

AC66503 868 MHz Hinged Whip Antenna

The Antenna Company AC66503 hinged whip antennas provide a compact omnidirectional 868 MHz antenna solution for all ISM applications including WiFi HaLow™ and LoRaWAN®.

The 108 mm long hinged whip antenna performs adjacent to a ground plane and the hinged connector permits use in straight or 90-degree bent applications to support backplane applications and in-position signal optimization. Additionally, the AC66503 supports IP65 ingress protection for wet and dusty applications.

The AC66503 blade antenna is available with SMA plug (male) connector.



AC66503-SMA 868 MHz ISM
Hinged Whip Antenna

Features

- High efficiency
- IP65 ingress protection
- Dimensions: 108 mm x 7.9 mm
- Performance at 863 MHz to 870 MHz
 - VSWR: 1.7
 - Peak Gain: 0.3 (dBi)
 - Efficiency: 53%
- Hinged for 0, 45 and 90 degree positioning.
- SMA termination

Applications

- Unlicensed low power wide area networking (LPWAN) applications
 - WiFi HaLow
 - LoRaWAN
 - Wi-Sun®
 - Wireless M-Bus
- 868 MHz band applications
- Industrial, scientific and medical (ISM) applications
- Internet of Things (IoT) devices
- Gateways/Routers

Ordering Information

Part Number	Description
AC66503-SMA	SMA-connector 868 MHz 108 mm hinged whip antenna

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

RF/Electrical Specifications

Parameter	Value
Frequency	863 MHz to 870 MHz
VSWR (max)	1.7
Peak Gain (dBi)	0.3
Average Gain (dBi)	-2.9
Average Efficiency (%)	51
Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omnidirectional
Wavelength	$\frac{1}{2}$ -wave
Max Power	10 W

Electrical specifications and plots measured with the antenna mounted at the edge of a 100 mm x 100 mm ground plane, straight.

Mechanical Specifications

Parameter	Value
Connection	SMA plug (male)
Ingress Protection	IP65
Operating Temp. Range	-40 °C to +85 °C (-40 °F to 185 °F)
Operating Relative Humidity	10 to 95%
Salt Spray Test	48 hours
Weight	9.4 g (0.33 oz)
Dimensions	108.0 mm x 7.9 mm (Straight), (4.25 in x 0.31 in)

Antenna Dimensions

Figure 1 provides dimensions of the AC66503 antenna. The antenna whip can be tilted 90 degrees, with a detent at 45 degrees enabling the antenna to be oriented in any direction. The rotating base allows for continuous positioning through 360 degrees even while installed.

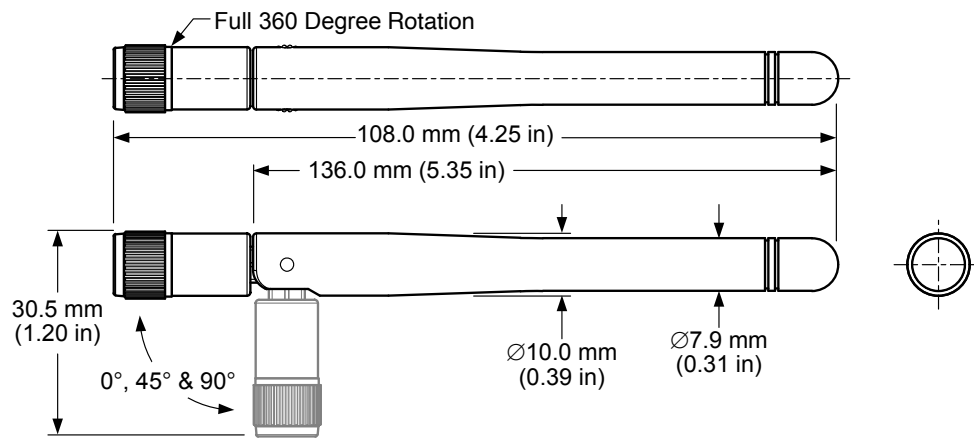
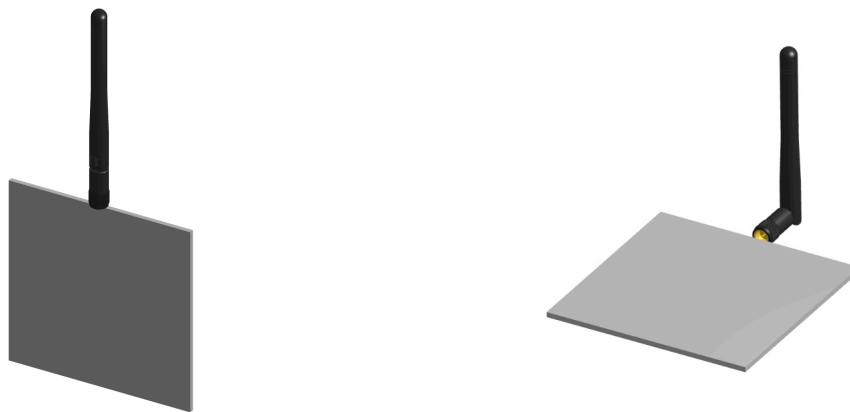


Figure 1. AC66503 Antenna Dimensions

Antenna Test Orientations

The AC66503 antenna is characterized in two antenna orientations as shown in Figure 2. Characterization on an adjacent ground plane (100 mm x 100 mm) provides insight into antenna performance when attached to a printed circuit board with ground plane in both the straight and hinge-bent positions. These two orientations represent common end-product use cases.



Antenna at Edge of Ground Plane, Straight

Antenna at Edge of Ground Plane, Bent 90 Degrees

Figure 2. AC66503 Test Orientations

Edge of Ground Plane, Straight

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

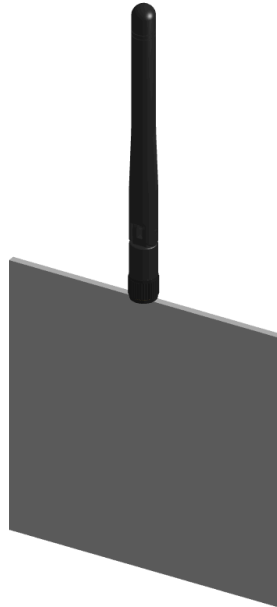


Figure 3. AC66503 Antenna at Edge of Ground Plane, Straight

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.

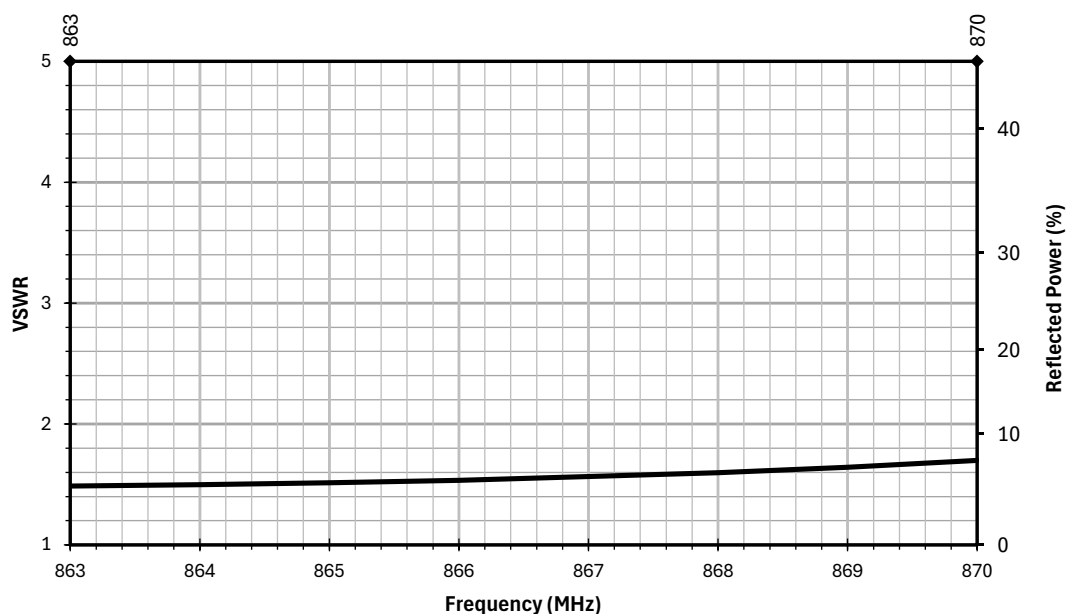


Figure 4. AC66503 Antenna VSWR at edge of Ground Plane, Straight

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.

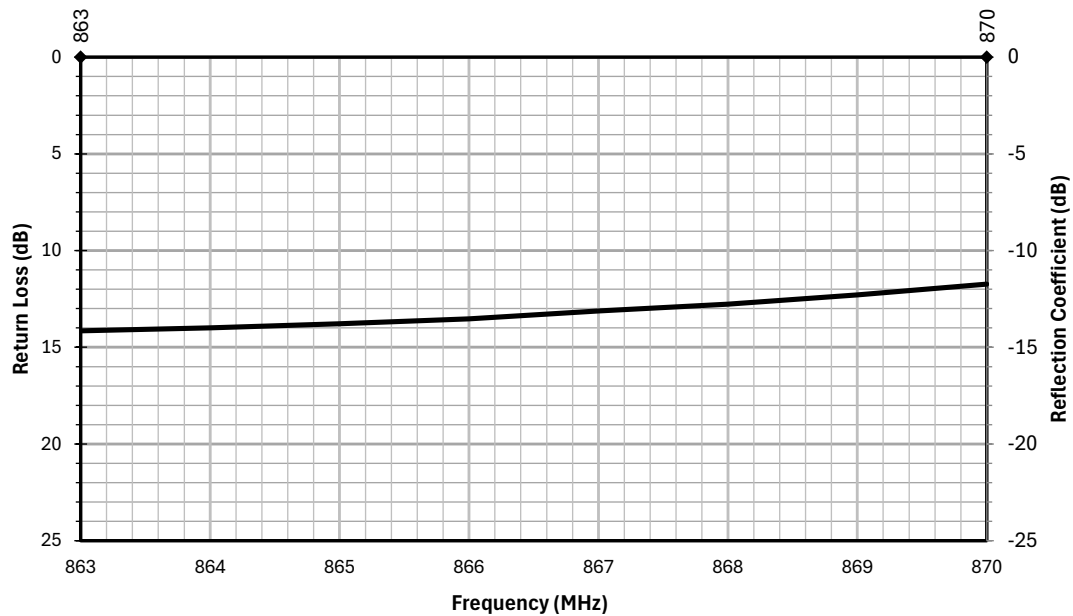


Figure 5. AC66503 Antenna Return Loss at edge of Ground Plane, Straight

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.

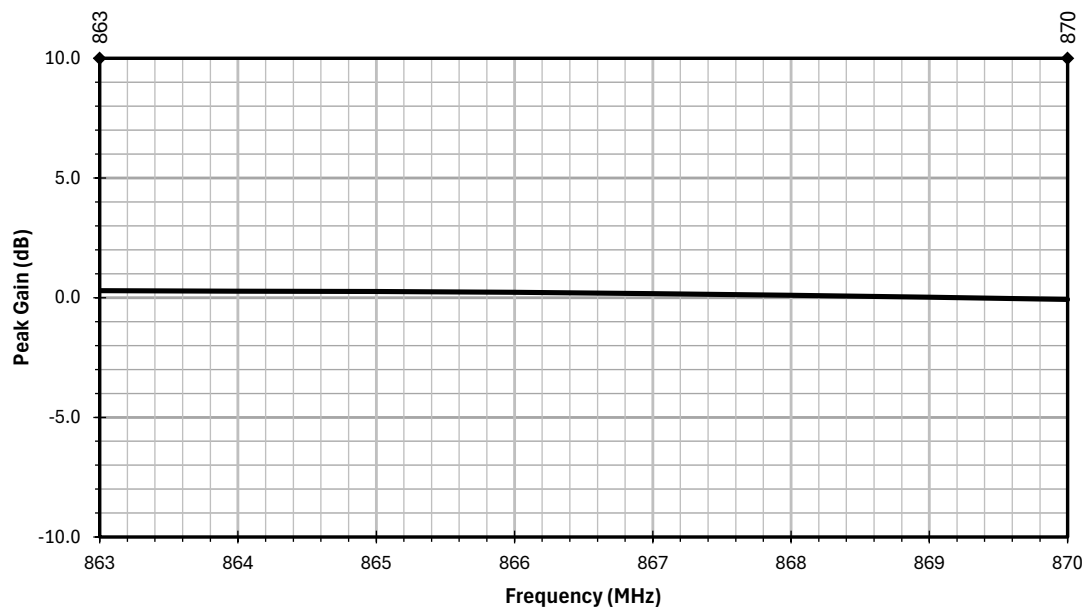


Figure 6. AC66503 Antenna Peak Gain at edge of Ground Plane, Straight

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.

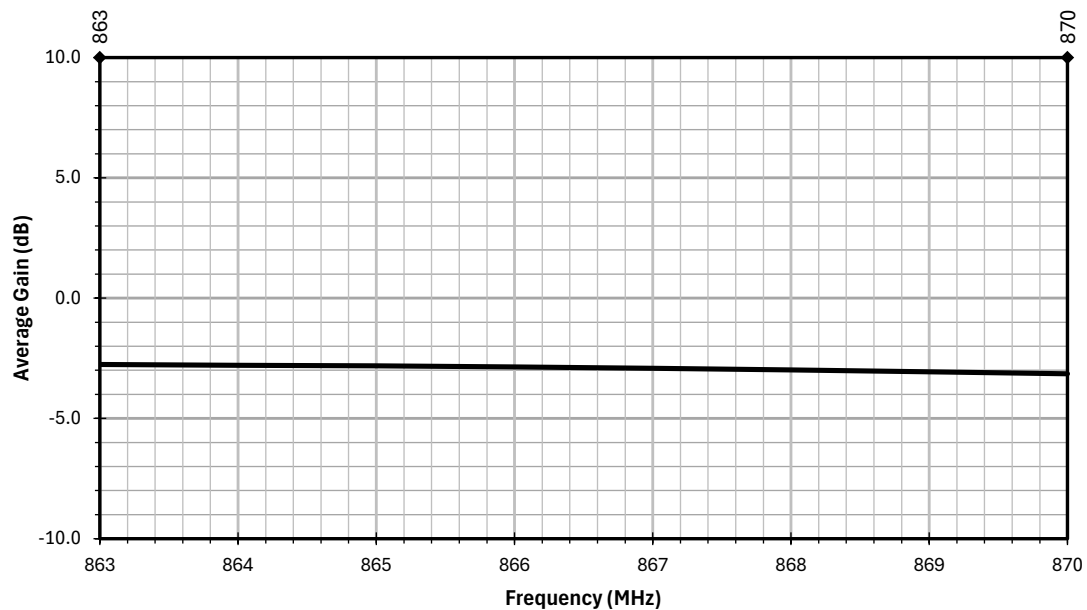


Figure 7. AC66503 Antenna Average Gain at edge of Ground Plane, Straight

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.

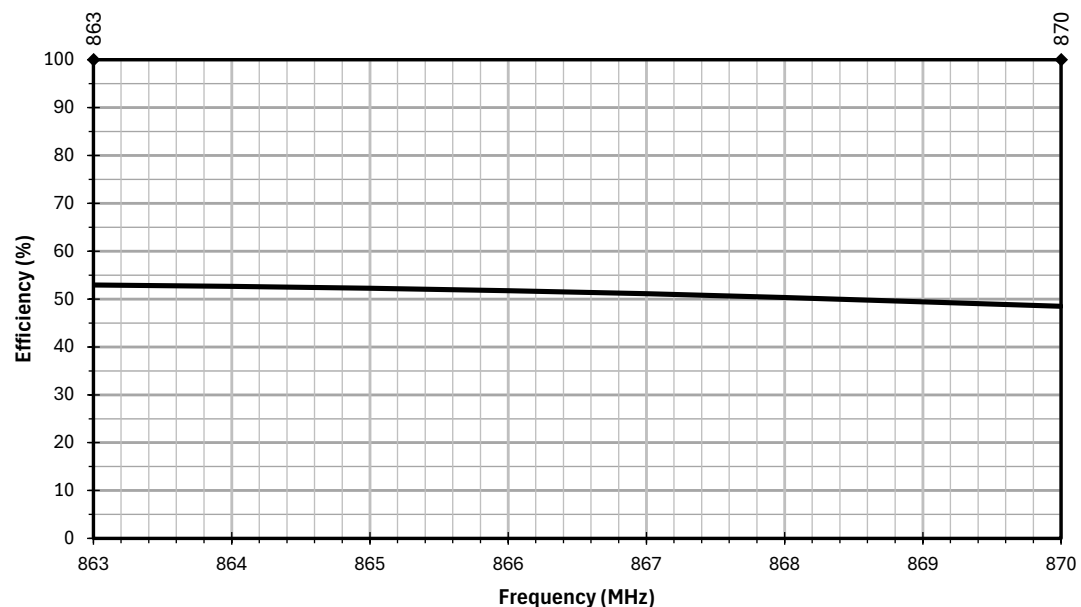


Figure 8. AC66503 Antenna Efficiency at edge of Ground Plane, Straight

Radiation Patterns - Edge of Ground Plane, Straight

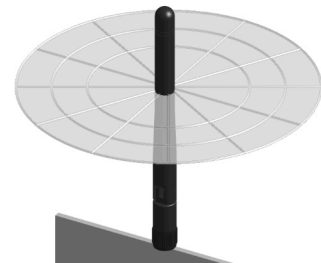
Radiation patterns provide information about the directional performance of the antenna by plotting gain in three orthogonal planes at the high-, low- and center-frequencies of an antenna frequency band. Antenna radiation patterns (Figure 9) are shown using polar plots covering 360 degrees with the plane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

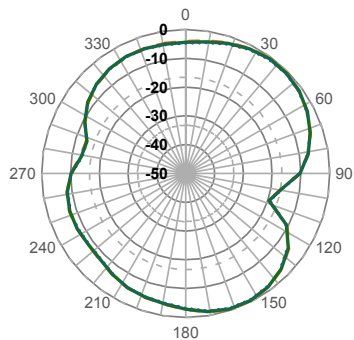


YZ-Plane Gain

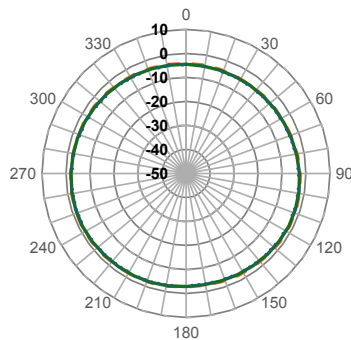


XY-Plane Gain

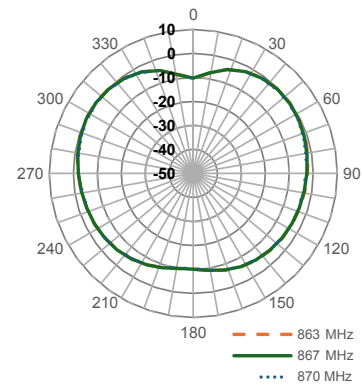
863 MHz to 870 MHz (867 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

Figure 9. Radiation Patterns for the AC66503 Antenna at edge of Ground Plane, Straight

Edge of Ground Plane, Bent

The charts on the following pages represent data taken with the antenna oriented at the edge of a 100 mm x 100 mm ground plane as shown in Figure 10.



Figure 10. AC66503 Antenna at Edge of Ground Plane, Bent 90 Degrees

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.

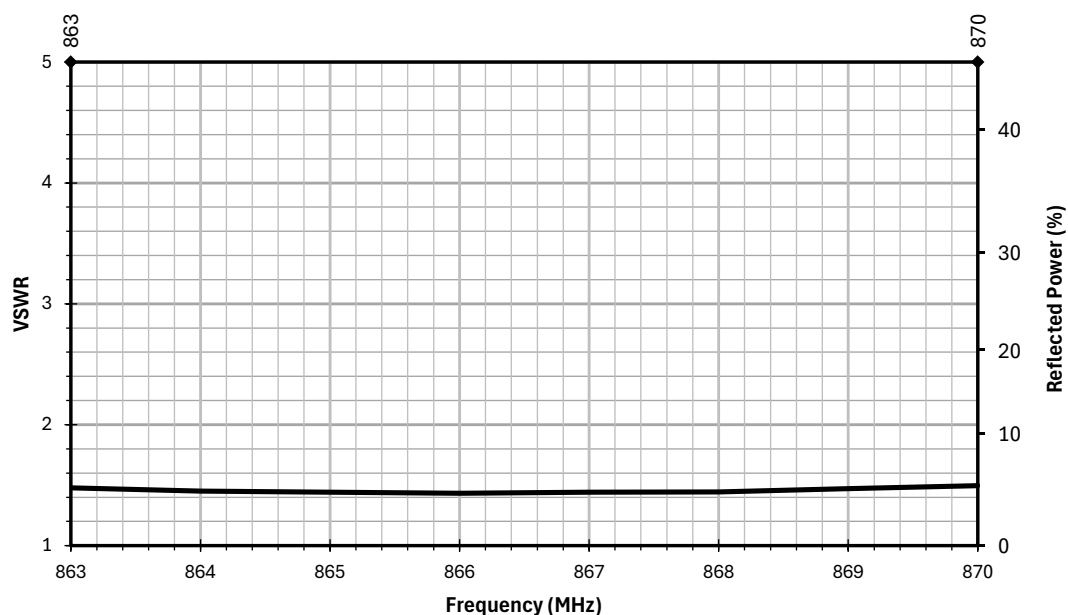


Figure 11. AC66503 Antenna VSWR at edge of Ground Plane, Bent 90 Degrees

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.

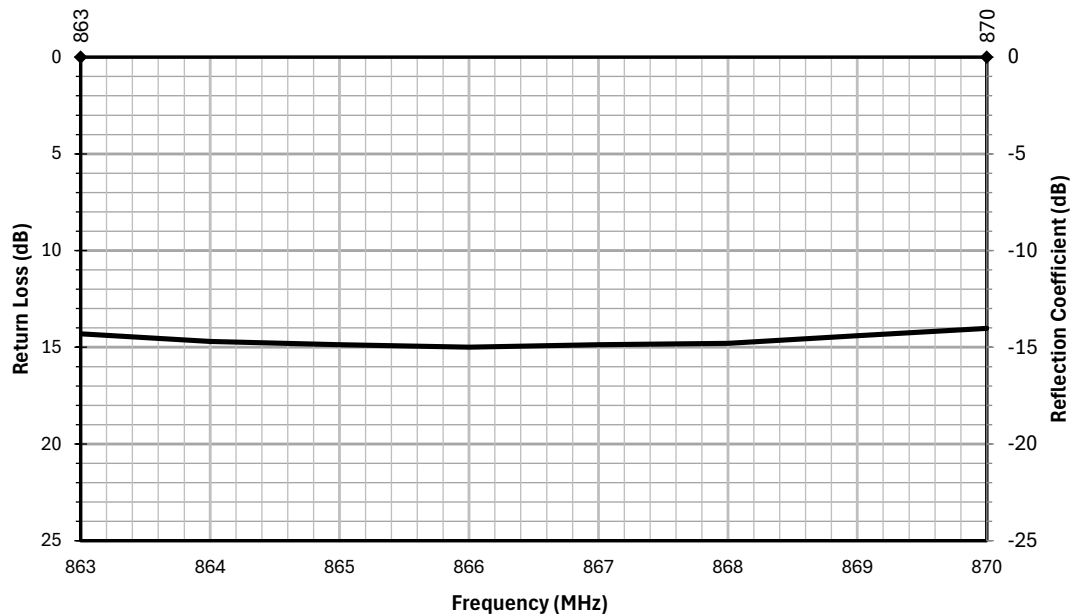


Figure 12. AC66503 Antenna Return Loss at edge of Ground Plane, Bent 90 Degrees

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.

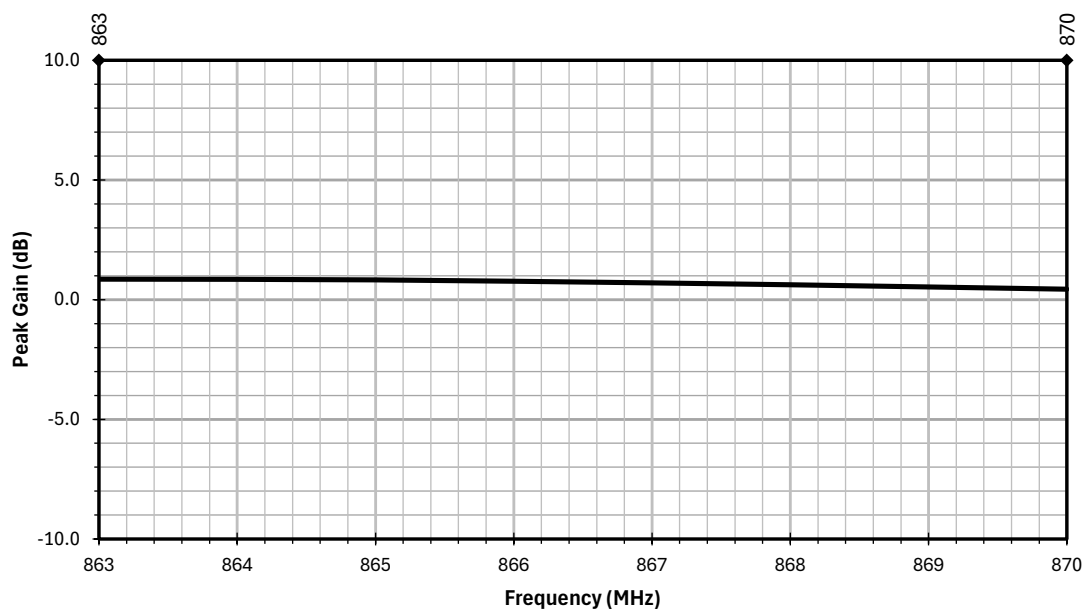


Figure 13. AC66503 Antenna Peak Gain at edge of Ground Plane, Bent 90 Degrees

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.

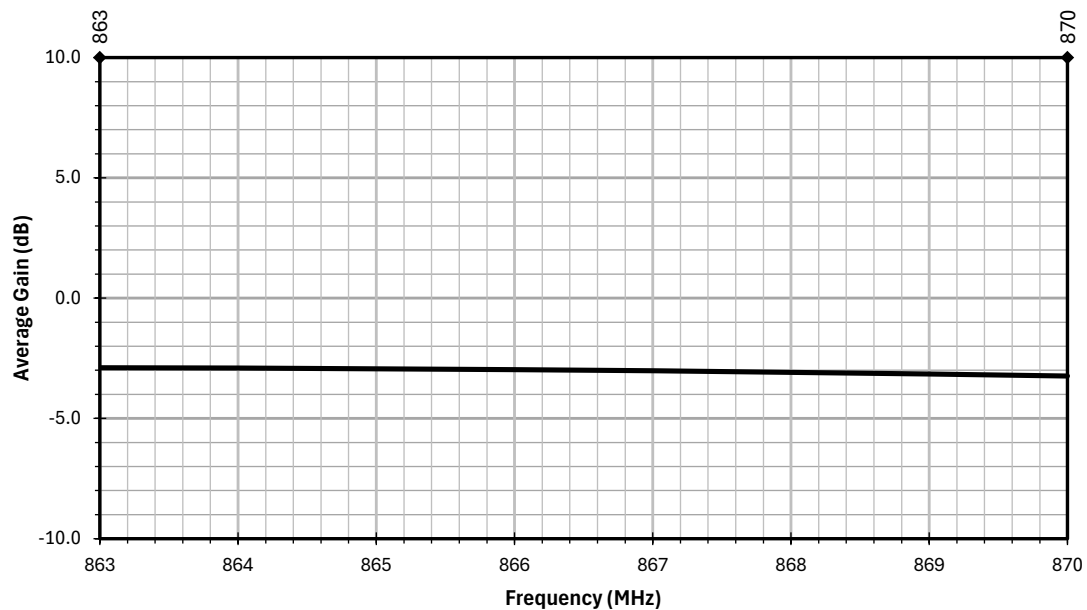


Figure 14. AC66503 Antenna Average Gain at edge of Ground Plane, Bent 90 Degrees

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.

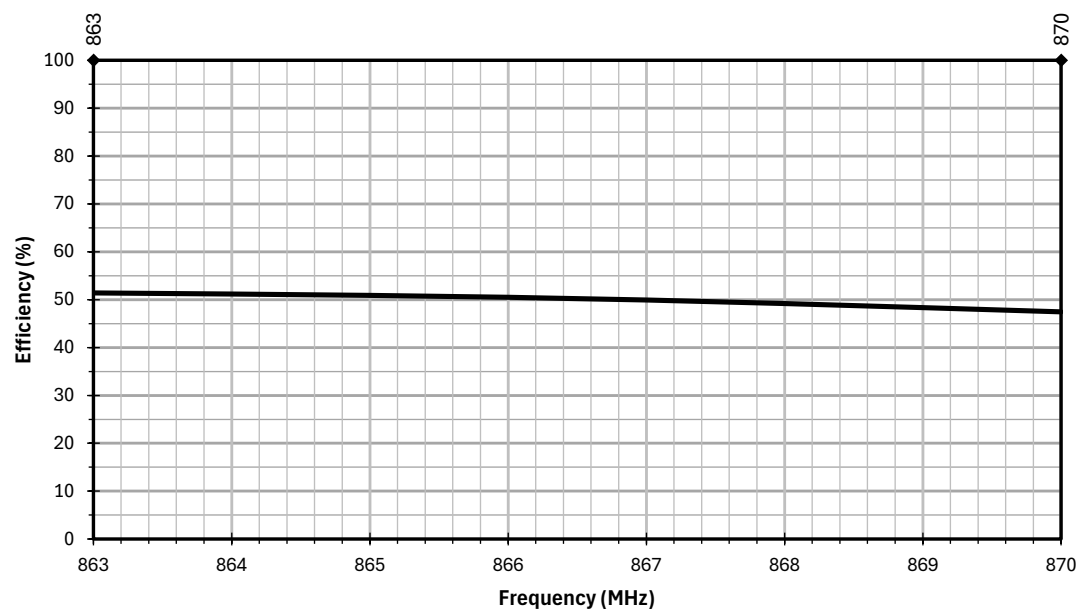
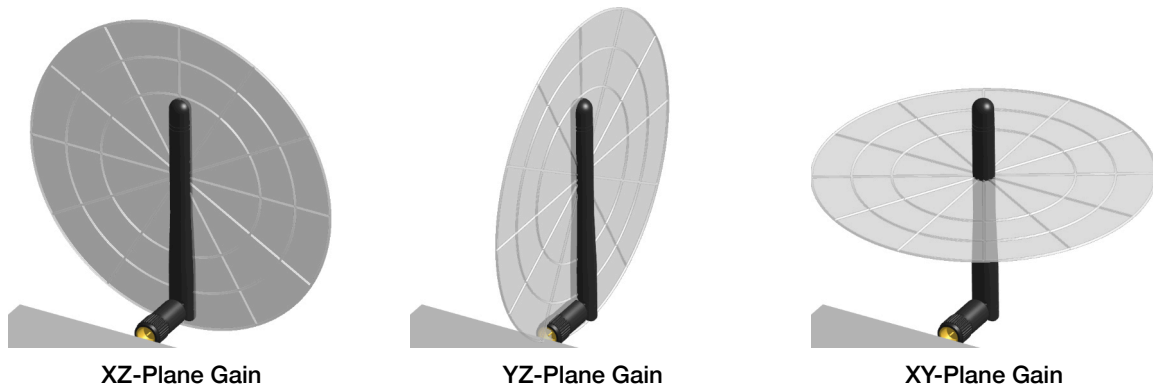


Figure 15. AC66503 Antenna Efficiency at edge of Ground Plane, Bent 90 Degrees

Radiation Patterns - Edge of Ground Plane, Bent

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.



863 MHz to 870 MHz (867 MHz)

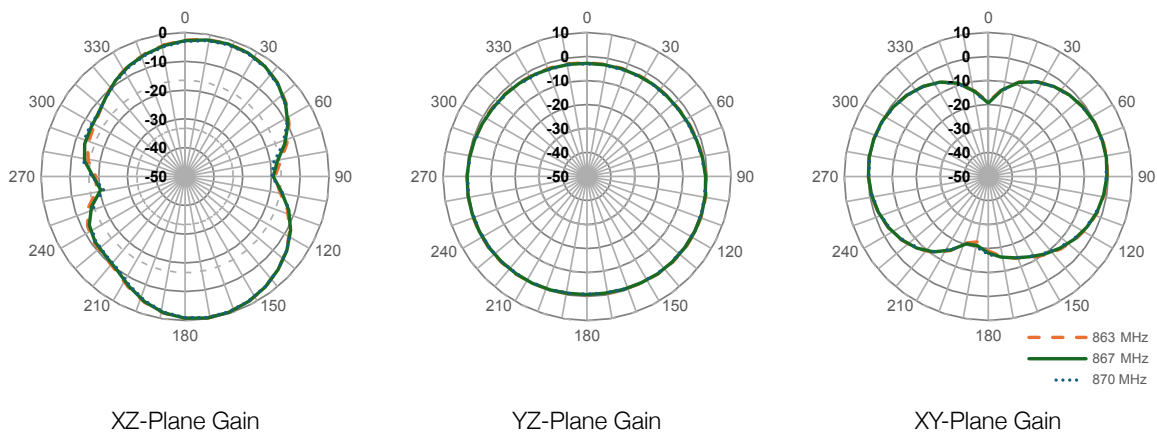


Figure 16. Radiation Patterns for the AC66503 Antenna at edge of Ground Plane

Packaging Information

The AC66503 antenna is packaged 10 at a time in a polyethylene 10-up row bag. 5, 10-up row bags are placed in a large, sealed polyethylene bag for a total of 50 antennas. 20 sealed polyethylene bags are packaged in a carton totalling 1000 antennas. Carton dimensions are 360 mm x 280 mm x 260 mm (14.2 in x 11.0 in x 10.2 in).

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