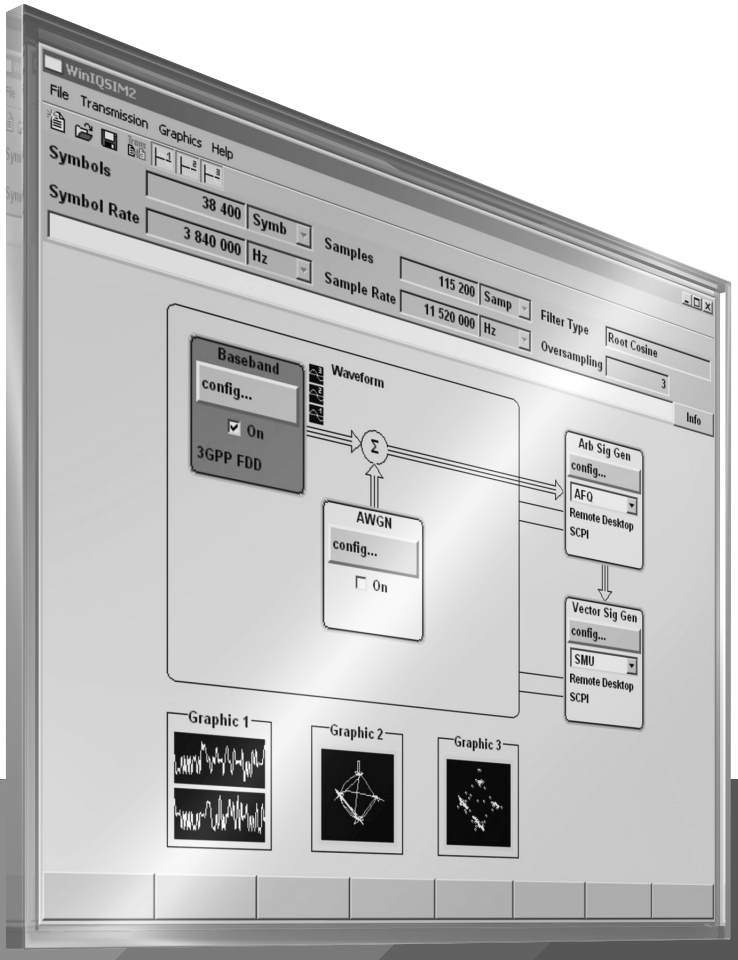
R&S®WINIQSIM2™ SIMULATION SOFTWARE

Specifications



Data Sheet
Version 15.00

ROHDE&SCHWARZ
Make ideas real

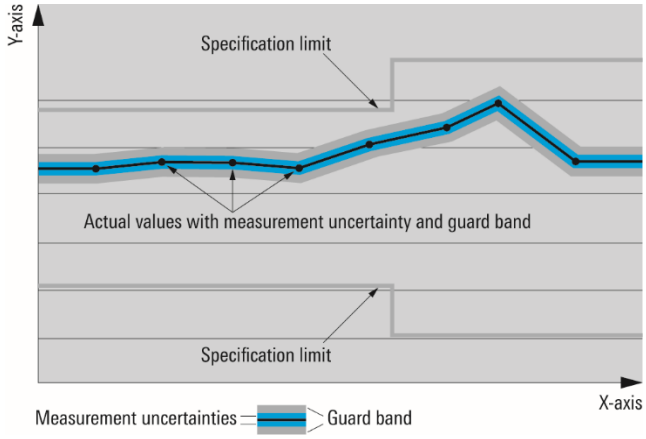
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP/3GPP2 standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bits per second (Gbps), million bits per second (Mbps), thousand bits per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

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-conforming waveform with all the included standards and to generate 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 and R&S®AFQ100B arbitrary waveform generators as well as by the R&S®SMW200A (R&S®SMW-B9/-B10 options), R&S®SMU200A (R&S®SMU-B9/-B10/-B11 options), R&S®SMJ100A (R&S®SMJ-B9/-B10/-B11/-B50/-B51 options), R&S®SMBV100A (R&S®SMBV-B10/-B50/-B51 options), R&S®SMBV100B, R&S®SMCV100B and R&S®SGT100A (R&S®SGT-K510 option) vector signal generators and the R&S®AMU200A baseband signal generator and fading simulator. Some standards also work for the R&S®CMW500/R&S®CMW100/R&S®CMW290 wideband radio communication tester, the R&S®CMW270 wireless connectivity tester, the R&S®CMA180 radio test set and the R&S®EX-IQ-Box digital signal interface module. R&S®WinIQSIM2™ can be downloaded from www.rohde-schwarz.com – search term: WinIQSIM2.

This document describes the capabilities of the R&S®WinIQSIM2™ software. Please note that additional hardware limitations of the used Rohde & Schwarz signal generator (especially maximum signal bandwidth, ARB memory size and maximum sample clock rate) apply. For instrument-specific data, see the data sheet of the respective Rohde & Schwarz instrument.

Key features

Large variety of digital standards

- 5G New Radio
- Verizon 5GTF signals
- OFDM signal generation
- LTE, incl. Rel. 8, Rel. 9, Rel. 10, Rel. 11, Rel. 12, Rel. 13, Rel. 14 and Rel. 15
- Cellular IoT (eMTC and NB-IoT), incl. Rel. 13, Rel. 14 and Rel. 15
- OneWeb reference signals and OneWeb user-defined signal generation
- GSM/EDGE
- EDGE Evolution, VAMOS
- 3GPP FDD with HSDPA, HSUPA and HSPA+ (HSPA Evolution)
- CDMA2000® with 1xEV-DV
- 1xEV-DO Rev. A, Rev. B
- TD-SCDMA
- WLAN IEEE 802.11a/b/g/n/j/p/ac/ax/ad
- IEEE 802.16 WiMAX™ supporting OFDM and OFDMA
- DVB-T/DVB-H
- DAB/T-DMB
- DVB-S2/DVB-S2X
- UWB (ECMA-368)
- GPS, GLONASS, Galileo, BeiDou (Compass), NavIC (IRNSS)
- Bluetooth®, up to release 5.1
- TETRA Release 2
- NFC A/B/F including EMV Type A/B [1]
- LoRa®

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 allows several digital signals to be combined to form one waveform with different frequency offsets
- Multisegment waveform function makes it possible to have multiple different waveforms in an arbitrary waveform generator's memory and ensures 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 performed and AWGN can be added

Extended graphics

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

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

[1] NFC Forum and the NFC Forum logo are trademarks of the Near Field Communication Forum™.

Options

The following R&S®WinIQSIM2™ options are supported for the R&S®AFQ100A, R&S®AFQ100B, R&S®AMU200A, R&S®SMU200A, R&S®SMJ100A and R&S®SMBV100A. The short form xxx stands for R&S®AFQ, R&S®AMU, R&S®SMU, R&S®SMJ and R&S®SMBV. The nomenclature of the different options is identical for the five instruments.

xxx-K240	GSM/EDGE
xxx-K241	EDGE Evolution
xxx-K242	3GPP FDD
xxx-K243	3GPP FDD enhanced MS/BS tests incl. HSDPA
xxx-K244	GPS (1 satellite)
xxx-K245	3GPP FDD HSUPA
xxx-K246	CDMA2000® incl. 1xEV-DV
xxx-K247	1xEV-DO Rev. A
xxx-K248	IEEE 802.11 (a/b/g)
xxx-K249	IEEE 802.16
xxx-K250	TD-SCDMA
xxx-K251	TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA
xxx-K252	DVB-T/DVB-H
xxx-K253	DAB/T-DMB
xxx-K254	IEEE 802.11a/b/g/n/j/p
xxx-K255	LTE Release 8
xxx-K259	3GPP FDD HSPA+
xxx-K260	Bluetooth® EDR/Low Energy
xxx-K261	Multicarrier CW signal generation
xxx-K262	AWGN
xxx-K266	Galileo (1 satellite)
xxx-K268	TETRA Release 2
xxx-K284	LTE Release 9
xxx-K285	LTE Release 10 (LTE-Advanced)
xxx-K286	IEEE 802.11ac
xxx-K287	1xEV-DO Rev. B
xxx-K289	NFC A/B/F (incl. EMV Type A/B)
xxx-K294	GLONASS (1 satellite)
xxx-K407	BeiDou (1 satellite)
xxx-K412	LTE Release 11

The following R&S®WinIQSIM2™ options are additionally supported for the R&S®SMBV100A.

xxx-K413	LTE Release 12
xxx-K414	OFDM Signal Generation
xxx-K415	Cellular IoT Release 13
xxx-K416	DVB-S2/DVB-S2X
xxx-K417	Bluetooth® 5.x
xxx-K418	Verizon 5GTF
xxx-K419	LTE Release 13/14/15
xxx-K431	LoRa®
xxx-K442	IEEE 802.11ax
xxx-K443	Cellular IoT Release 14
xxx-K444	5G New Radio
xxx-K446	Cellular IoT Release 15

The following R&S®WinIQSIM2™ options are additionally supported for the R&S®AFQ100A and R&S®AFQ100B.

xxx-K413	LTE Release 12
xxx-K415	Cellular IoT Release 13
xxx-K418	Verizon 5GTF
xxx-K419	LTE Release 13/14
xxx-K442	IEEE 802.11ax

One R&S®WinIQSIM2™ option is only available for the R&S®AFQ100B.

R&S®AFQ-K264	UWB MB-OFDM ECMA-368

The following R&S®WinIQSIM2™ options are supported for the R&S®SMW200A vector signal generator.

R&S®SMW-K240	GSM/EDGE
R&S®SMW-K241	EDGE Evolution
R&S®SMW-K242	3GPP FDD
R&S®SMW-K244	GPS (1 satellite)
R&S®SMW-K246	CDMA2000® incl. 1xEV-DV
R&S®SMW-K247	1xEV-DO Rev. A
R&S®SMW-K249	IEEE 802.16
R&S®SMW-K250	TD-SCDMA
R&S®SMW-K251	TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA
R&S®SMW-K252	DVB-T/DVB-H
R&S®SMW-K253	DAB/T-DMB
R&S®SMW-K254	IEEE 802.11a/b/g/n/j/p
R&S®SMW-K255	LTE Release 8
R&S®SMW-K260	Bluetooth® EDR/Low Energy
R&S®SMW-K261	Multicarrier CW signal generation
R&S®SMW-K262	AWGN
R&S®SMW-K266	Galileo (1 satellite)
R&S®SMW-K268	TETRA Release 2
R&S®SMW-K283	3GPP FDD HSPA/HSPA+, enhanced BS/MS test
R&S®SMW-K284	LTE Release 9
R&S®SMW-K285	LTE Release 10 (LTE-Advanced)
R&S®SMW-K286	IEEE 802.11ac
R&S®SMW-K287	1xEV-DO Rev. B
R&S®SMW-K289	NFC A/B/F (incl. EMV Type A/B)
R&S®SMW-K294	GLONASS (1 satellite)
R&S®SMW-K297	NavIC (IRNSS) (1 satellite)
R&S®SMW-K298	Modernized GPS (1 satellite with L2C or L5)
R&S®SMW-K355	OneWeb reference signals
R&S®SMW-K407	BeiDou (1 satellite)
R&S®SMW-K412	LTE Release 11
R&S®SMW-K413	LTE Release 12
R&S®SMW-K414	OFDM signal generation
R&S®SMW-K415	Cellular IoT Release 13
R&S®SMW-K416	DVB-S2/DVB-S2X
R&S®SMW-K417	Bluetooth® 5.x
R&S®SMW-K418	Verizon 5GTF
R&S®SMW-K419	LTE Release 13/14/15
R&S®SMW-K430	OneWeb user-defined signal generation
R&S®SMW-K431	LoRa®
R&S®SMW-K432	Modernized Beidou (1 satellite)
R&S®SMW-K441	IEEE 802.11ad
R&S®SMW-K442	IEEE 802.11ax
R&S®SMW-K443	Cellular IoT Release 14
R&S®SMW-K444	5G New Radio
R&S®SMW-K446	Cellular IoT Release 15

In the following the R&S®SMW-Kyyy options are referred to as xxx-Kyyy, where yyy stands for the respective option number.

The following R&S®WinIQSIM2™ options are supported for the R&S®SMBV100B vector signal generator.

R&S®SMBVB-K240	GSM/EDGE
R&S®SMBVB-K241	EDGE Evolution
R&S®SMBVB-K242	3GPP FDD
R&S®SMBVB-K244	GPS (1 satellite)
R&S®SMBVB-K246	CDMA2000® incl. 1xEV-DV
R&S®SMBVB-K247	1xEV-DO Rev. A
R&S®SMBVB-K250	TD-SCDMA
R&S®SMBVB-K251	TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA
R&S®SMBVB-K252	DVB-T/DVB-H
R&S®SMBVB-K253	DAB/T-DMB
R&S®SMBVB-K254	IEEE 802.11a/b/g/n/j/p
R&S®SMBVB-K255	LTE Release 8
R&S®SMBVB-K260	Bluetooth® EDR/Low Energy
R&S®SMBVB-K261	Multicarrier CW signal generation
R&S®SMBVB-K262	AWGN
R&S®SMBVB-K266	Galileo (1 satellite)
R&S®SMBVB-K283	3GPP FDD HSPA/HSPA+, enhanced BS/MS test
R&S®SMBVB-K284	LTE Release 9
R&S®SMBVB-K285	LTE Release 10 (LTE-Advanced)
R&S®SMBVB-K286	IEEE 802.11ac
R&S®SMBVB-K287	1xEV-DO Rev. B
R&S®SMBVB-K289	NFC A/B/F (incl. EMV Type A/B)
R&S®SMBVB-K294	GLONASS (1 satellite)
R&S®SMBVB-K297	NavIC (IRNSS) (1 satellite)
R&S®SMBVB-K298	Modernized GPS (1 satellite with L2C or L5)
R&S®SMBVB-K407	BeiDou (1 satellite)
R&S®SMBVB-K412	LTE Release 11
R&S®SMBVB-K413	LTE Release 12
R&S®SMBVB-K414	OFDM signal generation
R&S®SMBVB-K415	Cellular IoT Release 13
R&S®SMBVB-K416	DVB-S2/DVB-S2X
R&S®SMBVB-K417	Bluetooth® 5.x
R&S®SMBVB-K418	Verizon 5GTF
R&S®SMBVB-K419	LTE Release 13/14/15
R&S®SMBVB-K431	LoRa®
R&S®SMBVB-K432	Modernized Beidou (1 satellite)
R&S®SMBVB-K442	IEEE 802.11ax
R&S®SMBVB-K443	Cellular IoT Release 14
R&S®SMBVB-K444	5G New Radio
R&S®SMBVB-K446	Cellular IoT Release 15

In the following the R&S®SMBVB-Kyyy options are referred to as xxx-Kyyy, where yyy stands for the respective option number.

The following R&S®WinIQSIM2™ options are supported for the R&S®SGT100A vector signal generator.

R&S®SGT-K240	GSM/EDGE
R&S®SGT-K241	EDGE Evolution
R&S®SGT-K242	3GPP FDD
R&S®SGT-K244	GPS (1 satellite)
R&S®SGT-K246	CDMA2000® incl. 1xEV-DV
R&S®SGT-K247	1xEV-DO Rev. A
R&S®SGT-K249	IEEE 802.16
R&S®SGT-K250	TD-SCDMA
R&S®SGT-K251	TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA
R&S®SGT-K252	DVB-T/DVB-H
R&S®SGT-K253	DAB/T-DMB
R&S®SGT-K254	IEEE 802.11 a/b/g/n/j/p
R&S®SGT-K255	LTE Release 8
R&S®SGT-K260	Bluetooth® EDR/Low Energy
R&S®SGT-K261	Multicarrier CW signal generation
R&S®SGT-K262	AWGN
R&S®SGT-K266	Galileo (1 satellite)
R&S®SGT-K268	TETRA Release 2
R&S®SGT-K283	3GPP FDD HSPA/HSPA+, enhanced BS/MS test
R&S®SGT-K284	LTE Release 9
R&S®SGT-K285	LTE Release 10 (LTE-Advanced)
R&S®SGT-K286	IEEE 802.11ac
R&S®SGT-K287	1xEV-DO Rev. B
R&S®SGT-K289	NFC A/B/F (incl. EMV Type A/B)
R&S®SGT-K294	GLONASS (1 satellite)
R&S®SGT-K298	Modernized GPS (1 satellite with L2C or L5)
R&S®SGT-K407	BeiDou (1 satellite)
R&S®SGT-K412	LTE Release 11
R&S®SGT-K413	LTE Release 12
R&S®SGT-K414	OFDM signal generation
R&S®SGT-K415	Cellular IoT Release 13
R&S®SGT-K416	DVB-S2/DVB-S2X
R&S®SGT-K417	Bluetooth® 5.x
R&S®SGT-K418	Verizon 5GTF
R&S®SGT-K419	LTE Release 13/14/15
R&S®SGT-K431	LoRa®
R&S®SGT-K442	IEEE 802.11ax
R&S®SGT-K443	Cellular IoT Release 14
R&S®SGT-K444	5G New Radio
R&S®SGT-K446	Cellular IoT Release 15

In the following the R&S®SGT-Kyyy options are referred to as xxx-Kyyy, where yyy stands for the respective option number.

The following R&S®WinIQSIM2™ options are supported for the R&S®SMCV100B vector signal generator.

R&S®SMCVB-K240	GSM/EDGE
R&S®SMCVB-K241	EDGE Evolution
R&S®SMCVB-K242	3GPP FDD
R&S®SMCVB-K244	GPS (1 satellite)
R&S®SMCVB-K246	CDMA2000® incl. 1xEV-DV
R&S®SMCVB-K247	1xEV-DO Rev. A
R&S®SMCVB-K250	TD-SCDMA
R&S®SMCVB-K251	TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA
R&S®SMCVB-K252	DVB-T/DVB-H
R&S®SMCVB-K253	DAB/T-DMB
R&S®SMCVB-K254	IEEE 802.11 a/b/g/n/j/p
R&S®SMCVB-K255	LTE Release 8
R&S®SMCVB-K260	Bluetooth® EDR/Low Energy
R&S®SMCVB-K261	Multicarrier CW signal generation
R&S®SMCVB-K262	AWGN
R&S®SMCVB-K266	Galileo (1 satellite)
R&S®SMCVB-K283	3GPP FDD HSPA/HSPA+, enhanced BS/MS test
R&S®SMCVB-K284	LTE Release 9
R&S®SMCVB-K285	LTE Release 10 (LTE-Advanced)
R&S®SMCVB-K286	IEEE 802.11ac
R&S®SMCVB-K287	1xEV-DO Rev. B
R&S®SMCVB-K289	NFC A/B/F (incl. EMV Type A/B)
R&S®SMCVB-K294	GLONASS (1 satellite)
R&S®SMCVB-K297	NavIC (IRNSS) (1 satellite)
R&S®SMCVB-K298	Modernized GPS (1 satellite)
R&S®SMCVB-K407	BeiDou (1 satellite)
R&S®SMCVB-K412	LTE Release 11
R&S®SMCVB-K413	LTE Release 12
R&S®SMCVB-K414	OFDM signal generation
R&S®SMCVB-K415	Cellular IoT Release 13
R&S®SMCVB-K416	DVB-S2/DVB-S2X
R&S®SMCVB-K417	Bluetooth® 5.x
R&S®SMCVB-K418	Verizon 5GTF
R&S®SMCVB-K419	LTE Release 13/14/15
R&S®SMCVB-K431	LoRa®
R&S®SMCVB-K432	Modernized Beidou (1 satellite)
R&S®SMCVB-K442	IEEE 802.11ax
R&S®SMCVB-K443	Cellular IoT Release 14
R&S®SMCVB-K444	5G New Radio
R&S®SMCVB-K446	Cellular IoT Release 15

In the following the R&S®SMCVB-Kyyy options are referred to as xxx-Kyyy, where yyy stands for the respective option number.

A subset of R&S®WinIQSIM2™ options is available for the R&S®EX-IQ-Box if the options for the CPRI™ digital interface standard (R&S®EXBOX-K10/K11 and R&S®EXBOX-K90) are also installed.

R&S®EXBOXK240	GSM/EDGE
R&S®EXBOXK241	EDGE Evolution
R&S®EXBOXK242	3GPP FDD
R&S®EXBOXK243	3GPP FDD enhanced MS/BS tests incl. HSDPA
R&S®EXBOXK245	3GPP FDD HSUPA
R&S®EXBOXK246	CDMA2000® incl. 1xEV-DV
R&S®EXBOXK247	1xEV-DO Rev. A
R&S®EXBOXK249	IEEE 802.16
R&S®EXBOXK250	TD-SCDMA
R&S®EXBOXK251	TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA
R&S®EXBOXK254	IEEE 802.11n (including a/b/g/n/j/p)
R&S®EXBOXK255	LTE Release 8
R&S®EXBOXK259	3GPP FDD HSPA+
R&S®EXBOXK284	LTE Release 9
R&S®EXBOXK285	LTE Release 10 (LTE-Advanced)
R&S®EXBOXK286	IEEE 802.11ac

In the following the R&S®EXBOXKyyy options are referred to as xxx-Kyyy, where yyy stands for the respective option number.

A subset of R&S®WinIQSIM2™ options is supported for the R&S®CMW500 and R&S®CMW100.

R&S®CMW-KW010	AWGN (same feature set as xxx-K262)
R&S®CMW-KW200	GSM/EDGE (same feature set as xxx-K240)
R&S®CMW-KW201	EDGE Evolution (same feature set as xxx-K241)
R&S®CMW-KW300	LTE NB-IoT (NB-IoT feature set as xxx-K415)
R&S®CMW-KW400	WCDMA (same feature set as xxx-K242)
R&S®CMW-KW401	HSDPA (same feature set as xxx-K243)
R&S®CMW-KW402	HSUPA (same feature set as xxx-K245)
R&S®CMW-KW403	WCDMA Release 7 HSPA+ (same feature set as xxx-K259)
R&S®CMW-KW500	LTE (same feature set as xxx-K255)
R&S®CMW-KW502	LTE R10 (same feature set as xxx-K285)
R&S®CMW-KW504	LTE R12 (same feature set as xxx-K413)
R&S®CMW-KW514	LTE R13 LAA (LAA features set of xxx-K419)
R&S®CMW-KW570	LTE R14 C-V2X (V2X feature set of xxx-K419)
R&S®CMW-KW590	LTE MTC (eMTC feature set of xxx-K415)
R&S®CMW-KW6000	5G NR (same feature set as xxx-K444)
R&S®CMW-KW610	Bluetooth® (same feature set as xxx-K260)
R&S®CMW-KW620	GPS (1 satellite, same feature set as xxx-K244 and xxx-K298)
R&S®CMW-KW621	GLONASS (1 satellite, same feature set as xxx-K294)
R&S®CMW-KW622	Galileo (1 satellite, same feature set as xxx-K266)
R&S®CMW-KW623	BeiDou (1 satellite, same feature set as xxx-K407)
R&S®CMW-KW630	DVB (same feature set as xxx-K252)
R&S®CMW-KW632	DAB (same feature set as xxx-K253)
R&S®CMW-KW650	WLAN IEEE 802.11a/b/g/n/j/p (same feature set as xxx-K254)
R&S®CMW-KW656	WLAN IEEE 802.11ac (same feature set as xxx-K286)
R&S®CMW-KW657	WLAN IEEE 802.11ax (same feature set as xxx-K442)
R&S®CMW-KW683	LoRa® (same feature set as xxx-K431)
R&S®CMW-KW750	TD-SCDMA (same feature set as xxx-K250)
R&S®CMW-KW751	TD-SCDMA enhanced (same feature set as xxx-K251)
R&S®CMW-KW800	CDMA2000® (same feature set as xxx-K246)
R&S®CMW-KW880	1xEV-DO Rev. A (same feature set as xxx-K247)

A subset of R&S®WinIQSIM2™ options is supported for the R&S®CMW290.

R&S®CMW-KW010	AWGN (same feature set as xxx-K262)
R&S®CMW-KW200	GSM/EDGE (same feature set as xxx-K240)
R&S®CMW-KW201	EDGE Evolution (same feature set as xxx-K241)
R&S®CMW-KW400	WCDMA (same feature set as xxx-K242)
R&S®CMW-KW401	HSDPA (same feature set as xxx-K243)
R&S®CMW-KW402	HSUPA (same feature set as xxx-K245)
R&S®CMW-KW403	WCDMA Release 7 HSPA+ (same feature set as xxx-K259)
R&S®CMW-KW500	LTE (same feature set as xxx-K255)
R&S®CMW-KW610	Bluetooth® (same feature set as xxx-K260)
R&S®CMW-KW620	GPS (1 satellite, same feature set as xxx-K244 and xxx-K298)
R&S®CMW-KW621	GLONASS (1 satellite, same feature set as xxx-K294)
R&S®CMW-KW622	Galileo (1 satellite, same feature set as xxx-K266)
R&S®CMW-KW623	BeiDou (1 satellite, same feature set as xxx-K407)
R&S®CMW-KW630	DVB (same feature set as xxx-K252)
R&S®CMW-KW650	WLAN IEEE 802.11a/b/g/n/j/p (same feature set as xxx-K254)
R&S®CMW-KW656	WLAN IEEE 802.11ac (same feature set as xxx-K286)
R&S®CMW-KW657	WLAN IEEE 802.11ax (same feature set as xxx-K442)
R&S®CMW-KW750	TD-SCDMA (same feature set as xxx-K250)
R&S®CMW-KW751	TD-SCDMA enhanced (same feature set as xxx-K251)
R&S®CMW-KW800	CDMA2000® (same feature set as xxx-K246)
R&S®CMW-KW880	1xEV-DO Rev. A (same feature set as xxx-K247)

A subset of R&S®WinIQSIM2™ options is supported for the R&S®CMW270.

R&S®CMW-KW010	AWGN (same feature set as xxx-K262)
R&S®CMW-KW610	Bluetooth® (same feature set as xxx-K260)
R&S®CMW-KW620	GPS (1 satellite, same feature set as xxx-K244 and xxx-K298)
R&S®CMW-KW621	GLONASS (1 satellite, same feature set as xxx-K294)
R&S®CMW-KW622	Galileo (1 satellite, same feature set as xxx-K266)
R&S®CMW-KW623	BeiDou (1 satellite, same feature set as xxx-K407)
R&S®CMW-KW630	DVB (same feature set as xxx-K252)
R&S®CMW-KW650	WLAN IEEE 802.11a/b/g/n/j/p (same feature set as xxx-K254)
R&S®CMW-KW656	WLAN IEEE 802.11ac (same feature set as xxx-K286)
R&S®CMW-KW657	WLAN IEEE 802.11ax (same feature set as xxx-K442)
R&S®CMW-KW683	LoRa® (same feature set as xxx-K431)

A subset of R&S®WinIQSIM2™ options is supported for the R&S®CMA180.

R&S®CMA-KW620	GPS-Test (1 satellite, same feature set as xxx-K244 and xxx-K298)
R&S®CMA-KW621	GLONASS-Test (1 satellite, same feature set as xxx-K294)
R&S®CMA-KW622	Galileo-Test (1 satellite, same feature set as xxx-K266)
R&S®CMA-KW668	Tetra Release 2 (same feature set as xxx-K268)

Specifications

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, QPSK EDGE, AQPSK, OQPSK, π/4-QPSK, π/2-DBPSK, π/4-DQPSK, π/8-D8PSK, 8PSK, 8PSK EDGE
	QAM	16QAM, 16QAM EDGE, 32QAM, 32QAM EDGE, 64QAM, 128QAM, 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), APCO25(FSK), APCO25(8PSK), PWT, TFTS/TETRA, INMARSAT, VDL, 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
	EDGE narrow pulse shape	
	EDGE wide pulse shape	
	cdmaOne, cdmaOne + equalizer	
	cdmaOne 705 kHz	
	cdmaOne 705 kHz + equalizer	
	CDMA2000® 3X	
	EUTRA/LTE	
	APCO25 C4FM	
	rolloff factor	0.05 to 0.99
	APCO25 (H-CPM)	
	APCO25 (LSM)	
	Gauss cutoff frequency	400 Hz to 25 MHz
	lowpass cutoff frequency	400 Hz to 25 MHz
	rectangular	
	split phase	
	filter parameter B × T	0.15 to 2.5
	lowpass (ACP optimized)	
	cutoff frequency factor	0.05 to 2.00
	lowpass (EVM optimized)	
	cutoff frequency factor	0.05 to 2.00
	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®SMU200A, the maximum symbol rate is 60 Msps for linear modulation (such as BPSK or 16QAM) and 20 Msps for MSK (nonlinear 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	APCO phase 1 (C4FM, CQPSK, LSM, WCQPSK), APCO phase 2 (H-CPM, H-DQPSK, H-D8PSK wide, H-D8PSK narrow), Bluetooth®, DECT, ETC, GSM, GSM EDGE, NADC, PDC, PHS, TETRA, TFTS, WCDMA 3GPP, TD-SCDMA, CDMA2000® forward, CDMA2000® reverse, worldspace
Multisegment waveform	number of segments	depending on instrument
Multicarrier waveform	number of carriers	max. 512
	mode	equidistant carrier spacing, arbitrary carrier frequency
	total RF bandwidth	depending on instrument
	crest factor modes	maximize, minimize, off
	clipping	on (with specification of target crest factor and filter cutoff frequency), off
	signal period modes in equidistant carrier spacing mode	longest file, shortest file, user (max. 1 s)
	single carrier gain	–80 dB to 0 dB
	single carrier start phase	0° to 360°
	single carrier delay	0 s to 1 s

Digital modulation systems

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

Note that the given parameter ranges may be additionally restricted due to inter-parameter dependencies.

5G New Radio (xxx-K444 or R&S®CMW-KW6000 option)

3GPP 5G NR digital standard		in line with the following versions of the 3GPP Release 15 specifications: • TS 38.211 15.4.0 • TS 38.212 15.4.0 • TS 38.213 15.4.0 • TS 38.214 15.4.0
Note that the given parameter ranges may be additionally restricted due to inter-parameter dependencies.		
General settings		
Sequence length		can be entered in frames (10 ms each); the maximum length depends on the ARB size of the corresponding Rohde & Schwarz signal generator and the configured 5G NR settings, e.g. the channel bandwidth.
Filter mode		channel BW, per BWP, off
Suppress subcarrier on output carrier		on/off
Link direction		downlink, uplink
Node settings		
Number of carriers		1 to 16
RF phase compensation		on/off
Cell indicator	per carrier	0 to 15
Cell ID	per carrier	0 to 1007
Deployment	per carrier	f ≤ 3 GHz
		3 GHz < f ≤ 6 GHz
		f > 6 GHz
Frequency	per carrier	0 to 44 GHz
Channel bandwidth	per carrier, note that the resulting signal sample rate does not only depend on the configured channel bandwidth but also on other 5G NR settings.	5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz, 200 MHz, 400 MHz
DMRS type A position	per carrier	2, 3
SUL	per carrier	on/off
Point A to carrier center	per carrier	frequency in the lower half of the channel bandwidth
Use 15 kHz SCS	per carrier	on/off
Use 30 kHz SCS	per carrier	on/off
Use 60 kHz SCS	per carrier	on/off
Use 120 kHz SCS	per carrier	on/off
TX bandwidth offset/RB 15 kHz SCSs	per carrier	0 to 9
TX bandwidth offset/RB 30 kHz SCSs	per carrier	0 to 9
TX bandwidth offset/RB 60 kHz SCSs	per carrier	0 to 9
TX bandwidth offset/RB 120 kHz SCSs	per carrier	0 to 9
Number of SS/PBCH patterns	per carrier	1 to 4
SS/PBCH offset relative to	per carrier	TX BW, point A
SS/PBCH subcarrier spacing	per carrier and per SS/PBCH pattern	15 kHz, 30 kHz, 120 kHz, 240 kHz
SS/PBCH RB offset and SC offset	per carrier and per SS/PBCH pattern	in the channel bandwidth
SS/PBCH case	per carrier and per SS/PBCH pattern	A, B, C, D, E
SS/PBCH L	per carrier and per SS/PBCH pattern	4, 8, 64
SS/PBCH positions	per carrier and per SS/PBCH pattern	pattern of 0 or 1
SS/PBCH burst set periodicity	per carrier and per SS/PBCH pattern	5 ms, 10 ms, 20 ms, 40 ms, 80 ms, 160 ms
PSS power	per carrier and per SS/PBCH pattern	–80 dB to +10 dB
SSS power	per carrier and per SS/PBCH pattern	–80 dB to +10 dB
PBCH power	per carrier and per SS/PBCH pattern	–80 dB to +10 dB
PBCH dummy content for MIB	per carrier and per SS/PBCH pattern	off (MIB), on (dummy)
MIB content	per carrier and per SS/PBCH pattern	as of 3GPP TS 38.331
PBCH channel coding	per carrier and per SS/PBCH pattern	on/off
PBCH data source	per carrier and per SS/PBCH pattern	All0, All1, pattern, PNx (length: 1 bit to 64 bit) and data list

Dummy RE state	per carrier	on/off
Dummy RE power	per carrier	–80 dB to +10 dB
Dummy RE subcarrier spacing	per carrier	15 kHz, 30 kHz, 60 kHz, 120 kHz, 240 kHz
Dummy RE modulation	per carrier	BPSK, π/2-BPSK, QPSK, 16QAM, 64QAM, 256QAM
Dummy RE slot format	per carrier	0 to 1
Dummy RE transform precoding	per carrier	on/off
Dummy RE data source	per carrier	All0, All1, pattern, PNx (length: 1 bit to 64 bit) and data list
Users/BWP settings		
Number of users		1 to 10
UE ID	per user	0 to 65535
DSCH/USCH channel coding	per user	on/off
PDSCH data source	per user	All0, All1, pattern, PNx (length: 1 bit to 64 bit) and data list
Number of DL BWPs	per user and per carrier	1 to 4
Number of UL BWPs	per user and per carrier	0 to 4
BWP indicator	per user and per carrier and per BWP	0 to 3
BWP subcarrier spacing	per user and per carrier and per BWP	15 kHz, 30 kHz, 60 kHz, 120 kHz
BWP number of RBs	per user and per carrier and per BWP	in the transmission bandwidth of the respective numerology
BWP RB offset in TX BW	per user and per carrier and per BWP	in the transmission bandwidth of the respective numerology
PDSCH/PUSCH: DMRS configuration type	per user and per carrier and per BWP per DMRS set (DL and UL)	1, 2
PDSCH/PUSCH: DMRS additional position index	per user and per carrier and per BWP per DMRS set (DL and UL)	0 to 3
PDSCH/PUSCH: DMRS maximum length	per user and per carrier and per BWP per DMRS set (DL and UL)	1, 2
PDSCH/PUSCH: use scrambling ID	per user and per carrier and per BWP	on/off
PDSCH/PUSCH: data scrambling ID	per user and per carrier and per BWP	0 to 1023
PDSCH/PUSCH: maximum number of codewords per DCI	per user and per carrier and per BWP	1, 2
PDSCH/PUSCH: VRB-to-PRB interleaver	per user and per carrier and per BWP	non-interleaved
PDSCH/PUSCH: MCS table	per user and per carrier and per BWP	64QAM, 256QAM, 64QAM LowSE
PDSCH/PUSCH: resource allocation	per user and per carrier and per BWP	type 1
PUCCH: additional DMRS	per user and per carrier and per BWP	on/off
PUCCH: π/2-BPSK	per user and per carrier and per BWP	on/off
PUCCH: simultaneous HARQ-ACK-CSI	per user and per carrier and per BWP	off
PUSCH: transform precoding	per user and per carrier and per BWP	on/off
PUSCH: maximum rank	per user and per carrier and per BWP	1 to 4
PUSCH: TX config	per user and per carrier and per BWP	non-codebook, codebook
PUSCH: codebook subset	per user and per carrier and per BWP	• fully and partial and non-coherent, • partial and non-coherent, • non-coherent
PUSCH: MCS table (TP)	per user and per carrier and per BWP	64QAM, 256QAM, 64QAM LowSE
PUSCH UCI: state	per user and per carrier and per BWP	on/off
PUSCH UCI: mode	per user and per carrier and per BWP	UCI only, UCI+UL-SCH
PUSCH UCI: scaling alpha	per user and per carrier and per BWP	0.5, 0.65, 0.8, 1.0
PUSCH UCI: I_HARQ_offset 0/1/2	per user and per carrier and per BWP	0 to 15
PUSCH UCI: I_CSI1_offset 0/1	per user and per carrier and per BWP	0 to 18
PUSCH UCI: I_CSI2_offset 0/1	per user and per carrier and per BWP	0 to 18
Scheduling settings		
Number of allocations	per carrier and per subframe and per BWP	0 to 64
Content	per carrier and per subframe and per BWP and per allocation	CORESET, PDSCH, PUSCH, PRACH, PUCCH
Slot	per carrier and per subframe and per BWP and per allocation	0 to 15
Map type (PDSCH/PUSCH)	per carrier and per subframe and per BWP and per allocation	A, B
Format (PUCCH)	per carrier and per subframe and per BWP and per allocation	F0, F1, F2, F3, F4
Slot format	per carrier and per subframe and per BWP and per allocation	0 to 1

Number of symbols	per carrier and per subframe and per BWP and per allocation	1 to 14
Symbol offset	per carrier and per subframe and per BWP and per allocation	0 to 13
Number of RBs	per carrier and per subframe and per BWP and per allocation	in the respective BWP
RB offset	per carrier and per subframe and per BWP and per allocation	in the respective BWP
Modulation	per carrier and per subframe and per BWP and per allocation	BPSK, π/2-BPSK, QPSK, 16QAM, 64QAM, 256QAM
Transform precoding	per carrier and per subframe and per BWP and per allocation	on/off
Power	per carrier and per subframe and per BWP and per allocation	–80 dB to +10 dB
State	per carrier and per subframe and per BWP and per allocation	on/off
Repetition	per carrier and per subframe and per BWP and per allocation	off, slot, subframe, frame
PDSCH type	per carrier and per subframe and per BWP and per allocation	DCI format 1_0, DCI format 1_1
PUSCH type	per carrier and per subframe and per BWP and per allocation	DCI format 0_0, DCI format 0_1
Modulation	per carrier and per subframe and per BWP and per allocation	BPSK, π/2-BPSK, QPSK, 16QAM, 64QAM, 256QAM
Number of codewords (PDSCH)	per carrier and per subframe and per BWP and per allocation	1, 2
DMRS length	per carrier and per subframe and per BWP and per allocation	1, 2
DMRS power	per carrier and per subframe and per BWP and per allocation	–80 dB to +10 dB
CDM groups without data	per carrier and per subframe and per BWP and per allocation	1 to 3
Number of layers	per carrier and per subframe and per BWP and per allocation	1 to 8 (PDSCH), 1 to 4 (PUSCH)
Antenna ports	per carrier and per subframe and per BWP and per allocation	1000 to 1011 (PDSCH), 0 to 11 (PUSCH)
I_MCS	per carrier and per subframe and per BWP and per allocation	0 to 28
Redundancy version index	per carrier and per subframe and per BWP and per allocation	0 to 3
Antenna ports mapping	per carrier and per subframe and per BWP and per allocation	real, imag value mapping from antenna ports to baseband outputs
Coreset settings		
Interleaving state	per carrier and per subframe and per BWP and per coreset allocation	on/off
Interleaving bundle size	per carrier and per subframe and per BWP and per coreset allocation	2, 3, 6
Interleaving shift index	per carrier and per subframe and per BWP and per coreset allocation	0 to 274
Interleaving size	per carrier and per subframe and per BWP and per coreset allocation	2, 3, 6
Precoder granularity	per carrier and per subframe and per BWP and per coreset allocation	REG bundle, all contiguous RBs
Use DMRS scrambling ID	per carrier and per subframe and per BWP and per coreset allocation	on/off
ID	per carrier and per subframe and per BWP and per coreset allocation	0 to 65535
Number of DCIs	per carrier and per subframe and per BWP and per coreset allocation	1 to 4
Usage	per DCI	C-RNTI
DCI format	per DCI	0_0, 0_1, 1_0, 1_1, custom
Search space	per DCI	USS, type 3 USS
Aggregation level	per DCI	1, 2, 4, 8, 16
CCE index	per DCI	in the whole CORESET
Content	per DCI	as of 3GPP TS 38.212
Create PDSCH	per DCI	on/off

PUCCH settings		
Group hopping	per carrier and per subframe and per BWP and per PUCCH allocation	neither, enable, disable
Hopping ID	per carrier and per subframe and per BWP and per PUCCH allocation	0 to 1024
Intra slot frequency hopping	per carrier and per subframe and per BWP and per PUCCH allocation	on/off
Second hop PRB	per carrier and per subframe and per BWP and per PUCCH allocation	0 to 272
Initial cyclic shift	per carrier and per subframe and per BWP and per PUCCH allocation	0 to 11
Payload and format specific settings	per carrier and per subframe and per BWP and per PUCCH allocation	as needed for the different PUCCH formats
PRACH settings		
PRACH subcarrier spacing	per carrier and per subframe and per BWP and per PRACH allocation	1.25 kHz, 5 kHz, 15 kHz, 30 kHz, 60 kHz, 120 kHz
Format	per carrier and per subframe and per BWP and per PRACH allocation	0, 1, 2, 3, A1, A2, A3, B1, B2, B3, B4, C0, C2
Restricted set	per carrier and per subframe and per BWP and per PRACH allocation	unrestricted, type A, type B
Logical root sequence	per carrier and per subframe and per BWP and per PRACH allocation	0 to 837
Zero correlation zone	per carrier and per subframe and per BWP and per PRACH allocation	0 to 15
Preamble index	per carrier and per subframe and per BWP and per PRACH allocation	0 to 63

Verizon 5GTF (xxx-K418 option)

Predefined configurations		Downlink_Config_{1-4}, Uplink_Config_{1-4}

Downlink		
General settings		
Scheduling		manual, AutoDCI
CA		
Physical cell ID		0 to 503
N_ID^CSI		0 to 503
Relative power (CSI)		–80 dB to +10 dB
Signals		
P-SYNC power		–80 dB to +10 dB
S-SYNC power		–80 dB to +10 dB
E-SYNC power		–80 dB to +10 dB
Number of antenna ports (BRS)		1, 2, 4 or 8
BRS transmission period		1 slot, 1 subframe, 2 subframes, 4 subframes
Antenna ports		AP 0-7 (xPBCH), AP 16-31 (CSI-RS), AP 300-313 (PSS, SSS, ESS)
Frame configuration		
General		
Number of configurable subframes		1 to 48
User configuration		
State		on/off
TX modes		mode 1, mode 2, mode 3
Antenna mapping		AP 8-15 (xPDSCH), AP 60/61 (DL PCRS), AP 107/109 (xPDCCH)
UE ID		0 to 503
Data source		All0, All1, pattern, PNx and data list
Subframe configuration		
Modulation		QPSK, 16QAM, 64QAM, 256QAM
No. RB		4 to 100
Number of symbols		1 to 11
Offset RB		0 to 96
Offset sym.		1, 2
Data source		All0, All1, pattern, PNx and data list
Relative power		–80 dB to +10 dB
Content type		xPDSCH, CSI-RS, xPDCCH, xPBCH
Enhanced settings		
Precoding	TX mode 1	none
	TX mode 2	TX diversity
	TX mode 3	TX diversity, spatial multiplexing
Antenna ports (precoding)	xPBCH	AP 0 to 7
	xPDSCH	AP 8 to 15
	xPDCCH	AP 107/109
N_SCID	xPDSCH	0, 1
N_ID (DMRS)	xPDSCH	N_ID^Cell, N_ID^DMRS
N_ID^DMRS	xPDSCH	0 to 503
AP configuration (DL PCRS)	xPDSCH	none, 60, 61, 60/61
Relative power (DL PCRS)	xPDSCH	–80 dB to +10 dB
N_ID (DL PCRS)	xPDSCH	N_ID^Cell, N_ID^DMRS
N_ID^PCRS	xPDSCH	0 to 503
Antenna ports (CSI)	CSI-RS	AP 16/17, AP 18/19, AP 20/21, AP 22/23, AP 24/25, AP 26/27, AP 28/29, AP 30/31

xPDCCH		
Relative power		–80 dB to +10 dB
Dummy CCE xREGs		data, DTX
Dummy CCE data source		All0, All1, pattern, PNx and data list
User		user 1, user 2, user 3, user 4
DCI format		A1, A2, B1, B2
xPDCCH format		0 to 3
xPDCCH symbol		0, 1
CCE index		0 to 14
Content	Can be set according to V5G.213 specification.	bit data

Uplink		
General settings		
Physical cell ID		0 to 503
Frame configuration		
No. of xPUCCH configurations		1 to 48
No. of xPUSCH configurations		1 to 48
User configuration		
UE ID/n_RNTI		0 to 65535
UE power		–80 dB to +10 dB
Data source		All0, All1, pattern, PNx and data list
Channel coding		on/off
Relative UE baseband power		–80 dB to +10 dB
Subframe configuration		
Modulation		QPSK, 16QAM, 64QAM, 256QAM
No. RB		4 to 100
No. offset	depends on No. RB	0 to 96
Relative power		–80 dB to +10 dB
n_xPUCCH^2	xPUCCH	0 to 15
RE mapping index k_i	xPUSCH	0 to 4
N_ID (DMRS)	xPUSCH	N_ID^Cell, N_ID^DMRS
N_ID^DMRS	xPUSCH	0 to 503
UL PCRS State	xPUSCH	on/off
Relative power (UL PCRS)	xPUSCH	–80 dB to +10 dB
N_ID (UL PCRS)	xPUSCH	N_ID^Cell, N_ID^DMRS
N_ID^PCRS	xPUSCH	0 to 503
Code rate	xPUSCH, depends on modulation, No. RB	1/2, 2/3, 3/4, 5/6
Transport block size	xPUSCH, according to V5G.212	see tables in V5G.212

OFDM signal generation (xxx-K414 option)

Modulation type		OFDM, f-OFDM, UFMC, FBMC, GFDM
General settings		
Physical settings		
Total number of subcarriers		64 to 16384
Occupied number of subcarriers		1 to 0.83 × total number of subcarriers
Sequence length	2400 in case of OFDM, f-OFDM	1 to 150
Subcarrier spacing		1 to x Hz, x is calculated as follows: total number of subcarriers / max. sampling rate (depends on R&S®SMW200A baseband options)
Cyclic prefix length		1 to total number of subcarriers
Cyclic prefix no. symbols	OFDM, f-OFDM	0 to sequence length
Alt. cyclic prefix length	OFDM, f-OFDM	1 to total number of subcarriers
Alt. cyclic prefix no. symbols	OFDM, f-OFDM	0 to (sequence length – cyclic prefix no. symbols)
Filter settings		
Filter type	OFDM	none, user
	f-OFDM	soft truncation, user, none
	UFMC	Dolph-Chebyshev, user
	FBMC	root raised cosine, user
	GFDM	raised cosine, root raised cosine, Dirichlet, rectangular, user
Filter length	OFDM, f-OFDM, UFMC	1 to 2048
Stopband attenuation	UFMC	–80 dB to +10 dB
Rolloff factor	GFDM	0.0 to 1.0
Windowing method	f-OFDM	none, Hanning, Hamming
Cut transient response	f-OFDM, FBMC	on/off
Load user filter	OFDM, f-OFDM, UFMC selected filter type: user	.dat/.iqw filter coefficient file
Modulation-specific configuration		
Number of subbands	OFDM, f-OFDM, UFMC	1 to occupied number of subcarriers
Datablock size	GFDM	1 to sequence length, must be a common divisor of sequence length
Allocation settings		
User		
Data source		All0, All1, pattern, PNx and data list
Relative power ρ		–80 dB to +10 dB
State		on/off
Allocations		
Number of allocations		500
Modulation		BPSK,QPSK,16QAM,64QAM,256QAM, SCMA, custom I/Q
No. SC		1 to occupied number of subcarriers
Number of symbols		1 to sequence length
Offset SC		0 to (occupied number of subcarriers – no. SC)
Offset sym.		0 to (sequence length – number of symbols)
Data source		All0, All1, pattern, PNx, data list and I/Q source
Relative power ρ		–80 dB to +10 dB
Content type		data
Content type	OFDM, f-OFDM	data, pilot, reserved
SCMA configuration		
Spreading factor K		4 (fixed)
Codebook size M		4 (fixed)
Number of layers J		6 (fixed)
SCMA layer mapping		
LayerX		user0 to user5, one user can be allocated to multiple layers
Relative power ρ		0 dB (fixed)
Export path for XML settings	Sets the path for saving OFDM settings in XML format. These files can be used for for measurements, e.g. with the R&S®VSE-K96 OFDM vector signal analysis application.	

LTE Release 8 (xxx-K255 or R&S®CMW-KW500 option)

EUTRA/LTE digital standard		in line with 3GPP Release 8: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6.0
General settings		
Sequence length	sequence length can be entered in frames (10 ms each); max. length depending on channel bandwidth, oversampling and ARB size of the corresponding Rohde & Schwarz signal generator. oversampling = 2: 16 Msample: 27 (20 MHz bandwidth) to 436 (1.4 MHz bandwidth) frames 64 Msample: 109 (20 MHz bandwidth) to 1747 (1.4 MHz bandwidth) frames 128 Msample: 218 (20 MHz bandwidth) to 3495 (1.4 MHz bandwidth) frames 1 Gsample: 1747 (20 MHz bandwidth) to 27962 (1.4 MHz bandwidth) frames	
Mode	restricts the user interface to certain LTE/cellular IoT features for simplicity or enables access to all features according to the installed options	
Baseband filter	EUTRA/LTE filter with different optimization modes	best EVM, best ACP, best ACP (narrow), best EVM (no upsampling); for some LTE configurations, the filter is configured automatically
	other	see data sheet of respective Rohde & Schwarz instrument, "I/Q baseband generator" section
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 %
Duplexing		FDD, TDD
Link direction		downlink, uplink
Physical layer mode	fixed value; depends on selected link direction: OFDMA in downlink, SC-FDMA in uplink	
EUTRA test models (downlink)	in line with 3GPP TS 36.141 v.8.12.0 both FDD and TDD E-TMs are supported	E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3
Physical settings		
Channel bandwidth	determines the channel bandwidth used	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, user-defined
FFT size	The FFT size (128, 256, 512, 1024, 2048) is user-selectable if it is larger than the selected number of occupied subcarriers. For 15 MHz bandwidth, an FFT size of 1536 can be selected.	
Sampling rate	The sampling rate 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.	
Number of resource blocks	The number of resource blocks is automatically set in line with the selected channel bandwidth and physical resource block bandwidth.	
Cell-specific settings		
Physical cell ID group	determines cell ID together with physical layer ID	0 to 167
Physical layer ID	determines cell ID together with physical cell ID group	0 to 2
TDD special subframe configuration	only selectable if duplexing mode is set to TDD	0 to 8
TDD uplink/downlink configuration	only selectable if duplexing mode is set to TDD	0 to 6
Cyclic prefix	determines whether a normal or extended cyclic prefix is used for the subframes Note: It automatically determines the number of symbols per subframe.	normal, extended, user-defined

Downlink simulation		
Additional cell-specific settings in downlink		
PDSCH ratio P_B/P_A	sets the energy per resource element ratio between OFDM symbols containing a reference signal and those not containing one for PDSCH	selectable values in line with TS 36.213
PDCCH ratio P_B/P_A	sets the energy per resource element ratio between OFDMA symbols containing a reference signal and those not containing one for PDCCH	–10 dB to +10 dB in steps of 0.01 dB
PBCH ratio P_B/P_A	sets the energy per resource element ratio between OFDMA symbols containing a reference signal and those not containing one for PBCH	–10 dB to +10 dB in steps of 0.01 dB
PHICH duration		normal, extended
PHICH N_g		1/6, 1/2, 1, 2, custom
MIMO		
Global MIMO configuration	simulated cell-specific antenna configuration	1, 2, 4 transmit antennas, SISO+BF
Simulated antenna	simulated antenna	antenna 1, 2, 3, 4
Downlink reference signal structure		
Reference symbol power	power of reference symbol	–80 dB to +10 dB in steps of 0.01 dB
Synchronization signal settings		
P-/S-SYNC TX antenna	determines the antenna(s) from which the SYNC signal is transmitted	all, antenna 1, 2, 3, 4
P-SYNC power	determines the power of the primary synchronization signal	–80 dB to +10 dB in steps of 0.01 dB
S-SYNC power	determines the power of the secondary synchronization signal	–80 dB to +10 dB in steps of 0.01 dB
Resource allocation downlink		
Number of configurable subframes	determines the number of configurable subframes; the subframe configurations are used periodically Note: P/S-SYNC and PBCH are configured globally and therefore not copied here. The use of this function ensures a valid frame configuration.	up to 40 subframes The actual range depends on the duplex mode, on the sequence length and – in the case of TDD – on the UL/DL configuration.
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: It automatically determines the number of OFDMA symbols per subframe.	normal, extended Note: The cyclic prefix type can be set here only if the cyclic prefix type in the general settings dialog is set to user-defined.
Number of allocations used	determines the number of scheduled allocations in the selected subframe	up to 60
Allocation table		
Codeword	up to 2 codewords can be configured for MIMO	1/1, 1/2, 2/2
Modulation	determines modulation scheme used	QPSK, 16QAM, 64QAM
VRB gap	generates VRBs of localized and distributed type	0 (localized), 1, 2
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 subframe
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
Data source	determines data source of selected allocation Note: Data sources for users 0 to 3 can be configured in the Configure User panel.	All0, All1, pattern, PNx, data list, user 0, user 1, user 2 and user 3

Power	determines power of selected allocation	–80 dB to +10 dB in steps of 0.01 dB
Content type	determines type of selected allocation	PDSCH, PDCCH, PBCH
State	sets state of selected allocation	on/off
Enhanced settings PBCH		
Scrambling state		on/off
Channel coding state	enables channel coding (FEC)	on/off
MIB (including SFN)	activates the automatic MIB generation for the PBCH	on/off
SFN offset	sets the starting system frame number encoded in the MIB	0 to 1020 in steps of 4
MIB spare bits	sets the MIB spare bits	pattern of 10 bit
Transport block size		1 to 100000
Enhanced settings PDSCH		
Precoding scheme	sets multi-antenna mode for selected allocation Note: The available selection depends on the global MIMO configuration.	none, transmit diversity, spatial multiplexing, TX mode 7
Number of layers	The available selection depends on the global MIMO configuration.	1 to 4
Codebook index	The available selection depends on the global MIMO configuration.	0 to 15
Cyclic delay diversity	The available selection depends on the global MIMO configuration.	no CDD, large delay
Scrambling state		on/off
UE ID/n_RNTI	user equipment identifier (n_RNTI) for selected allocation	0 to 65535
Channel coding state	enables channel coding (FEC)	on/off
Transport block size		1 to 100000
Redundancy version index		0 to 3
IR soft buffer size		800 to 304000
Configuration of PCFICH, PHICH, PDCCH		
State	enables PCFICH, PHICH, PDCCH	on/off
Precoding scheme	sets multi-antenna mode for PCFICH, PHICH and PDCCH Note: The available selection depends on the global MIMO configuration.	transmit diversity
PCFICH power	determines power of PCFICH	–80 dB to +10 dB in steps of 0.01 dB
PCFICH scrambling state		on/off
Control region for PDCCH		1 to 4 OFDM symbols
PHICH power	determines power of a single PHICH symbol	–80 dB to +10 dB in steps of 0.01 dB
Number of PHICH groups		0 to 112
ACK/NACK pattern	can be set individually for each PHICH group	0, 1, – (up to 8 values)
PDCCH power	determines power of PDCCH	–80 dB to +10 dB in steps of 0.01 dB
PDCCH scrambling state		on/off
PDCCH format	PDCCH format –1 is Rohde & Schwarz signal generator's proprietary format for legacy support; PDCCH format variable allows flexible configuration of DCIs	–1 to 3, variable
Number of PDCCHs		depends on selected PDCCH format
Data source PDCCH	determines data source of PDCCH	All0, All1, pattern, PNx and data list
DCI format	can be individually mapped to CCEs	0, 1, 1a, 1b, 1c, 1d, 2, 2a, 3, 3a
Configure user		
	The "Configure user" dialog makes it possible to define and configure up to 4 scheduled users that can be distributed over the entire frame configuration by setting the data source of a specific allocation in the allocation table to user. Subframe allocations that are not adjacent or allocations of a different subframe can be configured to allow the use of a common data source.	
Transmission mode	selects the downlink transmission mode	user, mode 1 to mode 7
Scrambling state	enables scrambling for all allocations belonging to the selected user	on/off
Channel coding state	enables channel coding (FEC) for all allocations belonging to the selected user	on/off
UE ID/n_RNTI	user equipment identifier (n_RNTI) for selected user	0 to 65535

Data source	determines data source of user currently being configured	All0, All1, pattern, PNx and data list
Configure dummy data		
Dummy data modulation		QPSK, 16QAM, 64QAM
Dummy data source		All0, All1, pattern, PNx and data list
Dummy data power	determines power of dummy data allocations	–80 dB to +10 dB in steps of 0.01 dB
Uplink simulation		
Additional cell-specific settings in uplink		
Group hopping	activates reference signal group hopping while deactivating sequence hopping	on/off
Sequence hopping	only selectable if group hopping is deactivated	on/off
Delta sequence shift for PUSCH		0 to 29
n(1)_DMRS	sets the broadcast part of the DMRS index	0 to 11
Enable n_PRS		on/off
PRACH configuration		1 to 63
Restricted set		on/off
Uplink frequency hopping mode		intra-SF, inter-SF
PUSCH hopping offset		0 to total number of RBs – 2
Number of subbands		1 to 4
Number of RBs used for PUCCH		0 to total number of RBs
Delta shift		1 to 3
Delta offset		0 to delta shift – 1
N(1)_cs	if number of RBs used for PUCCH is 0	always 0
	otherwise	0 to 7, but only multiples of delta shift
N(2)_RB	if N(1)_cs is 0	0 to number of RBs used for PUCCH
	otherwise	0 to number of RBs used for PUCCH – 1
SRS subframe configuration		0 to 15
SRS bandwidth configuration		0 to 7
A/N-SRS simultaneous TX	enables simultaneous transmission of SRS and PUCCH	on/off
Resource allocation uplink		
Select user equipment	up to 8 UEs can be configured individually and allocated to the subframes.	
Number of configurable subframes (for FDD), number of configurable uplink subframes (for TDD)	determines the number of configurable uplink subframes; the subframe configurations are used periodically Note: Sounding reference signals are configured globally and therefore not copied here.	up to 40 subframes The actual range depends on the duplex mode, on the sequence length and – in the case of TDD – on the UL/DL configuration.
Cyclic prefix	determines whether a normal or extended cyclic prefix is used for a specific subframe Note: It automatically determines the number of SC-FDMA symbols per subframe.	normal, extended Note: The cyclic prefix type can be set here only if the cyclic prefix type in the general settings dialog is set to user-defined.
Allocation table		
Content type	UE can be set to PUSCH or PUCCH	PUSCH, PUCCH
Modulation	determines the modulation scheme used if content type is PUSCH or the PUCCH format if content type is PUCCH	QPSK, 16QAM, 64QAM or format 1, 1a, 1b, 2, 2a, 2b
Number of resource blocks (RB)	defines size of selected allocation in terms of resource blocks	1 to total number of RBs
Offset VRB	sets the virtual resource block offset; the physical resource block offset for the two slots of the corresponding subframe is set automatically depending on the frequency hopping settings	0 to total number of RBs – 1
Power	determines power of selected allocation	–80 dB to +10 dB in steps of 0.01 dB
State	sets state of selected allocation	on/off

User equipment configuration		
3GPP release		Release 8/9
UE ID/n_RNTI	user equipment identifier (n_RNTI) for selected user equipment	0 to 65535
Power	sets power level of selected UE	–80 dB to +10 dB in steps of 0.01 dB
Mode		standard, PRACH
Restart Data, A/N, CQI and RI every subframe	If activated, all data sources are restarted every subframe.	on/off
FRC state	If activated, several parameters are set in line with the fixed reference channel definitions in 3GPP TS 36.141 v.8.3.0.	on/off
FRC	selects the FRC	A1-1, A1-2, A1-3, A1-4, A1-5, A1-6, A1-7 A2-1, A2-2, A2-3, A3-1, A3-2, A3-3, A3-4, A3-5, A3-6, A3-7, A4-1, A4-2, A4-3, A4-4, A4-5, A4-6, A4-7, A4-8, A5-1, A5-2, A5-3, A5-4, A5-5, A5-6, A5-7, A7-1, A7-2, A7-3, A7-4, A7-5, A7-6, A8-1, A8-2, A8-3, A8-4, A8-5, A8-6 A12-1, A12-2, A12-3, A12-4, A12-5, A12-6 A13-1, A13-2, A13-3, A13-4, A13-5, A13-6 (the actual range depends on the configured bandwidth and cyclic prefix settings of the general settings dialog)
Offset VRB	If the FRC state is switched on, this value replaces all offset VRB values in the allocation table.	0 to total number of FRC RBs – 1
n(2)_DMRS	If the FRC state is switched on, this value replaces all n(2)_DMRS values for layer 0 in the enhanced settings for PUSCH.	0, 2, 3, 4, 6, 8, 9, 10
Data source	determines data source used for PUSCH of selected UE	All0, All1, pattern, PNx and data list
Scrambling state		on/off
Channel coding state	enables channel coding (FEC) and multiplexing of control and data information	on/off
Channel coding mode	selects whether data, control information or both is transmitted on the PUSCH	UL-SCH only, UCI + UL-SCH, UCI only
I_HARQ_Offset		0 to 14
I_RI_Offset		0 to 12
I_CQI_Offset		2 to 15
DRS power offset	sets power of DRS relative to power level of PUSCH/PUCCH allocation of corresponding subframe	–80 dB to +10 dB in steps of 0.01 dB
SRS state	enables sending of sounding reference signals	on/off
Transmit trigger type 0 SRS	enables the transmission of SRS trigger type 0	always on if LTE release is Release 8/9
SRS power offset	sets power of SRS relative to power level of corresponding UE	–80 dB to +10 dB in steps of 0.01 dB
SRS cyclic shift	cyclic shift used for SRS	0 to 11
Configuration index I_SRS	SRS configuration index	0 to 636 for FDD, 0 to 644 for TDD
Bandwidth configuration B_SRS	SRS bandwidth configuration	0 to 3
Transmission comb k_TC	SRS transmission comb	0 to 1
Hopping bandwidth b_hop	SRS hopping bandwidth	0 to 3
Frequency domain position n_RRC	SRS frequency domain position	0 to 100

Enhanced settings for PUSCH		
Cyclic shift field	for DRS	0 to 7
n(2)_DMRS, 0	sets for layer 0 the part of the DMRS index which is part of the uplink scheduling assignment	0, 2, 3, 4, 6, 8, 9, 10
Frequency hopping		on/off
Information in hopping bits		0 to 1 if the total number of RBs is less than 50, otherwise 0 to 3
HARQ ACK mode	Note: Bundling will be supported in a later version.	multiplexing, bundling
Number of ACK/NACK bits		0 to 20
ACK/NACK pattern		0, 1
Number of RI bits		0 to 512
RI pattern		0, 1
Number of CQI bits		0 to 1024
CQI pattern		0, 1
Transport block size UL-SCH		1 to 253440
Redundancy version index UL-SCH		0 to 3
Enhanced settings for PUCCH		
n_PUCCH	sets PUCCH index	range depending on cell-specific settings
ACK/NACK pattern		0, 1
Number of CQI bits		1 to 13
Number of coded CQI bits		20
CQI pattern		0, 1
Settings for PRACH		
Preamble format	set indirectly by PRACH configuration	0 to 4
RB offset	sets the start resource block used for the PRACH Note: Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.	0 to total number of RBs – 1
N_cs configuration	Note: Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.	0 to 15
Logical root sequence index	Note: Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.	0 to 837
Sequence index (v)	Note: Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.	0 to 63
Δt	delays the corresponding PRACH by Δt in µs Note: Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.	–250 µs to +250 µs in steps of 0.01 µs
State	activates the PRACH for the corresponding subframe Note: Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.	on/off

LTE Release 9 (xxx-K284 option)

For each K284 option, a K255 option must also be installed.

General description	This option enhances the xxx-K255 option (EUTRA/LTE digital standard) to support LTE Release 9, including the following features: • Generation of positioning reference signals (PRS) • Dual-layer beamforming (transmission mode 8) • MBMS single frequency network (MBSFN) The xxx-K284 option requires the xxx-K255 option. Therefore, all general parameters of the xxx-K255 option are also valid for the xxx-K284 option, unless stated otherwise in the sections below.	
EUTRA/LTE digital standard		in line with 3GPP Release 9: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6
Positioning reference signals (PRS)		
PRS state		on/off
PRS configuration index	in line with TS 36.211-910, table 6.10.4.3-1	0 to 2399
PRS periodicity (T_PRS)	read-only, displays the periodicity of the PRS generation in line with TS 36.211-910, table 6.10.4.3-1	160, 320, 640, 1280 subframes
PRS subframe offset (Delta_PRS)	read-only, displays the subframe offset of the PRS generation in line with TS 36.211-910, table 6.10.4.3-1	0 to 1279 subframes
Number of PRS DL subframes (N_PRS)	defines the number of consecutive PRS subframes	1, 2, 4, 6 subframes
PRS bandwidth	defines the resource blocks in which the PRS are transmitted	1.4/3/5/10/15/20 MHz
PRS power	sets the power of a PRS resource element relative to a common reference signal (CRS) resource element	–80 dB to +10 dB
Dual-layer beamforming		
This option enables the generation of downlink signals dedicated to UE that is set to transmission mode 8. In order to support this mode, the DCI format 2B is introduced. The way that the (logical) antenna ports are mapped to the (physical) TX antennas of the signal generator is configurable. This feature allows UE receiver testing in line with the beamforming model defined in TS 36.101, B.4.		
Antenna port mapping	defines how the (logical) antenna ports are mapped to the (physical) TX antennas of the signal generator	codebook, random codebook, fixed weights
Transmission mode	selects the downlink transmission mode	transmission mode range is extended by transmission mode 8
DCI format	selects the DCI format	DCI format range is extended by format 2B
MBMS single frequency network (MBSFN)		
This option enables the generation of MBSFN subframes. All different allocation, modification and repetition periods can be set individually within the maximum number of frames that can be generated in line with the sequence length enabled by the xxx-K255 option. References to the official 3GPP TS 36.331 v.9.5.0 specification are abbreviated as 36.331.		
MBSFN mode	mixed: 15 kHz subcarrier spacing dedicated: 7.5 kHz subcarrier spacing [2]	off, mixed, dedicated
MBSFN rho A	sets the power of the MBSFN channels relative to the common reference signals	–80 dB to +10 dB
UE category	defines the MBMS UE category as specified in 36.306	1 to 5
Radio frame allocation period	(from 36.331, MBSFN-SubframeConfig) indicates the radio frames that contain MBSFN subframes	1, 2, 4, 8, 16, 32 frames
Radio frame allocation offset	(from 36.331, MBSFN-SubframeConfig) indicates the radio frames that contain MBSFN subframes	0 to 7 frames
Subframe allocation mode	(from 36.331, MBSFN-SubframeConfig) defines whether MBSFN periodic scheduling is done in 1 or 4 frame mode	1 frame, 4 frames

[2] The dedicated mode will be supported in a later version.

Allocation value (HEX)	(from 36.331, MBSFN-SubframeConfig, identical to bitmap of subframe allocation) defines which subframes are used for MBSFN	
	1 frame	0x00 to 0x3F (hex)
	4 frames	0x000000 to 0xFFFFFF (hex)
Area ID (N_ID_MBSFN)	(from 36.331, MBSFN-AreaInfoList) indicates the MBSFN area ID	0 to 255
Non-MBSFN region length	(from 36.331, MBSFN-AreaInfoList) indicates how many symbols from the beginning of the subframe constitute the non-MBSFN region	1, 2 OFDMA symbols
Notification indicator	(from 36.331, MBSFN-AreaInfoList) indicates which PDCCH bit is used to notify the UE about changes of the MCCH	0 to 7
MCCH state		on/off
MCCH repetition period	(from 36.331, MBSFN-AreaInfoList) defines the interval between transmissions of MCCH information in radio frames	32, 64, 128, 256 frames
MCCH offset	(from 36.331, MBSFN-AreaInfoList) indicates, together with the MCCH repetition period, the radio frames in which the MCCH is scheduled [3]	0 to 7 frames
MCCH modification period	(from 36.331, MBSFN-AreaInfoList) defines periodically appearing boundaries; the contents of different transmissions of MCCH information can only be different if there is at least one such boundary between them	512, 1024 frames
MCCH MCS	(from 36.331, MBSFN-AreaInfoList) indicates the modulation and coding scheme (MCS) for the MCCH	2, 7, 13, 19
Notification subframe index	(from 36.331, MBMS-NotificationConfig) indicates the subframe used to transmit MCCH change notifications on PDCCH	1 to 6
Notification repetition coefficient	(from 36.331, MBMS-NotificationConfig) actual change notification repetition period for the MCCH	2, 4
Notification offset	(from 36.331, MBMS-NotificationConfig) indicates, together with the notification repetition coefficient, the radio frames in which the MCCH information change notification is scheduled [3]	0 to 7 frames
Common subframe allocation period	(from 36.331, MBSFN-AreaConfiguration) indicates the period during which resources corresponding with the radio frame allocation period field are divided between the PMCHs that are configured for this MBSFN area	4, 8, 16, 32, 64, 128, 256 frames
Number of PMCHs	defines the number of PMCHs of the simulated MBSFN area	1 to 15
Subframe allocation start	indicates the first subframe allocated to a specific PMCH within a period identified by the radio frame allocation period	0 to 1534
Subframe allocation end	indicates the last subframe allocated to a specific PMCH within a period identified by the radio frame allocation period	1 to 1535
Scheduling period	(from 36.331, PMCH-InfoList) indicates the MCH scheduling period, i.e. the periodicity used for providing MCH scheduling information at lower layers (MAC) for a specific PMCH	8, 16, 32, 64, 128, 256, 512, 1024 frames
MCS	(from 36.331, PMCH-InfoList) indicates the modulation and coding scheme (MCS) for a specific PMCH	0 to 28
Data source	sets the data source for a specific PMCH	All0, All1, pattern, PNx and data list

[3] Read-only, same value as radio frame allocation offset.

LTE Release 10 (LTE-Advanced) (xxx-K285 or R&S®CMW-KW502 option)

For each xxx-K285 (R&S®CMW-KW502) option, a xxx-K255 (R&S®CMW-KW500) option must also be installed.

General description	This option enhances the xxx-K255 (R&S®CMW-KW500) option (EUTRA/LTE digital standard) to support LTE Release 10 (LTE-Advanced) including the following features: • DL carrier aggregation including cross-carrier scheduling • Generation of DCIs with carrier indicator field (CIF) • DL transmission mode 9 for up to 8 layer beamforming • PUCCH format 3 • Simultaneous PUSCH and PUCCH transmission • Noncontiguous PUSCH transmission (uplink resource allocation type 1) • PUSCH transmission mode 2 (uplink MIMO) • Aperiodic SRS (SRS trigger type 1) The xxx-K285 (R&S®CMW-KW502) option requires the xxx-K255 (R&S®CMW-KW500) option. Therefore, all general parameters of the xxx-K255 (R&S®CMW-KW500) option are also valid for the xxx-K285 (R&S®CMW-KW502) option, unless stated otherwise in the sections below.	
EUTRA/LTE digital standard		in line with 3GPP Release 10: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6
Downlink simulation		
CSI reference signals		
This option enables the generation of DL CSI reference signals. References to the official 3GPP TS 36.331 v.10.8.0 specification are abbreviated as 36.331.		
General CSI settings		
ZeroPowerCSI-RS	(from 36.331, CSI-RS-Config) each bit set to 1 in this bitmap enables the corresponding CSI-RS configuration to be used for zero transmission power	0x0000 to 0xFFFF (hex)
Subframe configuration (I_CSI-RS)	(from 36.331, CSI-RS-Config) defines the subframes that contain the ZeroTxPower CSI-RS	0 to 154
CSI-RS state	enables the transmission of CSI reference signals in the cell	on/off
Number of CSI-RS antenna ports	(from 36.331, CSI-RS-Config) defines the number of antenna ports used for CSI-RS; the antenna ports are mapped to the physically available antennas in the “AP mapping” panel	1, 2, 4, 8
CSI-RS configuration	(from 36.331, CSI-RS-Config) Note: The range of valid configurations depends on the cyclic prefix, duplex mode and number of CSI antenna ports.	0 to 31
Subframe configuration (I_CSI-RS)	(from 36.331, CSI-RS-Config) defines the subframes that contain the CSI-RS	0 to 154
CSI-RS power	sets the CSI-RS EPRE in relation to the cell-specific RS (CRS)	–8.00 dB to +15.00 dB
Configure user/enhanced settings PDSCH for CSI		
CSI awareness	defines whether the receiving UE is aware of the CSI-RS or not; PDSCH coding and mapping are adjusted accordingly	on/off
Carrier aggregation settings		
This option enables the generation of DL carrier aggregation signals with up to five component carriers (1 × primary cell/PCell and 4 × secondary cells/SCells) in line with EUTRA Release 10. The exact number of component carriers that can be generated within one baseband depends on the maximum available bandwidth of the target generator, the bandwidth and the exact frequency offsets of the individual component carriers. References to the official 3GPP TS 36.331 v.10.8.0 specification are abbreviated as 36.331.		
General CA settings		
Activate carrier aggregation	activates the generation of several component carriers (CC)	on/off
Cell index	(from 36.331, RRCConnectionReconfiguration) cell index of SCell, not to be mixed up with the physical cell ID; is required for signaling on the DCI CIF (carrier indicator field)	1 to 7

Phy cell ID	(from 36.331, RRCConnectionReconfiguration) sets the physical cell ID of the SCell	0 to 503
Bandwidth	sets the bandwidth of the SCell	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
Δf	defines the frequency shift for this SCell relative to the PCell	
	range	depends on the respective Rohde & Schwarz instrument
	resolution	0.1 MHz
CIF present	(from 36.331, CrossCarrierSchedulingConfig) defines whether the CIF (carrier indicator field) is present or not in PDCCH DCI formats transmitted from this cell	on/off
schedCell index	(from 36.331, CrossCarrierSchedulingConfig) defines from which cell this cell receives the DL and UL grants	0 to 7
PDSCH start	(from 36.331, CrossCarrierSchedulingConfig) sets the starting symbol of the PDSCH for the SCell (control region for PDCCH)	1 to 4
PHICH N_g		1/6, 1/2, 1, 2, custom
PHICH duration		normal, extended
Power	sets the power offset of the SCell relative to the PCell	–80 dB to +80 dB
Delay	configures a time delay of the SCell relative to the PCell	0 ns to 700 000 ns
State	activates/deactivates this cell	on/off
CA settings in the downlink user configuration		
Activate CA	activates/deactivates CA support for the user	on/off
UL carriers	activates/deactivates the associated uplink carriers for the downlink carriers	on/off
DCI configuration		
Cell index	defines from which cell this DCI is transmitted when carrier aggregation is activated	0 to 7
Carrier indicator field	part of DCI when CIF is set to be present; defines on which cell UL/DL transmission takes place	0 to 7
DL transmission mode 9 for up to 8 layer beamforming		
This option enables the generation of downlink signals dedicated to UE that is set to transmission mode 9. In order to support this mode, the DCI format 2C is introduced. The way that the (logical) antenna ports are mapped to the (physical) TX antennas of the signal generator is configurable.		
Transmission mode	selects the downlink transmission mode	transmission mode range is extended by transmission mode 9
DCI format	selects the DCI format	DCI format range is extended by format 2C

Uplink simulation		
General configuration		
This option enables the generation of uplink signals in line with EUTRA Release 10.		
3GPP release	enables/disables the Release 10 functionality for a user equipment	Releases 8/9, LTE-Advanced
Number of configurable uplink subframes	independently configurable for PUSCH and PUCCH if a user equipment is a configured LTE-Advanced user equipment	1 to the number of uplink subframes in 4 frames
PUCCH format 3		
This option enables the generation of PUCCH with format 3 for configured LTE-Advanced user equipment.		
Modulation/format (for the PUCCH of a configured LTE-Advanced user equipment)	selects the format of the PUCCH	F1, F1a, F1b, F2, F2a, F2b, F3
Simultaneous PUSCH and PUCCH transmission		
This option enables the generation of PUSCH and PUCCH of a configured LTE-Advanced user equipment in the same subframe.		
Content	For a configured LTE-Advanced user equipment, both channel types are available for configuration in the same subframe.	PUCCH, PUSCH
Noncontiguous PUSCH transmission (uplink resource allocation type 1)		
This option enables the generation of PUSCH with noncontiguous frequency allocation (two resource block sets according to uplink resource allocation type 1).		
Set 1 No. RB	number of resource blocks for the first set of an LTE-Advanced user equipment PUSCH or for the only set of a Release 8/9 user equipment PUSCH or for the PUCCH	1 to total number of RBs; the actual range can be limited due to other configurations of the cell or of the user equipment
Set 1 Offset VRB	VRB offset for the first set of an LTE-Advanced user equipment PUSCH or for the only set of a Release 8/9 user equipment PUSCH	0 to total number of RBs – 1; the actual range can be limited due to other configurations of the cell or of the user equipment
Set 2 No. RB	number of resource blocks for the second set of an LTE-Advanced user equipment PUSCH	0 to total number of RBs – 2; the actual range can be limited due to other configurations of the cell or of the user equipment
Set 2 Offset VRB	VRB offset for the second set of an LTE-Advanced user equipment PUSCH	2 to total number of RBs – 3; the actual range can be limited due to other configurations of the cell or of the user equipment
PUSCH transmission mode 2 (uplink MIMO)		
This option enables the generation of PUSCH with transmission mode 2 (uplink MIMO).		
Transmission mode	transmission mode for PUSCH, only available for LTE-Advanced user equipment	1 (spatial multiplexing not possible), 2 (spatial multiplexing possible)
Maximum number of antenna ports for PUSCH		1, 2, 4
Activate DMRS with OCC for one antenna port		on/off
Number of antenna ports for SRS		1, 2, 4
Number of antenna ports for PUCCH format 1/1a/1b		1, 2
Number of antenna ports for PUCCH format 2/2a/2b		1, 2
Number of antenna ports for PUCCH format 3		1, 2
Precoding scheme	for PUSCH	none, spatial multiplexing
Number of codewords	for PUSCH	1, 2
Number of layers	for PUSCH	1, 2, 4
Number of used antenna ports	for PUSCH	1, 2, 4
Codebook index	for PUSCH	depends on the codewords/layers/antenna ports configuration
Cyclic shift field	for PUSCH DRS	0 to 7
Transport block size	for PUSCH codeword 1	1 to 100000
Redundancy version index	for PUSCH codeword 1	0 to 3
n_PUCCH antenna port 201	for PUCCH	range depending on cell-specific settings

Aperiodic SRS (SRS trigger type 1)		
This option enables the generation of SRS signals according to SRS trigger type 1 (aperiodic SRS).		
Transmit trigger type 0 SRS	enables the transmission of SRS trigger type 0 in addition to SRS trigger type 1	always on for a Release 8/9 user equipment; on/off for an LTE-Advanced user equipment
Configuration sets for trigger type 1	individual SRS configuration sets for trigger type 1 SRS transmissions	DCI0, DCI1A/2B/2C/2D, DCI4Set1, DCI4Set2, DCI4Set3
Number of transmissions	number of scheduled SRS transmissions for a specific configuration set	0 to 50
Subframes for transmissions	subframes in which SRS transmissions are scheduled for a specific configuration set	the range depends on the configured ARB sequence length

LTE Release 11 (xxx-K412 option)

For each xxx-K412 option, a xxx-K255 option must also be installed.

General description	This option enhances the xxx-K255 option (EUTRA/LTE digital standard) to support LTE Release 11 and enhanced features, including the following features: • Release 11 special subframe configurations 9 (normal cyclic prefix) and 7 (extended cyclic prefix) • PUCCH format 3 for periodic CSI • Uplink carrier aggregation including mixed TDD settings • Mixed TDD settings for downlink carrier aggregation • PDSCH scheduling mode “Auto Sequence” for automatic scheduling of downlink transmissions according to long HARQ patterns • Enhanced PDCCH (EPDCCH) • Transmission mode 10, DCI format 2D, scrambling settings for CoMP/eICIC/feICIC The xxx-K412 option requires the xxx-K255 option. Therefore, all general parameters of the xxx-K255 option are also valid for the xxx-K412 option, unless stated otherwise in the sections below.	
EUTRA/LTE digital standard		in line with 3GPP Release 11: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6
Release 11 special subframe configurations		
This option enables the generation of TDD signals with special subframe configuration 9 and normal cyclic prefix, as well as TDD signals with special subframe configuration 7 and extended cyclic prefix.		
TDD special subframe configuration	defines the special subframe configuration for TDD (frame structure type 2)	0 to 9 For the values 8 and 9 cyclic prefix type “normal” is allowed only. For the values 0 to 7 both cyclic prefix types, “normal” and “extended” are allowed.
PUCCH format 3 for periodic CSI		
This option enables the generation of PUCCH format 3 with up to 22 information bit before channel coding, independently of the duplexing mode. This is needed for transmitting periodic CSI reports by means of PUCCH format 3.		
Number of A/N + SR + CSI bits	defines the number of PUCCH format 3 information bit before channel coding	0 to 22
Uplink carrier aggregation		
This option enables the generation of uplink carrier aggregation signals with up to five component carriers (1 × primary cell/PCell and 4 × secondary cells/SCells) in line with EUTRA Release 10. The exact number of component carriers that can be generated within one baseband depends on the maximum available bandwidth of the target generator, the bandwidth and the exact frequency offsets of the individual component carriers. References to the official 3GPP TS 36.331 v.10.8.0 specification are abbreviated as 36.331.		
Activate carrier aggregation	activates the generation of several component carriers (CC)	on/off
Cell index	(from 36.331, RRCConnectionReconfiguration) cell index of SCell, not to be mixed up with the physical cell ID	1 to 7
Phy cell ID	(from 36.331, RRCConnectionReconfiguration) sets the physical cell ID of the SCell	0 to 503
Bandwidth	sets the bandwidth of the SCell	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
Δf	defines the frequency shift for this SCell relative to the PCell	
	range	depends on the respective Rohde & Schwarz instrument
	resolution	1 MHz
UL/DL configuration	in case of TDD: UL/DL configuration of this uplink component carrier	0 to 6
Special SF configuration	in case of TDD: special subframe configuration of this uplink component carrier	0 to 9
n(1)_DMRS	sets the broadcast part of the DMRS index for the SCell	0 to 11
SRS SF configuration	SRS subframe configuration for the SCell	0 to 15
SRS BW C_SRS	SRS bandwidth configuration for the SCell	0 to 7
Delay	configures a time delay of the SCell relative to the PCell	0 ns to 700 000 ns
State	activates/deactivates this cell	on/off

Cell	in the user equipment configuration and the user equipment's antenna port mapping table	PCell, SCell 1, SCell 2, SCell 3, SCell 4
Cell	in the subframe configuration	PCell, SCell 1, SCell 2, SCell 3, SCell 4
Power	for a specific cell (in the antenna port mapping table)	–80 dB to 10 dB
Mixed TDD settings for downlink carrier aggregation		
This option enables the usage of different TDD UL/DL configurations and TDD special subframe configurations in individual downlink component carriers, in line with EUTRA Release 11.		
UL/DL configuration	in case of TDD: UL/DL configuration of this downlink component carrier	0 to 6
Special SF configuration	in case of TDD: special subframe configuration of this downlink component carrier	0 to 9
PDSCH scheduling mode "Auto Sequence"		
This option enables the PDSCH scheduling mode "Auto Sequence". By means of this mode, an easy configuration of downlink transmissions according to long HARQ patterns is possible. In the scheduling modes "Manual" and "Auto/DCI", which are also available without the option K112, the maximum length of HARQ patterns is limited by the maximum number of configurable downlink subframes. In the scheduling mode "Auto Sequence", this limitation does not apply.		
PDSCH scheduling	determines the PDSCH scheduling mode	manual, auto/DCI, auto scheduling
Number of configurable subframes	determines the number of independent subframe configurations	not available in PDSCH scheduling mode "Auto Sequence" (subframe configurations are determined automatically in PDSCH scheduling mode "Auto Sequence")
DCI format	PDCCH settings	in PDSCH scheduling mode "Auto Sequence", only one downlink DCI and one uplink DCI is configurable per each user and each cell (downlink and uplink DCIs are determined automatically from these template DCIs in PDSCH scheduling mode "Auto Sequence")
Parameters for "Autofill Sequences"		
Autofill DL sequence	determines if the autofill feature should create entries in the downlink auto sequence tables	off/on
Number of HARQ process IDs	determines the number of downlink HARQ process IDs available for the autofill feature	1 to 15
Starting NDI (downlink)	determines whether the autofill feature starts with NDI 0 or 1 in the downlink auto sequence tables	off/on
Number of HARQ transmissions (downlink)	determines the number of HARQ transmissions in each downlink HARQ process before a retransmission is scheduled	1 to 32
Skip process at unused subframes	determines whether the HARQ process IDs should be skipped in unused subframes	off/on
Subframes to use	determines which downlink or special subframes should be used for downlink transmission	off/on (per subframe)
Autofill UL sequence	determines if the autofill feature should create entries in the uplink auto sequence tables	off/on
Number of HARQ transmissions (uplink)	determines the number of HARQ transmissions in each uplink HARQ process before a retransmission is scheduled	1 to 32
Starting NDI (uplink)	determines whether the autofill feature starts with NDI 0 or 1 in the uplink auto sequence tables	off/on
Parameters for the downlink auto sequence tables		
MCS mode	determines the MCS mode	manual, fixed, target code rate
Target code rate	determines the target code rate	0 to 1
Target modulation	determines the target modulation	QPSK, 16QAM, 64QAM
MCS (for fixed MCS mode)	determines the MCS for fixed MCS mode	0 to 31

RV coding sequence	determines the sequence of redundancy versions used for the HARQ transmissions	sequence of the values 0 to 3
Use RLC Counter	determines whether the RLC counter should be included in the user's downlink transport blocks	off/on
Subframe	subframe number of an actual downlink transmission	range depends on the available ARB memory
MCS (for manual MCS mode)	MCS of an actual downlink transmission	0 to 31
HARQ process	HARQ process ID of an actual downlink transmission	0 to 15
NDI	NDI of an actual downlink transmission	off/on
Parameters for the uplink auto sequence tables		
Vary UL tx power and RBA	determines if the TPC commands and the resource block assignments can vary inside the uplink DCI transmissions	off/on
Subframe	subframe number of an actual uplink DCI transmission	range depends on the available ARB memory
RBA	determines the resource block assignment of an actual uplink DCI transmission	range depends on the channel bandwidth
NDI	determines the NDI of an actual uplink DCI transmission	off/on
PUSCH TPC	determines the PUSCH TPC of an actual uplink DCI transmission	0 to 3
Enhanced PDCCH (EPDCCH)		
This option enables the use of the Enhanced PDCCH (EPDCCH) channel in the PDSCH scheduling modes "Auto/DCI" and "AutoSequence"		
Parameters in the user configuration		
Activate EPDCCH	activates the EPDCCH for this user	on/off
Set 1 / 2 state	activates the EPDCCH set 1 / 2	on/off
Set 1 / 2 transmission type	determines the transmission type for EPDCCH set 1 / 2	localized/distributed
Set 1 / 2 number of PRB pairs	determines the number of PRB pairs for EPDCCH set 1 / 2	2, 4, 8
Set 1 / 2 resource block assignment	determines the resource block assignment for EPDCCH set 1 / 2	range depends on channel bandwidth and other EPDCCH settings
Set 1 / 2 n^EPDCCH_ID	determines the users specific EPDCCH identifier for EPDCCH set 1 / 2	0 to 503
Set 1 / 2 rel. EPDCCH power	determines the relative EPDCCH power of EPDCCH set 1 / 2	–80 dB to +10 dB
Antenna port mapping for antenna ports 107 to 110	configures the antenna port mapping for the EPDCCH antenna ports 107 to 110	complex mapping values where real and imaginary parts range from –1.0 to +1.0
Parameters in the DCI configuration		
(E)PDCCH	selects whether the DCI is transmitted in the PDCCH or EPDCCH set 1 or EPDCCH set 2	PDCCH, EPDCCH Set 1, EPDCCH set 2
Transmission mode 10, DCI format 2D, scrambling settings for CoMP/eICIC/feICIC		
This option enables the use of downlink transmission mode 10, DCI format 2D and scrambling settings for CoMP, eICIC, feICIC.		
Parameters in the user configuration		
Transmission mode	selects the downlink transmission mode	transmission mode range is extended by transmission mode 10
Use DMRS scrambling identities	activates the usage of alternative DMRS scrambling identities for individual downlink carriers	on/off
DMRS scrambling identity 1	configures the DMRS scrambling identity 1	0 to 503
DMRS scrambling identity 2	configures the DMRS scrambling identity 2	0 to 503
Parameters in the DCI configuration		
DCI format	selects the DCI format	DCI format range is extended by format 2D

LTE Release 12 (xxx-K413 or R&S®CMW-KW504 option)

For each xxx-K413 (R&S®CMW-KW504) option, a xxx-K255 (R&S®CMW-KW500) option must also be installed on the respective instrument.

General description	This option enhances the xxx-K255 option (EUTRA/LTE digital standard) to support LTE Release 12, including the following features: • 256QAM modulation for PDSCH, downlink dummy resource elements and PMCH • Downlink test models for 256QAM according to 3GPP TS 36.141 v. 12.9.0 • DCI format 1C for eIMTA-RNTI • Mixed duplexing for uplink carrier aggregation • Mixed duplexing for downlink carrier aggregation • Further DL MIMO enhancements (enhanced 4TX codebook) • Sidelink (D2D) The xxx-K413 (R&S®CMW-KW504) option requires the xxx-K255 (R&S®CMW-KW500) option. Therefore, all general parameters of the xxx-K255 (R&S®CMW-KW500) option are also valid for the xxx-K413 (R&S®CMW-KW504) option, unless stated otherwise in the sections below.	
EUTRA/LTE digital standard		in line with 3GPP Release 12: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6
256QAM modulation for PDSCH, downlink dummy resource elements and PMCH		
This option enables the generation of downlink signals with 256QAM modulation in the PDSCH channel, the PMCH channel, as well as in the dummy OFDM resource elements.		
Parameter	**Condition**	**Range**
Modulation	dummy data configuration	QPSK, 16QAM, 64QAM, 256QAM
MCS table 2	downlink user configuration	on/off
Modulation	PDSCH allocation	QPSK, 16QAM, 64QAM, 256QAM
Use table 2	PMCH configuration	on/off
Downlink test models for 256QAM according to 3GPP TS 36.141 v. 12.9.0		
This option enables the configuration and generation of the 256QAM test models according to 3GPP TS 36.141 v. 12.9.0 for FDD as well as TDD.		
Parameter	**Condition**	**Range**
EUTRA test models (downlink)	in line with 3GPP TS 36.141 v.12.9.0 both FDD and TDD E-TMs are supported	E-TM1.1, E-TM1.2, E-TM2, E-TM3.1, E-TM3.2, E-TM3.3, E-TM2a, E-TM3.1a
DCI format 1C for eIMTA-RNTI		
This option enables the generation of downlink DCI format 1C in case of eIMTA-RNTI.		
Parameter	**Condition**	**Range**
eIMTA-RNTI	downlink user configuration for TDD	1 to 65523
User	PDCCH DCI configuration	user1 eIMTA, user2 eIMTA, user3 eIMTA, user4 eIMTA
UL/DL configuration	DCI 1C configuration in case of eIMTA-RNTI	pattern of 0 or 1, length 12
Mixed duplexing for downlink and uplink carrier aggregation		
This option enables the usage of different duplexing modes (FDD, TDD) in individual component carriers for downlink carrier aggregation and uplink carrier aggregation, in line with EUTRA Release 12.		
Duplexing	duplexing of this component carrier	FDD, TDD
Further DL MIMO enhancements (enhanced 4TX codebook)		
This option enables the usage of the enhanced 4TX codebook, in line with EUTRA Release 12.		
Use alternative codebooks	in case of 4TX	on/off
Sidelink		
This option enables the configuration and generation of D2D signals in line with EUTRA Release 12.		
Parameters in the sidelink tab in the user configuration		
Parameters in the common tab		
State		on/off
Mode		communication, discovery
Data source		All0, All1, pattern, PNx and data list
Restart data every transmission		on/off
Communication mode		
Parameters in the resource pool control tab		
Control period	FDD: {40;80;160;320} TDD UL/DL config 0: {70:140;280} TDD UL/DL config 1-5: {40;80;160;320} TDD UL/DL config 6: {60;120;240}	60, 40, 70, 80, 120, 140, 160, 240, 280, 320 subframes
Offset indicator		0 to 319 subframes
PRB start	range depends on the signal bandwidth	0 to number of RBs – 1
PRB end	range depends on the signal bandwidth	0 to number of RBs – 1
PRB number	range depends on the signal bandwidth	1 to number of RBs

Control subframe bitmap	must always contain at least two '1'	FDD: 40 bit TDD config 0: 42 bit TDD config 1: 16 bit TDD config 2: 8 bit TDD config 3: 12 bit TDD config 4: 8 bit TDD config 5: 4 bit TDD config 6: 30 bit
Parameters in the resource pool data tab		
Offset indicator	depends on the control period from control resource pool	0 to 319 subframes
PRB start	range depends on the signal bandwidth	0 to number of RBs – 1
PRB end	range depends on the signal bandwidth	0 to number of RBs – 1
PRB number	range depends on the signal bandwidth	1 to number of RBs
Control subframe bitmap	must always contain at least one '1'	FDD: 40 bit TDD config 0: 42 bit TDD config 1: 16 bit TDD config 2: 8 bit TDD config 3: 12 bit TDD config 4: 8 bit TDD config 5: 4 bit TDD config 6: 30 bit
TRPT subset	must always contain at least one '1'	FDD 3 bit TDD config 0: 5 bit TDD config 1: 3 bit TDD config 2: 3 bit TDD config 3: 4 bit TDD config 4: 3 bit TDD config 5: 3 bit TDD config 6: 4 bit
Hopping parameter		0 to 504
Number of subbands		1, 2, 4
RB offset	range depends on the signal bandwidth	0 to 98
Parameters in the synchronization tab		
Synchronization state		on/off
In-coverage flag		on/off
SLSS ID	range depends on in-coverage flag	0 to 335
Sync offset indicator		0 to 39
Parameters in the SCI config tab		
Number of SCI config		0 to 49
SL TX mode		1, 2
PSCCH period		0 to 99
n_PSCCH	range depends on the control resource pool	
SCI format		0
Frequency hopping flag		on/off
RBA and hopping resource allocation	range depends on the signal bandwidth	0 to 8191
Time resource pattern (ITRP)		0 to 127
Modulation and coding scheme		0 to 28
Timing advance indication		0 to 2047
Group destination ID		0 to 225
Parameters in the allocation tab		
Content		PSCCH, PSSCH, PSBCH
SF	subframes where the transmission occurs	calculated
Modulation		QPSK, 16QAM
DRS – cyclic shift		0 to 7
Scrambling – state		on/off
Channel coding – state	for PSSCH and PSBCH only	on/off
Channel coding – number of physical bits	for PSSCH and PSBCH only	calculated
Channel coding – transport block size index	for PSSCH only	0 to 26
Channel coding – transport block size	for PSSCH and PSBCH only	0 to 75376
Physical bits	number of physical bits	calculated
Power		–80 dB to +10 dB
State		on/off
Conflict		on/off

Discovery mode		
Parameters in the resource pool tab		
Control period		32, 64, 128, 256, 512, 1024 frames
Offset indicator		0 to 10239 subframes
PRB start	range depends on the signal bandwidth	0 to number of RBs – 1
PRB end	range depends on the signal bandwidth	0 to number of RBs – 1
PRB number	range depends on the signal bandwidth	1 to number of RBs
PRB index	range depends on the signal bandwidth	0 to number of RBs
Control subframe bitmap	must always contain at least one '1'	FDD: 40 bit TDD config 0: 42 bit TDD config 1: 16 bit TDD config 2: 8 bit TDD config 3: 12 bit TDD config 4: 8 bit TDD config 5: 4 bit TDD config 6: 30 bit
Number of retransmissions		0 to 3
Number of repetitions		1 to 50
N(1)_PSDCH		1 to 200
N(2)_PSDCH		1 to 10
N(3)_PSDCH		1, 5
Subframe index		0 to 209
Parameters in the synchronization tab		
Synchronization state		on/off
In-coverage flag		on/off
SLSS ID	range depends on in-coverage flag	0 to 335
Sync offset indicator		0 to 39
Parameters in the allocation tab		
Number of transmissions		0 to 100
Content		PSDCH, PSBCH
Discovery type		1, 2B
PSDCH period		0 to 100
n_PSDCH/n'	range depends on the resource pool and the discovery type	on/off
SF	subframes where the transmission occurs	calculated
Modulation		QPSK
DRS - cyclic shift		0 to 7
Scrambling - state		on/off
Channel coding – state		on/off
Channel coding – number of physical bits		calculated
Channel coding – transport block size	for PSSCH and PSBCH only	0 to 75376
Physical bits	number of physical bits	calculated
Power		–80 dB to +10 dB
State		on/off
Conflict		on/off
Parameters in the antenna port mapping tab		
AP 1000 SL	appears if sidelink is active	on/off
AP 1010 PSBCH	appears if sidelink is active	on/off
AP 1020 SL Sync	appears if sidelink is active	on/off

LTE Release 13/14/15 (xxx-K419 or R&S®CMW-KW514/-KW570 option)

For each xxx-K419 (R&S®CMW-KW514/-KW570) option, a xxx-K255 (R&S®CMW-KW500) option must also be installed on the respective instrument. The R&S®CMW-KW514 option covers the LAA related feature set only. The R&S®CMW-KW570 option covers the C-V2X related feature set only.

General description	This option enhances the xxx-K255 option (EUTRA/LTE digital standard) to support LTE Releases 13, 14 and 15, including the following features: • 1024QAM modulation for PDSCH • 256QAM modulation for PUSCH • DL LAA (frame structure type 3, DRS for LAA, DCI1C for LAA) (R&S®SMW-K85 is also required) • PUCCH formats 4 and 5 • Special subframe configuration 10 (PUSCH in special subframe) • Enhancements for DCI formats 2C/2D (dmrsAltTable/semiOpenLoop) • SRS enhancements (extra UpPTS symbols for SRS) • Enhanced uplink DMRS (ul-DMRS-IFDMA) • PRACH restricted set type B • V2X	
EUTRA/LTE digital standard		in line with 3GPP Release 13/14/15: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6
1024QAM modulation for PDSCH		
This option extends the LTE carrier aggregation feature of the R&S®SMW-K85 option for generation of downlink signals with 1024QAM modulation in the PDSCH channel.		
256QAM modulation for PUSCH		
This option extends the LTE carrier aggregation feature of the R&S®SMW-K85 option for generation of uplink signals with 256QAM modulation in the PUSCH channel.		
Modulation	PUSCH allocation	QPSK, 16QAM, 64QAM, 256QAM
FRC	selects the FRC	A1-1, A1-2, A1-3, A1-4, A1-5, A1-6, A1-7 A2-1, A2-2, A2-3, A3-1, A3-2, A3-3, A3-4, A3-5, A3-6, A3-7, A4-1, A4-2, A4-3, A4-4, A4-5, A4-6, A4-7, A4-8, A5-1, A5-2, A5-3, A5-4, A5-5, A5-6, A5-7, A7-1, A7-2, A7-3, A7-4, A7-5, A7-6, A8-1, A8-2, A8-3, A8-4, A8-5, A8-6 A12-1, A12-2, A12-3, A12-4, A12-5, A12-6 A13-1, A13-2, A13-3, A13-4, A13-5, A13-6 A17-1, A17-2, A17-3, A17-4, A17-5, A17-6 (The actual range depends on the configured bandwidth and cyclic prefix settings of the general settings dialog.)
Downlink LAA		
This option enables the configuration and generation of signals for downlink LAA SCells (frame structure type 3), including DRS for LAA and DCI Format 1C for LAA.		
Duplexing	SCells in the downlink carrier aggregation table, in case of PDSCH scheduling modes “Auto/DCI” or “Auto Sequence”	FDD, TDD, LAA
DRS state	only for SCells with duplexing “LAA”	on/off
DRS periodicity		40, 80, 160 ms
DRS offset		range depends on DRS periodicity
DRS duration		1 to 5 ms
DRS pattern		range depends on DRS periodicity
CSI-RS part of DRS		on/off
DRS zero power CSI-RS	up to 5 zero power CSI-RS configurations	0 to FFFF (hex)
DRS I_CSI_RS	up to 5 CSI-RS configurations	0 to 154
Number of LAA bursts		0 to 10
Starting subframe		0 to 9999
Starting symbol		s0 or s7
Burst duration		1 ms to 10 ms
Number of ending symbols		3, 6, 9, 10, 11, 12, 14
LAA DCI 1C mode		manual, n-1, n, (n-1)&n
(E)PDCCH format		2 or 3

(e)FD-MIMO		
This option enables the configuration and generation of CSI-RS for FD-MIMO (Release 13) and eFD-MIMO (Release 14).		
CSI-RS in DwPTS		on/off
Number of CSI-RS configurations		1, 2, 3, 4, 5, 7
Number of CSI-RS antenna ports per CSI-RS configuration	possible values depend on “Number of CSI-RS configurations”	1, 2, 4, 8
CDMType		CDM2, CDM4, CDM8
Frequency density		1, 1/2, 1/3
Transmission comb	possible values depend on “Frequency density”	0, 1, 2
PUCCH formats 4 and 5		
This option enables the configuration and generation of signals for PUCCH formats 4 and 5.		
Modulation/format		F1, F1a, F1b, F2, F2a, F2b, F3, F4, F5
M_RB		depends on n n_PUCCH antenna port 100
n_oc		0 to 1
Number of A/N + SR + CSI bits	length	1 to 64 for F4 and F5
Cyclic shift field		0 to 7, one-to-one correspondence with N(1)_DMRS
N(1)_DMRS		0, 2, 3, 4, 6, 8, 9, 10 one-to-one correspondence with cyclic shift field
N(2)_DMRS		0, 6
	for F4	always 0
	for F5	
	when n_oc = 0	0
	when n_oc = 1	6
Special subframe configuration		
TDD special subframe configuration	only selectable if duplexing mode is set to TDD	0 to 10
PUSCH in UpTPS state	only selectable if TDD special subframe configuration is set to 10	on/off
Less DMRS		on/off
Number of symbols	possible values depend on “Cyclic Prefix” and “Less DMRS”	1 to 6
Enhancements for DCI formats 2C/2D		
This option enables the configuration of the higher layer parameters *dmrsAltTable* and *semiOpenLoop*		
Parameters in the user configuration		
DMRS alt. table	selects whether *dmrsAltTable* is true or not on each cell	on/off
Semi open loop	selects whether *semiOpenLoop* is true or not on each cell	on/off
SRS enhancements		
This option enables to configure and generate SRS enhanced in Rel. 13 (*srs-UpPtsAdd*/*transmissionCombNum*)		
Parameters in the SRS tab in the user configuration		
srs-UpPtsAdd	only configurable if duplexing mode is set to TDD	0, 2, 4
Transmission Comb Num K TC		2, 4
Enhanced uplink DMRS		
This option enables to configure and generate PUSCH transmissions with enhanced DMRS in Rel. 14 (*ul-DMRS-IFDMA*)		
Parameter in the DRS tab in the user configuration		
Enhanced DMRS	only configurable if the user is a “LTE-A” one	on/off
Parameter in the DRS tab in the enhanced settings of a PUSCH allocation		
Bit for DMRS mapping table	only configurable if enhanced DMRS is set to on	on/off
PRACH restricted set type B		
This option enables to configure and generate PRACH signals with restricted set type B in Rel. 14		
Parameter in the PRACH tab in the general settings		
PRACH restricted set		unrestricted set, restricted set type A, restricted set type B
V2X		
This option enables to configure and generate V2X signals in Rel. 14.		
Parameter in the sidelink tab in the user configuration		
Parameters in the common tab		
State		on/off
Mode		communication, discovery, V2X communication

Data source		All0, All1, pattern, PNx and data list
Restart data every transmission		on/off
V2X communication mode		
Parameters in the resource pool tab		
Offset indicator		0 to 319
Subframe bitmap length		10, 16, 20, 30, 40, 50, 60, 100 FDD: 16, 20, 100 TDD config 0: 60 TDD config 1: 40 TDD config 2: 20 TDD config 3: 30 TDD config 4: 20 TDD config 5: 10 TDD config 6: 50
Subframe bitmap	must contain one '1' at least	bit pattern
Adjacent PSCCH/PSSCH		on/off
Number of subchannels	range depends on the signal bandwidth	1, 3, 5, 8, 10, 15, 20
Subchannel size	range depends on the signal bandwidth	if adjacent PSCCH/PSSCH is TRUE, {5, 6, 10, 15, 20, 25, 50, 75, 100} if adjacent PSCCH/PSSCH is FALSE, {4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 30, 48, 72, 96}
Start RB subchannel	range depends on the signal bandwidth	0 to number of RBs – 1
Start RB PSCCH pool	range depends on the signal bandwidth	0 to number of RBs – 1
Parameters in the synchronization tab		
Synchronization state		on/off
In-coverage flag		on/off
SLSS ID	range depends on in-coverage flag	0 to 335
Sync offset indicator		0 to 159
Parameters in the SCI config tab		
Number of SCI config		0 to 49
SL TX mode		3, 4
Start SF	depends on the resource pool parameters and the synchronization state	0 to 9999
Subchannel	depends on the number of subchannels	0 to 19
SF	subframes where the transmission occurs	calculated
SCI format		1
Priority		0 to 7
Resource reservation		0 to 12
Frequency resource location of initial TX and ReTX	range depends on the number of subchannels	calculated
Time gap between initial TX and ReTX		0 to 15
Modulation and coding scheme		0 to 28
Retransmission index		off
Parameters in the allocation tab		
Content		PSCCH, PSSCH, PSBCH
SF	subframes where the transmission occurs	calculated
Modulation		QPSK, 16QAM
DRS – cyclic shift		0 to 7
Scrambling – state		on/off
Channel coding – state	for PSSCH and PSBCH only	on/off
Channel coding – number of physical bits	for PSSCH and PSBCH only	calculated
Channel coding – transport block size index	for PSSCH only	0 to 26
Channel coding – transport block size	for PSSCH and PSBCH only	0 to 75376
Physical bits	number of physical bits	calculated
Power		–80 dB to +10dB
State		on/off
Conflict		on/off
V2X RMCs		in line with TS 36.521: A 8.2.1, A 8.2.2, A 8.2.3

Cellular IoT Release 13 (xxx-K415 or R&S®CMW-KW300/-KW590 option)

The R&S®CMW-KW300 option covers the NB-IoT related feature set only. The R&S®CMW-KW590 option covers the MTC related feature set only. For R&S®CMW-KW590 option, an R&S®CMW-KW500 option must also be installed on the respective instrument.

General description	This option contains the support for the LTE Release 13 cellular IoT variants NB-IoT (narrowband IoT, Cat-NB1) and eMTC (enhanced machine type communication, Cat-M1). • NB-IoT and eMTC downlink [4] and uplink signal generation • NB-IoT modes in-band, guard band and standalone Although the K415 option (cellular IoT standard) does not depend on the K255 option (EUTRA/LTE digital standard), the cellular IoT standard shares configuration parameters with the EUTRA/LTE digital standard where applicable. Therefore, all general parameters of the K255 option are also valid for the K415 option, unless stated otherwise in the sections below.	
Cellular IoT standard		in line with 3GPP Release 13: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6.0
General settings		
Mode	restricts the user interface to certain LTE/cellular IoT features for simplicity or enables access to all features according to the installed options	only available if EUTRA as well as cellular IoT option(s) are installed in the software
Uplink simulation		
Physical settings		
Channel bandwidth	determines the channel bandwidth used	200 kHz,1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
Number of resource blocks	The number of resource blocks is automatically set in line with the selected channel bandwidth.	
Number of eMTC narrowbands	The number of eMTC narrowbands is automatically set in line with the selected channel bandwidth.	
Cell specific settings		
eMTC valid subframes	The eMTC valid subframes are configurable freely.	on/off
Signals – NB-IoT-DRS		
Group hopping	activates reference signal group hopping	on/off
Use base sequences	only selected base sequences are used	on/off
Delta sequence shift for NPUSCH		0 to 29
Three tone cyclic shift		0 to 2
Six tone cyclic shift		0 to 3
Three tone base sequence		0 to 11
Six tone base sequence		0 to 13
Twelve tone base sequence		0 to 29
eMTC-PUSCH settings		
Narrowband hopping	enables or disables the PUSCH hopping between narrowbands	on/off
Hopping offset		1 to 15 narrowbands
eMTC-PRACH settings		
Hopping offset	PRACH hopping offset as number of resource blocks	1 to 110
Restricted set (high speed mode)		on/off
CE Level	different coverage extension levels are defined	0, 1, 2, 3
PRACH config		0 to 63
Frequency offset		0 to 94
Hopping		on/off
Number of repetitions	PRACH repetitioins	1, 2, 4, 8, 16, 32, 64 and 128
Starting subframe periodicity in ms		2, 4, 8, 16, 32, 64, 128 and 256
NB-IoT-NPRACH settings		
Preamble format		0,1
NPRACH configuration		0, 1, 2
Periodicity in ms		40 to 2560
Starting time in ms		8, 16, 32, 64, 128, 256, 512, 1024

[4] eMTC downlink signal generation will be supported in a later release.

Number of repetitions	number of NPRACH repetitions	1, 2, 4, 8, 16, 32, 64 and 128
Number of subcarriers	setting number of subcarriers	12, 24, 36, 48
Subcarrier offset	offset between the subcarriers	0, 2, 12, 18, 24, 34, 36
UE specific settings		
3GPP release	selects the functionality for a user equipment	the range is extended by the values eMTC and NB-IoT
UE specific settings for eMTC users		
CE level	coverage extension level	0, 1 or 2, 3
Narrowband hopping interval	number of consecutive subframes for which the narrowband remains the same	
	CE level 0, 1	1, 2, 4, 8
	CE level 2, 3	2, 4, 8, 16
Number of transmissions		1 to 20
PUSCH settings (allocation table of eMTC users)		
Modulation		QPSK, 16QAM and 64QAM
Start subframe		0 to 9999
Repetitions	CE level 0, 1	1, 2, 4, 8, 16, 32
	CE level 2, 3	1, 4, 8, 16, 32, 64, 128, 192, 256, 384, 512, 768, 1024, 1536, 2048
No. of absolute subframes	total number of subframes including repetitions and invalid subframes	read only
Start narrowband		0 to 15
Number of resource blocks (RB)		1 to 6
Offset VRB	variable offset inside one narrowband	0 to 5
Power		–80 dB to +10 dB
Starting redundancy version index (rv_idx)		0, 1, 2, 3
PUCCH settings (allocation table of eMTC users)		
Format	CE level 0, 1	
	FDD	1, 1a, 2, 2a, 2b
	TDD	1, 1a, 1b, 2, 2a, 2b
	CE level 2, 3	
	FDD	1, 1a
	TDD	1, 1a
Start subframe		0 to 9999
Repetitions	CE level 0, 1	1, 2, 4, 8
	CE level 2, 3	4, 8, 16, 32
Number of absolute subframes	total number of subframes including repetitions and invalid subframes	read only
Number of resource blocks (RB)		read only and equal to 1
PRACH settings (for eMTC users in mode PRACH)		
Number of preamble attempts		1 to 40
CE Level		0 to 3
Starting subframe		calculated from other PRACH parameters
Ncs config		0 to 15
Logical root sequence index		0 to 838
Sequence index (v)		0 to 63
Δt		–500 µs to +500 µs
Power		–80 dB to +10 dB
UE specific settings for NB-IoT users		
NPUSCH+SRS simultaneous TX		on/off
DRS power offset		–80 dB to +10 dB
Disable group hopping		on/off
Subcarrier spacing		3.75 kHz and 15 kHz
Mode		in-band, guard band and stand alone
Resource block index		0 to 99
Number of transmissions		1 to 20
NPUSCH settings (allocation table of NB-IoT users)		
NPUSCH format		F1 and F2
Modulation		π/2 BPSK, π/4 QPSK and QPSK
Start subframe		0 to 133329
Number of repetitions		1, 2, 4, 8, 16, 32, 64, 128
Number of resource units	format 1	1, 2, 3, 4, 5, 6, 8, 10
	format 2	1
Subcarrier indication field	valid only at 15 kHz	0 to 18
ACK/NAK res. field	valid only at 3.75 kHz	0 to 47
Power		–80 dB to +10 dB
Starting redundancy version index (rv_idx)		0 or 2

NPRACH settings (for NB-IoT users in mode PRACH)		
Number of preamble attempts		1 to 30
NPRACH configuration		0, 1, 2
Starting subframe		0 to 133329
n init		0 to 11
NB-IoT downlink simulation		
Physical settings		
Channel bandwidth	determines the channel bandwidth used	200 kHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz
General NB-IoT settings		
Activate NB-IoT	enable or disable the NB-IoT DL	on/off
Carrier number		1, 2, 3, 4
Type	different types of carriers	anchor and dummy carriers
Mode		standalone, in-band and guard band
CRS sequence info	depends on the channel bandwidth	3 MHz: 6, 7
		5 MHz: 5, 6, 7, 8
		10 MHz: 19, 20, 21, 22, 23, 24, 25, 26
		15 MHz: 0 to 13
		20 MHz: 14 to 31
RB index	depends on the channel bandwidth	3 MHz: 2, 12
		5 MHz: 2, 7, 17, 22
		10 MHz: 4, 9, 14, 19, 30, 35, 40, 45
		15 MHz: 2, 7, 12, 17, 22, 27, 32, 42, 47, 52, 57, 62, 67, 72
		20 MHz: 4, 9, 14, 19, 24, 29, 34, 39, 44, 55, 60, 65, 70, 75, 80, 85, 90, 95
		3 MHz: 2, 12
Δf to DC	frequeny offset to DC carrier	–100 MHz to +100 MHz
NCellID		0 to 503
NCellID group		0 to 167
Identity		0 to 2
Valid subframes	bitmap for valid subframes	standalone : 0 to 9
		in-band: 0 to 40
Common search space	common search space parameters	paging (type 1): R_{max}: 1, 2, 4, 8, 16, 32, 64 random access (type 2): R_{max}: 1, 2, 4, 8, 16, 32, 64 G: 1.5, 2, 4, 8, 16, 32, 48 α offset: 0, 1/8, 3/8, 1/4
State		on/off
Frame configuration general settings		
Users		1 to 4
UE specific search space	UE specific search space config params	R_{max}: 1, 2, 4, 8, 16, 32, 64 G: 1.5, 2, 4, 8, 16, 32, 48 α offset: 0, 1/8, 3/8, 1/4
NB-IoT DCI config	DCI configuration	
User		user 1 to 4, P-RNTI, RA-RNTI
UE_ID/n_RNTI	UE_ID of user or n_RNTI of NPDCCH	0 to 65535
DCI format	different DCI formats	N0, N1, N2
Search space		UE specific, type 1 common, type 2 common
DCI N0 configuration		
Subcarrier indication field (Isc)		0 to 47
Resource assignment field (Iru)		0 to 7
Scheduling delay field (Idelay)		0 to 3
Modulation and coding scheme (Imcs)		0 to 10
Redundancy version		0, 1
Number of NPUSCH repetitions field		0 to 7
New data indicator		on/off
Repetitions of DCI subframe		0 to 3
Number of resource units (Nru)		1, 2, 3, 4, 5, 6, 8, 10
Repetitions of NPDCCH(R)		1, 2, 4, 8

DCI N1 configuration		
NPDCCH order indicator		on/off
Scheduling delay field (Idelay)		0 to 7
Resource assignment field (Isf)		0 to 7
Scheduling delay field (Idelay)		0 to 3
Modulation and coding scheme (Imcs)		0 to 10
Number of NPDSCH repetitions field		0 to 15
New data indicator		on/off
HARQ-ACK resource field		0 to 15
Repetitions of DCI subframe		0 to 3
Transport block size		16 to 680
Number of NPDSCH subframes (Nsf)		1 to 10
DCI N2 configuration		
Flag for paging/direct indication		on/off
Scheduling delay field (Idelay)		0 to 7
Resource assignment field(Isf)		0 to 7
Modulation and coding scheme (Imcs)		0 to 10
Number of NPDSCH repetitions field		0 to 15
New data indicator		on/off
HARQ-ACK resource field		0 to 15
Repetitions of DCI subframe		0 to 3
Transport block size		16 to 680
Number of NPDSCH subframes (Nsf)		1 to 10
Start subframe	depends on the search space config and valid subframe bitmap	0 to 66659
NPDCCH format		0, 1
Number NCCEs		1, 2
NB-IoT allocation		
Content type	supported channels	NPBCH, NPDCCH, NPDSCH
Modulation		QPSK
Data source – NPBCH		PN 9 to PN 23, All0, All1
Enhanced settings – NPBCH		
Precoding scheme		none, TX diversity
Scrambling		on/off
SFN offset		0 to 1020
Scheduling SIB1		0 to 11
NPDSCH repetition carrying SIB1		4, 8,16
Starting frame carrying SIB1		0, 16, 32, 48
MIB spare bits		1 to 11
Transport block size/payload		34
Enhanced settings – NPDCCH		
Precoding scheme		none, TX diversity
Scrambling		on/off
UE ID/n_RNTI		0 to 65535
Channel coding		on/off
Enhanced settings – NPDSCH		
Precoding scheme		none, TX diversity
Scrambling		on/off
UE ID/n_RNTI		0 to 65535
Channel coding		on/off
Subframe list	subframe list is displayed	
Start symbol	indicates the first symbol	0, 1, 2, 3
Data source		All0, All1, pattern, PNx and data list
Power		–80 dB to +10 dB
State		on/off

Uplink FRCs		
FRC state	If activated, several parameters are set in line with the fixed reference channel definitions in 3GPP TS 36.141 and 36.521.	on/off
Uplink FRC	selects the FRC	TS 36.141: A14-1, A14-2, A14-3, A14-4, A15-1, A15-2, A16-1, A16-2, A16-3, A16-4, A16-5; TS 36.521: A2.4-1, A2.4-2, A2.4-3, A2.4-4, A2.4-5, A2.4-6, A2.4-7 (The actual range depends on the configured bandwidth and cyclic prefix settings of the general settings dialog.)
NB-IoT test models (downlink)		
Test models	in line with 3GPP TS 36.141 Release 13	N-TM_Standalone, N-TM_Inband_SamePCI, N-TM_Inband_DifferentPCI, N-TM_Guardband, N-TM_Guardband_With_E_TM1_1, N-TM_Inband_With_E_TM1_1

Cellular IoT Release 14 (xxx-K443 option)

For each xxx-K443 option, a xxx-K415 option must also be installed.

General description	This option contains the support for the LTE Release 14 cellular IoT variants NB-IoT (narrowband IoT, Cat-NB2) and eMTC (enhanced machine type communication, Cat-M2). The xxx-K443 option requires the xxx-K415 option. Therefore, all general parameters of the xxx-K415 option are also valid for the xxx-K443 option, unless otherwise stated in the sections below.	
Cellular IoT standard		in line with 3GPP Release 14: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6.
General settings		
Uplink simulation		
Physical settings		
Wideband config	to enable or disable the wideband configuration	on/off
Number of eMTC widebands	The number of eMTC widebands is automatically set in line with the selected channel bandwidth.	
Cell specific settings		
Retuning symbols	retuning symbols between narrowbands/widebands	0, 1, 2
eMTC-PRACH settings		
PRACH restricted set (high speed mode)		unrestricted, restricted type A and restricted type B
UE specific settings		
PUSCH settings (allocation table of eMTC users)		
Start wideband		0 to 3
Repetitions		12, 24
Number of resource blocks (RB)		3, 6, 9, 12, 15, 18, 21, 24
Offset VRB	variable offset inside one wideband	0, 3, 6, 9, 12, 15, 18, 21
PUCCH settings (allocation table of eMTC users)		
Number of resource blocks (RB)		read only and equal to 3
Repetitions		64, 128
NPUSCH settings		
Transport block size index		0 to 13
NB-IoT downlink simulation		
General NB-IoT settings		
NPRS		
NPRS state		on/off
NPRS parameter		PART A/PART B/PART A+B
NPRS power		–80 dB to 10 dB
NPRS ID		0 to 4095

NPRS sequence information		0 to 174
NPRS bitmap		10, 40
NPRS bitmap config		depends on the bitmap
NPRS mutinginfo A		2 to 16
NPRS period		160 ms, 320 ms, 640 ms,1280 ms
NPRS start subframe		0, 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, 7/8
NPRS number of subframes		10 ms, 20 ms, 40 ms, 60 ms, 80 ms, 160 ms, 320 ms, 640 ms, 1280 ms
NPRS mutinginfo B		
Antenna port 2006 (AP 2006)	used only when NPRS is enabled	
Frame configuration general settings		
UE category		NB2
NB-IoT DCI config	DCI configuration	
DCI N0 configuration		
HARQ process number		0 to 1
DCI N1 configuration		
HARQ process number		0 to 1
NB-IoT allocation		
Enhanced settings – NPDSCH		
Modulation and coding scheme		in-band: 0 to 10, standalone/guard band: 0 to 13
eMTC downlink simulation		
Physical settings		
Wideband config	to enable or disable the wideband configuration	on/off
Number of eMTC widebands	The number of eMTC widebands is automatically set in line with the selected channel bandwidth.	
eMTC DCI config		
Resource block assignment flag	enabled only when wideband config is 20 MHz	on/off

Cellular IoT Release 15 (xxx-K446 option)

For each xxx-K446 option, a xxx-K415 option must also be installed.

General description	This option enhances the LTE cellular IoT variants NB-IoT (narrowband IoT) and eMTC (enhanced machine type communication) according to Release 15. The K446 option requires the K415 option. Therefore, all general parameters of the K415 option are also valid for the K446 option, unless stated otherwise in the sections below.	
Cellular IoT standard		in line with 3GPP Release 15: TS 36.211 v.15.6.0, TS 36.212 v.15.6.0, TS 36.213 v.15.6.0
General settings		
Duplexing		FDD, TDD
General uplink settings		
Physical settings		
TDD UL/DL configuration		1 to 5
TDD special subframe config		0 to 10
Cell settings		
NB-IoT bitmap subframes		10, 40
NPRACH premable format FDD		2
NB-IoT-NPRACH settings TDD		
Preamble format		0, 1, 0-A, 1-A
NPRACH configuration		0, 1, 2
Periodicity		80, 160, 320, 640, 1280, 2560, 5120, 10240
Starting time in ms		10, 20, 40, 80, 160, 320, 640, 1280, 2560, 5120
Number of repetitions	number of NPRACH repetitions	1, 2, 4, 8, 16, 32, 64 ,128, 256 and 512
Number of subcarriers	setting number of subcarriers	12, 24, 36, 48
Subcarrier offset	offset between the subcarriers	0, 2, 12, 18, 24, 34, 36
TDD-NPUSCH settings		
NPUSCH format		F1 and F2
Modulation		π/2 BPSK, π/4 QPSK, QPSK
Start subframe		2 to 66659

Number of repetitions		1, 2, 4, 8, 16, 32, 64, 128
Number of resource units	format 1	1, 2, 3, 4, 5, 6, 8, 10
	format 2	1
Subcarrier indication field	valid only at 15 kHz	0 to 18
ACK/NAK resource field	valid only at 3.75 kHz	0 to 47
Power		–80 dB to +10 dB
Starting redundancy version index (rv_idx)		0 or 2
Early transmission (EDT) settings		
Early transmission (EDT) support		on/off
EDT-TBS		88, 328, 408, 504, 584, 680, 808, 936, 1000
NB-IoT downlink TDD		
Physical settings		
TDD UL/DL configuration		1 to 5
TDD special subframe configuration		0 to 10
Cell settings		
NB-IoT bitmap subframes		10 and 40
Enhanced settings – NPBCH		
Scheduling SIB1		0 to 15
NPUSCH F2-FDD		
Scheduling request (SR) support		on/off
NWUS (narrowband wakeup signal)		
NWUS state		on/off
NWUS power		–80 dB to +10 dB
NWUS max duration		1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024
NWUS actual duration		1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024
NWUS time offset		40, 80, 160, 240
NWUS start subframe		1 and maximum frame number

OneWeb user-defined signal generation (xxx-K430 option)

General settings		
Mode		predefined and user defined modes
Baseband filter	standard	root cosine with rolloff 0.085
	other	see data sheet of respective Rohde & Schwarz instrument, “baseband generator” section
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		restart
Triggering		see data sheet of respective Rohde & Schwarz instrument, “I/Q baseband generator” section
Link direction		downlink, uplink
Physical layer mode	downlink	SC-TDM
	uplink	SC-FDMA

Downlink simulation		
Physical settings		
Channel bandwidth		250 MHz
Sampling rate		230.4 MHz
Cell ID		0 to 255
RA-RNTI		1 to 240
Downlink reference signal structure		
Reference signal power	power of reference symbol	0 dB
P-SYNC power	determines the power of the primary synchronization signal	–80 dB to +10 dB in steps of 0.001 dB
Global MIMO configuration	simulated cell specific antenna configuration	1

Number of configurable subframes	determines the number of configurable subframes; the subframe configurations are used periodically Note: P-SYNC and PBCH are configured globally and therefore not copied here. The use of this function ensures a valid frame configuration.	up to 40 subframes; the actual range depends on the sequence length
Allocation table		
Codeword	up to 2 codewords can be configured	1/1,1/2, 2/2
Modulation	determines modulation scheme used	QPSK, 8PSK, 16QAM
Number of resource blocks (RB)	defines size of selected allocation in terms of resource blocks	1 to 1152
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
Data source	determines data source of selected allocation Note: Data sources for users 0 to 3 can be configured in the Configure User panel.	All0, All1, pattern, PNx, data list, user 0, user 1, user 2 and user 3
Power	determines power of selected allocation	–80 dB to +10 dB in steps of 0.001 dB
Content type	determines type of selected allocation	PDSCH, PDCCH, PBCH
State	sets state of selected allocation	on/off
Enhanced settings PBCH		
Scrambling state		on/off
Channel coding state	enables channel coding (FEC)	on/off
MIB (including SFN)	activates automatic MIB generation for PBCH	on/off
SFN offset	sets starting system frame number encoded in MIB	0 to 1020 in steps of 4
MIB spare bits	sets the MIB spare bits	pattern of 16 bit
Transport block size		32

Enhanced settings PDSCH		
Scrambling state		on/off
UE ID/n_RNTI	user equipment identifier (n_RNTI) for selected allocation	0 to 65535
Channel coding state	enables channel coding (FEC)	on
Transport block size		16 to 850656
Redundancy version index		0 to 3
IR soft buffer size		31296 to 458400
Configuration of PCFICH, PDCCH		
State	enables PCFICH, PDCCH	on/off
PCFICH power	determines power of PCFICH	–80 dB to +10 dB in steps of 0.001 dB
PCFICH scrambling state		on/off
PCFICH CFI		1 to 12
PDCCH power		–80 dB to +10 dB in steps of 0.001 dB
PDCCH scrambling state		on/off
PDCCH format		0 to 4
User		user 1 to user 4, P-RNTI, SI-RNTI, RA-RNTI
Number of CCEs		depends on selected PDCCH format
CCE index		0 to 599
Data source PDCCH		All0, All1, pattern, PNx and data list
DCI format		0, 1ow,1a, 2ow, 3, 3a, 3ow
Search spaces		auto, common, UE-specific
DCI format 0 configuration		
Carrier indicator field		0 to 7
Resource block assignment		0 to 8191
Modulation, coding scheme and redundancy version		0 to 31
New data indicator		on/off
TPC command for PUSCH		0 to 3
Cyclic shift for DMRS		0 to 11
CSI/CQI request		0 to 3
SRS request		0 to 1
DCI format 1OW configuration		
Resource block assignment		0 to 1048575
Modulation and coding scheme		0 to 31
HARQ process number		0 to 63
New data indicator		on/off
Redundancy version		0 to 3
TPC command for PUCCH		0 to 3
DCI format 1A configuration		
Mode		PDSCH, PRACH
Resource block assignment		0 to 26564
Modulation and coding scheme		0 to 31
HARQ process number		0 to 63
New data indicator		on/off
Redundancy version		0 to 3
TPC command for PUCCH		0 to 3
SRS request		0 to 1
Preamble index		0 to 63
PRACH mask index		0 to 15
DCI format 2OW configuration		
Resource block assignment		0 to 524287
TPC command for PUCCH		0 to 3
HARQ process number		0 to 63
MCS for a first transmission		0 to 31
MCS for a retransmission		0 to 3
New data indicator		on/off
Redundancy version		0 to 3
DCI format 3 configuration		
TPC command		pattern of 64 bit
DCI format 3a configuration		
TPC command		pattern of 64 bit

Configure user	The configure user dialog makes it possible to define and configure up to 4 scheduled users that can be distributed over the entire frame configuration by setting the data source of a specific allocation in the allocation table to user. Subframe allocations that are not adjacent or allocations of a different subframe can be configured to allow the use of a common data source.	
Transmission mode	selects the downlink transmission mode	mode 1OW, mode 2OW
Scrambling state	enables scrambling for all allocations belonging to the selected user	on/off
Channel coding state	enables channel coding (FEC) for all allocations belonging to the selected user	on/off
UE ID/n_RNTI	user equipment identifier (n_RNTI) for selected user	0 to 65535
Data source	determines data source of user currently being configured	All0, All1, pattern, PNx and data list
UE category		1 to 5

Uplink simulation		
General settings		
Channel bandwidth	determines the channel bandwidth used	20 MHz
FFT size		2048
Number of resource blocks		100
Cell ID		0 to 255
Physical cell ID group		0 to 167
Physical layer ID		0 to 2
SFN offset		0 to 4095
Group hopping	activates reference signal group hopping while deactivating sequence hopping	on/off
Sequence hopping	only selectable if group hopping is deactivated	on/off
Delta sequence shift for PUSCH		0 to 29
n(1)_DMRS	sets the broadcast part of the DMRS index	0 to 11
PRACH configuration		0 to 47
Restricted set		on/off
PRACH frequency offset		0 to 94
Number of RBs used for PUCCH		0 to 100
Delta shift		1 to 3
N(1)_cs	if number of RBs used for PUCCH is 0	always 0
	otherwise	0 to 6, but only multiples of delta shift
N(2)_RB	if N(1)_cs is 0	0 to number of RBs used for PUCCH
	otherwise	0 to number of RBs used for PUCCH – 1
SRS subframe configuration		0 to 15
SRS bandwidth configuration		0 to 7
Carrier aggregation settings		
Activate carrier aggregation		on/off
Cell index		0, 1
Physical cell ID		0 to 503
Bandwidth	bandwidth of the SCell	20 MHz
Δf in MHz	defines the frequency shift for this SCell relative to the PCell	
Setting range		depends on the respective Rohde & Schwarz instrument
Setting resolution		0.1 MHz
Duplexing		FDD
n(1)_DMRS	sets the broadcast part of the DMRS index	0 to 11
SRS subframe configuration		0 to 15
SRS bandwidth configuration		0 to 7
Delay	configures a time delay of the SCell relative to the PCell	0 ns to 700000 ns
State	activates/deactivates this cell	on/off

Resource allocation uplink		
Select user equipment	up to 4 UE can be configured individually and allocated to the subframes.	
Number of configurable subframes	determines the number of configurable uplink subframes; the subframe configurations are used periodically Note: Sounding reference signals are configured globally and therefore not copied here.	up to 40 subframes
Cyclic prefix	determines whether a normal or extended cyclic prefix is used for a specific subframe Note: It automatically determines the number of SC-FDMA symbols per subframe.	normal
Allocation table		
Content type	UE can be set to PUSCH or PUCCH or PUACH	PUSCH, PUCCH, PUACH
Modulation	determines the modulation scheme used (if content type is PUSCH or PUACH) or the PUCCH format (if content type is PUCCH)	QPSK, 8PSK,16QAM or format 1, 1a, 1b, 2, 2a, 2b, 3
Number of resource blocks (RB)	defines size of selected allocation in terms of resource blocks	1 to 100
Offset VRB	sets the virtual resource block offset The physical resource block offset for the two slots of the corresponding subframe is set automatically depending on the frequency hopping setting.	0 to 99
Power	determines power of selected allocation	–80 dB to +10 dB in steps of 0.01 dB
State	sets state of selected allocation	on/off
User equipment configuration		
UE ID/n_RNTI	user equipment identifier (n_RNTI) for selected user equipment	0 to 65535
Power	sets power level of selected UE	–80 dB to +10 dB in steps of 0.01 dB
Mode		standard, PRACH
Data source	determines data source used for PUSCH or PUACH of selected UE	All0, All1, pattern, PNx and data list
Scrambling state	valid for both PUSCH and PUACH	on/off
Channel coding state	enables channel coding (FEC) and multiplexing of control and data information, valid for both PUSCH and PUACH	on/off
Channel coding mode PUSCH	selects whether data, control information or both is transmitted on the PUSCH	UL-SCH only, UCI + UL-SCH, UCI only
Channel coding mode PUACH		UL-SCH only
DRS power offset	sets power of DRS relative to power level of PUSCH/PUACH/PUCCH allocation of corresponding subframe	–80 dB to +10 dB in steps of 0.001 dB
SRS state	enables sending of sounding reference signals	on/off
Transmit trigger type 0 SRS	enables the transmission of SRS trigger type 0	
SRS power offset	sets power of SRS relative to power level of corresponding UE	–80 dB to +10 dB in steps of 0.001 dB
SRS cyclic shift	cyclic shift used for SRS	0 to 11
Configuration index I_SRS	SRS configuration index	0 to 636 for FDD
Bandwidth config. B_SRS	SRS bandwidth configuration	0 to 3
Transmission comb k_TC	SRS transmission comb	0 to 1
Hopping bandwidth b_hop	SRS hopping bandwidth	0 to 3
Frequency domain position n_RRC	SRS frequency domain position	0 to 100
Enhanced settings for PUSCH		
Cyclic shift field	for DRS	0 to 7
n(2)_DMRS,0	sets for layer 0 the part of the DMRS index which is part of the uplink scheduling assignment	0, 2, 3, 4, 6, 8, 9, 10
Transport block size UL-SCH		1 to 253440
Redundancy version index UL-SCH		0 to 3

Enhanced settings for PUCCH		
n_PUCCH	sets PUCCH index	range depends on cell-specific settings
ACK/NACK pattern		0, 1
Number of CQI bits		1 to 13
Number of coded CQI bits		20
CQI pattern		0, 1
Enhanced settings for PUACH		
Cyclic shift field	for DRS	0 to 7
n(2)_DMRS,0	sets for layer 0 the part of the DMRS index which is part of the uplink scheduling assignment	0, 2, 3, 4, 6, 8, 9, 10
Transport block size UL-SCH		1 to 253440
Redundancy version index UL-SCH		0 to 3
Settings for PRACH		
Power ramping settings		
PRACH power ramping state		on/off
Transition time		0 µs to 30 µs in steps of 0.01 µs
Preamble format	set indirectly by PRACH configuration	0
RB offset [5]	sets the start resource block used for the PRACH	0 to total number of RBs – 1
N_cs configuration [5]		0 to 15
Logical root sequence index [5]		0 to 837
Sequence index (v) [5]		0 to 63
Δt [5]	delays the corresponding PRACH by Δt in µs	–500 µs to +500 µs in steps of 0.01 µs
State [5]	activates the PRACH for the corresponding subframe	on/off

[5] Can be set individually for each subframe that is allowed to carry a PRACH in line with the selected PRACH configuration.

OneWeb reference signals (xxx-K355 option)

Reference waveforms can be played on both R&S®SMW-B9 and -B10 (wideband and standard baseband)	HY11-H9951-2_2.0_RL_8PSK_1CC_1cl_736371.1831.wv
	HY11-H9951-2_2.0_RL_8PSK_2CC_1cl_736371.1817.wv
	HY11-H9951-2_2.0_RL_16QAM_1CC_1cl_736371.1833.wv
	HY11-H9951-2_2.0_RL_16QAM_2CC_1cl_736371.1823.wv
	HY11-H9951-2_2.0_RL_QPSK_1CC_1cl_736371.1827.wv
	HY11-H9951-2_2.0_RL_QPSK_2CC_1cl_736371.18.wv
	HY11-HA563-1_1.0_RL_8PSK_1CC_2cl_736408.2524.wv
	HY11-HA563-1_1.0_RL_8PSK_2CC_2cl_736408.2531.wv
	HY11-HA563-1_1.0_RL_16QAM_1CC_2cl_736408.2521.wv
	HY11-HA563-1_1.0_RL_16QAM_2CC_2cl_736408.2528.wv
	HY11-HA563-1_1.0_RL_QPSK_1CC_2cl_736408.2518.wv
	HY11-HA563-1_1.0_RL_QPSK_2CC_2cl_736408.2527.wv
	HY11-HA674-1_1.0_RL_8PSK_1CC_TDD_736523.4025.wv
	HY11-HA674-1_1.0_RL_16QAM_1CC_TDD_736523.4179.wv
	HY11-HA674-1_1.0_RL_QPSK_1CC_TDD_736523.4201.wv
	HY11-HA674-2_1.0_RL_8PSK_2CC_TDD_736523.4383.wv
	HY11-HA674-2_1.0_RL_16QAM_2CC_TDD_736523.441.wv
	HY11-HA674-2_1.0_RL_QPSK_2CC_TDD_736523.4217.wv
Reference waveforms played only on R&S®SMW-B9 (wideband baseband)	HY11-H9878-2_2.0_FL_8psk_736399.8358.wv
	HY11-H9878-2_2.0_FL_16qam_736399.8052.wv
	HY11-H9878-2_2.0_FL_qpsk_736399.837.wv
	HY11-HA610-1_1.0_FLwvfm736292.5983.8psk.notch.wv
	HY11-HA610-1_1.0_FLwvfm736292.5996.qpsk.notch.wv
	HY11-HA610-1_1.0_FLwvfm736345.2465.16qam.notch.wv
	OneWeb_RL_6Carrier_8PSK_channel1.wv
	OneWeb_RL_6Carrier_8PSK_channel2.wv
	OneWeb_RL_6Carrier_8PSK_channel3.wv
	OneWeb_RL_6Carrier_8PSK_channel4.wv
	OneWeb_RL_6Carrier_8PSK_channel5.wv
	OneWeb_RL_6Carrier_8PSK_channel6.wv
	OneWeb_RL_6Carrier_8PSK_channel7.wv
	OneWeb_RL_6Carrier_8PSK_channel8.wv
	OneWeb_RL_6Carrier_QPSK_channel1.wv
	OneWeb_RL_6Carrier_QPSK_channel2.wv
	OneWeb_RL_6Carrier_QPSK_channel3.wv
	OneWeb_RL_6Carrier_QPSK_channel4.wv
	OneWeb_RL_6Carrier_QPSK_channel5.wv
	OneWeb_RL_6Carrier_QPSK_channel6.wv
	OneWeb_RL_6Carrier_QPSK_channel7.wv
	OneWeb_RL_6Carrier_QPSK_channel8.wv
	OneWeb_RL_48Carrier_8PSK.wv
	OneWeb_RL_48Carrier_QPSK_v4.wv

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

WCDMA 3GPP FDD digital standard	in line with 3GPP Release 11	
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 four user-configured mobile stations (PRACH, PCPCH or DPCCH and up to six DPDCHs) together with up to 128 of identical configuration can be simulated. The sequence length can be entered in frames (10 ms each); the max length depends on oversampling and the type of the instrument the waveform file is generated for. Example: With an oversampling of 2, the user has 13.65 frames/Msample. If an R&S®SMU-B10 with 64 Msample memory is selected and an oversampling of 2 is applied, R&S®WinIQSIM2™ can generate 873 frames.	
Enhanced channels	special capabilities in up to four channels of base station 1 on downlink and in DPDCH channels of mobile station 1 on uplink: channel coding, simulation of bit and block errors	
Modulation		BPSK (uplink)
		QPSK (downlink)
		16QAM (downlink HS-PDSCH)
		64QAM (downlink HS-PDSCH)
Test models	downlink (in line with TS 25.141)	test model 1 with 4/8/16/32/64 DPCH
		test model 2
		test model 3 with 4/8/16/32 DPCH
		test model 4
		test model 5 with 8/4/2 HS-PDSCH channels (in case of 4 HS-PDSCH with 4 or 14 DPCH)
		test model 6 with 8/4 HS-PDSCH
	uplink (not standardized)	DPCCH + 1 DPDCH at 60 ksps
		DPCCH + 1 DPDCH at 960 ksps
Generation of waveform file	generating and saving a waveform as a waveform file	
Enhanced component		
Channel coding	coding of 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	
	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 24
	rate matching attribute	1 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 rate	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 rate	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	
Parameters	OCNS state	on/off
	OCNS mode	standard, HSDPA, HSDPA 2
Applications	testing the receiver of the mobile station under real conditions; measuring the maximum input level in line with TS 25.101	
Additional user equipment	simulation of up to 128 mobile stations in addition to the four user-configurable mobile stations; the additional mobile stations use different scrambling codes	
Parameters	number of additional mobile stations	1 to 128
	scrambling code step	1 to FFFFFF (hex)
	power offset	–80 dB to 0 dB
Applications	base station tests under real receive conditions	
General settings		
Chip rate	standard	3.840 Mcps
	range	0.4 Mcps to 5 Mcps
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 four base stations (BS) of 128 code channels each
	uplink	up to four user-configurable mobile stations (MS) and 128 additional MS of identical configuration in each of the following modes: PRACH only, PCPCH only, DPCCH + DPDCHs
Power reference	for uplink only	RMS power, first DPCCH, PRACH message part, last PRACH preamble
Parameters of every BS		
State		on/off
Scrambling code		0 to 5FFF (hex)
Second 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 chip
Diversity/MIMO	The antenna type can be selected according to different antenna configurations.	single antenna, antenna 1 of 2, antenna 2 of 2
Open loop transmit diversity	The output signal can be generated according to an antenna configuration with or without open loop transmit diversity.	on/off

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, 16QAM or 64QAM	
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) and data list
Multicode state	depending on physical channel type	on/off
Timing offset	depending on physical channel type time offset that can be separately set for each code channel	0 to 150 (in units of 256 chip)
Pilot length	depending on physical channel type and 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		PRBS: 9, 11, 15, 16, 20, 21, 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
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 dB to +10 dB
TFCI state		on/off
TFCI		0 to 1023
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 chip
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 generation of preambles
	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
Start offset		0 to 100 access slots
Time from preamble to preamble		1 to 14 access slots
Time from preamble to message part		1 to 14 access slots
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
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) and data list
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	generation of preambles only
	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
Start offset		0 to 14 access slots
Time from preamble to preamble		1 to 14 access slots
Time from preamble to message part		1 to 14 access slots
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
Message part length		1 frame to 10 frames
Power control preamble length		0, 8 slots
FBI mode		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) and data list
Channel coding	reference measurement channel for UL CPCH in line with TS 25.141	
	state	on/off
	transport block size	168, 360

DPCCH + DPDCH mode		
DPCCH	dedicated physical control channel	
Power		–80 dB to 0 dB
DL-UL timing offset		0 chip, 1024 chip
Channelization code		0, fixed
Slot format		0 to 3
FBI mode		off/1 bit
FBI pattern		pattern (length: 1 bit to 32 bit)
TFCI state		on/off
TFCI		0 to 1023
TPC mode		2 bit
TPC data source		All0, All1, pattern (length: 1 bit to 64 bit) and data list
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 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) and data list
Graphical display		domain conflicts, code domain, channel graph, slot structure and formats offered in graphics block, scheduling list

3GPP FDD enhanced MS/BS test including HSDPA (xxx-K243, xxx-K283 or R&S®CMW-KW401 option)

One xxx-K242 (R&S®CMW-KW400) option must be installed.

Note for R&S®SMW200A and R&S®SGT100A users: The R&S®xxx-K283 option includes 3GPP FDD enhanced MS/BS tests including HSDPA as well as 3GPP HSUPA and 3GPP HSPA+.

General parameters	This option extends the xxx-K242 (R&S®CMW-KW400) option (3GPP FDD digital standard) to HSDPA support. Therefore, all general parameters of the xxx-K242 such as modulation are also valid for the xxx-K243, xxx-K283 or R&S®CMW-KW401 option.	
Downlink simulation		
HSDPA channels (HS-SCCH, HS-PDSCH and F-DPCH)		
Enhancements	The xxx-K242 (R&S®CMW-KW400) supports simulation of HSDPA/HSPA+ channels in a continuous mode needed for TX measurements in line with TS 25.141 (test models 5 and 6). The xxx-K243/xxx-K283 (R&S®CMW-KW401) 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 and the possibility to set start subframe and inter-TTI distance. In addition, several F-DPCHs (fractional dedicated physical channel) can be generated.	
Application	TX measurements on 3GPP FDD NodeBs with realistic statistics	
	RX measurements on 3GPP FDD UE with correct timing	
Ranges (valid for HS-SCCH and HS-PDSCH with QPSK or 16QAM modulation)	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 or HS-SCCH packets
		off: transmission of dummy data between two HS-PDSCH or HS-SCCH packets
Ranges (valid for F-DPCH)	slot format	0
Fixed reference channel definition H-Set		
Enhancements	The xxx-K243/xxx-K283 (R&S®CMW-KW401) allows the generation of HSDPA downlink channels with channel coding in line with the definition of the fixed reference channels (H-Sets 1 to 6, H-Set 10, H-Set 12) in TS 25.101; in addition, a user-editable H-Set configuration is possible.	
Ranges	H-Set	H-Set 1 to H-Set 6, H-Set 10, H-Set 12, user-editable H-Set
	HS-SCCH type	type 1 (normal)
	data source	PRBS: 9, 11, 15, 16, 20, 21, 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
	UEID	0 to 65535
	number of HS-PDSCH channel codes	1 to 15
	total HS-PDSCH power	range depends on the number of HS-PDSCH channel codes
	HS-PDSCH modulation	QPSK, 16QAM
	UE supports 64QAM (only for 16QAM modulation)	on: The information signaled in the HS-SCCH is provided under the assumption that the device under test basically supports 64QAM modulation. off: The information signaled in the HS-SCCH is provided under the assumption that the device under test does not support 64QAM modulation.
	transport block size table	0: The transport block size is evaluated in line with table 0 in TS 25.321, subclause 9.2.3.1. 1: The transport block size is evaluated in line with table 1 in TS 25.321, subclause 9.2.3.1.
	transport block size index	0 to 62; index in line with TS 25.321, subclause 9.2.3.1.
	virtual IR buffer size (per HARQ process)	up to 304000 in steps of 800; the lower limit depends on the transport block size configuration
	number of HARQ processes per stream	1 to 8

Ranges (continued)	HARQ simulation mode	Constant ACK: Every transmitted HS-PDSCH packet contains new data. Constant NACK: Several retransmissions of the same data take place in the HS-PDSCH packets of the individual HARQ processes.
	redundancy version (only for HARQ simulation mode set to constant ACK)	0 to 7
	redundancy version sequence (only for HARQ simulation mode set to constant NACK)	sequence of a maximum of 30 entries in the range from 0 to 7; the number of entries also determines the number of transmissions of the same data in the HS-PDSCH packets of the individual HARQ processes before new data is transmitted
Uplink simulation		
HS-DPCCH (high speed dedicated physical control channel)		
Enhancements	The xxx-K242 (R&S®CMW-KW400) does not support HSDPA for the uplink. The xxx-K243/xxx-K283 (R&S®CMW-KW401) 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 NodeBs supporting HDSPA	
Ranges	compatibility mode	up to Release 7, Release 8 and later
	power	–80 dB to 0 dB
	start delay	0 to 250 (in units of 256 chip)
Ranges if compatibility mode is set to “Up to Release 7”	inter-TTI distance	1 subframe to 16 subframes
	power offset ACK	–10 dB to +10 dB
	power offset NACK	–10 dB to +10 dB
	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
Ranges if compatibility mode is set to “Release 8 and Later”	inter-TTI distance (interval)	1 subframe to 16 subframes
	number of rows	1 to 32
	HARQ-ACK repeat after	max. 2.5 s; the range in intervals depends on the inter-TTI distance
	PCI/CQI repeat after	max. 2.5 s; the range in intervals depends on the inter-TTI distance
	ranges for parameters in each row	
	HARQ-ACK from interval	range depends on the inter-TTI distance
	HARQ-ACK to interval	range depends on the inter-TTI distance
	HS-DPCCH1 HARQ-ACK	DTX, A, N, PRE, POST
	power offset HARQ-ACK	–10 dB to +10 dB
	PCI/CQI from interval	range depends on the inter-TTI distance
	PCI/CQI to interval	range depends on the inter-TTI distance
	HS-DPCCH1 PCI/CQI 1 type	DTX, CQI
	CQI	0 to 30
	power offset PCI/CQI	–10 dB to +10 dB
Power reference		RMS power, first DPCCH, PRACH message part, last PRACH preamble, first HARQ-ACK, first PCI/CQI
Uplink test models (in line with TS 34.121) for the xxx-K283 option		
3GPP Release 6 test models		TS 34.121, table C.10.1.4, subtests 1 to 6
3GPP Release 8 test models		TS 34.121, table C.10.1.4, subtests 1 to 4
		TS 34.121, table C.11.1.3, subtests 1 to 5
		TS 34.121, table C.11.1.4, subtest 1
Uplink test models (in line with TS 34.121), Rohde & Schwarz instruments with -K43/-K45/-K59 or R&S®CMW with -KW401/-KW402/-KW403 options		
3GPP Release 6 test models	xxx-K243 (R&S®CMW-KW401) option required	TS 34.121, table C.10.1.4, subtests 1 to 6
3GPP Release 8 test models	xxx-K243 (R&S®CMW-KW401) option required	TS 34.121, table C.10.1.4, subtests 1 to 4
	xxx-K243 and xxx-K245 R&S®CMW -KW401 and -KW402) options required	TS 34.121, table C.11.1.3, subtests 1 to 5
	xxx-K243, xxx-K245 and xxx-K259 (R&S®CMW-KW401, -KW402 and -KW403) options required	TS 34.121, table C.11.1.4, subtest 1

3GPP FDD HSUPA (xxx-K245, xxx-K283 or R&S®CMW-KW402 option)

One xxx-K242 (R&S®CMW-KW400) option must be installed.

Note for R&S®SMW200A and R&S®SGT100A users: The xxx-K283 option includes 3GPP FDD enhanced MS/BS tests including HSDPA as well as 3GPP HSUPA and 3GPP HSPA+.

General parameters	This option extends the xxx-K242 (R&S®CMW-KW400) option (3GPP FDD digital standard) to HSUPA support. Therefore, all general parameters of the xxx-K242 such as modulation are also valid for the xxx-K245/xxx-K283 (R&S®CMW-KW402).	
Downlink simulation		
HSUPA channels (E-AGCH, E-RGCH, E-HICH)		
Enhancements	In downlink, the xxx-K245/xxx-K283 (R&S®CMW-KW402) supports simulation of the 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) 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 39 (in line with TS 25.211)
	τ <DPCH>	0 to 149 (in units of 256 chip)
Ranges (valid for E-RGCH)	relative grant pattern	up to 32 UP/DOWN/HOLD commands sent periodically
Ranges (valid for E-HICH)	ACK/NACK pattern	up to 32 ACK/NACK commands sent periodically
Ranges (valid for E-AGCH)	E-AGCH information field coding	on/off
	E-DCH TTI	2 ms, 10 ms
	number of configurable TTIs	1 to 10
	ranges for the parameters in each of the TTI configurations (used cyclically)	
	UEID	0 to 65535
	absolute grant value index	0 to 31
	absolute grant scope	all HARQ processes, per HARQ process
Uplink simulation		
E-DPCCH (E-DCH dedicated physical control channel), E-DPDCH (E-DCH dedicated physical data channel)		
Enhancements	In uplink, the xxx-K245 (R&S®CMW-KW402) option 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) in each of the mobile stations, and for mobile station 1 also with channel coding in line with the definition of the fixed reference channels in TS 25.104 and TS 25.141 or with user-configured coding chain.	
Application	RX measurements on 3GPP FDD NodeBs 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-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, 2 × 960 ksps I only, 2 × 960 ksps Q only, 2 × 1920 ksps I only, 2 × 1920 ksps Q only, 2 × 960 + 2 × 1920 ksps I only, 2 × 960 + 2 × 1920 ksps Q only
Modulation	depending on overall symbol rate	BPSK
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	separately for each E-DPDCH	PRBS: 9, 11, 15, 16, 20, 21, 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list

E-DCH scheduling		
E-DCH TTI		2 ms, 10 ms
Number of table rows		1 to 32
E-DCH schedule repeats after		max. 2.5 s; the range in TTIs depends on the E-DCH TTI size
E-DCH from TTI	in each table row	range depends on the E-DCH TTI size
E-DCH to TTI	in each table row	range depends on the E-DCH TTI size
HSUPA FRC	channel coding in line with the definition of fixed reference channels in TS 25.104 and TS 25.141 or with user-configured coding chain; in addition, user-configurable “virtual HARQ mode” and bit/block error insertion	
Fixed reference channel (FRC)	predefined channel coding schemes	FRC 1 to 7, user
Data source E-DCH		PRBS: 9, 11, 15, 16, 20, 21, 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
Overall symbol rate		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
Modulation		BPSK
E-DCH TTI		2 ms, 10 ms
Transport block size table		table 0 (2 ms), table 1 (2 ms), table 0 (10 ms), table 1 (10 ms)
Transport block size index (E-TFCI)		range depends on the selected table
DTX pattern		up to 32 TX/DTX commands sent periodically
HARQ simulation mode		virtual HARQ
Always use redundancy version 0		on/off
HARQ ACK/NACK pattern	individual ACK/NACK pattern for each HARQ process	up to 32 ACK/NACK commands used 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 rate	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 rate	0.5 to 10^{-4}
Application	verification of internal BLER calculation in line with TS 25.141 (BS conformance testing)	
Power reference		RMS power, first DPCCH, PRACH message part, last PRACH preamble, first E-DCH
Uplink test models (in line with TS 34.121) for the xxx-K283 option		
3GPP Release 6 test models		TS 34.121, table C.10.1.4, subtests 1 to 6
3GPP Release 8 test models		TS 34.121, table C.10.1.4, subtests 1 to 4, TS 34.121, table C.11.1.3, subtests 1 to 5, TS 34.121, table C.11.1.4, subtest 1
Uplink test models (in line with TS 34.121), Rohde & Schwarz instruments with -K43/-K45/-K59 or R&S®CMW with -KW401/-KW402/-KW403 options		
3GPP Release 6 test models	xxx-K243 (R&S®CMW-KW401) option required	TS 34.121, table C.10.1.4, subtests 1 to 6
3GPP Release 8 test models	xxx-K243 (R&S®CMW-KW401) option required	TS 34.121, table C.10.1.4, subtests 1 to 4
	xxx-K243 and xxx-K245 (R&S®CMW-KW401 and -KW402) options required	TS 34.121, table C.11.1.3, subtests 1 to 5
	xxx-K243, xxx-K245 and xxx-K259 (R&S®CMW-KW401, -KW402 and -KW403) options required	TS 34.121, table C.11.1.4, subtest 1

3GPP FDD HSPA+ (xxx-K259, xxx-K283 or R&S®CMW-KW403 option)

xxx-K259 (R&S®CMW-KW403) options: One xxx-K243 (R&S®CMW-KW401) option or xxx-K245 (R&S®CMW-KW402) option must be installed. The functionalities of the xxx-K259 (R&S®CMW-KW403) option depend on the availability of the xxx-K243 (R&S®CMW-KW401) and/or xxx-K245 (R&S®CMW-KW402) option.

Note for R&S®SMW200A and R&S®SGT100A users: The xxx-K283 option includes 3GPP FDD enhanced MS/BS tests including HSDPA as well as 3GPP HSUPA and 3GPP HSPA+.

R&S®SMW-K283/R&S®SGT-K283 option: as prerequisite at least one xxx-K242 option must be installed on the instrument.

General parameters	This option extends the xxx-K243 (R&S®CMW-KW401) option (3GPP FDD enhanced BS/MS test including HSDPA) and/or the xxx-K245 (R&S®CMW-KW402) option (3GPP HSUPA) to support HSPA+ in downlink and uplink. The xxx-K243 (R&S®CMW-KW401) and xxx-K245 (R&S®CMW-KW402) options require the xxx-K242 (R&S®CMW-KW400) option (3GPP FDD digital standard). Therefore, all general parameters of the xxx-K242 (R&S®CMW-KW400) option such as modulation are also valid for the xxx-K259/xxx-K283 (R&S®CMW-KW403) option. All general parameters of the xxx-K243 and/or xxx-K245 (R&S®CMW-KW401 and/or R&S®CMW-KW402) option(s) such as the H-Set parameters or the FRC HARQ simulation parameters are also valid for the xxx-K259/xxx-K283 (R&S®CMW-KW403) option, unless stated otherwise in the sections below.	
Downlink simulation		
Downlink continuous packet connectivity (CPC): HS-SCCH-less operation (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K243 (R&S®CMW-KW401) option)		
Enhancements	The xxx-K243 (R&S®CMW-KW401) option supports simulation of the HS-SCCH in H-Sets with HS-SCCH type 1 (in line with TS 25.212) only. In order for the instrument to support HS-SCCH-less operation, the xxx-K259/xxx-K283 (R&S®CMW-KW403) option now enables simulation of H-Sets with HS-SCCH type 2 (for H-Set 7 and user-editable H-Set).	
Ranges	H-Set	H-Set 1 to H-Set 12, user-editable H-Set; CPC (HS-SCCH-less operation) can be simulated by selecting H-Set 7 or the user-editable H-Set with appropriate settings
	HS-SCCH type	HS-SCCH types 1 to 3, in line with TS 25.212; CPC can be simulated by selecting HS-SCCH type 2
	number of HS-PDSCH channel codes (if HS-SCCH type is set to HS-SCCH type 2)	1 to 2
	HS-PDSCH modulation (if HS-SCCH type is set to HS-SCCH type 2)	always QPSK
	transport block size reference (if HS-SCCH type is set to HS-SCCH type 2)	0 to 3, representing the signaled transport block size information in the HS-SCCH blocks, in line with TS 25.212 Note: The actual transport block size configuration for the HS-PDSCH channel is the same as in the xxx-K243 option.
	redundancy version (if HS-SCCH type is set to HS-SCCH type 2 and HARQ simulation mode is set to constant ACK)	always 0
	redundancy version sequence (if HS-SCCH type is set to HS-SCCH type 2 and HARQ simulation mode is set to constant NACK)	The three entries are always 0, 3, 4.
Downlink higher order modulation (HOM): 64QAM (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K243 (R&S®CMW-KW401) option)		
Enhancements	The xxx-K243 (R&S®CMW-KW401) option supports simulation of HS-PDSCH channels with channel coding in H-Sets with QPSK and 16QAM modulation only. The xxx-K259/xxx-K283 (R&S®CMW-KW403) option extends the functionality by 64QAM modulation for HS-PDSCH channels with channel coding inside H-Sets (for H-Set 8, H-Set 11 and user-editable H-Set). Note: 64QAM for HS-PDSCH channels in continuous mode without channel coding is already supported by the xxx-K242 (R&S®CMW-KW400) option.	

Ranges	H-Set	H-Set 1 to H-Set 12, user-editable H-Set; 64QAM can be simulated by selecting H-Set 8, H-Set 11 or by selecting the user-editable H-Set with appropriate settings
	HS-SCCH type	HS-SCCH types 1 to 3, in line with TS 25.212; 64QAM is available only for HS-SCCH type 1 or HS-SCCH type 3
	HS-PDSCH modulation (if HS-SCCH type is set to HS-SCCH type 1 or HS-SCCH type 3)	QPSK, 16QAM or 64QAM
	transport block size table (if HS-PDSCH modulation is set to 64QAM)	always table 1: transport block size evaluated in line with table 1 in TS 25.321, subclause 9.2.3.1
Downlink MIMO (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K243 (R&S®CMW-KW401) option)		
Enhancements	The xxx-K243 (R&S®CMW-KW401) option does not support MIMO. The xxx-K259/xxx-K283 (R&S®CMW-KW403) option now supports MIMO for the downlink HS-PDSCH channels (double transmit antenna array, D-TxAA).	
Ranges	precoding weight pattern (w2) (if HS-PDSCH channels with MIMO are used)	sequence of up to 16 entries in the range from 0 to 3; specifies the MIMO precoding weight w_2 in line with TS 25.214 used for the HS-PDSCH packets
	stream 2 active pattern (if HS-PDSCH channels with MIMO are used)	sequence of up to 16 entries that are either “1” or “-” and specify in which HS-PDSCH packets (TTIs) one or two transport blocks are sent
Ranges if HSDPA mode is not set to H-Set	modulation (if HS-PDSCH channels with MIMO are used)	The modulation for the two MIMO streams can be set independently to QPSK, 16QAM or 64QAM.
Ranges if HSDPA mode is set to H-Set	H-Set	H-Set 1 to H-Set 12, user-editable H-Set; MIMO can be simulated by selecting H-Set 9, H-Set 11 or by selecting the user-editable H-Set with appropriate settings
	HS-SCCH type	HS-SCCH types 1 to 3, in line with TS 25.212; MIMO is simulated by selecting HS-SCCH type 3
	HS-PDSCH modulation (if HS-PDSCH modulation is set to HS-SCCH type 3)	The modulation for the two MIMO streams can be QPSK, 16QAM or 64QAM. Note: Only the combinations of modulation modes specified in TS 25.212 table 14 are possible.
	transport block size table (if HS-PDSCH modulation is set to HS-SCCH type 3)	can be set independently for the two MIMO streams 0: The transport block size is evaluated in line with table 0 in TS 25.321, subclause 9.2.3.1. 1: The transport block size is evaluated in line with table 1 in TS 25.321, subclause 9.2.3.1. For 64QAM modulation, only table 1 is applicable to the respective stream.
	transport block size index (if HS-PDSCH modulation is set to HS-SCCH type 3)	can be set independently for the two MIMO streams; 0 to 62; index in line with TS 25.321, subclause 9.2.3.1
	virtual IR buffer size (per HARQ process) (if HS-PDSCH modulation is set to HS-SCCH type 3)	can be set independently for the two MIMO streams; up to 304000 in steps of 800; lower limit depends on transport block size

Ranges if HSDPA mode is set to H-Set (continued)	redundancy version (if HS-PDSCH modulation is set to HS-SCCH type 3 and HARQ simulation mode to constant ACK)	can be set independently for the two MIMO streams; 0 to 3
	redundancy version sequence (if HS-PDSCH modulation is set to HS-SCCH type 3 and HARQ simulation mode to constant NACK)	can be set independently for the two MIMO streams; sequence of a maximum of 30 entries in the range from 0 to 3; the number of entries also determines the number of transmissions of the same data in the HS-PDSCH packets of the individual HARQ processes before new data is transmitted
Enhanced F-DPCH (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K243 (R&S®CMW-KW401) option)		
Enhancements	The xxx-K243 (R&S®CMW-KW401) option supports simulation of F-DPCH channels with slot format 0 only. The xxx-K259/xxx-K283 (R&S®CMW-KW403) option now enables simulation of slot formats 0 to 9.	
Ranges (valid for F-DPCH)	slot format	0 to 9
Features for type 3i enhanced performance requirements tests (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K243 (R&S®CMW-KW401) option)		
Enhancements	The xxx-K243 (R&S®CMW-KW401) option does not support OCNS generation for type 3i enhanced performance requirements tests or generation of H-Sets with varying modulation and number of HS PDSCH codes. The xxx-K259/xxx-K283 (R&S®CMW-KW403) enhances the functionality for supporting both of these features.	
Ranges in the H-Set dialog	randomly varying modulation and number of codes state (only if HS-SCCH type is set to type 1)	on/off
	alternative HS-PDSCH modulation (only if HS-SCCH type is set to type 1)	QPSK, 16QAM, 64QAM
	alternative number of HS-PDSCH channelization codes (only if HS-SCCH type is set to type 1)	1 to 15
	random seed (only if HS-SCCH type is set to type 1)	0 to 65535
Ranges in the 3GPP main dialog	OCNS mode	standard, HSDPA, HSDPA 2, 3i
	OCNS seed (only if OCNS mode is set to 3i)	0 to 65535
Uplink simulation		
Uplink higher order modulation (HOM): 4PAM (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K245 (R&S®CMW-KW402) option)		
Enhancements	The xxx-K245 (R&S®CMW-KW402) option supports E-DPDCH channels with BPSK modulation only. The xxx-K259/xxx-K283 (R&S®CMW-KW403) option now enables 4PAM modulation for E-DPDCH channels without channel coding and with channel coding (FRC 8).	
Ranges in the E-DPDCH settings	modulation (if the overall symbol rate is 2 × 960 ksps, 2 × 1920 ksps, 2 × 960 + 2 × 1920 ksps, 2 × 960 ksps I only, 2 × 960 ksps Q only, 2 × 1920 ksps I only, 2 × 1920 ksps Q only, 2 × 960 + 2 × 1920 ksps I only or 2 × 960 + 2 × 1920 ksps Q only)	BPSK, 4PAM
Ranges in the FRC settings	fixed reference channel (FRC)	1 to 8, user 4PAM can be simulated by selecting FRC 8
	modulation (if the overall symbol rate is 2 × 960 ksps, 2 × 1920 ksps or 2 × 960 ksps + 2 × 1920 ksps)	BPSK, 4PAM
	transport block size table	table 0 (2 ms), table 1 (2 ms), table 2 (2 ms), table 3 (2 ms), table 0 (10 ms), table 1 (10 ms)
Uplink HS-DPCCH extensions for MIMO, DC-HSDPA, 4C-HSDPA and 8C-HSDPA (all instruments except R&S®SMW200A/ R&S®SGT100A: requires the xxx-K243 (R&S®CMW-KW401) option)		

Enhancements	The xxx-K243 (R&S®CMW-KW401) option allows the generation of HS-DPCCH channels to simulate UEs that are neither configured in MIMO mode nor for an active secondary cell. The xxx-K259/xxx-K283 (R&S®CMW-KW403) option now also enables the simulation of UEs that are configured in MIMO mode and/or for an active secondary cell.	
Ranges	MIMO mode	on/off
Ranges if compatibility mode is set to "Release 8 and Later"	secondary cell enabled	0 to 7
	secondary cell active	0 to 7
Ranges if compatibility mode is set to "Up to Release 7" and MIMO mode is on	power offset ACK/ACK	–10 dB to +10 dB
	power offset ACK/NACK	–10 dB to +10 dB
	power offset NACK/ACK	–10 dB to +10 dB
	power offset NACK/NACK	–10 dB to +10 dB
	power offset CQI type A	–10 dB to +10 dB
	number of TTIs	1 to 32
	ranges for the parameters in each of the TTI configurations (used cyclically)	
	HARQ-ACK	DTX, single TB: ACK, single TB: NACK, TB1: ACK, TB2: ACK, TB1: ACK, TB2: NACK, TB1: NACK, TB2: ACK, TB1: NACK, TB2: NACK
	PCI	0 to 3
	CQI type	type A single TB, type A dual TB, type B
	CQI/CQIs/CQI1	0 to 30 (for CQI type A single TB or type B), 0 to 14 (for CQI type A dual TB)
	CQI2 (only for CQI type A dual TB)	0 to 14
Ranges if compatibility mode is set to "Release 8 and Later" and MIMO mode is on and secondary cell enabled is 0	ranges for parameters in each table row	
	HARQ-ACK	DTX, A, N, AA, AN, NA, NN, PRE, POST
	CQI type	DTX, type A single TB, type A dual TB, type B
	CQI/CQIs/CQI1	0 to 30 (for CQI type A single TB or type B), 0 to 14 (for CQI type A dual TB)
	CQI2 (only for CQI type A dual TB)	0 to 14
	PCI	0 to 3
Ranges if compatibility mode is set to "Release 8 and Later" and secondary cell enabled is > 0 and secondary cell active is > 0	ranges for parameters in each table row	
	Physical HS-DPCCH channels	HS-DPCCH 1, HS-DPCCH 2, depending on the settings "MIMO Mode", "Secondary Cell Active" and "Secondary Cell Enabled"
	HS-DPCCH Slot Format	0 to 1, depending on the settings "MIMO Mode", "Secondary Cell Active" and "Secondary Cell Enabled"
	HARQ-ACK	DTX and all HARQ-ACK combinations of 3GPP TS 25.212, depending on the settings "MIMO Mode", "Secondary Cell Active" and "Secondary Cell Enabled"
	CQI type	DTX, CQI, composite CQI, type A single TB, type A dual TB, type B, depending on the settings "MIMO Mode", "Secondary Cell Active" and "Secondary Cell Enabled"
	$CQI/CQI_s/CQI_1$	0 to 30
	CQI_2	0 to 30
Uplink DPCCH with 4 TPC bits (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K243 or xxx-K245 (R&S®CMW-KW401 or -KW402) option)		
Enhancements	The xxx-K242 (R&S®CMW-KW401) option allows the simulation of DPCCH with 2 TPC bit per slot only (slot formats 0 to 3). The xxx-K259/xxx-K283 (R&S®CMW-KW403) option now enables simulation of DPCCH with 4 TPC bit per slot (slot formats 0 to 4).	
Ranges in the uplink DPCCH settings	slot format	0 to 4
	TPC mode	2 bit, 4 bit

UL-DTX CPC feature (all instruments except R&S®SMW200A/R&S®SGT100A: requires the xxx-K245 option)		
Enhancements	The xxx-K259/xxx-K283 (R&S®CMW-KW403) option enables simulation of the UL-DTX CPC feature for mobile station 1.	
Ranges in the UL-DTX configuration dialog	state	on/off
	E-DCH TTI	2 ms, 10 ms
	offset	0 to 159 subframes for 2 ms TTI size, 0 to 155 subframes for 10 ms TTI size
	inactivity threshold for cycle 2	1, 4, 8, 16, 32, 64, 128, 256 TTIs
	long preamble length	2, 4, 15 slots
	DTX cycle 1	1, 4, 5, 8, 10, 16, 20 subframes
	DPCCH burst length 1	1, 2, 5 subframes
	preamble length 1	2 slots, fixed
	postamble length 1	1 slot, fixed
	DTX cycle 2	4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160 subframes
	DPCCH burst length 2	1, 2, 5 subframes
	preamble length 2	2 slots, fixed
	postamble length 2	1 slot, fixed
Uplink test models (in line with TS 34.121) for the R&S®SMW-K283/R&S®SGT-K283 option		
3GPP Release 6 test models		TS 34.121, table C.10.1.4, subtests 1 to 6
3GPP Release 8 test models		TS 34.121, table C.10.1.4, subtests 1 to 4, TS 34.121, table C.11.1.3, subtests 1 to 5, TS 34.121, table C.11.1.4, subtest 1
Uplink test models (in line with TS 34.121) for Rohde & Schwarz instruments with -K243/-K245/-K259 or R&S®CMW with -KW401/ -KW402/-KW403 options		
3GPP Release 6 test models	xxx-K243 (R&S®CMW-KW401) option required	TS 34.121, table C.10.1.4, subtests 1 to 6
3GPP Release 8 test models	xxx-K243 (R&S®CMW-KW401) option required	TS 34.121, table C.10.1.4, subtests 1 to 4
	xxx-K243 and xxx-K245 (R&S®CMW-KW401 and -KW402) options required	TS 34.121, table C.11.1.3, subtests 1 to 5
	xxx-K243, xxx-K245 and xxx-K259 (R&S®CMW-KW401, -KW402 and -KW403) options required	TS 34.121, table C.11.1.4, subtest 1

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

GSM/EDGE digital standard		in line with GSM standard
Sequence length	sequence length entered in frames (60/13 ms ≈ 4.61 ms each), maximum length depending on ARB memory size	
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 involving the combination of 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 dB to +60 dB, eight different levels simultaneously possible (full level and seven attenuated levels)
Burst on/off ratio		> 100 dB
Data sources	for characteristics of data sources, see “I/Q baseband generator” section	
	internal data sources	PRBS 9, 11, 15, 16, 20, 21, 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
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

EDGE Evolution (xxx-K241 or R&S®CMW-KW201 option)

One xxx-K240 (R&S®CMW-KW200) option must be installed.

General parameters	This option extends the xxx-K240 (R&S®CMW-KW200) option (GSM/EDGE digital standard) to support EDGE Evolution (EDGE+) including VAMOS. Therefore, all general parameters of the xxx-K240 option such as slot attenuation are also valid for the xxx-K241 (R&S®CMW-KW201) option.	
Symbol rate mode		normal symbol rate, higher symbol rate
Sequence mode	unframed	normal symbol rate: MSK, AQPSK, 8PSK EDGE, 16QAM EDGE or 32QAM EDGE higher symbol rate: QPSK EDGE, 16QAM EDGE or 32QAM EDGE
	framed (single)	configuration of a signal via frame structure (see frame structure below)
	framed (double)	configuration of simple multiframe
Modulation		normal symbol rate: MSK, FSK, AQPSK, 8PSK EDGE, 16QAM EDGE or 32QAM EDGE; higher symbol rate: QPSK EDGE, 16QAM EDGE or 32QAM EDGE
Training sequence		set 1 set 2: normal (GMSK), normal (AQPSK)
Symbol rate	standard	normal symbol rate: 270.833 kHz; higher symbol rate: 325 kHz
	range	400 Hz to 325 kHz
Baseband filter	GSM, standard for normal symbol rate	Gaussian with B × T = 0.3
	range	B × T = 0.15 to 2.5
	EDGE, standard for normal symbol rate	Gaussian linearized (EDGE)
	EDGE+ for higher symbol rate	narrow pulse shape, wide pulse shape
Frame structure	change possible from slot to slot and frame to frame	normal symbol rate: GSM, AQPSK, 8PSK EDGE, 16QAM EDGE, 32QAM EDGE higher symbol rate: QPSK EDGE, 16QAM EDGE, 32QAM EDGE
	additional burst types for normal symbol rate	normal (AQPSK, full rate – full rate), normal (AQPSK, full rate – half rate), normal (AQPSK, half rate – half rate), normal (16QAM), normal (32QAM), all data (16QAM), all data (32QAM)
	additional burst types for higher symbol rate	normal (QPSK), normal (16QAM), normal (32QAM), all data (QPSK), all data (16QAM), all data (32QAM)

CDMA2000® 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 maximum 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 Msample 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	four base stations with a maximum of 78 code channels each (depending on radio configuration)
	forward link	four mobile stations with a maximum of eight code channels each (depending on radio configuration)
Clipping level	setting of a limit value relative to the highest peak in percent; limitation is performed prior to baseband filtering and reduces the crest factor	value range 1 % to 100 %
Generation of waveform file		filtering of data generated in ARB mode and saving it as a 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 chip
PN offset		0 to 511
Transmit diversity	If this function is activated, the output signal can be generated for either antenna 1 or antenna 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), PNx and data list
Long code mask		0 to 3FF FFFF FFFF (hex)
Power control data source		All0, All1, pattern (length up to 64 bit) and 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. Four options are available:	
	off	channel coding off
	complete	channel coding completely on
	without interleaving	channel coding on 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. Four options are available:	
	off	channel coding off
	complete	channel coding completely on
	without interleaving	channel coding on without interleaver
	interleaving only	channel coding off, only interleaver is active
Operating mode	simulates MS operating 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) and 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, PNx and data list

1xEV-DO Rev. A (xxx-K247 or R&S®CMW-KW880 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 (reverse link)	sequence length entered in slots (1.67 ms each), maximum length depending on ARB memory size	
	128 Msample	65536 slots
	64 Msample	32768 slots
	16 Msample	8192 slots
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 four independent traffic channels for different users.
	reverse link	Up to four completely independent access terminals can be simulated.
Clipping level	setting of a limit value relative to the highest peak in percent; limitation is performed prior to baseband filtering and reduces the crest factor	value range 1 % to 100 %
Generation of waveform file	filtering of data generated in ARB mode and saving it as a waveform file	
PN offset		0 to 511
System time		0 to 2199023255551
Forward link parameters		
Physical layer subtype		0 and 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 to 3
Reverse activity bit (MAC)	state	on/off
	level	–25.0 dB to –7.0 dB
	length (subtypes 0 and 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 subtypes 0 and 1, the packet size depends only on the rate index	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	subtypes 0 and 1	5 to 63
	subtype 2	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, subtypes 0 and 1	0, 8, 16
	period, subtype 2	0, 4
	length	1, 4, 8, 16, 32
	frame offset	0 to 15
HARQ mode	subtype 2 only	off, ACK, NAK

Settings for each reverse link access terminal in traffic mode		
Physical layer subtype		0 and 1 or 2
Disable quad. spreading		on/off
Long code mask I		0 to 3FFF FFFF FFF (hex)
Long code mask Q		0 to 3FFF FFFF FFF (hex)
Pilot channel gain		–80 dB to +10 dB
Auxiliary pilot channel	subtype 2 only	
	state	on/off
	relative gain	–80 dB to +10 dB
	minimum payload	128 bit to 12288 bit
RRI channel	state	on/off
	relative gain (subtype 2 only)	–80 dB to +10 dB
DSC channel	subtype 2 only	
	state	on/off
	relative gain	–80 dB to +10 dB
	length	8 to 256 slots
	values	up to 16 octal values
DRC channel	state	on/off
	relative gain	–80 dB to +10 dB
	length	1, 2, 4, 8 slots
	values	up to 16 hexadecimal values
	cover	0 to 7
	gating	on/off
ACK channel	state	on/off
	relative gain	–80 dB to +10 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 (subtypes 0 and 1) or 1 to 3 (subtype 2)
	relative gain	–80 dB to +10 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, subtypes 0 and 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), PNx and data list
	append FCS	on/off
Settings for each reverse link access terminal in access mode		
Physical layer subtype		0 and 1 or 2
Disable quad. spreading		on/off
Long code mask I		0 to 3FFF FFFF FFF (hex)
Long code mask Q		0 to 3FFF FFFF FFF (hex)
Preamble length		1 to 7 frames
Access cycle duration		1 to 255 slots
Access cycle offset		0 to 12 slots
Pilot channel gain		–80 dB to +10 dB
Data channel	state	on/off
	relative gain	–80 dB to +10 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), PNx and data list
	append FCS	on/off

1xEV-DO Rev. B (xxx-K287)

For each xxx-K287 option, a xxx-K247 option must also be installed on the respective instrument.

General parameters	This option enhances the xxx-K247 option (1xEV-DO Revision A) to support 1xEV-DO Revision B. The xxx-K287 option requires the xxx-K247 option (1xEV-DO Revision A). Therefore, all general parameters of the xxx-K247 option are also valid for the xxx-K287 option, unless stated otherwise below.	
1xEV-DO digital standard	Release B	in line with 3GPP2 C.S0024-B 3.0
Frequency	band class 0 to band class 21	410 MHz to 2690 MHz
Forward link parameters		
Physical layer subtype		0&1, 2 or 3
Reverse activity bit (MAC)	MAC index	4 to 127
Other users count	simulates additional MAC users	1 to 360
Settings for each forward link traffic channel		
Rate index	subtype 3	1 to 28
Packet size		128 bit to 12288 bit
Data rate	depending on rate index and packet size	4.8 kbps to 4915.2 kbps
MAC index	subtype 3	4 to 383
DRC lock (MAC)	period, subtype 3	0, 4
	length	1, 4, 8, 16, 32, 64
Multicarrier parameters		
Multicarrier state		on/off
	Activated multicarrier provides up to 16 concurrent carriers. Each carrier is modulated according to the signal configuration settings. Carrier frequencies can be set by CDMA channel number or by directly specifying the RF center frequency.	
Band class	band class selection defines the CDMA channel number frequencies	band class 0 (800 MHz band), band class 1 (1900 MHz band), band class 2 (TACS band), band class 3 (JTACS band), band class 4 (Korean PCS band), band class 5 (450 MHz band), band class 6 (2 GHz band), band class 7 (upper 700 MHz band), band class 8 (1800 MHz band), band class 9 (900-MHz band), band class 10 (secondary 800 MHz band), band class 11 (400 MHz European PAMR band), band class 12 (800 MHz PAMR band), band class 13 (2.5 GHz IMT-2000 extension band), band class 14 (US PCS 1.9 GHz band), band class 15 (AWS band), band class 16 (US 2.5 GHz band), band class 17 (US 2.5 GHz forward link only band), band class 18 (700 MHz public safety band), band class 19 (lower 700 MHz band),band class 20 (L band), band class 21 (S band)
Number of carriers		1 to 16
CDMA channel number		depends on selected band class
Center frequency		depends on selected band class

TD-SCDMA (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 a chip rate of 1.28 Mcps (low chip rate mode)	
Signal generation modes/sequence length	Simulation of up to four 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®SMU200A with 64 Msample memory is selected and an oversampling of 2 is applied, R&S®WinIQSIM2™ can generate 2621 frames.	
Modulation		QPSK, 8PSK
Generation of waveform file	filtering of data generated in ARB mode and saving it as a waveform file	
	application	for multicarrier or multisegment scenarios
General settings		
Triggering		see “I/Q baseband generator” section
Chip rate	standard	1.28 Mcps (seven 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, seven slots per subframe, simulation of up to four 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
Basic midamble code ID	automatic selection depending on scrambling code	0 to 127
Time delay	time delay in chip can be introduced between cells	max. 6400 chip
Phase rotation	phase rotation for DwPTS can be used	different auto modes; S1 and S2 supported
Parameters for each downlink slot		
State		on/off
Slot mode	downlink dedicated	
	simulation of up to 16 DPCHs and maximum six special channels	DPCH QPSK/8PSK: 0 to 24, DPCH PDSCH: 0 to 24, HS-PDSCH QPSK/16QAM/64QAM: 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 one PUSCH	DPCH QPSK, PUSCH: 0 to 69, DPCH 8PSK: 0 to 24, E-PUCH QPSK/16QAM: 0 to 24
	PRACH	
	simulation of one physical random access channel	
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)	
	high speed shared information channel (HS-SICH)	
	enhanced physical uplink shared channel QPSK (E-PUCH QPSK)	
	enhanced physical uplink shared channel 16QAM (E-PUCH 16QAM)	
Parameters of every code channel that can be set independently		
State		on/off
Midamble shift	time shift of midamble in chip: 8 chip step width controlled via current user and 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) and data list
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: 1 bit to 64 bit) and data list
TPC readout 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
UpPTS distance	distance of 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) and data list
Current user		1 to 16

TD-SCDMA (3GPP TDD LCR) enhanced BS/MS test including HSDPA (xxx-K251 or R&S®CMW-KW751 option)

One xxx-K250 (R&S®CMW-KW750) option must be installed.

General parameters	This option extends the xxx-K250 (R&S®CMW-KW750) option (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 (R&S®CMW-KW751).	
Signal generation modes/sequence length	simulation of up to four 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, 16QAM and 64QAM modulation), HS-SICH, HSDPA and HSUPA; insertion of bit and block errors possible	
Modulation		QPSK, 8PSK, 16QAM, 64QAM
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 physical downlink shared channel 64QAM (HS-PDSCH 64QAM)	
	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
		RMC PLCCH
		HSDPA
		user
	predefined channel coding schemes for uplink	RMC 12.2 kbps
		RMC 64 kbps
		RMC 144 kbps
		RMC 384 kbps
		RMC HS-SICH
		HSUPA
		user
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)	

GPS (xxx-K244 or R&S®CMW-/R&S®CMA-KW620 option)

GPS digital standard		in line with ICD-GPS-200 revision D
General settings		
RF bands		L1/E1, L2, default: L1/E1
Simulation modes		
Static mode		generation of a GPS ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the machine
Configurable sample rate		as a multiple integer factor of the GPS coarse acquisition chip rate
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value and size of ARB memory available on the signal generator
System time basis		GPS, UTC, default: GPS
Simulation time		flexible date and time or GPS time configuration with 1 ms resolution
Current leap seconds		automated
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data: almanac file as source for ephemeris and almanac subframes; ephemeris subframes are projected from the almanac subframes
Use of spreading code		on/off
GPS satellite configuration		
Signals (chip rates)		coarse acquisition C/A (1.023 MHz)
Modulation		BPSK (CDMA)
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chip to 20459.99 chip in steps of 0.01 chip; precision error depends on configurable sample rate
Space vehicle ID		C/A codes: 37 Gold codes, 1023 chip each
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		GPS NAV
Data rate		50 Hz
Number of ephemeris pages		1

Galileo (xxx-K266 or R&S®CMW-/R&S®CMA-KW622 option)

Galileo digital standard		in line with OD SIS ICD, E1 band, E5a, E5b and E6
General settings		
RF bands		L1/E1, E5a, E5b, E6
Simulation modes		
Static mode		generation of a Galileo ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the machine
Configurable sample rate		as a multiple integer factor of the Galileo minimum required sample rate 12.276 MHz with CBOC(6,1) and 20.46 MHz with E5a/E5b or E6
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value and size of ARB memory available on the signal generator
System time basis		GST, UTC, default: GST
Simulation time		flexible date and time or GST time configuration with 1 ms resolution
Current leap seconds		automated
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data (except for E6): almanac file as source for ephemeris and almanac subframes; ephemeris subframes are projected from the almanac subframes
Use of spreading code		on/off
Galileo satellite configuration		
Signals (chip rates)		E1 default (1.023 MHz), E5a/E5b, E6 (10.23 MHz)
Modulation		CBOC(6,1) for E1, QPSK for E5a/E5b, E6
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chip to 20459.99 chip in steps of 0.01 chip; precision error depends on configurable sample rate
Space vehicle ID		E1: 36 memory codes, 4092 chip each; E5a/E5b: 36 memory codes, 10230 chip each; E6: 36 memory codes, 5115 chip each
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		Galileo INAV for E1 and E5b, FNAV for E5a, All0, All1, pattern, PNx and data list for E6
Data rate		250 Hz for for E1 and E5b, 50 Hz for E5a, 1 kHz for E6
Number of ephemeris pages		1

GLONASS (xxx-K294 or R&S®CMW-/R&S®CMA-KW621 option)

GLONASS digital standard		in line with ICD-GLONASS version 5.0
General settings		
RF bands		L1/E1, L2, default: L1/E1
Simulation modes		
Static mode		generation of a GLONASS ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the machine
Configurable sample rate		as a multiple integer factor of the GLONASS coarse acquisition chip rate
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value, satellite frequency number and size of ARB memory available on the signal generator
System time basis		GLO, UTC, default: GLO
Simulation time		flexible date and time or GLO time configuration with 1 ms resolution
Current leap seconds		automated
UTC-UTC(SU)		allows the configuration of UTC-UTC(SU) phase shift and frequency drift
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data: almanac file as source for ephemeris and almanac subframes; ephemeris automatically generated from almanac file
Use of spreading code		on/off
GLONASS satellite configuration		
Signals (chip rates)		coarse acquisition R-C/A (511 kHz)
Frequency number	configurable in the absence of real navigation data	–7 to +13
Modulation		BPSK (CDMA)
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chip to 20459.99 chip in steps of 0.01 chip; precision error depends on configurable sample rate
Space vehicle ID		1 CDMA code shared by all GLONASS satellites, 511 chip per repetition
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		GLONASS NAV
Data rate		50 Hz, 100 Hz (after applying the meander code)
Number of ephemeris pages		1

Modernized GPS (xxx-K298 or R&S®CMW-/R&S®CMA-KW620 option)

GPS digital standard		in line with ICD-GPS-200 revision J (L2C), IS-GPS-705E (L5)
General settings		
RF bands		L2 for L2C, L5, default: L2
Simulation modes		
Static mode		generation of a GPS ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the instrument
Configurable sample rate		as a multiple integer factor of the GPS signal chip rate
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value and size of ARB memory available on the signal generator
System time basis		GPS, UTC, default: GPS
Simulation time		flexible date and time or GPS time configuration with 1 ms resolution
Current leap seconds		automated
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data: almanac file as source for ephemeris and almanac subframes; ephemeris subframes are projected from the almanac subframes
Use of spreading code		on/off
GPS satellite configuration		
Signals (chip rates)		L2C (1.023 MHz), L5 (10.23 MHz)
Modulation		BPSK for L2C, QPSK for L5
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chip to 20459.99 chip in steps of 0.01 chip; precision error depends on configurable sample rate
Space vehicle ID		37 L2 CM-/L2 CL codes
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		GPS CNAV
Data rate		50 Hz for L2C, 100 Hz for L5
Number of ephemeris pages		1

BeiDou (xxx-K407 or R&S®CMW-KW623 option)

BeiDou digital standard		in line with BDS-SIS-ICD-B1I-1.0
General settings		
RF bands		B1I on L1/E1, B2I on L5
Simulation modes		
Static mode		generation of a BeiDou ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the machine
Configurable sample rate		as a multiple integer factor of the BeiDou B1I/B2I chip rate
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value and size of ARB memory available on the signal generator
System time basis		BDT, UTC, default: BDT
Simulation time		flexible date and time or BDT time configuration with a resolution of 1 ms
Current leap seconds		automated
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data: almanac file as source for ephemeris and almanac subframes; ephemeris subframes are projected from the almanac subframes
Use of spreading code		on/off
BeiDou satellite configuration		
Signals (chip rates)		coarse acquisition B1I/B2I-C/A (2.046 MHz)
Modulation		BPSK (CDMA)
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chips to 20459.99 chips in steps of 0.01 chips
Space vehicle ID		B1I/B2I-C/A codes: 1 to 5: GEO, 6 to 37: MEO/IGSO; 2046 chips each
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		BeiDou D1 and D2
Data rate		50 Hz and 500 Hz for D1 and D2, respectively
Number of ephemeris pages		1

Modernized BeiDou (xxx-K432 or R&S®CMW-KW623 option)

BeiDou digital standard		in line with: BDS-SIS-ICD-B3I-1.0, BDS-SIS-ICD-B2a-1.0, BDS-SIS-ICD-B1C-1.0
General settings		
RF bands		B1C on L1, B2a on L5, B3I on L2
Simulation modes		
Static mode		generation of a BeiDou ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the machine
Configurable sample rate		as a multiple integer factor of the BeiDou B2a/B3I chip rate and B1C minimum sample rate (12.276 MHz)
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value and size of ARB memory available on the signal generator
System time basis		BDT, UTC, default: BDT
Simulation time		flexible date and time or BDT time configuration with a resolution of 1 ms
Current leap seconds		automated
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data: almanac file as source for ephemeris and almanac subframes; ephemeris subframes are projected from the almanac subframes
Use of spreading code		on/off
BeiDou satellite configuration		
Signals (chip rates)		coarse acquisition B3I-C/A (10.23 MHz), B1C (1.023 MHz), B2a (10.23 MHz)
Modulation		BPSK for B3I, QPSK for B2a, BOC for B1C
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chips to 20459.99 chips in steps of 0.01 chips
Space vehicle ID		1 to 5: GEO, 6 to 37: MEO/IGSO; 10230 chips each
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		BeiDou D1 and D2
Data rate		50 Hz and 500 Hz for D1 and D2, respectively; 100 Hz for B1C and 200 Hz for B2a
Number of ephemeris pages		1

NavIC (IRNSS) (xxx-K297)

BeiDou digital standard		in line with: ISRO-IRNSS-ICD-SPS-1.1
General settings		
RF bands		L5
Simulation modes		
Static mode		generation of an ARB satellite signal defined in time with user-definable initial code phase and Doppler, e.g. for sensitivity measurements; signal is continuously repeated on the machine
Configurable sample rate		as a multiple integer factor of the chip rate
Duration of satellite simulation		maximum simulation time depends on configurable sample rate, Doppler value and size of ARB memory available on the signal generator
System time basis		UTC, NavIC, default: UTC
Simulation time		flexible date and time or BDT time configuration with a resolution of 1 ms
Current leap seconds		automated
Marker		restart
		1 PPS
		1 PP2S
		10 PPS
		pulse
		pattern
		on/off ratio
Navigation data source		All0
		All1
		pattern (up to 64 bit)
		PN 9 to PN 23
		data lists
		real navigation data: almanac file as source for ephemeris and almanac subframes; ephemeris subframes are projected from the almanac subframes
Use of spreading code		on/off
NavIC satellite configuration		
Signals (chip rates)		coarse acquisition (1.023 MHz)
Modulation		BPSK (CDMA)
State		on/off
Initial code phase	configurable in the absence of real navigation data	0 chips to 20459.99 chips in steps of 0.01 chips
Space vehicle ID		1 to 14 1023 chips each
Doppler shift		–100 kHz to +100 kHz in steps of 0.01 Hz
Navigation data format		IRNSS master frame
Data rate		50 Hz
Number of ephemeris pages		1

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

IEEE 802.11a/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 modulation modes and data rates as 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 Mbps and a PSDU data length of 1024 byte, the user has 94.98 frames/Msample. Example: If an R&S®SMU-B10 with 64 Msample 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 following parameters: frame control, duration/ID, addresses 1 to 4 and sequence control
Frame check sequence		activating or deactivating a 32 bit (4 byte) checksum for protecting MAC header and 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
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 802.11a/b/g/n/j/p (xxx-K254 or R&S®CMW-KW650 option)

IEEE 802.11a/b/g/n/j/p digital standard		in line with IEEE 802.11-2012
General settings		
Bandwidth		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
Triggering		see data sheet of respective Rohde & Schwarz instrument, "I/Q baseband generator" section
Chip/sample rate	standard	11 Mcps, 10 Msample/s, 20 Msample/s, 40 Msample/s
	range	depending on Rohde & Schwarz instrument
Baseband filter		spectral mask in line with IEEE 802.11-2012, chapter 18.3.9.3 for LEGACY 10 MHz and 20 MHz modes, IEEE 802.11-2012, chapter 20.3.20.1 for high throughput (HT) modes
	CCK and PBCC	spectral mask in line with IEEE 802.11-2012, chapter 17.4.7.4
Transmit antenna setup	number of antennas	1 to 4
	mapping coefficient range	(–1000 –1000 i) to (+1000 +1000 i) with resolution = 0.01/dimension
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, MIXED MODE
Transmit mode	physical mode = LEGACY	L-10 MHz, L-20 MHz, L-Duplicate, L-Upper, L-Lower, CCK, PBCC
	physical mode = MIXED MODE or GREEN FIELD	HT-20 MHz, HT-40 MHz, HT-Duplicate, HT-Upper, HT-Lower
Frames		1 frame to 20000 frames (depending on frame duration)
Idle time	time between two successive frames (PPDUs)	
	range	0 ms to 1000 ms with 1 µs resolution

Settings for CCK		
PSDU parameters	MAC header	activating and configuring the MAC header with the following parameters: frame control, duration/ID, addresses 1 to 4, sequence control
	frame check sequence	activating or deactivating a 32 bit (4 byte) checksum for protecting MAC header and user data (frame body)
	PLCP preamble and header format	long PLCP and short PLCP
	preamble/header active	The preamble/header can be turned on or off. By turning it off and setting idle time to 0, the 'unframed' mode is available.
	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
Settings for PBCC		
PSDU parameters	MAC header	activating and configuring the MAC header with the following parameters: frame control, duration/ID, addresses 1 to 4, sequence control
	frame check sequence	activating or deactivating a 32 bit (4 byte) checksum for protecting MAC header and user data (frame body)
	PLCP preamble and header format	long PLCP and short PLCP
	preamble/header active	The preamble/header can be turned on or off. By turning it off and setting idle time to 0, the 'unframed' mode is available.
	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

Settings for OFDM		
PSDU parameters	MAC header	activating and configuring the MAC header with the following parameters: frame control, duration/ID, addresses 1 to 4, sequence control For high throughput (HT), i.e. 'Not Legacy', QoS Control and HT Control are also configurable.
	frame check sequence	activating or deactivating a 32 bit (4 byte) checksum 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	activated by simply choosing different values for number of spatial and space-time streams
	PSDU modulation/space stream	BPSK, QPSK, 16QAM, 64QAM
	data length	1 byte to 4061 byte [6] for LEGACY frames, 1 byte to 65495 byte for HT frames; 0 is permissible only 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	The preamble/header can be turned on or off. By turning it off and setting idle time to 0, the 'unframed' mode is available.
	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, indirect and spatial expansion

[6] The maximum PPDU length for legacy is 4095 byte. It can be obtained by activating all the MAC fields. The same applies to HT; 65535 byte can be implemented.

IEEE 802.11ac (xxx-K286 or R&S®CMW-KW656 option)

One xxx-K254 (R&S®CMW-KW650) option must be installed.

General parameters	This option enhances the xxx-K254 (R&S®CMW-KW650) option for IEEE 802.11a/b/g/n/j/p to also support IEEE 802.11ac modes. The xxx-K286 option (R&S®CMW-KW656) requires the xxx-K254 (R&S®CMW-KW650) option. Therefore, all general parameters of the xxx-K254 (R&S®CMW-KW650) option such as frame block configuration or PSDU parameters are also valid for the xxx-K286 (R&S®CMW-KW656) option, unless stated otherwise below.	
IEEE 802.11ac digital standard		in line with: IEEE P802.11ac/D1.2
General settings		
Bandwidth	depending on used Rohde & Schwarz instrument	20 MHz, 40 MHz, 80 MHz, 160 MHz
Sample rate	standard	20 Msample/s, 40 Msample/s, 80 Msample/s, 160 Msample/s
	range	depending on Rohde & Schwarz instrument
Baseband filter		spectral mask in line with IEEE P802.11ac/D1.2, chapter 22.3.18, for very high throughput (VHT) modes
Transmit antenna setup	number of antennas	1 to 8
Frame block configuration		
Transmit mode	physical mode = MIXED MODE	VHT-20 MHz, VHT-40 MHz, VHT-80 MHz, VHT-80+80 MHz, VHT-160 MHz
Settings for OFDM		
PSDU parameters	multi-user MIMO	With a minimum of 2 spatial streams configured, multi-user MIMO can be activated. N STS and group ID can be set individually for each of the 4 available users.
	MAC header	activating and configuring the MAC header with the following parameters: frame control, duration/ID, addresses 1 to 4, sequence control For very high throughput (VHT), QoS Control and VHT Control are also configurable.
	number of spatial streams	1 to 8
	number of space-time streams	1 to 8
	PSDU modulation/space stream	BPSK, QPSK, 16QAM, 64QAM, 256QAM
	data length	0 byte to 65495 byte for VHT frames
	raw data rate	up to 6933.33 Mbps

IEEE 802.11ax (xxx-K442 or R&S®CMW-KW657 option)

One xxx-K254 (R&S®CMW-KW650) option must be installed.

General parameters	This option enhances the xxx-K254 (R&S®CMW-KW657) option (IEEE 802.11a/b/g/n/j/p) to support IEEE 802.11ax modes. The xxx-K442 (R&S®CMW-KW657) option requires the xxx-K254 (R&S®CMW-KW650) option (IEEE 802.11a/b/g/n/j/p). Therefore, all general parameters of the xxx-K254 (R&S®CMW-KW650) option such as frame block configuration or PSDU parameters are also valid for the xxx-K442 (R&S®CMW-KW657) option, unless stated otherwise below.	
IEEE 802.11ax digital standard		in line with IEEE P802.11ax/D1.0
General settings		
Bandwidth	depending on used Rohde & Schwarz instrument	20 MHz, 40 MHz, 80 MHz, 160 MHz
Sample rate	standard	20 Msample/s, 40 Msample/s, 80 Msample/s, 160 Msample/s
	range	depends on the respective Rohde & Schwarz instrument
Baseband filter		spectral mask in line with IEEE P802.11ax/D1.0, chapter 28.3.18, for high efficienty (HE) modes
Transmit antenna setup	number of antennas	1 to 8
Frame block configuration		
Transmit mode	physical mode = MIXED MODE	HE-20 MHz, HE-40 MHz, HE-80 MHz, HE-80+80 MHz, HE-160 MHz
Settings for OFDM/OFDMA		
PPDU parameters	number of spatial streams	1 to 8
	number of space-time streams	1 to 8
	link direction	downlink, uplink
	PPDU format	HE SU, HE MU, HE trigger based, HE extended range SU
	guard	0.8 µs, 1.6 µs, 3.2 µs
	HE-LTF symbol duration	3.2 µs, 6.4 µs, 12.8 µs
	max. PE duration	0 µs, 8 µs, 16 µs
	SIG-B DCM	on/off
	SIG-B MCS	0 to 5
	beam change	on/off
	BSS color	0 to 63
	TXOP duration	0 to 127
	spatial reuse	0 to 15
	doppler	on/off
	RU allocation selection	00000000 to 11011yyy
	number of MU-MIMO users	1 to 8
	maximum total number of users	138
	STA ID	0 to 2074
	RU type	26-tone, 52-tone, 106-tone, 242-tone, 484-tone, 996-tone, 2 × 996-tone
	TxBF	on/off
	MCS	0 to 11
	PPDU modulation	BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
	channel coding	off, BCC, LDPC
	code rate	1/2, 2/3, 3/4, 5/6
	DCM	on/off
	number of MPDUs per A-MPDU	1 to 64
	data length of each MPDU	0 byte to 16384 bytes
	raw data rate	up to 9607.8 Mbps

IEEE 802.11ad (R&S®SMW-K441 option)

IEEE 802.11ad digital standard		in line with IEEE 802.11ad-2012
General settings		
Frame type		data
DMG phy mode		control, single carrier
Generate waveform file	filtering of data generated in ARB mode and saving it as waveform file	
Marker modes		restart, frame, frame active part, frame inactive part, pulse, pattern, on/off ratio
Triggering		see data sheet of R&S®SMW, "I/Q baseband generator" section.
Chip/sample rate	standard	1.76 GHz for control, single carrier
	range	400 Hz to 3 GHz
Baseband filter		spectral mask in line with: IEEE 802.11ad-2012, chapter 21.3.2
Clipping		vector or scalar clipping, applied before filtering
Sequence length (frames)		1 frame to 20000 frames (depends on frame duration)
Idle time	time between two successive frames (PPDUs)	
	range	0 s to 10 ms with 0.1 µs resolution
PPDU parameters	MAC header	activating and configuring the MAC header with the following parameters: frame control, duration/ID, addresses 1 to 4, sequence control, QoS control
	frame check sequence	activating or deactivating a 32 bit (4 byte) checksum for protecting MAC header and user data (frame body)
	preamble/header active	the preamble/header can be turned on or off
Settings for PHY mode single carrier		
MCS	Modulation and coding scheme	1 to 12
Modulation		π/2-BPSK, π/2-QPSK, π/2-16QAM
Channel coding		LDPC
Code rate		1/2, 3/4, 5/8, 13/16
Scrambler		on/off
Scrambler init		00 to 7F
Data length		1 to 262107 bytes
Training length		0 to 16
Turnaround		on/off
Last RSSI		–68 dBm to –42 dBm
Settings for PHY mode control		
MCS	Modulation and coding scheme	0
Modulation		DBPSK
Channel coding		LDPC
Code rate		3/4
Scrambler		on/off
Scrambler init		00 to 7F (hex)
Data length		14 to 987 bytes
Training length		0 to 16
Turnaround		on/off

IEEE 802.16 WiMAX™ including 802.16e (xxx-K249 option)

IEEE 802.16 digital standard	in line with IEEE 802.16 Rev. 2	
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 Msample memory is selected and an oversampling of 2 and a frame duration of 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: 1 bit to 64 bit), PNx and data list
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 and user with index 0 to 113
Number of zones/segments		8
Space-time coding modes		off, two antennas: matrix A or B, four antennas: matrix A, B or C, collaborative spatial multiplexing, CSTD
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 and interleaver can be switched on/off independently
Repetition coding		0, 2, 4, 6
Subcarrier permutation		FUSC, PUSC, AMC2×3, sounding
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, SUB-DL-UL-MAP, HARQ, ranging, fast feedback, data
Data		All0, All1, pattern (length: 1 bit to 64 bit), PNx and data list

NFC A/B/F (xxx-K289 option)

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NFC A/B/F digital standard	If the parameter technology is set to “NFC-A”, “NFC-B” or “NFC-F”, the signal generation is in line with the NFC Forum™ specifications “NFCForum-TS-DigitalProtocol-1.0” and “NFCForum-TS-Analog-1.0”. If the parameter technology is set to “EMV Type A” or “EMV Type B”, the signal generation is in line with the specification “Book D: Contactless Communication Protocol”, Version 2.2 from EMVCo, LLC.	
General settings		
Clipping	setting of clipping value relative to highest peak in percent; clipping reduces the crest factor	
	clipping level	1 % to 100 %
Technology		NFC-A
		NFC-B
		NFC-F
		EMV Type A
		EMV Type B
Divisor	for NFC-F only	2 (212 kbps)
		4 (424 kbps)
Transmission mode		for technology “NFC-A”, “NFC-B” or “NFC-F”: poll, listen for technology “EMV Type A” or “EMV Type B”: “PCD to PICC”, “PICC to PCD”
Modulation settings		
Bit rate	depends on the technology and divisor	NFC-A and EMV Type A: 105.938 kbit/s
		NFC-B and EMV Type B: 105.938 kbit/s
		NFC-F with divisor 2: 211.875 kbit/s
		NFC-F with divisor 4: 423.750 kbit/s
Baseband output	only for transmission modes “listen” and “PICC to PCD”	on/off
Slope		on/off
RLC curve	only for activated “Slope”	on/off
T_{fall} 90 % to 5 % (t1–t2)	only for activated “slope”, only for NFC-A poll and EMV Type A PCD to PICC	0 s to 2.70 µs
T_{rise} 5 % to 90 % (t3)	only for activated “slope”, only for NFC-A poll and EMV Type A PCD to PICC	0 s to 1.30 µs
T_{low} (t2)	only for activated “slope”, only for NFC-A poll and EMV Type A PCD to PICC	0.40 µs to 3.10 µs
T_{fall} 90 % to 10 %	only for activated “slope”, not for NFC-A poll or EMV Type A PCD to PICC	range depends on the technology, the divisor and the transmission mode
T_{rise} 10 % to 90%	only for activated “slope”, not for NFC-A poll or EMV Type A PCD to PICC	range depends on the technology, the divisor and the transmission mode
Overshoot rising slope (VOU)	only for activated “RLC curve”	0 % to 42 %
Undershoot falling slope (VOU)	only for activated “RLC curve”	0 % to 42 %
Modulation depth	only for NFC-A poll and EMV Type A PCD to PICC	0 % to 100 %
Modulation index	not for NFC-A poll or EMV Type A PCD to PICC, not for activated “baseband output”	0 % to 100 %
Inverse modulation	only for NFC-B listen and NFC-F listen and EMV Type B PICC to PCD	on/off
Sample rate		range depends on the technology, the divisor and the transmission mode

Sequence configuration			
Number of command blocks		1 to 100	
Command types	for NFC-A Poll	ALL_REQ SENS_REQ SDD_REQ SEL_REQ SLP_REQ RID RALL READ_Type1 WRITE-E WRITE-NE RSEG READ8 WRITE-E8	WRITE-NE8 READ_Type2 WRITE_Type2 SECTOR_SELECT RATS DATA_Type4A ATR_REQ PSL_REQ DEP_REQ DSL_REQ RLS_REQ IDLE BLANK
	for NFC-B Poll	ALLB_REQ SENSB_REQ SLOT_MARKER SLPB_REQ	ATTRIB DATA_Type4B IDLE BLANK
	for NFC-F Poll	SENSF_REQ CHECK UPDATE ATR_REQ PSL_REQ	DEP_REQ DSL_REQ RLS_REQ IDLE BLANK
	for NFC-A Listen	SENS_RES SDD_RES SEL_RES RID RALL READ_Type1 WRITE-E WRITE-NE RSEG READ8 WRITE-E8 WRITE-NE8	READ_Type2 ACK NACK ATS DATA_Type4A ATR_RES PSL_RES DEP_RES DSL_RES RLS_RES IDLE BLANK
	for NFC-B Listen	SENSB_RES SLPB_RES ATTRIB	DATA_Type4B IDLE BLANK
	for NFC-F Listen	SENSF_RES CHECK UPDATE ATR_RES PSL_RES	DEP_RES DSL_RES RLS_RES IDLE BLANK
	for EMV Type A PCD to PICC	WUPA REQA ANTICOLLISION SELECT HLTA	RATS DATA_Type_A IDLE BLANK
	for EMV Type B PCD to PICC	WUPB REQB HLTB ATTRIB	DATA_Type_B IDLE BLANK
	for EMV Type A PICC to PCD	ATQA ANTICOLLISION SAK ATS	DATA_Type_A IDLE BLANK
	for EMV Type B PICC to PCD	ATQB HLTB ATTRIB	DATA_Type_B IDLE BLANK
Repetition		0 to 9999	
Power offset		–20 dB to +20 dB	
Duration	for command types “IDLE” and “BLANK”	0 µs to 1 000 000 µs	
	for all other command types	determined automatically	
Frame configuration		depends on the command type	

Bluetooth® EDR/Low Energy (xxx-K260 or R&S®CMW-KW610 option)

Basic rate + EDR		
Bluetooth® version		version 4.2
Transport modes		ACL + EDR, SCO, eSCO + EDR
Supported packet types		ID, NULL, POLL, FHS, DM1, DM3, DM5, DH1, DH3, DH5, AUX1, 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5, HV1, HV2, HV3, DV, EV3, EV4, EV5, 2-EV3, 2-EV5, 3-EV3, 3-EV5; in all data mode or with packet editor
Sequence length		depending on available ARB memory
Data sources (in all data mode)		PRBS 7 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
Data whitening		supported
Packet editor features	access code	calculated from entered device address
	header bits	can be set individually, SEQN bit toggles with each generated packet
	HEC	calculated automatically
	payload data sources	PRBS 7 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
	payload CRC	calculated automatically
Power ramping	ramp function	$\cos^2$, linear
	ramp time	1 symbol to 32 symbol
	rise offset, fall offset	–32 symbol to +32 symbol
Modulation	defaults	preset in line with Bluetooth® standard 2FSK, 160 kHz deviation, 1 MHz symbol rate, π/4 DQPSK/8DPSK, 1 MHz symbol rate for EDR packets
	2FSK frequency deviation	100 kHz to 200 kHz
	2FSK symbol rate	400 Hz to 15 MHz
Filter	filter function	Gaussian, root cosine (others available)
	B × T (for Gaussian filter)	0.15 to 2.5
Dirty transmitter test	frequency drift rate	1.6 kHz
	start phase	0° to 359°
	frequency drift deviation	–100 kHz to +100 kHz
	carrier frequency offset	–150 kHz to +150 kHz
	symbol timing error	–150 ppm to +150 ppm
	modulation index	0.28 to 0.35
Bluetooth® low energy		
Bluetooth® low energy version		version 4.2
Channel types		advertising, data
Supported packet types		ADV_IND, ADV_DIRECT_IND, ADV_NONCONN_IND, ADV_DISCOVER_IND, SCAN_REQ, SCAN_RSP, CONNECT_REQ, DATA, CONTROL_DATA, TEST PACKET
Sequence length		depending on available ARB memory
Power ramping	ramp function	$\cos^2$, linear
	ramp time	1 symbol to 32 symbol
	rise offset, fall offset	–32 symbol to +32 symbol
Modulation	default settings	preset in line with Bluetooth® LE standard 2FSK, 250 kHz deviation, 1 MHz symbol rate
	2FSK frequency deviation	200 kHz to 300 kHz
	2FSK symbol rate	400 Hz to 15 MHz
Filter	filter function	Gaussian (others available)
	B × T (for Gaussian filter)	0.15 to 2.5
Dirty transmitter test	frequency drift rate	0 Hz or 625 Hz
	start phase	0° to 359°
	frequency drift deviation	–100 kHz to +100 kHz
	carrier frequency offset	–150 kHz to +150 kHz
	symbol timing error	–150 ppm to +150 ppm
	modulation index	0.45 to 0.55

Settings for advertising channel		
Advertising event interval		0.9 ms to 6.4 s
Advertising event delay		0 ms to 10 ms
Scan window		2.5 ms to 10.24 s
Scan interval		2.5 ms to 6.4 s
Data whitening		supported
Packet editor features	advertiser's address type	public, private
	initiator's address type	public, private
	scanner's address type	public, private
	advertiser's device address	user-definable
	initiator's device address	user-definable
	scanner's device address	user-definable
	access address	predefined in line with specification, user-definable for CONNECT_REQ packets
	payload data sources	PRBS 9 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
	payload CRC	calculated automatically
	CONNECT_REQ parameters	
	transmit window size	1.25 ms to 6.25 ms
	transmit window offset	0 ms to 7.5 ms
	connection event interval	7.5 ms to 6.4 s
	slave latency	0 to 1000 events
	LL connection timeout	100 ms to 32 s
	hop length	5 to 16
	sleep clock accuracy	20 ppm to 500 ppm
Settings for data channel		
Bluetooth® controller role		master, slave
Number of TX packets per event		1 to 3
Connection event interval		7.5 ms to 6.4 s
LL connection mode		unencrypted, encrypted
Data whitening		supported
Packet editor features	access address	user-definable
	NESN start value	0 or 1
	SN start value	0 or 1
	payload data sources	PRBS 9 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
	payload CRC	calculated automatically
	CONNECTION_UPDATE_REQ parameters	
	transmit window size	1.25 ms to 6.25 ms
	transmit window offset	0 ms to 7.5 ms
	connection event interval	7.5 ms to 4 s
	slave latency	0 to 1000 events
	LL connection timeout	100 ms to 32 s
	connection event count	0 or 1 events
Settings for test packets		
Packet interval		625 µs to 12.5 ms in steps of 625 µs
Payload type		PRBS 9, PRBS 15, pattern 11110000, 10101010, 11111111, 00000000, 00001111, 01010101
Payload length		37 to 255 bytes
Payload CRC		calculated automatically

Bluetooth® 5.x (xxx-K417)

Bluetooth® Low Energy		
Bluetooth® Low Energy version		version 5.1
Channel types		advertising, data
Supported packet types		ADV_IND, ADV_DIRECT_IND, ADV_NONCONN_IND, ADV_SCAN_IND, SCAN_REQ, SCAN_RSP, CONNECT_IND, ADV_EXT_IND, AUX_ADV_IND, AUX_CHAIN_IND, AUX_SYNC_IND, AUX_SCAN_REQ, AUX_SCAN_RSP, AUX_CONNECT_REQ, AUX_CONNECT_RSP, DATA, CONTROL_DATA, TEST PACKET
Packet format		LE 1M, LE 2M, LE Coded
Sequence length		depending on available ARB memory
Power ramping	ramp function	$\cos^2$, linear
	ramp time	1 symbol to 32 symbol
	rise offset, fall offset	–32 symbol to +32 symbol
Modulation	default settings	preset in line with Bluetooth® LE standard; 2FSK, 250 kHz deviation, 1 MHz symbol rate for LE 1M and LE Coded modes; 2FSK, 500 kHz deviation, 2 MHz symbol rate for LE 2M mode
	2FSK frequency deviation	200 kHz to 300 kHz for LE 1M and LE Coded modes; 400 kHz to 600 kHz for LE 2M mode
	2FSK symbol rate	400 Hz to 15 MHz
Filter	filter function	Gaussian (others available)
	B × T (for Gaussian filter)	0.15 to 2.5
Dirty transmitter test	frequency drift rate	0 Hz or 1250 Hz
	start phase	0° to 359°
	frequency drift deviation	–100 kHz to +100 kHz
	carrier frequency offset	–150 kHz to +150 kHz
	symbol timing error	–150 ppm to +150 ppm
	modulation index	0.45 to 0.55
	modulation index modes	standard, stable
Settings for advertising channel		
Corrupted CRC every 2nd packet		on/off
Advertising event interval		0.9 ms to 6.4 s
Advertising event delay		0 ms to 10 ms
Data whitening		supported
Packet editor features	advertiser's address type	public, random
	initiator's address type	public, random
	scanner's address type	public, random
	advertiser's device address	user-definable
	initiator's device address	user-definable
	scanner's device address	user-definable
	access address	predefined in line with specification, user-definable for CONNECT_IND packets
	payload data sources	PRBS 9 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
	payload CRC	calculated automatically
	CONNECT_IND parameters	
	transmit window size	1.25 ms to 5 ms
	transmit window offset	0 ms to 7.5 ms
	connection event interval	7.5 ms to 6.4 s
	slave latency	0 to 5 events
	LL connection timeout	100 ms to 32 s
	hop length	5 to 16
	sleep clock accuracy	0 ppm to 500 ppm

Settings for data channel		
Bluetooth® controller role		master, slave
Corrupted CRC every 2nd packet		on/off
Number of TX packets per event		1 to 3
Connection event interval		7.5 ms to 6.4 s
LL connection mode		unencrypted, encrypted
Data whitening		supported
Symbols per a bit		S=2, S=8 for LE Coded mode
Packet editor features	access address	user-definable
	NESN start value	0 or 1
	SN start value	0 or 1
	payload data sources	PRBS 9 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
	payload CRC	calculated automatically
	LL_CONNECTION_UPDATE_IND parameters	
	transmit window size	1.25 ms to 6.25 ms
	transmit window offset	0 ms to 7.5 ms
	connection event interval	7.5 ms to 6.4 s
	slave latency	0 to 5 events
	LL connection timeout	100 ms to 32 s
	connection instant	0 or 1 events
Settings for test packets		
Packet interval		625 µs to 12.5 ms in steps of 625 µs for LE 1M and LE 2M modes; 1.875 ms to 15 ms in steps of 625 µs for LE Coded mode
Symbols per a bit		S=2, S=8 for LE Coded mode
Payload type		PRBS 9, PRBS 15, pattern 11110000, 10101010, 11111111, 00000000, 00001111, 01010101
Payload length		37 bytes to 255 bytes
Payload CRC		calculated automatically

LoRa® (xxx-K431 or R&S®CMW-KW683)

LoRaWAN™ version		version 1.1
General settings		
Bandwidth		7.8125 kHz, 10.4167 kHz, 15.625 kHz, 20.8333 kHz, 31.25 kHz, 41.667 kHz, 62.5 kHz, 125 kHz, 250 kHz, 500 kHz
Idle interval		0 to 1 000 000 µs
Sequence length		depending on available ARB memory
Oversampling		1 to 32
Sample rate variation		400 Hz to 20 MHz
Modulation, coding, header and payload parameters		
Conding rate		0, 1, 2, 3, 4
Spreading factor		6 to 12
Encoder state		on/off
Interleaver state		on/off
Payload data length		1 byte to 255 bytes
Payload data source		PRBS 9 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
Payload CRC		on/off
Payload reduced coding mode		on/off
Sync mode		public, private
Unmodulated preamble length		6 to 8
Header state		on/off
Burst mode		on/off
Compressed mode		on/off
Reserved bit		on/off
Impairments		
State		on/off
Symbol timing error		–300 ppm to +300 ppm
Frequency offset		–200 kHz to +200 kHz
Frequency drift	state	on/off
	type	linear, sine
	deviation	–200 kHz to +200 kHz
	rate	160 Hz to 1600 Hz

UWB MB-OFDM ECMA-368 (R&S®AFQ-K264 option)

UWB MB-OFDM digital standard		in line with ECMA-368 digital standard, additionally includes extensions from WiMedia MBOA 2nd edition
General settings		
Sequence length	The sequence length can be entered in frames. With default values (including standard mode, a data rate of 200 Mbps and a payload of 2048 byte), the user has 17.93 frames/Msample. Example: If an R&S®SMU200A with 64 Msample memory is selected and the above values are applied, R&S®WinIQSIM2™ can generate 1147 frames.	
Baseband filter	none	
Sample rate	default	528 MHz
	user-defined	1 MHz to 600 MHz
Clipping	setting of clipping value relative to highest peak in percent; clipping reduces the crest factor	
	modes	vector |i + j q| scalar |i|, |q|
	clipping level	1 % to 100 %
Marker		• restart • standard frame start • pulse • pattern • on/off ratio
General UWB settings		
Frame type	determines some MAC header parameters	• data • beacon • control • command • aggregated
Band group	A band group diagram shows an overview and the band group that is selected.	1 to 6
TF code		1 to 10
Hopping sequence	A hopping sequence frequency/time diagram shows an overview, editable for user-defined hopping scenarios.	according to TFC and band group
		user-defined
Transport mode		• standard • burst
Interframe spacing	predefined types	• SIFS • MIFS
	user-defined	0 symbol to 99 symbol
PPDU settings		
Modulation	data rates from 53.3 Mbps to 200 Mbps	OFDM
	data rates from 320 Mbps to 480 Mbps	DCM
Data rate	determines the modulation used	53.3 Mbps, 80 Mbps, 106.7 Mbps, 160 Mbps, 200 Mbps, 320 Mbps, 400 Mbps, 480 Mbps
Data length (payload size)	transport mode	
	standard	0 byte to 4095 byte
	burst	1 byte to 4095 byte
Data source		All0, All1, pattern, PNx and data list
Cover sequence (sync.)		according to TFC
Preamble	standard	according to cover sequence
		user-defined
	burst (If transport mode is burst, the data rate is higher than 200 Mbps and the burst preamble is enabled.)	according to cover sequence
		user-defined
Scrambler	state	on/off
Convolutional encoder	state	on/off
Bit interleaver	state	on/off

MAC header settings		
MAC header	state	on/off
Frame control field	reserved	00 to 11 (bit)
	retry	0, 1 (bit)
	subtype	0000 to 1111 (bit)
	frame type	depending on frame type selection from general UWB settings
	ACK policy	00 to 11 (bit)
	secure	0, 1 (bit)
	protocol version	000 to 111 (bit)
Destination address		0 to FFFF (hex)
Source address		0 to FFFF (hex)
Sequence control	state	on/off
	fragments	start number, increment interval and “more fragments bit” settable
	sequence	start number and increment interval settable
Access info		0 to FFFF (hex)

TETRA Release 2 (xxx-K268 or R&S®CMA-KW668 option)

TETRA Release 2 digital standard		in line with ETSI EN 300 392-2 digital standard (V3.2.1) and TETRA conformance testing specification ETSI EN 300 394-1 (V3.1.1)
General settings		
Link direction	not available in T3 mode	downlink, uplink
Channel type	test channel (NOT logical channel) only in T1 and T4 mode	see “Test modes”
Sequence length	The sequence length can be entered in multiframes and is highly dependent on the settings made. With default values (T1), the user has 14.28 multiframes/Msample. Example: An R&S®SMU200A with 64 Msample can generate 913 multiframes.	
Baseband filter	default	root raised cosine (rolloff factor 0.2)
	others	available
Impulse length		1 to 40
Sample rate		calculated internally as a function of filter and oversampling requirements
Clipping	setting of clipping value relative to highest peak in percent; clipping reduces the crest factor	
	modes	vector |i + j q| scalar |i|, |q|
	clipping level	1 % to 100 %
Marker		• restart • slot start • frame start • multiframe start • hyperframe start • pulse • pattern • on/off ratio
Power ramping	ramp function	$\cos^2$, linear
	ramp time	1 symbol to 16 symbol
	rise offset	–4 symbol to 0 symbol
	fall offset	0 symbol to 4 symbol
Settable slot attenuation		0 dB to 50 dB, 5 different levels simultaneously possible (full level and 4 attenuated levels)
Test modes		
T1	downlink channels	0, 1, 2, 3, 4, 21, 22, 24
	uplink channels	7, 8, 9, 10, 11, 21, 23, 24
T2	TETRA interferer	phase modulation, QAM
T3	CW interferer	
T4	downlink channels	27
	uplink channels	25, 26
User-defined		see “User-defined mode”
Frame configuration		
Frames 1 to 17	slots	configurable with respect to test mode (logical channel, etc.), see “User-defined mode”; different slot levels (off, attenuated, full)
Frame 18	slots	configurable with respect to test mode (logical channel, etc.), see “User-defined mode”; different slot levels (off, attenuated, full)

User-defined mode		
In user-defined mode, the slots can be configured without restrictions. In all other test modes, the settings are limited by the test mode specification.		
Modulation type		phase modulation, QAM
Downlink burst type	only with phase modulation	continuous, discontinuous
Slot settings		
Slot level	full	not attenuated
	attenuated	1 of 4 attenuation levels
	off	inactive
Slot attenuation	A1 to A4	1 of 4 attenuation levels
Logical channel type (burst types are controlled by the logical channels)	downlink, phase modulation available burst types: • normal continuous downlink • synchronization continuous downlink • normal discontinuous downlink • synchronization discontinuous downlink	TCH/7,2 (π/4-DQPSK) TCH/4,8 (π/4-DQPSK) TCH/2,4 (π/4-DQPSK) TCH/F (π/4-DQPSK) TCH/H (π/4-DQPSK) STCH+TCH (π/4-DQPSK) STCH+STCH (π/4-DQPSK) SCH/F(π/4-DQPSK) TCH-P8/10,8/F(π/8-DQPSK) SCH-P8/F(π/8-DQPSK) SCH/HD | SCH/HD (π/4-DQPSK) BSCH | SCH/HD (π/4-DQPSK) SCH/HD | BNCH (π/4-DQPSK) BSCH | BNCH (π/4-DQPSK) SCH-P8/HD | SCH-P8/HD (π/8-DQPSK)
	uplink, phase modulation available burst types: • normal uplink • control uplink	TCH/7,2 (π/4-DQPSK) TCH/4,8 (π/4-DQPSK) TCH/2,4 (π/4-DQPSK) TCH/F (π/4-DQPSK) TCH/H (π/4-DQPSK) STCH+TCH (π/4-DQPSK) STCH+STCH (π/4-DQPSK) SCH/F(π/4-DQPSK) TCH-P8/10,8/F(π/8-DQPSK) SCH-P8/F(π/8-DQPSK) SCH/HU | SCH/HU (π/4-DQPSK) SCH-P8/HU | SCH-P8/HU (π/8-DQPSK) SCH/HU (π/4-DQPSK) | SCH-P8/HU (π/8-DQPSK) SCH-P8/HU (π/8-DQPSK) | SCH/HU (π/4-DQPSK)
	downlink, QAM available burst types: • normal downlink	SCH-Q/D-4H (4QAM, high protection) SCH-Q/D-16H SCH-Q/D-64H SCH-Q/D-64M (64QAM, mid-protection) SCH-Q/D-16U (16QAM, unprotected) SCH-Q/D-64U BNCH-Q/4H BNCH-Q/16H BNCH-Q/64H BNCH-Q/64M BNCH-Q/16U BNCH-Q/64U
	uplink, QAM available burst types: • normal uplink • control uplink • random access	SCH-Q/U-4H SCH-Q/U-16H SCH-Q/U-64H SCH-Q/U-64M SCH-Q/U-16U SCH-Q/U-64U SCH-Q/HU-4H | SCH-Q/HU-4H SCH-Q/HU-16H | SCH-Q/HU-16H SCH-Q/HU-64H | SCH-Q/HU-64H SCH-Q/HU-64M | SCH-Q/HU-64M SCH-Q/HU-16U | SCH-Q/HU-16U SCH-Q/HU-64U | SCH-Q/HU-64U SCH-Q/RA | SCH-Q/RA

Data sources (in all data modes)		PRBS 7 to PRBS 23, All0, All1, pattern (length: 1 bit to 64 bit) and data list
Scrambling		on/off
Training sequence TSC	only in phase modulation	default, user-defined
AACH-Q configuration – AACH-Q mode	only in QAM	ACCESS-ASSIGN PDU, reserved element
ACCESS-ASSIGN PDU	only in downlink	header: 2 bit
		field 1: 6 bit
		field 2: 6 bit
BSCH/BNCH/T settings		
Main carrier frequency calculation	carrier bandwidth	25 kHz, 50 kHz, 100 kHz, 150 kHz, depending on modulation type
	main carrier number	0 to 4096
	frequency band	100 MHz to 900 MHz in 100 MHz steps
	offset	0 kHz, –6.25 kHz, 6.25 kHz, 12.5 kHz
	duplex spacing	0 MHz, 1.6 MHz, 4.5 MHz
	downlink/uplink reversal	on/off
Content settings	system code	0 to 7
	sharing mode	• continuous transmission • carrier sharing • MCCH sharing • traffic carrier sharing
	TS reserved frames	1, 2, 3, 4, 6, 9, 12, 18
	U-plane DTX	allowed, not allowed
	frame 18 extension	allowed, not allowed
	cell service level	• cell load unknown • low cell load • medium cell load • high cell load
	late entry	supported, not supported
	MS_TXPWR_MAX_CELL	15 dBm to 45 dBm in 5 dBm steps
	ACCES_PARAMETER	–23 dBm to –53 dBm in 2 dBm steps
	Tx_On	reception on, transmission on
	Tx_Burst_Type	normal uplink burst, control uplink burst
	T1_T4_Burst_Type	most of the channels mentioned under “Logical channel type”
	loopback	on/off
	error correction	on/off
Neighbor cell broadcast	D-NWRK-BROADCAST broadcast	supported, not supported
	D-NWRK-BROADCAST enquiry	supported, not supported
Scrambling	base color code	1 to 63
	mobile country code	0 to 1023
	mobile network code	0 to 16383

DVB-T/DVB-H (xxx-K252 or R&S®CMW-KW630 option)

DVB-T/DVB-H digital standard		in line with ETSI EN 300 744 v1.5.1
General settings		
Hierarchy mode		non-hierarchical
Sequence length	The sequence length can be entered in superframes. 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®SMU200A with 64 Msample 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” section
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 %
Generation of waveform file	filtering of data generated in ARB mode and saving it as a 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, PN 23, All0, All1
	transport stream	transport stream file (.GTS, .TS, .TRP)
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 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		
Superframe 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

DVB-S2/DVB-S2X (xxx-K416 option)

DVB-S2/DVB-S2X digital standard		in line with ETSI EN 302 307-1 v. 1.4.1 and ETSI EN 302 307-2 v. 1.1.1
General settings		
Number of frames		minimum: 1; maximum: depending on baseband generator memory
VL-SNR mode		on/off
Baseband filter	standard	root cosine
	rolloff range	low, high
	rolloff factor	0.05, 0.1, 0.15, 0.2, 0.25, 0.35
Symbol rate		minimum: 100 sps; maximum: up to 600 Msps, depending on baseband generator bandwidth
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 • frame start • pulse • pattern • on/off ratio
Signal path parameters		
Stream type		transport, GP, GC, GSE-HEM
Input data		All0, All1, pattern, PNx, data list and data from file (see below)
	transport stream	transport stream file (.GTS, .TS, .TRP)
	GSE-HEM	GSE file
BB scrambler	state	on/off
Outer coder	state	on/off
Inner coder	state	on/off
Code type		normal, medium, short
MODCOD	for DVB-S2	QPSK 1/4, QPSK 1/3, QPSK 2/5, QPSK 1/2, QPSK 3/5, QPSK 2/3, QPSK 3/4, QPSK 4/5, QPSK 5/6, QPSK 8/9, QPSK 9/10, 8PSK 3/5, 8PSK 2/3, 8PSK 3/4, 8PSK 5/6, 8PSK 8/9, 8PSK 9/10, 16APSK 2/3, 16APSK 3/4, 16APSK 4/5, 16APSK 5/6, 16APSK 8/9, 16APSK 9/10, 32APSK 3/4, 32APSK 4/5, 32APSK 5/6, 32APSK 8/9, 32APSK 9/10
	for DVB-S2X	QPSK 13/45, QPSK 9/20, QPSK 11/20, 8APSK 5/9-L, 8APSK 26/45-L, 8PSK 23/36, 8PSK 25/36, 8PSK 13/18, 16APSK 1/2-L, 16APSK 8/15-L, 16APSK 5/9-L, 16APSK 26/45, 16APSK 3/5, 16APSK 3/5-L, 16APSK 28/45, 16APSK 23/36, 16APSK 2/3-L, 16APSK 25/36, 16APSK 13/18, 16APSK 7/9, 16APSK 77/90, 32APSK 2/3-L, 32APSK 32/45, 32APSK 11/15, 32APSK 7/9, 64APSK 32/45-L, 64APSK 11/15, 64APSK 7/9, 64APSK 4/5, 64APSK 5/6, 128APSK 3/4, 128APSK 7/9, 256APSK 29/45-L, 256APSK 2/3-L, 256APSK 31/45-L, 256APSK 32/45, 256APSK 11/15-L, 256APSK 3/4, QPSK 11/45, QPSK 4/15, QPSK 14/45, QPSK 7/15, QPSK 8/15, QPSK 32/45, 8PSK 7/15, 8PSK 8/15, 8PSK 26/45, 8PSK 32/45, 16APSK 7/15, 16APSK 8/15, 16APSK 26/45, 16APSK 3/5, 16APSK 32/45, 32APSK 2/3, 32APSK 32/45

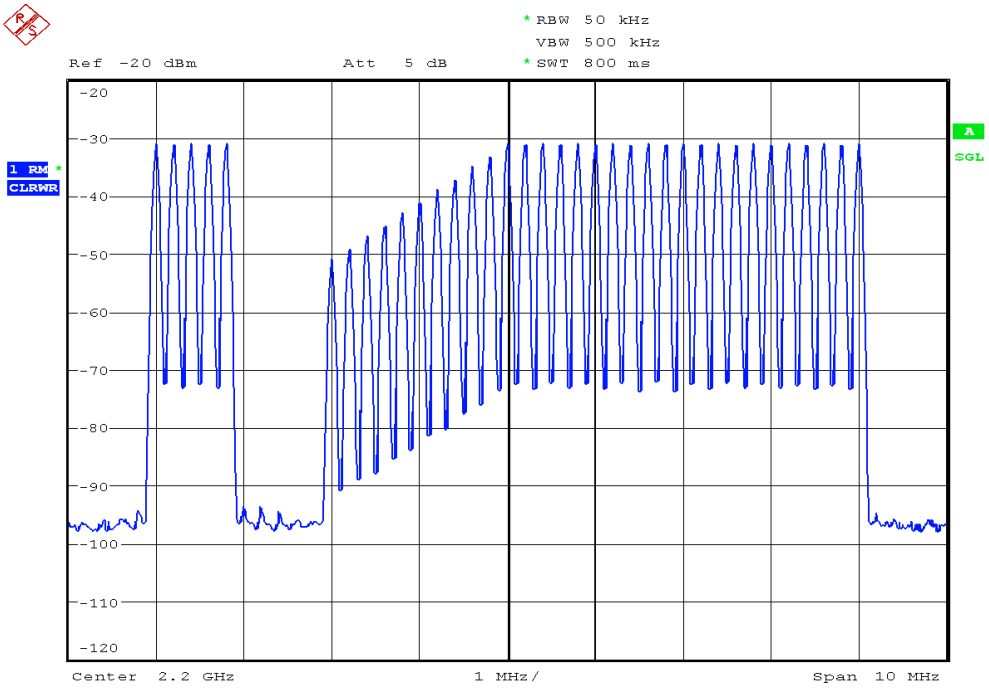
Pilot state		on/off
PL scrambler		on/off
Scrambling sequence		0 to 6

DAB/T-DMB (xxx-K253 or R&S®CMW-KW632 option)

DAB/T-DMB digital standard		in line with ETSI EN 300 401 v.1.3.3 (with restrictions, see below)
Ensemble transport interface		in line with ETSI ETS 300 799 (with restrictions, see below)
General settings		
Source data	FIC and CIFs, each filled with	All0, All1, PN 15, PN 23
	ETI frames, number of ETI frames to process	ETI file (.ETI) This number depends on the number and size of streams contained in the ETI file and on the free space on the hard disk.
Transport mode	for sources other than ETI file	I, II, III, IV
	ETI file	specified by ETI frames
Baseband filter	standard	cosine, α = 0.1
	other	see “I/Q baseband generator” section
Marker		• restart • frame start • pulse • pattern • on/off ratio
Signal path parameters		
PN scrambler state	affects all channels	on/off
Convolutional coder state	affects all channels; if off, missing bits are taken from source	on/off
Time interleaver state	affects all channels	on/off
DAB-related constraints		
Max. number of streams/channels		FIC + 15 streams
ETI-related constraints		
ETI type		ETI (NI, G.703)
Stream configuration	must not change within the frames	• multiplex configuration • number of streams • size of streams • protection of streams
Frame length		24 ms
Sample rate		48 kHz

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-selectable, maximum spacing depending on number of carriers and used Rohde & Schwarz instrument	1 Hz to 160 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		• unchanged • restart • pulse • pattern • ratio



Example spectrum of multicarrier CW signal

Noise

Additive white Gaussian noise (AWGN, xxx-K262 or R&S®CMW-KW010 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 (depending on Rohde & Schwarz instrument)	1 kHz to 2.4 GHz
	resolution	1 kHz

General data

Supported operating systems

Administrator rights are necessary for installation.

Windows 10		version 1607 “Anniversary Edition” 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™

Interfaces		Ethernet, USB, IEC/IEEE bus
VISA run-time library	required, depending on the manufacturer of the instrument to be controlled	
	National Instruments	v3.4 or higher
	Agilent Technologies/ Keysight Technologies	v14.0 or higher
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 R&S®SMW-B10/-B9, R&S®SGT-K510, R&S®SMU-B9/-B10/-B11, R&S®SMJ-B9/-B10/-B11/-B50/-B51, R&S®AMU-B10/-B11/-B12, R&S®AFQ-B10/-B11/-B12 device options)	1161.8473.02
Digital standards and options for the R&S®AFQ100A		
GSM/EDGE	R&S®AFQ-K240	1401.6302.02
EDGE Evolution	R&S®AFQ-K241	1401.6102.02
3GPP FDD	R&S®AFQ-K242	1401.6354.02
3GPP enhanced MS/BS tests incl. HSDPA	R&S®AFQ-K243	1401.6402.02
GPS, 1 Sat	R&S®AFQ-K244	1401.6454.02
3GPP FDD HSUPA	R&S®AFQ-K245	1401.6502.02
CDMA2000®	R&S®AFQ-K246	1401.6554.02
1xEV-DO Rev. A	R&S®AFQ-K247	1401.5958.02
IEEE 802.11 (a/b/g)	R&S®AFQ-K248	1401.6602.02
IEEE 802.16	R&S®AFQ-K249	1401.6654.02
TD-SCDMA	R&S®AFQ-K250	1401.6702.02
TD-SCDMA enhanced BS/MS test	R&S®AFQ-K251	1401.6754.02
DVB-T/DVB-H	R&S®AFQ-K252	1401.5858.02
DAB/T-DMB	R&S®AFQ-K253	1401.6054.02
IEEE 802.11 a/b/g/n/j/p	R&S®AFQ-K254	1401.5806.02
LTE Release 8	R&S®AFQ-K255	1401.5906.02
3GPP FDD HSPA+	R&S®AFQ-K259	1401.5658.02
Bluetooth®	R&S®AFQ-K260	1401.5758.02
Multicarrier CW signal generation	R&S®AFQ-K261	1401.6802.02
AWGN	R&S®AFQ-K262	1401.6854.02
Galileo, 1 Sat	R&S®AFQ-K266	1415.0330.02
TETRA Release 2	R&S®AFQ-K268	1401.6202.02
LTE Release 9	R&S®AFQ-K284	1415.0253.02
LTE Release 10 (LTE-Advanced)	R&S®AFQ-K285	1415.0276.02
IEEE 802.11ac	R&S®AFQ-K286	1415.0299.02
1xEV-DO Rev. B	R&S®AFQ-K287	1415.0353.02
NFC A/B/F	R&S®AFQ-K289	1415.0376.02
GLONASS, 1 Sat	R&S®AFQ-K294	1415.0318.02
BeiDou, 1 Sat	R&S®AFQ-K407	1410.8556.02
LTE Release 11	R&S®AFQ-K412	1410.8604.02
LTE Release 12	R&S®AFQ-K413	1424.1171.02
Cellular IoT Release 13	R&S®AFQ-K415	1424.1271.02
Verizon 5GTF	R&S®AFQ-K418	1424.1213.02
LTE Release 13/14	R&S®AFQ-K419	1424.1236.02
IEEE 802.11ax	R&S®AFQ-K442	1424.1259.02

Designation	Type	Order No.
Digital standards and options for the R&S®AFQ100B		
GSM/EDGE	R&S®AFQ-K240	1401.6302.02
EDGE Evolution	R&S®AFQ-K241	1401.6102.02
3GPP FDD	R&S®AFQ-K242	1401.6354.02
3GPP enhanced MS/BS tests incl. HSDPA	R&S®AFQ-K243	1401.6402.02
GPS, 1 Sat	R&S®AFQ-K244	1401.6454.02
3GPP FDD HSUPA	R&S®AFQ-K245	1401.6502.02
CDMA2000®	R&S®AFQ-K246	1401.6554.02
1xEV-DO Rev. A	R&S®AFQ-K247	1401.5958.02
IEEE 802.11 (a/b/g)	R&S®AFQ-K248	1401.6602.02
IEEE 802.16	R&S®AFQ-K249	1401.6654.02
TD-SCDMA	R&S®AFQ-K250	1401.6702.02
TD-SCDMA enhanced BS/MS test	R&S®AFQ-K251	1401.6754.02
DVB-T/DVB-H	R&S®AFQ-K252	1401.5858.02
DAB/T-DMB	R&S®AFQ-K253	1401.6054.02
IEEE 802.11 a/b/g/n/j/p	R&S®AFQ-K254	1401.5806.02
LTE Release 8	R&S®AFQ-K255	1401.5906.02
3GPP FDD HSPA+	R&S®AFQ-K259	1401.5658.02
Bluetooth® EDR	R&S®AFQ-K260	1401.5758.02
Multicarrier CW signal generation	R&S®AFQ-K261	1401.6802.02
AWGN	R&S®AFQ-K262	1401.6854.02
UWB (ECMA-368)	R&S®AFQ-K264	1410.8504.02
Galileo, 1 Sat	R&S®AFQ-K266	1415.0330.02
TETRA Release 2	R&S®AFQ-K268	1401.6202.02
LTE Release 9	R&S®AFQ-K284	1415.0253.02
LTE Release 10 (LTE-Advanced)	R&S®AFQ-K285	1415.0276.02
IEEE 802.11ac	R&S®AFQ-K286	1415.0299.02
1xEV-DO Rev. B	R&S®AFQ-K287	1415.0353.02
NFC A/B/F	R&S®AFQ-K289	1415.0376.02
GLONASS, 1 Sat	R&S®AFQ-K294	1415.0318.02
BeiDou, 1 Sat	R&S®AFQ-K407	1410.8556.02
LTE Release 11	R&S®AFQ-K412	1410.8604.02
LTE Release 12	R&S®AFQ-K413	1424.1171.02
Cellular IoT Release 13	R&S®AFQ-K415	1424.1271.02
Verizon 5GTF	R&S®AFQ-K418	1424.1213.02
LTE Release 13/14	R&S®AFQ-K419	1424.1236.02
IEEE 802.11ax	R&S®AFQ-K442	1424.1259.02

Designation	Type	Order No.
Digital standards and options for the R&S®SMW200A		
GSM/EDGE	R&S®SMW-K240	1413.4739.02
EDGE Evolution	R&S®SMW-K241	1413.4780.02
3GPP FDD	R&S®SMW-K242	1413.4839.02
GPS, 1 Sat	R&S®SMW-K244	1413.4880.02
CDMA2000®	R&S®SMW-K246	1413.4939.02
1xEV-DO Rev. A	R&S®SMW-K247	1413.4980.02
IEEE 802.16	R&S®SMW-K249	1413.5035.02
TD-SCDMA	R&S®SMW-K250	1413.5087.02
TD-SCDMA enhanced BS/MS tests	R&S®SMW-K251	1413.5135.02
DVB-T/DVB-H	R&S®SMW-K252	1413.6190.02
DAB/T-DMB	R&S®SMW-K253	1413.6248.02
IEEE 802.11 (a/b/g/n/j/p)	R&S®SMW-K254	1413.5187.02
LTE Release 8	R&S®SMW-K255	1413.5235.02
Bluetooth® EDR	R&S®SMW-K260	1413.5287.02
Multicarrier CW signal generation	R&S®SMW-K261	1413.5335.02
AWGN	R&S®SMW-K262	1413.6460.02
Galileo, 1 Sat	R&S®SMW-K266	1413.7015.02
TETRA Release 2	R&S®SMW-K268	1413.5387.02
3GPP FDD HSPA/HSPA+, enhanced BS/MS tests	R&S®SMW-K283	1413.6290.02
LTE Release 9	R&S®SMW-K284	1413.5535.02
LTE Release 10 (LTE-Advanced)	R&S®SMW-K285	1413.5587.02
IEEE 802.11ac	R&S®SMW-K286	1413.5687.02
1xEV-DO Rev. B	R&S®SMW-K287	1413.6560.02
NFC A/B/F	R&S®SMW-K289	1413.6654.02
GLONASS, 1 Sat	R&S®SMW-K294	1413.7067.02
NavIC (IRNSS), 1 Sat	R&S®SMW-K297	1414.6287.02
Modernized GPS, 1 Sat	R&S®SMW-K298	1414.3171.02
OneWeb reference signals	R&S®SMW-K355	1414.3742.02
BeiDou, 1Sat	R&S®SMW-K407	1413.7115.02
LTE Release 11	R&S®SMW-K412	1413.8557.02
LTE Release 12	R&S®SMW-K413	1414.2030.02
OFDM signal generation	R&S®SMW-K414	1414.4961.02
Cellular IoT Release 13	R&S®SMW-K415	1414.2769.02
DVB-S2/DVB-S2X	R&S®SMW-K416	1414.2681.02
Bluetooth® 5.x	R&S®SMW-K417	1414.3371.02
Verizon 5GTF	R&S®SMW-K418	1414.3507.02
LTE Release 13/14/15	R&S®SMW-K419	1414.3588.02
OneWeb user-defined signal generation	R&S®SMW-K430	1414.3820.02
LoRa®	R&S®SMW-K431	1414.6441.02
Modernized BeiDou, 1 Sat	R&S®SMW-K432	1414.6629.02
IEEE 802.11ad	R&S®SMW-K441	1414.1385.02
IEEE 802.11ax	R&S®SMW-K442	1414.3294.02
Cellular IoT Release 14	R&S®SMW-K443	1414.6093.02
5G New Radio	R&S®SMW-K444	1414.5022.02
Cellular IoT Release 15	R&S®SMW-K446	1414.6587.02

Designation	Type	Order No.
Digital standards and options for the R&S®SMCV100B		
GSM/EDGE	R&S®SMCVB-K240	1434.4150.02
EDGE Evolution	R&S®SMCVB-K241	1434.4173.02
3GPP FDD	R&S®SMCVB-K242	1434.4196.02
GPS, 1 Sat	R&S®SMCVB-K244	1434.4215.02
CDMA2000®	R&S®SMCVB-K246	1434.4238.02
1xEV-DO Rev. A	R&S®SMCVB-K247	1434.4250.02
TD-SCDMA	R&S®SMCVB-K250	1434.4273.02
TD-SCDMA enhanced BS/MS test	R&S®SMCVB-K251	1434.4296.02
DVB-T/DVB-H	R&S®SMCVB-K252	1434.4315.02
DAB/T-DMB	R&S®SMCVB-K253	1434.4338.02
IEEE 802.11 a/b/g/n/j/p	R&S®SMCVB-K254	1434.4350.02
LTE Release 8	R&S®SMCVB-K255	1434.4373.02
Bluetooth® EDR	R&S®SMCVB-K260	1434.4396.02
Multicarrier CW signal generation	R&S®SMCVB-K261	1434.4415.02
AWGN	R&S®SMCVB-K262	1434.4438.02
Galileo, 1 Sat	R&S®SMCVB-K266	1434.4450.02
3GPP FDD HSPA/HSPA+, enhanced BS/MS tests	R&S®SMCVB-K283	1434.4473.02
LTE Release 9	R&S®SMCVB-K284	1434.4496.02
LTE Release 10	R&S®SMCVB-K285	1434.4515.02
IEEE 802.11ac	R&S®SMCVB-K286	1434.4538.02
1xEV-DO Rev. B	R&S®SMCVB-K287	1434.4550.02
NFC A/B/F	R&S®SMCVB-K289	1434.4573.02
GLONASS, 1 Sat	R&S®SMCVB-K294	1434.4596.02
NavIC (IRNSS), 1 Sat	R&S®SMCVB-K297	1434.5734.02
Modernized GPS, 1 Sat	R&S®SMCVB-K298	1434.4615.02
BeiDou, 1 Sat	R&S®SMCVB-K407	1434.4638.02
LTE Release 11	R&S®SMCVB-K412	1434.4650.02
LTE Release 12	R&S®SMCVB-K413	1434.4673.02
OFDM signal generation	R&S®SMCVB-K414	1434.4696.02
Cellular IoT Release 13	R&S®SMCVB-K415	1434.4738.02
DVB-S2/DVB-S2X	R&S®SMCVB-K416	1434.4715.02
Bluetooth® 5.x	R&S®SMCVB-K417	1434.4750.02
Verizon 5GTF	R&S®SMCVB-K418	1434.4773.02
LTE Release 13/14/15	R&S®SMCVB-K419	1434.4796.02
LoRa®	R&S®SMCVB-K431	1434.4815.02
Modernized BeiDou, 1 Sat	R&S®SMCVB-K432	1434.5740.02
IEEE 802.11ax	R&S®SMCVB-K442	1434.4838.02
Cellular IoT Release 14	R&S®SMCVB-K443	1434.4850.02
5G New Radio	R&S®SMCVB-K444	1434.4873.02
Cellular IoT Release 15	R&S®SMCVB-K446	1434.5705.02

Designation	Type	Order No.
Digital standards and options for the R&S®SMBV100B		
GSM/EDGE	R&S®SMBVB-K240	1423.8166.02
EDGE Evolution	R&S®SMBVB-K241	1423.8172.02
3GPP FDD	R&S®SMBVB-K242	1423.8189.02
GPS, 1 Sat	R&S®SMBVB-K244	1423.8195.02
CDMA2000®	R&S®SMBVB-K246	1423.8208.02
1xEV-DO Rev. A	R&S®SMBVB-K247	1423.8214.02
TD-SCDMA	R&S®SMBVB-K250	1423.8220.02
TD-SCDMA enhanced BS/MS test	R&S®SMBVB-K251	1423.8237.02
DVB-T/DVB-H	R&S®SMBVB-K252	1423.8243.02
DAB/T-DMB	R&S®SMBVB-K253	1423.8250.02
IEEE 802.11 a/b/g/n/j/p	R&S®SMBVB-K254	1423.8266.02
LTE Release 8	R&S®SMBVB-K255	1423.8272.02
Bluetooth® EDR	R&S®SMBVB-K260	1423.8295.02
Multicarrier CW signal generation	R&S®SMBVB-K261	1423.8308.02
AWGN	R&S®SMBVB-K262	1423.8314.02
Galileo, 1 Sat	R&S®SMBVB-K266	1423.8320.02
3GPP FDD HSPA/HSPA+, enhanced BS/MS tests	R&S®SMBVB-K283	1423.8337.02
LTE Release 9	R&S®SMBVB-K284	1423.8343.02
LTE Release 10	R&S®SMBVB-K285	1423.8350.02
IEEE 802.11ac	R&S®SMBVB-K286	1423.8366.02
1xEV-DO Rev. B	R&S®SMBVB-K287	1423.8372.02
NFC A/B/F	R&S®SMBVB-K289	1423.8389.02
GLONASS, 1 Sat	R&S®SMBVB-K294	1423.8395.02
NavIC (IRNSS), 1 Sat	R&S®SMBVB-K297	1423.8695.02
Modernized GPS, 1 Sat	R&S®SMBVB-K298	1423.8408.02
BeiDou, 1 Sat	R&S®SMBVB-K407	1423.8489.02
LTE Release 11	R&S®SMBVB-K412	1423.8495.02
LTE Release 12	R&S®SMBVB-K413	1423.8508.02
OFDM signal generation	R&S®SMBVB-K414	1423.8595.02
Cellular IoT Release 13	R&S®SMBVB-K415	1423.8514.02
DVB-S2/DVB-S2X	R&S®SMBVB-K416	1423.8520.02
Bluetooth® 5.x	R&S®SMBVB-K417	1423.8537.02
Verizon 5GTF	R&S®SMBVB-K418	1423.8543.02
LTE Release 13/14/15	R&S®SMBVB-K419	1423.8550.02
LoRa®	R&S®SMBVB-K431	1423.8737.02
Modernized BeiDou, 1 Sat	R&S®SMBVB-K432	1423.8837.02
IEEE 802.11ax	R&S®SMBVB-K442	1423.8566.02
Cellullar IoT Release 14	R&S®SMBVB-K443	1423.8643.02
5G New Radio	R&S®SMBVB-K444	1423.8614.02
Cellular IoT Release 15	R&S®SMBVB-K446	1423.8814.02

Designation	Type	Order No.
Digital standards and options for the R&S®SGT100A		
GSM/EDGE	R&S®SGT-K240	1419.5950.02
EDGE Evolution	R&S®SGT-K241	1419.6004.02
3GPP FDD	R&S®SGT-K242	1419.6056.02
GPS, 1 Sat	R&S®SGT-K244	1419.6104.02
CDMA2000®	R&S®SGT-K246	1419.6156.02
1xEV-DO Rev. A	R&S®SGT-K247	1419.6204.02
IEEE 802.16	R&S®SGT-K249	1419.6504.02
TD-SCDMA	R&S®SGT-K250	1419.6556.02
TD-SCDMA enhanced BS/MS test	R&S®SGT-K251	1419.6604.02
DVB-T/DVB-H	R&S®SGT-K252	1419.6656.02
DAB/T-DMB	R&S®SGT-K253	1419.6704.02
IEEE 802.11 (a/b/g/n/j/p)	R&S®SGT-K254	1419.6756.02
LTE Release 8	R&S®SGT-K255	1419.6804.02
Bluetooth® EDR	R&S®SGT-K260	1419.6856.02
Multicarrier CW signal generation	R&S®SGT-K261	1419.6904.03
AWGN	R&S®SGT-K262	1419.6956.02
Galileo, 1 Sat	R&S®SGT-K266	1419.7000.02
3GPP FDD HSPA/HSPA+, enhanced BS/MS tests	R&S®SGT-K283	1419.7100.02
LTE Release 9	R&S®SGT-K284	1419.7152.07
LTE Release 10 (LTE-Advanced)	R&S®SGT-K285	1419.7200.02
IEEE 802.11ac	R&S®SGT-K286	1419.7252.07
1xEV-DO Rev. B	R&S®SGT-K287	1419.7300.02
NFC A/B/F	R&S®SGT-K289	1419.7352.02
GLONASS, 1 Sat	R&S®SGT-K294	1419.7400.02
Modernized GPS, 1 Sat	R&S®SGT-K298	1419.5766.02
LTE Release 11	R&S®SGT-K412	1419.7600.02
LTE Release 12	R&S®SGT-K413	1419.8159.02
OFDM signal generation	R&S®SGT-K414	1419.8188.02
Cellular IoT Release 13	R&S®SGT-K415	1426.3607.02
DVB-S2/DVB-S2X	R&S®SGT-K416	1426.3707.02
Bluetooth® 5.x	R&S®SGT-K417	1426.3759.02
Verizon 5GTF	R&S®SGT-K418	1419.7781.02
LTE Release 13/14/15	R&S®SGT-K419	1426.3859.02
LoRa®	R&S®SGT-K431	1419.7881.02
IEEE 802.11ax	R&S®SGT-K442	1426.3807.02
Cellular IoT Release 14	R&S®SGT-K443	1419.7752.02
5G New Radio	R&S®SGT-K444	1419.5908.02
Cellular IoT Release 15	R&S®SGT-K446	1419.8171.02

Designation	Type	Order No.
Options for the R&S®CMW500 and R&S®CMW100		
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, AWGN	R&S®CMW-KW010	1204.9000.02
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, EDGE Evolution extension of R&S®CMW-KW200	R&S®CMW-KW201	1204.8456.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE NB-IoT	R&S®CMW-KW300	1211.0686.02
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, WCDMA, HSDPA extension of R&S®CMW-KW400	R&S®CMW-KW401	1203.1058.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WCDMA, HSUPA extension of R&S®CMW-KW401	R&S®CMW-KW402	1203.1106.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WCDMA, HSPA+ extension of R&S®CMW-KW401 and/or R&S®CMW-KW402	R&S®CMW-KW403	1203.9059.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE	R&S®CMW-KW500	1203.5553.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE R10 extension of R&S®CMW-KW500	R&S®CMW-KW502	1208.5780.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ Waveform, LTE R12 extension of R&S®CMW-KW500	R&S®CMW-KW504	1211.1082.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE R13 LAA extension of R&S®CMW-KW500	R&S®CMW-KW514	1211.2743.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE R14 C-V2X extension of R&S®CMW-KW500	R&S®CMW-KW570	1211.3033.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE MTC	R&S®CMW-KW590	1211.0705.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, 5G NR	R&S®CMW-KW6000	1211.2914.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Bluetooth®	R&S®CMW-KW610	1203.6408.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GPS	R&S®CMW-KW620	1203.5953.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GLONASS	R&S®CMW-KW621	1207.8305.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Galileo	R&S®CMW-KW622	1207.8357.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, BeiDou	R&S®CMW-KW623	1208.8280.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, DVB	R&S®CMW-KW630	1203.6050.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, DAB	R&S®CMW-KW632	1208.8280.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11a/b/g/n/j/p	R&S®CMW-KW650	1203.1258.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11ac	R&S®CMW-KW656	1207.9001.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11ax	R&S®CMW-KW657	1211.0805.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Low Rate WAN (LoRaWAN™)	R&S®CMW-KW683	1211.4081.02

Designation	Type	Order No.
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, TD-SCDMA enhancements, extension of R&S®CMW-KW750	R&S®CMW-KW751	1203.1458.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, CDMA2000®	R&S®CMW-KW800	1203.1506.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, 1xEV-DO	R&S®CMW-KW880	1203.1558.02
Options for the R&S®CMW290		
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, AWGN	R&S®CMW-KW010	1204.9000.02
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, EDGE evolution extension of R&S®CMW-KW200	R&S®CMW-KW201	1204.8456.02
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, WCDMA, HSDPA extension of R&S®CMW-KW400	R&S®CMW-KW401	1203.1058.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WCDMA, HSUPA extension of R&S®CMW-KW401	R&S®CMW-KW402	1203.1106.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WCDMA, HSPA+ extension of R&S®CMW-KW401 and/or R&S®CMW-KW402	R&S®CMW-KW403	1203.9059.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, LTE	R&S®CMW-KW500	1203.5553.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Bluetooth®	R&S®CMW-KW610	1203.6408.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GPS	R&S®CMW-KW620	1203.5953.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GLONASS	R&S®CMW-KW621	1207.8305.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Galileo	R&S®CMW-KW622	1207.8357.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, BeiDou	R&S®CMW-KW623	1208.8280.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, DVB	R&S®CMW-KW630	1203.6050.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11a/b/g/n/j/p	R&S®CMW-KW650	1203.1258.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11ac	R&S®CMW-KW656	1207.9001.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11ax	R&S®CMW-KW657	1211.0805.02
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, TD-SCDMA enhancements, extension of R&S®CMW-KW750	R&S®CMW-KW751	1203.1458.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, CDMA2000®	R&S®CMW-KW800	1203.1506.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, 1xEV-DO	R&S®CMW-KW880	1203.1558.02

Designation	Type	Order No.
Options for the R&S®CMW270		
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, AWGN	R&S®CMW-KW010	1204.9000.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Bluetooth®	R&S®CMW-KW610	1203.6408.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GPS	R&S®CMW-KW620	1203.5953.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, GLONASS	R&S®CMW-KW621	1207.8305.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Galileo	R&S®CMW-KW622	1207.8357.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Beidou	R&S®CMW-KW623	1208.8280.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11a/b/g/n/j/p	R&S®CMW-KW650	1203.1258.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11ac	R&S®CMW-KW656	1207.9001.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, WLAN IEEE 802.11ax	R&S®CMW-KW657	1211.0805.02
Permanent R&S®CMW license: enabling R&S®WinIQSIM2™ waveform, Low Rate WAN (LoRaWAN™)	R&S®CMW-KW683	1211.4081.02
Options for the R&S®CMA180		
Permanent R&S®CMA license: enabling R&S®WinIQSIM2™ waveform, GPS	R&S®CMA-KW620	1209.6222.02
Permanent R&S®CMA license: enabling R&S®WinIQSIM2™ waveform, GLONASS	R&S®CMA-KW621	1209.6245.02
Permanent R&S®CMA license: enabling R&S®WinIQSIM2™ waveform, Galileo	R&S®CMA-KW622	1209.6268.02
Permanent R&S®CMA license: enabling R&S®WinIQSIM2™ waveform, Tetra Release 2	R&S®CMA-KW668	1209.6874.02

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