

R&S[®]AMS AERIAL MONITORING SYSTEM

Monitoring elevated to a new level



Product Brochure
Version 01.00

ROHDE & SCHWARZ

Make ideas real



AT A GLANCE

The R&S®AMS aerial monitoring system is a payload for drones that provides monitoring and analysis capabilities for VHF/UHF/SHF transmissions that are difficult to reach by conventional mobile or handheld solutions. Typical applications include monitoring of microwave links and interference hunting in dense urban environments.

The R&S®AMS payload comprises a spectrum analyzer, a VHF/UHF/SHF antenna, a GNSS receiver and antenna as well as a control PC. All components are securely integrated into a lightweight but sturdy frame that is attached underneath a drone.

Thanks to its own power supply and communications module, the monitoring system is completely independent of the drone's infrastructure. With a total weight as low as approx. 5 kg, standard medium-sized drones are absolutely sufficient to flexibly move the system to 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

Due to the propagation characteristics in the SHF/EHF range, most microwave transmissions are point-to-point connections. To detect and measure them, the antenna has to be positioned in the mainlobe or sidelobe. This is very difficult for 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. A drone can easily carry the measurement equipment to the desired position. Typical monitoring tasks are to verify that legal transmitters operate within the technical specifications defined in their licenses and to detect illegal or unlicensed operation.

Monitoring of microwave links

Key parameters for every transmission are 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 β % method as recommended by the ITU. Superimposing reference data, e.g. based on spectrum management information, clearly reveals whether thresholds are exceeded.

Another aspect in verifying license compliant operation is to validate that 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 to quickly obtain a comprehensive overview of a large part of the spectrum. It will show the true spectrum usage and help detect unoccupied frequencies that might be assigned to further transmitters.

Interference hunting

Interference is a major issue also in the microwave range. Analyzing the spectrum will reveal typical causes like adjacent channel interference and broadband noise. Once the interfering signal has been identified, the analyzer can tune to its frequency, and the drone performs a 360° rotation in azimuth. The angle 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 are efficiently done by conventional monitoring solutions. The big challenge is to determine the precise location, so that the interfering signal can be switched off. Especially in dense urban areas, common phenomena like reflection, refraction and multipath propagation impair the precision of classic location solutions. The results obtained often reveal only the coarse direction toward an area or a couple of buildings. Locating the unwanted signal by use of a handheld receiver and antennas is slow, inefficient and in many cases not practical.

An aerial solution such as the R&S®AMS is much faster and more efficient. Instead of carrying the equipment up the stairs, the operator stays on the ground and simply navigates the drone. With the directional antenna pointed toward the building, the drone will fly in a systematic pattern across the front of the house, covering each floor and section. A look at the live spectrum displayed on the control laptop will very soon show behind which window an interfering transmitter is located. For this task, a second antenna covering the frequency range from 300 MHz to 8 GHz is available as an option.

OPERATION

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 preconfigured 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. There is no monitoring operator 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

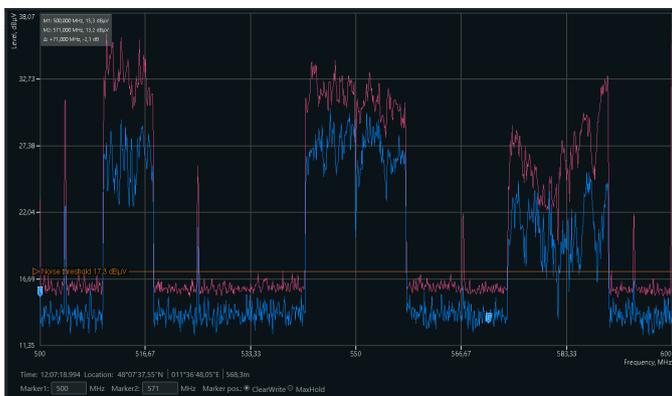
In interactive mode, a monitoring expert (operator) and a drone pilot are at the measurement site. A network connection from the operator's laptop to the R&S®AMS control PC is established using the internal Wi-Fi. Via this link the measurements are defined and controlled. The live spectrum is displayed 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.

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 which 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 approx. 4500 h of 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 which make operation efficient.

Analysis functions include, for example, automatic evaluation of the signal's occupied bandwidth and the examination of activities in the 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.

SYSTEM ASPECTS

The R&S®AMS payload includes an SHF antenna, a GNSS receiver and antenna and 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. It can also be used from 700 MHz with reduced sensitivity. Additionally, the R&S®AMS-OMNI1 omnidirectional antenna with a frequency range from 300 MHz to 8 GHz is available as an option. For both antennas, the polarization can easily be 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 approx. 8 h on a single battery charge.

The payload is securely connected to the drone via drone-specific brackets. Please be aware that the payload has a total weight of approx. 5 kg and select a drone that can carry this weight.

A drone of this type requires a licensed pilot in most countries. Please check the local legislation and regulations prior to operating the drone. The R&S®AMS is not certified for controlled airspace and can therefore only be used outside this space. Contact your airspace control authority for information on which airspaces require special certification and permissions. The R&S®AMS is designed for use in fair weather conditions. Do not use the payload in case of rain or snow.

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. Rohde & Schwarz recommends standard drones to which the payload can be directly attached. For other drones, mechanical adaptations may be required, which are available on request. Because of the rapidly changing drone market, please contact Rohde & Schwarz for an up-to-date list of supported drone models.

R&S®AMS aerial monitoring system, including a spectrum analyzer, microwave antenna, control PC and GNSS module.



SPECIFICATIONS IN BRIEF

Specifications in brief		
Frequency range	with horn antenna	4 GHz to 40 GHz ¹⁾ , 0.7 GHz to 4 GHz with limited sensitivity
	with omnidirectional antenna	0.3 GHz to 8 GHz
Dimensions	L × W × H	358 mm × 400 mm × 476 mm (14.09 in × 15.75 in × 18.74 in)
Weight	incl. R&S®Spectrum Rider FPH	5.2 kg (11.46 lb)
Operating temperature	incl. R&S®Spectrum Rider FPH	-10°C to +55°C
Operational altitude		< 4600 m
Battery life	operation independent of drone and R&S®Spectrum Rider FPH battery	8 h

For more information, see R&S®Spectrum Rider FPH handheld spectrum analyzer product brochure (PD 3607.2149.12).

¹⁾ Requires R&S®Spectrum Rider FPH model .44.

ORDERING INFORMATION

Designation	Type	Order No.
Base unit		
Aerial monitoring system, payload (including horn antenna from 4 GHz to 40 GHz, GNSS receiver and antenna, control PC with R&S®AMS control software), battery charger and transport case	R&S®AMS	3075.7501.03
Hardware options		
Omnidirectional antenna, 300 MHz to 8 GHz	R&S®AMS-OMNI1	3075.7701.02
Lithium-ion battery pack, 6.4 Ah	R&S®HA-Z306	1321.1334.02
Service options		
Extended warranty, one year	R&S®WE1	3598.9740S02
Extended warranty, two years	R&S®WE2	3598.9740S03
Extended warranty, three years	R&S®WE3	3598.9740S04
Extended warranty, four years	R&S®WE4	3598.9740S05

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ISO 9001

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ISO 14001

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