



## ANT-5GWWS1-SMA

### Cellular Sub-6 5G Antenna

The ANT-5GWWS1-SMA is a dipole, blade-style antenna for 5G New Radio, LTE, and cellular IoT (LTE-M, NB-IoT) applications. As a 5G NR antenna, the 5GWWS1 excels in the 617 MHz to 960 MHz low band, and 1710 MHz to 2690 MHz and 3300 MHz to 5000 MHz midband ranges for CBRS private networking, 4.9 GHz public safety and emerging 2.5 GHz and C-band applications.

The hinged design allows for the antenna to be positioned for optimum performance and reduces the potential for damage from impact compared to a fixed whip design. The antenna attaches with an SMA plug (male pin) connector.

#### FEATURES

- Performance at 3300 MHz to 3800 MHz
  - VSWR:  $\leq 1.9$
  - Peak Gain: 2.7 dBi
  - Efficiency: 66%
- Performance at 617 MHz to 960 MHz
  - VSWR:  $\leq 3.0$
  - Peak Gain: 0.7 dBi
  - Efficiency: 53%
- Hinged design with detents for straight, 45 degree and 90 degree positioning
- SMA plug (male pin) connector

#### APPLICATIONS

- Worldwide 5G/4G/3G/2G
- Cellular IoT: LTE-M (Cat-M1) and NB-IoT
- Private cellular networks
  - Citizens Broadband Radio Service (CBRS)
- 4.9 GHz Public Safety
- Emerging 5G C-Band applications
- Emerging 5G 2.5 GHz EBS applications
- Internet of Things (IoT) devices

#### ORDERING INFORMATION

Part Number	Description
ANT-5GWWS1-SMA	Cellular 5G, blade-style antenna with SMA plug (male pin) connector

Available from Linx Technologies and select distributors and representatives.

**TABLE 1. ELECTRICAL SPECIFICATIONS**

Bands	Frequency Range	VSWR (max.)	Peak Gain (dBi)	Avg. Gain (dBi)	Efficiency (%)
71	617 MHz to 698 MHz	3.0	0.7	-3.1	53
12, 13, 14, 17, 26, 28, 29, 44, 67, 68, 85, n83	698 MHz to 803 MHz	1.9	0.4	-3.0	53
5, 18, 19, 20, 26, 27, n82, n89	791 MHz to 960 MHz	2.8	0.6	-4.0	53
24	1553 MHz to 1609 MHz	1.4	3.3	-3.3	48
1, 2, 3, 4, 25, 66	1710 MHz to 2200 MHz	1.9	4.0	-2.0	68
30, 40	2300 MHz to 2400 MHz	1.9	4.0	-3.4	48
7, 41	2496 MHz to 2690 MHz	2.9	4.1	-3.3	57
22, 42, 43, 48, 49, 52	3300 MHz to 3800 MHz	1.9	2.7	-2.1	66
48, (CBRS)	3550 MHz to 3700 MHz	1.7	2.4	-1.4	76
C-Band	3700 MHz to 4200 MHz	3.1	2.2	-2.9	58
Public Safety	4940 MHz to 4990 MHz	1.9	3.5	-2.6	56

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

**TABLE 2. MECHANICAL SPECIFICATIONS**

Parameter	Value
Polarization	Linear
Radiation	Omnidirectional
Max Power	10 W
Wavelength	1/2-wave
Electrical Type	Dipole
Impedance	50 Ω
Operating Temperature Range	-20 °C to +65 °C
Weight	14.9 g (0.53 oz)
Dimensions	135.7 mm x 20.1 mm x 10.0 mm (5.34 in x 0.79 in x 0.39 in)
Connection	SMA Plug (male pin)

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

**PRODUCT DIMENSIONS**

Figure 1 provides dimensions of the ANT-5GW-IPW2-NP antenna.

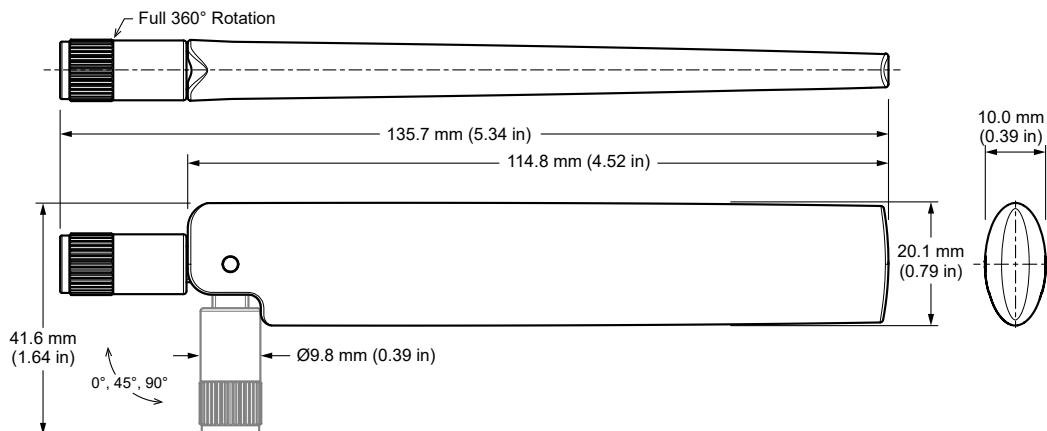


Figure 1. ANT-5GWWS1-SMA Antenna Dimensions

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## PACKAGING INFORMATION

Figure 1 provides dimensions of the ANT-5GWWS1-SMA. The antenna whip can be tilted 90 degrees, and has 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.

## ANTENNA ORIENTATION

The ANT-5GWWS1-SMA antenna is characterized in two antenna orientations as shown in Figure 2. The antenna straight orientation characterizes use of an antenna attached to an enclosure-mounted connector which is connected by cable to a printed circuit board. Although the antenna is a dipole not requiring a ground plane for function, characterization with an adjacent ground plane (102 mm x 102 mm) provides insight into antenna performance when attached directly to a printed circuit board mounted connector. The two orientations represent the most common end-product use cases.

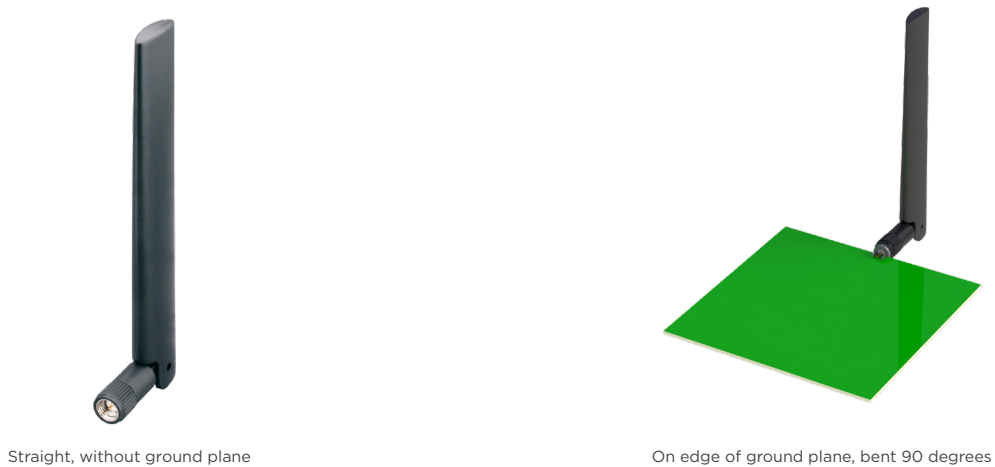


Figure 2. ANT-5GWWS1-SMA Test Orientation

## STRAIGHT, NO GROUND PLANE

The charts on the following pages represent data taken with the antenna oriented straight, as shown in Figure 3.



Figure 3. ANT-5GWWS1-SMA Straight, No Ground Plane (Straight)

## VSWR

Figure 4 provides the voltage standing wave ratio (VSWR) across the antenna bandwidth. VSWR describes the power reflected from the antenna back to the radio. 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 gauge of the percentage of transmitter power reflected back from the antenna.

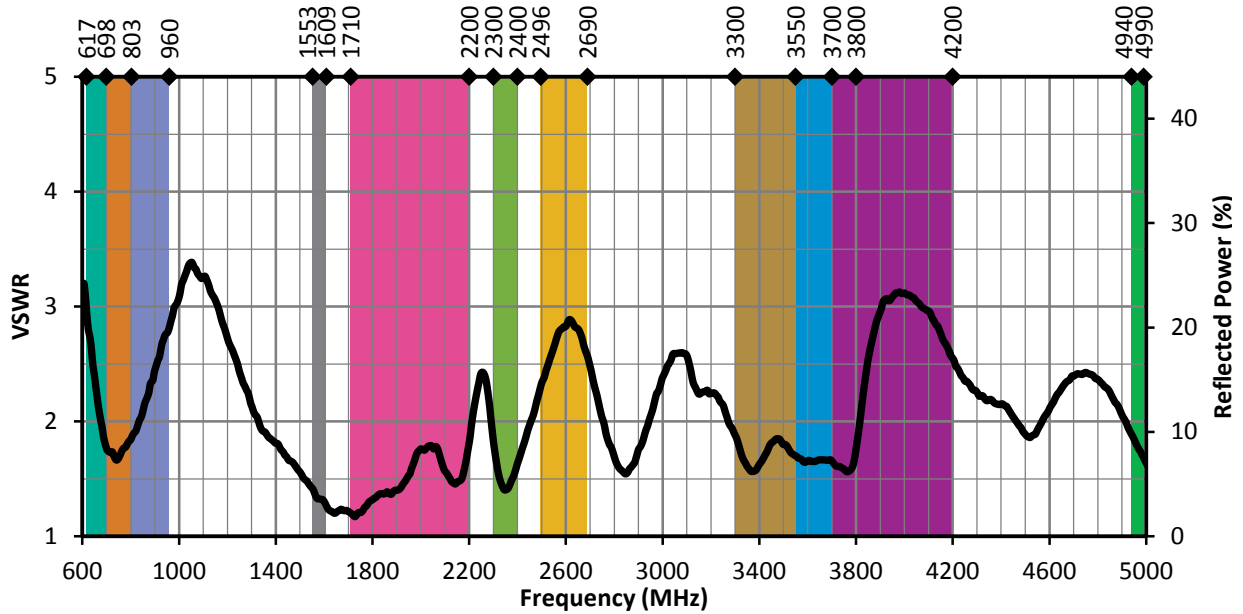


Figure 4. ANT-5GWWS1-SMA Antenna VSWR, Straight, with Frequency Band Highlights

## RETURN LOSS

Return loss (Figure 5), represents the loss in power at the antenna due to reflected signals. Like VSWR, a lower return loss value indicates better antenna performance at a given frequency.

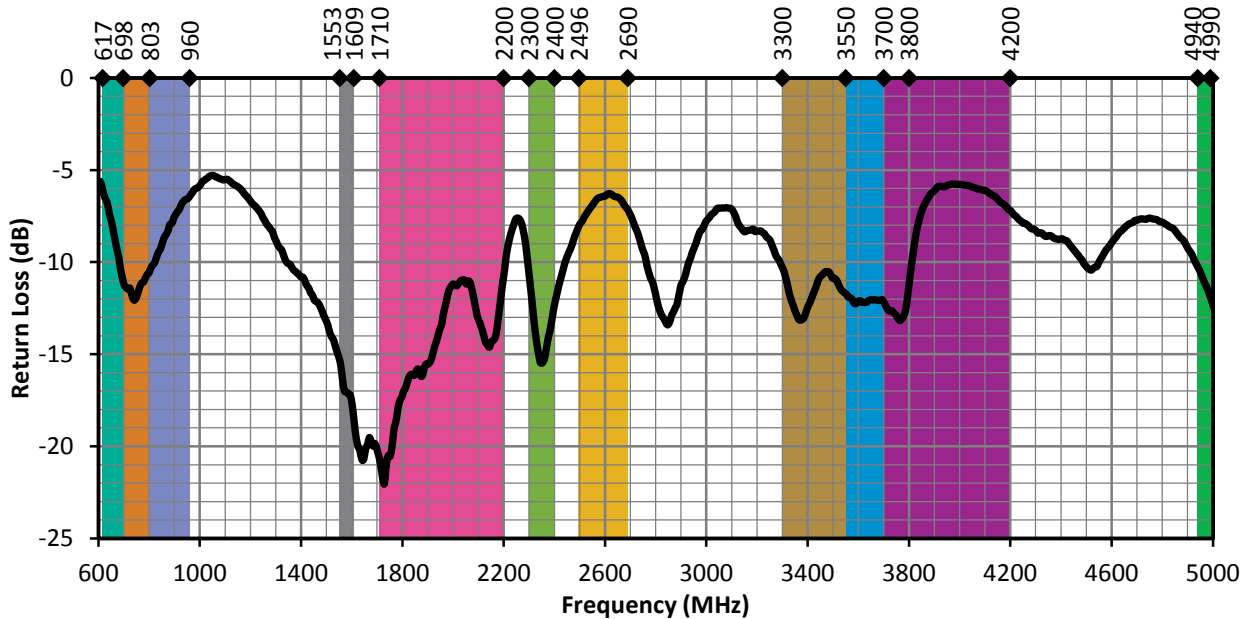


Figure 5. ANT-5GWWS1-SMA Antenna Return Loss, Straight, with Frequency Band Highlights

## PEAK GAIN

The peak gain across the antenna bandwidth is shown in Figure 6. Peak gain represents the maximum antenna input power concentration across 3-dimensional space, and therefore peak performance at a given frequency, but does not consider any directionality in the gain pattern.

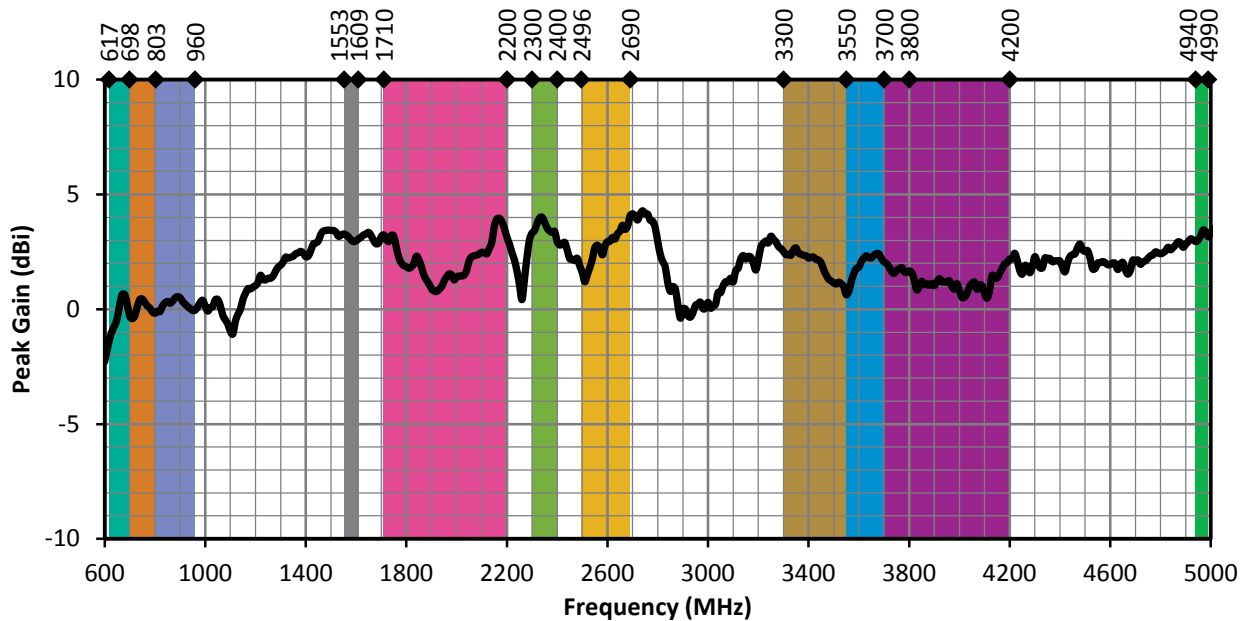


Figure 6. ANT-5GWWS1-SMA Antenna Peak Gain, Straight, with Frequency Band Highlights

## 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.

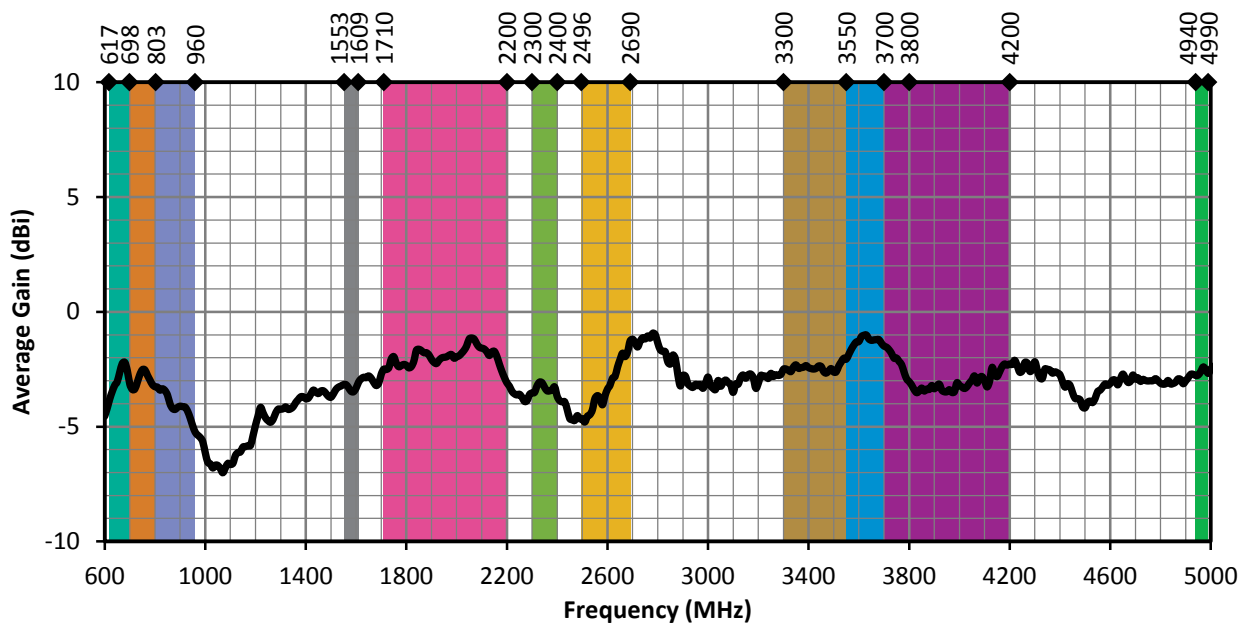


Figure 7. ANT-5GWWS1-SMA Antenna Average Gain, Straight, with Frequency Band Highlights

## RADIATION EFFICIENCY

Radiation efficiency (Figure 8), shows 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.

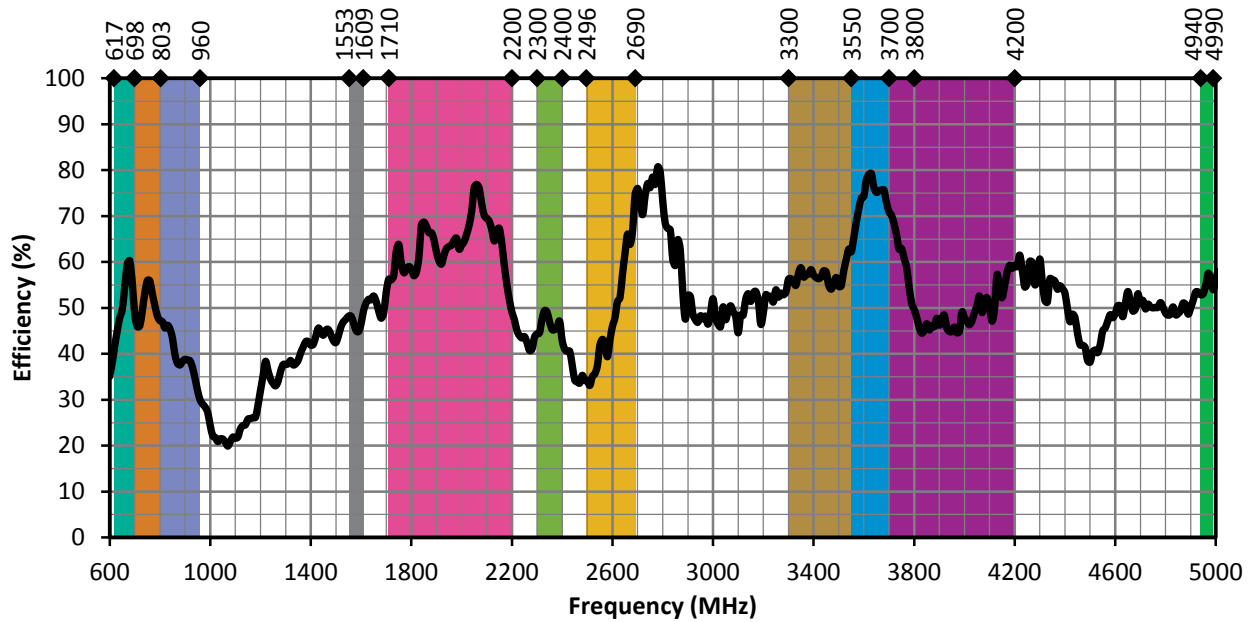


Figure 8. ANT-5GWWS1-SMA Antenna Efficiency, Straight, with Frequency Band Highlights

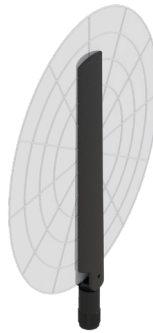
## RADIATION PATTERNS

Radiation patterns provide information about the directionality and 3-dimensional gain performance of the antenna by plotting gain at specific frequencies in three orthogonal planes. Antenna radiation patterns for a straight orientation are shown in Figure 9 using polar plots covering 360 degrees. The antenna graphic at the top of the page provides reference to the plane of the column of plots below it. Note: when viewed with typical PDF viewing software, zooming into radiation patterns is possible to reveal fine detail.

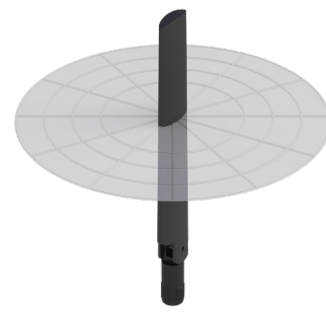
### RADIATION PATTERNS - STRAIGHT



XZ-Plane Gain

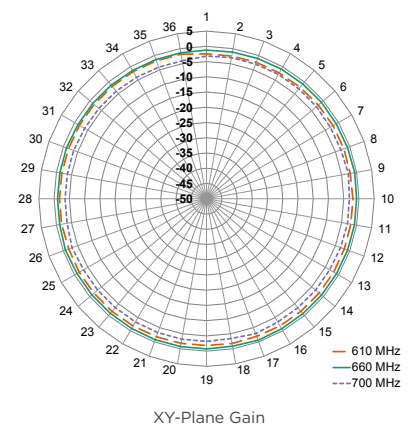
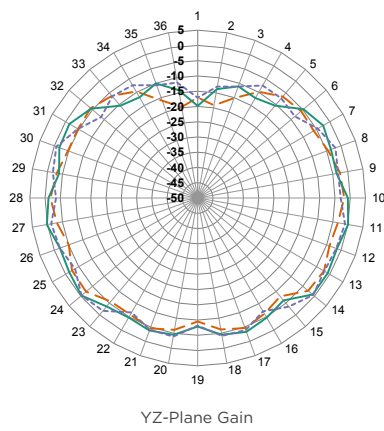
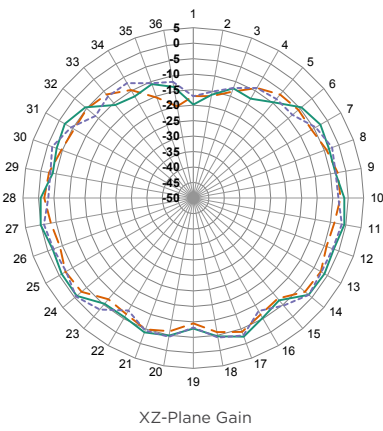


YZ-Plane Gain

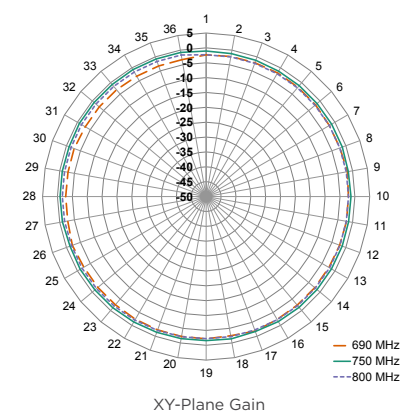
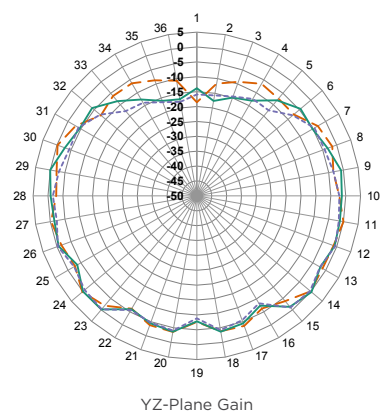
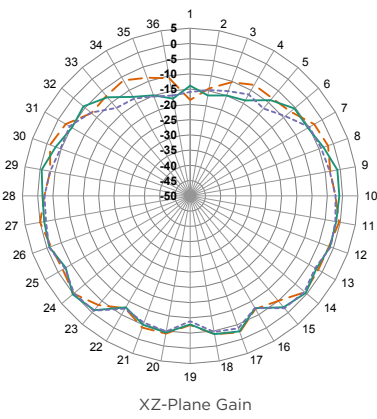


XY-Plane Gain

## 617 MHz TO 698 MHz (660 MHz)

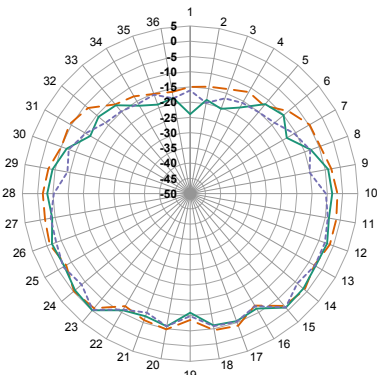


## 698 MHz TO 803 MHz (750 MHz)

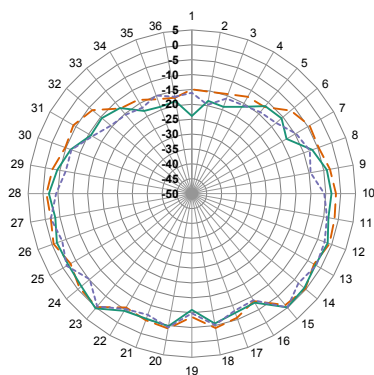


## RADIATION PATTERNS - STRAIGHT

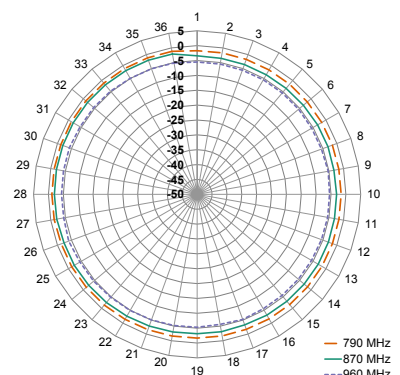
### 791 MHz TO 960 MHz (870 MHz)



XZ-Plane Gain

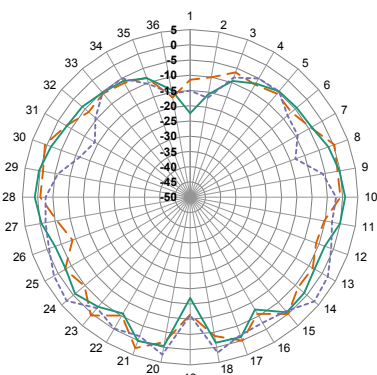


YZ-Plane Gain

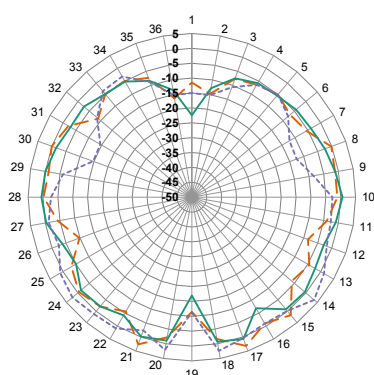


XY-Plane Gain

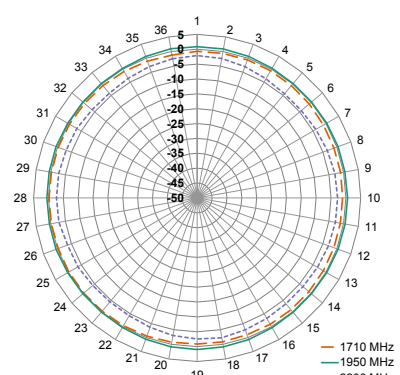
### 1710 MHz TO 2200 MHz (1950 MHz)



XZ-Plane Gain

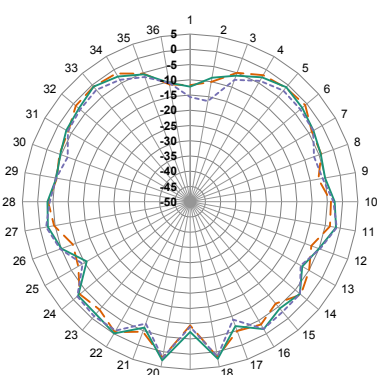


YZ-Plane Gain

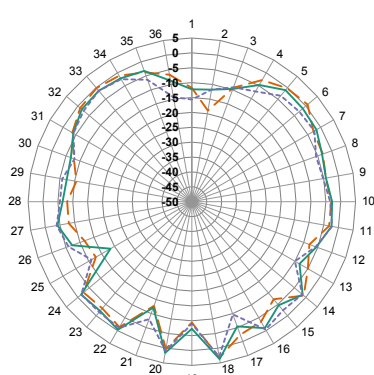


XY-Plane Gain

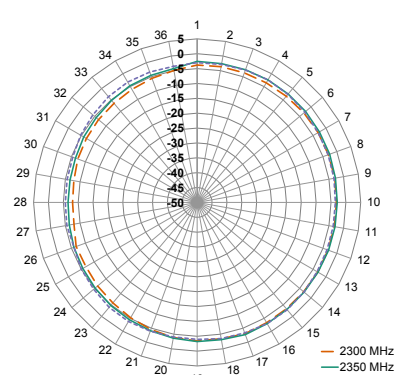
### 2300 MHz TO 2400 MHz (2350 MHz)



XZ-Plane Gain



YZ-Plane Gain

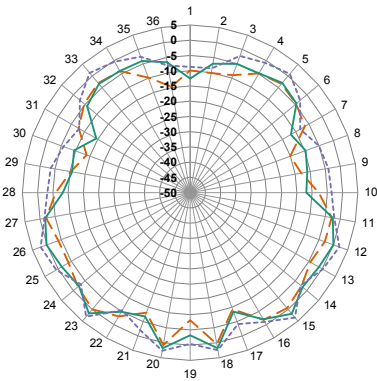


XY-Plane Gain

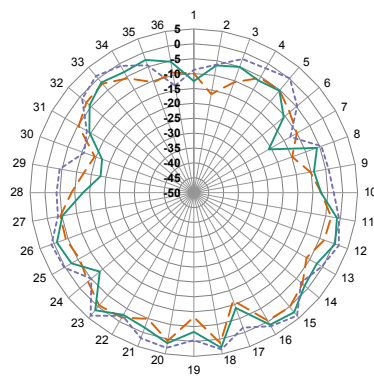


## RADIATION PATTERNS - STRAIGHT

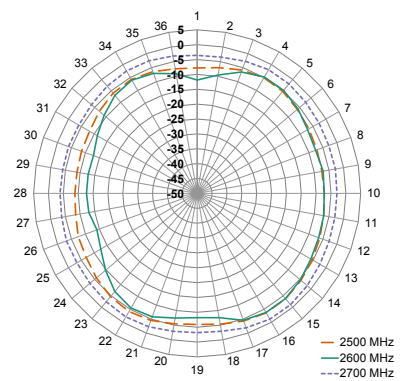
### 2496 MHz TO 2690 MHz (2600 MHz)



XZ-Plane Gain

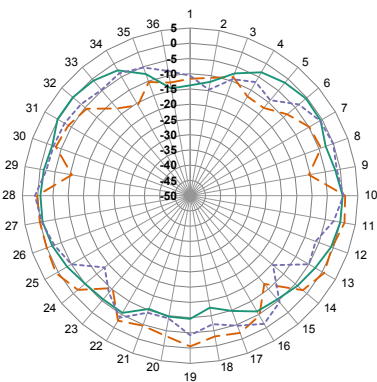


YZ-Plane Gain

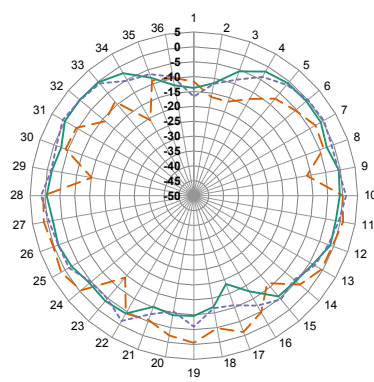


XY-Plane Gain

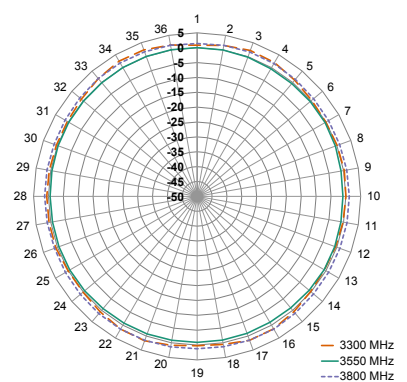
## 3300 MHz TO 3800 MHz (3550 MHz)



XZ-Plane Gain

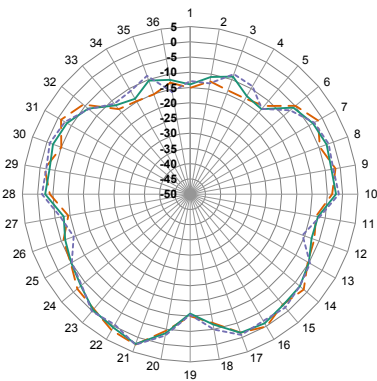


YZ-Plane Gain

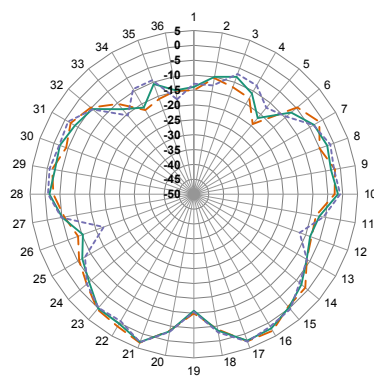


XY-Plane Gain

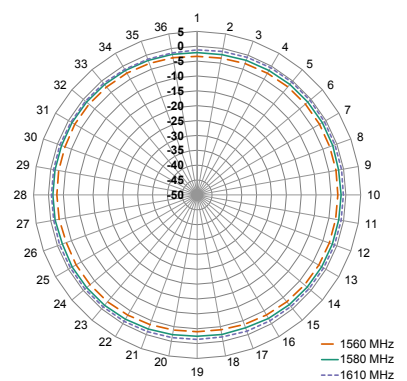
## 1553 MHz TO 1609 MHz (1580 MHz)



XZ-Plane Gain



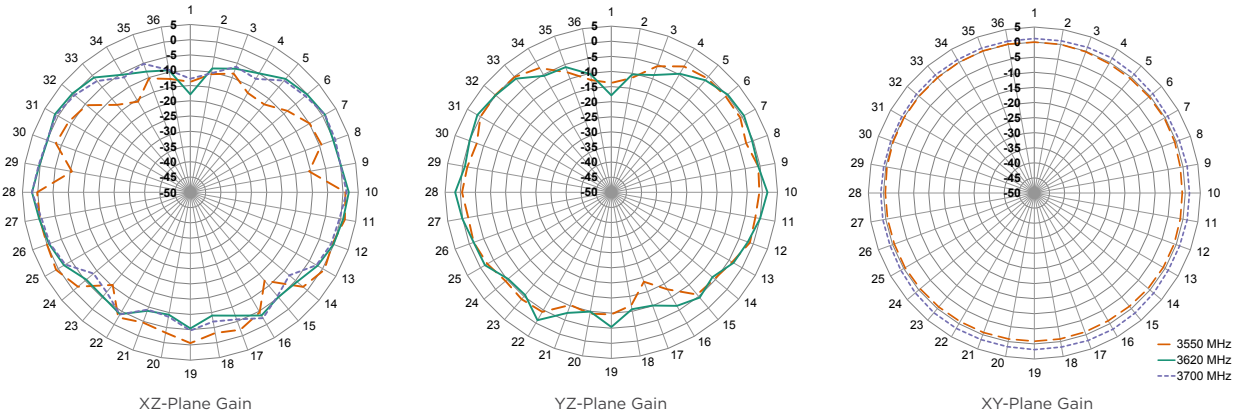
YZ-Plane Gain



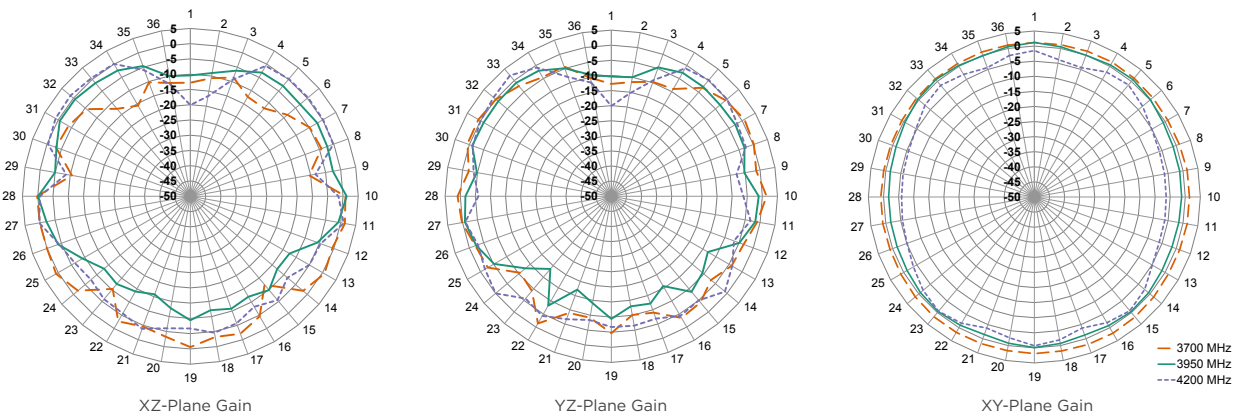
XY-Plane Gain

## RADIATION PATTERNS - STRAIGHT

### 3550 MHz TO 3700 MHz (3620 MHz)



### 3700 MHz TO 4200 MHz (3950 MHz)



### 4940 MHz TO 4990 MHz (4960 MHz)

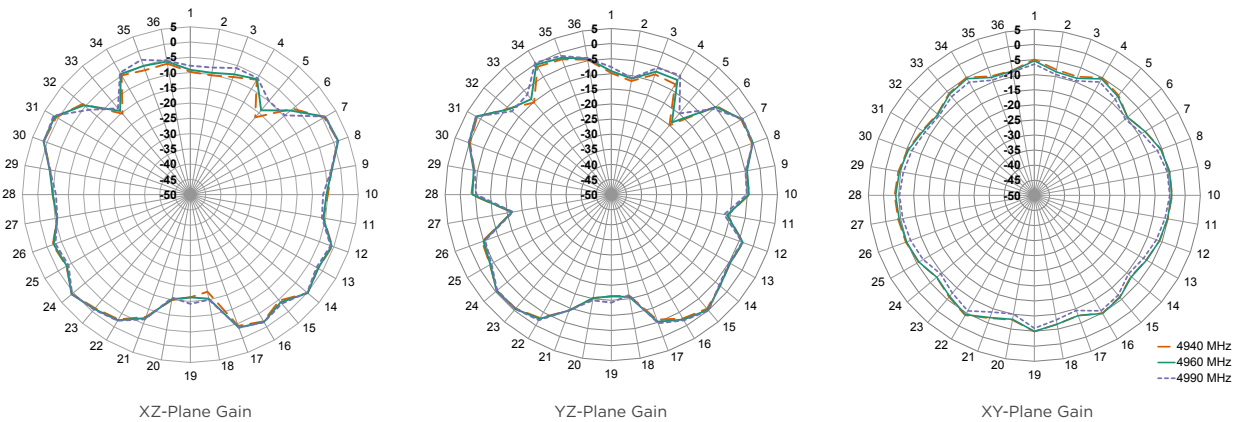


Figure 9. Radiation Patterns for ANT-5GW-IPW2-NP, Free Space

## EDGE OF GROUND PLANE, BENT 90 DEGREES

The charts on the following pages represent data taken with the antenna oriented at the edge of the ground plane, bent 90 degrees (Edge-Bent), as shown in Figure 10.

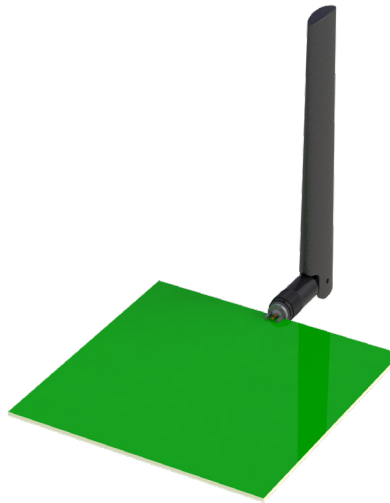


Figure 10. ANT-5GWWS1-SMA on Edge of Ground Plane, Bent 90 Degrees (Edge-Bent)

## VSWR

Figure 11 provides the voltage standing wave ratio (VSWR) across the antenna bandwidth. VSWR describes the power reflected from the antenna back to the radio. 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 gauge of the percentage of transmitter power reflected back from the antenna.

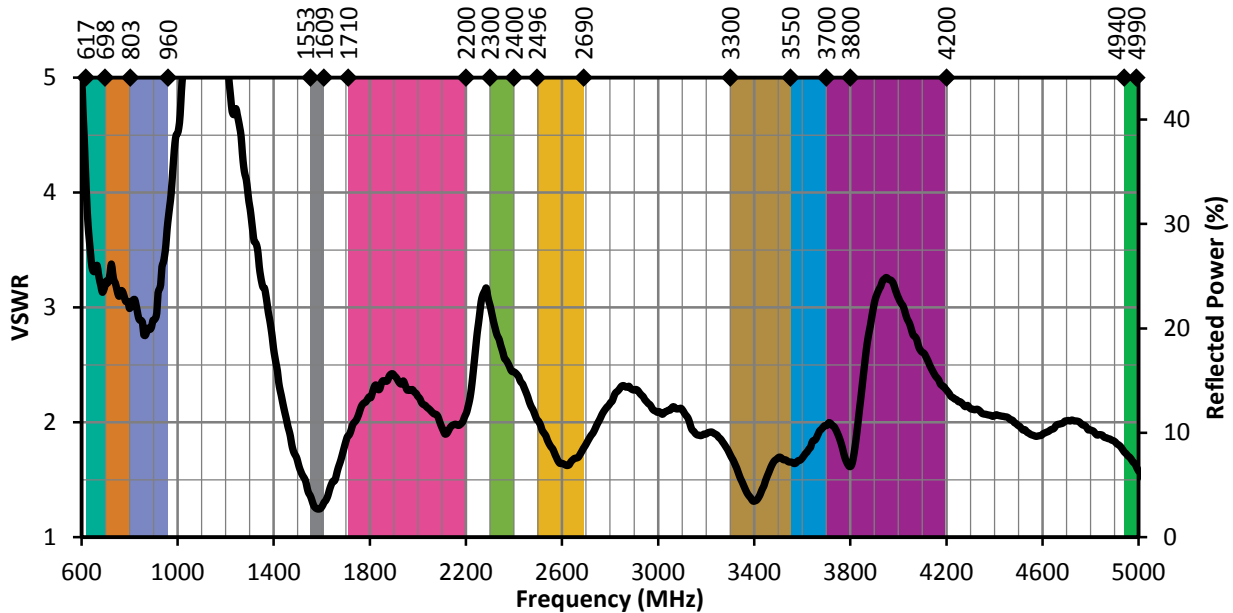


Figure 11. ANT-5GWWS1-SMA Antenna VSWR, Edge-Bent, with Frequency Band Highlights

## RETURN LOSS

Return loss (Figure 12), represents the loss in power at the antenna due to reflected signals. Like VSWR, a lower return loss value indicates better antenna performance at a given frequency.

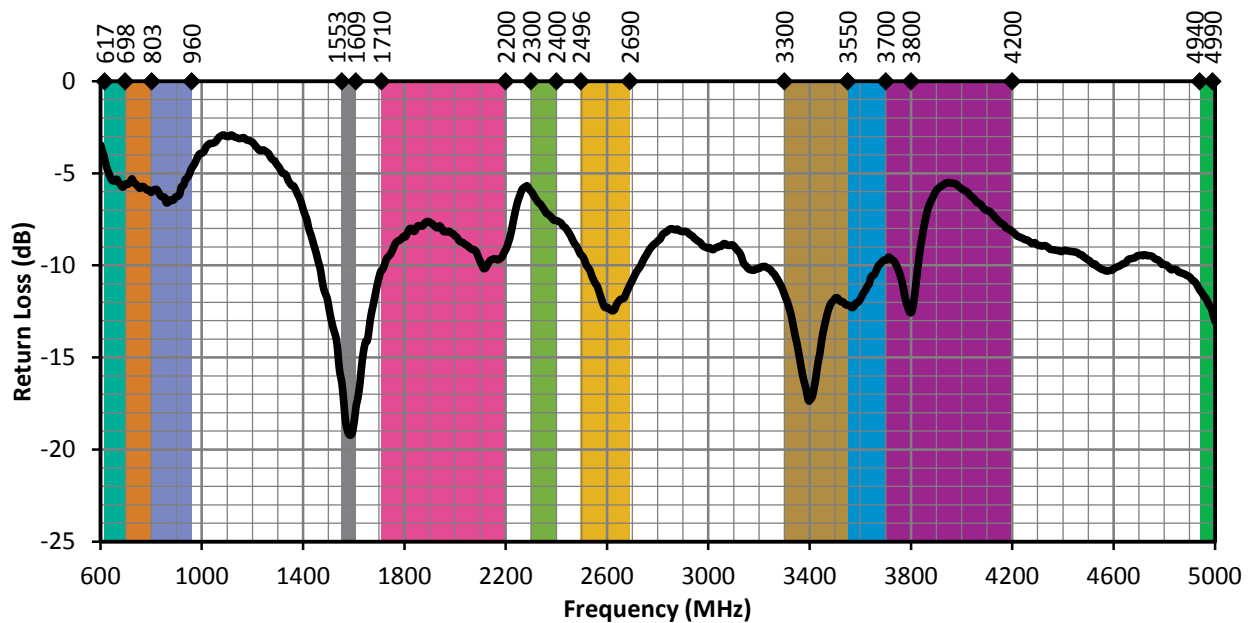


Figure 12. ANT-5GWWS1-SMA Antenna Return Loss, Edge-Bent, with Frequency Band Highlights

## PEAK GAIN

The peak gain across the antenna bandwidth is shown in Figure 13. Peak gain represents the maximum antenna input power concentration across 3-dimensional space, and therefore peak performance at a given frequency, but does not consider any directionality in the gain pattern.

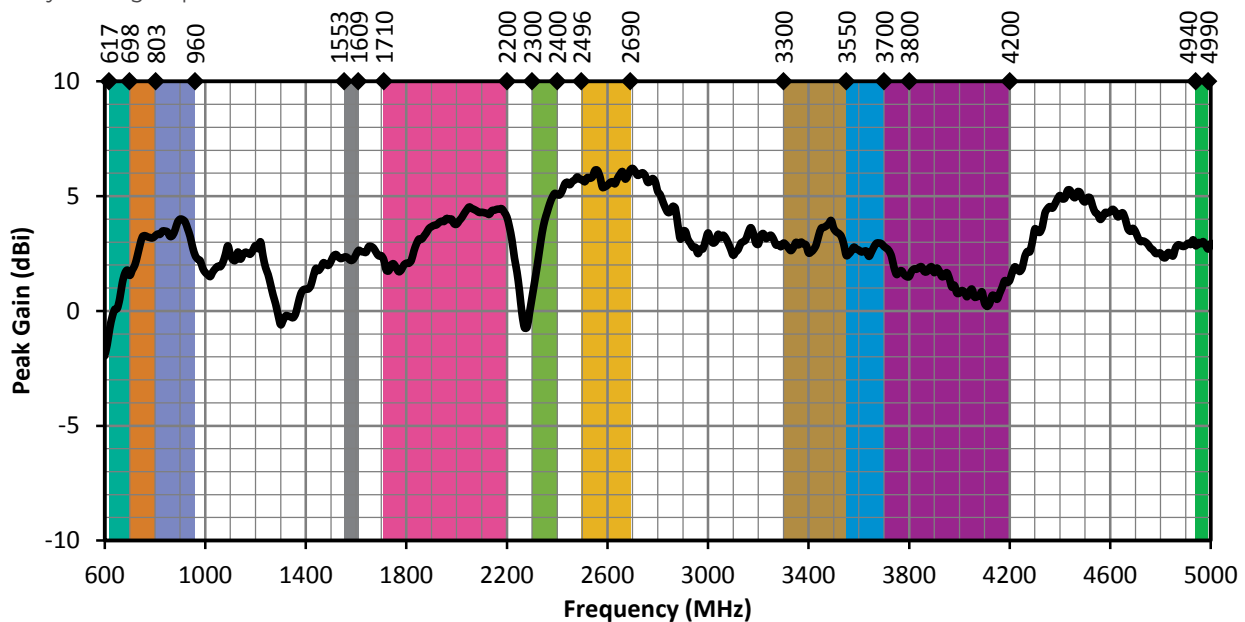


Figure 13. AANT-5GWWS1-SMA Antenna Peak Gain, Edge-Bent, with Frequency Band Highlights

## 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.

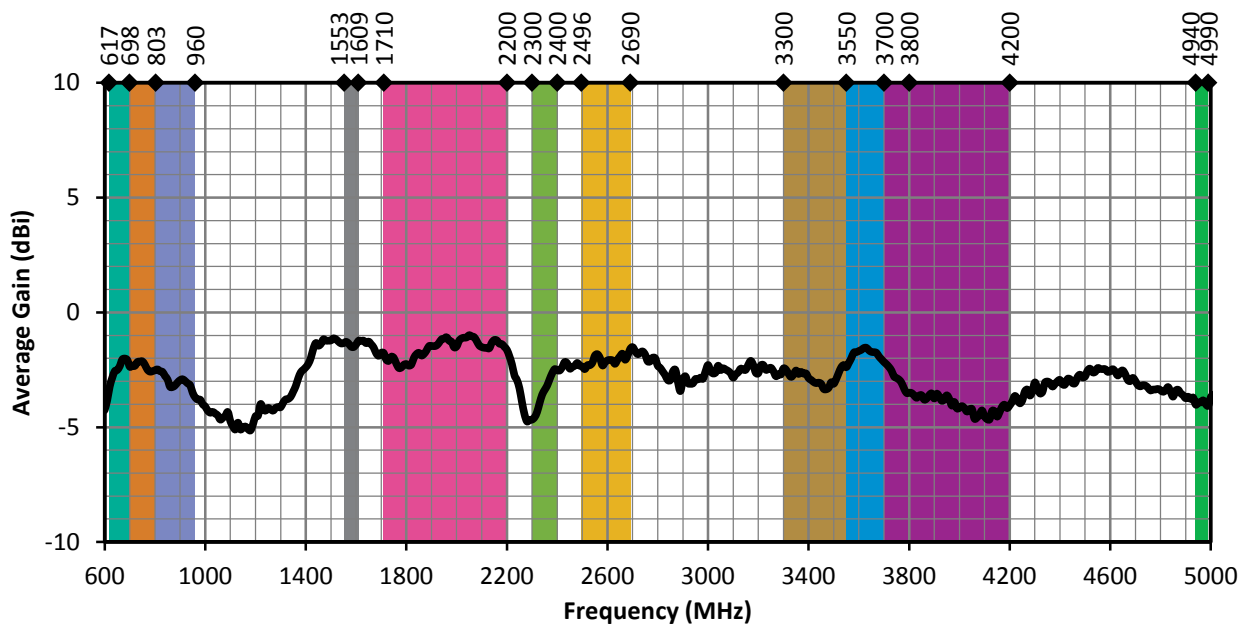


Figure 14. ANT-5GWWS1-SMA Antenna Average Gain, Edge-Bent, with Frequency Band Highlights

## RADIATION EFFICIENCY

Radiation efficiency (Figure 15), shows 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.

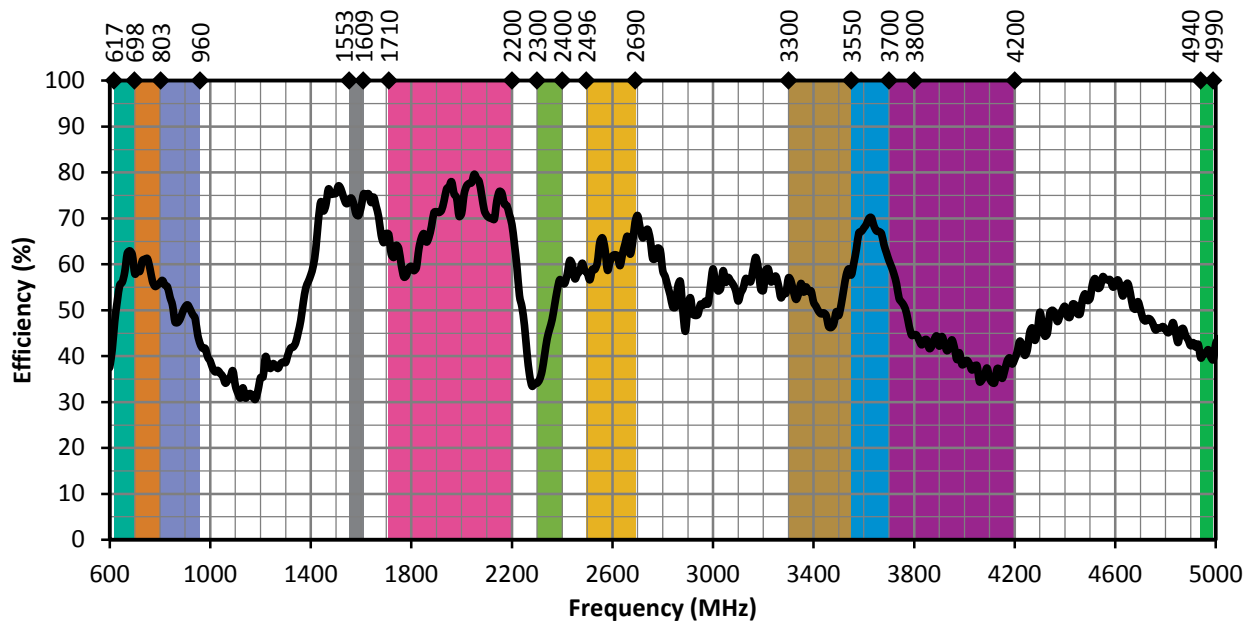
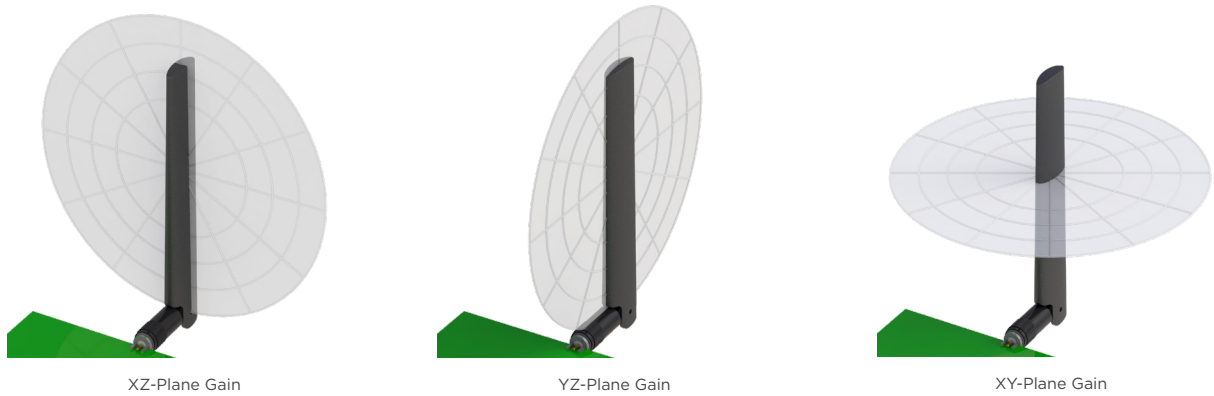


Figure 15. ANT-5GWWS1-SMA Antenna Efficiency, Edge-Bent, with Frequency Band Highlights

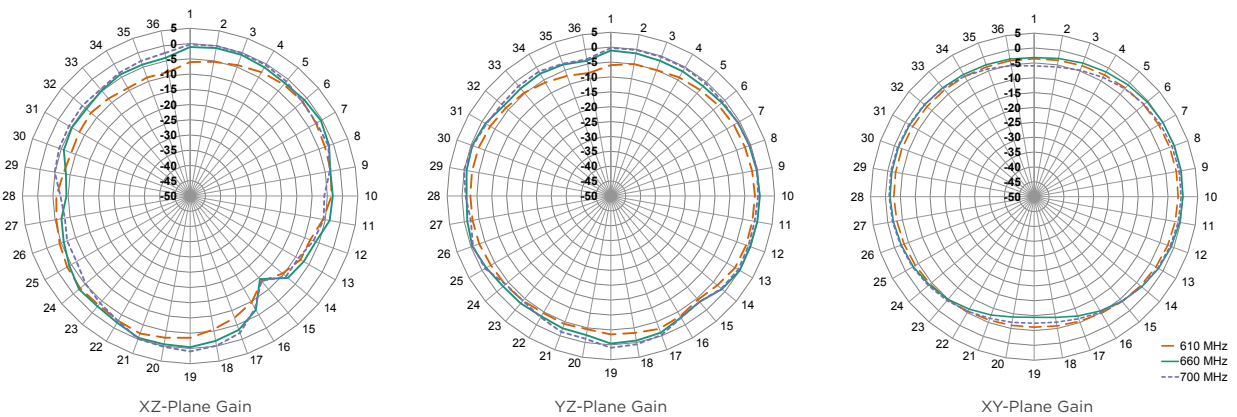
## RADIATION PATTERNS

Radiation patterns provide information about the directionality and 3-dimensional gain performance of the antenna by plotting gain at specific frequencies in three orthogonal planes. Antenna radiation patterns for an Edge-Bent orientation are shown in Figure 16 using polar plots covering 360 degrees. The antenna graphic at the top of the page provides reference to the plane of the column of plots below it. Note: when viewed with typical PDF viewing software, zooming into radiation patterns is possible to reveal fine detail.

### RADIATION PATTERNS - EDGE-BENT



#### 617 MHz TO 698 MHz (660 MHz)



#### 698 MHz TO 803 MHz (750 MHz)

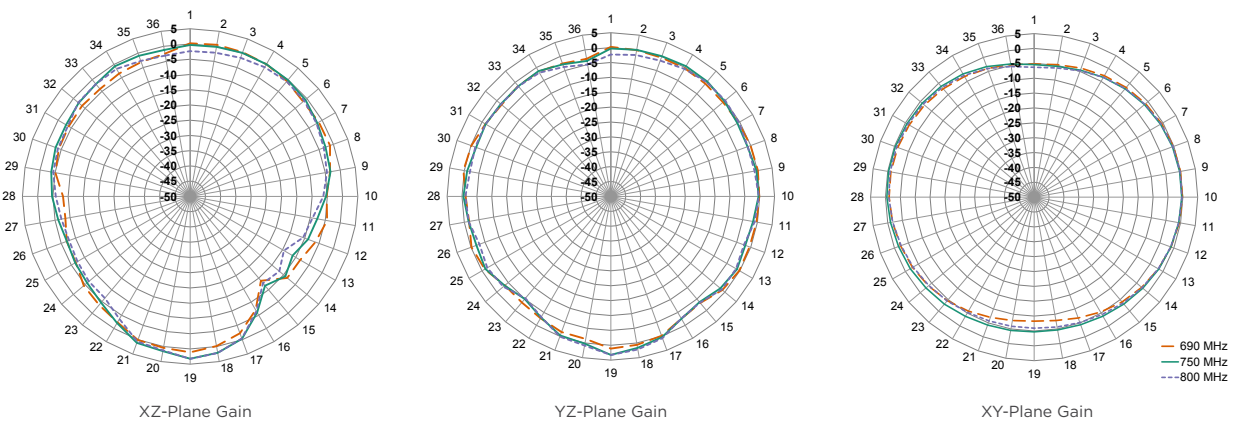
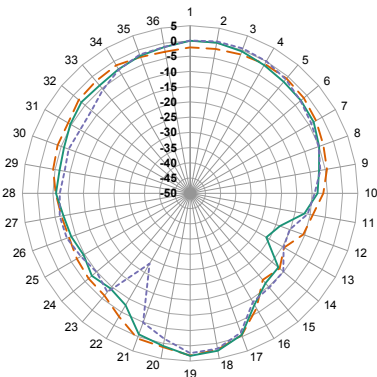


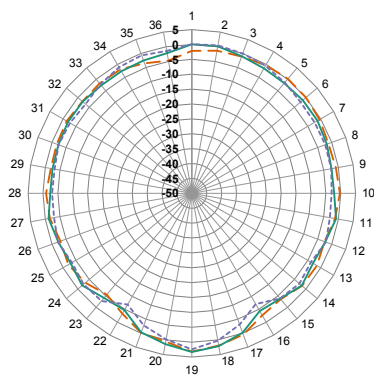
Figure 16. Radiation Patterns for ANT-8/9-IPW1-SMA, Straight

## RADIATION PATTERNS - EDGE-BENT

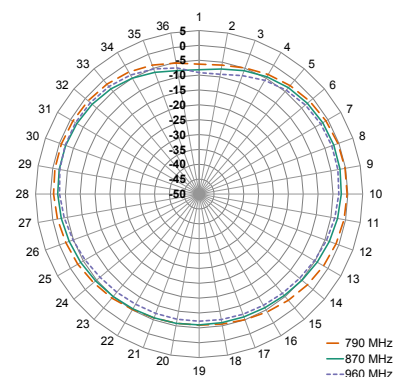
### 791 MHz TO 960 MHz (870 MHz)



XZ-Plane Gain

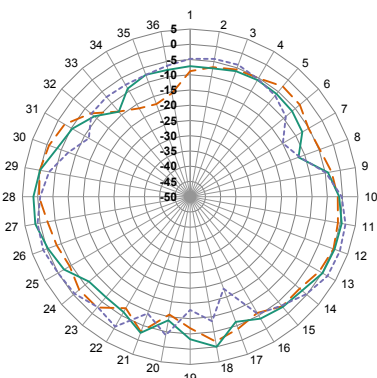


YZ-Plane Gain

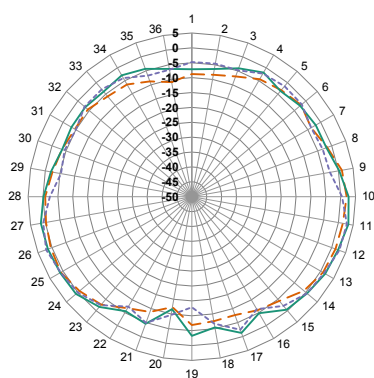


XY-Plane Gain

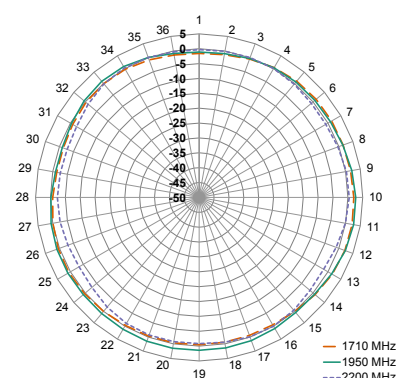
### 1710 MHz TO 2200 MHz (1950 MHz)



XZ-Plane Gain

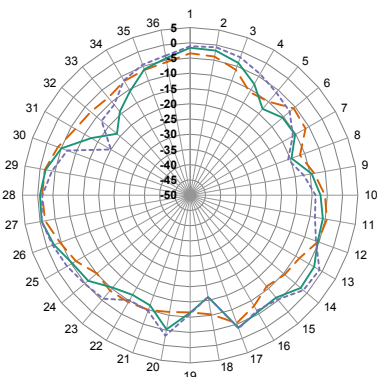


YZ-Plane Gain

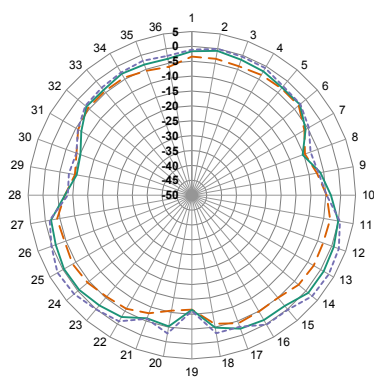


XY-Plane Gain

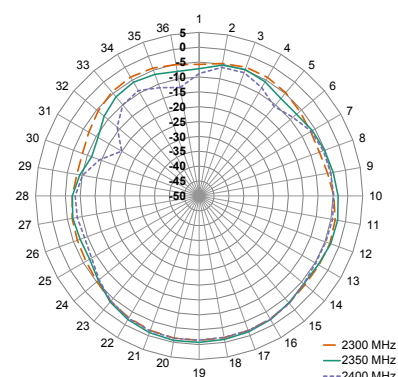
### 2300 MHz TO 2400 MHz (2350 MHz)



XZ-Plane Gain



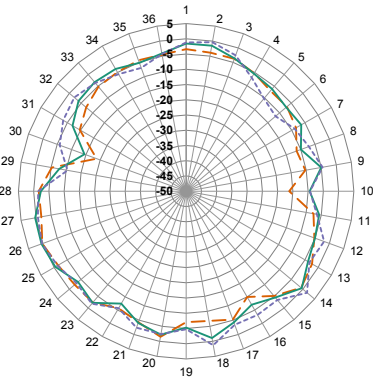
YZ-Plane Gain



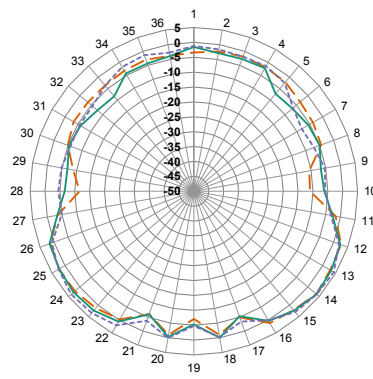
XY-Plane Gain

## RADIATION PATTERNS - EDGE-BENT

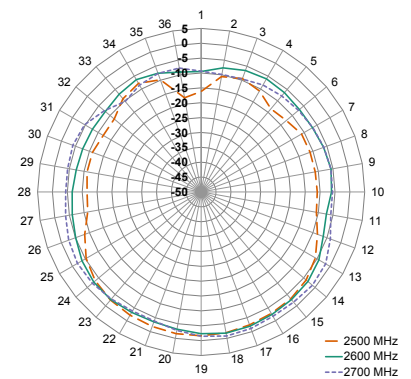
### 2496 MHz TO 2690 MHz (3620 MHz)



XZ-Plane Gain



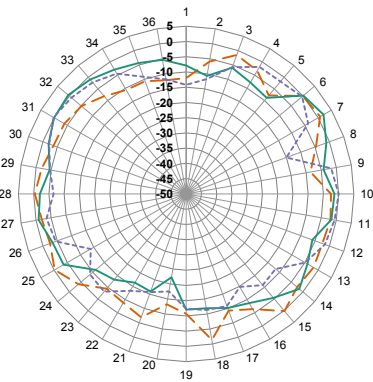
YZ-Plane Gain



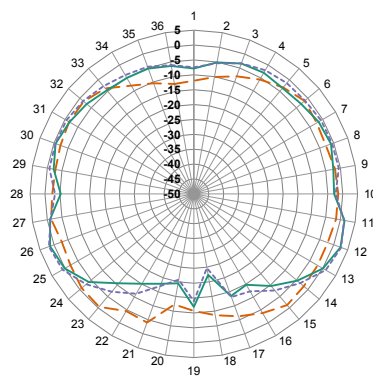
XY-Plane Gain

— 2500 MHz  
— 2600 MHz  
- - - 2700 MHz

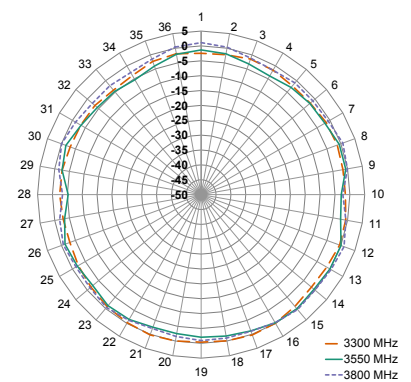
## 3300 MHz TO 3800 MHz (3550 MHz)



XZ-Plane Gain



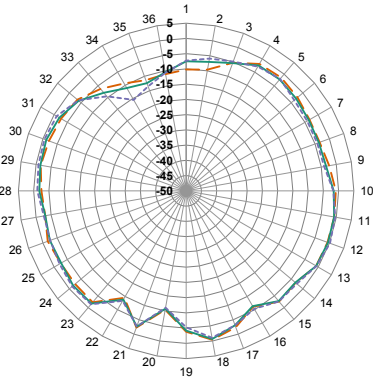
YZ-Plane Gain



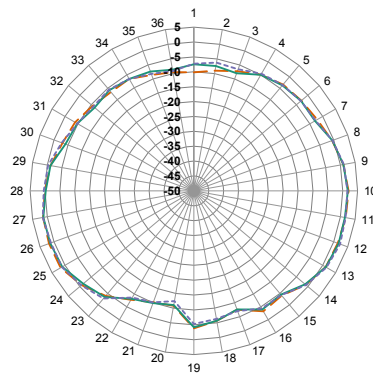
XY-Plane Gain

— 3300 MHz  
— 3550 MHz  
- - - 3800 MHz

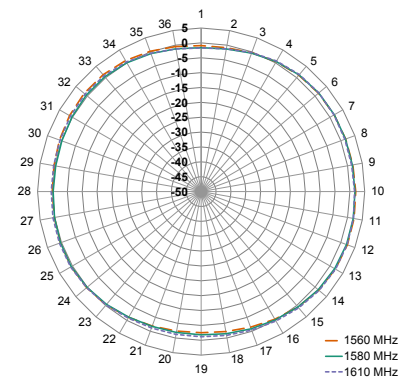
## 1553 MHz TO 1609 MHz (1580 MHz)



XZ-Plane Gain



YZ-Plane Gain



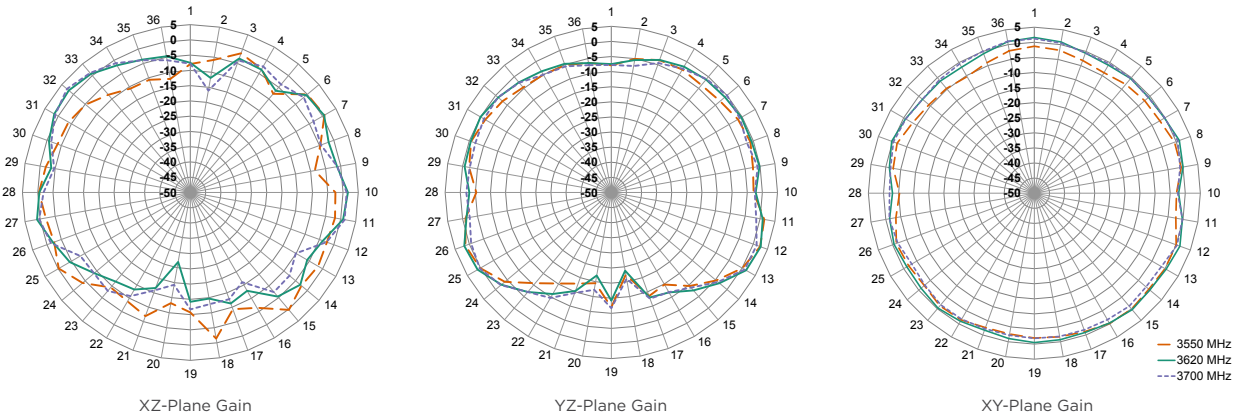
XY-Plane Gain

— 1560 MHz  
— 1580 MHz  
- - - 1610 MHz

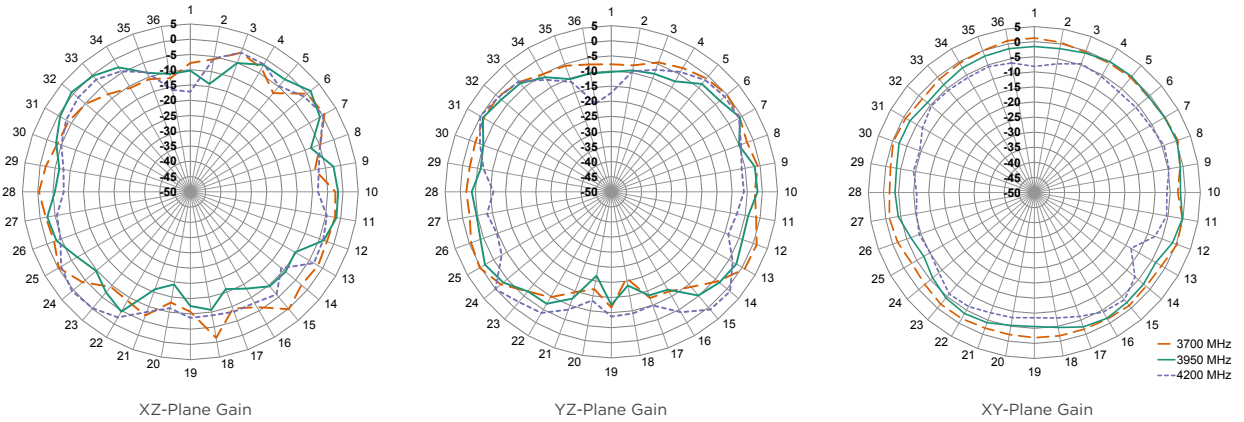


## RADIATION PATTERNS - EDGE-BENT

### 3550 MHz TO 3700 MHz (3620 MHz)



### 3700 MHz TO 4200 MHz (3950 MHz)



### 4940 MHz TO 4990 MHz (4960 MHz)

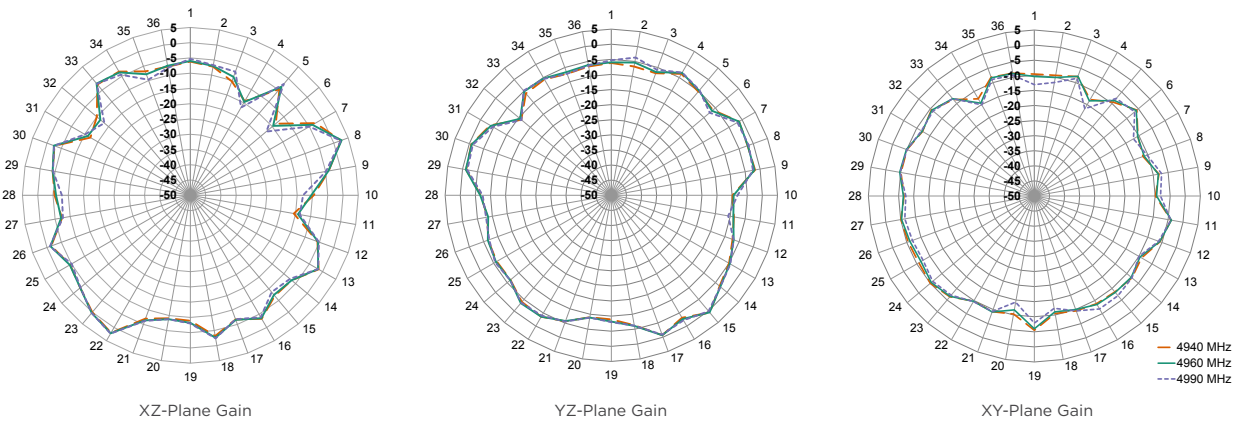


Figure 16. Radiation Patterns for ANT-5GWWS1-SMA, Edge-Bent