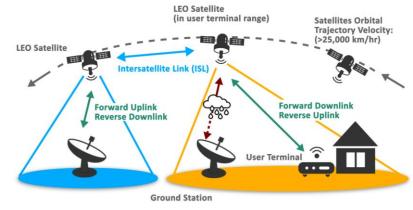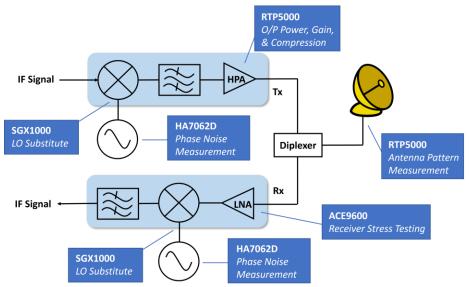# Uplink & Downlink Testing for Satellite Communications Systems

Deployments of low Earth orbit (LEO) satellites are happening at an ever-increasing rate. Due to the reduced latency of LEO systems, they are becoming, or will become, the system of choice for both civil/commercial and military applications including, but not limited to, 5G and military battlefield communications. Use of LEO systems for these types of operation leads to very demanding test requirements to ensure reliable operation.



Maury Microwave interconnect solutions, which include cable assemblies and adapters, ensure highly reliable, repeatable measurements for satellite systems. In addition, a demonstration showcases how solutions from Boonton, dBm, Holzworth, and Noisecom enable physical layer testing throughout the RF and microwave path of the uplink and downlink. The demonstration on the bench shows examples of these measurements, including propagation delay and 5G TDD network timing, noise tolerance testing, satellite amplifier linearity, phase noise analysis, and characterizing antenna performance.
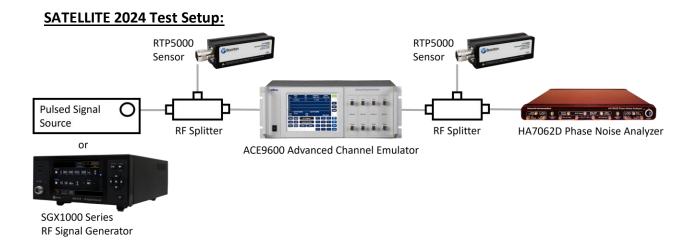


**Target Users:**

Target users include design engineers and technicians engaged in design, verification, and troubleshooting of the RF and microwave physical layer subsystems used in the uplinks and downlinks of ground and space segments.

**SATELLITE 2024 Test Setup:**



**Product Overviews:**

**Boonton RTP5000 Real-Time USB Peak Power Sensors to 40 GHz:**
The Boonton RTP5000 Series Real-Time USB Peak Power Sensors provide an excellent means of confirming power levels and delays throughout the up and downlink chains. With their fast measurement speed, they are ideal for making antenna pattern measurements. Crest factor measurement capability can quickly establish if amplifiers are being driven into compression.

**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.

**Holzworth HA7062D Real-Time Phase Noise Analyzer:**
The Holzworth HA7062D Phase Noise Analyzer provides industry-leading accuracy, high reliability, ease of automation, and the utmost flexibility. The real-time engine delivers extremely fast measurement speeds. It is excellent for evaluating absolute phase noise of the local oscillators and additive phase noise of the amplifiers in the uplink and downlink paths.

**Noisecom UFX7000B Programmable Noise Generator:**
The Noisecom UFX7000B Programmable Noise Generator adds controlled interference to better understand how RF signal paths in satellite applications perform under real-world interference challenges, such as signal jamming, reduced carrier-to-noise, and Eb/No scenarios.

**More Resources:**

Visit info.wtcom.com/satellite-2024 to learn more about T&M solutions for satellite communications systems.