

## Specification

|              |   |                                                                                                                 |
|--------------|---|-----------------------------------------------------------------------------------------------------------------|
| Part No.     | : | <b>FS.700.A.10WW111</b>                                                                                         |
| Product Name | : | I-Bar Response FirstNet Band 14 Adhesive Mount Antenna                                                          |
| Features     | : | FirstNet Band 14 Ready<br>3M Adhesive<br>Cable: 1 metre TGC-200<br>Connector: SMA(M) Straight<br>RoHS Compliant |



## 1. Introduction

The Response FS.700 FirstNet Wideband I-Bar Antenna is an external adhesive mount solution on glass and plastic for automotive and telematics applications. It covers not only FirstNet, but all Cellular, ISM and Wi-Fi working frequencies in the 700-6000 MHz spectrum. It has the highest wide-band efficiency in its range of any antenna in its category today.

FirstNet is a dedicated communications tool for First Responders in the US. It is an isolated network to provide faster critical information and data-sharing between First Responders and their agencies. New FirstNet devices are being deployed to allow for the multitude of services and applications which will be using the network for the following mission critical applications:

- Computer-aided dispatch (vehicle location)
- EMS Electronic Patient Care Reporting
- Vehicle Mounted RMS/ Citations/ Scanners
- Video Streaming

The FS.700 has been primarily designed for use with FirstNet modules, routers and devices that require the highest possible efficiency and peak gain to deliver best in class throughput on the FirstNet Band 14 for Public Safety applications.

It comes with 1 meter of coaxial cable and SMA (M) connector, in a low profile compact format for mounting via high quality first tier automotive approved 3M adhesive foam. Stable radiation is observed on both glass and plastic.

The FS.700 is backward compatible with all FirstNet applications and can be used in other required bands.

It is an ideal solution for any device requiring high, reliable performance. It will meet nearly all carrier certification requirements from an efficiency standpoint. The antenna also makes an excellent reference antenna for test purposes. It has been designed as an omni-directional antenna and the radiation patterns show this and are stable across all bands.

Cable and connectors are customizable, contact your regional Taoglas sales office for customization and additional support.

## 2. Specification

| ELECTRICAL          |                                         |               |                                                  |                       |               |               |               |               |               |
|---------------------|-----------------------------------------|---------------|--------------------------------------------------|-----------------------|---------------|---------------|---------------|---------------|---------------|
| Standard            | LTE/GSM/<br>CDMA<br>700/800/<br>850/900 | GNSS          | LTE/GSM/<br>HSPA/CDM<br>A<br>1700/1800<br>/ 1900 | UMTS/<br>HSPA<br>2100 | LTE<br>2300   | Wi-Fi<br>2400 | LTE<br>2600   | LTE<br>3500   | Wi-Fi<br>5800 |
| Frequency (MHz)     | 698~960                                 | 1565<br>~1612 | 1710<br>~1990                                    | 1920<br>~2170         | 2305<br>~2360 | 2400<br>~2500 | 2500<br>~2700 | 3400<br>~3600 | 4800~6000     |
| Efficiency (%)      |                                         |               |                                                  |                       |               |               |               |               |               |
| In free space       | 30cm                                    | 71.88         | 62.03                                            | 67.62                 | 67.81         |               | 68.79         | 71.08         | 48.73         |
|                     | 1M                                      | 68.64         | 56.57                                            | 61.77                 | 62.39         |               | 62.74         | 64.83         | 43.43         |
|                     | 2M                                      | 63.75         | 51.59                                            | 55.33                 | 56.02         |               | 54.64         | 55.89         | 36.76         |
|                     | 3M                                      | 59.34         | 45.98                                            | 48.75                 | 49.59         |               | 47.06         | 47.47         | 30.75         |
|                     | 5M                                      | 50.54         | 36.53                                            | 37.87                 | 39.04         |               | 36.10         | 36.30         | 22.34         |
| On the 2mm ABS Base | 30cm                                    | 74.99         | 64.23                                            | 70.69                 | 70.33         |               | 69.68         | 73.11         | 49.39         |
|                     | 1M                                      | 71.62         | 58.58                                            | 64.58                 | 64.68         |               | 63.55         | 66.67         | 44.02         |
|                     | 2M                                      | 66.53         | 53.42                                            | 57.85                 | 58.07         |               | 55.35         | 57.49         | 37.25         |
|                     | 3M                                      | 61.93         | 47.61                                            | 50.97                 | 51.41         |               | 47.67         | 48.82         | 31.16         |
|                     | 5M                                      | 52.78         | 37.82                                            | 39.60                 | 40.45         |               | 36.57         | 37.33         | 22.63         |
| On the Glass Base   | 30cm                                    | 74.73         | 73.00                                            | 80.37                 | 77.79         |               | 64.27         | 69.10         | 55.18         |
|                     | 1M                                      | 71.86         | 66.58                                            | 73.41                 | 71.51         |               | 58.62         | 63.02         | 49.18         |
|                     | 2M                                      | 67.23         | 60.72                                            | 65.79                 | 64.21         |               | 51.05         | 54.33         | 41.44         |
|                     | 3M                                      | 64.50         | 54.12                                            | 57.94                 | 56.81         |               | 43.97         | 46.14         | 34.81         |
|                     | 5M                                      | 55.06         | 42.99                                            | 45.03                 | 44.67         |               | 33.73         | 35.28         | 24.97         |
| Average Gain(dBi)   |                                         |               |                                                  |                       |               |               |               |               |               |
| In free space       | 30cm                                    | -1.46         | -2.08                                            | -1.72                 | -1.71         |               | -1.63         | -1.49         | -3.22         |
|                     | 1M                                      | -1.66         | -2.48                                            | -2.12                 | -2.07         |               | -2.03         | -1.89         | -3.72         |
|                     | 2M                                      | -1.98         | -2.88                                            | -2.59                 | -2.54         |               | -2.63         | -2.53         | -4.45         |
|                     | 3M                                      | -2.29         | -3.38                                            | -3.14                 | -3.07         |               | -3.28         | -3.24         | -5.22         |
|                     | 5M                                      | -2.99         | -4.38                                            | -4.23                 | -4.11         |               | -4.43         | -4.41         | -6.62         |
| On the 2mm ABS Base | 30cm                                    | -1.29         | -1.93                                            | -1.52                 | -1.55         |               | -1.57         | -1.37         | -3.13         |
|                     | 1M                                      | -1.49         | -2.33                                            | -1.92                 | -1.91         |               | -1.97         | -1.77         | -3.63         |
|                     | 2M                                      | -1.81         | -2.73                                            | -2.39                 | -2.38         |               | -2.57         | -2.41         | -4.37         |
|                     | 3M                                      | -2.12         | -3.23                                            | -2.94                 | -2.91         |               | -3.22         | -3.12         | -5.13         |
|                     | 5M                                      | -2.82         | -4.23                                            | -4.04                 | -3.95         |               | -4.37         | -4.28         | -6.53         |
| On the Glass Base   | 30cm                                    | -1.33         | -1.37                                            | -0.96                 | -1.11         |               | -1.92         | -1.62         | -2.62         |
|                     | 1M                                      | -1.50         | -1.77                                            | -1.35                 | -1.47         |               | -2.32         | -2.02         | -3.12         |
|                     | 2M                                      | -1.80         | -2.17                                            | -1.83                 | -1.94         |               | -2.92         | -2.66         | -3.87         |
|                     | 3M                                      | -2.02         | -2.67                                            | -2.38                 | -2.47         |               | -3.57         | -3.37         | -4.62         |
|                     | 5M                                      | -2.72         | -3.67                                            | -3.47                 | -3.51         |               | -4.72         | -4.53         | -6.07         |

| Peak Gain(dBi)              |      |                                          |           |                                                  |                           |             |                   |                 |             |                   |
|-----------------------------|------|------------------------------------------|-----------|--------------------------------------------------|---------------------------|-------------|-------------------|-----------------|-------------|-------------------|
| Standard                    |      | LTE/GS<br>M/CDMA<br>700/800<br>/ 850/900 | GNSS      | LTE/GSM/H<br>SPA/CDMA<br><br>1700/1800<br>/ 1900 | UMTS/<br>HSPA<br><br>2100 | LTE<br>2300 | Wi-Fi<br><br>2400 | LTE<br><br>2600 | LTE<br>3500 | Wi-Fi<br><br>5800 |
| Frequency (MHz)             |      | 698~960                                  | 1565~1612 | 1710~1990                                        | 1920~2170                 | 2305~2360   | 2400~2500         | 2500~2700       | 3400~3600   | 4800~6000         |
| In free<br>space            | 30cm | 1.56                                     | 1.38      | 3.79                                             | 3.06                      |             | 4.25              | 4.70            |             | 2.56              |
|                             | 1M   | 1.36                                     | 0.98      | 3.40                                             | 2.69                      |             | 3.85              | 4.30            |             | 2.06              |
|                             | 2M   | 1.04                                     | 0.58      | 2.92                                             | 2.23                      |             | 3.25              | 3.66            |             | 1.33              |
|                             | 3M   | 0.73                                     | 0.08      | 2.37                                             | 1.70                      |             | 2.60              | 2.95            |             | 0.56              |
|                             | 5M   | 0.03                                     | -0.92     | 1.28                                             | 0.66                      |             | 1.45              | 1.79            |             | -0.84             |
| On the<br>2mm ABS<br>Base   | 30cm | 1.65                                     | 1.74      | 3.85                                             | 3.13                      |             | 5.00              | 5.27            |             | 2.08              |
|                             | 1M   | 1.45                                     | 1.34      | 3.46                                             | 2.76                      |             | 4.60              | 4.87            |             | 1.58              |
|                             | 2M   | 1.13                                     | 0.94      | 2.99                                             | 2.30                      |             | 4.00              | 4.23            |             | 0.84              |
|                             | 3M   | 0.81                                     | 0.44      | 2.44                                             | 1.77                      |             | 3.35              | 3.52            |             | 0.08              |
|                             | 5M   | 0.11                                     | -0.56     | 1.34                                             | 0.73                      |             | 2.20              | 2.35            |             | -1.32             |
| On the<br>Glass Base        | 30cm | 1.52                                     | 3.20      | 4.76                                             | 4.12                      |             | 5.75              | 5.35            |             | 4.14              |
|                             | 1M   | 1.32                                     | 2.80      | 4.37                                             | 3.76                      |             | 5.35              | 4.95            |             | 3.64              |
|                             | 2M   | 0.99                                     | 2.40      | 3.89                                             | 3.29                      |             | 4.75              | 4.31            |             | 2.89              |
|                             | 3M   | 0.68                                     | 1.90      | 3.34                                             | 2.76                      |             | 4.10              | 3.60            |             | 2.14              |
|                             | 5M   | -0.02                                    | 0.90      | 2.25                                             | 1.72                      |             | 2.95              | 2.44            |             | 0.69              |
| Impedance                   |      |                                          |           | 50Ω                                              |                           |             |                   |                 |             |                   |
| Polarization                |      |                                          |           | Linear                                           |                           |             |                   |                 |             |                   |
| Radiation Pattern           |      |                                          |           | Omni                                             |                           |             |                   |                 |             |                   |
| Input Power                 |      |                                          |           | 5 W                                              |                           |             |                   |                 |             |                   |
| MECHANICAL                  |      |                                          |           |                                                  |                           |             |                   |                 |             |                   |
| Casing                      |      |                                          |           | ABS                                              |                           |             |                   |                 |             |                   |
| Coaxial Cable               |      |                                          |           | TGC-200 Low Loss Cable                           |                           |             |                   |                 |             |                   |
| Cable Length                |      |                                          |           | 1 Meter Standard, Fully Customizable             |                           |             |                   |                 |             |                   |
| Connector                   |      |                                          |           | SMA Male Standard, Fully Customizable            |                           |             |                   |                 |             |                   |
| Water Proof Level           |      |                                          |           | IP65                                             |                           |             |                   |                 |             |                   |
| Adhesive                    |      |                                          |           | 3M9448+CR4305 Double Sided Adhesive              |                           |             |                   |                 |             |                   |
| Weight                      |      |                                          |           | 127g                                             |                           |             |                   |                 |             |                   |
| ENVIRONMENTAL               |      |                                          |           |                                                  |                           |             |                   |                 |             |                   |
| Operation Temperature Range |      |                                          |           | -40°C to 85°C                                    |                           |             |                   |                 |             |                   |
| Storage Temperature Range   |      |                                          |           | -40°C to 85°C                                    |                           |             |                   |                 |             |                   |
| Humidity                    |      |                                          |           | Non-condensing 65°C 95% RH                       |                           |             |                   |                 |             |                   |

| LTE BANDS   |                                                      |                             |         |
|-------------|------------------------------------------------------|-----------------------------|---------|
| Band Number | LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA |                             |         |
|             | Uplink                                               | Downlink                    | Covered |
| 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)    | ✗       |
| 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. Antenna Characteristics

#### 3.1 Testing setup



In free space



On 2mm ABS Base



On Glass Base

**Figure.1** Test setup; a) In free space, b) On 2mm ABS Base, c) On the Glass Base

## 3.2 Return loss

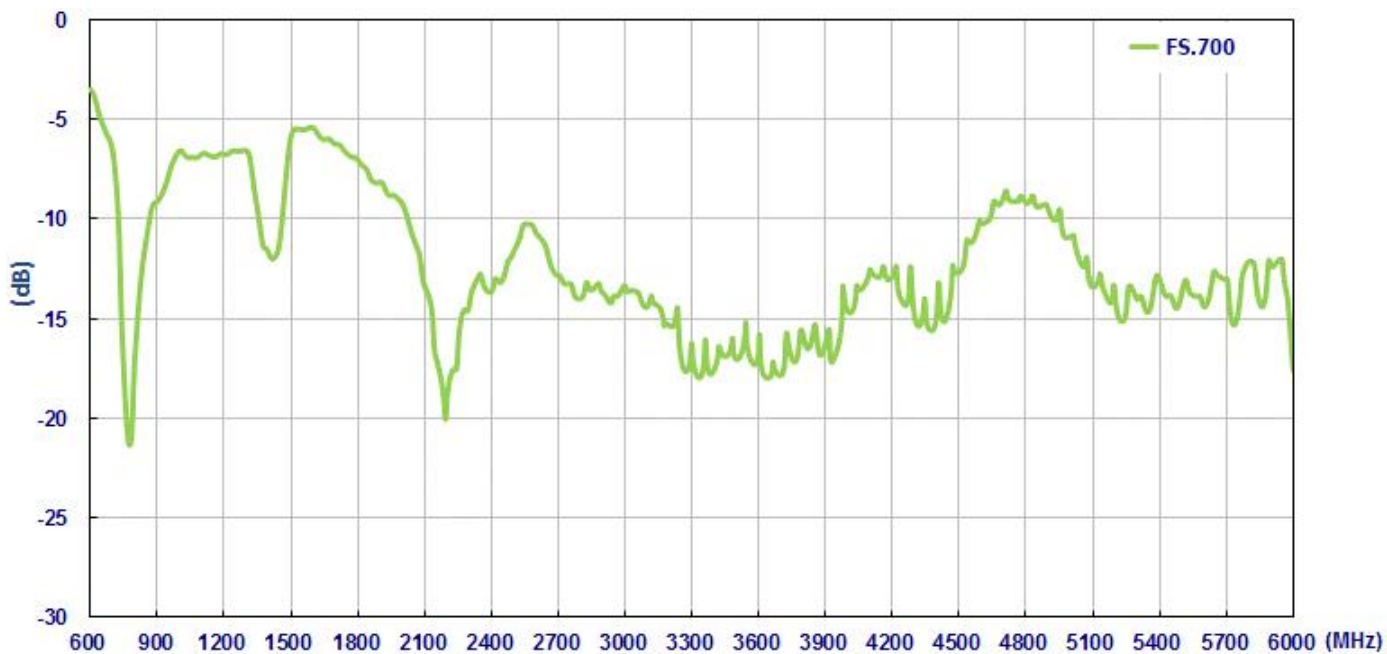


Figure2. Return loss of FS.700 with 1 meter cable length in free space

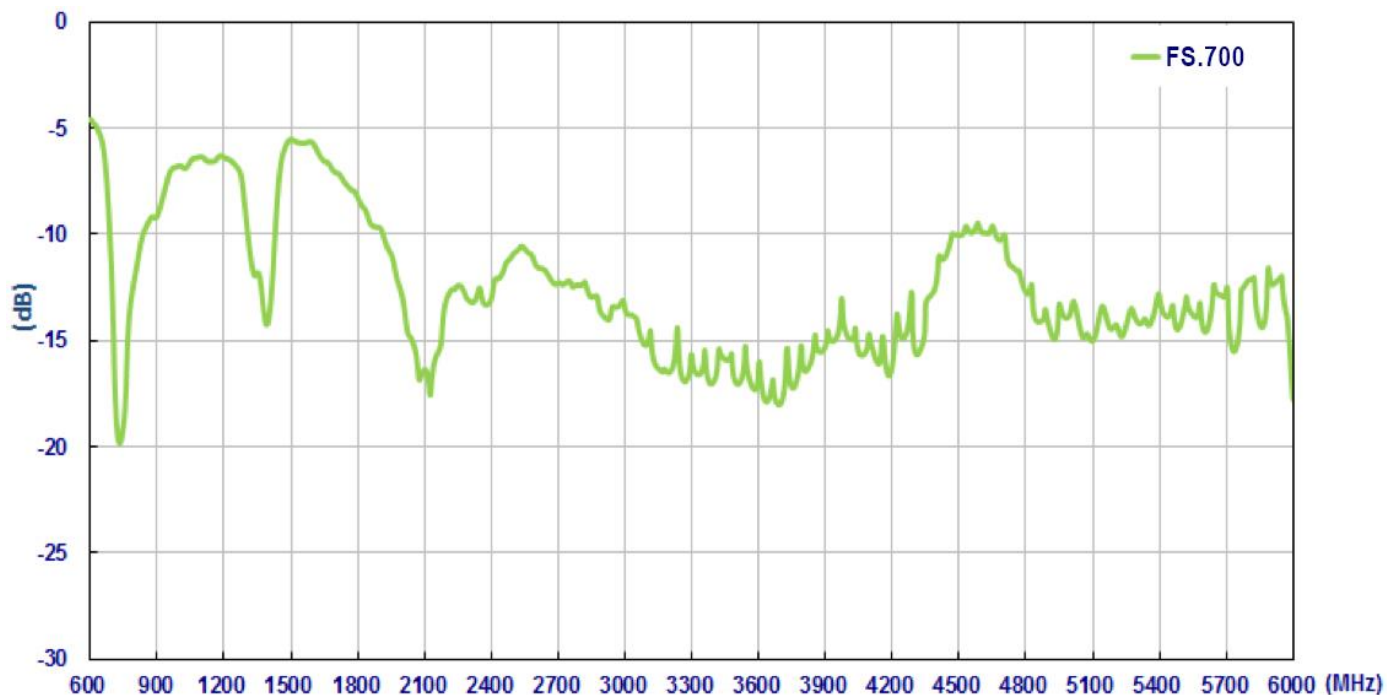
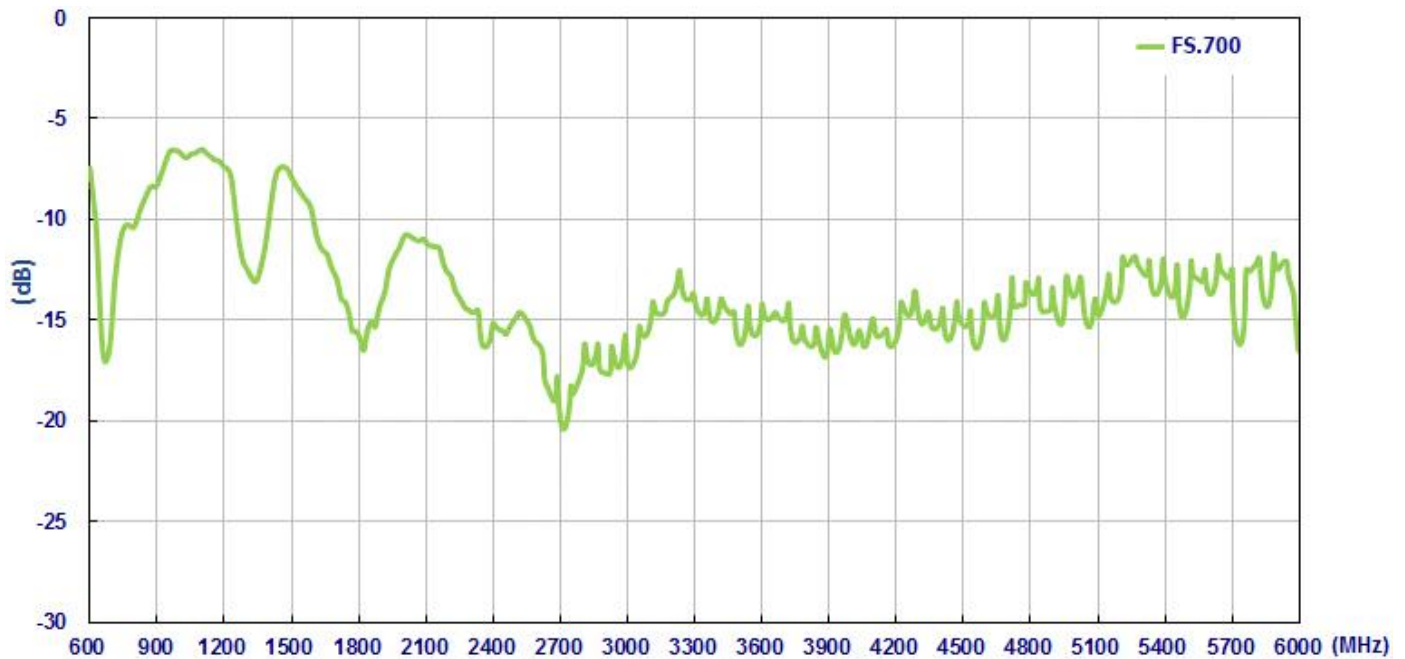
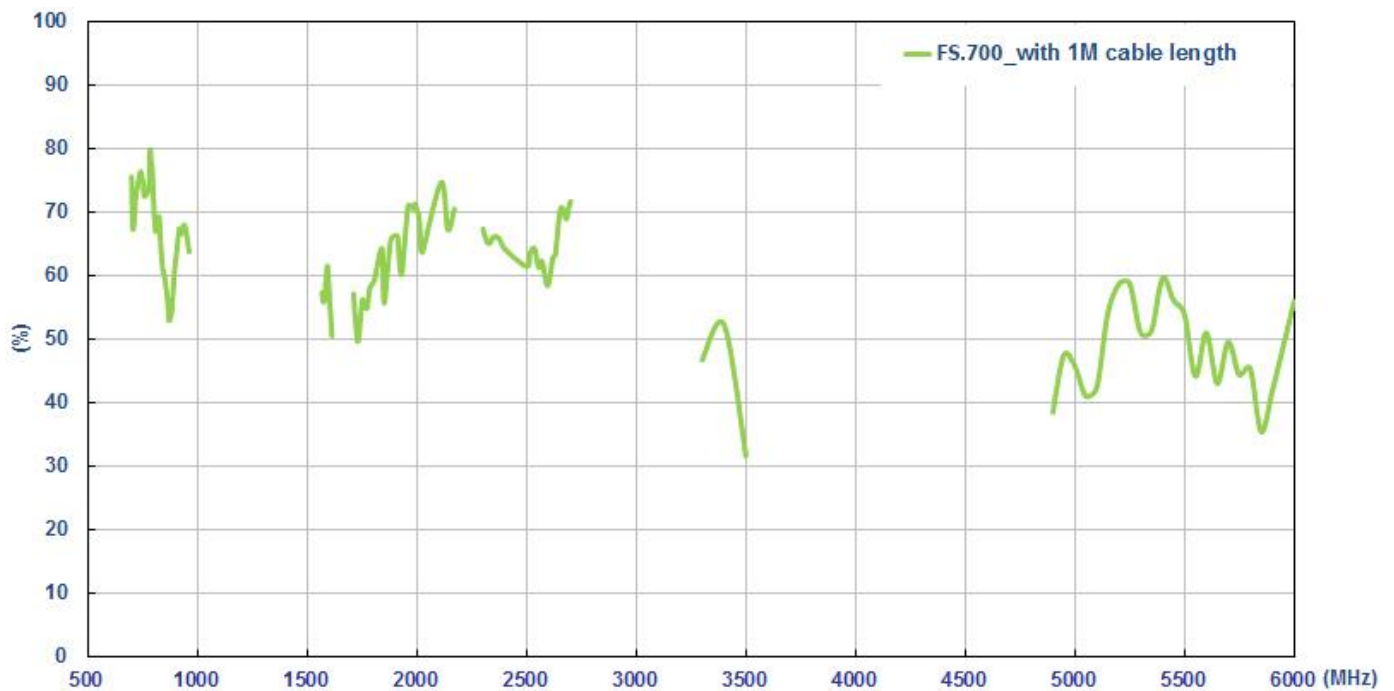


Figure3. Return loss of FS.700 with 1 meter cable length on the 2mm ABS base

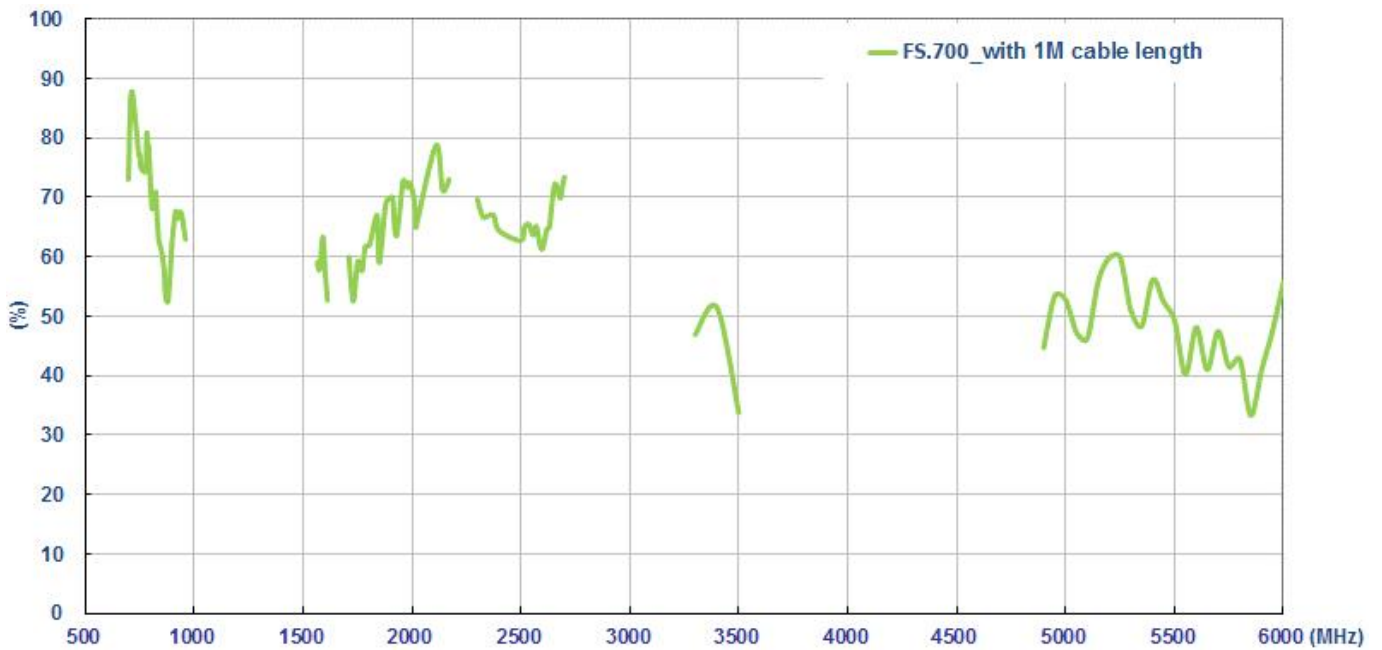


**Figure4.** Return loss of FS.700 with 1 meter cable length on the glass base

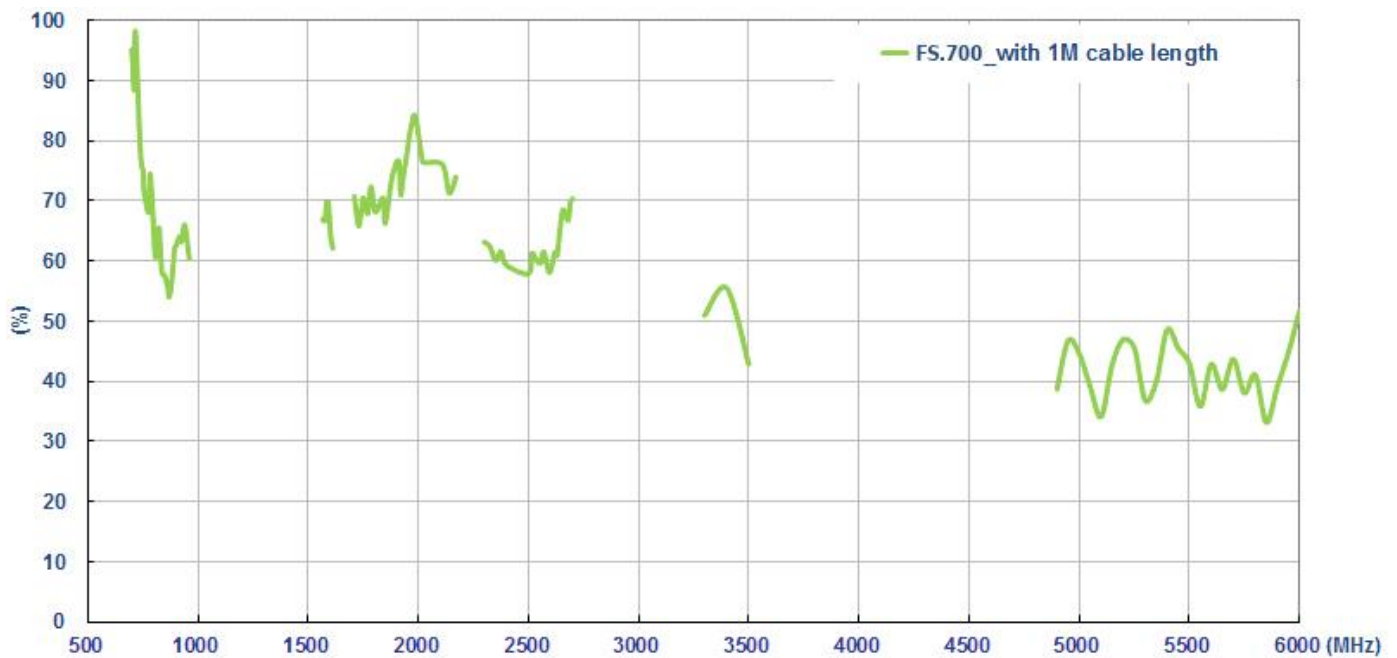
### 3.3 Efficiency



**Figure5.** Efficiency of FS.700 with 1 meter cable length in free space

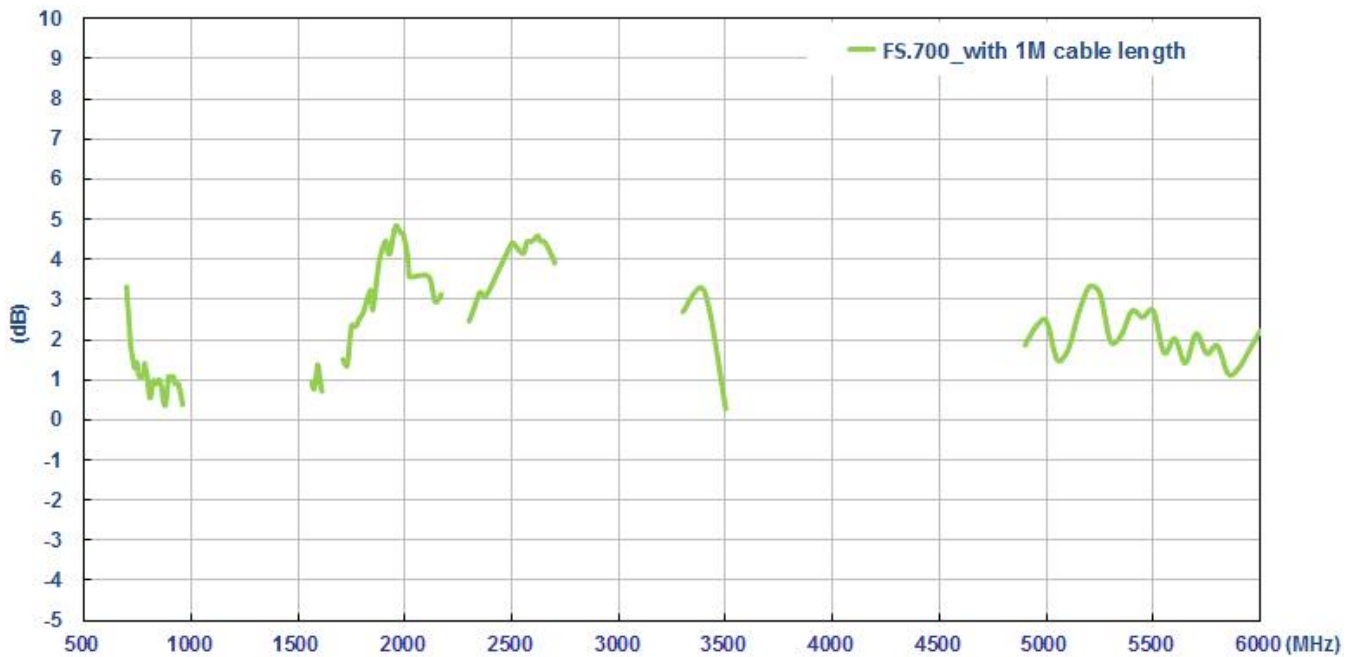


**Figure6.** Efficiency of FS.700 with 1 meter cable length on the 2mm ABS base

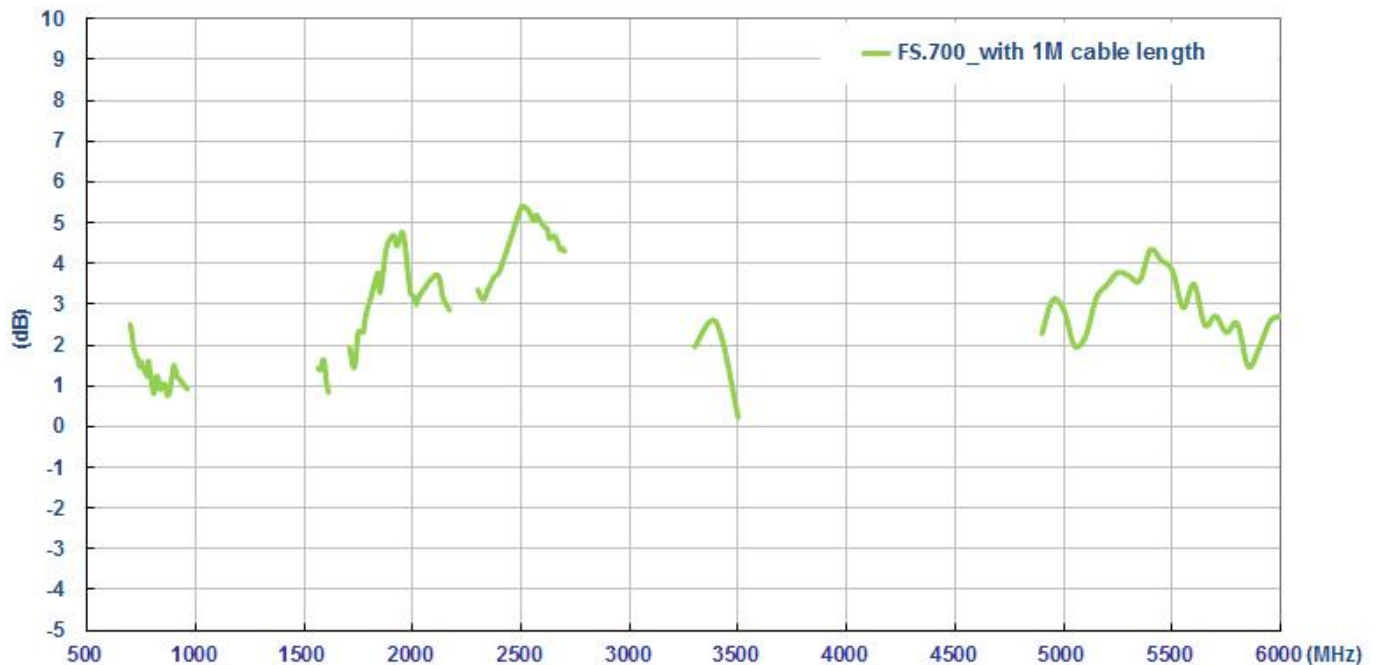


**Figure7.** Efficiency of FS.700 with 1 meter cable length on the glass base.

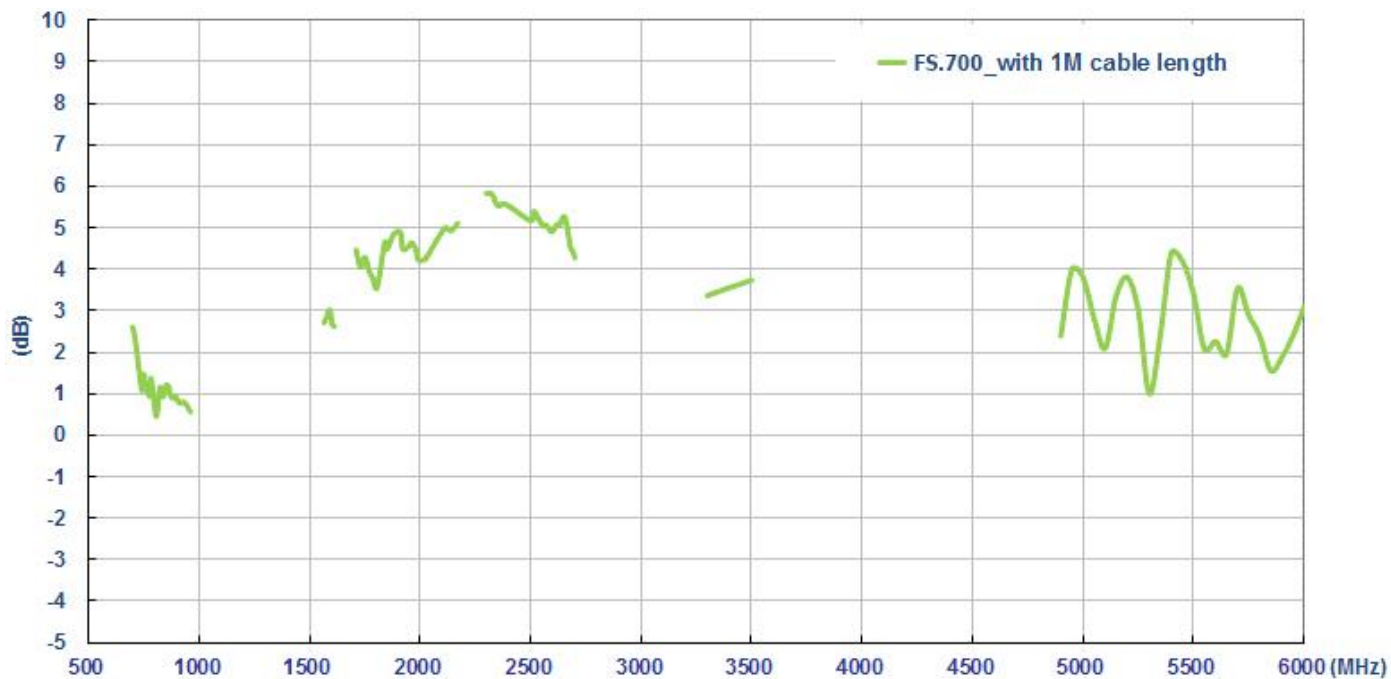
### 3.4 Peak gain



**Figure8.** Peak gain of FS.700 with 1 meter cable length in free space

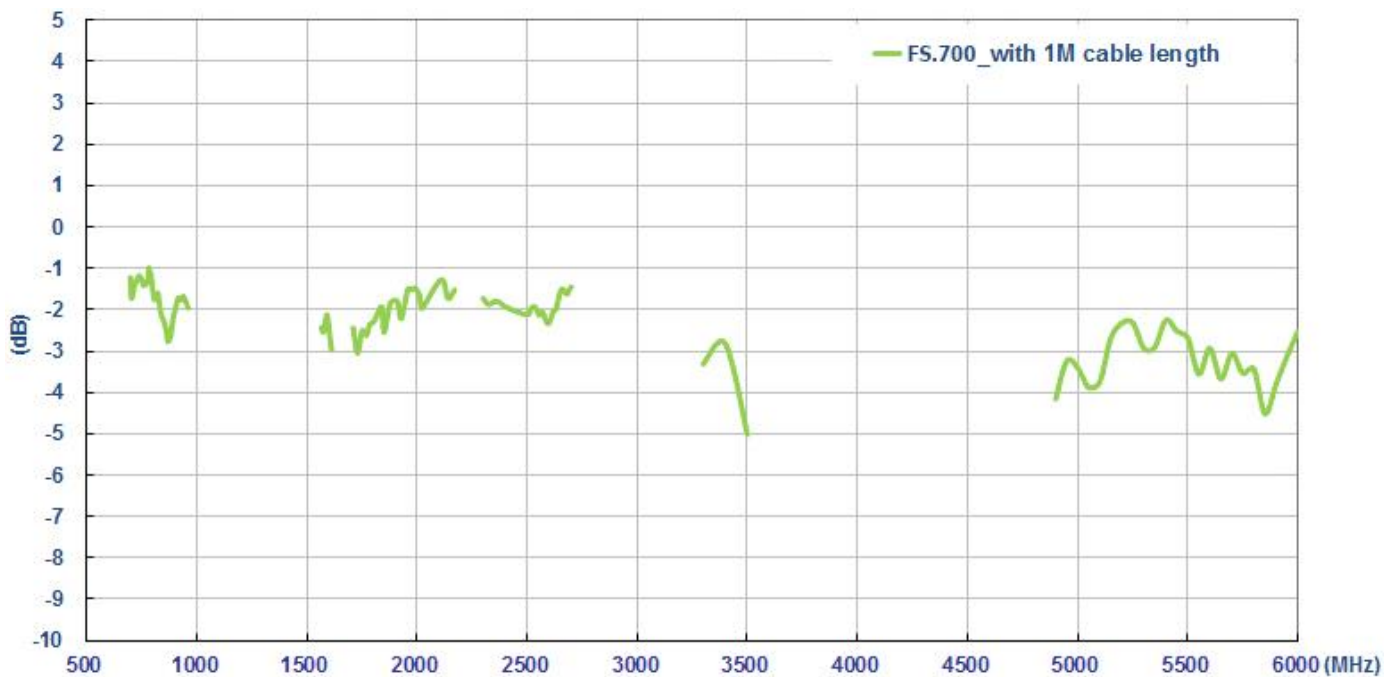


**Figure9.** Peak gain of FS.700 with 1 meter cable length on the 2mm ABS base

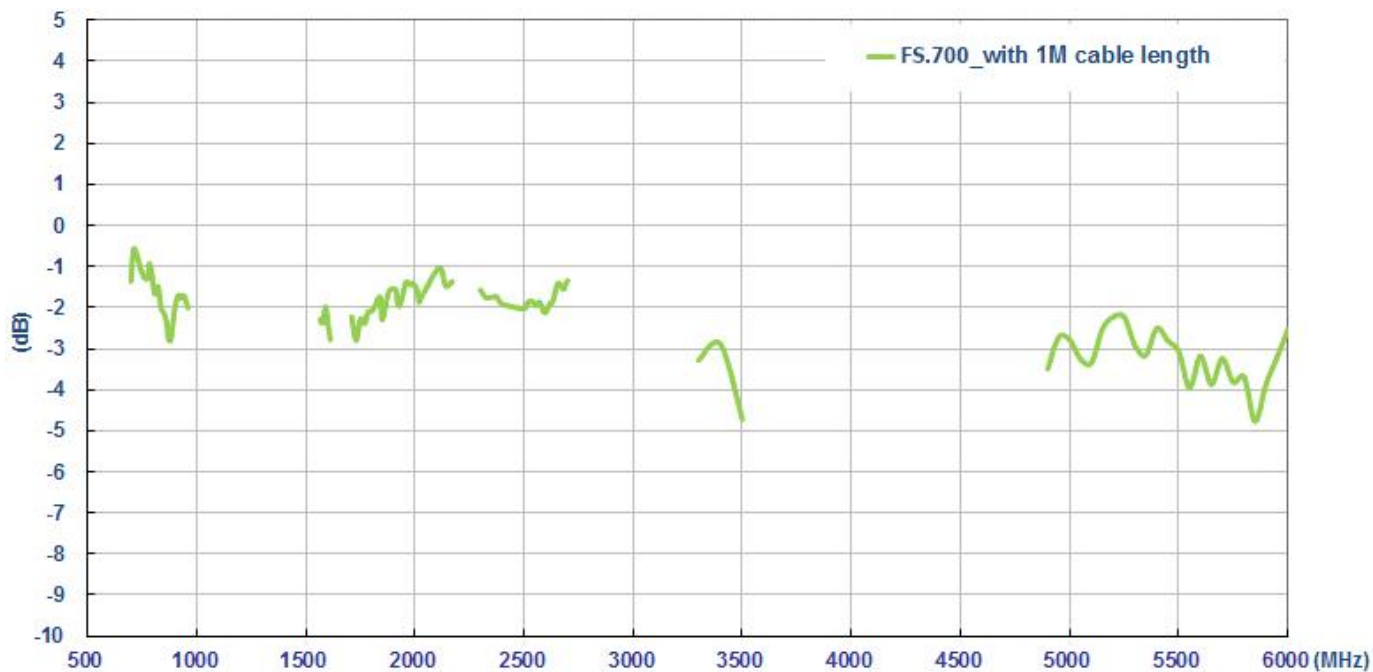


**Figure10.** Peak gain of FS.700 with 1 meter cable length on the glass base

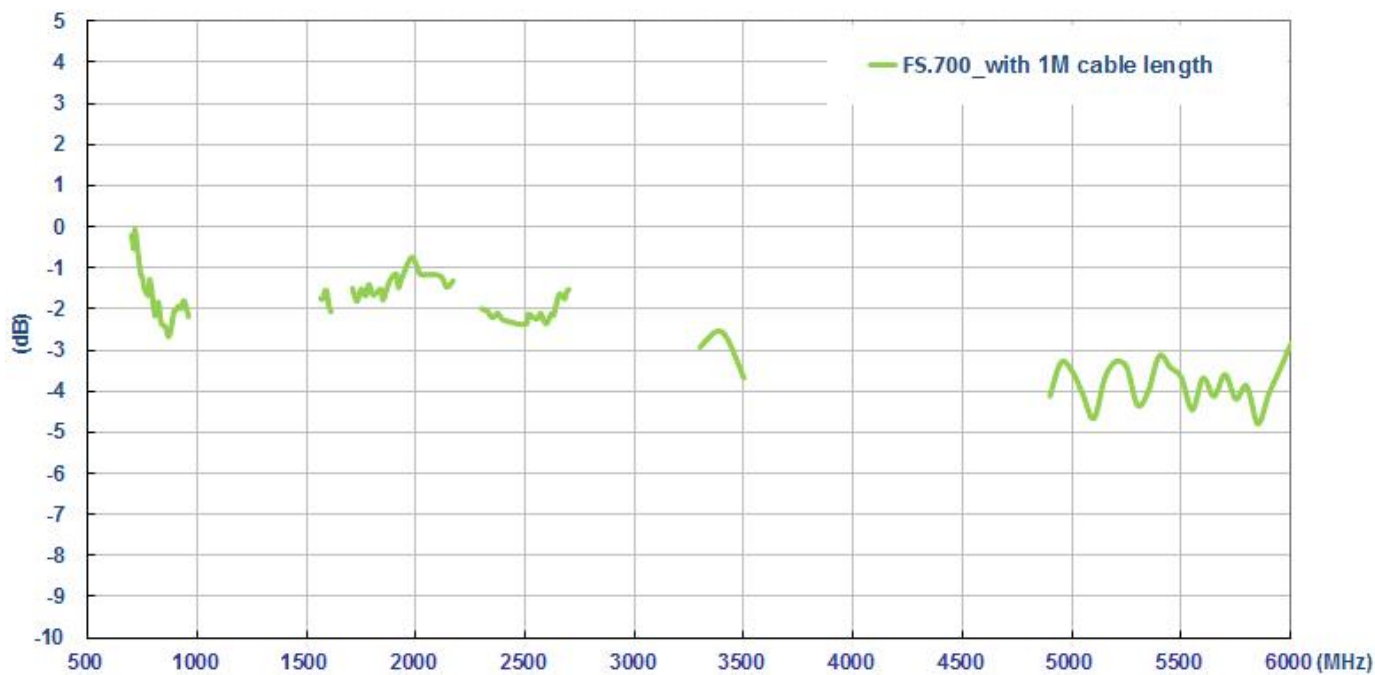
### 3.5 Average gain



**Figure11.** Average gain of FS.700 with 1 meter cable length in free space



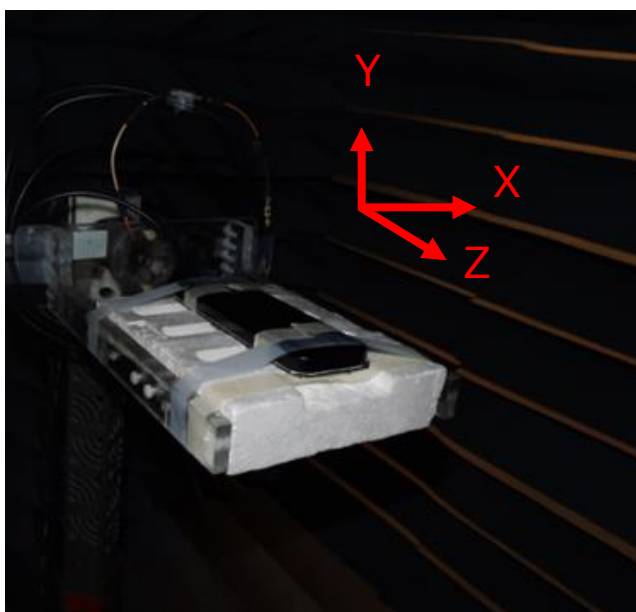
**Figure12.** Average gain of FS.700 with 1 meter cable length on the 2mm ABS base



**Figure13.** Average gain of FS.700 with 1 meter cable length on the glass base

## 4. Antenna Radiation Patterns

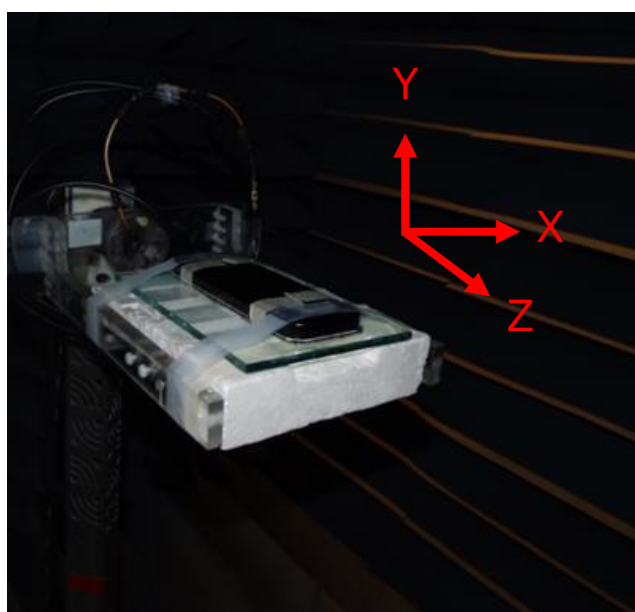
The antenna radiation patterns were measured in ETS Anechoic Chamber. The measurement setup as below,



In free space



On 2mm ABS base

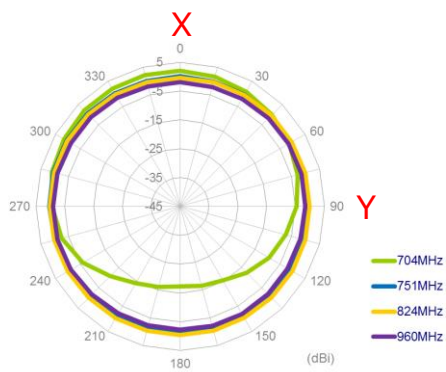


On glass base

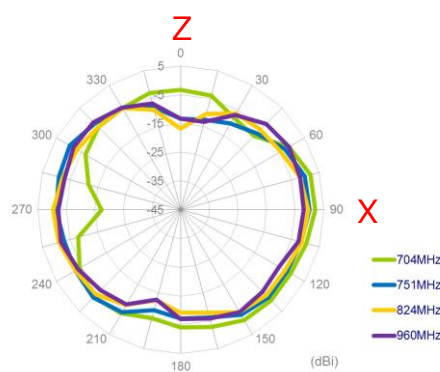
**Figure.14** The measurement setup; a) In free space, b) On the 2mm ABS base, c) On the glass base

## 4.1 1 Meter Cable in Free Space

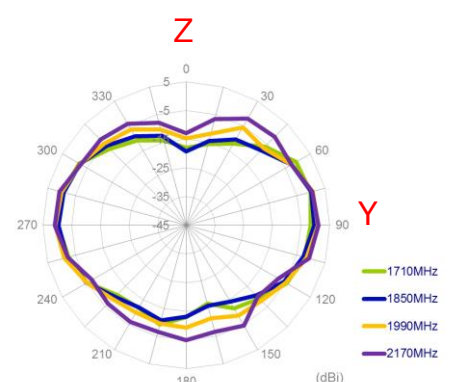
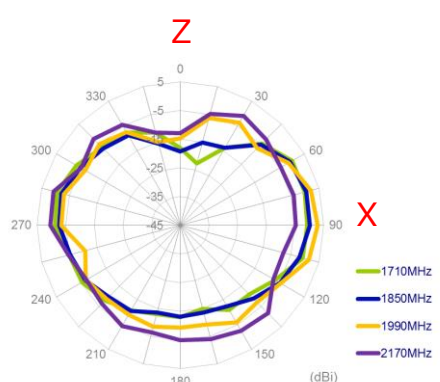
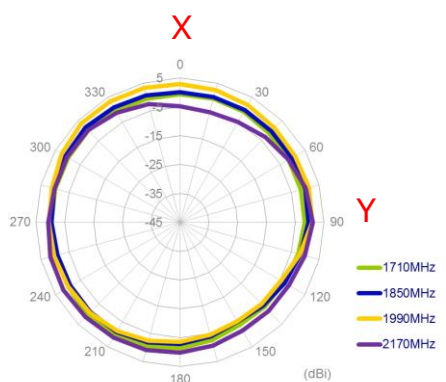
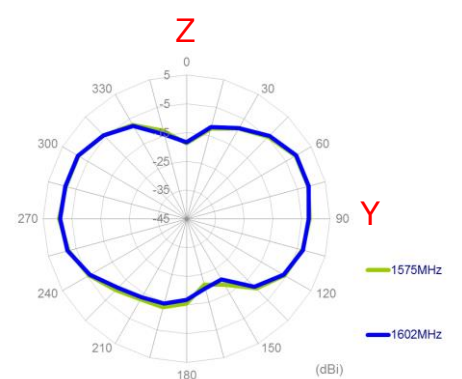
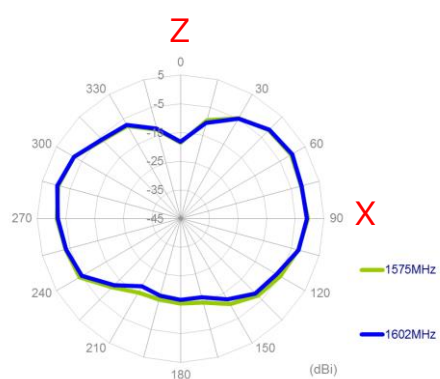
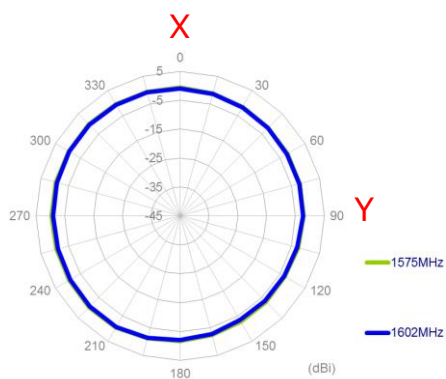
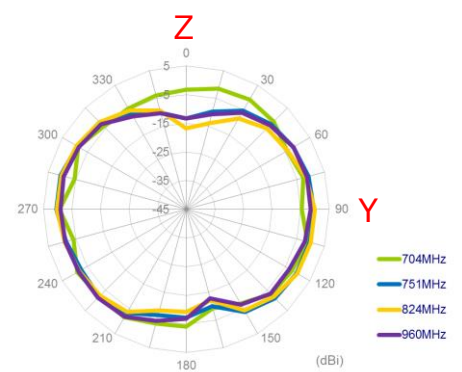
XY Plane



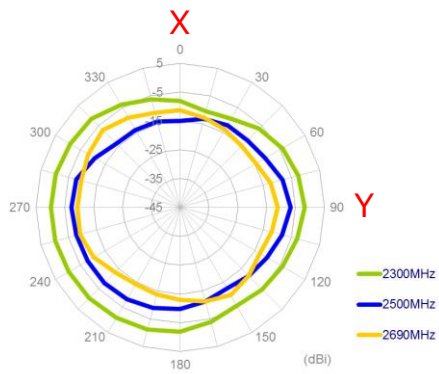
XZ Plane



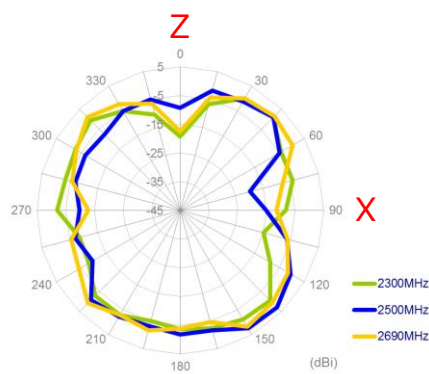
YZ Plane



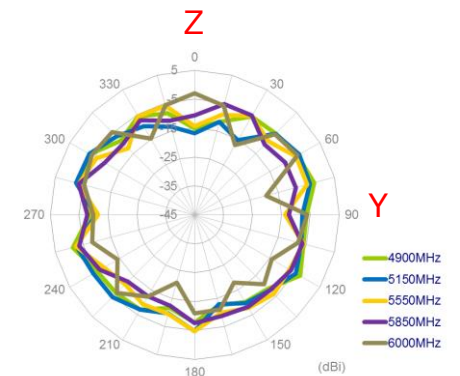
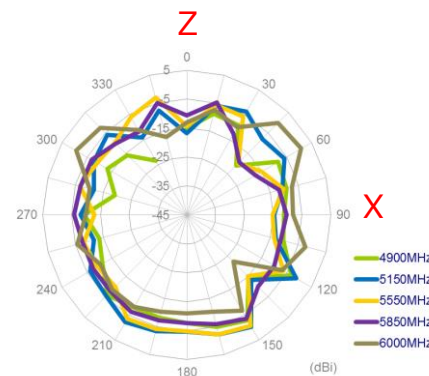
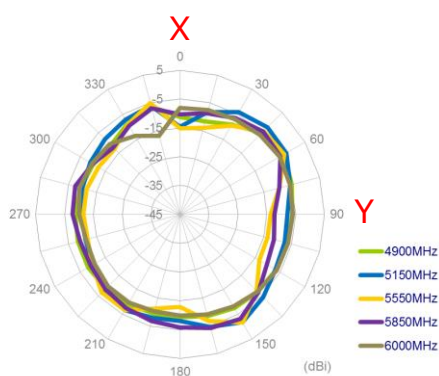
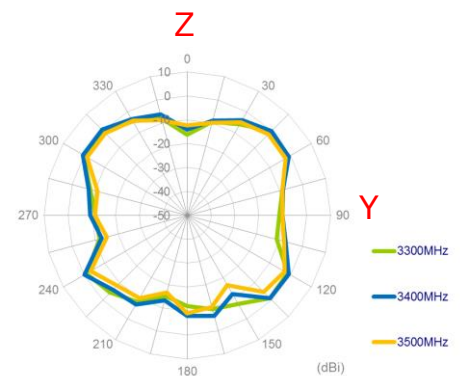
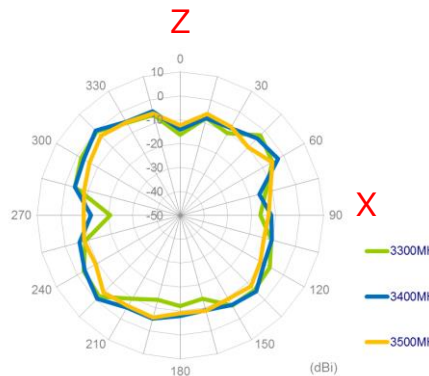
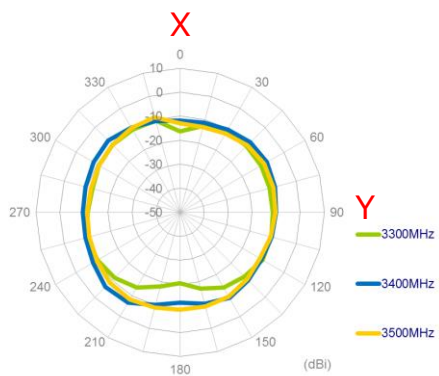
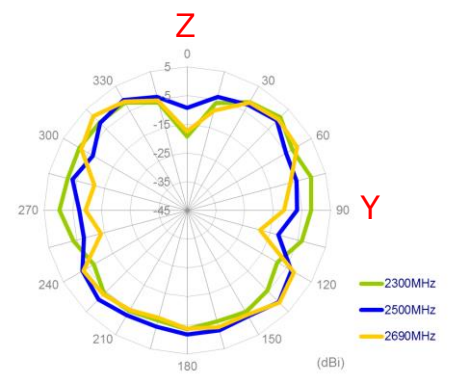
XY Plane



XZ Plane

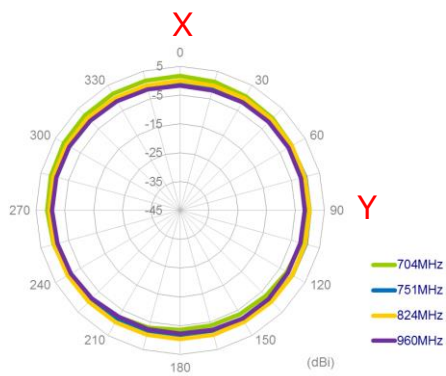


YZ Plane

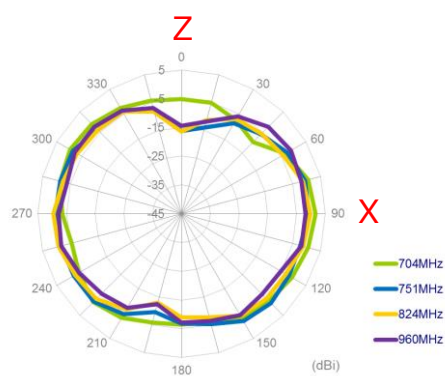


## 4.2 1 Meter Cable Length on 2mm ABS Base

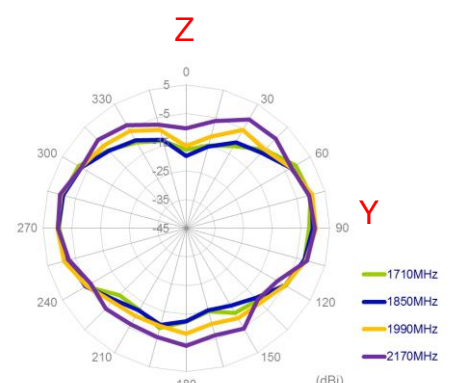
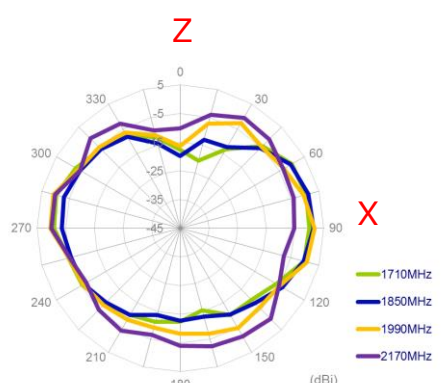
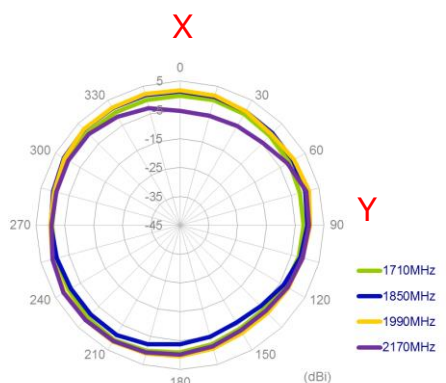
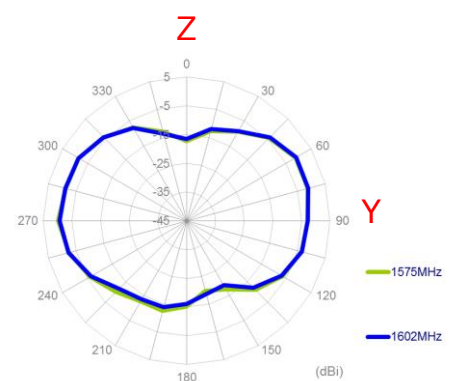
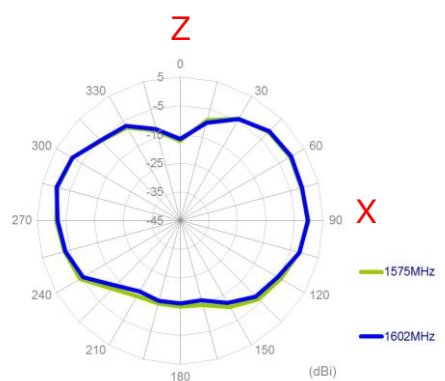
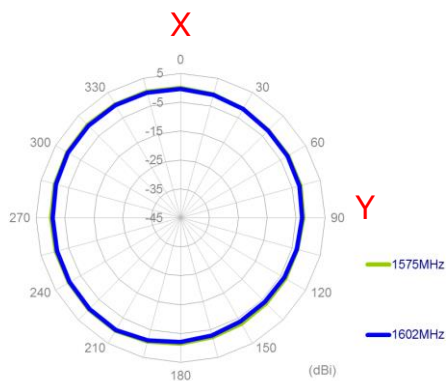
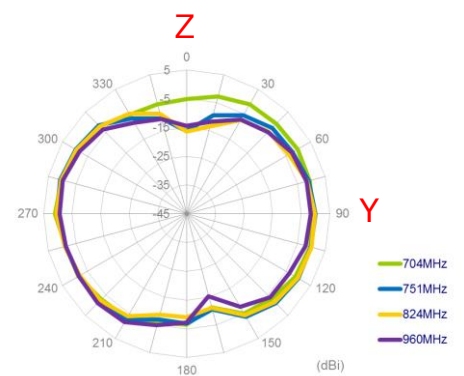
XY Plane



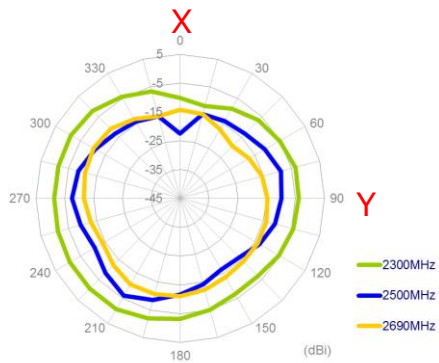
XZ Plane



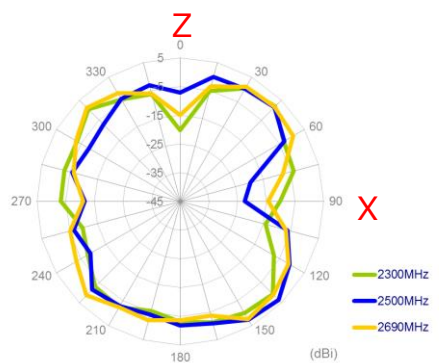
YZ Plane



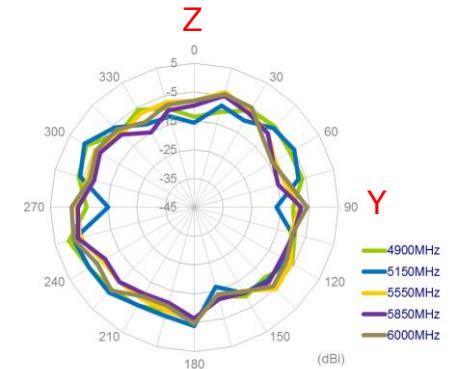
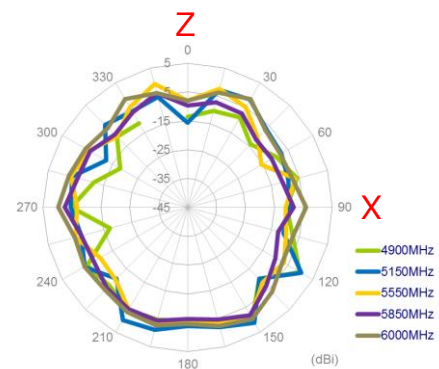
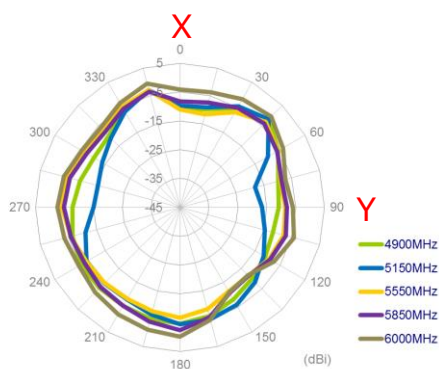
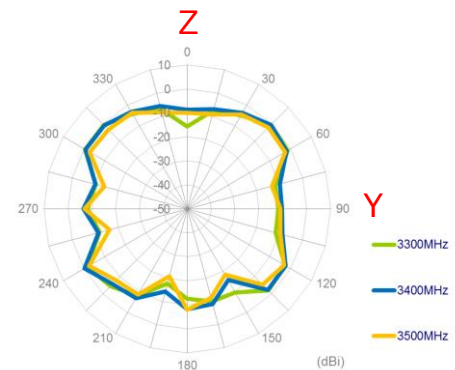
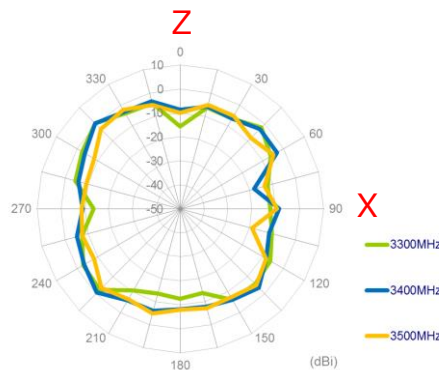
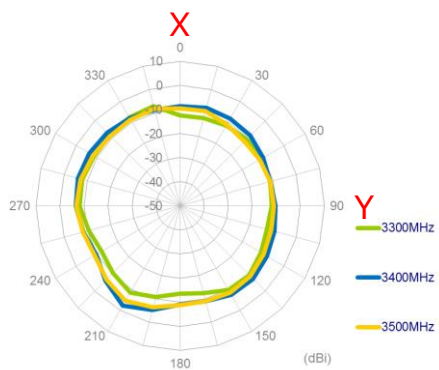
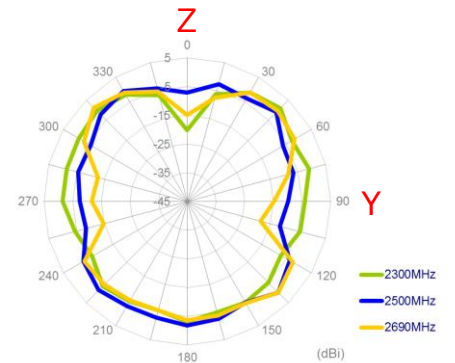
XY Plane



XZ Plane

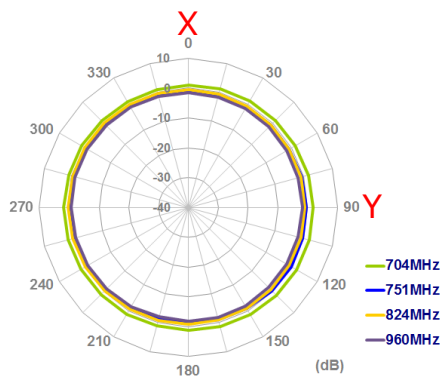


YZ Plane

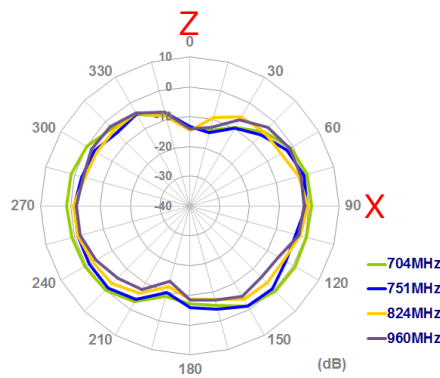


### 4.3 1 Meter Cable Length on Glass Base

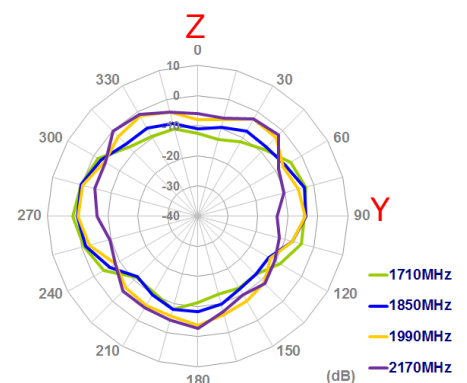
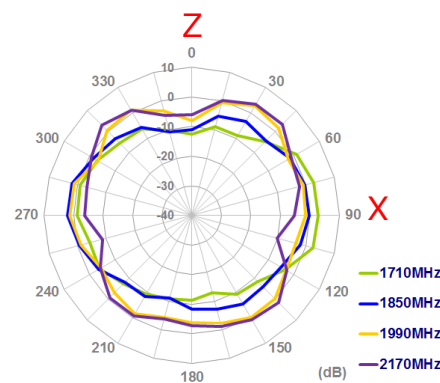
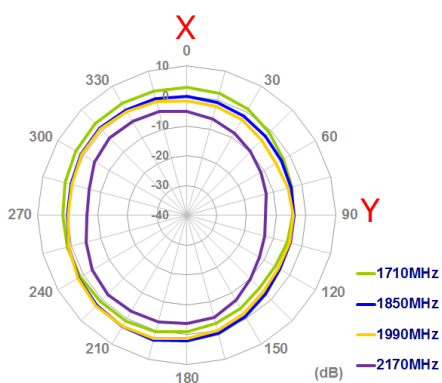
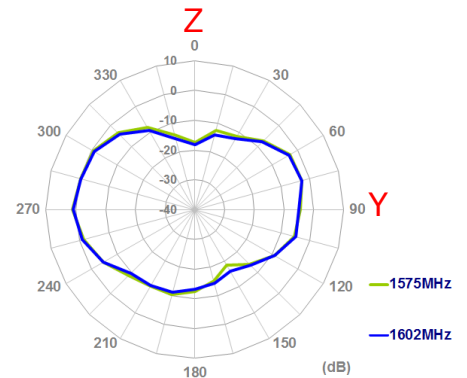
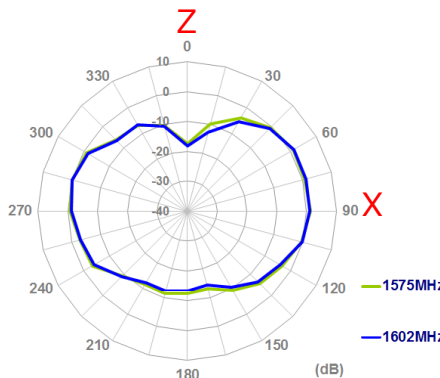
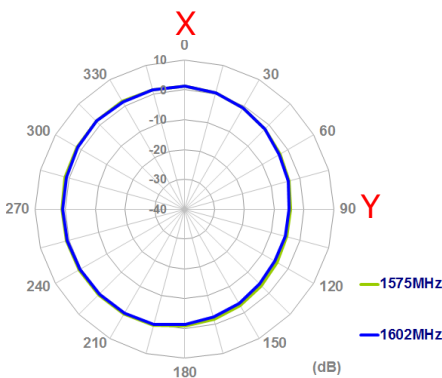
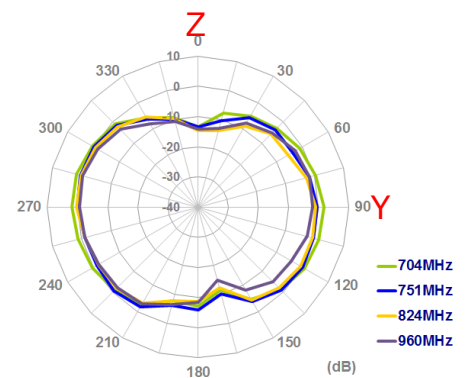
XY Plane



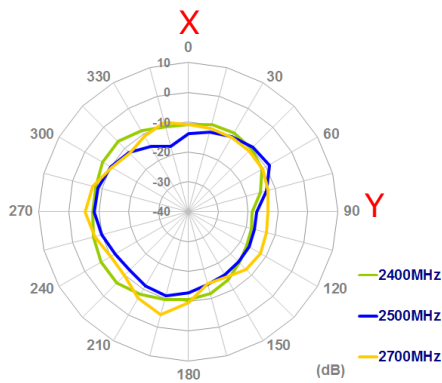
XZ Plane



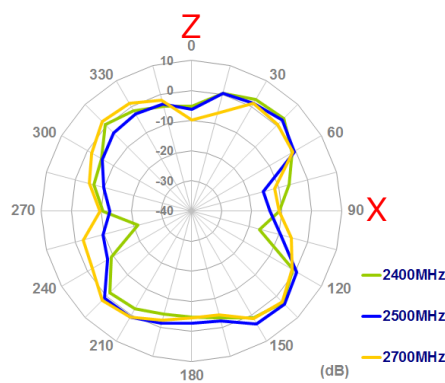
YZ Plane



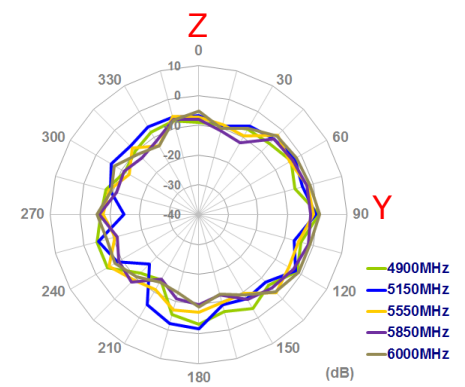
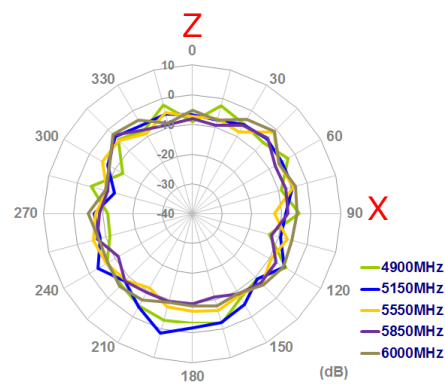
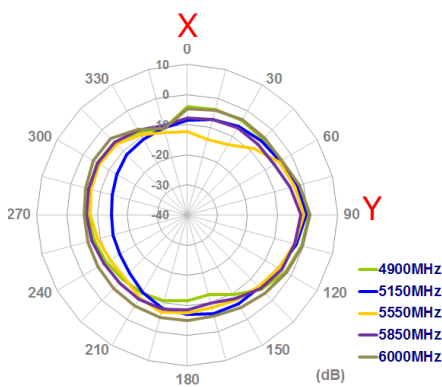
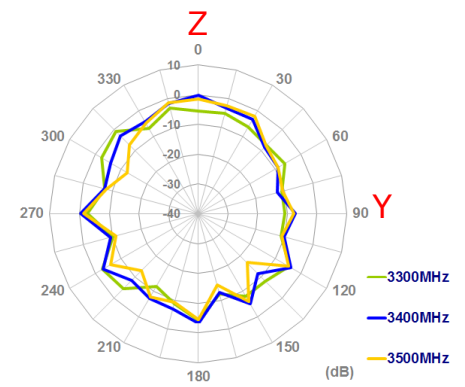
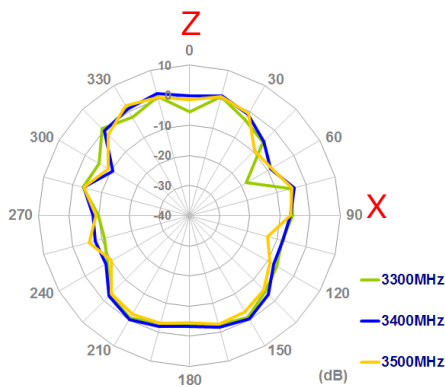
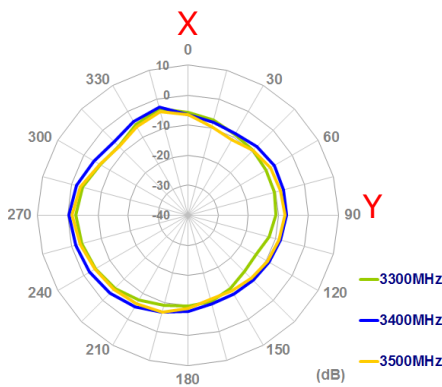
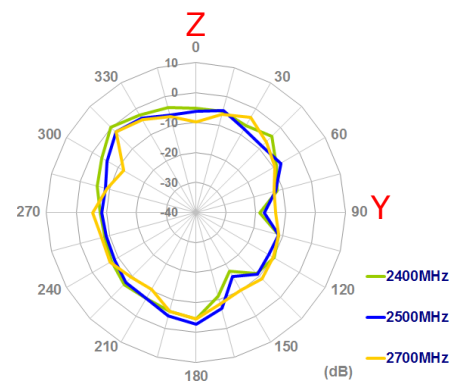
XY Plane



XZ Plane

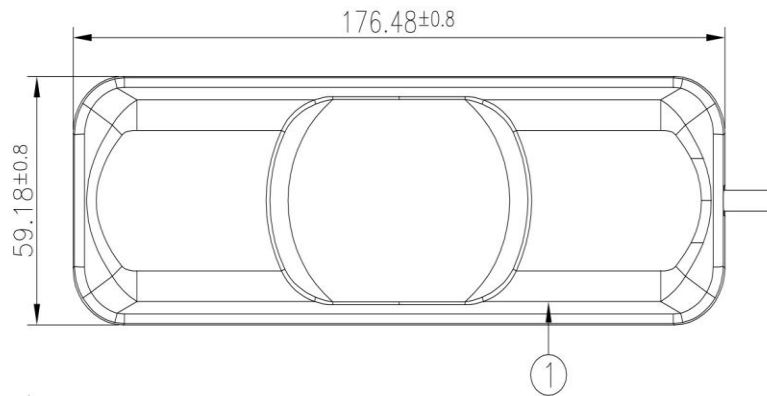


YZ Plane

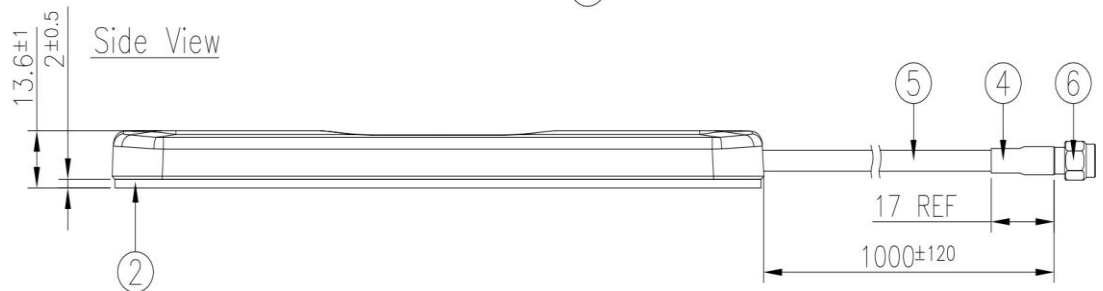


## 5 Drawing

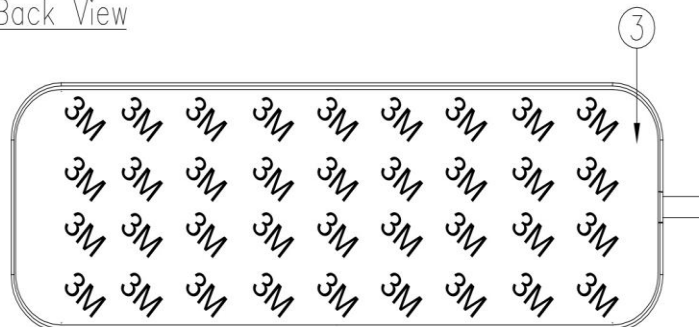
Front View



Side View



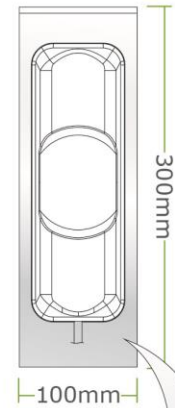
Back View



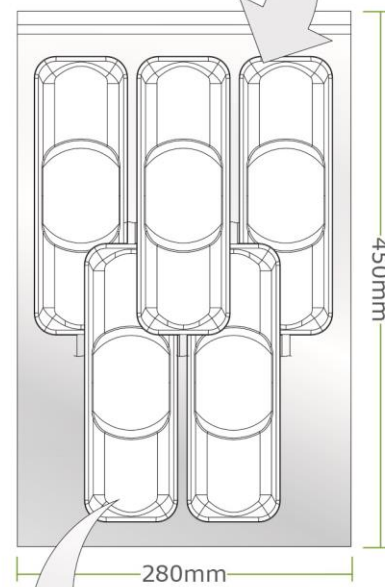
|   | Name                                        | Material        | Finish      | QTY |
|---|---------------------------------------------|-----------------|-------------|-----|
| 1 | Housing Top GSA8841                         | ABS             | Black       | 1   |
| 2 | Housing Bottom GSA8841                      | ABS             | Black       | 1   |
| 3 | Double Sided Adhesive With Foam(Black Foam) | 3M9448HK+CR4305 | White Liner | 1   |
| 4 | Heat Shrink Tube                            | PE              | Black       | 1   |
| 5 | TGC200 Coaxial Cable                        | PE              | Black       | 1   |
| 6 | SMA(M)ST                                    | Brass           | Au Plated   | 1   |

## 6 Packaging

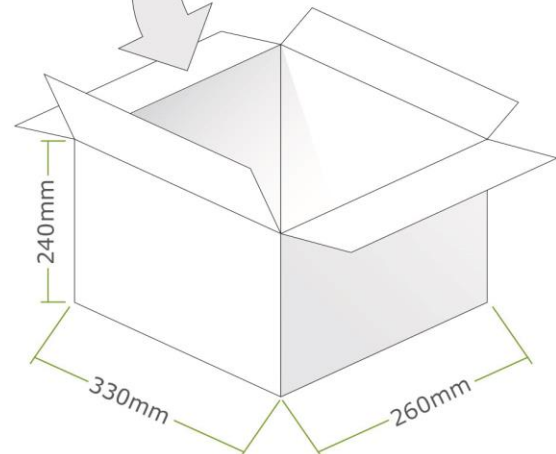
1pc FS.700.A.10WW111 per PE bag  
Bag Dimensions - 300\*100mm  
Weight - 127g



5pcs FS.700.A.10WW111 per Small Bag  
Small Bag Dimensions - 450\*280mm  
Weight - 0.635Kg



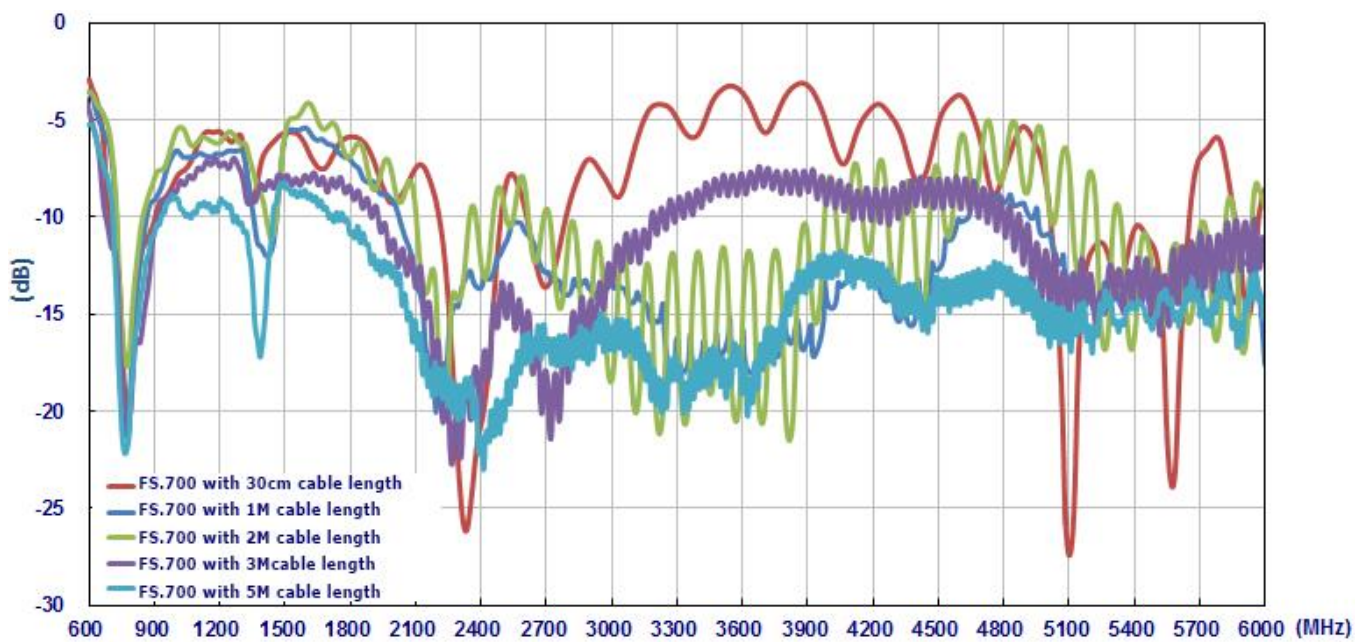
50pcs FS.700.A.10WW111 per carton  
Carton Dimensions - 330\*260\*240 mm  
Weight - 6.5Kg



## 7 Application Note

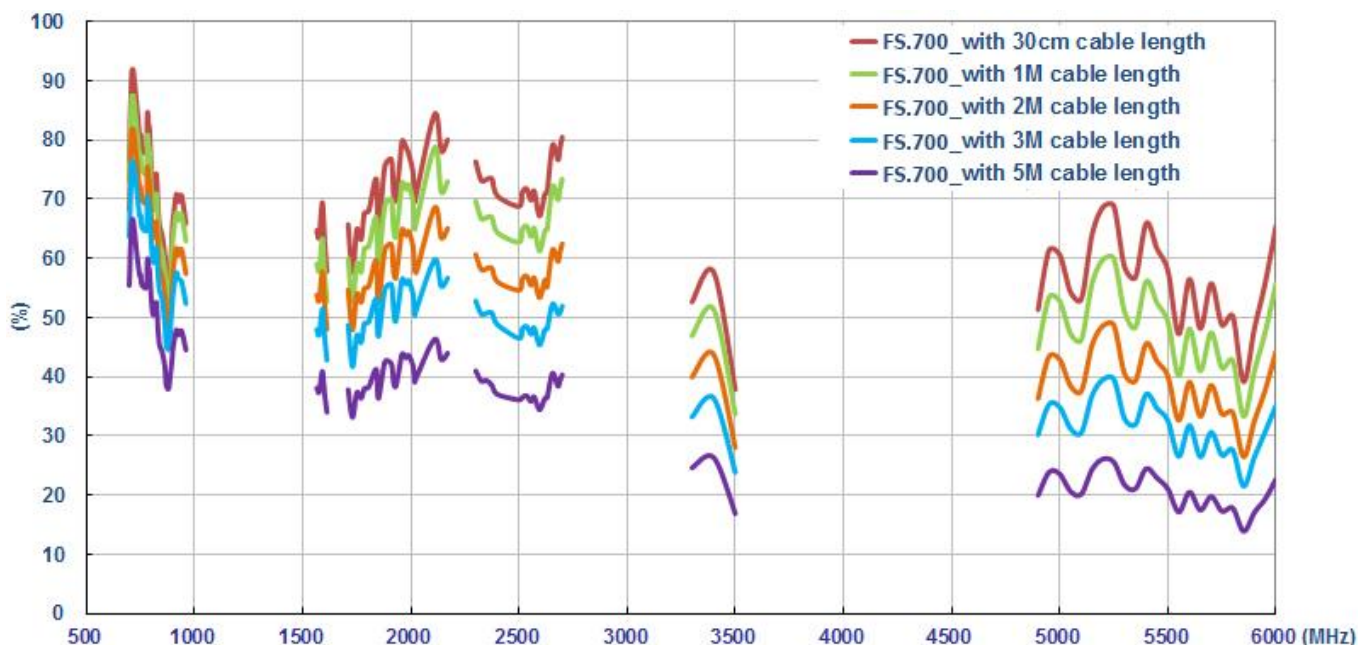
The FS.700 antenna measurement with difference cable length and difference environments, the performance is shown as below,

### 7.1 Return Loss (in free space)



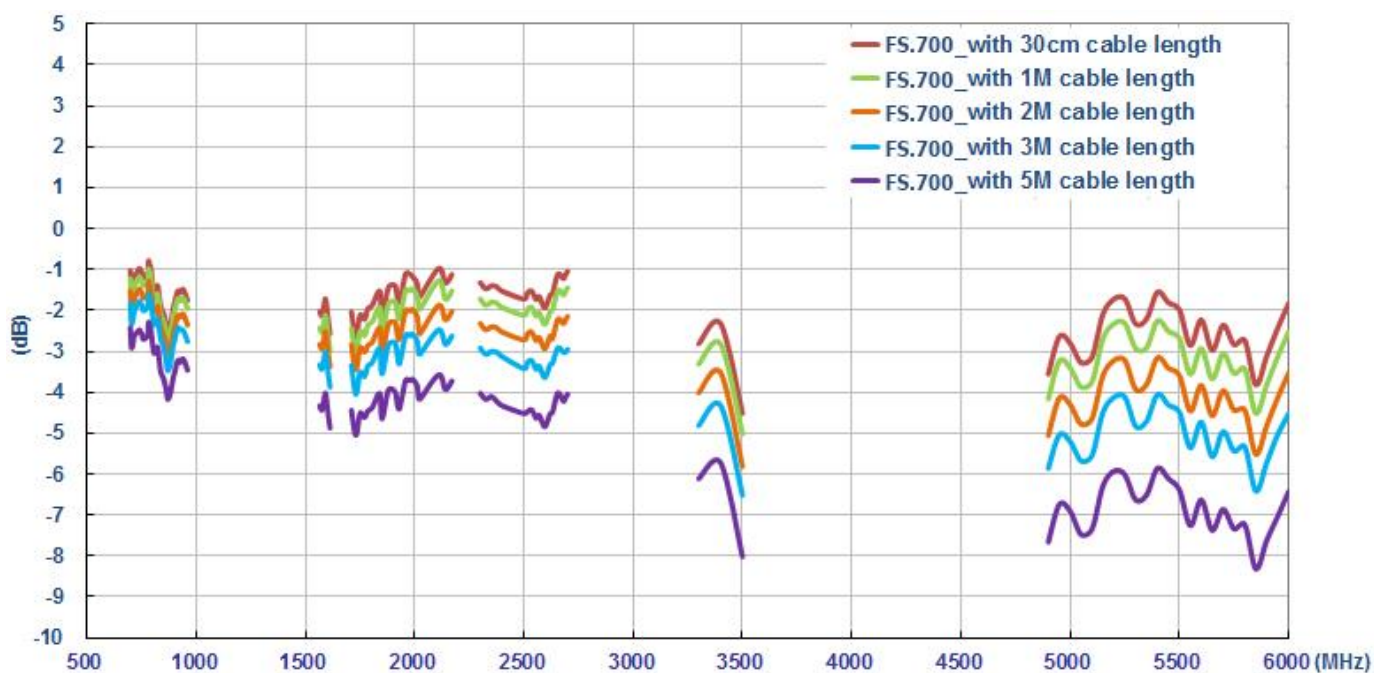
**Figure 15.** Measured the return loss of FS.700 Antenna with difference cable length

## 7.2 Efficiency (In free space)



**Figure 16.** Measured the efficiency of FS.700 Antenna with difference cable length

## 7.3 Average Gain (In free space)



**Figure 17.** Measured the Average Gain of FS.700 Antenna with difference cable length

## 7.4 Peak Gain (In free space)

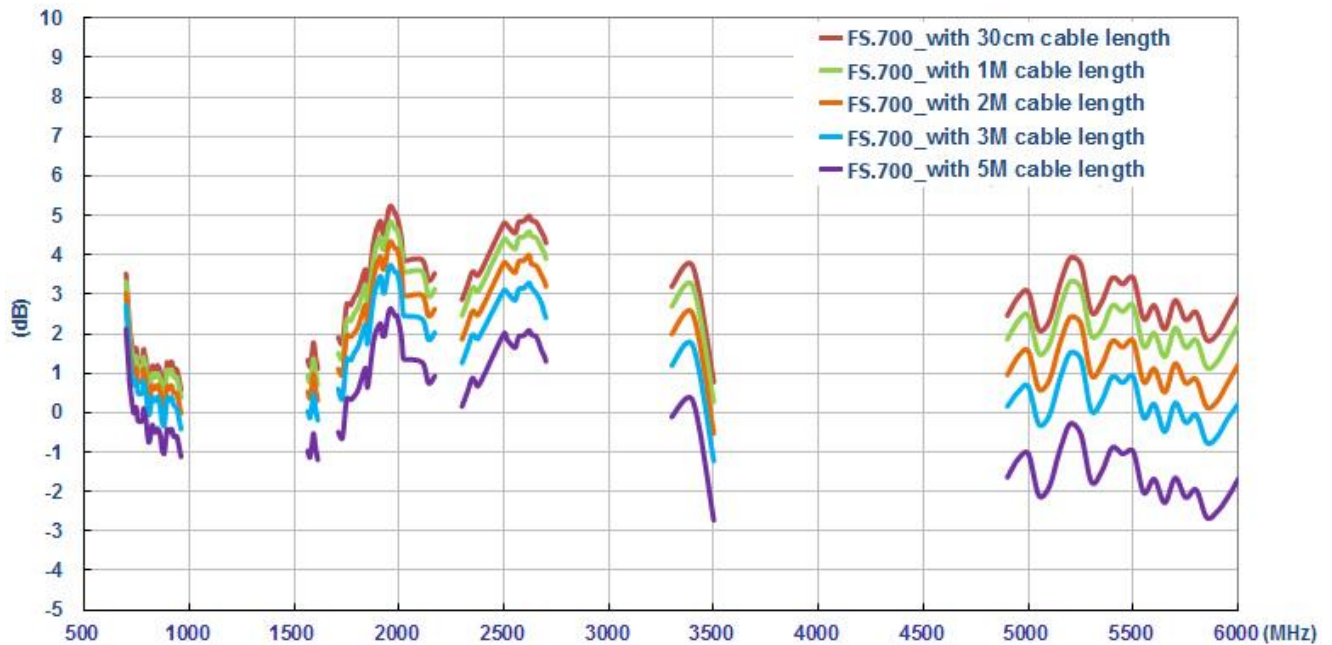


Figure 18. Measured the Peak Gain of FS.700 Antenna with difference cable length

## 7.5 Return loss (On the 2mm ABS base)

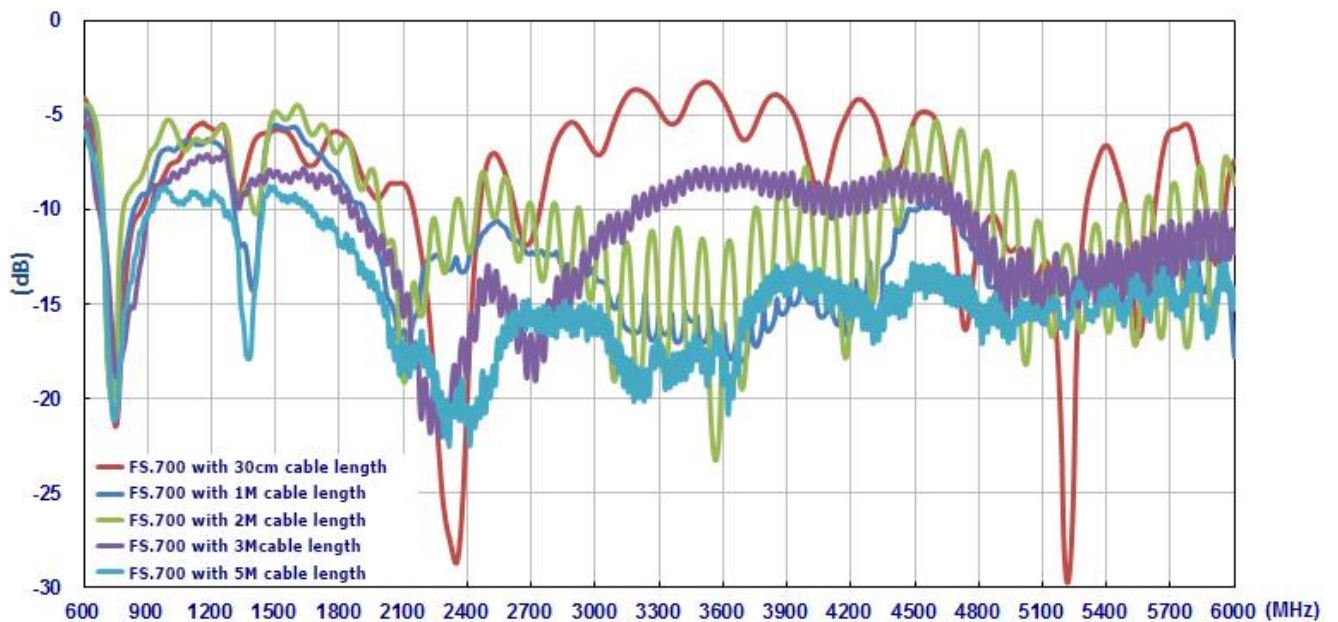
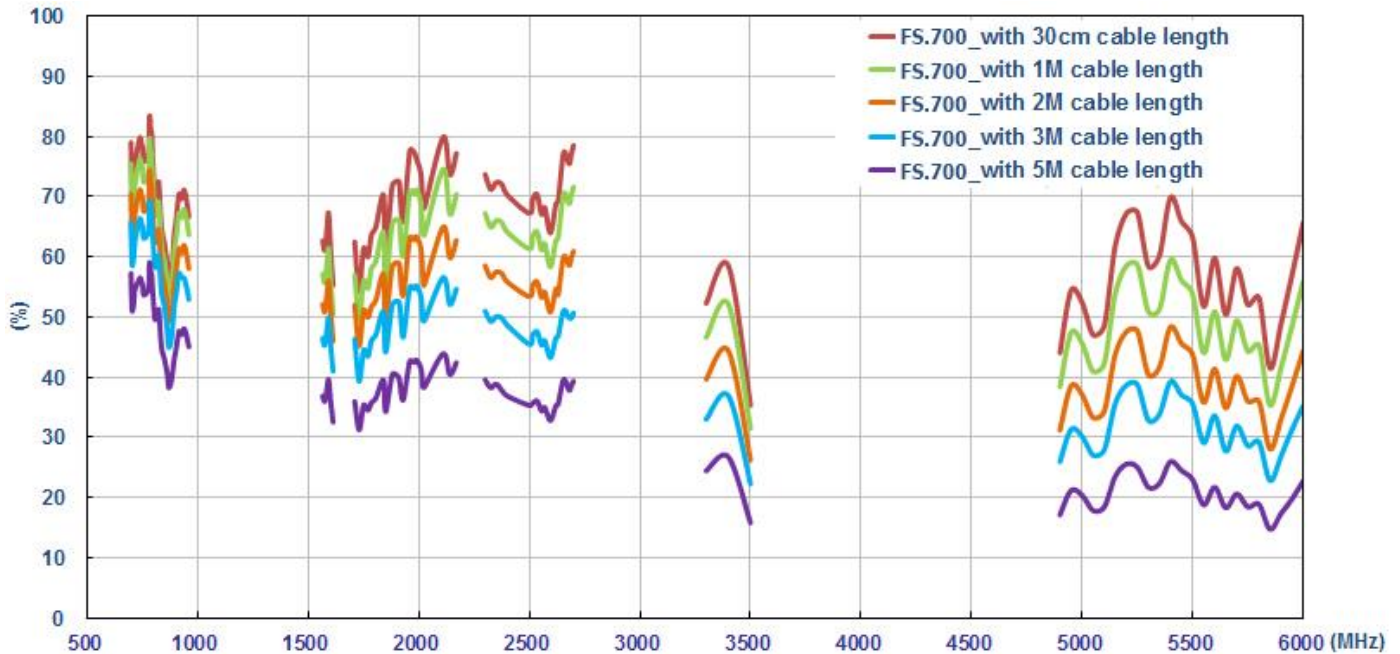


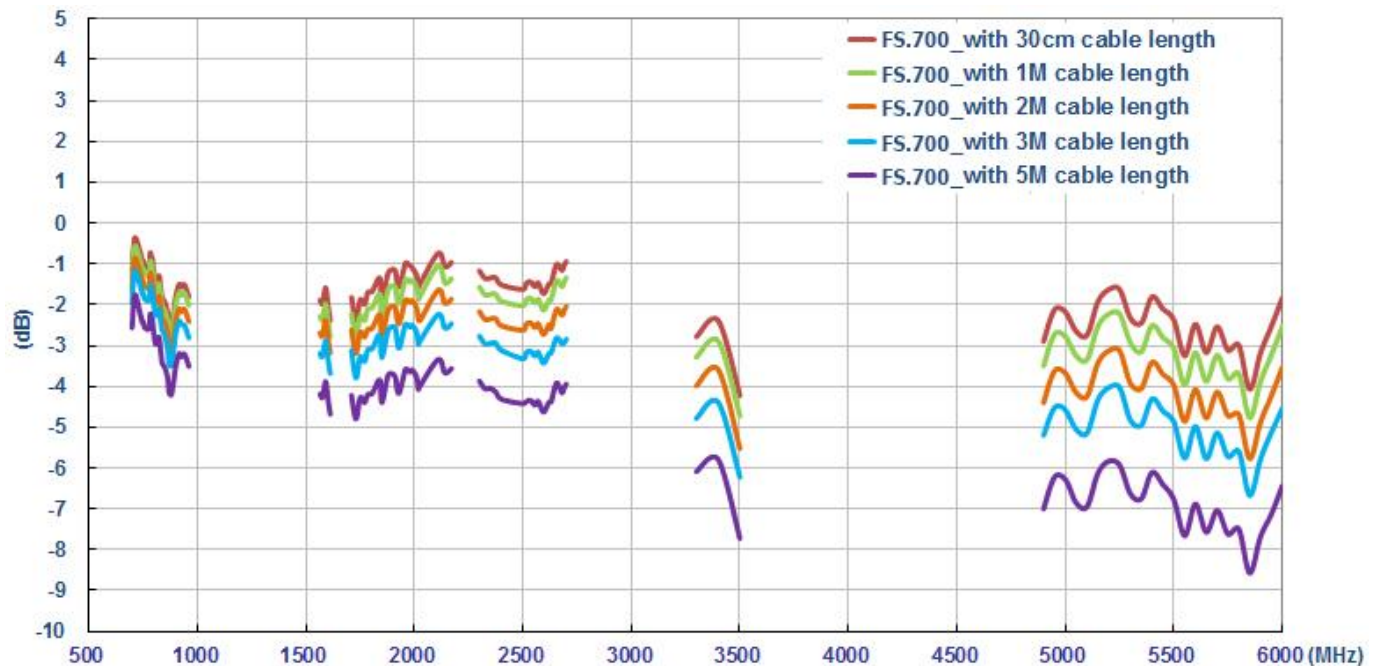
Figure 19. Measured the return loss of FS.700 Antenna with difference cable length

## 7.6 Efficiency (On the 2mm ABS base)



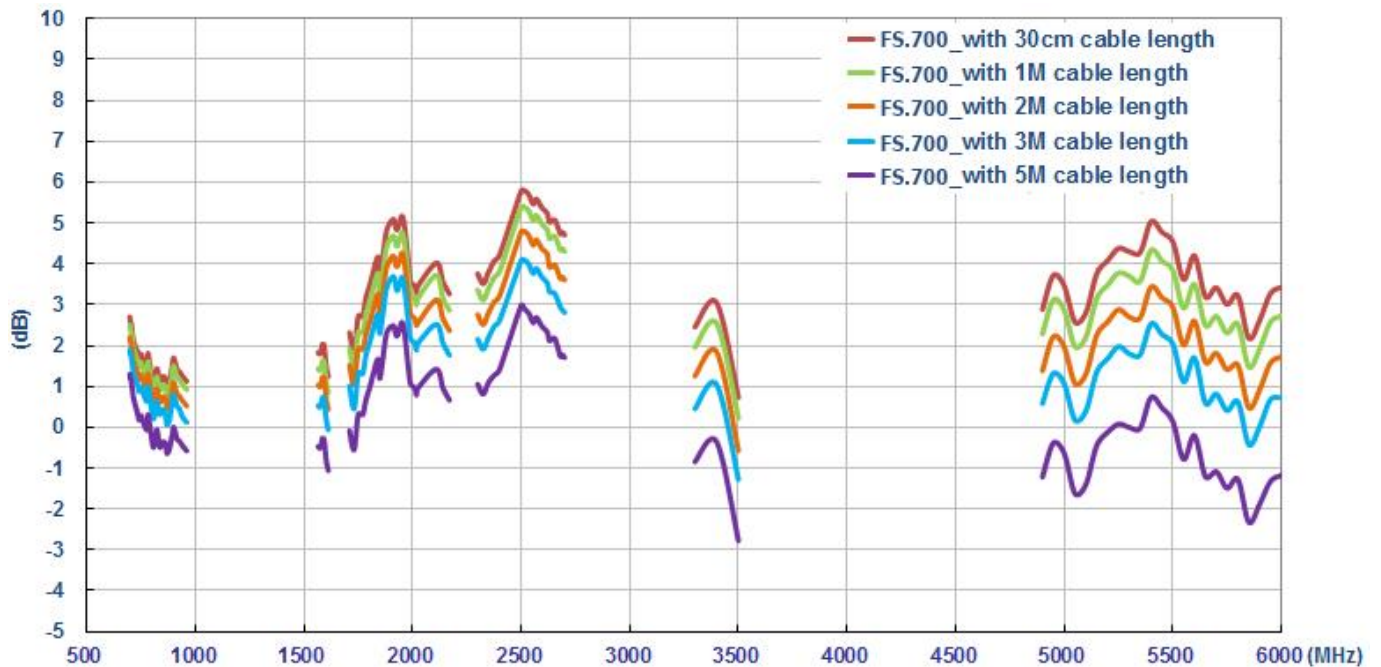
**Figure 20.** Measured the efficiency of FS.700 Antenna with difference cable length

## 7.7 Average Gain (On the 2mm ABS base)



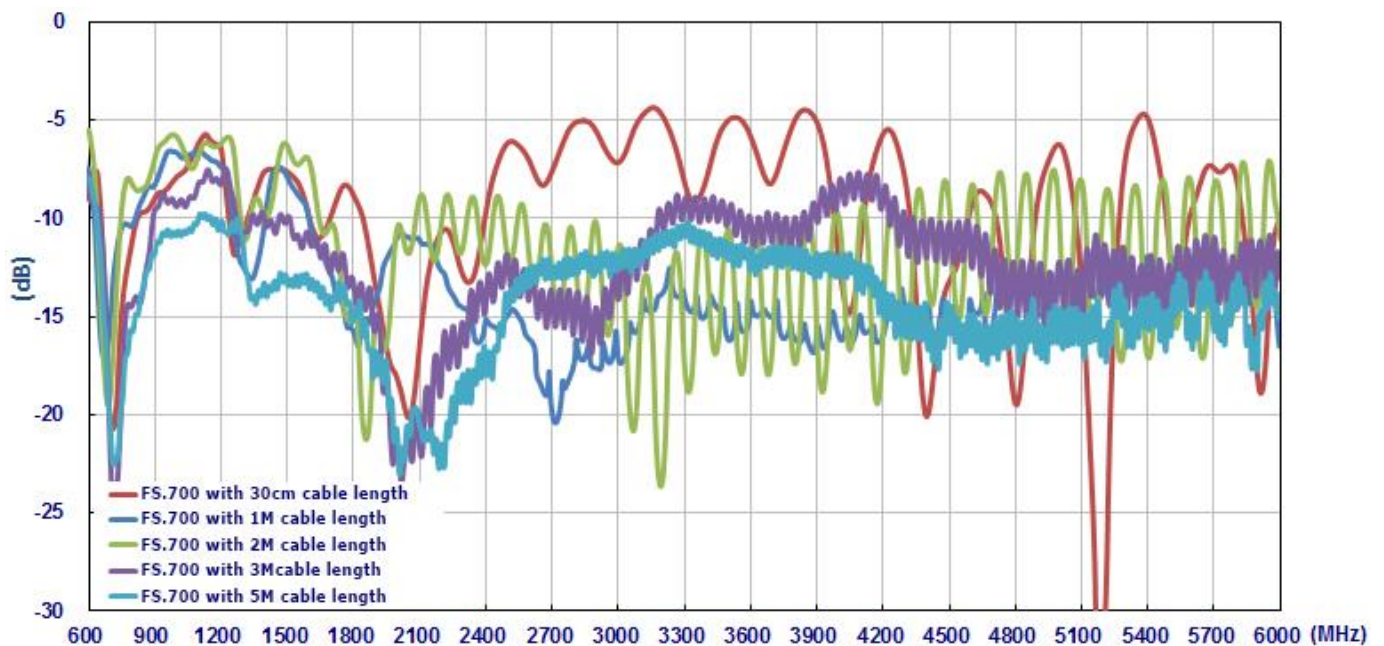
**Figure 21.** Measured the Average Gain of FS.700 Antenna with difference cable length

## 7.8 Peak Gain (On the 2mm ABS base)



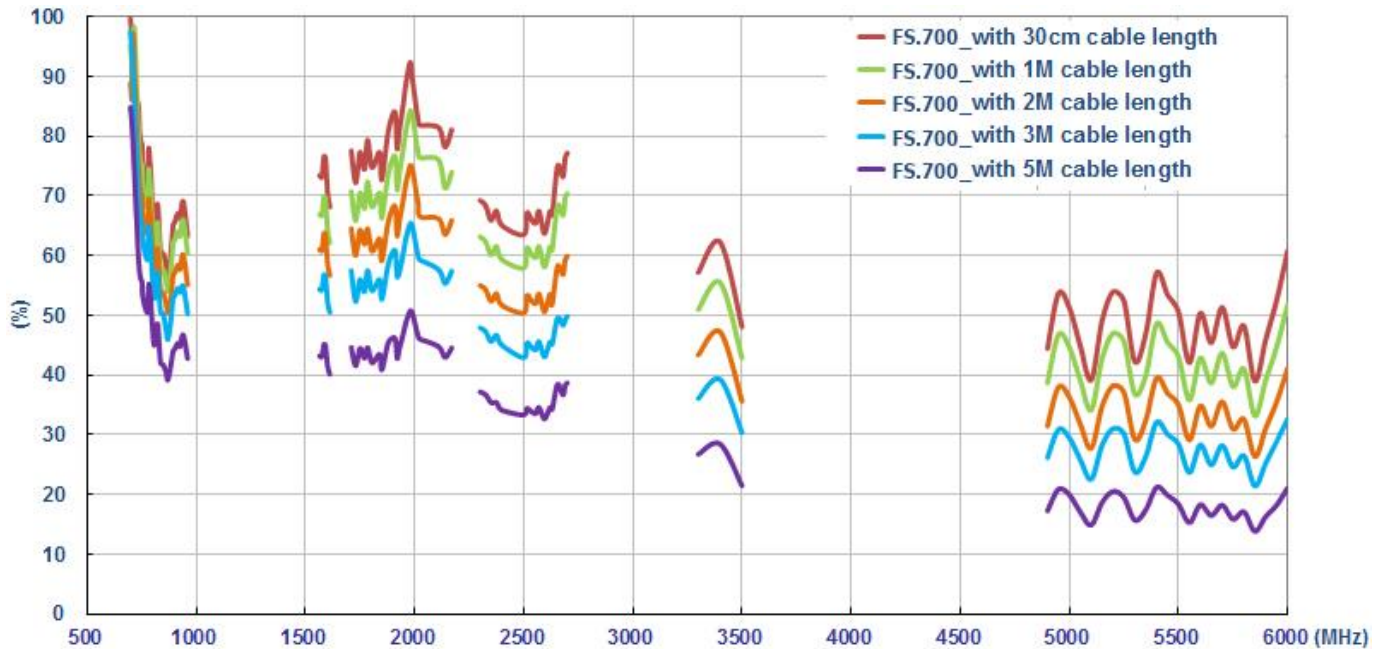
**Figure 22.** Measured the Peak Gain of FS.700 Antenna with difference cable length

## 7.9 Return loss (On the glass base)



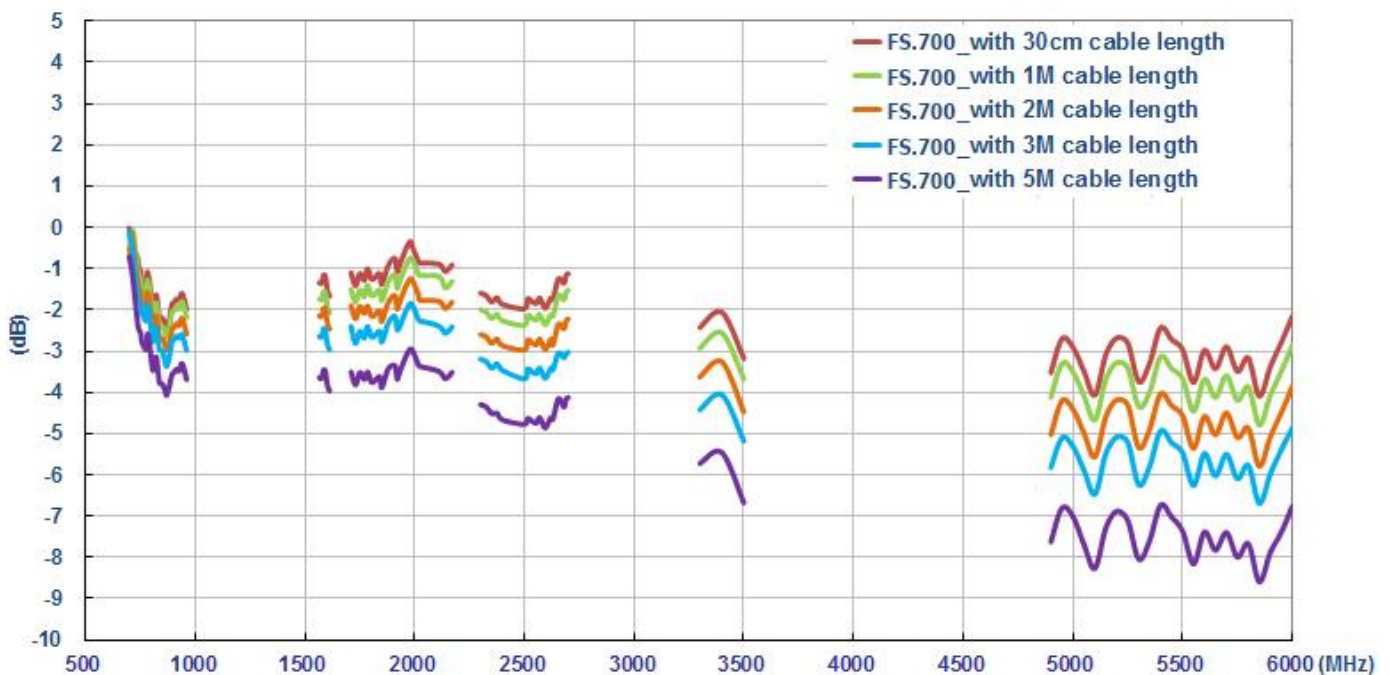
**Figure 23.** Measured the return loss of FS.700 Antenna with difference cable length

## 7.10 Efficiency (On the glass base)



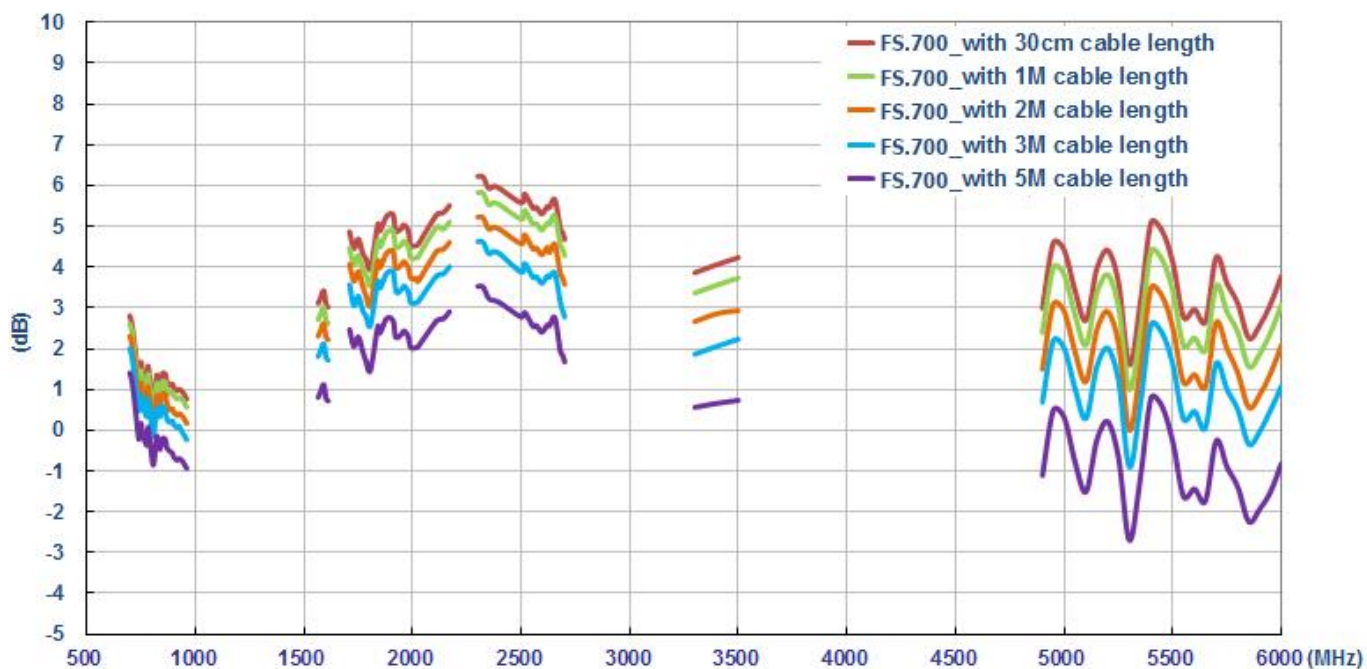
**Figure 24.** Measured the efficiency of FS.700 Antenna with difference cable length

## 7.11 Average Gain (On the glass base)



**Figure 25.** Measured the Average Gain of FS.700 Antenna with difference cable length

## 7.12 Peak Gain (On the glass base)



**Figure 26.** Measured the Peak Gain of FS.700 Antenna with difference cable length

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