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R&S®ATS1500C ANTENNA TEST CHAMBER FOR AUTOMOTIVE RADAR SENSORS

Antenna characterization, validation and calibration in a small footprint

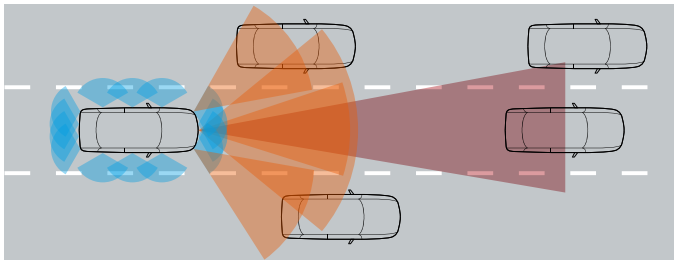
Flyer | Version 05.00

AT A GLANCE

The R&S®ATS1500C antenna test chamber is a CATR based compact, movable antenna test chamber for calibration and validation of automotive radar sensors. It is carefully designed to eliminate ghost targets within the chamber during target simulation tests and includes a highly accurate positioner for angular measurements.

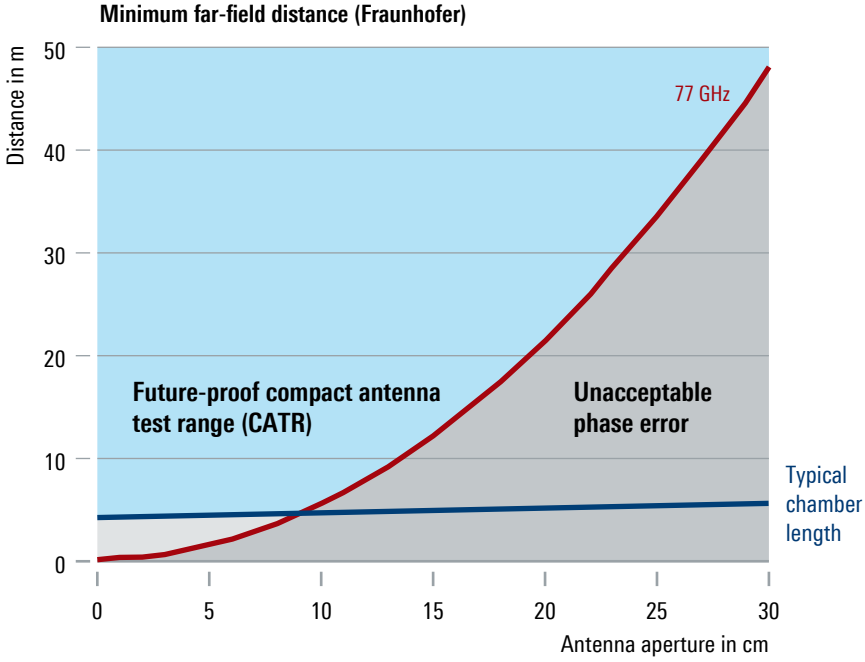
The R&S®ATS1500C antenna test chamber and the R&S®AREG800A automotive radar echo generator form the most complete system on the market for automotive radar sensor development, validation, calibration and compliance testing. The system can be enhanced with the R&S®FSW43 signal and spectrum analyzer and the R&S®SMW200A vector signal generator.

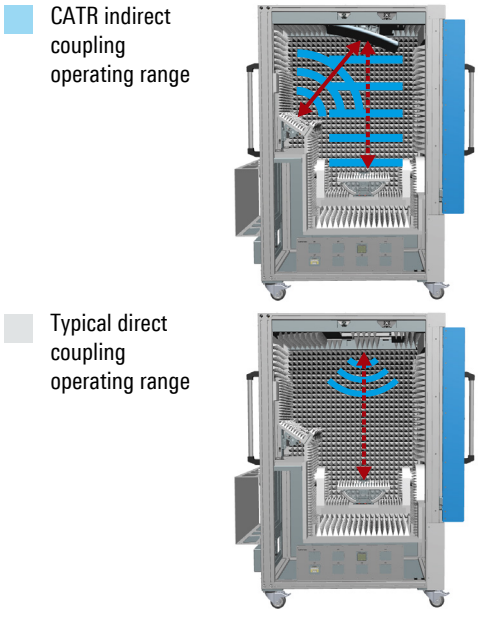
Vehicle equipped with automotive radar sensors



The next generation of advanced driver assistance systems (ADAS) and autonomous driving (AD) systems are coming soon and automotive radar sensors are increasingly important to road safety and driver convenience. Validating radar module compliance, functionality and accuracy will require reliable and high-precision test systems.

4D imaging radar combines higher angular resolution with large fields of view in the azimuth and elevation, which demands larger antenna apertures. Accurate EIRP is a key parameter for characterizing radar sensor RF performance and far-field measurements with a plane radar wave are needed. The Fraunhofer formula defines the minimum distance between the radar and the feed antenna in a direct coupling setup. 4D imaging radars may require large distances (over 10 m). Apart from the challenges involved in building anechoic chambers of this size, path loss from the required air gaps make precise and reproducible measurements difficult. A compact antenna test range (CATR) chamber is the solution. A CATR with a parabolic reflector transforms spherical radar waves into plane waves and generates a quiet zone with far-field conditions, all in a very small footprint. The quiet zone has no path loss, making accurate and highly reproducible measurements easy for different types of radar.





The fully shielded R&S®ATS1500C chamber is a CATR with a gold-plated parabolic reflector, a two-axis positioner for 3D movement, and the R&S®AREG800A frontend antenna as the feed. A universal feed antenna supporting 60 GHz to 90 GHz can be deployed for even more flexible use of the chamber in combination with the R&S®AREG800A frontend or a generic WR12 waveguide feedthrough. The universal feed antenna has an orthomode transducer that separates horizontal and vertical polarizations, which can be simultaneously accessed via two waveguide feedthroughs.

The patented parabolic reflector from Rohde&Schwarz has a precisely polished, very smooth surface to minimize quiet zone ripple, critical at high frequencies. The rolled reflector edges are optimized for uniform power distribution of reflected, collimated beams from the feed antenna or DUT. The CATR setup works bidirectionally for transmit and receive signals.

Although the R&S®ATS1500C is remarkably compact (W × H × D = 0.90 m × 1.99 m × 1.53 m), the future-proof CATR system can make measurements under far-field conditions for coming generations of 4D imaging radars. The chamber supports sensor antenna apertures up to ∅ 30 cm. The high-precision 3D tilt-tilt positioner was carefully designed to mimic radar sensors in operation. Both axes can be operated individually or in combination to simulate target detection under real-world conditions and measure 3D antenna patterns. The positioner has far better angular resolution and repeatability than coming 4D imaging radars.

The optional hardware trigger allows measurements to be synchronized while positioner axes are in continuous movement, significantly reducing measurement time.

The positioner axes swing in a circular motion so that the DUT polarization and distance are always aligned with the feed antenna.

The R&S®ATS1500C fully supports 3D radiation measurements under extreme temperatures to analyze how they affect a DUT. An isolated yet RF transparent enclosure can be placed on the 3D positioner for a tilt angle range of ±15° on the inner axis. The DUT is placed inside an enclosure which can be heated or cooled with an external thermal stream device. The dome-shaped lid is made from an RF transparent material that tightly encloses the DUT and has little to no influence on RF radiation. The enclosure size can also comfortably accommodate bigger devices for extreme temperature testing. Thickly insulated, temperature resistant hoses run through a specially designed air rotary joint.

APPLICATIONS

The R&S®ATS1500C and R&S®AREG800A setup can be complemented with other Rohde&Schwarz state-of-the-art T&M instruments to accommodate a variety of applications, including ETSI RED and FCC in-band precompliance tests, interference tests, angular calibration and antenna characterization; making it a future-proof must-have test system for every automotive radar chip or module developer.

KEY FACTS

- Highly compact, portable far-field over-the-air (OTA) test system based on CATR technology
- State-of-the-art CATR reflector with optimized edges for uniform power distribution and with high-precision surface finishing for minimal quiet zone deviations
- Large quiet zone to accommodate all types of radars including large 4D imaging radars
- For testing automotive radar sensors in the frequency range from 76 GHz to 81 GHz with the R&S®AREG800A
- Extended frequency range (60 GHz to 90 GHz) when using the universal feed antenna and a waveguide feedthrough
- Vertical and horizontal polarization can be accessed in parallel using the universal feed antenna and two waveguide feedthroughs
- High-precision, high-speed 3D tilt-tilt positioner for very short test times
- Optional hardware trigger to synchronize measurements with continuously moving positioner axes
- Optional enclosure for extreme temperature tests covering complete automotive radar module temperature range from –40 °C to 85 °C
- High shielding effectiveness of typically > 90 dB and extremely low reflections to eliminate ghost targets
- Multiple standardized interfaces for control purposes and data transmission
- RF shielded ventilation system to maintain a stable temperature during measurements
- Suitable for ETSI and FCC validation, including interference tests, angular calibration and antenna characterization

SPECIFICATIONS IN BRIEF

Specifications in brief		
Frequency range	chamber	18 GHz to 90 GHz
	with R&S®AREG8-81S mmWave remote frontend	76.0 GHz to 81.0 GHz
	with R&S®ARC-FX90 universal feed antenna	60 GHz to 90 GHz [1]
Shielding effectiveness	chamber	> 90 dB (meas.)
Polarization	feed antenna	linear (vertical or horizontal polarization); both polarizations in parallel with R&S®ARC-FX90 universal feed antenna and R&S®ARC-FX90UP upgrade kit
Quiet zone [2]	reflector	Ø 30 cm
	average amplitude taper	< 1.5 dB (meas.) [3]
	average amplitude ripple	< 0.5 dB (meas.) [3]
	phase taper	< 12° (meas.) [4]
Path loss	with R&S®ARC-FX90 universal feed antenna	58 dB (meas.) [4]
Angular resolution	readback resolution	0.03° (inner and outer axis) (nom.)
Tilt angle	outer axis	±180°
	inner axis	±45° (±15° with R&S®ARC-TEMP installed)
DUT load capability	positioner	4.0 kg, centered
Hardware triggering	positioner	optional (requires BNC feedthrough)
Feedthrough options for communication with DUT	chamber	USB 2.0, D-Sub9, Ethernet
Application programming interfaces	positioner	yes (C, C++, C#, VB.NET, Python, MATLAB®, and more)
Power supply	chamber	100 V to 120 V/200 V to 240 V (AC), 50 Hz to 60 Hz/max. 5 A
Weight	chamber	460 kg (1014.13 lb)
Dimensions (W × H × D) [5]	chamber	0.90 m × 1.99 m × 1.53 m (35.43 in × 78.35 in × 60.24 in)
Temperature range	operating temperature range	+20 °C to +30 °C

For more information, see specifications (PD 3608.2065.22)

[1] Up to 3 dB higher attenuation from 57 GHz to 60 GHz.
[2] In line with IEEE 149™-2021.
[3] Measured at 76.5 GHz.
[4] Measured at 67 GHz.
[5] Dimensions include all mounts and handle bars attached to the chamber (depth). If an optional banana plug feedthrough is mounted, the width is extended by 16 mm.

Ordering information

For ordering information, see specifications (PD 3608.2065.22) and www.rohde-schwarz.com

Rohde&Schwarz
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R&S®ATS1500C Antenna Test Chamber for Automotive Radar Sensors
Data without tolerance limits is not binding | Subject to change
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