

AC85002 NM Series Cellular IoT Compact Dome NMO-Mount Antennas

The AC85002-NM series NMO compact dome antennas provide robust compact, outdoor, omnidirectional cellular antenna solutions for cellular IoT applications including Cat-M1/LTE-M and NB-IoT systems from 698 MHz to 2690 MHz.

Each antenna supports IP67 and IP65 ingress protection as well as IK-10 impact resistance, all under an attractive, UV-resistant, dome. The 82 mm x 40mm mounted size combines excellent antenna performance with a compact low-profile that fits in many applications from mobile/vehicular roof-mount to fixed vending machine use, supports use on both metallic and non-metallic enclosures.

The AC85002-NM NMO compact dome antenna series is available in two colors, black and white, with fine matte finish. Similar-performing N-connector (AC85002 series) and cabled (AC87001 series) compact dome antennas are also available.



AC85002-NMB Compact Dome NMO-Mount Antenna

Features

- Very high efficiency
- IP67/IP65 ingress protection
- IK10 impact resistance
- O-ring mounting seal
- UV resistance
- Dimensions: 82 mm x 40 mm
- Ground plane independence
- NMO termination

Applications

- Cellular IoT
 - Cat-M1/LTE-M
 - NB-IoT
- Automotive/vehicular/OHV
- Outdoor CPE
- Fixed wireless
- Smart metering
- Substation monitoring
- Asset management
- Internet of Things (IoT) devices

Ordering Information

Part Number	Description
AC85002-NMB	Black NMO connector, cellular IoT compact dome antenna
AC85002-NMW	White NMO connector, cellular IoT compact dome antenna

See the AC87001 series compact dome antennas for cabled options and AC85002-NJ series for N connector termination options. Available from The Antenna Company (sales@antennacompany.com) and select distributors and representatives.

Electrical Specifications

Table 1. RF/Electrical Specifications

Frequency (MHz)	695-805	790-960	1425-1675	1695-2200	2300-2400	2480-2690
VSWR (max)	2.8	2.7	2.0	1.9	1.8	1.8
Peak Gain (dBi)	1.8	4.0	4.0	3.8	3.1	4.3
Average Gain (dBi)	-1.5	-1.0	-1.0	-0.9	-1.4	-1.6
Efficiency (%)	71	80	80	82	72	70
Impedance	50 Ω					
Polarization	Linear					
Radiation Pattern	Omnidirectional					
Wavelength	1/2-wave					
Maximum Input Power	10W					
Electrical Type	Dipole					

Electrical specifications and plots measured with the antenna mounted at the center of a 300 mm x 300 mm ground plane using NMO to N-connector test adapter.

Mechanical Specifications

Table 2. Mechanical Specifications

Parameter	Value
Antenna Connection (Termination)	NMO
Mounting Torque	Hand tighten, 2.0 Nm typical
Mating Connector	Commercially available NMO connectors vary widely. An NMO connector designed for high frequency (i.e. > 700 MHz) is recommended
Weight	AC85002-NMx = 56.7 g (2.0 oz)
Dimensions (mounted)	82.0 mm x Ø40.0 mm (3.23 in x Ø1.57 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%
Ingress Protection	IP67, IP65
Impact Resistance	IK10
Flammability Rating	UL 94-HB
Salt Spray	MIL-STD 810F/STM B117
Wind Resistance (max.)	300 km/hr (186 mi/hr)

Antenna Dimensions

The dimensions for the AC85002 are shown below in Figure 1.

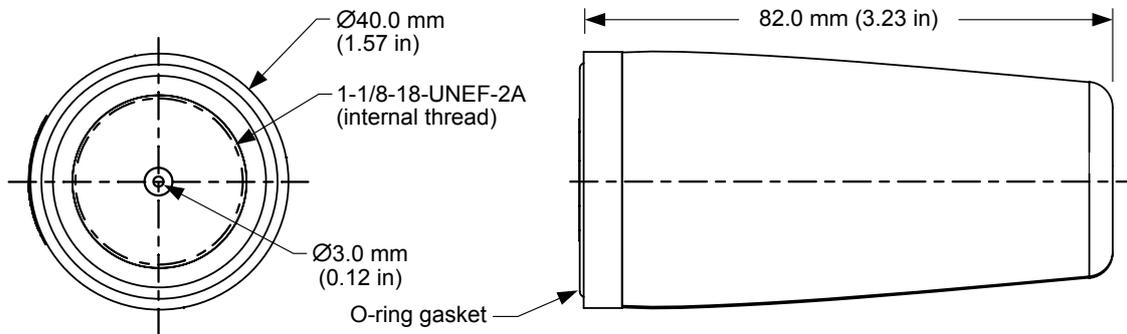


Figure 1. AC85002 Antenna Dimensions

Antenna Test Orientations

The AC85002 antenna is characterized in two antenna orientations as shown in Figure 2. Although the antenna does not require a ground plane to function, characterization on an adjacent ground plane (300 mm x 300 mm) provides insight into antenna performance when attached directly on a metal enclosure. The antenna free space orientation characterizes use of an antenna attached to a non-metallic enclosure. These two orientations represent common end-product use cases.

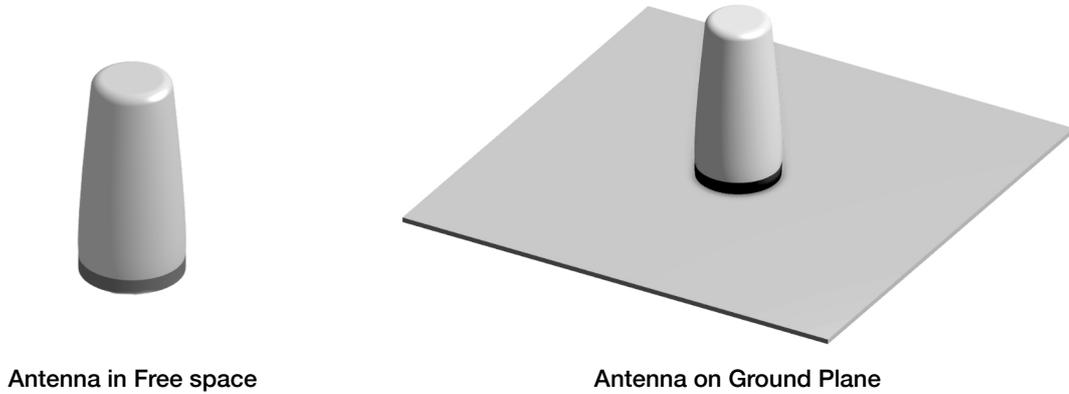


Figure 2. AC85002 Antenna Test Orientations

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 3.

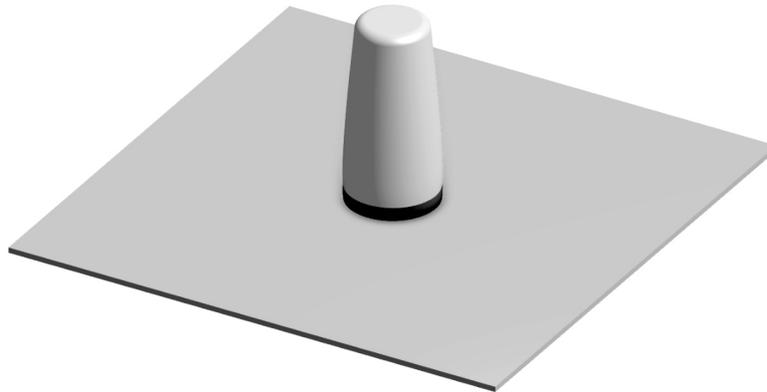


Figure 3. AC85002 Antenna On Ground Plane

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.

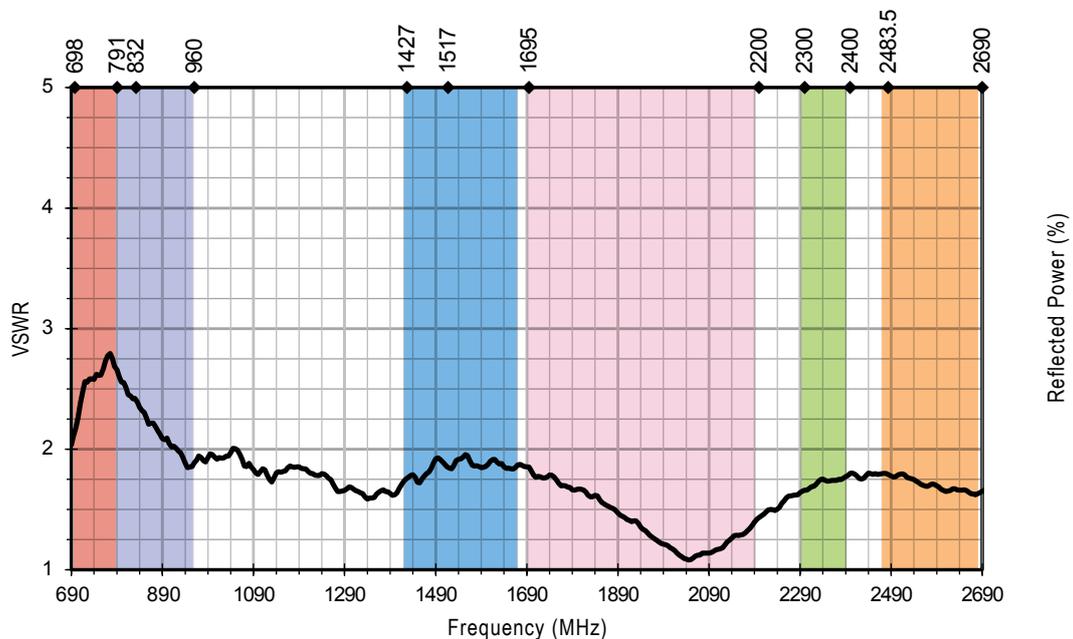


Figure 4. AC85002 Antenna VSWR on Ground Plane

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.

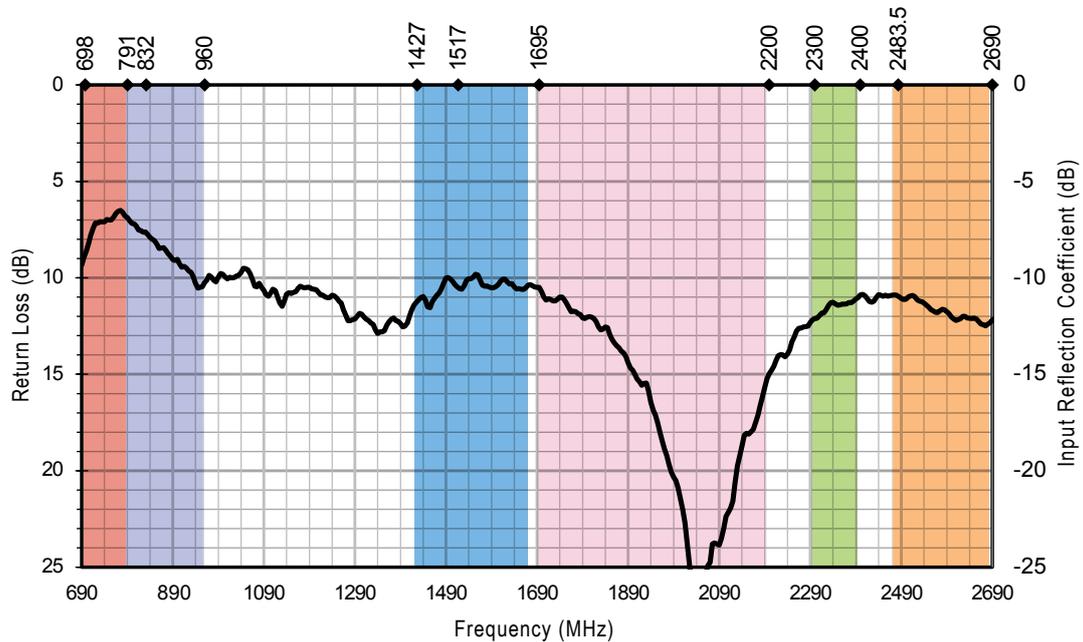


Figure 5. AC85002 Antenna Return Loss on Ground Plane

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.

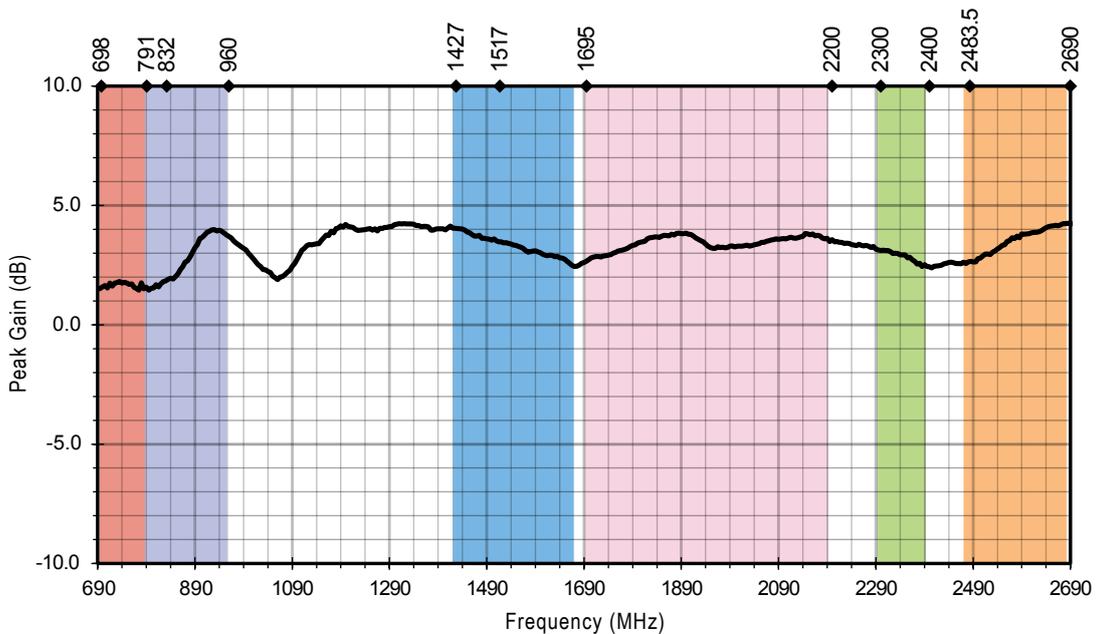


Figure 6. AC85002 Antenna Peak Gain on Ground Plane

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.

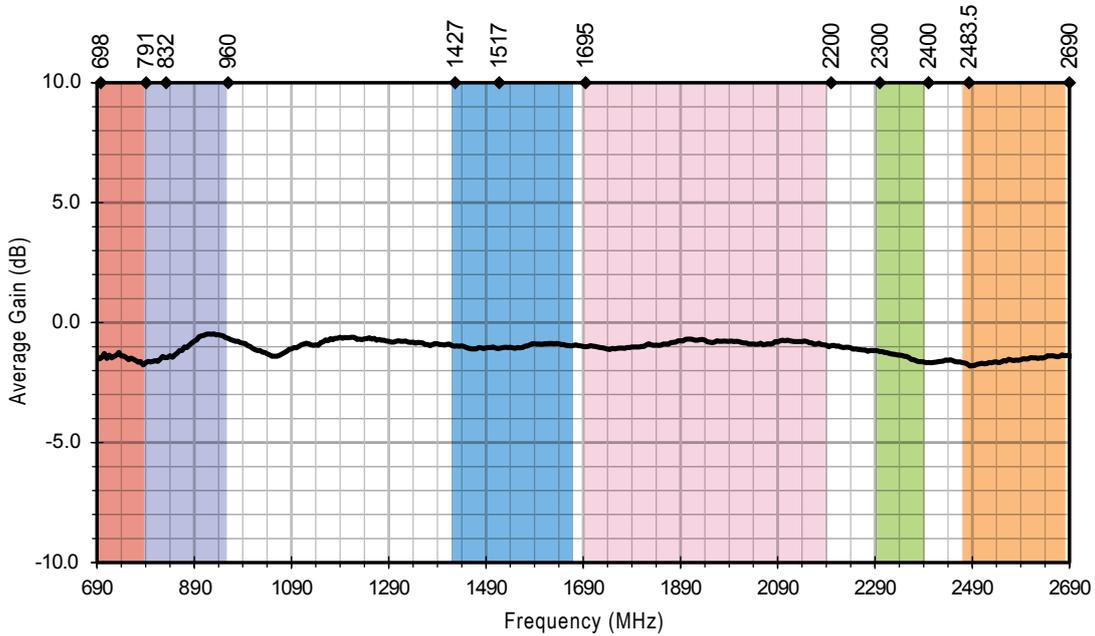


Figure 7. AC85002 Antenna Average Gain on Ground Plane

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.

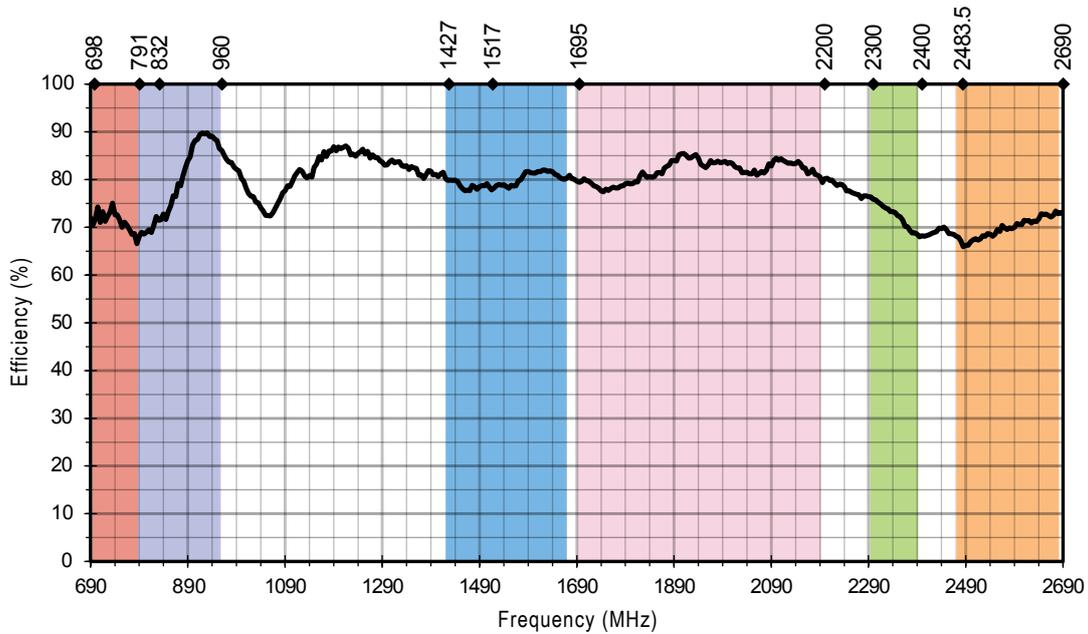
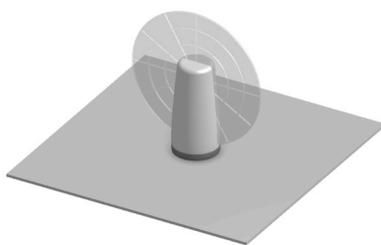


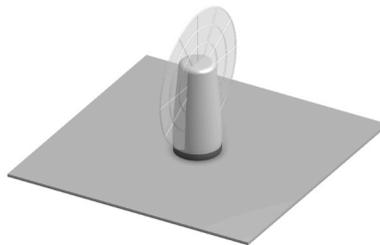
Figure 8. AC85002 Antenna Efficiency on Ground Plane

Radiation Patterns - On Ground Plane

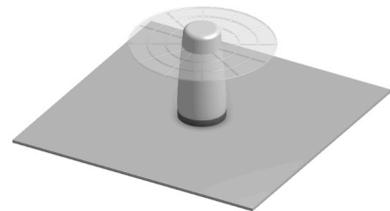
Radiation patterns provide information about the directional performance of the antenna by plotting gain in three orthogonal planes at the high-, low- and center-frequencies of an antenna frequency band. Antenna radiation patterns (Figure 9), are shown using polar plots covering 360 degrees with the 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

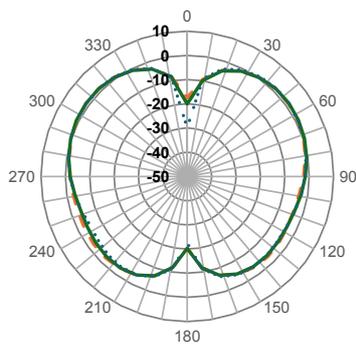


YZ-Plane Gain

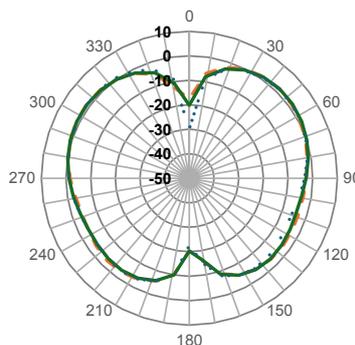


XY-Plane Gain

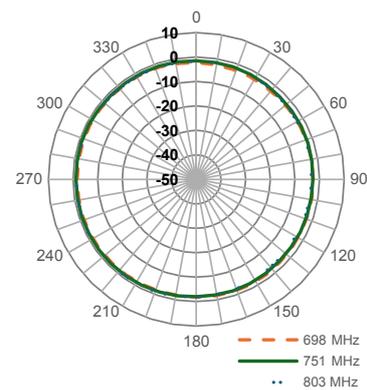
698 MHz to 803 MHz (751 MHz)



XZ-Plane Gain

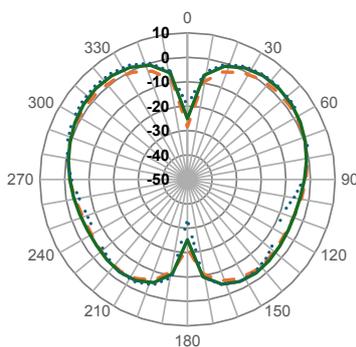


YZ-Plane Gain

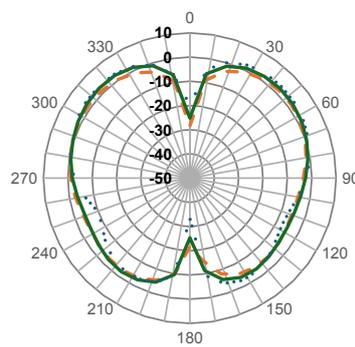


XY-Plane Gain

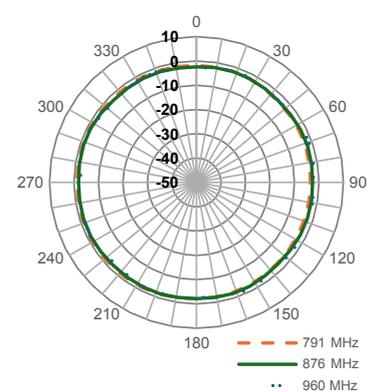
791 MHz to 960 MHz (876 MHz)



XZ-Plane Gain



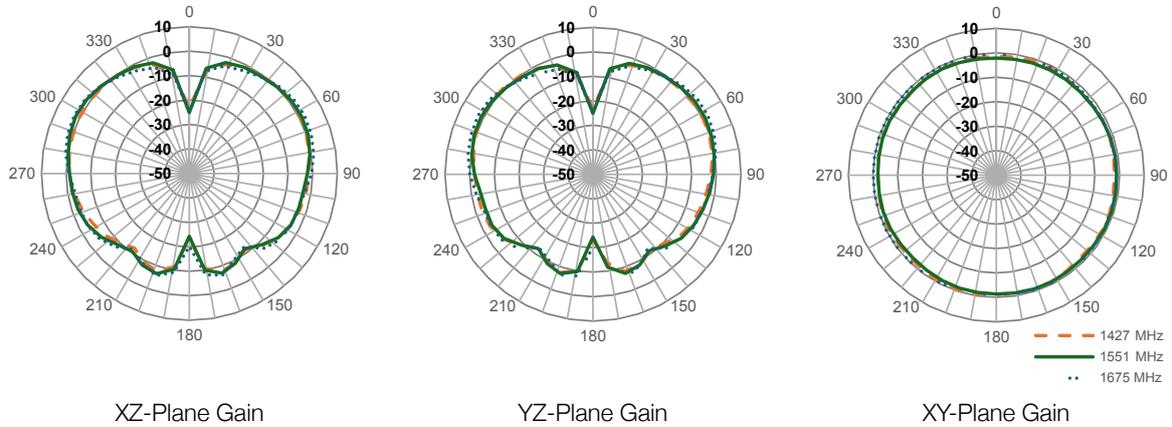
YZ-Plane Gain



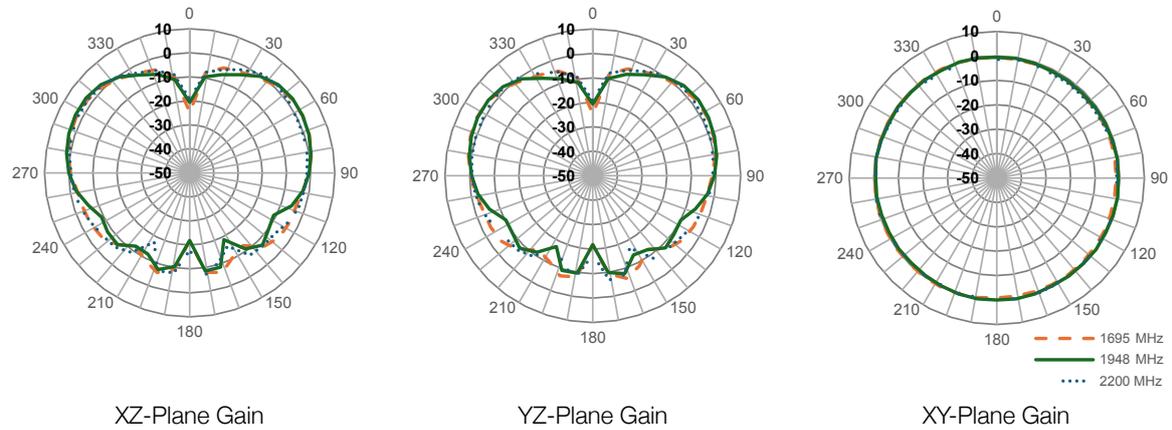
XY-Plane Gain

Radiation Patterns

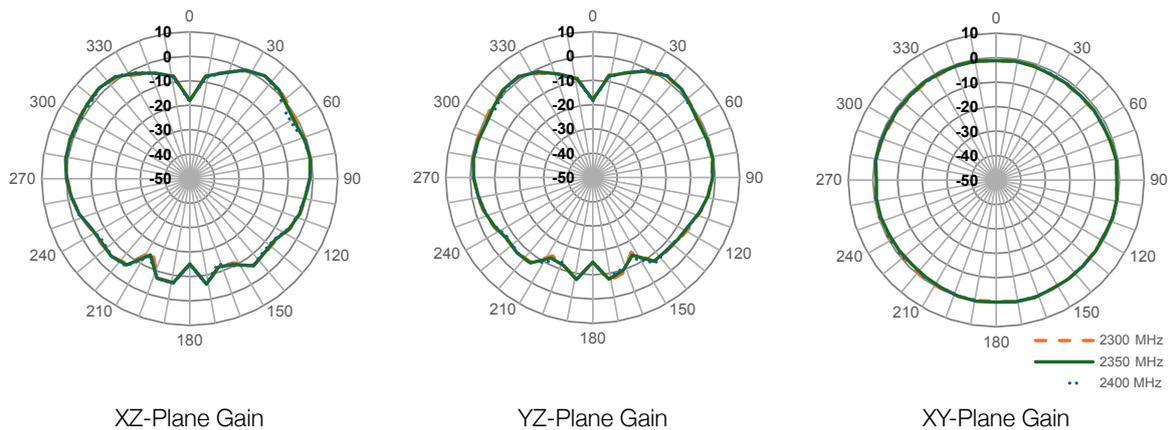
1427 MHz to 1675 MHz (1551 MHz)



1695 MHz to 2200 MHz (1948 MHz)



2300 MHz to 2400 MHz (2350 MHz)



Radiation Patterns

2483 MHz to 2690 MHz (2587 MHz)

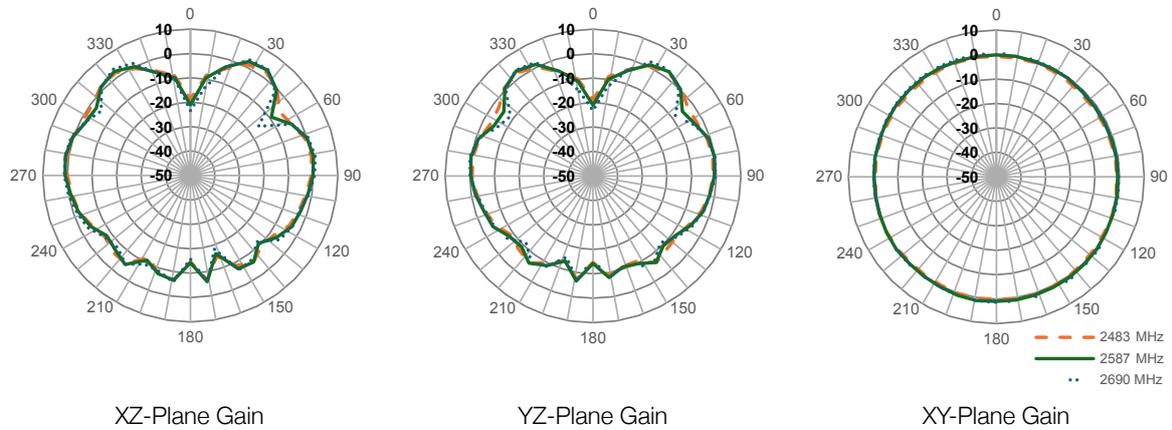


Figure 9. Radiation Patterns for AC85002 Antenna on Ground Plane

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.

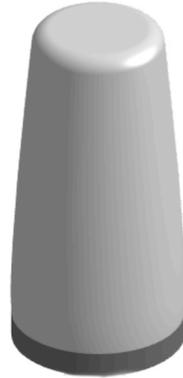


Figure 10. AC85002 Antenna, Free Space, no Ground Plane

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.

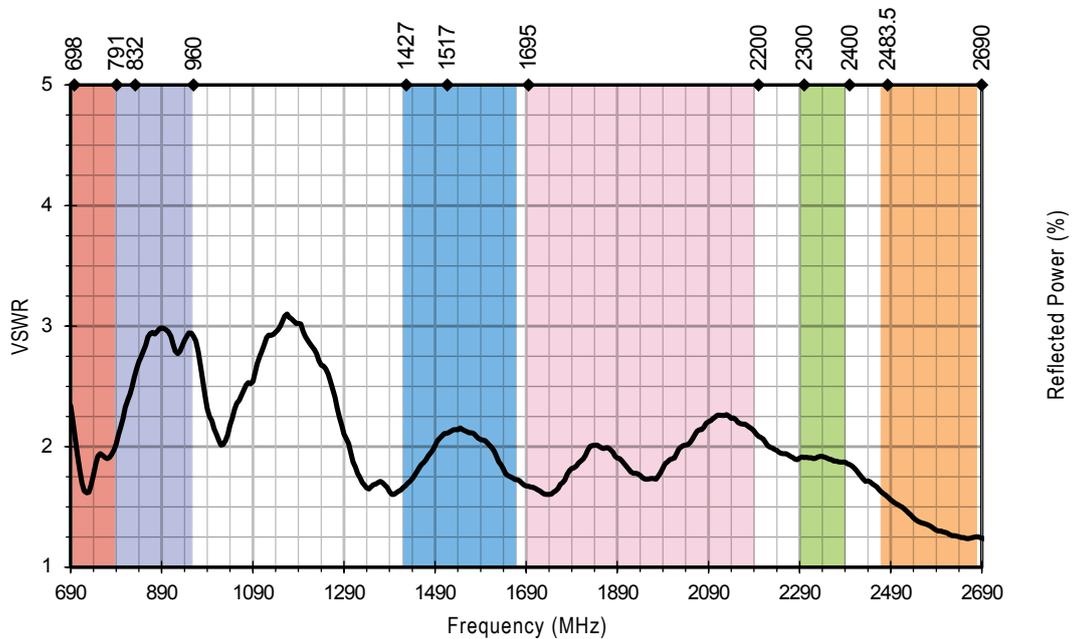


Figure 11. AC85002 Antenna VSWR, Free Space

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.

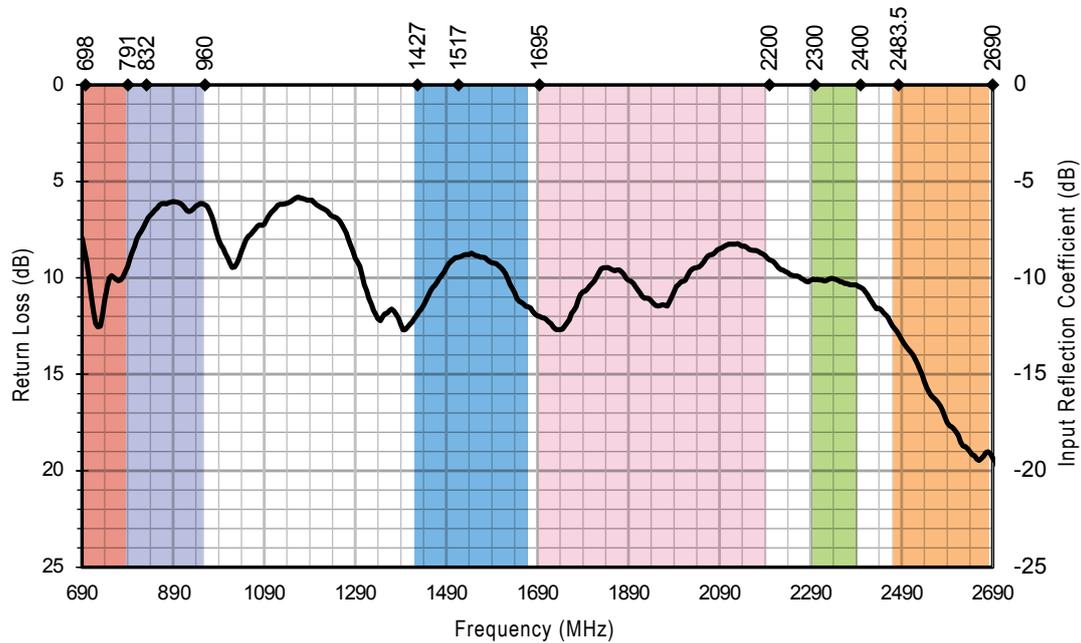


Figure 12. AC85002 Antenna Return Loss, Free Space

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.

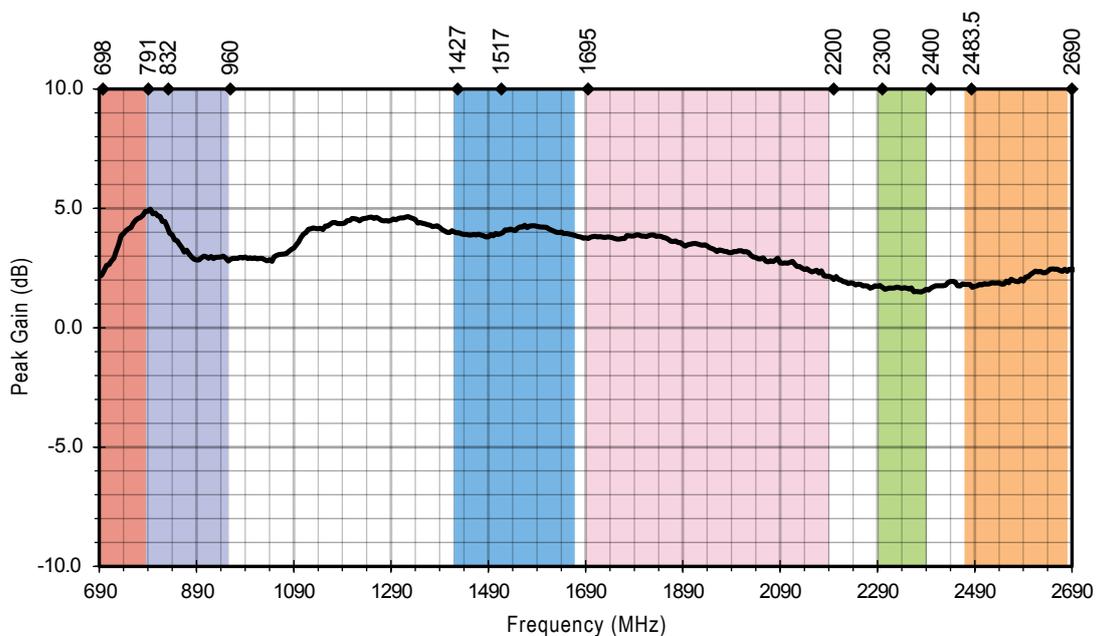


Figure 13. AC85002 Antenna Peak Gain, Free Space

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.

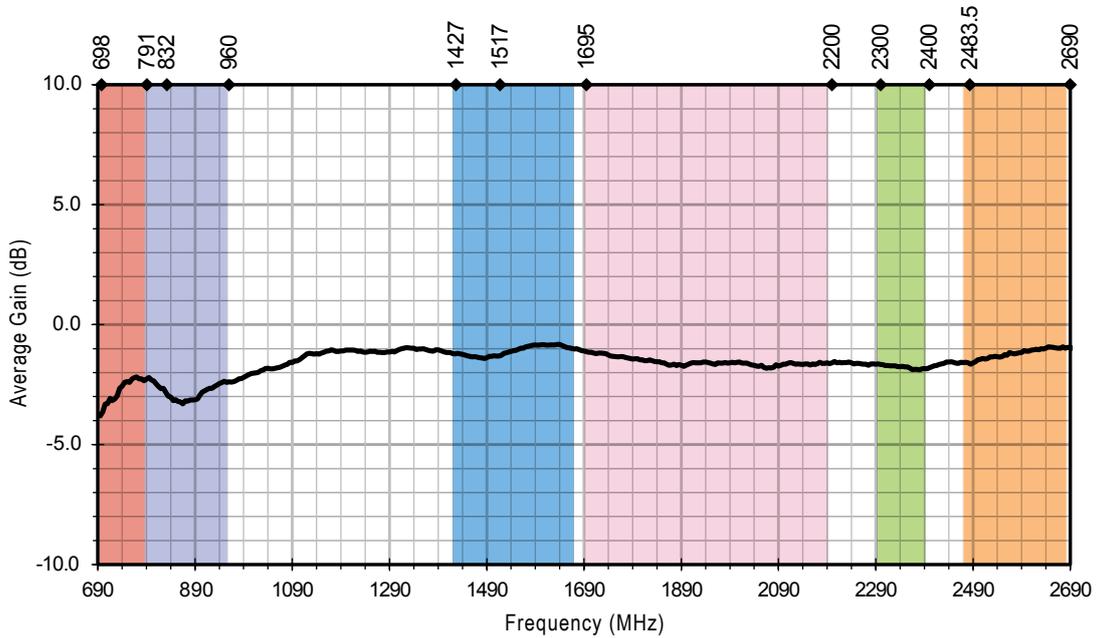


Figure 14. AC85002 Antenna Average Gain, Free Space

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.

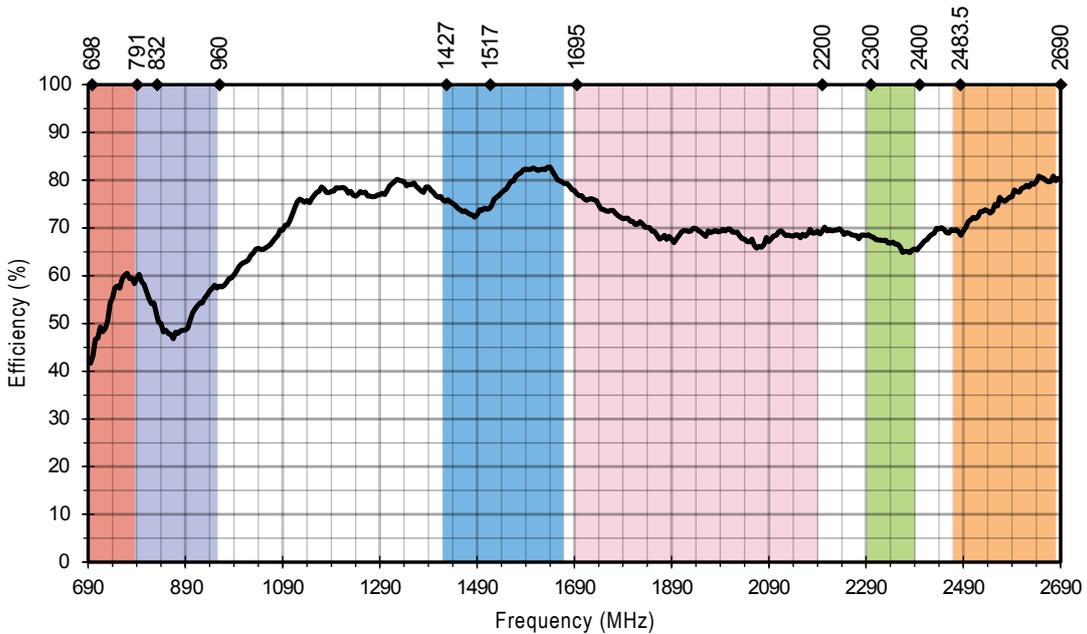
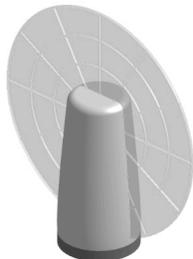


Figure 15. AC85002 Antenna Efficiency, Free Space

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 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

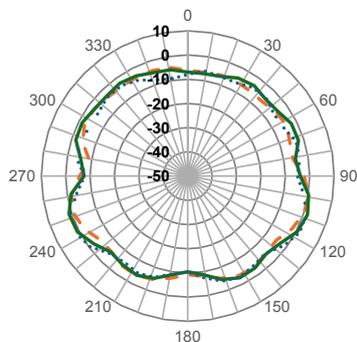


YZ-Plane Gain

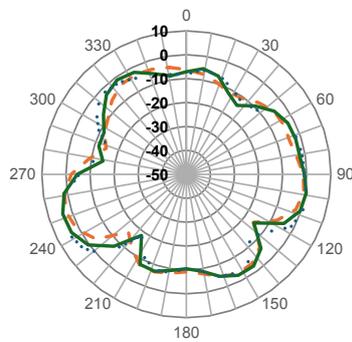


XY-Plane Gain

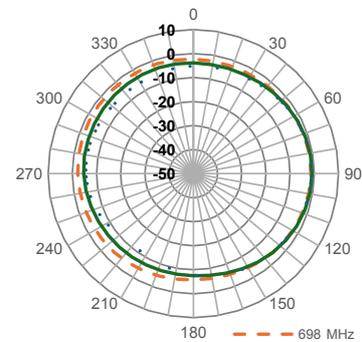
698 MHz to 803 MHz (751 MHz)



XZ-Plane Gain



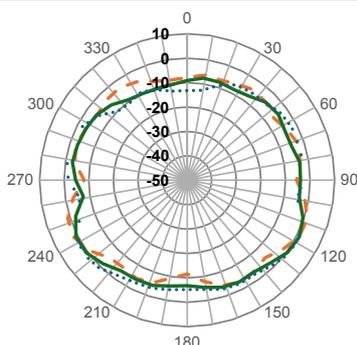
YZ-Plane Gain



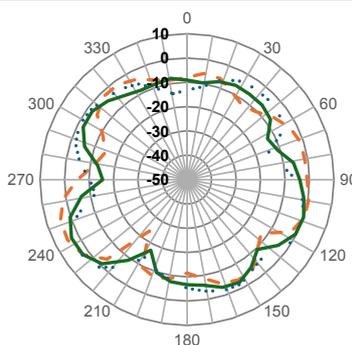
XY-Plane Gain

--- 698 MHz
— 751 MHz
... 803 MHz

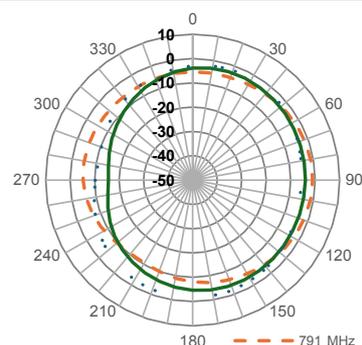
791 MHz to 960 MHz (876 MHz)



XZ-Plane Gain



YZ-Plane Gain

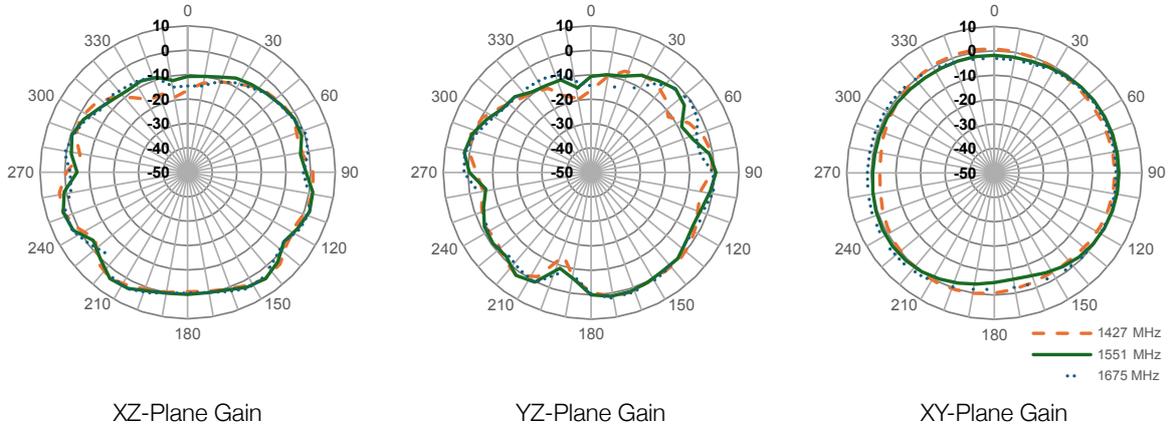


XY-Plane Gain

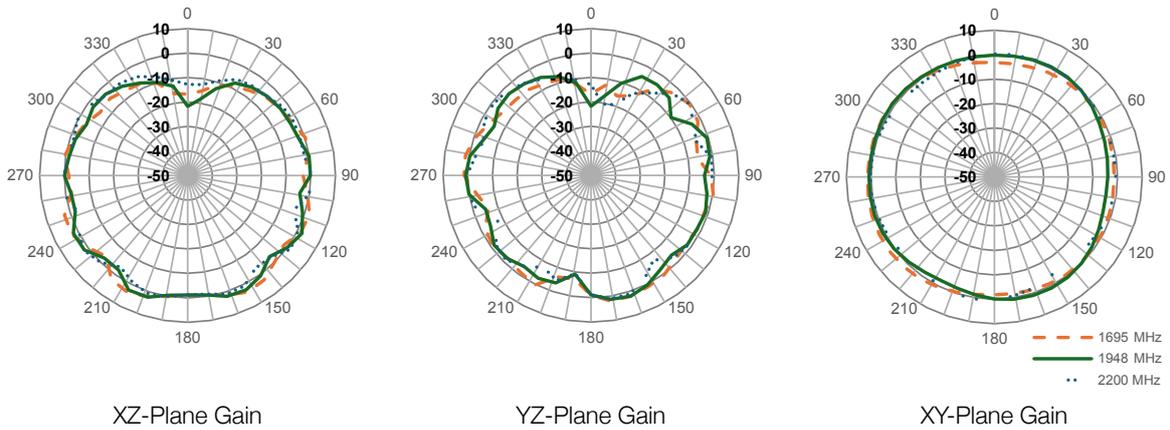
--- 791 MHz
— 876 MHz
... 960 MHz

Radiation Patterns

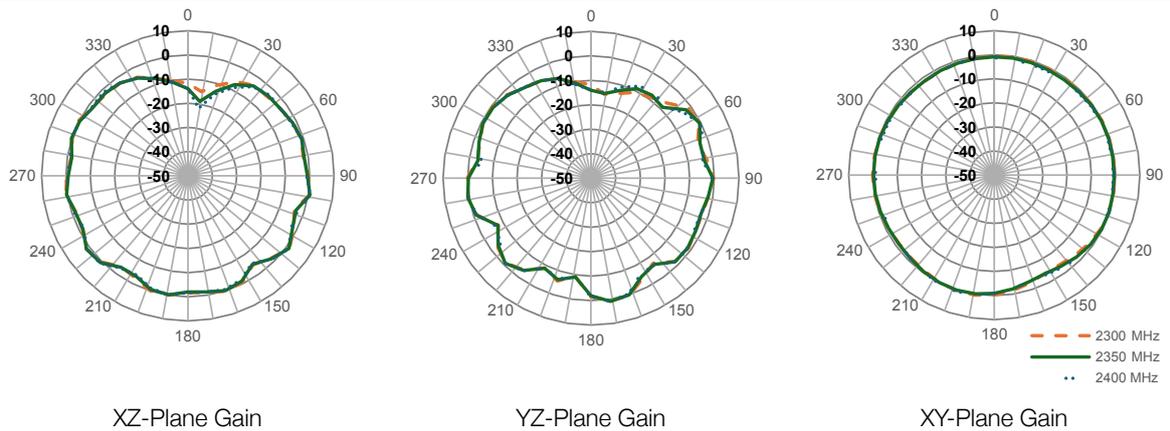
1427 MHz to 1675 MHz (1551 MHz)



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Radiation Patterns

2483 MHz to 2690 MHz (2587 MHz)

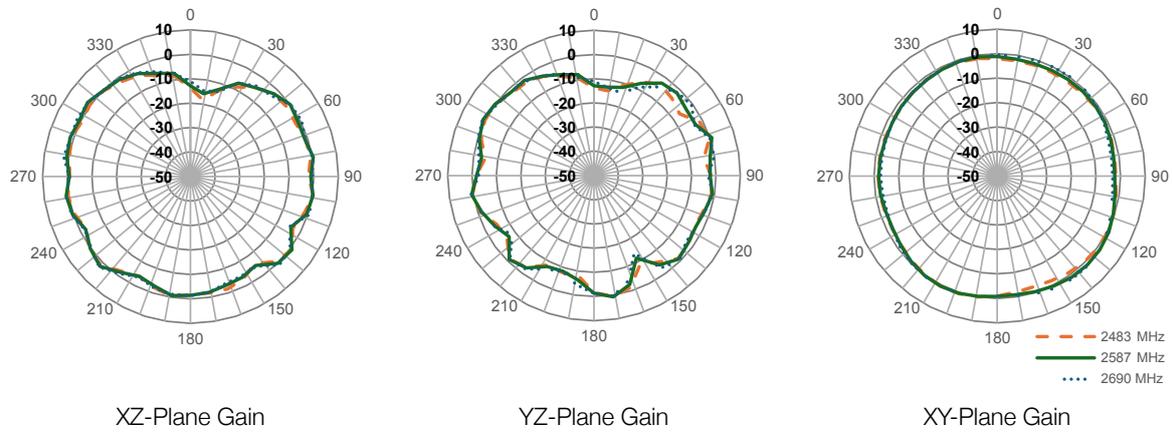
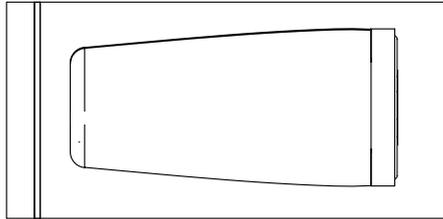


Figure 16. Radiation Patterns for AC85002 Antenna in Free Space

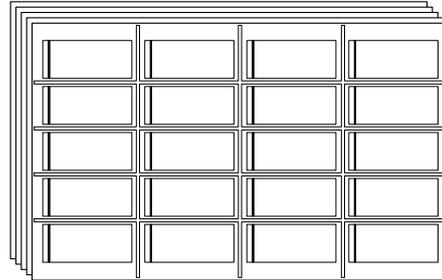
Packaging Information

The AC85002 antennas are individually packaged in a resealable polyethylene bag. Bagged antennas are placed in “honeycomb” divided pockets in a carton at 100 antennas per carton. 5 layers of 20 antennas per layer. Layers are separated by protective sheets. Carton dimensions are 590 mm x 290 mm x 270 mm, 23.2 in x 11.4 in x 10.6 in.

Table 4. Packing Materials and Specifications



Antenna in resealable bag



Antennas arranged in layers

Regional Environmental Regulation Compliance

Table 5. Environmental Compliance Data

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 2017/821
European Union	Persistent Organic Pollutants	(EU) 2019/1021
European Union	Packaging Directive	94/62/EC
European Union	PFOA Free	2006/122/ECOF

Website: <http://www.antennacompany.com>
Offices: Eindhoven, The Netherlands
EMAIL: sales@antennacompany.com

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