is now part of

HDP Industrial Series

Remote Adhesive-Mount 868 MHz/915 MHz Antenna

The Linx HDP industrial series offers rugged remote- mount dipole antennas having excellent performance for low-power, wide-area (LPWA) applications such as LoRaWAN®, Sigfox® and WiFi HaLow™ as well as other sub-1 GHz unlicensed spectrum applications.

The LPWA HDP industrial antennas are durable, low profile, IP67 ratable, and UV protected. They mount permanently to non-conductive surfaces using the integrated adhesive patch and connect using 2 meters of RG-174/U low-loss cable terminated in an SMA plug (male pin), or RP-SMA plug (female socket) connector for FCC Part 15 compliant applications.

FEATURES

- Performance at 868 MHz
  - VSWR: ≤ 1.8
  - Peak Gain: 0.6 dBi
  - Efficiency: 27%
- Performance at 915 MHz
  - VSWR: ≤ 1.9
  - Peak Gain: 0.4 dBi
  - Efficiency: 25%
- Low profile
  - 104.0 mm x 17.0 mm x 4.2 mm
- Durable UV protected enclosure rated at IP67 for heavy-duty outdoor use
- Low-loss RG-174/U coaxial cable for improved performance at higher frequencies
- SMA plug (male pin) or RP-SMA plug (female socket) connector

APPLICATIONS

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

ORDERING INFORMATION

Part Number	Description
ANT-410-CW-QW-SMA	410 MHz CW Series antenna with SMA plug (male pin)

Available from Linx Technologies and select distributors and representatives.

Notes
1 Use of an O-ring is recommended, IP-ratings cannot be guaranteed
2 With appropriate counterpoise

ELECTRICAL SPECIFICATIONS

ANT-410-CW-QW-SMA	410 MHz
Frequency Range	410 MHz to 430 MHz
VSWR (max)	1.8
Peak Gain (dBi)	4.1
Average Gain (dBi)	-1.2
Efficiency (%)	80
Polarization	Linear
Radiation	Omnidirectional
Max Power	10 W
Wavelength	1/4-wave
Impedance	50 Ω
Connection	SMA plug (male pin)
Height	177.2 mm (6.98 in)
Weight	19.5 g (0.69 oz)
Operating Temperature	-40 °C to +90 °C

Electrical specifications and plots measured with a 102 mm x 102 mm (4 in x 4 in) reference ground plane.

VSWR

Figure 1 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.

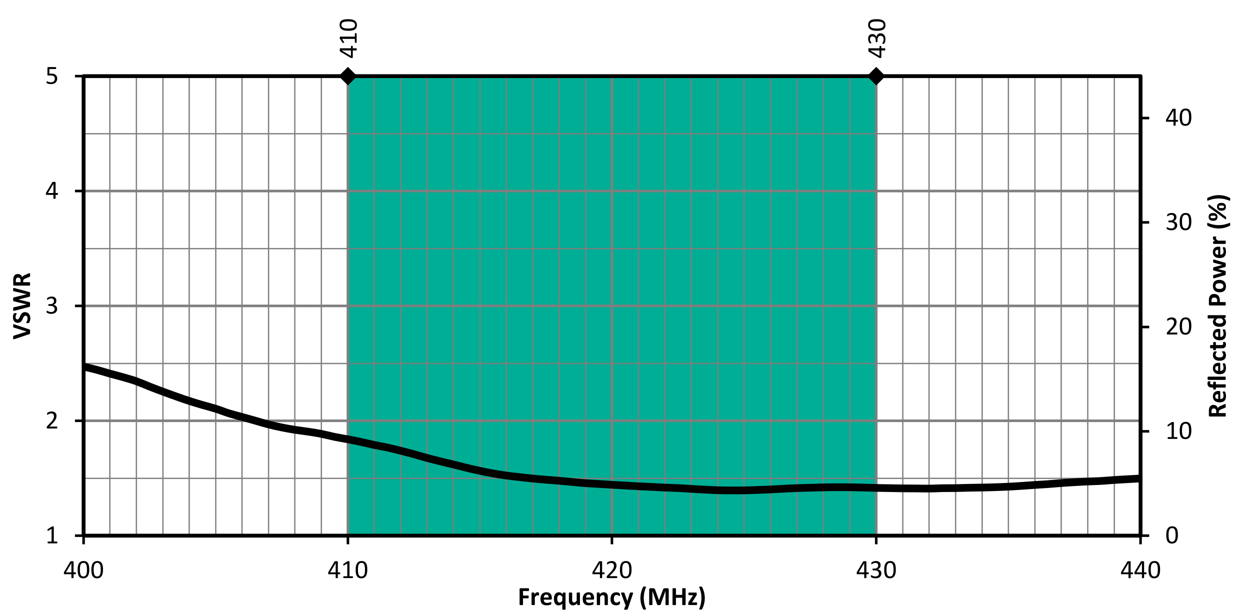


Figure 1. CW 410 MHz Antenna VSWR with Band Highlight

RETURN LOSS

Return loss (Figure 2), 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.

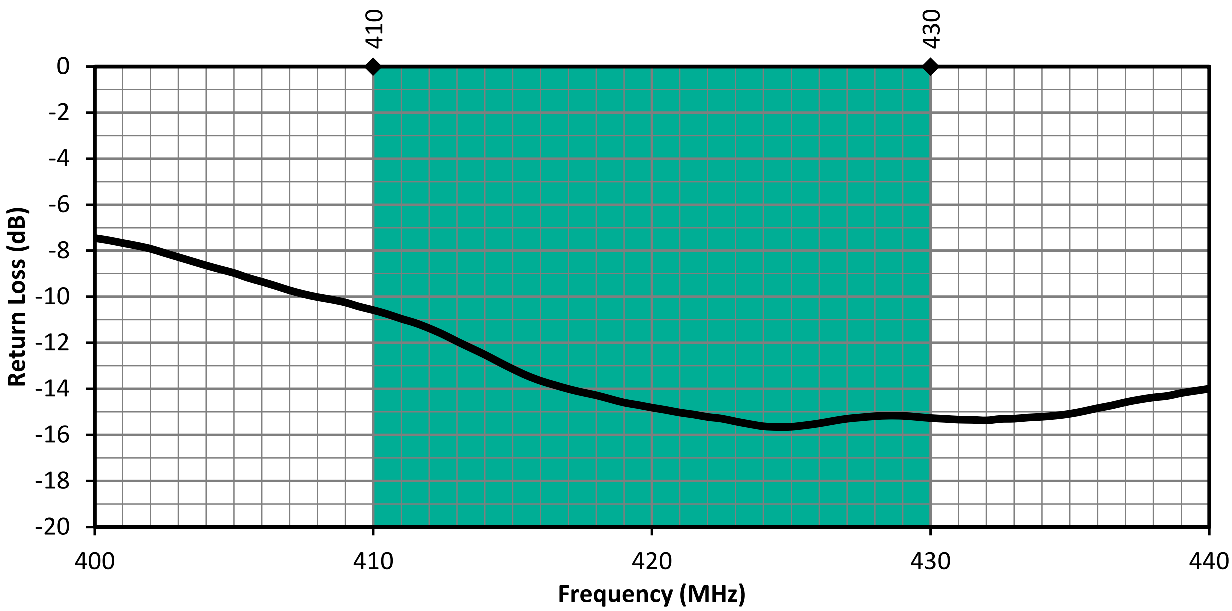


Figure 2. CW 410 MHz Antenna Return Loss with Band Highlight

PEAK GAIN

The peak gain across the antenna bandwidth is shown in Figure 3. 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.

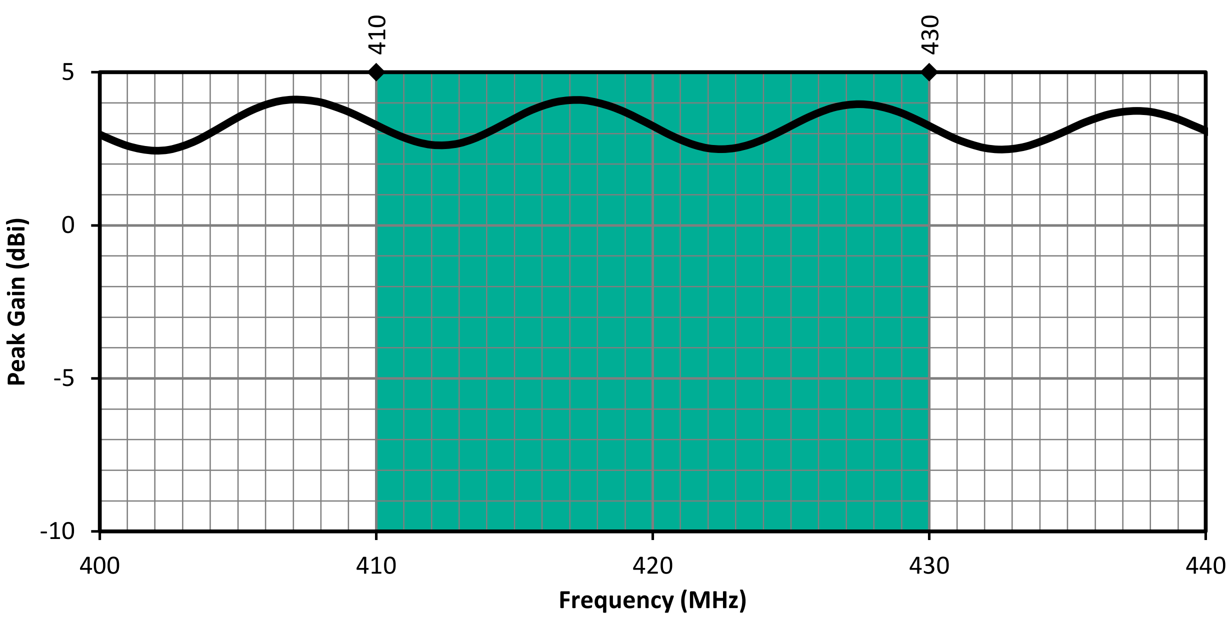


Figure 3. CW 410 MHz Antenna Peak Gain with Band Highlight

AVERAGE GAIN

Average gain (Figure 4), is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

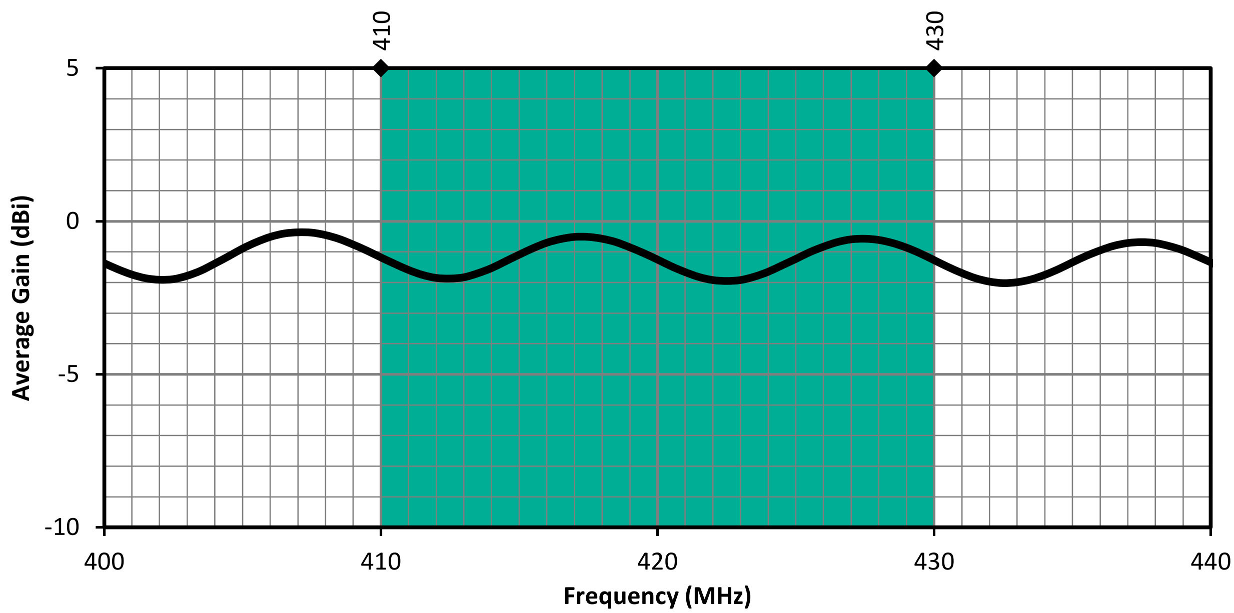


Figure 4. CW 410 MHz Antenna Average Gain with Band Highlight

RADIATION EFFICIENCY

Radiation efficiency (Figure 5), 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.

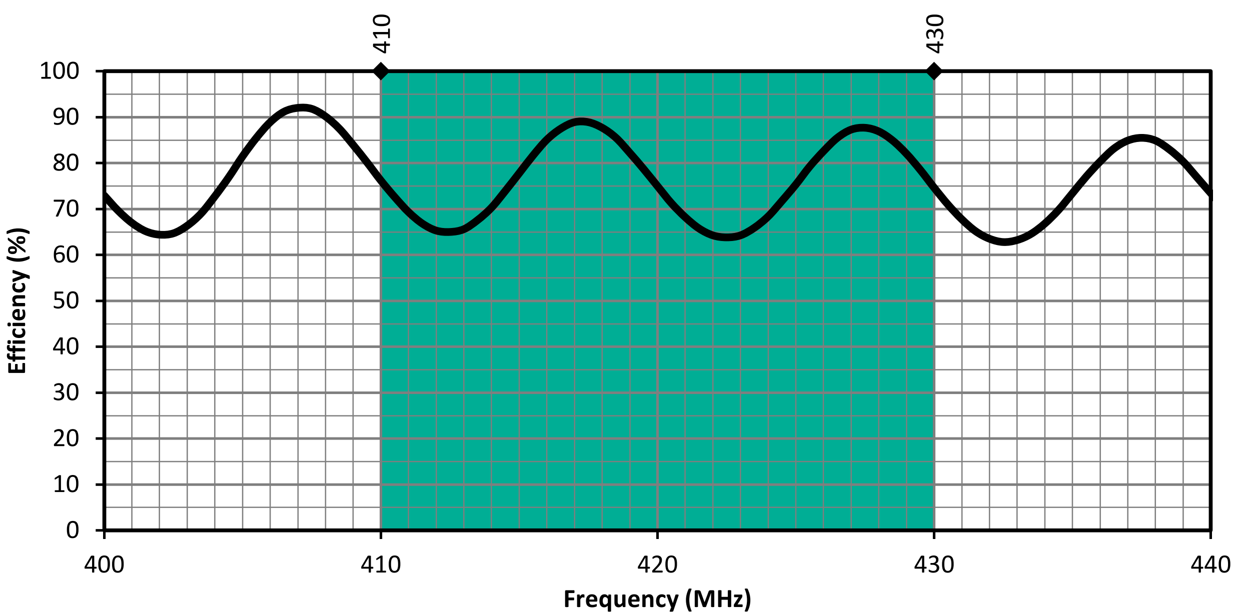


Figure 5. CW 410 MHz Antenna Radiation Efficiency with Band Highlight

PRODUCT DIMENSIONS

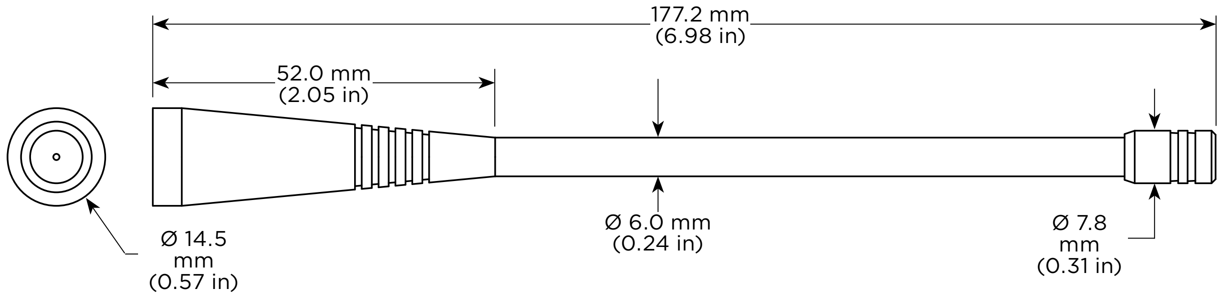


Figure 6. CW 410 MHz Antenna Dimensions

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.

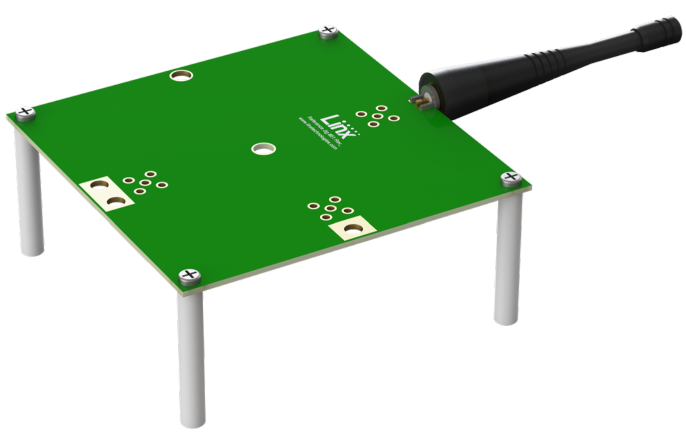
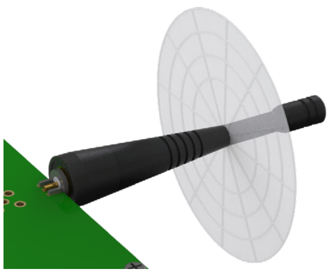


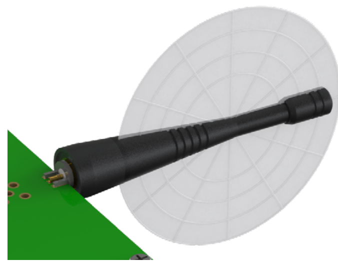
Figure 7. CW 410 MHz Antenna Shown On Edge of Evaluation Board

RADIATION PATTERNS

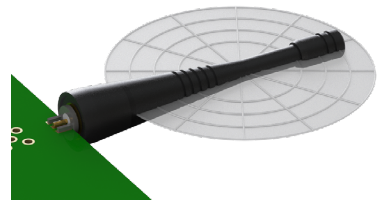
Radiation patterns provide information about the directionality and 3-dimensional gain performance of the antenna by plotting gain at specific frequencies in three orthogonal planes. Antenna radiation patterns (Figure 8), are shown using polar plots covering 360 degrees. The antenna graphic above the 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.



XZ-Plane Gain

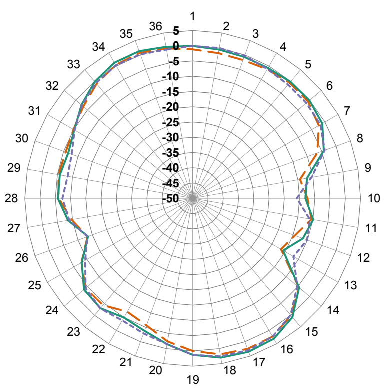


YZ-Plane Gain

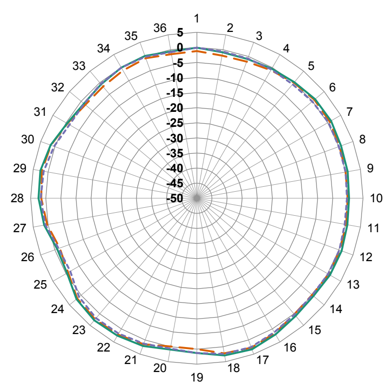


XY-Plane Gain

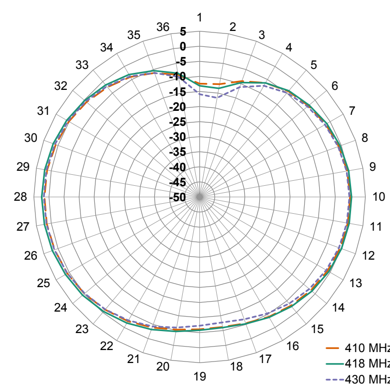
410 MHz to 430 MHz (410 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

Figure 8. Radiation Patterns for CW 410 MHz Antenna

ANTENNA DEFINITIONS AND USEFUL FORMULAS

VSWR - Voltage Standing Wave Ratio. VSWR is a unitless ratio that describes the power reflected from the antenna back to the radio. A lower VSWR value indicates better antenna performance at a given frequency. VSWR is easily derived from Return Loss.

$$\mathrm{VSWR} = \frac{10^{\left[\frac{\mathrm{Return\ \ Loss}}{20}\right]} + 1}{10^{\left[\frac{\mathrm{Return\ \ Loss}}{20}\right]} - 1}$$

Return Loss - Return loss represents the loss in power at the antenna due to reflected signals, measured in decibels. A lower return loss value indicates better antenna performance at a given frequency. Return Loss is easily derived from VSWR.

$$\mathrm{Return\ Loss} = -20\,\log_{10}\left[\frac{\mathrm{VSWR} - 1}{\mathrm{VSWR} + 1}\right]$$

Efficiency (η) - The total power radiated from an antenna divided by the input power at the feed point of the antenna as a percentage.

Total Radiated Efficiency - (TRE) The total efficiency of an antenna solution comprising the radiation efficiency of the antenna and the transmitted (forward) efficiency from the transmitter.

$$\mathrm{TRE} = \eta \bullet \left(1 - \left(\frac{\mathrm{VSWR} - 1}{\mathrm{VSWR} + 1}\right)^2\right)$$

Gain - The ratio of an antenna's efficiency in a given direction (G) to the power produced by a theoretical lossless (100% efficient) isotropic antenna. The gain of an antenna is almost always expressed in decibels.

$$G_{db} = 10\,\log_{10}(G)$$

$$G_{dBd} = G_{dBi} - 2.51\mathrm{dB}$$

Peak Gain - The highest antenna gain across all directions for a given frequency range. A directional antenna will have a very high peak gain compared to average gain.

Average Gain - The average gain across all directions for a given frequency range.

Maximum Power - The maximum signal power which may be applied to an antenna feed point, typically measured in watts (W).

Reflected Power - A portion of the forward power reflected back toward the amplifier due to a mismatch at the antenna port.

$$\left(\frac{\mathrm{VSWR} - 1}{\mathrm{VSWR} + 1}\right)^2$$