

## SPECIFICATION

|              |   |   |
|--------------|---|---|
| Part No.     | : | <b>MA673.A.CGH.004</b>  |
| Product Name | : | Spartan Antenna 3in1 MA673<br>Low Profile Screw-Mount (Permanent Mount)<br>3 * 2.4/5.8GHz MIMO 802.11ac antenna   |
| Features     | : | 802.11ac compatible<br>IP67 Waterproof<br>High Efficiency / Peak Gain Outdoor Antenna<br>Advanced RF Design and Materials<br>Standard 3M CFD-200 RP-SMA(M)<br><b>RoHS Compliant</b> |



## **1. Introduction**

The Spartan MA673 2.4 / 4.9~5.8GHz 3\*MIMO antenna is a low profile, heavy-duty, fully IP67 waterproof external antenna for use in 802.11ac high data throughput and video broadcast applications.

The Spartan is unique in the market because it combines three 2.4 / 4.9~5.8GHz antenna elements in a heavy-duty antenna with high efficiency in a low profile and high quality aesthetic styled housing. The antenna screws down permanently onto a roof or metal panel and can be pole or wall-mounted.

Care has been taken to optimize the isolation at more than 20dB from any one antenna to the other, and radiation patterns are distinct allowing for greater de-correlation, vital factors for optimization of MIMO system efficiency.

For industries such as remote monitoring, smart meter systems, construction equipment, public safety at only 40mm high, the Spartan provides an unobtrusive, robust, rugged antenna that is durable even in extreme environments. This specification shows the true performance including 3 meters of cable loss. If cable is shorter antenna performance will increase even more.

## 2. Specification

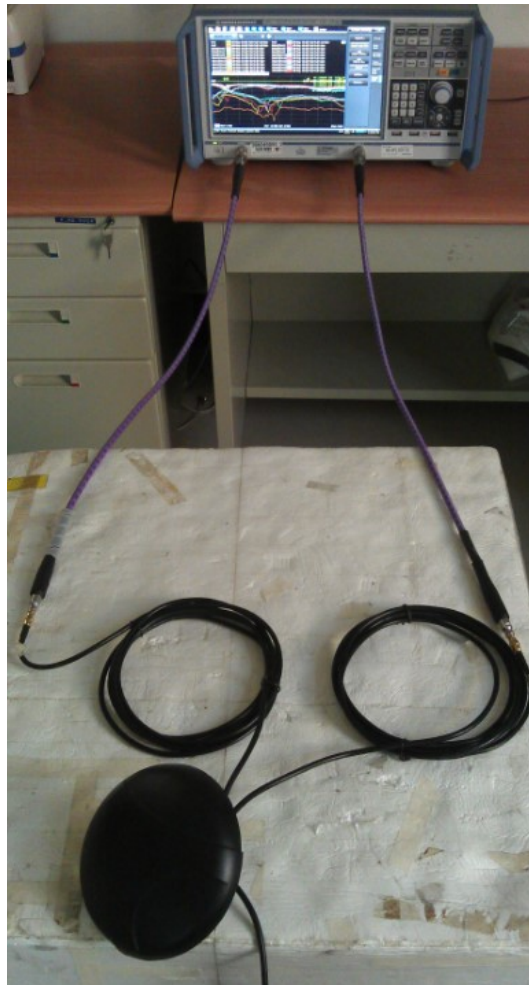
| ELECTRICAL               |           |              |              |              |              |              |              |              |              |
|--------------------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Frequency (MHz)          |           | 2400MHz      | 2450MHz      | 2500MHz      | 4900MHz      | 5150MHz      | 5350MHz      | 5725MHz      | 5850MHz      |
| <b>Efficiency (%)</b>    |           |              |              |              |              |              |              |              |              |
| 2.4/5GHz MIMO 1          | 1M        | 66.38        | 72.74        | 71.97        | 42.13        | 57.11        | 57.50        | 60.02        | 48.22        |
|                          | 2M        | 57.82        | 63.35        | 62.68        | 34.24        | 46.42        | 46.74        | 48.79        | 38.31        |
|                          | <b>3M</b> | <b>50.36</b> | <b>53.92</b> | <b>53.35</b> | <b>28.48</b> | <b>37.73</b> | <b>37.99</b> | <b>38.75</b> | <b>31.14</b> |
|                          | 5M        | 39.09        | 41.86        | 40.47        | 18.82        | 24.93        | 25.10        | 25.02        | 20.10        |
| 2.4/5GHz MIMO 2          | 1M        | 43.38        | 45.94        | 42.44        | 46.39        | 50.96        | 49.13        | 54.72        | 49.65        |
|                          | 2M        | 37.78        | 40.01        | 36.96        | 37.71        | 41.42        | 39.94        | 44.48        | 39.44        |
|                          | <b>3M</b> | <b>32.91</b> | <b>34.06</b> | <b>31.46</b> | <b>31.37</b> | <b>33.67</b> | <b>32.46</b> | <b>35.33</b> | <b>32.06</b> |
|                          | 5M        | 25.54        | 26.44        | 23.86        | 20.72        | 22.25        | 21.45        | 22.81        | 20.70        |
| 2.4/5GHz MIMO 3          | 1M        | 50.96        | 60.66        | 51.48        | 31.84        | 62.67        | 58.42        | 35.87        | 34.80        |
|                          | 2M        | 44.38        | 52.83        | 44.83        | 25.88        | 50.94        | 47.49        | 29.16        | 27.64        |
|                          | <b>3M</b> | <b>38.66</b> | <b>44.97</b> | <b>38.16</b> | <b>21.53</b> | <b>41.41</b> | <b>38.60</b> | <b>23.16</b> | <b>22.47</b> |
|                          | 5M        | 30.01        | 34.91        | 28.95        | 14.22        | 27.36        | 25.50        | 14.95        | 14.51        |
| <b>Average Gain(dBi)</b> |           |              |              |              |              |              |              |              |              |
| 2.4/5GHz MIMO 1          | 1M        | -1.78        | -1.38        | -1.43        | -3.75        | -2.43        | -2.40        | -2.22        | -3.17        |
|                          | 2M        | -2.38        | -1.98        | -2.03        | -4.65        | -3.33        | -3.30        | -3.12        | -4.17        |
|                          | <b>3M</b> | <b>-2.98</b> | <b>-2.68</b> | <b>-2.73</b> | <b>-5.45</b> | <b>-4.23</b> | <b>-4.20</b> | <b>-4.12</b> | <b>-5.07</b> |
|                          | 5M        | -4.08        | -3.78        | -3.93        | -7.25        | -6.03        | -6.00        | -6.02        | -6.97        |
| 2.4/5GHz MIMO 2          | 1M        | -3.63        | -3.38        | -3.72        | -3.34        | -2.93        | -3.09        | -2.62        | -3.04        |
|                          | 2M        | -4.23        | -3.98        | -4.32        | -4.24        | -3.83        | -3.99        | -3.52        | -4.04        |
|                          | <b>3M</b> | <b>-4.42</b> | <b>-4.68</b> | <b>-5.02</b> | <b>-5.04</b> | <b>-4.73</b> | <b>-4.89</b> | <b>-4.52</b> | <b>-4.94</b> |
|                          | 5M        | -5.93        | -5.78        | -6.22        | -6.84        | -6.53        | -6.69        | -6.42        | -6.84        |
| 2.4/5GHz MIMO 3          | 1M        | -2.93        | -2.17        | -2.88        | -4.97        | -2.03        | -2.33        | -4.45        | -4.58        |
|                          | 2M        | -3.53        | -2.77        | -3.48        | -5.87        | -2.93        | -3.23        | -5.35        | -5.58        |
|                          | <b>3M</b> | <b>-4.13</b> | <b>-3.47</b> | <b>-4.18</b> | <b>-6.67</b> | <b>-3.83</b> | <b>-4.13</b> | <b>-6.35</b> | <b>-6.48</b> |
|                          | 5M        | -5.23        | -4.57        | -5.38        | -8.47        | -5.63        | -7.13        | -8.25        | -8.38        |
| <b>Peak Gain(dBi)</b>    |           |              |              |              |              |              |              |              |              |
| 2.4/5GHz MIMO 1          | 1M        | 2.33         | 3.04         | 3.27         | 3.51         | 5.00         | 4.86         | 5.11         | 3.69         |
|                          | 2M        | 1.73         | 2.44         | 2.67         | 2.61         | 4.10         | 3.96         | 4.21         | 2.69         |
|                          | <b>3M</b> | <b>1.13</b>  | <b>1.74</b>  | <b>1.97</b>  | <b>1.81</b>  | <b>3.20</b>  | <b>3.06</b>  | <b>3.21</b>  | <b>1.79</b>  |
|                          | 5M        | 0.03         | 0.64         | 0.77         | 0.01         | 1.40         | 1.26         | 1.31         | -0.11        |
| 2.4/5GHz MIMO 2          | 1M        | 2.47         | 2.38         | 1.84         | 3.48         | 3.16         | 2.46         | 3.50         | 3.66         |
|                          | 2M        | 1.87         | 1.78         | 1.24         | 2.58         | 2.26         | 1.56         | 2.60         | 2.66         |
|                          | <b>3M</b> | <b>1.60</b>  | <b>1.08</b>  | <b>0.54</b>  | <b>1.78</b>  | <b>1.36</b>  | <b>0.66</b>  | <b>1.60</b>  | <b>1.76</b>  |
|                          | 5M        | 0.17         | -0.02        | -0.66        | -0.02        | -0.44        | -1.14        | -0.30        | -0.14        |
| 2.4/5GHz MIMO 3          | 1M        | 3.66         | 4.11         | 3.42         | 3.17         | 5.64         | 4.79         | 3.29         | 3.33         |
|                          | 2M        | 3.06         | 3.51         | 2.82         | 2.27         | 4.74         | 3.89         | 2.39         | 2.33         |
|                          | <b>3M</b> | <b>2.92</b>  | <b>2.81</b>  | <b>2.12</b>  | <b>1.47</b>  | <b>3.84</b>  | <b>2.99</b>  | <b>1.39</b>  | <b>1.43</b>  |
|                          | 5M        | 1.36         | 1.71         | 0.92         | -0.33        | 2.04         | 25.50        | -0.51        | -0.47        |
| Impedance                |           |              |              |              | 50Ω          |              |              |              |              |
| Polarization             |           |              |              |              | Linear       |              |              |              |              |
| Radiation Pattern        |           |              |              |              | Omni         |              |              |              |              |
| Input Power              |           |              |              |              | 5 W          |              |              |              |              |

| MECHANICAL                      |                                   |
|---------------------------------|-----------------------------------|
| Antenna Dimensions              | Height 65.35mm x Diameter 147.5mm |
| Casing                          | Wonderloy PC-540                  |
| Base and thread                 | CAN10 Zinc Alloy                  |
| Waterproof                      | IP67                              |
| Thread diameter                 | M30 x 2 Thread 32L                |
| Nut                             | Nickel Plated Steel               |
| Foam                            | CR-4305                           |
| 3M Adhesive                     | 3M 9448 HK                        |
| Cable                           | CFD-200 Low Loss Coaxial Cable    |
| Cable length                    | 3 meters, fully customizable      |
| Connector                       | RP-SMA(M) ST, fully customizable  |
| Weight(Antenna unpackaged)      | 0.908kg                           |
| Weight(Antenna Individual Box)  | 1.078kg                           |
| Recommended Torque for Mounting | 49N·m                             |
| Max Torque for Mounting         | 58.8N·m                           |
| ENVIRONMENTAL                   |                                   |
| Operation Temperature           | -30°C to 85°C                     |
| Storage Temperature             | -40°C to 90°C                     |
| Humidity                        | Non-condensing 65°C 95% RH        |

## 3. Antenna Characteristics

### 3.1 Testing setup

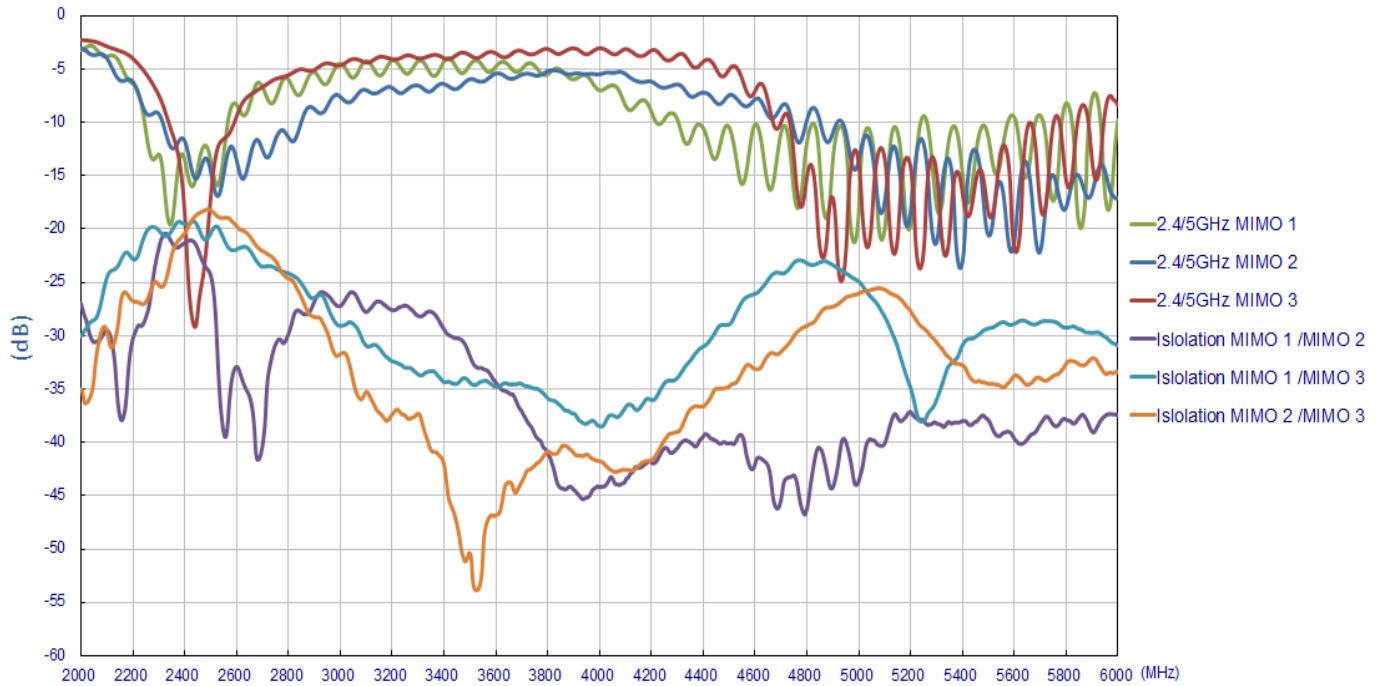
**MA673 antenna was tested with R&S ZNB-8 network analyzer.**



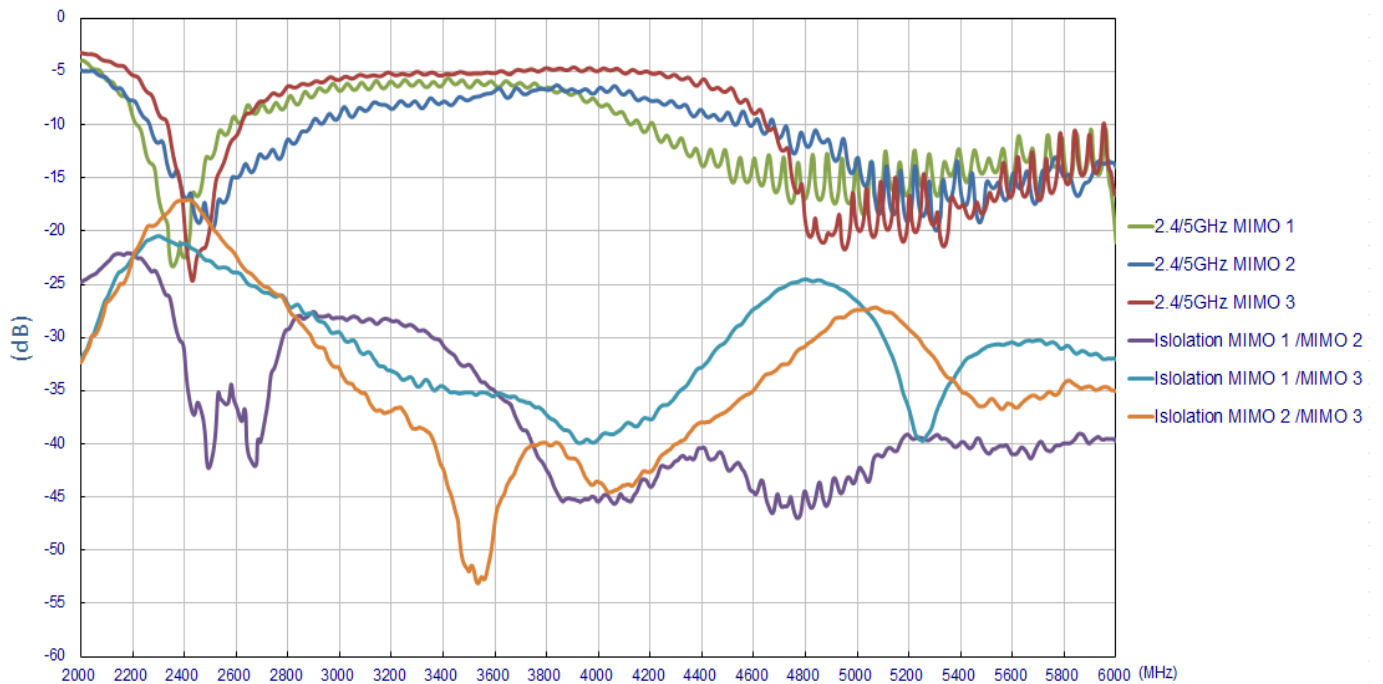
**In free space**

## 3.2 Return Loss and Isolation

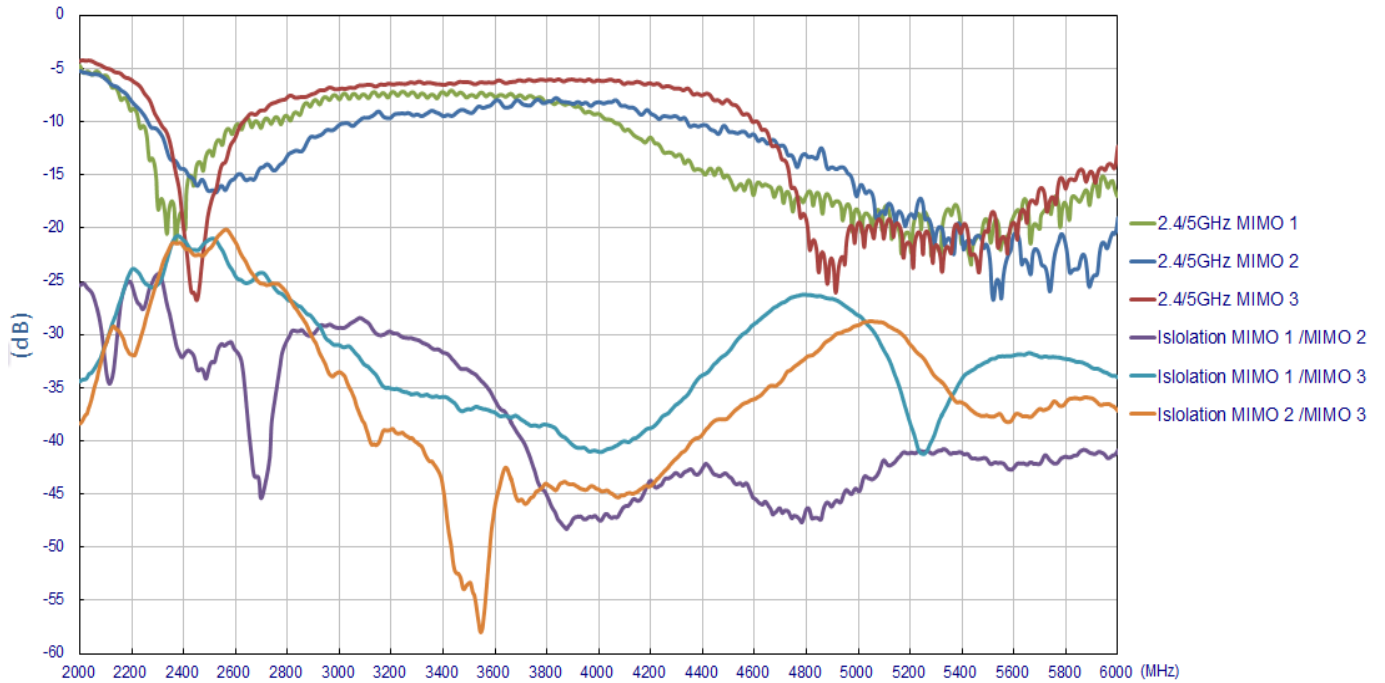
### 3.2.1 With 1M coaxial cable



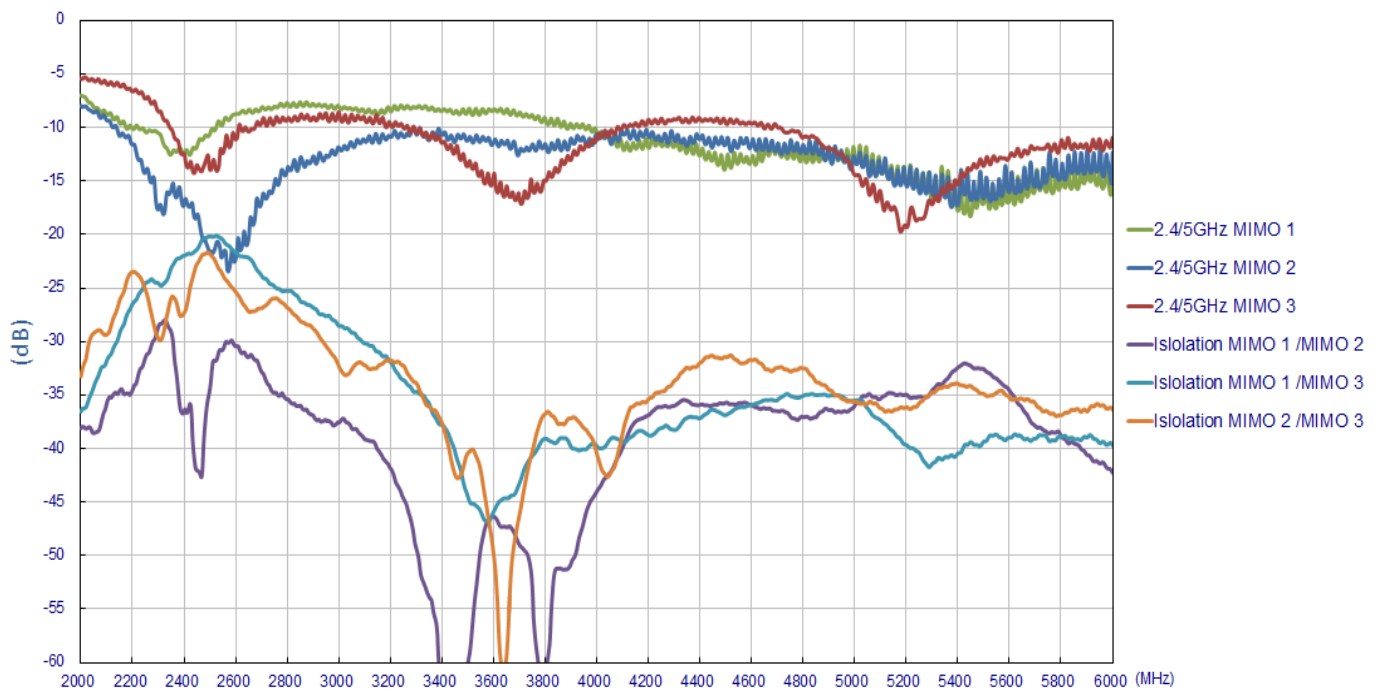
### 3.2.2 With 2M coaxial cable



### 3.2.3 With 3M coaxial cable

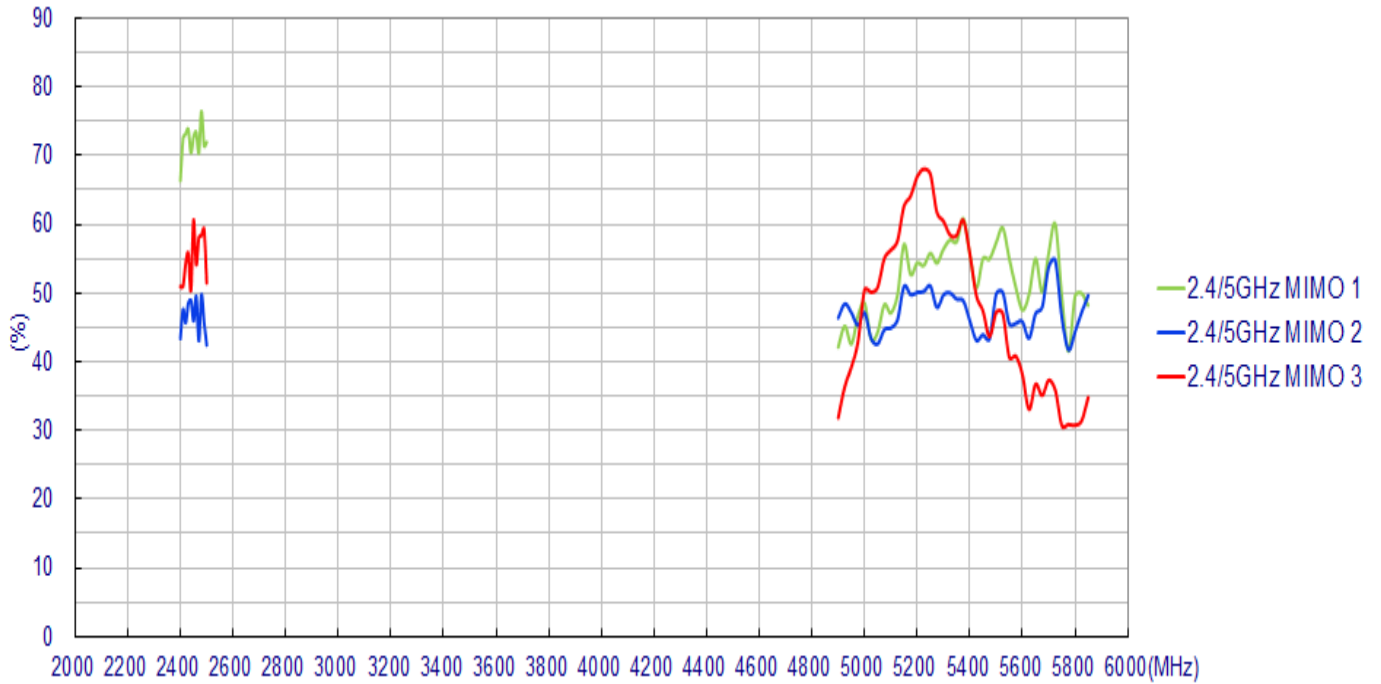


### 3.2.4 With 5M coaxial cable

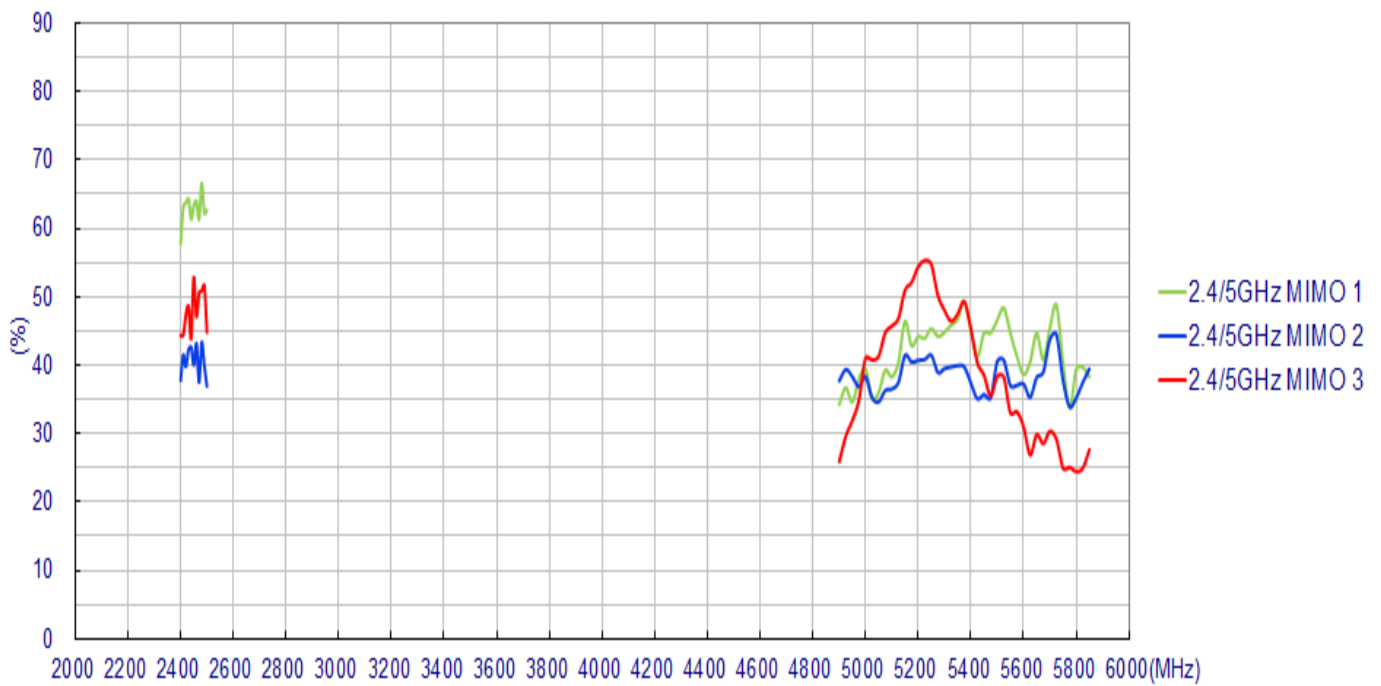


### 3.3 Efficiency

#### 3.3.1 With 1M coaxial cable

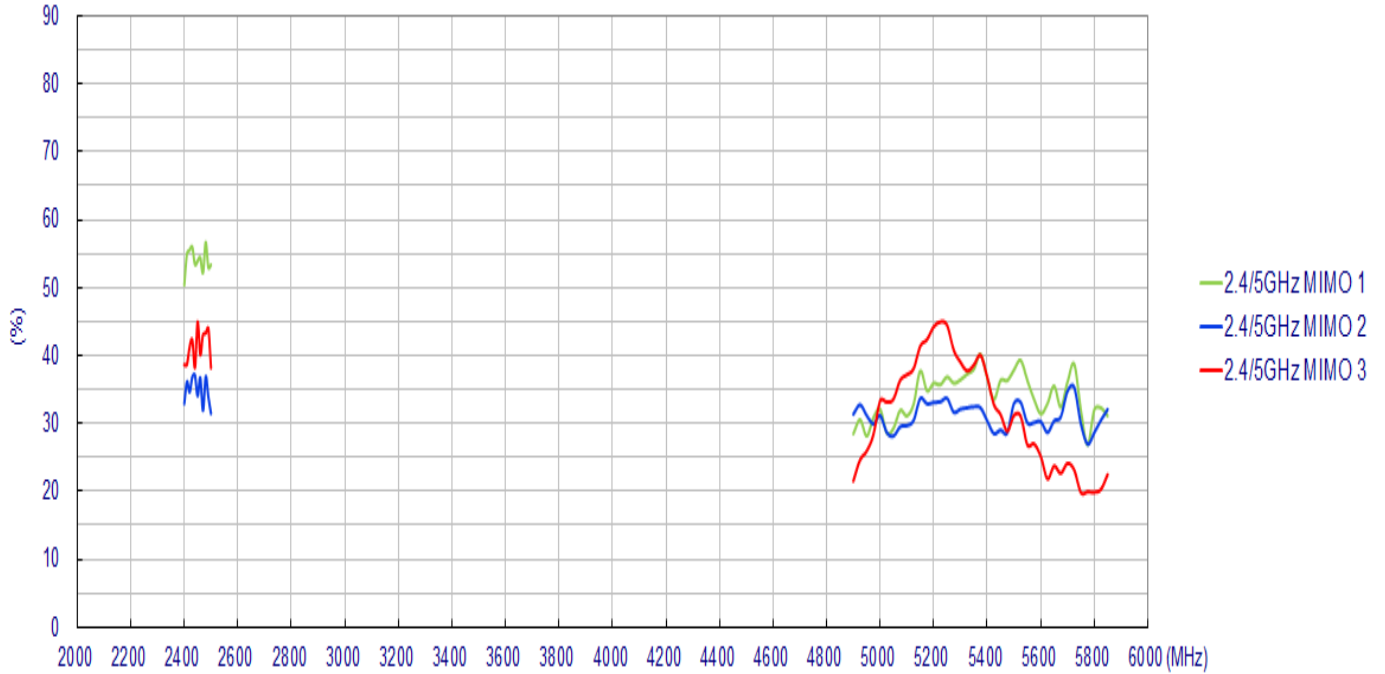


#### 3.3.2 With 2M coaxial cable

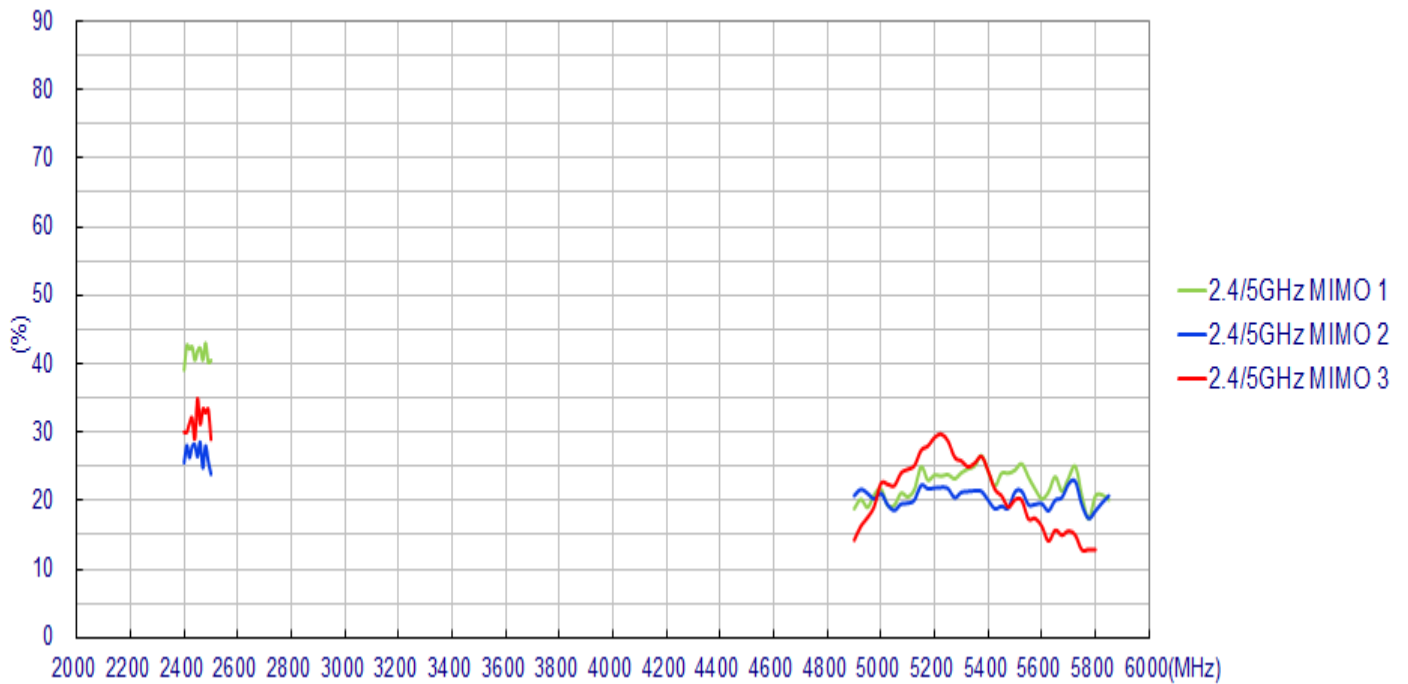




### 3.3.3 With 3M coaxial cable

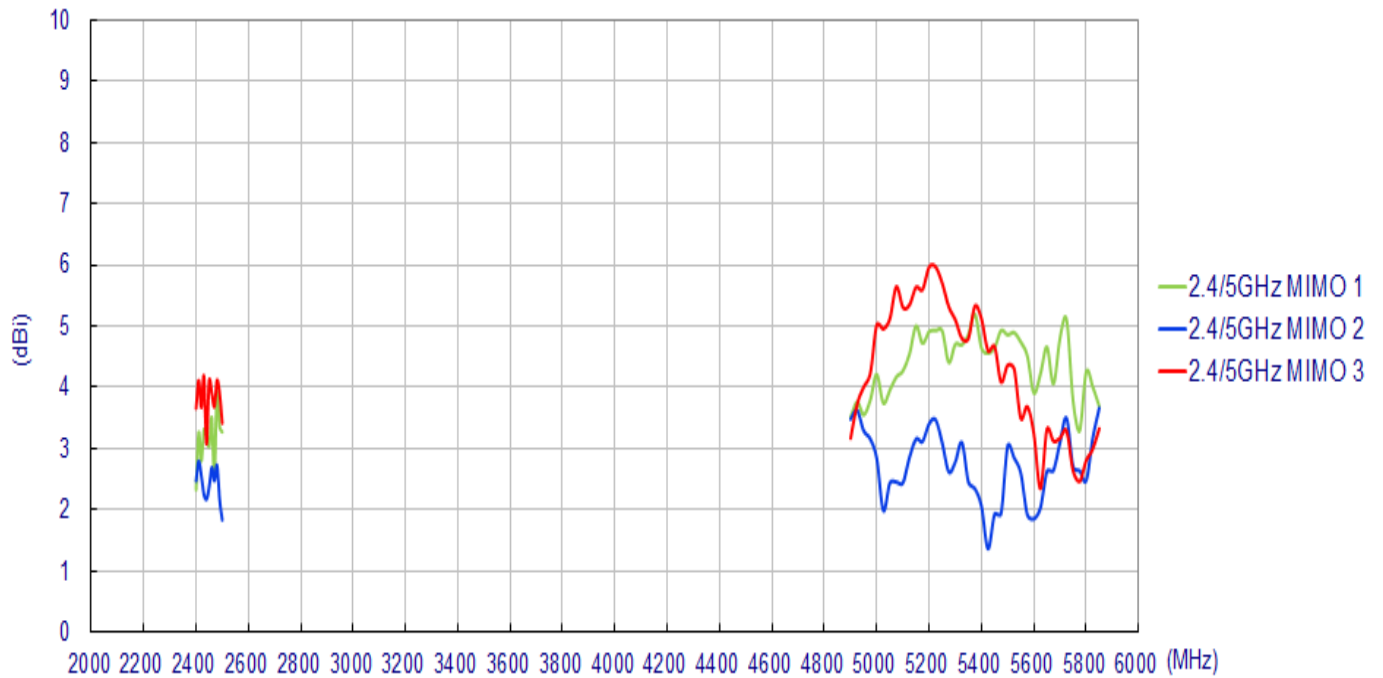


### 3.3.4 With 5M coaxial cable

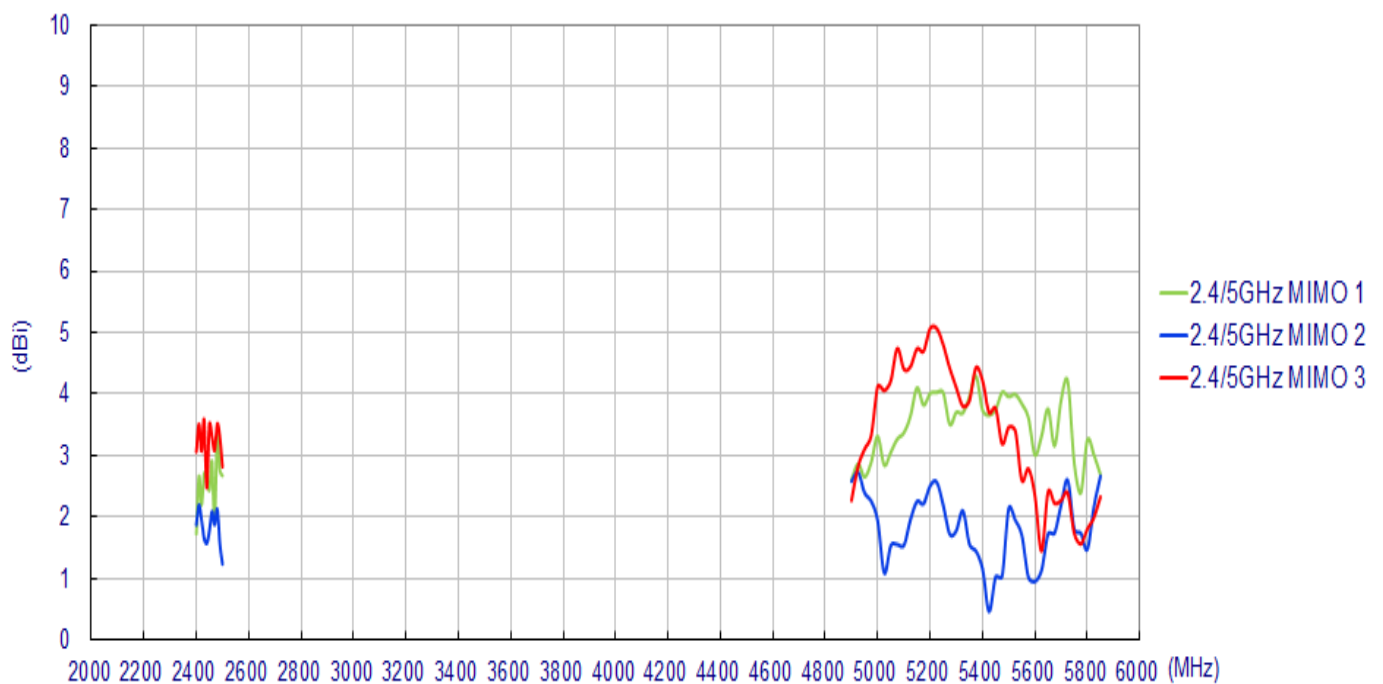


### 3.4 Peak Gain

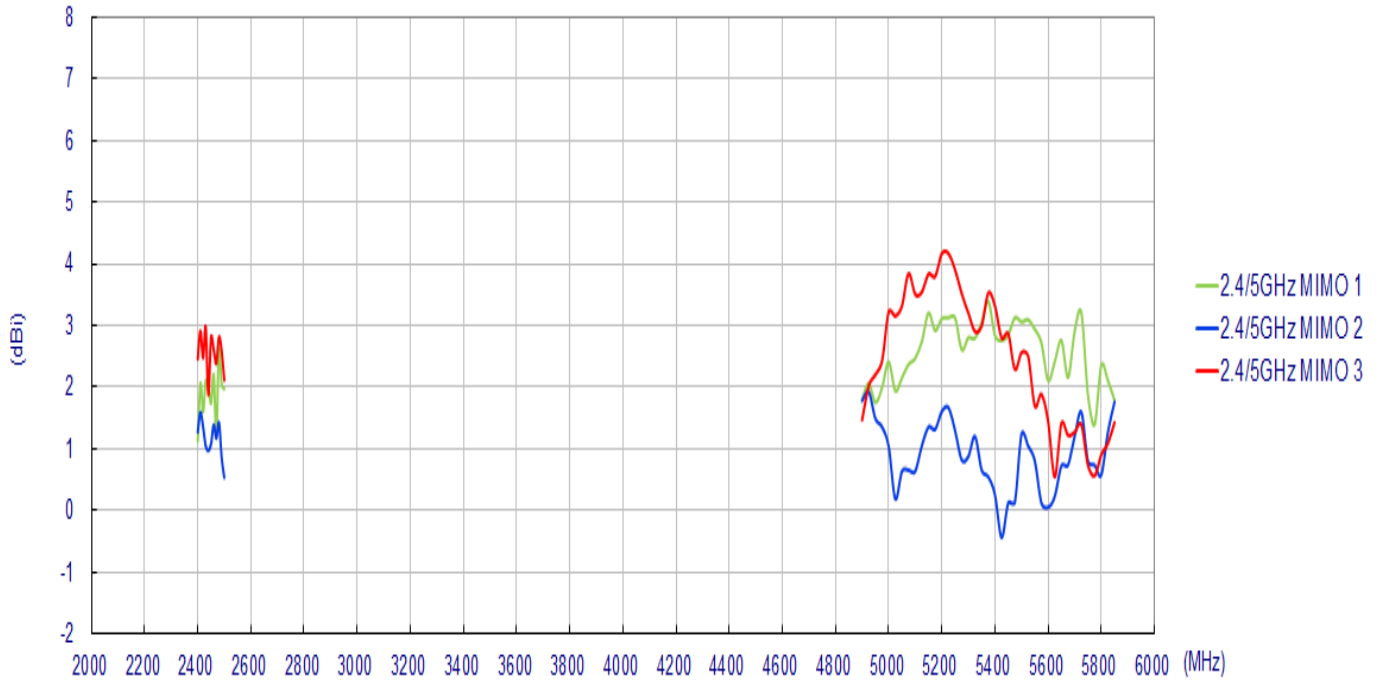
#### 3.4.1 With 1M coaxial cable



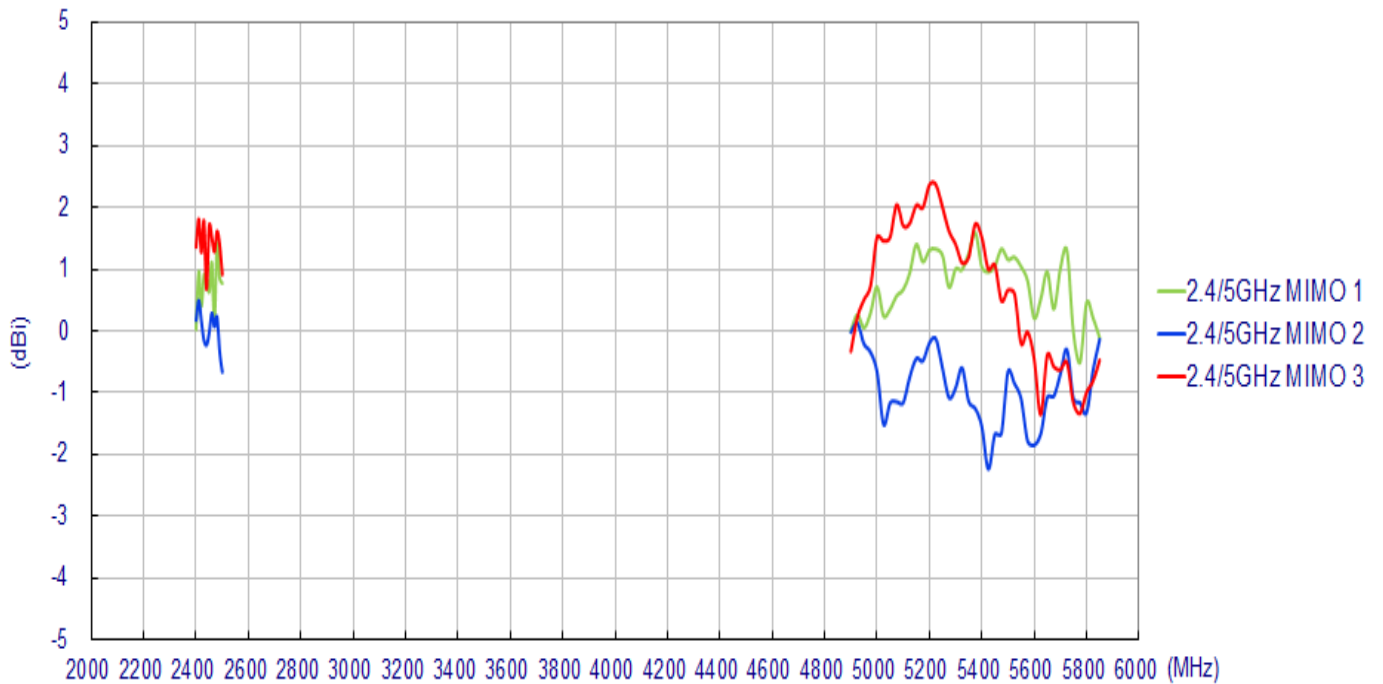
#### 3.4.2 With 2M coaxial cable



### 3.4.3 With 3M coaxial cable

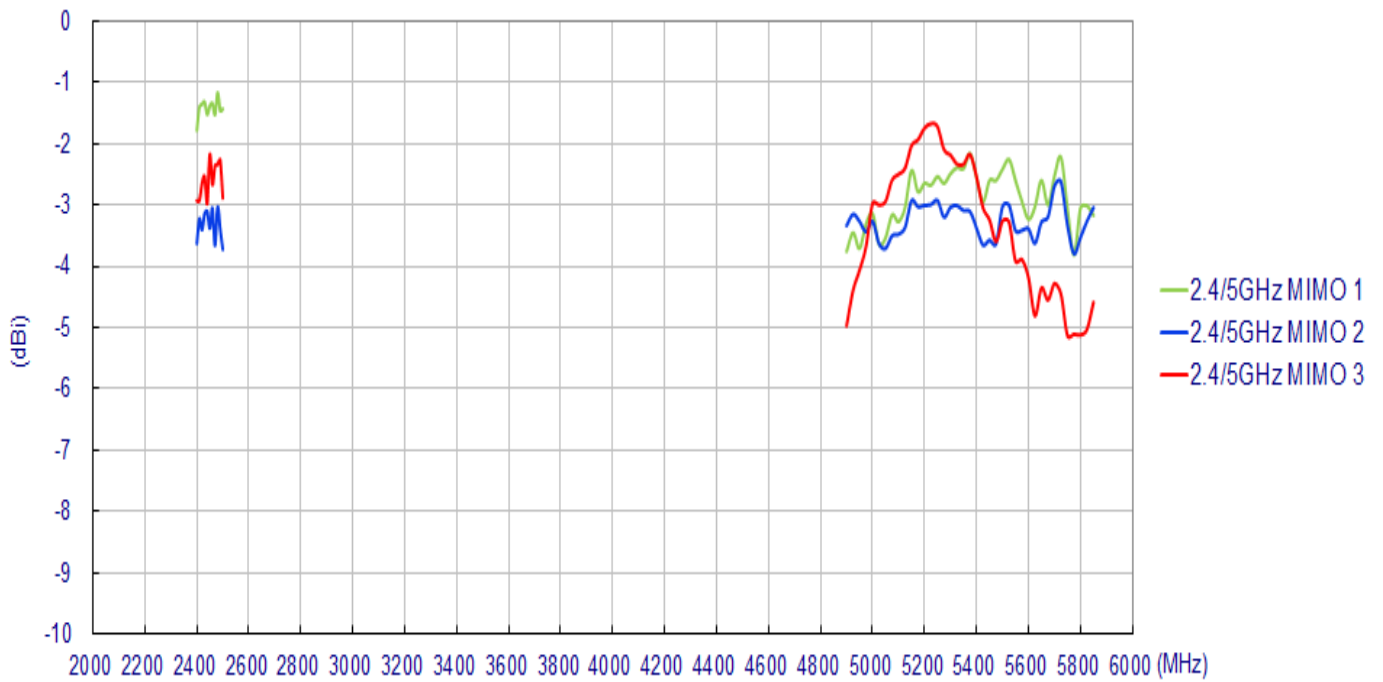


### 3.4.4 With 5M coaxial cable

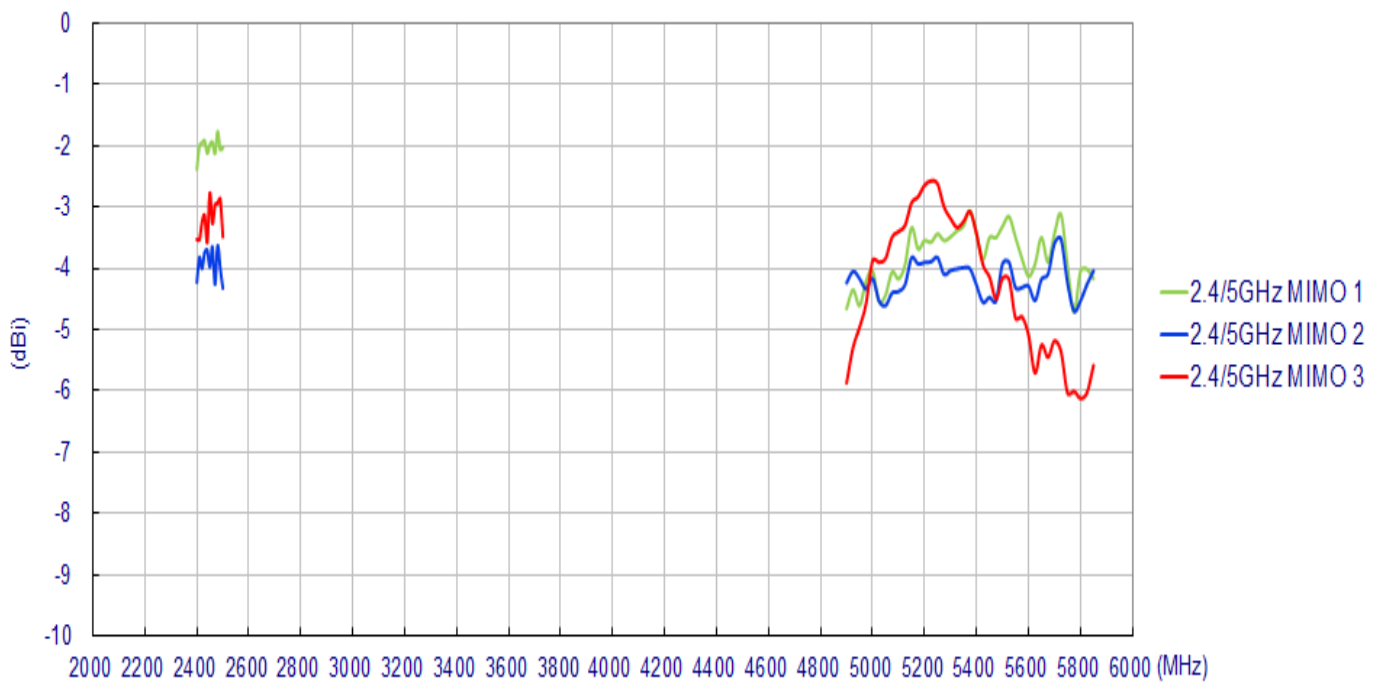


### 3.5 Average Gain

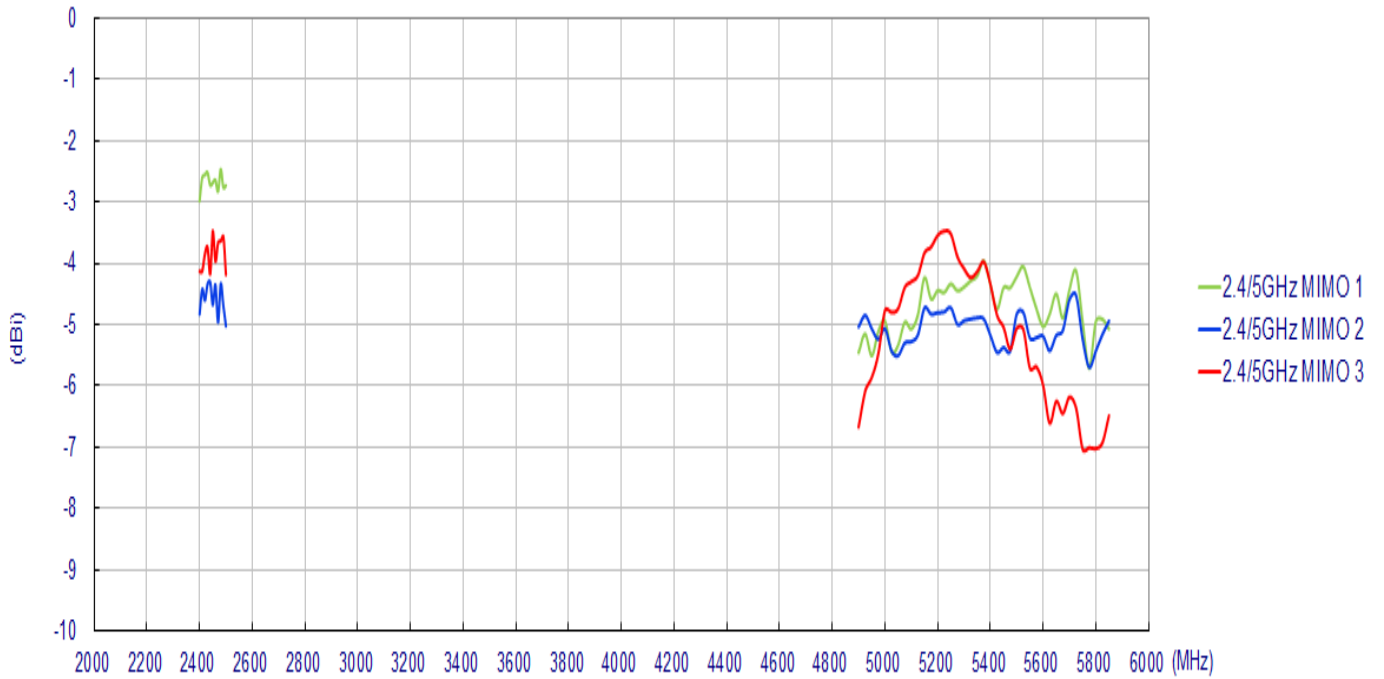
#### 3.5.1 With 1M coaxial cable



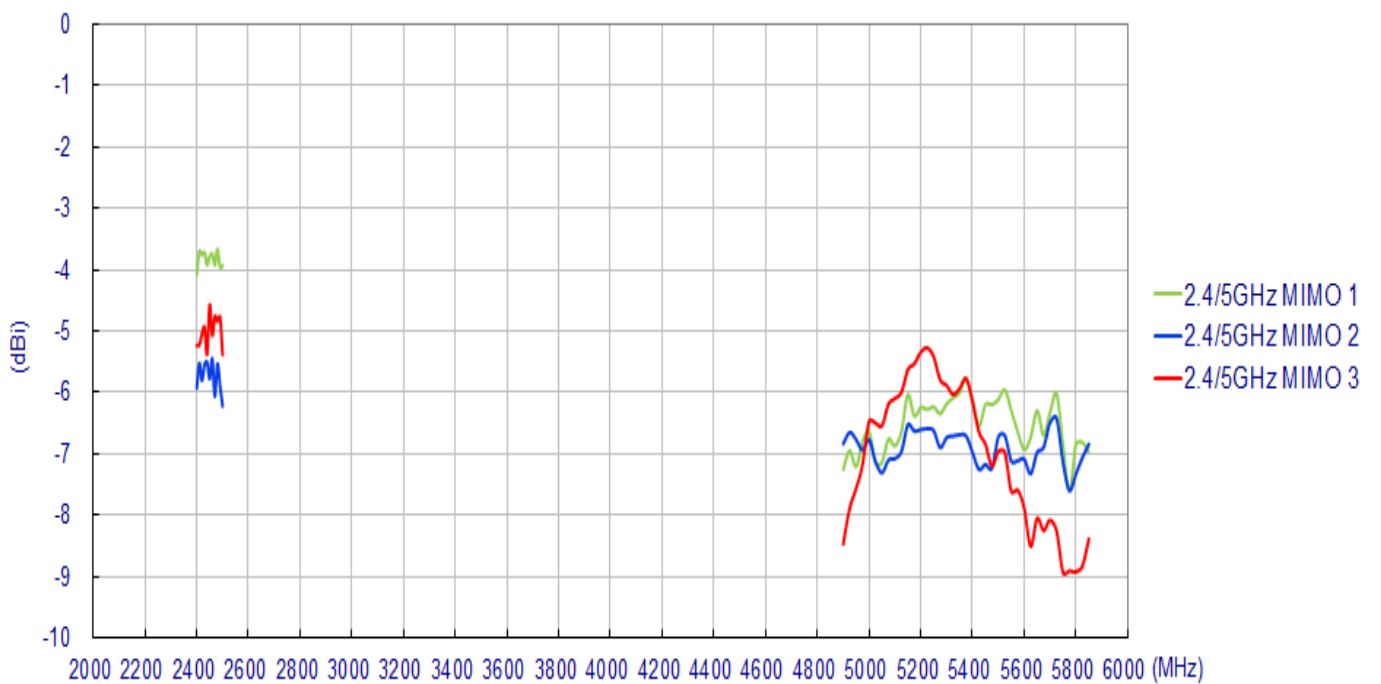
#### 3.5.2 With 2M coaxial cable



### 3.5.3 With 3M coaxial cable



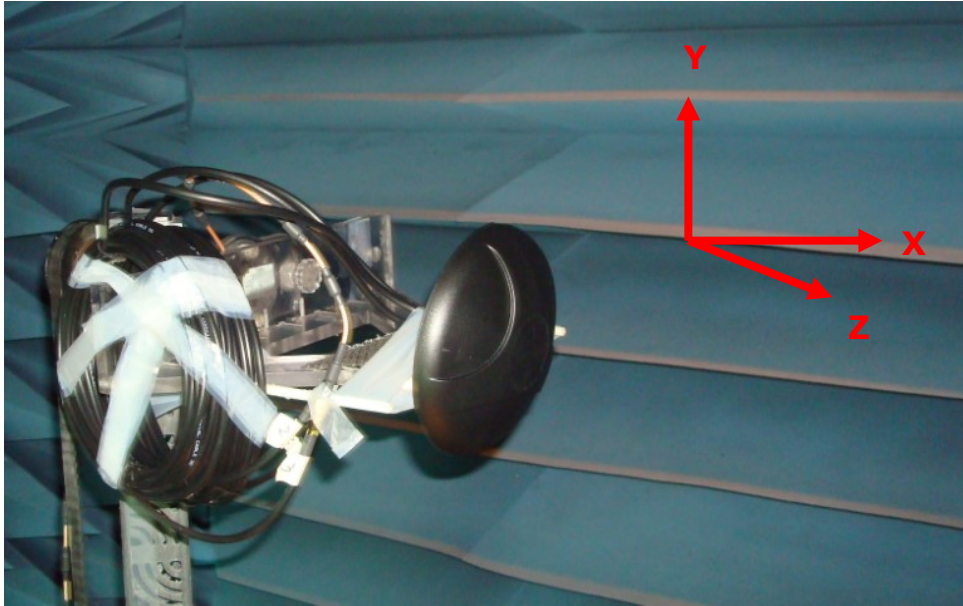
### 3.5.4 With 5M coaxial cable



## 4. Antenna Radiation Patterns

### 4.1 Antenna setup

The antenna radiation pattern measured setup as shown the below, (with 3 meters cable length)

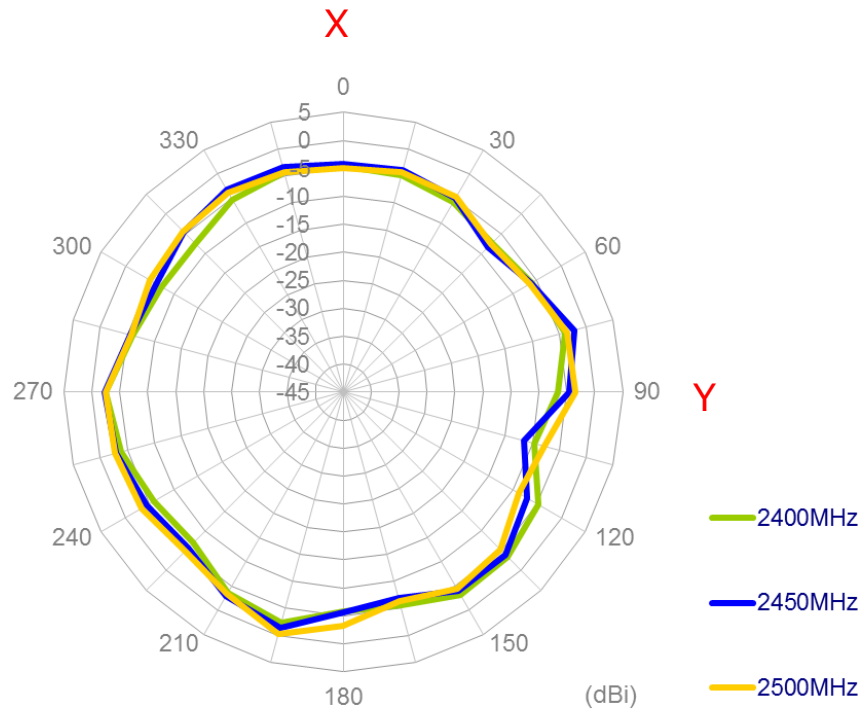


**In free space**

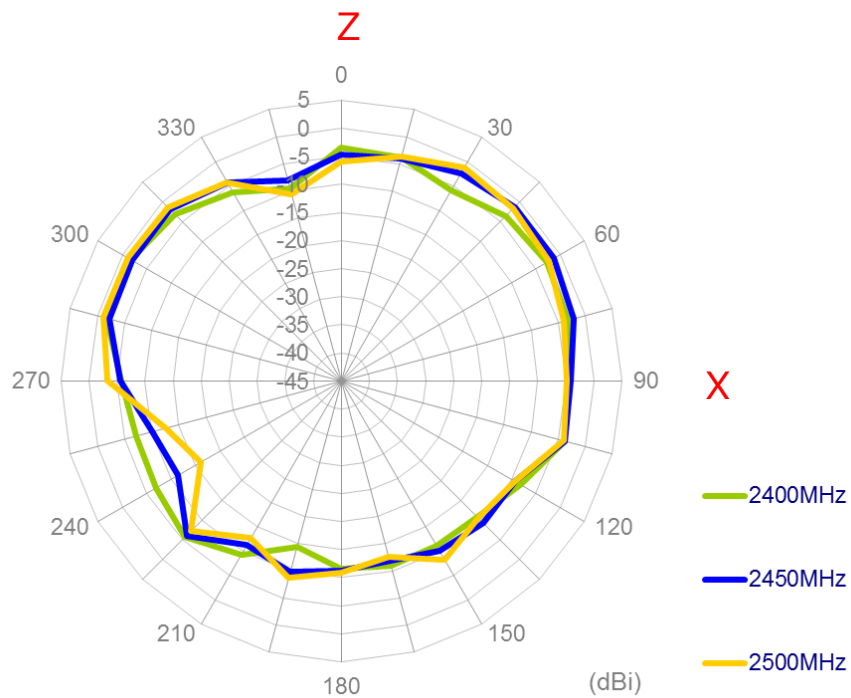
## 4.2 Antenna radiation patterns

### 4.2.1 2.4/5.8GHz MIMO 1

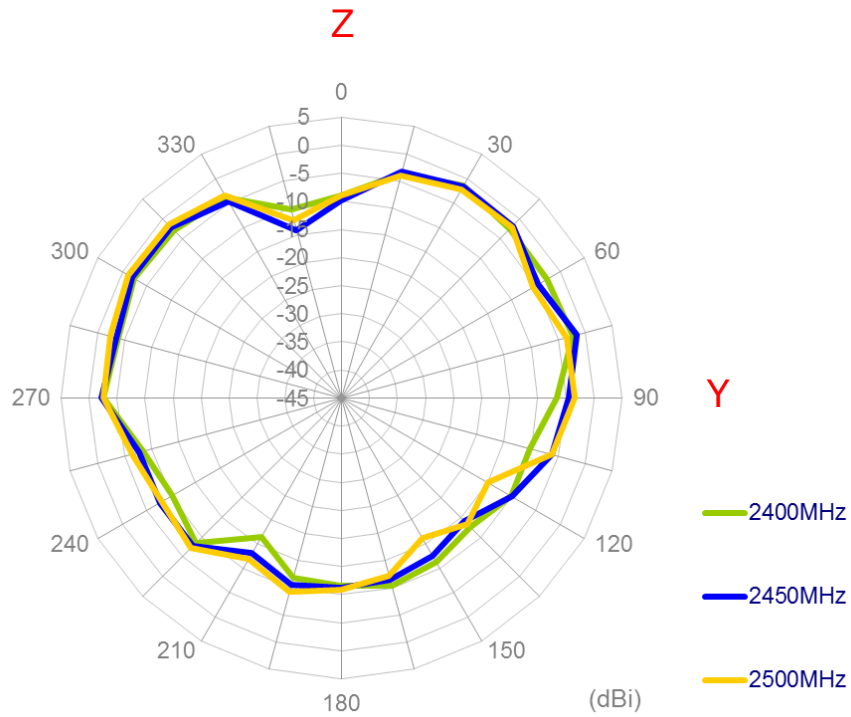
#### XY Plane



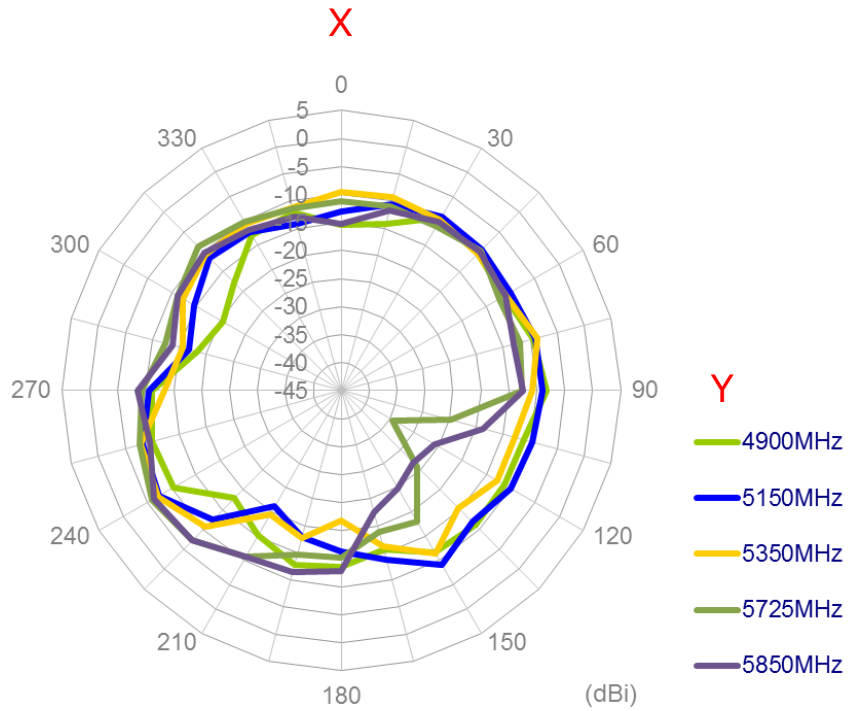
#### XZ Plane



**YZ Plane**

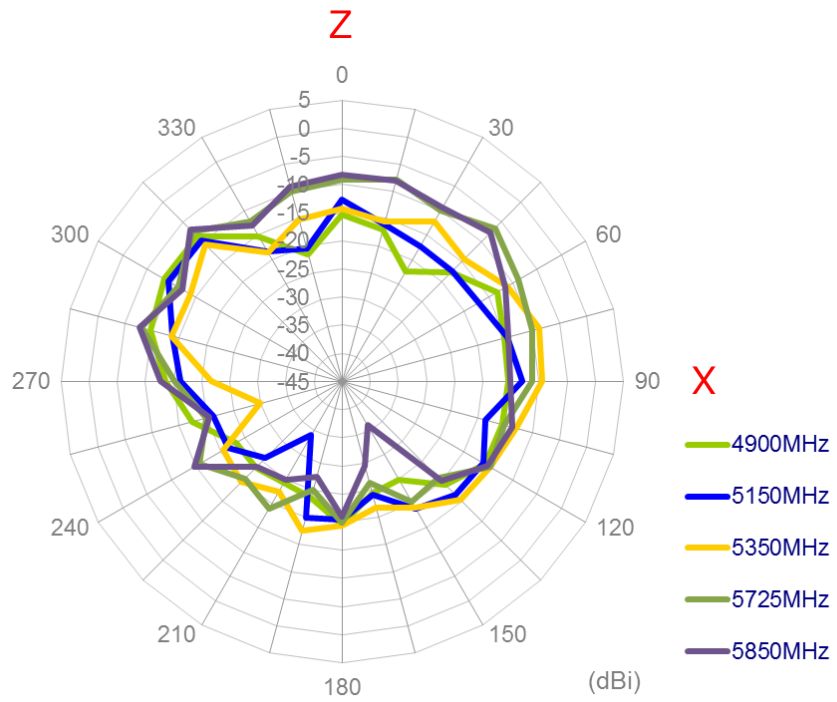


**XY Plane**

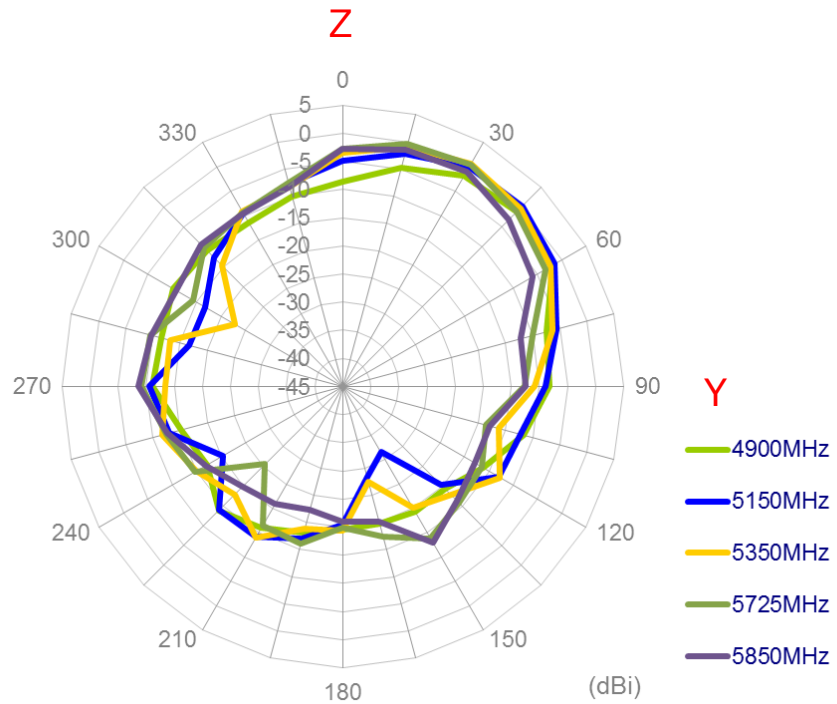




**XZ Plane**

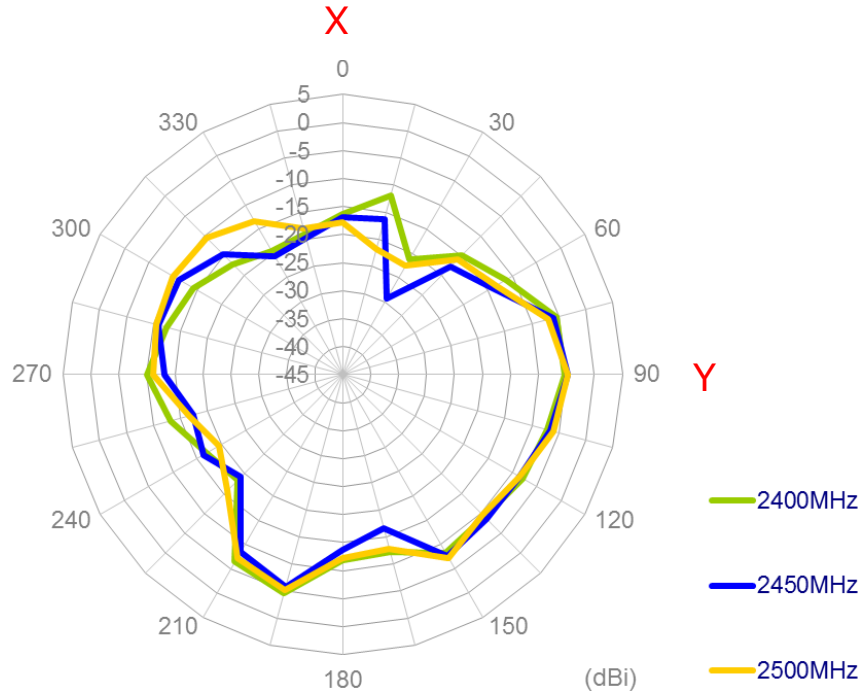


**YZ Plane**

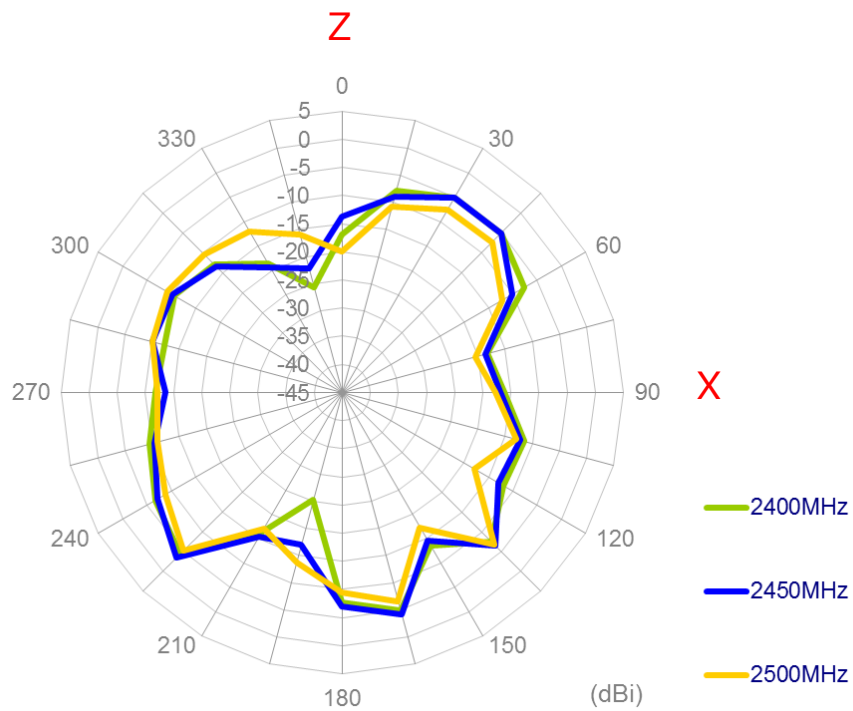


### 4.2.2 2.4/5GHz MIMO 2

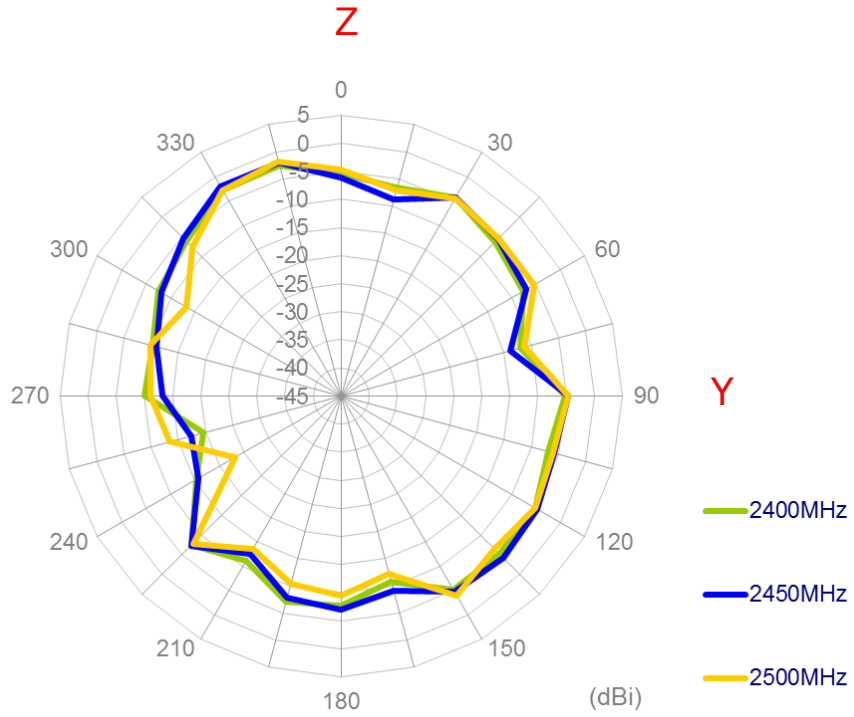
#### XY Plane



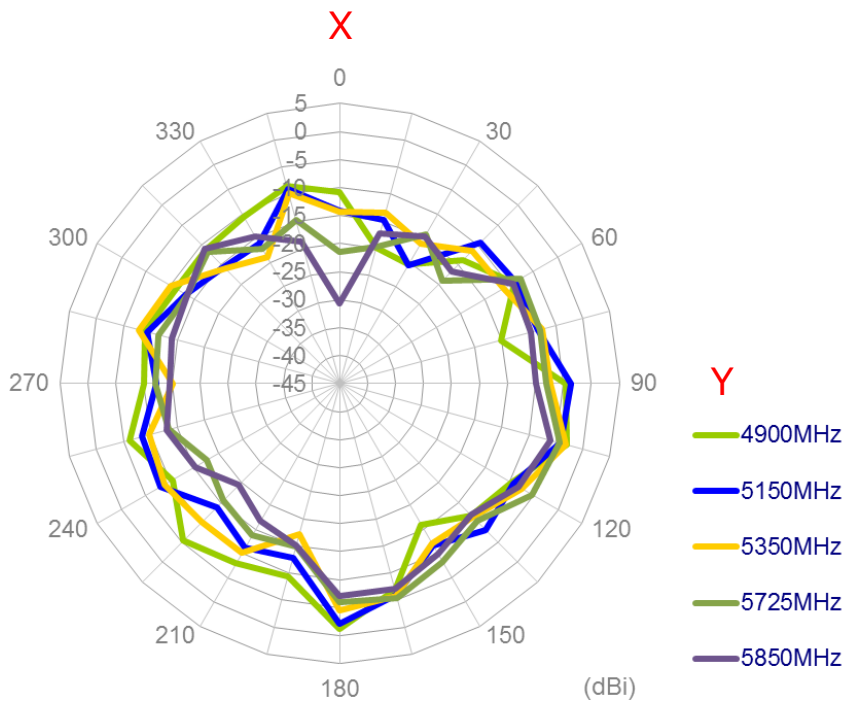
#### XZ Plane



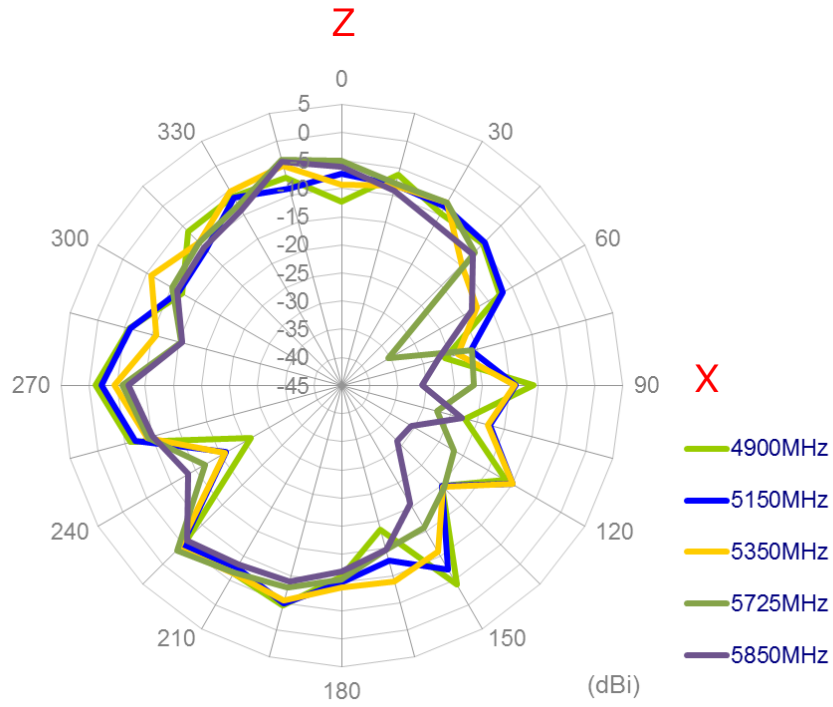
**YZ Plane**



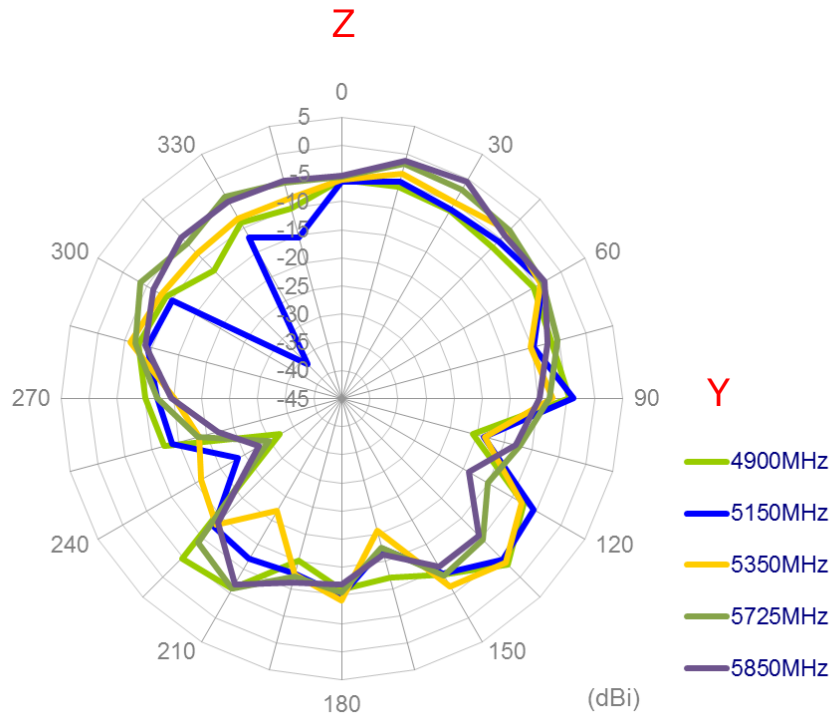
**XY Plane**



**XZ Plane**

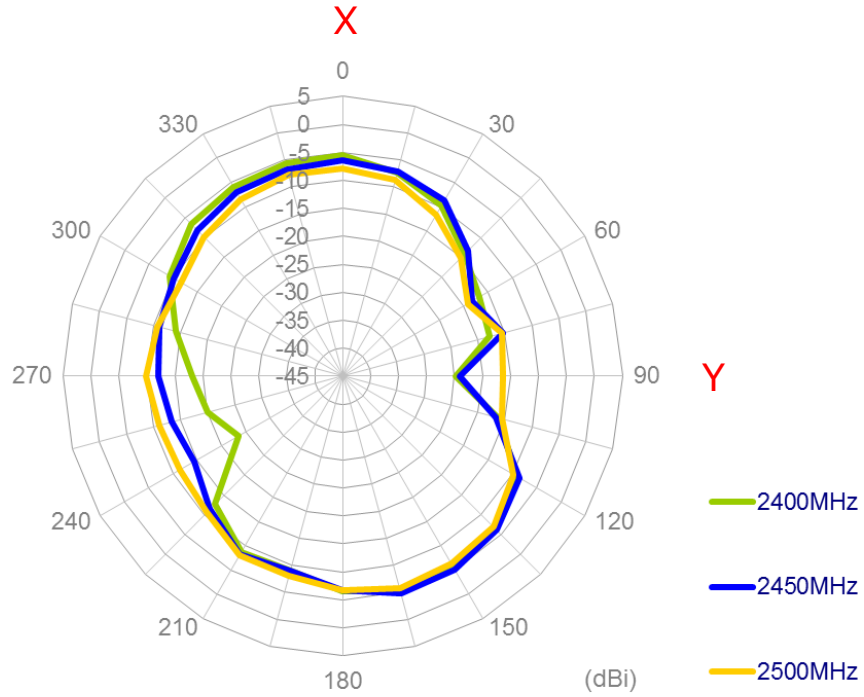


**YZ Plane**

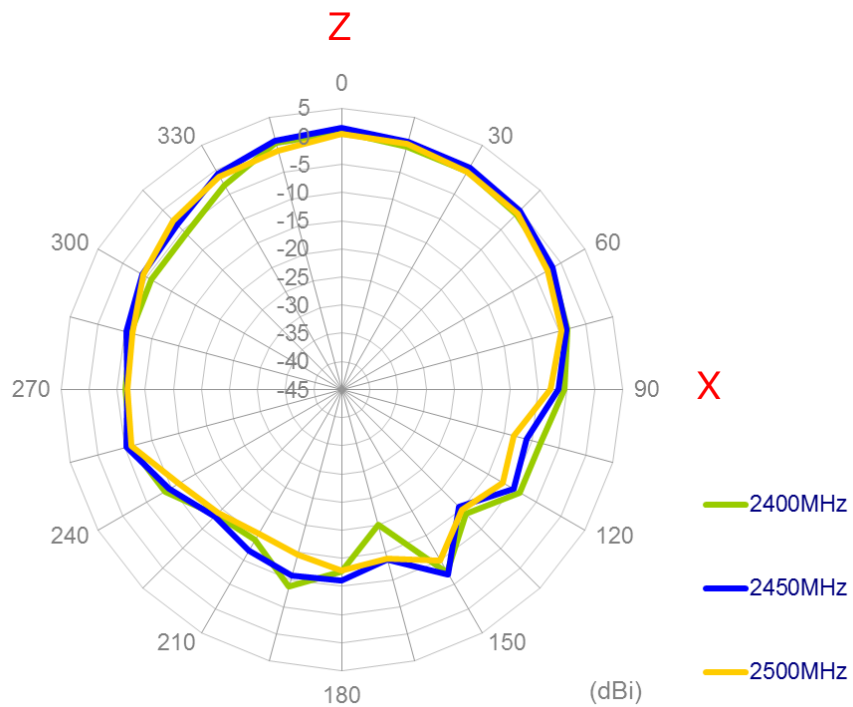


### 4.2.3 2.4/5GHz MIMO 3

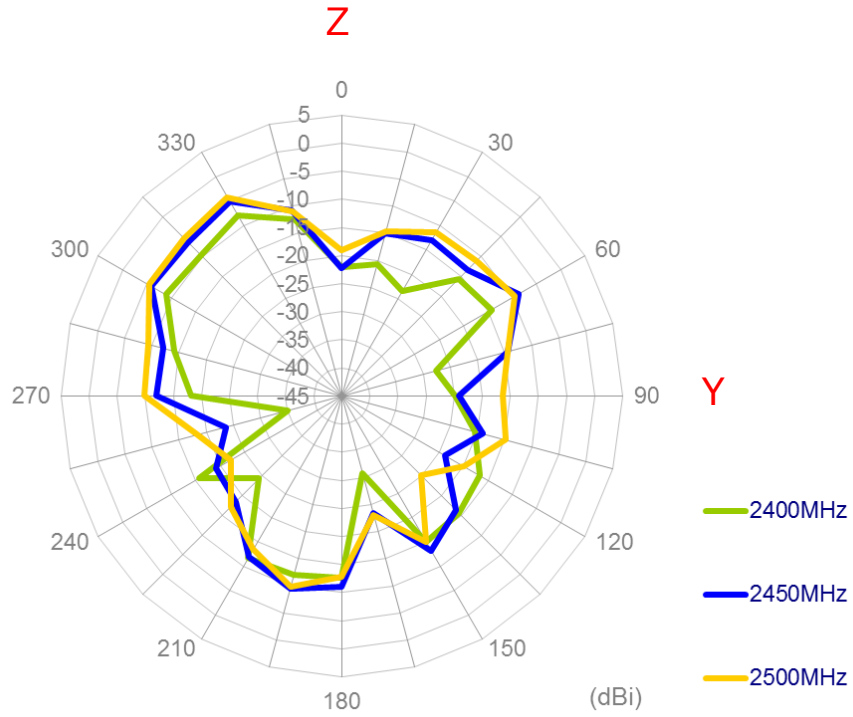
#### XY Plane



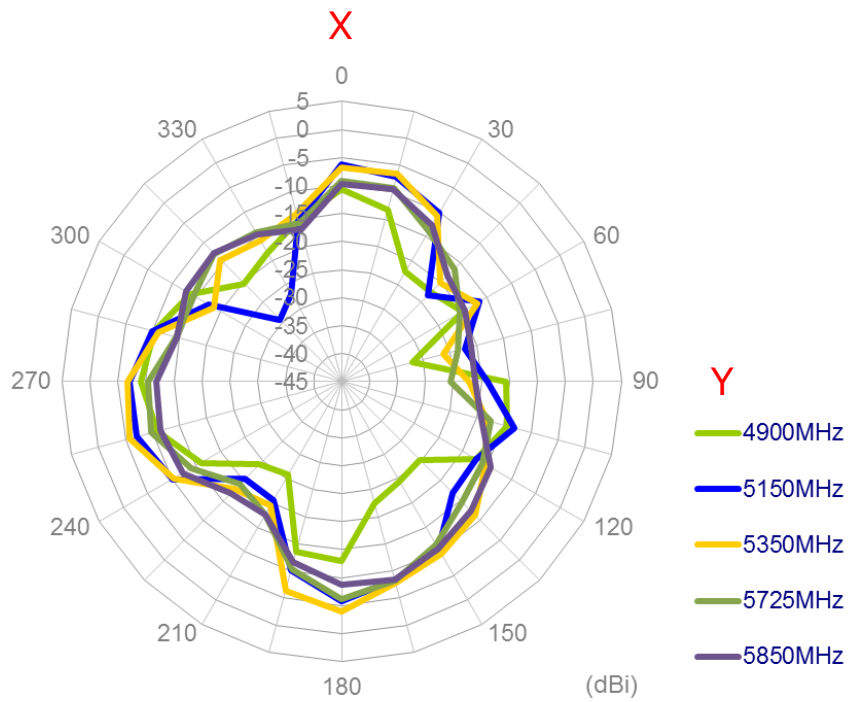
#### XZ Plane



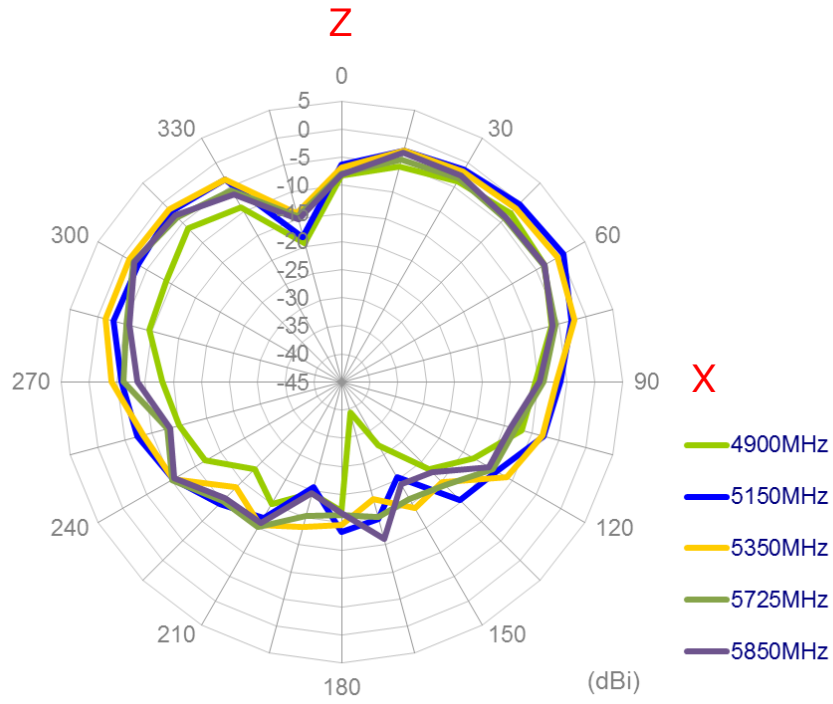
**YZ Plane**



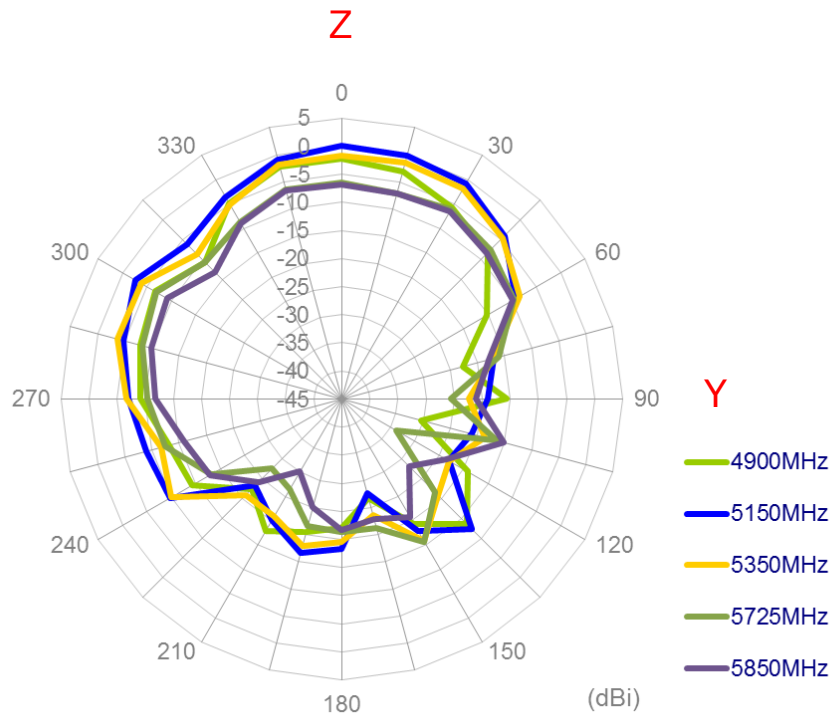
**XY Plane**



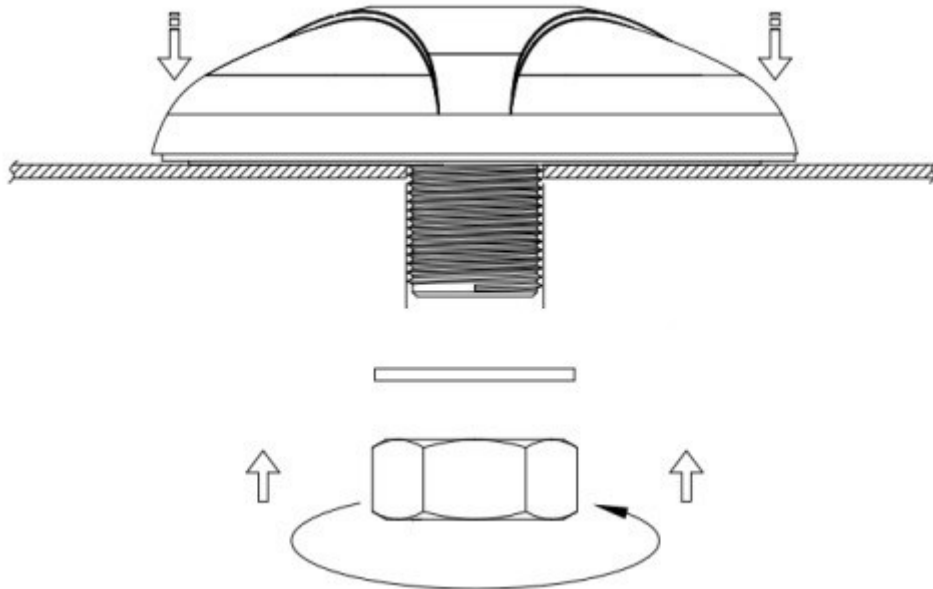
**XZ Plane**



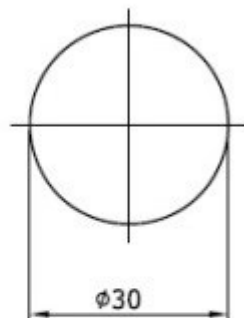
**YZ Plane**



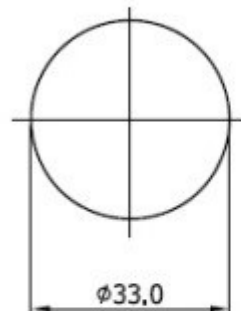
## 5. Installation



Recommended Torque for Mounting 49 N·m  
 Maximum Torque for Mounting 58.8 N·m



**Thread  
 Diameter**

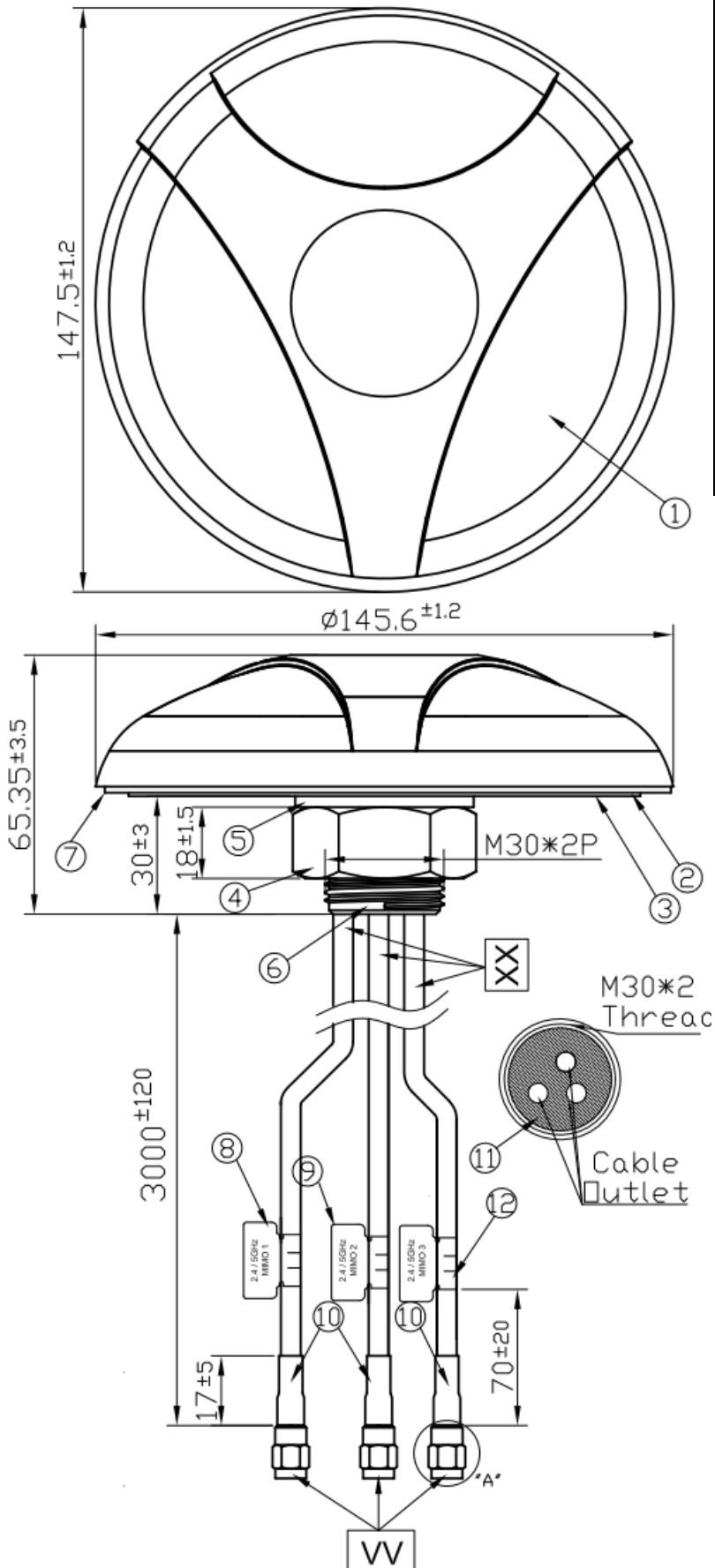


**Recommended  
 Mounting Hole**

**Unit: mm**



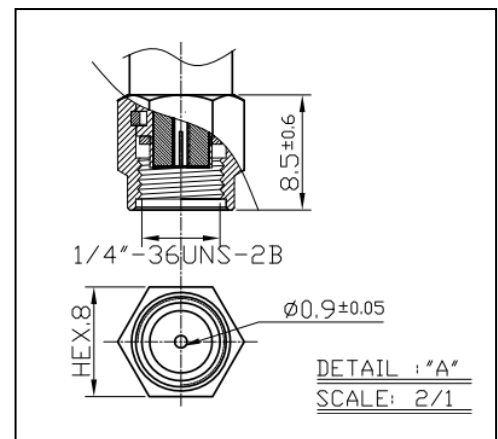
## 6. Drawing



|    | Name                          | Material        | Finish       | QTY |
|----|-------------------------------|-----------------|--------------|-----|
| 1  | Housing                       | PC 540          | Black        | 1   |
| 2  | Closed Cell Foam              | CR 4305         | Black        | 1   |
| 3  | 3M Double Adhesive            | 3M 9448 HK      | White Liner  | 1   |
| 4  | M30 Nut                       | Steel AISI 1215 | Ni Plated    | 1   |
| 5  | Washer                        | Steel AISI 1215 | Ni Plated    | 1   |
| 6  | M30x 2 Thread 32L             | Zinc Alloy      | Ni Plated    | 1   |
| 7  | Waterproof Rubber             | Silicon         | Black        | 1   |
| 8  | 2.4/5 GHz MIMO1 Label (48x30) | Coated Paper    | Dark Green   | 1   |
| 9  | 2.4/5 GHz MIMO2 Label (48x30) | Coated Paper    | Green Yellow | 1   |
| 10 | Heat Shrink Tube              | PE              | Black        | 3   |
| 11 | Rubber Stopper                | Silicone Rubber | Black        | 1   |
| 12 | 2.4/5 GHz MIMO3 Label (48x30) | Coated Paper    | Lime Green   | 1   |

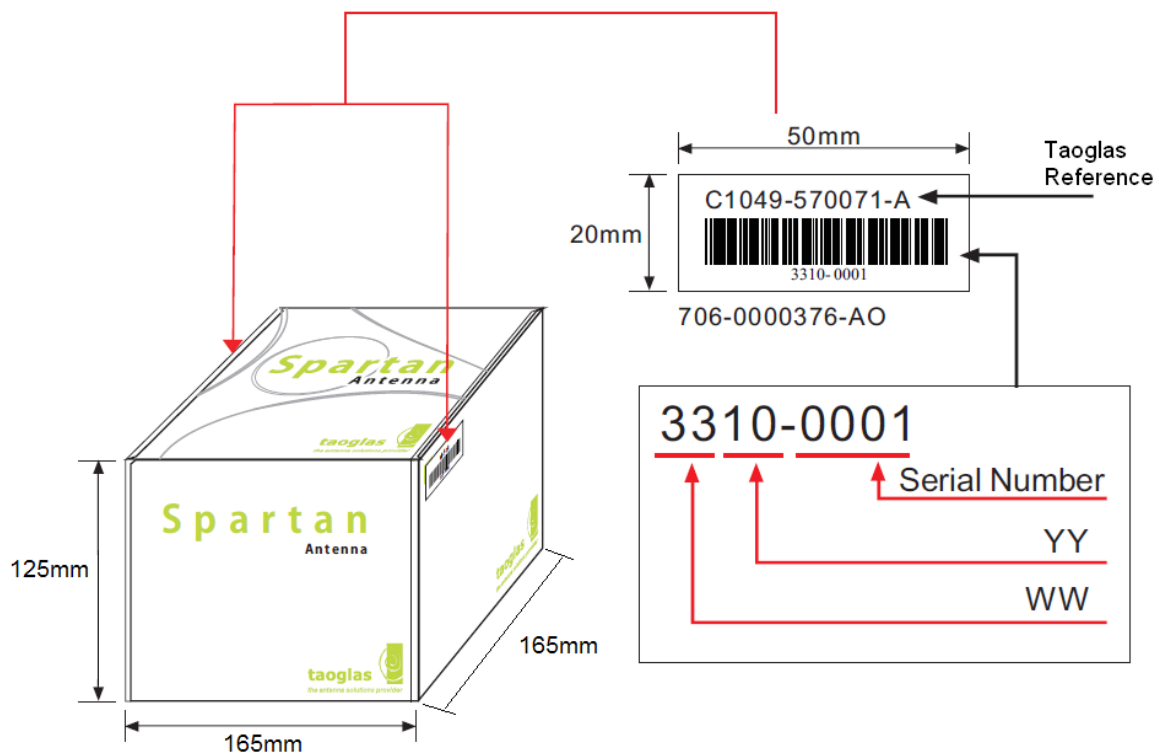
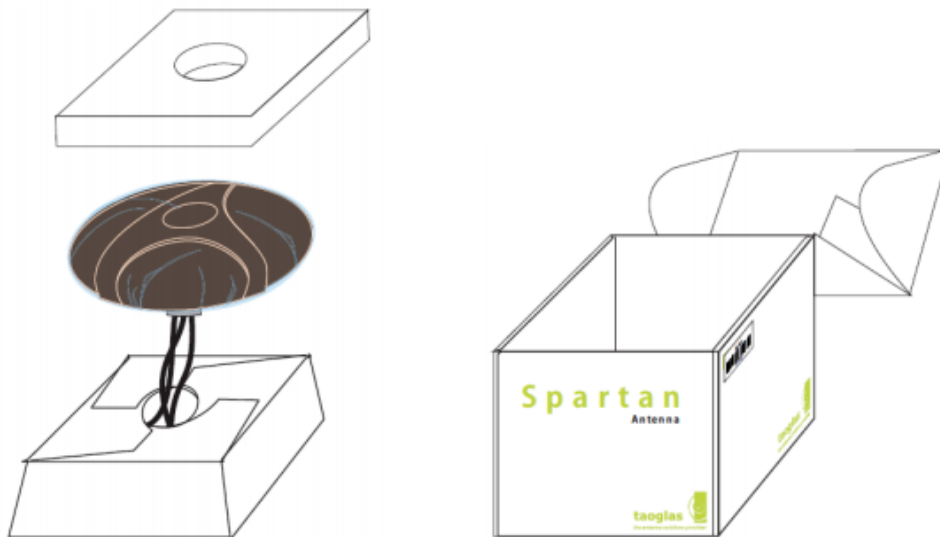
  

|    | Name           | Spec        | Finish | QTY |
|----|----------------|-------------|--------|-----|
| VV | Connector Type | SMA(M)RP ST | Gold   | 3   |
| XX | Cable Type     | CFD 200     | Black  | 3   |

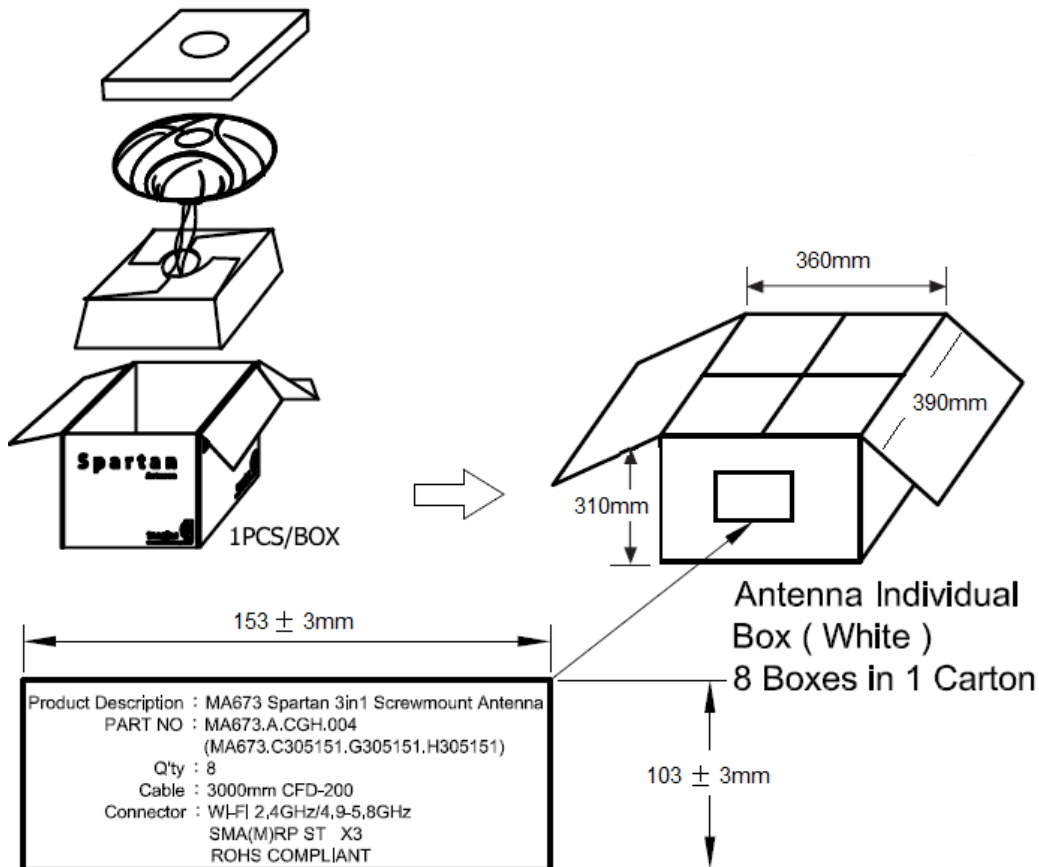


## 7. Packaging

- 1 antenna per Individual Box (L:165mm:B:165mm:H:125mm)
- Weight 1.078kg



- 8 Individual Boxes per Carton (L:390mm:B:360mm:H:310mm)
- Weight 9.5kg



**Label x 2 Paste To Both Sides**

- 32 Cartons per pallet(110\*110cm)
- 256 Pieces per Pallet

