

## WRT Series 916 MHz External Panel-Mount Antenna

The ANT-916-WRT is a low-profile, panel-mount dipole antenna designed for low-power, wide-area (LPWA) applications including LoRaWAN®, remote controls, and ISM band applications in the 902 MHz to 930 MHz range.

The ANT-916-WRT antenna's compact size and tamper-resistant design allow it to be mounted securely in enclosures requiring added security such as wireless vending, security, traffic and power equipment.

The ANT-916-WRT antenna is designed with an integrated counterpoise that eliminates the need for additional ground plane in the product making it ideal for applications with non-conductive or RF transparent enclosures.

The antenna connects to the radio via SMA plug (male pin), RP-SMA plug (female socket), or MHF1/U.FL-type plug (female socket) on RG-174 coaxial cable or 1.32 mm coaxial cable with the U.FL connector.



### Features

- Performance at 916 MHz
  - VSWR:  $\leq 1.5$
  - Peak Gain: 4.4 dBi
  - Efficiency: 50%
- Low-profile
  - Height: 10.0 mm (0.40 in)
  - Diameter: 19.0 mm (0.75 in)
- Tamper resistant design mounts permanently with pressure sensitive adhesive ring and provided hex nut
- Available with SMA plug (male pin), RP-SMA plug (female socket) or MHF1/U.FL-type plug (female socket)

### Applications

- Low-power, wide-area (LPWA) applications
  - LoRaWAN®
- ISM applications
- Remote control, sensing and monitoring
  - Security systems
  - Industrial machinery
  - Automated equipment
  - AMR (automated meter reading)
- Internet of Things (IoT) devices
- Smart Home networking

### Ordering Information

Part Number	Description
<b>ANT-916-WRT-SMA</b>	916 MHz antenna with an SMA plug (male pin) on 216 mm (8.5 in) of RG-174 coaxial cable
<b>ANT-916-WRT-RPS</b>	916 MHz antenna with an RP-SMA plug (female socket) on 216 mm (8.5 in) of RG-174 coaxial cable
<b>ANT-916-WRT-UFL</b>	916 MHz antenna with an MHF1/U.FL-type plug (female socket) on 216 mm (8.5 in) of 1.32 mm coaxial cable

Table 1. Electrical Specifications

ANT-916-WRT	916 MHz		
Frequency Range	902 MHz to 930 MHz		
VSWR (max)	1.5		
Peak Gain (dBi)	4.4		
Average Gain (dBi)	-3.2		
Efficiency (%)	50		
Polarization	Linear	Radiation	Omnidirectional
Impedance	50 Ω	Max Power	5 W
Wavelength	1/2-wave	Electrical Type	Dipole

Electrical specifications and plots measured with a 102 mm x 102 mm (4.0 in x 4.0 in) reference ground plane.

Table 2. Mechanical Specifications

ANT-916-WRT	
Operating Temp. Range	-40 °C to +90 °C
Weight	12.5 g (0.44 oz)
Connection	216 mm (8.5 in) RG-174 terminated in an SMA plug (male pin) 216 mm (8.5 in) RG-174 terminated in an RP-SMA plug (female socket) 216 mm (8.5 in) 1.32 mm coaxial cable terminated in an MHF1/U.FL-type plug (female socket)
Dimensions	Height: 10.0 mm (0.40 in) Diameter: 19.0 mm (0.75 in)

### Packaging Information

The ANT-916-WRT antenna is placed in a clear plastic sleeve and sealed in clear plastic bags in quantities of 50 pcs. Bags are packaged in cartons of 250 (5 bags). Distribution channels may offer alternative packaging options.

### Product Dimensions

Figure 1 provides dimensions for the ANT-916-WRT antenna.

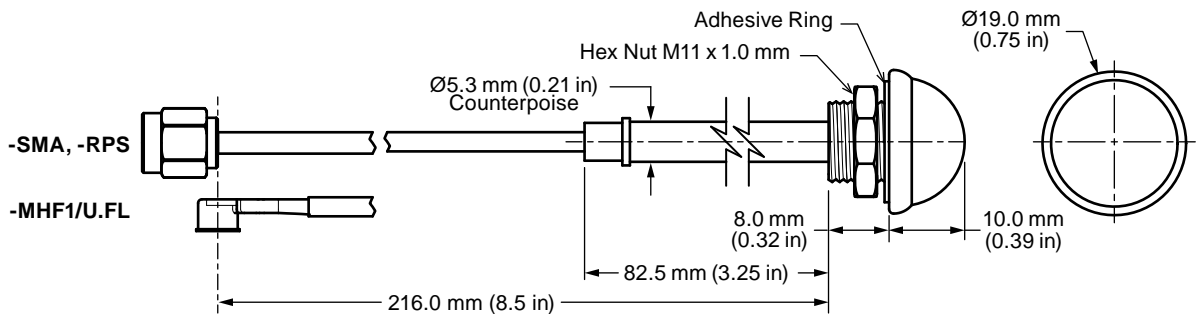


Figure 1. ANT-916-WRT Antenna Dimensions

### Recommended Mounting

The recommended enclosure mounting dimensions are shown in Figure 2. The ANT-916-WRT series antenna is supplied with an integrated closed-cell pressure sensitive adhesive ring which helps seal enclosures against external elements. The adhesive ring has a protective plastic backing that must be removed prior to installation. A pull tab has been provided for easy removal of the protective backing. The antenna can be permanently mounted using the provided hex nut which should be tightened to 3.0 kgf/cm (5 in/lbs) max. The recommended maximum enclosure wall thickness is 3.18 mm (0.125 in).

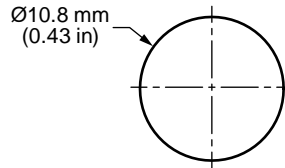


Figure 2. ANT-916-WRT Series Antenna Recommended Enclosure Mounting Dimensions

### Antenna Orientation

The ANT-916-WRT series antenna is characterized in two antenna orientations as shown in Figure 3. The antenna 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, and with the antenna in free space characterizes use of an antenna attached to an enclosure-mounted connector which is connected by cable to a printed circuit board. The two orientations represent the most common end-product use cases.

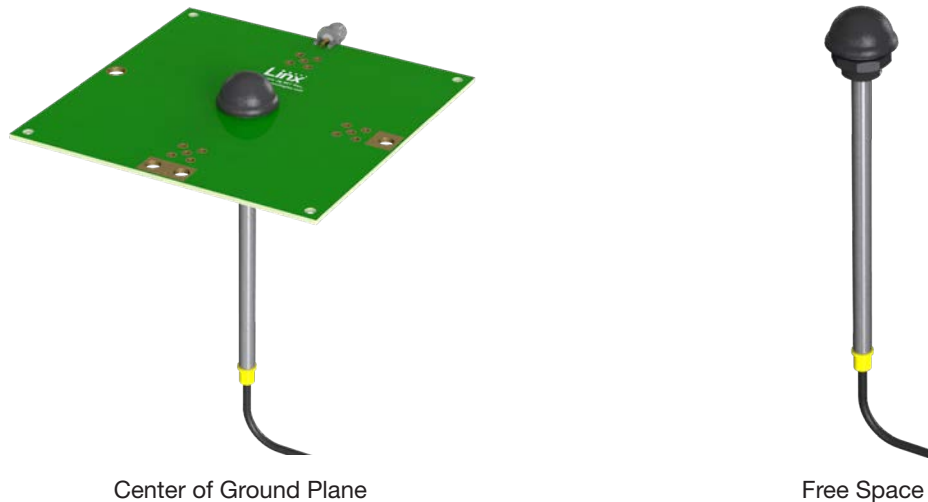


Figure 3. ANT-916-WRT Test Orientations

### Center of Ground Plane

The charts on the following pages represent data taken with the antenna oriented at the center of the ground plane, as shown in Figure 4.

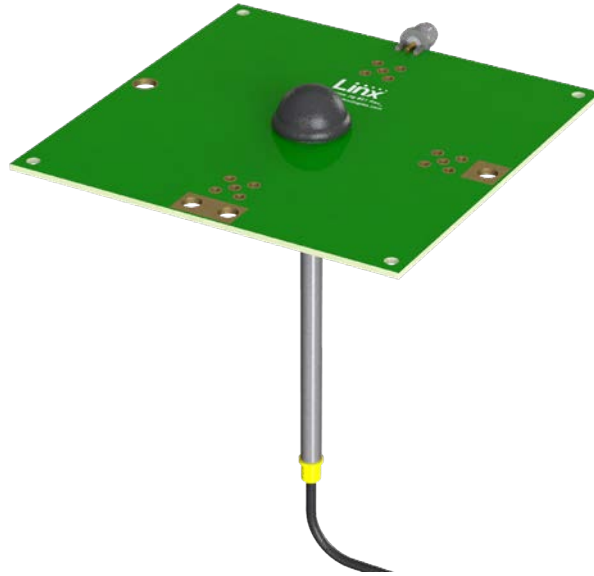


Figure 4. ANT-868-WRT at Center of Ground Plane

### VSWR

Figure 5 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.

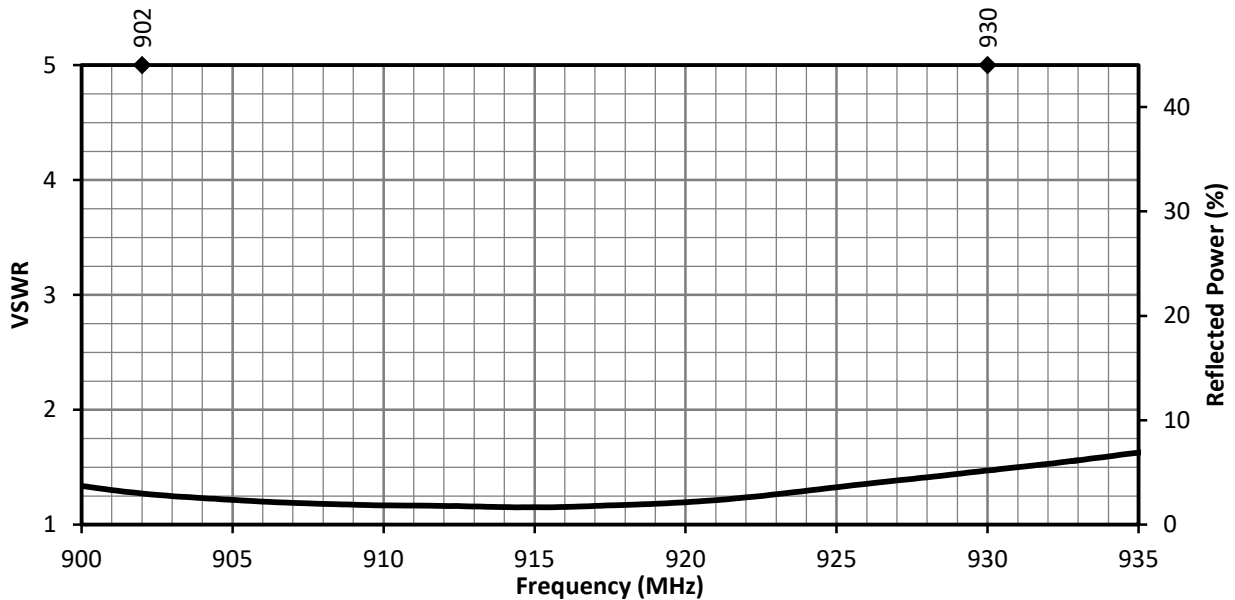


Figure 5. ANT-916-WRT VSWR , Center of Ground Plane

### Return Loss

Return loss (Figure 6), 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.

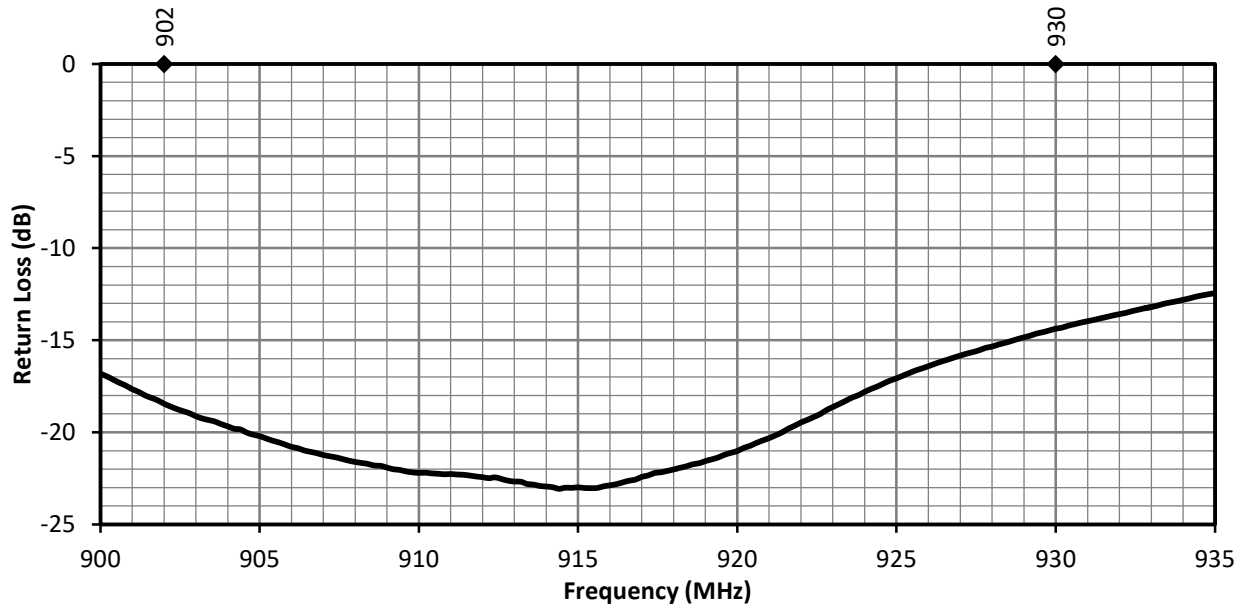


Figure 6. ANT-916-WRT Return Loss , Center of Ground Plane

### Peak Gain

The peak gain across the antenna bandwidth is shown in Figure 7. 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.

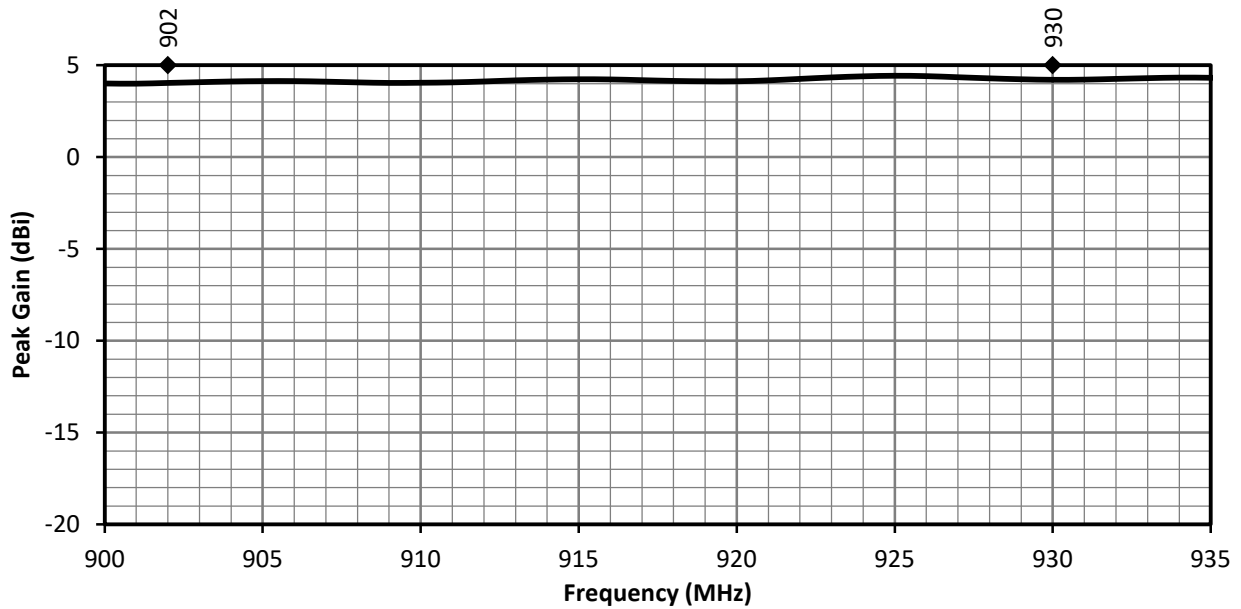


Figure 7. ANT-916-WRT Peak Gain , Center of Ground Plane

### 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.

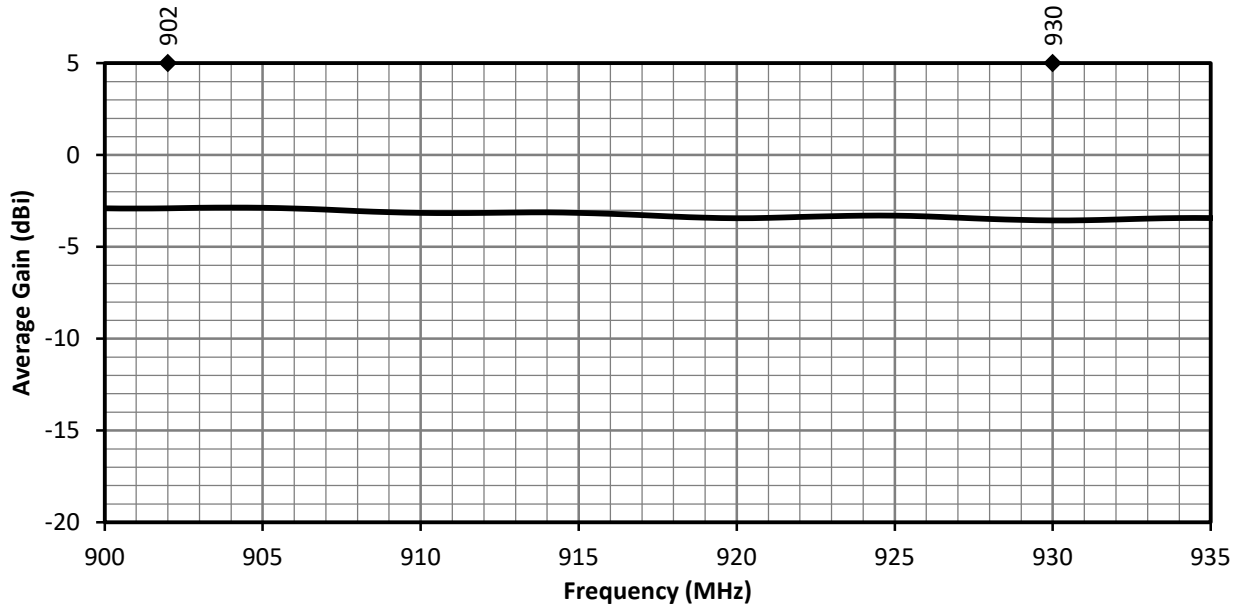


Figure 8. ANT-916-WRT Antenna Average Gain , Center of Ground Plane

### Radiation Efficiency

Radiation efficiency (Figure 9), 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.

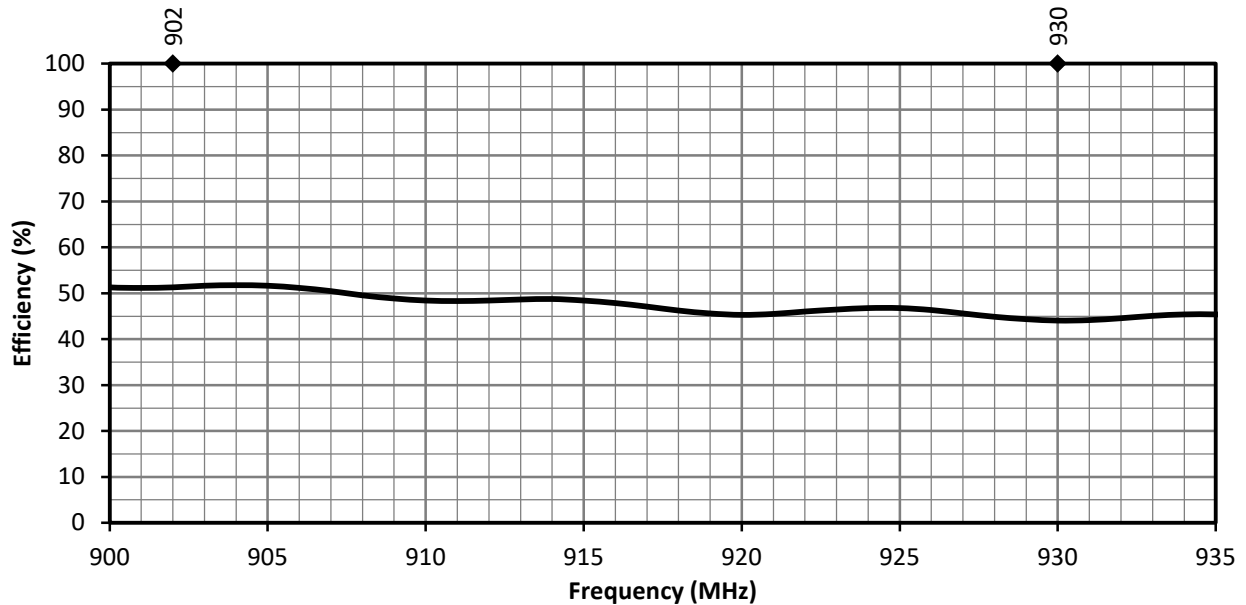
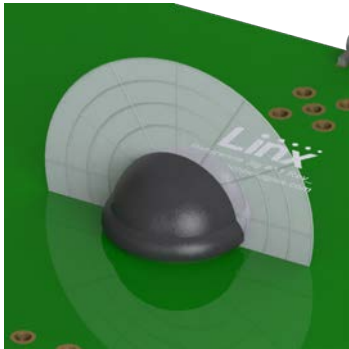


Figure 9. ANT-916-WRT Antenna Radiation Efficiency , Center of Ground Plane

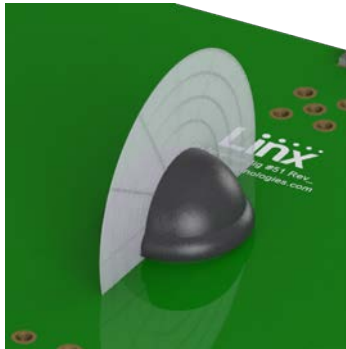
### Radiation Patterns

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 are shown in Figure 10 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.

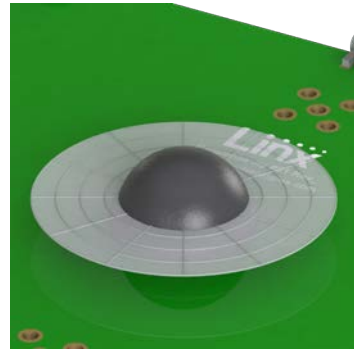
### Radiation Patterns - Center of Ground Plane



XZ-Plane Gain

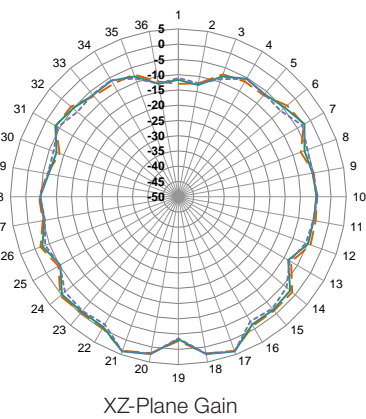


YZ-Plane Gain

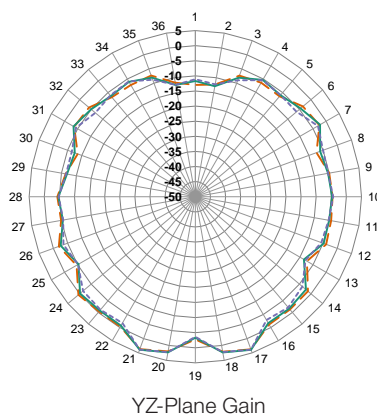


XY-Plane Gain

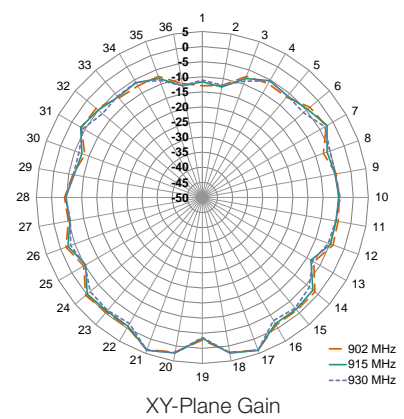
### 902 MHz to 930 MHz (915 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

Figure 10. ANT-916-WRT Radiation Patterns , Center of Ground Plane

### Free Space, No Ground Plane

The charts on the following pages represent data taken with the antenna oriented in free space without a ground plane, as shown in Figure 11.



Figure 11. ANT-916-WRT in Free Space, No Ground Plane

### VSWR

Figure 12 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.

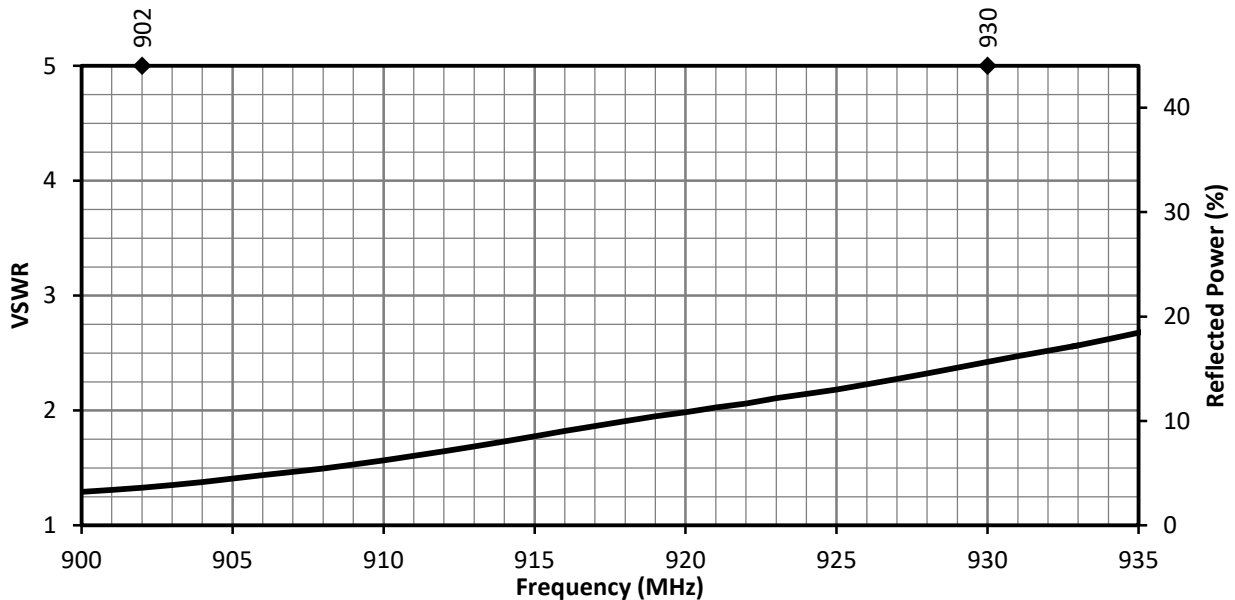


Figure 12. ANT-916-WRT VSWR , Free Space



Return Loss

Return loss (Figure 13), 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.

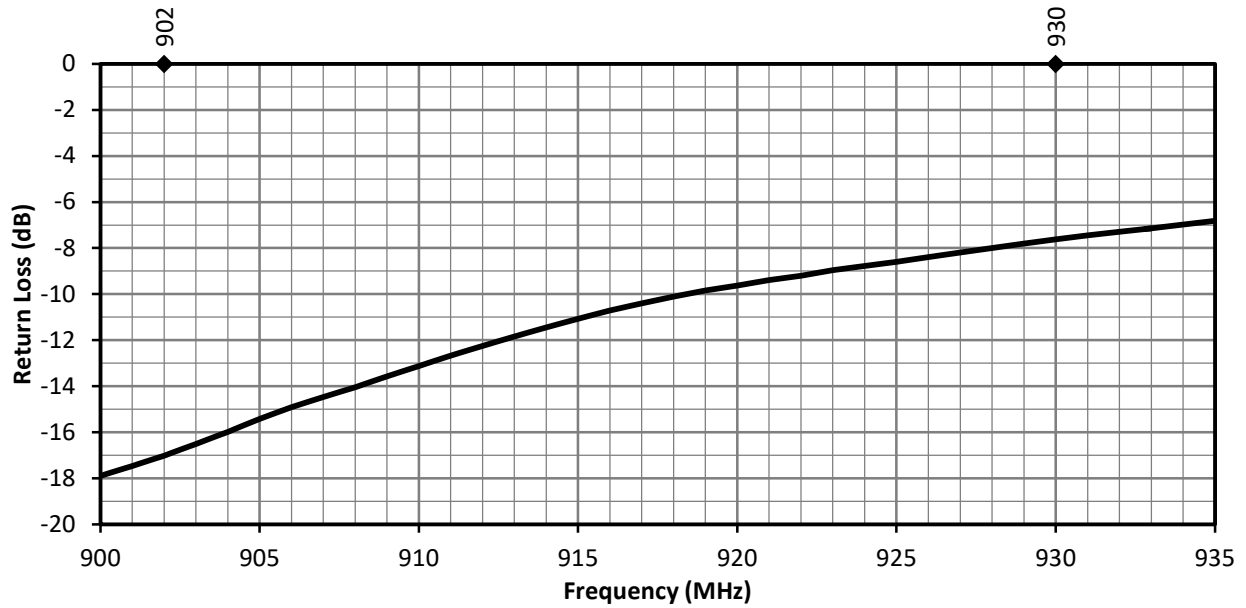


Figure 13. ANT-916-WRT Return Loss , Free Space

Peak Gain

The peak gain across the antenna bandwidth is shown in Figure 14. 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.

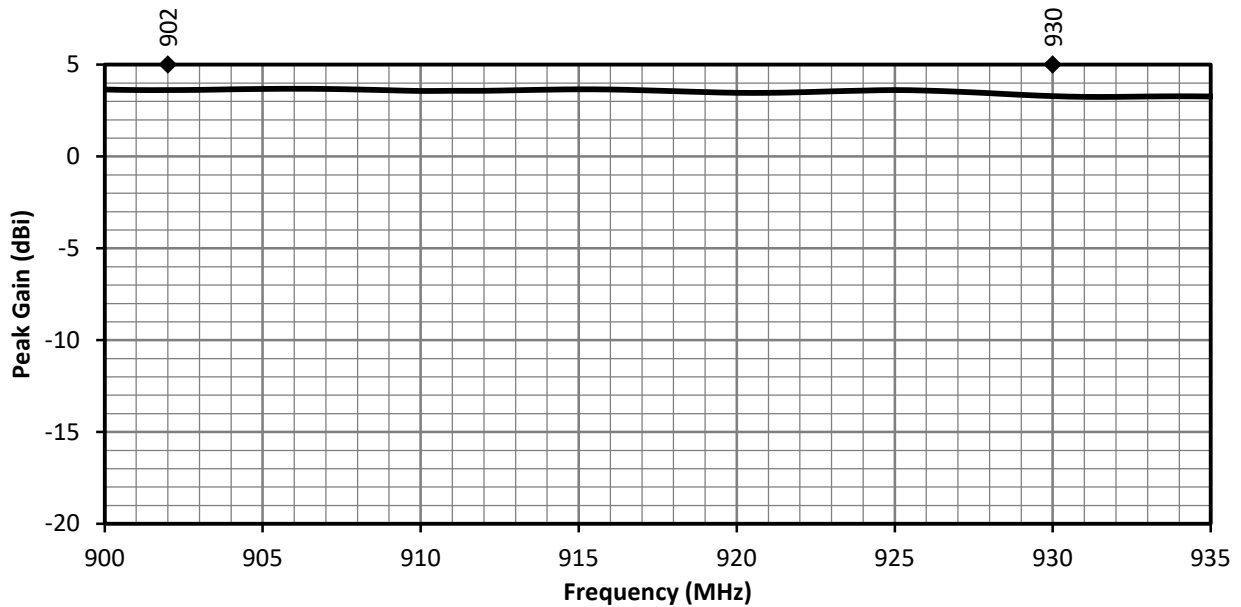


Figure 14. ANT-916-WRT Peak Gain , Free Space

### 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.

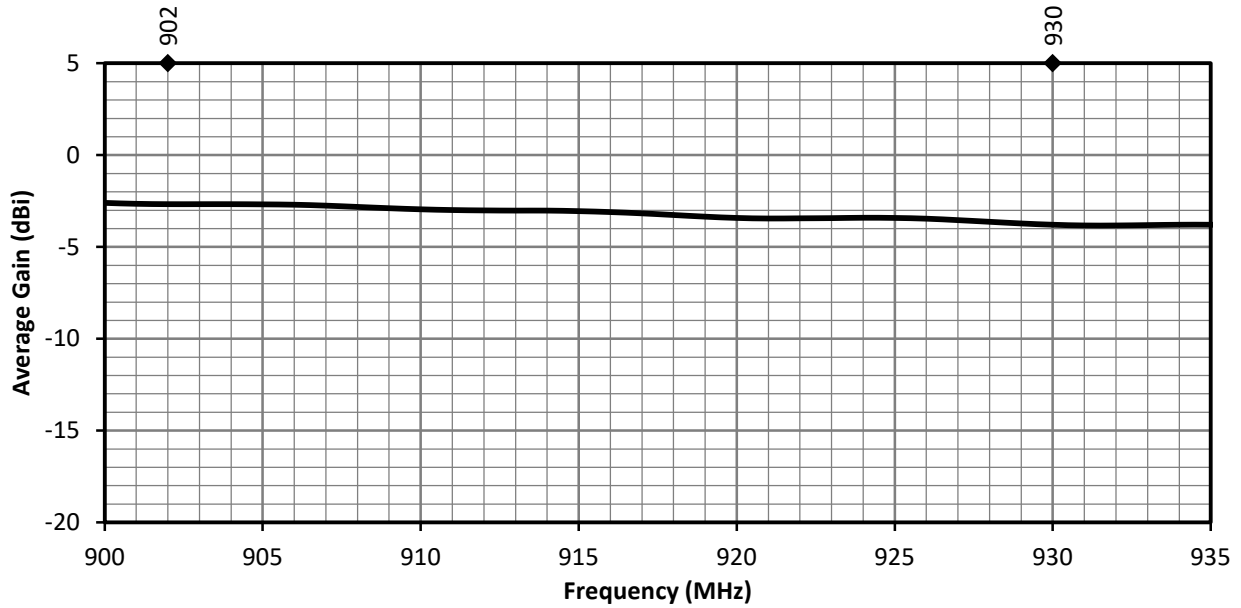


Figure 15. ANT-916-WRT Antenna Average Gain , Free Space

### Radiation Efficiency

Radiation efficiency (Figure 16), 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.

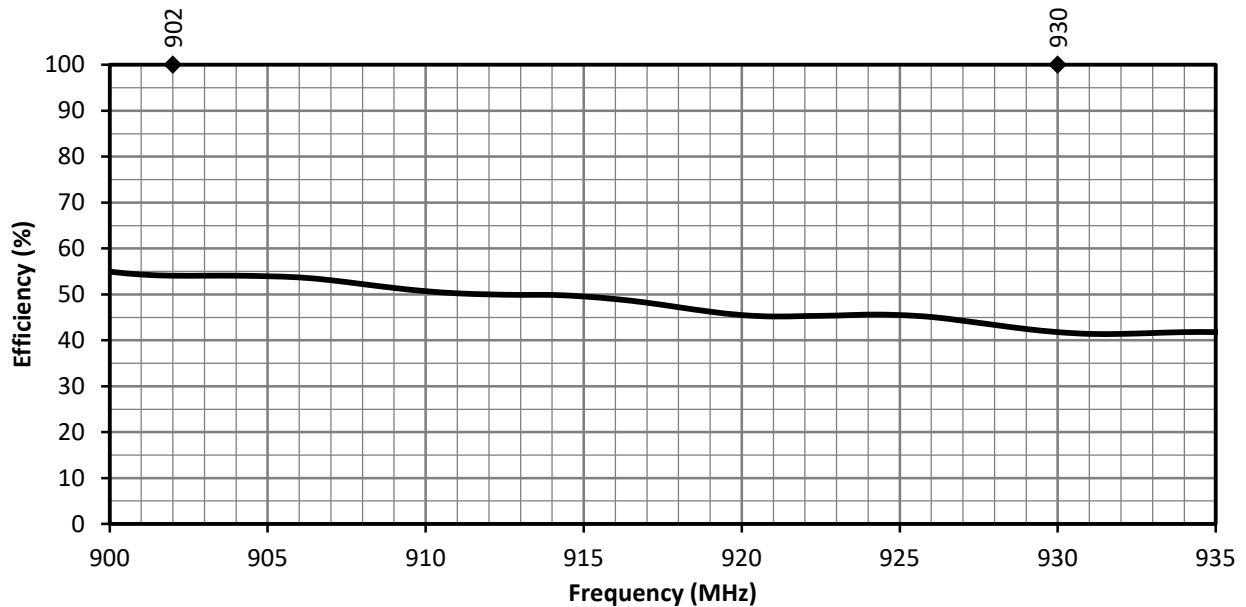


Figure 16. ANT-916-WRT Antenna Radiation Efficiency , Free Space

Datasheet

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 are shown in Figure 17 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 - Free Space



902 MHz to 930 MHz (915 MHz)

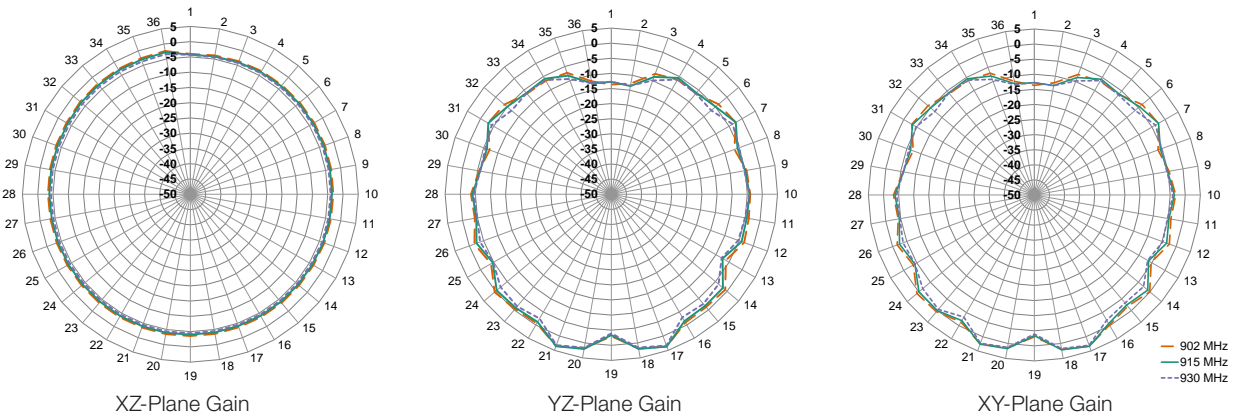


Figure 17. ANT-916-WRT Radiation Patterns , Free Space

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