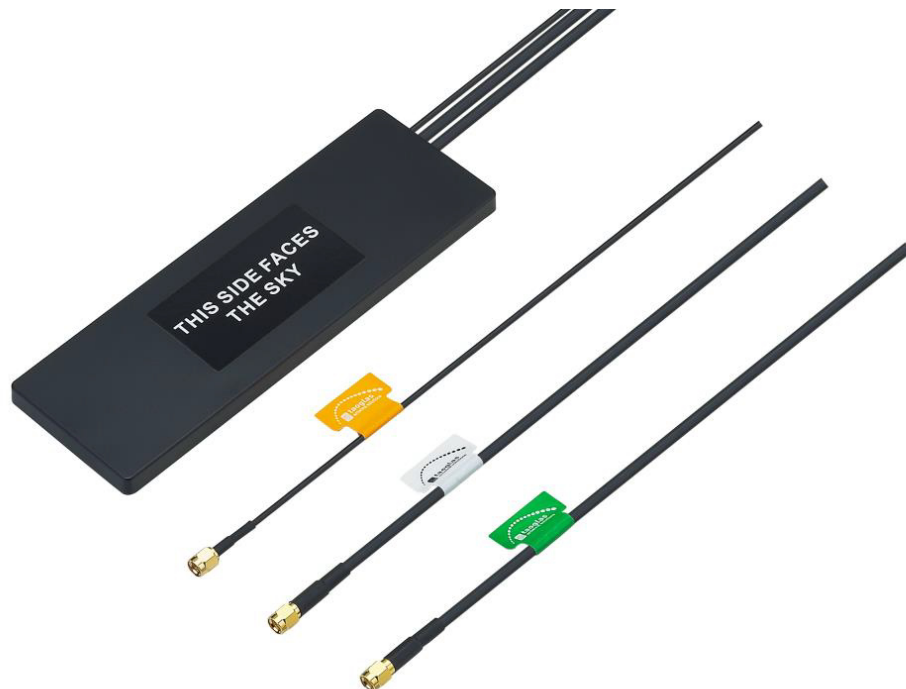


Data Sheet

Part No.	:	100001279_MA231
Product Name	:	MA231 3-in-1 Stream 3M: GNNS,LTE , Wi-Fi dash mount Adhesive Mount Antenna
Features	:	IP67 Antenna GPS-GLONASS-GALILEO: 3M RG RG-174 SMA(M) ST 1.8~5.5V/30dB Cellular 4G/3G/2 G: 3M Low Loss CFD CFD-200 SMA(M) ST Wi -Fi: 3M Low Loss CFD CFD-200 RP -SMA(M) ST Dimensions: 200.5mm x 66.5mm x 9mm RoHS Compliant
Suggested TCG-4	:	Any TCG-4 model



1. Introduction

The 3-in-1 MA231 GPS-GLONASS-GALILEO, LTE Cellular 4G/3G/2G and Wi-Fi 2.4/5.8GHz 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 3in1 is unique in the market as it combines the highest possible efficiency and peak gain for GPS-GLONASS-GALILEO, Wi-Fi dual-band 2.4/5.8GHz and all cellular bands in 4G/3G/2G in a low profile compact format for mounting via high quality first tier automotive approved 3M adhesive foam.

The patent pending design incorporates a custom 35mm GPS-GLONASS-GALILEO patch antenna on an extended integral ground-plane. A front-end SAW filter dramatically reduces radiated spurious emissions.

The extended ground-plane used with an innovative internal 4G/3G/2G Cellular PIFA also enables the unique wide-band 4G/3G/2G response to deliver the highest performance possible, at 3 meters cable length. High antenna efficiencies are absolutely critical in today's 4G and 2G systems to achieving targeted data-speeds and coverage.

A powerful Wi-Fi dual-band 2.4/5.8GHz antenna gives maximum gain and coverage for common applications.

The Stream works best when attached to plastic or glass, but can also be used on metal if a minimum of 40mm foam spacing is added.

2. Specification Table

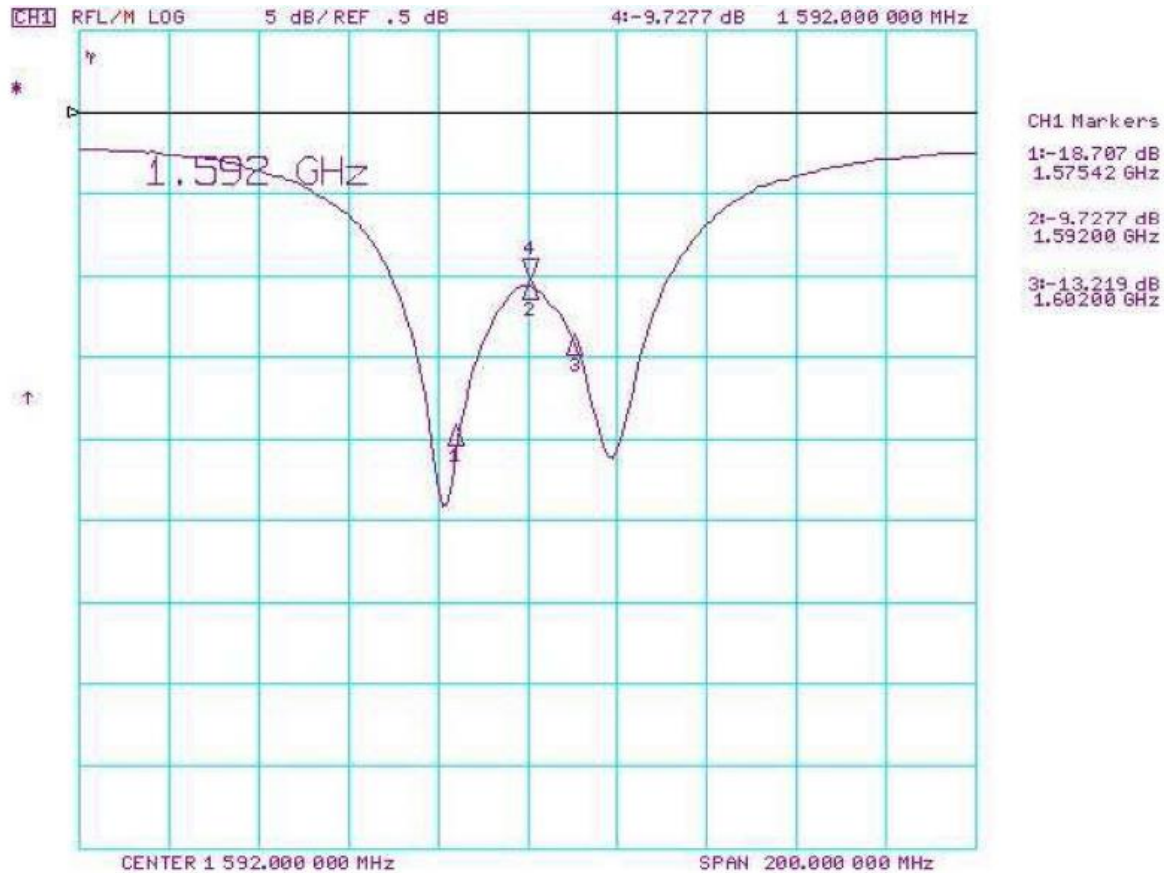
Performance Specifications			
Parameter	GPS-GLONASS-GALILEO Antenna	Cellular Antenna	Wi-Fi Antenna
Frequency Range	1,575.42±10MHz 1,602±8MHz	700-960MHz 1710-2170MHz 2500-2690MHz	2400-2484MHz 5150-5850MHz
Gain	1575.42MHz:1.3dBi typ. @ Zenith 1602MHz:2.9dBi typ. @ Zenith	Listed below	Listed below
VSWR	2.0 Max	3.0 Max	2.0 Max
Impedance	50Ω	50Ω	50Ω
Efficiency	-	≥ 70% @ 700MHz ≥ 60% @ 750MHz ≥ 50% @ 824MHz ≥ 50% @ 880MHz ≥ 40% @ 890MHz ≥ 25% @ 960MHz ≥ 50% @ 1710MHz ≥ 50% @ 1880MHz ≥ 50% @ 1990MHz ≥ 45% @ 2110MHz ≥ 45% @ 2170MHz ≥ 30% @ 2500MHz ≥ 15% @ 2690MHz	≥ 35% @ 2450MHz ≥ 35% @ 5250MHz ≥ 35% @ 5650MHz

MECHANICAL			
Cable / Connector	3M RG-174 with SMA(M) Fully customizable	3M CFD-200 with SMA(M) Fully customizable	3M CFD-200 with RP-SMA(M) Fully customizable
Housing	ABS		
Adhesive Mount	3M 1600TB(196.57*62.57*1.25mm)		
Protection Class	IP-67		
Weight	180g		

ENVIRONMENTAL	
Operation Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Relative Humidity	20% to 95%

3. GPS-GLONASS-GALILEO Antenna

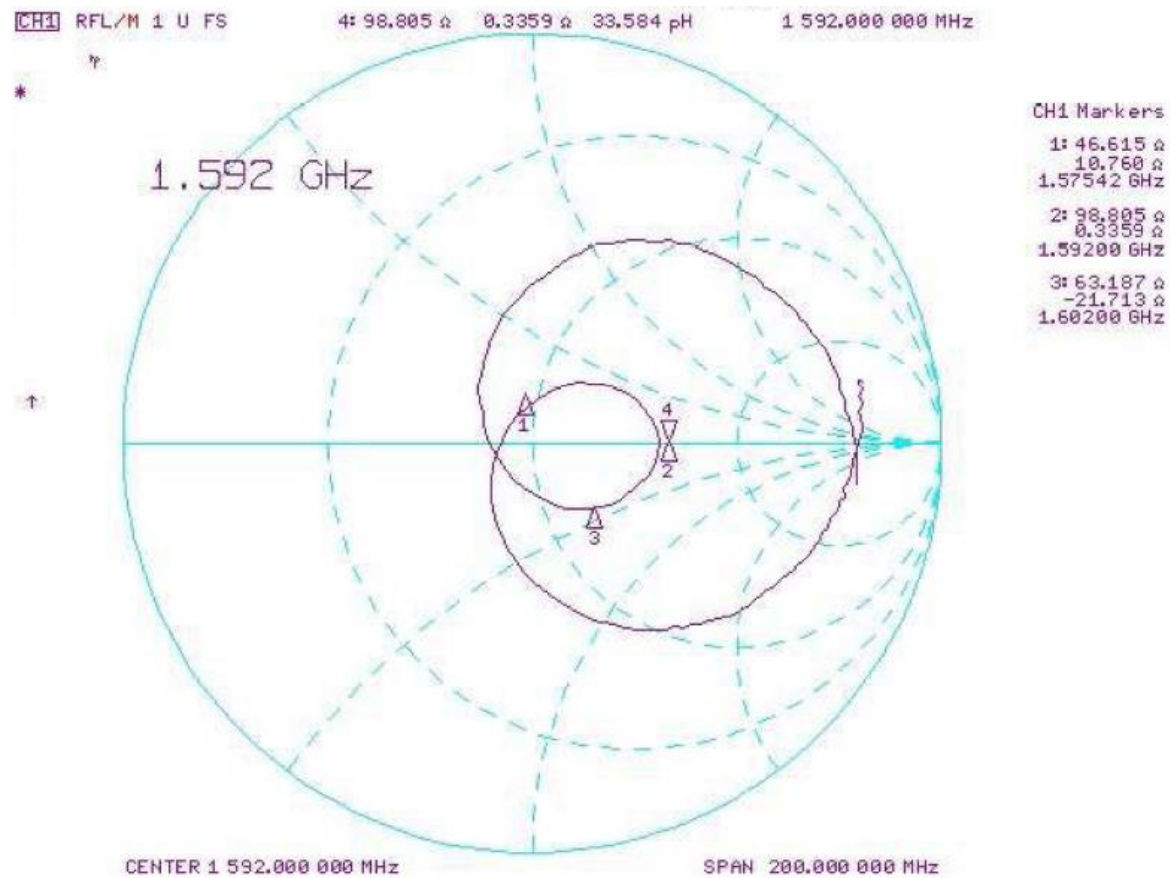
3.1 Return Loss



Return Loss: -18.70 dB@1575.42MHz

Return Loss: -13.21 dB@1602MHz

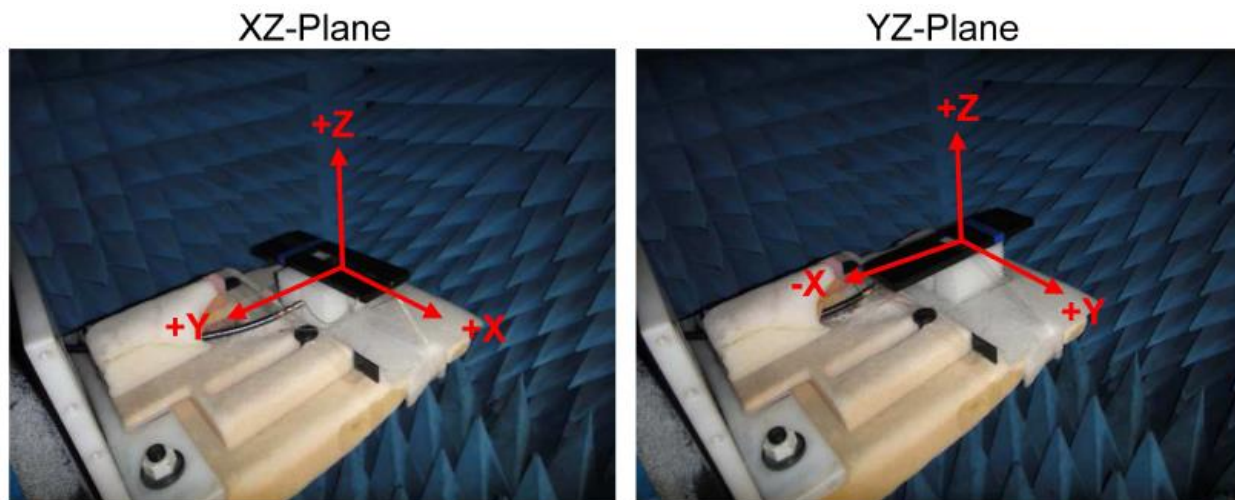
3.2 Smith Chart



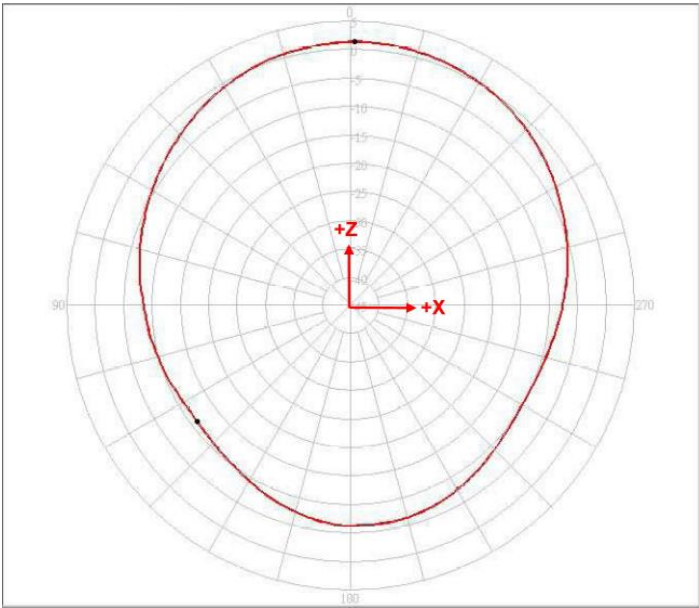
Impedance: $46.61 + j10.76 \text{ Ohm}$ @1575.42MHz

Impedance: $63.18 - j21.73 \text{ Ohm}$ @1602MHz

3.3 Radiation Patterns

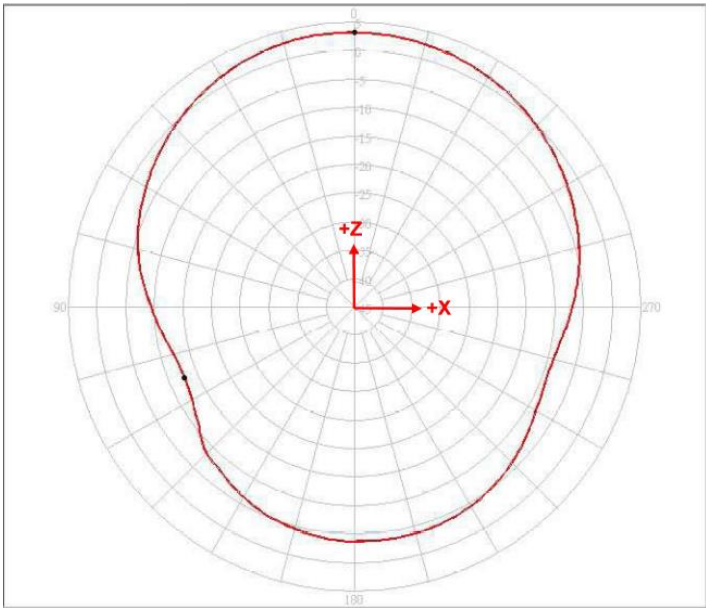


3.3.1. XZ Plane 1575.42MHz



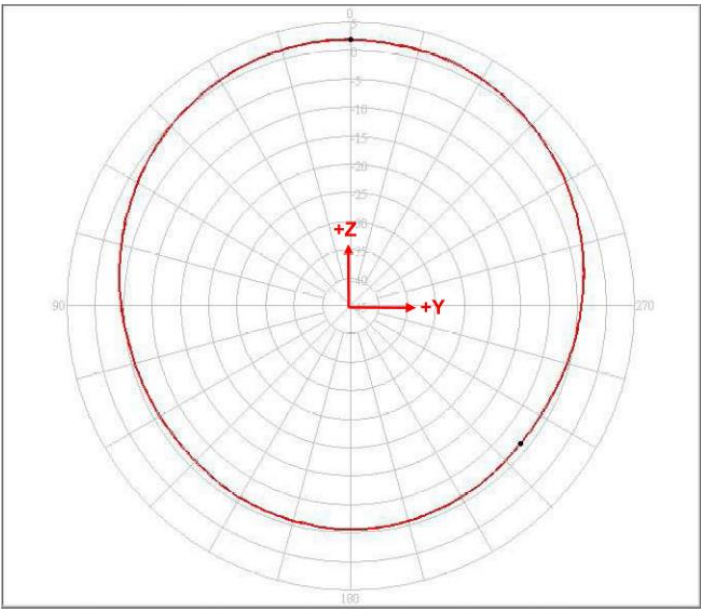
1575.42MHZ	Peak Gain	Zenith Gain
V+H	1.39 dBi	1.35 dBi

3.3.2. XZ Plane 1602MHz



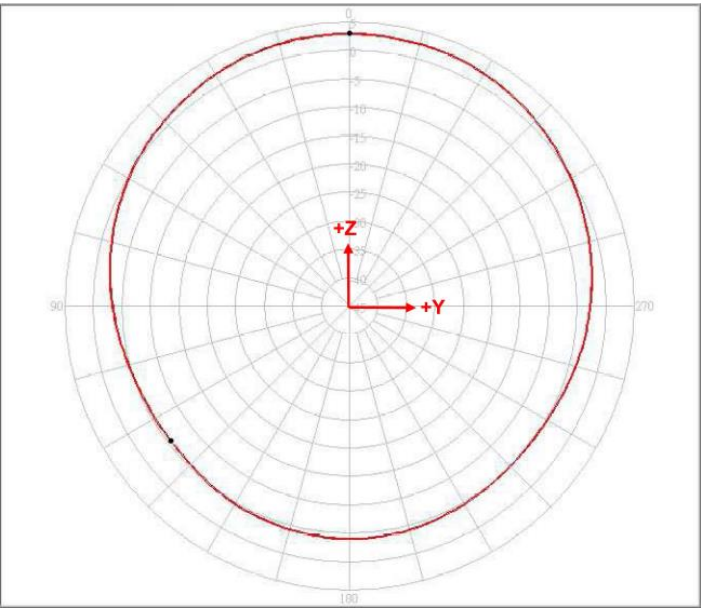
1602MHZ	Peak Gain	Zenith Gain
V+H	3.19 dBi	3.19 dBi

3.3.3. YZ Plane 1575.42MHz



1575.42MHZ	Peak Gain	Zenith Gain
V+H	1.92 dBi	1.92 dBi

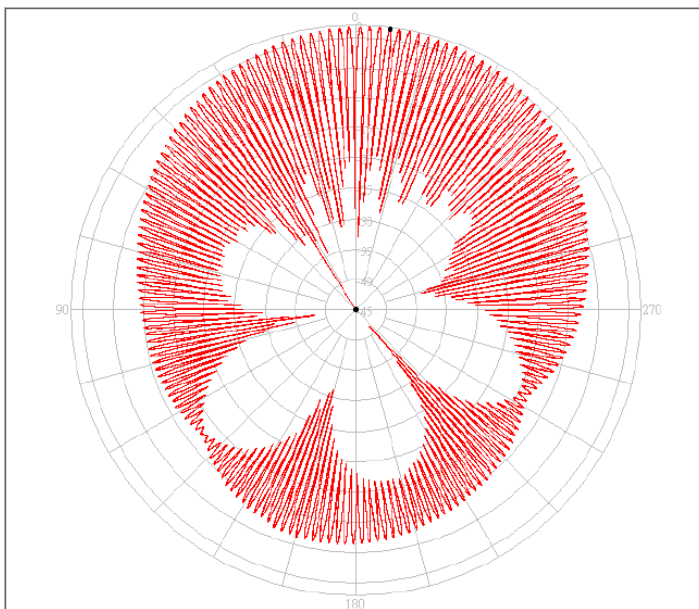
3.3.4. YZ Plane 1602MHz



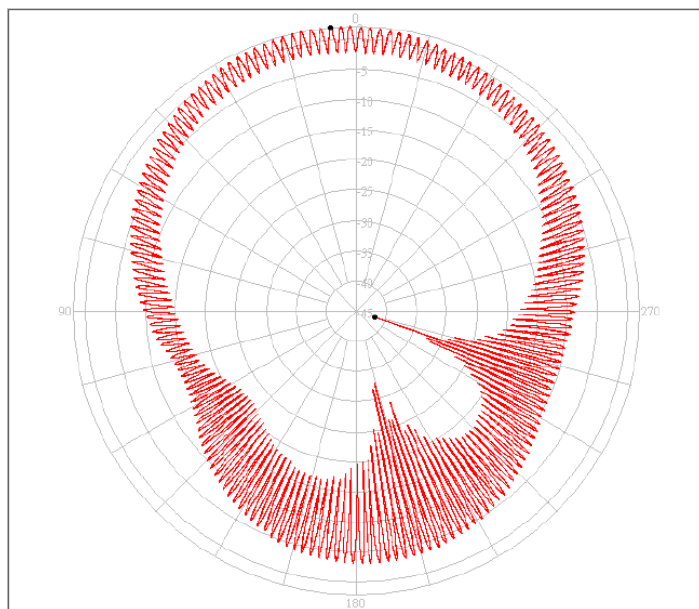
1602MHZ	Peak Gain	Zenith Gain
V+H	2.92 dBi	2.92 dBi

3.4 Axial Ratio Pattern

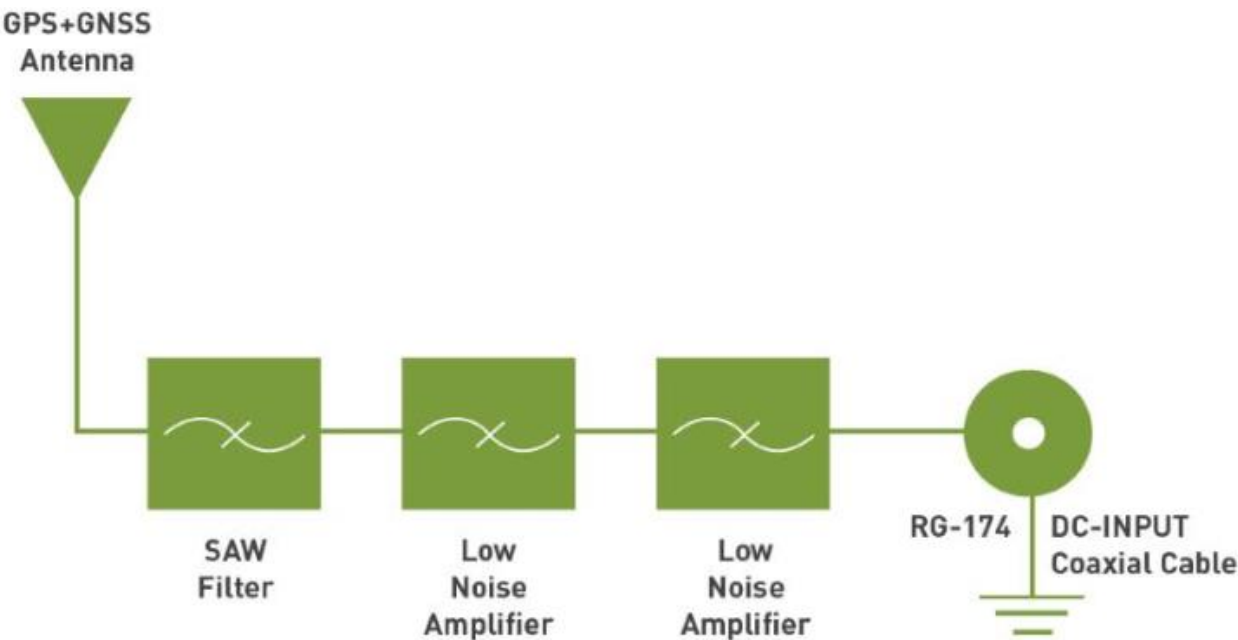
3.4.1. 1575.42MHz



3.4.2. 1602MHz

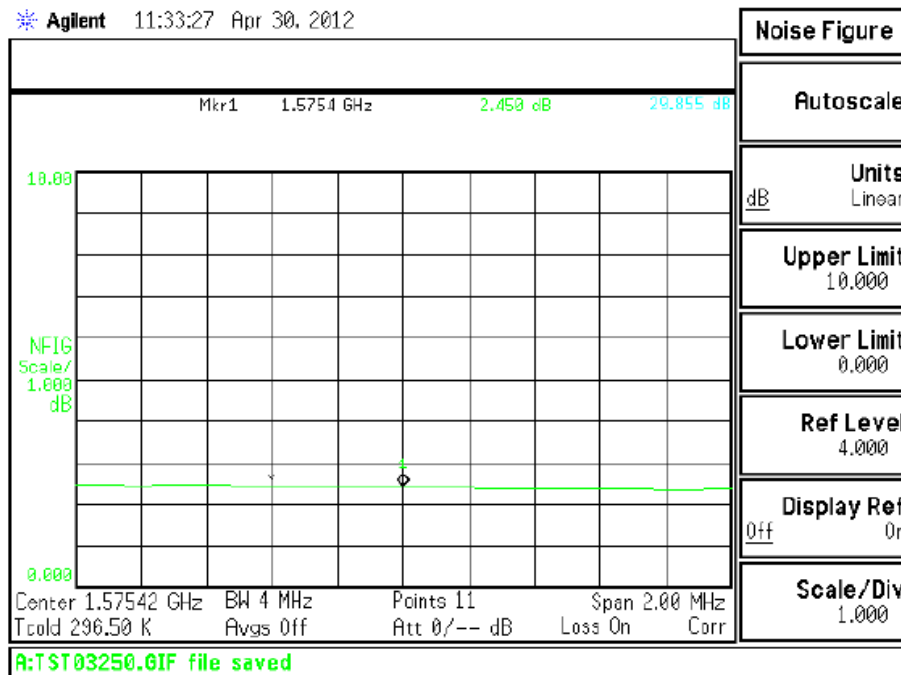


3.5 LNA characteristics

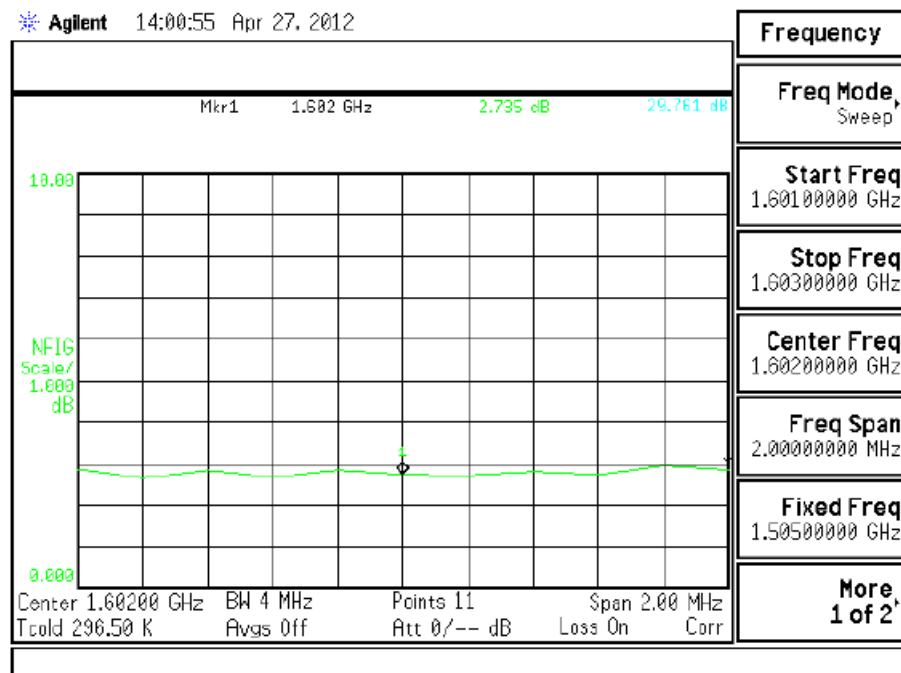


Parameter	
Frequency Range	1,575.42±10MHz For GPS/GALILEO 1,602±8MHz For GLONASS
Output Impedance	50 Ohm
Output VSWR	2.0 max

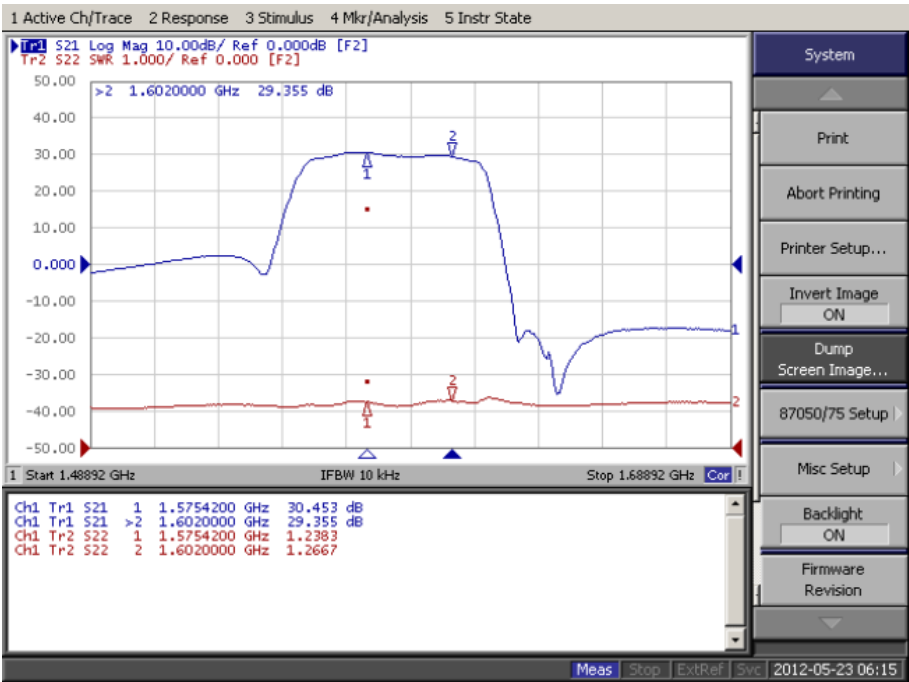
Supply Voltage	Gain(Typ)	Noise Figure(Typ)	Power Consumption(Typ)
1.8V	24dB	-	5.5mA
3.0V	30dB	2.4dB For GPS/GALILEO 2.7dB For GLONASS	13.2mA
5.5V	32dB	-	16.2mA



LNA Noise Figure@3.0V for 1575.42MHz



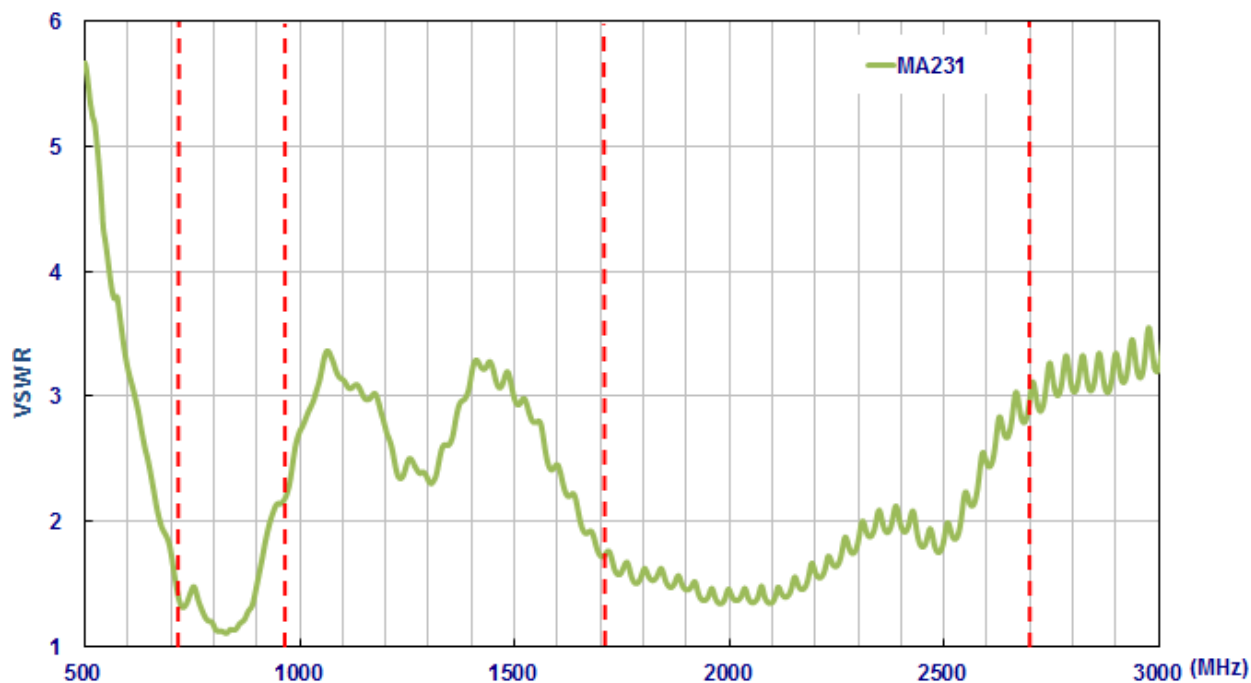
LNA Noise Figure@3.0V for 1602MHz



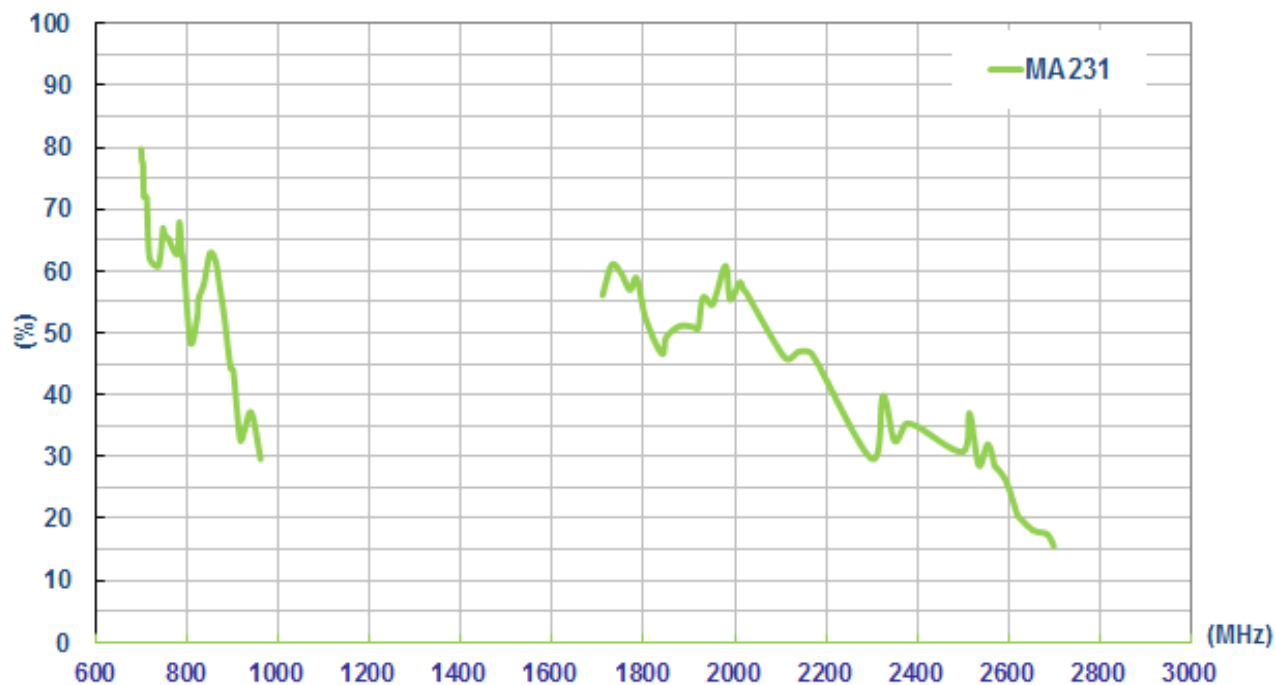
LNA Gain and Output of VSWR at 3.0V

4. Cellular 4G/3G/2G antenna

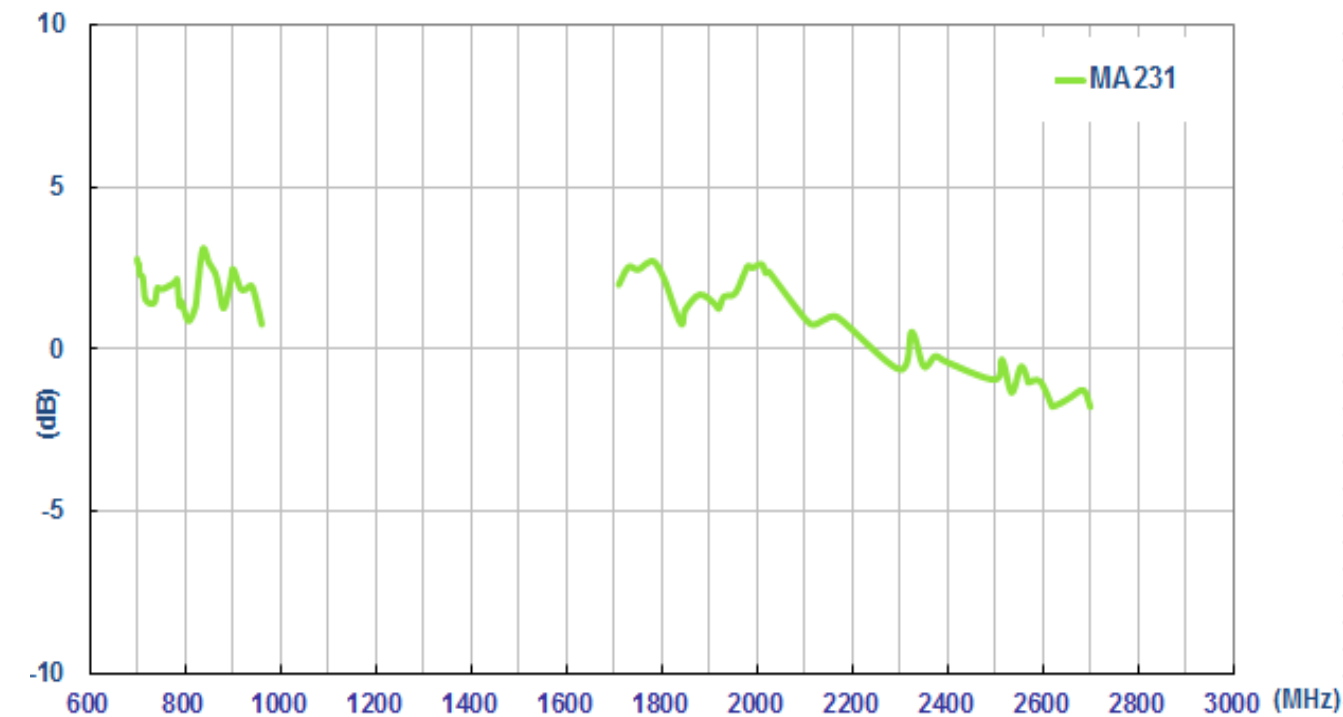
4.1 VSWR



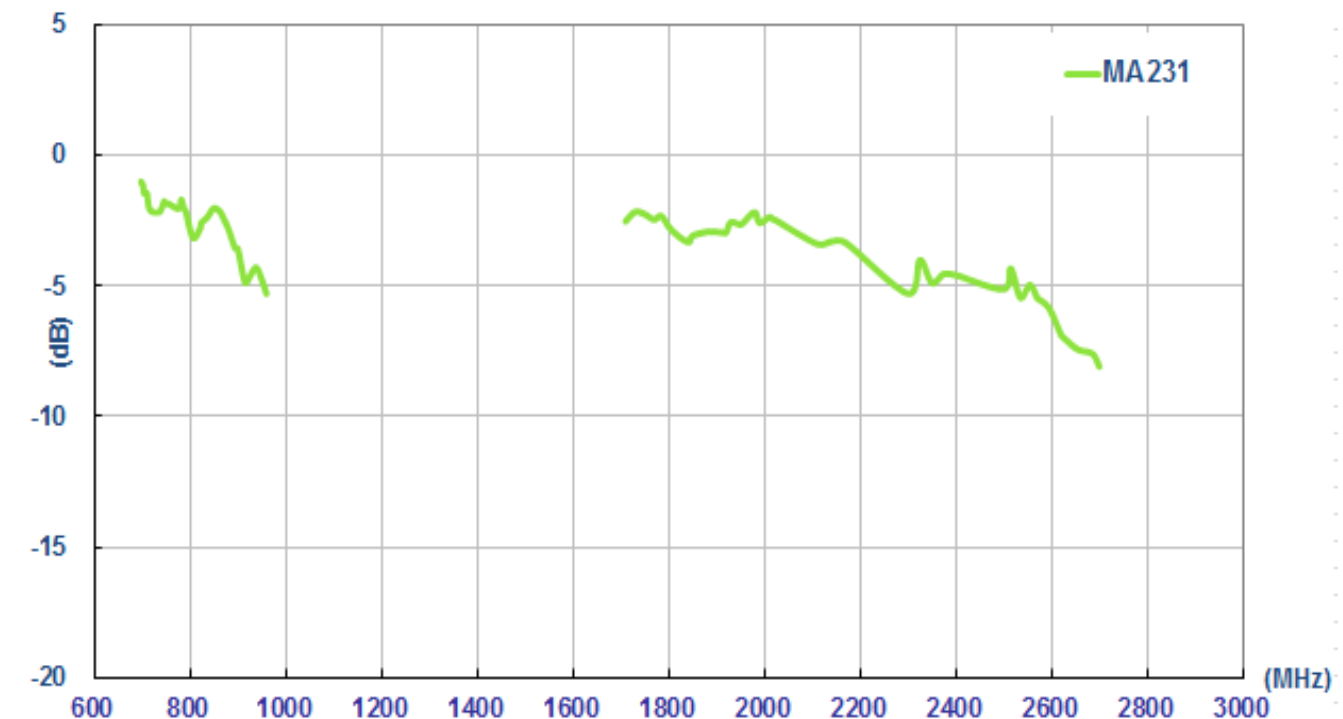
4.2 Efficiency



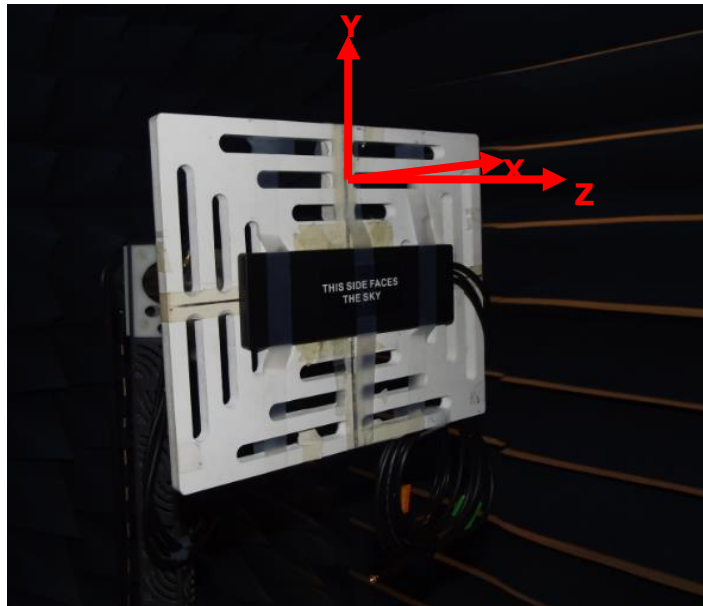
4.3 Peak Gain



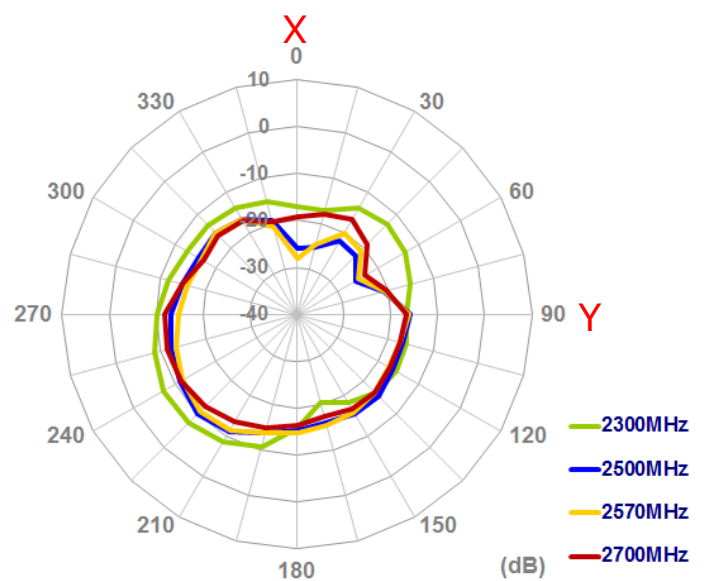
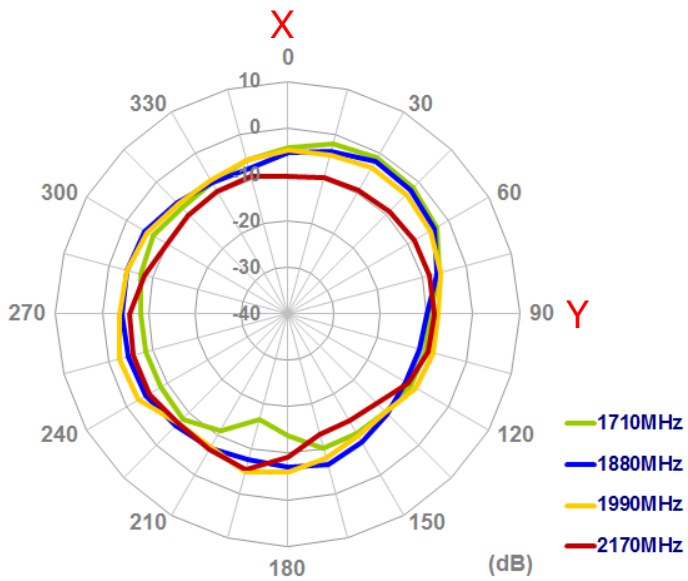
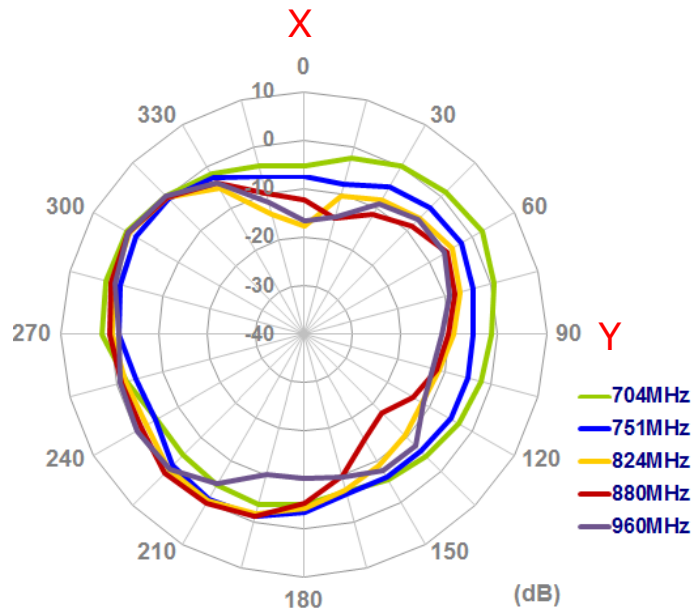
4.4 Average Gain



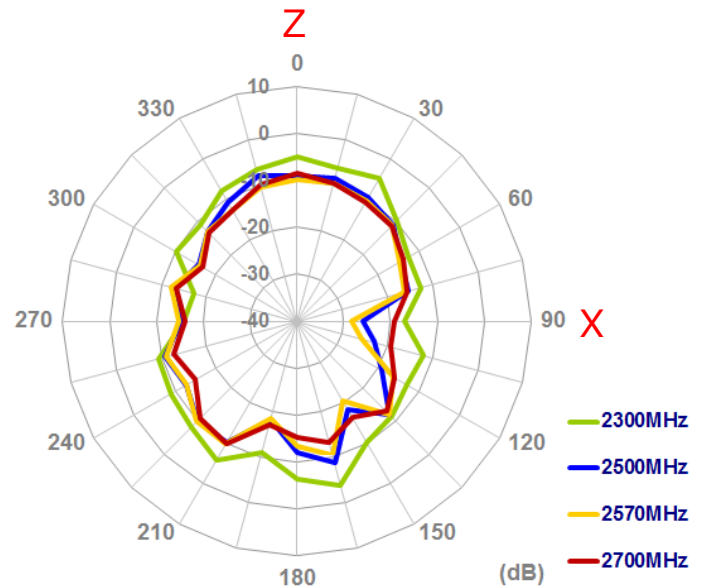
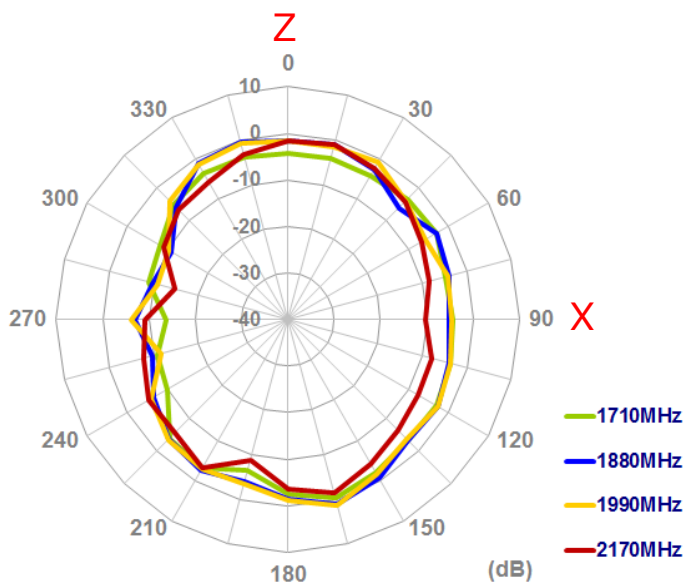
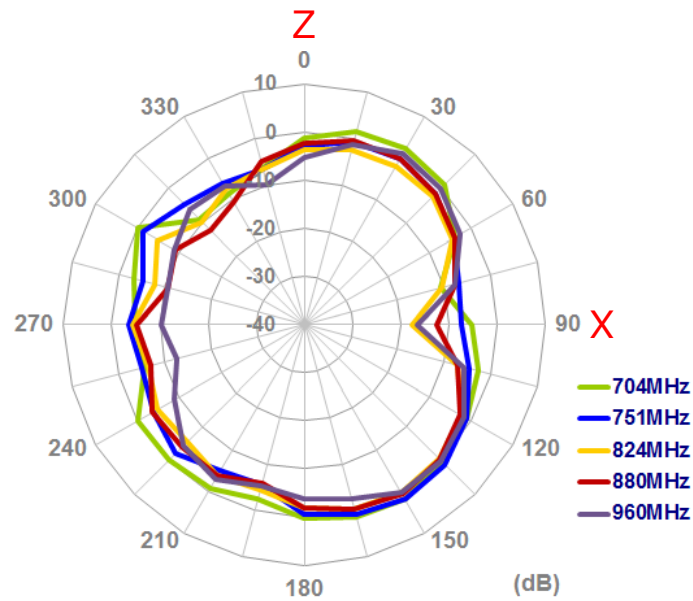
4.5 Antenna Radiation Pattern



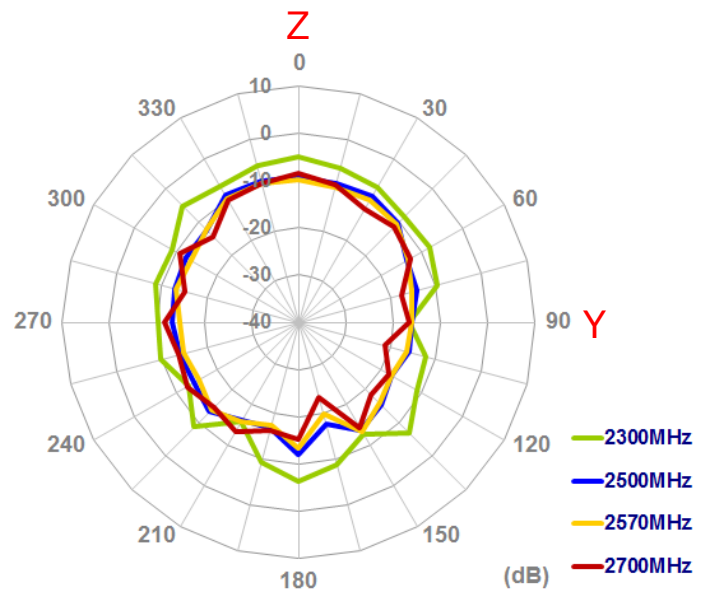
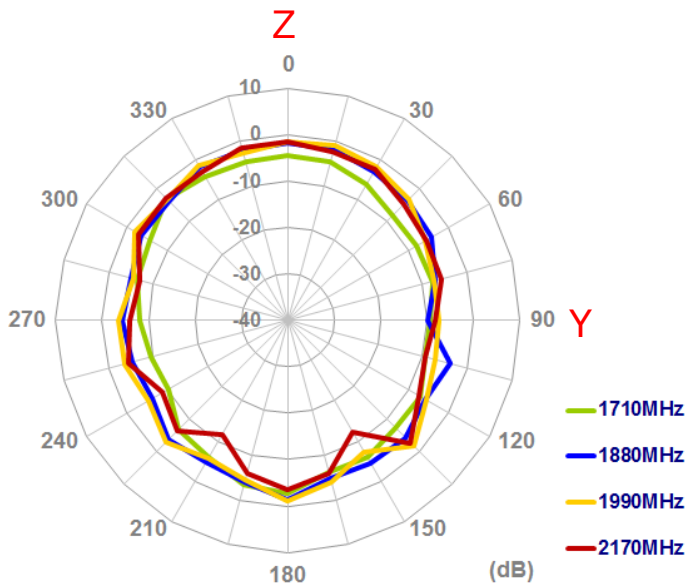
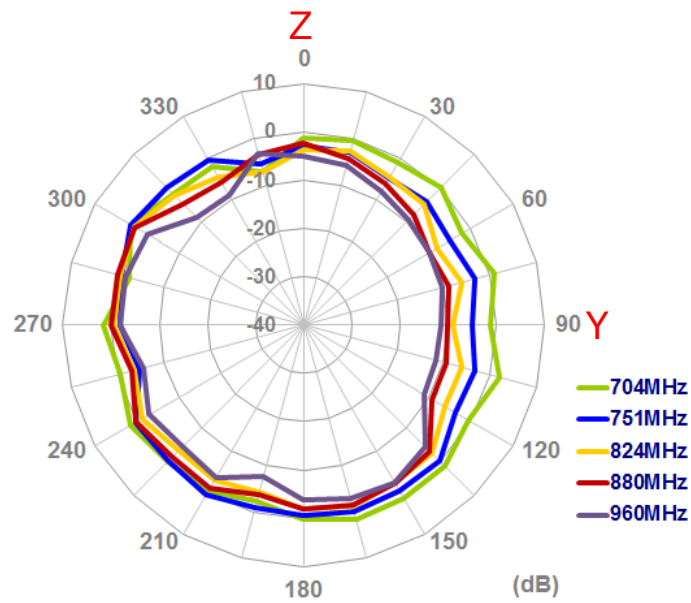
XY Plane



ZX Plane

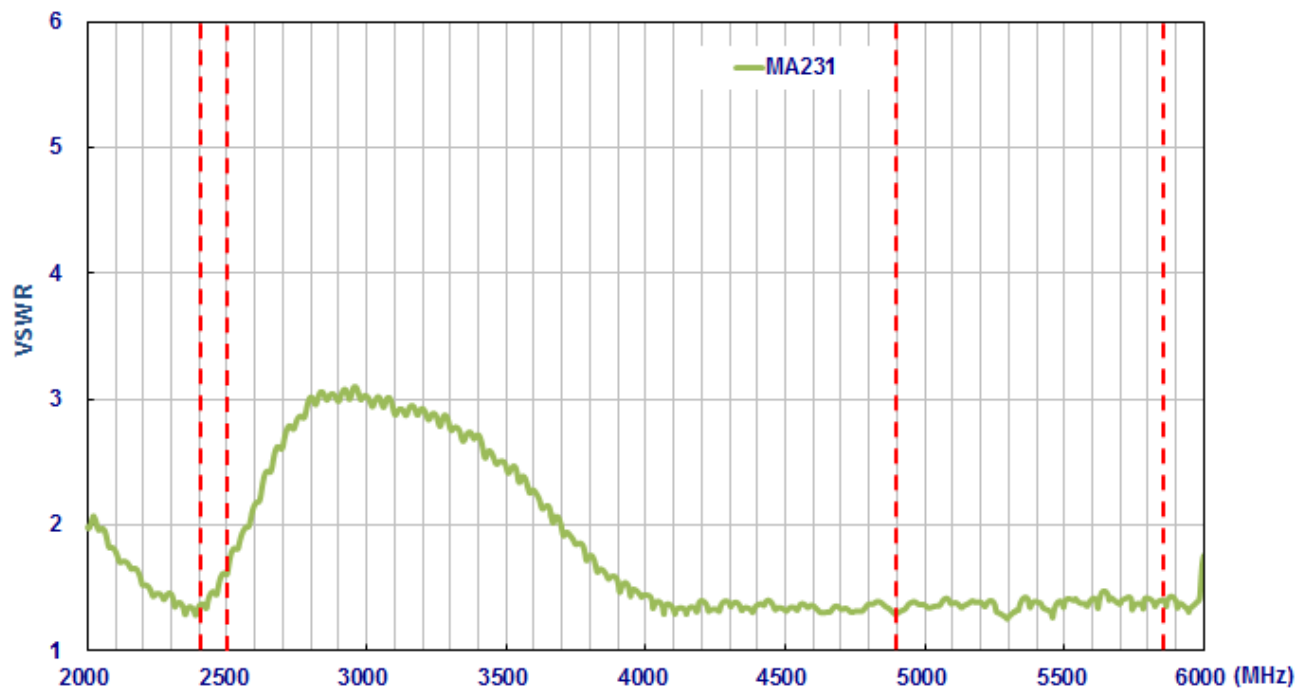


ZY Plane

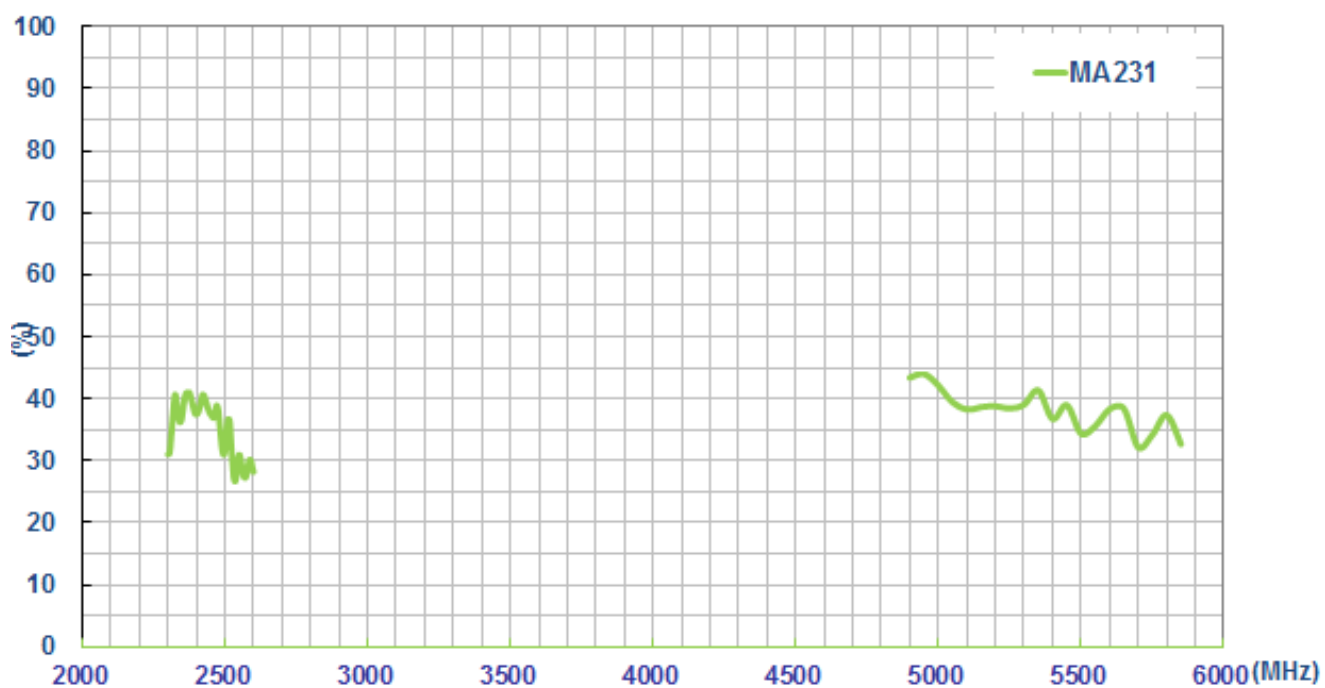


5. Wi-Fi 2.4/5.0 GHz antenna

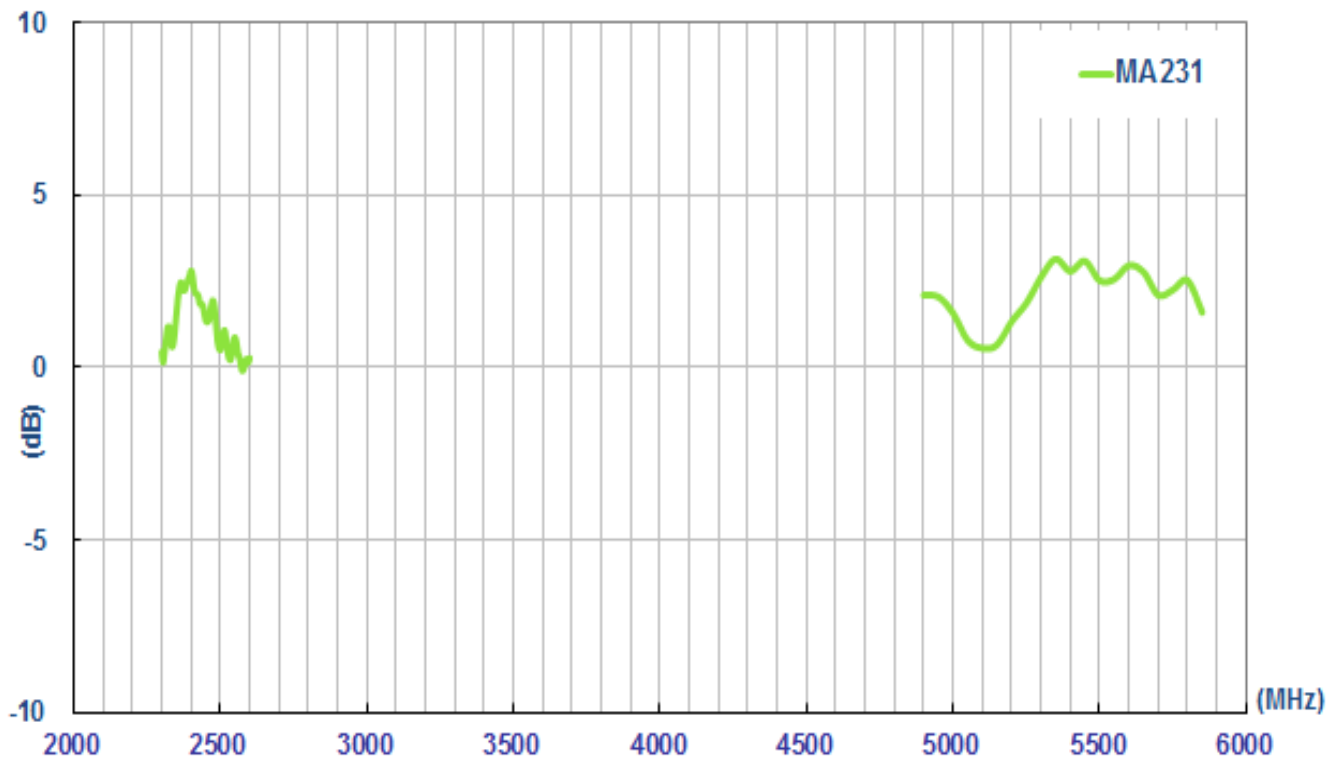
5.1 VSWR



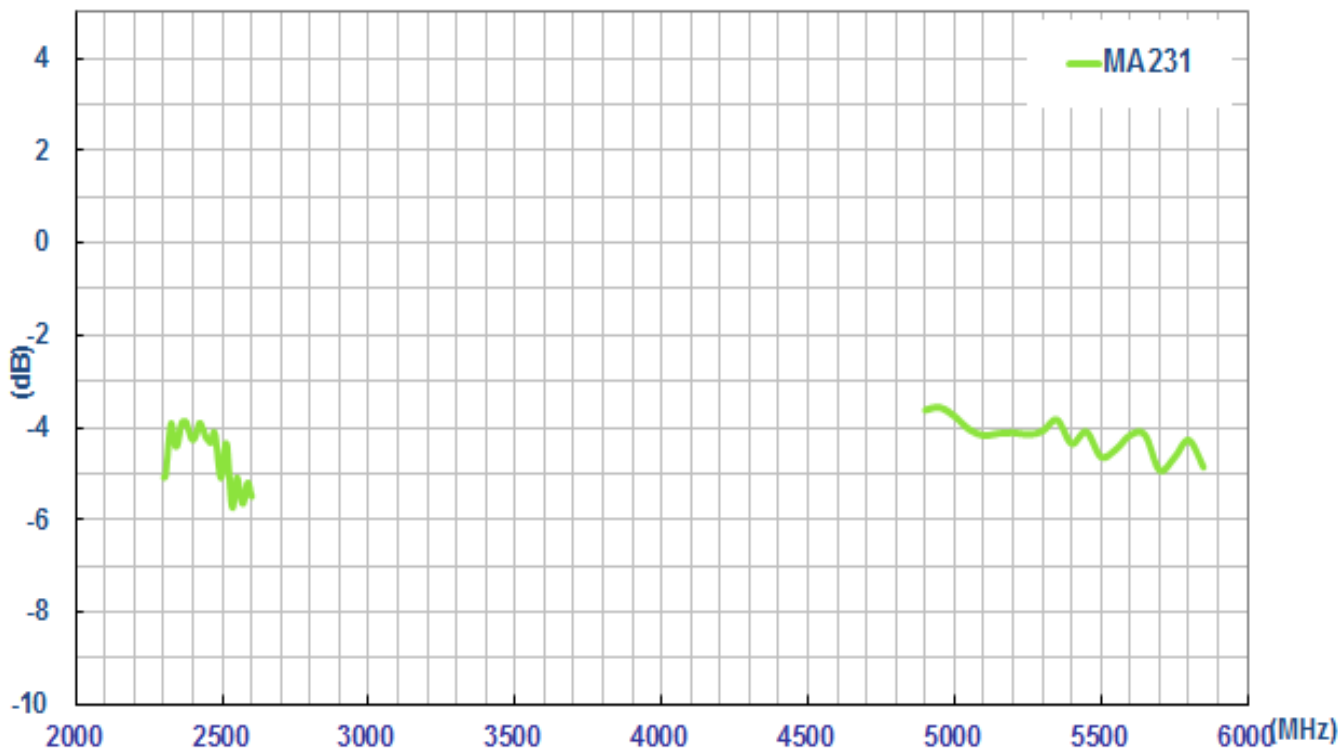
5.2 Efficiency



5.3 Peak Gain

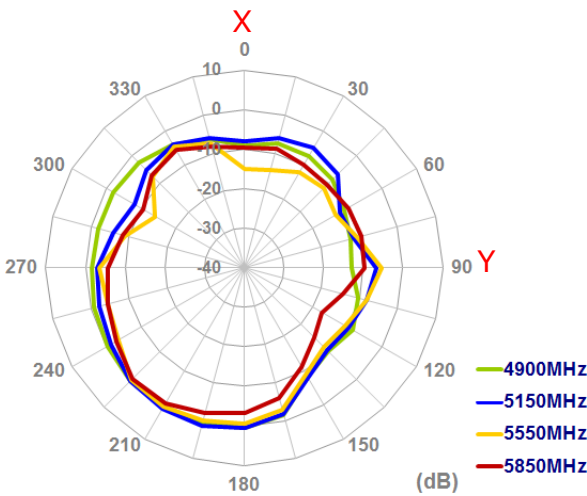
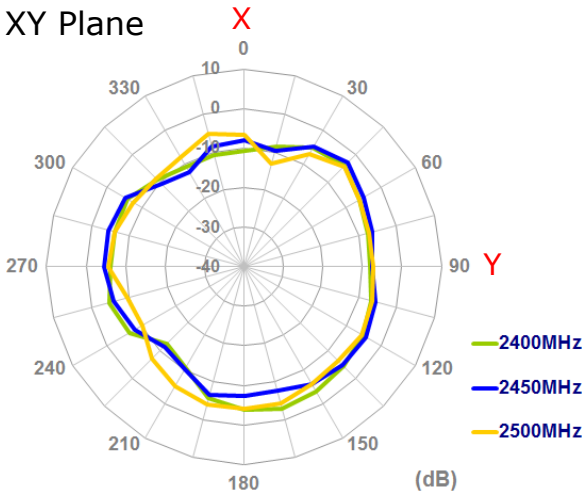


5.4 Average Gain

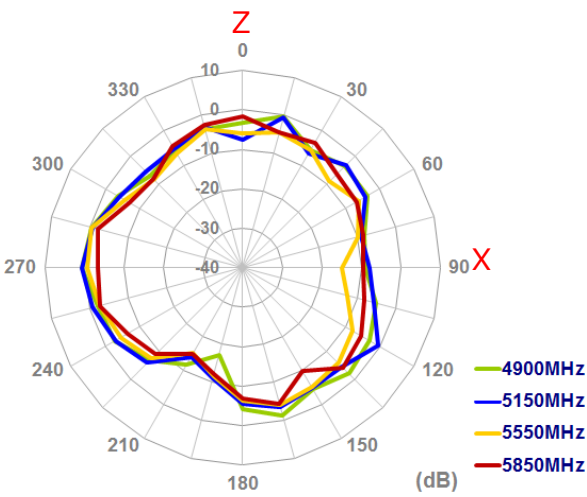
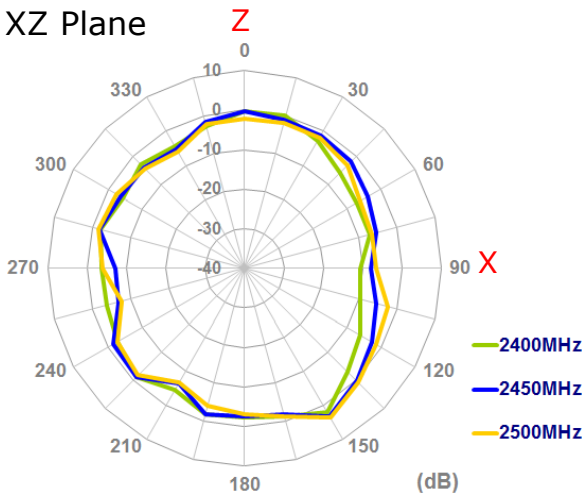


5.5 2D Radiation Pattern

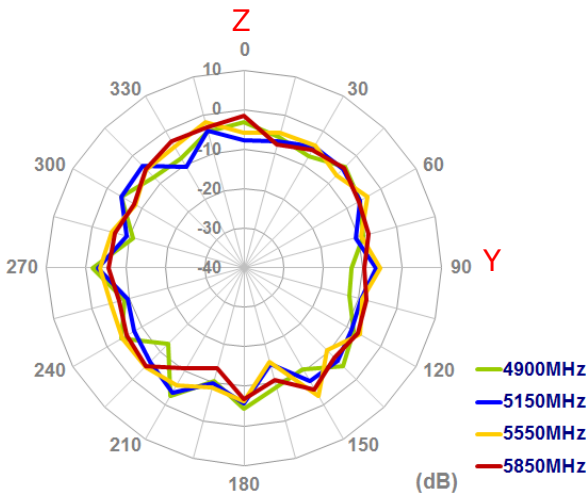
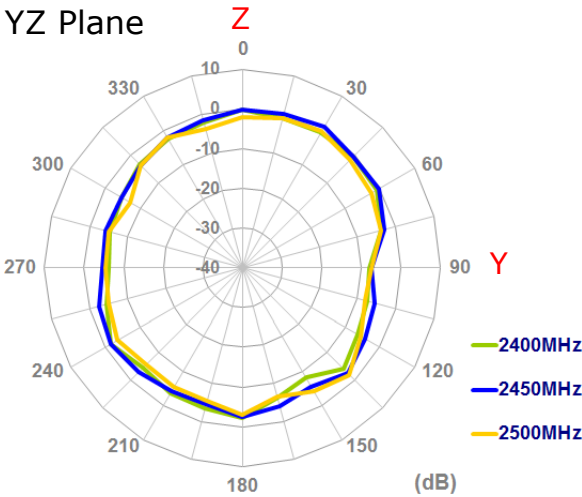
XY Plane



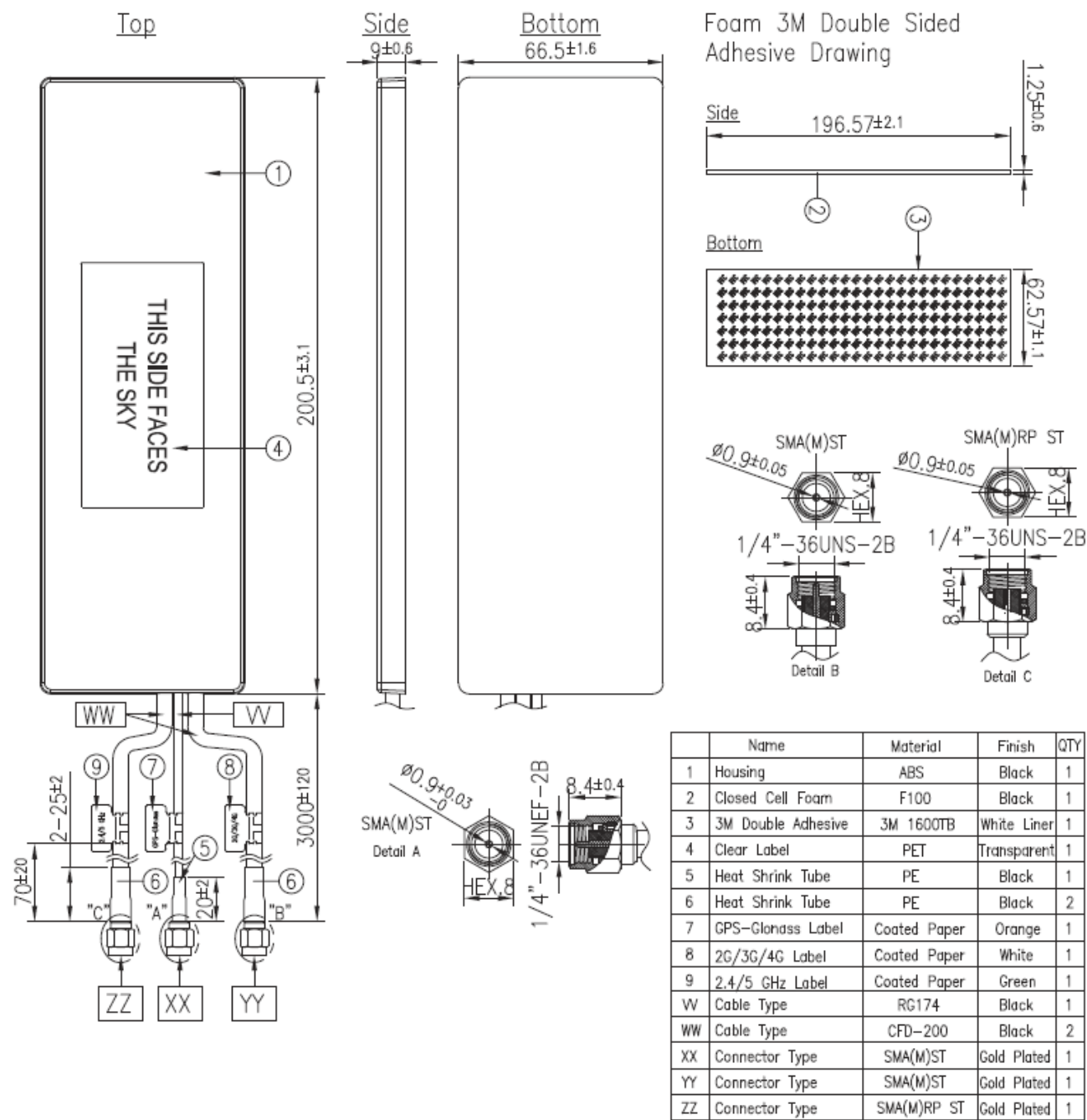
XZ Plane



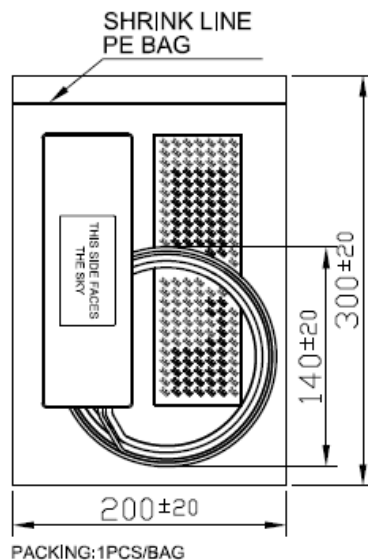
YZ Plane



6. Mechanical Drawing



7. Packaging



30pcs antennas
in one box

