ROHDE&SCHWARZ

Make ideas real

INTERFERENCE HUNTING

Solution overview

Efficient interference hunting with portable receiver and handheld directional antenna

INTERFERENCE HUNTING

The dramatic upsurge in mobile and other wireless services has caused the number of cases of interference to rise. New signal types with more complex modulations increasingly occupy the spectrum. This increases the risk of interference and makes it more difficult to mitigate. However, advanced equipment from Rohde & Schwarz significantly facilitates the interference hunting process.

Interference occurs in all radiocommunications services. Everyone is familiar with pixelated TV screens, interrupted mobile phone coverage, wireless devices with poor data rates or noisy DECT phones. Users of wireless services report such cases to responsible authorities or network operators, who will respond accordingly.

Mission tasks and requirements
Interference hunting usually begins at the place where the interference was reported. The first step is for operators to verify its presence at that location. This can be done either with a mobile monitoring station, a receiver or a spectrum analyzer. In the case of mobile networks, a test mobile phone can also come in handy since it offers the subscriber experience, instantly showing if there is network accessibility and the quality of the services.

When monitoring receivers or spectrum analyzers show interfered signals in the spectrum display, operators might even be able to identify the interfering signal or at least get a first hint. The spectrum at or nearby the useful signal can visualize the potential interference. High spectral resolution and specialized displays help operators detect and identify unwanted emissions.

Directional antennas, rotatable in azimuth and polarization, make it possible to separate the interfering emission from the wanted signal. Such antennas can be mounted on the mast of a vehicle or on handheld units for indoor operation. Directional antennas can also be used for direction finding and homing in on emitters.

Experienced operators may be able to recognize the type of interfering signal by listening to the demodulated audio. This acoustic analysis is often combined with rotating the directional antennas and visualizing the spectrum. Once an unwanted signal is separated, the next step is to locate it. In urban areas, multipath propagation of signals can mislead operators when using direction finders. System-supported guidance makes it much easier to geolocate emitters.

Today's cell phone networks present special challenges. In such networks, it is not that easy to separate the signals from different transmitters. Here, too, the Rohde & Schwarz portfolio offers optimal solutions.

The interference hunting process is as diverse as the signals themselves. It depends on whether the interfering signal is permanently active, such as during broadcast transmissions, or whether the channel is only temporarily occupied. If the interferer appears only occasionally, it might be necessary to leave spectrum analyzers, receivers or network scanners on site or to temporarily deploy transportable monitoring stations. Due to remote control, trigger setting capabilities and automatic procedures, such systems operate unattended and can record signals for post-analysis of the interfering source.

Rohde & Schwarz provides efficient Interference hunting tools:
► Fixed and remote monitoring stations
► Mobile monitoring stations
► Portable equipment

The right equipment depends on the individual situation.

FIXED AND REMOTE STATIONS

Manned and unmanned fixed monitoring stations can support interference hunting in their coverage area. The stations can be controlled interactively or can autonomously run automatic tasks to detect occasionally occurring interference. Then the systems can perform measurements on the spectrum or single frequencies 24/7. Automatic measurements make it possible to detect unwanted emissions in the spectrum and trigger subsequent events, such as audio recording, direction finding or transmission of alarms.

A compact spectrum monitoring station with minimal infrastructure requirement

Automatic operation

If autonomously operating remote stations detect measured results outside a defined value range, they can alert operators and trigger events such as recordings of the audio signal, geolocation of the emitter and other measurements. Operators can configure these settings individually so that the remote stations can autonomously investigate interference.

Transportable stations

If occasionally occurring interference is reported, authorities can decide to temporarily deploy monitoring stations in this area. These can automatically detect, record and geolocate the unwanted emission. The transportable stations also allow radiomonitoring in different situations, such as at large-scale events and other temporarily critical locations.

Customized configurations

Rohde & Schwarz can customize the configuration of fixed or transportable stations to meet particular requirements. The modular concept allows flexibility across all radiomonitoring tasks, combines angle of arrival (AOA) and time difference of arrival (TDOA) geolocation technologies, and is beneficial for both experts and less experienced operators.

TDOA/AoA Hybrid Geolocation
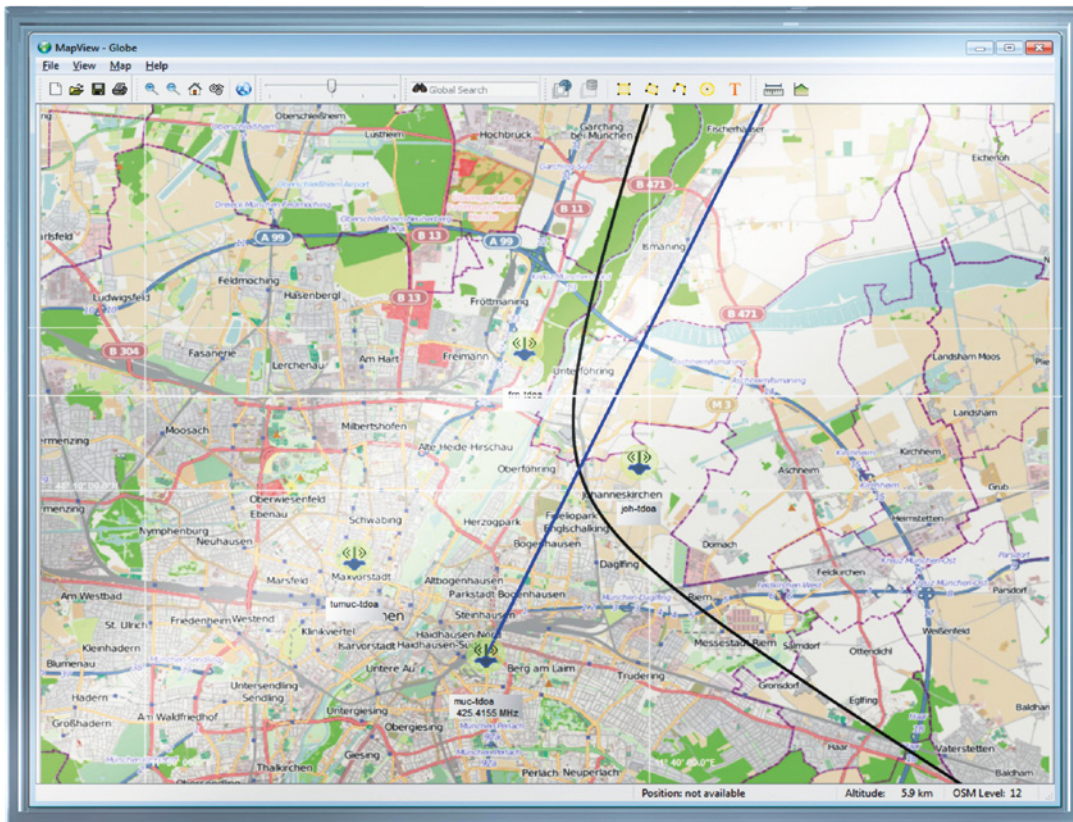
MOBILE UNITS

Mobile units play a key role in between fixed monitoring stations and portable equipment. They are often the initial effective asset for mitigating an interference issue. Such units include mobile monitoring stations (MMS) that are also able to perform general spectrum monitoring tasks as well as vehicles that are specialized in interference hunting. These vehicles can incorporate the monitoring and direction finding system as a fixed or temporary installation.

A mobile monitoring station

Operators of mobile stations work in a fatigue-free environment that features an ergonomic design. Facing frontward, operators can control the system while on the move, making it possible for them to provide instructions to the driver during homing and location tasks.

Well-equipped platforms

Rohde & Schwarz integrates radiomonitoring systems into suitable vehicle platforms. The mobile stations are usually equipped with a mast for elevating the antennas. For each measurement, operators can select the right antenna – an omnidirectional or directional monitoring antenna or a direction finding antenna. Rotators make it possible to steer the directional antennas and change the antenna polarization.

Efficient geolocation In difficult RF environments, such as urban areas where multipath signal propagation is common, the Rohde & Schwarz mobile locator algorithm efficiently supports the geolocation process. It statistically analyzes the bearings and continuously calculates the most probable signal direction. The software displays the probability cloud on a digital map, ultimately indicating the emitter's location with a red circle.

Interference in cellular networks

Rohde & Schwarz provides mobile and portable units that are specialized in detecting and analyzing interference in cellular networks in indoor and outdoor scenarios. The systems determine the quality of service (QoS) and can read out network parameters. This makes it possible to recognize out-of-band interferers that affect TV transmissions in the digital dividend spectrum. Special postprocessing tools such as coverage, neighborhood, spectrum and interference analysis automatically highlight the location of trouble spots in the network.

The right antenna for the right task – even for mobile stations
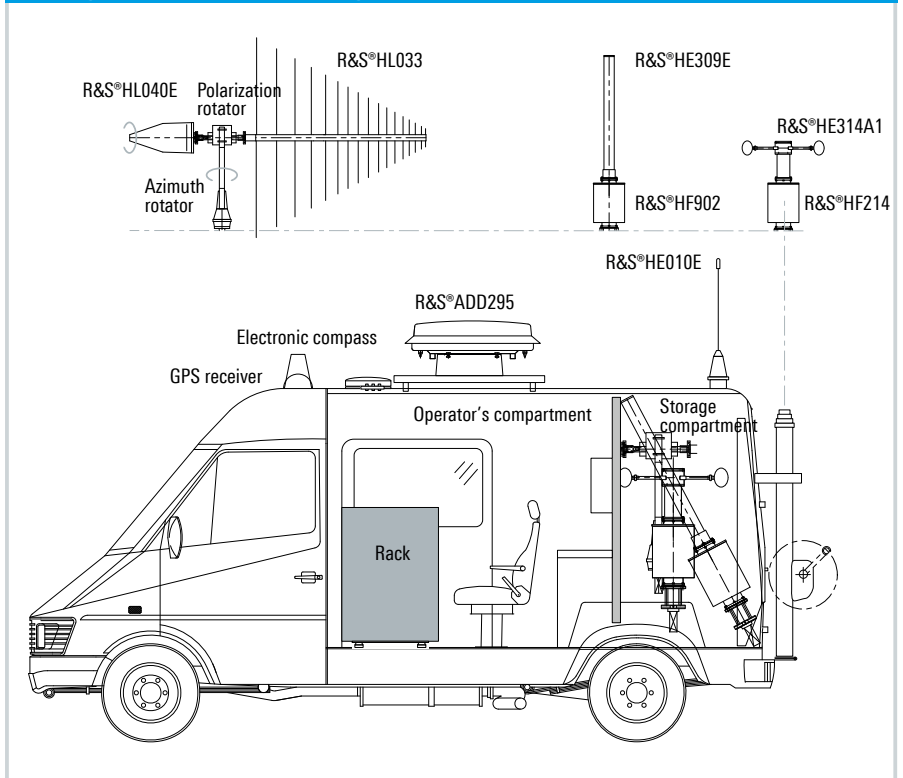
PORTABLE EQUIPMENT

Portable equipment provides the greatest possible flexibility and allows efficient operation in the field. It often serves as the guide for the final meters of the hunt, but can also be used as an initial tool for hunting interference. Portable spectrum analyzers and receivers with handheld antennas can display the frequency spectrum, demodulate audio and determine the bearing by manually turning the directional antenna. Portable network analysis systems can provide an overview of all cellular technologies over all frequency bands and detect irregularities. The lightweight equipment is battery-powered and easy to use.

Portable equipment can detect and locate harmful interference, even indoors, at critical infrastructures such as airports

Rohde & Schwarz portable receivers and direction finders offer smart features for hunting interference and other radiomonitoring tasks.

Coping with all spectrum environments
The powerful portable receivers detect, analyze and geolocate RF emissions in the wide frequency range from VLF to SHF. Their unrivaled RF performance, extensive preselection and high dynamic range allows operators to effectively hunt interference, even in dense spectrum environments.

Exploring the spectrum
The portable receivers unveil details in the spectrum that are easy to miss. Frequency and time domain analysis with high real-time bandwidths and fast panorama scans allow comprehensive spectrum visualization. The portable devices detect weak and pulsed interferers superimposed on the wanted signals. Directional antennas help operators steer towards the recognized unwanted signal.

Saving records
Rohde & Schwarz portable receivers offer extensive recording capabilities that allow evidence to be preserved and permit post-mission analysis. Recorded measurements can be time stamped, geotagged and include the type of antenna element used – for seamless traceability.

Operational efficiency
The receivers offer multiple display views that allow individual and clear result presentation. Their display ensures perfect readability even in sunlight, and the backlit keypad permits reliable operation irrespective of the ambient light level. The portable devices promote efficient operation. The hierarchically flat menu makes changing settings fast. The app cockpit allows operators to personalize the receivers by composing their distinct environment for the most common tasks.

Beneficial in the field
Rohde & Schwarz portable receivers are designed for operation in the field. Operators can operate them with the controls on the top, on the front panel, and via smartphone on the handheld antenna. The device can conveniently be carried in a backpack for fatigue-free operations. The portable receivers feature field-friendly compact size, low weight and long battery life.

Individual solutions
Many options and accessories for individual requirements and unique solutions, such as the direction finding upgrade.

Cellular network
analysis system
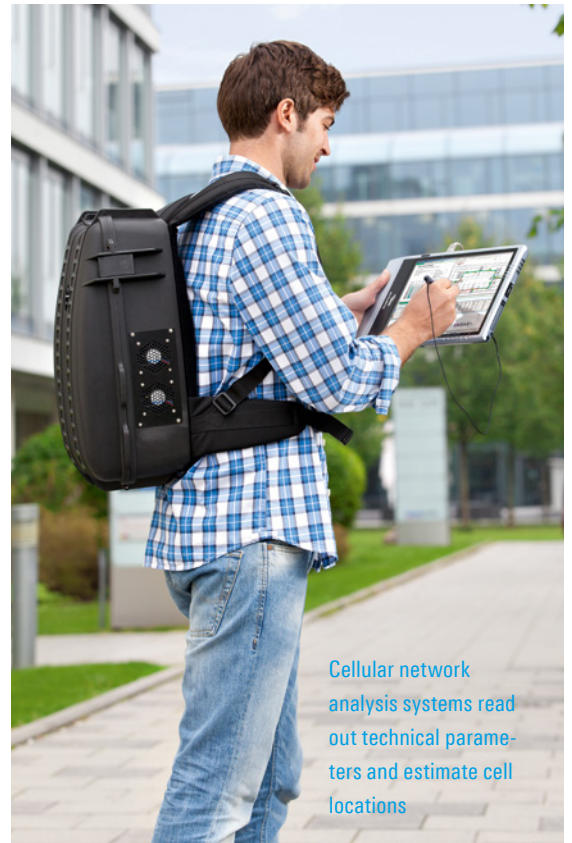
Cellular network analysis systems read out technical parameters and estimate cell locations

SOFTWARE THAT SUPPORTS INTERFERENCE HUNTING

For state-of-the-art interference hunting at fixed, semi-fixed and onboard mobile stations, Rohde & Schwarz provides spectrum monitoring software. Its numerous functions support computer-aided control of the devices and system operations. Thanks to the software's intuitive user interface and its interactive and automatic measurement modes, it is easy to use. The measurements and results analysis strictly follow ITU recommendations.
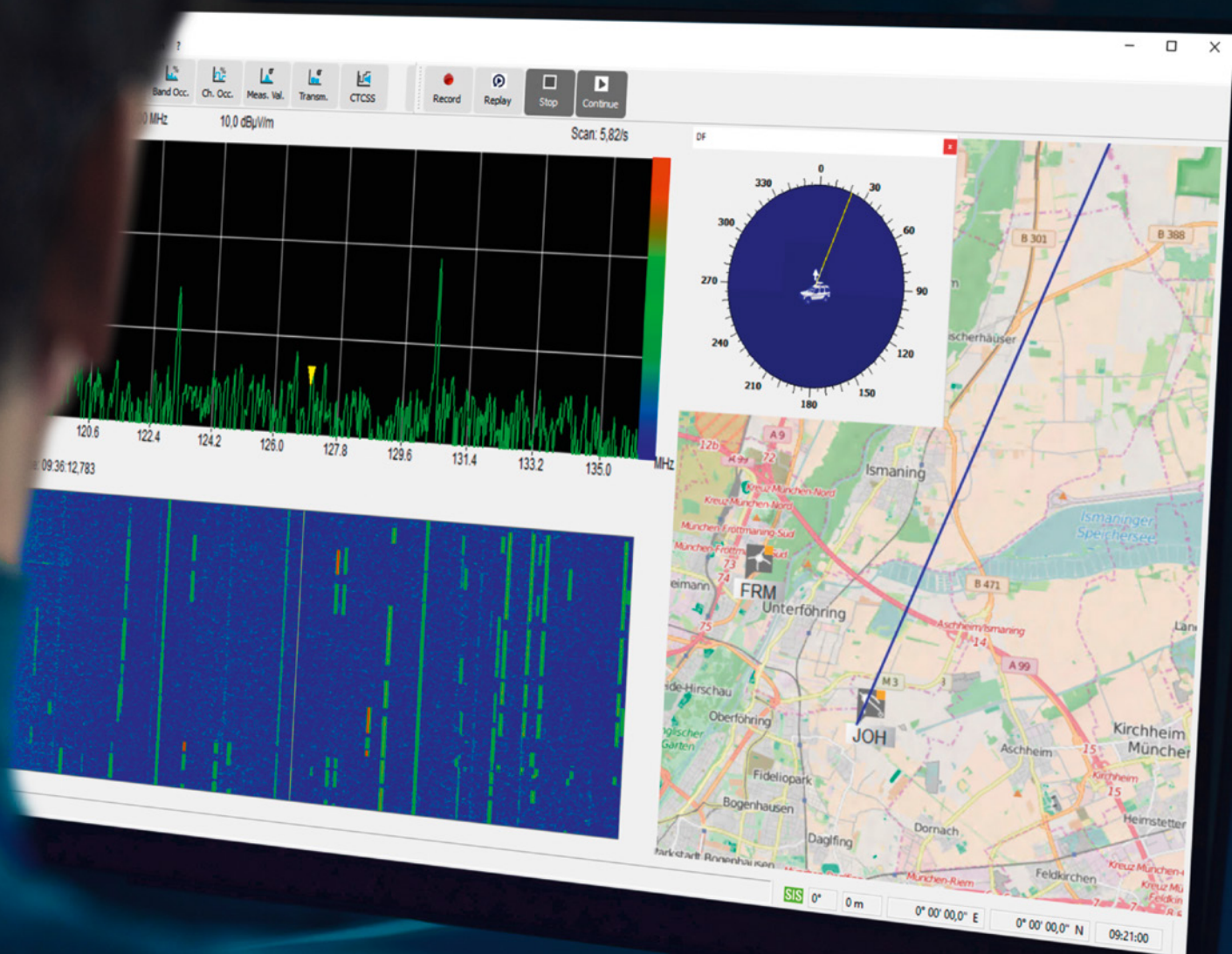
The Rohde & Schwarz spectrum monitoring software is a modular software that makes it possible to control single devices as well as large radiomonitoring networks. It controls the receivers, direction finders and other devices and supports efficient evaluation and reports.

Automatic investigations

In automatic mode, the software performs routine measurement tasks according to a definable time schedule and can detect measured values outside a permitted range. It can trigger alarms, locate potential interferers and make recordings, allowing users to reconstruct the interference and preserve evidence.

Intermodulation analysis

Intermodulation is a common type of interference. It appears under diverse circumstances and is often hard to detect. The Rohde & Schwarz spectrum monitoring software interactively supports intermodulation analysis. The software measures originating signals and calculates possible combinations for stepwise investigation of intermodulation sources.

Violation detection

The software can automatically detect emissions that are not supposed to exist. These can include any unwanted emission, but also unlicensed transmitters. However, the software can preventively detect potential interferers by simply comparing a detected emission with a reference list e.g. from a frequency management system. This enables the software to automatically detect any violation of the frequency spectrum.

OUR PRODUCT PORTFOLIO

Rohde & Schwarz offers a comprehensive portfolio of equipment, software and other components for hunting interference. These modules can be combined in diverse ways to configure individual systems. The systems can be portable, mobile or fixed stations that can be networked and operate unattended and automatically 24/7.

The entire Rohde & Schwarz product portfolio is developed in-house and manufactured in the company's own production facilities. A constant focus on customer feedback and new technologies helps the company enhance its products in accordance with market and customer requirements

Antennas
The Rohde & Schwarz product line encompasses a wide range of highly sensitive active and passive antennas for portable, mobile and stationary use, providing complete coverage for the frequency range from 100 Hz to 44 GHz. Their broadband capabilities minimize the number of antennas needed to cover wide frequency ranges.

Receivers
A comprehensive range of monitoring receivers is available for detecting and investigating interference sources and performing precise measurements from 8 kHz to 26.5 GHz and even up to 100 GHz using frequency converters. Sets of portable monitoring receivers and handheld antennas allow operators to home in on emissions.

Direction finders
The Rohde & Schwarz family of direction finders ranges from portable instruments to high-speed scanning direction finders and covers all DF and radiolocation applications. Temporarily or permanently integrated into vehicles, the direction finders are often used to take bearings on distant emitters.

Specialized signal analyzers
TV signal analyzers support interference investigation on broadcast transmissions. The Rohde & Schwarz product portfolio includes comprehensive equipment for hunting interference in mobile phone networks and other wireless communications services.

Compact outdoor monitoring systems
The family of universal monitoring systems comprises compact, standalone radiomonitoring stations that perform automatic measurements around the clock. Integrated recording capabilities make the systems ideal for hunting sporadic interferers. The systems can automatically initiate measurements and remotely alert operators when unwanted emitters are active.

Special software
Rohde & Schwarz cellular network analysis software measures and analyzes mobile network parameters. It detects and geolocates irregularities and automatically identifies interference in mobile networks.

Intelligent software makes it possible to geolocate any emitter, even an interferer. Its integrated algorithms master even difficult signal environments, such as urban areas where multi-path propagation is common.

Mobile network scanner
Mobile network scanners measure technical parameters of cellular networks. They read out configuration data of the cells and can even identify irregularities and trouble-causing issues in mobile networks.

FROM PRE-SALE TO SERVICE.
AT YOUR DOORSTEP.

Rohde & Schwarz operates a global service network in order to safeguard the investments of its customers.

The following on-site services are offered worldwide:
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► Maintenance and repair
► Product updates and upgradesRohde & Schwarz regional service centers, plants and specialized subsidiaries provide a wide range of additional services:
► System integration
► System support
► Installation and commissioning
► Application support
► Development of customized modules, instruments and systems
► Software development
► Mechanical and electrical design
► Manufacturing to order
► Technical documentation
► Logistics concepts

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Portland

Ottawa

Toronto

Columbia/Maryland

USA

Los Angeles

Dallas

Monterrey

Mexico

Mexico City

● ● Sales locations

■ Lead service centers

● ● Service centers

Colombia

Brazil

Rio de Janeiro

São Paulo

Uruguay

Chile

Argentina

Inset map (Europe):

Finland
Norway
Sweden
Estonia
Denmark
Latvia
Lithuania
United Kingdom
Netherlands
Poland
Russian Federation
Belgium
Czech Republic
Ukraine
France
Austria
Hungary
Switzerland
Slovenia
Romania
Serbia
Bulgaria
Azerbaijan
Italy
Portugal
Spain
Greece
Turkey
Malta
Cyprus

Main map:

Cologne
Germany
Memmingen
Teisnach
Kazakhstan
Mongolia
Beijing
Azerbaijan
South Korea
Seoul
Daejeon
Japan
Tokyo
Algeria
Xi'an
Gumi City
Kanagawa
Islamabad
Chengdu
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Canberra
New Zealand

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 more than 85 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

Service that adds value
► Worldwide
► Local and personalized
► Customized and flexible
► Uncompromising quality
► Long-term dependability

Sustainable product design
► Environmental compatibility and eco-footprint
► Energy efficiency and low emissions
► Longevity and optimized total cost of ownership

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ISO 9001

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ISO 14001

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