ACTIVE ELECTRONICALLY SCANNED ARRAY AND ANTENNA TESTING

Improving TRM testing accuracy and throughput

Test challenges for AESA TRMs in development and production

Breakthrough technological advancements, such as direct digital synthesis, phased arrays and gallium nitride (GaN) components, have spawned a new breed of radar – multifunctional active electronically scanned array (AESA) radar. The AESA radar performance strongly depends on the quality of transmit and receive modules (TRM), and due to their complexity, the TRMs require a lot of verification and testing during their development, which has a big time and cost impact.

Flexibility and efficiency are the most important parameters taken into consideration when developing and testing TRMs. The testing setup has to be both radar and customer specific, but also scalable and efficient in order to ensure the required performance in each phase of development and production. It is a complex demand for the test equipment involved, and Rohde & Schwarz holds the right solution.

The Rohde & Schwarz scalable solutions for multiple tests in a single setup

The characterization of TRMs requires flexible test and measurement equipment capable of handling arrays of different measurements. Due to this, TRM test and measurement setups are complex in configuration, calibration and measurement, but also error-prone - if one device is not working properly, the whole configuration fails.

All typical TRM test cases can be covered with a single network analyzer, such as the R&S®ZNA. If higher performance for example pulsed noise figure, is required from a spectrum analyzer, the R&S®FSW signal and spectrum analyzer is added to the setup. The R&S®TS6 TRM test library, based on the the R&S®TSrun test sequencer software, adds flexible test automation with powerful evaluation features in a simpler setup with fewer cables. In a combination with a signal conditioning unit, the R&S®ZVAX-TRM extension unit, all tests, including multiplexing, can be carried out without any reconnection.

A special feature is the calibration routine in the the R&S®TS6 TRM test library. It collects all the calibration requirements from the test and runs an optimized calibration without any compromises in accuracy. The support of multiport calibration units enables the efficient calibration of devices under test (DUTs) with many ports. This combination of a simplified test setup with a high degree of automation ensures reliable and reproducible measurements by a scalable solution that always adapts to your requirements: from the manual testing of components, over complete module characterization in development to automated production testing.

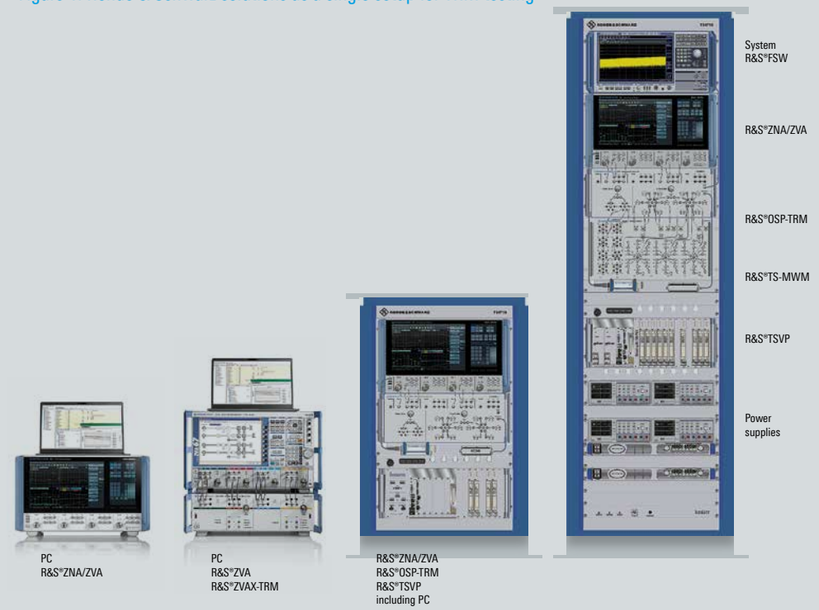
Ideal for increasing your test throughput

Each AESA radar consists of a large number of TRMs. Each of them has to be tested and, depending on the application, individually calibrated over a large number of DUT states and frequencies. Here, time is of the essence, and Rohde & Schwarz offers testing of parallelly running systems during production. The R&S®TS6 TRM test library together with the R&S®TS6710 TRM radar test system are ideal solutions for this. Years of experience in TRM testing has helped us deliver the fastest possible speeds for TRM testing, as expected by the Rohde & Schwarz test equipment, in combination with a fast handover between measurement and device programming.

Advertorial

As an example, thanks to the fast frequency sweeps and the possibility of multiple measurements within one pulse, the number of required TRM state changes is reduced and the overall test time is minimized. With the R&S®ZVAX-TRM signal conditioning unit, all tests run automatically without interaction, including port multiplexing. A typical test time for a complete TRM characterization can be reduced from hours, required by the legacy TRM test systems, to only a few minutes.

Figure 1: Rohde & Schwarz solutions as a single setup for TRM testing



Webinar: AESA Radar Frontend Testing

The capabilities of modern AESA radar designs depend significantly on the performance of state-of-the-art Transmit-Receive-Modules (TRM). In this webinar, our experts tackle the question of how to precisely validate TRM performance in large array antennas and reduce complexity of testing TRMs significantly with the help of the latest test systems from Rohde & Schwarz.

Watch the webinar here: **https://www.rohde-schwarz.com/aerospace-defense/AESAwebinar**

Confidentiality and flexibility ensured with an open DUT interface

The parameters of TRM designs are radar specific and are considered confidential. Each TRM must be controlled by a specific interface, protocol and trigger for testing. The R&S®TS6 TRM test library has an open software interface for TRM control. The plugin can be programmed locally and can interface with any Rohde & Schwarz hardware. In combination with the wide range of test parameters, the whole test configuration can be carried out locally. This also allows faster on-site adaptations and optimizations. An efficient option for TRM control is the R&S®CompactTSVP test system versatile platform with flexible and fast control interfaces, plus digital and analog measurements. In this configuration, shorter test times are achieved in many setups without any field-programmable gate array (FPGA) programming.

Rohde & Schwarz offers:

- Scalable solution for TRM testing from development to production
- Frequency range from 1 GHz to 40 GHz
- Very short test times
- Multiplexing of up to 32 TRM channels per test system
- Test sequencer for user-configurable test runs
- Open C# interface for customer DUT control
- Turnkey solution from a single source
- Based on commercial off-the-shelf instruments from Rohde & Schwarz.

Follow our series of articles and webinars on latest test solutions for radar and EW testing. In November, in our next edition, we will be talking about radar design debugging.For more information, visit:
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