Specifications

Version 05.00

September 2005

Vector Network Analyzers R&S®ZVB

Specifications

ROHDE&SCHWARZ

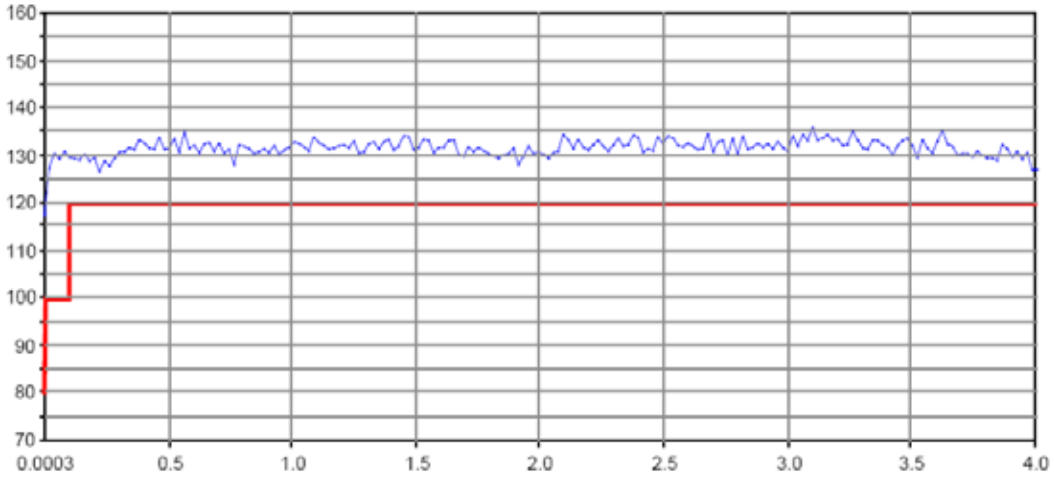
Specifications apply under the following conditions:

90 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal adjustments performed. Data designated "overrange“ and data without tolerance limits is not binding. Unless stated otherwise, specifications apply to test ports and a nominal source power of –10 dBm.

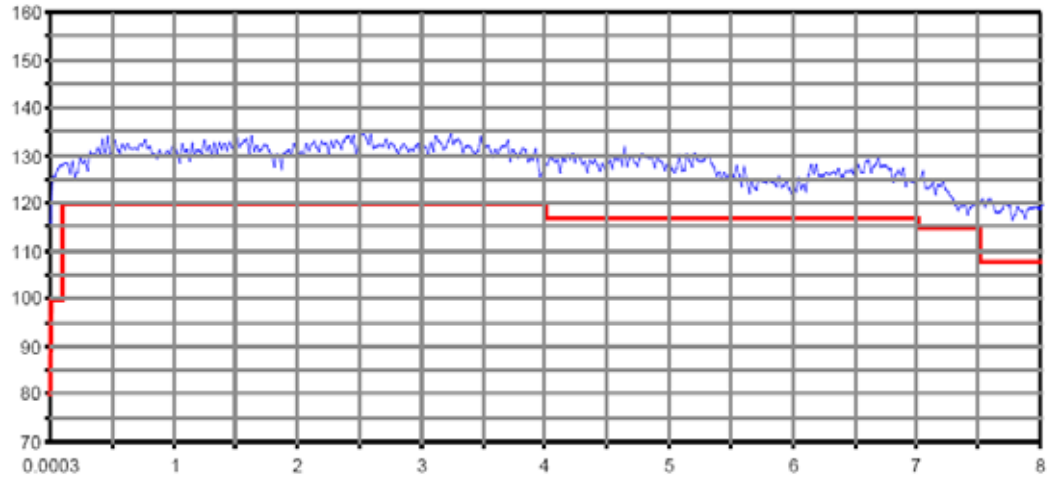
Measurement range

Impedance		50 Ω
Test port connector	R&S ZVB4 and R&S ZVB8 R&S ZVB20	N, female 3.5 mm, male
Number of test ports		2, 3 or 4
Frequency range	R&S ZVB4 R&S ZVB8 R&S ZVB20	300 kHz to 4 GHz 300 kHz to 8 GHz 10 MHz to 20 GHz
Static frequency accuracy	without optional oven quartz with optional oven quartz	8×10^{-6} 1×10^{-7}
Frequency resolution		1 Hz
Number of measurement points	per trace	2 to 20001
Measurement bandwidths	1/2/5 steps	1 Hz to 500 kHz
Dynamic range of R&S ZVB4 two-port model and R&S ZVB8 two-port model	from PORT 1 to PORT 2 300 kHz to 5 MHz 5 MHz to 100 MHz 100 MHz to 4 GHz 4 GHz to 7 GHz (R&S ZVB8 only) 7 GHz to 7.5 GHz (R&S ZVB8 only) 7.5 GHz to 8 GHz (R&S ZVB8 only)	 >80 dB, typ. 100 dB >100 dB, typ. 120 dB >120 dB, typ. 130 dB >117 dB, typ. 127 dB >115 dB, typ. 120 dB >108 dB, typ. 118 dB
Dynamic range of R&S ZVB4 three-port and four-port models and R&S ZVB8 three-port and four-port models	from PORT 1 to PORT 2 and from PORT 3 to PORT 4 (for four-port models only) 300 kHz to 5 MHz 5 MHz to 100 MHz 100 MHz to 500 MHz 500 MHz to 4 GHz 4 GHz to 7 GHz (R&S ZVB8 only) 7 GHz to 7.5 GHz (R&S ZVB8 only) 7.5 GHz to 8 GHz (R&S ZVB8 only)	 >80 dB, typ. 100 dB >100 dB, typ. 120 dB >120 dB, typ. 130 dB >123 dB, typ. 130 dB >120 dB, typ. 130 dB >115 dB, typ. 125 dB >108 dB, typ. 125 dB
Dynamic range of R&S ZVB20	from PORT 1 to PORT 2 and from PORT 3 to PORT 4 (for four-port model only) 10 MHz to 100 MHz 100 MHz to 700 MHz 700 MHz to 8 GHz 8 GHz to 20 GHz	 >80 dB, typ. 110 dB >100 dB, typ. 130 dB >120 dB, typ. 133 dB >110 dB, typ. 122 dB
The dynamic range is defined as the difference between the maximum source power and the rms value of the data trace of the transmission magnitude produced by noise and crosstalk with test ports short-circuited. The specification is valid without system error correction and at 10 Hz measurement bandwidth. The dynamic range can be increased by using a measurement bandwidth of 1 Hz.		

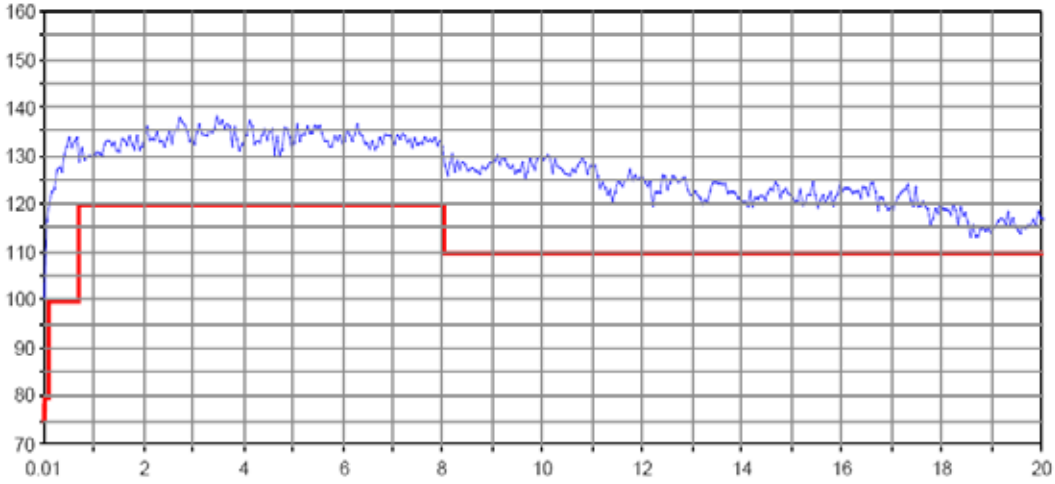
Dynamic range in dB versus frequency in GHz of the R&S ZVB4



Dynamic range in dB versus frequency in GHz range of the R&S ZVB8



Dynamic range in dB versus frequency in GHz range of the R&S ZVB20



Measurement speed

Measurement time	for 201 measurement points, with span 100 MHz, 500 kHz measurement bandwidth, ALC and display switched off with center frequency 1.1 GHz with center frequency 5.1 GHz	 <6 ms <4.5 ms
Measurement time per point	CW mode, 1 MHz measurement bandwidth	<3.5 µs
Data transfer time	for 201 measurement points via IEC/IEEE bus via VX11 over 100 Mbit/s LAN via RSIB over 100 Mbit/s LAN	 <2.9 ms <1.3 ms <0.7 ms
Time for measurement and data transfer	for 201 measurement points, with start frequency 1 GHz, stop frequency 1.1 GHz, 500 kHz measurement bandwidth, and display switched off (No additional time for data transfer is needed, as it is performed simultaneously during the measurement.)	<6 ms
Switching time between channels	with not more than 2001 points	<1 ms
Switching time between two preloaded instrument settings	with not more than 2001 points	<10 ms

Sweep times of the R&S ZVB

Number of measurement points	**51**	**101**	**201**	**401**	**801**	**1601**

Start frequency 5 GHz, stop frequency 5.2 GHz, ALC off, and measurement bandwidth 100 kHz						
with full one-port calibration or with correction switched off	2.4 ms	3.9 ms	6.3 ms	11 ms	20.4 ms	40.2 ms
with TOSM calibration	4.7 ms	8.6 ms	16.4 ms	32.4 ms	65 ms	170 ms

Start frequency 6 GHz, stop frequency 8 GHz, ALC off, and measurement bandwidth 100 kHz						
with full one-port calibration or with correction switched off	3.4 ms	6.2 ms	11 ms	17.3 ms	28.2 ms	49 ms
with TOSM calibration	5.3 ms	9.8 ms	18 ms	33 ms	63 ms	160 ms

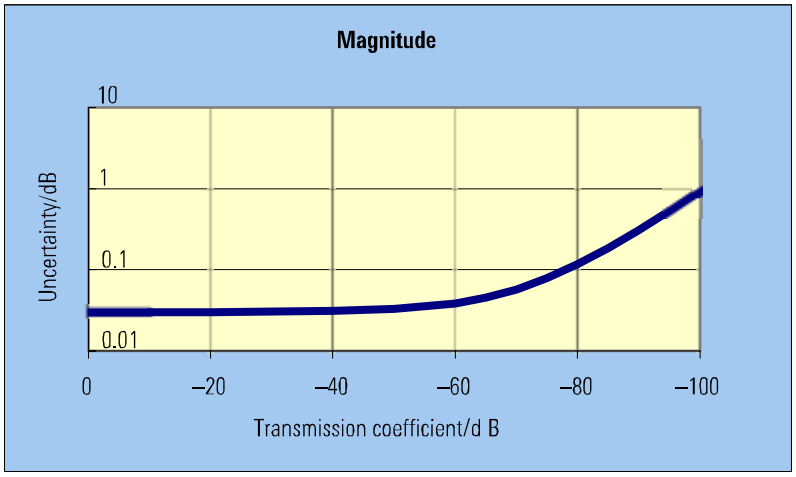
Start frequency 10 MHz, stop frequency 4 GHz (R&S ZVB4), 8 GHz (R&S ZVB8) or 20 GHz (R&S ZVB20), ALC off, and measurement bandwidth 100 kHz						
with full one-port calibration or with correction switched off	8.4 ms	12.6 ms	19.5 ms	30.5 ms	53.2 ms	88.2 ms
with TOSM calibration	10.3 ms	16.6 ms	28 ms	47 ms	81 ms	190 ms

Measurement accuracy

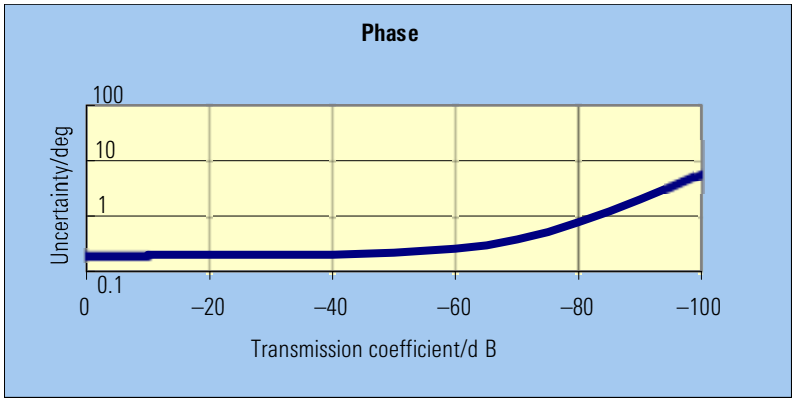
This data applies to temperatures between 18 °C and 28 °C, provided the temperature has not varied by more than 1 K after calibration. The specified data depends on the use of a suitable calibration kit by which the effective system data specified below is achieved. Frequency points have to be identical for measurement and calibration (no interpolation allowed).

Accuracy of transmission measurements		
R&S ZVB4 and R&S ZVB8		
300 kHz to 50 MHz	for +15 dB to –30 dB for –30 dB to –45 dB	<0.2 dB or <2° <1 dB or <6°
Above 50 MHz	for +15 dB to +5 dB for +5 dB to –55 dB for –55 dB to –70 dB for –70 dB to –85 dB	<0.2 dB or <2° <0.1 dB or <1° <0.2 dB or <2° <1 dB or <6°
R&S ZVB20		
50 MHz to 700 MHz	for +15 dB to –30 dB for –30 dB to –45 dB	<0.2 dB or <2° <1 dB or <6°
700 MHz to 8 GHz	for +15 dB to +5 dB for +5 dB to –55 dB for –55 dB to –70 dB for –70 dB to –85 dB	<0.2 dB or <2° <0.1 dB or <1° <0.2 dB or <2° <1 dB or <6°
8 GHz to 20 GHz	for +15 dB to +5 dB for +5 dB to –35 dB for –35 dB to –50 dB for –50 dB to –65 dB	<0.2 dB or <2° <0.1 dB or <1° <0.2 dB or <2° <1 dB or <6°
Specifications are based on a matched DUT, a measurement bandwidth of 10 Hz, and a nominal source power of –10 dBm.		

Typical accuracy of transmission magnitude measurements

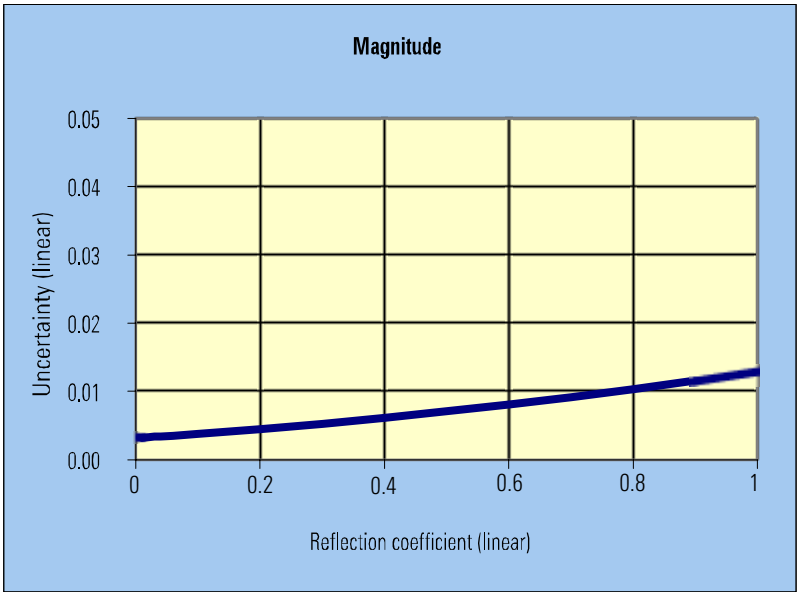


Typical accuracy of transmission phase measurements

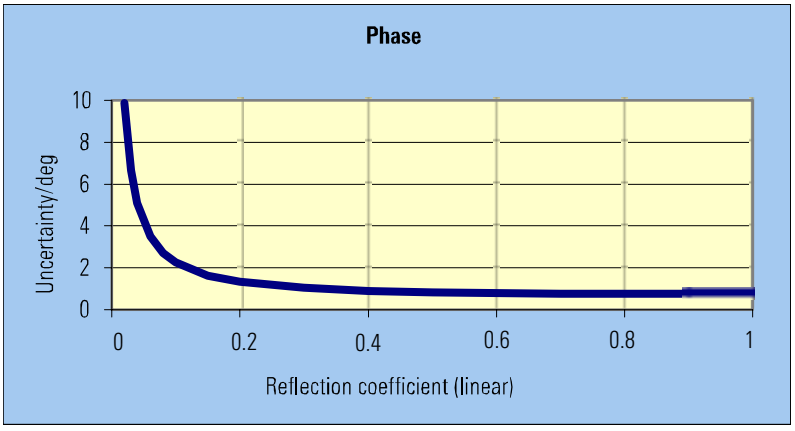


Accuracy of reflection measurements		
R&S ZVB4 and R&S ZVB8		
Above 300 kHz	for +10 dB to +3 dB for +3 dB to –15 dB for –15 dB to –25 dB for –25 dB to –35 dB	<0.6 dB or <4° <0.4 dB or <3° <1 dB or <6° <3 dB or <20°
R&S ZVB20		
50 MHz to 20 GHz	for +10 dB to +3 dB for +3 dB to –15 dB for –15 dB to –25 dB for –25 dB to –35 dB	<0.6 dB or <4° <0.4 dB or <3° <1 dB or <6° <3 dB or <20°
Specifications are based on an isolating DUT, a measurement bandwidth of 10 Hz, and a nominal source power of –10 dBm.		

Typical accuracy of reflection magnitude measurements



Typical accuracy of reflection phase measurements



Trace stability		
Trace noise of S11 (rms) **R&S ZVB4 and R&S ZVB8** Above 300 kHz **R&S ZVB20** 700 MHz to 8 GHz 8 GHz to 20 GHz	at 0 dBm source power and 0 dB reflection and 1 kHz measurement bandwidth	 <0.004 dB, typ. 0.001 dB <0.004 dB, typ. 0.001 dB <0.015 dB, typ. 0.004 dB
Temperature dependence	at 0 dB transmission or reflection	<0.05 dB/K or <0.4°/K

Effective system data

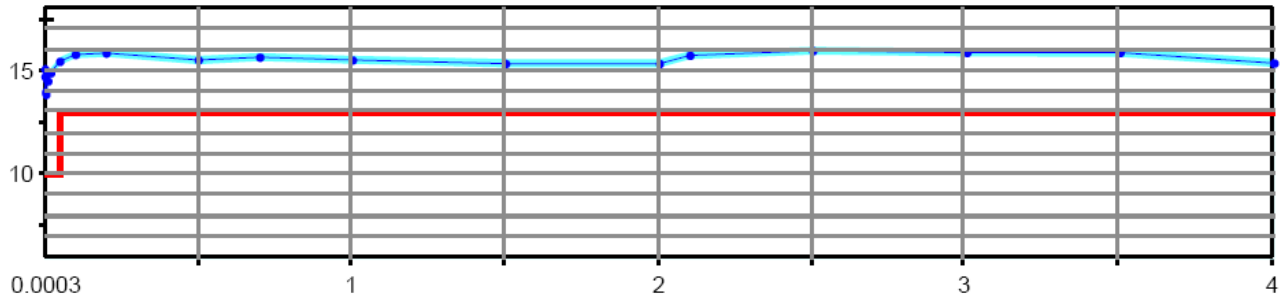
This data applies to temperatures between 18 °C and 28 °C, provided the temperature has not varied by more than 1 K after calibration. The data is based on a measurement bandwidth of 10 Hz and system error calibration by means of a suitable calibration kit.

R&S ZVB4 and R&S ZVB8		
Directivity	300 kHz to 4 GHz 4 GHz to 8 GHz (R&S ZVB8 only)	>46 dB, typ. 50 dB >40 dB, typ. 50 dB
Source match	300 kHz to 4 GHz 4 GHz to 8 GHz (R&S ZVB8 only)	>40 dB, typ. 46 dB >36 dB, typ. 40 dB
Reflection tracking	300 kHz to 4 GHz 4 GHz to 8 GHz (R&S ZVB8 only)	<0.04 dB, typ. 0.01 dB <0.1 dB, typ. 0.01 dB
Load match	300 kHz to 4 GHz 4 GHz to 8 GHz (R&S ZVB8 only)	>46 dB, typ. 50 dB >40 dB, typ. 46 dB
Transmission tracking	300 kHz to 4 GHz 4 GHz to 8 GHz (R&S ZVB8 only)	<0.06 dB, typ. 0.01 dB <0.2 dB, typ. 0.05 dB
R&S ZVB20		
Directivity	700 MHz to 20 GHz	>40 dB, typ. 50 dB
Source match	700 MHz to 20 GHz	>30 dB, typ. 48 dB
Reflection tracking	700 MHz to 20 GHz	<0.3 dB, typ. 0.05 dB
Load match	700 MHz to 20 GHz	>40 dB, typ. 50 dB
Transmission tracking	700 MHz to 20 GHz	<0.3 dB, typ. 0.1 dB

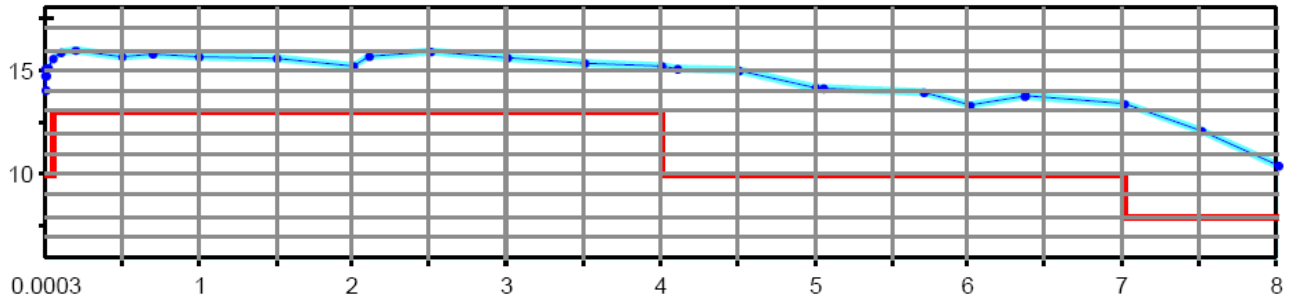
Test port output

Power range	R&S ZVB4 and R&S ZVB8 300 kHz to 50 MHz 50 MHz to 4 GHz 4 GHz to 7 GHz (R&S ZVB8 only) 7 GHz to 8 GHz (R&S ZVB8 only) R&S ZVB20 10 MHz to 12 GHz 12 GHz to 20 GHz	 –40 dBm to +10 dBm, typ. –45 dBm to +14 dBm –40 dBm to +13 dBm, typ. –45 dBm to +15 dBm –40 dBm to +10 dBm, typ. –45 dBm to +13 dBm –40 dBm to +8 dBm, typ. –45 dBm to +12 dBm –30 dBm to +10 dBm, typ. –40 dBm to +15 dBm –30 dBm to +5 dBm, typ. –40 dBm to +10 dBm
Power accuracy	R&S ZVB4 and R&S ZVB8 at –10 dBm without power calibration in temperature range 18 °C to 28 °C above 50 MHz R&S ZVB20 at –10 dBm without power calibration in temperature range 18 °C to 28 °C 50 MHz to 20 GHz	 <2 dB <0.8 dB, typ. 0.3 dB <3 dB <0.8 dB, typ. 0.3 dB
Power linearity	referenced to –10 dBm in temperature range 18 °C to 28 °C above 50 MHz	<2 dB <0.8 dB, typ. 0.2 dB
Power resolution		0.01 dB
Harmonics	R&S ZVB4 and R&S ZVB8 50 MHz to 8 GHz at +8 dBm R&S ZVB20 50 MHz to 24 GHz at +10 dBm	 <–20 dBc, typ. <–30 dBc <–20 dBc, typ. <–30 dBc

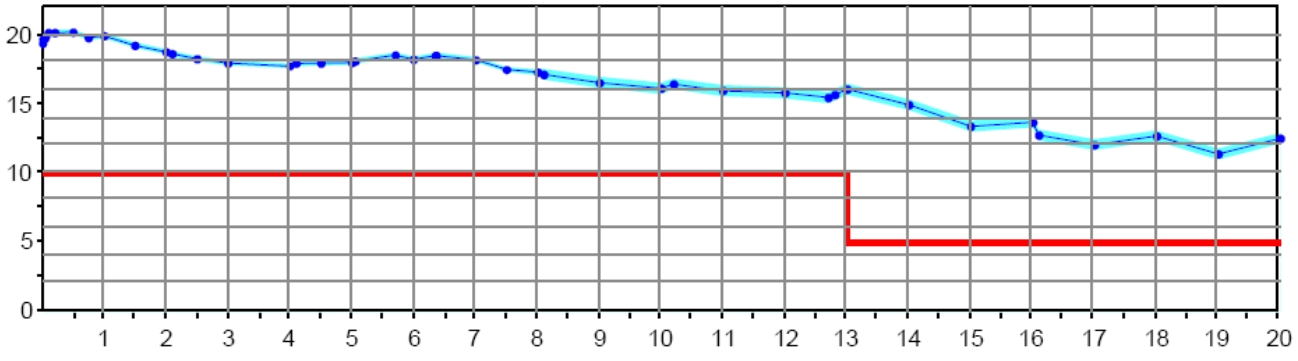
Maximum output power in dBm versus frequency in GHz of the R&S ZVB4



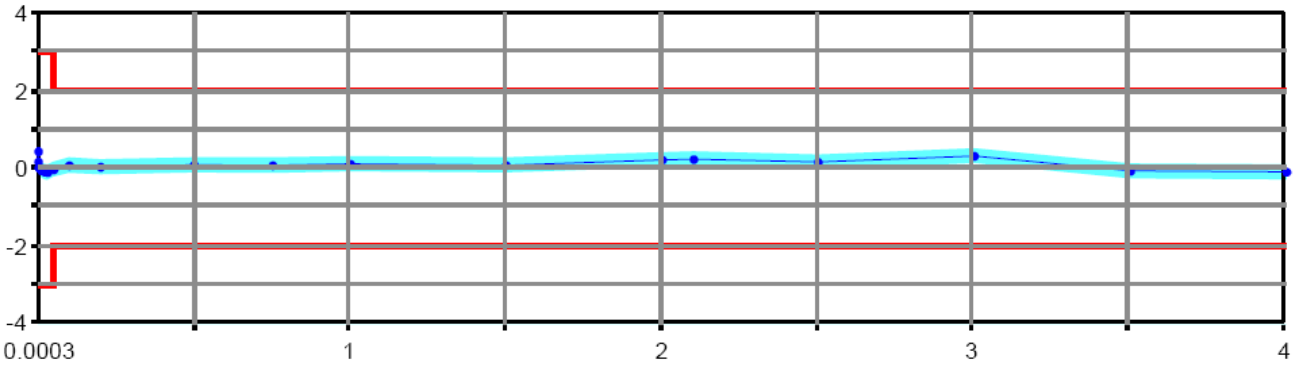
Maximum output power in dBm versus frequency in GHz of the R&S ZVB8



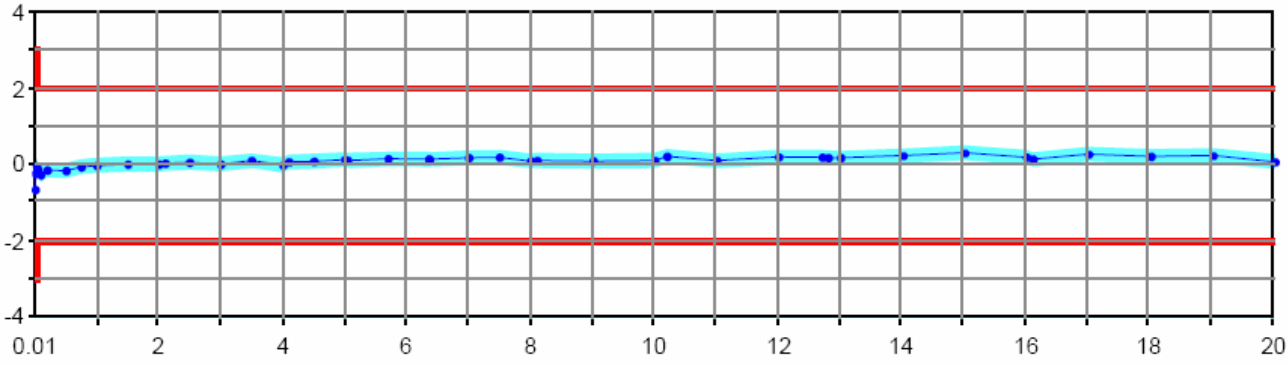
Maximum output power in dBm versus frequency in GHz of the R&S ZVB20



Output power accuracy in dB versus frequency in GHz of the R&S ZVB4



Output power accuracy in dB versus frequency in GHz of the R&S ZVB20



Test port input

Match	without system error correction	
	R&S ZVB4 300 kHz to 8 GHz	>16 dB
	R&S ZVB8 300 kHz to 7 GHz	>16 dB
	7 GHz to 8 GHz	>14 dB
	R&S ZVB20 10 MHz to 50 MHz	>10 dB
	50 MHz to 2 GHz	>16 dB
	2 GHz to 20 GHz	>8 dB
Maximum nominal input level	R&S ZVB4 and R&S ZVB8	+13 dBm
	R&S ZVB20 10 MHz to 8 GHz	+10 dBm
	8 GHz to 20 GHz	0 dBm
Power measurement accuracy	at –10 dBm without power calibration	
	in temperature range 18 °C to 28 °C	
	10 MHz to 8 GHz	1 dB
	8 GHz to 20 GHz (R&S ZVB20 only)	2 dB
Receiver linearity	referenced to –10 dBm	
	in temperature range 18 °C to 28 °C	
	R&S ZVB4 and R&S ZVB8	
	for +20 dB to –60 dB	
	50 MHz to 4 GHz	0.1 dB
	4 GHz to 6 GHz (R&S ZVB8 only)	0.1 dB
	6 GHz to 8 GHz (R&S ZVB8 only)	0.2 dB
	R&S ZVB20	
	for +20 dB to –30 dB	
	50 MHz to 700 MHz	0.1 dB
	for +20 dB to +15 dB	
	700 MHz to 13 GHz	0.2 dB
	for +15 dB to –45 dB	
	700 MHz to 20 GHz	0.1 dB
Damage level		+27 dBm
Damage DC voltage		30 V
Noise level	at 10 Hz measurement bandwidth	
	R&S ZVB4 and R&S ZVB8	
	300 kHz to 100 MHz	<–70 dBm
	100 MHz to 4 GHz	<–110 dBm
	4 GHz to 8 GHz (R&S ZVB8 only)	<–105 dBm
	R&S ZVB20	
	100 MHz to 700 MHz	<–70 dBm
	700 MHz to 8 GHz	<–105 dBm
	8 GHz to 20 GHz	<–100 dBm
The noise level is defined as the rms value of the indicated noise floor.		

Additional front-panel connectors

USB	(two) USB connectors for connecting USB devices (USB 1.1); two additional USB connectors at the rear panel

Display

Screen	21 cm (8.4") diagonal color LCD
Resolution	800 × 600 × 262144 (high color)

Rear-panel connectors

IEC BUS	remote control in accordance with IEEE488, IEC60625; 24 pins

LAN 1	first LAN connector, 8 pins, RJ-45

LAN 2	second LAN connector, 8 pins, RJ-45

USB	(two) USB connectors for connecting USB devices (USB 1.1); two additional USB connectors at the front panel

10 MHz REF	alternatively input or output for external frequency reference signal	
Connector type		BNC, female
Input frequency		10 MHz
Maximum permissible deviation		1 kHz
Input power		0 dBm ± 3 dB
Input impedance		50 Ω
Output frequency		10 MHz
Output frequency accuracy		80 Hz
Output power		–3 dBm ± 8 dB at 50 Ω

DC MEAS 1 V	DC measurement input	
Connector type		4-pin Mini DIN, female
Voltage range		–1 V to +1 V
Measurement accuracy		2.5 % of reading + 2.5 mV
Input impedance		>10 kΩ
Damage voltage		30 V

DC MEAS 10 V	DC measurement input	
Connector type		4-pin Mini DIN, female
Voltage range		–10 V to +10 V
Measurement accuracy		2.5 % of reading + 25 mV
Input impedance		>10 kΩ
Damage voltage		30 V

PORT BIAS	DC bias input for PORT	
Connector type		BNC, female
Maximum nominal input voltage		30 V
Maximum nominal input current		200 mA
Damage voltage		30 V
Damage current		500 mA

MONITOR	IBM-PC-compatible VGA monitor connector, 15-pin D-Sub (for external monitor)

USER CONTROL	several control and trigger signals, 25-pin D-Sub, 3.3 V TTL for controlling external generators, for limit checks, sweep signals, etc	
FOOT SWITCH 1 and FOOT SWITCH 2	pin 24 and pin 25 (inputs)	control inputs
DRIVE PORT 1 to DRIVE PORT 4	pin 16 to pin 19 (outputs)	indicate driving port
CHANNEL BIT 0 to CHANNEL BIT 3	pin 8 to pin 11 (outputs)	channel-specific user-configurable bits
PASS 1 and PASS 2	pin 13 and pin 14 (outputs)	pass/fail results of limit checks
BUSY	pin 4 (output)	measurements running
READY FOR TRIGGER	pin 6 (output)	ready for trigger
EXT GEN TRIGGER	pin 21 (output)	control signal for external generator
EXT GEN BLANK	pin 22 (input)	handshake signal from external generator
EXTERNAL TRIGGER	pin 2 (input)	trigger input for analyzer

EXT TRIGGER	trigger input for analyzer	
Connector type		BNC, female
TTL signal (edge-triggered)		3 V
Polarity (selectable)		positive or negative
Minimum pulse width		1 µs
Input impedance		>10 kΩ

General specifications

Temperature loading	operating temperature range storage temperature range	5 °C to 40 °C –40 °C to +70 °C meets IEC 60068-2-1 and IEC 60068-2-2
Damp heat		40 °C at 95 % rel. humidity, meets IEC 60068-2-30
Mechanical resistance	vibration, sinusoidal	5 Hz to 150 Hz, meets IEC 60068-2-6
	vibration, random	10 Hz to 300 Hz, meets IEC 60068-2-64
	shock	40 g shock spectrum, meets IEC 60068-2-27, MIL-STD-810
Calibration interval		1 year
EMC, RF emission		meets CISPR 11/EN 55011 group 1 class B (for a shielded test setup)
EMC, other emissions and immunity		meets IEC/EN 61326, emission class B (residential environment), immunity: industrial environment (excluding operating frequency)
Safety		meets IEC 61010-1, EN61010-1 and UL 3111-1
Power supply		100 V to 240 V (AC) with tolerance ±10 %, 50 Hz to 60 Hz with tolerance ±5 %, safety class I to VDE 411
Power consumption		450 W, typ. 350 W (standby: typ. 10 W)
Test mark		VDE, GS, CSA, CSA-NRTL/C, CE conformity mark
Dimensions (W × H × D)	R&S ZVB4 and R&S ZVB8 R&S ZVB20 with two ports or three ports R&S ZVB20 with four ports	465.1 mm × 241.8 mm × 417.0 mm 465.1 mm × 241.8 mm × 417.0 mm 465.1 mm × 286.2 mm × 417.0 mm
Weight	R&S ZVB4 and R&S ZVB8 R&S ZVB20 with two ports or three ports R&S ZVB20 with four ports	20 kg 20 kg 25 kg

Ordering information

Designation	**Type**	**Order No.**
Vector Network Analyzer, 4 GHz, 2 ports	R&S ZVB4	1145.1010.04
Vector Network Analyzer, 4 GHz, 3 ports	R&S ZVB4	1145.1010.05
Vector Network Analyzer, 4 GHz, 4 ports	R&S ZVB4	1145.1010.06
Vector Network Analyzer, 8 GHz, 2 ports	R&S ZVB8	1145.1010.08
Vector Network Analyzer, 8 GHz, 3 ports	R&S ZVB8	1145.1010.09
Vector Network Analyzer, 8 GHz, 4 ports	R&S ZVB8	1145.1010.10
Vector Network Analyzer, 20 GHz, 2 ports	R&S ZVB20	1145.1010.20
Vector Network Analyzer, 20 GHz, 4 ports	R&S ZVB20	1145.1010.22
Options		
Oven Quartz (OCXO)	R&S ZVAB-B4	1164.1757.02
Time Domain	R&S ZVAB-K2	1164.1657.02
Mixer and Harmonic Measurements	R&S ZVB-K3	1164.1592.02

For product brochure, see PD 0758.1529.12
and www.rohde-schwarz.com
(search term: ZVB)

Certified Quality System
ISO 9001
DQS REG. NO 1954 QM

Certified Environmental System
ISO 14001
DQS REG. NO 1954 UM

ROHDE&SCHWARZ

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