

# R&S<sup>®</sup>AMS AERIAL MONITORING SYSTEM

Monitoring elevated to a new level



Product Brochure  
Version 02.01

**ROHDE & SCHWARZ**

Make ideas real





# AT A GLANCE

The R&S®AMS aerial monitoring system is a flying monitoring solution from Rohde & Schwarz. It consists of a drone payload that can be used to make measurements in locations that are difficult to reach with conventional systems. This solution is the perfect tool for missions high above ground. Typical tasks include measurements on microwave links and interference hunting. Aerial systems can measure emissions with unprecedented efficiency where such measurements work best.

The R&S®AMS allows aerial monitoring and interference hunting measurements with proven Rohde & Schwarz quality – independent of the drone. The R&S®AMS payload itself comprises a spectrum analyzer, a VHF/UHF/SHF antenna, a GNSS receiver and antenna as well as a control PC. All components are securely attached underneath a drone.

Thanks to having its own power supply and communications module, the monitoring system is completely independent of the drone's infrastructure. With total weight as low as approximately 5 kg, standard medium-sized drones are entirely sufficient to flexibly deploy the system wherever it is needed.

## KEY FACTS

- ▶ Aerial monitoring and interference hunting
- ▶ Two antennas covering the frequency ranges from 300 MHz to 8 GHz and 4 GHz to 40 GHz
- ▶ Automatic and interactive measurement modes
- ▶ Independent of drone model and drone infrastructure
- ▶ Evaluation and reporting in R&S®ARGUS



# APPLICATIONS

The Rohde & Schwarz flying monitoring system is a payload that can be used with drones to make measurements at elevated heights. The system provides monitoring and analysis capabilities for VHF/UHF/SHF transmissions that are difficult to measure using conventional or handheld solutions. This can help national regulatory bodies to ensure coordinated usage of microwave frequencies, for example. Typical applications include monitoring of microwave links and interference hunting.

In the field of spectrum monitoring, microwave links will play an important role as 5G deployment accelerates and the number of mobile base stations increases worldwide. As a key method for service provision in the absence of fibers, the microwave range will be increasingly important in the context of the evolution of higher telecommunications standards such as 5G.

Due to the propagation characteristics in the SHF/EHF range, most microwave transmissions are point-to-point connections. To detect and measure such transmissions, the antenna must be positioned in the main lobe or sidelobe. This is very difficult using conventional mobile or handheld solutions since most transmissions take place between antennas on high masts or on top of tall buildings or at other elevated positions. However, a drone can easily carry the measurement equipment to the desired position.

Most microwave interference is not measurable from ground positions due to the nature of microwave propagation. This is a major problem that leaves operators in an uncomfortable situation by slowing down the detection and resolution of interference problems. The R&S®AMS elevates interference hunting to a new level that is much faster and more efficient. Instead of carrying conventional mobile or handheld equipment, the investigator can remain on the ground and simply navigate the drone.



# MICROWAVE MONITORING

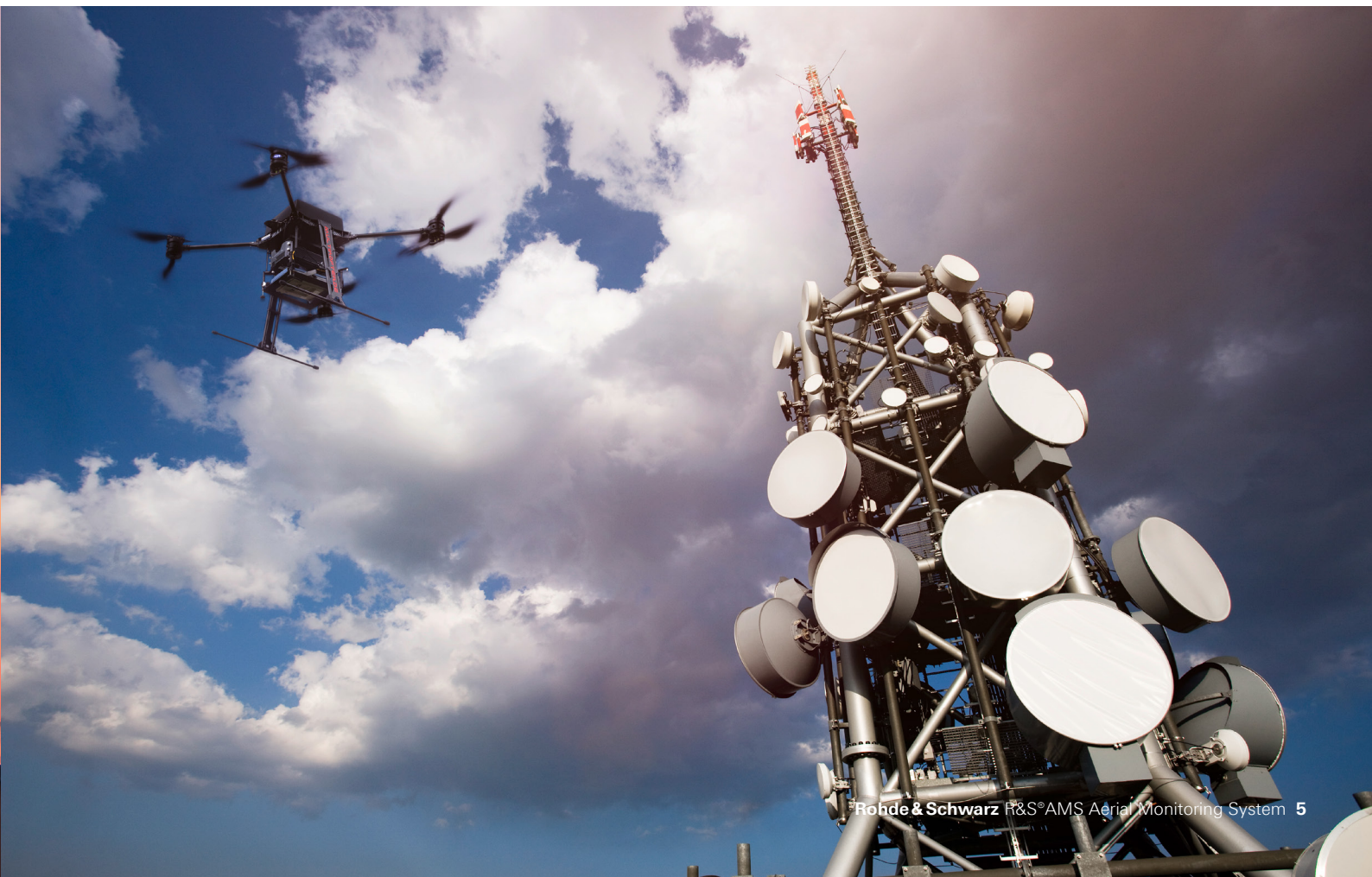
## Verification of license-compliant microwave links: easy and reliable

Regulators are responsible for monitoring the contractual compliance of radio traffic and identifying and resolving any non-conformities in the microwave bandwidths. With this new flying monitoring solution, Rohde&Schwarz is empowering customers to monitor and analyze microwave wireless transmissions.

Key parameters for every transmission are the center frequency, occupied bandwidth and level. The integrated spectrum analyzer measures multiple frequency bands of interest, displays the spectrum with high resolution and calculates the occupied bandwidth for each captured signal in line with the  $\beta$  % method as recommended by the ITU. Superimposing reference data, e.g. based on spectrum management information, clearly reveals whether thresholds are exceeded.

Another aspect of verifying license-compliant operation involves checking whether the transmitter uses the correct polarization. Comparing the spectra measured, e.g. with the antenna set to horizontal and vertical polarization, indicates the signal's actual polarization. This is compared to the signal's nominal polarization to verify proper operation.

In addition to enabling a detailed look at selected signals, the aerial monitoring solution is also a very efficient tool for quickly obtaining a comprehensive overview of a large part of the spectrum. By showing the true spectrum usage, it can help to detect unoccupied frequencies that can be assigned to further transmitters.





# INTERFERENCE HUNTING

## Fast and efficient

Interference is a growing problem in the microwave range as well. Analyzing the spectrum will reveal typical causes like adjacent channel interference and broadband noise. In many cases, microwave interference is not measurable from ground positions due to the nature of microwave propagation. The R&S®AMS aerial monitoring system makes it possible to easily carry the measurement equipment to the desired position. Elevated positions increase the chance of measuring a signal and thus enable efficient hunting.

Once the interfering signal has been identified, the analyzer can tune to its frequency and the drone performs a 360° rotation in azimuth. The orientation at which the highest level is obtained indicates the direction of the source of interference. Via the drone's camera, it might even be possible to recognize potential sources.

In the VHF/UHF range, detection and coarse location of interference sources can be efficiently handled using conventional monitoring solutions. The big challenge is to determine the precise location so that the interfering signal can be switched off. Common phenomena like reflection, refraction and multipath propagation impair the precision of classic location solutions. The results obtained often reveal only a coarse direction towards an area. Locating an unwanted signal with a handheld receiver and antenna is slow, inefficient and in many cases, simply not practical.

Instead of carrying the equipment up the mast, the operator can stay on the ground and simply navigate the drone. An aerial solution such as the R&S®AMS is much faster and more efficient.



# SYSTEM CONCEPT: R&S®AMS

## Monitoring elevated to a new level

The R&S®AMS payload includes an SHF antenna, a GNSS receiver and antenna as well as a control PC with a power supply, all integrated into the frame attached underneath the drone. The computer runs the control software that commands the R&S®Spectrum Rider FPH handheld spectrum analyzer to perform the measurements. All data is saved to the R&S®AMS control PC's internal SSD. Thanks to the system's integrated communications module, it is possible to control the measurements and observe the live spectrum and data on a PC on the ground.

The GNSS data provides the spatial reference for the measurements. The horn antenna included as standard covers a nominal frequency range from 4 GHz to 40 GHz. The antenna polarization can be easily changed by rotating the antenna while the drone is still on the ground. Rotation is possible between 0° and 135° in 45° steps.

Power is supplied via a battery pack. It is the same type as the one used in the R&S®Spectrum Rider FPH. A battery charger is supplied with the R&S®AMS. The system runs for approximately 8 h on a single battery charge. The payload is securely connected to the drone via drone-specific brackets.

In case the customer already owns an R&S®Spectrum Rider FPH, this device can be used. If not, the spectrum analyzer can be ordered separately. To provide a very economic and flexible approach, a drone is not included in the standard scope of delivery but can be ordered.





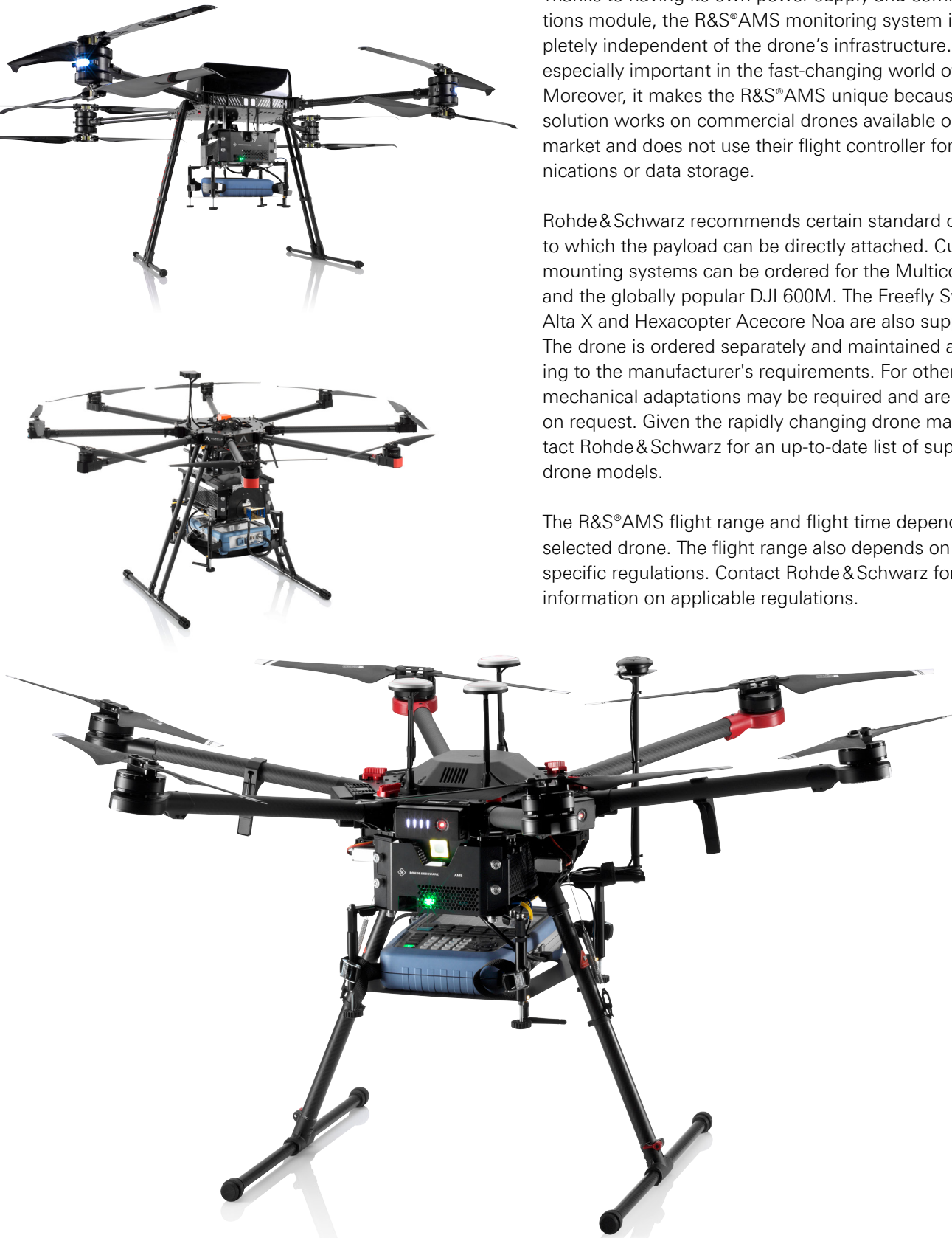
# SYSTEM CONCEPT: DRONE

Independent and flexible for everyone to use

Thanks to having its own power supply and communications module, the R&S®AMS monitoring system is completely independent of the drone's infrastructure. This is especially important in the fast-changing world of drones. Moreover, it makes the R&S®AMS unique because the solution works on commercial drones available on the market and does not use their flight controller for communications or data storage.

Rohde&Schwarz recommends certain standard drones to which the payload can be directly attached. Currently, mounting systems can be ordered for the Multicopter X25 and the globally popular DJI 600M. The Freefly Systems Alta X and Hexacopter Acecore Noa are also supported. The drone is ordered separately and maintained according to the manufacturer's requirements. For other drones, mechanical adaptations may be required and are available on request. Given the rapidly changing drone market, contact Rohde&Schwarz for an up-to-date list of supported drone models.

The R&S®AMS flight range and flight time depend on the selected drone. The flight range also depends on country-specific regulations. Contact Rohde&Schwarz for more information on applicable regulations.





# OPERATION MODE

For maximum operational flexibility, the R&S®AMS provides two different modes of operation: automatic and interactive.

## Automatic operation

In automatic mode, multiple measurements are pre-configured via the integrated R&S®AMS-SW control software, e.g. by a monitoring expert in the office. Switching on the system at the actual measurement location will initiate a system check. On successful completion of the check, the configured tasks will start immediately and the measured data is stored on the internal hard disk of the R&S®AMS control PC. No monitoring operator is required – just a pilot who navigates the drone. Back in the office, the monitoring expert can analyze the data and compile comprehensive reports.

## Interactive operation

In interactive mode, a monitoring expert (operator) and a drone pilot are at the measurement site. A network connection from the operator's laptop to the R&S®AMS control PC is established using the internal Wi-Fi. Via this link, the measurements are defined and controlled. The live spectrum is displayed on the operator's screen. In this way, the operator can if necessary react immediately by (re)configuring and starting/stopping the measurements. The operator can save the results to the R&S®AMS control PC's internal hard disk.

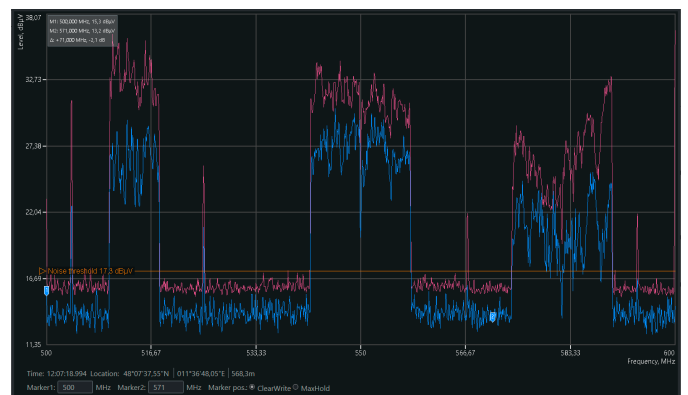
Wi-Fi is a registered trademark of Wi-Fi Alliance.

## Control software

The R&S®AMS-SW control software is an integral part of the R&S®AMS. It allows drone based in-flight measurements with data recording and postprocessing capabilities. Multiple frequency ranges can be defined that are measured with or without a monitoring expert being present on site. Data is displayed in real time in dedicated graphics featuring all the standard functions like multiple markers, zooming, panning and scaling. The R&S®AMS control PC's internal hard disk provides sufficient space for recording.

For specific parameters, the user can select from a list of values to ensure that only valid entries are made. In other cases, there are sanity checks to avoid any issues due to typos or invalid inputs. The status bar clearly shows information, warnings and error messages. These are just some features of the user-friendly GUI that make operation efficient.

Analysis functions include, for example, automatic evaluation of the signal's occupied bandwidth and examination of activities in specified ranges. Further postprocessing is possible using third-party tools after saving the data in .csv format. In addition, the R&S®ARGUS spectrum monitoring software for ITU-compliant spectrum monitoring provides sophisticated analysis and reporting capabilities for R&S®AMS data. All features of the R&S®ARGUS evaluation module are available to gain deep insight into the true signal scenario. The extended reporting capabilities provided by R&S®ARGUS, including multiple user-defined templates, allow comprehensive documentation with contents and formats tailored to individual needs.



Spectrum display on the integrated R&S®AMS-SW control software GUI.

## 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 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](http://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

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

## Rohde & Schwarz customer support

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

