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ANT-GNFPC-SHL15 SERIES

Flexible Embedded L1/L5 GNSS Antennas

The ANT-GNFPC-SHL15 series of antennas from Linx Technologies are 25 mm x 25 mm adhesive flexible printed circuit (FPC) antennas for global navigation satellite system (GNSS), supporting GPS, Galileo, Beidou, NavIC and QZSS systems in the in the upper L1/E1/B1 and lower L5/E5B bands. These antennas should be used with multi-constellation GNSS receivers on dual GNSS bands to benefit from a more precise navigation and less dropouts in challenging environments such as tall buildings in urban areas.

The ANT-GNFPC-SHL15 antennas provide a ground plane independent dipole internal/embedded antenna solution. The flexibility and adhesive backing make the ANT-GNFPC-SHL15 series easier to mount in RF transparent (e.g., plastic) enclosures, enabling environmental sealing and protection from antenna damage. Connection is made to the radio via a coaxial cable terminated in an MHF1/U.FL-type plug (female socket), or MHF4- type plug (female socket) connector.

FEATURES

- Performance at 1164-1189 MHz
  - VSWR: ≤ 2.4
  - Peak Gain: -0.2 dBi
  - Efficiency: 26%
- Performance at 1559-1592 MHz
  - VSWR: ≤ 2.2
  - Peak Gain: 3.3 dBi
  - Efficiency: 46%
- Performance at 1598-1606 MHz
  - VSWR: ≤ 1.4
  - Peak Gain: 3.0 dBi
  - Efficiency: 43%
- Ground plane independent dipole antenna
- Linear polarization
- Compact, low-profile
- 25.0 mm x 25.0 mm x 0.1 mm
- Adhesive backing permanently adheres to non metal enclosures using 3M 467MP/200MP adhesive
- Flexible to fit in challenging enclosures

APPLICATIONS

- Global navigation
  - GPS L1/L5
  - Galileo E1/E5A
  - NavIC L5
  - Beidou B1C, B1I
  - QZSS L1/L5
- Timing solutions
- UAVs (Drones)
- Robotic lawnmowers
- Industrial and agricultural machines

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ORDERING INFORMATION

Part Number	Cable Length	Connector
ANT-GNFPC-SHL1550UF	50 mm (1.97 in)	MHF1/U.FL-type
ANT-GNFPC-SHL15100UF	100 mm (3.94 in)	MHF1/U.FL-type
ANT-GNFPC-SHL15150UF	150 mm (5.91 in)	MHF1/U.FL-type
ANT-GNFPC-SHL15200UF	200 mm (7.87 in)	MHF1/U.FL-type
ANT-GNFPC-SHL1550M4	50 mm (1.97 in)	MHF4-type
ANT-GNFPC-SHL15100M4	100 mm (3.94 in)	MHF4-type
ANT-GNFPC-SHL15150M4	150 mm (5.91 in)	MHF4-type
ANT-GNFPC-SHL15200M4	200 mm (7.87 in)	MHF4-type

Available from TE Connectivity and select distributors and representatives.

TABLE 1. ELECTRICAL SPECIFICATIONS

Frequency	GPS Bands	VSWR (max.)	Peak Gain (dBi)	Average Gain (dBi)	Efficiency (%)
1164-1189 MHz	Beidou B1I, Beidou B2A, GALILEO-E5a,GPS L5, NavIC L5, QZSS L5	2.4	-0.2	-6.1	26
1559-1592 MHz	GPS L1C, GPS L1C/A, Galileo E1, Beidou B1C, QZSS L1, Beidou B1I	2.2	3.3	-3.5	46
1598-1606 MHz	L1, GLONASS (FDMA) L1	1.4	3	-3.7	43

Polarization	Linear
Radiation	Omnidirectional
Impedance	50
Wavelength	1/2-wave
Max Power	2 W
Electrical Type	Dipole

Electrical specifications and plots measured with the antenna on a 2 mm (0.08 in) thick plastic sheet.

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TABLE 2. MECHANICAL SPECIFICATIONS

Part Number	Connection	Coaxial Cable, minimum inside bend radius	Weight
ANT-GNFPC-SHL1550UF	MHF1/U.FL-type plug	1.13 mm: 5.0 mm (0.20 in)	0.4 g (0.01 oz)
ANT-GNFPC-SHL15100UF	MHF1/U.FL-type plug	1.13 mm: 5.0 mm (0.20 in)	0.6 g (0.02 oz)
ANT-GNFPC-SHL15150UF	MHF1/U.FL-type plug	1.13 mm: 5.0 mm (0.20 in)	0.7 g (0.03 oz)
ANT-GNFPC-SHL15200UF	MHF1/U.FL-type plug	1.13 mm: 5.0 mm (0.20 in)	0.9 g (0.03 oz)
ANT-GNFPC-SHL1550M4	MHF4-type plug	1.13 mm: 5.0 mm (0.20 in)	0.4 g (0.01 oz)
ANT-GNFPC-SHL15100M4	MHF4-type plug	1.13 mm: 5.0 mm (0.20 in)	0.5 g (0.02 oz)
ANT-GNFPC-SHL15150M4	MHF4-type plug	1.13 mm: 5.0 mm (0.20 in)	0.7 g (0.02 oz)
ANT-GNFPC-SHL15200M4	MHF4-type plug	1.13 mm: 5.0 mm (0.20 in)	0.8 g (0.03 oz)

Operating Temp. Range (After full cure)	-40 °C to +85 °C (-40 °F to 185 °F)
Storage Temp. Range	21ºC @ 50% relative humidity to achieve full adhesion properties
Dimensions	25.0 mm x 25.0 mm x 0.3 mm (0.98 in x 0.98 in x 0.012 in)

PACKAGING INFORMATION

The ANT-GNFPC-SHL15 antenna is individually packaged in a plastic bag and placed in bags of 100 pcs. Distribution channels may offer alternative packaging options.

ANTENNA MOUNTING

The ANT-GNFPC-SHL1 antenna is a flexible, adhesive backed antenna that allows it to be permanently installed onto non-metallic surfaces. The adhesive backing is 3M 467MP/200MP, which provides outstanding adhesion to high surface energy plastics. The adhesive delivers excellent shear strength to resist slippage and edge lifting, but can be repositioned before the adhesive cures, allowing for accurate positioning. Once cured, this adhesive is highly resistant to solvents, humidity, and moisture, as well as heat up to 204 °C (400 °F) for short periods. The antenna should never be bent past a 2mm / .078” min bend radius nor should the angle of the bend be allowed to fall below 90 degrees (i.e., become acute) as this will impair function and may cause permanent damage.

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PRODUCT DIMENSIONS

Figure 1 provides dimensions for the ANT-GNFPC-SHL1 series antenna.

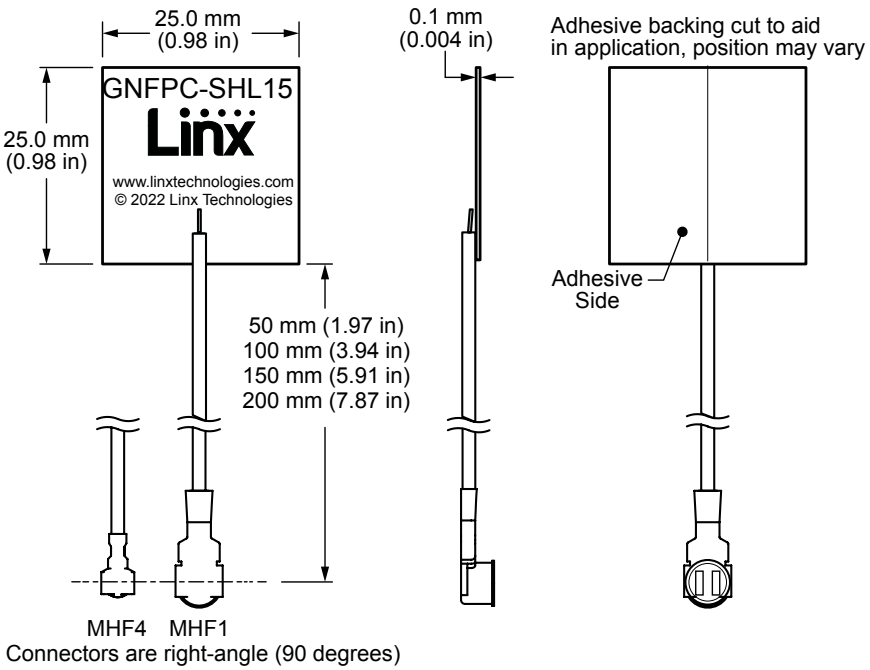


Figure 1. ANT-GNFPC-SHL15 Product Dimensions

ADHESIVE FOR USE ON HSE (HIGH SURFACE ENERGY) SUBSTRATES

Use an appropriate primer suitable for full adhesion to Low Surface Energy or difficult plastics such as polypropylene and polyethylene.

Antenna assembly application of adhesive to surface:

1. Clean surfaces and ensure no large surface gaps are present.
2. Apply an appropriate primer to surface if dealing with a plastic or LSE material.
3. Remove backing and apply antenna using even pressure for 10 seconds.
4. Apply to surface between 21ºC and 38ºC [70ºF and 100ºF]
5. Full adhesion properties in 24 hours.

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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.

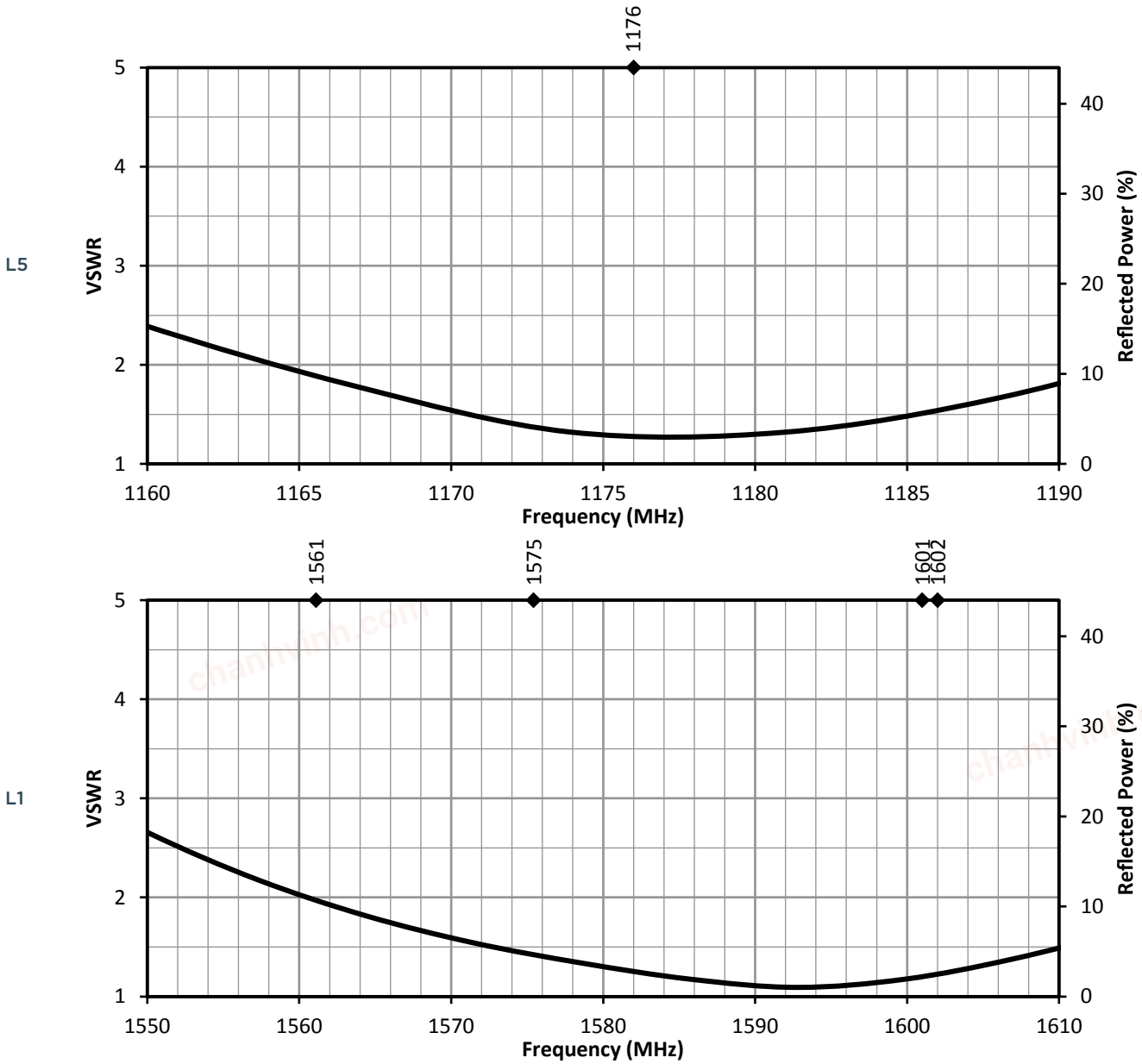


Figure 2. ANT-GNFPC-SHL15 Antenna VSWR with Frequency Band Highlights

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.

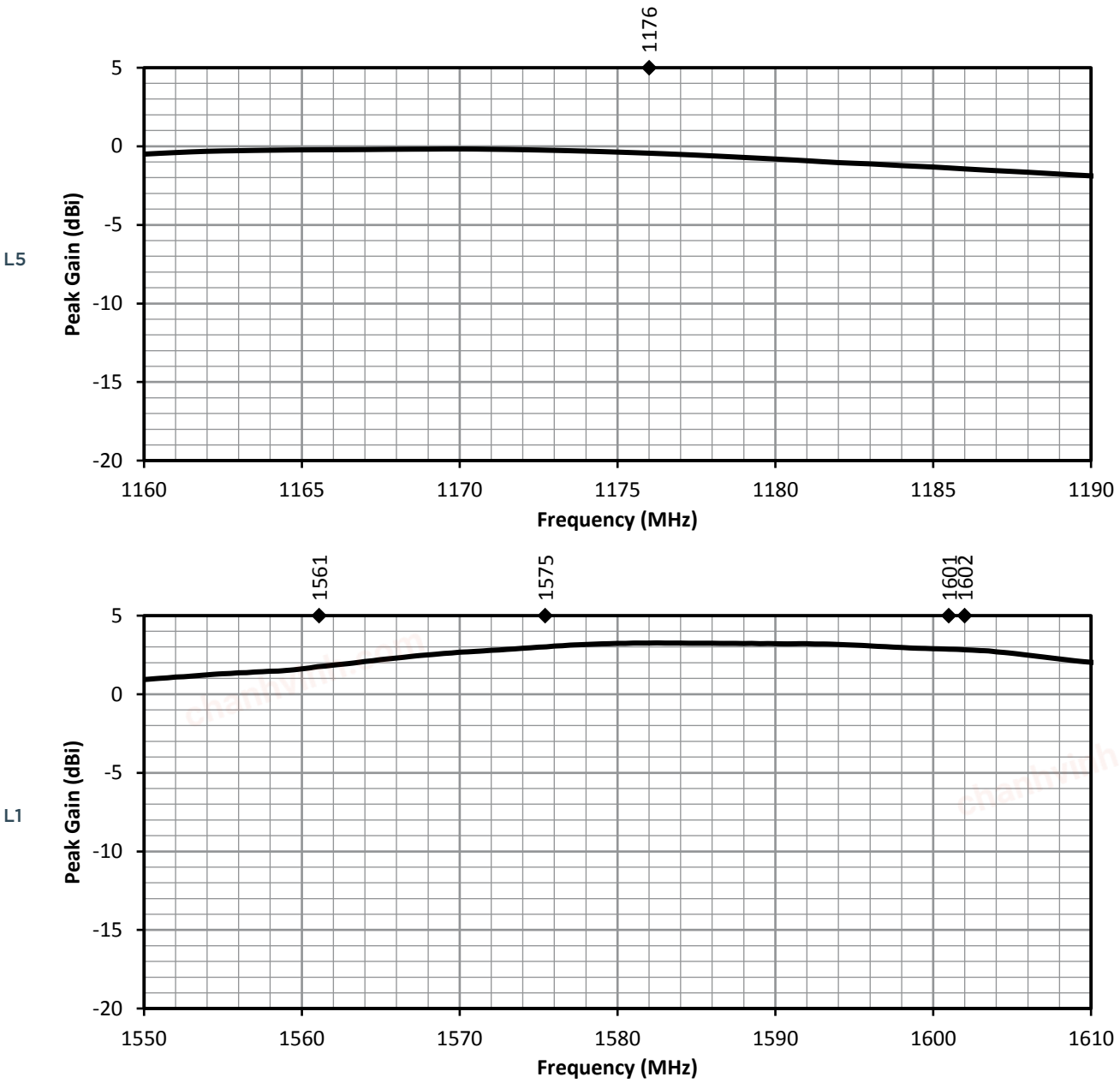


Figure 3. ANT-GNFPC-SHL15 Antenna Peak Gain with Frequency Band Highlights

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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.

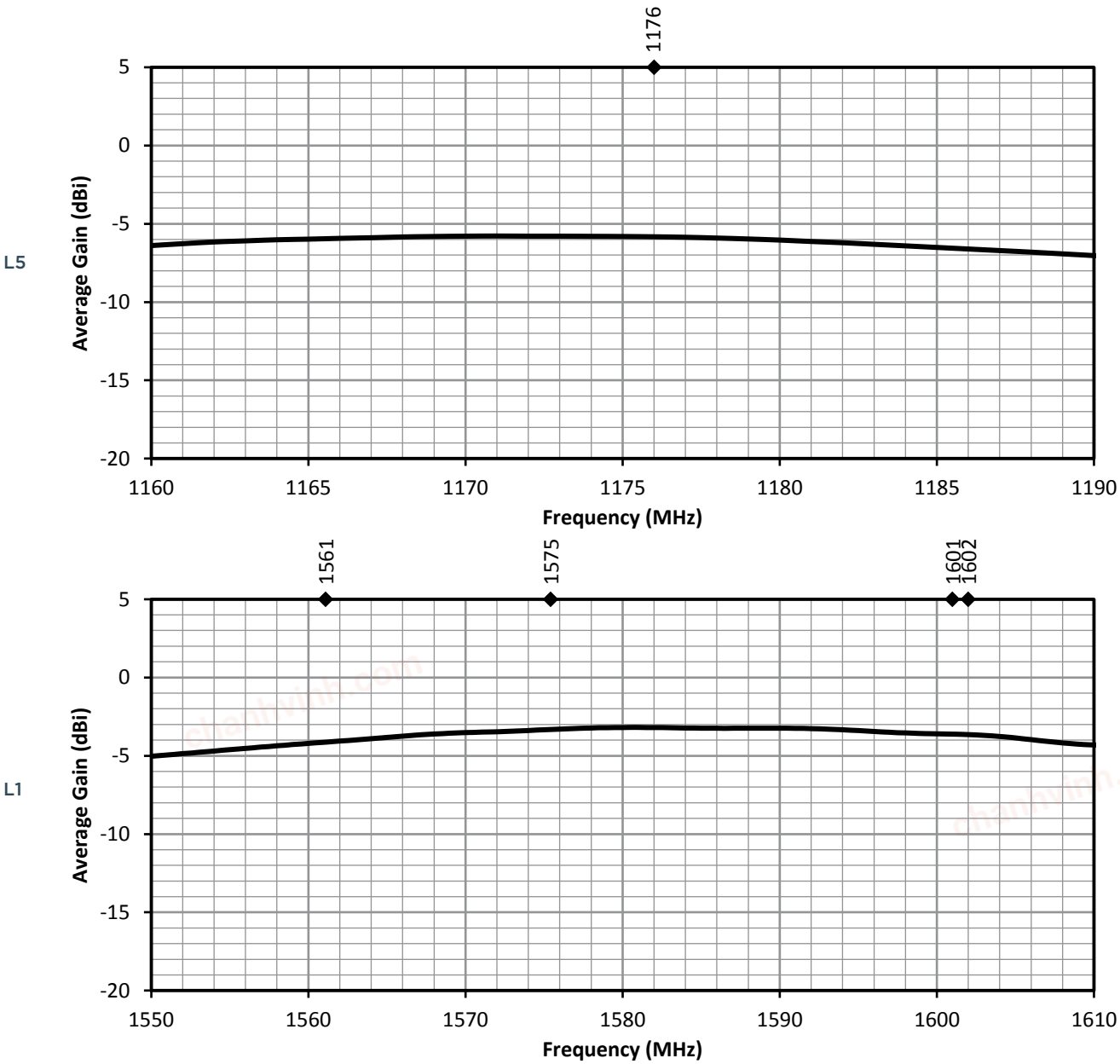


Figure 4. ANT-GNFPC-SHL15 Antenna Average Gain with Frequency Band Highlights

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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.

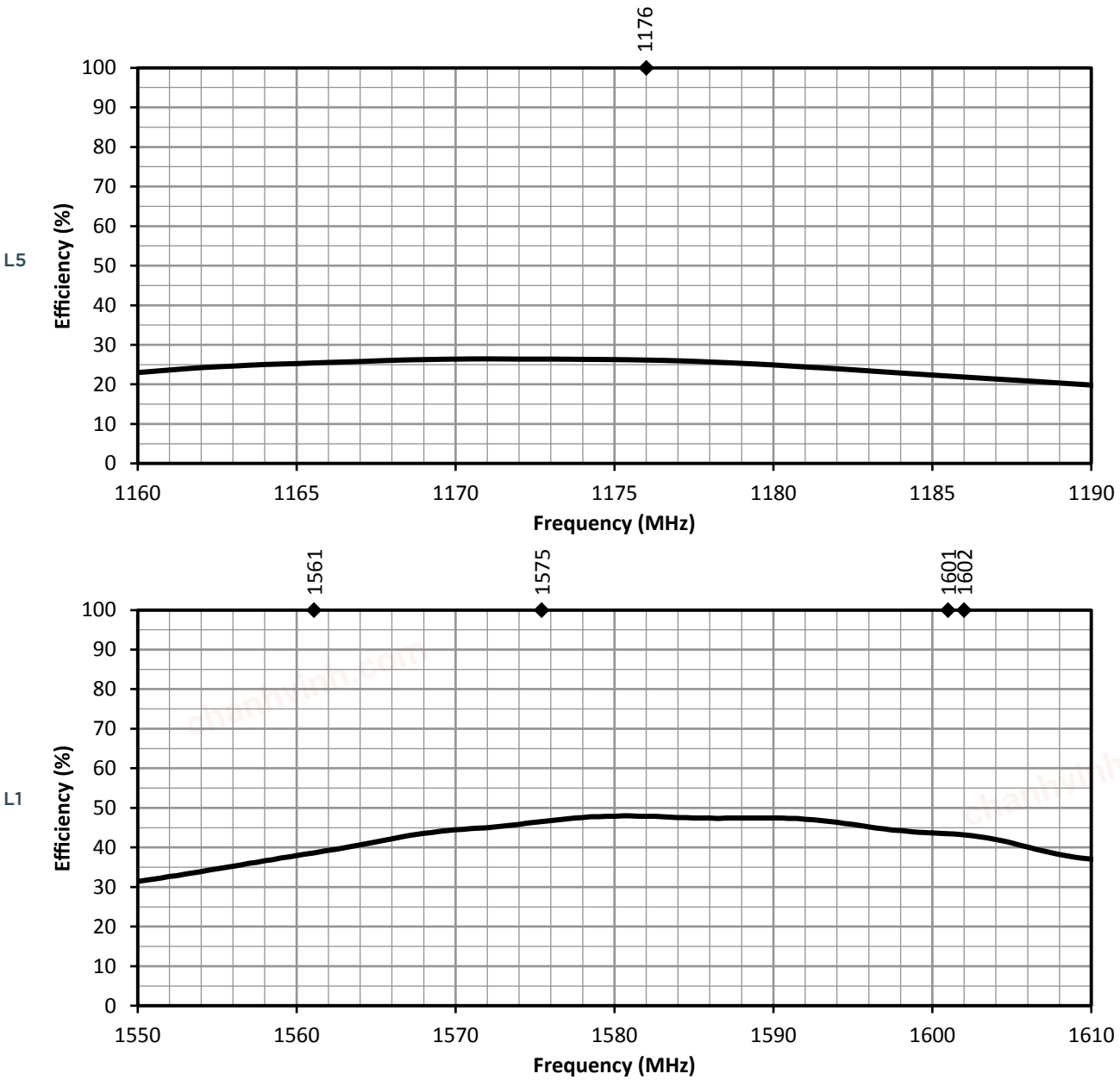


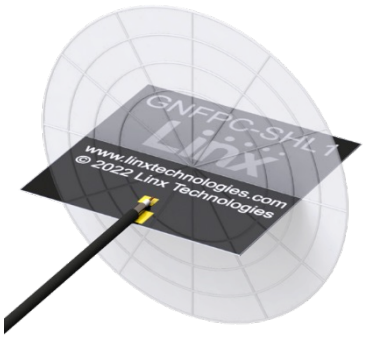
Figure 5. ANT-GNFPC-SHL15 Antenna Radiation Efficiency with Frequency Band Highlights

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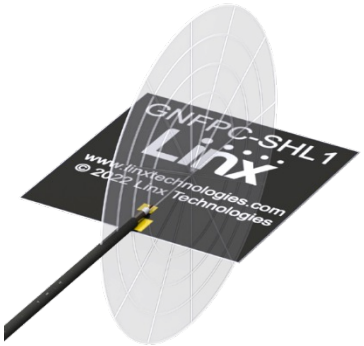
RADIATION PATTERNS

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 6) 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.

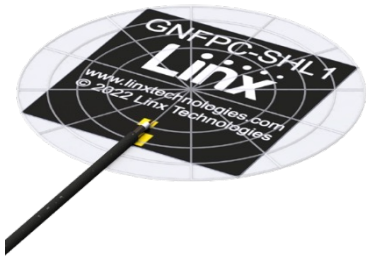
RADIATION PATTERNS - HORIZONTAL



XZ-Plane Gain

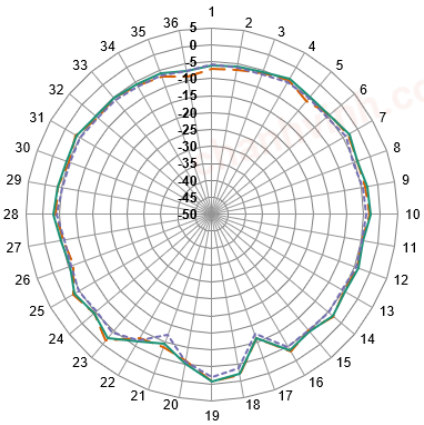


YZ-Plane Gain

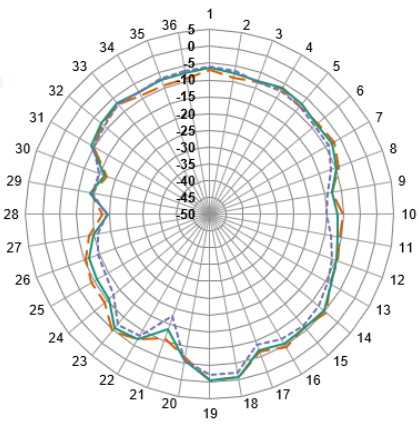


XY-Plane Gain

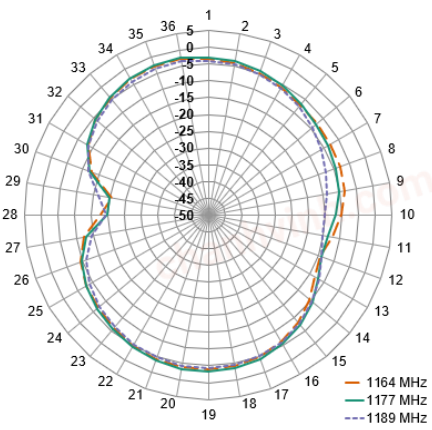
1164 MHz TO 1189 MHz (1177 MHz)



XZ-Plane Gain



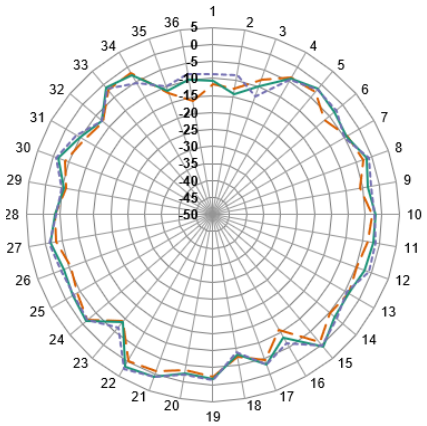
YZ-Plane Gain



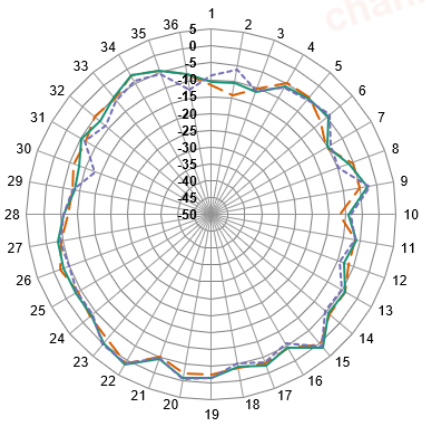
XY-Plane Gain

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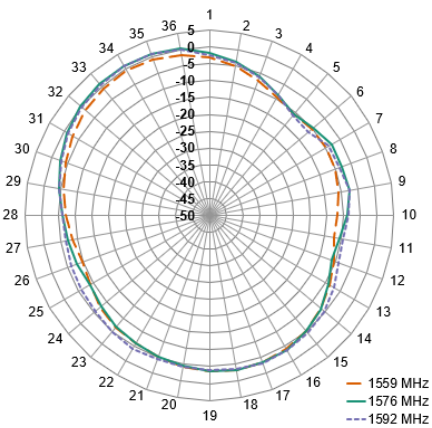
1559 MHz TO 1592 MHz (1576 MHz)



XZ-Plane Gain

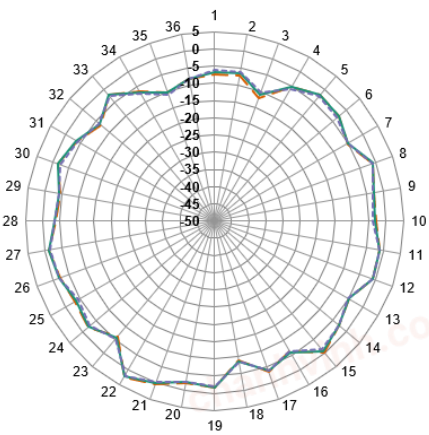


YZ-Plane Gain

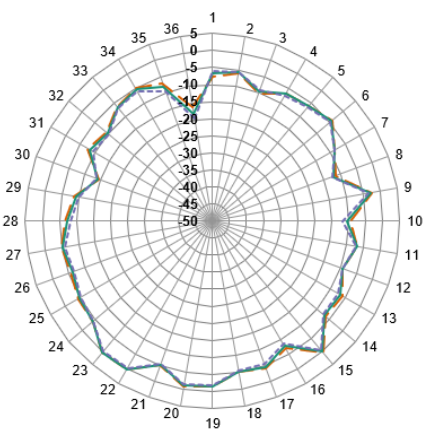


XY-Plane Gain

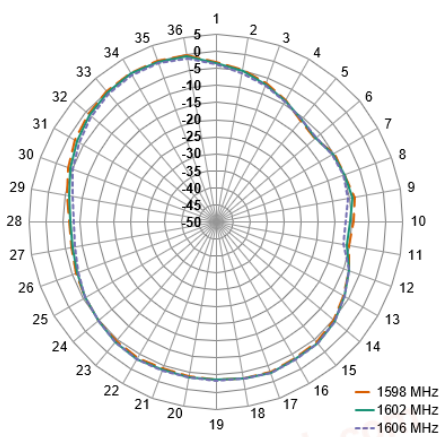
1598 MHz TO 1606 MHz (1602 MHz)



XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain

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