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

Product Flyer | Version 04.00

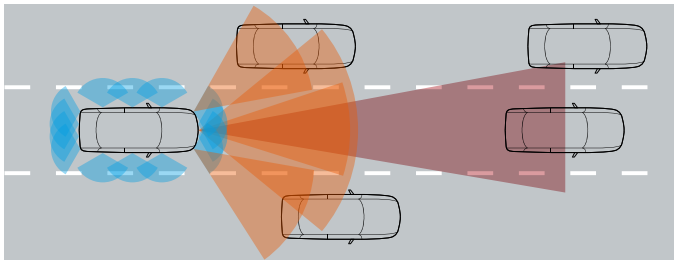
Antenna characterization, validation and calibration in a small footprint

AT A GLANCE

The R&S®ATS1500C antenna test chamber is a CATR based compact, movable antenna test chamber for calibration and validation of 77 GHz and 79 GHz 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 together with the R&S®AREG800A automotive radar echo generator is the most complete system on the market for automotive radar sensor development, validation, calibration and compliance testing. The system can optionally be enhanced with other instruments like the R&S®FSW43 signal and spectrum analyzer and the R&S®SMW200A vector signal generator.

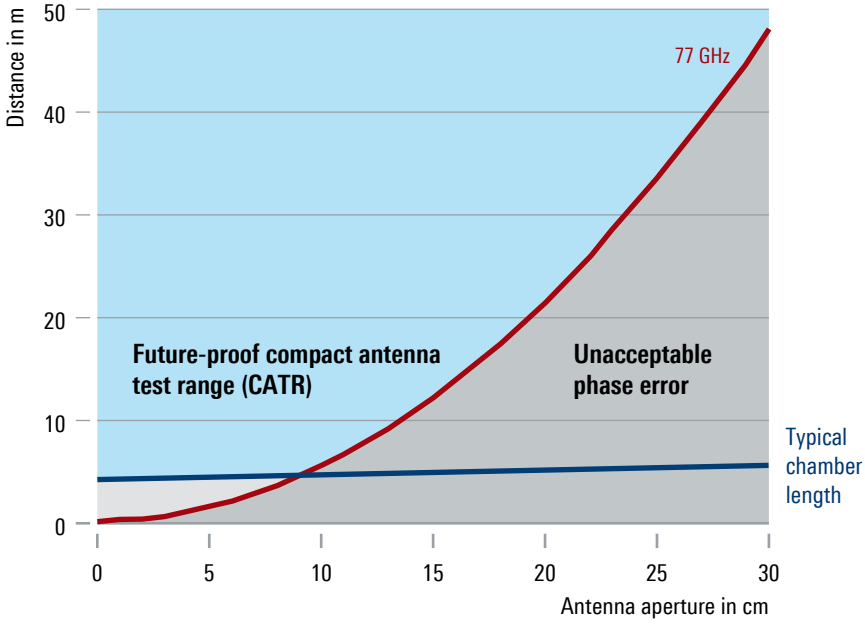
Vehicle equipped with automotive radar sensors

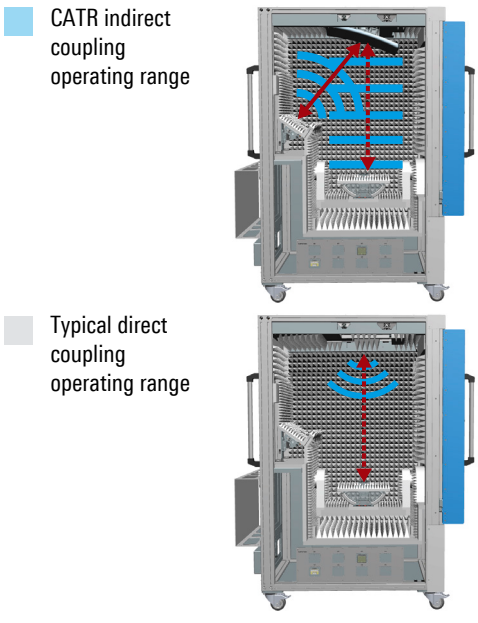


With the next generation of advanced driver assistance systems (ADAS) and autonomous driving (AD) right around the corner, automotive radar sensors will play an increasingly important role in improving road safety and driver convenience. A reliable and highly accurate test system is therefore required to validate compliance, functionality and accuracy of the radar modules.

The trend toward 4D imaging radars comes with higher angular resolution in combination with large fields of view in azimuth and elevation. Antenna apertures are therefore becoming increasingly larger. EIRP is one of the key parameters for characterizing the RF performance of radar sensors, and measurements need to be performed in the far field with a plane radar wave. The minimum distance between the radar and the feed antenna in a direct coupling setup is defined by the Fraunhofer formula. For 4D imaging radars, large distances far beyond 10 m may be required. Apart from the challenges involved in building anechoic chambers of this size, the path losses due to the required air gaps make precise and reproducible measurements difficult. The solution is a compact antenna test range (CATR) chamber, where a parabolic reflector transforms the spherical radar wave into a plane wave and generates a quiet zone with far-field conditions while offering a very small footprint. There is no path loss in the quiet zone, which makes it easy to perform accurate and highly reproducible measurements on different types of radars.

Minimum far-field distance (Fraunhofer)





The fully shielded R&S®ATS1500C chamber is a compact antenna test range (CATR) consisting of a gold-plated parabolic reflector, a two-axis positioner allowing for 3D movements, and the R&S®AREG800A frontend antenna as the feed antenna. Alternatively, a universal feed antenna supporting 60 GHz to 90 GHz can be deployed that allows an even more flexible use of the chamber, i.e. it can be used in combination with the R&S®AREG800A frontend or via a generic WR12 waveguide feedthrough. The universal feed antenna includes an orthomode transducer that separates the horizontal and vertical polarizations, which can be accessed simultaneously via two waveguide feedthroughs.

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

Although the R&S®ATS1500C has a remarkably compact size of 0.90 m × 1.99 m × 1.61 m (W × H × D), the future-proof CATR system will allow measurements under far-field conditions even for the upcoming 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 to measure 3D antenna patterns. The positioner offers significantly better angular resolution and repeatability than upcoming 4D imaging radars.

The optional hardware trigger allows measurements to be performed while the positioner axes are in continuous movement. This significantly reduces measurement time.

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

APPLICATIONS

The setup of the R&S®ATS1500C and R&S®AREG800A can be further complemented by other Rohde&Schwarz state-of-the-art test and measurement 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 polarizations accessible in parallel using the universal feed antenna and two waveguide feedthroughs
- High-precision high speed 3D tilt-tilt positioner for very short test times
- 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		
In-band frequency range	with R&S®AREG8-77S mmWave remote frontend	76.0 GHz to 77.0 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
Out-of-band frequency range [1]	chamber	6 GHz to 110 GHz
Shielding effectiveness	chamber	> 90 dB (typ.)
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
	average amplitude ripple	< 0.5 dB
Angular resolution	readback resolution	0.03° (inner and outer axis) (nom.)
Tilt angle	outer axis	±180°
	inner axis	±45°
DUT load capability	positioner	2.0 kg, centered
Hardware triggering	positioner	optional (requires BNC feedthrough)
Feedthrough options for communication with DUT	chamber	USB 2.0, D-Sub9, Ethernet
Positioner API	positioner	yes (C, C++, C#, VB.NET, Python, MATLAB®, and more)
Power supply	chamber	100 V to 230 V (AC) (–5%/+10%), max. 13 A
Weight	chamber	approx. 500 kg (1102.31 lb)
Dimensions (W × H × D) [3]	chamber	0.90 m × 1.99 m × 1.61 m (2.95 ft × 6.5 ft × 5.28 ft)
Temperature range	operating temperature range	+20°C to +30°C

For more information, see data sheet (PD 3608.2065.22)

[1] Limited by feeding structure.
[2] Measured at 76.5 GHz.
[3] 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 data sheet (PD 3608.2065.22) and www.rohde-schwarz.com

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.

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PD 3608.2065.32 | Version 04.00 | September 2022 (mt)
R&S®ATS1500C Antenna Test Chamber for Automotive Radar Sensors
Data without tolerance limits is not binding | Subject to change

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