

R&S® QAT100 ADVANCED ANTENNA ARRAY



Electronically steerable frontend for realistic target generation in automotive radar system tests



Product Brochure
Version 02.01

ROHDE & SCHWARZ

Make ideas real



YOUR CHALLENGE

Radar based advanced driver assistance systems (ADAS) must be rigorously tested. The long-term goal is to create failsafe object and movement detection systems to enable autonomous driving.

Consequently, ADAS test requirements are particularly demanding. The use of benchtop tests or hardware-in-the-loop (HIL) setups in the validation process helps ensure that all ADAS system components work together as intended. There are multiple ways of verifying radar components in such systems:

- ▶ The simplest method requires taking the sensor out of the loop and inserting data representing radar targets directly into system data processing. The major disadvantage of this method is that the radar sensor itself is not included in the system test.
- ▶ A more comprehensive test method includes over-the-air radar object simulation. This returns the sensor to the test setup. However, conventional radar test systems are too limited in their capabilities to produce precise test results. Only objects coming from a single azimuth direction are simulated. Testing more complex scenarios requires physically moving the antennas.

Moving the antennas causes increased wear and tear along with additional inaccuracies due to the required physical movement of the system. Fast-moving lateral targets are extremely challenging because the frontends must be moved at high speeds.

The R&S®QAT100 simulates angular moving targets without physically moving antenna components. This increases accuracy and test setup durability while significantly reducing test times.

Visit our website to find out more about the R&S®QAT100:
<http://www.rohde-schwarz.com/qat>

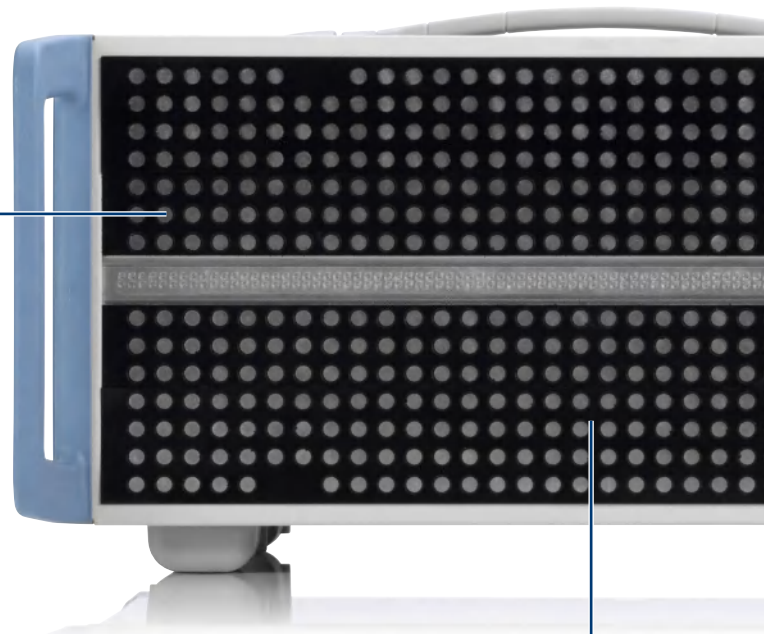


OUR SOLUTION

Mastering physical and technical challenges

With up to 2×96 individually switchable transmit antennas (with the R&S®QAT-B2 option), the R&S®QAT100 ensures high resolution, high speed and high repeatability. Electronic switching of the antennas does not produce any wear and tear on RF cables or other moving parts.

With its 4 GHz instantaneous bandwidth, the R&S®QAT100 is ideal for supporting state-of-the-art automotive radar sensors.



High angular resolution and high speed

The antenna spacing of only 3.7 mm provides a high angular resolution for realistic simulation of complex radar scenarios. Electronic antenna switching makes it possible to accurately simulate extremely high angular velocities with complete reproducibility.



Shielded environment for better results

The R&S®QAT-Z50 and R&S®QAT-Z53 shielding systems provide a nearly interference-free RF environment that perfectly suits the R&S®QAT100. Used in lab setups, the optional shielding systems provide a multipath and reflection-free environment for the radar under test.



Next generation MIMO radar support

Next generation radar sensors rely on MIMO technology to create high-resolution maps of their surroundings. The R&S®QAT100 requires a suitable antenna architecture for using multiple transmit and receive antennas in the automotive radar sensor. The R&S®QAT-B21 option provides 96 receive and 96 transmit channels to generate up to four radar echoes on a single R&S®QAT100.



Reduced reflections and multipath effects

Small patch antennas together with an absorber covered surface provide a clean RF frontend with very low RCS, reducing the sensor noise floor and suppressing close-range targets and potential multipath reflections.



Support for advanced scenarios

Complex driving scenarios require multiple targets. The R&S®QAT100 equipped with the R&S®QAT-B2 option has two lines with four independent segments each, making it possible to connect up to eight individually controllable IF paths to a single instrument. This combines perfectly with the eight completely independent artificial objects simulated by a fully equipped R&S®AREG800A. Each of the IF paths can be steered freely within an R&S®QAT100 segment.



Scalable number of IF paths and targets

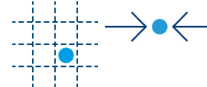
Basic tests do not require point clouds or micro-Doppler simulation, which minimizes the amount of external cabling required. The four segments of each line can be fed either individually or through a common connector.

The simulated echoes from a single IF path are steered to one or more of the 96 transmit antennas of each R&S®QAT100 TX line.



Compact form factor for functional testing

Equipped with the R&S®QAT-B5 option, the R&S®QAT100 simulates short-range echoes at different longitudinal and azimuthal locations for functional radar sensor tests. The echo is generated directly within the analog stepped delay line (ASDL) embedded in the frontend. No additional backend is required for basic functional testing.



Extremely scalable and versatile

Multiple R&S®QAT100 can be combined to increase the field of view. The R&S®AREG800A dynamic radar echo generator synchronizes all R&S®QAT100 arrays in a multi-instrument advanced antenna array setup for simulating complex ADAS scenarios.



SPECIFICATIONS IN BRIEF

Specifications in brief

Frequency and bandwidth

| | | |
|----------------------------|------------|------------------|
| RF frequency range | R&S®QAT100 | 76 GHz to 77 GHz |
| | | 77 GHz to 81 GHz |
| RF instantaneous bandwidth | | 4 GHz |

Artificial objects

| | | |
|----------------------------|------------------------|---|
| Object type | | dynamic and static |
| Maximum number of IF paths | with R&S®QAT100 | up to 4 with individual azimuth, distance, RCS, Doppler |
| | with R&S®QAT-B2 option | up to 8 with individual azimuth, distance, RCS, Doppler |

Antennas

| | | |
|-----------------------|--|-----------------|
| Antenna configuration | with R&S®QAT100 and R&S®QAT-B11 frontend | 96 TX channels |
| | | 5 RX channels |
| | with additional R&S®QAT-B2 option | 192 TX channels |
| | | 10 RX channels |
| | with R&S®QAT100 and R&S®QAT-B21 frontend | 96 TX channels |
| | | 96 RX channels |

ORDERING INFORMATION

| Designation | Type | Order No. |
|--|-------------|--------------|
| Advanced antenna array, base unit, including power cable and quick start guide | R&S®QAT100 | 1341.0004K02 |
| Standard frontend | R&S®QAT-B11 | 1343.0240.11 |
| Single-line MIMO frontend | R&S®QAT-B21 | 1343.0240.21 |
| Second line of 96 transmit antennas | R&S®QAT-B2 | 1341.0162.02 |
| Analog stepped delay line | R&S®QAT-B5 | 1341.0179.02 |
| Hinge set | R&S®QAT-Z6 | 1341.0210.02 |
| Shielding system, length: 50 cm | R&S®QAT-Z50 | 1341.0156.02 |
| Shielding trio | R&S®QAT-Z53 | 1341.0191.02 |

Warranty

| | |
|-------------------------------|--------|
| Base unit | 1 year |
| All other items ¹⁾ | 1 year |

Service options

| | | |
|------------------------------|---------|---|
| Extended warranty, one year | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended warranty, two years | R&S®WE2 | |

¹⁾ For options installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.



R&S®QAT-B21 single-line MIMO frontend



R&S®QAT-B11 standard frontend

Service that adds value

- ▶ Worldwide
- ▶ Local and personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

Rohde & Schwarz

The Rohde&Schwarz technology group is among the trail-blazers 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.

www.rohde-schwarz.com

Sustainable product design

- ▶ Environmental compatibility and eco-footprint
- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

Certified Quality Management

ISO 9001

Certified Environmental Management

ISO 14001

Rohde & Schwarz training

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