

Hercules

MA130.A.LP.002

## Specification

<b>Part No.</b>	MA130.A.LP.002
<b>Product Name</b>	<b>Hercules</b> MA130 GPS/GLONASS and ISM Band 868MHz 2 in 1 Combination Hercules Screw Mount (Permanent Thread Mount)
<b>Feature</b>	Stable and High efficiency 4dBi Gain 868MHz ISM Band -200mm RG316 SMA(M) GPS/GLONASS- Two Stage 27dB+LNA - 200mm RG174 SMA(M) Low profile - Height 28.5mm, Diameter 47.8mm Robust, UV and Vandal resistant PC housing IP67/IP69K Water Resistant RoHS Compliant



## 1. Introduction

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 antenna has been optimized to work on both GPS 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 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 and rugged polycarbonate construction, which can withstand direct attack and hazards such as tree-branches, coupled with a waterproof rating of IP67 and IP69K (waterproof against high pressure industrial cleaning from top and bottom sides) 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						
Frequency	1574~1606MHz					
Impedance	50 ohm					
VSWR	2.0 Max					
GPS 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					

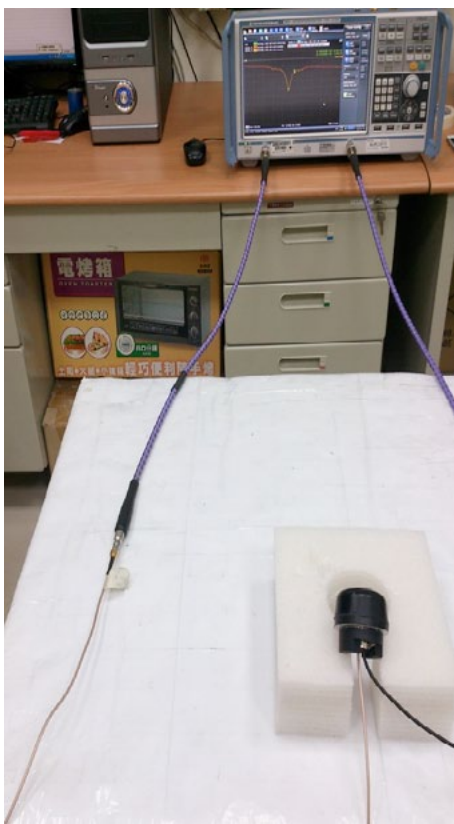
## 2. Specification

MECHANICAL	
<b>Dimension (mm)</b>	Height = 28.5 mm and Diameter = 47.8 mm
<b>Cable length</b>	200mm RG316 of ISM Band antenna – Fully Customizable 200mm RG174 of GPS/GLOANSS antenna –Fully Customizable
<b>Connector</b>	Both are SMA(M)ST – Fully Customizable
<b>Casing</b>	PC
<b>Base and Thread</b>	Nickel plated steel
<b>Thread Diameter</b>	18 mm
<b>Weather proof gasket</b>	CR4305
<b>Sealant</b>	Rubber Stopper
<b>Weight</b>	140g (200mm cable length)
ENVIRONMENTAL RATINGS	
<b>Protection</b>	IP67 & IP69K
<b>Corrosion</b>	5% NaCl for 96hrs - Nickel plated steel base and thread
<b>Temperature Range</b>	-40°C to +85°C
<b>Thermal Shock</b>	100 cycles -40°C to +85°C
<b>Humidity</b>	Non-condensing 65°C 95% RH
<b>Shock (Drop Test)</b>	1m drop on concrete 6 axes
<b>Cable Pull</b>	8 Kgf
<b>Recommended Torque Setting for Mounting</b>	24.5N·m
<b>Maximum Torque Setting for Mounting</b>	29.5N·m

### 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**



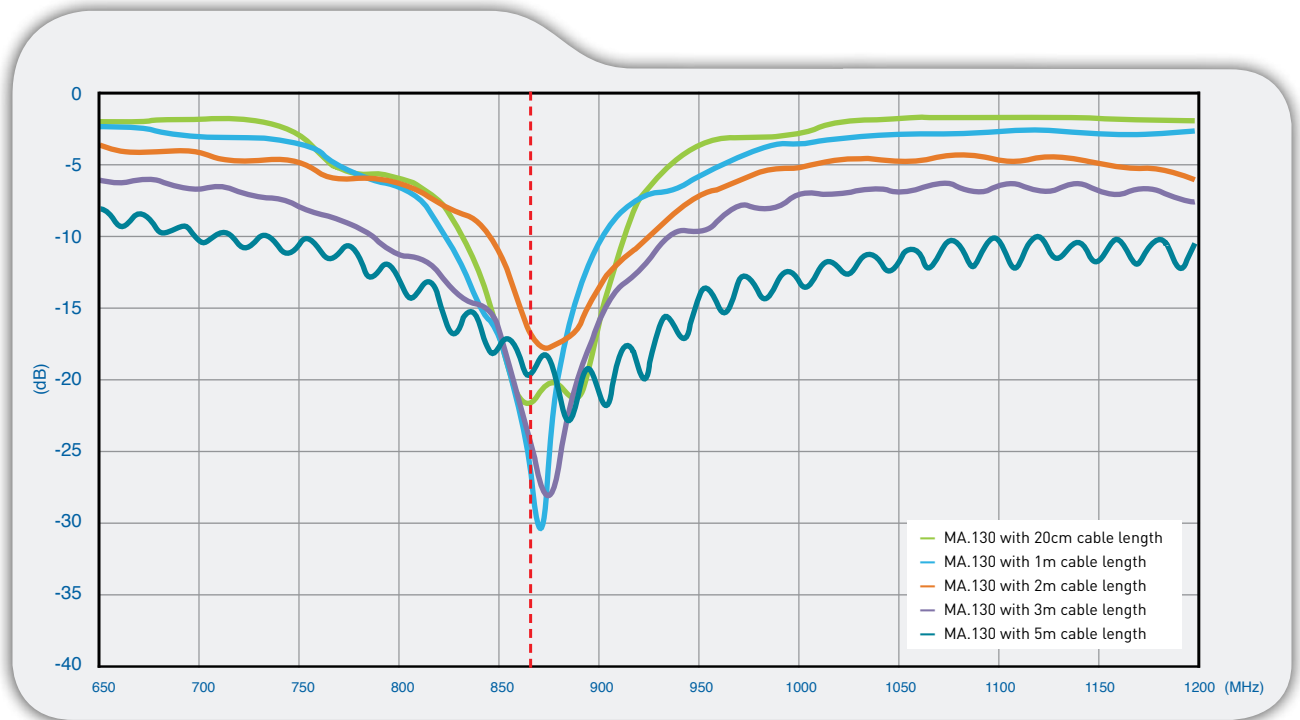
**On 30x30 ground plane**

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

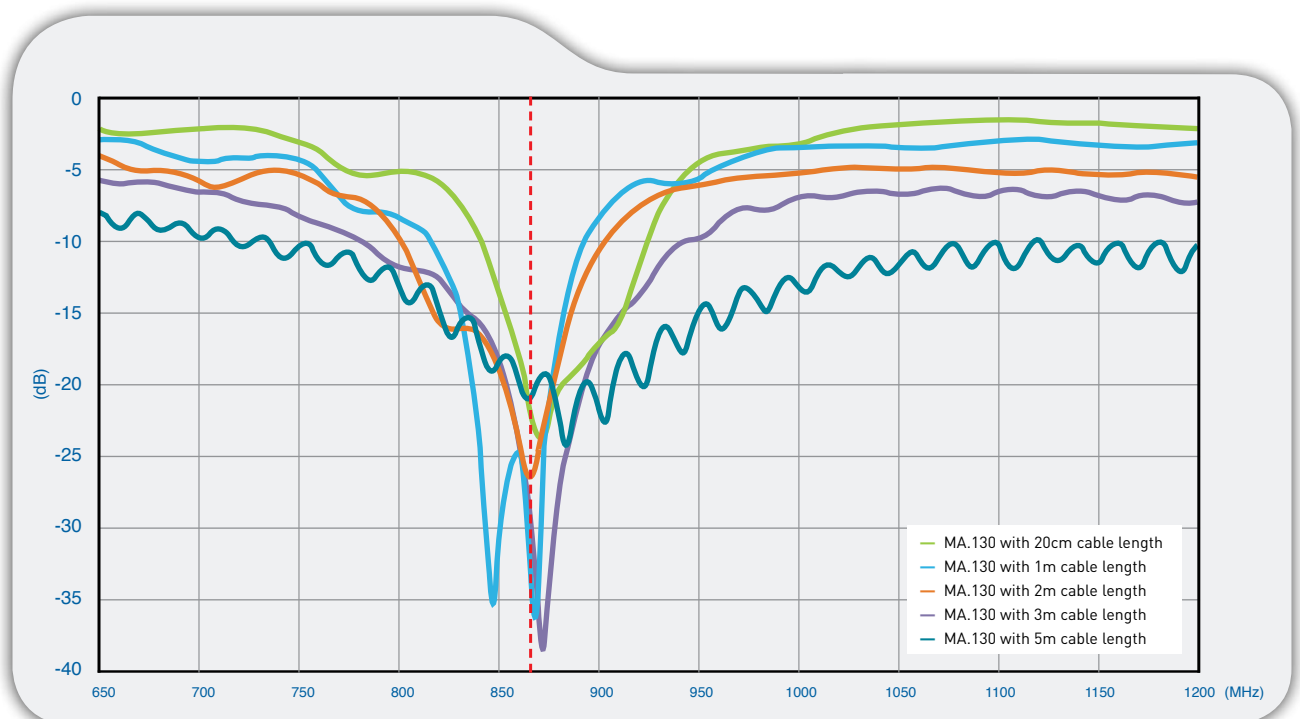
## 4. 868MHz Antenna

### 4.1 Return Loss

#### 4.1.1 In free space

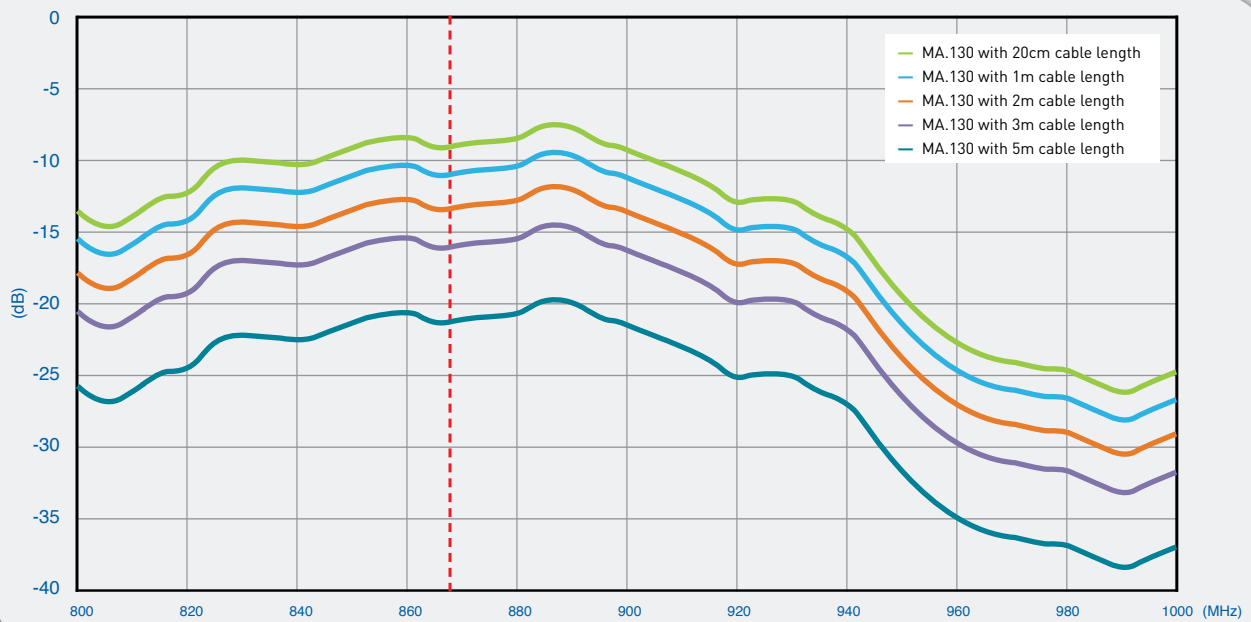


#### 4.1.2 On 30X30cm ground plane

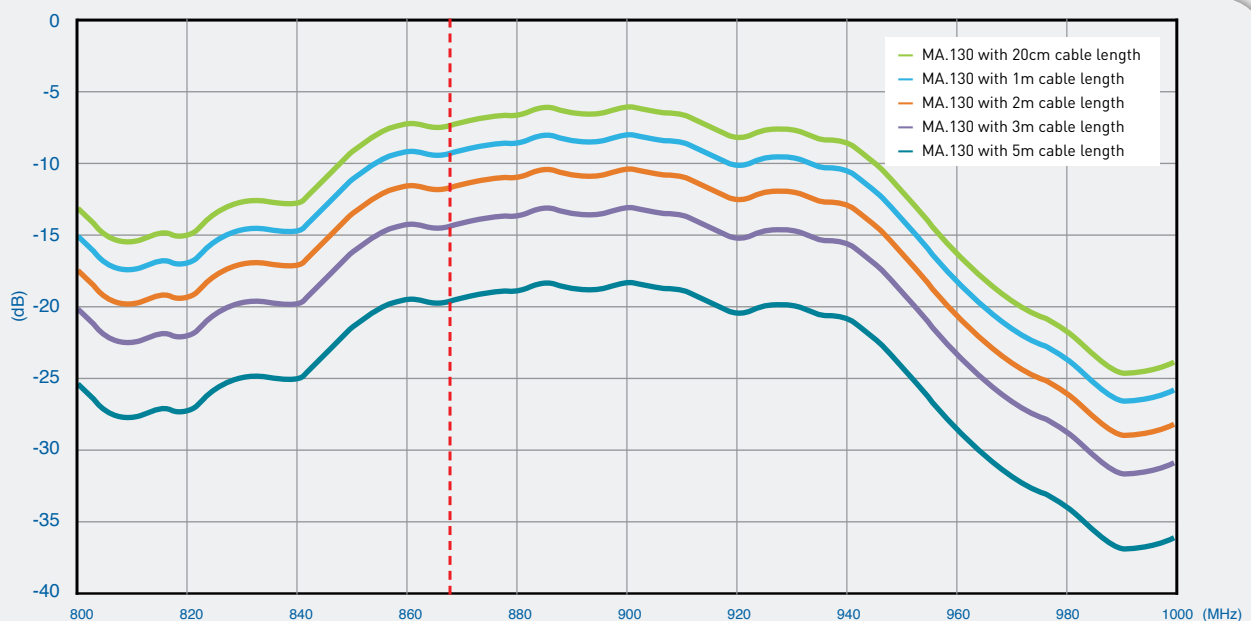


## 4.2 Average Gain

### 4.2.1 In free space

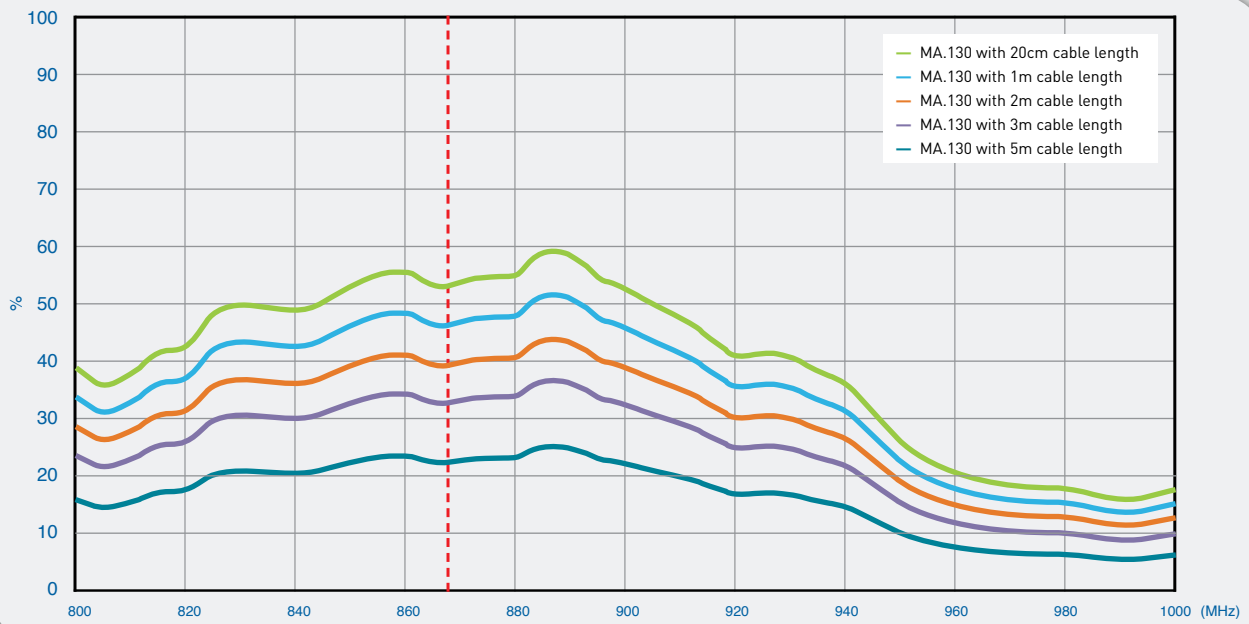


### 4.2.2 On 30x30cm ground plane

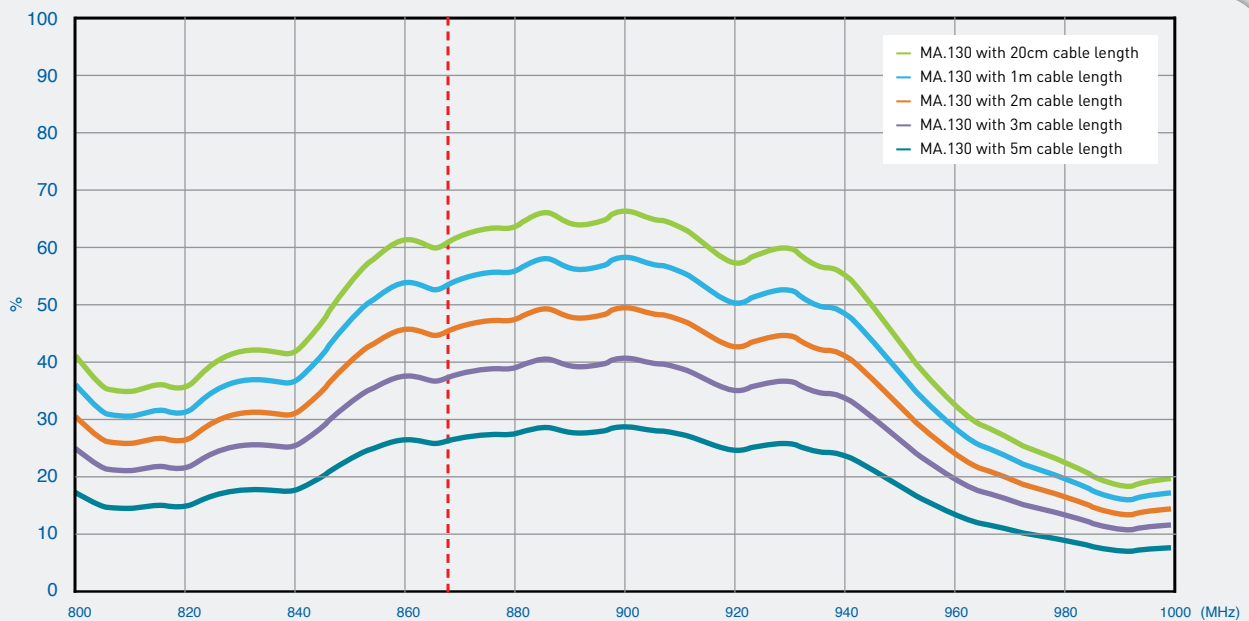


### 4.3 Efficiency

#### 4.3.1 In free space



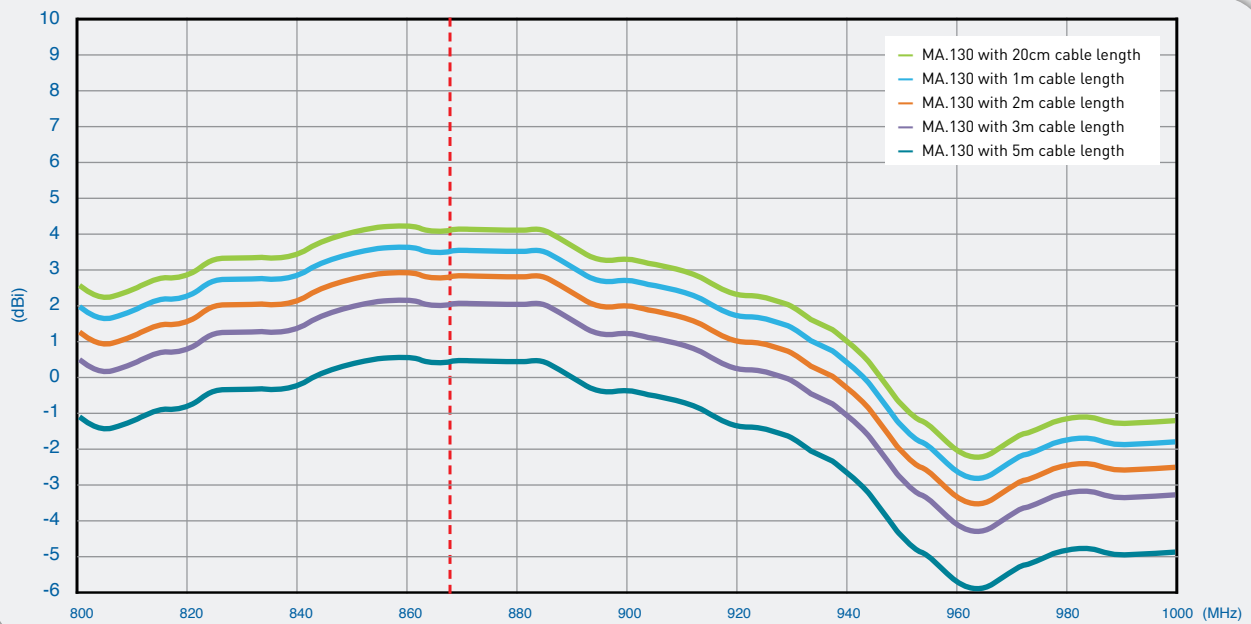
#### 4.3.2 On 30x30cm ground plane



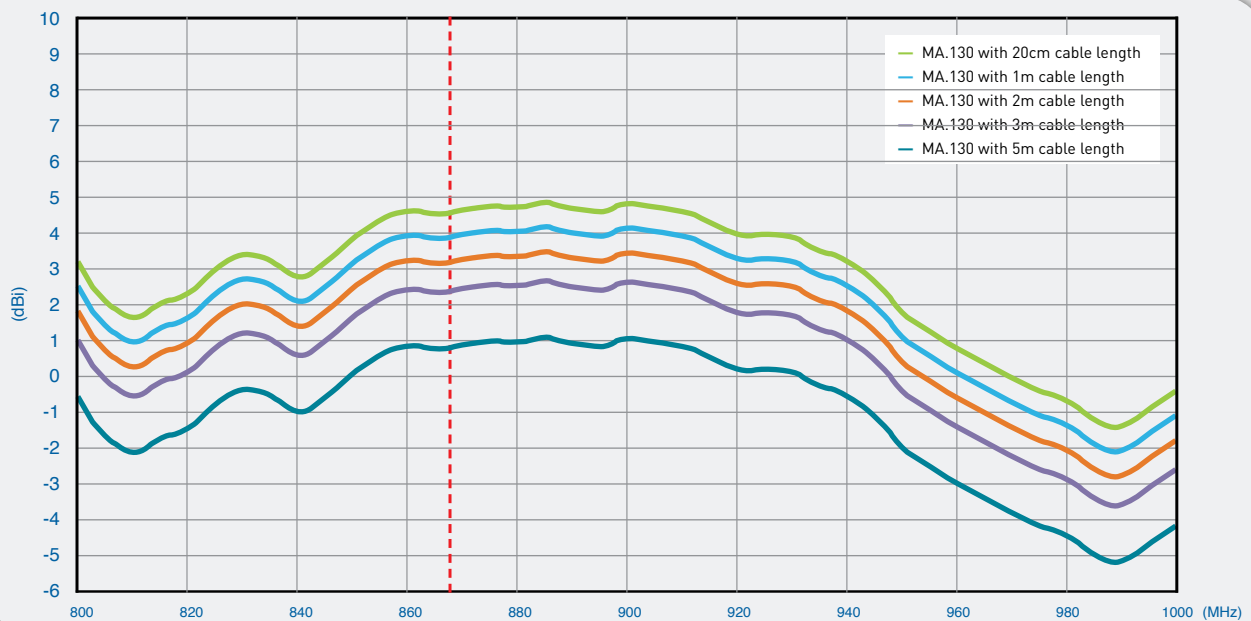


## 4.4 Peak Gain

### 4.4.1 In free space



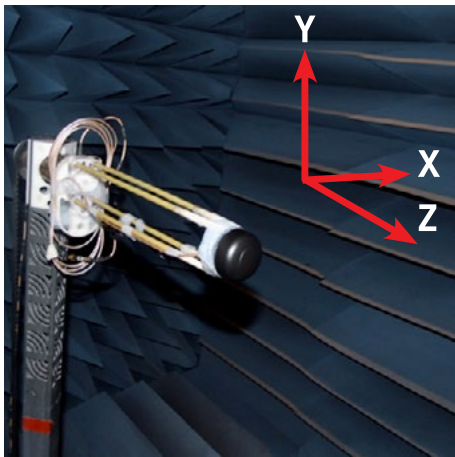
### 4.4.2 On 30x30cm ground plane



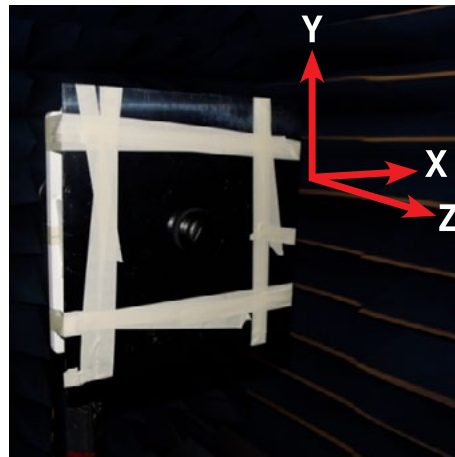
## 4.5 Antenna Radiation Patterns

### 4.5.1 Antenna Setup

The antenna radiation pattern test setup is shown below:



In free space

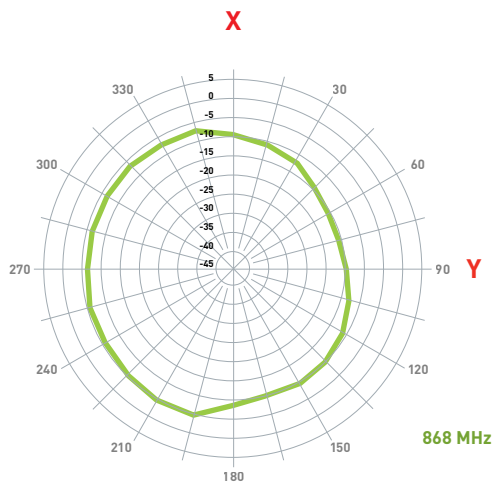


On 30x30 ground plane

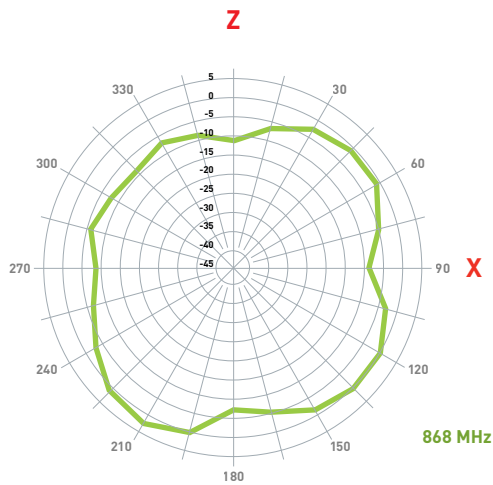
## 4.5.2 Antenna Radiation Patterns

### In Free Space

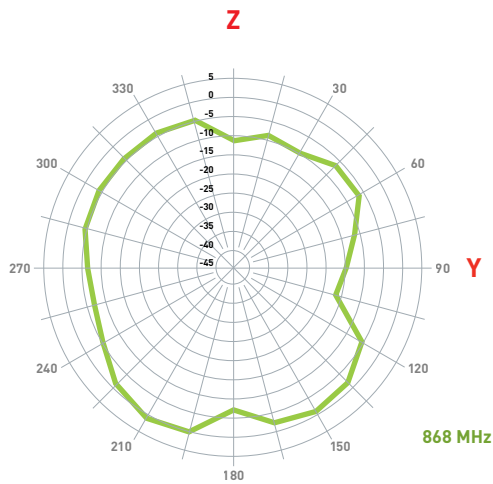
XY Plane



XZ Plane

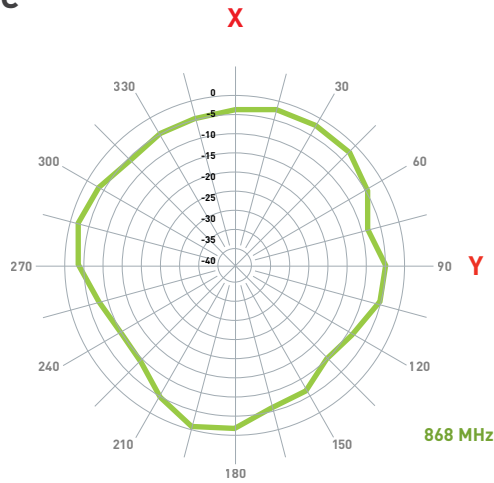


YZ Plane

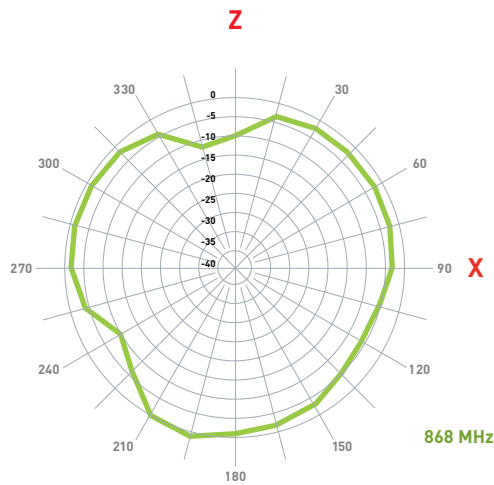


## On 30x30cm Ground Plane

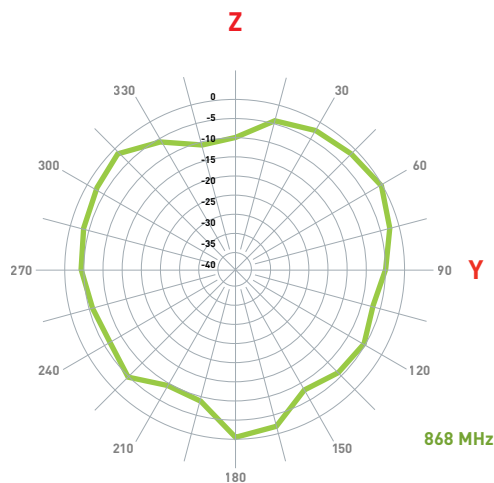
XY Plane



XZ Plane

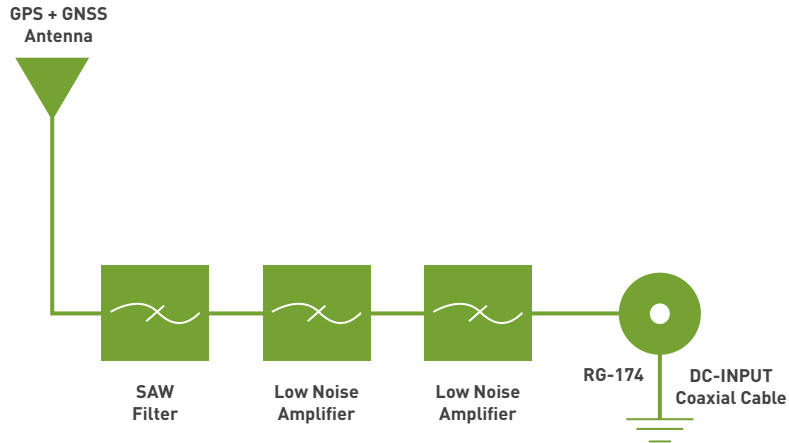


YZ Plane



## 5. GPS-GLONASS Antenna

### 5.1 System Block Diagram



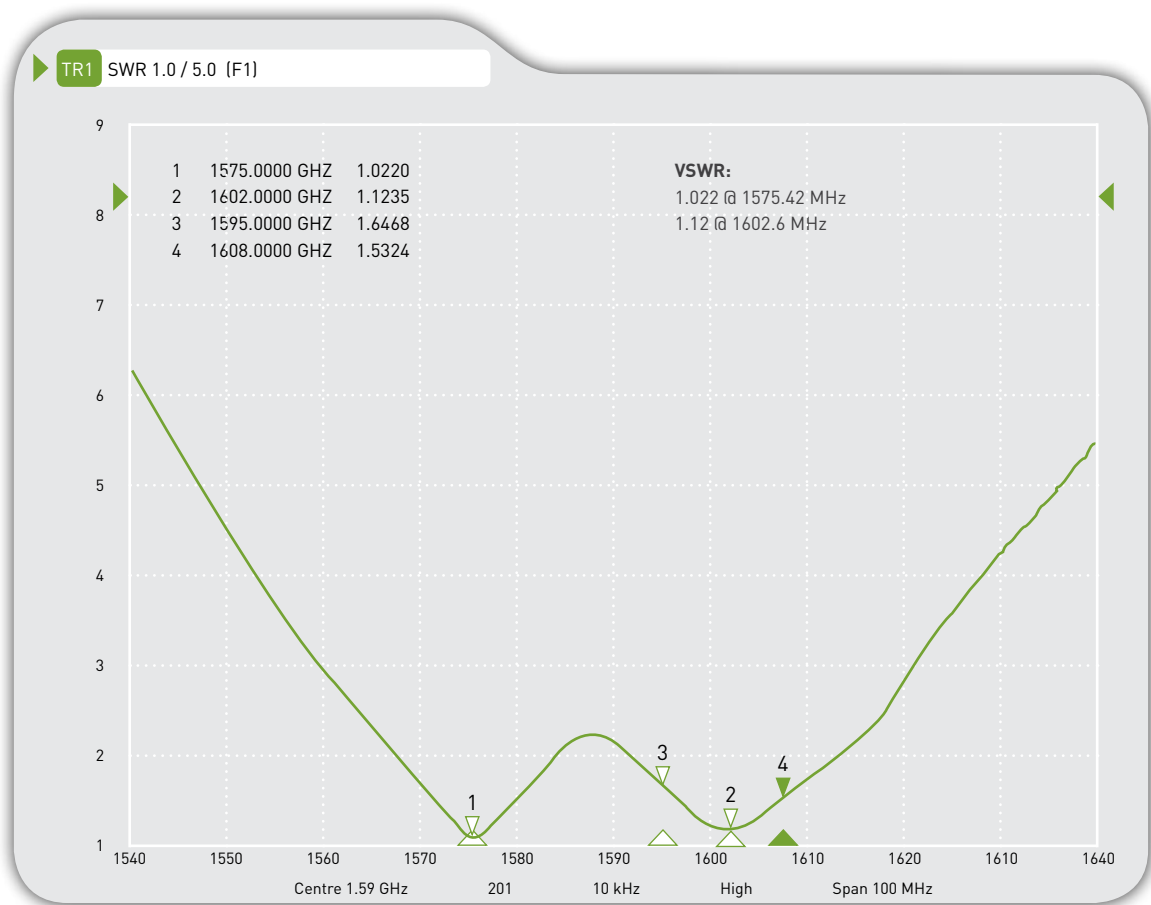
### 5.2 GPS-GLONASS Passive Antenna Result

#### 5.2.1 Return Loss

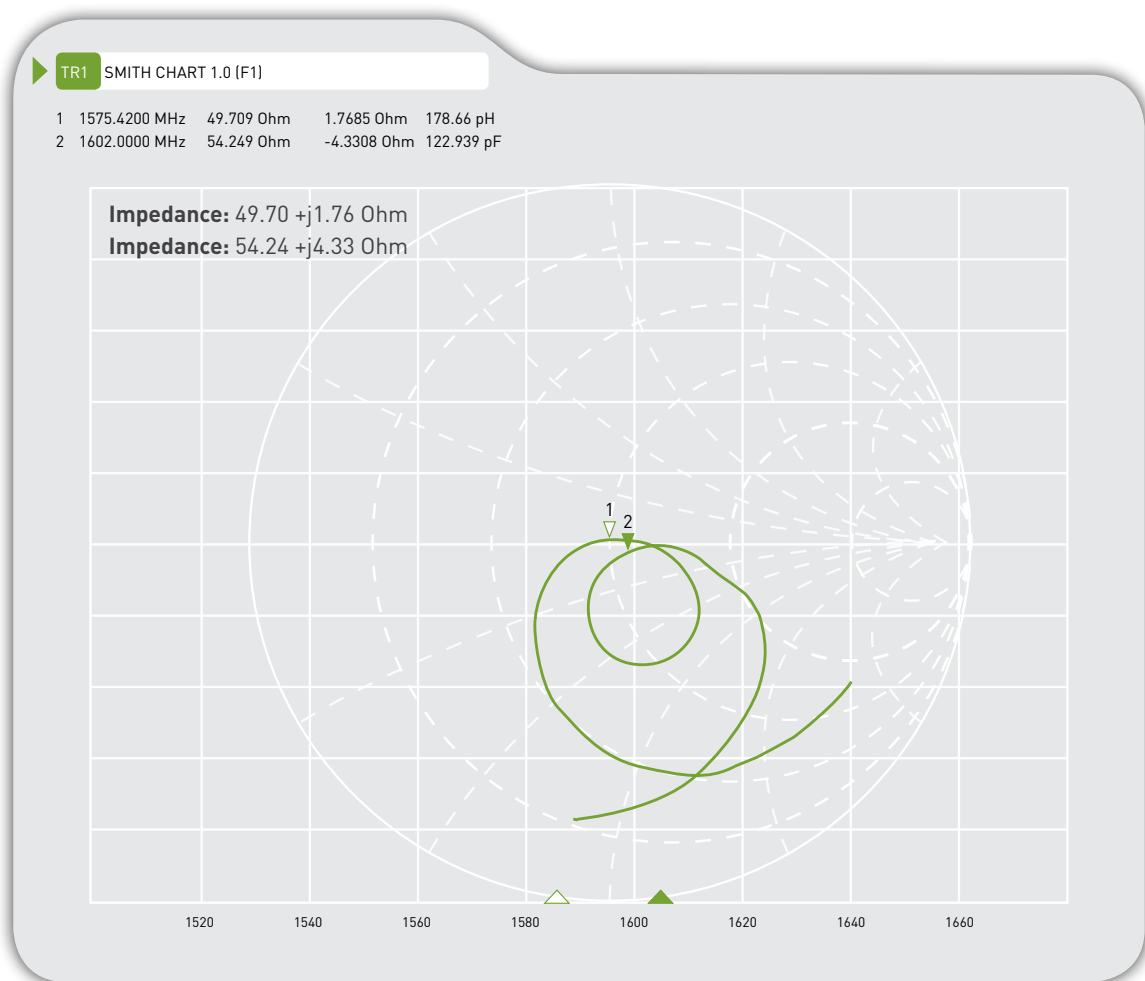


## 5.2 GPS-GLONASS Passive Antenna Result

### 5.2.2 VSWR

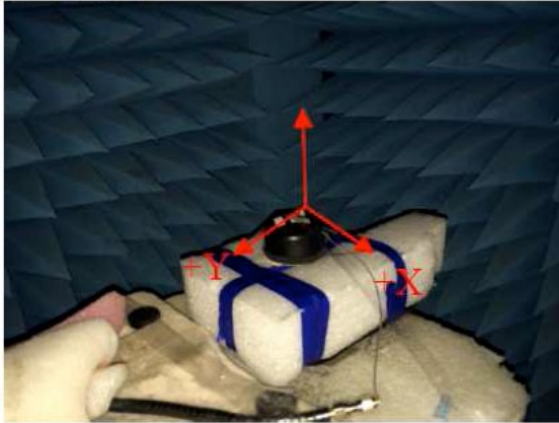


### 5.2.3 Smith Chart

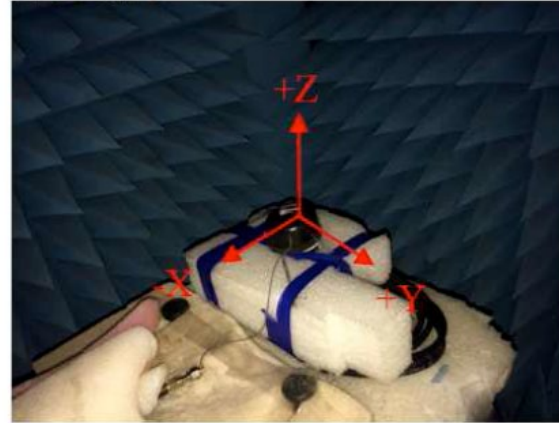


### 5.3 GPS-GLONASS Radiation Patterns

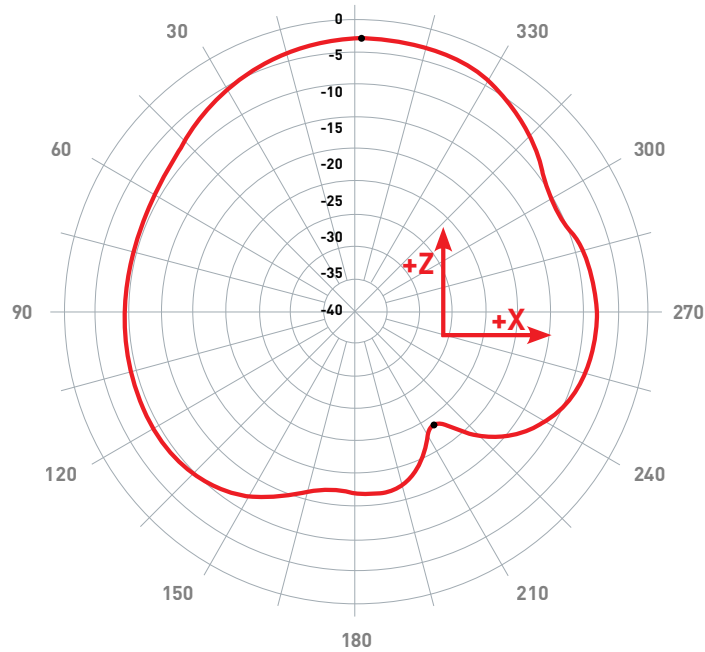
XZ-Plane



YZ-Plane



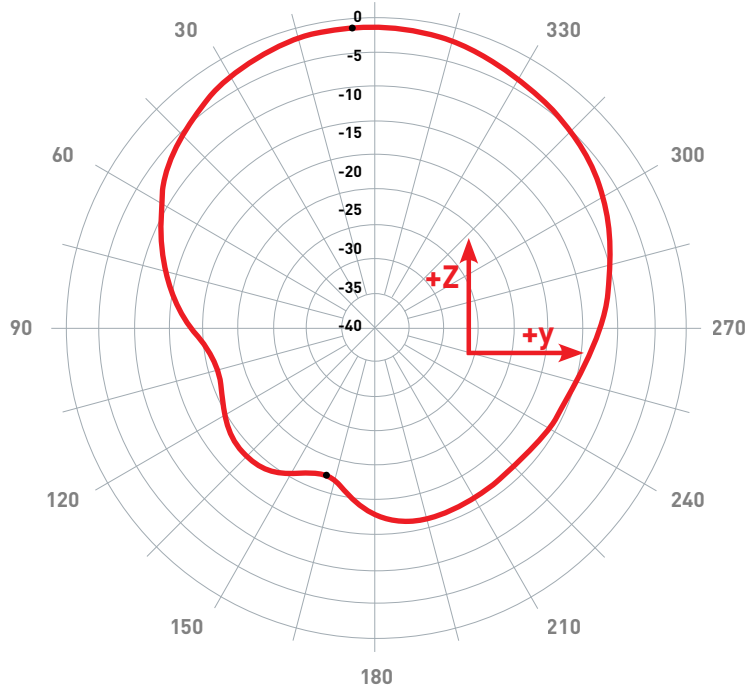
#### 5.3.1.1 1575.42 MHz XZ-Plane



Pattern	Model No.	Test Mode	Freq (Mhz)	Max Gain (dBi)	Min Gain (dBi)	Avg. Gain (dBi)	Source Polar	Date
1	25x25x4.0	XZ	1575.42	2.50 / 399.09	-11.09 / 214.00	-2.61	V & H	2014/4/1

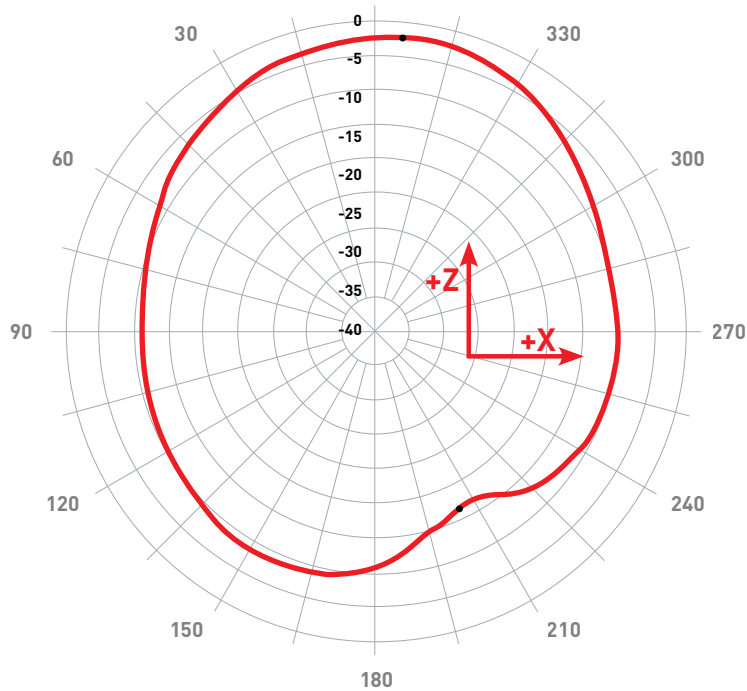


### 5.3.1.1 1575.42 MHz XZ-Plane



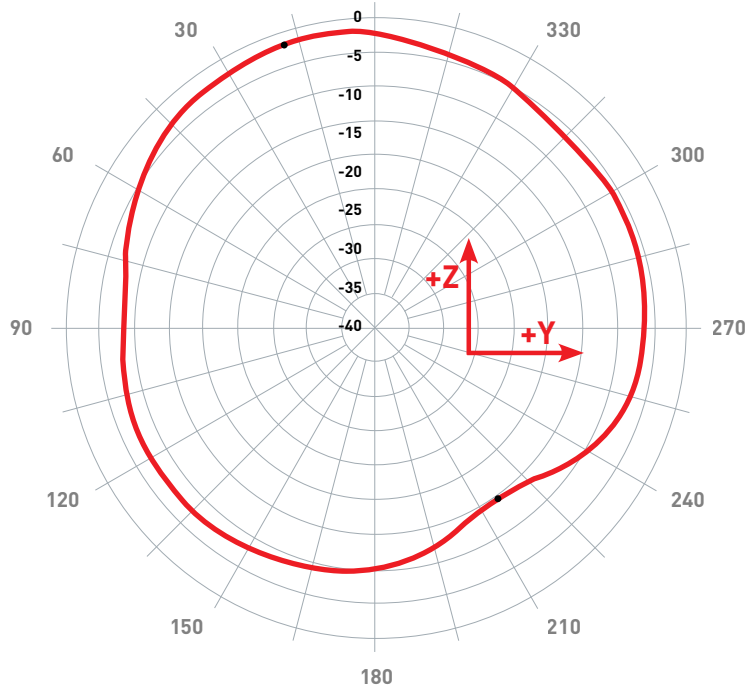
Pattern	Model No.	Test Mode	Freq (Mhz)	Max Gain (dBi)	Min Gain (dBi)	Avg. Gain (dBi)	Source Polar	Date
1	25x25x4.0	YZ	1575.42	3.58 / 4.00	-17.76 / 161.00	-2.47	V & H	2014/4/1

### 5.3.3 1602 MHz XZ-Plane



Pattern	Model No.	Test Mode	Freq (Mhz)	Max Gain (dBi)	Min Gain (dBi)	Avg. Gain (dBi)	Source Polar	Date
1	25x25x4.0	XZ	1602	2.58 / 355.0	-11.95 / 206.00	-2.56	V & H	2014/4/1

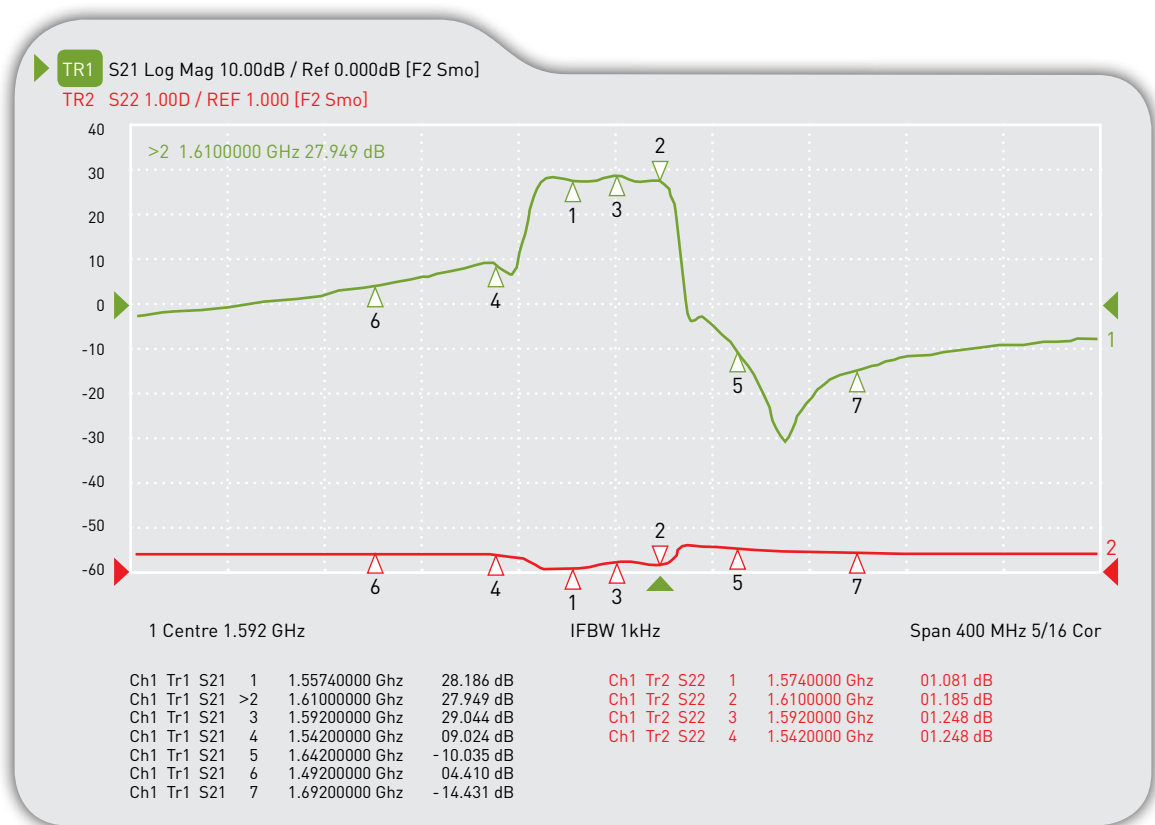
### 5.3.4 1606 MHz YZ-Plane



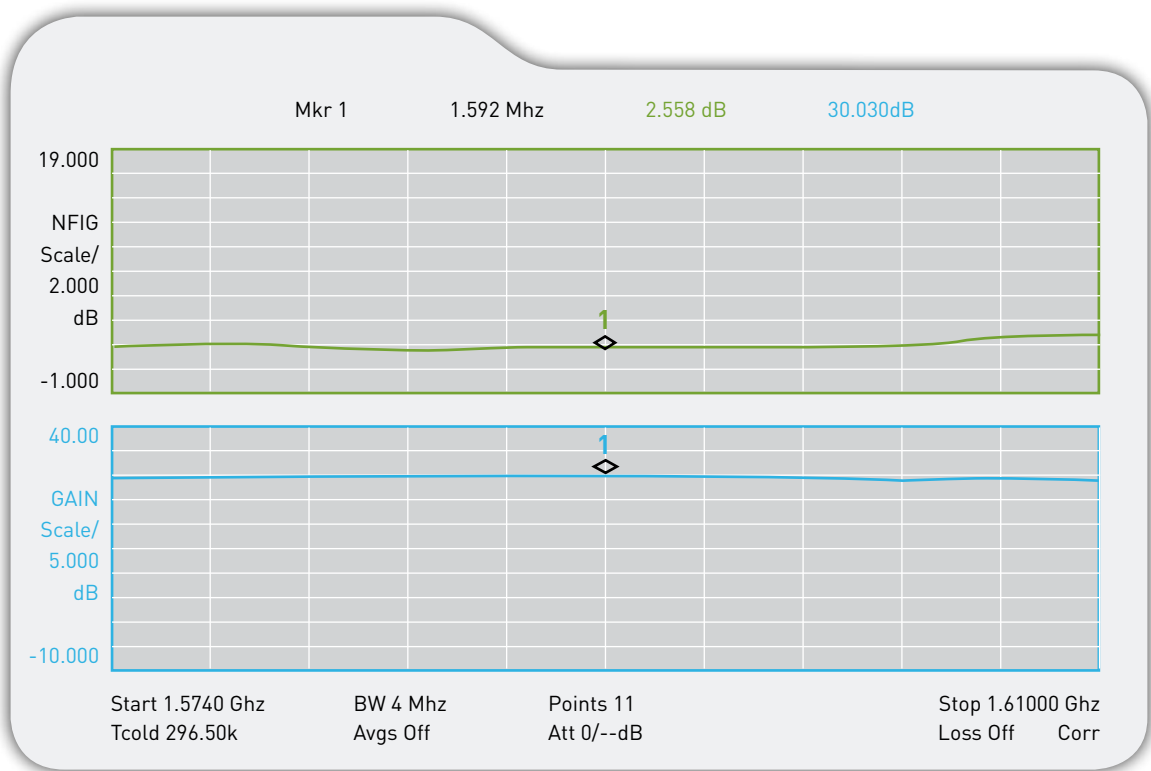
Pattern	Model No.	Test Mode	Freq (Mhz)	Max Gain (dBi)	Min Gain (dBi)	Avg. Gain (dBi)	Source Polar	Date
1	25x25x4.0	YZ	1602.00	3.03 / 18.00	-10.22 / 213.00	-1.11	V & H	2014/4/1

## 5.4 GPS-GLONASS - Low Noise Amplifier

### 5.4.1 S21 Gain

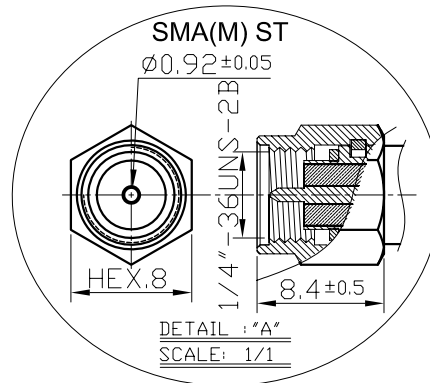
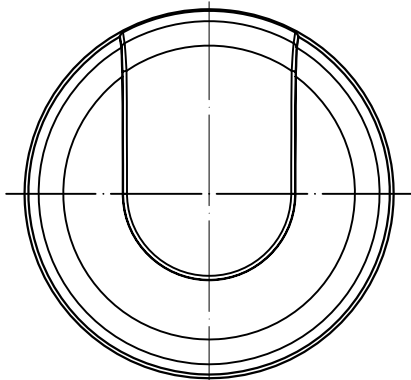


### 5.4.2 Noise Figure

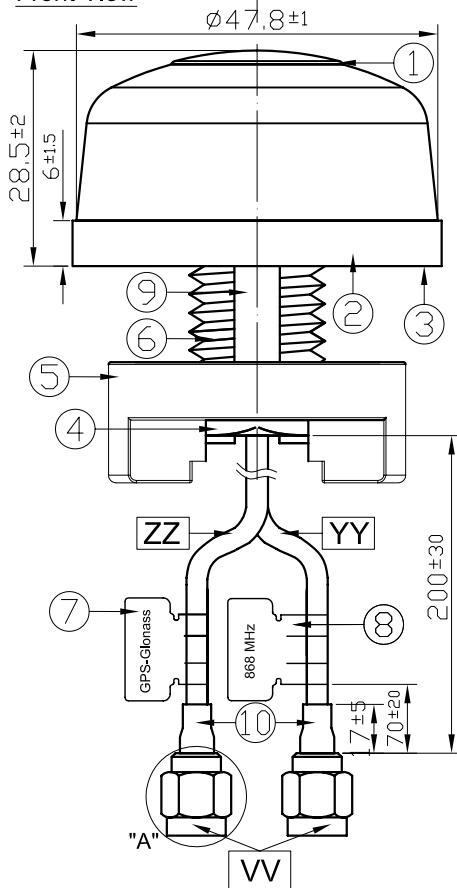


## 6. Mechanical Drawings

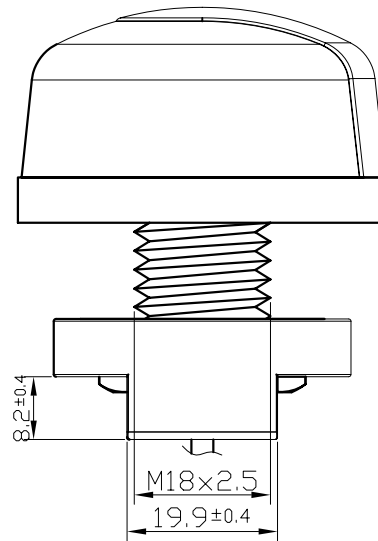
Top View



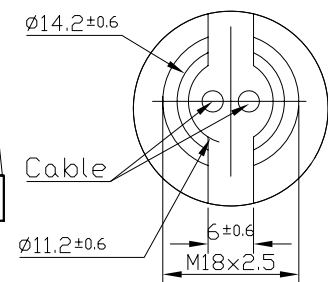
Front View



Side View



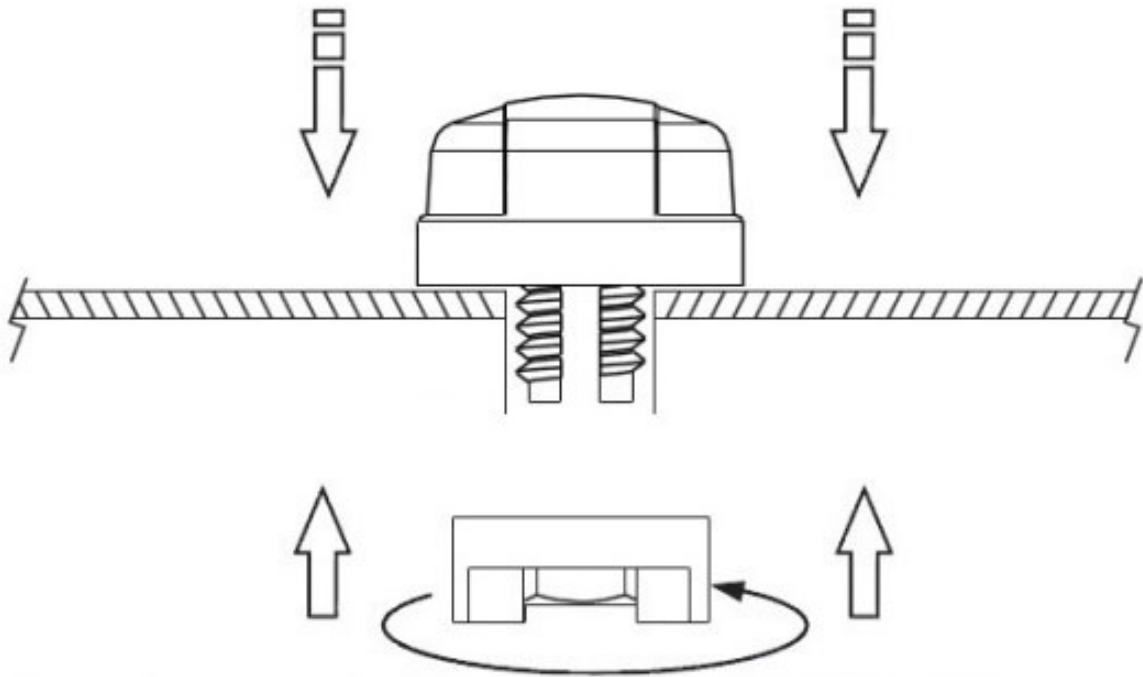
Bottom Thread View



	Name	Material	Finish	QTY
1	Housing	PC	Black	1
2	Closed Cell Foam	CR 4305	Black	1
3	3M Double Adhesive	3M 9448 HK	White Liner	1
4	M18 Inner Nut	Carbon Steel	Ni Plated	1
5	Outer Nut Cover	ABS	Black	1
6	Hercules Metal Base	Zinc alloy	Ni Plated	1
7	GPS-Glonass Label	Coated Paper	Orange	1
8	868 MHz Label	Coated Paper	Brown	1
9	Rubber Stopper	Rubber	Black	1
10	Heat Shrink Tube	PE	Black	2

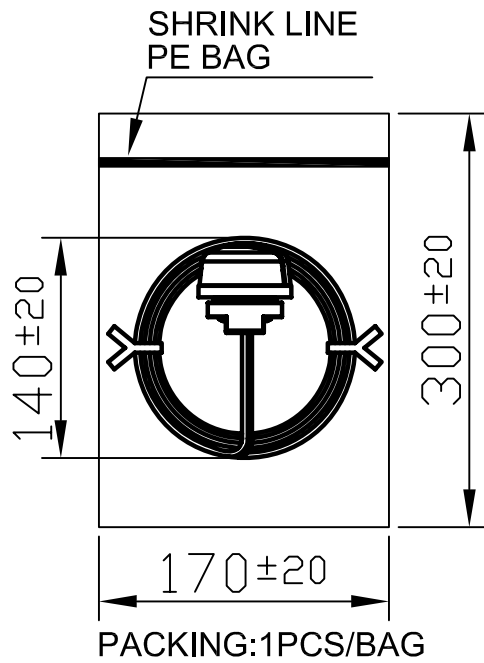
	Name	Spec	Finish	QTY
VV	Connector Type	SMA(M)ST	Gold	2
YY	Cable Type	RG-316	Brown	1
ZZ	Cable Type	RG-174	Black	1

## 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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