**Datasheet**

# AC85002 NJ Series
# Cellular IoT Compact Dome Panel-Mount Antennas

The AC85002 series N-connector 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 vending machines to mobile/vehicular roof mounts, and supports use on both metallic and non-metallic enclosures or in free space on a bracket.

The AC85002 compact dome antennas are available in black and white with fine matte finish, and two termination options: 24 mm N-connector jack, and 14 mm N-connector jack for thin/limited area mounts. Similar-performing NMO-terminated (AC85002-NM series) and cabled (AC87001 series) compact dome antennas are also available.

AC85002-NJW Compact Dome Panel-Mount Antenna

## Features

- Very high efficiency
- IP67/IP65 ingress protection
- IK10 impact resistance
- O-ring mounting seal
- UV resistance
- Ground plane independence
- Dimensions: 82 mm x 40 mm
- 24 mm and 14 mm N-connector termination options

## Applications

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

## Ordering Information

| Part Number | Description |
|---|---|
| **AC85002-NJB** | Black 24 mm N-connector jack cellular IoT compact dome antenna |
| **AC85002-NJW** | White 24 mm N-connector jack cellular IoT compact dome antenna |
| **AC85002-2NJB** | Black 14 mm N-connector jack cellular IoT compact dome antenna |
| **AC85002-2NJW** | White 14 mm N-connector jack cellular IoT compact dome antenna |

See the AC87001 series compact dome antennas for cabled options and AC85002-NM series for NMO 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 | ½-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.

## Mechanical Specifications

Table 2. Mechanical Specifications

| Parameter | Value |
|---|---|
| Antenna Connection (Termination) | N Jack, 24 mm or 14 mm |
| Available Panel Mount Thickness (washer, nut and N plug attached) | AC85002-NJx = 10 mm<br>AC85002-2NJx = 1.5 mm |
| Mounting torque | 1.0 - 1.5 Nm |
| Weight | AC85002-NJx = 119.07 g (4.2 oz)<br>AC85002-2NJx = 107.73 g (3.8 oz) |
| Dimensions (mounted) | 82.0 mm x Ø40.0 mm<br>(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.

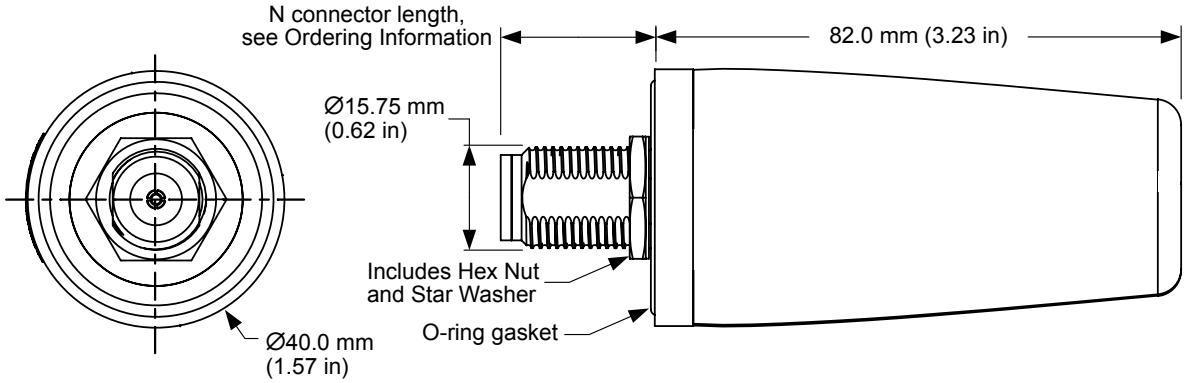



Figure 1. AC85002 Antenna Dimensions

## Mounting Dimensions

The mounting dmensions for the AC85002 NJ series antennas is shown in Figure 2.

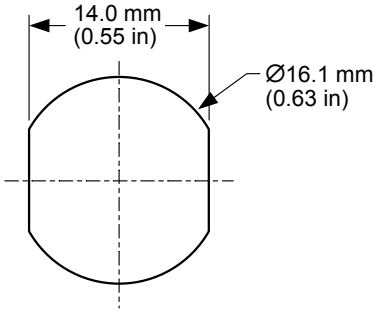
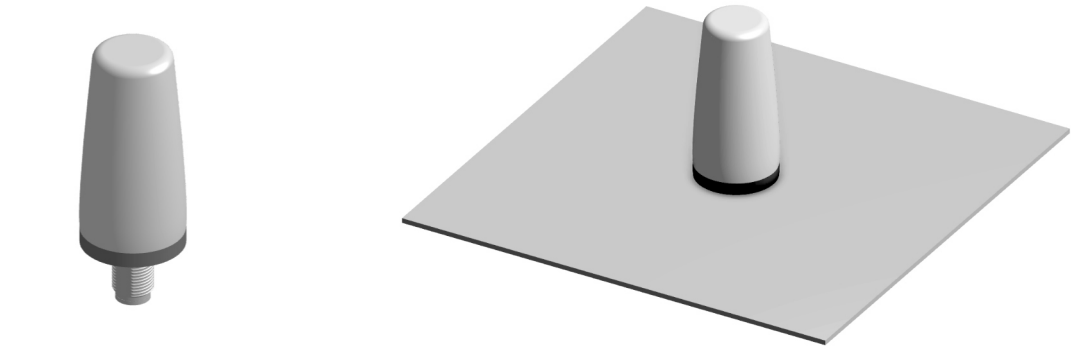



Figure 2. AC85002 Antenna Mounting Dimensions

## Antenna Test Orientations

The AC85002 antenna is characterized in two antenna orientations as shown in Figure 3. 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.



Antenna in Free space Antenna on Ground Plane

Figure 3. 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 4.

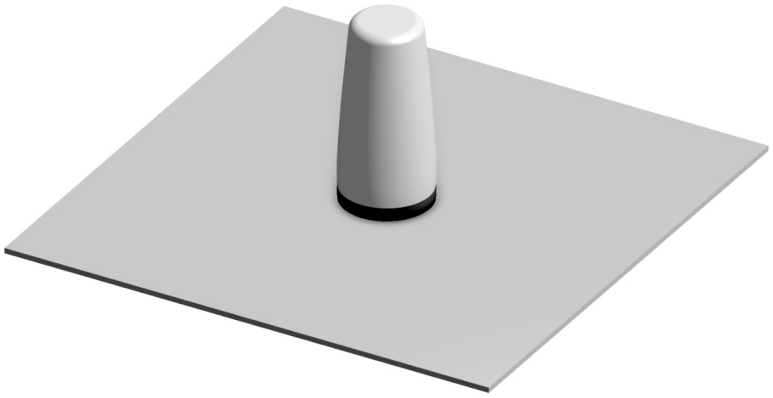


Figure 4. AC85002 Antenna On Ground Plane

## VSWR

Figure 5 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.

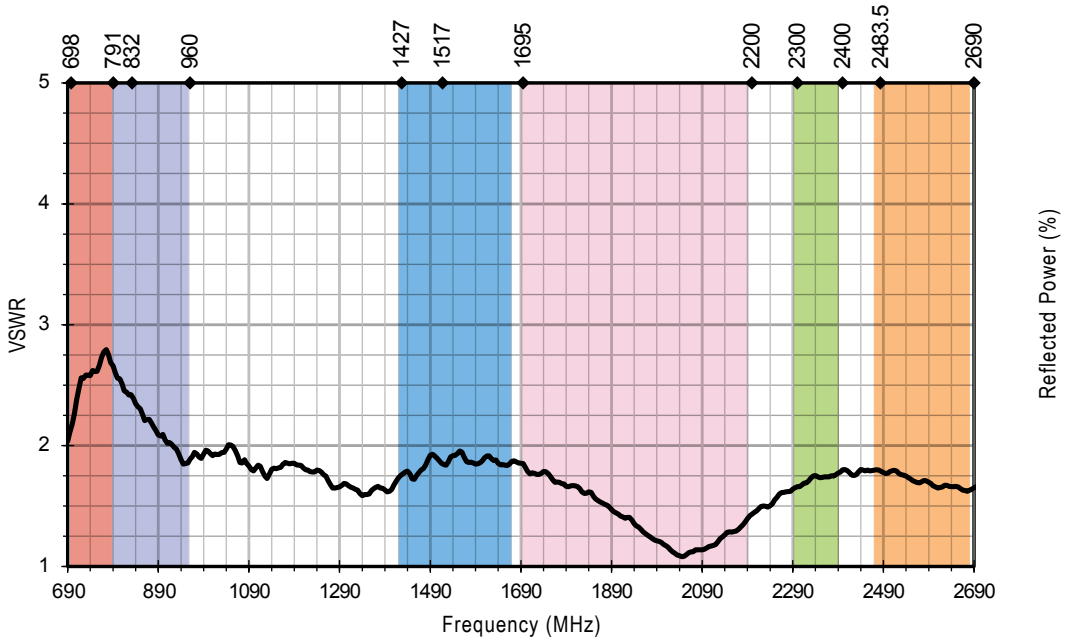



Figure 5. AC85002 Antenna VSWR on Ground Plane

## Return Loss

Return loss (Figure 6), 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.

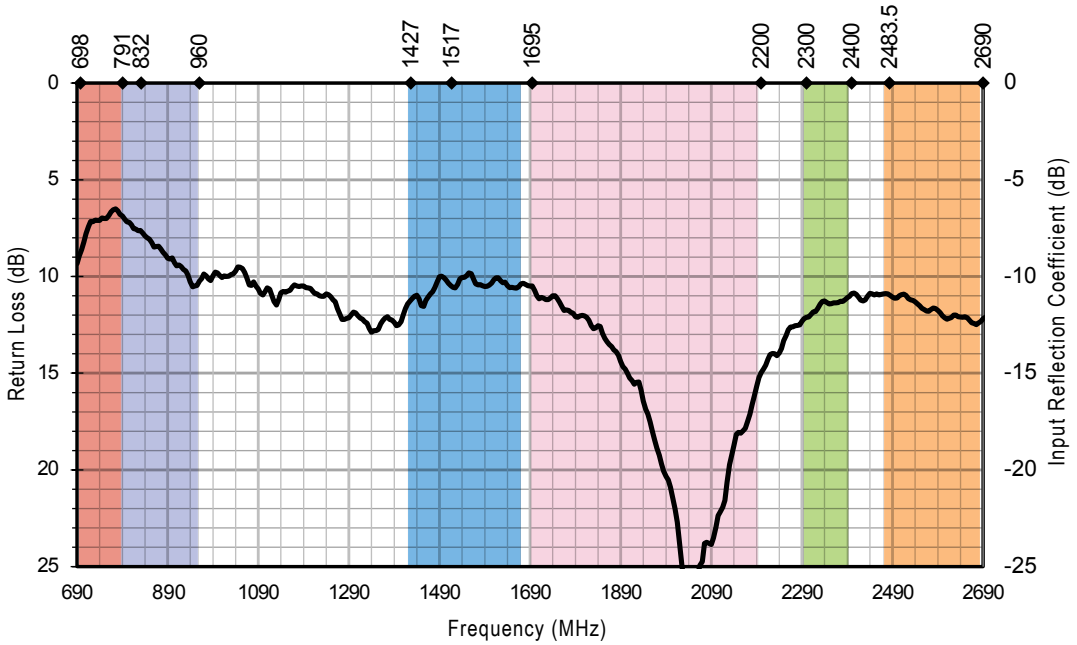



Figure 6. AC85002 Antenna Return Loss on Ground Plane

## Peak Gain

Peak gain, (See Figure 7) 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.

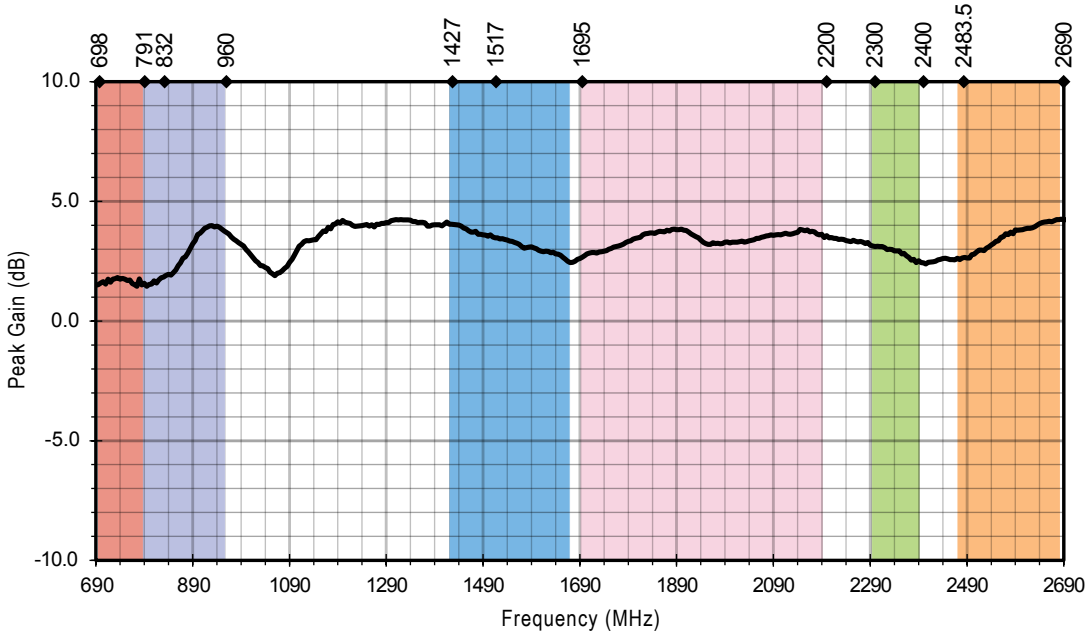



Figure 7. AC85002 Antenna Peak Gain on Ground Plane

## Average Gain

Average gain (Figure 8), is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

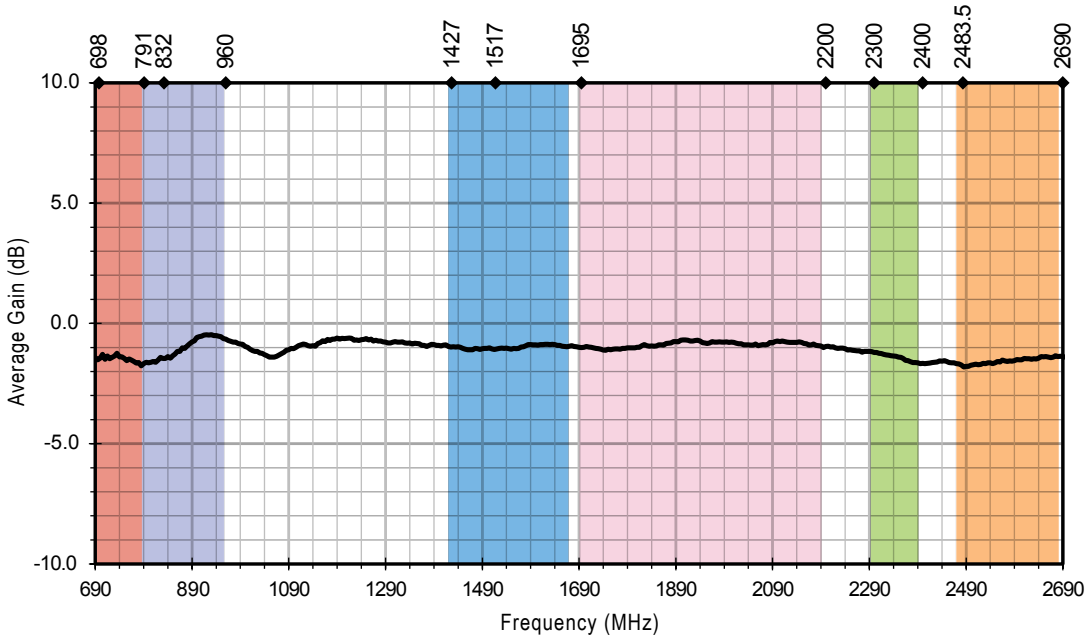



Figure 8. AC85002 Antenna Average Gain on Ground Plane

## Efficiency

Efficiency (Figure 9), 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.

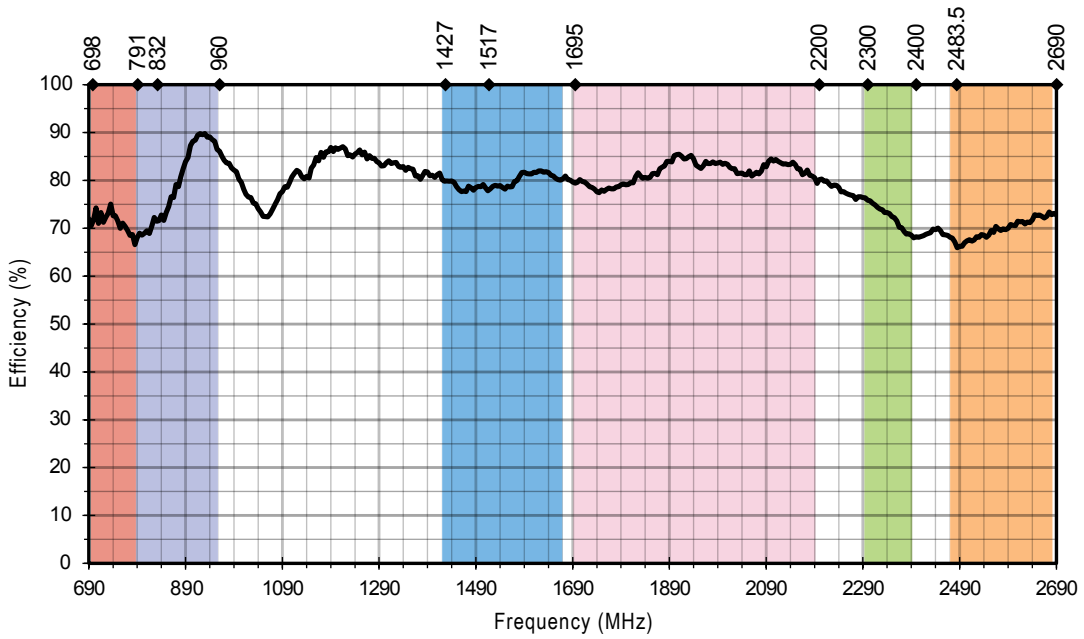
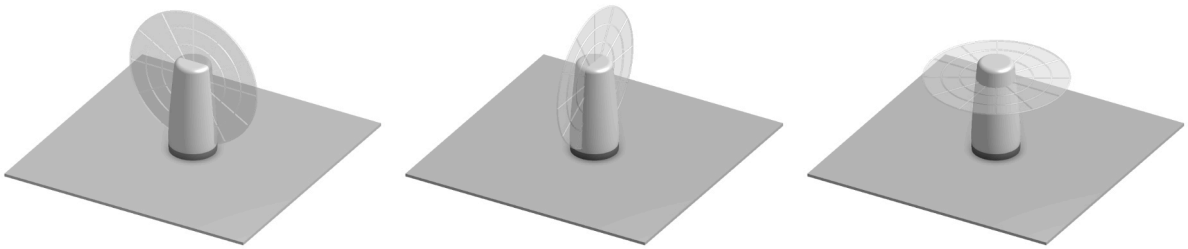



Figure 9. AC85002 Antenna Efficiency on Ground Plane

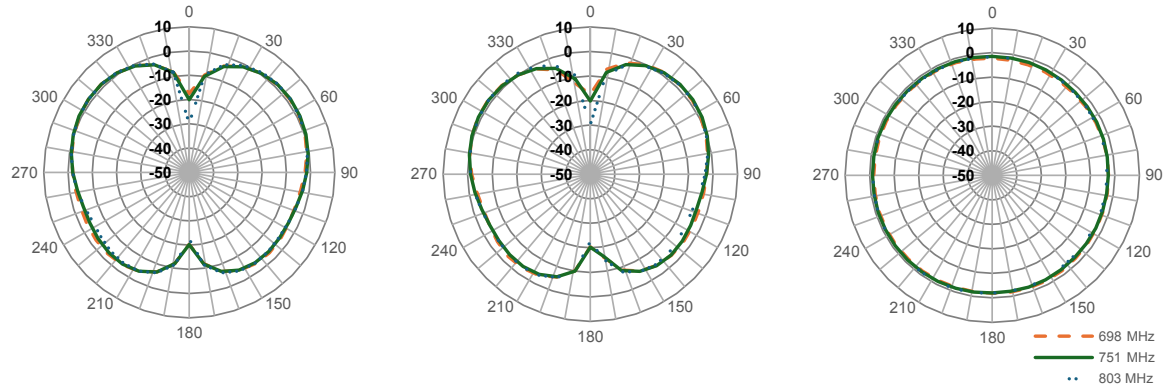
## Radiation Patterns - On Ground Plane

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 10), 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.



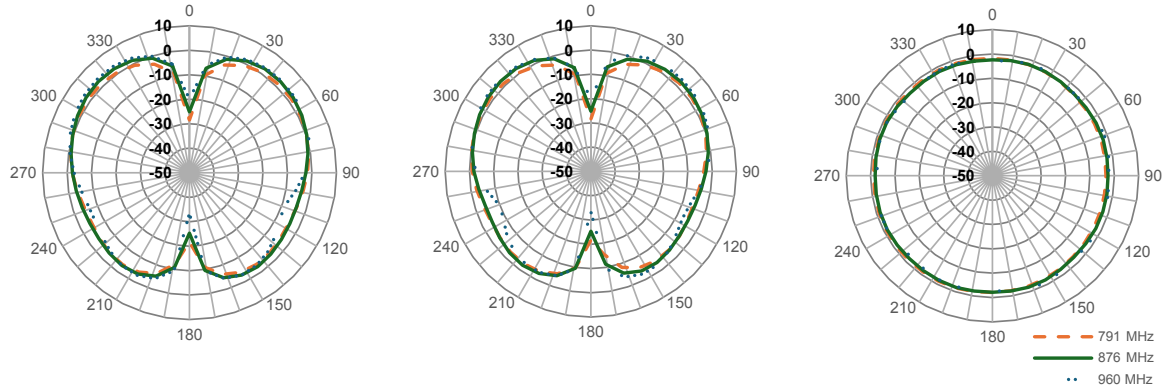
**XZ-Plane Gain** **YZ-Plane Gain** **XY-Plane Gain**

### 698 MHz to 803 MHz (751 MHz)




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

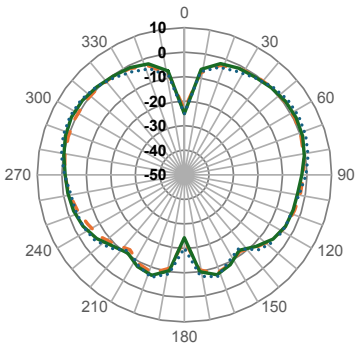
### 791 MHz to 960 MHz (876 MHz)



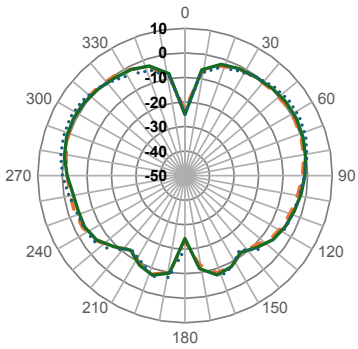

XZ-Plane Gain YZ-Plane Gain XY-Plane Gain

## Radiation Patterns

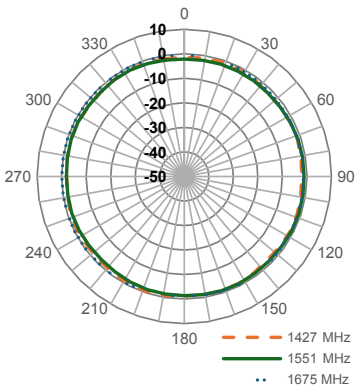
### 1427 MHz to 1675 MHz (1551 MHz)




XZ-Plane Gain

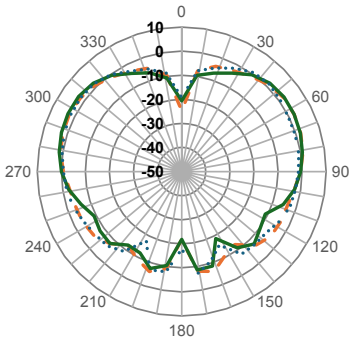



YZ-Plane Gain

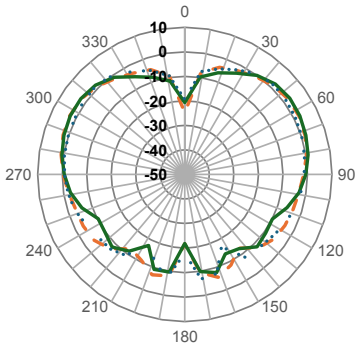



XY-Plane Gain

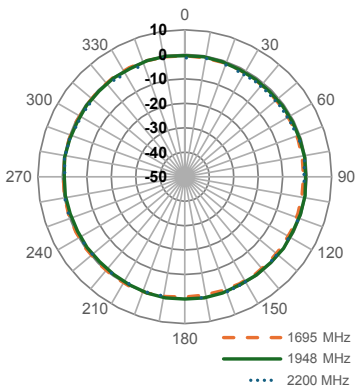
### 1695 MHz to 2200 MHz (1948 MHz)




XZ-Plane Gain

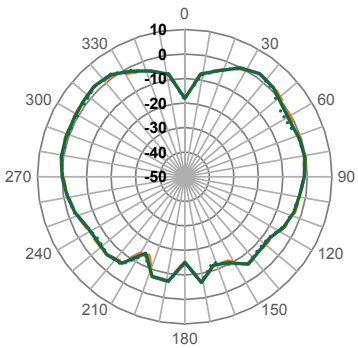



YZ-Plane Gain

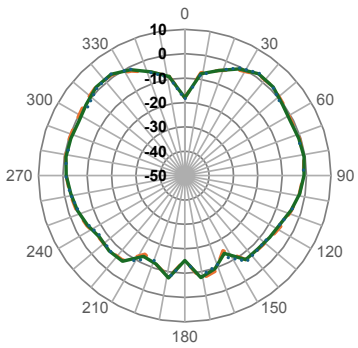



XY-Plane Gain

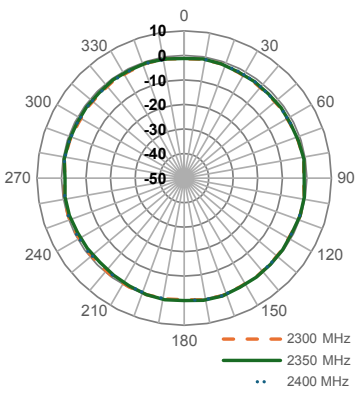
### 2300 MHz to 2400 MHz (2350 MHz)




XZ-Plane Gain



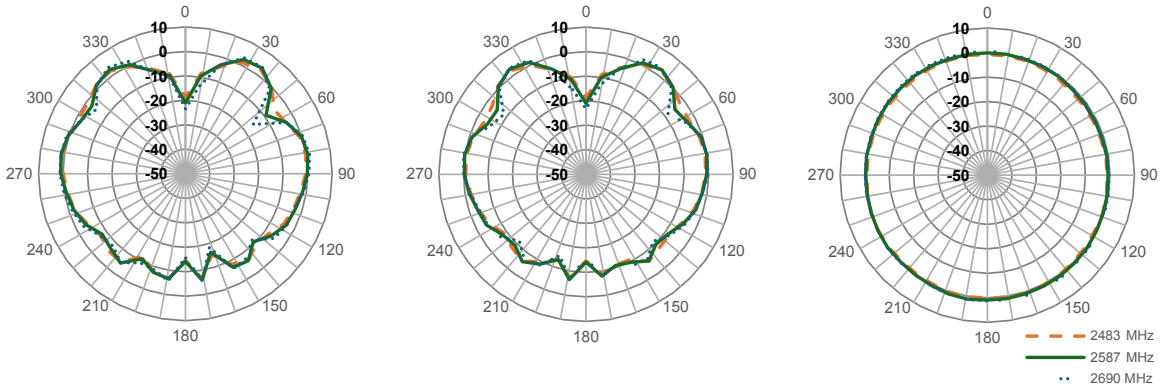

YZ-Plane Gain




XY-Plane Gain

## Radiation Patterns

### 2483 MHz to 2690 MHz (2587 MHz)




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

**Figure 10. 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 11.

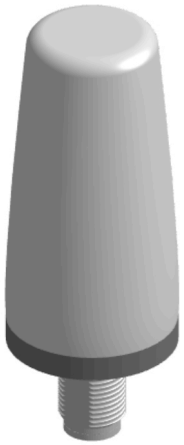


Figure 11. AC85002 Antenna, Free Space, no Ground Plane

## VSWR

Figure 12 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.

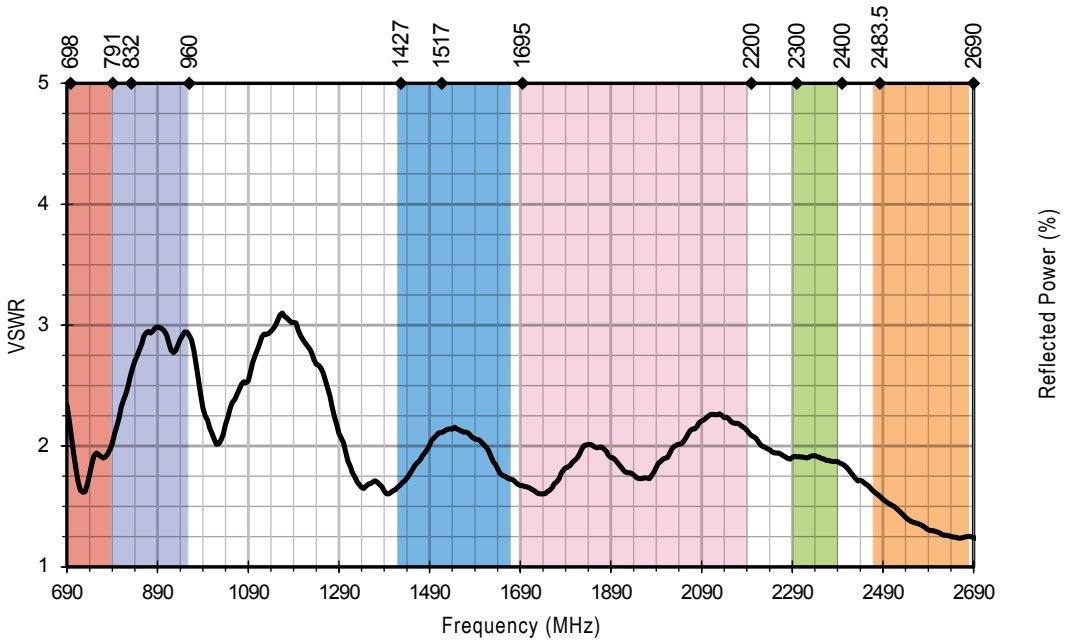



Figure 12. AC85002 Antenna VSWR, Free Space

## Return Loss

Return loss (Figure 13), 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.

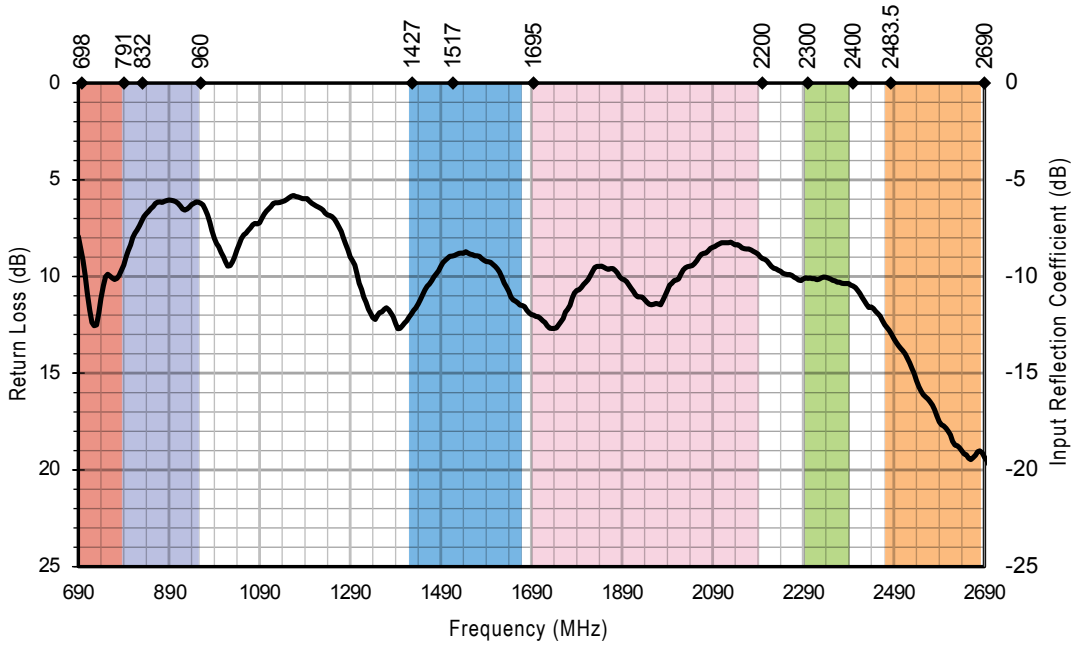



**Figure 13. AC85002 Antenna Return Loss, Free Space**

## Peak Gain

Peak gain, (See Figure 14) 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.

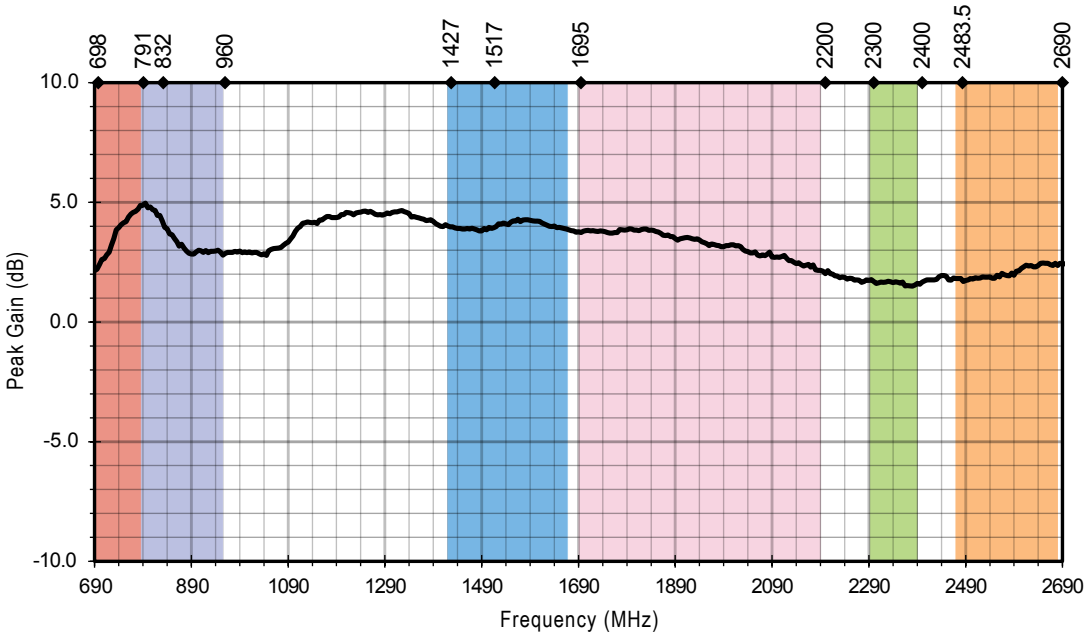



**Figure 14. AC85002 Antenna Peak Gain, Free Space**

## Average Gain

Average gain (Figure 15), is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

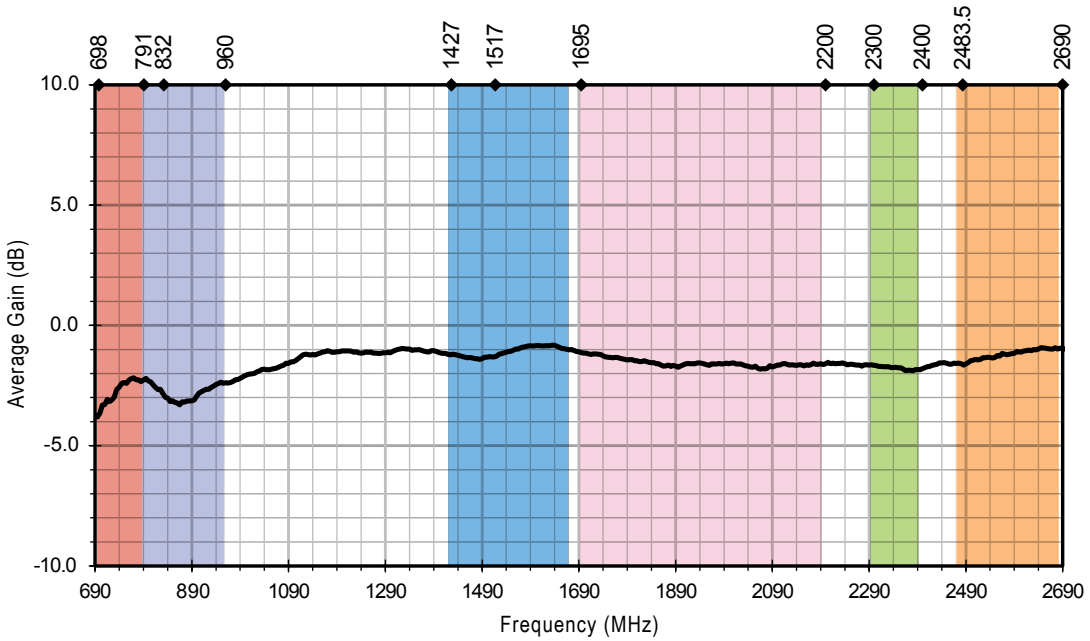



**Figure 15. AC85002 Antenna Average Gain, Free Space**

## Efficiency

Efficiency (Figure 16), 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.

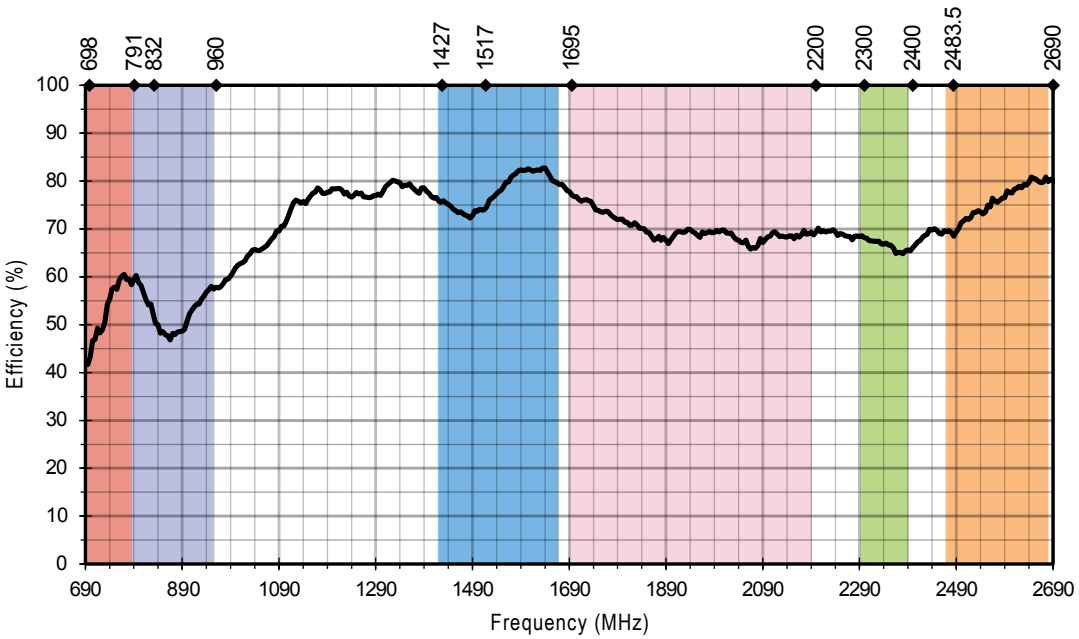



**Figure 16. AC85002 Antenna Efficiency, Free Space**

## Radiation Patterns - Free Space

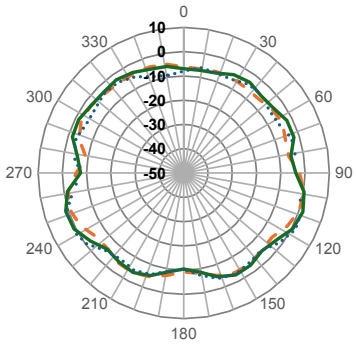
Radiation patterns provide information about the directional performance of the antenna by plotting gain in three orthogonal planes at the high-, low- and center-frequencies of an antenna frequency band. Antenna radiation patterns (Figure 17), are shown using polar plots covering 360 degrees with the 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**

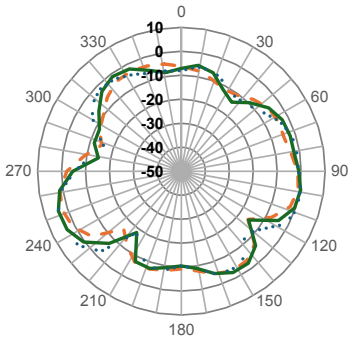
**YZ-Plane Gain**

**XY-Plane Gain**

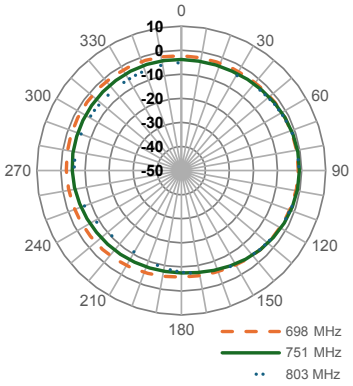
## 698 MHz to 803 MHz (751 MHz)




XZ-Plane Gain

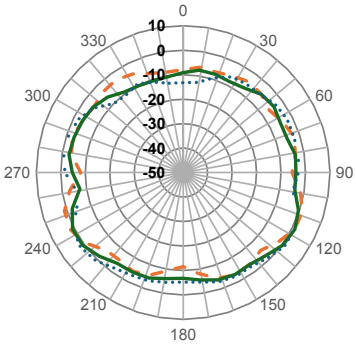



YZ-Plane Gain

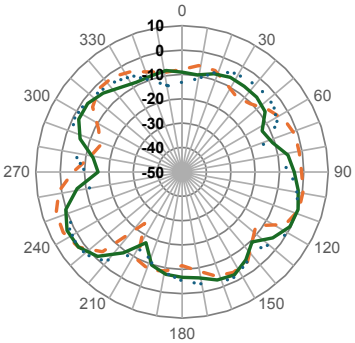



XY-Plane Gain

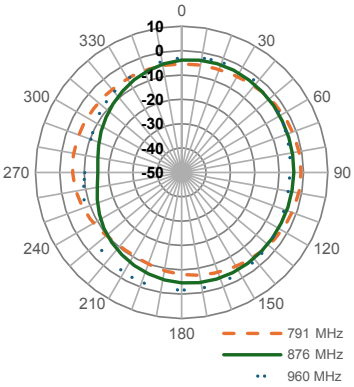
## 791 MHz to 960 MHz (876 MHz)




XZ-Plane Gain



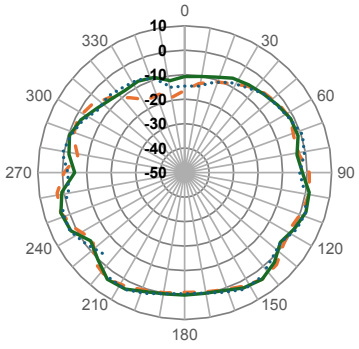

YZ-Plane Gain



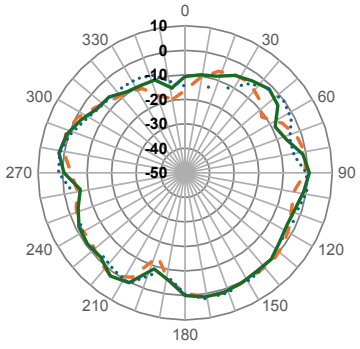

XY-Plane Gain

## Radiation Patterns

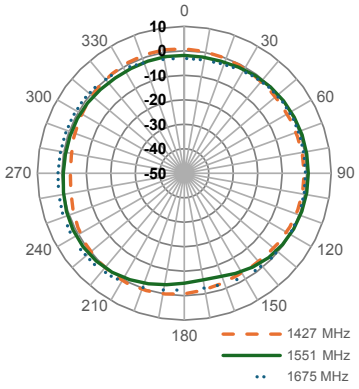
### 1427 MHz to 1675 MHz (1551 MHz)




XZ-Plane Gain

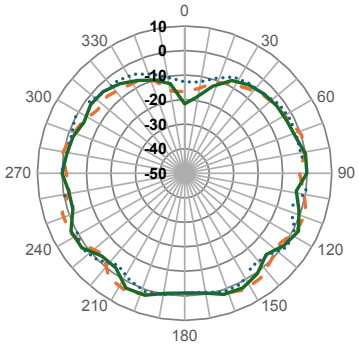



YZ-Plane Gain

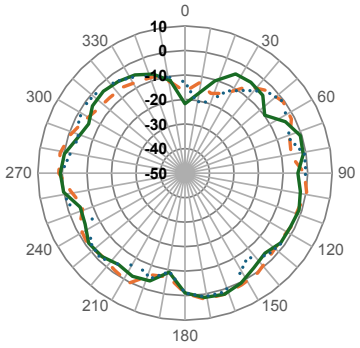



XY-Plane Gain

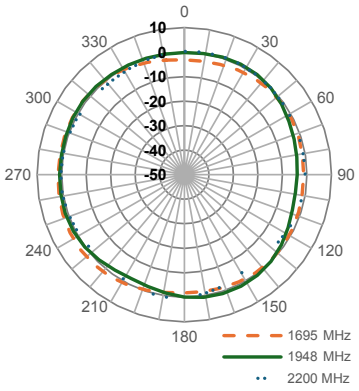
### 1695 MHz to 2200 MHz (1948 MHz)




XZ-Plane Gain

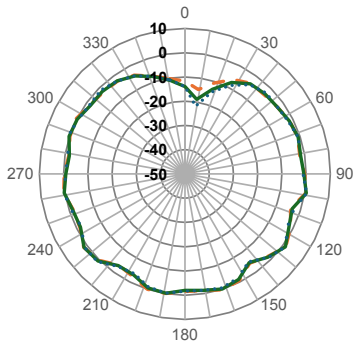



YZ-Plane Gain

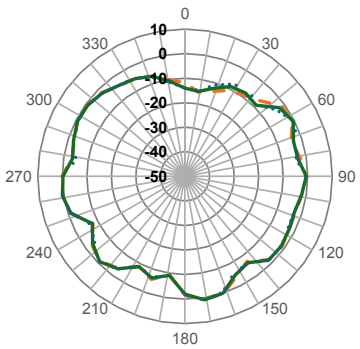



XY-Plane Gain

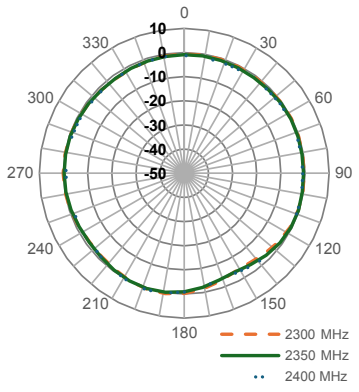
### 2300 MHz to 2400 MHz (2350 MHz)




XZ-Plane Gain



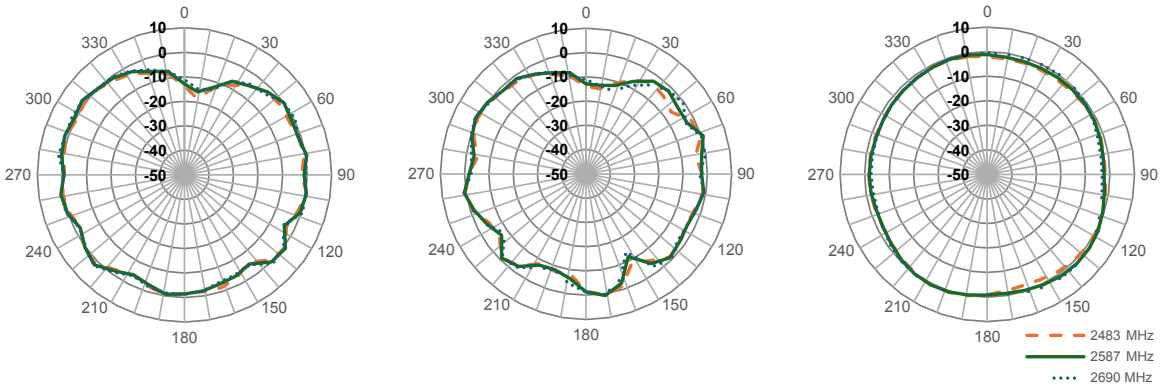

YZ-Plane Gain




XY-Plane Gain

## Radiation Patterns

### 2483 MHz to 2690 MHz (2587 MHz)



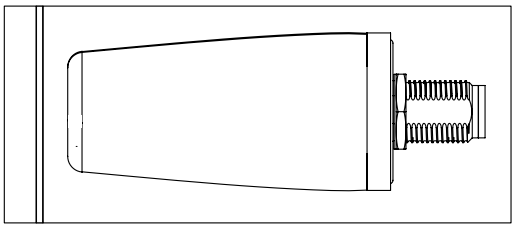

XZ-Plane Gain YZ-Plane Gain XY-Plane Gain

**Figure 17. Radiation Patterns for AC85002 Antenna in Free Space**

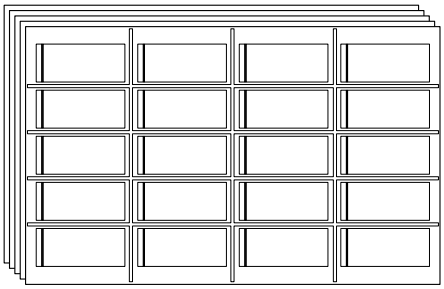
## Packaging Information

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 270mm, (23.23 in x 11.42 in x 10.63 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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