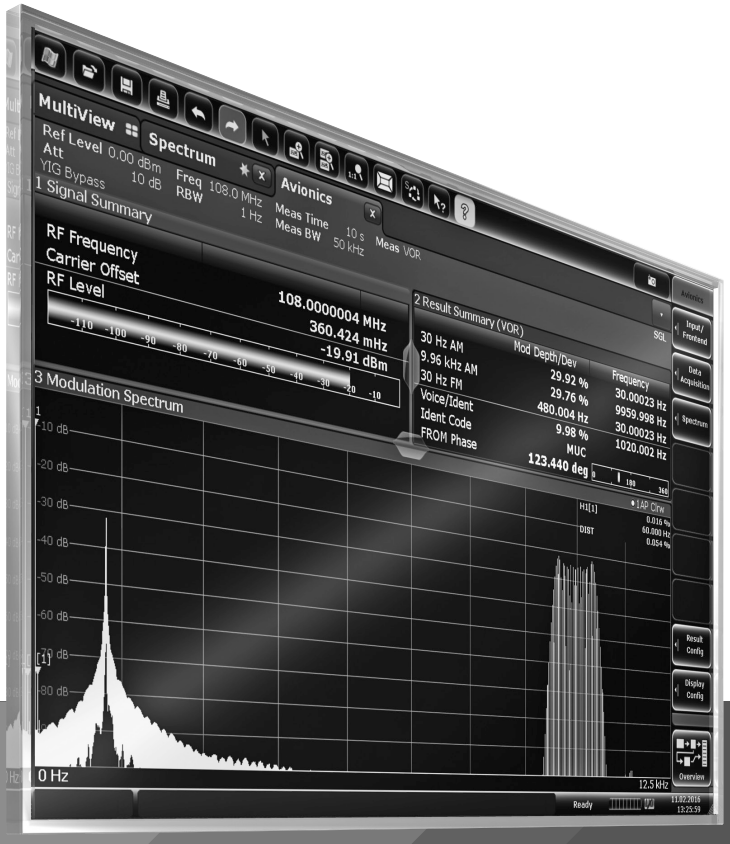
R&S®FSMR3-K15
VOR/ILS MEASUREMENT APPLICATION

Specifications



Data Sheet
Version 01.00

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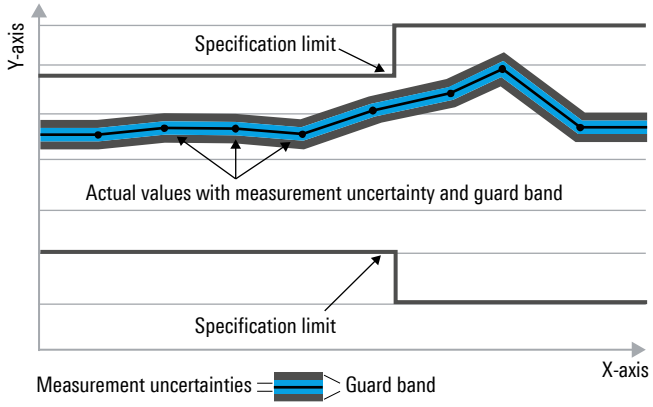
CONTENTS

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

Specifications

The specifications of the R&S®FSMR3-K15 VOR/ILS measurement application are based on the specifications in the data sheet for the R&S®FSMR3000 measuring receiver (PD 3608.5741.22). Measurement uncertainties are given as 95 % confidence intervals. They apply for the specified frequency ranges, signal levels and default measurement times. The specified accuracies do not take into account systematic errors due to reduced signal-to-noise ratio (SNR) and mismatch errors.

Frequency

Center frequency	usable frequency range	same as instrument frequency range
	specified frequency range	10 MHz to 12 MHz
		70 MHz to 120 MHz
		319 MHz to 341 MHz

Level

Reference level range	RF input, specified level range	−60 dBm to +30 dBm
Reference level setting		manual

Signal acquisition

Supported navigation systems		ILS localizer
		ILS glide slope
		VOR
Input		RF
Demodulation bandwidth	ILS	100 kHz, 50 kHz, 12.5 kHz, 3.2 kHz, 800 Hz
	VOR	100 kHz, 50 kHz, 25 kHz
Measurement time	ILS demodulation bandwidth	
	100 kHz, 50 kHz, 12.5 kHz	100 ms to 8.356 s
	3.2 kHz	100 ms to 33.4 s
	800 Hz	100 ms to 133 s
	VOR	100 ms to 30 s
Triggering	RF input	free run, IF power, external

Result display

Signal summary	RF frequency	resolution: 1 Hz
	carrier offset	min. 4 digits
	RF level, numeric display and bargraph	resolution: 0.01 dB
Result summary ILS	for audio signals: 90 Hz AM, 150 Hz AM, SDM (90 Hz +150 Hz), voice/ident	
	AM modulation depth	resolution: 0.01 %
	modulation or audio frequency	resolution: 7 digits
	harmonic distortion (K2, K3) and total harmonic distortion (THD)	• range: –100 dB to 0 dB, 0.001 % to 100 % • resolution: 0.01 %, 0.01 dB • unit: dB, %
	ident morse code	
	phase difference 90 Hz/150 Hz	• range: ±60° • resolution: 0.001°
	DDM, numeric display and bar graph	• resolution: 0.000001 DDM • range: 0 to ±0.999999 DDM unit: 1, %
Result summary VOR	for audio signals: 30 Hz AM, 9960 Hz AM, voice/ident	
	AM modulation depth	resolution: 0.01 %
	modulation or audio frequency	resolution: 7 digits
	harmonic distortion (K2, K3) and total harmonic distortion (THD)	• range: –100 dB to 0 dB 0.001 % to 100 % • resolution: 0.01 %, 0.01 dB • unit: dB, %
	for audio signal: 30 Hz FM	
	FM deviation	• maximum deviation: 700 Hz • resolution: 0.001 Hz
	modulation or audio frequency	resolution: 7 digits
	harmonic distortion (K2, K3) and total harmonic distortion (THD)	• range: –100 dB to 0 dB, 0.001 % to 100 % • resolution: 0.01 %, 0.01 dB • unit dB, %
	ident morse code	
	azimuth phase, numeric display and bar graph	• notation: FROM, TO, • range: 0° to 360°, • resolution: 0.001°
Modulation spectrum	spectrum of the AF signal	logarithmic or linear scale
		supports user specific distortion analysis (markers)
Distortion summary ILS	K2, K3 and THD of: 90 Hz AM, 150 Hz AM, SDM (90+150), voice/ident	• range: –100 dB to 0 dB, 0.001 % to 100 % • resolution: 0.01 %, 0.01 dB • unit: dB, %
Distortion summary VOR	K2, K3 and THD of: 30 Hz AM, 30 Hz FM, 9960 Hz AM, voice/ident	• range: –100 dB to 0 dB, 0.001 % to 100 % • resolution: 0.01 %, 0.01 dB • unit: dB, %
Marker table		marker x and y positions for modulation spectrum

Measurement uncertainty

Level and frequency

Level measurement uncertainty		same as R&S®FSMR3000 (see R&S®FSMR3000 total measurement uncertainty)
RF frequency counter accuracy	S/N > 25 dB	same as R&S®FSMR3000 (see R&S®FSMR3000 count accuracy)

ILS signal analysis

Modulation depth measurement		
Accuracy: 90 Hz/150 Hz ± 1 % and 300 Hz to 4 kHz (voice/identifier)	RF signal	< 0.4 %
Audio frequency counter		
Accuracy		< 0.002 %
DDM measurement		
Accuracy	f_{mod}: 90 Hz/150 Hz ± 1 %, SDM 40 % (localizer)	
	DDM < 0.1, RF signal	< 0.0002 DDM ± 0.1 % of reading
	DDM > 0.1, RF signal	< 0.0002 DDM ± 0.2 % of reading
	f_{mod}: 90 Hz/150 Hz ± 1 %, SDM 80 % (glideslope)	
	DDM < 0.2, RF signal	< 0.0004 DDM ± 0.1 % of reading
	DDM > 0.2, RF signal	< 0.0004 DDM ± 0.2 % of reading
Phase measurement 90 Hz/150 Hz		
Accuracy	90 Hz/150 Hz modulation depths > 5%, f_{mod}: 90 Hz/150 Hz ± 1 %, RF signal	< 0.03°

VOR signal analysis

AM modulation depth		
Accuracy of reference and variable signal	30 Hz ± 1 %, 9960 Hz ± 1 %	
	RF signal	< 0.5 %
Accuracy: 300 Hz to 4 kHz (voice/identifier)	RF signal	< 1 %
FM modulation deviation		
Accuracy	9960 Hz ± 1 %	< 0.5 %
Audio frequency counter		
Accuracy		< 0.002 %
Azimuth phase measurement		
Accuracy	modulation depths not below 5 %, f_{mod}: 30 Hz ± 1 %, 9960 Hz ± 1 %	< 0.03°

Distortion analysis

Level		
Accuracy		0.5 dB
Inherent harmonic distortion	VOR: 30 Hz, 1020 Hz signal	< 0.1 %

Ordering information

Designation	Type	Order No.
Measuring receiver, 100 kHz to 8 GHz	R&S®FSMR3008	1345.4004.08
Measuring receiver, 100 kHz to 26.5 GHz	R&S®FSMR3026	1345.4004.26
Measuring receiver, 100 kHz to 50 GHz	R&S®FSMR3050	1345.4004.50

Firmware

Designation	Type	Order No.	Remarks
VOR/ILS measurements	R&S®FSMR3-K15	1345.3143.02	requires R&S®FSMR3-B1 option

Options

Designation	Type	Order No.	Retro-fittable	Remarks
Spectrum analyzer, 2 Hz to 8 GHz	R&S®FSMR3-B1	1345.3050.08	yes	for R&S®FSMR3008, user-retrofittable
Spectrum analyzer, 2 Hz to 26 GHz	R&S®FSMR3-B1	1345.3050.26	no	for R&S®FSMR3026, ex-factory
Spectrum analyzer, 2 Hz to 50 GHz	R&S®FSMR3-B1	1345.3050.50	no	for R&S®FSMR3050, ex-factory
OCXO, precision frequency reference	R&S®FSMR3-B4	1345.3072.02	yes	user-retrofittable
RF preamplifier, 100 kHz to 8 GHz	R&S®FSMR3-B24	1345.3108.08	yes	
RF preamplifier, 100 kHz to 26.5 GHz	R&S®FSMR3-B24	1345.3108.26	yes	
RF preamplifier, 100 kHz to 50 GHz	R&S®FSMR3-B24	1345.3108.49	yes	

For R&S®FSMR3000 product brochure, see PD 5214.5984.12, for R&S®FSMR3000 data sheet, see PD 3608.5741.22 and www.rohde-schwarz.com

Service that adds value

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

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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

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PD 3609.8915.22 | Version 01.00 | July 2021 (st)
R&S®FSMR3-K15 VOR/ILS Measurement Application
Data without tolerance limits is not binding | Subject to change

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