ROHDE&SCHWARZ

Make ideas real

STAY AHEAD IN RADAR AND ELECTRONIC WARFARE TESTING

A collection of articles on Rohde&Schwarz test and measurement solutions for:

- AESA TRM testing
- Emitter simulations for radar warning receiver testing
- Advanced pulse stability measurements for radar system performance validation
- Ultra-wideband signal analysis for next generation jammer performance evaluation

www.rohde-schwarz.com/radar

ACTIVE ELECTRONICALLY SCANNED ARRAY AND ANTENNA TESTING

Improving TRM testing accuracy and throughput

Development and production testing challenges for AESA TRMs

Breakthrough technologies, such as direct digital synthesis, phased arrays and gallium nitride (GaN) components, helped create multi-functional active electronically scanned array (AESA) radar. AESA radar performance strongly depends on the quality of transmit and receive modules (TRM) and TRM complexity demands extensive verification and testing during development, which has a big impact on time and cost. Flexibility and efficiency are the most important parameters when developing and testing TRMs. The test setup must be radar and customer specific and also scalable and efficient to ensure the required performance in each development and production phase. This places tough demands on test equipment and Rohde&Schwarz can satisfy them.

Rohde&Schwarz scalable solutions for multiple tests in a single setup

TRM characterization requires flexible test and measurement equipment that can handle arrays of different measurements. This makes the configuration, calibration and measurement of TRM test and measurement setups complex and error prone – if one device malfunctions, the whole configuration will fail.

A single network analyzer such as the R&S®ZNA can cover all typical TRM use cases. If higher performance is required from a spectrum analyzer for a pulsed noise figure, the R&S®FSW signal and spectrum analyzer can be added to the setup. The R&S®TS6 TRM test library is based on R&S®TSrun test sequencer software and adds flexible test automation with powerful evaluation features in a simpler setup with fewer cables. When combined with a signal conditioning unit, the R&S®ZVAX-TRM extension unit, all tests can be carried out without any reconnection even for multiplexing.

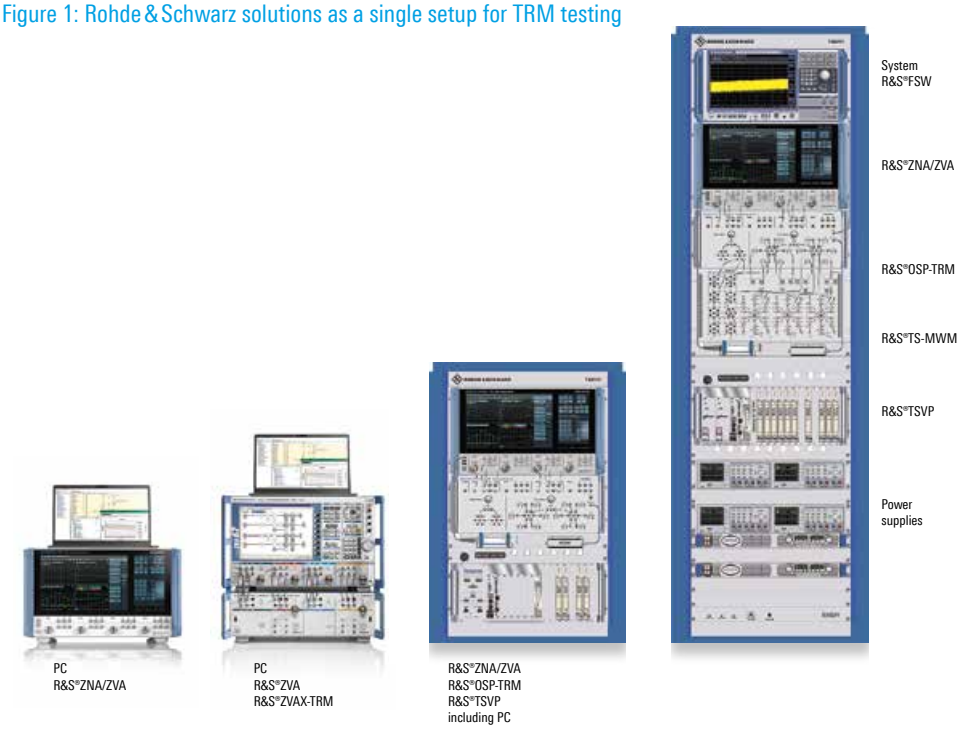
The calibration routine in the R&S®TS6 TRM test library is a special feature that collects all the calibration requirements from the tests and runs an optimized calibration without compromising accuracy. Supporting multiport calibration units enables efficient calibration of devices under test (DUTs) with multiple ports. A simplified test setup combined with a high degree of automation ensures reliable and reproducible measurements from a scalable solution that can always adapt to requirements: including manual component testing, complete module characterization in development and automated production testing.

Ideal for increasing test throughput

Each AESA radar has a large number of TRMs, which have to be tested and individually calibrated over a large number of DUT states and frequencies. Time is of the essence here and Rohde&Schwarz can test systems running in parallel during production. The R&S®TS6 TRM test library and R&S®TS6710 TRM radar test system are ideal solutions. Rohde&Schwarz has years of TRM testing experience, helping the company deliver the fastest possible TRM testing speeds possible from test equipment, together fast handovers between measurement and device programming.

For example, fast frequency sweeps and multiple measurements within one pulse reduce the number of required TRM state changes and minimize the overall test time. The R&S®ZVAX-TRM signal conditioning unit runs all tests automatically without interaction, including port multiplexing. Typical test times for a complete TRM characterization can be reduced from hours, required by the legacy TRM test systems, to just a few minutes.

Figure 1: Rohde&Schwarz solutions as a single setup for TRM testing



Webinar: AESA Radar Frontend Testing
Modern AESA radar design capabilities depend significantly on the performance of state-of-the-art transmit receive modules (TRM). In this webinar, our experts tackle the challenge of precisely validating TRM performance in large array antennas and significantly reducing TRM testing complexity with the latest test systems from Rohde&Schwarz.

Watch the webinar here: **https://www.rohde-schwarz.com/aerospace-defense/AESAwebinar**

Confidentiality and flexibility with open DUT interfaces

TRM design parameters are radar specific and confidential. A specific interface, protocol and trigger for testing is needed to control each TRM. The R&S®TS6 TRM test library has an open software interface for TRM controls. The plug-in can be programmed locally and works with all Rohde&Schwarz hardware. In combination with the wide range of test parameters, the whole test configuration can be carried out locally, allowing for faster on-site adaptation and optimization. One efficient TRM control option is the versatile R&S®Compact TSVP test system platform with flexible and fast control interfaces for digital and analog measurements. This configuration can achieve shorter test times in many setups without needing any programming of field-programmable gate arrays (FPGA).

Rohde&Schwarz offers:

- Scalable solution for TRM testing from development to production
- Frequency range from 1 GHz to 40 GHz
- Very short test times
- Multiplexing of up to 32 TRM channels per test system
- Test sequencer for user-configurable test runs
- Open C# interface for customer DUT control
- Turnkey solution from a single source
- Based on commercial, off-the-shelf instruments from Rohde&Schwarz.

For more information on Rohde&Schwarz solutions for AESA and antenna testing, visit:
www.rohde-schwarz.com/aerospace-defense/AESA

TEST SYSTEMS. COUNTER THREATS

Emitter simulations for radar warning receiver testing

High-performance simulation with off-the-shelf equipment?

Testing radar warning equipment in realistic scenarios is crucial to reliable performance in the field. Radar warning receivers are an integral part of airborne electronic warfare (EW) self-protection suites on modern aircraft and need to be tested before becoming operational. Traditionally, such testing involved dedicated instruments with specialized hardware. The increase of available bandwidth and processing power in commercial vector signal generators such as the R&S®SMW200A make these instruments a good alternative. A signal source can be shared among different applications, ranging from simple vector signal generation to high-end radar simulation and enjoy the benefits of outstanding RF performance, reduced costs and improved flexibility.

High-speed PDW streaming for real-life scenarios

The R&S®SMW200A can assemble desired RF environments. Pulse descriptor word (PDW) streaming via LAN to the R&S®SMW200A enables ultra-long scenario playtimes, which can then take on the role of an agile RF signal source. This supports classic unmodulated radar pulses, Barker coded pulses, frequency modulated continuous wave (FMCW) signals, or any kind of I/Q modulation on pulse to simulate state-of-the-art, low probability of intercept (LPI) radar. The R&S®SMW200A supports PDW rates of up to 12 MPDW/s.

The R&S®SMW200A and the R&S®Pulse Sequencer setup – ready for testing

Create complex scenarios and watch them in 3D

Engineers need realistic test cases that reflect what radar warning receivers actually see when in operation in all stages of development, from initial functional testing to final operational simulation testing. R&S®Pulse Sequencer software can define a wide range of radar scenarios extending from simple pulses to dense multi-emitter RF environments. The software comes standard with smart pulse interleaving algorithms and an optimized, user-defined priority scheme and the lowest available drop rates. Users can also simulate true pulse-on-pulse situations as they occur and without any pulse dropping. The software covers all typical types of radar such as CW, FMCW, pulsed radars with wide bandwidth, frequency agile radars with complex inter-pulse modulation (IPM) or modulation on pulse (MOP). Emitters and the receiver can move along predefined or imported trajectories with six degrees of freedom to make simulations as realistic as possible. Usability is a core software requirement and 3D previews and graphical live visualizations of configured scenarios quickly familiarize users with it. Calculation results of complex multi-emitter scenarios are also quickly available, reducing waiting times for results and enabling convenient test case optimization.

Webinar: Simulating radar signals for meaningful radar warning receiver tests
Learn how to create radar scenarios ranging from simple pulses to the most demanding emitter scenarios, generate complex radar signals and increase flexibility during radar simulation by streaming pulse descriptor words (PDW).

Watch the webinar here: **www.rohde-schwarz.com/radarwarningreceivertests**

Cutting-edge RF performance for AoA and pulse-on-pulse simulation

R&S®SMW200A RF software supports all typical radar bands up to 44 GHz. Multiple coupled dual-path R&S®SMW200A vector signal generators can simulate radar signal angles of arrival (AoA). In a small form factor, coupled instruments support testing devices that use time difference of arrival (TDOA) interferometric or amplitude comparison. Digital hardware flexibility with 2 GHz internal I/Q bandwidth in the R&S®SMW200A enables simulation of pulse-on-pulse situations with up to six overlapping pulses in an instrument with one RF port and a maximum pulse density up to six times 3.3 Mpulses/s.

White paper: Simulation of angle of arrival (AoA)
Learn how to test the direction finding capabilities of radar warning receivers in the lab with multiple coupled R&S®SMW200A vector signal generators that are phase-coherent and time-synchronized.

Download the free white paper at: **www.rohde-schwarz.com/aerospace-defense/AOA**

Innovative Rohde&Schwarz test equipment allows radar engineers to reduce testing uncertainty and gain confidence for testing that mimicks real operational scenarios.

Rohde&Schwarz offers:

- Support high speed PDW streaming with up to 12 MPDW/s
- Powerful radar scenario simulation with R&S®Pulse Sequencer PC software
- Simulation of multiple emitters with up to six times 3.3 Mpulses/s in one instrument
- Pulse-on-pulse from six emitters with a single RF port in one instrument
- Commercial of-the-shelf simulator hardware with RF carrier frequencies up to 44 GHz and 2 GHz bandwidth
- Realistic simulation of angle of arrival (AoA) with coupled instruments
- Support of TDOA, interferometric and amplitude comparison techniques

For more information on Rohde&Schwarz solutions for scenario generation and receiver testing, visit:
www.rohde-schwarz.com/radar-simulation

PERFORMANCE PREVAILS

Advanced pulse stability measurements for radar system performance

Ensuring higher performance for modern radar systems

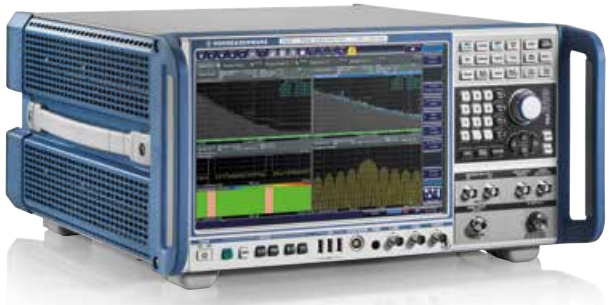
The arrival of sophisticated radar and communications systems has made phase noise the most important factor during system design and validation phases. This is because phase stability is a key parameter for defining target acquisition in radars, spectral integrity in communications systems and precision beam steering capabilities in active electronic scanned array antennas (AESA).

This need for stability is particularly strong for the latest generation of multi-functional radar systems developed in response to increasing mission complexity, physical requirements of congested and contested electronic environments and rapid advances in electronic warfare (EW) capabilities.

Measurement challenges of modern radar design

The latest radar architectures have many design challenges, including frequency, waveform and mode agility. Transmitted radar pulse phase and amplitude stability is crucial when assessing radar sensitivity and is vital to detecting small and slow moving targets such as drones and UAVs. Power amplifiers (PA) can degrade phase stability, causing engineers to look elsewhere for precision measurement tools.

High-sensitivity pulse phase and amplitude stability measurements previously required complicated test setups with multiple instruments. A new option for the R&S®FSWP phase noise analyzer and VCO tester provides easy and straightforward measurements. The R&S®FSWP-K6P option takes full advantage of the unmatched ultra-low R&S®FSWP phase noise design. This one-instrument solution offers design engineers high sensitivity measurements. The R&S®FSWP can feed the power amplifier or other device under test (DUT) while analyzing the response signal from the amplifier. It can do this thanks to its ability to generate demanding pulse sequences that mimick the original radar system.



The R&S®FSWP phase noise analyzer and VCO tester

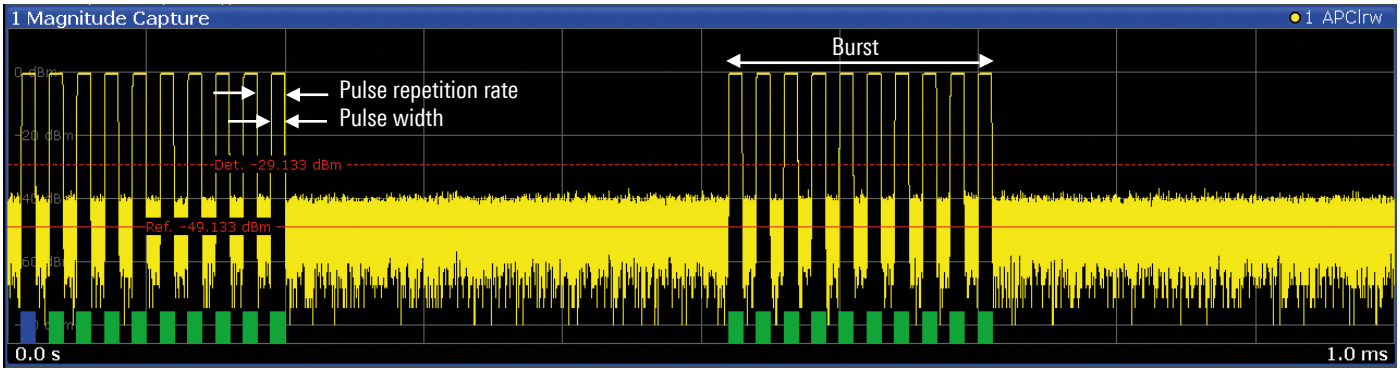
Unmatched sensitivity for best phase noise measurements

The R&S®FSWP has a built-in ultra-low phase noise oscillator and internal components optimized for phase noise testing that provide a wide dynamic range for phase stability measurements. Since the local oscillator in the R&S®FSWP and the pulsed signal applied to the DUT are correlated, the phase noise can be further suppressed by up to 50 dB, so that only the phase instability from the device is tested. This residual measurement has sensitivity of less than –80 dB. For greater flexibility, the R&S®FSWP also allows an external source to be used as a local oscillator for the measurement.

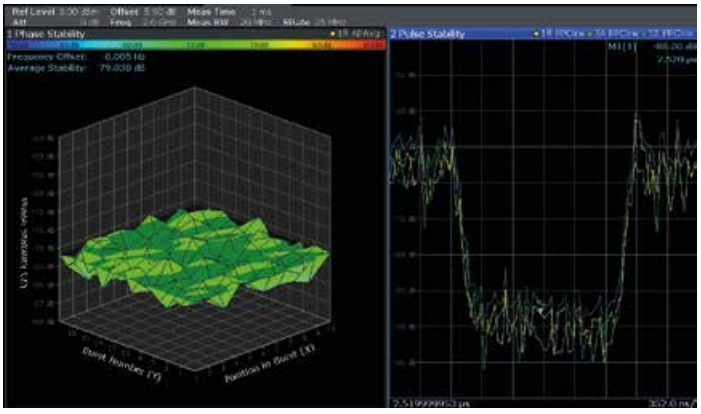
Application Note: Measurement setup for phase noise testing at frequencies above 50 GHz
The R&S®FSWP is the most modern phase noise tester on the market with unrivaled sensitivity. It combines high-end internal local sources with the latest A/D converter technology incombination with cross-correlation.
Discover the full potential of the R&S®FSWP for radar measurement applications with this practical application note from Rohde&Schwarz.
Download here: **www.rohde-schwarz.com/applications/phase-noise-test-above-50ghz**

Complex burst and pulse sequences for real-life performance measurements

Advanced radar applications employ bursts or complex pulse sequences. Consequently, accurately testing radar components under realistic modes of operation require the same burst signals. The R&S®FSWP can generate pulse sequences and bursts based on the original pulse descriptor word (PDW) information from the radar system. Operational effects such as component heating during the "on" portion of the burst and their effect on the system phase and amplitude stability can be analyzed very precisely in a well-defined and reproducible environment.



The burst signal consists of 10 pulses, followed by a pause.



Phase deviation from the average of each pulse, for all recorded bursts (left). Pulse-to-pulse phase stability (yellow), amplitude stability (green) and the sum of the two (blue) averaged over all pulses (right).

Full measurement flexibility for every test requirement

The R&S®FSWP-K6P option can make measurements with the broadband spectrum analyzer or the highly sensitive phase noise tester. With the latter, the pulsed signal can either be measured directly or in the residual test mode using internally generated pulses to stimulate the device being tested.
Phase and amplitude stability can be displayed for each individual pulse with deviations from the average calculated and displayed at each sampling point in a pulse. The R&S®FSWP can average the values over an entire burst or calculate the difference between pulses for pulse-to-pulse phase and amplitude stability. Both of these averaging techniques produce smoother, more instructive traces.

Rohde&Schwarz offers:

- High sensitivity phase noise measurements thanks to cross-correlation and extremely low internal noise reference sources
- Typ. –172 dBc (1 Hz) at 1 GHz carrier frequency and 10 kHz offset
- Simultaneous measurement of amplitude noise and phase noise
- Internal source for measuring additive phase noise, including on pulsed signals
- Wide dynamic range thanks to low displayed average noise level (DANL) of –156 dBm (1 Hz) (without noise cancellation) and high TOI of typ. 25 dBm

For more information on Rohde&Schwarz solutions or multifunctional radar system testing, visit:
www.rohde-schwarz.com/aerospace-defense/multifunctional-radar

NEXT GENERATION JAMMER TESTING

Ultra-wideband signal analysis and systems performance evaluation

Test challenges for advanced and integrated jammer designs

Advanced jammer design is vital to protecting modern military system platforms since they face a multitude of radar threats spread over a wide frequency range and which now generally have agile operational parameters. Interoperability with other subsystems like radar warning receiver (RWR) systems or tactical air navigation (TACAN) systems is needed to check whether the right parameters are in place for jamming and deception techniques. Since imminent threats often combine different emitters (early warn, target acquisition, target track/illumination and missile guidance radars), different parts of the electromagnetic spectrum also need to be tested.

The art of radar simulation and signal generation

Multiple-domain analysis is crucial when verifying an electronic countermeasure (ECM) parameter set. R&S®SMW200A vector signal generators can simulate threat radars or full scenarios. One possible ECM is a sophisticated coherent range gate pull-off (RGPO) with range-Doppler matching to emulate one or more moving false targets that aims break a threat radar lock. The original radar pulse is the ECM reference. Time domain analysis is needed to measure the position of the cover pulse, the hook and the dynamic behavior of the RGPO pulse. At the same time, evaluations need to be made in the frequency domain to determine whether the false target will also inherit the relevant Doppler behavior.

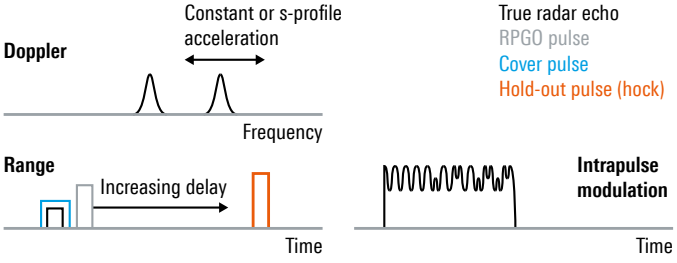


Fig. 1: Domains tested for a coherent RGPO deception technique

Most modern radar systems use matched filtering and pulse compression that forces the retransmitted false targets to maintain coherence with the original signal. Otherwise, they will lose processing gain relative to the original signal, rendering them ineffective. For frequency agile radars (pulse-to-pulse or burst-to-burst), the DRFM must track the agility, making it necessary to conduct an RF hopper analysis over a relatively wide bandwidth. Note that lab testing only verifies the correct ECM settings, not the effect on a radar system, which requires a live threat system evaluation.

Webinar: Deceptive jammer/DRFM testing

Rohde&Schwarz offers cutting edge test and measurement solutions for verifying proper operation and timing of the deception techniques on the system level, qualifying individual components, submodules and modules at the RF/IF level, as well as addressing clock jitter and power integrity early, at the design stage.

Watch our webinar at: **www.rohde-schwarz.com/DRFMJammerTesting/webinar**

Ultra-wideband signal analysis. Needed now, more than ever.

To analyze these scenarios in the lab, a wide frequency band has to be captured and saved that can cover different radar emitters at the same time. The multi-standard radio analyzer mode can provide detailed look at different frequencies by resampling the whole capture buffer and analyzing how all these systems interfere with each other or the frequencies in frequency agile systems. The R&S®FSW signal and spectrum analyzer can capture a signal from the wide RF frequency range of 8.3 GHz to 90 GHz in one box.

The data can be saved and analyzed with software tools running on an external computer or with internal tools such as the multi-standard radio analyzer in combination with other application software. The analyzer has the tools to analyze hopping sequences of frequency agile radar systems or characterize pulses or pulse compression techniques as well as tools for analyzing digitally modulated signals.

All R&S®FSW models from 26 GHz and above support up to 2 GHz internal analysis bandwidth, models from 43 GHz and higher frequencies offer 8.3 GHz internal bandwidth. Internal memory options up to 24 Gsamples/s make a capture times of several seconds possible at a bandwidth of 1 GHz. If longer sequences are needed, signals with bandwidths up to 512 MHz can be streamed over the I/Q interface and sequences up to 40 minutes can be recorded with the R&S®IQW wideband I/Q data recorder. With smaller bandwidths, the sequences can be significantly longer. For example, users can measure real-world scenarios in the field and use a signal generator for realistic environment feeds in lab scenarios.

Fig. 2: The R&S®FSW signal and spectrum analyzer

The development and characterization of frequency agile radar systems and communications solutions also require seamless acquisition and processing of signals as well as the detection of extremely short signals with a frequency mask trigger without interruptions. A real-time signal analyzer calculating up to 2 million spectra per second is vital. The R&S®FSW signal and spectrum analyzer offers real-time analysis with a bandwidth 800 MHz. The fast Fourier transform (FFT) can be adjusted between 32 and 16,384 for various resolution bandwidths. Signals as short as 0.46 µs are detected with correct signal levels and 100% probability of intercept (POI) and signals lasting only a few nanoseconds are still reliably detected but not necessarily with the correct signal level.

Video Series: The latest radar and jammer test solutions from Rohde&Schwarz

Watch our series of application videos on testing the latest radar and jammer designs. Our experts cover topics such as:

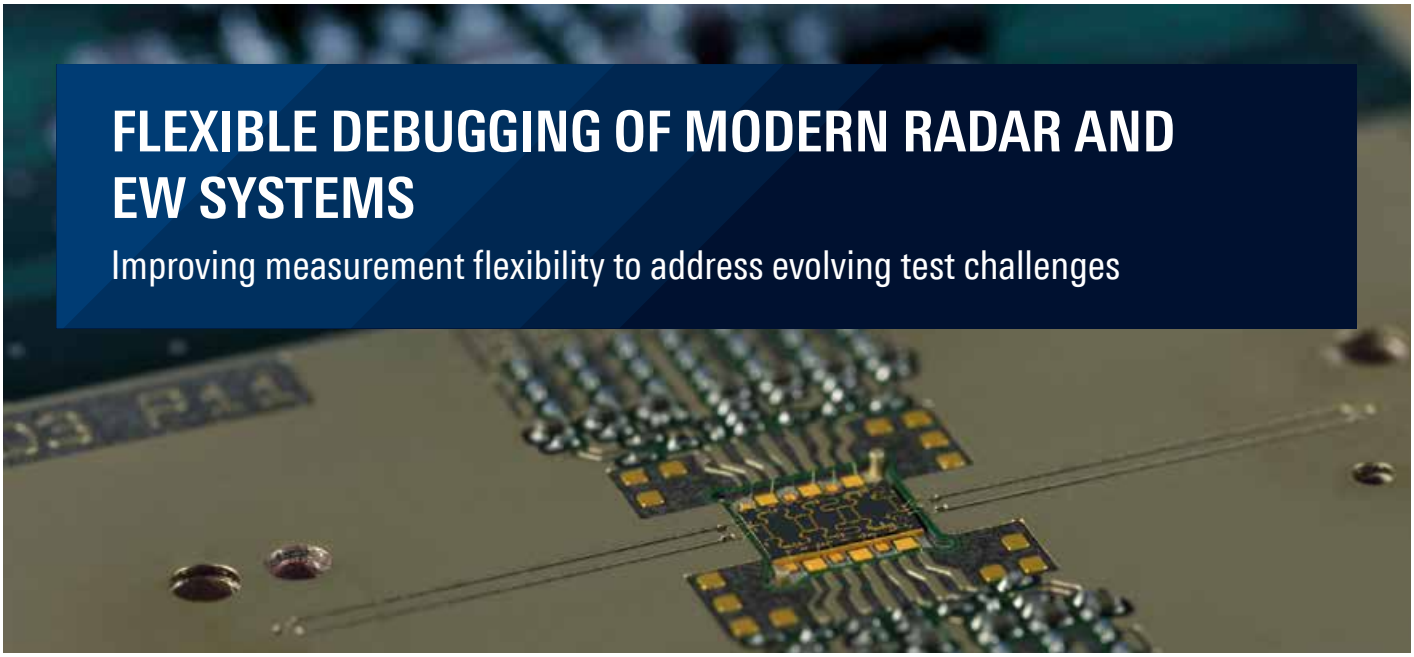
- Radar chirp analysis
- Radar pulse analysis and segmented capture
- Pulse compression radar measurements

Watch our video series at: **www.rohde-schwarz.com/DRFMJammerTesting**

Rohde&Schwarz offers:

- Frequency range from 2 Hz to 90 GHz (up to 500 GHz with Rohde&Schwarz external harmonic mixers)
- Up to 8.3 GHz internal analysis bandwidth
- 800 MHz real-time analysis bandwidth with 2.4 million FFT/s, 0.46 µs POI for detection of shortest signals
- 500 MHz I/Q data streaming interface to capture real-world scenarios
- Low phase noise of –140 dBc (1 Hz) at 10 kHz offset, –143 dBc at 100 kHz offset (1 GHz carrier)
- SCPI recorder simplifies code generation
- Multiple measurement applications like pulse and hopping analysis can be run and displayed in parallel

For more information on Rohde&Schwarz solutions for validating the performance of advanced smart jammer designs, visit:
www.rohde-schwarz.com/DRFMJammerTesting



FLEXIBLE DEBUGGING OF MODERN RADAR AND EW SYSTEMS

Improving measurement flexibility to address evolving test challenges

The importance of fast and accurate signal analysis

Modern radar and electronic warfare (EW) architectures are showing a multitude of technological advancements that make more flexible testing approaches necessary. Originally purely analog, radar and EW modules are becoming ever more integrated and have a variety of digital interfaces, especially with the extensive adoption of advanced digital signal processing (DSP) techniques for a fast and accurate signal analysis.

When characterizing and debugging designs, developers of these systems often look for versatile instruments that can handle both RF and digital testing requirements and that reduce effort and costs. The R&S®RTP high-performance oscilloscope is ideal here since it combines powerful RF signal analysis capabilities with a large set of features for signal integrity and digital interface tests.

Precise characterization of multi-antenna designs

Sophisticated radar systems increasingly rely on electronically steered phased array antennas. To characterize such systems, test equipment must have multichannel capabilities and make sure all channels are constantly phase-coherent. Rohde&Schwarz oscilloscopes are excellent for such applications since they provide multiple, closely aligned channels and do not need any additional calibration before performing multichannel phase-coherent measurements. The R&S®RTP oscilloscope can handle any such measurements. For the best possible phase accuracy, the R&S®RTP oscilloscope can also measure the channel-to-channel skew and compensate for it across the entire signal path between the device under test (DUT) and the oscilloscope channel inputs by using the R&S®RTP-B7 high-accuracy differential pulse source option to generate calibration signals.

Fig. 1: The R&S®RTP high-performance oscilloscope

Leading-edge multichannel pulse analysis capabilities

In addition to multi-antenna design characterization, phase coherence is crucial when analyzing modulated pulsed signals relative to each other.

Webinar: Analyzing multichannel phase-coherent radar signals

This webinar explains the importance of phase-coherent measurements in a variety of real-world use cases and presents relevant Rohde&Schwarz solutions needed to perform them.

Watch our webinar at:
www.rohde-schwarz.com/aerospace-defense/multichannel-pulse-webinar

A classic example is the digital radio frequency memory (DRFM) jamming, where the jammer receives the original radar signal and creates a fake radar echo representing a false target that transmitting radars cannot distinguish from legitimate signals. The retransmitted false targets must to maintain coherence with the original signal. This can only be validated when both the original and retransmitted pulses are analyzed relative to one another. The R&S®RTP oscilloscope enables phase-coherent analysis of both signals in the time and frequency domains. With an internal analysis bandwidth up to 16 GHz, it even offers RF hopper analysis for frequency-agile radars over a relatively wide bandwidth to verify the DRFM is tracking the agility.

Fig. 2: Analysis of retransmitted echo in relation to the original pulse with the R&S®RTP oscilloscope onboard-tools. Changes over time can be tracked in both time and frequency domain

Pulse detection accuracy is greatly improved by the advanced trigger system in the R&S®RTP oscilloscope. All Rohde&Schwarz oscilloscopes have fully digital triggers systems to operate directly on A/D converter samples. The measurement signal is not split into two paths as with conventional analog triggers, intentionally eliminating analog trigger system impairments. The result is lower trigger jitter and flexible trigger sensitivity that can be optimized as needed.

The R&S®RTP oscilloscope can be combined with R&S®VSE vector signal explorer software, a powerful analysis tool for a variety of signals, for more in-depth pulse analysis. R&S®VSE software can provide the R&S®RTP oscilloscope trigger system full support with no trigger type or parameter limits. This allows flexible optimization of the trigger settings for stable and reliable trigger conditions for the signal of interest, leading to better measurement performance, especially when irrelevant signal portions, such as off-times, are much longer than the pulses/pulse sequences.

In the DRFM example, the R&S®VSE-K6A multichannel pulse analysis option compares pulse parameters and statistics over multiple channels for a comprehensive analysis of the DRFM retransmitted pulse changes over time relative to the original signal.

A single solution for all digital design test needs

Digital testing needs (including signal integrity, high-speed digital interface and memory tests) are growing more important for prototyping and validating radar and EW designs. This is increased by the intensive use of DSP blocks for real-time signal processing and the current trend towards deploying wideband converters as close as possible to antennas and relying on advanced digital technologies to form and steer beams. Oscilloscopes are the top choice for such measurements. For example, the R&S®RTP offers a wide range of signal integrity functions (such as eye diagram and jitter analysis). It also provides a variety of digital interface and memory test solutions for multiple standards (e.g. PCIe and DDR) and for aerospace and defense specific buses (e.g. MIL-STD-1553, ARINC 429 and SpaceWire).

When combined with its RF multichannel analysis capabilities the R&S®RTP oscilloscope is a general-purpose solution ideal for debugging complex systems by providing research and development and validation engineers with an all-in-one solution to help characterize their prototypes from RF frontend to bitstream.

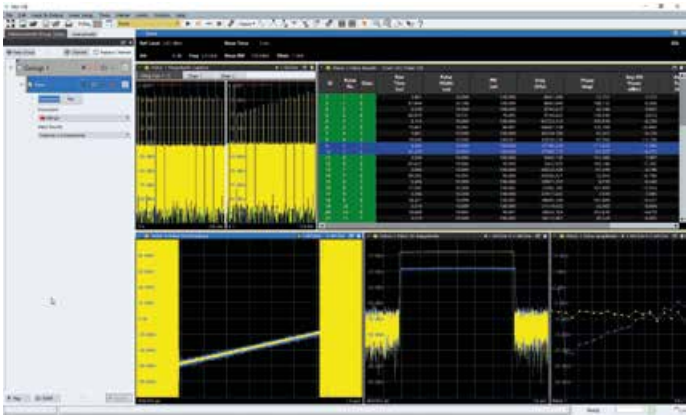


Fig. 3: In-depth analysis of the retransmitted pulse echo (channel 3) in relation to the original pulse (channel 1) with the R&S®VSE-K6A multichannel pulse analysis option

Rohde&Schwarz offers:

- Analysis bandwidth up to 16 GHz
- Advanced fully digital trigger system supporting full instrument bandwidth
- Dedicated multichannel pulse analysis tool
- Wide range of digital design measurement functions
- Unrivaled update rate of 750000 waveforms/s
- Versatile solution than can handle both RF and digital test requirements

For more information on Rohde&Schwarz solutions for radar/EW component testing, visit:
www.rohde-schwarz.com/aerospace-defense/radar-component-testing

EXCELLENCE IN TEST AND MEASUREMENT

Test and measurement solutions from Rohde&Schwarz can meet the most challenging requirements for precise signal and phase noise analysis, clean signal generation and high-resolution time domain verification with unrivaled instrument performance and ease of use.

Here are some key instruments in our large portfolio.

R&S®ZNA vector network analyzer

Masters the most challenging measurement tasks

Scan the QR code for more information

The R&S®ZNA vector network analyzers are the high-end series of the Rohde&Schwarz VNA portfolio: excellent RF-performance is combined with a wide range of software features and a unique hardware concept. The touch-only operation together with the DUT-centric approach makes the R&S®ZNA a powerful, universal and compact measurement system for characterizing passive and active devices.

R&S®FSW signal and spectrum analyzer

Setting standards in innovation and usability

Scan the QR code for more information

The high-performance R&S®FSW signal and spectrum analyzer helps with even the most demanding tasks. Its wide internal analysis bandwidth can characterize wideband components and communications systems. The unparalleled phase noise facilitates the development of high-performance oscillators such as those used in radars.

R&S®FSWP phase noise analyzer and VCO tester
High end analysis of signal sources and components

Scan the QR code
for more information

The R&S®FSWP phase noise analyzer and VCO tester features very high sensitivity thanks to extremely low internal noise sources and cross-correlation. It can measure phase noise on highly stable sources such as those in radar applications in just seconds. Additional options such as pulsed signal measurements, additive phase noise (including pulsed) characterization and integrated high-end signal and spectrum analysis make the R&S®FSWP a unique test instrument.

R&S®SMW200A vector signal generator
The fine art of signal generation

Scan the QR code
for more information

The R&S®SMW200A is the vector signal generator for the most demanding applications. Its flexibility, performance and intuitive operation make it ideal for generating complex, digitally modulated high quality signals.

R&S®RTP high-performance oscilloscope
Signal integrity in realtime

Scan the QR code
for more information

The R&S®RTP oscilloscope combines high-class signal integrity with a fast acquisition rate. Customized frontend ASIC and realtime processing hardware enable highly accurate measurements with unprecedented speed in a compact form factor.

EXCELLENCE IN TEST AND MEASUREMENT

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Notes

Service that adds value

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

Rohde&Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, 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

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