

# **SPECIFICATION**

Part No. : **MA231.LBC.003** 

Product Name : MA231 3 in1Stream 3M: GPS-GLONASS-GALILEO

RG174 RP-SMA(M), 2G/3G/4G CFD-200 RP-SMA(M),

Wi-Fi CFD-200 RP-SMA(M)

Feature : IP67 Antenna

GPS-GLONASS-GALILEO: 3M RG-174 SMA(M) ST

1.8~5.5V/30dB

Cellular 4G/3G/2G: 3M Low Loss CFD-200 SMA(M) ST

Wi-Fi: 3M Low Loss CFD-200 RP-SMA(M) ST

Dimensions: 200.5\*66.5\*9mm

**RoHS Compliant** 





#### 1. Introduction

The Stream 3in1 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 Taoglas 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	-	<ul> <li>≥ 70% @ 700MHz</li> <li>≥ 60% @ 750MHz</li> <li>≥ 50% @ 824MHz</li> <li>≥ 50% @ 880MHz</li> <li>≥ 40% @ 890MHz</li> <li>≥ 25% @ 960MHz</li> <li>≥ 50% @ 1710MHz</li> <li>≥ 50% @ 1880MHz</li> <li>≥ 50% @ 1990MHz</li> <li>≥ 45% @ 2110MHz</li> <li>≥ 45% @ 2170MHz</li> <li>≥ 30% @ 2500MHz</li> <li>≥ 15% @ 2690MHz</li> </ul>	≥ 35% @ 2450MHz ≥ 35% @ 5250MHz ≥ 35% @ 5650MHz



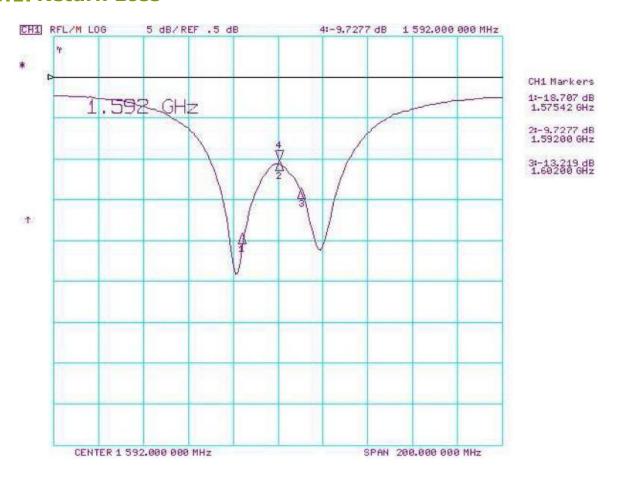
MECHANICAL			
	3M RG-174 with	3M CFD-200 with	3M CFD-200 with
Cable / Connector	SMA(M)	SMA(M)	RP-SMA(M)
	Fully customizable	Fully customizable	Fully customizable
Housing	ABS		
Adhesive Mount	3M 1600TB(196.57*62.57*1.25mm)		
Protection Class	IP-67		
Weight	180g		

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

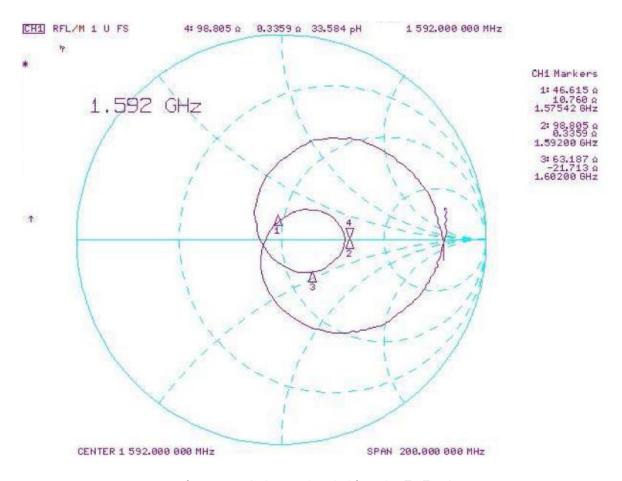


Return Loss: -18.70 dB@1575.42MHz

Return Loss: -13.21 dB@1602MHz



#### 3.2. Smith Chart

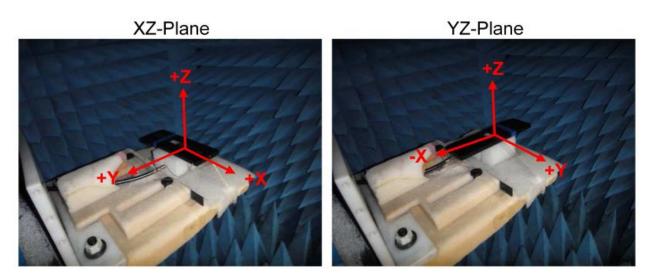


Impedance: 46.61+j10.76 Ohm@1575.42MHz

Impedance: 63.18-j21.73 Ohm@1602MHz

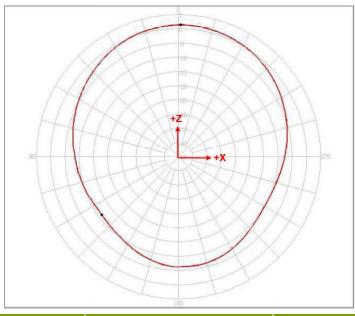


## 3.3. Radiation Patterns



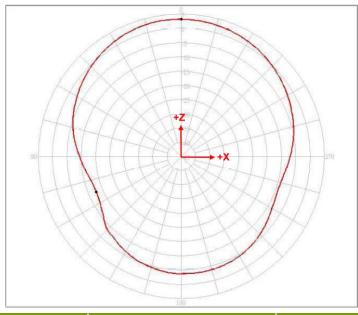


## 3.3.1. XZ Plane 1575.42MHz



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

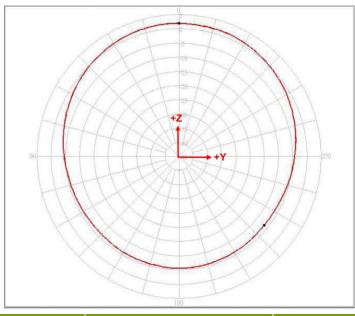
### 3.3.2. XZ Plane 1602MHz



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

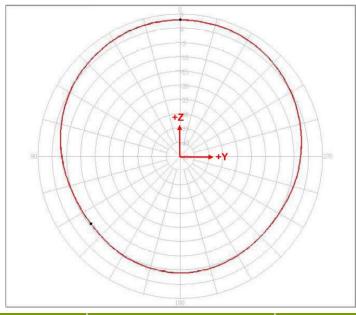


## 3.3.3. YZ Plane 1575.42MHz



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

### 3.3.4. YZ Plane 1602MHz

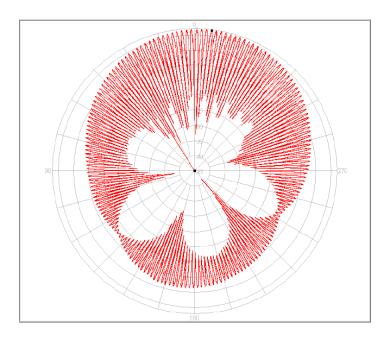


1602MHZ	Peak Gain	Zenith Gain
V+H	2.92 dBi	2.92 dBi

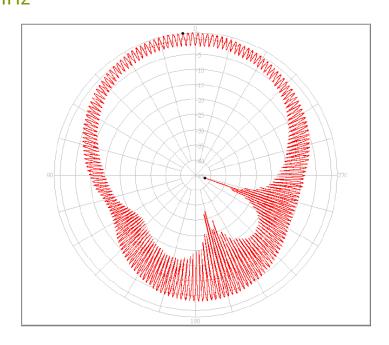


### 3.4. Axial Ratio Pattern

#### 3.4.1. 1575.42MHz

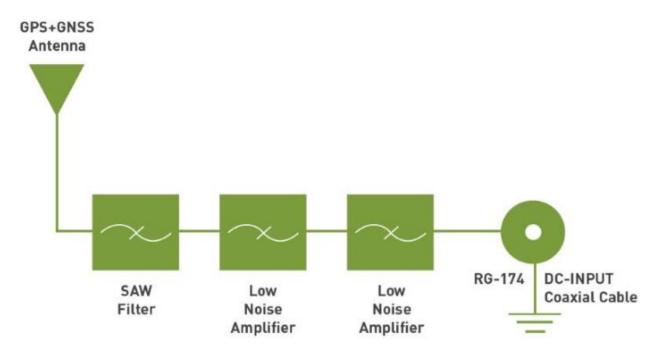


### 3.4.2. 1602MHz





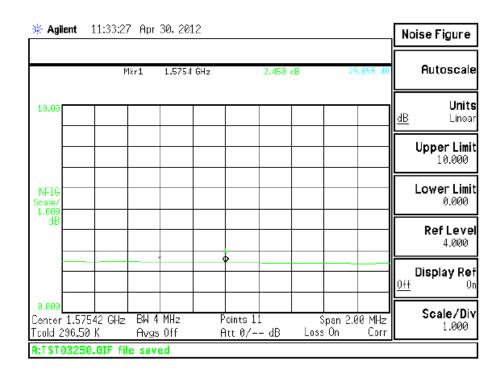
### 3.5. LNA characteristics



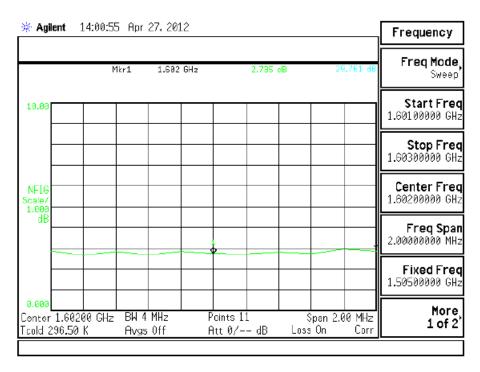
Parameter			
Frequency Pange	1,575.42±10MHz For GPS/GALILEO		
Frequency Range	1,602±8MHz For GLONASS		
Output Impedance	50 Ohm		
Output VSWR	2.0 max		

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



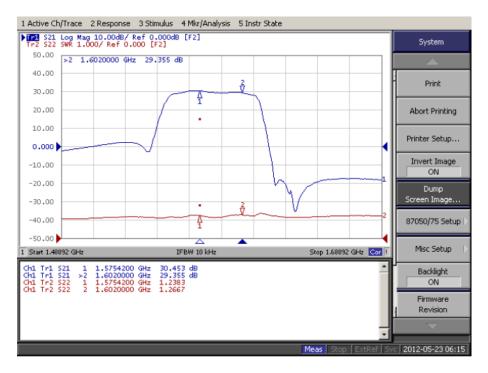


LNA Noise Figure@3.0V for 1575.42MHz



LNA Noise Figure@3.0V for 1602MHz



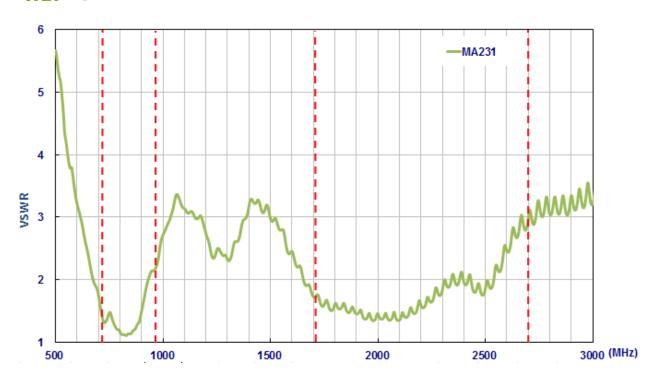


LNA Gain and Output of VSWR at 3.0V

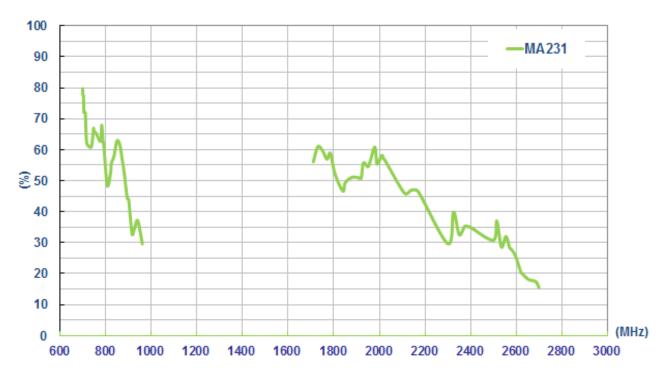


# 4. Cellular 4G/3G/2G antenna

#### **4.1. VSWR**

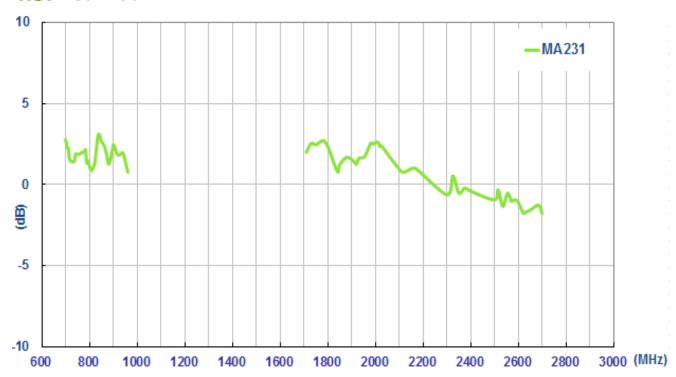


# 4.2. Efficiency

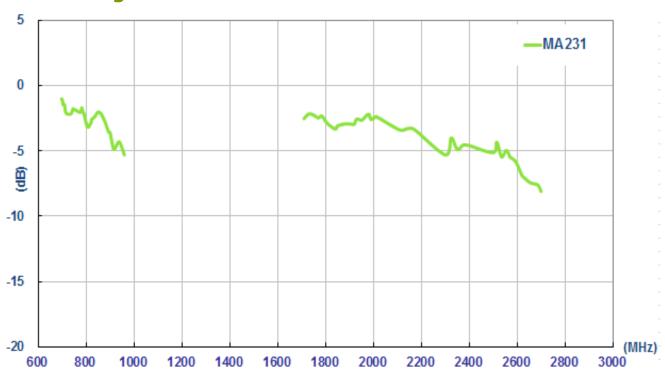




### 4.3. Peak Gain

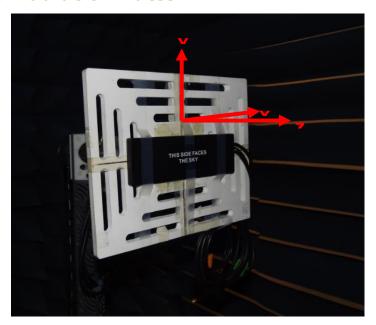


# 4.4. Average Gain



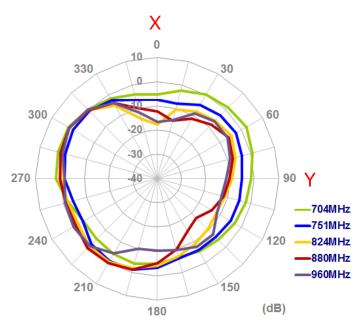


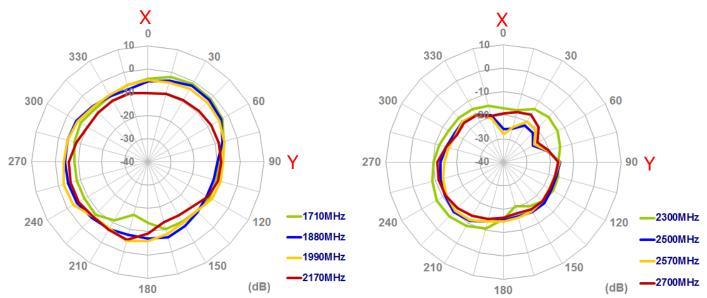
## 4.5. Antenna Radiation Pattern





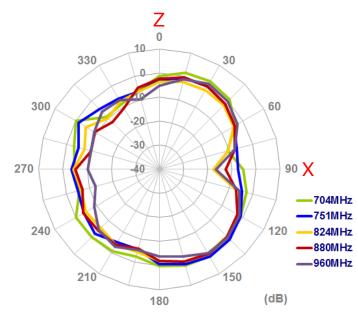
#### XY Plane

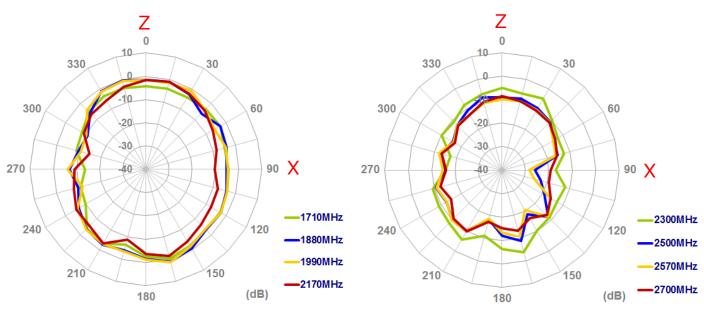






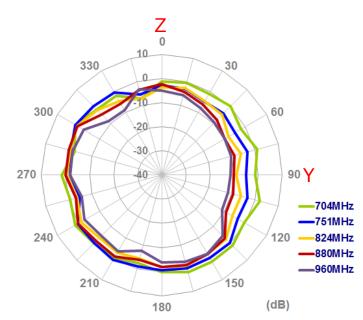
#### ZX Plane

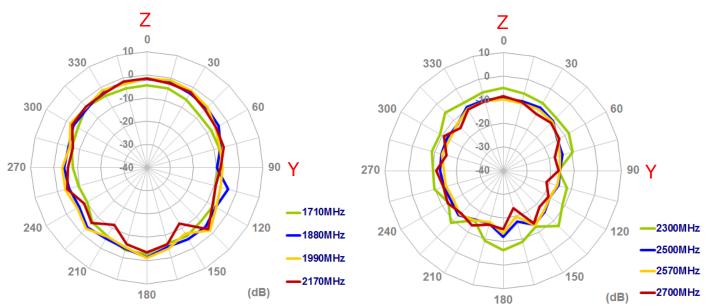






#### **ZY Plane**

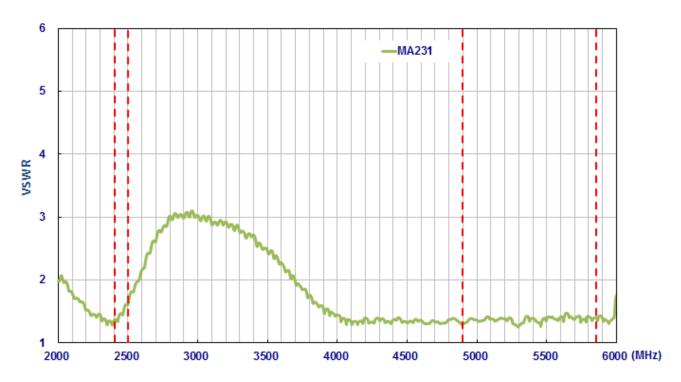




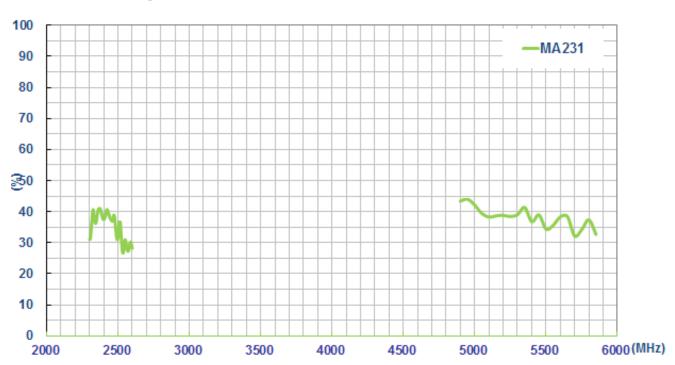


# 5. Wi-Fi 2.4/5.0 GHz antenna

#### **5.1. VSWR**

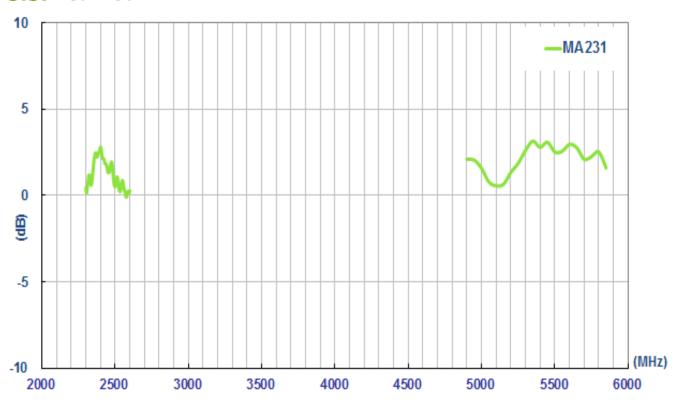


## 5.2. Efficiency

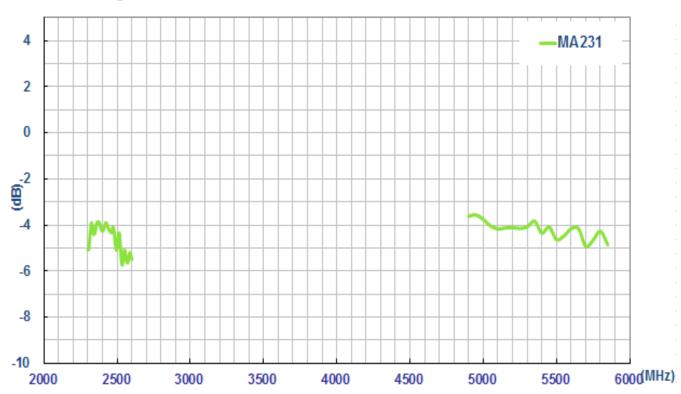




### 5.3. Peak Gain

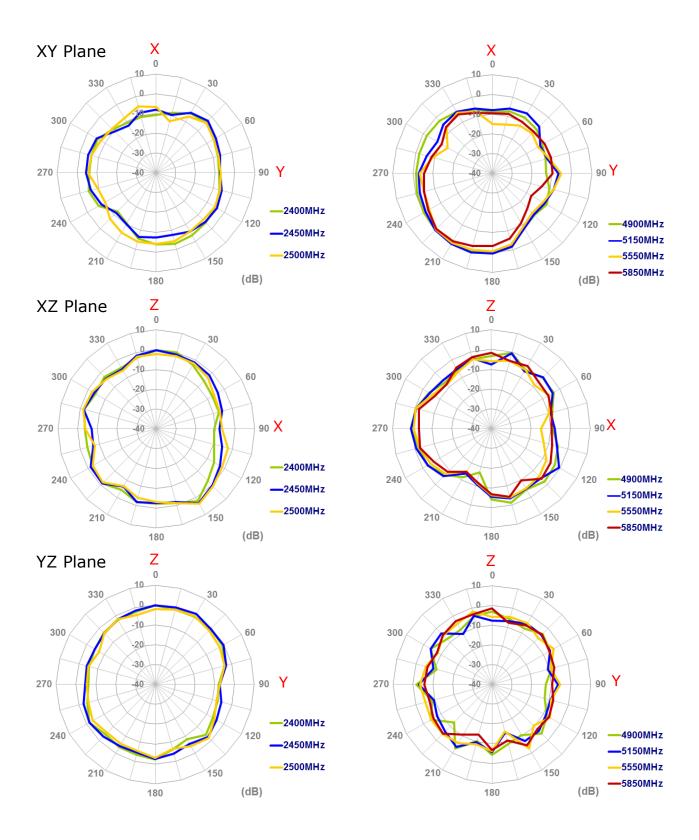


# 5.4. Average Gain



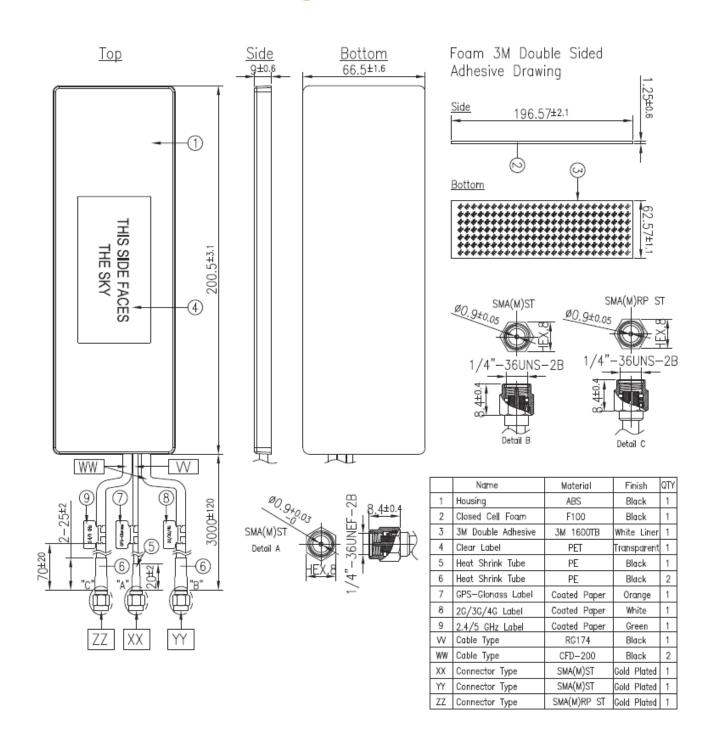


#### 5.5. 2D Radiation Pattern



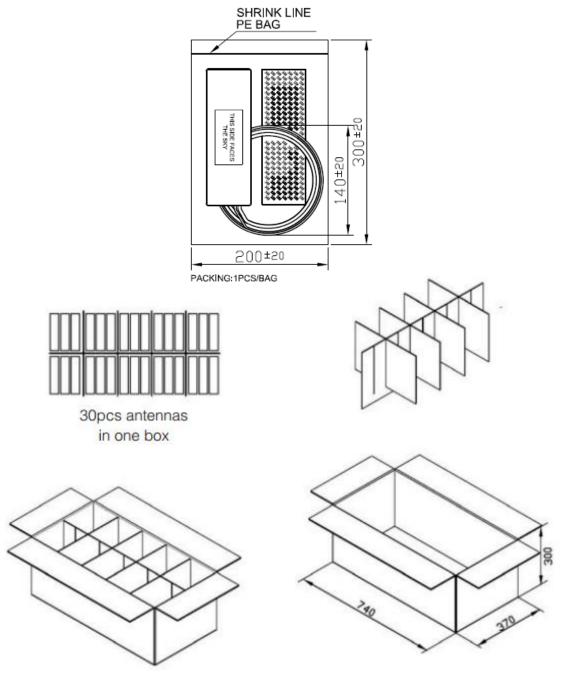


# 6. Mechanical Drawing





# 7. Packaging



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