OFDM VECTOR SIGNAL ANALYSIS APPLICATION

Specifications

R&S®FSW-K96/R&S®FSWT-K96/R&S®FSV3-K96/R&S®VSE-K96
OFDM Vector Signal Analysis Application

Specifications
Version 05.00

ROHDE&SCHWARZ
Make ideas real

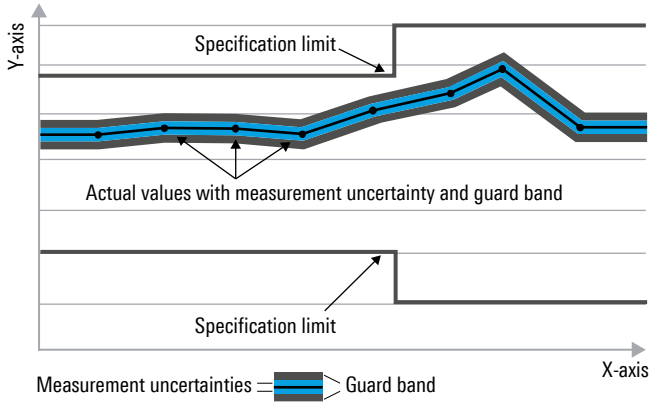
CONTENTS

Definitions

General
Product data applies under the following conditions:

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

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



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 designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

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

Specifications

The specifications of the R&S®VSE-K96/R&S®FSWT-K96/R&S®FSW-K96/R&S®FSV3-K96 OFDM vector signal analysis application are based on the data sheet specifications of the R&S®FSW, R&S®FSWT, R&S®FSVA3000, R&S®FSV3000, R&S®FSVA, R&S®FSV signal and spectrum analyzers and the R&S®RTO oscilloscopes. 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-K96, the R&S®FSWT-K96, R&S®FSV3-K96 and the R&S®VSE-K96.

The R&S®FSWT-K96 runs on the R&S®FSWT device itself. The R&S®FSW-K96 runs on the R&S®FSW device itself.
The R&S®FSV3-K96 runs on the R&S®FSVA3000 or R&S®FSV3000 device itself. The R&S®VSE-K96 runs on a PC that can be connected to the analyzers and oscilloscopes as specified below.

If not stated otherwise, the data sheet values are device-specific, i.e. the same value applies to the R&S®FSWT-K96 and the R&S®VSE-K96 with connected R&S®FSWT. Accordingly, the same value applies to the R&S®FSW-K96 and the R&S®VSE-K96 with connected R&S®FSW. The same value applies to the R&S®FSV3-K96 and the R&S®VSE-K96 with connected R&S®FSVA3000 respectively R&S®FSV3000.

Overview

		R&S®FSW	**R&S®FSWT**	**R&S®FSVA3000/ R&S®FSV3000**	**R&S®FSVA/ R&S®FSV**	**R&S®RTO**
R&S®FSW-K96	software that runs on device	• FSW-K96	–	–	–	–
R&S®FSWT-K96	software that runs on device	–	• FSWT-K96	–	–	–
R&S®FSV3-K96	software that runs on device	–	–	R&S®FSVA3000/ R&S®FSV3000	–	–
R&S®VSE-K96	PC software that can be connected to device	•	•	•	•	•

OFDM vector signal analysis application

Signal acquisition

Capture length	max. 8 Msample, unless the instrument supports less	
	The usable record length depends on the OFDM system configuration, the PC memory available for the application and the Rohde & Schwarz instrument. The record length is reduced if the adjustable channel filter is selected.	
Trigger modes	only available, if available on the instrument	free run, external, I/Q power, IF power, RF power, time trigger
Sample rate		same as instrument; When the R&S®FSW-K96/ R&S®FSWT-K96/R&S®VSE-K96 channel filter is activated, the available maximum sample rate is divided in half.
Input	standard	RF
		Iq-tar file
	with R&S®FSW-B17 option	digital baseband
	with R&S®FSW-B71 or R&S®FSW-B71E option	analog baseband
	with R&S®FSW-B21/R&S®FSV3-B21 option	external mixer
	with R&S®FSW-K553/R&S®FSV3-K553	external frontends
Oversampling	1 or 2	can capture I/Q data with doubled sample rate and then internally decimate by 2, can increase the usable relative bandwidth from typically 80 % to 95 % of final sample rate
Channel filter	configurable filter passband width within the supplied I/Q bandwidth, stopband attenuation 50 dB or larger	

OFDM system configuration

Manual settings	FFT size	8 to 60000 (only integer numbers allowed)
	cyclic prefix length	4 to FFT length (only integer numbers allowed)
	advanced cyclic prefix configuration	conventional mode (every OFDM symbol has the same cyclic prefix length), two different cyclic prefix lengths, periodic or non-periodic range for different cyclic prefix lengths
	preamble symbol characteristics	block length, frame start offset
	DFT-s-OFDM/SC-FDMA	transform precoding of all data cells in a symbol. If pilot cells exist in the symbol either just exclude them from transform or do no transform at all
	cyclic delay	–FFT length to +FFT length (only integer numbers allowed)
	phase compensation	off, manual value, use the set center frequency
Configuration file settings	OFDM cell types	zero, pilot, data, do not care
	pilot modulation	arbitrary complex numbers
	data modulation	each data cell individually assigned to a constellation
	constellations	arbitrary complex numbers, e.g. PSK or QAM

Measurement parameters

Burst search		on/off
Synchronization	time synchronization	cyclic prefix/repetitive preamble
	parameter estimation and channel estimation	pilot aided/pilot and data aided
	modulation detection	defined by configuration file/per symbol/per carrier
Synchronization thresholds	minimum time sync metric	0 to 1
	minimum frame sync metric	0 to 1
Demodulation	FFT shift relative to cyclic prefix length	0 to 1
	maximum carrier offset	0 to 16
Tracking/compensation	phase tracking	on/off
	timing tracking	on/off
	level tracking	on/off
	channel compensation	on/off
EVM normalization		RMS pilots and data
		RMS data
		RMS pilots
		peak pilots and data
		peak data
		peak pilots
		none
Frame averaging	EVM scalar results	mean square
		RMS

Result displays

Result summary	min./mean/max.	EVM all
		EVM data
		EVM pilot
		MER
		frequency error
		sample clock error
		I/Q offset
		gain imbalance
		quadrature error
		frame power
		crest factor
Power		power versus symbol versus carrier
		power versus carrier
		power versus symbol
		magnitude capture
		power spectrum
EVM		EVM versus symbol versus carrier
		EVM versus carrier
		EVM versus symbol
Channel		flatness
		group delay
		impulse response
Constellation		constellation diagram
		constellation versus carrier
		constellation versus symbol
Miscellaneous and statistics		CCDF
		signal flow
		allocation matrix as defined in configuration file
		trigger to sync
		bitstream

Measurement uncertainty (nominal)

Specifications apply under the following conditions: temperature range from +20 °C to +30 °C, signal level 0 dBm, properly adjusted reference level, center frequency of 1.0 GHz

EVM		
Residual EVM	generic OFDM signal, 2048 FFT size, 512 cyclic prefix length, 1200 used subcarriers, 75 kHz carrier spacing, 153.6 MHz sample rate, 90 MHz signal bandwidth, properly adjusted reference level, phase tracking on, timing tracking on, level tracking on, channel compensation on, center frequency 1 GHz, parameter estimation: pilot aided	
	R&S®FSW	–49.5 dB
	R&S®FSWT	–49.5 dB
	R&S®FSVA3000	–48.0 dB
	R&S®FSV/R&S®FSVA	–47.0 dB
	R&S®RTO	–42.1 dB

Ordering information

Designation	Type	Order No.
OFDM vector signal analysis application		
OFDM vector signal analysis	R&S®FSW-K96	1313.1539.02
OFDM vector signal analysis	R&S®FSWT-K96	1338.7576.02
OFDM vector signal analysis	R&S®FSV3-K96	1346.6469.02
OFDM vector signal analysis measurement software	R&S®VSE-K96	1320.7922.06
Vector signal explorers		
Basic edition	R&S®VSE	1345.1011.06
Enterprise edition	R&S®VSE	1345.1105.06
Signal and spectrum analyzers		
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
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
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSV4	1321.3008.04
Signal and spectrum analyzer, 10 Hz to 7 GHz	R&S®FSV7	1321.3008.07
Signal and spectrum analyzer, 10 Hz to 13 GHz	R&S®FSV13	1321.3008.13
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSV30	1321.3008.30
Signal and spectrum analyzer, 10 Hz to 40 GHz [1]	R&S®FSV40	1321.3008.39
Signal and spectrum analyzer, 10 Hz to 40 GHz	R&S®FSV40	1321.3008.40
Signal and spectrum analyzer, 10 Hz to 4 GHz	R&S®FSVA4	1321.3008.05
Signal and spectrum analyzer, 10 Hz to 7 GHz	R&S®FSVA7	1321.3008.08
Signal and spectrum analyzer, 10 Hz to 13 GHz	R&S®FSVA13	1321.3008.14
Signal and spectrum analyzer, 10 Hz to 30 GHz	R&S®FSVA30	1321.3008.31
Signal and spectrum analyzer, 10 Hz to 40 GHz	R&S®FSVA40	1321.3008.41
Test receiver		
Test receiver, 10 Hz to 26.5 GHz	R&S®FSWT26	1313.7008.26
Oscilloscopes		
Oscilloscope, 600 MHz	R&S®RTO1002	1316.1000.02
Oscilloscope, 600 MHz	R&S®RTO1004	1316.1000.04
Oscilloscope, 1 GHz	R&S®RTO1012	1316.1000.12
Oscilloscope, 1 GHz	R&S®RTO1014	1316.1000.14
Oscilloscope, 2 GHz	R&S®RTO1022	1316.1000.22
Oscilloscope, 2 GHz	R&S®RTO1024	1316.1000.24
Oscilloscope, 4 GHz	R&S®RTO1044	1316.1000.44
Oscilloscope, 600 MHz, 2 channels	R&S®RTO2002	1329.7002.02
Oscilloscope, 600 MHz, 4 channels	R&S®RTO2004	1329.7002.04
Oscilloscope, 1 GHz, 2 channels	R&S®RTO2012	1329.7002.12
Oscilloscope, 1 GHz, 4 channels	R&S®RTO2014	1329.7002.14
Oscilloscope, 2 GHz, 2 channels	R&S®RTO2022	1329.7002.22
Oscilloscope, 2 GHz, 4 channels	R&S®RTO2024	1329.7002.24
Oscilloscope, 3 GHz, 2 channels	R&S®RTO2032	1329.7002.32
Oscilloscope, 3 GHz, 4 channels	R&S®RTO2034	1329.7002.34
Oscilloscope, 4 GHz, 4 channels	R&S®RTO2044	1329.7002.44
Oscilloscope, 6 GHz, 4 channels	R&S®RTO2064	1329.7002.64
Service option		
R&S®VSE software maintenance	R&S®VSE-SWM	1320.7622.81

[1] Max. bandwidth 10 MHz.

Service at Rohde&Schwarz
You're in great hands

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

Rohde&Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test&measurement, technology systems and networks&cybersecurity. Founded more than 85 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

Rohde&Schwarz training
www.training.rohde-schwarz.com

Rohde&Schwarz customer support
www.rohde-schwarz.com/support

PD 5215.3991.22 | Version 05.00 | July 2023 (ja)
OFDM Vector Signal Analysis Application
Data without tolerance limits is not binding | Subject to change

5215399122
5215.3991.22 05.00 PDP/PDW 1 en