Datasheet

ANT-915-IPW1-RPS
915 MHz LPWA Weatherproof Antenna

The ANT-915-IPW1-RPS antenna is a hinged-whip IP67-rated dipole antenna designed for use in 915 MHz frequency bands for low-power, wide-area (LPWA) applications such as LoRaWAN® and WiFi HaLow™ as well as ISM and remote control applications.

The ANT-915-IPW1-RPS provides a ground plane independent dipole antenna solution. 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 RP-SMA plug (female socket) connector.



Features

- Performance at 902 MHz to 930 MHz
  - VSWR: ≤ 1.8
  - Peak Gain: 2.7 dBi
  - Efficiency: 99%
- Hinged design with detents for straight, 45 degree and 90 degree positioning
- IP67 rated
- RP-SMA plug (female socket) connector

Applications

- Low-power, wide-area (LPWA) applications
  - LoRaWAN®
  - WiFi HaLow™ (802.11ah)
- Remote control, monitoring and sensing
- Internet of Things (IoT) devices
- ISM applications

Ordering Information

Part Number	Description
ANT-915-IPW1-RPS	Hinged whip LPWA antenna with RP-SMA plug (female socket) connector

Available from Linx Technologies and select distributors and representatives.

Table 1. Electrical Specifications

ANT-915-IPW1-RPS	915 MHz
Frequency Range	902 MHz to 930 MHz
VSWR (max.)	1.8
Peak Gain (dBi)	2.7
Average Gain (dBi)	-0.1
Efficiency (%)	99
Impedance	50 Ω
Wavelength	1/2-wave
Electrical Type	Dipole
Polarization	Linear
Radiation	Omnidirectional
Max Power	2 W

Electrical specifications and plots measured with the antenna at the edge of a 102 mm x 102 mm ground plane, bent 90 degrees.

Table 2. Mechanical Specifications

Parameter	Value
Connection	RP-SMA plug (female socket)
Operating Temperature Range	-30 °C to +70 °C
Ingress Protection Rating (IP)	IP67 rated
Antenna Color	Black
Weight	24.9 g (0.88 oz)
Dimensions	203.0 mm x 13.2 mm x 13.2 mm (7.99 in x 0.52 in x 0.52 in)

Product Dimensions

Figure 1 provides dimensions of the ANT-915-IPW1-RPS. 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.

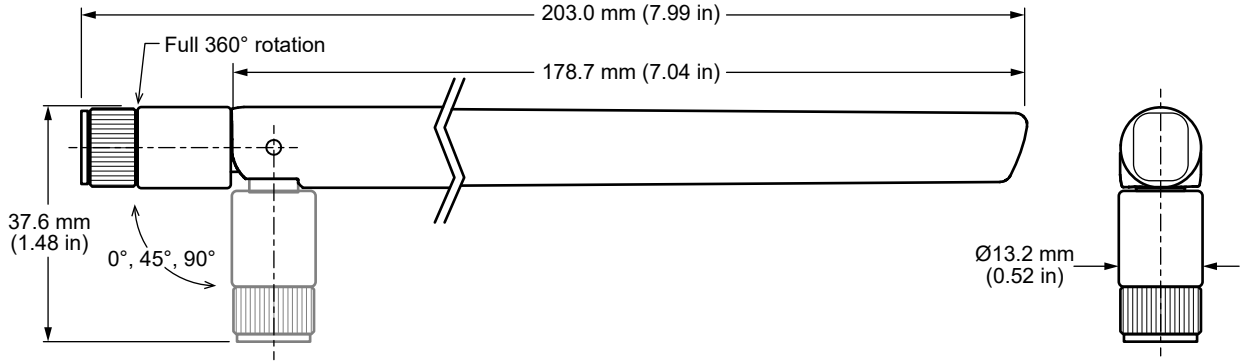


Figure 1. ANT-915-IPW1-RPS Antenna Dimensions

IP (Ingress Protection) Rating

An ingress protection rating (IP rating) refers to the capability of a device to withstand the ingress of dust and/or water under specified conditions. IP rating is typically reserved for marketable product (device) rather than constituent components because design and assembly may affect performance of the device under testing. IP-rated antennas are designed to support the specified level of ingress protection and may be tested in a standalone configuration, however IP testing should be performed on the complete end product to ensure desired performance.

Packaging Information

The ANT-915-IPW1-RPS antenna is packaged in a plastic bag. Distribution channels may offer alternative packaging options.

LPWA: LoRaWAN® and Sigfox®

LoRaWAN and Sigfox LPWA technologies operate within several of the frequencies supported by the 915-IPW1-RPS antenna. Notably, LoRaWAN operates at the frequency bands shown in Table 3. Sigfox operates at different frequencies determined by country (Table 4).

Table 3. LoRaWAN® Channel plan

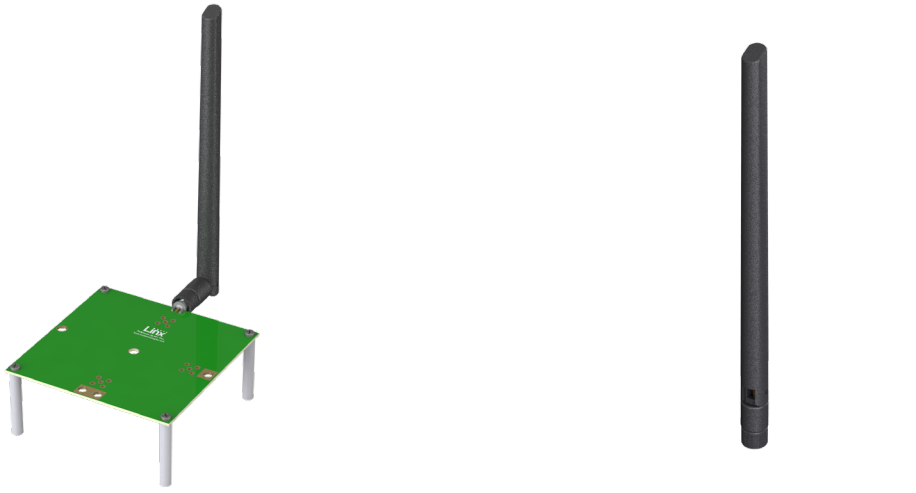
Frequency Band	LoRaWAN Channel Plan
779 MHz to 787 MHz	CN779-787
865 MHz to 867 MHz	IN765-867
868 MHz to 873 MHz	EU863-870
902 MHz to 928 MHz	US902-928, AS923
915 MHz to 928 MHz	AU915-928
917 MHz to 923.5 MHz	KR920-923

Table 4. Sigfox® Frequencies by Country/Region

Center Frequency	Select Countries/Regions
868 MHz	Europe
902 MHz	USA, Mexico, Brazil
920 MHz	Australia
923 MHz	Japan

Antenna Orientation

The ANT-915-IPW1-RPS 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.



On edge of ground plane, bent 90 degrees Straight, without ground plane

Figure 2. ANT-915-IPW1-RPS Antenna on Evaluation PCB

Edge of Ground Plane

The charts on the following pages represent data taken with the antenna oriented at the edge of the ground plane, bent 90 degrees as shown in Figure 3.

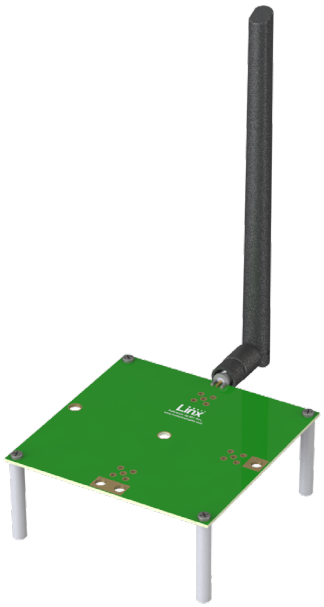


Figure 3. ANT-915-IPW1-RPS at Edge of Ground Plane, Bent 90 Degrees (Edge Bent)

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.

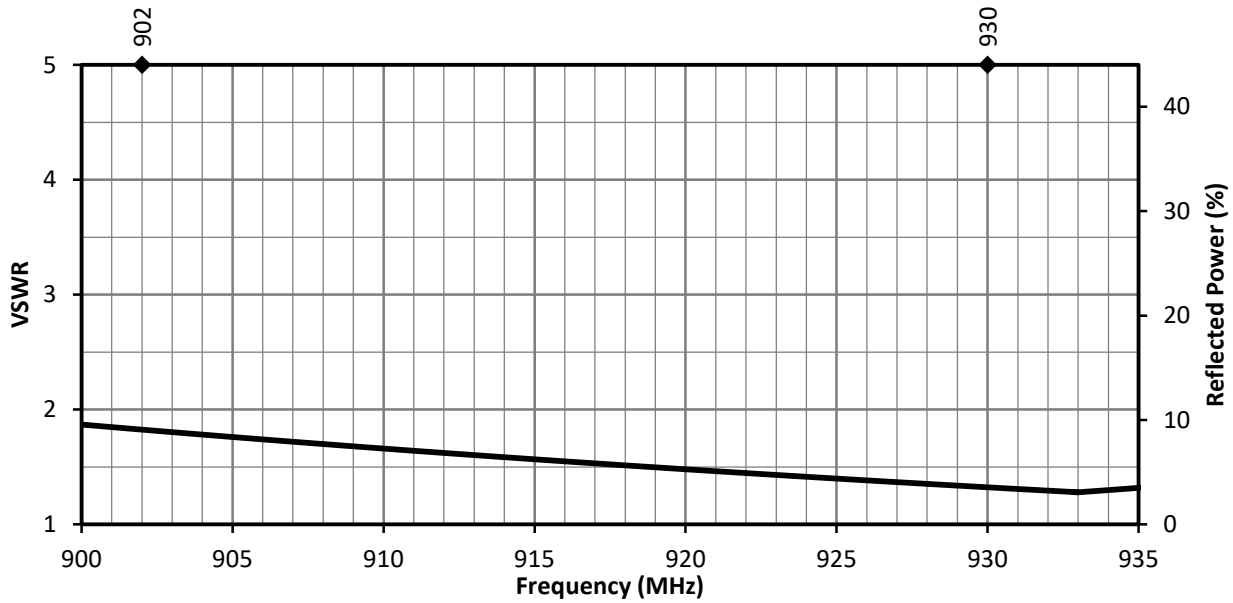


Figure 4. ANT-915-IPW1-RPS Antenna VSWR, Edge Bent

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.

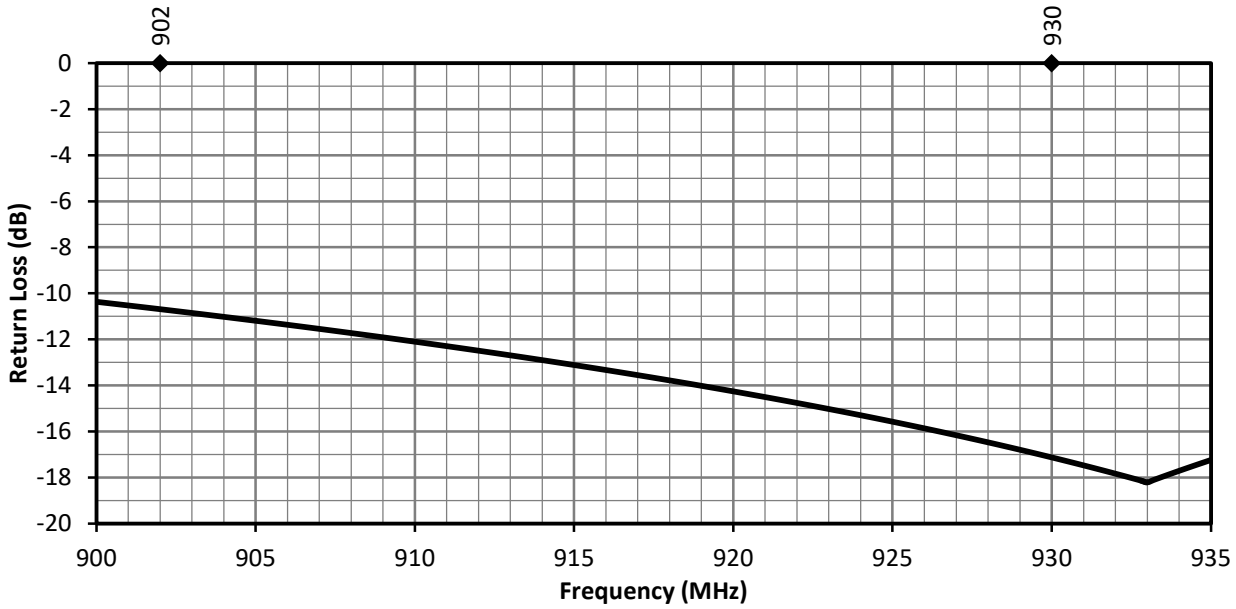


Figure 5. ANT-915-IPW1-RPS Antenna Return Loss, Edge Bent

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.

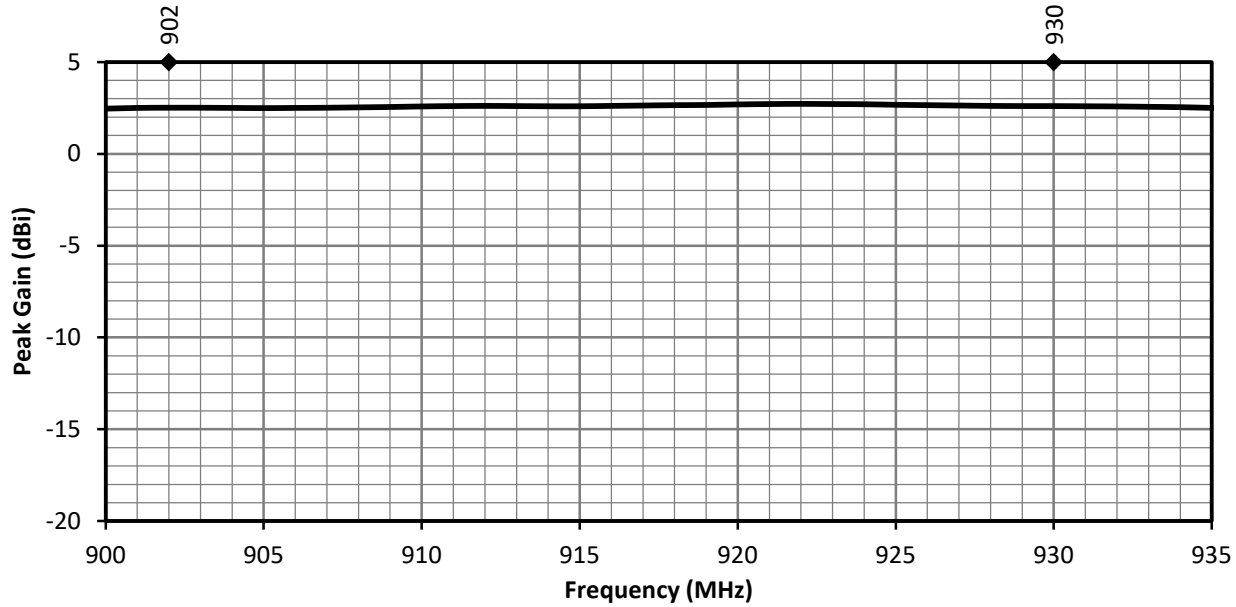


Figure 6. ANT-915-IPW1-RPS Antenna Peak Gain, Edge Bent

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.

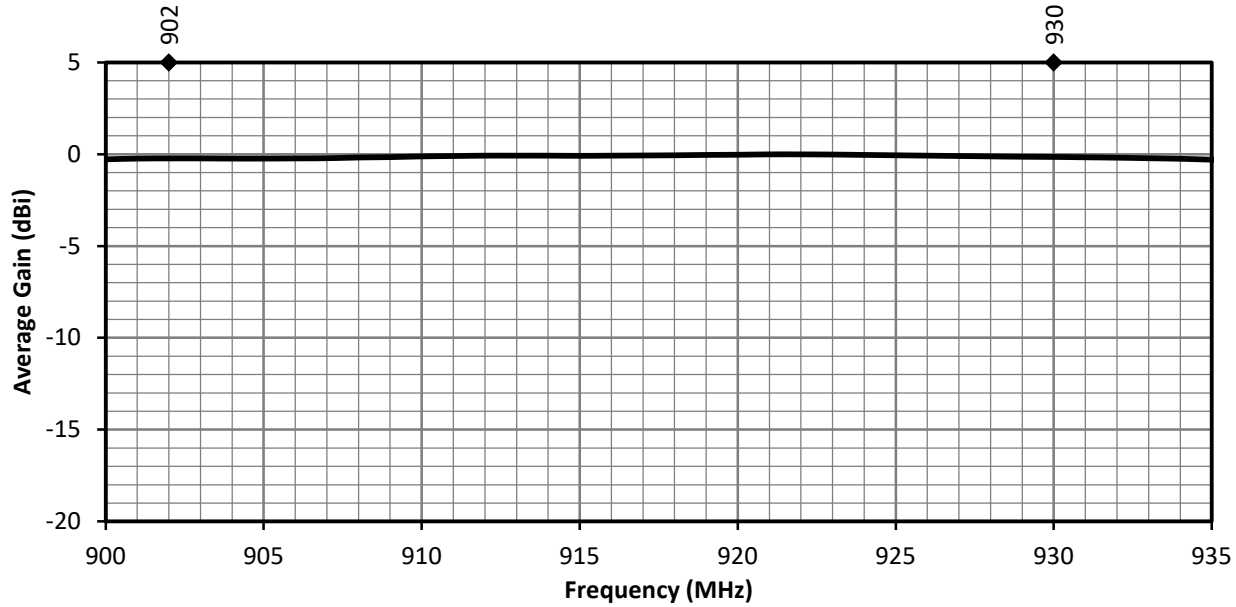


Figure 7. ANT-915-IPW1-RPS Antenna Average Gain, Edge Bent

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.

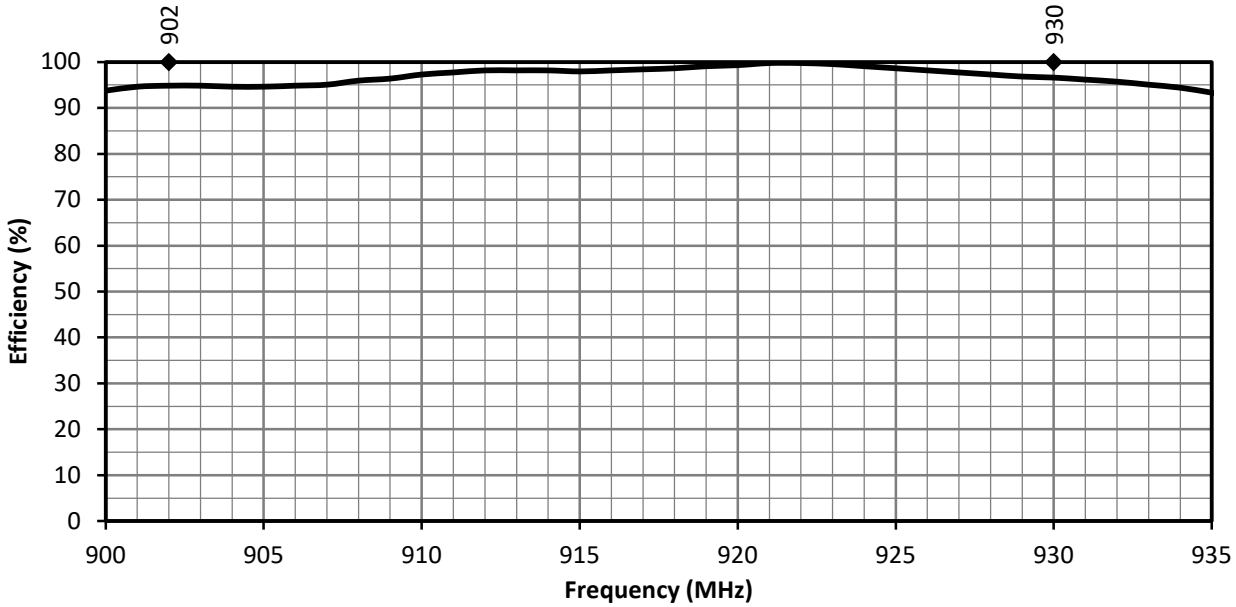
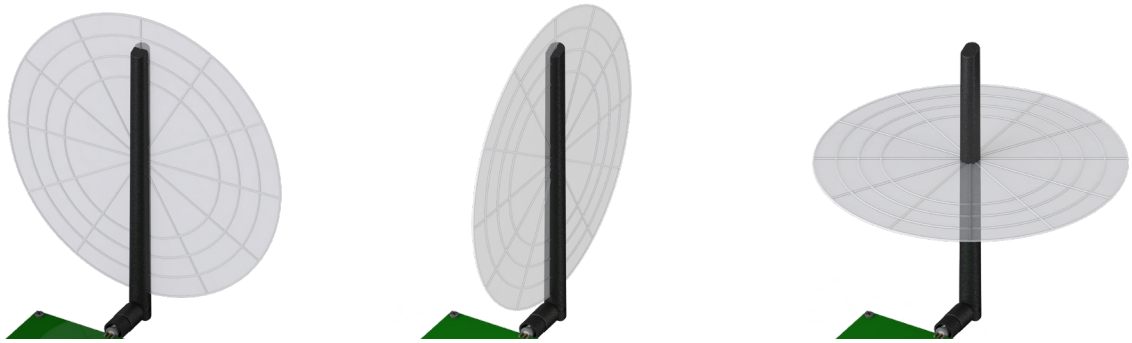


Figure 8. ANT-915-IPW1-RPS Antenna Radiation Efficiency, Edge Bent

Radiation Patterns

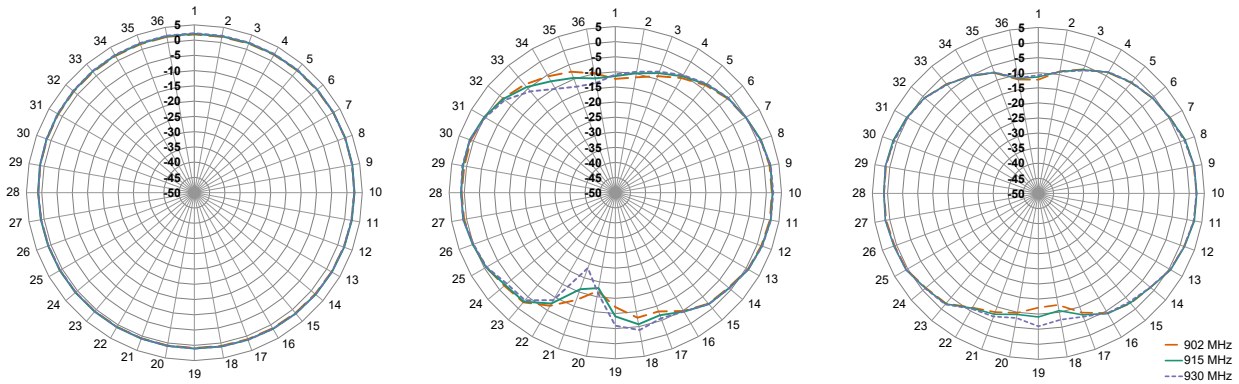
Radiation patterns provide information about the directionality and 3-dimensional gain performance of the antenna by plotting gain at specific frequencies in three orthogonal planes. Antenna radiation patterns for an orientation at the center of the ground plane are shown in Figure 9 using polar plots 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 - Edge of Ground Plane, Bent 90 egrees



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 9. Radiation Patterns for ANT-915-IPW1-RPS, Edge Bent

Straight, No Ground Plane

The charts on the following pages represent data taken with the antenna oriented straight as shown in Figure 10.



Figure 10. ANT-915-IPW1-RPS Straight, No Ground Plane (Straight)

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.

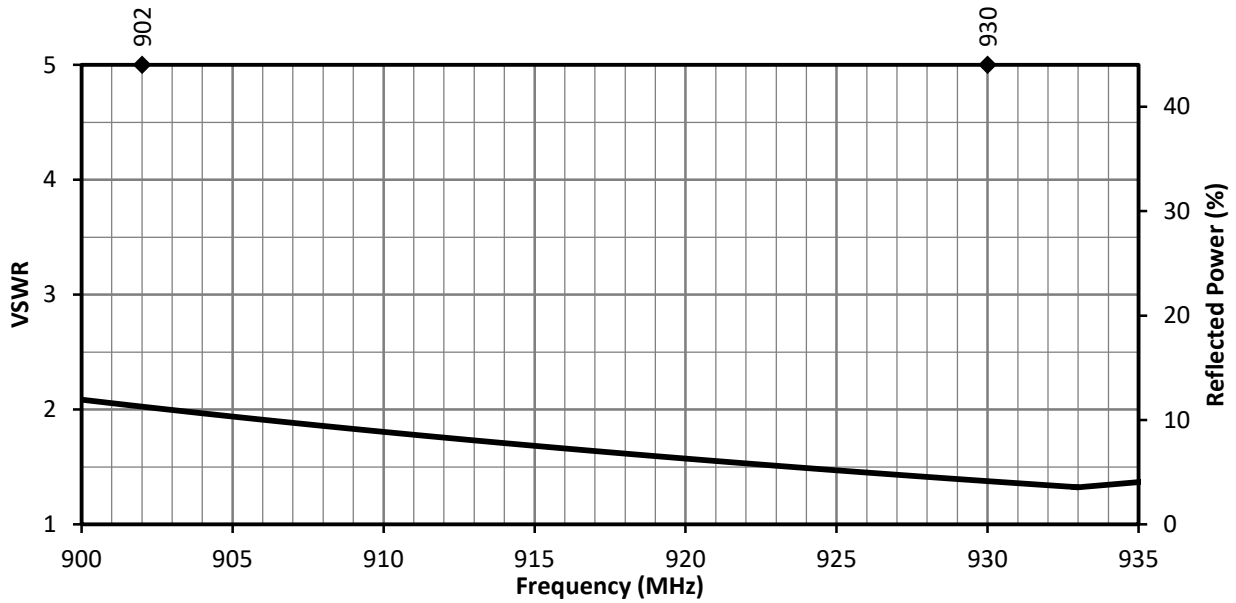


Figure 11. ANT-915-IPW1-RPS Antenna VSWR, Straight

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.

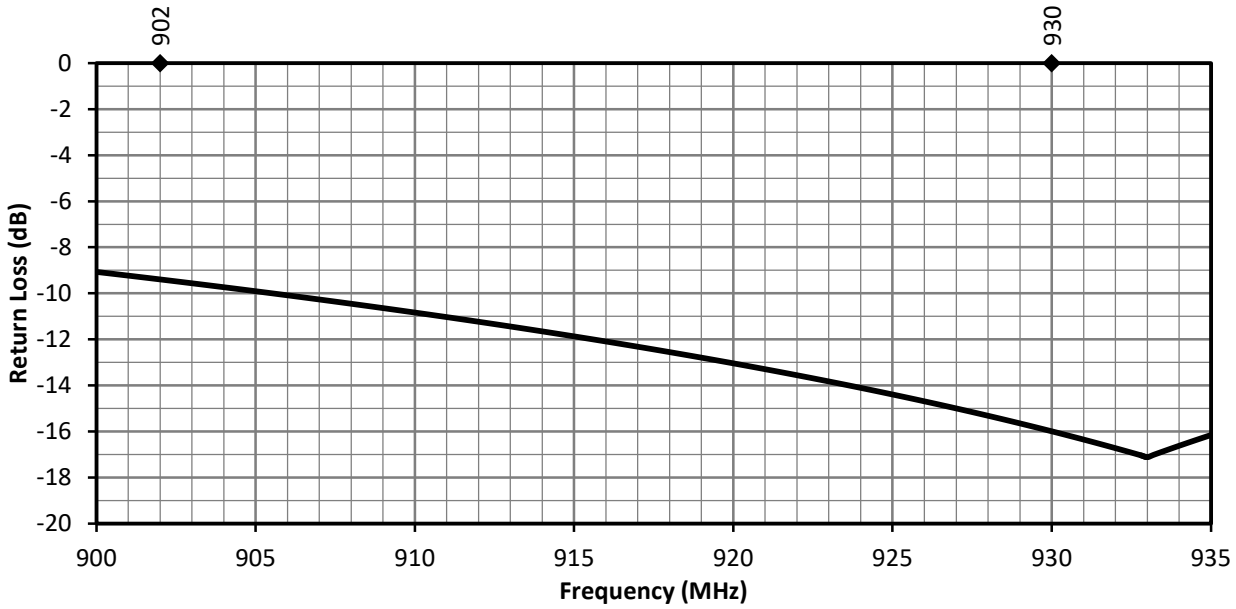


Figure 12. ANT-915-IPW1-RPS Antenna Return Loss, Straight

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.

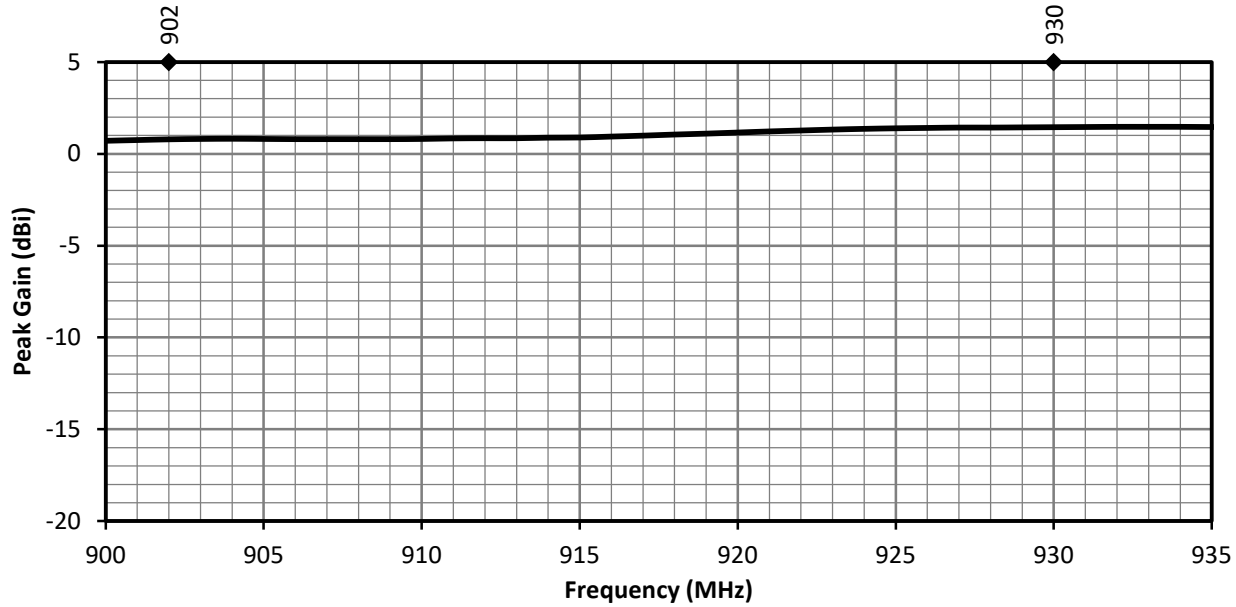


Figure 13. ANT-915-IPW1-RPS Antenna Peak Gain, Straight

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.

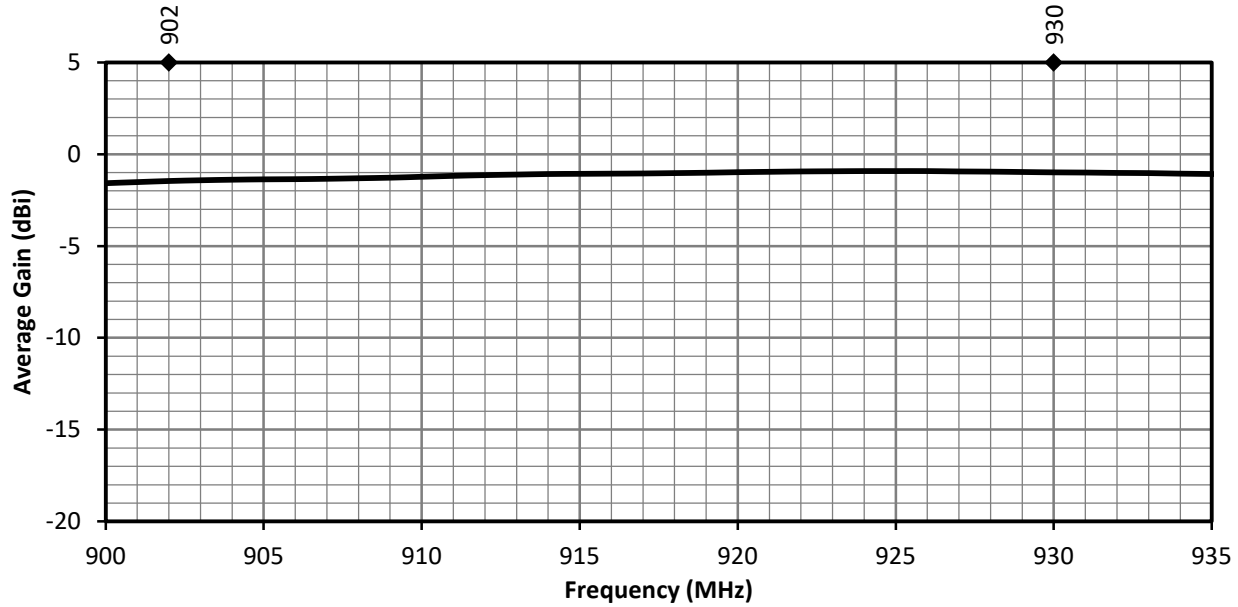


Figure 14. ANT-915-IPW1-RPS Antenna Average Gain, Straight

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.

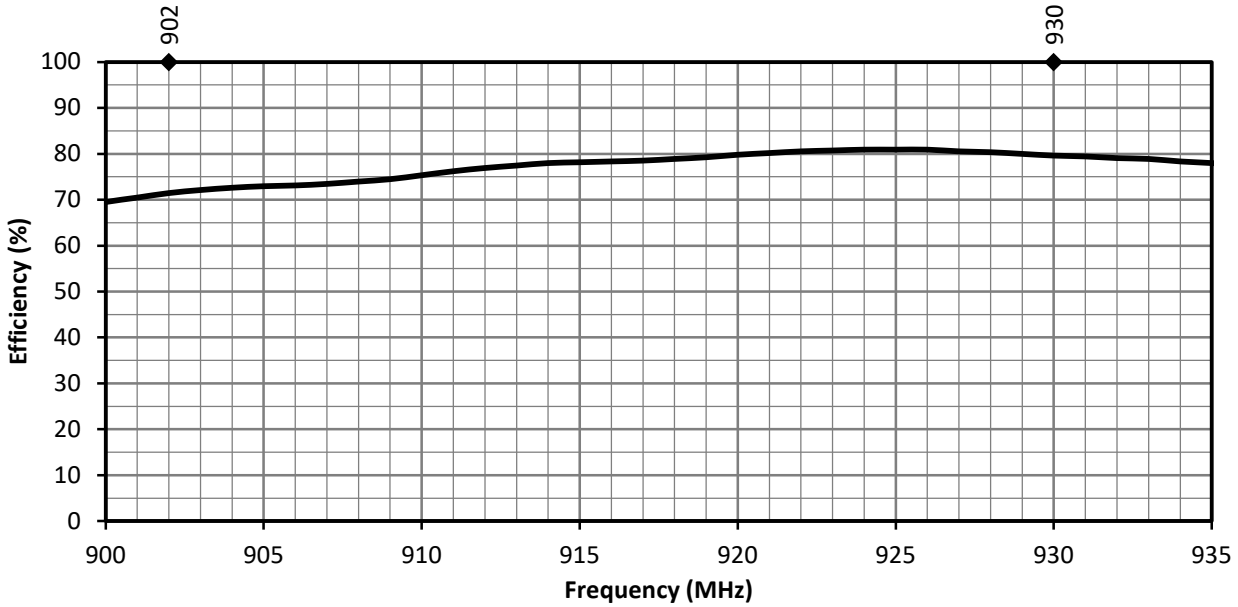


Figure 15. ANT-915-IPW1-RPS Antenna Radiation Efficiency, Straight

Radiation Patterns

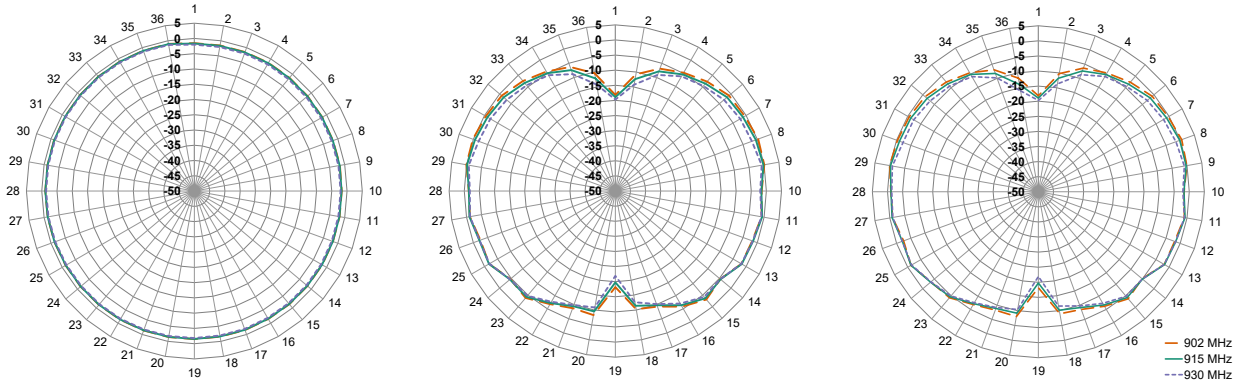
Radiation patterns provide information about the directionality and 3-dimensional gain performance of the antenna by plotting gain at specific frequencies in three orthogonal planes. Antenna radiation patterns for a free space orientation are shown in Figure 16 using polar plots covering 360 degrees. 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 - Straight, No 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 16. Radiation Patterns for ANT-915-IPW1-RPS, Straight

Packaging Information

The ANT-915-IPW1-RPS antenna is packaged in a clear plastic bag. Distribution channels may offer alternative packaging options.

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Doc# DS21277-189ANT