

# R&S®CMW100 Communications Manufacturing Test Set Specifications

R&S®CMW100 – model K03



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**Data valid for the R&S®CMW100 model K03 unless otherwise stated.**

Data sheet values for frequencies above 4000 MHz are only available with the R&S®CMW-K046 option.

# Definitions

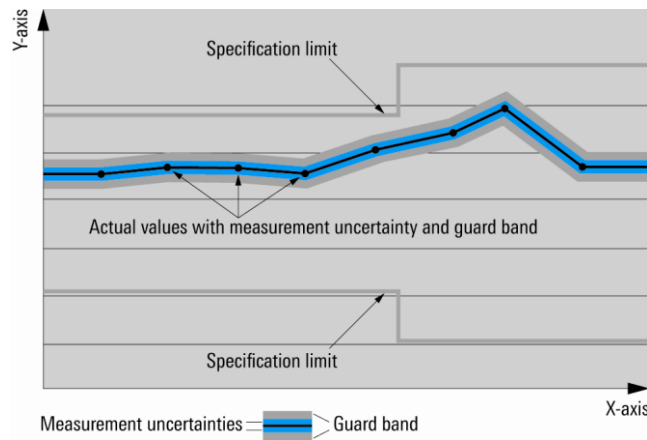
## General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Based on a 24-month calibration interval unless otherwise stated
- Recommended calibration interval adhered to
- Internal path correction (IPC) adjustment performed

## 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  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , 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.

Device settings and GUI parameters are indicated as follows: "parameter: value".

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 Mcps (million chips per second), whereas bit rates and symbol rates are specified in Gbps (billion bits per second), Mbps (million bits per second), kbps (thousand bits per second), Msps (million symbols per second) or ksps (thousand symbols per second), and sample rates are specified in Msample/s (million samples per second). Gbps, Mcps, kbps, Msps, ksps and Msample/s are not SI units.

# General technical specifications

|                                                                                   |                                   |                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General functions                                                                 |                                   | simultaneous receiver and transmitter testing                                                                                                                                                                                                                                                                                                                       |
|                                                                                   | RF generator/analyzer, RF1 to RF8 | 8 × SnapN, RF input/output to DUT                                                                                                                                                                                                                                                                                                                                   |
|                                                                                   | RF generator, TX AUX              | 1 × SnapN, RF output                                                                                                                                                                                                                                                                                                                                                |
| Receiver test functions                                                           |                                   | <ul style="list-style-type: none"> <li>RF generator signal is split and forwarded to 8 output ports</li> <li>every output can be switched off separately</li> <li>collective output level setting for connectors RF 1 to RF 8</li> <li>frequency-dependent attenuation (FDA) table for customer-specific corrections, separate for connectors RF1 to RF8</li> </ul> |
| Transmitter test functions                                                        |                                   | <ul style="list-style-type: none"> <li>8 input signals to be multiplexed to RF analyzer</li> <li>frequency-dependent attenuation (FDA) tables for customer-specific corrections, separate for connectors RF 1 to RF 8</li> </ul>                                                                                                                                    |
| <b>Isolation</b>                                                                  |                                   |                                                                                                                                                                                                                                                                                                                                                                     |
| Power meter,<br>any "OFF" port to active port,<br>RF generator active             | 900 MHz                           | typ. > 50 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 2400 MHz                          | typ. > 55 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 3800 MHz                          | typ. > 60 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 6000 MHz                          | typ. > 50 dB                                                                                                                                                                                                                                                                                                                                                        |
| Power meter,<br>any "OFF" port to active port,<br>RF generator off at active port | 900 MHz                           | typ. > 95 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 2400 MHz                          | typ. > 85 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 3800 MHz                          | typ. > 80 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 6000 MHz                          | typ. > 65 dB                                                                                                                                                                                                                                                                                                                                                        |
| RF generator,<br>active port to any "OFF" port                                    | 900 MHz                           | typ. > 80 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 2400 MHz                          | typ. > 70 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 3800 MHz                          | typ. > 65 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 6000 MHz                          | typ. > 50 dB                                                                                                                                                                                                                                                                                                                                                        |
| RF generator,<br>power meter port to RF generator port                            | 900 MHz                           | typ. > 60 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 2400 MHz                          | typ. > 60 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 3800 MHz                          | typ. > 60 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 6000 MHz                          | typ. > 60 dB                                                                                                                                                                                                                                                                                                                                                        |
| RF generator port to power meter port,<br>RF generator off at power meter port    | 900 MHz                           | typ. > 50 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 2400 MHz                          | typ. > 40 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 3800 MHz                          | typ. > 35 dB                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                   | 6000 MHz                          | typ. > 25 dB                                                                                                                                                                                                                                                                                                                                                        |
| <b>VSWR</b>                                                                       |                                   |                                                                                                                                                                                                                                                                                                                                                                     |
| RF 1 to RF 8                                                                      | 70 MHz to 3300 MHz                | < 1.3                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                   | 3300 MHz to 4000 MHz              | < 1.5                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                   | 4000 MHz to 6000 MHz              | < 1.5                                                                                                                                                                                                                                                                                                                                                               |
| TX AUX                                                                            | 70 MHz to 4000 MHz                | < 1.8                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                   | 4000 MHz to 6000 MHz              | < 2.2                                                                                                                                                                                                                                                                                                                                                               |

## RF generator

|                              |  |                                                                    |
|------------------------------|--|--------------------------------------------------------------------|
| <b>Frequency range</b>       |  | 70 MHz to 4000 MHz,<br>up to 6000 MHz with the R&S®CMW-K046 option |
| <b>Frequency resolution</b>  |  | 0.1 Hz                                                             |
| <b>Frequency uncertainty</b> |  | same as timebase + frequency resolution                            |

|                           |                           |                     |
|---------------------------|---------------------------|---------------------|
| <b>Output level range</b> |                           |                     |
| RF 1 to RF 8              | 70 MHz to 400 MHz         |                     |
|                           | continuous wave (CW)      | –130 dBm to –8 dBm  |
|                           | peak envelope power (PEP) | up to –8 dBm        |
|                           | overranging (PEP)         | up to –3 dBm        |
|                           | 400 MHz to 4000 MHz       |                     |
|                           | continuous wave (CW)      | –130 dBm to –8 dBm  |
|                           | peak envelope power (PEP) | up to –8 dBm        |
|                           | overranging (PEP)         | up to –3 dBm        |
|                           | 4000 MHz to 6000 MHz      |                     |
|                           | continuous wave (CW)      | –120 dBm to –15 dBm |
|                           | peak envelope power (PEP) | up to –15 dBm       |
|                           | overranging (PEP)         | up to –10 dBm       |
| TX AUX                    | 70 MHz to 400 MHz         |                     |
|                           | continuous wave (CW)      | –80 dBm to 8 dBm    |
|                           | peak envelope power (PEP) | –80 dBm to 8 dBm    |
|                           | overranging (PEP)         | –80 dBm to 13 dBm   |
|                           | 400 MHz to 4000 MHz       |                     |
|                           | continuous wave (CW)      | –80 dBm to 8 dBm    |
|                           | peak envelope power (PEP) | –80 dBm to 8 dBm    |
|                           | overranging (PEP)         | –80 dBm to 13 dBm   |
|                           | 4000 MHz to 6000 MHz      |                     |
|                           | continuous wave (CW)      | –80 dBm to 8 dBm    |
|                           | peak envelope power (PEP) | –80 dBm to 8 dBm    |
|                           | overranging (PEP)         | –80 dBm to 13 dBm   |

|                                 |                                                    |                       |
|---------------------------------|----------------------------------------------------|-----------------------|
| <b>Output level uncertainty</b> | in temperature range +20 °C to +30 °C <sup>1</sup> |                       |
| RF 1 to RF 8                    | output level > –120 dBm                            |                       |
|                                 | 70 MHz to 400 MHz                                  | < 1.2 dB <sup>2</sup> |
|                                 | 400 MHz to 2700 MHz                                | < 0.6 dB <sup>2</sup> |
|                                 | 2700 MHz to 4000 MHz                               | < 1.2 dB <sup>2</sup> |
|                                 | 4000 MHz to 6000 MHz                               | < 1.2 dB <sup>2</sup> |
| TX AUX                          | output level > –80 dBm                             |                       |
|                                 | 70 MHz to 400 MHz                                  | < 1.6 dB <sup>2</sup> |
|                                 | 400 MHz to 2700 MHz                                | < 0.8 dB <sup>2</sup> |
|                                 | 2700 MHz to 4000 MHz                               | < 1.6 dB <sup>2</sup> |
|                                 | 4000 MHz to 6000 MHz                               | < 1.6 dB <sup>2</sup> |

|                                 |                                      |                       |
|---------------------------------|--------------------------------------|-----------------------|
| <b>Output level uncertainty</b> | in temperature range +5 °C to +45 °C |                       |
| RF 1 to RF 8                    | output level > –120 dBm              |                       |
|                                 | 70 MHz to 400 MHz                    | < 2.0 dB <sup>2</sup> |
|                                 | 400 MHz to 2700 MHz                  | < 1.0 dB <sup>2</sup> |
|                                 | 2700 MHz to 4000 MHz                 | < 2.0 dB <sup>2</sup> |
|                                 | 4000 MHz to 6000 MHz                 | < 2.0 dB <sup>2</sup> |
| TX AUX                          | output level > –80 dBm               |                       |
|                                 | 70 MHz to 400 MHz                    | < 2.0 dB <sup>2</sup> |
|                                 | 400 MHz to 2700 MHz                  | < 1.2 dB <sup>2</sup> |
|                                 | 2700 MHz to 4000 MHz                 | < 2.0 dB <sup>2</sup> |
|                                 | 4000 MHz to 6000 MHz                 | < 2.0 dB <sup>2</sup> |

|                               |                               |               |
|-------------------------------|-------------------------------|---------------|
| <b>Output level imbalance</b> | difference between RF1 to RF8 | typ. < 0.6 dB |
|-------------------------------|-------------------------------|---------------|

<sup>1</sup> Relevant is the internal unit temperature, influenced by natural or forced convection.

<sup>2</sup> Valid for a 12-month calibration interval.

|                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                 |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Frequency-dependent attenuation (FDA) setting range</b>            |                                                                                                                                                                                                                                                                                                                                                                                                               | –30 dB to 0 dB                                                  |
| <b>Max. FDA setting range</b>                                         | for specified output level uncertainty                                                                                                                                                                                                                                                                                                                                                                        | –10 dB to 0 dB                                                  |
| <b>Output level linearity with fixed RF output attenuator setting</b> | in temperature range +20 °C to +30 °C <sup>3</sup> ,<br>GPRF generator list mode,<br>level range 0 dB to –30 dB                                                                                                                                                                                                                                                                                               |                                                                 |
| RF 1 to RF 8                                                          | no overranging                                                                                                                                                                                                                                                                                                                                                                                                | < 0.2 dB, typ. < 0.1 dB                                         |
| <b>Output level resolution</b>                                        |                                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 dB                                                         |
| <b>Output level settling time</b>                                     | to within 0.1 dB                                                                                                                                                                                                                                                                                                                                                                                              | < 50 µs <sup>4</sup>                                            |
| <b>Output level repeatability</b>                                     | typical values after 1 h warm-up time,<br>always returning to same level and<br>frequency, no temperature change,<br>insignificant time change                                                                                                                                                                                                                                                                |                                                                 |
|                                                                       | output level ≥ –80 dBm                                                                                                                                                                                                                                                                                                                                                                                        | < 0.01 dB                                                       |
|                                                                       | output level < –80 dBm                                                                                                                                                                                                                                                                                                                                                                                        | < 0.05 dB                                                       |
| <b>Attenuation of second harmonic</b>                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                 |
| RF 1 to RF 8                                                          | 70 MHz to 6000 MHz, P < –10 dBm                                                                                                                                                                                                                                                                                                                                                                               | > 30 dB                                                         |
| TX AUX                                                                | 70 MHz to 6000 MHz, P < 0 dBm                                                                                                                                                                                                                                                                                                                                                                                 | > 30 dB                                                         |
| <b>Attenuation of third harmonic</b>                                  |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                 |
| RF 1 to RF 8                                                          | 70 MHz to 6000 MHz, P < –10 dBm                                                                                                                                                                                                                                                                                                                                                                               | > 40 dB                                                         |
| TX AUX                                                                | 70 MHz to 6000 MHz, P < 0 dBm                                                                                                                                                                                                                                                                                                                                                                                 | > 40 dB                                                         |
| <b>Attenuation of nonharmonics</b>                                    | > 5 kHz offset from carrier,<br>for output level > –40 dBm,<br>for full-scale CW signal                                                                                                                                                                                                                                                                                                                       |                                                                 |
|                                                                       | 400 MHz to 3300 MHz,<br>except $f_{\text{nonharmonic}} = 3900 \text{ MHz} - f_{\text{carrier}}$ ,<br>except $f_{\text{nonharmonic}} = 3900 \text{ MHz}$ ,<br>except $f_{\text{carrier}} = (899 \text{ to } 901) \text{ MHz} +$<br>$n \times 800 \text{ MHz}$ with $n = 1, 2, 3, 4, 5, 6, 7$ ,<br>except $f_{\text{nonharmonic}} = 350 \text{ MHz} +$<br>$n \times 50 \text{ MHz}$ with $n = 1 \text{ to } 12$ | > 60 dB                                                         |
|                                                                       | 3300 MHz to 3600 MHz                                                                                                                                                                                                                                                                                                                                                                                          | > 25 dB                                                         |
|                                                                       | 3600 MHz to 6000 MHz,<br>except $f_{\text{nonharmonic}} = 2 \times f_{\text{carrier}} - 6400 \text{ MHz}$                                                                                                                                                                                                                                                                                                     | > 40 dB                                                         |
| <b>Phase noise</b>                                                    | single sideband, 70 MHz to 3300 MHz                                                                                                                                                                                                                                                                                                                                                                           |                                                                 |
| Carrier offset                                                        | ≥ 1 MHz                                                                                                                                                                                                                                                                                                                                                                                                       | < –120 dBc, 1 Hz                                                |
| <b>Phase noise</b>                                                    | single sideband, 3300 MHz to 6000 MHz                                                                                                                                                                                                                                                                                                                                                                         |                                                                 |
| Carrier offset                                                        | ≥ 1 MHz                                                                                                                                                                                                                                                                                                                                                                                                       | < –117 dBc, 1 Hz                                                |
| <b>Signal-to-noise ratio</b>                                          | 70 MHz to 3300 MHz                                                                                                                                                                                                                                                                                                                                                                                            |                                                                 |
| RF 1 to RF 8                                                          | 5 MHz offset from carrier,<br>for output level > –30 dBm                                                                                                                                                                                                                                                                                                                                                      | > 90 dB, typ. > 98 dB, 1 kHz<br>(> 122 dB, typ. > 128 dB, 1 Hz) |
| <b>Signal-to-noise ratio</b>                                          | 3300 MHz to 6000 MHz                                                                                                                                                                                                                                                                                                                                                                                          |                                                                 |
| RF 1 to RF 8                                                          | 5 MHz offset from carrier,<br>for output level > –30 dBm                                                                                                                                                                                                                                                                                                                                                      | > 89 dB, 1 kHz                                                  |

<sup>3</sup> Relevant is the internal unit temperature, influenced by natural or forced convection.<sup>4</sup> When using list mode.

**Modulation source: arbitrary waveform generator (ARB)**

|                               |                                    |                   |
|-------------------------------|------------------------------------|-------------------|
| Memory size                   |                                    | 2.048 Gbyte       |
| Word length                   | I                                  | 16 bit            |
|                               | Q                                  | 16 bit            |
| Sample length                 | with 4-bit marker                  | up to 400 Msample |
| Sample rate                   | minimum                            | 400 Hz            |
|                               | maximum                            | 100 MHz           |
| Maximum possible RF bandwidth | depends on arbitrary waveform file | 80 MHz            |

**RF analyzer**

|                            |                                                                                                                                                                                   |                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Inherent spurious response | without input signal, 70 MHz to 6000 MHz,<br>except 4000, 4800 MHz,<br>5162.5 MHz, 5600 MHz, 6000 MHz<br>except $100 \text{ MHz} + n \times 50 \text{ MHz}$<br>with $n = 0$ to 62 |                                                         |
|                            | expected nominal power setting<br>$\leq -10 \text{ dBm}$                                                                                                                          | $< -100 \text{ dBm}$                                    |
|                            | expected nominal power setting<br>$> -10 \text{ dBm}$                                                                                                                             | $< -90 \text{ dB}$ below expected nominal power setting |

|                   |                                                                                                                                                                                                     |                    |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Spurious response | for full-scale single-tone input signal<br>70 MHz to 3300 MHz,<br>except $f_{\text{in}} = 1962.5 \text{ MHz}$ and<br>3925 MHz,<br>except $f_{\text{in}} = 1962.5 \text{ MHz} + f_{\text{selected}}$ | $< -55 \text{ dB}$ |
|                   | 3300 MHz to 3700 MHz,<br>except $f_{\text{in}} = 6400 \text{ MHz} - f_{\text{selected}}$ ,<br>except $f_{\text{in}} = 6400 \text{ MHz} - 0.5 \times f_{\text{selected}}$                            | $< -40 \text{ dB}$ |
|                   | 3700 MHz to 6000 MHz,<br>except $f_{\text{in}} = 6400 \text{ MHz} - 0.5 \times f_{\text{selected}}$                                                                                                 | $< -40 \text{ dB}$ |

|                   |                                                                                                         |                    |
|-------------------|---------------------------------------------------------------------------------------------------------|--------------------|
| Harmonic response | second harmonic                                                                                         |                    |
| RF 1 to RF 8      | $f_{\text{in}} = 70 \text{ MHz}$ to 1650 MHz,<br>$f_{\text{selected}} = 140 \text{ MHz}$ to 3300 MHz    | $< -30 \text{ dB}$ |
|                   | $f_{\text{in}} = 1650 \text{ MHz}$ to 3000 MHz,<br>$f_{\text{selected}} = 3300 \text{ MHz}$ to 6000 MHz | $< -30 \text{ dB}$ |

|                   |                                                                                                         |                    |
|-------------------|---------------------------------------------------------------------------------------------------------|--------------------|
| Harmonic response | third harmonic                                                                                          |                    |
| RF 1 to RF 8      | $f_{\text{in}} = 70 \text{ MHz}$ to 900 MHz,<br>$f_{\text{selected}} = 210 \text{ MHz}$ to 2700 MHz     | $< -50 \text{ dB}$ |
|                   | $f_{\text{in}} = 900 \text{ MHz}$ to 1100 MHz,<br>$f_{\text{selected}} = 2700 \text{ MHz}$ to 3300 MHz  | $< -45 \text{ dB}$ |
|                   | $f_{\text{in}} = 1100 \text{ MHz}$ to 2000 MHz,<br>$f_{\text{selected}} = 3300 \text{ MHz}$ to 6000 MHz | $< -50 \text{ dB}$ |
|                   |                                                                                                         |                    |

|                |                                     |                             |
|----------------|-------------------------------------|-----------------------------|
| Phase noise    | single sideband, 70 MHz to 3300 MHz |                             |
| Carrier offset | $\geq 1 \text{ MHz}$                | $< -120 \text{ dBc}$ , 1 Hz |

|                |                                       |                             |
|----------------|---------------------------------------|-----------------------------|
| Phase noise    | single sideband, 3300 MHz to 6000 MHz |                             |
| Carrier offset | $\geq 1 \text{ MHz}$                  | $< -117 \text{ dBc}$ , 1 Hz |

|                 |  |                                                                                                                   |
|-----------------|--|-------------------------------------------------------------------------------------------------------------------|
| Trigger         |  |                                                                                                                   |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: free run</li> <li>• GPRF: IF power</li> <li>• GPRF: Gen</li> </ul> |

**Power meter**

|                                                                  |                                                                                                                                                |                                                                                                                                                                                                |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b>                                           |                                                                                                                                                | 70 MHz to 4000 MHz,<br>up to 6000 MHz with the R&S®CMW-K046<br>option                                                                                                                          |
| <b>Frequency resolution</b>                                      |                                                                                                                                                | 0.1 Hz                                                                                                                                                                                         |
| <b>Resolution bandwidths</b>                                     |                                                                                                                                                | Gaussian, 1 kHz to 10 MHz, in 1/3/5 steps,<br>bandpass, 1 kHz to 30 MHz,<br>in 1/3/5 steps, RRC, $\alpha = 0.1$ ,<br>3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter,<br>1.2288 MHz, CDMA filter |
| <b>Expected nominal power setting range</b>                      | for ADC full scale                                                                                                                             |                                                                                                                                                                                                |
| RF 1 to RF 8                                                     | 70 MHz to 100 MHz                                                                                                                              | –37 dBm to +42 dBm <sup>5</sup>                                                                                                                                                                |
|                                                                  | 100 MHz to 3300 MHz                                                                                                                            | –47 dBm to +42 dBm <sup>5</sup>                                                                                                                                                                |
|                                                                  | 3300 MHz to 6000 MHz                                                                                                                           | –37 dBm to +42 dBm <sup>5</sup>                                                                                                                                                                |
| <b>Level range</b>                                               |                                                                                                                                                |                                                                                                                                                                                                |
| RF 1 to RF 8                                                     | 70 MHz to 100 MHz                                                                                                                              |                                                                                                                                                                                                |
|                                                                  | continuous power (CW)                                                                                                                          | –74 dBm <sup>6</sup> to +34 dBm                                                                                                                                                                |
|                                                                  | peak envelope power (PEP)                                                                                                                      | up to +36 dBm <sup>5</sup>                                                                                                                                                                     |
|                                                                  | 100 MHz to 3300 MHz                                                                                                                            |                                                                                                                                                                                                |
|                                                                  | continuous power (CW)                                                                                                                          | –84 dBm <sup>6</sup> to +34 dBm                                                                                                                                                                |
|                                                                  | peak envelope power (PEP)                                                                                                                      | up to +36 dBm <sup>5</sup>                                                                                                                                                                     |
|                                                                  | 3300 MHz to 6000 MHz                                                                                                                           |                                                                                                                                                                                                |
|                                                                  | continuous power (CW)                                                                                                                          | –74 dBm <sup>6</sup> to +34 dBm                                                                                                                                                                |
|                                                                  | peak envelope power (PEP)                                                                                                                      | up to +36 dBm <sup>5</sup>                                                                                                                                                                     |
|                                                                  | maximum input DC level                                                                                                                         | 0 V DC                                                                                                                                                                                         |
| <b>Level uncertainty</b>                                         | in temperature range +20 °C to +30 °C <sup>7</sup>                                                                                             |                                                                                                                                                                                                |
| RF 1 to RF 8                                                     | 70 MHz to 100 MHz                                                                                                                              | < 1.0 dB <sup>8</sup>                                                                                                                                                                          |
|                                                                  | 100 MHz to 3300 MHz                                                                                                                            | < 0.5 dB <sup>8</sup>                                                                                                                                                                          |
|                                                                  | 3300 MHz to 4000 MHz                                                                                                                           | < 1.0 dB <sup>8</sup>                                                                                                                                                                          |
|                                                                  | 4000 MHz to 6000 MHz                                                                                                                           | < 1.0 dB <sup>8</sup>                                                                                                                                                                          |
| <b>Level uncertainty</b>                                         | in temperature range +5 °C to +45 °C                                                                                                           |                                                                                                                                                                                                |
| RF 1 to RF 8                                                     | 70 MHz to 100 MHz                                                                                                                              | < 1.2 dB <sup>8</sup>                                                                                                                                                                          |
|                                                                  | 100 MHz to 3300 MHz                                                                                                                            | < 0.7 dB <sup>8</sup>                                                                                                                                                                          |
|                                                                  | 3300 MHz to 4000 MHz                                                                                                                           | < 1.2 dB <sup>8</sup>                                                                                                                                                                          |
|                                                                  | 4000 MHz to 6000 MHz                                                                                                                           | < 1.2 dB <sup>8</sup>                                                                                                                                                                          |
| <b>Level linearity with fixed expected nominal power setting</b> | in temperature range +20 °C to +30 °C <sup>7</sup>                                                                                             |                                                                                                                                                                                                |
| RF 1 to RF 8                                                     | level range 0 dB to –40 dB                                                                                                                     | < 0.15 dB, typ. < 0.1 dB                                                                                                                                                                       |
| <b>Level resolution</b>                                          |                                                                                                                                                | 0.01 dB                                                                                                                                                                                        |
| <b>Level repeatability</b>                                       | typical values after 1 h warm-up time,<br>always returning to same level and<br>frequency, no temperature change,<br>insignificant time change |                                                                                                                                                                                                |
|                                                                  | input level $\geq -40$ dBm                                                                                                                     | < 0.01 dB                                                                                                                                                                                      |
|                                                                  | input level < –40 dBm                                                                                                                          | < 0.03 dB                                                                                                                                                                                      |
| <b>Port switching time</b>                                       | to within 0.1 dB                                                                                                                               | < 50 $\mu$ s <sup>9</sup>                                                                                                                                                                      |

<sup>5</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.<sup>6</sup> RBW: 1 kHz.<sup>7</sup> Relevant is the internal unit temperature, influenced by natural or forced convection.<sup>8</sup> Valid for a 12-month calibration interval.<sup>9</sup> When using list mode.

|                                                              |                                                                                                               |                                 |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Dynamic range</b>                                         | 70 MHz to 3300 MHz, RBW: 1 kHz, with fixed expected nominal power setting and mixer level offset $\geq +4$ dB | > 100 dB                        |
| <b>Expected nominal power setting for full dynamic range</b> |                                                                                                               |                                 |
| RF 1 to RF 8                                                 |                                                                                                               | -8 dBm to +42 dBm <sup>10</sup> |

|                                                              |                                                                                                                 |                                 |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Dynamic range</b>                                         | 3300 MHz to 6000 MHz, RBW: 1 kHz, with fixed expected nominal power setting and mixer level offset $\geq +4$ dB | > 97 dB                         |
| <b>Expected nominal power setting for full dynamic range</b> |                                                                                                                 |                                 |
| RF 1 to RF 8                                                 |                                                                                                                 | +2 dBm to +42 dBm <sup>10</sup> |

## Spectrum measurements

|                              |  |                                                                 |
|------------------------------|--|-----------------------------------------------------------------|
| <b>FFT spectrum analyzer</b> |  |                                                                 |
| Frequency range              |  | 70 MHz to 4000 MHz, up to 6000 MHz with the R&S®CMW-K046 option |
| Frequency span               |  | 1.25 MHz, 2.5 MHz, 5 MHz, 10 MHz, 20 MHz, 40 MHz                |
| FFT length                   |  | 1k, 2k, 4k, 8k, 16k                                             |
| Detector                     |  | peak, RMS                                                       |

|                                                              |                                                                                                                         |                                 |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Dynamic range</b>                                         | 70 MHz to 3300 MHz, for FFT length: 16k and span: 5 MHz (equivalent to RBW: 781 Hz) and mixer level offset $\geq +4$ dB | > 100 dB                        |
| <b>Expected nominal power setting for full dynamic range</b> |                                                                                                                         |                                 |
| RF 1 to RF 8                                                 |                                                                                                                         | -8 dBm to +42 dBm <sup>10</sup> |

|                                                              |                                                                                                                           |                                 |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Dynamic range</b>                                         | 3300 MHz to 6000 MHz, for FFT length: 16k and span: 5 MHz (equivalent to RBW: 781 Hz) and mixer level offset $\geq +4$ dB | > 97 dB                         |
| <b>Expected nominal power setting for full dynamic range</b> |                                                                                                                           |                                 |
| RF 1 to RF 8                                                 |                                                                                                                           | +2 dBm to +42 dBm <sup>10</sup> |

|                                                        |                                               |                                                                 |
|--------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------|
| <b>RF spectrum analyzer (R&amp;S®CMW-KM010 option)</b> |                                               |                                                                 |
| Frequency range                                        |                                               | 70 MHz to 4000 MHz, up to 6000 MHz with the R&S®CMW-K046 option |
| Frequency span                                         | zero span                                     | 0 Hz                                                            |
|                                                        | with the R&S®CMW-K046 option                  | 500 Hz to 3930 MHz up to 5930 MHz                               |
| Resolution bandwidth (RBW)                             |                                               | 100 Hz to 10 MHz (additional 40 MHz in zero span)               |
| Video bandwidth (VBW)                                  |                                               | 10 Hz to 10 MHz                                                 |
| Sweep time                                             | frequency sweep, depends on RBW, VBW and span | 500 $\mu$ s to 2000 s                                           |
|                                                        | zero span, depends on RBW and VBW             | 80 $\mu$ s to 2000 s                                            |
| Detector                                               |                                               | average, RMS, sample, min. peak, max. peak, auto peak           |
| Trigger                                                | frequency sweep                               | free run                                                        |
|                                                        | zero span                                     | video, all R&S®CMW internal trigger sources                     |

<sup>10</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|                                                              |                                                                                        |                                      |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------|
| <b>Dynamic range</b>                                         | 70 MHz to 3300 MHz, RBW: 1 kHz,<br>detector: RMS,<br>mixer level offset $\geq +4$ dB   | > 100 dB                             |
| <b>Expected nominal power setting for full dynamic range</b> |                                                                                        |                                      |
| RF 1 to RF 8                                                 |                                                                                        | -8 dBm to +42 dBm <sup>11</sup>      |
| <b>Dynamic range</b>                                         | 3300 MHz to 6000 MHz, RBW: 1 kHz,<br>detector: RMS,<br>mixer level offset $\geq +4$ dB | > 97 dB                              |
| <b>Expected nominal power setting for full dynamic range</b> |                                                                                        |                                      |
| RF 1 to RF 8                                                 |                                                                                        | +2 dBm to +42 dBm <sup>11</sup>      |
| <b>Level range</b>                                           |                                                                                        | see general technical specifications |
| <b>Level uncertainty</b>                                     | for center frequency and detector: peak                                                | see general technical specifications |
| <b>Inherent spurious response</b>                            |                                                                                        | see general technical specifications |
| <b>Spurious response</b>                                     |                                                                                        | see general technical specifications |
| <b>Harmonic response</b>                                     |                                                                                        | see general technical specifications |
| <b>Phase noise</b>                                           |                                                                                        | see general technical specifications |

### GPRF pathloss measurement (R&S®CMW-KM015 option)

|                            |                                                                                                                                      |                                                                       |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Frequency range            |                                                                                                                                      | 70 MHz to 4000 MHz,<br>up to 6000 MHz with the R&S®CMW-K046<br>option |
| Pathloss measurement range |                                                                                                                                      | 0 dB to 12 dB                                                         |
| Level uncertainty          | in temperature range +20 °C to +30 °C <sup>12</sup>                                                                                  |                                                                       |
| RF 1 to RF 8               | 70 MHz to 400 MHz                                                                                                                    | < 0.9 dB <sup>13</sup> typ < 0.6 <sup>13</sup>                        |
|                            | 400 MHz to 2700 MHz                                                                                                                  | < 0.5 dB <sup>13</sup> typ < 0.3 <sup>13</sup>                        |
|                            | 3300 MHz to 6000 MHz                                                                                                                 | < 0.9 dB <sup>13</sup> typ < 0.6 <sup>13</sup>                        |
| Level repeatability        | typical values after 1 h warm-up time,<br>always returning to same frequency, no<br>temperature change, insignificant time<br>change |                                                                       |
|                            | attenuation < 6 dB                                                                                                                   | < 0.10 dB                                                             |
|                            | attenuation < 12 dB                                                                                                                  | < 0.15 dB                                                             |

## Timebase

### Timebase OCXO

|                             |                                                                                                                |                                                              |
|-----------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <b>Max. frequency drift</b> | in temperature range +5 °C to +45 °C                                                                           | $\pm 5 \times 10^{-8}$                                       |
| <b>Retrace</b>              | at +25 °C,<br>after 24 hours power on /<br>2 hours power off / 1 hour power on                                 | $\pm 2 \times 10^{-8}$                                       |
| <b>Max. aging</b>           | at +25 °C,<br>after 10 days of continuous operation                                                            | $\pm 1 \times 10^{-7}$ /year,<br>$\pm 1 \times 10^{-9}$ /day |
| <b>Warm-up time</b>         | at +25 °C,<br>the frequency is in the range that is<br>10 times the frequency drift ( $\pm 5 \times 10^{-7}$ ) | approx. 10 min                                               |

<sup>11</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

<sup>12</sup> Relevant is the internal unit temperature, influenced by natural or forced convection.

<sup>13</sup> Valid for a 12-month calibration interval.

# GSM specifications – mobile station test

## GSM RF generator

|                 |               |                      |
|-----------------|---------------|----------------------|
| Frequency range | GSM 450 band  | 460 MHz to 468 MHz   |
|                 | GSM 480 band  | 488 MHz to 496 MHz   |
|                 | GSM 750 band  | 747 MHz to 762 MHz   |
|                 | GSM 850 band  | 869 MHz to 894 MHz   |
|                 | GSM 900 band  | 921 MHz to 960 MHz   |
|                 | GSM 1800 band | 1805 MHz to 1880 MHz |
|                 | GSM 1900 band | 1930 MHz to 1990 MHz |

## GSM R&S®WiniQSIM2™ (R&S®CMW-KW200 option), GSM EDGE Evolution R&S®WiniQSIM2™ (R&S®CMW-KW201 option)

|                          |                                                          |                                                               |
|--------------------------|----------------------------------------------------------|---------------------------------------------------------------|
| Arbitrary waveform files | GMSK, $W \times D = 0.3$ , with the R&S®CMW-KW200 option | GSM_GMSK.WV (PAR = 0 dB),<br>GMSKDIGMOD.WV (PAR = 0 dB)       |
|                          | 8PSK, with the R&S®CMW-KW200 option                      | GSM_EDGE.WV (PAR = 3.23 dB),<br>EDGEDIGMOD.WV (PAR = 3.22 dB) |
| Arbitrary waveform files | 16QAM, with the R&S®CMW-KW200 and R&S®CMW-KW201 options  | EDGE_EVO_16QAM_A.WV<br>(PAR = 4.70 dB)                        |
|                          | 32QAM, with the R&S®CMW-KW200 and R&S®CMW-KW201 options  | EDGE_EVO_32QAM_B.WV<br>(PAR = 5.37 dB)                        |

|                          |                                                                                                                          |                                      |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Output level range       | depends on PAR                                                                                                           | see general technical specifications |
| Output level uncertainty | with the R&S®CMW-KW200 option,<br>waveform files used:<br>GMSKDIGMOD.WV or<br>EDGEDIGMOD.WV                              | see general technical specifications |
|                          | with the R&S®CMW-KW200 and R&S®CMW-KW201 options,<br>waveform files used:<br>EDGE_EVO_16QAM_A.WV,<br>EDGE_EVO_32QAM_B.WV | see general technical specifications |
| Output level resolution  |                                                                                                                          | see general technical specifications |

|                              |                                                                                                                                 |            |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Signal quality</b>        |                                                                                                                                 |            |
| Phase error                  | GMSK                                                                                                                            | < 1°, RMS  |
|                              | with the R&S®CMW-KW200 option,<br>waveform file used: GSM_GMSK.WV                                                               | < 4°, peak |
| Error vector magnitude (EVM) | 8PSK                                                                                                                            | < 2 %, RMS |
|                              | with the R&S®CMW-KW200 option,<br>waveform file used: GSM_EDGE.WV                                                               |            |
|                              | 16QAM / 32QAM level A<br>with the R&S®CMW-KW200 and R&S®CMW-KW201 options,<br>waveform file used:<br>EDGE_EVO_16QAM_A.WV        | < 2 %, RMS |
|                              | QPSK / 16QAM / 32QAM level B<br>with the R&S®CMW-KW200 and R&S®CMW-KW201 options,<br>waveform file used:<br>EDGE_EVO_32QAM_B.WV | < 2 %, RMS |

## GSM RF analyzer (R&S®CMW-KM200 option) and GSM EDGE Evolution A analyzer (R&S®CMW-KM201 option)

|                 |               |                                                                                                                                             |
|-----------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency range | GSM 450 band  | 450 MHz to 458 MHz                                                                                                                          |
|                 | GSM 480 band  | 478 MHz to 486 MHz                                                                                                                          |
|                 | GSM 750 band  | 777 MHz to 792 MHz                                                                                                                          |
|                 | GSM 850 band  | 824 MHz to 849 MHz                                                                                                                          |
|                 | GSM 900 band  | 876 MHz to 915 MHz                                                                                                                          |
|                 | GSM 1800 band | 1710 MHz to 1785 MHz                                                                                                                        |
|                 | GSM 1900 band | 1850 MHz to 1910 MHz                                                                                                                        |
| <b>Trigger</b>  |               |                                                                                                                                             |
| Trigger sources |               | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• GSM: free run</li> <li>• GSM: IF power</li> <li>• GSM: acquisition</li> </ul> |

### Modulation analysis

|                                                |                                                  |                                                                      |
|------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------|
| Level range                                    |                                                  | –28 dBm to +36 dBm <sup>14</sup>                                     |
| Analysis mode                                  | with the R&S®CMW-KW200 option                    | GMSK, 8PSK                                                           |
|                                                | with the R&S®CMW-KW200 and R&S®CMW-KW201 options | GMSK, 8PSK, 16QAM (level A)                                          |
| Inherent phase error                           | GMSK                                             | < 0.6°, RMS;<br>< 2°, peak                                           |
| Inherent error vector magnitude (inherent EVM) | 8PSK, 16QAM (level A)                            | < 0.8 %, RMS                                                         |
| Frequency measurement uncertainty              |                                                  | < 20 Hz + drift of timebase,<br>see general technical specifications |
| Inherent I/Q offset                            |                                                  | < –50 dB                                                             |
| Filter                                         | GMSK                                             | bandpass, 900 kHz, RRC filter, $\alpha = 0.16$                       |
|                                                | 8PSK, 16QAM (level A)                            | windowed raised-cosine filter in line with 3GPP TS 45.005            |

|                                |                                                |                                      |
|--------------------------------|------------------------------------------------|--------------------------------------|
| <b>Burst power measurement</b> |                                                |                                      |
| Level uncertainty              | bandpass, 900 kHz, RRC filter, $\alpha = 0.16$ | see general technical specifications |

### Power versus time measurement

|                                                       |                                                                         |                                      |
|-------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------|
| Filter                                                | selectable                                                              | Gaussian, 500 kHz or 1 MHz           |
| Dynamic range                                         | filter: 500 kHz, Gaussian,<br>with fixed expected nominal power setting |                                      |
|                                                       | GMSK                                                                    | > 72 dB, RMS                         |
|                                                       | 8PSK, 16QAM (level A)                                                   | > 69 dB, RMS                         |
| Expected nominal power setting for full dynamic range | RF1 to RF8                                                              | –8 dBm to +36 dBm <sup>14</sup>      |
| Relative measurement uncertainty                      | result > –40 dB                                                         | typ. < 0.1 dB                        |
|                                                       | –60 dB ≤ result ≤ –40 dB                                                | typ. < 0.5 dB                        |
| <b>Burst power measurement</b>                        |                                                                         |                                      |
| Level range                                           |                                                                         | –50 dBm to +36 dBm <sup>14</sup>     |
| Level uncertainty                                     | filter: 500 kHz or 1 MHz, Gaussian                                      | see general technical specifications |

<sup>14</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

**Spectrum due to modulation measurement**

|                                                       |                       |                                                          |
|-------------------------------------------------------|-----------------------|----------------------------------------------------------|
| Expected nominal power setting for full dynamic range | RF1 to RF8            | –8 dBm to +36 dBm <sup>15</sup>                          |
| Test method                                           |                       | relative measurement, averaging                          |
| Filter                                                |                       | Gaussian, 30 kHz, 5 pole                                 |
| Measurement                                           | at an offset of $\pm$ | 100/200/250/400/600/800/1000/1200/<br>1400/1600/1800 kHz |

|               |                        |         |
|---------------|------------------------|---------|
| Dynamic range | offset $\geq$ 1200 kHz |         |
|               | GMSK                   | > 74 dB |
|               | 8PSK, 16QAM (level A)  | > 70 dB |

**Spectrum due to switching measurement**

|                                                       |                       |                                 |
|-------------------------------------------------------|-----------------------|---------------------------------|
| Expected nominal power setting for full dynamic range | RF1 to RF8            | –8 dBm to +36 dBm <sup>15</sup> |
| Test method                                           |                       | absolute measurement, max. hold |
| Filter                                                |                       | Gaussian, 30 kHz, 5 pole        |
| Measurement                                           | at an offset of $\pm$ | 400/600/1200/1800 kHz           |

|               |                        |         |
|---------------|------------------------|---------|
| Dynamic range | offset $\geq$ 1200 kHz |         |
|               | GMSK                   | > 72 dB |
|               | 8PSK, 16QAM (level A)  | > 68 dB |

---

<sup>15</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## NB-IoT specifications – mobile station test

|          |  |                    |
|----------|--|--------------------|
| Standard |  | 3GPP NB-IoT HD-FDD |
|----------|--|--------------------|

### NB-IoT RF generator

|                 |                                                                                                       |                                         |
|-----------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Frequency range | NB-IoT operates in the E-UTRA bands 1, 2, 3, 5, 8, 11, 12, 13, 17, 18, 19, 20, 21, 25, 26, 28, 31, 66 | see LTE FDD RF generator specifications |
|-----------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------|

### NB-IoT WinIQSIM2™ (R&S®CMW-KW300 option)

|                         |               |                                                       |
|-------------------------|---------------|-------------------------------------------------------|
| Arbitrary waveform file | NB-IoT HD-FDD | KW300_NB_IOT_64frames_DCI_160ms.wv<br>(PAR = 8.64 dB) |
|-------------------------|---------------|-------------------------------------------------------|

|                          |                                                           |                                      |
|--------------------------|-----------------------------------------------------------|--------------------------------------|
| Output level range       | depends on PAR                                            | see general technical specifications |
| Output level uncertainty | waveform file used:<br>KW300_NB_IOT_64frames_DCI_160ms.wv | see general technical specifications |
| Output level resolution  |                                                           | see general technical specifications |

|                              |                                                                                                      |            |
|------------------------------|------------------------------------------------------------------------------------------------------|------------|
| Signal quality               |                                                                                                      |            |
| Error vector magnitude (EVM) | EVM NPDSCH QPSK,<br>bandwidth = 200 kHz<br>waveform file used:<br>KW300_NB_IOT_64frames_DCI_160ms.wv | < 2 %, RMS |

### NB-IoT HD-FDD RF analyzer (R&S®CMW-KM300 option)

|           |  |         |
|-----------|--|---------|
| Bandwidth |  | 200 kHz |
|-----------|--|---------|

|                 |                                                                                       |                                        |
|-----------------|---------------------------------------------------------------------------------------|----------------------------------------|
| Frequency range | NB-IoT operates in the E-UTRA bands 1, 2, 3, 5, 8, 12, 13, 17, 18, 19, 20, 26, 28, 66 | see LTE FDD RF analyzer specifications |
| Level setting   |                                                                                       | manual mode                            |

|                   |  |                                                          |
|-------------------|--|----------------------------------------------------------|
| Statistics        |  |                                                          |
| Statistical count |  | 1 to 1000                                                |
| Values            |  | current, average, minimum/maximum,<br>standard deviation |

|                 |  |                                                                                                                       |
|-----------------|--|-----------------------------------------------------------------------------------------------------------------------|
| Trigger         |  |                                                                                                                       |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• NB-IoT: free run</li> <li>• NB-IoT: IF power</li> </ul> |

### Power measurement

|                   |              |                                      |
|-------------------|--------------|--------------------------------------|
| Slot power        | RMS detector |                                      |
| Level range       |              | –50 dBm to +30 dBm, RMS              |
| Level uncertainty |              | see general technical specifications |

## Modulation analysis

|                     |                 |                                                                                                                                                                                  |
|---------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measured parameters | numeric results | error vector magnitude (EVM),<br>magnitude error (ME),<br>phase error (PE),<br>frequency error,<br>I/Q origin offset,<br>TX power,<br>peak power,<br>subcarrier power (SC power) |
|                     | graphical       | EVM versus SC-FDMA symbol,<br>ME versus SC-FDMA symbol,<br>PE versus SC-FDMA symbol,<br>in-band emissions,<br>I/Q constellation                                                  |

|                                     |                                                                   |                |
|-------------------------------------|-------------------------------------------------------------------|----------------|
| <b>Error vector magnitude (EVM)</b> |                                                                   |                |
| Inherent EVM                        | $-38 \text{ dBm} \leq \text{input level} < +30 \text{ dBm}$ , RMS | $< 1 \%$ , RMS |

|                                   |                               |                                                                                     |
|-----------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| <b>Frequency error</b>            |                               |                                                                                     |
| Measurement range                 | subcarrier spacing = 3.75 kHz | $\pm 1.8 \text{ kHz}$                                                               |
|                                   | subcarrier spacing = 15 kHz   | $\pm 7.0 \text{ kHz}$                                                               |
| Frequency measurement uncertainty |                               | $< 20 \text{ Hz}^{16}$ + drift of timebase,<br>see general technical specifications |

|                          |                                    |                    |
|--------------------------|------------------------------------|--------------------|
| <b>I/Q origin offset</b> |                                    |                    |
| Inherent I/Q offset      | for average $\geq 10$ measurements | $< -45 \text{ dB}$ |

|                                                       |            |                                      |
|-------------------------------------------------------|------------|--------------------------------------|
| <b>In-band emissions</b>                              |            |                                      |
| Dynamic range                                         |            | $> 45 \text{ dB}$                    |
| Expected nominal power setting for full dynamic range | RF1 to RF8 | see general technical specifications |

## Spectrum measurements

|                                                       |             |                                               |
|-------------------------------------------------------|-------------|-----------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                 |             |                                               |
| Filter                                                | NB-IoT, GSM | rectangle 180 kHz                             |
|                                                       | UTRA        | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter |
| Dynamic range                                         |             | $> 50 \text{ dB}$                             |
| Expected nominal power setting for full dynamic range | RF1 to RF8  | see general technical specifications          |

|                                     |  |                     |
|-------------------------------------|--|---------------------|
| <b>Spectrum emission mask (SEM)</b> |  |                     |
| Frequency span                      |  | 4 MHz               |
|                                     |  | $< -45 \text{ dBm}$ |

<sup>16</sup> For frequency error measurements relative to the downlink signal of the same R&S®CMW100, the uncertainty is in line with 3GPP TS 36.521 V14.3.0.

## WCDMA specifications – mobile station (UE) test

|          |          |
|----------|----------|
| Standard | 3GPP FDD |
|----------|----------|

### WCDMA RF generator

|                 |                 |                          |
|-----------------|-----------------|--------------------------|
| Frequency range | WCDMA band 1    | 2112.4 MHz to 2167.6 MHz |
|                 | WCDMA band 2    | 1932.4 MHz to 1987.6 MHz |
|                 | WCDMA band 3    | 1807.4 MHz to 1877.6 MHz |
|                 | WCDMA band 4    | 2112.4 MHz to 2152.6 MHz |
|                 | WCDMA band 5    | 871.4 MHz to 891.6 MHz   |
|                 | WCDMA band 6    | 877.4 MHz to 882.6 MHz   |
|                 | WCDMA band 7    | 2622.4 MHz to 2687.6 MHz |
|                 | WCDMA band 8    | 927.4 MHz to 957.6 MHz   |
|                 | WCDMA band 9    | 1847.4 MHz to 1877.4 MHz |
|                 | WCDMA band 10   | 2112.4 MHz to 2167.6 MHz |
|                 | WCDMA band 11   | 1478.4 MHz to 1498.4 MHz |
|                 | WCDMA band 12   | 730.4 MHz to 743.6 MHz   |
|                 | WCDMA band 13   | 748.4 MHz to 753.6 MHz   |
|                 | WCDMA band 14   | 760.4 MHz to 765.6 MHz   |
|                 | WCDMA band S    | 2182.4 MHz to 2197.6 MHz |
|                 | WCDMA band S170 | 2180 MHz to 2190 MHz     |
|                 | WCDMA band S190 | 2190 MHz to 2200 MHz     |

**WCDMA R&S®WinIQSIM2™ (R&S®CMW-KW400 option),**  
**WCDMA HSDPA R&S®WinIQSIM2™ (R&S®CMW-KW401 option),**  
**WCDMA HSUPA R&S®WinIQSIM2™ (R&S®CMW-KW402 option),**  
**WCDMA HSPA+ R&S®WinIQSIM2™ (R&S®CMW-KW403 option)**

|                          |                                                                          |                                                                 |
|--------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------|
| Arbitrary waveform files | with the R&S®CMW-KW400 option                                            | TM4CPICH.WV (PAR = 8.34 dB),<br>3GPPDEFAULT.WV (PAR = 10.65 dB) |
|                          | with the R&S®CMW-KW400 and<br>R&S®CMW-KW401 options                      | WCDMA_DL_HSDPA.WV<br>(PAR = 10.08 dB)                           |
|                          | with the R&S®CMW-KW400 and<br>R&S®CMW-KW401 and<br>R&S®CMW-KW402 options | WCDMA_DL_HSUPA.WV<br>(PAR = 10.12 dB)                           |

|                          |                                                                                               |                                      |
|--------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------|
| Output level range       | depends on PAR                                                                                | see general technical specifications |
| Output level uncertainty | with the R&S®CMW-KW400 option,<br>waveform file used:<br>3GPPDEFAULT.WV                       | see general technical specifications |
|                          | with the R&S®CMW-KW401 option,<br>waveform file used:<br>WCDMA_DL_HSDPA.WV                    | see general technical specifications |
|                          | with the R&S®CMW-KW402 option,<br>waveform file used:<br>WCDMA_DL_HSUPA.WV                    | see general technical specifications |
|                          | with the R&S®CMW-KW400 and<br>R&S®CMW-KW401 and<br>R&S®CMW-KW402 and<br>R&S®CMW-KW403 options | see general technical specifications |
| Output level resolution  |                                                                                               | see general technical specifications |

|                              |                                                                                               |            |
|------------------------------|-----------------------------------------------------------------------------------------------|------------|
| <b>Signal quality</b>        |                                                                                               |            |
| Error vector magnitude (EVM) | composite EVM,<br>with the R&S®CMW-KW400 option,<br>waveform file used:<br>TM4CPICH.WV        | < 2 %, RMS |
|                              | composite EVM,<br>with the R&S®CMW-KW401 option,<br>waveform file used:<br>WCDMA_DL_HSDPA.WV  | < 2 %, RMS |
|                              | composite EVM,<br>with the R&S®CMW-KW402 option,<br>waveform file used:<br>WCDMA_DL_HSUPA.WV  | < 2 %, RMS |
|                              | with the R&S®CMW-KW400 and<br>R&S®CMW-KW401 and<br>R&S®CMW-KW402 and<br>R&S®CMW-KW403 options | < 2 %, RMS |

## WCDMA RF analyzer (R&S®CMW-KM400, R&S®CMW-KM401, R&S®CMW-KM403 options)

|                 |                 |                          |
|-----------------|-----------------|--------------------------|
| Frequency range | WCDMA band 1    | 1922.4 MHz to 1977.6 MHz |
|                 | WCDMA band 2    | 1852.4 MHz to 1907.6 MHz |
|                 | WCDMA band 3    | 1712.4 MHz to 1782.6 MHz |
|                 | WCDMA band 4    | 1712.4 MHz to 1752.6 MHz |
|                 | WCDMA band 5    | 826.4 MHz to 846.6 MHz   |
|                 | WCDMA band 6    | 832.4 MHz to 837.6 MHz   |
|                 | WCDMA band 7    | 2502.4 MHz to 2567.6 MHz |
|                 | WCDMA band 8    | 882.4 MHz to 912.6 MHz   |
|                 | WCDMA band 9    | 1752.4 MHz to 1782.4 MHz |
|                 | WCDMA band 10   | 1712.4 MHz to 1767.6 MHz |
|                 | WCDMA band 11   | 1430.4 MHz to 1450.4 MHz |
|                 | WCDMA band 12   | 700.4 MHz to 713.6 MHz   |
|                 | WCDMA band 13   | 779.4 MHz to 784.6 MHz   |
|                 | WCDMA band 14   | 790.4 MHz to 795.6 MHz   |
|                 | WCDMA band S    | 2002.4 MHz to 2017.6 MHz |
|                 | WCDMA band S170 | 2010 MHz to 2020 MHz     |
|                 | WCDMA band S190 | 2000 MHz to 2010 MHz     |

|                   |  |                                                       |
|-------------------|--|-------------------------------------------------------|
| <b>Statistics</b> |  |                                                       |
| Statistical count |  | 1 to 1000                                             |
| Values            |  | current, average, minimum/maximum, standard deviation |

|                 |  |                                                                                                                                                                                                                                                                                                 |
|-----------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Trigger</b>  |  |                                                                                                                                                                                                                                                                                                 |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• WCDMA: free run</li> <li>• WCDMA: free run (fast sync)</li> <li>• WCDMA: IF power</li> <li>• WCDMA: DCCH TTI trigger</li> <li>• WCDMA: frame trigger</li> <li>• WCDMA: HS-DPCCH trigger</li> <li>• WCDMA: slot trigger</li> </ul> |

## Modulation analysis

|                            |                                                                    |                                                                                                                                                                                                                |
|----------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>              |                                                                    | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter                                                                                                                                                                  |
| <b>Level range</b>         |                                                                    | -28 dBm to +36 dBm <sup>17</sup>                                                                                                                                                                               |
| <b>Analysis modes</b>      | with the R&S®CMW-KM400 option                                      | QPSK, WCDMA                                                                                                                                                                                                    |
|                            | with the R&S®CMW-KM400 and R&S®CMW-KM401 options                   | WCDMA + HSDPA, WCDMA + HSUPA, WCDMA + HSPA                                                                                                                                                                     |
|                            | with the R&S®CMW-KM400 and R&S®CMW-KM401 and R&S®CMW-KM403 options | WCDMA + HSPA+                                                                                                                                                                                                  |
| <b>Measured parameters</b> | numeric results and standard deviation                             | error vector magnitude (EVM), magnitude error (ME), phase error (PE), frequency error, I/Q origin offset, I/Q imbalance, UE power, power steps, phase discontinuity, CDP, CDE                                  |
|                            | graphical                                                          | EVM versus time, EVM versus chip, ME versus time, ME versus chip, PE versus time, PE versus chip, FE versus time, UE versus time, PS versus slot, PD versus slot, CDP versus slot, CDE versus slot, CD monitor |

|                                     |  |                                         |
|-------------------------------------|--|-----------------------------------------|
| <b>Error vector magnitude (EVM)</b> |  |                                         |
| Measurement range                   |  | up to 25 %, RMS                         |
| Inherent EVM                        |  | < 2.5 %, RMS                            |
| Measurement length                  |  | half-slot, 1 slot, multislot (1 to 120) |

|                                   |  |                                                                   |
|-----------------------------------|--|-------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                   |
| Measurement range                 |  | ±3 kHz                                                            |
| Frequency measurement uncertainty |  | < 20 Hz + drift of timebase, see general technical specifications |

|                          |                                    |          |
|--------------------------|------------------------------------|----------|
| <b>I/Q origin offset</b> |                                    |          |
| Inherent I/Q offset      | for average $\geq 10$ measurements | < -55 dB |

|                        |  |          |
|------------------------|--|----------|
| <b>I/Q imbalance</b>   |  |          |
| Inherent I/Q imbalance |  | < -50 dB |

## Spectrum measurements

|                                                       |                                           |                                               |
|-------------------------------------------------------|-------------------------------------------|-----------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                 | RMS detector                              |                                               |
| Filter                                                |                                           | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter |
| Dynamic range                                         | first adjacent channel at $\pm 5$ MHz     | > 54 dB                                       |
|                                                       | second adjacent channel at $\pm 10$ MHz   | > 57 dB                                       |
| Expected nominal power setting for full dynamic range | RF1 to RF8                                | -4 dBm to +36 dBm <sup>17</sup>               |
| Uncertainty                                           | for -33 dBc first adjacent channel level  | < 0.5 dB                                      |
|                                                       | for -43 dBc second adjacent channel level | < 0.5 dB                                      |
| Measurement length                                    |                                           | 1 slot (2560 chip)                            |

<sup>17</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

**Power meter**

|                             |              |                                         |
|-----------------------------|--------------|-----------------------------------------|
| <b>UE power measurement</b> | RMS detector |                                         |
| Filter                      |              | bandpass, 6.3 MHz, RRC, $\alpha = 0.22$ |
| Level range                 |              | –55 dBm to +36 dBm <sup>18</sup>        |
| Level uncertainty           |              | see general technical specifications    |
| Measurement length          |              | half-slot, 1 slot                       |

|                              |              |                                                                          |
|------------------------------|--------------|--------------------------------------------------------------------------|
| <b>Off power measurement</b> | RMS detector |                                                                          |
| Filter                       |              | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter                            |
| Noise floor                  |              | –72 dBm                                                                  |
| Level uncertainty            |              | see general technical specifications +<br>uncertainty due to noise floor |

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<sup>18</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

# WCDMA specifications – small cell test

## WCDMA RF analyzer (R&S®CMW-KN400)

|                 |                 |                          |
|-----------------|-----------------|--------------------------|
| Frequency range | WCDMA band 1    | 2112.4 MHz to 2167.6 MHz |
|                 | WCDMA band 2    | 1932.4 MHz to 1987.6 MHz |
|                 | WCDMA band 3    | 1807.4 MHz to 1877.6 MHz |
|                 | WCDMA band 4    | 2112.4 MHz to 2152.6 MHz |
|                 | WCDMA band 5    | 871.4 MHz to 891.6 MHz   |
|                 | WCDMA band 6    | 877.4 MHz to 882.6 MHz   |
|                 | WCDMA band 7    | 2622.4 MHz to 2687.6 MHz |
|                 | WCDMA band 8    | 927.4 MHz to 957.6 MHz   |
|                 | WCDMA band 9    | 1847.4 MHz to 1877.4 MHz |
|                 | WCDMA band 10   | 2112.4 MHz to 2167.6 MHz |
|                 | WCDMA band 11   | 1478.4 MHz to 1498.4 MHz |
|                 | WCDMA band 12   | 730.4 MHz to 743.6 MHz   |
|                 | WCDMA band 13   | 748.4 MHz to 753.6 MHz   |
|                 | WCDMA band 14   | 760.4 MHz to 765.6 MHz   |
|                 | WCDMA band S    | 2182.4 MHz to 2197.6 MHz |
|                 | WCDMA band S170 | 2180 MHz to 2190 MHz     |
|                 | WCDMA band S190 | 2190 MHz to 2200 MHz     |

|                   |  |                                                       |
|-------------------|--|-------------------------------------------------------|
| <b>Statistics</b> |  |                                                       |
| Statistical count |  | 1 to 1000                                             |
| Values            |  | current, average, minimum/maximum, standard deviation |

|                 |  |                                                                                                                                                                                                                                                                                                 |
|-----------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Trigger</b>  |  |                                                                                                                                                                                                                                                                                                 |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• WCDMA: free run</li> <li>• WCDMA: free run (fast sync)</li> <li>• WCDMA: IF power</li> <li>• WCDMA: DCCH TTI trigger</li> <li>• WCDMA: frame trigger</li> <li>• WCDMA: HS-DPCCH trigger</li> <li>• WCDMA: slot trigger</li> </ul> |

## Modulation analysis

|                    |  |                                               |
|--------------------|--|-----------------------------------------------|
| <b>Filter</b>      |  | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter |
| <b>Level range</b> |  | -28 dBm to +36 dBm <sup>19</sup>              |

|                            |                                        |                                                                                                                                                                                                             |
|----------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Analysis modes</b>      | with the R&S®CMW-KM400 option          | QPSK, WCDMA                                                                                                                                                                                                 |
| <b>Measured parameters</b> | numeric results and standard deviation | error vector magnitude (EVM),<br>magnitude error (ME),<br>phase error (PE),<br>frequency error,<br>I/Q origin offset,<br>I/Q imbalance,<br>UE power,<br>power steps,<br>phase discontinuity,<br>CDP,<br>CDE |

<sup>19</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|  |           |                                                                                                                                                                                                                                           |
|--|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | graphical | EVM versus time, EVM versus chip,<br>ME versus time, ME versus chip,<br>PE versus time, PE versus chip,<br>FE versus time,<br>UE versus time,<br>PS versus slot,<br>PD versus slot,<br>CDP versus slot,<br>CDE versus slot,<br>CD monitor |
|--|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                     |  |                                          |
|-------------------------------------|--|------------------------------------------|
| <b>Error vector magnitude (EVM)</b> |  |                                          |
| Measurement range                   |  | up to 25 %, RMS                          |
| Inherent EVM                        |  | < 2.5 %, RMS                             |
| Measurement length                  |  | half-slot, 1 slot, multislots (1 to 120) |

|                                   |  |                                                                      |
|-----------------------------------|--|----------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                      |
| Measurement range                 |  | ±3 kHz                                                               |
| Frequency measurement uncertainty |  | < 20 Hz + drift of timebase,<br>see general technical specifications |

|                          |                               |          |
|--------------------------|-------------------------------|----------|
| <b>I/Q origin offset</b> |                               |          |
| Inherent I/Q offset      | for average ≥ 10 measurements | < -52 dB |

|                        |  |          |
|------------------------|--|----------|
| <b>I/Q imbalance</b>   |  |          |
| Inherent I/Q imbalance |  | < -50 dB |

## Spectrum measurements

|                                                       |                                           |                                               |
|-------------------------------------------------------|-------------------------------------------|-----------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                 | RMS detector                              |                                               |
| Filter                                                |                                           | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter |
| Dynamic range                                         | first adjacent channel at ±5 MHz          | > 52 dB                                       |
|                                                       | second adjacent channel at ±10 MHz        | > 52 dB                                       |
| Expected nominal power setting for full dynamic range | RF1 to RF8                                | -4 dBm to +36 dBm <sup>20</sup>               |
| Uncertainty                                           | for -33 dBc first adjacent channel level  | < 0.5 dB                                      |
|                                                       | for -43 dBc second adjacent channel level | < 0.5 dB                                      |
| Measurement length                                    |                                           | 1 slot (2560 chip)                            |

## Power meter

|                             |              |                                         |
|-----------------------------|--------------|-----------------------------------------|
| <b>UE power measurement</b> | RMS detector |                                         |
| Filter                      |              | bandpass, 6.3 MHz, RRC, $\alpha = 0.22$ |
| Level range                 |              | -55 dBm to +36 dBm <sup>20</sup>        |
| Level uncertainty           |              | see general technical specifications    |
| Measurement length          |              | half-slot, 1 slot                       |

|                              |              |                                                                          |
|------------------------------|--------------|--------------------------------------------------------------------------|
| <b>Off power measurement</b> | RMS detector |                                                                          |
| Filter                       |              | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter                            |
| Noise floor                  |              | -72 dBm                                                                  |
| Level uncertainty            |              | see general technical specifications +<br>uncertainty due to noise floor |

<sup>20</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

# LTE specifications – mobile station test

|          |                 |
|----------|-----------------|
| Standard | LTE FDD and TDD |
|----------|-----------------|

## LTE RF generator

|                 |                     |                          |
|-----------------|---------------------|--------------------------|
| Frequency range | E-UTRA band 1, FDD  | 2110 MHz to 2170 MHz     |
|                 | E-UTRA band 2, FDD  | 1930 MHz to 1990 MHz     |
|                 | E-UTRA band 3, FDD  | 1805 MHz to 1880 MHz     |
|                 | E-UTRA band 4, FDD  | 2110 MHz to 2155 MHz     |
|                 | E-UTRA band 5, FDD  | 869 MHz to 894 MHz       |
|                 | E-UTRA band 6, FDD  | 875 MHz to 885 MHz       |
|                 | E-UTRA band 7, FDD  | 2620 MHz to 2690 MHz     |
|                 | E-UTRA band 8, FDD  | 925 MHz to 960 MHz       |
|                 | E-UTRA band 9, FDD  | 1844.9 MHz to 1879.9 MHz |
|                 | E-UTRA band 10, FDD | 2110 MHz to 2170 MHz     |
|                 | E-UTRA band 11, FDD | 1475.9 MHz to 1495.9 MHz |
|                 | E-UTRA band 12, FDD | 729 MHz to 746 MHz       |
|                 | E-UTRA band 13, FDD | 746 MHz to 756 MHz       |
|                 | E-UTRA band 14, FDD | 758 MHz to 768 MHz       |
|                 | E-UTRA band 15, FDD | 2600 MHz to 2620 MHz     |
|                 | E-UTRA band 16, FDD | 2585 MHz to 2600 MHz     |
|                 | E-UTRA band 17, FDD | 734 MHz to 746 MHz       |
|                 | E-UTRA band 18, FDD | 860 MHz to 875 MHz       |
|                 | E-UTRA band 19, FDD | 875 MHz to 890 MHz       |
|                 | E-UTRA band 20, FDD | 791 MHz to 821 MHz       |
|                 | E-UTRA band 21, FDD | 1495.9 MHz to 1510.9 MHz |
|                 | E-UTRA band 22, FDD | 3510 MHz to 3590 MHz     |
|                 | E-UTRA band 23, FDD | 2180 MHz to 2200 MHz     |
|                 | E-UTRA band 24, FDD | 1525 MHz to 1559 MHz     |
|                 | E-UTRA band 25, FDD | 1930 MHz to 1995 MHz     |
|                 | E-UTRA band 26, FDD | 859 MHz to 894 MHz       |
|                 | E-UTRA band 27, FDD | 852 MHz to 869 MHz       |
|                 | E-UTRA band 28, FDD | 758 MHz to 803 MHz       |
|                 | E-UTRA band 29, FDD | 717 MHz to 728 MHz       |
|                 | E-UTRA band 30, FDD | 2350 MHz to 2360 MHz     |
|                 | E-UTRA band 31, FDD | 462.5 MHz to 467.5 MHz   |
|                 | E-UTRA band 33, TDD | 1900 MHz to 1920 MHz     |
|                 | E-UTRA band 34, TDD | 2010 MHz to 2025 MHz     |
|                 | E-UTRA band 35, TDD | 1850 MHz to 1910 MHz     |
|                 | E-UTRA band 36, TDD | 1930 MHz to 1990 MHz     |
|                 | E-UTRA band 37, TDD | 1910 MHz to 1930 MHz     |
|                 | E-UTRA band 38, TDD | 2570 MHz to 2620 MHz     |
|                 | E-UTRA band 39, TDD | 1880 MHz to 1920 MHz     |
|                 | E-UTRA band 40, TDD | 2300 MHz to 2400 MHz     |
|                 | E-UTRA band 41, TDD | 2496 MHz to 2690 MHz     |
|                 | E-UTRA band 42, TDD | 3400 MHz to 3600 MHz     |
|                 | E-UTRA band 43, TDD | 3600 MHz to 3800 MHz     |
|                 | E-UTRA band 44, TDD | 703 MHz to 803 MHz       |

**LTE R&S®WinIQSIM2™ (R&S®CMW-KW500 option)**

|                                 |                                                                                                                                                                                                                  |                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>Arbitrary waveform file</b>  | LTE FDD                                                                                                                                                                                                          | LTE_FDD_QPSK_10MHZ.WV<br>(PAR = 11.15 dB)  |
|                                 | LTE TDD                                                                                                                                                                                                          | LTE_TDD_64QAM_20MHZ.WV<br>(PAR = 11.10 dB) |
| <b>Output level range</b>       | depends on PAR                                                                                                                                                                                                   | see general technical specifications       |
| <b>Output level uncertainty</b> | waveform file used:<br>LTE_FDD_QPSK_10MHZ.WV                                                                                                                                                                     | see general technical specifications       |
|                                 | waveform file used:<br>LTE_TDD_64QAM_20MHZ.WV                                                                                                                                                                    | see general technical specifications       |
| <b>Output level resolution</b>  |                                                                                                                                                                                                                  | see general technical specifications       |
| <b>Signal quality</b>           |                                                                                                                                                                                                                  |                                            |
| Error vector magnitude (EVM)    | EVM PDSCH QPSK,<br>bandwidth = 10 MHz, 50 resource blocks,<br>PRB symbol offset = 3, 10 subframes,<br>PCFICH present,<br>waveform file used:<br>LTE_FDD_QPSK_10MHZ.WV                                            | < 2 %, RMS                                 |
|                                 | EVM PDSCH 64QAM,<br>bandwidth = 20 MHz, 100 resource blocks,<br>PRB symbol offset = 2, uplink/downlink<br>configuration 1, special subframe<br>configuration 7,<br>waveform file used:<br>LTE_TDD_64QAM_20MHZ.WV | < 2 %, RMS                                 |

**LTE FDD RF analyzer (R&S®CMW-KM500 option)**

|                        |                     |                                                  |
|------------------------|---------------------|--------------------------------------------------|
| <b>Bandwidth</b>       |                     | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz,<br>20 MHz |
| <b>Frequency range</b> | E-UTRA band 1, FDD  | 1920 MHz to 1980 MHz                             |
|                        | E-UTRA band 2, FDD  | 1850 MHz to 1910 MHz                             |
|                        | E-UTRA band 3, FDD  | 1710 MHz to 1785 MHz                             |
|                        | E-UTRA band 4, FDD  | 1710 MHz to 1755 MHz                             |
|                        | E-UTRA band 5, FDD  | 824 MHz to 849 MHz                               |
|                        | E-UTRA band 6, FDD  | 830 MHz to 840 MHz                               |
|                        | E-UTRA band 7, FDD  | 2500 MHz to 2570 MHz                             |
|                        | E-UTRA band 8, FDD  | 880 MHz to 915 MHz                               |
|                        | E-UTRA band 9, FDD  | 1749.9 MHz 1784.9 MHz                            |
|                        | E-UTRA band 10, FDD | 1710 MHz to 1770 MHz                             |
|                        | E-UTRA band 11, FDD | 1427.9 MHz to 1447.9 MHz                         |
|                        | E-UTRA band 12, FDD | 699 MHz to 716 MHz                               |
|                        | E-UTRA band 13, FDD | 777 MHz to 787 MHz                               |
|                        | E-UTRA band 14, FDD | 788 MHz to 798 MHz                               |
|                        | E-UTRA band 15, FDD | 1900 MHz to 1920 MHz                             |
|                        | E-UTRA band 16, FDD | 2010 MHz to 2025 MHz                             |
|                        | E-UTRA band 17, FDD | 704 MHz to 716 MHz                               |
|                        | E-UTRA band 18, FDD | 815 MHz to 830 MHz                               |
|                        | E-UTRA band 19, FDD | 830 MHz to 845 MHz                               |
|                        | E-UTRA band 20, FDD | 832 MHz to 862 MHz                               |
|                        | E-UTRA band 21, FDD | 1447.9 MHz to 1462.9 MHz                         |
|                        | E-UTRA band 22, FDD | 3410 MHz to 3490 MHz                             |
|                        | E-UTRA band 23, FDD | 2000 MHz to 2020 MHz                             |
|                        | E-UTRA band 24, FDD | 1625.5 MHz to 1660.5 MHz                         |
|                        | E-UTRA band 25, FDD | 1850 MHz to 1915 MHz                             |
|                        | E-UTRA band 26, FDD | 814 MHz to 849 MHz                               |
|                        | E-UTRA band 27, FDD | 807 MHz to 824 MHz                               |
|                        | E-UTRA band 28, FDD | 703 MHz to 748 MHz                               |
|                        | E-UTRA band 30, FDD | 2305 MHz to 2315 MHz                             |
|                        | E-UTRA band 31, FDD | 452.5 MHz to 457.5 MHz                           |
| <b>Level setting</b>   |                     | manual mode                                      |

|                   |  |                                                                                                                             |
|-------------------|--|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Statistics</b> |  |                                                                                                                             |
| Statistical count |  | 1 to 1000                                                                                                                   |
| Values            |  | current, average, minimum/maximum, standard deviation                                                                       |
| <b>Trigger</b>    |  |                                                                                                                             |
| Trigger sources   |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• LTE: free run (fast sync)</li> <li>• LTE: IF power</li> </ul> |

## Power measurement

|                   |              |                                      |
|-------------------|--------------|--------------------------------------|
| <b>Slot power</b> | RMS detector |                                      |
| Level range       |              | –50 dBm to +30 dBm, RMS              |
| Level uncertainty |              | see general technical specifications |

## Modulation analysis

|                            |                 |                                                                                                                                                                 |
|----------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b> | numeric results | error vector magnitude (EVM), magnitude error (ME), phase error (PE), frequency error, I/Q origin offset, TX power, peak power, resource block power (RB power) |
|                            | graphical       | EVM versus SC-FDMA symbol, ME versus SC-FDMA symbol, PE versus SC-FDMA symbol, EVM versus subcarrier, in-band emissions, spectrum flatness, I/Q constellation   |

|                                     |                                                |                 |
|-------------------------------------|------------------------------------------------|-----------------|
| <b>Error vector magnitude (EVM)</b> |                                                |                 |
| Inherent EVM                        | allocated resource blocks $\leq 15$            |                 |
|                                     | –34 dBm $\leq$ input level $< +30$ dBm, RMS    | $< 1\%$ , RMS   |
|                                     | –38 dBm $\leq$ input level $< -34$ dBm, RMS    | $< 1.5\%$ , RMS |
|                                     | allocated resource blocks $\leq 50$            |                 |
|                                     | –30 dBm $\leq$ input level $\leq +30$ dBm, RMS | $< 1\%$ , RMS   |
|                                     | –38 dBm $\leq$ input level $< -30$ dBm, RMS    | $< 2\%$ , RMS   |
|                                     | allocated resource blocks $\leq 100$           |                 |
|                                     | –28 dBm $\leq$ input level $\leq +30$ dBm, RMS | $< 1\%$ , RMS   |
|                                     | –38 dBm $\leq$ input level $< -28$ dBm, RMS    | $< 2.5\%$ , RMS |

|                                   |  |                                                                                   |
|-----------------------------------|--|-----------------------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                                   |
| Measurement range                 |  | $\pm 80$ kHz                                                                      |
| Frequency measurement uncertainty |  | $< 20$ Hz <sup>21</sup> + drift of timebase, see general technical specifications |

|                          |                                    |            |
|--------------------------|------------------------------------|------------|
| <b>I/Q origin offset</b> |                                    |            |
| Inherent I/Q offset      | for average $\geq 10$ measurements | $< -50$ dB |

|                                                       |                                                           |                                      |
|-------------------------------------------------------|-----------------------------------------------------------|--------------------------------------|
| <b>In-band emissions</b>                              |                                                           |                                      |
| Dynamic range                                         | allocated resource blocks $\leq 50$ , $f_{RF} < 3300$ MHz | $> 50$ dB                            |
|                                                       | allocated resource blocks $\leq 50$ , $f_{RF} > 3300$ MHz | $> 47$ dB                            |
| Expected nominal power setting for full dynamic range | RF1 to RF8                                                | see general technical specifications |

|                                    |                                     |            |
|------------------------------------|-------------------------------------|------------|
| <b>Equalizer spectrum flatness</b> |                                     |            |
| Level uncertainty                  | allocated resource blocks $\leq 50$ | $< 0.5$ dB |

<sup>21</sup> For frequency error measurements relative to the downlink signal of the same R&S®CMW100, the uncertainty is in line with 3GPP TS 36.521-1 V9.3.0.

**Spectrum measurements**

|                                                       |                             |                                                               |
|-------------------------------------------------------|-----------------------------|---------------------------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                 |                             |                                                               |
| Filter                                                | E-UTRA                      | rectangle 1.08 MHz, 2.7 MHz, 4.5 MHz, 9 MHz, 13.5 MHz, 18 MHz |
|                                                       | UTRA                        | 3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter                 |
| Dynamic range                                         | E-UTRA, $f_{RF} < 3300$ MHz | > 45 dB                                                       |
|                                                       | E-UTRA, $f_{RF} > 3300$ MHz | > 42 dB                                                       |
|                                                       | UTRA, $f_{RF} < 3300$ MHz   | > 52 dB                                                       |
|                                                       | UTRA, $f_{RF} > 3300$ MHz   | > 49 dB                                                       |
| Expected nominal power setting for full dynamic range | RF1 to RF8                  | see general technical specifications                          |

|                                     |                                   |           |
|-------------------------------------|-----------------------------------|-----------|
| <b>Spectrum emission mask (SEM)</b> |                                   |           |
| Frequency span                      |                                   | 70 MHz    |
| Noise floor                         | RBW: 1 MHz, $f_{RF} < 3300$ MHz   | < -35 dBm |
|                                     | RBW: 1 MHz, $f_{RF} > 3300$ MHz   | < -32 dBm |
|                                     | RBW: 100 kHz, $f_{RF} < 3300$ MHz | < -40 dBm |
|                                     | RBW: 100 kHz, $f_{RF} > 3300$ MHz | < -37 dBm |
|                                     | RBW: 30 kHz, $f_{RF} < 3300$ MHz  | < -45 dBm |
|                                     | RBW: 30 kHz, $f_{RF} > 3300$ MHz  | < -42 dBm |

**LTE TDD RF analyzer (R&S®CMW-KM550 option)**

|                  |  |                                               |
|------------------|--|-----------------------------------------------|
| <b>Bandwidth</b> |  | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz |
|------------------|--|-----------------------------------------------|

|                        |                     |                      |
|------------------------|---------------------|----------------------|
| <b>Frequency range</b> | E-UTRA band 33, TDD | 1900 MHz to 1920 MHz |
|                        | E-UTRA band 34, TDD | 2010 MHz to 2025 MHz |
|                        | E-UTRA band 35, TDD | 1850 MHz to 1910 MHz |
|                        | E-UTRA band 36, TDD | 1930 MHz to 1990 MHz |
|                        | E-UTRA band 37, TDD | 1910 MHz to 1930 MHz |
|                        | E-UTRA band 38, TDD | 2570 MHz to 2620 MHz |
|                        | E-UTRA band 39, TDD | 1880 MHz to 1920 MHz |
|                        | E-UTRA band 40, TDD | 2300 MHz to 2400 MHz |
|                        | E-UTRA band 41, TDD | 2496 MHz to 2690 MHz |
|                        | E-UTRA band 42, TDD | 3400 MHz to 3600 MHz |
|                        | E-UTRA band 43, TDD | 3600 MHz to 3800 MHz |
|                        | E-UTRA band 44, TDD | 703 MHz to 803 MHz   |
| <b>Level setting</b>   |                     | manual mode          |

|                   |  |                                                       |
|-------------------|--|-------------------------------------------------------|
| <b>Statistics</b> |  |                                                       |
| Statistical count |  | 1 to 1000                                             |
| Values            |  | current, average, minimum/maximum, standard deviation |

|                 |  |                                                                                                                             |
|-----------------|--|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Trigger</b>  |  |                                                                                                                             |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• LTE: free run (fast sync)</li> <li>• LTE: IF power</li> </ul> |

**Power measurement**

|                   |              |                                      |
|-------------------|--------------|--------------------------------------|
| <b>Slot power</b> | RMS detector |                                      |
| Level range       |              | -50 dBm to +30 dBm, RMS              |
| Level uncertainty |              | see general technical specifications |

## Modulation analysis

|                            |                 |                                                                                                                                                                                      |
|----------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b> | numeric results | error vector magnitude (EVM),<br>magnitude error (ME),<br>phase error (PE),<br>frequency error,<br>I/Q origin offset,<br>TX power,<br>peak power,<br>resource block power (RB power) |
|                            | graphical       | EVM versus SC-FDMA symbol,<br>ME versus SC-FDMA symbol,<br>PE versus SC-FDMA symbol,<br>EVM versus subcarrier,<br>in-band emissions,<br>spectrum flatness,<br>I/Q constellation      |

|                                     |                                                                      |                  |
|-------------------------------------|----------------------------------------------------------------------|------------------|
| <b>Error vector magnitude (EVM)</b> |                                                                      |                  |
| Inherent EVM                        | allocated resource blocks $\leq 15$                                  |                  |
|                                     | $-34 \text{ dBm} \leq \text{input level} < +30 \text{ dBm}$ , RMS    | $< 1 \%$ , RMS   |
|                                     | $-38 \text{ dBm} \leq \text{input level} < -34 \text{ dBm}$ , RMS    | $< 1.5 \%$ , RMS |
|                                     | allocated resource blocks $\leq 50$                                  |                  |
|                                     | $-30 \text{ dBm} \leq \text{input level} \leq +30 \text{ dBm}$ , RMS | $< 1 \%$ , RMS   |
|                                     | $-38 \text{ dBm} \leq \text{input level} < -30 \text{ dBm}$ , RMS    | $< 2 \%$ , RMS   |
|                                     | allocated resource blocks $\leq 100$                                 |                  |
|                                     | $-28 \text{ dBm} \leq \text{input level} \leq +30 \text{ dBm}$ , RMS | $< 1 \%$ , RMS   |
|                                     | $-38 \text{ dBm} \leq \text{input level} < -28 \text{ dBm}$ , RMS    | $< 2.5 \%$ , RMS |

|                                   |  |                                                                                     |
|-----------------------------------|--|-------------------------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                                     |
| Measurement range                 |  | $\pm 80 \text{ kHz}$                                                                |
| Frequency measurement uncertainty |  | $< 20 \text{ Hz}^{22}$ + drift of timebase,<br>see general technical specifications |

|                          |  |                    |
|--------------------------|--|--------------------|
| <b>I/Q origin offset</b> |  |                    |
| Inherent I/Q offset      |  | $< -50 \text{ dB}$ |

|                          |                                                                             |                                      |
|--------------------------|-----------------------------------------------------------------------------|--------------------------------------|
| <b>In-band emissions</b> |                                                                             |                                      |
| Dynamic range            | allocated resource blocks $\leq 50$ ,<br>$f_{\text{RF}} < 3300 \text{ MHz}$ | $> 50 \text{ dB}$                    |
|                          | allocated resource blocks $\leq 50$ ,<br>$f_{\text{RF}} > 3300 \text{ MHz}$ | $> 47 \text{ dB}$                    |
|                          | Expected nominal power setting for full dynamic range                       | see general technical specifications |

|                                    |                                     |                    |
|------------------------------------|-------------------------------------|--------------------|
| <b>Equalizer spectrum flatness</b> |                                     |                    |
| Level uncertainty                  | allocated resource blocks $\leq 50$ | $< 0.5 \text{ dB}$ |

<sup>22</sup> For frequency error measurements relative to the downlink signal of the same R&S®CMW100, the uncertainty is in line with 3GPP TS 36.521-1 V9.3.0.

**Spectrum measurements**

|                                                       |                             |                                                               |
|-------------------------------------------------------|-----------------------------|---------------------------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                 |                             |                                                               |
| Filter                                                | E-UTRA                      | rectangle 1.08 MHz, 2.7 MHz, 4.5 MHz, 9 MHz, 13.5 MHz, 18 MHz |
|                                                       | UTRA                        | 1.28 MHz, RRC, $\alpha = 0.22$ , WCDMA filter                 |
| Dynamic range                                         | E-UTRA, $f_{RF} < 3300$ MHz | > 45 dB                                                       |
|                                                       | E-UTRA, $f_{RF} > 3300$ MHz | > 42 dB                                                       |
|                                                       | UTRA, $f_{RF} < 3300$ MHz   | > 56 dB                                                       |
|                                                       | UTRA, $f_{RF} > 3300$ MHz   | > 53 dB                                                       |
| Expected nominal power setting for full dynamic range | RF1 to RF8                  | see general technical specifications                          |

|                                     |                                   |           |
|-------------------------------------|-----------------------------------|-----------|
| <b>Spectrum emission mask (SEM)</b> |                                   |           |
| Frequency span                      |                                   | 70 MHz    |
| Noise floor                         | RBW: 1 MHz, $f_{RF} < 3300$ MHz   | < -35 dBm |
|                                     | RBW: 1 MHz, $f_{RF} > 3300$ MHz   | < -32 dBm |
|                                     | RBW: 100 kHz, $f_{RF} < 3300$ MHz | < -40 dBm |
|                                     | RBW: 100 kHz, $f_{RF} > 3300$ MHz | < -37 dBm |
|                                     | RBW: 30 kHz, $f_{RF} < 3300$ MHz  | < -45 dBm |
|                                     | RBW: 30 kHz, $f_{RF} > 3300$ MHz  | < -42 dBm |

## LTE specifications – small cell test

|          |                 |
|----------|-----------------|
| Standard | LTE FDD and TDD |
|----------|-----------------|

### LTE FDD eNodeB RF analyzer (R&S® CMW-KN500 option)

|           |                                               |
|-----------|-----------------------------------------------|
| Bandwidth | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz |
|-----------|-----------------------------------------------|

|                 |                     |                          |
|-----------------|---------------------|--------------------------|
| Frequency range | E-UTRA band 1, FDD  | 2110 MHz to 2170 MHz     |
|                 | E-UTRA band 2, FDD  | 1930 MHz to 1990 MHz     |
|                 | E-UTRA band 3, FDD  | 1805 MHz to 1880 MHz     |
|                 | E-UTRA band 4, FDD  | 2110 MHz to 2155 MHz     |
|                 | E-UTRA band 5, FDD  | 869 MHz to 894 MHz       |
|                 | E-UTRA band 6, FDD  | 875 MHz to 885 MHz       |
|                 | E-UTRA band 7, FDD  | 2620 MHz to 2690 MHz     |
|                 | E-UTRA band 8, FDD  | 925 MHz to 960 MHz       |
|                 | E-UTRA band 9, FDD  | 1844.9 MHz to 1879.9 MHz |
|                 | E-UTRA band 10, FDD | 2110 MHz to 2170 MHz     |
|                 | E-UTRA band 11, FDD | 1475.9 MHz to 1495.9 MHz |
|                 | E-UTRA band 12, FDD | 729 MHz to 746 MHz       |
|                 | E-UTRA band 13, FDD | 746 MHz to 756 MHz       |
|                 | E-UTRA band 14, FDD | 758 MHz to 768 MHz       |
|                 | E-UTRA band 15, FDD | 2600 MHz to 2620 MHz     |
|                 | E-UTRA band 16, FDD | 2585 MHz to 2600 MHz     |
|                 | E-UTRA band 17, FDD | 734 MHz to 746 MHz       |
|                 | E-UTRA band 18, FDD | 860 MHz to 875 MHz       |
|                 | E-UTRA band 19, FDD | 875 MHz to 890 MHz       |
|                 | E-UTRA band 20, FDD | 791 MHz to 821 MHz       |
|                 | E-UTRA band 21, FDD | 1495.9 MHz to 1510.9 MHz |
|                 | E-UTRA band 22, FDD | 3510 MHz to 3590 MHz     |
|                 | E-UTRA band 23, FDD | 2180 MHz to 2200 MHz     |
|                 | E-UTRA band 24, FDD | 1525 MHz to 1559 MHz     |
|                 | E-UTRA band 25, FDD | 1930 MHz to 1995 MHz     |
|                 | E-UTRA band 26, FDD | 859 MHz to 894 MHz       |
|                 | E-UTRA band 27, FDD | 852 MHz to 869 MHz       |
|                 | E-UTRA band 28, FDD | 758 MHz to 803 MHz       |
|                 | E-UTRA band 29, FDD | 717 MHz to 728 MHz       |
|                 | E-UTRA band 30, FDD | 2350 MHz to 2360 MHz     |
|                 | E-UTRA band 31, FDD | 462.5 MHz to 467.5 MHz   |
| Level setting   | manual mode         |                          |

|                   |  |                                                       |
|-------------------|--|-------------------------------------------------------|
| Statistics        |  |                                                       |
| Statistical count |  | 1 to 1000                                             |
| Values            |  | current, average, minimum/maximum, standard deviation |

|                 |  |                                                                                                                             |
|-----------------|--|-----------------------------------------------------------------------------------------------------------------------------|
| Trigger         |  |                                                                                                                             |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• LTE: free run (fast sync)</li> <li>• LTE: IF power</li> </ul> |

### Power measurement

|                   |              |                                      |
|-------------------|--------------|--------------------------------------|
| Slot power        | RMS detector |                                      |
| Level range       |              | –50 dBm to +30 dBm, RMS              |
| Level uncertainty |              | see general technical specifications |

## Modulation analysis

|                     |                 |                                                                                                                                                                                                   |
|---------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measured parameters | numeric results | error vector magnitude (EVM),<br>magnitude error (ME),<br>phase error (PE),<br>frequency error,<br>I/Q origin offset,<br>TX power,<br>peak power,<br>reference symbol power,<br>OFDM symbol power |
|                     | graphical       | EVM versus OFDMA symbol,<br>ME versus OFDMA symbol,<br>PE versus OFDMA symbol,<br>OFDM symbol power<br>spectrum flatness,<br>spectrum ACLR<br>I/Q constellation                                   |

|                                     |                                                                                 |              |
|-------------------------------------|---------------------------------------------------------------------------------|--------------|
| <b>Error vector magnitude (EVM)</b> |                                                                                 |              |
| Inherent EVM                        | for average $\geq 10$ subframes<br>–20 dBm $\leq$ input level < +30 dBm,<br>RMS | < 1.5 %, RMS |

|                                   |  |                                                                                    |
|-----------------------------------|--|------------------------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                                    |
| Measurement range                 |  | $\pm 80$ kHz                                                                       |
| Frequency measurement uncertainty |  | < 20 Hz <sup>23</sup> + drift of timebase,<br>see general technical specifications |

## Spectrum measurements

|                                                          |                              |                                                                                                                                                 |
|----------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                    |                              |                                                                                                                                                 |
| Filter                                                   | E-UTRA                       | rectangle 1.08 MHz, 2.7 MHz, 4.5 MHz,<br>9 MHz, 13.5 MHz, 18 MHz                                                                                |
|                                                          | UTRA                         | 1.28 MHz, RRC, $\alpha = 0.22$ , WCDMA filter<br>3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter<br>7.68 MHz, RRC, $\alpha = 0.22$ , WCDMA filter |
| Dynamic range                                            | E-UTRA, $f_{RF} < 3300$ MHz  | > 50 dB                                                                                                                                         |
|                                                          | E-UTRA, $f_{RF} > 3300$ MHz  | > 48 dB                                                                                                                                         |
|                                                          | UTRA384, $f_{RF} < 3300$ MHz | > 52 dB                                                                                                                                         |
|                                                          | UTRA384, $f_{RF} > 3300$ MHz | > 52 dB                                                                                                                                         |
| Expected nominal power setting for full<br>dynamic range | RF1 to RF8                   | see general technical specifications                                                                                                            |

|                                     |                                                                           |           |
|-------------------------------------|---------------------------------------------------------------------------|-----------|
| <b>Spectrum emission mask (SEM)</b> |                                                                           |           |
| Frequency span                      |                                                                           | 70 MHz    |
| Noise floor                         | RBW $\leq 1$ MHz, expected nominal power<br>< 12 dBm, $f_{RF} < 3300$ MHz | < –58 dBm |
|                                     | RBW $\leq 1$ MHz, expected nominal power<br>< 12 dBm, $f_{RF} > 3300$ MHz | < –55 dBm |

<sup>23</sup> For frequency error measurements relative to the downlink signal of the same R&S®CMW100, the uncertainty is in line with 3GPP TS 36.521-1 V9.3.0.

## LTE TDD eNodeB RF analyzer (R&S®CMW-KN550 option)

|                        |                      |                                                                                                                             |
|------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Bandwidth</b>       |                      | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                                               |
| <b>Frequency range</b> | E-UTRA band 33, TDD  | 1900 MHz to 1920 MHz                                                                                                        |
|                        | E-UTRA band 34, TDD  | 2010 MHz to 2025 MHz                                                                                                        |
|                        | E-UTRA band 35, TDD  | 1850 MHz to 1910 MHz                                                                                                        |
|                        | E-UTRA band 36, TDD  | 1930 MHz to 1990 MHz                                                                                                        |
|                        | E-UTRA band 37, TDD  | 1910 MHz to 1930 MHz                                                                                                        |
|                        | E-UTRA band 38, TDD  | 2570 MHz to 2620 MHz                                                                                                        |
|                        | E-UTRA band 39, TDD  | 1880 MHz to 1920 MHz                                                                                                        |
|                        | E-UTRA band 40, TDD  | 2300 MHz to 2400 MHz                                                                                                        |
|                        | E-UTRA band 41, TDD  | 2496 MHz to 2690 MHz                                                                                                        |
|                        | E-UTRA band 42, TDD, | 3400 MHz to 3600 MHz                                                                                                        |
|                        | E-UTRA band 43, TDD, | 3600 MHz to 3800 MHz                                                                                                        |
|                        | E-UTRA band 44, TDD  | 703 MHz to 803 MHz                                                                                                          |
| <b>Level setting</b>   |                      | manual mode                                                                                                                 |
| <b>Statistics</b>      |                      |                                                                                                                             |
| Statistical count      |                      | 1 to 1000                                                                                                                   |
| Values                 |                      | current, average, minimum/maximum, standard deviation                                                                       |
| <b>Trigger</b>         |                      |                                                                                                                             |
| Trigger sources        |                      | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• LTE: free run (fast sync)</li> <li>• LTE: IF power</li> </ul> |

### Power measurement

|                   |              |                                      |
|-------------------|--------------|--------------------------------------|
| <b>Slot power</b> | RMS detector |                                      |
| Level range       |              | –50 dBm to +30 dBm, RMS              |
| Level uncertainty |              | see general technical specifications |

### Modulation analysis

|                                     |                                           |                                                                                                                                                                           |
|-------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b>          | numeric results                           | error vector magnitude (EVM), magnitude error (ME), phase error (PE), frequency error, I/Q origin offset, TX power, peak power, reference symbol power, OFDM symbol power |
|                                     | graphical                                 | EVM versus OFDMA symbol, ME versus OFDMA symbol, PE versus OFDMA symbol, OFDM symbol power, spectrum flatness, spectrum ACLR, I/Q constellation                           |
| <b>Error vector magnitude (EVM)</b> |                                           |                                                                                                                                                                           |
| Inherent EVM                        | for average $\geq 10$ subframes           |                                                                                                                                                                           |
|                                     | –20 dBm $\leq$ input level < +30 dBm, RMS | < 1.5 %, RMS                                                                                                                                                              |

|                                   |  |                                                                                    |
|-----------------------------------|--|------------------------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                                    |
| Measurement range                 |  | ±80 kHz                                                                            |
| Frequency measurement uncertainty |  | < 20 Hz <sup>24</sup> + drift of timebase,<br>see general technical specifications |

## Spectrum measurements

|                                                          |                                                                      |                                                                                                                                                 |
|----------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                    |                                                                      |                                                                                                                                                 |
| Filter                                                   | E-UTRA                                                               | rectangle 1.08 MHz, 2.7 MHz, 4.5 MHz,<br>9 MHz, 13.5 MHz, 18 MHz                                                                                |
|                                                          | UTRA                                                                 | 1.28 MHz, RRC, $\alpha = 0.22$ , WCDMA filter<br>3.84 MHz, RRC, $\alpha = 0.22$ , WCDMA filter<br>7.68 MHz, RRC, $\alpha = 0.22$ , WCDMA filter |
| Dynamic range                                            | E-UTRA, $f_{RF} < 3300$ MHz                                          | > 50 dB                                                                                                                                         |
|                                                          | E-UTRA, $f_{RF} > 3300$ MHz                                          | > 47 dB                                                                                                                                         |
|                                                          | UTRA128, $f_{RF} < 3300$ MHz                                         | > 52 dB                                                                                                                                         |
|                                                          | UTRA384, $f_{RF} < 3300$ MHz                                         | > 52 dB                                                                                                                                         |
|                                                          | UTRA768, $f_{RF} < 3300$ MHz                                         | > 49 dB                                                                                                                                         |
|                                                          | UTRA128, $f_{RF} > 3300$ MHz                                         | > 52 dB                                                                                                                                         |
|                                                          | UTRA384 1, $f_{RF} > 3300$ MHz                                       | > 50 dB                                                                                                                                         |
|                                                          | UTRA384 2, $f_{RF} > 3300$ MHz                                       | > 52 dB                                                                                                                                         |
| Expected nominal power setting for full<br>dynamic range | RF1 to RF8                                                           | see general technical specifications                                                                                                            |
| <b>Spectrum emission mask (SEM)</b>                      |                                                                      |                                                                                                                                                 |
| Frequency span                                           |                                                                      | 70 MHz                                                                                                                                          |
| Noise floor                                              | RBW ≤ 1 MHz, expected nominal power<br>< 12 dBm, $f_{RF} < 3300$ MHz | < -58 dBm                                                                                                                                       |
|                                                          | RBW ≤ 1 MHz, expected nominal power<br>< 12 dBm, $f_{RF} > 3300$ MHz | < -55 dBm                                                                                                                                       |

<sup>24</sup> For frequency error measurements relative to the downlink signal of the same R&S®CMW100, the uncertainty is in line with 3GPP TS 36.521-1 V9.3.0.

## Bluetooth® specifications

|          |               |                                                                                                                             |
|----------|---------------|-----------------------------------------------------------------------------------------------------------------------------|
| Standard | standard      | Bluetooth® Core Specification Version 5.0                                                                                   |
|          | test standard | Radio Frequency Bluetooth® Test Specification RF.TS.5.0.0, Low Energy RF PHY Bluetooth® Test Specification, RF-PHY.TS.5.0.0 |

## Bluetooth® RF generator

|                 |            |                      |
|-----------------|------------|----------------------|
| Frequency range | Bluetooth® | 2402 MHz to 2480 MHz |
|-----------------|------------|----------------------|

### Bluetooth® R&S®WinIQSIM2™ (R&S®CMW-KW610 option)

|                         |                          |                                                           |
|-------------------------|--------------------------|-----------------------------------------------------------|
| Arbitrary waveform file | basic rate               | BLUETOOTH_11110000_DH5.WV<br>LAP: 123456, (PAR = 0.00 dB) |
|                         | enhanced data rate (EDR) | BLUETOOTH_PRBS9_3-DH5.WV<br>LAP: 123456, (PAR = 3.20 dB)  |

|                          |                                                                                |                                      |
|--------------------------|--------------------------------------------------------------------------------|--------------------------------------|
| Output level range       | depends on PAR                                                                 | see general technical specifications |
| Output level uncertainty | waveform files used:<br>BLUETOOTH_11110000_DH5.WV,<br>BLUETOOTH_PRBS9_3-DH5.WV | see general technical specifications |
| Output level resolution  |                                                                                | see general technical specifications |

|                                            |                                                                                                                     |              |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------|
| Signal quality                             |                                                                                                                     |              |
| Modulation index uncertainty               | basic rate,<br>frequency deviation $\Delta f_1$ max. = 160 kHz,<br>waveform file used:<br>BLUETOOTH_11110000_DH5.WV | < 1 %        |
| Differential error vector magnitude (DEVm) | enhanced data rate,<br>waveform file used:<br>BLUETOOTH_PRBS9_3-DH5.WV                                              | < 1.5 %, RMS |

## Bluetooth® RF analyzer (R&S®CMW-KM610 option)

|                 |            |                      |
|-----------------|------------|----------------------|
| Frequency range | Bluetooth® | 2402 MHz to 2480 MHz |
|-----------------|------------|----------------------|

|                   |  |                                                           |
|-------------------|--|-----------------------------------------------------------|
| Statistics        |  |                                                           |
| Statistical count |  | 1 to 1000                                                 |
| Values            |  | current, average, maximum, minimum,<br>standard deviation |

|                |  |                      |
|----------------|--|----------------------|
| Trigger        |  |                      |
| Trigger source |  | Bluetooth®: IF power |

## Modulation analysis

|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>                                                                                  | filter bandwidth: wide                                                                                                                                           | 2.0 MHz bandpass                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                | filter bandwidth: narrow                                                                                                                                         | 1.3 MHz bandpass                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Level range</b>                                                                             |                                                                                                                                                                  | –35 dBm to +36 dBm <sup>25</sup>                                                                                                                                                                                                                                                                                                                                                      |
| <b>Supported packet types</b>                                                                  | basic rate                                                                                                                                                       | DH1, DH3, DH5                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                | enhanced data rate (EDR)                                                                                                                                         | 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5                                                                                                                                                                                                                                                                                                                                              |
| <b>Measured parameters</b>                                                                     | basic rate,<br>numeric results and standard deviation                                                                                                            | $\Delta f_2$ 99.9 %,<br>frequency accuracy,<br>frequency drift,<br>maximum drift rate,<br>frequency deviation $\Delta f_1$ average,<br>frequency deviation $\Delta f_1$ minimum,<br>frequency deviation $\Delta f_1$ maximum,<br>frequency deviation $\Delta f_2$ average,<br>frequency deviation $\Delta f_2$ minimum,<br>frequency deviation $\Delta f_2$ maximum,<br>nominal power |
| <b>Measured parameters</b>                                                                     | enhanced data rate (EDR),<br>numeric results and standard deviation                                                                                              | 99 % DEVM,<br>frequency stability $\omega_i$ ,<br>frequency stability $(\omega_o + \omega_i)_{\max}$ ,<br>frequency stability $\omega_{o \max}$ ,<br>RMS DEVM,<br>peak RMS,<br>nominal power                                                                                                                                                                                          |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Total measurement range for frequency accuracy, frequency deviation and frequency drift</b> | basic rate                                                                                                                                                       | ±250 kHz                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Frequency accuracy</b>                                                                      | basic rate                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                       |
| Measurement range                                                                              | for nominal deviation of 160 kHz                                                                                                                                 | ±100 kHz                                                                                                                                                                                                                                                                                                                                                                              |
| Uncertainty                                                                                    | for deviation ≤ 160 kHz                                                                                                                                          | < 2 kHz                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Frequency deviation</b>                                                                     | basic rate                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                       |
| Measurement range                                                                              | without frequency offset                                                                                                                                         | ≤ 210 kHz                                                                                                                                                                                                                                                                                                                                                                             |
| Uncertainty                                                                                    | for modulation index 0.22 to 0.42                                                                                                                                | < 1 %                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Frequency drift</b>                                                                         | basic rate                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                       |
| Measurement range                                                                              |                                                                                                                                                                  | ±50 kHz                                                                                                                                                                                                                                                                                                                                                                               |
| Uncertainty                                                                                    | measured in burst relative to frequency offset in preamble, with 10101010 pattern referenced to measured frequency offset in preamble (relative frequency drift) | < 2 kHz                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                |                                                                                                                                                                  | ≤ 1 kHz                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Frequency stability <math>\omega_i</math></b>                                               | enhanced data rate                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                       |
| Measurement range                                                                              |                                                                                                                                                                  | ±100 kHz                                                                                                                                                                                                                                                                                                                                                                              |
| Uncertainty                                                                                    | for $\omega_i \leq 75$ kHz, for deviation ≤ 160 kHz                                                                                                              | < 2 kHz                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Frequency stability <math>\omega_{o \max}</math></b>                                        | enhanced data rate                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                       |
| Measurement range                                                                              |                                                                                                                                                                  | ±15 kHz                                                                                                                                                                                                                                                                                                                                                                               |
| Uncertainty                                                                                    | for $\omega_o \leq 10$ kHz                                                                                                                                       | < 1 kHz                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Differential error vector magnitude (DEVM)</b>                                              | enhanced data rate                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                       |
| Inherent DEVM                                                                                  | for PRBS pattern                                                                                                                                                 | < 1.5 %, RMS;<br>< 3.0 %, peak                                                                                                                                                                                                                                                                                                                                                        |

<sup>25</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## Bluetooth® RF analyzer (R&S®CMW-KM611 option)

|                        |            |                                                        |
|------------------------|------------|--------------------------------------------------------|
| <b>Frequency range</b> | Bluetooth® | 2402 MHz to 2480 MHz                                   |
| <b>Statistics</b>      |            |                                                        |
| Statistical count      |            | 1 to 1000                                              |
| Values                 |            | current, average, maximum, minimum, standard deviation |
| <b>Trigger</b>         |            |                                                        |
| Trigger source         |            | Bluetooth®: IF power                                   |

### Modulation analysis

|                                                                                                 |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>                                                                                   | filter bandwidth: wide                                                                                                                                           | 2.0 MHz bandpass                                                                                                                                                                                                                                                                                                                |
|                                                                                                 | filter bandwidth: narrow                                                                                                                                         | 1.3 MHz bandpass                                                                                                                                                                                                                                                                                                                |
| <b>Level range</b>                                                                              |                                                                                                                                                                  | −35 dBm to +36 dBm <sup>26</sup>                                                                                                                                                                                                                                                                                                |
| <b>Supported packet types</b>                                                                   |                                                                                                                                                                  | RF PHY test reference packets                                                                                                                                                                                                                                                                                                   |
| <b>Measured parameters</b>                                                                      | numeric results and standard deviation                                                                                                                           | Δf2 99.9 %, frequency accuracy, frequency offset, initial frequency drift, frequency drift, max drift rate, frequency deviation Δf1 average, frequency deviation Δf1 minimum, frequency deviation Δf1 maximum, frequency deviation Δf2 average, frequency deviation Δf2 minimum, frequency deviation Δf2 maximum, nominal power |
| <b>Total measurement range for frequency accuracy, offset, deviation and drift measurements</b> |                                                                                                                                                                  | ±350 kHz                                                                                                                                                                                                                                                                                                                        |
| <b>Frequency accuracy (using preamble)</b>                                                      |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                 |
| Measurement range                                                                               | for nominal deviation of 250 kHz                                                                                                                                 | ±175 kHz                                                                                                                                                                                                                                                                                                                        |
| Uncertainty                                                                                     | for deviation ≤ 250 kHz                                                                                                                                          | < 2 kHz                                                                                                                                                                                                                                                                                                                         |
| <b>Frequency offset</b>                                                                         |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                 |
| Measurement range                                                                               | for nominal deviation of 250 kHz                                                                                                                                 | ±175 kHz                                                                                                                                                                                                                                                                                                                        |
| Uncertainty                                                                                     | for deviation ≤ 250 kHz                                                                                                                                          | < 2 kHz                                                                                                                                                                                                                                                                                                                         |
| <b>Frequency deviation</b>                                                                      |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                 |
| Measurement range                                                                               | without frequency offset                                                                                                                                         | ≤ 350 kHz                                                                                                                                                                                                                                                                                                                       |
| Uncertainty                                                                                     | for modulation index 0.40 to 0.60                                                                                                                                | < 1.0 %                                                                                                                                                                                                                                                                                                                         |
| <b>Frequency drift</b>                                                                          |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                 |
| Measurement range                                                                               |                                                                                                                                                                  | ±75 kHz                                                                                                                                                                                                                                                                                                                         |
| Uncertainty                                                                                     | measured in burst relative to frequency offset in preamble, with 10101010 pattern referenced to measured frequency offset in preamble (relative frequency drift) | < 2 kHz                                                                                                                                                                                                                                                                                                                         |
|                                                                                                 |                                                                                                                                                                  | ≤ 1 kHz                                                                                                                                                                                                                                                                                                                         |

<sup>26</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## Bluetooth® RF analyzer (R&S®CMW-KM721 option)

|                        |            |                                                        |
|------------------------|------------|--------------------------------------------------------|
| <b>Frequency range</b> | Bluetooth® | 2402 MHz to 2480 MHz                                   |
| <b>Statistics</b>      |            |                                                        |
| Statistical count      |            | 1 to 1000                                              |
| Values                 |            | current, average, maximum, minimum, standard deviation |
| <b>Trigger</b>         |            |                                                        |
| Trigger source         |            | Bluetooth®: IF power                                   |

### Modulation analysis

|                               |                                           |                                  |
|-------------------------------|-------------------------------------------|----------------------------------|
| <b>Filter</b>                 | filter bandwidth: wide (LE 2 Msymbol/s)   | 4.0 MHz bandpass                 |
|                               | filter bandwidth: wide (LE long range)    | 2.0 MHz bandpass                 |
|                               | filter bandwidth: narrow (LE 2 Msymbol/s) | 2.6 MHz bandpass                 |
|                               | filter bandwidth: narrow (LE long range)  | 1.3 MHz bandpass                 |
| <b>Level range</b>            |                                           | –35 dBm to +36 dBm <sup>27</sup> |
| <b>Supported packet types</b> |                                           | RF PHY Test Reference Packets    |

|                            |                                                         |                                                                                                                                                                                                                                             |
|----------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b> | numeric results and standard deviation (common)         | frequency accuracy, frequency offset, initial frequency drift, frequency drift, max drift rate, frequency deviation $\Delta f_1$ average, frequency deviation $\Delta f_1$ minimum, frequency deviation $\Delta f_1$ maximum, nominal power |
|                            | numeric results and standard deviation (LE 2 Msymbol/s) | $\Delta f_2$ 99.9 %<br>frequency deviation $\Delta f_2$ average, frequency deviation $\Delta f_2$ minimum, frequency deviation $\Delta f_2$ maximum,                                                                                        |
|                            | numeric results and standard deviation (LE long range)  | $\Delta f_1$ 99.9 %                                                                                                                                                                                                                         |

|                                                                                                 |                  |          |
|-------------------------------------------------------------------------------------------------|------------------|----------|
| <b>Total measurement range for frequency accuracy, offset, deviation and drift measurements</b> | LE 2 2 Msymbol/s | ±700 kHz |
|                                                                                                 | LE long range    | ±350 kHz |

|                                            |                                                   |          |
|--------------------------------------------|---------------------------------------------------|----------|
| <b>Frequency accuracy (using preamble)</b> |                                                   |          |
| Measurement range                          | for nominal deviation of 500 kHz (LE 2 Msymbol/s) | ±175 kHz |
|                                            | for nominal deviation of 250 kHz (LE long range)  |          |
| Uncertainty                                | for deviation ≤ 500 kHz (LE 2 Msymbol/s)          | < 2 kHz  |
|                                            | for deviation ≤ 250 kHz (LE long range)           |          |

|                         |                                                   |          |
|-------------------------|---------------------------------------------------|----------|
| <b>Frequency offset</b> |                                                   |          |
| Measurement range       | for nominal deviation of 500 kHz (LE 2 Msymbol/s) | ±175 kHz |
|                         | for nominal deviation of 250 kHz (LE long range)  |          |
| Uncertainty             | for deviation ≤ 500 kHz (LE 2 Msymbol/s)          | < 2 kHz  |
|                         | for deviation ≤ 250 kHz (LE long range)           |          |

<sup>27</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|                            |                                           |                |
|----------------------------|-------------------------------------------|----------------|
| <b>Frequency deviation</b> |                                           |                |
| Measurement range          | without frequency offset (LE 2 Msymbol/s) | $\leq 700$ kHz |
|                            | without frequency offset (LE long range)  | $\leq 350$ kHz |
| Uncertainty                | for modulation index 0.40 to 0.60         | $< 0.5$ %      |

|                        |                                                                                      |              |
|------------------------|--------------------------------------------------------------------------------------|--------------|
| <b>Frequency drift</b> |                                                                                      |              |
| Measurement range      |                                                                                      | $\pm 75$ kHz |
| Uncertainty            | measured in burst referenced to frequency offset in preamble                         | $< 2$ kHz    |
|                        | referenced to measured frequency offset value in preamble (relative frequency drift) | $\leq 1$ kHz |

## GPS specifications

|          |  |     |
|----------|--|-----|
| Standard |  | GPS |
|----------|--|-----|

### GPS RF generator

|                 |          |             |
|-----------------|----------|-------------|
| Frequency range | GPS band |             |
|                 | L1       | 1575.42 MHz |
|                 | L2       | 1227.6 MHz  |

### GPS R&S®WinIQSIM2™ (R&S®CMW-KW620 option)

|                          |                                       |                                      |
|--------------------------|---------------------------------------|--------------------------------------|
| Arbitrary waveform file  |                                       | GPS_DEFAULT.WV (PAR = 3.66 dB)       |
| Output level range       | depends on PAR                        | see general technical specifications |
| Output level uncertainty | waveform file used:<br>GPS_DEFAULT.WV | see general technical specifications |
| Output level resolution  |                                       | see general technical specifications |

## DVB specifications

|          |  |       |
|----------|--|-------|
| Standard |  | DVB-T |
|----------|--|-------|

### DVB RF generator

|                 |                   |                    |
|-----------------|-------------------|--------------------|
| Frequency range | VHF band III      |                    |
|                 | channels 5 to 12  | 174 MHz to 230 MHz |
|                 | UHF band IV       |                    |
|                 | channels 21 to 34 | 470 MHz to 582 MHz |
|                 | UHF band V        |                    |
|                 | channels 35 to 69 | 582 MHz to 862 MHz |

### DVB WinIQSIM2™ (R&S®CMW-KW630 option)

|                          |                                                               |                                                         |
|--------------------------|---------------------------------------------------------------|---------------------------------------------------------|
| Arbitrary waveform file  |                                                               | DVB-T_SCRAMBLED_16QAM_3SEC_TESTFILE.WV (PAR = 13.23 dB) |
| Output level range       | depends on PAR                                                | see general technical specifications                    |
| Output level uncertainty | waveform file used:<br>DVB-T_SCRAMBLED_16QAM_3SEC_TESTFILE.WV | see general technical specifications                    |
| Output level resolution  |                                                               | see general technical specifications                    |

## FM STEREO RADIO specifications

|          |  |                 |
|----------|--|-----------------|
| Standard |  | FM STEREO RADIO |
|----------|--|-----------------|

### FM STEREO RADIO generator

|                 |    |                   |
|-----------------|----|-------------------|
| Frequency range | FM | 70 MHz to 110 MHz |
|-----------------|----|-------------------|

### FM STEREO RADIO waveforms (R&S®CMW-KV645 option)

|                          |                                           |                                      |
|--------------------------|-------------------------------------------|--------------------------------------|
| Arbitrary waveform file  |                                           | FM_M_M1K0_D75K0.WV (PAR = 0.00 dB)   |
| Output level range       | depends on PAR                            | see general technical specifications |
| Output level uncertainty | waveform file used:<br>FM_M_M1K0_D75K0.WV | see general technical specifications |
| Output level resolution  |                                           | see general technical specifications |
| Signal quality           | RMS detector *SQRT(2)                     |                                      |
| Deviation error          | waveform file used:<br>FM_M_M1K0_D75K0.WV | < 1 %                                |

## WLAN specifications

|          |  |                                                                             |
|----------|--|-----------------------------------------------------------------------------|
| Standard |  | IEEE 802.11a, IEEE 802.11b,<br>IEEE 802.11g, IEEE 802.11n,<br>IEEE 802.11ac |
|----------|--|-----------------------------------------------------------------------------|

## WLAN RF generator

|                 |                                                                           |                      |
|-----------------|---------------------------------------------------------------------------|----------------------|
| Frequency range | WLAN IEEE 802.11b/g/n (2.4 GHz band)                                      | 2412 MHz to 2484 MHz |
|                 | WLAN IEEE 802.11a/n/ac (5 GHz band),<br>prerequisite: R&S®CMW-K046 option | 5000 MHz to 6000 MHz |

## WLAN ABGN R&S®WinIQSIM2™ (R&S®CMW-KW650 option)

|                          |                                                   |                                            |
|--------------------------|---------------------------------------------------|--------------------------------------------|
| Arbitrary waveform files | in line with IEEE 802.11a/g OFDM 64QAM            | WLAN_A_G_OFDM_64QAM.WV<br>(PAR = 10.01 dB) |
|                          | in line with IEEE 802.11b CCK DQPSK               | WLAN_B_CCK_DQPSK.WV<br>(PAR = 1.48 dB)     |
|                          | in line with IEEE 802.11n 64QAM,<br>code rate 5/6 | WLAN_N_64QAM_5_6.WV<br>(PAR = 10.01 dB)    |

|                          |                                                                                                |                                      |
|--------------------------|------------------------------------------------------------------------------------------------|--------------------------------------|
| Output level range       | depends on PAR                                                                                 | see general technical specifications |
| Output level uncertainty | waveform files used:<br>WLAN_A_G_OFDM_64QAM.WV,<br>WLAN_B_CCK_DQPSK.WV,<br>WLAN_N_64QAM_5_6.WV | see general technical specifications |
| Output level resolution  |                                                                                                | see general technical specifications |

|                                            |                                                                                                |                             |
|--------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Signal quality</b>                      |                                                                                                |                             |
| Error vector magnitude (EVM) <sup>28</sup> | IEEE 802.11b,<br>EVM,<br>waveform file used:<br>WLAN_B_CCK_DQPSK.WV                            | < 4 %, peak                 |
|                                            | IEEE 802.11g,<br>EVM all carriers,<br>waveform file used:<br>WLAN_A_G_OFDM_64QAM.WV            | < -40 dB, RMS               |
|                                            | IEEE 802.11a,<br>EVM all carriers,<br>waveform file used:<br>WLAN_A_G_OFDM_64QAM.WV            | < -40 dB, RMS <sup>29</sup> |
|                                            | IEEE 802.11n, 2.4 GHz band,<br>EVM all carriers,<br>waveform file used:<br>WLAN_N_64QAM_5_6.WV | < -40 dB, RMS               |
|                                            | IEEE 802.11n, 5 GHz band,<br>EVM all carriers,<br>waveform file used:<br>WLAN_N_64QAM_5_6.WV   | < -40 dB, RMS <sup>29</sup> |
|                                            |                                                                                                |                             |

<sup>28</sup> Measured with channel estimation based on payload.

<sup>29</sup> 2 dB less at temperature > +30 °C.

**WLAN AC WinIQSIM2™ (R&S®CMW-KW656 option)**

|                                            |                                                                                                                         |                                                |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| <b>Arbitrary waveform files</b>            | in line with IEEE 802.11ac 256QAM, 20 MHz, code rate 3/4                                                                | WLAN_VHT_BW20_MCS8_LEN4096.WV (PAR = 9.57 dB)  |
|                                            | in line with IEEE 802.11ac 256QAM, 40 MHz, code rate 3/4                                                                | WLAN_VHT_BW40_MCS8_LEN4096.WV (PAR = 11.23 dB) |
|                                            | in line with IEEE 802.11ac 256QAM, 80 MHz, code rate 3/4                                                                | WLAN_VHT_BW80_MCS8_LEN4096.WV (PAR = 10.24 dB) |
| <b>Output level range</b>                  | depends on PAR                                                                                                          | see general technical specifications           |
| <b>Output level uncertainty</b>            | waveform files used:<br>WLAN_VHT_BW20_MCS8_LEN4096.WV<br>WLAN_VHT_BW40_MCS8_LEN4096.WV<br>WLAN_VHT_BW80_MCS8_LEN4096.WV | see general technical specifications           |
| <b>Output level resolution</b>             |                                                                                                                         | see general technical specifications           |
| <b>Signal quality</b>                      |                                                                                                                         |                                                |
| Error vector magnitude (EVM) <sup>30</sup> | IEEE 802.11ac,<br>EVM all carriers,<br>waveform file used:<br>WLAN_VHT_BW20_MCS8_LEN4096.WV                             | < -40 dB, RMS                                  |
|                                            | WLAN_VHT_BW40_MCS8_LEN4096.WV                                                                                           | < -40 dB, RMS <sup>31</sup>                    |
|                                            | WLAN_VHT_BW80_MCS8_LEN4096.WV                                                                                           | < -38 dB, RMS <sup>31</sup>                    |

**WLAN ABG RF analyzer (R&S®CMW-KM650 option)**

|                        |                                                         |                                                                                                                        |
|------------------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b> | WLAN IEEE 802.11b/g                                     | 2412 MHz to 2484 MHz                                                                                                   |
|                        | WLAN IEEE 802.11a,<br>prerequisite: R&S®CMW-K046 option | 5000 MHz to 6000 MHz,<br>for frequency exceptions for inherent spurious response, see general technical specifications |
| <b>Statistics</b>      |                                                         |                                                                                                                        |
| Statistical count      |                                                         | 1 to 1000                                                                                                              |
| Values                 |                                                         | current, average, maximum, standard deviation                                                                          |
| <b>Trigger</b>         |                                                         |                                                                                                                        |
| Trigger sources        |                                                         | <ul style="list-style-type: none"> <li>WLAN: free run</li> <li>WLAN: IF power</li> </ul>                               |

**Modulation analysis**

|                       |      |                                                                                                                                       |
|-----------------------|------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>         |      | 20 MHz                                                                                                                                |
| <b>Level range</b>    |      | -28 dBm to +36 dBm <sup>32</sup>                                                                                                      |
| <b>Payload length</b> |      | ≥ 16 symbol                                                                                                                           |
| <b>Analysis modes</b> | DSSS | 1 Mbps DBPSK,<br>2 Mbps DQPSK,<br>5.5 Mbps CCK,<br>11 Mbps CCK                                                                        |
|                       | OFDM | 6 Mbps BPSK,<br>9 Mbps BPSK,<br>12 Mbps QPSK,<br>18 Mbps QPSK,<br>24 Mbps 16QAM,<br>36 Mbps 16QAM,<br>48 Mbps 64QAM,<br>54 Mbps 64QAM |

<sup>30</sup> Measured with channel estimation based on payload.<sup>31</sup> 2 dB less at temperature > +30 °C.<sup>32</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|                            |                                                 |                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b> | DSSS,<br>numeric results and standard deviation | burst power,<br>error vector magnitude (EVM) peak,<br>error vector magnitude (EVM) RMS,<br>center frequency error,<br>chip clock error,<br>I/Q offset,<br>gain imbalance,<br>quadrature error |
|                            | DSSS,<br>graphical                              | EVM versus chip,<br>I/Q constellation                                                                                                                                                         |
|                            | OFDM,<br>numeric results and standard deviation | burst power,<br>EVM all carriers,<br>EVM data carriers,<br>EVM pilot carriers,<br>center frequency error,<br>symbol clock error,<br>I/Q offset,<br>gain imbalance,<br>quadrature error        |
|                            | OFDM,<br>graphical                              | EVM versus symbol,<br>EVM versus carrier,<br>I/Q constellation,<br>spectrum flatness                                                                                                          |

|                                     |                                                        |                           |
|-------------------------------------|--------------------------------------------------------|---------------------------|
| <b>Error vector magnitude (EVM)</b> |                                                        |                           |
| Inherent EVM <sup>33</sup>          | DSSS, IEEE 802.11b/g                                   | < 5 %, peak<br>< 2 %, RMS |
|                                     | OFDM, IEEE 802.11g                                     | < -40 dB, RMS             |
|                                     | OFDM, IEEE 802.11a                                     |                           |
|                                     | -18 dBm ≤ input level ≤ +36 dBm <sup>34</sup> ,<br>RMS | < -40 dB, RMS             |
| Measurement length                  | DSSS                                                   | 1000 samples              |
|                                     | OFDM                                                   | entire PPDU               |

|                                   |                                                  |                                                                      |
|-----------------------------------|--------------------------------------------------|----------------------------------------------------------------------|
| <b>Center frequency error</b>     |                                                  |                                                                      |
| Frequency measurement uncertainty | DSSS, IEEE 802.11b/g                             | < 20 Hz + drift of timebase,<br>see general technical specifications |
|                                   | OFDM, IEEE 802.11g, for ≥ 100 symbol<br>(400 μs) | < 20 Hz + drift of timebase,<br>see general technical specifications |
|                                   | OFDM, IEEE 802.11a, for ≥ 100 symbol<br>(400 μs) | < 35 Hz + drift of timebase,<br>see general technical specifications |

|                         |      |         |
|-------------------------|------|---------|
| <b>Chip clock error</b> | DSSS |         |
| Uncertainty             |      | < 1 ppm |

|                           |      |         |
|---------------------------|------|---------|
| <b>Symbol clock error</b> | OFDM |         |
| Uncertainty               |      | < 1 ppm |

|                     |                                     |          |
|---------------------|-------------------------------------|----------|
| <b>I/Q offset</b>   |                                     |          |
| Inherent I/Q offset | DSSS, for average ≥ 10 measurements | < -50 dB |
|                     | OFDM, for average ≥ 10 measurements | < -45 dB |

|                          |                                   |          |
|--------------------------|-----------------------------------|----------|
| <b>Spectrum flatness</b> |                                   |          |
| Level uncertainty        | OFDM, IEEE 802.11g (2.4 GHz band) | < 0.5 dB |
|                          | OFDM, IEEE 802.11a (5 GHz band)   | < 0.8 dB |

<sup>33</sup> Measured with channel estimation based on payload.

<sup>34</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

**Spectrum measurements**

|                                                       |                             |                                  |
|-------------------------------------------------------|-----------------------------|----------------------------------|
| <b>Transmit spectrum mask</b>                         |                             |                                  |
| Frequency span                                        |                             | 80 MHz                           |
| Dynamic range                                         | DSSS                        | in line with IEEE 802.11b        |
|                                                       | OFDM                        | in line with IEEE 802.11a/g      |
| Expected nominal power setting for full dynamic range | RF1 COM, RF2 COM            |                                  |
|                                                       | IEEE 802.11g (2.4 GHz band) | +2 dBm to +36 dBm <sup>35</sup>  |
|                                                       | IEEE 802.11a (5 GHz band)   | +12 dBm to +36 dBm <sup>35</sup> |

**WLAN N RF analyzer (R&S® CMW-KM651 option)**

|                        |                                                                    |                                                                                                                     |
|------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b> | WLAN IEEE 802.11n (2.4 GHz band)                                   | 2412 MHz to 2484 MHz                                                                                                |
|                        | WLAN IEEE 802.11n (5 GHz band), prerequisite: R&S® CMW-K046 option | 5000 MHz to 6000 MHz, for frequency exceptions for inherent spurious response, see general technical specifications |

|                   |  |                                               |
|-------------------|--|-----------------------------------------------|
| <b>Statistics</b> |  |                                               |
| Statistical count |  | 1 to 1000                                     |
| Values            |  | current, average, maximum, standard deviation |

|                 |  |                                                                                          |
|-----------------|--|------------------------------------------------------------------------------------------|
| <b>Trigger</b>  |  |                                                                                          |
| Trigger sources |  | <ul style="list-style-type: none"> <li>WLAN: free run</li> <li>WLAN: IF power</li> </ul> |

|                             |  |                                          |
|-----------------------------|--|------------------------------------------|
| <b>High throughput (HT)</b> |  |                                          |
| PPDU format                 |  | legacy mode, mixed mode, greenfield mode |

**Modulation analysis**

|                       |                                |                                                                                                                                                                                                                                                                      |
|-----------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bandwidth</b>      |                                | 20 MHz, 40 MHz                                                                                                                                                                                                                                                       |
| <b>Level range</b>    |                                | -28 dBm to +36 dBm <sup>35</sup>                                                                                                                                                                                                                                     |
| <b>Payload length</b> |                                | ≥ 16 symbol                                                                                                                                                                                                                                                          |
| <b>Analysis modes</b> |                                | BPSK code rate 1/2 (MCS0), BPSK code rate 3/4, QPSK code rate 1/2 (MCS1), QPSK code rate 3/4 (MCS2), 16QAM code rate 1/2 (MCS3), 16QAM code rate 3/4 (MCS4), 64QAM code rate 1/2, 64QAM code rate 2/3 (MCS5), 64QAM code rate 3/4 (MCS6), 64QAM code rate 5/6 (MCS7) |
|                       | for optional 40 MHz MCS format | BPSK code rate 1/2 (MCS32)                                                                                                                                                                                                                                           |

|                            |                                        |                                                                                                                                                                |
|----------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b> | numeric results and standard deviation | burst power, EVM all carriers, EVM data carriers, EVM pilot carriers, center frequency error, symbol clock error, I/Q offset, gain imbalance, quadrature error |
|                            | graphical                              | EVM versus symbol, EVM versus carrier, spectrum flatness                                                                                                       |

<sup>35</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|                                     |                                                        |               |
|-------------------------------------|--------------------------------------------------------|---------------|
| <b>Error vector magnitude (EVM)</b> |                                                        |               |
| Inherent EVM <sup>36</sup>          | IEEE 802.11n (2.4 GHz band)                            |               |
|                                     | –28 dBm ≤ input level ≤ +36 dBm <sup>37</sup> ,<br>RMS | < –40 dB, RMS |
|                                     | IEEE 802.11n (5 GHz band)                              |               |
|                                     | –18 dBm ≤ input level ≤ +36 dBm <sup>37</sup> ,<br>RMS | < –40 dB, RMS |
| Measurement length                  |                                                        | entire PPDU   |

|                                   |                                                           |                                                                      |
|-----------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------|
| <b>Center frequency error</b>     |                                                           |                                                                      |
| Frequency measurement uncertainty | IEEE 802.11n (2.4 GHz band),<br>for ≥ 100 symbol (400 μs) | < 20 Hz + drift of timebase,<br>see general technical specifications |
|                                   | IEEE 802.11n (5 GHz band),<br>for ≥ 100 symbol (400 μs)   | < 35 Hz + drift of timebase,<br>see general technical specifications |

|                           |  |         |
|---------------------------|--|---------|
| <b>Symbol clock error</b> |  |         |
| Uncertainty               |  | < 1 ppm |

|                     |                               |          |
|---------------------|-------------------------------|----------|
| <b>I/Q offset</b>   |                               |          |
| Inherent I/Q offset | for average ≥ 10 measurements | < –45 dB |

|                          |                             |          |
|--------------------------|-----------------------------|----------|
| <b>Spectrum flatness</b> |                             |          |
| Level uncertainty        | IEEE 802.11n (2.4 GHz band) |          |
|                          | bandwidth 20 MHz            | < 0.5 dB |
|                          | bandwidth 40 MHz            | < 0.8 dB |
|                          | IEEE 802.11n (5 GHz band)   |          |
|                          | bandwidth 20 MHz            | < 0.8 dB |
|                          | bandwidth 40 MHz            | < 1.0 dB |

## Spectrum measurements

|                                                          |                             |                                  |
|----------------------------------------------------------|-----------------------------|----------------------------------|
| <b>Transmit spectrum mask</b>                            |                             |                                  |
| Frequency span                                           |                             | up to 160 MHz                    |
| Dynamic range                                            |                             | in line with IEEE 802.11n        |
| Expected nominal power setting for full<br>dynamic range | RF1 COM, RF2 COM            |                                  |
|                                                          | IEEE 802.11n (2.4 GHz band) | +2 dBm to +36 dBm <sup>37</sup>  |
|                                                          | IEEE 802.11n (5 GHz band)   | +12 dBm to +36 dBm <sup>37</sup> |

## WLAN N AC CMIMO RF analyzer (R&S® CMW-KM652 option)

|                        |                                                                          |                                                                                                                              |
|------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b> | WLAN IEEE 802.11n (2.4 GHz band)                                         | 2412 MHz to 2484 MHz                                                                                                         |
|                        | WLAN IEEE 802.11n/ac (5 GHz band),<br>prerequisite: R&S® CMW-K046 option | 5000 MHz to 6000 MHz,<br>for frequency exceptions for inherent<br>spurious response, see general technical<br>specifications |

|                   |  |                                                  |
|-------------------|--|--------------------------------------------------|
| <b>Statistics</b> |  |                                                  |
| Statistical count |  | 1 to 1000                                        |
| Values            |  | current, average, maximum, standard<br>deviation |

|                |  |                |
|----------------|--|----------------|
| <b>Trigger</b> |  |                |
| Trigger source |  | WLAN: IF power |

|                        |               |                                |
|------------------------|---------------|--------------------------------|
| <b>High throughput</b> |               |                                |
| PPDU format            | IEEE 802.11n  | mixed mode,<br>greenfield mode |
|                        | IEEE 802.11ac | mixed mode                     |

<sup>36</sup> Measured with channel estimation based on payload.

<sup>37</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

**Modulation analysis**

|                                     |                                        |                                                                                                                              |
|-------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Bandwidth</b>                    | IEEE 802.11n                           | 20 MHz, 40 MHz                                                                                                               |
|                                     | IEEE 802.11ac                          | 20 MHz, 40 MHz, 80 MHz, 80+80 MHz, 160 MHz                                                                                   |
| <b>Level range</b>                  |                                        | –28 dBm to +36 dBm <sup>38</sup>                                                                                             |
| <b>Payload length</b>               |                                        | ≥ 1 symbol (max. 1024)                                                                                                       |
| <b>Analysis modes</b> <sup>39</sup> | IEEE 802.11n                           | MCS0 to MCS7: data and pilot,<br>MCS8 to MCS31: pilot only,<br>MCS33 to MCS76: pilot only                                    |
|                                     | IEEE 802.11ac                          | MCS0 to MCS9: data and pilot                                                                                                 |
| <b>Measured parameters</b>          | numeric results and standard deviation | total power, STS1 to STS4 power,<br>EVM all carriers,<br>EVM data carriers,<br>EVM pilot carriers,<br>center frequency error |

|                                     |                                                           |               |
|-------------------------------------|-----------------------------------------------------------|---------------|
| <b>Error vector magnitude (EVM)</b> |                                                           |               |
| <b>Inherent EVM</b> <sup>40</sup>   | IEEE 802.11n (2.4 GHz band)                               |               |
|                                     | –28 dBm ≤ input level ≤ +36 dBm <sup>38</sup><br>RMS      | < –40 dB, RMS |
|                                     | IEEE 802.11n/ac (5 GHz band),<br>bandwidth 20 MHz, 40 MHz |               |
|                                     | –18 dBm ≤ input level ≤ +36 dBm <sup>38</sup> ,<br>RMS    | < –40 dB, RMS |
| <b>Measurement length</b>           |                                                           | entire PPDU   |

|                                          |                                                            |                                                                      |
|------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------|
| <b>Center frequency error</b>            |                                                            |                                                                      |
| <b>Frequency measurement uncertainty</b> | IEEE 802.11n (2.4 GHz band),<br>for ≥ 100 symbol (400 μs)  | < 20 Hz + drift of timebase,<br>see general technical specifications |
|                                          | IEEE 802.11n/ac (5 GHz band),<br>for ≥ 100 symbol (400 μs) | < 35 Hz + drift of timebase,<br>see general technical specifications |

**WLAN N AC switched MIMO RF analyzer (R&S®CMW-KM653 option)**

|                        |                                                                         |                                                                                                                              |
|------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b> | WLAN IEEE 802.11n (2.4 GHz band)                                        | 2412 MHz to 2484 MHz                                                                                                         |
|                        | WLAN IEEE 802.11n/ac (5 GHz band),<br>prerequisite: R&S®CMW-K046 option | 5000 MHz to 6000 MHz,<br>for frequency exceptions for inherent<br>spurious response, see general technical<br>specifications |

|                          |  |                                                  |
|--------------------------|--|--------------------------------------------------|
| <b>Statistics</b>        |  |                                                  |
| <b>Statistical count</b> |  | 1 to 1000                                        |
| <b>Values</b>            |  | current, average, maximum, standard<br>deviation |

|                        |  |                                                                                         |
|------------------------|--|-----------------------------------------------------------------------------------------|
| <b>Trigger</b>         |  |                                                                                         |
| <b>Trigger sources</b> |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• WLAN: IF power</li> </ul> |

|                             |               |                                |
|-----------------------------|---------------|--------------------------------|
| <b>High throughput (HT)</b> |               |                                |
| <b>PPDU format</b>          | IEEE 802.11n  | mixed mode,<br>greenfield mode |
|                             | IEEE 802.11ac | mixed mode                     |

**Modulation analysis**

|                       |               |                                            |
|-----------------------|---------------|--------------------------------------------|
| <b>Bandwidth</b>      | IEEE 802.11n  | 20 MHz, 40 MHz                             |
|                       | IEEE 802.11ac | 20 MHz, 40 MHz, 80 MHz, 80+80 MHz, 160 MHz |
| <b>Level range</b>    |               | –28 dBm to +36 dBm <sup>38</sup>           |
| <b>Payload length</b> |               | ≥ 1 symbol (max. 1024)                     |

<sup>38</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.<sup>39</sup> Modulation analysis on data possible after initial acquisition of training data.<sup>40</sup> Measured with channel estimation based on payload.

|                            |                                         |                                                                                                                                  |
|----------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Analysis modes</b>      | IEEE 802.11n                            | MCS0 to MCS7, MCS32,<br>all data and pilot                                                                                       |
|                            | IEEE 802.11ac                           | MCS0 to MCS9,<br>all data and pilot                                                                                              |
| <b>Measured parameters</b> | numeric results and standard deviation  | total power,<br>EVM all carriers,<br>EVM data carriers,<br>EVM pilot carriers,<br>center frequency error,<br>symbol clock error, |
|                            | numeric results for each spatial stream | EVM all carriers,<br>EVM data carriers,<br>EVM pilot carriers<br>power<br>I/Q offset                                             |

## WLAN P RF analyzer (R&S®CMW-KM655 option)

|                        |                                                         |                                                                                                                              |
|------------------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b> | WLAN IEEE 802.11p,<br>prerequisite: R&S®CMW-K046 option | 5000 MHz to 6000 MHz,<br>for frequency exceptions for inherent<br>spurious response, see general technical<br>specifications |
|------------------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|

|                   |  |                                                  |
|-------------------|--|--------------------------------------------------|
| <b>Statistics</b> |  |                                                  |
| Statistical count |  | 1 to 1000                                        |
| Values            |  | current, average, maximum, standard<br>deviation |

|                 |  |                |
|-----------------|--|----------------|
| <b>Trigger</b>  |  |                |
| Trigger sources |  | WLAN: IF power |

## Modulation analysis

|                       |                             |                                                                                                                                            |
|-----------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>         |                             | 5 MHz, 10 MHz, 20 MHz                                                                                                                      |
| <b>Level range</b>    |                             | –28 dBm to +36 dBm <sup>41</sup>                                                                                                           |
| <b>Payload length</b> |                             | ≥ 16 symbol                                                                                                                                |
| <b>Analysis modes</b> | OFDM 5 MHz channel spacing  | 1.5 Mbps BPSK,<br>2.25 Mbps BPSK,<br>3 Mbps QPSK,<br>4.5 Mbps QPSK,<br>6 Mbps 16QAM,<br>9 Mbps 16QAM,<br>12 Mbps 64QAM,<br>13.5 Mbps 64QAM |
|                       | OFDM 10 MHz channel spacing | 3 Mbps BPSK,<br>4.5 Mbps BPSK,<br>6 Mbps QPSK,<br>9 Mbps QPSK,<br>12 Mbps 16QAM,<br>18 Mbps 16QAM,<br>24 Mbps 64QAM,<br>27 Mbps 64QAM      |
|                       | OFDM 20 MHz channel spacing | 6 Mbps BPSK,<br>9 Mbps BPSK,<br>12 Mbps QPSK,<br>18 Mbps QPSK,<br>24 Mbps 16QAM,<br>36 Mbps 16QAM,<br>48 Mbps 64QAM,<br>54 Mbps 64QAM      |

<sup>41</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|                            |                                                 |                                                                                                                                                                                        |
|----------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured parameters</b> | OFDM,<br>numeric results and standard deviation | burst power,<br>EVM all carriers,<br>EVM data carriers,<br>EVM pilot carriers,<br>center frequency error,<br>symbol clock error,<br>I/Q offset,<br>gain imbalance,<br>quadrature error |
|                            | OFDM,<br>graphical                              | EVM versus symbol,<br>EVM versus carrier,<br>I/Q constellation,<br>spectrum flatness                                                                                                   |

|                                     |                                                                                    |               |
|-------------------------------------|------------------------------------------------------------------------------------|---------------|
| <b>Error vector magnitude (EVM)</b> |                                                                                    |               |
| Inherent EVM <sup>42</sup>          | $-18 \text{ dBm} \leq \text{input level} \leq +36 \text{ dBm}$ <sup>43</sup> , RMS | < -40 dB, RMS |
| Measurement length                  |                                                                                    | entire PPDU   |

|                                   |                                            |                                                                      |
|-----------------------------------|--------------------------------------------|----------------------------------------------------------------------|
| <b>Center frequency error</b>     |                                            |                                                                      |
| Frequency measurement uncertainty | for $\geq 100$ symbol (400 $\mu\text{s}$ ) | < 35 Hz + drift of timebase,<br>see general technical specifications |

|                           |  |         |
|---------------------------|--|---------|
| <b>Symbol clock error</b> |  |         |
| Uncertainty               |  | < 1 ppm |

|                     |                                    |          |
|---------------------|------------------------------------|----------|
| <b>I/Q offset</b>   |                                    |          |
| Inherent I/Q offset | for average $\geq 10$ measurements | < -45 dB |

|                          |  |          |
|--------------------------|--|----------|
| <b>Spectrum flatness</b> |  |          |
| Level uncertainty        |  | < 0.8 dB |

## Spectrum measurements

|                                                       |                  |                                         |
|-------------------------------------------------------|------------------|-----------------------------------------|
| <b>Transmit spectrum mask</b>                         |                  |                                         |
| Frequency span                                        |                  | up to 80 MHz                            |
| Dynamic range                                         |                  | in line with IEEE 802.11p up to class B |
| Expected nominal power setting for full dynamic range | RF1 COM, RF2 COM | +12 dBm to +36 dBm <sup>43</sup>        |

## WLAN AC RF analyzer (R&S®CMW-KM656 option)

|                        |                                                                       |                                                                                                                              |
|------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency range</b> | WLAN IEEE 802.11ac (5 GHz band),<br>prerequisite: R&S®CMW-K046 option | 5000 MHz to 6000 MHz,<br>for frequency exceptions for inherent<br>spurious response, see general technical<br>specifications |
|------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|

|                   |  |                                                  |
|-------------------|--|--------------------------------------------------|
| <b>Statistics</b> |  |                                                  |
| Statistical count |  | 1 to 1000                                        |
| Values            |  | current, average, maximum, standard<br>deviation |

|                |  |                |
|----------------|--|----------------|
| <b>Trigger</b> |  |                |
| Trigger source |  | WLAN: IF power |

|                             |  |            |
|-----------------------------|--|------------|
| <b>High throughput (HT)</b> |  |            |
| PPDU format                 |  | mixed mode |

<sup>42</sup> Measured with channel estimation based on payload.

<sup>43</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## Modulation analysis

|                                     |                                                        |                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bandwidth</b>                    |                                                        | 20 MHz, 40 MHz, 80 MHz, 80+80 MHz, 160 MHz                                                                                                                                                                                                                                                                                                                    |
| <b>Level range</b>                  |                                                        | –28 dBm to +36 dBm <sup>44</sup>                                                                                                                                                                                                                                                                                                                              |
| <b>Payload length</b>               |                                                        | ≥ 1 symbol                                                                                                                                                                                                                                                                                                                                                    |
| <b>Analysis modes</b>               |                                                        | BPSK code rate 1/2 (MCS0),<br>BPSK code rate 3/4,<br>QPSK code rate 1/2 (MCS1),<br>QPSK code rate 3/4 (MCS2),<br>16QAM code rate 1/2 (MCS3),<br>16QAM code rate 3/4 (MCS4),<br>64QAM code rate 1/2,<br>64QAM code rate 2/3 (MCS5),<br>64QAM code rate 3/4 (MCS6),<br>64QAM code rate 5/6 (MCS7)<br>256QAM code rate 3/4 (MCS8)<br>256QAM code rate 5/6 (MCS9) |
| <b>Measured parameters</b>          | numeric results and standard deviation                 | burst power,<br>EVM all carriers,<br>EVM data carriers,<br>EVM pilot carriers,<br>center frequency error,<br>symbol clock error,<br>I/Q offset                                                                                                                                                                                                                |
|                                     | graphical                                              | EVM versus symbol,<br>spectrum flatness,<br>I/Q constellation,<br>transmit spectrum mask                                                                                                                                                                                                                                                                      |
| <b>Error vector magnitude (EVM)</b> |                                                        |                                                                                                                                                                                                                                                                                                                                                               |
| Inherent EVM <sup>45</sup>          | bandwidth 20 MHz, 40 MHz                               |                                                                                                                                                                                                                                                                                                                                                               |
|                                     | –18 dBm ≤ input level ≤ +36 dBm <sup>44</sup> ,<br>RMS | < –40 dB, RMS                                                                                                                                                                                                                                                                                                                                                 |
|                                     | bandwidth 80 MHz                                       |                                                                                                                                                                                                                                                                                                                                                               |
|                                     | –18 dBm ≤ input level ≤ +36 dBm <sup>44</sup> ,<br>RMS | < –38 dB, RMS                                                                                                                                                                                                                                                                                                                                                 |
|                                     | bandwidth 160 MHz                                      |                                                                                                                                                                                                                                                                                                                                                               |
|                                     | –15 dBm ≤ input level ≤ +36 dBm <sup>44</sup> ,<br>RMS | typ. < –38 dB, RMS                                                                                                                                                                                                                                                                                                                                            |
| Measurement length                  |                                                        | entire PPDU                                                                                                                                                                                                                                                                                                                                                   |
| <b>Center frequency error</b>       |                                                        |                                                                                                                                                                                                                                                                                                                                                               |
| Frequency measurement uncertainty   | for ≥ 100 symbol (400 μs)                              | < 35 Hz + drift of timebase,<br>see general technical specifications                                                                                                                                                                                                                                                                                          |
| <b>Symbol clock error</b>           |                                                        |                                                                                                                                                                                                                                                                                                                                                               |
| Uncertainty                         | for ≥ 100 symbol (400 μs)                              | < 1 ppm                                                                                                                                                                                                                                                                                                                                                       |
| <b>I/Q offset</b>                   |                                                        |                                                                                                                                                                                                                                                                                                                                                               |
| Inherent I/Q offset                 | for average ≥ 10 measurements                          | < –45 dB                                                                                                                                                                                                                                                                                                                                                      |
| <b>Spectrum flatness</b>            |                                                        |                                                                                                                                                                                                                                                                                                                                                               |
| Level uncertainty                   | bandwidth 20 MHz                                       | < 0.8 dB                                                                                                                                                                                                                                                                                                                                                      |
|                                     | bandwidth 40 MHz                                       | < 1.0 dB                                                                                                                                                                                                                                                                                                                                                      |
|                                     | bandwidth 80 MHz                                       | < 1.5 dB                                                                                                                                                                                                                                                                                                                                                      |
|                                     | bandwidth 160 MHz                                      | typ. < 1.5 dB                                                                                                                                                                                                                                                                                                                                                 |

<sup>44</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

<sup>45</sup> Measured with channel estimation based on payload.

**Spectrum measurements**

|                                                       |                  |                                  |
|-------------------------------------------------------|------------------|----------------------------------|
| <b>Transmit spectrum mask</b>                         |                  |                                  |
| Frequency span                                        |                  | up to 640 MHz                    |
| Dynamic range                                         |                  | in line with IEEE 802.11ac       |
| Expected nominal power setting for full dynamic range | RF1 COM, RF2 COM |                                  |
|                                                       |                  | +12 dBm to +36 dBm <sup>46</sup> |

**LR-WPAN specifications**

|                 |                                          |                       |
|-----------------|------------------------------------------|-----------------------|
| <b>Standard</b> | low-rate wireless personal area networks | IEEE 802.15.4™ – 2011 |
|-----------------|------------------------------------------|-----------------------|

**LR-WPAN RF generator**

|                        |                     |                      |
|------------------------|---------------------|----------------------|
| <b>Frequency range</b> | 2450 MHz O-QPSK PHY | 2405 MHz to 2480 MHz |
|------------------------|---------------------|----------------------|

**LR-WPAN waveforms (R&S®CMW-KV680 option)**

|                                |                     |                                                           |
|--------------------------------|---------------------|-----------------------------------------------------------|
| <b>Arbitrary waveform file</b> | 2450 MHz O-QPSK PHY | LRWPAN_2450MHz_OQPSK_127Bytes_PRBS9.WV<br>(PAR = 0.06 dB) |
|--------------------------------|---------------------|-----------------------------------------------------------|

|                                 |                                                               |                                      |
|---------------------------------|---------------------------------------------------------------|--------------------------------------|
| <b>Output level range</b>       | depends on PAR                                                | see general technical specifications |
| <b>Output level uncertainty</b> | waveform file used:<br>LRWPAN_2450MHz_OQPSK_127Bytes_PRBS9.WV | see general technical specifications |
| <b>Output level resolution</b>  |                                                               | see general technical specifications |

|                               |                                                                                                                   |            |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------|------------|
| <b>Signal quality</b>         |                                                                                                                   |            |
| Offset error vector magnitude | measured over the PHY service data unit (PSDU),<br>waveform files used:<br>LRWPAN_2450MHz_OQPSK_127Bytes_PRBS9.WV | < 2 %, RMS |

**LR-WPAN RF analyzer (R&S®CMW-KM680 option)**

|                        |                     |                      |
|------------------------|---------------------|----------------------|
| <b>Frequency range</b> | 2450 MHz O-QPSK PHY | 2405 MHz to 2480 MHz |
|------------------------|---------------------|----------------------|

|                   |  |                                                        |
|-------------------|--|--------------------------------------------------------|
| <b>Statistics</b> |  |                                                        |
| Statistical count |  | 1 to 1000                                              |
| Values            |  | current, average, maximum, minimum, standard deviation |

|                |  |                  |
|----------------|--|------------------|
| <b>Trigger</b> |  |                  |
| Trigger source |  | LRWPAN: IF power |

**Modulation analysis**

|                            |                     |                                                                                           |
|----------------------------|---------------------|-------------------------------------------------------------------------------------------|
| <b>Level range</b>         |                     | –35 dBm to +36 dBm <sup>46</sup>                                                          |
| <b>Supported PHYs</b>      |                     | 2450 MHz O-QPSK PHY                                                                       |
| <b>Measured parameters</b> | 2450 MHz O-QPSK PHY | frequency accuracy,<br>symbol rate error,<br>offset RMS EVM PSDU,<br>offset peak EVM PSDU |

|                           |                     |                                                                      |
|---------------------------|---------------------|----------------------------------------------------------------------|
| <b>Frequency accuracy</b> | 2450 MHz O-QPSK PHY |                                                                      |
| Measurement range         |                     | ±800 kHz                                                             |
| Uncertainty               |                     | < 20 Hz + drift of timebase,<br>see general technical specifications |

|                        |                     |            |
|------------------------|---------------------|------------|
| <b>Offset EVM PSDU</b> | 2450 MHz O-QPSK PHY |            |
| Inherent EVM           | for PRBS pattern    | < 2 %, RMS |

<sup>46</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## TD-SCDMA specifications – mobile station (UE) test

|          |  |               |
|----------|--|---------------|
| Standard |  | TD-SCDMA CWTS |
|----------|--|---------------|

### TD-SCDMA RF generator

|                               |                                            |                          |
|-------------------------------|--------------------------------------------|--------------------------|
| Frequency range <sup>47</sup> | TD-SCDMA band A<br>channels 10054 to 10121 | 2010.8 MHz to 2024.2 MHz |
|                               | TD-SCDMA band E<br>channels 11504 to 11996 | 2300.8 MHz to 2399.2 MHz |
|                               | TD-SCDMA band F<br>channels 9404 to 9596   | 1880.8 MHz to 1919.2 MHz |
|                               |                                            |                          |

### TD-SCDMA R&S®WinIQSIM2™ (R&S®CMW-KW750 option) and TD-SCDMA Enhanced R&S®WinIQSIM2™ (R&S®CMW-KW751 option)

|                              |                                                              |                                                                                 |
|------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------|
| Arbitrary waveform files     | with the R&S®CMW-KW750 option                                | TD-SCDMA_DEFAULT.WV<br>(PAR = 3.14 dB),<br>TD-SCDMA_PTLOW.WV<br>(PAR = 2.67 dB) |
|                              | with the R&S®CMW-KW750 and<br>R&S®CMW-KW751 options          | TD-SCDMA-DL_12K2.WV<br>(PAR = 5.41 dB)                                          |
| Output level range           | depends on PAR                                               | see general technical specifications                                            |
| Output level uncertainty     | waveform file used:<br>TD-SCDMA_PTLOW.WV                     | see general technical specifications                                            |
| Output level resolution      |                                                              | see general technical specifications                                            |
| Signal quality               |                                                              |                                                                                 |
| Error vector magnitude (EVM) | composite EVM,<br>waveform file used:<br>TD-SCDMA_DEFAULT.WV | < 4 %, RMS                                                                      |

### TD-SCDMA RF analyzer (R&S®CMW-KM750 option)

|                               |                                            |                                                                                                                           |
|-------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Frequency range <sup>47</sup> | TD-SCDMA band A<br>channels 10054 to 10121 | 2010.8 MHz to 2024.2 MHz                                                                                                  |
|                               | TD-SCDMA band E<br>channels 11504 to 11996 | 2300.8 MHz to 2399.2 MHz                                                                                                  |
|                               | TD-SCDMA band F<br>channels 9404 to 9596   | 1880.8 MHz to 1919.2 MHz                                                                                                  |
|                               |                                            |                                                                                                                           |
| Statistics                    |                                            |                                                                                                                           |
| Statistical count             |                                            | 1 to 1000                                                                                                                 |
| Values                        |                                            | current, average, minimum/maximum,<br>standard deviation                                                                  |
| Trigger                       |                                            |                                                                                                                           |
| Trigger sources               |                                            | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• TD-SCDMA: free run</li> <li>• TD-SCDMA: IF power</li> </ul> |

<sup>47</sup> Bands A, E, F in line with the CCSA standard.

## Modulation analysis

|                            |                                        |                                                                                                                                                     |
|----------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>              |                                        | 1.28 MHz, RRC, $\alpha = 0.22$ , TD-SCDMA filter                                                                                                    |
| <b>Level range</b>         |                                        | –28 dBm to +36 dBm <sup>48</sup>                                                                                                                    |
| <b>Analysis modes</b>      | TD-SCDMA uplink                        | QPSK, DPCH,<br>QPSK, DPCH + HSDPA,<br>16QAM, DPCH + HSUPA                                                                                           |
| <b>Measured parameters</b> | numeric results and standard deviation | error vector magnitude (EVM),<br>magnitude error (ME),<br>phase error (PE),<br>frequency error,<br>I/Q origin offset,<br>I/Q imbalance,<br>UE power |
|                            | graphical                              | EVM versus time,<br>ME versus time,<br>PE versus time                                                                                               |

|                                     |  |                              |
|-------------------------------------|--|------------------------------|
| <b>Error vector magnitude (EVM)</b> |  |                              |
| Measurement range                   |  | up to 25 %, RMS              |
| Inherent EVM                        |  | < 2.5 %, RMS                 |
| Measurement length                  |  | 1 slot, multislot (1 to 112) |

|                                   |  |                                                                      |
|-----------------------------------|--|----------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                      |
| Measurement range                 |  | ±3 kHz                                                               |
| Frequency measurement uncertainty |  | < 20 Hz + drift of timebase,<br>see general technical specifications |

|                          |                                    |          |
|--------------------------|------------------------------------|----------|
| <b>I/Q origin offset</b> |                                    |          |
| Inherent I/Q offset      | for average $\geq 10$ measurements | < –55 dB |

|                        |  |          |
|------------------------|--|----------|
| <b>I/Q imbalance</b>   |  |          |
| Inherent I/Q imbalance |  | < –50 dB |

## Code domain

|                            |                                        |                                                           |
|----------------------------|----------------------------------------|-----------------------------------------------------------|
| <b>Filter</b>              |                                        | 1.28 MHz, RRC, $\alpha = 0.22$ , TD-SCDMA filter          |
| <b>Level range</b>         |                                        | –28 dBm to +36 dBm <sup>48</sup>                          |
| <b>Analysis modes</b>      | TD-SCDMA uplink                        | QPSK, DPCH,<br>QPSK, DPCH + HSDPA,<br>16QAM, DPCH + HSUPA |
| <b>Measured parameters</b> | numeric results and standard deviation | code domain error (CDE)                                   |
|                            | graphical                              | code domain power versus code                             |

|                                      |  |          |
|--------------------------------------|--|----------|
| <b>Code domain power versus code</b> |  |          |
| Uncertainty                          |  | < 0.4 dB |
| Measurement length                   |  | 1 slot   |

|                                |  |          |
|--------------------------------|--|----------|
| <b>Code domain error (CDE)</b> |  |          |
| Uncertainty                    |  | < 0.4 dB |
| Measurement length             |  | 1 slot   |

<sup>48</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

**Spectrum measurements**

|                                                       |                                           |                                                  |
|-------------------------------------------------------|-------------------------------------------|--------------------------------------------------|
| <b>Adjacent channel leakage ratio</b>                 | RMS detector                              |                                                  |
| Filter                                                |                                           | 1.28 MHz, RRC, $\alpha = 0.22$ , TD-SCDMA filter |
| Dynamic range                                         | first adjacent channel at $\pm 1.6$ MHz   | > 53 dB                                          |
|                                                       | second adjacent channel at $\pm 3.2$ MHz  | > 61 dB                                          |
| Expected nominal power setting for full dynamic range | RF1 to RF8                                | –3 dBm to +36 dBm <sup>49</sup>                  |
| Uncertainty                                           | for –33 dBc first adjacent channel level  | < 0.5 dB                                         |
|                                                       | for –43 dBc second adjacent channel level | < 0.5 dB                                         |
| Measurement length                                    |                                           | 1 slot                                           |

**Power meter**

|                            |                            |                                         |
|----------------------------|----------------------------|-----------------------------------------|
| <b>Measured parameters</b> | numeric current RMS values | UE power                                |
| <b>UE power</b>            | RMS detector               |                                         |
| Filter                     |                            | bandpass, 2.1 MHz, RRC, $\alpha = 0.22$ |
| Level range                |                            | –55 dBm to +36 dBm <sup>49</sup>        |
| Level uncertainty          |                            | see general technical specifications    |
| Measurement length         |                            | 1 slot                                  |

---

<sup>49</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## CDMA2000® 1xRTT specifications – mobile station test

|                    |                          |                        |
|--------------------|--------------------------|------------------------|
| <b>Standard</b>    | CDMA2000® standards      | TIA/EIA IS-2000 Rev. 0 |
|                    | CDMA2000® test standards | TIA/EIA IS-98-F        |
| <b>Symbol rate</b> |                          | 1.2288 Mcps            |

### CDMA2000® 1xRTT RF generator

|                        |               |                              |
|------------------------|---------------|------------------------------|
| <b>Frequency range</b> | band class 0  | 860.025 MHz to 893.985 MHz   |
|                        | band class 1  | 1930.000 MHz to 1990.000 MHz |
|                        | band class 2  | 917.0125 MHz to 959.9875 MHz |
|                        | band class 3  | 832.0125 MHz to 869.9875 MHz |
|                        | band class 4  | 1840.000 MHz to 1870.000 MHz |
|                        | band class 5  | 421.675 MHz to 493.480 MHz   |
|                        | band class 6  | 2110.000 MHz to 2169.950 MHz |
|                        | band class 7  | 746.000 MHz to 764.000 MHz   |
|                        | band class 8  | 1805.000 MHz to 1879.950 MHz |
|                        | band class 9  | 925.000 MHz to 958.750 MHz   |
|                        | band class 10 | 851.000 MHz to 939.975 MHz   |
|                        | band class 11 | 421.675 MHz to 493.475 MHz   |
|                        | band class 12 | 915.0125 MHz to 920.9875 MHz |
|                        | band class 13 | 2620.000 MHz to 2690 MHz     |
|                        | band class 14 | 1930.000 MHz to 1995.000 MHz |
|                        | band class 15 | 2110.000 MHz to 2155.000 MHz |
|                        | band class 16 | 2624.000 MHz to 2690.000 MHz |
|                        | band class 17 | 2624.000 MHz to 2690.000 MHz |
|                        | band class 18 | 757.000 MHz to 769.000 MHz   |
|                        | band class 19 | 728.000 MHz to 746.000 MHz   |
|                        | band class 20 | 1525.000 MHz to 1559.000 MHz |
|                        | band class 21 | 2190.000 MHz to 2200.000 MHz |

### CDMA2000® R&S®WinIQSIM2™ (R&S®CMW-KW800 option)

|                                 |                                                      |                                                                  |
|---------------------------------|------------------------------------------------------|------------------------------------------------------------------|
| <b>Arbitrary waveform files</b> |                                                      | CDMA_OQPSK.WV (PAR = 5.54 dB) or<br>CDMA_HPSK.WV (PAR = 6.97 dB) |
| <b>Output level range</b>       | depends on PAR                                       | see general technical specifications                             |
| <b>Output level uncertainty</b> | waveform file used:<br>CDMA_OQPSK.WV or CDMA_HPSK.WV | see general technical specifications                             |
| <b>Output level resolution</b>  |                                                      | see general technical specifications                             |
| <b>Signal quality</b>           |                                                      |                                                                  |
| Waveform quality (rho)          | waveform file used:<br>CDMA_OQPSK.WV or CDMA_HPSK.WV | > 0.99                                                           |

## CDMA2000® RF analyzer (R&S®CMW-KM800 option)

|                        |               |                              |
|------------------------|---------------|------------------------------|
| <b>Frequency range</b> | band class 0  | 815.025 MHz to 848.985 MHz   |
|                        | band class 1  | 1850.000 MHz to 1910.000 MHz |
|                        | band class 2  | 872.0125 MHz to 914.9875 MHz |
|                        | band class 3  | 887.0125 MHz to 924.9875 MHz |
|                        | band class 4  | 1750.000 MHz to 1780.000 MHz |
|                        | band class 5  | 411.675 MHz to 483.480 MHz   |
|                        | band class 6  | 1920.000 MHz to 1979.950 MHz |
|                        | band class 7  | 776.000 MHz to 794.000 MHz   |
|                        | band class 8  | 1710.000 MHz to 1784.950 MHz |
|                        | band class 9  | 880.000 MHz to 913.750 MHz   |
|                        | band class 10 | 806.000 MHz to 900.975 MHz   |
|                        | band class 11 | 411.675 MHz to 483.475 MHz   |
|                        | band class 12 | 870.0125 MHz to 875.9875 MHz |
|                        | band class 13 | 2500.000 MHz to 2570.000 MHz |
|                        | band class 14 | 1850.000 MHz to 1915.000 MHz |
|                        | band class 15 | 1710.000 MHz to 1755.000 MHz |
|                        | band class 16 | 2502.000 MHz to 2568.000 MHz |
|                        | band class 17 | 2502.000 MHz to 2567.950 MHz |
|                        | band class 18 | 787.000 MHz to 700.000 MHz   |
|                        | band class 19 | 698.000 MHz to 716.000 MHz   |
|                        | band class 20 | 1626.500 MHz to 1660.500 MHz |
|                        | band class 21 | 2000.000 MHz to 2029.950 MHz |

|                   |  |                                                       |
|-------------------|--|-------------------------------------------------------|
| <b>Statistics</b> |  |                                                       |
| Statistical count |  | 1 to 1000                                             |
| Values            |  | current, average, minimum/maximum, standard deviation |

|                 |  |                                                                                                                                           |
|-----------------|--|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Trigger</b>  |  |                                                                                                                                           |
| Trigger sources |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• C2K: free run</li> <li>• CDMA2000® signaling: superframe (80 ms)</li> </ul> |

### Modulation analysis

|                            |                                        |                                                                                                                                                                                            |
|----------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>              |                                        | 1.23 MHz, RRC, $\alpha = 0.22$ , CDMA filter                                                                                                                                               |
| <b>Level range</b>         |                                        | -28 dBm to +36 dBm <sup>50</sup>                                                                                                                                                           |
| <b>Analysis modes</b>      |                                        | OQPSK, HPSK                                                                                                                                                                                |
| <b>Measured parameters</b> | numeric results and standard deviation | error vector magnitude (EVM), magnitude error (ME), phase error (PE), frequency error, rho, carrier feedthrough, I/Q imbalance, power, wideband power (8 MHz), narrowband power (1.23 MHz) |
|                            | graphical                              | EVM versus time, ME versus time, PE versus time                                                                                                                                            |

|                               |                  |                   |
|-------------------------------|------------------|-------------------|
| <b>Waveform quality (rho)</b> |                  |                   |
| Uncertainty                   | for rho 0.9 to 1 | < 0.003           |
| Measurement length            |                  | 616 chip (0.5 ms) |

|                                     |  |                 |
|-------------------------------------|--|-----------------|
| <b>Error vector magnitude (EVM)</b> |  |                 |
| Measurement range                   |  | up to 25 %, RMS |
| Inherent EVM                        |  | < 2.5 %, RMS    |
| Measurement length                  |  | 0.5 ms          |

<sup>50</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

|                                   |  |                                                                      |
|-----------------------------------|--|----------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                      |
| Measurement range                 |  | ±3 kHz                                                               |
| Frequency measurement uncertainty |  | < 20 Hz + drift of timebase,<br>see general technical specifications |

|                              |                                    |          |
|------------------------------|------------------------------------|----------|
| <b>Carrier feedthrough</b>   |                                    |          |
| Inherent carrier feedthrough | for average $\geq 10$ measurements | < -55 dB |

|                        |  |          |
|------------------------|--|----------|
| <b>I/Q imbalance</b>   |  |          |
| Inherent I/Q imbalance |  | < -50 dB |

## Code domain

|                            |                                                             |                                                                 |
|----------------------------|-------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Filter</b>              |                                                             | 1.23 MHz, RRC, $\alpha = 0.22$ , CDMA filter                    |
| <b>Level range</b>         |                                                             | -28 dBm to +36 dBm <sup>51</sup>                                |
| <b>Measured parameters</b> | numeric values of current, average,<br>max. and min. values | code domain power (CDP),<br>code domain error (CDE)             |
|                            | graphical                                                   | code domain power versus code,<br>code domain error versus code |

|                                      |  |                   |
|--------------------------------------|--|-------------------|
| <b>Code domain power versus code</b> |  |                   |
| Uncertainty                          |  | < 0.4 dB          |
| Measurement length                   |  | 616 chip (0.5 ms) |

|                                      |  |                   |
|--------------------------------------|--|-------------------|
| <b>Code domain error versus code</b> |  |                   |
| Measurement uncertainty              |  | < 0.4 dB          |
| Measurement length                   |  | 616 chip (0.5 ms) |

## Spectrum measurements

|                                                          |                                                    |                                                              |
|----------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------|
| <b>Adjacent channel power</b>                            | RMS detector, at the selected frequency<br>offsets |                                                              |
| Filter                                                   | Gaussian                                           | 1 kHz, 6.25 kHz, 10 kHz, 12.5 kHz,<br>25 kHz, 30 kHz, 50 kHz |
|                                                          | Nyquist                                            | 100 kHz, 1 MHz, 1.23 MHz                                     |
| Frequency offset interval                                | up to 20 adjacent channels on each side            | -4 MHz to +4 MHz                                             |
| Dynamic range                                            |                                                    | > 70 dB                                                      |
| Expected nominal power setting for full<br>dynamic range | RF1 to RF8                                         | +1 dBm to +36 dBm <sup>51</sup>                              |
| Uncertainty                                              | for -43 dBc adjacent channel level                 | < 0.5 dB                                                     |
| Measurement length                                       | one power control group                            | 1536 chip (1.25 ms)                                          |

## Power meter

|                    |            |                                      |
|--------------------|------------|--------------------------------------|
| <b>MS power</b>    |            |                                      |
| Filter             | narrowband | bandpass, 1.25 MHz                   |
| Filter             | wideband   | bandpass, 8 MHz                      |
| Level range        |            | -55 dBm to +36 dBm <sup>51</sup>     |
| Level uncertainty  |            | see general technical specifications |
| Measurement length |            | 616 chip (0.5 ms)                    |

<sup>51</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## CDMA2000® 1xEV-DO specifications – access terminal test

|             |                                  |                              |
|-------------|----------------------------------|------------------------------|
| Standard    | CDMA2000® 1xEV-DO standards      | TIA/EIA 856-2                |
|             | CDMA2000® 1xEV-DO test standards | TIA/EIA 866-A, TIA/EIA 866-B |
| Symbol rate |                                  | 1.2288 Mcps                  |

### CDMA2000® 1xEV-DO RF generator

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Frequency range | band class 0  | 860.025 MHz to 893.985 MHz   |
|                 | band class 1  | 1930.000 MHz to 1990.000 MHz |
|                 | band class 2  | 917.0125 MHz to 959.9875 MHz |
|                 | band class 3  | 832.0125 MHz to 869.9875 MHz |
|                 | band class 4  | 1840.000 MHz to 1870.000 MHz |
|                 | band class 5  | 421.675 MHz to 493.480 MHz   |
|                 | band class 6  | 2110.000 MHz to 2169.950 MHz |
|                 | band class 7  | 746.000 MHz to 764.000 MHz   |
|                 | band class 8  | 1805.000 MHz to 1879.950 MHz |
|                 | band class 9  | 925.000 MHz to 958.750 MHz   |
|                 | band class 10 | 851.000 MHz to 939.975 MHz   |
|                 | band class 11 | 421.675 MHz to 493.475 MHz   |
|                 | band class 12 | 915.0125 MHz to 920.9875 MHz |
|                 | band class 13 | 2620.000 MHz to 2690 MHz     |
|                 | band class 14 | 1930.000 MHz to 1995.000 MHz |
|                 | band class 15 | 2110.000 MHz to 2155.000 MHz |
|                 | band class 16 | 2624.000 MHz to 2690.000 MHz |
|                 | band class 17 | 2624.000 MHz to 2690.000 MHz |
|                 | band class 18 | 757.000 MHz to 769.000 MHz   |
|                 | band class 19 | 728.000 MHz to 746.000 MHz   |
|                 | band class 20 | 1525.000 MHz to 1559.000 MHz |
|                 | band class 21 | 2190.000 MHz to 2200.000 MHz |

### 1xEV-DO R&S®WinIQSIM2™ (R&S®CMW-KW880 option)

|                          |                                     |                                      |
|--------------------------|-------------------------------------|--------------------------------------|
| Arbitrary waveform file  |                                     | EVDO_DEFAULT.WV (PAR = 4.85 dB)      |
| Output level range       | depends on PAR                      | see general technical specifications |
| Output level uncertainty | waveform file used: EVDO_DEFAULT.WV | see general technical specifications |
| Output level resolution  |                                     | see general technical specifications |
| Signal quality           |                                     |                                      |
| Waveform quality (rho)   | waveform file used: EVDO_DEFAULT.WV | > 0.99                               |

### CDMA2000® 1xEV-DO RF analyzer (R&S®CMW-KM880 option)

|                 |               |                              |
|-----------------|---------------|------------------------------|
| Frequency range | band class 0  | 815.025 MHz to 848.985 MHz   |
|                 | band class 1  | 1850.000 MHz to 1910.000 MHz |
|                 | band class 2  | 872.0125 MHz to 914.9875 MHz |
|                 | band class 3  | 887.0125 MHz to 924.9875 MHz |
|                 | band class 4  | 1750.000 MHz to 1780.000 MHz |
|                 | band class 5  | 411.675 MHz to 483.480 MHz   |
|                 | band class 6  | 1920.000 MHz to 1979.950 MHz |
|                 | band class 7  | 776.000 MHz to 794.000 MHz   |
|                 | band class 8  | 1710.000 MHz to 1784.950 MHz |
|                 | band class 9  | 880.000 MHz to 913.750 MHz   |
|                 | band class 10 | 806.000 MHz to 900.975 MHz   |
|                 | band class 11 | 411.675 MHz to 483.475 MHz   |
|                 | band class 12 | 870.0125 MHz to 875.9875 MHz |
|                 | band class 13 | 2500.000 MHz to 2570.000 MHz |
|                 | band class 14 | 1850.000 MHz to 1915.000 MHz |
|                 | band class 15 | 1710.000 MHz to 1755.000 MHz |
|                 | band class 16 | 2502.000 MHz to 2568.000 MHz |
|                 | band class 17 | 2502.000 MHz to 2567.950 MHz |
|                 | band class 18 | 787.000 MHz to 700.000 MHz   |
|                 | band class 19 | 698.000 MHz to 716.000 MHz   |
|                 | band class 20 | 1626.500 MHz to 1660.500 MHz |
|                 | band class 21 | 2000.000 MHz to 2029.950 MHz |

|                   |  |                                                                                                                                             |
|-------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Statistics</b> |  |                                                                                                                                             |
| Statistical count |  | 1 to 1000                                                                                                                                   |
| Values            |  | current, average, minimum/maximum, standard deviation                                                                                       |
| <b>Trigger</b>    |  |                                                                                                                                             |
| Trigger sources   |  | <ul style="list-style-type: none"> <li>• GPRF: Gen</li> <li>• 1xEV-DO: free run</li> <li>• 1xEV-DO signaling: superframe (80 ms)</li> </ul> |

## Modulation analysis

|                            |                                        |                                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Filter</b>              |                                        | 1.23 MHz, RRC, $\alpha = 0.22$ , CDMA filter                                                                                                                                                                                             |
| <b>Level range</b>         |                                        | -28 dBm to +36 dBm <sup>52</sup>                                                                                                                                                                                                         |
| <b>Analysis modes</b>      |                                        | dual BPSK                                                                                                                                                                                                                                |
| <b>Multicarrier</b>        |                                        | single carrier or 3 carriers within -8 MHz to +8 MHz                                                                                                                                                                                     |
| <b>Measured parameters</b> | numeric results and standard deviation | error vector magnitude (EVM), magnitude error (ME), phase error (PE), frequency error, rho, carrier feedthrough, I/Q imbalance, power, wideband power (8 MHz for single carrier or 16 MHz for multicarrier), narrowband power (1.23 MHz) |
|                            | graphical                              | EVM versus time, ME versus time, PE versus time                                                                                                                                                                                          |

|                               |                  |                            |
|-------------------------------|------------------|----------------------------|
| <b>Waveform quality (rho)</b> |                  |                            |
| Uncertainty                   | for rho 0.9 to 1 | < 0.003                    |
| Measurement length            | half-slot        | 1024 chip (833.33 $\mu$ s) |

|                                     |           |                            |
|-------------------------------------|-----------|----------------------------|
| <b>Error vector magnitude (EVM)</b> |           |                            |
| Measurement range                   |           | up to 25 %, RMS            |
| Inherent EVM                        |           | < 2.5 %, RMS               |
| Measurement length                  | half-slot | 1024 chip (833.33 $\mu$ s) |

|                                   |  |                                                                   |
|-----------------------------------|--|-------------------------------------------------------------------|
| <b>Frequency error</b>            |  |                                                                   |
| Measurement range                 |  | $\pm 3$ kHz                                                       |
| Frequency measurement uncertainty |  | < 20 Hz + drift of timebase, see general technical specifications |

|                              |                                    |          |
|------------------------------|------------------------------------|----------|
| <b>Carrier feedthrough</b>   |                                    |          |
| Inherent carrier feedthrough | for average $\geq 10$ measurements | < -55 dB |

|                        |  |          |
|------------------------|--|----------|
| <b>I/Q imbalance</b>   |  |          |
| Inherent I/Q imbalance |  | < -50 dB |

<sup>52</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## Code domain

|                            |                                                          |                                                              |
|----------------------------|----------------------------------------------------------|--------------------------------------------------------------|
| <b>Filter</b>              |                                                          | 1.23 MHz, RRC, $\alpha = 0.22$ , CDMA filter                 |
| <b>Level range</b>         |                                                          | –28 dBm to +36 dBm <sup>53</sup>                             |
| <b>Measured parameters</b> | numeric values of current, average, max. and min. values | code domain power (CDP), code domain error (CDE)             |
|                            | graphical                                                | code domain power versus code, code domain error versus code |

|                                      |           |                            |
|--------------------------------------|-----------|----------------------------|
| <b>Code domain power versus code</b> |           |                            |
| Uncertainty                          |           | < 0.4 dB                   |
| Measurement length                   | half-slot | 1024 chip (833.33 $\mu$ s) |

|                                      |           |                            |
|--------------------------------------|-----------|----------------------------|
| <b>Code domain error versus code</b> |           |                            |
| Measurement uncertainty              |           | < 0.4 dB                   |
| Measurement length                   | half-slot | 1024 chip (833.33 $\mu$ s) |

## Spectrum measurements

|                                                       |                                                 |                                                           |
|-------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------|
| <b>Adjacent channel power</b>                         | RMS detector, at the selected frequency offsets |                                                           |
| Filter                                                | Gaussian                                        | 1 kHz, 6.25 kHz, 10 kHz, 12.5 kHz, 25 kHz, 30 kHz, 50 kHz |
|                                                       | Nyquist                                         | 100 kHz, 1 MHz, 1.23 MHz                                  |
| Frequency offset interval                             | up to 20 adjacent channels on each side         | –4 MHz to +4 MHz to each carrier                          |
| Dynamic range                                         |                                                 | > 70 dB                                                   |
| Expected nominal power setting for full dynamic range | RF1 COM, RF2 COM                                | +1 dBm to +36 dBm <sup>53</sup>                           |
| Uncertainty                                           | for –43 dBc adjacent channel level              | < 0.5 dB                                                  |
| Measurement length                                    | half-slot                                       | 1024 chip (833.33 $\mu$ s)                                |

## Power meter

|                    |            |                                                               |
|--------------------|------------|---------------------------------------------------------------|
| <b>MS power</b>    |            |                                                               |
| Filter             | narrowband | bandpass, 1.25 MHz                                            |
| Filter             | wideband   | bandpass, 8 MHz for single carrier or 16 MHz for multicarrier |
| Level range        |            | –55 dBm to +36 dBm <sup>53</sup>                              |
| Level uncertainty  |            | see general technical specifications                          |
| Measurement length | half-slot  | 1024 chip (833.33 $\mu$ s)                                    |

<sup>53</sup> The maximum permissible continuous power is +34 dBm due to thermal limits.

## General data

|                                       |                                                                                                                                            |                                                                                                                                                                       |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RF connectors (front panel)</b>    |                                                                                                                                            |                                                                                                                                                                       |
| RF 1 TO RF 8                          |                                                                                                                                            | SnapN female, 50 $\Omega$ , compatible with N female connectors                                                                                                       |
| TX AUX                                |                                                                                                                                            | combined RF input and RF output                                                                                                                                       |
|                                       |                                                                                                                                            | RF output                                                                                                                                                             |
| <b>Control interface (rear panel)</b> |                                                                                                                                            |                                                                                                                                                                       |
| USB                                   | max. length 3 m                                                                                                                            | USB 3.0 type B connector                                                                                                                                              |
| <b>Power input (rear panel)</b>       |                                                                                                                                            |                                                                                                                                                                       |
|                                       | For safety reasons, the instrument is only to be used with the Rohde & Schwarz AC adapter (order no. 1210.7812.00).                        | DC socket                                                                                                                                                             |
| Rated voltage                         |                                                                                                                                            | 24 V DC ( $\pm 10\%$ )                                                                                                                                                |
| Rated current                         |                                                                                                                                            | max. 3 A                                                                                                                                                              |
| Power consumption                     |                                                                                                                                            | max. 72 W                                                                                                                                                             |
| <b>Environmental conditions</b>       |                                                                                                                                            |                                                                                                                                                                       |
| Temperature                           | operating temperature range                                                                                                                | +5 °C to +45 °C                                                                                                                                                       |
|                                       | storage temperature range                                                                                                                  | -25 °C to +60 °C                                                                                                                                                      |
| Damp heat                             |                                                                                                                                            | +40 °C, 80 % rel. humidity, steady state, in line with EN 60068-2-78                                                                                                  |
| <b>Product conformity</b>             |                                                                                                                                            |                                                                                                                                                                       |
| Electromagnetic compatibility         | EU: in line with EMC Directive 2014/30/EC                                                                                                  | applied harmonized standards: <ul style="list-style-type: none"> <li>EN 61326-1 (industrial environment)</li> <li>EN 61326-2-1</li> <li>EN 55011 (class A)</li> </ul> |
| Electrical safety                     | EU                                                                                                                                         | applied harmonized standard: EN 61010-1                                                                                                                               |
|                                       | USA/Canada                                                                                                                                 | applied harmonized standards: <ul style="list-style-type: none"> <li>UL 61010-1</li> <li>CAN C22.2 No. 61010-1</li> </ul>                                             |
| RoHS                                  | EU: in line with Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment | EN 50581                                                                                                                                                              |
| <b>Mechanical resistance</b>          |                                                                                                                                            |                                                                                                                                                                       |
| nonoperating mode                     |                                                                                                                                            |                                                                                                                                                                       |
| Vibration                             | sinusoidal                                                                                                                                 | 5 Hz to 55 Hz, 0.3 mm double amplitude const.,<br>55 Hz to 150 Hz, 0.5 g const.,<br>in line with EN 60068-2-6                                                         |
| Vibration                             | random                                                                                                                                     | 10 Hz to 300 Hz, acceleration 1.2 g RMS,<br>in line with EN 60068-2-64                                                                                                |
| Shock                                 |                                                                                                                                            | 40 g shock spectrum,<br>in line with MIL-STD-810, method 516, procedure I                                                                                             |
| <b>Dimensions</b>                     |                                                                                                                                            |                                                                                                                                                                       |
|                                       | W × H × D, overall                                                                                                                         | 354 mm × 112 mm × 389 mm<br>(14.0 in × 4.4 in × 15.3 in)                                                                                                              |
| <b>Weight</b>                         |                                                                                                                                            |                                                                                                                                                                       |
|                                       |                                                                                                                                            | approx. 6.8 kg (15 lb)                                                                                                                                                |
| <b>Calibration interval</b>           |                                                                                                                                            |                                                                                                                                                                       |
|                                       | 12 months                                                                                                                                  | recommended for highest accuracy, see specified RF generator and RF analyzer level uncertainty                                                                        |
|                                       | 24 months                                                                                                                                  | add 0.2 dB to specified RF generator and RF analyzer level uncertainty                                                                                                |

## Accessories delivered with R&S®CMW-PS10 (1210.7606.02)

### External Rohde & Schwarz AC adapter (1210.7812.00)

The external Rohde & Schwarz AC adapter is required to connect the R&S®CMW100 to AC mains.

|                     |                      |                           |
|---------------------|----------------------|---------------------------|
| <b>Power rating</b> |                      |                           |
| Rated voltage       |                      | 100 V to 240 V AC (±10 %) |
| Rated frequency     |                      | 50 Hz to 60 Hz (±5 %)     |
| Rated current       |                      | max. 1.4 A                |
| Output voltage      |                      | 24 V DC (±3 %)            |
| Output current      |                      | max. 5 A                  |
| Power consumption   | with R&S®CMW100 load | see general data          |
|                     | with no load         | approx. 0.15 W            |

|                                 |                             |                  |
|---------------------------------|-----------------------------|------------------|
| <b>Environmental conditions</b> |                             |                  |
| Temperature                     | operating temperature range | see general data |
|                                 | storage temperature range   | see general data |
| Damp heat                       |                             | see general data |

|                               |                                                   |                                                                                                                         |
|-------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Product conformity</b>     |                                                   |                                                                                                                         |
| Electromagnetic compatibility | EU: in line with EMC Directive 2014/30/EC         | applied harmonized standards: <ul style="list-style-type: none"> <li>• EN 61000</li> <li>• EN 55032 class B</li> </ul>  |
| Electrical safety             | EU: in line with Low Voltage Directive 2014/35/EC | applied harmonized standard: <ul style="list-style-type: none"> <li>• EN 60950-1</li> </ul>                             |
|                               | USA/Canada/Japan                                  | applied standards: <ul style="list-style-type: none"> <li>• UL/CAN/CSA-C22.2 No. 60950-1</li> <li>• J60950-1</li> </ul> |
|                               | Korea                                             | applied standard: <ul style="list-style-type: none"> <li>• Korea KC</li> </ul>                                          |

|                   |                    |                                                         |
|-------------------|--------------------|---------------------------------------------------------|
| <b>Dimensions</b> | W × H × D, overall | 167 mm × 67 mm × 35 mm<br>(6.57 in × 2.64 in × 1.38 in) |
| <b>Weight</b>     |                    | approx. 0.62 kg (1.37 lb)                               |

### USB 3.0 cable

The 3 m USB 3.0 cable (type A to type B) is required to connect the R&S®CMW100 to a computer.

## Ordering information

### R&S®CMW100 communications manufacturing test set

| Designation                                                                                                                                                                                                                                                                           | Type           | Order No.    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| Communications manufacturing test set                                                                                                                                                                                                                                                 | R&S®CMW100     | 1201.0002K03 |
| R&S®CMW100 hardware kit                                                                                                                                                                                                                                                               | R&S®CMW-PS10   | 1210.7606.02 |
| Documentation of calibration values                                                                                                                                                                                                                                                   | R&S®DCV-2      | 0240.2193.08 |
| R&S®CMW100, extended frequency range, 4 GHz to 6 GHz                                                                                                                                                                                                                                  | R&S®CMW-PK461  | 1210.7129.02 |
| R&S®CMW100, GSM WCDMA, TX measurements, UL                                                                                                                                                                                                                                            | R&S®CMW-PKM121 | 1210.7164.02 |
| R&S®CMW100, LTE, TX measurements, UL                                                                                                                                                                                                                                                  | R&S®CMW-PKM151 | 1210.7187.02 |
| R&S®CMW100, TD-SCDMA, TX measurements, UL                                                                                                                                                                                                                                             | R&S®CMW-PKM171 | 1210.7206.02 |
| R&S®CMW100, CDMA2000® 1xEV-DO, TX measurements, DL                                                                                                                                                                                                                                    | R&S®CMW-PKM181 | 1210.7229.03 |
| R&S®CMW100, Bluetooth® BR EDR LE, TX measurements (SL)                                                                                                                                                                                                                                | R&S®CMW-PKM611 | 1210.7264.02 |
| R&S®CMW100, WLAN 802.11 a/b/g/n/ac, TX measurements (SL)                                                                                                                                                                                                                              | R&S®CMW-PKM651 | 1210.7287.02 |
| R&S®CMW100, waveforms for ARB generator                                                                                                                                                                                                                                               | R&S®CMW-PKV191 | 1210.7306.03 |
| R&S®CMW100 communications manufacturing test set can be operated only in combination with a standard computer, which is not included. The required R&S®CMW100 software must be installed on the computer. It can be downloaded free of charge or ordered as accessory R&S®CMW100-Z31. |                |              |

### Recommended accessories

| Designation                             | Type           | Order No.    |
|-----------------------------------------|----------------|--------------|
| 19" rack mounting kit for R&S®CMW100    | R&S®CMW100-Z19 | 1210.7470.02 |
| CMW100 software and manual on USB stick | R&S®CMW100-Z31 | 1210.7570.02 |

### Computer requirements

The computer to be connected to the radio test head must fulfill the minimum requirements stated in the following table.

|                                               | Minimum requirements                                                                                                                                                        | Recommended                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Processor (CPU)                               | Intel Core i3, third generation                                                                                                                                             | Intel Core i7, quad-core, fourth generation |
| Memory (RAM)                                  | 8 Gbyte                                                                                                                                                                     | 16 Gbyte                                    |
| Storage medium <sup>54</sup>                  | 64 Gbyte free space, HDD or SSD                                                                                                                                             | 128 Gbyte free space, SSD                   |
| Graphics                                      | minimum resolution 1024 × 768 pixel                                                                                                                                         |                                             |
| Operating system                              | Windows 7 Professional, 64 bit or higher Windows versions, 64 bit, supporting English language;<br>The compatibility of other Windows versions cannot be guaranteed.        |                                             |
| USB socket for connecting the radio test head | 1 × USB 3.0;<br>Use a socket mounted to the motherboard, not a socket connected to the motherboard via a cable. Typically, sockets on the front of the PC are not suitable. |                                             |

<sup>54</sup> The free disk space on the storage medium is used, for example, for installation of test software, storage of measurement results and ARB files.

## Service options

| Service options                                                     |         |                                                         |
|---------------------------------------------------------------------|---------|---------------------------------------------------------|
| Extended warranty, one year                                         | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended warranty, two years                                        | R&S®WE2 |                                                         |
| Extended warranty, three years                                      | R&S®WE3 |                                                         |
| Extended warranty, four years                                       | R&S®WE4 |                                                         |
| Extended warranty with calibration coverage, one year               | R&S®CW1 |                                                         |
| Extended warranty with calibration coverage, two years              | R&S®CW2 |                                                         |
| Extended warranty with calibration coverage, three years            | R&S®CW3 |                                                         |
| Extended warranty with calibration coverage, four years             | R&S®CW4 |                                                         |
| Extended warranty with accredited calibration coverage, one year    | R&S®AW1 |                                                         |
| Extended warranty with accredited calibration coverage, two years   | R&S®AW2 |                                                         |
| Extended warranty with accredited calibration coverage, three years | R&S®AW3 |                                                         |
| Extended warranty with accredited calibration coverage, four years  | R&S®AW4 |                                                         |

### Extended warranty with a term of one to four years (WE1 to WE4)

Repairs carried out during the contract term are free of charge <sup>55</sup>. Necessary calibration and adjustments carried out during repairs are also covered.

### Extended warranty with calibration (CW1 to CW4)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs <sup>55</sup> and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

### Extended warranty with accredited calibration (AW1 to AW4)

Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs <sup>55</sup> and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

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<sup>55</sup> Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.





## Service that adds value

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