 dB relative power and slot format 2
- Same scrambling code as the wanted signal ("3GPP FDD" dialog)

"GMSK (270833 kHz)"
A GMSK signal (270.833 kHz bandwidth, PRBS9 data source) is generated for path B ("Custom Dig Mod" dialog).

"QPSK (3.84 MHz, Root Cosine 0.22)"
A QPSK signal (3.84 MHz bandwidth, root cosine filter 0.22, PRBS9 data source) is generated for path B ("Custom Dig Mod" dialog).

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:TYPE` on page 555

7.2.2.6 Test Case 7.8 - Verification of Internal BER

The test case requires the basic configuration and is performed using the standard test setup for one path.

The signal generator outputs a corrupted reference measurement channel signal (= wanted signal) at output RF A. The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T.

The following table lists the settings on the base station:

Parameter	Value
Frequency	B, M and T
RMC	12.2 kbps
Scrambling code	Any

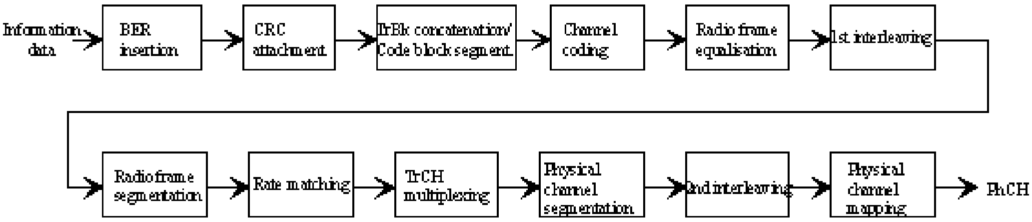
Test Purpose and Test Settings - Test Case 7.8

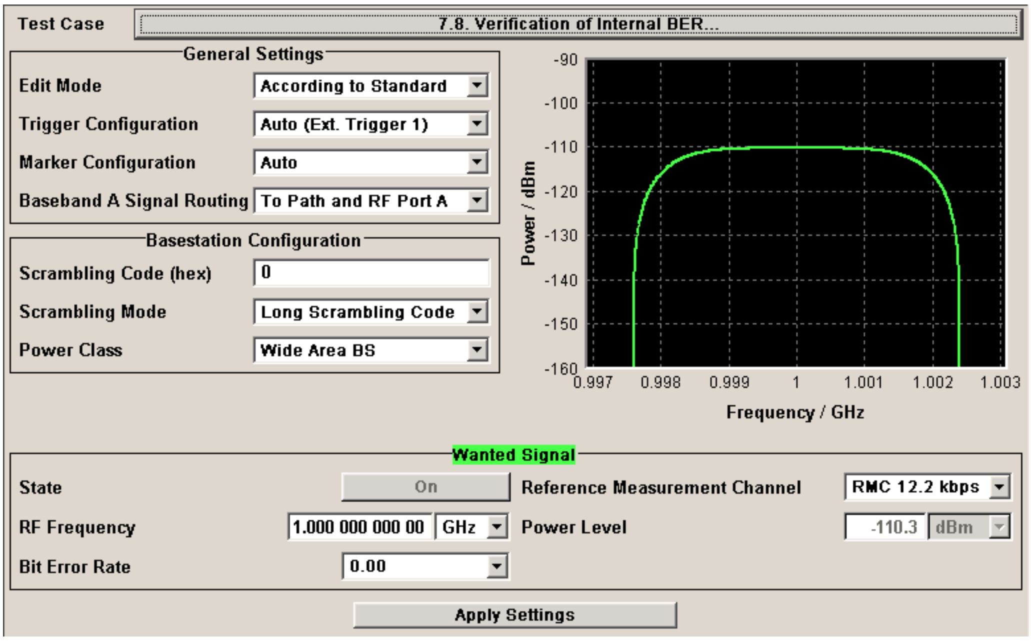
The test case verifies that a BS receiver has the capability to calculate the BER of a signal where erroneous bits are inserted in the data stream by the signal generator.

The test is passed when the calculated BER is within ±10% of the BER simulated by the signal generator the test frequencies B, M and T. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

Base Station System with internal BER calculation can synchronize it's receiver to known pseudo-random data sequence and calculates bit error ratio from the received data. This test is performed only if Base Station System has this kind of feature. This test is performed by feeding measurement signal with known BER to the input of the receiver. Locations of the erroneous bits shall be randomly distributed within a frame. Erroneous bits shall be inserted to the data bit stream as shown in the following figure.





Besides the settings described for all receiver test, Bit Error Rate and Block Error Rate selection is possible in edit mode "User Definable". In edit mode "According to Standard" only the Bit Error Rate setting is possible.

Bit Error Rate - Test Case 7.8

Sets the bit error rate. In edit mode "According to Standard" only values 0.00 (no bit errors are inserted) and 0.01 (1 percent bit errors are inserted) are available.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:DERRor:BIT:RATE`
on page 565

Block Error Rate - Test Case 7.8

Sets the block error rate in edit mode "User Definable".

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:DERRor:BLOCk:RATE`
on page 565

7.2.3 Performance Requirements

7.2.3.1 Test Case 8.2.1 - Demodulation of DCH in Static Propagation Conditions

For **non-diversity measurements**, the test case requires Additional White Gaussian Noise (AWGN) (K62) in addition to the basic configuration.

The measurement is performed using the standard test setup for one path.

The signal generator outputs a reference measurement channel signal (= wanted signal) that is superimposed by a AWGN signal at output RF A. The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

For **diversity measurements**, the test case requires option Second RF path (B20x), a second option Baseband Main Module (13), a second option Baseband Generator (B10/B11), a second option Digital Standard 3GPP FDD (K42) and option AWGN (K62) in addition to the standard configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs the reference measurement channel signal (= wanted signal) at output RF A and output RF B. The wanted signal is superimposed by a AWGN signal. The signals are fed into the base station Rx ports.

The signal generator will start signal generation at the first BS frame trigger sent to input Trigger 1.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

Table 7-4: The following table lists the settings on the base station:

Parameter	Value(s)
Frequency	B, M and T
RMC	12.2 kbps, 64 kbps, 144 kbps, 384 kbps
Scrambling code	Any

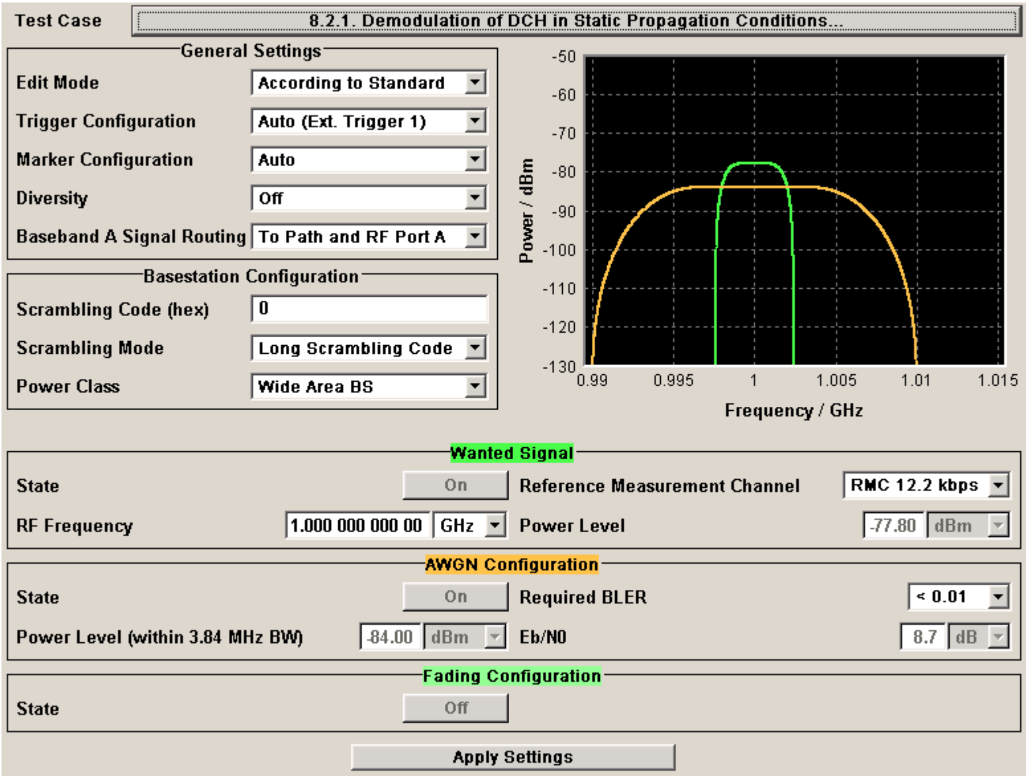
Test Purpose and Test Settings - Test Case 8.2.1

The test case shall verify that a BS receiver has the capability to demodulate a signal that is sent by the signal generator and is superimposed by a heavy AWGN signal.

The test is passed when the resulting BLER (calculated internally by the BS) does not exceed the required BLER settings. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

The performance requirement of DCH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.



Besides the settings described for all receiver test, AWGN Configuration is possible in edit mode "User Definable". In edit mode "According to Standard" only the Required BLER setting is possible. Fading is always off.

AWGN State - Test Case 8.x

Enables/disables the generation of the AWGN signal.

In edit mode "According to Standard" the state is fixed to "On".

Remote command:

`[:SOURce]:BB:W3GPp:TS25141:AWGN:STATe` on page 548

Required BLER - Test Case 8.x

Sets the required Block Error Rate in edit mode "According to Standard".

Remote command:

`[:SOURce]:BB:W3GPp:TS25141:AWGN:RBLock:RATE` on page 547

Power Level - Test Case 8.x

Sets the AWGN level in edit mode "User Definable".

In edit mode "According to Standard" the AWGN level is determined by the selected "Power Class" .

- "-84 dBm" for "Wide Area BS"
- "-74 dBm" for "Medium Range BS"
- "-70 dBm" for "Local Area BS"

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:POWer:NOISe on page 547

E_b to N_0 - Test Case 8.x

Sets the ratio of bit energy to noise power density.

In edit mode "According to Standard" the value depends on the E_b/N_0 test requirements (see table 7-5).

Table 7-5: E_b/N_0 test requirements in AWGN channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (5.5 dB)	n.a. (8.7 dB)	< 10^{-1}
	5.5 dB	8.7 dB	< 10^{-2}
64 kbps	1.9 dB	5.1 dB	< 10^{-1}
	2.1 dB	5.2 dB	< 10^{-2}
144 kbps	1.2 dB	4.2 dB	< 10^{-1}
	1.3 dB	4.4 dB	< 10^{-2}
384 kbps	1.3 dB	4.4 dB	< 10^{-1}
	1.4 dB	4.5 dB	< 10^{-2}

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:ENRatio on page 546

Fading State - Test Case 8.2.1

Indicates the state of the Fader.

The state is fixed to 'Off'.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:FSIMulator:STATe on page 550

7.2.3.2 Test Case 8.3.1 - Demodulation of DCH in Multipath Fading Case 1 Conditions

For **non-diversity measurements**, the test case requires option Additional White Gaussian Noise (AWGN) (K62) and options Fading Simulator (B14), Path Extension (B15), and Enhanced Resolution and Dynamic Fading (K71) in addition to the basic configuration.

The measurement is performed using the standard test setup for one path.

The signal generator outputs a reference measurement channel signal (= wanted signal) that is disturbed by an AWGN signal and multipath fading effects at output RF A(B). The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

For **diversity measurements**, the test case requires option Second RF path (B20x), a second option Baseband Main Module (13), two options Additional White Gaussian Noise (AWGN) (K62) and options Fading Simulator (B14) and Path Extension (B15), Enhanced Resolution and Dynamic Fading (K71) in addition to the basic configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs the reference measurement channel signal (= wanted signal) that is disturbed by an AWGN signal and multipath fading effects at output RF A and output RF B. The signals are fed into the base station Rx ports.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

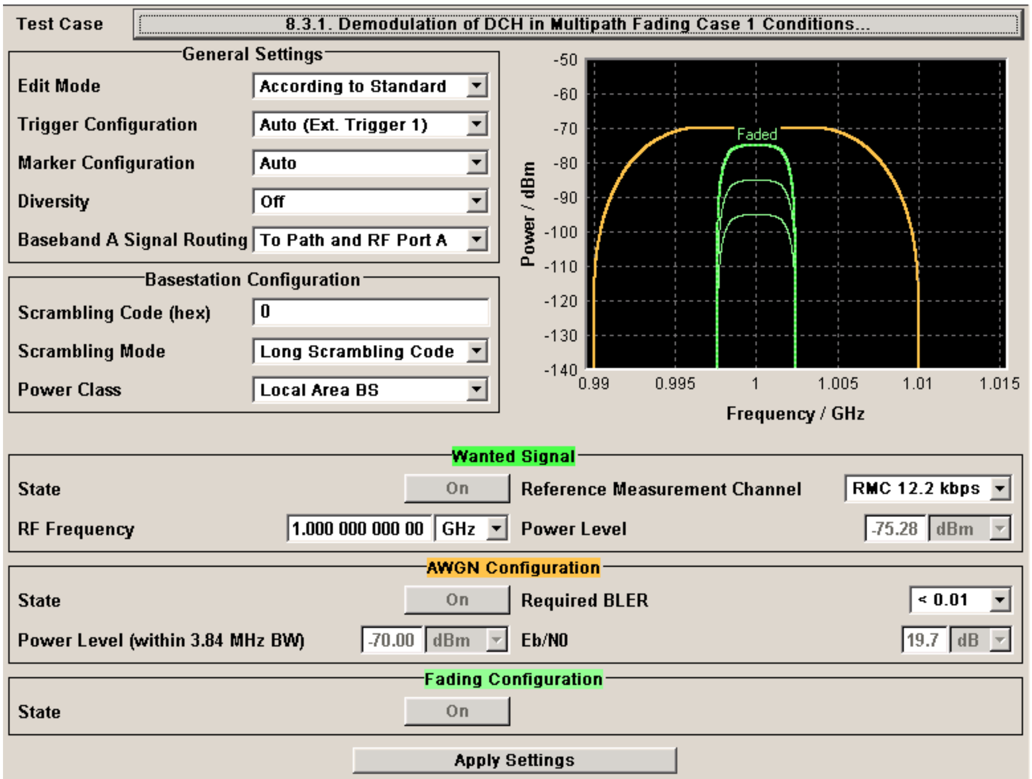
The following table lists the settings on the base station:

Parameter	Value(s)
Frequency	B, M and T
RMC	12.2 kbps, 64 kbps, 144 kbps, 384 kbps
Scrambling code	Any

Test Purpose and Test Settings - Test Case 8.3.1

The test case shall verify that a BS receiver has the capability to demodulate a signal that is sent by the signal generator but superimposed by a heavy AWGN signal and disturbed by multipath fading effects.

The test is passed when the resulting BLER (calculated internally by the BS) does not exceed the required BLER settings. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.



This test case settings are identical to test case 8.2.1 except from the channel simulation that is set to "Multipath Fading Case 1" ("Fading > Standard > 3GPP Case 1 UE/BS" and the specific E_b/N_0 test requirements (see table 7-6).

Table 7-6: E_b/N_0 Test requirements in multipath Case 1 channel

Measurement channel	Received E_b/N_0 for BS with Rx diversity	Received E_b/N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (12.5 dB)	n.a. (19.7 dB)	$< 10^{-1}$
	12.5 dB	19.7 dB	$< 10^{-2}$
64 kbps	6.8 dB	12.2 dB	$< 10^{-1}$
	9.8 dB	16.5 dB	$< 10^{-2}$
144 kbps	6.0 dB	11.4 dB	$< 10^{-1}$
	9.0 dB	15.6 dB	$< 10^{-2}$
384 kbps	6.4 dB	11.8 dB	$< 10^{-1}$
	9.4 dB	16.1 dB	$< 10^{-2}$

Fading State - Test Case 8.x

Indicates the state of the Fader.

The state is fixed to "On". The "Fading" dialog is preset with the required settings for the test case.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:FSIMulator:STATe on page 550

7.2.3.3 Test Case 8.3.2 - Demodulation of DCH in Multipath Fading Case 2 Conditions

This test case is identical to test case 8.3.1 except from the channel simulation that is set to "Multipath Fading Case 2" ("Fading" dialog: Standard = 3GPP Case 2 UE/BS) and the E_b/N_0 test requirements (see table 7-7).

Table 7-7: E_b/N_0 Test requirements in Multipath Case 2 channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (9.6 dB)	n.a. (15.6 dB)	$< 10^{-1}$
	9.6 dB	15.6 dB	$< 10^{-2}$
64 kbps	4.9 dB	9.8 dB	$< 10^{-1}$
	7.0 dB	12.9 dB	$< 10^{-2}$
144 kbps	4.3 dB	8.8 dB	$< 10^{-1}$
	6.2 dB	12.1 dB	$< 10^{-2}$
384 kbps	4.7 dB	9.3 dB	$< 10^{-1}$
	6.7 dB	12.7dB	$< 10^{-2}$

7.2.3.4 Test Case 8.3.3 - Demodulation of DCH in Multipath Fading Case 3 Conditions

This test case is identical to test case 8.3.1 except from the channel simulation that is set to 'Multipath Fading Case 3' ("> 3GPP Case 3 UE/BS") and the E_b/N_0 test requirements (see table 7-8).

Table 7-8: E_b/N_0 Test requirements in multipath Case 3 channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (7.8 dB)	n.a. (11.4 dB)	$< 10^{-1}$
	7.8 dB	11.4 dB	$< 10^{-2}$
	8.6 dB	12.3 dB	$< 10^{-3}$
64 kbps	4.0 dB	7.7 dB	$< 10^{-1}$
	4.4 dB	8.3 dB	$< 10^{-2}$
	4.7 dB	9.1 dB	$< 10^{-3}$
144 kbps	3.4 dB	6.6 dB	$< 10^{-1}$

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
	3.8 dB	7.3 dB	< 10^{-2}
	4.2 dB	7.8 dB	< 10^{-3}
384 kbps	3.8 dB	7.1 dB	< 10^{-1}
	4.2 dB	7.8 dB	< 10^{-2}
	4.8 dB	8.5 dB	< 10^{-3}

7.2.3.5 Test Case 8.3.4 - Demodulation of DCH in Multipath Fading Case 4 Conditions

This test case is identical to test case 8.3.1 except from the channel simulation that is set to "Multipath Fading Case 4" ("Fading > Standard > 3GPP Case 4 UE") and the E_b/N_0 test requirements (see following table).

Table 7-9: E_b/N_0 Test requirements in multipath Case 4 channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (10.8 dB)	n.a. (14.4 dB)	< 10^{-1}
	10.8 dB	14.4 dB	< 10^{-2}
	11.6 dB	15.3 dB	< 10^{-3}
64 kbps	7.0 dB	10.7 dB	< 10^{-1}
	7.4 dB	11.3 dB	< 10^{-2}
	7.7 dB	12.1 dB	< 10^{-3}
144 kbps	6.4 dB	9.6 dB	< 10^{-1}
	6.8 dB	10.3 dB	< 10^{-2}
	7.2 dB	10.8 dB	< 10^{-3}
384 kbps	6.8 dB	10.1 dB	< 10^{-1}
	7.2 dB	10.8 dB	< 10^{-2}
	7.8 dB	11.5 dB	< 10^{-3}

Table 7-10: E_b/N_0 Test requirements in multipath Case 4 channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (10.8 dB)	n.a. (14.4 dB)	< 10^{-1}
	10.8 dB	14.4 dB	< 10^{-2}
	11.6 dB	15.3 dB	< 10^{-3}
64 kbps	7.0 dB	10.7 dB	< 10^{-1}

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
	7.4 dB	11.3 dB	< 10^{-2}
	7.7 dB	12.1 dB	< 10^{-3}
144 kbps	6.4 dB	9.6 dB	< 10^{-1}
	6.8 dB	10.3 dB	< 10^{-2}
	7.2 dB	10.8 dB	< 10^{-3}
384 kbps	6.8 dB	10.1 dB	< 10^{-1}
	7.2 dB	10.8 dB	< 10^{-2}
	7.8 dB	11.5 dB	< 10^{-3}

Table 7-11: E_b/N_0 Test requirements in multipath Case 4 channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (10.8 dB)	n.a. (14.4 dB)	< 10^{-1}
	10.8 dB	14.4 dB	< 10^{-2}
	11.6 dB	15.3 dB	< 10^{-3}
64 kbps	7.0 dB	10.7 dB	< 10^{-1}
	7.4 dB	11.3 dB	< 10^{-2}
	7.7 dB	12.1 dB	< 10^{-3}
144 kbps	6.4 dB	9.6 dB	< 10^{-1}
	6.8 dB	10.3 dB	< 10^{-2}
	7.2 dB	10.8 dB	< 10^{-3}
384 kbps	6.8 dB	10.1 dB	
	7.2 dB	10.8 dB	< 10^{-2}
	7.8 dB	11.5 dB	< 10^{-3}

7.2.3.6 Test Case 8.4 - Demodulation of DCH in Moving Propagation Conditions

This test case is identical to test case 8.3.1 except from the channel simulation that is set to "Moving Propagation" ("Fading > Standard > Moving Propagation") and the E_b/N_0 test requirements.

Table 7-12: E_b/N_0 Test requirements in moving channel

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (6.3 dB)	n.a. (9.3 dB)	$< 10^{-1}$
	6.3 dB	9.3 dB	$< 10^{-2}$
64 kbps	2.7 dB	5.9 dB	$< 10^{-1}$
	2.8 dB	6.1 dB	$< 10^{-2}$

7.2.3.7 Test Case 8.5 - Demodulation of DCH in Birth/Death Propagation Conditions

This test case is identical to test case 8.3.1 except from the channel simulation that is set to B"irth/Death Propagation" ("Fading > Standard > Birth/Death Propagation") and the E_b/N_0test requirements.

Measurement channel	Received E_b to N_0 for BS with Rx diversity	Received E_b to N_0 for BS without Rx diversity	Required BLER
12.2 kbps	n.a. (8.3 dB)	n.a. (11.4 dB)	$< 10^{-1}$
	8.3 dB	11.4 dB	$< 10^{-2}$
64 kbps	4.7 dB	8.0 dB	$< 10^{-1}$
	4.8 dB	8.1 dB	$< 10^{-2}$

7.2.3.8 Test Case 8.6 - Verification of Internal BLER

For **non-diversity measurements**, the test case requires the basic configuration and is performed using the standard test setup for one path.

The signal generator outputs a corrupted reference measurement channel signal (= wanted signal) at output RF A. The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

For **diversity measurements**, the test case requires option Second RF path (B20x) and a second option Baseband Main Module (B13) in addition to the basic configuration.

For **diversity measurements**, the test case requires option Second RF path (B20x) and a second option Baseband Main Module (13) in addition to the standard configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs the corrupted reference measurement channel signal (= wanted signal) at output RF A and output RF B. The signals are fed into the base station Rx ports.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

The following table lists the settings on the base station

Parameter	Value
Frequency	B, M and T
RMC	12.2 kbps, 64 kbps, 144 kbps, 384 kbps
Scrambling code	Any

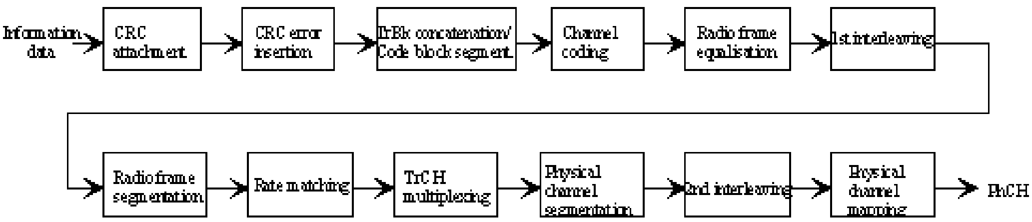
Test Purpose and Test Settings - Test Case 8.6

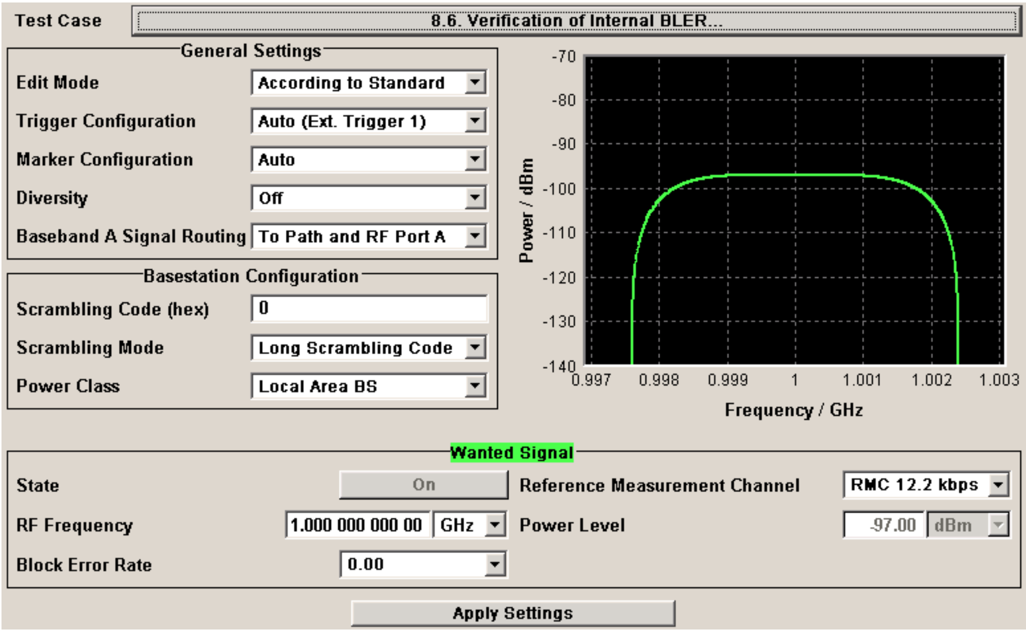
The test case verifies that a BS receiver has the capability to calculate the BLER of a signal where erroneous blocks are inserted in the data stream by the signal generator.

The test is passed when the calculated BLER is within ±10% of the BLER simulated by the signal generator the test frequencies B, M and T. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

Base Station System with internal BLER calculates block error rate from the CRC blocks of the received. This test is performed only if Base Station System has this kind of feature. All data rates which are used in clause 8 Performance requirement testing shall be used in verification testing. This test is performed by feeding measurement signal with known BLER to the input of the receiver. Locations of the erroneous blocks shall be randomly distributed within a frame. Erroneous blocks shall be inserted into the UL signal as shown in the following figure.





Besides the settings described for all receiver test, Bit Error Rate and Block Error Rate selection is possible in edit mode "User Definable". In edit mode "According to Standard" only the Block Error Rate setting is possible.

Table 7-13: UL signal levels for different data rates

Data rate	Signal level for Wide Area BS	Signal level for Medium Range BS	Signal level for Local Area BS	Unit
12,2 kbps	-111	-101	-97	dBm/3.84 MHz
64 kbps	-107	-97	-93	dBm/3.84 MHz
144 kbps	-104	-94	-90	dBm/3.84 MHz
384 kbps	-100	-90	-86	dBm/3.84 MHz

Block Error Rate - Test Case 8.6

Sets the block error rate. In edit mode "According to Standard" only values 0.00 (no block errors are inserted) and 0.01 (1 percent block errors are inserted) are available.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:DERRor:BLOCk:RATE`
on page 565

Bit Error Rate - Test Case 8.6

Sets the bit error rate in edit mode "User Definable".

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:DERRor:BIT:RATE`
on page 565

7.2.3.9 Test Case 8.8.1 - RACH Preamble Detection in Static Propagation Conditions

For **non-diversity measurements**, the test case requires option K62 - Additional White Gaussian Noise (AWGN) in addition to the basic configuration.

The measurement is performed using the standard test setup for one path.

The signal generator outputs a continuous sequence of preambles (wanted signal) that is superimposed by a AWGN signal at output RF A(B). The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first BS frame trigger sent to input "Trigger 1".

The measurement must be made at the three frequencies B, M and T.

For **diversity measurements**, the test case requires option Second RF path (B20x), a second option Baseband Main Module (13), and two options Additional White Gaussian Noise (AWGN) (K62) in addition to the standard configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs a continuous sequence of preambles (wanted signal) that is superimposed by a AWGN signal at output RF A and output RF B. The signals are fed into the base station Rx ports.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T.

The following table lists the settings on the base station:

Parameter	Value(s)
Frequency	B, M and T
RMC	RACH
Scrambling code	Any

Test Purpose and Test Settings - Test Case 8.8.1

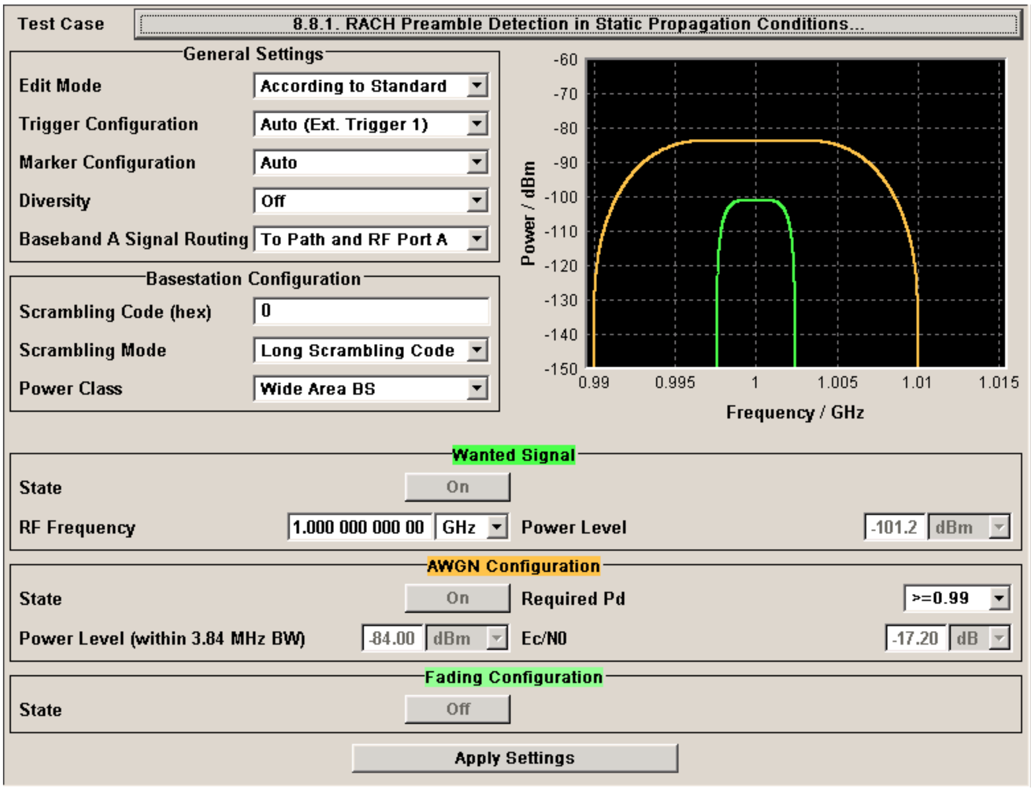
The test case verifies that a BS receiver has the capability to detect the RACH preamble that is sent by the signal generator and is superimposed by a heavy AWGN signal.

The test is passed when internally calculated Pd is equal or above the required Pd settings at the test frequencies B, M and T. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

The performance requirement of RACH for preamble detection in static propagation conditions is determined by the two parameters probability of false detection of the preaE_c/N_0mble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required at probability of detection, Pd of 0.99 and 0.999. Pfa is defined as a conditional probability of erroneous detection of the preamble when input is only noise (+interference). Pd is defined as conditional probability of detection of the preamble when the signal is present. Pfa shall be 10-3 or less. Only one signature is used and it is known by the receiver.

The Probability of false detection of the preamble (Pfa) test is not supported.



Besides the settings described for all receiver test, AWGN and Fading Configuration is possible in edit mode "User Definable". In edit mode "According to Standard "only the "Required Pd" setting is possible.

AWGN State - Test Case 8.x

Enables/disables the generation of the AWGN signal.

In edit mode "According to Standard" the state is fixed to "On".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:STATe on page 548

Required Pd - Test Case 8.x

Sets the Required Probability of Detection of Preamble (Required Pd) in edit mode "According to Standard":

- >= 0.99
- >= 0.999

This figure determines the ratio E_c/N_0 according to the following table of E_c/N_0 test requirements.

Table 7-14: Preamble detection test requirements in AWGN channel

	E_c/N_0 for required Pd (0.99	E_c/N_0 for required Pd (0.999
"BS with Rx Diversity"	-20.1 dB	-19.7 dB
"BS without Rx Diversity"	-17.2 dB	-16.4 dB

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:RPDetection:RATE on page 548

Power Level - Test Case 8.x
Sets the AWGN level in edit mode "User Definable".

In edit mode "According to Standard" the AWGN level is determined by the selected "Power Class" .

- "-84 dBm" for "Wide Area BS"
- "-74 dBm" for "Medium Range BS"
- "-70 dBm" for "Local Area BS"

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:POWer:NOISe on page 547

E_b/N_0 - Test Case 8.x
Sets the ratio of bit energy to noise power density.

In edit mode "According to Standard" the value depends on the selected "Required Pd".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:ENRatio on page 546

Fading State - Test Case 8.x.1
Indicates the state of the Fader.

The state is fixed to "Off".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:FSIMulator:STATe on page 550

7.2.3.10 Test Case 8.8.2 - RACH Preamble Detection in Multipath Fading Case 3

For **non-diversity measurements**, the test case requires option Additional White Gaussian Noise (AWGN) (K62) and options Fading Simulator (B14), Path Extension (B15), and Enhanced Resolution and Dynamic Fading (K71) in addition to the basic configuration.

The measurement is performed using the standard test setup for one path.

The signal generator outputs a continuous sequence of preambles (= wanted signal) that is disturbed by an AWGN signal and multipath fading effects at output RF A(B). The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first BS frame trigger sent to input "Trigger 1".

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

For **diversity measurements**, the test case requires option Second RF path (B20x), a second option Baseband Main Module (13), two options Additional White Gaussian Noise (AWGN) (K62) and options Fading Simulator (B14) and Path Extension (B15), Enhanced Resolution and Dynamic Fading (K71) in addition to the basic configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs a continuous sequence of preambles (= wanted signal) that is disturbed by an AWGN signal and multipath fading effects at output RF A and output RF B. The signals are fed into the base station Rx ports.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The RMC data rates are 12.2 kbps, 64 kbps, 144 kbps and 384 kbps.

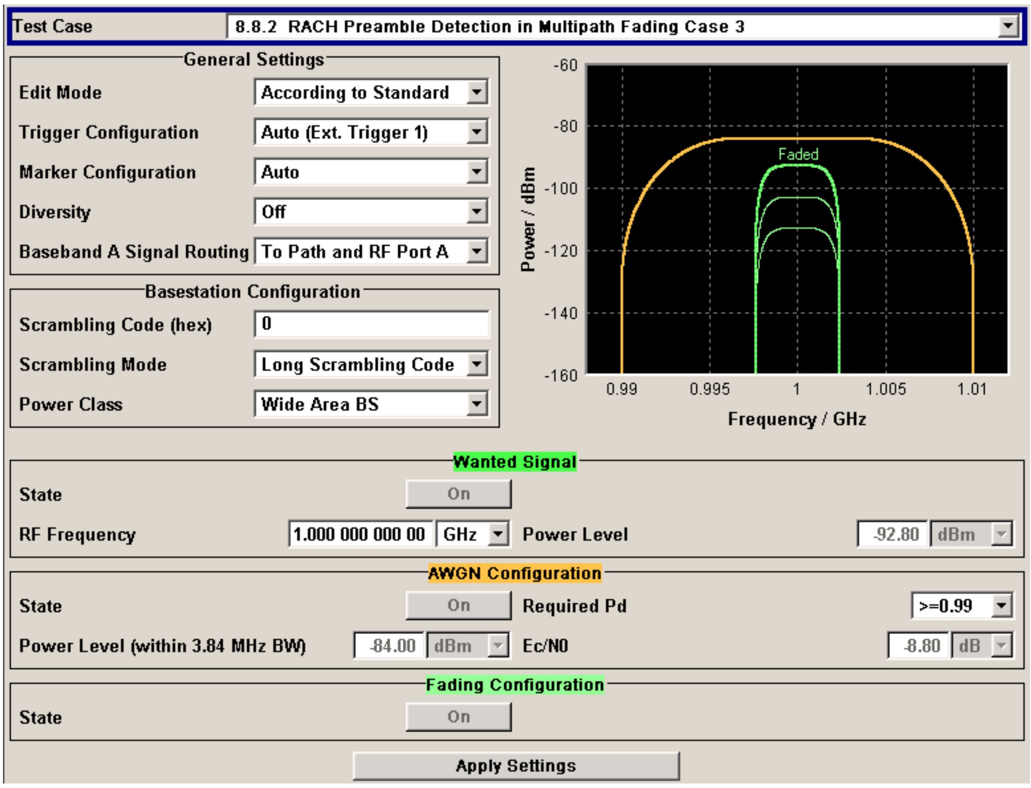
The following table lists the settings on the base station:

Parameter	Value(s)
Frequency	B, M and T
RMC	12.2 kbps, 64 kbps, 144 kbps, 384 kbps
Scrambling code	Any

Test Purpose and Test Settings - Test Case 8.8.2

The test case shall verify that a BS receiver has the capability to detect the RACH preamble that is sent by the signal generator and is superimposed by a heavy AWGN signal and disturbed by multipath fading effects.

The test is passed when internally calculated Pd is equal or above the required Pd settings at the test frequencies B, M and T. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.



This test case is identical to test case 8.8.1 except from the channel simulation that is set to "Multipath Fading Case 3" ("Fading > Standard = 3GPP Case 3 UE/BS") by default and the specific E_C/N_0 ratio requirements (see following table).

	E_c/N_0 for required Pd (0.99	E_c/N_0 for required Pd (0.999
"BS with Rx Diversity"	-14.9 dB	-12.8 dB
"BS without Rx Diversity"	-8.8 dB	-5.8 dB

Fading State - Test Case 8.x
Indicates the state of the Fader.

The state is fixed to "On". The "Fading" dialog is preset with the required settings for the test case.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:FSIMulator:STATe` on page 550

7.2.3.11 Test Case 8.8.3 - RACH Demodulation of Message Part in Static Propagation Conditions

For **non-diversity** measurements, the test case requires option K62 - Additional White Gaussian Noise (AWGN) in addition to the basic configuration.

The measurement is performed using the standard test setup for one path.

The signal generator outputs a RACH message signal (= wanted signal) that is superimposed by a AWGN signal at output RF A(B). The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first BS frame trigger sent to input "Trigger 1".

The measurement must be made at the three frequencies B, M and T. The Transport Block Sizes are 168 bits and 360 bits.

For **diversity measurements**, the test case requires option Second RF path (B20x), a second option Baseband Main Module (13), and two options Additional White Gaussian Noise (AWGN) (K62) in addition to the standard configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs the RACH message signal (= wanted signal) that is superimposed by a AWGN signal at output RF A and output RF B. The signals are fed into the base station Rx ports.

The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The Transport Block Sizes are 168 bits and 360 bits.

The following table lists the settings on the base station:

Parameter	Value(s)
Frequency	B, M and T
Transport Block Size	168 bits, 360 bits
RMC	RACH
Scrambling code	Any

Test Purpose and Test Settings - Test Case 8.8.3

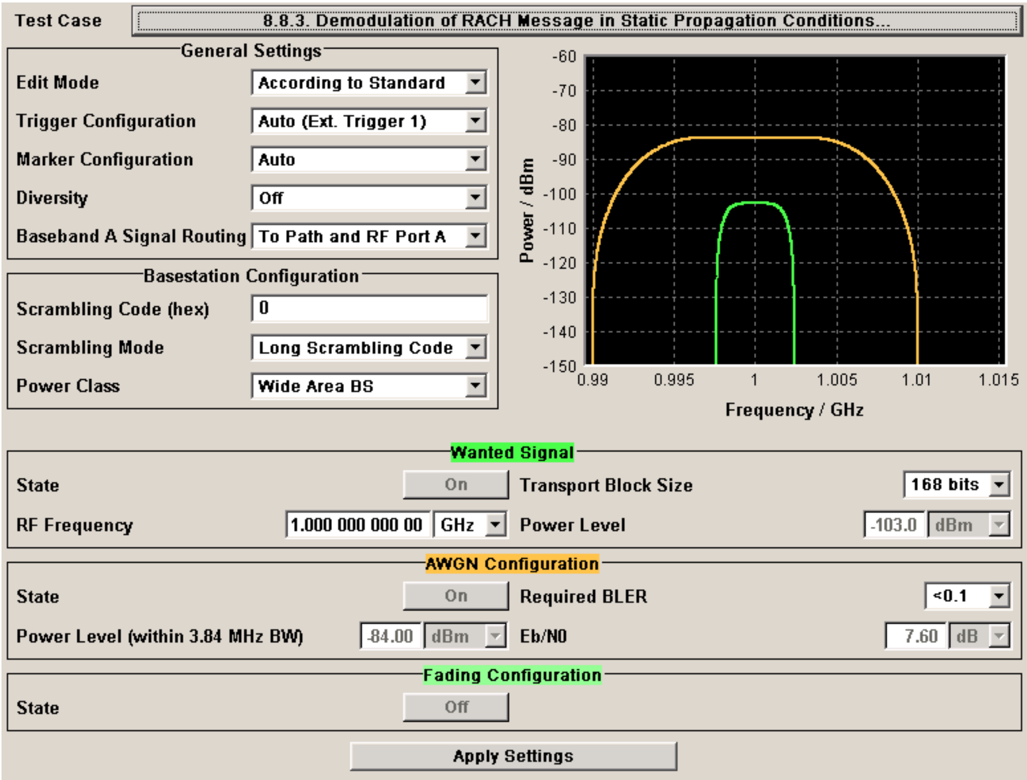
The test case shall verify that a BS receiver has the capability to demodulate the RACH message sent by the signal generator but superimposed by AWGN.

The test is passed when the resulting BLER (calculated internally by the BS) does not exceed the required BLER settings. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.

Quotation from TS 25.141:

The performance requirement of RACH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

The preamble threshold factor is chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.



Besides the settings described for all receiver test, selection of "Transport Block Size" of the wanted signal and AWGN Configuration is possible in edit mode "According to Standard".

Transport Block Size - Test Case 8.8.x

Sets the Transport Block Size:

- 168 bits
- 360 bits

Remote command:

`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:PRACh:CCODing:TYPE` on page 568

AWGN State - Test Case 8.8.3

Enables/disables the generation of the AWGN signal.

In edit mode "According to Standard" the state is fixed to "On".

Remote command:

`[:SOURce]:BB:W3GPp:TS25141:AWGN:STATe` on page 548

Required BLER - Test Case 8.x

Sets the required Block Error Rate in edit mode "According to Standard".

- < 0.1
- < 0.01

This figure determines the ratio E_b/N_0 according to the list of E_b/N_0 test requirements (see following table).

E_b/N_0 requirements in AWGN channel

Table 7-15: Transport Block size TB and TTI in frames: 168 bits, TTI = 20 ms / 360 bits, TTI = 20 ms

	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
"BS with Rx Diversity"	4.5 dB	5.4 dB	4.3 dB	5.2 dB
"BS without Rx Diversity"	7.6 dB	8.5 dB	7.3 dB	8.2 dB

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:RBLock:RATE on page 547

Power Level - Test Case 8.8.3
Sets the AWGN level in edit mode "User Definable".

In edit mode "According to Standard" the AWGN level is determined by the selected "Power Class" .

"-84 dBm" for "Wide Area BS"

"-74 dBm" for "Medium Range BS"

"-70 dBm" for "Local Area BS"

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:POWer:NOISe on page 547

E_b/N_0- Test Case 8.8.3
Sets the ratio of bit energy to noise power density.

In edit mode "According to Standard" the value depends on the selected "Required BLER".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:AWGN:ENRatio on page 546

Fading State - Test Case 8.8.3
Indicates the state of the Fader.

The state is fixed to "Off".

Remote command:
[:SOURce]:BB:W3GPp:TS25141:FSIMulator:STATe on page 550

7.2.3.12 Test Case 8.8.4 - RACH Demodulation of Message Part in Multipath Fading Case 3

For **non-diversity measurements**, the test case requires option Additional White Gaussian Noise (AWGN) (K62) and options Fading Simulator (B14), Path Extension (B15), and Enhanced Resolution and Dynamic Fading (K71) in addition to the basic configuration.

The measurement is performed using the standard test setup for one path.

The signal generator outputs a RACH message signal (= wanted signal) that is disturbed by an AWGN signal and multipath fading effects at output RF A. The signal is fed into the base station Rx port.

The signal generator will start signal generation at the first BS frame trigger sent to input "Trigger 1".

The measurement must be made at the three frequencies B, M and T. The Transport Block Sizes are 168 bits and 360 bits.

For **diversity measurements**, the test case requires option Second RF path (B20x), a second option Baseband Main Module (13), two options Additional White Gaussian Noise (AWGN) (K62) and options Fading Simulator (B14) and Path Extension (B15), Enhanced Resolution and Dynamic Fading (K71) in addition to the basic configuration.

It is performed using the standard test setup for diversity measurement.

The signal generator outputs a RACH message signal (= wanted signal) that is disturbed by an AWGN signal and multipath fading effects at output RF A and output RF B. The signals are fed into the base station Rx ports.

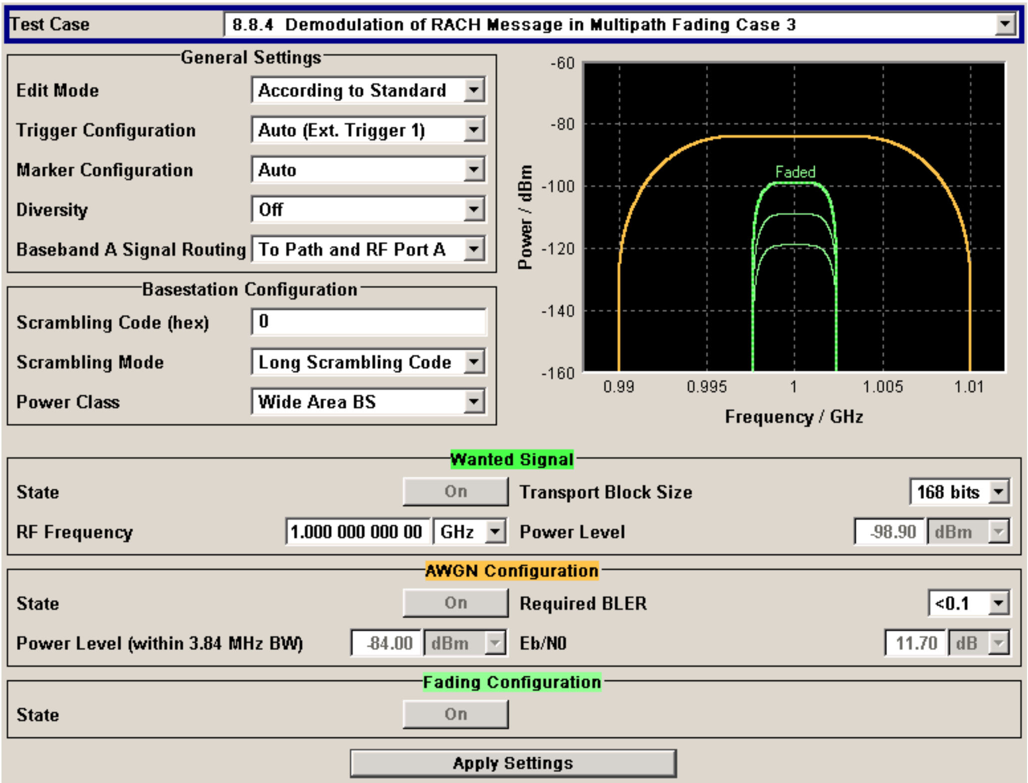
The signal generator will start signal generation at the first received BS frame trigger.

The measurement must be made at the three frequencies B, M and T. The Transport Block Sizes are 168 bits and 360 bits.

Test Purpose and Test Settings - Test Case 8.8.4

The test case shall verify that a BS receiver has the capability to demodulate the RACH message sent by the signal generator but superimposed by AWGN and disturbed by multipath fading effects.

The test is passed when the resulting BLER (calculated internally by the BS) does not exceed the required BLER settings. Note TS 25.141 Annex C: General Rules for Statistical Testing, where test conditions in terms of test methods and test conditions are defined.



This test case is identical to test case 8.8.3 except from the channel simulation that is set to "Multipath Fading Case 3" ("Fading > Standard > 3GPP Case 3 UE/BS") and the specific E_b/N_0 ratio requirements.

E_b/N_0 test requirements in fading case 3 channel

Transport Block size TB and TTI in frames: 168 bits, TTI = 20 ms / 360 bits, TTI = 20 ms

	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
"BS with Rx Diversity"	8.0 dB	9.1 dB	7.9 dB	8.9 dB
"BS without Rx Diversity"	11.7 dB	13.0 dB	11.6 dB	12.7 dB

7.2.3.13 Test Case 8.9.1 - CPCH Access Preamble and Collision Detection Preamble Detection in Static Propagation Conditions

This test case is identical to test case 8.8.1 except that the CPCH Preamble is used instead of the RACH preamble.

7.2.3.14 Test Case 8.9.2 - CPCH Access Preamble and Collision Detection Preamble Detection in Multipath Fading Case 3

This test case is identical to test case 8.8.2 except that the CPCH Preamble is used instead of the RACH preamble.

7.2.3.15 Test Case 8.9.3 - Demodulation of CPCH Message in Static Propagation Conditions

This test case is identical to test case 8.8.3 except from differing Eb/N0 ratio requirements and the demodulation of CPCH Message instead of the RACH Message.

Test requirements in AWGN channel

Transport Block size TB and TTI in frames: 168 bits, TTI = 20 ms / 360 bits, TTI = 20 ms

	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
"BS with Rx Diversity"	4.5 dB	5.4 dB	4.3 dB	5.2 dB
"BS without Rx Diversity"	7.5 dB	8.4 dB	7.3 dB	8.2 dB

Transport Block Size (TB) - Test Case 8.9.3
Sets the Transport Block Size:

168 bits

360 bits

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:PCPCh:CCODing:TYPE` on page 567

7.2.3.16 Test Case 8.9.4 - Demodulation of CPCH Message in Multipath Fading Case 3

This test case is identical to test case 8.8.4 except from differing Eb/N0 ratio requirements and the demodulation of the CPCH Message instead of the RACH Message.

Test requirements in fading case 3 channel

Transport Block size TB and TTI in frames: 168 bits, TTI = 20 ms / 360 bits, TTI = 20 ms

	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
"BS with Rx Diversity"	8.1 dB	9.1 dB	7.9 dB	8.7 dB
"BS without Rx Diversity"	11.4 dB	12.6 dB	11.3 dB	12.3 dB

7.3 Transmitter Tests

7.3.1 Basic Configuration

The test cases for transmitter tests require at least the following equipment layout for the signal generator:

- Digital Standard 3GPP FDD (K42)
- Universal Coder / Arbitrary Waveform Generator (B10/B11),
- Baseband Main module (DACIF; B13),
- Frequency option (B10x: RF 100 kHz - x GHz).

Transmitter tests always require a separate measuring equipment to perform the tests, e.g. the Vector Signal Analyzer R&S FSQ.

Test cases where the signal generator hardware equipment is not sufficient are shown in grey color but are not selectable. RF power and frequency limitations of the hardware equipment restrict the setting ranges.

7.3.2 Test Case 6.4.2 - Power Control Steps

The test case requires the basic configuration.

It can be performed using the standard test setup according to TS 25.141. A vector signal analyzer is required, e.g. the Vector Signal Analyzer R&S FSQ.

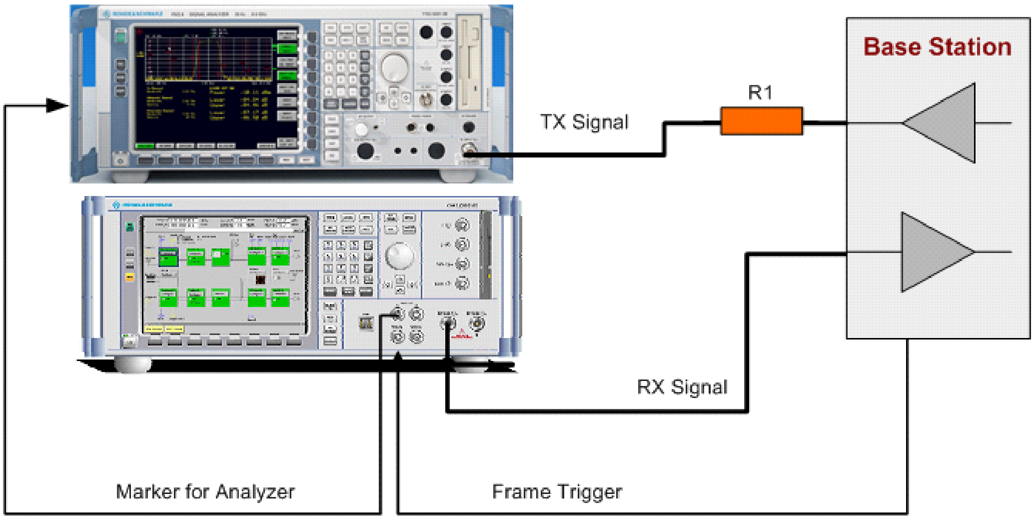
For the signal generator, in case of two-path instruments signal routing to path A is assumed.

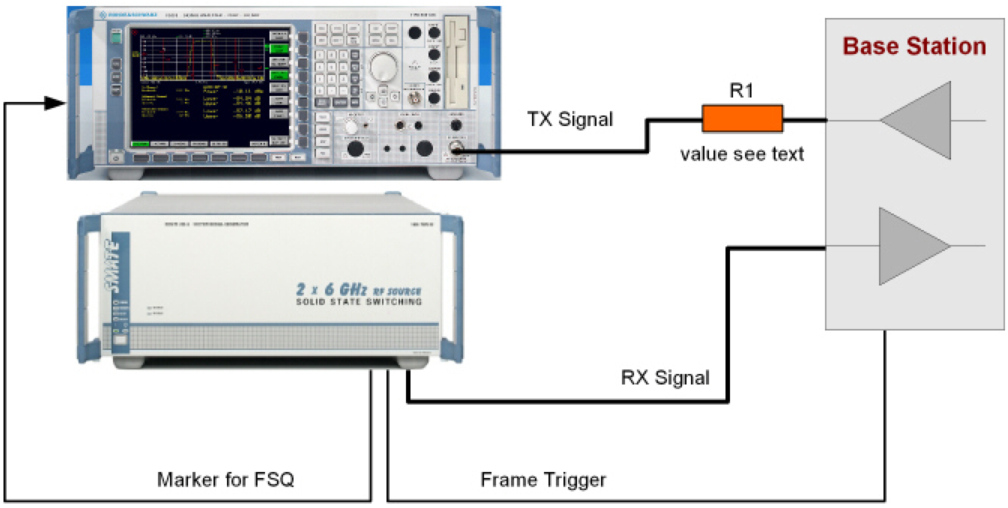
Output RF A of the signal generator is connected to the Rx port of the base station. The Tx signal of the base station is connected to the RF input of the analyzer via an attenuator.

The signal generator will start signal generation at the first received BS frame trigger. The analyzer is triggered by a marker signal ("Marker 1") of the generator.

The signal generator provides an uplink link signal with a precisely defined TPC bit sequence. The base station responds to the TPC bits by controlling the transmitted power of the data channel which is checked by the analyzer.

The analyzer measures the base station transmit power in the code domain to verify the transmitter power control step tolerance and aggregated power control step range.





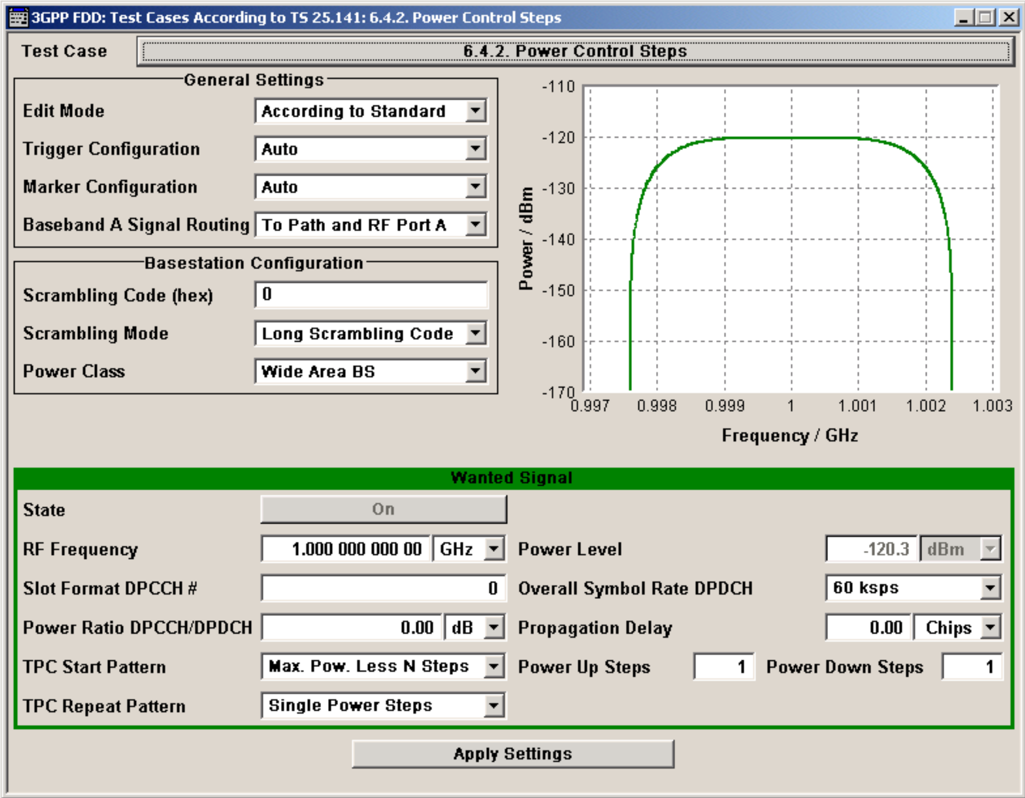
7.3.2.1 Test Purpose and Test Settings - Test Case 6.4.2

The test case verifies that a BS receiver has the capability to adjust its transmit power in response to the uplink TPC pattern. The cumulative power change as a result of ten successive (identical) TPC bits is also checked (aggregated transmit power).

The test is passed when the single or aggregated power control steps are within tolerance throughout the total dynamic range at the test frequencies B, M, and T.

Quotation from TS 25.141

The power control step is the required step change in the code domain power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.



Wanted Signal State - Test Case 6.4.2

Enables/disables the signal generation of the wanted 3GPP signal.

In edit mode "According to Standard" the state is fixed to On.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:STATe on page 568

Wanted Signal Frequency - Test Case 6.4.2

Sets the RF frequency of the wanted signal.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:FREQuency on page 566

Wanted Signal Level - Test Case 6.4.2

Sets the RF level in edit mode "User Definable".

In edit mode "According to Standard" the RF level is determined by the selected "Power Class".

It is always 10 dBm above the reference sensitivity:

- "-120.3 dB + 10 dBm" when "Wide Area BS"
- "-110.3 dB + 10 dBm" when "Medium Range BS"

- "-106.3 dB + 10 dBm" when "Local Area BS"

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:POWer on page 567

Slot Format DPCCH - Test Case 6.4.2
Selects the slot format.

Slot formats 0 to 5 are available for the DPCCH channel. The slot format defines the FBI mode and the TFCI status.

"Slot format 0"	no FBI field / TFCI on
"Slot format 1"	no FBI field / TFCI off
"Slot format 2"	1 FBI field / TFCI on
"Slot format 3"	1 FBI field / TFCI off
"Slot format 4"	2 FBI field / TFCI off
"Slot format 5"	2 FBI field / TFCI on

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:SFORmat on page 561

Overall Symbol Rate - Test Case 6.4.2
Sets the overall symbol rate of all the DPDCH channels.

The structure of the DPDCH channel table depends on this parameter. The overall symbol rate determines which DPDCHs are active, which symbol rate they have and which channelization codes they use.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:ORATe on page 566

Power Ratio DPCCH to DPDCH - Test Case 6.4.2
Sets the channel power ratio of DPCCH to DPDCH.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DCRatio on page 561

Propagation Delay - Test Case 6.4.2
Sets an additional propagation delay besides the fixed DL-UL timing offset of 1024 chip periods.

Note: The additional propagation delay is achieved by charging the start trigger impulse with the respective delay (= entering the value as an "External Delay" in the 3GPP "Trigger /Marker" dialog).

Remote command:
[:SOURce]:BB:W3GPp:TS25141:WSIGnal:TRIGger[:EXTernal]:DELay on page 568

TPC Start Pattern - Test Case 6.4.2
Sets the TPC pattern for initialization of the base stations power level in edit mode "User Definable". The TPC start pattern is sent before the TPC repeat pattern.

In edit mode "According to Standard" the pattern is fixed to "Maximum Power Less n Steps".

Note: In edit mode "According to Standard", the TPC bits are read out of predefined data lists.

The TPC start pattern ensures that the base station responds reliably to the TPC bits from the generator. It sets the base station to a defined initial state for the actual recording of the measurement data. The analyzer is only triggered after the generation of the start pattern using marker 1 of the generator.

"Maximum Power Less n Steps"
A sequence of power up steps (TPC bits "1") is followed by a number of power down steps (TPC bits "0").
A sufficiently long sequence of TPC bits "1" ('power up' commands) forces the base station to maximum transmit power. By the n 'power down' commands the base station is set to a defined number of n power steps (e.g. 1 dB or 0.5 dB) below its maximum transmit power at the beginning of the measurement.

"Data List" The TPC start pattern is taken from a user defined data list. When "Data List" is selected, a button appears for calling the "File Select" window.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa` on page 563
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa:DSELect`
on page 563

TPC Power Up Steps - Test Case 6.4.2
If "TPC Start Pattern > Max. Pow. Less N Steps", sets the number of power up bits ("1") in the TPC start pattern. The total TPC start pattern length is the number of 'power up' bits plus the number of n 'power down' bits.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa:PUSTeps`
on page 564

TPC Power Down Steps - Test Case 6.4.2
If "TPC Start Pattern > Max. Pow. Less N Steps", sets the number of power down bits ('0') in the TPC start pattern. The total TPC start pattern length is the number of 'power up' ('1') bits plus the number of n 'power down' ('0') bits.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa:PDSTeps`
on page 564

TPC Repeat Pattern - Test Case 6.4.2
Sets the TPC pattern for verification of the base stations power control steps.

In edit mode "According to Standard" the selection is limited.

"Single Power Steps"
A 01 pattern is sent periodically for measurement of the transmitter power control step tolerance.

"Aggregated Power Steps"
A 00000000001111111111 pattern is sent periodically for measurement of the transmitter aggregated power control step range. The power of the base station is measured after 10 consecutive equal TPC bits ('1' or '0').

"(All 1) Maximum Power"
A all 1 pattern is sent continuously. The base station is forced to maximum power. This selection is only available in edit mode "User Definable"

"(All 0) Minimum Power"
A all 0 pattern is sent continuously. The base station is forced to minimum power. This selection is only available in edit mode "User Definable"

"User Defined Pattern"
The TPC repeat pattern can be input. When "User Defined Pattern" is selected, an input field appears for entering the pattern. The maximum bit pattern length is 64 bits. This selection is only available in edit mode "User Definable"

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:RDATa:PATTern`
on page 562

"Data List" The TPC repeat pattern is taken from a data list. When "Data List" is selected, a button appears for calling the "File Select" window.

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:RDATa:DSELect`
on page 562

Remote command:
`[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:RDATa` on page 561

7.3.2.2 Carrying Out the Test Case 6.4.2 Measurement

For the preset Marker Configuration "Auto", Marker 1 starts delayed by the TPC start pattern length.

Each slot takes 0.625 ms and consists of 2560 chips. Depending on the slot format 1 or 2 TPC bits are sent for each slot.

Table 7-16: The following table lists the settings on the base station:

Parameter	Value
Frequency	B, M and T
Test Model	2
Transmit power	Any
Scrambling Code	Any

1. Set the base station to the basic state

a) Initialize the base station,
b) Set the scrambling scheme,
c) Set the base station to test model 2,
d) Set the frequency

2. Set the signal generator to the basic state
   a) Preset the signal generator unless some settings (e.g. in terms of I/Q and RF blocks) have to be kept.
3. Set the analyzer to the basic state
   a) Set the test case wizard
   b) Open the 3GPP FDD menu in the baseband block
   c) Open the Test Case Wizard and select Test Case 6.4.2.
      The General Settings parameters are preset according to TS 25.141
   d) Enter scrambling code and scrambling mode according to the base station scrambling scheme.
   e) Enter the power class of the base station under test. The RF level is automatically adjusted to the selected power class.
   f) Enter the test frequency (e.g. M). It must be the same as the base station has been set to.
   g) Enter the Wanted Signal parameters.
   h) Activate the settings with the "Apply Settings" button.
      The signal generator is now ready to start signal generation
4. Set the analyzer to the measurement frequency
5. Switch on RF output
6. Start the measurement
   a) Send a start trigger impulse from the base station to the signal generator and to the analyzer.
      Signal generation and measurement procedures are started.
7. Calculate the result
   The analyzer calculates the resulting code domain power of the BS downlink channel.

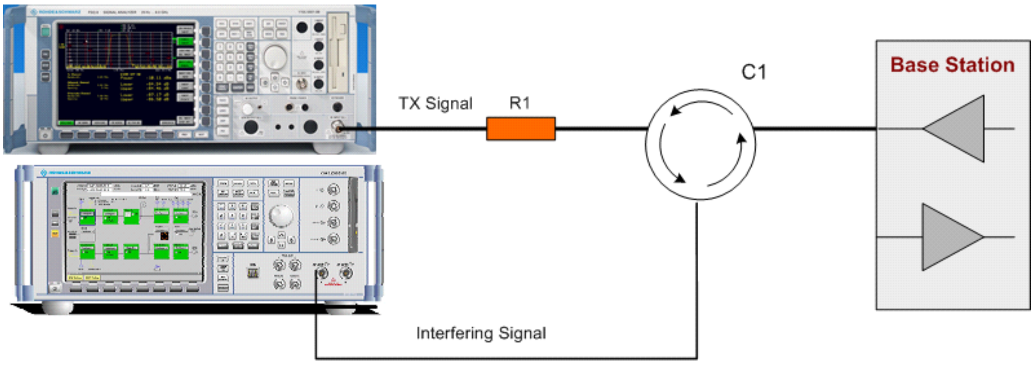
7.3.3 Test Case 6.6 - Transmit Intermodulation

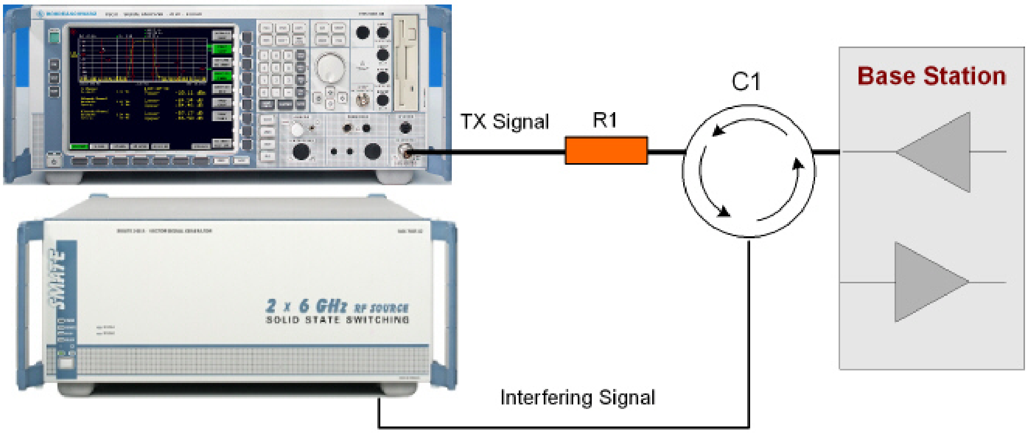
The test case requires the basic configuration.

It can be performed using the standard test setup according to TS 25.141. A vector signal analyzer is required, e.g. the Vector Signal Analyzer R&S FSQ.

For the signal generator, in case of two-path instruments signal routing to path A is assumed.

RF port A is connected to the RF input of the analyzer via a circulator and an external attenuator. The Tx Signal of the base station is connected to the RF input of the analyzer via a circulator.





The signal generator outputs the test model interfering signal with different frequency offsets in relation to the BS carrier frequency and provides the trigger for the analyzer ("Marker 1").

7.3.3.1 Test Purpose and Test Settings - Test Case 6.6

The test case verifies that a BS transmitter has the capability to inhibit intermodulation products of non linear elements caused by the presence of an interfering signal at the adjacent frequency channels from the signal generator.

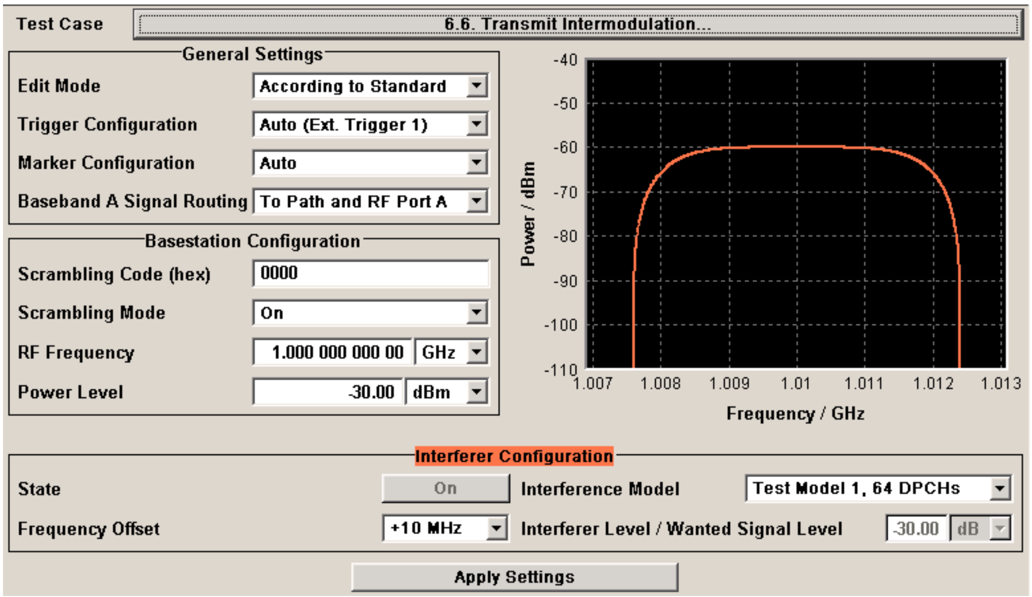
The test is passed when the transmit intermodulation level is below an upper out of band emission and spurious emission threshold at the test frequencies B, M, and T.

Quotation from TS 25.141

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna

The transmit intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into an antenna connector at a mean power level of 30 dB lower than that of the mean power of the wanted signal. The frequency of the interference signal shall be 5 MHz, 10 MHz and 15 MHz offset from the subject signal carrier frequency, but exclude interference frequencies that are outside of the allocated frequency band for UTRA-FDD downlink specified in subclause 3.4.1.

The requirements are applicable for single carrier.



BS Frequency - Test Case 6.6
Enters the RF frequency of the base station.

Note: In this test case the signal generator generates no wanted signal, but just the interfering signal.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:BSSignal:FREQuency on page 549

BS RF Power - Test Case 6.6
Enters the RF power of the base station.

Note: In this test case the signal generator generates no wanted signal, but just the interfering signal.

Remote command:
[:SOURce]:BB:W3GPp:TS25141:BSSignal:POWer on page 549

Interferer State - Test Case 6.6
Enables/disables the signal generation of the interfering 3GPP signal.

In edit mode "According to Standard" the state is fixed to "On".

NoteIn this test case the signal generator generates no wanted signal, but just the interfering signal .

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:STATe on page 556

Interferer Mode - Test Case 6.6
Selects the interfering signal from a list of test models in accordance with TS 25.141. All test models refer to the predefined downlink configurations. In edit mode "According to Standard" Test Model 1, 64 DPCHs is fixed.

The following test models are available for selection in edit mode "User Definable":
- Test Model 1; 64 DPCHs
- Test Model 1; 16 Channels
- Test Model 1; 32 Channels
- Test Model 2
- Test Model 3; 16 Channels
- Test Model 3; 32 Channels
- Test Model 4
- Test Model 5; 38 Channels
- Test Model 5; 28 Channels
- Test Model 5; 8 Channels

Remote-control command: TM164

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:SETTing:TMODel:BSTation on page 556

Frequency Offset - Test Case 6.6
Enters the frequency offset of the interfering signal versus the wanted signal.

In edit mode "According to Standard" the choice is limited to values between +/-15 MHz in 5 MHz steps:

Remote-control command: -15 MHz

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:FOFFset on page 553

Interferer Level to Signal Level - Test Case 6.6
Enters the ratio of interfering signal level versus wanted signal level.

In edit mode "According to Standard" the value is fixed to - 30 dB:

Remote-control command: -30

Remote command:
[:SOURce]:BB:W3GPp:TS25141:IFSignal:CNRatio on page 551

7.3.3.2 Carrying Out a Test Case 6.6 Measurement

The signal generator outputs the test model interfering signal.

Table 7-17: The following table lists the settings on the base station:

Parameter	Value
Frequency	B, M and T
Test Model	1
Transmit power	Maximum
Scrambling Code	any

1. Set the base station to the basic state
   a) Initialize the base station,

   b) Set the scrambling scheme,
   c) Set the base station to test model 1,
   d) Set maximum transmit power,
   e) Set the frequency
2. Set the signal generator to the basic state
   a) Preset the signal generator unless some settings (e.g. in terms of I/Q and RF blocks) have to be kept.
3. Set the analyzer to the basic state
4. Set the test case wizard
   a) Open the 3GPP FDD menu in the baseband block
   b) Open the Test Case Wizard and select Test Case 6.6.
      The "General Settings" parameters are preset according to TS 25.141
   c) Enter scrambling code and scrambling mode according to the base station scrambling scheme.
   d) Enter the power class of the base station under test. The RF level is automatically adjusted to the selected power class.
   e) Enter the test frequency (e.g. M). It must be the same as the base station has been set to.
   f) Enter the Interfering Signal parameters.
   g) Activate the settings with the "Apply Settings" button.
      The signal generator is now ready to start signal generation
5. Set the analyzer to the measurement frequency
6. Switch on RF output
7. Start the measurement
   a) Send a start trigger impulse from the base station to the signal generator and to the analyzer.
      Signal generation and measurement procedures are started.
8. Calculate the result
   The analyzer calculates the out of band emission and the spurious emission.

8 Remote-Control Commands

The following commands are required to perform signal generation with the 3GPP FDD options in a remote environment. We assume that the R&S Signal Generator has already been set up for remote operation in a network as described in the R&S Signal Generator documentation. Knowledge about the remote control operation and the SCPI command syntax are assumed.

Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote Control Commands" in the R&S Signal Generator operating manual.

Common Suffixes

The following common suffixes are used in remote commands:

Suffix	Value range	Description
`SOURce<hw>`	[1]|2	available baseband signals
`OUTPut<ch>`	1 .. 4	available markers (R&S SMBV supports 2 markers)
`EXTernal<ch>`	1|2	external trigger connector
`BSTation<st>`	1 .. 4	Base station If the suffix is omitted, BS1 is selected.
`CHANnel<ch>`	0 .. 138	channel If the suffix is omitted, Channel1 is selected.
`MSTation<st>`	1 .. 4	user equipment. If the suffix is omitted, MS1 is selected.

Placeholder <root>

For commands that read out or save files in the default directory, the default directory is set using command `MMEM:CDIRectory`. The examples in this description use the place holder `<root>` in the syntax of the command.

- `D:\` - for selecting the internal hard disk of a Windows instrument
- `E:\` - for selecting the memory stick which is inserted at the USB interface of a Windows instrument
- `/var/user/` - for selecting the internal flash card of a Linux instrument
- `/usb/` - for selecting the memory stick which is inserted at the USB interface of a Linux instrument.

Tasks (in manual or remote operation) that are also performed in the base unit in the same way are not described here.

In particular, this includes:

- Managing settings and data lists, i.e. storing and loading settings, creating and accessing data lists, accessing files in a particular directory, etc.
- Information on regular trigger, marker and clock signals as well as filter settings, if appropriate.
- General instrument configuration, such as configuring networks and remote operation
- Using the common status registers

For a description of such tasks, see the R&S Signal Generator operating manual.

The commands in the `SOURce:BB:W3GPp` subsystem are described in several sections, separated into general remote commands, commands for base station settings and commands for user equipment settings.

This subsystem contains commands for the primary and general settings of the 3GPP FDD standard. These settings concern activation and deactivation of the standard, setting the transmission direction, filter, clock, trigger and clipping settings, defining the chip rate and the sequence length, as well as the preset and power adjust setting.

The commands for setting the base station and the user equipment, the enhanced channels of the base and user equipment, as well as the commands for selecting the test models and the test setups, are described in separate sections. The commands are divided up in this way to make the extremely comprehensive `SOURce:BB:W3GPp` subsystem clearer.

The following commands specific to the 3GPP FDD options are described here:

8.1 General Commands

[:SOURce<hw>]:BB:W3GPp:PRESet

Sets the parameters of the digital standard to their default values (`*RST` values specified for the commands).

Not affected is the state set with the command `SOURce<hw>:BB:W3GPp:STATe`

Example: `SOURce1:BB:W3GPp:PRESet`

Usage: Event

Manual operation: See "Set to default" on page 57

[:SOURce<hw>]:BB:W3GPp:SETTing:CATalog?

This command reads out the files with 3GPP FDD settings in the default directory. The default directory is set using command `MMEM:CDIRectory`. Only files with the file extension `*.3g` will be listed.

Return values:
<Catalog> string

Example: `MMEM:CDIR '<root>3gpp`
sets the default directory.
`BB:W3GP:SETT:CAT?`
reads out all the files with 3GPP FDD settings in the default directory.
`Response: UPLINK,DOWNLINK`
the files `UPLINK` and `DOWNLINK` are available.

Usage: Query only

Manual operation: See "Save/Recall" on page 57

[:SOURce<hw>]:BB:W3GPp:SETTing:DELete <Filename>

This command deletes the selected file with 3GPP FDD settings The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension `*.3g` will be deleted.

Setting parameters:

<Filename> <file_name>

Example: `BB:W3GP:SETT:DEL 'UPLINK'`
deletes file `UPLINK`.

Usage: Setting only

Manual operation: See "Save/Recall" on page 57

[:SOURce<hw>]:BB:W3GPp:SETTing:LOAD <Filename>

This command loads the selected file with 3GPP FDD settings The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. The file extension may be omitted. Only files with the file extension `*.3g` will be loaded.

Setting parameters:

<Filename> <file_name>

Example: `BB:W3GP:SETT:LOAD 'UPLINK'`
loads file `UPLINK`.

Usage: Setting only

Manual operation: See "Save/Recall" on page 57

[:SOURce<hw>]:BB:W3GPp:SETTing:STORe <Filename>

This command stores the current 3GPP FDD settings into the selected file. The directory is set using command `MMEM:CDIRectory`. A path can also be specified, in which case the files in the specified directory are read. Only the file name has to be entered. 3GPP FDD settings are stored as files with the specific file extensions `*.3g`.

Setting parameters:

<Filename> string

Example: `BB:W3GP:SETT:STOR 'UPLINK'`
stores the current 3GPP FDD settings into file `UPLINK`.

Usage: Setting only

Manual operation: See "Save/Recall" on page 57

[:SOURce<hw>]:BB:W3GPp:SETTing:STORe:FAST <Fast>

Determines whether the instrument performs an absolute or a differential storing of the settings.

Enable this function to accelerate the saving process by saving only the settings with values different to the default ones.

Note: This function is not affected by the "Preset" function.

Parameters:

<Fast> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "Save/Recall" on page 57

[:SOURce<hw>]:BB:W3GPp:SLENgth <SLength>

Defines the sequence length of the arbitrary waveform component of the 3GPP signal in the number of frames. This component is calculated in advance and output in the arbitrary waveform generator. It is added to the realtime signal components (Enhanced Channels).

When working in Advanced Mode (`W3GP:BST1:CHAN:HSDP:HSET:AMOD ON`), it is recommended to adjust the current ARB sequence length to the suggested one.

Parameters:

<SLength> integer

Range: 1 to Max. No. of Frames = Arbitrary waveform memory size/(3.84 Mcps x 10 ms).

*RST: 1

Example: `BB:W3GP:SLEN 10`

sets the sequence length to 10 frames.

Manual operation: See "Sequence Length ARB" on page 71

[:SOURce<hw>]:BB:W3GPp:STATe <State>

Activates the standard and deactivates all the other digital standards and digital modulation modes in the same path.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `SOURce1:BB:W3GPp:STATe ON`

Manual operation: See "State" on page 56

[:SOURce<hw>]:BB:W3GPp:WAVeform:CREate <Filename>

This command creates a waveform using the current settings of the 3GPP FDD menu. The file name is entered with the command. The file is stored with the predefined file extension `*.wv`. The file name and the directory it is stored in are user-definable.

Setting parameters:

<Filename> <file_name>

Example: `MMEM:CDIR '<root>waveform'`

sets the default directory to <root>waveform.

`BB:W3GP:WAV:CRE 'gpp3_bs'`

creates the waveform file `gpp3_bs.wv` in the default directory.

Usage: Setting only

Manual operation: See "Generate Waveform" on page 59

[:SOURce]:BB:W3GPp:GPP3:VERSion?

The command queries the version of the 3GPP standard underlying the definitions.

Return values:

<Version> string

Example: `BB:W3GP:GPP3:VERS?`
queries the 3GPP version.

Usage: Query only

Manual operation: See "3GPP Version" on page 60

[:SOURce<hw>]:BB:W3GPp:BSTation:PRESet

The command produces a standardized default for all the base stations. The settings correspond to the `*RST` values specified for the commands.

All base station settings are preset.

Example: `BB:W3GP:BST:PRES`
resets all the base station settings to default values.

Usage: Event

Manual operation: See "Reset all Base Stations" on page 62

[:SOURce<hw>]:BB:W3GPp:COPY:COFFset <COffset>

Sets the offset for the channelization code in the destination base station.

Parameters:

<COffset> integer

Range: 0 to 511
*RST: 0

Example: `BB:W3GP:COPY:COFF 10`
the channelization code is shifted by 10 when the source base station is copied to the destination base station.

Manual operation: See "Copy Basestation/Copy User Equipment..." on page 63

[:SOURce<hw>]:BB:W3GPp:COPY:DESTination <Destination>

The command selects the station to which data is to be copied. Whether the data is copied to a base station or a user equipment depends on which transmission direction is selected (command `W3GPp:LINK UP | DOWN`).

Parameters:

<Destination> 1 | 2 | 3 | 4

Range: 1 to 4
*RST: 2

Example: `BB:W3GP:LINK DOWN`
selects the downlink transmit direction (base station to user equipment).
`BB:W3GP:COPY:SOUR 1`
selects base station 1 as the source.
`BB:W3GP:COPY:DEST 4`
selects base station 4 as the destination.
`BB:W3GP:COPY:EXEC`
starts copying the parameter set of base station 1 to base station 4.

Manual operation: See "Copy Basestation/Copy User Equipment..." on page 63

[:SOURce<hw>]:BB:W3GPp:COPY:EXECute

The command starts the copy process. The dataset of the source station is copied to the destination station. Whether the data is copied to a base station or a user equipment depends on which transmission direction is selected (command `W3GPp:LINK UP | DOWN`).

Example: `BB:W3GP:COPY:EXEC`
starts copying the parameter set of the selected source station to the selected destination station.

Usage: Event

Manual operation: See "Copy Basestation/Copy User Equipment..." on page 63

[:SOURce<hw>]:BB:W3GPp:COPY:SOURce <Source>

The command selects the station that has data to be copied. Whether the station copied is a base or user equipment depends on which transmission direction is selected (command `W3GPp:LINK UP | DOWN`).

Parameters:

<Source> 1 | 2 | 3 | 4

Range: 1 to 4
*RST: 1

Example: `BB:W3GP:LINK UP`
selects the uplink transmit direction (user equipment to base station).
`BB:W3GP:COPY:SOUR 1`
selects user equipment 1 as the source.
`BB:W3GP:COPY:DEST 4`
selects user equipment 4 as the destination.
`BB:W3GP:COPY:EXEC`
starts copying the parameter set of user equipment 1 to user equipment 4.

Manual operation: See "Copy Basestation/Copy User Equipment..." on page 63

[:SOURce<hw>]:BB:W3GPp:LINK <Link>

The command defines the transmission direction. The signal either corresponds to that of a base station (`FORWard|DOWN`) or that of a user equipment (`REVerse|UP`).

Parameters:

<Link> DOWN | UP | FORWard | REVerse

*RST: FORWard|DOWN

Example: `BB:W3GP:LINK DOWN`
the transmission direction selected is base station to user equipment. The signal corresponds to that of a base station.

Manual operation: See "Link Direction" on page 60

[:SOURce<hw>]:BB:W3GPp:POWer:ADJust

The command sets the power of the active channels in such a way that the total power of the active channels is 0 dB. This will not change the power ratio among the individual channels.

Example: `BB:W3GP:POW:ADJ`
the total power of the active channels is set to 0 dB, the power ratio among the individual channels is unchanged.

Usage: Event

Manual operation: See "Adjust Total Power to 0dB" on page 65

[:SOURce<hw>]:BB:W3GPp:POWer[:TOTal]?

The command queries the total power of the active channels. After "Power Adjust", this power corresponds to 0 dB.

Return values:

<Total> float

Example: `BB:W3GP:POW?`
queries the total power of the active channels.
`Response: -22.5`
the total power is -25 dB.

Usage: Query only

Manual operation: See "Total Power" on page 65

8.2 Filter/Clipping Settings

[:SOURce<hw>]:BB:W3GPp:CLIPping:LEVel <Level>

The command sets the limit for level clipping (Clipping). This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Level clipping is activated with the command `SOUR:BB:W3GP:CLIP:STAT ON`

Parameters:

<Level> integer

Range: 1 to 100
*RST: 100

Example: `BB:W3GP:CLIP:LEV 80PCT`
sets the limit for level clipping to 80% of the maximum level.
`BB:W3GP:CLIP:STAT ON`
activates level clipping.

Manual operation: See "Clipping Level" on page 70

[:SOURce<hw>]:BB:W3GPp:CLIPping:MODE <Mode>

The command sets the method for level clipping (Clipping).

Parameters:

<Mode> VECTor | SCALar

VECTor
The reference level is the amplitude | i+jq |

SCALar
The reference level is the absolute maximum of the I and Q values.

*RST: VECTor

Example: `BB:W3GP:CLIP:MODE SCAL`
selects the absolute maximum of all the I and Q values as the reference level.
`BB:W3GP:CLIP:LEV 80PCT`
sets the limit for level clipping to 80% of this maximum level.
`BB:W3GP:CLIP:STAT ON`
activates level clipping.

Manual operation: See "Clipping Mode" on page 70

[:SOURce<hw>]:BB:W3GPp:CLIPping:STATe <State>

The command activates level clipping (Clipping). The value is defined with the command `BB:W3GPp:CLIPping:LEVel`, the mode of calculation with the command `BB:W3GPp:CLIPping:MODE`.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:CLIP:STAT ON`
activates level clipping.

Manual operation: See "Clipping State" on page 69

[:SOURce<hw>]:BB:W3GPp:CRATe?

The command queries the set system chip rate. The output chip rate can be set with the command `SOUR:BB:W3GP:CRAT:VAR`.

Return values:

<CRate> R3M8

*RST: R3M8

Example: `BB:W3GP:CRAT?`
queries the system chip rate.
`Response: R3M8`
the system chip rate is 3.8 Mcps.

Usage: Query only

Manual operation: See "Chip Rate" on page 60

[:SOURce<hw>]:BB:W3GPp:CRATe:VARiation <Variation>

Sets the output chip rate.

The chip rate entry changes the output clock and the modulation bandwidth, as well as the synchronization signals that are output. It does not affect the calculated chip sequence.

Parameters:

<Variation> float

Range: 400 to 5E6
Increment: 0.001
*RST: 3.84 MCps

Example: `BB:W3GP:CRAT:VAR 4086001`
sets the chip rate to 4.08 Mcps.

Manual operation: See "Chip Rate Variation" on page 69

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:APCO25 <Apco25>

The command sets the roll-off factor for filter type APCO25.

Parameters:

<Apco25> float

Range: 0.05 to 0.99
Increment: 0.01
*RST: 0.2

Example: `BB:W3GP:FILT:PAR:APCO25 0.2`
sets the roll-off factor to 0.2 for filter type APCO25.

Manual operation: See "Roll Off Factor or BxT" on page 68

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:COSine <Cosine>

The command sets the roll-off factor for the Cosine filter type.

Parameters:

<Cosine> float

Range: 0 to 1
Increment: 0.01
*RST: 0.35

Example: `BB:W3GP:FILT:PAR:COS 0.35`
sets the roll-off factor to 0.35 for filter type Cosine.

Manual operation: See "Roll Off Factor or BxT" on page 68

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:GAUSs <Gauss>

The command sets the roll-off factor for the Gauss filter type.

Parameters:

<Gauss> float

Range: 0.15 to 2.5
Increment: 0.01
*RST: 0.5

Example: `BB:W3GP:FILT:PAR:GAUS 0.5`
sets B x T to 0.5 for the Gauss filter type.

Manual operation: See "Roll Off Factor or BxT" on page 68

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:LPASs <LPass>

Sets the cut off frequency factor for the Lowpass (ACP opt.) filter type. The minimum/maximum values depend on the current symbol rate:

Parameters:

<LPass> float

Range: 0.05 to 2
Increment: 0.01
*RST: 0.5

Example: `BB:W3GP:FILT:PAR:LPAS 0.5`
the cut of frequency factor is set to 0.5.

Manual operation: See "Cut Off Frequency Factor" on page 69

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:LPASSEVM <LPassEvm>

Sets the cut off frequency factor for the Lowpass (EVM opt.) filter type.

Parameters:

<LPassEvm> float

Range: 0.05 to 2
Increment: 0.01
*RST: 0.5

Example: `BB:W3GP:FILT:PAR:LPASSEVM 0.5`
the cut of frequency factor is set to 0.5.

Manual operation: See "Cut Off Frequency Factor" on page 69

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:RCOSine <RCosine>

The command sets the roll-off factor for the Root Cosine filter type.

Parameters:

<RCosine> float

Range: 0 to 1.0
Increment: 0.01
*RST: 0.22

Example: `BB:W3GP:FILT:PAR:RCOS 0.22`
sets the roll-off factor to 0. 22 for filter type Root Cosine.

Manual operation: See "Roll Off Factor or BxT" on page 68

[:SOURce<hw>]:BB:W3GPp:FILTer:PARameter:SPHase <SPhase>

The command sets B x T for the Split Phase filter type.

Parameters:

<SPhase> float

Range: 0.15 to 2.5
Increment: 0.01
*RST: 2

Example: `BB:W3GP:FILT:PAR:SPH 0.5`
sets B x T to 0.5 for the Split Phase filter type.

Manual operation: See "Roll Off Factor or BxT" on page 68

[:SOURce<hw>]:BB:W3GPp:FILTer:TYPE <Type>

The command selects the filter type.

Parameters:

<Type> RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 | COEQualizer | COFequalizer | C2K3x | APCO25 | SPHase | RECTangle | LPASs | DIRac | ENPShape | EWPShape | LPASSEVM | PGAuss

*RST: RCOSine

Example: `BB:W3GP:FILT:TYPE COS`
sets the filter type COSine.

Manual operation: See "Filter" on page 68

8.3 Trigger Settings

The trigger settings are available for R&S SMx and R&S AMU instruments only.

`EXTernal<ch>`

The numeric suffix to `EXTernal<ch>` distinguishes between the external trigger via the TRIGGER 1 (suffix 1) and TRIGGER 2 (suffix 2) connector.

[:SOURce<hw>]:BB:W3GPp:TRIGger:ARM:EXECute

The command stops signal generation for trigger modes Armed_Auto and Armed_Retrigger. A subsequent internal or external trigger event restart signal generation.

Example: `BB:W3GP:TRIG:SOUR INT`
sets internal triggering.
`BB:W3GP:TRIG:SEQ ARET`
sets Armed_Retrigger mode, i.e. every trigger event causes signal generation to restart.
`BB:W3GP:TRIG:EXEC`
executes a trigger, signal generation is started.
`BB:W3GP:TRIG:ARM:EXEC`
signal generation is stopped.
`BB:W3GP:TRIG:EXEC`
executes a trigger, signal generation is started again.

Usage: Event

Manual operation: See "Arm" on page 74

[:SOURce<hw>]:BB:W3GPp:TRIGger:EXECute

The command executes a trigger. The internal trigger source must be selected using the command `BB:W3GP:TRIG:SOUR INT` and a trigger mode other than `AUTO` must be selected using the command `:BB:W3GP:TRIG:SEQ`.

Example: `BB:W3GP:TRIG:SOUR INT`
sets internal triggering.
`BB:W3GP:TRIG:SEQ RETR`
sets Retrigger mode, i.e. every trigger event causes signal generation to restart.
`BB:W3GP:TRIG:EXEC`
executes a trigger.

Usage: Event

Manual operation: See "Execute Trigger" on page 60

[:SOURce<hw>]:BB:W3GPp:TRIGger:EXTernal:SYNChronize:OUTPut <Output>

Enables/disables output of the signal synchronous to the external trigger event.

Parameters:

<Output> 0 | 1 | OFF | ON

*RST: 1

Example: `BB:W3GPp:TRIG:SOUR EXT`
sets external triggering.
`BB:W3GPp:TRIG:EXT:SYNC:OUTP ON`
enables synchrounous output to external trigger

Manual operation: See "Sync. Output to External Trigger" on page 74

[:SOURce<hw>]:BB:W3GPp:TRIGger:OBASeband:DELay <Delay>

Specifies the trigger delay (expressed as a number of chips) for triggering by the trigger signal from the second path.

Parameters:

<Delay> float

Range: 0 to 65535
Increment: 0.01
*RST: 0

Example: `BB:W3GP:TRIG:SOUR OBAS`
sets for path A the internal trigger executed by the trigger signal from the second path (path B).
`BB:W3GP:TRIG:OBAS:DEL 50`
sets a delay of 50 chips for the trigger.

Manual operation: See "Trigger Delay" on page 76

[:SOURce<hw>]:BB:W3GPp:TRIGger:OBASeband:INHibit <Inhibit>

Specifies the number of chips by which a restart is to be inhibited following a trigger event. This command applies only for triggering by the second path (two-path instruments only).

Parameters:

<Inhibit> integer

Range: 0 to 67108863
*RST: 0

Example: `BB:W3GP:TRIG:SOUR OBAS`
sets for path A the internal trigger executed by the trigger signal from the second path (path B).
`BB:W3GP:TRIG:INH 200`
sets a restart inhibit for 200 chips following a trigger event.

Manual operation: See "Trigger Inhibit" on page 76

[:SOURce<hw>]:BB:W3GPp:TRIGger:RMODe?

The command queries the current status of signal generation for all trigger modes with 3GPP FDD modulation on.

Return values:

<RMode> STOP | RUN

STOP
the signal is not generated. A trigger event did not occur in the triggered modes, or signal generation was stopped by the command `:BB:W3GP:TRIG:ARM:EXECute` (armed trigger modes only).

RUN
the signal is generated. A trigger event occurred in the triggered mode.

*RST: STOP

Example:
`BB:W3GP:TRIG:SOUR EXT`
sets external triggering.
`BB:W3GP:TRIG:MODE ARET`
selects the Armed_Retrigger mode.
`BB:W3GP:TRIG:RMOD?`
queries the current status of signal generation.
`Response: RUN`
the signal is generated, an external trigger was executed.

Usage: Query only

Manual operation: See "Running/Stopped" on page 73

[:SOURce<hw>]:BB:W3GPp:TRIGger:SLENgth <SLength>

Defines the length of the signal sequence to be output in the Single trigger mode.

Parameters:

<SLength> integer

Range: 1 to 4293120000
*RST: 1

Example:
`SOURce1:BB:W3GPp:TRIGger:SEQuence SINGle`
sets trigger mode Single.
`SOURce1:BB:W3GPp:TRIGger:SLUNit CHIP`
sets unit chips for the entry of sequence length.
`SOURce1:BB:W3GPp:TRIGger:SLENgth 200`
sets a sequence length of 200 chips. The first 200 chips of the current frame will be output after the next trigger event.

Manual operation: See "Signal Duration" on page 73

[:SOURce<hw>]:BB:W3GPp:TRIGger:SLUNit <SLunit>

The command defines the unit for the entry of the length of the signal sequence (`SOUR:BB:W3GPp:TRIG:SLEN`) to be output in the Single trigger mode (`SOUR:BB:W3GPp:SEQ SING`).

Parameters:

<SLunit> CHIP | FRAMe | SLOT | SEQuence

*RST: SEQuence

Example: `BB:W3GP:SEQ SING`
sets trigger mode Single.
`BB:W3GP:TRIG:SLUN FRAM`
sets unit frames for the entry of sequence length.
`BB:W3GP:TRIG:SLEN 2`
sets a sequence length of 2 frames. The current frame will be output twice after the next trigger event.

Manual operation: See "Signal Duration Unit" on page 73

[:SOURce<hw>]:BB:W3GPp:TRIGger:SOURce <Source>

The command selects the trigger source.

Parameters:

<Source> INTernal|OBASeband|BEXTernal|EXTernal

INTernal
manual trigger or `*TRG`.
EXTernal|BEXTernal
trigger signal on the TRIGGER 1/2 connector.
OBASeband
trigger signal from the other path

*RST: INTernal

Example: `SOURce1:BB:W3GPp:TRIGger:SOURce EXTernal`
sets external triggering via the TRIGGER 1 connector.

Manual operation: See "Trigger Source" on page 74

[:SOURce<hw>]:BB:W3GPp:TRIGger[:EXTernal<ch>]:DELay <Delay>

The command specifies the trigger delay (expressed as a number of chips) for external triggering.

Parameters:

<Delay> float

Range: 0 chips to 2^32-1 chip
Increment: 1 chip
*RST: 0 chips

Example: `BB:W3GP:TRIG:SOUR EXT`
sets an external trigger via the TRIGGER 1 connector.
`BB:W3GP:TRIG:DEL 50`
sets a delay of 50 chips for the trigger.

Manual operation: See "Trigger Delay" on page 76

[:SOURce<hw>]:BB:W3GPp:TRIGger[:EXTernal<ch>]:INHibit <Inhibit>

The command specifies the number of chips by which a restart is to be inhibited following a trigger event. This command applies only in the case of external triggering.

Parameters:

<Inhibit> integer

Range: 0 chips to 2^32-1 chips
Increment: 1 chip
*RST: 0 chips

Example: `BB:W3GP:TRIG:SOUR EXT`
selects an external trigger via the TRIGGER 1 connector.
`BB:W3GP:TRIG:INH 200`
sets a restart inhibit for 200 chips following a trigger event.

Manual operation: See "Trigger Inhibit" on page 76

[:SOURce<hw>]:BB:W3GPp[:TRIGger]:SEQuence <Sequence>

The command selects the trigger mode.

Parameters:

<Sequence> AUTO | RETRigger | AAUTo | ARETrigger | SINGle

AUTO
The modulation signal is generated continuously.

RETRigger
The modulation signal is generated continuously. A trigger event (internal or external) causes a restart.

AAUTo
The modulation signal is generated only when a trigger event occurs. After the trigger event the signal is generated continuously. Signal generation is stopped with command `SOUR:BB:W3GP:TRIG:ARM:EXEC` and started again when a trigger event occurs.

ARETrigger
The modulation signal is generated only when a trigger event occurs. The device automatically toggles to RETRIG mode. Every subsequent trigger event causes a restart.
Signal generation is stopped with command `SOUR:BB:W3GP:TRIG:ARM:EXEC` and started again when a trigger event occurs.

SINGle
The modulation signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified with command `SOUR:BB:W3GP:TRIG:SLEN`. Every subsequent trigger event causes a restart.

*RST: AUTO

Example: `BB:W3GP:SEQ AAUT`
sets the Armed_auto trigger mode; the device waits for the first trigger (e.g. with `*TRG`) and then generates the signal continuously.

Manual operation: See "Trigger Mode" on page 73

8.4 Marker Settings

This section lists the remote control commands, necessary to configure the markers.

The marker delay settings are available for R&S SMx and R&S AMU instruments only.

`OUTPut<ch>`

The numeric suffix to `OUTPut` distinguishes between the available markers.

Only two markers are available for the R&S SMBV, i.e. the allowed values for the suffix are 1 or 2.

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut:DELay:FIXed <Fixed>

The command restricts the marker delay setting range to the dynamic range. In this range the delay can be set without restarting the marker and signal. If a delay is entered in setting ON but is outside this range, the maximum possible delay is set and an error message is generated.

The numeric suffix in `OUTPut` has no significance for this command, since the setting always affects every marker.

Parameters:

<Fixed> ON | OFF

*RST: OFF

Example: `BB:W3GP:TRIG:OUTP:DEL:FIX ON`
restricts the marker signal delay setting range to the dynamic range.

Manual operation: See "Fix marker delay to current range" on page 78

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:DELay <Delay>

Defines the delay between the signal on the marker outputs and the start of the signal, expressed in terms of chips.

Parameters:

<Delay> float

Range: 0 to 16777215
Increment: 1E-3
*RST: 0

Example: `BB:W3GP:TRIG:OUTP2:DEL 16000`
sets a delay of 16000 chips for the corresponding marker signal.

Manual operation: See "Marker x Delay" on page 78

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:DELay:MAXimum?

The command queries the maximum marker delay for setting `:BB:W3GPp:TRIG:OUTP:DEL:FIX ON`.

Return values:

<Maximum> float

Increment: 0.001

Example: `BB:W3GP:TRIG:OUTP:DEL:FIX ON`
restricts the marker signal delay setting range to the dynamic range.
`BB:W3GP:TRIG:OUTP:DEL:MAX`
queries the maximum of the dynamic range.
`Response: 20000`
the maximum for the marker delay setting is 20000 chips.

Usage: Query only

Manual operation: See "Current Range without Recalculation" on page 78

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:DELay:MINimum?

The command queries the minimum marker delay for setting `:BB:W3GPp:TRIGger:OUTPut:DELay:FIXed ON`.

Return values:

<Minimum> float

Increment: 0.001

Example: `BB:W3GP:TRIG:OUTP:DEL:FIX ON`
restricts the marker signal delay setting range to the dynamic range.
`BB:W3GP:TRIG:OUTP:DEL:MIN`
queries the minimum of the dynamic range.
`Response: 0`
the minimum for the marker delay setting is 0 chips.

Usage: Query only

Manual operation: See "Current Range without Recalculation" on page 78

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:MODE <Mode>

Defines the signal for the selected marker output.

Parameters:

<Mode>

SLOT | RFRame | CSPeriod | SFNR | RATio | USER | DPC | HFE | TRIGger

SLOT
A marker signal is generated at the start of each slot (every 2560 chips or 0.667 ms).

RFRame
A marker signal is generated at the start of each frame (every 38400 chips or 10 ms).

CSPeriod
A marker signal is generated at the start of every arbitrary waveform sequence (depending on the selected arbitrary waveform sequence length, see `[:SOURce<hw>]:BB:W3GPp:SLENgth`). If the signal does not contain an arbitrary waveform component, a radio frame trigger is generated.

SFNR
A marker signal is generated at the start of every SFN period (every 4096 frames).

RATio
A marker signal corresponding to the Time Off / Time On specifications in the commands `[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:OFFTime` and `[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:ONTime` is generated.

USER
A marker signal is generated at the beginning of every user-defined period. The period is defined with command `[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:PERiod`.

DPC
(the parameter is not available for R&S SMBV)
This marker is used internally. Marker 4 is set automatically to this value if "Dynamic Power Control" is enabled.

HFE
(the parameter is not available for R&S SMBV)
This marker is used internally. Marker 4 is set automatically to this value if "HARQ Feedback" is enabled.

TRIGger
A received internal or external trigger signal is output at the marker connector.

*RST: RFRame

Example:

`SOURce1:BB:W3GPp:TRIGger:OUTPut2:MODE SLOT`
selects the slot marker for the corresponding marker signal.

Manual operation: See "Marker Mode" on page 77

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:ONTime <OnTime>
[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:OFFTime <OffTime>

Sets the number of chips in a period (ON time + OFF time) during which the marker signal in setting `SOURce:BB:W3GPp:TRIGger:OUTPut:MODE RATio` on the marker outputs is OFF.

Parameters:

<OffTime> integer

Range: 1 to 16777215
*RST: 1
Default unit: chip

Example: `BB:W3GP:TRIG:OUTP2:OFFT 2000`
sets an OFF time of 2000 chips for marker signal 2.

Manual operation: See "Marker Mode" on page 77

[:SOURce<hw>]:BB:W3GPp:TRIGger:OUTPut<ch>:PERiod <Period>

For user marker, sets the repetition rate for the signal at the marker outputs, expressed in terms of chips.

Parameters:

<Period> integer

Range: 2 to 2^32-1 chips
Increment: 1 chip
*RST: 1 Frame (38 400 Chips)

Example: `BB:W3GP:TRIG:OUTP2:MODE USER`
selects the user marker for the corresponding marker signal
`BB:W3GP:TRIG:OUTP2:PER 1600`
sets a period of 1600 chips, i.e. the marker signal is repeated every 1600th chip.

Manual operation: See "Marker Mode" on page 77

8.5 Clock Settings

This section lists the remote control commands, necessary to configure the clock.

The clock settings are available for R&S SMx and R&S AMU instruments only.

[:SOURce<hw>]:BB:W3GPp:CLOCk:MODE <Mode>

Sets the type of externally supplied clock.

For two-path instruments, the only numerical suffix allowed for SOURce is 1, since the external clock source is permanently allocated to path A.

Parameters:

<Mode> CHIP | MCHip

*RST: CHIP

Example: `SOURce1:BB:W3GPp:CLOCk:MODE CHIP`
selects clock type Chip, i.e. the supplied clock is a chip clock.

Manual operation: See "Clock Mode" on page 79

[:SOURce<hw>]:BB:W3GPp:CLOCk:MULTiplier <Multiplier>

Sets the multiplier for clock type Multiplied.

For two-path instruments, the only numerical suffix allowed for `SOURce` is 1, since the external clock source is permanently allocated to path A.

Parameters:

<Multiplier> integer

Range: 1 to 64
*RST: 4

Example: `SOURce1:BB:W3GPp:CLOCk:SOURce EXT`
selects the external clock source.
`SOURce1:BB:W3GPp:CLOCk:MODE MCHip`
selects clock type multiplied, i.e. the supplied clock has a rate which is a multiple of the chip rate.
`SOURce1:BB:W3GPp:CLOCk:MULTiplier 12`
the multiplier for the external clock rate is 12.

Manual operation: See "Chip Clock Multiplier" on page 80

[:SOURce<hw>]:BB:W3GPp:CLOCk:SOURce <Source>

Sets the clock source.

For two-path instruments, selecting `EXTernal` is only possible for path A, since the external clock source is permanently allocated to path A. Selection `AINternal` is only possible for path B.

Parameters:
<Source> INTernal | EXTernal | AINTernal

INTernal
The internal clock reference is used.

EXTernal
The external clock reference is supplied to the CLOCK connector.

AINTernal
The clock source of path A is used for path B.

*RST: INTernal

Example: `BB:W3GP:CLOC:SOUR EXT`
selects an external clock reference.
`BB:W3GP:CLOC:MODE CHIP`
specifies that a chip clock is supplied via the clock connector.

Manual operation: See "Clock Source" on page 79

[:SOURce<hw>]:BB:W3GPp:CLOCk:SYNChronization:EXECute

Performs automatically adjustment of the instrument's settings required for the synchronization mode, set with the command `BB:W3GP:CLOC:SYNC:MODE`.

Example: `:BB:W3GP:CLOC:SYNC:MODE MAST`
the instrument is configured to work as a master one.
`:BB:W3GP:CLOC:SYNC:EXEC`
all synchronization's settings are adjusted accordingly.

Usage: Event

Manual operation: See "Set Synchronization Settings" on page 79

[:SOURce<hw>]:BB:W3GPp:CLOCk:SYNChronization:MODE <Mode>

Selects the synchronization mode.

This parameter is used to enable generation of very precise synchronous signal of several connected R&S SMBVs.

Note: If several instruments are connected, the connecting cables from the master instrument to the slave one and between each two consecutive slave instruments must have the same length and type. This applies for all connections, the REF OUT to REF IN connection, the MARKER 1 to TRIGGER connection and the CLOCK OUT to CLOCK IN connection. Avoid unnecessary cable length and branching points.

Parameters:

<Mode> NONE | MASTer | SLAVe

NONE
The instrument is working in stand-alone mode.

MASTer
The instrument provides all connected instrument with its synchronisation (including the trigger signal) and reference clock signal.

SLAVe
The instrument receives the synchronisation and reference clock signal from another instrument working in a master mode.

*RST: NONE

Example: `:BB:W3GP:CLOC:SYNC:MODE MAST`
the instrument is configured to work as a master one.

Manual operation: See "Sync. Mode" on page 78

8.6 Test Models and Predefined Settings

The provided commands gives you the opportunity to generate standardized or predefined test settings:

- Test Models:
  - selection of test models for the downlink in accordance with 3GPP standard 25.141.
  - Selection of non-standardized test models for the uplink.
- Predefined Settings:
  Definition of Predefined Settings for base station 1 which enable the creation of highly complex scenarios for the downlink by presetting the channel table of base station 1. The settings take effect only after execution of command `BB:W3GPp:PPARameter:EXECute`.

[:SOURce<hw>]:BB:W3GPp:PPARameter:CRESt <Crest>

This commands selects the desired range for the crest factor of the test scenario. The crest factor of the signal is kept in the desired range by automatically setting appropriate channelization codes and timing offsets.

The setting takes effect only after execution of command `BB:W3GPp:PPARameter:EXECute`.

The settings of commands

- `BB:W3GP:BST<n>:CHAN<n>:CCODe` and
- `BB:W3GP:BST<n>:CHAN<n>:TOFFset`

are adjusted according to the selection.

Parameters:

<Crest> MINimum | AVERage | WORSt

MINimum
The crest factor is minimized. The channelization codes are distributed uniformly over the code domain. The timing offsets are increased by 3 per channel.

AVERage
An average crest factor is set. The channelization codes are distributed uniformly over the code domain. The timing offsets are all set to 0.

WORSt
The crest factor is set to an unfavorable value (i.e. maximum). The channelization codes are assigned in ascending order. The timing offsets are all set to 0.

*RST: MINimum

Example: `BB:W3GP:PPAR:CRES WORS`
sets the crest factor to an unfavorable value.

Manual operation: See "Crest Factor" on page 85

[:SOURce<hw>]:BB:W3GPp:PPARameter:DPCH:COUNt <Count>

Sets the number of activated DPCHs. The maximum number is the ratio of the chip rate and the symbol rate (maximum 512 at the lowest symbol rate of 7.5 ksps).

Parameters:

<Count> integer

Range: 0 to 512 (Max depends on other settings)
*RST: 10

Example: `BB:W3GP:PPAR:DPCH:COUN 21`
the predefined signal contains 21 DPCHs.
`BB:W3GPp:PPARameter:EXECute`

Manual operation: See "Number of DPCH" on page 84

[:SOURce<hw>]:BB:W3GPp:PPARameter:DPCH:SRATe <SRate>

This command sets the symbol rate of DPCHs.

The setting takes effect only after execution of command `BB:W3GPp:PPARameter:EXECute`.

Parameters:

<SRate> D7K5 | D15K | D30K | D60K | D120k | D240k | D480k | D960k

*RST: D30K

Example: `BB:W3GP:PPAR:DPCH:SRAT D240K`
sets the symbol rate of the DPCHs to 240ksps.

Manual operation: See "Symbol Rate DPCH" on page 85

[:SOURce<hw>]:BB:W3GPp:PPARameter:EXECute

This command presets the channel table of base station 1 with the parameters defined by the PPARameter commands.

Example: `BB:W3GP:PPAR:EXEC`
configures the signal sequence as defined by the `:PPARameter` commands.

Usage: Event

Manual operation: See "Accept" on page 85

[:SOURce<hw>]:BB:W3GPp:PPARameter:SCCPch:SRATe <SRate>

The command sets the symbol rate of S-CCPCH.

The setting takes effect only after execution of command `BB:W3GPp:PPARameter:EXECute`.

Parameters:

<SRate> D15K | D30K | D60K | D120k | D240k | D480k | D960k

*RST: D30K

Example: `BB:W3GP:PPAR:SCCP:SRAT D240K`
'sets the SCCPCH to 240 ksps.

Manual operation: See "Symbol Rate S-CCPCH" on page 84

[:SOURce<hw>]:BB:W3GPp:PPARameter:SCCPch:STATe <State>

Activates/deactivates the S-CCPCH.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:PPAR:SCCP:STAT ON`
S-CCPCH is activated.
`BB:W3GPp:PPARameter:EXECute`

Manual operation: See "Use S-CCPCH" on page 84

[:SOURce<hw>]:BB:W3GPp:PPARameter:SCHannels <SChannels>

The command activates/deactivates the PCPICH, PSCH, SSCH and PCCPCH. These "special channels" are required by a user equipment for synchronization.

The setting takes effect only after execution of command `BB:W3GPp:PPARameter:EXECute`.

Parameters:

<SChannels> 0 | 1 | OFF | ON

*RST: 0

Manual operation: See "Use Channels" on page 84

[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:BSTation <BStation>

Selects a standard test model for the downlink.

Parameters:

<BStation> string

Example: `SOURce1:BB:W3GPp:SETTing:TMODel:BSTation:CATalog?`
queries the list of available test models for the downlink transmission direction.
`Response: Test_Model_1_16channels,...`
`SOURce1:BB:W3GPp:SETTing:TMODel:BSTation: "Test_Model_1_64channels"`
selects the test model Measurement: Spectrum emission mask ACLR; 64 Channels.

Manual operation: See "Test Models Downlink" on page 80

[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:BSTation:CATalog?

Queries the list of test models defined by the standard for the downlink.

Return values:

<Catalog> string

Example: see `[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:BSTation` on page 377

Usage: Query only

Manual operation: See "Test Models Downlink" on page 80

[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:MSTation <MStation>

he command selects a test model that is not defined by the standard for the uplink.

Parameters:

<MStation> string

DPCCH_DPDCH_60ksps
Preset, Uplink, UE1 on, DPDCH + DPCCH, Overall symbol rate 60 ksps.

DPCCH_DPDCH960ksps
Preset, Uplink, UE1 on, DPDCH + DPCCH, Overall symbol rate 960 ksps

TS34121_R6_Table_C_10_1_4_Subtest4
Uplink test model according to 3GPP TS 34.121 Release 6, Table C.10.1.4.

TS34121_R8_Table_C_10_1_4_Subtest3
Uplink test models for transmitter characteristics tests with HS-DPCCH according to 3GPP TS 34.121 Release 8, Table C. 10.1.4.

TS34121_R8_Table_C_11_1_3_Subtest2
Uplink test models for transmitter characteristics tests with HS-DPCCH and E-DCH according to 3GPP TS 34.121 Release 8, Table C.11.1.3.

TS34121_R8_Table_C_11_1_4_Subtest1
Uplink test model for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM according to 3GPP TS 34.121 Release 8, Table C.11.1.4.

Example: `BB:W3GP:SETT:TMOD:MST 'DPCCH_DPDCH960ksps'`
selects the test model with a symbol rate of 960 ksps.

Manual operation: See "Test Models Uplink" on page 82

[:SOURce<hw>]:BB:W3GPp:SETTing:TMODel:MSTation:CATalog?

The command queries the list of non-standardized test models for the uplink.

Return values:

<Catalog> string

Example: `BB:W3GP:SETT:TMOD:MST:CAT?`
queries the list of available test models
`Response: DPCCH_DPDCH960ksps,DPCCH_DPDCH_60ksps`

Usage: Query only

Manual operation: See "Test Models Uplink" on page 82

8.7 Setting Base Stations

The `SOURce:BB:W3GPp:BSTation` system contains commands for setting base stations. The commands of this system only take effect if the 3GPP FDD standard is activated, the `DOWN` transmission direction is selected and the particular base station is enabled:

`SOURce:BB:W3GPp:STATe ON`

`SOURce:BB:W3GPp:LINK DOWN`

`SOURce:BB:W3GPp:BSTation2:STATe ON`

BSTation<st>

The numeric suffix to `BSTation` determines the base station. The value range is 1 .. 4. If the suffix is omitted, BS1 is selected.

CHANnel<ch>

In case of remote control, suffix counting for channels corresponds to the suffix counting with 3GPP FDD (channel 0 to channel 138). SCPI prescribes that suffix 1 is the default state and used when no specific suffix is specified. Therefore, channel 1 (and not channel 0) is selected when no suffix is specified.

The commands for setting the enhanced channels of base station 1 are described in chapter 8.8, "Enhanced Channels of Base Station 1", on page 426.

[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:STATe <State>

The command activates OCNS channels, as defined in the standard.

Four different OCNS scenarios are defined in the standard; one standard scenario, two scenarios for testing HSDPA channels and one for enhanced performance type 3i tests. The required scenario can be selected with the command `[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:MODE`.

Parameters:

<State>	ON | OFF	
	*RST:	OFF

Example: `BB:W3GP:BST:OCNS:MODE STAN`
selects the standard scenario.
`BB:W3GP:BST:OCNS:STAT ON`
activates the OCNS channels with the settings defined in the standard.

Manual operation: See "OCNS On" on page 61

[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:MODE <Mode>

The command selects the scenario for setting the OCNS channels.

Four different OCNS scenarios are defined in the standard; one standard scenario, two scenarios for testing HSDPA channels and one for enhanced performance type 3i tests.

Parameters:

<Mode> STANdard | HSDPa | HSDP2 | M3I

*RST: STANdard

Example: `BB:W3GP:BST:OCNS:MODE HSDP`

selects the scenario for testing the high-speed channels.

`BB:W3GP:BST:OCNS:STAT ON`

activates the OCNS channels with the settings defined in the standard.

Options: M3I requires option R&S SMx/AMU-K43 and -K59

Manual operation: See "OCNS Mode" on page 62

[:SOURce<hw>]:BB:W3GPp:BSTation:OCNS:SEED <Seed>

In "3i" OCNS mode, sets the seed for both the random processes, the power control simulation process and the process controlling the switch over of the channelization codes.

Parameters:

<Seed> integer

Range: 0 to 65535

*RST: dynamic

Options: R&S SMx/AMU-K43 and -K59

Manual operation: See "OCNS Seed" on page 62

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel:HSDPa:HSET:PRESet

Sets the default settings of the channel table for the HSDPA H-Set mode. Channels 12 to 17 are preset for HSDPA H-Set 1.

Example: `SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:MODE HSET`

selects H-Set mode.

`SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:PRES`

presets the H-Set.

`SOURce1:BB:W3GPp:BSTation1:CHANnel12:TYPE?`

Response: `HSSC`

`SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:PREDefined?`

Response: `P1QPSK`

Usage: Event

Manual operation: See "Preset HSDPA H-Set" on page 90

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel:PRESet

The command calls the default settings of the channel table.

Example: `BB:W3GP:BST:CHAN:PRES`
presets all channels of the base station.

Usage: Event

Manual operation: See "Reset All Channels" on page 90

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:AICH:ASLOt <ASlot>

Selects the slot in which the burst is transmitted.

Suffix:
<ch0> 7..7

Parameters:
<ASlot> integer
Range: 0 to 15
*RST: 0

Example: `SOURce1:BB:W3GPp:BSTation1:CHANnel7:AICH:ASLOt 5`
defines the slot to transmit the burst.

Manual operation: See "Access Slot" on page 144

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:AICH:SAPattern <SaPattern>

Enters the 16 bit pattern for the ACK/NACK field.

Parameters:
<SaPattern> <16 bit pattern>
*RST: +000000000000

Example: `SOURce1:BB:W3GPp:BSTation1:CHANnel<ch0>:AICH:SAPattern "+000000000000"`
sets the bit pattern to "+000000000000" (ACK).

Manual operation: See "Signature ACK/NACK Pattern" on page 143

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:APAIch:ASLOt <ASlot>

Selects the slot in which the burst is transmitted.

Suffix:
<ch0> 8..8

Parameters:

<ASlot> integer

Range: 0 to 15
*RST: 0

Example: `SOURce1:BB:W3GPp:BSTation1:CHANnel8:APAIch:ASLOt 5`
defines the slot to transmit the burst.

Manual operation: See "Access Slot" on page 144

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:APAIch:SAPattern <SaPattern>

Enters the 16 bit pattern for the ACK/NACK field.

This field is used by the base station to acknowledge, refuse or ignore requests of up to 16 user equipments.

Parameters:

<SaPattern> <16 bit pattern>

*RST: "+000000000000"

Example: `SOUR:BB:W3GP:BST1:CHAN8:APAI:SAP "+000000000000"`
sets the bit pattern to "+" (ACK).

Manual operation: See "Signature ACK/NACK Pattern" on page 143

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:CCODe <CCode>

The command sets the channelization code (formerly the spreading code number). The range of values of the channelization code depends on the symbol rate of the channel. The standard assigns a fixed channelization code to some channels (P-CPICH, for example, always uses channelization code 0).

[chip-rate(=3.84Mcps) / symbol_rate] - 1

The slot format determines the symbol rate (and thus the range of values for the channelization code), the TFCI state and the pilot length. If the value of any one of the four parameters is changed, all the other parameters will be adapted as necessary.

In the case of enhanced channels with active channel coding, the selected channel coding also affects the slot format and thus the remaining parameters. If these parameters are changed, the channel coding type is set to user.

Parameters:

<CCode> integer

Range: 0 to 511
Increment: 1
*RST: depends on channel type

Example: `BB:W3GP:BST1:CHAN15:CCOD 123`
sets channelization code 123 for channel 15 of base station 1.

Manual operation: See "Channelization Code" on page 93

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA <Data>

The command determines the data source for the data fields of the specified channel.

For enhanced channels with channel coding, the data source is set with the command `[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA` on page 434.

Parameters:

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTern

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `:BB:W3GPp:BST:CHANnel:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used The bit pattern for the data is defined by the command `:BB:W3GPp:BST:CHANnel:DATA:PATTern`.

*RST: PN9

Example: `BB:W3GP:BST2:CHAN13:DATA PATT`
selects as the data source for the data fields of channel 13 of base station 2, the bit pattern defined with the following command.
`BB:W3GP:BST2:CHAN13:DATA:PATT #H3F,8`
defines the bit pattern.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:BST2:CHAN13:DATA DLIS`
selects the Data Lists data source.
`MMEM:CDIR '<root>IqData'`
selects the directory for the data lists.
`BB:W3GP:BST2:CHAN13:DATA:DSEL '3gpp_list1'`
selects file '`3gpp_list1`' as the data source. This file must be in the directory `<root>IqData` and have the file extension `*.dm_iqd`.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DATA:PATTern <Pattern>

The command determines the bit pattern for the PATTern selection. The maximum length is 64 bits.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:BST2:CHAN13:DATA:PATT #H3F,8`
defines the bit pattern.

Manual operation: See "Data" on page 94

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:MCODe <MCode>

The command activates multicode transmission for the selected channel (ON) or deactivates it (OFF). The multicode channels are destined for the same receiver, that is to say, are part of a radio link. The first channel of this group is used as the master channel. The common components (Pilot, TPC and TCFI) for all the channels are then spread using the spreading code of the master channel.

Parameters:

<MCode> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:BST2:CHAN12:DPCC:MCOD ON`
activates the simulation in multicode mode for channel 12 of base station 2.
`BB:W3GP:BST2:CHAN13:DPCC:MCOD ON`
activates the simulation in multicode mode for channel 13 of base station 2. Channel 12 is the master channel.

Manual operation: See "Multicode State (DPCCH)" on page 146

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:PLENgth <PLength>

Sets the length of the pilot fields.

The range of values for this parameter depends on the channel type and the symbol rate. The slot format determines the symbol rate (and thus the range of values for the channelization code), the TFCI state and the pilot length. If the value of any one of the four parameters is changed, all the other parameters will be adapted as necessary.

In the case of enhanced channels with active channel coding, the selected channel coding also affects the slot format and thus the remaining parameters. If these parameters are changed, the channel coding type is set to user.

Parameters:

<PLength> BIT2 | BIT4 | BIT8 | BIT16 | BIT0

*RST: BIT4, bei S-CCPCH 0

Example:

```
SOURce1:W3GPp:BSTation1:CHANnel12:DPCCh:PLENgth
BIT8
```

sets the length of the pilot fields for channel 12 of base station 1.

Manual operation: See "Pilot Length" on page 143

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:POFFset:PILot <Pilot>

Sets an offset to the set channel power for the pilot field.

Parameters:

<Pilot> float

Range: -10 to 10
Increment: 0.01
*RST: 0

Example:

```
BB:W3GP:BST2:CHAN12:DPCC:POFF:PIL -2 dB
```

in the pilot field, sets an offset of -2 dB relative to the channel power.

Manual operation: See "Power Offset Pilot (DPCCH)" on page 149

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:POFFset:TFCI <Tfci>

The command sets an offset to the set channel power for the TFCI field.

Parameters:

<Tfci> float

Range: -10 to 10
Increment: 0.01
*RST: 0

Example: `BB:W3GP:BST2:CHAN12:DPCC:POFF:PIL -2 dB`
in the TFCI field, sets an offset of -2 dB relative to the channel power.

Manual operation: See "Power Offset TFCI (DPCCH)" on page 149

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:POFFset:TPC <Tpc>

The command sets an offset to the set channel power for the TPC field.

This setting is only valid for the DPCHs.

Parameters:

<Tpc> float

Range: -10 to 10
Increment: 0.01
*RST: 0

Example: `BB:W3GP:BST2:CHAN12:DPCC:POFF:TPC -2 dB`
in the TPC field, sets an offset of -2 dB relative to the channel power.

Manual operation: See "Power Offset TPC (DPCCH)" on page 149

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TFCI <Tfci>

The command enters the value of the TFCI field (Transport Format Combination Indicator) for the selected channel of the specified base station. The TFCI field is always filled with exactly 10 bits with leading zeros.

Parameters:

<Tfci> integer

Range: 0 to 1023
*RST: 0

Example: `BB:W3GP:BST2:CHAN12:DPCC:TFCI 22`
sets the value 22 for the TFCI field of channel 12 of base station 2.

Manual operation: See "TFCI Value" on page 143

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TFCI:STATe <State>

The command activates the TFCI field (Transport Format Combination Identifier) for the selected channel of the specified base station.

The slot format determines the symbol rate (and thus the range of values for the channelization code), the TFCI state and the pilot length. If the value of any one of the four parameters is changed, all the other parameters will be adapted as necessary.

In the case of enhanced channels with active channel coding, the selected channel coding also affects the slot format and thus the remaining parameters. If these parameters are changed, the channel coding type is set to user.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:BST2:CHAN12:DPCC:TFCI:STAT OFF`

sets that the TFCI field of channel 12 of base station 2 is not used.

Manual operation: See "Use TFCI" on page 142

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA <Data>

Determines the data source for the TPC field of the channel.

Parameters:

<Data> ZERO | ONE | PATTern | DLISt

DLISt

A data list is used. Use the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA:DSELect` to define the data list file.

ZERO | ONE

Internal 0 and 1 data is used.

PATTern

Internal data is used. Use the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA:PATTern` to define the bit battern.

*RST: ZERO

Example: `SOURce1:BB:W3GPp:BSTation2:CHANnel13:DPCCh:TPC:DATA PATTern`

selects as the data source for the TPC field of channel 13 of base station 2

`SOURce1:BB:W3GPp:BSTation2:CHANnel13:DPCCh:TPC:DATA:PATTern #H3F,8`

defines the bit pattern.

Example: `SOURce1:BB:W3GPp:BSTation2:CHANnel13:DPCCh:TPC:DATA DLIS`

selects the data source.

`MMEM:CDIR '<root>IqData'`

selects the directory for the data lists.

`SOURce1:BB:W3GPp:BSTation2:CHANnel13:DPCCh:TPC:DATA:DSELect 'tpc_ch4'`

selects the file `tpc_ch4` as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA: DSELect <DSelect>

Selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions *.dm_iqd in a directory of the user's choice. The directory is defined with the command MMEMory:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> <data list name>

Example: see [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA on page 387

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA: PATTern <Pattern>

Determines the bit pattern.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: see [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:DATA on page 387

Manual operation: See "TPC Data Source (DPCCH)" on page 146

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:MISuse <MisUse>

The command activates "mis-" use of the TPC field (Transmit Power Control) of the selected channel for controlling the channel powers of these channels of the specified base station.

The bit pattern (see commands :W3GPp:BSTation<n>:CHANnel<n>:DPCCh:TPC...) of the TPC field of each channel is used to control the channel power. A "1" leads to an increase of channel powers, a "0" to a reduction of channel powers. Channel power is limited to the range 0 dB to -60 dB. The step width of the change is defined with the command [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:PSTep.

Parameters:

<MisUse> ON | OFF

*RST: 0

Manual operation: See "Misuse TPC for Output Power Control (DPCCH)" on page 147

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:PSTep <PowerStep>

The command defines the step width for the change of channel powers in the case of "mis-" use of the TPC field.

Parameters:

<PowerStep> float

Range: -10 to 10
Increment: 0.01
*RST: 0

Example: `BB:W3GP:BST2:CHAN13:DPCC:TPC:PST 1 dB`
sets the step width for the change of channel powers for channel 13 of base station 2 to 1 dB.

Manual operation: See "TPC Power Step (DPCCH)" on page 148

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:DPCCh:TPC:READ <Read>

The command sets the read out mode for the bit pattern of the TPC field.

The bit pattern is defined with the commands `:BB:W3GPp:BST<i>:CHANnel<n>:DPCCh:TPC...` .

Parameters:

<Read> CONTinuous | S0A | S1A | S01A | S10A

CONTinuous
The bit pattern is used cyclically.

S0A
The bit pattern is used once, then the TPC sequence continues with 0 bits.

S1A
The bit pattern is used once, then the TPC sequence continues with 1 bits.

S01A
The bit pattern is used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

S10A
The bit pattern is used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

*RST: CONTinuous

Example: `BB:W3GP:BST2:CHAN13:DPCC:TPC:READ S0A`
the bit pattern is used once, after which a 0 sequence is generated (applies to channel 13 of base station 2).

Manual operation: See "TPC Read Out Mode (DPCCH)" on page 147

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA <Data>

The command determines the data source for the TPC field of the channel.

Parameters:

<Data> DLISt | ZERO | ONE | PATTern

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:DSELect`

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:PATTern`.

*RST: PATTern

Example: `BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:DATA PATT`
selects as the data source for the TPC field of channel 11 of base station 1, the bit pattern defined with the following command:
`BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:DATA:PATT #H3F,8`
defines the bit pattern.

Manual operation: See "TPC Source" on page 154

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> <data list name>

Example: `BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:DATA DLIS`
selects the "Data Lists" data source.
`MMEM:CDIR '<root>IqData'`
selects the directory for the data lists.
`BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:DATA:DSEL 'tpc_ch4'`
selects the file '`tpc_ch4`' as the data source. This file must be in the directory `<root>IqData` and have the file extension `*.dm_iqd`.

Manual operation: See "TPC Source" on page 154

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:PATTern <Pattern>

The command determines the bit pattern for the PATTern selection. The maximum bit pattern length is 32 bits.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:DATA:PATT #H3F, 8`

defines the bit pattern for the TPC field of channel 11 of base station 1.

Manual operation: See "TPC Source" on page 154

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:MISuse <Misuse>

The command activates "mis-" use of the TPC field (Transmit Power Control) of the selected channel for controlling the channel powers of these channels of the specified base station.

The bit pattern (see command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:DATA:PATTern`) of the TPC field of each channel is used to control the channel power. A "1" leads to an increase of channel powers, a "0" to a reduction of channel powers. Channel power is limited to the range 0 dB to -60 dB. The step width of the change is defined with the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:PSTep`.

Parameters:

<Misuse> ON | OFF

*RST: 0

Example: `BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:MIS ON`

activates regulation of channel power for channel 11 of base station 1 via the bit pattern of the associated TPC field.

`BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:PST 1dB`

sets the step width for the change of channel powers for channel 11 of base station 1 to 1 dB.

Manual operation: See "TPC For Output Power Control (Mis-) Use" on page 155

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC:PSTep <PStep>

The command defines the step width for the change of channel powers in the case of "mis-" use of the TPC field.

Suffix:

<ch0> 11..138

Parameters:

<PStep> float

Range: -10.0 dB to 10.0 dB
Increment: 0.01 dB
*RST: 0 dB

Example: `BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:PST 1.5dB`
sets the step width for the change of channel powers for channel 11 of base station 1 to 1.5 dB.

Manual operation: See "TPC Power Step (F-DPCH)" on page 156

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:FDPCh:DPCCh:TPC: READ <Read>

The command sets the read out mode for the bit pattern of the TPC field.

Parameters:

<Read> CONTinuous | S0A | S1A | S01A | S10A

CONTinuous
The bit pattern is used cyclically.

S0A
The bit pattern is used once, then the TPC sequence continues with 0 bits.

S1A
The bit pattern is used once, then the TPC sequence continues with 1 bits.

S01A
The bit pattern is used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

S10A
The bit pattern is used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

*RST: CONTinuous

Example: `BB:W3GP:BST1:CHAN11:FDPC:DPCC:TPC:READ S0A`
the bit pattern is used once, after which a 0 sequence is generated (applies to channel 11 of base station 1).

Manual operation: See "TPC Read Out Mode (F-DPCH)" on page 154

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:BMODe[:STATe] <State>

The command activates/deactivates burst mode. The signal is bursted when on, otherwise dummy data are sent during transmission brakes.

Parameters:

<State> ON | OFF

*RST: 1

Example: `BB:W3GP:BST1:CHAN12:HSDP:BMOD OFF`
deactivates burst mode, dummy data are sent during the transmission brakes.

Manual operation: See "Burst Mode" on page 108

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:CVPB <Cvpb>

The command switches the order of the constellation points of the 16QAM and 64QAM mapping. The re-arrengement is done according to 3GPP TS25.212.

Parameters:

<Cvpb> integer

Range: 0 to 3
*RST: 0

Example: `BB:W3GP:BST1:CHAN12:HSDP:CVPB 1`
selects interchange of MSBs with LSBs.

Manual operation: See "Constellation Version Parameter b - BS" on page 108

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:AMODe <AMode>

Activates/deactivates the advanced mode in which the H-Set will be generated by the ARB.

The parameter can be configured only for H-Sets 1 - 5.

For H-Sets 6 - 12 and User it is always enabled.

Parameters:

<AMode> ON | OFF

*RST: OFF (H-Sets 1..5); ON (H-Sets 6..12, User);

Example: `BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:PRED P1QAM16`
selects H-Set 1 (16QAM).
`BB:W3GP:BST1:CHAN12:HSDP:HSET:AMOD ON`
enables advanced mode for the selected H-Set.

Manual operation: See "Advanced Mode (requires ARB)" on page 113

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:ACLength <AcLength>

Sets the alternative number of HS-PDSCH channelization codes (see chapter 4.13.9, "Randomly Varying Modulation And Number Of Codes (Type 3i) Settings", on page 124).

Parameters:

<AcLength> integer

Range: 1 to 15 (max depends on other values)
*RST: 5

Example:
```
SOURce:BB:W3GP:BST1:CHANnel12:HSDPa:HSET:
CLENgth 8
SOURce:BB:W3GP:BST1:CHANnel12:HSDPa:HSET:
ACLength 8
```

Options: R&S SMx/AMU-K59

Manual operation: See "Alternative Number of HS-PDSCH Channelization Codes" on page 125

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:ALTModulation <ALTModulation>

Sets the alternative modulation (see chapter 4.13.9, "Randomly Varying Modulation And Number Of Codes (Type 3i) Settings", on page 124).

Parameters:

<ALTModulation> QPSK | QAM16 | QAM64

*RST: QAM16

Example:
```
:SOURce:BB:W3GPp:BSTation1:CHANnel12:HSDPa:
HSET:ALTModulation QPSK
```

Options: R&S SMx/AMU-K59

Manual operation: See "Alternative HS-PDSCH Modulation" on page 125

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:BCBTti<di>?

Displays the binary channel bits per TTI and per stream.

The value displayed is calculated upon the values sets with the commands:

- `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:MODulation<di>`,
- `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:SRATe` and
- `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HSCCode`.

Return values:

<Bcbtti>	float

Example:
`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE MIMO`
sets the H-set type.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:BCBT2?`
queries the binary channel bits per TTI for stream 2.
`Response: "4800"`

Usage: Query only

Manual operation: See "Binary Channel Bits per TTI (Physical Layer) Stream1/2" on page 119

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:BPAYload<di>?

The command queries the payload of the information bit. This value determines the number of transport layer bits sent in each subframe.

Return values:

<BPayload>	float Range: 1 to 5000

Example:
`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:BPAY2?`
queries the payload of the information bit.
`Response: "256"`

Usage: Query only

Manual operation: See "Information Bit Payload (TB-Size) Stream 1/2" on page 120

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:CLENgth <CLength>

The command queries the number of physical HS-PDSCH data channels assigned to the HS-SCCH.

Parameters:

<CLength>	integer Range: 1 to 15 *RST: 5

Example:
`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:CLEN?`
queries the number of physical HS-PDSCH data channels assigned to the HS-SCCH.
`Response: "4"`

Manual operation: See "Number of HS-PDSCH Channelization Codes" on page 117

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:CRATe<di>?

Queries the resulting coding rate per stream.

The coding rate is calculated as a relation between the "Information Bit Payload" and "Binary Channel Bits per TTI".

Return values:

<CRate> float

Example:

```
BB:W3GP:BST1:CHAN12:HSDP:MODE HSET
```
selects H-Set mode.
```
BB:W3GP:BST1:CHAN12:HSDP:HSET:CRAT2?
```
queries the coding rate of stream 2.
```
Response: "0.658"
```

Usage: Query only

Manual operation: See "Coding Rate Stream 1/2" on page 120

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA <Data>

Selects the data source for the transport channel.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. Use the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA:PATTern` to set the pattern.

DLISt
A data list is used. Use the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA:DSELect` to select the data list file.

*RST: PN9

Example:

```
BB:W3GP:BST1:CHAN11:HSDP:HSET:DATA PATT
```
selects as the data source for the transport channel
```
BB:W3GP:BST1:CHAN11:HSDP:HSET:DATA:PATT #H3F,8
```
defines the bit pattern.

Manual operation: See "Data Source (HS-DSCH)" on page 116

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

The lists are stored as files with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the following commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example:
`BB:W3GP:BST1:CHAN11:HSDP:HSET:DATA DLIS`
selects the `Data Lists` data source.
`MMEM:CDIR '<root>H-Sets'`
selects the directory for the data lists.
`BB:W3GP:BST1:CHAN11:HSDP:HSET:DATA:DSEL 'hset_ch11'`
selects the file `hset_ch11` as the data source. This file must be in the directory `<root>H-Sets` and have the file extension `*.dm_iqd`.

Manual operation: See "Data Source (HS-DSCH)" on page 116

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:DATA:PATTern <Pattern>

Determines the bit pattern for the `PATTern` selection.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example:
`BB:W3GP:BST1:CHAN11:HSDP:HSET:DATA PATT`
selects as the data source for the H-set
`BB:W3GP:BST1:CHAN11:HSDP:HSET:DATA:PATT #H3F, 8`
defines the bit pattern for the H-set.

Manual operation: See "Data Source (HS-DSCH)" on page 116

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HARQ:LENGth <Length>

Sets the number of HARQ processes. This value determines the distribution of the payload in the subframes.

Parameters:

<Length> integer

Range: 1 to 6
*RST: 0

Example:

`SOURce1:BB:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:HARQ:MODE HSET`

selects H-Set mode.

`SOURce1:BB:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:HARQ:LENGth?`

queries the number of HARQ processes.

`Response:2`

Manual operation: See "Number of HARQ Processes per Stream" on page 121

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HARQ:MODE <Mode>

Sets the HARQ Simulation Mode.

Parameters:

<Mode> CACK | CNACk

CACK
New data is used for each new TTI.

CNACk
Enables NACK simulation, i.e. depending on the sequence selected for the parameter Redundancy Version Parameter Sequence packets are retransmitted.

*RST: CACK

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`

selects H-Set mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:AMOD ON`

enables advanced mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:HARQ:MODE CNAC`

sets Constant NACK HARQ Mode.

Manual operation: See "Mode (HARQ Simulation)" on page 122

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:HSCCode <HsCCode>

Sets the channelization code of the HS-SCCH.

Note: To let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware, set the same Channelization Codes as the codes used for your physical channels.

Parameters:

<HsCCode> float

Range: 0 to 127

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`

selects H-Set mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:HSCC 10`

sets channalization code 10 for the HS-SCCH.

Manual operation: See "Channelization Code HS-SCCH (SF128)" on page 117

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:MODulation<di> <Modulation>

Sets the modulation for stream 1 and stream 2 to QPSK, 16QAM or 64QAM.

The modulation 64QAM is available for instruments equipped with option SMx-K59 only.

For HS-SCCH Type 2, the available modulation scheme is QPSK only.

Parameters:

<Modulation> QPSK | QAM16 | QAM64

*RST: QPSK

Example:

`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE MIMO`
sets MIMO operation mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:MOD1 QAM64`
sets the modulation of stream 2 to 64QAM

Manual operation: See "HS-PDSCH Modulation Stream1/2" on page 118

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:NAIBitrate?

Queries the average data rate on the transport layer (Nominal Average Information Bitrate).

Return values:

<NaiBitrate> float

Range: 1 to 5000
Increment: 0.1
*RST: 0

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:NAIB?`
queries the average data rate on the transport layer.
`Response:"455"`

Usage: Query only

Manual operation: See "Nominal Average Information Bitrate" on page 114

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:PREDefined <Predefined>

The command selects the H-Set and the modulation according to TS 25.101 Annex A. 7.

Parameters:

<Predefined> P1QPSK | P1QAM16 | P2QPSK | P2QAM16 | P3QPSK | P3QAM16 | P4QPSK | P5QPSK | P6QPSK | P6QAM16 | P7QPSK | P8QAM64 | P9QAM16QPSK | P10QPSK | P10QAM16 | P11QAM64QAM16 | P12QPSK | USER

*RST: P1QPSK

Example: `BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`

selects H-Set mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:PRED P3QPSK`

selects H-Set 3 (QPSK).

Manual operation: See "Predefined H-Set" on page 112

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: PWPattern <PwPattern>

Sets the precoding weight parameter w2 for MIMO precoding.

The values of the weight parameters w1, w3 and w4 are calculated based on the value for w2 (see chapter 3.1.15, "MIMO in HSPA+", on page 37).

Parameters:

<PwPattern> string

*RST: 0

Example: `BB:W3GP:BST1:CHAN12:HSDP:HSET:PWP "0,1,3"`

selects the pattern.

Manual operation: See "Precoding Weight Pattern (w2)" on page 115

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: RVParameter<di> <RvParameter>

The parameter is enabled for "HARQ Simulation Mode" set to Constant ACK.

The command sets the Redundancy Version Parameter. This value determines the processing of the Forward Error Correction and Constellation Arrangement (QAM16 and 64QAM modulation), see TS 25.212 4.6.2.

For HS-SCCH Type 2 (less operation), the Redundancy Version Parameter is always 0.

Parameters:

<RvParameter> integer

Range: 0 to 7

*RST: 0

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`

selects H-Set mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:HARQ:MODE CACK`

sets Constant ACK HARQ Mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:RVP 7`

sets the Redundancy Version Parameter to 7.

`BB:W3GP:BST1:TDIV ANT1`

enables transmit diversity

`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE MIMO`

selects HS-SCCH Type 3 (MIMO).

`BB:W3GP:BST1:CHAN12:HSDP:HSET:RVP2 4`

sets the Redundancy Version Parameter of stream 2.

Manual operation: See "Redundancy Version Stream1/2" on page 122

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:RVPSequence<di> <RvpSequence>

The parameter is enabled for "HARQ Simulation Mode" set to Constant NACK.

Enters a sequence of Redundancy Version Parameters per stream. The value of the RV parameter determines the processing of the Forward Error Correction and Constellation Arrangement (16/64QAM modulation), see TS 25.212 4.6.2.

The sequence has a length of maximum 30 values. The sequence length determines the maximum number of retransmissions. New data is used after reaching the end of the sequence.

For HS-SCCH Type 2 (less operation), the Redundancy Version Parameter Sequence is a read-only parameter.

Parameters:

<RvpSequence> string

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`

selects H-Set mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:AMOD ON`

enables advanced mode.

`BB:W3GP:BST1:CHAN12:HSDP:HSET:HARQ:MODE CNAC`

sets Constant NACK HARQ Mode.

`BB:W3GP:BST1:TDIV ANT1`

enables transmit diversity

`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE MIMO`

selects HS-SCCH Type 3 (MIMO).

`BB:W3GP:BST1:CHAN12:HSDP:HSET:RVPS2 '0,1,3,2,0,1,2,3'`

sets the Redundancy Version Parameter sequence of stream 2.

Example:

`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE LOP`

selects HS-SCCH Type 2 (less operation).

`BB:W3GP:BST1:CHAN12:HSDP:HSET:RVPS?`

queries the Redundancy Version Parameter sequence.

`Response: 0,3,4`

Manual operation: See "Redundancy Version Sequence Stream 1/2" on page 122

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: RVSTate <RvState>

Enables/disables the random variation of the modulation and number of codes (see chapter 4.13.9, "Randomly Varying Modulation And Number Of Codes (Type 3i) Settings", on page 124).

Parameters:

<RvState> 0 | 1 | OFF | ON

*RST: OFF

Example: `SOURce:BB:W3GPp:BST1:CHAN12:HSDPa:HSET:RVSTate ON`

Options: R&S SMx/AMU-K59

Manual operation: See "Randomly Varying Modulation And Number Of Codes" on page 125

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SEED <Seed>

Sets the seed for the random process deciding between the four option (see chapter 4.13.9, "Randomly Varying Modulation And Number Of Codes (Type 3i) Settings", on page 124).

Parameters:

<Seed> integer

Range: 0 to 65535

*RST: 0 for path A, 1 for path B

Example: `SOURce:BB:W3GPp:BST1:CHANnel12:HSDPa:HSET:SEED 5`

Options: R&S SMx/AMU-K59

Manual operation: See "Random Seed" on page 125

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: S64Qam <S64qam>

Enables/disables UE support of 64QAM.

This command is enabled only for HS-SCCH Type 1 (normal operation) and 16QAM modulation.

In case this parameter is disabled, i.e. the UE does not support 64QAM, the xccs,7 bit is used for channelization information.

Parameters:

<S64qam> ON | OFF

*RST: OFF

Example: `BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE NORM`
selects HS-SCCH Type 1 (normal operation).
`BB:W3GP:BST1:CHAN12:HSDP:HSET:MOD QAM16`
sets 16QAM modulation.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:S64Q ON`
enables UE to support 64QAM

Manual operation: See "UE Supports 64QAM" on page 119

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SCCode <SCcode>

Sets the channelization code of the first HS-PDSCH channel in the H-Set. The channelization codes of the rest of the HS-PDSCHs in this H-Set are set automatically.

Note: To let the instrument generate a signal equal to the one generated by an instrument equipped with an older firmware, set the same Channelization Codes as the codes used for your physical channels.

Parameters:

<SCcode> integer

Range: 1 to 15
*RST: 8

Example: `BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:SCC 10`
sets channelization code of the first HS-PDSCH.

Manual operation: See "Start Channelization Code HS-PDSCH (SF16)" on page 117

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: SLENgth?

Queries the suggested ARB sequence length.

Return values:

<SLength> integer

Range: 1 to max

Example: see `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:SLENgth:ADJust` on page 404

Usage: Query only

Manual operation: See "Advanced Mode (requires ARB)" on page 113

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: SLENgth:ADJust

Sets the ARB sequence length to the suggested value.

Example:
`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:AMOD ON`
enables advanced mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:SLEN?`
queries the suggested ABR sequence length.
`Response: 21`
`BB:W3GP:SLEN?`
queries the current ABR sequence length.
`Response: 12`
`BB:W3GP:BST1:CHAN12:HSDP:HSET:SLEN:ADJ`
sets the ARB sequence length to the suggested value.
`BB:W3GP:SLEN?`
queries the current ABR sequence length.
`Response: 21`

Usage: Event

Manual operation: See "Adjust" on page 114

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: SPATtern<di>?

Queries the distribution of packets over time. A "-" indicates no packet

Return values:
<SPattern> string

Example:
`BB:W3GP:BST1:CHAN15:HSDP:TTID 3`
sets the TTI
`BB:W3GP:BST1:CHAN12:HSDP:HSET:HARQ:LENG 2`
sets the number of HARQ processes
`BB:W3GP:BST1:CHAN12:HSDP:HSET:SPAT1?`
queries the signaling pattern for stream 1
`Response: 0,-,-1,-,-`

Usage: Query only

Manual operation: See "Signaling Pattern Stream1/2" on page 121

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET: STAPattern <StaPattern>

Enables/disables a temporal deactivation of Stream 2 per TTI in form of sending pattern.

The stream 2 sending pattern is a sequence of max 16 values of "1" (enables Stream 2 for that TTI) and "-" (disabled Stream 2 for that TTI).

Parameters:

<StaPattern> string

*RST: 1

Example:
```
BB:W3GP:BST1:CHAN12:HSDP:HSET:STAP "11-"
```
selects the pattern.

Manual operation: See "Stream 2 Active Pattern" on page 116

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TPOWer <Tpower>

Sets the total power of the HS-PDSCH channels in the H-Set.

The individual power levels of the HS-PDSCHs are calculated automatically and can be queried with the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:POWer`.

Parameters:

<Tpower> float

The min/max values depend on the number of HS-PDSCH channelization codes (`[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:CLENgth`) and are calculated as follow:

min = -80 dB + 10*$\log_{10}$(NumberOfHS-PDSCHChannelizationCodes)

max = 0 dB + 10*$\log_{10}$(NumberOfHS-PDSCHChannelizationCodes)

Range: dynamic to dynamic
Increment: 0.01
*RST: -13.01

Example:
```
:SOURce:BB:W3GPp:BST1:CHAN12:HSDPa:MODE HSET
:SOURce:BB:W3GPp:BST1:CHAN12:HSDPa:HSET:
CLENgth?
Response: 5
:SOURce:BB:W3GPp:BST1:CHAN13:POWer -10
:SOURce:BB:W3GPp:BST1:CHAN12:HSDPa:HSET:TPOWer?
Response: -3.01029995663981 dB
:SOURce:BB:W3GPp:BST1:CHAN12:HSDPa:HSET:TPOWer
-5
:SOURce:BB:W3GPp:BST1:CHAN13:POWer?
Response: -11.9897000433602 dB
```

Manual operation: See "Total HS-PDSCH Power" on page 118

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TBS:INDex<di> <Index>

Selects the Index ki for the corresponding table and stream, as described in in 3GPP TS 25.321.

Parameters:

<Index> integer

Range: 0 to 62

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TBS:TABL2 TAB0`
selects Table 0 for stream 2.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TBS:IND2 25`
sets the Index ki

Manual operation: See "Transport Block Size Index Stream1/2" on page 119

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TBS:REFerence <Reference>

While working in less operation mode, this command is signaled instead of the command `BB:W3GP:BST:CHAN:HSDP:HSET:TBS:IND`.

Parameters:

<Reference> integer

Range: 0 to 3
*RST: 0

Example:

`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE LOP`
selects less operation mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TBS:TABL2 TAB0`
selects Table 0 for stream 2.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:TBS:REF 2`
sets the reference.

Manual operation: See "Transport Block Size Reference Stream1/2" on page 119

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TBS:TABLe<di> <Table>

Selects Table 0 or Table 1 as described in in 3GPP TS 25.321.

For HS-PDSCH Modulation set to 64QAM, only Table 1 is available.

Parameters:

<Table> TAB0 | TAB1

*RST: TAB0

Example: BB:W3GP:BST1:CHAN12:HSDP:MODE HSET
selects H-Set mode.
BB:W3GP:BST1:CHAN12:HSDP:HSET:TBS:TABL2 TAB0
selects Table 0 for stream 2.

Manual operation: See "Transport Block Size Table Stream1/2" on page 119

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:TYPE <Type>

Sets the HS-SCCH type.

Parameters:

<Type> NORMal | LOPeration | MIMO

NORMal
Normal operation mode.

LOPeration
HS-SCCH less operation mode.

MIMO
HS-SCCH Type 3 mode is defined for MIMO operation.
Enabling this operation mode, enables the MIMO parameters [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:CVPB<di>, [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:MODulation<di>, [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:PWPattern and [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:STAPattern and all Stream 2 parameters.

*RST: NORMal

Example: BB:W3GP:BST1:TDIV ANT1
enables transmit diversity and antenna 1.
BB:W3GP:BST1:CHAN12:HSDP:HSET:TYPE MIMO
sets MIMO operation mode.

Manual operation: See "HS-SCCH Type" on page 114

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:UECategory?

Queries the UE category number.

Return values:

<UeCategory> integer

Range: 0 to 5000

Example:
`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:PRED P3QPSK`
selects H-Set 3 (QPSK).
`BB:W3GP:BST1:CHAN12:HSDP:HSET:UEC?`
queries the UE Category.
`Response: 5`

Usage: Query only

Manual operation: See "UE Category" on page 114

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:UEID <Ueid>

The command sets the UE identity which is the HS-DSCH Radio Network Identifier (H-RNTI) defined in 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol Specification".

Parameters:
<Ueid> integer
Range: 0 to 65535
*RST: 0

Example:
`BB:W3GP:BST1:CHAN12:HSDP:MODE HSET`
selects H-Set mode.
`BB:W3GP:BST1:CHAN12:HSDP:HSET:UEID 256`
sets the UE identity.

Manual operation: See "UEID (H-RNTI)" on page 117

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:HSET:VIBSize<di> <VibSize>

Sets the size of the Virtual IR Buffer (Number of SMLs per HARQ-Process) per stream.

Parameters:
<VibSize> integer
Range: 800 to 304000
Increment: 800
*RST: 9600

Example:
`SOURce1:BB:W3GPp:BSTation1:TDIV ANT1`
`SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:TYPE MIMO`
`SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:VIBSize1?`
Response: `9600`
`SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:VIBSize1 300000`
`SOURce1:BB:W3GPp:BSTation1:CHANnel12:HSDPa:HSET:VIBSize2 300000`

Manual operation: See "Virtual IR Buffer Size (per HARQ Process) Stream1/2" on page 120

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:CVPB<di> <Cvpb>

The command switches the order of the constellation points of the 16QAM and 64QAM mapping.

The re-arrengement is done according to 3GPP TS25.212.

Parameters:

<Cvpb> 0 | 1 | 2 | 3

Range: 0 to 3
*RST: 0

Example: `BB:W3GP:BST1:CHAN12:HSDP:MIMO:CVPB2 1`
selects interchange of MSBs with LSBs for stream 2.

Manual operation: See "Constellation Version Parameter b Stream 1/2 - BS" on page 109

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:MODulation<di> <Modulation>

Sets the modulation for stream 1 and stream 2 to QPSK, 16QAM or 64QAM.

The modulation 64QAM is available for instruments equipped with option SMx-K59 only.

Parameters:

<Modulation> QPSK | QAM16 | QAM64

*RST: HSQP

Example: `BB:W3GP:BST1:CHAN12:HSDP:MIMO:MOD1 HS64Q`
sets the modulation of stream 2 to 64QAM

Manual operation: See "Modulation Stream 1/2 (HS-PDSCH MIMO)" on page 109

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:PWPattern <PwPattern>

Sets the precoding weight parameter w2 for MIMO precoding.

The values of the weight parameters w1, w3 and w4 are calculated based on the value for w2 (see chapter 3.1.15, "MIMO in HSPA+", on page 37).

Parameters:

<PwPattern> string

*RST: 0

Example: `BB:W3GP:BST1:CHAN12:HSDP:MIMO:PWP "0,1,3`
selects the pattern.

Manual operation: See "Precoding Weight Pattern (w2)" on page 109

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MIMO:STAPattern <StaPattern>

Enables/disables a temporal deactivation of Stream 2 per TTI in form of sending pattern.

The stream 2 sending pattern is a sequence of max 16 values of "1" (enables Stream 2 for that TTI) and "-" (disabled Stream 2 for that TTI).

Parameters:

<StaPattern> string

*RST: 1

Example: `BB:W3GP:BST1:CHAN12:HSDP:MIMO:STAP "11-"`

selects the pattern.

Manual operation: See "Stream 2 Active Pattern" on page 109

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:MODE <Mode>

The command selects the HSDPA mode.

Parameters:

<Mode> CONTinuous | PSF0 | PSF1 | PSF2 | PSF3 | PSF4 | HSET

CONTinuous
The high speed channel is generated continuously. This mode is defined in test model 5.

PSFx
The high speed channel is generated in packet mode. The start of the channel is set by selecting the subframe in which the first packet is sent.

HSET
The high speed channels are preset according to TS 25.1401 Annex A.7, H-Set.

*RST: CONTinuous

Example: `BB:W3GP:BST1:CHAN12:HSDP:MODE PSF1`

selects packet mode for channel 12. The first packet is sent in packet subframe 1 (PSF1).

Manual operation: See "HSDPA Mode" on page 107

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:HSDPa:TTIDistance <TtiDistance>

The command selects the distance between two packets in HSDPA packet mode. The distance is set in number of sub-frames (3 slots = 2 ms). An "Inter TTI Distance" of 1 means continuous generation.

Parameters:

<TtiDistance> integer

Range: 1 to 16
*RST: 5

Example: `BB:W3GP:BST1:CHAN12:HSDP:TTID 2`
selects an Inter TTI Distance of 2 subframes.

Manual operation: See "Inter TTI Distance (H-Set)" on page 108

[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>:POWer <Power>

Sets the channel power relative to the powers of the other channels. This setting also determines the starting power of the channel for Misuse TPC, Dynamic Power Control and the power control sequence simulation of OCNS mode 3i channels.

With the command `SOURce:BB:W3GPp:POWer:ADJust`, the power of all the activated channels is adapted so that the total power corresponds to 0 dB. This will not change the power ratio among the individual channels.

Parameters:

<Power> float

Range: -80 to 0
Increment: 0.01
*RST: depends on channel

Example: `BB:W3GP:BST2:CHAN12:POW -10dB`
sets the channel power of channel 12 of base station 2 to -10 dB relative to the power of the other channels.

Manual operation: See "Power" on page 94

[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>:SFORmat <SFormat>

The command sets the slot format of the selected channel. The value range depends on the selected channel.

The slot format determines the symbol rate (and thus the range of values for the channelization code), the TFCI state and the pilot length. If the value of any one of the four parameters is changed, all the other parameters will be adapted as necessary.

In the case of enhanced channels with active channel coding, the selected channel coding also affects the slot format and thus the remaining parameters. If these parameters are changed, the channel coding type is set to user.

Parameters:

<SFormat> integer

Range: 0 to dynamic
*RST: 0

Example: `BB:W3GP:BST2:CHAN12:SFOR 8`
selects slot format 8 for channel 12 of base station 2.

Manual operation: See "Slot Format" on page 93

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:SRATe <SRate>

The command sets the symbol rate of the selected channel. The value range depends on the selected channel and the selected slot format.

The slot format determines the symbol rate (and thus the range of values for the channelization code), the TFCI state and the pilot length. If the value of any one of the four parameters is changed, all the other parameters will be adapted as necessary.

In the case of enhanced channels with active channel coding, the selected channel coding also affects the slot format and thus the remaining parameters. If these parameters are changed, the channel coding type is set to user.

Parameters:

<SRate> D7K5 | D15K | D30K | D60K | D120k | D240k | D480k | D960k

*RST: DPCHs D30K; CHAN1..10 D15K; DL-DPCCH (CHAN11) D7K5;

Example: `BB:W3GP:BST2:CHAN12:SRAT D120K`
sets the symbol rate for channel 12 of base station 2 to 120 ksps.

Manual operation: See "Symbol Rate" on page 93

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:STATe <State>

The command activates the selected channel.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST2:CHAN12:STAT OFF`
deactivates channel 12 of base station 2.

Manual operation: See "Channel State" on page 96

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:TOFFset <TOffset>

Sets the timing offset.

Parameters:

<TOffset> integer

For F-DPCH channels, the value range is 0 to 9.

*RST: 0

Example: `BB:W3GP:BST2:CHAN12:TOFF 20`
defines a frame shift relative to the scrambling code sequence of 20*256 chips.

Manual operation: See "Timing Offset" on page 95

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>:TYPE <Type>

Sets the channel type.

Parameters:

<Type> PCPich | SCPich | PSCH | SSCH | PCCPch | SCCPch | PICH | APAich | AICH | PDSCh | DPCCh | DPCH | HSSCch | HSQPsk | HSQam | HS64Qam | HSMimo | EAGCh | ERGCh | EHICh | FDPCh | HS16Qam

The channels types of `CHANnel0` to `CHANnel8` are predefined. For the remaining channels, you can select a channel type from the relevant standard channels and the high-speed channels

Example:

```
SOURce1:BB:W3GPp:BSTation1:CHANnel12:TYPE
HSQPsk
```

selects channel type HS-PDS, QPSK for channel 12

Manual operation: See "Channel Type" on page 92

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh: IFCoding <IfCoding>

Enables/disables the information coding.

Parameters:

<IfCoding> 0 | 1 | OFF | ON

0|OFF
corresponds to a standard operation; no coding is performed and the data is sent uncoded.

1|ON
you can configure the way the data is coded

*RST: 0

Example:

```
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:IFCoding 1
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTIEdch 2
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTICount 2
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTI0:UEID 100
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTI0:AGVIndex 20
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTI0:AGSCope PER
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTI1:UEID 10000
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTI1:AGVIndex 1
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTI1:AGSCope ALL
```

Manual operation: See "E-AGCH Information Field Coding" on page 150

[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTI<di0>:AGSCope <AGScope>

Sets the scope of the selected grant. According to the TS 25.321, the impact of each grant on the UE depends on this parameter.

For E-DCH TTI = 10ms, the absolute grant scope is always `ALL` (All HARQ Processes).

Parameters:

<AGScope> ALL | PER

Example: see `[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:IFCoding` on page 413

Manual operation: See "Absolute Grant Scope" on page 151

[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTI<di0>:AGVIndex <AgvIndex>

Sets the Index for the selected TTI. According to the TS 25.212 (4.10.1A.1), there is a cross-reference between the grant's index and the grant value.

Parameters:

<AgvIndex> integer

Range: 0 to 31

Example: see `[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:IFCoding` on page 413

Manual operation: See "Absolute Grant Value Index" on page 151

[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTI<di0>:UEID <Ueid>

Sets the UE Id for the selected TTI.

Parameters:

<Ueid> integer

Range: 0 to 65535

Example: see `[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:IFCoding` on page 413

Manual operation: See "UEID (A-GCH)" on page 151

[:SOURce<hw>]:BB:W3GPp:BStation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTICount <TtiCount>

Sets the number of configurable TTIs.

Parameters:

<TtiCount> integer

Range: 1 to 10

Example:
```
SOURce1:BB:W3GPp:BSTation1:CHANnel9:TYPE EAGCh
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EAGCh:TTICount 5
```

Manual operation: See "Number of Configurable TTIs" on page 150

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:TTIEdch <Ttiedch>

Sets the processing duration.

Parameters:

<Ttiedch> 2ms | 10ms

*RST: 2ms

Example: see [:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EAGCh:IFCoding on page 413

Manual operation: See "E-DCH TTI" on page 150

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe <CType>

Sets the cell type.

Parameters:

<CType> SERVing | NOSERVing

*RST: SERVing

Example:
```
SOURce1:BB:W3GPp:BSTation1:CHANnel9:TYPE EHICh
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:CTYPe SERVing
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:TTIEdch 2ms
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:SSINdex 2
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:DTAU 2
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:ETAU?
```
Response: 5
```
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:RGPAttern "+-+-"
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:CTYPe NOSERVing
SOURce1:BB:W3GPp:BSTation1:CHANnel9:HSUPa:
EHICh:RGPAttern "+0+0"
```

Manual operation: See "Type of Cell" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:DTAU <Dtau>

Sets the offset of the downlink dedicated offset channels.

Suffix:

<ch0> 9..138

Parameters:

<Dtau> integer

Range: 0 to 149
*RST: 0

Example: see `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe` on page 415

Manual operation: See "Tau DPCH" on page 153

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:ETAU?

Queries the offset of the P-CCPCH frame boundary.

Return values:

<Etau> integer

Range: 0 to 149

Example: see `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe` on page 415

Usage: Query only

Manual operation: See "Tau E-RGCH/E-HICH" on page 153

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:RGPAttern <RgPattern>

Sets the bit pattern for the ACK/NACK field.

Parameters:

<RgPattern> <32-bit long pattern>

"+" (ACK) and "0" (no signal)
For the non serving cell

"+" (ACK) and "-" (NACK)
For the serving cell

*RST: +

Example: see `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe` on page 415

Manual operation: See "ACK/NACK Pattern" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:SSINdex <SsIndex>

Sets the value that identifies the user equipment. The values are defined in TS 25.211.

Suffix:

<ch0> 9..138

Parameters:

<SsIndex> integer

Range: 0 to 39
*RST: 0

Example: see `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe` on page 415

Manual operation: See "Signature Hopping Pattern Index – HSUPA BS" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:TTIEdch <Ttiedch>

Sets the processing duration.

Parameters:

<Ttiedch> 2ms | 10ms

*RST: 2ms

Example: see `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:EHICh:CTYPe` on page 415

Manual operation: See "E-DCH TTI" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh:CTYPe <CType>

The command selects the cell type.

Parameters:

<CType> SERVing | NOSERVing

*RST: SERVing

Example: `SOUR:BB:W3GP:BST1:CHAN9:HSUP:ERGC:CTYP SERV`
selects the serving cell type.

Manual operation: See "Type of Cell" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh: DTAU <Dtau>

The command sets the offset of the downlink dedicated offset channels.

Parameters:

<Dtau> integer

Range: 0 to 149
*RST: 0

Example: `SOUR:BB:W3GP:BST1:CHAN12:HSUP:ERGC:DTAU 5`
sets the offset of the downlink dedicated offset channels.

Manual operation: See "Tau DPCH" on page 153

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh: ETAU?

The command queries the offset of the P-CCPCH frame boundary.

Return values:

<Etau> integer

Range: 0 to 149

Example: `SOUR:BB:W3GP:BST1:CHAN12:HSUP:ERGC:ETAU?`
queries the offset of the P-CCPCH frame boundary.

Usage: Query only

Manual operation: See "Tau E-RGCH/E-HICH" on page 153

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh: RGPAttern <RgPattern>

The command sets the bit pattern for the Relative Grant Pattern field.

Parameters:

<RgPattern> string

Example: `SOUR:BB:W3GP:BST1:CHAN10:HSUP:ERGC:RGPA "-"`
sets the bit pattern to "-" (Down).

Manual operation: See "Relative Grant Pattern" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh: SSINdex <SsIndex>

The command sets the value that identifies the user equipment. The values are defined in TS 25.211.

Parameters:

<SsIndex> integer

Range: 0 to 39

*RST: 0

Example: `SOUR:BB:W3GP:BST1:CHAN9:HSUP:ERGC:SSIN 0`

sets the value to identify the user equipment.

Manual operation: See "Signature Hopping Pattern Index – HSUPA BS" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CHANnel<ch0>[:HSUPa]:ERGCh: TTIEdch <Ttiedch>

The command sets processing duration.

Parameters:

<Ttiedch> 2ms | 10ms

*RST: 2ms

Example: `SOUR:BB:W3GP:BST1:CHAN10:HSUP:ERGC:TTIE 2ms`

sets the processing duration to 2 ms.

Manual operation: See "E-DCH TTI" on page 152

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:DLFStructure <DlfStructure>

The command selects the frame structure. The frame structure determines the transmission of TPC and pilot field in the transmission gaps.

Parameters:

<DlfStructure> A | B

A

Type A, the pilot field is sent in the last slot of each transmission gap.

B

Type B, the pilot field is sent in the last slot of each transmission gap. The first TPC field of the transmission gap is sent in addition.

*RST: A

Example: `BB:W3GP:BST2:CMOD:DLFS A`

selects frame structure of type A.

Manual operation: See "DL Frame Structure - BS" on page 99

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:METHod <Method>

The command selects compressed mode method.

Parameters:

<Method> PUNCturing | HLSCheduling | SF2

PUNCturing
The data is compressed by reducing error protection.

HLSCheduling
The data is compressed by stopping the transmission of the data stream during the transmission gap.

SF2
The data is compressed by halving the spreading factor.

*RST: SF2

Example: `BB:W3GP:BST2:CMOD:METH HLSC`
selects compressed mode method High Layer Scheduling.

Manual operation: See "Compressed Mode Method - BS" on page 98

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGD <Tgd>

Sets the transmission gap distances.

Parameters:

<Tgd> integer

Range: 3 to 100
*RST: 15

Example: `BB:W3GP:BST2:CMOD:PATT2:TGD 7`
sets transmission gap distance of pattern 2 to 7 slots.

Manual operation: See "Distance" on page 101

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGL<di> <Tgl>

Sets the transmission gap lengths.

Parameters:

<Tgl> integer

Range: 3 to 14
*RST: 3

Example: `BB:W3GP:BST2:CMOD:PATT2:TGL1 4`
sets transmission gap length of gap 1 of pattern 2 to 4 slots.

Manual operation: See "Gap Len:" on page 101

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGPL <Tgpl>

The command sets the transmission gap pattern lengths. Setting 0 is available only for pattern 2.

The transmission gap pattern length of the user equipment with the same suffix as the selected base station is set to the same value.

Parameters:

<Tgpl> integer

Range: 0 to 100
*RST: 2

Example: `BB:W3GP:BST2:CMOD:PATT2:TGPL 7`
sets transmission gap pattern length of pattern 2 to 7 frames.

Manual operation: See "Pattern Len:" on page 101

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:PATTern<ch>:TGSN <Tgsn>

Sets the transmission gap slot number of pattern 1.

Parameters:

<Tgsn> integer

Range: 0 to 14
*RST: 7

Example: `BB:W3GP:BST2:CMOD:PATT:TGSN 4`
sets slot number of pattern 1 to slot 4.

Manual operation: See "At Slot:" on page 101

[:SOURce<hw>]:BB:W3GPp:BSTation<st>|MSTation<st>:CMODe:POFFset <POffset>

The command sets the power offset for mode USER.

Parameters:

<POffset> float

Range: 0 dB to 10 dB
Increment: 0.01 dB
*RST: 0 dB

Example: `BB:W3GP:BST2|UE2:CMOD:POFF 4`
sets the power offset value to 4 dB.
`BB:W3GP:BST2|UE2:CMOD:POM USER`
selects power offset mode USER

Manual operation: See "Power Offset" on page 100

[:SOURce<hw>]:BB:W3GPp:BSTation<st>|MSTation<st>:CMODe:POMode <PoMode>

The command selects the power offset mode.

Parameters:
<PoMode> AUTO | USER

AUTO
The power offset is obtained by pilot bit ratio as follows: Number of pilots bits of non-compressed slots / Number of pilot bits by compressed slots.

USER
The power offset is defined by command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>|MSTation<st>:CMODe:POFFset`.

*RST: AUTO

Example: `BB:W3GP:BST2|UE2:CMOD:POFF 4`
sets the power offset value to 4 dB.
`BB:W3GP:BST2|UE2:CMOD:POM USER`
selects power offset mode USER.

Manual operation: See "Power Offset Mode" on page 100

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:CMODe:STATe <State>

The command activates/deactivates the compressed mode.

Parameters:
<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST2:CMOD:STAT ON`
activates compressed mode for base station 2.

Manual operation: See "Compressed Mode State" on page 89

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:DCONflict:RESolve

The command resolves existing domain conflicts by modifying the Channelization Codes of the affected channels.

Example: `BB:W3GP:BST2:DCON:STAT?`
queries whether a code domain conflict exists for base station 2.
`Response: 1`
there is a conflict.
`BB:W3GP:BST2:DCON:RES`
resolves the code domain error by modifying the Channelization codes of the affected channels.

Usage: Event

Manual operation: See "Domain Conflict, Resolving Domain Conflicts" on page 96

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:DCONflict[:STATe]?

The command queries whether there is (response 1) or is not (response 0) a conflict (overlap) in the hierarchically-structured channelization codes. The cause of a possible domain conflict can be ascertained by manual operation in the "BS > Code Domain" dialog.

Return values:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:BST2:DCON:STAT?`
queries whether a code domain conflict exists for base station 2.
`Response: 0`
there is no conflict.

Usage: Query only

Manual operation: See "Domain Conflict, Resolving Domain Conflicts" on page 96

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:OLTDiversity <OltDiversity>

Activates/deactivates open loop transmit diversity.

The antenna whose signal is to be simulated is selected with the command `[:SOURce<hw>]:BB:W3GPp:BSTation<st>:TDIVersity`.

Parameters:

<OltDiversity> ON | OFF

*RST: OFF

Example: `BB:W3GP:BST2:TDIV ANT2`
calculates and applies the output signal for antenna 2 of one two-antenna system.
`BB:W3GP:BST2:OLTD ON`
enables open loop transmit diversity.

Manual operation: See "Open Loop Transmit Diversity" on page 89

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:PINDicator:COUNt <Count>

The command sets the number of page indicators (PI) per frame in the page indicator channel (PICH).

Parameters:

<Count> D18 | D36 | D72 | D144

*RST: D18

Example: `BB:W3GP:BST2:PIND:COUN D36`
sets the number of page indicators (PI) per frame in the page indicator channel (PICH) to 36.

Manual operation: See "Page Indicators/Frame" on page 88

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SCODe <SCode>

Sets the identification for the base station. This value is simultaneously the initial value of the scrambling code generator.

Parameters:

<SCode> integer

Range: #H0 to #H5FFF
*RST: #H0

Example: `BB:W3GP:BST2:SCOD #H1FFF`
sets the scrambling code

Manual operation: See "Scrambling Code" on page 88

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SCODe:STATe <State>

The command makes it possible to deactivate base station scrambling for test purposes.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BB:W3GP:BST2:SCOD:STAT OFF`
deactivates scrambling for base station 2.

Manual operation: See "Scrambling Code" on page 88

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SCPich:PREFerence[:STATe] <State>

The command activates or deactivates the use of S-CPICH as reference phase.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST2:SCP:PREF ON`
activates the use of S-CPICH as reference phase for base station 2.

Manual operation: See "S-CPICH as Phase Reference" on page 89

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:SSCG?

The command queries the secondary synchronization code group. This parameter is specified in the table defined by the 3GPP standard "Allocation of SSCs for secondary SCH". This table assigns a specific spreading code to the synchronization code symbol for every slot in the frame. The value is calculated from the scrambling code.

Return values:

<Sscg> integer

Range: 0 to 63

Example: `BB:W3GP:BST2:SSCG?`
queries the 2nd search code group for base station 2.
`Response: 24`
the base station is part of second search group 24.

Usage: Query only

Manual operation: See "2nd Search Code Group" on page 88

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:STATe <State>

Activates and deactivates the specified base station.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: 1 (BSTation1), 0 (all other)

Example: `BB:W3GP:BST2:STAT OFF`
deactivates base station 2.

Manual operation: See "Select Basestation/User Equipment" on page 64

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:TDELay <Tdelay>

The command sets the time shift of the selected base station compared to base station 1 in chips.

Parameters:

<Tdelay> integer
Range: 0 chips to 38400 chips
*RST: 0 chips

Example: `BB:W3GP:BST2:TDEL 256`
shifts base station 2 by 256 chips compared to base station 1.

Manual operation: See "Time Delay" on page 88

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:TDIVersity <TDiversity>

Selects the antenna and the antenna configuration to be simulated.

To simulate transmit diversity, a two-antenna system has to be selected and Open Loop Transmit Diversity has to be activated (command `BB:W3GP:BST:OLTD ON`).

Parameters:

<TDiversity> SANT | ANT1 | ANT2 | OFF
SANT = single-antenna system
*RST: SANT

Example: `BB:W3GP:BST2:TDIV ANT2`
the signal of antenna 2 of one two-antenna system is simulated.

Manual operation: See "Diversity / MIMO" on page 88

8.8 Enhanced Channels of Base Station 1

The `SOURce:BB:W3GPp:BSTation:ENHanced` subsystem contains the commands for setting the enhanced channels of base station 1. The commands of this system only take effect when the 3GPP FDD standard is activated, the downlink transmission direction is selected, base station 1 is enabled and enhanced channels are activated:

`SOURce:BB:W3GPp:STATe ON`

`SOURce:BB:W3GPp:LINK DOWN`

`SOURce:BB:W3GPp:BST1:STATe ON`

`SOURce:BB:W3GPp:BST:ENHanced:CHANnel<11...13>:DPCH:STATe ON`

or

`SOURce:BB:W3GPp:BST:ENHanced:PCCPch:STATe ON`

BSTation<st>

The numeric suffix to `BSTation` determines the base station. Enhanced channels are enabled for base station 1 only.

CHANnel<ch0>

The value range is `CHANnel<11|12|13>` for enhanced DPCHs and `CHANnel<4>` for P-CCPCH.

TCHannel<di>

The transport channel designations for remote control are `TCHannel0` for DCCH, `TCHannel1` to `TCHannel6` for DTCH1 to DTCH6.

8.8.1 General Settings

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:STATe <State>

The command switches the selected channel to the enhanced state.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:STAT ON`
switches DPCH 13 to Enhanced State.

Manual operation: See "Enhanced State" on page 129

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:STATe <State>

The command activates or deactivates the enhanced state of the P-CCPCH (BCH).

Parameters:

<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:BST:ENH:PCCP:STAT ON`

switches the P-CCPCH to Enhanced State.

Manual operation: See "State (Enhanced P-CCPCH)" on page 126

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:ENHanced:PCPich:PATTern <Pattern>

Sets the P-CPICh pattern (channel 0).

Parameters:

<Pattern> ANT1 | ANT2

*RST: ANT1

Example: `BB:W3GP:BST2:ENH:PCP:PATT ANT2`

sets the P-CPICH Pattern to Antenna 2.

Manual operation: See "P-CPICH Pattern " on page 125

8.8.2 Channel Coding

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel:DPCH:CCODing: USER:DELete <Filename>

Deletes the specified files with stored user channel codings.

The files are stored with the fixed file extensions `*.3g_ccod_dl` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Setting parameters:

<Filename>	string

Example:	`MMEM:CDIR '<root>CcodDpchUser'`
	selects the directory for the user channel coding files.
	`BB:W3GP:BST:ENH:CHAN:DPCH:CCOD:USER:DEL 'user_cc1'`
	deletes the specified file with user coding.

Usage:	Setting only

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: CCODing:BPFRame?

Queries the number of data bits in the DPDCH component of the frame at the physical layer.

Return values:

<BpFrame> integer

Range: 30 to 20000
*RST: 510

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:BPFR?`
queries the number of data bits.
`Response: 1`
the number of data bits is 1.

Usage: Query only

Manual operation: See "Bits per Frame (DPDCH)" on page 133

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: CCODing:SFORmat <SFormat>

The command sets the slot format for the selected enhanced DPCH of base station 1. The slot format is fixed for channel-coded measurement channels conforming to the standard - "Reference Measurement Channel". Changing the slot format automatically activates User coding (`W3GP:BST:ENH:CHAN<11...13>:DPCH:CCOD:TYPE USER`). The slot format also fixes the symbol rate, bits per frame, pilot length and TFCI state parameters.

When a channel coding type conforming to the standard is selected (`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:TYPE`) and channel coding is activated, the slot format is (`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:STATe`) automatically set to the associated value.

Changing the slot format automatically activates User coding (`W3GP:BST:ENH:CHAN<11...13>:DPCH:CCOD:TYPE USER`).

The command sets the symbol rate (`W3GP:BST:ENH:CHAN:DPCH:CCOD:SRAT`), the bits per frame (`W3GP:BST:ENH:CHAN:DPCH:CCOD:BPFR`), the pilot length (`W3GP:BST1:CHAN:DPCC:PLEN`), and the TFCI state (`W3GP:BST1:CHAN:DPCC:TFCI STAT`) to the associated values.

Parameters:

<SFormat> integer

Range: 0 to dynamic
*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:SFOR 4`
sets slot format 4 for Enhanced DPCH13.

Manual operation: See "Slot Format (DPDCH)" on page 133

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: CCODing:SRATe?

The command queries the symbol rate.

The symbol rate depends on the selected slot format (`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:SFORmat`), and if the slot format changes, this changes automatically as well.

Return values:

<SRate> D7K5 | D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2880k | D3840k | D4800k | D5760k | D2X1920K | D2X960K2X1920K

*RST: D30K

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:SRAT?`
queries the symbol rate.
`Response: 'D30K'`
the symbol rate of Enhanced DPCH 13 is 30 ksps.

Usage: Query only

Manual operation: See "Symbol Rate (DPDCH)" on page 133

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:STATe <State>

The command activates or deactivates channel coding for the selected enhanced DPCH.

When channel coding is activated and a channel coding type conforming to the standard is selected, (`BB:W3GP:BST:ENH:CHAN:DPCH:CCOD:TYPE`) the slot format, (`BB:W3GP:BST:ENH:CHAN:DPCH:CCOD:SFOR`) and thus the symbol rate, (`BB:W3GP:BST:ENH:CHAN:DPCH:CCOD:SRAT`) the bits per frame, (`BB:W3GP:BST:ENH:CHAN:DPCH:CCOD:BPFR`), the pilot length (`BB:W3GP:BST1:CHAN:DPCC:PLEN`) and the TFCI state (`BB:W3GP:BST1:CHAN:DPCC:TFCI STAT`) are set to the associated values.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:TYPE M12K2`
selects channel coding type RMC 12.2 kbps for Enhanced DPCH 13.
`BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:STAT ON`
activates channel coding.

Manual operation: See "Channel Coding State" on page 131

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:TYPE <Type>

The command selects the channel coding scheme in accordance with the 3GPP specification.

The 3GPP specification defines 4 reference measurement channel coding types, which differ in the input data bit rate to be processed (12.2, 64, 144 and 384 ksps). The additional AMR CODER coding scheme generates the coding of a voice channel. The BTFD coding types with different data rates are also defined in the 3GPP specification (TS 34.121). They are used for the receiver quality test Blind Transport Format Detection.

When a channel coding type conforms to the standard and channel coding is activated, (`:BB:W3GP:BST:ENH:CHAN<n>:DPCH:CCOD:STAT`) the slot format (`:BB:W3GP:BST:ENH:CHAN<n>:DPCH:CCOD:SFOR`) and thus the symbol rate (`:BB:W3GP:BST:ENH:CHAN<n>:DPCH:CCOD:SRAT`), the bits per frame, (`:BB:W3GP:BST:ENH:CHAN<n>:DPCH:CCOD:BPFR`), the pilot length (`:BB:W3GP:BST1:CHAN<n>:DPCC:PLEN`) and the TFCI state (`:BB:W3GP:BST1:CHAN<n>:DPCC:TFCI:STAT`) are set to the associated values.

Parameters:

<Type> M12K2 | M64K | M144k | M384k | AMR | BTFD1 | BTFD2 | BTFD3

M12K2
Measurement channel with an input data bit rate of 12.2 ksps.

M64K
Measurement channel with an input data bit rate of 64 ksps.

M144k
Measurement channel with an input data bit rate of 144 ksps.

M384k
Measurement channel with an input data bit rate of 384 ksps.

AMR
Channel coding for the AMR Coder (coding a voice channel).

USER
This parameter cannot be set. USER is returned whenever a user-defined channel coding is active, that is to say, after a channel coding parameter has been changed or a user coding file has been loaded. The file is loaded by the command `[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:USER:LOAD`.

BTFD1
Blind Transport Format Detection Rate 1 (12.2 kbps).

BTFD2
Blind Transport Format Detection Rate 2 (7.95 kbps).

BTFD3
Blind Transport Format Detection Rate 3 (1.95 kbps).

*RST: M12K2

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:TYPE M144`
selects channel coding scheme RMC 144 kbps.

Manual operation: See "Channel Coding Type" on page 131

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel:DPCH:CCODing:USER:CATalog?

Queries existing files with stored user channel codings.

The files are stored with the fixed file extensions `*.3g_ccod_dl` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`.

Return values:

<Catalog> string

Example:
`MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:BST:ENH:CHAN:DPCH:CCOD:USER:CAT?`
queries the existing files with user coding.
`Response: user_cc1`
there is one file with user coding.

Usage: Query only

Manual operation: See "User Coding" on page 132

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:USER:LOAD <Filename>

The command loads the specified files with stored user channel codings.

The files are stored with the fixed file extensions `*.3g_ccod_dl` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Setting parameters:

<Filename> <user_coding>

Example:
`MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:USER:LOAD 'user_cc1'`
loads the specified file with user coding.

Usage: Setting only

Manual operation: See "User Coding" on page 132

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:CCODing:USER:STORe <Filename>

The command saves the current settings for channel coding as user channel coding in the specified file.

The files are stored with the fixed file extensions `*.3g_ccod_dl` in a directory of the user's choice. The directory in which the file is stored is defined with the command `MMEMory:CDIR`. To store the files in this directory, you only have to give the file name, without the path and the file extension.

Setting parameters:

<Filename> string

Example: `MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:USER:STOR 'user_cc1'`
saves the current channel coding setting in file `user_cc1` in directory `<root>CcodDpchUser`.

Usage: Setting only

Manual operation: See "User Coding" on page 132

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:INTerleaver2 <Interleaver2>

The command activates or deactivates channel coding interleaver state 2 for the selected channel.

Interleaver state 2 is activated or deactivated for all the transport channels together. Interleaver state 1 can be activated and deactivated for each transport channel individually (command `[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:INTerleaver`).

Note: The interleaver states do not cause the symbol rate to change.

Parameters:

<Interleaver2> ON | OFF
*RST: ON

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:INT OFF`
deactivates channel coding interleaver state 2 for all the TCHs of DPCH13.

Manual operation: See "Interleaver 2 State" on page 136

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:CRCSize <CrcSize>

The command defines the CRC length for the selected transport channel. It is also possible to deactivate checksum determination.

Parameters:

<CrcSize> NONE | 8 | 12 | 16 | 24
*RST: 16

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH0:CRCS NONE`
deactivates checksum determination for the DCCH of DPCH13.

Manual operation: See "Size of CRC" on page 135

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: TCHannel<di0>:DATA <Data>

The command determines the data source for the data fields of enhanced channels with channel coding. If channel coding is not active, the DPCH data source is used (`:SOURce:BB:W3GPp:BST:CHANnel:DATA`).

Parameters:

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTern |

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used The bit pattern for the data is defined with the command `[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA:PATTern`.

*RST: PN9

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:DATA PATT`
selects the Pattern data source for the data fields of DTCH1 of DPCH13. The bit pattern is defined with the following command.
`BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:DATA:PATT #H3F,8`
defines the bit pattern.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: TCHannel<di0>:DATA:DSELect <DSelect>

The command selects the data list for enhanced channels for the DLISt selection.

The files are stored with the fixed file extensions *.dm_iqd in a directory of the user's choice. The directory applicable to the commands is defined with the command MMEMory:CDIR. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:DATA DLIS`
selects the Data Lists data source for DTCH1 of DPCH13.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:DATA:DSEL 'bts_tch'`
selects the file `bts_tch` as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DATA:PATTern <Pattern>

The command determines the bit pattern for the PATTern selection. The maximum length is 64 bits.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:DATA:PATT #H3F, 8`
defines the bit pattern.

Manual operation: See "Data Source" on page 134

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:DTX <Dtx>

The command sets the number of DTX (Discontinuous Transmission) bits. These bits are entered in the data stream between rate matching and interleaver 1 and used for the BTFD reference measurement channels rate 2 and rate 3.

Parameters:

<Dtx> integer

Range: 0 to 1024
*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:DTX 257`
257 bits are entered in the data stream between rate matching and interleaver 1.

Manual operation: See "DTX Indication Bits" on page 136

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:EPRotection <EProtection>

The command determines the error protection.

Note:

The transport channel designations for remote control are TCHannel0 for DCCH, TCHannel1 to TCHannel6 for DTCH1 to DTCH6.

Parameters:

<EProtection> NONE | TURBo3 | CON2 | CON3

NONE
No error protection

TURBo3
Turbo Coder of rate 1/3 in accordance with the 3GPP specifications.

CON2 | CON3
Convolution Coder of rate ½ or 1/3 with generator polynomials defined by 3GPP.

*RST: CON3

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:EPR NONE`
error protection for transp⅓ort channel DTCH1 of DPCH13 is deactivated.

Manual operation: See "Error Protection" on page 136

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:INTerleaver <Interleaver>

The command activates or deactivates channel coding interleaver state 1 for the selected channel.

Interleaver state 1 can be activated and deactivated for each transport channel individually. The channel is selected via the suffix at TCHannel.

Interleaver state 2 can only be activated or deactivated for all the transport channels together (`[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:INTerleaver2`).

Note: The interleaver states do not cause the symbol rate to change.

Parameters:

<Interleaver> ON | OFF

*RST: ON

Manual operation: See "Interleaver 1 State" on page 136

The transport channel designations for remote control are TCHannel0 for DCCH, TCHannel1 to TCHannel6 for DTCH1 to DTCH6.

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:RMATtribute <RmAttribute>

Sets data rate matching.

Parameters:

<RmAttribute> integer

Range: 1 to 1024

*RST: 256

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:RMAT 1024`

sets the rate matching attribute for DTCH1 of DPCH13 to 1024.

Manual operation: See "Rate Matching Attribute" on page 135

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:STATe <State>

The command activates/deactivates the selected transport channel.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH1:STAT ON`

activates DTCH1 of DPCH13.

Manual operation: See "Transport Channel State" on page 134

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:TBCount <TbCount>

Defines the number of blocks used for the selected transport channel.

Parameters:

<TbCount> integer

Range: 1 to 24

*RST: 1

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH:TBC 4`

sets 4 transport blocks for DTCH1 of DPCH13.

Manual operation: See "Transport Block" on page 135

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:TBSize <TbSize>

Sets the size of the data blocks.

Parameters:

<TbSize> integer

Range: 0 to 4096

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:TCH:TBS 1024`

sets the length of the transport blocks for DTCH1 of DPCH13 to 1024.

Manual operation: See "Transport Block Size" on page 135

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:TCHannel<di0>:TTINterval <TtInterval>

Sets the number of frames into which a TCH is divided. This setting also defines the interleaver depth.

Parameters:

<TtInterval> 10MS | 20MS | 40MS

Example: `SOURce1:BB:W3GPp:BSTation:ENHanced:CHANnel13:DPCH:TCHannel1:TTINterval 20ms`
sets that DTCH1 of DPCH13 is divided into 2 frames.

Manual operation: See "Transport Time Interval" on page 135

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:CCODing:INTerleaver<di> <Interleaver>

The command activates or deactivates channel coding interleaver state 1 or 2 for the P-CCPCH.

Note: The interleaver states do not cause the symbol rate to change.

Parameters:

<Interleaver> ON | OFF
*RST: ON

Example: `BB:W3GP:BST:ENH:PCCP:CCOD:INT1 OFF`
deactivates channel coding interleaver state 1 for the P-CCPCH.

Manual operation: See "Interleaver" on page 128

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:CCODing:STATe <State>

The command activates or deactivates channel coding for the enhanced P-CCPCH. The coding scheme of the P-CCPCH (BCH) is defined in the standard.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `BB:W3GP:BST:ENH:PCCP:CCOD:STAT ON`
activates channel coding for the enhanced P-CCPCH.

Manual operation: See "Channel Coding State" on page 127

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:PCCPch:CCODing:TYPE?

The command queries the channel coding scheme in accordance with the 3GPP specification. The coding scheme of the P-CCPCH (BCH) is defined in the standard. The channel is generated automatically with the counting system frame number (SFN). The system information after the SFN field is completed from the selected data source.

Return values:

<Type> BCHSfn

*RST: BCHSfn

Example: `BB:W3GP:BST:ENH:PCCP:CCOD:TYPE?`
queries the channel coding scheme of the P-CCPCH.
`Response: 'BCHS'`
the channel coding scheme with SFN is used.

Usage: Query only

Manual operation: See "Channel Coding Type" on page 128

8.8.3 Dynamic Power Control Settings

The R&S WinIQSIM2 does not support Dynamic Power Control.

Example: Configuring the Dynamic Power Control Settings

The following is a simple programing example with the purpose to show **all** commands for this task. In real application, some of the commands may be ommited.

```
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:DIRection UP
// selects direction up, a high level of the control signals
// leads to an increase of the channel power
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:STEP 1 dB
// selects a step width of 1 dB.
// A high level of the control signal leads to
// an increase of 1 dB of the channel power,
// a low level to a decrease of 1 dB.
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:RANGe:DOWN 10 dB
// selects a dynamic range of 10 dB for ranging up the channel power
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:RANGe:UP 50 dB
// selects a dynamic range of 50 dB for ranging up the channel power
// The overall increase and decrease of channel power,
// i.e. the dynamic range is limited to 60 dB
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:MODE TPC
// selects the source of the power control signal
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:STATe ON
// activates Dynamic Power Control for DPCH 11
SOURce:BB:W3GPp:BSTation:ENHanced:CHAN11:DPCH:DPControl:POWer?
// queries the deviation of the channel power of DPCH 11
```

[:SOURce<hw>]:BB:W3GPp:BStation:ENHanced:CHANnel<ch0>:DPCH:DPControl:DIRection <Direction>

The command selects the Dynamic Power Control direction. The selected mode determines if the channel power is increased (UP) or decreased (DOWN) by a control signal with high level.

Parameters:

<Direction> UP | DOWN

*RST: UP

Example: see example "Configuring the Dynamic Power Control Settings" on page 439

Manual operation: See "Direction" on page 140

[:SOURce<hw>]:BB:W3GPp:BStation:ENHanced:CHANnel<ch0>:DPCH:DPControl:CONNector <Connector>

Determines the input connector at that the instrument expects the external control signal.

Parameters:

<Connector> LEVatt | USER1

*RST: LEVatt

Manual operation: See "Connector" on page 140

[:SOURce<hw>]:BB:W3GPp:BStation:ENHanced:CHANnel<ch0>:DPCH:DPControl:MODE <Mode>

The command selects the control signal source for Dynamic Power Control.

Note: R&S SMBV instruments do not support External Dynamic Power Control.

Parameters:

<Mode> TPC | MANual | EXTernal

*RST: TPC

Example: see example "Configuring the Dynamic Power Control Settings" on page 439

Manual operation: See "Mode" on page 140

[:SOURce<hw>]:BB:W3GPp:BSTation<st>:ENHanced:CHANnel<ch0>:DPCH:DPControl:RANGe:UP <Up>
[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:RANGe:DOWN <Down>

The command selects the dynamic range for ranging down the channel power.

Parameters:

<Down> float

Range: 0 to 60
Increment: 0.01
*RST: 10
Default unit: dB

Example: see example "Configuring the Dynamic Power Control Settings" on page 439

Manual operation: See "Up Range/Down Range" on page 141

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:STATe <State>

The command activates/deactivates Dynamic Power Control.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: see example "Configuring the Dynamic Power Control Settings" on page 439

Manual operation: See "Dynamic Power Control State" on page 140

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DPControl:STEP:MANual <Manual>

This command provides the control signal for manual mode of Dynamic Power Control.

Setting parameters:

<Manual> MAN0 | MAN1

*RST: MAN0

Example:

```
BB:W3GP:BST:ENH:CHAN11:DPCH:DPC:MODE MAN
BB:W3GP:BST:ENH:CHAN11:DPCH:DPC:STEP 0.5 dB
BB:W3GP:BST:ENH:CHAN11:DPCH:DPC:STAT ON
BB:W3GP:BST:ENH:CHAN11:DPCH:DPC:STEP:MAN MAN0
```

Usage: Setting only

Manual operation: See "Mode" on page 140

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: DPControl:STEP[:EXTernal] <External>

This command sets step width by which – with Dynamic Power Control being switched on - the channel power of the selected enhanced channel is increased or decreased.

Parameters:

<External> float

Range: 0.5 to 6
Increment: 0.01
*RST: 1
Default unit: dB

Example: see example "Configuring the Dynamic Power Control Settings" on page 439

Manual operation: See "Power Step" on page 141

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH: DPControl[:POWer]?

The command queries the deviation of the channel power (delta POW) from the set power start value of the corresponding enhanced channels.

Return values:

<Power> float

Range: -60 to 60
Increment: 0.01
*RST: 0

Example: see example "Configuring the Dynamic Power Control Settings" on page 439

Usage: Query only

Manual operation: See "Power Control Graph" on page 141

8.8.4 Error Insertion

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:LAYer <Layer>

The command selects the layer in the coding process in which bit errors are inserted.

Parameters:

<Layer> TRANsport | PHYSical

TRANsport
Transport Layer (Layer 2). This layer is only available when channel coding is active.

PHYSical
Physical layer (Layer 1).

*RST: PHYSical

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:DERR:BIT:LAY PHYS`
selects layer 1 for entering bit errors.

Manual operation: See "Insert Errors On" on page 137

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:RATE <Rate>

The command sets the bit error rate.

Parameters:

<Rate> float

Range: 1E-7 to 0.5
Increment: 1E-7
*RST: 0.001

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:DERR:BIT:RATE 1E-4`
sets a bit error rate of 0.0001.

Manual operation: See "Bit Error Rate" on page 137

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:STATe <State>

The command activates bit error generation or deactivates it.

Bit errors are inserted into the data fields of the enhanced channels. When channel coding is active, it is possible to select the layer in which to insert the errors (the physical or the transport layer, [:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BIT:LAYer). When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:DERR:BIT:STAT ON`
activates bit error generation.

Manual operation: See "Bit Error State (Enhanced DPCHs)" on page 136

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BLOCk:RATE <Rate>

Sets the block error rate.

Parameters:

<Rate> float

Range: 1E-4 to 0.5
Increment: 1E-4
*RST: 0.1

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:DERR:BLOC:RATE 1E-2`
sets the block error rate to 0.01.

Manual operation: See "Block Error Rate" on page 137

[:SOURce<hw>]:BB:W3GPp:BSTation:ENHanced:CHANnel<ch0>:DPCH:DERRor:BLOCk:STATe <State>

The command activates or deactivates block error generation. Block error generation is only possible when channel coding is activated.

During block error generation, the CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate a defective signal.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN13:DPCH:CCOD:STAT ON`
activates channel coding.
`BB:W3GP:BST:ENH:CHAN13:DPCH:DERR:BLOC:RATE 5E-1`
sets the block error rate to 0.1.
`BB:W3GP:BST:ENH:CHAN13:DPCH:DERR:BLOC:STAT ON`
activates block error generation.

Manual operation: See "Block Error State" on page 137

[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BIT:LAYer <Layer>

The command selects the layer in the coding process in which bit errors are inserted.

Parameters:

<Layer> TRANsport | PHYSical

TRANsport
Transport Layer (Layer 2)

PHYSical
Physical layer (Layer 1)

*RST: PHYSical

Example: `BB:W3GP:BST:ENH:CHAN12:HSDP:DERR:BIT:LAY PHYS`
selects layer 1 for entering bit errors.

Manual operation: See "Insert Errors On (HSDPA H-Set)" on page 123

[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BIT:RATE <Rate>

Sets the bit error rate.

Parameters:

<Rate> float

*RST: 1E-3

Example: `BB:W3GP:BST:ENH:CHAN12:HSDP:DERR:BIT:RATE 1E-4`
sets a bit error rate of 0.0001.

Manual operation: See "Bit Error Rate (HSDPA H-Set)" on page 123

[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BIT:STATe <State>

The command activates bit error generation or deactivates it.

Bit errors are inserted into the data stream of the coupled HS-PDSCHs. It is possible to select the layer in which the errors are inserted (physical or transport layer). When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN12:HSDP:DERR:BIT:STAT ON`
activates bit error generation.

Manual operation: See "Bit Error State (HSDPA H-Set)" on page 123

[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BLOCk:RATE <Rate>

The command sets the block error rate.

Parameters:

<Rate> float

Range: 1E-4 to 5E-1
*RST: 5E-1

Example: `BB:W3GP:BST:ENH:CHAN12:HSDP:DERR:BLOC:RATE 1E-2`
sets the block error rate to 0.01.

Manual operation: See "Block Error Rate (HSDPA H-Set)" on page 124

[:SOURce<hw>]:BB:W3GPp:BSTation[:ENHanced]:CHANnel<ch0>:HSDPa:DERRor:BLOCk:STATe <State>

The command activates or deactivates block error generation. During block error generation, the CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate a defective signal.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:BST:ENH:CHAN12:HSDP:DERR:BLOC:RATE 5E-1`
sets the block error rate to 0.1.
`BB:W3GP:BST:ENH:CHAN12:HSDP:DERR:BLOC:STAT ON`
activates block error generation.

Manual operation: See "Block Error State (HSDPA H-Set)" on page 123

8.9 User Equipment Settings

The `SOURce:BB:W3GPp:MSTation` system contains commands for setting the user equipment. The commands of this system only take effect when the 3GPP FDD standard is activated, the UP transmission direction is selected and the particular user equipment is enabled:

`SOURce:BB:W3GPp:STATe ON`

`SOURce:BB:W3GPp:LINK UP`

`SOURce:BB:W3GPp:MSTation2:STATe ON`

`MSTation<st>`

The numeric suffix to `MSTation` determines the user equipment. The value range is 1 .. 4. If the suffix is ommited, MS1 is selected.

8.9.1 General Settings

[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:COUNt <Count>

The command sets the number of additional user equipment.

Up to 128 additional user equipment can be simulated - corresponding to a receive signal for a base station with high capacity utilization. The fourth user equipment (UE4) serves as a template for all other stations. The only parameters of the additional user equipment to be modified are the scrambling code and the power.

Parameters:

<Count> integer

Range: 1 to 128
*RST: 4

Example:

`BB:W3GP:MST:ADD:COUN 20`
sets 20 additional user equipment.
`BB:W3GP:MST:ADD:POW:OFFS -3.0`
sets the power offset to -3 dB.
`BB:W3GP:MST:ADD:SCOD:STEP 1`
sets the step width for increasing the scrambling code to 1.
`BB:W3GP:MST:ADD:STAT ON`
connects the 20 user equipment to the 3GPP FDD signal.

Manual operation: See "Number of Additional UE" on page 86

[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:POWer:OFFSet <Offset>

Sets the power offset of the active channels of the additional user equipment relative to the power of the active channels of the reference station UE4.

The offset applies to all the additional user equipment. The resultant overall power must fall within the range 0 ... - 80 dB. If the value is above or below this range, it is limited automatically.

Parameters:

<Offset> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example: `BB:W3GP:MST:ADD:POW:OFFS -3.0`
sets the offset to -3 dB.

Manual operation: See "Power Offset" on page 86

[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:SCODe:STEP <Step>

Sets the step width for increasing the scrambling code of the additional user equipment. The start value is the scrambling code of UE4.

Parameters:

<Step> integer

Range: 0 to #HFFFFFF

Example: `BB:W3GP:MST:ADD:SCOD:STEP #H55`
sets the step width for increasing the scrambling code to #H55.

Manual operation: See "Scrambling Code Step" on page 86

[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:STATe <State>

Activates additional user equipment.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `SOURce1:BB:W3GPp:MSTation:ADDitional:STATe ON`
connects the additional user equipment to the 3GPP FDD signal.

Manual operation: See "State" on page 86

[:SOURce<hw>]:BB:W3GPp:MSTation:ADDitional:TDELay:STEP <Step>

The command sets the step width for the time delay of the additional user equipment to one another. The start value is the time delay of UE4. Entry is made in chips and can be a maximum of 1 frame.

Parameters:

<Step> integer

Range: 0 to 38400

*RST: 0

Example: `BB:W3GP:MST:ADD:TDEL:STEP 256`

shifts each of the user equipment 256 chips apart, starting from the time delay of UE4.

Manual operation: See "Time Delay Step" on page 86

[:SOURce<hw>]:BB:W3GPp:MSTation:PRESet

The command produces a standardized default for all the user equipment. The settings correspond to the `*RST` values specified for the commands.

All user equipment settings are preset.

Example: `BB:W3GP:MST:PRES`

resets all the user equipment settings to default values.

Usage: Event

Manual operation: See "Reset User Equipment" on page 63

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:MODE <Mode>

The command selects the operating mode for the user equipment.

Parameters:

<Mode> PRACh | PCPCh | DPCDch | PPRach | PPCPch

PRACh
The user equipment only generates a signal with a physical random access channel (PRACH). This channel is used to set up the user equipment connection with the base station. The channel-specific parameters of the PRACH can be set with the commands `:SOURce:BB:W3GPp:MSTation<n>:PRACh:....`

PPRAch
The user equipment only generates a signal with the preamble component of a physical random access channel (PRACH). The parameters of the PRACH preamble can be set with the commands `:SOURce:BB:W3GPp:MSTation<n>:PRACh:....`

PCPCh
The user equipment only generates a signal with a physical common packet channel (PCPCH). This channel is used to transmit packet-oriented services (e.g. SMS). The channel-specific parameters of the PCPCH can be set with the commands `:SOURce:BB:W3GPp:MSTation<n>:PCPCh:....`

PPCPch
The user equipment only generates a signal with the preamble component of a physical common packet channel (PCPCH). The parameters of the PCPCH preamble can be set with the commands `:SOURce:BB:W3GPp:MSTation<n>:PCPCh:....`

DPCDch
The user equipment generates a signal with a dedicated physical control channel (DPCCH), up to 6 dedicated physical data channels (DPDCH), up to one HS-DPCCH channel, up to one E-DPCCH channel and up to four E-DPDCH channels. This signal is used for voice and data transmission.

*RST: DPCDch

Example: `BB:W3GP:MST1:MODE DPCD`
switches the user equipment to standard mode - transmission of voice and data.

Manual operation: See "Mode" on page 161

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:SCODe <SCode>

The command sets the scrambling code. Long or short scrambling codes can be generated (command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:SCODe:MODE`).

Parameters:

<SCode> integer

Range: #H0 to #HFFFFFF
*RST: #H0

Example: `BB:W3GP:MST2:SCOD #H12`
sets scrambling code #12.

Manual operation: See "Scrambling Code (hex)" on page 162

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:SCODe:MODE <Mode>

The command sets the type for the scrambling code. The scrambling code generator can also be deactivated for test purposes.

SHORt is only standardized for the selection `:BB:W3GP:MST:MODE DPCDh` and `:BB:W3GP:MST:MODE PCPCh`. But it can also be generated for the PCPCH for test purposes.

Parameters:

<Mode> LONG | SHORt | OFF

*RST: LONG

Example: `BB:W3GP:MST2:SCOD:MODE OFF`
deactivates the scrambling code generator.

Manual operation: See "Scrambling Mode" on page 162

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:STATe <State>

The command activates and deactivates the specified user equipment.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: ON

Example: `BB:W3GP:MST2:STAT OFF`
deactivates user equipment 2.

Manual operation: See "Select Basestation/User Equipment" on page 64

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:TDELay <TDelay>

The command sets the time shift of the selected user equipment compared to user equipment 1 in chips.

Parameters:

<TDelay> integer

Range: 0 to 38400
*RST: 0

Example: `BB:W3GP:MST2:TDEL 256`
shifts user equipment 2 by 256 chips compared to user equipment 1.

Manual operation: See "Time Delay" on page 163

[:SOURce<hw>]:BB:W3GPp:LREFerence <Reference>

Determines the power reference for the calculation of the output signal power in uplink direction.

Parameters:

<Reference> RMS | DPCC | PMP | LPP | EDCH | HACK | PCQI

`RMS` = RMS Power, `DPCC` = First DPCCH, `PMP` = PRACH Message Part, `LPP` = Last PRACH Preamble, `EDCH` = First E-DCH, `HACK` = First HARQ-ACK, `PCQI` = First PCI/CQI

*RST: RMS

Example: `SOURce1:BB:W3GPp:LREFerence RMS`

Manual operation: See "Power Reference" on page 65

8.9.2 Compressed Mode Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:METHod <Method>

The command selects compressed mode method.

Parameters:

<Method> HLSCheduling | SF2

SF2
The data is compressed by halving the spreading factor.

HLSCheduling
The data is compressed by stopping the transmission of the data stream during the transmission gap.

*RST: SF2

Example: `BB:W3GP:MST2:CMOD:METH HLSC`
selects compressed mode method High Layer Scheduling.

Manual operation: See "Compressed Mode Method - UE" on page 98

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGD <Tgd>

Sets the transmission gap distances.

Parameters:

<Tgd> integer

Range: 3 to 100
*RST: 15

Example: `BB:W3GP:MST2:CMOD:PATT2:TGD 7`
sets transmission gap distance of pattern 2 to 7 slots.

Manual operation: See "Distance" on page 101

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGL<di> <Tgl>

Sets the transmission gap lengths.

Parameters:

<Tgl> integer

Range: 3 to 14
*RST: 3

Example: `BB:W3GP:MST2:CMOD:PATT2:TGL1 4`
sets transmission gap length of gap 1 of pattern 2 to 4 slots.

Manual operation: See "Gap Len:" on page 101

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGPL <Tgpl>

The command sets the transmission gap pattern lengths. Setting 0 is available only for pattern 2.

The transmission gap pattern lengths of the base station with the same suffix as the selected user equipment is set to the same value.

Parameters:

<Tgpl> integer

Range: 0 to 100
*RST: 2

Example: `BB:W3GP:MST2:CMOD:PATT2:TGPL 7`
sets transmission gap pattern length of pattern 2 to 7 frames.

Manual operation: See "Pattern Len:" on page 101

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:PATTern<ch>:TGSN <Tgsn>

Sets the transmission gap slot number of pattern 1.

Parameters:

<Tgsn> integer

Range: 0 to 14
*RST: 7

Example: `BB:W3GP:MST2:CMOD:PATT:TGSN 4`
sets slot number of pattern 1 to slot 4.

Manual operation: See "At Slot:" on page 101

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CMODe:STATe <State>

The command activates/deactivates the compressed mode.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:MST2:CMOD:STAT ON`

activates compressed mode for user equipment 2.

Manual operation: See "Compressed Mode State" on page 89

8.9.3 DPCCH Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:CCODe?

Queries the channelization code and the modulation branch of the specified channel. The value is fixed.

Return values:

<CCode> integer

Range: 0 to max

Example: `BB:W3GP:MST1:DPCC:CCOD?`

queries the channelization code for DPCCH of user equipment 1.

`Response: Q,64`

Usage: Query only

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:MODE <Mode>

The command sets the number of bits for the FBI field. With OFF, the FBI field is not used.

Note: The former 2-bits long FBI Mode "D2B" according to 3GPP Release 4 specification TS 25.211 is not supported any more.

The command sets the slot format (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:SFORmat`) in conjunction with the set TFCI status (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI:STATe`) and the TPC Mode (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MODE`) to the associated values.

Parameters:

<Mode> OFF | D1B

*RST: OFF

Example: `BB:W3GP:MST1:DPCC:FBI:MODE OFF`
an FBI field is not used.

Manual operation: See "FBI Mode" on page 198

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:PATTern <Pattern>

The command determines the bit pattern when the `PATTern` data source is selected for the FBI field.

Parameters:

<Pattern> 32 bits

The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use.

*RST: #H0,1

Example: `BB:W3GP:MST1:DPCC:FBI:PATT #H3F,8`
defines the bit pattern of the data for the FBI field.

Manual operation: See "FBI Pattern (bin)" on page 199

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:POWer <Power>

The command defines the channel power for the DPCCH.

Parameters:

<Power> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:DPCC:POW -10 dB`
sets the channel power to -10 dB.

Manual operation: See "Power" on page 196

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:SFORmat <SFormat>

The command sets the slot format for the DPCCH. The slot format defines the structure of the DPCCH slots and the control fields.

Slot Format # 4 is available only for instruments equipped with R&S SMx/AMU-K59.

Slot formats 0 to 4 are available for the DPCCH channel as defined in the 3GPP Release 7 specification TS 25.211.

Note:

The former slot formats 4 and 5 according to 3GPP Release 4 specification TS 25.211 are not supported any more.

The command sets the FBI mode (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:MODE`), the TFCI status (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI:STATe`) and the TPC Mode (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MODE`) to the associated values.

Parameters:

<SFormat> integer

Range: 0 to 4
*RST: 0

Example: `BB:W3GP:MST2:DPCC:SFOR 3`
selects slot format 3 for the DPCCH of user equipment 2.

Manual operation: See "Slot Format #" on page 197

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI <Tfci>

Sets the value of the TFCI (Transport Format Combination Indicator) field. This value selects a combination of 30 bits, which are divided into two groups of 15 successive slots.

Parameters:

<Tfci> integer

Range: 0 to 1023
*RST: 0

Example: `BB:W3GP:MST1:DPCC:TFCI 21`
sets the TFCI value to 21.

Manual operation: See "TFCI" on page 198

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI:STATe <State>

The command activates the TFCI (Transport Format Combination Indicator) field for the DPCCH.

The command sets the slot format ([:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:SFORmat) in conjunction with the set FBI mode ([:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:MODE) and the TPC Mode ([:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MODE) to the associated values.

Parameters:

<State> ON | OFF

*RST: 1

Example: `BB:W3GP:MST1:DPCC:TFCI:STAT ON`
activates the TFCI field.

Manual operation: See "Use TFCI" on page 198

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TOFFset <TOffset>

Sets the timing offset.

Parameters:

<TOffset> integer

Range: 0 to 1024
Increment: 1024

Example: `BB:W3GP:MST1:DPCC:TOFF?`
queries the timing offset.

Manual operation: See "DL-UL Timing Offset" on page 196

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA <Data>

The command determines the data source for the TPC field of the DPCCH.

Parameters:

<Data> DLISt | ZERO | ONE | PATTern |

DLISt
A data list is used. The data list is selected with the command [:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:DSELect.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command [:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:PATTern. The maximum length is 64 bits.

*RST: ZERO

Example: `BB:W3GP:MST2:DPCC:TPC:DATA PATT`
selects as the data source for the TPC field of user equipment 2 the bit pattern defined with the following command.
`BB:W3GP:MST2:DPCC:TPC:DATA:PATT #H48D0,16`
defines the bit pattern.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:DSELect <DSelect>

The command selects the data list when the DLISt data source is selected for the TPC field of the DPCCH.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:MST1:DPCC:TPC:DATA DLIS`
selects the Data Lists data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST1:DPCC:TPC:DATA:DSEL 'dpcch_tpc_1'`
selects the data list `dpcch_tpc1`.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:DATA:PATTern <Pattern>

The command determines the bit pattern for the PATTern data source selection. The maximum length of the bit pattern is 64 bits.

Parameters:

<Pattern> 64 bits
*RST: #H0,1

Example: `BB:W3GP:MST1:DPCC:TPC:DATA:PATT #B11110000,8`
defines the bit pattern of the data for the TPC field.

Manual operation: See "TPC Data Source" on page 199

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MISuse <MisUse>

The command activates "mis-" use of the TPC field (Transmit Power Control) for controlling the channel power of the user equipment.

The bit pattern (see commands `:SOURce:BB:W3GPp:MSTation:DPCCh:TPC:DATA...`) of the TPC field of the DPCCH is used to control the channel power. A "1" leads to an increase of channel powers, a "0" to a reduction of channel powers. Channel power is limited to the range 0 dB to -60 dB. The step width for the change is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:PSTep`.

Note: "Mis-"using the TPC field is available for UE2, UE3,UE4 only.

Parameters:

<MisUse> ON | OFF

*RST: 0

Example: `BB:W3GP:MST2:DPCC:TPC:MIS ON`

activates regulation of the channel power via the bit pattern of the TPC field.

`BB:W3GP:MST2:DPCC:TPC:PST 1 dB`

sets the step width for the change of channel power to 1 dB.

Manual operation: See "Misuse TPC for Output Power Control" on page 200

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:MODE <Mode>

Selects the TPC (Transmit Power Control) mode.

The command sets the slot format (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:SFORmat`) in conjunction with the set TFCI status (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TFCI:STATe`) and the FBI Mode (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:FBI:MODE`) to the associated values.

Parameters:

<Mode> D2B | D4B

D2B
A TPC field with a length of 2 bits is used.

D4B
(enabled only for instruments equipped with R&S SMx/AMU-K59)
A TPC field with a length of 4 bits is used.
A 4 bits long TPC field can be selected, only for Slot Format 4 and disabled FBI and TFCI fields.

*RST: D2B

Example: `BB:W3GP:MST1:DPCC:TPC:MODE D2B`

an TPC field with a length of 2 bits is used.

Manual operation: See "TPC Mode" on page 199

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:PSTep <PStep>

The command sets the level of the power step in dB for controlling the transmit power via the data of the TPC field.

Parameters:

<PStep> float

Range: -10 to 10
Increment: 0.01
*RST: 0

Example: `BB:W3GP:MST:DPCC:TPC:MIS ON`
activates regulation of the channel power via the bit pattern of the TPC field.
`BB:W3GP:MST:DPCC:TPC:PST 1 dB`
sets the step width for the change of channel power to 1 dB.

Manual operation: See "TPC Power Step" on page 201

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:TPC:READ <Read>

The command sets the read out mode for the bit pattern of the TPC field of the DPCCH.

The bit pattern is selected with the command `SOUR:BB:W3GPp:MST:DPCC:TPC:DATA:PATT`.

Parameters:

<Read> CONTinuous | S0A | S1A | S01A | S10A

CONTinuous
The bit pattern is used cyclically.

S0A
The bit pattern is used once, then the TPC sequence continues with 0 bits.

S1A
The bit pattern is used once, then the TPC sequence continues with 1 bits.

S01A
The bit pattern is used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

S10A
The bit pattern is used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

*RST: CONTinuous

Example: `BB:W3GP:MST2:DPCC:TPC:READ CONT`
the selected bit pattern is repeated continuously for the TPC sequence.

Manual operation: See "TPC Read Out Mode" on page 199

8.9.4 HS-DPCCH Settings

8.9.4.1 Common Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:STATe <State>

This command activates or deactivates the HS-DPCCH.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:MST1:DPCC:HS:STAT ON`
activates HS-DPCCH.

Manual operation: See "State (HS-DPCCH)" on page 205

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer <Power>

The command sets the channel power in dB. The power entered is relative to the powers of the other channels. If "Adjust Total Power to 0 dB" is executed (`[:SOURce<hw>]:BB:W3GPp:POWer:ADJust`), the power is normalized to a total power for all channels of 0 dB. The power ratios of the individual channels remains unchanged.

Parameters:

<Power> float

Range: -80 dB to 0 dB
Increment: 0.01
*RST: 0 dB

Example: `BB:W3GP:MST1:DPCC:HS:POW -30`
sets the channel power to -30 dB.

Manual operation: See "Power (HS-DPCCH)" on page 205

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:COMPatibility <Compatibility>

The concept of the graphical user interface for the configuration of HS-DPCCH has been adapted to support simultaneous DC-HSDPA and MIMO operation, as required in 3GPP Release 9 onwards.

This command enables the configuration of the HS-DPCCH settings provided for backwards compatibility ("Up to Release 7").

Parameters:

<Compatibility> REL7 | REL8 | REL8RT

*RST: REL8

Example: `BB:W3GP:MST1:DPCC:HS:COMP REL8`

sets the compatibility mode to Release 8 and Later.

Manual operation: See "Compatibility Mode (HS-DPCCH)" on page 206

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CCODe?

Queries the channelization code and the modulation branch of the HS-DPCCH.

Return values:

<CCode> integer

Range: 1 to 64
*RST: 64

Example: `BB:W3GP:MST1:DPCC:HS:CCOD?`

queries the channelization code.

`Response: Q,32`

the channelization code is 32 and the modulation branch is Q.

Usage: Query only

Manual operation: See "Channelization Code" on page 196

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SDELay <SDelay>

Sets the delay between the uplink HS-DPCCH and the frame of uplink DPCH.

Parameters:

<SDelay> integer

a multiple m of 256 chips according to TS 25.211 7.7

Range: 0 to 250
*RST: 101
Default unit: * 256 Chips

Example: `BB:W3GP:MST1:DPCC:HS:SDEL 101`

sets a start delay of 101 x 256 chips.

Manual operation: See "Start Delay" on page 206

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:TTIDistance <TtiDistance>

Selects the distance between two packets in HSDPA packet mode.

Parameters:

<TtiDistance> integer

Range: 1 to 16
*RST: 5

Example: `BB:W3GP:MST1:DPCC:HS:TTID 4`
selects an Inter TTI Distance of 4 subframes.

Manual operation: See "Inter TTI Distance (Interval)" on page 207

8.9.4.2 Up to Release 7 Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POACk <Poack>

(Up to Release 7)

The command sets the channel power part of the ACK in dB.

Parameters:

<Poack> float

Range: -10 to 10 dB
Increment: 0.1
*RST: 0 dB

Example: `BB:W3GP:MST1:DPCC:HS:POAC -2.5dB`
sets the channel power part of the ACK to 2.5 dB.

Manual operation: See "Power Offset ACK" on page 217

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:PONAck <PoNack>

(Up to Release 7)

The command sets the channel power part of the NACK in dB.

Parameters:

<PoNack> float

Range: -10 dB to 10 dB
Increment: 0.1
*RST: 0 dB

Example: `BB:W3GP:MST1:DPCC:HS:PONA -2.5dB`
sets the channel power part of the NACK to 2.5 dB.

Manual operation: See "Power Offset NACK" on page 218

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:HAPattern <HaPattern>

(Up to Release 7)

The command enters the pattern for the HARQ-ACK field (Hybrid-ARQ Acknowledgement). One bit is used per HS-DPCCH packet.

Parameters:

<HaPattern> string

The pattern is entered as string, the maximum number of entries is 32. Three different characters are permitted.

1
The HARQ ACK is sent (ACK). Transmission was successful and correct.

0
The NACK is sent (NACK). Transmission was not correct. With an NACK, the UE requests retransmission of the incorrect data.

-
Nothing is sent. Transmission is interrupted (Discontinuous Transmission, DTX).

*RST: <empty>

Example:
```
BB:W3GP:MST1:DPCC:HS:COMP REL7
BB:W3GP:MST1:DPCC:HS:HAP "110--110-0"
```
enters the pattern for the HARQ-ACK field.

Manual operation: See "ACK/NACK Pattern" on page 218

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CQI:PLENgth <PLength>

Sets the length of the CQI sequence.

The values of the CQI sequence are defined with command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CQI<ch>[:VALues]`. The pattern is generated cyclically.

Parameters:

<PLength> integer

Range: 1 to 10
*RST: 1

Example: `BB:W3GP:MST1:DPCC:HS:CQI:PLEN 2`
the CQI sequence length is 2 values.
`BB:W3GP:MST1:DPCC:HS:CQI1 -1`
the first CQI value is -1.
`BB:W3GP:MST1:DPCC:HS:CQI2 2`
the second CQI value is 2.

Manual operation: See "CQI Pattern Length" on page 218

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CQI<ch>[:VALues] <Values>

Sets the values of the CQI sequence.

The length of the CQI sequence is defined with command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:CQI:PLENgth`. The pattern is generated cyclically.

Parameters:

<Values> integer

Value `-1` means that no CQI is sent (DTX - Discontinuous Transmission).

Range: -1 to 30
*RST: 1

Example: `BB:W3GP:MST1:DPCC:HS:CQI:PLEN 2`
the CQI sequence length is 2 values.
`BB:W3GP:MST1:DPCC:HS:CQI1 1`
the first CQI value is -1.
`BB:W3GP:MST1:DPCC:HS:CQI2 2`
the second CQI value is 2.

Manual operation: See "CQI Values" on page 218

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO[:MODE] <Mode>

Enables/disables working in MIMO mode for the selected UE.

Parameters:

<Mode> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.

Options: R&S SMx/AMU-K59

Manual operation: See "MIMO Mode (Up to Release 7)" on page 219

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:POAAck <PoaAck>

(up to Release 7)

Sets the power offset $P_{off\_ACK/ACK}$ of an ACK/ACK response to two scheduled transport blocks relative to the CQI Power P_{CQI} ([:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer).

The power PACK/ACK used during the HARQ-ACK slots is calculated as:

$P_{ACK/ACK} = P_{CQI} + P_{off\_ACK/ACK}$

Parameters:

<PoaAck> float

Range: -10 to 10 dB
Increment: 0.1
*RST: 0 dB

Example:

`BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK AACK`
sets the HARQ-ACK to ACK/ACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:POAA -2.5dB`
sets the power offset to -2.5 dB.

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset ACK/ACK" on page 220

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:POANack <PoaNack>

(up to Release 7)

Sets the power offset $P_{off\_ACK/NACK}$ of an ACK/NACK response to two scheduled transport blocks relative to the CQI Power P_{CQI} ([:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer).

The power $P_{ACK/NACK}$ used during the HARQ-ACK slots is calculated as:

$P_{ACK/NACK} = P_{CQI} + P_{off\_ACK/NACK}$

Parameters:

<PoaNack> float

Range: -10 to 10 dB
Increment: 0.1
*RST: 0 dB

Example:

`BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK ANAC`
sets the HARQ-ACK to ACK/NACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:POAN -1.5dB`
sets the power offset to -1.5 dB.

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset ACK/NACK" on page 220

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:PONAck <PoNack>

(up to Release 7)

Sets the power offset $P_{off\_NACK/ACK}$ of an NACK/ACK response to two scheduled transport blocks relative to the CQI Power P_{CQI} (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer`).

The power $P_{NACK/ACK}$ used during the HARQ-ACK slots is calculated as:

$P_{NACK/ACK} = P_{CQI} + P_{off\_NACK/ACK}$

Parameters:

<PoNack> float

Range: -10 to 10 dB
Increment: 0.1
*RST: 0 dB

Example:

`BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK NACK`
sets the HARQ-ACK to NACK/ACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:PONA -1dB`
sets the power offset to -1dB.

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset NACK/ACK" on page 221

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:PONNack <PonNack>

(up to Release 7)

Sets the power offset $P_{off\_NACK/NACK}$ of an NACK/NACK response to two scheduled transport blocks relative to the CQI Power P_{CQI} (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer`).

The power $P_{NACK/NACK}$ used during the HARQ-ACK slots is calculated as:

$P_{NACK/NACK} = P_{CQI} + P_{off\_NACK/NACK}$

Parameters:

<PonNack> float

Range: -10 to 10 dB
Increment: 0.1
*RST: 0 dB

Example:

`BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK NNAC`
sets the HARQ-ACK to NACK/NACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:PONN -3dB`
sets the power offset to -3dB.

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset NACK/NACK" on page 221

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:POCA <Poca>

(up to Release 7)

Sets the power offset $P_{off\_CQI\ Type\ A}$ of the PCI/CQI slots in case a CQI Type A report is sent relative to the CQI Power P_{CQI} (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer`).

The power $P_{CQI\ Type\ A}$ used during the PCI/CQI slots is calculated as:

$P_{CQI\ Type\ A} = P_{CQI} + P_{off\_CQI\ Type\ A}$

Since the CQI Type B reports are used in a single stream transmission, the power $P_{CQI\ Type\ B} = P_{CQI}$.

Parameters:

<Poca> float

Range: -10 dB to 10 dB
Increment: 0.1
*RST: 0 dB

Example:

`BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:MODE:TT2:CQIT TADT`
selects CQI Type A Dual TB report for TTI2.
`BB:W3GP:MST1:DPCC:HS:MIMO:POCA -4dB`
sets the power offset to -4dB.

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset CQI Type A" on page 221

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTICount <TtiCount>

Selects the number of configurable TTI's.

Parameters:

<TtiCount> integer

Range: 1 to 32
*RST: 1

Example:

`BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTIC 4`
sets the number of configurable TTI's to 4.

Options: R&S SMx/AMU-K59

Manual operation: See "Number of TTIs (Up to Release 7)" on page 221

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:HACK <Hack>

Selects the information transmitted during the HARQ-ACK slot of the corresponding TTI.

Suffix:
<ch0> 0..Number of TTI -1

Parameters:
<Hack> DTX | SACK | SNACk | AACK | ANACk | NACK | NNACk
*RST: AACK (for TTI 1)

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK SACK`
sets the HARQ-ACK to single ACK.

Options: R&S SMx/AMU-K59

Manual operation: See "HARQ-ACK (Up to Release 7)" on page 222

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:PCI <Pci>

Selects the PCI value transmitted during the PCI/CQI slots of the corresponding TTI.

Suffix:
<ch0> 0..Number of TTI -1

Parameters:
<Pci> integer
Range: 0 to 3
*RST: 0

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK SACK`
sets the HARQ-ACK to single ACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:PCI 2`
sets the PCI.

Options: R&S SMx/AMU-K59

Manual operation: See "PCI (Up to Release 7)" on page 222

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:CQIType <CqiType>

Selects the type of the CQI report.

Suffix:
<ch0> 0..Number of TTI -1

Parameters:

<CqiType> TAST | TADT | TB

*RST: TADT

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK SACK`
sets the HARQ-ACK to single ACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQIT TADT`
selects CQI Type A dual TB report for TTI2.

Options: R&S SMx/AMU-K59

Manual operation: See "CQI Type (Up to Release 7)" on page 222

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MIMO:TTI<ch0>:CQI<di> <Cqi>

Selects the CQI report transmitted during the PCI/CQI slots of the corresponding TTI.

For single stream transmission (`BB:W3GP:MST:DPCC:HS:MIMO:TTI:CQI1`), this command set the CQI values of the following cases:

- The CQI (the value for CQI Type B report)
- The CQI_S (the CQI value in case a CQI Type A report when 1 transport block is preferred)

For dual stream transmission (`BB:W3GP:MST:DPCC:HS:MIMO:TTI:CQI2`), this command sets:

- The CQI_1, the first of the two CQI values of CQI Type A report when 2 transport blocks are preferred
- the CQI_2, the second of the two CQI values of CQI Type A report when 2 transport blocks are preferred. The CQI then is calculated as follow:
  $CQI = 15*CQI_1+CQI_2+31$

Suffix:

<ch0> 0..Number of TTI -1
TTI

<di> 1|2
The suffix `CQI<1|2>` distinquishes between CQI/CQI_S/CQI_1 and CQI_2.

Parameters:

<Cqi> integer

Range: 0 to 30
*RST: 0

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:MODE ON`
enables MIMO mode for UE 1.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:HACK SACK`
sets the HARQ-ACK to single ACK.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQIT TADT`
selects CQI Type A dual TB report for TTI2.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQI1 1.5`
sets CQI1
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQI2 2`
sets CQI2

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQIT TAST`
selects CQI Type A single TB report for TTI2.
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQI1 3`
sets CQIS

Example: `BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQIT TB`
selects CQI Type B
`BB:W3GP:MST1:DPCC:HS:MIMO:TTI2:CQI1 0`
sets CQI

Options: R&S SMx/AMU-K59

Manual operation: See "CQI/CQI_S/CQI_1/CQI_2 (Up to Release 7)" on page 222

8.9.4.3 Release 8 and Later (RT) Settings

Example: HS-DPCCH Scheduling

The following is a simple example intended to explain the principle. Configured is an HS-DPCCH scheduling in MIMO Mode and with "Secondary Cell Enabled = 1".

```
BB:W3GP:MST1:DPCC:HS:COMP REL8
BB:W3GP:MST1:DPCC:HS:TTID 5
BB:W3GP:MST1:DPCC:HS:MMOD ON
BB:W3GP:MST1:DPCC:HS:SC:ENABled 1
BB:W3GP:MST1:DPCC:HS:SC:ACT 0
BB:W3GP:MST1:DPCC:HS:HACK:ROWS 2
BB:W3GP:MST1:DPCC:HS:HACK:REPeat 4
BB:W3GP:MST1:DPCC:HS:ROW0:HACK:FROM 0
BB:W3GP:MST1:DPCC:HS:ROW0:HACK:TO 1
BB:W3GP:MST1:DPCC:HS:ROW0:HACK1 MS_AA_D
BB:W3GP:MST1:DPCC:HS:ROW1:HACK:FROM 3
BB:W3GP:MST1:DPCC:HS:ROW1:HACK:TO 3
BB:W3GP:MST1:DPCC:HS:ROW1:HACK1 MS_NN_NN
BB:W3GP:MST1:DPCC:HS:PCQI:ROWS 2
BB:W3GP:MST1:DPCC:HS:PCQI:REPeat 3
BB:W3GP:MST1:DPCC:HS:ROW0:PCQI:FROM 0
BB:W3GP:MST1:DPCC:HS:ROW0:PCQI:TO 0
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI1:TYPE DTX
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI:FROM 1
```

```
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI:TO 1
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI1:TYPE TADT
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI1:CQI1 10
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI1:CQI2 20
BB:W3GP:MST1:DPCC:HS:ROW1:PCQI1:PCI 2
BB:W3GP:MST1:DPCC:HS:STAT ON
```


[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SFORmat?

Queries the used slot format.

Return values:

<SlotFormat> integer

Range: 0 to 1
*RST: 0

Usage: Query only

Options: R&S SMx/AMU-K59

Manual operation: See "Slot Format" on page 207

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:MMODe <MMode>

(Release 8 and Later, Release 8 and Later (RT)

Enables/disables working in MIMO mode for the selected UE.

Parameters:

<MMode> 0 | 1 | OFF | ON

*RST: 0

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "MIMO Mode" on page 209

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SC:ENABled <SecCellEnabled>

Enables the selected number of secondary cells for the selected UE.

Parameters:

<SecCellEnabled> integer

Range: 0 to 7
*RST: 0

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "Secondary Cell Enabled" on page 209

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SC:ACTive <SecCellActive>

(Release 8 and Later)

Sets the number of active secondary cells for the selected UE.

Parameters:

<SecCellActive> integer

Range: 0 to 7
*RST: 0

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "Secondary Cell Active" on page 210

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:HACK:ROWS <RowCount>
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:PCQI:ROWS <RowCount>

Determines the number of the rows in the HARQ-ACK respectivelly in the PCI/CQI scheduling table.

Parameters:

<RowCount> integer

Range: 1 to 32
*RST: 1

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "Number of Rows" on page 213

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:HACK:FROM <HackFrom>
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:HACK:TO <HackTo>

(Release 8 and Later)

Defines the beginning / end of the HARQ-ACK transmissions inside the HARQ-ACK cycle (specified by HARQ ACK Repeat After). The range is specified in multiples of intervals (Inter TTI distace).

Suffix:
<ch0> 0..<RowCount>

Parameters:
<HackTo> integer

Range: 0 to dynamic
*RST: row index

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "HARQ-ACK From Interval/ HARQ-ACK To Interval" on page 210

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:HACK<di> <HarqAck>

(Release 8 and Later)

Sets the information transmitted during the HARQ-ACK slots of the TTIs during the corresponding specified HARQ-ACK From/To range.

For detailed description, see "HS-DPCCH 1/2, HARQ-ACK 1/2/3/4" on page 210. The table 8-1 provides the neccessary cross-reference information.

Table 8-1: Cross-reference between the used GUI terms and abbreviations in the SCPI command

Value name	Parameter value
"DTX"	DTX | D_DTX
"PRE, POST"	PRE | POST
"A, N"	A | N
"AA, AN, NA, NN"	M_A | M_N | M_AA | M_AN | M_NA | M_NN
"A/D, N/A, ... " (different combinations possible)	S_A_D | S_N_A | ... (different combinations possible)

Value name	Parameter value
"A/D/D, N/D/D, ... " (different combinations possible)	`S2_N_N_N | S2_N_N_A | ...` (different combinations possible)
"AN/NN, D/AA, ... " (different combinations possible)	`MS_AA_AA | MS_D_AA ...` (different combinations possible)

Suffix:
<ch0> 0..<RowCount>

Parameters:
<HarqAck> DTX | PRE | POST | A | N | M_A | M_N | M_AA | M_AN | M_NA | M_NN | S_A_D | S_N_D | S_D_A | S_D_N | S_A_A | S_A_N | S_N_A | S_N_N | MS_A_D | MS_N_D | MS_AA_D | MS_AN_D | MS_NA_D | MS_NN_D | MS_D_A | MS_D_N | MS_D_AA | MS_D_AN | MS_D_NA | MS_D_NN | MS_A_A | MS_A_N | MS_N_A | MS_N_N | MS_A_AA | MS_A_AN | MS_A_NA | MS_A_NN | MS_N_AA | MS_N_AN | MS_N_NA | MS_N_NN | MS_AA_A | MS_AA_N | MS_AN_A | MS_AN_N | MS_NA_A | MS_NA_N | MS_NN_A | MS_NN_N | MS_AA_AA | MS_AA_AN | MS_AA_NA | MS_AA_NN | MS_AN_AA | MS_AN_AN | MS_AN_NA | MS_AN_NN | MS_NA_AA | MS_NA_AN | MS_NA_NA | MS_NA_NN | MS_NN_AA | MS_NN_AN | MS_NN_NA | MS_NN_NN | S2_A_D_D | S2_N_D_D | S2_D_A_D | S2_D_N_D | S2_D_D_A | S2_D_D_N | S2_A_A_D | S2_A_N_D | S2_N_A_D | S2_N_N_D | S2_A_D_A | S2_A_D_N | S2_N_D_A | S2_N_D_N | S2_D_A_A | S2_D_A_N | S2_D_N_A | S2_D_N_N | S2_A_A_A | S2_A_A_N | S2_A_N_A | S2_A_N_N | S2_N_A_A | S2_N_A_N | S2_N_N_A | S2_N_N_N | D_DTX

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "HS-DPCCH 1/2, HARQ-ACK 1/2/3/4" on page 210

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:POHAck <PoHack>

(Release 8 and Later)

Sets the power offset of a HARQ-ACK response relative to the `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer`.

Suffix:
<ch0> 0..<RowCount>

Parameters:

<PoHack> float

Range: -10 to 10
Increment: 0.1
*RST: 0

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset HARQ-ACK" on page 212

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI:FROM <PcqiFrom>
[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI:TO <PcqiTo>

(Release 8 and Later)

Defines the beginning / end of the PCI/CQI transmissions inside the PCI/CQI cycle (specified by PCI/CQI Repeat After). The range is specified in multiples of intervals (Inter TTI distace).

Suffix:

<ch0> 0..<RowCount>

Parameters:

<PcqiTo> integer

Range: 0 to dynamic
*RST: row index

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "PCI-CQI From Interval/ PCI-CQI To Interval" on page 213

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI<di>:TYPE <CqiType>

Selects the type of the PCI/CQI report.

Suffix:

<ch0> 0..<RowCount>

Parameters:

<CqiType> DTX | CQI | TAST | TADT | TB | CCQI

TAST|TADT
Type A Single TB, Type A Double TB

TB
Type B

CCQI
Composite CQI

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "HS-DPCCH 1/2, PCI/CQI 1/2/3/4 Type" on page 213

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI<di>:CQI<us> <Cqi>

Parameters:

<Cqi> integer

Range: 0 to 30
*RST: 0

Example: see example "HS-DPCCH Scheduling" on page 471

Options: R&S SMx/AMU-K59

Manual operation: See "CQI/CQI_S/CQI_1/CQI_2" on page 214

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:PCQI<di>:PCI <PCI>

Suffix:

<ch0> 0..<RowCount>

Parameters:

<PCI> integer

Range: 0 to 3
*RST: 0

Example: see example "HS-DPCCH Scheduling" on page 471

Manual operation: See "PCI" on page 215

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:ROW<ch0>:POPCqi <PoPcqi>

(Release 8 and Later)

Sets the power offset $P_{off\_PCI/CQI}$ of all PCI/CQI slots during the corresponding specified PCI/CQI From/To range relative to the `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:POWer`.

Suffix:

<ch0> 0..<RowCount>

Parameters:

<PoPcqi> float

Range: -10 to 10
Increment: 0.1
*RST: 0

Options: R&S SMx/AMU-K59

Manual operation: See "Power Offset PCI/CQI" on page 214

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:HACK:REPeat <HackRep>

Defines the cycle length after that the information in the HS-DPCCH scheduling table is read out again from the beginning.

Parameters:

<HackRep> integer

Range: 1 to dynamic

Example: see example "HS-DPCCH Scheduling" on page 471

Manual operation: See "HARQ-ACK Repeat After" on page 210

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:PCQI:REPeat <PcqiRep>

(Release 8 and Later)

Defines the cycle length after that the information in the HS-DPCCH scheduling table is read out again from the beginning.

Parameters:

<PcqiRep> integer

Range: 1 to dynamic
*RST: 1

Example: see example "HS-DPCCH Scheduling" on page 471

Manual operation: See "PCI/CQI Repeat After" on page 213

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SLENgth?

(Release 8 and Later)

Queries the suggested and current ARB sequence length.

The current ARB sequence length is adjusted with the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SLENgth:ADJust` on page 479.

Return values:

<SLength> float

Example: `BB:W3GP:MST1:DPCC:HS:SLEN?`
queries the ARB sequence length

Usage: Query only

Options: R&S SMx/AMU-K59

Manual operation: See "Suggested / Current ARB Seq. Length (HS-DPCCH)" on page 215

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPCCh:HS:SLENgth:ADJust

(Release 8 and Later)

Sets the current ARB sequence length to the suggested value.

Example: `BB:W3GP:MST1:DPCC:HS:SLEN:ADJ`
adjusts the ARB sequence length

Usage: Event

Options: R&S SMx/AMU-K59

Manual operation: See "Adjust ARB Sequence Length (HS-DPCCH)" on page 217

8.9.5 DPDCH Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:CCODe?

The command queries the channelization code of the specified channel. The value is fixed and depends on the overall symbol rate of the user equipment.

Return values:
<CCode> float

Example: `BB:W3GP:MST1:CHAN:DPDC:CCOD?`
queries the channelization code for DPDCH 1 of user equipment 1.

Usage: Query only

Manual operation: See "Channelization Code" on page 226

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA <Data>

The command determines the data source for the selected DPDCH.

For the enhanced channels of user equipment 1 (UE1), this entry is valid when channel coding is deactivated. When channel coding is active, data sources are selected for the transport channels with the commands `:BB:W3GPp:MST:CHANnel:DPDCh:DCCH:DATA` and `:BB:W3GPp:MST:ENHanced:TCHannel:DATA`.

Parameters:

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTern

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA:PATTern`.

*RST: PN9

Example: `BB:W3GP:MST1:CHAN:DPDC:DATA PN11`
selects internal PRBS data with period length 2^{11}-1 as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source selection.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> <data list name>

Example: `BB:W3GP:MST1:CHAN1:DPDC:DATA DLIS`
selects the Data Lists data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST1:CHAN1:DPDC:DATA:DSEL 'dpdch_13'`
selects the file `dpdch_13` as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:DATA:PATTern <Pattern>

The command enters the bit pattern for the PATTern data source selection. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:MST1:CHAN1:DPDC:DATA PATT`
selects the Pattern data source.
`BB:W3GP:MST1:CHAN1:DPDC:DATA:PATT #H3F, 8`
defines the bit pattern.

Manual operation: See "DPDCH Data Source" on page 226

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:CHANnel<ch>:DPDCh:SRATe?

The command queries the symbol rate of the DPDCH. The symbol rate depends on the overall symbol rate set and cannot be modified.

Return values:

<SRate> D15K | D30K | D60K | D120k | D240k | D480k | D960k

Example: `BB:W3GP:MST4:CHAN2:DPDC:SRAT?`
queries the symbol rate of DPDCH 2 of user equipment 4.
`Response: 960`
the symbol rate is 960 ksps.
Note:
DPDCH 2 is only active once the overall symbol rate is 2 x 960 ksps or more. When overall symbol rates are less, the error message "???" is returned.

Usage: Query only

Manual operation: See "Symbol Rate / State" on page 226

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:FCIO <Fcio>

The command sets the channelization code to I/0. This mode can only be activated if the overall symbol rate is < 2 x 960 kbps.

Parameters:

<Fcio> ON | OFF

*RST: OFF

Example: `BB:W3GP:MST1:DPDC:FCIO ON`
sets the channelization code to I/O.

Manual operation: See "Force Channelization Code To I/0" on page 225

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:ORATe <ORate>

The command sets the overall symbol rate. The overall symbol rate determines the number of DPDCHs as well as their symbol rate and channelization codes.

Parameters:

<ORate> D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2880k | D3840k | D4800k | D5760k

D15K ... D5760K
15 ksps ... 6 x 960 ksps

*RST: D60K

Example: `BB:W3GP:MST1:DPDC:ORAT D15K`
sets the overall symbol rate to 15 ksps. Only DPDCH1 is active, the symbol rate is 15 ksps and the channelization code is 64.

Manual operation: See "Overall Symbol Rate" on page 225

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:POWer <Power>

The command defines the channel power of the DPDCHs. The power entered is relative to the powers of the other channels. If "Adjust Total Power to 0 dB" is executed (`[:SOURce<hw>]:BB:W3GPp:POWer:ADJust`), the power is normalized to a total power for all channels of 0 dB. The power ratios of the individual channels remains unchanged.

Note: The uplink channels are not blanked in this mode (duty cycle 100%).

Parameters:

<Power> float

Range: -80 dB to 0 dB
Increment: 0.01 dB
*RST: 0 dB

Example: `BB:W3GP:MST4:DPDC:POW -60dB`
sets the channel power for DPDCH 2 of user equipment 4 to -60 dB. The channel power relates to the power of the other channels.
`BB:W3GP:POW:ADJ`
the channel power relates to 0 dB.

Manual operation: See "Channel Power" on page 224

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:STATe <State>

The command activates or deactivates DPDCHs. This always activates or deactivates all the channels. The number of channels (1...6) is determined by the overall symbol rate.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:MST1:DPDC:STAT ON`
activates all the DPDCHs.

Manual operation: See "State (DPDCH)" on page 224

8.9.6 PCPCH Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:CPOWer <CPower>

The command defines the power of the control component of the PCPCH.

Parameters:

<CPower> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PCPC:CPOW -10 dB`
sets the power to -10 dB.

Manual operation: See "Control Power" on page 190

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:CPSFormat <CpSFormat>

The command defines the slot format of the control component of the PCPCH.

The slot format sets the associated FBI mode automatically:

- Slot format 0 = FBI OFF
- Slot format 1 = FBI 1 bit
- Slot format 2 = FBI 2 bits

Parameters:

<CpSFormat> integer

Range: 0 to 2
*RST: 0

Example: `BB:W3GP:MST1:PCPC:CPSF 2`
sets slot format 2.

Manual operation: See "Slot Format" on page 190

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA <Data>

The command determines the data source for the PCPCH.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `SOURce:BB:W3GPp:MST:PCPCh:DATA:DSELect` `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:PATTern`.

*RST: PN9

Example: `BB:W3GP:MST1:PCPC:DATA PN11`
selects internal PRBS data with period length 2^11-1 as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:MST1:PCPC:DATA DLIS`
selects data lists as the data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST1:PCPC:DATA:DSEL 'pcpch_data'`
selects the data list `pcpch_data`.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DATA:PATTern <Pattern>

The command determines the bit pattern for the data component when the PATTern data source is selected. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:MST:PCPC:DATA:PATT #H3F,8`
defines the bit pattern of the data for the DATA component.

Manual operation: See "Data Source" on page 191

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:DPOWer <DPower>

The command defines the power of the data component of the PCPCH.

Parameters:

<DPower> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PCPC:DPOW -10 dB`
sets the power to -10 dB.

Manual operation: See "Data Power" on page 190

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:FBI:MODE <Mode>

The command sets the number of bits (1 or 2) for the FBI field. With OFF, the field is not used.

The FBI pattern automatically sets the associated slot format:

- FBI OFF = Slot format 0
- FBI 1 bit = Slot format 1
- FBI 2 bits = Slot format 2

Parameters:

<Mode> OFF | D1B | D2B
*RST: OFF

Example: `BB:W3GP:MST2:PCPC:FBI:MODE OFF`
the FBI field is not used.

Manual operation: See "FBI Mode" on page 190

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:FBI:PATTern <Pattern>

The command determines the bit pattern for the FBI field when the PATTern data source is selected. The maximum length of the pattern is 32 bits. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use.

Parameters:

<Pattern> 32 bits
*RST: #H0,1

Example: `BB:W3GP:MST1:PCPC:FBI:PATT #H3F,8`
defines the bit pattern of the data for the FBI field.

Manual operation: See "FBI Pattern" on page 191

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:MLENgth <MLength>

The command sets the length of the message component as a number of frames.

Parameters:

<MLength> 1 | 2 Frames
Range: 1 to 2
*RST: 1 Frame

Example: `BB:W3GP:MST4:PCPC:MLEN 2`
the length of the message component is 2 frames.

Manual operation: See "Message Length" on page 190

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PLENgth <PLength>

The command defines the length of the power control preamble of the PCPCH as a number of slots.

Parameters:

<PLength> S0 | S8

*RST: S8

Example: `BB:W3GP:MST1:PCPC:PLEN S8`

sets a length of 8 slots for the power control preamble.

Manual operation: See "Power Control Preamble Length" on page 189

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PPOWer <PPower>

The command defines the power of the preamble component of the PCPCH. If the preamble is repeated and the power increased with each repetition, this setting specifies the power achieved during the last repetition.

Parameters:

<PPower> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PCPC:PPOW -10 dB`

sets the power to -10 dB.

`BB:W3GP:MST1:PCPC:PPOW:STEP 1 dB`

sets an increase in power of 1 dB per preamble repetition.

`BB:W3GP:MST1:PCPC:PREP 2`

sets a sequence of 2 preambles. The power of the first preamble is - 9 dB, the power of the second, -1 dB.

Manual operation: See "Preamble Power" on page 189

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PPOWer:STEP <Step>

The command defines the step width of the power increase, by which the preamble component of the PCPCH is increased from repetition to repetition. The power during the last repetition corresponds to the power defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PPOWer`.

Parameters:

<Step> float

Range: 0 dB to 10 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PCPC:PPOW:STEP 2dB`

the power of the PCPCH preamble is increased by 2 dB with every repetition.

Manual operation: See "Preamble Power Step" on page 189

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:PREPetition <PRepetition>

The command defines the number of PCPCH preamble components.

Parameters:

<PRepetition> integer

Range: 1 to 10

*RST: 1

Example: `BB:W3GP:MST1:PCPC:PREP 3`

sets three preamble components.

Manual operation: See "Preamble Repetition" on page 189

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RAFTer <Repeatafter>

Sets the number of access slots after that the PCPCH structure will be repeated.

Parameters:

<Repeatafter> integer

Range: 1 to 1000

*RST: 18

Example: see `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RARB` on page 488

Manual operation: See "Repeat Structure After (x Acc. Slots)" on page 188

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RARB <State>

Enables/disables repeating the selected PCPCH structure during one ARB sequence.

Parameters:

<State> 0 | 1 | OFF | ON

ON

Within one ARB sequence, the selected PCPCH structure is repeated once.

OFF

The selected PCPCH structure can be repeated several time, depending on the structure length (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:SPERiod?`) and the `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RAFTer`.

*RST: 1

Example:
```
SOURce1:BB:W3GPp:SLENgth 4
SOURce1:BB:W3GPp:MSTation3:PCPCh:TIMing:
SPERiod?
Response: 14
SOURce1:BB:W3GPp:MSTation1:PCPCh:RARB OFF
SOURce1:BB:W3GPp:MSTation1:PCPCh:RAFTer 20
```

Manual operation: See "Repeat Structure After ARB Sequence Length" on page 188

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:SIGNature <Signature>

The command selects the signature of the PCPCH (see Table 3 in 3GPP TS 25.213 Version 3.4.0 Release 1999).

Parameters:

<Signature> integer

Range: 0 to 15
*RST: 0

Example:
```
BB:W3GP:MST1:PCPC:SIGN 5
```
selects signature 5.

Manual operation: See "Signature" on page 189

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:SRATe <SRate>

The command sets the symbol rate of the PCPCH.

User Equipment 1: When channel coding is active, the symbol rate is limited to the range between 15 and 120 ksps. Values above this limit are automatically set to 120 ksps.

Parameters:

<SRate> D15K | D30K | D60K | D120k | D240k | D480k | D960k

*RST: D30K

Example:
```
BB:W3GP:MST1:PCPC:SRAT D15K
```
sets the symbol rate of the PCPCH of user equipment 1 to 15 ksps.

Manual operation: See "Symbol Rate" on page 191

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TFCI <Tfci>

Sets the value of the TFCI (Transport Format Combination Indicator) field. This value selects a combination of 30 bits, which are divided into two groups of 15 successive slots.

Parameters:

<Tfci> integer

Range: 0 to 1023
*RST: 0

Example: `BB:W3GP:MST1:PCPC:TFCI 21`
sets the TFCI value to 21.

Manual operation: See "TFCI" on page 192

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:DPOWer:MPARt?

Queries the level correction value for the message part. In case of one UE active, the power of the message part can be calculated by adding the set RF level.

Return values:

<MPart> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example: `BB:W3GP:MST3:PCPC:TIM:DPOW:MPAR?`
queries the level correction value for the message part.
`Response: 1.2`
the correction value is 1.2 dB.
`POW?`
queries the RF level.
`Response: 2`
the RF output level is 2 dBm. The message part power is 3.2 dBm

Usage: Query only

Manual operation: See "Delta Power (Message Part)" on page 186

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:DPOWer:PREamble?

Queries level correction value for the last AICH preamble before the message part. This value is identical to the correction value for the CD preamble. The level of the other preambles can be calculated by subtracting the set Preamble Power Step.

Return values:

<PReamble> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example: `BB:W3GP:MST3:PCPC:TIM:DPOW:PRE?`
queries the level correction value for the last AICH preamble before the message part.

Usage: Query only

Manual operation: See "Delta Power (Preamble)" on page 186

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:SOFFset <SOffset>

This command defines the start offset of the PCPCH in access slots. The starting time delay in timeslots is calculated according to: 2 x Start Offset.

Parameters:

<SOffset> integer

Range: 1 to 14
*RST: 0

Example: `BB:W3GP:MST3:PCPC:TIM:SOFF 1`
the start offset of the PCPCH of UE 3 is 2 access slots.

Manual operation: See "Start Offset #" on page 186

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:SPERiod?

Queries the structure lentgh.

Return values:

<SPeriod> float

Example: see `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:RARB` on page 488

Usage: Query only

Manual operation: See "Structure Length" on page 187

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:TIME:PREMp <Premp>

This command defines the AICH Transmission Timing. This parameter defines the time difference between the preamble and the message part. Two modes are defined in the standard. In mode 0, the preamble to message part difference is 3 access slots, in mode 1 it is 4 access slots.

Parameters:

<Premp> integer

Range: 1 to 14
*RST: 3

Example: `BB:W3GP:MST3:PCPC:TIM:TIME:PREM 3`
the difference between the preamble and the message part is 3 access slots.

Manual operation: See "Transmission Timing (Message Part)" on page 187

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TIMing:TIME:PREPre <Prepre>

This command defines the time difference between two successive preambles in access slots.

Parameters:

<Prepre> integer

Range: 1 to 14
*RST: 3

Example: `BB:W3GP:MST3:PCPC:TIM:TIME:PREP 3`
the time difference between two successive preambles is 3 access slots.

Manual operation: See "Transmission Timing (Preamble)" on page 187

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA <Data>

The command determines the data source for the TPC field of the PCPCH.

Parameters:

<Data> ZERO | ONE | PATTern | DLISt

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:PATTern`. The maximum length is 64 bits.

*RST: PATTern

Example: `BB:W3GP:MST2:PCPC:TPC:DATA PATT`
selects as the data source for the TPC field of user equipment 2 the bit pattern defined with the following command.
`BB:W3GP:MST2:PCPC:TPC:DATA:PATT #H48D0,16`
defines the bit pattern.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:DSELect <DSelect>

The command selects the data list when the DLISt data source is selected for the TPC field of the PCPCH.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example:

`BB:W3GP:MST1:PCPC:TPC:DATA DLIS`
selects data lists as the data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST1:PCPC:TPC:DATA:DSEL 'dpcch_tpc_1'`
selects the data list `dpcch_tpc1`.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA:PATTern <Pattern>

The command determines the bit pattern for the `PATTern` data source selection. The maximum length of the bit pattern is 64 bits.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example:

`BB:W3GP:MST1:PCPC:DATA:PATT #H3F,8`
defines the bit pattern of the data for the FBI field.

Manual operation: See "TPC Data Source" on page 192

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:READ <Read>

The command sets the read out mode for the bit pattern of the TPC field of the PCPCH.

The bit pattern is selected with the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PCPCh:TPC:DATA`.

Parameters:

<Read> CONTinuous | S0A | S1A | S01A | S10A

CONTinuous
The bit pattern is used cyclically.

S0A
The bit pattern is used once, then the TPC sequence continues with 0 bits.

S1A
The bit pattern is used once, then the TPC sequence continues with 1 bits.

S01A
The bit pattern is used once and then the TPC sequence is continued with 0 and 1 bits alternately (in multiples, depending on by the symbol rate, for example, 00001111).

S10A
The bit pattern is used once and then the TPC sequence is continued with 1 and 0 bits alternately (in multiples, depending on by the symbol rate, for example, 11110000).

*RST: CONTinuous

Example: `BB:W3GP:MST2:PCPC:TPC:READ CONT`
the selected bit pattern is repeated continuously for the TPC sequence.

Manual operation: See "Read Out Mode" on page 192

8.9.7 PRACH Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:ATTiming <AtTiming>

This command defines which AICH Transmission Timing, time difference between the preamble and the message part or the time difference between two successive preambles in access slots, will be definded.

Parameters:

<AtTiming> ATT0 | ATT1

*RST: ATT0

Example: `BB:W3GP:MST3:PRAC:ATT ATT1`
selects the AICH Transmission Timing as the difference between the preamble and the message part.

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:CPOWer <CPower>

The command defines the power of the control component of the PRACH.

Parameters:

<CPower> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PRAC:CPOW -10 dB`
sets the power to -10 dB.

Manual operation: See "Control Power" on page 180

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA <Data>

The command determines the data source for the PRACH.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:PATTern`.

*RST: PN9

Example: `BB:W3GP:MST1:PRAC:DATA PN11`
selects internal PRBS data with period length 2^{11}-1 as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:MST1:PRAC:DATA DLIS`
selects data lists as the data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST1:PRAC:DATA:DSEL 'pcpch_data'`
selects the data list `pcpch_data`.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DATA:PATTern <Pattern>

The command determines the bit pattern for the data component when the PATTern data source is selected. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:MST1:PRAC:DATA:PATT #H3F,8`
defines the bit pattern of the data for the DATA component.

Manual operation: See "Data Source" on page 181

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:DPOWer <DPower>

The command defines the power of the data component of the PRACH.

Parameters:

<DPower> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PRAC:DPOW -10 dB`
sets the power to -10 dB.

Manual operation: See "Data Power" on page 180

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:MLENgth <MLength>

The command sets the length of the message component as a number of frames.

Parameters:

<MLength> 1 | 2 Frames

*RST: 1

Example: `BB:W3GP:MST4:PRAC:MLEN 2`
the length of the message component is 2 frames.

Manual operation: See "Message Length" on page 180

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PPOWer <PPower>

The command defines the power of the preamble component of the PRACH. If the preamble is repeated and the power increased with each repetition, this setting specifies the power achieved during the last repetition.

Parameters:

<PPower> float

Range: -80 dB to 0 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PRAC:PPOW -10 dB`
sets the power to -10 dB.
`BB:W3GP:MST1:PRAC:PPOW:STEP 1 dB`
sets an increase in power of 1 dB per preamble repetition.
`BB:W3GP:MST1:PRAC:PREP 2`
sets a sequence of 2 preambles. The power of the first preamble is - 9 dB, the power of the second, -1 dB.

Manual operation: See "Preamble Power" on page 179

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PPOWer:STEP <Step>

The command defines the step width of the power increase, by which the preamble component of the PRACH is increased from repetition to repetition. The power defined during the last repetition corresponds to the power defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PPOWer`.

Parameters:
<Step> float

Range: 0 dB to 10 dB
Increment: 0.1 dB
*RST: 0 dB

Example: `BB:W3GP:MST1:PRAC:PPOW:STEP 2 dB`
the power of the PRACH preamble is increased by 2 dB with every repetition.

Manual operation: See "Preamble Power Step" on page 179

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:PREPetition <PRepetition>

The command defines the number of PRACH preamble components.

Parameters:
<PRepetition> integer

Range: 1 to 10
*RST: 1

Example: `BB:W3GP:MST1:PRAC:PREP 3`
sets three preamble components.

Manual operation: See "Preamble Repetition" on page 180

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RAFTer <Repeatafter>

Sets the number of access slots after that the PRACH structure will be repeated.

Parameters:
<Repeatafter> integer

Range: 1 to 1000
*RST: 11

Example: see [:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RARB on page 499

Manual operation: See "Repeat Structure After (x Acc. Slots)" on page 179

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RARB <State>

Enables/disables repeating the selected PRACH structure during one ARB sequence.

Parameters:

<State> 0 | 1 | OFF | ON

ON
Within one ARB sequence, the selected PRACH structure is repeated once.

OFF
The selected PRACH structure can be repeated several time, depending on the structure length ([:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:SPERiod?) and the [:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RAFTer.

*RST: 1

Example:

```
SOURce1:BB:W3GPp:SLENgth 4
SOURce1:BB:W3GPp:MSTation3:PRACh:TIMing:
SPERiod?
Response: 14
SOURce1:BB:W3GPp:MSTation1:PRACh:RARB OFF
SOURce1:BB:W3GPp:MSTation1:PRACh:RAFTer 20
```

Manual operation: See "Repeat Structure After ARB Sequence Length" on page 178

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SFORmat <SFormat>

Defines the slot format of the PRACH.

A change of slot format leads to an automatic change of symbol rate [:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SRATe

When channel coding is active, the slot format is predetermined. So in this case, the command has no effect.

Parameters:

<SFormat> 0 | 1 | 2 | 3

*RST: 1

Example: `BB:W3GP:MST:PRAC:SFOR 2`
sets slot format 2.

Manual operation: See "Slot Format" on page 180

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SIGNature <Signature>

The command selects the signature of the PRACH (see Table 3 in 3GPP TS 25.213 Version 3.4.0 Release 1999).

Parameters:

<Signature> integer

Range: 0 to 15
*RST: 0

Example: `BB:W3GP:MST1:PRAC:SIGN 5`
selects signature 5.

Manual operation: See "Signature" on page 180

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SRATe <SRate>

The command sets the symbol rate of the PRACH.

A change of symbol rate leads to an automatic change of slot format `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:SFORmat`.

Parameters:

<SRate> D15K | D30K | D60K | D120k

*RST: D30K

Example: `BB:W3GP:MST1:PRAC:SRAT D15K`
sets the symbol rate of the PRACH of user equipment 1 to 15 ksps.

Manual operation: See "Symbol Rate" on page 181

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TFCI <Tfci>

Sets the value of the TFCI (Transport Format Combination Indicator) field. This value selects a combination of 30 bits, which are divided into two groups of 15 successive slots.

Parameters:

<Tfci> integer

Range: 0 to 1023
*RST: 0

Example: `BB:W3GP:MST1:PRAC:TFCI 21`
sets the TFCI value to 21.

Manual operation: See "TFCI" on page 181

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:MPARt?

Queries the level correction value for the message part. In case of one UE active and "Level Reference" set to "RMS Power", the power of the message part can be calculated by adding the set RF level.

Return values:

<MPart> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example:

```
BB:W3GP:MST3:PRAC:TIM:DPOW:MPAR?
```
queries the level correction value for the message part.
```
Response: 1.2
```
the correction value is 1.2 dB.
```
POW?
```
queries the RF level.
```
Response: 2
```
the RF output level is 2 dBm. The message part power is 3.2 dBm.

Usage: Query only

Manual operation: See "Delta Power (Message Part)" on page 176

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:MPARt:CONTrol?

Queries the level correction value for the message control part.

Return values:

<Control> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example:

```
BB:W3GP:MST3:PRAC:TIM:DPOW:MPAR:CONT?
```
queries the level correction value for the message control part.
```
Response: -3.24
```
the correction value is -3.24 dB.

Usage: Query only

Manual operation: See "Delta Power (Message Part)" on page 176

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:MPARt:DATA?

Queries the level correction value for the message data part.

Return values:

<Data> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example: `BB:W3GP:MST3:PRAC:TIM:DPOW:MPAR:DATA?`
queries the level correction value for the message data part.
`Response: -3.24`
the correction value is -3.24 dB.

Usage: Query only

Manual operation: See "Delta Power (Message Part)" on page 176

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:DPOWer:PREamble?

Queries level correction value for the preamble before the message part.

Return values:

<Preamble> float

Range: -80 to 0
Increment: 0.01
*RST: 0

Example: `BB:W3GP:MST3:PRAC:TIM:DPOW:PRE?`
queries the level correction value for the last preamble before the message part.

Usage: Query only

Manual operation: See "Delta Power (Preamble)" on page 176

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:SOFFset <SOffset>

This command defines the start offset of the PRACH in access slots. The starting time delay in timeslots is calculated according to: 2 x Start Offset.

Parameters:

<SOffset> integer

Range: 1 to 50
*RST: 0

Example: `BB:W3GP:MST3:PRAC:TIM:SOFF 1`
the start offset of the PRACH of UE 3 is 2 access slots.

Manual operation: See "Start Offset #" on page 177

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:SPERiod?

Queries the structure length.

Return values:

<SPeriod> float

Example: see `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:RARB` on page 499

Usage: Query only

Manual operation: See "Structure Length" on page 177

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:TIME:PREMp <Premp>

This command defines the AICH Transmission Timing. This parameter defines the time difference between the preamble and the message part. Two modes are defined in the standard. In mode 0, the preamble to message part difference is 3 access slots, in mode 1 it is 4 access slots.

Parameters:

<Premp> integer

Range: 1 to 14
*RST: 3

Example: `BB:W3GP:MST3:PRAC:TIM.TIME:PREM 3`
the difference between the preamble and the message part is 3 access slots.

Manual operation: See "Time Pre->MP" on page 177

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:PRACh:TIMing:TIME:PREPre <Prepre>

This command defines the time difference between two successive preambles in access slots.

Parameters:

<Prepre> integer

Range: 1 to 14
*RST: 3

Example: `BB:W3GP:MST3:PRAC:TIM.TIME:PREP 3`
the time difference between two successive preambles is 3 access slots.

Manual operation: See "Time Pre->Pre" on page 177

8.9.8 HSUPA Settings

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:CCODe?

Queries the channelization code and the modulation branch (I or Q) of the E-DPDCH channel.

The channelization code is dependent on the overall symbol rate set and cannot be modified.

Return values:

<ChannelCode> integer

Example: `BB:W3GP:MST4:HSUP:CHAN1:DPDC:E:CCOD?`
queries the channelization code and the modulation branch (I or Q) of E-DPDCH 1 of user equipment 4.
`Response: Q,32`

Usage: Query only

Manual operation: See "Channelization Code" on page 230

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA <Data>

The command selects the data source for the E-DPDCH channel.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command SOURce: `[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:DATA:PATTern`.

*RST: PN9

Example: `SOUR:BB:W3GP:MST1:HSUP:CHAN1:DPDC:E:DATA PN11`
selects internal PRBS data with period length 2^{11}-1 as the data source.

Manual operation: See "E-DPDCH Data Source" on page 230

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E: DATA:DSELect <DSelect>

The command selects the data list for the DLISt data source.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `SOUR:BB:W3GP:MST1:CHAN1:DPDC:E:DATA DLIS`
selects data lists as the data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST1:CHAN1:DPDC:E:DATA:DSEL 'dp1'`
selects the data list `dp1`.

Manual operation: See "DPDCH Data Source" on page 226

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E: DATA:PATTern <Pattern>

The command determines the bit pattern for the data component when the PATTern data source is selected. The first parameter determines the bit pattern (choice of hexadecimal, octal or binary notation), the second specifies the number of bits to use.

Parameters:

<Pattern> 64 bits
*RST: #H0,1

Example: `SOUR:BB:W3GP:MST1:HSUP:CHAN1:DPDC:E:PATT #H3F,8`
defines the bit pattern of the data for the DATA component.

Manual operation: See "E-DPDCH Data Source" on page 230

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E: POWer <Power>

The command sets the power of the selected E-DPDCH channel.

Parameters:

<Power> float

Range: -80 dB to 0 dB
Increment: 0.01
*RST: 0 dB

Example: `BB:W3GP:MST1:HSUP:CHAN1:DPDC:E:POW -2.5dB`
sets the power of E-DPDCH channel 1 to 2.5 dB.

Manual operation: See "Channel Power" on page 230

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:CHANnel<ch>:DPDCh:E:SRATe?

The command queries the symbol rate and the state of the E-DPDCH channel.

The symbol rate and the state of the channels are dependent on the overall symbol rate set and cannot be modified.

Return values:

<SRate> D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2X1920K | D2X960K2X1920K

Example: `BB:W3GP:MST4:HSUP:CHAN1:DPDC:E:SRAT?`
queries the symbol rate of E-DPDCH 1 of user equipment 4.
`Response: 960`
the symbol rate is 960 ksps.

Usage: Query only

Manual operation: See "Symbol Rate / State" on page 230

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:CHANnel <Channel>

The command sets the FRC according to TS 25.141 Annex A.10.

Selection of FRC#8 is enabled only for instruments equipped with option SMx/AMU-K59.

Parameters:

<Channel> USER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

*RST: 4

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:CHAN 4`
sets the FRC to channel 4.

Manual operation: See "Fixed Reference Channel (FRC)" on page 237

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:CRATe?

The command queries the relation between the information bits to binary channel bits.

Return values:

<CRate> float

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:CRAT?`
queries the coding rate.
`Response: 0.705`
the coding rate is 0.705.

Usage: Query only

Manual operation: See "Coding Rate (Ninf/Nbin)" on page 240

[:SOURce<hw>]:BB:W3GPp:MStation<st>[:HSUPa]:DPCCh:E:FRC:DATA <Data>

Selects the data source for the E-DCH channels, i.e. this paramter affects the corresponding paramter of the E-DPDCH.

Parameters:

<Data> PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | ZERO | ONE | PATTern

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:MStation<st>[:HSUPa]:DPCCh:E:FRC:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MStation<st>[:HSUPa]:DPCCh:E:FRC:DATA:PATTern`. The maximum length is 64 bits.

*RST: PN9

Example: `BB:W3GP:MST:HSUP:DPCC:E:FRC:DATA PATT`
selects as the data source
`BB:W3GP:MST:HSUP:DPCC:E:FRC:DATA:PATT #H48D0,16`
defines the bit pattern.

Manual operation: See "Data Source (E-DCH)" on page 238

[:SOURce<hw>]:BB:W3GPp:MStation<st>[:HSUPa]:DPCCh:E:FRC:DATA:DSELect <DSelect>

The command selects the data list when the DLISt data source is selected for E-DCH channels.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:MST:HSUP:DPCC:E:FRC:DATA DLIS`
selects the Data Lists data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST:HSUP:DPCC:E:FRC:DATA:DSEL 'frc_1'`
selects the data list `frc_1`.

Manual operation: See "Data Source (E-DCH)" on page 238

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DATA:PATTern <Pattern>

The command determines the bit pattern for the PATTern data source selection. The maximum length of the bit pattern is 64 bits.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:MST:HSUP:DPCC:E:FRC:DATA:PATT #B11110000,8`
defines the bit pattern of the data for the E-DCH channels.

Manual operation: See "Data Source (E-DCH)" on page 238

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BIT:LAYer <Layer>

The command sets the layer in the coding process at which bit errors are inserted.

Parameters:

<Layer> TRANsport | PHYSical

*RST: PHYSical

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DERR:BIT:LAY TRAN`
sets the bit error insertion to the transport layer.

Manual operation: See "Insert Errors On" on page 245

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BIT:RATE <Rate>

Sets the bit error rate.

Parameters:

<Rate> float

Range: 1E-7 to 0.5
Increment: 1E-7
*RST: 0.001

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DERR:BIT:RATE 1e-3`
sets the bit error rate to 1E-3.

Manual operation: See "Bit Error Rate" on page 245

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BIT:STATe <State>

The command activates or deactivates bit error generation.

Parameters:

<State> ON | OFF

*RST: 0

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DERR:BIT:STAT ON`
activates the bit error state.

Manual operation: See "Bit Error State" on page 245

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BLOCk:RATE <Rate>

Sets the block error rate.

Parameters:

<Rate> float

Range: 1E-4 to 0.5
Increment: 1E-4
*RST: 0.1

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DERR:BLOC:RATE 1E-3`
sets the block error rate.

Manual operation: See "Block Error Rate" on page 246

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DERRor:BLOCk:STATe <State>

The command activates or deactivates block error generation.

Parameters:

<State> ON | OFF

*RST: 0

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DERR:BLOC:STAT ON`
activates the block error generation.

Manual operation: See "Block Error State" on page 245

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DTX:PATTern <Pattern>

The command sets the user-definable bit pattern for the DTX.

Parameters:

<Pattern> string
*RST: "1"

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DTX:PATT "11-1-"`
sets the bit pattern for the DTX.

Manual operation: See "User Data (DTX Pattern)" on page 241

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:DTX:STATe <State>

The command activates or deactivates the DTX (Discontinuous Transmission) mode.

Parameters:

<State> ON | OFF
*RST: 0

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:DTX:STAT ON`
activates the DTX.

Manual operation: See "State (DTX)" on page 241

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:CONNector <Connector>

Determines the input connector at that the instrument expects the feedback signal.

Parameters:

<Connector> LEVatt | USER1
*RST: LEVatt

Manual operation: See "Connector (HARQ)" on page 244

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:ADEFinition <ADefinition>

(not for R&S SMBV instruments)

Selects whether a high level (TTL) is interpreted as an ACK or a low level.

Parameters:

<ADefinition> HIGH | LOW

*RST: HIGH

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:ADEF HIGH`

a high level (TTL) is interpreted as an ACK.

Manual operation: See "ACK Definition (HARQ)" on page 244

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:DELay:AUSer <AUser>

(not for R&S SMBV instruments)

Selects an additional delay to adjust the delay between the HARQ and the feedback.

Parameters:

<AUser> integer

Range: -50 to 60

*RST: 0

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:DEL:AUS 20`

sets the additional user delay to 20.

Manual operation: See "Additional User Delay" on page 244

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:DELay:FEEDback?

(not for R&S SMBV instruments)

Queries the delay between the HARQ and the feedback.

Return values:

<Feedback> float

Range: 0 to 600

*RST: 378

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:DEL:FEED?`

queries the delay between HARQ and feedback.

Usage: Query only

Manual operation: See "Delay Between HARQ And Feedback (HARQ)" on page 244

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:MODE <Mode>

Selects the HARQ simulation mode.

Parameters:

<Mode> VHARq | HFEedback

VHARq
This mode simulates basestation feedback. For every HARQ process (either 4 or 8), a bit pattern can be defined to simulate ACKs and NACKs.

HFEedback
(not for R&S SMBV instruments)
This mode allows the user to dynamically control the transmission of the HSUPA fixed reference channels. An "ACK" from the base station leads to the transmission of a new packet while a "NACK" forces the instrument to retransmit the packet with a new channel coding configuration (i.e. new "redundancy version") of the concerned HARQ process.

*RST: HFE

Example:
```
SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:MODE VHAR
```
sets simulation mode Virtual HARQ.

Manual operation: See "Mode (HARQ)" on page 242

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:MRETransmissions <MRetransmission>

(not for R&S SMBV instruments)

Sets the maximum number of retransmissions. After the expiration of this value, the next packet is send, regardless of the received feedback.

Parameters:

<MRetransmission> integer

Range: 0 to 20
*RST: 4

Example:
```
SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:MRET 10
```
sets the maximum number of retransmissions to 10.

Manual operation: See "Maximum Number Of Retransmissions (HARQ)" on page 244

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation:RVZero <RvZero>

If activated, the same redundancy version is sent, that is, the redundancy version is not adjusted for the next retransmission in case of a received NACK.

Parameters:

<RvZero> ON | OFF

*RST: 1

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:RVZ ON`
the same redundancy version is sent for the next retransmission.

Manual operation: See "Always Use Redundancy Version 0 (HARQ)" on page 243

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ:SIMulation[:STATe] <State>

Activates or deactivates the HARQ simulation mode.

Parameters:

<State> ON | OFF
*RST: 0

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:STAT ON`
activates the HARQ simulation mode.

Manual operation: See "State (HARQ)" on page 242

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HARQ[:SIMulation]:PATTern<ch> <Pattern>

Sets the HARQ Pattern. The maximum length of the pattern is 32 bits.

Parameters:

<Pattern> string

Example: `SOUR1:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HARQ:SIM:HARQ:PATT 1010`
sets the HARQ simulation pattern.

Manual operation: See "HARQ1..8: ACK/NACK" on page 243

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:HPROcesses?

The command queries the number of HARQ (Hybrid-ARQ Acknowlegement) process.

Return values:

<HProcesses> integer
Range: 1 to 8

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HPRO?`
queries the number of HARQ processes.
`Response: 5`

Usage: Query only

Manual operation: See "Number Of HARQ Processes" on page 239

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:MIBRate?

Queries the maximum information bit rate.

Return values:

<MiBRate> float

Increment: 0.1

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:HPRO?`
queries the maximum ninformation bit rate.
`Response: 1353.0`

Usage: Query only

Manual operation: See "Maximum Information Bitrate/kbps" on page 237

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:MODulation <Modulation>

Sets the modulation used for the selected FRC.

Two modulation schemes are defined: BPSK for FRC 1 - 7 and 4PAM (4 Pulse-Amplitude Modulation) for FRC 8.

Parameters:

<Modulation> BPSK | PAM4

*RST: BPSK

Example: `BB:W3GP:MST1:HSUP:DPCC:E:FRC:CHAN 8`
sets the FRC to channel 8.
`BB:W3GP:MST1:HSUP:DPCC:E:FRC:MOD 4PAM`
sets the modulation.

Manual operation: See "Modulation" on page 239

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:ORATe <ORate>

Sets the overall symbol rate for the E-DCH channels, i.e. this parameter affects the corresponding parameter of the E-DPDCH.

Parameters:

<ORate> D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2X1920K | D2X960K2X1920K

*RST: D960k

Example: `BB:W3GP:MST1:HSUP:DPCC:E:FRC:ORAT D2X1920K`
sets the overall symbol rate.

Manual operation: See "Overall Symbol Rate" on page 239

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:PAYBits?

The command queries the payload of the information bit. This value determines the number of tranport layer bits sent in each HARQ process.

Return values:

<PayBits> integer

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:PAYB?`
queries the payload of the information bit.
`Response: 2706`

Usage: Query only

Manual operation: See "Information Bit Payload (Ninf)" on page 240

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:STATe <State>

The command activates or deactivates the FRC state for the E-DPCCH channels.

Parameters:

<State> ON | OFF
*RST: 0

Example: `SOUR:BB:W3GP:MST1:HSUP:DPCC:E:FRC:STAT ON`
activates the FRC state for the E-DPCCH channels.

Manual operation: See "State (HSUPA FRC)" on page 236

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TBS:INDex <Index>

Selects the Transport Block Size Index (E-TFCI) for the corresponding table, as described in in 3GPP TS 25.321, Annex B.

The value range of this parameter depends on the selected Transport Block Size Table (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TBS:TABLe`).

Parameters:

<Index> integer
Range: 0 to max
*RST: 41

Example: `BB:W3GP:MST:HSUP:DPCC:E:FRC:TBS:TABL TAB0TTI10`
sets the transport block size table
`BB:W3GP:MST:HSUP:DPCC:E:FRC:TBS:INX 127`
sets the transport block size index.

Manual operation: See "Transport Block Size Index (E-TFCI)" on page 240

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TBS:TABLe <Table>

Selects the Transport Block Size Table from 3GPP TS 25.321, Annex B according to that the transport block size is configured.

The transport block size is determined also by the Transport Block Size Index (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TBS:INDex`).

The allowed values for this command depend on the selected E-DCH TTI (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TTIEdch`) and modulation scheme (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:MODulation`).

E-DCH TTI	Modulation	Transport Block Size Table	SCPI Paramater	Transport Block Size Index (E-TFCI)
2ms	BPSK	Table 0	TAB0TTI2	0 .. 127
		Table 1	TAB1TTI2	0 .. 125
	4PAM	Table 2	TAB2TTI2	0 .. 127
		Table 3	TAB3TTI2	0 .. 124
10ms	-	Table 0	TAB0TTI10	0 .. 127
		Table 1	TAB1TTI10	0 .. 120

Parameters:

<Table> TAB0TTI2 | TAB1TTI2 | TAB2TTI2 | TAB3TTI2 | TAB0TTI10 | TAB1TTI10

*RST: TAB0TTI10

Example:

`BB:W3GP:MST:HSUP:DPCC:E:FRC:ORAT D1920`
sets the overall symbol rate
`BB:W3GP:MST:HSUP:DPCC:E:FRC:MOD BPSK`
sets the modulation
`BB:W3GP:MST:HSUP:DPCC:E:FRC:TTIE 2`
sets the E-DCH TTI
`BB:W3GP:MST:HSUP:DPCC:E:FRC:TBS:TABL TAB0TTI2`
sets the transport block size table
`BB:W3GP:MST:HSUP:DPCC:E:FRC:TBS:IND 25`
sets the transport block size index

Manual operation: See "Transport Block Size Table" on page 239

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TTIBits?

The command queries the number of physical bits sent in each HARQ process.

Return values:

<TtiBits> float

Example: `BB:W3GP:MST1:HSUP:DPCC:E:FRC:TTIB?`
queries the number of physical bits sent in each HARQ process.

Usage: Query only

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:TTIEdch <Ttiedch>

Sets the TTI size (Transmission Time Interval).

Parameters:

<Ttiedch> 2ms | 10ms
*RST: 2ms

Example: `BB:W3GP:MST1:HSUP:DPCC:E:FRC:TTIE 2ms`
sets the TTI.

Manual operation: See "E-DCH TTI" on page 239

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:UECategory?

Queries the UE category that is minimum required for the selected FRC.

Return values:

<UeCategory> integer

Example: `BB:W3GP:MST1:HSUP:DPCC:E:FRC:UEC?`
queries the UE category.

Usage: Query only

Manual operation: See "UE Category" on page 237

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:CCODe?

Querries the channelization code.

Return values:

<CCode> integer
Range: 1 to max
*RST: 1

Usage: Query only

Manual operation: See "Channelization Code" on page 202

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:HBIT <Hbit>

The command activates the happy bit.

Parameters:

<Hbit> ON | OFF
*RST: ON

Example: `BB:W3GP:MST1:HSUP:DPCC:E:HBIT ON`
sets the happy bit.

Manual operation: See "Happy Bit" on page 202

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:POWer <Power>

The command sets the power of the E-DPCCH channel.

Parameters:
<Power> float

Range: -80 dB to 0 dB
Increment: 0.01
*RST: 0 dB

Example: `BB:W3GP:MST1:HSUP:DPCC:E:POW -2.5dB`
sets the power of the E-DPCCH channel.

Manual operation: See "Power" on page 201

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:RSNumber <RsNumber>

The command sets the retransmission sequence number.

Parameters:
<RsNumber> integer

Range: 0 to 3
*RST: 0

Example: `BB:W3GP:MST1:HSUP:DPCC:E:RSN 0`
sets the retransmission sequence number.

Manual operation: See "Retransmission Sequence Number" on page 202

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:STATe <State>

The command activates deactivates the E-DPCCH.

Parameters:
<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:MST1:HSUP:DPCC:E:STAT ON`
activates the E-DPCCH.

Manual operation: See "State (E-DPCCH)" on page 201

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:TFCI <Tfci>

The command sets the value for the TFCI (Transport Format Combination Indicator) field.

Parameters:

<Tfci> integer

Range: 0 to 127
*RST: 0

Example: `BB:W3GP:MST1:HSUP:DPCC:E:TFCI 0`
sets the value for the TFCI.

Manual operation: See "E-TFCI Information" on page 202

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:FCIO <Fcio>

The command sets the channelization code to I/0.

Parameters:

<Fcio> ON | OFF

*RST: OFF

Example: `BB:W3GP:MST1:HSUP:DPDC:E:FCIO ON`
sets the channelization code to I/0.

Manual operation: See "Force Channelization Code To I/0" on page 228

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:MODulation <Modulation>

Sets the modulation of the E-DPDCH.

There are two possible modulation schemes specified for this channel, BPSK and 4PAM (4 Pulse-Amplitude Modulation). The latter one is available only for the following Overall Symbol Rates (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:ORATe`):

- 2x960 ksps
- 2x1920 ksps
- 2x960 + 2x1920 ksps
- 2x960 ksps, I or Q only
- 2x1920 ksps, I or Q only
- 2x960 + 2x1920 ksps, I or Q only

Parameters:

<Modulation> BPSK | PAM4

*RST: BPSK

Example: `BB:W3GP:MST1:HSUP:DPDC:E:ORAT D2x960K2x1920K`
sets the overall symbol rate
`BB:W3GP:MST1:HSUP:DPDC:E:MOD 4PAM`
sets the modulation to 4PAM

Options: Modulation scheme 4PAM requires the HSPA+ option R&S SMx/AMU-K59.

Manual operation: See "Modulation" on page 229

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:ORATe <ORate>

The command sets the overall symbol rate of all the E-DPDCH channels.

Parameters:

<ORate> D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2X1920K | D2X960K2X1920K | D2x960KI | D2x960KQ | D2X1920KI | D2X1920KQ | D2X960K2X1920KI | D2X960K2X1920KQ

*RST: D60K

Example: `BB:W3GP:MST1:HSUP:DPDC:E:ORAT D60K`
sets the overall symbol rate

Manual operation: See "Overall Symbol Rate" on page 228

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:STATe <State>

The command activates or deactivates the E-DPDCHs. This always activates or deactivates all the channels.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:MST1:HSUP:DPDC:E:STAT ON`
activates all the E-DPDCHs.

Manual operation: See "State (E-DPDCH)" on page 228

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPDCh:E:TTIEdch <Ttiedch>

The command sets the value for the TTI (Transmission Time Interval).

Parameters:

<Ttiedch> 2ms | 10ms

*RST: 2ms

Example: `BB:W3GP:MST1:HSUP:DPDC:E:TTIE 2ms`
sets the value for the TTI to 2 ms.

Manual operation: See "E-DCH TTI" on page 233

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:TTIEdch <Ttiedch>

Sets the value for the TTI size (Transmission Time Interval).

This command is a query only, if an UL-DTX is enabled (`[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:STATe` ON) or an FRC is activated (`[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:DPCCh:E:FRC:STATe` ON).

Parameters:

<Ttiedch> 2ms | 10ms

*RST: 2ms

Example:

```
BB:W3GP:MST[:HSUPa]:EDCH:TTIE 10ms
BB:W3GP:MST:UDTX:TTIE 2ms
BB:W3GP:MST:UDTX:STAT ON
BB:W3GP:MST[:HSUPa]:EDCH:TTIE?
Response: 2ms
```

Manual operation: See "E-DCH TTI" on page 233

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:REPeat <Repeat>

Determine the number of TTIs after that the E-DCH scheduling is repeated.

Parameters:

<Repeat> integer

Range: 1 to dynamic
*RST: 1

Example: [:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROWCount on page 522

Manual operation: See "E-DCH Schedule Repeats After" on page 234

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROW<ch0>:FROM <TtiFrom>
[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROW<ch0>:TO <TtiTo>

Determines the start/end TTI of the corresponding E-DCH burst.

Parameters:

<TtiTo> integer

Range: 0 to dynamic
*RST: row index

Example: [:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROWCount on page 522

Manual operation: See "E-DCH TTI To" on page 234

[:SOURce<hw>]:BB:W3GPp:MSTation<st>[:HSUPa]:EDCH:ROWCount <RowCount>

Sets the number of the rows in the scheduling table.

Parameters:

<RowCount> integer

Range: 1 to 32
*RST: 1

Example: E-DCH scheduling example

```
BB:W3GP:MST[:HSUPa]:EDCH:TTIE 2ms
BB:W3GP:MST[:HSUPa]:EDCH:ROWC 2
BB:W3GP:MST[:HSUPa]:EDCH:REP 1000
BB:W3GP:MST[:HSUPa]:EDCH:ROW0:FROM 3
BB:W3GP:MST[:HSUPa]:EDCH:ROW0:TO 6
BB:W3GP:MST[:HSUPa]:EDCH:ROW1:FROM 128
BB:W3GP:MST[:HSUPa]:EDCH:ROW0:TO 156
```

Manual operation: See "Number of Table Rows" on page 233

8.9.9 UL-DTX and Uplink Scheduling Settings

The following are simple programing examples with the purpose to show **all** commands for this task. In real application, some of the commands may be ommited.

Example: Configuring the UL-DTX settings

```
****************************************************
SOURce:BB:W3GPp:LINK UP
SOURce:BB:W3GPp:MSTation:UDTX:MODE UDTX
SOURce:BB:W3GPp:MSTation:UDTX:TTIEdch 2
SOURce:BB:W3GPp:MSTation:UDTX:OFFSet 2
SOURce:BB:W3GPp:MSTation:UDTX:ITHReshold 8
SOURce:BB:W3GPp:MSTation:UDTX:LPLength 4
SOURce:BB:W3GPp:MSTation:UDTX:CYCLe1 4
SOURce:BB:W3GPp:MSTation:UDTX:CYCLe2 8
SOURce:BB:W3GPp:MSTation:UDTX:BURSt1 1
SOURce:BB:W3GPp:MSTation:UDTX:BURSt2 1
// SOURce:BB:W3GPp:MSTation:UDTX:PREamble2?
// SOURce:BB:W3GPp:MSTation:UDTX:POSTamble1?
SOURce:BB:W3GPp:MSTation:UDTX:STATe ON
```

Example: Enabling User Scheduling

```
****************************************************
SOURce:BB:W3GPp:LINK UP
SOURce:BB:W3GPp:MSTation:UDTX:MODE USCH
SOURce:BB:W3GPp:MSTation:UDTX:USCH:CATalog?
// queries the files with user scheduling settings *.3g_sch
// in the default directory
// "example", "ul_sch_dpc","up_sch_loop"
SOURce:BB:W3GPp:MSTation:UDTX:USCH:FSELect "up_sch_loop"
SOURce:BB:W3GPp:MSTation:UDTX:USCH:DELete "example"
SOURce:BB:W3GPp:MSTation:UDTX:STATe ON
```

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:MODE <UldtxMode>

Switches between the UL-DTX and User Scheduling functions.

Parameters:

<UldtxMode> UDTX | USCH

*RST: UDTX

Example: see "Example: Enabling User Scheduling" on page 523 and "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "Mode" on page 171

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:STATe <State>

Enables/disables UL-DTX or user scheduling, as selected with the command `[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:MODE`.

Enabling the UL-DTX deactivates the DPDCH and the HSUPA FRC; enabled user scheduling deactivates the HSUPA FRC.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "UL-DTX... / User Scheduling State" on page 170

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:TTIEdch <EdchTti>

Sets the duration of a E-DCH TTI.

Parameters:

<EdchTti> 2ms | 10ms

Range: 2ms to 10ms
*RST: 2ms

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "E-DCH TTI" on page 171

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:OFFSet <Offset>

Sets the parameter UE_DTX_DRX_Offset and determines the start offset in subframes of the first uplink DPCCH burst (after the preamble). The offest is applied only for bursts belonging to the DPCCH burst pattern; HS-DPCCH or E-DCH transmissions are not affected.

Parameters:

<Offset> integer

Range: 0 to 159
Increment: depends on E-DCH TTI parameter
*RST: 0

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "UL-DTX Offset" on page 171

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:ITHReshold <Threshold>

Defines the number of consecutive E-DCH TTIs without an E-DCH transmission, after which the UE shall immediately move from UE-DTX cycle 1 to using UE-DTX cycle 2.

Parameters:

<Threshold> 1 | 4 | 8 | 16 | 32 | 64 | 128 | 256

*RST: 16

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "Inactivity Threshold for Cycle 2" on page 172

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:LPLength <LongPreamble>

Determines the length in slots of the preamble associated with the UE-DTX cycle 2.

Parameters:

<LongPreamble> 2 | 4 | 15

*RST: 2

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "Long Preamble Length" on page 172

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:CYCLe<ch> <DtxCycle>

Sets the offset in subframe between two consecutive DPCCH bursts within the corresponding UE-DTX cycle, i.e. determines how often the DPCCH bursts are transmitted.

The UE-DTX cycle 2 is an integer multiple of the UE-DTX cycle 1, i.e. has less frequent DPCCH transmission instants.

Note: The allowed values depend on the selected E-DCH TTI.

Suffix:

<ch> 1|2
UL-DTX cycle 1 or 2

Parameters:

<DtxCycle> 1 | 4 | 5 | 8 | 10 | 16 | 20 | 32 | 40 | 64 | 80 | 128 | 160
*RST: 5

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "DTX Cycle 1 / DTX Cycle 2" on page 172

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:BURSt<ch> <BurstLength>

Determines the uplink DPCCH burst length in subframes without the peramble and postamble, when the corresponding UE-DTX cycle is applied.

Suffix:

<ch> 1|2
UL-DTX cycle 1 or 2

Parameters:

<BurstLength> 1 | 2 | 5
*RST: 1

Example: see "Example: Configuring the UL-DTX settings" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "DPCCH Burst Length 1 / DPCCH Burst Length 2" on page 172

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:PREamble<ch>?

Queries the preamble length in slots, when the corresponding UE-DTX cycle is applied.

The preamble length is fixed to 2 slots.

Suffix:

<ch> 1|2
UL-DTX cycle 1 or 2

Return values:

<Preamble> integer

Range: 2 to 2
*RST: 2

Example: see "Example: Configuring the UL-DTX settings" on page 523

Usage: Query only

Options: R&S SMx/AMU-K45/K59

Manual operation: See "Preamble Length 1 / Preamble Length 2" on page 172

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:POSTamble<ch>?

Queries the postamble length in slots, when the corresponding UE-DTX cycle is applied.

The postamble length is fixed to 1 slot.

Suffix:

<ch> 1|2
UL-DTX cycle 1 or 2

Return values:

<PostAmble> integer

Range: 1 to 1

Example: see "Example: Configuring the UL-DTX settings" on page 523

Usage: Query only

Options: R&S SMx/AMU-K45/K59

Manual operation: See "Postamble Length 1 / Postamble Length 2" on page 172

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:USCH:CATalog?

Queries the files with uplink user scheduling settings (file extension `*.3g_sch`) in the default or the specified directory.

Return values:

<Catalog> string

Example: see "Example: Enabling User Scheduling" on page 523

Usage: Query only

Options: R&S SMx/AMU-K45/K59

Manual operation: See "User Scheduling File" on page 171

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:USCH:DELete <Filename>

Deletes the selected file from the default or specified directory. Deleted are files with the file extension `*.3g_sch`.

Setting parameters:
<Filename> string

Example: see "Example: Enabling User Scheduling" on page 523

Usage: Setting only

Options: R&S SMx/AMU-K45/K59

Manual operation: See "User Scheduling File" on page 171

[:SOURce<hw>]:BB:W3GPp:MSTation:UDTX:USCH:FSELect <Filename>

Loads the selected file from the default or the sepcified directory. Load are files with extension `*.3g_sch`.

Parameters:
<Filename> string

Example: see "Example: Enabling User Scheduling" on page 523

Options: R&S SMx/AMU-K45/K59

Manual operation: See "User Scheduling File" on page 171

8.9.10 Dynamic Power Control Settings

Example: Configuring the Dynamic Power Control Settings

The following is a simple programing example with the purpose to show **all** commands for this task. In real application, some of the commands may be ommited.

```
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:DIRection UP
// selects direction up, a high level of the control signals
// leads to an increase of the channel power
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:STEP 1 dB
// selects a step width of 1 dB.
// A high level of the control signal leads to
// an increase of 1 dB of the channel power,
// a low level to a decrease of 1 dB.
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:RANGe:DOWN 10 dB
// selects a dynamic range of 10 dB for ranging up the channel power
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:RANGe:UP 50 dB
// selects a dynamic range of 50 dB for ranging up the channel power
// The overall increase and decrease of channel power,
// i.e. the dynamic range is limited to 60 dB
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:MODE TPC
// selects the source of the power control signal
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:STATe ON
// activates Dynamic Power Control for the enhanced channels of UE1
SOURce:BB:W3GPp:MSTation:ENHanced:DPDCh:DPControl:POWer?
// queries the deviation of the channel power (delta POW)
```

```
// from the set power start value of the DPDCH
SOURce:BB:W3GPp:MStation:ENHanced:DPDCh:DPControl:AOUE ON
```


[:SOURce<hw>]:BB:W3GPp:MStation[:ENHanced:DPDCh]:DPControl: ASSignment <ASSignment>

Enabled for UL-DTX mode only (`[:SOURce<hw>]:BB:W3GPp:MStation:UDTX:STATe` ON).

The power control recognizes the UL-DPCCH gaps according to 3GPP TS 25.214. Some of the TPC commands sent to the instrument over the external line or by the TPC pattern are ignored, whereas others are summed up and applied later. The processing of the TPC commands depends only on whether the BS sends the TPC bits on the F-DPCH with slot format 0/ slot format 9 or not.

Parameters:

<ASSignment> NORMal | FDPCh

*RST: NORMal

Example:
```
BB:W3GP:MST1:UDTX:STAT ON
BB:W3GP:MST:DPC:ASS FDPC
```

Manual operation: See "Assignment Mode for UL-DTX" on page 167

[:SOURce<hw>]:BB:W3GPp:MStation[:ENHanced:DPDCh]:DPControl:DIRection <Direction>

The command selects the Dynamic Power Control direction. The selected direction determines if the channel power is increased (`UP`) or decreased (`DOWN`) by control signal with high level.

Parameters:

<Direction> UP | DOWN

*RST: UP

Example: see example "Configuring the Dynamic Power Control Settings" on page 528

Manual operation: See "Direction" on page 166

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:MODE <Mode>

Determines the source of the control signal.

Note: The R&S SMBV does not support External Power Control.

Parameters:

<Mode> TPC | MANual | EXTernal

*RST: EXTernal

Example: see example "Configuring the Dynamic Power Control Settings" on page 528

Manual operation: See "Mode" on page 165

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:CONNector <Connector>

Determines the input connector at that the instrument expects the external control signal.

Parameters:

<Connector> LEVatt | USER1

*RST: LEVatt

Manual operation: See "Connector" on page 166

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl[:POWer]?

The command queries the deviation of the channel power (delta POW) from the set power start value of the DPDCH.

Return values:

<Power> float

Range: -60 to 60
Increment: 0.01
*RST: 0

Example: see example "Configuring the Dynamic Power Control Settings" on page 528

Usage: Query only

Manual operation: See "Power Control Graph" on page 166

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:RANGe:DOWN <Down>
[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:RANGe:UP <Up>

The command selects the dynamic range for ranging up the channel power.

Parameters:

<Up> float

Range: 0 to 60
Increment: 0.01
*RST: 10
Default unit: dB

Example: `BB:W3GP:MST:ENH:DPDC:DPC:RANG:UP 20dB`
selects a dynamic range of 20 dB for ranging up the channel power.

Manual operation: See "Up Range/Down Range" on page 166

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:STATe <State>

The command activates/deactivates Dynamic Power Control.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: see example "Configuring the Dynamic Power Control Settings" on page 528

Manual operation: See "Dynamic Power Control State" on page 165

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:STEP:MANual <Manual>

This command provides the control signal for manual mode of Dynamic Power Control.

Parameters:

<Manual> MAN0 | MAN1

*RST: MAN0

Example: `BB:W3GP:MST:ENH:DPDC:DPC:MODE MAN`
selects manual power control.
`BB:W3GP:MST:ENH:DPDC:DPC:STAT ON`
activates Dynamic Power Control for the enhanced channels of UE1.
`BB:W3GP:MST:ENH:DPDC:DPC:STEP:MAN MAN0`
decreases the level by 0.5 dB.

Manual operation: See "Mode" on page 165

[:SOURce<hw>]:BB:W3GPp:MSTation[:ENHanced:DPDCh]:DPControl:STEP[:EXTernal] <External>

This command sets step width by which – with Dynamic Power Control being switched on - the channel power of the enhanced channels is increased or decreased.

Parameters:

<External> float

Range: 0.5 to 6
Increment: 0.01
*RST: 1
Default unit: dB

Example: see example "Configuring the Dynamic Power Control Settings" on page 528

Manual operation: See "Power Step" on page 166

8.10 Enhanced Channels of the User Equipment

The `SOURce:BB:W3GPp:MSTation:ENHanced` subsystem contains the commands for setting the enhanced channels of user equipment 1 (UE1).

The commands of this system only take effect when the 3GPP FDD standard is activated, the uplink transmission direction is selected and user equipment 1 is enabled:

- `SOURce:BB:W3GPp:STATe ON`
- `SOURce:BB:W3GPp:LINK UP`
- `SOURce:BB:W3GPp:MSTation1:STATe ON`

`TCHannel<di>`

The transport channel designations for remote control are `TCHannel0` for DCCH, `TCHannel1` to `TCHannel6` for DTCH1 to DTCH6.

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:BPFRame?

The command queries the number of data bits in the DPDCH component of the frame at the physical layer. The number of data bits depends on the overall symbol rate.

Return values:

<BpFrame> integer

Range: 150 to 9600

Example: `BB:W3GP:MST:ENH:DPDC:BPFR?`
queries the number of data bits.
`Response: 300`
the number of data bits is 300.

Usage: Query only

Manual operation: See "Bits per Frame (DPDCH)" on page 250

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:STATe <State>

The command activates or deactivates channel coding for the enhanced channels.

When channel coding is activated, the overall symbol rate (`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:ORATe`) is set to the value predetermined by the selected channel coding type (`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:TYPE`).

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:MST:ENH:DPDC:CCOD:TYPE M12K2`
selects channel coding type RMC 12.2 kbps.
`BB:W3GP:MST:ENH:DPDC:CCOD:STAT ON`
activates channel coding.

Manual operation: See "Channel Coding State" on page 248

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:TYPE <Type>

The command selects the channel coding scheme in accordance with the 3GPP specification. The channel coding scheme selected predetermines the overall symbol rate.

When channel coding is activated (`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:STATe`) the overall symbol rate (`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:ORATe`) is set to the value predetermined by the selected channel coding type.

Parameters:

<Type> M12K2 | M64K | M144k | M384k | AMR

M12K2
Measurement channel with an input data bit rate of 12.2 ksps.

M64K
Measurement channel with an input data bit rate of 64 ksps.

M144K
Measurement channel with an input data bit rate of 144 ksps.

M384K
Measurement channel with an input data bit rate of 384 ksps.

AMR
Channel coding for the AMR Coder (coding a voice channel).

USER
This parameter cannot be set. USER is returned whenever a user-defined channel coding is active, that is to say, after a channel coding parameter has been changed or a user coding file has been loaded. The file is loaded by the command `[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:LOAD`.

*RST: M12K2

Example: `BB:W3GP:MST:ENH:DPDC:CCOD:TYPE M144K`
selects channel coding scheme RMC 144 kbps.

Manual operation: See "Coding Type" on page 248

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:CATalog?

The command queries existing files with stored user channel codings.

The files are stored with the fixed file extensions `*.3g_ccod_ul` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`.

Return values:

<Catalog> string

Example: `MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:MST:ENH:DPDC:CCOD:USER:CAT?`
queries the existing files with user coding.
`Response: 'user_cc1'`
there is one file with user coding.

Usage: Query only

Manual operation: See "User Coding ..." on page 249

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:DELete <Filename>

The command deletes the specified files with stored user channel codings.

The files are stored with the fixed file extensions `*.3g_ccod_ul` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

The command triggers an event and therefore has no query form and no *RST value.

Setting parameters:

<Filename> string

Example: `MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:MST:ENH:DPDC:CCOD:USER:DEL 'user_cc1'`
deletes the specified file with user coding.

Usage: Setting only

Manual operation: See "User Coding ..." on page 249

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:LOAD <Filename>

The command loads the specified files with stored user channel codings.

The files are stored with the fixed file extensions `*.3g_ccod_ul` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Setting parameters:

<Filename> string

Example: `MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:MST:ENH:DPDC:CCOD:USER:LOAD 'user_cc1'`
loads the specified file with user coding.

Usage: Setting only

Manual operation: See "User Coding ..." on page 249

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:CCODing:USER:STORe <Filename>

The command saves the current settings for channel coding as user channel coding in the specified file.

The files are stored with the fixed file extensions `*.3g_ccod_ul` in a directory of the user's choice. The directory in which the file is stored is defined with the command `MMEMory:CDIR`. To store the files in this directory, you only have to give the file name, without the path and the file extension.

Setting parameters:

<Filename> string

Example: `MMEM:CDIR '<root>CcodDpchUser'`
selects the directory for the user channel coding files.
`BB:W3GP:MST:ENH:DPDC:CCOD:USER:STOR 'user_cc1'`
saves the current channel coding setting in file `user_cc1` in directory `<root>CcodDpchUser`.

Usage: Setting only

Manual operation: See "User Coding ..." on page 249

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:LAYer <Layer>

The command selects the layer at which bit errors are inserted.

Parameters:

<Layer> TRANsport | PHYSical

TRANsport
Transport Layer (Layer 2). This layer is only available when channel coding is active.

PHYSical
Physical layer (Layer 1)

*RST: PHYSical

Example: `BB:W3GP:MST:ENH:DPDC:DERR:BIT:LAY PHYS`
selects layer 1 for entering bit errors.

Manual operation: See "Insert Errors On" on page 254

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:RATE <Rate>

Sets the bit error rate.

Parameters:

<Rate> float

Range: 1E-7 to 0.5
Increment: 1E-7
*RST: 0.001

Example: `BB:W3GP:MST:ENH:DPDC:DERR:BIT:RATE 1E-2`
sets a bit error rate of 0.01.

Manual operation: See "Bit Error Rate TCH1" on page 253

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BIT:STATe <State>

The command activates or deactivates bit error generation.

Bit errors are inserted into the data fields of the enhanced channels. When channel coding is active, it is possible to select the layer in which the errors are inserted (physical or transport layer). When the data source is read out, individual bits are deliberately inverted at random points in the data bit stream at the specified error rate in order to simulate an invalid signal.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:MST:ENH:DPDC:DERR:BIT:RATE 1E-2`
sets a bit error rate of 0.01.
`BB:W3GP:MST:ENH:DPDC:DERR:BIT:LAY PHYS`
selects layer 1 for entering bit errors.
`BB:W3GP:MST:ENH:DPDC:DERR:BIT:STAT ON`
activates bit error generation.

Manual operation: See "Bit Error State" on page 253

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor:BLOCk:RATE <Rate>

Sets the block error rate.

Parameters:

<Rate> float

Range: 1E-4 to 0.5
Increment: 1E-4
*RST: 0.1

Example: `BB:W3GP:MST:ENH:DPDC:DERR:BLOC:RATE 1E-2`
sets the block error rate to 0.01.

Manual operation: See "Block Error Rate" on page 254

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:DERRor[:BLOCk]:STATe <State>

The command activates or deactivates block error generation. Block error generation is only possible when channel coding is activated.

During block error generation, the CRC checksum is determined and then the last bit is inverted at the specified error probability in order to simulate a defective signal.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `BB:W3GP:MST:ENH:DPDC:CCOD:STAT ON`
activates channel coding.
`BB:W3GP:MST:ENH:DPDC:DERR:BLOC:RATE 10E-2`
sets the block error rate to 0.1.
`BB:W3GP:MST:ENH:DPDC:DERR:BLOC:STAT ON`
activates block error generation.

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:INTerleaver2 <Interleaver2>

The command activates or deactivates channel coding interleaver state 2 for all the transport channels.

Interleaver state 1 can be activated and deactivated for each channel individually (`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:INTerleaver`).

Note: The interleaver states do not cause the symbol rate to change

Parameters:

<Interleaver2> 0 | 1 | OFF | ON

*RST: 1

Example: `BB:W3GP:MST:ENH:DPDC:INT2 OFF`
deactivates channel coding interleaver state 2 for all the transport channels.

Manual operation: See "Interleaver 2 State" on page 253

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:ORATe <ORate>

The command queries the overall symbol rate (Overall Symbol Rate) of the enhanced channels. The value is set with the command `[:SOURce<hw>]:BB:W3GPp:MSTation<st>:DPDCh:ORATe`. This setting also defines the number of active channels, their symbol rates and channelization codes.

Parameters:

<ORate> D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2880k | D3840k | D4800k | D5760k

*RST: D60K

Example: `BB:W3GP:MST:ENH:DPDC:ORAT?`
queries the overall symbol rate of the DPDCH of user equipment 1.

Manual operation: See "Overall Symbol Rate" on page 249

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:STATe <State>

Queries the enhaced state of the station.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 1

Example: `BB:W3GP:MST1:ENH:DPDC:STAT?`

Manual operation: See "Enhanced Channels State" on page 246

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>: RMATtribute <RmAttribute>

Sets data rate matching.

Parameters:

<RmAttribute> integer

Range: 1 to 1024
*RST: 1

Example: `BB:W3GP:MST:ENH:DPDC:TCH:RMAT 1024`
sets rate matching to 1024 for DTCH1.

Manual operation: See "Rate Matching Attribute" on page 252

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:STATe <State>

The command activates/deactivates the selected transport channel.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:MST:ENH:DPDC:TCH1:STAT`
activates DTCH1.

Manual operation: See "Transport Channel State" on page 251

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:TBCount <TbCount>

The command sets the transport block count.

Parameters:

<TbCount> integer

Range: 1 to 16
*RST: 1

Example: `BB:W3GP:MST:ENH:DPDC:TCH2:TBC 4`
activates 4 transport blocks for DTCH1.

Manual operation: See "Number of Transport Blocks" on page 252

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:TBSize <TbSize>

Sets the size of the data blocks.

Parameters:

<TbSize> integer

Example: `BB:W3GP:MST:ENH:DPDC:TCH2:TBS 1024`
sets the length of the transport blocks for DTCH2 to 1024.

Manual operation: See "Transport Block Size" on page 252

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:TTINterval <TtInterval>

Sets the number of frames into which a TCH is divided. This setting also defines the interleaver depth.

Parameters:

<TtInterval> 10MS | 20MS | 40MS

Example: `BB:W3GP:MST:ENH:DPDC:TCH2:TTIN 20ms`
sets that the transport channel is divided into 2 frames.

Manual operation: See "Transport Time Interval" on page 251

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:CRCSize <CrcSize>

The command defines the CRC length for the selected transport channel. It is also possible to deactivate checksum determination.

Parameters:

<CrcSize> NONE | 8 | 12 | 16 | 24

*RST: 12

Example: `BB:W3GP:MST:ENH:DPDC:TCH:CRCS NONE`
deactivates checksum determination for DTCH1.

Manual operation: See "Size of CRC" on page 252

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA <Data>

Selects the data source for the transport channel.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

PNxx
The pseudo-random sequence generator is used as the data source. Different random sequence lengths can be selected.

DLISt
A data list is used. The data list is selected with the command `[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:DSELect`.

ZERO | ONE
Internal 0 and 1 data is used.

PATTern
Internal data is used. The bit pattern for the data is defined by the command `[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:PATTern`.

*RST: PN9

Example: `BB:W3GP:MST:ENH:DPDC:TCH2:DATA PATT`
selects as the data source for the data fields of DTCH2 of user equipment 1, the bit pattern defined with the following command.
`BB:W3GP:MST:ENH:DPDC:TCH2:DATA:PATT #H3F, 8`
defines the bit pattern.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:DSELect <DSelect>

The command selects the data list for the enhanced channels for the DLISt selection.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, you only have to give the file name, without the path and the file extension.

Parameters:

<DSelect> string

Example: `BB:W3GP:MST:ENH:DPDC:TCH1:DATA DLIS`
selects the Data Lists data source.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:MST:ENH:DPDC:TCH1:DATA:DSEL 'TCH1'`
selects the file `tch1` as the data source.

Manual operation: See "Data List Management" on page 58

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:DATA:PATTern <Pattern>

The command determines the bit pattern for the `PATTern` data source selection for transport channels.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example: `BB:W3GP:MST:ENH:DPDC:TCH0:DATA:PATT #H3F, 8`
defines the bit pattern for DCCH.

Manual operation: See "Data Source" on page 251

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:EPRotection <EProtection>

The command determines the error protection.

Parameters:

<EProtection> NONE | CON2 | CON3 | TURBo3

NONE
No error protection.

TURBo3
Turbo Coder of rate 1/3 in accordance with the 3GPP specifications.

CON2 | CON3
Convolution Coder of rate ½ or 1/3 with generator polynomials defined by 3GPP.

*RST: CON1/3

Example: `BB:W3GP:MST:ENH:DPDC:TCH1:EPR NONE`
error protection is deactivated.

Manual operation: See "Error Protection" on page 252

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:TCHannel<di0>:INTerleaver <Interleaver>

The command activates or deactivates channel coding interleaver state 1 for the selected channel. Interleaver state 1 can be activated and deactivated for each channel individually. The channel is selected via the suffix at TCHannel.

Interleaver state 2 can only be activated or deactivated for all the channels together (`[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:DPDCh:INTerleaver2`).

Parameters:

<Interleaver> 0 | 1 | OFF | ON

*RST: 1

Example: `BB:W3GP:MST:ENH:DPDC:TCH5:INT1 OFF`
deactivates channel coding interleaver state 1 for TCH 5.

Manual operation: See "Interleaver 1 State" on page 252

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:PCPCh:CCODing:STATe <State>

The command activates or deactivates channel coding for the PCPCH.

When channel coding is active, the symbol rate is limited to the range between 15 and 120 ksps. Values above this limit are automatically set to 120 ksps.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:MST:ENH:PCPC:CCOD:TYPE TB168`
selects channel coding type CPCH RMC (TB size 168 bits).
`BB:W3GP:MST:ENH:PCPC:CCOD:STAT ON`
activates channel coding.

Manual operation: See "Channel Coding State" on page 193

[:SOURce<hw>]:BB:W3GPp:MSTation:ENHanced:PCPCh:CCODing:TYPE <Type>

The command selects the channel coding scheme in accordance with the 3GPP specification.

Parameters:

<Type> TB168 | TB360

TB168
CPCH RMC (TB size 168 bits)

TB360
CPCH RMC (TB size 360 bits)

*RST: TB168

Example: `BB:W3GP:MST:ENH:PCPC:CCOD:TYPE TB168`
selects channel coding scheme RMC 168 bits.

Manual operation: See "Channel Coding Type" on page 193

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:ENHanced:PRACh:CCODing:STATe <State>

The command activates or deactivates channel coding for the PRACH.

Parameters:

<State> ON | OFF

*RST: 0

Example: `BB:W3GP:MST:ENH:PRAC:CCOD:TYPE TB168`
selects channel coding type RACH RMC (TB size 168 bits).
`BB:W3GP:MST:ENH:PRAC:CCOD:STAT ON`
activates channel coding.

Manual operation: See "Channel Coding State" on page 182

[:SOURce<hw>]:BB:W3GPp:MSTation<st>:ENHanced:PRACh:CCODing:TYPE <Type>

The command selects the channel coding scheme in accordance with the 3GPP specification.

Parameters:

<Type> TB168 | TB360 | TU168 | TU360

TB168
RACH RMC (TB size 168 bits)

TB360
RACH RMC (TB size 360 bits)

*RST: TB168

Example: `BB:W3GP:MST:ENH:PRAC:CCOD:TYPE TB168`
selects channel coding scheme RMC 168 bits.

Manual operation: See "Channel Coding Type" on page 182

8.11 Setting up Test Cases according to TS 25.141

The signal generator gives you the opportunity to generate predefined settings which enable tests on base stations in conformance with the 3G standard 3GPP FDD. It offers a selection of predefined settings according to Test Cases in TS 25.141. The settings take effect only after execution of command `[:SOURce]:BB:W3GPp:TS25141:TCASe:EXECute`. For most test cases, the parameters of one or more of the subsystems `SOURce:AWGN`, `SOURce:W3GPp`, `SOURce:DM` and `SOURce:FSIM` are adjusted.

The test setups and equipment requirements for each Test Case are described in chapter 7.1, "Introduction", on page 279.

Unlike most of the other commands of the SOURce:BB:W3GPp subsystem, key word SOURce is without suffix. Signal routing is possible only for Test Cases that do not use diversity and is performed via command [:SOURce]:BB:W3GPp:TS25141:ROUTe.

Most of the commands are setting commands in mode "User definable" and respectively are query only in mode "According to Standard", see the description of the command [:SOURce]:BB:W3GPp:TS25141:EMODe. The edit mode "According to Standard" puts the required limits in the value ranges of the related commands.

[:SOURce]:BB:W3GPp:TS25141:AWGN:CNRatio <CnRatio>

Sets/queries the carrier/noise ratio.

Parameters:

<CnRatio> float

Range: -50 to 45
Increment: 0.01
*RST: -16.8

Example:

`BB:W3GP:TS25141:TCAS TC73`
selects test case 7.3.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:AWGN:POW:NOIS?`
queries the noise level of the interfering signal.
`Response: -73`
the noise level of the interfering signal is -73 dB.
`BB:W3GP:TS25141:AWGN:CNR?`
queries the signal/noise ratio of the interfering signal.
`Response: -16.80`
the signal/noise ratio of the interfering signal is -16.8 dB.

Options: Test Cases 7.3, 8.x (not 8.6); minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case.

Manual operation: See "C/N - Test Case 7.3" on page 299

[:SOURce]:BB:W3GPp:TS25141:AWGN:ENRatio <EnRatio>

Sets/queries the ratio of bit energy to noise power density.

Parameters:

<EnRatio> float

Range: -80 dB to 80 dB
Increment: 0.01 dB
*RST: 8.7 dB

Example:

`BB:W3GP:TS25141:TCAS TC821`
selects test case 8.2.1.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:AWGN:ENR?`
queries the ratio of bit energy to noise power density of the interfering signal.
`Response: 8.70`
the E/N ratio of the interfering signal is 8.7 dB.

Options: Test Cases 8.x (not 8.6); minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case

Manual operation: See "E_b to N_0 - Test Case 8.x" on page 317

[:SOURce]:BB:W3GPp:TS25141:AWGN:POWer:NOISe <Noise>

Sets/queries the noise level.

Parameters:

<Noise> float

Increment: 0.01

Example: see [:SOURce]:BB:W3GPp:TS25141:AWGN:CNRatio on page 546

Options: Test Cases 7.3, 8.x (not 8.6); minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case

Manual operation: See "Power Level - Test Case 7.3" on page 299

[:SOURce]:BB:W3GPp:TS25141:AWGN:RBLock:RATE <Rate>

Sets the required block error rate. The possible selection depends on the selected fading configuration.

Parameters:

<Rate> B0 | B01 | B001 | B0001

*RST: B001

Example: `BB:W3GP:TS25141:TCAS TC893`
selects test case 8.9.3.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:AWGN:RBL:RATE B01`
sets the required block error rate to < 0.01.

Options: Test Cases 8.x (not 8.6, 8.8.1, 8.8.2, 8.9.1, 8.9.2); minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case
Test Cases 8.x (not 8.6, 8.8.1, 8.9.1); minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case

Manual operation: See "Required BLER - Test Case 8.x" on page 316

[:SOURce]:BB:W3GPp:TS25141:AWGN:RPDetection:RATE <Rate>

Sets the required probability of detection of preamble (Pd). The selection determines the ratio E_b/N_0.

Parameters:
<Rate> PD099 | PD0999
*RST: PD099

Example: `BB:W3GP:TS25141:TCAS TC892`
selects test case 8.9.2.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:AWGN:RPD:RATE PD099`
sets the required probability of detection of preamble to > 0.99. The E/N ratio of the interfering signal is -8.8 dB.

Options: Test Cases 8.8.1, 8.8.2, 8.9.1, 8.9.2; minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case

Manual operation: See "Required Pd - Test Case 8.x" on page 327

[:SOURce]:BB:W3GPp:TS25141:AWGN:STATe <State>

Enables/disables the generation of the AWGN signal.

Parameters:
<State> 0 | 1 | OFF | ON
*RST: 1

Example: `BB:W3GP:TS25141:TCAS TC892`
selects test case 8.9.2.
`BB:W3GP:TS25141:EMOD USER`
selects mode "User definable". Also settings that are not in compliance with the standard can be made.
`BB:W3GP:TS25141:AWGN:STAT OFF`
disables the generation of the AWGN signal.

Options: Test Cases 7.3, 8.x (not 8.6); minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case.

Manual operation: See "AWGN State - Test Case 8.x" on page 316

[:SOURce]:BB:W3GPp:TS25141:BSPClass <BspClass>

Selects the base station power class.

Parameters:

<BspClass> WIDE | MEDium | LOCal

*RST: WIDE

Example: `BB:W3GP:TS25141:BSPC WIDE`
the base station under test is a wide area base station.

Options: All test cases except for 6.6; minimum requirement: Options B13, B10/B11 and K42; For additionally required options see selected test case.

Manual operation: See "Power Class" on page 289

[:SOURce]:BB:W3GPp:TS25141:BSSignal:FREQuency <Frequency>

Sets the RF frequency of the base station.

Parameters:

<Frequency> float

Range: 100 kHz to 6 GHz
*RST: 1.0 GHz

Example: `BB:W3GP:TS25141:BSS:FREQ 1GHz`
the frequency of the base station under test is 1 GHz.

Options: Test case 6.6; Options B13, B10/B11 and K42

Manual operation: See "BS Frequency - Test Case 6.6" on page 345

[:SOURce]:BB:W3GPp:TS25141:BSSignal:POWer <Power>

Sets the RF power of the base station.

Parameters:
<Power> float

Increment: 0.01
*RST: -30 dBm

Example: `BB:W3GP:TS25141:TCAS TC66`
selects test case 6.6.
`BB:W3GP:TS25141:BSS:POW -30`
the power of the base station under test is -30 dBm.

Options: Test case 6.6; Options B13, B10/B11 and K42.

Manual operation: See "BS RF Power - Test Case 6.6" on page 345

[:SOURce]:BB:W3GPp:TS25141:EMODe <EMode>

Selects the edit mode for the configuration of the test cases.

Parameters:
<EMode> STANdard | USER

STANdard
Edit mode "According to Standard". Only settings in compliance with TS 25.141 are possible. All other parameters are preset.

USER
Edit mode "User definable". A wider range of settings is possible

*RST: STANdard

Example: `BB:W3GP:TS25141:EMOD USER`
selects edit mode "User definable".

Options: All test cases; minimum requirement: Options B13, B10/B11 and K42; For additionally required options see selected test case.

Manual operation: See "Edit Mode" on page 286

[:SOURce]:BB:W3GPp:TS25141:FSIMulator:STATe <State>

Queries the state of the Fading Simulator.

Parameters:
<State> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:TS25141:TCAS TC892`
selects test case 8.9.2.
`BB:W3GP:TS25141:FSIM:STAT?`
queries the state of the fading simulator.
`Response: 0`
the fading simulator is disabled.

Options: Test Cases 8.x (not 8.6); minimum requirement Options B13, B10/B11, B14, B15, K42, K62 and K71; For additionally required options see selected test case.

Manual operation: See "Fading State - Test Case 8.2.1" on page 317

[:SOURce]:BB:W3GPp:TS25141:IFSignal:BWIDth <BWidth>

Selects the interferer scenario.

Parameters:

<BWidth> WIDE | NARRow

*RST: WIDE

Example: `BB:W3GP:TS25141:TCAS TC76`
selects test case 7.6.
`BB:W3GP:TS25141:IFS:BWID WIDE`
selects a 3GPP FDD uplink interfering signal 1

Options: Test Case 7.6; Option K62 and B20x, two options B13, B10/B11, and K42 each.

Manual operation: See "Interferer Bandwidth Type - Test Case 7.6" on page 311

[:SOURce]:BB:W3GPp:TS25141:IFSignal:CNRatio <CnRatio>

In test case 7.4, sets the power ratio of wanted signal to interfering signal.

In test case 6.6, sets the power ratio of interfering signal to wanted signal.

Parameters:

<CnRatio> float

Range: -80 dB to 80 dB
Increment: 0.01 dB
*RST: -63 dB

Example: `BB:W3GP:TS25141:TCAS TC74`
selects test case 7.4.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:IFS:CNR?`
queries the power ratio.
`Response:-63.0`
the signal/noise ratio of the interfering signal is -63 dB.

Options: Test case 6.6; Options B13, B10/B11 and K42 Test case 7.4; Options B13, B10/B11, B20x , and two options K42.

Manual operation: See "C to I - Test Case 7.4" on page 301

[:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:FOFFset <FOffset>

Sets frequency offset of the CW interfering signal versus the wanted signal RF frequency.

Parameters:
<FOffset> float

Increment: 0.01
*RST: 10 MHz

Example: see [:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:STATe on page 552

Options: Test Case 7.6; Options B20x and K62, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Interferer 1 and 2 Frequency Offset - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:POWer <Power>

Sets the RF level of the CW interfering signal.

Parameters:
<Power> float

*RST: -48 dBm

Example: see [:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:STATe on page 552

Options: Test Case 7.6; Options B20x and K62, two options B10/B11, B13, two options and K42 each.

Manual operation: See "Interferer 1 and 2 Power Level - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:CW:STATe <State>

This command enable/disables the CW interfering signal. In mode "According to Standard" (`:SOURce:BB:W3GPp:TS25141:EMODe STANdard`) the value is fixed to ON.

Sets commands `:SOURce2:AWGN:CNRatio` and `:SOURce2:AWGN:POWer:NOISe` after execution of `:SOURce:BB:W3GP:TS25141:TCAS:EXEC`

Parameters:
<State> 0 | 1 | OFF | ON

*RST: 1

Example:
`BB:W3GP:TS25141:TCAS TC76`
selects test case 7.6.
`BB:W3GP:TS25141:EMOD STAN`
selects mode According to Standard. Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:IFS:IFS:BWID WIDE`
selects interferer scenario wideband.
`BB:W3GP:TS25141:IFS:CW:FOFF?`
queries the frequency offset of the CW interferer.
`Response: 10000000`
the frequency offset is 10 MHz.
`BB:W3GP:TS25141:IFS:BWID NARR`
`BB:W3GP:TS25141:IFS:CW:POW?`
queries the RF level of the CW interferer.
`Response: -47`
the RF level is -47.00 dBm.
`BB:W3GP:TS25141:IFS:CW:STAT?`
queries the state of the CW interferer.
`Response: 1`
the CW interferer is enabled.

Options: Test Case 7.6; Options B20x and K62, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Interferer 1 and 2 State - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:FOFFset <FOffset>

Sets frequency offset of the interfering signal versus the wanted signal RF frequency.).

Parameters:

<FOffset> float

Range: -40 MHz to 40 MHz
Increment: 0.01 Hz
*RST: 1 MHz

Example:
`BB:W3GP:TS25141:TCAS TC74`
selects test case 7.4.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:IFS:FOFF 0.5 MHz`
sets the frequency offset of the interferer to 5 MHz.

Options: Test cases 7.4 / 7.5; Option B20x, two options B10/B11, B13 and K42 each.

Manual operation: See "Frequency Offset - Test Case 7.4" on page 301

[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:FOFFset <FOffset>

Sets frequency offset of the modulated interfering signal versus the wanted signal RF frequency.

Parameters:

<FOffset> float

Range: -40 MHz to 40 MHz
Increment: 0.01 Hz
*RST: 20 MHz

Example:

`BB:W3GP:TS25141:TCAS TC76`
selects test case 7.6.
`BB:W3GP:TS25141:EMOD STAN`
selects mode According to Standard. Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:IFS:BWID WIDE`
selects interferer scenario wideband.
`BB:W3GP:TS25141:IFS:MOD:FOFF?`
queries the frequency offset of the modulated interferer.
`Response: 20000000`
the frequency offset is 20 MHz.

Options: Test Case 7.6; Options B20x and K62, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Interferer 1 and 2 Frequency Offset - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:POWer <Power>

Sets the RF level of the modulated interfering signal.

Parameters:

<Power> float

*RST: -48 dBm

Example:
`BB:W3GP:TS25141:TCAS TC76`
selects test case 7.6.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:IFS:BWID NARR`
selects interferer scenario narrowband.
`BB:W3GP:TS25141:IFS:MOD:POW?`
queries the RF level of the modulated interferer.
`Response: -47`
the RF level is 47.00 dBm.
`BB:W3GP:TS25141:IFS:MOD:TYPE?`
queries the type of the modulated interferer.
`Response: GMSK`
the modulation type is GMSK.
`BB:W3GP:TS25141:IFS:MOD:STAT?`
queries the state of the modulated interferer.
`Response: 1`
the modulated interferer is enabled.

Options: Test Case 7.6; Options B20x and K62, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Interferer 1 and 2 Power Level - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:STATe <State>

Enable/disables the modulated interfering signal.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: 1

Example: see `[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:POWer` on page 554

Options: Test Case 7.6; Options B20x and K62, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Interferer 1 and 2 State - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:TYPE <Type>

Selects the type of modulation for the interfering uplink signal in the second path.

Parameters:

<Type> WCDMa | CW | GMSK | QPSK
*RST: WCDMa

Example: see `[:SOURce]:BB:W3GPp:TS25141:IFSignal:MODulated:POWer` on page 554

Options: Test case 7.6 Options; B20x and K62, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Interferer 2 Modulation - Test Case 7.6" on page 312

[:SOURce]:BB:W3GPp:TS25141:IFSignal:POWer <Power>

Sets the RF level of the interfering signal.

Parameters:

<Power> float

Example:

`BB:W3GP:TS25141:TCAS TC75`
selects test case 7.6.
`BB:W3GP:TS25141:EMOD STAN`
selects mode "According to Standard". Only settings in compliance with the standard can be made.
`BB:W3GP:TS25141:WSIG:BTYP NARR`
selects blocking scenario narrowband.
`BB:W3GP:TS25141:IFS:POW?`
queries the RF level of the CW interferer.
`Response: -47`
the RF level is -47.00 dBm.

Options: Test case 7.5; Option B20x, second option B10/B11 and B13 each, two options K42.

Manual operation: See "Power Level - Test Case 7.5" on page 305

[:SOURce]:BB:W3GPp:TS25141:IFSignal:SETTing:TMODel:BSTation <BStation>

Selects the interfering signal from a list of test models in accordance with TS 25.141. All test models refer to the predefined downlink configurations.

Parameters:

<BStation> TM164 | TM116 | TM132 | TM2 | TM316 | TM332 | TM4 | TM538 | TM528 | TM58

Example:

`BB:W3GP:TS25141:TCAS TC66`
selects test case 6.6.
`BB:W3GP:TS25141:EMOD USER`
selects mode "User Definable".
`BB:W3GP:TS25141:IFS:SETT:TMOD:BST TM116`
the interfering signal is generated according to test model Test Model 1; 16 Channels.

Options: Test case 6.6; Options B13, B10/B11 and K42.

Manual operation: See "Interferer Mode - Test Case 6.6" on page 345

[:SOURce]:BB:W3GPp:TS25141:IFSignal:STATe <State>

Enable/disables the modulated interfering signal.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 1

Example:

`BB:W3GP:TS25141:TCAS TC75`

selects test case 7.5.

`BB:W3GP:TS25141:EMOD STAN`

selects mode "According to Standard". Only settings in compliance with the standard can be made.

`BB:W3GP:TS25141:IFS:STAT?`

queries the state of the interferer.

`Response: 1`

the interferer is enabled.

Options: Test cases 7.4 / 7.5; Options B13, B10/B11, B20x , and two K42

Manual operation: See "Interferer State - Test Case 7.4" on page 301

[:SOURce]:BB:W3GPp:TS25141:IFSignal:TYPE <Type>

Selects the type of modulation for the interfering signal.

Parameters:

<Type> WCDMa | CW | GMSK | QPSK

*RST: WCDMa

Example:

`BB:W3GP:TS25141:TCAS TC75`

selects test case 7.5.

`BB:W3GP:TS25141:EMOD STAN`

`BB:W3GP:TS25141:IFS:TYPE?`

queries the type of the interferer.

`Response: CW`

the modulation type is CW interferer.

Options: Test cases 7.4 / 7.5; Options B13, B10/B11, B20x , and two K42.

Manual operation: See "Interferer Modulation - Test Case 7.4" on page 301

[:SOURce]:BB:W3GPp:TS25141:ROUTe <Route>

Selects the signal routing for baseband A signal which in most test cases represents the wanted signal (exception test case 6.6). The command is only available for two-path-instruments and only for test cases that do not use both paths anyway.

Parameters:

<Route> A | B

*RST: A

Example:

`BB:W3GP:TS25141:ROUT B`

the baseband signal of path A is introduced into path B.

Options: All test cases; minimum requirement: Option B20x, B10/B11, K42 and two options B13.

Manual operation: See "Baseband A Signal Routing" on page 288

[:SOURce]:BB:W3GPp:TS25141:RXDiversity <RxDiversity>

Sets the signal generator according to the base station diversity processing capability. The command is only available for two-path-instruments and only for test cases that do not use both paths anyway.

Parameters:

<RxDiversity> 0 | 1 | OFF | ON

*RST: 0

Example: `BB:W3GP:TS25141:RXD ON`

the baseband signal of path A is introduced into both paths.

Options: Test cases 8.x; Options B20x, B14, B15, K71, and K62, two options B10/B11 and B13 each.

Manual operation: See "Diversity" on page 286

[:SOURce]:BB:W3GPp:TS25141:SCODe <SCode>

Sets the scrambling code. The value range depends on whether the generator is used in uplink or downlink direction (test case 6.6) according to the selected test case.

Parameters:

<SCode> integer

*RST: #H0

Example: `BB:W3GP:TS25141:SCOD #H5FFF`

sets scrambling code #H5FFF.

Options: All test cases; minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case

Manual operation: See "Scrambling Code (hex)" on page 288

[:SOURce]:BB:W3GPp:TS25141:SCODe:MODE <Mode>

Sets the type for the scrambling code for the uplink direction. In downlink direction (test case 6.6), the scrambling generator can be switched on and off.

Parameters:

<Mode> OFF | ON | LONG | SHORt

Example: `BB:W3GP:TS25141:SCOD:MODE OFF`

deactivates the scrambling code generator.

Options: All test cases; minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case.

Manual operation: See "Scrambling Mode" on page 288

[:SOURce]:BB:W3GPp:TS25141:TCASe <TCase>

Selects a test case defined by the standard. The signal generator is preset according to the selected standard.

Depending on the selected test case the parameters of the TS25141 commands are preset. For most test cases also the parameters of one or more of the subsystems `SOURce:AWGN, SOURce:W3GPp`, `SOURce:DM` and `SOURce:FSIM` are preset. The preset parameters are activated with command `:BB:W3GP:TS25141:TCAS:EXEC`

Parameters:

<TCase> TC642 | TC66 | TC72 | TC73 | TC74 | TC75 | TC76 | TC78 | TC821 | TC831 | TC832 | TC833 | TC834 | TC84 | TC85 | TC86 | TC881 | TC882 | TC883 | TC884 | TC891 | TC892 | TC893 | TC894

*RST: TC642

Example: `BB:W3GP:TS25141:TCAS TC73`
selects the test case 7.3, Dynamic Range.

Options: Minimum requirement: Options B13, B10/B11 and K42 .

Manual operation: See "Test Case" on page 283

[:SOURce]:BB:W3GPp:TS25141:TCASe:EXECute

The command activates the current settings of the test case wizard. Signal generation is started at the first trigger received by the generator. The RF output is not activated / deactivated by this command, so care has to be taken that "RF State" is "On" (`OUTPut:STATe ON`) at the beginning of the measurement.

The command activates the preset parameters of the TS25141 commands and - for most test cases - also the parameters of one or more of the subsystems `SOURce:AWGN`, `SOURce:W3GPp`, `SOURce:DM` and `SOURce:FSIM`.

Example: `BB:W3GP:TS25141:TCAS TC73`
selects the settings for test case 7.3, Dynamic Range.
`BB:W3GP:TS25141:BSPC MED`
sets the base station power class Medium Range BS.
`BB:W3GP:TS25141:SCOD #H000FFF`
sets the uplink scrambling code 'H000FFF.
`BB:W3GP:TS25141:WSIG:FREQ 1710MHz`
sets the wanted signal frequency.
`BB:W3GP:TS25141:TCAS:EXEC`
activates the settings for test case 7.3, Dynamic Range. For all other parameters the preset values are used.
`OUTP ON`
activates RF output A.

Usage: Event

Options: Minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case.

Manual operation: See "Apply Settings" on page 289

[:SOURce]:BB:W3GPp:TS25141:TRIGger <Trigger>

Selects the trigger mode. The trigger is used to synchronize the signal generator to the other equipment.

Parameters:

<Trigger> AUTO | PRESet | SINGle

*RST: AUTO

Example: `BB:W3GP:TS25141:TRIG AUTO`
selects customization of trigger mode for the selected test case

Options: All test cases; Minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case.

Manual operation: See "Trigger Configuration" on page 286

[:SOURce]:BB:W3GPp:TS25141:TRIGger:OUTPut <Output>

Defines the signal for the selected marker output.

When "AUTO" is selected, all commands of the `W3GPp` Subsystem concerning the marker settings are adjusted to the selected test case after execution of `SOUR:BB:W3GP:TS25141:TCASe:EXEC`

Parameters:

<Output> AUTO | PRESet

*RST: AUTO

Example: `BB:W3GP:TS25141:TRIG:OUTP PRES`
selects that the current marker setting are kept independently of the selected test case.

Options: All test cases; Minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case.

Manual operation: See "Marker Configuration" on page 286

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:BTYPe <BType>

Selects the type of blocking scenario and determines the type of interfering signal and its level.

Parameters:

<BType> WIDE | COLocated | NARRow

*RST: WIDE

Example: `BB:W3GP:TS25141:TCAS TC75`
selects the settings for test case 7.5, Blocking Characteristics.
`BB:W3GP:TS25141:WSIG:BTYP NARR`
selects the GMSK (270.833 kHz) interfering signal

Options: Test case 7.5; Option B20x, two options B10/B11, B13 and K42 each.

Manual operation: See "Blocking Scenario - Test Case 7.5" on page 304

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DCRatio <DcRatio>

Sets channel power ratio of DPCCH to DPDCH.

Parameters:

<DcRatio> float

Range: -80 to 80
Increment: 0.01
*RST: 0

Example: `BB:W3GP:TS25141:TCAS TC642`
selects the settings for test case 6.4.2, Power Control Steps.
`BB:W3GP:TS25141:WSIG:DCR -3 dB`
sets a ratio of -3 dB for DPCCH power/DPDCH power

Options: Test case 6.4.2; Options B13, B10/B11 and K42

Manual operation: See "Power Ratio DPCCH to DPDCH - Test Case 6.4.2" on page 340

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:SFORmat <SFormat>

Sets the slot format for the DPCCH. The slot format defines the FBI mode and the TFCI status.

Parameters:

<SFormat> float

Range: 0 to 5
*RST: 0

Example: `BB:W3GP:TS25141:TCAS TC642`
selects the settings for test case 6.4.2, Power Control Steps.
`BB:W3GP:TS25141:WSIG:DPCC:SFOR 3`
selects slot format 3 for the DPCCH

Options: Test case 6.4.2; Options B13, B10/B11 and K42

Manual operation: See "Slot Format DPCCH - Test Case 6.4.2" on page 340

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:RDATa <RData>

Sets the TPC repeat pattern for verification of the base stations power control steps.

Parameters:

<RData> SINGle | AGGRegated | ONE | ZERO | PATTern | DLISt

*RST: SINGle

Example: `BB:W3GP:TS25141:TCAS TC642`
selects the settings for test case 6.4.2, Power Control Steps.
`BB:W3GP:TS25141:WSIG:DPCC:TPC:RDAT SING`
selects the 01 pattern

Options: Test case 6.4.2; Options B13, B10/B11 and K42

Manual operation: See "TPC Repeat Pattern - Test Case 6.4.2" on page 341

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:RDATa:DSELect <DSelect>

Selects the data list when the `DLISt` data source is selected for the TPC repeat pattern of the DPCCH.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, only the file name has to be given, without the path and the file extension.

Parameters:

<DSelect> <data_list_name>

Example: `BB:W3GP:TS25141:TCAS TC642`
`BB:W3GP:TS25141:WSIG:DPCC:TPC:RDAT DLIS`
selects the data source DLISt
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:TS25141:WSIG:DPCC:TPC:RDAT:DSEL 'dpcch_tpc_1'`
selects the data list `dpcch_tpc1`.

Options: Test case 6.4.2; Options B13, B10/B11 and K42

Manual operation: See "TPC Repeat Pattern - Test Case 6.4.2" on page 341

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:RDATa:PATTern <Pattern>

Determines the bit pattern for the `PATTern` data source selection.

Parameters:

<Pattern> 64 bits

*RST: #H0,1

Example:
`BB:W3GP:TS25141:TCAS TC642`
`BB:W3GP:TS25141:WSIG:DPCC:TPC:RDAT PATT`
selects the data source pattern
`BB:W3GP:TS25141:WSIG:DPCC:TPC:RDAT:PATT #HF0C20,19`
defines the TPC pattern

Options: Test case 6.4.2; Options B13, B10/B11 and K42

Manual operation: See "TPC Repeat Pattern - Test Case 6.4.2" on page 341

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa <SData>

Sets the TPC pattern for initialization of the base stations power level.

Parameters:

<SData> PMAX | DLISt

PMAX
Maximum Power Less n Steps

DLISt
The TPC start pattern is taken from a data list.

*RST: PMAX

Example:
`BB:W3GP:TS25141:TCAS TC642`
selects the settings for test case 6.4.2, Power Control Steps.
`BB:W3GP:TS25141:WSIG:DPCC:TPC:SDAT DLIS`
selects the data source data list for TPC start pattern.
`MMEM:CDIR '<root>IQData'`
selects the directory for the data lists.
`BB:W3GP:TS25141:WSIG:DPCC:TPC:SDAT:DSEL 'dpcch_tpc_s'`
selects the data list `dpcch_tpcs`.
`BB:W3GP:TS25141:WSIG:DPCC:TPC:SDAT PMAX`
selects the pattern "Max. Pow. Less N Steps"
`BB:W3GP:TS25141:WSIG:DPCC:TPC:SDAT:PUST 100`
defines 100 power up bits. The base station is (presumably) set to maximum transmit power.
`BB:W3GP:TS25141:WSIG:DPCC:TPC:SDAT:PDST 10`
defines 10 power down bits. The base station is set to two power steps below its maximum transmit power. The TPC start patter is 110 bits long.

Options: Test case 6.4.2; Options B13, B10/B11 and K42

Manual operation: See "TPC Start Pattern - Test Case 6.4.2" on page 340

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa:DSELect <DSelect>

Selects the data list when the `DLISt` data source is selected for the TPC start pattern of the DPCCH.

The files are stored with the fixed file extensions `*.dm_iqd` in a directory of the user's choice. The directory applicable to the commands is defined with the command `MMEMory:CDIR`. To access the files in this directory, only the file name has to be given, without the path and the file extension.

Parameters:

<DSelect>	<data_list_name>
Example:	see [:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa on page 563
Options:	Test case 6.4.2; Options B13, B10/B11 and K42
Manual operation:	See "TPC Start Pattern - Test Case 6.4.2" on page 340

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa:PDSTeps <PdSteps>

Sets the number of power down bits in the TPC start pattern.

Parameters:

<PdSteps>	integer Range: 0 to 1000 *RST: 1
Example:	see [:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa on page 563
Options:	Test case 6.4.2; Options B13, B10/B11 and K42
Manual operation:	See "TPC Power Down Steps - Test Case 6.4.2" on page 341

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa:PUSTeps <PuSteps>

Sets the number of power up bits in the TPC start pattern.

Parameters:

<PuSteps>	integer Range: 0 to 1000 *RST: 1
Example:	see [:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPCCh:TPC:SDATa on page 563
Options:	Test case 6.4.2; Options B13, B10/B11 and K42
Manual operation:	See "TPC Power Up Steps - Test Case 6.4.2" on page 341

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:CCODing:TYPE <Type>

Selects the channel coding scheme in accordance with the 3GPP specification.

Parameters:

<Type> M12K2 | M64K | M144k | M384k | AMR

M12K2 | M64K | M144K | M384K
Measurement channel with an input data bit rate of respectivelly 12.2 ksps, 64 ksps, 144 ksps and 384 ksps

AMR
Channel coding for the AMR Coder (coding a voice channel)

*RST: M12K2

Example: `BB:W3GP:TS25141:WSIG:DPDC:CCOD:TYPE M144K`
selects channel coding scheme RMC 144 kbps.

Options: Test cases 7.3, 8.x; minimum requirement: Options B13, B10/B11, K42 and K62; For additionally required options see selected test case

Manual operation: See "RMC - Receiver Tests" on page 296

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:DERRor:BIT:RATE <Rate>

Sets the bit error rate.

Parameters:

<Rate> float

*RST: 0.0

Example: `BB:W3GP:TS25141:WSIG:DPDC:DERR:BIT:RATE 1E-2`
sets a bit error rate of 0.01.

Options: Test cases 7.8, 8.6; minimum requirement: Options B13, B10/B11, K42 and K62. For additionally required options see selected test case

Manual operation: See "Bit Error Rate - Test Case 7.8" on page 314

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:DERRor:BLOCk:RATE <Rate>

Sets the block error rate.

Parameters:

<Rate> float

Range: 0 to 0.1
Increment: 0.001
*RST: 0.0

Example: `BB:W3GP:TS25141:WSIG:DPDC:DERR:BLOC:RATE 1E-2`
sets a bit error rate of 0.01.

Options: Test cases 7.8, 8.6; minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case

Manual operation: See "Block Error Rate - Test Case 7.8" on page 314

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:DPDCh:ORATe <ORate>

Sets the overall symbol rate.

Parameters:

<ORate> D15K | D30K | D60K | D120k | D240k | D480k | D960k | D1920k | D2880k | D3840k | D4800k | D5760k

15 ksps ... 6 x 960 ksps

*RST: D60K

Example: `BB:W3GP:TS25141:TCAS TC642`
selects the settings for test case 6.4.2, Power Control Steps.
`BB:W3GP:TS25141:WSIG:DPDC:ORAT D15K`
sets the overall symbol rate to 15 ksps. Only DPDCH1 is active, the symbol rate is 15 ksps and the channelization code is 64.

Options: Test case 6.4.2; Options B13, B10/B11, and K42

Manual operation: See "Overall Symbol Rate - Test Case 6.4.2" on page 340

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:FREQuency <Frequency>

The command sets the RF frequency of the wanted signal.

Parameters:

<Frequency> float

Range: 100E3 to 6E9
Increment: 0.01
*RST: 1.95E9

Example: `BB:W3GP:TS25141:WSIG:FREQ 2.5GHz`
sets a frequency of 2.5 GHz for the wanted signal.

Options: All test cases except for 6.6; minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case

Manual operation: See "Wanted Signal Frequency - Receiver Tests" on page 297

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:OBANd <OBand>

Selects the operating band of the base station for "Wideband Blocking". The operating band is required for calculation of power levels and interferer modulation.

Parameters:

<OBand> I | II | III | IV | V | VI

*RST: I

Example:
`BB:W3GP:TS25141:TCAS TC75`
selects the settings for test case 7.5, Blocking Characteristics.
`BB:W3GP:TS25141:EMOD STAN`
`BB:W3GP:TS25141:WSIG:BTYP WIDE`
selects blocking scenario wideband.
`BB:W3GP:TS25141:WSIG:OBAN III`
selects operating band III.

Options: Test case 7.5; Option B20x, two options B10/B11, B13 and K42 each.

Manual operation: See "Operating Band - Test Case 7.5" on page 304

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:PCPCh:CCODing:TYPE <Type>

Selects the Transport Block Size, 168 bits or 360 bits.

Parameters:

<Type> TB168 | TB360

*RST: TB168

Example:
`BB:W3GP:TS25141:TCAS TC893`
selects the settings for test case 8.9.3, Demodulation of CPCH Message in Static Propagation Conditions.
`BB:W3GP:TS25141:WSIG:PCPC:CCOD:TYPE TB168`
selects transport block size 168 bits.

Options: Test case 8.9.3; Option B20xs, and two option B13, B10/B11, and K42 each

Manual operation: See "Transport Block Size (TB) - Test Case 8.9.3" on page 336

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:POWer <Power>

Sets the RF level of the wanted signal.

Parameters:

<Power> float

Increment: 0.01
*RST: -110.3

Example:
`BB:W3GP:TS25141:WSIG:POW?`
queries the RF level of the wanted signal.
`Response: -103.1`
the RF level is -103.1 dBm

Options: Test cases 7.x, 8.x, 6.4.2; minimum requirement: Options B13, B10/B11 and K42. For additionally required options see selected test case

Manual operation: See "Wanted Signal Level - Receiver Tests" on page 297

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:PRACh:CCODing:TYPE <Type>

Selects the Transport Block Size to 168 bits or to 360 bits.

Parameters:

<Type> TB168 | TB360

*RST: TB168

Example: `BB:W3GP:TS25141:TCAS TC883`
selects the settings for test case 8.8.3, Demodulation of RACH Message in Static Propagation Conditions.
`BB:W3GP:TS25141:WSIG:PRAC:CCOD:TYPE TB168`
selects transport block size 168 bits.

Options: Test case 8.8.3; Option B20x, and two options B13, B10/B11, and K42 each

Manual operation: See "Transport Block Size - Test Case 8.8.x" on page 332

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:STATe <State>

Enables/disables the generation of the wanted signal.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 1

Example: `BB:W3GP:TS25141:TCAS TC892`
selects test case 8.9.2, CPCH Access Preamble and Collision Detection in Multipath Fading Case 3.
`BB:W3GP:TS25141:EMOD USER`
selects mode "User definable". Also settings that are not in compliance with the standard can be made.
`BB:W3GP:TS25141:WSIG:STAT OFF`
disables the generation of the wanted signal.

Options: Test cases 6.4.2, 7.3, 8.x; minimum requirement: Options B13, B10/B11, K62 and K42. For additionally required options see selected test case

Manual operation: See "Wanted Signal State - Receiver Tests" on page 296

[:SOURce]:BB:W3GPp:TS25141:WSIGnal:TRIGger[:EXTernal]:DELay <Delay>

Sets an additional propagation delay besides the fixed DL-UL timing offset of 1024 chip periods.

The additional propagation delay is obtained by charging the start trigger impulse with the respective delay.

Parameters:

<Delay> float

Range: 0 chips to 65535 chips

*RST: 0 chips

Example: `BB:W3GP:TS25141:TCAS TC642`

selects the settings for test case 6.4.2, Power Control Steps.

`BB:W3GP:TS25141:WSIG:TRIG:EXT:DEL 14`

sets a additional propagation delay of 14 chips.

Options: Test case 6.4.2. Options B13, B10/B11, and K42

Manual operation: See "Propagation Delay - Test Case 6.4.2" on page 340

A Reference

Supported channel types

Table 1-1: List of supported channel types and their sequence in the 3GPP FDD channel table

Index	Shortform	Name	Function	Optional Enhanced in BS1
0	P-CPICH	Primary Common Pilot Channel	• Specifies the scrambling code in the scrambling code group (2nd stage of scrambling code detection) • Phase reference for additional downlink channels • Reference for the signal strength	no
1	S-CPICH	Secondary Common Pilot Channel		no
2	P-SCH	Primary Sync Channel	Slot synchronization	no
3	S-SCH	Secondary Sync Channel	• Frame synchronization • Specifies the scrambling code group	no
4	P-CCPCH	Primary Common Control Phys. Channel	• Transfers the system frame number (SFN) • Timing reference for additional downlink channels • Contains the BCH transport channel	yes
5	S-CCPCH	Secondary Common Control Phys. Channel		no
6	PICH	Page Indication Channel	Transfers the paging indicator	no
7	AICH	Acquisition Indication Channel		no
8	AP-AICH	Access Preamble Acquisition Indication Channel		no
9 / 10	PDSCH	Phys. Downlink Shared Channel		no
	DL-DPCCH	Dedicated Physical Control Channel		
	HS-SCCH	High Speed Shared Control Channel		
	E-AGCH	E-DCH Absolute Grant Channel		
	E-RGCH	E-DCH Relative Grant Channel		
	E-HICH	E-DCH Hybrid ARQ Indicator Channel		
11 - 13	DPCH	Dedicated Phys. Channel	Transfers the user data and the control information	yes
	HS-SCCH	High Speed Shared Control Channel		no
	HS-PDSCH (QPSK)	High Speed Physical Downlink Shared Channel (QPSK)		no

Index	Shortform	Name	Function	Optional Enhanced in BS1
	HS-PDSCH (16 QAM)	High Speed Physical Downlink Shared Channel (16 QAM)		no
	HS-PDSCH (64 QAM)	High Speed Physical Downlink Shared Channel (64 QAM)		no
	HS-PDSCH (MIMO)	High Speed Physical Downlink Shared Channel (MIMO)		no
	E-AGCH	E-DCH Absolute Grant Channel		no
	E-RGCH	E-DCH Relative Grant Channel		no
	E-HICH	E-DCH Hybrid ARQ Indicator Channel		no
	F-DPCH	Fractional Dedicated Phys. Channel		no
14 - 138	DPCH	Dedicated Phys. Channel	Transfers the user data and the control information	no
	HS-SCCH	High Speed Shared Control Channel		
	HS-PDSCH (QPSK)	High Speed Physical Downlink Shared Channel (QPSK)		
	HS-PDSCH (16 QAM)	High Speed Physical Downlink Shared Channel (16 QAM)		
	HS-PDSCH (64 QAM)	High Speed Physical Downlink Shared Channel (64 QAM)		
	HS-PDSCH (MIMO)	High Speed Physical Downlink Shared Channel (MIMO)		
	E-AGCH	E-DCH Absolute Grant Channel		
	E-RGCH	E-DCH Relative Grant Channel		
	E-HICH	E-DCH Hybrid ARQ Indicator Channel		
	F-DPCH	Fractional Dedicated Phys. Channel		

Channel tables of the DPDCH and E-DPDCH

Table 1-2: Structure of the DPDCH channel table in conjunction with the overall symbol rate

Overall Symbol Rate	DPDCH 1	DPDCH 2	DPDCH 3	DPDCH 4	DPDCH 5	DPDCH 6
I or Q branch	I	Q	I	Q	I	Q
15 ksps	**State: ON** **S-Rate: 15k** **Ch. Code: 64**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF

Overall Symbol Rate	DPDCH 1	DPDCH 2	DPDCH 3	DPDCH 4	DPDCH 5	DPDCH 6
30 ksps	**State: ON** **S-Rate: 30k** **Ch. Code: 32**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF
60 ksps	**State: ON** **S-Rate: 60k** **Ch. Code: 16**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF
120 ksps	**State: ON** **S-Rate: 120k** **Ch. Code: 8**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF
240 ksps	**State: ON** **S-Rate: 240k** **Ch. Code: 4**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF
480 ksps	**State: ON** **S-Rate: 480k** **Ch. Code: 2**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF
960 ksps	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	State: OFF	State: OFF	State: OFF	State: OFF	State: OFF
2 x 960 ksps	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	State: OFF	State: OFF	State: OFF	State: OFF
3 x 960 ksps	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	State: OFF	State: OFF	State: OFF
4 x 960 ksps	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	State: OFF	State: OFF

Overall Symbol Rate	DPDCH 1	DPDCH 2	DPDCH 3	DPDCH 4	DPDCH 5	DPDCH 6
5 x 960 ksps	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	**State: ON** **S-Rate: 960k** **Ch. Code: 2**	State: OFF
6 x 960 ksps	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 1**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	**State: ON** **S-Rate: 960k** **Ch. Code: 3**	**State: ON** **S-Rate: 960k** **Ch. Code: 2**	**State: ON** **S-Rate: 960k** **Ch. Code: 2**

Table 1-3: Structure of the E-DPDCH channel table in conjunction with the overall symbol rate and no DPDCH active

Overall Symbol Rate	E-DPDCH 1	E-DPDCH 2	E-DPDCH 3	E-DPDCH 4
I or Q branch	**I**	**Q**	**I**	**Q**
15 Ksps	**State: ON** **S-Rate: 15 k** **Ch. Code: 64**	State: OFF	State: OFF	State: OFF
30 ksps	**State: ON** **S-Rate: 30 k** **Ch. Code: 32**	State: OFF	State: OFF	State: OFF
60 ksps	**State: ON** **S-Rate: 60 k** **Ch. Code: 16**	State: OFF	State: OFF	State: OFF
120 ksps	**State: ON** **S-Rate: 120 k** **Ch. Code: 8**	State: OFF	State: OFF	State: OFF
240 ksps	**State: ON** **S-Rate: 240 k** **Ch. Code: 4**	State: OFF	State: OFF	State: OFF
480 ksps	**State: ON** **S-Rate: 480 k** **Ch. Code: 2**	State: OFF	State: OFF	State: OFF
960 ksps	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	State: OFF	State: OFF	State: OFF
2 x 960 ksps	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	State: OFF	State: OFF

Overall Symbol Rate	E-DPDCH 1	E-DPDCH 2	E-DPDCH 3	E-DPDCH 4
I or Q branch	**I**	**Q**	**I**	**Q**
2 x1920 ksps	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF	State: OFF
2 x 960 ksps + 2 x 1920 ksps	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**
2 x 960 ksps, I only	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	State: OFF	State: OFF	State: OFF
2 x 960 ksps, Q only	State: OFF	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	State: OFF	State: OFF
2 x 1920 ksps, I only	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF	State: OFF	State: OFF
2 x 1920 ksps, Q only	State: OFF	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF	State: OFF
2 x 960 ksps + 2 x 1920 ksps, I only	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**	State: OFF
2 x 960 ksps + 2 x 1920 ksps, Q only	State: OFF	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF	**State: ON** **S-Rate: 960 k** **Ch. Code: 1**

Table 1-4: Structure of the E-DPDCH channel table in conjunction with the overall symbol rate and one DPDCH active

Overall Symbol Rate	E-DPDCH 1	E-DPDCH 2	E-DPDCH 3	E-DPDCH 4
Active HS-DPCCH? **I or Q branch**	**No** **Q**	**No** **I**	**Yes** **I**	**Yes** **Q**
15 ksps	**State: ON** **S-Rate: 15 k** **Ch. Code: 128**	State: OFF	**State: ON** **S-Rate: 15 k** **Ch. Code: 128**	State: OFF
30 ksps	**State: ON** **S-Rate: 30 k** **Ch. Code: 64**	State: OFF	**State: ON** **S-Rate: 30 k** **Ch. Code: 64**	State: OFF

Overall Symbol Rate	**E-DPDCH 1**	**E-DPDCH 2**	**E-DPDCH 3**	**E-DPDCH 4**
Active HS-DPCCH? **I or Q branch**	**No** **Q**	**No** **I**	**Yes** **I**	**Yes** **Q**
60 ksps	**State: ON** **S-Rate: 60 k** **Ch. Code: 32**	State: OFF	**State: ON** **S-Rate: 60 k** **Ch. Code: 32**	State: OFF
120 ksps	**State: ON** **S-Rate: 120 k** **Ch. Code: 16**	State: OFF	**State: ON** **S-Rate: 120 k** **Ch. Code: 16**	State: OFF
240 ksps	**State: ON** **S-Rate: 240 k** **Ch. Code: 8**	State: OFF	**State: ON** **S-Rate: 240 k** **Ch. Code: 8**	State: OFF
480 ksps	**State: ON** **S-Rate: 480 k** **Ch. Code: 4**	State: OFF	**State: ON** **S-Rate: 480 k** **Ch. Code: 4**	State: OFF
960 ksps	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	State: OFF	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	State: OFF
2 x 960 ksps	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**
2 x1920 ksps	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**
2 x 960 ksps, I only	State: OFF	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	State: OFF
2 x 960 ksps, Q only	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**	State: OFF	State: OFF	**State: ON** **S-Rate: 960 k** **Ch. Code: 2**
2 x 1920 ksps, I only	State: OFF	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF
2 x 1920 ksps, Q only	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**	State: OFF	State: OFF	**State: ON** **S-Rate: 1920 k** **Ch. Code: 1**

List of Commands

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