Cisco 4G LTEA, 4G LTE, and 3G Omnidirectional Dipole Antenna (LTE-ANTM2-SMA-D)

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Overview

This document provides the description, supported features, and installation instructions for the Cisco 3G/4G LTE and LTEA Omnidirectional Dipole Antenna (LTE-ANTM2-SMA-D).

Caution Read the information in Safety Instructions before installing or replacing antennas.

The LTE-ANTM2-SMA-D omnidirectional dipole antenna is designed for indoor use with Cisco 4G Long Term Evolution (LTE) and Long Term Evolution Advanced (LTEA) Service Routers (ISRs) and Pluggable Modules with an SMA connector.

The LTE-ANTM2-SMA-D antenna is marked with a dual green band to indicate that it supports Cisco LTEA routers and modules.

This antenna has the following features:

- Support for frequencies of 617-960, 1400-1700, 1710-2690, 3400-3900, and 5150-6000 MHz.
- Articulating joint that can maneuver into three stop positions: 0°, 45°, and 90°.
- Male SubMiniature A connector that allows direct mounting of the antenna to any Cisco supported router or Pluggable Module with an SMA connector.
- The SMA connector design has added rotational frictional torque to ensure the SMA interface stays properly mated, and to reduce chances of a disconnect. The design is also more finger friendly compared to a classic SMA hex nut design.

For optimal performance, we strongly recommend that you use two antennas to take full advantage of MIMO technology on all Cisco cellular routers that support MIMO (4G LTE and later releases).

Figure 1: Cisco LTE-ANTM2-SMA-D Omnidirectional Dipole Antenna

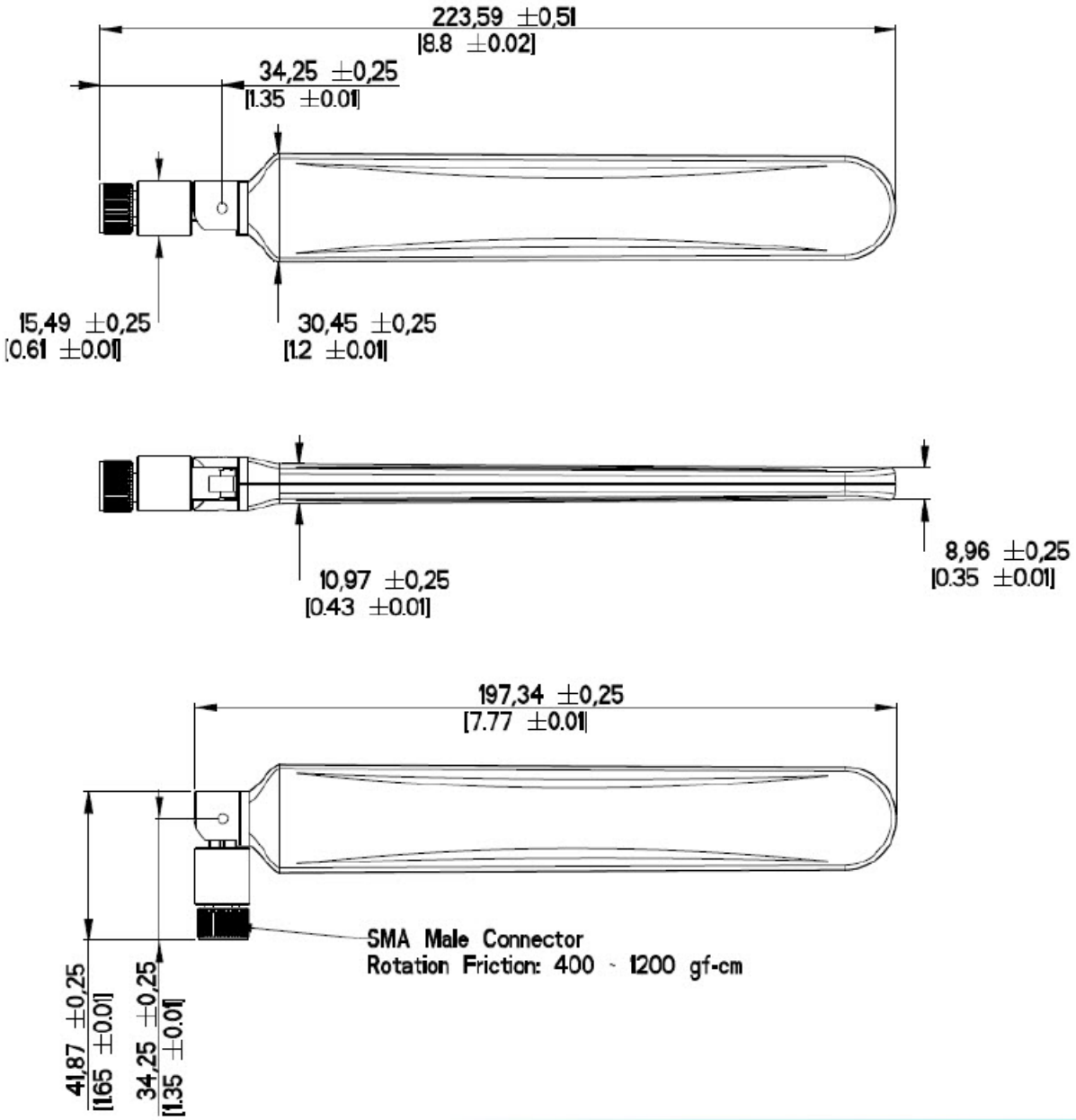
Specifications

Table 1: Specifications of the LTE-ANTM2-SMA-D antenna

Operating Frequencies	• 617-960 MHz • 1400-1700 MHz • 1710-2690 MHz • 3400-3900 MHz • 5150-6000 MHz
Polarization	Vertical
Nominal Impedance	50 Ohms
Peak Gain	• 617-960 MHz - 0 dBi • 1400-2690 MHz -2 dBi • 3400-3900 MHz- 5 dBi • 2500-2690 MHz- 5 dBi Note The standalone antenna peak gain numbers are provided above. When you install an antenna close to metallic objects or directly on chassis, the peak gain will be affected. We recommend that you keep antennas away from very large chassis and metallic objects. You can install antennas directly on smaller or medium size chassis. In all cases, we recommend that you keep different antennas away from each other and from various known sources of electromagnetic radiation.

VSWR	• 4.5:1@698-960 MHz • 4:1@1400-2690 MHz • 4:1@3400-3900 MHz • 4:1@5150-6000 MHz
Power withstanding	3 W
DC Power	No DC power required for LTE-ANTM2-SMA-D antenna operation.
Dimensions	9” (L) x 1.46” (W) x 0.43” (D) (229 x 37 x 11 mm)
Weight	50 grams
Efficiency	LTE-ANTM2-SMA-D antennas have high standalone efficiency, and maintain high efficiency when directly installed on front plate of a small or medium size Cisco router. However, depending on chassis size and a variety of other electromagnetic considerations, installing the antenna directly on the chassis is not always recommended.
Temperature Range	-30°C to + 85°C (Operating) -40°C to + 85°C (Storage)

Figure 2: Mechanical Drawing



Antenna Radiation Patterns

Figure 3: VSWR Vs Frequency

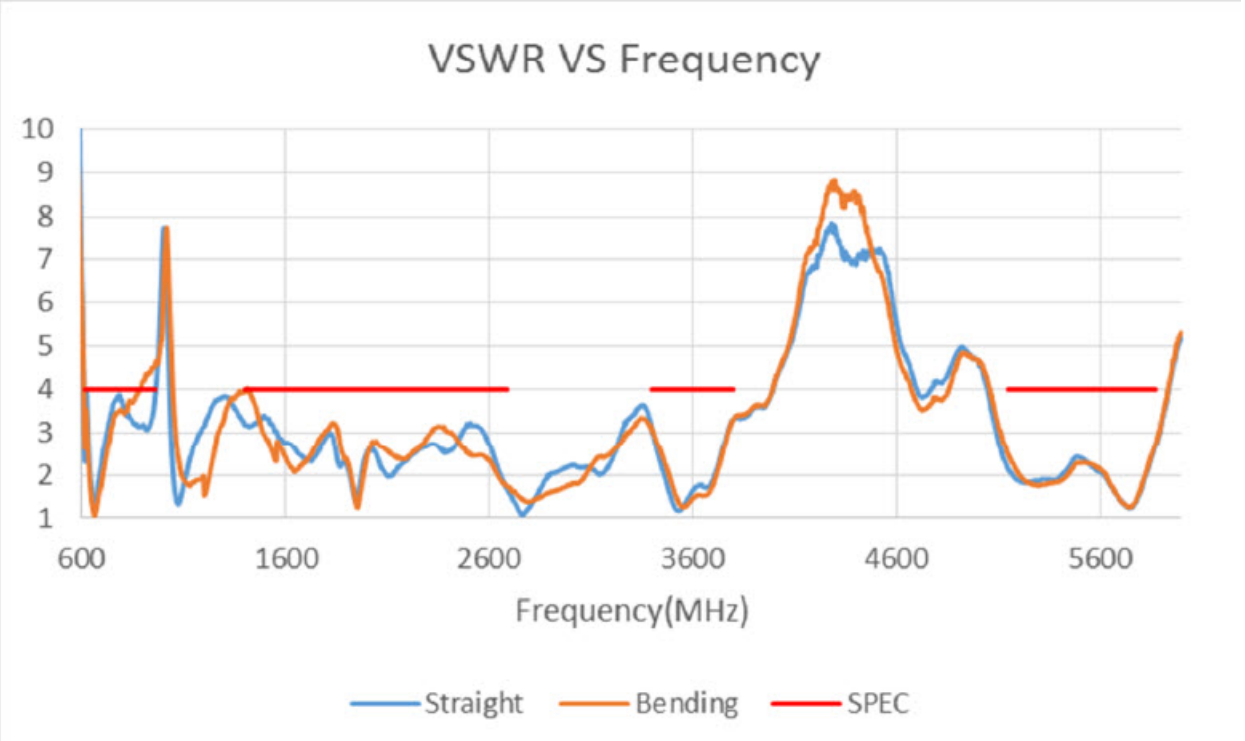


Figure 4: Efficiency Vs Frequency

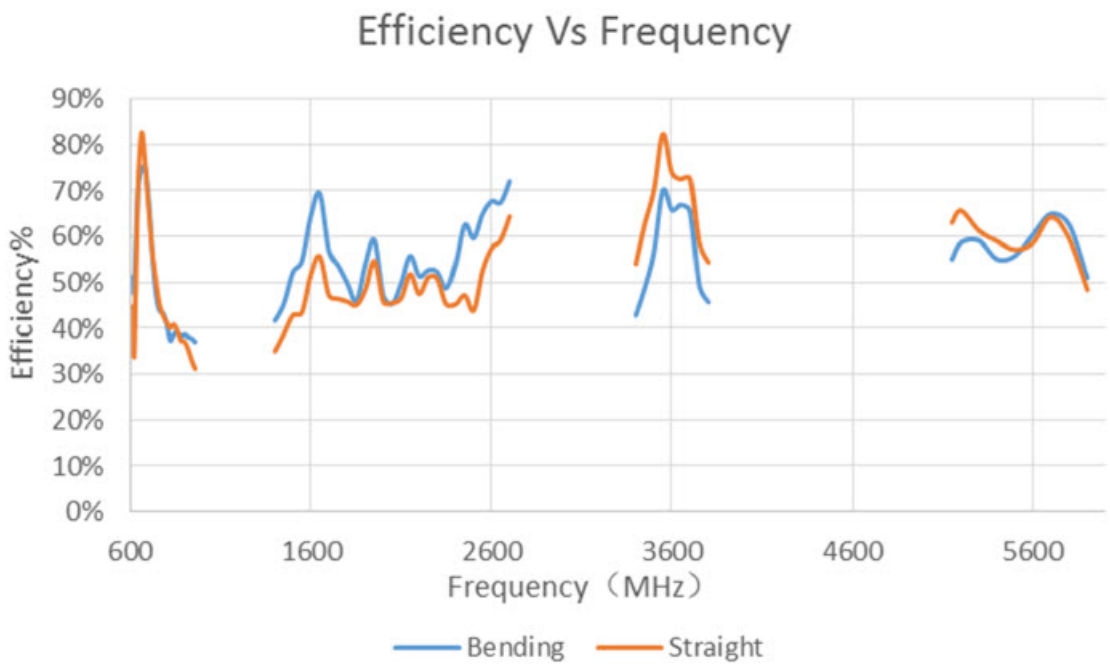


Figure 5: Gain Vs Frequency

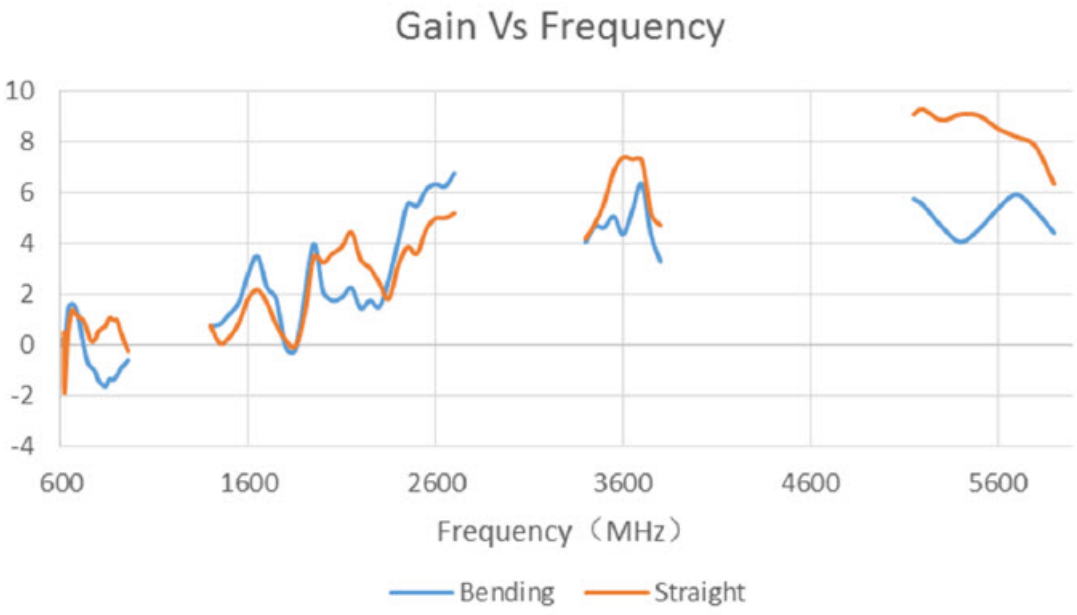
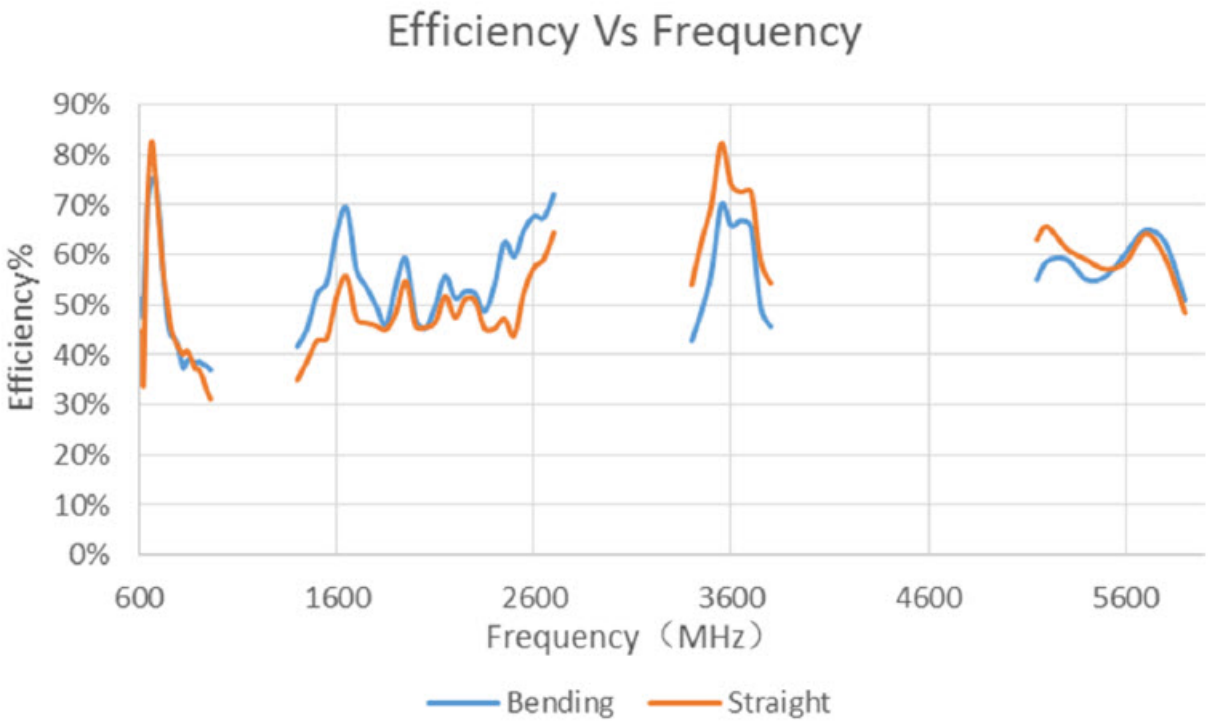


Figure 6: Efficiency Vs Frequency



Gain Plots 617-900 MHz

Figure 7: XY Plane

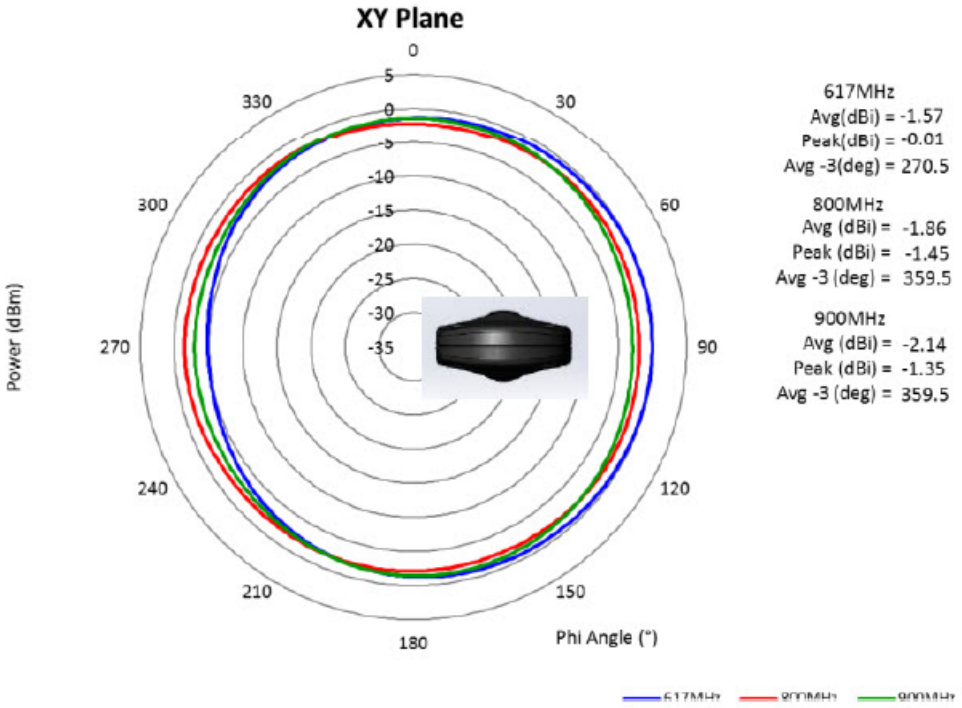


Figure 8: ZX Plane

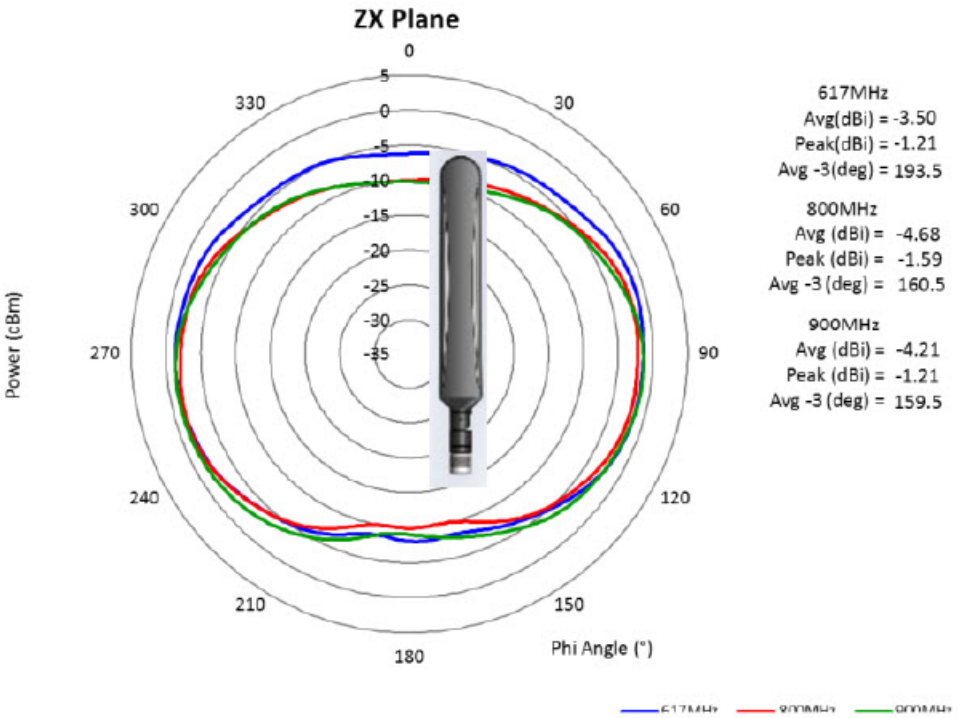
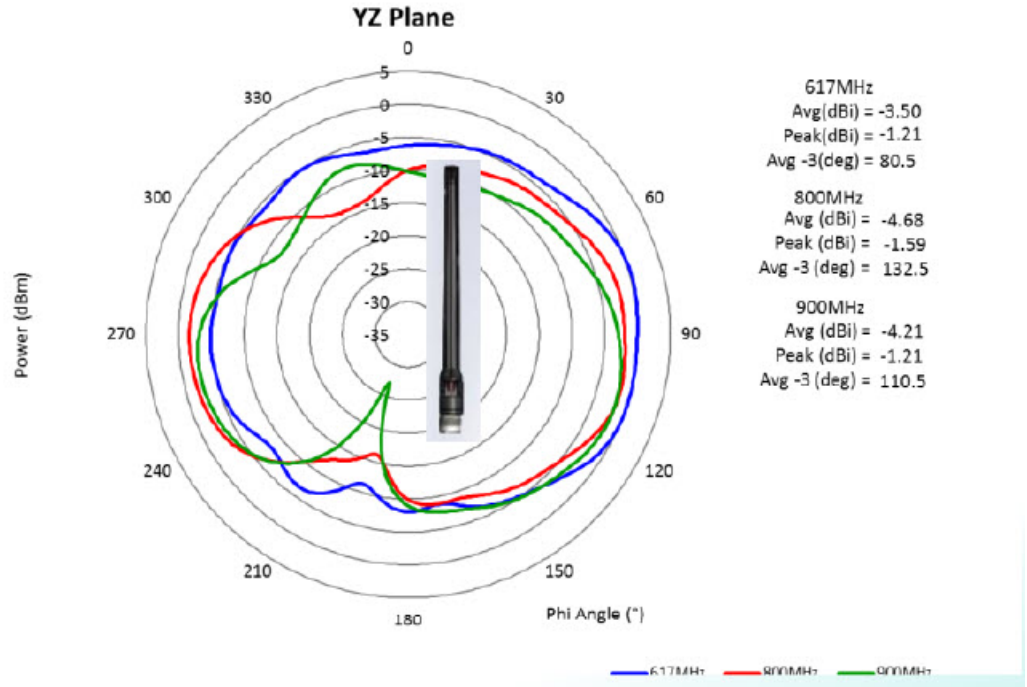


Figure 9: YZ Plane



Gain Plots 1400-2700 MHz

Figure 10: XY Plane

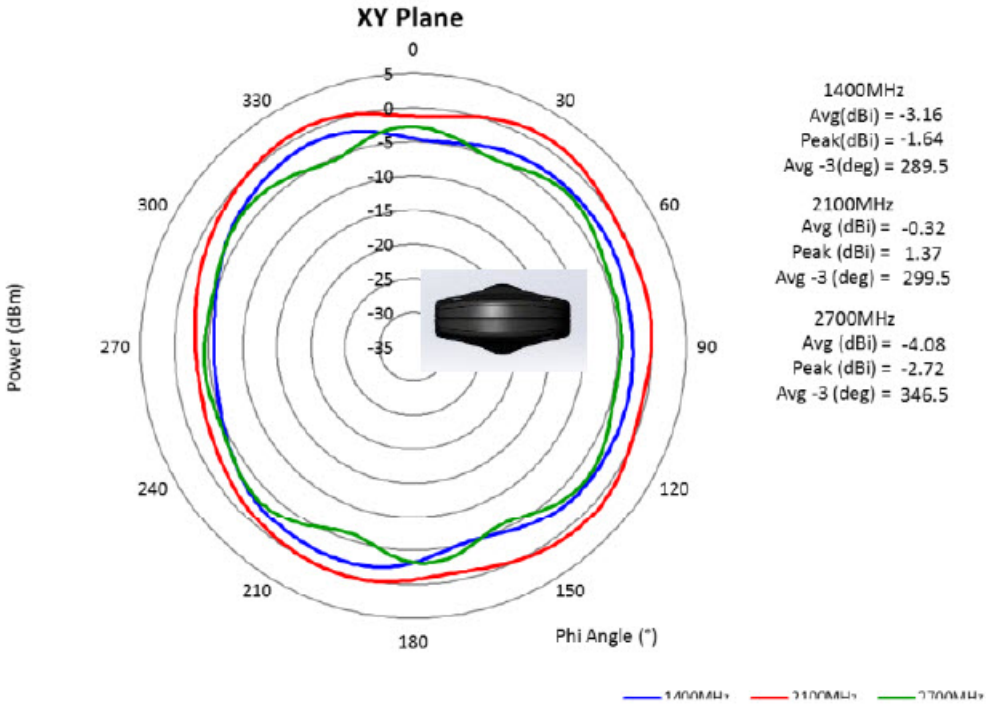


Figure 11: ZX Plane

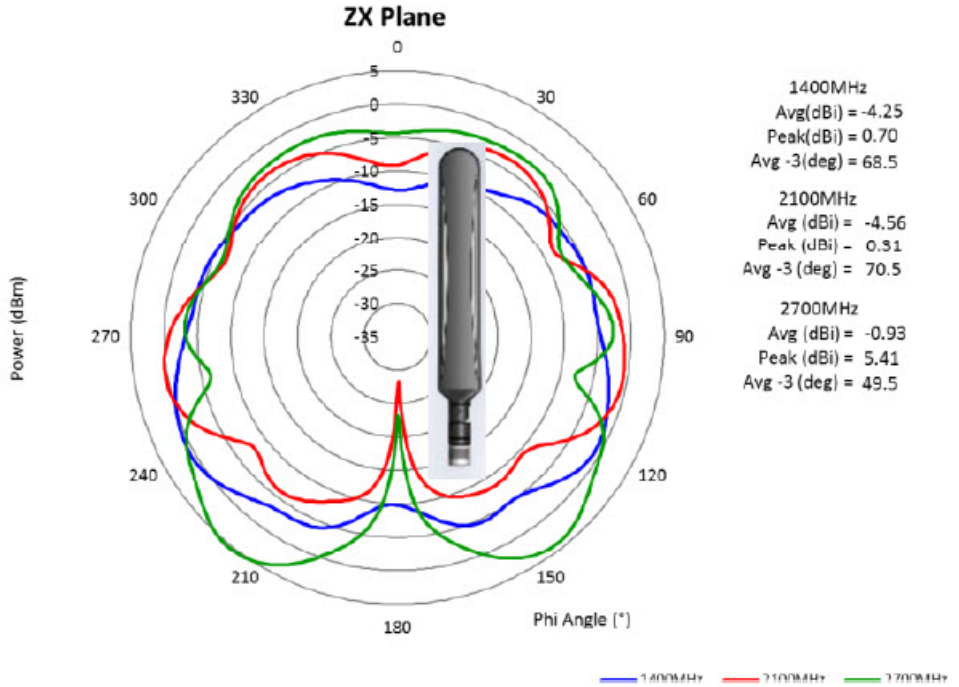
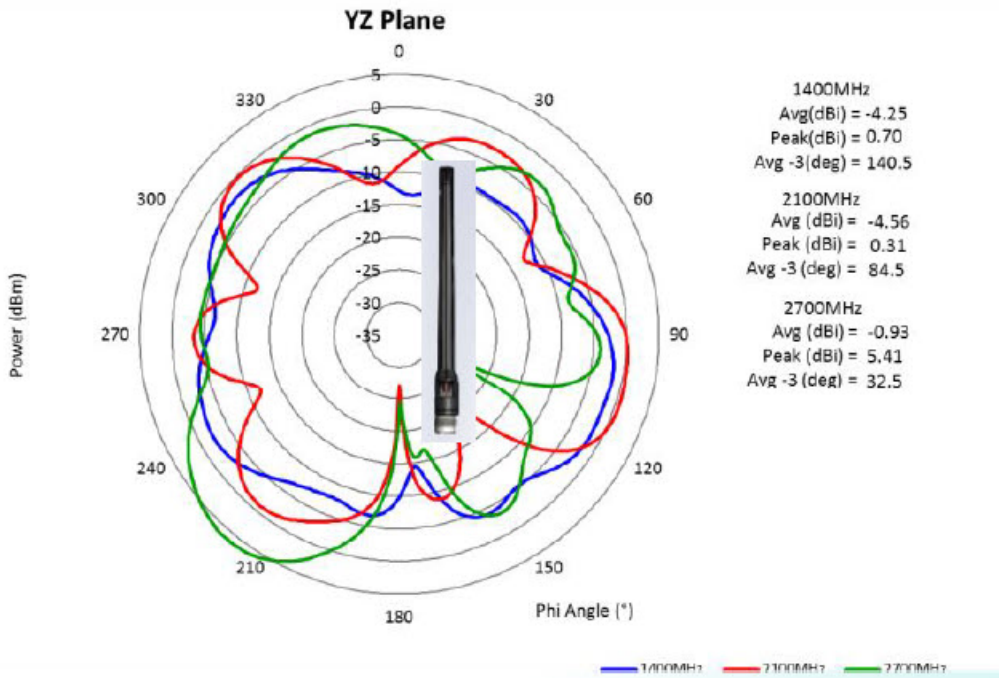


Figure 12: YZ Plane



Gain Plots 3400-3900 MHz

Figure 13: XY Plane

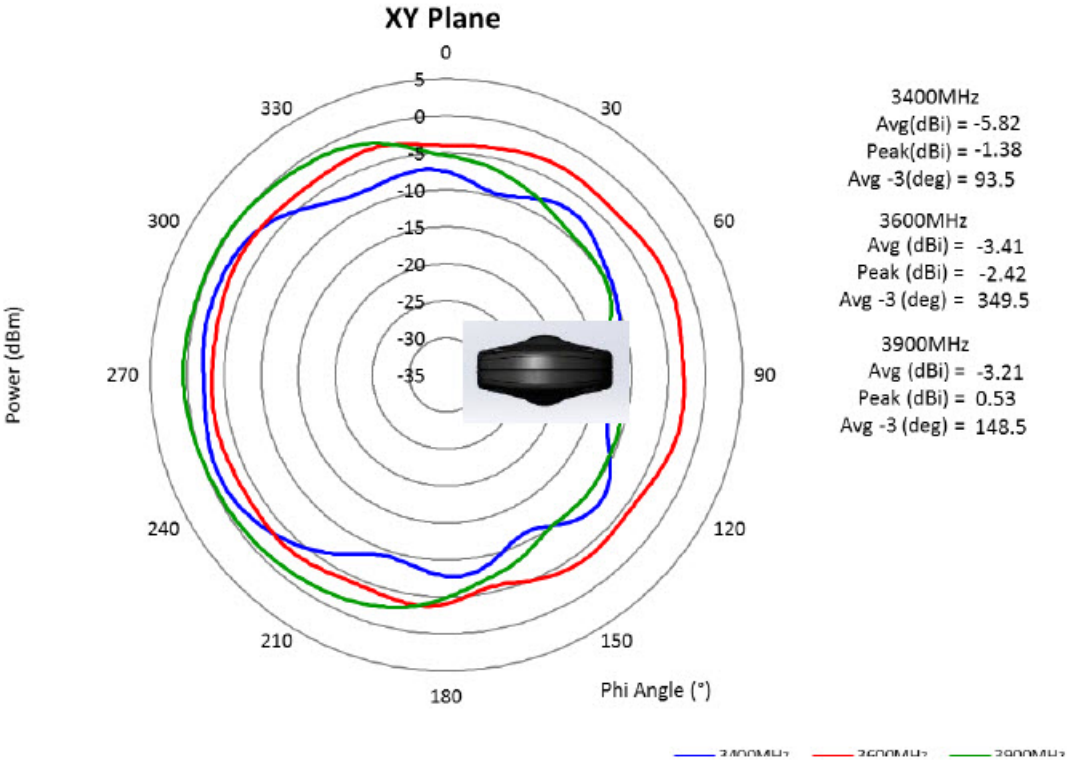


Figure 14: ZX Plane

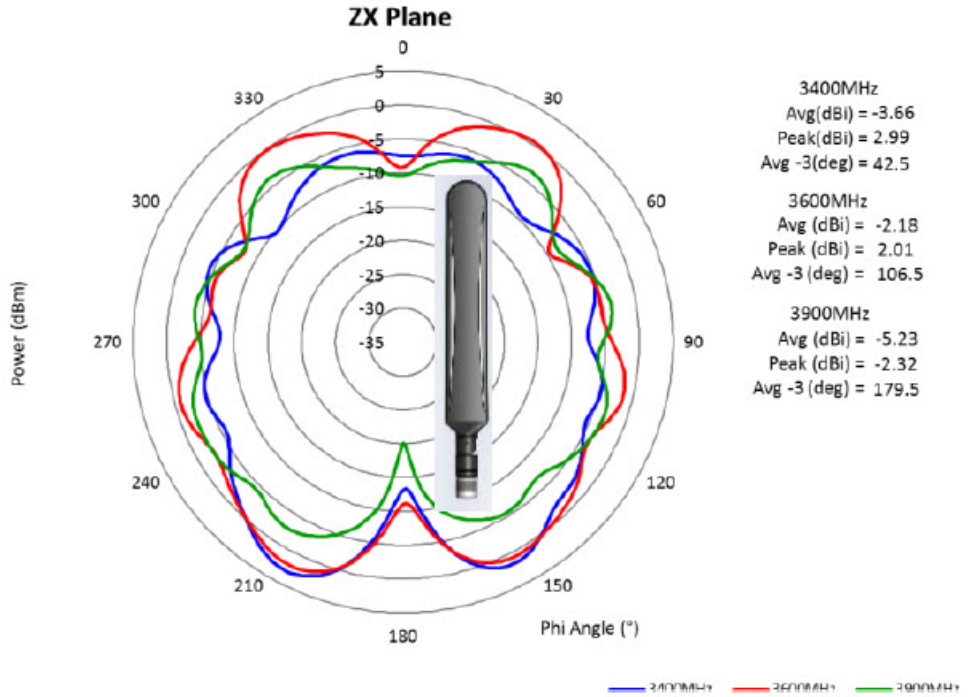
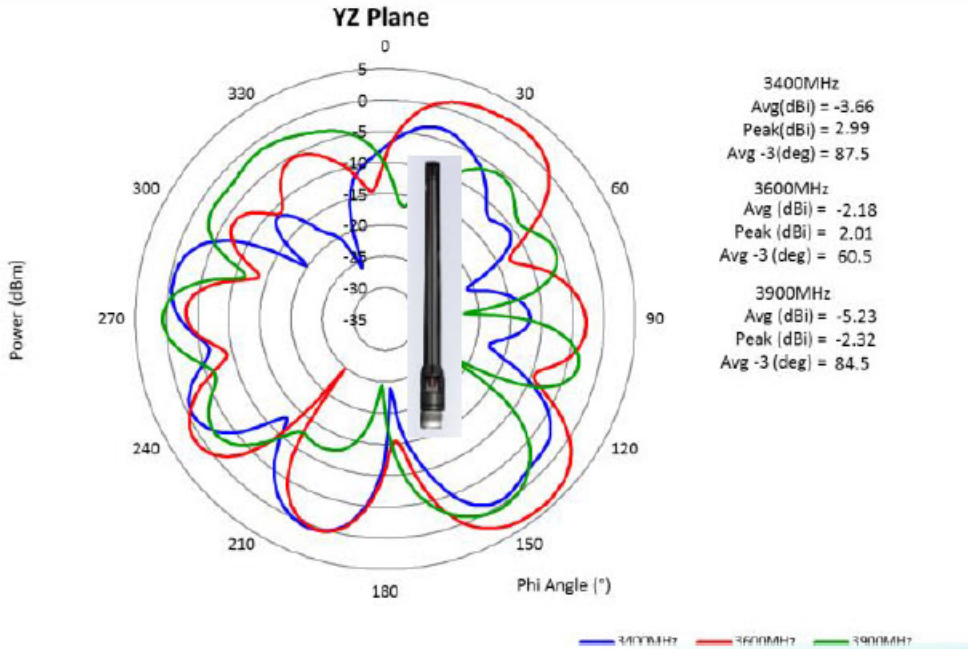


Figure 15: YZ Plane



Gain Plots 5150-6000 MHz

Figure 16: XY Plane

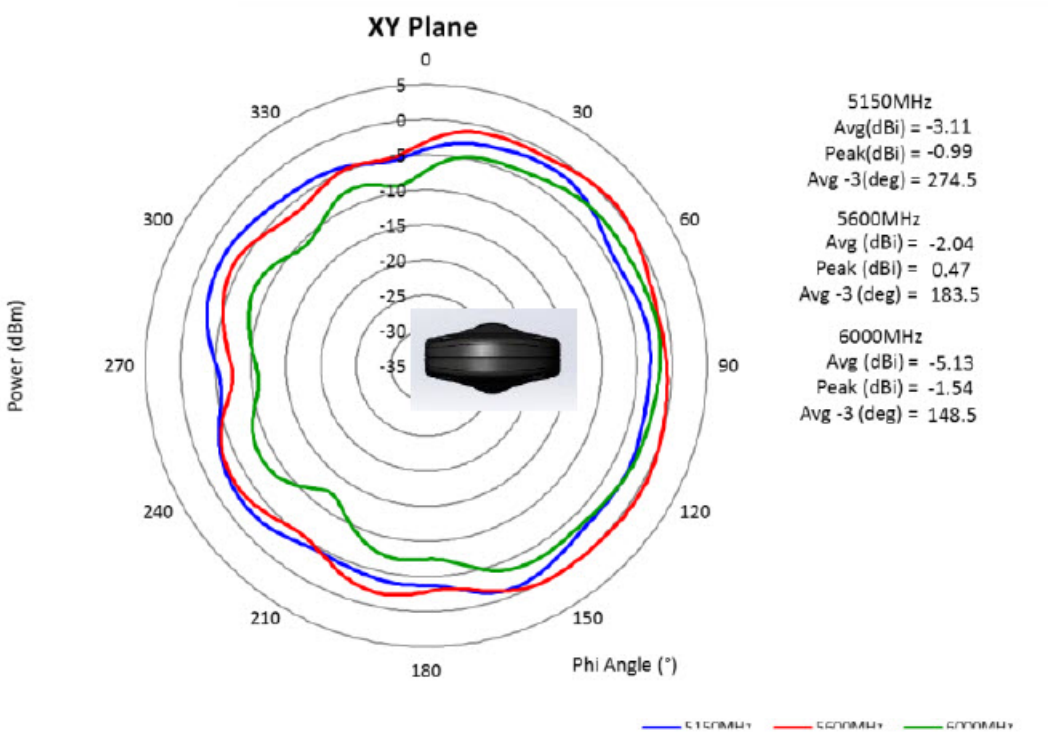


Figure 17: ZX Plane

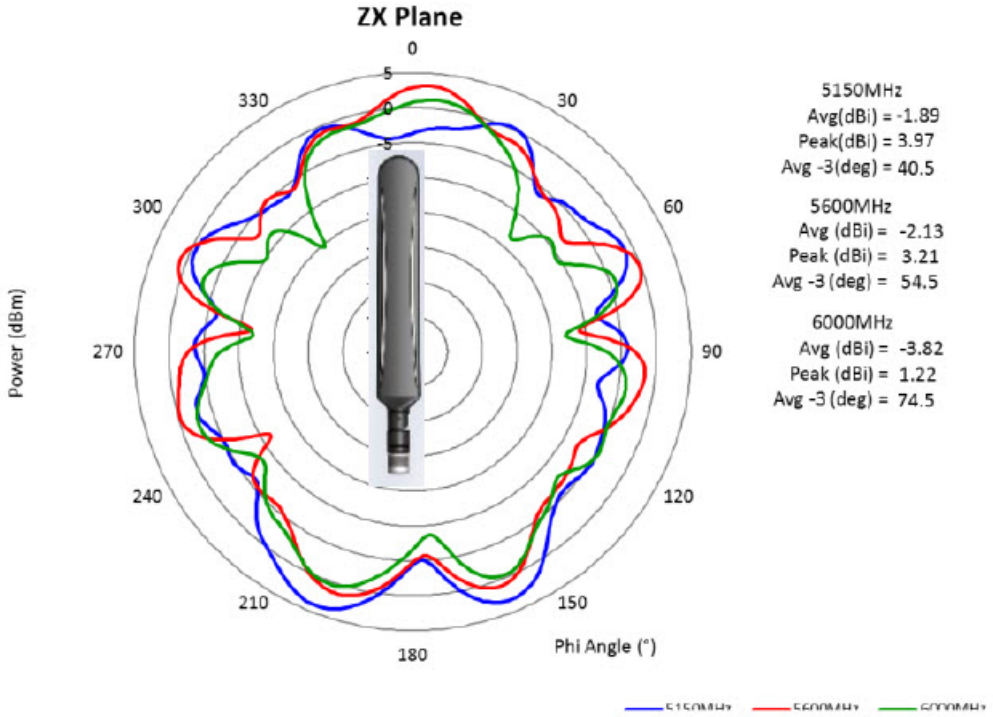
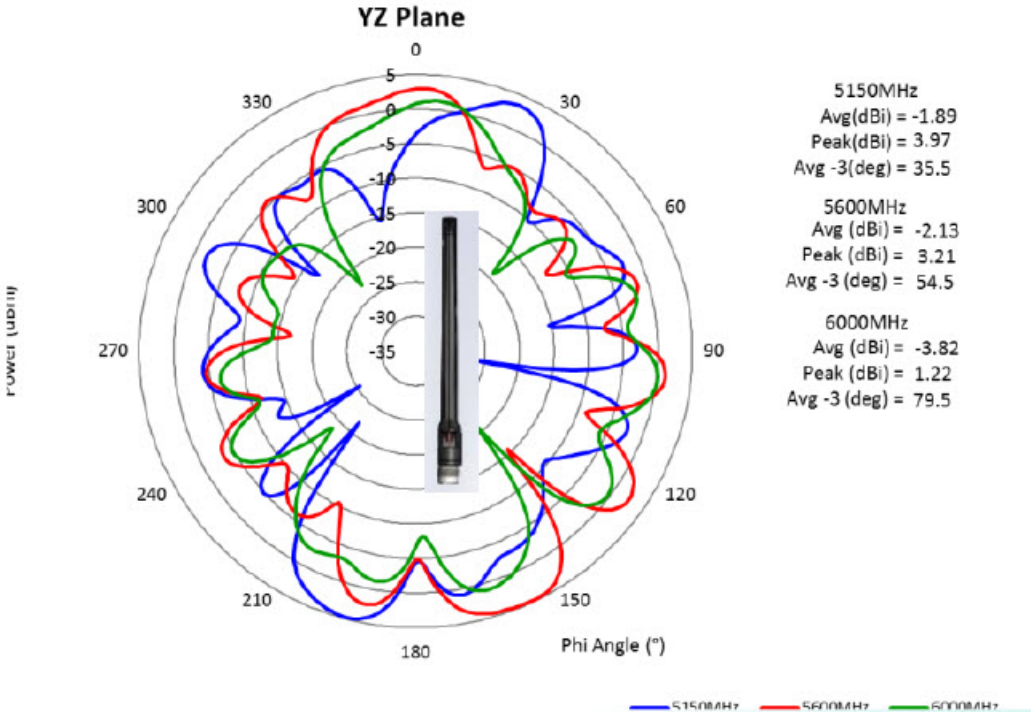


Figure 18: YZ Plane



General Safety Precautions

Warning This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. **Statement 1071**

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. **Statement 1001**

Warning Do not locate the outdoor antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada:Canadian Electrical Code, Section 54). **Statement 1052**

Warning In order to comply with FCC radio frequency (RF) exposure limits, antennas should be located at a minimum of 7.9 inches (20 cm) or more from the body of all persons. **Statement 332**

Each year hundreds of people are killed or injured when attempting to install an antenna. In many of these cases, the victim was aware of the danger of electrocution, but did not take adequate steps to avoid the hazard.

Warning For your safety, and to help you achieve a good installation, please read and follow these safety precautions. **They may save your life!**

For your safety, read and follow these safety precautions.

- If you are installing an antenna for the first time, for your own safety as well as others, seek professional assistance. Your Cisco sales representative can explain which mounting method to use for the size and type antenna you are about to install.
- Before you install an antenna, contact your Cisco account representative to explain which mounting method to use for the size and type of antenna that you are about to install.
- Find someone to help you—installing an antenna is often a two-person job.
- Select your installation site with safety, as well as performance, in mind. Remember that electric power lines and phone lines look alike. For your safety, assume that any overhead line can kill you.
- Contact your electric power company. Tell them your plans and ask them to come look at your proposed installation.
- Plan your installation carefully and completely before you begin. Each person involved in an installation should be assigned to a specific task, and should know what to do and when to do it. One person should be in charge of the operation to issue instructions and watch for signs of trouble.

- When installing your antenna, follow these guidelines:
  - Do not use a metal ladder.
  - Do not work on a wet or windy day.
  - Do dress properly—wear shoes with rubber soles and heels, rubber gloves, and a long-sleeved shirt or jacket.
- If the assembly starts to drop, move away from it and let it fall. Because the antenna, mast, cable, and metal guy wires are all excellent conductors of electrical current, even the slightest touch of any of these parts to a power line completes an electrical path through the antenna and the installer.
- If any part of the antenna system should come in contact with a power line, do not touch it or try to remove it yourself. Call your local power company to have it removed safely.
- If an accident should occur with the power lines, call for qualified emergency help immediately.

Unused Antenna Ports

Port plugs must be installed in any unused antenna ports.

The weatherproof caps on the connectors protect the router interior from environmental elements including water, heat, cold, and dust. They are installed on unused ports before the router is shipped.

When you install a new antenna in a port with an N-connector:

- Chassis-mounted antennas—Remove the weather proof cap before installing a chassis-mounted antenna.
- External antennas—Remove weatherproof cap, then connect the supported Cisco cable to the connector.

Installation Instructions

The following section contains information for installing the LTE-ANTM2-SMA-D antenna:

This antenna is designed to be mounted either directly or on an antenna extension stand to any Cisco 3G/4G wireless ISR, LTE and LTEA router with an SMA(f) connector by threading it onto the mating connector. Refer to the routers technical documentation for recommendations of direct mounting of antenna to the router versus installing the antenna on an antenna extension stand. Mount and deploy the antenna at the 0° position, 45° position, or the 90° position, and then change that position at will. The rotation of the antenna into the proper position can take place while the antenna is still loose on the mating connector. No software is required for this installation.

In addition to the antenna orientation, the installation location of 4G routers and cellular modules play a significant role in determining overall network performance. Routers located at the farthest coverage points might have 10 to 50 percent of the bandwidth available compared to routers located closer to the cellular base station tower.

Because antennas transmit and receive radio signals, their performance can be adversely affected by the surrounding environment, including physical obstructions. Radio frequency (RF) interference may occur between wireless systems located close to each other, especially if the antennas of these systems are located close to each other.

Follow these guidelines to ensure the best possible performance:

- When you use the antenna on a modular router with an LTE pluggable module, always mount the antenna on an appropriate extension cable and antenna stand. The antenna performance, and therefore that of the router, will not be optimal if mounted directly to the pluggable module.

- Mounting of the antenna directly to smaller physical size routers is allowed.
- For optimal performance, space multiple antennas apart by at least 17 inches (43 cm).
- The lowest LTE frequency of 700 MHz 17 inches represents 1 wavelength. Spacing of 0.5 wavelength or 8.5 inch (22.5cm) results in good performance.
- Spacing of less than 8.5 inch may result in significantly reduced MIMO performance.
- Spacing antennas close to each other (e.g. 3") results in antennas detuning from their original designed performance due to antenna coupling.
- Wherever possible, mount the ISR cellular router or the pluggable LTE module and antenna where the cellular base station or tower are within sight and without physical obstructions. Barriers along the line of sight between the device and the local base station will degrade the wireless radio signals. Install ISR cellular routers, pluggable modules and antennas above floor level in office environments or near the ceiling for better performance because most obstructions tend to be near the floor level.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through while still maintaining adequate coverage. Consider the following before choosing the location for installing your antenna:
  - Paper and vinyl walls have very little effect on signal penetration.
  - Solid and precast concrete walls limit signal penetration to one or two walls without degradation of coverage.
  - Concrete and wood block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall or wire-mesh stucco wall causes signals to reflect back and causes poor penetration.
- Avoid mounting the antenna next to a column or vertical support that could create a shadow zone and reduce the coverage area.
- Keep the antenna away from reflective metal objects such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use an extension cable to relocate the antenna away from these obstructions.

Related Documentation

- For information about antennas and modules, see: http://www.cisco.com/go/cg-modules
- For information about omnidirectional and directional antennas, see: http://www.cisco.com/en/US/tech/tk722/tk809/technologies_tech_note09186a00807f34d3.shtml

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