NOFFZ TECHNOLOGIES

UTP 506X

# RADAR SENSOR TEST SYSTEMS

## FOR END-OF-LINE, PRODUCT VALIDATION & SENSOR CALIBRATION

## PRODUCT

**End product:** Short-Range Radar (SRR), Mid-Range Radar (MRR), Long-Range Radar (LRR), Imaging Radars, Forward-Looking Radar (FLR), In-Cabin Sensing (ICS)

**Industry:** Automotive, Transportation, Industry Electronics

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# RADAR SENSOR TEST AND CALIBRATION AT A GLANCE

NOFFZ radar test systems provide world-class sensor calibration in validation and high-volume production. The experienced team offers various testers for tailored customer solutions. With a global presence, NOFFZ supports customers throughout the entire quality-oriented product development process and promotes long-term collaboration.

## NOFFZ RADAR TEST SYSTEM FAMILY UTP 506X

All radar test systems are categorized according to production stage and measurement method. Differentiation is made between validation and high-volume end-of-line environments with their specific detailed requirements. Direct Far Field (DFF) and Compact Antenna Test Range (CATR) measurement setups are available.

| | | Measurement Technology | |
|---|---|---|---|
| | | **Direct Far Field (DFF)** for shorter far field distances | **Compact Antenna Test Range (CATR)** for longer far field distances |
| **Application** | **Validation** for detailed analysis |  UTP 5062 |  UTP 5063 |
| | **Production** for end-of-line test |  UTP 5065 |  UTP 5069 |

# TEST SYSTEM MODULARITY

NOFFZ radar test systems are modular in design and offer various equipment options for the realization of individual testing solutions. During the consulting phase, NOFFZ experts identify the best technical solution for every testing requirement.

| Tester Orientation | Measurement Setup | DUT Input & Output |
|---|---|---|
| Horizontal | Direct Far Field | Single-DUT Handling |
| Vertical | Compact Antenna Test Range | Multiple-DUT Handling |

| DUT Motion | Target Simulation | DUT Handling Variants |
|---|---|---|
| 2-Axis Independent Motion | Radar Target Simulator | Manual DUT Handling |
| Goniometer & Turntable | Corner Reflector | Semi-Automated DUT Handling |
| Robot | Doppler Generators | Fully Automated DUT Handling |

## TESTER ORIENTATION

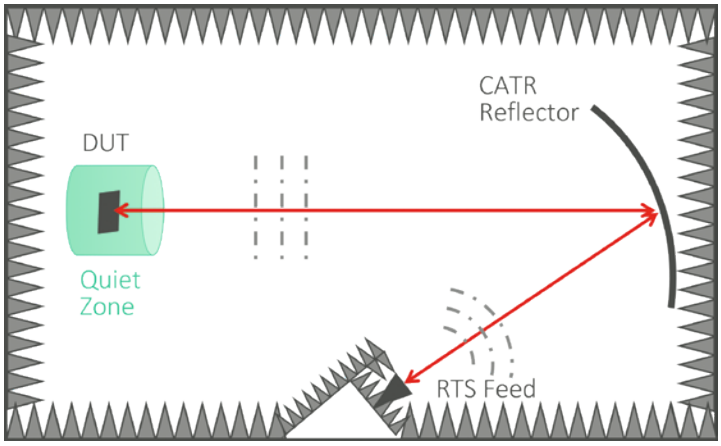
Depending on the production environment, NOFFZ builds a test system with a horizontal or vertical radar beam path. A vertical tester design is ideal for far field distances less than 2.5 meters. It offers optimal space saving with a minimal footprint. The horizontal design is convenient for any limits of ceiling height.


**vertical tester design example**

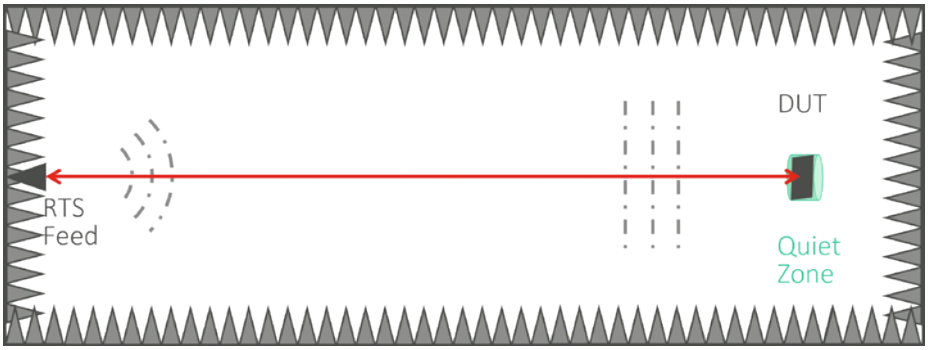

**horizontal tester design example**

## MEASUREMENT SETUP

In contrast to Direct Far Field (DFF) measurements, Compact Antenna Test Range (CATR) is a cutting-edge technology for indirect radar measurements. By integrating an RF reflector, a plane wavefront (quiet zone) is generated in a comparable compact housing – with typical distances of less than 1.2 meters between the DUT and the reflector. For a standard DFF measurement, the DUT and the radar target simulator (RTS) are placed in a perpendicular direction. This leads to larger tester housings with longer far field distances.




**CATR (Compact Antenna Test Range)**

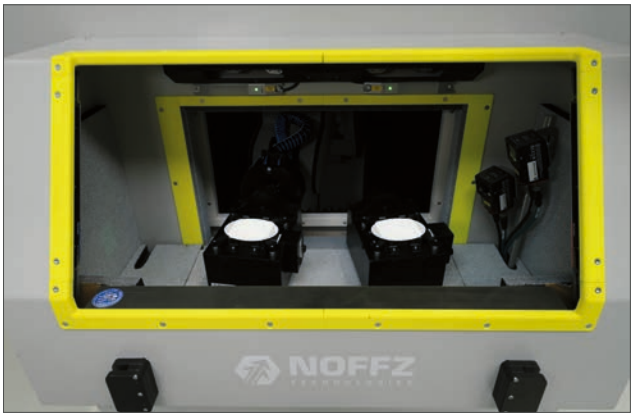



**DFF (Direct Far Field)**

## DUT INPUT & OUTPUT

The loading and unloading process of the DUT can be done manually or automatically. To reduce cycle times, NOFFZ has not only developed a single-DUT adapter, but also a multi-DUT adapter. The latter has two nests that allow the previously tested DUT to be unloaded and the next DUT to be loaded while another DUT is being calibrated. The cycle time can be shortened significantly as the DUT in the waiting position can already be powered, the firmware updated and some initial tests performed.

**Loading unit with a single nest**




**Dual nest unit for faster multi-DUT handling**

# DUT MOTION

The antenna characteristic must be analyzed for the calibration of radar sensors. In NOFFZ test systems, the radar target simulator or corner reflectors are fixed in position while the DUT is moved in azimuth (angle in the horizontal plane) and elevation (angle in the vertical plane). The NOFFZ test systems offer the following motion options:

### 2-axis independent motion

- independent and separated motion
- azimuth sweep at elevation 0 deg or elevation sweep at azimuth 0 deg
- with linear sledge for input and output

### 2-axis goniometer on turntable

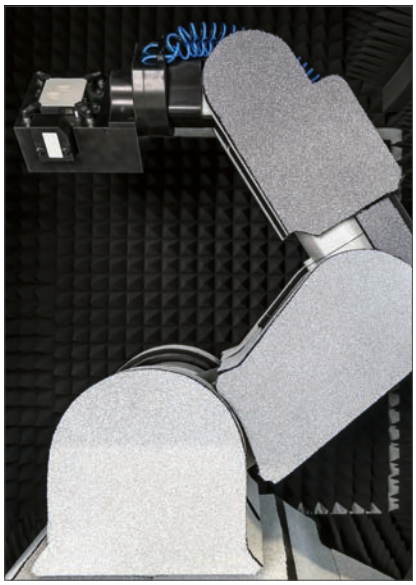
- independent and separated motion
- azimuth sweep at fixed elevation

### 6-axis robot

- independent and simultaneous motion
- azimuth sweep at fixed elevation or elevation sweep at fixed azimuth
- free choice of basic coordination system

**Two indepenedent actuators**

**2-axis goniometer on turntable**



**6-axis robot**

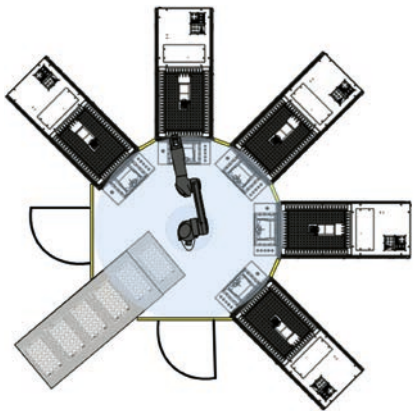
# TARGET SIMULATION

Typically, a radar target simulator is used to manipulate the radar signal in distance, Radar Cross Section (RCS) and relative velocity. Frequency ranges include 76-81 GHz, 58-64 GHz, and 24 GHz. For static targets at relatively short distances a corner reflector can be used as a less expensive and complex solution.

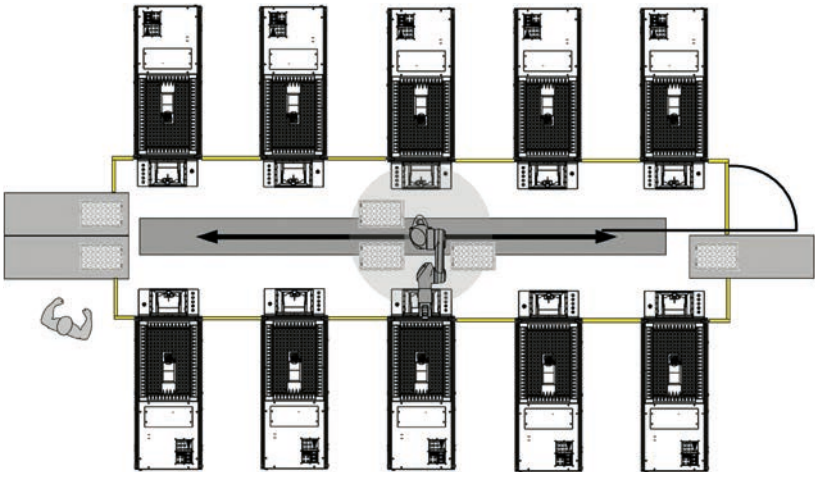

**NOFFZ test software solution UTP Suite for Automated Test includes a wide range of tools for configuring, developing, analyzing, debugging, and executing test sequences**

## DUT HANDLING VARIANTS

For high volumes and short cycle times, NOFFZ supports automation outside the test system: From developing a fully automated DUT handling system to combining multiple testers into a production line. The connection to external automation such as pick-and-place machines or robots is quite typical. As customer requirements can vary greatly, there are various setups for realization.



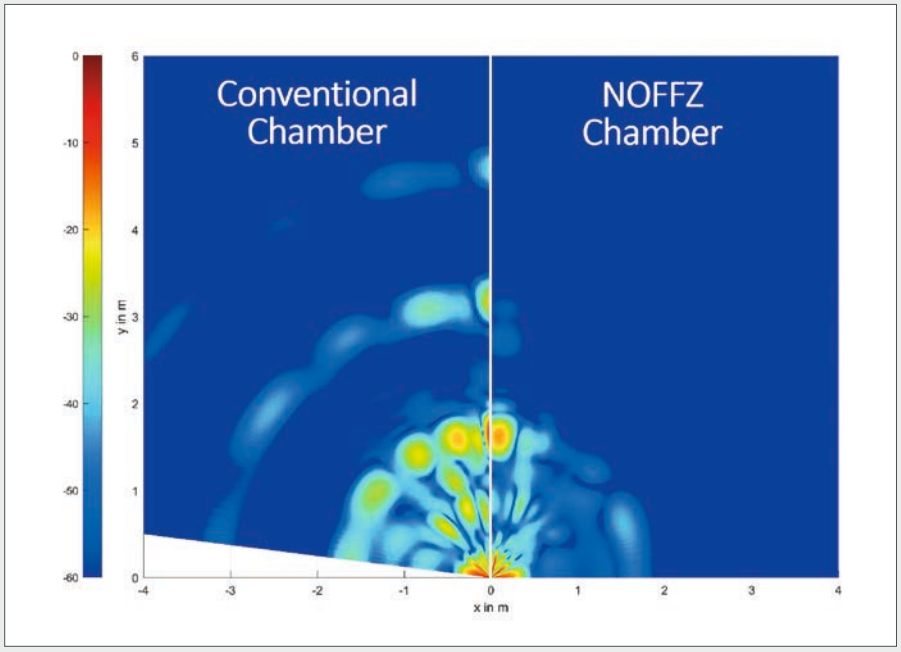
**Exemplary design of a robot operating several testers**



**Exemplary setup with automated input from an assembly line**

## DID YOU KNOW?

Reflection suppression inside the anechoic chamber is crucial for error-free measurements when calibrating radar sensors. The NOFFZ tester housing and all installed components are designed to be extremely low-reflective so that interference signals and multiple reflections are suppressed.




**NOFFZ anechoic test chamber (right) has significantly less interferences than a conventional chamber (left)**

# WHY NOFFZ?

**NOFFZ offers everything you need for testing radar sensors:**

- Validation and end-of-line environments
- Direct Far Field (DFF) and Compact Antenna Test Range (CATR) setups
- Horizontal and vertical tester designs
- Automated loading and unloading stations with up to two nests for volume production
- Hinged and sliding doors for validation and laboratory environments
- Advanced DUT motion with robots, goniometers, and two independent actuators (separate azimuth and elevation control)
- Seamless integration of radar target simulators, doppler generators and corner reflectors
- Easy maintenance thanks to easy accessibility for alignment and service purposes
- High priority of best possible reflection suppression in anechoic chamber
- Advanced reflection analysis of anechoic chamber environment
- Sophisticated software including system HMI, user-friendly API, specific configuration and service tools
- Worldwide consulting, sales, manufacturing and support from NOFFZ teams in Europe, the USA and Asia

## NOFFZ ALSO OFFERS SPECIFIC TESTER SOLUTIONS LIKE:

In-Cabin monitoring tests solutions for 60 GHz radar sensors

Radome tests for radar sensor enclosures, front grilles, bumpers, emblems and more

Radome positioning optimization solutions

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## EXPERIENCE GLOBAL EXCELLENCE IN TESTING & AUTOMATION

At NOFFZ Technologies, our dynamic innovation and unwavering commitment to customer service have made us a global leader in testing & automation systems. With a worldwide network of locations in USA, Mexico, Germany, Hungary, Serbia, and China, we provide local expertise and prompt support to industries such as automotive, telecommunication, smart homes, medical technology, and semiconductors. Our market-leading technologies, combined with our international team of experts, ensure the successful implementation and operation of our cutting-edge solutions. Experience global excellence in testing & automation with NOFFZ Technologies today.

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