

# SPECIFICATION

**PATENT PENDING**

- Part No. : **MA1130.A.LBICGT.002**
- Product Name : Raptor II - 6 in 1 Next Generation Dual Fin Permanent Mount External Antenna with GPS/GLONASS/GALILEO/BeiDou, LTE MIMO 1&2, Wi-Fi MIMO 1&2 and AM/FM
- Feature : 2 x 4G/3G/2G MIMO Antenna
  - (698~960MHz, 1710~2170MHz, 2300~2700MHz)
 1 x GPS/GLONASS/GALILEO/BeiDou Antenna
  - (1561/1575.42/1602MHz)
 2 x Wi-Fi 2.4GHz/5.8GHz MIMO Antenna
  - MIMO2 antenna can be replaced by DSRC band
 1 x AM/FM Antenna  
 IP67 Waterproof  
 Front End SAW Filter  
 High Efficiency/Peak Gain Outdoor Antenna  
 SMA(M) and RP-SMA(M) Connectors as standard (Fakra Optional)  
 0.3m RG-316 Cable as standard  
**RoHS Compliant**



## 1. Introduction

The Raptor II MA1130.A is a 6in1 next generation, dual fin, permanent screw mount antenna for vehicle roof applications. It is fully IP67 waterproof with a distinct quality dual fin high gloss finish housing that has passed highest automotive hardness testing levels to help prevent scratching. The 6 separate antennas inside support frequency bands in LTE, GPS/GLONASS/GALILEO/BeiDou, Wi-Fi, 4G/3G/2G and AM/FM radio.

This outstanding, patent pending, antenna delivers powerful MIMO antenna technology for LTE, Wi-Fi 2.4/5.8GHz 802.11n and the emerging 802.11ac, plus a high gain omnidirectional DSRC (V2V/V2X) 5.9GHz antenna, and an optimized GPS/GLONASS/GALILEO/BeiDou patch antenna for location.

The LTE antennas also include backward compatibility to work at most worldwide 3G and 2G bands.

Applications include:

- Next generation OEM car connectivity
- Multimedia, navigation and telematics systems
- V2V and V2X applications
- Fleet management
- Real-time HD video streaming
- E-Call

Examples of new uses that require such a highly sophisticated antenna are real-time streaming applications that demand high speed video uplink and downlink into the cabin of the car. These challenges are resolved by the highly efficient, high gain MIMO antennas, with high isolation, which is necessary to achieve the required signal to noise ratio and throughput.



The Raptor II can also be customized for your particular wireless application and frequency band, subject to NRE and MOQ.

The six standard cables are .3m RG-316, terminating in SMA(M) for GNSS, LTE MIMO 1&2, AM/FM, DSRC and RP SMA(M) for Wi-Fi.

Cable length and connector types are customizable. For short cable runs up to 1 meter, RG174 can be used. For longer cable runs it is recommended to use low loss CFD200 cable extensions.

Contact your regional Taoglas sales office for support.

## 2. Specification Table

| 4G/3G/2G MIMO        |  |         |         |           |           |           |           |
|----------------------|--|---------|---------|-----------|-----------|-----------|-----------|
| Band                 | LTE 700                                  | GSM 850 | GSM 900 | DCS       | PCS       | UMTS1     | LTE 2600  |
| Frequency (MHz)      | 698-824                                  | 824-894 | 880-960 | 1710-1880 | 1850-1990 | 1920-2170 | 2500-2690 |
| MIMO 1               |  |         |         |           |           |           |           |
| Peak Gain (dBi) *    | 1.61                                     | 0.64    | -0.23   | 4.00      | 3.54      | 3.40      | 5.69      |
| Average Gain (dBi)*  | -5.34                                    | -4.49   | -6.04   | -3.88     | -3.37     | -3.57     | -3.51     |
| Efficiency (%)*      | 29.82                                    | 35.55   | 25.57   | 41.12     | 45.98     | 43.97     | 44.80     |
| Return loss (dB) *   | <-6                                      | <-6     | <-4     | <-5       | <-10      | <-10      | <-8       |
| MIMO 2               |  |         |         |           |           |           |           |
| Peak Gain (dBi) *    | 0.26                                     | 1.44    | 0.53    | 3.74      | 3.98      | 4.08      | 6.12      |
| Average Gain (dBi) * | -5.36                                    | -4.21   | -5.15   | -4.18     | -3.48     | -3.59     | -3.30     |
| Efficiency (%) *     | 29.59                                    | 38.02   | 30.91   | 38.35     | 44.87     | 43.83     | 46.83     |
| Return loss (dB) *   | <-6                                      | <-6     | <-4     | <-5       | <-10      | <-10      | <-8       |
| Polarization         | Linear                                   |         |         |           |           |           |           |
| Impedance            | 50Ω                                      |         |         |           |           |           |           |
| Cable                | 30cm RG-316 standard, fully customizable |         |         |           |           |           |           |
| Connector            | SMA Male Straight, fully customizable    |         |         |           |           |           |           |

| 2.4GHz/5.8GHz MIMO   |  |           |
|----------------------|--|-----------|
| Frequency (GHz)      | 2.4~2.5                                  | 5.15~5.85 |
| MIMO 1               |  |           |
| Peak Gain (dBi) *    | 3.43                                     | 2.92      |
| Average Gain (dBi) * | -4.38                                    | -4.23     |
| Efficiency (%)*      | 36.57                                    | 37.75     |
| Return loss (dB) *   | <-10                                     | <-6       |
| MIMO 2               |  |           |
| Peak Gain (dBi) *    | 6.81                                     | 6.37      |
| Average Gain (dBi) * | -2.86                                    | -3.65     |
| Efficiency (%)*      | 52.66                                    | 44.19     |
| Return loss (dB) *   | <-10                                     | <-6       |
| Polarization         | Linear                                   |           |
| Impedance            | 50Ω                                      |           |
| Cable                | 30cm RG-316 standard, fully customizable |           |
| Connector            | SMA Male RP Straight, fully customizable |           |

| DSRC                 |  |
|----------------------|--|
| Frequency (GHz)      | 5.850~5.925                              |
| Peak Gain (dBi) *    | 6.6                                      |
| Average Gain (dBi) * | -3.81                                    |
| Efficiency (%)*      | 41.69                                    |
| Return loss (dB) *   | <-10                                     |
| Polarization         | Linear                                   |
| Impedance            | 50Ω                                      |
| Cable                | 30cm RG-316 standard, fully customizable |
| Connector            | SMA Male Straight, fully customizable    |

| GPS/GLONASS/GALILEO/BeiDou |  |                   |                      |
|----------------------------|--|-------------------|----------------------|
| Center Frequency fc        | BeiDou:1561.098 ± 2MH                    | GPS:1575.42±3 MHz | GLONASS:1602±0.5 MHz |
| Gain                       | -1 dBi typ.                              | -2.5 dBi typ.     | -1.5 dBi typ.        |
| VSWR(@Center Frequency)    | < 2                                      |                   |                      |
| Polarization               | RHCP                                     |                   |                      |
| Impedance                  | 50Ω                                      |                   |                      |
| Antenna size               | 25*25*4mm                                |                   |                      |
| Cable                      | 30cm RG-316 standard, fully customizable |                   |                      |
| Connector                  | SMA Male Straight, fully customizable    |                   |                      |
| LNA Electrical Properties  |  |                   |                      |
| Frequency                  | 1558~1610MHz                             |                   |                      |
| Gain @3V                   | 28 dB typical                            |                   |                      |
| DC Power Input             | 3V                                       |                   |                      |
| Noise Figure @3V           | 2.8dB                                    |                   |                      |
| Power Consumption @3V      | 10 mA                                    |                   |                      |

| MECHANICAL            |                             |
|-----------------------|-----------------------------|
| Antenna Dimensions    | 176.2*84.5*70.8mm ( L*W*H ) |
| Housing               | PC                          |
| Waterproof            | IP67                        |
| Base                  | Aluminum                    |
| Thread diameter       | M20 x 1.5P                  |
| Nut                   | Nickel Plated Steel         |
| 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 30cm cable length

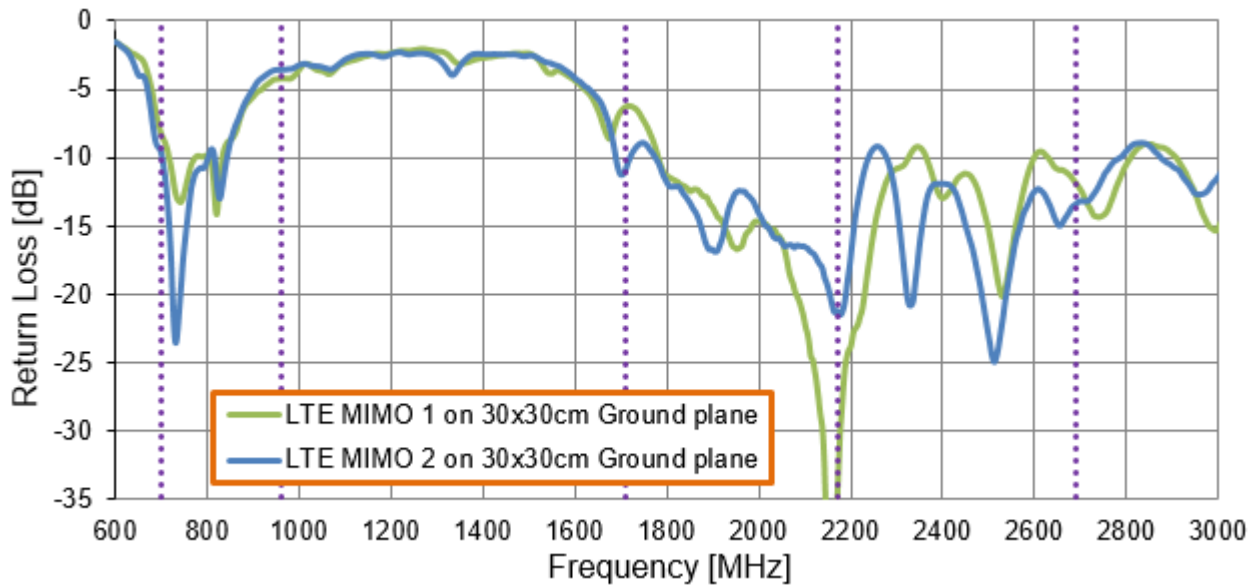
| LTE BANDS   |  |                               |        |        |
|-------------|--|-------------------------------|--------|--------|
| Band Number | LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA |                               |        |        |
|             | Uplink   | Downlink                      | 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%

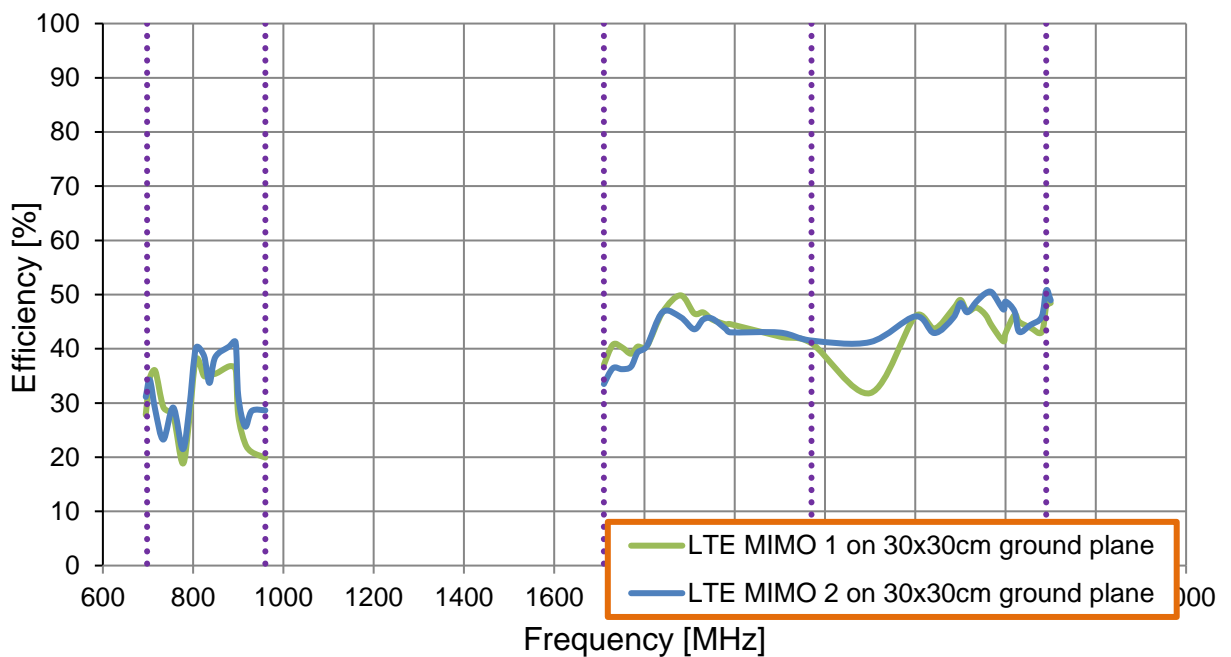
### 3. LTE MIMO

#### 3.1. LTE MIMO1 and 2 Characteristics

##### 3.1.1. Return Loss on 30\*30cm GND

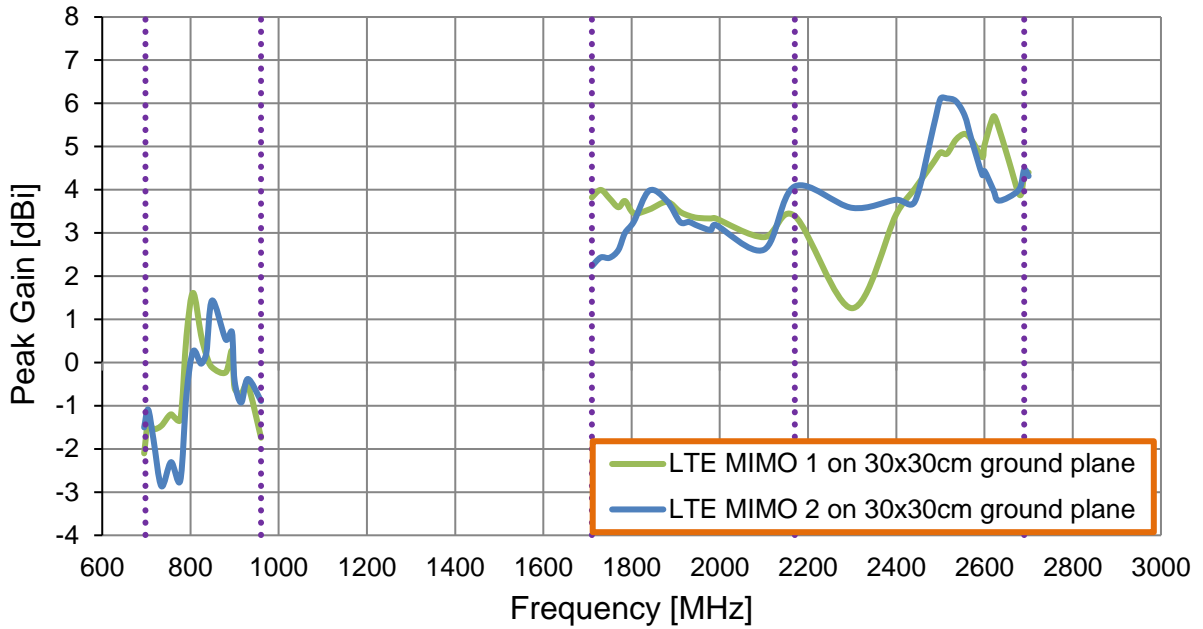


##### 3.1.2. Efficiency on 30\*30cm GND

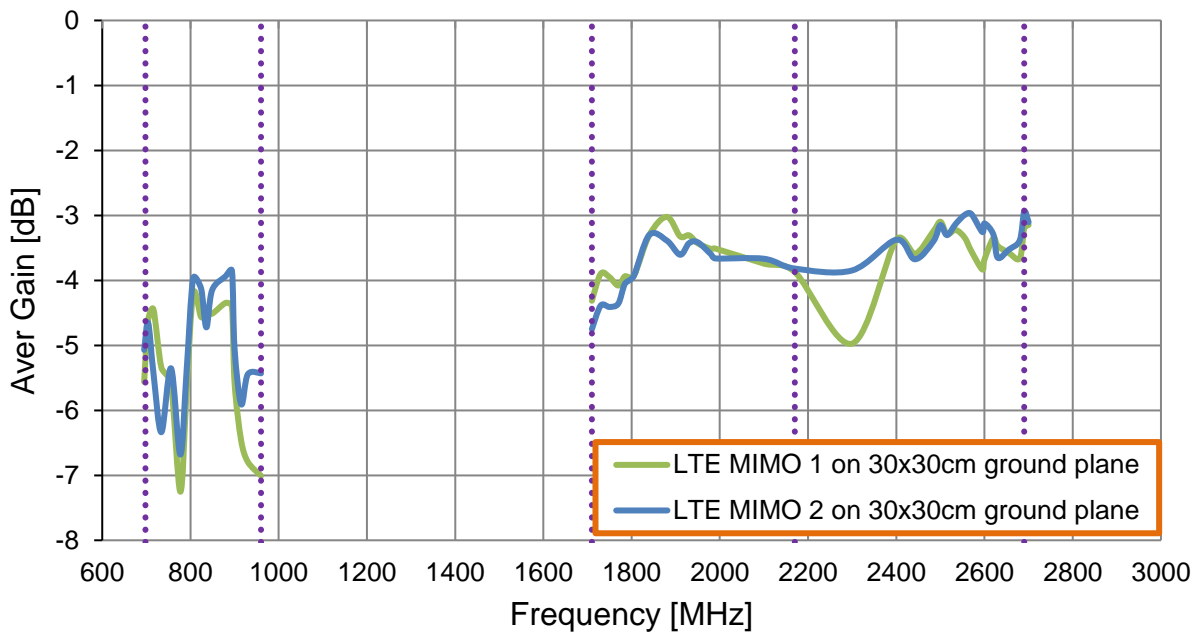




### 3.1.3. Peak Gain on 30\*30cm GND

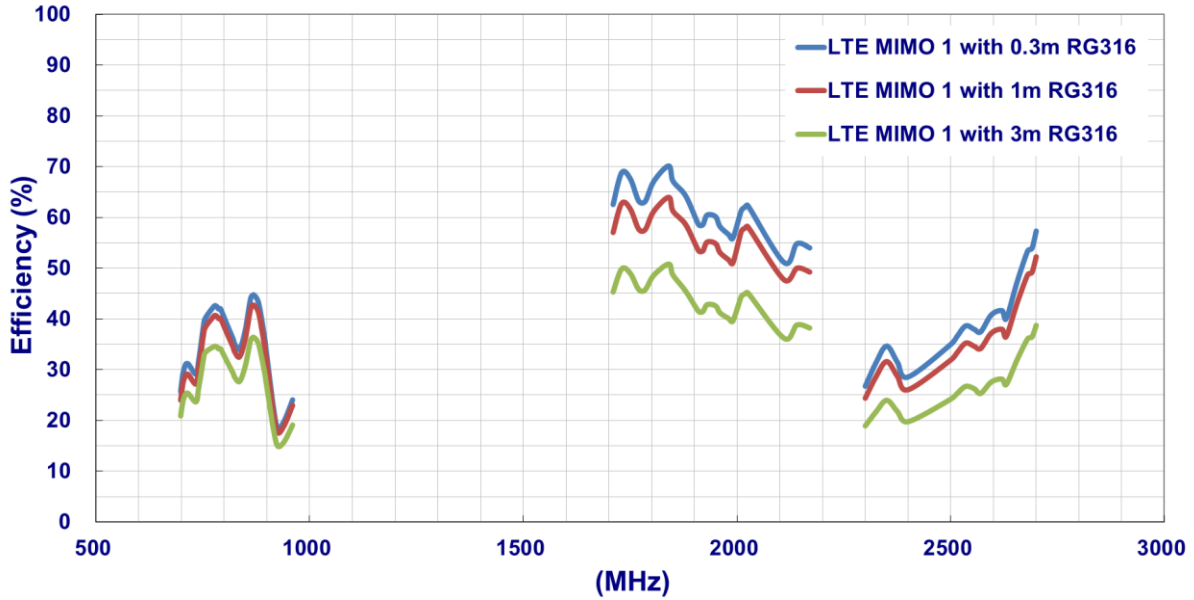


### 3.1.4. Average Gain on 30\*30cm GND

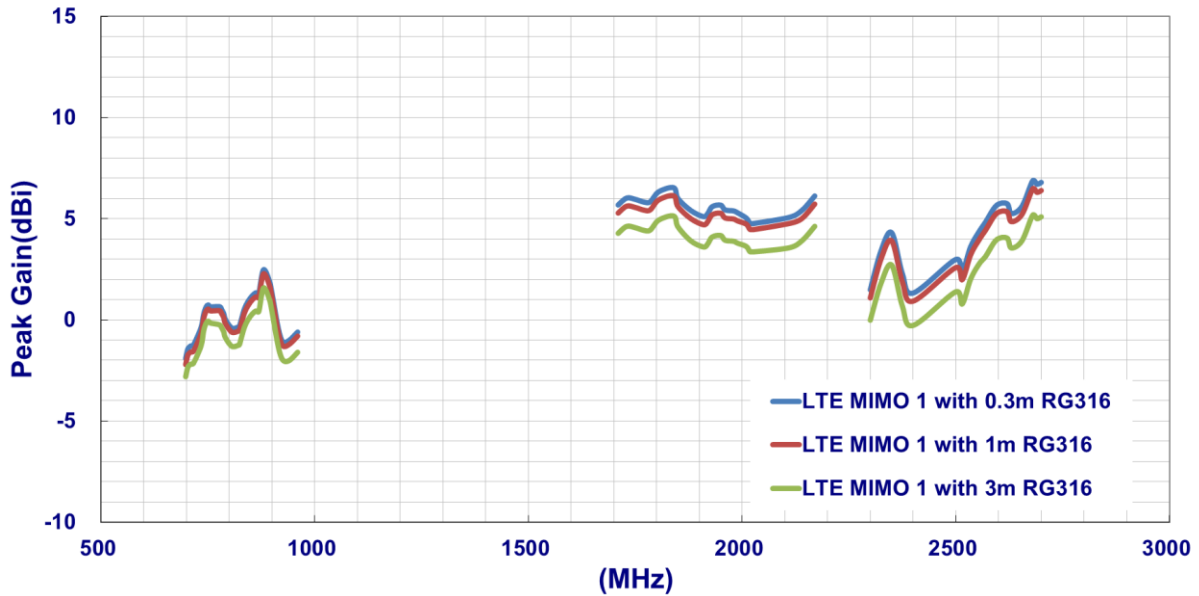


### 3.2. LTE Characteristics with different cable length

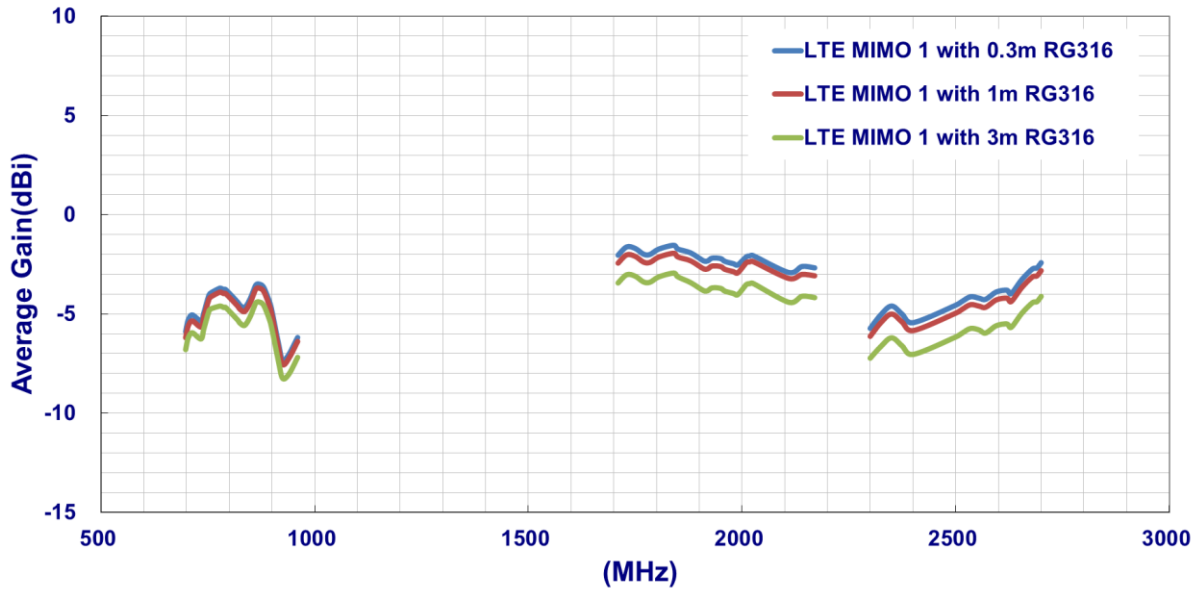
#### 3.2.1. MIMO 1 Efficiency



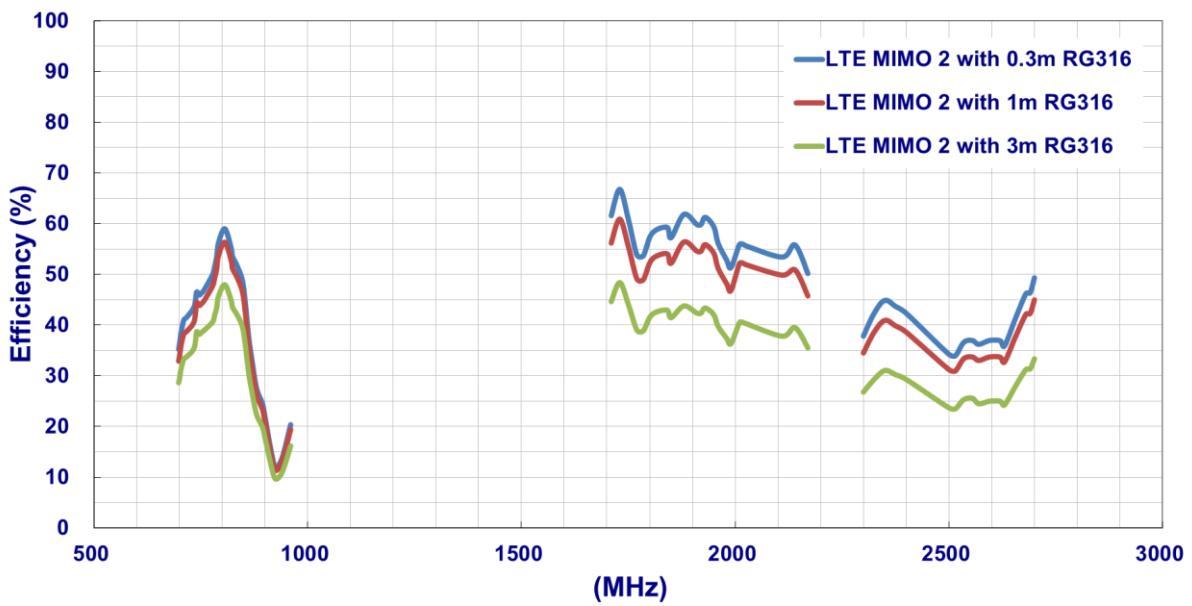
#### 3.2.2. MIMO 1 Peak Gain



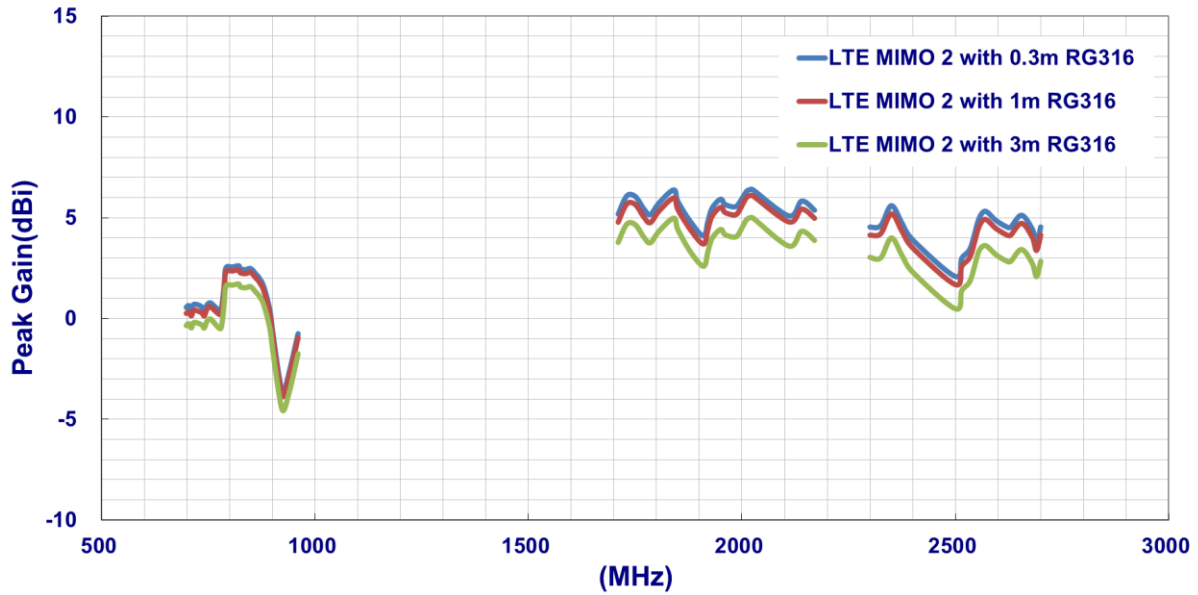
### 3.2.3. MIMO 1 Average Gain



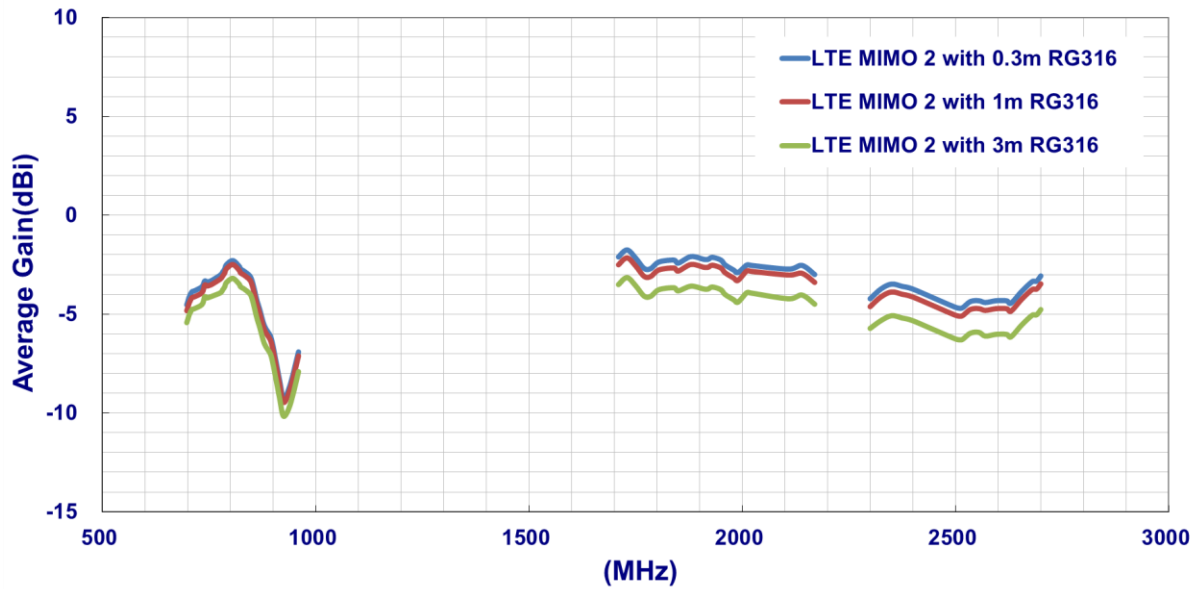
### 3.2.4. MIMO 2 Efficiency



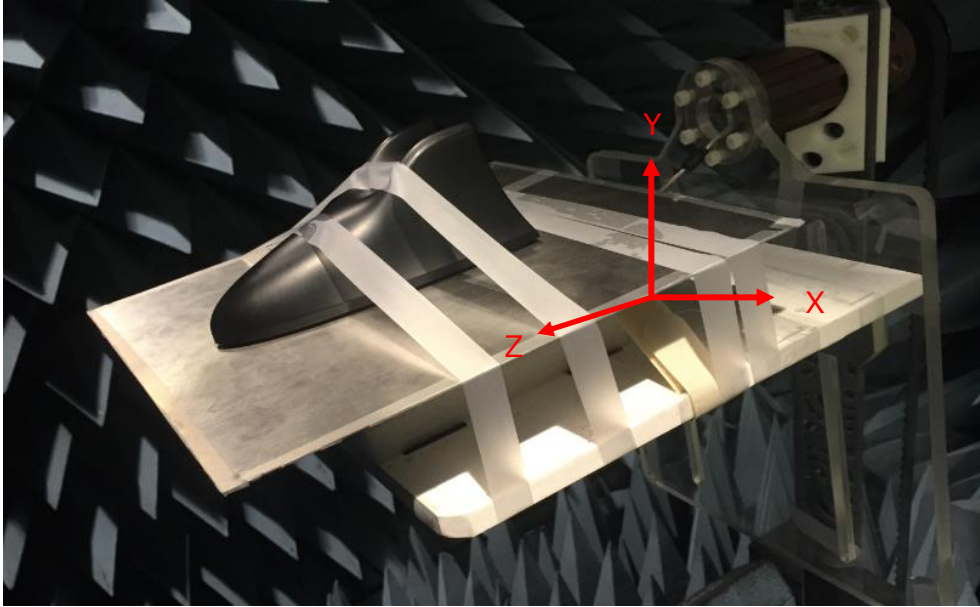
### 3.2.5. MIMO 2 Peak Gain



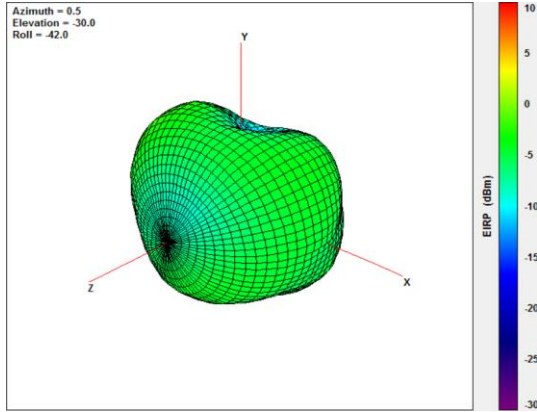
### 3.2.6. MIMO 2 Average Gain



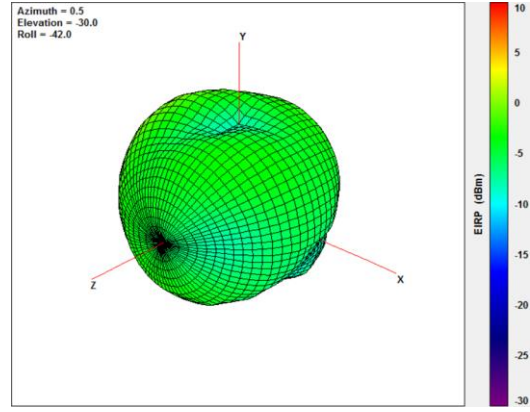
### 3.3. 3D Radiation Pattern



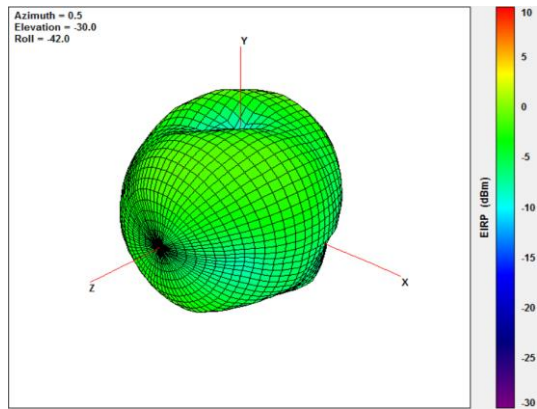
### 3.3.1. LTE MIMO1 3D Radiation Pattern



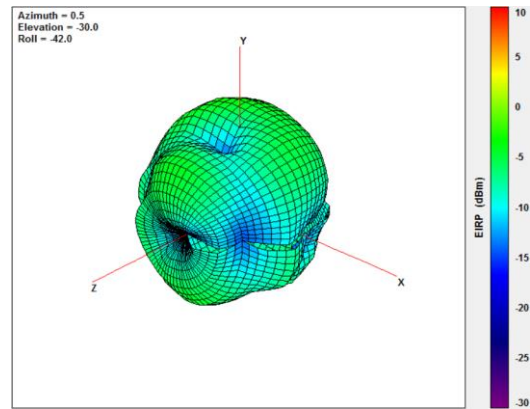
@756MHz



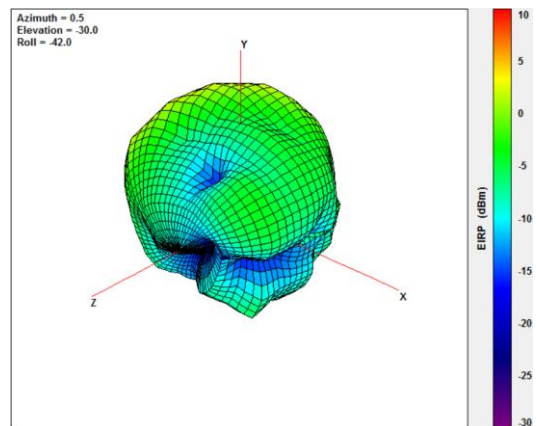
@824MHz



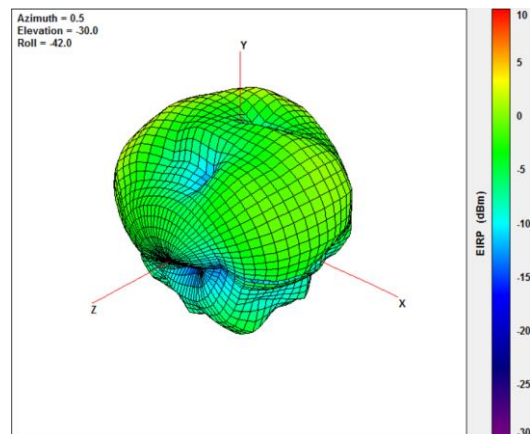
@880MHz



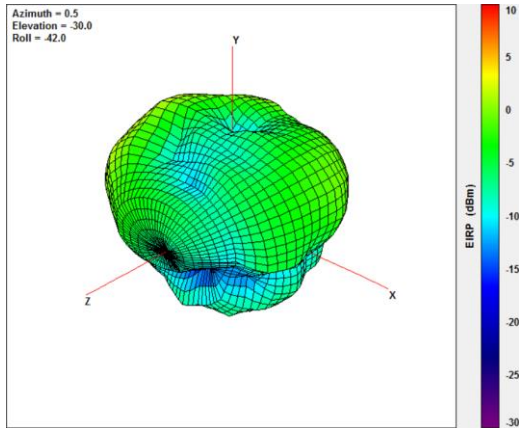
960MHz



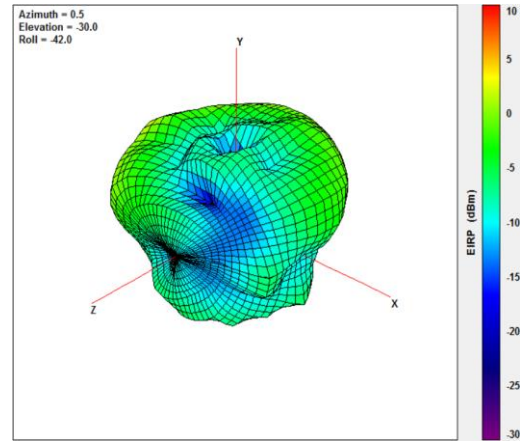
@1710MHz



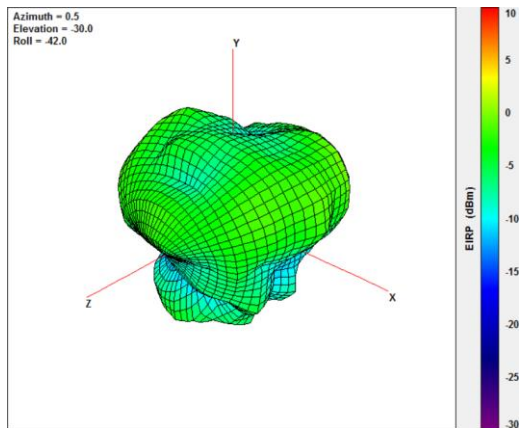
@1880MHz



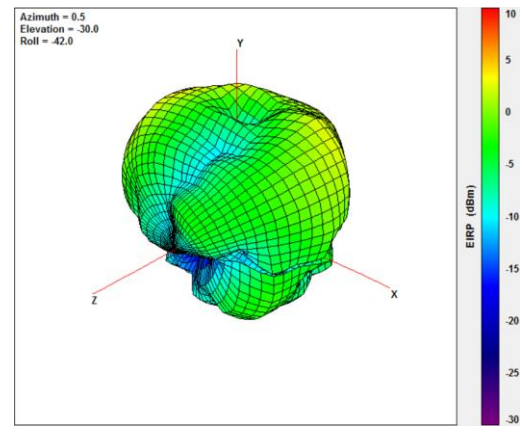
@1990MHz



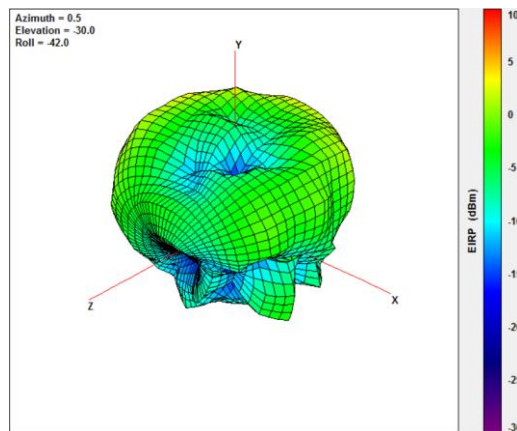
@2170MHz



@2300MHz



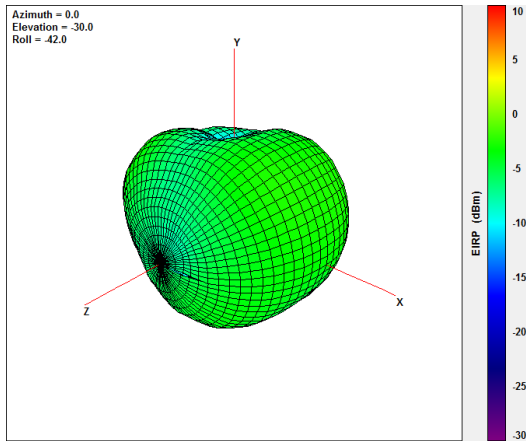
@2500MHz



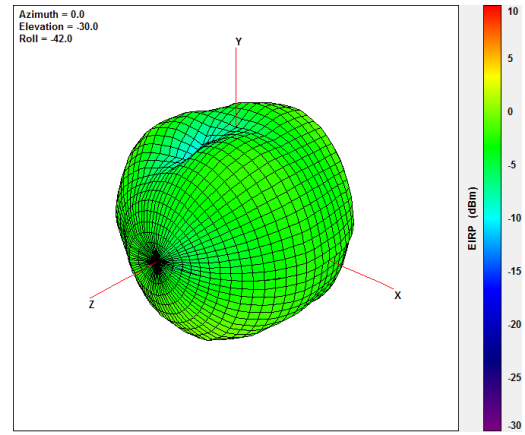
@2690MHz



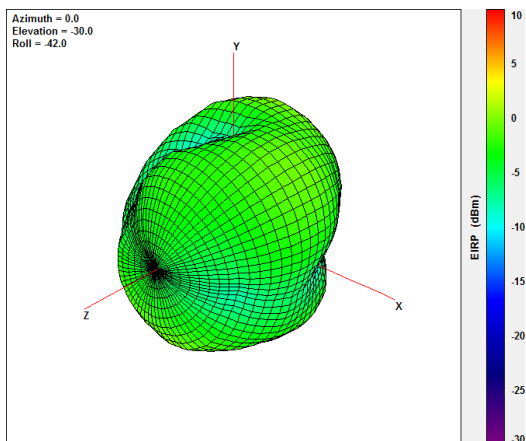
### 3.3.2. LTE MIMO2 3D Radiation Pattern



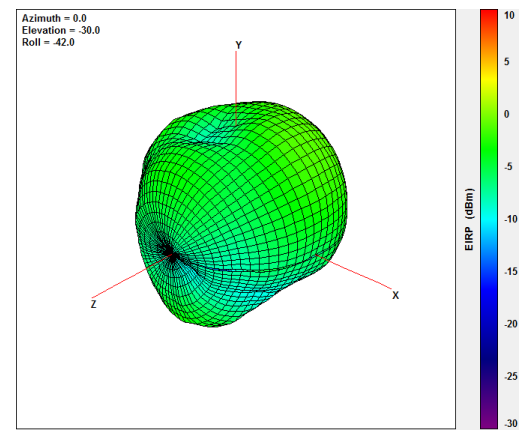
@756MHz



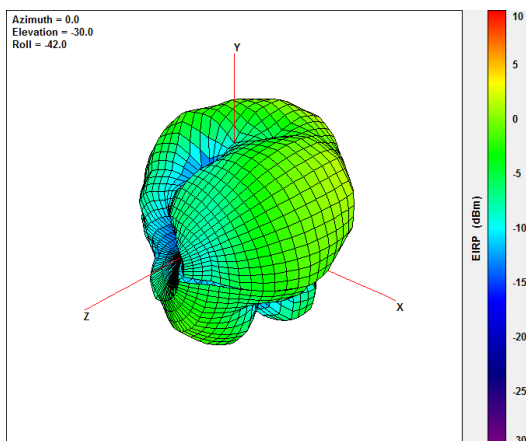
@824MHz



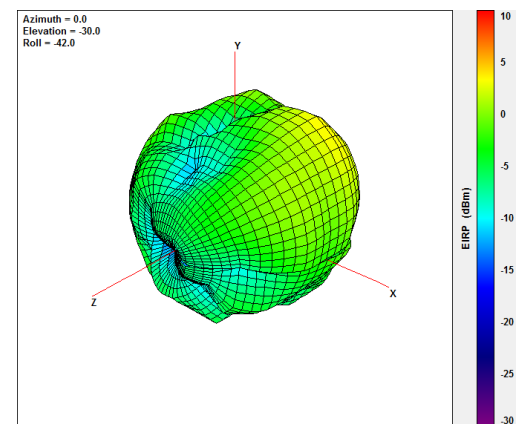
@88MHz



@960MHz

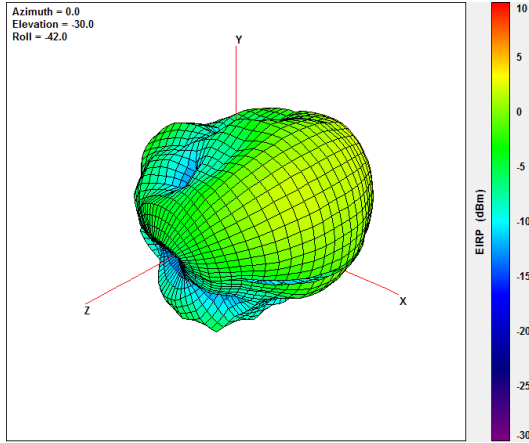


@1710MHz

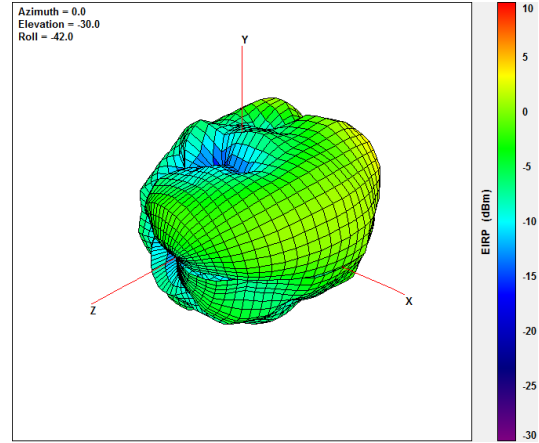


@1880MHz

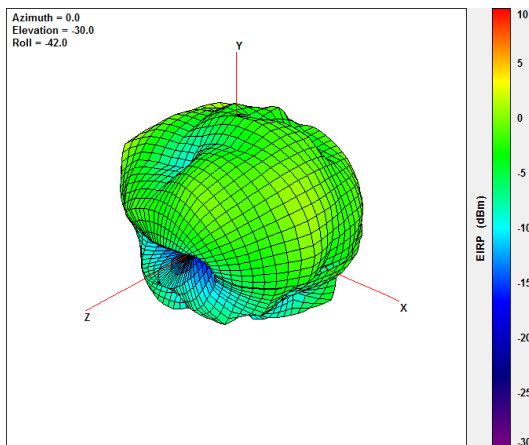




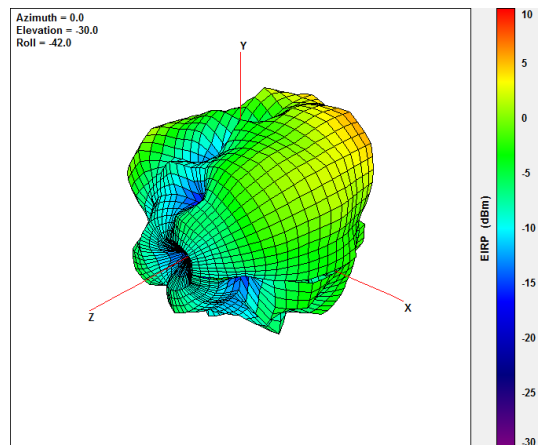
@1990MHz



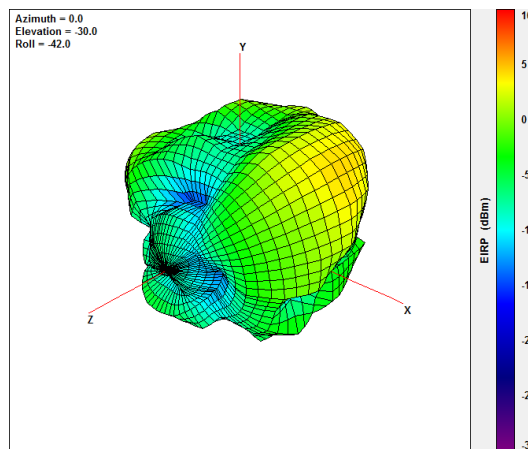
@2170MHz



@2300MHz



@2500MHz

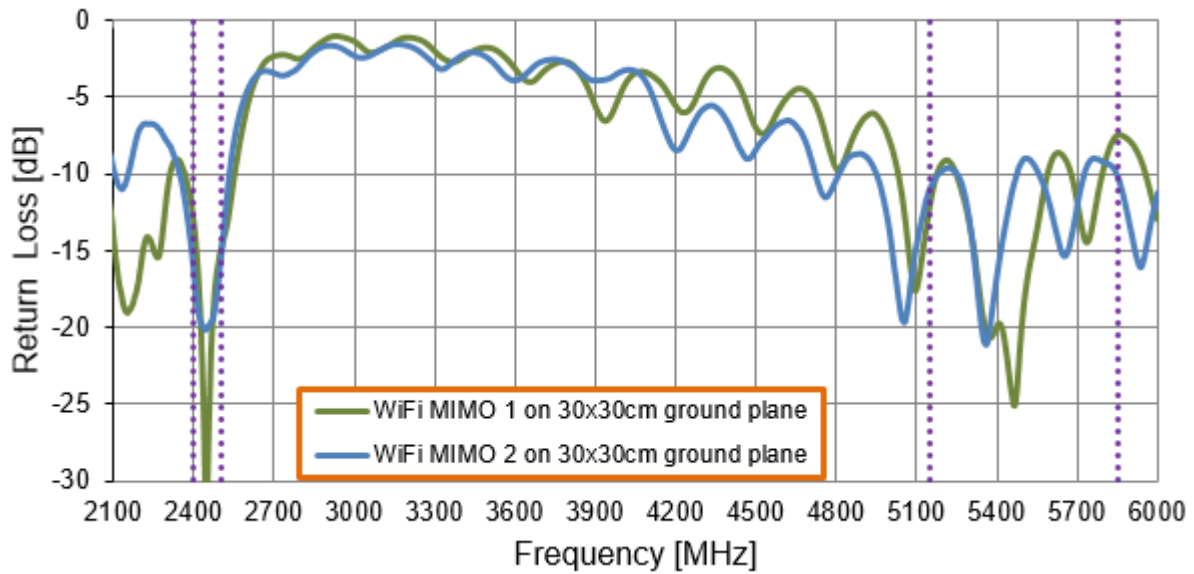


@2690MHz

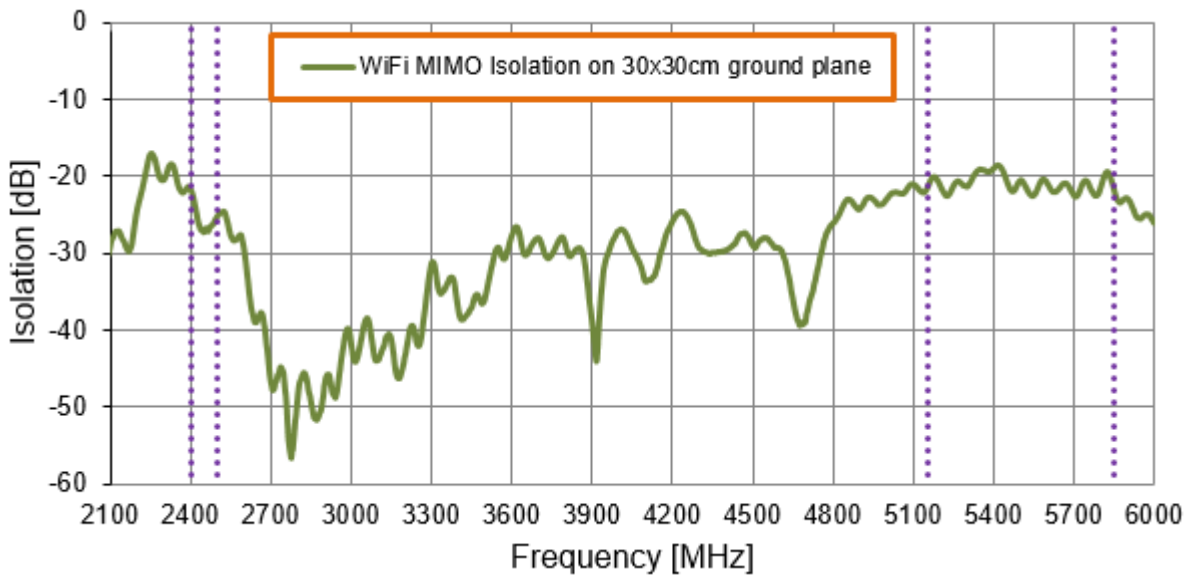
## 4. Wi-Fi 2.4/5.8GHz

### 4.1. Wi-Fi 2.4/5.8GHz Characteristics

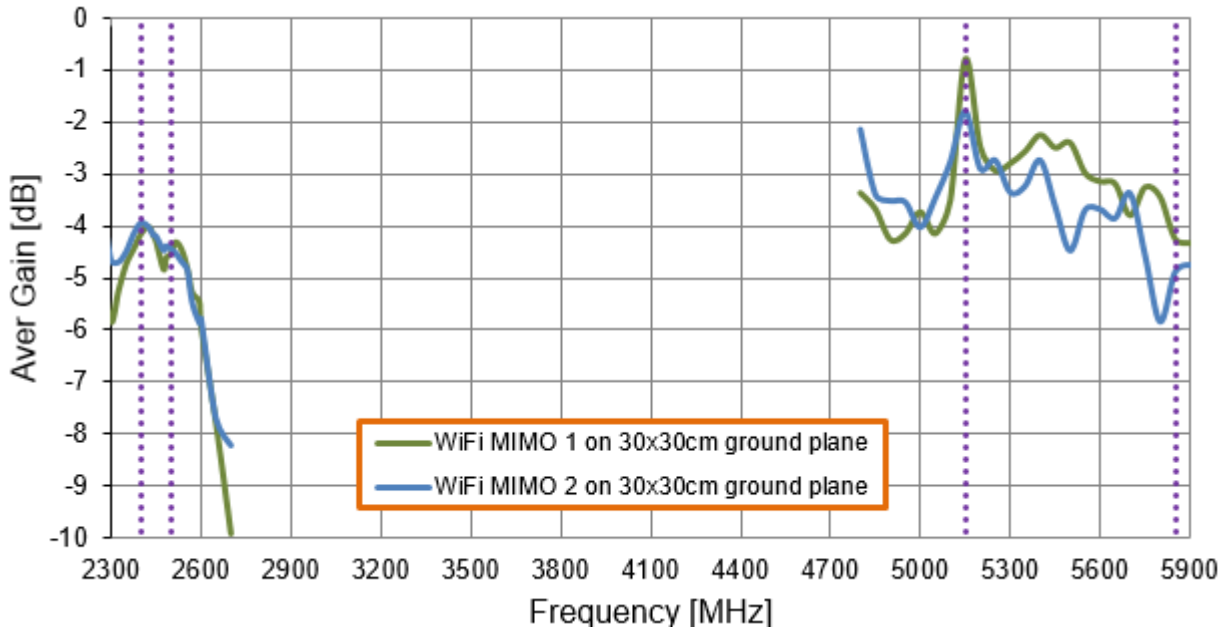
#### 4.1.1. Return Loss on 30\*30cm GND



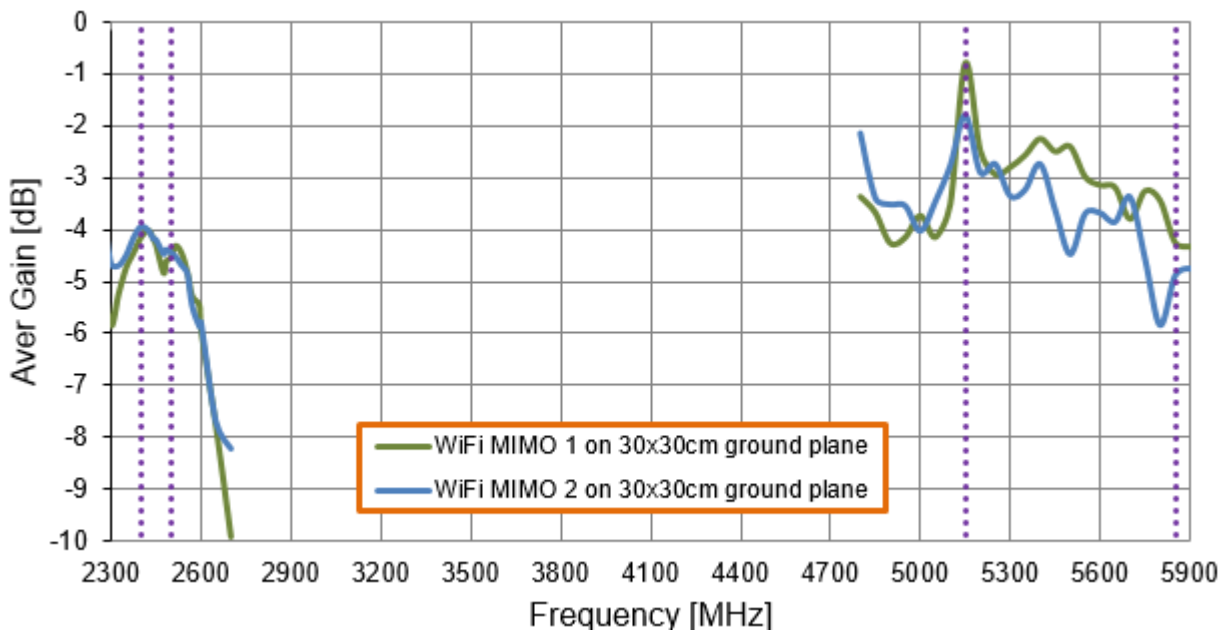
#### 4.1.2. Isolation on 30\*30cm GND



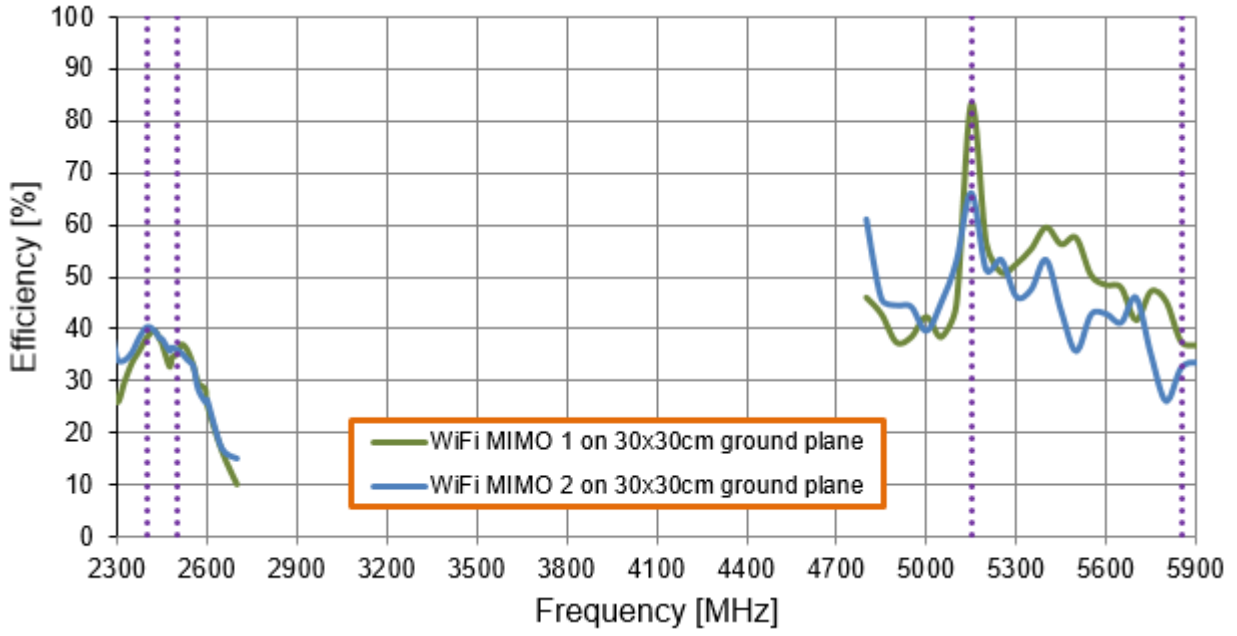
### 4.1.3. Average Gain on 30\*30cm GND



### 4.1.4. Peak Gain on 30\*30cm GND

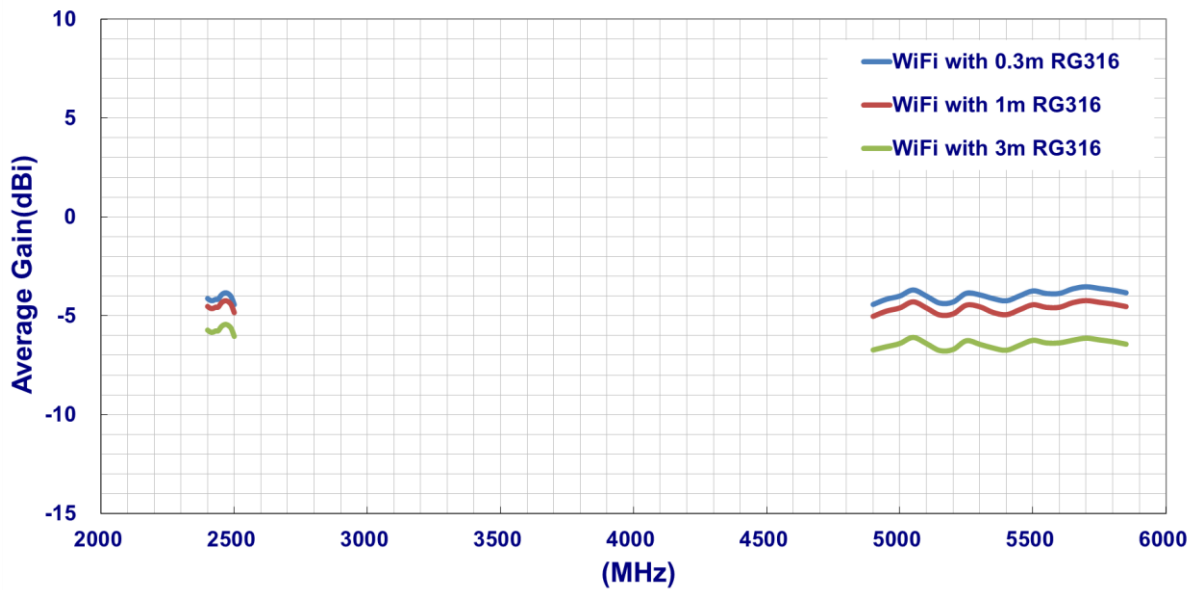


#### 4.1.5. Efficiency on 30\*30cm GND

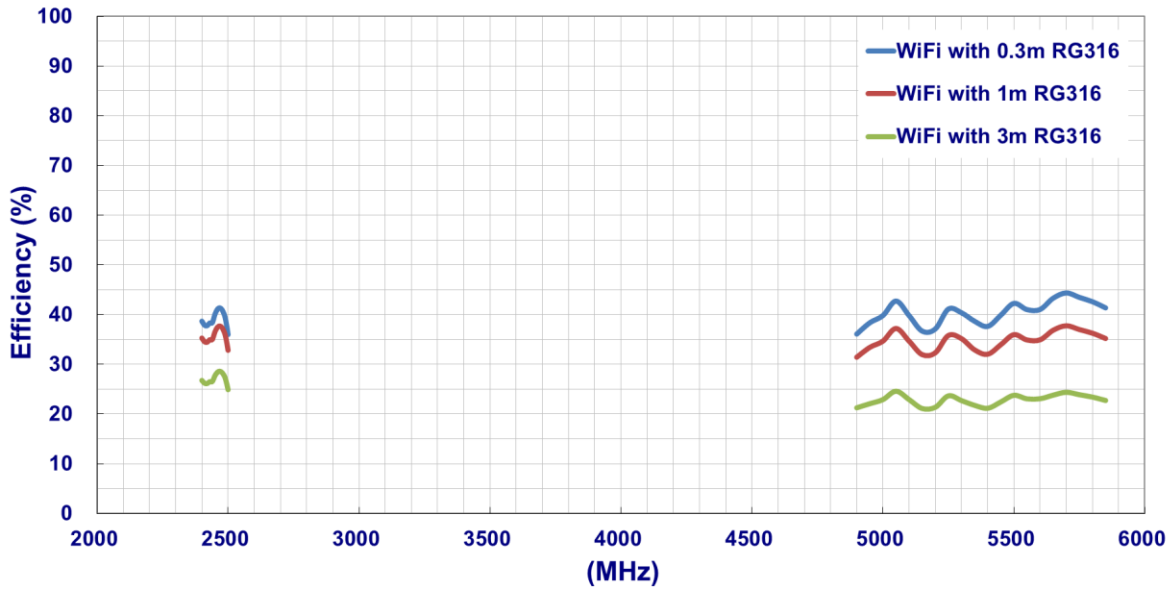


## 4.2. Wi-Fi Characteristics with different cable length

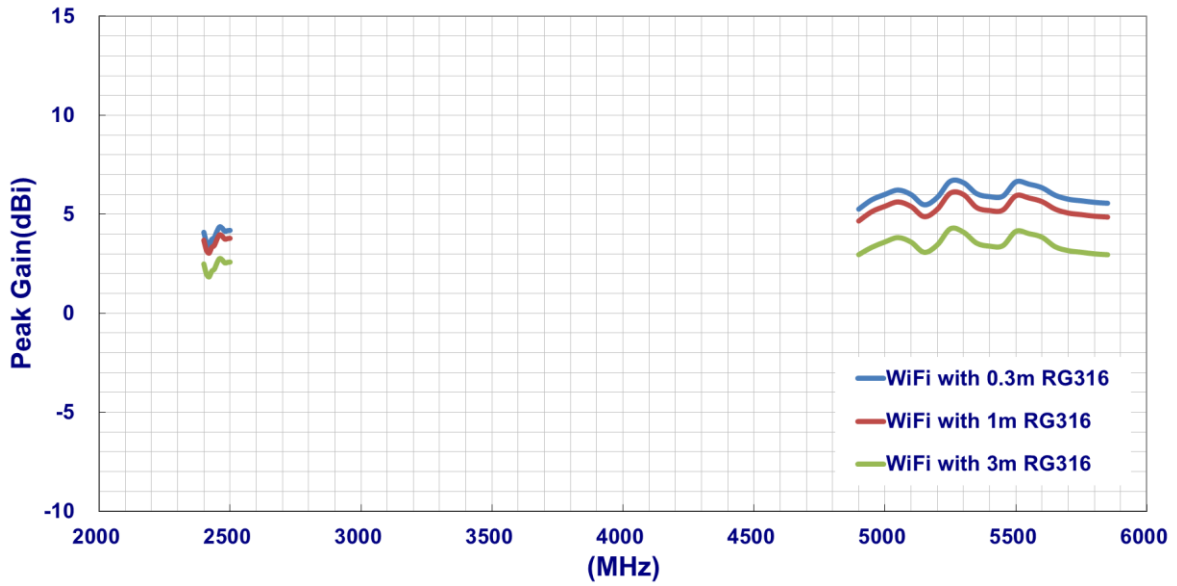
### 4.2.1. Average Gain



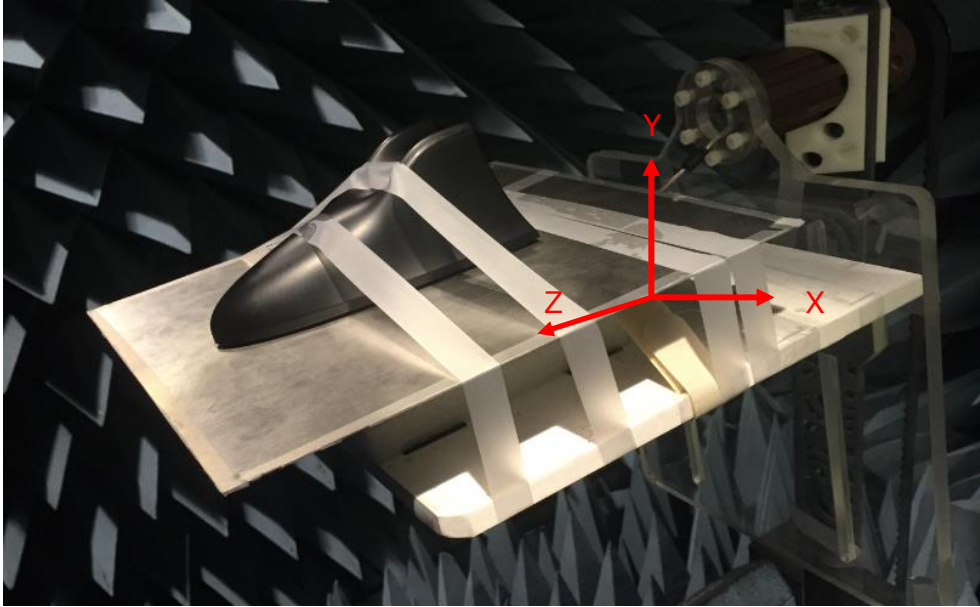
### 4.2.2. Peak Gain



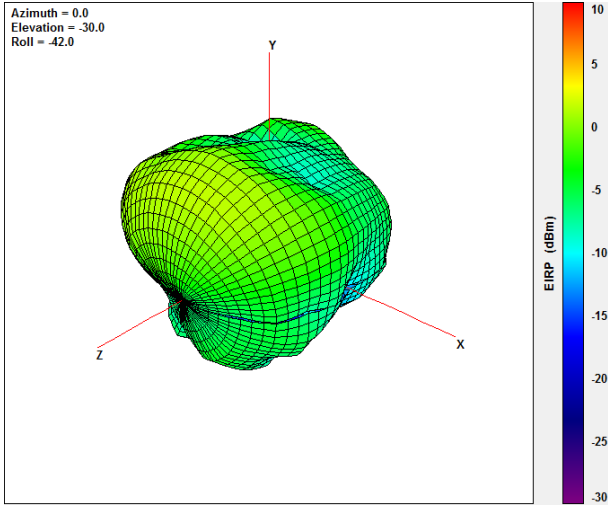
### 4.2.3. Efficiency



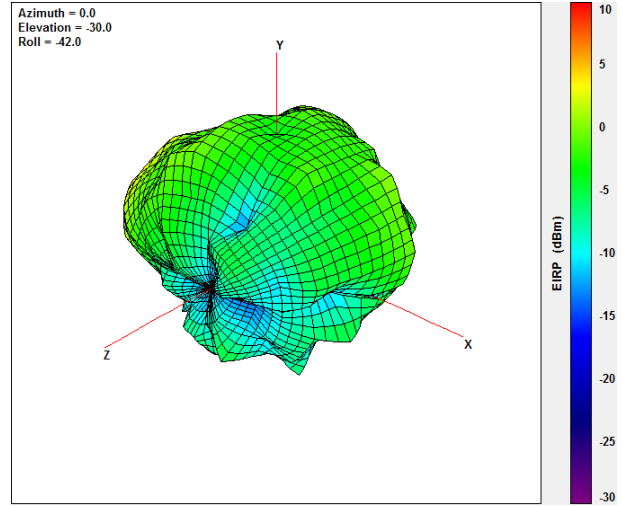
### 4.3. 3D Radiation Patterns



### 4.3.1. 2.4/5.8GHz Wi-Fi MIMO1 3D Radiation Pattern

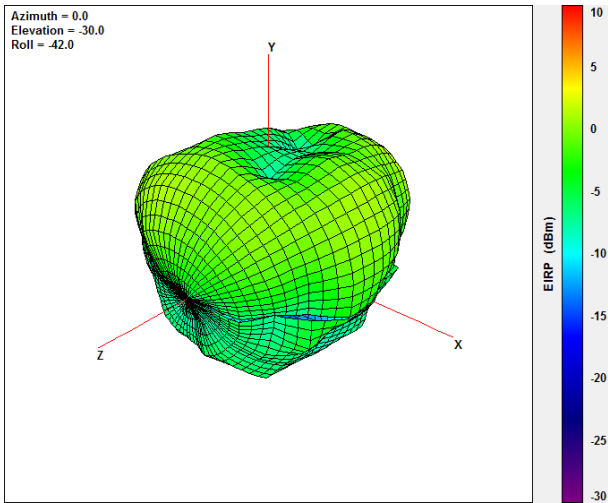


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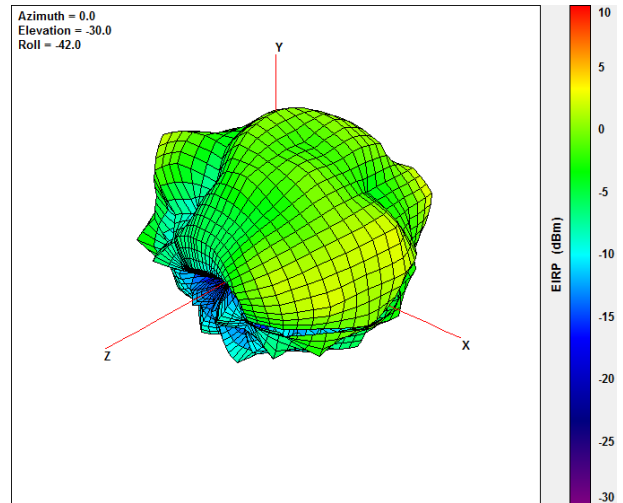


@5550MHz

### 4.3.2. 2.4/5.8GHz Wi-Fi MIMO2 3D Radiation Pattern



@2450MHz

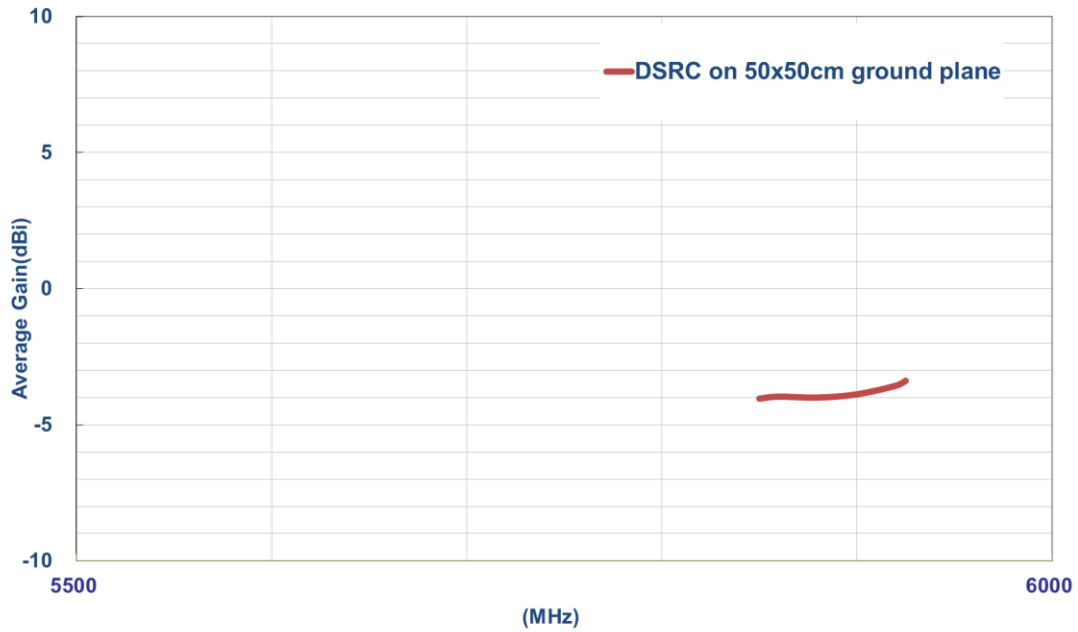


@5550MHz

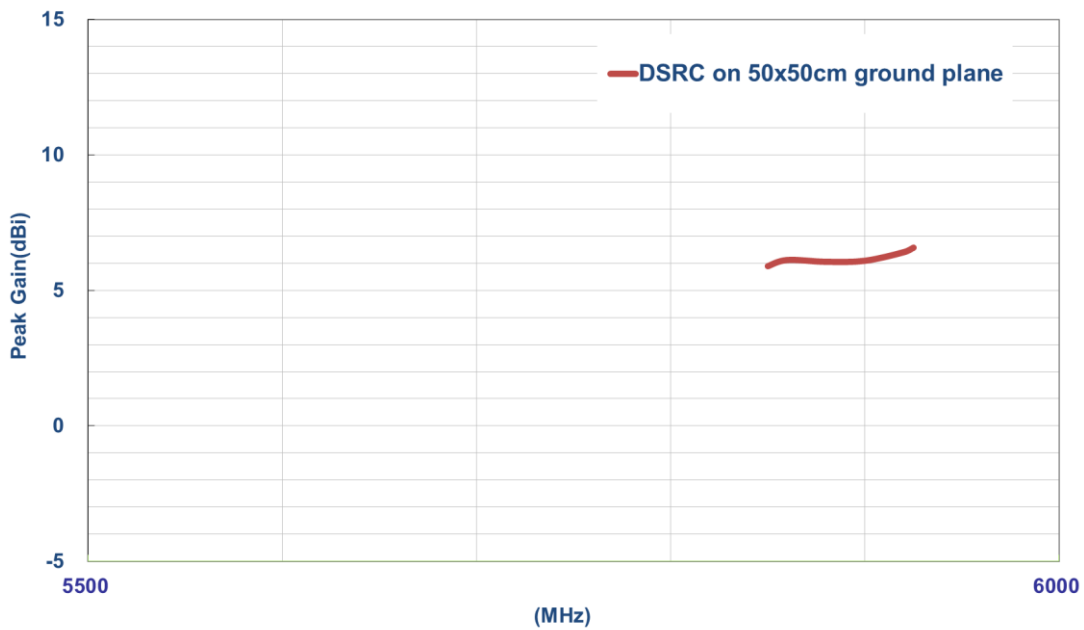
## 5. DSRC 5.9GHz

### 5.1. DSRC 5.9GHz Characteristics

#### 5.1.1. Average Gain on 50\*50cm GND

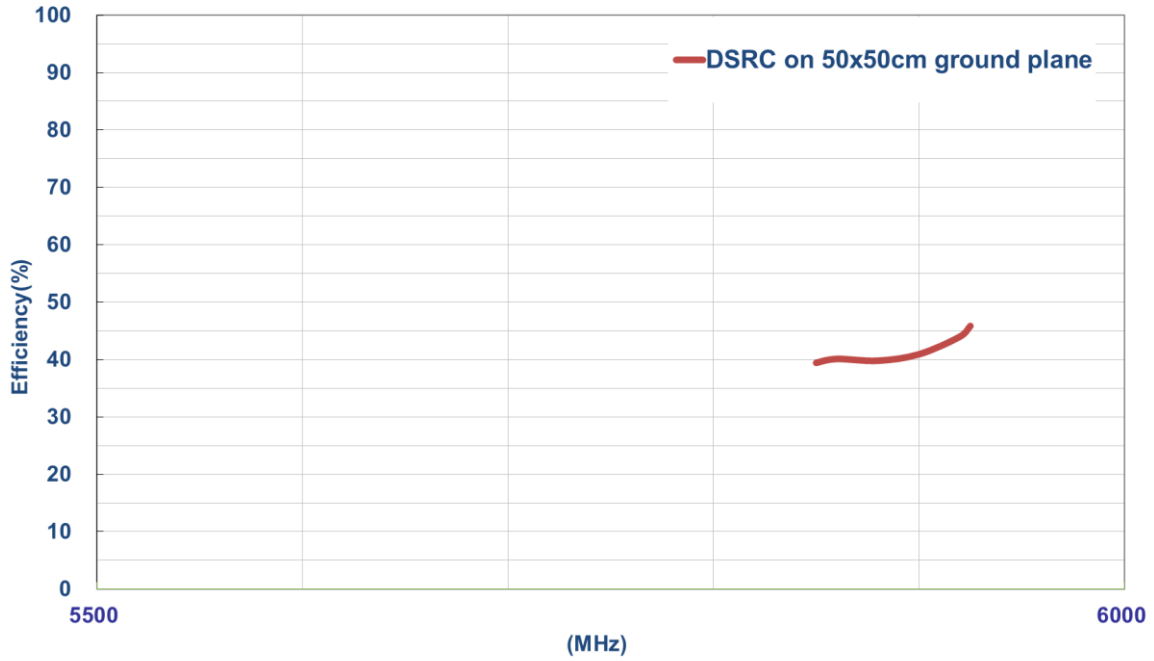


#### 5.1.2. Peak Gain on 50\*50cm GND



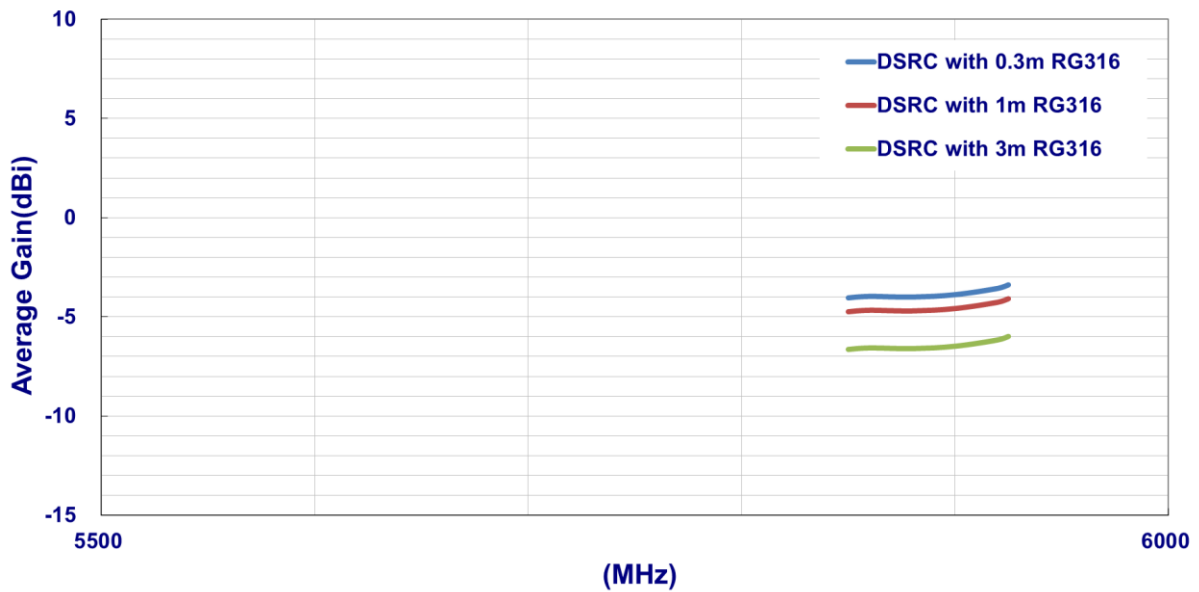


### 5.1.3. Efficiency on 50\*50cm GND

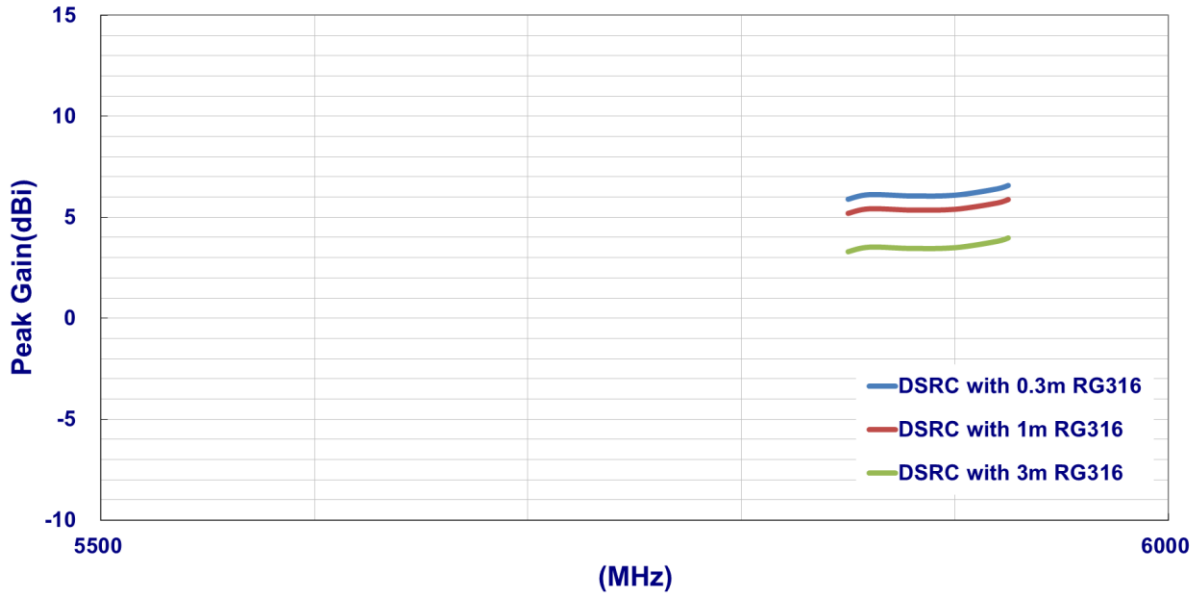


## 5.2. DSRC Characteristics with different cable length

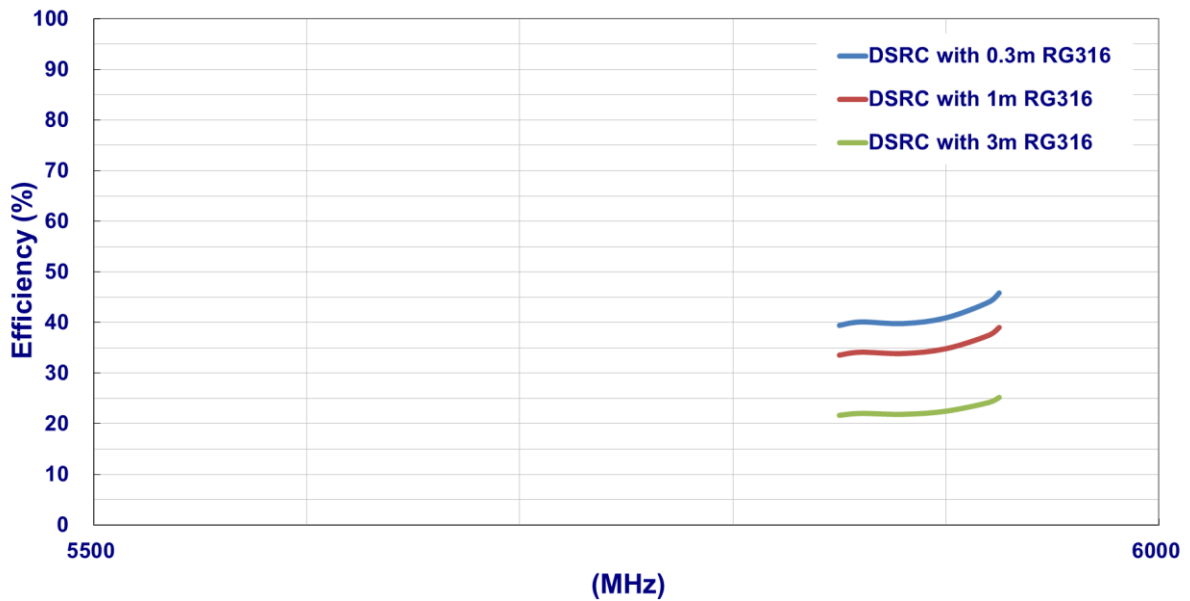
### 5.2.1. Average Gain



### 5.2.2. Peak Gain



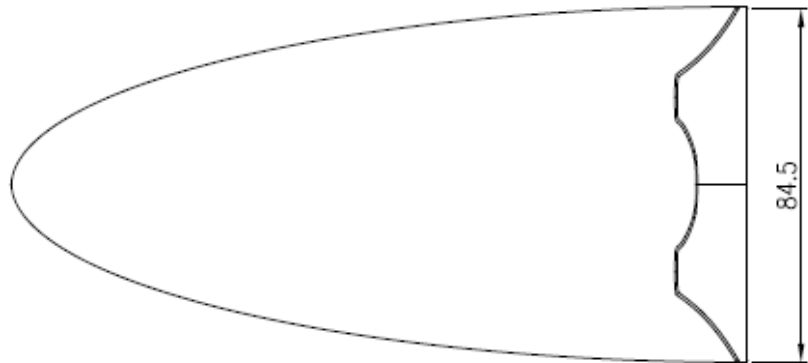
### 5.2.3. Efficiency



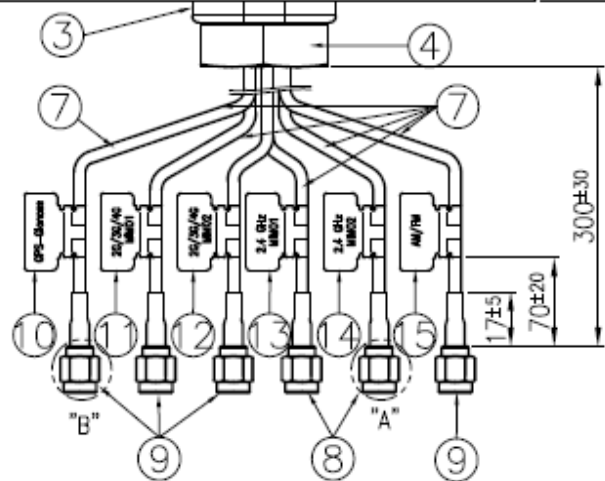
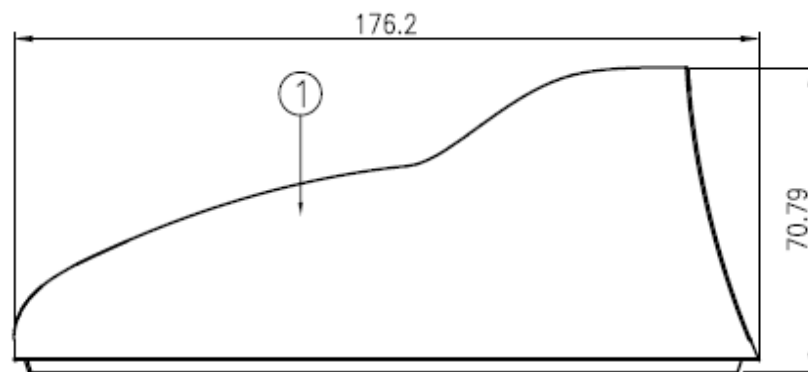


## 6. Drawing

Front View

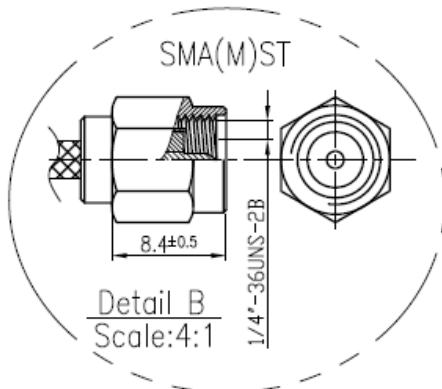
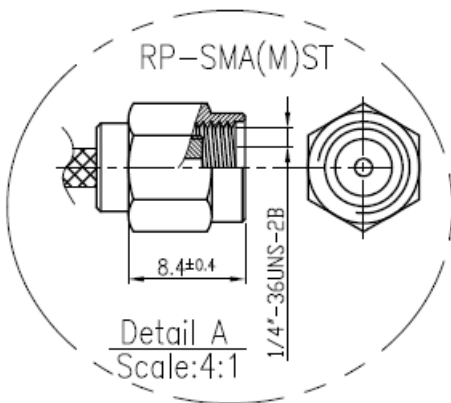
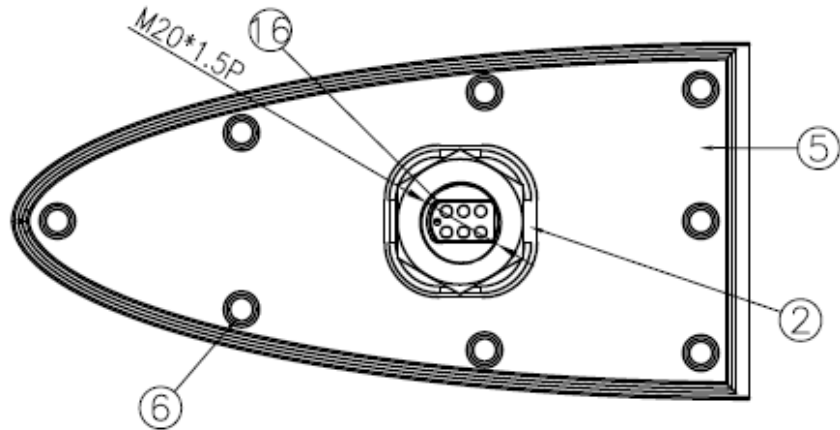


Side View





Back View



|    | Name                   | Material       | Finish       | QTY |
|----|------------------------|----------------|--------------|-----|
| 1  | Housing                | PC             | Black        | 1   |
| 2  | Base                   | Aluminum       | Natural      | 1   |
| 3  | Spacer                 | POM            | Black        | 1   |
| 4  | Nut                    | Steel          | Ni Plated    | 1   |
| 5  | Rubber                 | Silicon Rubber | Black        | 1   |
| 6  | Screw TP-1 $\phi$ 3x14 | Steel          | Ni Plated    | 8   |
| 7  | RG316 Coaxial Cable    | FEP            | Brown        | 6   |
| 8  | RP-SMA(M)ST            | Brass          | Gold         | 2   |
| 9  | SMA(M)ST               | Brass          | Gold         | 4   |
| 10 | GPS-Glonass Label      | Coated Paper   | Orange       | 1   |
| 11 | 2G/3G/4G MIM01 Label   | Coated Paper   | Light Gray   | 1   |
| 12 | 2G/3G/4G MIM02 Label   | Coated Paper   | White        | 1   |
| 13 | 2.4 GHz MIM01 Label    | Coated Paper   | Sea Green    | 1   |
| 14 | 2.4 GHz MIM02 Label    | Coated Paper   | Forest Green | 1   |
| 15 | AM/FM Label            | Coated Paper   |              | 1   |
| 16 | Rubber                 | Silicon Rubber | Black        | 1   |

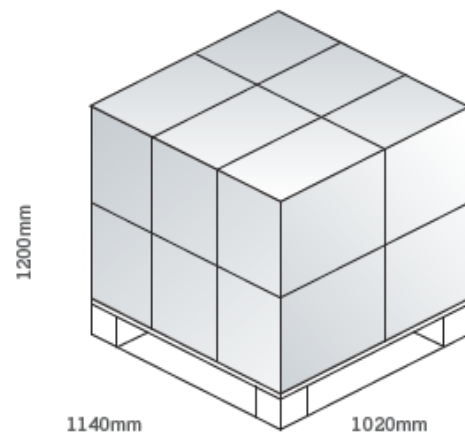
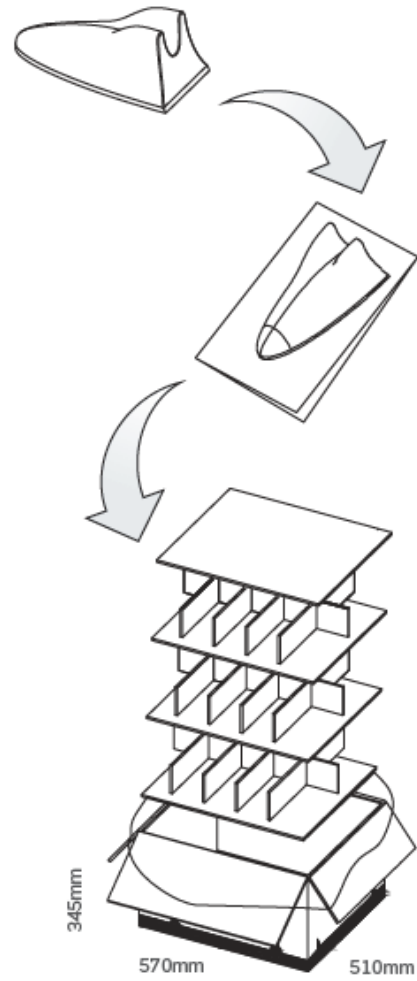
## 7. Packaging

### MA1130.A.LBICGT.001 Packaging Specifications

1 pcs MA850.A.LBICG.002 per Blister Top Cover  
Blister Top Dimensions - 211 x 110 x 85mm  
Weight - 390g

16 pcs MA1130.A.LBICGT.001 per carton  
Carton - 570 x 510 x 345mm  
Weight - 10.8Kg

Pallet Dimensions 1140 x 1020 x 1200mm  
12 Cartons per Pallet  
6 Cartons per layer  
2 Layers





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