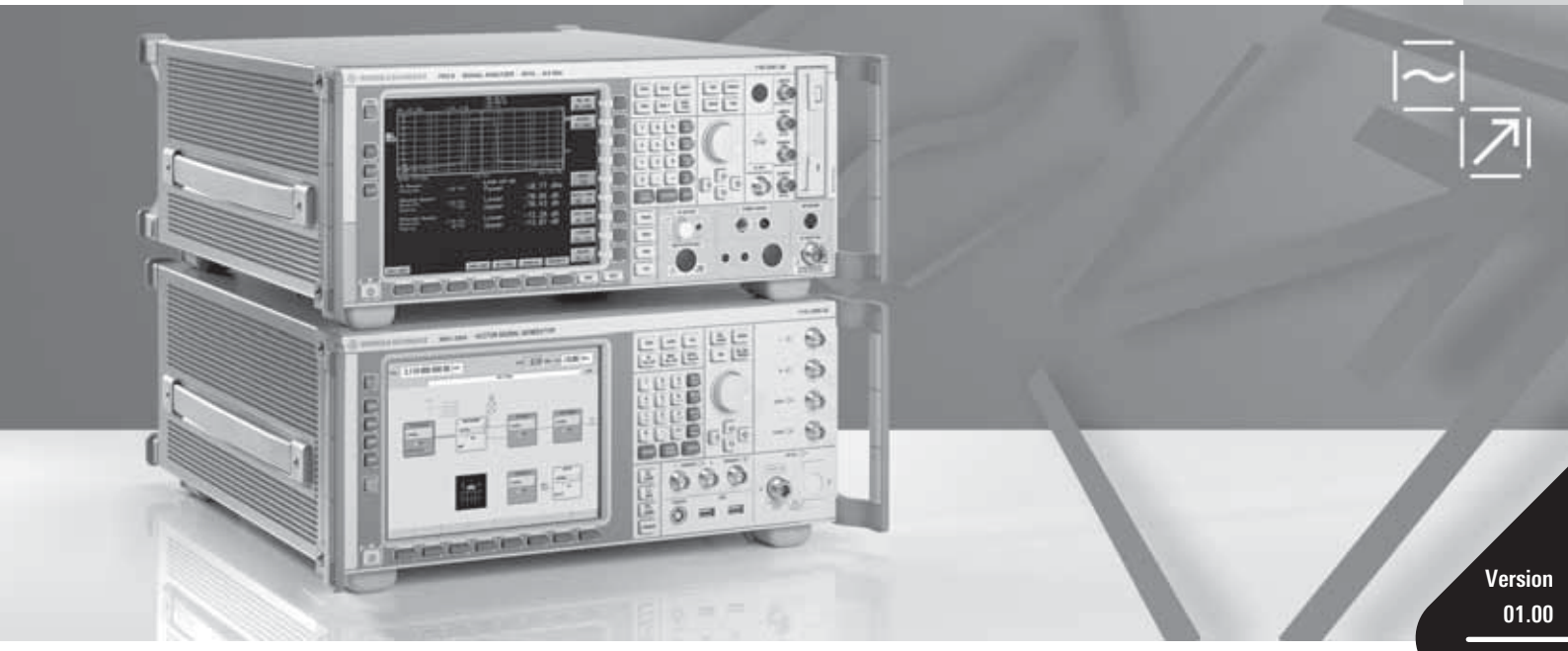
Specifications



Version 01.00

March 2005

WCDMA Base Station Test Set R&S®FSMU-W

Specifications

ROHDE&SCHWARZ

Key features of the R&S FSMU-W

The R&S FSMU-W test set includes the Vector Signal Generator R&S SMU200A and the Signal Analyzer R&S FSQ.
The R&S FSMU-W supports the 3GPP FDD test cases in accordance with TS 25.141 (base station conformance testing):

6.2 Base station output power

6.3 Frequency error

6.4 Output power dynamics

6.5 Output RF spectrum emissions

6.6 Transmit intermodulation

6.7 Transmit modulation

7.2 Reference sensitivity level

7.3 Dynamic range

7.4 Adjacent channel selectivity

7.5 Blocking characteristics

7.6 Intermodulation characteristics

7.7 Spurious emissions

7.8 Verification of the internal BER calculation

8.2 Demodulation in static propagation conditions

8.3 Demodulation of DCH in multipath fading conditions

8.4 Demodulation of DCH in moving propagation conditions

8.5 Demodulation of DCH in birth/death propagation conditions

8.6 Verification of the internal BLER calculation

8.8 RACH performance

8.9 CPCH performance

The specifications below apply to the R&S FSMU-W (R&S FSMU-W 3/8/26). They are based on the data sheet specifications of the Signal Analyzer R&S FSQ, of WCDMA 3GPP Application Firmware R&S FS-K72 (3GPP FDD Base Station Test) and R&S FS-K74 (3GPP FDD HSDPA Base Station Test) as well as on the data sheet specifications of the Vector Signal Generator R&S SMU200-A.

The R&S FSQ specifications apply under the following conditions: frequency lower than 3.6 GHz, 15 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to and internal calibration performed. Data with tolerances are measurement uncertainties with a confidence level of 95 %. The specified level measurement errors do not take into account systematic errors due to reduced S/N ratio.

The R&S SMU200-A specifications are valid under the following conditions: 30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to and all internal adjustments performed. Data designated "overrange" or "underrange" and data without tolerance limits are not binding.

Frequency and level

Basic functions	
R&S FSQ	see the R&S FSQ data sheet
R&S SMU200A	see the R&S SMU200A data sheet

R&S FSQ		
Frequency		
Frequency range	R&S FSMU-W3 (based on the R&S FSQ3)	20 Hz to 3.6 GHz
	R&S FSMU-W8 (based on the R&S FSQ8)	20 Hz to 8 GHz
	R&S FSMU-W26 (based on the R&S FSQ26)	20 Hz to 26.5 GHz
Level		
Max. input power	RF attenuator ≥10 dB	30 dBm
R&S SMU200A		
Frequency		
Frequency range	underrange	100 kHz to 300 kHz
		300 kHz to 3 GHz
Resolution of setting		0.01 Hz
Level		
Setting range		–145 dBm to +30 dBm
Max. level		+19 dBm (peak envelope power)
Level uncertainty	for levels >–120 dBm, attenuator mode "auto", temperature range 18 °C to 33 °C	<0.5 dB
Digital standard 3GPP FDD (option R&S SMU-K42)		
Error vector magnitude	1 DPCH, rms	<0.8 %, typ. 0.3 %
Adjacent channel leakage ratio (ACLR)	test model 1, 64 DPCHs with frequency options ≤3 GHz level ≤10.5 dBm PEP, ≤17.5 dBm PEP with options R&S SMU-B31/-B32/-B36/-B37 with frequency options >3 GHz level ≤5.5 dBm PEP ≤14.5 dBm PEP with options R&S SMU-B31/-B32/-B36/-B37 frequency 1800 MHz to 2200 MHz offset 5 MHz (baseband gain 3 dB) offset 10 MHz (baseband gain 6 dB)	 >67 dB, typ. 70 dB >72 dB, typ. 74 dB
Fading simulator (option R&S SMU-B14) and fading simulator extension (option R&S SMU-B15)		
Fading path loss	setting range resolution accuracy	0 dB to 50 dB 0.01 dB <0.01 dB
Additive white Gaussian noise (AWGN, option R&S SMU-K62)		
C/N, E_b/N_0	setting range resolution uncertainty for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	–30 dB to +30 dB 0.1 dB <0.1 dB
System bandwidth	(bandwidth for determining the noise power) range resolution	 1 kHz to 80 MHz 100 Hz

R&S SMU200A test case wizard

General settings		
Test case	in accordance with the following chapters of TS 25.141: 6.4.2 Power control steps 6.6 Transmit intermodulation 7.2 Reference sensitivity level 7.3 Dynamic range 7.4 Adjacent channel selectivity 7.5 Blocking characteristics 7.6 Intermodulation characteristics 7.8 Verification of internal BER 8.2/8.3/8.4/8.5 Demodulation of DCH in static propagation/fading case 1, 2, 3, 4/ moving propagation/birth-death propagation 8.6 Verification of internal BLER 8.8.1/8.8.2 RACH preamble detection in static propagation/fading case 3 8.8.3/8.8.4 Demodulation of RACH message in static propagation/fading case 3 8.9.1/8.9.2 CPCH access preamble and collision detection in static propagation/fading case 3 8.9.3/8.9.4 Demodulation of CPCH message in static propagation/fading case 3	
Edit mode		in accordance with standard, user-definable
Trigger configuration		auto (external trigger1), unchanged
Marker configuration		auto, unchanged
Diversity	test case 8.x	off, on
Baseband A signal routing	no diversity mode and R&S SMU200A option sufficient	to path and RF port A, to path and RF port B
Base station configuration		
Scrambling code	forward link reverse link	0 to 5FFF hex 0 to FF FFF hex
Scrambling mode	test case 6.6 other test cases	off, on off, short scrambling code (except PRACH), long scrambling code
Base station power class	in accordance with standard and test cases other than 6.6	wde area BS, medium range BS, local area BS
RF frequency	test case 6.6	depends on RF frequency range
Power	test case 6.6	depends on RF level range
Test case specifications		
Test case 6.4.2: Power control steps		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Wanted signal power level	user-definable	depends on RF level range
Slot format DPCCH #		0, 1, 2, 3, 4 and 5
Overall symbol rate DPDCH		15 ksps, 30 ksps, 60 ksps, 120 ksps, 240 ksps, 480 ksps, 960 ksps, 2 × 960 ksps, 3 × 960 ksps, 4 × 960 ksps, 5 × 960 ksps, 6 × 960 ksps
Power ratio DPCCH/DPDCH		–80 dB to +80 dB
Propagation delay	external trigger 1	0.0 chips to 65535 chips
TPC start pattern	in accordance with standard user-definable	maximum power less N steps maximum power less N steps, data list
Power up steps	TPC start pattern ‘Maximum Power Less N Steps’	0 to 1000
Power down steps	TPC start pattern ‘Maximum Power Less N Steps’	0 to 1000
Select data list	TPC start pattern ‘Data List’	user-defined
TPC repeat pattern	 also user-definable	single power steps, aggregated power steps, data list all 1 (maximum power) , all 0 (minimum power), user-defined pattern
Select data list	TPC repeat pattern ‘Data List’	user-defined
Pattern	TPC repeat pattern ‘User Defined Pattern’	

Test case 6.6: Transmit intermodulation		
Interferer signal state	in accordance with standard user-definable	on on, off
Interference model	in accordance with standard also user-definable	test model 1: 64 DPCHs test model 1: 16 channels, 32 channels test model 2: 16 channels test model 3: 16 channels, 32 channels test model 4: 38 channels test model 5: 8 channels, 28 channels, 38 channels
Frequency offset	in accordance with standard user-definable	–15 MHz, –10 MHz, –5 MHz, 5 MHz, 10 MHz, 15 MHz any offset value where limitations are set by RF options
Interferer level/wanted signal level	user-definable	
Test case 7.2: Reference sensitivity level		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	in accordance with standard user-definable	RMC 12.2 ksps RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Power level	user-definable	
Test case 7.3: Dynamic range		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	in accordance with standard user-definable	RMC 12.2 ksps RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Wanted signal power level	user-definable	depends on RF level range
AWGN state	in accordance with standard user-definable	on on, off
C/N	user-definable	
Test case 7.4: Adjacent channel selectivity		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	in accordance with standard user-definable	RMC 12.2 ksps RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Wanted signal power level	user-definable	depends on RF level range
Interferer state	in accordance with standard user-definable	on on, off
C/I	user-definable	
Frequency offset	in accordance with standard user-definable	–5 MHz or +5 MHz any offset value where limitations are set by RF options
Modulation	 also user-definable	3GPP uplink signal, QPSK signal (in accordance with 3GPP modulation)
Test case 7.5: Blocking characteristics		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	in accordance with standard user-definable	RMC 12.2 ksps RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Wanted signal power level	user-definable	depends on RF level range

Blocking scenario	in accordance with standard	wideband blocking, colocated BS blocking, narrowband blocking
Operating band	in accordance with standard and blocking scenario 'Wideband Blocking'	I: 1920 MHz to 1980 MHz II: 1850 MHz to 1910 MHz III: 1710 MHz to 785 MHz IV: 1710 MHz to 1755 MHz V: 824 MHz to 849 MHz VI: 830 MHz to 840 MHz
Interferer state	in accordance with standard user-definable	on on, off
Interferer power level	in accordance with standard and power class 'Medium Range BS' and blocking scenario 'Colocated BS Blocking' in accordance with standard and power class 'Local Area BS' and blocking scenario 'Colocated BS Blocking' user-definable	–3 dBm, +5 dBm, +8 dBm –7 dBm, –6 dBm, –4 dBm any level value where limitations are set by RF options
Frequency offset	in accordance with standard user-definable	any multiple of 1 MHz any offset value limitations are set by RF options
Modulation	user-definable	3GPP uplink signal, CW carrier, GMSK signal (270 833.3 Hz symbol rate), QPSK signal (in accordance with 3GPP modulation)
Test case 7.6: Intermodulation characteristics		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	in accordance with standard user-definable	RMC 12.2 ksps RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Wanted signal power level	user-definable	
Bandwidth type		wideband, narrowband
Interferer I (CW carrier) state	in accordance with standard user-definable	on on, off
Interferer I power level	user-definable	
Interferer I frequency offset	user-definable	Any offset value can be entered. Limitations depend on RF options and total baseband bandwidth.
Interferer II (modulated signal) state	in accordance with standard user-definable	on on, off
Interferer II power level	user-definable	
Interferer II frequency offset	user-definable	Any offset value can be entered. Limitations depend on RF options and total baseband bandwidth.
Interferer II modulation	user-definable	3GPP uplink signal, GMSK signal (270 833.3 Hz symbol rate), QPSK signal (in accordance with 3GPP modulation)
Test case 7.8: Verification of the internal BER calculation		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	in accordance with standard user-definable	RMC 12.2 ksps RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Wanted signal power level	user-definable	depends on RF level range
BER	in accordance with standard user-definable	0.00 or 0.01 any value from 0.001 to 0.100 (resolution 0.001)
BLER	user-definable	any value from 0.001 to 0.100 (resolution 0.001)

Test case 8.2.1: Demodulation of DCH in static propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps AMR 12.2
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
Eb/N0	user-definable	
AWGN power level	user-definable	
Test case 8.3.1: Demodulation of DCH in multipath fading conditions case 1		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps AMR 12.2 ksps
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
Eb/N0	user-definable	
AWGN power level	user-definable	
Test case 8.3.2 Demodulation of DCH in multipath fading conditions case 2		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Referencemeasurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps AMR 12.2 ksps
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
Eb/N0	user-definable	
AWGN power level	user-definable	
Test case 8.3.3 Demodulation of DCH in multipath fading conditions case 3		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps AMR 12.2 ksps
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01, <0.001
Eb/N0	user-definable	
AWGN power level	user-definable	
Test case 8.3.4 Demodulation of DCH in multipath fading conditions case 4		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps AMR 12.2 ksps
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01, <0.001
Eb/N0	user-definable	
AWGN power level	user-definable	

Test case 8.4: Demodulation of DCH in moving propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF Frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
AWGN state	in accordance with standard User-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
Eb/N0	user-definable	
AWGN power level	user-definable	
Test case 8.5: Demodulation of DCH in birth/death propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
Eb/N0	user-definable	
AWGN power level	user-definable	
Test case 8.6: Verification of the internal BLER calculation		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Reference measurement channel	also user-definable	RMC 12.2 ksps, RMC 64 ksps, RMC 144 ksps, RMC 384 ksps, AMR 12.2 ksps
Wanted signal power level	user-definable	depends on RF level range
BLER	in accordance with standard user-definable	0.00, 0.01 any value from 0.001 to 0.100 (resolution 0.001)
BER	user-definable	any value from 0.001 to 0.100 (resolution 0.001)
Test case 8.8.1: RACH preamble detection in static propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
AWGN state	in accordance with standard user-definable	on on, off
Required Pd	in accordance with standard	≥0.99, ≥0.999
AWGN power level	user-definable	
Ec/N0	user-definable	
Test case 8.8.2: RACH preamble detection in multipath fading case 3		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
AWGN state	in accordance with standard user-definable	on on, off
Required Pd	in accordance with standard	≥0.99, ≥0.999
AWGN power level	user-definable	
Ec/N0	user-definable	
Test case 8.8.3: Demodulation of RACH message in static propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Transport block size		168 bits, 360 bits
AWGN state	in accordance with standard user-definable	on on, off

Required BLER	in accordance with standard	<0.1, <0.01
AWGN power level	user-definable	
Eb/N0	user-definable	
Test case 8.8.4: Demodulation of RACH message in multipath fading case 3		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Transport block size		168 bits, 360 bits
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
AWGN power level	user-definable	
Eb/N0	user-definable	
Test case 8.9.1: CPCH access preamble and collision detection preamble detection in static propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
AWGN state	in accordance with standard user-definable	on on, off
Required Pd	in accordance with standard	≥0.99, ≥0.999
AWGN power level	user-definable	
Ec/N0	user-definable	
Test case 8.9.2: CPCH access preamble and collision detection preamble detection in multipath fading case 3		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
AWGN state	in accordance with standard user-definable	on on, off
Required Pd	in accordance with standard	≥0.99, ≥0.999
AWGN power level	user-definable	
Ec/N0	user-definable	
Test case 8.9.3: Demodulation of CPCH message in static propagation conditions		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Transport block size		168 bits, 360 bits
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
AWGN power level	user-definable	
Eb/N0	user-definable	
Test case 8.9.4: Demodulation of CPCH message in multipath fading case 3		
Wanted signal state	in accordance with standard user-definable	on on, off
RF frequency		depends on RF frequency range
Transport block size		168 bits, 360 bits
AWGN state	in accordance with standard user-definable	on on, off
Required BLER	in accordance with standard	<0.1, <0.01
AWGN power level	user-definable	
Eb/N0	user-definable	

Measurement uncertainties in accordance with TS 25.141

Transmitter tests

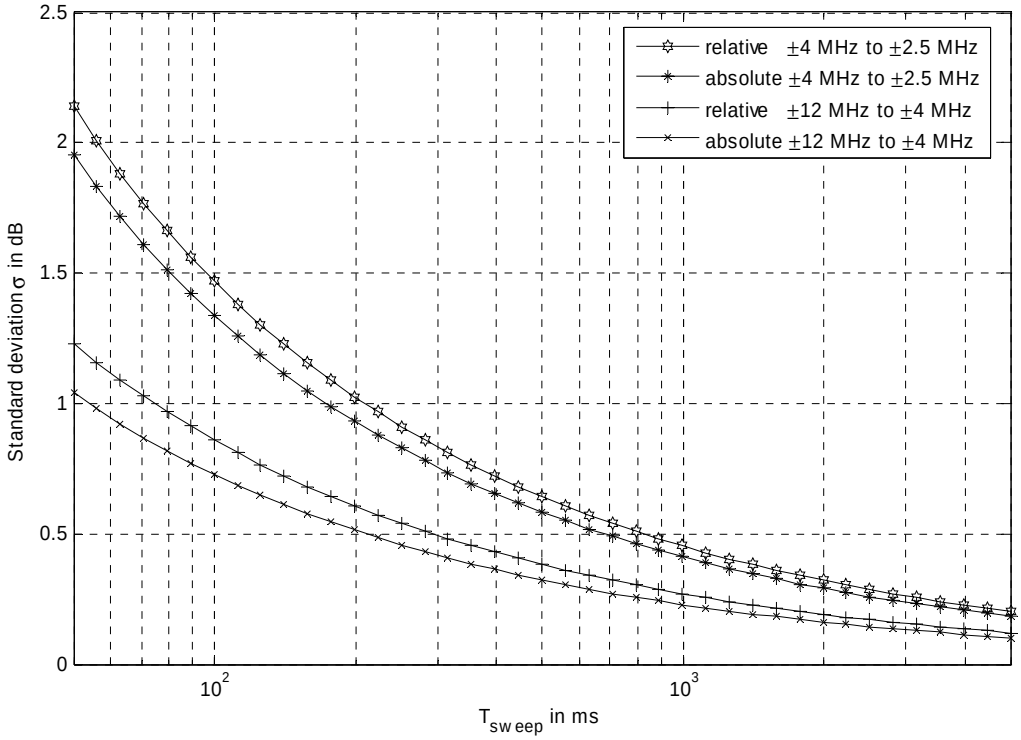
Specifications apply at frequencies lower than 3.6 GHz (R&S FSQ).

PMU = permissible measurement uncertainty in accordance with test specification 3GPP TS 25.141.

Test case 6.2.1: Base station output power		**R&S FSQ**	**PMU**
Level range		–70 dBm +30 dBm	
Level uncertainty	P_{total} > –60 dBm	<0.25 dB	<0.7 dB
Test case 6.2.2 CPICH power accuracy		**R&S FSQ**	**PMU**
Level range of total power	P_{total}	–40 dBm to +30 dBm	
Level range of CPICH	P_{CPICH}	–40 dB to 0 dB	
Level uncertainty (absolute power)	≥–10 dB ≥–20 dB ≥–30 dB ≥–40 dB	<0.26 dB (σ = 0.003) <0.27 dB (σ = 0.010) <0.32 dB (σ = 0.034) <0.45 dB (σ = 0.100)	<0.8 dB
Level uncertainty (relative power)	≥–10 dB ≥–20 dB ≥–30 dB ≥–40 dB	< 0.010 dB (σ = 0.003) < 0.020 dB (σ = 0.010) < 0.070 dB (σ = 0.034) < 0.200 dB (σ = 0.100)	<0.3 dB
Test case 6.3: Frequency error		**R&S FSQ**	**PMU**
Measurement range	CPICH synchronization	±5 kHz	<1 kHz
	SCH synchronization	±1.6 kHz	
Measurement uncertainty	S/N > 40 dB	<5 Hz + Δf_{ref}[1] (σ = 2 Hz)	<12 Hz + Δf_{ref}[1]
Test case 6.4.2 (test model 2): Power control steps		**R&S FSQ**	**PMU**
Level range		–40 dBm to +30 dBm	
Rel. level uncertainty	P_{dyn} ≤ 30 dB 1 × 1 dB step 1 × 0.5 dB step 10 × 1 dB steps 10 × 0.5 dB steps	 <0.03 dB (σ = 0.01dB) <0.03 dB (σ = 0.01dB) <0.03 dB (σ = 0.01dB) <0.03 dB (σ = 0.01dB)	 <0.1 dB <0.1 dB <0.1 dB <0.1 dB
Number of frames per measurement		100	—
Test case 6.4.3 (test model 2): Power control dynamic range		**R&S FSQ**	**PMU**
Level range (P_{total})		–40 dBm to +30 dBm	
Abs. level uncertainty	P_{total} > –40 dBm $P_{channel}$ ≥ –30 dB	<0.5 dB (σ = 0.07dB)	<1.1 dB
Rel. level uncertainty	P_{total} > –40 dBm $P_{channel}$ ≥ –30 dB	<0.3 dB (σ = 0.07dB)	<1.1 dB
Number of frames per measurement		100	
Test case 6.4.4: Total power dynamic range		**R&S FSQ**	**PMU**
Level range (P_{total})		–70 dBm to +30 dBm	
Level uncertainty	–70 dBm < P_{total} P_{dyn} < 30 dB	<0.07 dB (σ = 0.02dB)	<0.3 dB
Test case 6.5.1: Occupied bandwidth		**R&S FSQ**	**PMU**
Measurement uncertainty	P > –40 dBm span ≤ 10 MHz	< 38 kHz (σ = 18kHz)	<100 kHz
Test case 6.5.2.1: Spectrum emission mask		**R&S FSQ**	**PMU**
Dynamic range	P > –20dBm	69 dB	
Relative level uncertainty		<0.15 dB + 2σ (T_{sweep})[2]	<1.5 dB
Absolute level uncertainty		<0.4 dB + 2σ (T_{sweep})[2]	<1.5 dB

[1] Δf_{ref} – uncertainty of reference frequency.

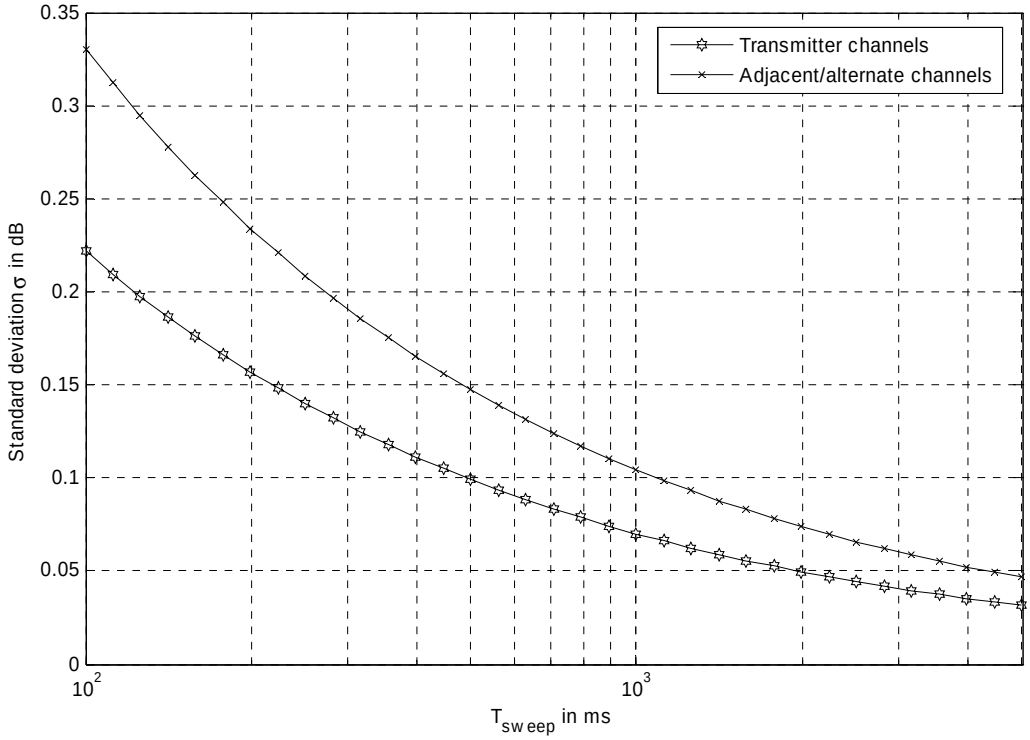
[2] The standard deviation σ (T_{sweep}) of Gaussian-distributed signals depends on the selected sweep time (T_{sweep}). Increasing the sweep time decreases the standard deviation (σ).



Deviation σ of spectrum emission mask measurement as a function of sweep time (T_{sweep})

Test case 6.5.2.2: Adjacent channel leakage ratio		**R&S FSQ**	**PMU**
Single carrier	**test model 1 with 64 DPCHs**	**carrier power >–10 dBm**	
Dynamic range	noise correction OFF 1**st** adjacent **2nd** adjacent noise correction ON **1st** adjacent **2nd** adjacent	 typ. 77 dB typ. 78 dB typ. 84 dB typ. 85 dB	
Two carriers			
Dynamic range	noise correction OFF **1st** adjacent **2nd** adjacent noise correction ON **1st** adjacent **2nd** adjacent	 typ. 74 dB typ. 78 dB typ. 82 dB typ. 84 dB	
Four carriers			
Dynamic range	noise correction OFF **1st** adjacent **2nd** adjacent noise correction ON **1st** adjacent **2nd** adjacent	 typ. 69 dB typ. 72 dB typ. 78 dB typ. 78 dB	
Measurement uncertainty		0.15 dB + 2σ(T_{sweep}) [3]	<0.8 dB

[3] The standard deviation σ (T_{sweep}) of Gaussian-distributed signals depends on the selected sweep time (T_{sweep}). Increasing the sweep time decreases the standard deviation (σ).



Standard deviation σ of adjacent channel leakage ratio measurement as a function of the selected sweep time (T_{sweep})

Test case 6.5.3: Spurious emissions		**R&S FSQ**	**PMU**
Measurement uncertainty	f < 10 MHz 10 MHz < f < 2.2 GHz 2.2 GHz < f < 3.6 GHz 3.6 GHz < f < 4 GHz 4 GHz < f < 8 GHz 8 GHz < f < 22 GHz	<0.5 dB (σ = 0.2 dB) <0.3 dB (σ = 0.1 dB) <0.3 dB (σ = 0.1 dB) <1.5 dB (σ = 0.5 dB) <1.5 dB (σ = 0.5 dB) <2.0 dB (σ = 0.7 dB)	<1.5 dB <1.5 dB <2.0 dB <2.0 dB <4.0 dB <4.0 dB
Test case 6.6: Transmit intermodulation		**R&S FSQ/R&S SMU200A**	**PMU**
Max. level	attenuator = 0 dB attenuator ≥ 10 dB	+20 dBm +30 dBm	—
Third order intercept (TOI)	300 MHz < f < 3.6 GHz	20 dBm	—
Level uncertainty	P > –120 dBm, 2.0 GHz < f < 2.3 GHz 6.2 GHz < f < 6.6 GHz 10.4 GHz < f < 11.0 GHz	 <0.3 dB (σ = 0.1 dB) <1.5 dB (σ = 0.5 dB) <2.0 dB (σ = 0.7 dB)	 <1.5 dB <4.0 dB <4.0 dB
Measurement	adjacent channel leakage spectrum emission mask spurious emissions		
Level uncertainty from R&S SMU200A	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode ‘auto’, temperature range 18 °C to 28 °C, f < 3GHz	typ. 0.7 dB	—
Test case 6.7.1: Composite EVM		**R&S FSQ**	**PMU**
Measurement range		1.5 % to 25 %	
Inherent EVM		<0.7 %	
Measurement uncertainty	test models 1 to 4 P > –40 dBm	<0.4 % (σ = 0.1 %)	<2.5 %

Test case 6.7.2: Peak code domain error power (PCDEP)		R&S FSQ	PMU
Measurement range	–50 dB to 0 dB	0 dB to –60 dB	
Inherent PCDEP		<–60 dB (σ = 0.5 dB)	
Measurement uncertainty	–30 dB < PCDEP –40 dB < PCDEP < –30 dB –50 dB < PCDEP < –40 dB –60 dB < PCDEP < –50 dB	<0.10 dB (σ = 0.02 dB) <0.20 dB (σ = 0.05 dB) <0.50 dB (σ = 0.15 dB) <1.00 dB (σ = 0.35 dB)	<1.0 dB <1.0 dB <1.0 dB <1.0 dB

Receiver tests

PMU = permissible measurement uncertainty in accordance with test specification 3GPP TS 25.141.

Note: Calculation uncertainty evaluations are based on TS 25.141 formula sqrt(wanted_level_error^2 + interferer_level_error^2).

Test case 7.2: Reference sensitivity level		R&S SMU200A	PMU
Level uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode 'auto', temperature range 18 °C to 28 °C, f < 3 GHz	typ. 0.7 dB	<0.7 dB
Test case 7.3: Dynamic range		**R&S SMU200A**	**PMU**
Level uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode 'auto', temperature range 18 °C to 28 °C and f < 3 GHz, system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	typ. 0.8 dB	<1.2 dB
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	—
Test case 7.4: Adjacent channel selectivity		**R&S SMU200A**	**PMU**
Level uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode 'auto', temperature range 18 °C to 28 °C and f < 3 GHz	typ. 0.7 dB	—
Test system uncertainty	typ. 0.7 dB wanted and interfering signal level uncertainty, eliminated ACLP by filtering interferer	typ. 0.99 dB	<1.1 dB
Test case 7.5: Blocking characteristics		**R&S SMU200A**	**PMU**
Level uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode 'auto', temperature range 18 °C to 28 °C and f < 3 GHz	typ. 0.7 dB	—
Test system uncertainty	typ. 0.7 dB wanted and interfering signal level uncertainty, eliminated ACLP by filtering interferer and broadband noise	typ. 0.99 dB	system error with blocking signal <15 MHz offset: <1.4 dB blocking signal ≥ 15 MHz offset and f ≤ 2.2 GHz: <1.1 dB + broadband noise 2.2 GHz < f ≤ 4 GHz: ±1.8 dB f > 4 GHz: ±3.2 dB

Test case 7.6: Intermodulation characteristics		**R&S SMU200A**	**PMU**
Level uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode 'auto', temperature range 18 °C to 28 °C and f < 3 GHz	typ. 0.7 dB	—
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.4 dB
Test system uncertainty	typ. 0.7 dB wanted and interfering signal level uncertainty, 0.1 dB C/N error for C/N uncertainty <0.1 dB, eliminated ACLP by filtering interferer and broadband noise	typ. 1.0 dB	<1.3 dB
Test case 7.7: Spurious emissions		**R&S FSQ**	**PMU**
Measurement uncertainty	P > –120 dBm f < 10 MHz 10 MHz < f < 2.2 GHz 2.2 GHz < f < 3.6 GHz 3.6 GHz < f < 4 GHz 4 GHz < f < 8 GHz 8 GHz < f < 22 GHz	 <0.5 dB (σ = 0.2 dB) <0.3 dB (σ = 0.1 dB) <0.3 dB (σ = 0.1 dB) <1.5 dB (σ = 0.5 dB) <1.5 dB (σ = 0.5 dB) <2.0 dB (σ = 0.7 dB)	 <1 dB <1 dB <1 dB — — —
Test case 7.8: Verification of the internal BER calculation		**R&S SMU200A**	**PMU**
Level uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode 'auto', temperature range 18 °C to 28 °C and f < 3 GHz	typ. 0.7 dB	—

Performance tests

Test case 8.2.1: Demodulation of DCH in static propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.4 dB
Test case 8.3.x: Demodulation of DCH in multipath fading conditions (case 1, 2, 3, 4)		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.6 dB
Test case 8.4: Demodulation of DCH in moving propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.6 dB
Test case 8.5: Demodulation of DCH in birth/death propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.6 dB

Test case 8.6: Verification of the internal BLER calculation		**R&S SMU200A**	**PMU**
C/N uncertainty	I/Q modulation bandwidth <10 MHz, level >–120 dBm, attenuator mode ‘auto’, temperature range 18 °C to 28 °C and f < 3GHz	typ. 0.7 dB	—
Test case 8.8.1: RACH preamble detection in static propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.4 dB
Test case 8.8.2: RACH preamble detection in multipath fading case 3		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.6 dB
Test case 8.8.3: Demodulation of RACH message in static propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.4 dB
Test case 8.8.4: Demodulation of RACH message in multipath fading case 3		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.6 dB
Test case 8.9.1: CPCH access preamble and collision detection preamble detection in static propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	—
Test case 8.9.2: CPCH Access preamble and collision detection preamble detection in multipath fading case 3		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	—
Test case 8.9.3: Demodulation of CPCH message in static propagation conditions		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.4 dB

Test case 8.9.4: Demodulation of CPCH message in multipath fading case 3		**R&S SMU200A**	**PMU**
C/N uncertainty	setting range: –30 dB to 30 dB resolution: 0.1 dB for system bandwidth = symbol rate, symbol rate <4 MHz, –24 dB < C/N < 30 dB and crest factor <12 dB	<0.1 dB	<0.6 dB

General data

Operating data of the R&S SMU200A

Power supply	input voltage range, AC, nominal	100 V to 240 V
	AC supply frequency	47 Hz to 63 Hz
	power factor correction	meets EN 61000-3-2
EMC		meets EN 55011 class B, EN 61326
Immunity to interfering field strength		up to 10 V/m
Environmental conditions	operating temperature range	5 °C to 45 °C meets EN 60068-2-1, EN 60068-2-2
	storage temperature range	–20 °C to +60 °C
	climatic resistance, 95 % rel. humidity, cyclic test at +25°C/+40°C	meets EN 60068-2-3, EN 60068-2-30
Mechanical resistance	vibration, sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz, 55 Hz to 150 Hz, 0.5 g const., meets EN 60068-2-6
	vibration, random	10 Hz to 300 Hz, acceleration 1.2 g (rms), meets EN 60068-2-64
	shock	40 g shock spectrum, meets EN 60068-2-27, MIL-STD-810E
Electrical safety		meets EN 61010-1
Dimensions (W × H × D)		435 mm x 192 mm x 460 mm
Weight	when fully equipped	25 kg
Recommended calibration interval		3 years

Operating data of the R&S FSQ

Power supply	AC supply	100 V to 240 V, 3.1 A to 1.3 A; 50 Hz to 400 Hz, class of protection I to VDE 411
Power consumption	R&S FSQ3, R&S FSQ8 R&S FSQ26, R&S FSQ40	typ. 130 VA typ. 150 VA
RFI suppression		meets EMC directive of EU (89/336/EEC) and German EMC legislation
Immunity to interfering field strength		
Environmental conditions	operating temperature range	+5 °C to +40 °C
	permissible temperature range	+0 °C to +50 °C
	climatic resistance, +40 °C at 95 % relative humidity	meets EN 60068-2-30
Mechanical resistance	sinusoidal vibration	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; meets DIN EN 60068-2-6: 1996-05, DIN EN 60068-2-30: 2000-02, DIN EN 61010-1, MIL-T-28800D, class 5
	random vibration	10 Hz to 100 Hz, acceleration 1 g (rms)
	shock	40 g shock spectrum, meets MIL-STD-810C and MIL-T-28800D, classes 3 and 5
Electrical safety		meets EN 61010-1, UL 3111-1, CSA C22.2 No. 1010-1, IEC 1010-1
Dimensions (W × H × D)		435 mm × 192 mm × 460 mm
Weight	R&S FSQ3 R&S FSQ8 R&S FSQ26 R&S FSQ40	14.6 kg 15.4 kg 16.5 kg 16.8 kg
Recommended calibration interval	operation with external reference operation with internal reference	2 years 1 year

Configuration of the R&S FSMU-W

Standard configuration

The R&S FSMU-W (standard configuration) includes the following:	
R&S FSQ	**Signal Analyzer**
R&S FSP-B10 R&S FS-K72 R&S FS-K74	External Generator Control Application Firmware (3GPP FDD WCDMA Base Station Test) Application Firmware (3GPP FDD HSDPA Base Station Test)
R&S SMU200A	**Vector Signal Generator**
R&S SMU-B103 R&S SMU-B11 R&S SMU-B13 R&S SMU-K42 R&S SMU-K43 R&S SMU-K62	RF Path 100 kHz to 3 GHz Baseband Generator Baseband Main Module Digital Standard 3GPP FDD 3GPP Enhanced MS/BS Tests incl. HSDPA Additive White Gaussian Noise
Documentation	
CD-ROM R&S FSMU-W Op. Man. R&S FSMU-W Op. Man. R&S FSQ Op. Man. R&S FS-K72/K74 CD-ROM R&S SMU200A Quick Start Guide R&S SMU200A	CD-ROM with demonstration programs and operating manuals for the R&S FSMU-W operating manual for the R&S FSMU-W operating manual for the Signal Analyzer R&S FSQ operating manual for WCDMA 3GPP Application Firmware R&S FS-K72/K74 CD-ROM with operating manuals for the Vector Signal Generator R&S SMU200A quick start guide for the Vector Signal Generator R&S SMU200A

Extension options

Type	**Consisting of**	**Description**
R&S FSMU-B1 Package for 2nd Signal Generator RF Path	R&S SMU-B203 R&S SMU-B13 R&S SMU-K62 R&S SMU-B36	2nd RF Path (3.0 GHz) Baseband Main Module Additive White Gaussian Noise High-Power Output
R&S FSMU-B2 Package for 2nd Signal Generator Baseband	R&S SMU-B11 R&S SMU-K42 R&S SMU-K43	Baseband Generator Digital Standard 3GPP FDD Enhanced MS/BS Tests incl. HSDPA
R&S FSMU-B3 Package for Fading	R&S SMU-B14 R&S SMU-B15 2 × R&S SMU-K71	Fading Simulator Fading Simulator Extension Dynamic Fading

Required options

Transmitter tests	
Test case 6.2.1: Base station maximum output power	R&S FSMU-W
Test case 6.2.2: CPICH power accuracy	R&S FSMU-W
Test case 6.3: Frequency error	R&S FSMU-W
Test case 6.4.2: Power control steps	R&S FSMU-W
Test case 6.4.3: Power control dynamic range	R&S FSMU-W
Test case 6.4.5: Total power dynamic range	R&S FSMU-W
Test case 6.5.1: Occupied bandwidth	R&S FSMU-W
Test case 6.5.2.1: Spectrum emission mask	R&S FSMU-W
Test case 6.5.2.2: Adjacent channel leakage ratio (ACLR)	R&S FSMU-W
Test case 6.5.3: Spurious emissions	R&S FSMU-W
Test case 6.6: Transmit intermodulation	R&S FSMU-W
Test case 6.7.1: Error vector magnitude (EVM)	R&S FSMU-W
Test case 6.7.2: Peak code domain error	R&S FSMU-W
Test case 6.7.3: Time alignment error in TX diversity	R&S FSMU-W[4]
Receiver tests	
Test case 7.2: Reference sensitivity level	R&S FSMU-W
Test case 7.3: Dynamic range	R&S FSMU-W
Test case 7.4: Adjacent channel selectivity	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B2
Test case 7.5: Blocking characteristics	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B2[5]
Test case 7.6: Intermodulation characteristics	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B2
Test case 7.7: Spurious emissions	R&S FSMU-W
Test case 7.8: Verification of internal BER calculation	R&S FSMU-W + R&S FSMU-B1
Performance tests	
Test case 8.2: Demodulation in static propagation conditions	R&S FSMU-W + R&S FSMU-B1
Test case 8.3: Demodulation of DCH in multipath fading conditions	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3
Test case 8.4: Demodulation of DCH in moving propagation conditions	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3
Test case 8.5: Demodulation of DCH in birth/death propagation conditions	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3
Test case 8.6: Verification of internal BLER calculation	R&S FSMU-W + R&S FSMU-B1
Test case 8.8.1: RACH preamble detection in static propagation conditions	R&S FSMU-W + R&S FSMU-B1[6]
Test case 8.8.2: RACH preamble detection in multipath fading case 3	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3[6]
Test case 8.8.3: Demodulation of RACH message in static propagation conditions	R&S FSMU-W + R&S FSMU-B1
Test case 8.8.4: Demodulation of RACH message in multipath fading case 3	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3
Test case 8.9.1: CPCH AP/CD preamble detection in static propagation condition	R&S FSMU-W + R&S FSMU-B1[6]
Test case 8.9.2: CPCH AP/CD preamble detection in multipath fading case 3	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3[6]
Test case 8.9.3: Demodulation of CPCH message in static propagation conditions	R&S FSMU-W + R&S FSMU-B1
Test case 8.9.4: Demodulation of CPCH message in multipath fading case 3	R&S FSMU-W + R&S FSMU-B1 + R&S FSMU-B3

[4] Measurement can be performed as a two-step measurement.

[5] Test case partly requires large offset frequencies of interfering signal beyond R&S SMU200A capabilities.

[6] Probability of false detection of preamble (Pfa) test is not supported.

Ordering information

Designation	Type	Order No
WCDMA Base Station Test Set		
Based on the Signal Analyzer R&S FSQ3, 3 GHz	R&S FSMU-W3	1166.1554.03
Based on the Signal Analyzer R&S FSQ8, 8 GHz	R&S FSMU-W8	1166.1554.08
Based on the Signal Analyzer R&S FSQ26, 26 GHz	R&S FSMU-W26	1166.1554.26
Options for the R&S FSMU-W		
Package for 2nd RF Path	R&S FSMU-B1	1404.2008.02
Package for 2nd Baseband	R&S FSMU-B2	1404.2308.02
Package for Fading	R&S FSMU-B3	1404.2608.02
Extension to the following standards		
GSM/EDGE	R&S FS-K5	1141.1496.02
	R&S SMU-K40	1160.7609.02
CDMA2000® [7]	R&S FS-K82	1157.2316.02
	R&S SMU-K46	1160.9876.02
1xEV-DO	R&S FS-K84	1157.2851.02
	R&S SMU-K17	1160.7009.02
TD-SCDMA	R&S FS-K76	1300.7291.02
	R&S SMU-K14[8]	1160.6202.02
Options for R&S SMU200A		
Multicarrier CW Signal Generation	R&S SMU-K61	1160.8505.02
Digital Standard CDMA2000® incl. 1xEV-DV	R&S SMU-K46[8]	1160.9876.02
Digital Standard IS-95	R&S SMU-K11[8]	1160.5335.02
Digital Standard 3GPP TDD	R&S SMU-K13[8]	1160.5906.02
Digital Standard TD-SCDMA	R&S SMU-K14[8]	1160.6202.02
Digital Standard IEEE 802.11(a/b/g)	R&S SMU-K19[8]	1160.8805.02
User-Defined OFDM signals	R&S SMU-K15[89]	1160.6402.02
Digital Standard 3GPP FDD incl. HSDPA	R&S SMU-K20[8]	1160.9460.02
Options for the R&S FSQ		
Noise Measurement Software	R&S FS-K3	1057.3028.02
Phase Noise Measurement Software	R&S FS-K4	1108.0088.02
AM/FM/φM Measurement Demodulator	R&S FS-K7	1141.1796.02
Bluetooth® [10] Transmitter Measurements	R&S FS-K8	1157.2568.02
Power Sensor Measurements	R&S FS-K9	1157.3006.02
Noise Figure and Gain Measurements	R&S FS-K30	1300.6508.02
Modulation and Code Domain Power Measurements to 3GPP TS 25.141 on Mobile Station Signals (UE)	R&S FS-K73	1154.7252.02
Modulation and Code Domain Power Measurements on TD-SCDMA Mobile Station Signals (UE)	R&S FS-K77	1300.8100.02
Modulation and Code Domain Power Measurements on CDMA2000®/1xEV-DV Mobile Station Signals (UE)	R&S FS-K83	1157.2416.02
Modulation and Code Domain Power Measurements on CDMA2000®1xEV-DV Mobile Station Signals (UE)	R&S FS-K85	1300.6689.02
Universal Vector Signal Analysis	R&S FSQ-K70	1161.8038.02
Modulation and Spectrum Measurements on WLAN Signals to 802.11a/b/g/j	R&S FSQ-K91	1157.3129.02

[7] CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA-USA).

[8] With WinIQSIM™.

[9] With WinIQOFDM.

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