Fully tuned for microwave testing

ROHDE&SCHWARZ

75 Years of Driving Innovation

Testing excellence
up to 325 GHz

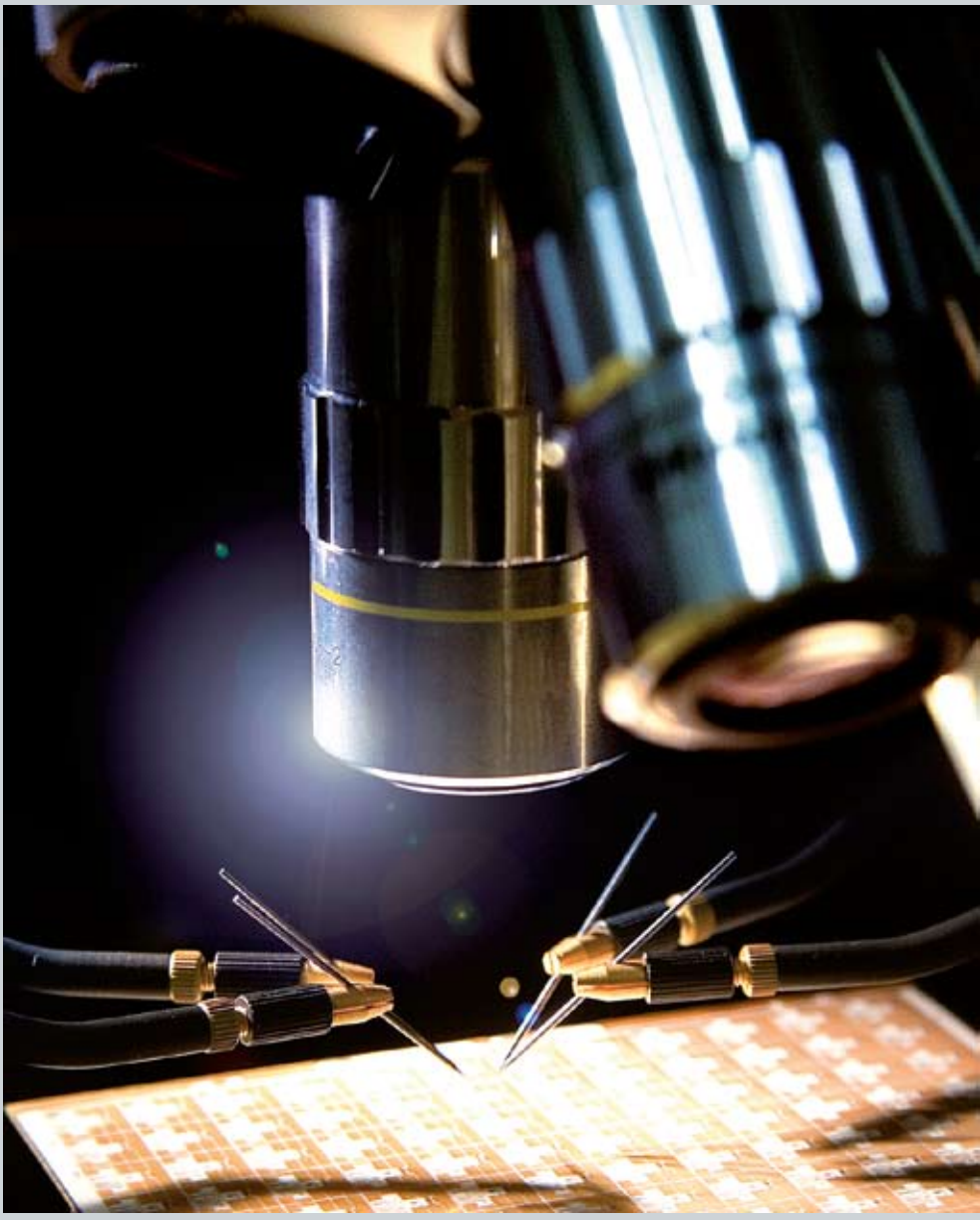
Riding the microwave has its rewards but has never been easy. The rewards are considerable. The combination of frequencies well into the gigahertz range with wavelengths measured in millimeters provides the basic physical properties needed to meet the insatiable demand for communications systems with ever more bandwidth, as well as passing easily through the atmosphere.

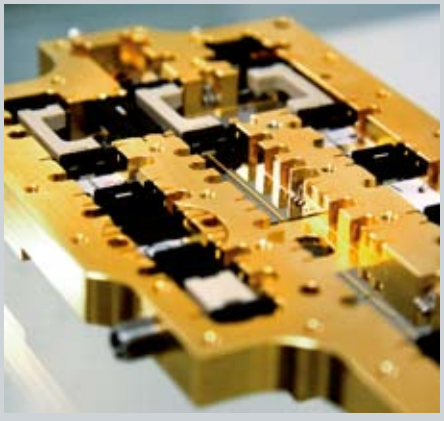
There are downsides, too. The absorption of microwaves by water molecules introduced an entirely new method of heating food – the microwave oven. The same property also represents a health risk and means that microwave communications are subject to interference by rain and snow. To reap the benefits of riding the microwave, the effects of signal degradation and loss must be managed, as well as the associated power consumption and overheating problems.

From the early applications of microwaves for radar, the advantage of increased bandwidth has been a deciding factor in shifting toward microwave for communications technologies. This started with satellite transmissions and then came down to earth with cable television and Wireless Local Area Network protocols from Bluetooth® to WiFi. All modern computers feature chips running at low microwave frequencies.

The demands for microwave test and measurement equipment are even more exacting than for the devices themselves. Rohde&Schwarz has long been one of the world's few suppliers of full-scope microwave test and measurement equipment up to 325 GHz. We offer a broad portfolio of products including signal generators, spectrum analyzers, signal analyzers, network analyzers, and power meters, plus accessories. We also offer EMC test equipment in the microwave range up to 40 GHz.

No matter whether you are dealing with pulsed, swept or modulated signals in the microwave range, our instruments generate and analyze to the highest accuracy – quickly, reliably and with high quality. Our solutions support you every step of the way from R&D through certification, production and service.





For microwave read diversity

Transmitter tests

Suitable products

	Signal generation								Network analysis				Spectrum and signal analysis							Phase noise meas.	Power measurement
	R&S®SMF100A	R&S®SMR	R&S®SMA100A	R&S®SMB100A	R&S®SMJ100A	R&S®SMBV100A	R&S®SMU200A	R&S®SMATE200A	R&S®ZVL	R&S®ZVB	R&S®ZVT	R&S®ZVA	R&S®FSH	R&S®FSL	R&S®FSP/R&S®FSV	R&S®FSG	R&S®FSU	R&S®FSQ	R&S®FSUP	R&S®NRP
AFC (auto frequency control)	●	●	●	●	●	●	●	●							●	●	●	●	●	
AM/PM conversion	●	●	●	●	●	●	●	●		●	●	●				●		●		
Barker coding					●	●	●	●								●		●		
Compression	●	●	●	●	●	●	●	●		●	●	●				●		●		●
Duty cycle	●	●	●	●					●			●	●	●	●	●	●	●	●	
Efficiency										●	●	●								●
Frequency	●	●	●	●	●	●	●	●	●				●	●	●	●	●	●	●	
Frequency settling	●	●	●	●	●	●	●	●						●	●	●	●	●	●	
Gain	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Conversion gain	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Harmonic distortion	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Hot S-parameters											●	●								
Intermodulation distortion	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	
Mixed-mode S-parameters										●	●	●								
Modulation on pulse																				
AMOP	●	●	●	●	●	●	●	●	●					●	●	●	●	●	●	
FMOP	●	●	●	●	●	●	●	●	●					●	●	●	●	●	●	
PMOP									●					●	●	●	●	●	●	
Noise figure									●					●	●	●	●	●	●	
Phase coding																●		●		
Phase linearity									●	●	●	●				●		●		
Phase noise									●					●	●	●	●	●	●	
Power (average)									●	●	●	●	●	●	●	●	●	●	●	●
Power (peak)									●		●	●		●	●	●	●	●	●	●
Pulse parameters																				
Droop	●	●	●	●					●		●	●	●	●	●	●	●	●	●	●
Overshoot/undershoot	●	●	●	●					●		●	●	●	●	●	●	●	●	●	●
PRF (PRI/PRP)									●		●	●	●	●	●	●	●	●	●	●
Profile											●	●								●
Pulse width	●	●	●	●					●		●	●	●	●	●	●	●	●		●
Rise/fall time	●	●	●	●					●		●	●	●	●	●	●	●	●	●	●
S-parameters											●	●							●	
RF spectrum									●				●	●	●	●	●	●	●	
S-parameters									●	●	●	●	●							
Spurious outputs									●		●	●	●	●	●	●	●	●	●	
Switching speed (frequency-agile)									●					●	●	●	●	●	●	
VCO settling									●					●	●	●	●	●	●	
VSWR									●	●	●	●	●	●	●	●	●	●		●
Vector signal analysis																				
Modulation formats QPSK, QAM, BPSK					●	●	●	●								●		●		
EVM					●	●	●	●								●		●		
Modulated parameters I/Q imbalance, origin offset					●	●	●	●								●		●		
Demodulated bits					●	●	●	●								●		●		
General OFDM analysis																		●		
Phase coherence									●		●	●		●		●		●		

Receiver tests

Suitable products

	Signal generation								Network analysis				Spectrum and signal analysis						Phase noise meas.	Power measurement
	R&S®SMF100A	R&S®SMR	R&S®SMA100A	R&S®SMB100A	R&S®SMJ100A	R&S®SMBV100A	R&S®SMU200A	R&S®SMATE200A	R&S®ZVL	R&S®ZVB	R&S®ZVT	R&S®ZVA	R&S®FSH	R&S®FSL	R&S®FSP/R&S®FSV	R&S®FSG	R&S®FSU	R&S®FSQ	R&S®FSUP	R&S®NRP
AGC response	●	●	●	●	●	●	●	●												
Bandwidth	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	
Clutter rejection	●	●	●	●																
Doppler accuracy	●	●	●	●	●	●	●	●												
Dynamic range	●	●	●	●	●	●	●	●	●	●	●	●								
Gain compression (1 dB and 3 dB)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Gain versus frequency	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Harmonic distortion	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
I/Q gain imbalance					●	●	●	●			●	●								
Insertion loss	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Intercept point	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	
Intermodulation distortion	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	
Minimum detectable signal	●	●	●	●	●	●	●	●												
Mixed-mode S-parameters										●	●	●								
Mixer image rejection	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Modulated signals					●	●	●	●	●				●	●	●	●	●	●	●	●
Noise figure									●				●	●	●	●	●	●	●	
Phase versus frequency	●	●	●	●	●	●	●	●	●	●	●	●							●	
Probability of detection	●	●	●	●	●	●	●	●												
Probability of false alarm	●	●	●	●	●	●	●	●												
Pulse parameters	●	●	●	●							●	●								
Quadrature error					●	●	●	●								●		●		
Quantization error (ADC)					●	●	●	●								●		●		
S-parameters					●	●	●	●	●	●	●	●	●							
Saturation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Sensitivity	●	●	●	●	●	●	●	●												
Signal simulation agility																				
Frequency hopping	●	●	●	●	●	●	●	●												
Chirp waveforms (LFM, NLFM)					●	●	●	●												
Clutter	●	●	●	●																
Doppler shift	●	●	●	●	●	●	●	●												
Jamming	●	●	●	●																
Moving targets	●	●	●	●																
Multiple targets	●	●	●	●																
Noise					●	●	●	●												
Spurious outputs									●		●	●	●	●	●	●	●	●	●	
Phase coherence					●	●	●				●	●								

Rohde & Schwarz has the instruments for every kind of microwave testing

Signal generation			
Product	**Frequency ranges**	**Applications**	**Features**
R&S®SMF100A R&S®SMR	100 kHz to 22/43.5 GHz 10 MHz to 50/60 GHz	❙ Measurements with passive and active components ❙ Measurements with radar pulses ❙ Scalar network analysis in combination with spectrum analyzer	❙ Analog ramp sweep ❙ AM/FM/scan modulator option ❙ Optional pulse modulation and pulse generator
R&S®SMU200A	100 kHz to 2.2/3/4/6 GHz	❙ Measurements with pulsed and vector-modulated signals (radar and communications systems) ❙ Scalar network analysis in combination with spectrum analyzer	❙ Up to two signal generators in one box ❙ GPIB and LAN remote control ❙ I/Q modulator with 200 MHz RF bandwidth ❙ Lossless combination of baseband signals in the digital domain (e.g. for testing multi-standard base stations) ❙ High output power up to +19 dBm ❙ Optional fading simulator and AWGN source ❙ Optional BERT
R&S®SMATE200A	100 kHz to 3/6 GHz	❙ Fast production measurements with pulsed and vector-modulated signals (radar and communications systems)	❙ Up to two signal generators in one box ❙ Fast hardware list mode ❙ Multisegment waveforms ❙ Hardware trigger for selected GPIB commands ❙ All I/O signals bundled on one SCSI connector
R&S®SMJ100A R&S®SMBV100A	100 kHz to 3/6 GHz	❙ Measurements with pulsed signals (radar and communications systems)	❙ GPIB and LAN remote control ❙ I/Q modulator with 200 MHz RF bandwidth ❙ Optional AWGN source ❙ Optional BERT
R&S®SMA100A	9 kHz to 3/6 GHz	❙ Measurements with pulsed signals (radar and communications systems) ❙ Scalar network analysis with filter measurements	❙ Excellent signal quality ❙ Intuitive operating concept ❙ Removable mass storage
R&S®SMB100A	9 kHz to 1.1/2.2/3.2/6 GHz	❙ Measurements with pulsed signals (radar and communications systems)	❙ Best signal quality in the mid-range ❙ Highest output power in its class ❙ On-site servicing as a convenient alternative

R&S®SMF100A

R&S®SMBV100A

Spectrum and signal analysis

Product	Frequency ranges	Applications	Features
R&S®FSH	R&S®FSH3: 100 kHz to 3 GHz R&S®FSH6: 100 kHz to 6 GHz R&S®FSH18: 10 MHz to 18 GHz	❙ Installation ❙ Field VSWR ❙ EMI scan ❙ EMF ❙ Interference location	❙ Handheld, standby time 4 h ❙ Tracking generator (models 13, 23 and 26) ❙ Preamplifier (except model 13) ❙ DANL typ. –135 dBm (RBW 100 Hz)
R&S®FSL	9 kHz to to 3/6/18 (20) GHz	❙ Installation ❙ Field service ❙ Channel power measurements ❙ Pulse measurements ❙ Noise figure	❙ I/Q demodulation bandwidth 28 MHz ❙ DANL –152 dBm (1 Hz) ❙ Low weight: under 8 kg/18 lbs ❙ Internal battery option with typ. 1 h operating time ❙ Measurement routines for TOI, ACP, OBW, CCDF, APD, etc. as standard ❙ Models with built-in tracking generator
R&S®FSV	9 kHz (20 Hz) to 3.6/7/13.6/30 GHz	❙ Production and development ❙ Channel and adjacent channel power measurement, C/N measurements ❙ Spurious emissions measurements ❙ Spur search ❙ Pulse measurements	❙ DANL -155 dBm (1 Hz) ❙ TOI typ. 18 dBm ❙ 28/40 MHz signal analysis bandwidth ❙ Up to 5 times faster than other signal analyzers ❙ Measurement routines for TOI, ACP, OBW, CCDF, APD, SEM etc. as standard ❙ Easy-to-use with touch screen, built-in Help and UNDO/REDO functions
R&S®FSP	9 kHz to 3/7/13/30/40 GHz	❙ Production and development ❙ Channel and adjacent channel power measurement, C/N measurements ❙ Spurious emissions measurements ❙ Pulse measurements ❙ Noise figure ❙ Phase noise	❙ DANL –155 dBm (1 Hz) ❙ Phase noise –113 dB (1 Hz) at 10 kHz ❙ Measurement routines for TOI, ACP, OBW, CCDF, APD, etc. as standard ❙ Noise figure and phase noise measurement personality
R&S®FSU	20 Hz to 3.6 /8 /26.5/46/50/67 GHz	❙ Production and development ❙ Channel and adjacent channel power measurement, C/N measurements ❙ Spurious emissions measurements ❙ Spur search ❙ Pulse measurements ❙ Noise figure ❙ Phase noise	❙ Dynamic range of a high-end spectrum analyzer ❙ TOI typ. +25 dBm ❙ 1 dB compression typ. +13 dBm ❙ Phase noise –128 dBc (1 Hz), typ. –133 dBc (1 Hz) (R&S®FSG –110 dBc) ❙ 84 dB ACLR/3GPP with noise correction ❙ Measurement routines for TOI, ACP, OBW, CCDF, APD, etc. as standard ❙ Noise figure and phase noise measurement personality
R&S®FSQ R&S®FSG	20 Hz to 3.6/8/26.5/40 GHz 9 kHz to 8/13.6 GHz	❙ See R&S®FSU ❙ Broadband modulation measurements, e.g. for MMDS or proprietary OFDM systems ❙ Chirp	❙ RF performance: see R&S®FSU ❙ 28 MHz demodulation bandwidth (R&S®FSQ: optional 120 MHz) ❙ 16 Msample I and Q memory (R&S®FSQ), 4 Msample I and Q (R&S®FSG) ❙ General-purpose vector signal analysis ❙ General OFDM/OFDMA vector signal analysis

Phase noise measurement

Product	Frequency ranges	Applications	Features
R&S®FSUP	10 MHz (20 Hz) to 8/26/50 GHz	❙ Phase noise measurements ❙ Oscillator characteristics	❙ Spectrum analyzer and signal analyzer in one box ❙ PLL method for phase noise measurements with internal and external references ❙ Two signal paths for cross-correlation ❙ Low-noise DC source

R&S®FSUP

R&S®FSU

Network analysis

Product	Frequency ranges	Applications	Features
R&S®ZVA	R&S®ZVA8: 300 kHz to 8 GHz R&S®ZVA24: 10 MHz to 24 GHz R&S®ZVA40: 10 MHz to 40 GHz R&S®ZVA50: 10 MHz to 50 GHz	❙ Measurement on filters with high stop band rejection ❙ Linear and nonlinear measurements on amplifiers and mixers ❙ Measurements with true differential signals on nonlinear balanced devices ❙ Average pulse and point-in-pulse measurements ❙ High-performance pulse profile measurements ❙ Antenna measurements ❙ Characterization of T/R modules	❙ High dynamic range up to 140 dB ❙ Two independent coherent sources ❙ Wide IF bandwidths up to 30 MHz ❙ Wide power sweep range up to 60 dB ❙ High measurement speed ❙ Up to 60,000 points per trace
R&S®ZVB	R&S®ZVB 4: 300 kHz to 4 GHz R&S®ZVB 8: 300 kHz to 8 GHz R&S®ZVB 14: 10 MHz to 14 GHz R&S®ZVB 20: 10 MHz to 20 GHz	❙ Linear measurements on filter amplifiers and mixers ❙ Measurements on linear balanced devices ❙ Average pulse and point-in-pulse measurements	❙ High dynamic range and measurement speed ❙ Two internal sources for mixer testing ❙ 500 kHz IF bandwidth ❙ Intuitive operation
R&S®ZVL	9 kHz to 3/6 GHz	❙ Measurements on filters and small signal amplifiers with high dynamic range ❙ Service and installation	❙ High dynamic range ❙ Distance to fault measurement ❙ Noise figure measurement ❙ Full spectrum analysis with signal analysis ❙ Low weight and battery option
R&S®ZVT	300 kHz to 8/20 GHz	❙ Linear and nonlinear measurements on amplifiers and mixers ❙ Measurements with true differential signals on nonlinear balanced devices ❙ High-performance pulse profile measurements ❙ Antenna measurements ❙ Characterization of T/R modules ❙ Measurements on multiport devices with up to 8 ports	❙ High dynamic range up to 140 dB ❙ Two independent coherent sources ❙ Wide IF bandwidths up to 30 MHz ❙ Wide power sweep range up to 60 dB ❙ High measurement speed ❙ Up to 60,000 points per trace ❙ Measurement with 8 ports in parallel
R&S®ZVA-Z	R&S ZVA-Z75: 50 GHz to 75 GHz R&S ZVA-Z110: 75 GHz to 110 GHz R&S ZVA-Z325: 220 GHz to 325 GHz	❙ Measurements on components for anti-collision radar ❙ Measurements of components in the mm-wave range for aerospace and defense	❙ Frequency range up to 325 GHz ❙ High dynamic range up to 110 dB ❙ Easy setup and configuration

Power measurement

Product	Frequency ranges	Applications	Features
R&S®NRP	DC to 6/8/18/26.5/40 GHz	❙ Average, peak and peak-to-average power measurements	❙ Up to 90 dB dynamic range ❙ Sensor operation directly from PC or a Rohde&Schwarz signal generator via USB interface ❙ Absolute calibration, simply plug in and measure ❙ Two-year calibration cycle
R&S®NRV	DC to 6/18/26.5/40 GHz	❙ Average and peak power measurements	❙ Absolute calibration, simply plug in and measure ❙ High long-term stability ❙ Excellent temperature response
R&S®NRT	200 kHz to 4 GHz	❙ Measurement of peak power, crest factor and average burst power	❙ Intelligent sensors: simply plug in and go ❙ Simultaneous display of power and reflection ❙ Sensor operation directly on PC

R&S®ZVA

R&S®ZVA-Z110

R&S®NRP

EMC and OTA measurements			
Product	**Frequency ranges**	**Applications**	**Features**
R&S®ESU	20 Hz to 8/26.5/40 GHz	▌Standard-compliant EMI measurements with maximum precision at unparalleled measurement speed ▌For all commercial and military standards such as CISPR, EN, FCC, ETS, VCCI, MIL-STD, VG, DEF STAN, etc.	▌Compliant with latest edition of CISPR 16-1-1 incl. RMS-average detector ▌High sensitivity (internal preamplifier) ▌Integrated preselection ▌Very short measurement times with FFT-based time domain scan ▌Automated measurement procedures ▌Time domain measurement (e.g. click rate) ▌New amplitude probability distribution function (APD) ▌Integrated report generator ▌High-end spectrum analyzer included
R&S®TS8991	400 MHz to 6 GHz	▌Over the air (OTA) RF performance	▌PTCRB test case ▌CTIA 2.2.1 ▌TR 34.114 ▌RPT 0.3.0
R&S®TS8996 R&S®TS9975	30 MHz to 40 GHz	▌EMI for mobile radiocommunications equipment ▌Conformance ▌Measurements of radiated spurious emissions (RSE) from mobile radio-communications equipment	▌ETSI EN 301 489-X, ETSI EN 301 908-1 (3GPP) ▌EMC measurements in line with ITE standards e.g. EN 55022 and FCC ▌ETSI EN 301 511 R & TTE ▌ETSI TS 151 010-1: TS 12.2 etc. (GCF/PTCRB test cases)
R&S®TS9982	1 GHz to 40 GHz	▌EMS for mobile radiocommunications equipment ▌Automotive ▌MIL	▌ETSI EN 301 489-X ▌ISO 11451, SAE J 551 vehicle test ▌ISO 11452, SAE J 1113 vehicle components ▌RTCA DO 160 aircraft ▌MIL-STD-461E

R&S®ESU

Application notes	
Description	**Number**
FreRes – Program for Frequency Response Measurements	1MA09
Measurement of Frequency Settling Time of Synthesizers and Transmitters	1MA15
AmpTune – Software for Measuring Amplifier Nonlinearity in Realistic Conditions	1MA27
IQWizard – IQ Signal Measurement and Conversion	1MA28
NPR – Noise Power Ratio Signal Generation and Measurement	1MA29
Frequency Response Compensation for SMx Generator Series	1MA56
Tackling the Challenges of Pulsed Signal Measurements	1MA124
Overview of Tests on Radar Systems and Components	1MA127
Level Error Calculation for Spectrum Analyzers	1EF36
Frequency Range Extension of Spectrum Analyzers with Harmonic Mixers	1EF43
Spurious Emission Measurement on 3GPP Base Station Transmitters	1EF45
Power Measurement on Pulsed Signals with Spectrum Analyzers	1EF48
Measuring Balanced Components with Vector Network Analyzer ZVB	1EZ53
Millimeter-Wave Measurements Using Converters of the R&S® ZVA Family	1EZ55
Multiport Millimeter-Wave Measurements Using Converters of the R&S® ZVA Family	1EZ56

Microwave accessories

Rohde&Schwarz also supplies microwave accessories such as attenuators, cables, calibration kits/verification standards, harmonic mixers, etc.

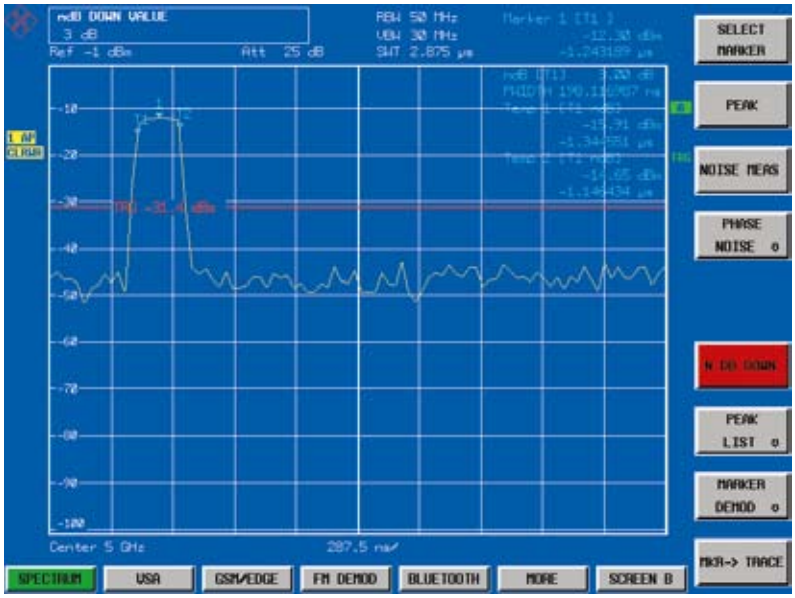
External mixers up to 110 GHz
(R&S®FS-Z60, R&S®FS-Z75, R&S®FS-Z90, R&S®FS-Z110)

Sample microwave applications
Signal analysis

Power measurements on pulsed radar signals

Rohde&Schwarz spectrum analyzers can perform highly accurate mean and peak power measurements on a pulsed radar signal over a wide dynamic range. The high bandwidth is optimally suited for measuring short rise/fall times.

The R&S®NRP-Z81 wideband power sensor also measures pulsed radar signals.

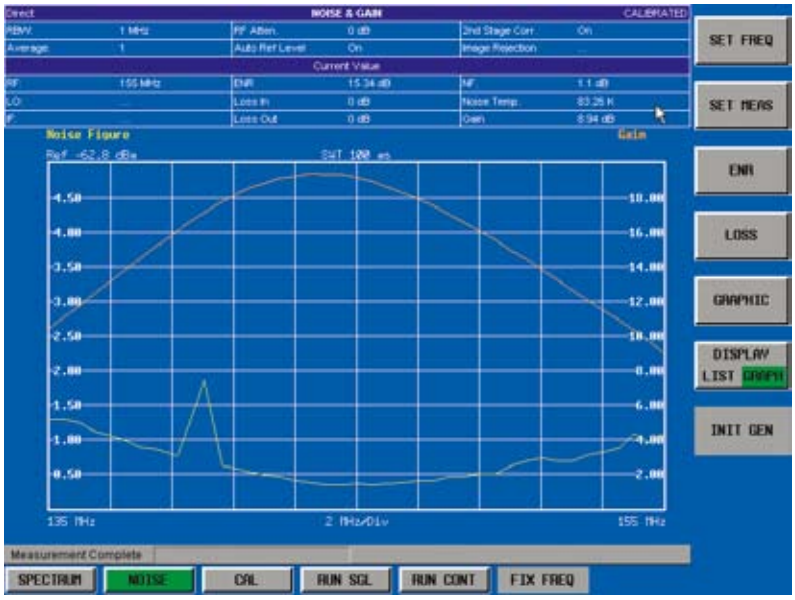


Pulse width determined with delta markers

Noise figure measurement

The swept noise figure test solution covers 100 kHz to 67 GHz and offers a wide variety of resolution bandwidths for every application, even for measurements on narrowband DUTs. If results are questionable, use the analyzer to check the test setup for radiated interference or nonharmonics. Measurements on frequency-converting DUTs are supported by an external generator.

The R&S®FSQ signal analyzer or the R&S®FSP or R&S®FSU spectrum analyzer can detect and analyze interference sources.



Measurements on a GaAs preamplifier show an anomaly at 140 MHz; its cause can easily be traced in the spectrum analyzer mode

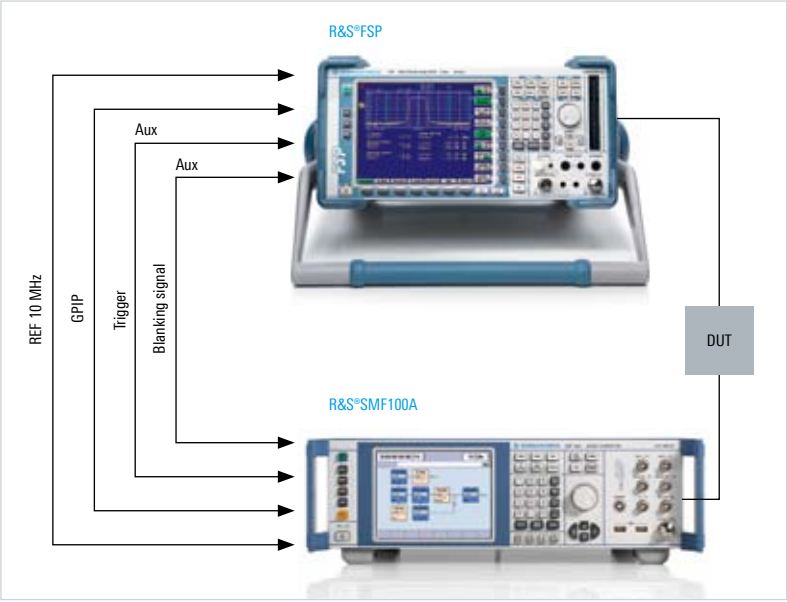
Scalar analysis with independent generation and spectrum analysis capability

Applications include filter tuning, measurements on frequency-converting DUTs, harmonics and subharmonics (i.e. frequency multiplier and divider).

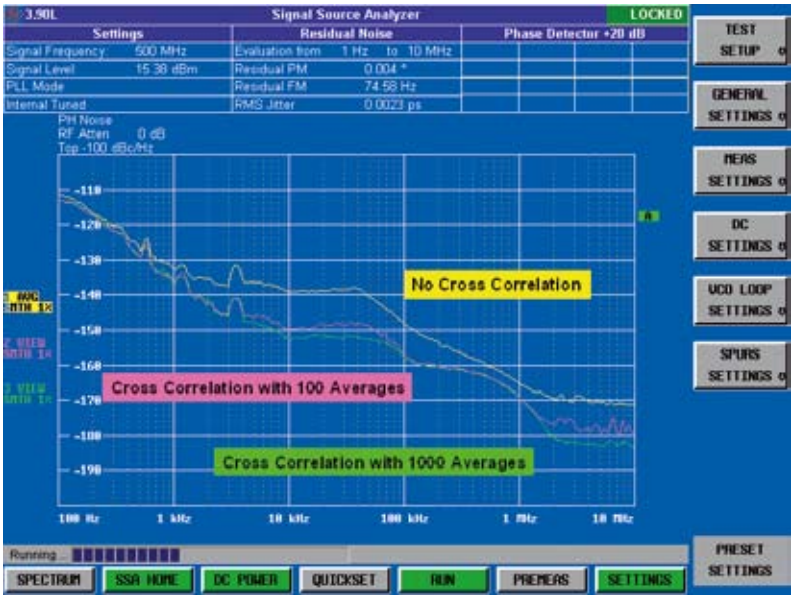
The system can be enhanced by adding a second generator for testing double mixers or other frequency-converting devices.

Phase noise measurement – cross-correlation to reduce phase noise

The R&S®FSUP-B60 option provides the R&S®FSUP signal source analyzer with two parallel receive paths. You can perform cross-correlation between the two paths owing to the symmetrical structure, and eliminate the uncorrelated inherent noise of the two reference sources. This significantly increases sensitivity, which is no longer limited by the phase noise of the internal references. The degree of improvement depends on the number of averages and can be up to 20 dB.



Setup for scalar network analysis in the microwave range using an R&S®FSP spectrum analyzer and an R&S®SMF100A signal generator



Improvement of phase noise sensitivity by means of cross-correlation; the screenshot shows a phase noise measurement without cross-correlation (yellow trace) and with cross-correlation (100 and 1000 averages)

Sample microwave applications
Vector network analysis

Millimeter-wave measurements up to 325 GHz

The frequency range of an R&S®ZVA24/40/50 or an R&S®ZVT20 can be extended by using frequency converters, covering the following frequency ranges:

- 50 GHz to 75 GHz (R&S®ZVA-Z75)
- 75 GHz to 110 GHz (R&S®ZVA-Z110)
- 220 GHz to 325 GHz (R&S ZVA-Z325)

Two-port millimeter-wave measurements are possible without any additional hardware, using a four-port R&S®ZVA24/40/50 or a R&S®ZVT20. The modularity and ease of use allow a fast measurement setup. All necessary parameters are set automatically. The converters feature very fast measurement speed, highest dynamic range and output power and are equipped with a manual attenuator.

Three- or four-port measurements can be performed by using three or four converters simultaneously. The converters can also be used for pulsed measurement applications.

Millimeter-wave measurements up to 110 GHz are performed with the R&S®ZVA network anayzer and the R&S®ZVA-Z110 converter

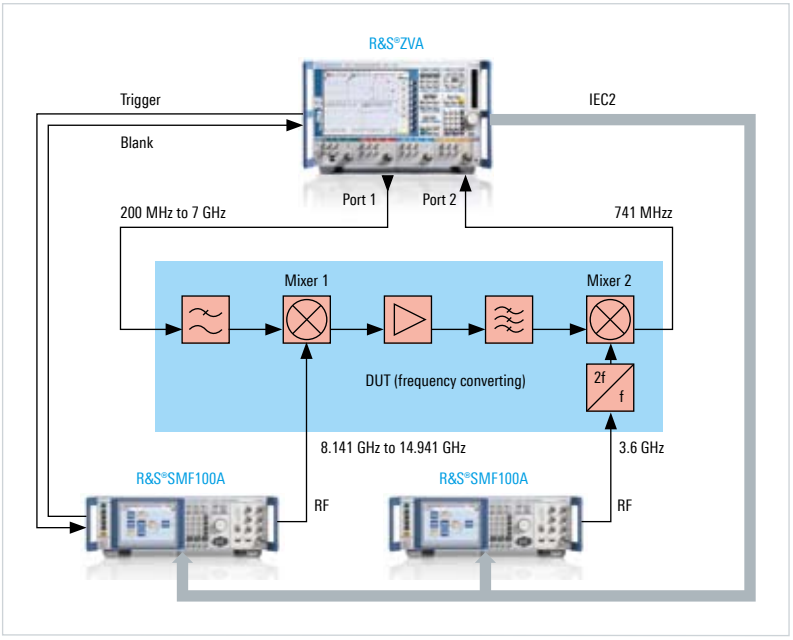
Frequency-converting measurements of frontends

Use the R&S®ZVx frequency-conversion measurement mode for:

- Fast and easy configuration of arbitrary measurements on frequency-converting DUTs
- Easy-to-use full measurement configuration

Test example: a double-converting frontend. LO signals provided by two R&S®SMF signal generators (automatic IEC/IEEE bus control by the R&S®ZVA). Examples of further possible measurements: conversion loss, return loss, gain, harmonics, intermodulation, spurious, crosstalk of RF and LO.

Available with the R&S®ZVA, R&S®ZVT and R&S®ZVB (partly)

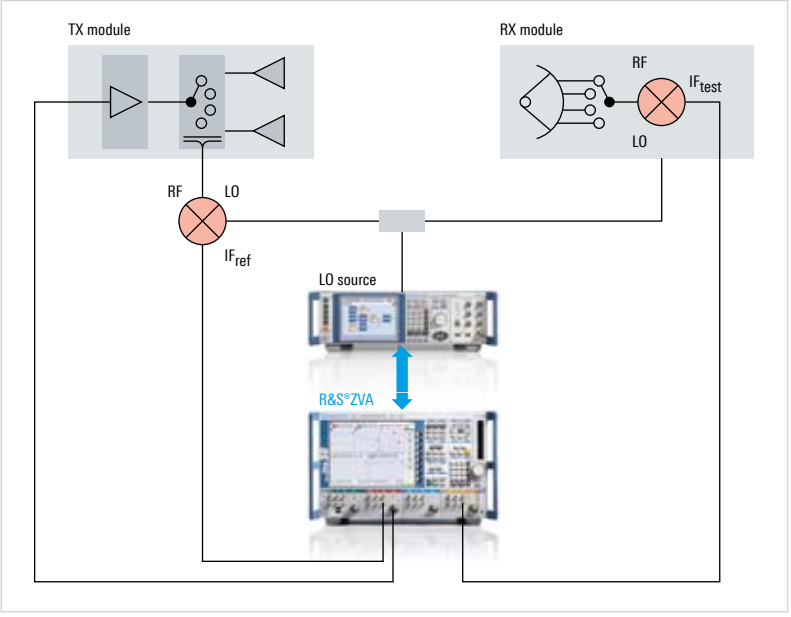


Test setup for measurements on a double-converting frontend module

Antenna measurement with remote mixers

External upconverting/downconverting is used to prevent cable loss in the high gigahertz range. The R&S®SMF100A signal generator is used as the external LO source. The R&S®ZVA-K4 frequency-converting measurement option provides full control of the R&S®SMF100A (fixed and swept LO mode possible). The RF test signal is provided by the R&S®ZVT/R&S®ZVA port 1.

- Up to 8 receiver channels are available with the four-port R&S®ZVA;
  up to 16 receiver channels are available with the eight-port R&S®ZVT8
- The R&S®ZVT/R&S®ZVA TTL ports provide easy control for switching the RX/TX modules

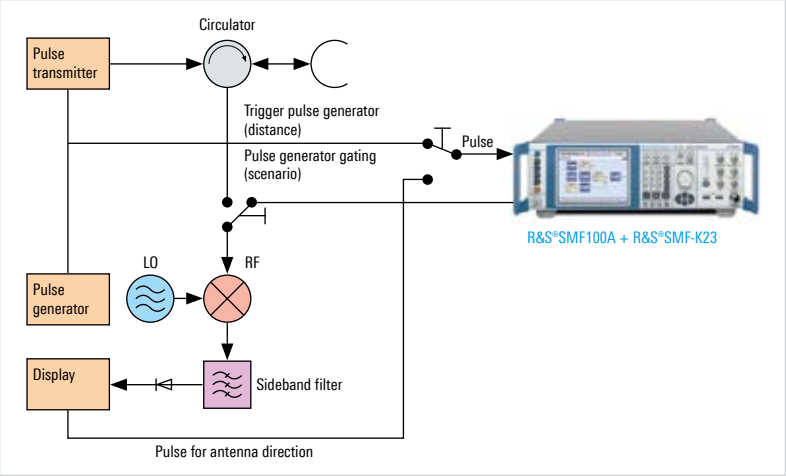


The R&S®ZVT/R&S®ZVA and R&S®SMF100A as key instruments in antenna measurement systems (simplified block diagram)

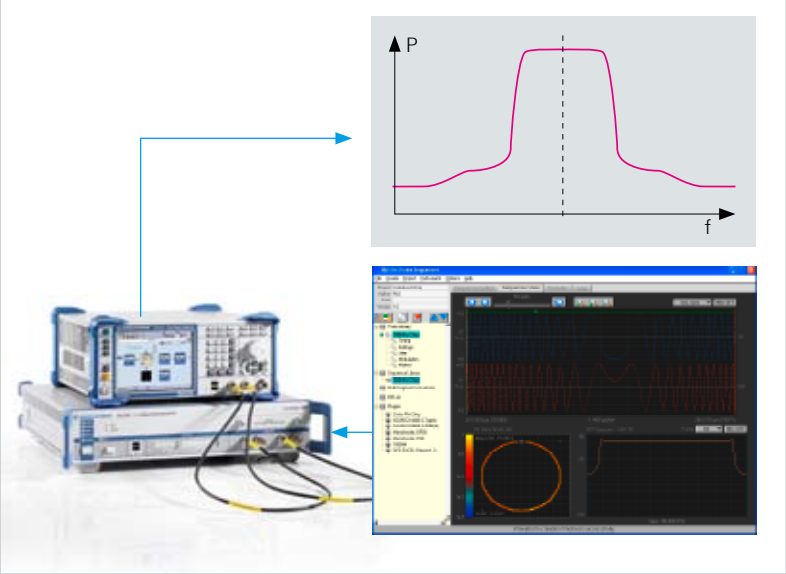
Sample microwave applications
Signal generation

Simplifying radar testing
This test setup simulates distance and direction, and verifies the values on the radar display. The external pulse is used to trigger the R&S®SMF100A.

Wideband modulation up to 528 MHz
To generate digitally modulated signals that cover an RF bandwidth of 528 MHz, the I/Q signal from the R&S®AFQ100B is applied to the external I/Q inputs of the R&S®SMBV100A. The R&S®SMBV100A upconverts the digitally modulated signal to the RF frequency range. The R&S®AFQ-K6 PC software option simplifies the generation of signals, such as pulsed signals or wideband chirps.



Radar tests (switch position 1 for testing the distance indicated by radar, switch position 2 for testing the antenna direction indicated by radar)



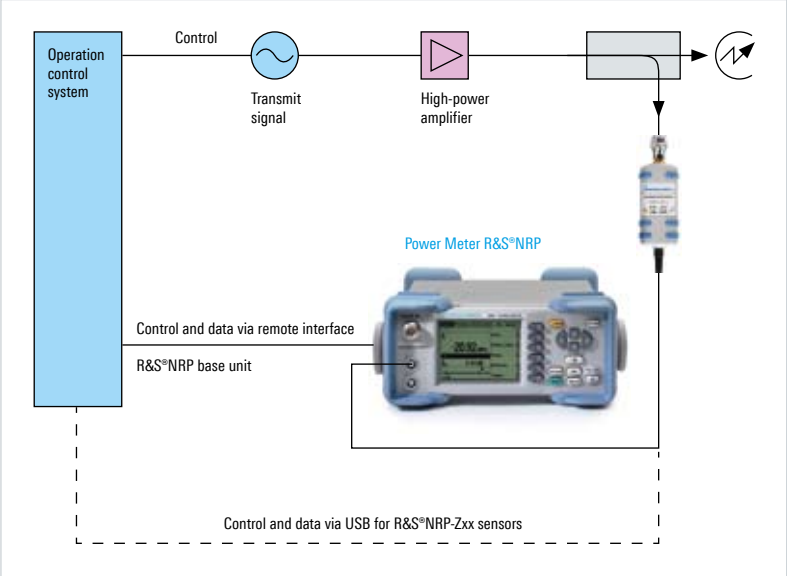
The R&S®AFQ100B and R&S®SMBV100A as sources for wideband signals

Power measurement

EIRP measurements

For satellite communications, being able to continuously monitor transmission signals directly from the antenna is of critical importance. Continuous measurements need to be performed on the effective isotropic radiated power (EIRP) of the antenna in order to assess the receive and transmit quality of the signals.

The R&S®NRP power meter is ideal for this purpose. It measures the transmit power (see figure) or receive power, and forwards this information to a control unit. The control unit evaluates the data and compares it with reference values. If deviations occur, the antenna is adjusted until the optimum receive and transmit power levels are obtained.



Typical transmit path setup of a satellite communications antenna. Continuous EIRP measurements are performed to check the antenna's transmit signal quality; the purpose of the power meter is to check the antenna's transmit power

EMC measurement

EMS microwave tests from 1 GHz to 40 GHz

The R&S®TS9982 is a test system for conducted and radiated EMS measurements in line with commercial, wireless, automotive and MIL standards. All necessary equipment such as signal generator, power amplifier and power meter are included in a mobile rack for 1 GHz to 18 GHz or 40 GHz measurements. This prevents cable losses, allowing more amplifier power to be used for field generation. The system can be configured for different test levels up to 600 V/m in 1 m test distance. It is controlled by the EMC software from outside the chamber via fiber-optic link. The R&S®EMC32 EMC test software is a convenient and reliable tool, enabling fast and easy system operation and high throughput. The extended test and configuration capabilities ensure high reproducibility of results.

Example of an R&S®TS9982 EMS test system for microwave tests from 1 GHz to 40 GHz

About Rohde&Schwarz

Rohde&Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde&Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

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