

AC86001 Wideband Cellular Baton Antenna

The Antenna Company AC86001 baton antenna provides robust indoor/outdoor performance for use in many cellular configurations from single-antenna (SISO) and MIMO fixed wireless and IoT applications from 617 MHz to 5925 MHz.

180 mm long with N-plug connector termination, the AC86001 supports IP67 ingress protection and an ASA UV resistant baton-style radome for outdoor installation, and comes in white, with fine matte finish.



AC86001 Wideband Cellular Baton Antenna

Features

- Performance at 615 MHz to 710 MHz
 - VSWR: 2.5
 - Peak Gain: 3.6 dBi
 - Efficiency: 72%
- Performance at 3300 MHz to 3800 MHz
 - VSWR: 1.9
 - Peak Gain: 5.4 dBi
 - Efficiency: 88.3%
- IP67 ingress protection
- UV resistance
- N Plug connector
- 180 mm x 25.4 mm
- Excellent ground plane and free space performance

Applications

- 5G/4G/LTE
 - Cat-M1/LTE-M
 - NB-IoT
- Indoor/Outdoor CPE
- Fixed wireless access (FWA)
- Internet of Things (IoT) devices

Ordering Information

Part Number	Description
AC86001-NPW	Wideband cellular baton-style antenna with N-plug (male) connector, white dome

Available from The Antenna Company (sales@antennacompany.com) and select distributors and representatives.

RF/Electrical Specifications

Frequency (MHz)	VSWR (max)	Peak Gain (dBi)	Average Gain (dBi)	Efficiency (%)
615 to 710	2.5	3.6	-1.5	72
690 to 810	1.7	4.3	-1.0	80
790 to 960	2.8	3.4	-1.8	67
830 to 1520	4.9	3.4	-2.9	52
1420 to 1680	2.4	2.5	-1.6	70
1690 to 2200	2.5	3.7	-1.3	75
2300 to 2400	1.6	3.7	-1.3	74
2480 to 2690	2.3	4.9	-1.7	68
3300 to 3800	1.9	5.4	-0.9	82
4400 to 5930	1.9	5.5	-1.0	79

Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omnidirectional
Wavelength	$\frac{1}{2}$ -wave
Max Power	2 W
Electrical Type	Dipole

Electrical specifications and plots measured with the AC86001 in free space.

Mechanical Specifications

Parameter	Value
Connection	N plug (Male)
Radome Material	UV resistant ASA plastic, Color = White
Operating Temp. Range	-40 °C to +80 °C (-104 °F to 176 °F)
Ingress Protection	IP67
Weight	78.5 g (2.77 oz)
Dimensions	180.0 mm x $\varnothing$ 25.4 mm (7.10 in x $\varnothing$ 1.0 in)

Antenna Dimensions

The dimensions for the AC86001 are shown below in Figure 1.

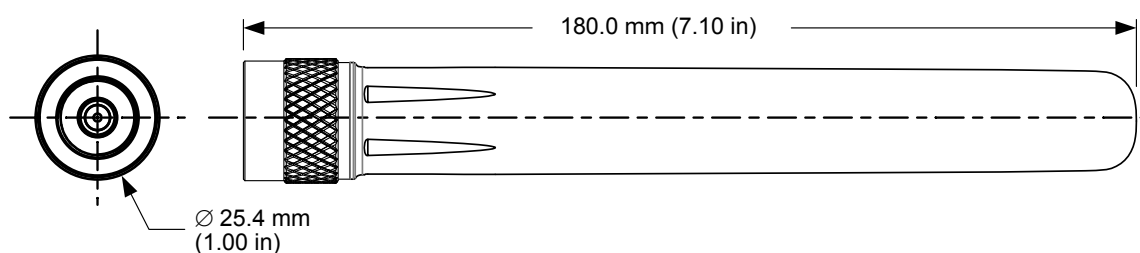


Figure 1. AC86001 Antenna Dimensions

Antenna Test Orientations

The AC86001 antenna is characterized in two antenna orientations as shown in Figure 2. The antenna free space orientation characterizes use of an antenna attached to an enclosure-mounted connector which is connected by cable to the radio. Although the antenna is a dipole not requiring a ground plane for function, characterization on an adjacent ground plane (300 mm x 300 mm) provides insight into antenna performance when attached directly to a connector on a metal enclosure. The two orientations represent the most common end-product use cases

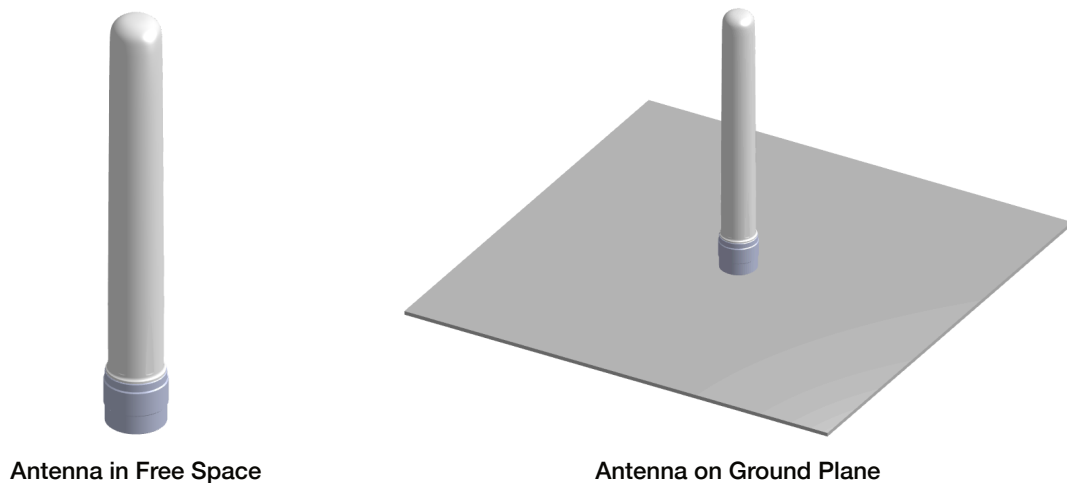


Figure 2. AC86001 Antenna Test Orientations

Free Space, No Ground Plane

The charts on the following pages represent data taken with the antenna, in free space as shown in Figure 3.



Figure 3. AC86001 Antenna, Free Space

VSWR

Figure 4 provides the voltage standing wave ratio (VSWR) across the antenna bandwidth. VSWR characterizes the power reflected from the antenna back to the transmitter. A lower VSWR value indicates better antenna performance at a given frequency. Reflected power is also shown on the right-side vertical axis as a measure of the percentage of transmitter power reflected back from the antenna.

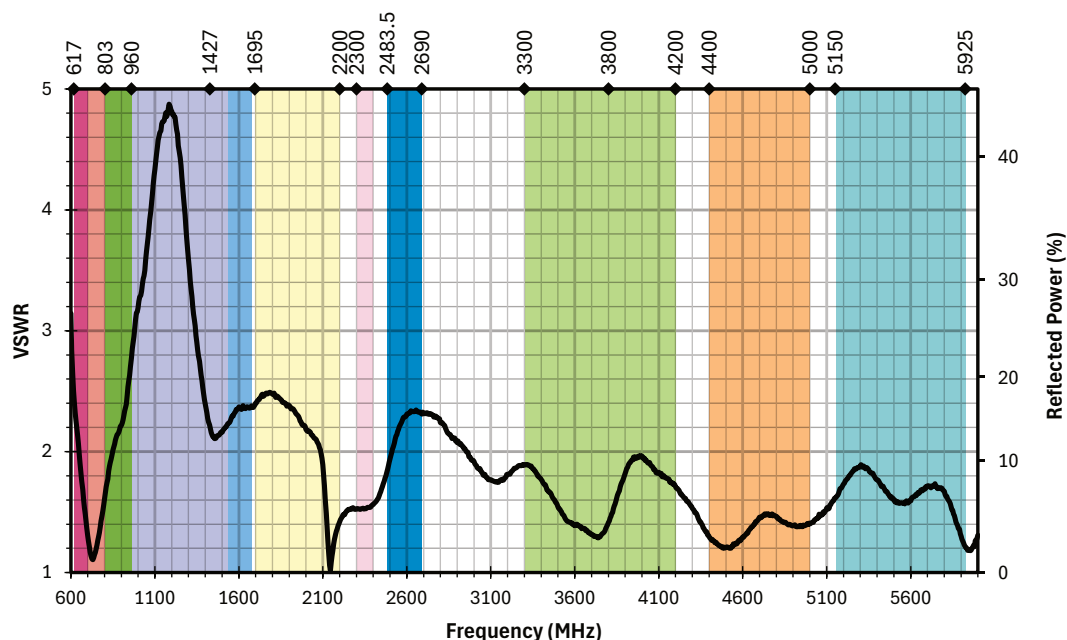


Figure 4. AC86001 Antenna VSWR, Free Space

Return Loss

Return loss (Figure 5) represents the loss in power at the antenna due to reflected signals. A higher magnitude return loss indicates better performance. Return loss is the negative of input reflection coefficient, in decibels (dB), and the two values are often used interchangeably.

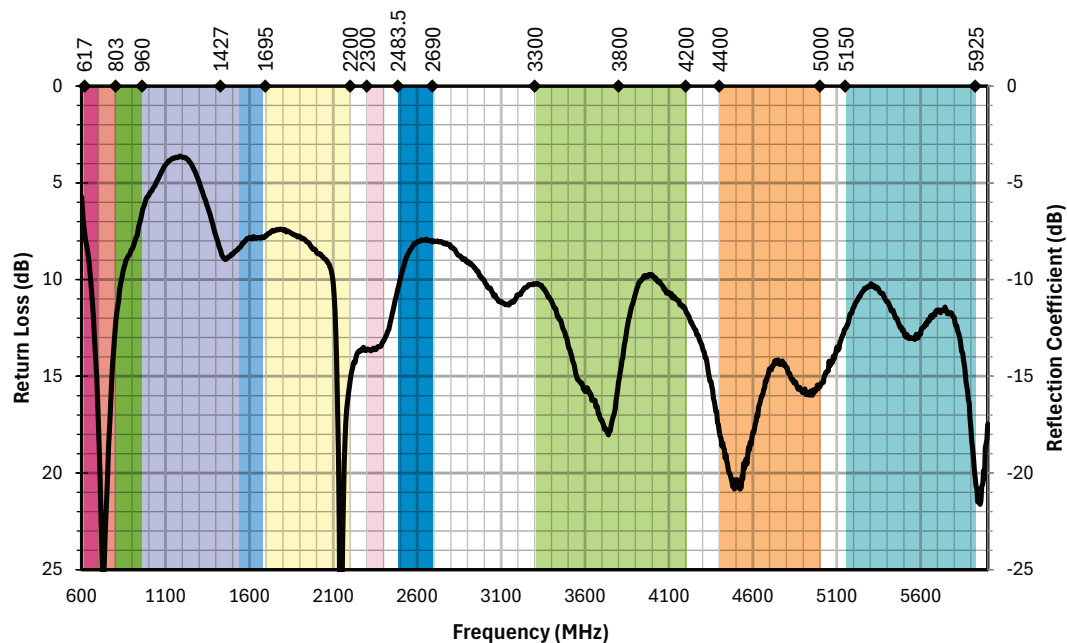


Figure 5. AC86001 Antenna Return Loss, Free Space

Peak Gain

Peak gain (Figure 6) provides a measure of the maximum conversion of antenna input power to radio waves at a given frequency. Peak gain does not account for the directionality of gain in 3-dimensional space.

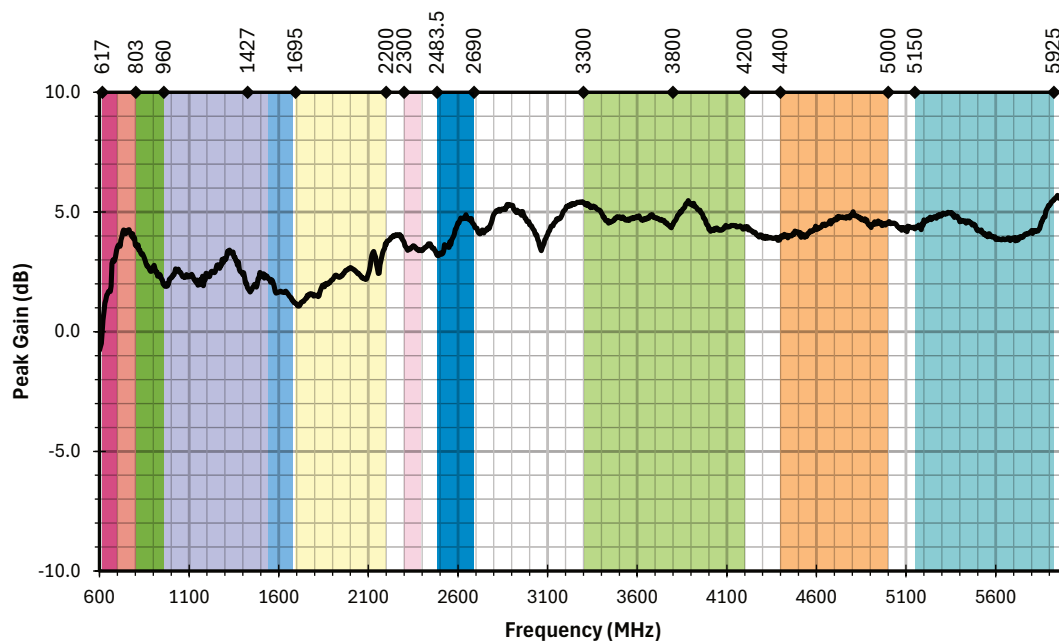


Figure 6. AC86001 Antenna Peak Gain, Free Space

Average Gain

Average gain (Figure 7) is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

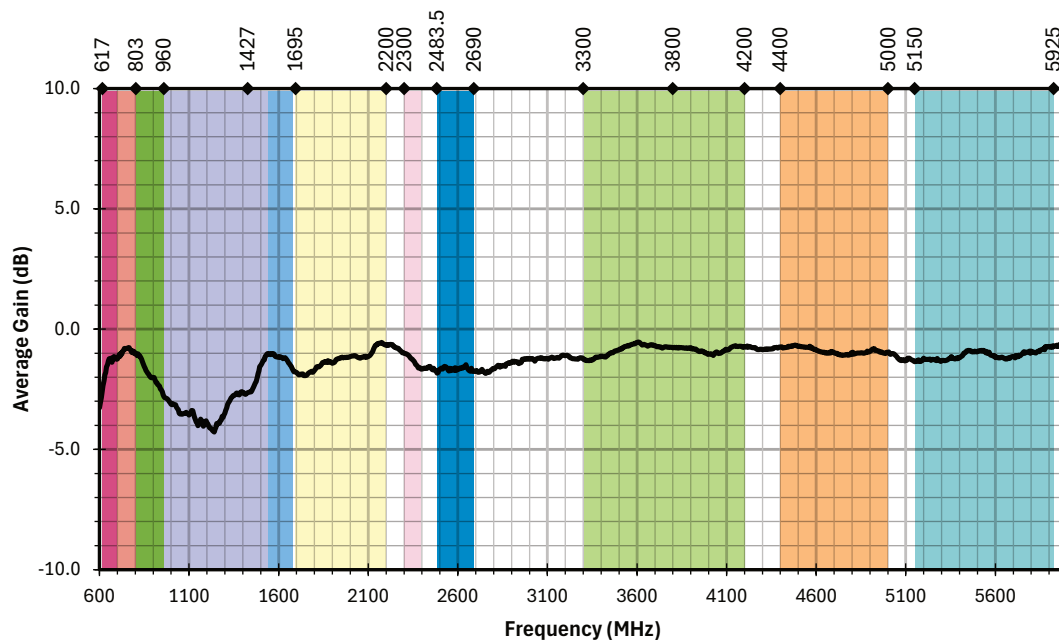


Figure 7. AC86001 Antenna Average Gain, Free Space

Efficiency

Efficiency (Figure 8) is the ratio of power radiated by the antenna to the power delivered to the antenna terminals, expressed as a percentage, where a higher percentage indicates better performance at a given frequency.

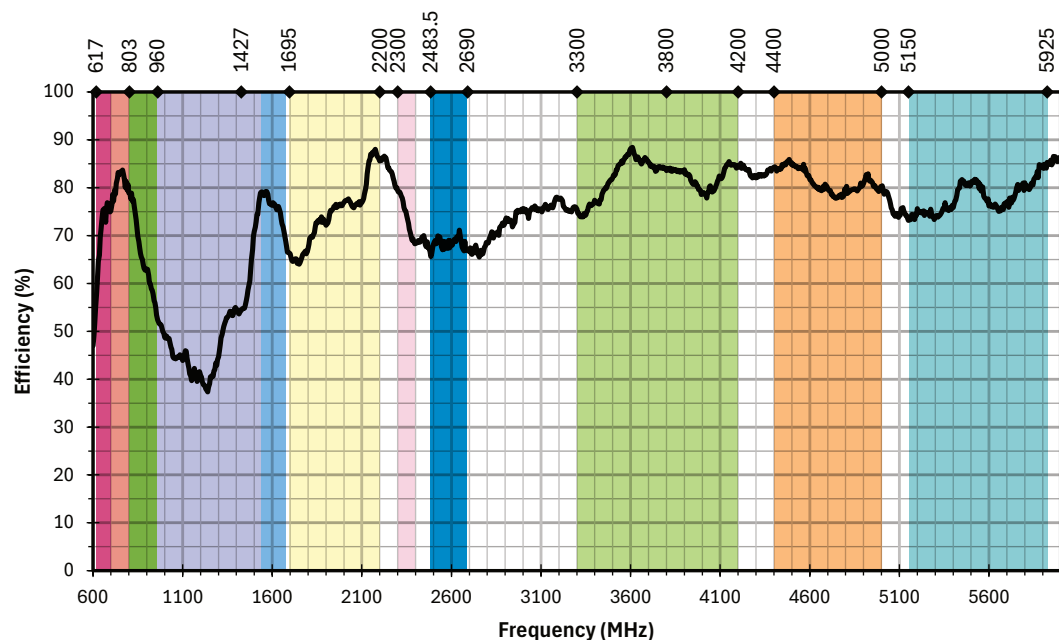
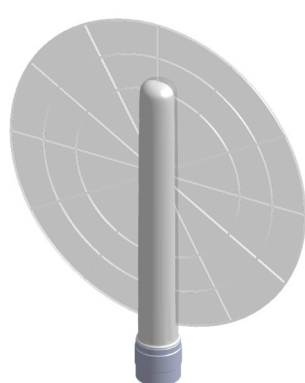


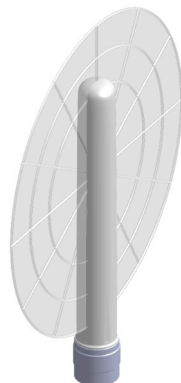
Figure 8. AC86001 Antenna Efficiency, Free Space

Radiation Patterns - Free Space

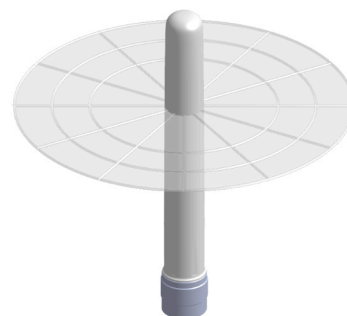
Radiation patterns provide information about the directional performance of the antenna by plotting gain in three orthogonal planes at the high-, low- and center-frequencies of an antenna frequency band. Antenna radiation patterns (Figure 9), are shown using polar plots covering 360 degrees with the plane of reference depicted above the plots. Note: when viewed with typical PDF viewing software, zooming into radiation patterns is possible to reveal fine detail.



XZ-Plane Gain

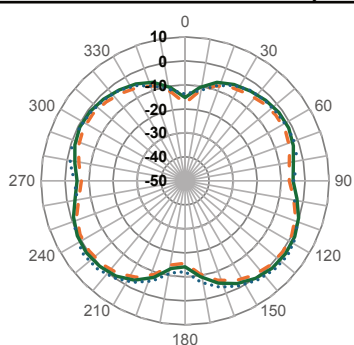


YZ-Plane Gain

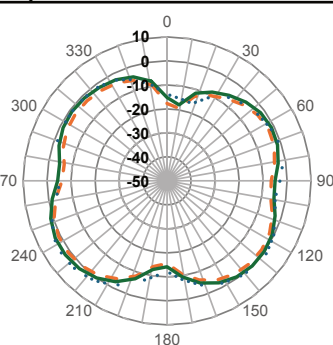


XY-Plane Gain

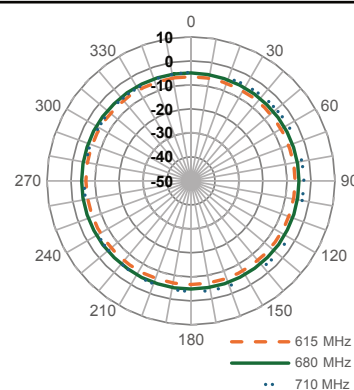
615 MHz to 710 MHz (680 MHz)



XZ-Plane Gain

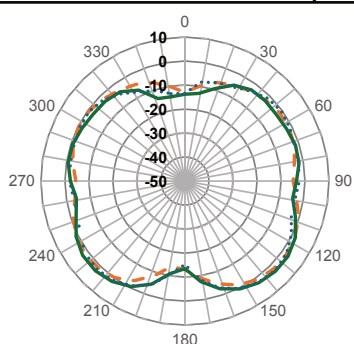


YZ-Plane Gain

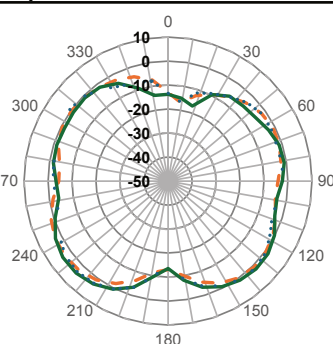


XY-Plane Gain

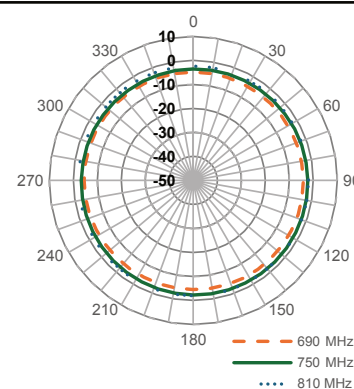
690 MHz to 810 MHz (750 MHz)



XZ-Plane Gain



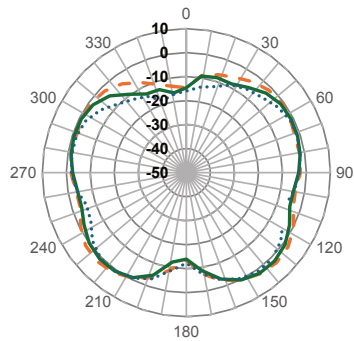
YZ-Plane Gain



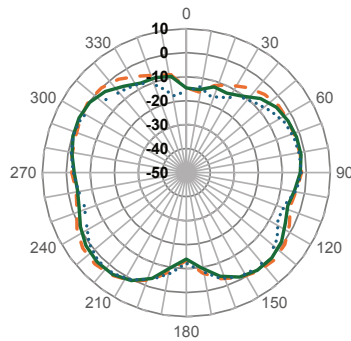
XY-Plane Gain

Radiation Patterns

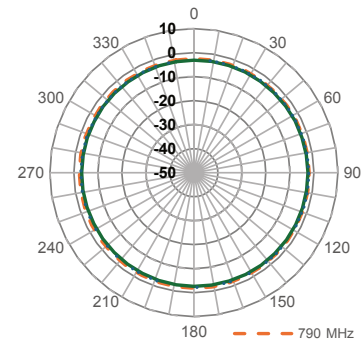
790 MHz to 960 MHz (870 MHz)



XZ-Plane Gain

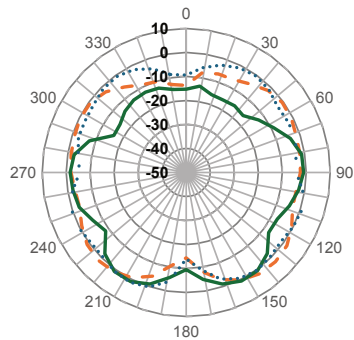


YZ-Plane Gain

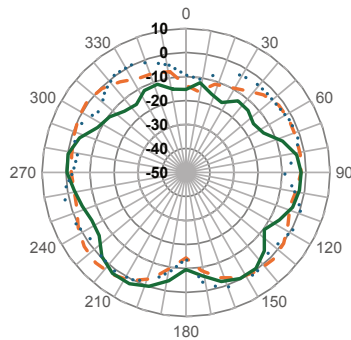


XY-Plane Gain

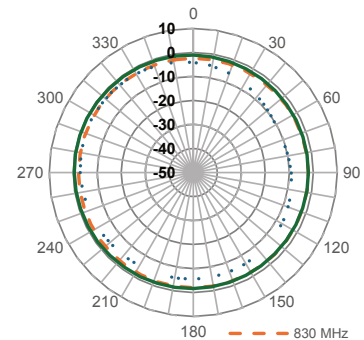
830 MHz to 1520 MHz (1170 MHz)



XZ-Plane Gain

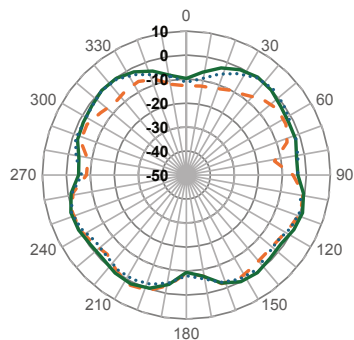


YZ-Plane Gain

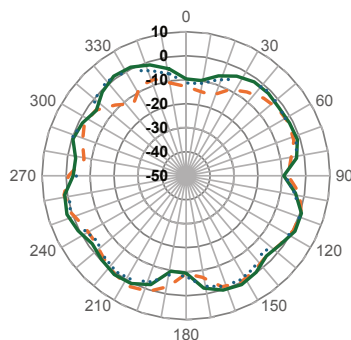


XY-Plane Gain

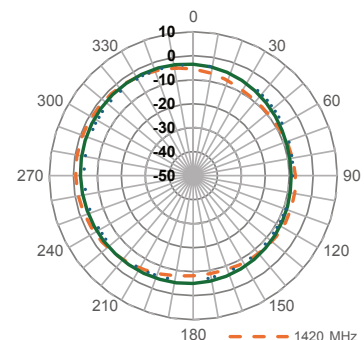
1420 MHz to 1680 MHz (1550 MHz)



XZ-Plane Gain



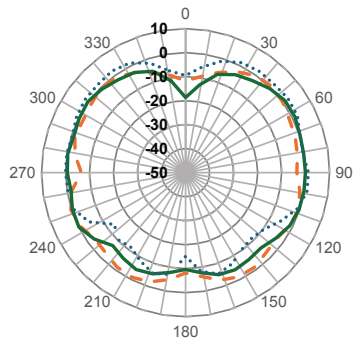
YZ-Plane Gain



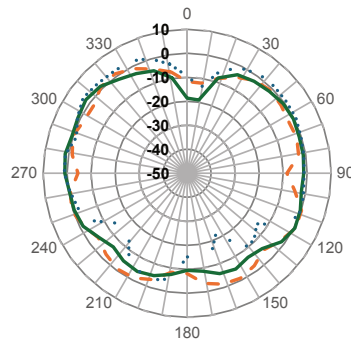
XY-Plane Gain

Radiation Patterns

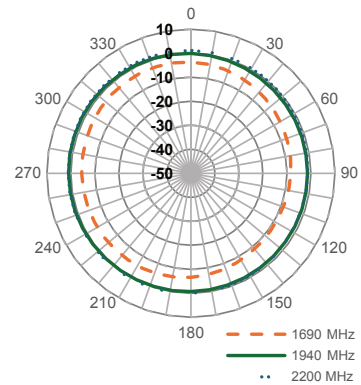
1690 MHz to 2200 MHz (1940 MHz)



XZ-Plane Gain

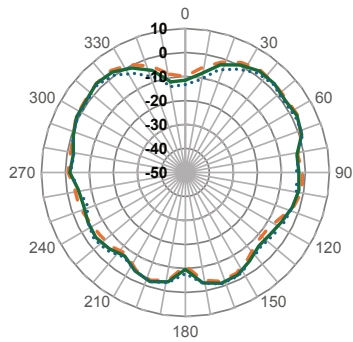


YZ-Plane Gain

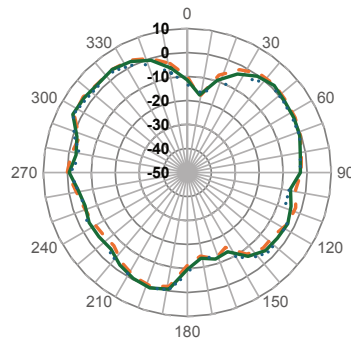


XY-Plane Gain

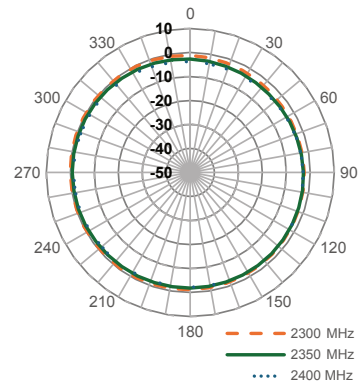
2300 MHz to 2400 MHz (2350 MHz)



XZ-Plane Gain

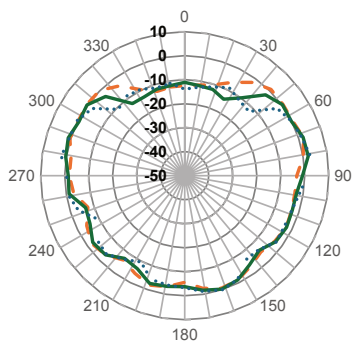


YZ-Plane Gain

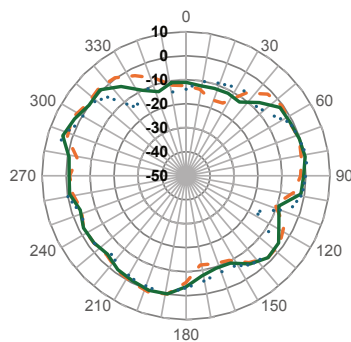


XY-Plane Gain

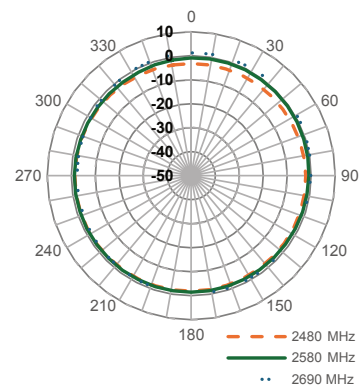
2480 MHz to 2690 MHz (2580 MHz)



XZ-Plane Gain



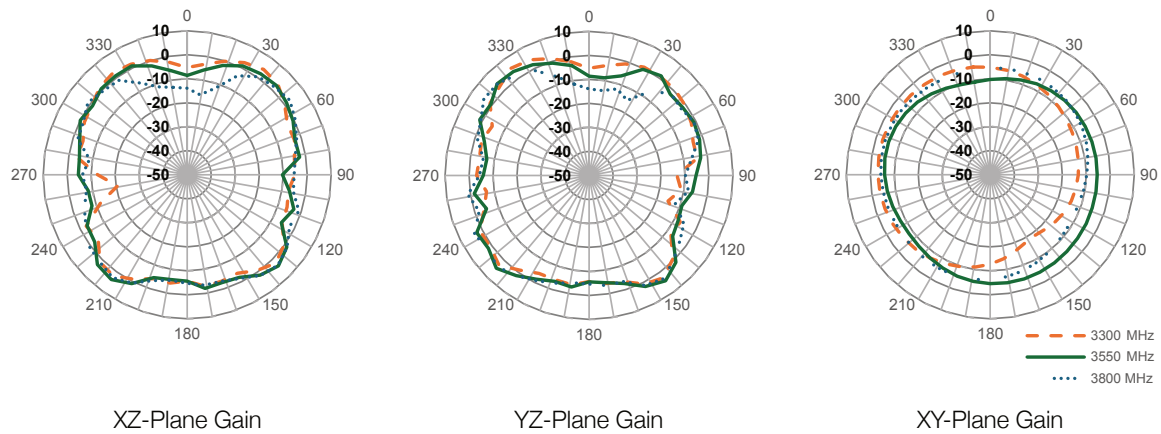
YZ-Plane Gain



XY-Plane Gain

Radiation Patterns

3300 MHz to 3800 MHz (3550 MHz)



4400 MHz to 5930 MHz (5150 MHz)

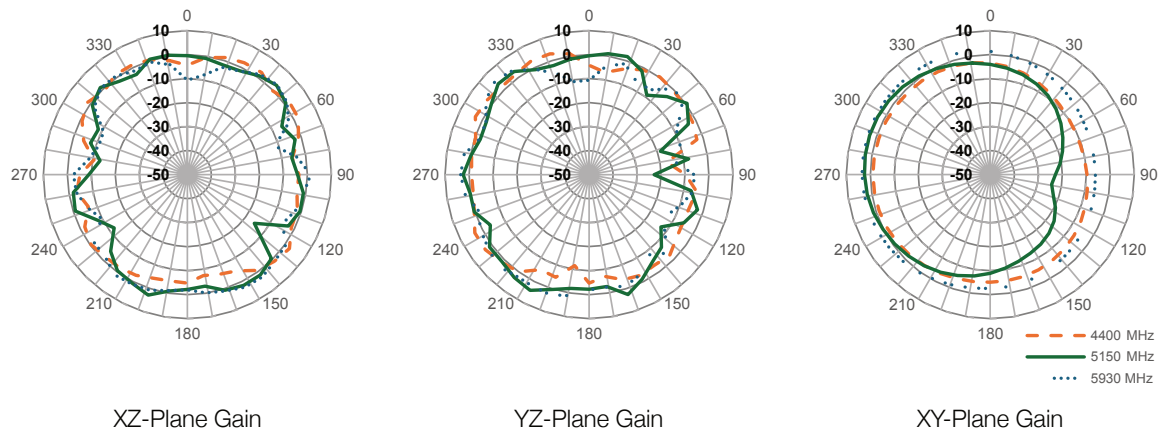


Figure 9. Radiation Patterns for AC86001 Antenna, Free Space

On Ground Plane

The charts on the following pages represent data taken with the antenna oriented at the center of the 300 mm x 300 mm metal plate as shown in Figure 10.

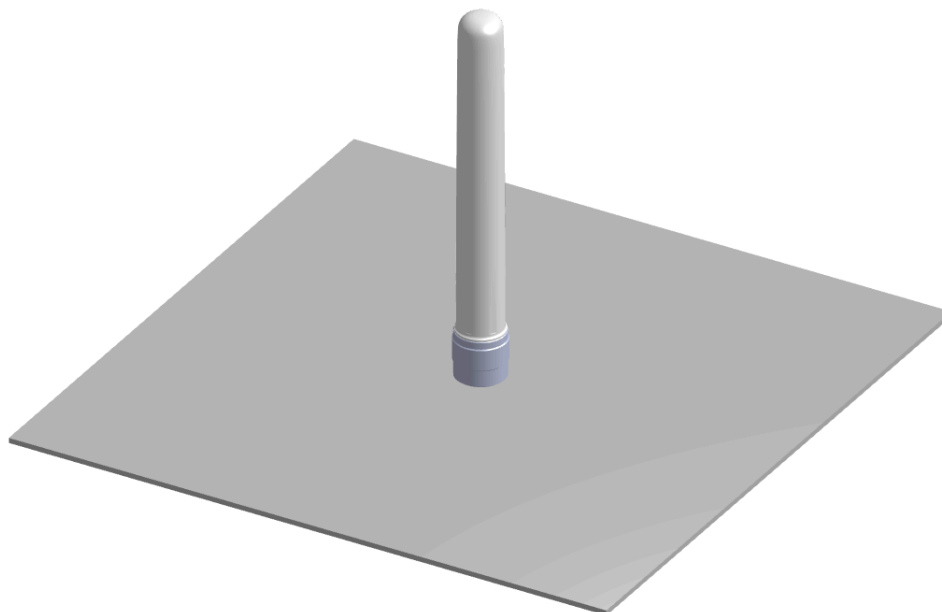


Figure 10. AC86001 Antenna On Ground Plane

VSWR

Figure 11 provides the voltage standing wave ratio (VSWR) across the antenna bandwidth. VSWR characterizes the power reflected from the antenna back to the transmitter. A lower VSWR value indicates better antenna performance at a given frequency. Reflected power is also shown on the right-side vertical axis as a measure of the percentage of transmitter power reflected back from the antenna.

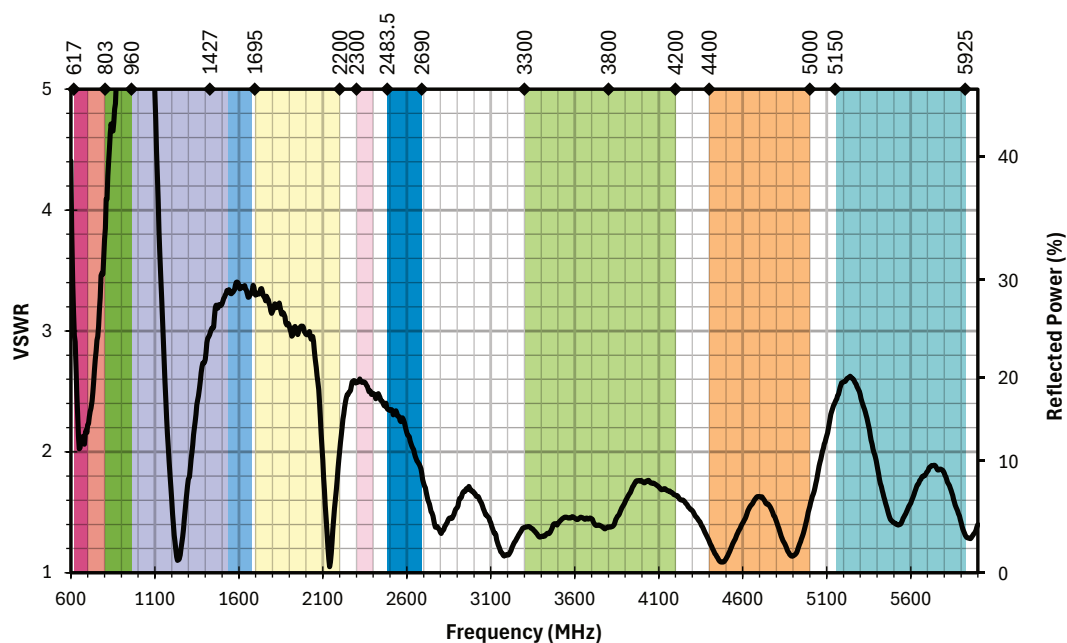


Figure 11. AC86001 Antenna VSWR on Ground Plane

Return Loss

Return loss (Figure 12) represents the loss in power at the antenna due to reflected signals. A higher magnitude return loss indicates better performance. Return loss is the negative of input reflection coefficient, in decibels (dB), and the two values are often used interchangeably.

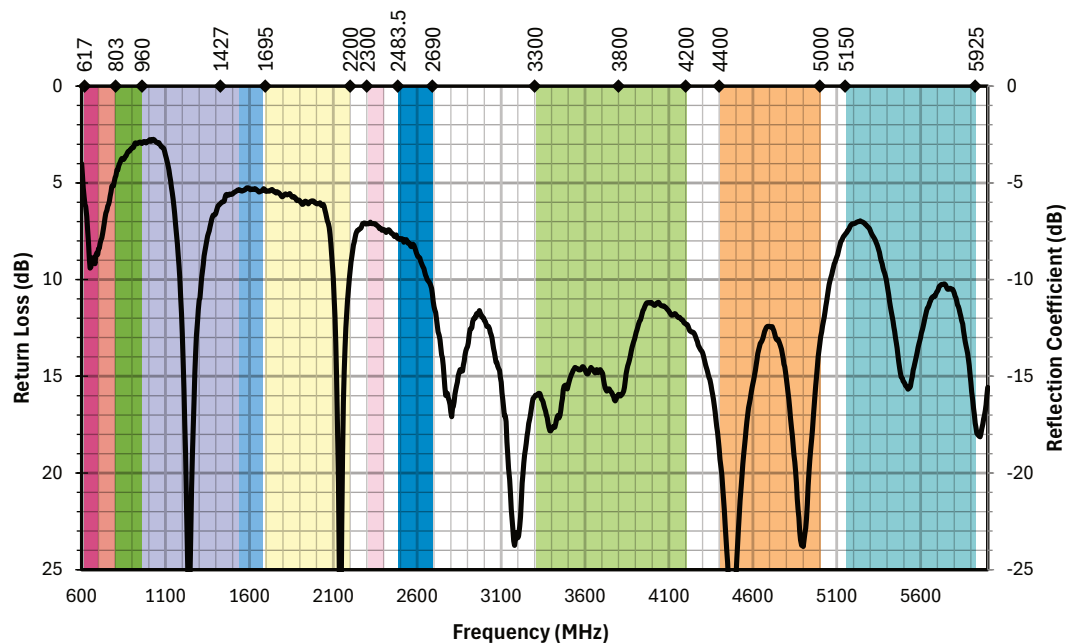


Figure 12. AC86001 Antenna Return Loss on Ground Plane

Peak Gain

Peak gain (Figure 13) provides a measure of the maximum conversion of antenna input power to radio waves at a given frequency. Peak gain does not account for the directionality of gain in 3-dimensional space.

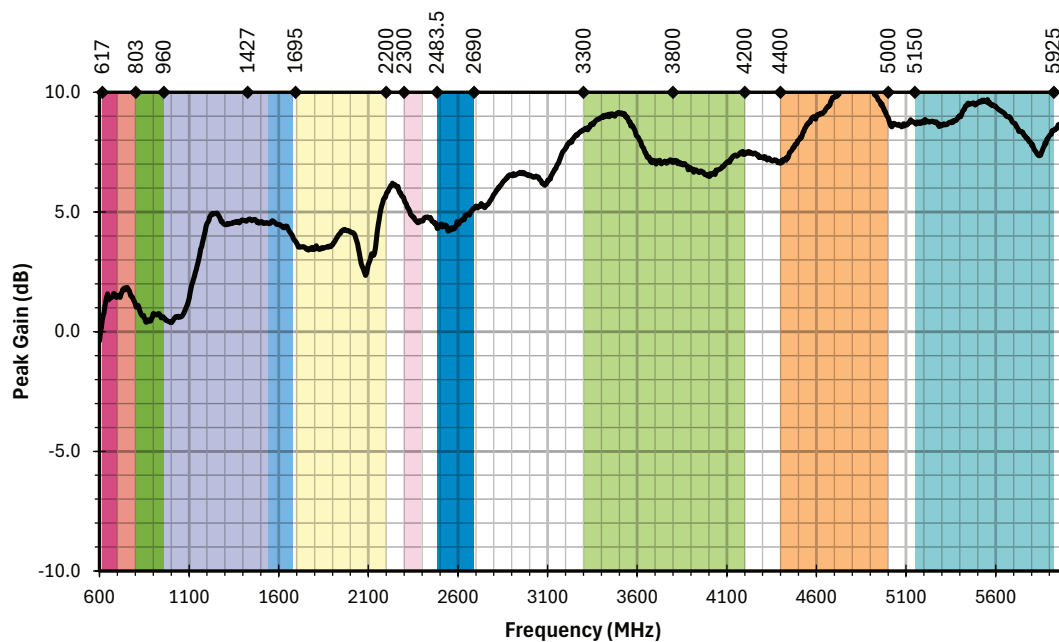


Figure 13. AC86001 Antenna Peak Gain on Ground Plane

Average Gain

Average gain (Figure 14) is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

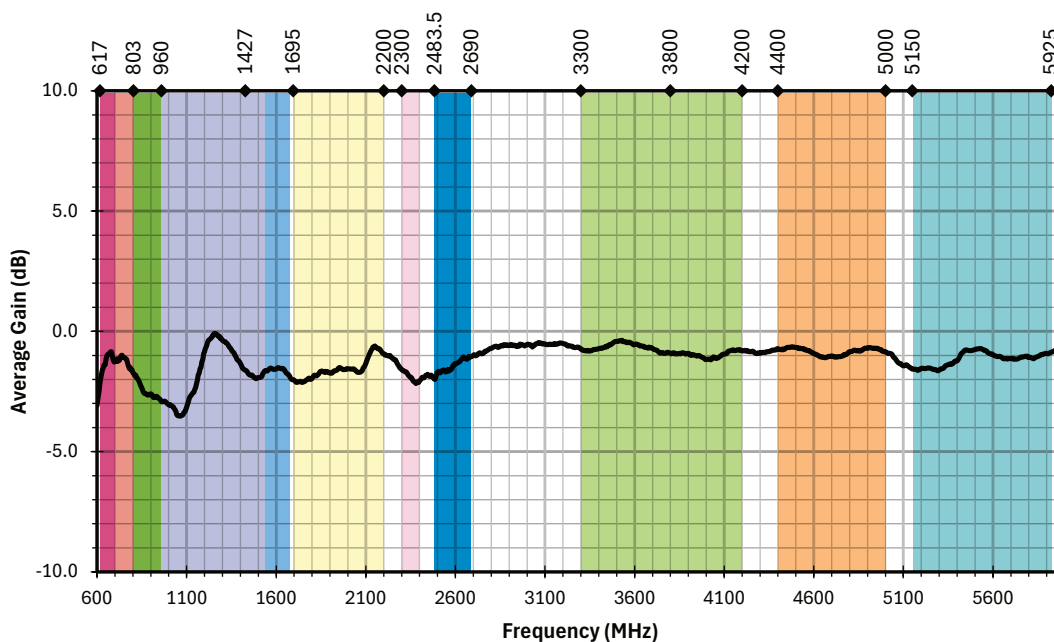


Figure 14. AC86001 Antenna Average Gain on Ground Plane

Efficiency

Efficiency (Figure 15) is the ratio of power radiated by the antenna to the power delivered to the antenna terminals, expressed as a percentage, where a higher percentage indicates better performance at a given frequency.

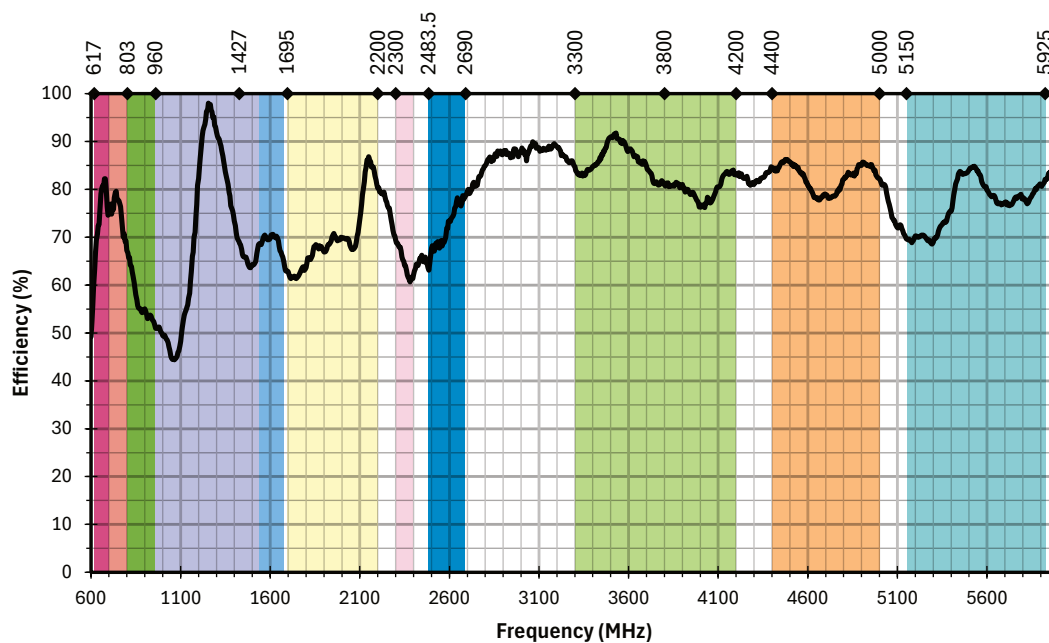
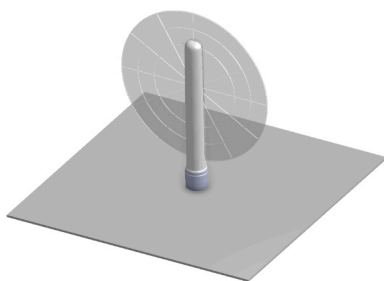


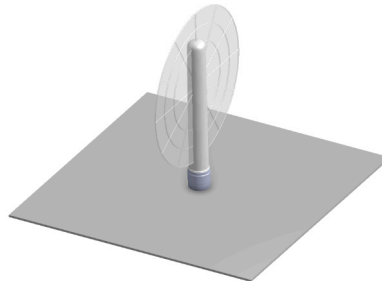
Figure 15. AC86001 Antenna Efficiency on Ground Plane

Radiation Patterns - On Ground Plane

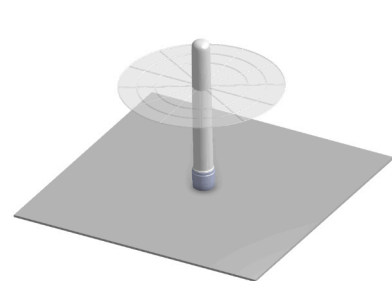
Radiation patterns provide information about the directional performance of the antenna by plotting gain in three orthogonal planes at the high-, low- and center-frequencies of an antenna frequency band. Antenna radiation patterns (Figure 16), are shown using polar plots covering 360 degrees with the plane of reference depicted above the plots. Note: when viewed with typical PDF viewing software, zooming into radiation patterns is possible to reveal fine detail.



XZ-Plane Gain

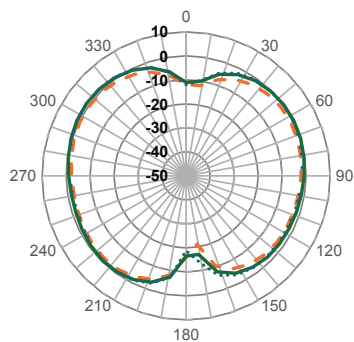


YZ-Plane Gain

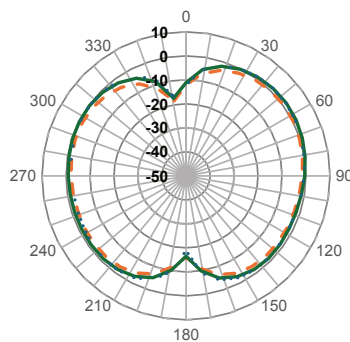


XY-Plane Gain

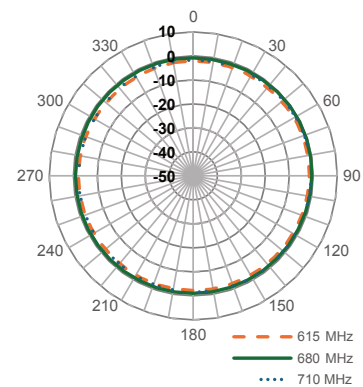
615 MHz to 710 MHz (680 MHz)



XZ-Plane Gain

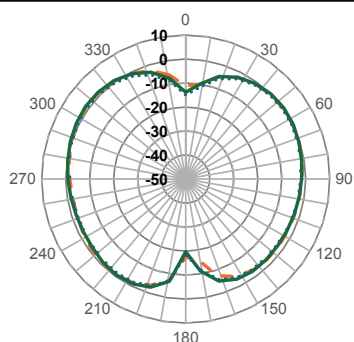


YZ-Plane Gain

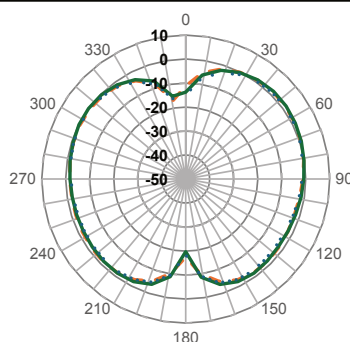


XY-Plane Gain

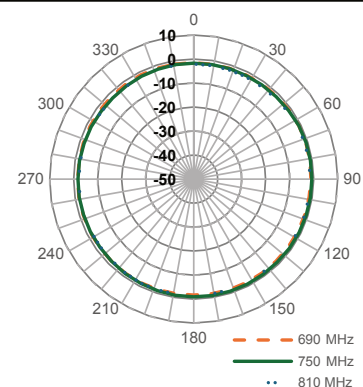
690 MHz to 810 MHz (750 MHz)



XZ-Plane Gain



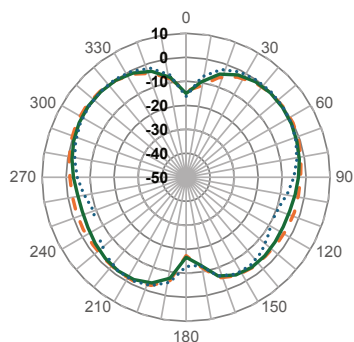
YZ-Plane Gain



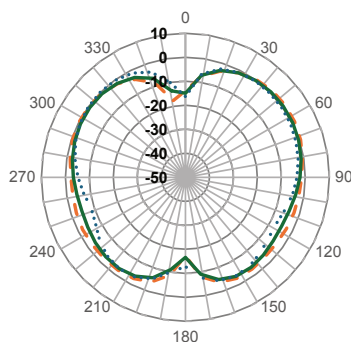
XY-Plane Gain

Radiation Patterns

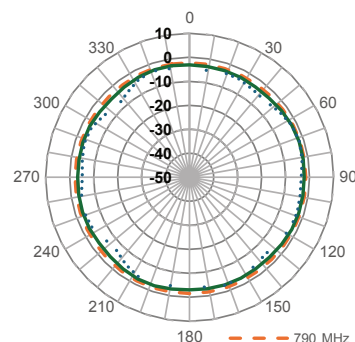
790 MHz to 960 MHz (870 MHz)



XZ-Plane Gain

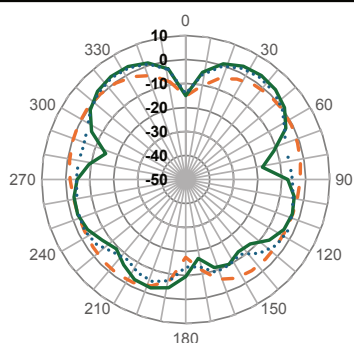


YZ-Plane Gain

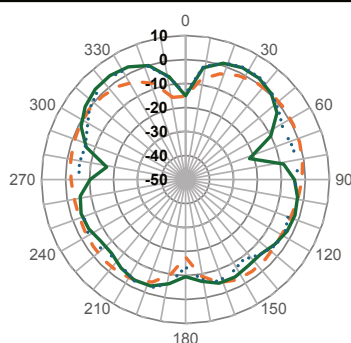


XY-Plane Gain

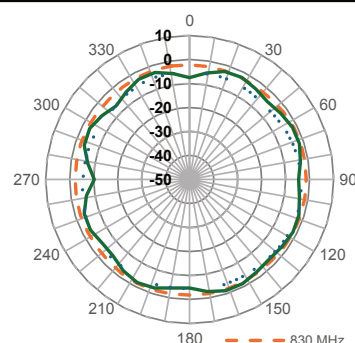
830 MHz to 1520 MHz (1170 MHz)



XZ-Plane Gain

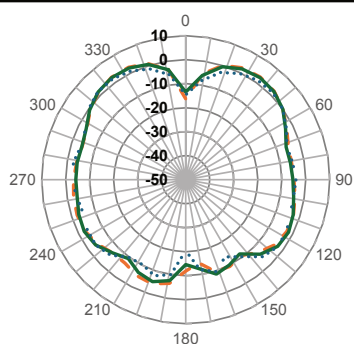


YZ-Plane Gain

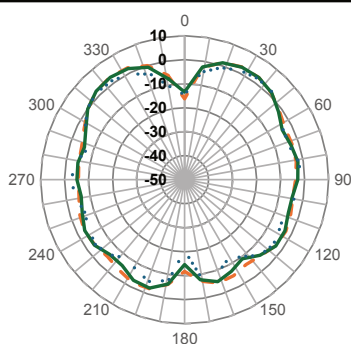


XY-Plane Gain

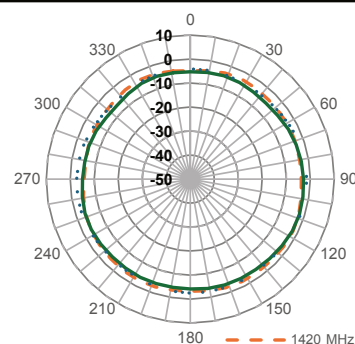
1420 MHz to 1680 MHz (1550 MHz)



XZ-Plane Gain



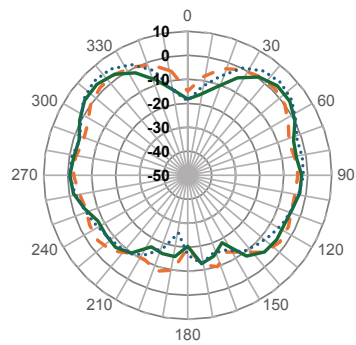
YZ-Plane Gain



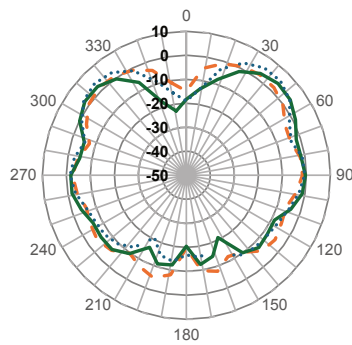
XY-Plane Gain

Radiation Patterns

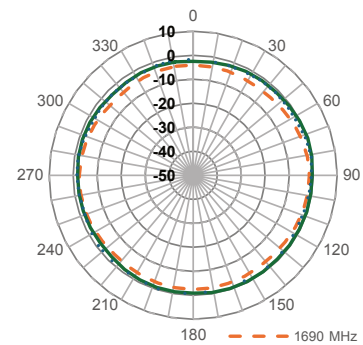
1690 MHz to 2200 MHz (1940 MHz)



XZ-Plane Gain

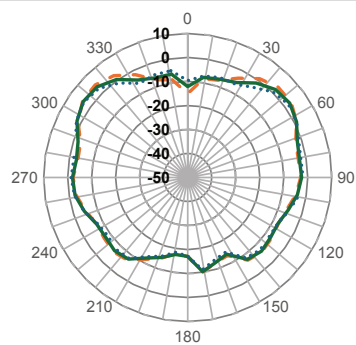


YZ-Plane Gain

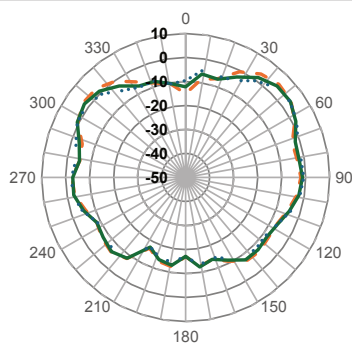


XY-Plane Gain

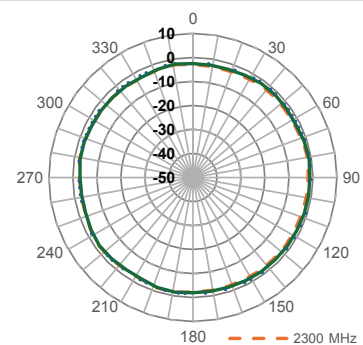
2300 MHz to 2400 MHz (2350 MHz)



XZ-Plane Gain

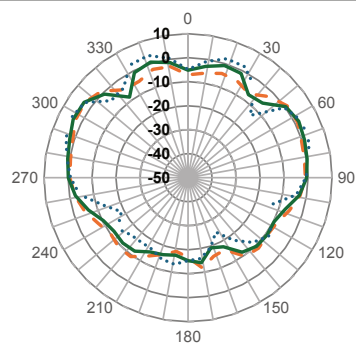


YZ-Plane Gain

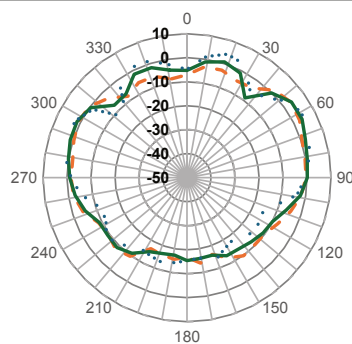


XY-Plane Gain

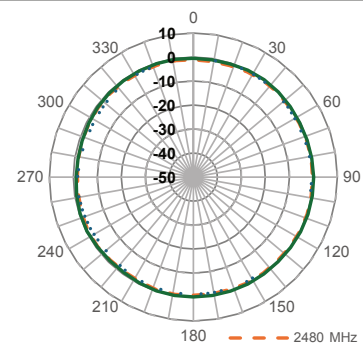
2480 MHz to 2690 MHz (2580 MHz)



XZ-Plane Gain



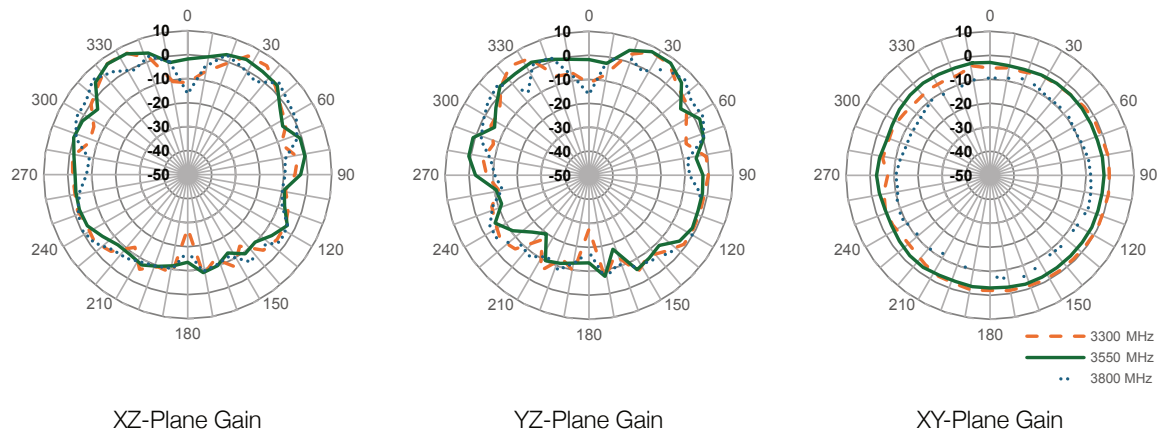
YZ-Plane Gain



XY-Plane Gain

Radiation Patterns

3300 MHz to 3800 MHz (3550 MHz)



4400 MHz to 5930 MHz (5150 MHz)

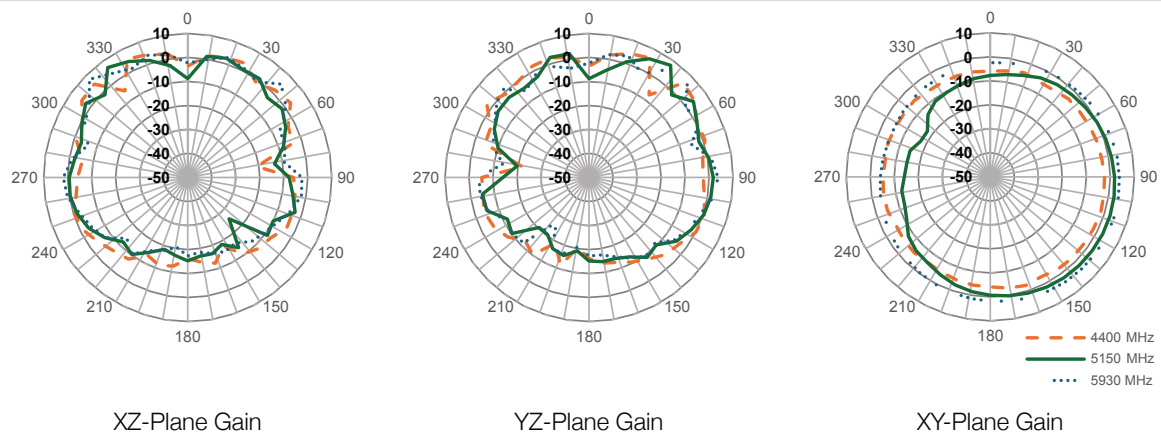


Figure 16. Radiation Patterns for AC86001 Antenna on Ground Plane

Packaging Information

The AC86001 antenna is individually packaged in a sealed and labeled polyethylene bag and then bulk packaged in a sealed polyethylene bag in quantities of 50 pcs. See Figure 17.

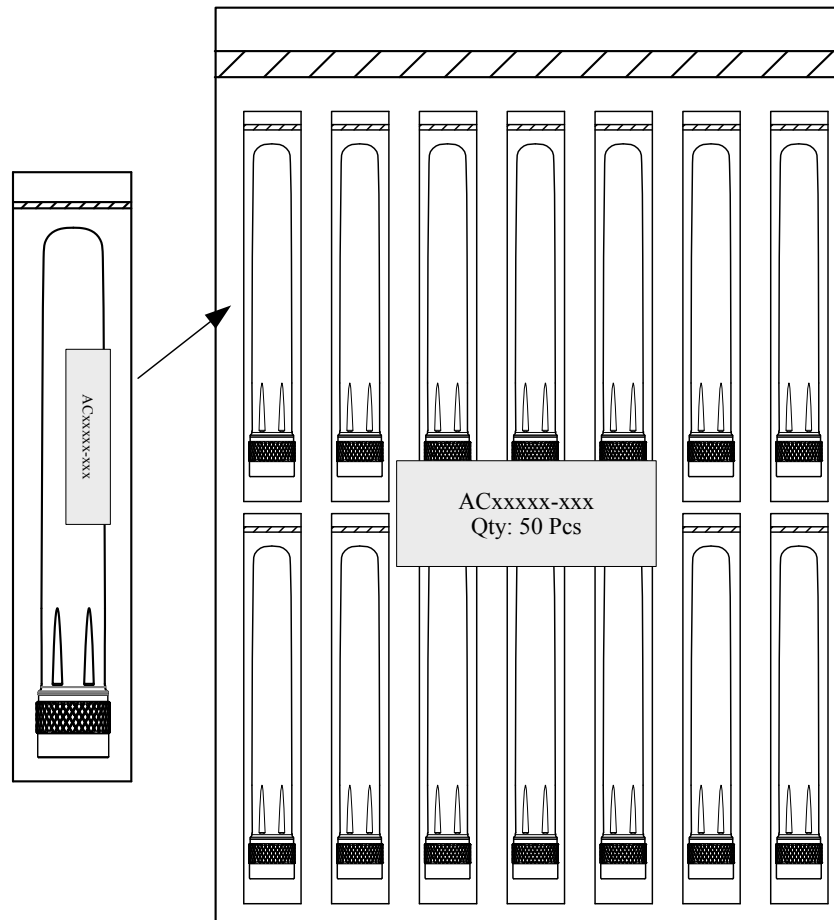


Figure 17. AC86001 Antenna in Sealed Polyethylene Bags

Two sealed bulk polyethylene bags are packed yielding 100 pieces per carton. Carton dimensions are 295 mm x 240 mm x 240 mm (11.6 in x 9.5 in x 9.5 in).

Antenna Definitions and Useful Formulas

VSWR - Voltage Standing Wave Ratio. VSWR is a unitless ratio that describes the power reflected from the antenna back to the radio. A lower VSWR value indicates better antenna performance at a given frequency. VSWR is easily derived from Return Loss.

$$VSWR = \frac{10^{\left[\frac{\text{Return Loss}}{20}\right]} + 1}{10^{\left[\frac{\text{Return Loss}}{20}\right]} - 1}$$

Return Loss - Return loss represents the loss in power at the antenna due to reflected signals, measured in decibels. A larger magnitude return loss value indicates better antenna performance at a given frequency. Return Loss is easily derived from VSWR.

$$\text{Return Loss} = -20 \log_{10} \left[\frac{VSWR - 1}{VSWR + 1} \right]$$

Efficiency (η) - The total power radiated from an antenna divided by the input power at the feed point of the antenna as a percentage.

Total Radiated Efficiency - (TRE) The total efficiency of an antenna solution comprising the radiation efficiency of the antenna and the transmitted (forward) efficiency from the transmitter.

$$TRE = \eta \cdot \left(1 - \left(\frac{VSWR - 1}{VSWR + 1} \right)^2 \right)$$

Gain - The gain of an antenna is the ratio of its radiation intensity in a given direction (G) to the radiation intensity that would be obtained if the total power accepted by the antenna were radiated isotropically (identically in all directions). Realized gain is antenna gain accounting for input reflection and mismatch losses. Realized gain is typically labeled simply as “gain” in antenna datasheets.

$$G_{db} = 10 \log_{10}(G)$$

$$G_{dBd} = G_{dBi} - 2.51\text{dB}$$

Peak Gain - The highest antenna gain across all directions for a given frequency range. A directional antenna will have a very high peak gain compared to average gain.

Average Gain - The average gain across all directions for a given frequency range.

Maximum Power - The maximum signal power which may be applied to an antenna feed point, typically measured in watts (W).

Reflected Power - A portion of the forward power reflected back toward the amplifier due to a mismatch at the antenna port.

$$\left(\frac{VSWR - 1}{VSWR + 1} \right)^2$$

decibel (dB) - A logarithmic unit of measure of the power of an electrical signal.

decibel isotropic (dBi) - A comparative measure in decibels between an antenna under test and an isotropic radiator.

decibel relative to a dipole (dBd) - A comparative measure in decibels between an antenna under test and an ideal half-wave dipole.

Dipole - An ideal dipole comprises a straight electrical conductor measuring 1/2 wavelength from end to end connected at the center to a feed point for the radio.

Isotropic Radiator - A theoretical antenna which radiates energy equally in all directions as a perfect sphere.

Omnidirectional - Term describing an antenna radiation pattern that is uniform in all directions. An isotropic antenna is the theoretical perfect omnidirectional antenna. An ideal dipole antenna has a donut-shaped radiation pattern and other practical antenna implementations will have less perfect but generally omnidirectional radiation patterns which are typically plotted on three axes.

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REACH Article 33 notice: This product contains the SVHC lead (CAS 7439-92-1) above 0.1% w/w. Please handle accordingly.

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