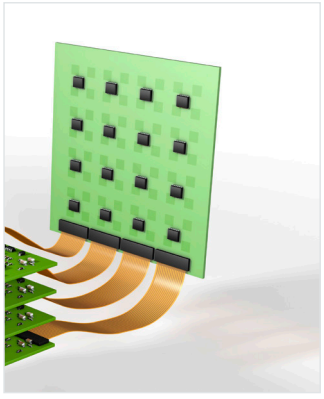
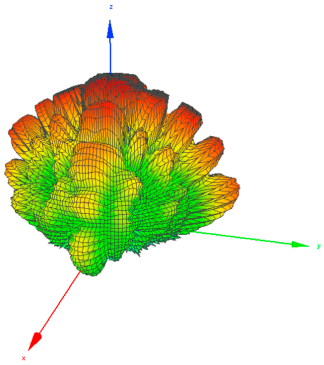
# OTA CHARACTERIZATION OF PHASED ARRAY ANTENNAS AND ANTENNA IN PACKAGE (AIP)

With its small footprint, the R&S®ATS1000 antenna test system is the ideal direct far-field OTA system to test phased array antennas. The system tests and optimizes the radiation characteristics of any modules using the AiP technology from 18 GHz to 87 GHz.





## Your task

AiP will give customers an advantage in the ever-changing technological scene and pave the way for elegant 5G antenna solutions and other millimeterwave applications. Modules using AiP will miniaturize the antenna. These modules will also have more antenna elements, which increases radiation gain and enables more economical and energy efficient solutions.

Challenges arise when chip manufacturers are confronted with the key design constraints of phased array antennas. Since RF components are fully integrated into the self-contained module, conducted tests are no longer feasible. Requirements for module optimization and validations all point to over-the-air (OTA) tests during system level testing, integration and production. Millimeterwave beamforming demands accurate, reliable and efficient solutions.

## T&M solution

The R&S®ATS1000 antenna test system is a shielded chamber solution ready to address the diverse antenna testing market, especially highly integrated frontends of phased array antennas. Each element of the phased array antenna can also be characterized individually with the R&S®AMS32 software. The R&S®ATS1000 fulfills all testing requirements for 3D antenna pattern characterization and antenna system characterization of AiP. The system performs fast and reliable measurements in direct far-field conditions in a fully anechoic chamber over the wide frequency range from 18 GHz to 87 GHz.

To complement the R&S®ATS1000, a variety of state-of-the-art Rohde&Schwarz test and measuring instruments are available for testing AiP OTA parameters such as TRP, EiRP and 3D patterns. One example is the R&S®ZNA, a high-quality vector network analyzer (VNA) with high measurement throughput, which accurately generates and measures CW signals simultaneously.

In addition, the R&S®SMW200A vector signal generator couples with the R&S®FSW signal and spectrum analyzer to verify parameters such as ACLR, EVM and BER. The R&S®ATS1000 accurately generates, measures and analyzes complex modulated signals and provides valuable insights to further enhance the RF properties of AiP modules.

### Far-field scanner and 3D radiation patterns

AiP modules fit easily into the R&S®ATS1000 for direct far-field OTA measurements. Moreover, the high-precision conical cut positioner allows movements with extremely high repeatability and an angular resolution of 0.03° for both azimuth and elevation. Hardware triggering facilitates fast and accurate RF characterization of phased array antennas.

### Compact, mobile and accurate

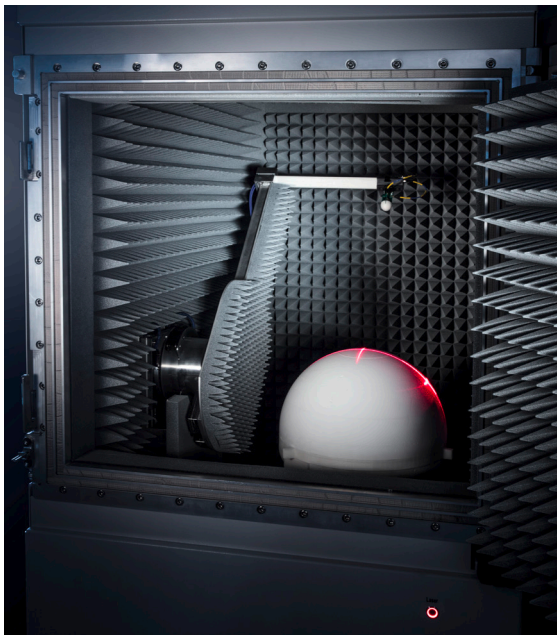
Investing in a fixed test chamber means generally losing a significant amount of floor space in the facility. However, the mobile R&S®ATS1000 can fit into any lab with its small footprint of 1.3 m². The chamber size is comparable to a 19" rack but offers the same measurement accuracy as a conventional antenna chamber three times its size.

### Extreme temperature test

Radiation patterns of miniaturized antennas can be influenced by temperature, so thermal diagnosis is gaining traction, especially in AiP. The R&S®ATS1000 can be retrofitted with a temperature testing option to perform fast and precise 3D thermal measurements from –20 °C to +85 °C.

## Key features and benefits

- Fast and accurate characterization of phased array antennas and AiP
- Compact and portable system
- Wide frequency range from 18 GHz to 87 GHz
- Direct far-field measurements with a quite zone 7 cm in diameter
- Integrated high-precision conical cut positioner with a 0.03° angular resolution
- Passive antenna measurements (magnitude and phase) and active antenna measurements (TRP, EiRP, TIS, EiS, EVM)
- 3D extreme temperature test from –20 °C to +85 °C
- NF-FF transformation with the R&S®AMS32 test measurement and control software
- One-stop shop for antenna measurements: R&S®ATS1000 chamber, R&S®AMS32 software and test instruments



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OTA characterization of phased array antennas and antenna in package (AiP)
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