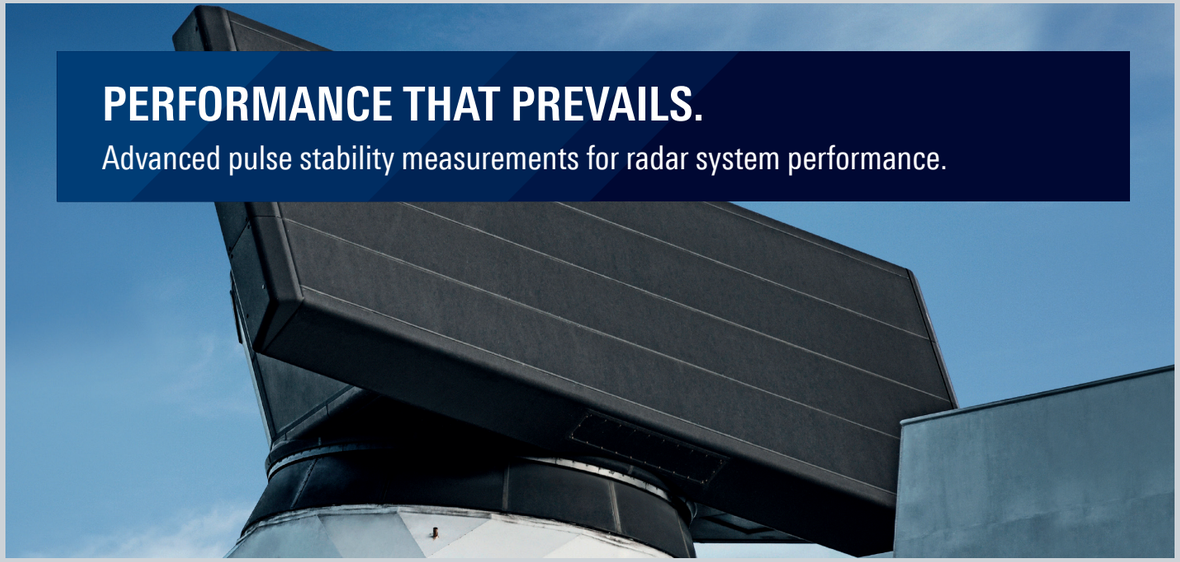
Advertorial

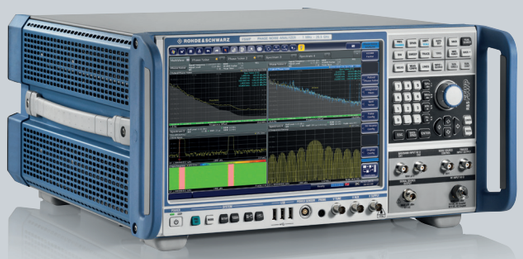


Ensuring higher performance for modern radar systems

With the arrival of sophisticated radar and communication systems, phase noise has become the most important factor that is addressed during the design and validation phase of these systems. This is because phase stability is the key parameter defining target acquisition in radars, spectral integrity in communication systems and precision beam steering capabilities in active electronic scanned array antennas (AESA).
This is exceptionally true for the latest generation of multifunctional radar system designs that were developed in response to the increasing complexity of missions, physical requirements of congested and contested electronic environments and rapid advances in electronic warfare (EW) capabilities.

The measurement challenges of modern radar designs

The latest radar architectures come with a number of key design challenges, such as frequency, waveform and mode agility. Phase and amplitude stability of transmitted radar pulses are crucial to assessing the radar's sensitivity and are vital to detect e.g. small and slow moving targets like drones and UAVs. Power amplifiers (PA) in particular can degrade phase stability, making engineers look for new tools for precise measurements.
These high-sensitivity measurements of the phase and amplitude stability of pulses previously required complicated test setups with multiple instruments. A new option for the R&S®FSWP phase noise analyzer by Rohde & Schwarz makes these measurements easy and straightforward. The R&S®FSWP-K6P option takes full advantage of the unmatched ultra-low phase noise design of the R&S®FSWP. This one-instrument solution offers high sensitivity measurements to design engineers.
Based on the ability to generate demanding pulse sequences like the original radar systems, the R&S®FSWP can feed the power amplifier - or other device under test - and analyze the response signal from the amplifier at the same time.



The R&S®FSWP phase noise analyzer and VCO tester

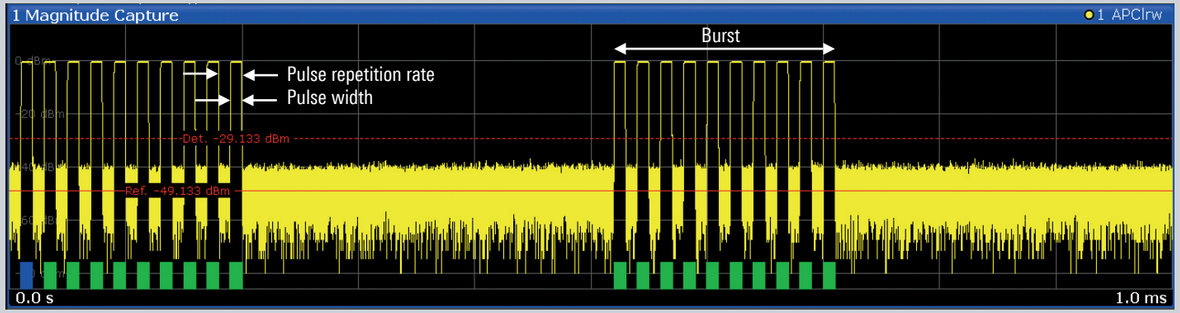
Unmatched sensitivity for best phase noise measurements

The R&S®FSWP has a built-in ultra-low phase noise oscillator and internal components optimized for phase noise testing. This provides a wide dynamic range for phase stability measurements. Since the local oscillator in the R&S®FSWP and the pulsed signal applied to the DUT are correlated, the phase noise can be even more suppressed by up to 50 dB, testing only the phase instability caused by the device. This residual measurement has a sensitivity of less than –80 dB. For even more flexibility, the R&S®FSWP also allows users to an external source as a local oscillator for the measurement.

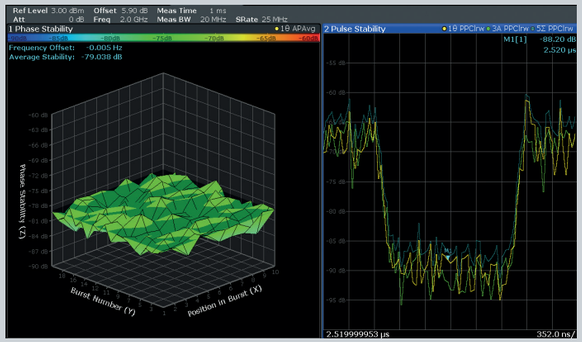
Application Note: Measurement setup for phase noise test at frequencies above 50 GHz
The R&S®FSWP is the most modern phase noise tester on the market with unrivalled sensitivity. It combines high-end internal local sources with the latest technology for AD converters in combination with cross-correlation.
Discover the full potential of the R&S®FSWP for your radar measurement applications with this practical application note by Rohde & Schwarz.
Download here: **www.rohde-schwarz.com/applications/phase-noise-test-above-50ghz**

Complex burst and pulse sequences for real-life performance measurements

Advanced radar applications employ bursts or complex pulse sequences. Consequently, the same burst signals are required to accurately test radar components under realistic modes of operation. The R&S®FSWP can generate pulse sequences and bursts based on the original pulse descriptor word (PDW) information from the radar system. Operational effects like the heating of components during the "on" portion of the burst and their effect on the system's phase and amplitude stability can hence be analyzed with great precision and in a well-defined and reproducible environment.



The burst signal consists of 10 pulses, followed by a pause.



Phase deviation from the average of each pulse, for all recorded bursts (left). Pulse-to-pulse phase stability (yellow), amplitude stability (green) and the sum of the two (blue) averaged over all pulses (right).

Full measurement flexibility to support every test requirement

The R&S®FSWP-K6P option also allows users to choose whether to make measurements using the broadband spectrum analyzer or the highly sensitive phase noise tester. With the latter, users can either measure the pulsed signal directly or employ the residual test mode using internally generated pulses to stimulate the device being tested.
Phase and amplitude stability can be displayed for each individual pulse, with the deviation from the average at each sampling point in a pulse calculated and displayed. The R&S®FSWP can average the values over an entire burst or calculate the difference between pulses, delivering pulse-to-pulse phase and amplitude stability. Both of these averaging techniques produce smoother, more instructive traces.

Rohde & Schwarz offers:

- High sensitivity for phase noise measurements thanks to cross correlation and extremely low noise internal reference sources
- typ. –172 dBc (1 Hz) at 1 GHz carrier frequency and 10 kHz offset
- Simultaneous measurement of amplitude noise and phase noise
- Internal source for measuring additive phase noise, including on pulsed signals
- Wide dynamic range thanks to low displayed average noise level (DANL) of –156 dBm (1 Hz) (without noise cancellation) and high TOI of typ. 25 dBm

Follow our series of articles and webinars on latest test solutions for radar and EW testing. Next month, we will be focusing on next generation jammer test and ultra-wideband signal analysis and system performance evaluation. For more information, visit:
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