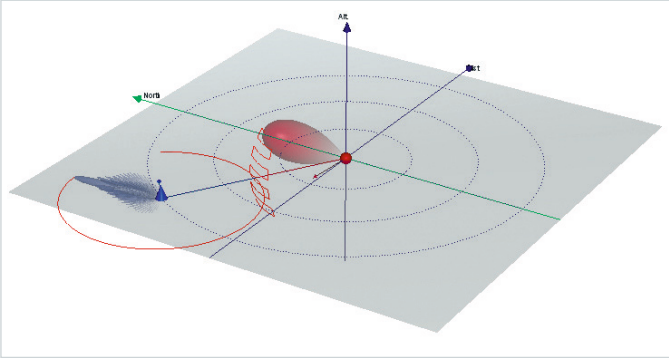
Simplify pulse and emitter generation for radar testing

The R&S®SMW200A signal generator together with the R&S®Pulse Sequencer software simplifies signal generation for multi-emitter environments.



Realistic emitter and receiver simulation with antenna diagrams and antenna scans in 3D space.

Your task

For engineers and technical staff responsible for testing radar receivers, the challenge of creating meaningful signals to stimulate the receiver is always a complex, time-consuming task. In all stages of the development cycle, from initial functional testing to final operational simulation testing, the challenge is the same: to use commercial off-the-shelf equipment to produce accurate, repeatable signals to fully stress the performance of the receiver.

Testing these types of receivers requires a certain level of creativity as there is no industry standard that defines the signals to be used. Initial functional testing might start with simple pulsed signals, but this will quickly progress to more complex sequences to simulate a real-world environment. Often multiple subsequences are required to verify if the receiver can recognize and process a range of ideal and nonideal signals.

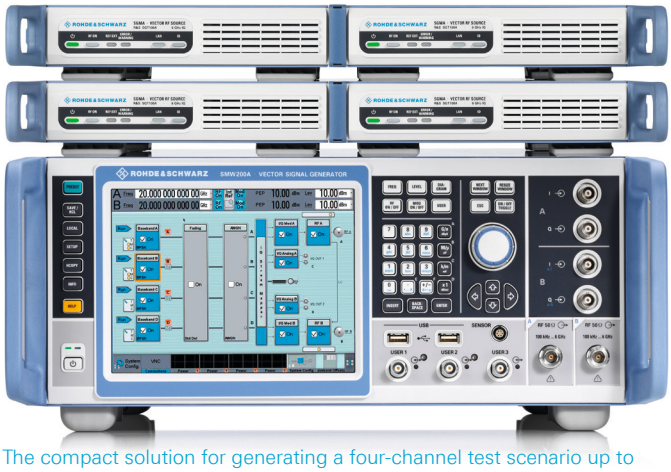
Typically an offline software package is used to create all the signals required to accurately produce the complex simulation scenarios that reflect what the receiver will actually see. Many of these solutions exist today, but they have limitations when required to go beyond the traditional creation of pulses and sequences, especially when it comes to mapping complex test scenarios such as real-world environments with multiple emitters and interferers. Producing the RF signals for multi-emitter environments, all with different physical parameters and potentially phase coherent, usually requires a rack of different signal generators. Their setup and synchronization are often challenging and very time-consuming, particularly when you have to deal with multiple different user interfaces.

Having a software package that can handle the advanced requirements, is easy to use and interfaces with commercial off-the-shelf signal generators has long been a requirement for engineers working on radar applications and especially on multi-emitter environment simulations.

T&M solution

The R&S®SMW200A vector signal generator equipped with the R&S®SMW-K300 pulse sequencing or R&S®SMW-K301 enhanced pulse sequencing option together with the associated R&S®Pulse Sequencer software is the perfect solution. The complexity level of signals that can be generated ranges from simple pulses for components tests to full-scale testing of complex radar systems.

The R&S®SMW200A provides hardware capable of generating very clean, accurate RF signals. For multiple emitter scenarios up to 20 GHz, the generator has an integrated second RF channel, and can be expanded to up to four phase-coherent channels by adding two sets of the R&S®SGS100A SGMA RF source/R&S®SGU100A SGMA upconverter combination.



The compact solution for generating a four-channel test scenario up to 20 GHz.

Even an eight-channel configuration up to 6 GHz is a compact bench top solution that requires only one R&S®SMW200A and six small R&S®SGT100A SGMA vector RF sources. All eight channels are controlled via a single user interface.

R&S®Pulse Sequencer software

However, what really makes this T&M off-the-shelf hardware a tailored solution for challenging radar test cases is the R&S®Pulse Sequencer software – a standalone, PC-based software package that creates waveform files and automatically configures the signal generators. With an intuitive user interface, this software enables the creation of everything from a simple pulse sequence to complex multiple emitter scenarios. The user can define every parameter, from the modulation on each individual pulse to the location of each emitter relative to the receiver.

The R&S®Pulse Sequencer software supports all types of scenarios typically required for such waveforms and sequences, such as:

- Multiple pulses on top of each other with powerful sequencing features
- Antenna profile and scan pattern for each emitter, both on the transmit and receive end
- Import of propriety waveforms from waveforms libraries
- Import of waveforms that represent commercial signals such as LTE, WLAN

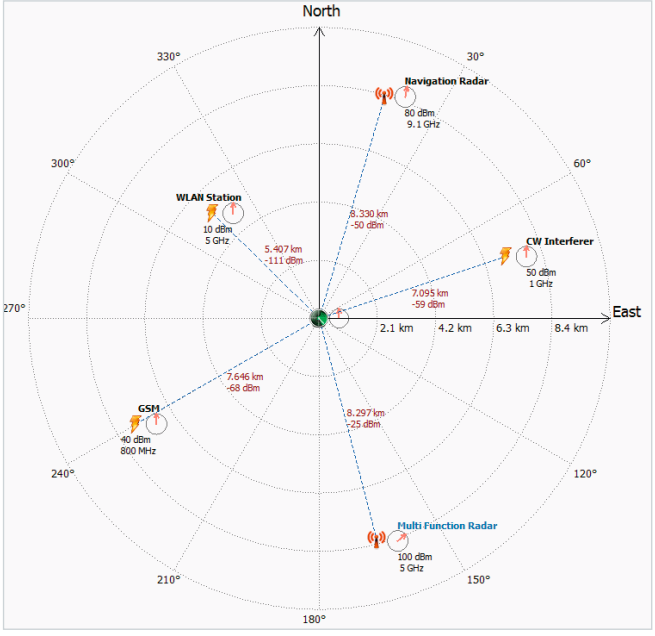
3D visualization tools provide a clear preview of the configured signals, antenna diagrams, antenna scan and the scenario geometry itself. The design of the user interface ensures that all this capability is presented to the user in a straightforward and clearly structured manner.

The included scenario simulation allows the user to place one or multiple emitters onto a 2D map. Emitters are transmitting stations that are characterized through basic pulses with or without modulation on pulse (MOP), a sequence of the defined pulses, antenna diagram, antenna scan type and EIRP. They can also contain multiple items such as antenna diagrams or sequences that can be recombined in order to allow multiple radar modes. Similar to the emitters, a receiver, configured with an antenna diagram and scan type, can also be placed on the map. After configuration, the software calculates the signal as seen at the output of the receiver antenna.

Combining the signal generator hardware with the R&S®Pulse Sequencer software provides a compact, space-saving solution for multi-emitter target simulation that brings reality into the lab, significantly simplifying the testing of radar hardware with real-world radar signal profiles.

See also

www.rohde-schwarz.com/product/SMW200A



The 2D map enables easy creation of complex scenarios.

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