# R&S®ATS1000
# ANTENNA TEST SYSTEM

## 5G antenna characterization with a small footprint


Product Brochure
Version 03.00

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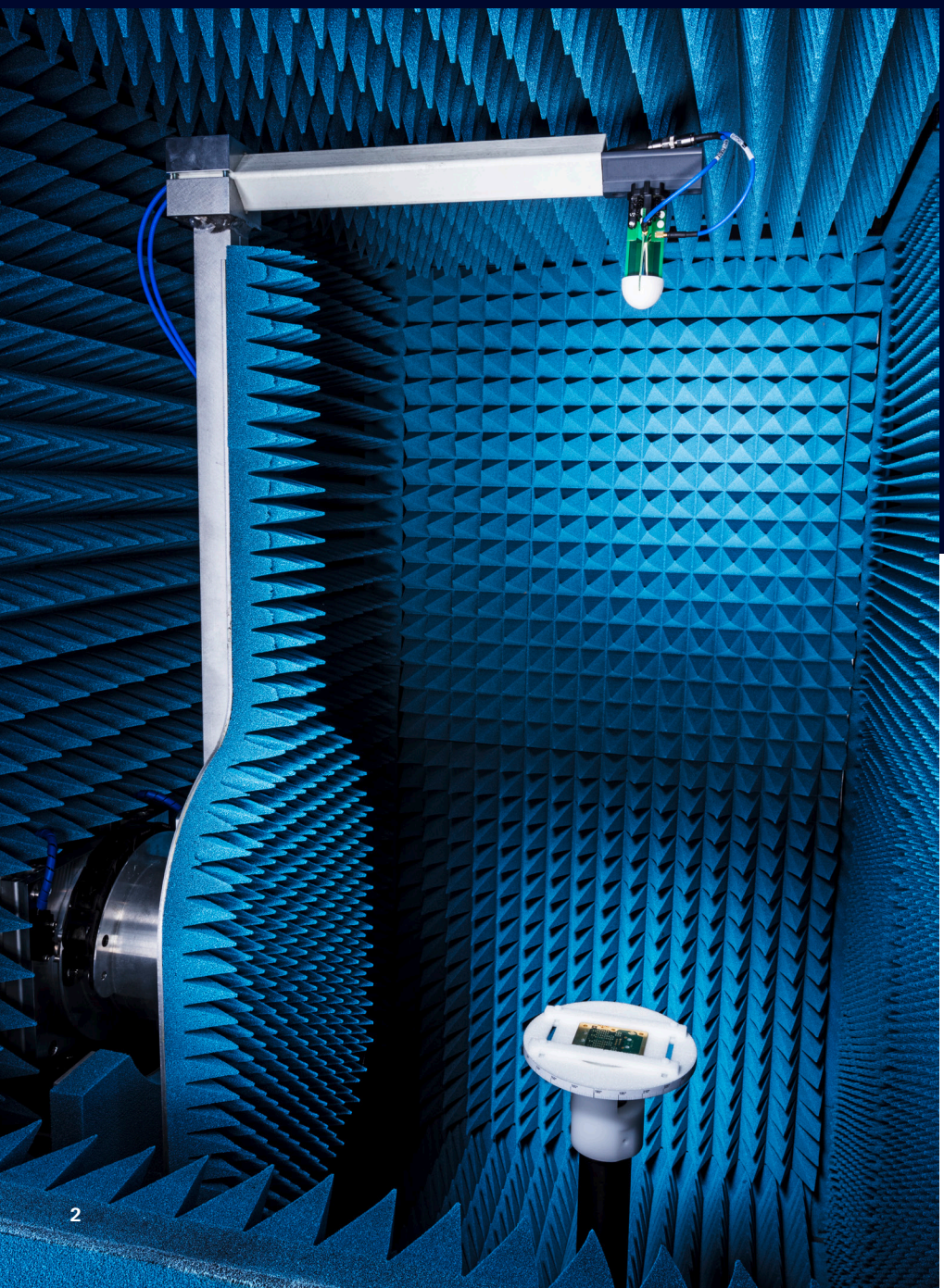
# AT A GLANCE

The R&S®ATS1000 antenna test chamber is the ideal environment for 5G antenna characterization throughout the entire process from R&D to production for both active and passive devices.

The compact design of the R&S®ATS1000 supports far-field and near-field antenna measurements inside any R&D lab space. The mobile chamber helps optimize the overall RF performance of antenna modules already in the initial phases of development, avoiding costly and time-consuming modifications for a large number of prototypes later on. Antenna testing during development reduces costs and keeps product launches on schedule with a faster time to market.

One-stop-shop solutions combine the R&S®ATS1000 with a Rohde&Schwarz test system for fast and smooth measurements in the lab and optimized capabilities for determining 5G device antenna performance and characteristics in the millimeter range.

In summary: The R&S®ATS1000 antenna test system is a convenient and highly accurate solution for testing 5G antenna modules and all antennas designed for millimeter wave frequencies in a mobile shielded chamber.



# KEY FACTS

- Extremely fast and accurate 3D antenna characterization
- Designed for maximum compactness and mobility: includes wheels and easily fits next to a 19" rack
- Chamber frequency range from 18 GHz to 87 GHz
- Greater than 50 dB shielding effectiveness up to 87 GHz
- Broadband measurement antenna from 4 GHz to 87 GHz with very low radar cross section
- Passive (magnitude and phase) and active (TRP, EiRP, TIS, EiS, EVM) antenna measurements
- Near-field to far-field transformation with the R&S®AMS32 OTA performance measurement software
- One-stop-shop for 5G device measurements: R&S®ATS1000 chamber, R&S®AMS32 software, test instruments

# BENEFITS



# APPLICATIONS



5G is all about data, speed and reliability using high frequency millimeter wave bands. The lack of conventional external RF connectors make 5G antenna characterization challenging. 5G antenna, chipset and UE manufacturers as well as wireless network operators need a viable solution for research, diagnostics and debugging up to type approval.

# EXTREMELY FAST AND ACCURATE 3D ANTENNA CHARACTERIZATION

5G is all about speed and reliability. The high precision conical cut positioner integrated in the R&S®ATS1000 enables extremely fast and accurate antenna characterizations.

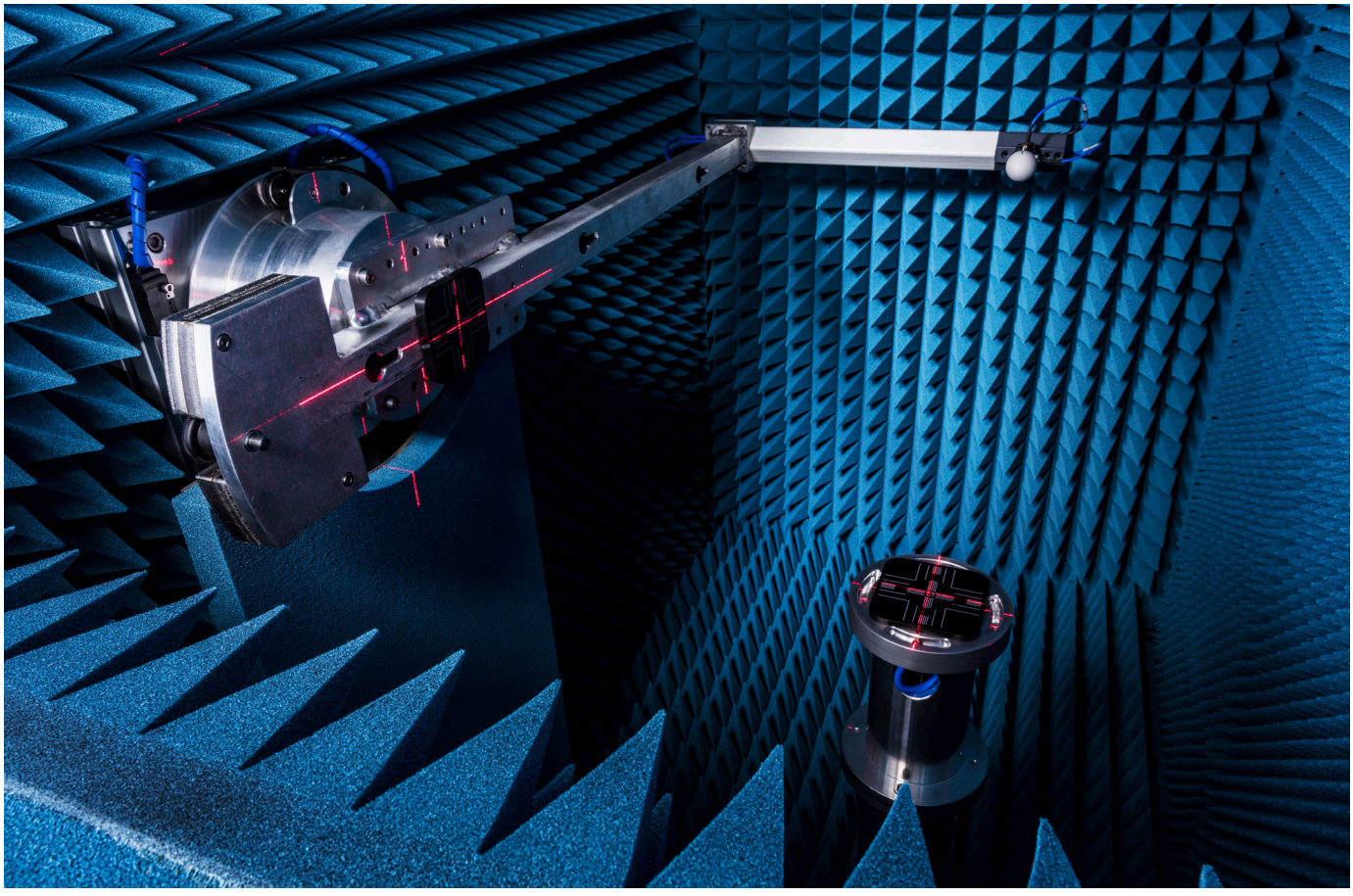
The conical cut positioner allows high-precision azimuth and elevation movements with extremely high repeatability and angular resolutionn for accurate 3D antenna measurements.

Most passive antenna modules require wiring for multiple signals such as power supply, USB communications and Ethernet. This is absolutely no problem in the R&S®ATS1000 thanks to the rotary joints and wiring inside the turntable for complete 3D measurements of a device under test (DUT).

Different DUT holders and fixtures enable convenient measurements for different sizes and weights. The holders are made of an RF transparent material to reduce reflections in the chamber.

Accurate DUT positioning and RF calibration are essential for high-precision results. Cross lasers integrated in the chamber ensure maximum precision for proper DUT alignment.

Typical testing speed: 9 minutes for full 3D radiation patterns with 4° equidistant steps in azimuth and elevation at 55 frequencies from 26.5 GHz to 40 GHz.

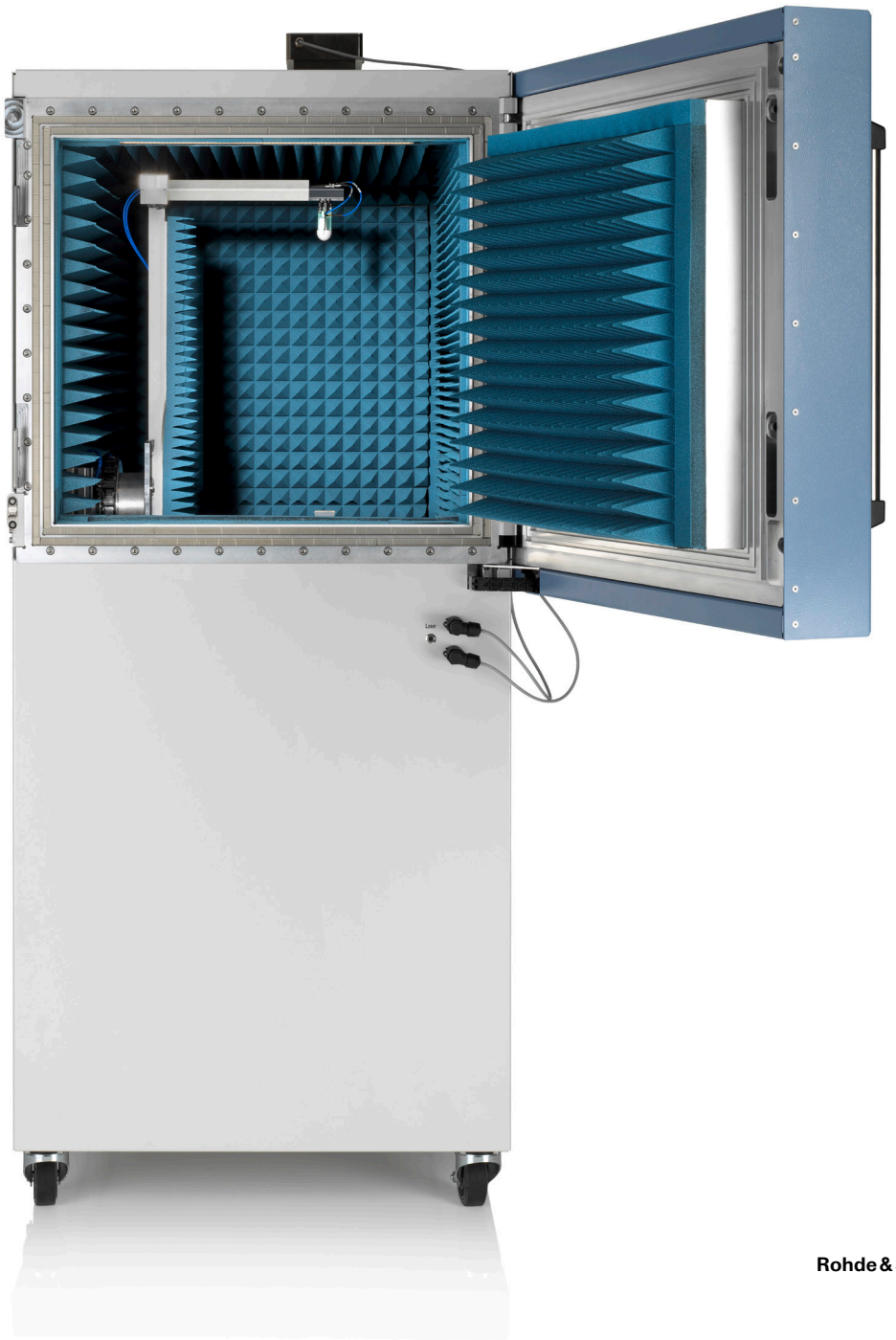


# DESIGNED FOR MAXIMUM COMPACTNESS AND MOBILITY

## The compact and versatile R&S®ATS1000 fits into any lab with a small footprint of about 1.3 $m^2$.

Developers no longer need large, external antenna chambers in a fixed location to test and optimize products in the design phase and can avoid measurement bottlenecks, since the chambers are usually booked long in advance. A mobile shielded chamber can be easily shared among multiple departments for a higher return of investment.

The R&S®ATS1000 provides a high performance shielded and anechoic environment over a wide frequency range from 18 GHz to 87 GHz. The decisive advantage of the R&S®ATS1000 is measurement accuracy as high as that of stationary and much larger antenna chambers in a compact form. The R&S®ATS1000 fits into any lab and does not require investment in new infrastructure.

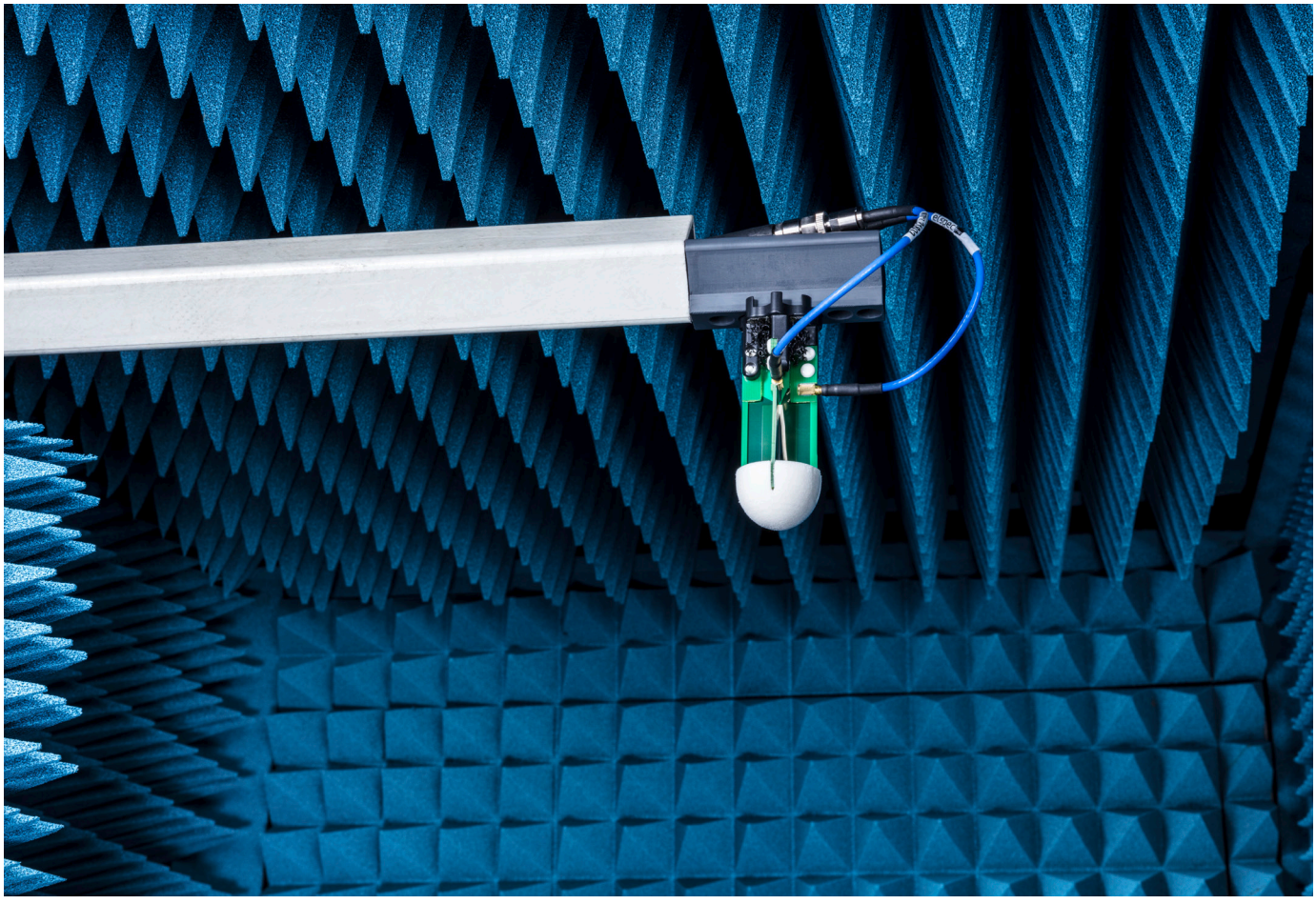


# SHORTEST CALIBRATION TIME, BROADBAND MEASUREMENTS

The measurement probe integrated in the R&S®ATS1000 is the R&S®TC-TA85CP cross-polarized Vivaldi antenna operates from 4 GHz to 87 GHz with high gain (VSWR < 2.5).

The R&S®TC-TA85CP cross-polarized Vivaldi antenna features a much smaller radar cross section than horn antennas, preventing internal reflections in the chamber. The R&S®TC-TA85CP is cross-polarized to reduce measurement times in half thanks to simultaneous vertical and horizontal polarization measurements.

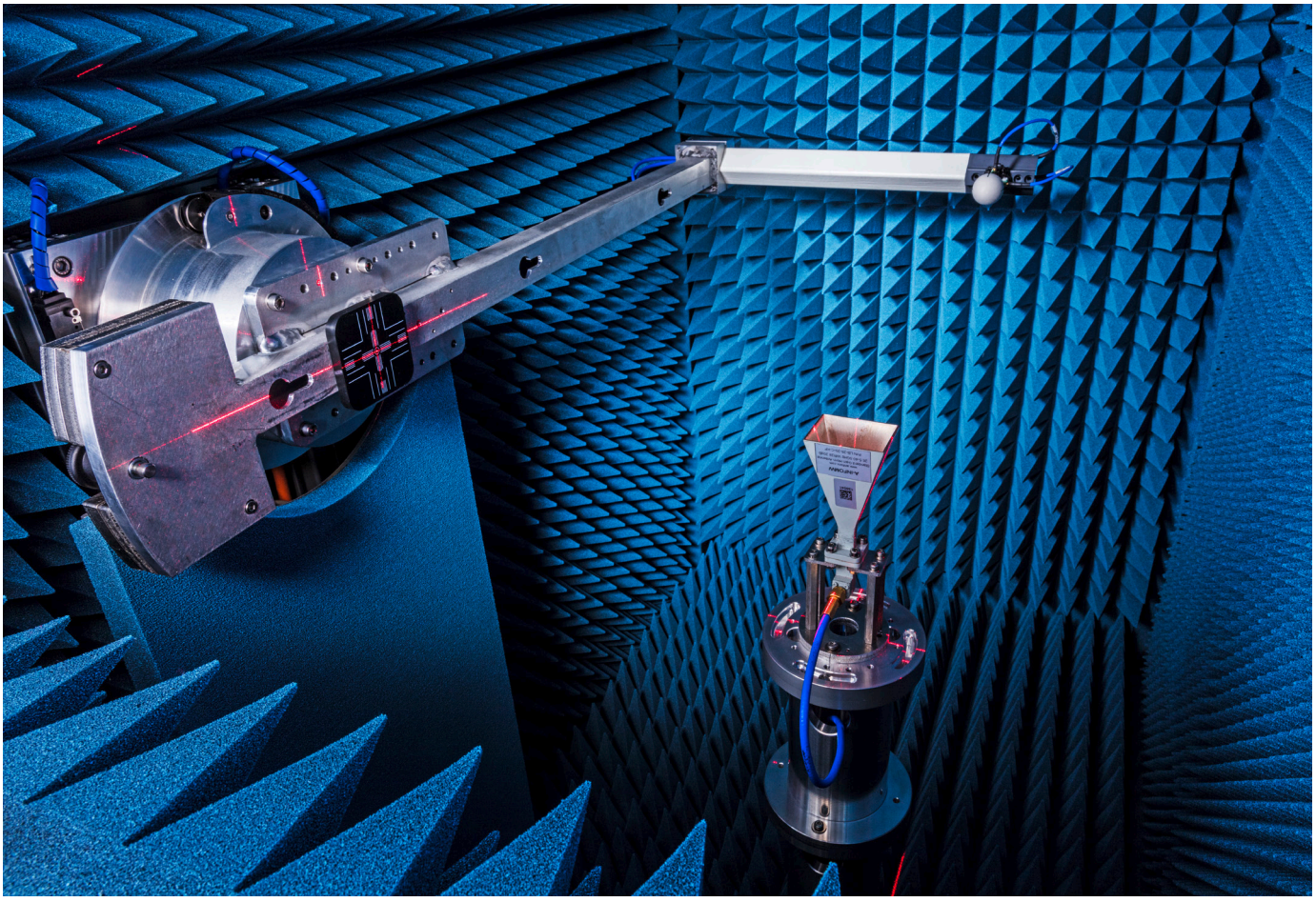
System calibration time is also significantly decreased thanks to the broadband characteristics of the measurement antenna. Measurement antennas no longer need to be switched out when calibrating the system for different frequency bands with the R&S®TC-TA85CP cross-polarized Vivaldi antenna. This leads to very short calibration times, some as quick as a couple of minutes.



# FAR-FIELD MEASUREMENTS IN A SMALL FOOTPRINT

## Most future 5G test cases will be under far-field conditions, particularly for transceiver measurements such as channel power, EVM and ACLR.

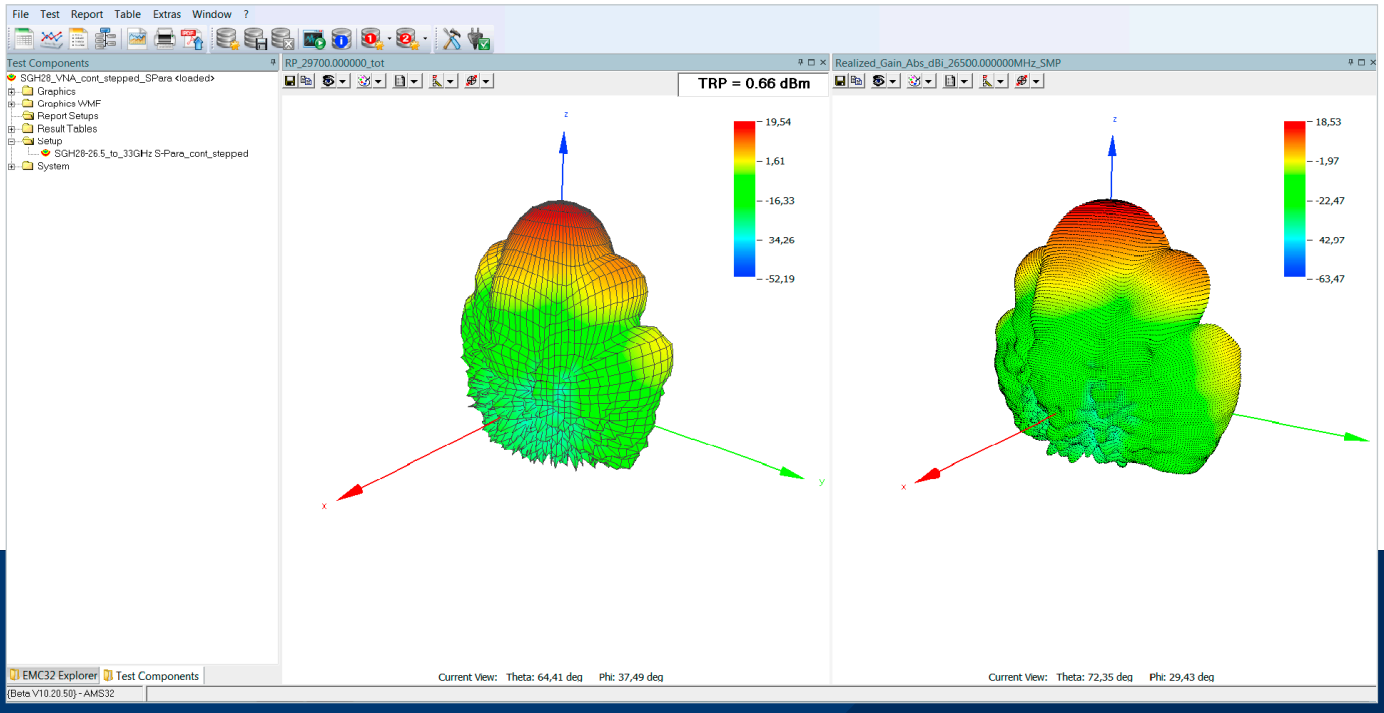
The flexibility of the R&S®ATS1000 and the variable height of the elevation arm results customizable range lengths, for far-field measurements in a compact setup. This can be useful when measurements at a closer distance are required due to high free space path loss.



# NEAR-FIELD TO FAR-FIELD TRANSFORMATION

When the device under test exceeds the maximum size for far-field conditions, a near-field to far-field transformation is necessary for increased measurement accuracy.

The R&S®AMS32 software not only controls the measurement equipment, positioner and automates the 3D measurements; but also contains new features and options to perform fast near-field to far-field transformations with arbitrary or uniform grid sampling.



A wide range of different antenna characterization and parameterization measurements are possible within the R&S®ATS1000. Either passive modules such as an antenna array or 5G active devices need to be qualified. The R&S®ATS1000 is the perfect combination with other Rohde&Schwarz measurement instruments to perform this analysis.

# 5G ANTENNA MODULE TESTS

## Passive and active measurements using CW signals

In the early stages of antenna module development, a fast check using continuous wave (CW) signals helps R&D design teams improve module designs. A four-port Rohde&Schwarz vector network analyzer is the only thing needed to perform passive measurements (magnitude and phase) with CW signals for both orthogonal polarizations at the same time. Combined with the conical cut positioner and hardware triggering, near-field measurements are almost as fast as direct far-field measurements. Complete 3D characterization of a device with accurate angular step resolution can be done in just a few minutes.

Active measurements such as EiRP and TRP can also be done with the same setup.

Following measurements are possible with such scenario.

- Directivity, gain, realized gain
- Efficiency
- Beamwidth
- EiRP, TRP
- 2D and 3D patterns
- Phase measurements for near-field to far-field transformation

All measurements are implemented in the R&S®AMS32 OTA performance measurement software.

# 5G TRANSCEIVER MODULE TESTS

## Passive and active measurements using modulated signals

In the advanced development stages and debugging phases of 5G devices, measurements that use modulated signals are needed for high first-time pass rates during final type approval to save time and money.

The tests required in R&D and quality assurance are fast and easy when the R&S®ATS1000 and Rohde&Schwarz vector signal generators and spectrum analyzer (e.g. R&S®SMW200A and R&S®FSW) are combined.

The following parameters can be measured using modulated signals:

- EVM (error vector magnitude)
- ACLR (adjacent-channel leakage ratio)
- SEM (spectrum emission mask)
- Directivity, gain, realized gain
- Efficiency
- Beamwidth
- EiRP, TRP, channel power
- 2D and 3D beamforming pattern

# SPECIFICATIONS IN BRIEF

| Specifications in brief | | |
|---|---|---|
| Frequency range | | 18 GHz to 87 GHz [1] |
| | with R&S®ATS-CSRF1 RF cable set | 18 GHz to 40 GHz |
| | with R&S®ATS-CSRF2 RF cable set | 18 GHz to 50 GHz |
| | with R&S®ATS-CSRF3 RF cable set | 18 GHz to 67 GHz |
| Shielding effectiveness | 18 GHz to 87 GHz | > 50 dB |
| Dimensions (W × H × D) | outside dimensions including handles | 0.90 m × 1.99 m × 1.53 m [2]<br>(2.95 ft × 6.53 ft × 5.02 ft) |
| | inside width | 0.47 m × 1.25 m × 0.92 m<br>(1.54 ft × 4.10 ft × 3.02 ft) |
| Wheels | | 4 |
| Weight | without positioner | 300 kg (661.4 lb) |
| | with positioner | 350 kg (771.6 lb) |
| | with positioner and wooden transportation box | 540 kg (1190.5 lb) |
| Door operation | | manually operated, electrical closing mechanism |
| Conical cut positioning system | | |
| Angular resolution | azimuth/elevation | 0.03° |
| Positioning repeatability | azimuth/elevation | 0.1° |
| Load capability | weight | 20 kg (44.1 lb), centered |
| | maximum dimensions of the DUT | 20 cm × 20 cm (7.9 in × 7.9 in) |
| Measurement antenna (R&S®TC-TA85CP) | | |
| Frequency range | nominal | 6 GHz to 85 GHz |
| | extended | 4 GHz to 87 GHz |
| Polarization | dual polarized | |

[1] Measurement antenna up to 87 GHz. Direct RF measurements up to 67 GHz, depending on internal RF cable set.
[2] Outer dimensions including the R&S®ATS-LASER option: 0.984 m × 2.1 m × 1.53 m.

# ORDERING INFORMATION

For ordering information, see specifications (PD 5214.7170.22) and www.rohde-schwarz.com

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PD 5214.7170.12 | Version 03.00 | December 2024 (ch)
R&S®ATS1000 Antenna Test System
Data without tolerance limits is not binding | Subject to change