

# Multifunctional radar

Test solutions for  
advanced radar designs



**ROHDE & SCHWARZ**



# Your challenge

Breakthrough technological advancements such as direct digital synthesis, phased arrays and GaN components have spawned a new breed of radar – multifunctional active electronically scanned array (AESA) radar.

Multifunctional radar was developed in response to the increasing complexity of missions/environments and advances in electronic warfare (EW) capabilities. Since the new architecture comes with a number of key challenges, such as frequency agility, waveform agility, mode agility, multifunctionality and radar design, engineers are looking for advanced tools and solutions to address these challenges.

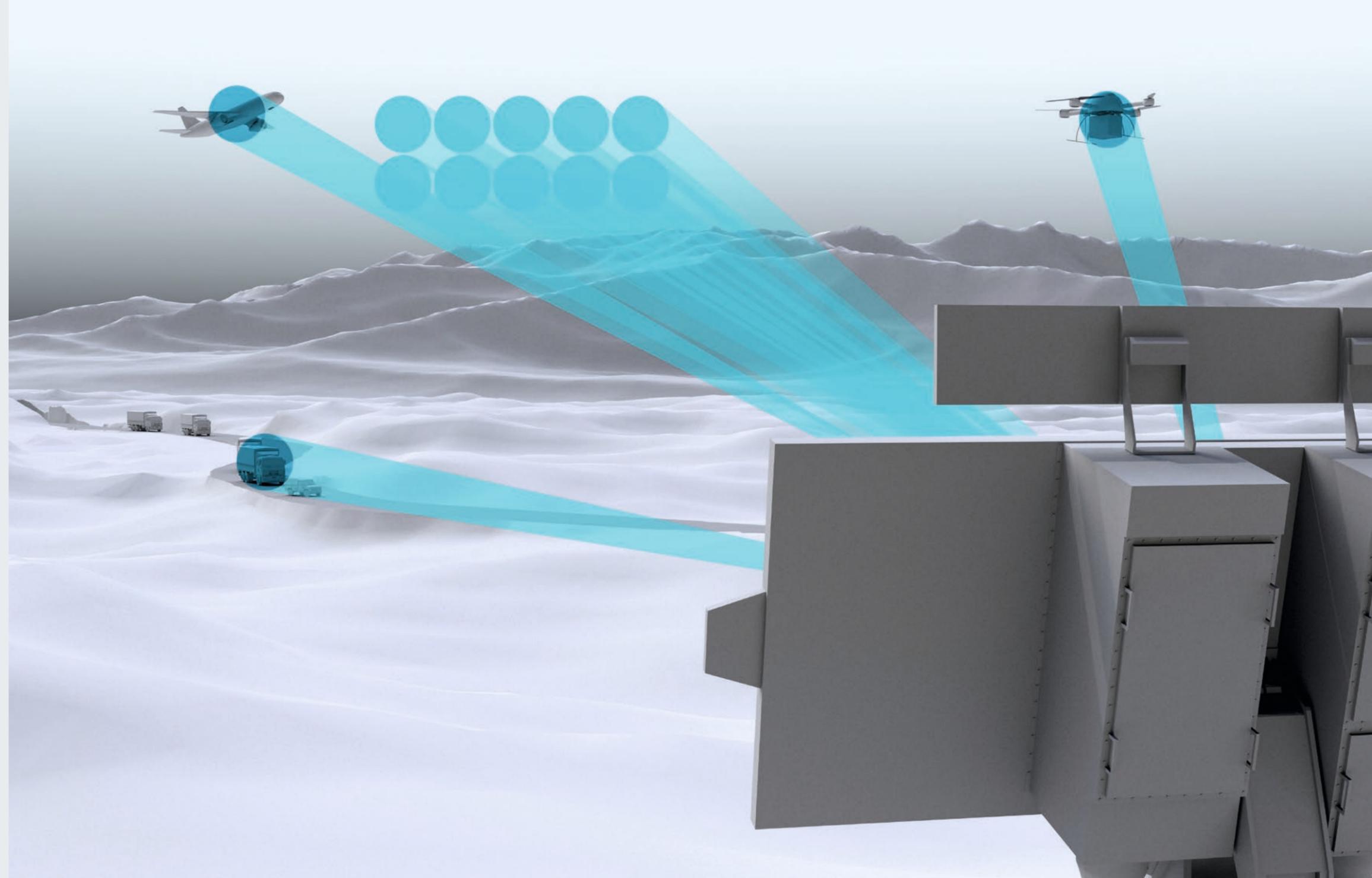
# Our solution

Radar performance verification is a costly and time-consuming process, especially when expensive field tests at designated test ranges are required.

Rohde&Schwarz provides solutions for radar and EW testing that bring realistic field test scenarios to your lab, significantly reducing costs and effort while providing in-depth insights early in the development process.

Rohde&Schwarz solutions are designed to meet the most challenging radar and EW test requirements by offering cutting-edge signal analysis and generation tools, unrivaled instrument performance and ease of use. Find out about our solutions for:

- ▮ Synthetic target generation
- ▮ Advanced, precise signal analysis
- ▮ Realistic, complex environment simulation
- ▮ Clean source substitution for advanced design validation



## Comprehensive signal insight

**Perform accurate and repeatable advanced signal analysis with ease.**

Rohde&Schwarz offers a comprehensive suite of signal analysis tools that simplify signal capture, decrease the measurement effort by automating some of the tasks and ensure accurate and repeatable results. This allows engineers to focus on optimizing system performance and spend less time interpreting measurement results.

## Move the field to the lab

**Verify radar performance in a controlled environment for reproducible results.**

Rohde&Schwarz radar target generators use a COTS based approach to simulate moving or static radar targets, providing greater utilization of existing test equipment.

## Receiver stress test

**Be prepared for any threat with complex electromagnetic environment simulation.**

The R&S®Pulse Sequencer software, together with vector signal generators, allows the user to generate complex scenarios for radar receiver tests. The result is flexible and realistic dense emitter environment simulation based on COTS technology.

# Move the field to the lab

## Controlled, reproducible and reliable radar performance verification

Radar performance verification is a costly and time-consuming process. It is carried out in restricted areas on land, in the air and at sea and requires significant effort for planning, coordinating with authorities, reserving time slots and securing the area. Controllable and repeatable lab tests save time and effort, significantly reduce costs and, best of all, reduce development risks by providing reliable insights at an early stage in the design process.

Most test systems measure single radar parameters or substitute components, but do not test the entire system including the antenna frontend. The Rohde&Schwarz

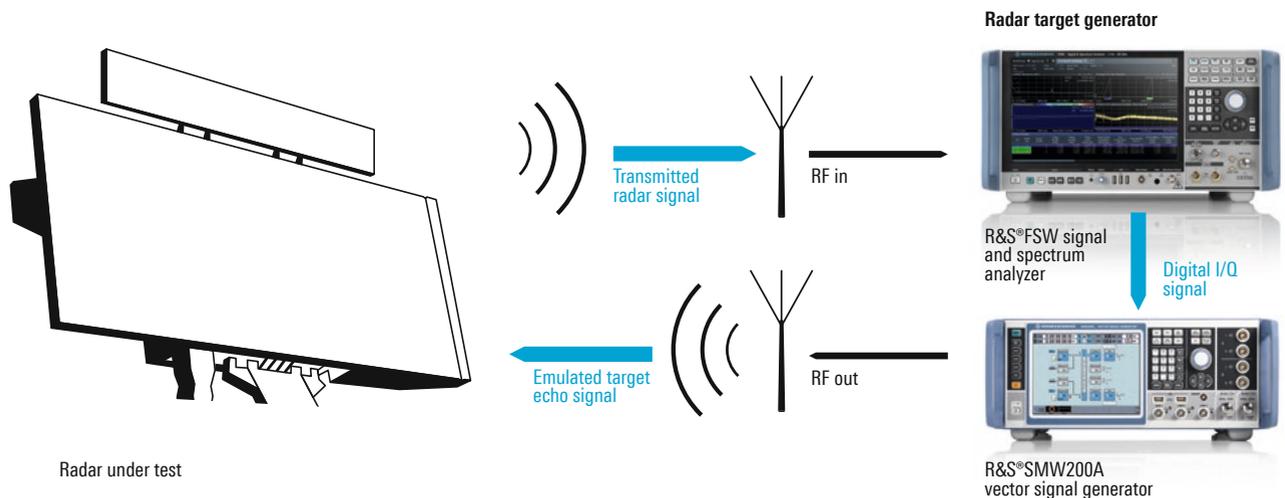
radar target generator (RTG) allows the complete radar system to be tested. The RTG is radar signal agnostic and generates radar echo signals with arbitrary range, Doppler frequency and radar cross section (RCS). Arbitrary virtual targets can be generated, making it possible to perform real-time tests on both pulse and Doppler radars.

Unlike dedicated products, this commercial off-the-shelf (COTS) based solution offers high availability and easy serviceability. Uninterrupted testing is ensured by simply replacing the serviceable unit with a similarly optioned unit. When not used for radar tests, the instruments can be used for other projects, offering optimum efficiency for the capital investment.

### Key benefits

- Reliable and repeatable measurements in a controlled environment
- High availability thanks to COTS solutions
- Fast measurement setup via the multifunctional and intuitive GUI

## Radar System Performance verification with real-time Target Generation.



# Comprehensive signal insights

## Perform advanced signal analysis with ease and precision

The multifunctional radar incorporates the latest technological advances in radar design. Based on AESA architecture, the radar employs a variety of modulation/pulse compression techniques, pulse-to-pulse waveform and frequency agility, large bandwidth time products, pulse-to-pulse coherence, side-lobe control, pulse repetition interval (PRI) agility and power agility.

The R&S®FSW spectrum analyzer and R&S®FSWP phase noise analyzer from Rohde & Schwarz are high-performance instruments for pulse, wideband, transient and frequency agile signal analysis. Offering advanced analysis features for e.g. parameter spectrum, parameter trend, pulse parameters, pulse-to-pulse stability and time side lobes, Rohde & Schwarz enables radar engineers to easily and quickly conduct highly sophisticated and in-depth analysis.

## Key benefits

- Deep capture of low duty cycle signals to validate the performance of surveillance radars and standoff jammers
- User-friendly, multitouch gesture support and high-resolution display for comprehensive signal insights
- Excellent measurement performance for spectrum and phase noise analysis

Radar System Performance verification with real-time Target Generation.



# Receiver stress test

## Realistic, complex environment simulation

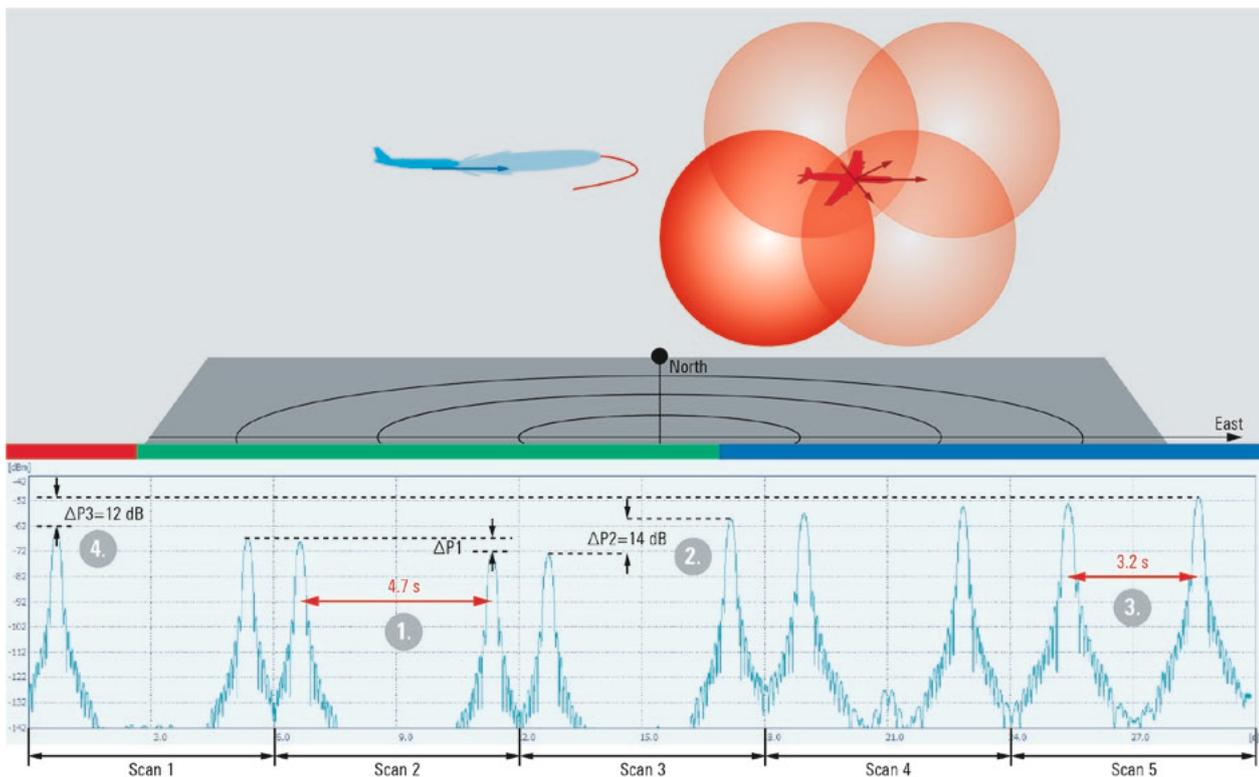
Advanced radar and EW receivers have to deal with conventional factors such as static clutter and weather-related or propagation-related fading while operating in a highly contested and dense emitter environment. Scenarios that simulate receiver operating conditions as realistically as possible are crucial to enhancing system performance and ensuring proper operation even under the most adverse conditions.

The R&S®Pulse Sequencer software and vector signal generators from Rohde&Schwarz provide a simulation solution that generates reproducible, realistic and highly deterministic scenarios that support complex radar waveforms, custom and standard antenna radiation patterns, real-time pulse descriptor word (PDW) streaming as well as multiport phase-coherent generation for angle of arrival (AoA) tests. Testing the systems early in the development cycle under realistic conditions can significantly reduce development time and result in substantial cost savings.

## Key benefits

- Extensive play time for testing various radar types in long-term scenarios
- Creation of scenarios with multiple moving emitters for validating AoA radar warning receivers and direction finding capabilities
- Secure import of PDWs, antenna diagram specifications and even classified waveforms for realistic and dense environment simulation

Test your receiver performance in realistic and complex scenarios with Rohde & Schwarz pulse sequencer software.



# A clean source for best performance

## Clean source substitution for advanced design verification

Coherent oscillators (COHO) and stable local oscillators (STALO) play a crucial role in the radar's ability to fulfill its mission. Special emphasis is placed on the stability and signal purity of the COHO and STALO, since jitter or noise will directly affect the radar's ability to filter out unwanted signals or discriminate between targets.

During the development phase of the various radar sub-systems, engineers often use signal generators to simulate the COHO or STALO. Any generator performance limitations will directly affect the overall design. One critical element of advanced radar/EW systems is the close-in carrier phase noise performance. The modern threat of unmanned aerial vehicles (UAV) combined with hypersonic stealth techno-

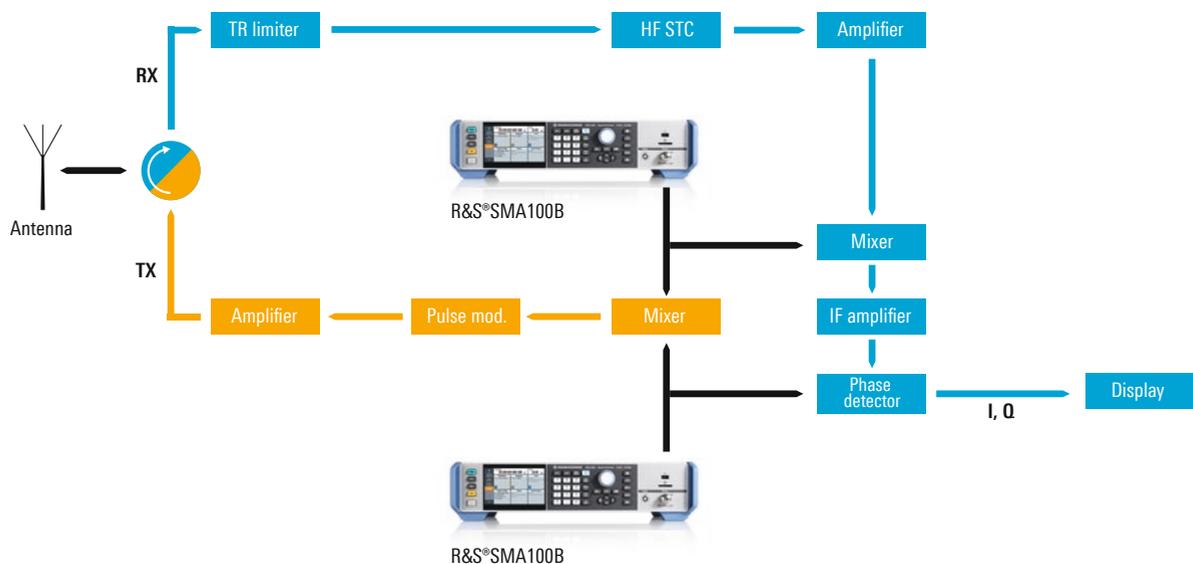
logy means that advanced radar/EW systems must detect both slow and small targets as well as targets with synthetically small RCS values at long distances. Phase noise performance is a critical design milestone toward being able to detect micro-Doppler shifts and weak signals.

The R&S®SMB100B RF signal generator and R&S®SMA100B RF and microwave signal generator from Rohde and Schwarz allow radar/EW engineers to focus on optimizing the entire RF chain while isolating critical components such as the COHO or STALO.

### Key benefits

- Ultra low phase noise local oscillator (LO) with high output power (-167 dBc at 10 MHz offset; +38 dBm)
- Stable pulse trains with pulse leveling for optimum repeatability and accuracy
- Off-the-shelf availability and excellent performance

## Generic radar design with two R&S®SMA signal generators acting as stable and coherent LOs



## Service that adds value

- | Worldwide
- | Local und personalized
- | Customized and flexibel
- | Uncompromising quality
- | Long-term dependability

## About 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.

## 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 GmbH & Co. KG

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

## Rohde & Schwarz training

[www.training.rohde-schwarz.com](http://www.training.rohde-schwarz.com)

## Regional contact

- | Europe, Africa, Middle East | +49 89 4129 12345  
[customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)
- | North America | 1 888 TEST RSA (1 888 837 87 72)  
[customer.support@rsa.rohde-schwarz.com](mailto:customer.support@rsa.rohde-schwarz.com)
- | Latin America | +1 410 910 79 88  
[customersupport.la@rohde-schwarz.com](mailto:customersupport.la@rohde-schwarz.com)
- | Asia Pacific | +65 65 13 04 88  
[customersupport.asia@rohde-schwarz.com](mailto:customersupport.asia@rohde-schwarz.com)
- | China | +86 800 810 82 28 | +86 400 650 58 96  
[customersupport.china@rohde-schwarz.com](mailto:customersupport.china@rohde-schwarz.com)

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG  
Trade names are trademarks of the owners  
PD 5216.1528.32 | Version 01.00 | April 2019  
Multifunctional radar, Test solutions for advanced radar designs  
Data without tolerance limits is not binding | Subject to change  
© 2019 Rohde & Schwarz GmbH & Co. KG | 81671 Munich, Germany



5216152832