



# TAOGLAS®



## Datasheet

### Apex II

**Part No:**  
**TG.35.8113W**

#### **Description:**

Apex II - Hinged White TG.35 Wideband 4G LTE Antenna

#### **Features:**

Highest efficiency for worldwide LTE and Wi-Fi  
LTE / CAT-M1 / NB-IoT / GPS / Wi-Fi  
Compatible also with 2G/3G Applications  
5G NR Sub 6GHz  
600MHz - 6000MHz Band 71 Applicable  
224mm \* 58mm \* 13mm  
Dipole Swivel Terminal Antenna  
Hinged 90° termination with SMA(M) Connector  
Enhanced hinge structure for Vibration Environments  
Connector Customizable  
RoHS & REACH Compliant

|                            |    |
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# 1. Introduction



The hinged Apex II TG.35 Wideband Dipole Antenna has been designed to cover all Cellular, ISM and Wi-Fi working frequencies in the 600-6000MHz spectrum. Evolved from the already highly successful Apex TG.30, this second generation has the highest wide-band efficiency in its range of any terminal antenna on the market today.

The Apex II has been primarily designed for use with 4G LTE modules and devices that require the highest possible efficiency and peak gain to deliver best in class throughput on all major cellular (2G/3G/4G) bands worldwide for access points, terminals and routers. This also includes CAT-M1 and NB-IoT and the recently introduced 600MHz Extended LTE Band 71. High efficiency is vital for applications such as high speed video and real-time streaming, or high capacity MIMO networks on public transportation.

This attractive slim-line antenna is ground plane independent, meaning it does not need to be connected to the ground-plane of a device to radiate efficiently, on the other hand neither is it seriously detuned by connecting to a ground-plane, thus avoiding a problem notorious to smaller antennas.

It comes with an SMA(M) connector and swivel mechanism that allows the antenna part to be rotated to fit in tight environments. The 90° hinge structure has been improved and strengthened so that the antenna in a 90° position would not fall down to 180° in vibration environment.

The Apex II is backward compatible with 3G and 2G cellular applications such as HSPA, GSM, GPRS, UMTS, Wi-Fi and even has GPS included for Assisted GPS and/or E911 applications.

In summary the Apex II is the ideal solution for any device requiring high, reliable performance. It will meet most type approval or 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 prove this, being stable across all bands.

Connector type is customizable. Housing is also available in black. Contact Taoglas regional sales office for more information.

## 2. Specifications

| Electrical                               |          |                                         |                 |                                              |                    |               |               |               |               |               |
|------------------------------------------|----------|-----------------------------------------|-----------------|----------------------------------------------|--------------------|---------------|---------------|---------------|---------------|---------------|
| Standard                                 |          | LTE/GSM/<br>CDMA<br>700/800/<br>850/900 | GPS/<br>GLONASS | LTE/GSM/<br>HSPA/ CDMA<br>1700/1800/<br>1900 | UMTS/<br>HSPA 2100 | LTE<br>2300   | Wi-Fi<br>2400 | LTE<br>2600   | Wi-Fi<br>5800 | LTE<br>3500   |
| Frequency (MHz)                          |          | 698<br>~960                             | 1565<br>~1612   | 1710<br>~1990                                | 1920<br>~2170      | 2305<br>~2360 | 2400<br>~2500 | 2500<br>~2700 | 4800<br>~6000 | 3400<br>~3600 |
| Efficiency (%)                           |          |                                         |                 |                                              |                    |               |               |               |               |               |
| In free space                            | straight | 53.92                                   | 55.66           | 64.44                                        | 62.55              |               | 49.61         | 53.14         | 56.35         |               |
|                                          | bent     | 56.51                                   | 55.19           | 68.87                                        | 68.72              |               | 53.41         | 54.11         | 55.84         |               |
| On 150*90mm<br>ground plane edge         | straight | 84.72                                   | 66.85           | 71.00                                        | 71.43              |               | 56.21         | 52.22         | 51.59         |               |
|                                          | bent     | 80.92                                   | 71.38           | 71.62                                        | 71.14              |               | 52.81         | 53.28         | 51.82         |               |
| On 30*30cm<br>ground plane<br>center     | straight | 59.06                                   | 51.56           | 62.34                                        | 61.21              |               | 67.43         | 53.51         | 51.25         |               |
|                                          | bent     | 57.15                                   | 36.67           | 52.88                                        | 57.70              |               | 60.70         | 58.10         | 56.74         |               |
| On 30*30cm<br>ground plane edge          | straight | 59.62                                   | 48.19           | 65.51                                        | 64.78              |               | 63.28         | 56.84         | 56.30         |               |
|                                          | bent     | 53.18                                   | 41.91           | 63.43                                        | 62.24              |               | 62.99         | 46.66         | 47.09         |               |
| Average Gain(dBi)                        |          |                                         |                 |                                              |                    |               |               |               |               |               |
| In free space                            | straight | -2.71                                   | -2.55           | -1.91                                        | -2.05              |               | -3.05         | -2.76         | -2.59         |               |
|                                          | bent 90  | -2.50                                   | -2.61           | -1.63                                        | -1.64              |               | -2.72         | -2.67         | -2.63         |               |
| On 150*90mm<br>ground plane edge         | straight | -0.74                                   | -1.75           | -1.50                                        | -1.46              |               | -2.50         | -2.82         | -2.92         |               |
|                                          | bent 90  | -0.96                                   | -1.46           | -1.45                                        | -1.48              |               | -2.77         | -2.74         | -2.89         |               |
| On 30*30cm<br>ground plane<br>center     | straight | -2.31                                   | -2.88           | -2.06                                        | -2.13              |               | -1.74         | -2.72         | -2.94         |               |
|                                          | bent 90  | -2.44                                   | -4.36           | -2.78                                        | -2.40              |               | -2.18         | -2.37         | -2.52         |               |
| On 30*30cm<br>ground plane<br>center     | straight | -2.26                                   | -3.17           | -1.85                                        | -1.89              |               | -2.01         | -2.45         | -2.58         |               |
|                                          | bent 90  | -2.81                                   | -3.78           | -1.99                                        | -2.08              |               | -2.02         | -3.32         | -3.37         |               |
| Peak Gain(dBi)                           |          |                                         |                 |                                              |                    |               |               |               |               |               |
| In free space                            | straight | 4.42                                    | 1.59            | 3.15                                         | 2.70               |               | 4.93          | 4.43          | 2.55          |               |
|                                          | bent     | 3.16                                    | 1.64            | 3.37                                         | 3.34               |               | 3.28          | 3.06          | 2.09          |               |
| On the 150*90mm<br>ground plane edge     | straight | 3.28                                    | 3.70            | 4.79                                         | 5.02               |               | 2.50          | 2.36          | 2.67          |               |
|                                          | bent     | 2.77                                    | 3.24            | 4.07                                         | 4.35               |               | 4.47          | 3.80          | 2.68          |               |
| On the 30*30cm<br>ground plane<br>center | straight | 6.37                                    | 0.75            | 3.34                                         | 3.39               |               | 6.44          | 6.92          | 5.29          |               |
|                                          | bent     | 6.47                                    | 5.12            | 6.27                                         | 6.44               |               | 5.78          | 8.14          | 6.05          |               |
| On the 30*30cm<br>ground plane<br>center | straight | 4.87                                    | 1.70            | 3.62                                         | 4.01               |               | 4.63          | 6.02          | 4.87          |               |
|                                          | bent     | 4.78                                    | 4.07            | 5.95                                         | 5.45               |               | 5.87          | 3.89          | 4.59          |               |
| In free space                            | straight | 4.42                                    | 1.59            | 3.15                                         | 2.70               |               | 4.93          | 4.43          | 2.55          |               |
|                                          | bent     | 3.16                                    | 1.64            | 3.37                                         | 3.34               |               | 3.28          | 3.06          | 2.09          |               |
| Impedance                                |          |                                         |                 | 50Ω                                          |                    |               |               |               |               |               |
| Polarization                             |          |                                         |                 | Linear                                       |                    |               |               |               |               |               |
| Radiation Pattern                        |          |                                         |                 | Omni                                         |                    |               |               |               |               |               |
| Input Power                              |          |                                         |                 | 5 W                                          |                    |               |               |               |               |               |

| Mechanical                      |                            |
|---------------------------------|----------------------------|
| Casing                          | UV Resistant PC/ABS        |
| Connector                       | SMA Male Hinged 90°        |
| Weight                          | 75g                        |
| Recommended Torque for Mounting | 0.9 N·m                    |
| Max torque for Mounting         | 1.176 N·m                  |
| Environmental                   |                            |
| Temperature Range               | -40°C to 85°C              |
| Humidity                        | Non-condensing 65°C 95% RH |

## 2.1 LTE Bands bent 90 degrees on 30\*30cm on center Ground Plane

| 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 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%

## 2.2 LTE Bands straight on 30\*30cm on Ground Plane edge

| 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 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%

## 2.3 LTE Bands bent 90 degrees on 30\*30cm on Ground Plane edge

| 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 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%

## 2.4 LTE Bands straight on 30\*30cm on center Ground Plane

| 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 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%

## 2.5 LTE Bands straight in free space

| 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 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%

## 2.6 LTE Bands bent 90 degrees in free space

| 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 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%

## 2.7 LTE Bands straight on 150\*90mm Ground Plane edge

| 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 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%

## 2.7 LTE Bands bent 90 degrees on 150\*90mm Ground Plane edge

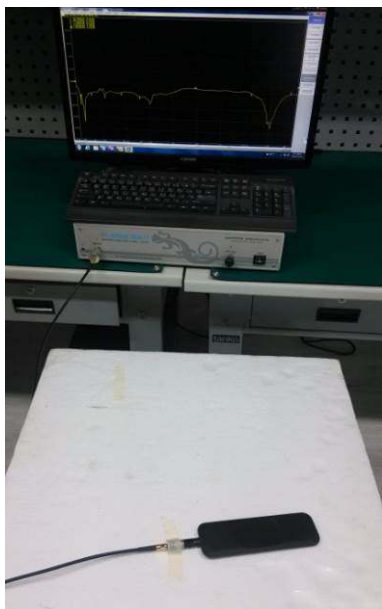
| LTE Bands   |                                                      |                               |         |
|-------------|------------------------------------------------------|-------------------------------|---------|
| Band Number | LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA |                               |         |
|             | 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 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%

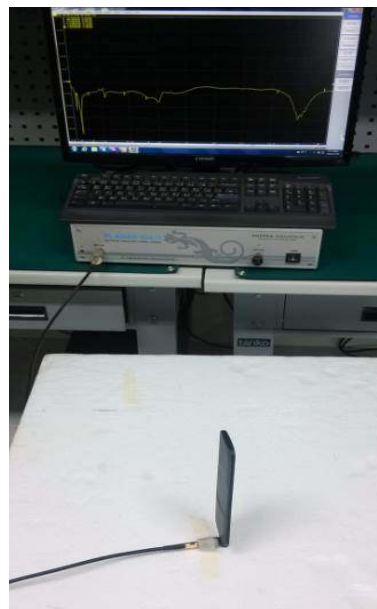
## 3. Antenna Characteristics

### 3.1 Test Setup

#### In Free Space

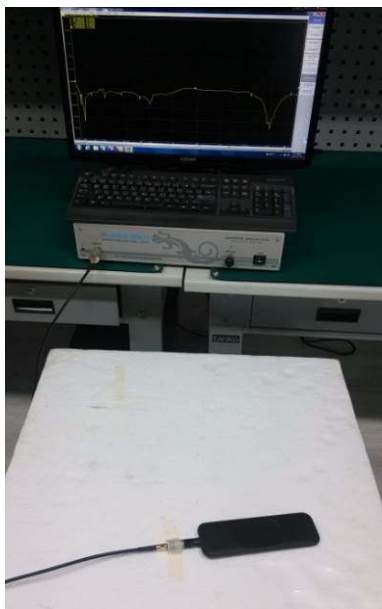


Antenna straight

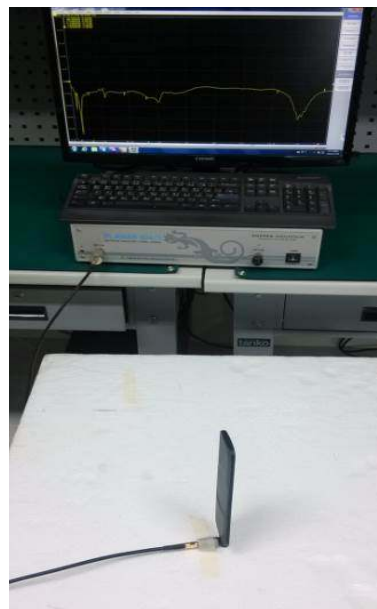


Antenna bent 90°

#### On 150\*90mm ground plane edge

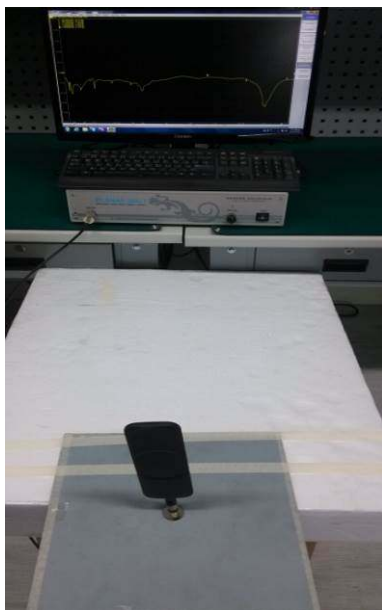


Antenna straight

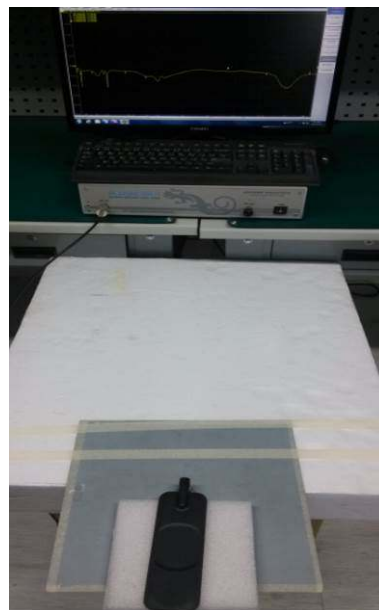


Antenna bent 90°

On 30cm\*30cm ground plane center



Antenna straight



Antenna bent 90°

On 30cm\*30cm ground plane edge

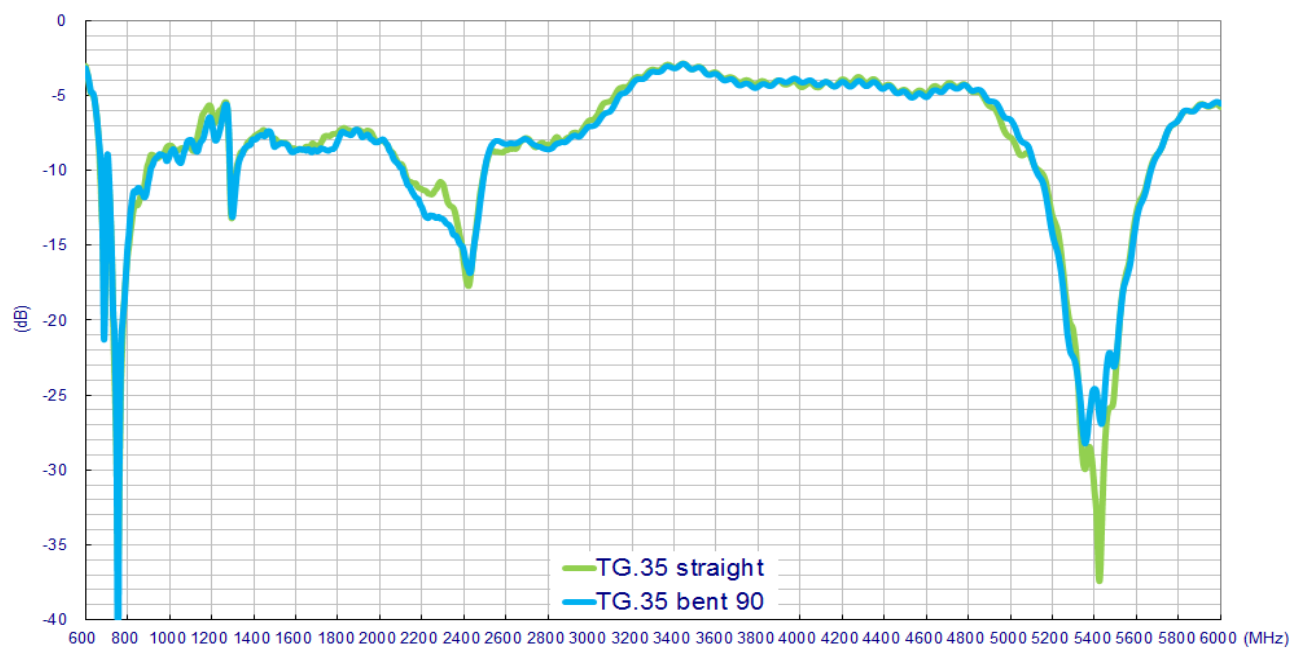


Antenna straight

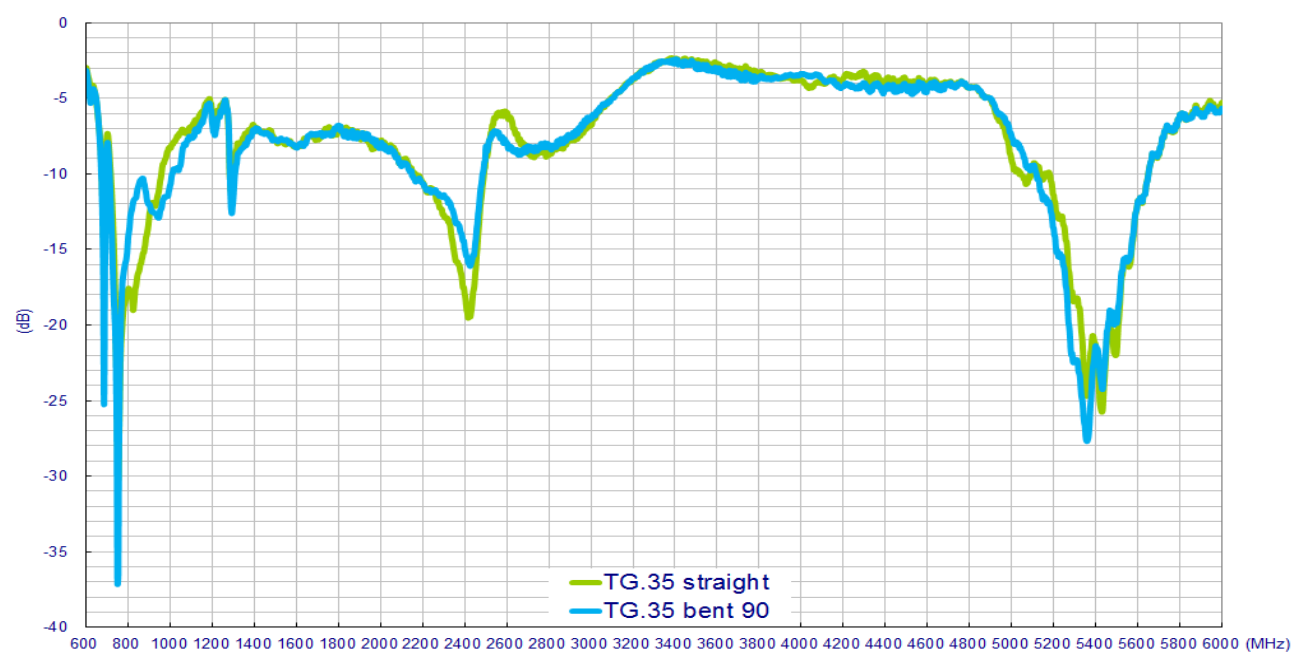


Antenna bent 90°

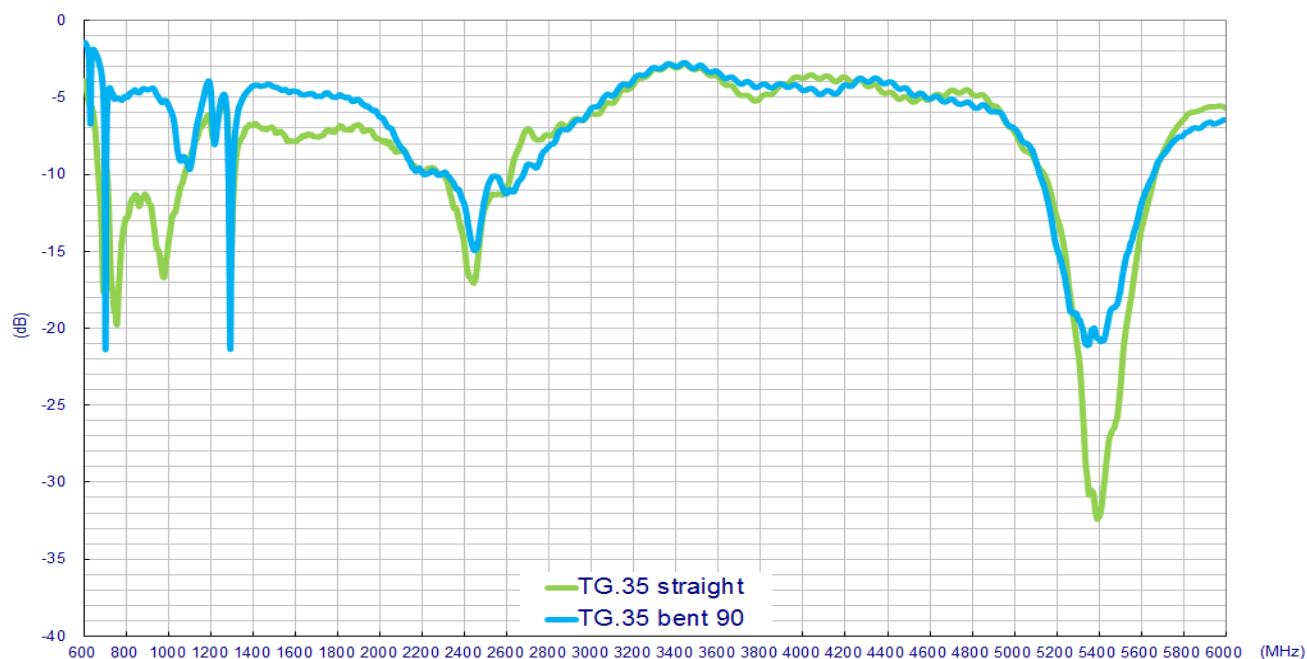
## 3.2 Return Loss



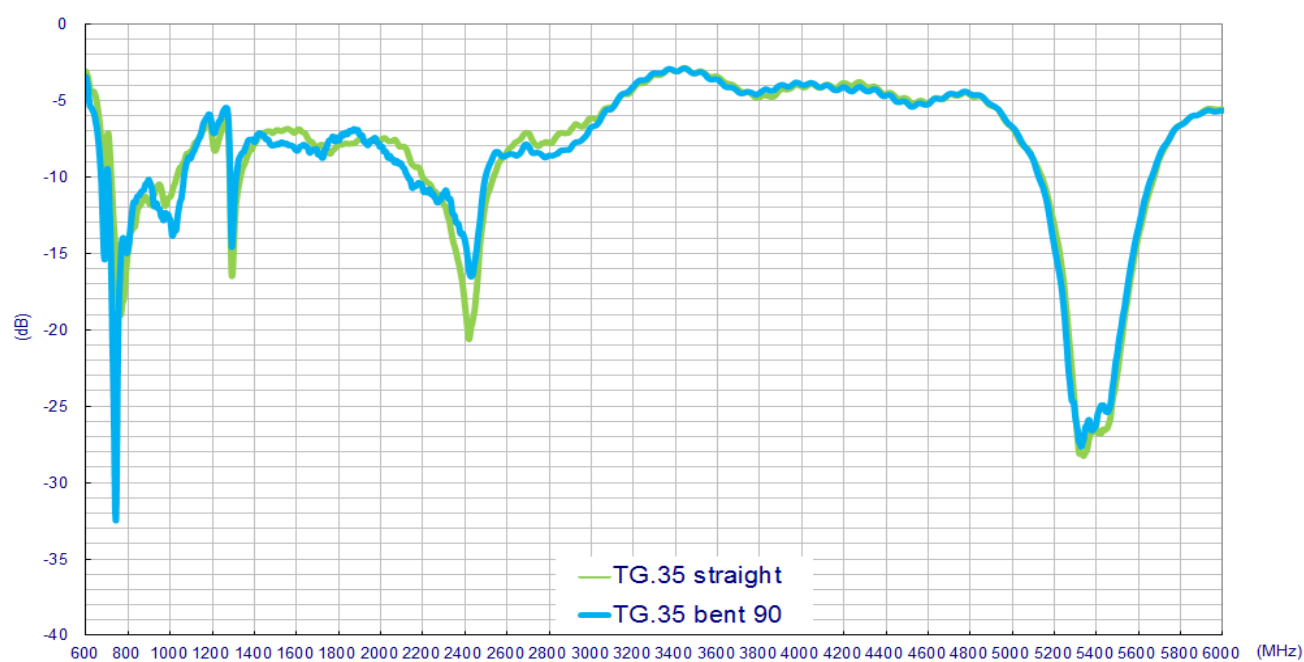
In Free Space



On 150\*90mm ground plane edge

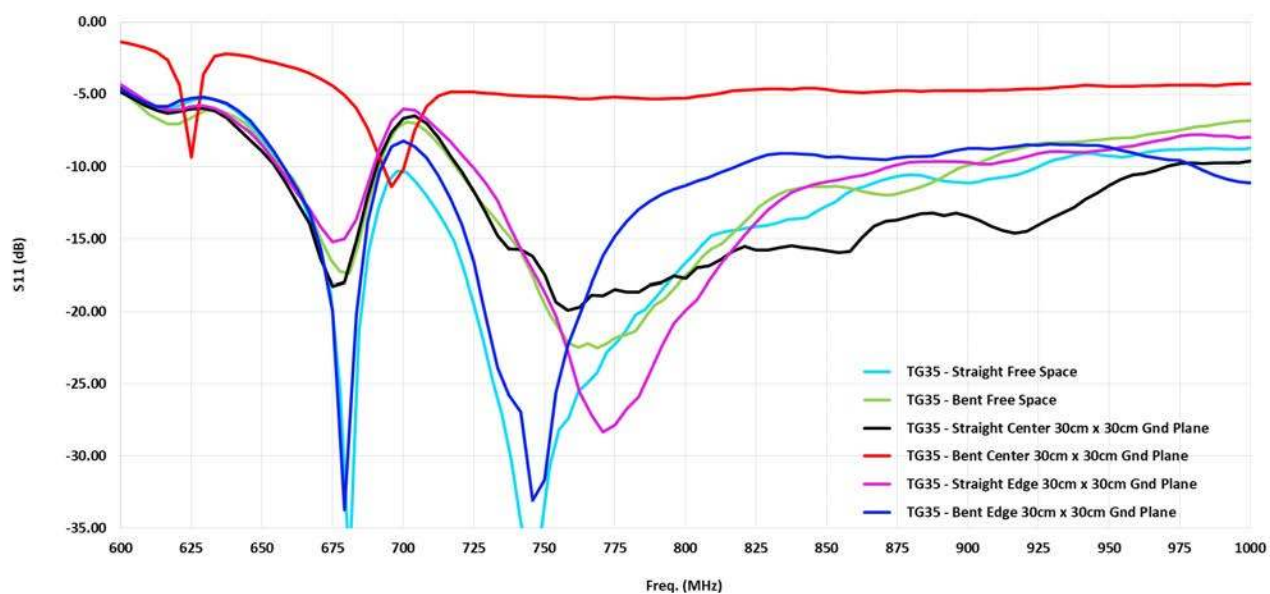


On 30\*30cm ground plane center

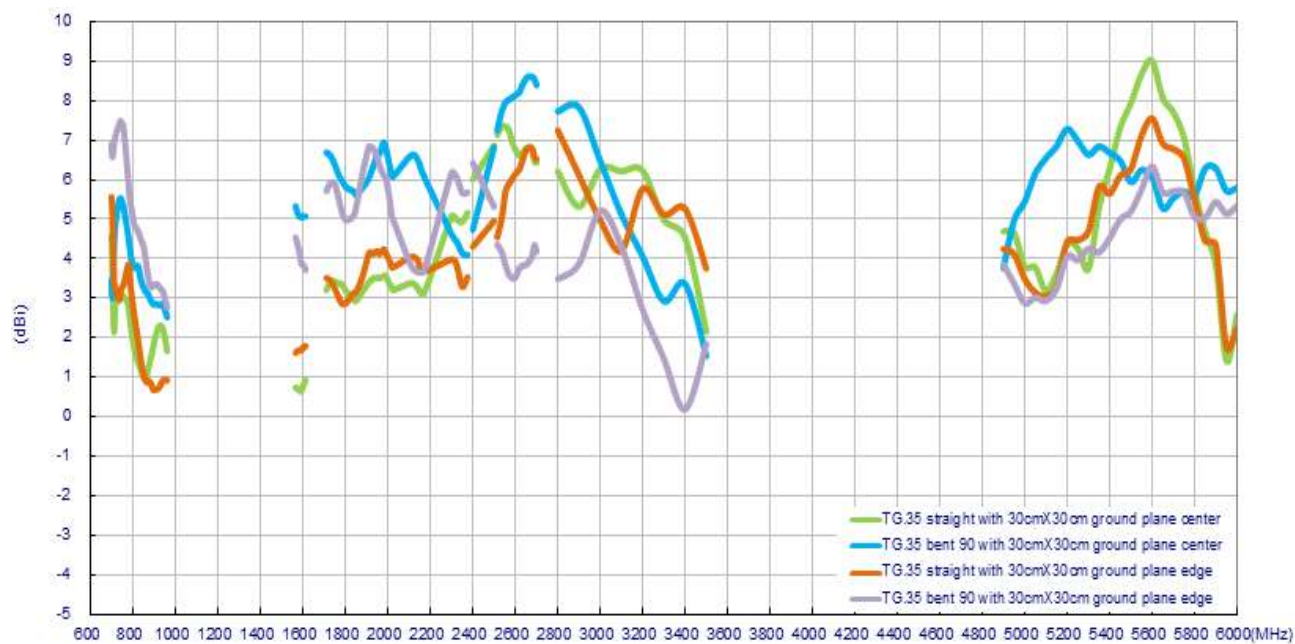


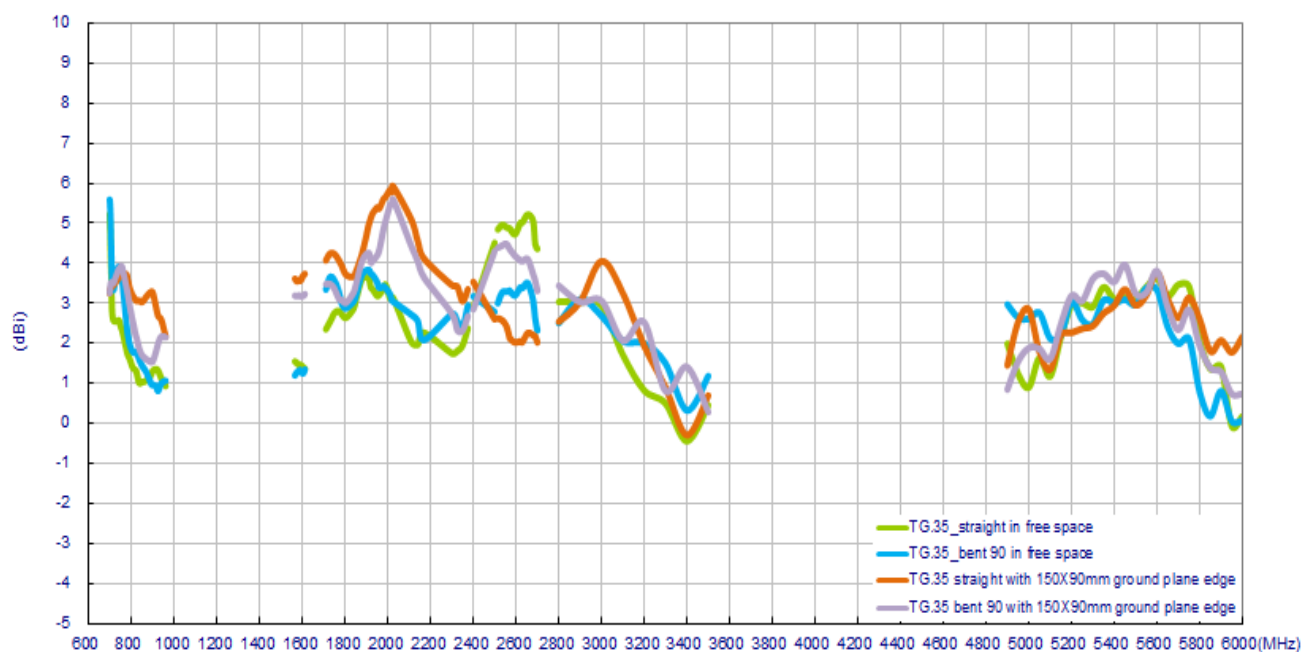
On 30\*30cm ground plane edge

### 3.3 Return Loss of Low Band Frequencies

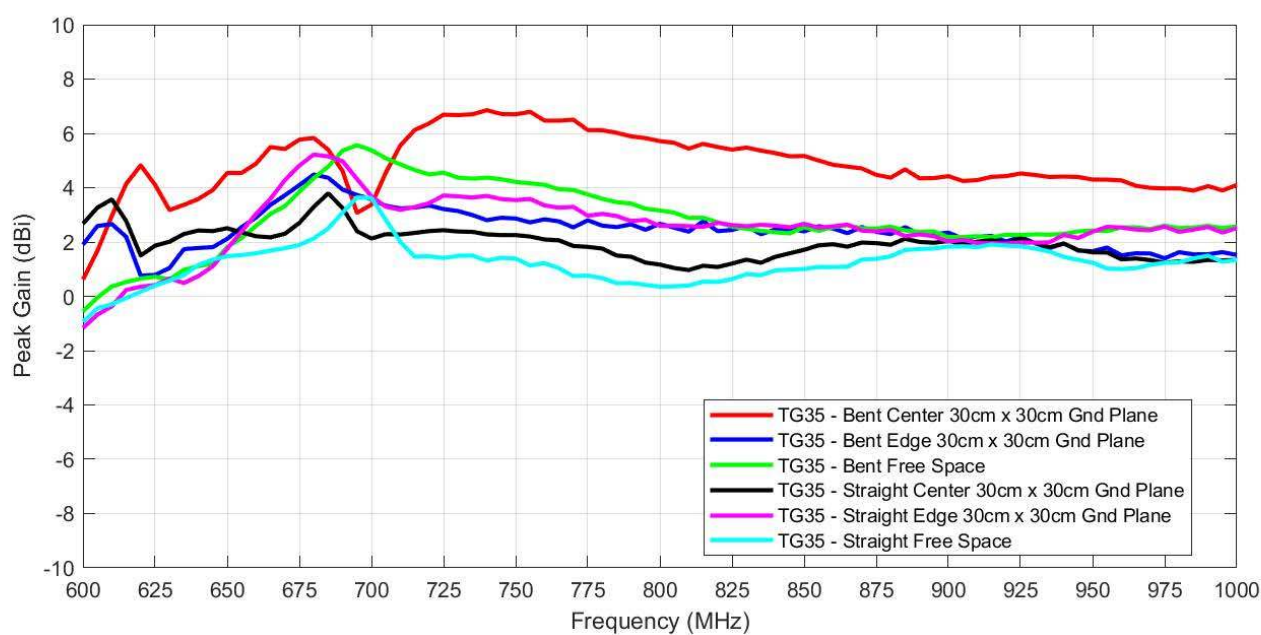


### 3.4 Peak Gain

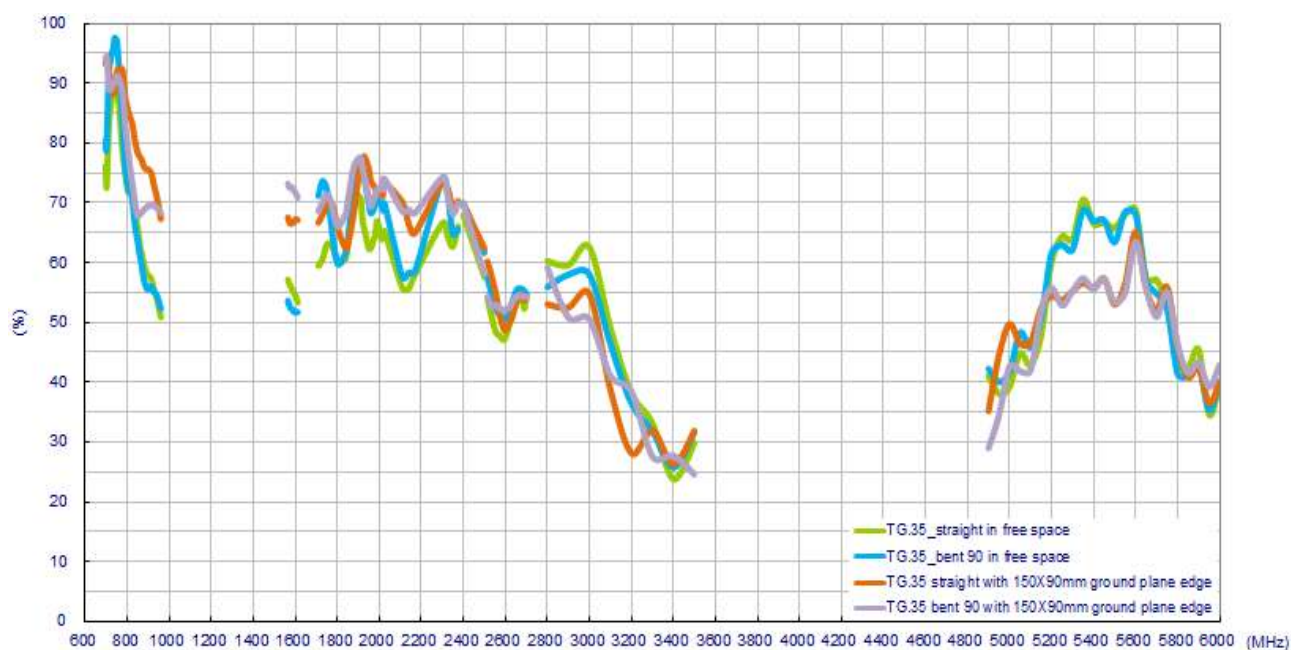




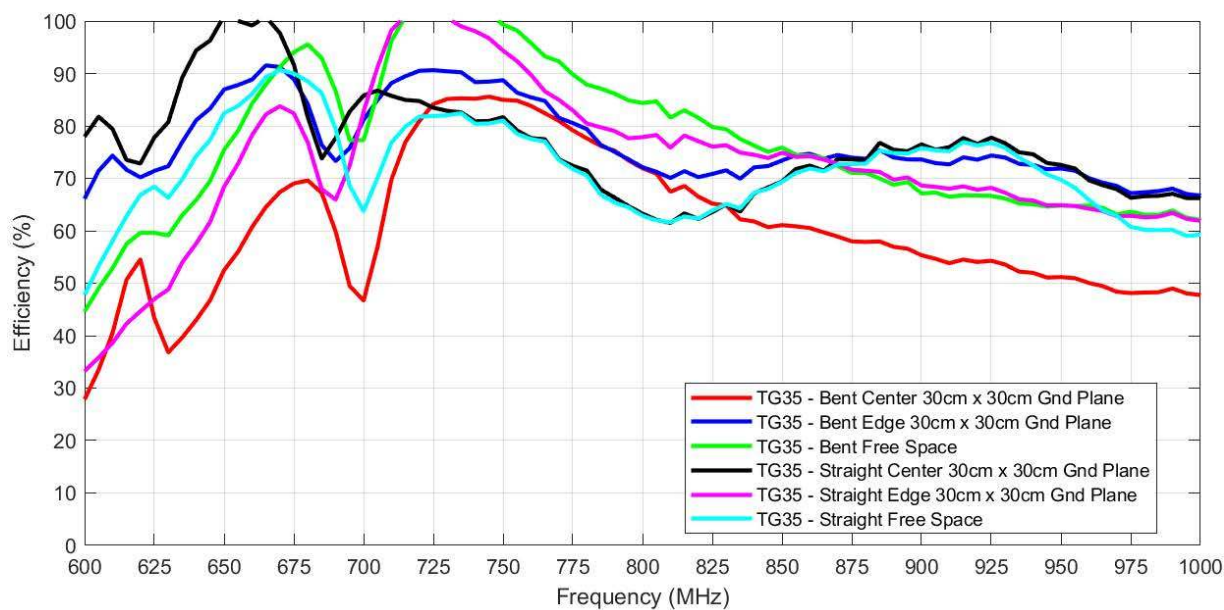
### 3.5 Peak Gain of Low Band Frequencies



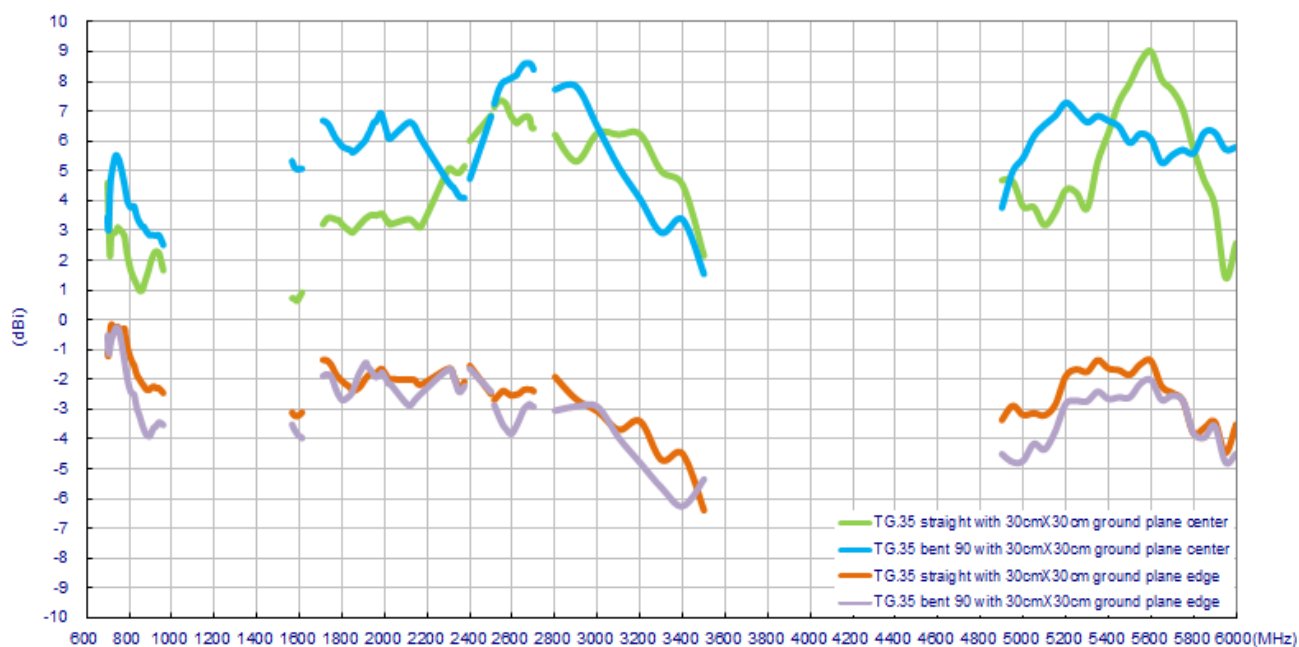
### 3.6 Efficiency

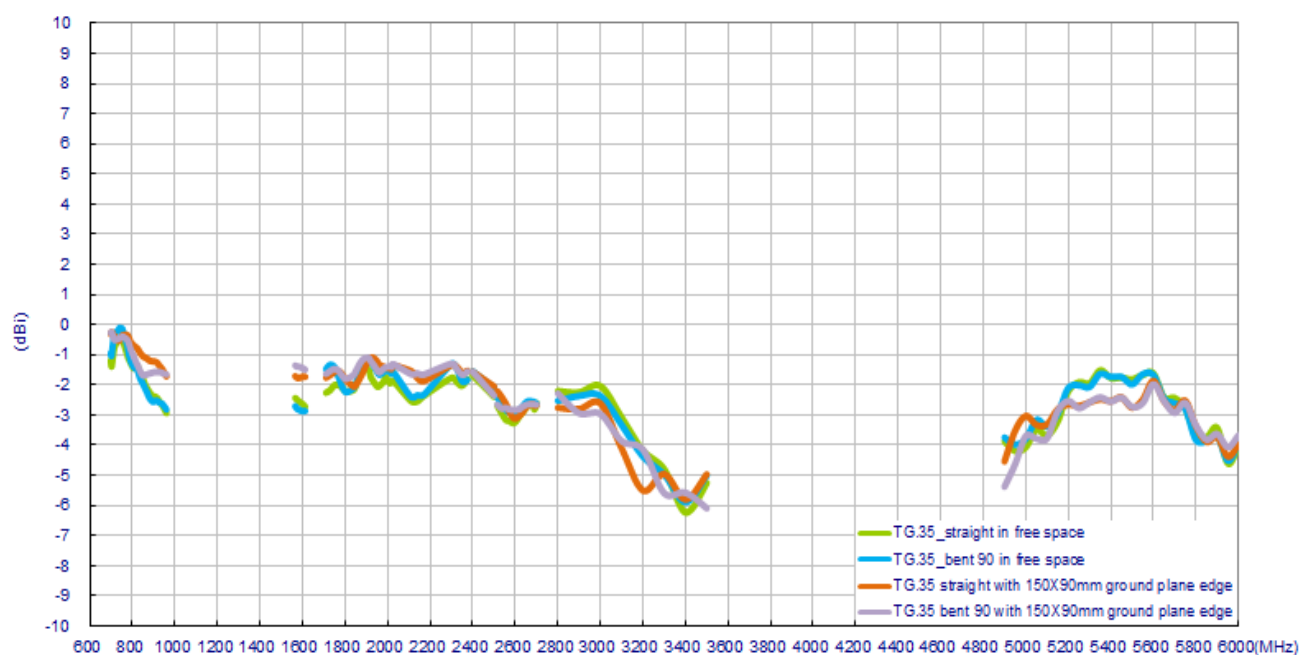


### 3.7 Efficiency of Low Band Frequencies

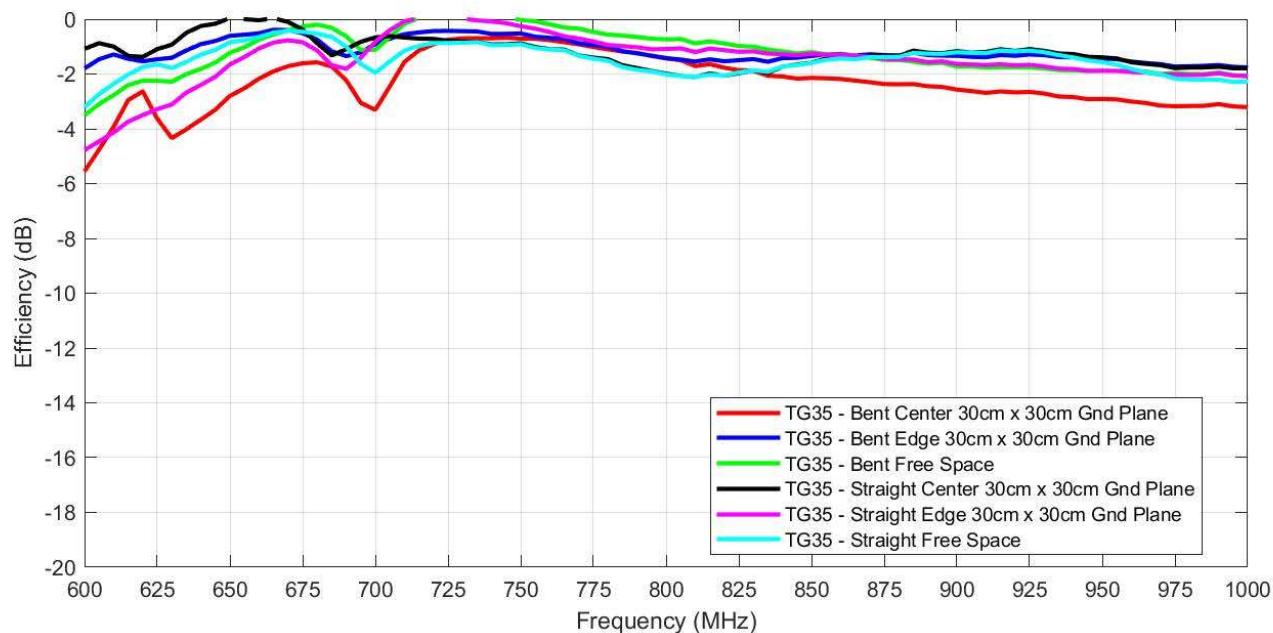


### 3.8 Average Gain



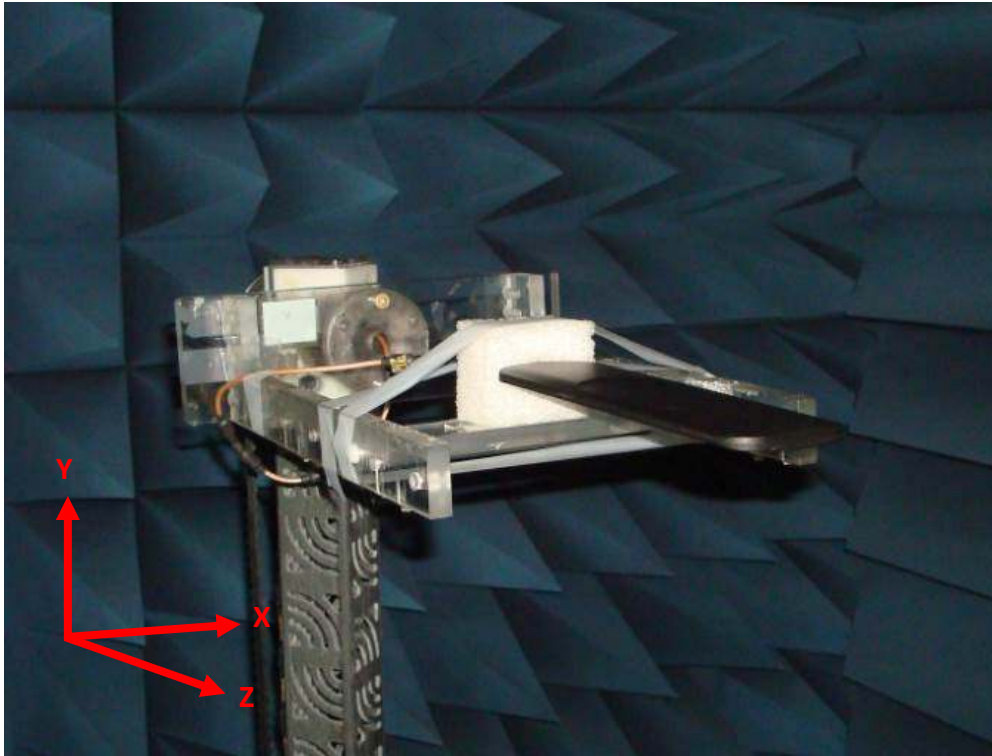


### 3.9 Average Gain of Low Band Frequencies



## 4. 2D Radiation Patterns

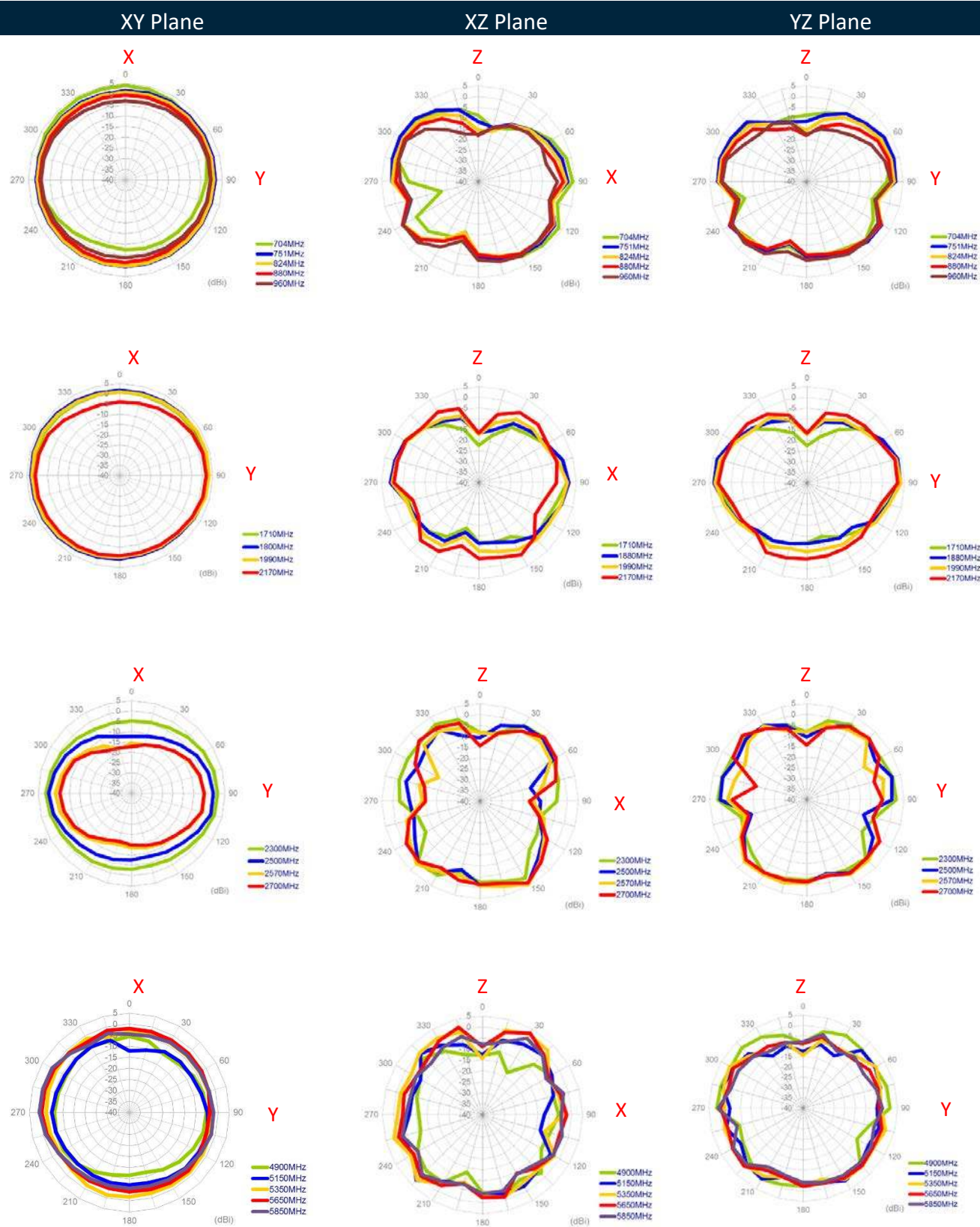
### 4.1 Antenna Test Setup



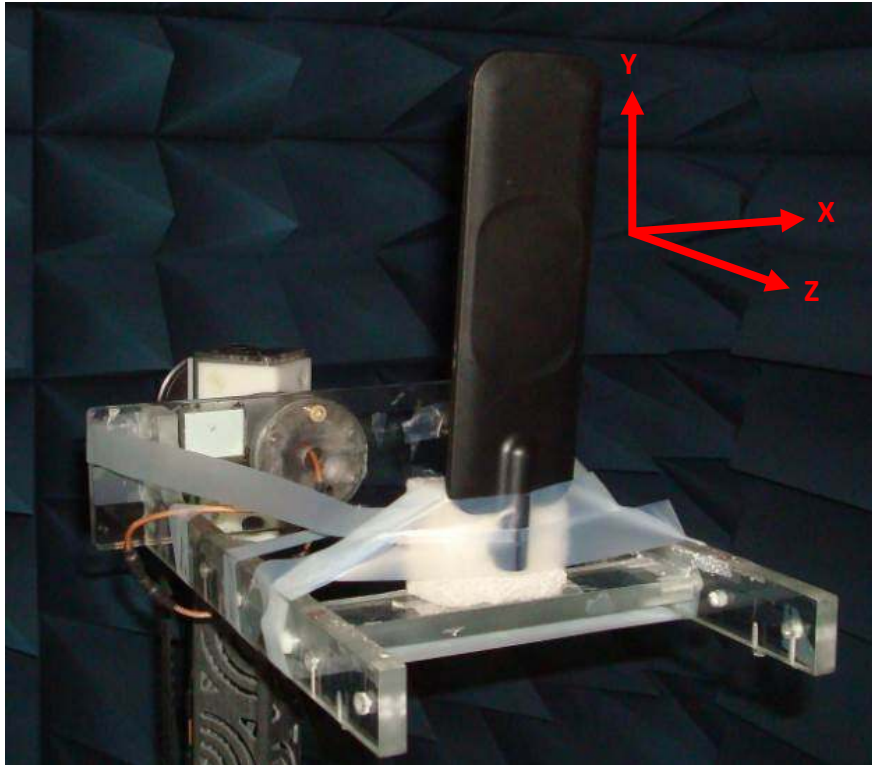
Antenna straight in free space

## 4.2 2D Radiation Patterns

### 4.2.1 Antenna straight in free space



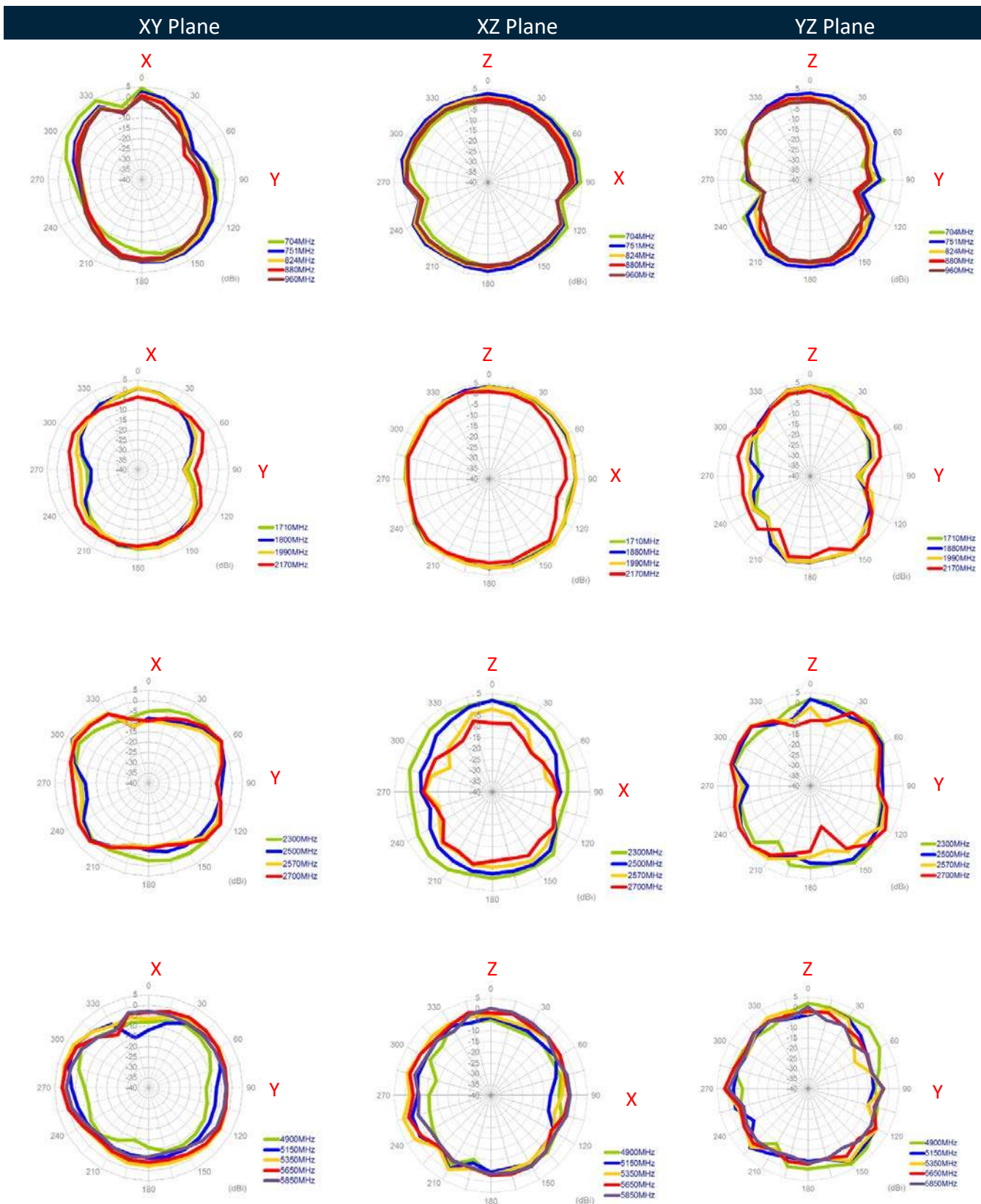
### 4.3 Antenna Test Setup



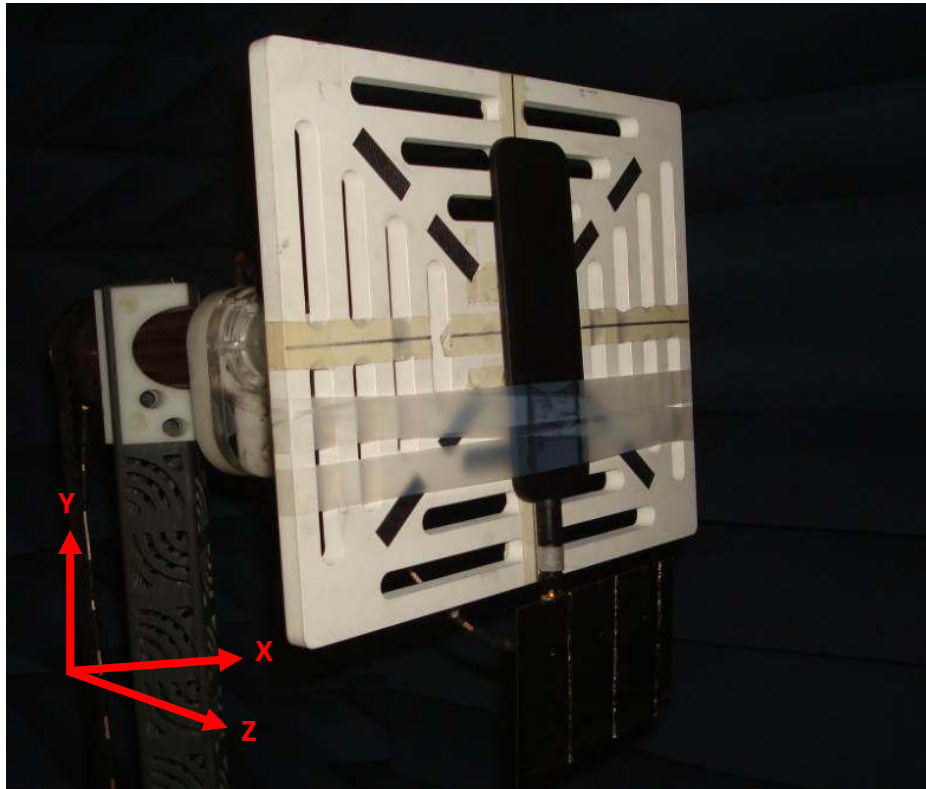
Antenna bent 90° in free space

## 4.4 2D Radiation Patterns

### 4.4.1 Antenna bent 90° in free space



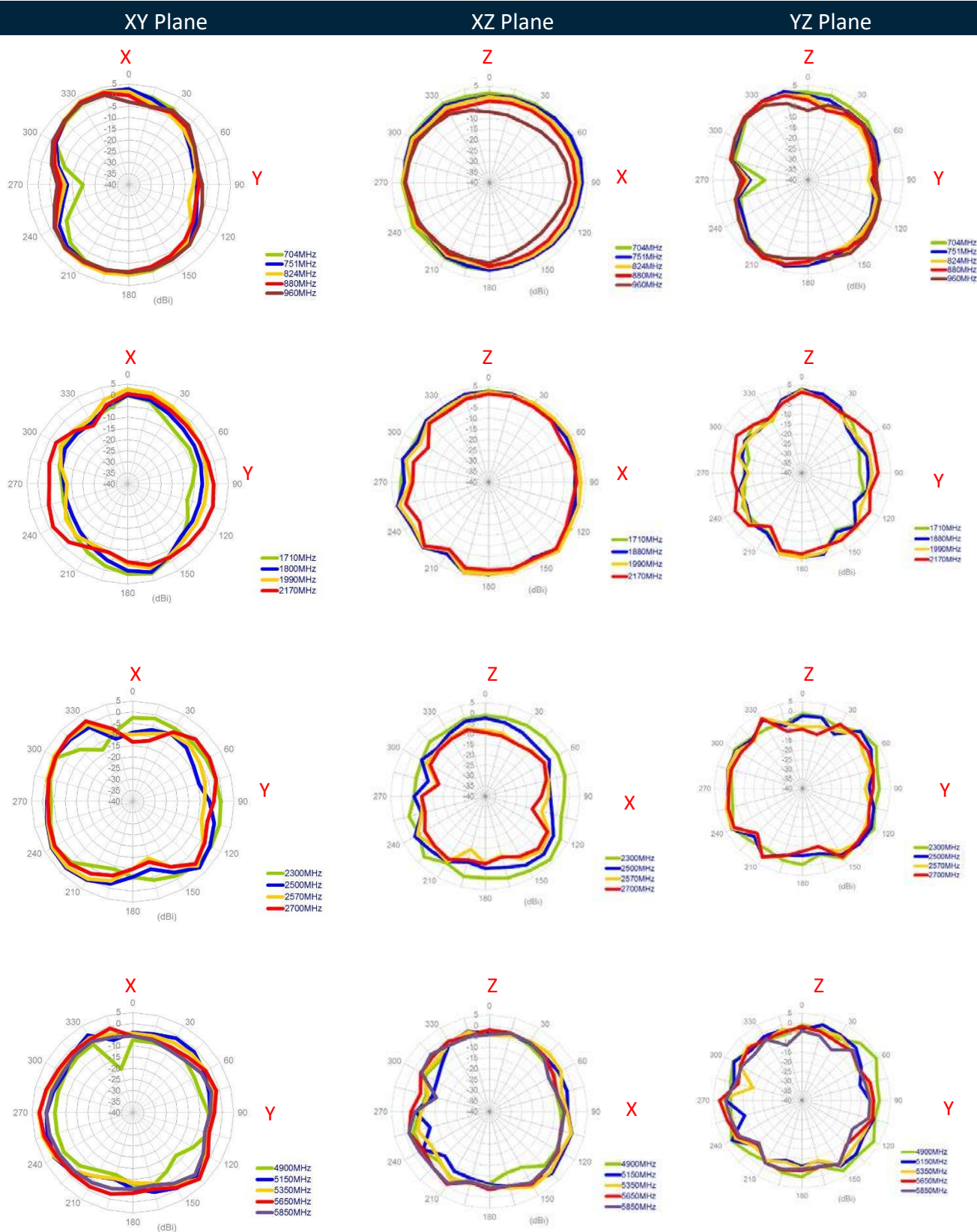
## 4.5 Antenna Test Setup



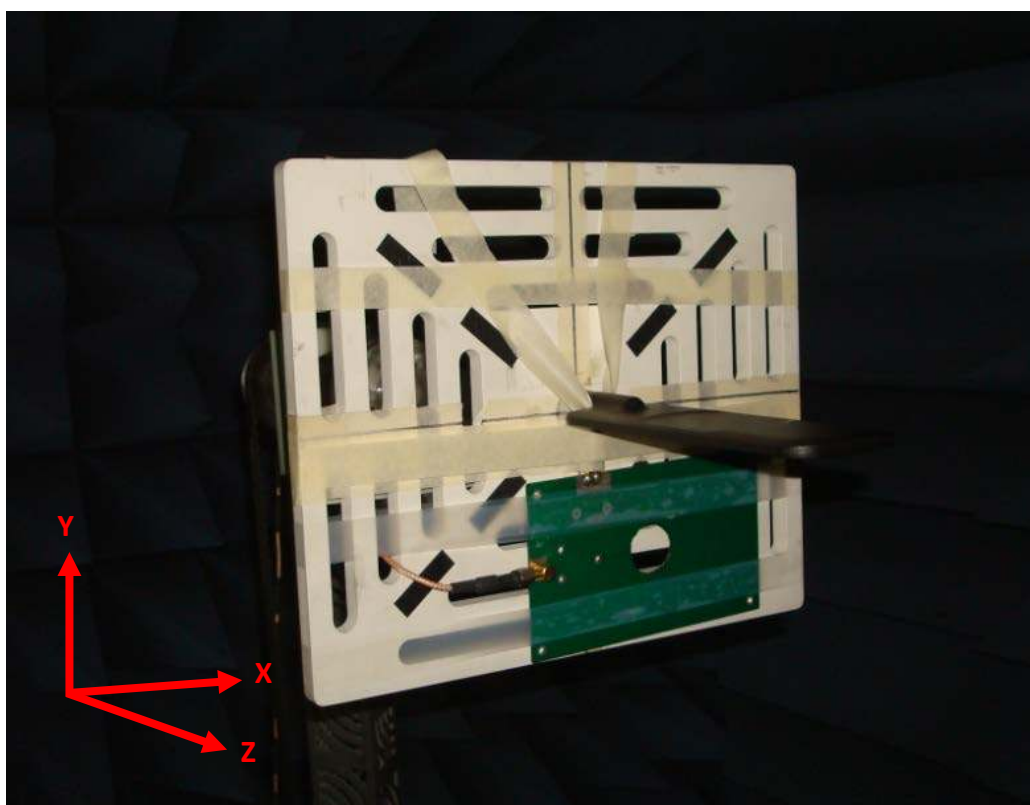
Antenna bent 90° with 90mmx150mm ground plane

## 4.6 2D Radiation Patterns

### 4.6.1 Antenna bent 90° with 90mmx150mm ground plane



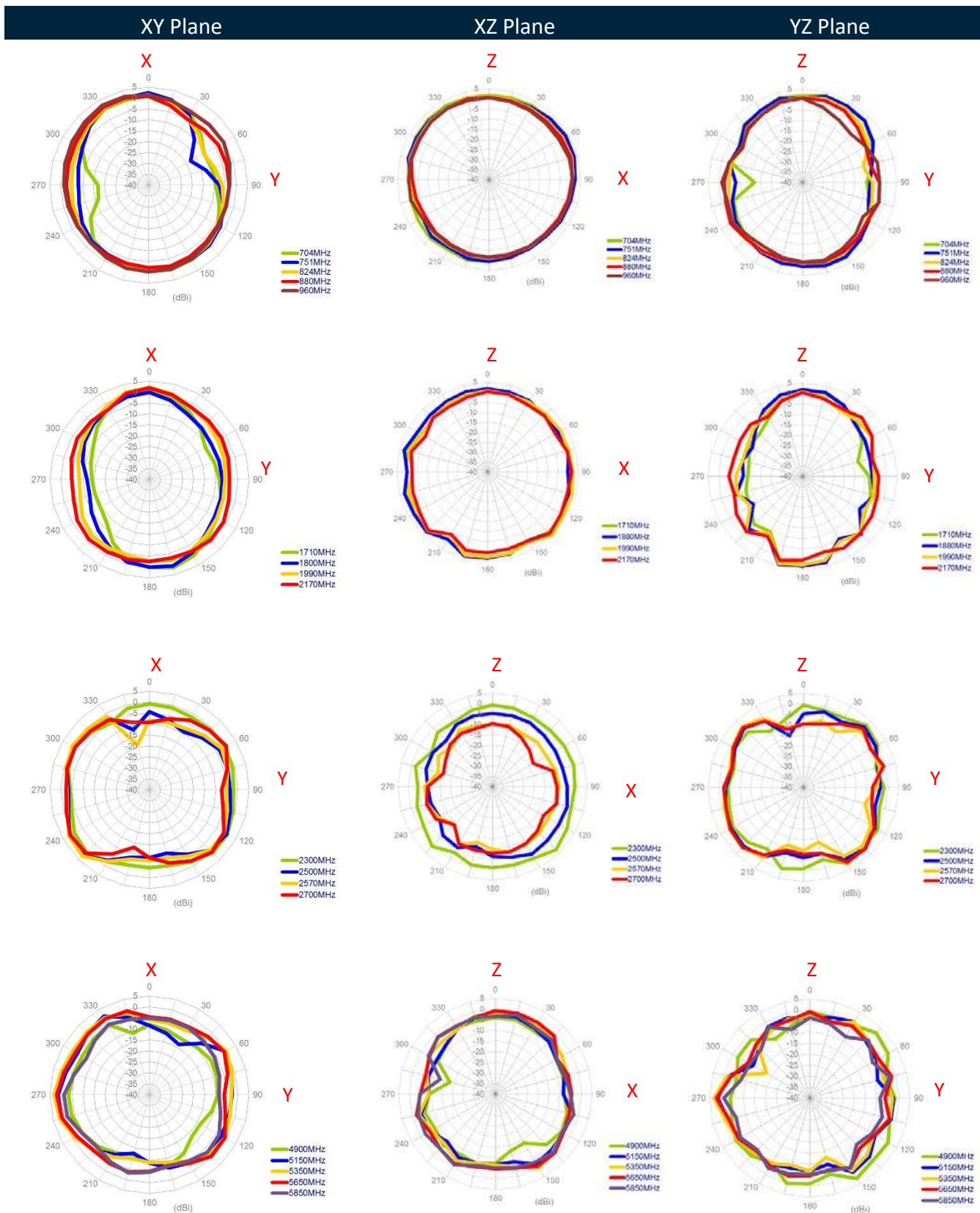
## 4.7 Antenna Test Setup



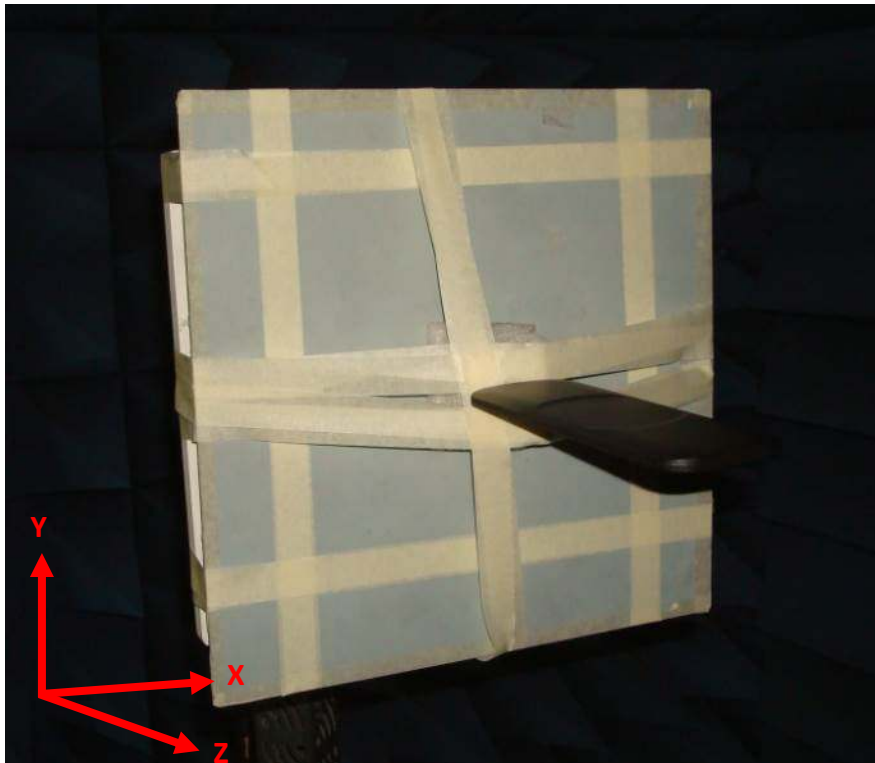
Antenna bent 90° with 90mmx150mm ground plane

## 4.8 2D Radiation Patterns

### 4.8.1 Antenna bent 90° with 90mmx150mm ground plane



## 4.9 Antenna Test Setup

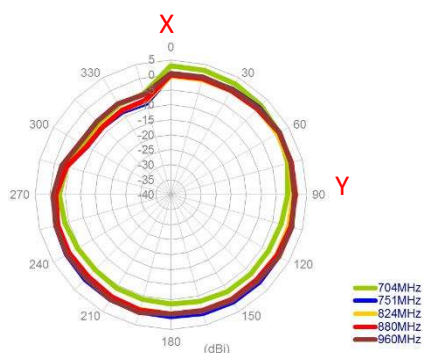


Antenna straight with 30x30cm ground plane center

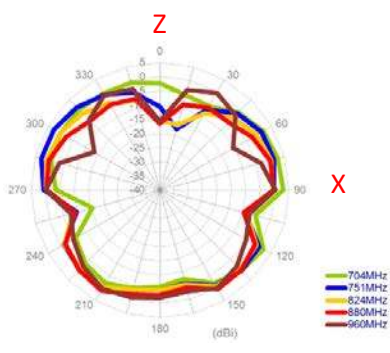
## 4.10 2D Radiation Patterns

### 4.10.1 Antenna straight with 30x30cm ground plane center

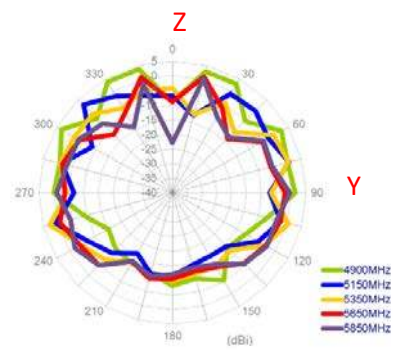
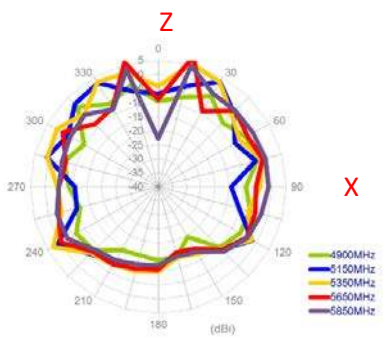
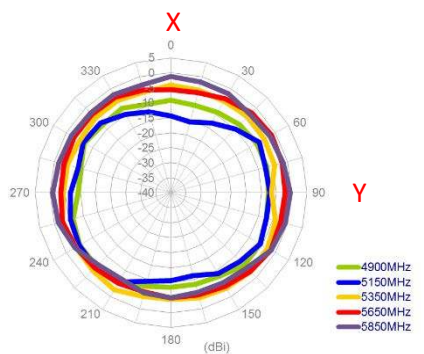
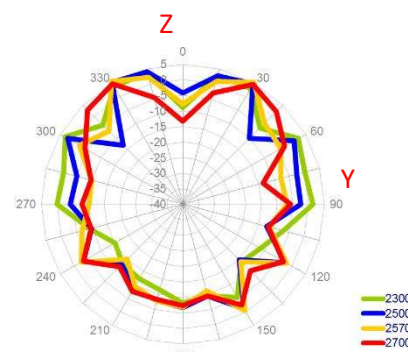
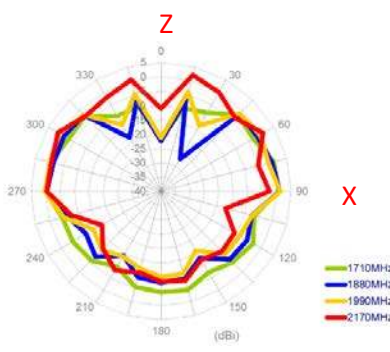
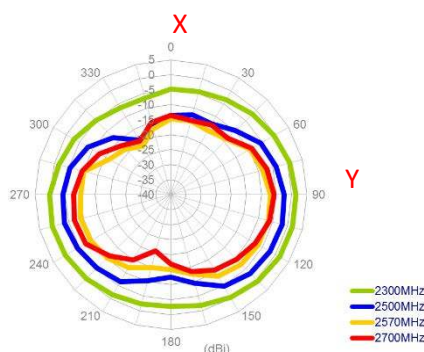
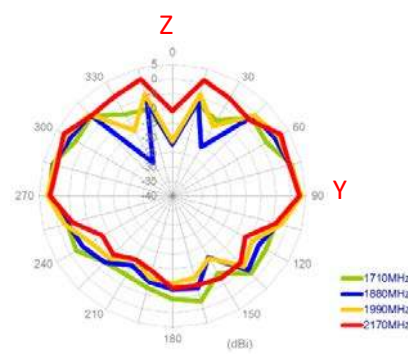
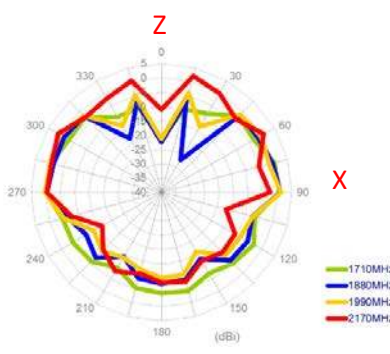
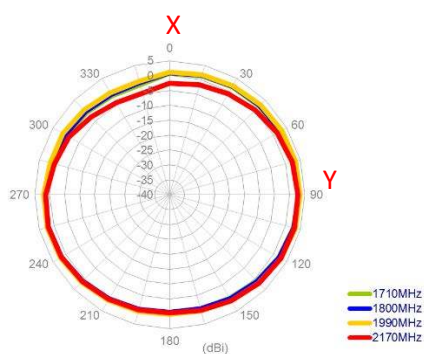
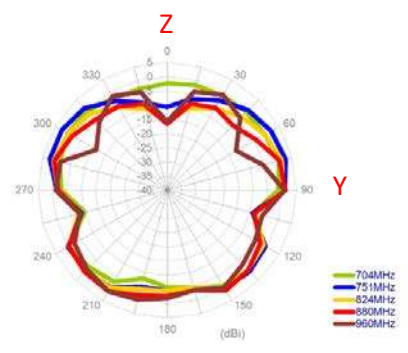
XY Plane



XZ Plane



YZ Plane



## 5. Installation

### TG.35/45 Installation Instructions

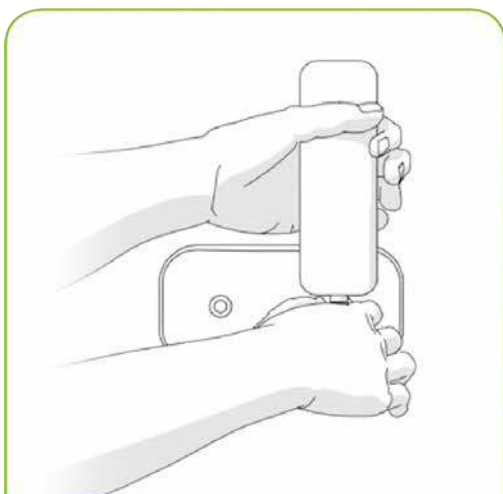
The TG.35/45 antenna has an independent rotating SMA connector, which enables users to install the antenna in a preferable direction. After tightening the SMA connector, the antenna will sit firmly on users' base/router either on a table or on a wall. This installation sheet illustrates using the TG.35/45 on a wall mounted device as an example.

#### Step 1.

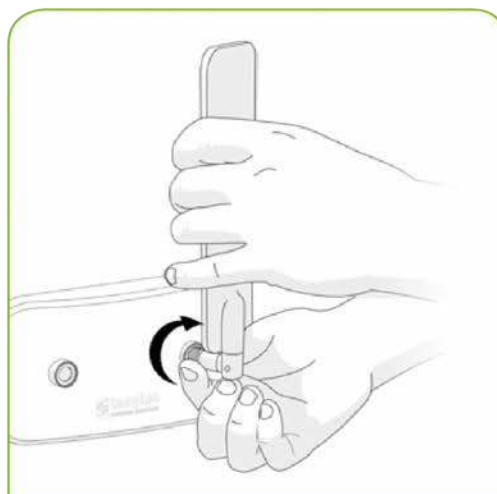
Adjust the antenna to preferable direction, then mount the SMA(M) connector on devices SMA(F) connector. (See figure 1)

#### Step 2.

Hold the antenna housing with one hand, while rotating the SMA(M) connector with the other hand until the connector is tight. If the connector was tightened properly, the antenna will keep its position without slipping down. (See figure 2)



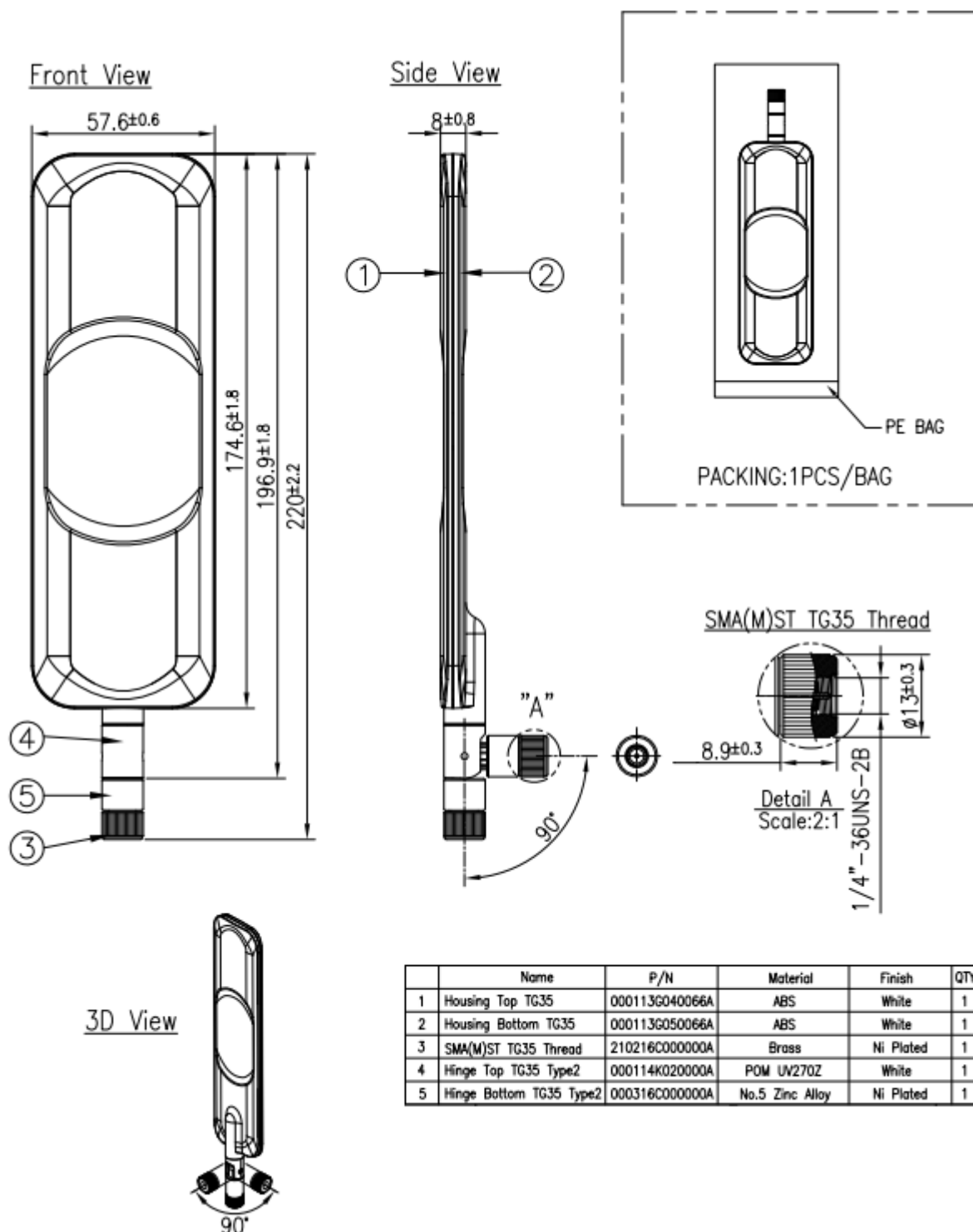
**Figure 1.** Place the TG.35/45 antenna onto the connector of the device and hold the antenna in the preferred orientation.



**Figure 2.** Fix the connector to the device by twisting the rotating head of the SMA connector until it is tight enough to hold the antenna in the correct position.

[www.taoglas.com/tg35-tg45-installation-instructions/](http://www.taoglas.com/tg35-tg45-installation-instructions/)

## 6. Mechanical Drawing (Units: mm)



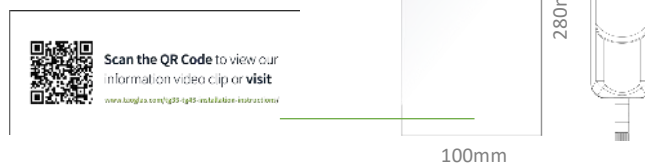
Download Drawing



Download 3D Model

## 7. Packaging

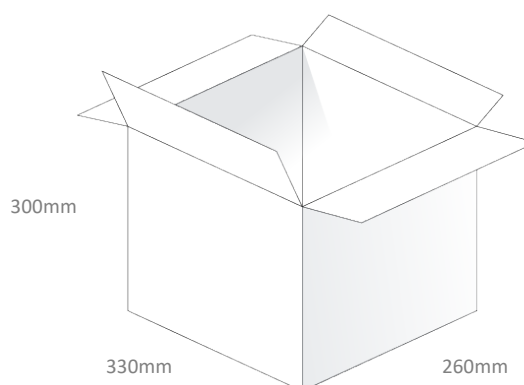
1pc TG.35.8113W per Small PE Bag with Video Link label  
 Dimensions: 100\*280mm  
 Weight: 73.5g



25pcs per Large PE Bag  
 Dimensions: 280\*430mm  
 Weight: 1.85Kg



75pcs TG.35.8113 per Carton  
 Carton Dimensions: 330\*260\*300mm  
 Weight: 6.1Kg



## Changelog for the datasheet

### SPE-14-8-083 – TG.35.8113W

#### Revision: F (Current Version)

|                  |                         |
|------------------|-------------------------|
| Date:            | 2019-04-19              |
| Changes:         | Updated Frequency range |
| Changes Made by: | Jack Conroy             |

#### Previous Revisions

##### Revision: E

|                  |                      |
|------------------|----------------------|
| Date:            | 2018-12-10           |
| Changes:         | Amended Average Gain |
| Changes Made by: | David Connolly       |

##### Revision: D

|                  |                 |
|------------------|-----------------|
| Date:            | 2017-03-30      |
| Changes:         | Added LTE Table |
| Changes Made by: | Andy Mahoney    |

##### Revision: C

|                  |               |
|------------------|---------------|
| Date:            | 2015-09-18    |
| Changes:         | Updated Hinge |
| Changes Made by: | Aine Doyle    |

##### Revision: B

|                  |            |
|------------------|------------|
| Date:            | 2014-09-04 |
| Changes:         | Added Note |
| Changes Made by: | Aine Doyle |

##### Revision: A (Original First Release)

|         |            |
|---------|------------|
| Date:   | 2014-08-22 |
| Notes:  |            |
| Author: | Aine Doyle |



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