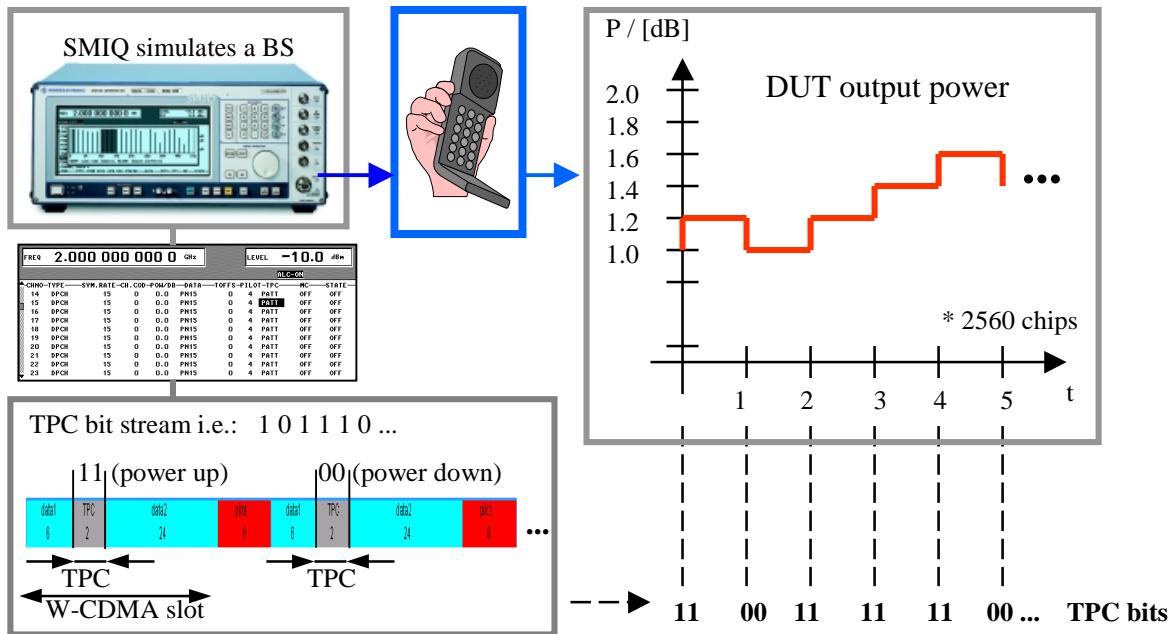


Misuse TPC in WCDMA/3GPP

First of all some words about TPC

TPC (“Transmit Power Control”) bits are used for W-CDMA to inform the called station if the transmit power has to be increased or decreased.

TPC symbol should be used to vary power level of the receiving station every time slot.



The TPC symbol is used to control the transmit power of the DUT. It is used for the downlink in DPCH, DL-DPCCH and for the uplink in DPCCH. A bit pattern for the sequence of TPC symbols can be indicated as a channel-specific pattern.

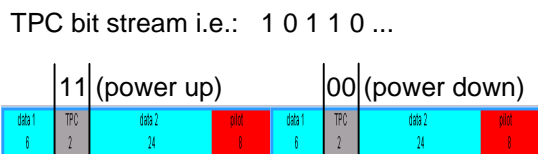
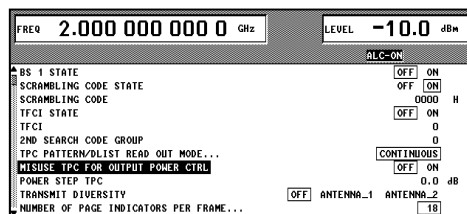
Misuse TPC

If the TPC function is misused, the given pattern is used to vary SMIQ’s transmitted code channel power over time. For each slot, one bit of this pattern is taken to increase (bit = 1) or decrease (bit = 0) the code channel power by the stated power step (POWER STEP TPC). The upper limit for the code channel power is 0 dB and the lower -60 dB.

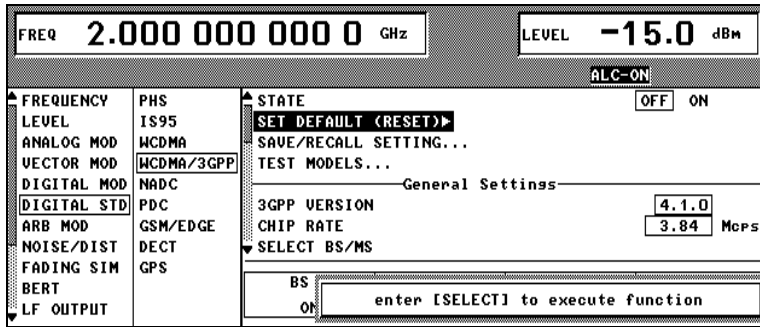
- TPC is artificially used to vary power in specific code channels.
- Requested by manufacturer to stress mobiles.
- Binary pattern varies code channel power between 0 and -60dB.
- Misuse TPC function is based on SMIQB45



SMIQ Misuse TPC settings



1

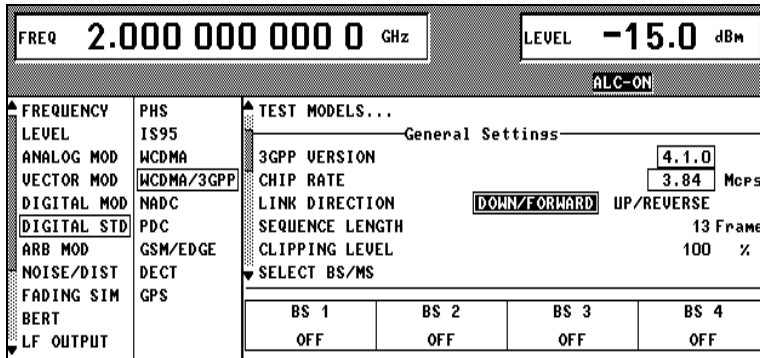


Start with SET DEFAULT (main menu)

In the following you will find guidelines for two different cases:

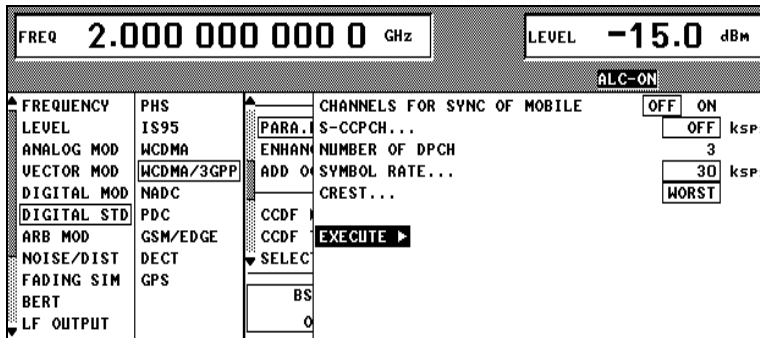
I. Downlink (BS => MS)

2



For the downlink case choose 13 frames sequence length.
Hint: the influence of the TPC settings can be better demonstrated on a oscilloscope with longer sequences.

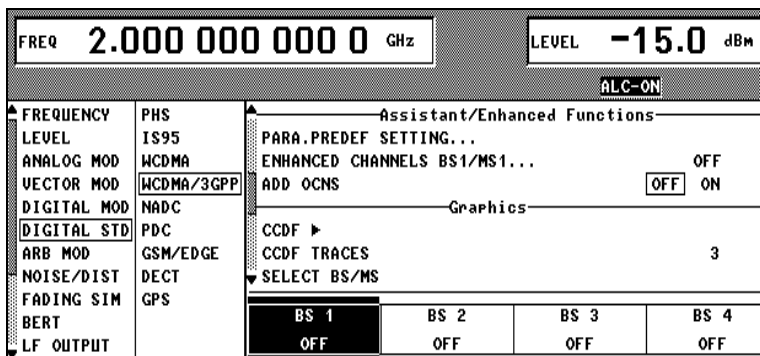
3



PARA. PREDEF SETTING... :

- Switch OFF the *CHANNELS FOR SYNC OF MOBILE* ("special channels" for synchronization: P-CPICH, P-SCH, S-SCH, P-CCPCH) and S-CCPCH
- Select the symbol rate of the DPCH
- Set 2 for *NUMBER OF DPCH*
- Select the optimization criterium WORST of the *CREST* Factor
- Select *EXECUTE* to finalize your entries
- Go back into SMIQ's W-CDMA main menu by pressing the RETURN key

3



Select BS1

4

- Switch BS1 STATE on
- Select CONTINUOUS in the TPC PATTERN READ OUT MODE
- Activate MISUSE TPC
- Adjust a POWER STEP TPC of +0.1dB

A TPC 1 leads to power up; a TPC 0 leads to power down with a step of 0.1 dB. In this example a 0 bit stream for the TPC pattern is generated (CONTINUOUS mode + TPC PATTERN = 0). This leads to a overall power reduction of 19.5dB for one code channel; 13 frames * 15 time slots * 0.1 dB = 19.5 dB.

5

CHNO	TYPE	SYM. RATE	CH. COD	POW/DB	DATA	TOFFS	PILOT	TPC	MC	STATE
5	S-CCPCH	15	0	0.0	PN15					OFF
6	PICH	15	0	0.0	PN15					OFF
7	AP-AICH	15	0	0.0				PATT		OFF
8	AICH	15	0	0.0				PATT		OFF
9	PDSCH	15	0	0.0	PN15					OFF
10	DL-DPCCH	7.5	0	0.0				PATT		OFF
11	DPCH	30	1	0.0	PN15	0	4	PATT	OFF	ON
TPC PATTERN										0000 Bin
12	DPCH	30	2	0.0	PN15	0	4	PATT	OFF	ON
13	DPCH	15	0	0.0	PN15	0	4	PATT	OFF	OFF

The default settings behind the "PATT" mode are 0 BIN.

6

Start the calculation with "STATE" on.

For showing the influence of the TPC settings connect the I/Q outputs of the SMIQ to the inputs of an oscilloscope.

For results have a look on the last page of this Getting Started paper.

II. Uplink (MS => BS)

2

For the uplink case choose 13 frames sequence length.

Hint: the influence of the TPC settings can be better demonstrated on a oscilloscope with longer sequences.

3

FREQ 2.000 000 000 0 GHz		LEVEL -15.0 dBm	
ALC-ON			
General Settings			
FREQUENCY	PHS	3GPP VERSION	4.1.0
LEVEL	IS95	CHIP RATE	3.84 Mcps
ANALOG MOD	WCDMA	LINK DIRECTION	DOWN/FORWARD
VECTOR MOD	WCDMA/3GPP	SEQUENCE LENGTH	1 Frame
DIGITAL MOD	NADC	CLIPPING LEVEL	100 %
DIGITAL STD	PDC	FILTER...	WCDMA 0.22
ARB MOD	GSM/EDGE	SELECT BS/MS	
NOISE/DIST	DECT	MS 1	MS 2
FADING SIM	GPS	OFF	OFF
BERT		MS 3	MS 4
LF OUTPUT		OFF	OFF

Select MS1

4

FREQ 2.000 000 000 0 GHz		LEVEL -15.0 dBm	
ALC-ON			
MS 1 STATE OFF ON			
MS MODE... DPCCH+DPDCH			
SCRAMBLING CODE MODE... LONG			
SCRAMBLING CODE 00 0000 H			
TPC... PATT			
TPC PATTERN 0 Bin			
TPC PATTERN/DLIST READ OUT MODE... CONTINUOUS			
DPCCH Settings			
POWER 0.0 dB			
DL-UL TIMING OFFSET 1024 Chip			
SLOT FORMAT 0 1 2 3 4 5			

- Switch the MS1 STATE to on
- Keep the default setting 0 for TPC PATTERN
- Select PATT for TPC... and CONTINUOUS in the TPC PATTERN READ OUT MODE

5

FREQ 2.000 000 000 0 GHz		LEVEL -15.0 dBm	
ALC-ON			
DPCCH Settings			
POWER 0.0 dB			
DL-UL TIMING OFFSET 1024 Chip			
SLOT FORMAT 0 1 2 3 4 5			
TFCI STATE OFF ON			
TFCI 0			
FBI MODE OFF 1_BIT 2_BIT			
FBI ALLO ALL1 PATT			
FBI PATTERN 0 Bin			
MISUSE TPC FOR OUTPUT POWER CTRL OFF ON			
TPC POWER STEP +0.1 dB			

Adjustments in the DPCCH Settings menu

- Activate MISUSE TPC
- Adjust a POWER STEP TPC of +0.1 dB.

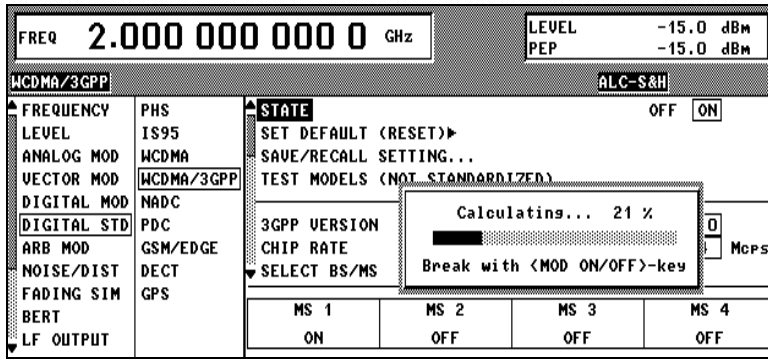
A TPC 1 leads to power up; a TPC 0 leads to power down with a step of 0.1 dB. In this example a 0 bit stream for the TPC pattern is generated (CONTINUOUS mode + TPC PATTERN = 0). This leads to a overall power reduction of 19.5dB for one code channel; 13 frames * 15 time slots * 0.1 dB = 19.5 dB.

6

FREQ 2.000 000 000 0 GHz		LEVEL -15.0 dBm	
ALC-ON			
TPC POWER STEP +0.1 dB			
DPDCH Settings			
ENHANCED CHANNELS... OFF			
OVERALL SYMBOL RATE... 4*960 ksps			
POWER 0.0 dB			
CHANNEL NUMBER	1	2	3
TYPE	DPDCH	DPDCH	DPDCH
SYMBOL RATE	960	960	960
CHAN CODE	1	1	3
DATA	PN15	PN15	PN15

For the DPDCH a symbol rate of 4*960 ksps is adjusted.

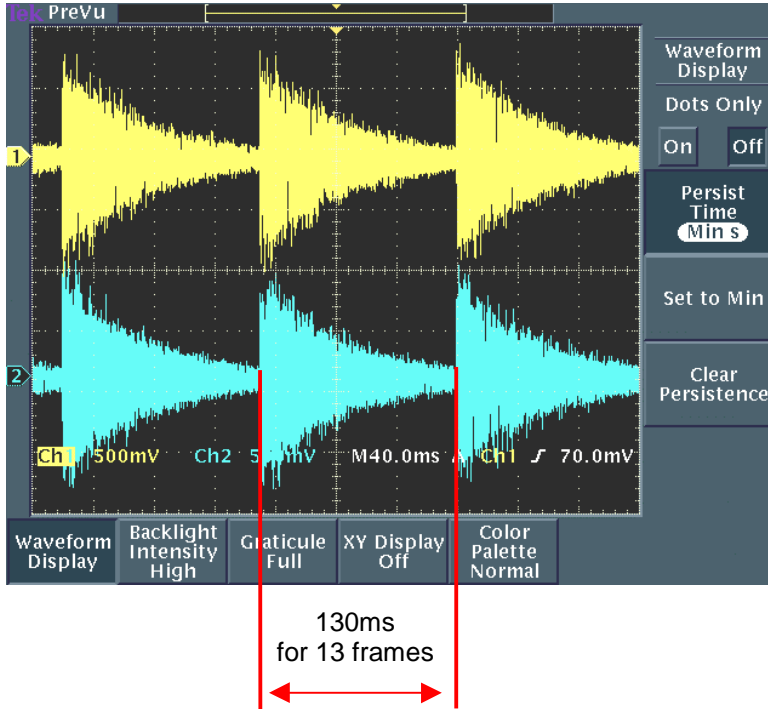
7



Start the calculation with “STATE” on.

For showing the influence of the TPC settings connect the I/Q outputs of the SMIQ to the inputs of an oscilloscope.

8



The oscilloscope display could look like this on the left side.

You can measure on the time axis 130 ms for 13 frames sequence length and the output power reduction over this time period.

Hint: The RMS output power (in the example above over a time period of 13 frames !) of the SMIQ is never influenced by the “Misuse TPC” settings. The signal with the “Misuse TPC” function is precalculated in this way so you will get out the same RMS power as without “Misuse TPC”.