

Solutions brochure

CELLULAR TESTING, FROM DEVICE TO NETWORK



ROHDE & SCHWARZ

Make ideas real



As 5G networks continue to expand and the industry prepares for 6G, the cellular ecosystem is becoming more interconnected, software-driven and intelligent. Innovations such as Open RAN (O-RAN), non-terrestrial networks (NTN), AI-native networks and integrated sensing and communication (ISAC) are transforming how devices, infrastructure and networks are designed, deployed and operated.

This growing complexity places ever greater demands on testing. Every component in the cellular ecosystem must deliver reliable performance, comply with evolving standards and interoperate seamlessly under real-world conditions. Comprehensive test and measurement solutions are essential for faster development, efficient production, successful deployment and continuous maintenance and optimization.

Rohde & Schwarz supports every development stage with a comprehensive portfolio of test solutions for mobile devices, infrastructure and networks. By combining deep measurement expertise with an integrated approach, we help customers accelerate innovation, ensure compliance and prepare for the next generation of wireless communications.



MOBILE DEVICE TESTING

Wireless device testing is a comprehensive process that verifies whether wireless communication devices – such as smartphones and tablets – work properly, meet performance standards and comply with regulatory requirements. The testing involves several critical domains that ensure a device provides a high-quality user experience and functions correctly within live networks.

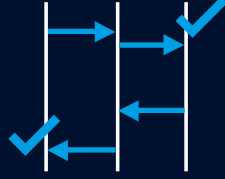
Advanced 4G and particularly 5G networks are being continuously extended to prepare for 6G and ubiquitous connectivity. Key enablers include the integration of terrestrial networks (TN) with non-terrestrial networks (NTN), as well as the integration of AI-RAN and other transformative technologies, such as integrated sensing and communication (ISAC). These technologies, together with digital twins, will reshape testing in all development phases.

Wireless device testing is categorized by testing stage: from R&D and conformance to production and even service.

RF PERFORMANCE

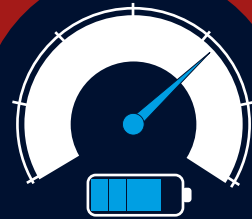
Radio frequency (RF) performance testing ensures that the transmitter (TX) and receivers (RX) function correctly and meet performance standards. TX tests evaluate metrics such as output power, error vector magnitude (EVM) quality and spectrum emissions. RX tests characterize performance; the two main metrics are sensitivity (the minimum signal level for reliable decoding) and selectivity (the ability to function in the presence of interference).

RF performance



Signal and protocol

Application performance



Confo

SIGNAL AND PROTOCOL

Signaling and protocol testing emulates a mobile network environment to verify device protocol implementations and performance parameters using varying network parameters and scenarios. This is essential for verifying how a device handles complex network scenarios, such as dual connectivity (DC), dynamic spectrum sharing (DSS) and standalone (SA) vs. non-standalone (NSA) architecture.

APPLICATION PERFORMANCE

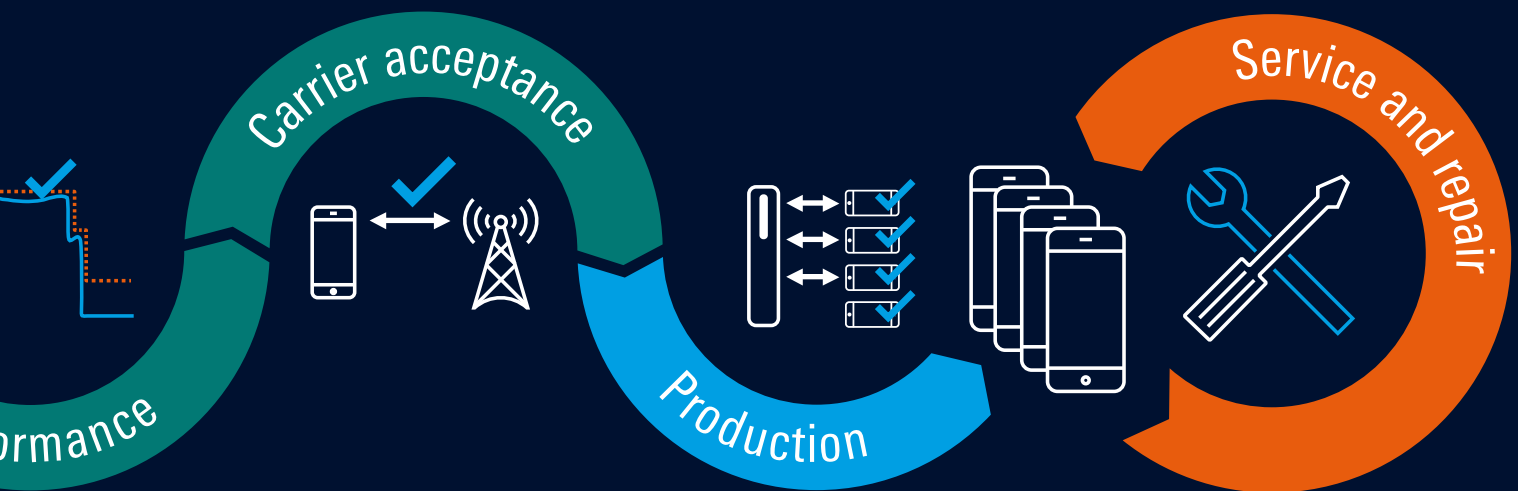
Application performance testing verifies specific service performance by assessing the actual user experience. Measurement parameters include data throughput, latency and power consumption.

CONFORMANCE

Conformance testing is conducted in line with standards defined by regulatory bodies such as GCF and PTCRB. Conformance testing ensures that a device complies with 3GPP specifications. Certification criteria are assessed in four test areas: radio frequency conformance (RF), radio resource management conformance (RRM), protocol conformance (PC) and performance quality analysis (PQA). The testing is essential to interoperability with live networks.

SERVICE AND REPAIR

Service and repair require easy-to-use test solutions for service and repair centers. The solutions support the repair, refurbishment and reuse of wireless devices.



CARRIER ACCEPTANCE

Carrier acceptance tests are specified by some operators to ensure that devices in their network provide the expected functions and performance.

PRODUCTION

Production testing focuses on high-volume calibration and verification. The tests are often performed in non-signaling mode with chipset-specific interfaces to minimize test time and cost while maximizing yield.



Learn more about our mobile device testing solutions

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Rohde & Schwarz has **integrated test solutions** that cover the **entire wireless device lifecycle**, from initial R&D and design verification to conformance approval, production and repair. Our portfolio is engineered to **solve the technical challenges** of cellular standards (5G NR) as well as major non-cellular standards (Wi-Fi, Bluetooth and UWB). We support the transition to **over-the-air (OTA) testing** that integrated **antenna arrays** and **millimeter wave architecture** demand. Our test solutions range from **individual instruments** to complete **turn-key systems** with **user-friendly software** for **seamless automation**. We also actively support **research endeavors** that will shape 6G, the next generation of wireless communications.



MOBILE INFRASTRUCTURE TESTING

Wireless infrastructure testing is the systematic verification and validation of everything that makes a mobile centric service work. It ensures that a user experiences reliable, fast and secure service under real-world conditions.

Radio access networks (RAN) and the associated infrastructure equipment are undergoing a transformative evolution. The introduction of Open RAN (O-RAN) is making radio access networks (RAN) more open, disaggregated and flexible. Cost optimization and commitments to net zero have made energy efficiency a strategic priority for mobile network operators and one of the most important areas of network transformation. The goal of ubiquitous connectivity involves using non-terrestrial networks (NTN) to bring connectivity to rural areas and remote locations. Artificial intelligence (AI) and RAN functionalities will converge in AI-native networks.

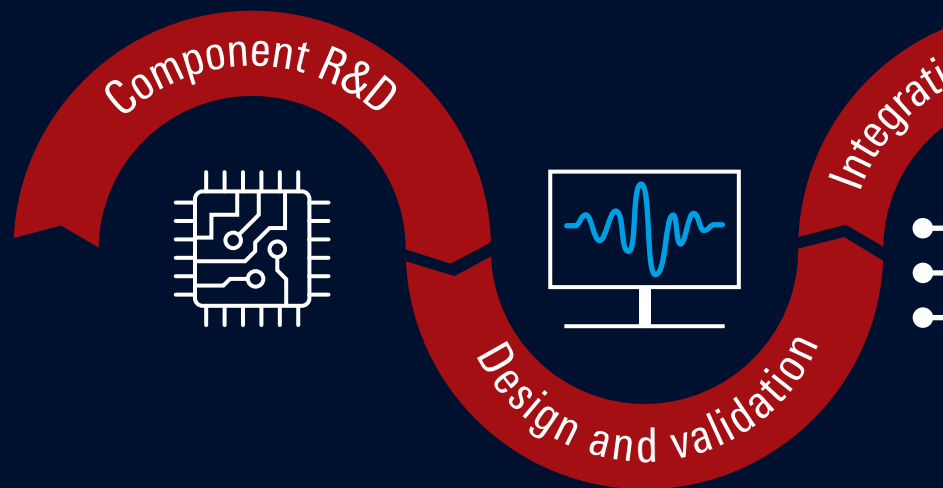
Moving from current 5G networks to next generation 6G systems also entails new requirements for infrastructure equipment, which comes with challenging testing needs. The ever-increasing diversification and complexity of wireless infrastructure equipment demands innovative, flexible and future-ready test and measurement solutions.

Mobile infrastructure testing is categorized based on the stage of the product lifecycle and the specific technical domain being evaluated.



COMPONENT R&D

Component R&D involves testing RF components and requires measurement systems with wide frequency coverage, wide bandwidth, high dynamic range, high output power, spectral flatness and high signal quality.



DESIGN AND VALIDATION

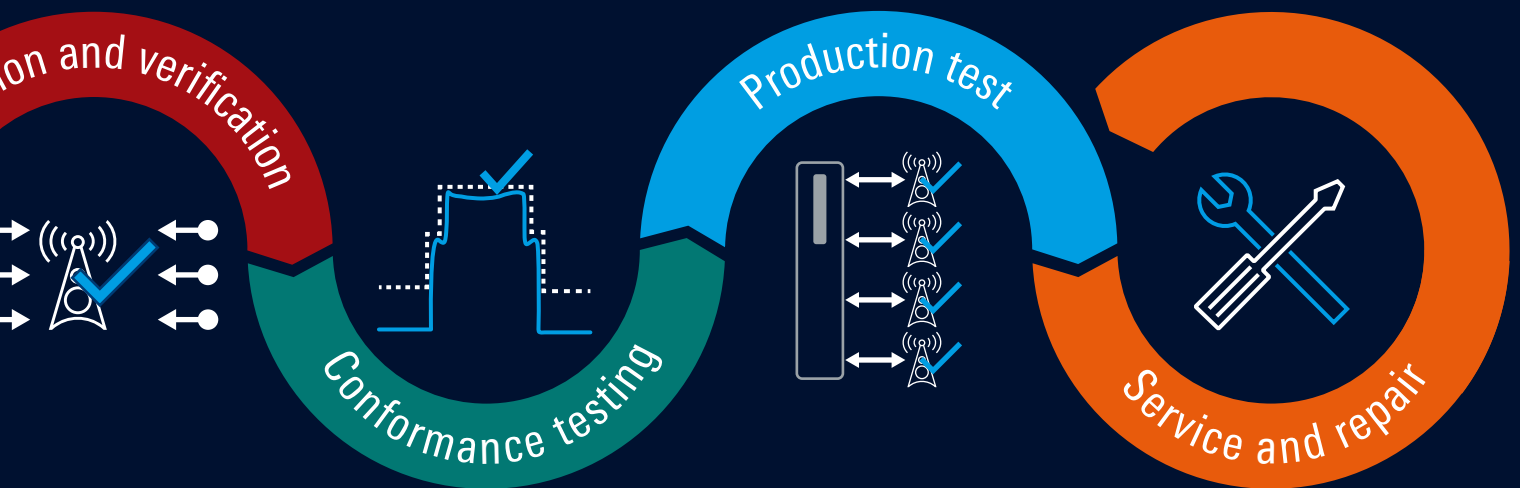
Design and validation requires functional performance verification over a wide range of conditions. The testing covers the power and modulation performance of components and transmitters as well as the beamforming accuracy and signal integrity over high-speed interfaces.

INTEGRATION AND VERIFICATION

Integration and verification focuses on feature sets and completeness of tests, covering spherical radiation pattern, total radiated power, transmitter characteristics and receiver performance as well as broad performance analysis.

SERVICE AND REPAIR

Service and repair ensure overall functionality, business continuation and accuracy of test and measurement instruments for years to come.



CONFORMANCE

Conformance testing ensures that base stations operate within well-defined RF and performance constraints. Based on 3GPP conformance tests, regional standardization bodies, local regulators and network operators implement additional test standards according to their own requirements. The O-RAN ALLIANCE defines conformance specifications to verify the interoperability of network equipment from different vendors.

PRODUCTION TESTING

Production testing is increasingly parallelized and automated. Efficient testing is essential for reducing test times while maintaining quality.



Learn more about our mobile infrastructure testing solutions

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The **flexible and scalable architecture** of the Rohde & Schwarz test solution portfolio supports **the long-term evolution of mobile network deployments**. Our test solutions are 3GPP-compliant and suitable for O-RU development, integration and production. The offerings range from individual instruments to complete test systems with **user-friendly software** for **seamless automation**. We help customers adapt to evolving standards and deployment models for a smooth transition to **next-generation mobile networks**.



MOBILE NETWORK TESTING

Mobile network testing is the systematic process of evaluating wireless networks to ensure it meets performance standards and involves the continuous monitoring, optimization and validation of the radio environment and data throughput. By analyzing real-world signal behavior, engineers can maximize spectral efficiency, ensure connectivity and that the network provides a seamless, high-quality experience for all connected devices.





RESEARCH AND ENGINEERING

Engineering focuses on network and device interoperability. By simulating high device density and interference, engineers optimize radio and application layers to understand network behavior under various conditions. This phase utilizes detailed analysis to precisely control parameters. It also identifies the root causes of complex data transmission errors.

Research & engineering



ROLLOUT PREPARATION

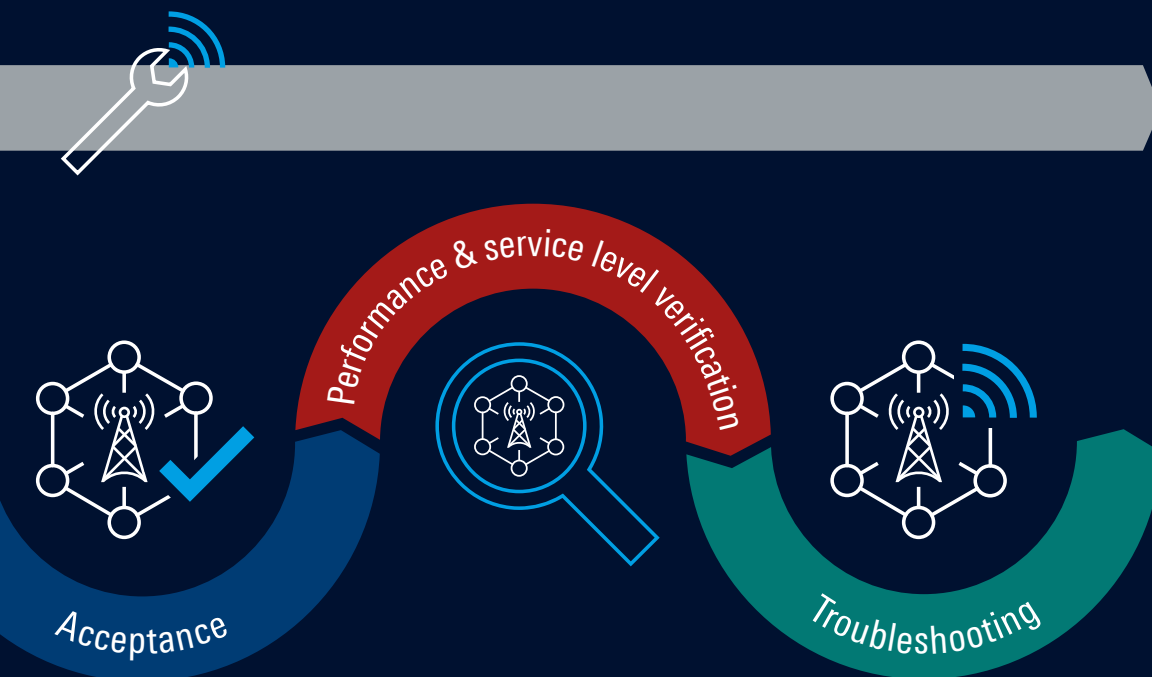
Preparation ensures that the dedicated frequency spectrum is free from external interference before rollout. Network planners verify the radio environment to document the spectral landscape. This ensures a clean baseline for commissioning, minimizing potential performance risks and ensuring that the reserved frequency remains available for authorized private network use.

PERFORMANCE & SERVICE LEVEL VERIFICATION

Verification manages long-term reliability through a tiered monitoring system to ensure continuous KPI assurance. Manual site surveys complement automated, distributed measurement probes that track performance trends and identify anomalies. This setup provides real-time visibility and automated alerts, enabling proactive maintenance and faster resolution of service breaches.

TROUBLESHOOTING

Troubleshooting focuses on the rapid identification and resolution of operational issues. Current signal quality is compared against baseline data to detect degradation, followed by application testing to isolate performance drops. Detailed root-cause analysis is then performed at the network level to pinpoint the source of the problem and restore optimal performance.



ACCEPTANCE

Optimization validates network performance against established KPIs to ensure formal acceptance. Coverage and signal quality are verified through passive and active testing across the operational area. By emulating end-devices, engineers test latency and real-time application responsiveness, using data visualization to confirm the network is ready for deployment.



Learn more about our mobile network testing solutions

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Rohde & Schwarz provides integrated test solutions across **the entire network lifecycle**. Our portfolio supports all cellular technologies and mobile network architectures, helping organizations mitigate risks such as poor coverage and signal congestion. Precise validation and continuous monitoring of networks enable operators to **make OoE-centric business decisions** with confidence, shorten time-to-market for new technologies and services, and protect their business value.

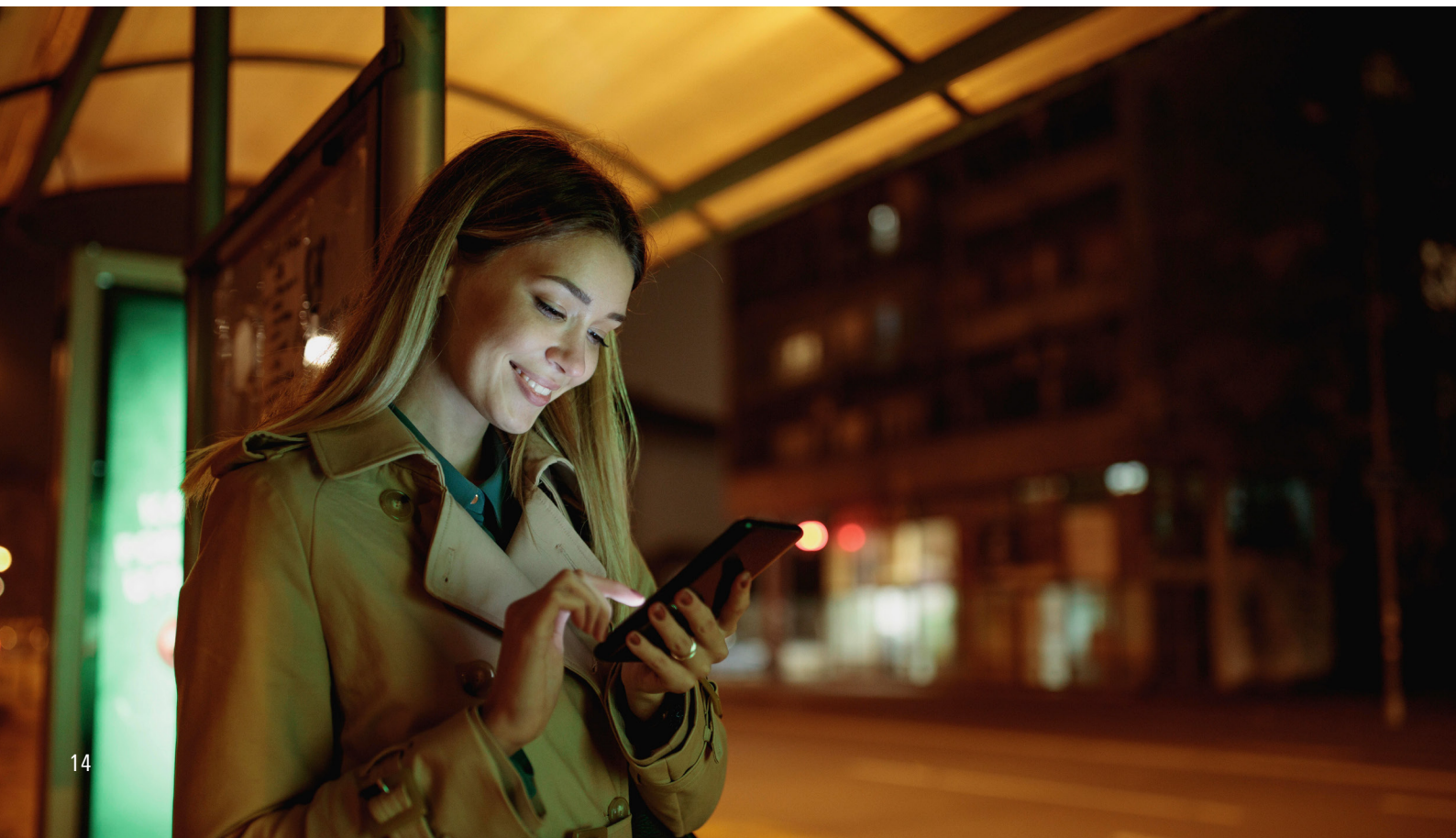
THE COMPREHENSIVE APPROACH FROM ROHDE & SCHWARZ

Combining device and network testing creates a closed-loop validation ecosystem that goes beyond isolated measurements. By analyzing how a device interacts with a live or simulated network, engineers achieve comprehensive test coverage that identifies interoperability issues early. The integrated approach ensures that theoretical device performance translates perfectly into real-world network reliability, reducing the risk of costly post-launch failures.

Rohde&Schwarz is well positioned as a single-source provider with a deep portfolio that spans the entire wireless ecosystem. Our instruments work in harmony, whether as lab-based signaling testers for device R&D or as high-precision scanners for field network optimization. This synergy enables efficient testing solutions that streamline workflows, simplify data correlation and provide a unified technical language across different engineering departments.

OUTLOOK FOR FUTURE TECHNOLOGIES

As the industry approaches the next frontier, Rohde&Schwarz remains at the forefront of 6G research and development. Our commitment to innovation includes our active participation in global standardization bodies and early-stage prototyping for sub-terahertz frequencies and AI-native air interfaces. By investing in these future technologies today, we will make sure our customers have the tools they need to lead the transition to the next generation of connectivity.



CUSTOMER BENEFITS

Partnering with Rohde & Schwarz provides a clear competitive advantage throughout the product and network lifecycle:

- ▶ Shorter development times through automated workflows and seamless data integration
- ▶ Improved product quality and optimized network performance via high-precision measurement hardware
- ▶ Increased efficiency through scalable test systems that adapt to evolving standards

SERVICES

Our relationship with our customers extends far beyond initial hardware acquisition. We have a global network of expertise to ensure long-term operational success:

- ▶ **Support:** Rapid technical assistance and troubleshooting from local experts
- ▶ **Training:** In-depth workshops to keep your team updated on the latest 3GPP standards and test methodologies
- ▶ **Calibrations:** Regular precision services to maintain the accuracy and compliance of your equipment
- ▶ **Consulting:** Tailored advice on test laboratory setup and complex network architecture optimization



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Service at Rohde & Schwarz You're in great hands

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

Rohde & Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test&measurement, technology systems and networks&cybersecurity. Founded 90 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and 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

Rohde & Schwarz training

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Rohde & Schwarz customer support

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