Datasheet

AC94541-01N
External Panel-Mount Cellular Dome Antenna

The AC94541-01N cellular 5G/4G/LTE panel-mount dome antenna combines excellent cellular and cellular IoT (Cat-M1/LTE-M, NB-IoT) performance in the 410 LTE, 450 LTE bands and bands from 600 MHz to 3800 MHz.

AC94541-01N antenna incorporates IP67 ingress protection, IK10 impact resistance and a UV stabilized dome, and have been tested for salt spray resistance and flammability rating, providing a high level of robustness for challenging outdoor applications and environments.

The AC94541-01N antenna is terminated with an N jack (female) connector.

AC94541-01N Cellular antenna

Features

- Excellent multiband coverage:
  - 410-470 MHz
  - 600-960 MHz
  - 1700-3800 MHz
- Suitable for mounting on metallic and non-metallic surfaces
- N jack (female) connector
- Environmental performance
  - IP67 Ingress protection
  - MIL-STD 810F/ASTM B117 salt spray testing
  - UL 94-HB flammability rating
  - IK10 Impact resistance

Applications

- Cellular IoT
  - Cat-M1/LTE-M
  - NB-IoT
- Long-Reach Cellular
  - LTE 410
  - LTE 450
- 900 MHz Cellular
- Smart Utility infrastructure

Ordering Information

Part Number	Description
AC94541-01N	Panel-mount antenna
AC94541-01NA	Panel-mount antenna with mounting accessories

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

Electrical Specifications

Table 1. RF/Electrical Specifications

Frequency (MHz)	410-427	450-467	695-805	790-960	1425-1675	1695-2200	2300-2400	2480-2700	3300-3800
VSWR	6.0	1.8	2.1	2.5	3.8	3.6	2.0	2.4	6.9
Peak Gain (dBi)	-0.2	2.0	4.7	4.7	3.5	3.0	3.0	5.0	3.1
Average Gain (dBi)	-3.2	-0.9	-0.5	-0.8	-1.1	-1.3	-1.2	-1.2	-3.6
Efficiency (%)	48	81	90	83	79	75	77	76	45

Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omnidirectional
Wavelength	½-wave
Max. Input Power	45 W
Electrical Type	Dipole

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

Mechanical Specifications

Table 2. Mechanical Specifications

Parameter	Value
Connection	N jack (female)
Radome Material	UV stabilized ASA (Light Grey)
Weight	240 g (8.47 oz)
Dimensions	255.0 mm x 70.0 mm x 70.0 mm (10.00 in x 2.75 in x 2.75 in)

Environmental Specifications

Table 3. Environmental Specifications

Parameter	Value
Operating Temp. Range	-40 °C to +85 °C (-104 °F to 185 °F)
Operating Relative Humidity	98% max.
Storage Temperature	-40 °C to +85 °C (-104 °F to 185 °F)
Storage Humidity	5% to 95% non-condensing
Ingress Protection	IP67
Impact Resistance	IK10
Enclosure Flammability Rating	UL 94-HB
Salt Spray	MIL-STD 810F/ASTM B117

Antenna Dimensions

The dimensions for the AC94541-01N are shown below in Figure 1.

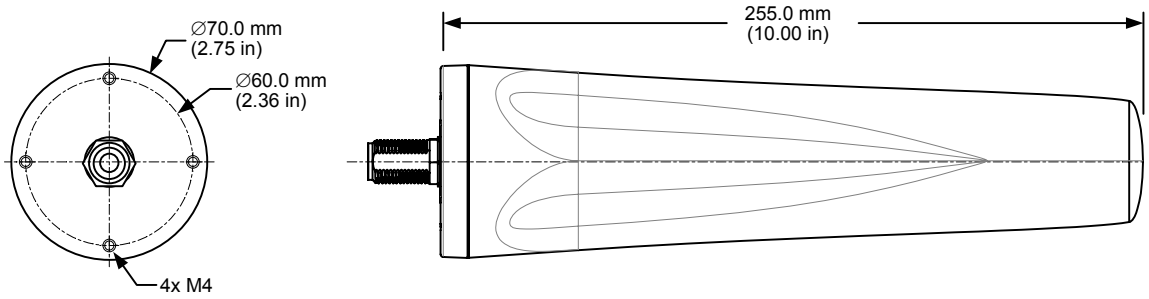
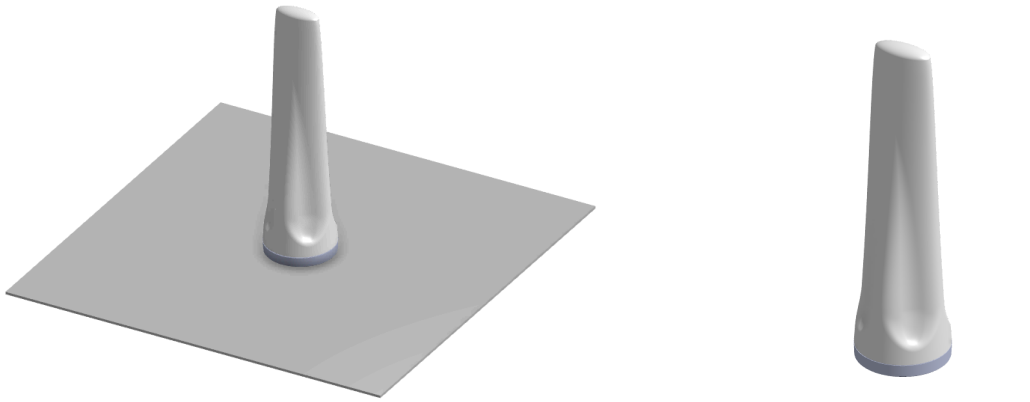


Figure 1. AC94541-01N Antenna Dimensions

Antenna Test Orientations

The AC94541-01N antenna is characterized in two antenna orientations as shown in Figure 2. The antenna free space orientation characterizes use of the antenna mounted on a remote bracket or non-metallic enclosure. Although the antenna is a dipole not requiring a ground plane for function, characterization on an adjacent ground plane (500 mm x 500 mm) provides insight into antenna performance when attached directly on a metal enclosure. The two orientations represent the most common end-product use cases.



Antenna on Ground Plane

Antenna in Free Space

Figure 2. AC94541-01N Antenna Test Orientations

On Ground Plane

The charts on the following pages represent data taken with the antenna oriented at the center of the 500 mm x 500 mm metal plate as shown in Figure 3.

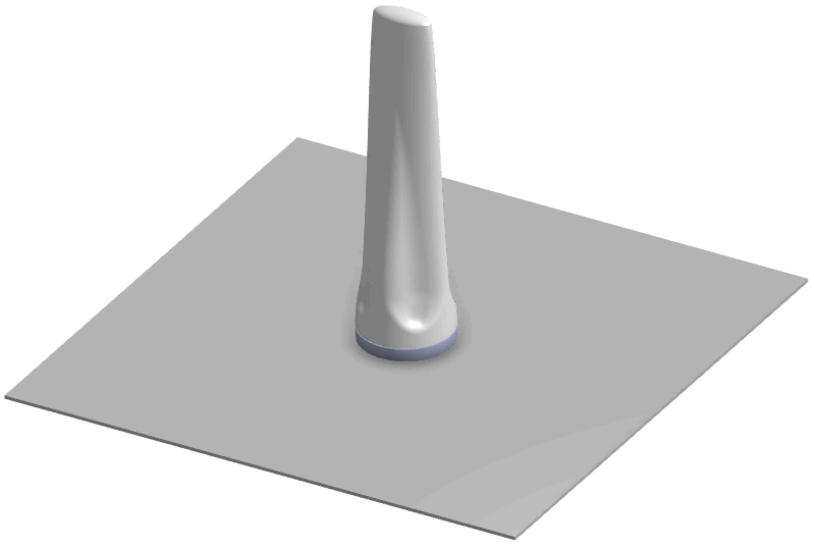


Figure 3. AC94541-01N Antenna On Ground Plane

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.

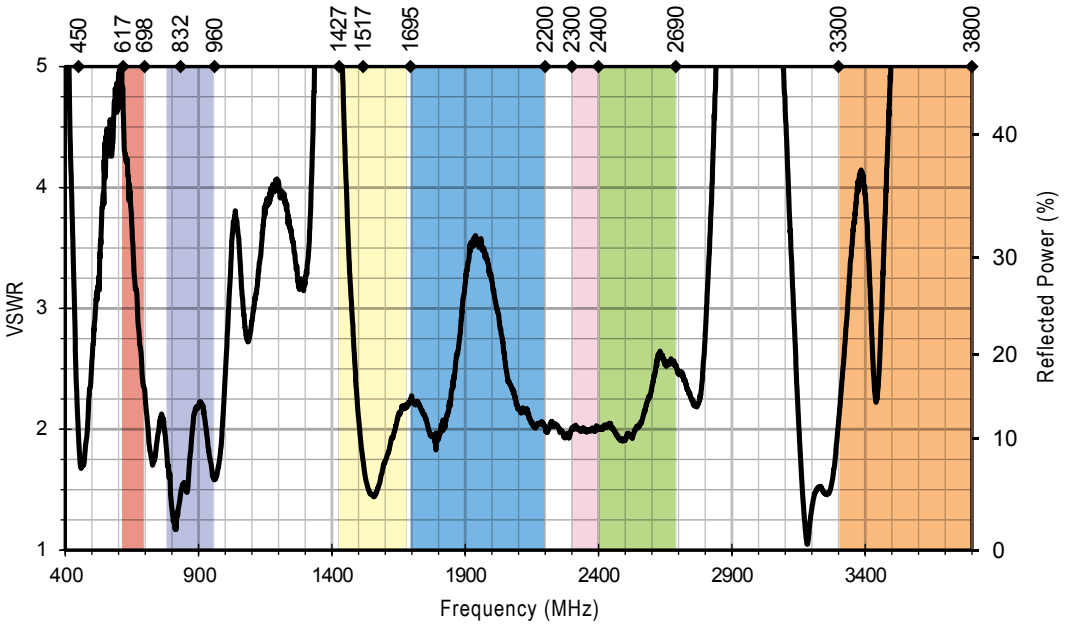


Figure 4. AC94541-01N Antenna VSWR on Ground Plane

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.

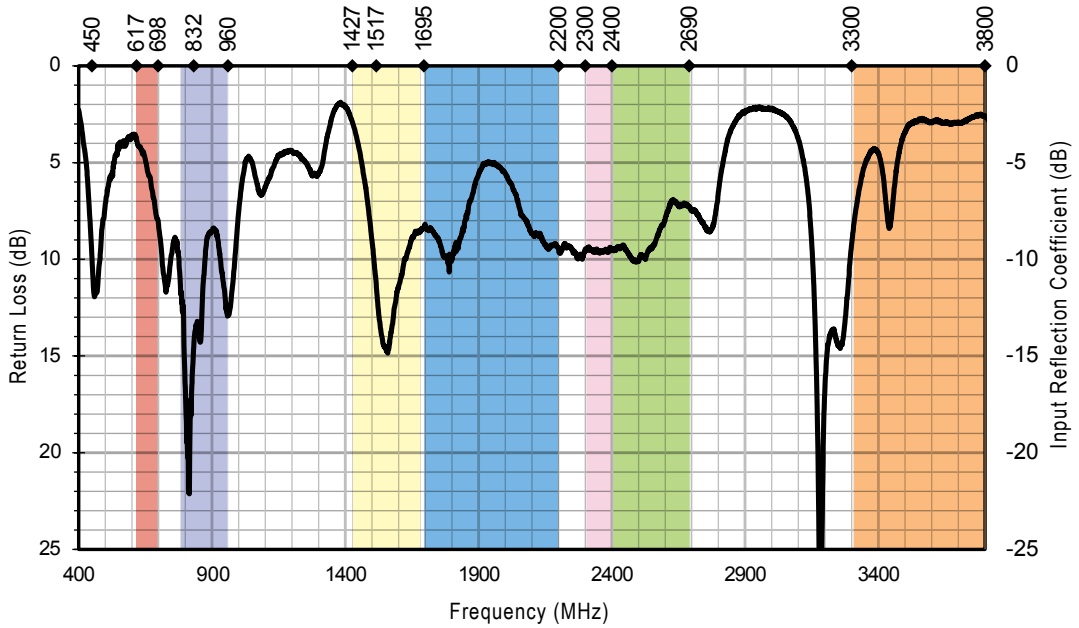


Figure 5. AC94541-01N Antenna Return Loss on Ground Plane

Peak Gain

Peak gain, (See 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.

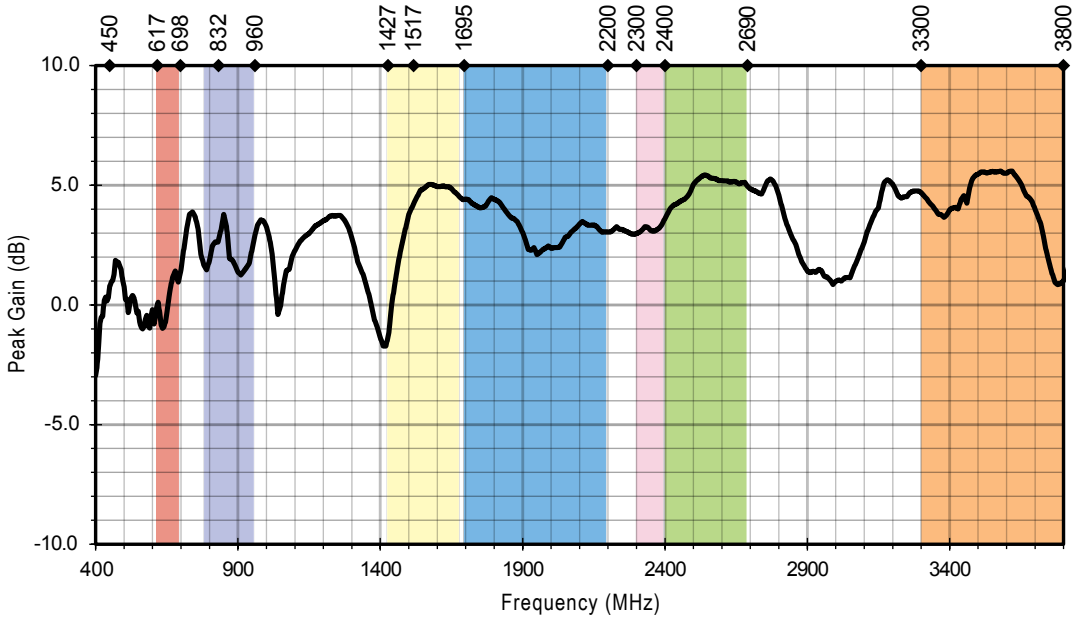


Figure 6. AC94541-01N Antenna Peak Gain on Ground Plane

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.

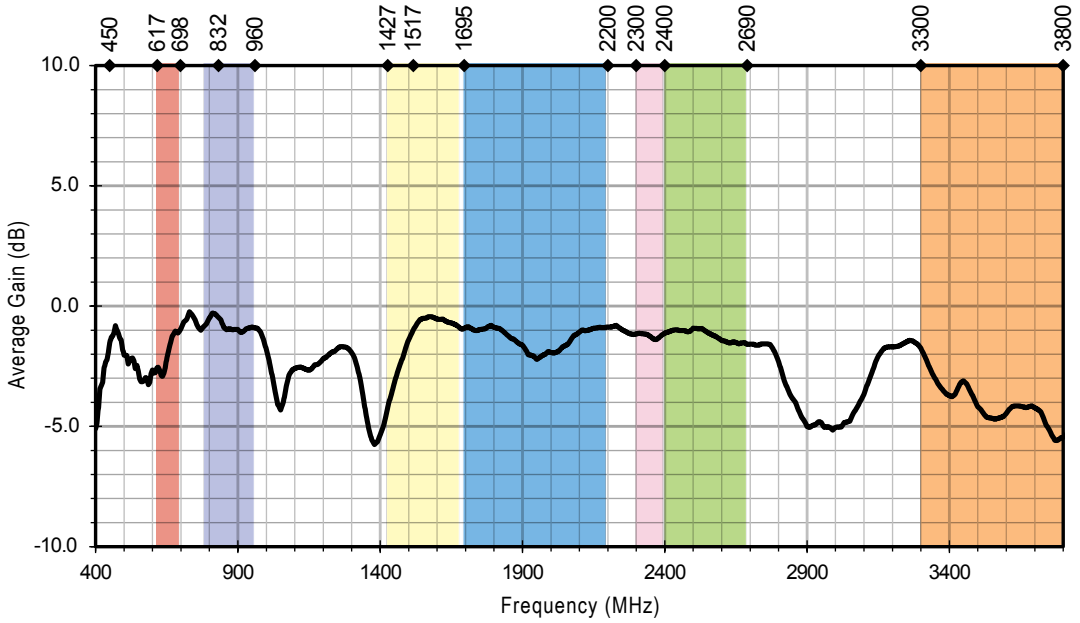


Figure 7. AC94541-01N Antenna Average Gain on Ground Plane

Efficiency

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

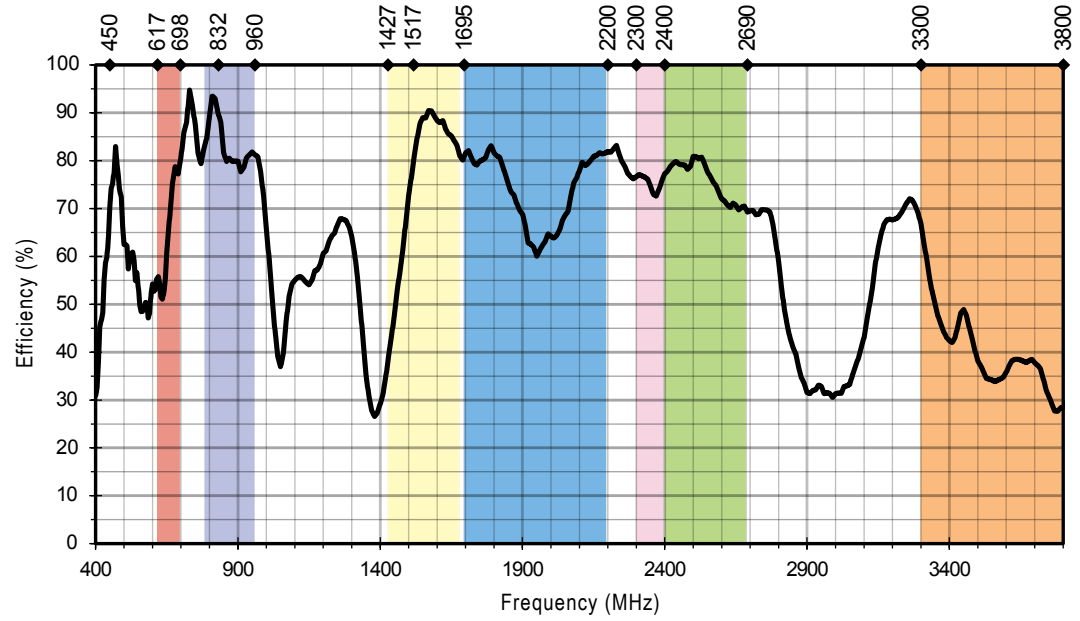
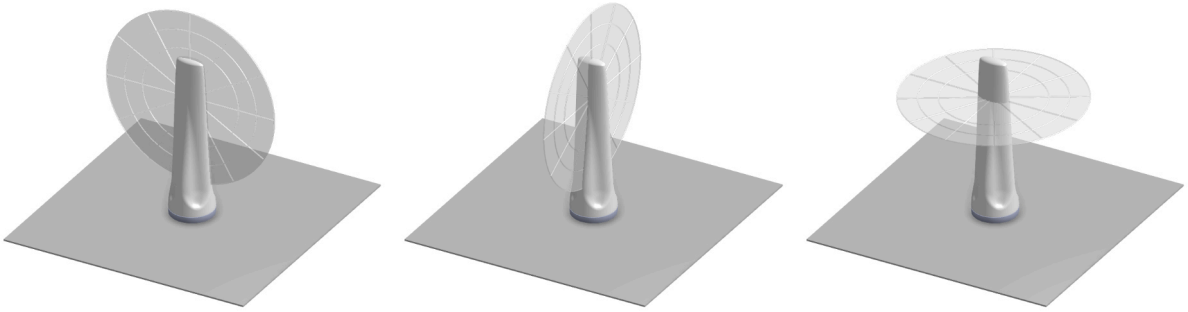


Figure 8. AC94541-01N Antenna Radiation Efficiency on Ground Plane

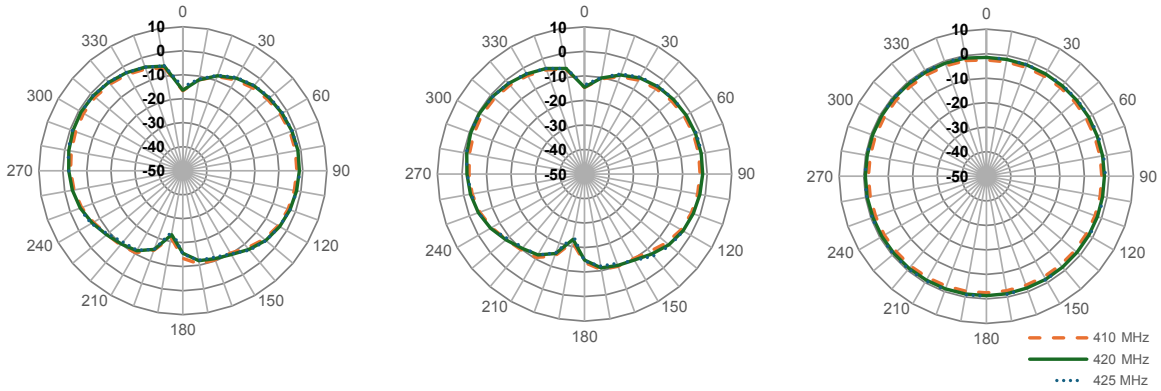
Radiation Patterns - On Ground Plane

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 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.



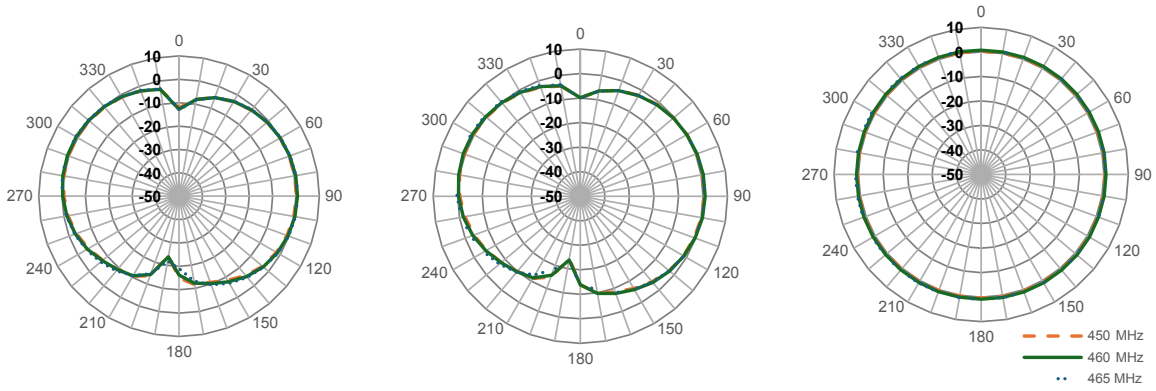
XZ-Plane Gain **YZ-Plane Gain** **XY-Plane Gain**

410 MHz to 425 MHz (420 MHz)



XZ-Plane Gain YZ-Plane Gain XY-Plane Gain

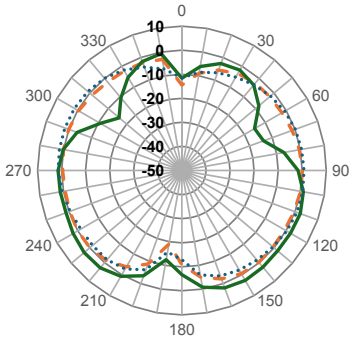
450 MHz to 465 MHz (460 MHz)



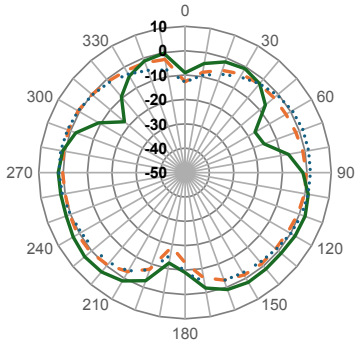
XZ-Plane Gain YZ-Plane Gain XY-Plane Gain

Radiation Patterns

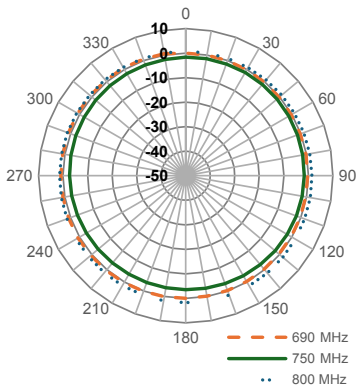
690 MHz to 800 MHz (750 MHz)



XZ-Plane Gain

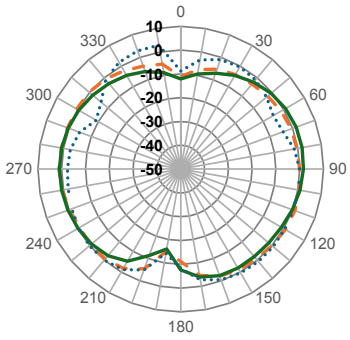


YZ-Plane Gain

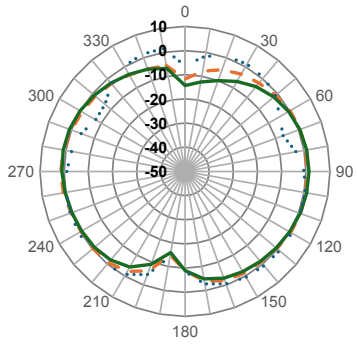


XY-Plane Gain

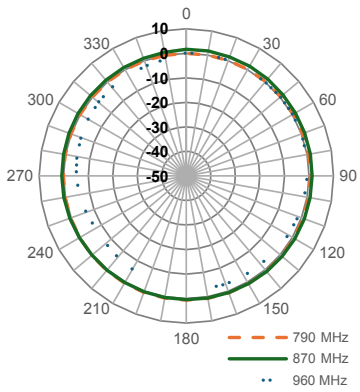
790 MHz to 960 MHz (870 MHz)



XZ-Plane Gain

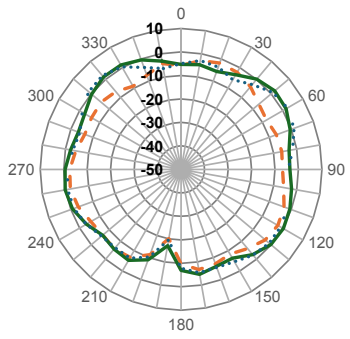


YZ-Plane Gain

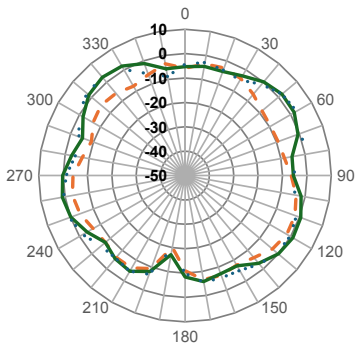


XY-Plane Gain

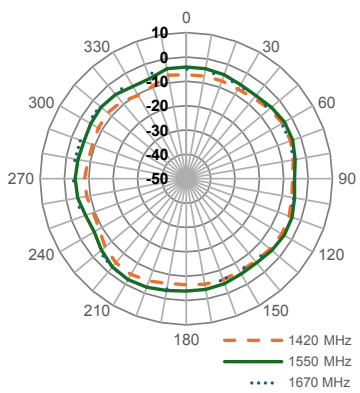
1420 MHz to 1670 MHz (1550 MHz)



XZ-Plane Gain



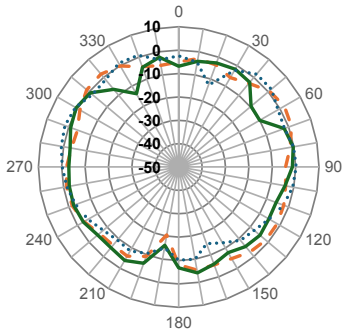
YZ-Plane Gain



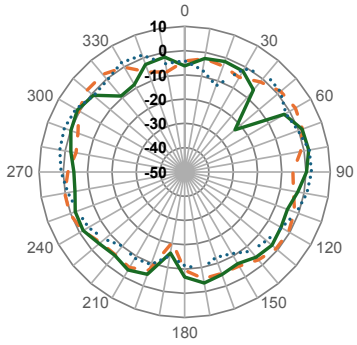
XY-Plane Gain

Radiation Patterns

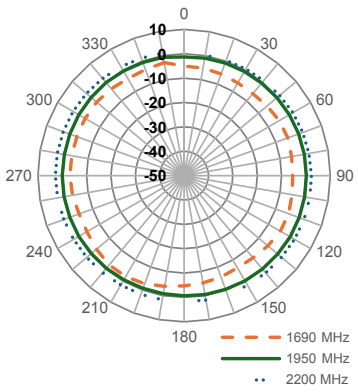
1690 MHz to 2200 MHz (1950 MHz)



XZ-Plane Gain

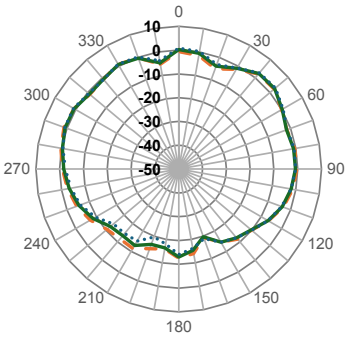


YZ-Plane Gain

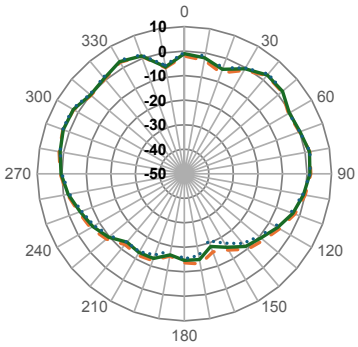


XY-Plane Gain

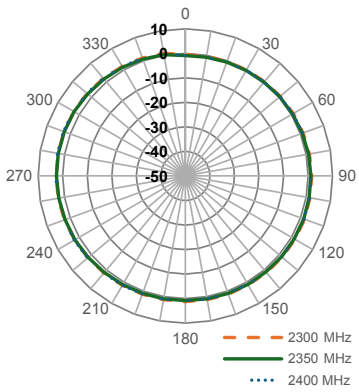
2300 MHz to 2400 MHz (2350 MHz)



XZ-Plane Gain

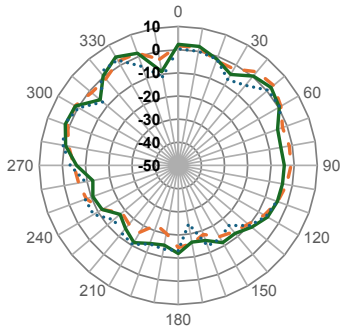


YZ-Plane Gain

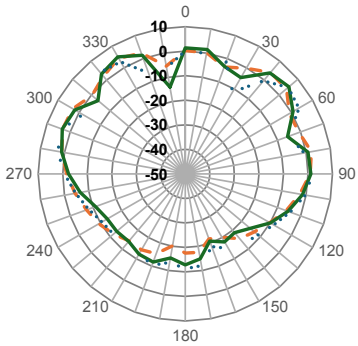


XY-Plane Gain

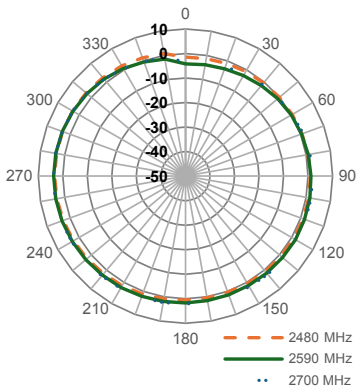
2480 MHz to 2700 MHz (2590 MHz)



XZ-Plane Gain



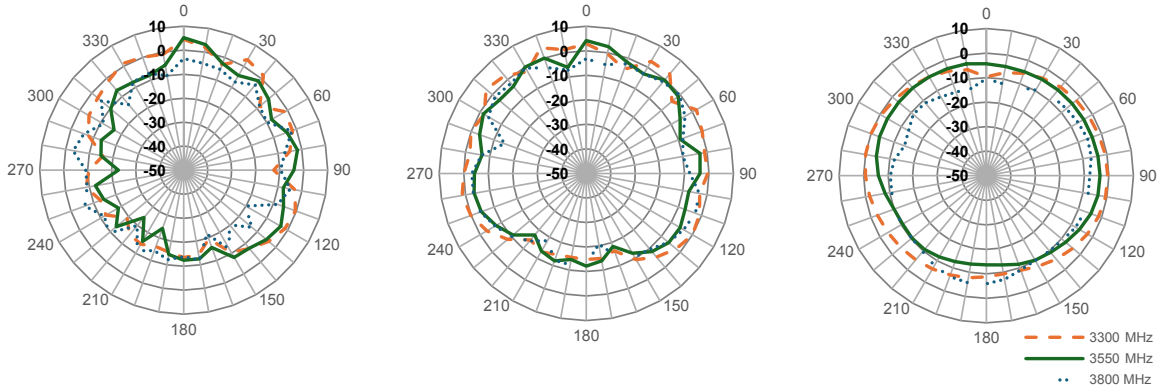
YZ-Plane Gain



XY-Plane Gain

Radiation Patterns

3300 MHz to 3800 MHz (3550 MHz)



XZ-Plane Gain YZ-Plane Gain XY-Plane Gain

Figure 9. Radiation Patterns for AC94541-01N Antenna on Ground Plane

Free Space, No Ground Plane

The charts on the following pages represent data taken with the antenna, in free space as shown in Figure 10.

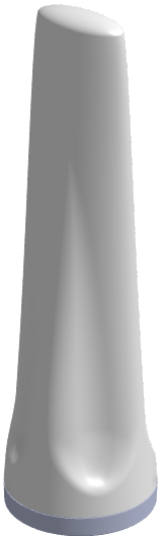


Figure 10. AC94541-01N Antenna, Free Space, no Ground Plane

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.

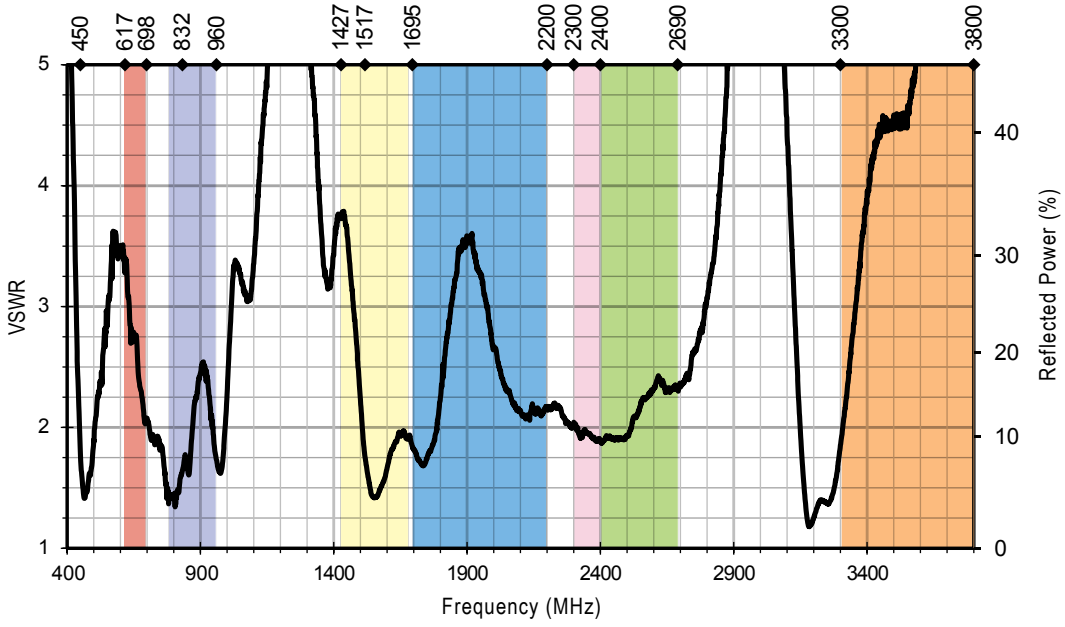


Figure 11. AC94541-01N Antenna VSWR, Free Space

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.

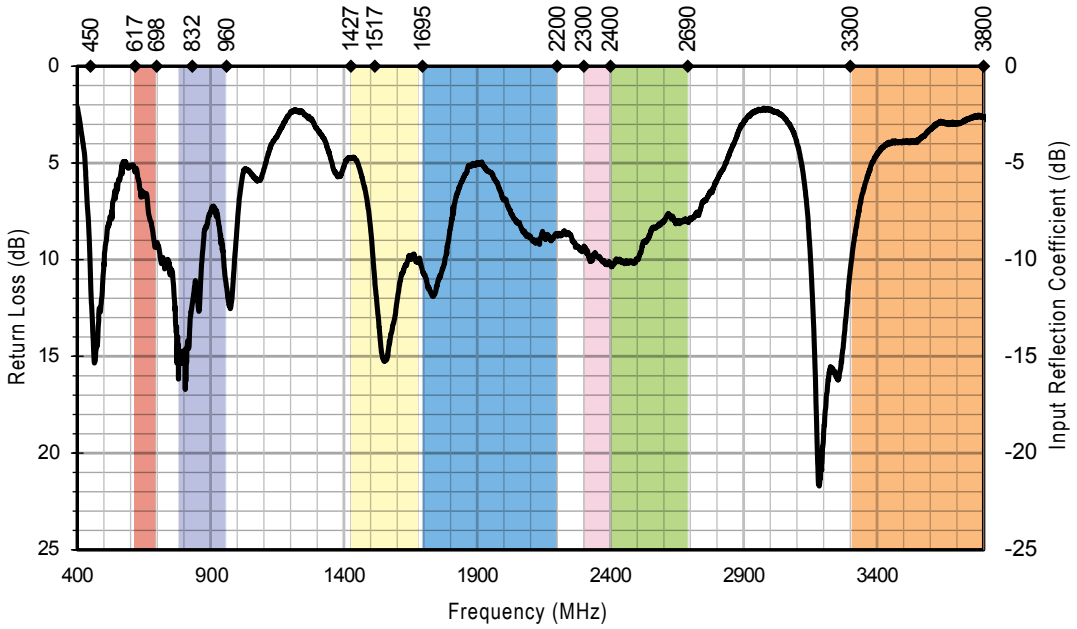


Figure 12. AC94541-01N Antenna Return Loss, Free Space

Peak Gain

Peak gain, (See 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.

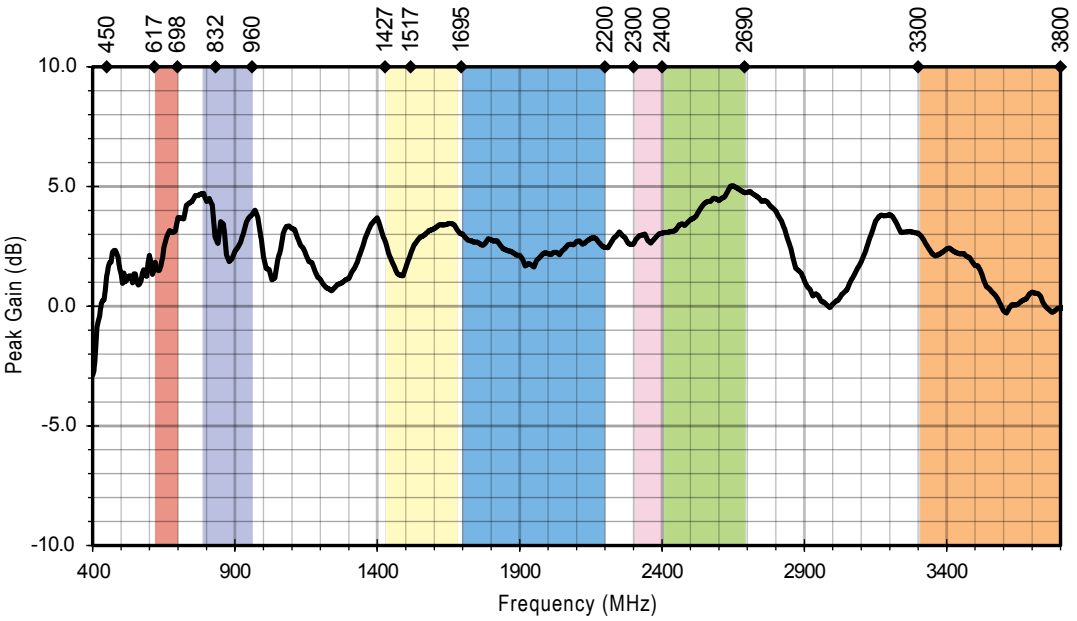


Figure 13. AC94541-01N Antenna Peak Gain, Free Space

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.

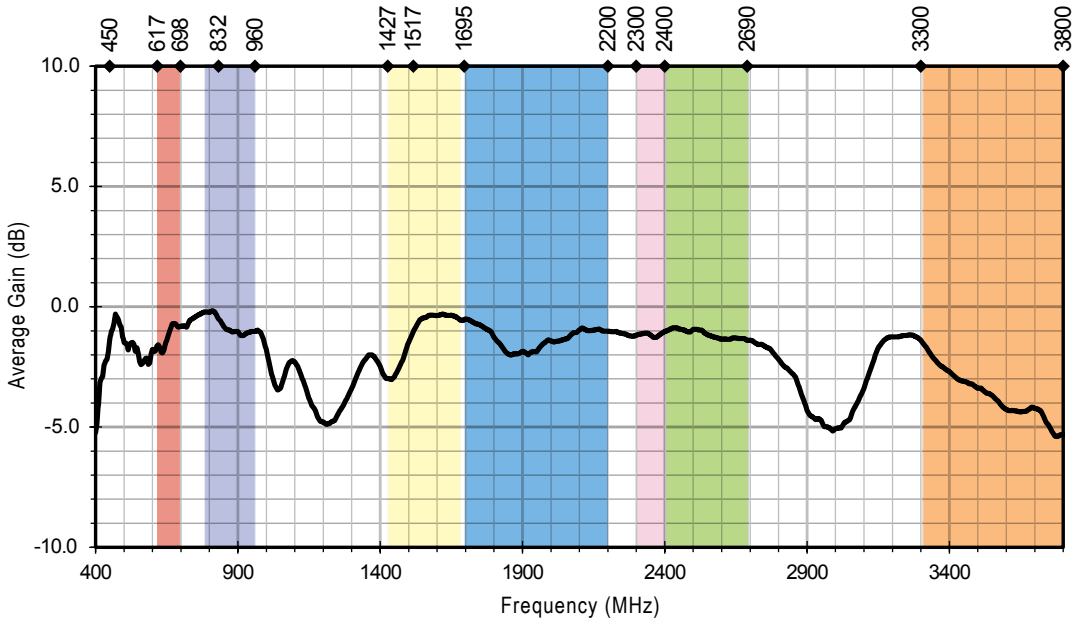


Figure 14. AC94541-01N Antenna Average Gain, Free Space

Efficiency

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

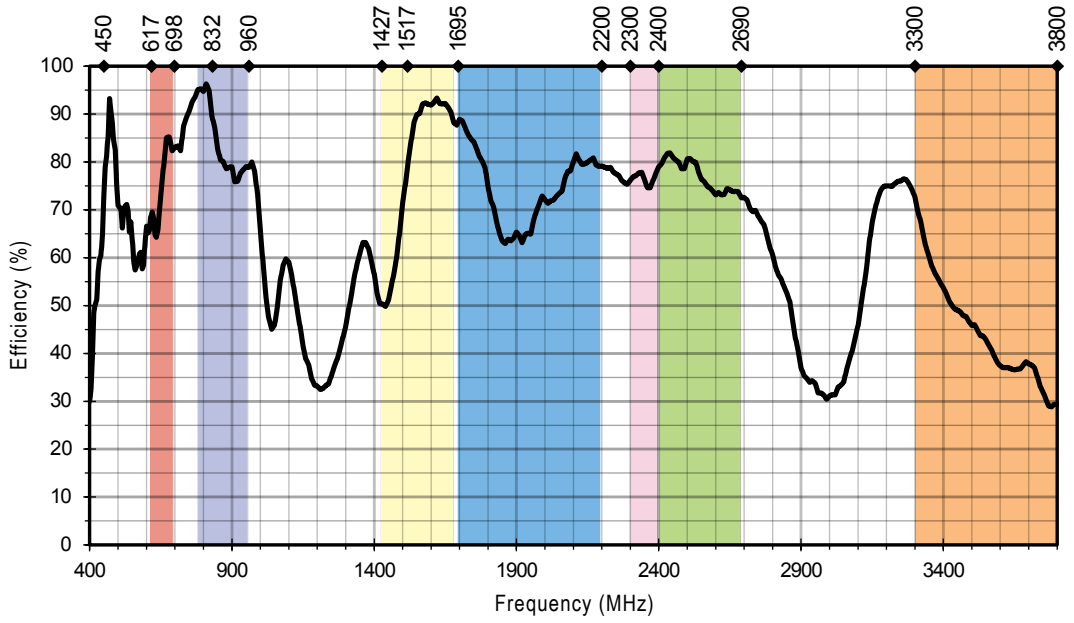
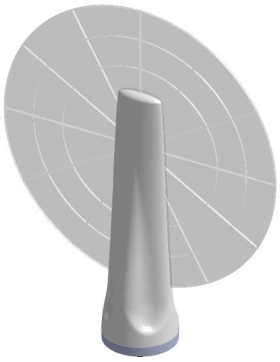


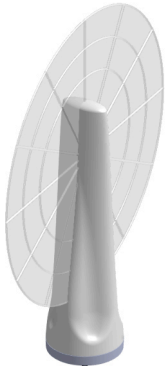
Figure 15. AC94541-01N Antenna Radiation Efficiency, Free Space

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 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.



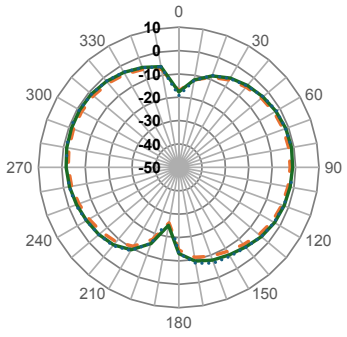
XZ-Plane Gain



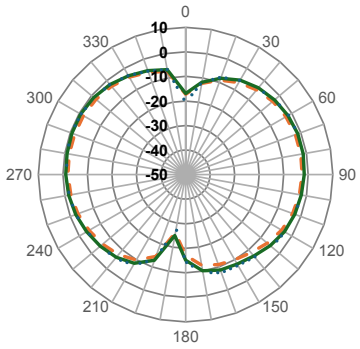
YZ-Plane Gain

XY-Plane Gain

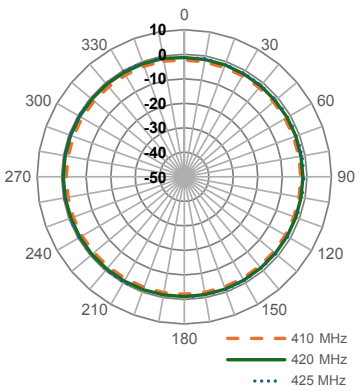
410 MHz to 425 MHz (420 MHz)



XZ-Plane Gain

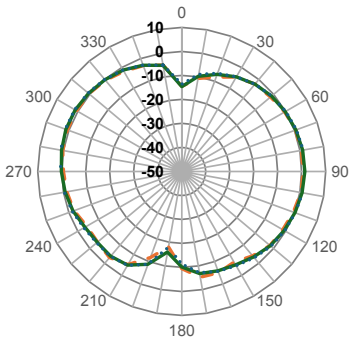


YZ-Plane Gain

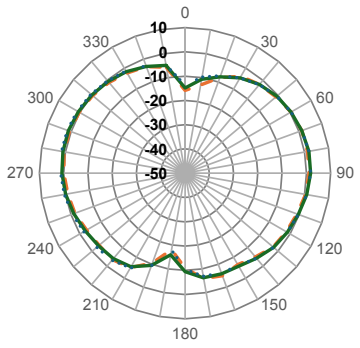


XY-Plane Gain

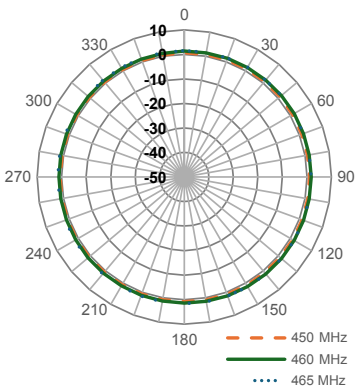
450 MHz to 465 MHz (460 MHz)



XZ-Plane Gain



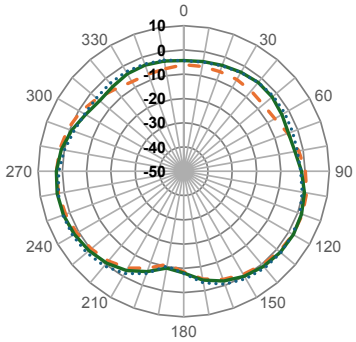
YZ-Plane Gain



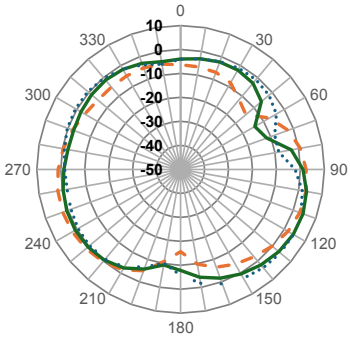
XY-Plane Gain

Radiation Patterns

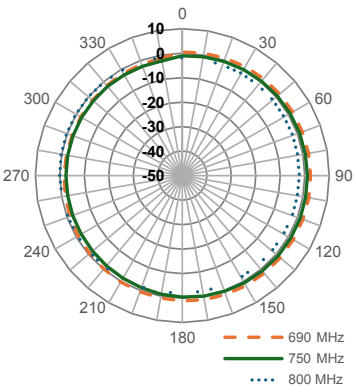
690 MHz to 800 MHz (750 MHz)



XZ-Plane Gain

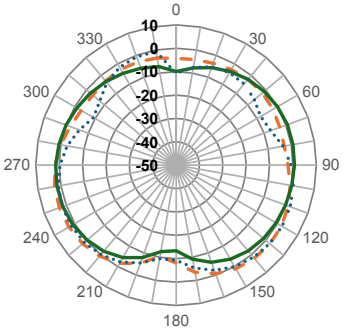


YZ-Plane Gain

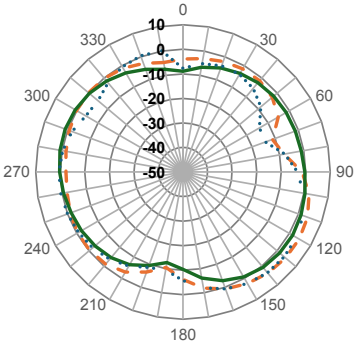


XY-Plane Gain

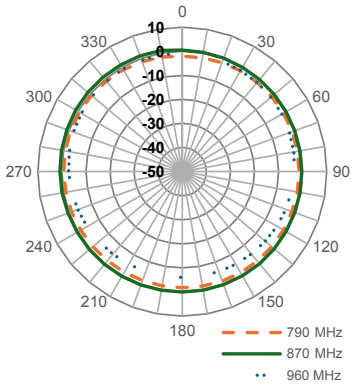
790 MHz to 960 MHz (870 MHz)



XZ-Plane Gain

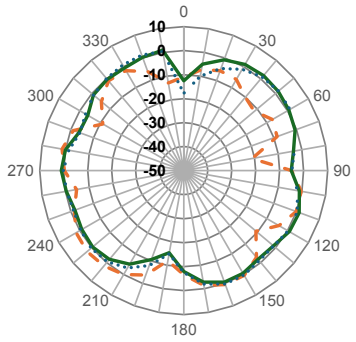


YZ-Plane Gain

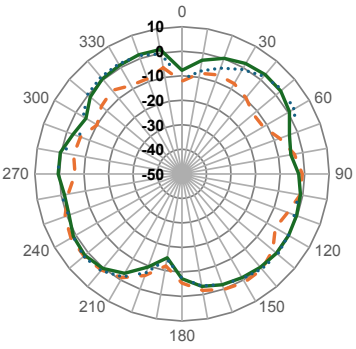


XY-Plane Gain

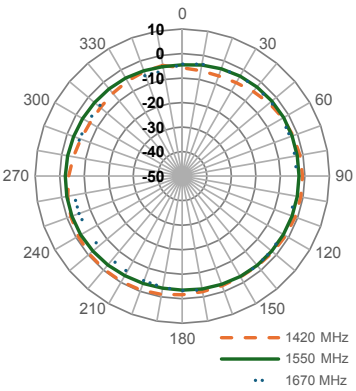
1420 MHz to 1670 MHz (1550 MHz)



XZ-Plane Gain



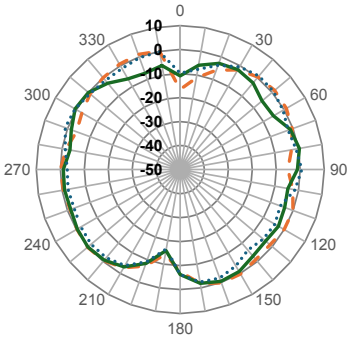
YZ-Plane Gain



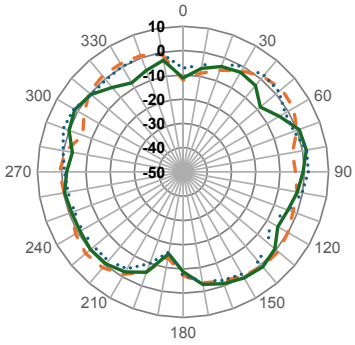
XY-Plane Gain

Radiation Patterns

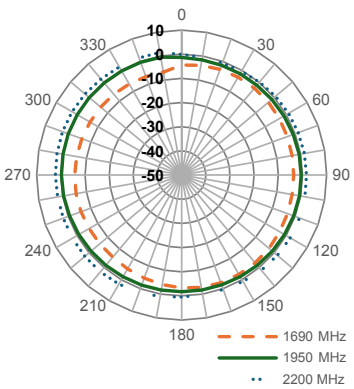
1690 MHz to 2200 MHz (1950 MHz)



XZ-Plane Gain

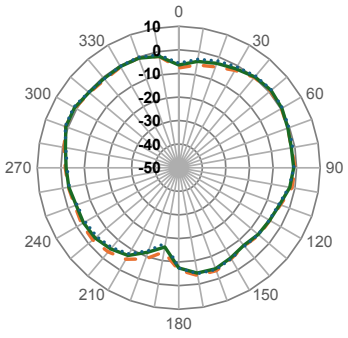


YZ-Plane Gain

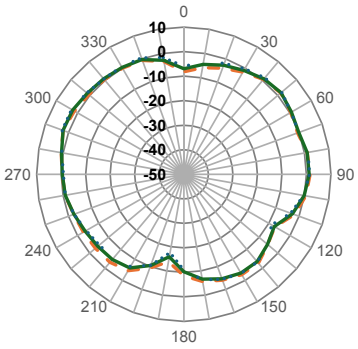


XY-Plane Gain

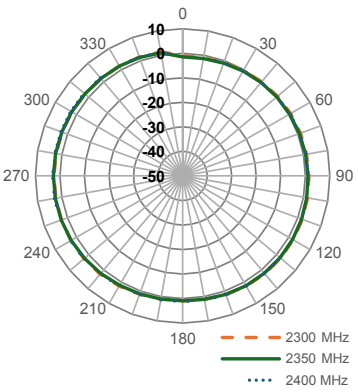
2300 MHz to 2400 MHz (2350 MHz)



XZ-Plane Gain

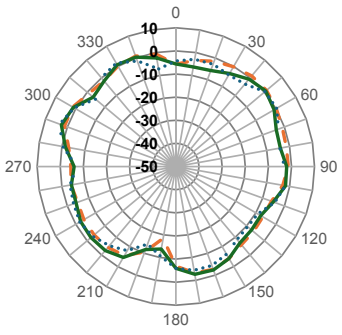


YZ-Plane Gain

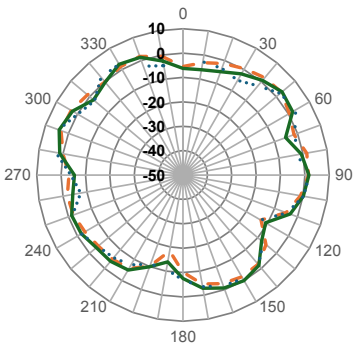


XY-Plane Gain

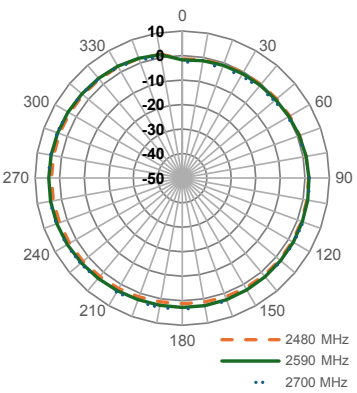
2480 MHz to 2700 MHz (2590 MHz)



XZ-Plane Gain



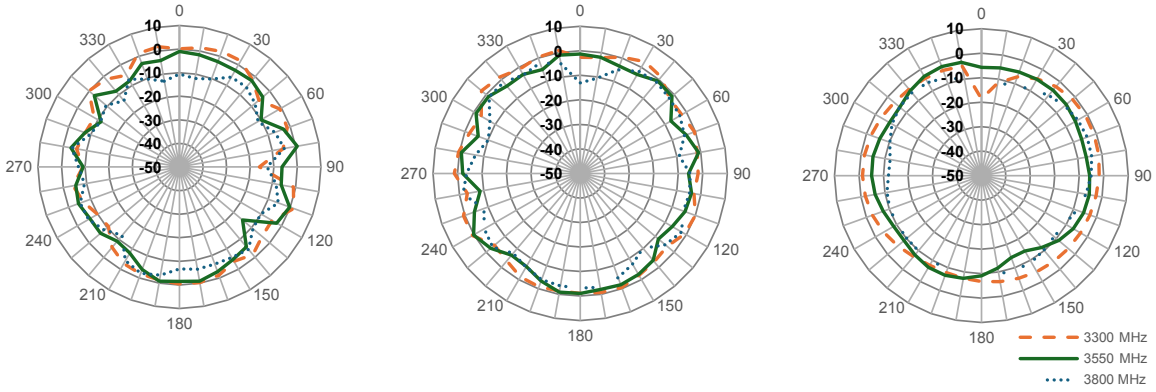
YZ-Plane Gain



XY-Plane Gain

Radiation Patterns

3300 MHz to 3800 MHz (3550 MHz)



XZ-Plane Gain YZ-Plane Gain XY-Plane Gain

Figure 16. Radiation Patterns for AC94541-01N Antenna in Free Space

Mounting Accessory Pack

Part numbers ending in "A" (e.g. AC94541-01NA) include the mounting accessories listed in Table 4 and shown in Figure 17.

Table 4. Mounting Accessory Pack List of Contents

Item	Accessory	Qty
A	Mounting bracket, stainless steel	1
B	Adhesive foam gasket, closed-cell Polyethylene foam w/ 2-sided peel-n-stick adhesive	1
C	Band-Clamp, adjustable	1
D	Plastic wall anchor w/integrated screw	2
E	M4 x 12 mm machine screw w/washer	4

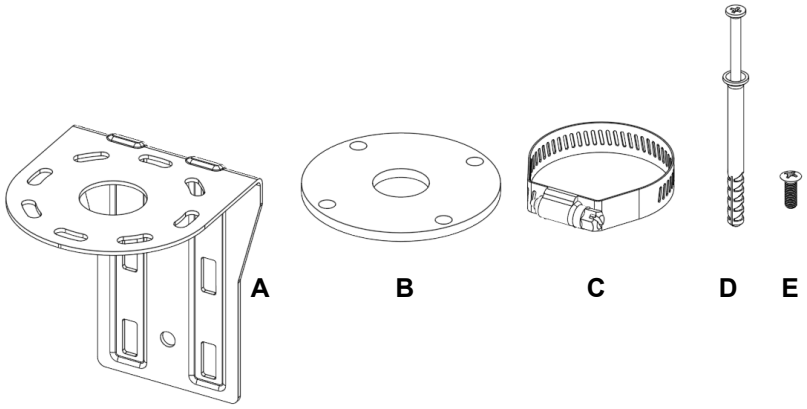


Figure 17. Mounting Accessory Pack

Antenna Mounting

The AC94541-01N antenna, when purchased with the optional mounting accessory pack, attaches to the mounting bracket along with the gasket and 4 M4 machine screws as shown in Figure 18. The mounting bracket installs onto any surface type including solid walls using the provided wall anchors. A band clamp is also provided for pole mounting of the mounting bracket.

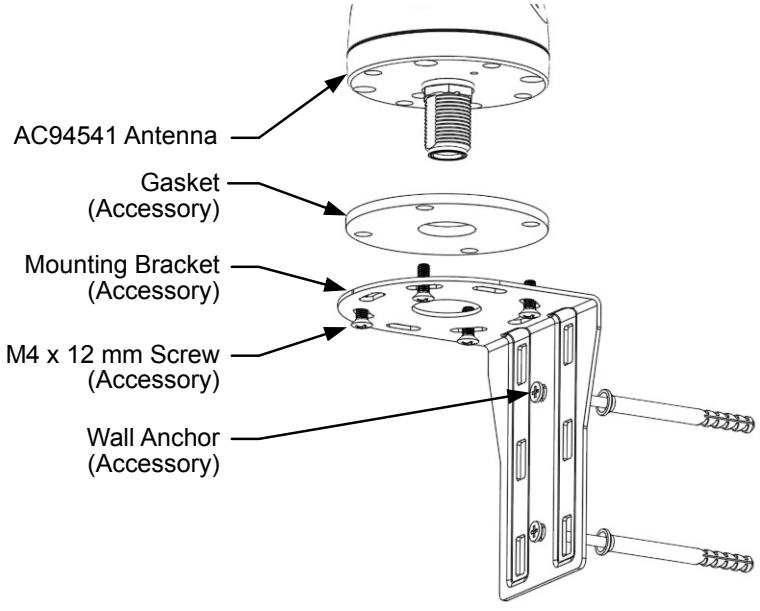


Figure 18. AC94541-01N Antenna Mounting Methods

Packaging Information

The AC94541-01N antennas are individually packaged in a carton, (Figure 19) 350 mm x 108 mm x 78 mm (13.78 in x 4.25 in x 3.07 in) 20 antennas per large carton.

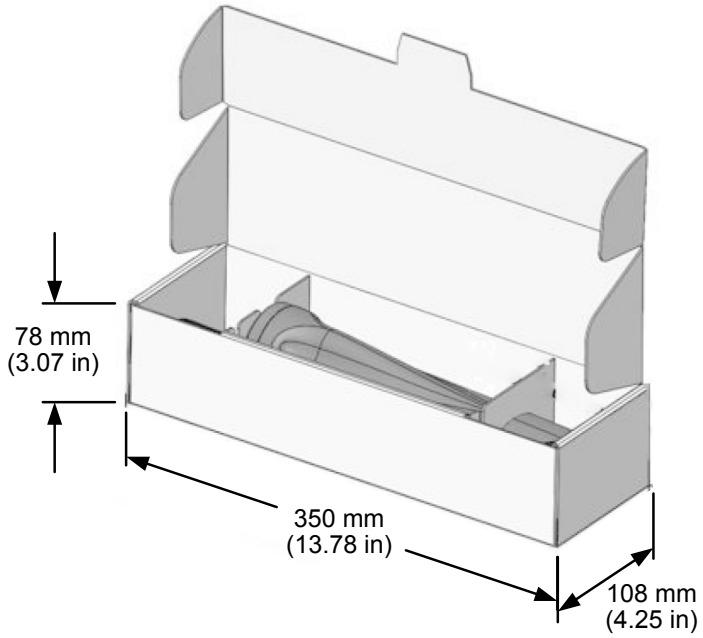


Figure 19. AC94541-01N Antenna Packaging Dimensions

Regional Environmental Regulation Compliance Status

Table 5. Environmental Compliance

Region	Regulation	Reference
United States	US EPA Toxic Substances Control Act amended December 2020 Declaration	TSCA Section 6(h)
United States	California Proposition 65 Safe Drinking Water & Toxic Enforcement Act of 1986 Declaration	HSC division 20 chapter 6.6
European Union	RoHS 3	EU 2015/863
European Union	EU REACH	EU 1907/2006
Worldwide	Responsible Minerals Initiatives	Dodd Frank act 1502; EU 2017/B21
European Union	Persistent Organic Pollutants	(EU) 2019/1021
European Union	Packaging Directive	94/62/EC
European Union	PFOA Free	2006/122/ECOF
United States	Flammability rating	UL 94-HB
Worldwide	Salt spray	MIL-STD 810F/ASTM B117

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