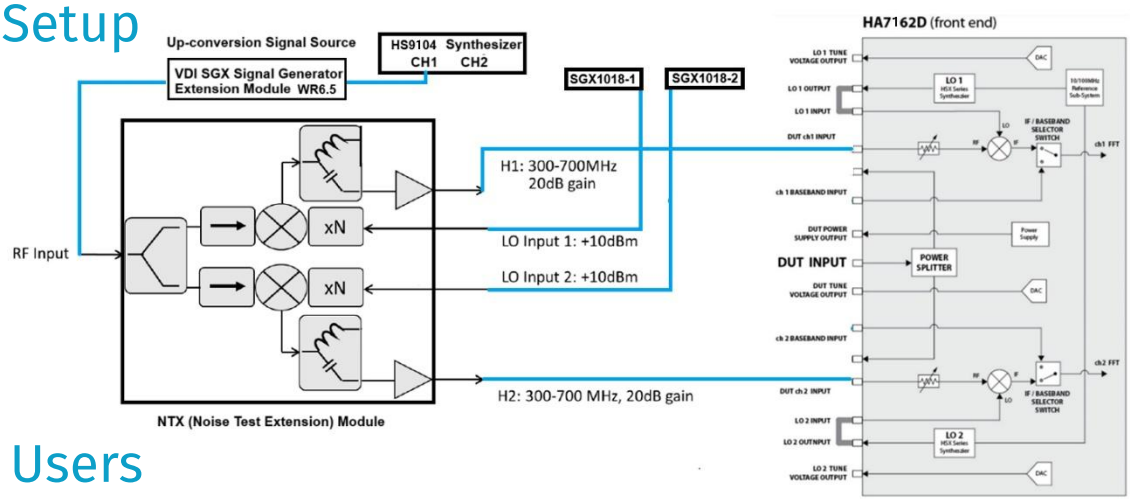
D-Band Oscillator Phase Noise Analysis for 6G Applications

D-band is increasingly being used, or is planned to be used, for civilian and defense applications. Examples include 6G wireless communications, inter-satellite links, and imaging radar systems. Phase noise is a major factor when considering symbol and hence bit errors in communication systems and degradations of sensitivity in radar systems. This means that reliable measurement of phase noise at D-band frequencies is increasingly important.

This demonstration shows a D-band phase measurement system based on the Maury HA7162D, which features cross correlation. This standard feature enables the reduction of uncorrelated sources of system noise such as that in the frequency extender, the local oscillators, and the internal components of the phase noise analyzer.

The demo consists of two Maury SGX1018 RF signal generators that provide the local oscillator signals to the VDI NTX frequency extender. The NTX splits the DUT signal into two paths, which are then downconverted to an IF and input to the Maury HA7162D phase noise analyzer. After phase detection and digitization, the standard 2-channel architecture of the HA7162D enables cross correlation to enhance the sensitivity of the phase noise measurement. The HS9104A and VDI SGX extender are used as the example DUT running at 140 GHz.

Demo Setup



Target Users

Target users include researchers and developers working in the communications, defense electronics, and RF components industries who are developing D-band systems and/or component parts such as frequency synthesizers.

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Product Overview

HA7162D Real-Time Phase Noise Analyzer

The HA7162D real-time phase noise analyzer offers a unique combination of accuracy, speed, flexibility, and reliability in a compact form factor. Control is easy through an intuitive GUI or simple remote commands, making them ideal for the lab and production.

KEY SPECIFICATIONS AND FEATURES:

- DUT input: 10 MHz to 6 GHz, 26 GHz, or optional 40 GHz (with extender to 170 GHz).
- Measurement bandwidth: 0.1 Hz to 100 MHz.
- Automated absolute and additive (residual) measurements.
- Only analyzer available that allows actual noise floor measurements as standard.
- Real-time cross correlation as standard; extremely fast measurement speeds.

HS9100 Series Multi-channel RF Synthesizer

The HS9100 Series multi-channel RF synthesizers use proprietary non-PLL technology to deliver both fast switching speed and low phase noise. The instrument can be configured with up to 8 independently controlled phase coherent channels in a compact 1U high chassis.

KEY SPECIFICATIONS AND FEATURES:

- Fully independent channels: 10 MHz to 1, 2, 3, 4, or 6 GHz and 100 MHz to 12 or 18 GHz.
- Phase-coherent channel that can be different frequency range; channel-to channel stability.

SGX1000 Series RF Signal Generator

The SGX1000 RF signal generators offer high performance signal generation with an easy-to-use interface in a compact form factor. The SGX1000 utilizes a proprietary blend of direct digital and direct analog synthesis to provide ultra-fine frequency resolution, lightning-fast frequency switching, ultra-low phase noise and jitter, and superior reliability.

KEY SPECIFICATIONS AND FEATURES:

- Frequency range: 10 MHz to 18 GHz; output power range: -50 to +18 dBm.
- Lightning-fast switching speed: 350 µs (typ).
- Ultra-low phase noise (3 GHz, 10 kHz offset) -122 dBc/Hz (typ).
- Ultra-low jitter: 60 fs (typ); excellent amplitude accuracy (as low as -40 dBm): +/-0.5 dB (typ).

More Resources

Visit maurymw.com/info/eumw-2025 to learn more about Maury Microwave solutions.

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