Quality automotive radome tester analyzes your radar integration

Integrating automotive radar sensors into cars is very challenging. Radars operate behind bumpers, design emblems, in side mirrors or other plastic parts of the car. All radome materials need to be sufficiently transparent and homogeneous for automotive radars, which operate in the 77 GHz and 79 GHz band or even both simultaneously. The new system measures, visualizes and analyzes radar radomes in a manner you have never seen before. Optimize your radome material for best performance and effective integration of modern automotive radar sensors.

Your task

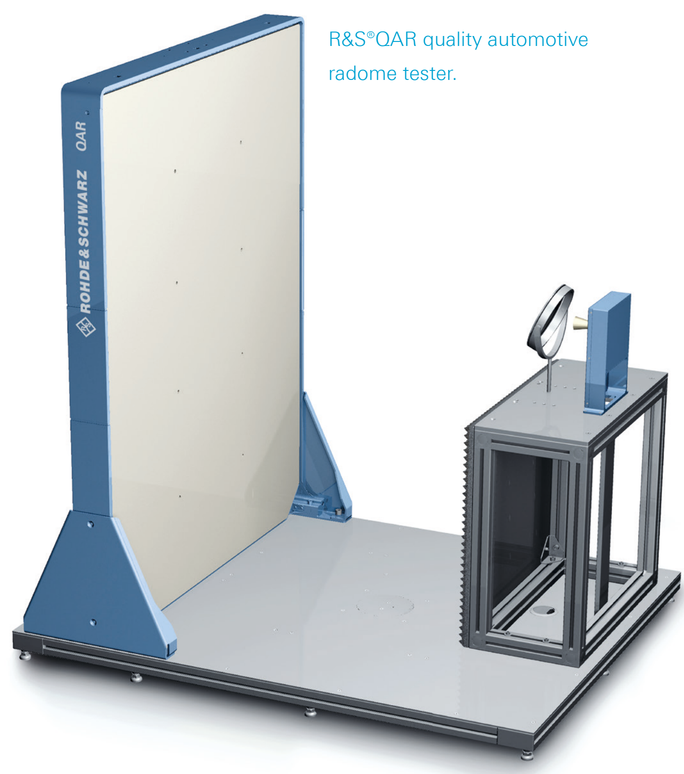
Since radar sensors are used to monitor the vehicle surroundings, sensor integration is often a compromise between vehicle design and sensor performance. Due to demanding vehicle design rules, many car manufacturers want sensors to be completely hidden. This is achieved by placing the radar sensors behind emblem radomes or bumpers, which causes additional challenges since you have to make sure that the radar can achieve its required performance in the presence of an arbitrarily shaped radome design made of material of varying quality.

The electrical properties of the parts covering the radar sensor are highly critical to its performance. If not chosen correctly, the induced reflection and transmission loss in the radar sensor's field of view can severely degrade the sensor's performance. Considering the criticality of the applications that use radar sensors, this can lead to unacceptable uncertainties.

T&M solution

The R&S®QAR quality automotive radome tester is a tailored solution for radar integration testing to measure, analyze and evaluate the radar compatibility of radomes and bumpers.

The R&S®QAR is a millimeterwave imaging system operating in the E-band automotive frequency range. Thanks to its spatially resolved reflection measurement capability, it provides a very intuitive yet powerful way to evaluate radome performance. The high resolution of the resulting reflection images makes it possible to identify even the smallest disturbances in the radome's build-up. Since the R&S®QAR frequency range matches that of the 77 GHz and 79 GHz automotive radar bands, any faults visible in the millimeterwave image directly correspond to a degradation of the radar signal.



R&S®QAR quality automotive radome tester.

ROHDE&SCHWARZ

In addition to the spatially resolved reflection measurement, the R&S®QAR can also provide a detailed spectral measurement of the transmission loss of a radome.

Reflection measurement

The reflection measurement determines the amount of energy reflected by the DUT (radome). This energy does not pass through the radome and consequently contributes to performance degradation. Reflected signals decrease the performance of the radar and can even interfere with the received signals, leading to reduced radar sensitivity, less accuracy or even blocking. Areas with high reflection can result from material defects, undesired interaction between several layers of materials, excessive amounts of certain materials, thick paint, foreign objects and other reasons.

The R&S®QAR measures spatially resolved reflection by coherently linking the information collected by the distributed transmit and receive antennas. The resulting millimeterwave image allows for an intuitive evaluation of the material reflection behavior.

The GUI of the QAR software provides a dedicated area for the measured millimeterwave image. The relevant data can be exported for later use in external applications.

Transmission measurement

The total amount of radar energy that passes through the radome is crucial. High losses reduce the maximum range in which a radar can detect a target. For example, if the radome causes a 3 dB two-way transmission loss, the maximum range would be reduced by 16 % according to the radar range equation.

In order to determine the transmission loss of the radome, the R&S®QAR can be equipped with an optional transmitter module that is located behind the DUT. This module delivers spectral information regarding the DUT's RF matching at the exact frequency band intended for radar operation, either 77 GHz or 79 GHz. The spectral measurement is therefore independent of the actual signal waveform utilized by the radar unit, which facilitates testability and optimization of the radome itself and makes it future-proof for new radar generations.

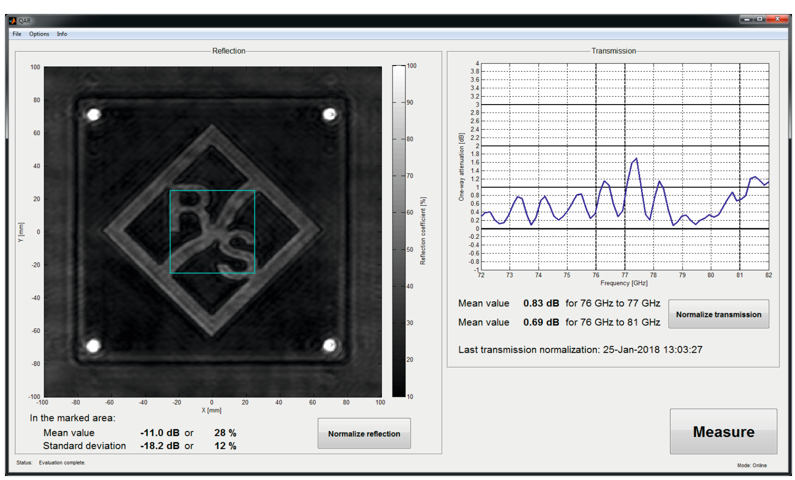
Benefits and key features

- Supports 77 GHz and 79 GHz radar bands
- Radar independent test with no need for a golden radar sensor
- Supports all material designs and form factors up to 30 cm × 50 cm
- In most cases, no extra shielding is required
- Comprehensive measurement results
- Standalone, commercial off-the-shelf solution
- Intuitive graphical user interface
- Fully remote controllable for highly automated tests
- Data acquisition in less than 100 ms
- Results displayed in a few seconds
- Small footprint

See also

www.rohde-schwarz.com/product/QAR

Example radome. The Rohde&Schwarz logo is 600 µm thicker than the base plate to cause RF mismatch at 77 GHz.



R&S®QAR measurement results of the example radome. On the left, reflection results demonstrate the increased reflection coefficient on the logo surface. On the right, the spectral transmission loss is displayed.

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