COMMSCOPE®

Technical publication

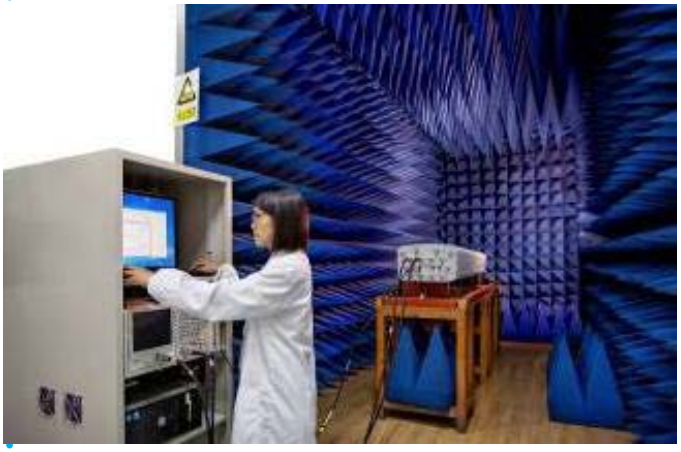
Base station antenna environmental criteria

CommScope Base Station Antennas are tested to a variety of environmental stress conditions to help ensure they perform as needed in wireless networks. These tests, which follow IEC 60068-2 methods and ETS 300 019-1-4 class 4.1E criteria with adjustments for antenna systems used in tower top conditions, are described below. The operating limits may vary slightly for antenna models but are detailed in their specifications.

Baseline testing

Baseline testing of antennas under nominal conditions is done before environmental exposures. This includes measuring RF performance such as:

- Return Loss / VSWR plots
- Passive Intermodulation (PIM) plots
- Isolation plots, if applicable
- Pattern data that includes: Beamwidth (vertical and horizontal), Gain, Beam, squint, Tilt, Front-to-Back Ratio (F/B), First Sidelobe Level (FSLL), Cross Polar Discrimination (if required), and other antenna RF parameters.



Reliability testing

Reliability testing of antennas starts in development and continues into production as samples are tested to a defined plan that confirms specifications are met and demonstrates reliable performance. Typically, these tests include:

Cold exposure at –40°C (or the minimum operating temperature) following IEC 60068-2-1 and ETS 300 019-1-4 class 4.1E conditions

Heat exposure at +70°C (or the maximum operating temperature) following IEC 60068-2-2 ETS 300 019-1-4 class 4.1E conditions

Temperature cycling following IEC 60068-2-14 and ETS 300 019-1-4 class 4.1E conditions and cycling between –40°C and +70°C (or the operating temperature limits)

Humidity exposure following IEC 60068-2-78 and ETS 300 019-1-4 class 4.1E conditions at +40°C.

Humidity cycling following IEC 60068-2-30 and ETS 300 019-1-4 class 4.1E conditions between +25°C to +40°C

Rain exposure following IEC 60068-2-18 and ETS 300 019-1-4 class 4.1E conditions using a custom rain chamber with multiple spray nozzles and 360 degree rotation stage to simulating general, heavy and huge rain effects on antenna surface.

Salt fog corrosion testing following IEC 60068-2-11 and ETS 300 019-1-4 class 4.1E conditions for corrosion testing.

Vibration and shock testing following IEC 60068-2-6 Sinusoidal Vibration, IEC 60068-2-64 Random Vibration and IEC 60068-2-27 Shock/Bump methods

UV weatherization testing is done on radome and other polymer materials that may be exposed to sunlight following IEC 60068-2-5 and ETS 300 019-1-4 class 4.1E conditions

Packaging/drop testing is done following IEC 60068-2-31 methods. This calls for free fall drops on each face of a packaged antenna from a height determined by its weight.

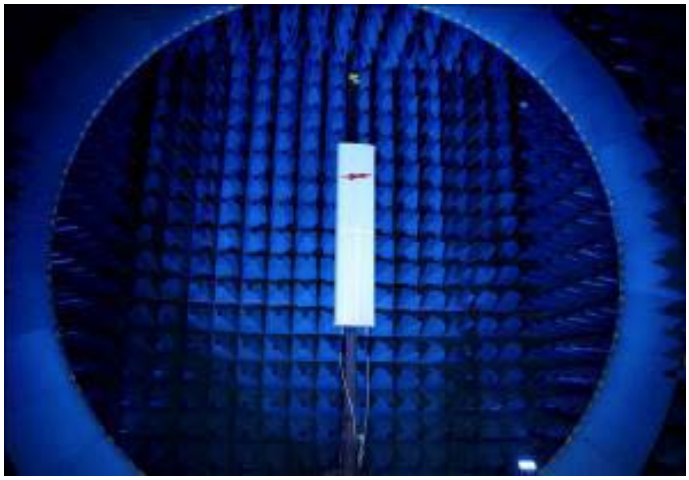
Wind survivability is tested using the simulated force of 241 km/h (150 mph) wind following the EN 1991-1-4 and/or EIA/TIA 222-G method. Force is spread over the antenna to test both the radome/housing and the mount and mechanical tilt hardware

Post test verification is done by re-measuring RF performance or other parameters following environmental exposures. Data collected during and after these tests are analyzed, documented and used for continuous reliability improvements.

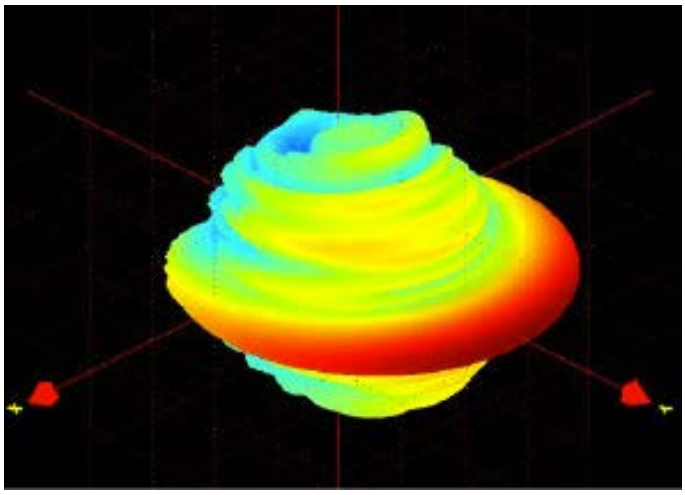
Passive intermodulation (PIM) is tested repeatedly during antenna development to assure performance is within spec and remains stable using a two tone, 20 Watt per carrier test method dynamically. During development and in 100% production PIM testing, antenna are mechanically stressed to detect marginal or intermittent performance.

Power handling of new antenna types is tested during development using an enclosed system that can power antennas using 16 carriers with up to 35 Watts per carrier to assure the power handling ability or 500 watts for single carrier. Typically covered 850MHz, 1900MHz and 2600MHz.

Lightning protection surge testing is a part of EMC compliance testing refer from IEC61000-4-5 and UL1449 standard, typically equipment output with 1.2µs/50µs or 8µs /20µs pulse surge generator and max capability with 20KV (10KA). Testing typically focused on RET, AISG/bias tee/AILP board and other electrical/active PCBA plus filters, in addition, some of RF port surge verification at different surge level is also required.



Pattern testing of RF performance is used during antenna development to qualify new designs as well as during production to monitor quality. Pattern tests are performed at indoor cylindrical and spherical near field test range or outdoor far field range. Spherical near field range Commscope antenna performance assurance center (CAPAC) cover 400MHz to 6GHz frequency range and anechoic chamber with 100dB shielding effectiveness. 8-port high speed RF switches, 127 data collection and one calibration probes arch (4.2m inner diameter) with oversampling capability, which results in max AUT size up to 3.3 meter.



Everyone communicates. It's the essence of the human experience. *How* we communicate is evolving. Technology is reshaping the way we live, learn and thrive. The epicenter of this transformation is the network—our passion. Our experts are rethinking the purpose, role and usage of networks to help our customers increase bandwidth, expand capacity, enhance efficiency, speed deployment and simplify migration. From remote cell sites to massive sports arenas, from busy airports to state-of-the-art data centers—we provide the essential expertise and vital infrastructure your business needs to succeed. The world's most advanced networks rely on CommScope connectivity.

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