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Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

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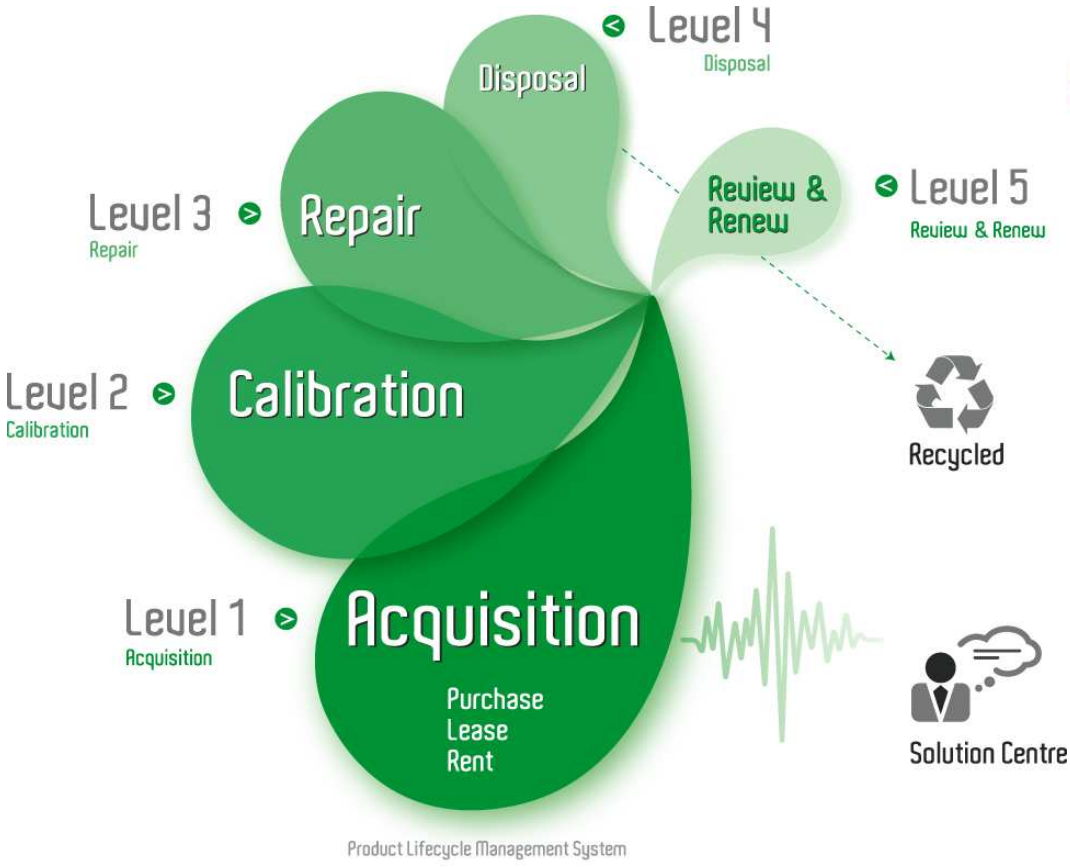

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R&S®WinIQSIM2™ Simulation Software

Data Sheet

ROHDE&SCHWARZ

CONTENT

Introduction

R&S®WinIQSIM2™ has been especially developed for easily generating digitally modulated signals. The graphical user interface allows intuitive operation, supported by context-sensitive help. By offering a convenient way to create any standard conform waveform with all the included standards and generating multicarrier signals as well as multisegment waveforms, R&S®WinIQSIM2™ is suitable for a wide range of applications.

The signals generated with the aid of the R&S®WinIQSIM2™ software can be output by the R&S®AFQ100A arbitrary waveform generator as well as the integrated solutions in the R&S®SMU200A (R&S®SMU-B9/-B10/-B11 options) and the R&S®SMJ100A (R&S®SMJ-B9/-B10/-B11 options) vector signal generators, in the R&S®AMU200A baseband signal generator and fading simulator. Some standards also work for the Wideband radio communication tester R&S®CMW500 and the WiMAX communication tester R&S®CMW270. R&S®WinIQSIM2™ is included with these arbitrary waveform generators free of charge; they can also be downloaded from www.rohde-schwarz.com – search item R&S®WinIQSIM2™.

Key features

Large variety of digital standards

- EUTRA/LTE
- GSM/EDGE
- 3GPP FDD with HSDPA and HSUPA
- CDMA2000® with 1xEV-DV
- 1xEV-DO Rev A
- TD-SCDMA
- IEEE 802.11(a/b/g) WLAN
- IEEE 802.11n WLAN
- IEEE 802.16 WiMAX supporting OFDM and OFDMA
- DVB-H

Additional systems in R&S®WinIQSIM2™

- Custom digital waveforms allow the generation of user-definable digital signals while offering user-selectable modulation parameters
- Multicarrier CW signal generation
- Multicarrier generation allow several digital signals to be combined to form one waveform with different frequency offsets
- Multisegment waveform function, allow to have multiple different waveforms in an arbitrary waveform generator's memory, ensuring minimum transition times, while even seamless transitions are possible
- AWGN generation and addition to the signal
- Import function to import I/Q samples via a server connection into the R&S®WinIQSIM2™ signal generation chain where filtering can be applied and AWGN can be added

Extended graphics

- I and Q versus time
- Absolute value and phase versus time
- Vector diagram
- Constellation diagram
- FFT magnitude shows the spectrum of the signal
- Eye diagram of I and Q
- CCDF (complementary cumulative distribution function)

Convenient connections

- Waveform transmission via GPIB, USB and LAN
- Waveforms can be locally stored on the PC; a USB memory stick can be used for data transmission
- Control of instruments via remote desktop connection via LAN

Options

All options from R&S®WinIQSIM2™ are available on the R&S®AFQ100A, R&S®AMU200A, R&S®SMU200A and R&S®SMJ100A.

The list below is valid for all these instruments. The short form xxx stands for R&S®AFQ, R&S®AMU, R&S®SMU and R&S®SMJ. The nomenclature of the different options is identical for all three instruments.

xxx-K240	GSM/EDGE digital standard
xxx-K242	3GPP FDD digital standard
xxx-K243	3GPP FDD enhanced MS/BS tests, incl. HSDPA
xxx-K245	HSUPA digital standard
xxx-K246	CDMA2000® digital standard incl. 1xEV-DV
xxx-K247	1xEV-DO digital standard
xxx-K248	IEEE 802.11(a/b/g) digital standard
xxx-K249	IEEE 802.16-2004 digital standard
xxx-K250	TD-SCDMA digital standard
xxx-K251	TD-SCDMA enhanced
xxx-K252	DVB-H digital standard
xxx-K254	IEEE 802.11 n digital standard
xxx-K255	EUTRA/LTE digital standard
xxx-K261	Multicarrier CW signal generation
xxx-K262	AWGN

A subset of options from R&S®WinIQSIM2™ is available on the R&S®CMW500:

R&S®CMW-KW200 GSM/EDGE (same feature set as xxx-K240)

R&S®CMW-KW400 WCDMA (same feature set as xxx-K242)

R&S®CMW-KW700 WiMAX (same feature set as xxx-K249)

R&S®CMW-KW750 TD-SCDMA (same feature set as xxx-K250)

R&S®CMW-KW800 CDMA2000® (same feature set as xxx-K246)

One option from R&S®WinIQSIM2™ is available on the R&S®CMW270:

R&S®CMW-KW700 WiMAX (same feature set as xxx-K249)

Specifications

Specifications apply under the following conditions: In line with the 3GPP standard, chip rates are specified in Mcps (million chips per second), whereas bit rates and symbol rates are specified in kbps (thousand bits per second) or ksps (thousand symbols per second). Mcps, kbps and ksps are not SI units.

I/Q baseband generator

Types of modulation	ASK	
	modulation index	0 % to 100 %
	resolution	0.1 %
	FSK	2FSK, 4FSK, MSK
	deviation	0.1 to 1.5 × f_{sym}
	maximum	10 MHz
	resolution	<0.1 Hz
	setting uncertainty	<0.5 %
	variable FSK	4FSK, 8FSK, 16FSK
	deviations	–1.5 × f_{sym} to +1.5 × f_{sym}
	maximum	10 MHz
	resolution	<0.1 Hz
	PSK	BPSK, QPSK, QPSK 45° offset, OQPSK, π/4-QPSK, π/2-DBPSK, π/4-DQPSK, π/8-D8PSK, 8PSK, 8PSK EDGE
	QAM	16QAM, 32QAM, 64QAM, 256QAM, 1024QAM
Coding	Not all coding methods can be used with every type of modulation.	OFF, Differential, Diff. Phase, Diff.+Gray, Gray, GSM, NADC, PDC, PHS, TETRA, APCO25 (PSK), PWT, TFTS, INMARSAT, VDL, EDGE, APCO25(FSK), ICO, CDMA2000®, WCDMA

Baseband filter	Any filter can be used with any type of modulation. The bandwidth of the modulation signal depends on the instrument for which the waveform is generated; the signal is clipped if the bandwidth is exceeded.	
	oversampling	2 to 32
	impulse length	1 to 128
	cosine, root cosine	
	filter parameter α	0.05 to 1.00
	Gaussian	
	filter parameter B × T	0.15 to 2.50
	cdmaOne, cdmaOne + equalizer	
	cdmaOne 705 kHz	
	cdmaOne 705 kHz + equalizer	
	CDMA2000® 3X	
	APCO25 C4FM	
	rectangular	
	split phase	
	filter parameter B × T	0.15 to 2.5
	dirac	(= no filter, only oversampling)
	resolution of filter parameter	0.01

Symbol rate	The symbol rate depends on the selected instrument. Example: With an R&S®SMU, the max. symbol rate is 60 Msps for linear modulation (like BPSK or 16QAM) and 20 Msps for an MSK (non-linear modulation).	
	resolution	0.001 Hz
Data sources	All0, All1	
	PRBS	9, 11, 15, 16, 20, 21, 23
	sequence length	1 bit to 64 bit
	pattern	
	length	1 bit to 64 bit
	data lists	8 bit to 2 Gbit
Marker outputs	number	4
	operating modes	control list, restart, pulse, pattern, ratio
Level reduction	setting range	0 dB to 60 dB
Burst	operating range	max. 5 MHz
	rise/fall time	
	setting range	0.5 symbol to 16 symbol
	resolution	0.1 symbol
	ramp shape	cosine, linear
Predefined settings	modulation, filter, symbol rate and coding in line with standard	
	standards	Bluetooth®, DECT, ETC, GSM, GSM EDGE, NADC, PDC, PHS, TETRA, WCDMA 3GPP, TD-SCDMA, CDMA2000® Forward, CDMA2000® Reverse, Worldspace

Digital modulation systems

The specified data applies together with the parameters of the relevant standard.

Digital standard GSM/EDGE (xxx-K240 or R&S®CMW-KW200 option)

GSM/EDGE digital standard		in line with GSM standard
Sequence length		
Modes	unframed	generation of a signal without slot and frame structure and power ramping, with symbol rate and filtering in line with GSM standard; MSK or 8PSK EDGE modulation can be selected
	framed (single)	configuration of a signal via frame structure (see frame structure below)
	framed (double)	configuration of simple multiframe
	application: simulation of modulation change in a slot versus time	scenarios by combining two frames (frame structure see below); a repetition factor can be specified for each of the two frames
Modulation		MSK, switchable to FSK with settable deviation for simulating frequency deviation errors 8PSK EDGE
Symbol rate	standard	270.833 kHz
	range	400 Hz to 300 kHz
Baseband filter	GSM, standard	Gaussian with B × T = 0.3
	range	B × T = 0.15 to 2.5
	EDGE, standard	Gaussian linearized (EDGE)
Frame structure	Change between GSM and EDGE possible from slot to slot and frame to frame; half rate and GPRS at the physical layer. Slots 0 to 7 of the frames are user-defined for uplink and downlink. In the normal burst half-rate mode, the burst parameters can be defined independently for two users that alternate from frame to frame.	
	burst types	normal (full rate) normal (half rate) EDGE synchronization frequency correction (normal + compact) dummy access all data (GSM) all data (EDGE)

Burst rise/fall time	standard	in line with GSM power time template
	selectable	
	ramp time	0.3 symbol to 4 symbol
	ramp delay	–1.0 symbol to 1.0 symbol
	rise delay	–9 symbol to 9 symbol
	fall delay	–9 symbol to 9 symbol
Settable slot attenuation		0.0 dB to 60.0 dB, 8 different levels simultaneously possible (full level and 7 attenuated levels)
Burst ON/OFF ratio		>100 dB
Data sources	for characteristics of data sources, see section I/Q baseband generator	
	internal data sources	
Training sequence	for normal burst (full rate), normal burst (half rate), EDGE burst	TSC0 to TSC7 user TSC
	for sync burst	standard CTS compact user
	for access burst	TS0 to TS2
Markers		convenient graphics editor for defining marker signals; in addition: frame, multiple frame slot, multiple slot pulse pattern ON/OFF ratio
Phase error	MSK, Gaussian filter B × T = 0.3	
	rms	<0.4°, typ. 0.15°
	peak	<1.2°, typ. 0.4°

WCDMA 3GPP FDD digital standard (xxx-K242 or R&S®CMW-KW400 option)

WCDMA 3GPP FDD digital standard	in line with 3GPP standard, release 6	
Signal generation modes/sequence length	In downlink mode, the P-CCPCH (BCCH with running SFN), several DPCHs and all other channels (frame-cycle control channels such as SCH, OCNS simulation, other base stations, etc) can be generated. In uplink mode, up to 4 user-configured mobile stations (PRACH, PCPCH or DPCCH and up to 6 DPDCHs) together with up to 64 of identical mode can be simulated. The sequence length can be entered in frames (10 ms each); the max. length depends on oversampling. With an oversampling of 2, the user has 13.65 frames/Msample. Example: If an R&S®SMU-B10 with 64 Msamples memory is selected and an oversampling of 2 is applied, R&S®WinIQSIM2™ can generate 873 frames.	
Enhanced channels	special capabilities in up to 4 channels of base station 1, on downlink and in all channels of mobile station 1, on uplink: channel coding, simulation of bit and block errors	
Modulation		BPSK (uplink)
		QPSK (downlink)
		16QAM (downlink HSDPA)
Test models	downlink (in line with TS 25.141)	test model 1 with 16/32/64 channels
		test model 2
		test model 3 with 16/32 channels
		test model 4
		test model 5 with 8/4/2 HS-PDSCH channels
	uplink (not standardized)	DPCCH + 1 DPDCH at 60 ksps
		DPCCH + 1 DPDCH at 960 ksps
Generate waveform file	filtering of data generated in ARB mode and saving as waveform file	
Enhanced component		
Channel coding	coding of up to 4 enhanced channels in line with the definition of reference measurement channels in TS 25.101, TS 25.104 and TS 25.141; in addition, user-configurable channel coding for each enhanced channel station	
	predefined channel coding schemes for uplink and downlink	RMC 12.2 kbps
		AMR 12.2 kbps
		RMC 64 kbps
		RMC 144 kbps
		RMC 384 kbps
	possible settings of user-configurable channel coding	
	transport channels	1 DCCH
		up to 6 DTCHs
	transport block size	1 to 4096
	transport blocks	1 to 16
	rate matching attribute	16 to 1024
	transport time interval	10 ms, 20 ms, 40 ms
	CRC size	none, 8, 12, 16, 24
	error protection	none, convolutional coding rate 1/3, convolutional coding rate 1/2, turbo coding rate 1/3
	interleaver 1/2 state	ON/OFF

Applications	BER measurements in line with TS 25.101/104/141 (radio transmission and reception), e.g.	
	adjacent channel selectivity	
	blocking characteristics	
	intermodulation characteristics	
	BLER measurements in line with TS 25.101/104 (radio transmission and reception)	demodulation of dedicated channel under static propagation conditions
		test of decoder in receiver
Bit error insertion	deliberate generation of bit errors by impairing the data stream prior to channel coding or at the physical layer	
	bit error ratio	0.5 to 10^{-7}
Application	verification of internal BER calculation in line with TS 25.141 (BS conformance testing)	
Block error insertion	deliberate generation of block errors by impairing the CRC during coding of enhanced channels	
	block error ratio	0.5 to 10^{-4}
Application	verification of internal BLER calculation in line with TS 25.141 (BS conformance testing)	
Add OCNS	simulation of orthogonal background and interfering channels of a base station in line with TS 25.101 The power of the OCNS channels is configured automatically so that the total power of the BS is 1.	
Applications	testing the receiver of the mobile station under real conditions; measuring the maximum input level in line with TS 25.101	
Additional mobile stations	simulation of up to 64 mobile stations in addition to the 4 user-configurable mobile stations; the additional mobile stations use different scrambling codes	
Parameters	number of additional mobile stations	1 to 50
	scrambling code step	1 to 1000 hex
	power offset	–20 dB to 20 dB
Applications	base station tests under real receive conditions	
General settings		
Chip rate	standard	3.840 Mcps (15 slots/frame)
Link direction		uplink (reverse link) and downlink (forward link)
Baseband filter	standard	$\sqrt{\cos}$, α = 0.22
	other filters	$\sqrt{\cos}$, cos, user filters
Clipping	setting of clipping value relative to highest peak in percent; clipping takes place prior to baseband filtering; clipping reduces the crest factor	
	modes	vector |i + j q| scalar |i|, |q|
	clipping level	1 % to 100 %
Code channels	downlink	up to 512 data channels (plus special channels) divided among up to 4 base stations (BS) of 128 code channels each
	uplink	up to four user-configurable mobile stations (MS) and 64 additional MS of identical configuration in each of the modes PRACH only, PCPCH only, DPCCH + DPDCHs

Parameters of every BS		
State		ON/OFF
Scrambling code		0 to 5FFF hex
2nd search code group		0 to 63
Page indicators per frame		18, 36, 72, 144
Time delay	The signals of the various base stations are delayed against each other.	0 chip to 38400 chips
Transmit diversity	The output signal can be generated either for antenna 1 or 2, as defined in the standard.	OFF/antenna 1/antenna 2
Physical channels in 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 physical channel (P-CCPCH)	
	secondary common control physical channel (S-CCPCH)	
	page indication channel (PICH)	
	access preamble acquisition indication channel (AP-AICH)	
	collision detection acquisition indication channel (AICH)	
	physical downlink shared channel (PDSCH)	
	dedicated physical control channel (DL-DPCCH)	
	dedicated physical channel (DPCH)	
	high-speed shared control channel (HS-SCCH)	
	high-speed physical downlink shared channel (HS-PDSCH), modulation QPSK or 16QAM	
Parameters of every downlink code channel that can be set independently		
State		ON/OFF
Slot format	depending on physical channel type	0 to 16
Symbol rate	depending on physical channel type	7.5 ksps to 960 ksps
Channelization code	value range depending on physical channel type and symbol rate	0 to 511
Power		–80 dB to 0 dB
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit) data lists
Multicode state		ON/OFF
Timing offset	time offset that can be separately set for each code channel	0 to 150 (in units of 256 chips)
Pilot length	depending on symbol rate	2 bit, 4 bit, 8 bit, 16 bit
Pilot power offset	power offset of pilot field against data fields	–10 dB to 10 dB
TPC pattern		All0, All1, pattern (length 1 bit to 32 bit), data lists
TPC pattern readout mode	application mode for TPC pattern	continuous, single + All0, single + All1, single + alt. 01, single + alt. 10
Use of TPC for dynamic output power control	If this function is active, the TPC pattern is used to vary the transmit power of the code channels versus time.	
	state	ON/OFF
	output power control step	–10 dB to +10 dB
TPC power offset	power offset of TPC field relative to data fields	–10 to +10 dB
TFCI state		ON/OFF
TFCI		0 dB to 1023 dB

TFCI power offset	power offset of TFCI field relative to data fields	–10 dB to +10 dB
Parameters of every MS		
State		ON/OFF
Mode		PRACH only, PCPCH only, DPCCH + DPDCHs
Scrambling code		0 to FF FFFF hex
Scrambling code mode		long, short
Time delay	The signals of the various mobile stations are delayed against each other.	0 chip to 38400 chips
Physical channels in uplink		
	physical random access channel (PRACH)	
	physical common packet channel (PCPCH)	
	dedicated physical control channel (DPCCH)	
	dedicated physical data channel (DPDCH)	
PRACH only mode		
Submodes	preamble only	only preambles are generated
	application	detection of RACH preamble in line with TS 25.141
	standard	The message part of the PRACH is generated in addition to a settable number of preambles. It can also be channel-coded.
	application	demodulation of RACH message part in line with TS 25.141
Frame structure		preamble(s), message part consisting of data and control component
Slot format		0 to 3
Symbol rate		15 ksps, 30 ksps, 60 ksps, 120 ksps
Preamble part power		–80 dB to 0 dB
Preamble power step		0 dB to 10 dB
Preamble repetition		1 to 10
Data part power		–80 dB to 0 dB
Control part power		–80 dB to 0 dB
Signature		0 to 15
Access slot		0 to 14
AICH transmission timing		0 (3 access slots) or 1 (4 access slots)
Message part length		1, 2 frames
TFCI		0 to 1023
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit), data lists
Channel coding	reference measurement channel for UL RACH in line with TS 25.141	
	state	ON/OFF
	transport block size	168, 360
PCPCH only mode		
Submodes	preamble only	only preambles are generated
	application	detection of CPCH preamble in line with TS 25.141
	standard	The message part of the PCPCH is generated in addition to a settable number of preambles. It can also be channel-coded.
	application	demodulation of CPCH message part in line with TS 25.141

Frame structure		access preamble(s), collision detection preamble, power control preamble, message part consisting of data and control component
Slot format control part		0 to 2
Symbol rate		15 ksps, 30 ksps, 60 ksps, 120 ksps, 240 ksps, 480 ksps, 960 ksps
Preamble part power		–80 dB to 0 dB
Preamble power step		0 dB to 10 dB
Preamble repetition		1 to 10
Data part power		–80 dB to 0 dB
Control part power		–80 dB to 0 dB
Signature		0 to 15
Access slot		0 to 14
AICH transmission timing		0 (3 access slots) or 1 (4 access slots)
Message part length		1 frame to 10 frames
Power control preamble length		0, 8 slots
FBI state		OFF/1 bit/2 bit
FBI pattern		pattern (length 1 bit to 32 bit)
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit) data lists
Channel coding	reference measurement channel for UL CPCH in line with TS 25.141	
	state	ON/OFF
	transport block size	168, 360
DPCCH + DPDCH only mode		
DPCCH	dedicated physical control channel	
Symbol rate		15 ksps
Power		–80 dB to 0 dB
Channelization code		0, fixed
FBI state		OFF/1 bit/2 bit
FBI pattern		pattern (length 1 bit to 32 bit)
TFCI state		ON/OFF
TFCI		0 to 1023
TPC pattern		All0, All1, pattern (length 1 bit to 32 bit), data lists
TPC pattern readout mode	application mode for TPC pattern	continuous, single + All1, single + All1, single + alt. 01, single + alt. 10
Use TPC for dynamic output power control	If this function is active, the TPC pattern is used to vary the transmit power of the code channels of the MS versus time.	
	state	ON/OFF
	output power control step	–10 dB to +10 dB

DPDCH	dedicated physical data channel	
Overall symbol rate	total symbol rate of all uplink DPDCHs	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
Active DPDCHs	depending on overall symbol rate	1 to 6
Symbol rate	depending on overall symbol rate	fixed for active DPDCHs
Channelization code	depending on overall symbol rate	fixed for active DPDCHs
Channel power	common for all DPDCHs	–80 dB to 0 dB
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit) data lists
Graphical display		domain conflicts, code domain, channel graph, slot structure and formats offered in graphics block

3GPP FDD enhanced BS/MS test including HSDPA (xxx-K243 option)

One xxx-K242 option must be installed.

General parameters	This option extends the xxx-K242 (3GPP FDD digital standard) to full HSDPA support. Therefore, all general parameters of the xxx-K242 such as modulation are also valid for the xxx-K243.	
Downlink simulation		
HSDPA channels (HS-SCCH, HS-PDSCH and F-DPCH)		
Enhancements	The xxx-K242 supports simulation of HDSPA channels in a continuous mode needed for TX measurements in line with TS 25.141 (test model 5). The xxx-K243 now supports simulation of HS-SCCH (high speed shared control channel) and HS-PDSCH (high speed physical downlink shared channel) in line with TS 25.211. This implies the correct timing between these channels as well as the possibility to set start subframe and inter-TTI distance.	
Application	In addition, several F-DPCHs (fractional dedicated physical channel) can be generated.	
	RX measurements on 3GPP FDD UE with correct timing	
Ranges (valid for HS-SCCH and HS-PDSCH)	HSDPA mode	continuous, subframe 0 to subframe 4 (where first packet is sent), H set
	inter-TTI distance	1 to 16
	burst mode	ON: DTX between two HS-PDSCH packets
		OFF: transmission of dummy data between two HS-PDSCH packets
Fixed reference channel definition H set		
Enhancements	The xxx-K243 allows the generation of HSDPA downlink channels with channel coding in line with the definition of the fixed reference channels (H set) in TS 25.101; in addition, user-configurable bit/block error insertion.	
Ranges	H set	H set 1 to 6
	slot format	QPSK, 16QAM (H set 1 to 3)
	RV parameter	0 to 7
	UEID	0 to 65535
	bit error insertion	0.5 to 10^{-7} (insertion prior to channel coding or at the physical layer)
	block error insertion	0.5 to 10^{-4}
Uplink simulation		
HS-DPCCH (high speed dedicated physical control channel)		
Enhancements	The xxx-K242 does not support HSDPA for uplink. The xxx-K243 now allows the simulation of an HS-DPCCH (high speed dedicated physical control channel) in every UE.	
Application	TX measurements on 3GPP FDD UE supporting HSDPA	
	RX measurements on 3GPP FDD Node Bs supporting HDSPA	
Ranges	power	–80 dB to 0 dB
	start delay	101 to 250 (in units of 256 chips)
	inter-TTI distance	1 subframe to 16 subframes
	CQI pattern	up to 10 CQI values sent periodically, support of DTX
	ACK/NACK pattern	up to 32 ACK/NACK commands sent periodically, support of DTX

3GPP FDD enhanced BS/MS test including HSUPA (xxx-K245 option)

One xxx-K242 option must be installed.

General parameters	This option extends the xxx-K242 (3GPP FDD digital standard) to full HSUPA support. Therefore, all general parameters of the xxx-K242 such as modulation are also valid for the xxx-K245.	
Downlink simulation		
HSUPA channels (E-AGCH, E-RGCH, E-HICH, F-DPCH)		
Enhancements	The xxx-K245 in downlink supports simulation of HSUPA control channels E-AGCH (E-DCH absolute Grant channel), E-RGCH (E-DCH relative Grant channel) and E-HICH (E-DCH hybrid ARQ indicator channel) together with several F-DPCHs (fractional dedicated physical channel) in line with TS 25.211.	
Application	RX measurements on 3GPP FDD UE with correct timing	
Ranges (valid for E-RGCH and E-HICH)	type of cell	serving cell, non-serving cell
	E-DCH TTI	2 ms, 10 ms
	signature sequence index	0 to 9 (in line with TS 25.211)
	relative Grant pattern	up to 32 UP/DOWN/HOLD commands sent periodically
	ACK/NACK pattern	up to 32 ACK/NACK commands sent periodically
Uplink simulation		
E-DPCCH (E-DCH dedicated physical control channel), E-DPDCH (E-DCH dedicated physical data channel)		
Enhancements	The xxx-K245 allows the simulation of an E-DPCCH (E-DCH dedicated physical control channel) and up to four E-DPDCHs (E-DCH dedicated physical data channel) with channel coding in line with the definition of the fixed reference channels in TS 25.104 and TS 25.141.	
Application		RX measurements on 3GPP FDD Node Bs supporting HSUPA
E-DPCCH		
Power		–80 dB to 0 dB
Retransmission sequence number		0 to 3
E-TFCI information		0 to 127
Happy bit		0, 1
E-DCH TTI		2 ms, 10 ms
DTX pattern		up to 32 TX/DTX commands sent periodically
E-DPDCH		
Overall symbol rate	total symbol rate of all uplink E-DPDCHs	15 ksps, 30 ksps, 60 ksps, 120 ksps, 240 ksps, 480 ksps, 960 ksps, 2 × 960 ksps, 2 × 1920 ksps, 2 × 960 ksps + 2 × 1920 ksps
Active E-DPDCHs	depending on overall symbol rate	1 to 4
Symbol rate	depending on overall symbol rate	fixed for active E-DPDCHs
Channelization code	depending on overall symbol rate	fixed for active E-DPDCHs
Channel power	separately for each E-DPDCH	–80 dB to 0 dB
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit) data lists
E-DCH TTI		2 ms, 10 ms
DTX pattern		up to 32 TX/DTX commands sent periodically

HSUPA FRC	channel coding in line with the definition of fixed reference channels in TS 25.104 and TS 25.141; in addition, user-configurable “virtual HARQ mode” and bit/block error insertion	
Fixed reference channel (FRC)	predefined channel coding schemes	FRC 1 to 7
DTX pattern		up to 32 TX/DTX commands sent periodically
HARQ ACK/NACK pattern	individual ACK/NACK pattern for each HARQ process	up to 32 ACK/NACK commands sent periodically
Bit error insertion	deliberate generation of bit errors by impairing the data stream prior to channel coding or at the physical layer	
	bit error ratio	0.5 to 10^{-7}
Application	verification of internal BER calculation in line with TS 25.141 (BS conformance testing)	
Block error insertion	deliberate generation of block errors by impairing the CRC during coding of enhanced channels	
	block error ratio	0.5 to 10^{-4}
Application	verification of internal BLER calculation in line with TS 25.141 (BS conformance testing)	

CDMA2000® digital standard incl. 1xEV-DV (xxx-K246 or R&S®CMW-KW800 option)

CDMA2000® digital standard	release C	in line with 3GPP2 C.S0002-C
Sequence length	The sequence length of the ARB component can be entered in frames (80 ms each) the max. length depends on chip rate, mode and oversampling. With an oversampling of 2 the user has 5.33 frames/Msample. Example: If an R&S®SMU-B10 with 64 Msamples memory is selected and an oversampling of 2 is applied, R&S®WinIQSIM2™ can generate 341 frames.	
Chip rates	standard	1.2288 MHz (1X)
Mode		1X direct spread (spreading rate 1)
Link direction		forward link and reverse link
Baseband filter	standard for reverse link	cdmaOne
	standard for forward link	cdmaOne + equalizer
	for enhanced ACLR	
	reverse link	cdmaOne 705 kHz
	forward link	cdmaOne 705 kHz + equalizer
Code channels	reverse link	4 base stations with a maximum of 78 code channels each (depending on radio configuration)
	forward link	4 mobile stations with a maximum of 8 code channels each (depending on radio configuration)
Clipping level	setting of a limit value relative to the highest peak in percent; limitation is effected prior to baseband filtering and reduces the crest factor	value range 1 % to 100 %
Generate waveform file		filtering of data generated in ARB mode and saving as waveform file
Parameters of every BS		
State		ON/OFF
Time delay	timing offset of signals of individual base stations	BS1: 0 chip (fixed)
		BS2 to BS4: 0 chip to 98304 chips
PN offset		0 to 511
Transmit diversity	If this function is activated, the output signal can be generated for either antenna 1 or 2, as defined in the standard.	OFF/antenna 1/antenna 2
Diversity mode		OTD/STS
Quasi-orthogonal Walsh sets		set 1 to set 3

Parameters of every forward link code channel that can be set independently		
State		ON/OFF
Channel types	forward link	forward pilot (F-PICH)
		transmit diversity pilot (F-TDPICH)
		auxiliary pilot (F-APICH)
		auxiliary transmit diversity pilot (F-ATDPCH)
		sync (F-SYNC)
		paging (F-PCH)
		broadcast (F-BCH)
		quick paging (F-QPCH)
		common power control (F-CPCCH)
		common assignment (F-CACH)
		common control (F-CCCH)
		packet data control (F-PDCCH)
		packet data (F-PDCH)
		traffic channel
		fundamental (F-FCH)
		supplemental (F-SCH)
		dedicated control (F-DCCH)
Radio configuration	chip rate 1.2288 Mcps (1X)	RC 1 to RC 5 and RC 10
Frame length	depending on channel type and radio configuration	5 ms, 10 ms, 20 ms, 40 ms, 80 ms, 160 ms
Data rate	depending on channel type and radio configuration	1.2 kbps to 1036.8 kbps
Walsh code	depending on channel type and radio configuration	0 to 127
Quasi-orthogonal code		ON/OFF
Power		–80 dB to 0 dB
Data		All0, All1, pattern (length up to 64 bit), PN 9 to PN 23, data lists
Long code mask		0 to 3FF FFFF FFFF hex
Power control data source		All0, All1, pattern (length up to 64 bit), data list
(Mis)use for output power control	If this function is active, the power control data is used to vary the transmit power of the code channels versus time.	
	state	ON/OFF
	output power control step	–10 dB to +10 dB
Channel coding	All stages of channel coding specified by IS-2000 (e.g. frame quality indicator, convolutional encoder/turbo coder, symbol puncture and interleaver) are available. All frame length and data rate combinations are supported. 4 options are available:	
	OFF	channel coding OFF
	complete	channel coding completely on
	without interleaving	channel coding on but without interleaver
	interleaving only	channel coding OFF, only interleaver is active

Parameters of every MS		
State		ON/OFF
Radio configuration	chip rate 1.2288 Mcps (1X)	RC 1 to RC 4
Channel coding	All stages of channel coding specified by IS-2000 (e.g. frame quality indicator, convolutional encoder, symbol puncture and interleaver) are available. All frame length and data rate combinations are supported. 4 options are available:	
	OFF	channel coding OFF
	complete	channel coding completely on
	without interleaving	channel coding on but without interleaver
	interleaving only	channel coding OFF, only interleaver is active
Operation mode	simulates MS operation mode and defines available channels	traffic
		access
		enhanced access
		common control
Long code mask		0 to 3FF FFFF FFFF hex
Power control data source	In reverse link, the power control data is used only for the misuse mode.	All0, All1, pattern (length up to 64 bit), data list
(Mis)use for output power control	If this function is active, the power control data is used to vary the transmit power of the code channels versus time.	
	state	ON/OFF
	output power control step	–10 dB to +10 dB
Parameters of every reverse link code channel that can be set independently		
State		ON/OFF
Channel types	reverse link	reverse pilot (R-PICH)
		access (R-ACH)
		enhanced access (R-EACH)
		reverse common control (R-CCCH)
		reverse dedicated control (R-DCCH)
		traffic channel
		fundamental (R-FCH)
		supplemental code (R-SCCH)
		supplemental (R-SCH)
Frame length	depending on channel type and radio configuration	5 ms, 10 ms, 20 ms, 40 ms, 80 ms
Data rate	depending on channel type and radio configuration	1.2 kbps to 1036.8 kbps
Power		–80 dB to 0 dB
Data		All0, All1, pattern (length up to 64 bit), PN 9 to PN 23, data lists

1xEV-DO digital standard (xxx-K247 option)

1xEV-DO digital standard	release A	in line with 3GPP2 C.S0024-A 3.0
Chip rates	standard	1.2288 MHz (1X)
	range	1 MHz to 5 MHz
Link direction		forward link and reverse link
Sequence length	sequence length entered in slots (1.67 ms each), max. length depending on ARB memory size	
Baseband filter	standard for reverse link	cdmaOne
	standard for forward link	cdmaOne + equalizer
	for enhanced ACLR:	
	reverse link	cdmaOne 705 kHz
	forward link	cdmaOne 705 kHz + equalizer
Traffic channels	forward link	One base station generates up to 4 independent traffic channels for different users.
	reverse link	Up to 4 completely independent access terminals can be simulated.
Clipping level	Setting of a limit value relative to the highest peak in percent. Limitation is effected prior to baseband filtering and reduces the crest factor.	value range 1 % to 100 %
Generate waveform file	filtering of data generated in ARB mode and saving it as waveform file	
PN offset		0 to 511
System time		0 to 2199023255551
Forward link parameters		
Physical layer subtype		0&1 or 2
Continuous pilot mode	transmits pilot and a set of MAC channels only	ON/OFF
Control channel	state	ON/OFF
	data rate	38.4 kbps or 76.8 kbps
	packet start offset	0 – 3
Reverse activity bit (MAC)	state	ON/OFF
	level	–25.0 dB to –7.0 dB
	length (subtype 0&1 only)	8, 16, 32, 64
	offset	0 to 7
Other users count	simulates additional MAC users	1 to 110
Settings for each forward link traffic channel		
State		ON/OFF
Number of packets to send		0 to 65536 or infinite
Packet start offset		0 to 255
Rate index		1 to 12
Packet size	for subtype 0&1 the packet size depends on the rate index only	128 bit to 12288 bit
Data rate	depending on rate index and packet size	4.8 kbps to 3072.0 kbps
Slot count	depending on rate index and packet size	1 to 16
Data pattern		32 bit value
MAC index	subtype 0&1: subtype 2:	5 to 63 6 to 127
MAC level		–25.0 dB to –7.0 dB
Interleave factor		1 to 4
RPC modes		Hold, All Up, All Down, Range, Pattern

DRC lock (MAC)	state	ON/OFF
	period, subtype 0&1:	0, 8, 16
	period, subtype 2:	0, 4
	length	1, 4, 8, 16, 32
	frame offset	0 to 15
H-ARQ mode	subtype 2 only	OFF, ACK, NAK
Settings for each reverse link access terminal in traffic mode		
Physical layer subtype		0&1 or 2
Disable quad. spreading		ON/OFF
Long code mask I		0 to 3FFF FFFF FFF
Long code mask Q		0 to 3FFF FFFF FFF
Pilot channel gain		–80.0 dB to +10.0 dB
Auxiliary pilot channel	subtype 2 only	
	state	ON/OFF
	relative gain	–80.0 dB to +10.0 dB
	minimum payload	128 bit to 12288 bit
RRI channel	state	ON/OFF
	relative gain (subtype 2 only)	–80.0 dB to +10.0 dB
DSC channel	subtype 2 only	
	state	ON/OFF
	relative gain	–80.0 dB to +10.0 dB
	length	8 to 256 slots
	values	up to 16 octal values
DRC channel	state	ON/OFF
	relative gain	–80.0 dB to +10.0 dB
	length	1, 2, 4, 8 slots
	values	up to 16 hexadezimal values
	cover	0 to 7
	gating	ON/OFF
ACK channel	state	ON/OFF
	relative gain	–80.0 dB to +10.0 dB
	mode	BPSK / OOK (subtype 2 only)
	gating	can be set individually per slot, up to 16 values possible
	values	up to 16 binary values
Data channel	number of individual packets	1 (subtype 0&1) / 1 v 3 (subtype 2)
	relative gain	–80.0 dB to +10.0 dB
	number of packets to send	0 to 65536 or infinite
	subpackets (subtype 2 only)	1 to 4
	payload size	128 bit to 12288 bit
	modulation, subtype 0&1	BPSK
	modulation, subtype 2	B4, Q4, Q2, Q4Q2, E4E2
	channel coding	ON/OFF
	data source	All0, All1, pattern (length 1 bit to 64 bit), PN 9 to PN 23, data lists
	append FCS	ON/OFF

Settings for each reverse link access terminal in access mode		
Physical layer subtype		0&1 or 2
Disable quad. spreading		ON/OFF
Long code mask I		0 to 3FFF FFFF FFF
Long code mask Q		0 to 3FFF FFFF FFF
Preamble length		1 to 7 frames
Access cycle duration		1 to 255 slots
Access cycle offset		0 to 12 slots
Pilot channel gain		–80.0 dB to +10.0 dB
Data channel	state	ON/OFF
	relative gain	–80.0 dB to +10.0 dB
	capsule length	1 to 15 frames
	data rate	9.6 kbps, 19.2 kbps, 38.4 kbps
	data source	All0, All1, pattern (length 1 bit to 64 bit), PN 9 to PN 23, data lists
	append FCS	ON/OFF

IEEE 802.11a/b/g digital standard (xxx-K248 option)

IEEE 802.11 a/b/g digital standard	in line with IEEE 802.11a-1999, IEEE 802.11b-1999, IEEE 802.11g-2003	
General settings		
Modes	unframed	generation of a non-packet-oriented signal without frame structure, with the modulation modes and data rates defined by the IEEE 802.11 standard
	framed	generation of a sequence of data packets with the frame structure defined by the standard, interrupted by an idle time
Sequence length	1 frame to over 1024 frames (depending on frame duration, idle time and memory of destination instrument) With an oversampling of 2, an idle time of 0.1 ms, OFDM 801.11g, 54 Mbit/s, the user has 94.98 frames/Msample. Example: If an R&S®SMU-B10 with 64 Msamples memory is selected and the above values are applied, R&S®WinIQSIM2™ can generate 6078 frames.	
Marker modes		restart, frame start, frame active part, pulse, pattern, ON/OFF ratio
Parameters in framed mode		
Idle time	time between two successive packets (PPDUs)	
	range	0 s to 10000 µs
Clipping		vector or scalar clipping, applied before filtering
MAC header		activating and configuring the MAC header with the parameters frame control, duration/ID, address 1 to 4 and sequence control
Frame check sequence		activating or deactivating a 32 bit (4 byte) check sum for protecting the MAC header and the user data (frame body)
Settings for CCK (IEEE 802.11b/IEEE 802.11g)		
Chip rate	standard	11 Mcps
Baseband filter		spectral mask in line with IEEE 802.11b-1999 wireless LAN MAC and PHY specifications – chapter 18.4.7.3
Parameters in framed mode		
PLCP preamble and header format		long PLCP and short PLCP
PSDU bit rate		1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps
PSDU modulation	depending on PSDU bit rate	DBPSK, DQPSK, CCK
PSDU data length	length of user data field in bytes of the packet to be transferred	
	range	0 byte to 4095 byte
Scrambling		data scrambling can be activated or deactivated
Parameters in unframed mode		
PSDU bit rate		1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps
PSDU modulation	depending on PSDU bit rate	DBPSK, DQPSK, CCK
Scrambling		data scrambling can be activated or deactivated

Settings for OFDM (IEEE 802.11a/IEEE 802.11g)		
Kernel sample rate	standard	20 Msample/s
Baseband filter		spectral mask in line with IEEE 802.11b-1999 wireless LAN MAC and PHY specifications – chapter 17.3.9.6.2
Parameters in framed mode		
PLCP preamble and header format		long PLCP and short PLCP
PLCP signal field		automatically calculated
PSDU bit rate		6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps
PSDU modulation	depending on PSDU bit rate	BPSK, QPSK, 16QAM, 64QAM
PSDU data length	length of user data field in bytes of the packet to be transferred	
	range	0 byte to 4095 byte
Number of data symbols	number of OFDM symbols in data portion of packet	0 byte to 100000 byte
Scrambling		data scrambling can be activated or deactivated; initial scrambler state can be set randomly or to a user-defined value
Interleaver		can be activated or deactivated
Time domain windowing	transition times	0 s to 1000 ns
Service field		user-defined service field value supported
Parameters in unframed mode		
PSDU bit rate		6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps
PSDU modulation	depending on PSDU bit rate	BPSK, QPSK, 16QAM, 64QAM
PSDU data length	length of user data field in bytes of the packet to be transferred	
	range	0 byte to 2312 byte
Number of data symbols	number of OFDM symbols to be generated	directly proportional to PSDU data length
Scrambling		data scrambling can be activated or deactivated; initial scrambler state can be set randomly or to a user-defined value
Interleaver		can be activated or deactivated
Time domain windowing	transition times	0 s to 1000 ns
Service field		user-defined service field value supported
Settings for PBCC (IEEE 802.11b/IEEE 802.11g)		
Chip rate	standard	11 Mcps
Baseband filter		spectral mask in line with IEEE 802.11b-1999 wireless LAN MAC and PHY specifications – chapter 18.4.7.3
Parameters in framed mode		
PLCP preamble and header format		long PLCP and short PLCP
PSDU bit rate		1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps, 22 Mbps
PSDU modulation	depending on PSDU bit rate	DBPSK, DQPSK, PBCC
PSDU data length	length of user data field in bytes of the packet to be transferred	
	range	0 byte to 4095 byte
Scrambling		data scrambling can be activated or deactivated
Parameters in unframed mode		
PSDU bit rate		1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps, 22 Mbps
PSDU modulation	depending on PSDU bit rate	DBPSK, DQPSK, PBCC
Scrambling		data scrambling can be activated or deactivated

IEEE 802.16 WiMAX digital standard including 802.16e (xxx-K249 or R&S®CMW-KW700 option)

IEEE 802.16 digital standard	in line with IEEE 802.16-2004/Cor1-2005 and 802.16e-2005	
Link direction		forward link and reverse link
Physical layer modes		OFDM, OFDMA, OFDMA – WiBro
Duplexing		TDD, FDD
Frame durations		2 ms, 2.5 ms, 4 ms, 5 ms, 8 ms, 10 ms, 12.5 ms, 20 ms, continuous, user
Sequence length (frames)	1 to over 2000 (depending on frame duration, sample rate and available ARB memory) With an oversampling of 2 and a frame duration of 10 ms, the user has 26.21 frames/Msample. Example: If an R&S®SMU-B10 with 64 Msamples memory is selected and an oversampling of 2 and a frame duration 10 ms are applied, R&S®WinIQSIM2™ can generate 1677 frames.	
Predefined frames	in OFDM mode	short, mid and long test messages for BPSK, QPSK, 16QAM and 64QAM modulation
	in OFDMA mode	predefined setups for all bandwidths and modulations specified in MRCT 1.0.0, appendix 2
Level reference	in OFDM mode	FCH/burst or preamble
	in OFDMA/WiBro mode	preamble or subframe RMS power
Parameters in OFDM mode		
Predefined frequency bands		ETSI, MMDS, WCS, U-NII, user
Channel bandwidth		1.25 MHz to 30 MHz, depending on selected frequency band
Sampling rate		1.5 MHz to 32 MHz, depending on channel bandwidth
Tg/Tb settings		1/4, 1/8, 1/16, 1/32
FFT size		256 (fixed)
Frame preamble		long, short, OFF
Modulation and RS-CC rates		BPSK 1/2, QPSK 1/2, QPSK 3/4, 16QAM 1/2, 16QAM 3/4, 64QAM 2/3, 64QAM 3/4
Subchannelization (number of possible channels)		1, 2, 4, 8, 16 (all)
Number of bursts with different modulation formats per frame		64
Burst types		data, DL-MAP, UL-MAP, ranging
Data		All0, All1, pattern (length up to 64 bit), PN 9 to PN 23, data lists
Midamble repetition	in uplink mode	OFF, 5, 9, 17
Parameters in OFDMA mode		
Predefined frequency bands		ETSI, MMDS, WCS, U-NII, WiBro, user
Channel bandwidth		1.25 MHz to 30 MHz, depending on selected frequency band
Sampling rate		1.5 MHz to 32 MHz, depending on channel bandwidth
Tg/Tb settings		1/4, 1/8, 1/16, 1/32
FFT size		128, 512, 1024, 2048
Preamble modes		auto & user with index 0 to 113
Number of zones/segments		8
Space-time coding modes		OFF, 2 antennas matrix A, 2 antennas matrix B
Modulation and coding rates		QPSK 1/2, QPSK 3/4, 16QAM 1/2, 16QAM 3/4, 64QAM 1/2, 64QAM 2/3, 64QAM 3/4, 64QAM 5/6
Channel coding modes		OFF, CC, CTC

Channel coding parts		scrambler, FEC, interleaver can be switched ON/OFF independently
Repetition coding		0, 2, 4, 6
Subcarrier permutation		FUSC, PUSC, AMC2×3
Subchannel map		user-definable for PUSC
Subchannel rotation		ON/OFF (for uplink PUSC)
Dedicated pilots		ON/OFF (for downlink PUSC and AMC2×3)
Number of bursts with different modulation formats		64 per zone
Burst types		FCH, DL-MAP, UL-MAP, DCD, UCD, HARQ, ranging, fast feedback, data
Data		All0, All1, pattern (length 1 bit to 64 bit), PN 9 to PN 23, data lists

TD-SCDMA digital standard (3GPP TDD LCR) (xxx-K250 or R&S®CMW-KW750 option)

WCDMA 3GPP TDD LCR digital standard (TD-SCDMA)	in line with 3GPP TDD standard for chip rate 1.28 Mcps (low chip rate mode)	
Signal generation modes/sequence length	Simulation of up to 4 TD-SCDMA cells with variable switching point of uplink and downlink. User-configurable channel table for each slot and simulation of the downlink and uplink pilot time slot. In uplink, a PRACH can also be generated. The sequence length can be entered in frames (10 ms each). With an oversampling of 2, the user has 40.96 frames/Msample. Example: If an R&S®SMU with 64 Msamples memory is selected and an oversampling of 2 is applied, R&S®WinIQSIM2™ can generate 2621 frames.	
Modulation		QPSK, 8PSK
Generate waveform file	filtering of data generated in ARB mode and saving as waveform file	
	application	for multicarrier or multisegment scenarios
General settings		
Triggering		see I/Q baseband generator
Chip rate	standard	1.28 Mcps (7 slots/subframe)
Link direction		uplink (reverse link) and downlink (forward link)
Baseband filter	standard	$\sqrt{\cos}$, α = 0.22
	other filters	$\sqrt{\cos}$, cos, user filters
Clipping	setting of clipping value relative to highest peak in percent; clipping takes place prior to baseband filtering; clipping reduces the crest factor	
	modes	vector |i + j q| scalar |i|, |q|
	clipping level	1 % to 100 %
Code channels	downlink/uplink: up to 16 data channels (plus special channels) per slot, 7 slots per subframe, simulation of up to 4 cells	
Configure cell		
Reset all cells	all channels are deactivated	
Copy cell	adopting the configuration of a cell for another cell to define multicell scenarios parameters: source and destination of copying	
Predefined settings	generation of complex signal scenarios with parameterizable default settings selectable parameters: use of P-CCPCH, number and spreading factors of data channels, crest factor: minimal/average/worst	
Parameters of each cell		
State		ON/OFF
Scrambling code	scrambling code can be disabled for testing	0 to 127
SYNC-DL code	automatic selection depending on scrambling code	0 to 31
SYNC-UL code	range depending on SYNC-DL code	0 to 255
Number of users	range depending on scrambling code	2, 4, 6, 8, 10, 12, 14, 16
Switching point	switchover between uplink and downlink slots	1 to 6
DwPTS power		–80 dB to 10 dB
Time delay	A time delay in chips can be introduced between the cells.	max time delay: 6400 chips
Phase rotation	phase rotation for DwPTS can be used	different Auto modes, S1 and S2 are supported

Parameters for each downlink slot		
State		ON/OFF
Slot mode	downlink dedicated	
	simulation of up to 16 DPCHs and max. 6 special channels	DPCH QPSK/8PSK
		0 to 24
		DPCH PDSCH
		0 to 24
		S-CCPCH
		0 to 9
Parameters for each uplink slot		
State		ON/OFF
Slot mode	uplink dedicated	
	simulation of up to 16 DPCHs and 1 PUSCH	DPCH QPSK, PUSCH: 0 to 69
	PRACH	
	simulation of one physical random access channel	DPCH 8PSK: 0 to 24
Physical channels in downlink		
	primary common control physical channel 1 (P-CCPCH 1)	
	primary common control physical channel 2 (P-CCPCH 2)	
	secondary common control physical channel 1 (S-CCPCH 1)	
	secondary common control physical channel 2 (S-CCPCH 2)	
	fast physical access channel (FPACH)	
	physical downlink shared channel (PDSCH)	
	dedicated physical channel modulation QPSK (DPCH QPSK)	
	dedicated physical channel modulation 8PSK (DPCH 8PSK)	
Physical channels in uplink		
	physical uplink shared channel (PUSCH)	
	dedicated physical channel modulation QPSK (DPCH QPSK)	
	dedicated physical channel modulation 8PSK (DPCH 8PSK)	
Parameters of every code channel that can be set independently		
State		ON/OFF
Midamble shift	time shift of midamble in chips: step width 8 chips controlled via the current user and the number of users	0 to 120
Slot format	depending on physical channel type	0 to 69
Spreading factor	depending on physical channel type and link direction	1, 2, 4, 8, 16
Spreading code	depending on physical channel type and spreading factor	1 to 16
Power		–80 dB to 0 dB
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit), data lists
Number of TFCI bits	depending on modulation type	QPSK
		0, 4, 8, 16, 32
		8PSK
		0, 6, 12, 24, 48
TFCI value		0 to 1023

Number of sync shift and TPC bits	depending on modulation type	QPSK
		0 & 0, 3 & 3, 48 & 48
		8PSK
		0 & 0, 2 & 2, 32 & 32
Sync shift pattern	up to 64 UP/DOWN/HOLD commands sent periodically	“1” -> up: increase sync shift “0” -> down: decrease sync shift “–“ -> do nothing
Sync shift repetition M		1 to 8
TPC source		All0, All1, pattern (length 1bit to 64 bit), data lists
TPC read out mode		Continuous, Single+All0, Single+All1, Single+alt.01, Single+alt.10
Parameters in uplink PRACH mode		
UpPTS start subframe	selection of first frame in which UpPTS is sent	1 subframe to 10 subframes
UpPTS power		–80 dB to 0 dB
UpPTS power step		0 dB to 10 dB
Distance UpPTS	distance UpPTS to PRACH message part	1 subframe to 4 subframes
UpPTS repetition	number of UpPTS repetitions	1 to 10
RACH message part state		ON/OFF
Message part length		1, 2, 4 subframes
Spreading factor		4, 8, 16
Spreading code		0 to (spreading factor – 1)
Message part power		–80 dB to 0 dB
Payload data		PRBS: 9, 11, 15, 16, 20, 21, 23 All0, All1, pattern (length 1 bit to 64 bit), data lists
Current user		1 to 16

TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA (xxx-K251 option)

One xxx-K250 option must be installed.

General parameters	This option extends the xxx-K250 (TD-SCDMA digital standard) to full channel coding and HSDPA support. Therefore, all general parameters of the xxx-K250 such as modulation are also valid for the xxx-K251.	
Signal generation modes/sequence length	Simulation of up to 4 TD-SCDMA cells with generation of the coded P-CCPCH (BCH with running SFN) and the reference measurement channels RMC 12.2 kbps up to RMC 2048 kbps. Simulation of the HSDPA channels HS-SCCH, HS-PDSCH (QPSK and 16QAM modulation), HS-SICH and the channel-coded H-RMC 526 kbps and H-RMC 730 kbps. Furthermore, bit and block errors can be inserted.	
Modulation		QPSK, 8PSK, 16QAM
HSDPA physical channels	high speed shared control channel 1 (HS-SCCH 1)	
	high speed shared control channel 2 (HS-SCCH 2)	
	high speed physical downlink shared channel QPSK (HS-PDSCH QPSK)	
	high speed physical downlink shared channel 16QAM (HS-PDSCH 16QAM)	
	high speed shared information channel (HS-SICH)	

Channel coding	coding of enhanced channels in line with the definition of reference measurement channels in TS 25.102, TS 25.105 and TS 25.142	
	predefined channel coding schemes for downlink	coded BCH including SFN
		RMC 12.2 kbps
		RMC 64 kbps
		RMC 144 kbps
		RMC 384 kbps
		RMC 2048 kbps
		H-RMC 526 kbps
		H-RMC 730 kbps
	predefined channel coding schemes for uplink	RMC 12.2 kbps
		RMC 64 kbps
		RMC 144 kbps
		RMC 384 kbps
Applications	BER measurements in line with TS 25.102/105/142 (radio transmission and reception), e.g.	
	adjacent channel selectivity	
	blocking characteristics	
	intermodulation characteristics	
	BLER measurements in line with TS 25.102/105 (radio transmission and reception), e.g.	
	demodulation of dedicated channel under static propagation conditions	
	test of decoder in receiver	
Bit error insertion	deliberate generation of bit errors by impairing the data stream prior to channel coding or at the physical layer	
	bit error ratio	0.5 to 10^{-7}
Application	verification of internal BER calculation in line with TS 25.142 (BS conformance testing)	
Block error insertion	deliberate generation of block errors by impairing the CRC during coding of enhanced channels	
	block error ratio	0.5 to 10^{-4}
Application	verification of internal BLER calculation in line with TS 25.142 (BS conformance testing)	

DVB-H digital standard (xxx-K252 option)

DVB-H digital standard		in line with ETSI EN 300 744 V1.5.1 standard
General settings		
Hierarchy mode		non-hierarchical
Sequence length	The sequence length can be entered in super frames. With an oversampling of 2, a guard interval of 1/8 and Tx mode 2, the user has 0.82 superframes/Msample. Example: If an R&S®SMU with 64 Msamples memory is selected and the above values are applied, R&S®WinIQSIM2™ can generate 53 superframes.	
Baseband filter	standard	cosine, α = 0.1
	other	see I/Q baseband generator
Clipping	setting of clipping value relative to highest peak in percent; clipping takes place prior to baseband filtering; clipping reduces the crest factor	
	modes	vector |i + j q| scalar |i|, |q|
	clipping level	1 % to 100 %
Generate waveform file	filtering of data generated in ARB mode and saving it as waveform file	
Marker		restart superframe start frame start pulse pattern ON/OFF ratio
Signal path parameters		
Input data	Zero packets are generated and filled with desired data.	PN 15, 23 All0 All1
	transport stream	transport stream file (.GTS)
Scrambler	state	ON/OFF
Outer coder		Reed Solomon (204, 188, t = 8)
	state	ON/OFF
Outer interleaver		convolutional byte-wise (depth: 12)
	state	ON/OFF
Inner coder		convolutional, punctured
	state	ON/OFF
	code rates	1/2, 2/3, 3/4, 5/6, 7/8
Inner interleaver		bit-wise interleaving symbol interleaving
	state	ON/OFF
	symbol interleaving block size	1512 bit in 2K mode 3024 bit in 4K mode 6048 bit in 8K mode
	symbol interleaving modes	native, in-depth
Modulation		QPSK, 16QAM, 64QAM
Transmission modes		2K with 1705 carriers 4K with 3409 carriers 8K with 6817 carriers
Guard interval	cyclic continuation of useful signal component	length: 1/4, 1/8, 1/16, 1/32 of useful signal component

Framing and signaling		
Super frame size		4 frames
Frame size		68 OFDM symbols
TPS settings	cell ID	0000 to FFFF (user-defined)
	time-slicing	ON/OFF
	MPE-FEC	ON/OFF

IEEE 802.11 n digital standard (xxx-K254 option)

IEEE 802.11 n digital standard		in line with IEEE P802.11n/D3.00 – October 2007
General settings		
BW		20 MHz, 40 MHz
Clipping		vector or scalar clipping, applied before filtering
Generate waveform file	filtering of data generated in ARB mode and saving it as waveform file	
Marker modes		Restart, Frame Block, Frame, Frame Active Part, Pulse, Pattern, ON/OFF Ratio
Kernel sample rate	standard	20 Msample/s, 40 Msample/s
	range	depending on ARB instrument used
Baseband filter		spectral mask in line with 'IEEE 802.11a-1999 – wireless LAN MAC and PHY specifications – chapter 17.3.9.6.2' for LEGACY 20 MHz and 'IEEE P802.11n/D3.00, chapter 20.3.20.1' for other modes
Transmit antenna setup	number of antennas	1 to 4
	mapping coefficient range	(–1000 –1000 i) to (+1000 +1000 i) with a resolution = 0.01/dimension
	output destination	baseband, file, OFF
Frame block configuration		
Frame blocks (table rows)		Limited to 100. The wave-file size is checked at the beginning of the computation process to make sure that sufficient ARB memory is available.
Type		DATA, SOUNDING
Physical mode	type = DATA	LEGACY, MIXED MODE, GREEN FIELD
	type = SOUNDING	GREEN FIELD
Transmit mode	physical mode = LEGACY	L-20MHz, L-Duplicate, L-Upper, L-Lower
	physical mode = MIXED MODE or GREEN FIELD	HT-20MHz, HT-40MHz, HT-Duplicate, HT-Upper, HT-Lower
Frames		1 to 1024 frames (depending on frame duration)
Idle time	time between two successive frames (PPDUs)	
	range	0 to 1000 ms with 1 µs resolution

PSDU parameters	MAC header	Activating and configuring the MAC header with the following parameters: frame control, duration/ID, address 1 to 4, and sequence control. For high throughput (HT), i.e. 'Not Legacy', QoS control and HT control can also be configured.
	frame check sequence	activating or deactivating a 32 bit (4 byte) check sum for protecting MAC header and user data (frame body)
	number of spatial streams	1 to 4
	number of space time streams	1 to 4
	number of extended spatial streams	0 to 3
	space time block coding	Easily activated by choosing different values for the number of 'Spatial ' and 'Space Time' streams
	PSDU modulation/space stream	BPSK, QPSK, 16QAM, 64QAM
	data length	1 byte to 4061[1] byte for LEGACY frames, 1 byte to 65495 byte for HT frames. 0 is only allowed with sounding frames
	number of data symbols (number of OFDM symbols in data portion of packet)	directly proportional to PSDU data length
	raw data rate	up to 600 Mbps
	preamble/header active	Preamble/header can be turned ON or OFF. By turning it OFF and setting Idle Time to 0, this corresponds to the unframed mode.
	guard interval	short, long
	scrambling	data scrambling can be activated or deactivated; initial scrambler state can be set randomly or to a user-defined value
	coding	convolutional coding (BCC) or OFF, 1 or 2 encoders based on setup and coding rates of 1/2, 2/3, 3/4 and 5/6
	interleaver	can be activated or deactivated
	time domain windowing (transition times)	0 s to 1000 ns
	service field	user-defined service field value supported
	spatial mapping	OFF, direct, spatial expansion and beamforming

[1] The maximum PPDU length for legacy is 4095 byte; it can be obtained by activating all MAC fields. The same applies to HT, 65535 byte is possible.

EUTRA/LTE digital standard (xxx-K255 option)

EUTRA/LTE digital standard		in line with 3GPP standard, release 8
General settings		
Sequence length	The sequence length can be entered in frames. With an oversampling of 2 and a bandwidth of 10 MHz, the user has 3.41 frames/Msample. Example: If an R&S®SMU with 64 Msamples memory is selected and the above values are applied, R&S®WinIQSIM2™ can generate 218 frames.	
Baseband filter	standard	cosine, α = 0.1
	other	see I/Q baseband generator
Clipping	setting of clipping value relative to highest peak in percent; clipping takes place prior to baseband filtering; clipping reduces the crest factor	
	modes	vector |i + j q| scalar |i|, |q|
	clipping level	1 % to 100 %
Marker		subframe radio frame start restart pulse pattern ON/OFF ratio
Duplexing	determines duplexing mode Note: TDD is not supported in this version.	FDD,TDD
Link direction	determines whether uplink or downlink is simulated Note: Uplink is not supported in this version.	downlink, uplink
General DL/UL settings: physical settings		
Channel bandwidth	determines the channel bandwidth used	1.25 MHz, 2.5 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, user
Number of resource blocks per slot	If “Channel bandwidth” is set to “User”, the number of resource blocks per slot is set to determine the channel bandwidth used.	6 to 110
Sampling rate	The sampling rate is automatically set in line with the selected channel bandwidth.	
FFT size	The FFT size is automatically set in line with the selected channel bandwidth.	
Number of occupied subcarriers	The number of occupied subcarriers is automatically set in line with the selected channel bandwidth.	
Number of left guard subcarriers	The number of left guard carriers is automatically set in line with the selected FFT size.	
Number of right guard subcarriers	The number of right guard carriers is automatically set in line with the selected FFT size.	
General DL settings: MIMO		
Global MIMO configuration	determines the number of transmit antennas of the simulated EUTRA/LTE system Note: One baseband simulates one antenna	1 TX antenna, 2 TX antennas, 4 TX antennas
Simulated antenna	determines the simulated antenna	antenna 1, antenna 2, antenna 3, antenna 4
General DL settings: downlink reference signal structure		
First reference symbol position	position in subframe of the first reference symbols Note: This value is automatically set in line with the selected antenna configuration.	1st symbol, 2nd symbol

Subcarrier offset	offset in subcarriers within one resource block Note: This value is automatically set in line with the selected antenna configuration.	0.3
Use second reference symbols	determines whether 2nd reference symbols are used Note: This value is automatically set in line with the selected antenna configuration.	yes, no
First reference symbol power	power of 1st reference symbols	–80 dB to 10 dB
Second reference symbol power	power of 2nd reference symbols	–80 dB to 10 dB
Hopping sequence	determines the cell-specific integer sequence f_hop(.)	0 to 5, individually for each subframe
Orthogonal sequence	determines the orthogonal sequence R_os	S0, S1, S2
PRS modulation scheme	Determines the type of the pseudo-random sequence R_prs. Selection of either QPSK with user-definable data list or a file that contains I/Q samples is possible.	QPSK, I/Q file
General DL settings: SCH settings		
SCH repetition period	determines the period in slots between two SCH slots Note: A SCH slot includes P-SCH and S-SCH.	2/4/5/10/20 slots
First SCH slot	determines the slot in the frame in which the SCH is initially transmitted	0 to (“SCH_rep_period” – 1)
SCH modulation scheme	Determines the type of the sequences used for generating the P-SCH and the S-SCH. Selection of either QPSK with user-definable data list or a file that contains I/Q samples is possible.	QPSK, I/Q file
P-SCH power	determines the power of the P-SCH	–80 dB to 10 dB
S-SCH power	determines the power of the S-SCH	–80 dB to 10 dB
Downlink: general frame configuration		
Number of configurable subframes	Sets the number of configurable subframes. All ten subframes of a frame are filled periodically with the configured subframes with the exception of the P- and S-SCH which are set globally in the General DL Settings menu and the PBCH which can only be configured in subframe 0.	1 to 10
Behavior in unscheduled resource blocks	determines whether unscheduled resource blocks and subframes are filled with dummy data or left DTX	dummy data, DTX
Cyclic prefix	determines whether a normal or extended cyclic prefix is used for a specific subframe Note: Automatically determines the number of OFDM symbols per subframe.	normal, extended
Downlink: allocation table		
Code word	Determines whether 1 or 2 code words share the same resource. If two code words are selected, the code word defines whether code word #1 or #2 is configured with this allocation entry. Note: In this release, only one code word (1/1) is supported.	1/1, 1/2, 2/2
Modulation	determines the modulation scheme used	QPSK, 16QAM, 64QAM
Enhanced settings	opens configuration of pre-coding and channel coding Note: In this release pre-coding and channel coding are not supported	

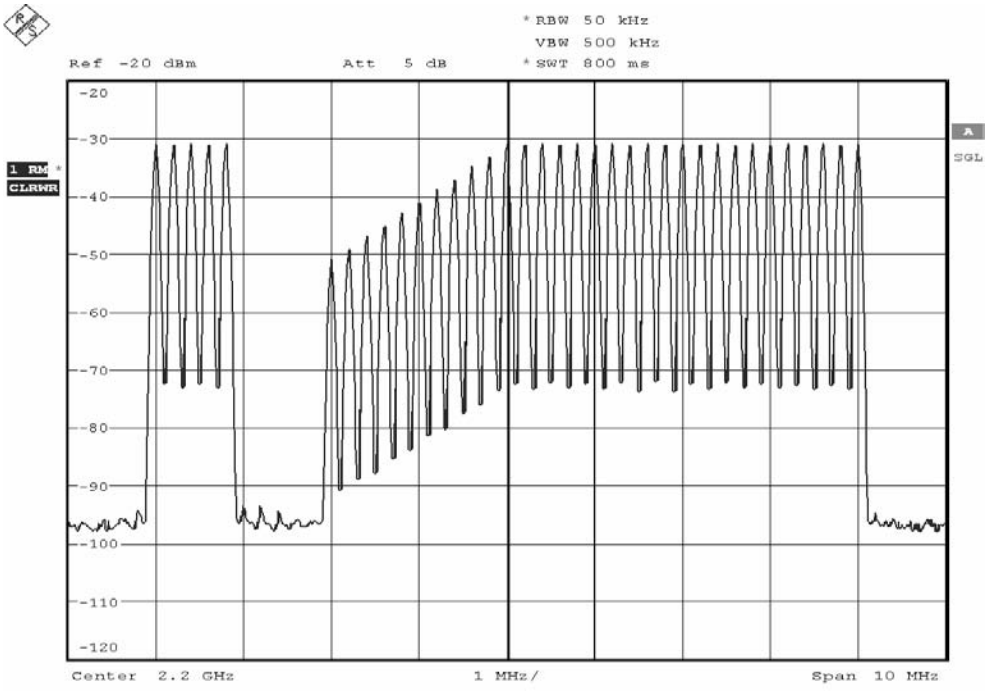
Number of resource blocks (RB)	defines size of selected allocation in terms of resource blocks	1 to “total number of RBs”
Number of symbols	defines size of selected allocation in terms of OFDM symbols	1 to ”number of OFDM symbols per sub-frame”
Offset RB	defines start resource block of selected allocation Note: This value is read-only if Auto mode is activated for selected allocation.	0 to (“total number of RBs” – 1)
Offset symbol	defines start OFDM symbol of allocation	0 to “number of OFDM symbols per subframe - 1”
Number of bits	displays size of selected allocation in bits	
Data source	determines data source of selected allocation Note: Data sources for users 0 to 3 can be configured in the Configure User panel	user 0, user 1, user 2, user 3, PN9, PN11, PN15, …, PN 23, DList, pattern, All0, All1
Power	determines power of selected allocation	–80 dB to +10 dB
Content type	determines type of selected allocation Note: PBCH can only be configured in subframe 0. Note: PDCCH can also be used to emulate PCFICH and PHICH	PDCCH, PDSCH, PBCH
State	sets the allocation to active or inactive state	ON, OFF
Conflict	Indicates a conflict between allocations. Note: If a resource conflict between a data allocation and a control channel occurs, the control channel wins, and no conflict is displayed here.	
Downlink: configure user		
	The Configure User dialog offers the possibility to define and configure up to 4 scheduled units of UE that can be distributed over the whole frame by setting the data source of a specific allocation in the allocation table to User. Thus, subframe allocations that are not adjacent or allocations of a different subframe can be configured to allow the use of a common data source.	
Channel coding	determines channel coding scheme of the user currently being configured Note: Turbo coder is not supported in this version.	TC (turbo coding)/OFF
Data source	determines the data source of the user currently being configured	PN9, PN11, PN15, …, PN 23, DList, pattern, All0, All1
Downlink: configure dummy data		
Dummy data modulation	determines modulation of dummy data	QPSK, 16QAM, 64QAM
Dummy data data source	determines data source of dummy data	PN9, PN11, PN15, …, PN 23, DList, pattern, All0, All1
Dummy data power	determines power of dummy data allocations	–80 dB to +10dB
Uplink: general frame configuration		
Number of configurable subframes	Sets the number of configurable subframes. All ten subframes of a frame are filled periodically with the configured subframes with the exception of the sounding reference signal which is set individually for each UE in the User Equipment menu.	1 to 10

Cyclic prefix	determines whether a normal or extended cyclic prefix is used for a specific subframe Note: Automatically determines the number of SC-FDMA symbols per subframe.	normal, extended
Uplink: allocation table		
Content type	selects the type of the selected allocation Note: In this release, only PUSCH is supported	PUSCH, PUCCH
User equipment	selects the UE of the selected allocation	UE1, UE2, UE3, UE4
Modulation	selects the modulation scheme of the selected allocation	QPSK, 16QAM, 64QAM
Number of resource blocks (RB)	defines size of selected allocation in terms of resource blocks	1 to “total number of RBs”
Offset RB slot n	sets the start resource block of the selected allocation in the first slot of the subframe	0 to (“total number of RBs” – 1)
Offset RB slot n+1	sets the start resource block of the selected allocation in the second slot of the subframe	0 to (“total number of RBs” – 1)
Number of bits	shows size of selected allocation in bits	
Data source	determines data source of selected allocation	PN9, PN11, PN15, …, PN 23, DList, pattern, All0, All1
Power	determines power of selected allocation	–80 dB to +10 dB
State	sets the allocation to active or inactive state	ON, OFF
Conflict	indicates a conflict between allocations.	
Uplink: user equipment 1 to 4		
State	activates or deactivates the user equipment. Neither reference signal nor PUSCH/PUCCH allocations will be transmitted if the UE is deactivated.	ON, OFF
Mode	selects whether the user equipment is in standard or in PRACH mode. Note: In this release, only standard mode is supported.	standard, PRACH
Demodulation / sounding reference signal		
Power	Sets the power of the reference signal. Note: Individual settings for demodulation and sounding reference signal	–80 dB to +10 dB
Definition	Sets whether the reference signal sequence is defined for the full bandwidth or only for the allocated bandwidth. Note: Individual settings for demodulation and sounding reference signal	full BW, allocated BW
DFT precoding	Activates DFT pre-coding for the reference signal as defined in 3GPP TS 36.211 5.3.3 “Transform Precoding” Note: Individual settings for demodulation and sounding reference signal	ON, OFF
Sequence	Determines the type of the sequences used for generating the reference signal. Selection of either a CAZAC sequence or a file that contains I/Q samples is possible. Note: Individual settings for demodulation and sounding reference signal.	CAZAC, I/Q file

CAZAC parameters		
Parameter u	Sets the value for the CAZAC configuration parameter u. Note: Calculation with zero is not defined.	–1320 to 1320 /{0}
Parameter q	Sets the value for the CAZAC configuration parameter q. Note: In order to get a GCL sequence as defined in 3GPP TS 36.211 5.5 “Reference Signals”, this value has to be set to 0.	–2147483648 to 2147483647
Parameter alpha	Sets the parameter alpha used for time-domain cyclic shift as defined in 3GPP TS 36.211 5.5 “Reference Signals”.	double range
CAZAC mode	Determines how the reference signal is designed: Truncation (as in 3GPP TS 36.211): the sequence length is the minimum prime number greater than the number of subcarriers. Extension (as in 3GPP TS 36.211): the sequence length is the maximum prime number smaller than the number of subcarriers. Auto: the sequence length is the prime number nearest to the number of subcarriers (extension is prioritized). Direct: the sequence length is equal to the number of subcarriers.	Truncation, Extension, Auto, Direct
Sounding reference signal structure		
SC-FDMA symbol in subframe	Sets the SC-FDMA symbol in a subframe which is used for transmission of the sounding reference signal. Note: During this symbol, the UE is transmitting no PUSCH.	0 to 13
Number of RBs	Sets the number of resource blocks that are affected by the sounding reference signal. The actual number of occupied subcarriers also depends on the frequency spacing.	1 to “total number of RBs”
Frequency hopping pattern	Sets the first resource block that is affected by the sounding reference signal. This signal can be set individually for each subframe. Note: The value –1 deactivates the generation of a sounding reference signal for this subframe.	–1 to “total number of RBs”–1
Frequency spacing	spacing in subcarriers between two pilots	1 to 6
Subcarrier offset	offset in subcarriers within one resource block	0 to “Frequency Spacing”–1

Multicarrier CW signal generation (xxx-K261 option)

Signal generation	simulation of unmodulated multicarrier signals in arbitrary waveform mode	
Number of carriers		1 to 8192
Carrier spacing	user-settable, maximum spacing depending on number of carriers	1 Hz to 80 MHz
Parameters of each carrier	state	ON/OFF
	power	–80 dB to 0 dB
	start phase	0° to +360°
Crest factor	optimization of crest factor by varying the start phases of the carrier; available modes	
	OFF	no optimization, manual entry of phase possible
	Chirp	the phases of each carrier are set such that a chirp signal is obtained for the I and Q components
	target crest	iterative variation of carrier start phases until a presettable crest factor is attained
Marker	Number	4
	operating modes	unchanged, restart, pulse, pattern, ratio



Example spectrum of multicarrier CW signal

Noise

Additive white Gaussian noise (AWGN, xxx–K262 option)

Addition of an AWGN signal of settable bandwidth and settable C/N ratio or E_b/N_0 to a wanted signal.

Noise	distribution density	Gaussian, statistical, separate for I and Q
	crest factor	>18 dB
C/N, E_b/N_0	setting range	–50 dB to +30 dB
	resolution	0.01 dB
System bandwidth	bandwidth for determining noise power	
	range	1 kHz to 100 MHz
	resolution	1 kHz

General data

Supported operating systems

Microsoft Windows®	XP	Service Pack 2 and later

Remote control of R&S®WinIQSIM2™

Systems	remote control via Ethernet.	local host, Ethernet
Command set		SCPI 1999.5

Remote control of instruments from R&S®WinIQSIM2™

Systems	A VISA run-time library is necessary. The version of VISA has to be equal to or later than 3.4 (National Instruments) 14 (Agilent)	Ethernet, USB, IEC/IEEE bus
Command set		SCPI 1999.5
IEC/IEEE bus address		0 to 30

Ordering information

Designation	Type	Order No.
Simulation Software	R&S®WinIQSIM2™	1405.7032.08
VISA Driver	VISA I/O library (already included in the delivery of the R&S®SMU-B9/R&S®SMJ-B9 R&S®SMU-B10/R&S®SMJ-B10R&S®SMU-B11/R&S®SMJ-B11/ R&S®AMU-B11/R&S®SMJ-B50, R&S®SMJ-B51 and R&S®AFQ100A device options)[2]	1161.8473.02
Options for the R&S®AFQ100A		
Digital Standard GSM/EDGE	R&S®AFQ-K240	1401.6302.02
Digital Standard 3GPP FDD	R&S®AFQ-K242	1401.6354.02
3GPP Enhanced MS/BS Tests incl. HSDPA	R&S®AFQ-K243	1401.6402.02
Digital Standard 3GPP FDD HSUPA	R&S®AFQ-K245	1401.6502.02
Digital Standard CDMA2000®	R&S®AFQ-K246	1401.6554.02
Digital Standard 1xEV-DO Rev. A	R&S®AFQ-K247	1401.5958.02
Digital Standard IEEE 802.11 (a/b/g)	R&S®AFQ-K248	1401.6602.02
Digital Standard IEEE 802.16	R&S®AFQ-K249	1401.6654.02
Digital Standard TD-SCDMA	R&S®AFQ-K250	1401.6702.02
Digital Standard TD-SCDMA Enhanced BS/MS Test	R&S®AFQ-K251	1401.6754.02
Digital Standard DVB-H	R&S®AFQ-K252	1401.5858.02
Digital Standard IEEE 802.11n	R&S®AFQ-K254	1401.5806.02
Digital Standard EUTRA/LTE	R&S®AFQ-K255	1401.5906.02
Multicarrier CW Signal Generation	R&S®AFQ-K261	1401.6802.02
AWGN	R&S®AFQ-K262	1401.6854.02
Options for the R&S®AMU200A		
Digital Standard GSM/EDGE	R&S®AMU-K240	1402.7602.02
Digital Standard 3GPP FDD	R&S®AMU-K242	1402.7702.02
3GPP Enhanced MS/BS Tests incl. HSDPA	R&S®AMU-K243	1402.7802.02
Digital Standard 3GPP FDD HSUPA	R&S®AMU-K245	1402.8009.02
Digital Standard CDMA2000®	R&S®AMU-K246	1402.8109.02
Digital Standard 1xEV-DO Rev. A	R&S®AMU-K247	1402.9357.02
Digital Standard IEEE 802.11 (a/b/g)	R&S®AMU-K248	1402.8209.02
Digital Standard IEEE 802.16	R&S®AMU-K249	1402.8309.02
Digital Standard TD-SCDMA	R&S®AMU-K250	1402.8409.02
Digital Standard TD-SCDMA Enhanced BS/MS Test	R&S®AMU-K251	1402.8509.02
Digital Standard DVB-H	R&S®AMU-K252	1402.9505.02
Digital Standard IEEE 802.11n	R&S®AMU-K254	1402.9505.02
Digital Standard EUTRA/LTE	R&S®AMU-K255	1402.9457.02
Multicarrier CW Signal Generation	R&S®AMU-K261	1402.8609.02
AWGN	R&S®AMU-K262	1402.8709.02

[2] The VISA driver is included in the delivery of the specified options/instrument deliveries since September 1, 2006.

Options for the R&S®SMU200A		
Digital Standard GSM/EDGE	R&S®SMU-K240	1408.5518.02
Digital Standard 3GPP FDD	R&S®SMU-K242	1408.5618.02
3GPP Enhanced MS/BS Tests incl. HSDPA	R&S®SMU-K243	1408.5718.02
Digital Standard 3GPP FDD HSUPA	R&S®SMU-K245	1408.5918.02
Digital Standard CDMA2000®	R&S®SMU-K246	1408.6014.02
Digital Standard 1xEV-DO Rev. A	R&S®SMU-K247	1408.7462.02
Digital Standard IEEE 802.11 (a/b/g)	R&S®SMU-K248	1408.6114.02
Digital Standard IEEE 802.16	R&S®SMU-K249	1408.6214.02
Digital Standard TD-SCDMA	R&S®SMU-K250	1408.6314.02
Digital Standard TD-SCDMA Enhanced BS/MS Test	R&S®SMU-K251	1408.6414.02
Digital Standard DVB-H	R&S®SMU-K252	1408.7510.02
Digital Standard IEEE 802.11n	R&S®SMU-K254	1408.7610.02
Digital Standard EUTRA/LTE	R&S®SMU-K255	1408.7362.02
Multicarrier CW Signal Generation	R&S®SMU-K261	1408.6514.02
AWGN	R&S®SMU-K262	1400.6609.02
Options for the R&S®SMJ100A		
Digital Standard GSM/EDGE	R&S®SMJ-K240	1409.0510.02
Digital Standard 3GPP FDD	R&S®SMJ-K242	1409.0610.02
3GPP Enhanced MS/BS Tests incl. HSDPA	R&S®SMJ-K243	1409.0710.02
Digital Standard 3GPP FDD HSUPA	R&S®SMJ-K245	1409.0910.02
Digital Standard CDMA2000®	R&S®SMJ-K246	1409.1016.02
Digital Standard 1xEV-DO Rev. A	R&S®SMJ-K247	1409.2358.02
Digital Standard IEEE 802.11 (a/b/g)	R&S®SMJ-K248	1409.1116.02
Digital Standard IEEE 802.16	R&S®SMJ-K249	1409.1216.02
Digital Standard TD-SCDMA	R&S®SMJ-K250	1409.1316.02
Digital Standard TD-SCDMA Enhanced BS/MS Test	R&S®SMJ-K251	1409.1416.02
Digital Standard DVB-H	R&S®SMJ-K252	1409.2406.02
Digital Standard IEEE 802.11n	R&S®SMJ-K254	1409.2506.02
Digital Standard EUTRA/LTE	R&S®SMJ-K255	1409.2258.02
Multicarrier CW Signal Generation	R&S®SMJ-K261	1409.1516.02
AWGN	R&S®SMJ-K262	1400.6650.02
Options for the R&S®CMW		
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GSM/EDGE	R&S®CMW-KW200	1203.0951.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WCDMA	R&S®CMW-KW400	1203.1006.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WiMAX	R&S®CMW-KW700	1203.1358.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, TD-SCDMA	R&S®CMW-KW750	1203.1406.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, CDMA2000®	R&S®CMW-KW800	1203.1506.02

See at www.rohde-schwarz.com
(search term: WinIQSIM2)

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