# SPECIFICATION

Part No. : **MA602.A.ABJ.002**

Product Name : Spartan Screwmount 3in1 Combination Antenna
GPS/GLONASS/GALILEO-SMA(M)1M RG174
Cellular-SMA(M)1M CFD-200
IRIDIUM-SMA(M) 1M CFD-200

Feature : IP67 Waterproof
High performance outdoor antenna
Custom cables and connectors available
RoHS Compliant

# 1. Introduction

The Spartan MA602 antenna is a heavy-duty, fully IP67 waterproof external M2M antenna for use in telematics, transportation and remote monitoring applications.

The Spartan is unique in the market because it combines a 3in1 GPS/GLONASS/GALILEO, Cellular (3G and 2G) and IRIDIUM, heavy-duty antenna with high efficiency in a compact format. The antenna screws down permanently onto a roof or metal panel and can be pole or wall-mounted with a metal bracket.

For industries such as commercial vehicle telematics, remote monitoring, smart meter systems and construction equipment, the Spartan provides a robust, rugged antenna that is durable, even in extreme environments.

Customized cables and connectors version available.

## 2. Specification Table

| Cellular Antenna | | | |
|---|---|---|---|
| Frequency | 824~960MHz | 1710~1990MHz | 1990~2170MHz |
| Average Gain | ≧-5 dBi | ≧-4 dBi | ≧-4 dBi |
| Average Efficiency | 60.18% | 53.97% | 79.27% |
| VSWR | ≦4.5 | ≦5.2 | ≦3.0 |
| Polarization | Linear | | |
| Impedance | 50Ω Nominal | | |
| Cable | 1M CFD200 Coaxial Cable, fully customizable | | |
| Connector | SMA(M) standard, fully customizable | | |

| GPS/GLONASS/GALILEO Antenna | | |
|---|---|---|
| Center Frequency fc | 1575.42MHz | 1602MHz |
| Gain @Zenith | 3 dBic Min. | 2.5 dBic Min. |
| Efficiency | 76% | 70% |
| VSWR | 1.92 Max | 1.92 Max |
| Polarization | Linear | Linear |
| Impedance | 50Ω Nominal | 50Ω Nominal |
| Cable | 1M RG-174 Coaxial Cable, fully customizable | |
| Connector | SMA(M) standard, fully customizable | |

| IRIDIUM Antenna | |
|---|---|
| Frequency Range | 1616~1626.5MHz |
| Gain @Zenith | 3.5 dBic Min. |
| Efficiency | 90 % |
| VSWR | 1.92 Max. |
| Axial Ratio | 4 dB Max. |
| Polarization | RHCP |
| Impedance | 50Ω Nominal |
| Cable | 1M CFD200 Coaxial Cable, fully customizable |
| Connector | SMA(M) standard, fully customizable |

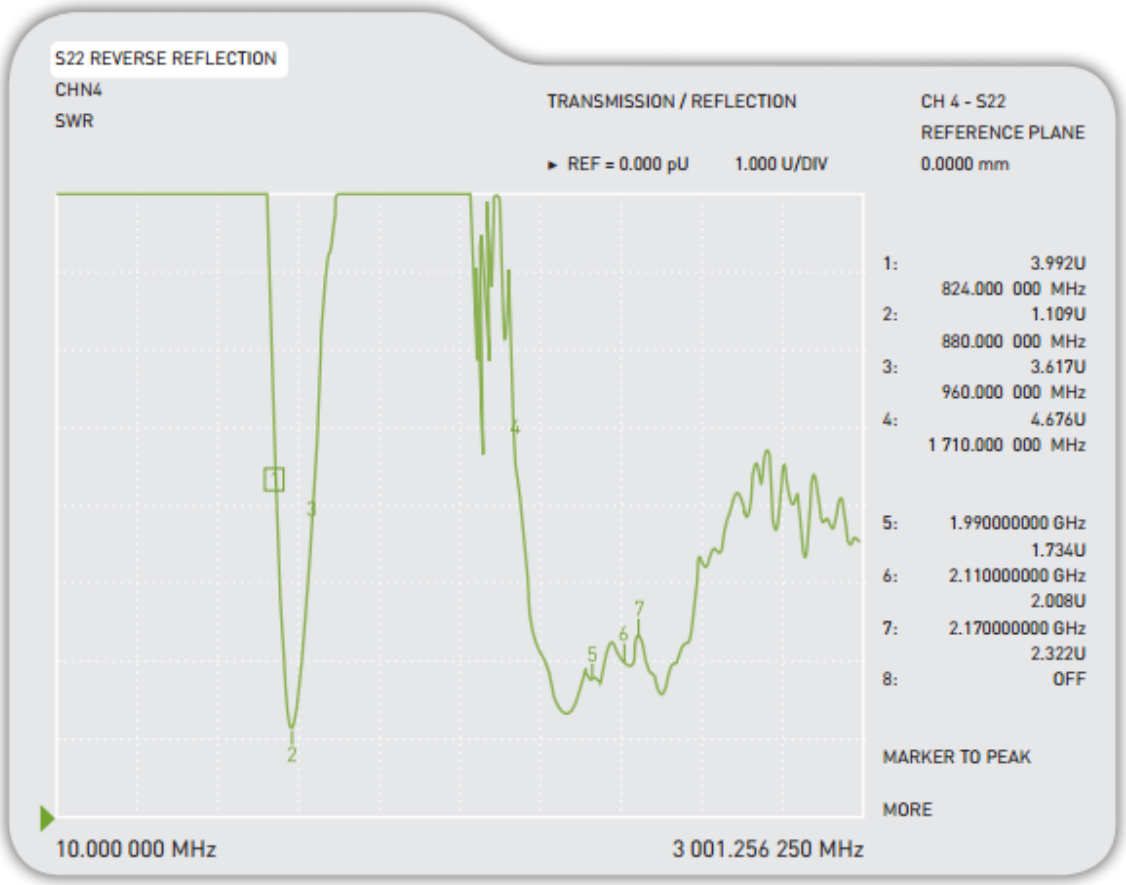
| GPS/GLONASS/GALILEO LNA Electrical Properties | |
|---|---|
| Frequency | GPS/GALILEO:1575.42±3MHz<br>GLONASS:1598~1610MHz |
| Impedance | 50Ω Nominal |
| VSWR | 1.92:1 Max. |
| Return Loss | 10 dB Min. |
| Gain@3.3V | 29~30dB |
| DC Power Input | 3~5V |
| Noise Figure @3.3V | 3 dB Typ. |
| Power Consumption | 7~9 mA Typ. |

| MECHANICAL | |
|---|---|
| Dimensions | Profile 39.5mm x Diameter 145.6mm |
| Casing | UV resistant PVC |
| Base and thread | Nickel Plated Zinc |
| Thread diameter | 30mm |
| Waterproof | IP67 |
| Weight | 1.03Kg |
| Recommended Torque for Mounting | 49N·m |
| Maximum Torque for Mounting | 58.8N·m |

| ENVIRONMENTAL | |
|---|---|
| Operation Temperature | -40°C to 85°C |
| Storage Temperature | -40°C to 85°C |
| Humidity | Non-condensing 65°C 95% RH |

# 3. Cellular Antenna Characteristics

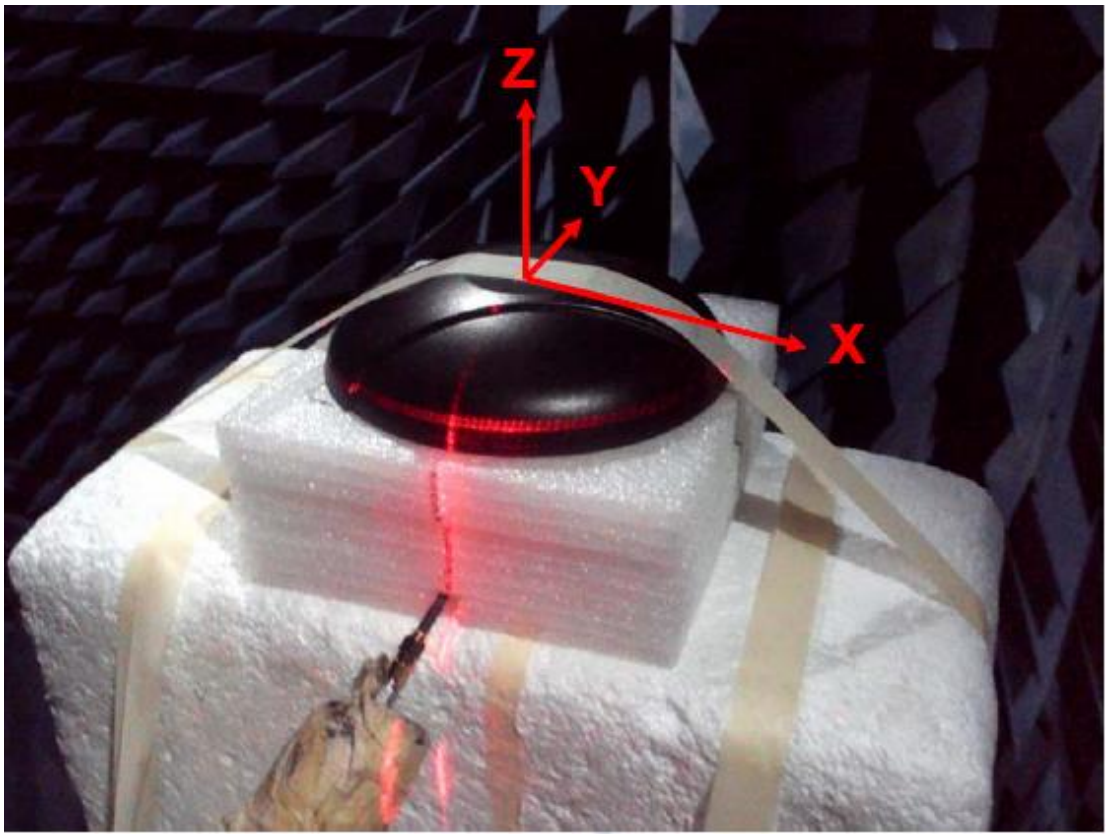
## 3.1. VSWR




## 3.2. 3D Efficiency

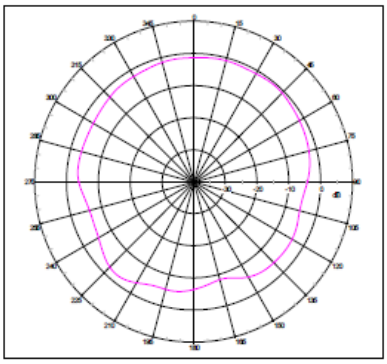
| Frequency (MHz) | Average Gain(dBi) | Efficiency (%) |
|---|---|---|
| 824 | -3.68 | 42.78 |
| 894 | -1.19 | 76.00 |
| 960 | -2.09 | 61.75 |
| 1710 | -5.11 | 30.79 |
| 1990 | -1.12 | 77.15 |
| 2110 | -0.68 | 85.44 |
| 2170 | -1.23 | 75.21 |

## 3.3. 2D Radiation Pattern

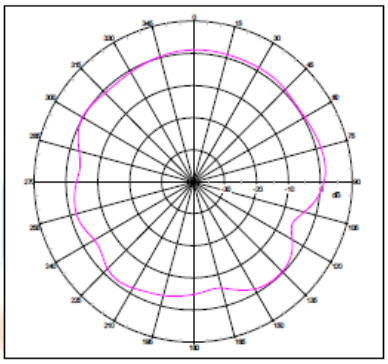


### 3.3.1. XZ Plane

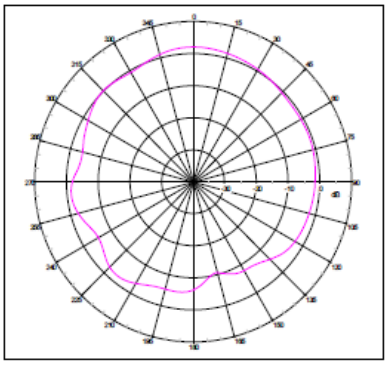
824 MHz



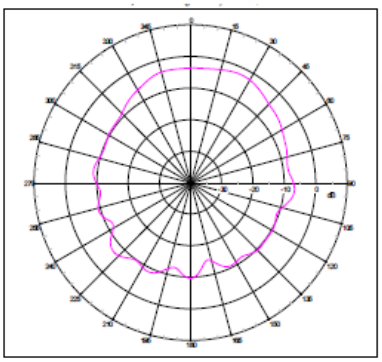
894 MHz



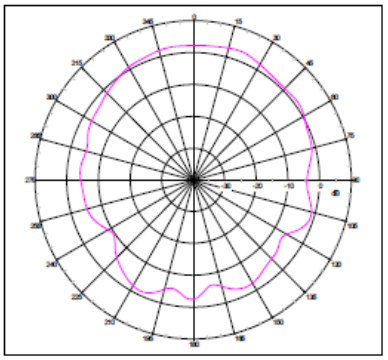
960 MHz



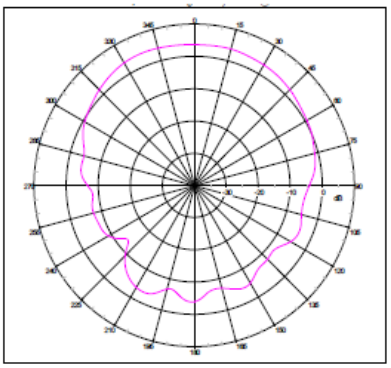
1710 MHz



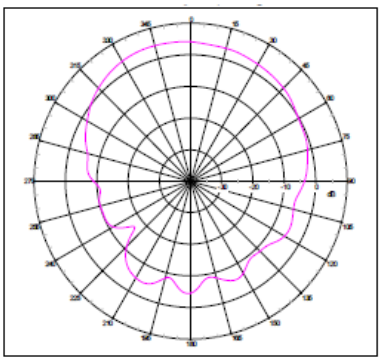
1990 MHz



2110 MHz

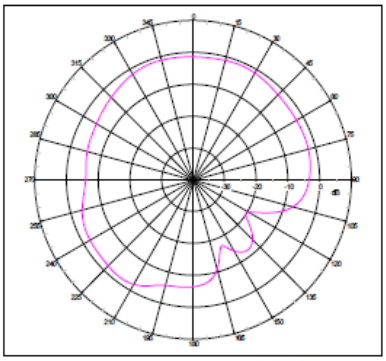


2170 MHz

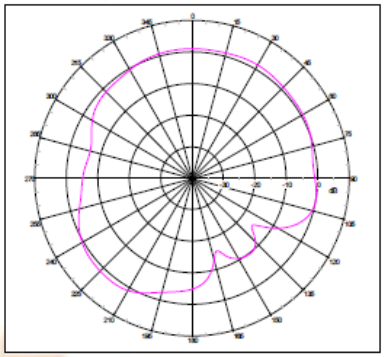


## 3.3.2. YZ Plane

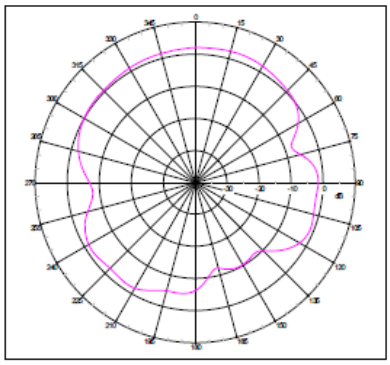
824 MHz



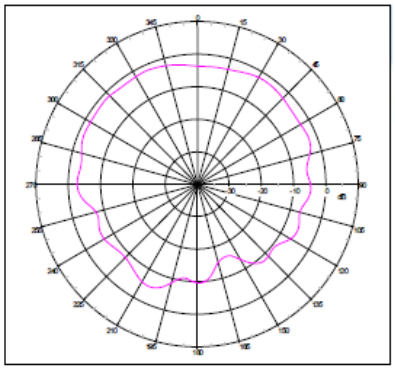
894 MHz



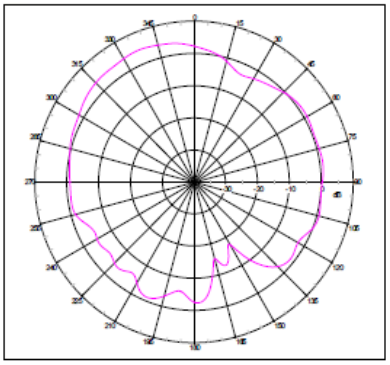
960 MHz



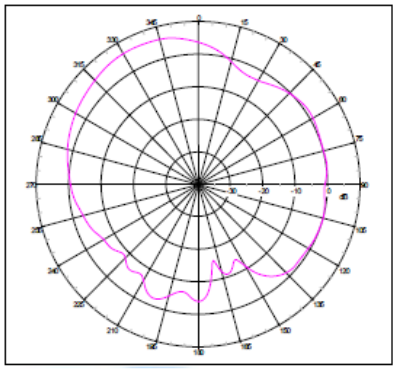
1710 MHz



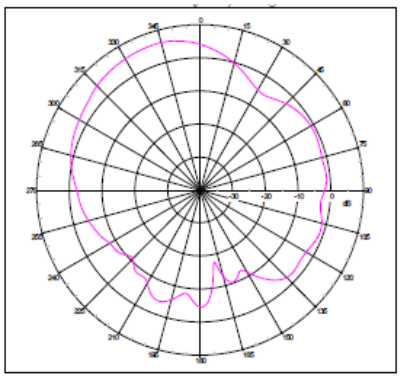
1990 MHz



2110 MHz

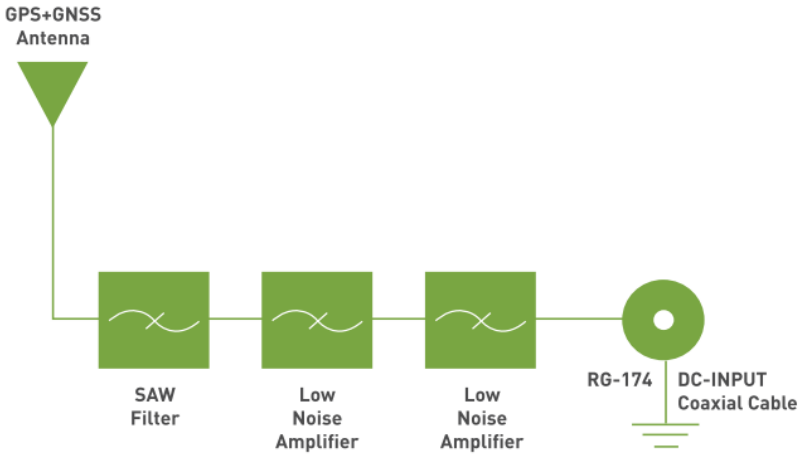


2170 MHz



# 4. GPS/GLONASS/GALILEO Antenna Characteristics

## 4.1. Block Diagram



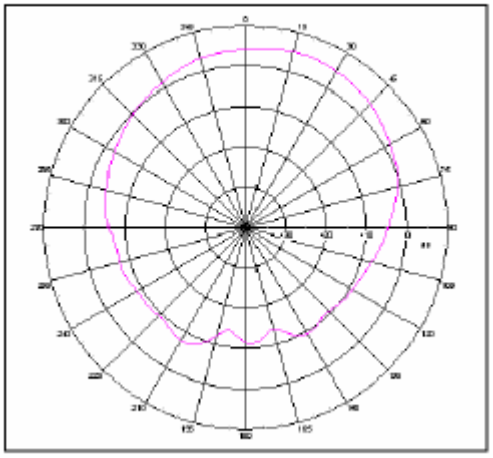
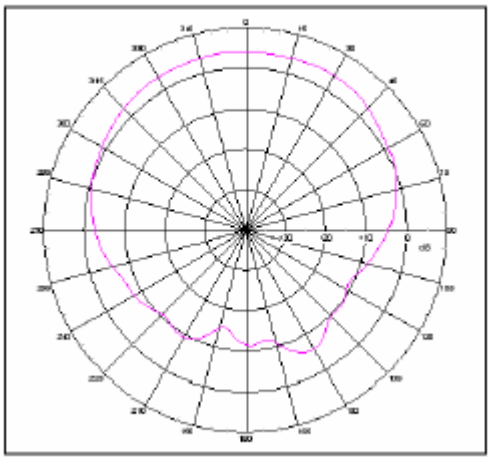

## 4.2. S-Parameter Measurement


## 4.3. 3D Efficiency

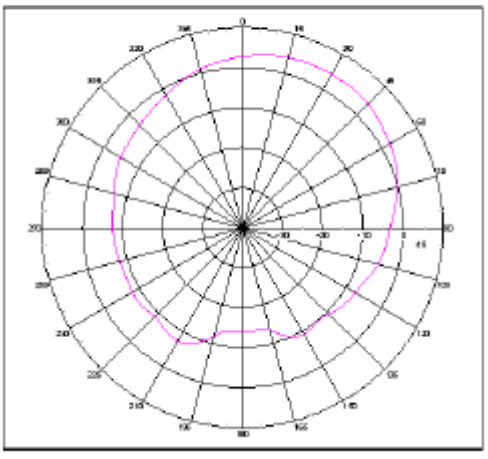
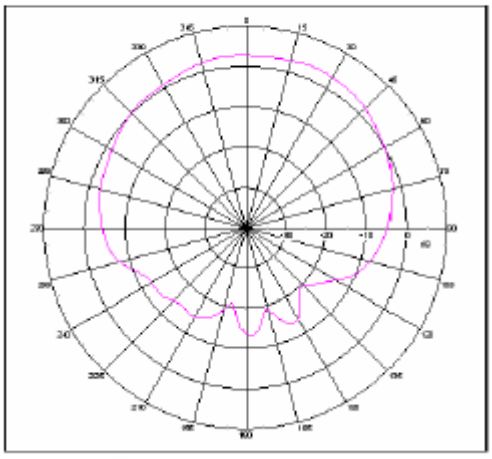
| Frequency (MHz) | Gain @Zenith ( dBic) | Efficiency (%) |
|---|---|---|
| 1575.42 | 3.6 | 76 |
| 1602 | 3.0 | 70 |

## 4.4. Radiation Pattern

### 4.4.1. GPS/GALILEO/GALILEO Antenna(@1575.42MHz)

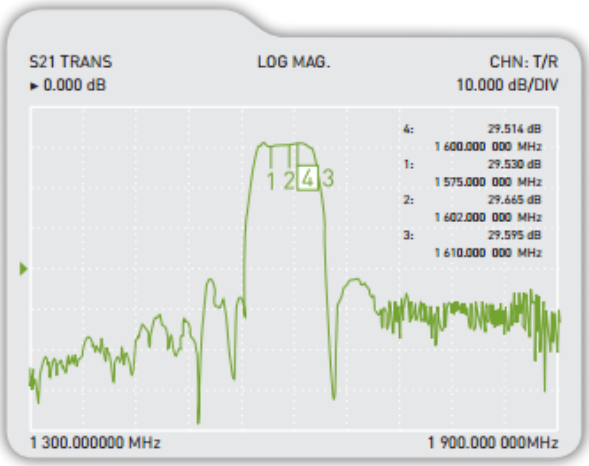
| XZ Plane | YZ Plane |
| --- | --- |
|  |  |

### 4.4.2. GLONASS Antenna(@1602MHz)

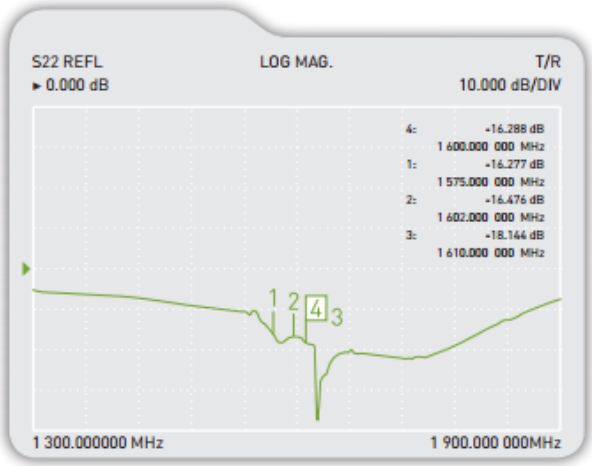
| XZ Plane | YZ Plane |
| --- | --- |
|  |  |

## 4.5. GPS/GLONASS/GALILEO LNA

S21



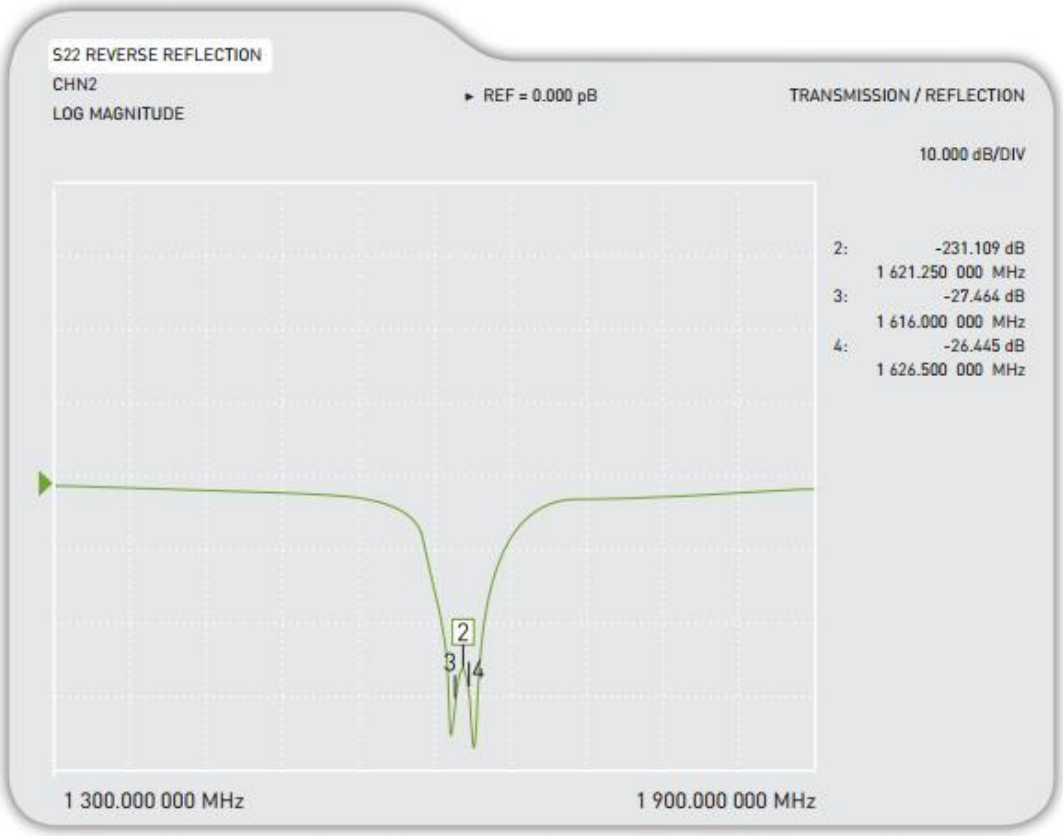

S22




| Test Item | 1575.42 MHz (GPS/GALILEO Band) | 1602 MHz (GLONASS Band) |
|---|---|---|
| Gain @3.3V | 29.5 dB | 29.6 dB |
| Return Loss @3.3V | -16 dB | -16 dB |
| Noise Figure @3.3V | 3 dB | 3 dB |
| Current consumption @3.3V | 7-9 mA | |

# 5. IRIDIUM Antenna Characteristics

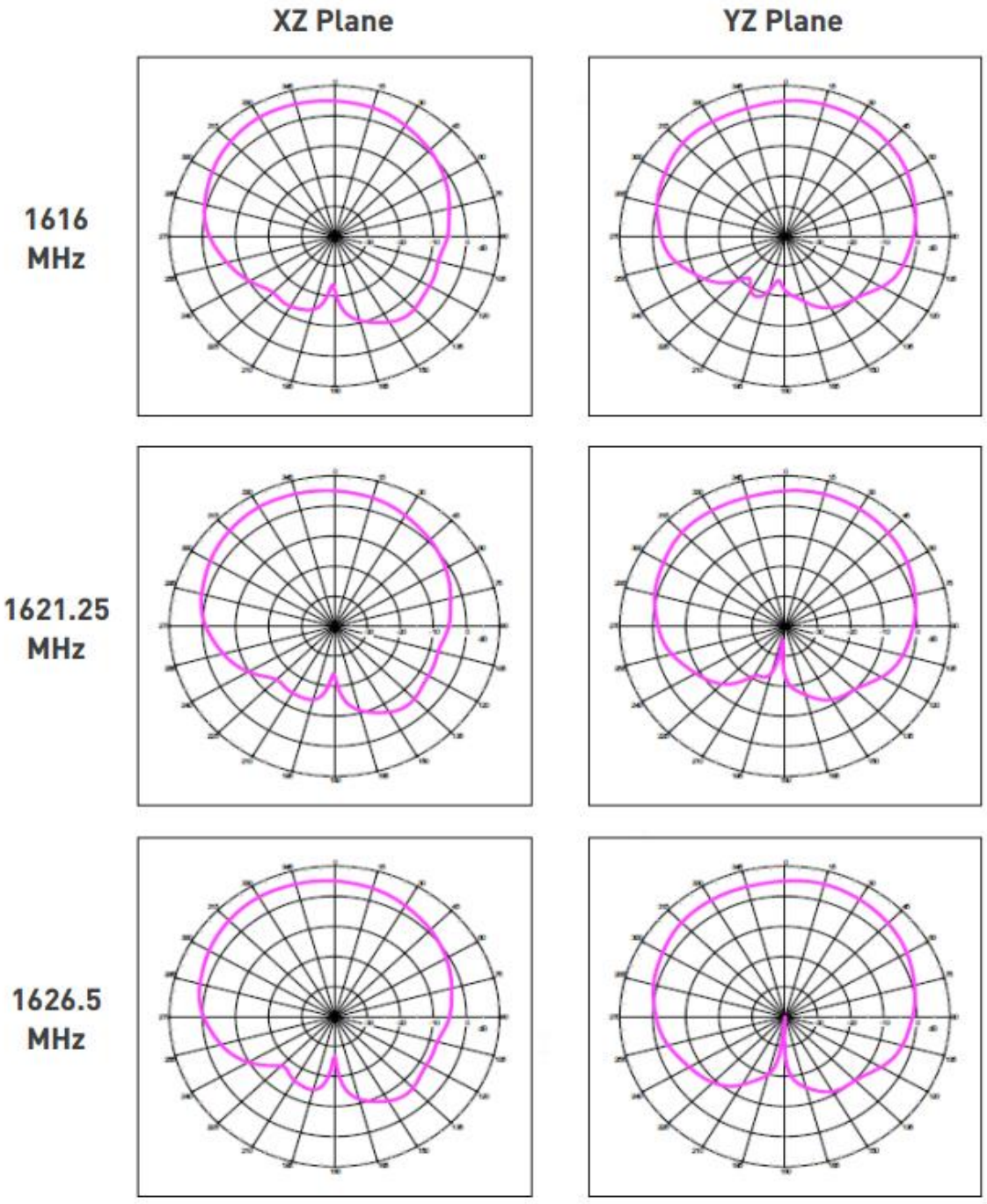
## 5.1. S-Parameter Measurement



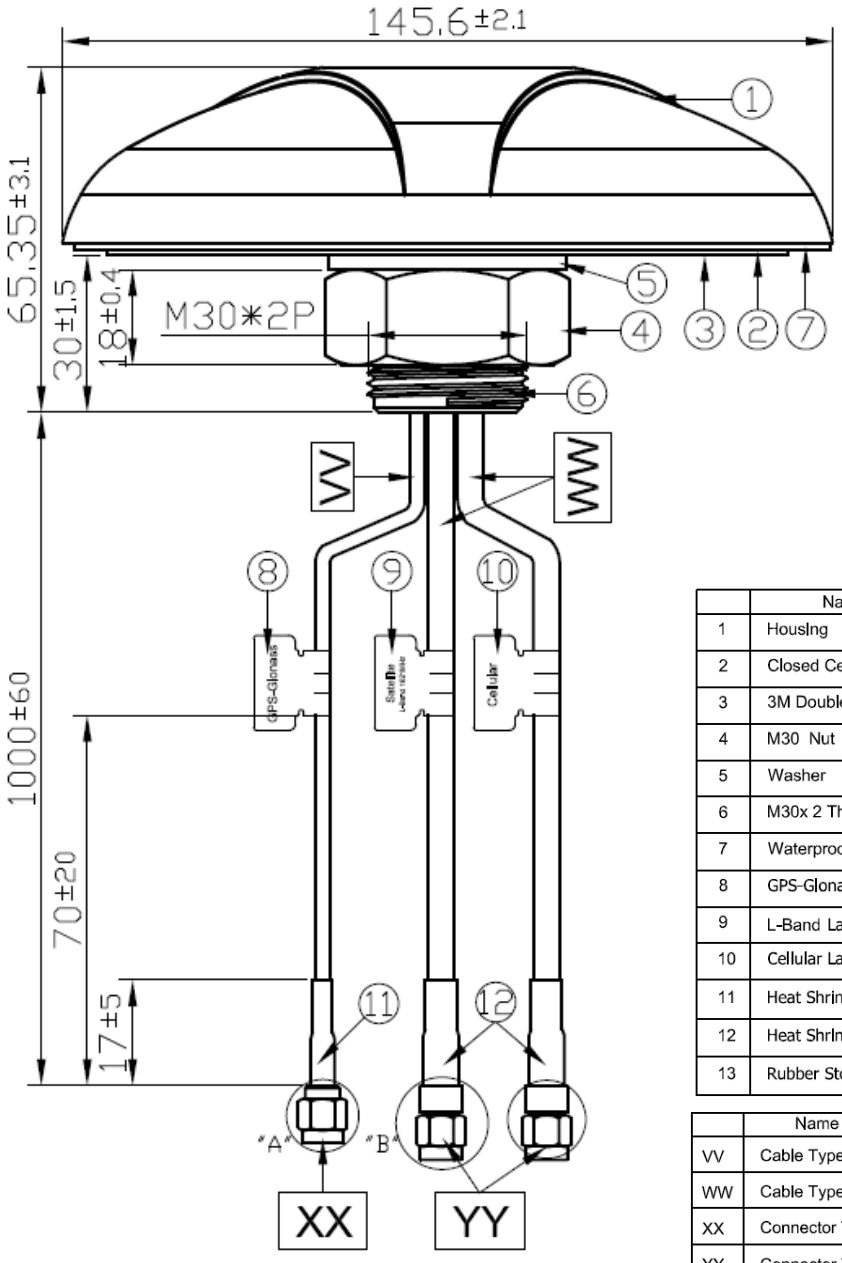

## 5.2. 3D Efficiency

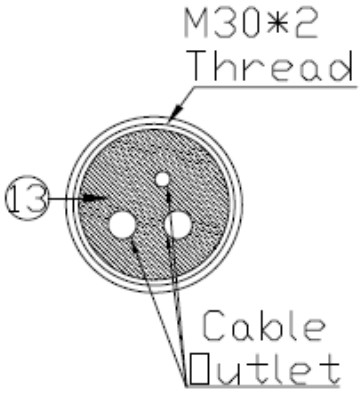
| Frequency (MHz) | Gain @Zenith (dBic) | Efficiency (%) |
|---|---|---|
| 1616 | 4.9 | 88 |
| 1621.25 | 5.7 | 93 |
| 1626.5 | 5.0 | 89 |

## 5.3. Radiation Pattern



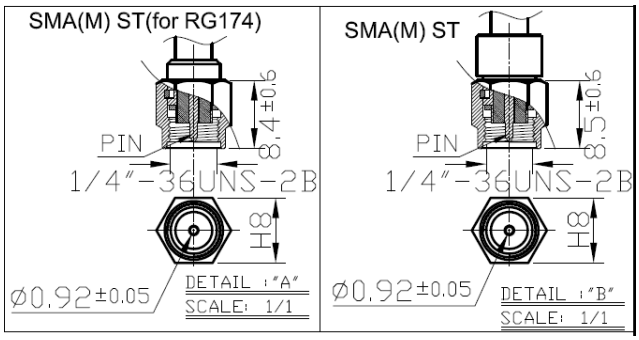
# 6. Mechanical Drawing



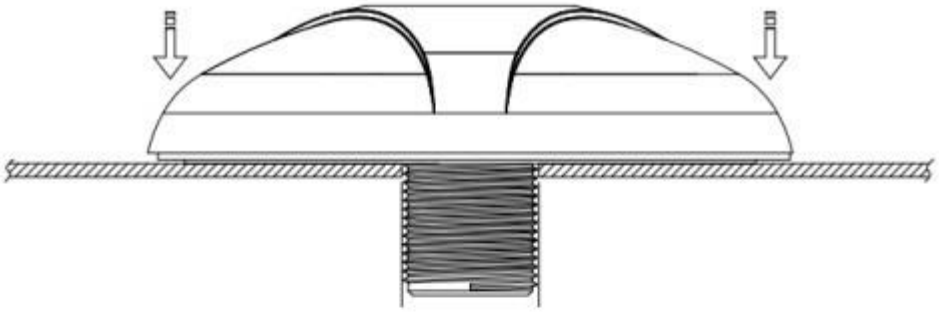



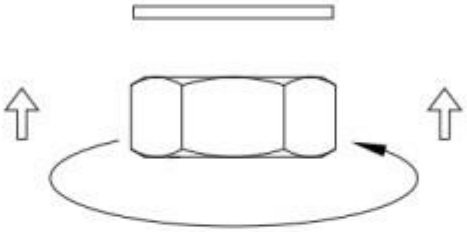

| | Name | Material | Material | Finish | QTY |
|---|---|---|---|---|---|
| 1 | Housing | 000111F000015A | PC 540 | Black | 1 |
| 2 | Closed Cell Foam | 001011F030015A | CR 4305 | Black | 1 |
| 3 | 3M Double Adhesive | 001011F030015A | 3M 9448 HK | White Liner | 1 |
| 4 | M30 Nut | 000411F000015A | Steel AISI 1215 | Ni Plated | 1 |
| 5 | Washer | 000411F010015A | Steel AISI 1215 | Ni Plated | 1 |
| 6 | M30x 2 Thread 32L | 000311F000015A | Zinc Alloy | Ni Plated | 1 |
| 7 | Waterproof Rubber | 000711F000015A | Silicon | Black | 1 |
| 8 | GPS-Glonass Label | 001012K010015A | Coated Paper | Orange | 1 |
| 9 | L-Band Label | 001014C000015A | Coated Paper | Moccasin | 1 |
| 10 | Cellular Label | 001011F020015A | Coated Paper | Blue | 1 |
| 11 | Heat Shrink Tube | 001311F000015A | PE (RG-174) | Black | 1 |
| 12 | Heat Shrink Tube | 001311F010015A | PE (CFD-200) | Black | 2 |
| 13 | Rubber Stopper | 000711F010015A | Silicone Rubber | Black | 1 |

| | Name | P/N | Spec | Finish | QTY |
|---|---|---|---|---|---|
| VV | Cable Type | 301313A000015A | RG174 | Black | 1 |
| WW | Cable Type | 301413A000015A | CFD200 | Black | 2 |
| XX | Connector Type | 200212G000015A | SMA(M) ST(RG-174) | Gold | 1 |
| YY | Connector Type | 200212G010015A | SMA(M) ST(CFD-200) | Gold | 1 |



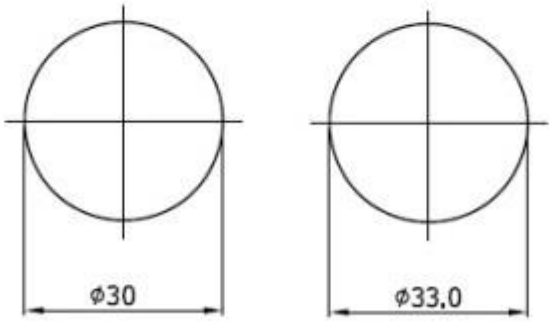
# 7. Installation





Recommended Torque for Mounting 49 N·m

Maximum Torque for Mounting 58.8 N·m

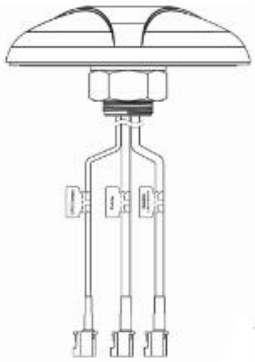



**Thread Diameter** **Recommended Mounting Hole**

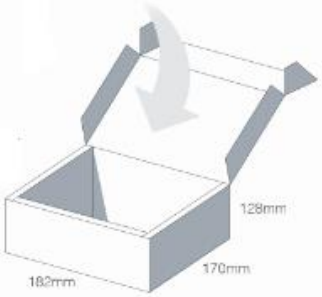
**Unit: mm**

Maximum torque: 600kgf-cm

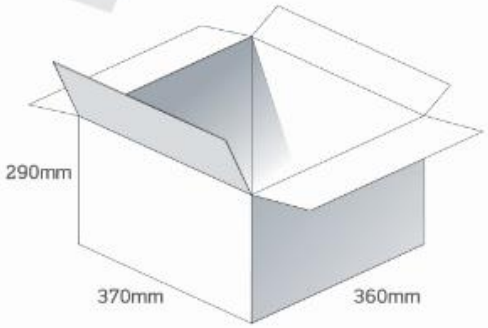
# 8. Packaging



1 pcs MA602.A.ABJ.002 per box
Box Dimensions - 170 x 182 x 128mm
Weight - 0.95g




8 pcs MA602 per carton
Carton - 370 x 360 x 290mm
Weight - 8.4Kg




Pallet Dimensions 1200 x 1000 x 1360mm
18 Cartons per Pallet
6 Cartons per layer
3 Layers