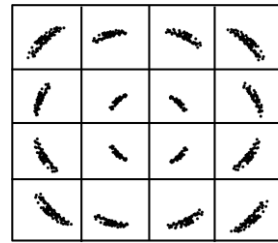
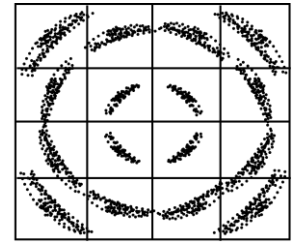


Phase Noise Measurements for Radar & Satellite Networks

Satellite communication systems that utilize higher order modulation schemes, such as those used in 5G applications, increase bit rate/bandwidth. While data rates increase, so does the network's vulnerability to symbol errors due to phase noise. In radar systems, phase noise can mask return signals, limiting a radar receiver's ability to resolve Doppler-shifted target information.

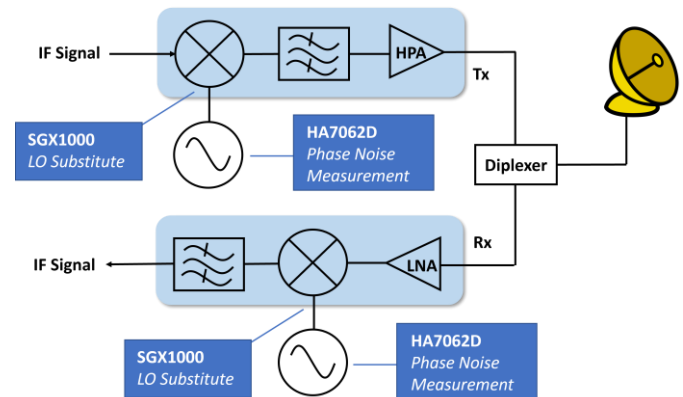


16-QAM MODULATION
(LO with Low Phase Noise Performance)



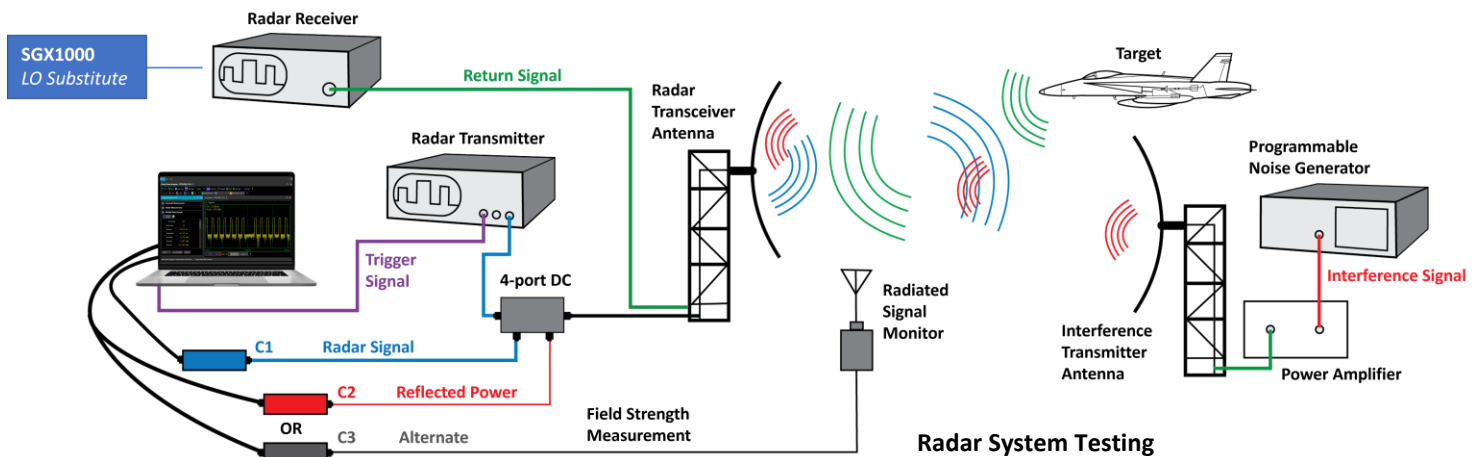
16-QAM MODULATION
(LO with Poor Phase Noise Performance)

Local oscillators (LO) can be the cause of excessive phase noise if the system is experiencing poor performance/symbol errors. The dBm ACE9600 Advanced Channel Emulator can reproduce the phase noise generated by a system's LOs, while the Holzworth HA7062D Real-Time Phase Noise Analyzer can evaluate LO phase noise performance. LO substitution, which replaces the LO with a high-quality, low phase noise signal generator, such as the Boonton SGX1000 Series RF Signal Generator, can determine if the LO itself is the cause of performance issues within the system. LO substitution can also isolate up/downconverter chains for more accurate testing without faulty LO characteristics distorting results.



Satellite Communications System Testing

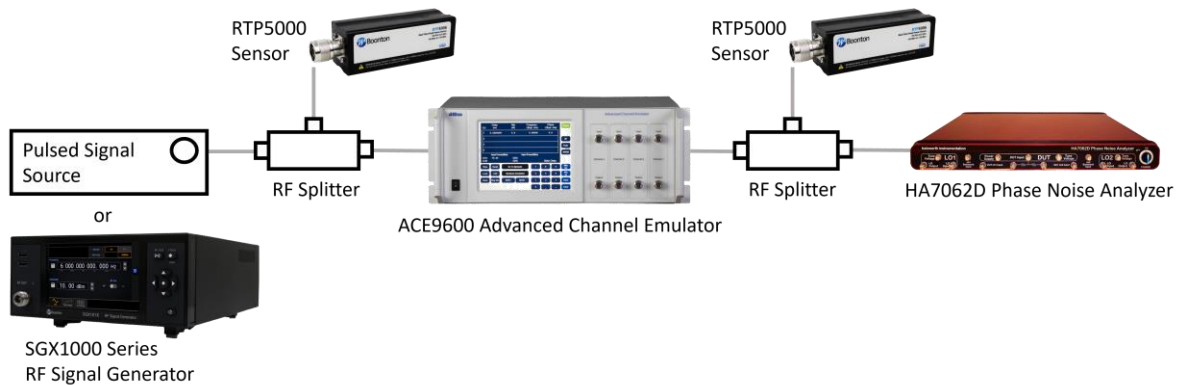
Transmissions often go over multiple links, ranging from ground station uplinks, satellite-to-satellite links, and downlinks to receiving stations. The ACE9600 can emulate the link effects that occur during signal propagation. For phase noise analysis, the HA7062D can measure the additive phase noise of a signal as it travels through a network.



Radar System Testing

AOC 2023 Test Setup:

The SGX1000 Series generates a signal with exceptionally low phase noise. The ACE9600 is used to inject phase noise onto the signal, which is later measured by the HA7062D phase noise analyzer. The HA7062D will also measure the phase noise of the LO in the ACE9600, highlighting the impact excessive LO phase noise has on performance and the importance of LO substitution during system testing.



Product Overviews:

Boonton SGX1000 Series RF Signal Generator:

The SGX1000 utilizes a proprietary blend of direct digital and direct analog synthesis to provide ultra-fine frequency resolution, lightning-fast frequency switching, and ultra-low phase noise. This performance makes the SGX1000 Series an ideal LO substitute for radar and satellite communications system testing.

Holzworth HA7062D Real-Time Phase Noise Analyzer:

Holzworth Phase Noise Analyzers utilize real-time, dual core engines for cross correlation speed, which are coupled with a pair of high performance internal LOs from Holzworth HSX Series RF Synthesizers. It is an ideal instrument for absolute and additive phase noise measurements for radar and satellite networks.

dBm ACE9600 Advanced Channel Emulator:

The dBm ACE9600 Advanced Channel Emulator can add RF link impairments (delay, Doppler, path loss, AWGN, multipath fading) and hardware-in-the-loop impairments (amplifier compression/distortion, phase noise, IMUX/OMUX filter shaping) to fully emulate satellite uplinks/downlinks.

More Resources:

Visit info.wtcom.com/aoc-2023 to learn more about T&M solutions for radar and satellite communications systems.

