

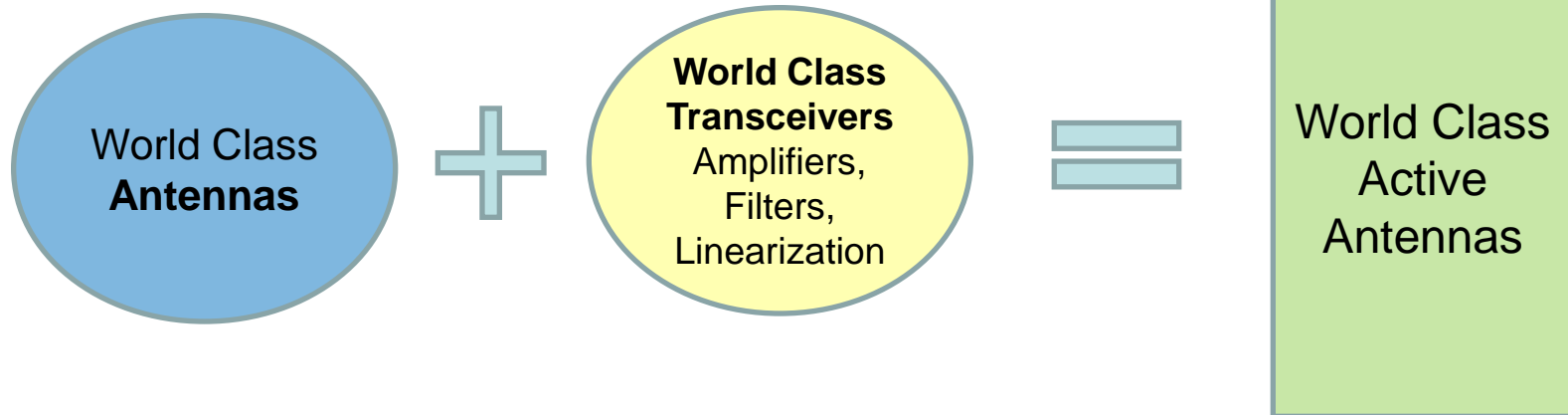


Active Antenna Systems

 on the go

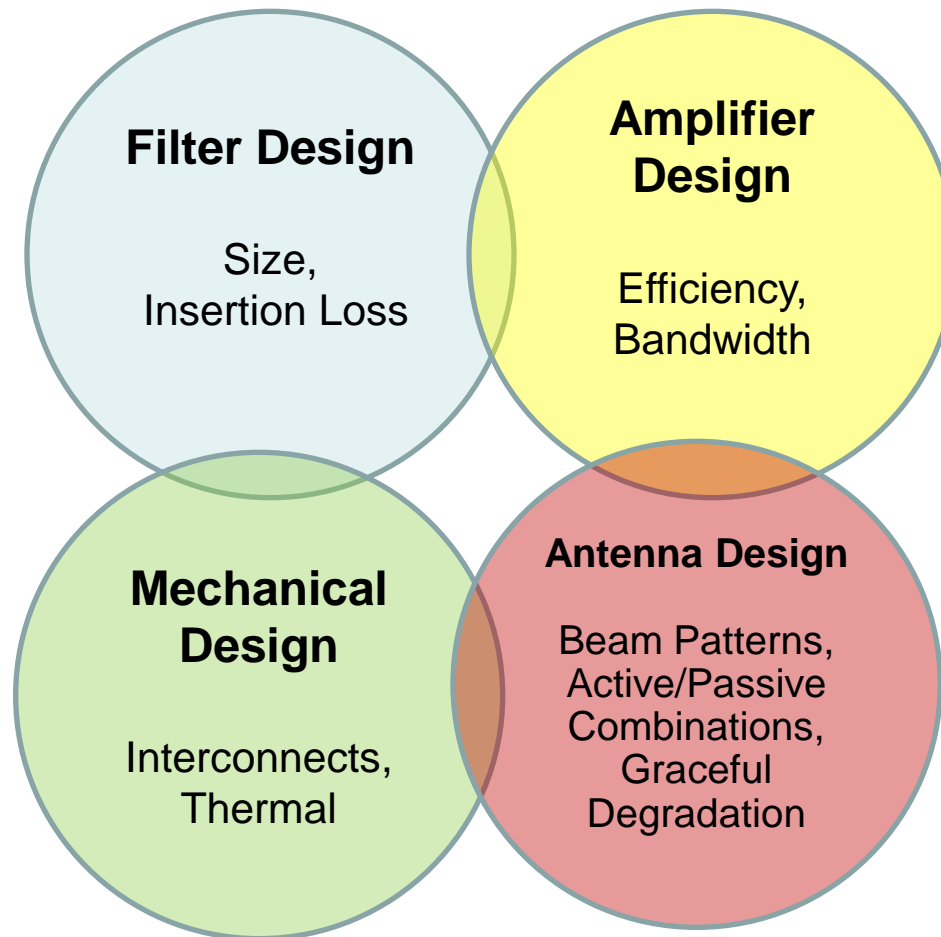
connect+evolve

Leader in active antennas



- CommScope is a world leader in antenna designs
- Pioneering active antennas for over 10 years
- Joint development with Ubidyne since 2007
- CommScope has developed industry-leading technology in remote radioheads, filters, amplifiers, and wideband linearization
- Combined expertise positions CommScope as a global leader in active antennas

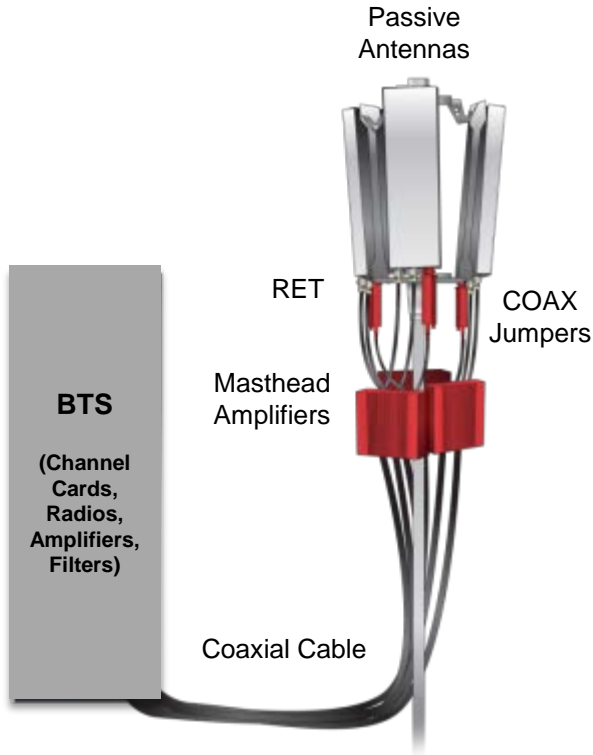
Active Antenna Design Challenges



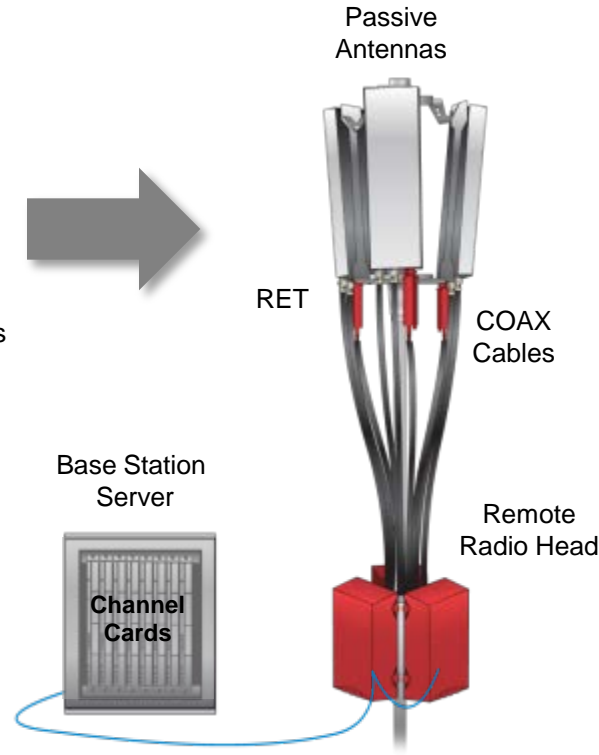
All are CommScope core competencies

Wireless Network Evolution

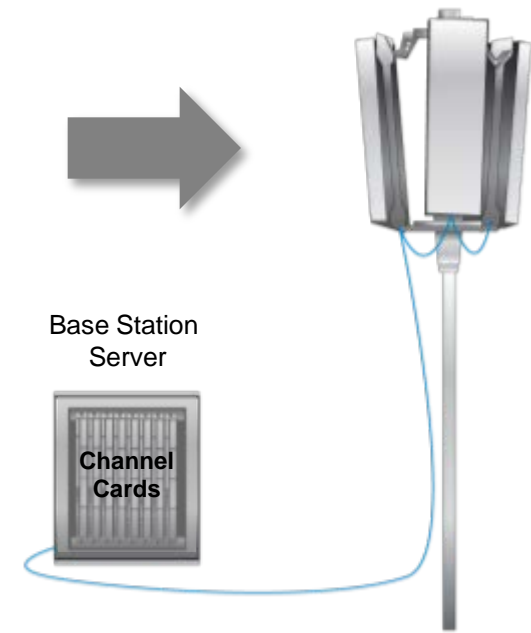
The Past Conventional BTS



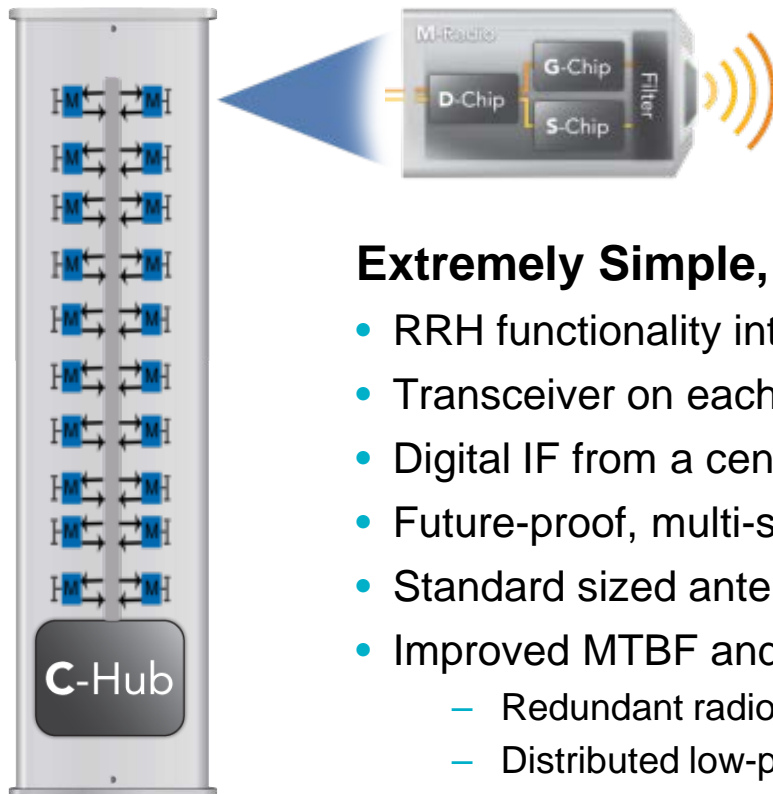
The Present Remote Radio Head



The Future Active Antennas



Minimizing the hardware footprint is a key benefit to active antenna design



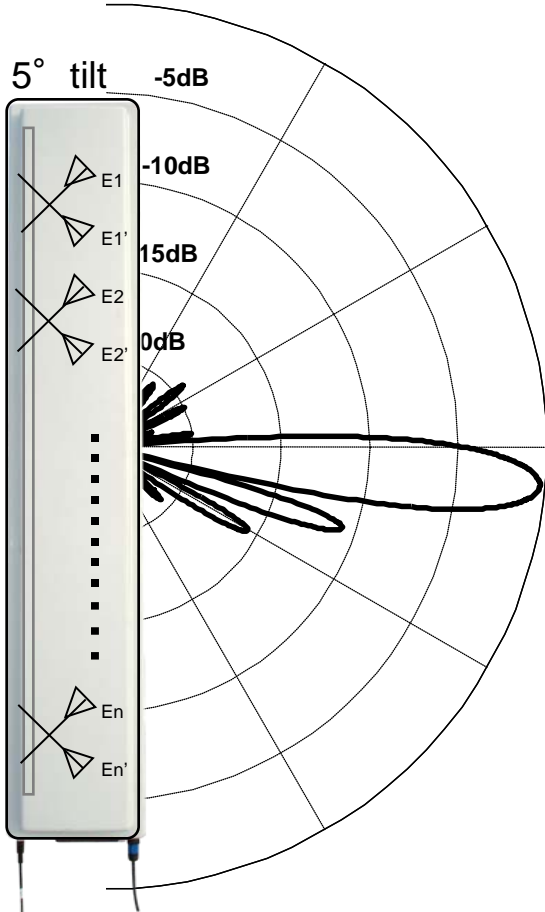
Antenna Embedded Radio™

Extremely Simple, Digital Architecture

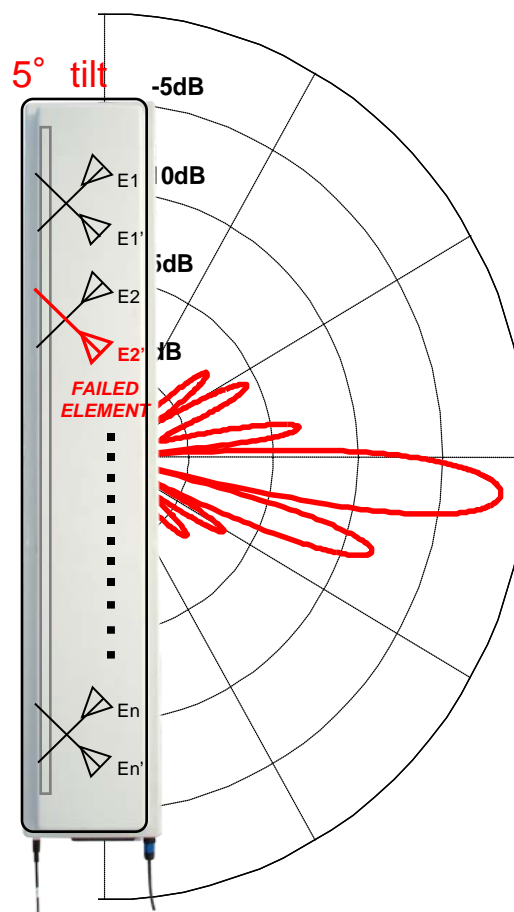
- RRH functionality integrated and distributed into the antenna
- Transceiver on each element — redundant architecture
- Digital IF from a central DSP unit, C-Hub
- Future-proof, multi-standard, soft-configurable
- Standard sized antenna — fiber feed from the base band radio
- Improved MTBF and network reliability
 - Redundant radio architecture
 - Distributed low-power transceivers
 - Custom chip integration
 - Passive cooling
- Direct control of signals to each radiator enables digital elevation beam control at baseband — capacity improvements

A Self-Healing Response To A Failure

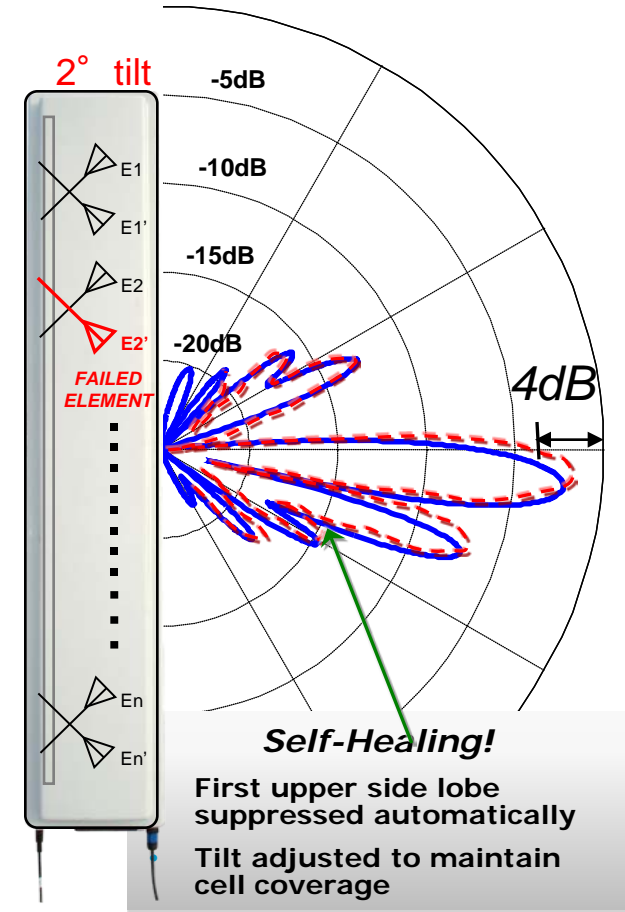
Normal Pattern



Single Failure Before Compensation



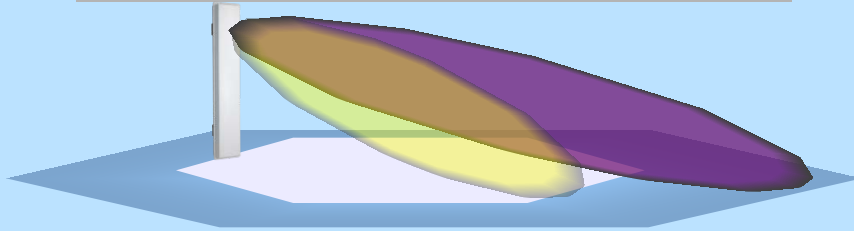
Single Failure After Compensation



Unmatched Service Life Due To Built-In Redundancy And Unique Pattern Compensation Capability

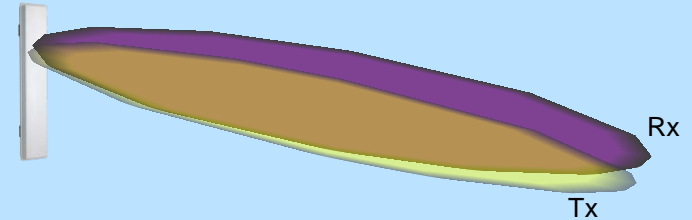
Dynamic Electronic Pattern Control

Tilt by Carrier- Vertical Sectorization



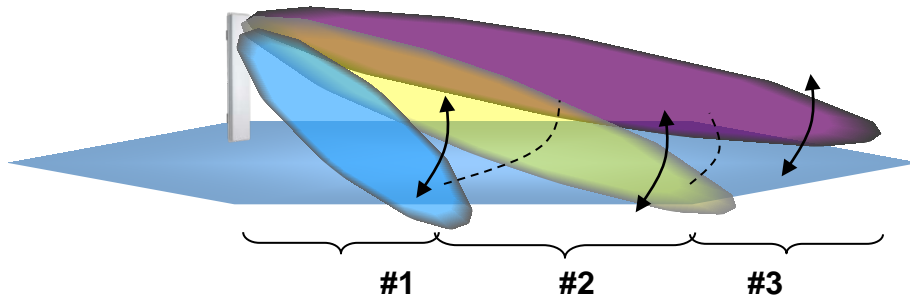
- Multiple beams per carrier enables vertical sub-sectorization for capacity enhancement

Tx / Rx Tilt Optimization



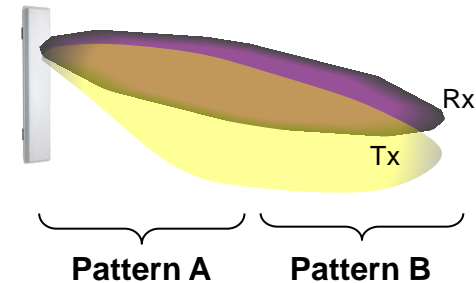
- Significant capacity improvement
 - Improves handset battery life

Tilt by Standard- Air Interface



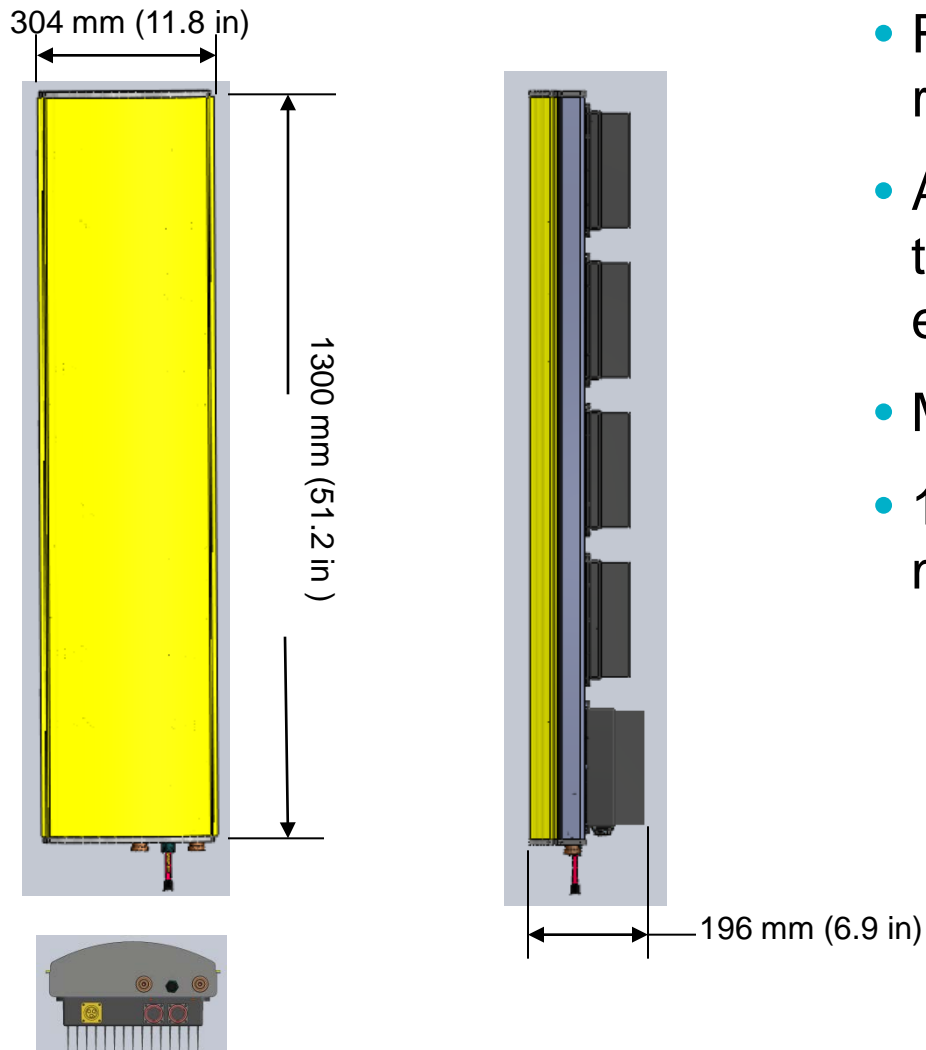
- Tilt per standard (GSM/UMTS/LTE)
 - Simplifies RAN sharing

Beam Shape Control



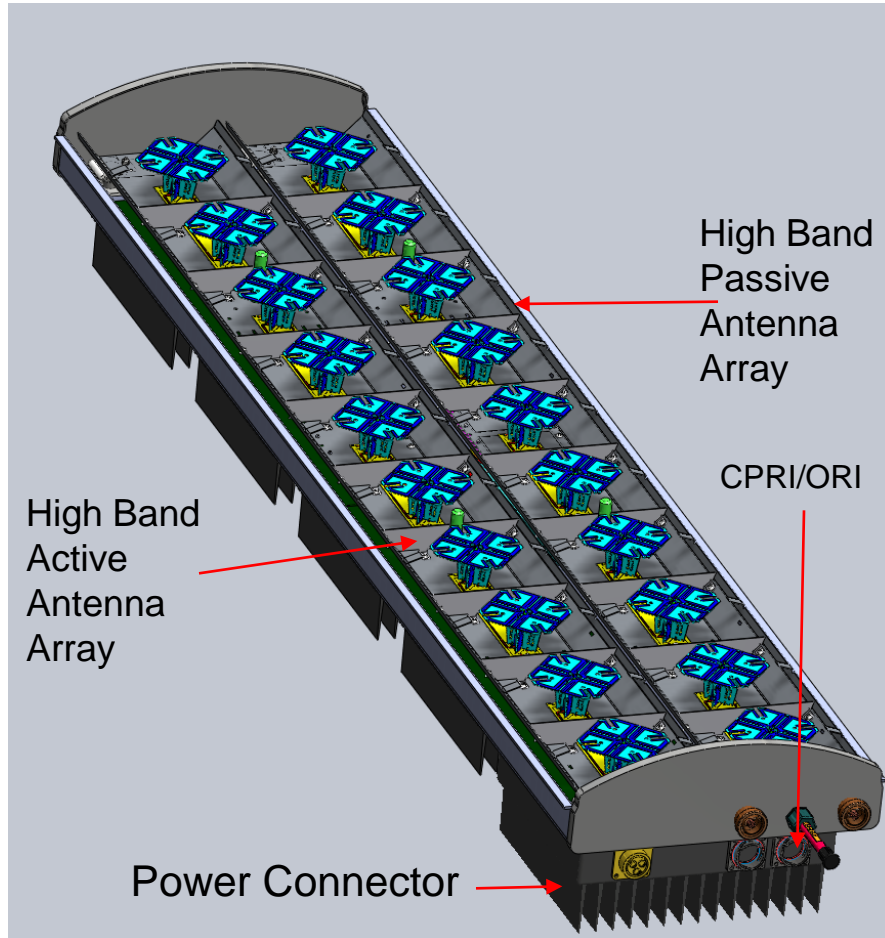
Unique capability to optimize signal patterns of each carrier of each sector for Maximum Network Performance

High-band Active Antenna Currently in Development



- Radio modules are field replaceable
- Antenna array elements identical to current Andrew passive element arrays
- Multi-standard
- 1800, 1900, AWS and 2600 MHz models in the roadmap

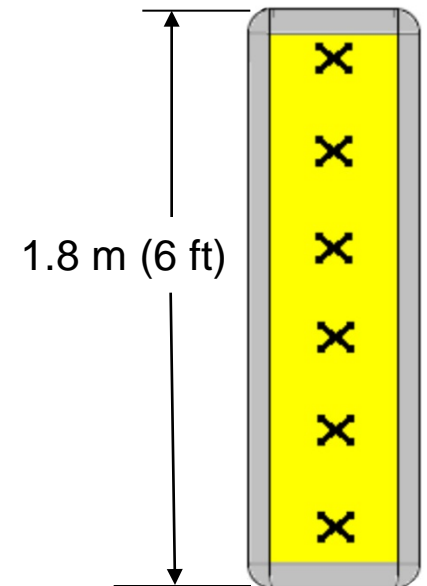
Active-Passive Antennas in Development



- Passive and Active antenna arrays in a dual-column arrangement
- Design borrows from CommScope's industry leading antenna arrays
- Broadband elements to cover low-band or high-band applications

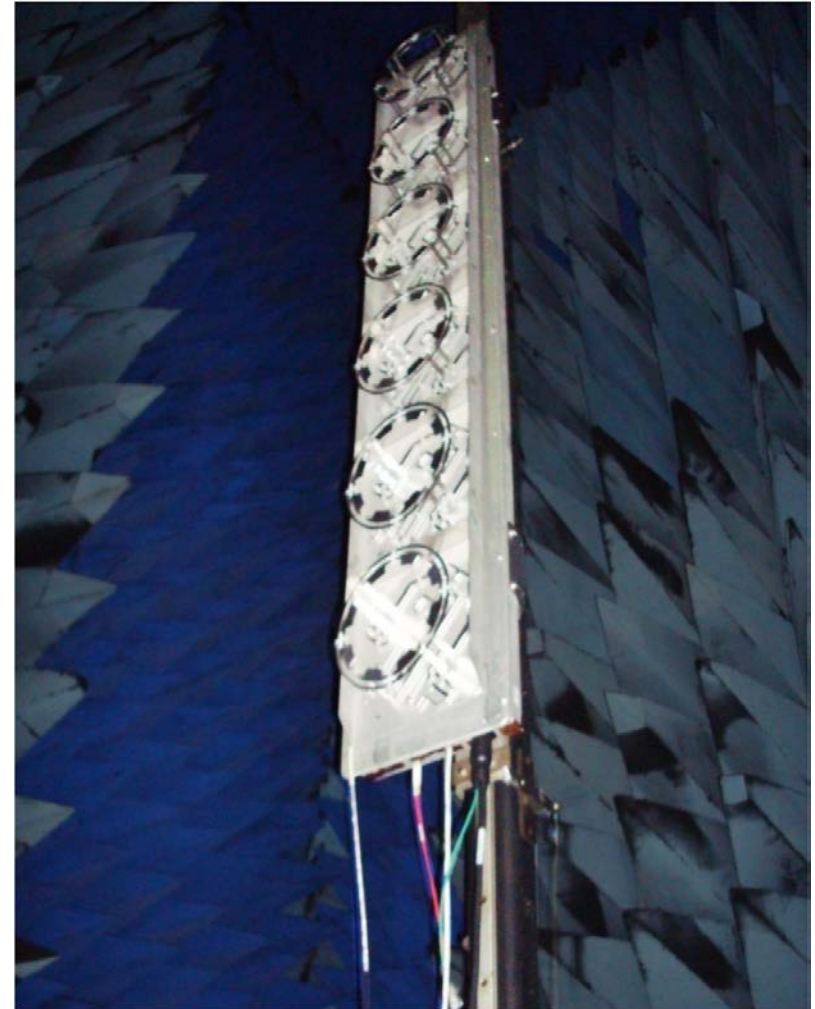
700 MHz Active Antenna General Specifications

- 1.8 m (6 ft) antenna
- 12° elevation beamwidth
- 65° azimuth beamwidth
- 16.5 dBi gain
- 15 W RF output power per array (6 x 2.5 W)
- 30 W RF output power total (2 x 15 W)
- Single 10 MHz LTE carrier
- 6 dual-polarized radiating elements with 12 total Tx/Rx paths



**700 MHz
Active
Antenna
LTE Trial**

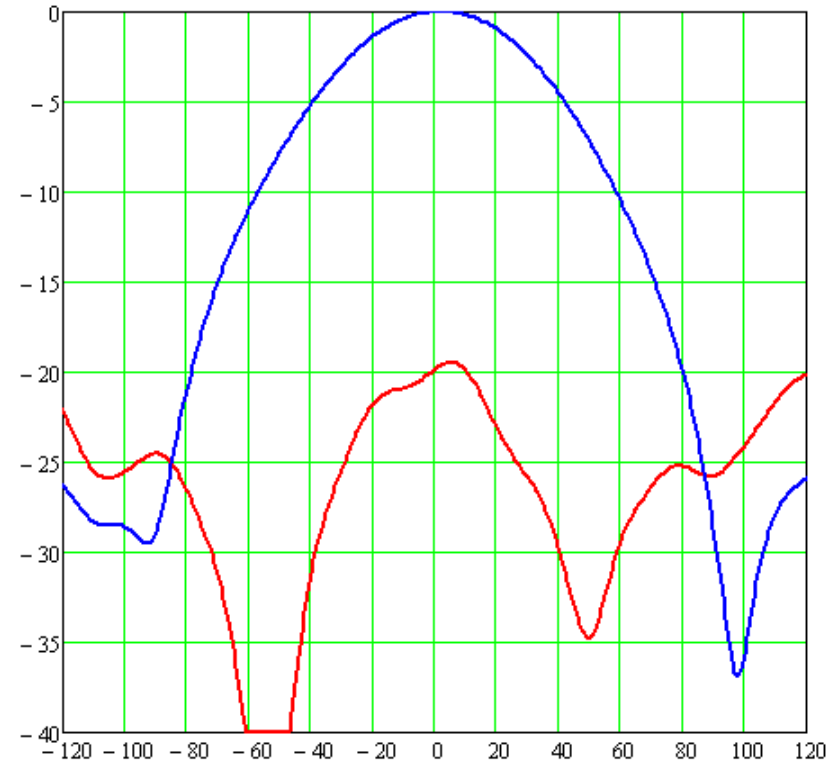
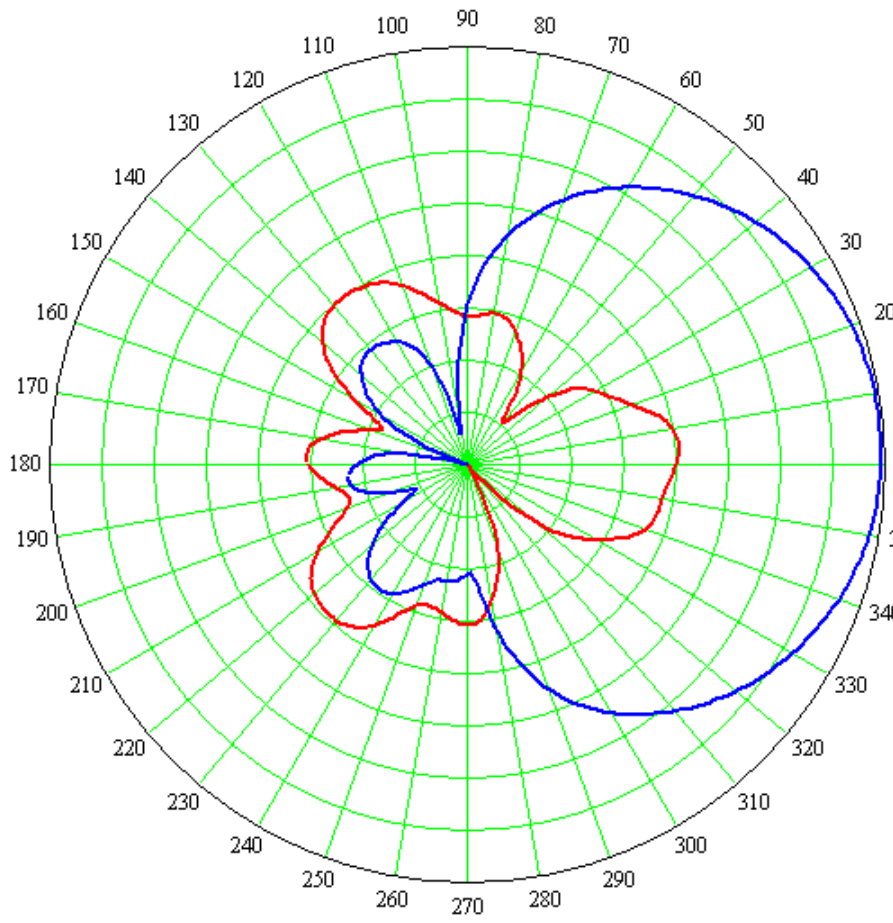
- Azimuth and elevation patterns recorded in May, 2011
- Elevation beam down-tilting characterization completed for 0° to 14° range
- Elevation pattern shaping confirmed with excellent agreement to theoretical patterns
- Pattern compensation demonstrated for simulated transceiver failures



700 MHz Active Antenna in Anechoic Chamber

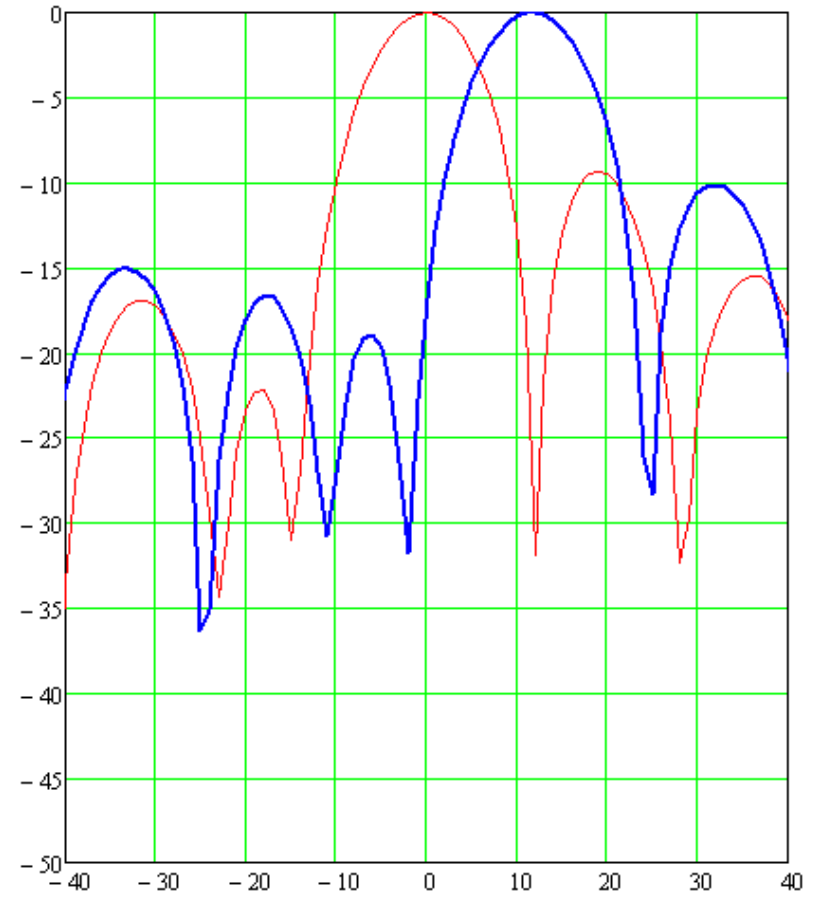
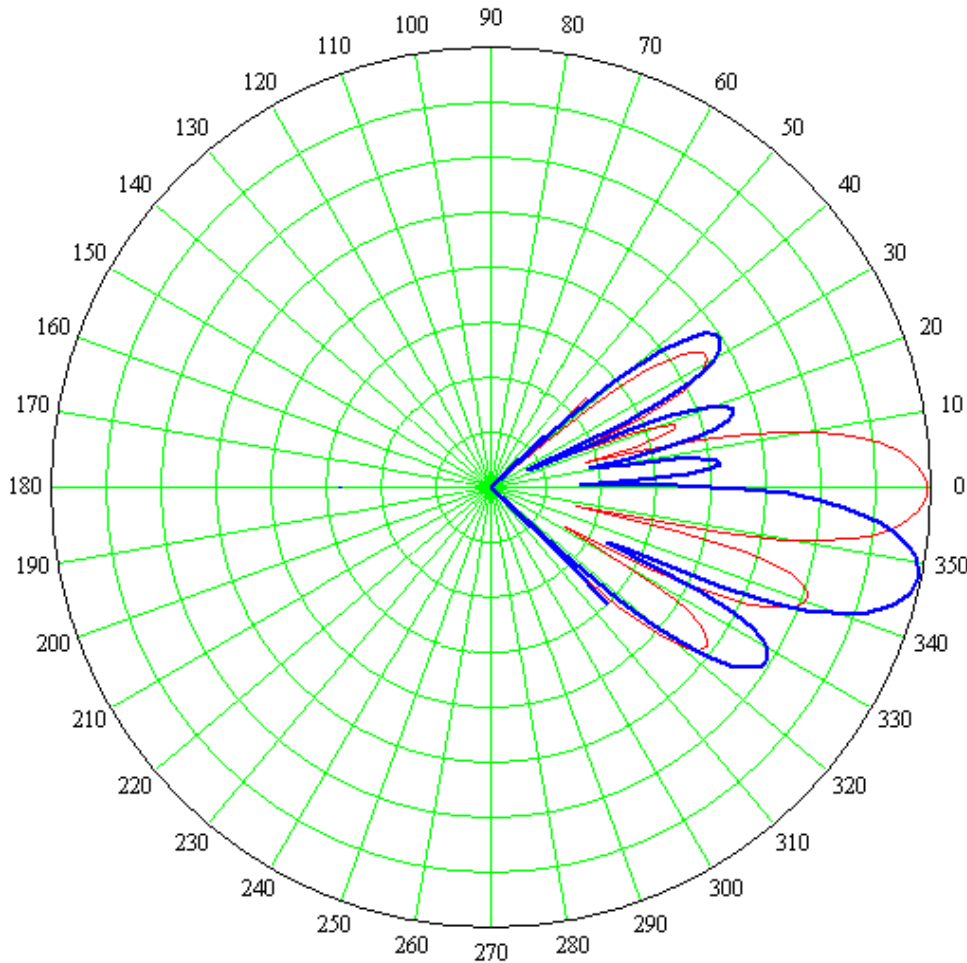
700 MHz Active Antenna Azimuth Pattern

Excellent cross-polarization patterns



700 MHz Active Antenna Elevation Pattern

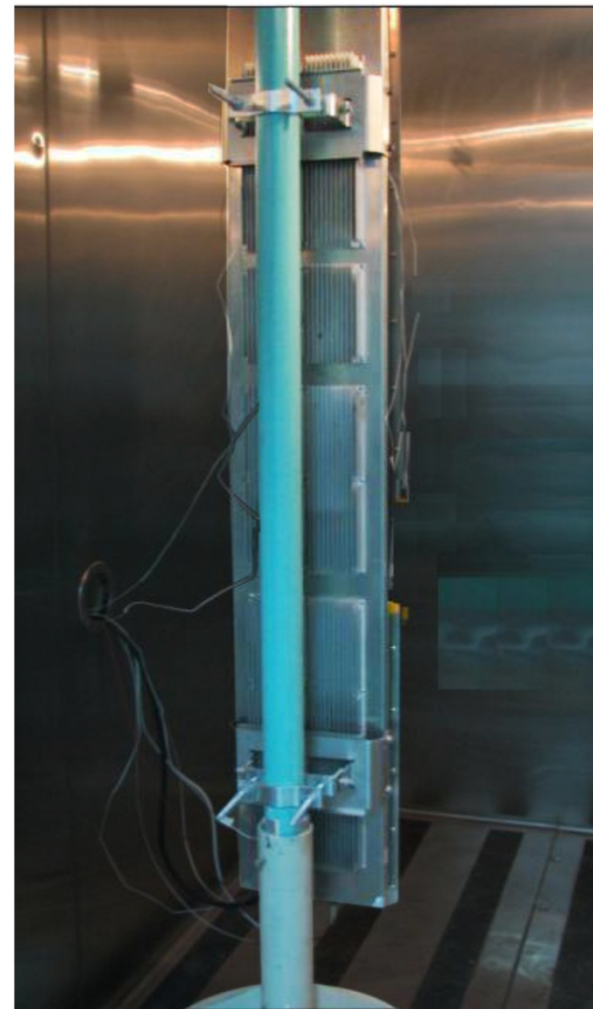
Excellent elevation patterns and upper side-lobe performance with down tilt



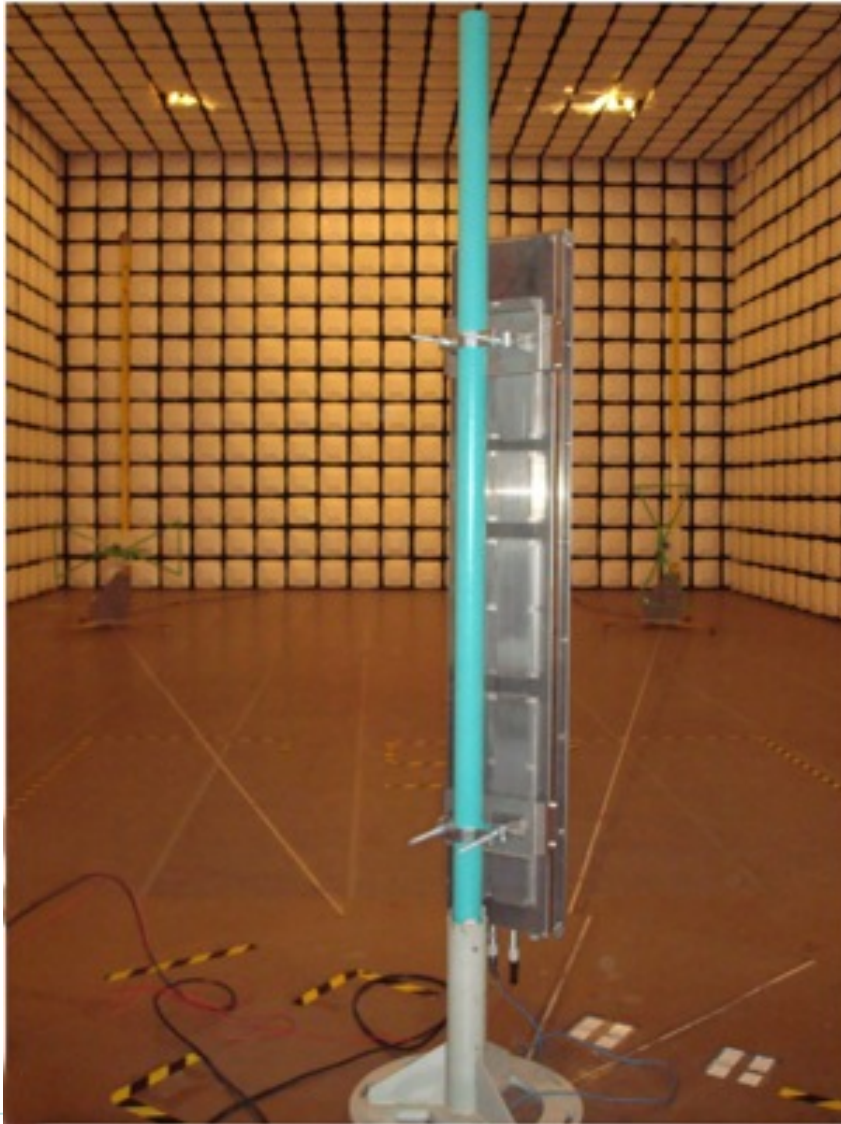
Environmental Verification Testing: Thermal Characterization and Burn-In



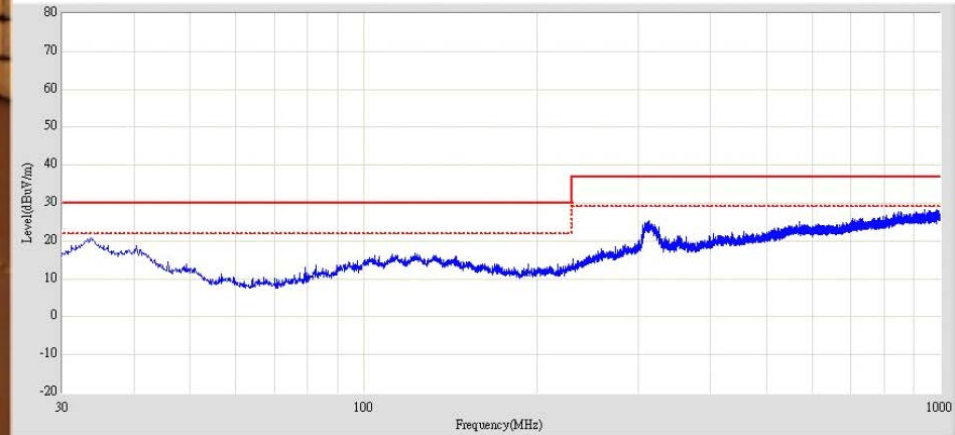
48 hour full power burn-in testing



High temperature (50° C) thermal testing



- Radiated emissions compliance demonstrated for CISPR22 Class B for 10 m (32.8 ft) distance:
- 30 to 230 MHz (30 dB μ V per m)
- 230 to 1000 MHz (37 dB μ V per m)



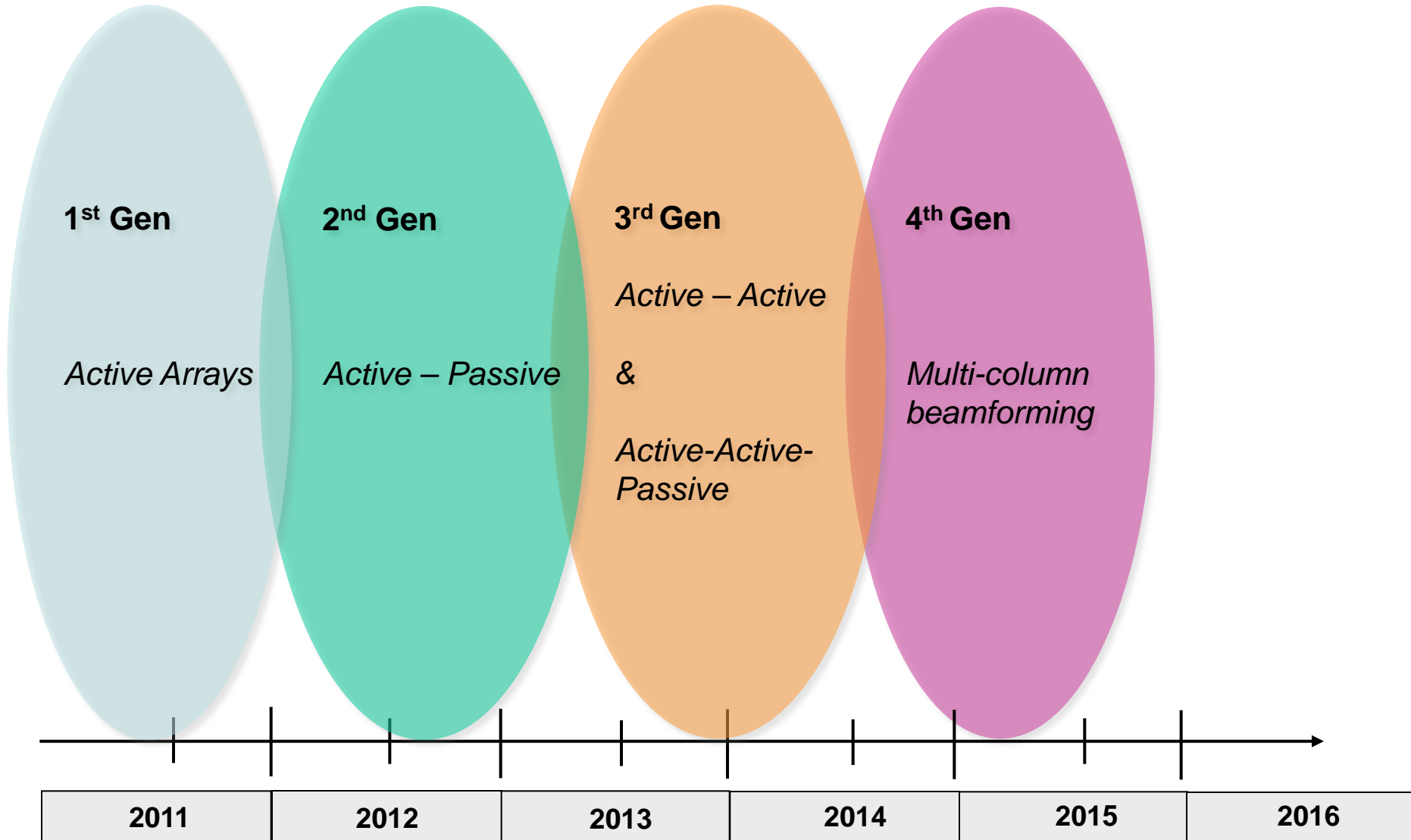
Field Trial Installation



700 MHz
Active Antenna



Active Antenna Product Roadmap



Thank You

COMMSCOPE®