

AC31002

Global Navigation (GNSS) Embedded FPC Antenna

The AC31002 flexible printed circuit (FPC) antenna is an omnidirectional, linearly polarized, global navigation antenna operating in the GPS L1, Galileo E1, GLONASS L1, Beidou B1-BOC and QZSS bands. The AC31002 antenna features excellent efficiency and VSWR characteristics, providing quality of service for GNSS applications like vehicle tracking. The flexibility and peel-and-stick adhesive backing make the AC31002 antenna easy to mount in unique and custom enclosures.

Connection is made to the radio via a 1.13 mm coaxial cable terminated in a U.FL-type plug connector. Various cable length options are available (See Ordering Information).



AC31002-100UF
GNSS GPS Galileo GLONASS Beidou antenna

Features

- Performance at 1.567 GHz to 1.584 GHz
 - VSWR: 1.3
 - Peak Gain: 4.5 dBi
 - Efficiency: 83%
- Performance at 1.593 GHz to 1.609 GHz
 - VSWR: 1.2
 - Peak Gain: 4.5 dBi
 - Efficiency: 86%
- Compact I-shape form factor
 - 50.0 mm x 20.1 mm x 0.25 mm
- Linear polarization for use in varying orientations
- MHF1/U.FL compatible plug termination
- Ground plane independent
- Clean resonance with no unwanted out of band response

Applications

- Global Navigation (GNSS)
 - GPS L1,
 - Galileo E1
 - GLONASS L1
 - Beidou B1-BOC
 - QZSS
- Timing Applications
- OBD-II Modules
- IoT Applications
 - Asset Tracking
 - Smart Energy
 - M2M Industrial
 - Wearables/Healthcare
 - UAV/Drones

Ordering Information

Part Number	Description	Cable Length	Connector
AC31002-050UF	GNSS 50 mm x 20 mm FPC Antenna	50 mm (1.97 in)	MHF1/U.FL-type plug (male)
AC31002-100UF	GNSS 50 mm x 20 mm FPC Antenna	100 mm (3.94 in)	MHF1/U.FL-type plug (male)
AC31002-150UF	GNSS 50 mm x 20 mm FPC Antenna	150 mm (5.91 in)	MHF1/U.FL-type plug (male)
AC31002-200UF	GNSS 50 mm x 20 mm FPC Antenna	200 mm (7.87 in)	MHF1/U.FL-type plug (male)

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

Electrical Specifications

Center Frequency	GPS Bands	VSWR	Return Loss (dB)	Peak Gain (dBi)	Efficiency (%)
1561 MHz	COMPASS C/II/Beidou-B1, E2	1.3	-16.6	4.4	79
1575 MHz	GPS L1, Galileo E1, GLONASS II L1, COMPASS C/II/Beidou B1-BOC, QZSS	1.3	-17.9	4.5	82
1590 MHz	COMPASS C/II/Beidou-B1-2	1.2	-20.2	4.5	83
1601/1602 MHz	GLONASS I L1, GLONASS II L1	1.2	-21.1	4.5	85

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 antenna mounted on a 2 mm (0.08 in) thick sheet of ABS plastic.

Mechanical Specifications

Part Number	AC31002-050UF	AC31002-100UF	AC31002-150UF	AC31002-200UF
Weight	0.45 g (0.02 oz)	0.55 g (0.02 oz)	0.65 g (0.02 oz)	0.75 g (0.03 oz)
Coaxial cable, minimum inside bend radius	1.13 mm: 5.0 mm (0.20 in)			
Connection	MHF1/U.FL-type plug (male)			
Dimensions	50.0 mm x 20.1 mm x 0.25 mm (1.97 in x 0.79 in x 0.01 in)			
Operating Temp. Range	-40 °C to +85 °C (-40 °F to 185 °F)			
Recommended Storage Conditions	16° C - 27° C and 40% to 60% relative humidity			

Antenna Mounting

The AC31002 antenna is a flexible, adhesive-backed antenna that allows it to be permanently installed onto non-metallic surfaces. The adhesive backing is 3M 467MP™, which provides outstanding adhesion to high surface energy plastics. The adhesive delivers excellent shear strength to resist slippage and edge lifting, but can be repositioned before the adhesive cures, allowing for accurate positioning. This adhesive is highly resistant to solvents, humidity and moisture, as well as heat up to 204 °C (400 °F) for short periods.

The antenna should never be bent to the point of creating a crease or allowing the angle of the bend to fall below 90 degrees (i.e. become acute) as this will impair function and may cause permanent damage.

Antenna Dimensions

The dimensions for the AC31002 are shown below in Figure 1.

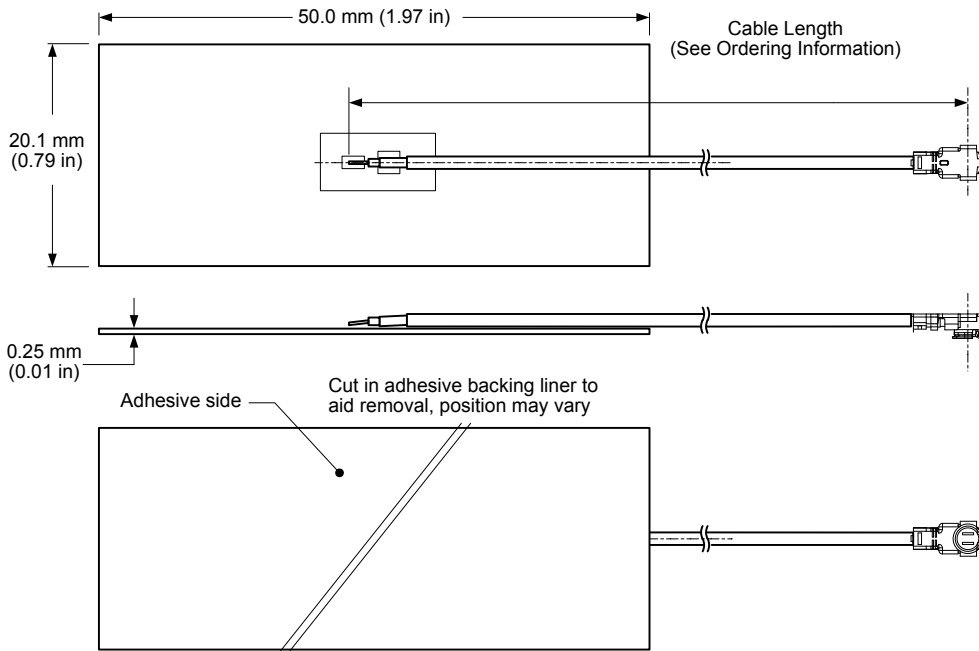


Figure 1. AC31002 Antenna Dimensions

VSWR

Figure 2 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.

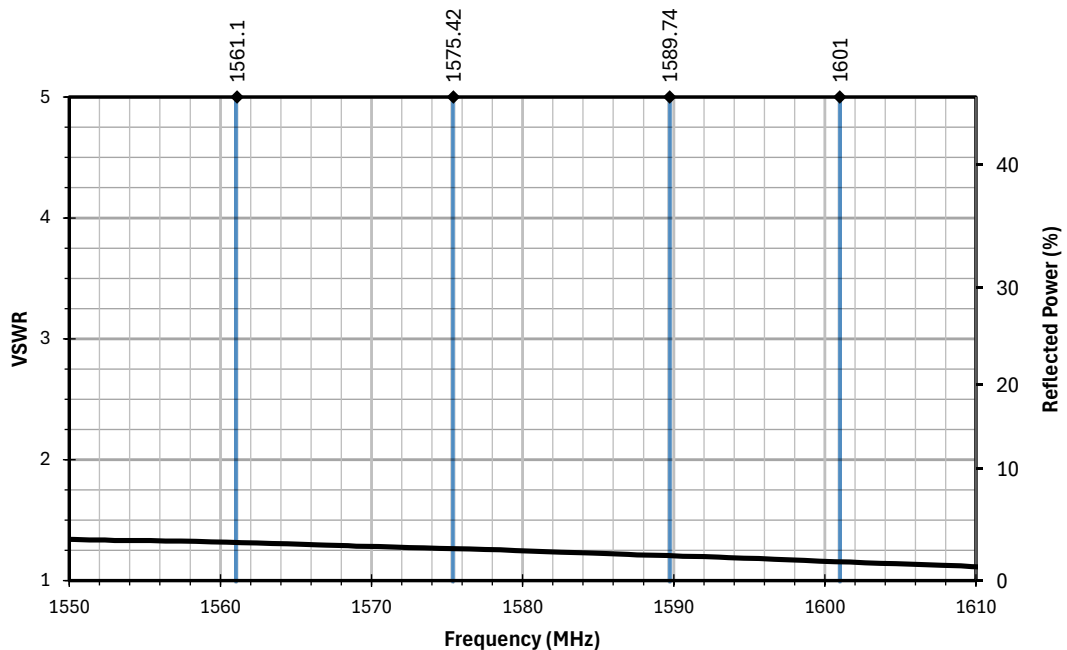


Figure 2. AC31002 Antenna VSWR with Frequency Band Highlights

Return Loss

Return loss (Figure 3) 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.

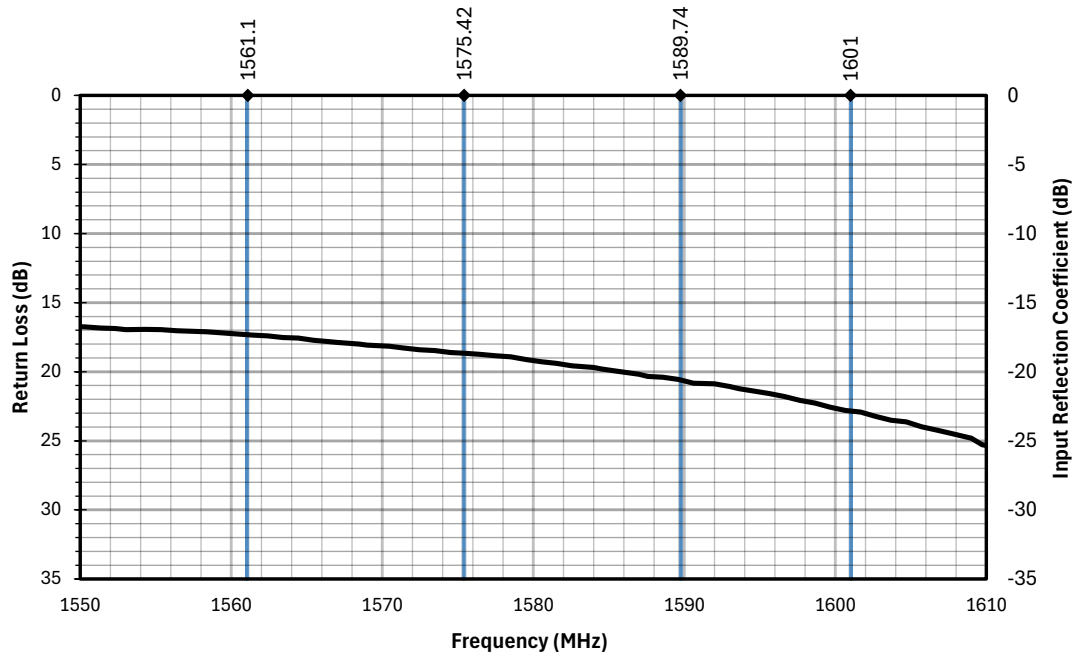


Figure 3. AC31002 Antenna Return Loss with Frequency Band Highlights

Peak Gain

Peak gain (Figure 4) 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.

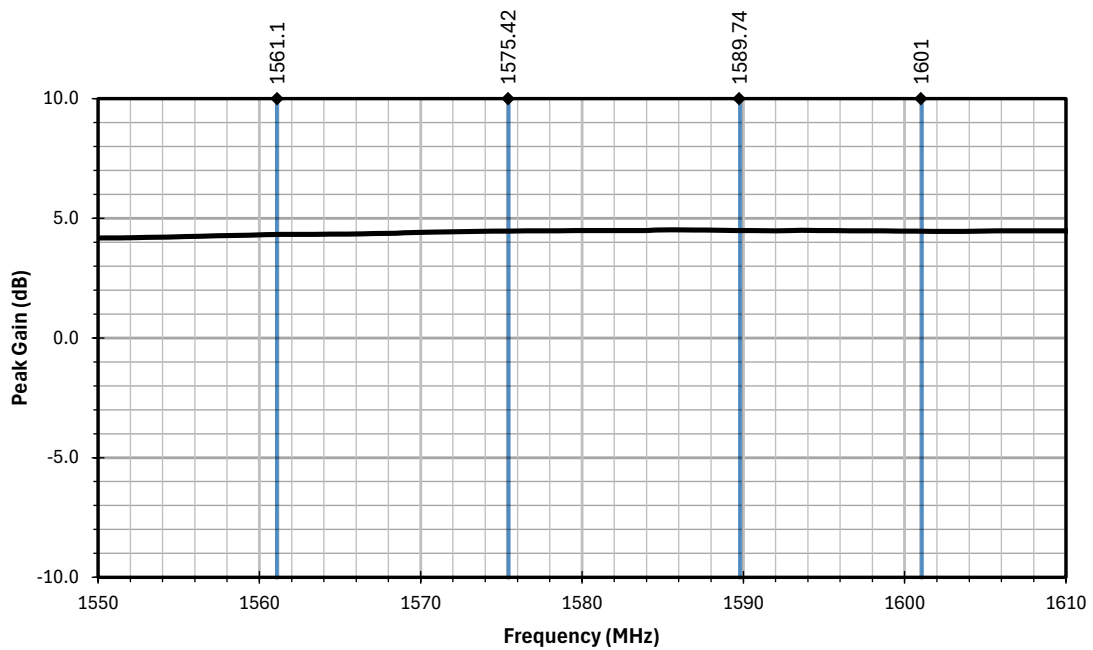


Figure 4. AC31002 Antenna Peak Gain with Frequency Band Highlights

Average Gain

Average gain (Figure 5) is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

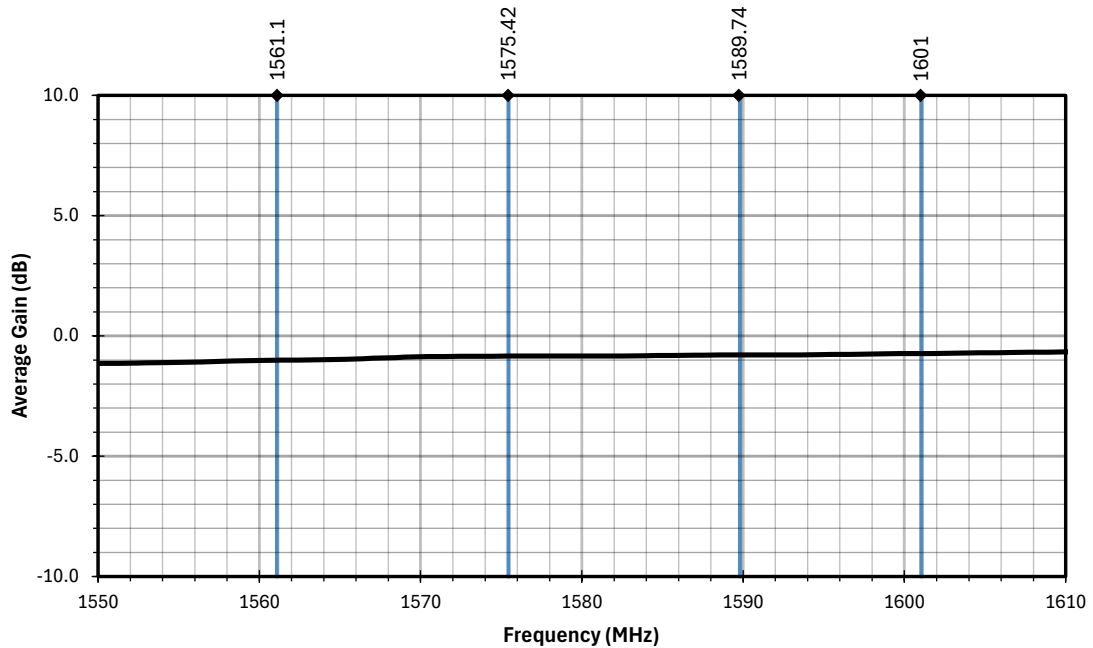


Figure 5. AC31002 Antenna Average Gain with Frequency Band Highlights

Efficiency

Efficiency (Figure 6) 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.

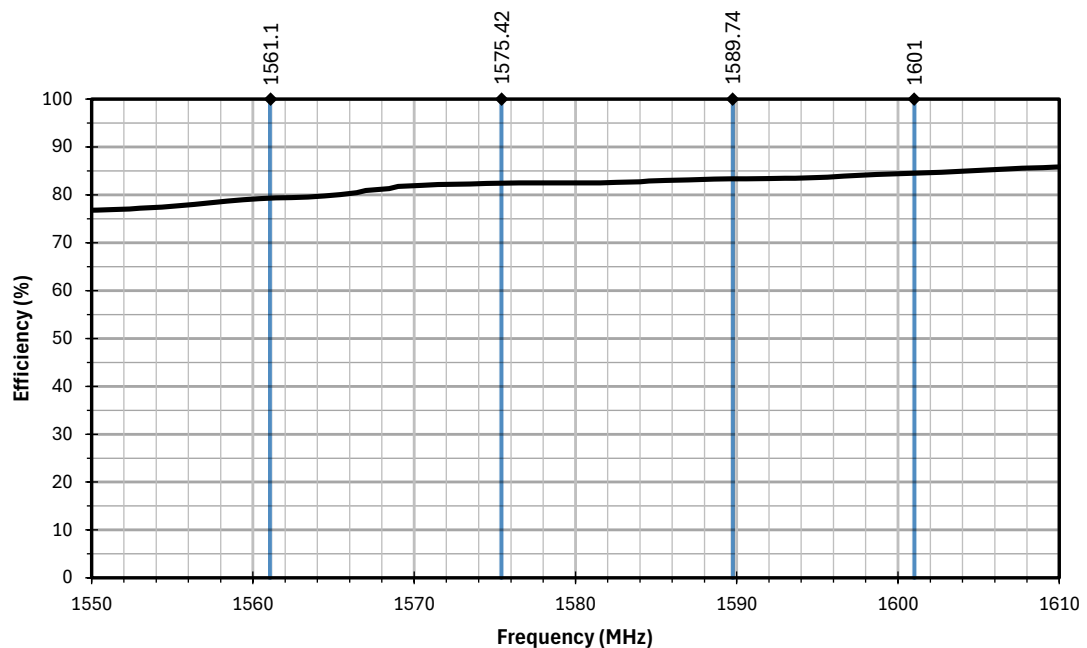
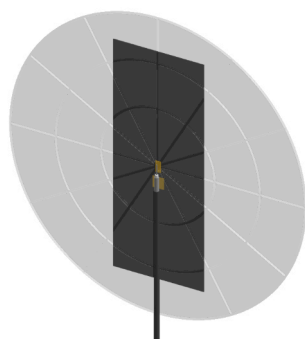


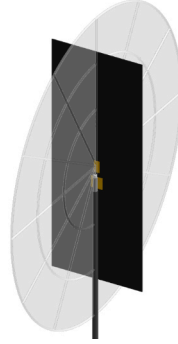
Figure 6. AC31002 Antenna Efficiency with Frequency Band Highlights

Radiation Patterns

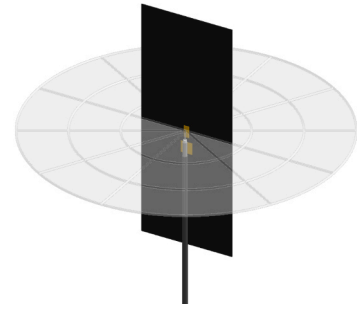
Radiation patterns provide information about the directional performance of the antenna by plotting gain in three orthogonal planes at the high-, low- and center-frequencies of an antenna frequency band. Antenna radiation patterns (Figure 7) are shown using polar plots covering 360 degrees with the plane 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

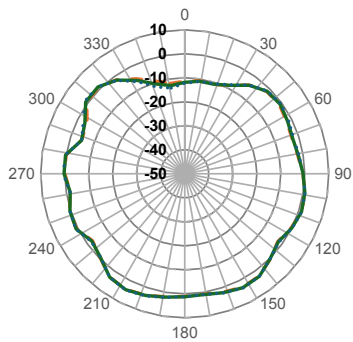


YZ-Plane Gain

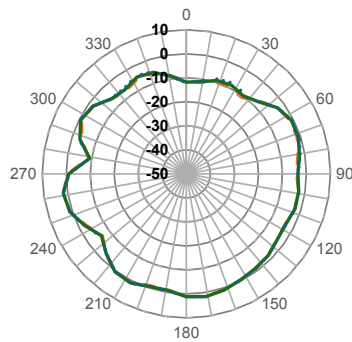


XY-Plane Gain

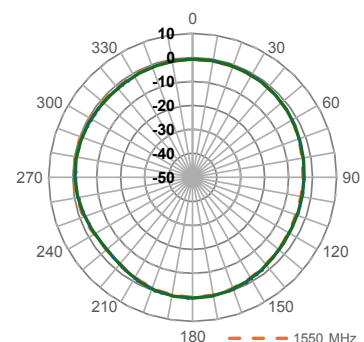
1550 MHz to 1570 MHz (1561 MHz)



XZ-Plane Gain



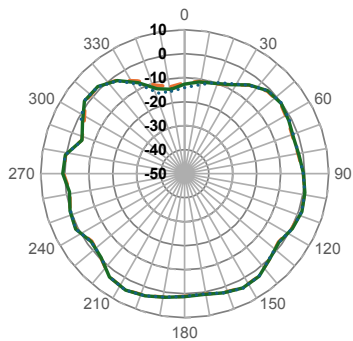
YZ-Plane Gain



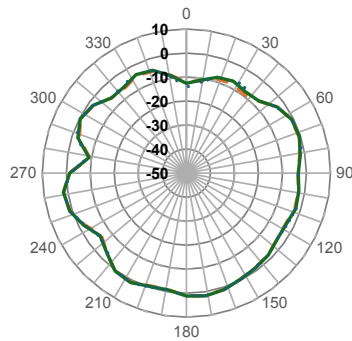
XY-Plane Gain

— 1550 MHz
— 1561 MHz
.. 1570 MHz

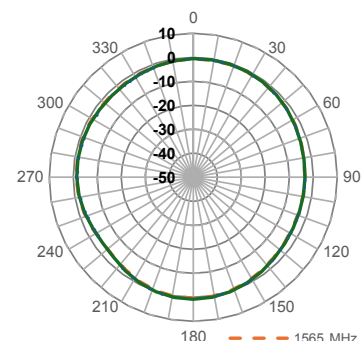
1565 MHz to 1585 MHz (1575 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

— 1565 MHz
— 1575 MHz
.. 1585 MHz

1589 MHz to 1610 MHz (1601 MHz)

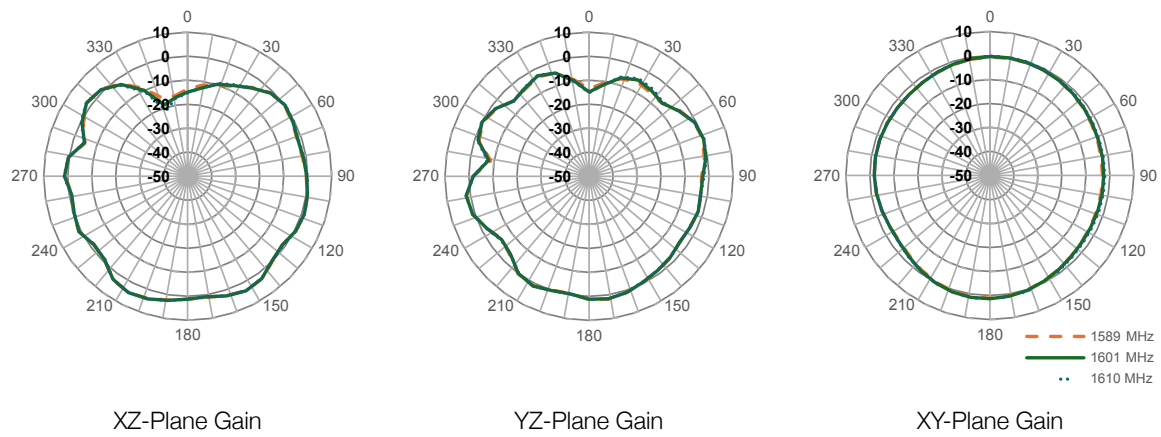


Figure 7. Radiation Patterns for AC31002 Antenna

Packaging Information

The AC31002 antenna is individually packaged in a labeled polyethylene bag and bulk packaged in a polyethylene bag in quantities of 50 pcs. Sealed bulk polyethylene bags are packed in cartons in quantities totaling 8000 pieces per carton. Carton dimensions are 340 mm x 340 mm x 200 mm (13.4 in x 13.4 in x 7.9 in).

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Series: FPC.

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