

Specification

- Part No. : MA251.A.BI.001
- Product Name : Sentinel Adhesive Mount 2*LTE MIMO Antenna
- Feature : Ideal for IoT / M2M / Automotive Applications
Smallest High Performance MIMO
2 x LTE MIMO 1&2 Antennas
4G Allowing Fallback to 3G & 2G
IP67 Waterproof
High Efficiency
Low Profile Housing – Only 14mm in Height
2m CFD-200 and RG-174 Cables
SMA(M) Connectors
Dimensions: 139*76*14mm
RoHS & REACH Compliant



1. Introduction

The MA251 Sentinel 2in1 adhesive mount 4G 2*LTE MIMO antenna is an omnidirectional, fully IP67 waterproof external M2M antenna for use in telematics, transportation and remote monitoring applications worldwide. It is designed to be mounted directly on glass or plastic in the interior of vehicles.

It is the smallest high performance solution in the market, 50% smaller than the previous generation, with higher efficiency and wider bandwidth to cover emerging LTE bands. Its performance is comparable with much larger permanent roof mount antennas and now offers a convenient and economical alternative in-cabin mounting solution.

Typical applications include;

- HD video over LTE
- First Responder and Emergency Services
- Automotive vehicle tracking
- Telematics

It is mounted via high quality, first tier automotive approved, 3M adhesive.

In-house world leading dielectric ceramic antenna technology inside allows for smaller size antennas without loss in efficiency. It delivers powerful 2*2 MIMO antenna technology for worldwide 4G LTE bands at 700MHz/ 800MHz/ 1700MHz/ 1800MHz /2300MHz /2600MHz, while allowing fallback to all common worldwide 3G and 2G frequency bands.

4G wireless applications demand high speed data uplink and downlink. High efficiency and high gain MIMO antennas are necessary to achieve the required signal to noise ratio and throughput required to solve these challenges. Taoglas also takes care to have high isolation between the two MIMO antennas to prevent self-interference. Low loss cables are used to keep efficiency high over long cable lengths.

The IP67 waterproof housing measures just 139*76*14mm with 3M foam adhesive. The antenna can be mounted internally or externally on a vehicle. Both MIMO 1 and MIMO 2 coaxial cables are 2m low loss CFD-200 with SMA(M) connectors.

Customized cable and connector versions are also available. The antenna also comes in a 2in1 LTE/GNSS or a single LTE only variant. Contact your regional Taoglas sales office for support.

2. Specification Table

| 4G/3G/2G MIMO 1 Antenna | | | | | | | | |
|-------------------------|------|---------|---------|---------|-----------|-----------|-----------|-----------|
| Frequency (MHz) | | LTE700 | GSM850 | GSM900 | DCS | PCS | UMTS1 | LTE2600 |
| | | 698~803 | 824~894 | 880~960 | 1710~1880 | 1850~1990 | 1920~2170 | 2490~2690 |
| Efficiency (%) | | | | | | | | |
| In free space | 30cm | 41.77 | 58.99 | 60.75 | 66.44 | 76.05 | 66.91 | 56.87 |
| | 1M | 39.89 | 56.33 | 58.01 | 60.59 | 69.53 | 61.59 | 51.86 |
| | 2M | 37.22 | 52.23 | 52.91 | 54.49 | 61.97 | 54.72 | 44.70 |
| | 3M | 34.74 | 48.42 | 49.06 | 48.24 | 54.54 | 47.85 | 37.97 |
| | 5M | 29.75 | 40.81 | 41.20 | 37.70 | 42.12 | 37.06 | 29.04 |
| On 2mm ABS base | 30cm | 41.14 | 54.04 | 57.58 | 66.82 | 76.00 | 66.82 | 55.38 |
| | 1M | 39.29 | 51.61 | 54.99 | 60.94 | 69.48 | 61.51 | 50.51 |
| | 2M | 36.67 | 47.83 | 50.15 | 54.81 | 61.93 | 54.64 | 43.54 |
| | 3M | 34.22 | 44.34 | 46.52 | 48.52 | 54.49 | 47.79 | 36.98 |
| | 5M | 29.32 | 37.37 | 39.06 | 37.92 | 42.08 | 37.01 | 28.29 |
| On the glass base | 30cm | 43.33 | 55.50 | 58.33 | 63.40 | 63.83 | 55.87 | 56.49 |
| | 1M | 41.38 | 53.00 | 55.71 | 57.82 | 58.35 | 51.42 | 51.52 |
| | 2M | 38.62 | 49.13 | 50.81 | 52.03 | 52.01 | 45.69 | 44.42 |
| | 3M | 36.04 | 45.54 | 47.12 | 46.04 | 45.77 | 39.95 | 37.74 |
| | 5M | 30.91 | 38.38 | 39.57 | 36.00 | 35.35 | 30.95 | 28.86 |
| Average Gain(dBi) | | | | | | | | |
| In free space | 30cm | -3.87 | -2.29 | -2.17 | -1.81 | -1.19 | -1.81 | -2.48 |
| | 1M | -4.07 | -2.49 | -2.37 | -2.21 | -1.58 | -2.17 | -2.88 |
| | 2M | -4.37 | -2.82 | -2.77 | -2.66 | -2.08 | -2.68 | -3.53 |
| | 3M | -4.67 | -3.15 | -3.10 | -3.20 | -2.63 | -3.27 | -4.23 |
| | 5M | -5.34 | -3.89 | -3.85 | -4.26 | -3.76 | -4.37 | -5.40 |
| On the 2mm ABS base | 30cm | -3.89 | -2.68 | -2.41 | -1.78 | -1.19 | -1.83 | -2.60 |
| | 1M | -4.09 | -2.88 | -2.61 | -2.18 | -1.58 | -2.18 | -3.00 |
| | 2M | -4.39 | -3.21 | -3.01 | -2.64 | -2.08 | -2.70 | -3.64 |
| | 3M | -4.69 | -3.54 | -3.33 | -3.17 | -2.64 | -3.28 | -4.35 |
| | 5M | -5.36 | -4.28 | -4.09 | -4.24 | -3.76 | -4.39 | -5.51 |
| On the glass base | 30cm | -3.65 | -2.56 | -2.34 | -1.99 | -1.95 | -2.60 | -2.50 |
| | 1M | -3.85 | -2.76 | -2.54 | -2.39 | -2.34 | -2.95 | -2.90 |
| | 2M | -4.15 | -3.09 | -2.94 | -2.84 | -2.84 | -3.47 | -3.54 |
| | 3M | -4.45 | -3.42 | -3.27 | -3.38 | -3.40 | -4.05 | -4.25 |
| | 5M | -5.12 | -4.16 | -4.03 | -4.44 | -4.52 | -5.16 | -5.41 |
| Peak Gain(dBi) | | | | | | | | |
| In free space | 30cm | 1.22 | 1.89 | 2.73 | 4.69 | 4.69 | 4.27 | 4.15 |
| | 1M | 1.02 | 1.69 | 2.53 | 4.29 | 4.29 | 3.87 | 3.75 |
| | 2M | 0.72 | 1.29 | 2.13 | 3.79 | 3.79 | 3.37 | 3.05 |
| | 3M | 0.42 | 0.99 | 1.73 | 3.29 | 3.29 | 2.87 | 2.35 |
| | 5M | -0.28 | 0.19 | 1.03 | 2.19 | 2.19 | 1.67 | 1.15 |
| On the 2mm ABS base | 30cm | 0.76 | 1.57 | 1.79 | 3.68 | 3.68 | 3.22 | 3.24 |
| | 1M | 0.56 | 1.37 | 1.59 | 3.28 | 3.28 | 2.86 | 2.84 |
| | 2M | 0.26 | 0.97 | 1.19 | 2.78 | 2.78 | 2.36 | 2.14 |
| | 3M | -0.04 | 0.67 | 0.89 | 2.28 | 2.28 | 1.82 | 1.44 |
| | 5M | -0.74 | -0.13 | 0.09 | 1.18 | 1.18 | 0.66 | 0.24 |
| On glass base | 30cm | 1.86 | 1.94 | 2.06 | 3.10 | 2.90 | 2.90 | 3.66 |
| | 1M | 1.66 | 1.74 | 1.86 | 2.70 | 2.50 | 2.50 | 3.26 |
| | 2M | 1.36 | 1.44 | 1.46 | 2.30 | 2.00 | 2.00 | 2.56 |
| | 3M | 1.06 | 1.14 | 1.06 | 1.70 | 1.40 | 1.40 | 1.86 |
| | 5M | 0.46 | 0.34 | 0.36 | 0.70 | 0.30 | 0.30 | 0.75 |

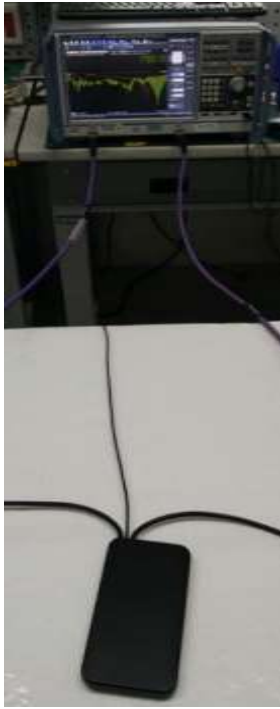
| 4G/3G/2G MIMO 2 Antenna | | | | | | | | |
|----------------------------------|------|---------|---------|-----------------|-----------|-----------|-----------|-----------|
| Frequency (MHz) | | LTE700 | GSM850 | GSM900 | DCS | PCS | UMTS1 | LTE2600 |
| | | 698~803 | 824~894 | 880~960 | 1710~1880 | 1850~1990 | 1920~2170 | 2490~2690 |
| Efficiency (%) | | | | | | | | |
| In free space | 30cm | 46.24 | 33.45 | 35.37 | 54.05 | 57.08 | 51.87 | 67.48 |
| | 1M | 44.16 | 31.95 | 33.78 | 49.29 | 52.17 | 47.71 | 61.55 |
| | 2M | 41.21 | 29.61 | 30.81 | 44.42 | 46.50 | 42.38 | 53.09 |
| | 3M | 38.46 | 27.44 | 28.56 | 39.27 | 40.93 | 37.07 | 45.10 |
| | 5M | 33.09 | 23.13 | 24.00 | 30.73 | 31.59 | 28.70 | 34.48 |
| On 2mm ABS base | 30cm | 50.50 | 40.14 | 42.93 | 53.67 | 56.84 | 53.32 | 66.89 |
| | 1M | 48.23 | 38.33 | 41.00 | 48.95 | 51.96 | 49.05 | 61.01 |
| | 2M | 45.01 | 35.53 | 37.39 | 44.10 | 46.31 | 43.57 | 52.61 |
| | 3M | 42.01 | 32.93 | 34.66 | 39.00 | 40.76 | 38.10 | 44.68 |
| | 5M | 36.10 | 27.75 | 29.12 | 30.51 | 31.46 | 29.51 | 34.17 |
| On glass base | 30cm | 48.41 | 37.93 | 39.94 | 54.71 | 61.77 | 61.21 | 66.66 |
| | 1M | 46.24 | 36.22 | 38.14 | 49.90 | 56.48 | 56.36 | 60.79 |
| | 2M | 43.15 | 33.57 | 34.78 | 44.97 | 50.34 | 50.04 | 52.42 |
| | 3M | 40.27 | 31.11 | 32.25 | 39.76 | 44.28 | 43.76 | 44.51 |
| | 5M | 34.63 | 26.22 | 27.09 | 31.11 | 34.18 | 33.90 | 34.04 |
| Average Gain(dBi) | | | | | | | | |
| In free space | 30cm | -3.54 | -4.77 | -4.51 | -2.69 | -2.46 | -2.89 | -1.71 |
| | 1M | -3.74 | -4.97 | -4.71 | -3.09 | -2.84 | -3.24 | -2.11 |
| | 2M | -4.04 | -5.30 | -5.11 | -3.55 | -3.34 | -3.76 | -2.75 |
| | 3M | -4.34 | -5.63 | -5.44 | -4.08 | -3.90 | -4.34 | -3.46 |
| | 5M | -5.01 | -6.37 | -6.20 | -5.15 | -5.02 | -5.45 | -4.63 |
| On 2mm ABS base | 30cm | -3.08 | -3.98 | -3.67 | -2.72 | -2.47 | -2.76 | -1.75 |
| | 1M | -3.28 | -4.18 | -3.87 | -3.12 | -2.86 | -3.11 | -2.15 |
| | 2M | -3.58 | -4.51 | -4.27 | -3.57 | -3.36 | -3.63 | -2.79 |
| | 3M | -3.88 | -4.83 | -4.60 | -4.11 | -3.91 | -4.21 | -3.50 |
| | 5M | -4.55 | -5.58 | -5.36 | -5.17 | -5.04 | -5.32 | -4.67 |
| On the glass base | 30cm | -3.31 | -4.22 | -3.99 | -2.64 | -2.11 | -2.14 | -1.77 |
| | 1M | -3.51 | -4.42 | -4.19 | -3.04 | -2.50 | -2.50 | -2.17 |
| | 2M | -3.81 | -4.75 | -4.59 | -3.49 | -3.00 | -3.02 | -2.82 |
| | 3M | -4.11 | -5.08 | -4.92 | -4.03 | -3.55 | -3.60 | -3.52 |
| | 5M | -4.77 | -5.82 | -5.67 | -5.09 | -4.67 | -4.71 | -4.69 |
| Peak Gain(dBi) | | | | | | | | |
| In free space | 30cm | 3.75 | 1.34 | 1.45 | 4.53 | 3.17 | 3.32 | 4.17 |
| | 1M | 3.55 | 1.14 | 1.25 | 4.13 | 2.77 | 2.92 | 3.77 |
| | 2M | 3.25 | 0.74 | 0.85 | 3.73 | 2.27 | 2.42 | 3.07 |
| | 3M | 2.95 | 0.44 | 0.54 | 3.23 | 1.77 | 1.82 | 2.37 |
| | 5M | 2.35 | -0.31 | -0.25 | 2.13 | 1.77 | 0.72 | 1.17 |
| On 2mm ABS base | 30cm | 3.78 | 2.32 | 2.39 | 3.45 | 4.37 | 4.37 | 5.63 |
| | 1M | 3.58 | 2.12 | 2.19 | 3.05 | 3.97 | 3.97 | 5.23 |
| | 2M | 3.28 | 1.74 | 1.79 | 2.55 | 3.47 | 3.47 | 4.53 |
| | 3M | 2.98 | 1.42 | 1.49 | 2.05 | 2.87 | 2.87 | 3.73 |
| | 5M | 2.38 | 0.72 | 0.72 | 0.95 | 1.77 | 1.77 | 2.63 |
| On glass base | 30cm | 3.35 | 1.54 | 2.10 | 3.15 | 3.86 | 3.86 | 3.75 |
| | 1M | 3.15 | 1.34 | 1.90 | 2.75 | 3.46 | 3.46 | 3.35 |
| | 2M | 2.85 | 1.03 | 1.50 | 2.35 | 2.96 | 2.96 | 2.71 |
| | 3M | 2.55 | 0.64 | 1.10 | 1.85 | 2.36 | 2.36 | 2.01 |
| | 5M | 1.95 | 0.64 | 0.40 | 0.75 | 1.26 | 1.26 | 0.91 |
| Envelope Correlation Coefficient | | | | All Bands < 0.3 | | | | |
| Impedance | | | | 50Ω | | | | |
| Polarization | | | | Linear | | | | |
| Return Loss | | | | < -6dB | | | | |
| Input Power | | | | 5W | | | | |

| MECHANICAL | |
|-----------------------|----------------------------|
| Antenna Dimensions | 139.27*76.27*14mm |
| Housing | ABS |
| Waterproof | IP67 |
| Connector | SMA(M) ST |
| Cable type | LTE: CFD-200 |
| Cable length | 2000mm |
| Weight | 235g |
| ENVIRONMENTAL | |
| Operation Temperature | -40°C to 85°C |
| Storage Temperature | -40°C to 85°C |
| Humidity | Non-condensing 65°C 95% RH |

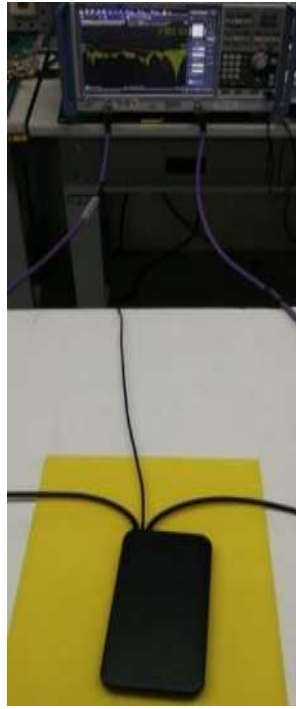
3. Antenna Characteristics

3.1. LTE Characteristics

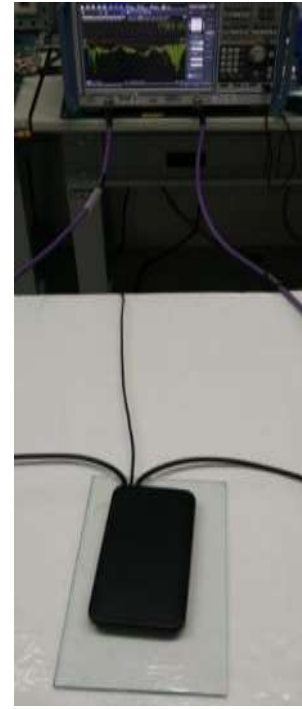
3.1.1. Test Setup



In free space

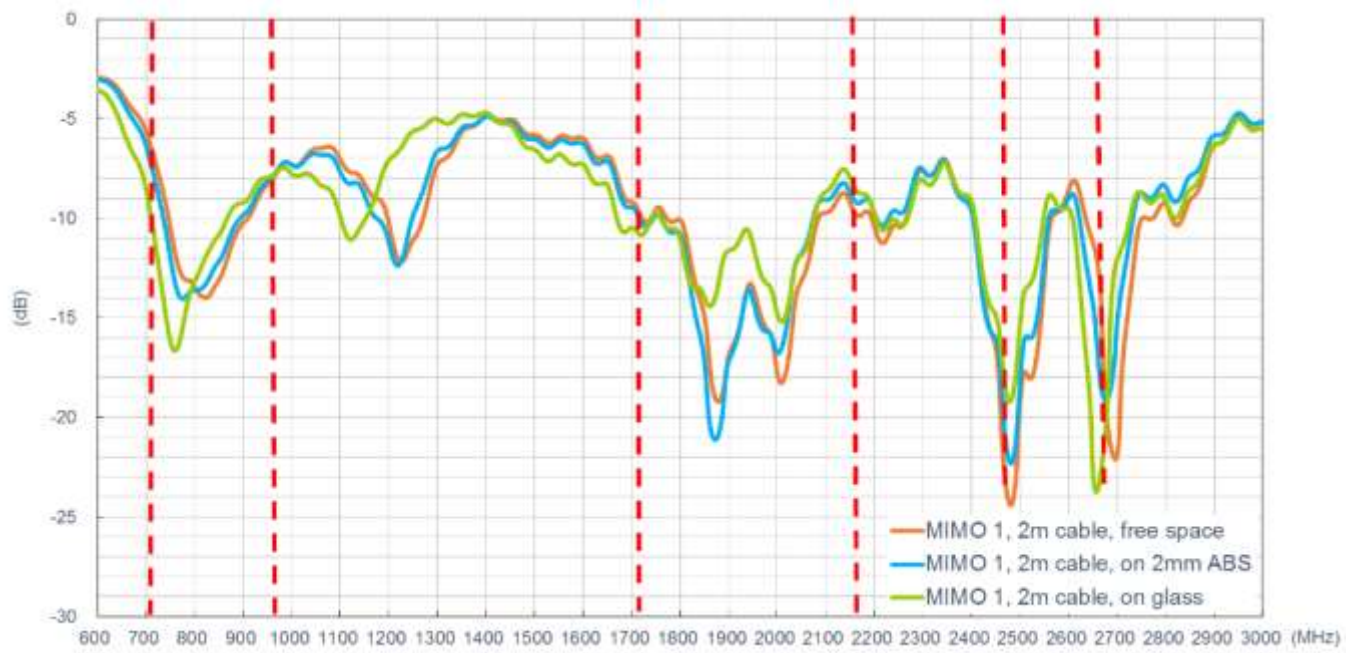


On 2mm ABS

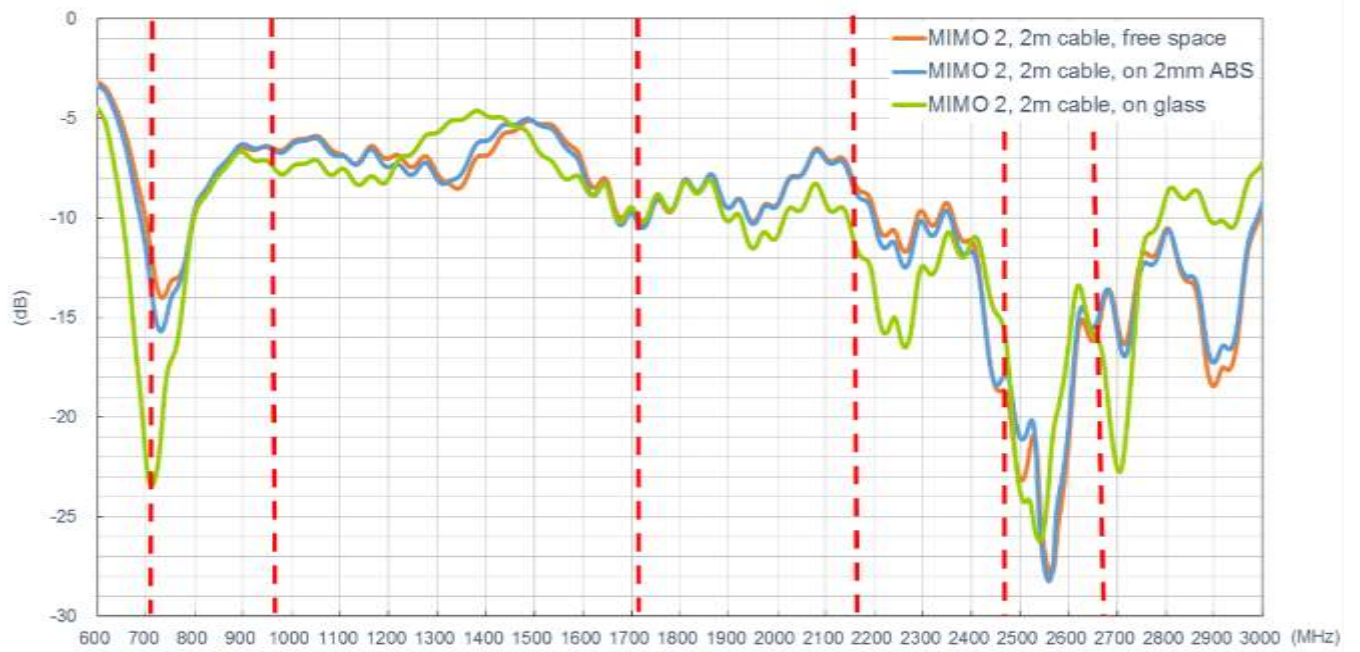


On glass

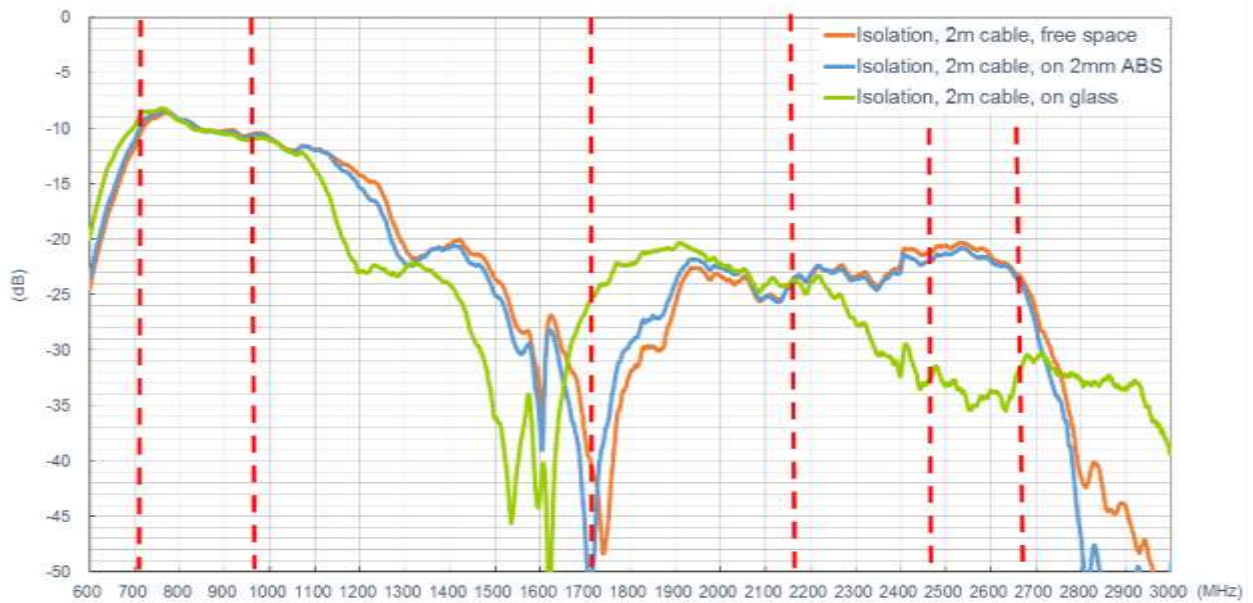
3.1.2. Return loss (MIMO 1)



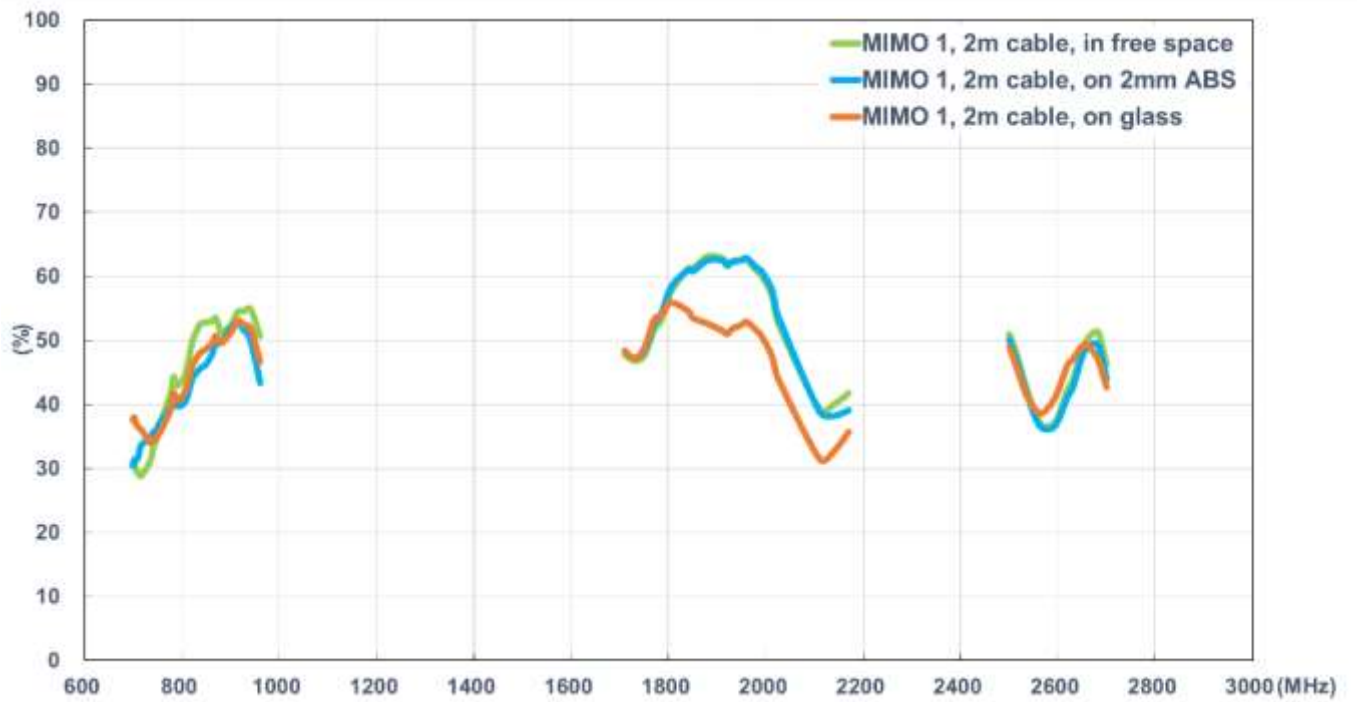
3.1.3. Return loss (MIMO 2)



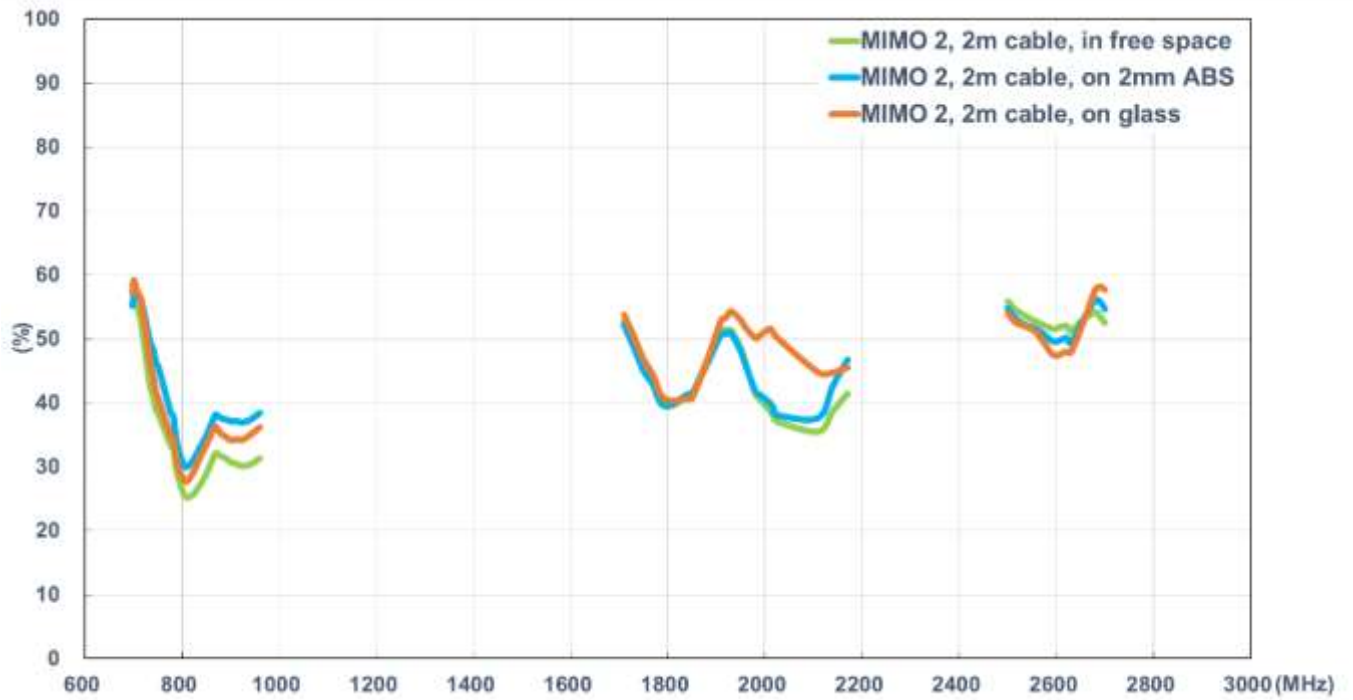
3.1.4. Isolation



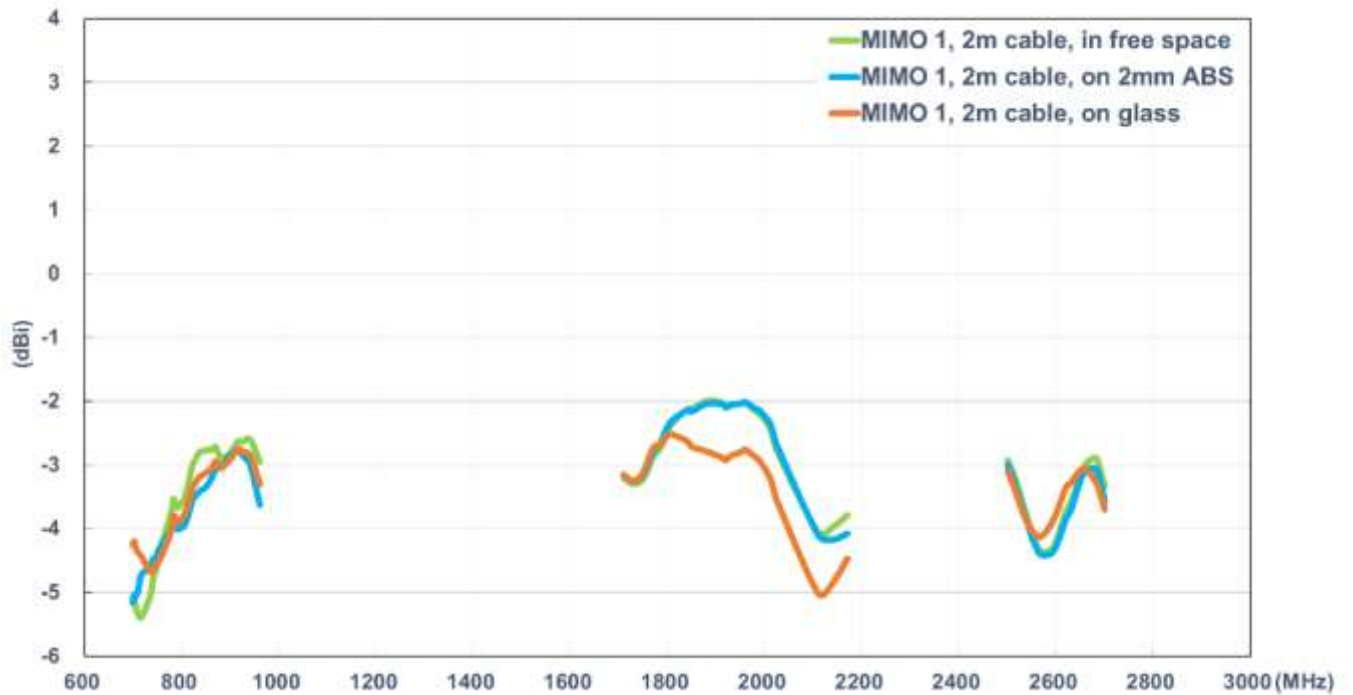
3.1.5. Efficiency (MIMO 1)



3.1.6. Efficiency (MIMO 2)



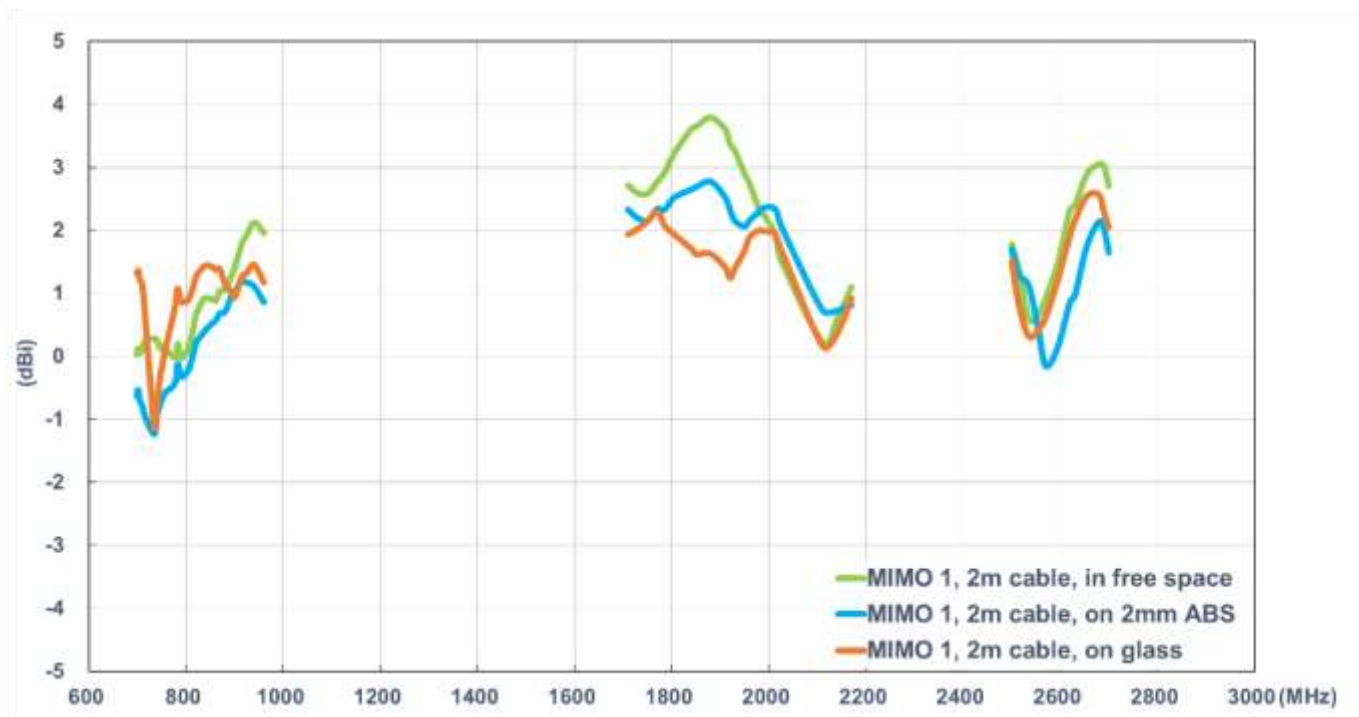
3.1.7. Average Gain (MIMO 1)



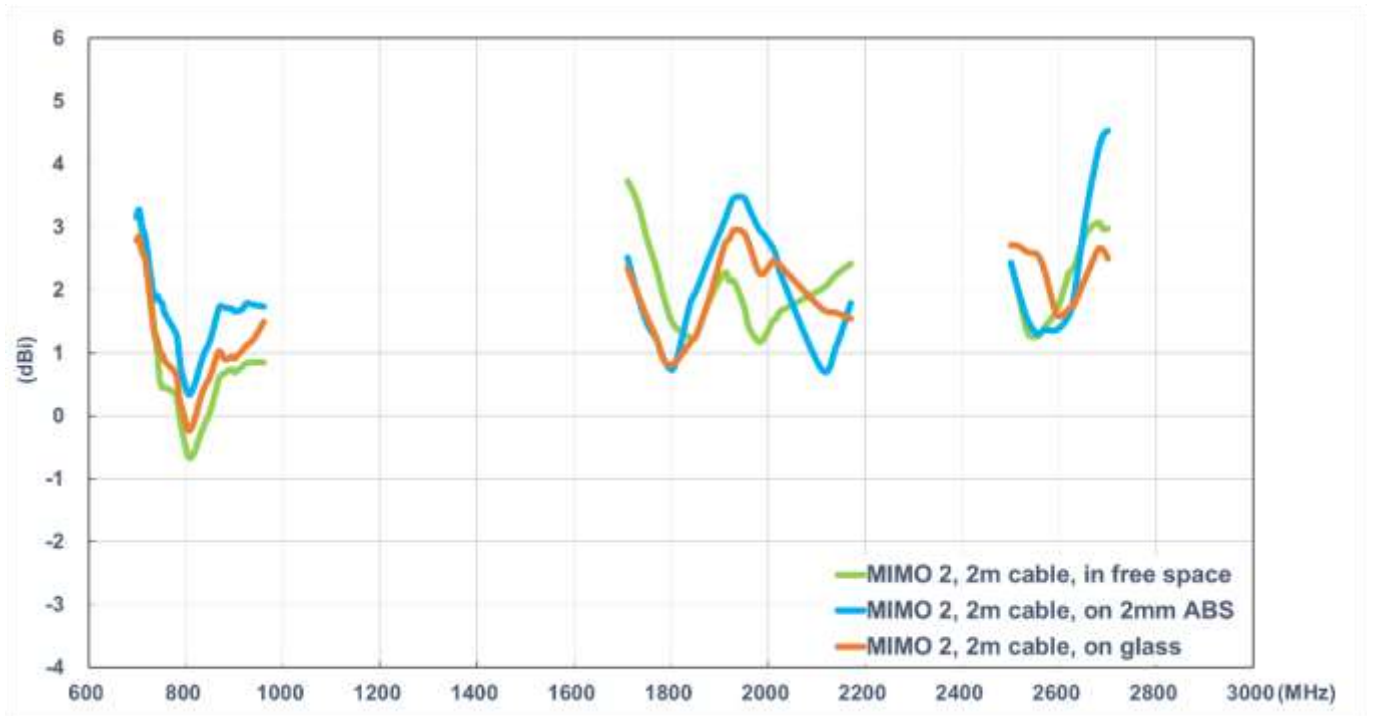
3.1.8. Average Gain (MIMO 2)



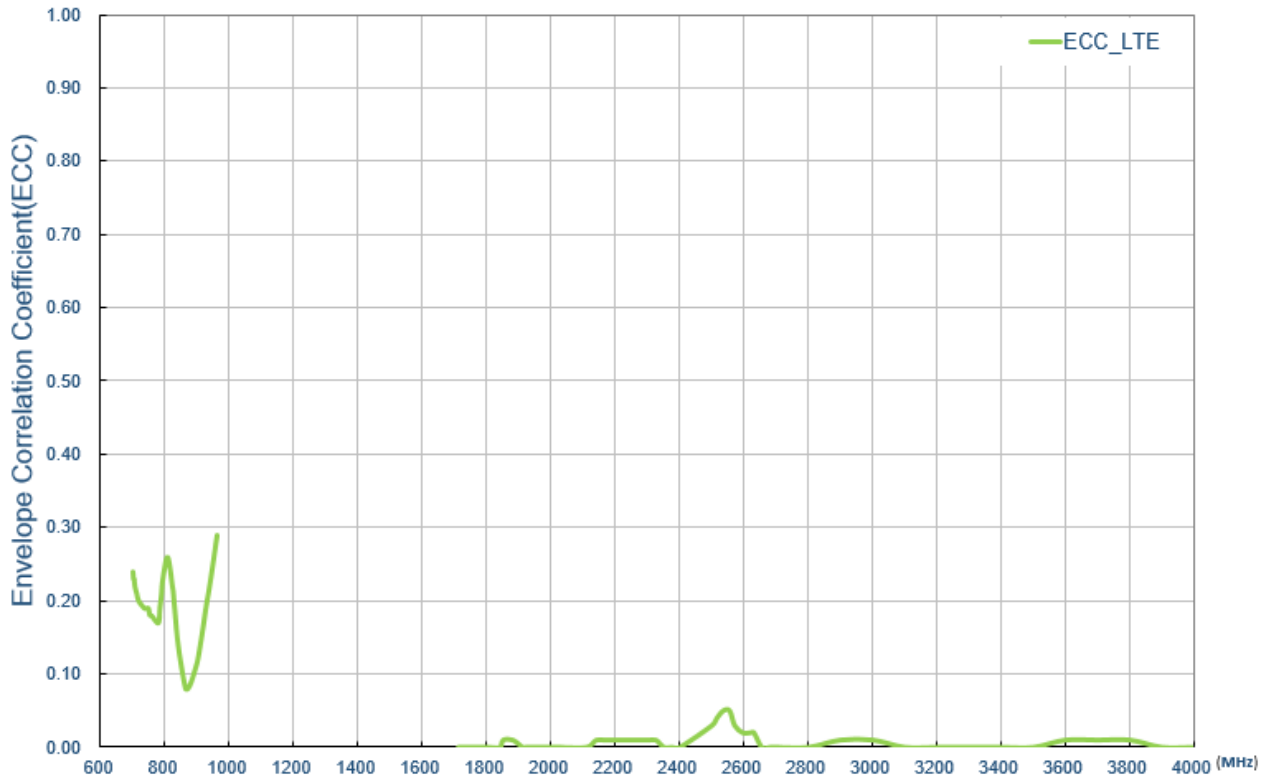
3.1.9. Peak Gain (MIMO 1)



3.1.10. Peak Gain (MIMO 2)

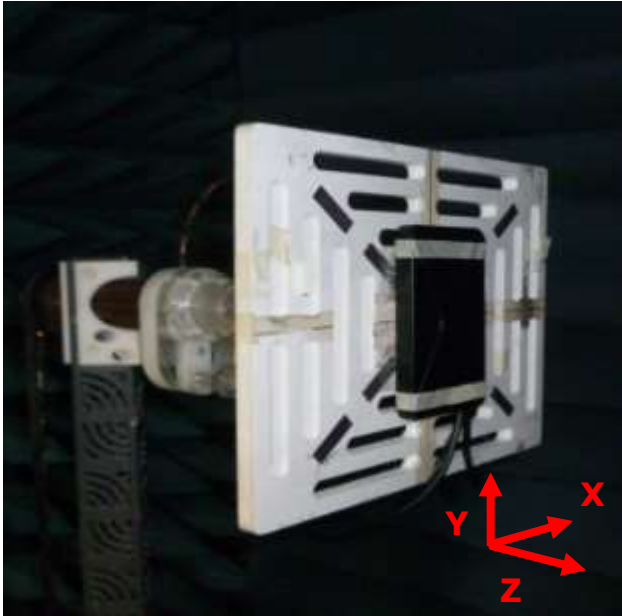


3.1.11. Envelope Correlation Coefficient (ECC)

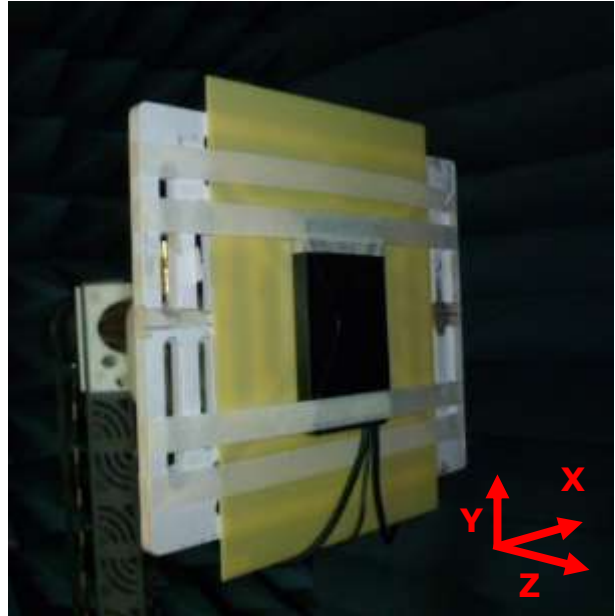


3.2. 2D Radiation Pattern

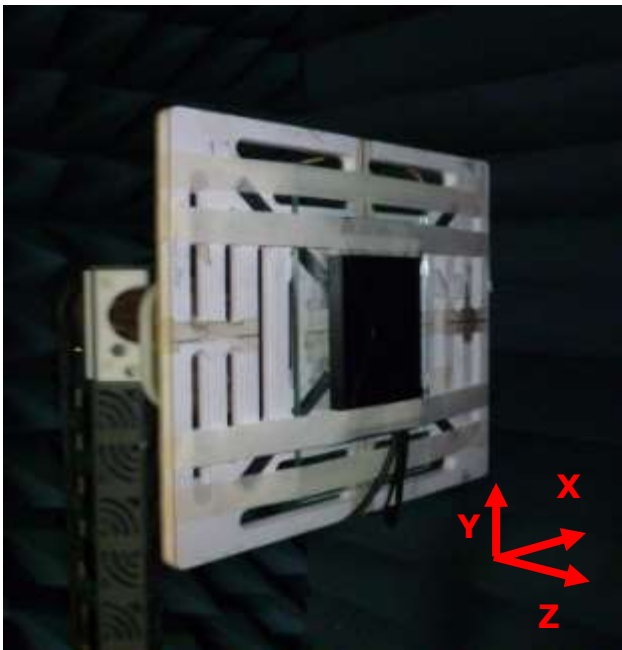
3.2.1. Test Setup



In free space



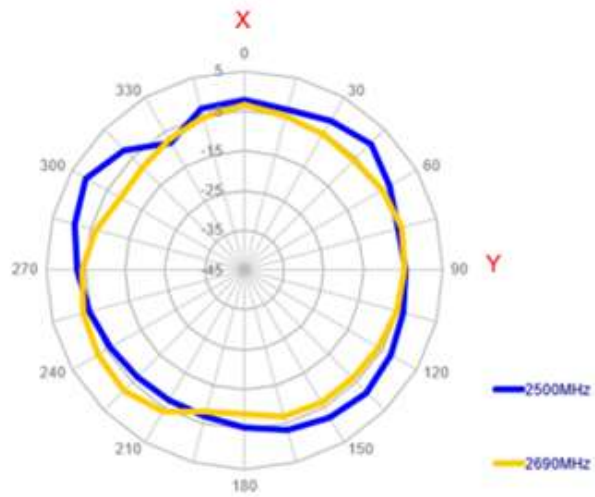
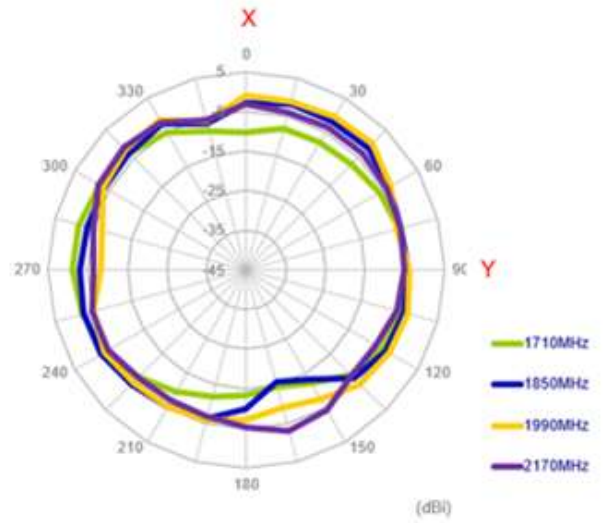
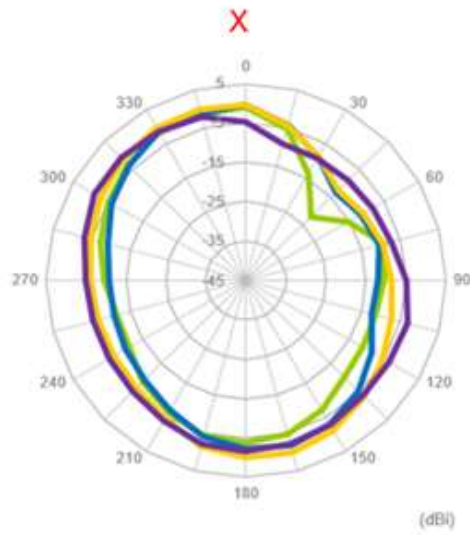
On 2mm ABS



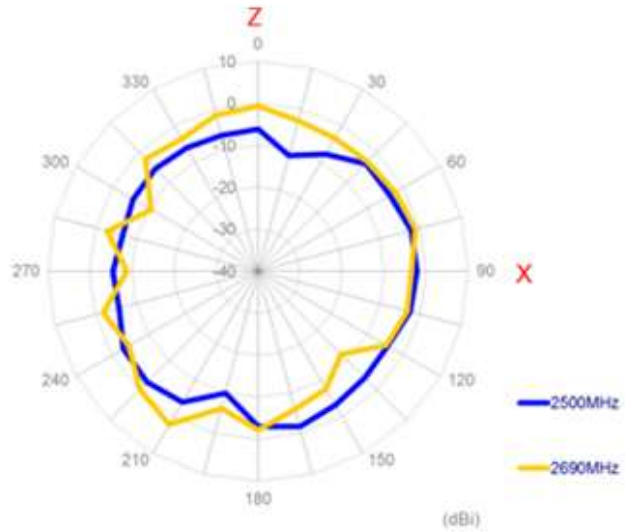
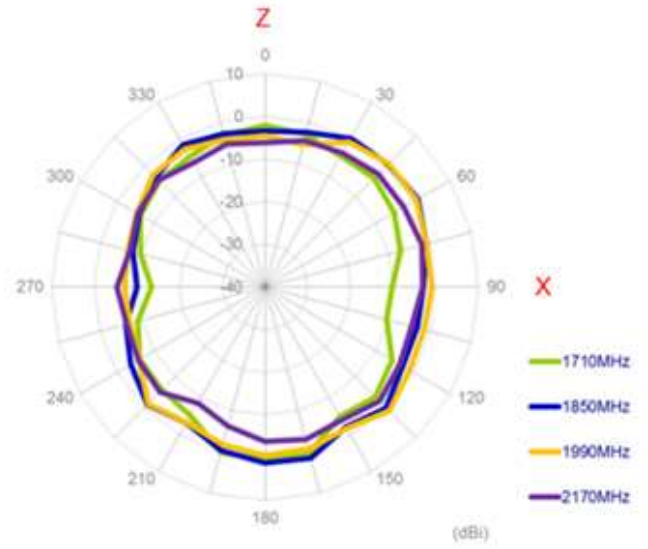
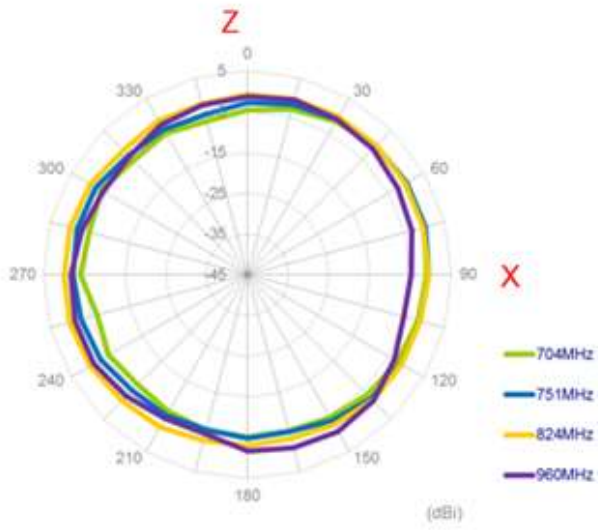
On glass base

3.2.2. LTE with 2M cable length in free space (MIMO 1)

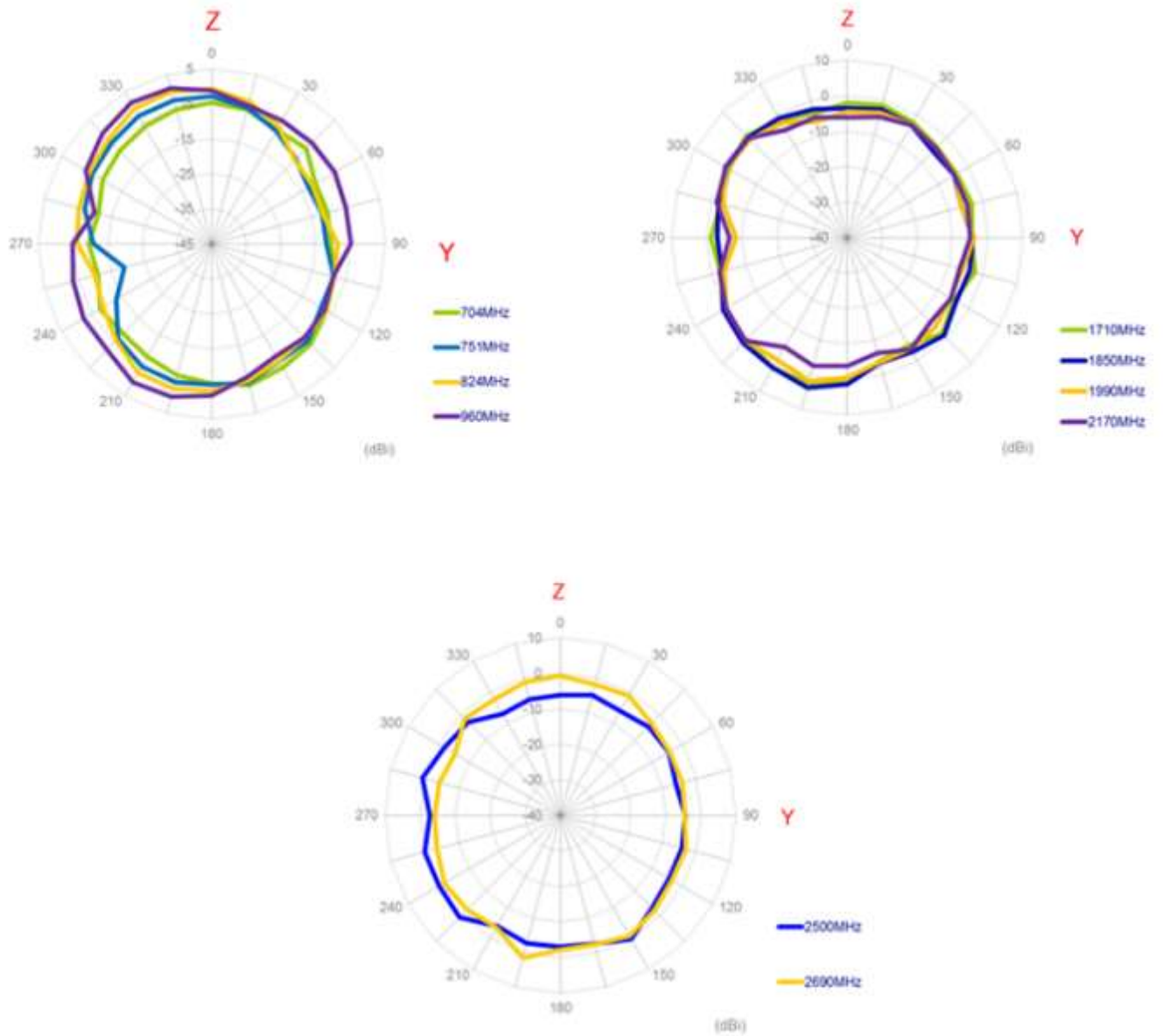
XY Plane



XZ Plane

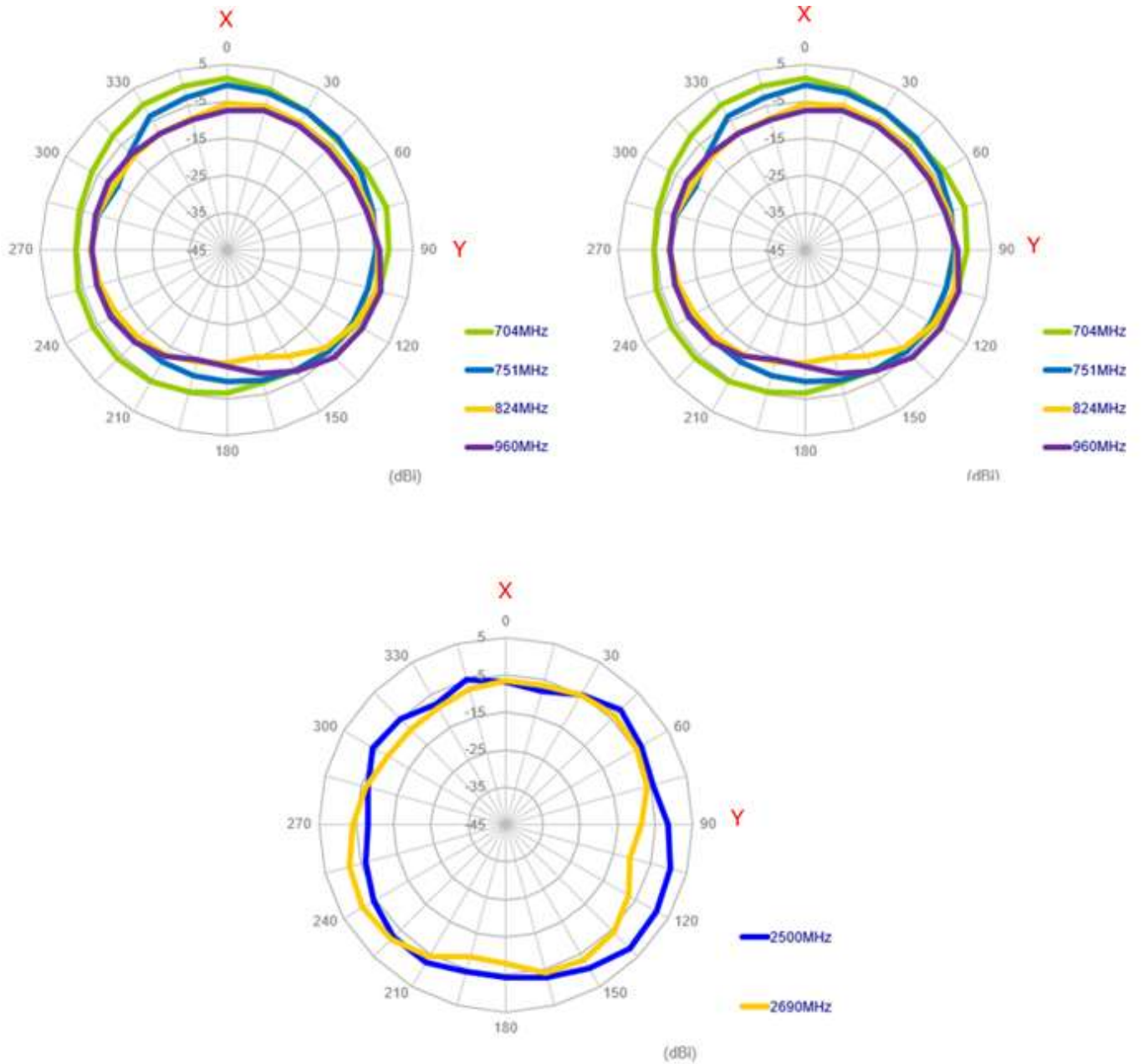


YZ Plane

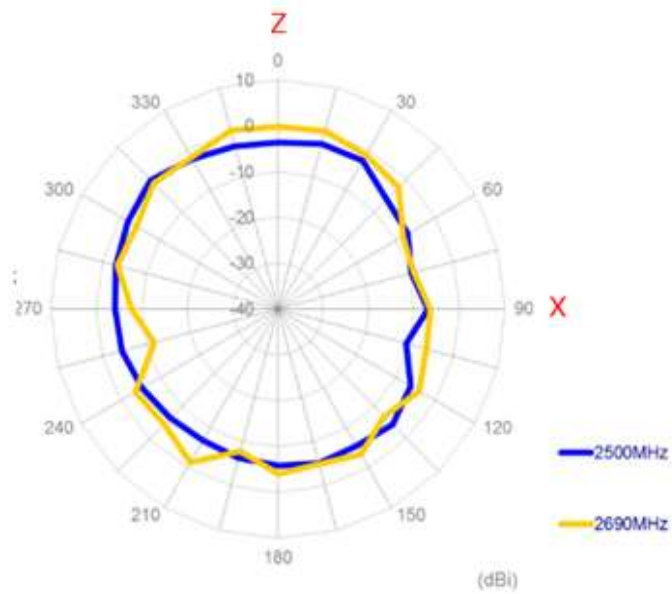
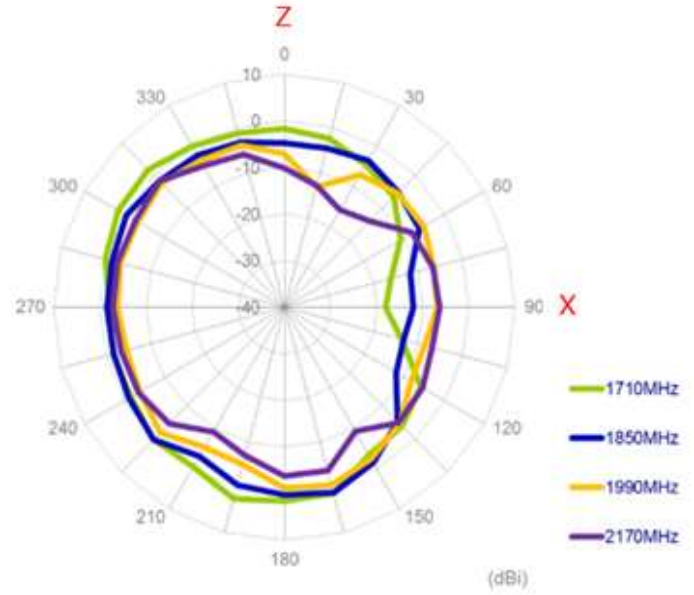
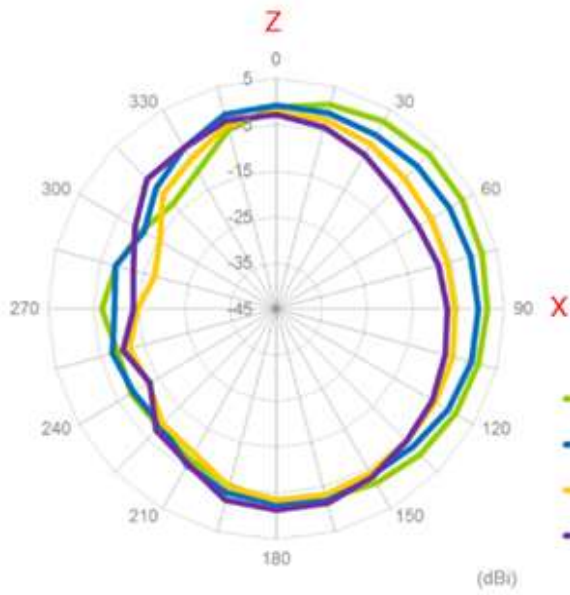


3.2.3. LTE with 2M cable length in free space (MIMO 2)

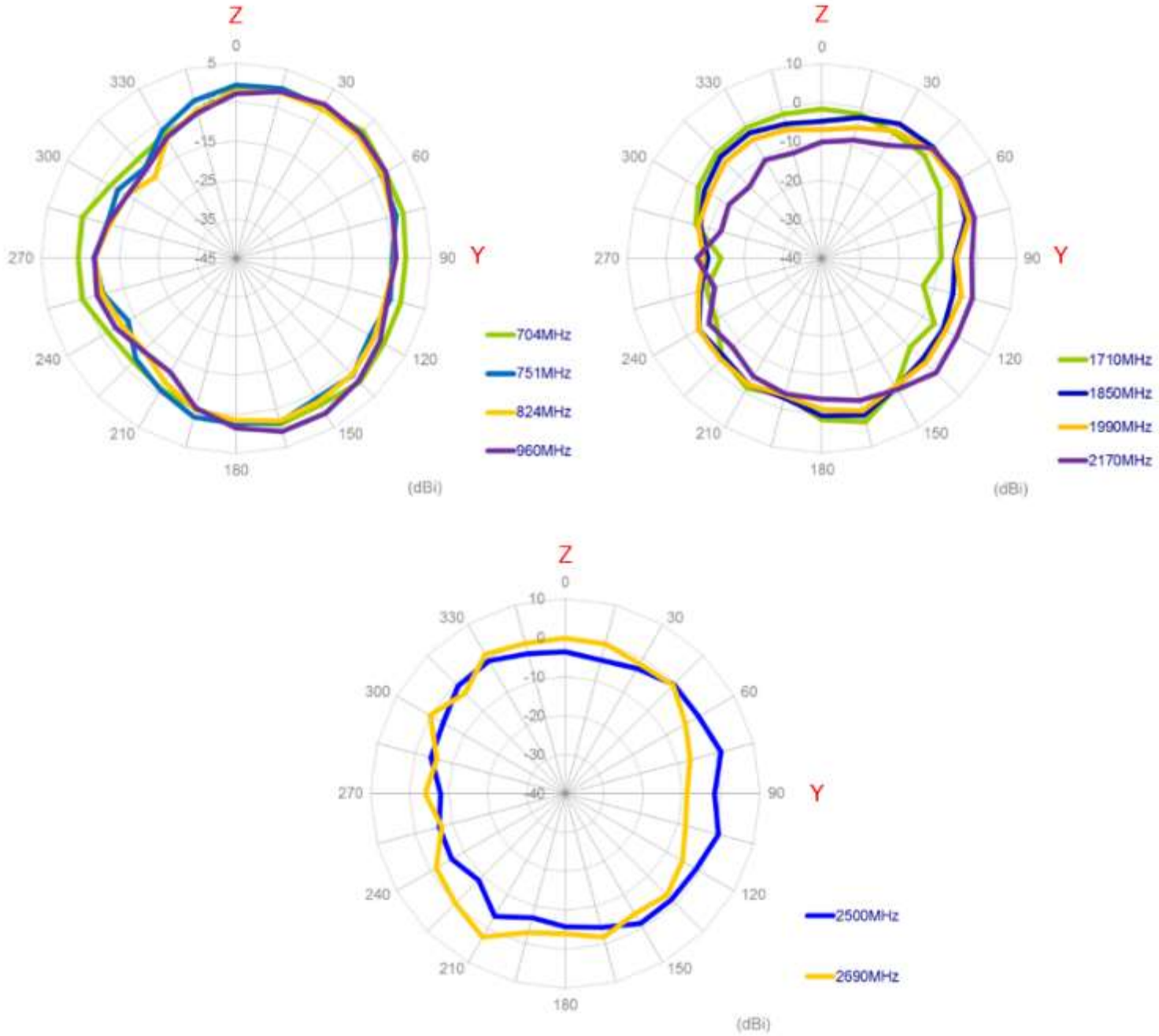
XY Plane



XZ Plane

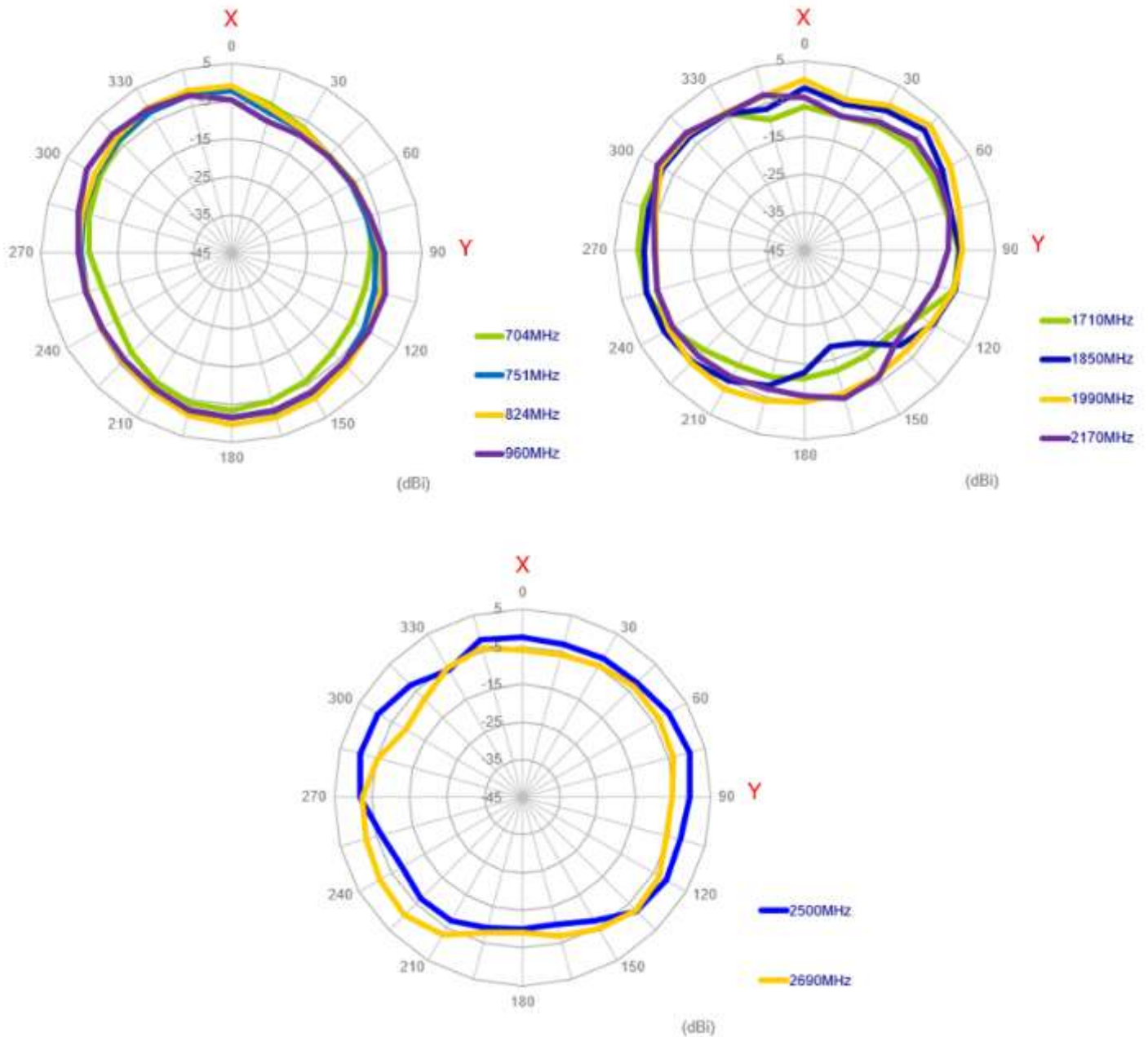


YZ Plane

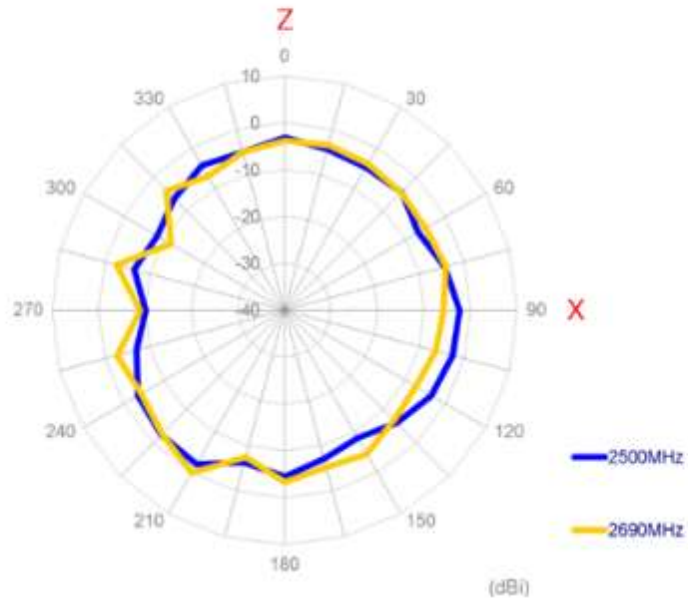
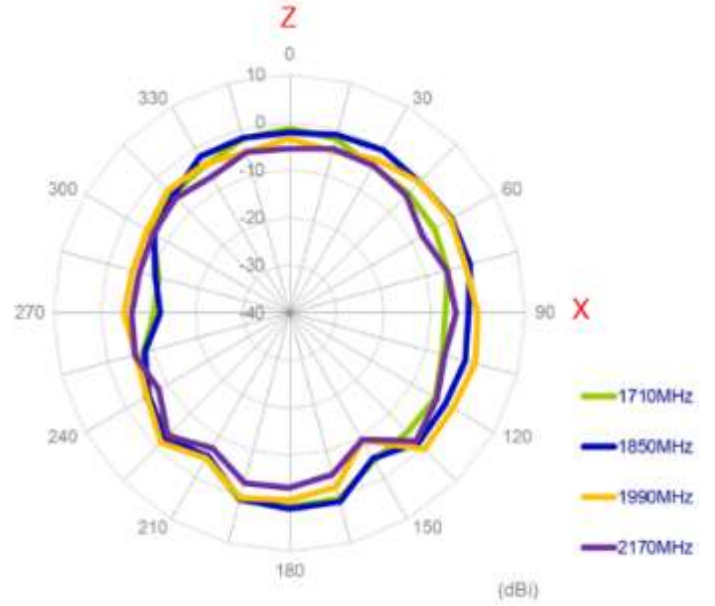
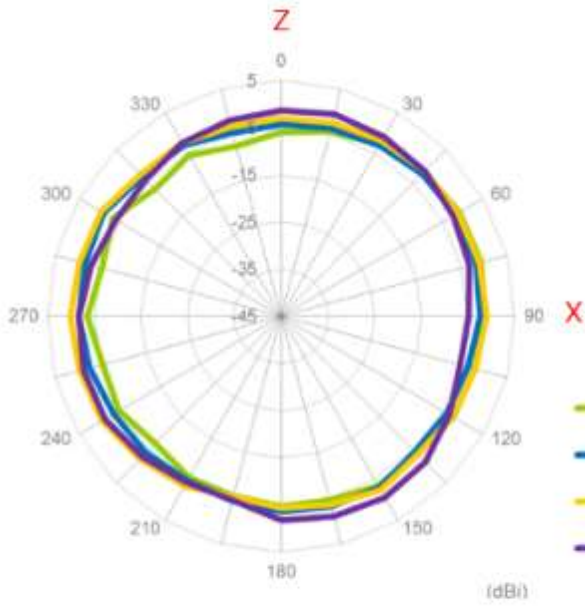


3.2.4. LTE with 2M cable length on the 2mm ABS (MIMO 1)

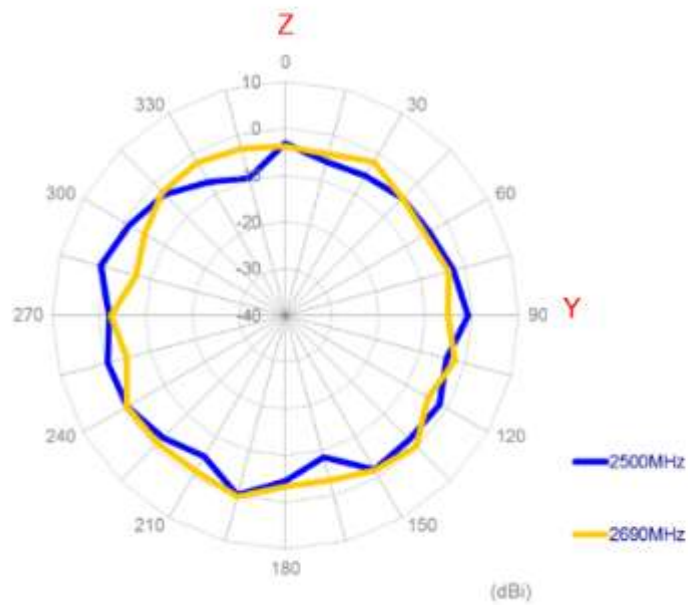
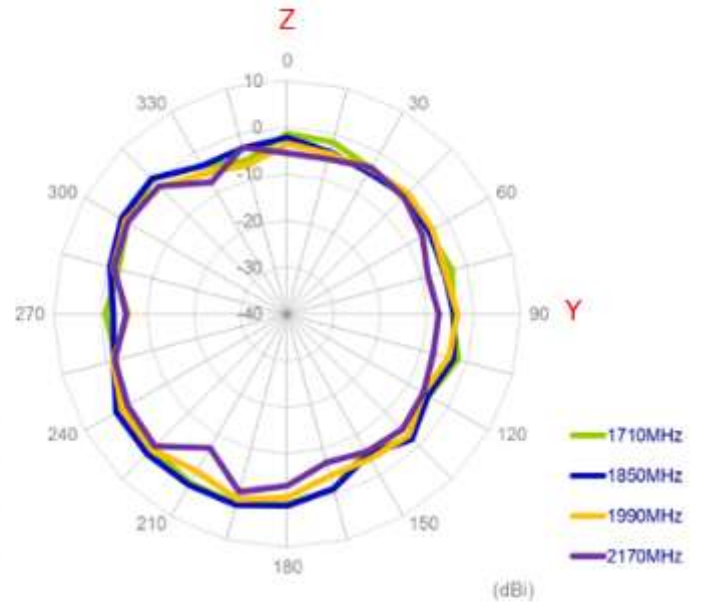
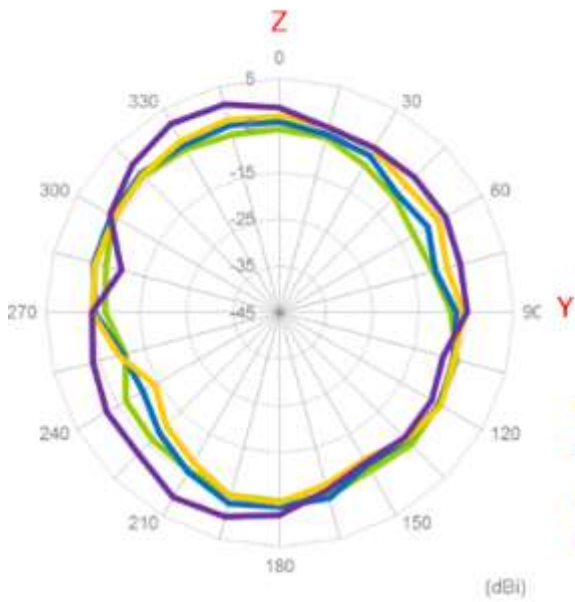
XY Plane



XZ Plane

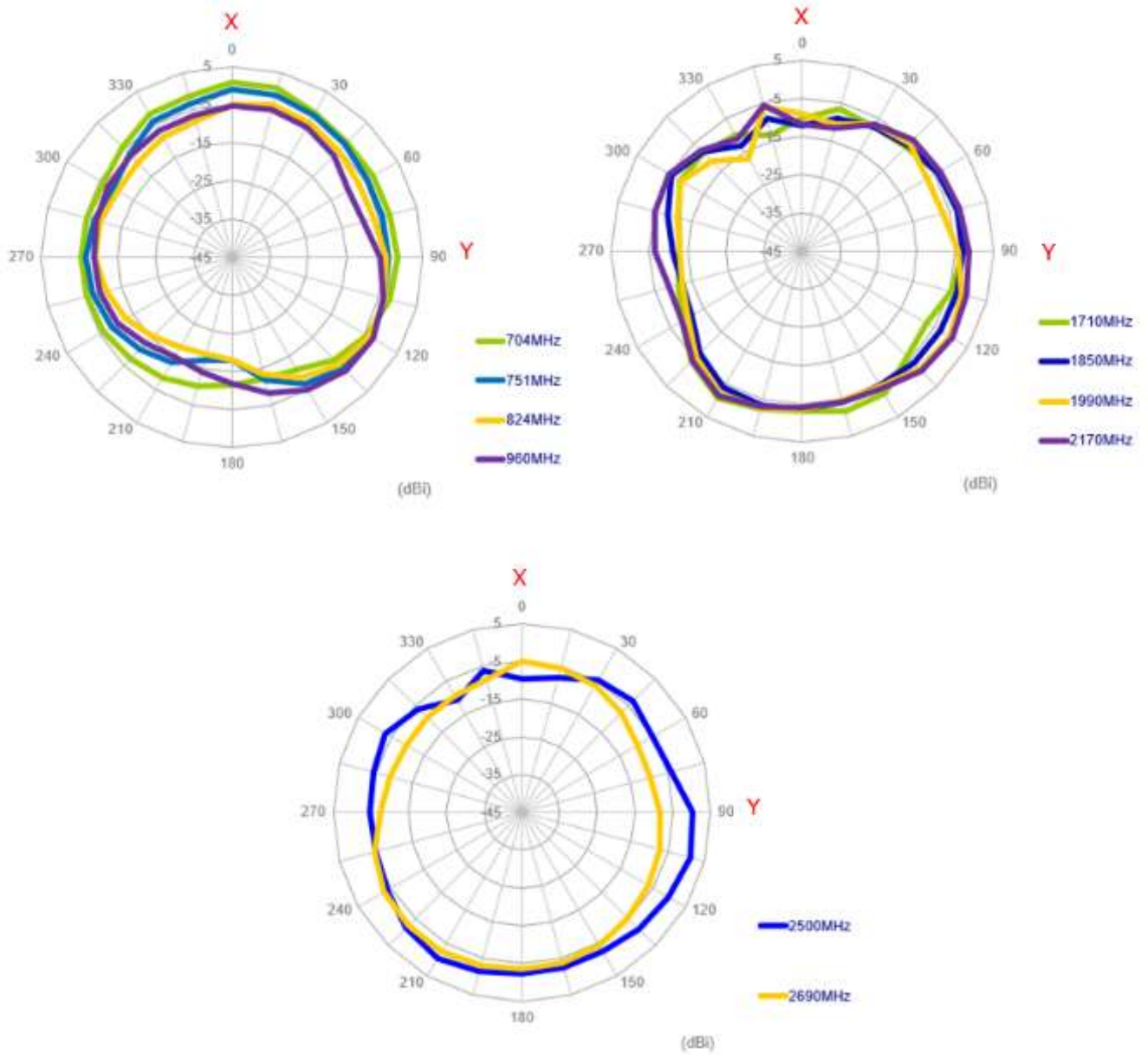


YZ Plane

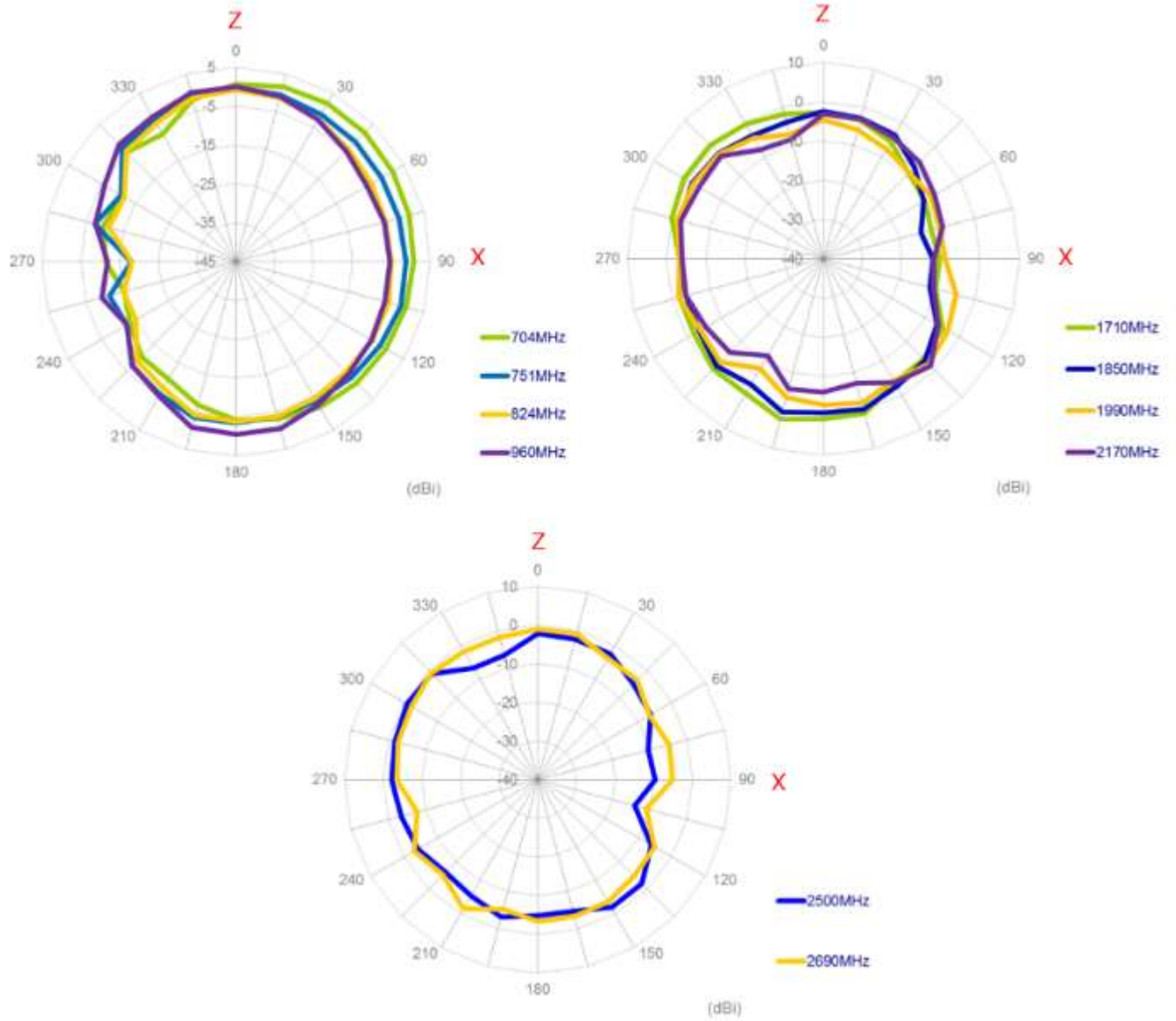


3.2.5. LTE with 2M cable length on the 2mm ABS (MIMO 2)

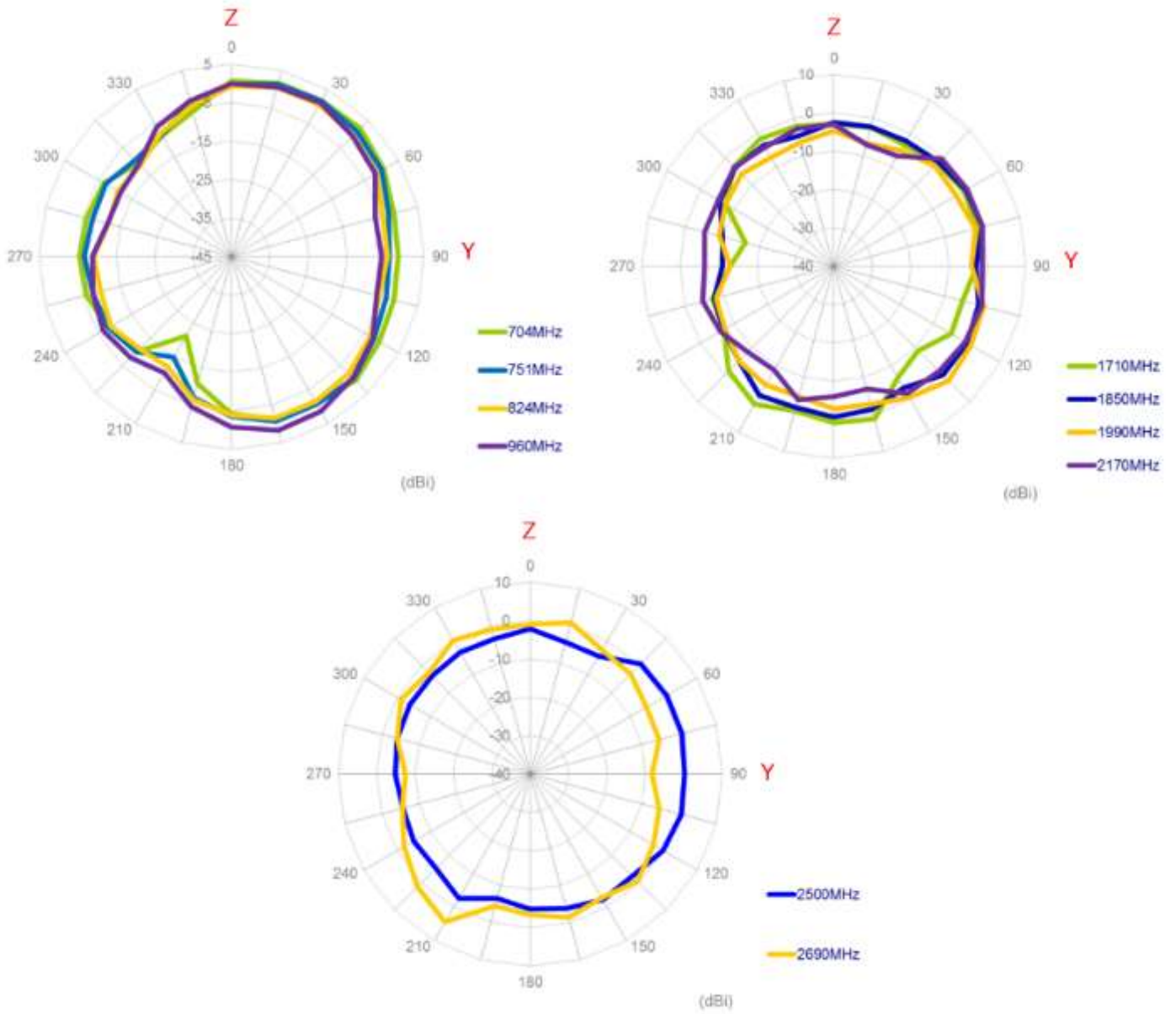
XY Plane



XZ Plane

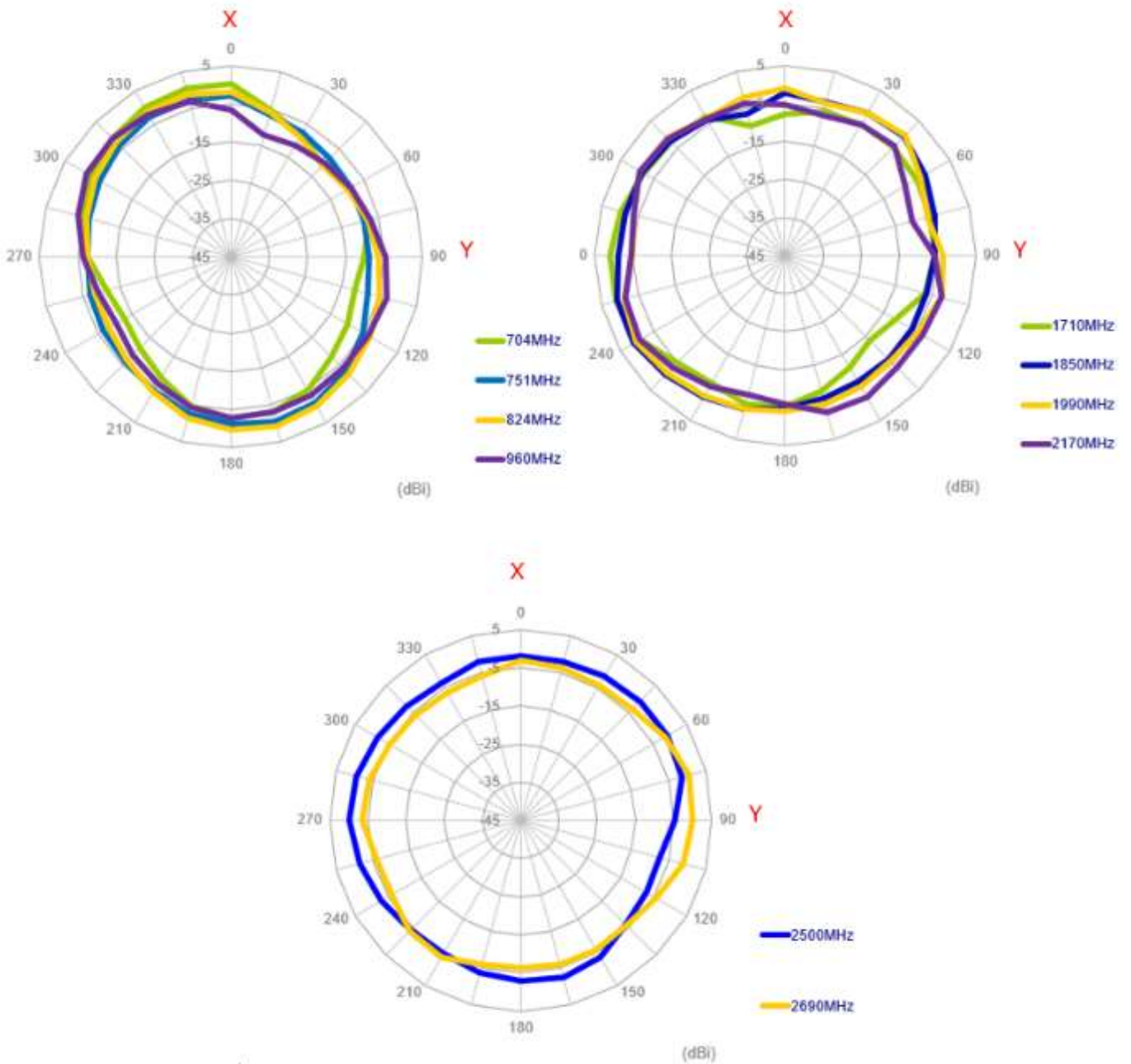


YZ Plane

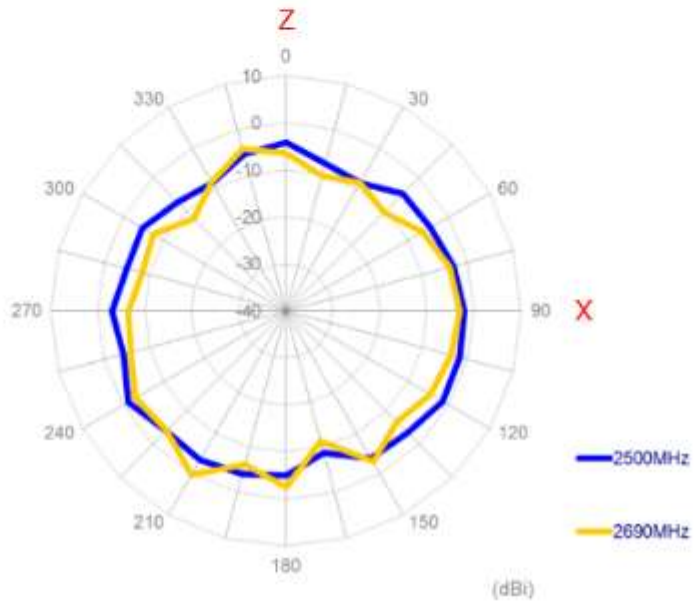
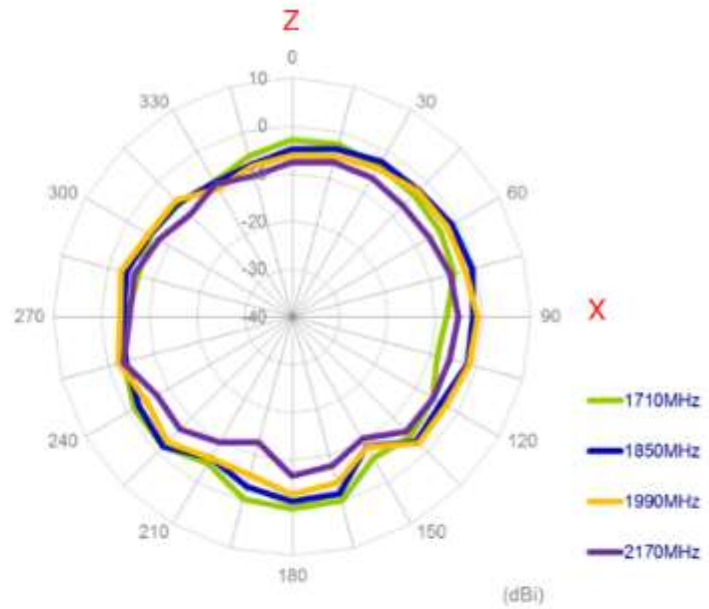
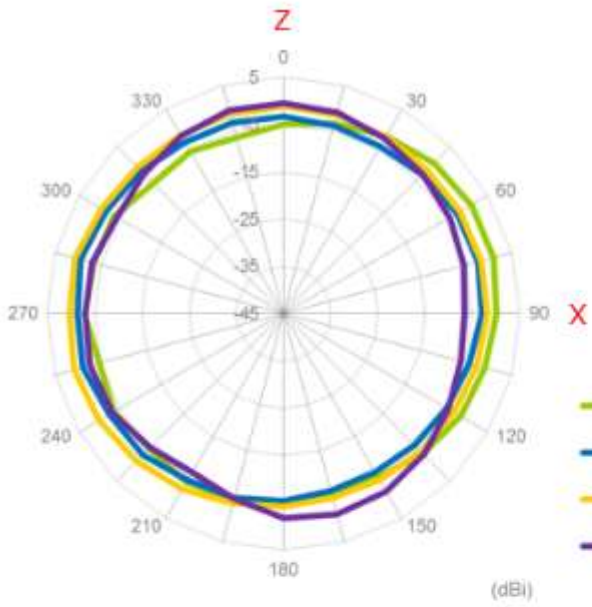


3.2.6. LTE with 2M cable length on the glass (MIMO 1)

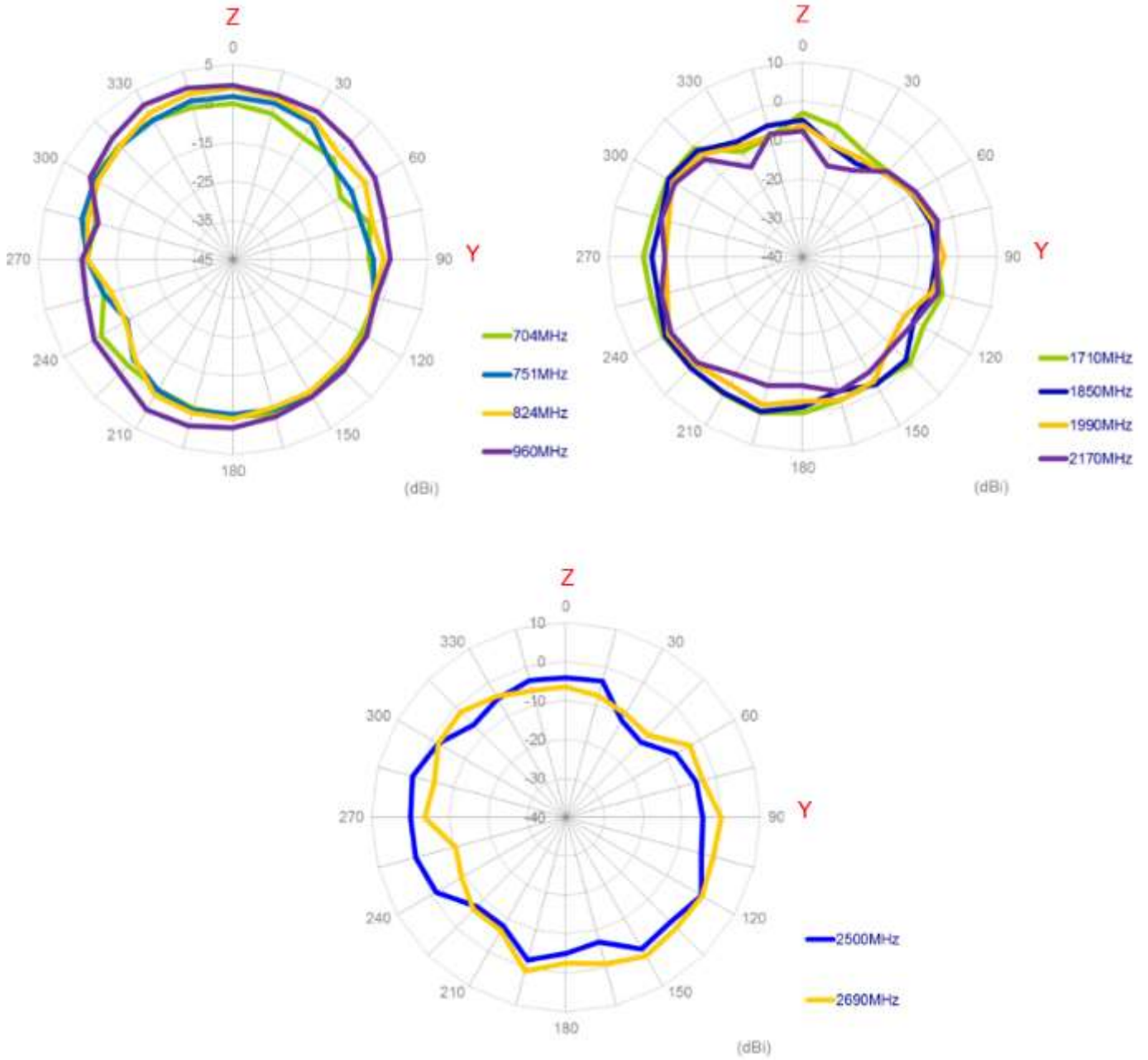
XY Plane



XZ Plane

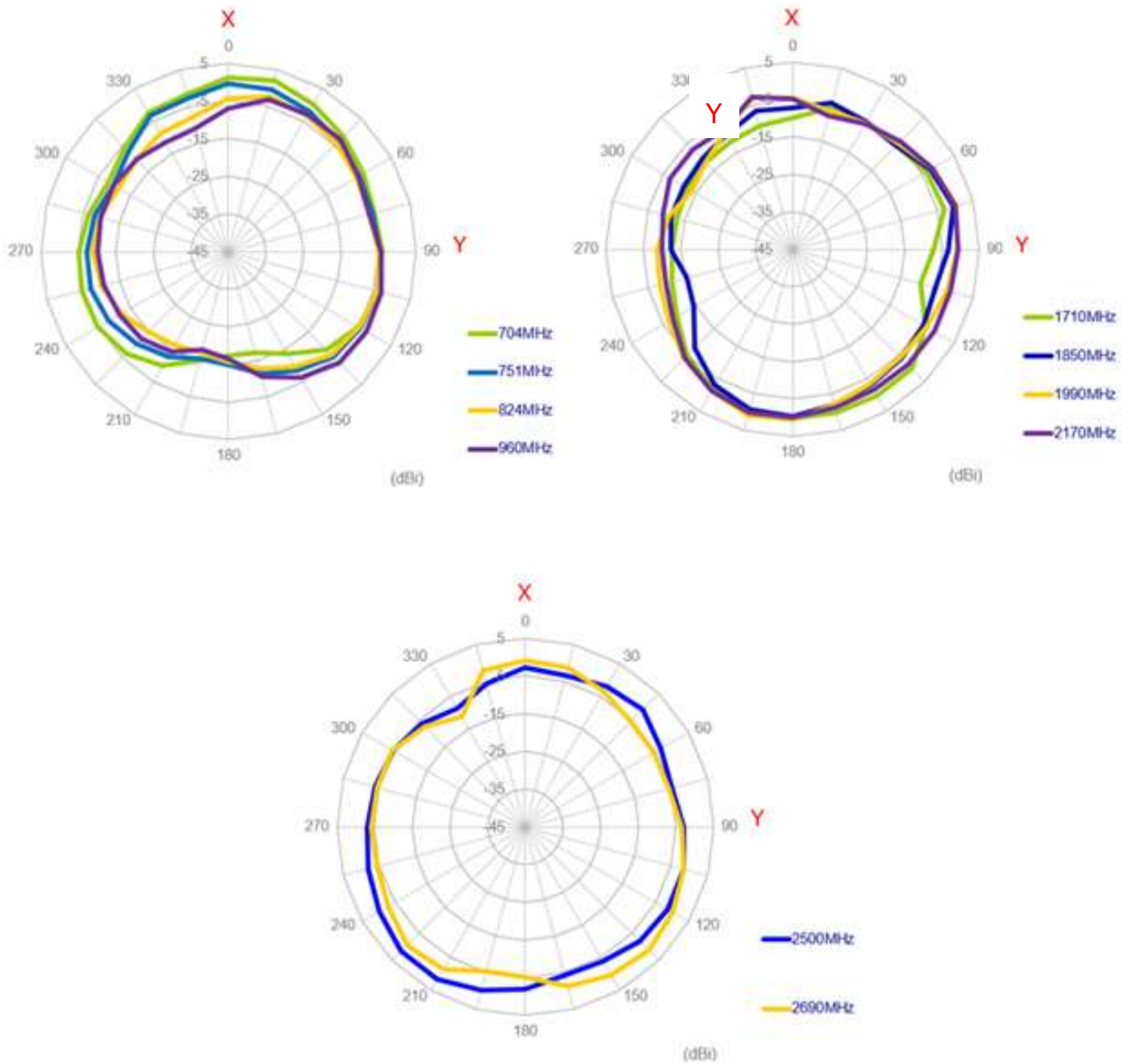


YZ Plane

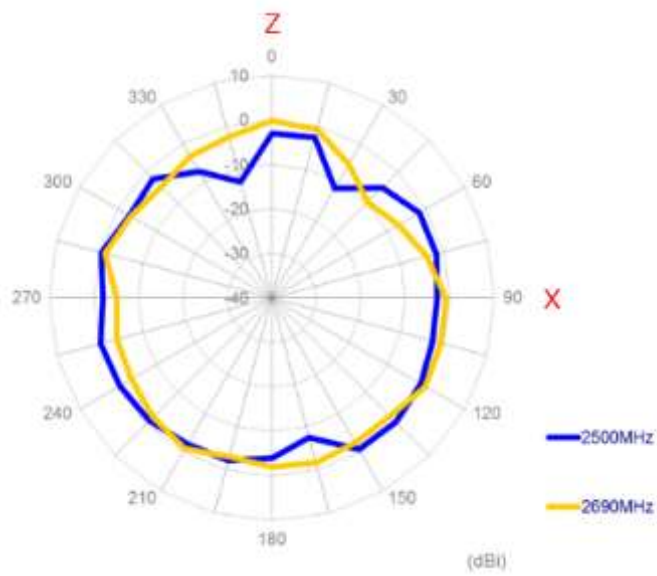
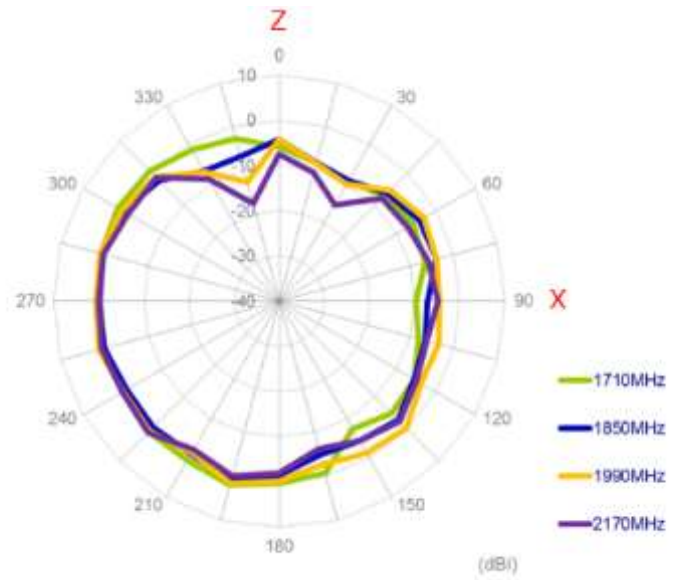
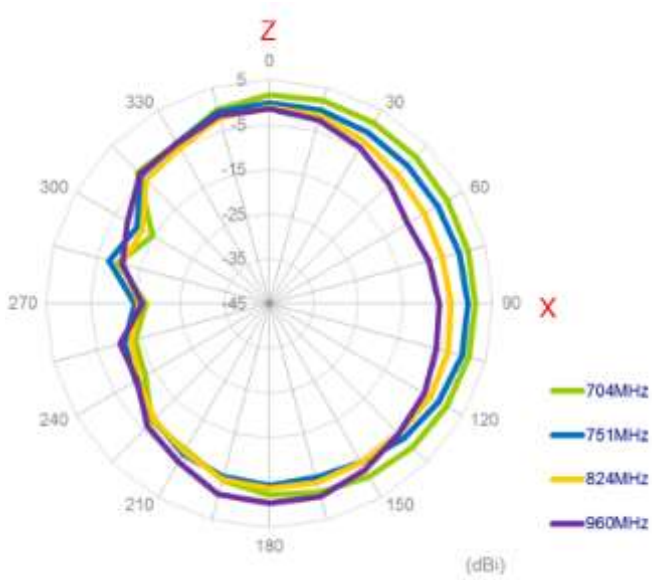


3.2.7. LTE with 2M cable length on the glass (MIMO 2)

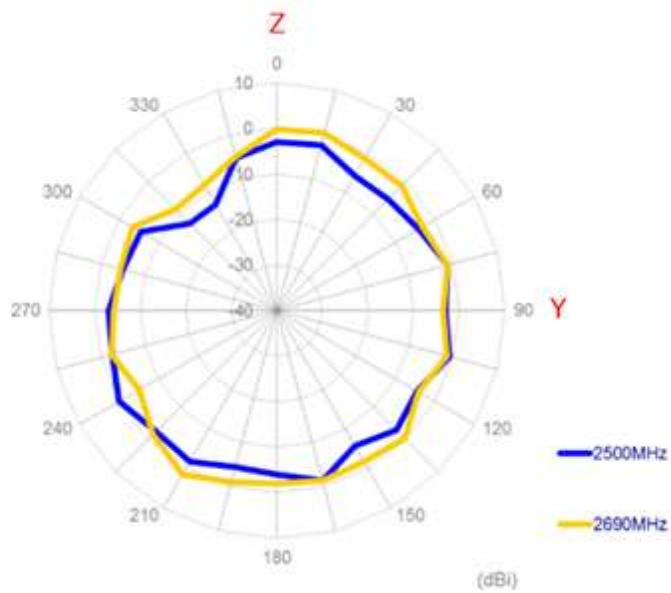
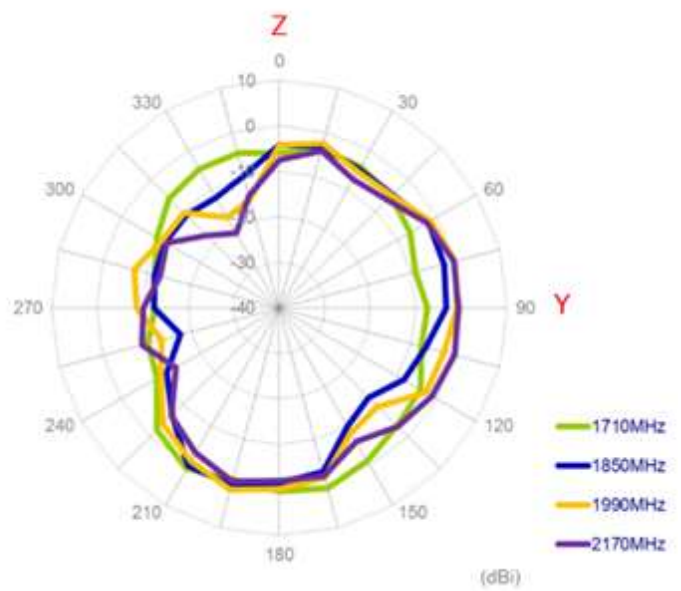
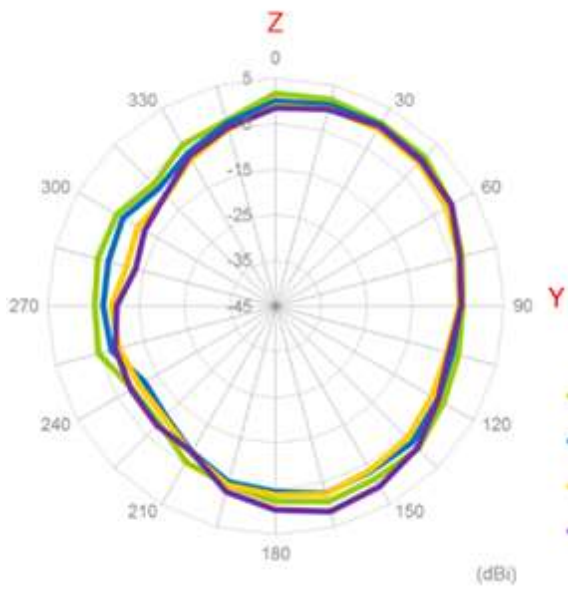
XY Plane



XZ Plane

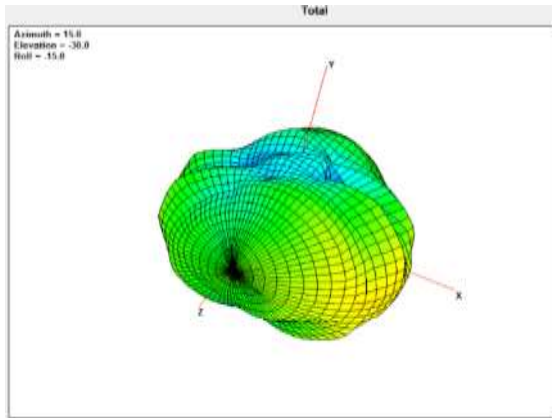


YZ Plane

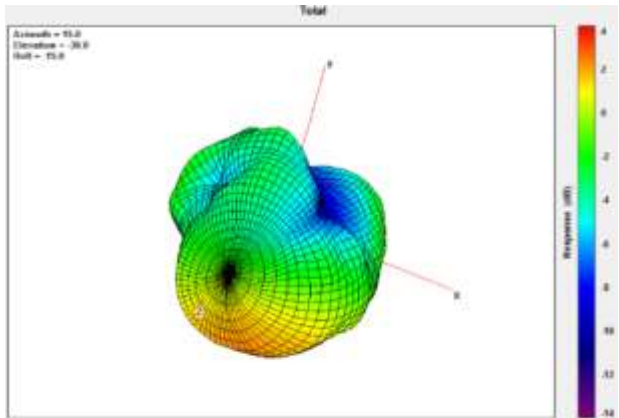


3.3. 3D Radiation Pattern

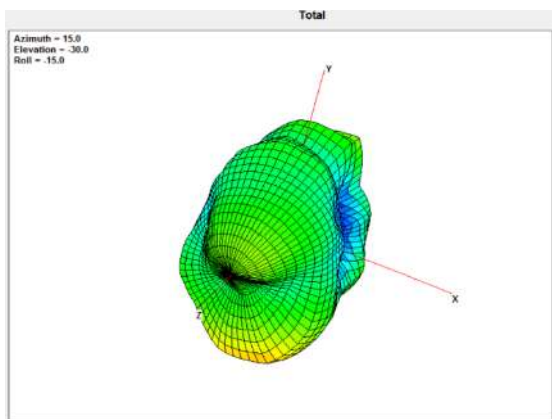
3.3.1. LTE with 2M cable length in free space (MIMO 1)



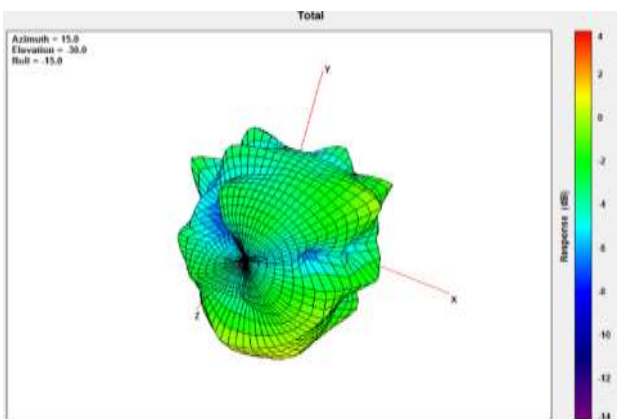
704MHz



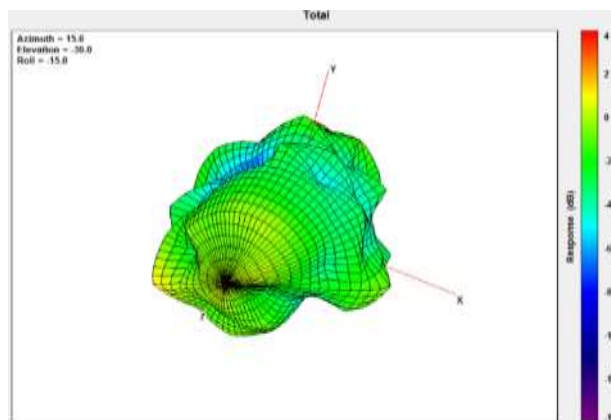
960MHz



1710MHz

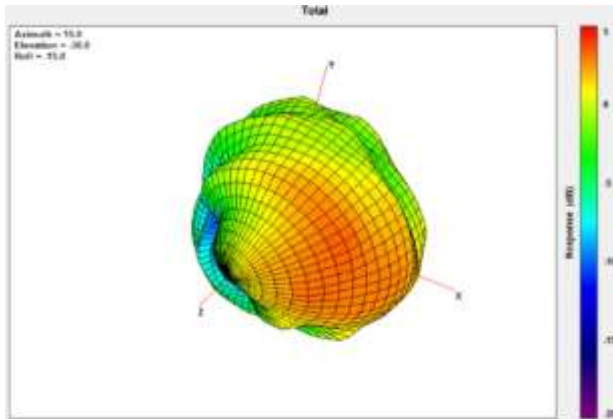


2170MHz

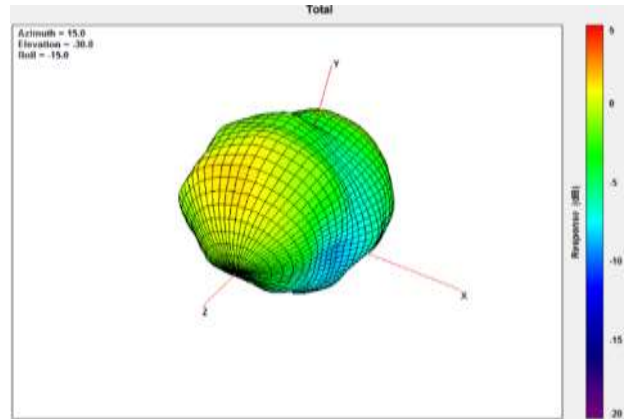


2690MHz

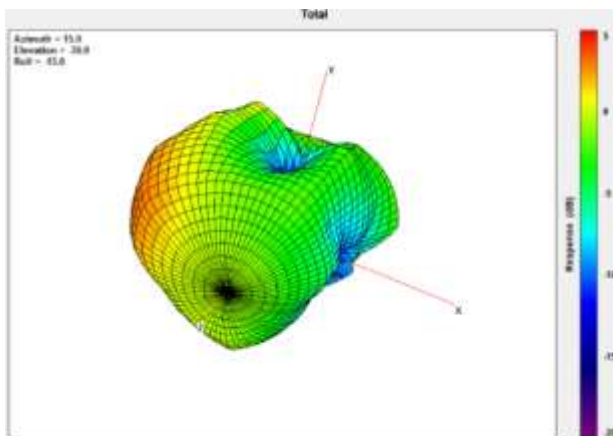
3.3.2. LTE with 2M cable length in free space (MIMO 2)



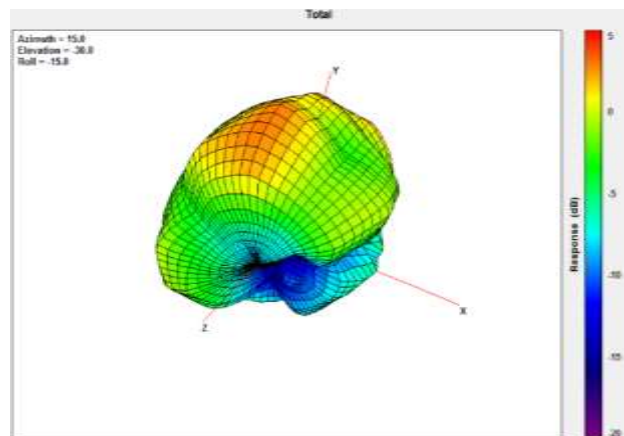
704MHz



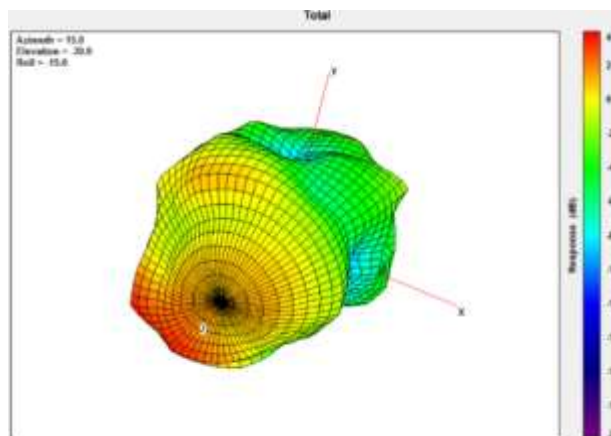
960MHz



1710MHz

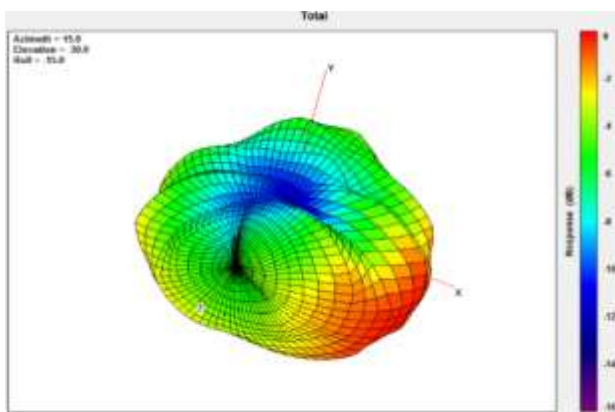


2170MHz

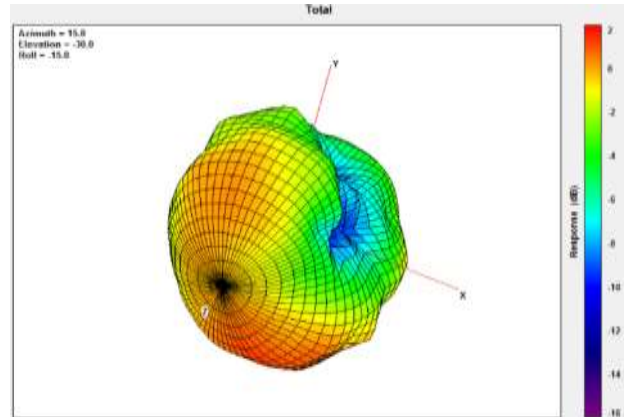


2690MHz

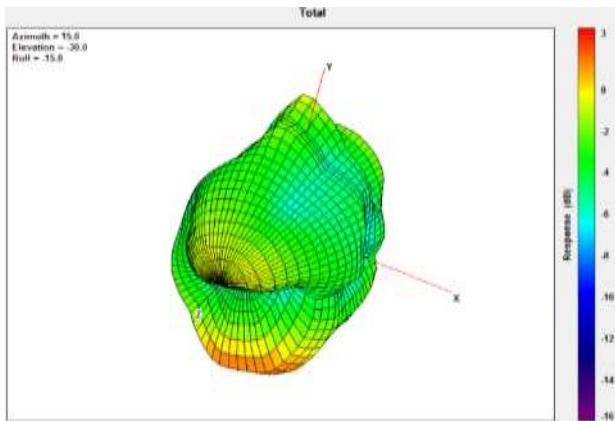
3.3.3. LTE with 2M cable length on the 2mm ABS (MIMO 1)



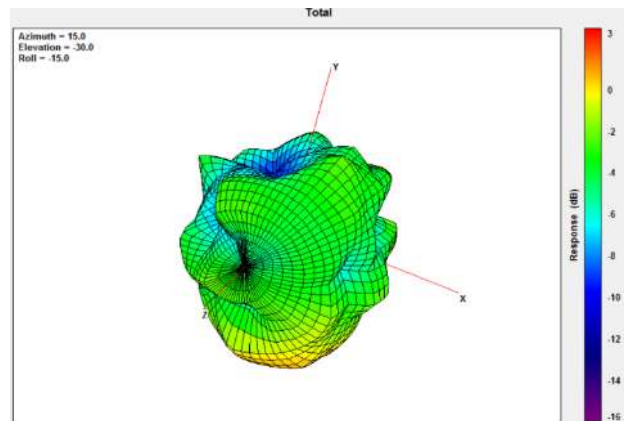
704MHz



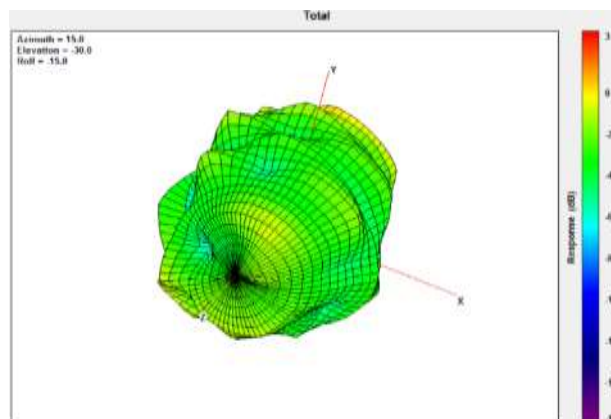
960MHz



1710MHz

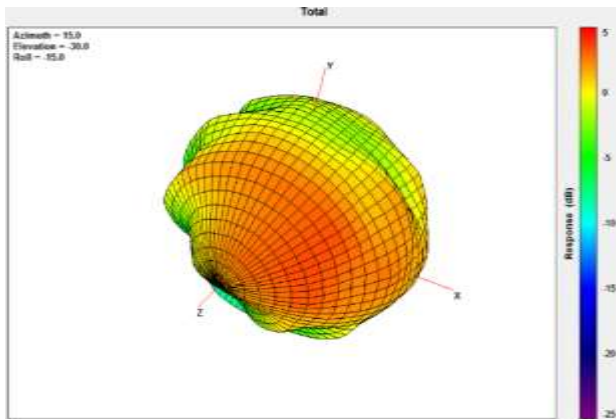


2170MHz

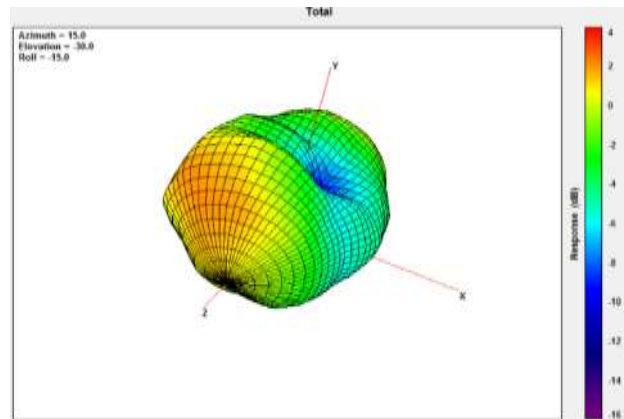


2690MHz

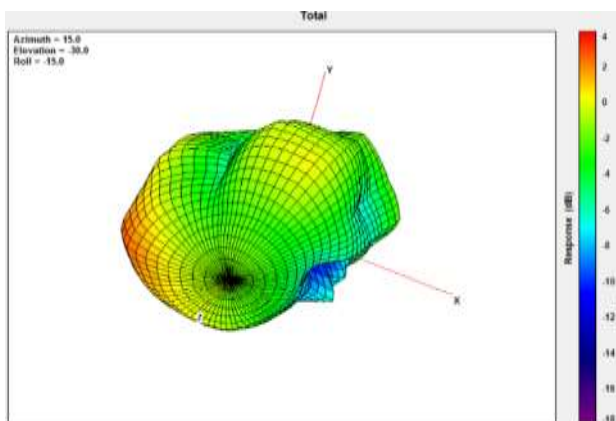
3.3.4. LTE with 2M cable length on the 2mm ABS (MIMO 2)



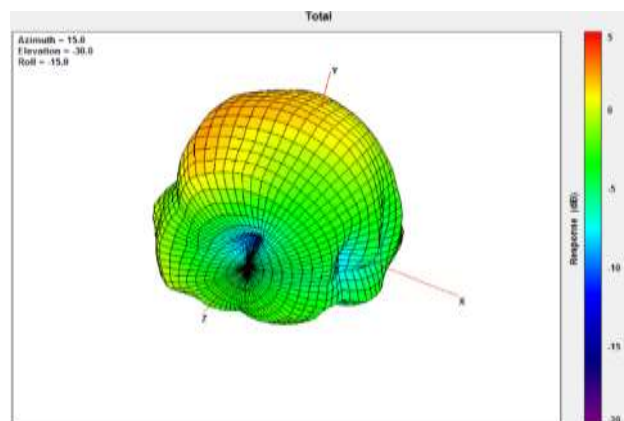
704MHz



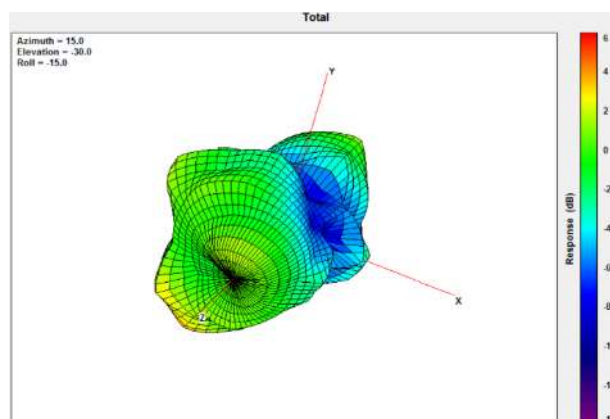
960MHz



1710MHz

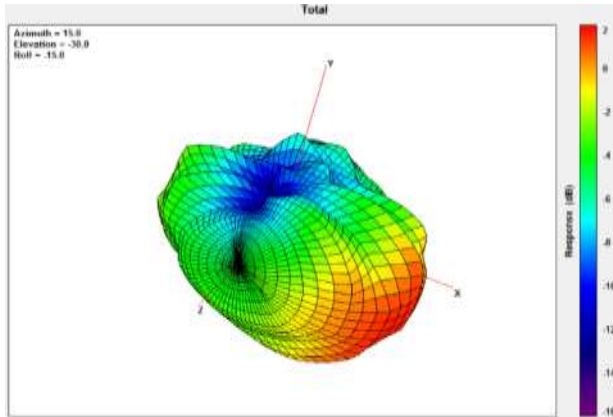


2170MHz

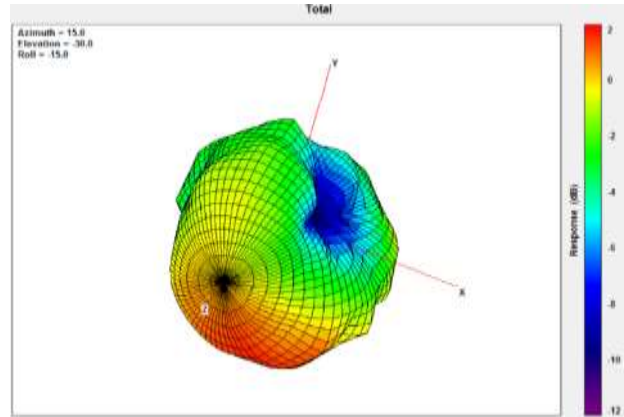


2690MHz

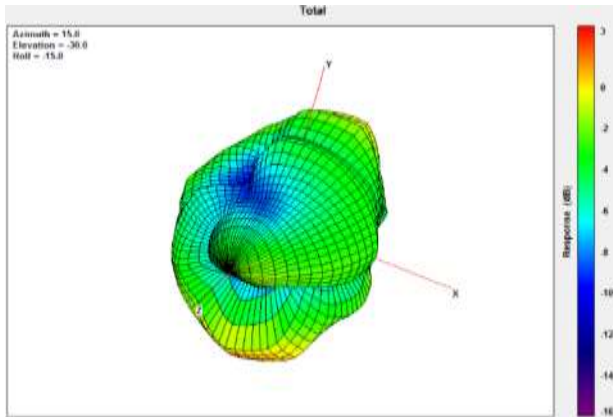
3.3.5. LTE with 2M cable length on the glass (MIMO 1)



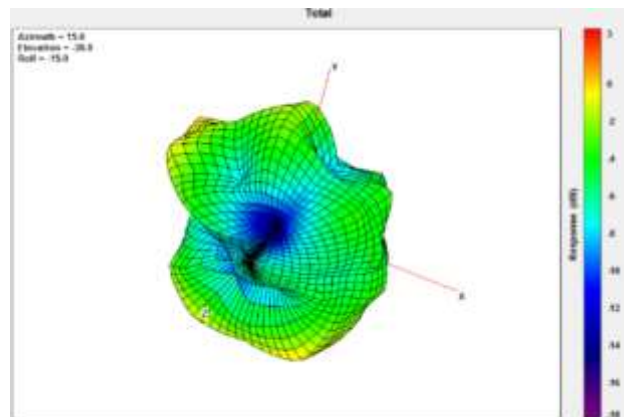
704MHz



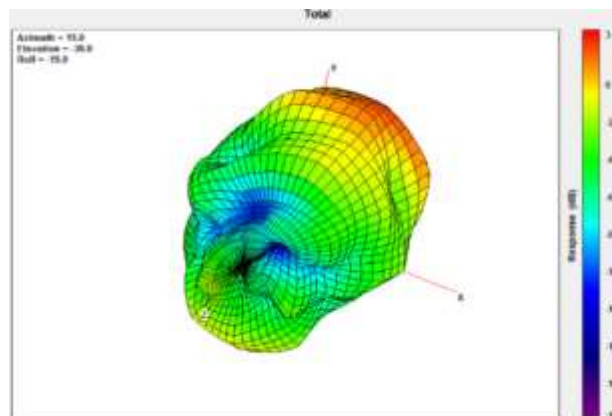
960MHz



1710MHz

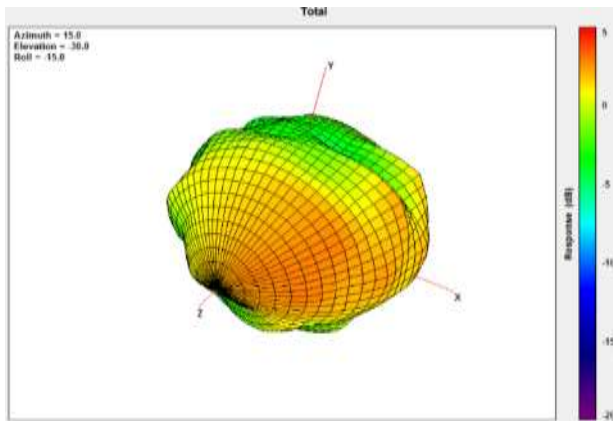


2170MHz

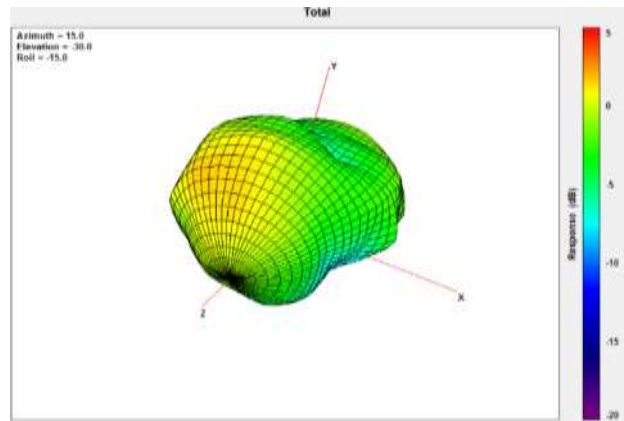


2690MHz

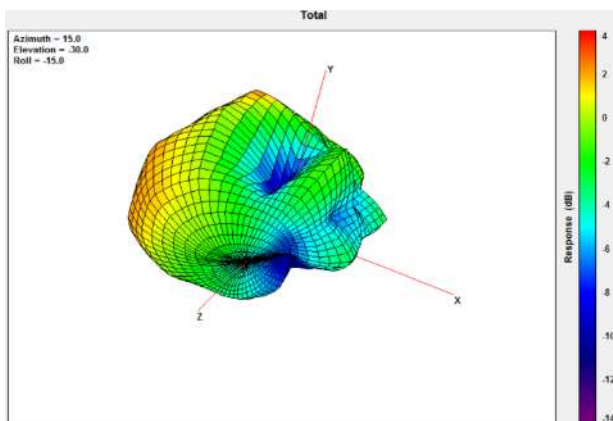
3.3.6. LTE with 2M cable length on the glass (MIMO 2)



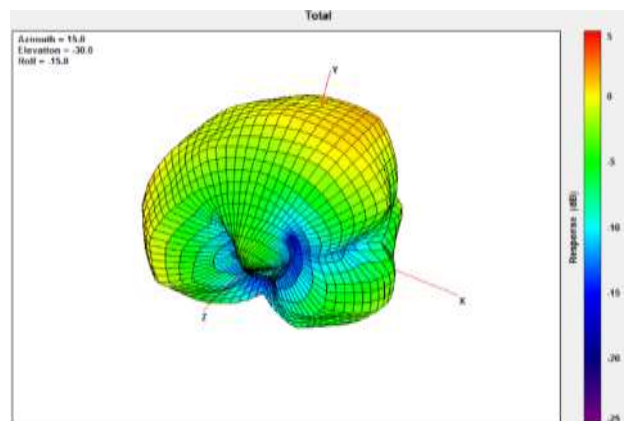
704MHz



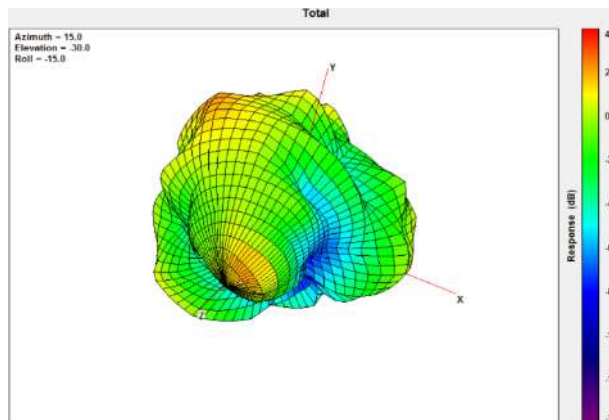
960MHz



1710MHz



2170MHz



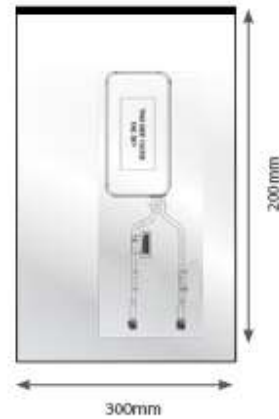
2690MHz

5. Packaging

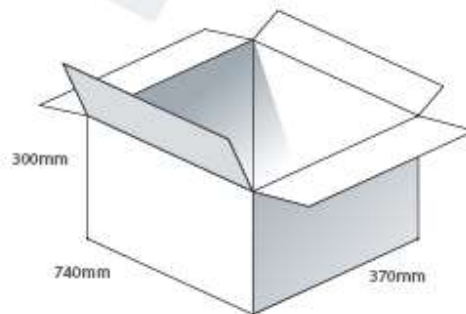
MA251.A.BI.001

Packaging Specifications

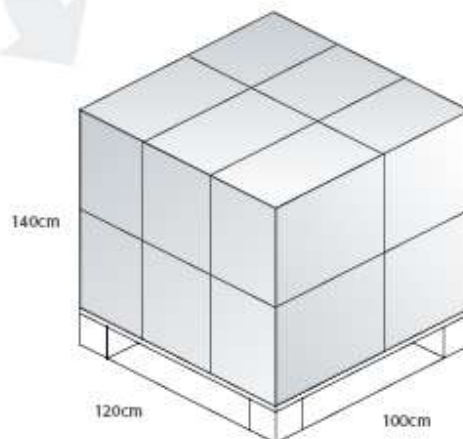
1pcs MA251.A.BI.001 per PE Bag
 Bag Dimensions - 300 x 200mm
 Weight - 227g



40 pcs MA251.A.BI.001 per carton
 Carton - 740x 370 x 300mm
 Weight - 11.1Kg



Pallet Dimensions 120 x 100x 140cm
 12 Cartons per Pallet
 6 Cartons per layer
 2 Layers



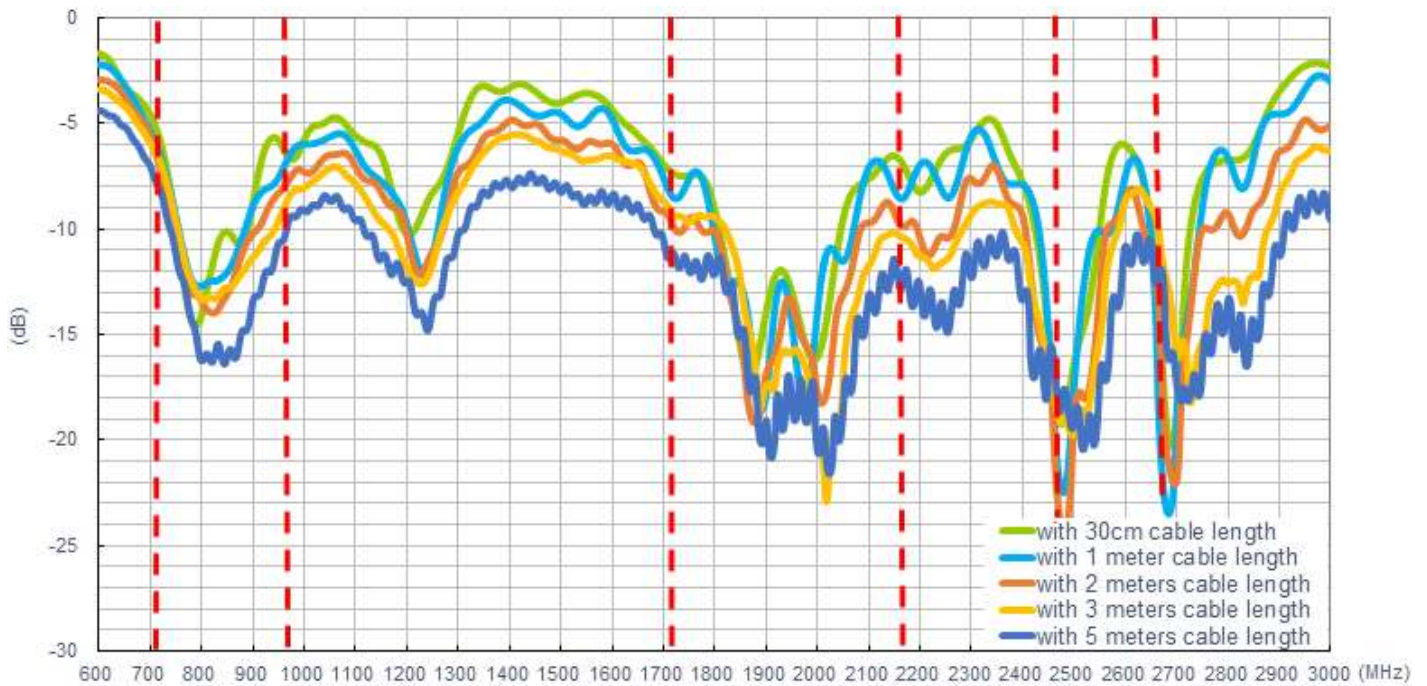
6. Application Note

The antenna is tested with different cable lengths and various base mounting options to indicate its performance to act as a reference for a customer's design.

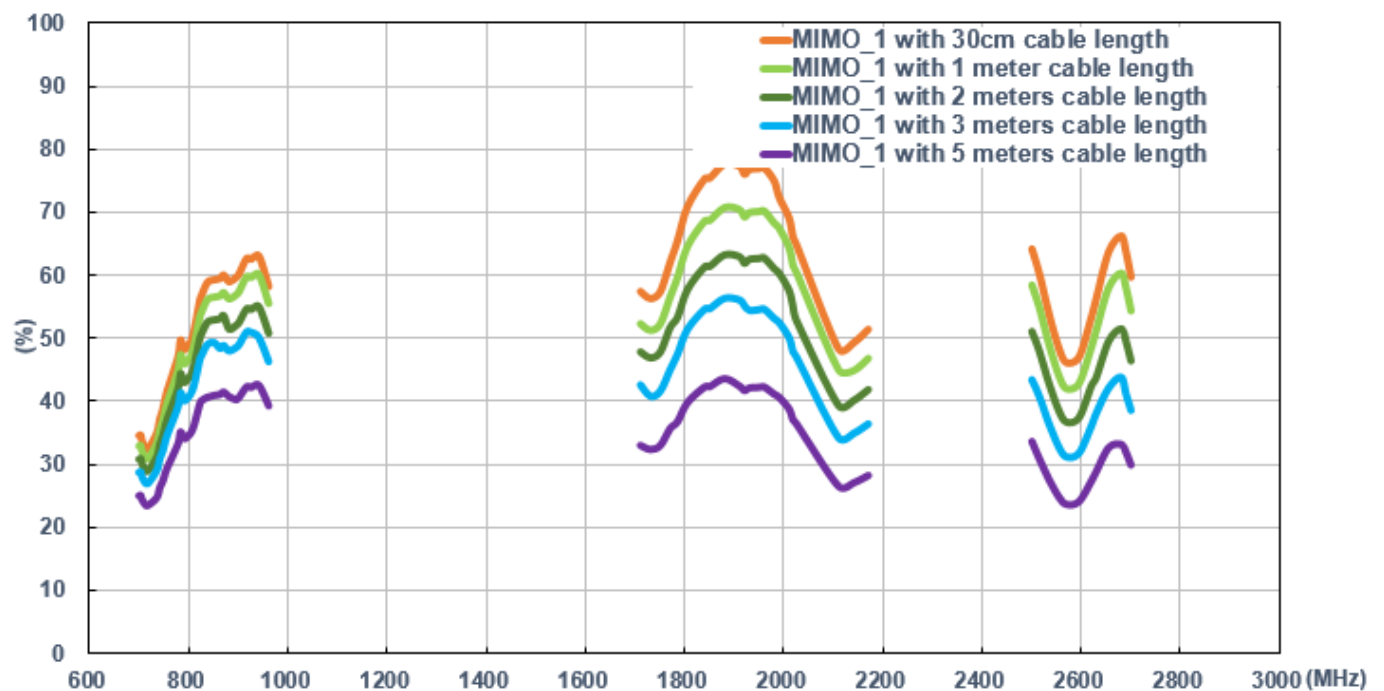
In Free Space

LTE MIMO 1

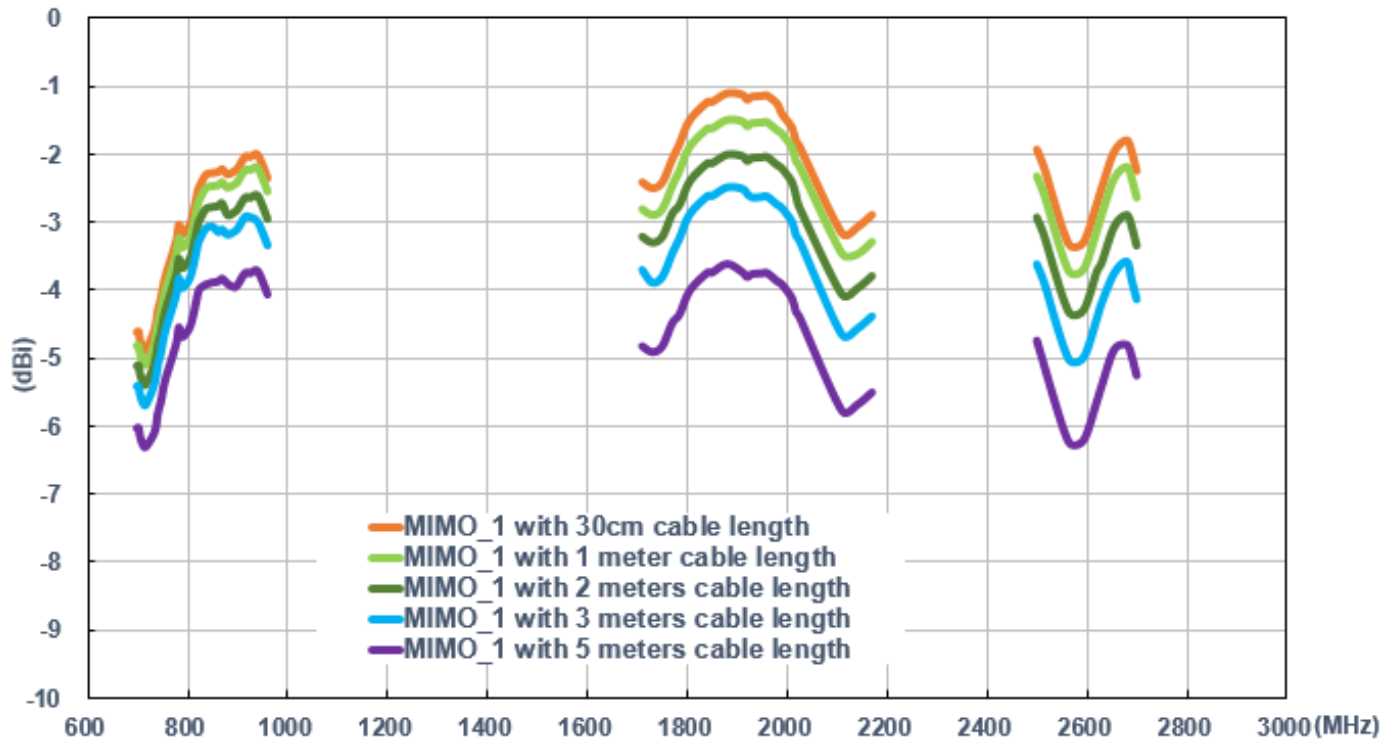
Return Loss



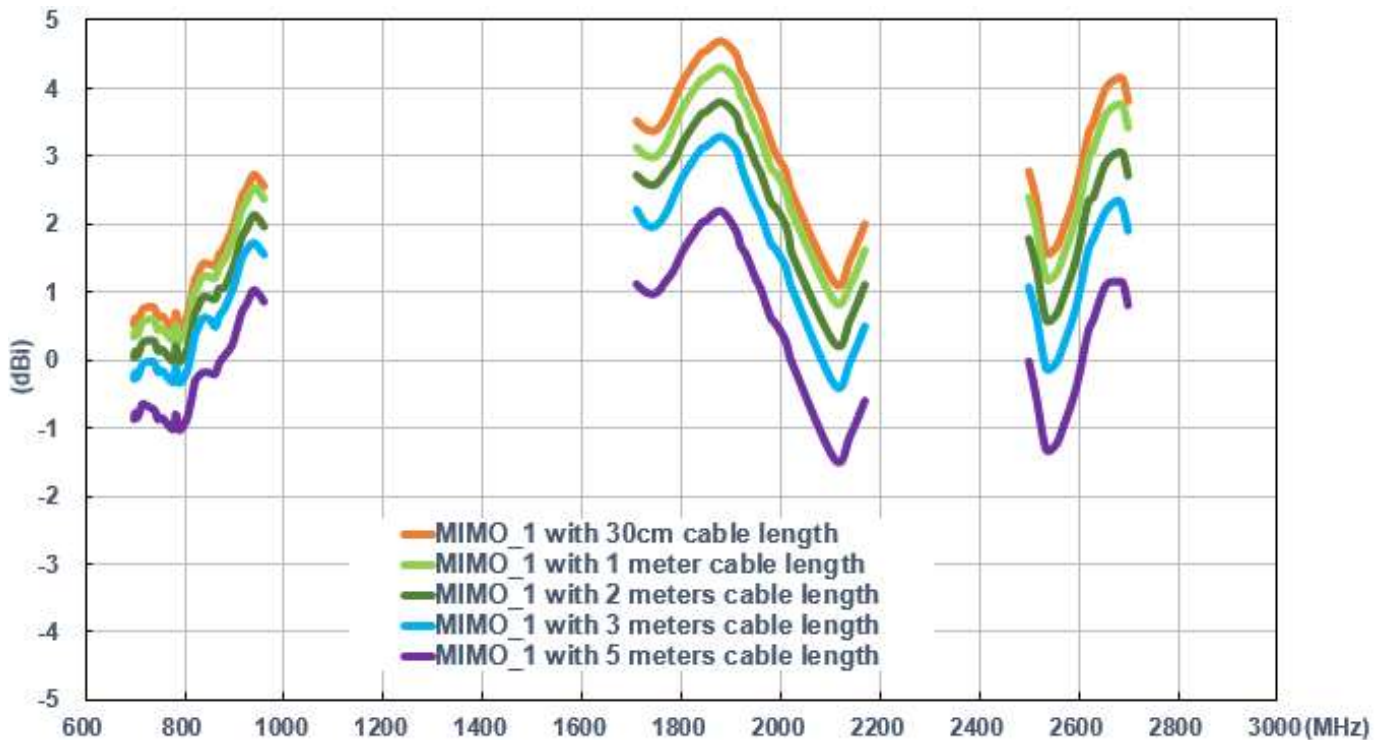
Efficiency



Average Gain

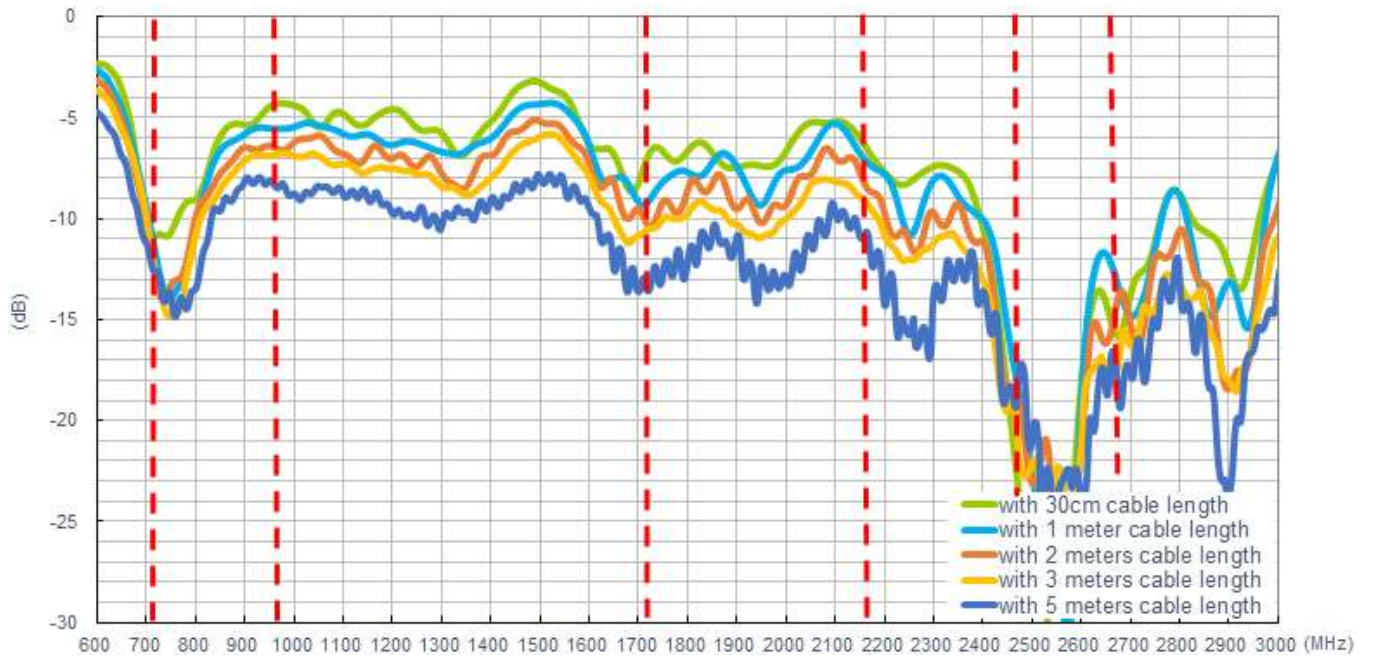


Peak Gain

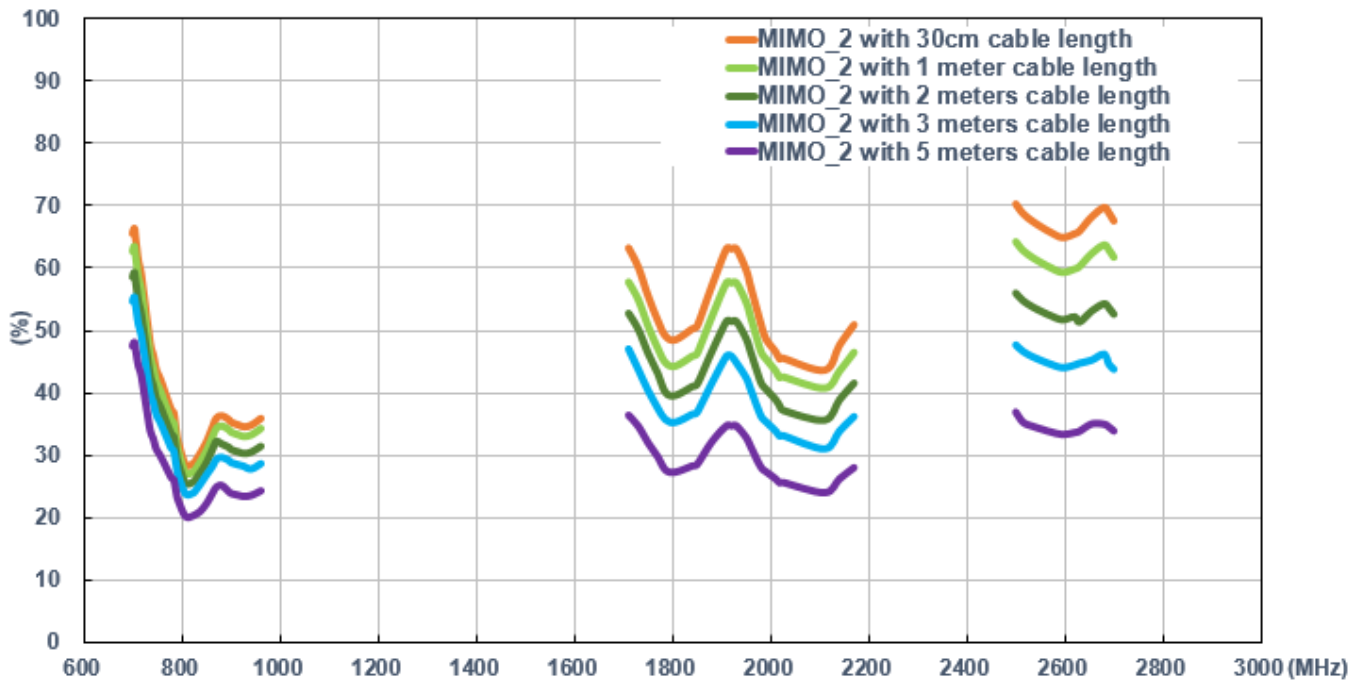


LTE MIMO 2

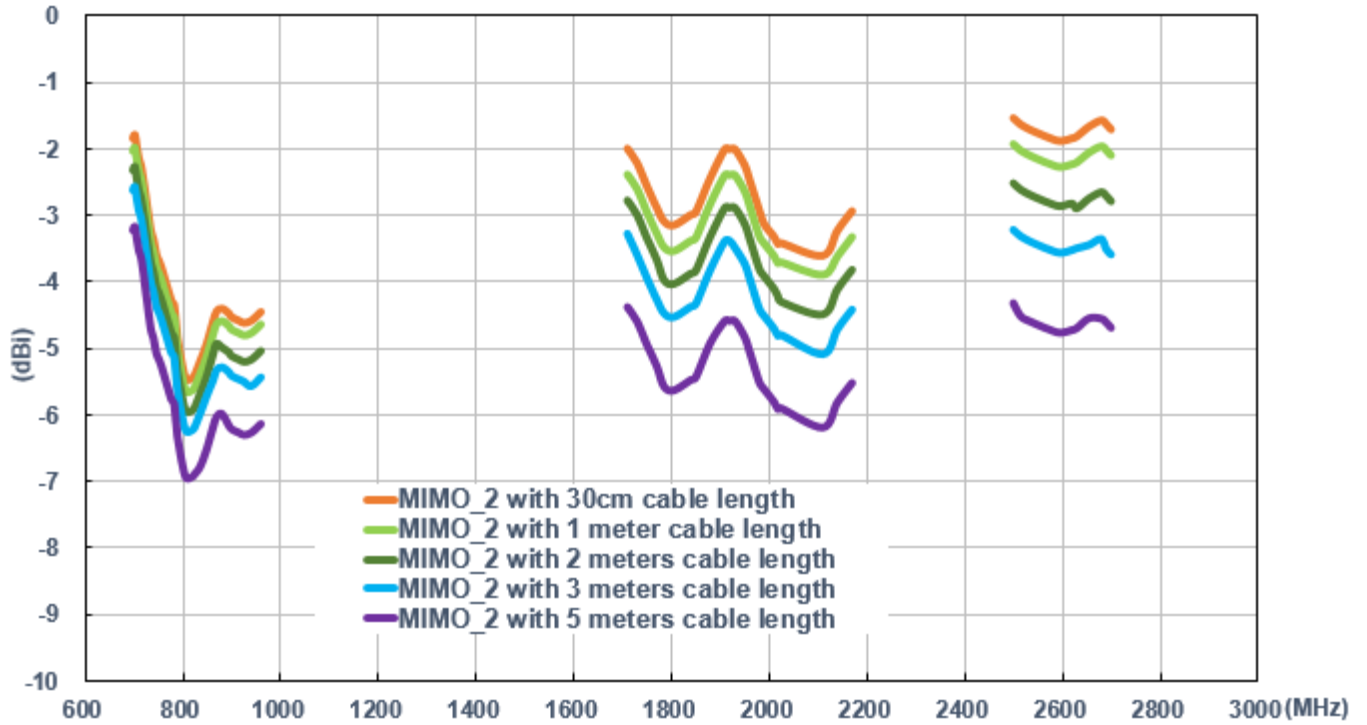
Return Loss



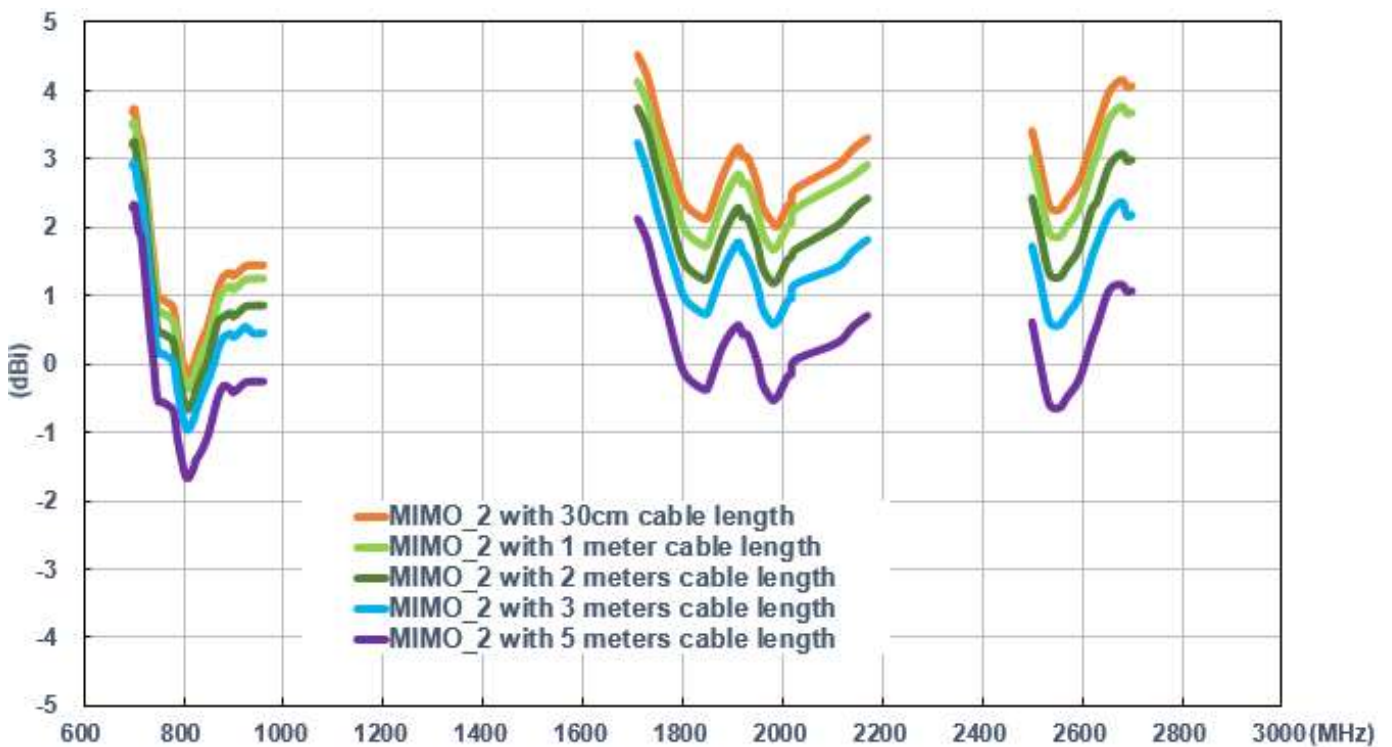
Efficiency



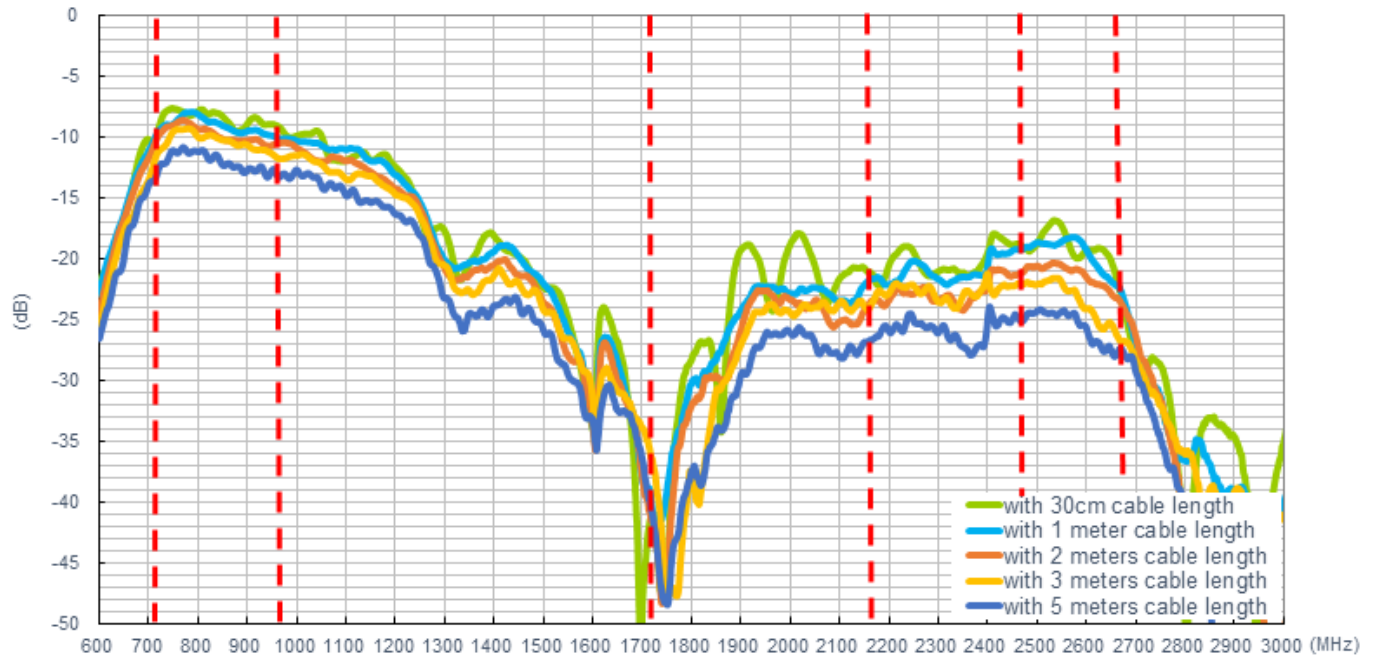
Average Gain



Peak Gain



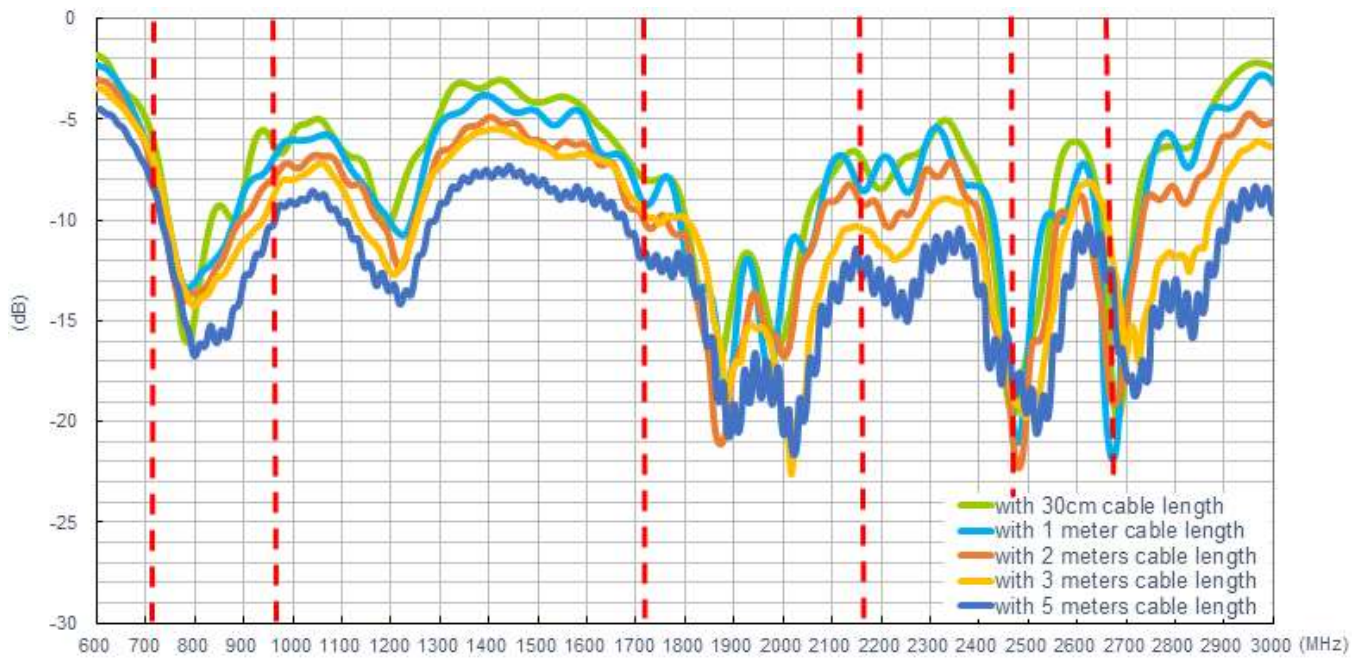
Isolation of MIMO 1 and MIMO 2



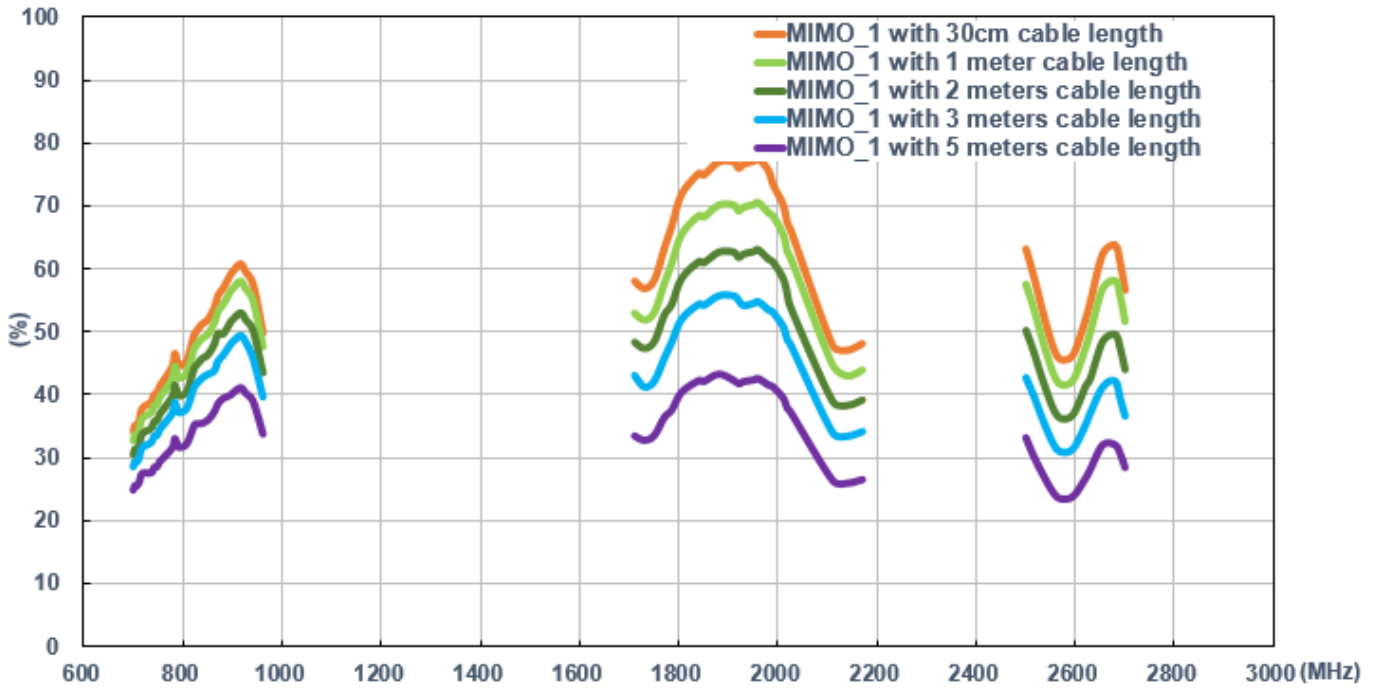
On 2mm ABS

LTE MIMO 1

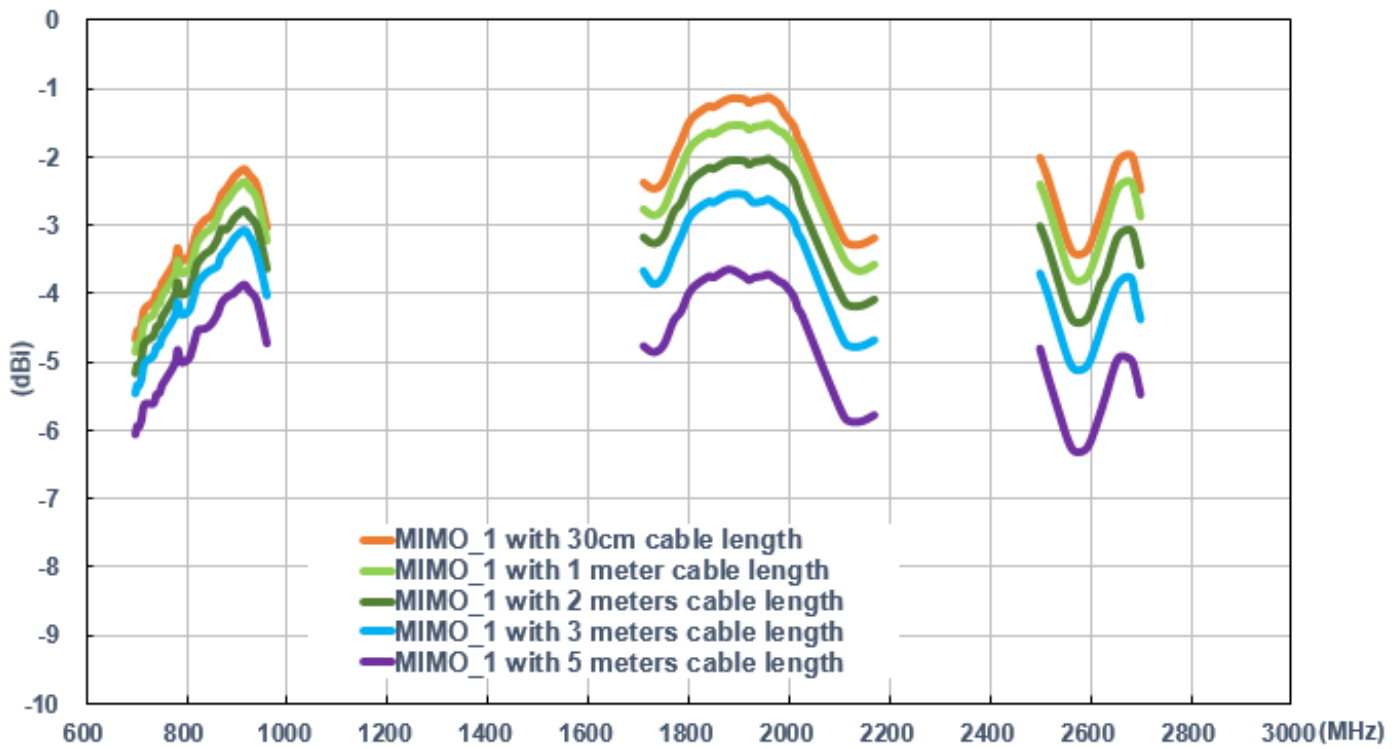
Return Loss



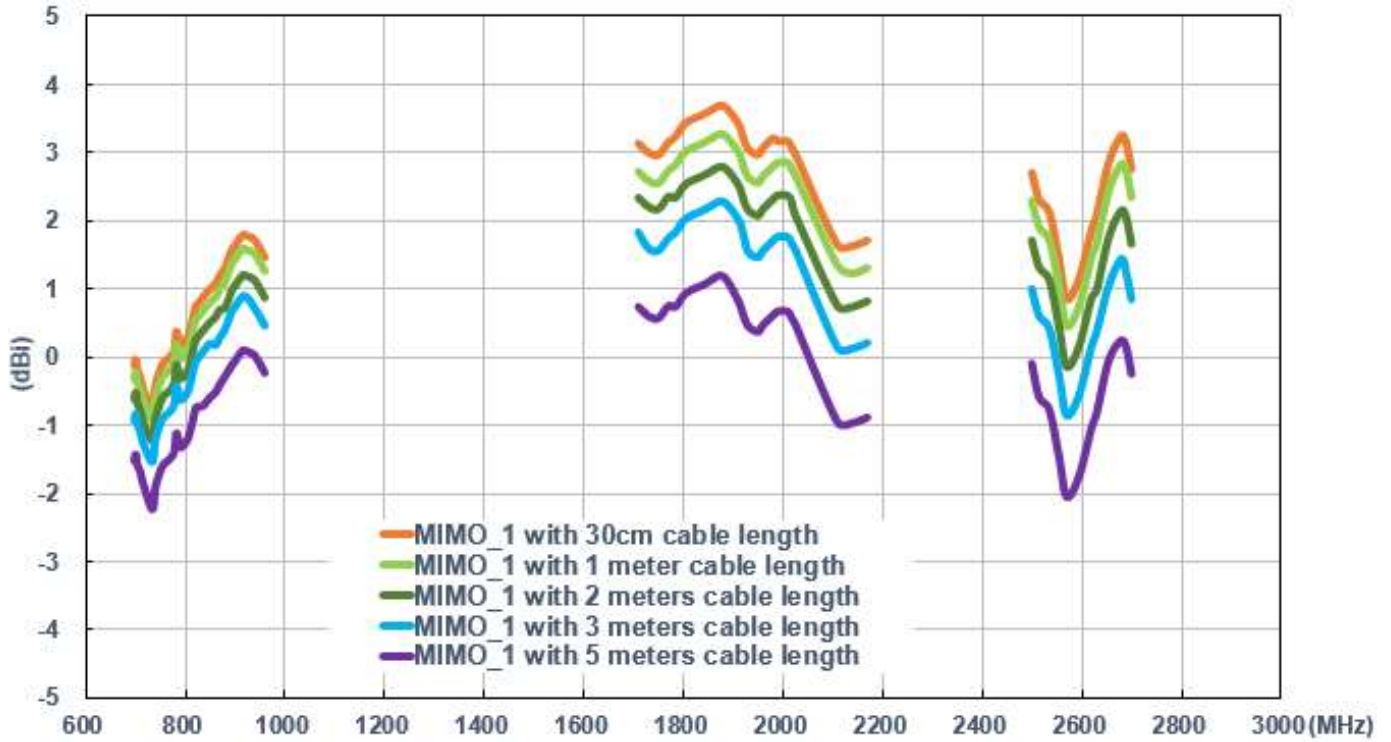
Efficiency



Average Gain

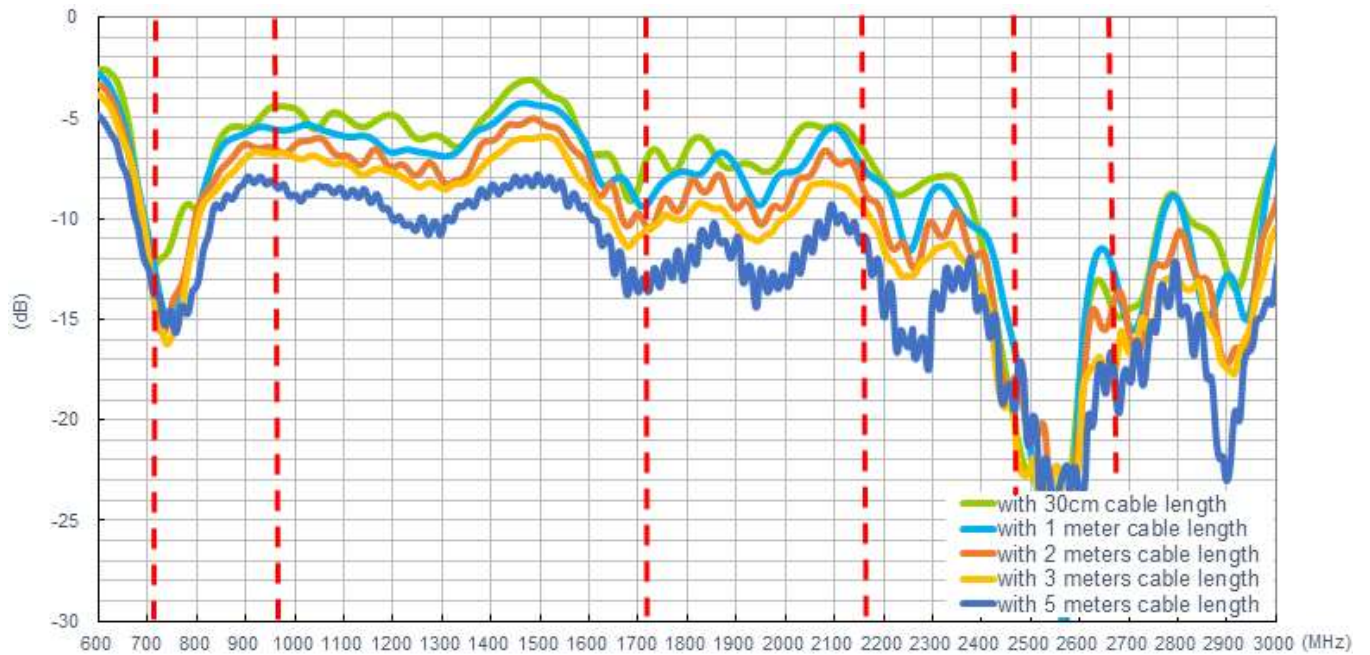


Peak Gain

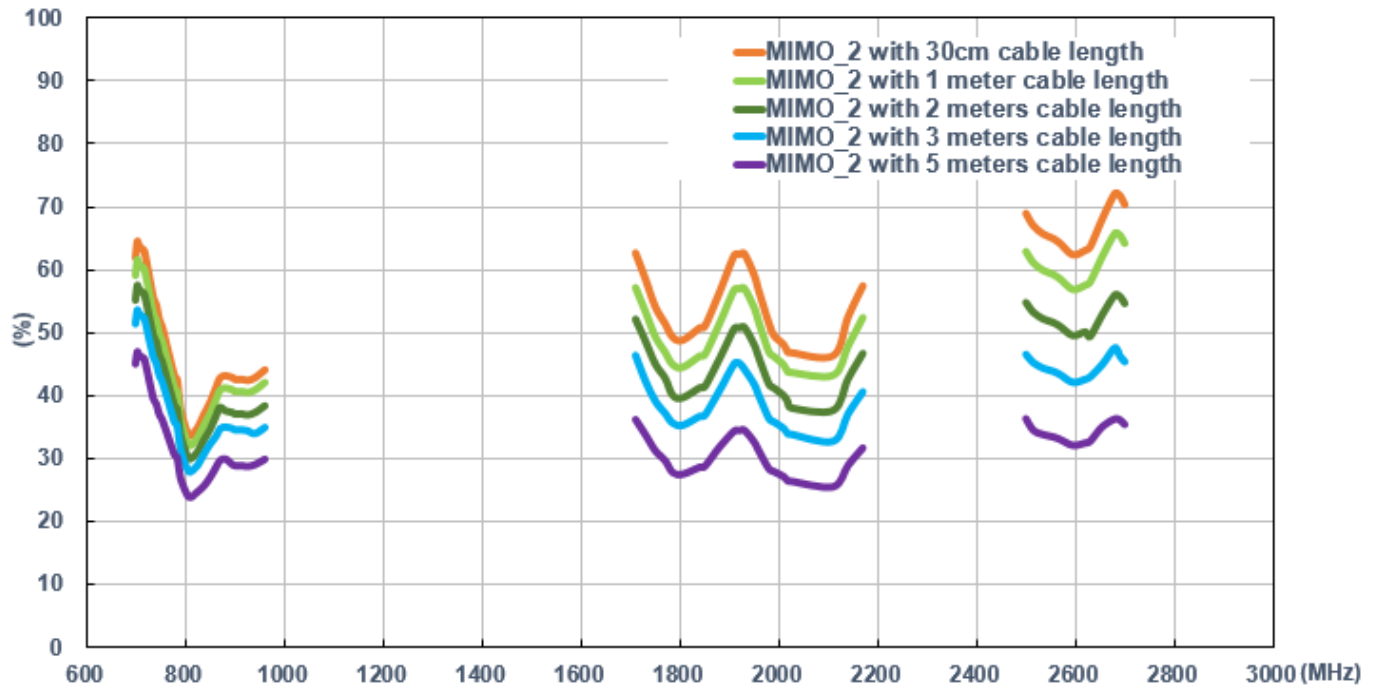


LTE MIMO 2

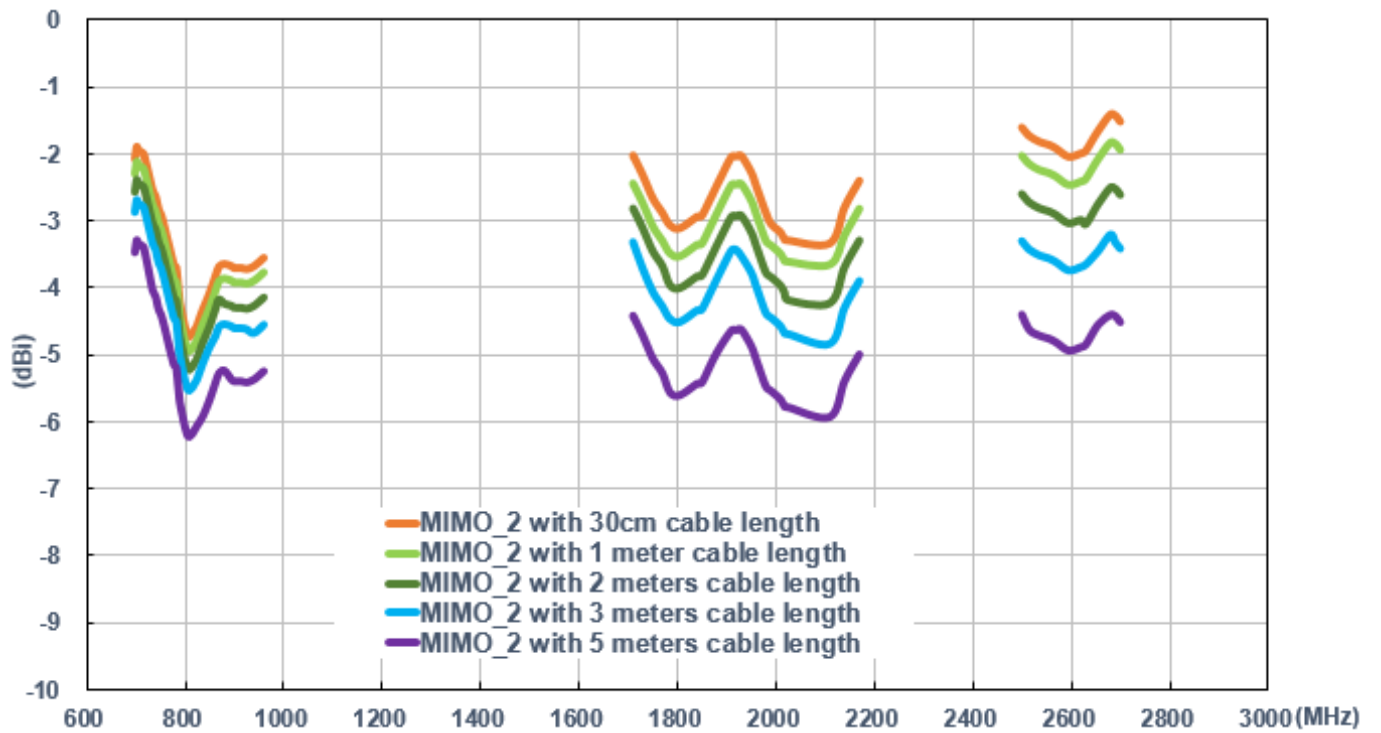
Return Loss



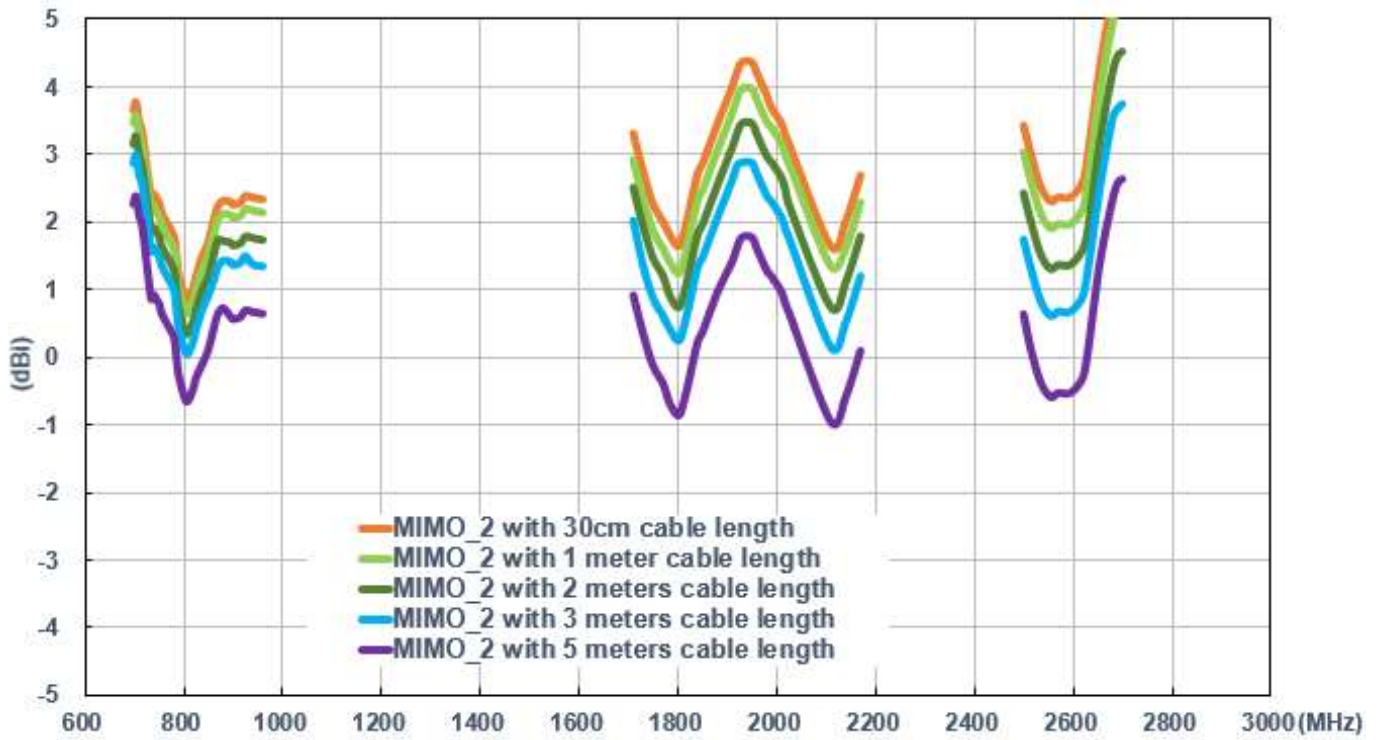
Efficiency



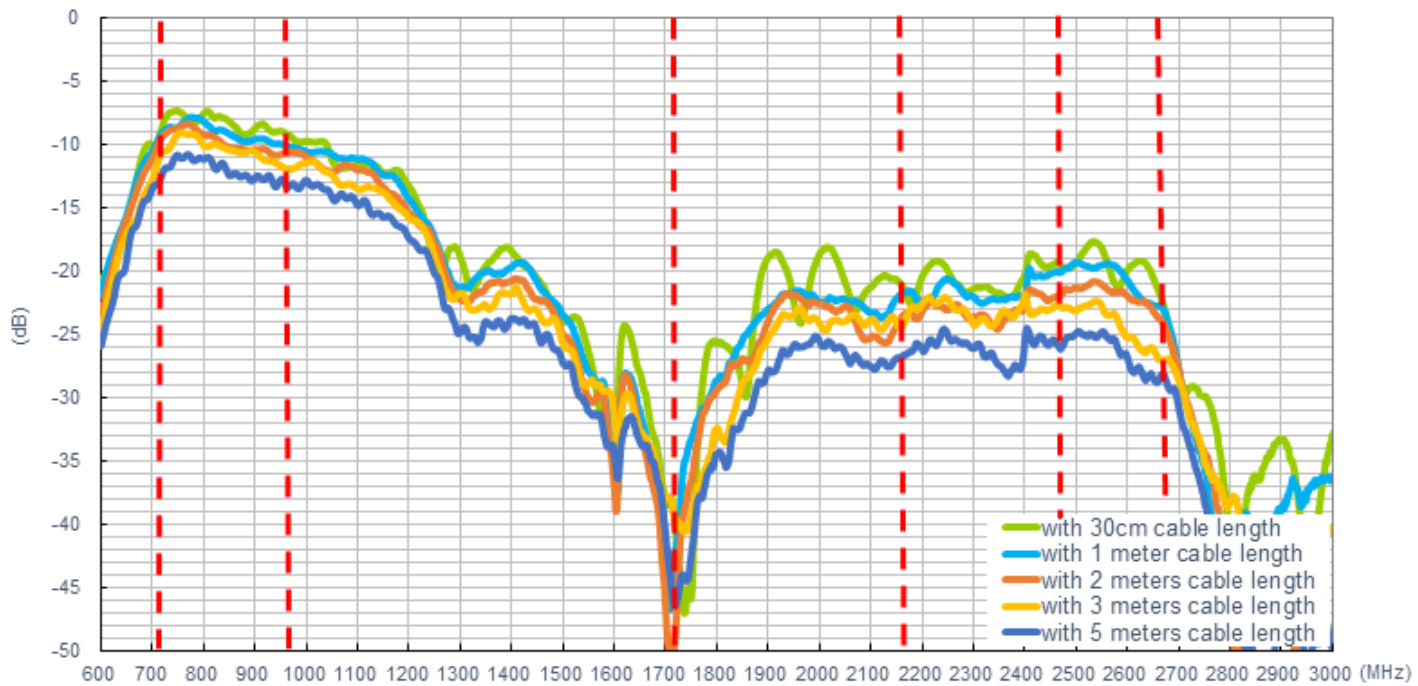
Average Gain



Peak Gain



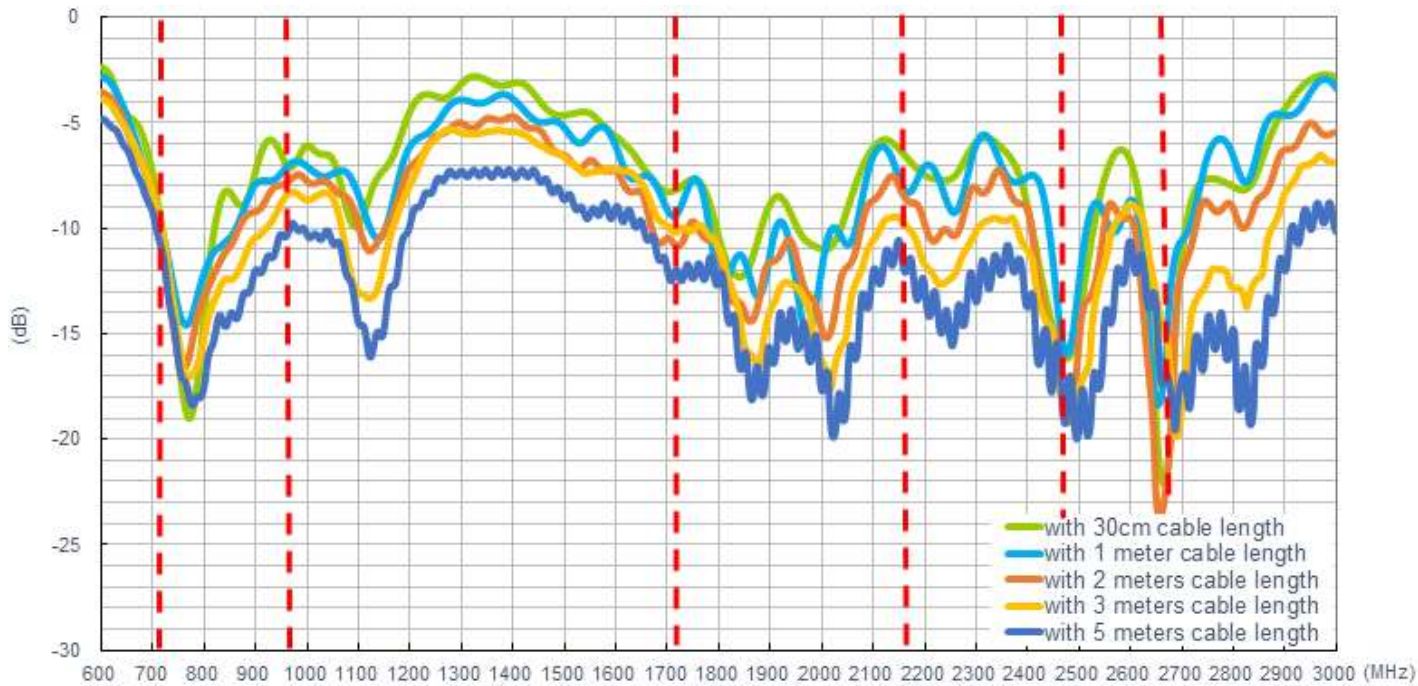
Isolation of MIMO 1 and MIMO 2



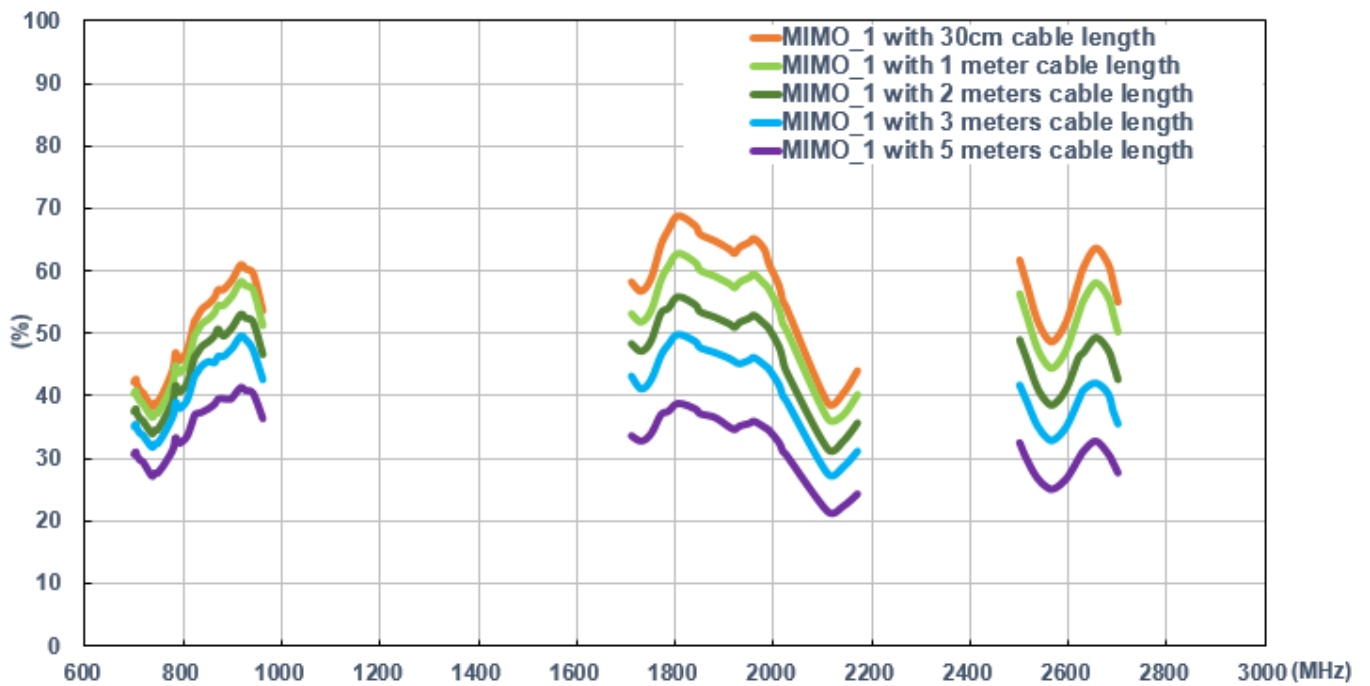
On glass base

LTE MIMO 1

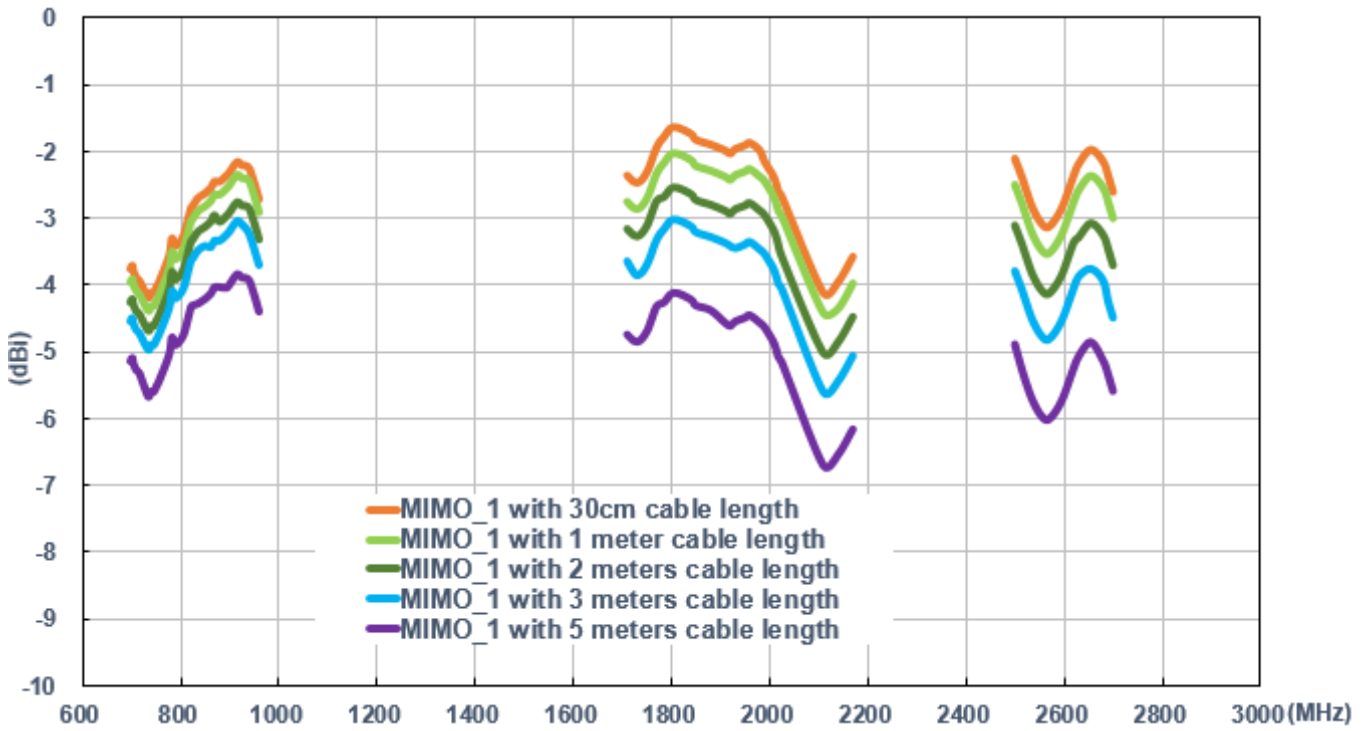
Return Loss



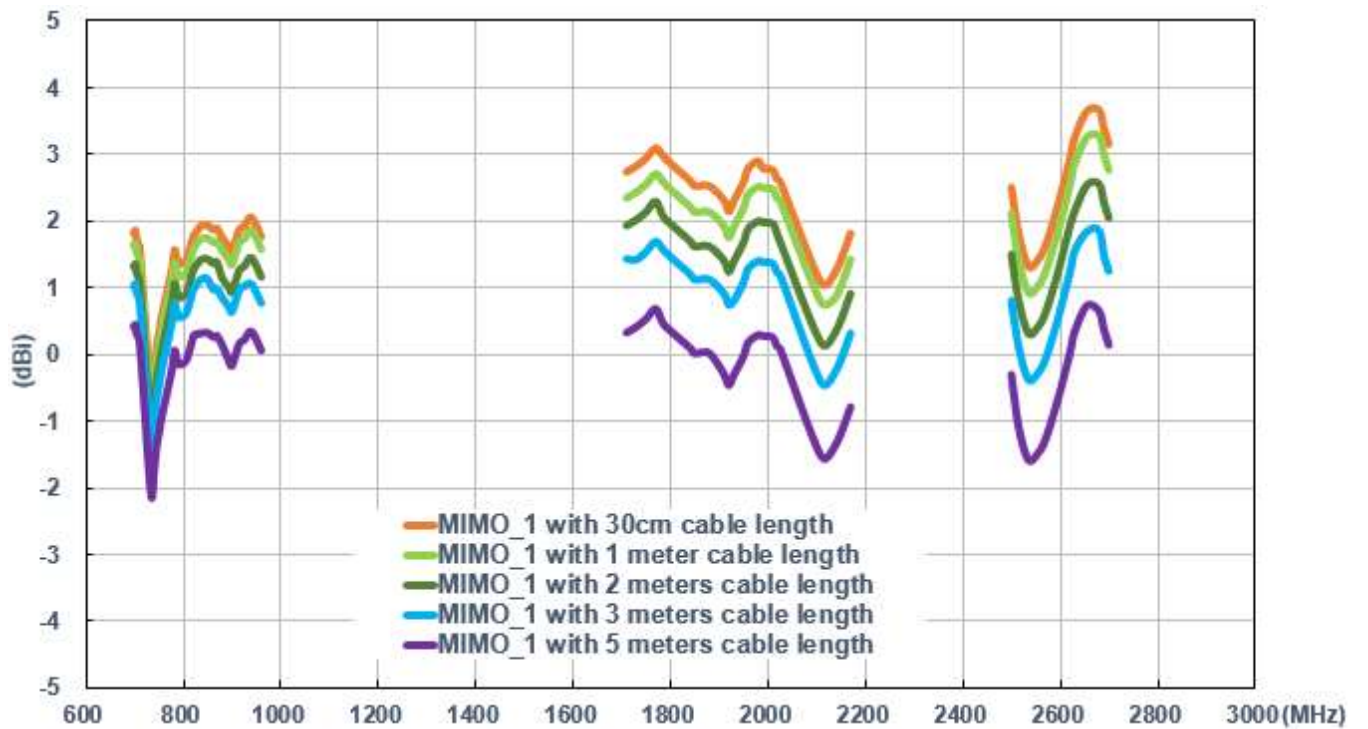
Efficiency



Average Gain

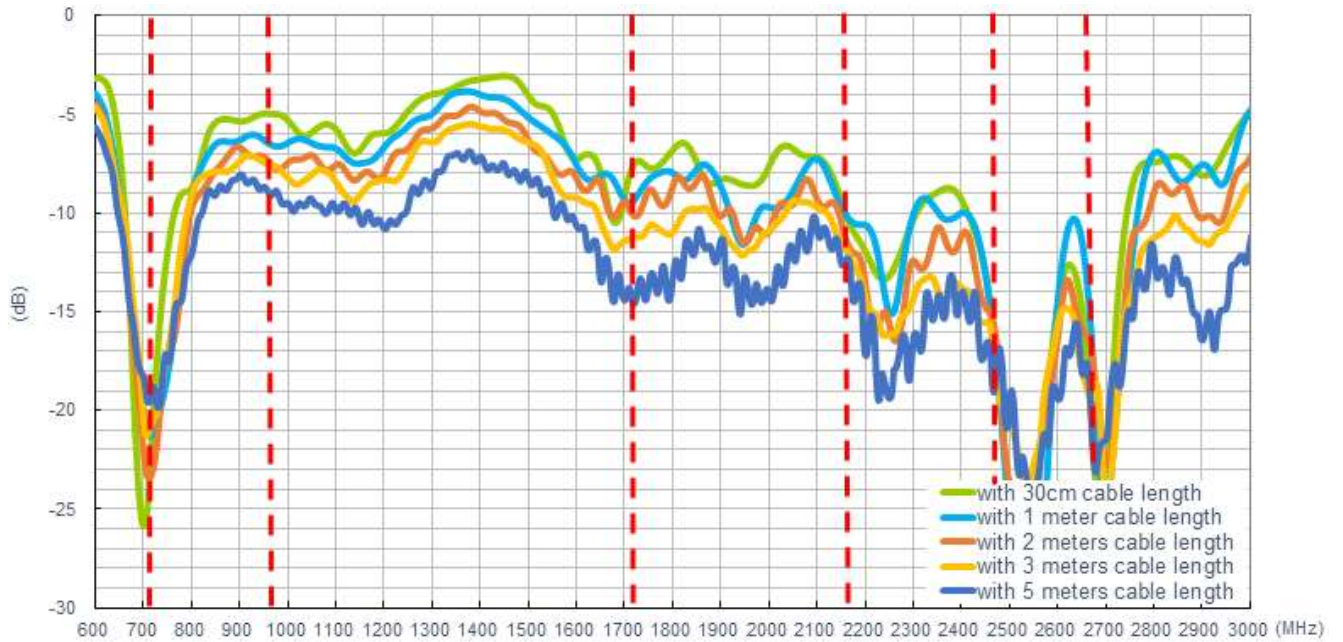


Peak Gain

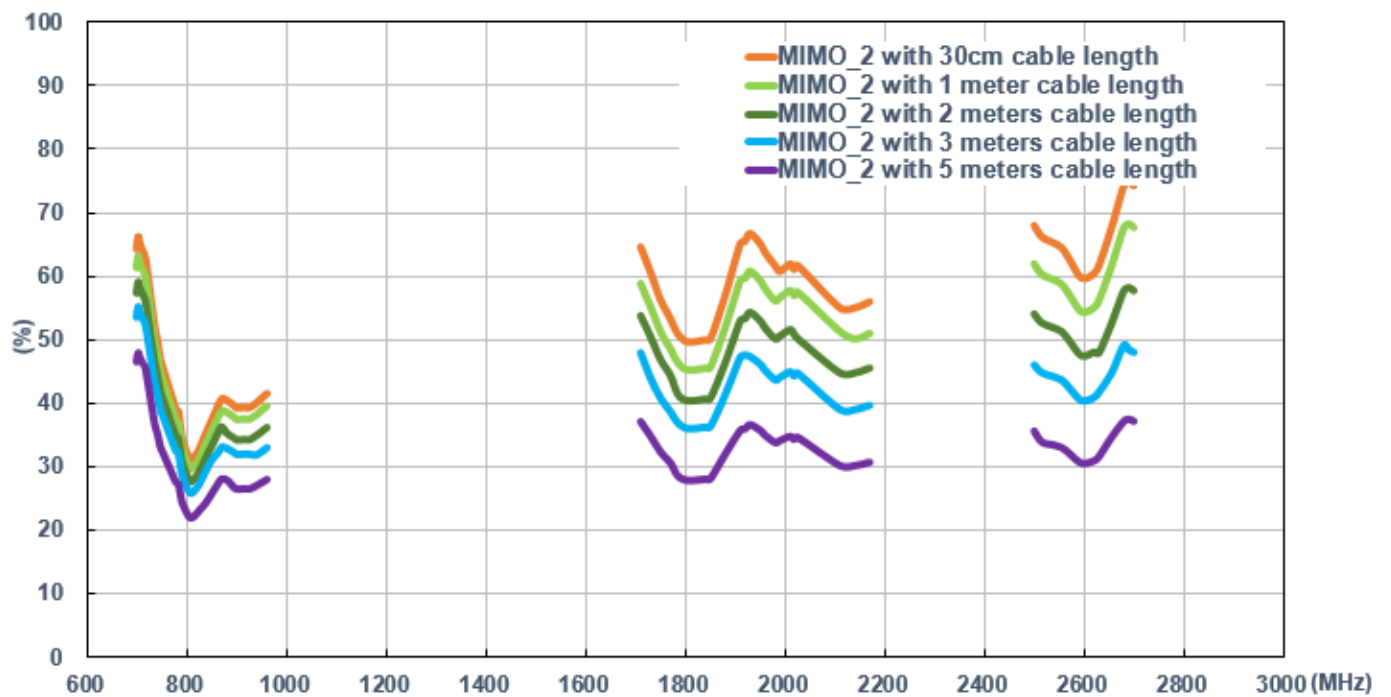


LTE MIMO 2

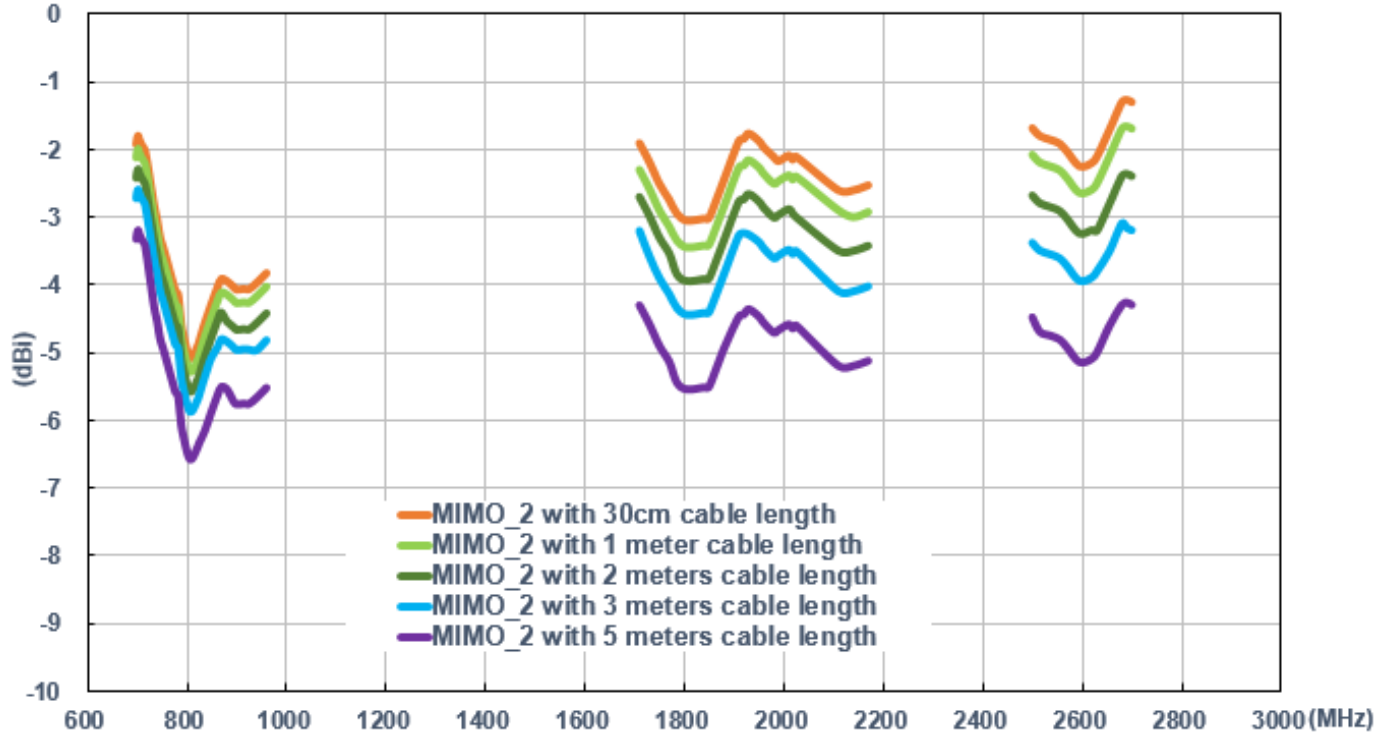
Return Loss



Efficiency



Average Gain



Peak Gain

