



## HDP INDUSTRIAL SERIES

### Remote Adhesive-Mount Dual-Band WiFi Antenna

The Linx HDP industrial series offers rugged remote-mount dipole antennas having excellent performance for single- and dual-band WiFi/WLAN as well as other 2.4 GHz or 5 GHz ISM and U-NII frequency band applications.

The dual-band 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 2.4 GHz
  - VSWR:  $\leq 1.5$
  - Peak Gain: 4.3 dBi
  - Efficiency: 37%
- Performance at 5 GHz
  - VSWR:  $\leq 1.4$
  - Peak Gain: 2.3 dBi
  - Efficiency: 15%
- 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

- Single- and dual-band WiFi/WLAN
  - 802.11b/g
  - WiFi 4 (802.11n)
  - WiFi 5 (802.11ac)
  - U-NII bands 1-4
- Smart Home networking
  - Bluetooth®
  - ZigBee®
- Internet of Things (IoT) devices
- Smart Home networking
- Sensing and remote monitoring

#### ORDERING INFORMATION

| Part Number          | Description   |
|----------------------|---|
| ANT-2/5-HDP-2000-SMA | Remote adhesive-mount dual-band WiFi antenna with 2 m of RG-174/U low-loss coaxial cable terminated in an SMA plug (male pin)         |
| ANT-2/5-HDP-2000-RPS | Remote adhesive-mount dual-band WiFi antenna with 2 m of RG-174/U low-loss coaxial cable terminated in an RP-SMA plug (female socket) |

Available from Linx Technologies and select distributors and representatives.

**TABLE 1. ELECTRICAL SPECIFICATIONS**

| ANT-2/5-HDP-2000   | 2.4 GHz              | 5 GHz                |
|--------------------|----------------------|----------------------|
| Frequency Range    | 2.4 GHz to 2.485 GHz | 5.15 GHz to 5.85 GHz |
| VSWR (max)         | 1.5                  | 1.4                  |
| Peak Gain (dBi)    | 4.3                  | 2.3                  |
| Average Gain (dBi) | -4.6                 | -8.6                 |
| Efficiency (%)     | 37                   | 15                   |

**TABLE 2. MECHANICAL SPECIFICATIONS**

| Parameter             | Dual Band WiFi  |
|-----------------------|---|
| Polarization          | Linear  |
| Radiation             | Omnidirectional   |
| Max Power             | 10 W  |
| Wavelength            | 1/2-wave  |
| Electrical Type       | Dipole  |
| Impedance             | 50 $\Omega$   |
| Operating Temp. Range | -40 °C to +85 °C  |
| Dimensions            | 104.0 mm x 17.0 mm x 5.5 mm (4.09 in x 0.67 in x 0.22 in) |
| Connection            | SMA plug (male pin) or RP-SMA plug (female socket)        |
| Cable                 | 2.0 m (78.74 in) of RG-174/U low-loss coaxial cable       |
| Weight                | 42.0 g (1.48 oz)  |

## PRODUCT DIMENSIONS

Figure 1 provides dimensions of the ANT-2/5-HDP-2000. The antenna comes with 2 m (78.74 in) of RG-174/U low-loss coaxial cable terminated by an SMA plug (male pin) or RP-SMA plug (female socket) connector.

## ANTENNA MOUNTING

The remote adhesive-mount HDP industrial series antenna mounts permanently to non-conductive surfaces using the integrated adhesive patch. The mounting surface should be clean, dry and free of oil residue for ideal adhesion.

## PACKAGING INFORMATION

The HDP industrial series antennas are packaged in bags of 50. Distribution channels may offer alternative packaging options.

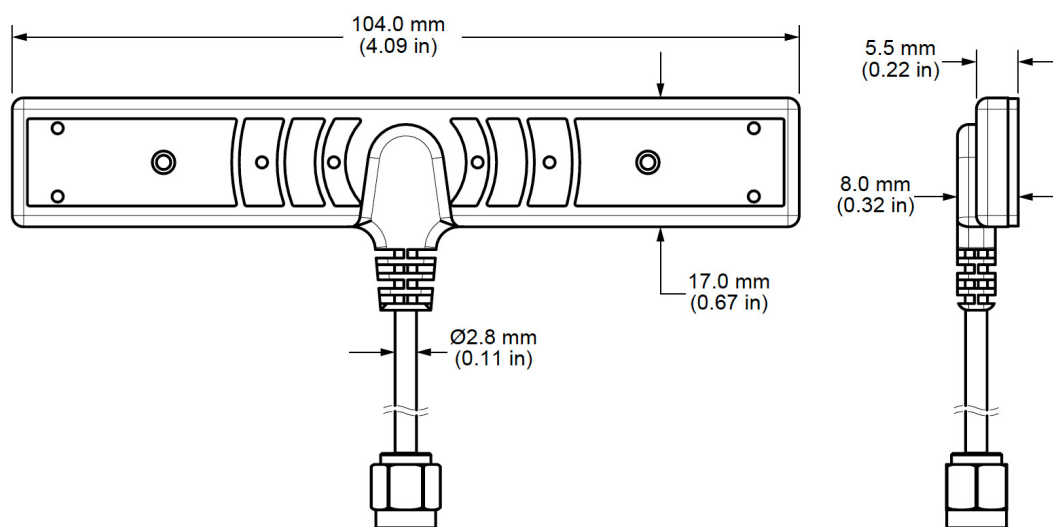


Figure 1. ANT-2/5-HDP-2000 Antenna Dimensions

## VSWR

Figure 2 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.

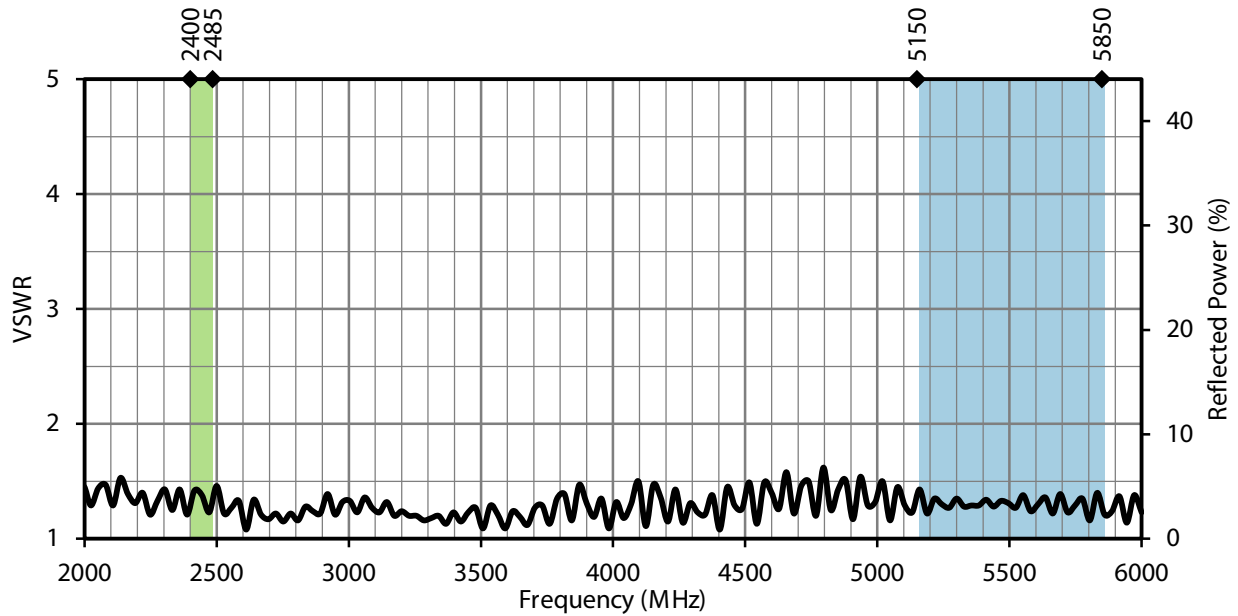


Figure 2. ANT-2/5-HDP-2000 VSWR with Frequency Band Highlights

## RETURN LOSS

Return loss (Figure 3), 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.

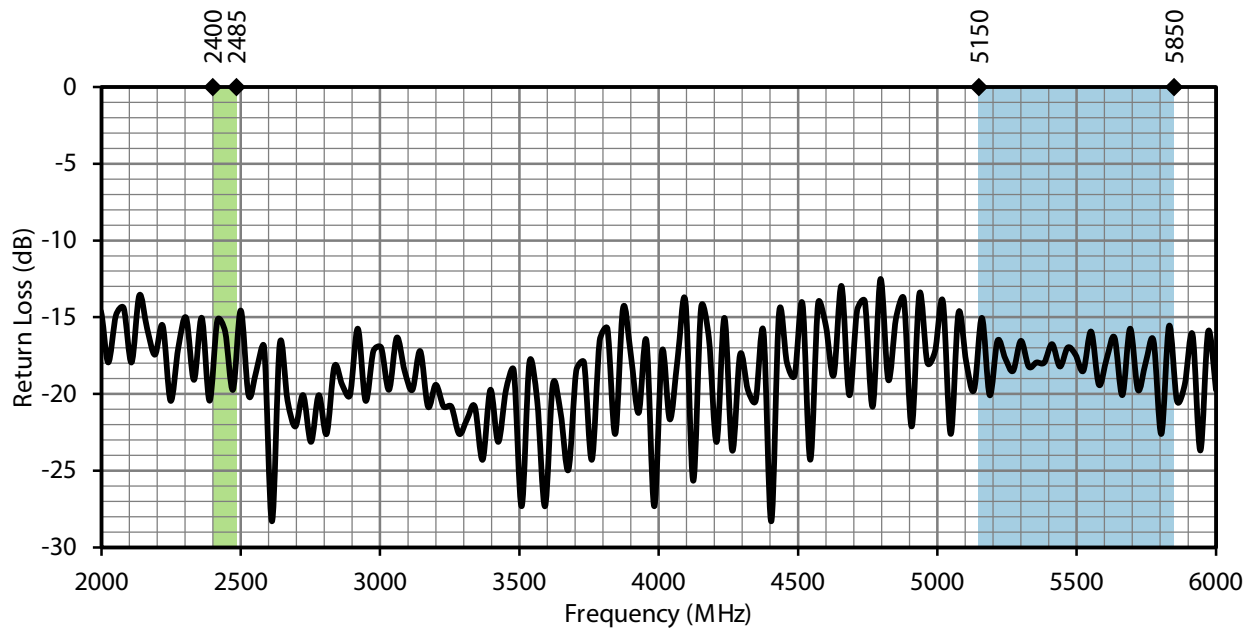


Figure 3. ANT-2/5-HDP-2000 Return Loss with Frequency Band Highlightss

## PEAK GAIN

The peak gain across the antenna bandwidth is shown in Figure 4. 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.

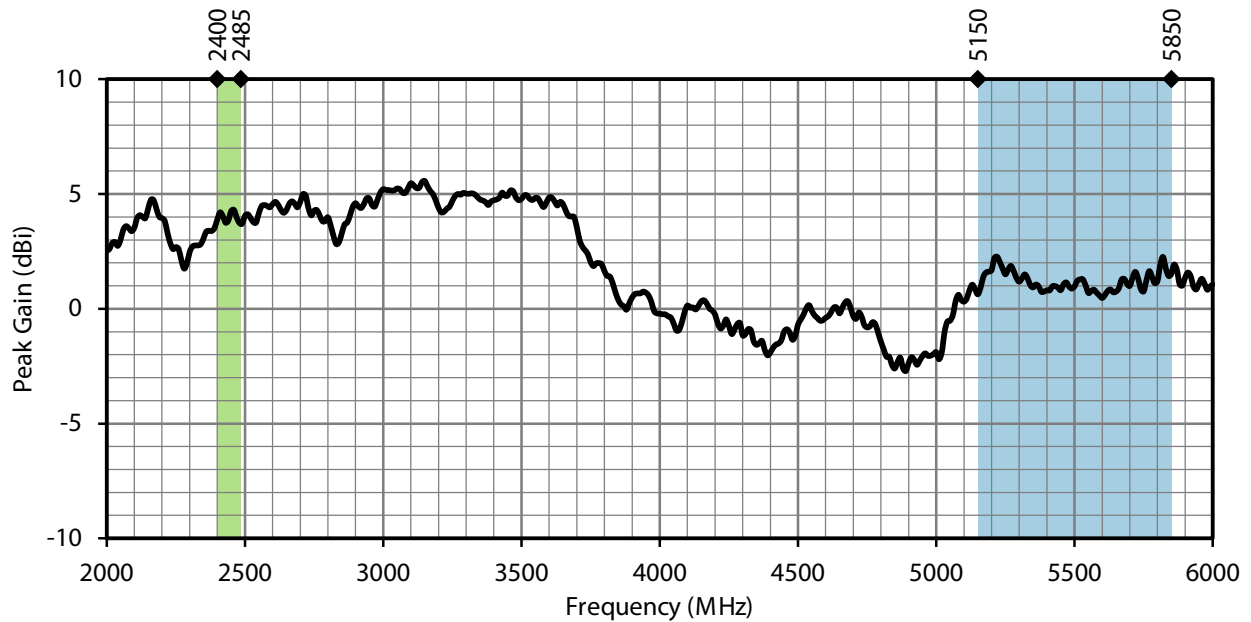


Figure 4. ANT-2/5-HDP-2000 Peak Gain with Frequency Band Highlightss

## AVERAGE GAIN

Average gain (Figure 5), is the average of all antenna gain in 3-dimensional space at each frequency, providing an indication of overall performance without expressing antenna directionality.

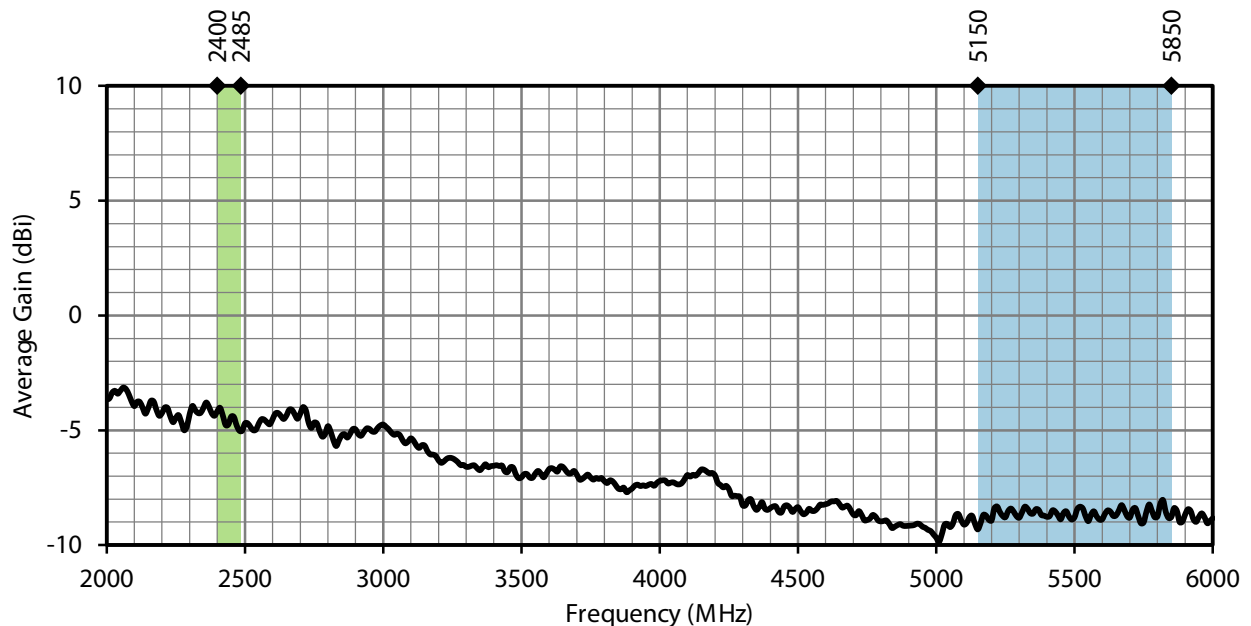


Figure 5. ANT-2/5-HDP-2000 Antenna Average Gain with Frequency Band Highlights

## RADIATION EFFICIENCY

Radiation efficiency (Figure 6), 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.

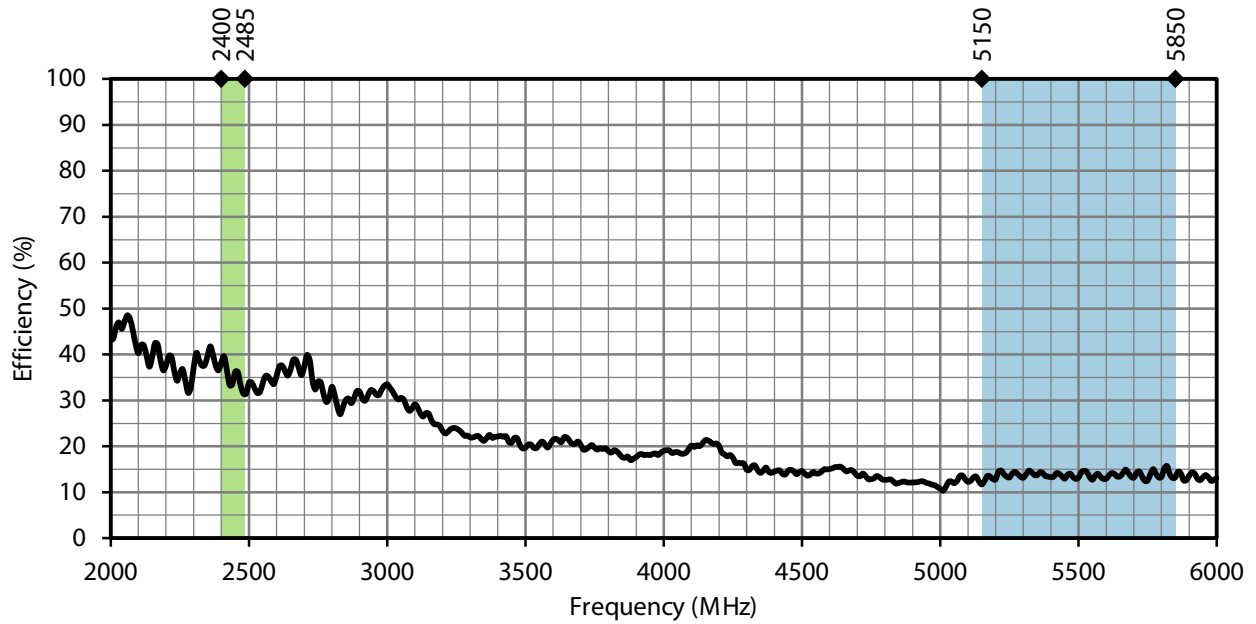
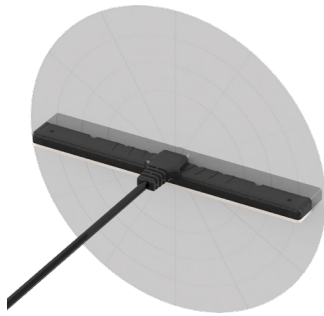


Figure 6. ANT-2/5-HDP-2000 Antenna Radiation Efficiency with Frequency Band Highlights

## 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 are shown in Figure 7 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



XZ-Plane Gain

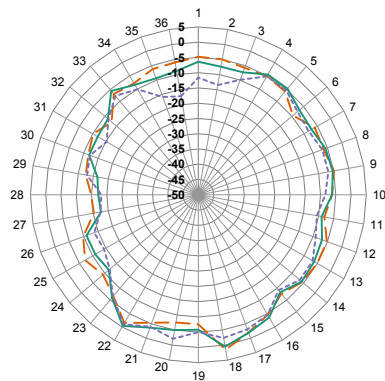


YZ-Plane Gain

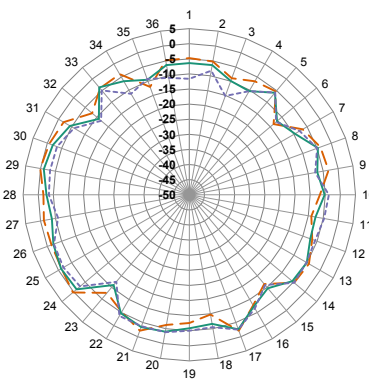


XY-Plane Gain

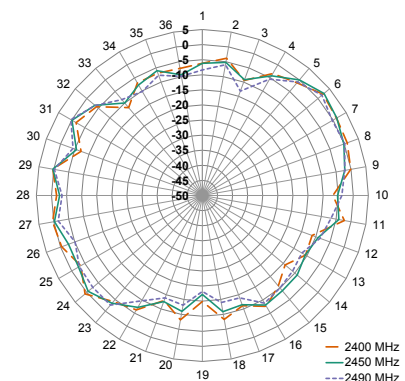
## 2400 MHz TO 2485 MHz (2450 MHz)



XZ-Plane Gain

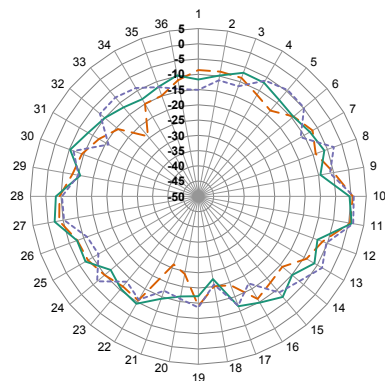


YZ-Plane Gain

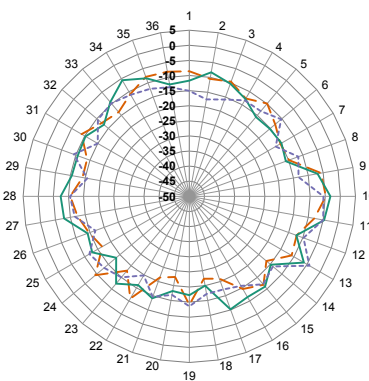


XY-Plane Gain

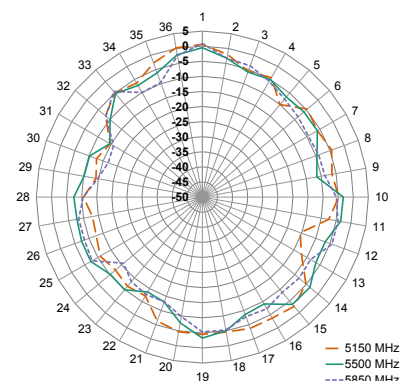
## 5150 MHz TO 5850 MHz (5500 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

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## 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.

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

**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.

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

**Efficiency ( $\eta$ )** - 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.

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

**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.

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

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

**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.

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

**decibel (dB)** - A logarithmic unit of measure of the power of an electrical signal.

**decibel isotropic (dBi)** - A comparative measure in decibels between an antenna under test and an isotropic radiator.

**decibel relative to a dipole (dBd)** - A comparative measure in decibels between an antenna under test and an ideal half-wave dipole.

**Dipole** - An ideal dipole comprises a straight electrical conductor measuring 1/2 wavelength from end to end connected at the center to a feed point for the radio.

**Isotropic Radiator** - A theoretical antenna which radiates energy equally in all directions as a perfect sphere.

**Omnidirectional** - Term describing an antenna radiation pattern that is uniform in all directions. An isotropic antenna is the theoretical perfect omnidirectional antenna. An ideal dipole antenna has a donut shaped radiation pattern and other practical antenna implementations will have less perfect but generally omnidirectional radiation patterns which are typically plotted on three axes.

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## TE TECHNICAL SUPPORT CENTER

|                   |                       |
|-------------------|-----------------------|
| USA:              | +1 (800) 522-6752     |
| Canada:           | +1 (905) 475-6222     |
| Mexico:           | +52 (0) 55-1106-0800  |
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