

## Specification

- Part No. : **MA130.A.LP.002**
- Product Name : MA130 GPS/GLONASS/Galileo and ISM Band 868MHz  
2 in 1 Combination Hercules Screw Mount  
(Permanent Thread Mount)
- Features : Stable and High efficiency  
4dBi Gain 868MHz ISM Band  
-200mm RG316 SMA(M)  
GPS/GLONASS/Galileo - Two Stage 27dB+LNA  
- 200mm RG-174 SMA(M)  
Low profile - Height 28.5mm, Diameter 47.8mm  
Robust, UV and Vandal resistant PC housing  
IP65 Rated Enclosure  
**RoHS & REACH Compliant**



## 1. Introduction

The MA130 Hercules antenna is a GPS/GLONASS/Galileo and ISM Band 868MHz combination 2in1 high performance solution for remote monitoring. The integrated metal thread-mount allows for external use on vehicles and outdoor assets worldwide.

The 868MHz ISM Band antenna has an inbuilt ground-plane and comparatively wide-bandwidth of 30MHz+, at a minimum return loss of -10dB from 850MHz to 880MHz, delivering complete stability of performance when mounted on a ground-plane or in free-space, thus permitting a wide variety of installations. The omni-directional gain pattern, with a peak gain of 4dBi when using shorter cable lengths, ensures constant reception and transmission.

The GPS/GLONASS/Galileo antenna has been optimized to work on both GPS/Galileo and GLONASS bands, allowing the antenna to see the maximum amount of satellites in the sky and improving tracking accuracy enormously especially in built up areas, such as urban canyons where traditional GPS-only solutions struggle to maintain a lock driving around corners. A front-end SAW filter attenuates any nearby out-of-band wireless transmissions so the GPS/Galileo LNA is not driven into compression or damaged.

The Hercules is also prized by the leading wireless device brands globally due to its unique mechanical construction. The compact size, IP65 rated enclosure and rugged polycarbonate construction, which can withstand direct attack and hazards such as tree-branches, are un-matched in the industry.

The standard option comes with 200mm cables and SMA(M) connectors. The cable length and connector are customizable. Taoglas supplies low loss extension cables according to your requirement. Maximum cable length should not go beyond 5 meters. The Hercules is also available in White. Contact your regional sales office for further information.

## 2. Specification

### ELECTRICAL ISM Band 868MHz

Operation Frequency (MHz)		868 MHz				
Cable length (M)		0.2	1	2	3	5
In free space	Average Gain (dB)	-2.69	-3.29	-3.99	-4.79	-6.39
	Efficiency (%)	53.79	46.85	39.87	33.16	22.95
	Peak Gain	3.98	3.38	2.68	1.88	0.28
Cable length (M)		0.2	1	2	3	5
On 30x30cm ground plane	Average Gain (dB)	-2.14	-2.74	-3.44	-4.24	-5.84
	Efficiency (%)	61.04	53.16	45.25	37.64	26.04
	Peak Gain	4.51	3.91	3.21	2.41	0.81
Max VSWR		2:1				
Max. Return Loss (dB)		-10				
Polarization		Linear				
Impedance		50 Ohms				
Max Input Power		5 Watts				

### ELECTRICAL GPS-GLONASS-GALILEO

Frequency	1574~1606MHz
Impedance	50 ohm
VSWR	2.0 Max
GPS/GALILEO Patch Gain @ Zenith	-1.4dBi Passive Gain @ Zenith
GLONASS Patch Gain @ Zenith	-1.3dBi Passive Gain @ Zenith
Out Band Rejection	fo = 1575.42MHz
	fo ± 30 MHz 5dB Min.
	fo ± 50 MHz 20dB Min.
	fo ± 100 MHz 25dB Min.
Input Voltage	Typ. 2.5~5.5V
Total Gain @ Zenith	27dB typical at 3.0V
Current Consumption	10mA typical at 3.0V
Noise Figure	1.3dB typical

<b>MECHANICAL</b>	
Dimension (mm)	Height = 28.5 mm and Diameter = 47.8 mm
Cable length	200mm RG316 of ISM Band antenna – Fully Customizable 200mm RG174 of GPS/GLONASS/GALILEO antenna –Fully Customizable
Connector	Both are SMA(M)ST – Fully Customizable
Casing	PC
Base and Thread	Nickel plated steel
Thread Diameter	18 mm
Weather proof gasket	CR4305
Sealant	Rubber Stopper
Weight	140g (200mm cable length)
<b>ENVIRONMENTAL RATINGS</b>	
Corrosion	5% NaCl for 48hrs - Nickel plated steel base and thread
Temperature Range	-40°C to +85°C
Thermal Shock	100 cycles -40°C to +85°C
Humidity	Non-condensing 65°C 95% RH
Shock (Drop Test)	1m drop on concrete 6 axes
Cable Pull	8 Kgf
Recommended Torque Setting for Mounting	24.5N·m
Maximum Torque Setting for Mounting	29.5N·m
Ingress Protection	IP65

## 3. Antenna Characteristics

### 3.1. Test Setup

MA.130.A.LP.002 antenna was tested with R&S ZNB-8 network analyzer.



**In free space**



**On 30x30 ground plane**

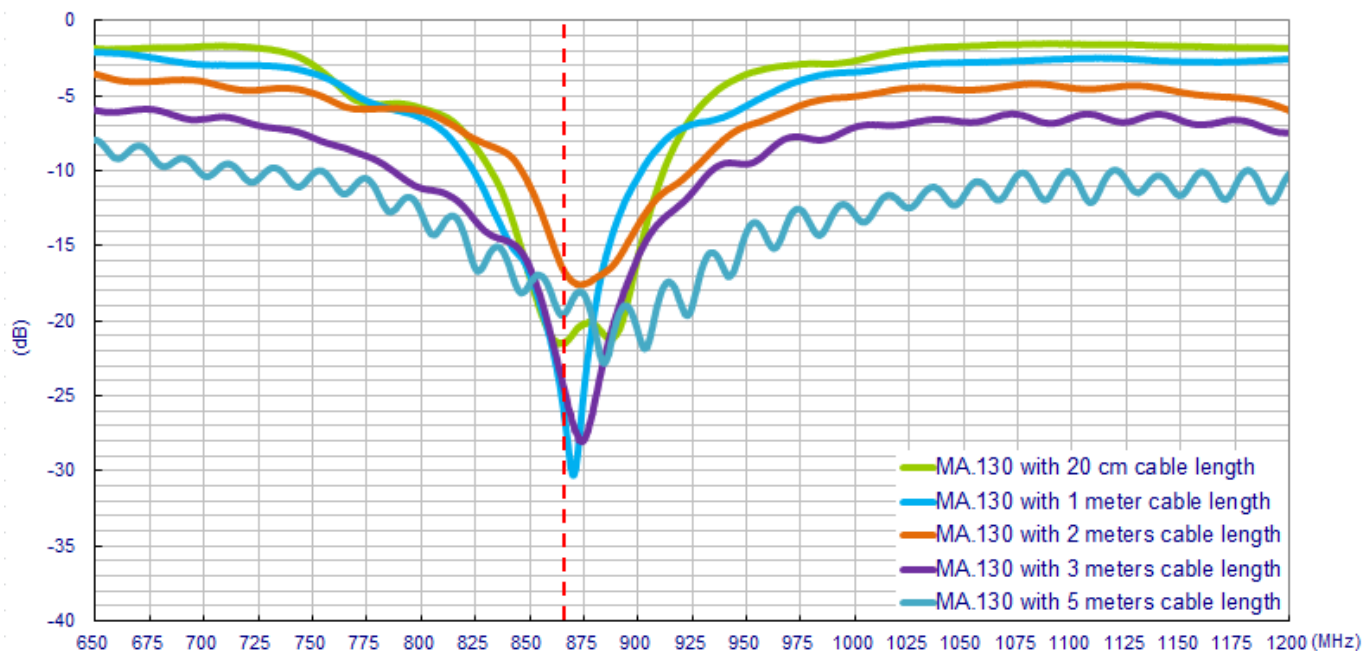
Taoglas measured the antenna with two states - in free space, and mounted on a 30x30cm ground plane



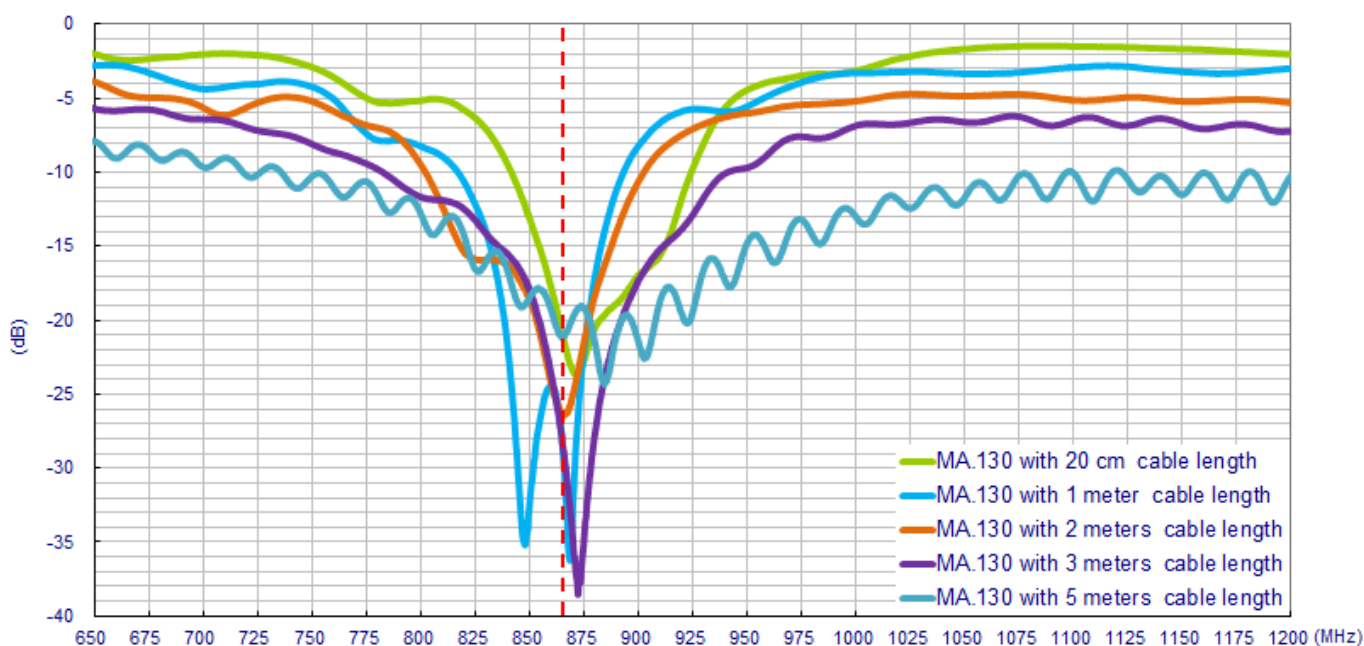
## 4.868MHz Antenna

### 4.1. Return Loss

#### 4.1.1. In free space

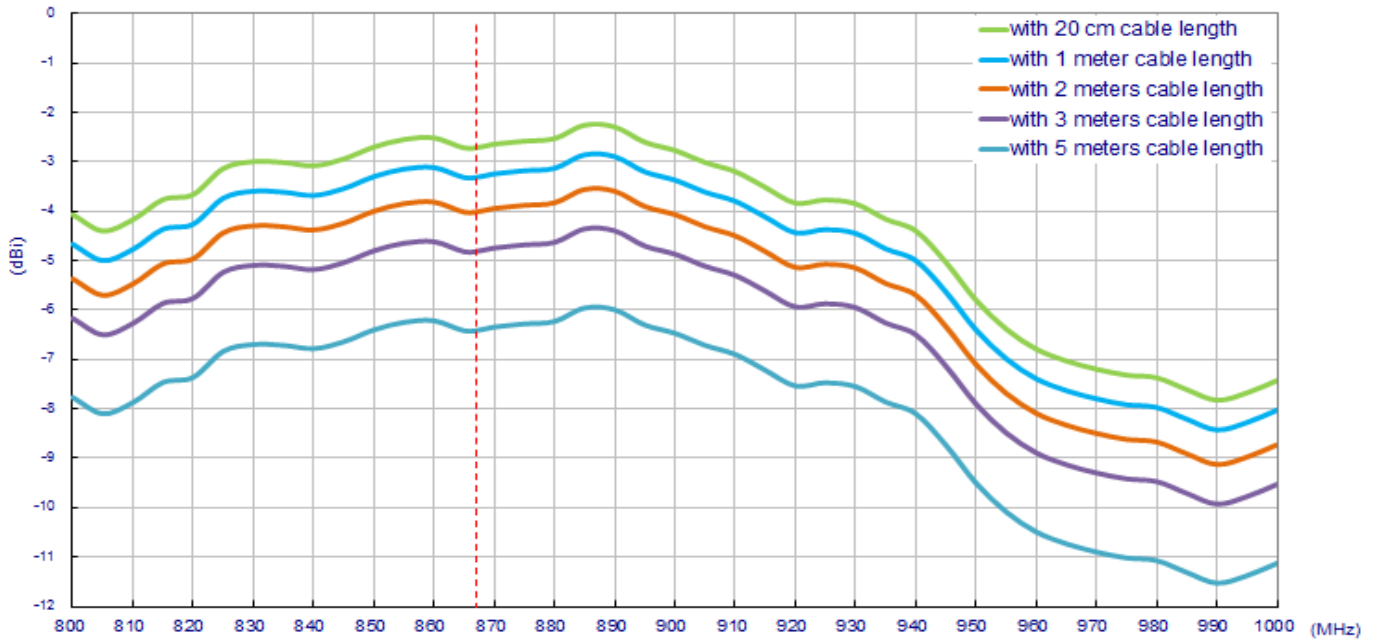


#### 4.1.2. On 30X30cm ground plane

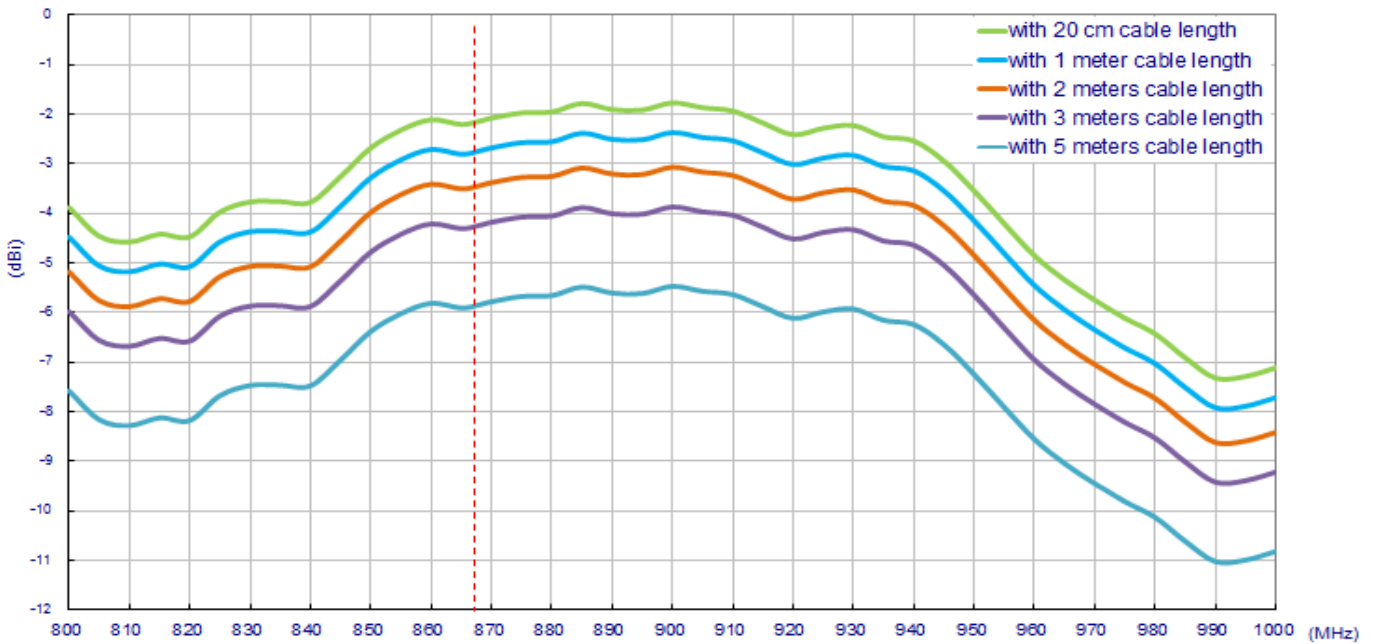


## 4.2. Average Gain

### 4.2.1. In free space

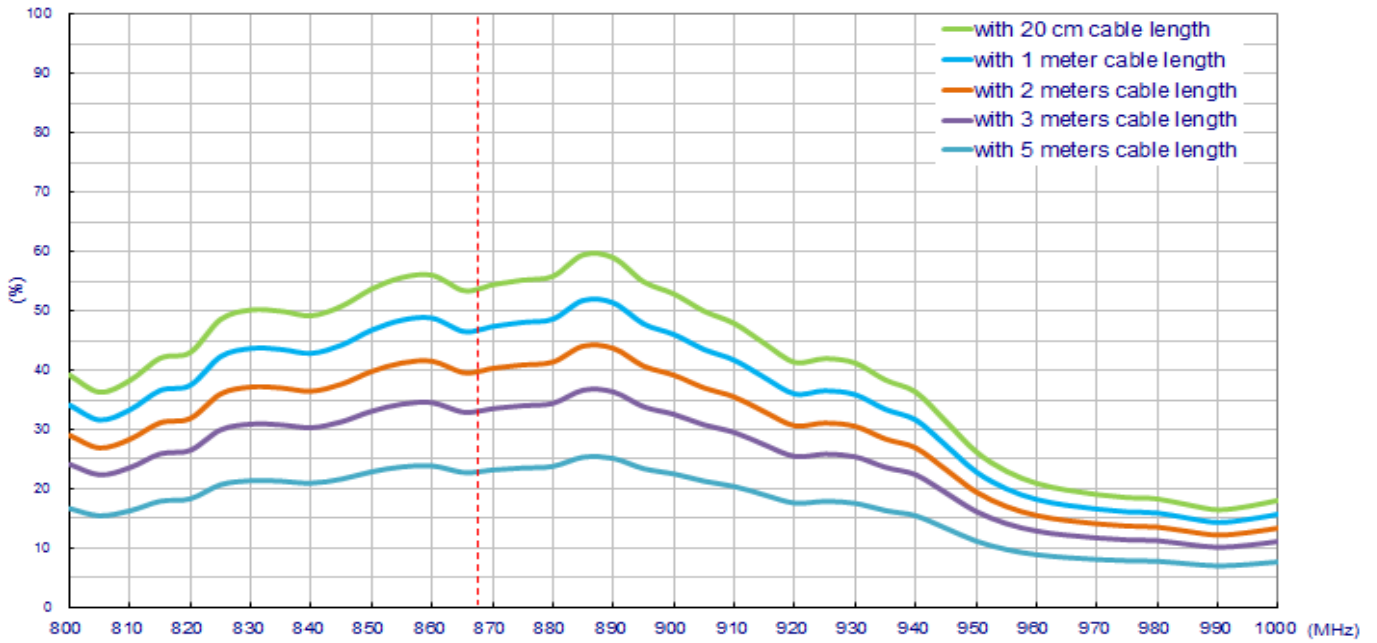


### 4.2.2. On 30x30cm ground plane

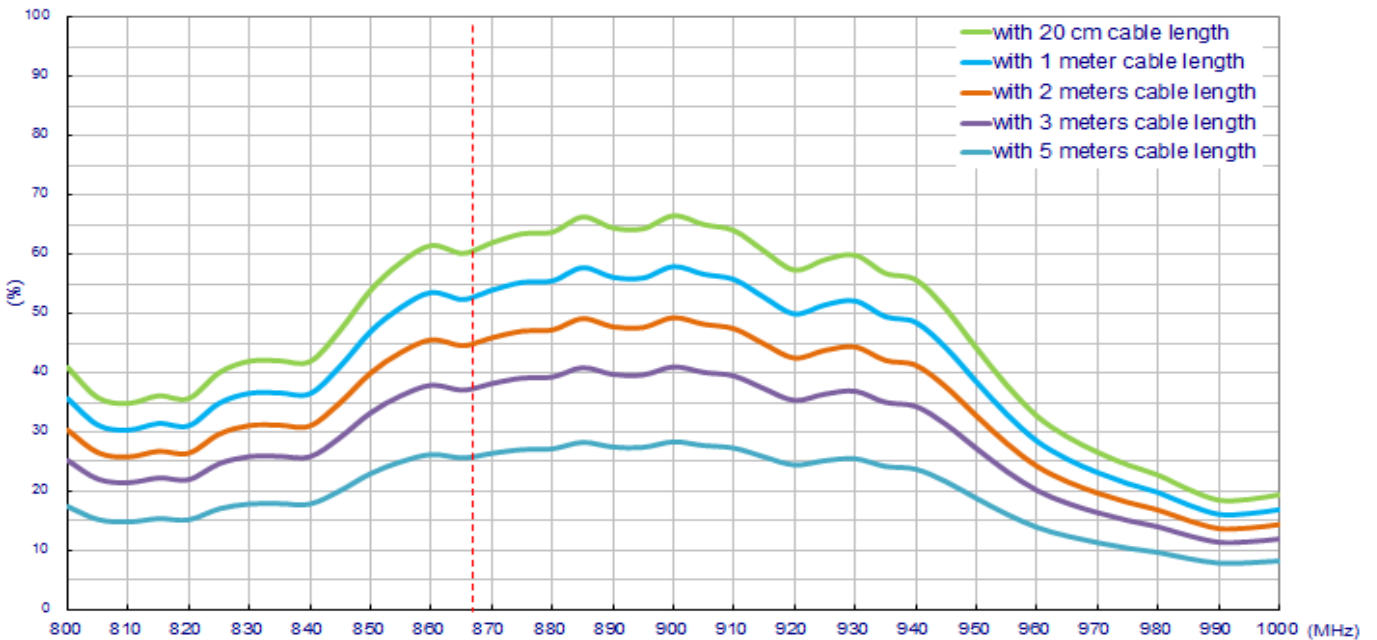


### 4.3. Efficiency

#### 4.3.1. In free space



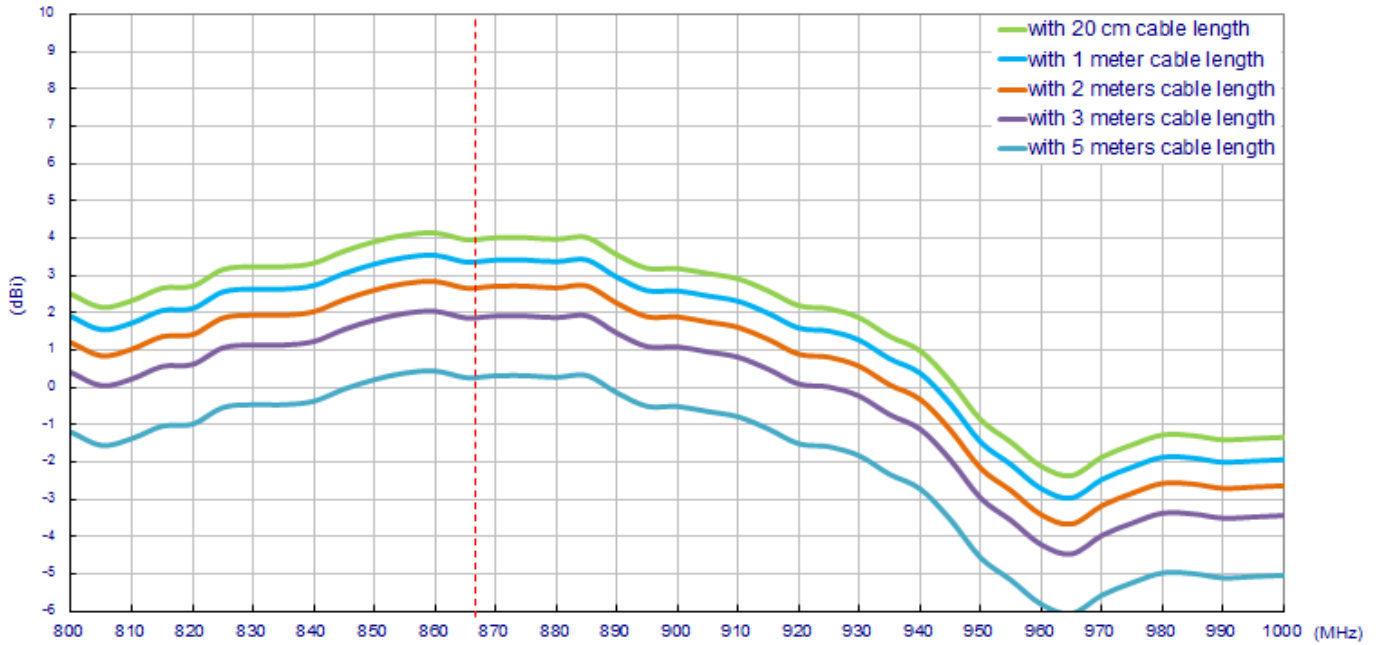
#### 4.3.2. On 30x30cm ground plane



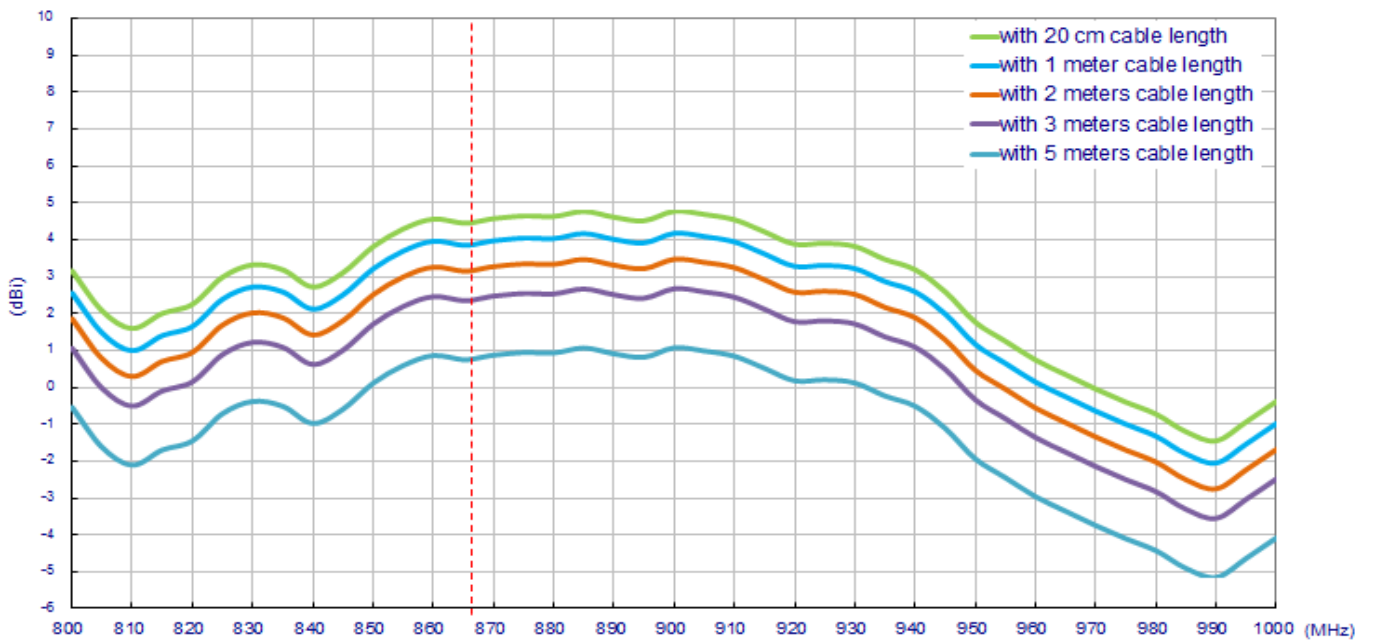


## 4.4. Peak Gain

### 4.4.1. In free space



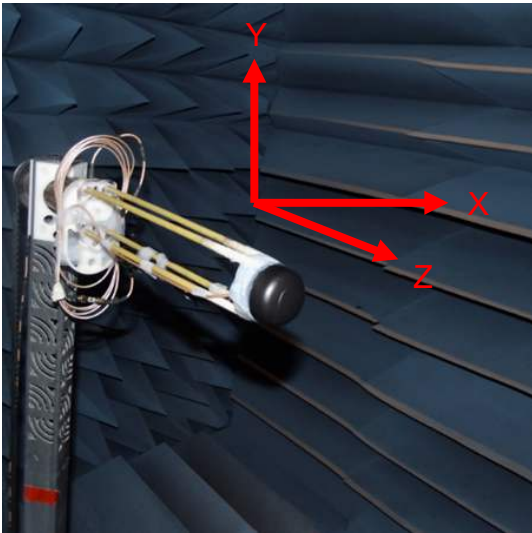
### 4.4.2. On 30x30cm ground plane



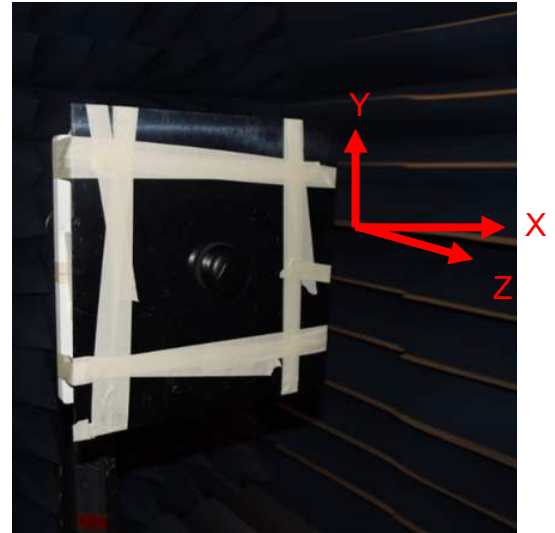
## 4.5. Antenna Radiation Patterns

### 4.5.1. Antenna Setup

The antenna radiation pattern test setup is shown below.



**In free space**

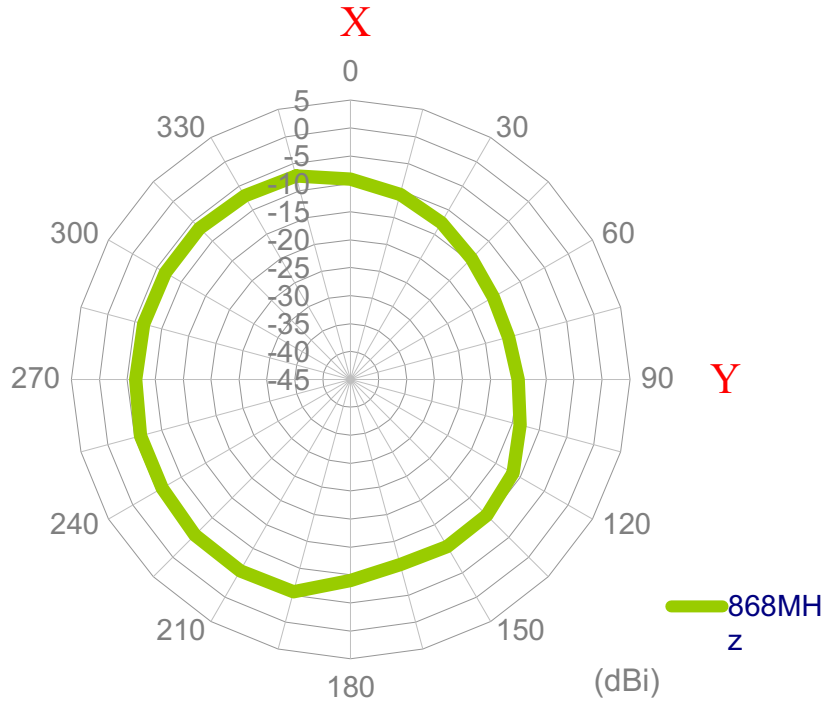


**On 30x30 ground plane**

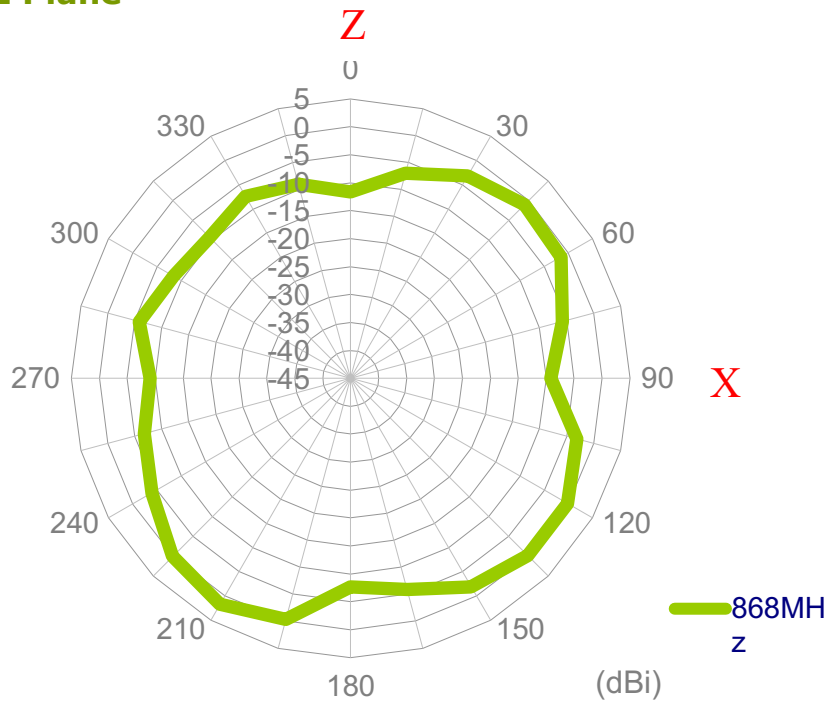


## 4.5.2. Antenna Radiation Patterns

**In free space  
XY Plane**

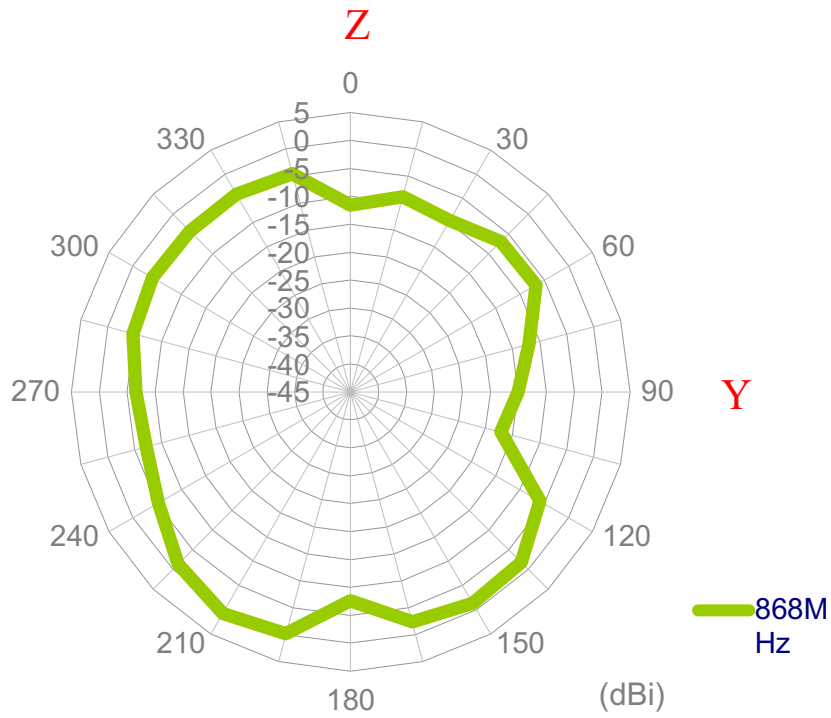


**XZ Plane**

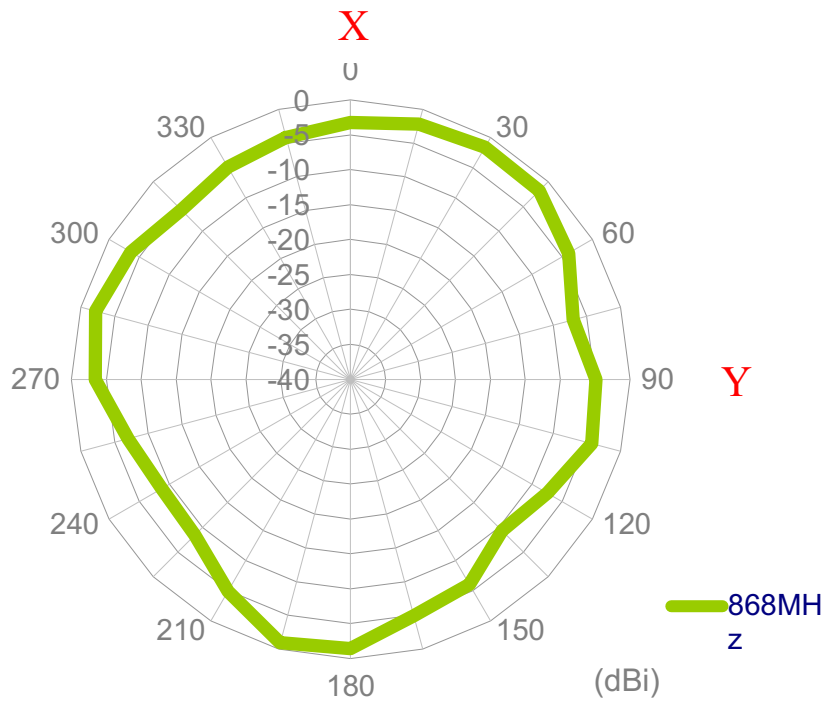




## YZ Plane

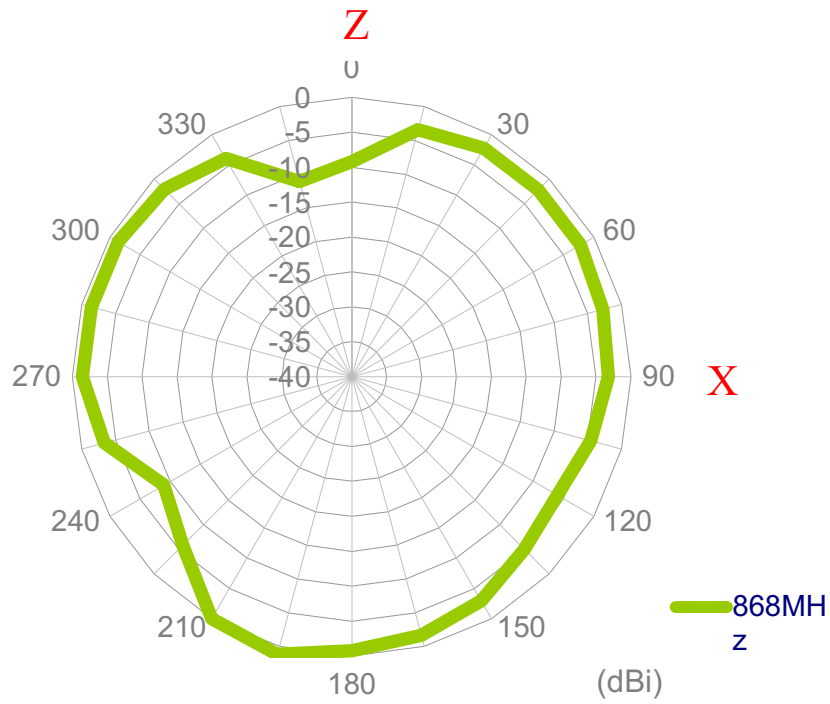


## On 30x30cm ground plane XY Plane

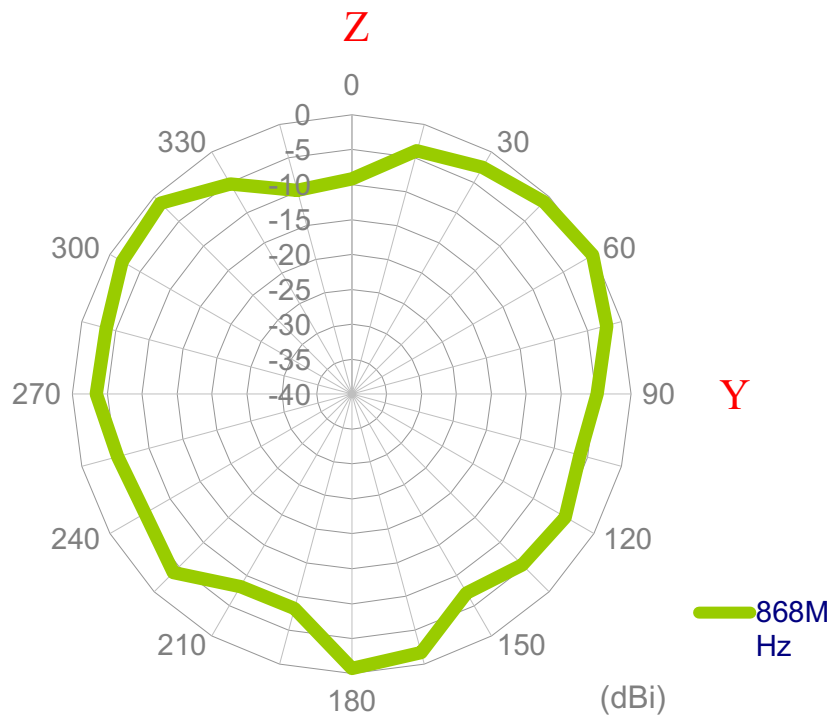




## XZ Plane

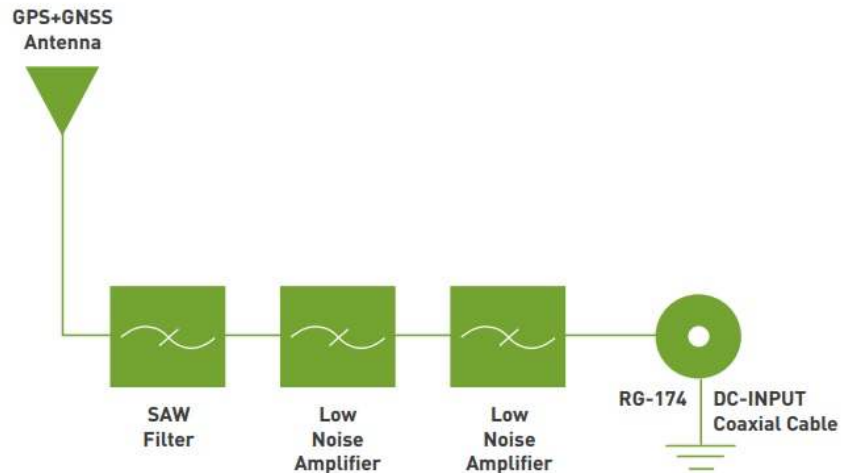


## YZ Plane



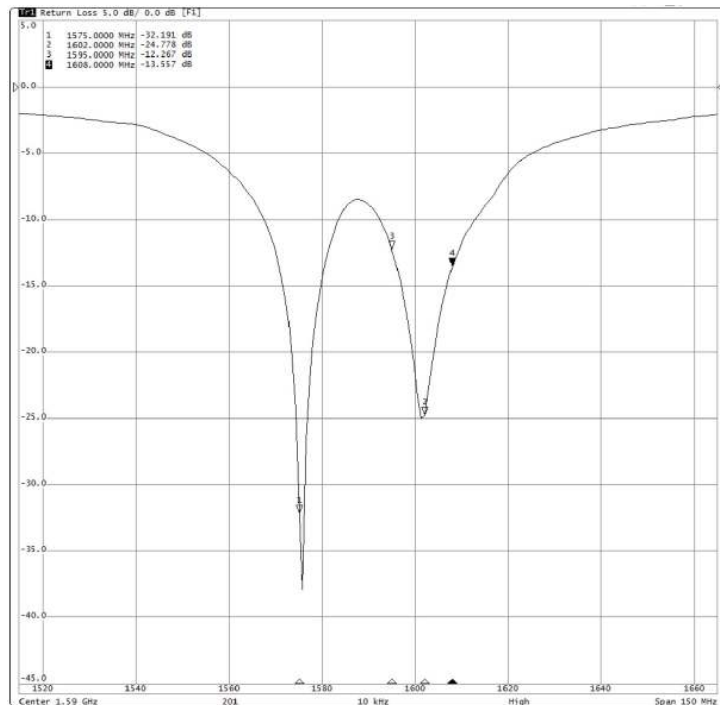
## 5. GPS-GLONASS-GALILEO Antenna

### 5.1. System Block Diagram



### 5.2. GPS-GLONASS-GALILEO Passive Antenna Result

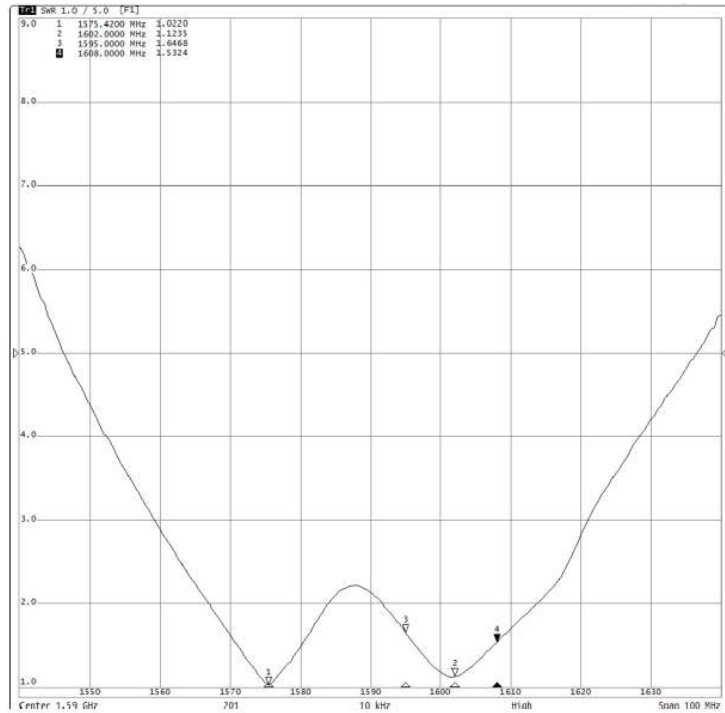
#### 5.2.1. Return Loss



Return Loss : 1575.42 MHz -32.19 dB  
1602.6 MHz -24.77 dB



## 5.2.2. VSWR

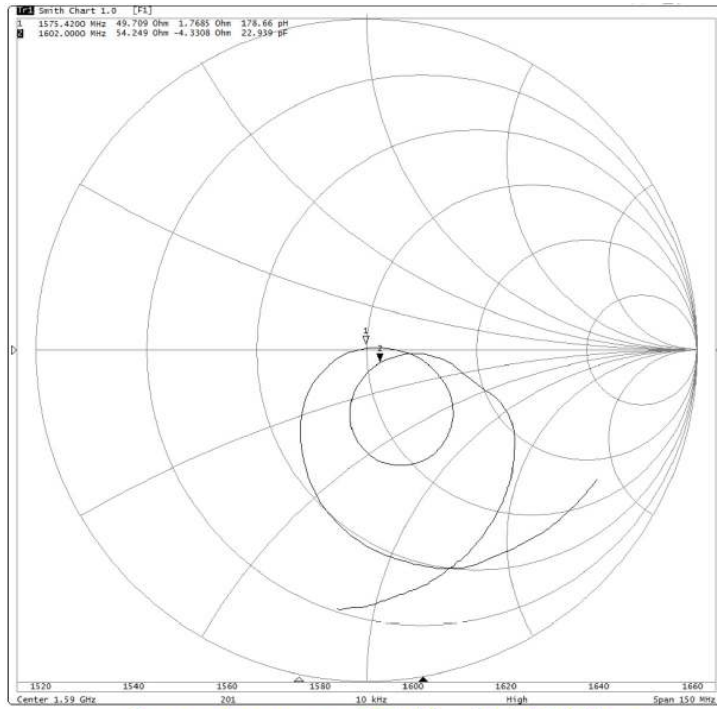


VSWR: 1.022 @ 1575.42 MHz

1.12 @ 1602.6 MHz



## 5.2.3. Smith Chart



Impedance :  $49.70 + j1.76$  Ohm

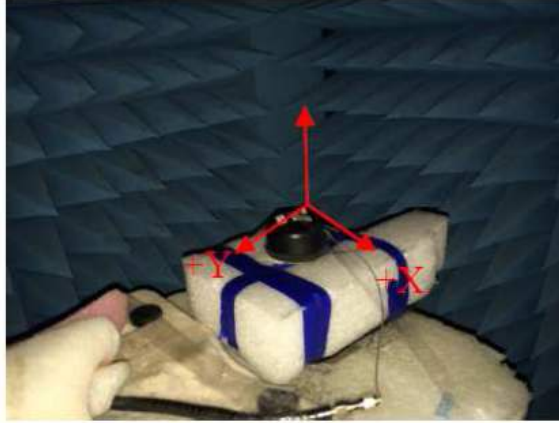
Impedance :  $54.24 - j4.33$  Ohm



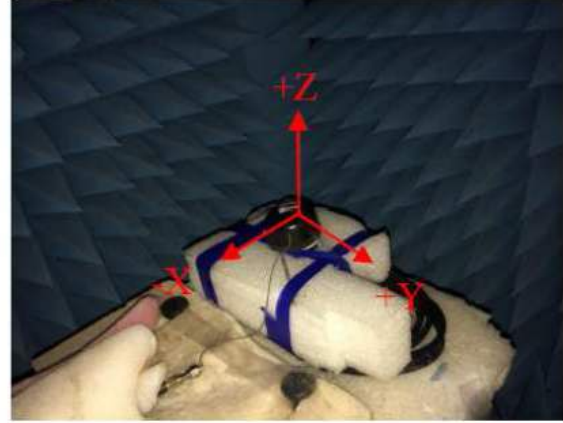


## 5.3. GPS-GLONASS-GALILEO Radiation Patterns

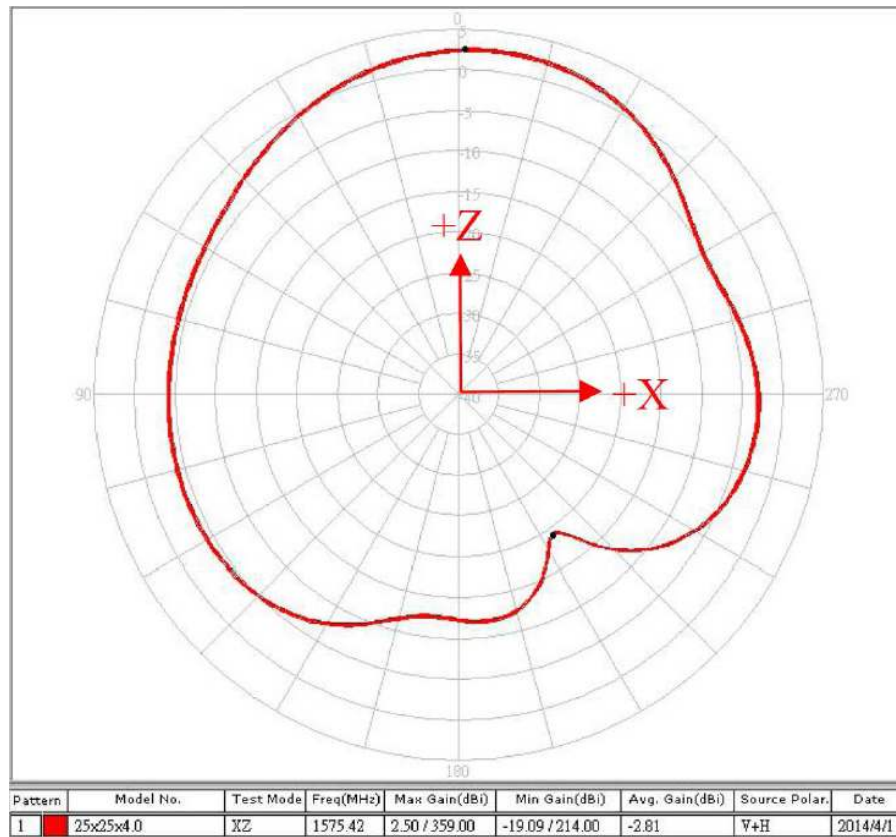
XZ-Plane



YZ-Plane

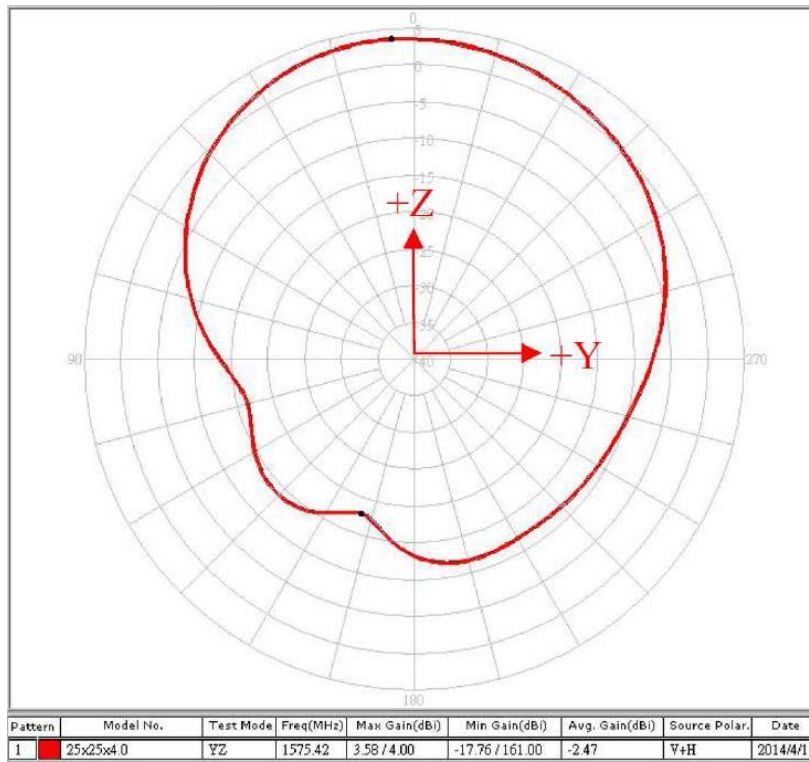


### 5.3.1. 1575.42 MHz XZ-Plane

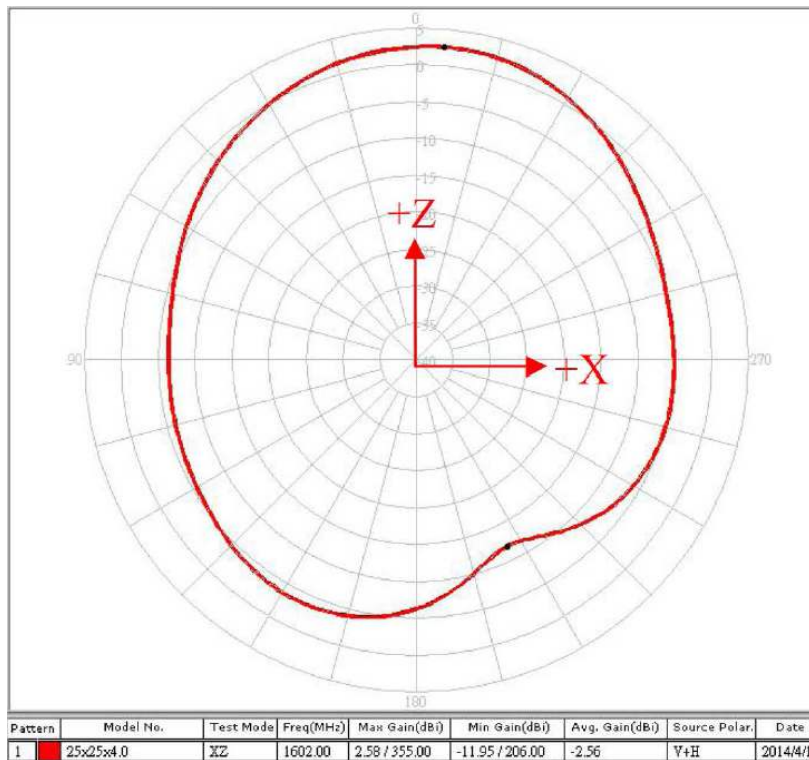




## 5.3.2. 1575.42 MHz YZ-Plane

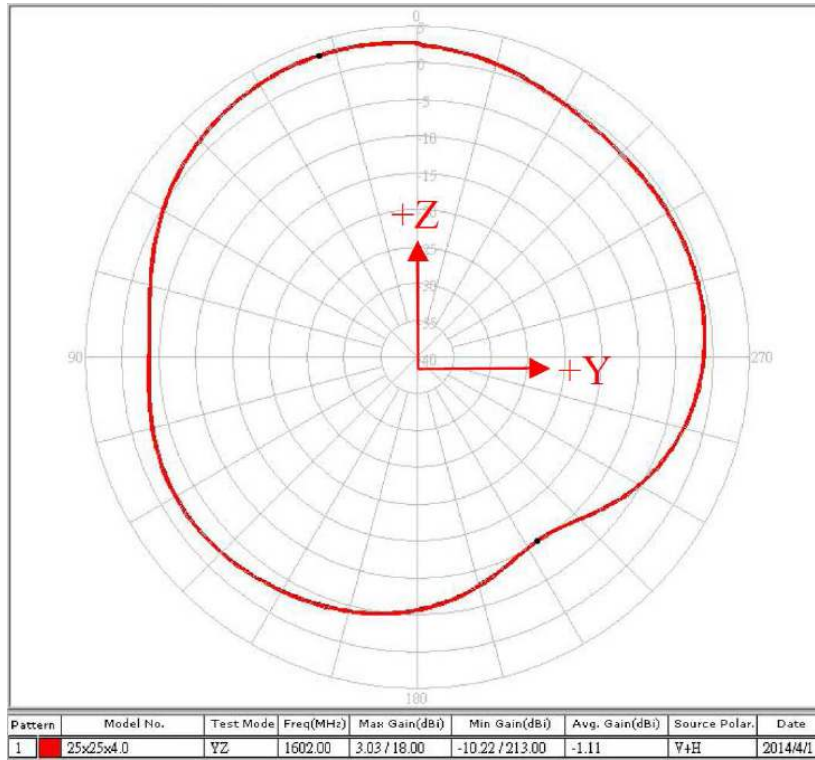


## 5.3.3. 1602 MHz XZ-Plane





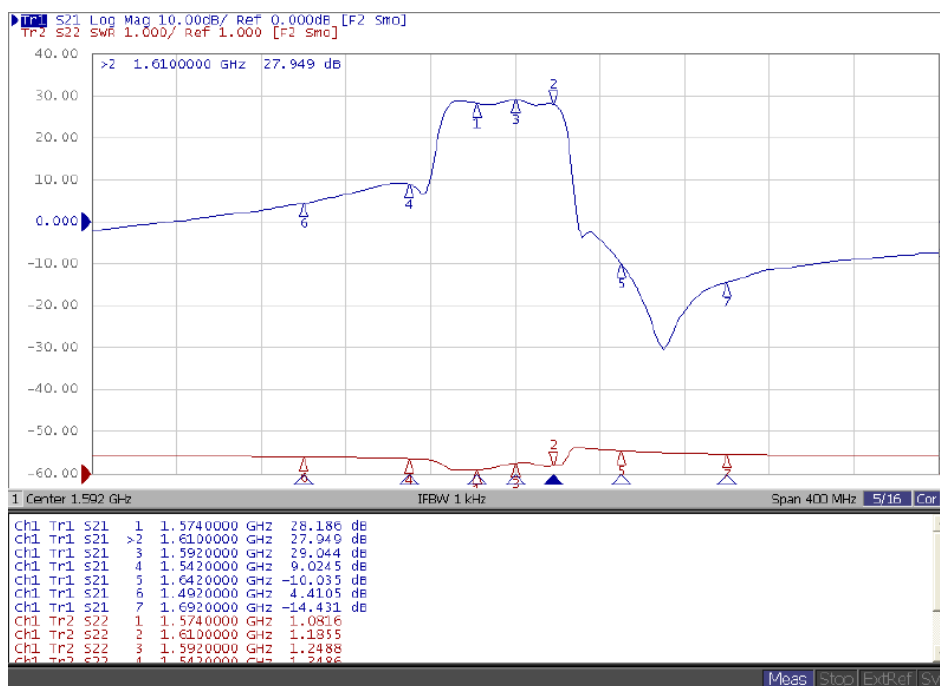
## 5.3.4. 1606 MHz YZ-Plane



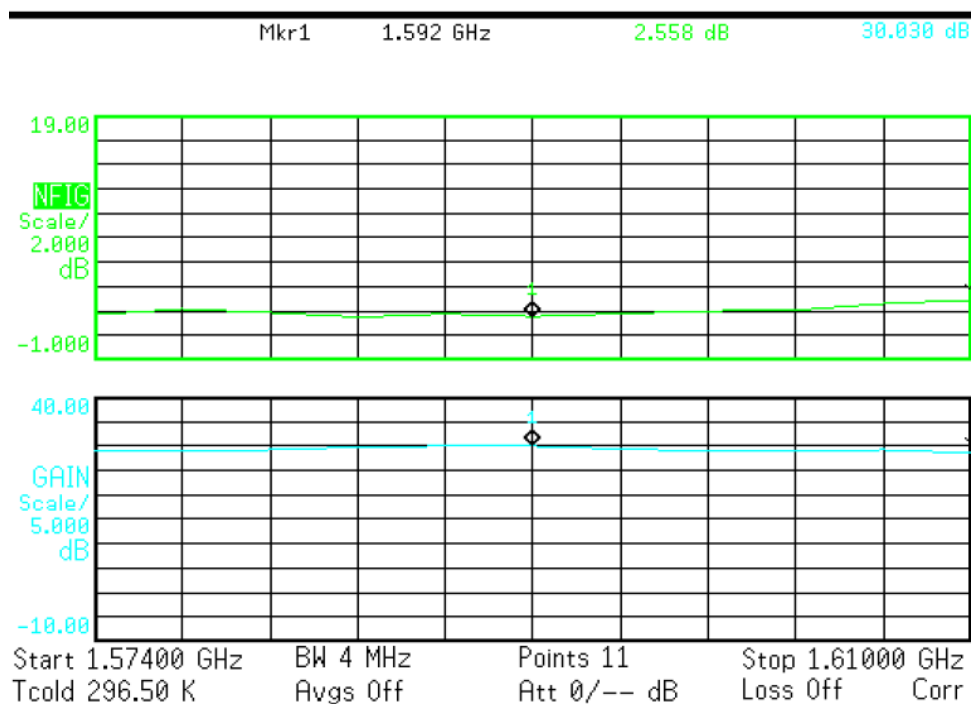


## 5.4. GPS-GLONASS-GALILEO - Low Noise Amplifier

### 5.4.1. S21\_Gain

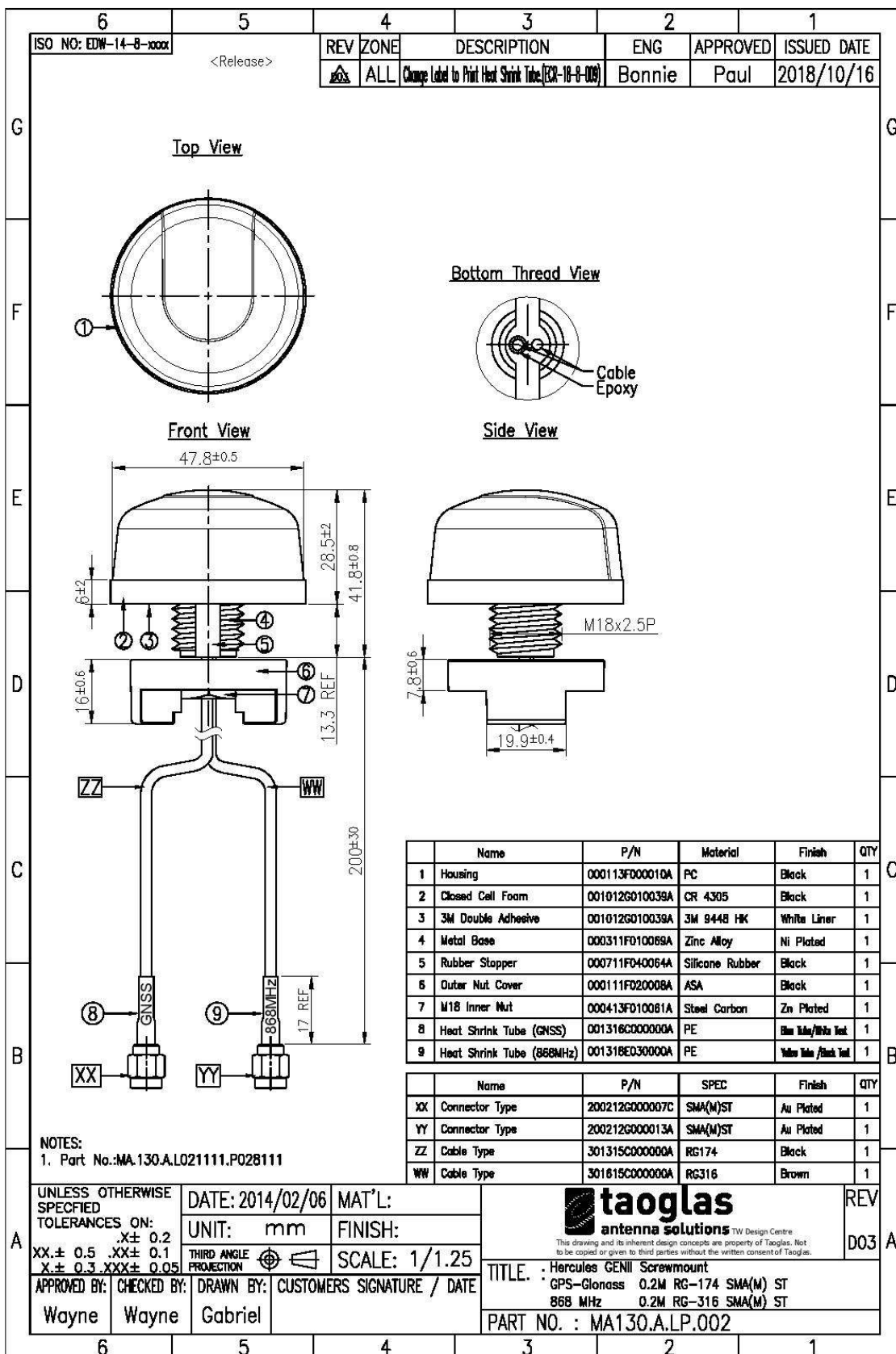


### 5.4.2. Noise Figure



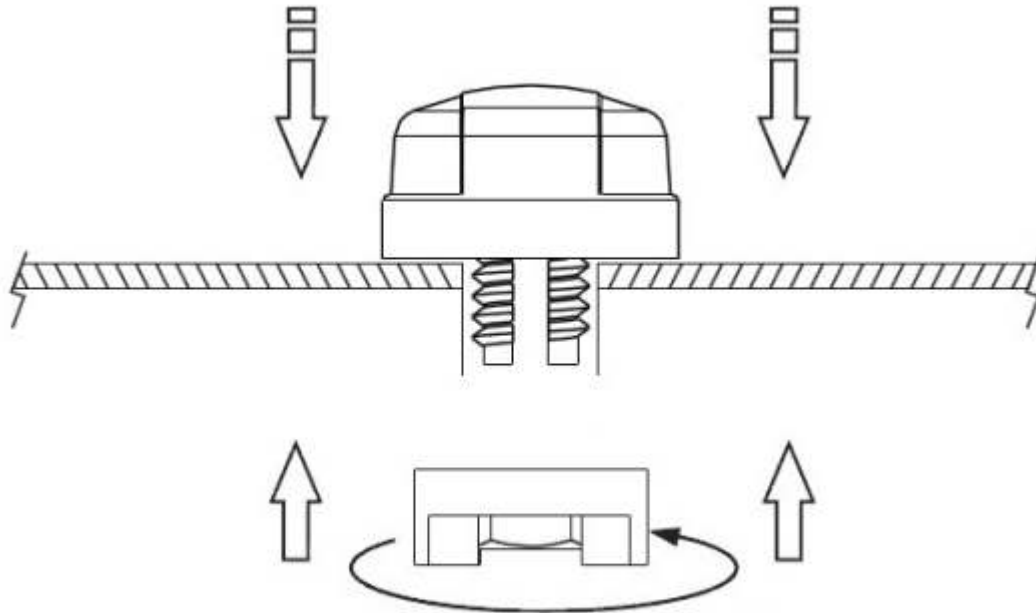


## 6. Drawing



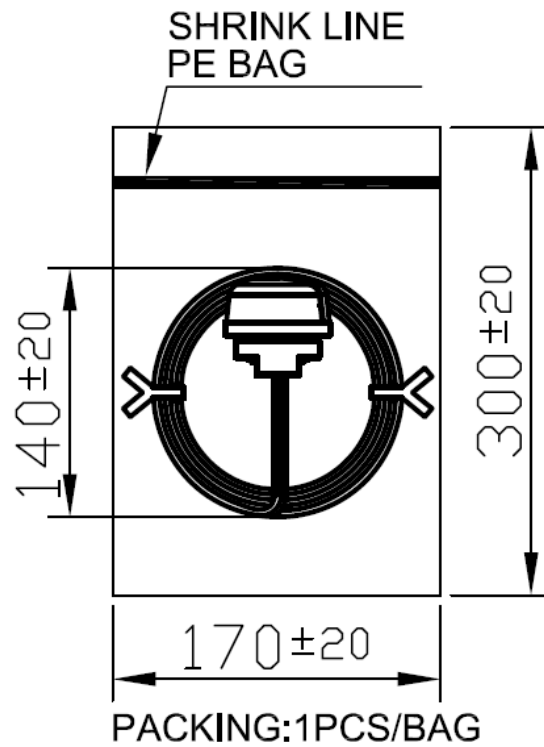


## 7. Installation



Recommended torque for Mounting is 24.5N·m  
Maximum torque for mounting is 29.4 N·m

## 8. Packaging



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