

## SPECIFICATION

|              |                                                                                                                                                                                                                                                                                                 |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part No.     | : <b>MA710.A.ABI.001</b>                                                                                                                                                                                                                                                                        |
| Product Name | : Pantheon Antenna 3in1 MA.710<br>Screw-Mount (Permanent Mount)<br>2 x 4G/3G/2G LTE MIMO Cellular Antenna<br>1 x GPS/GLONASS/GALILEO Antenna                                                                                                                                                    |
| Feature      | : 2 x Cellular 2G/3G/4G Antennas (MIMO)<br>LTE / HSPA / GSM / GPRS / CDMA / UMTS<br>698~960MHz / 1710~2170MHz / 2300~2700MHz /<br>2900-3500MHz<br>1 x GPS/GLONASS/GALILEO 1575.42/1602MHz Active<br>Antenna<br>IP67 Waterproof<br>High Efficiency / Peak Gain Outdoor Antenna<br>RoHS Compliant |



## 1. Introduction

The MA710 Pantheon antenna is an omnidirectional heavy-duty, fully IP67 waterproof external M2M antenna for use in telematics, transportation and remote monitoring applications. It includes two LTE MIMO antennas and one GPS/GLONASS/GALILEO antenna, in the highest efficiency and peak gain possible. This antenna particularly finds its application in mobile video, vehicle communications, location and fleet management, safety & security, remote industrial equipment monitoring. The antenna consists of two LTE MIMO elements 698-960MHz, 1710-2170MHz, 2300~2700MHz, 2900-3500MHz. The antennas are designed to work equally well on LTE to deliver maximum data rates, or on legacy 3G and 2G frequencies where LTE is not available.

The GNSS antenna is a wide-band GPS/GLONASS/GALILEO element tuned to have optimum gain at 1575.42 MHz GPS/GALILEO and 1602MHz GLONASS frequencies.

Mechanically, we have packed 3 high efficiency and gain antennas in an extremely robust IP67 direct mount antenna package with excellent isolation (20dB+). The strengthened domed housing is designed to deflect tree branches and wires that tend to catch and break shark fin or rigid whip antennas. The Pantheon has its own internal ground-plane and can radiate on any mounting environment such as metal or plastic without affecting performance. The internal components are individually screwed down onto a robust plate, preventing damage from regular vehicle vibrations. A completely waterproof mounting seal prevents water from leaking under the housing.

The connectors and cable length are customizable. It is also available in White (MA710W).

## 2. Specification Table

| 4G/3G/2G MIMO         |                                    |          |          |                                  |            |                                  |            |                                  |     |
|-----------------------|------------------------------------|----------|----------|----------------------------------|------------|----------------------------------|------------|----------------------------------|-----|
|                       | LTE                                | GSM 850  | GSM 900  | DCS                              | PCS        | WCDMA I                          | ISM        | LTE                              |     |
| Frequency             | 698 ~787                           | 824 ~896 | 880 ~960 | 1710 ~1880                       | 1850 ~1990 | 1920 ~2170                       | 2400 ~2500 | 2600~3500                        | MHz |
| MIMO 1                |                                    |          |          |                                  |            |                                  |            |                                  |     |
| VSWR (max.)           | 2.5                                | 2.5      | 3        | 2.5                              | 2.5        | 2.5                              | 3          | 2.5                              |     |
| Efficiency            | 66.17                              | 51.88    | 47.87    | 39.97                            | 47.67      | 45.97                            | 28.73      | 38.35                            | %   |
| Peak Gain             | 2.52                               | 1.48     | 1.15     | 1.03                             | 1.22       | 1.22                             | 0.15       | 3.20                             | dBi |
| MIMO 2                |                                    |          |          |                                  |            |                                  |            |                                  |     |
| VSWR (max.)           | 3.5                                | 3.5      | 3.5      | 2.5                              | 2.5        | 2.5                              | 2          | 2.5                              |     |
| Efficiency            | 35.98                              | 18.41    | 20.24    | 40.85                            | 35.42      | 37.68                            | 42.27      | 35.24                            | %   |
| Peak Gain             | 1.56                               | -2.08    | -2.31    | 1.69                             | 0.86       | 2.06                             | 2.99       | 2.97                             | dBi |
| Polarization          | Vertical                           |          |          |                                  |            |                                  |            |                                  |     |
| Impedance             | 50                                 |          |          |                                  |            |                                  |            |                                  | Ω   |
| GPS-GLONASS-GALILEO   |                                    |          |          |                                  |            |                                  |            |                                  |     |
| Centre Frequency      | 1575.42MHz / 1602MHz               |          |          |                                  |            |                                  |            |                                  |     |
| Bandwidth             | 10MHz                              |          |          |                                  |            |                                  |            |                                  |     |
| Radiation Efficiency  | 50 % (without cable)               |          |          |                                  |            |                                  |            |                                  |     |
| Passive Gain @ Zenith | 4.0 dBi typ. (with ψ=140mm ground) |          |          |                                  |            |                                  |            |                                  |     |
| VSWR                  | 2                                  |          |          |                                  |            |                                  |            |                                  |     |
| Impedance             | 50Ω                                |          |          |                                  |            |                                  |            |                                  |     |
| DC Power Input Range  | 1.8V ~ 5V                          |          |          |                                  |            |                                  |            |                                  |     |
| DC input              | 1.8V                               |          | 3.3V     |                                  | 4.0V       |                                  | 5.5V       |                                  |     |
| MHz                   | 1575.42                            | 1602     | 1575.42  | 1602                             | 1575.42    | 1602                             | 1575.42    | 1602                             |     |
| VSWR                  | 2                                  | 2        | 2        | 2                                | 2          | 2                                | 2          | 2                                |     |
| LNA Gain              | 17                                 | 17       | 29.2     | 29                               | 31         | 31                               | 32.3       | 32                               |     |
| Noise Figure          | 3.4                                | 3.4      | 3.1      | 3.1                              | 3.2        | 3.2                              | 3.4        | 3.4                              |     |
| Power Consumption     | 3.2                                | 3.2      | 7.5      | 7.5                              | 9.4        | 9.4                              | 15         | 15                               |     |
| Band Attenuation      | 1535MHz: -20dB<br>1642MHz: -20dB   |          |          | 1520MHz: -20dB<br>1642MHz: -20dB |            | 1520MHz: -20dB<br>1642MHz: -20dB |            | 1520MHz: -20dB<br>1642MHz: -20dB |     |
| Cable                 | 3m RG174 standard                  |          |          |                                  |            |                                  |            |                                  |     |
| Connector             | SMA(M) standard                    |          |          |                                  |            |                                  |            |                                  |     |

| MECHANICAL            |                                  |
|-----------------------|----------------------------------|
| Antenna Dimensions    | Height 85.7mm x Diameter 145.6mm |
| Casing                | Wonderloy PC-540 PC/ABS Alloy    |
| Waterproof            | IP67                             |
| 4G/3G/2G MIMO 1       | 3M Low Loss CFD-200 SMA(M)       |
| 4G/3G/2G MIMO 2       | 3M Low Loss CFD-200 SMA(M)       |
| GPS/GLONASS/GALILEO   | 3M RG-174 SMA(M)                 |
| ENVIRONMENTAL         |                                  |
| Operation Temperature | -40°C to 85°C                    |
| Storage Temperature   | -40°C to 90°C                    |
| Humidity              | Non-condensing 65°C 95% RH       |

\* all measurements were conducted with 3m low loss CFD200 cable on cellular and RG-174 cable on GPS/GLONASS/GALILEO

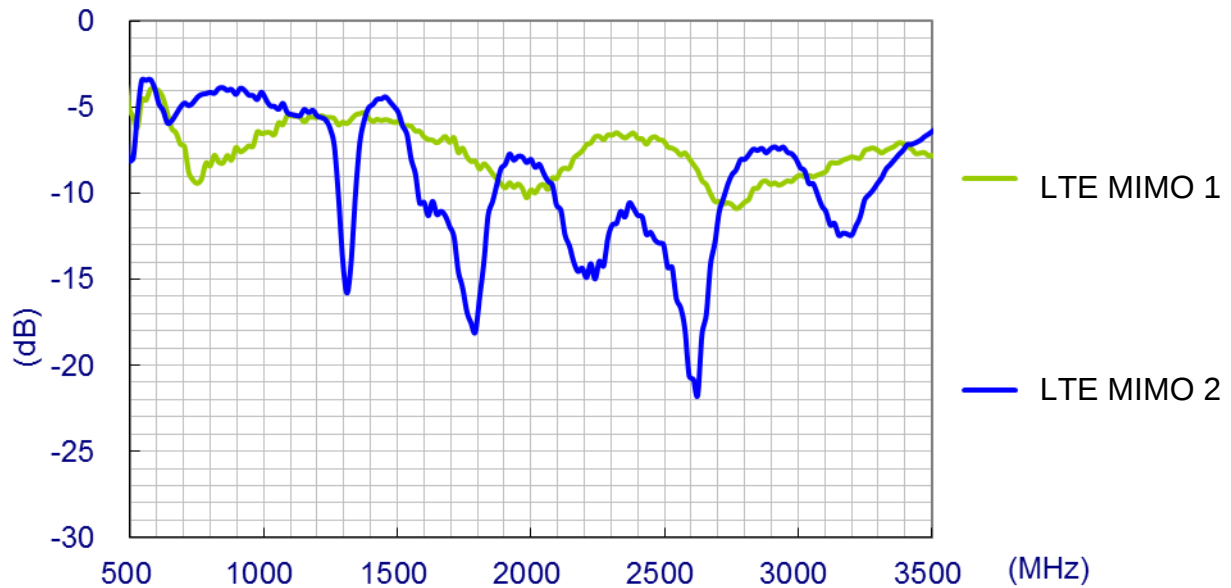
| LTE BANDS   |                                                      |                               |        |        |
|-------------|------------------------------------------------------|-------------------------------|--------|--------|
| Band Number | LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA |                               |        |        |
|             | Uplink                                               | Downlink                      | MIMO 1 | MIMO 2 |
| 1           | UL: 1920 to 1980                                     | DL: 2110 to 2170              | ✓      | ✓      |
| 2           | UL: 1850 to 1910                                     | DL: 1930 to 1990              | ✓      | ✓      |
| 3           | UL: 1710 to 1785                                     | DL: 1805 to 1880              | ✓      | ✓      |
| 4           | UL: 1710 to 1755                                     | DL: 2110 to 2155              | ✓      | ✓      |
| 5           | UL: 824 to 849                                       | DL: 869 to 894                | ✓      | ✗      |
| 7           | UL: 2500 to 2570                                     | DL: 2620 to 2690              | ✓      | ✓      |
| 8           | UL: 880 to 915                                       | DL: 925 to 960                | ✓      | ✗      |
| 9           | UL: 1749.9 to 1784.9                                 | DL: 1844.9 to 1879.9          | ✓      | ✓      |
| 11          | UL: 1427.9 to 1447.9                                 | DL: 1475.9 to 1495.9          | ✗      | ✗      |
| 12          | UL: 699 to 716                                       | DL: 729 to 746                | ✓      | ✓      |
| 13          | UL: 777 to 787                                       | DL: 746 to 756                | ✓      | ✓      |
| 14          | UL: 788 to 798                                       | DL: 758 to 768                | ✓      | ✓      |
| 17          | UL: 704 to 716                                       | DL: 734 to 746 (LTE only)     | ✓      | ✓      |
| 18          | UL: 815 to 830                                       | DL: 860 to 875 (LTE only)     | ✓      | ✗      |
| 19          | UL: 830 to 845                                       | DL: 875 to 890                | ✓      | ✗      |
| 20          | UL: 832 to 862                                       | DL: 791 to 821                | ✓      | ✗      |
| 21          | UL: 1447.9 to 1462.9                                 | DL: 1495.9 to 1510.9          | ✗      | ✗      |
| 22          | UL: 3410 to 3490                                     | DL: 3510 to 3590              | ✗      | ✗      |
| 23          | UL: 2000 to 2020                                     | DL: 2180 to 2200 (LTE only)   | ✓      | ✓      |
| 24          | UL: 1625.5 to 1660.5                                 | DL: 1525 to 1559 (LTE only)   | ✓      | ✓      |
| 25          | UL: 1850 to 1915                                     | DL: 1930 to 1995              | ✓      | ✓      |
| 26          | UL: 814 to 849                                       | DL: 859 to 894                | ✓      | ✗      |
| 27          | UL: 807 to 824                                       | DL: 852 to 869 (LTE only)     | ✓      | ✗      |
| 28          | UL: 703 to 748                                       | DL: 758 to 803 (LTE only)     | ✓      | ✗      |
| 29          | UL: -                                                | DL: 717 to 728 (LTE only)     | ✓      | ✓      |
| 30          | UL: 2305 to 2315                                     | DL: 2350 to 2360 (LTE only)   | ✓      | ✓      |
| 31          | UL: 452.5 to 457.5                                   | DL: 462.5 to 467.5 (LTE only) | ✗      | ✗      |
| 32          | UL: -                                                | DL: 1452 - 1496               | ✗      | ✗      |
| 35          | 1850 to 1910                                         |                               | ✓      | ✓      |
| 38          | 2570 to 2620                                         |                               | ✓      | ✓      |
| 39          | 1880 to 1920                                         |                               | ✓      | ✓      |
| 40          | 2300 to 2400                                         |                               | ✓      | ✓      |
| 41          | 2496 to 2690                                         |                               | ✓      | ✓      |
| 42          | 3400 to 3600                                         |                               | ✓      | ✗      |
| 43          | 3600 to 3800                                         |                               | ✗      | ✗      |

\*Covered bands represent an efficiency greater than 20%

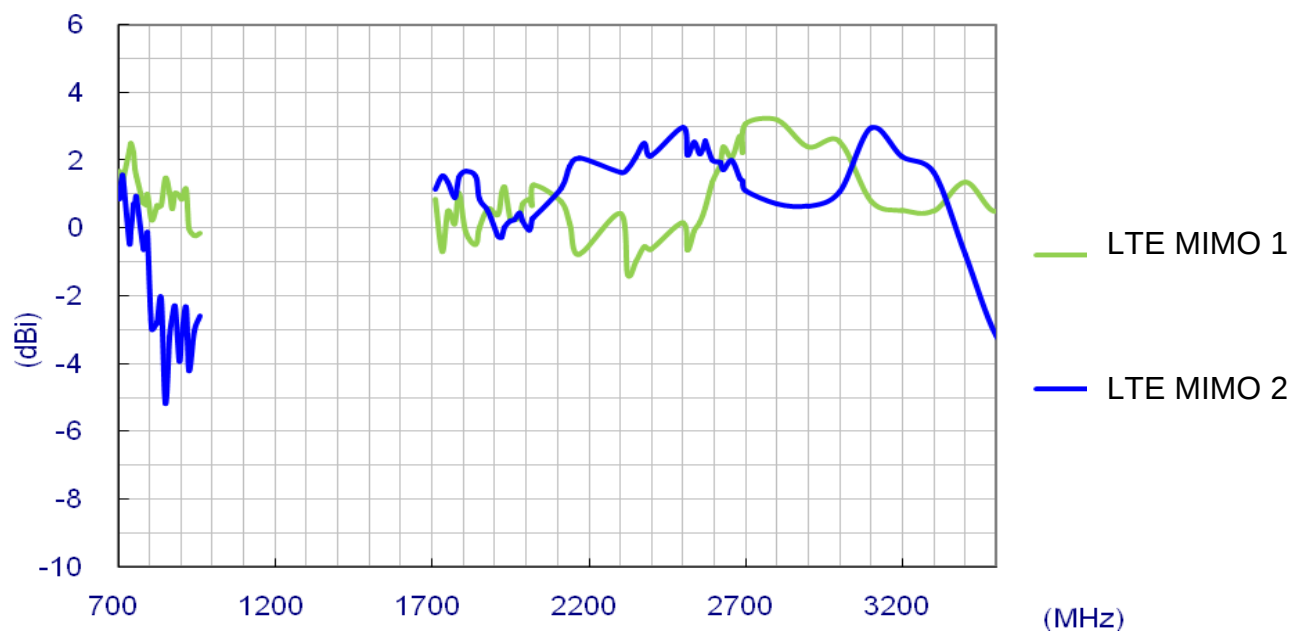
## 3. LTE MIMO

### 3.1. LTE MIMO 1 and LTE MIMO 2 Specification

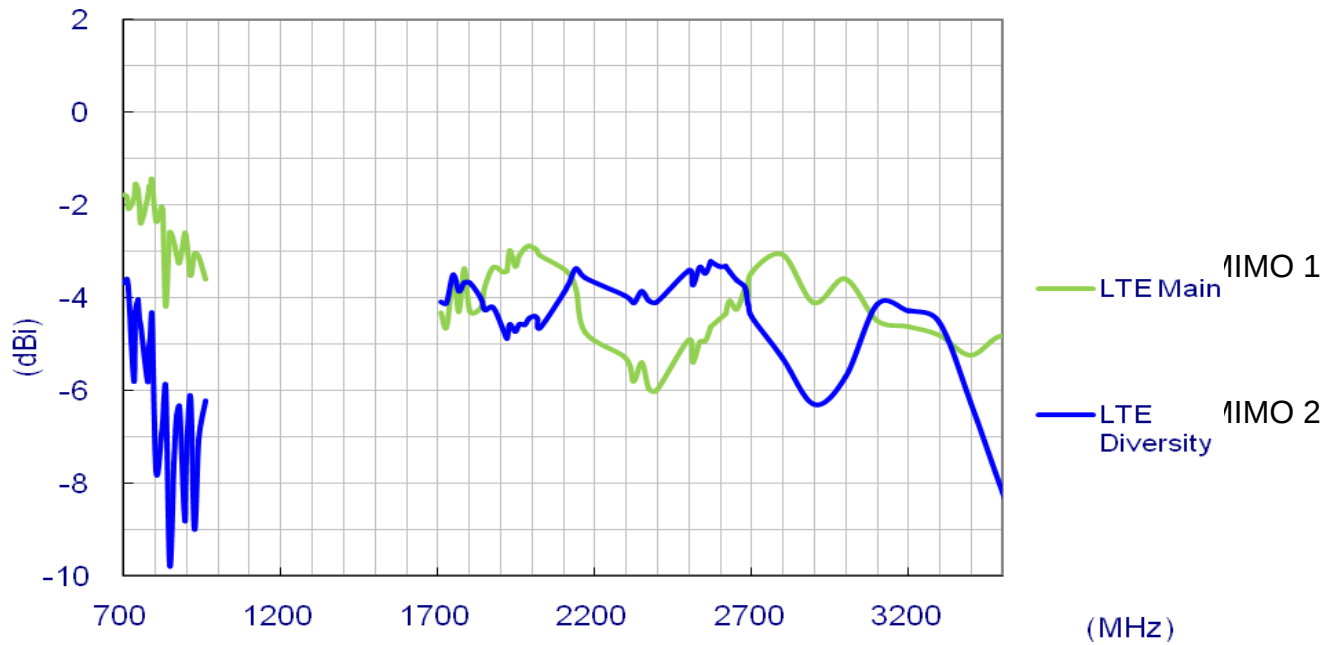
#### 3.1.1. Return Loss



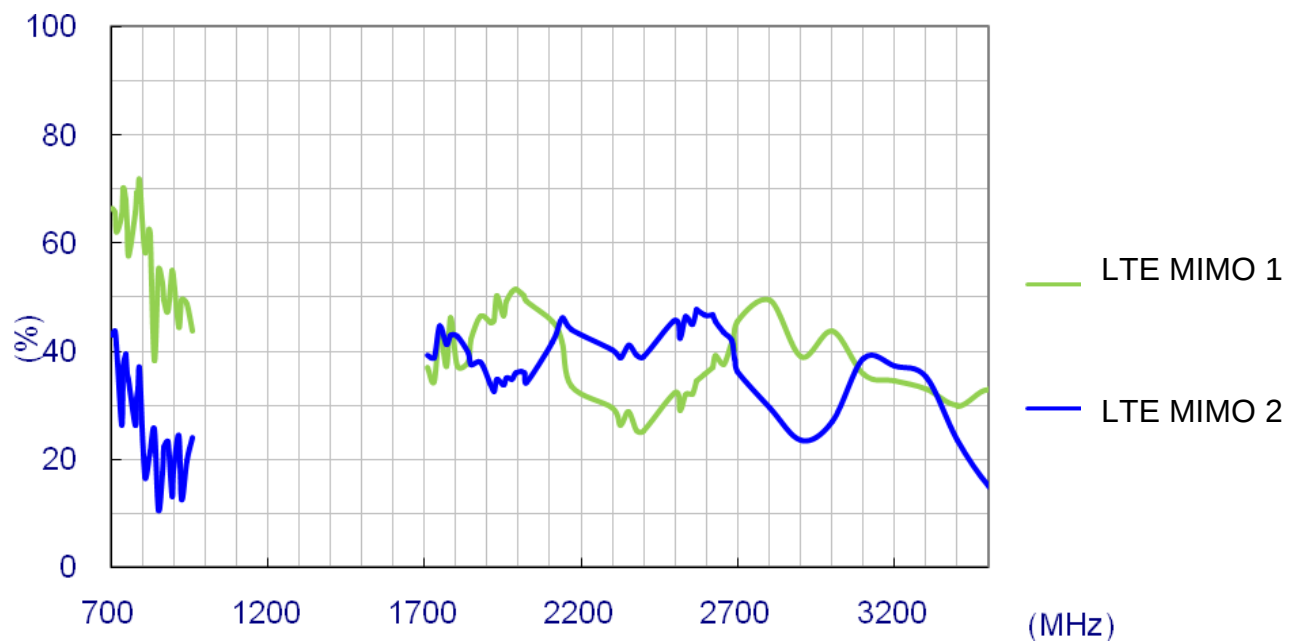
#### 3.1.2. Maximum Gain



### 3.1.3. Average Gain



### 3.1.4. Efficiency

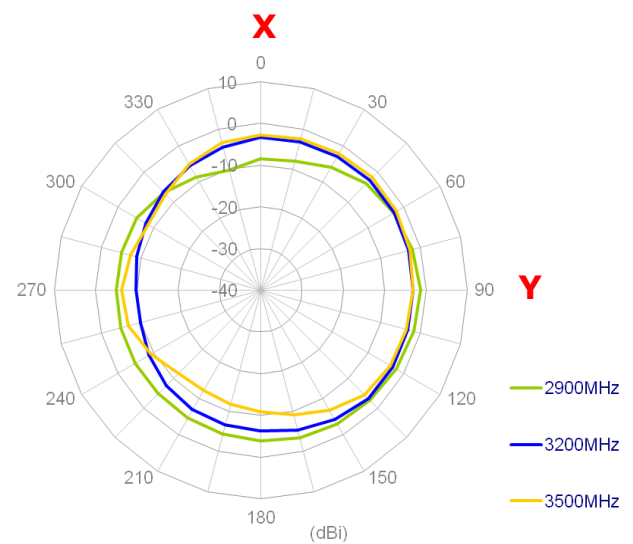
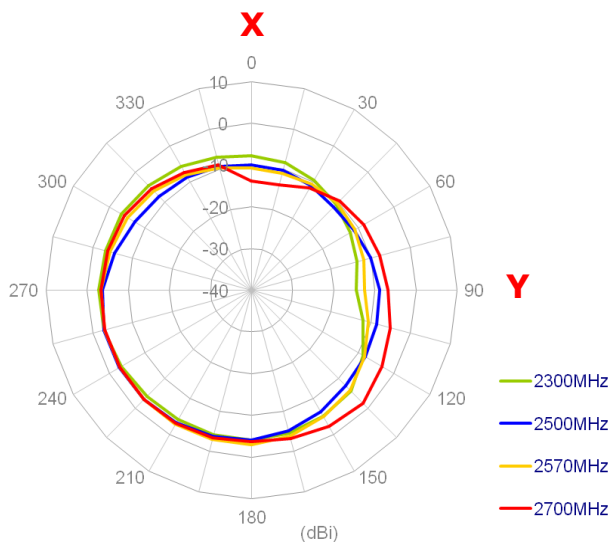
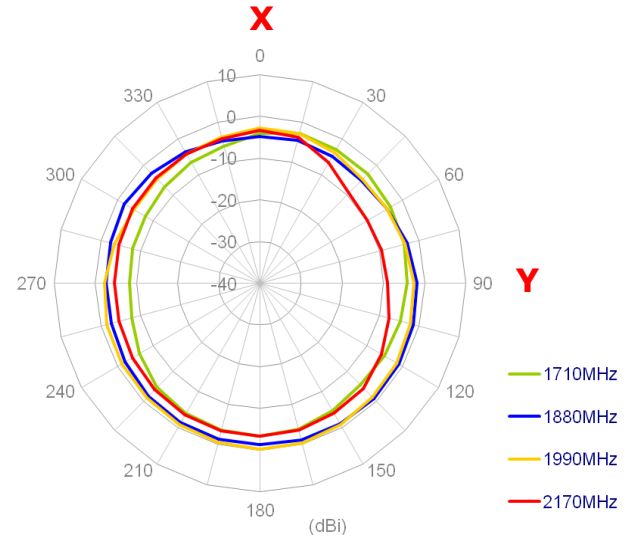
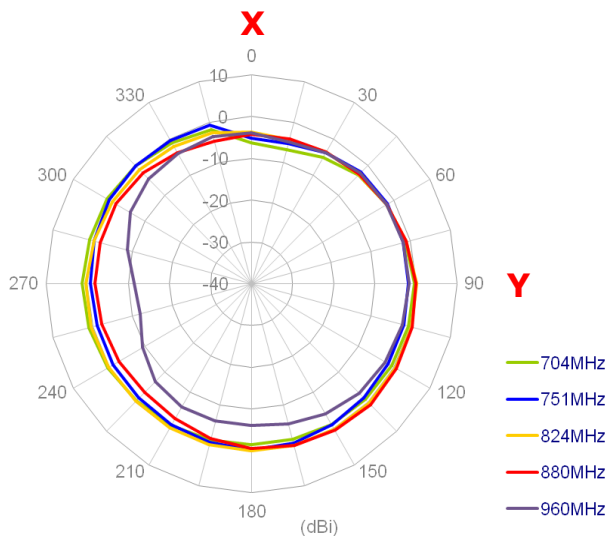


## 3.2. Radiation Patterns

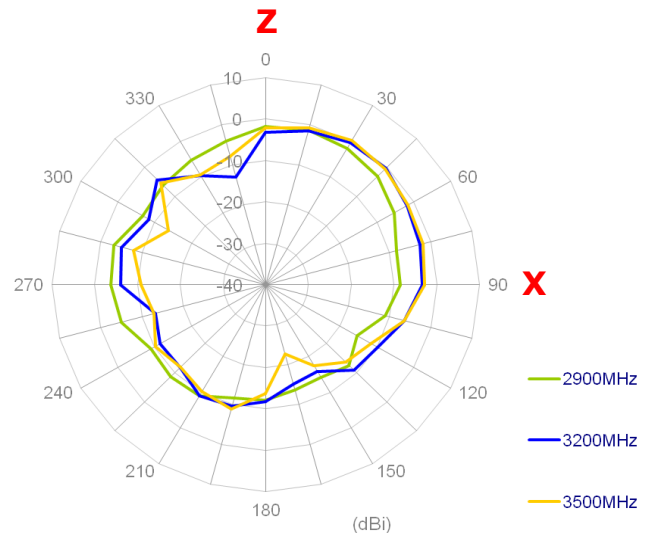
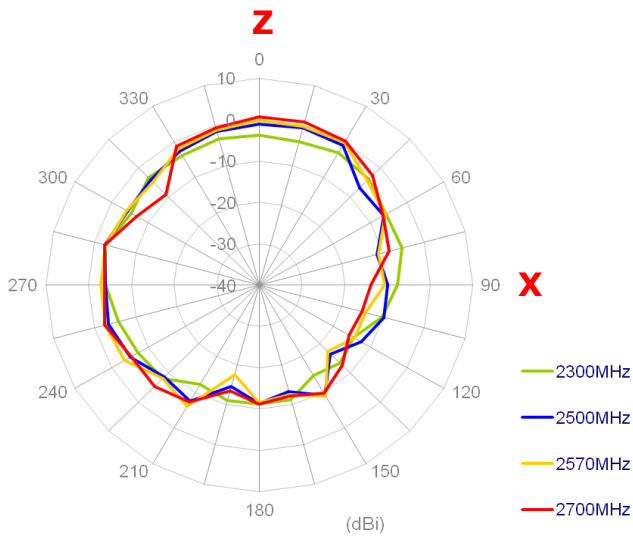
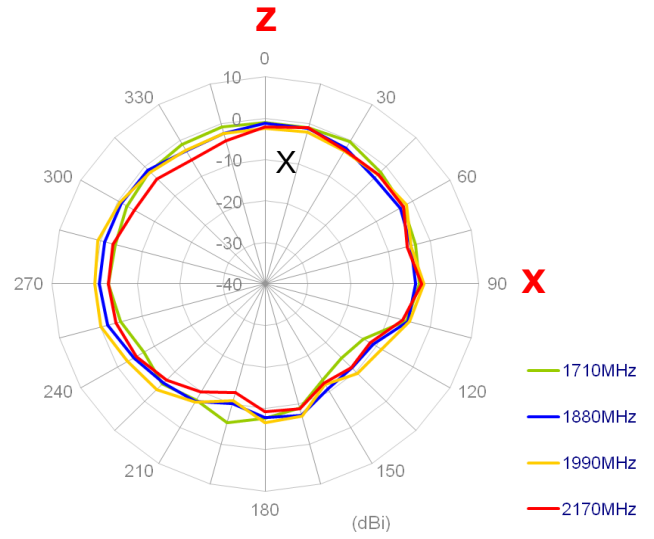
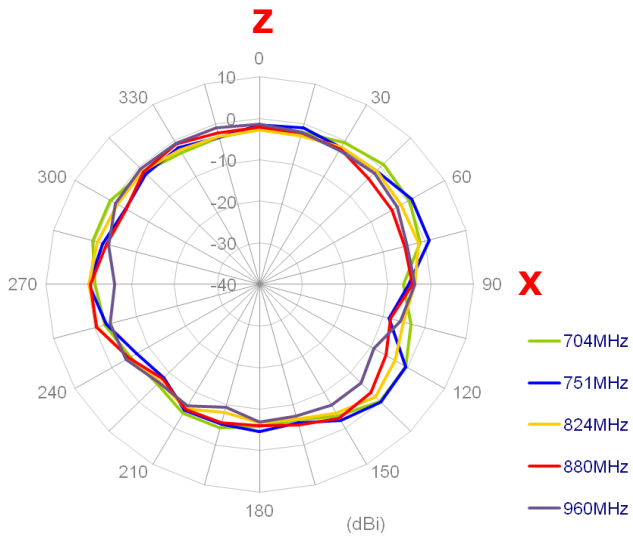


### 3.2.1. 3.2.1 LTE MIMO 1 Radiation Pattern

XY plane

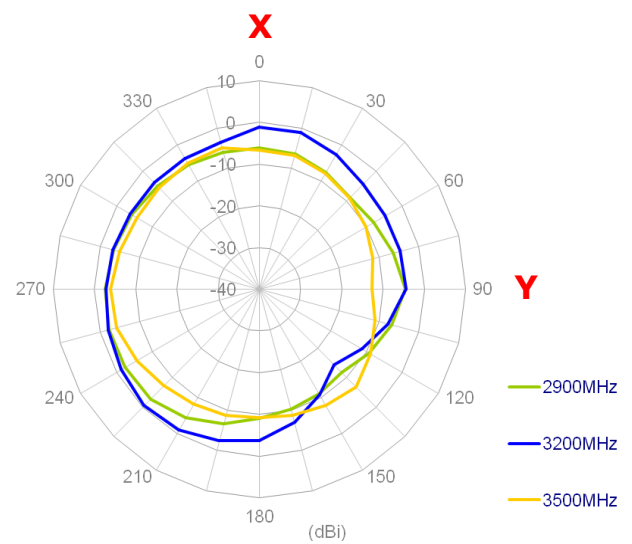
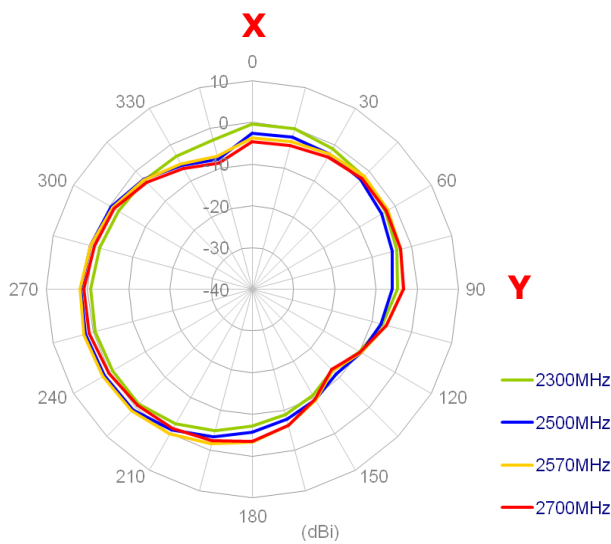
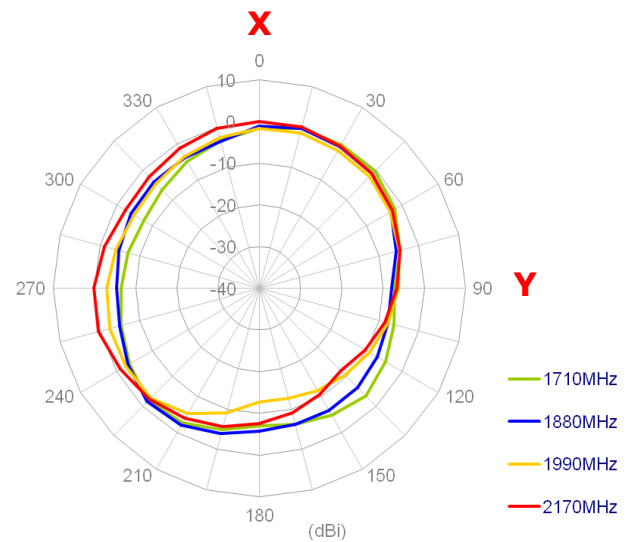
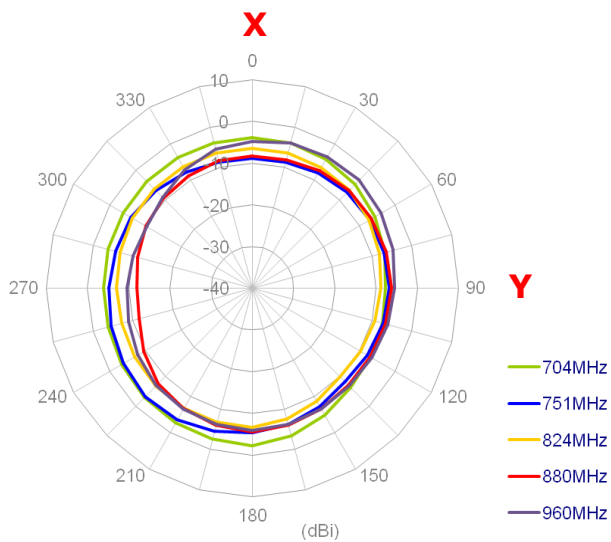


## XZ Plane

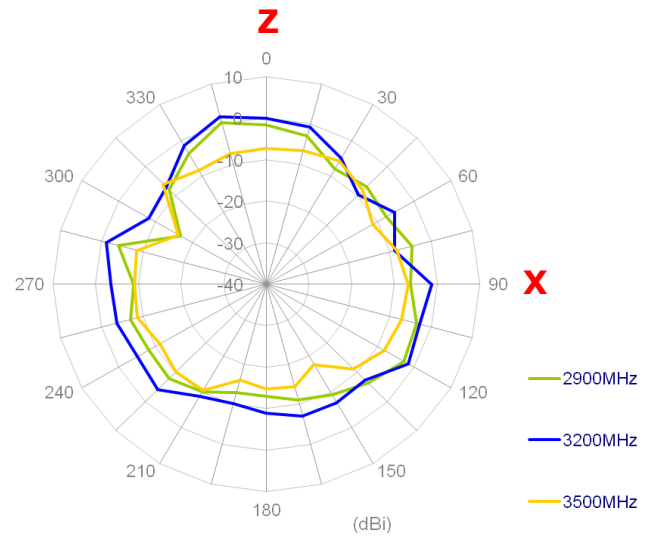
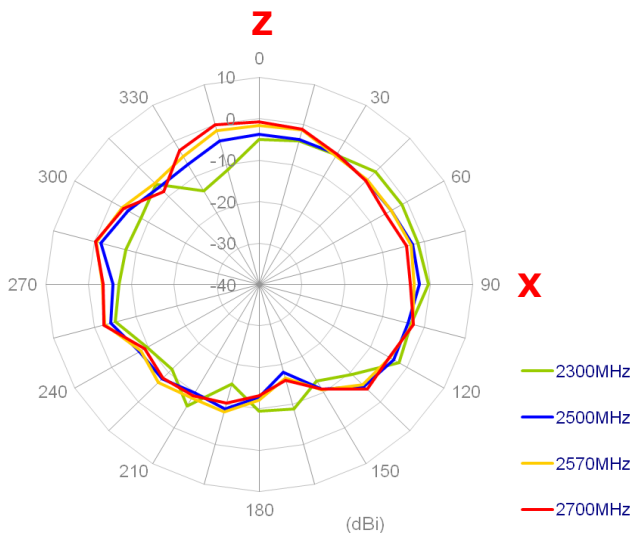
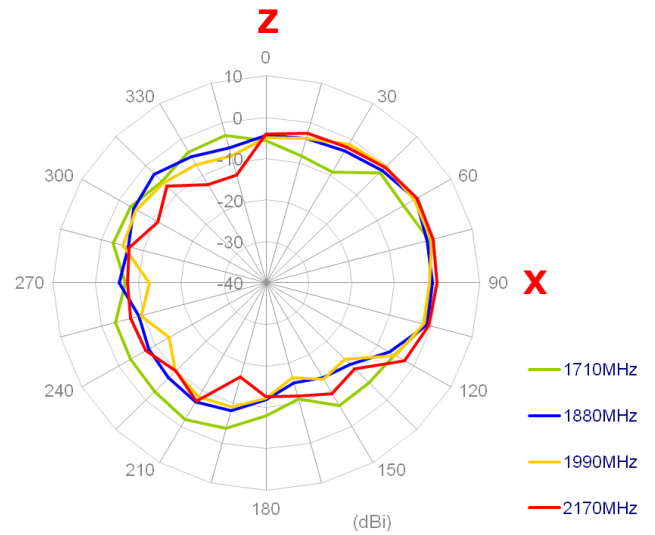
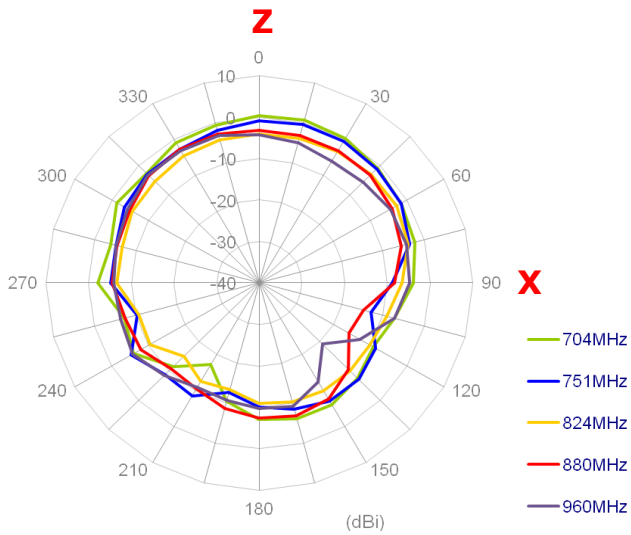


### 3.2.2. LTE MIMO 2 Radiation Pattern

#### XY Plane

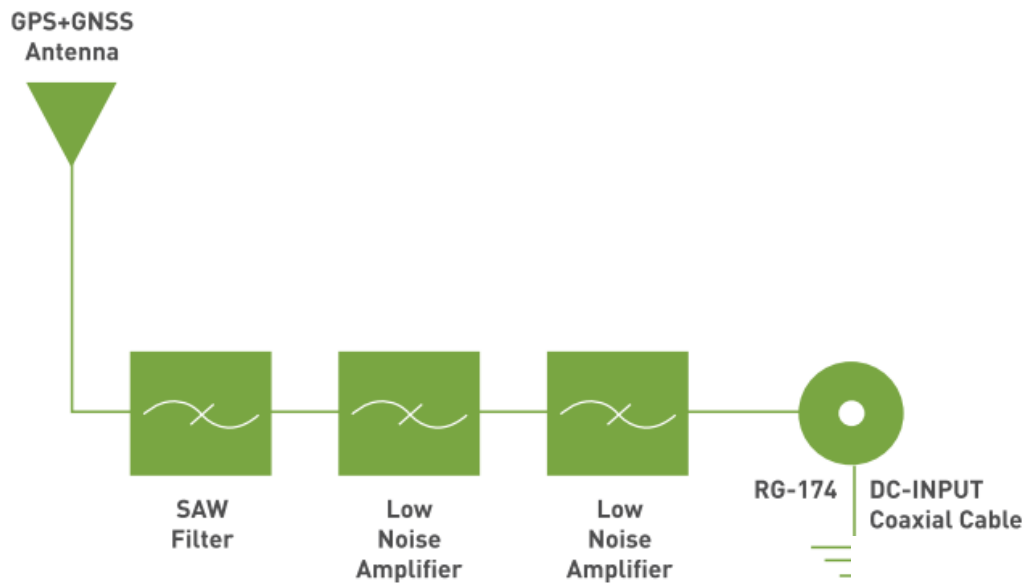


## XZ Plane

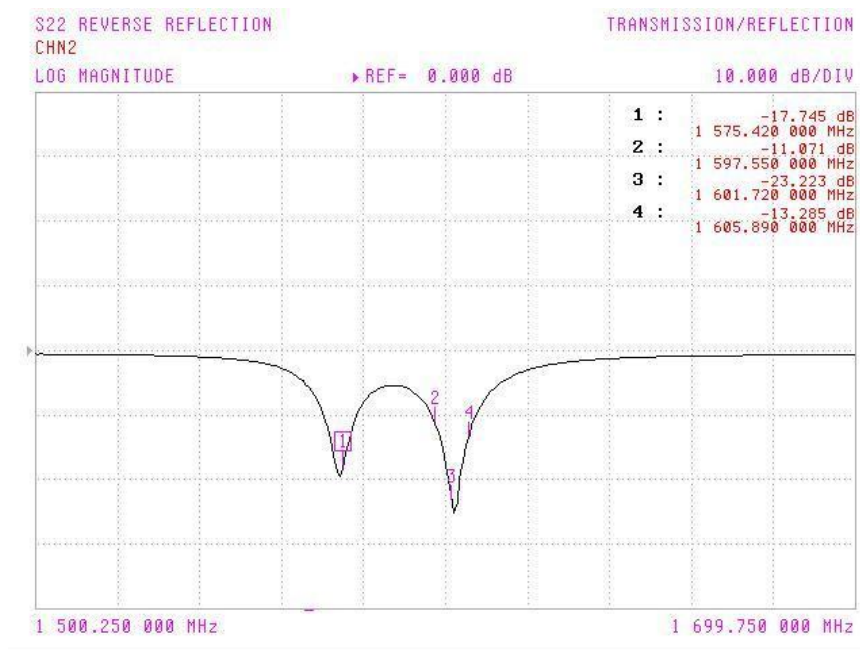


## 4. GPS/GLONASS/GALILEO

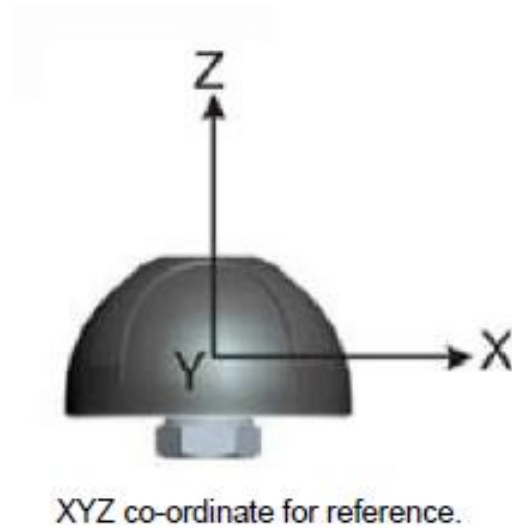
### 4.1. Block diagram



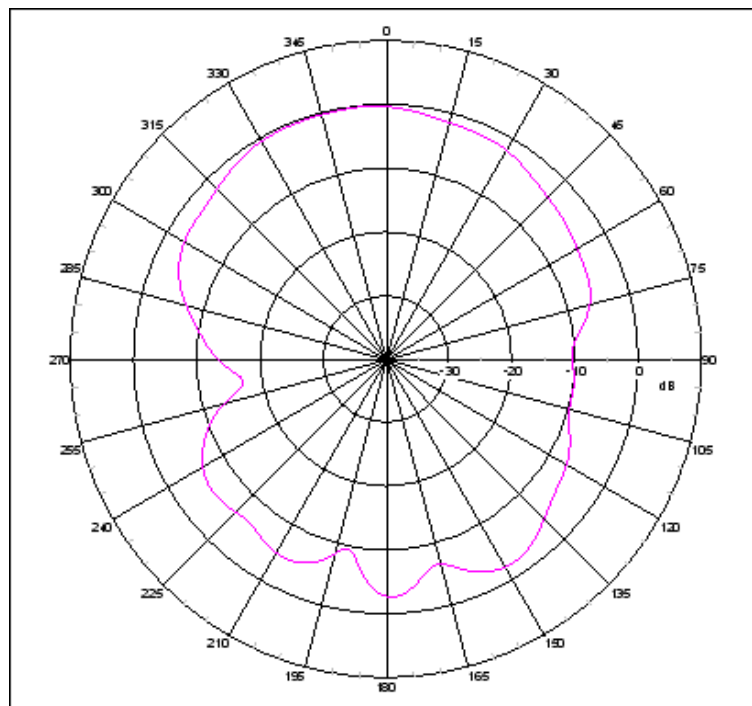
### 4.2. Return Loss



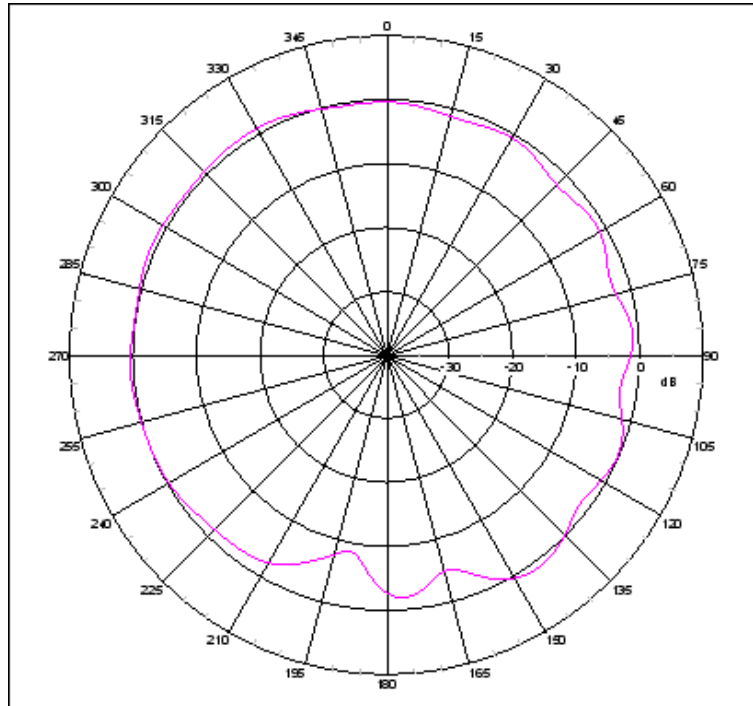
### 4.3. Radiation pattern



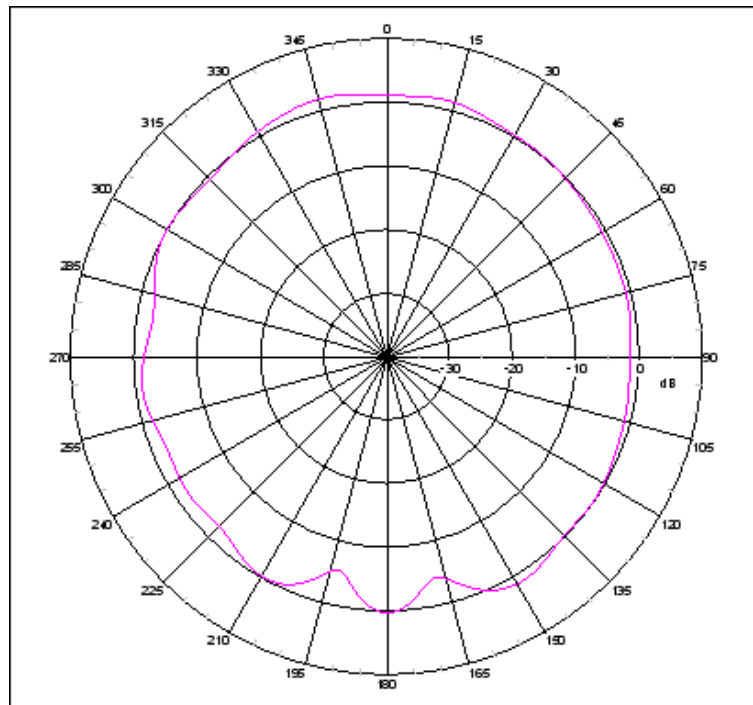
XZ Plane Free Space @1575.42MHz



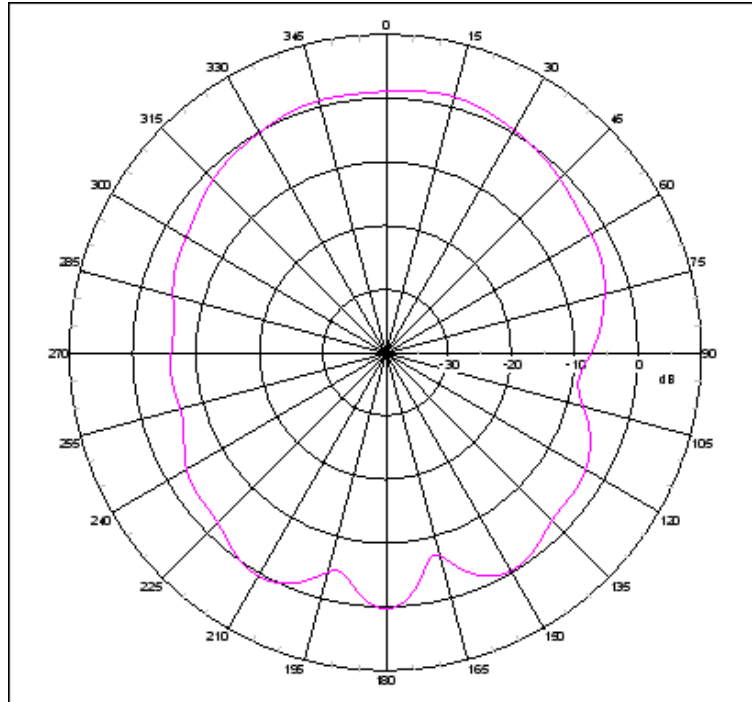
# YZ Plane Free Space @1575.42MHz



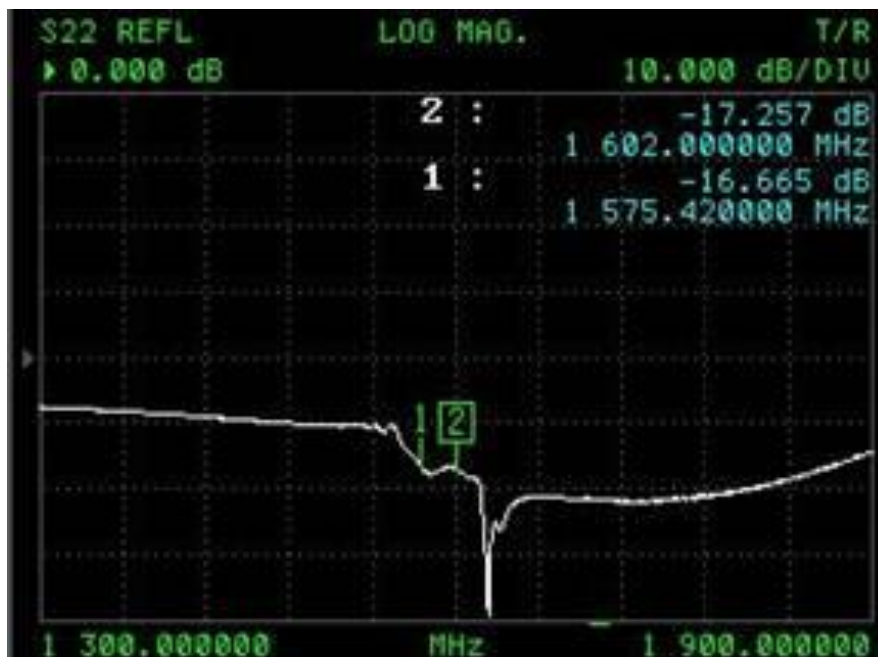
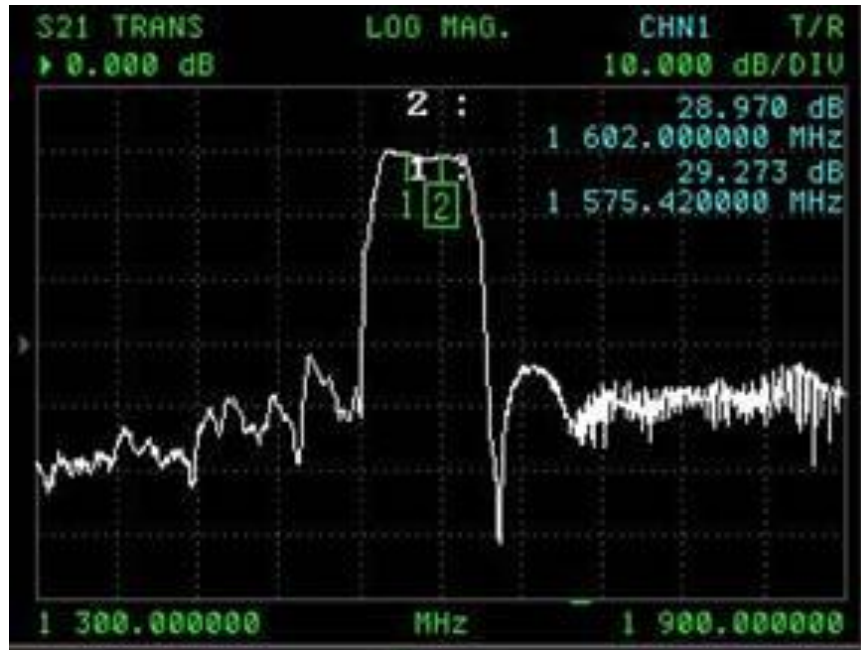
# XZ Plane Free Space @1602MHz



# YZ Plane Free Space @1602MHz

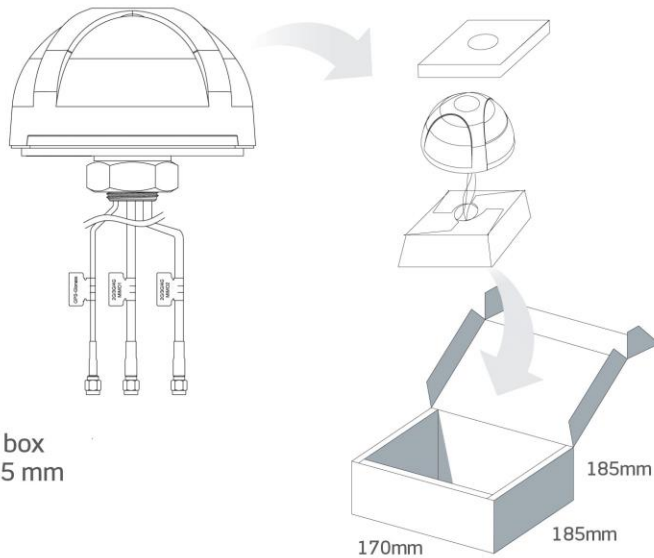


## 4.4 GPS/GLONASS/GALILEO LNA

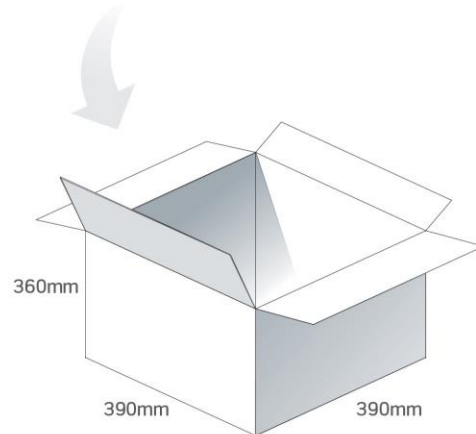




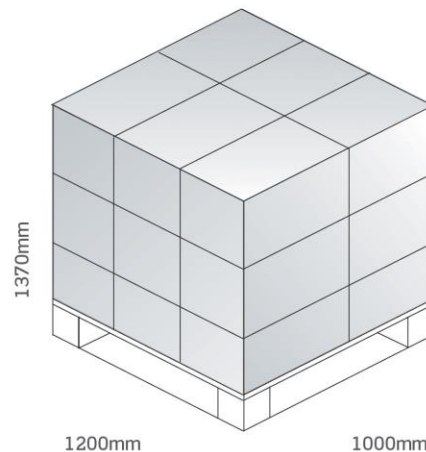
## 6. Packaging



1 pcs MA710.W.A.ABI.001 per box  
Box Dimensions - 185\*170\*185 mm  
Weight - 1300g



8 pcs MA710.W.A.ABI.001 per carton  
Carton - 390\*360\*390mm  
Weight - 11.5Kg



Pallet Dimensions 1200 x 1000 x 1370mm  
18 Cartons per Pallet  
6 Cartons per layer  
3 Layers

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