ROHDE&SCHWARZ

Make ideas real



LAND BASED SIGINT/EW Solution overview



INFORMATION SUPERIORITY AND SPECTRUM DOMINANCE The electromagnetic spectrum (EMS): a new confrontational dimension

Today's information world is shaped by constant and rapid evolutions that have created a high synergy between information and communications technologies. Thanks to its characteristics and plasticity, the EMS is a universal medium that enables information to be exchanged with utmost flexibility through the land, naval, air and space environments. Contesting the access to the EMS makes it possible to hamper or control information exchanges and may rapidly affect all activities that use them. In times of peace as well as in hybrid warfare and high-intensity conflicts, the freedom to use the spectrum is of paramount importance to civil and defense actors. The EMS has become a full confrontational space where functions such as spectrum management and electronic warfare play a key role to ensure its access.

The ability to maneuver on the spectrum

In the defense domain, the EMS is particularly crucial in order to enable command, control, communications, computer, cyber, intelligence, surveillance and reconnaissance (C5ISR). Spectrum management deals with the ad hoc use of the spectrum resource by the forces. Electronic warfare (EW) is the function that supports spectrum dominance and provides the ability to maneuver on the spectrum in order to control, defend, conquer or deny parts or all of it. Signal intelligence (SIGINT) plays a critical role in achieving information superiority by exploiting and evaluating the enemy's entire electromagnetic activity and by understanding its intentions.

Cyber and electromagnetic activities (CEMA)

The convergence of information and communications technologies has created an interdependence of two domains initially separated: EMS and cyberspace. At the crossroads between electronic and cyber warfare, the EMS is now the playground of cyber and electromagnetic activities (CEMA), whether they are for defensive, protective or attack purposes.

Rohde & Schwarz expertise

Offering state-of-the-art land based solutions for a wide variety of land forces' platforms, Rohde & Schwarz covers the entire signal interception chain, from signal detection to the production of signal intelligence, including the command and control of sensors and effectors.

Ranging from individual EW manpack up to major SIGINT systems at brigade level, Rohde & Schwarz solutions contribute to commanders' decision-making processes with situational awareness, intelligence and common operating pictures. Through their excellent performance, Rohde & Schwarz direction finding systems provide key information that helps locate SIGINT targets and contributes to the fusion of geospatial intelligence (GEOINT) products.



Command, control and analysis solutions



Stationary systems



Deployable systems



Mobile electronic attack systems





Mobile electronic support systems

Man-portable systems

Handheld solutions

COMMAND AND CONTROL



In order to make right decisions both in operational theaters and at headquarters, commanders require precise information about what to expect from the adversary. Collecting, structuring and utilizing information about the environment provides a decision-making advantage. It is imperative to possess the most up-to-date, accurate and complete information about enemies, in symmetric as well as asymmetric warfare scenarios. Knowledge about their disposition and capabilities, about their location and intentions is vital for the decision-making process.

Rohde & Schwarz land based SIGINT and EW systems provide these decision-focused situation pictures and they allow target-oriented countermeasures. The systems can reveal the enemies' locations, dispositions and intentions and can disrupt their command and control chain. The land based SIGINT and EW systems' aggregated outcome offer timely, relevant, accurate and predictive information. This allows tactical commanders to develop estimates, support decisions for planning, controlling and accomplishing operations. Besides enhanced situational awareness, the systems support immediate threat warning, preventing surprise from adversary action. This gives commanders decision-making advantages and tactical superiority and helps to protect their own and allied forces.

Rohde & Schwarz systems support forces even at early stages when planning the SIGINT and EW missions. Crucial factors here include the mission objectives, the preknowledge about potential adversaries' communications, the capabilities of the SIGINT and EW systems and the terrain of the area of interest. The systems also support electronic orders and reports for efficient operations in the field and throughout the hierarchical structures.

The SIGINT and EW systems' open interfaces allow data fusion with from other sources. They are able to create, visualize and share views of operational environments. This lets commanders at headquarters and in tactical operations centers make timely decisions for commanding and controlling troops. The gathered information supports force protection and target-oriented operations. Thus, the systems exploit the electromagnetic environment for the benefit of the commander's own and allied forces.



COMMUNICATIONS INTELLIGENCE



Rohde & Schwarz COMINT systems provide relevant information to executives involved in strategic decisionmaking. Due to their capability to intercept radio communications from far beyond a country's borders and geolocation, the systems allow effective remote intelligence gathering. They support creating and updating the strategic situation picture as a basis for current and potential future missions.

The strategic COMINT systems provide information about the key areas of interest. They make it possible to realistically assess situations and changes, helping to unveil threats and other situations where anticipation and further intelligence collection are advisable or mandatory. The systems support an early warning function by identifying emerging tendencies and patterns at an early stage. This allows political or military decision-makers to adapt their strategy to the respective circumstances. The stationary COMINT systems allow automatic procedures for detecting, geolocating, analyzing and evaluating gathered communications traffic. They usually cover the HF range. However, VHF/UHF interception can also enhance the situation picture if the systems can cover the areas of interest. Further strategic intelligence sources include Rohde&Schwarz satellite intercept systems.

The Rohde&Schwarz COMINT systems support the entire intelligence cycle. They provide tools for planning the missions and distributing the orders. The systems make it possible to collect emissions, analyze their content and geolocate the emitters. They also log parameters, create recordings and support data fusion. Finally, the systems make it possible to generate intelligence reports and disseminate them.

Due to their high sensitivity, Rohde&Schwarz land based COMINT systems can cover wide regions of the world. Their planned and careful deployments enable to intercept communications from far beyond national borders or remote front lines. The systems can perform surveillance over large areas, enabling timely combat readiness.

- ► From HF to VHF/UHF
- Satellite intelligence
- Multichannel automatic signal detection, classification and processing
- ► Network intelligence
- Mobile phone montoring
- Integrated intelligence workflow



HIGHLY MOBILE RADIO RECONNAISSANCE



- Intercepting military radio and nonmilitary communications
- Automatic signal processing
- Multichannel capabilities
- Direction finding and geolocation
- Network operations support
- Platform independent configurations

A commander's essential information requirements in close combat comprise timely relevant facts about the adversaries. Forces in highly mobile and light armored reconnaissance vehicles can provide this information and thus support the battlespace operations. The units can initiate immediate threat warnings for protecting their own forces and contribute to an up-to-date, accurate situation picture.

Light armored reconnaissance vehicles allow operators to conduct onboard radio reconnaissance. These units combine quick dislocation capability and permit operators to take advantage of the protection afforded by the platforms. In operational theaters, they can intercept valuable indications of potential targets and threats. When detecting signals of interest, two or three interoperating mobile units can geolocate the emitters. This information contributes to the situation picture and increases survivability during tactical maneuvers.

Integrated mission planning tools help to find the best sites for reliably covering the area of interest. Soldiers can efficiently load the device's presettings from received orders. The mobile unit's radio reconnaisance systems detect upcoming signals in real time and geolocate emitters in triangulation networks. Traffic analysis makes it possible to evaluate the hostile communications behavior and gives commanders a continuously updated situation picture and near-real-time targeting information.

Reconnaissance vehicles can operate as principal ground communications electronic support measures (C-ESM) units for tactical signals interception, but they can also contribute to broader COMINT missions. The vehicles are rapidly deployable, agile, versatile, survivable and sustainable.

DEPLOYABLE RADIO INTERCEPTION

Deployable radio reconnaissance units allow operations over longer periods and thus can provide more and detailed information. Focused on a specified area, such dismounted surveillance missions make it possible to gather a comprehensive situation picture. This enhances security for one's own troops and allied forces, especially when moving in areas where there is enemy activity. Deployable systems reach suitable sites either man-carried or transported in vehicles. They usually enable favorable positioning of the antenna, making it highly probable that emissions from the area of interest will be intercepted. Moreover, the selected site may allow camouflaged operations for minimizing the chance of visual or even physical contact with the enemy.

If required, deployable radio reconnaissance systems can be operated remotely. This allows the operators to control the system in defilade when they expect to come under fire. They can operate more safely, especially when exposed positioned systems or antennas could call the enemy's attention. Operators can establish and continuously update the situation picture and profoundly report to commanders and senior reporting levels. Light transportable radio reconnaissance systems can be carried by soldiers to sites that provide cover. Operators quickly deploy the systems that allow widely concealed radio surveillance throughout areas of interest. For longer hauling operations, shelterized radio reconnaissance systems are advisable. The shelters offer an efficient operational environment for more advanced systems and several crewmembers. Such electrically powered and air-conditioned shelterized units can operate even on a long-term basis.

- ► Wide frequency range from HF to SHF
- Monitoring, signal analysis, direction finding and recording
- Optimized in size, weight and power (SWaP) for efficient field operations







MAN-PORTABLE OPERATIONS



- Wide frequency range from 8 kHz to 8 (18) GHz
- Broad bandwidths and fast scan for reliable signal detection
- Efficient result display on large color screens
- Capability for homing in on emitters
- Lightweight for efficient field operations

Dismounted radio reconnaissance can provide timely, accurate and valuable information about enemy activity within a prescribed area. Patrols on foot benefit from the concealment offered by vegetation and terrain or buildings. Even when operating unconcealed, they do not emit a significant visual or audio signature. Moreover, man-portable radio intercept equipment allows users to conduct reconnaissance operations in difficult topographies, where no vehicle can gain access. The equipment can passively intercept communications signals at long ranges without being detected.

Man-portable radio intercept equipment can detect emissions and makes it possible to listen in on the audio and even geolocate enemy forces. It is modular, allows flexible missions and can also be operated from a vehicle or set up at a fixed site. The cost-efficient, man-portable radio intercept equipment is interoperable with other fielded reconnaissance assets. It can function either as a standalone system or as an integral part of larger overall reconnaissance architecture.

The man-portable radio intercept equipment provides efficient signal processing despite its long operational endurance, due to its low power consumption. Combined with its compact size and low weight, these features qualify it for extensive field operations. Multiple views of intercepted results including visualization of emitter locations on digital maps make it possible to improve force protection and situational awareness in the field. The man-portable equipment provides the smallest possible battlefield footprint, quick emplacement operations and high reliability.

COMMUNICATIONS JAMMING

Rohde & Schwarz communications electronic countermeasures (C-ECM) systems can provide one's own forces with decisive tactical advantages. The systems focus on the vulnerability of the hostile forces' command and control medium: their wireless radio and data communications. By disrupting these communications links, the jamming systems help to detract an enemy's commanding and reporting capabilities and thereby reduce the enemy's tactical efficiency.

Integrated in suitable vehicles, the jamming units cover wide frequency ranges either in HF or in VHF/UHF/ SHF. Seamlessly interconnected in Rohde&Schwarz EW networks, the C-ECM systems are highly effective. Their detector-exciter units make it possible to focus on specific hostile signals and disregard communications of one's own and allied forces. Due to their large real-time bandwidth and fast signal processing, they can jam even the quickest frequency hopping radio communications, thus enabling unrivaled spectrum dominance.

The Rohde & Schwarz C-ECM systems support profound jam assessment and mission planning capabilities. Their modular design and excellent reception characteristics make it possible to effectively jam even highly secured communications links. The C-ECM systems can be tailored to meet individual requirements.

- Selective jamming of radio networks from 1.5 MHz to 6 GHz
- Fast follower jamming for reliable disruption of FH communications
- Additional powerful C-ESM functionality
- Flexible configuration for integration into suitable platforms
- Seamlessly integratable into Rohde&Schwarz C-ESM systems
- Quick deployment and retreat

RELIABLE ELECTRONIC INTELLIGENCE (ELINT)





Rohde & Schwarz ELINT solutions feature advanced search, collection, measurement and analysis systems. They provide radar parameter knowledge that is essential for up-to-date radar emitter databases. This data allows automated emitter identification of newly built hostile platforms. Therefore, the systems support target recognition and contribute to the situational picture in operations. Moreover, the ELINT solutions are a precondition for reliable early warning alerts and support self-protection of one's own platforms.

The Rohde&Schwarz ELINT systems can intercept and analyze signals from state-of-the-art radars. These include multifunction radars that simultaneously operate in multiple modes or rapidly switch their emission parameters to serve multiple purposes. The systems digitally process the advanced waveforms, allow highquality recordings and provide efficient analysis capabilities. Due to their high sensitivity, the Rohde&Schwarz ELINT systems also intercept signals that operate at much lower power levels, even over wide ranges.

However, Rohde&Schwarz ELINT systems also process legacy radar signals in the VHF/UHF range. Integrated in suitable platforms, the field-proven systems focus on operator usability and functionality. They have demonstrated their ability to successfully exploit today's radar environments as well as those of the past.

- ► LPI (low probability of intercept) radars
- Low-power solid-state radars (SSR)
- Multifunction AESA/PESA radars
- ► K band radars
- VHF/UHF long-range early warning radars



CELL PHONE MONITORING

Especially asymmetric warfare missions rely on reconnaissance results from mobile phone communications. Here, the systems can identify individuals' phones, verify their presence, intercept all communications of entire frequency bands at once or perform other reconnaissance tasks. Rohde&Schwarz offers a wide range of different solutions to cover such requirements in any scenario.

Passive mobile phone monitoring systems can identify cell phones, estimate their location, track them and acquire the communications content. Passive systems operate covertly and are able to intercept all GSM cell phone links in the area. Active systems simulate a network operator's base transceiver station (BTS) and can completely control cell phones within their coverage areas on all technologies (GSM, UMTS and LTE). Both types of systems provide specific capabilities and can be deployed in combination for comprehensive monitoring tasks and accurate target localization. Evaluation centers process the intercepted data for efficient intelligence gathering.

For optimizing results in monitoring missions, it is advantageous to configure the systems with values from the actual networks. For gathering this data, Rohde&Schwarz cellular network analysis systems can make them transparent. The systems analyze the structures and read out their parameters. The results help to optimize the monitoring system settings for ensuring the mission success.

In an era with omnipresent Wi-Fi networks, additional data is available. Parameters of access points and mobile units can provide valuable information. Operators can correlate and evaluate them with interceptions from cell phone networks, thus providing additional insight.

- Active, vehicle-integrated multichannel solutions for 2G/3G/4G
- Active multichannel portable (backpack) solutions 2G/3G/4G
- Passive full-band monitoring systems
- ► Mobile network analysis
- ► Homing capabilities
- Wi-Fi interception and evaluation

SATELLITE INTELLIGENCE



Mobile satellite service (MSS) makes it possible to exchange information in areas without communications infrastructure. This service is also used to escape national mobile phone and fixed line interception. The use of VSAT/FSS (very small aperture terminal / fixed satellite service) is also on the rise, especially for data links. For intercepting these communications, Rohde&Schwarz offers a variety of satellite intercept systems. They can detect targets, reveal their locations, intercept communications, perform surveillance of areas and efficiently complete the intelligence gap of ground networks' intercept systems.

Rohde & Schwarz satellite phone monitoring systems support the standards of the major MSS operators. These include Inmarsat, Iridium and Thuraya. The VSAT monitoring systems also support well-established standards such as SCPC and DVB-S/S2/S2X, and already extend these capabilities to more sophisticated and efficient VSAT technologies from iDirect, Gilat, Viasat, Hughes and others. The Rohde & Schwarz VSAT satellite intelligence solutions support outbound and/or inbound interception even in carrier-in-carrier scenarios. The Rohde&Schwarz product portfolio of satellite intelligence solutions ranges from flexible, tactical solutions to complex strategic systems for long-term continuous mass interception of multiple satellites. For flexible operations in the field, tactical satellite intelligence systems are often integrated in vehicles or aircraft. However, they can also be operated as transportable units at different sites. For increasing mission success, Rohde&Schwarz offers hybrid systems that are able to simultaneously intercept multiple MSS standards.

- Tactical intercept systems
- Strategic intercept and evaluation systems
- MSS: Inmarsat including BGAN, Thuraya, Iridium and Globalstar
- FSS: wide range of VSAT and SCPC technologies

TURNKEY SOLUTIONS



Rohde & Schwarz not only develops, designs and manufactures cutting-edge products conforming to top quality standards; the company also combines and integrates them to create highly effective turnkey solutions. The modular system design of both the hardware and software makes it possible to tailor most modern solutions according to our customers' unique operational needs. The state-of-the-art modules also permit scalability in the initial configuration and allow for future expansions.

Rohde & Schwarz has incorporated the experience and feedback from countless operators for optimized user interfaces. The field-proven system software not only performs automatic intercept tasks, but also supports the entire intelligence cycle including mission planning, evaluation and reporting. The software allows flexibly tailorable workflows according to the forces' individual requirements. Rohde & Schwarz has extensive experience in creating land based SIGINT and EW systems. Comprehensive services range from system integration throughout the entire system lifecycle support. Internal company standards ensuring thorough quality management and efficient organizational structure, and project teams with many years of experience in SIGINT and EW technologies, provide a strong basis for our customers' satisfaction.

Rohde & Schwarz provides training programs for the operation of the SIGINT and EW systems. Optional maintenance training can enable our customers' vast autonomy. The Rohde & Schwarz systems support this sovereignty. They can continuously monitor the functioning status of all devices and system parameters 24/7, ensuring smooth and uninterrupted operation. Self-calibration routines and integrated diagnostic procedures of the core components complement the modern maintenance concept.

In addition, with service level agreements (SLA) Rohde&Schwarz provides lifecycle support for the land based SIGINT and EW systems. These can include software updates and hardware upgrades, further training, preventive and corrective maintenance services, including the provision of spare parts for long-term successful operation of the land based SIGINT and EW systems.

PRODUCTS

ANTENNAS

The Rohde & Schwarz product line encompasses a wide range of highly sensitive active and passive antennas for mobile and stationary use, providing complete coverage for the frequency range from 100 Hz to 40 GHz and beyond. Their broadband capabilities minimize the number of antennas needed for covering wide frequency ranges.



MONITORING RECEIVERS

A comprehensive range of monitoring receivers is available for finding interference sources and performing precise measurements from 8 kHz to 26.5 GHz and even up to 100 GHz using frequency converters.



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. Innovative active/passive switchover capabilities included in the antennas help to adapt the direction finders to any signal environment.



SIGNAL ANALYSIS

Signal analysis systems allow classification, demodulation and decoding of signals. They analyze highly complex, diverse signals automatically or manually and can record signals for offline analysis. Moreover, integrated signal detection algorithms allow also automatic operation of COMINT systems.





SYSTEM COMPONENTS

For switching signal paths, monitoring the system status or rotating directional antennas, Rohde & Schwarz offers system components to meet any requirement.







SYSTEM SOFTWARE

The Rohde&Schwarz system software controls the devices, detects, classifies and processes signals, stores interceptions, analyzes communications traffic, controls information flows, builds up situation pictures and supports operators with many more tasks.







PRODUCTS

SATELLITE INTELLIGENCE

The Rohde&Schwarz product portfolio of satellite intelligence solutions ranges from flexible, tactical MSS* solutions to complex strategic systems for long-term continuous mass interception of multiple MSS and FSS**.

* mobile satellite system ** fixed satellite system



CELL PHONE MONITORING

Rohde&Schwarz active cell phone monitoring systems range from portable multichannel, multi-standard backpack solutions to large vehicle-integrated configurations. The passive systems are powerful installations, able to intercept entire 2G bands.





FROM PRE-SALES TO SERVICE.

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. The world's changing political landscape, the increasing diversity of wireless and IP communications and the presence of asymmetric threats are making it more difficult to detect and pursue organized crime and terrorism. Modular concepts and custom-built solutions are required to allow the targeted adaptation of existing monitoring systems to the ever-growing number of new communications standards and equipment.

Using a wide range of systems and instruments from Rohde&Schwarz, government agencies and armed forces can speed up the process of gathering information and detecting emitters in the context of crisis management and peacekeeping missions. Users in internal and external security, spectrum monitoring and network operation work with monitoring solutions from Rohde&Schwarz.



Service that adds value

- ► Worldwide
- Local and personalized
- Uncompromising quality
- Long-term dependability

Rohde & Schwarz

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Sustainable product design

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



Rohde & Schwarz training

www.training.rohde-schwarz.com

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