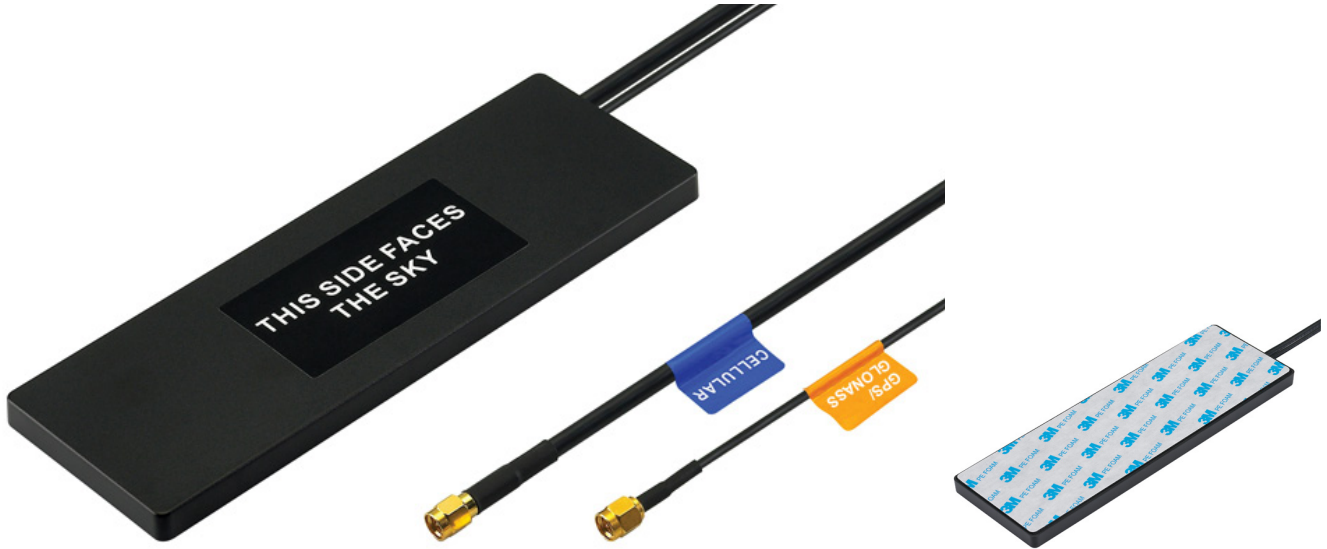




Topside View

Underside View

**MA209.A.LB.001**

## Specification

|                     |                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Part No.</b>     | <b>MA209.A.LB.001</b>                                                                                                                                                                                        |
| <b>Product Name</b> | Stream Two - GPS/Glonass & Cellular<br>(LTE/GSM/CDMA/UMTS/HSPA)<br>2in1 Combination Antenna                                                                                                                  |
| <b>Feature</b>      | Adhesive Mount IP67 Antenna<br>GPS/ Glonass: 1575MHz to 1610MHz<br>with 3M RG-174 SMA(M)<br>Cellular: 700MHz~960MHz,1,710MHz~2,170MHz<br>with 3M Low Loss CFD-200 SMA(M)<br>200.5*66.5*9mm<br>RoHS Compliant |

## 1. Introduction

The 'Stream Two' - MA.209 GPS/Glonass, LTE Cellular antenna is a low profile, heavy-duty, fully IP67 waterproof external M2M antenna for use by RF professionals in telematics, transportation and remote monitoring applications. The Stream Two is unique in the market as it combines the highest possible efficiency and peak gain for GPS/Glonass and all cellular bands in 2G/3G/4G in a low profile compact format for mounting via high quality first tier automotive approved 3M adhesive foam.

The patent pending design incorporates internally a custom Taoglas 35mm patch antenna on an extended integral ground-plane to deliver more than

3.5dBiC gain. A front-end SAW filter dramatically reduces radiated spurious emissions. The extended ground-plane used with an innovative internal cellular PIFA also enables the unique wide-band 2G/3G/4G response to deliver the highest performance possible, at 3 metres cable length.

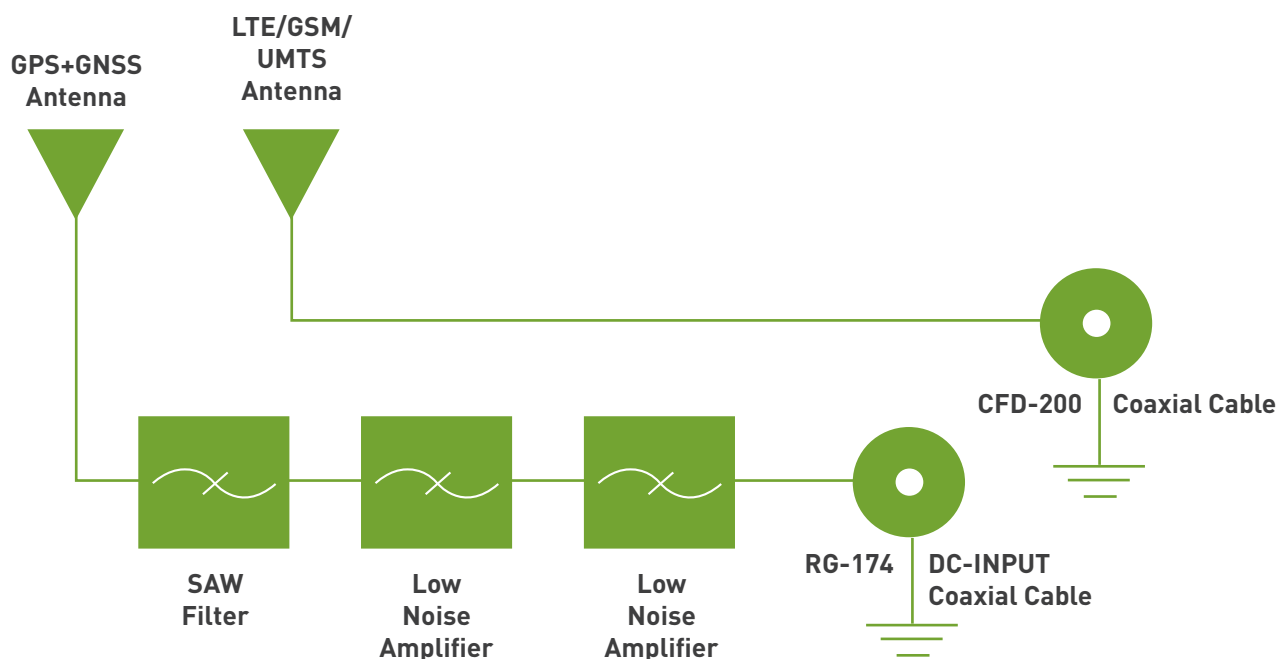
Nothing else out there comes close in terms of consistency of efficiency and peak gain at all cellular bands, with an awesome 70%+ at the LTE 700MHz band, again including 3 metres of cable loss. High antenna efficiencies are absolutely critical in today's 3G and 4G systems to achieving targeted data-speeds and coverage.

All this is done while still maintaining 20dB isolation between antennas. The Stream uses high-shielded PTFE dielectric ultra low-loss cables that maintain low attenuation at all frequency bands, and high noise rejection, with an average loss of only 0.3dB per meter (0.1dB per foot), compared to 0.7dB for RG58 and 1.2dB for RG174.

Because of this, the Stream maximizes chances of passing PTCRB and network approvals first time. The Stream Two works best when attached to plastic or glass, but can also be used on metal if some foam spacing of 40mm or more is added.

## 2. System Configuration

This antenna specification covers the LTE/GSM/UMTS Full band for 700MHz~960MHz, 1,710MHz~2,170MHz and GPS (L1 Band),GNSS.



## 3. Specification

### 3.1 Electrical Data

| Parameter          | GPS/Glonass Antenna                                                | Cellular Antenna                                                                                                                                                             |
|--------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Features</b>    | High performance<br>GPS/Glonass 35*35*4mm<br>ceramic patch antenna | LTE:700MHz<br>CDMA:824~896MHz<br>GSM:880~960MHz<br>GSM:880~960MHz<br>PCS:1850~1990MHz<br>3G:1920~2170MHz                                                                     |
| <b>Gain</b>        | 1575MHz 1.98dBi typ @ Zenith<br>1602MHz 3.25dBi typ @ Zenith       | Average:-3.03dBi at 700~960MHz<br>-4.34dBi at 1710~2170MHz<br>Peak:2.16dBi at 700~960MHz<br>0.42dBi at 1710~2170MHz                                                          |
| <b>Return Loss</b> | <-10dB                                                             | <-10dB                                                                                                                                                                       |
| <b>VSWR</b>        | 1.24 Max at 1575MHz<br>1.27Max at 1602MHz                          | 3.3 Max. at 700~960MHz<br>3.6 Max. at 1710~1850MHz<br>2.2 Max. at 1880~2170MHz                                                                                               |
| <b>Impedance</b>   | 50Ω                                                                | 50Ω                                                                                                                                                                          |
| <b>Efficiency</b>  | ---                                                                | 68% @ 700MHz<br>72% @ 750MHz<br>66% @ 824MHz<br>56% @ 890MHz<br>61% @ 880MHz<br>53% @ 960MHz<br>37% @1710MHz<br>51% @1880MHz<br>55% @1990MHz<br>54% @2110MHz<br>45% @2170MHz |

### 3.2 Cable and Connectors (Fully Customisable)

| Parameter | GPS/Glonass Antenna | Cellular Antenna    |
|-----------|---------------------|---------------------|
| Cable     | 3M RG-174           | 3M Low Loss CFD-200 |
| Connector | SMA(M)              | SMA(M)              |

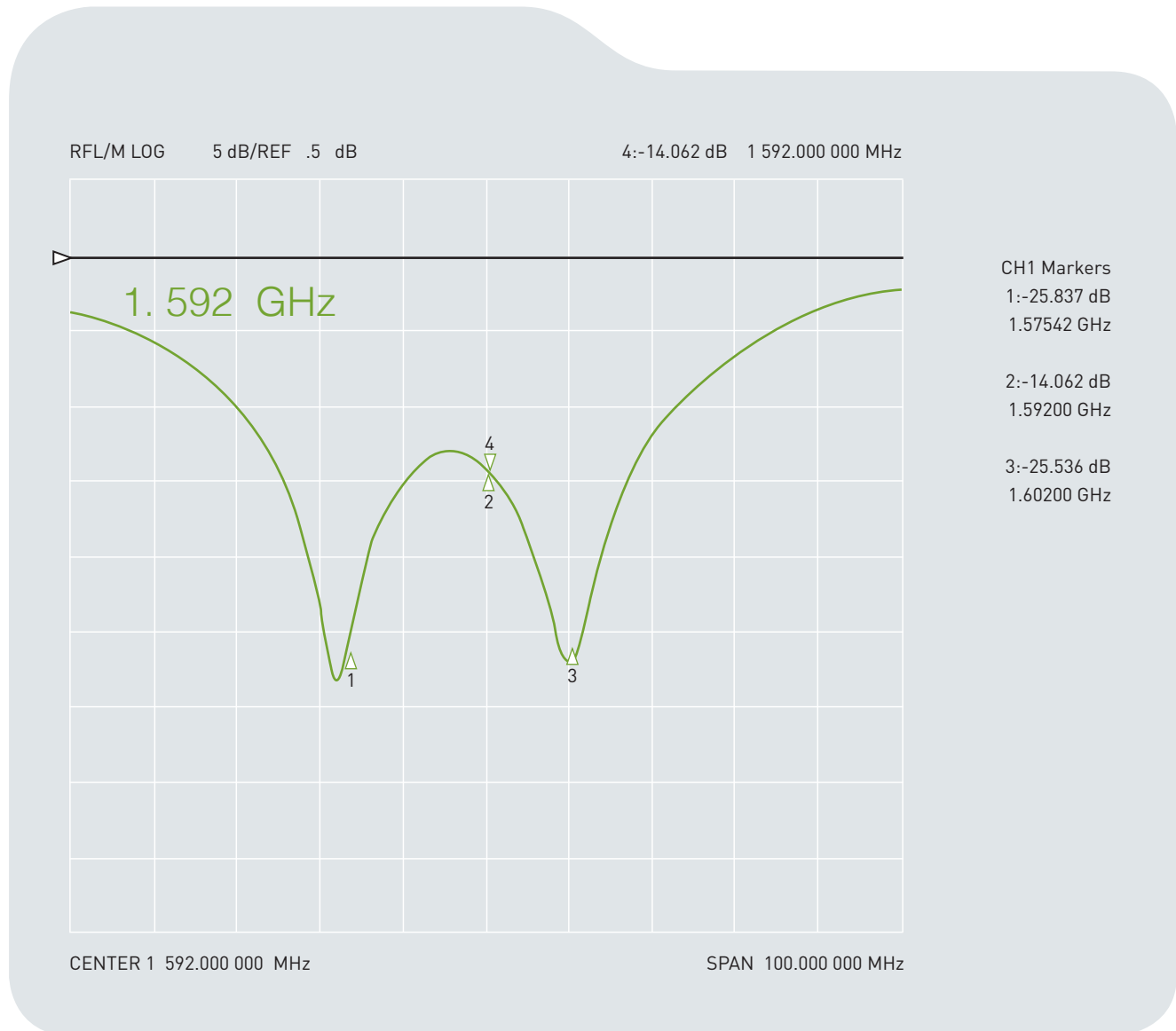
### 3.3 Mechanical Data

| Parameter             |                                      |
|-----------------------|--------------------------------------|
| Housing               | UV resistant PVC                     |
| Adhesive Mount        | F100 Foam & 3M 9448B(197.5*63.5*6mm) |
| Protection Class      | IP-67                                |
| Operation Temperature | -40°C to +85°C                       |
| Storage Temperature   | -40°C to +85°C                       |
| Relative Humidity     | 20% to 95%                           |
| Weight per unit       | 0.18kg                               |

**\*Note:** specifications may be subject to change

## 4. GPS/ Glonass Antenna

### 4.1 Return Loss

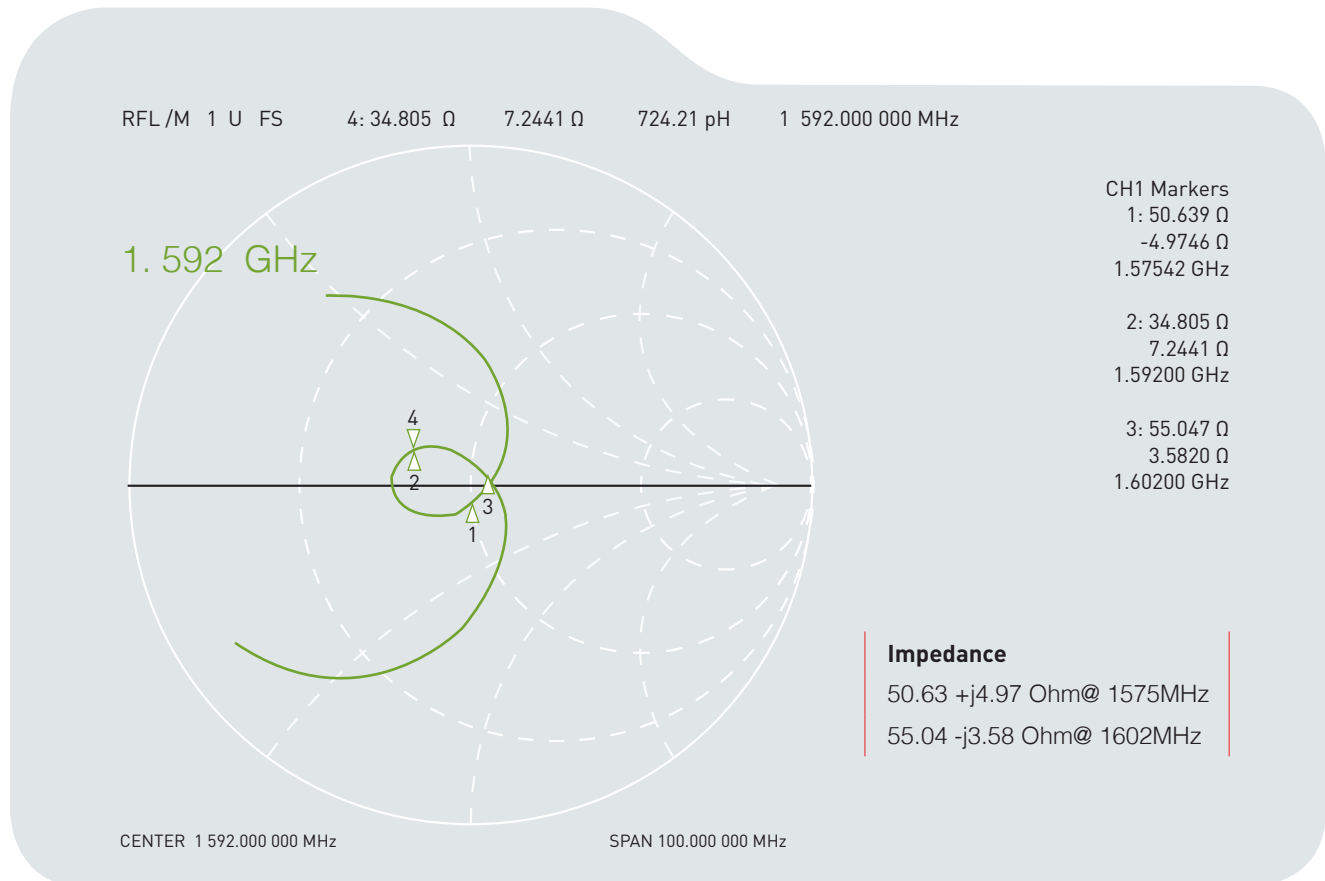


#### Return Loss

-25.83 dB @ 1575MHz

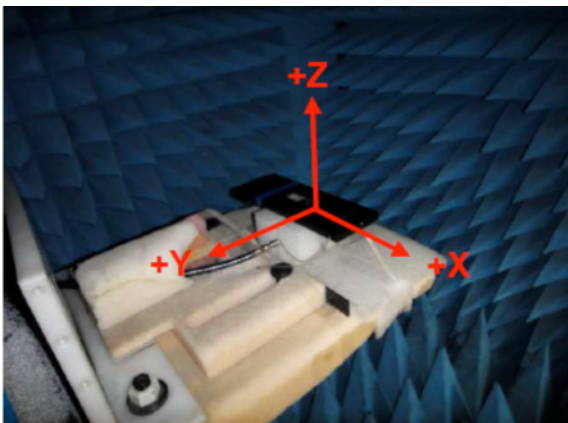
-25.53 dB @ 1602MHz

## 4.2 Smith Chart

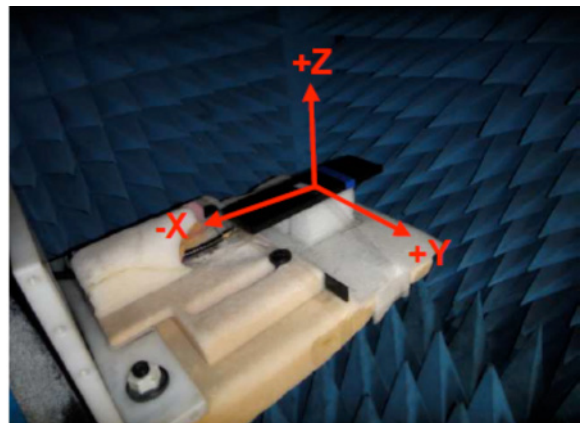


## 4.3 Radiation Patterns

XZ - Plane

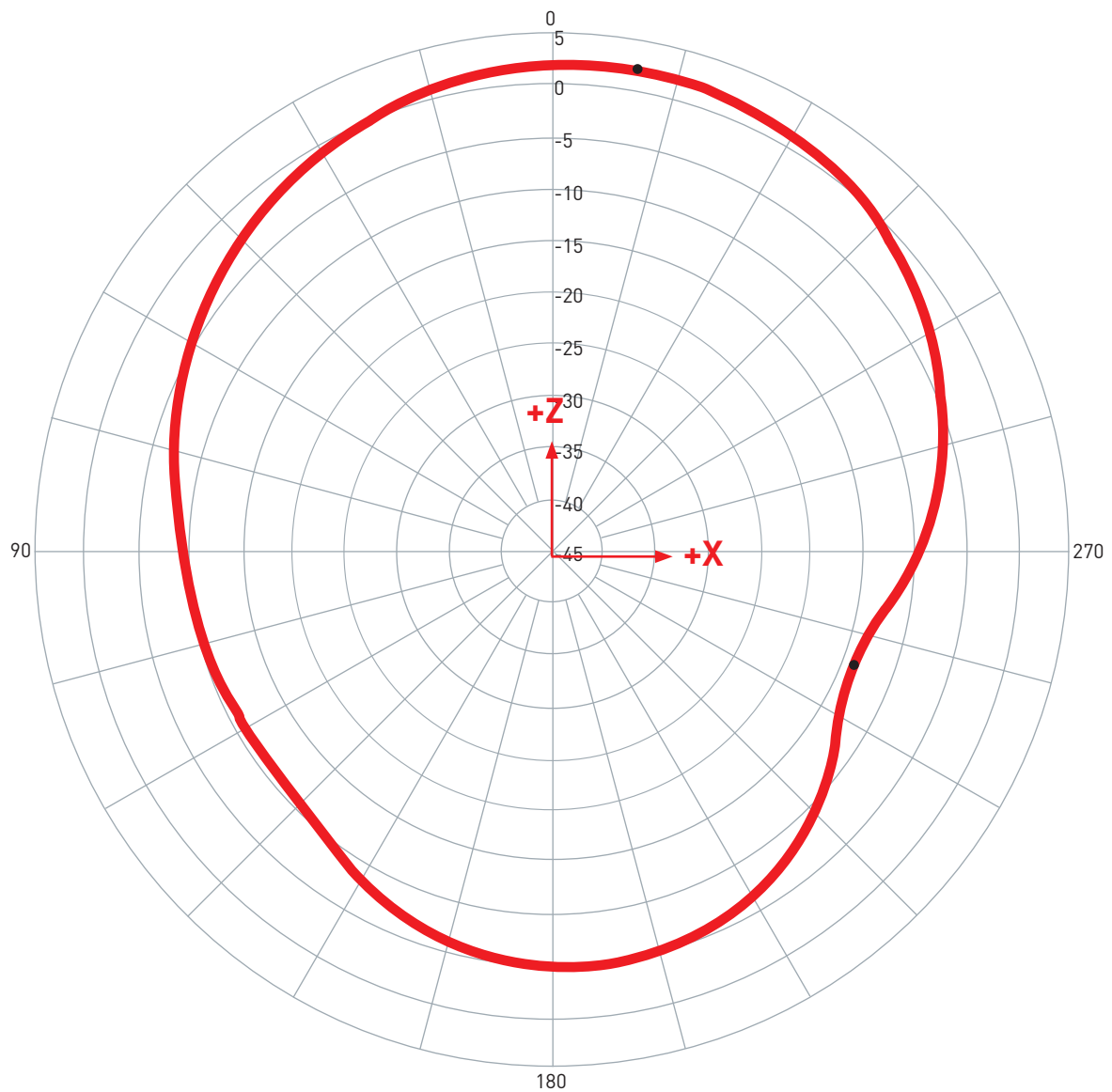


YZ - Plane



## 4.3 Radiation Patterns

### 4.3.1 XZ Plane 1575.42MHz Horizontal & Vertical



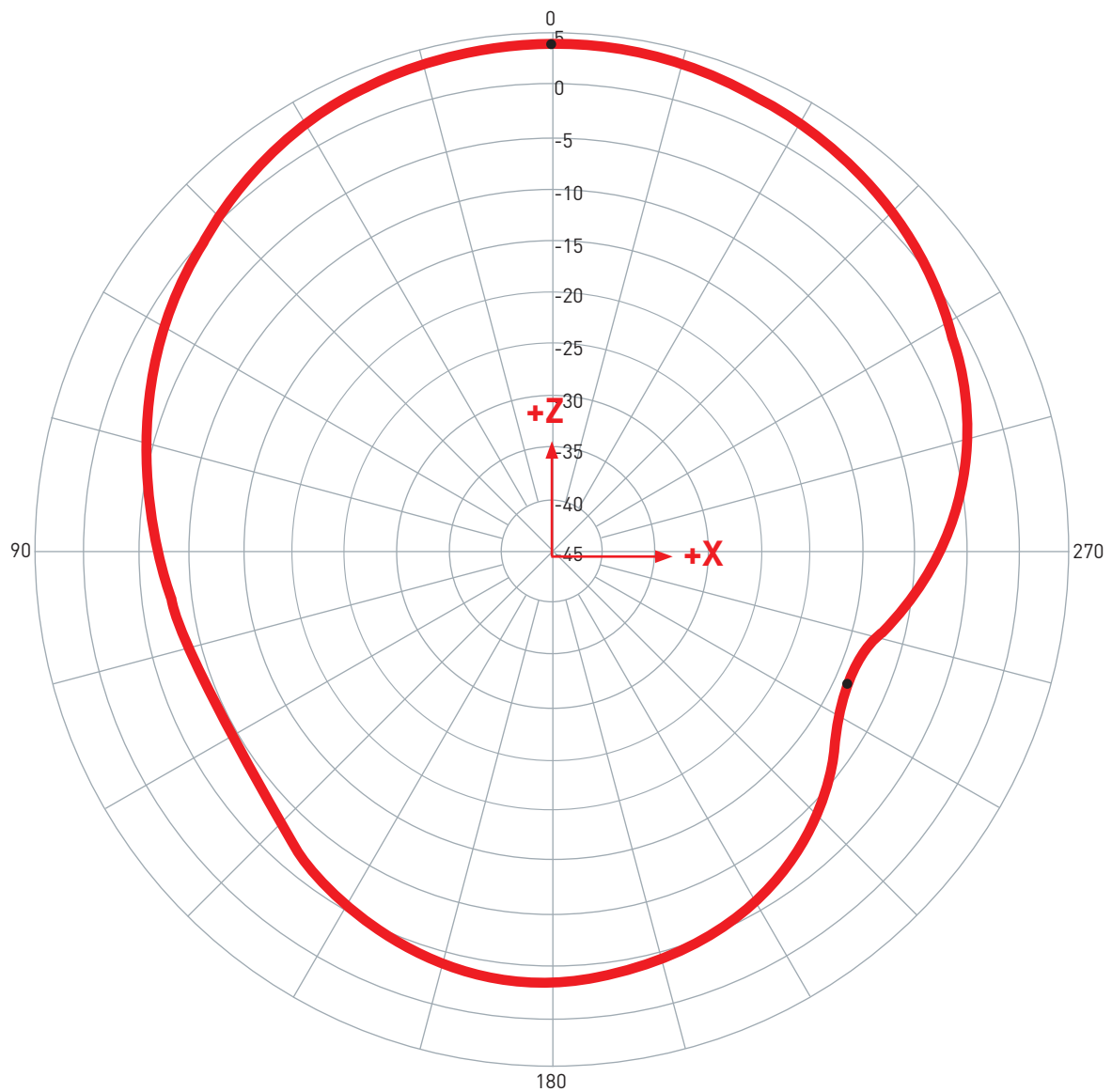
**1575 MHz**  
V+H

**Peak Gain**  
2.18dBi

**Zenith Gain**  
1.98dBi

## 4.3 Radiation Patterns

### 4.3.2 XZ Plane 1602MHz Horizontal & Vertical



**1602 MHz**  
V+H

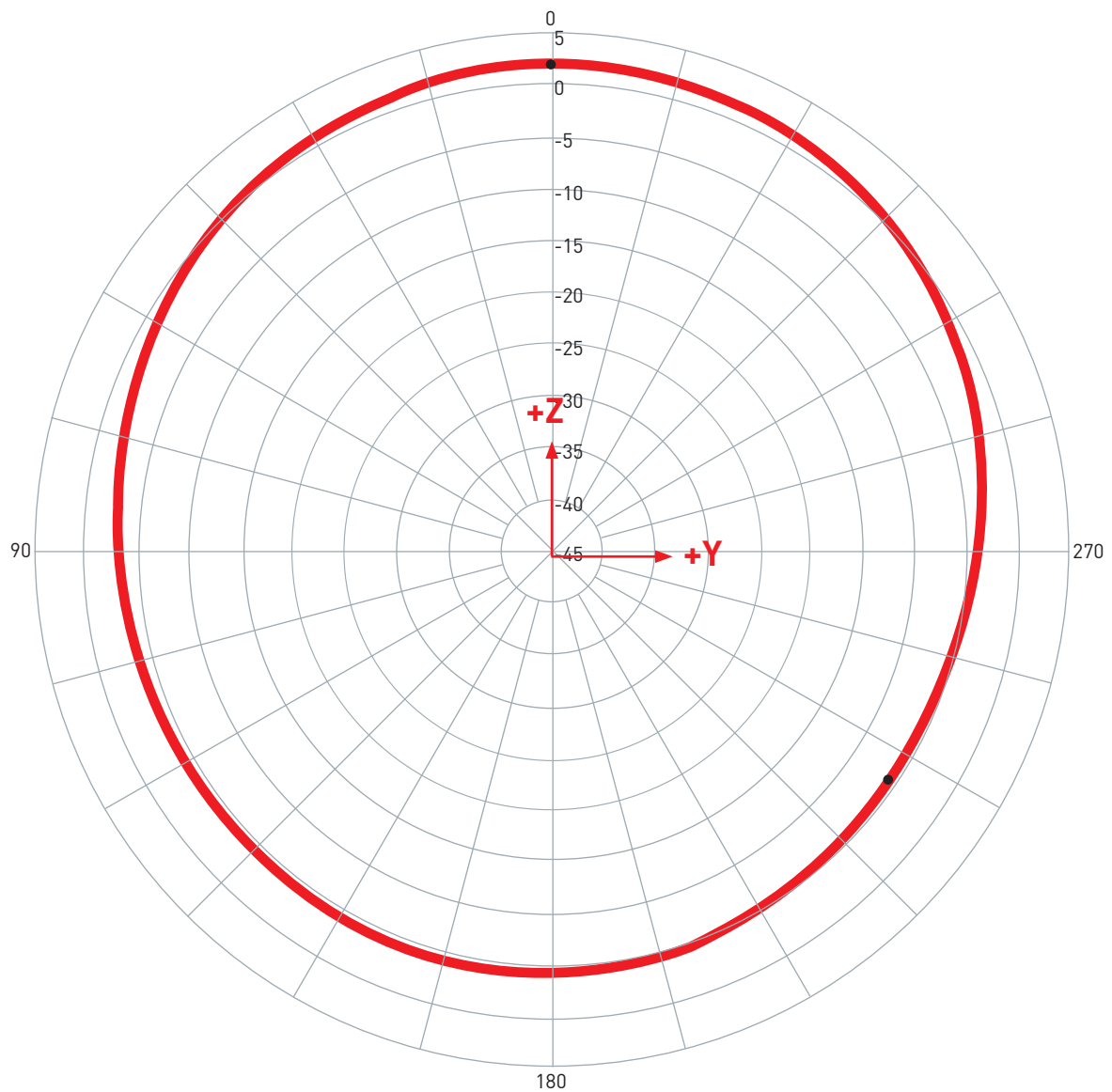
**Peak Gain**  
3.61dBi

**Zenith Gain**  
3.61dBi



## 4.3 Radiation Patterns

### 4.3.3 YZ Plane 1575.42MHz Horizontal & Vertical



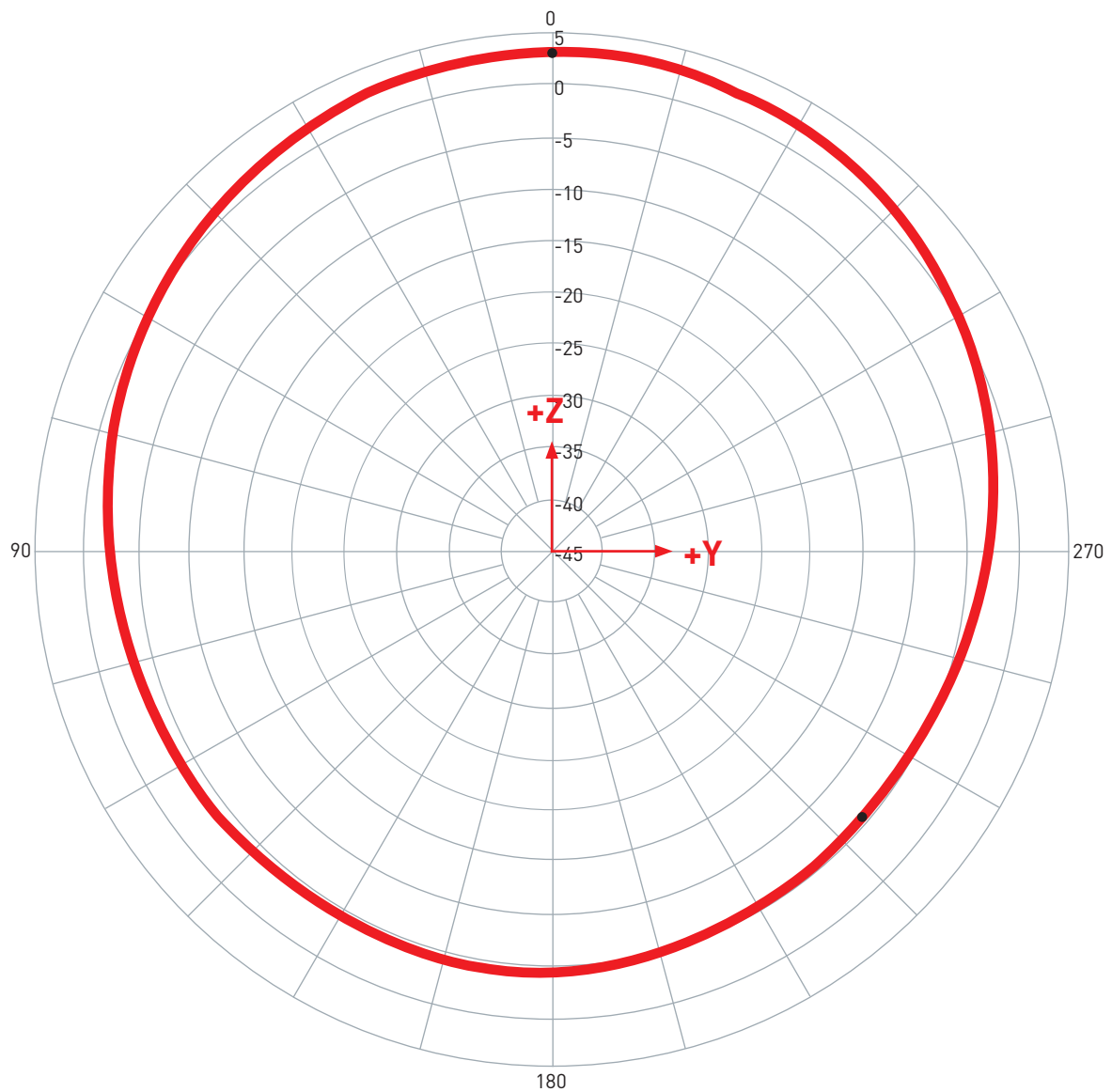
**1575 MHz**  
V+H

**Peak Gain**  
2.12dBi

**Zenith Gain**  
2.12dBi

## 4.3 Radiation Patterns

### 4.3.4 YZ Plane 1602MHz Horizontal & Vertical



**1602 MHz**  
V+H

**Peak Gain**  
3.25dBi

**Zenith Gain**  
3.25dBi

## 4.4 LNA

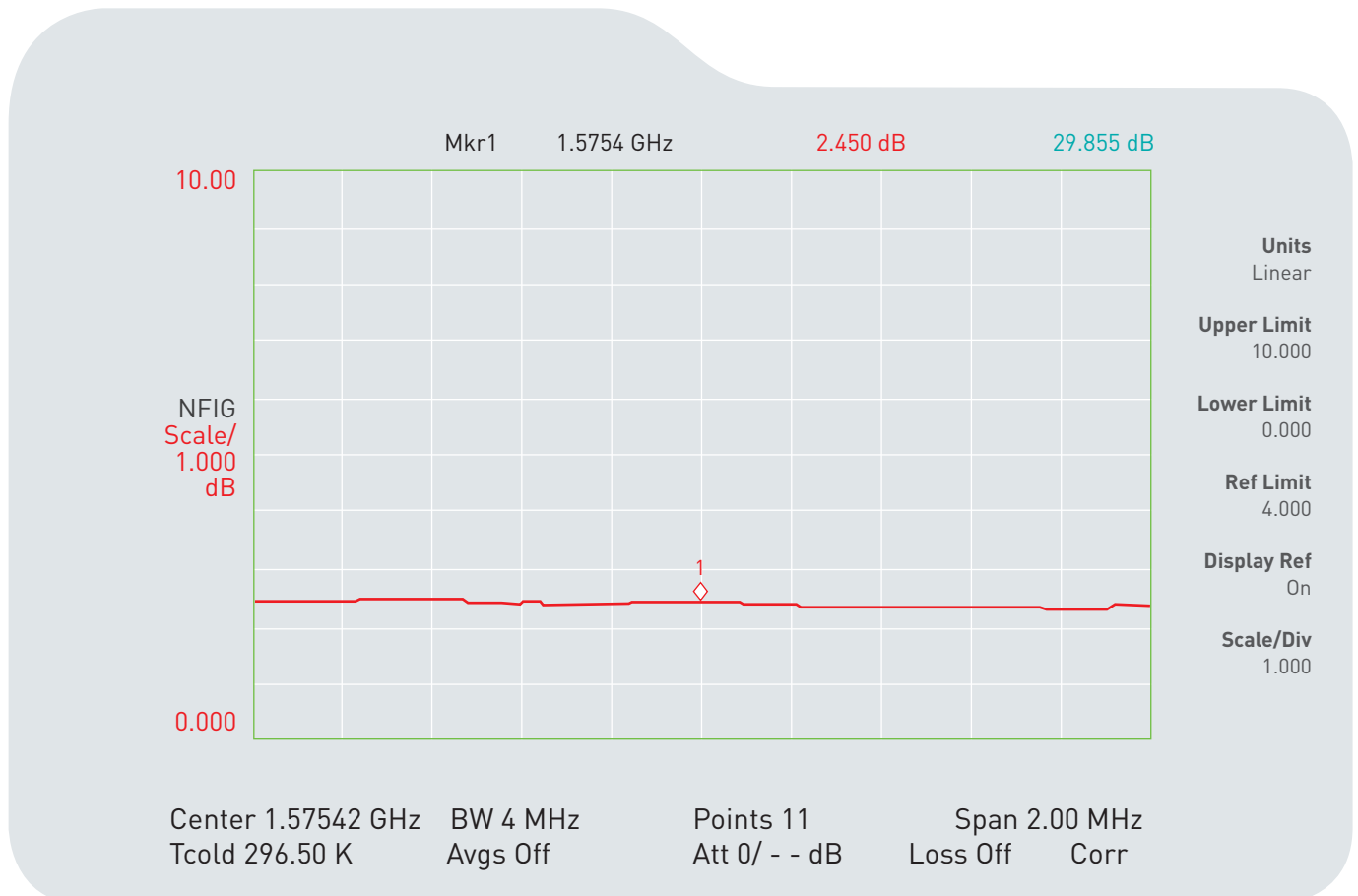
### Parameter

|                         |                                           |
|-------------------------|-------------------------------------------|
| <b>Frequency Range</b>  | 1575.42±10MHz for GPS, 1602±8MHz for GNSS |
| <b>Output Impedance</b> | 50Ω                                       |
| <b>Output VSWR</b>      | 2.0 Max.                                  |

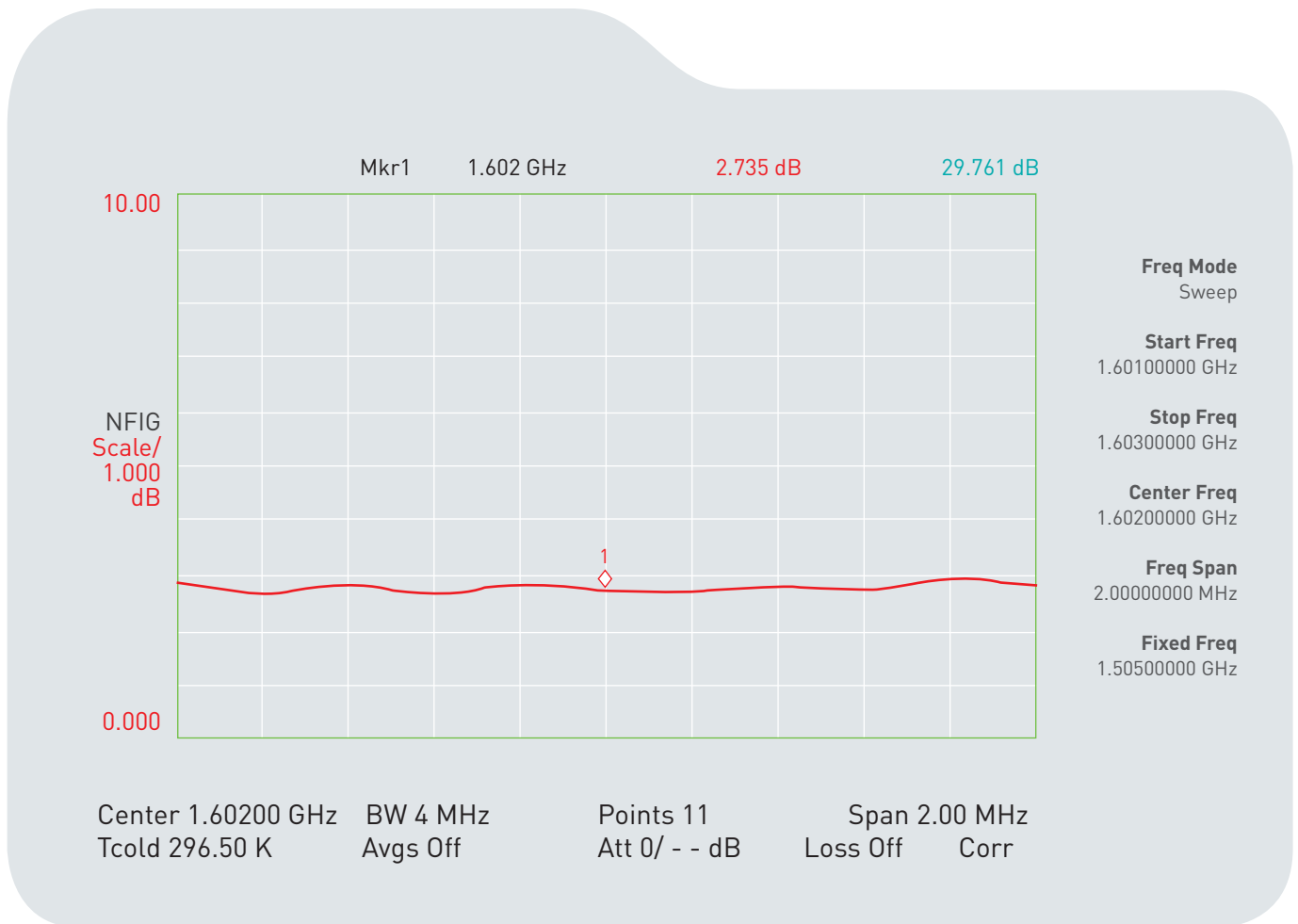
| Supply Voltage | Gain(Typ) | Noise Figure(Typ)             | Power Consumption (Typ.) |
|----------------|-----------|-------------------------------|--------------------------|
| 1.8V           | 24dBi     | 2.4dB for GPS, 2.7dB for GNSS | 5.5mA                    |
| 3.0V           | 30dBi     | 2.4dB for GPS, 2.7dB for GNSS | 13.2mA                   |
| 5.5V           | 32dBi     | 2.4dB for GPS, 2.7dB for GNSS | 16.2mA                   |

## 4.5 LNA Noise Figure @ 3.0V

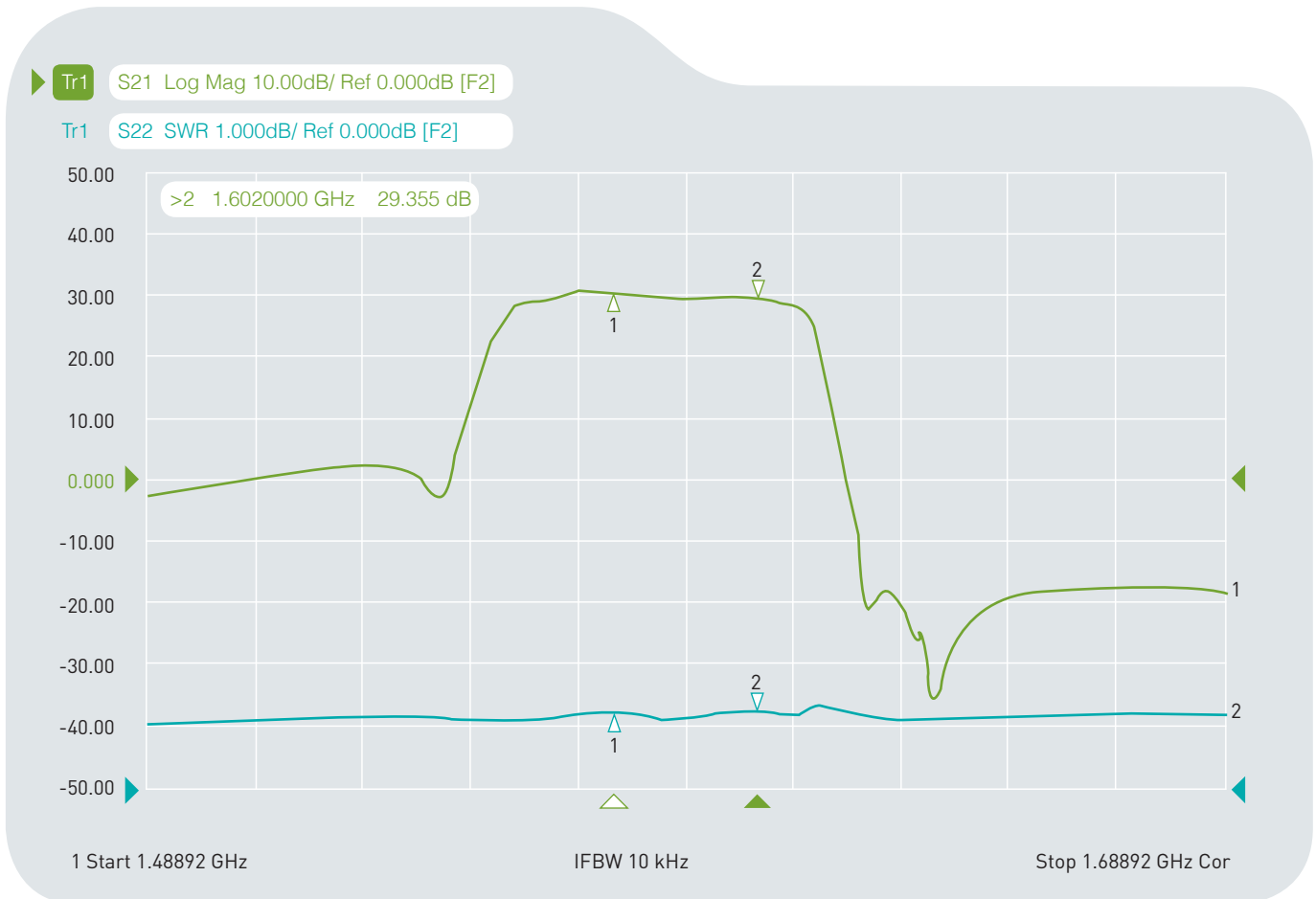
### 4.5.1 1575MHz



## 4.5.2 1602MHz



## 4.6 LNA Gain and Output of VSWR @ 3.0V



|     |     |     |    |               |           |
|-----|-----|-----|----|---------------|-----------|
| Ch1 | Tr1 | S21 | 1  | 1.5754200 GHz | 30.453 dB |
| Ch1 | Tr1 | S21 | >2 | 1.6020000 GHz | 29.355 dB |
| Ch1 | Tr1 | S22 | 1  | 1.5754200 GHz | 1.2383    |
| Ch1 | Tr1 | S22 | 2  | 1.6020000 GHz | 1.2667    |

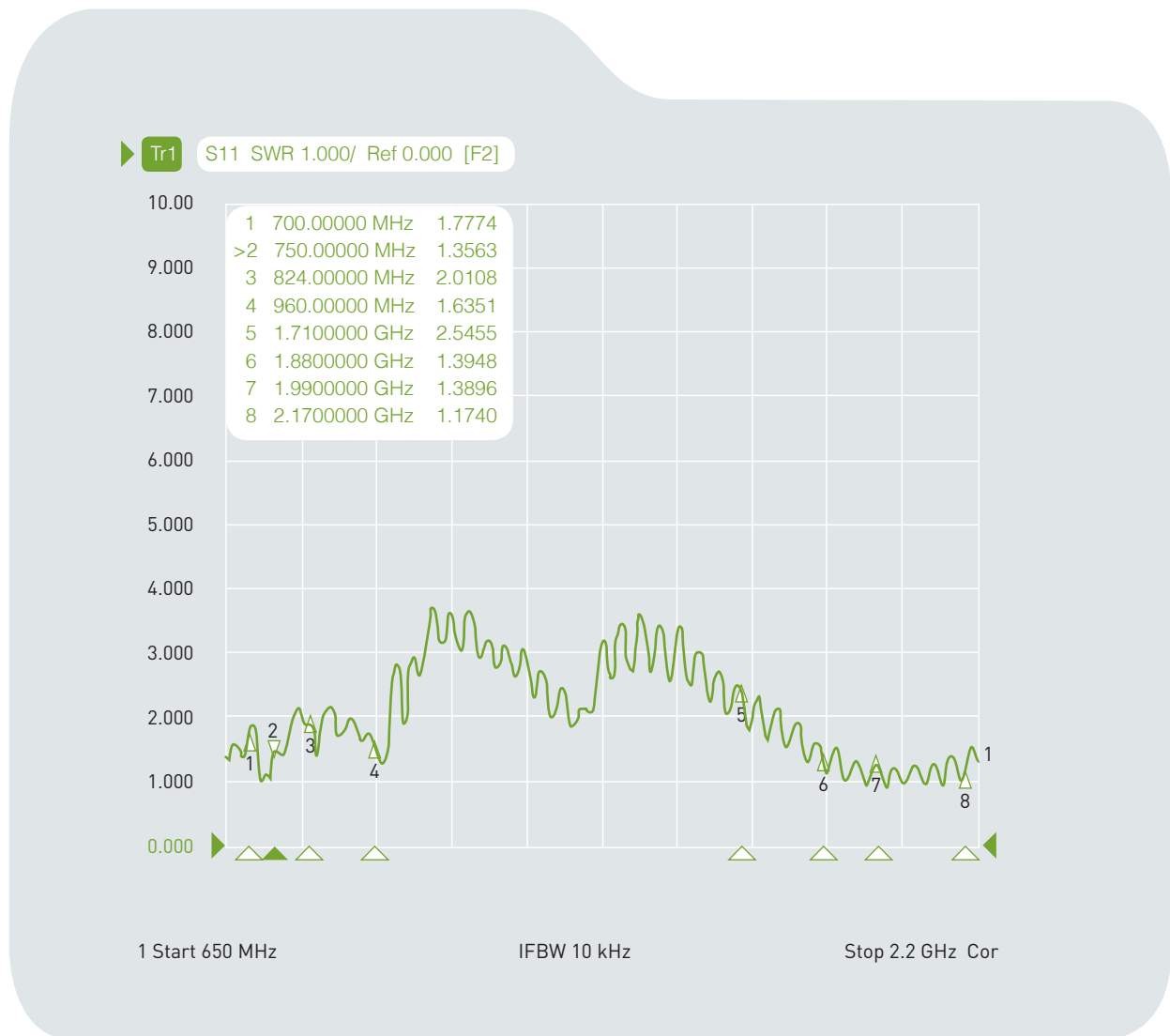
## 4.7 GPS/GNSS Antenna Specifications (Through Antenna, LNA and Cable Assembly)

### Parameter

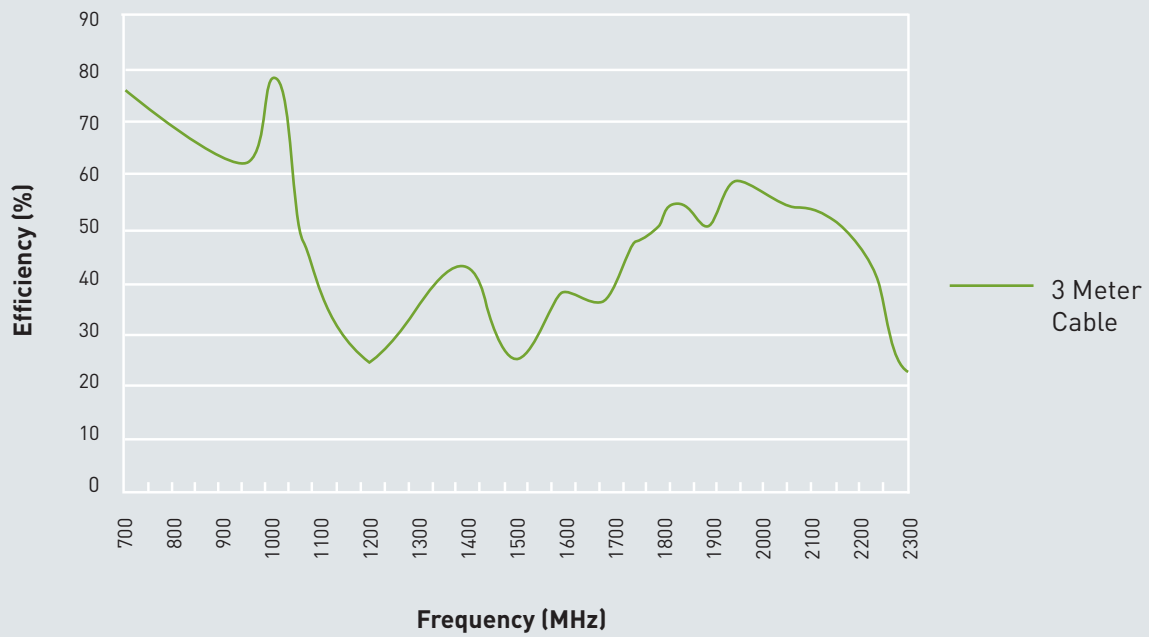
|                  |                                           |
|------------------|-------------------------------------------|
| Frequency Range  | 1575.42±10MHz for GPS, 1602±8MHz for GNSS |
| Gain at 3.0V     | 30dB Typ. @ Zenith                        |
| Output VSWR      | 2.0 Max.                                  |
| Output Impedance | 50Ω                                       |

## 5. Cellular Antenna

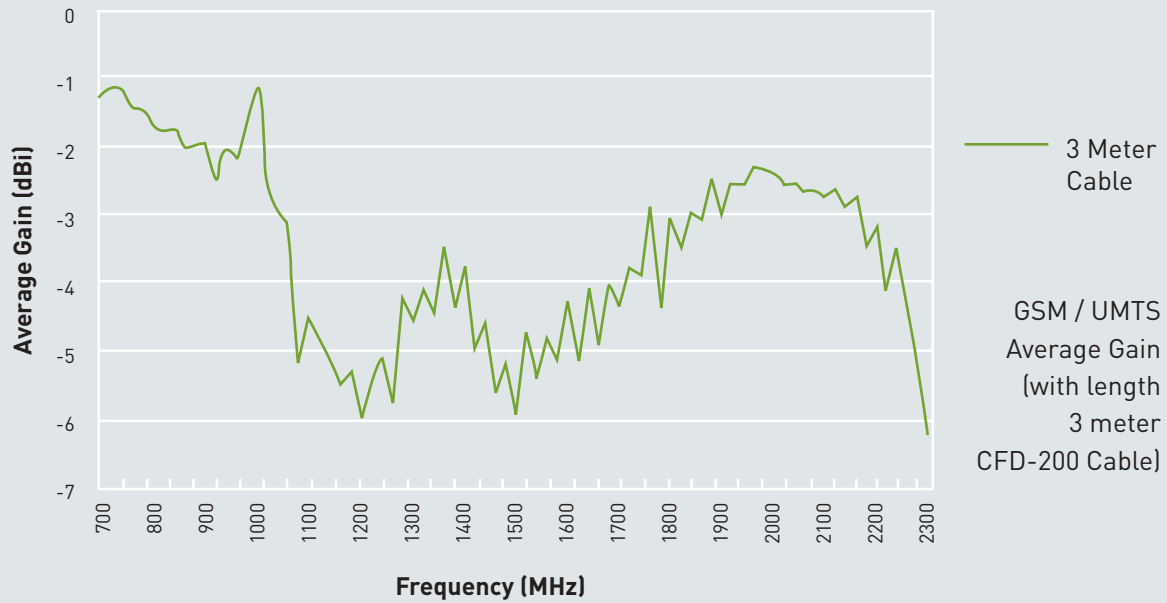
### 5.1 VSWR



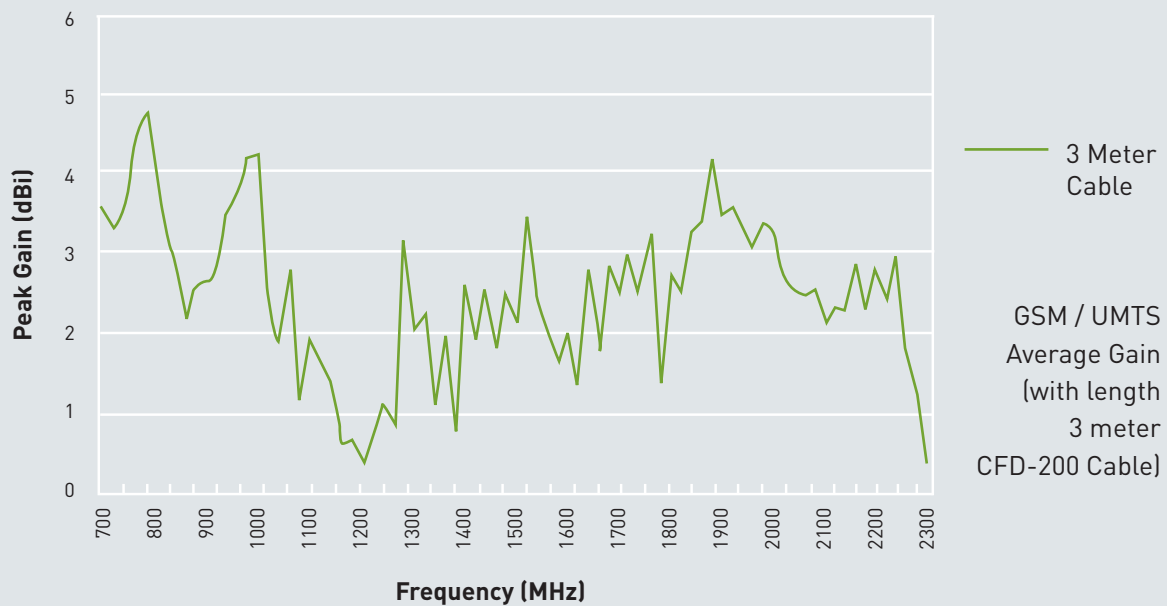
## 5.2 Efficiency



### 5.3 Average Gain



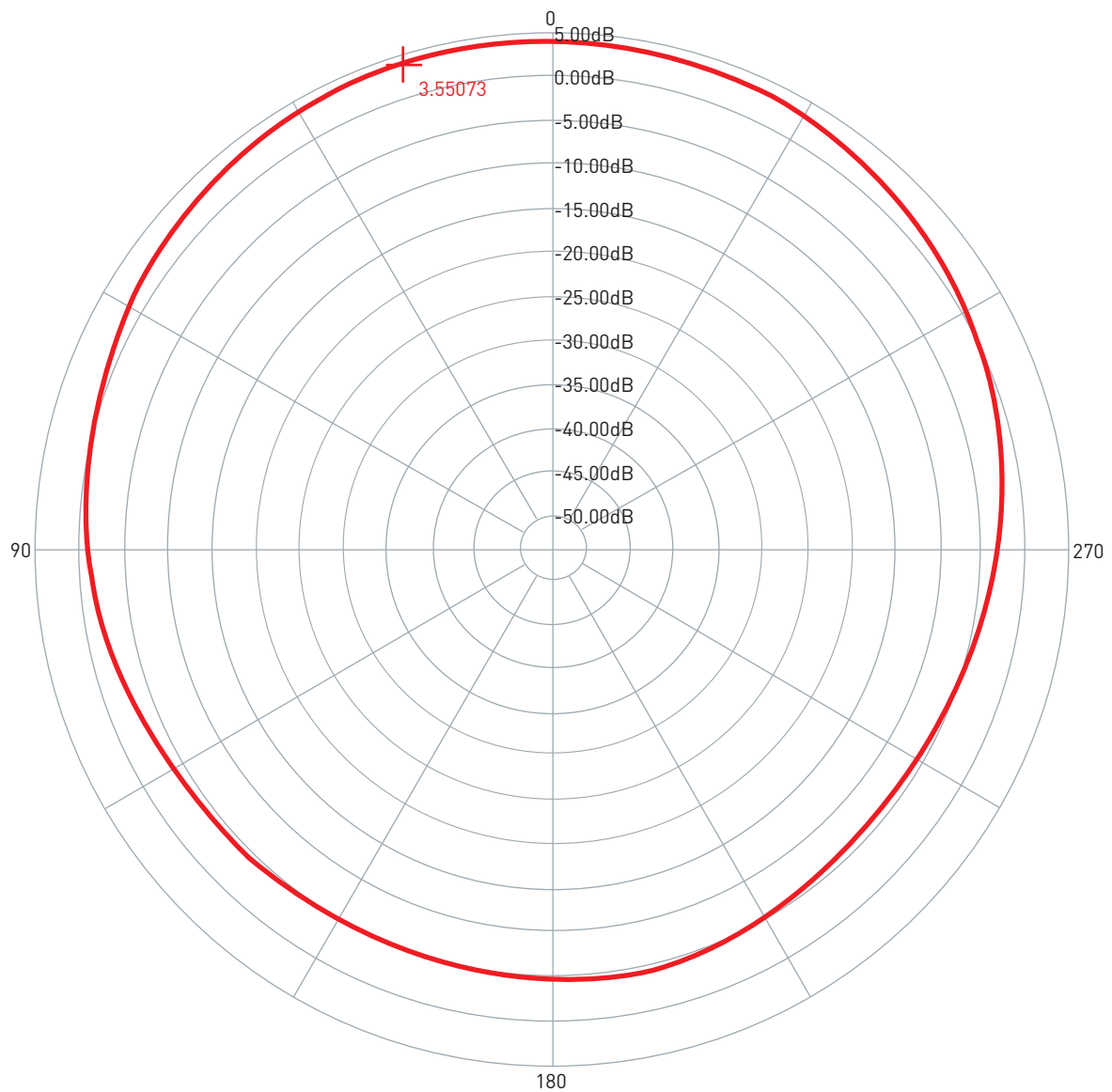
### 5.4 Peak Gain





## 5.5 Radiation Patterns

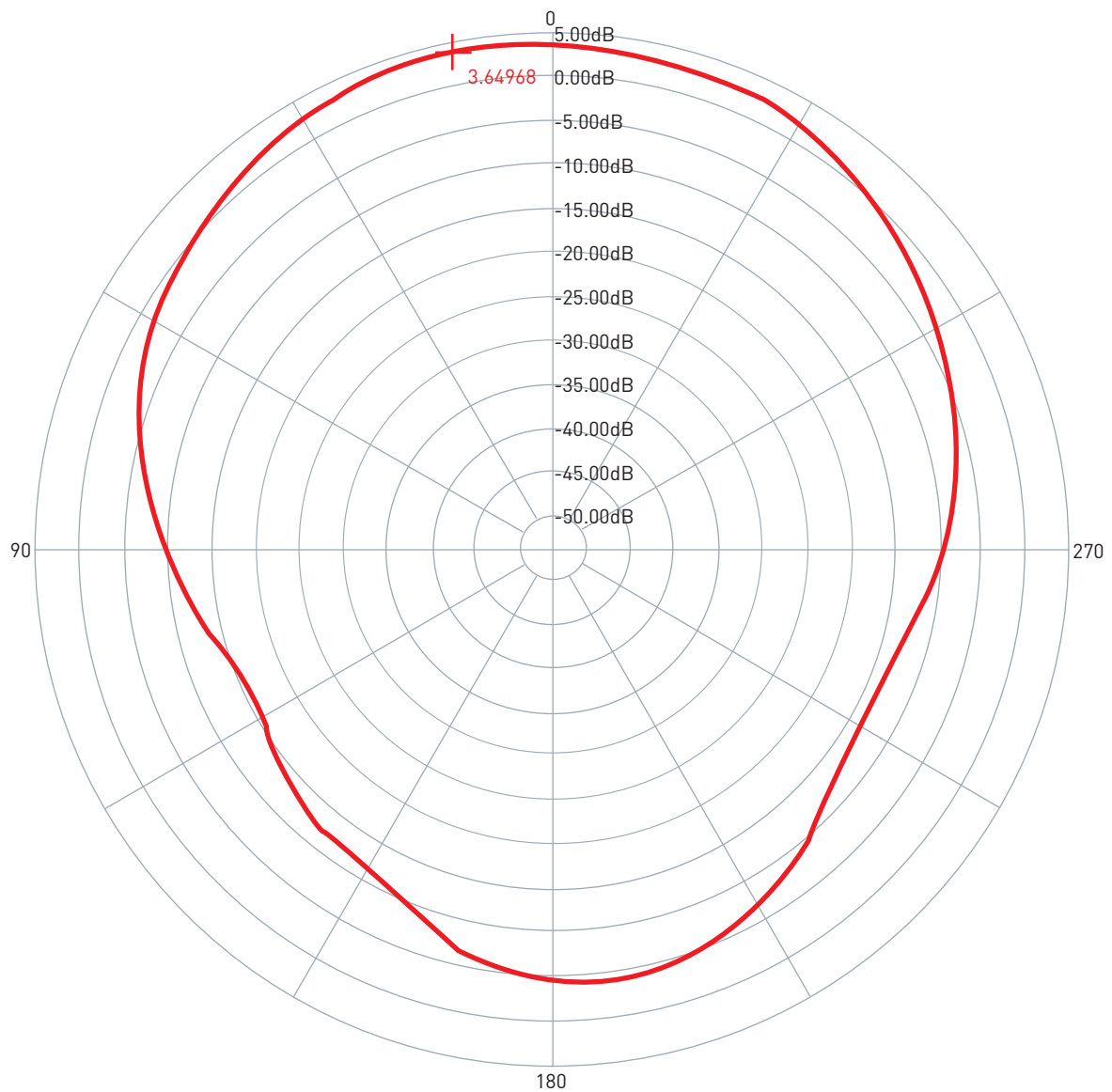
### 5.5.1 Radiation Pattern in XZ plane



#### Legend

— Polar RC Amp dB(dB)

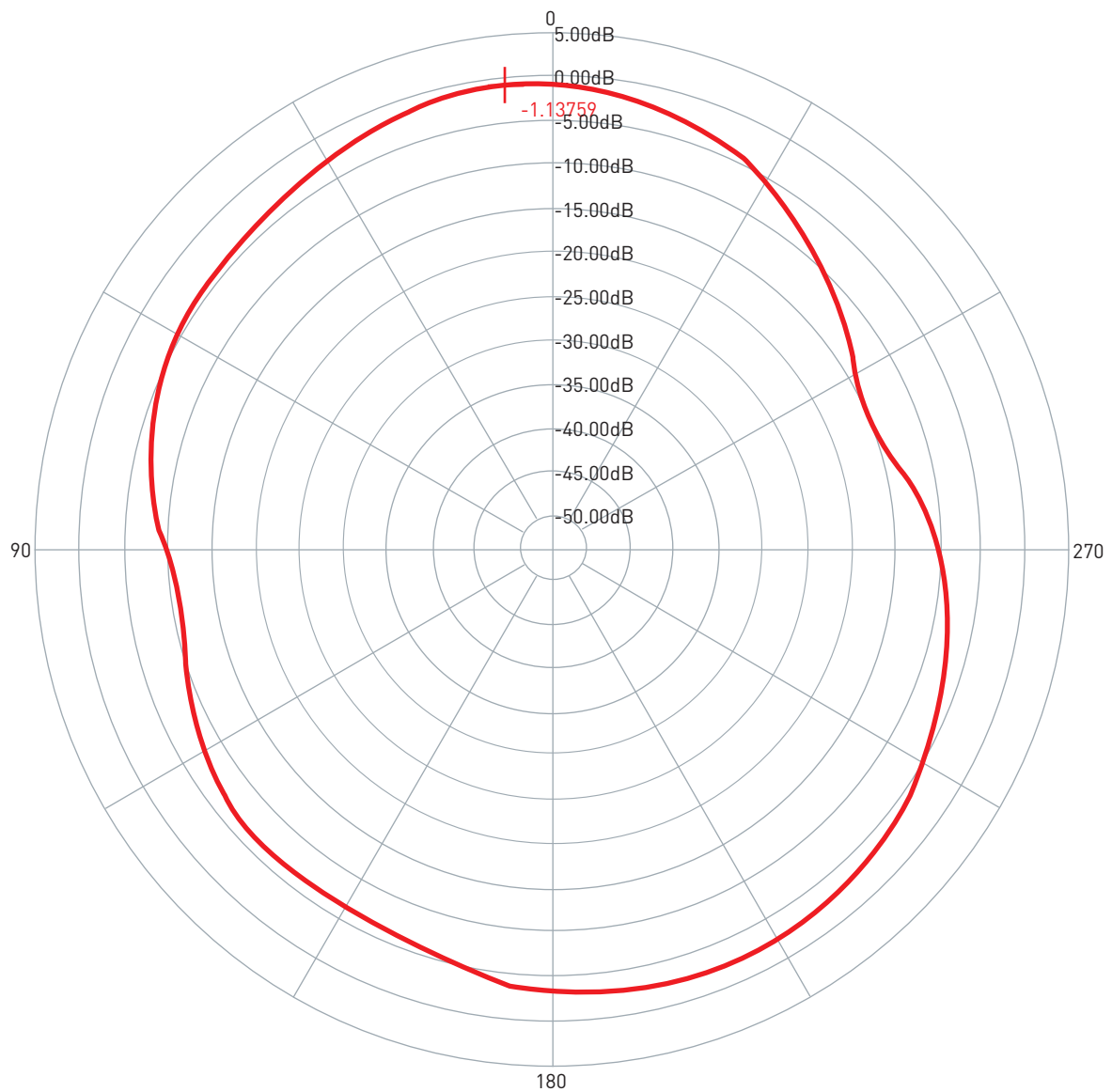
## 5.5.2 Radiation Pattern in YZ plane



### Legend

— Polar RC Amp dB(dB)

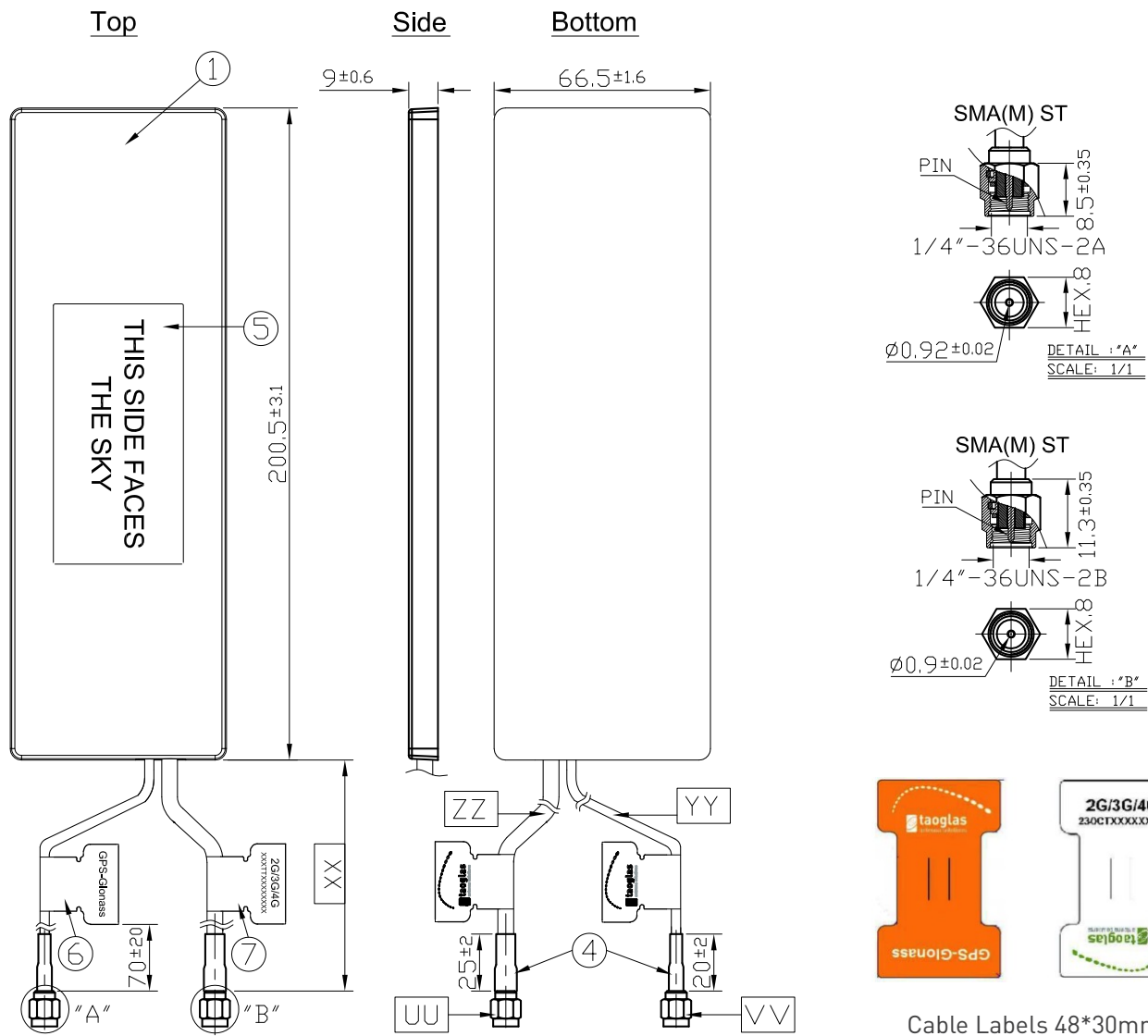
## 5.5.2 Radiation Pattern in YZ plane



### Legend

— Polar RC Amp dB(dB)

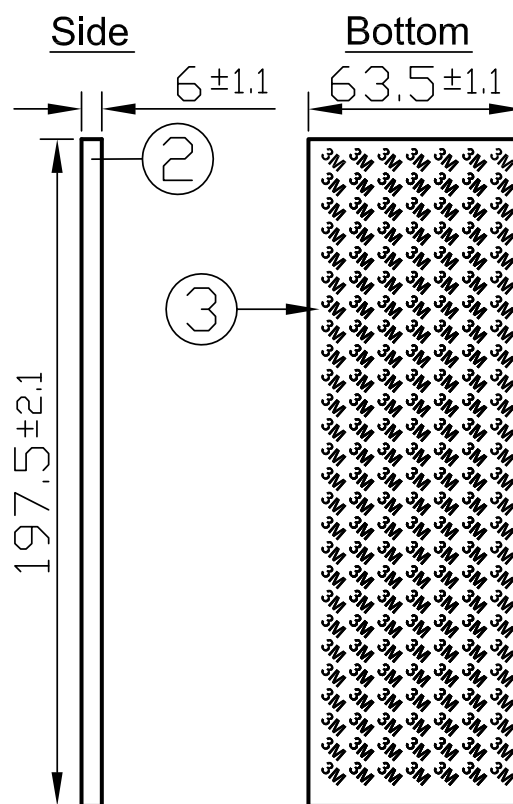
## 6. Drawing



|   | Name               | Material     | Finish       | QTY |    | Name           | Material   | Finish | QTY |
|---|--------------------|--------------|--------------|-----|----|----------------|------------|--------|-----|
| 1 | Housing            | ABS          | Black        | 1   | UU | Connector Type | SMA(M) ST  | Brass  | 1   |
| 2 | Closed Cell Foam   | F100         | Black        | 1   | VV | Connector Type | SMA(M) ST  | Brass  | 1   |
| 3 | 3M Double Adhesive | 3M 9448 B    | White Linear | 1   | XX | Cable Length   | 3000±60 mm |        | 1   |
| 4 | Heat Shrink Tube   | PE           | Black        | 2   | YY | Cable Type     | RG174      | Black  | 1   |
| 5 | Clear Label        | PET          | Transparent  | 1   | ZZ | Cable Type     | CFD 200    | Black  | 1   |
| 6 | GPS Label          | Coated Paper | Orange       | 1   |    |                |            |        |     |
| 7 | 2G/3G/4G Label     | Coated Paper | White        | 1   |    |                |            |        |     |

## 6.1 Adhesive Pad

### Foam 3M Double Sided Adhesive Drawing

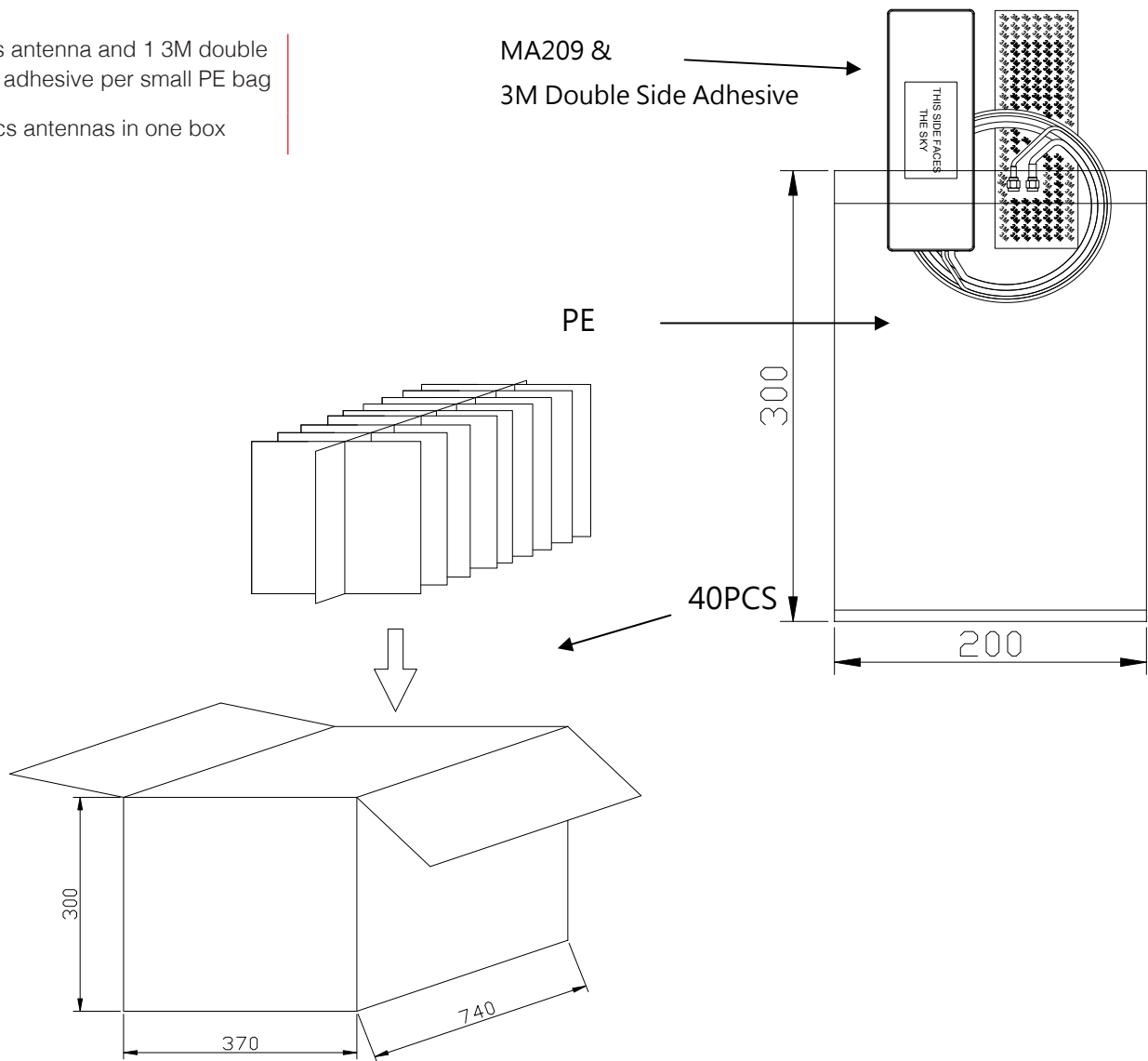


**THIS SIDE FACES  
THE SKY**

Antenna Body Label 80\*40mm

## 7. Packaging

1pcs antenna and 1 3M double side adhesive per small PE bag  
40pcs antennas in one box



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