Datasheet

JOYMAX
EnJOY MAX Wireless®

GPX-026XNF2W

RFID & LPWA Directional Patch Antenna

The Joymax GPX-026XNF2W antenna is a flat panel, outdoor directional patch antenna for RFID, sub-1 GHz 915 MHz, and low-power, wide-area (LPWA) applications including LoRaWAN®, Sigfox®, Weightless-P®, Wi-Fi HaLow™ and other unlicensed ISM bands in the 902 MHz to 930 MHz range.

The IP65 rated, bracket mount antenna attaches with a bracket and an N-Type Jack (female socket) connector.

Features

- Bandwidth 902 MHz to 930 MHz
- Performance at 915 MHz
  - VSWR: ≤ 1.1
  - Peak Gain: 8.2 dBi
  - Efficiency: 79%
- Bracket Mount on a mast
- Directional Radiation
- N-Type Jack (female socket) connector

Applications

- RFID (Radio Frequency Identification) Reader
- Low-power, wide-area (LPWA) applications:
  - LoRaWAN®
  - Sigfox®
  - Weightless-P®
  - Wi-Fi HaLow™
- ISM applications
- Smart Warehouse/Shelf Management

Ordering Information

Part Number	Description
GPX-026XNF2W	Outdoor 915MHz RFID/LPWA Directional Patch Antenna, N-Type Jack connector

Available from Joymax Electronics and select distributors and representatives.

Table 1: Electrical Specifications

GPX-026XNF2W	Sub-1 GHz LPWA & ISM (MHz)		
Frequency Range	902 MHz	915 MHz	928 MHz
VSWR (Max)	1.1	1.1	1.2
Peak Gain (dBi)	8.2	8.2	8.0
Average Gain (dBi)	-1.2	-1.1	-1.0
Efficiency (%)	77	79	82
Polarization	RHCP		
Radiation	Directional		
Max Power	10 W		
Wavelength	½-λ		
Electrical Type	Radiating Patch		
Impedance	50 Ω		

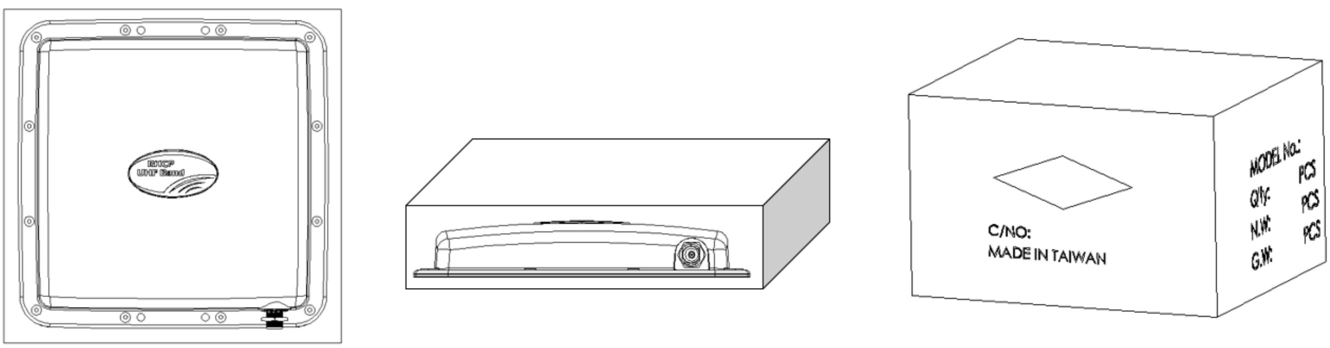
Electrical specifications and plots measured with the antenna in vertical installation orientation.

Table 2: Mechanical Specifications

Parameter	Value
Connection	N-Type Jack (female socket)
Operating Temp.	-40˚C to +85˚C
Weight	1049 g
Dimension	260 mm x 260 mm x 44 mm
Antenna Color	White
Ingress Protection	IP65

Packaging Information

The GPX-026XNF2W antennas are individually sealed in a clear plastic bag and packed into a flat box. **Figure 1**. 10 pcs per carton, 610 mm x 350 mm x 540 mm (24.01 in x 13.77 in x 21.25 in), total weight 15.39 kgs (33.92 lb) Distribution channels may offer alternative packaging options.



1pcs antenna / 1 PE bag

1pcs antenna/1 Box

10pcs antenna / 1 Carton

Figure 1. Antenna Packaging

Product Dimensions

Figure 2 provides dimensions of the GPX-026XNF2W. The antenna is shipped with a bracket and screws for mast mount installation.

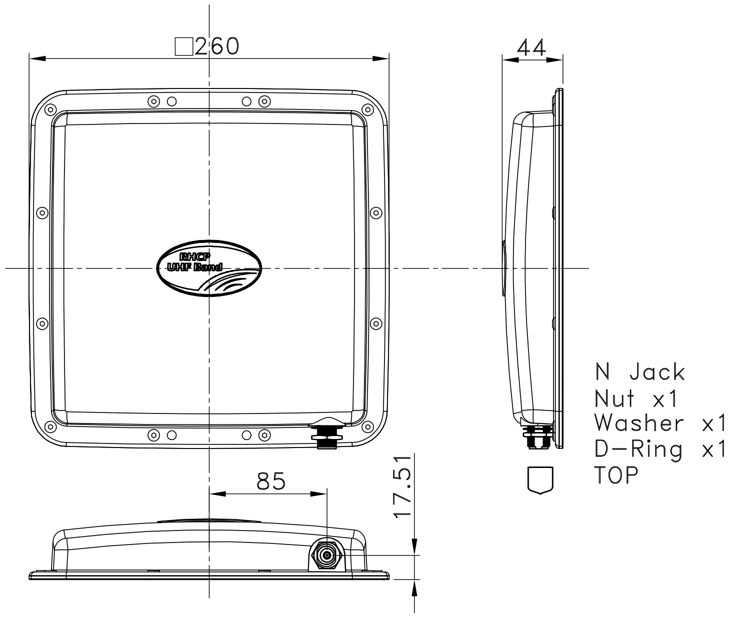


Figure 2. Antenna Dimensions

Antenna Orientation

The GPX-026XNF2W antenna is characterized for enabling easily mounted on a mast as shown in **Figure 3**. The antenna orientation characterizes use of an antenna attached to a bracket-mount installation. The vertical orientation represents the most common end-product use cases.

Figure 3. Antenna Test Orientation

VSWR

Figure 4 provides the voltage standing wave ratio (VSWR) across the antenna bandwidth. VSWR is a function of the reflection coefficient, which 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.

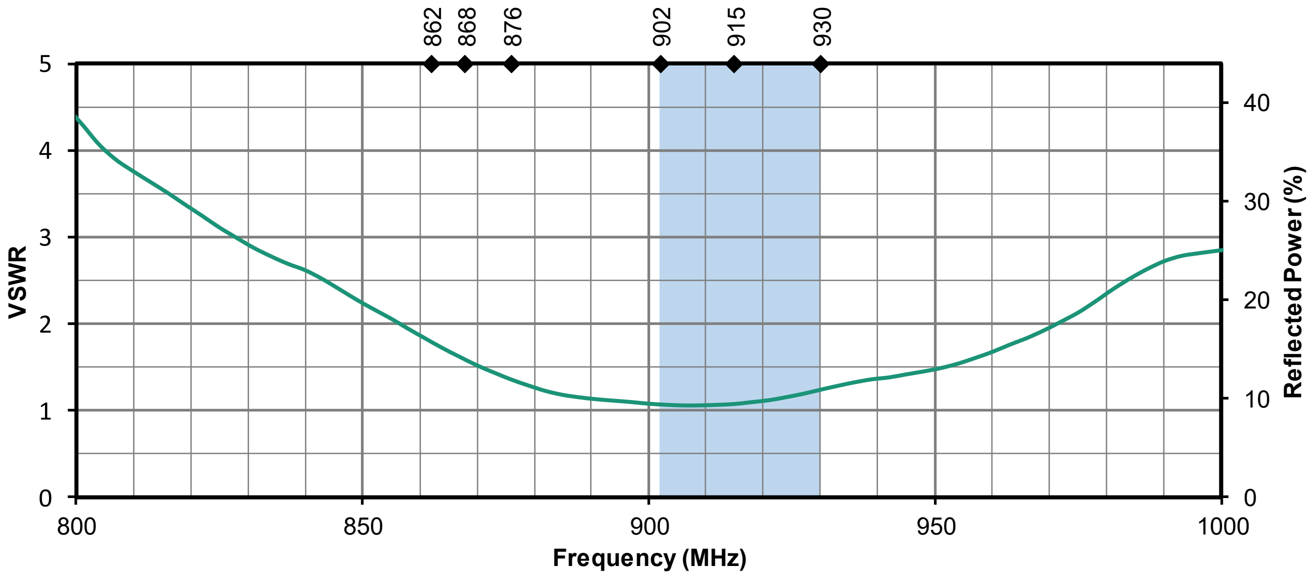


Figure 4. Antenna VSWR, Vertical

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.

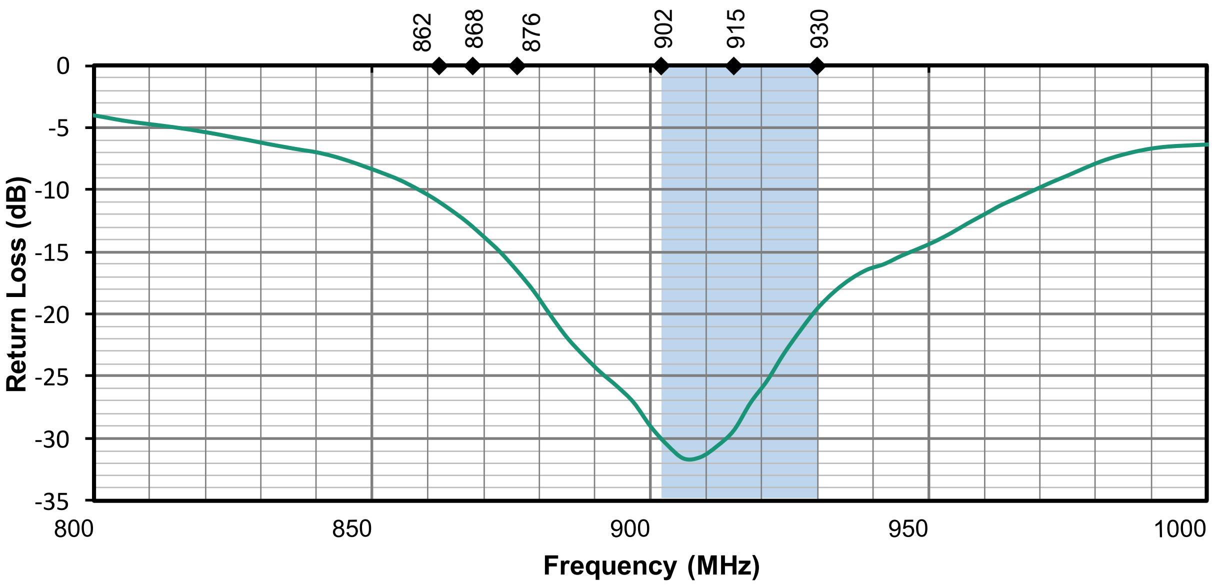


Figure 5. Antenna Return Loss, Vertical

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.

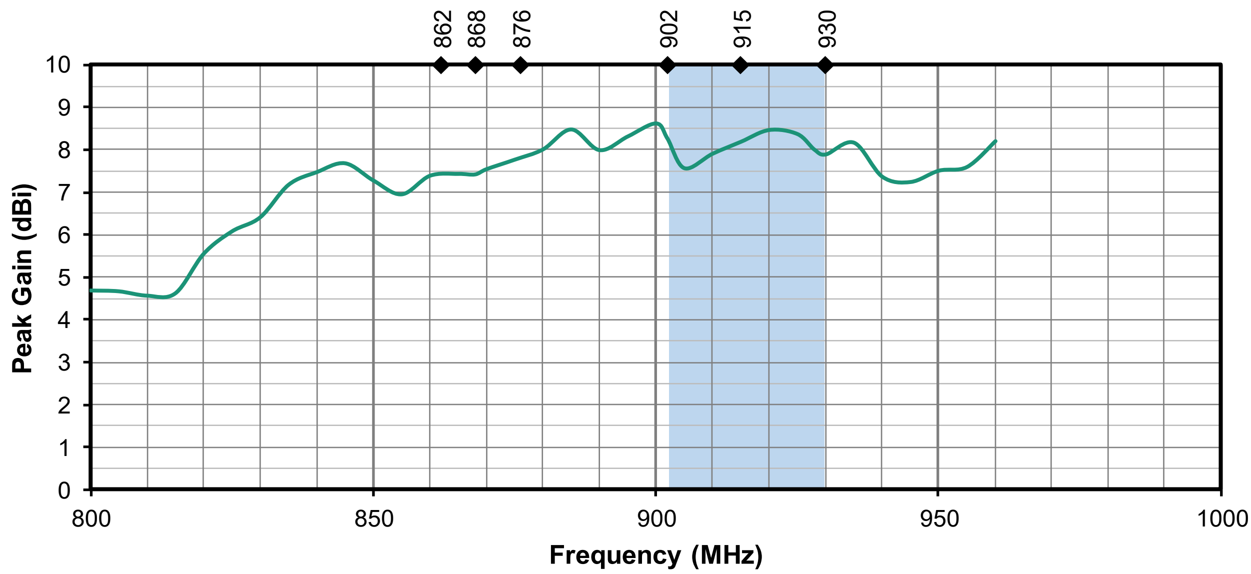


Figure 6. Antenna Peak Gain, Vertical

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.

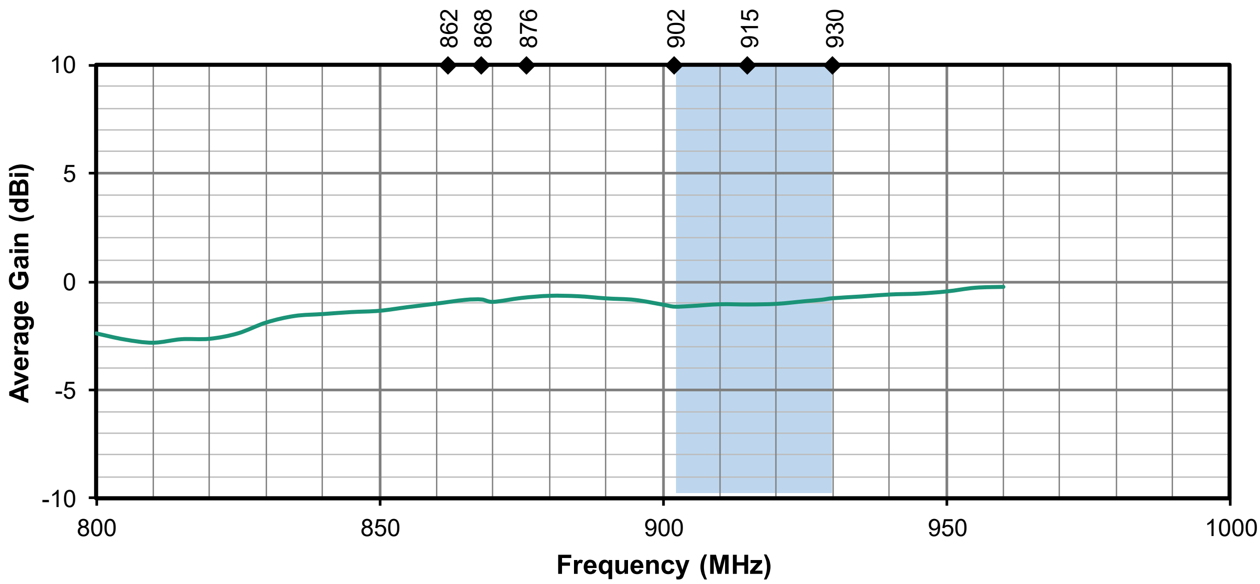


Figure 7. Antenna Average Gain, Vertical

Radiation Efficiency

Radiation efficiency (**Figure 8**), shows the ratio of power radiated by the antenna relative to the power supplied to the antenna, expressed as a percentage, where a higher percentage indicates better performance at a given frequency. An ideal antenna has 100% efficiency. But in really world, usually an external antenna radiates only 50~60% of power supplied to it.

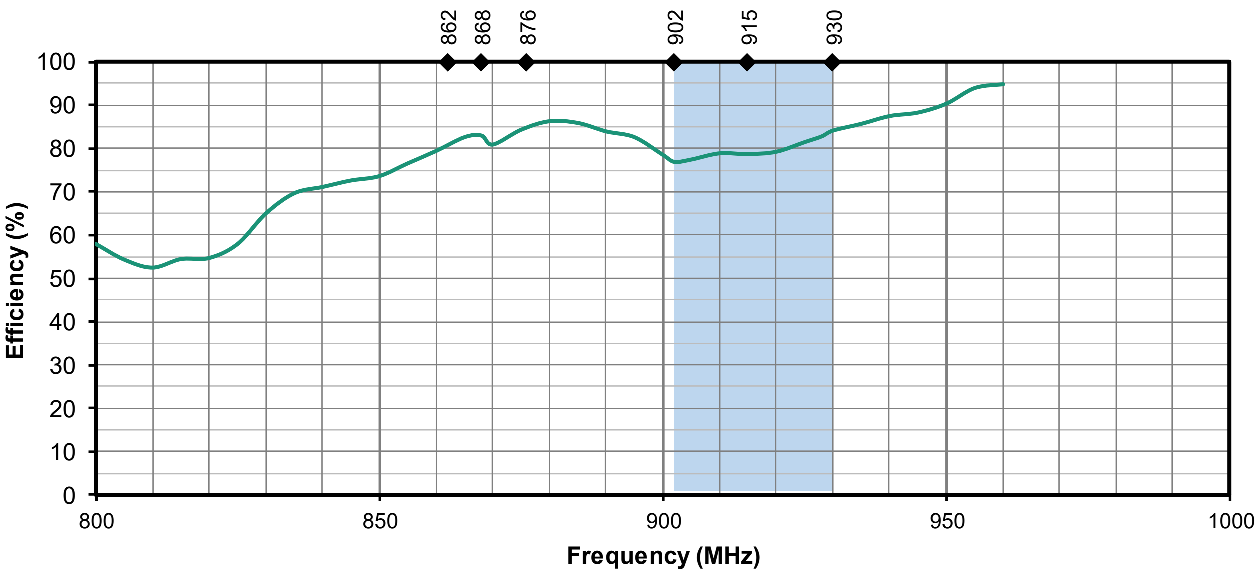
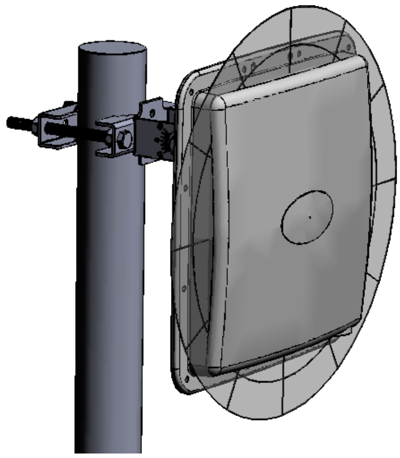
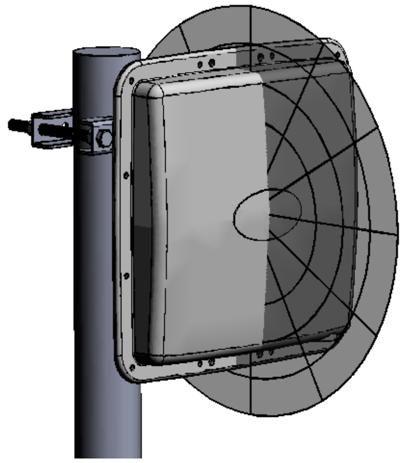


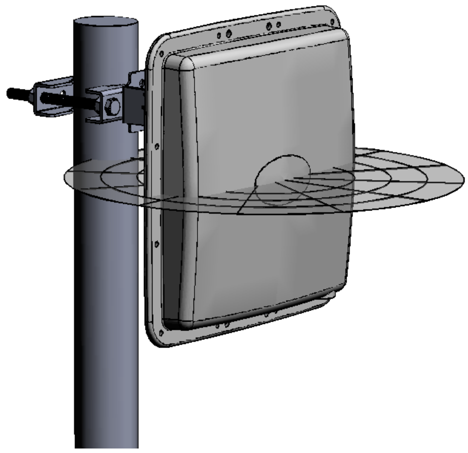
Figure 8. Antenna Efficiency, Vertical

Radiation Patterns

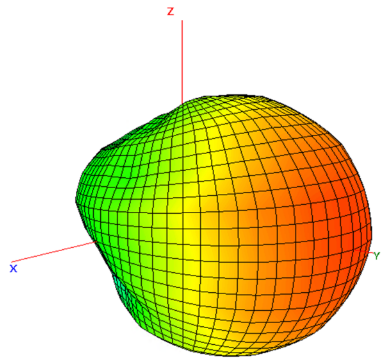
Radiation patterns provide information about the directionality and 3-dimensional gain performance of the antenna by plotting gain at specific frequencies in three orthogonal planes. Antenna radiation patterns for a vertical orientation are shown in **Figure 9** using polar plots covering 360 degrees. The antenna graphic at the top of the page provides reference to the plane of the column of plots below it.

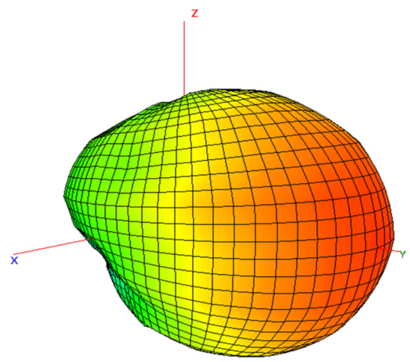

XZ-Plane Gain

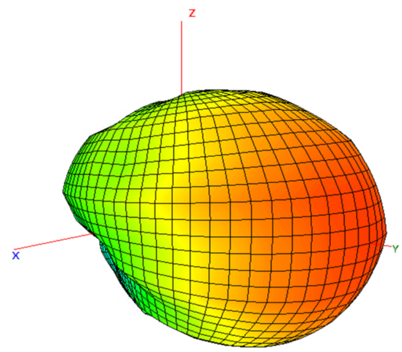

YZ-Plane Gain

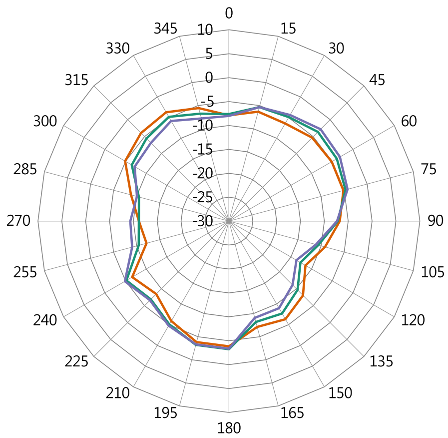

XY-Plane Gain

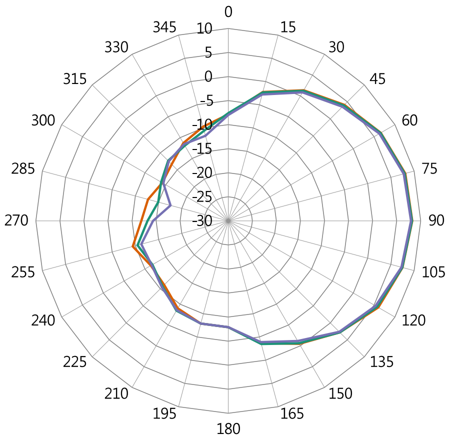
902 MHz to 928 MHz (915 MHz)

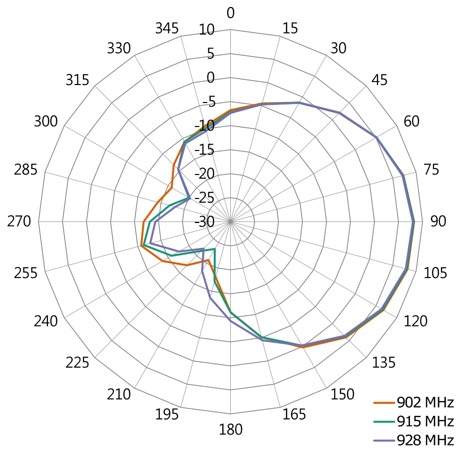

902 MHz


915 MHz


928 MHz


XZ-Plane Gain


YZ-Plane Gain



XY-Plane Gain

Figure 9. Antenna Radiation Patterns, Vertical

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Antenna FAQs

Q: What is an antenna?

An antenna is used for transmission or reception of radio signals in wireless communication.

Q: How do antennas work?

Electricity flowing into the transmitter antenna makes electrons vibrate up and down it, producing radio waves. The radio waves travel through the air at the speed of light. When the waves arrive at the receiver antenna, they make electrons vibrate inside it.

Q: Does antenna size matter?

A bigger antenna, properly designed, will always have more **gain** than a smaller one. And it will be the best kind of **gain**, much better than using a small antenna and simply over-amplifying it, because a small antenna just won't pull in truly weak signals like this gigantic one will.

Q: What is the advantage of external antennas?

External antennas usually offer **better bandwidth** and **high performance** due to the nature of their larger size. This often results in a higher rated **gain** (dBi) than their internal counterparts. Due to its smaller size, an internal antenna would not function well to support lower frequencies.

Ease of integration – an external antenna requires fewer design resources and shorter time to integrate to allow for a more rapid time-to-market. An internal antenna's performance is influenced by device environment – PCB ground plane, nearby metal part, and enclosure. That would require much more effort such as impedance matching network to complete antenna design

Q: Why is most antenna impedance 50 Ohm?

50 Ohm is an industry standard of coax cables and power amplifiers. It was chosen as a tradeoff between maximum power handling for the transmit coax and the copper losses. The optimum would have been anyway in the range of **30 to 100 ohm** with average at 50 Ohm

Q: Why does GNSS require RHCP (Right-hand-circularly-polarized) antennas?

Satellite's signal has a low power density, especially after propagating through the **atmosphere** (**ionosphere** affect radio wave). Polarized waves oscillate in more than one direction, which deliver satellite's signal to receiver on Earth surface more effectively.

Website:	https://www.joymax.com.tw
Offices:	5, Dong-Yuan 2nd Road, Zhong-Li Dist., Tao-Yuan City 32063 Taiwan (R.O.C.)
Phone:	+886 3 433 5698
E-MAIL:	info@joymax.com.tw

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