

SPECIFICATION

- Part No. : **MA413.A.B.002**
- Product Name : MA413 Storm LTE Screw Mount Antenna
- Features : LTE 698 to 960MHz/1710 to 2170MHz/
2490 to 2690MHz Antenna
Screw-Mount [Permanent Mount]
Worldwide 4G Bands including 3G and 2G
Aerodynamic, Super Low-profile Vandal Resistant Housing
IP67 Enclosure
Dims: 216.24*93.25*30.95mm
3M CFD-200 with SMA(M) Connector
Custom Cables and Connectors Available
Product conforms to the EMC directive 2014/30/EU
RoHS Compliant



1. Introduction

The Storm MA413 antenna is a low profile, heavy-duty, fully IP67 waterproof external M2M antenna for use in worldwide telematics applications which combine Global Cellular communications. The MA413 delivers best in class LTE antenna performance. You will never be out of touch with this extremely robust antenna.

At only 31mm high, the Storm is the world's lowest profile global telematics antenna solution. It delivers powerful worldwide 4G LTE antenna technology while also covering the 3G and 2G bands.

Typical applications:

- Telematics
- HD Video over LTE
- First Responder and Emergency Services
- Internet of Things (IoT market)
- Wireless LTE M2M Devices
- Digital Signage

LTE 4G applications demand high speed data uplink and downlink. The MA413 does not require a ground plane. Low loss cables are used to keep efficiency high over long cable lengths.

Conformity is declared under the following standard: **EN55022 Class B**

This is to declare that the product listed above conforms to the EMC directive 2014/30/EU.

Cable length and connector types are customizable. Contact your regional Taoglas sales office for support.

2. Specification

| 4G/3G/2G LTE Antenna | | | | | | | | | |
|-------------------------|---------|--|---------|-----------|-----------|-----------|-----------|-----------|-------|
| Frequency (MHz) | LTE700 | GSM850 | GSM900 | DCS | PCS | UMTS1 | LTE2600 | LTE3500 | |
| | 698~803 | 824~894 | 880~960 | 1710~1880 | 1850~1990 | 1920~2170 | 2490~2690 | 3300~3600 | |
| Efficiency (%) | | | | | | | | | |
| On 50*50cm ground plane | 30cm | 62.06 | 41.76 | 49.16 | 44.93 | 59.56 | 59.39 | 55.42 | 37.39 |
| | 1M | 59.27 | 39.88 | 46.95 | 40.98 | 54.46 | 54.71 | 50.55 | 33.33 |
| | 2M | 55.31 | 36.93 | 42.81 | 36.86 | 48.53 | 48.56 | 43.53 | 27.99 |
| | 3M | 51.62 | 34.20 | 39.76 | 32.65 | 42.73 | 42.47 | 36.84 | 23.59 |
| | 5M | 44.25 | 28.85 | 33.36 | 25.50 | 32.98 | 32.90 | 28.22 | 16.96 |
| In free space | 30cm | 65.08 | 48.08 | 55.44 | 49.41 | 57.62 | 59.92 | 54.98 | 38.19 |
| | 1M | 62.15 | 45.91 | 52.95 | 45.06 | 52.69 | 55.18 | 50.14 | 34.83 |
| | 2M | 58.00 | 42.54 | 48.29 | 40.62 | 46.96 | 48.99 | 43.17 | 29.65 |
| | 3M | 54.13 | 39.46 | 44.80 | 35.92 | 41.31 | 42.84 | 36.53 | 24.66 |
| | 5M | 46.39 | 33.24 | 37.60 | 28.10 | 31.89 | 33.19 | 27.99 | 19.14 |
| Average Gain(dBi) | | | | | | | | | |
| On 50*50cm ground plane | 30cm | -2.22 | -3.98 | -3.20 | -3.55 | -2.27 | -2.27 | -2.57 | -4.36 |
| | 1M | -2.42 | -4.18 | -3.40 | -3.95 | -2.66 | -2.63 | -2.97 | -4.86 |
| | 2M | -2.72 | -4.51 | -3.80 | -4.40 | -3.16 | -3.14 | -3.62 | -5.61 |
| | 3M | -3.02 | -4.84 | -4.13 | -4.94 | -3.72 | -3.73 | -4.35 | -6.36 |
| | 5M | -3.70 | -5.58 | -4.88 | -6.00 | -4.84 | -4.84 | -5.50 | -7.79 |
| In free space | 30cm | -2.02 | -3.19 | -2.60 | -3.11 | -2.42 | -2.23 | -2.62 | -4.25 |
| | 1M | -2.22 | -3.39 | -2.80 | -3.51 | -2.81 | -2.59 | -3.02 | -4.65 |
| | 2M | -2.52 | -3.72 | -3.20 | -3.97 | -3.31 | -3.10 | -3.67 | -5.35 |
| | 3M | -2.82 | -4.05 | -3.52 | -4.50 | -3.86 | -3.69 | -4.39 | -6.15 |
| | 5M | -3.50 | -4.79 | -4.28 | -5.57 | -4.98 | -4.80 | -5.55 | -7.25 |
| Peak Gain(dBi) | | | | | | | | | |
| On 50*50cm ground plane | 30cm | 5.37 | 3.66 | 4.35 | 6.24 | 7.04 | 7.11 | 7.91 | 6.46 |
| | 1M | 5.17 | 3.46 | 4.15 | 5.84 | 6.64 | 6.81 | 7.51 | 5.96 |
| | 2M | 4.87 | 3.06 | 3.75 | 5.34 | 6.14 | 6.31 | 6.91 | 5.16 |
| | 3M | 4.57 | 2.76 | 3.45 | 4.84 | 5.64 | 5.71 | 6.21 | 4.46 |
| | 5M | 3.87 | 2.06 | 2.65 | 3.74 | 4.44 | 4.61 | 5.11 | 4.82 |
| In free space | 30cm | 3.54 | 4.07 | 4.13 | 4.67 | 6.57 | 6.69 | 8.11 | 6.27 |
| | 1M | 3.34 | 3.87 | 3.93 | 4.27 | 6.17 | 6.35 | 7.71 | 5.87 |
| | 2M | 3.04 | 3.47 | 3.53 | 3.77 | 5.67 | 5.79 | 7.11 | 5.17 |
| | 3M | 2.74 | 3.17 | 3.23 | 3.27 | 5.07 | 5.19 | 6.41 | 4.37 |
| | 5M | 2.04 | 2.37 | 2.43 | 2.17 | 3.97 | 4.09 | 5.31 | 3.27 |
| Impedance | | 50Ω | | | | | | | |
| Polarization | | Linear | | | | | | | |
| VSWR | | < 3 | | | | | | | |
| Cable | | 3 meters CFD200 standard, fully customizable | | | | | | | |
| Connector | | SMA Male connector, fully customizable | | | | | | | |

| MECHANICAL | |
|---------------------------|----------------------------|
| Antenna Dimensions | 216.24*93.25*30.95mm |
| Casing | ABS+PC |
| Base and Thread | Nickel Plated Aluminum |
| Weight (including cable) | 480g |
| Ingress Protection Rating | IP67 |
| Maximum Assembly Torque | 39.2 N-m |
| ENVIRONMENTAL | |
| Operation Temperature | -40°C to 85°C |
| Storage Temperature | -40°C to 90°C |
| Humidity | Non-condensing 65°C 95% RH |

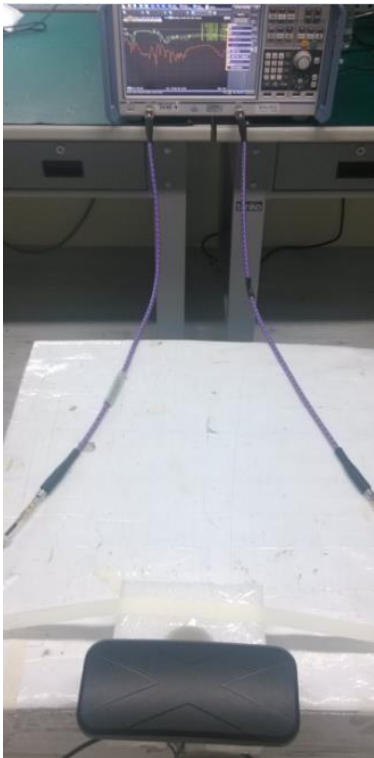
| LTE BANDS | | | |
|-------------|--|-------------------------------|---------|
| Band Number | LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA | | |
| | Uplink | Downlink | Covered |
| 1 | UL: 1920 to 1980 | DL: 2110 to 2170 | ✓ |
| 2 | UL: 1850 to 1910 | DL: 1930 to 1990 | ✓ |
| 3 | UL: 1710 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 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%

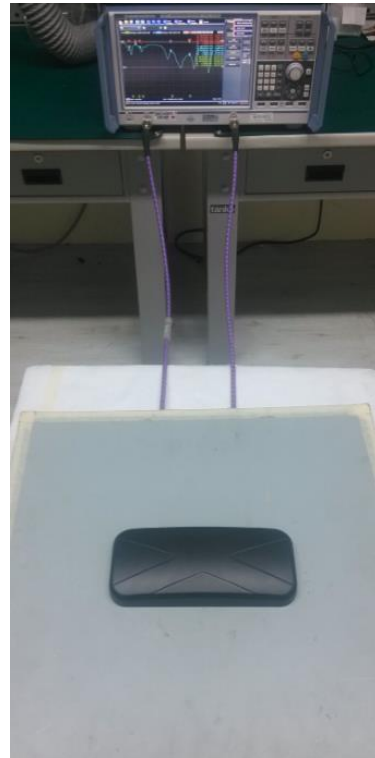
3. Antenna Characteristics

3.1 LTE Antenna

3.1.1 Test Setup



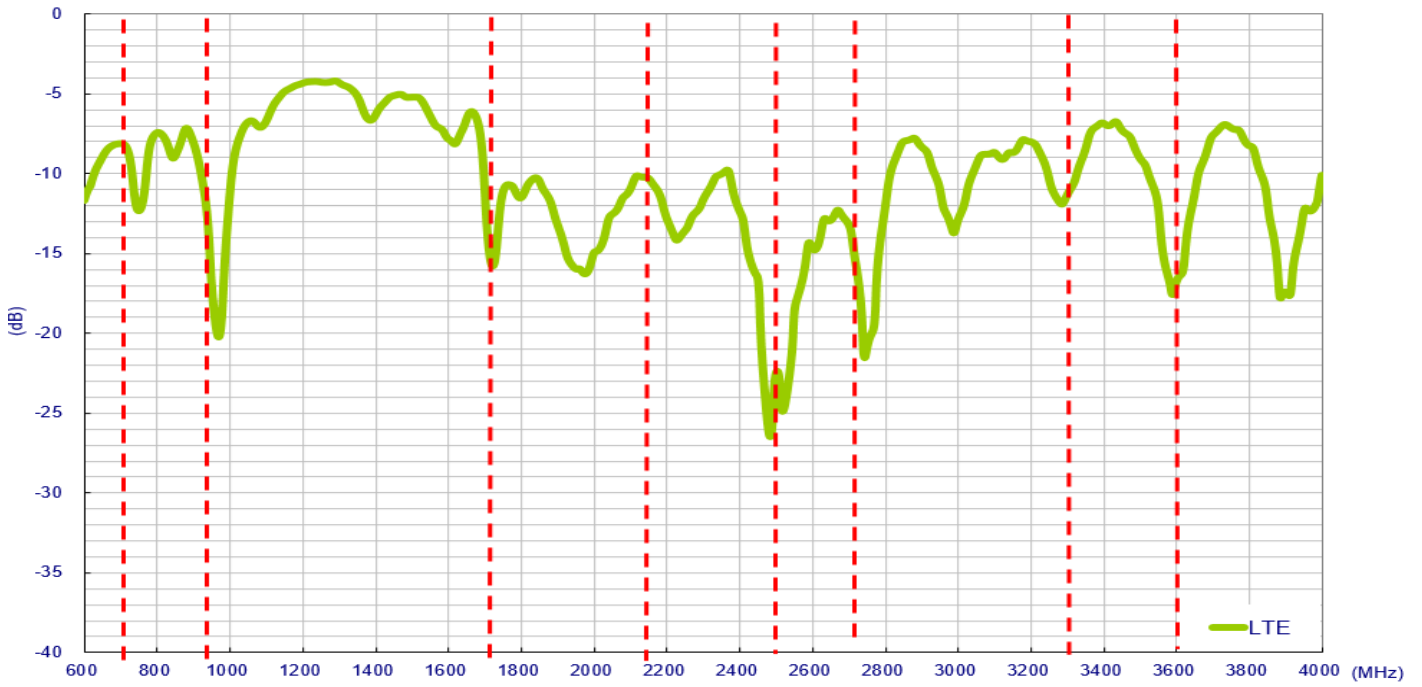
In free space



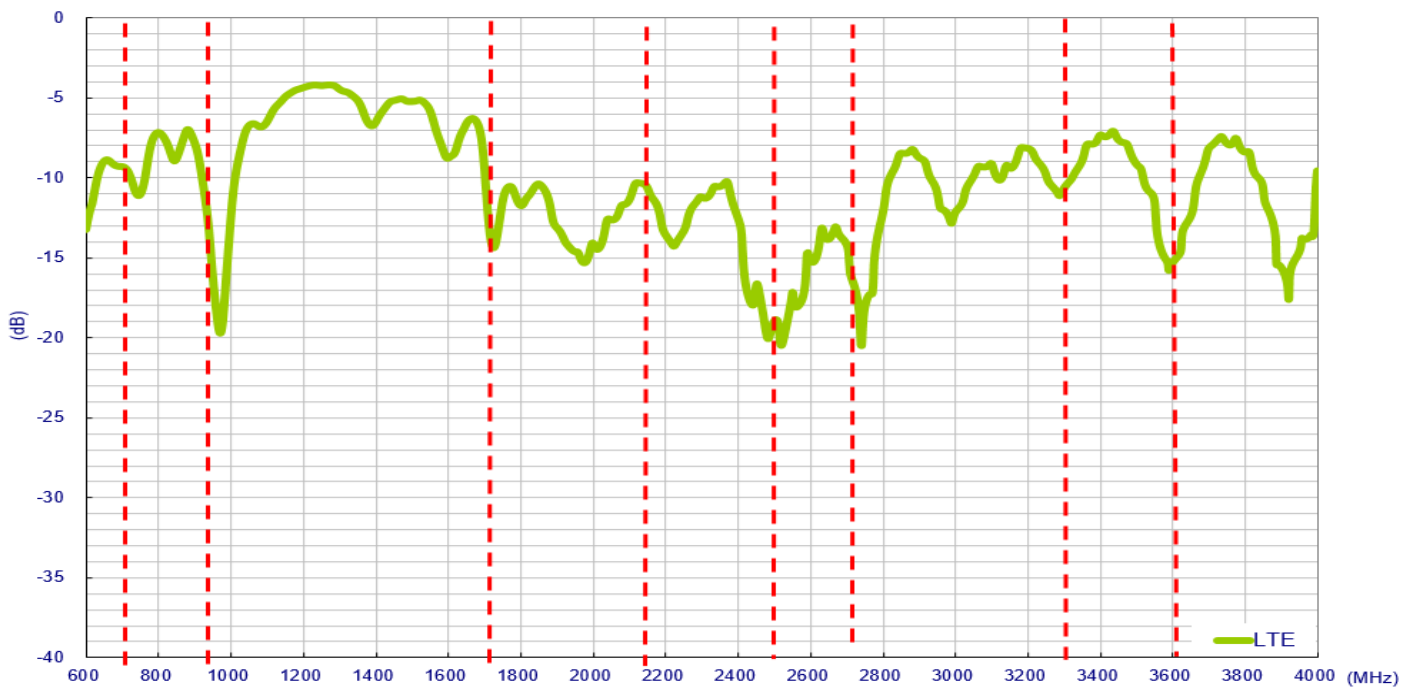
On the 50*50cm ground plane

3.1.2 LTE Antenna Return Loss and Isolation

Setup on 50*50cm ground plane with 3 meter cable length

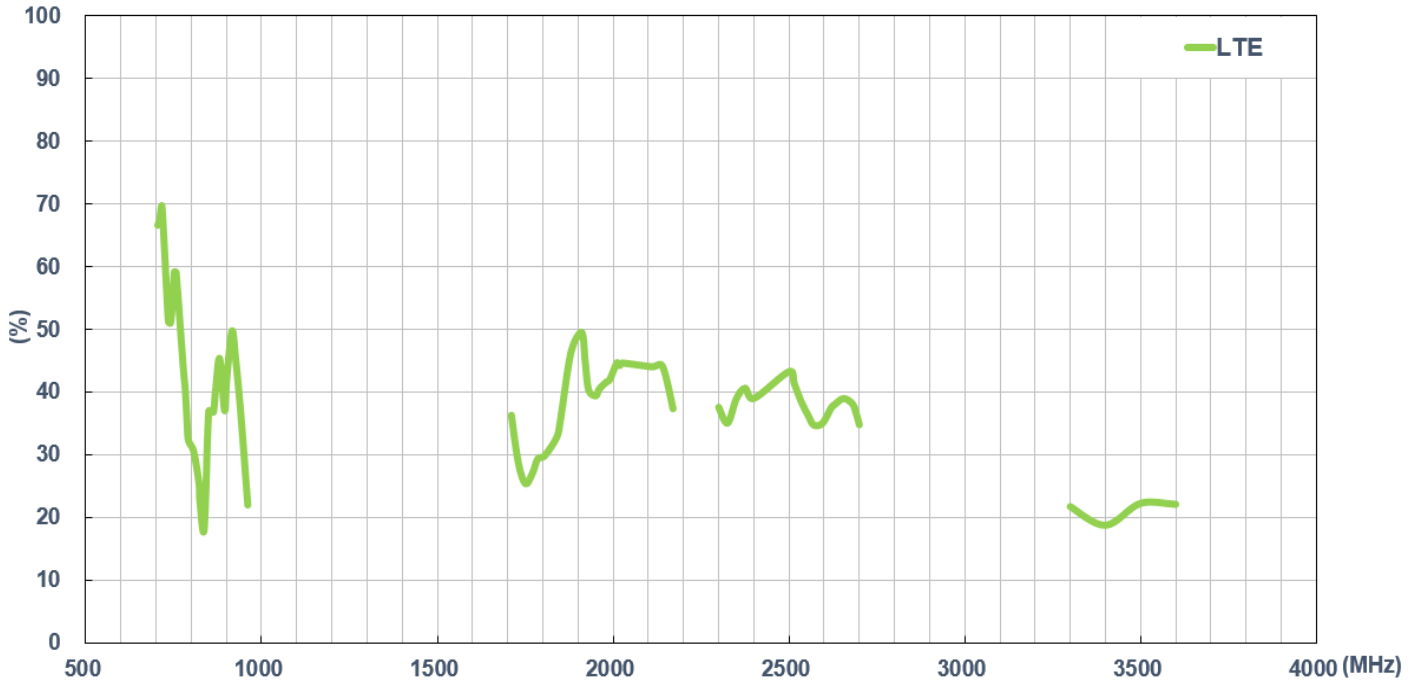


Setup in free space with 3 meters cable length

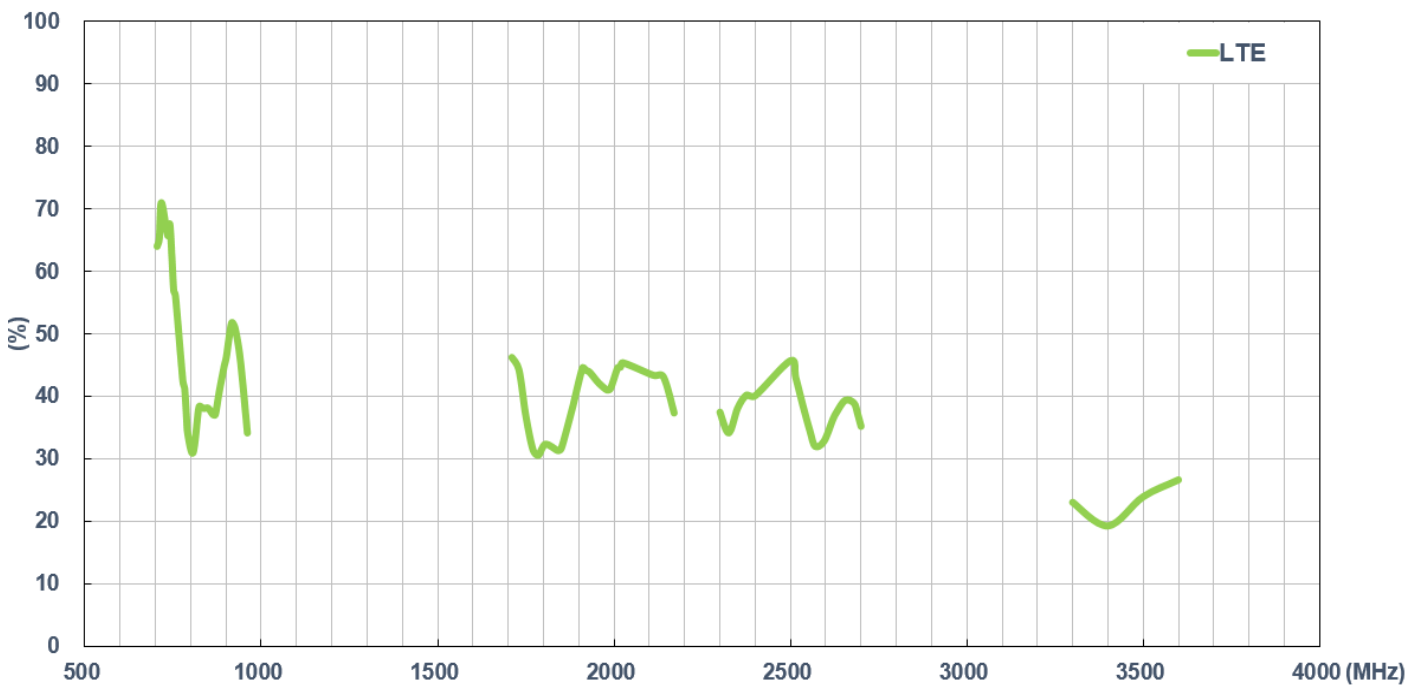


3.1.3 LTE Antenna Efficiency

Setup on 50*50cm ground plane with 3 meter cable length

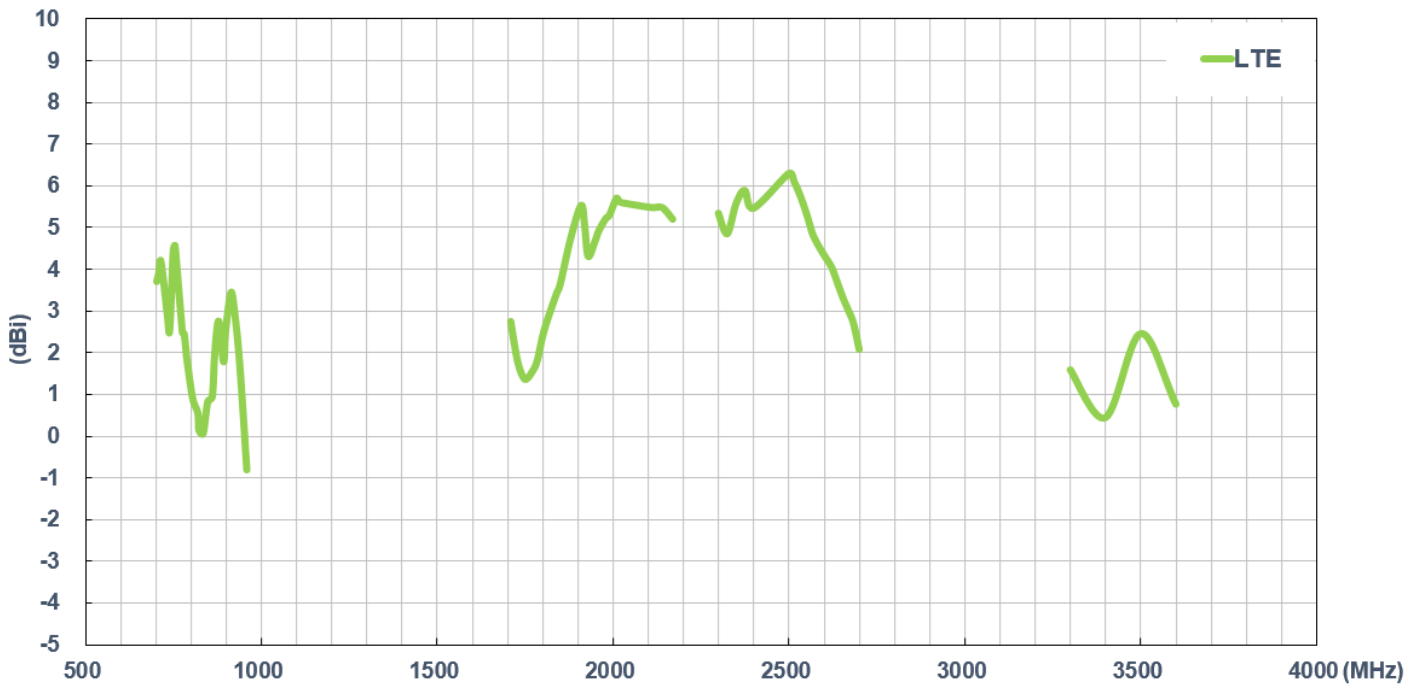


Setup in free space with 3 meter cable length

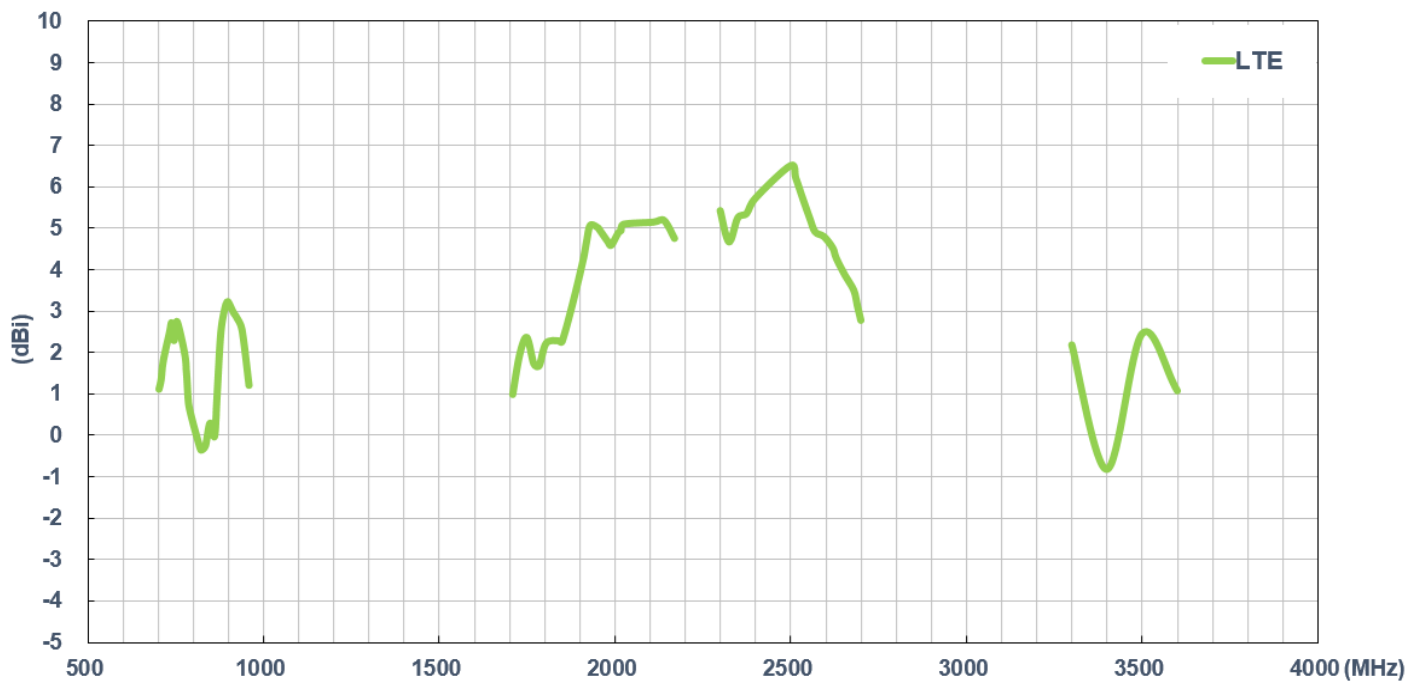


3.1.4 LTE Antenna Peak Gain

Setup on 50*50cm ground plane with 3 meter cable length

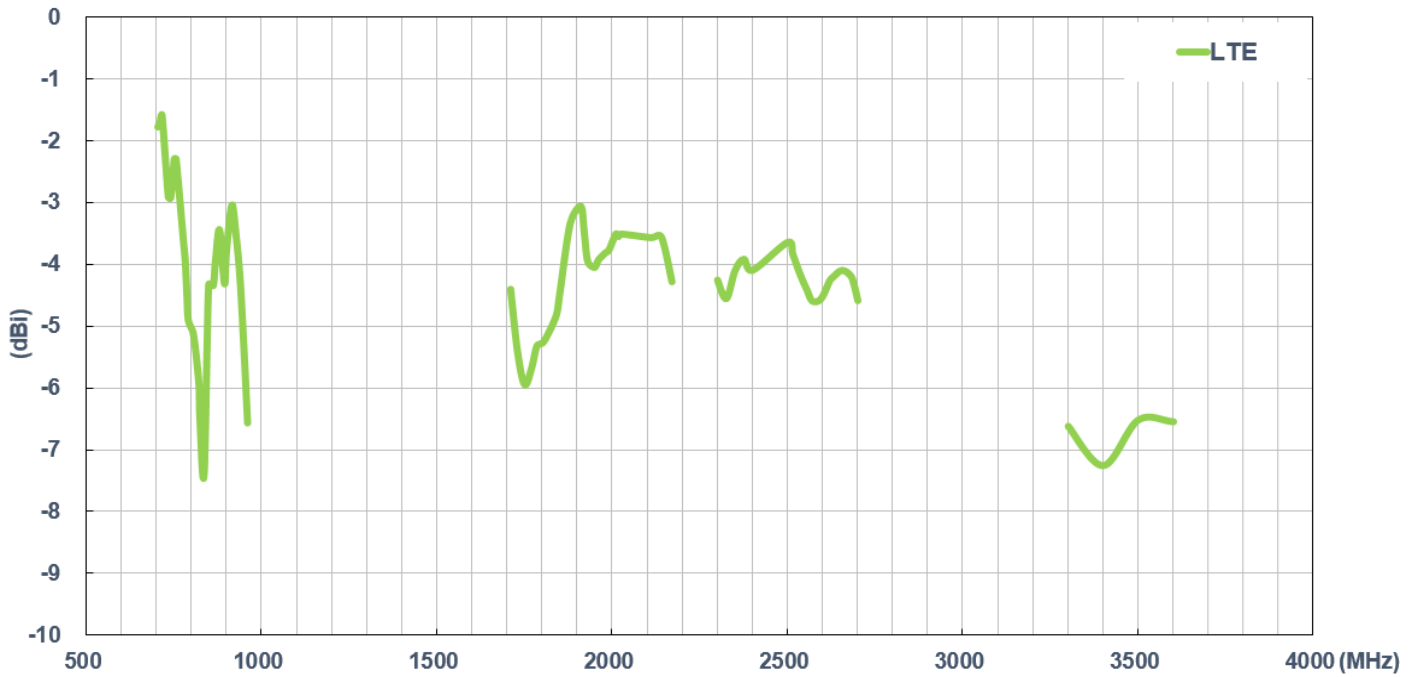


Setup in free space with 3 meter cable length

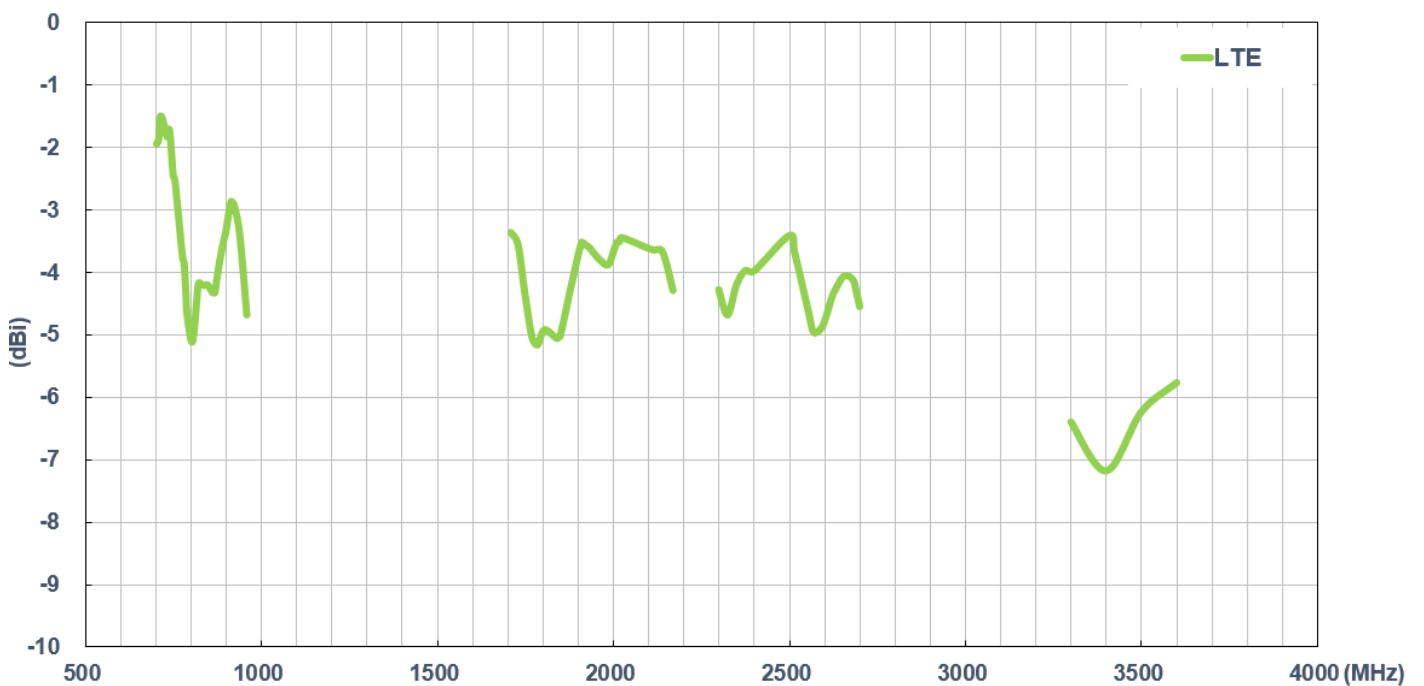


3.1.5 LTE Antenna Average gain

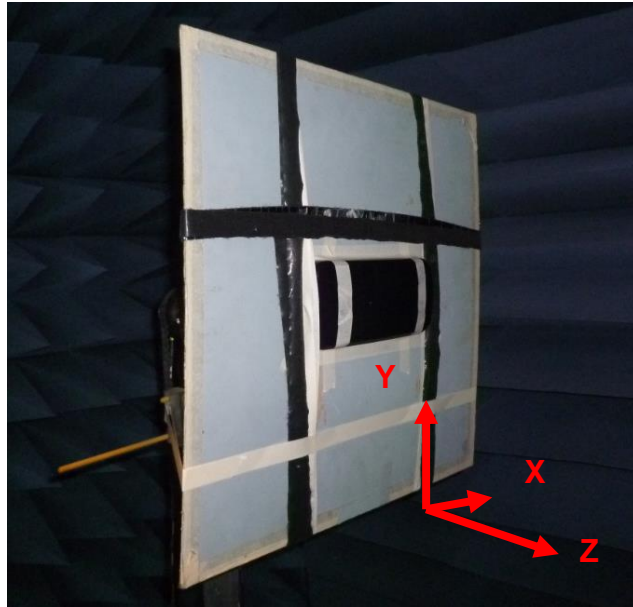
Setup on 50*50cm ground plane with 3 meter cable length



Setup in free space with 3 meter cable length



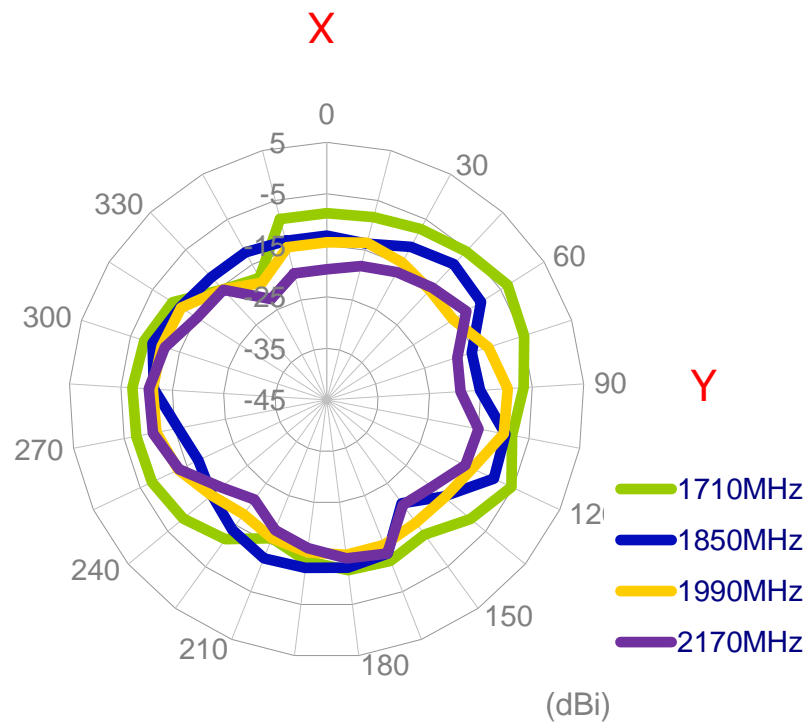
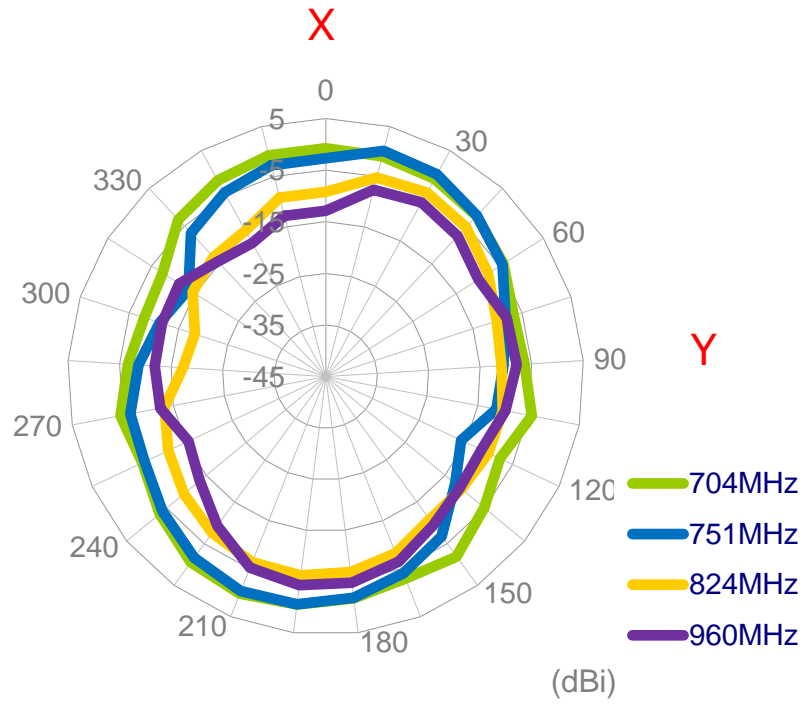
3.1.6 Test Setup for Antenna Radiation Pattern (ETS Anechoic chamber)

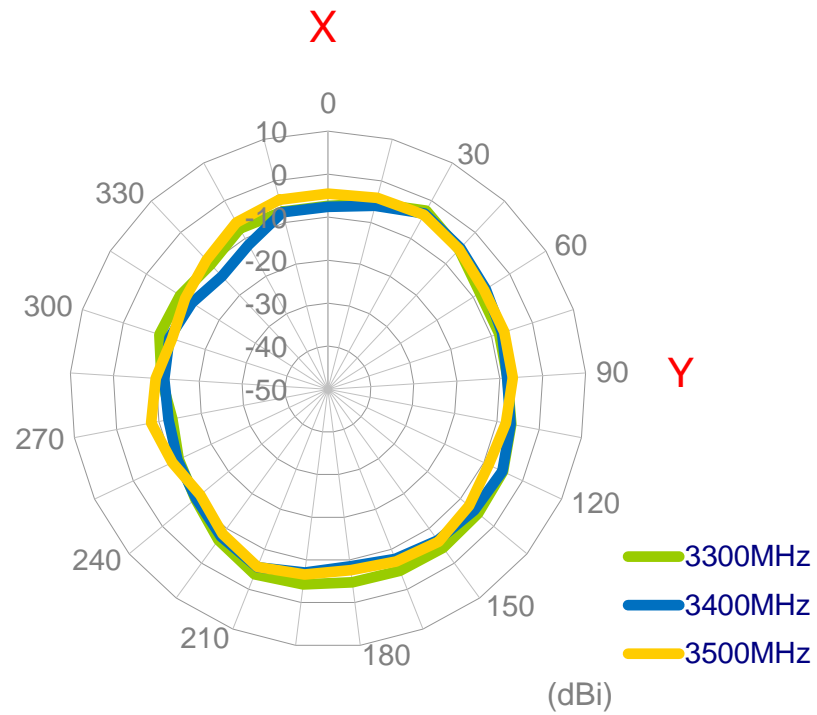
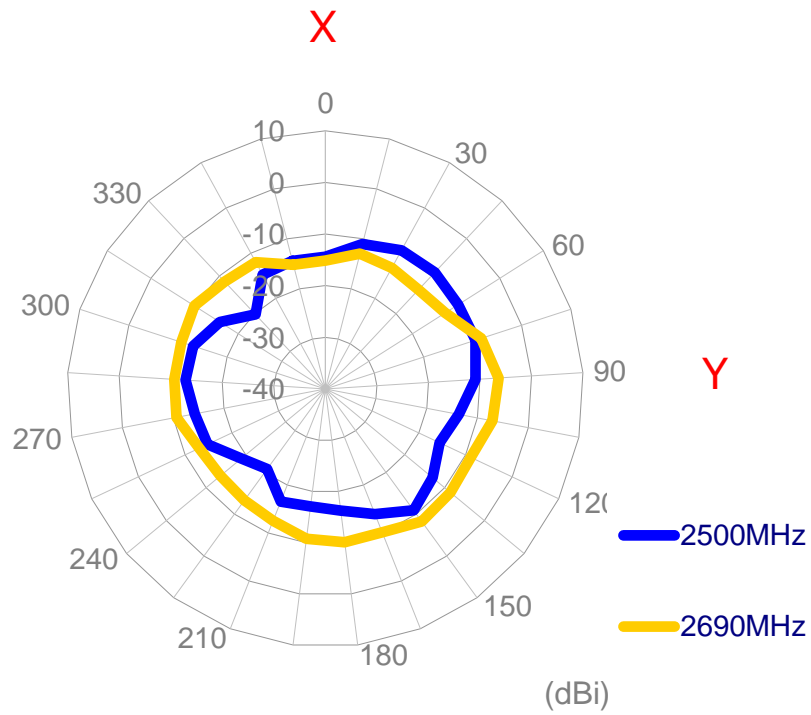


On the 50*50cm ground plane

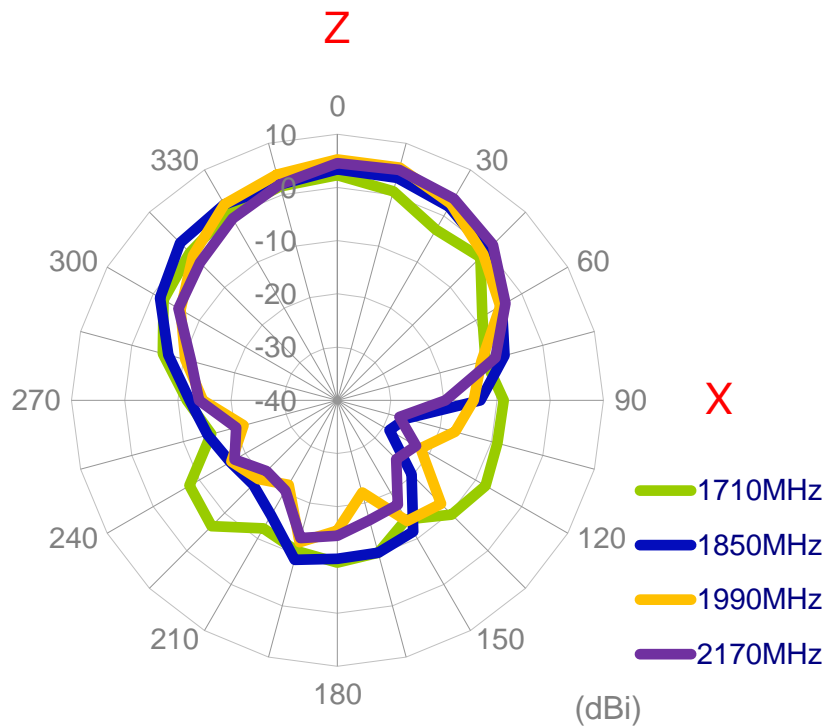
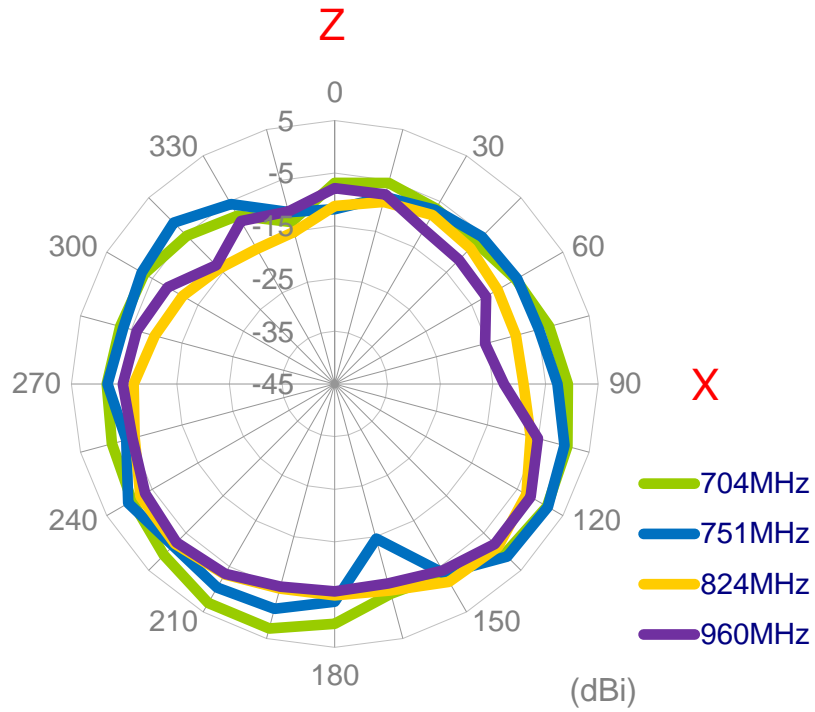
3.1.7 2D Radiation pattern (LTE with 3M cable length on the 50*50 ground plane)

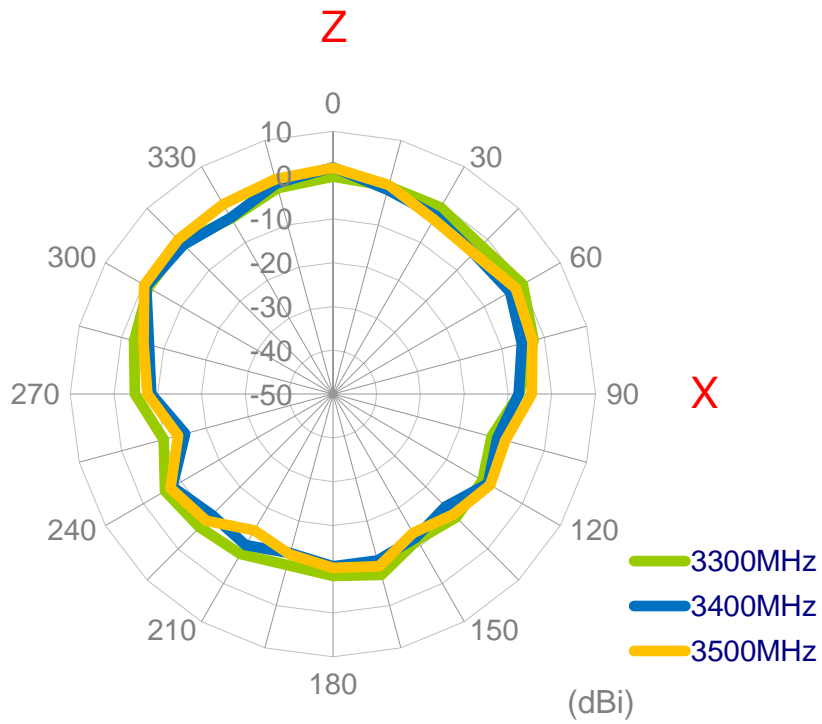
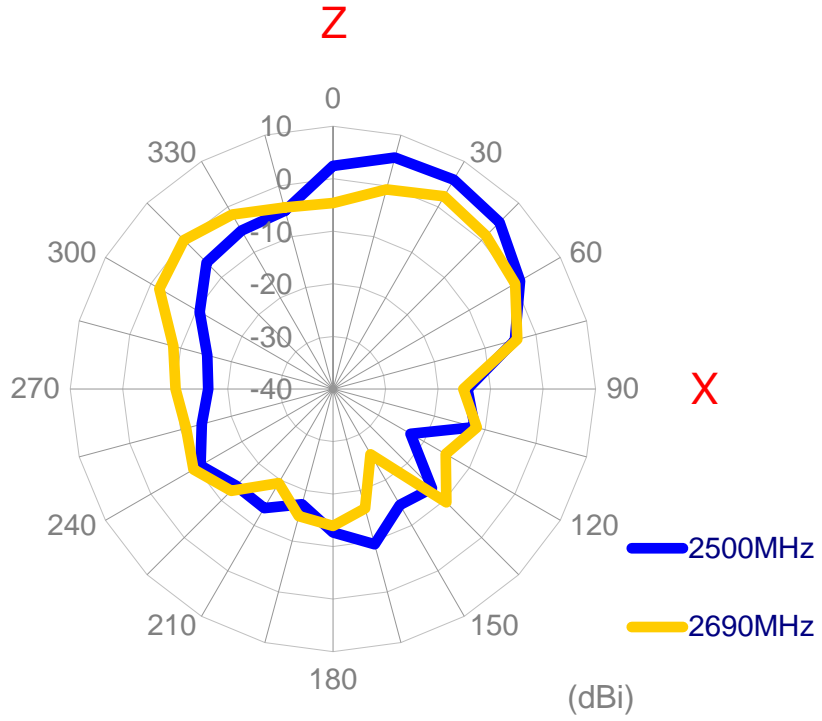
XY Plane



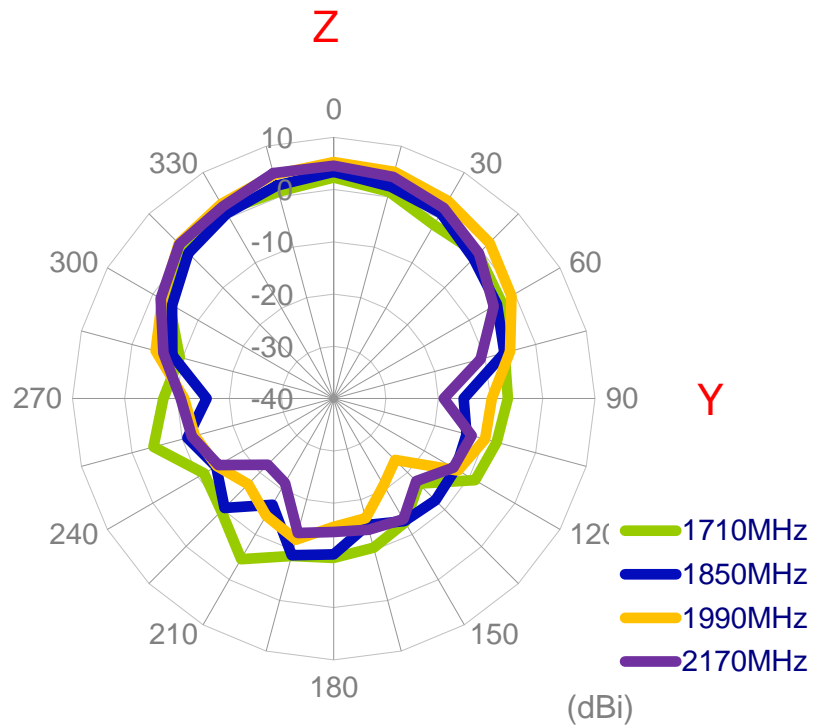
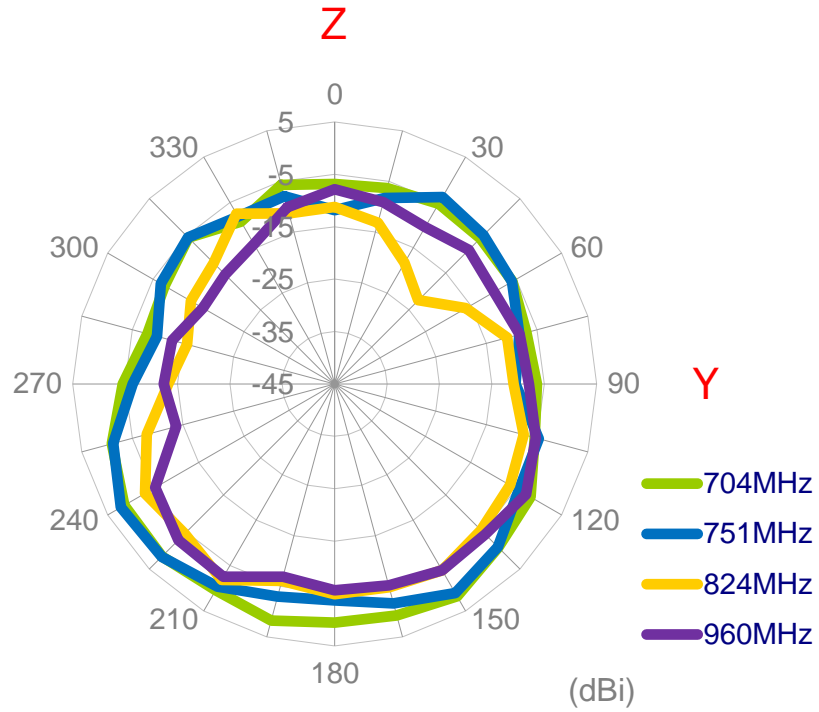


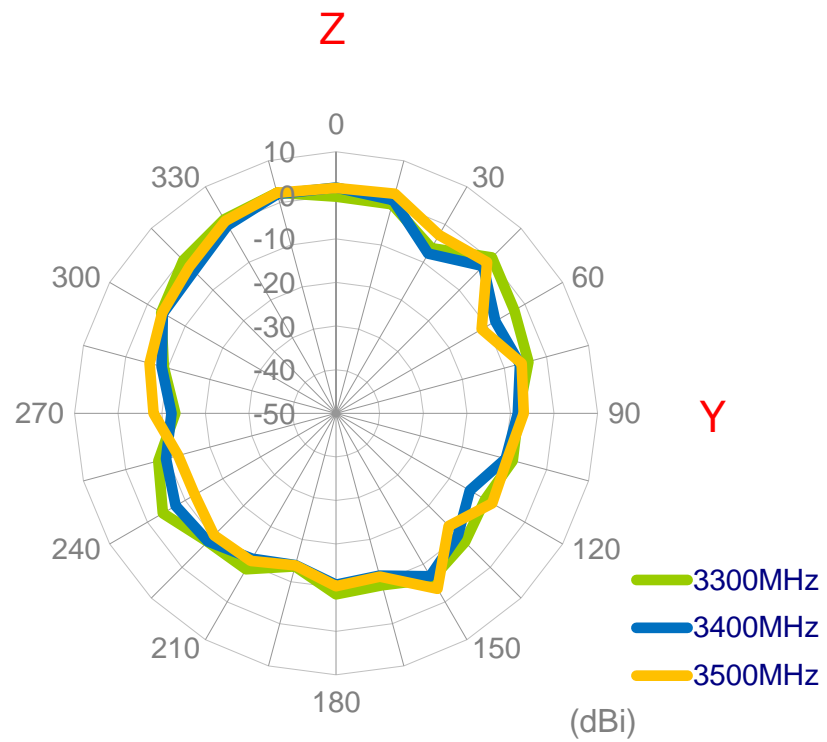
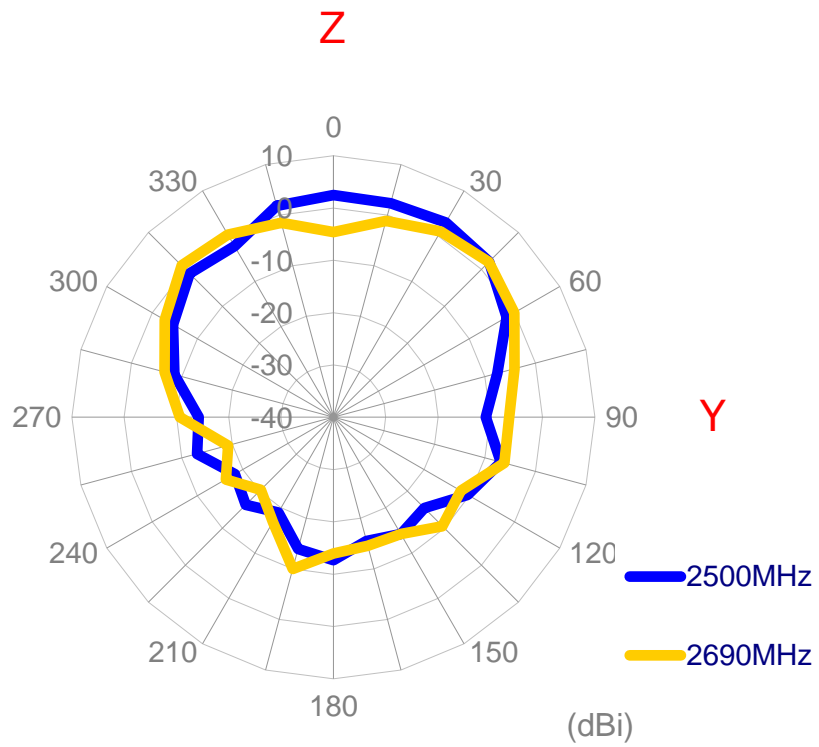
XZ Plane



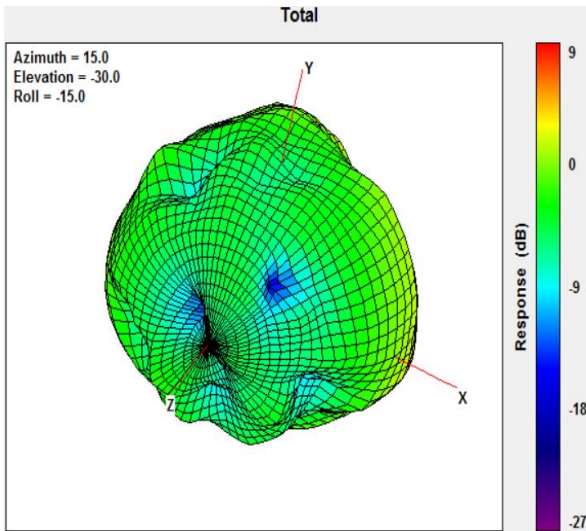


YZ Plane

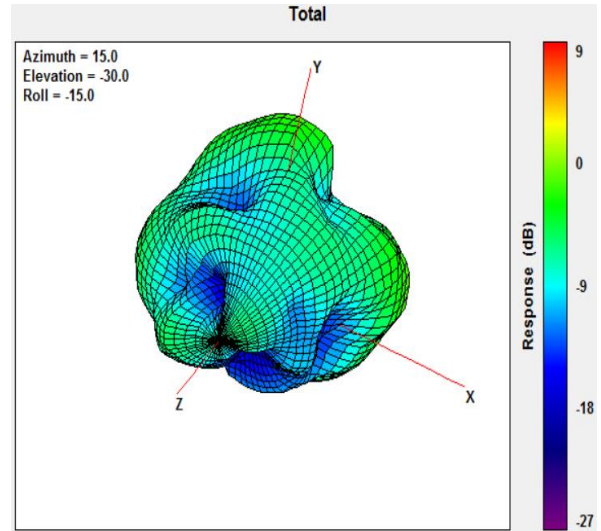




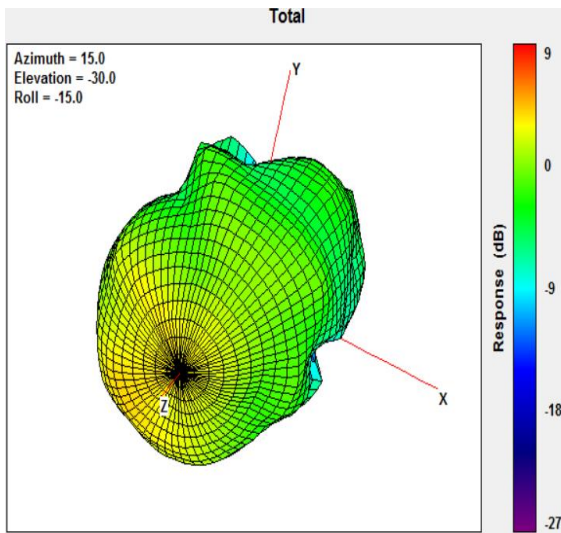
3.1.8 3D Radiation pattern (LTE with 3M cable length on the 50*50 ground plane)



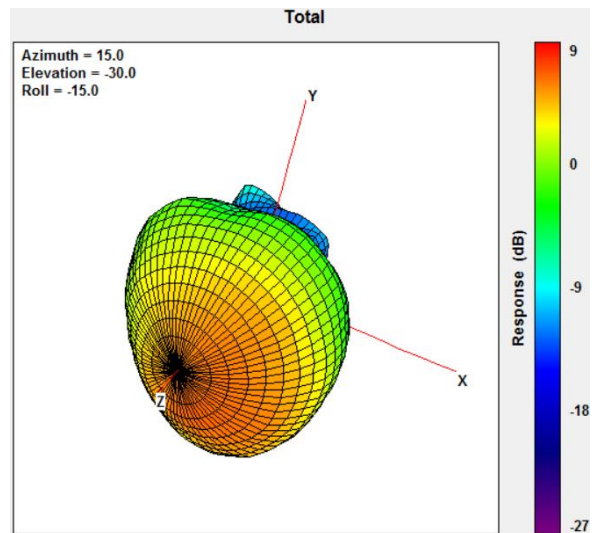
704MHz



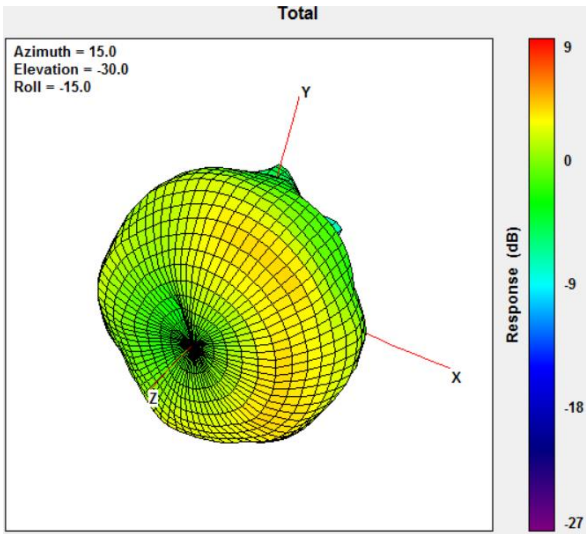
960MHz



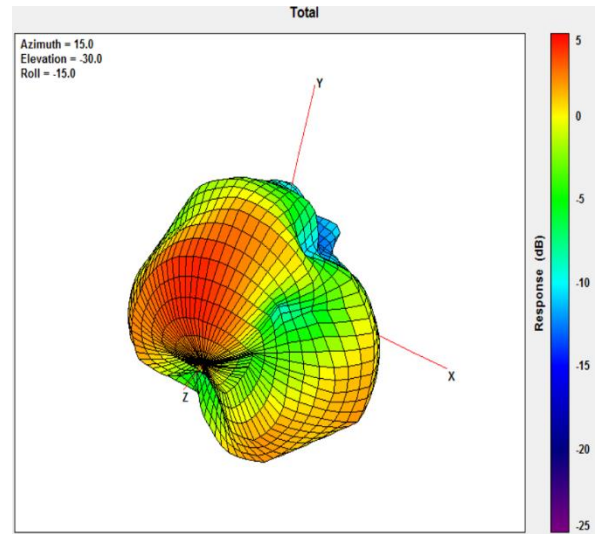
1710MHz



2170MHz

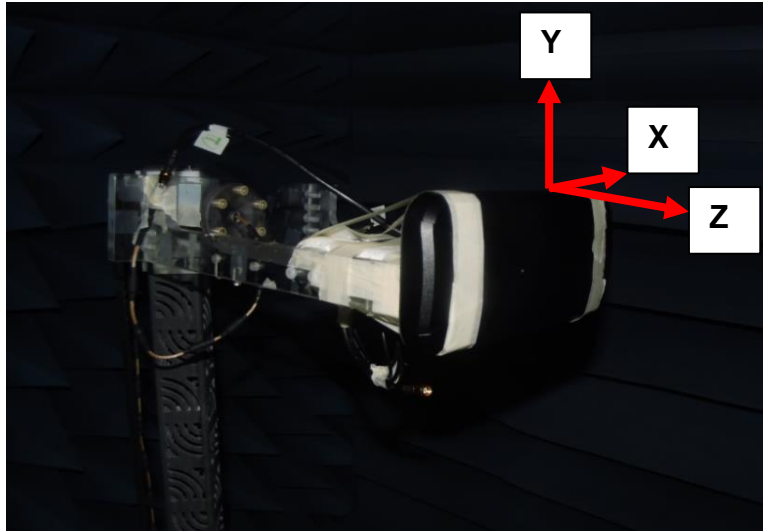


2690MHz



3500MHz

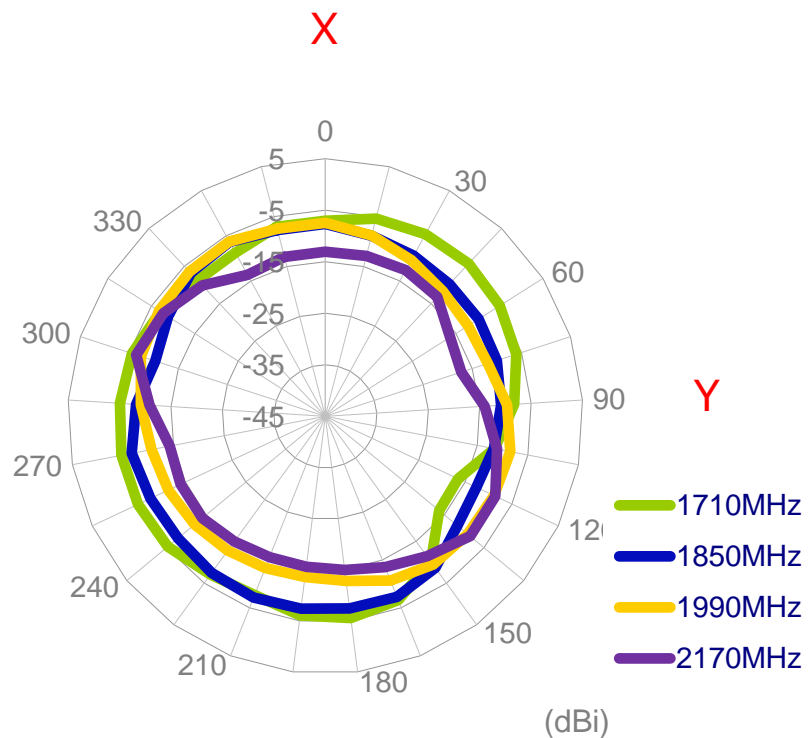
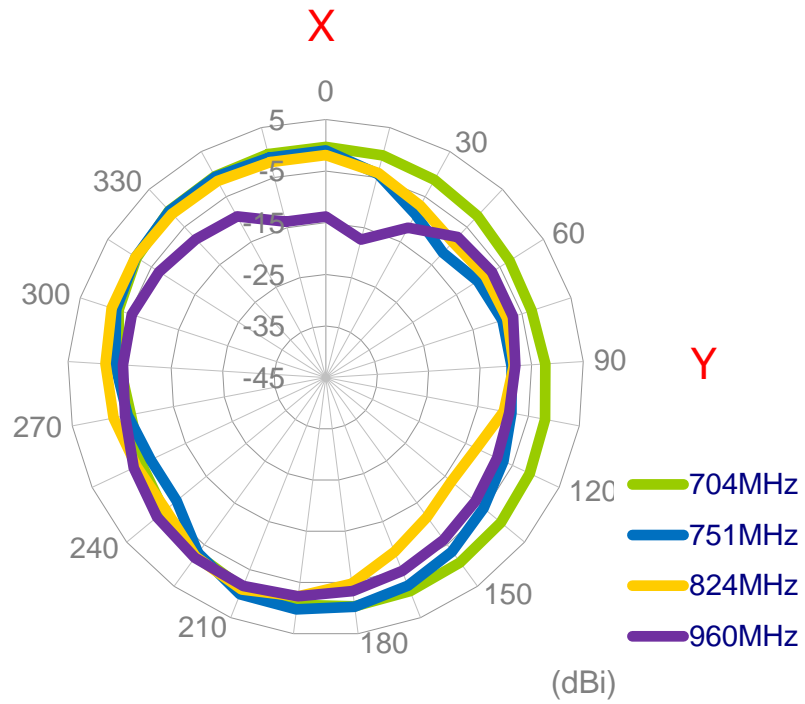
3.1.9 Test Setup for Antenna Radiation Pattern (ETS Anechoic chamber)

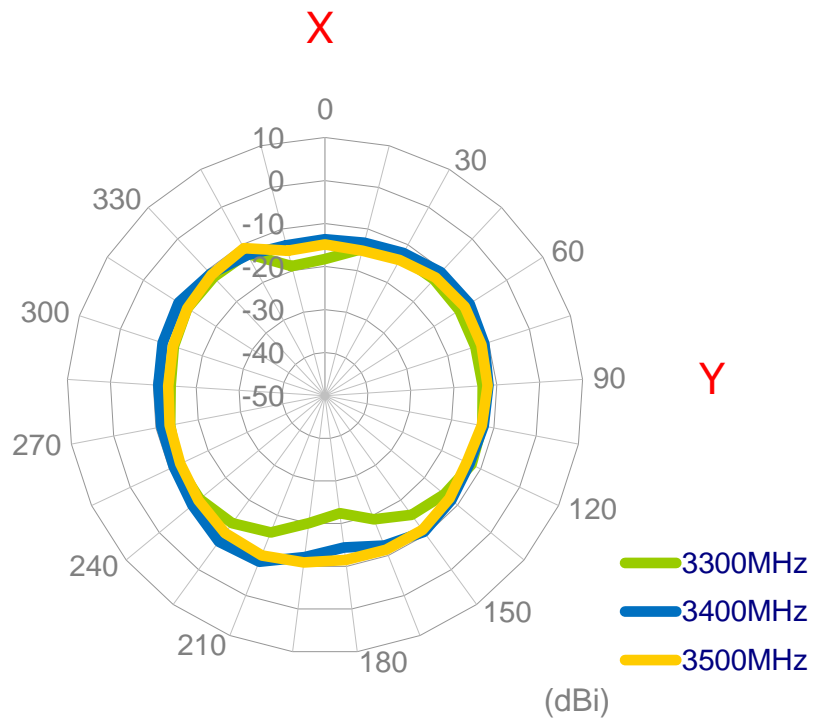
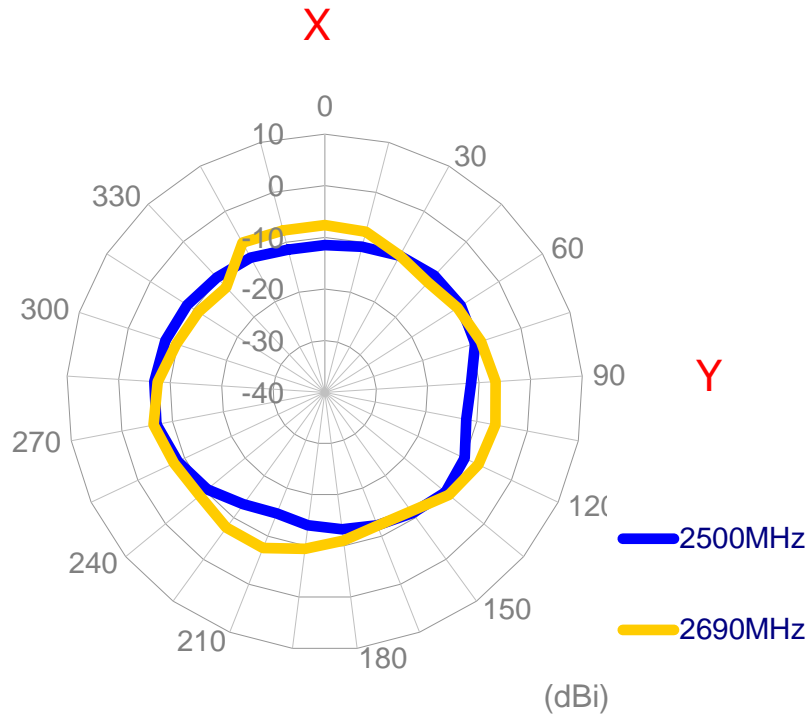


In free space

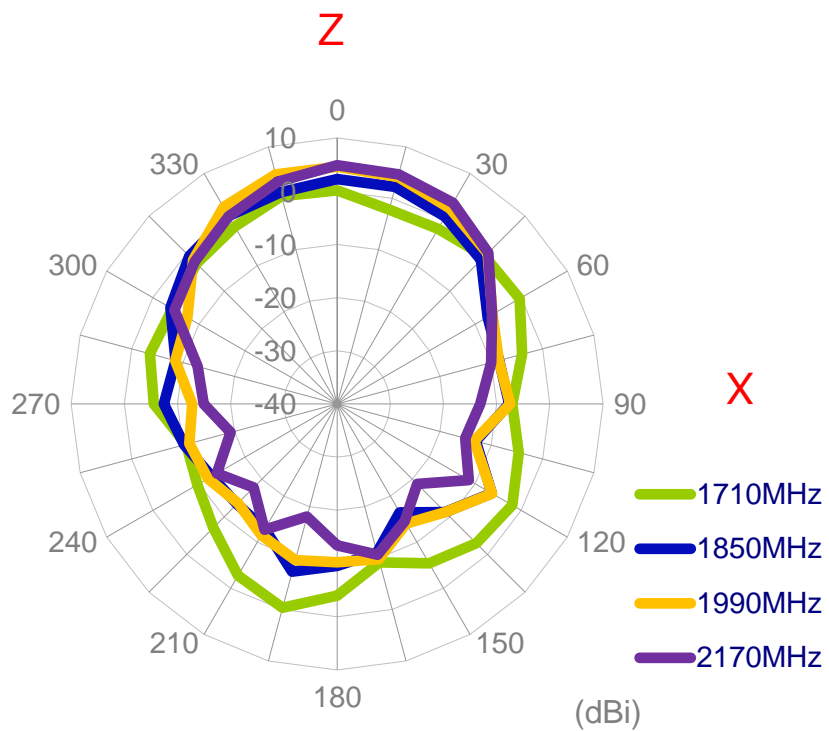
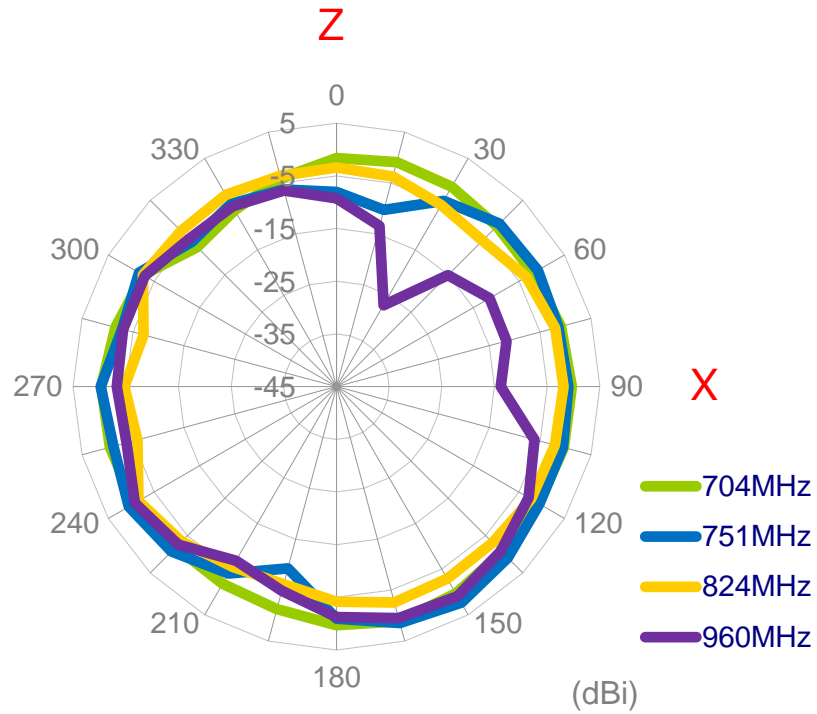
3.1.10 2D Radiation pattern (LTE with 3M cable length in free space)

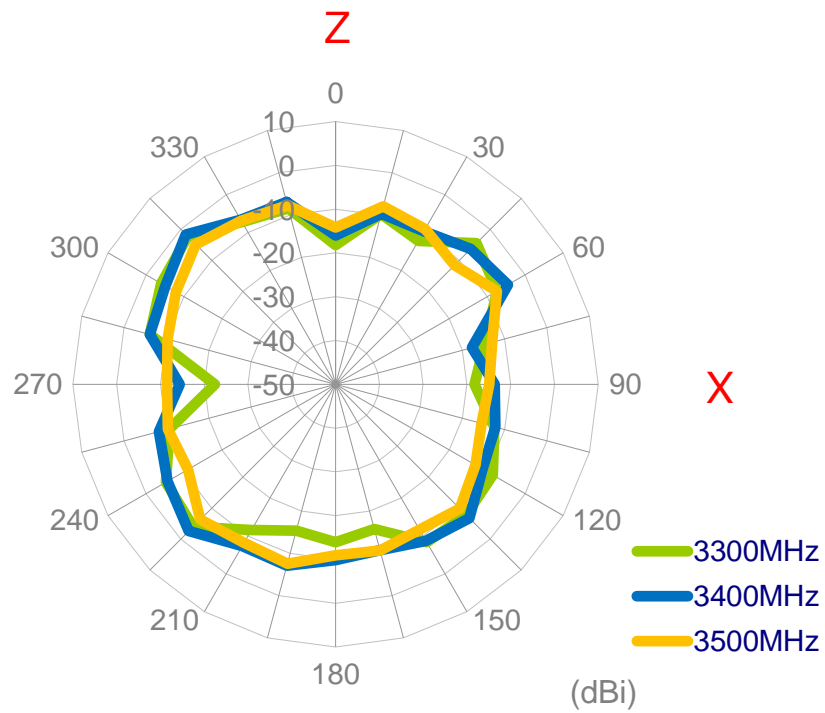
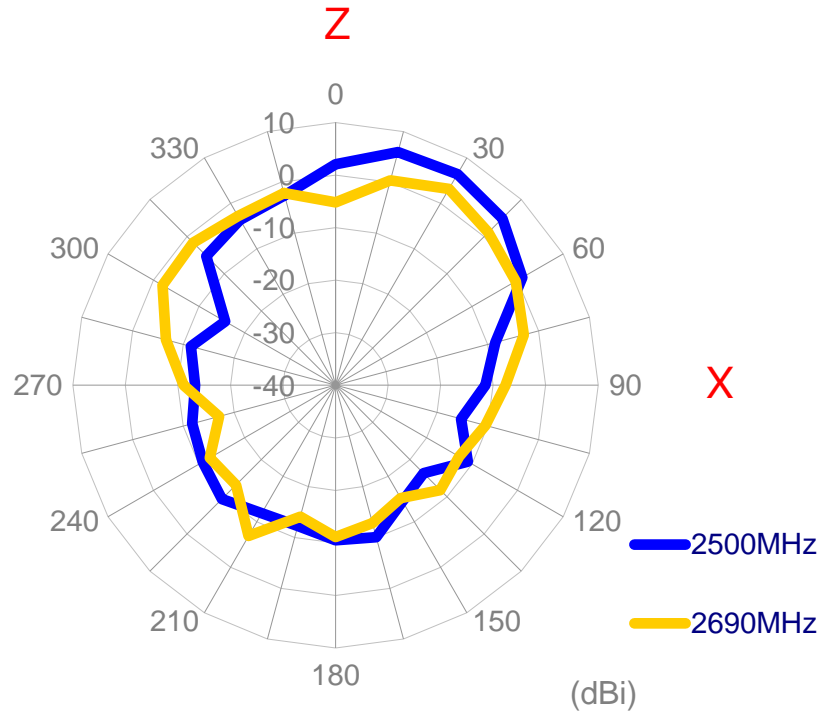
XY Plane



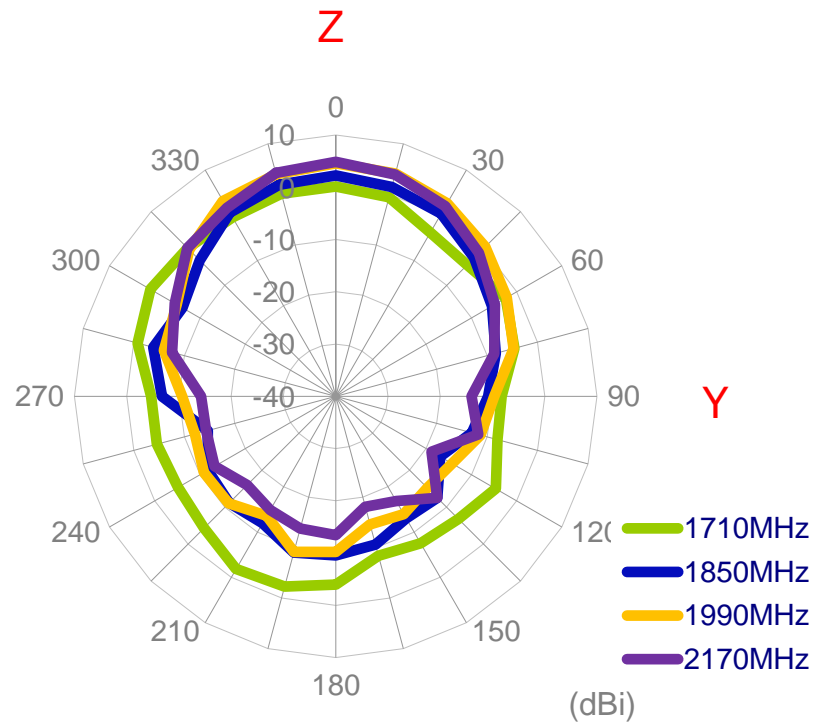
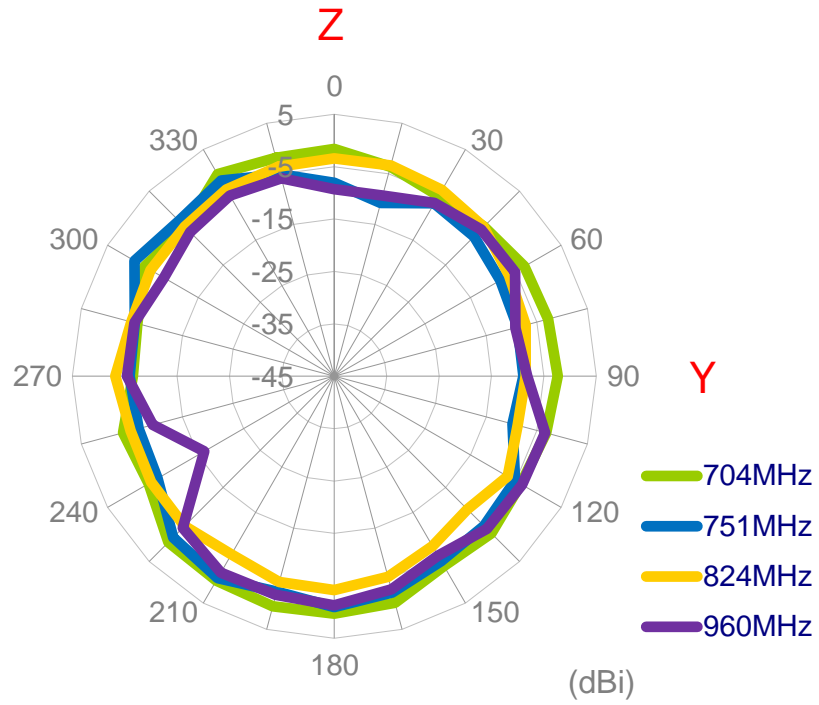


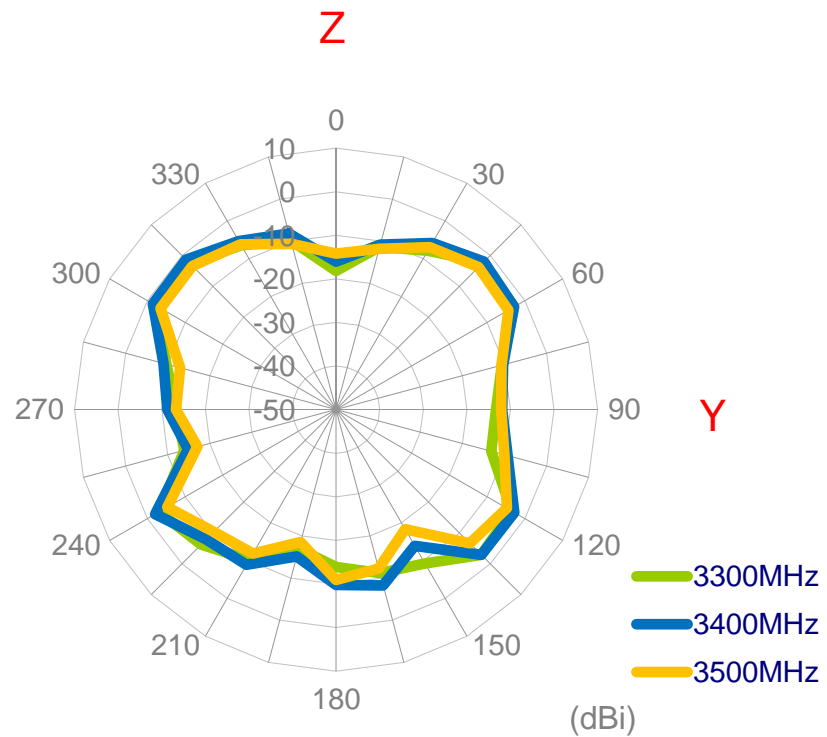
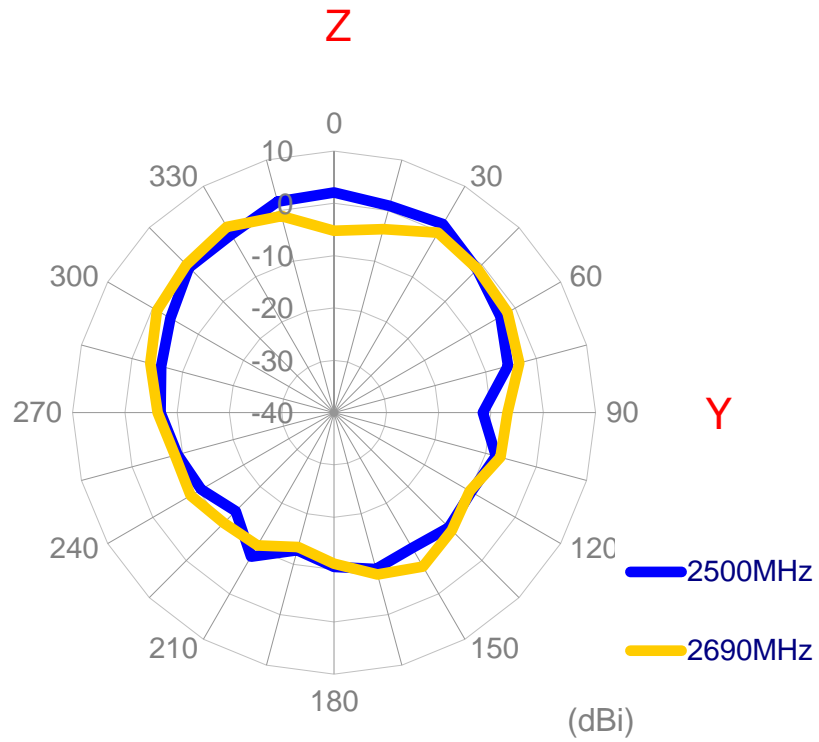
XZ Plane



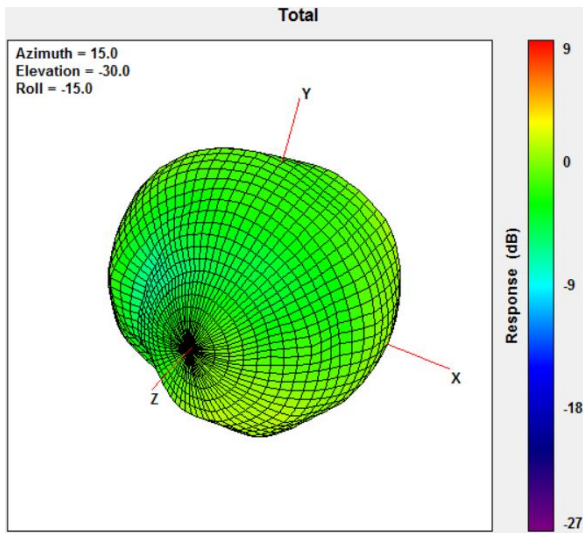


YZ Plane

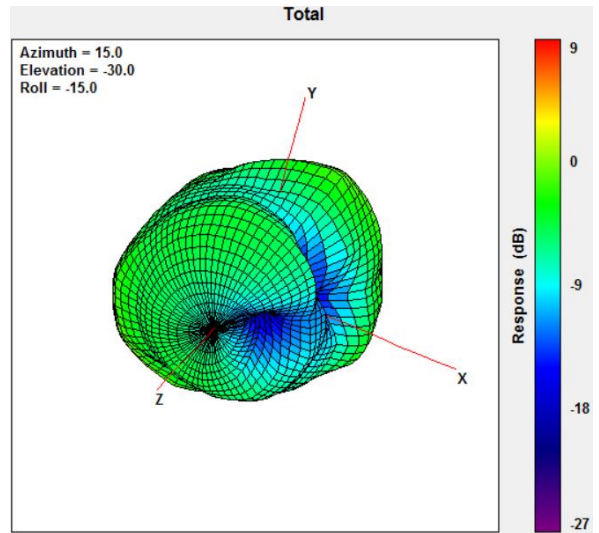




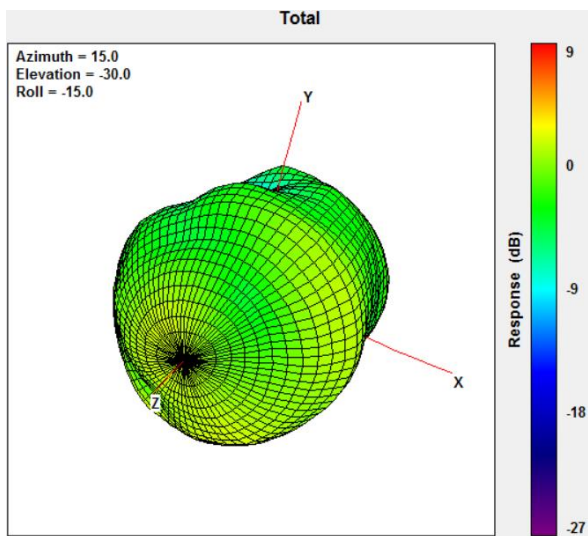
3.1.11 3D Radiation pattern (LTE with 3M cable length in free space)



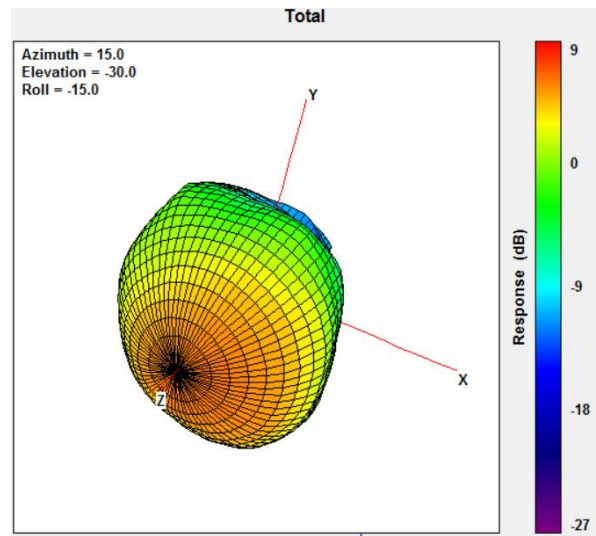
704MHz



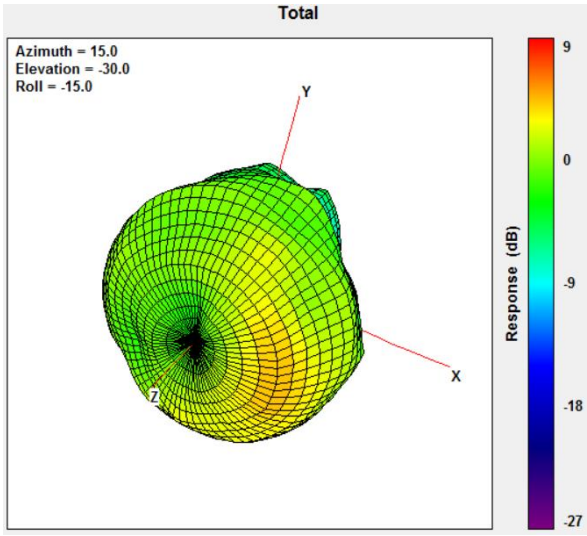
960MHz



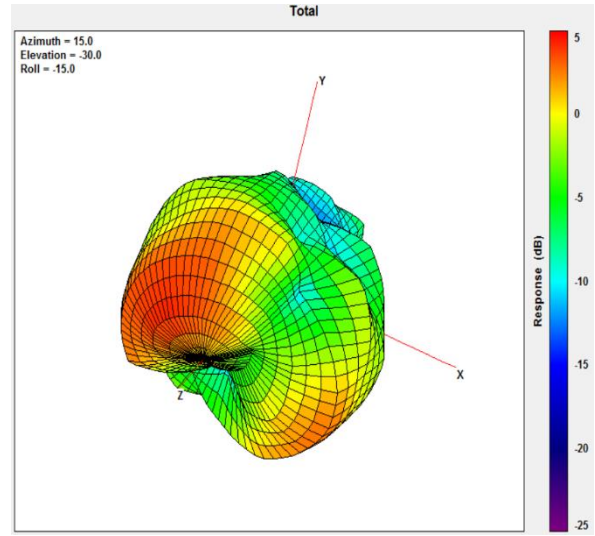
1710MHz



2170MHz

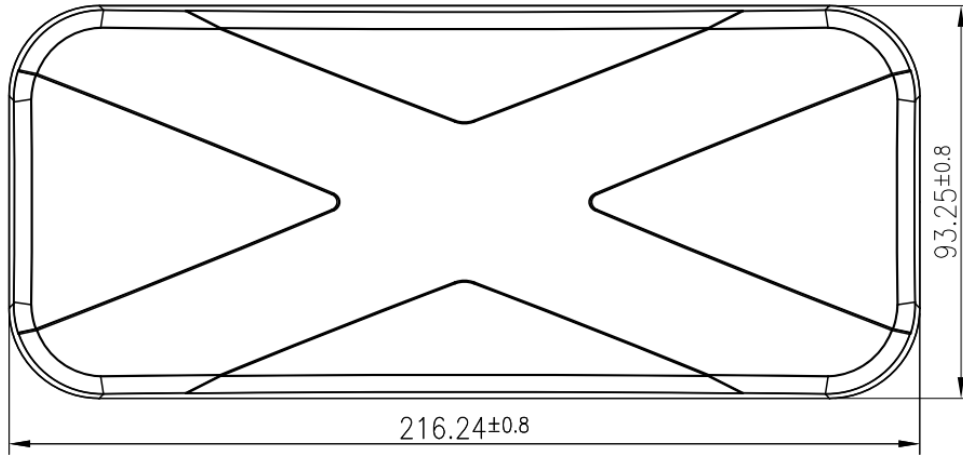


2690MHz

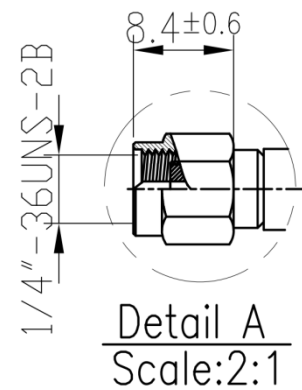
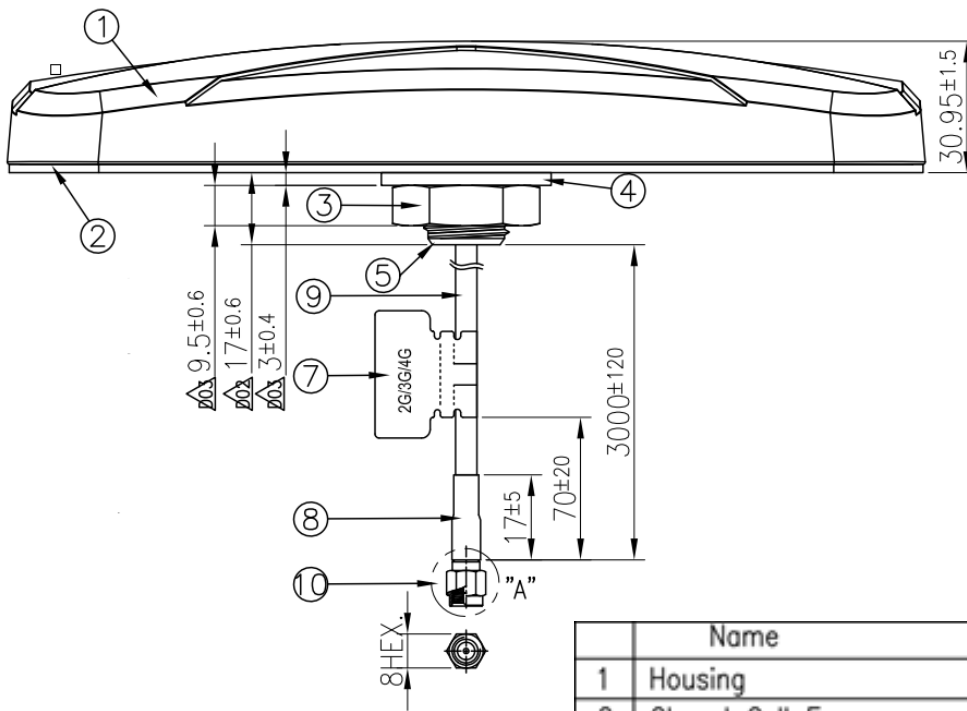
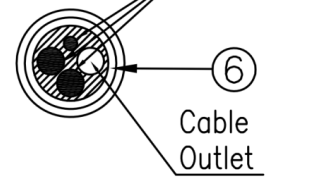


3500MHz

4. Mechanical Drawing (mm)

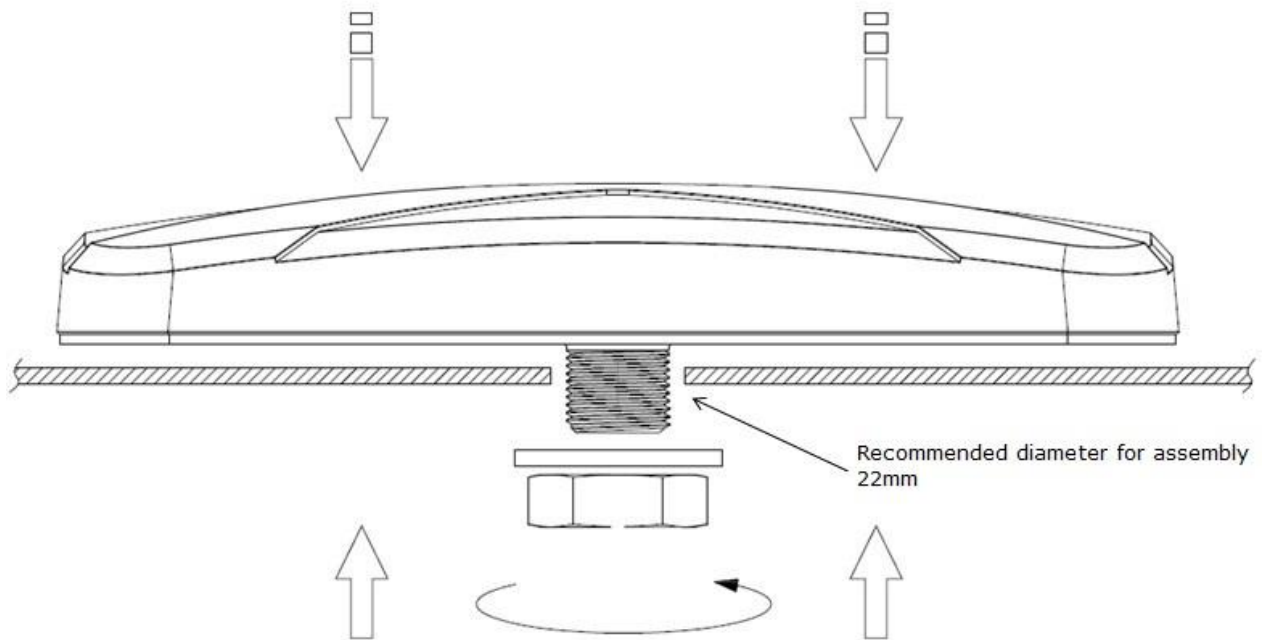


Bottom Thread View



| | Name | Material | Finish | QTY |
|----|----------------------|-----------------|-----------|-----|
| 1 | Housing | ABS+PC | Black | 1 |
| 2 | Closed Cell Foam | 3M 9448+CR-4305 | Black | 1 |
| 3 | Nut_M20x1.5Px10H Cut | Steel | Ni Plated | 1 |
| 4 | Washer_Cut | Steel | Ni Plated | 1 |
| 5 | Metal Base | AL | Ni Plated | 1 |
| 6 | Cable Rubber | Silicone Rubber | Black | 1 |
| 7 | 2G/3G/4G Label | Coated Paper | White | 1 |
| 8 | Heat Shrink Tube | PE | Black | 1 |
| 9 | CFD200 Coaxial Cable | PVC | Black | 1 |
| 10 | SMA(M)ST | Brass | Au Plated | 1 |

5. Installation



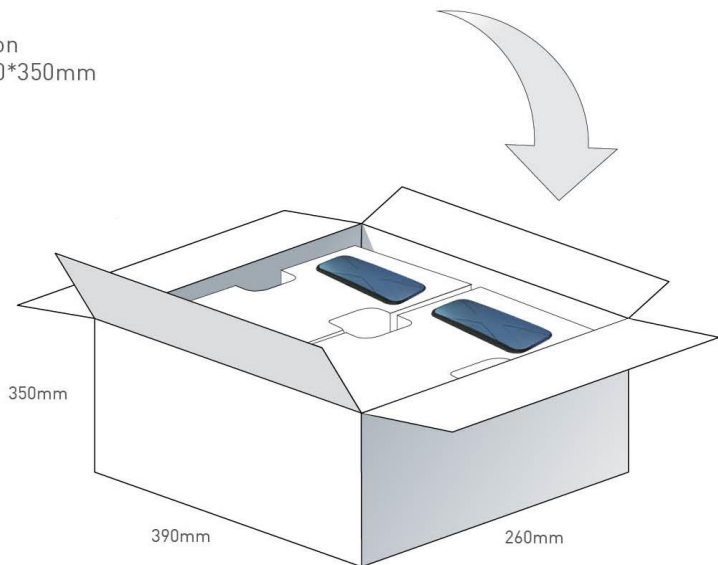
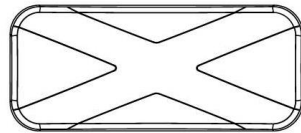
Recommended torque for mounting is 29.4 N.m
Maximum torque for mounting is 39.2 N.m

6. Packaging Spec

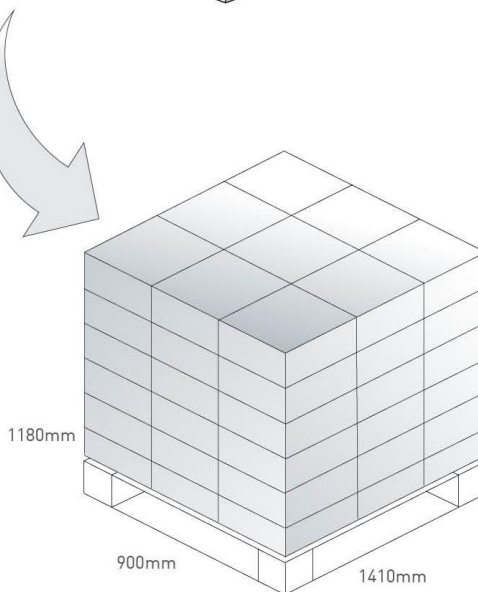
MA413.A.B.002

Packaging Specifications

2 pc MA413.A.B.002 per carton
 Carton Dimensions - 390*260*350mm
 Total Weight - 1.42Kg



Pallet Dimensions 1180*900*1410mm
 54 Cartons per pallet
 9 Cartons per layer
 6 Layers

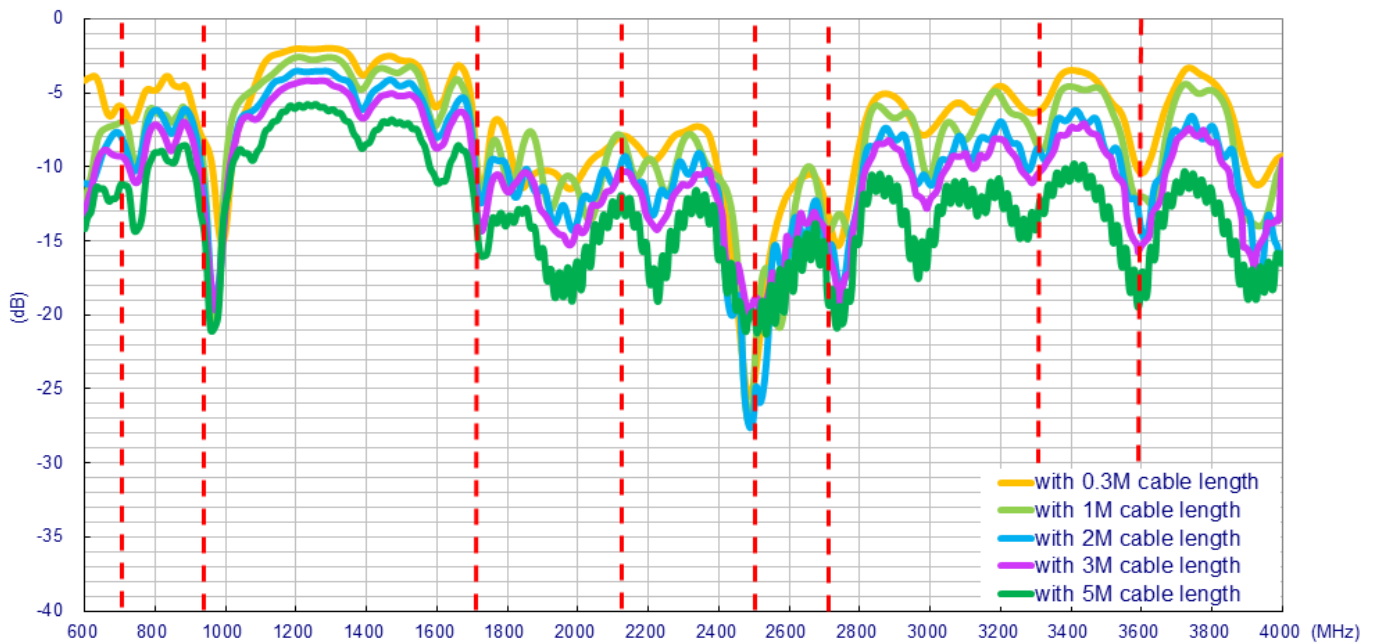


7. Application Note (LTE Antenna)

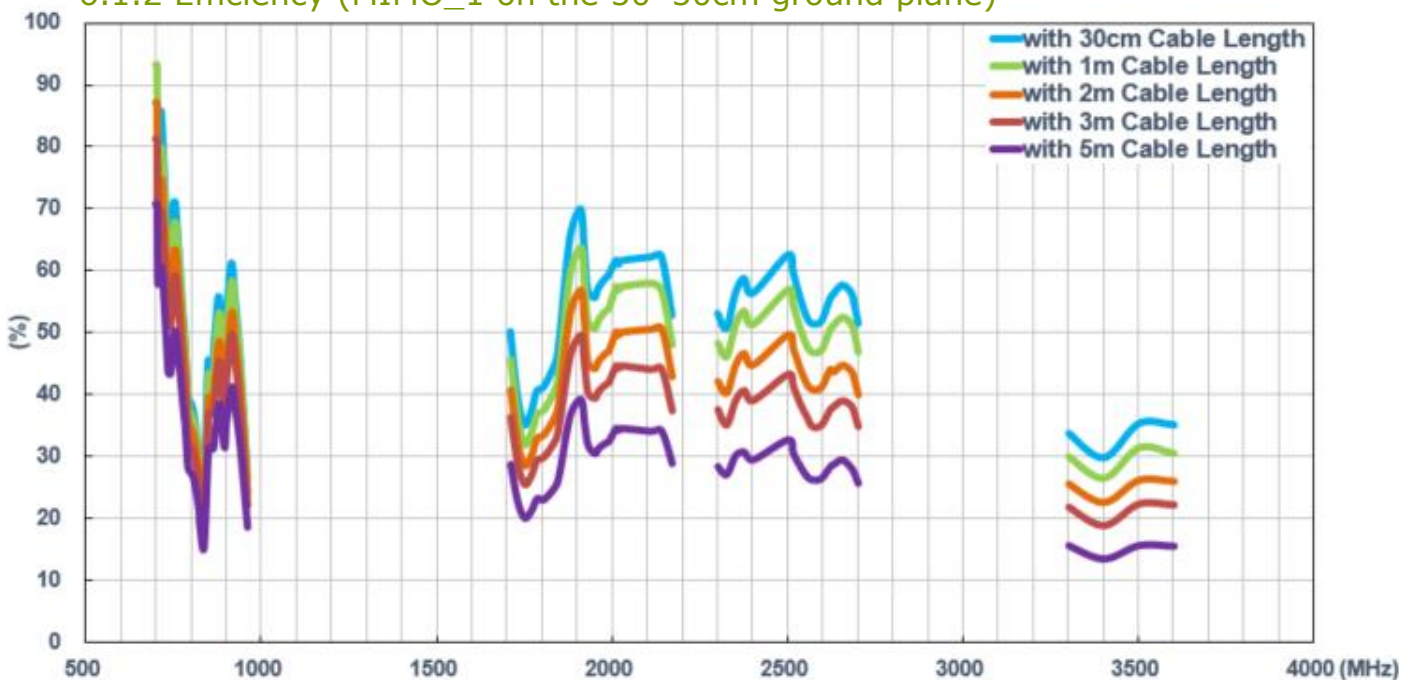
The MA413 antenna performance with different cable lengths and different environments is shown below.

6.1 On 50*50cm ground plane

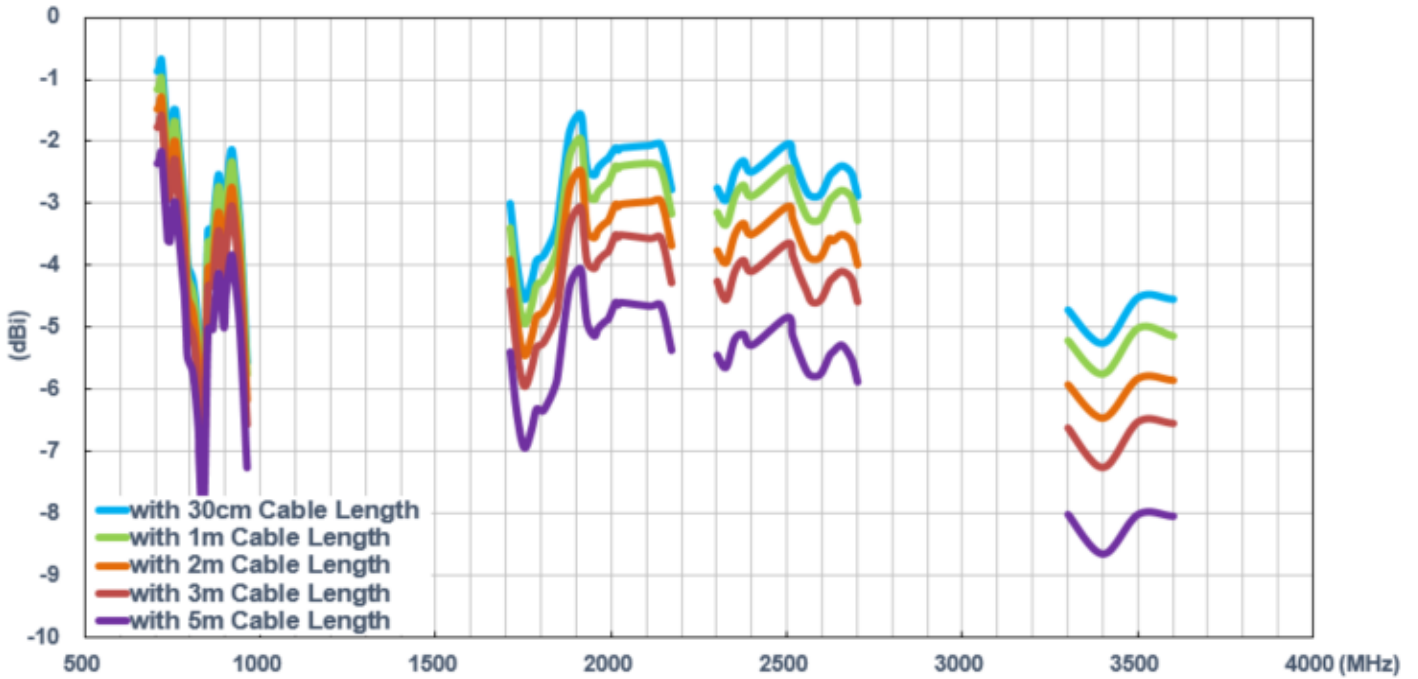
6.1.1 Return Loss (MIMO_1 on the 50*50cm ground plane)



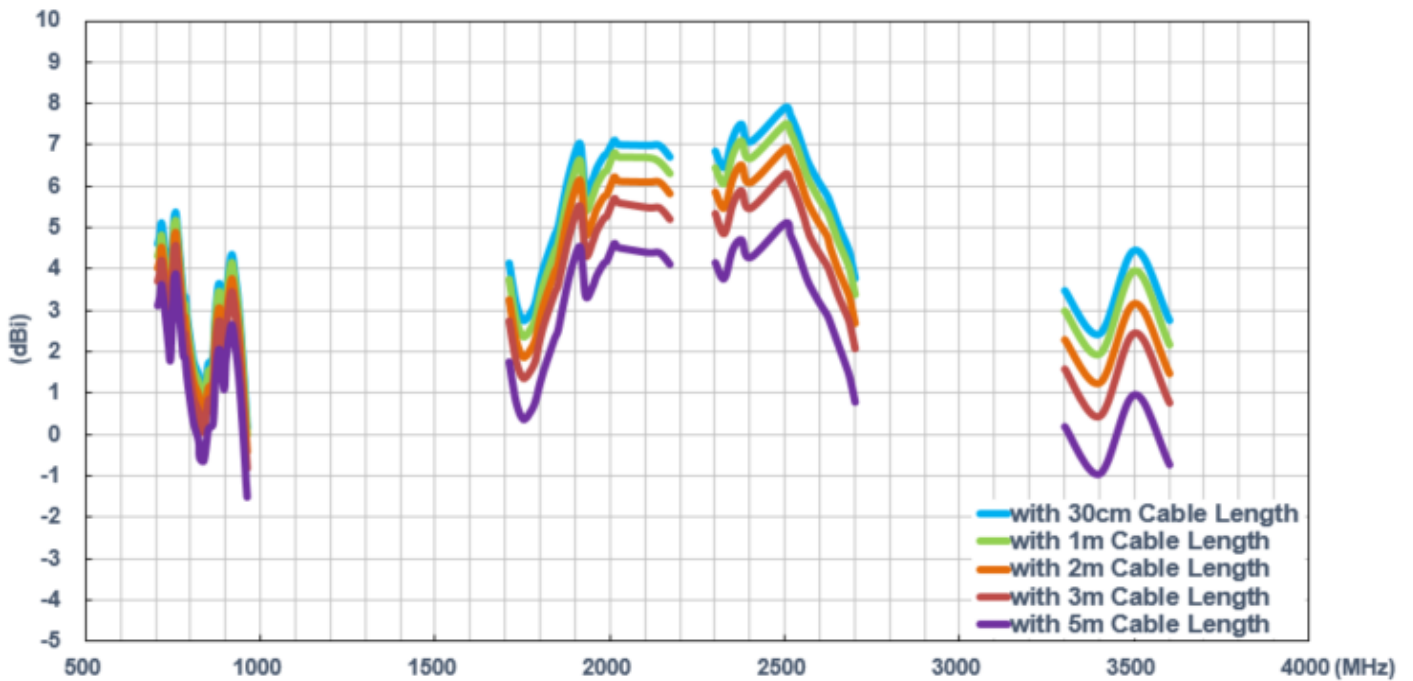
6.1.2 Efficiency (MIMO_1 on the 50*50cm ground plane)



6.1.3 Average Gain (MIMO_1 on the 50*50cm ground plane)

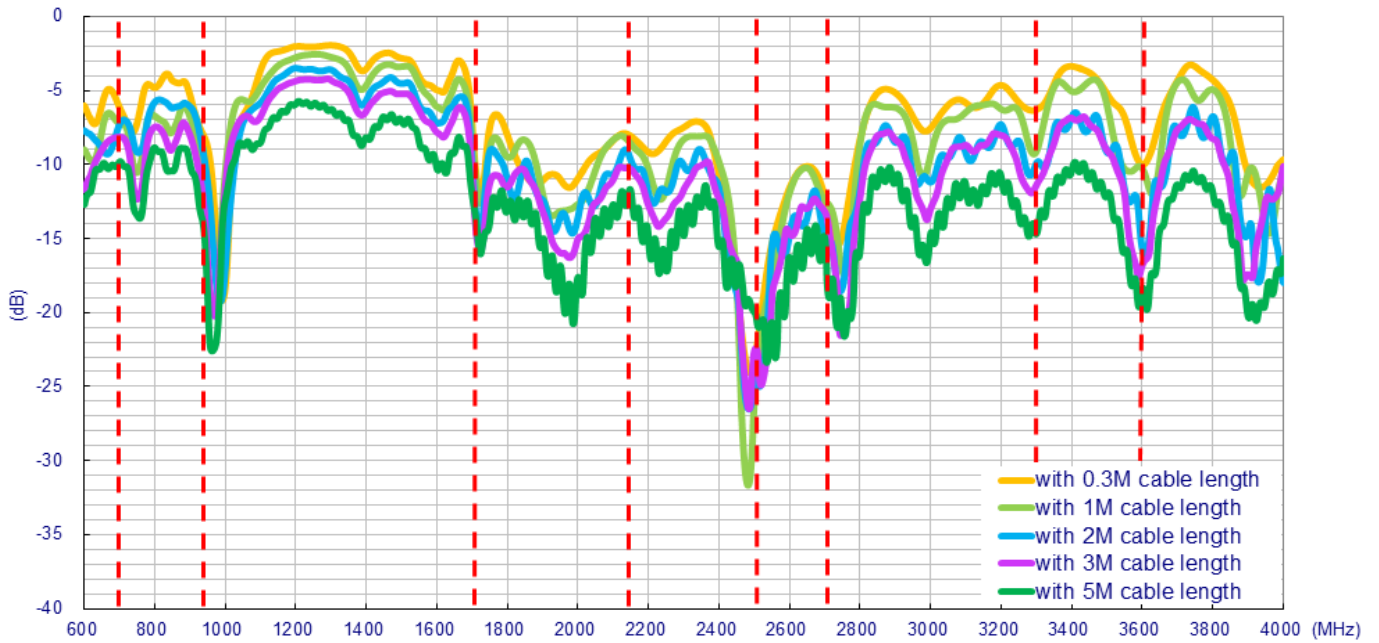


6.1.4 Peak Gain (MIMO_1 on the 50*50cm ground plane)

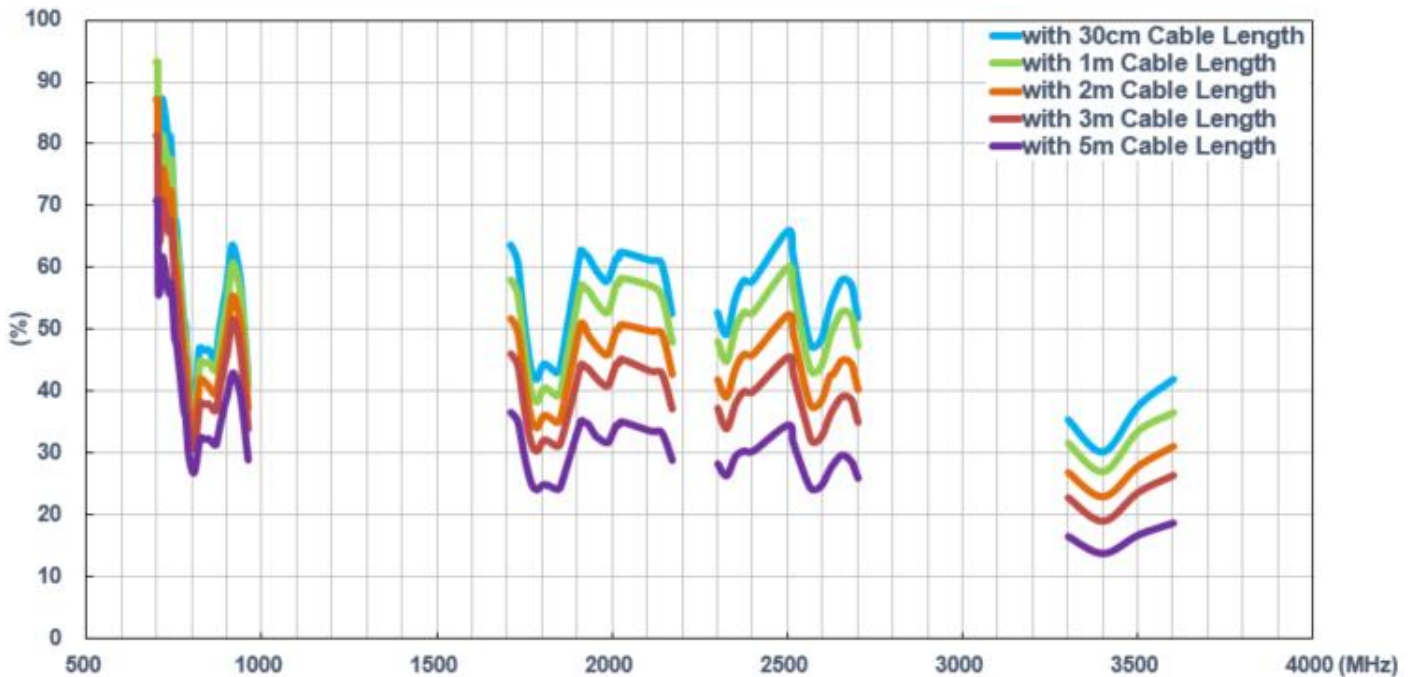


6.2 In free space

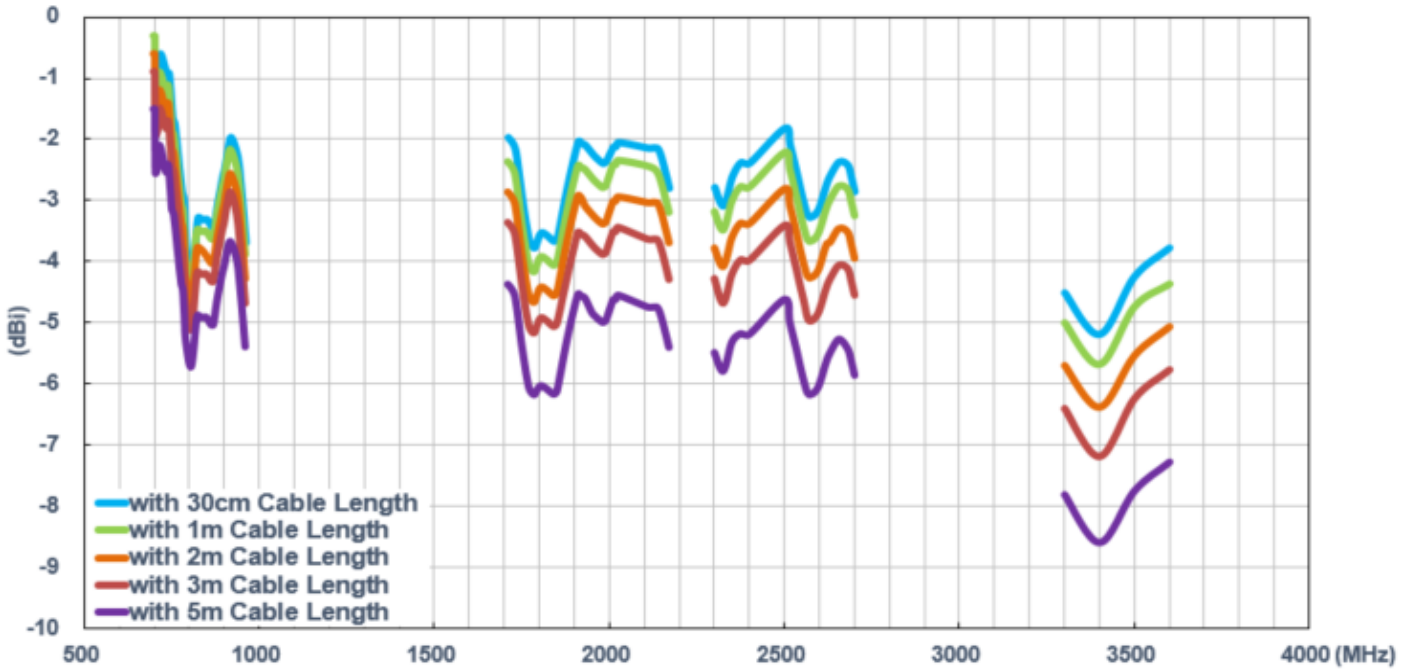
6.2.1 Return Loss (MIMO_1 in free space)



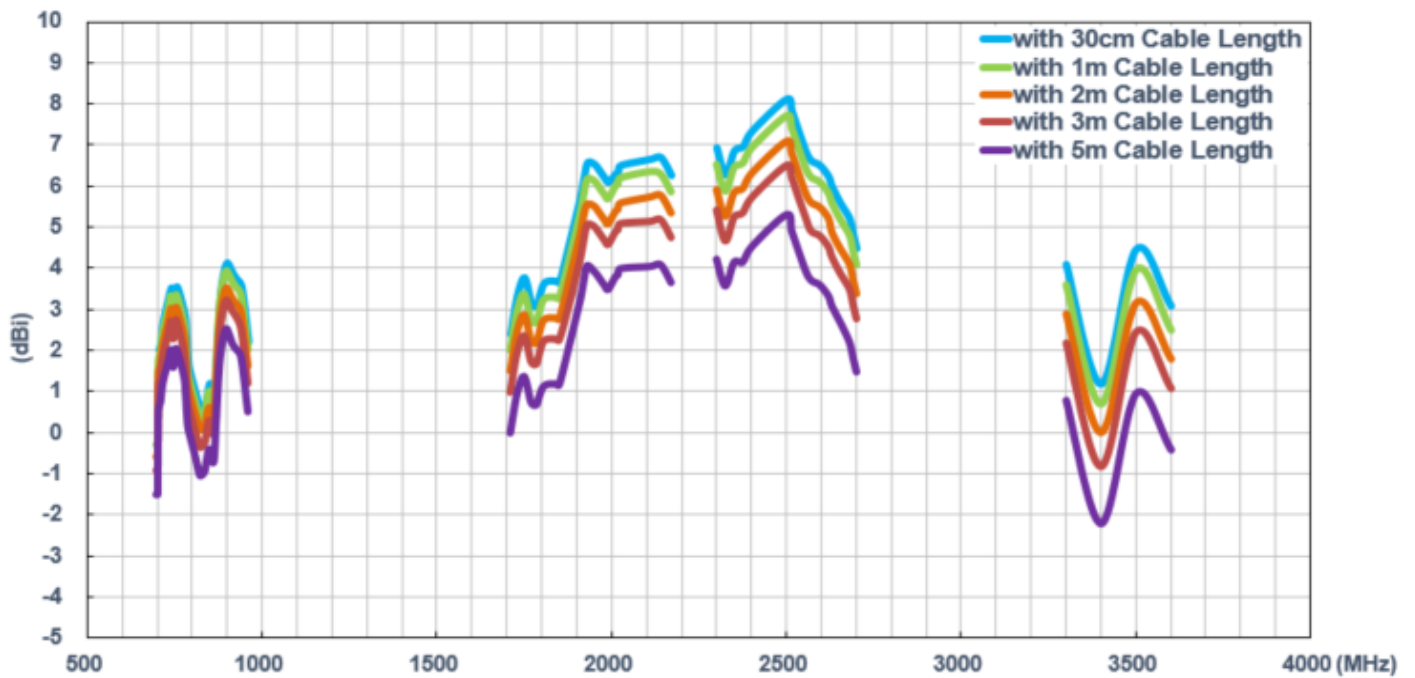
6.2.2 Efficiency (MIMO_1 in free space)



6.2.3 Average Gain (MIMO_1 in free space)



6.2.4 Peak Gain (MIMO_1 in free space)



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