

5G NR MEASUREMENT APPLICATION

Specifications

R&S®FSW-K144 5G NR Downlink Measurement Application
R&S®FSW-K145 5G NR Uplink Measurement Application
R&S®FSV3-K144 5G NR Downlink Measurement Application
R&S®FSV3-K145 5G NR Uplink Measurement Application
R&S®FSV-K144 5G NR Downlink Measurement Application
R&S®VSE-K144 5G NR Uplink and Downlink Measurement Application
R&S®VSE-K146 5G NR MIMO Measurement Application



Data Sheet
Version 08.00

ROHDE & SCHWARZ

Make ideas real



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Definitions

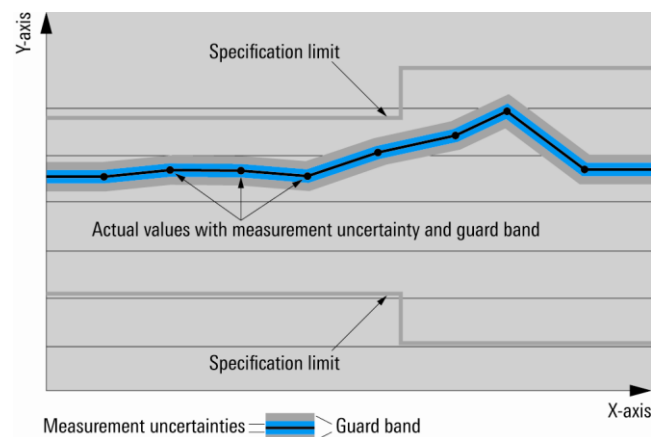
General

Product data applies under the following conditions:

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

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \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.



Non-traceable specifications with limits (n. trc.)

Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

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, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

Specifications

The specifications of the R&S®FSW-K144/-K145, the R&S®FSV3-K144/-K145, the R&S®FSV-K144, the R&S®FPS-K144 and the R&S®VSE-K144/-K146 are based on the specifications of the R&S®FSW, R&S®FSVA3000, R&S®FSV3000, R&S®FSVA, R&S®FSV and R&S®FPS signal and spectrum analyzers, the R&S®RTO and R&S®RTP oscilloscope and the R&S®NRQ6 power sensor. They have not been checked separately and are not verified during instrument calibration. Measurement uncertainties are given as 95 % confidence intervals. The specified level measurement errors do not take into account systematic errors due to reduced signal-to-noise ratio (SNR).

General remarks

This data sheet covers the R&S®FSW-K144/-K145, the R&S®FSV3-K144/-K145, the R&S®FSV-K144, R&S®FPS-K144 and the R&S®VSE-K144/-K146. The R&S®FSW-K144/-K145, the R&S®FSV3-K144/-K145, R&S®FSV-K144 and the R&S®FPS-K144 are summarized with the term R&S®FSx-K144/-K145.

The R&S®FSx-K144/-K145 runs on the analyzer itself.

The R&S®VSE-K144/-K146 runs on a PC that can be connected to the devices as specified below.

If not stated otherwise, the data sheet values are device-specific, e.g. the same value applies to the R&S®FSW-K144/-K145 and the R&S®VSE-K144/-K146 with connected R&S®FSW.

For feature tables the following convention applies:

•	Feature always supported i.e. with the R&S®VSE-K144/-K146 connected to the device and with the corresponding R&S®FSx-K144/-K145 option when running directly on the device.
• (VSE)	Feature supported only with the R&S®VSE-K144/-K146 connected to the device. Not with the corresponding R&S®FSx-K144/-K145 option when running directly on the device.
• (FSx-K144/-K145)	Feature supported only when running directly on the device with the corresponding R&S®FSx-K144/-K145 option. Not supported in the R&S®VSE-K144/-K146.
–	Feature not supported with this device.

Overview

Measurement application	Description	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV	R&S®FPS	R&S®RTO/ R&S®RTP	R&S®NRQ6
R&S®FSx-K144/ -K145	software that runs on device	• R&S®FSW-K144/ -K145	• R&S®FSV3-K144/ -K145	• R&S®FSV-K144	• R&S®FPS-K144	–	–
R&S®VSE-K144/ -K146	PC software that can be connected to device	•	•	•	•	•	•

Application overview

Assignment of option numbers to link modes and access modes

R&S®FSx-K144	5G NR downlink
R&S®FSx-K145	5G NR uplink
R&S®VSE-K144	5G NR downlink and uplink
R&S®VSE-K146	5G NR MIMO measurements

Supported standards

Supported standards	R&S®FSx-K144/K145 and R&S®VSE-K144/-K146 in line with [1]
Supported physical channels and signals	
R&S®FSx-K144, R&S®VSE-K144/-K146	PDSCH, DL PT-RS, PDCCH, PBCH, PSS, SSS, CSI-RS support of multi-numerology scenarios
R&S®FSx-K145, R&S®VSE-K144	PUSCH, UL PT-RS, PUCCH (format 0/1/2), SRS, support of transform precoding

References

[1] 3GPP TS 38.211 v15.6.0, 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical Channels and Modulation (Release 15).

5G NR analysis

Inputs

	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV	R&S®FPS	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
RF input	•	•	•	•	•	•
Analog baseband input	• (FSW-K144/-K145) ²	–	–	–	•	–
File	•	•	•	•	•	•

Signal acquisition

		R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV	R&S®FPS	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
Capture length	default	1.0 ms to 50.1 ms	1.0 ms to 50.1 ms	1.0 ms to 50.1 ms	1.0 ms to 50.1 ms	1.0 ms to 50.1 ms	1.0 ms to 50.1 ms
	long capture	50.1 ms to 1 s	50.1 ms to 1 s ³	> 50.1 ms (depending on sampling rate) (VSE)	50.1 ms to 1 s	> 50.1 ms (depending on sampling rate)	> 50.1 ms (depending on sampling rate)
Trigger modes	free run	•	•	•	•	•	•
	external	•	•	•	•	•	•

¹ R&S®NRQ6-K1 option required for measurements with R&S®VSE.

² R&S®FSW-B71 or R&S®FSW-B2071 option required.

³ With R&S®FSV3-B200 or R&S®FSV3-B400 installed, value only valid up to carrier bandwidth 40 MHz.

Measurement parameters

	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV	R&S®FPS	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
Resource allocation						
Channel bandwidth	5/10/15/20/25/30/40/50/60/70/80/90/100/200/ 400 MHz ⁴		5/10/15/20/25/30/40/50/60/70/80/90/100 MHz ⁴		5/10/15/20/25/30/40/ 50/60/70/80/90/100/ 200/400 MHz	5/10/15/20/25/30/40/ 50/60/70/80/90/ 100 MHz
Number of component carriers	16	16	16 (VSE)	16	16	16
Switchable multicarrier filter	•	•	•	•	•	•
Number of frames to be allocated (per capture)	5	5	5 (VSE) 1 (FSV-K144)	5	5	5
Modulation types	π/2-BPSK (uplink TP only), QPSK, 16QAM, 64QAM, 256QAM					
MIMO						
Configuration	1-8 RX antennas (VSE-K146, DL only)					
Number of input sources	1-8 (VSE-K146, DL only)					
Spectrum emission mask/adjacent channel leakage power ratio (ACLR)⁵						
Measurements available	• (FSW-K144/-K145)	• (FSV3-K144/-K145)	• (FSV-K144)	• (FPS-K144)	–	–
Frequency range	FR1/FR2				–	–
Base station type (R&S®FSx-K144)	1-C, 1-H, 1-O, 2-O				–	–
Category (SEM)	A, B (option 1, option 2), local area, home (FSx-K144); general SEM (FSx-K145)		A, B (option 1, option 2), local area, home (FSx-K144)		–	–
Adjacent channel (ACLR)	NR of same BW, 5 MHz E-UTRA (FSx-K144); 3.84 MHz UTRA (FSx-K145)		NR of same BW, 5 MHz E-UTRA (FSx-K144)		–	–
ACLR noise correction	•	•	•	•	–	–
Auto gating	•	•	•	•	–	–

⁴ Matching bandwidth option required. E.g. R&S®FSW-B512/R&S®FSV3-B400/R&S®FSV-B160/R&S®FPS-B160 required for the respective analyzer to support all given 5G NR channel bandwidths.

⁵ As defined in section 6.6 of 3GPP TS 38.141-1/2 v15.1.0 or in section 6.5 TS 38.521-1/2 v15.2.0.

Result displays downlink

	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV	R&S®FPS	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
Result summary						
EVM PDSCH QPSK	•	•	•	•	•	•
EVM PDSCH 16QAM	•	•	•	•	•	•
EVM PDSCH 64QAM	•	•	•	•	•	•
EVM PDSCH 256QAM	•	•	•	•	•	•
EVM physical channel	•	•	•	•	•	•
EVM physical signal	•	•	•	•	•	•
EVM all	•	•	•	•	•	•
Center frequency error	•	•	•	•	•	•
Sampling error	•	•	•	•	•	•
Time alignment error	•	•	• (VSE)	•	•	•
I/Q offset	•	•	•	•	•	•
I/Q gain imbalance	•	•	•	•	•	•
I/Q quadrature error	•	•	•	•	•	•
OSTP (OFDM symbol TX power)	•	•	•	•	•	•
RSTP	•	•	• (VSE)	•	•	•
CSI-RSRP	•	•	• (VSE)	•	•	•
SS-RSRP	•	•	• (VSE)	•	•	•
Power	•	•	•	•	•	•
Crest factor	•	•	• (VSE)	•	•	•
Power versus time						
Capture buffer	•	•	•	•	•	•
On/off power	• (FSW-K144)	• (FSV3-K144)	–	–	–	–
Power versus symbol and carrier	•	•	• (VSE)	•	•	•
EVM						
EVM versus carrier	•	•	•	•	•	•
EVM versus symbol	•	•	•	•	•	•
EVM versus symbol and carrier	•	•	• (VSE)	•	•	•
EVM versus resource block	•	•	• (VSE)	•	•	•
Frequency error versus symbol	•	•	• (VSE)	•	•	•

	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV	R&S®FPS	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
Spectrum						
Power spectrum	•	•	•	•	•	•
Channel flatness	•	•	•	•	•	•
Spectrum mask	• (FSW-K144)	• (FSV3-K144)	• (FSV-K144)	• (FPS-K144)	–	–
ACLR	• (FSW-K144)	• (FSV3-K144)	• (FSV-K144)	• (FPS-K144)	–	–
Constellation						
Constellation diagram	•	•	•	•	•	•
Statistics/miscellaneous						
CCDF	•	•	•	•	•	•
Allocation summary list	•	•	•	•	•	•
Bit stream	•	•	• (VSE)	•	•	•
Allocation ID versus symbol and carrier	•	•	• (VSE)	•	•	•
Channel decoder results (PBCH only)	•	•	• (VSE)	•	•	•
Statistics/miscellaneous						
Reference signal phase versus carrier	•	•	• (VSE)	•	•	•
Reference signal phase difference versus carrier	•	•	• (VSE)	•	•	•
Beamforming summary	•	•	• (VSE)	•	•	•

Result displays uplink

	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV (VSE)	R&S®FPS (VSE)	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
Result summary						
EVM PUSCH $\pi/2$ -BPSK (TP only)	•	•	•	•	•	•
EVM PUSCH QPSK	•	•	•	•	•	•
EVM PUSCH 16QAM	•	•	•	•	•	•
EVM PUSCH 64QAM	•	•	•	•	•	•
EVM PUSCH 256QAM	•	•	•	•	•	•
EVM DMRS PUSCH $\pi/2$ -BPSK (TP only)	•	•	•	•	•	•
EVM DMRS PUSCH QPSK	•	•	•	•	•	•
EVM DMRS PUSCH 16QAM	•	•	•	•	•	•
EVM DMRS PUSCH 64QAM	•	•	•	•	•	•
EVM DMRS PUSCH 256QAM	•	•	•	•	•	•
EVM PUCCH	•	•	•	•	•	•
EVM DMRS PUCCH	•	•	•	•	•	•
EVM physical channel	•	•	•	•	•	•
EVM physical signal	•	•	•	•	•	•
EVM all	•	•	•	•	•	•
center frequency error	•	•	•	•	•	•
Sampling error	•	•	•	•	•	•
I/Q offset	•	•	•	•	•	•
I/Q gain imbalance	•	•	•	•	•	•
I/Q quadrature error	•	•	•	•	•	•
Power	•	•	•	•	•	•
Crest factor	•	•	•	•	•	•
Power versus time						
Capture buffer	•	•	•	•	•	•
Power versus symbol and carrier	•	•	•	•	•	•
EVM						
EVM versus carrier	•	•	•	•	•	•
EVM versus symbol	•	•	•	•	•	•
EVM versus symbol and carrier	•	•	•	•	•	•
EVM versus resource block	•	•	•	•	•	•
Frequency error versus symbol	•	•	•	•	•	•
Spectrum						
Power spectrum	•	•	•	•	•	•
Relative inband emissions	•	•	•	•	•	•
Spectrum flatness	•	•	•	•	•	•

	R&S®FSW	R&S®FSVA3000/ R&S®FSV3000	R&S®FSVA/ R&S®FSV (VSE)	R&S®FPS (VSE)	R&S®RTO/ R&S®RTP (VSE)	R&S®NRQ6 ¹ (VSE)
Spectrum mask	• (FSW-K145)	• (FSV3-K145)	–	–	–	–
ACLR	• (FSW-K145)	• (FSV3-K145)	–	–	–	–
Constellation						
Constellation diagram	•	•	•	•	•	•
Statistics/miscellaneous						
CCDF	•	•	•	•	•	•
Allocation summary list	•	•	•	•	•	•
Bit stream	•	•	•	•	•	•
Allocation ID versus symbol and carrier	•	•	•	•	•	•

Measurement uncertainty (nom.)

Specifications apply under the following conditions:

- Temperature range from +20 °C to +30 °C
- Reference level properly adjusted
- External reference frequency applied
- R&S®FSW/R&S®FSVA device serial number larger than 104019/101423

Output power

Output power	
Level uncertainty	same as R&S®FSW/R&S®FSVA3000/R&S®FSV3000/R&S®FSVA/R&S®FPS (see R&S®FSW/R&S®FSVA3000/R&S®FSV3000/R&S®FSVA/R&S®FPS total measurement uncertainty)

Transmitted signal quality base station

EVM	<ul style="list-style-type: none"> • all SS/PBCH blocks transmitted where not overlapping PDSCH DMRS • one bandwidth part occupying full carrier bandwidth (no CSI-RS) • one full bandwidth PDSCH allocation, 64QAM, config type 1, mapping type A, DMRS additional position 1 (no PT-RS) • CORESET in first symbol • one component carrier • EVM: max. EVM measured at window W extremities • input: RF, input level > -10 dBm 														
Residual EVM															
450 MHz to 3 GHz	carrier bandwidth 20 MHz, subcarrier spacing 15 kHz <table border="1"> <tbody> <tr> <td>R&S®FSW43</td> <td>< 0.11 % (-59.1 dB)</td> </tr> <tr> <td>R&S®FSW67</td> <td>< 0.13 % (-57.7 dB)</td> </tr> <tr> <td>R&S®FSVA3000</td> <td>< 0.13 % (-57.9 dB)</td> </tr> <tr> <td>R&S®FSV3000</td> <td>< 0.14 % (-57.1 dB)</td> </tr> <tr> <td>R&S®FSVA40</td> <td>< 0.15 % (-56.2 dB)</td> </tr> <tr> <td>R&S®FPS40</td> <td>< 0.38 % (-48.4 dB)</td> </tr> </tbody> </table>	R&S®FSW43	< 0.11 % (-59.1 dB)	R&S®FSW67	< 0.13 % (-57.7 dB)	R&S®FSVA3000	< 0.13 % (-57.9 dB)	R&S®FSV3000	< 0.14 % (-57.1 dB)	R&S®FSVA40	< 0.15 % (-56.2 dB)	R&S®FPS40	< 0.38 % (-48.4 dB)		
R&S®FSW43	< 0.11 % (-59.1 dB)														
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R&S®FSV3000	< 0.14 % (-57.1 dB)														
R&S®FSVA40	< 0.15 % (-56.2 dB)														
R&S®FPS40	< 0.38 % (-48.4 dB)														
3 GHz to 6 GHz	carrier bandwidth 100 MHz, subcarrier spacing 30 kHz <table border="1"> <tbody> <tr> <td>R&S®FSW43-B512</td> <td>< 0.27 % (-51.3 dB)</td> </tr> <tr> <td>R&S®FSW43-B1200/-B2001</td> <td>< 0.37 % (-48.6 dB)</td> </tr> <tr> <td>R&S®FSW67-B1200/-B2001</td> <td>< 0.37 % (-48.6 dB)</td> </tr> <tr> <td>R&S®FSVA3000-B200</td> <td>< 0.40 % (-48.0 dB)</td> </tr> <tr> <td>R&S®FSV3000-B200</td> <td>< 0.45 % (-46.9 dB)</td> </tr> <tr> <td>R&S®FSVA40-B160</td> <td>< 0.51 % (-45.8 dB)</td> </tr> <tr> <td>R&S®FPS40-B160</td> <td>< 0.67 % (-43.4 dB)</td> </tr> </tbody> </table>	R&S®FSW43-B512	< 0.27 % (-51.3 dB)	R&S®FSW43-B1200/-B2001	< 0.37 % (-48.6 dB)	R&S®FSW67-B1200/-B2001	< 0.37 % (-48.6 dB)	R&S®FSVA3000-B200	< 0.40 % (-48.0 dB)	R&S®FSV3000-B200	< 0.45 % (-46.9 dB)	R&S®FSVA40-B160	< 0.51 % (-45.8 dB)	R&S®FPS40-B160	< 0.67 % (-43.4 dB)
R&S®FSW43-B512	< 0.27 % (-51.3 dB)														
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R&S®FSVA3000-B200	< 0.40 % (-48.0 dB)														
R&S®FSV3000-B200	< 0.45 % (-46.9 dB)														
R&S®FSVA40-B160	< 0.51 % (-45.8 dB)														
R&S®FPS40-B160	< 0.67 % (-43.4 dB)														
28 GHz	carrier bandwidth 100 MHz, subcarrier spacing 120 kHz <table border="1"> <tbody> <tr> <td>R&S®FSW43-B512</td> <td>< 0.69 % (-43.3 dB)</td> </tr> <tr> <td>R&S®FSW43-B1200/-B2001</td> <td>< 0.71 % (-43.0 dB)</td> </tr> <tr> <td>R&S®FSW67-B1200/-B2001</td> <td>< 0.75 % (-42.5 dB)</td> </tr> <tr> <td>R&S®FSVA3000-B200</td> <td>< 0.80 % (-41.9 dB)</td> </tr> <tr> <td>R&S®FSV3000-B200</td> <td>< 0.85 % (-41.4 dB)</td> </tr> <tr> <td>R&S®FSVA40-B160</td> <td>< 0.90 % (-40.9 dB)</td> </tr> <tr> <td>R&S®FPS40-B160</td> <td>< 1.09 % (-39.3 dB)</td> </tr> </tbody> </table>	R&S®FSW43-B512	< 0.69 % (-43.3 dB)	R&S®FSW43-B1200/-B2001	< 0.71 % (-43.0 dB)	R&S®FSW67-B1200/-B2001	< 0.75 % (-42.5 dB)	R&S®FSVA3000-B200	< 0.80 % (-41.9 dB)	R&S®FSV3000-B200	< 0.85 % (-41.4 dB)	R&S®FSVA40-B160	< 0.90 % (-40.9 dB)	R&S®FPS40-B160	< 1.09 % (-39.3 dB)
R&S®FSW43-B512	< 0.69 % (-43.3 dB)														
R&S®FSW43-B1200/-B2001	< 0.71 % (-43.0 dB)														
R&S®FSW67-B1200/-B2001	< 0.75 % (-42.5 dB)														
R&S®FSVA3000-B200	< 0.80 % (-41.9 dB)														
R&S®FSV3000-B200	< 0.85 % (-41.4 dB)														
R&S®FSVA40-B160	< 0.90 % (-40.9 dB)														
R&S®FPS40-B160	< 1.09 % (-39.3 dB)														

39 GHz	carrier bandwidth 100 MHz, subcarrier spacing 120 kHz	
	R&S®FSW43-B512	< 0.88 % (–41.1 dB)
	R&S®FSW43-B1200/-B2001	< 0.91 % (–40.8 dB)
	R&S®FSW67-B1200/-B2001	< 0.91 % (–40.8 dB)
	R&S®FSVA3000-B200	< 1.10 % (–39.2 dB)
	R&S®FSV3000-B200	< 1.20 % (–38.4 dB)
	R&S®FSVA40-B160	< 1.22 % (–38.3 dB)
Time alignment between transmitter branches	<ul style="list-style-type: none"> • all SS/PBCH blocks transmitted • one bandwidth part occupying full carrier bandwidth (no CSI-RS) • one full bandwidth PDSCH allocation, QPSK, config type 2, mapping type A, DMRS length 2, DMRS additional position 1 • one component carrier 	
	R&S®FPS40-B160	< 1.56 % (–36.1 dB)
Uncertainty	carrier bandwidth 10 MHz, subcarrier spacing 30 kHz	
	R&S®FSW	< 2.5 ns
	R&S®FSVA3000	< 2.5 ns
	R&S®FSV3000	< 2.5 ns
	R&S®FPS	< 2.5 ns

Transmitted signal quality UE

EVM	<ul style="list-style-type: none"> • one bandwidth part occupying full carrier bandwidth (no PUCCH, no SRS) • one full bandwidth PUSCH allocation, 64QAM, config type 1, mapping type A, DMRS additional position 1 (no PT-RS) • one component carrier • EVM: max. EVM measured at window W extremities • input: RF, input level > –10 dBm 	
Residual EVM		
450 MHz to 3 GHz	carrier bandwidth 20 MHz, subcarrier spacing 15 kHz	
	R&S®FSW43	< 0.11 % (–59.1 dB)
	R&S®FSW67	< 0.12 % (–58.2 dB)
	R&S®FSVA3000	< 0.12 % (–58.2 dB)
	R&S®FSV3000	< 0.14 % (–57.4 dB)
	R&S®FSVA40	< 0.15 % (–56.3 dB)
3 GHz to 6 GHz	carrier bandwidth 100 MHz, subcarrier spacing 30 kHz	
	R&S®FSW43-B512	< 0.28 % (–51.2 dB)
	R&S®FSW43-B1200/-B2001	< 0.37 % (–48.6 dB)
	R&S®FSW67-B1200/-B2001	< 0.37 % (–48.6 dB)
	R&S®FSVA3000-B200	< 0.40 % (–48.0 dB)
	R&S®FSV3000-B200	< 0.45 % (–46.9 dB)
	R&S®FSVA40-B160	< 0.52 % (–45.8 dB)
28 GHz	carrier bandwidth 100 MHz, subcarrier spacing 120 kHz	
	R&S®FSW43-B512	< 0.71 % (–43.0 dB)
	R&S®FSW43-B1200/-B2001	< 0.71 % (–43.0 dB)
	R&S®FSW67-B1200/-B2001	< 0.79 % (–42.0 dB)
	R&S®FSVA3000-B200	< 0.80 % (–41.9 dB)
	R&S®FSV3000-B200	< 0.85 % (–41.4 dB)
	R&S®FSVA40-B160	< 0.90 % (–40.9 dB)

39 GHz	carrier bandwidth 100 MHz, subcarrier spacing 120 kHz	
	R&S®FSW43-B512	< 0.89 % (-41.0 dB)
	R&S®FSW43-B1200/-B2001	< 0.88 % (-41.1 dB)
	R&S®FSW67-B1200/-B2001	< 0.88 % (-41.1 dB)
	R&S®FSVA3000-B200	< 1.10 % (-39.2 dB)
	R&S®FSV3000-B200	< 1.20 % (-38.4 dB)
	R&S®FSVA40-B160	< 1.22 % (-38.3 dB)

Ordering information

Designation	Type	Order No.
5G NR measurement applications		
R&S®FSW		
5G NR downlink measurement application	R&S®FSW-K144	1338.3606.02
5G NR uplink measurement application	R&S®FSW-K145	1338.3612.02
R&S®FSVA3000, R&S®FSV3000		
5G NR downlink measurement application	R&S®FSV3-K144	1330.7219.02
5G NR uplink measurement application	R&S®FSV3-K145	1330.7225.02
R&S®FSVA, R&S®FSV		
5G NR downlink measurement application	R&S®FSV-K144	1329.0537.02
R&S®FPS		
5G NR downlink measurement application	R&S®FPS-K144	1321.4979.02
R&S®VSE		
5G NR uplink and downlink measurement application	R&S®VSE-K144	1309.9574.02
5G NR MIMO measurement application	R&S®VSE-K146	1345.1305.02
Signal and spectrum analyzers		
R&S®FSW		
Signal and spectrum analyzer, 2 Hz to 8 GHz	R&S®FSW8	1331.5003.08
Signal and spectrum analyzer, 2 Hz to 13.6 GHz	R&S®FSW13	1331.5003.13
Signal and spectrum analyzer, 2 Hz to 26.5 GHz	R&S®FSW26	1331.5003.26
Signal and spectrum analyzer, 2 Hz to 43.5 GHz	R&S®FSW43	1331.5003.43
Signal and spectrum analyzer, 2 Hz to 50 GHz	R&S®FSW50	1331.5003.50
Signal and spectrum analyzer, 2 Hz to 67 GHz	R&S®FSW67	1331.5003.67
Signal and spectrum analyzer, 2 Hz to 85 GHz	R&S®FSW85	1331.5003.85
R&S®FSVA3000, R&S®FSV3000		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSVA3004	1330.5000.05
Signal and spectrum analyzer, 10 Hz to 7.5 GHz	R&S®FSVA3007	1330.5000.08
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FSVA3013	1330.5000.14
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSVA3030	1330.5000.31
Signal and spectrum analyzer, 10 Hz to 44 GHz	R&S®FSVA3044	1330.5000.44
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSV3004	1330.5000.04
Signal and spectrum analyzer, 10 Hz to 7.5 GHz	R&S®FSV3007	1330.5000.07
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FSV3013	1330.5000.13
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSV3030	1330.5000.30
Signal and spectrum analyzer, 10 Hz to 44 GHz	R&S®FSV3044	1330.5000.43

R&S®FSVA, R&S®FSV		
Signal and spectrum analyzer	R&S®FSVA4	1321.3008.05
Signal and spectrum analyzer	R&S®FSVA7	1321.3008.08
Signal and spectrum analyzer	R&S®FSVA13	1321.3008.14
Signal and spectrum analyzer	R&S®FSVA30	1321.3008.31
Signal and spectrum analyzer	R&S®FSVA40	1321.3008.41
Signal and spectrum analyzer	R&S®FSV4	1321.3008.04
Signal and spectrum analyzer	R&S®FSV7	1321.3008.07
Signal and spectrum analyzer	R&S®FSV13	1321.3008.13
Signal and spectrum analyzer	R&S®FSV30	1321.3008.30
Signal and spectrum analyzer ⁶	R&S®FSV40	1321.3008.39
Signal and spectrum analyzer	R&S®FSV40	1321.3008.40
R&S®FPS		
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FPS4	1319.2008.04
Signal and spectrum analyzer, 10 Hz to 7 GHz	R&S®FPS7	1319.2008.07
Signal and spectrum analyzer, 10 Hz to 13.6 GHz	R&S®FPS13	1319.2008.13
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FPS30	1319.2008.30
Signal and spectrum analyzer, 10 Hz to 40 GHz	R&S®FPS40	1319.2008.40
Oscilloscopes		
R&S®RTO		
Digital oscilloscope, 6 GHz, 4 channels	R&S®RTO2064	1329.7002.64
R&S®RTP		
Digital oscilloscope, 6 GHz, 4 channels	R&S®RTP064	1320.5007.06
Power Sensor		
R&S®NRQ6		
Frequency selective power sensor, 50 MHz to 6 GHz	R&S®NRQ6	1421.3509K02
Vector signal explorer		
R&S®VSE basic edition	R&S®VSE	1345.1011.06
R&S®VSE enterprise edition	R&S®VSE	1345.1105.06
R&S®VSE software maintenance	R&S®VSE-SWM	1320.7622.81
Recommended options and extras		
R&S®FSW		
28 MHz analysis bandwidth	R&S®FSW-B28	1313.1645.02
40 MHz analysis bandwidth	R&S®FSW-B40	1313.0861.02
80 MHz analysis bandwidth	R&S®FSW-B80	1313.0878.02
160 MHz analysis bandwidth	R&S®FSW-B160	1325.4850.04
320 MHz analysis bandwidth	R&S®FSW-B320	1325.4867.04
512 MHz analysis bandwidth	R&S®FSW-B512	1313.4296.04
1.2 GHz analysis bandwidth	R&S®FSW-B1200	1331.6400.04
2 GHz analysis bandwidth	R&S®FSW-B2001	1331.6916.04

⁶ Max. bandwidth: 10 MHz.

R&S®FSVA3000, R&S®FSV3000		
YIG preselector bypass	R&S®FSV3-B11	1330.3865.02
40 MHz analysis bandwidth	R&S®FSV3-B40	1330.4103.02
200 MHz analysis bandwidth	R&S®FSV3-B200	1330.4132.02
400 MHz analysis bandwidth	R&S®FSV3-B400	1330.7154.02
R&S®FSVA, R&S®FSV		
YIG preselector bypass for R&S®FSVA13	R&S®FSVA-B11	1321.3714.13
YIG preselector bypass for R&S®FSVA30	R&S®FSVA-B11	1321.3714.30
YIG preselector bypass for R&S®FSVA40	R&S®FSVA-B11	1321.3714.40
40 MHz analysis bandwidth for R&S®FSVA	R&S®FSVA-B40	1329.0214.02
40 MHz analysis bandwidth for R&S®FSV	R&S®FSV-B70	1310.9645.02
160 MHz analysis bandwidth for R&S®FSV4/R&S®FSV7	R&S®FSV-B160	1311.2015.02
160 MHz analysis bandwidth for R&S®FSV13	R&S®FSV-B160	1311.2015.13
160 MHz analysis bandwidth for R&S®FSV30/R&S®FSV40	R&S®FSV-B160	1311.2015.40
R&S®FPS		
YIG preselector bypass for R&S®FPS30	R&S®FPS-B11	1326.5467.30
YIG preselector bypass for R&S®FPS40	R&S®FPS-B11	1326.5467.40
160 MHz analysis bandwidth for R&S®FPS4 and R&S®FPS7	R&S®FPS-B160	1321.4285.02
160 MHz analysis bandwidth for R&S®FPS13	R&S®FPS-B160	1321.4285.13
160 MHz analysis bandwidth for R&S®FPS30 and R&S®FPS40	R&S®FPS-B160	1321.4285.40
R&S®RTO		
OCXO 10MHz	R&S®RTO-B4	1304.8305.02
I/Q software interface	R&S®RTO-K11	1329.7360.02
R&S®RTP		
I/Q software interface	R&S®RTP-K11	1800.6683.02
R&S®NRQ6		
I/Q data interface	R&S®NRQ6-K1	1421.4705.02
Phase coherent measurements	R&S®NRQ6-K3	1421.4770.02