ANT-8/9-PW-LPN

868 MHz/915 MHz Compact LPWA Helical Antenna

The ANT-8/9-PW-LPN is a compact helical antenna designed for use in 868 MHz and 915 MHz frequency bands for low-power, wide-area (LPWA) applications such as LoRaWAN®, Sigfox® and WiFi HaLow™ as well as ISM and remote control applications.

The ANT-8/9-PW-LPN is designed for embedded, inside-the-enclosure, applications, mounting directly to a printed circuit board (PCB) using a 6-32UNC screw. By eliminating the plastic housing and the need for an RF connector on the PCB, the ANT-8/9-PW-LPN provides a low-cost but high- performing antenna solution.

FEATURES

- Performance at 862 MHz to 876 MHz
  - VSWR: ≤ 2.5
  - Peak Gain: 5.8 dBi
  - Efficiency: 84%
- Performance at 902 MHz to 930 MHz
  - VSWR: ≤ 1.7
  - Peak Gain: 6.8 dBi
  - Efficiency: 82%
- Compact size
  - Height 46.9 mm (1.85 in)
  - Diameter 6.0 mm (0.23 in)
- Omnidirectional radiation pattern
- Antenna mounts using provided 6-32UNC machine screw

APPLICATIONS

- Low-power, wide-area (LPWA) applications
  - LoRaWAN® (ITU-T Y.4480)
  - Sigfox®
  - WiFi HaLow™ (802.11ah)
- Remote control, sensing and monitoring
  - Security systems
  - Industrial machinery
  - Automated equipment
  - AMR (automated meter reading)
- Internet of Things (IoT) devices
- ISM applications

ORDERING INFORMATION

Part Number	Description
ANT-8/9-PW-LPN	868/915 MHz LPWA helical antenna with 6-32UNC screw-mount connection

Available from Linx Technologies and select distributors and representatives.

TABLE 1. ELECTRICAL SPECIFICATIONS

ANT-8/9-PW-LPN	868 MHz	915 MHz
Frequency Range	862 MHz to 876 MHz	902 MHz to 930 MHz
VSWR (max.)	2.5	1.7
Peak Gain (dBi)	5.8	6.8
Average Gain (dBi)	-0.9	-0.9
Efficiency (%)	84	82

Polarization	Linear	Radiation	Omnidirectional
Max Power	15 W	Wavelength	1/4-wave
Electrical Type	Monopole	Impedance	50 Ω

Electrical specifications and plots measured at the edge of a ground plane (40 mm x 80 mm).

TABLE 2. MECHANICAL SPECIFICATIONS

Parameter	Value
Connection	Screw mount 6-32UNC
Dimensions	46.9 mm x Ø6.0 mm (1.85 in x Ø0.23 in)
Weight	4.5 g (0.16 oz)
Operating Temp. Range	-40 °C to +85 °C

PACKAGING INFORMATION

The ANT-8/9-PW-LPN antenna is sealed in protective trays of 90 pcs. Distribution channels may offer alternative packaging options.

PRODUCT DIMENSIONS

Figure 1 provides dimensions for the ANT-8/9-PW-LPN antenna.

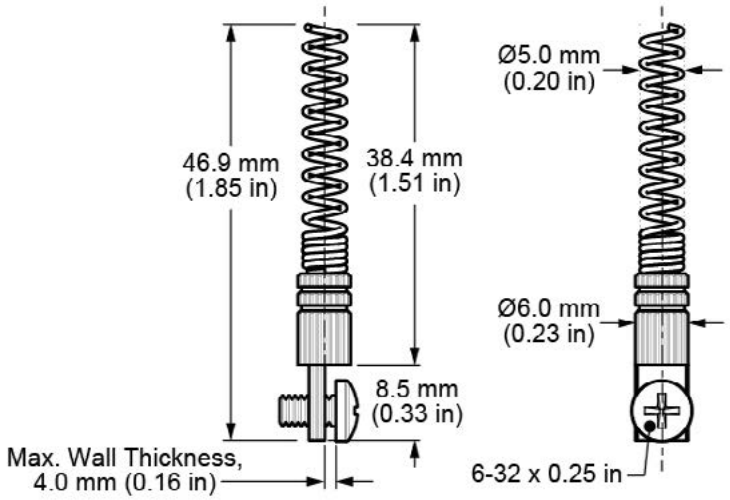


Figure 1. ANT-8/9-PW-LPN Antenna Dimensions

RECOMMENDED ANTENNA MOUNTING AND PCB FOOTPRINT

The ANT-8/9-PW-LPN attaches to a printed circuit board using the provided 6-32UNC x 0.25 in. machine screw. The maximum PCB thickness the antenna can mount to is 4.0 mm (0.16 in) and the maximum torque applied to the machine screw should not exceed 0.6 Nm (5.3 in/lbs). The recommended PCB footprint is shown in Figure 2.

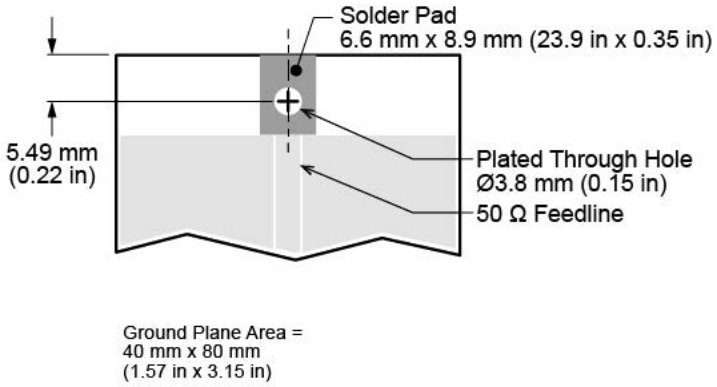


Figure 2. ANT-8/9-PW-LPN Recommended Mounting and PCB Footprint

COUNTERPOISE

Quarter-wave or monopole antennas require an associated ground plane counterpoise for proper operation. The size and location of the ground plane relative to the antenna will affect the overall performance of the antenna in the final design. When used in conjunction with a ground plane smaller than that used to tune the antenna, the center frequency typically will shift higher in frequency and the bandwidth will decrease. The proximity of other circuit elements and packaging near the antenna will also affect the final performance.

For further discussion and guidance on the importance of the ground plane counterpoise, please refer to Linx Application Note, *AN-00501: Understanding Antenna Specifications and Operation.*

ANTENNA ORIENTATION

The ANT-8/9-PW-LPN antenna is characterized at the edge of a ground plane (40 mm x 80 mm) as shown in Figure 3 providing insight into antenna performance when attached to a metal enclosure. The charts on the following pages represent data taken with the antenna oriented at the edge of the ground plane.

Figure 3. ANT-8/9-PW-LPN Test Orientation

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.

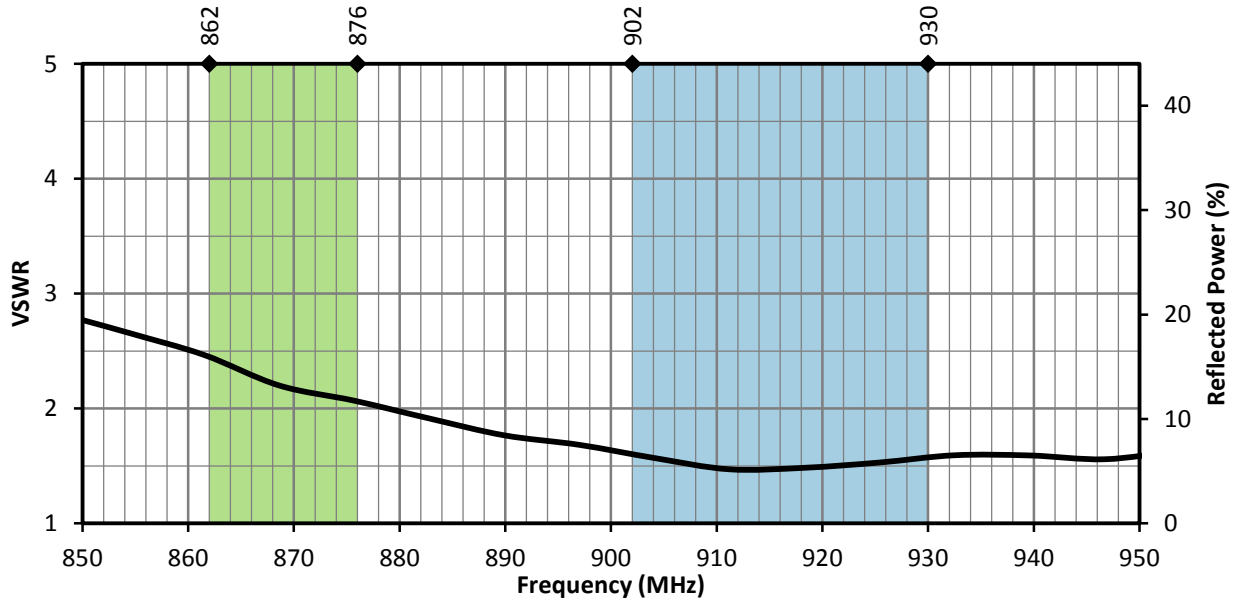


Figure 4. VSWR for ANT-8/9-PW-LPN, Edge of ground Plane

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.

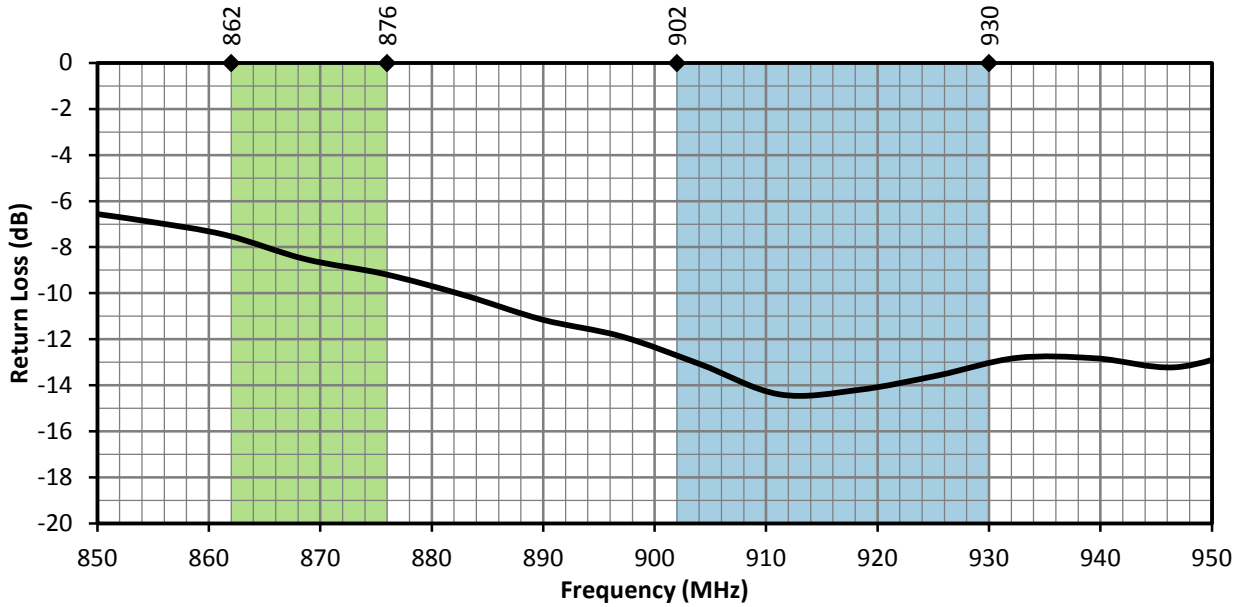


Figure 5. Return Loss for ANT-8/9-PW-LPN, Edge of ground Plane

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.

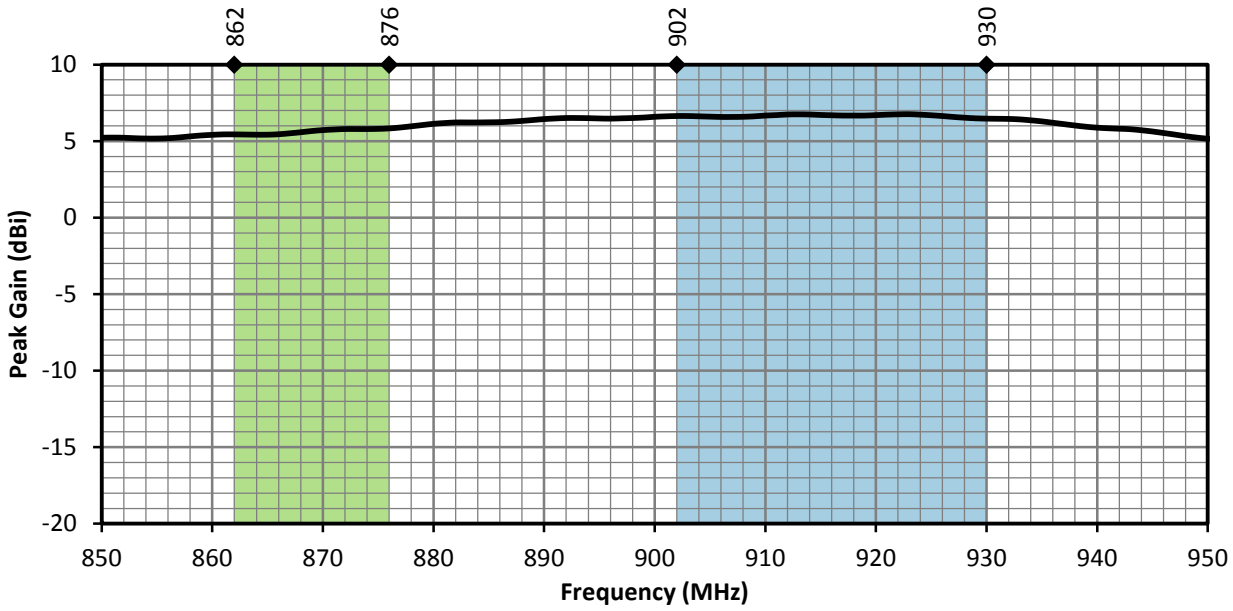


Figure 6. Peak Gain for ANT-8/9-PW-LPN, Edge of ground Plane

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.

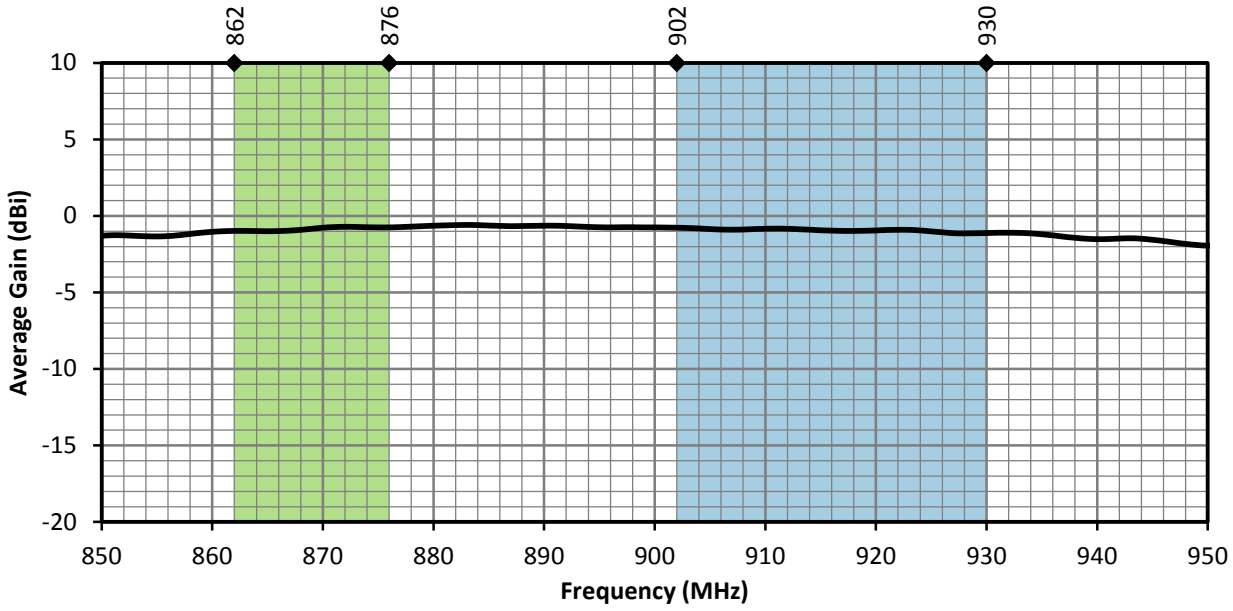


Figure 7. Antenna Average Gain for ANT-8/9-PW-LPN, Edge of ground Plane

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.

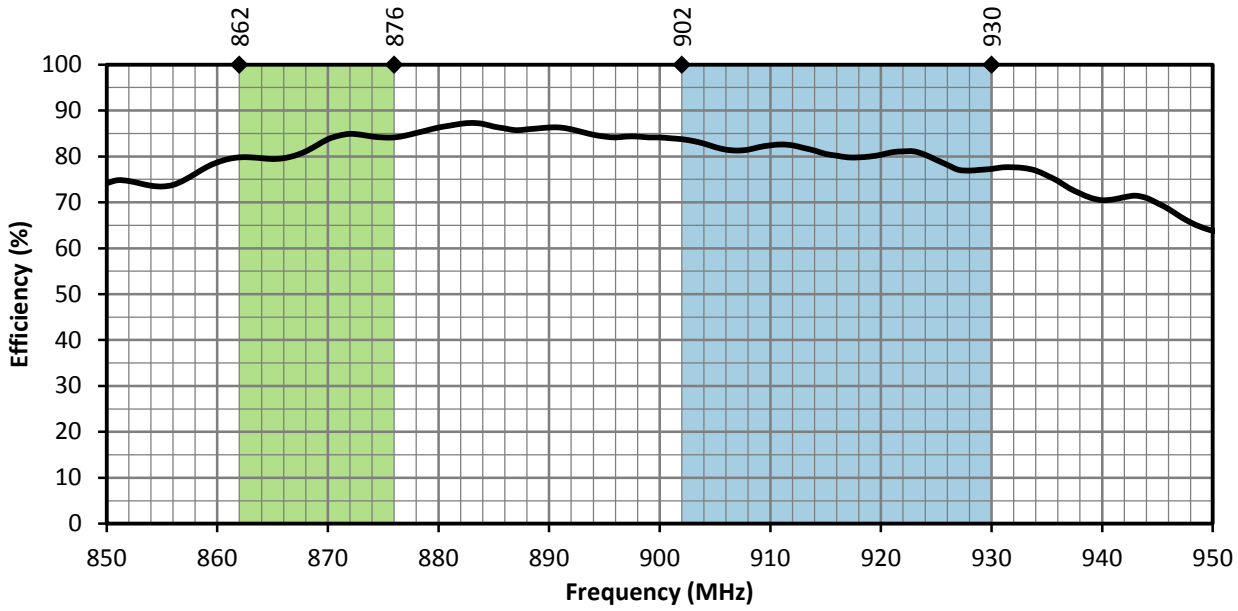


Figure 8. Antenna Radiation Efficiency for ANT-8/9-PW-LPN, Edge of ground Plane

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 (Figure 9), are shown using polar plots covering 360 degrees. The antenna graphic above the plots 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.

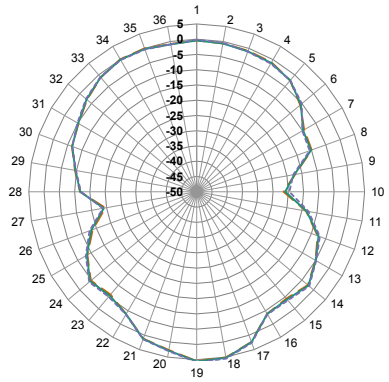
RADIATION PATTERNS - EDGE OF GROUND PLANE

XZ-Plane Gain

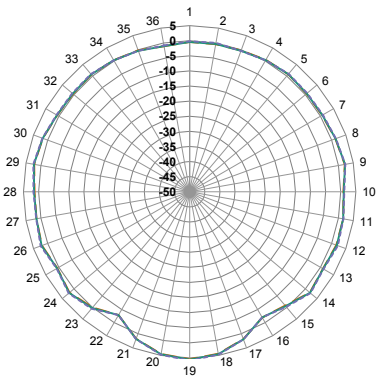
YZ-Plane Gain

XY-Plane Gain

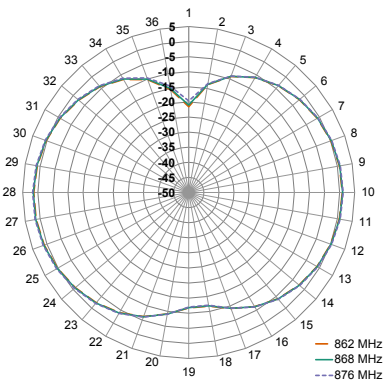
862 MHz TO 876 MHz (868 MHz)



XZ-Plane Gain

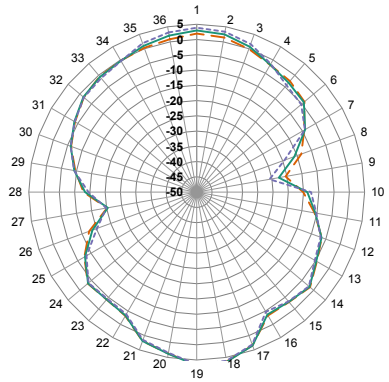


YZ-Plane Gain

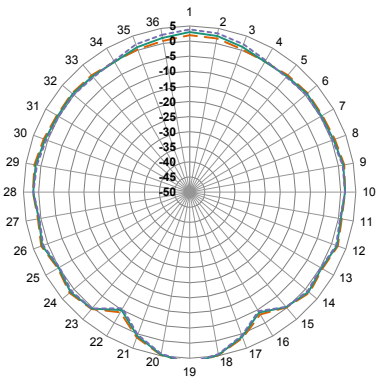


XY-Plane Gain

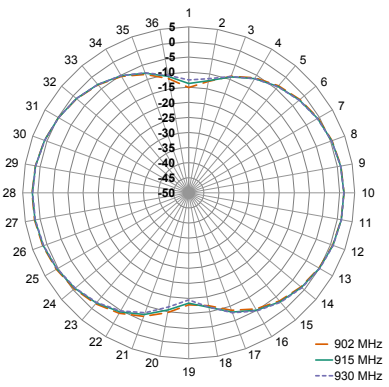
902 MHz TO 930 MHz (915 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

Figure 9. Radiation Patterns for ANT-8/9-PW-LPN Antenna, Edge of ground Plane