



TAOGLAS®



Datasheet

3-in-1 Sentinel

Part No:
MA250.A.LBI.001

Description:

Sentinel 3-in-1 Combination Adhesive Mount GNSS & 2*4G MIMO antenna

Features:

Ideal for IoT and Automotive Applications
Small High-Performance Combination Antenna
2 x Cellular 4G/3G/2G MIMO 1&2 Antennas
1 x GPS-GLONASS-GALILEO-BeiDou L1 Active Antenna
IP67 Waterproof
High Efficiency
Low Profile Housing – Only 14mm in Height
Cables: 2m TGC-200 for Cellular and 2m RG-174 for GNSS
Connector: SMA(M)
Dimensions: 139*76*14mm
RoHS & Reach Compliant

| | |
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1. Introduction



The MA250 Sentinel 3in1 Adhesive Mount 4G LTE MIMO and GPS/GLONASS/GALILEO/BeiDou L1/B1/E1 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
- :: Automotive vehicle tracking
- :: First Responder and Emergency Services
- :: 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. The antenna has an output for GPS-GLONASS-GALILEO-BeiDou for next generation location accuracy.

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 TGC-200 with SMA(M) connectors. The GPS-GLONASS-GALILEO-BeiDou cable is RG-174 with SMA(M) connector.

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 customer support team for further information.

2. Specifications

| GNSS Frequency Bands Covered | | | | | | | |
|------------------------------|-------------------------------|---------------------------|------------------|--------------------|------------------|---------------|------------------|
| GPS/QZSS | L1 1575.42MHz | L2 1227.6MHz | L5 1176.45MHz | L6 1278.75MHz | | | |
| | ■ | □ | □ | □ | | | |
| GLONASS | L5R 1176.45MHz | L3PT 1201.5MHz | L2PT 1246MHz | L1CR 1575.42MHz | L1PT 1602MHz | | |
| | □ | □ | □ | ■ | ■ | | |
| Galileo | E5a 1176.45MHz | E5b 1201.5MHz | E4 1215MHz | E3 1256MHz | E6 1278.75MHz | E2 1561MHz | L1 1575.42MHz |
| | □ | □ | □ | □ | □ | ■ | ■ |
| BeiDou | B1 1561MHz | B2 1207.14MHz | B3 1268.52MHz | | | | |
| | ■ | □ | □ | | | | |
| Compass | E5B(B2)/ E6(B3) 1268.56MHz | E2(B1) 1561MHz | | | | | |
| | □ | ■ | | | | | |
| SBAS | Omnistar 1542.5MHz | WAAS/EGN OS 1575.42MHz | | | | | |
| | □ | ■ | | | | | |

| GNSS Electrical | | | |
|---|-----------|---------|------|
| Frequency (MHz) | 1561 | 1575.42 | 1602 |
| VSWR (max.) | 3:1 | 3:1 | 3:1 |
| Passive Antenna Efficiency (%) (Without cable loss) | 62.2 | 65.9 | 75.1 |
| Passive Antenna Peak Gain at Zenith (dBi) (Without cable loss) | 1.7 | 4.2 | 3 |
| Average Gain | -2 | -1.8 | -1.3 |
| Axial Ratio (dB) | 9 | 12.5 | 20.6 |
| Polarization | RHCP | | |
| Impedance | 50Ω | | |
| Cable | 2m RG-174 | | |
| Connector | SMA(M)ST | | |

| LNA and Filter Electrical Properties | | | |
|--|-------------|----------------|-------------|
| Frequency (MHz) | 1561 | 1575.42 | 1602 |
| VSWR (max.) | 2:1 | 2:1 | 2:1 |
| Gain@1.8V (Typ.) | 25.3 | 25.3 | 25.3 |
| Gain@3.0V (Typ.) | 28.6 | 28.6 | 28.6 |
| Gain@5.5V (Typ.) | 32.8 | 32.8 | 32.8 |
| Noise@1.8V (Typ.) | 2.3 | 2.3 | 2.3 |
| Noise@3.0V (Typ.) | 2.7 | 2.7 | 2.7 |
| Noise@5.5V (Typ.) | 3 | 3 | 3 |
| Power consumption@1.8V (Typ.) | 5mA | | |
| Power consumption@3.0V (Typ.) | 10mA | | |
| Power consumption@5.5V (Typ.) | 23mA | | |
| Total Specification (Through Antenna, SAW Filter and LNA) | | | |
| Frequency (MHz) | 1561 | 1575.42 | 1602 |
| Gain@3V (dBi) | 28.1 | 28.6 | 27.8 |
| Output Impedance | 50 Ω | | |
| Return Loss | <-10dB | | |

| 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 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 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 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 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 | -3.87 | -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 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 |

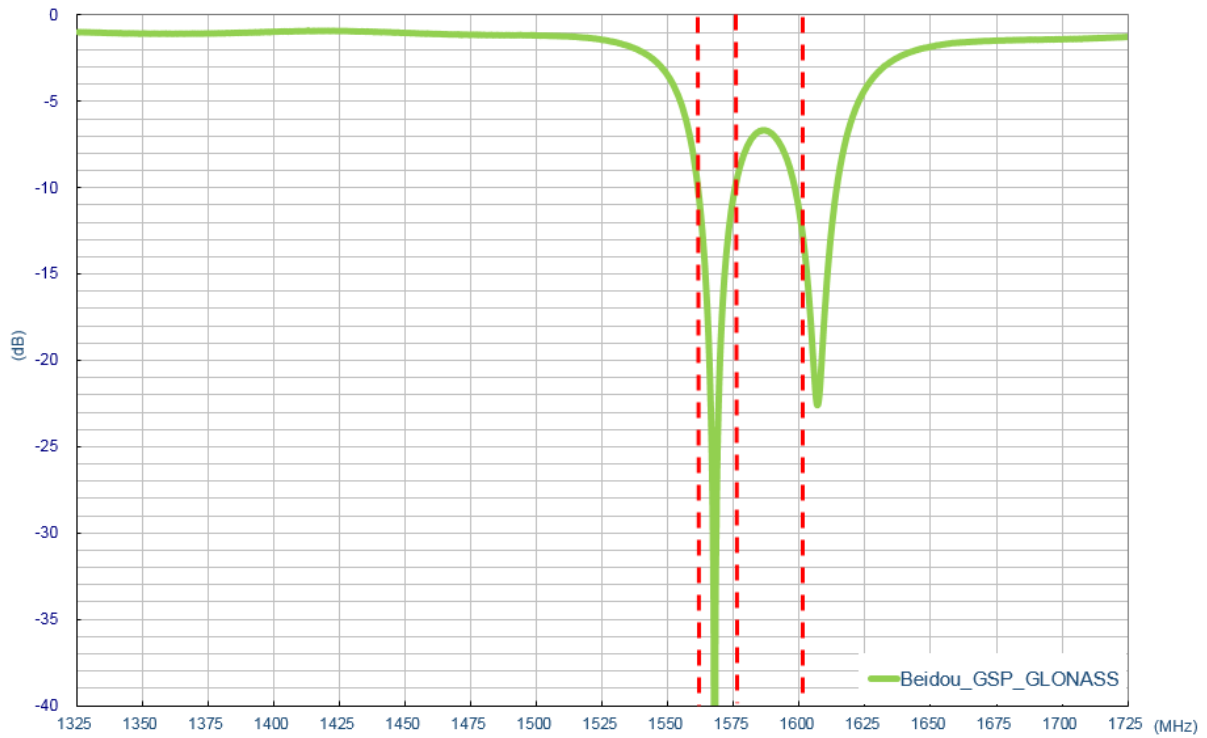
| | | | | | | | | |
|-----------------------|------|-------|-------|-------|-------|-------|-------|-------|
| On glass base | 30cm | -3.65 | -2.56 | -2.34 | -1.99 | -1.95 | -2.60 | -2.50 |
| | 1m | -3.85 | -2.76 | -2.54 | -2.39 | -2.34 | -2.95 | -2.90 |
| | 2m | -4.15 | -3.09 | -2.94 | -2.84 | -2.84 | -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 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 |

| 5G/4G Bands | | | |
|-------------|--|----------------------|---------|
| Band Number | 5G NR / FR1 / 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 | ✓ |
| 18 | UL: 815 to 830 | DL: 860 to 875 | ✓ |
| 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 | ✓ |
| 24 | UL: 1625.5 to 1660.5 | DL: 1525 to 1559 | ✓ |
| 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 | ✓ |
| 28 | UL: 703 to 748 | DL: 758 to 803 | ✓ |
| 29 | UL: - | DL: 717 to 728 | ✓ |
| 30 | UL: 2305 to 2315 | DL: 2350 to 2360 | ✓ |
| 31 | UL: 452.5 to 457.5 | DL: 462.5 to 467.5 | ✗ |
| 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 | ✗ |
| 48 | | 3550 to 3700 | ✗ |
| 66 | UL: 1710-1780 | DL: 2110-2200 | ✗ |
| 71 | | 617 to 698 | ✗ |
| 74/75/76 | | 1427 to 1518 | ✗ |
| 77 | | 3300 to 4200 | ✗ |
| 78 | | 3300 to 3800 | ✗ |
| 79 | | 4400 to 5000 | ✗ |

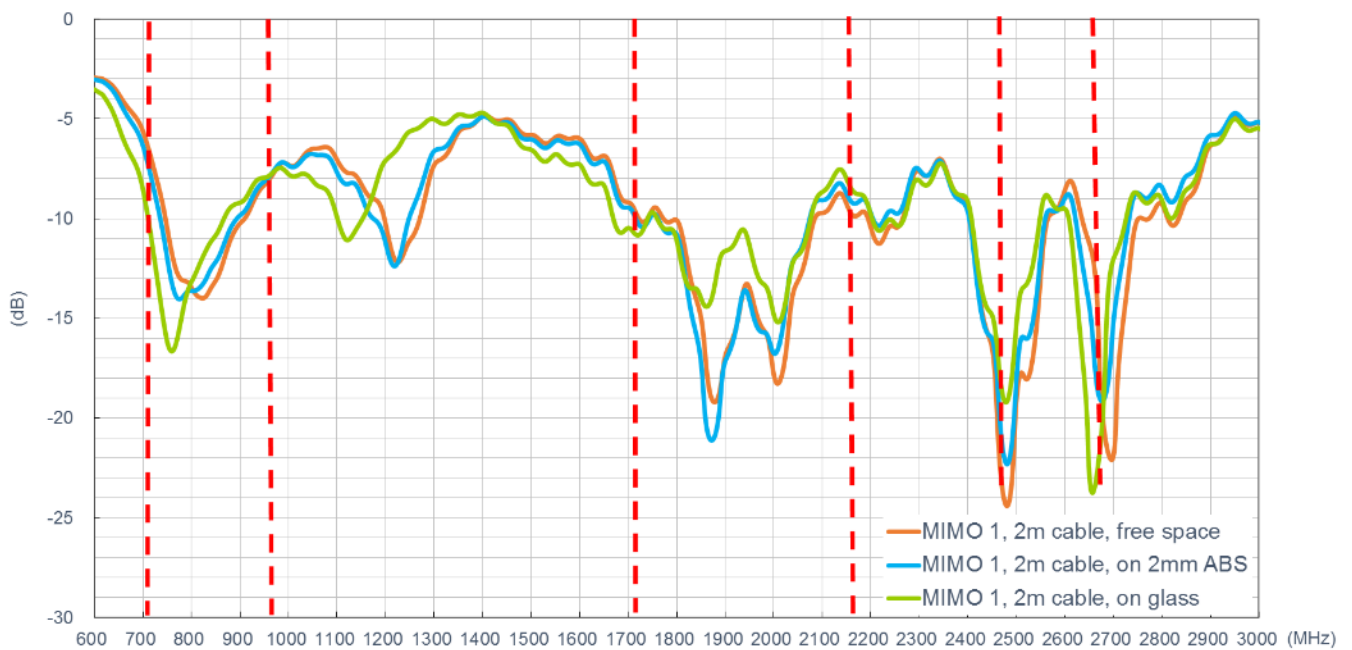
| Mechanical | |
|----------------------|---|
| Dimension | 139.27*76.27*14mm |
| Casing | ABS |
| Cable | GNSS: 2m RG-174 Cellular: 2m TGC-200 |
| Connector | SMA(M)ST |
| Weight | 280g |
| Adhesive | 3M 1600TB-10 |
| Environmental | |
| Ingress Protection | IP67 |
| Temperature Range | -40°C to 85°C |
| Humidity | Non-condensing 65°C 95% RH |

3. Antenna Characteristics

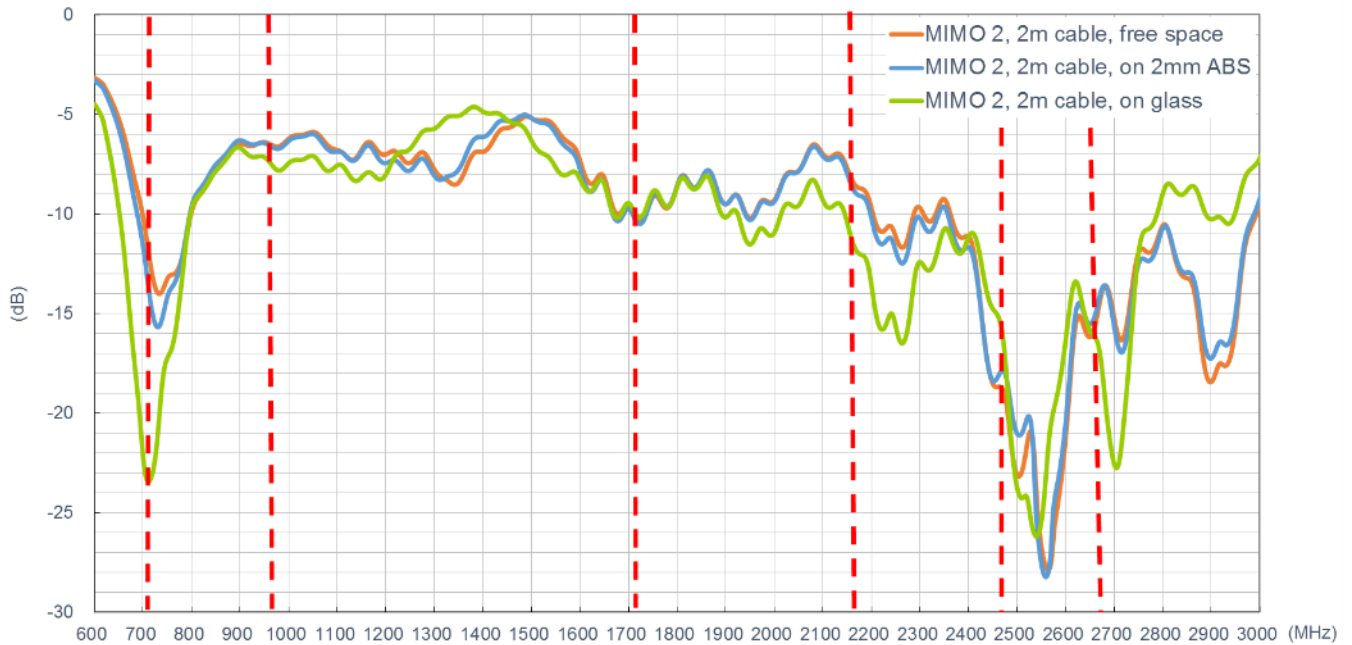
3.1 Return Loss – GNSS



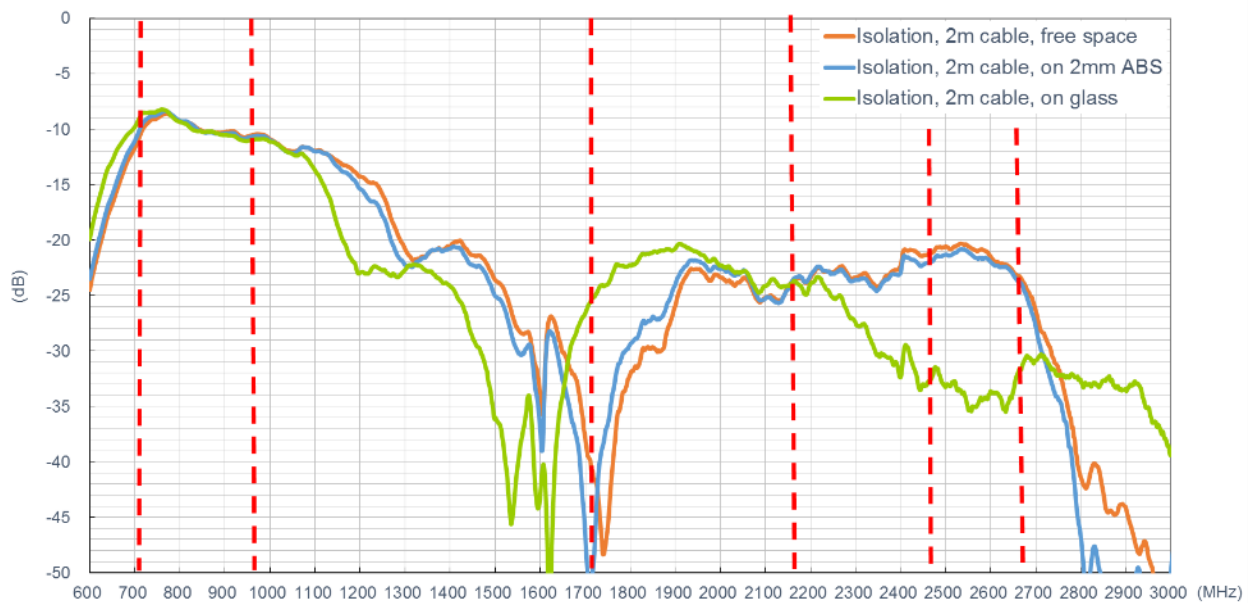
3.2 Return Loss – 4G MIMO 1



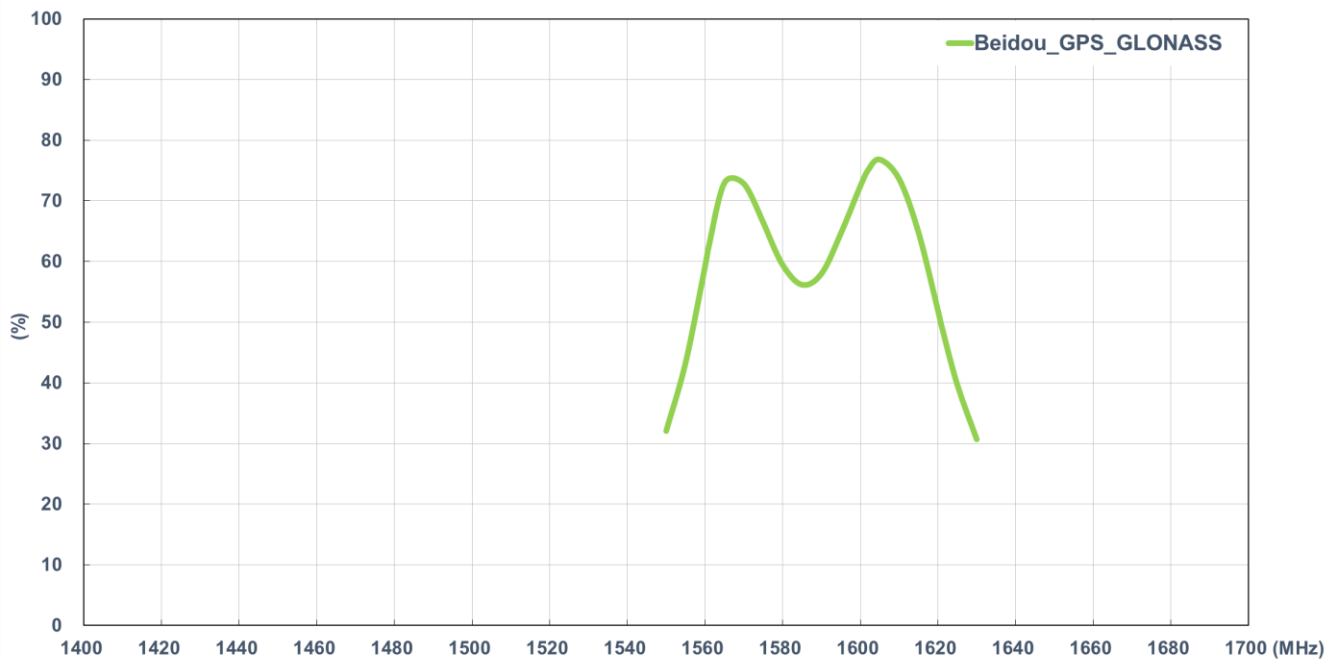
3.3 Return Loss – 4G MIMO 2



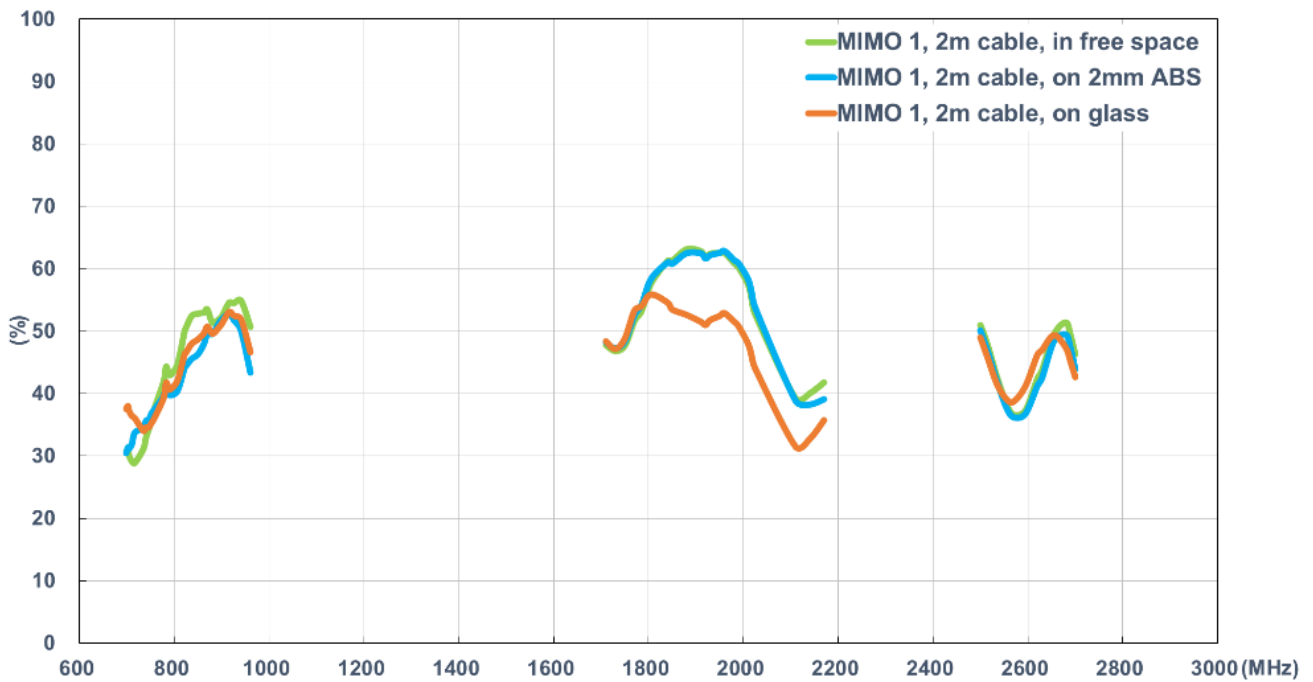
3.4 Isolation



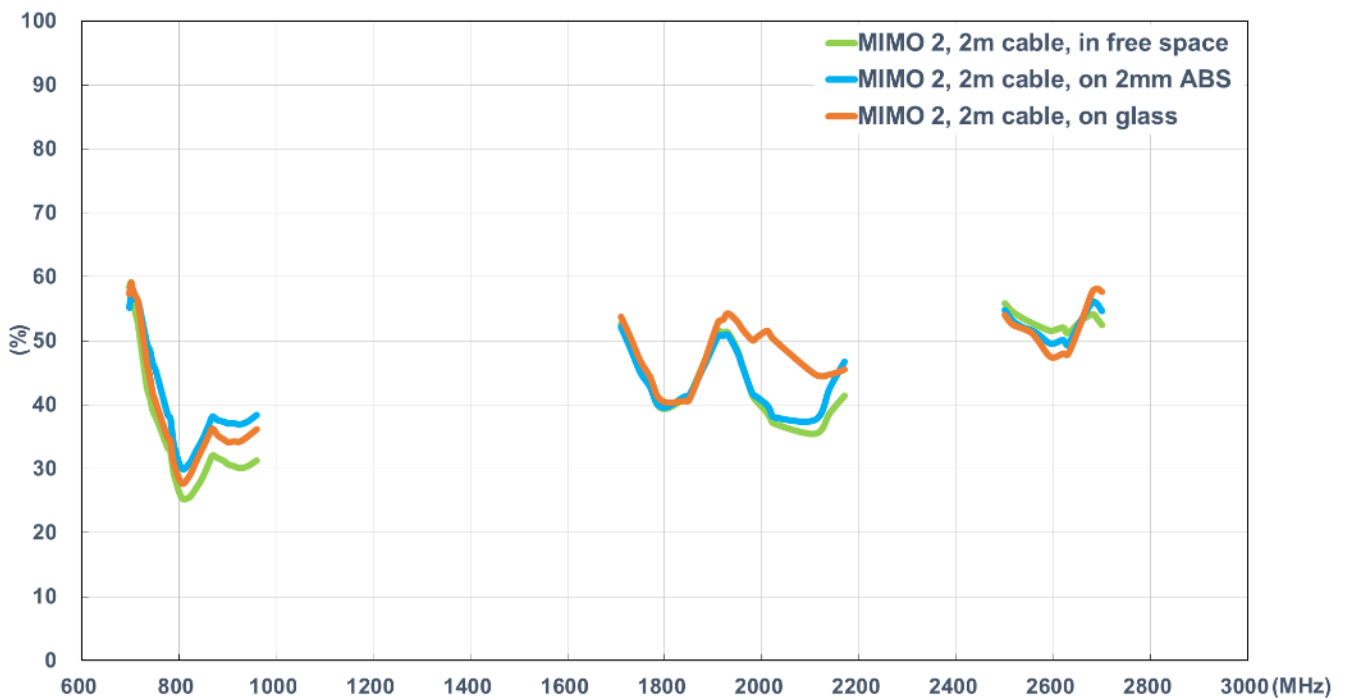
3.5 Efficiency – GNSS



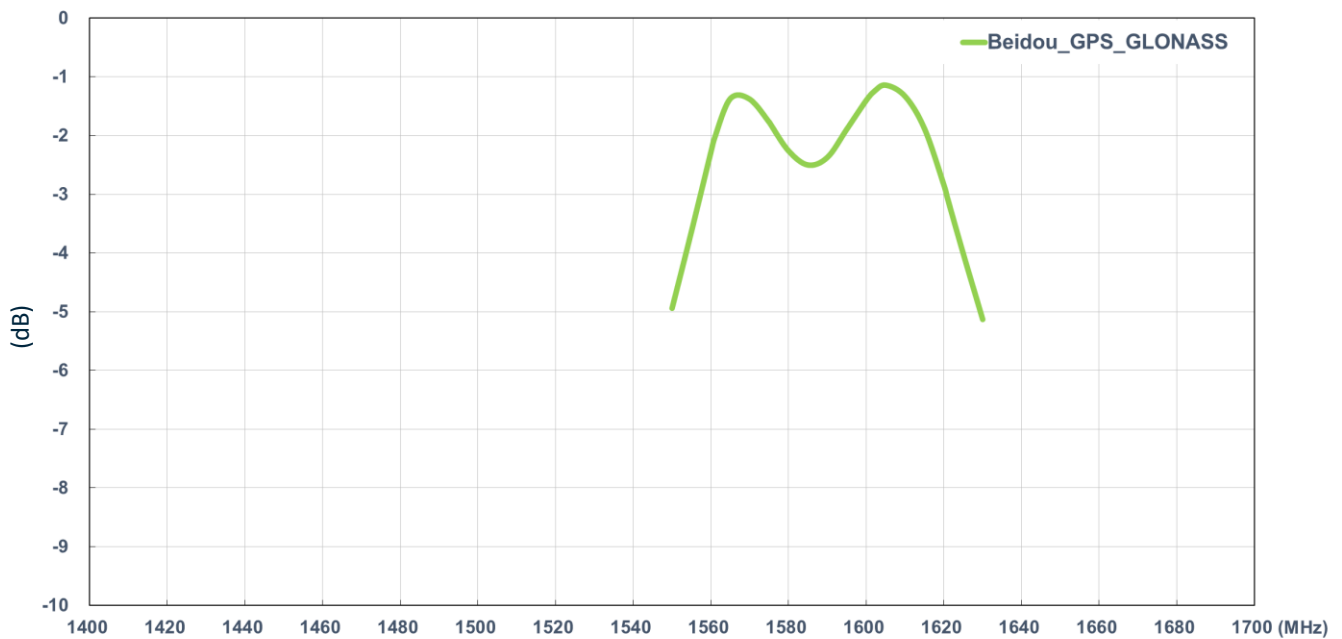
3.6 Efficiency – 4G MIMO 1



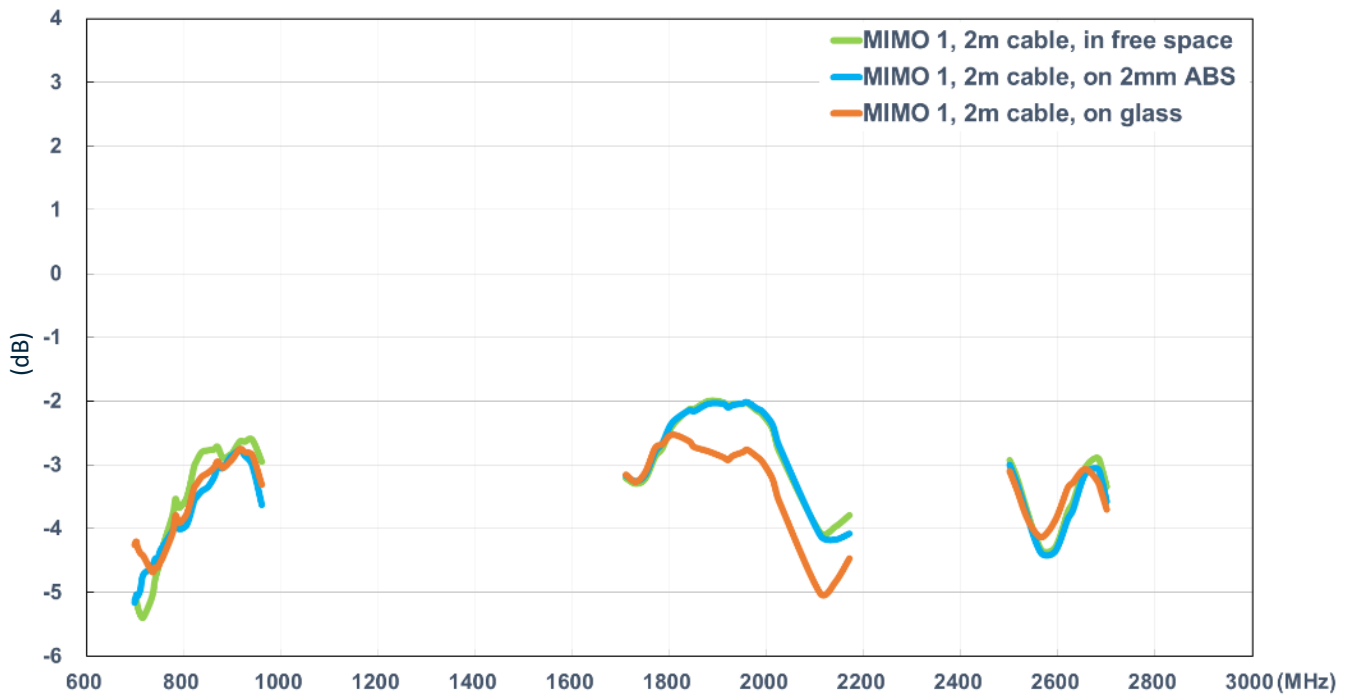
3.7 Efficiency – 4G MIMO 2



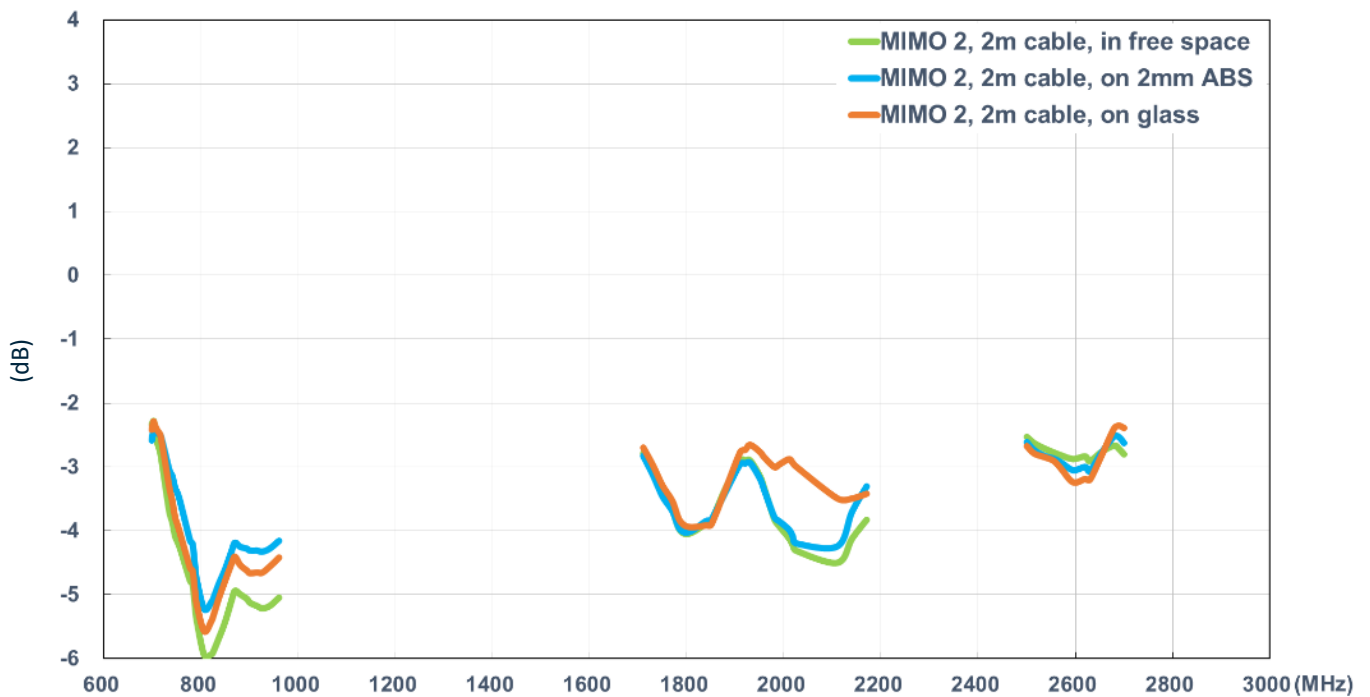
3.8 Average Gain - GNSS



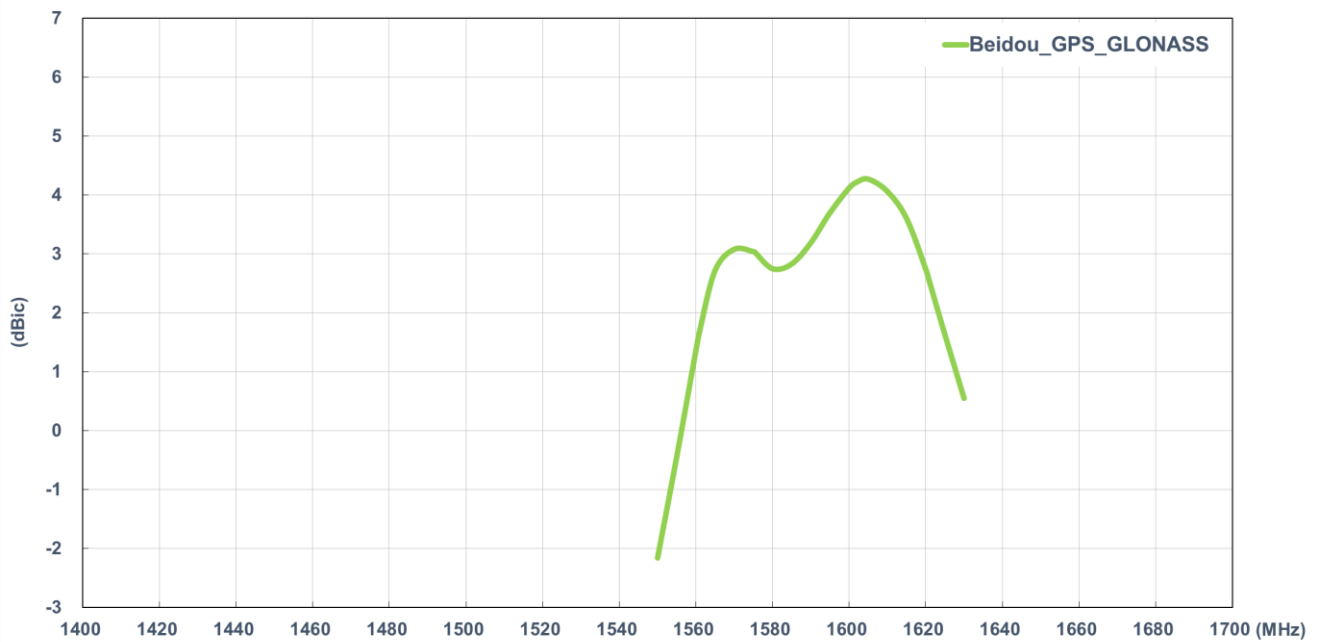
3.9 Average Gain – 4G MIMO 1



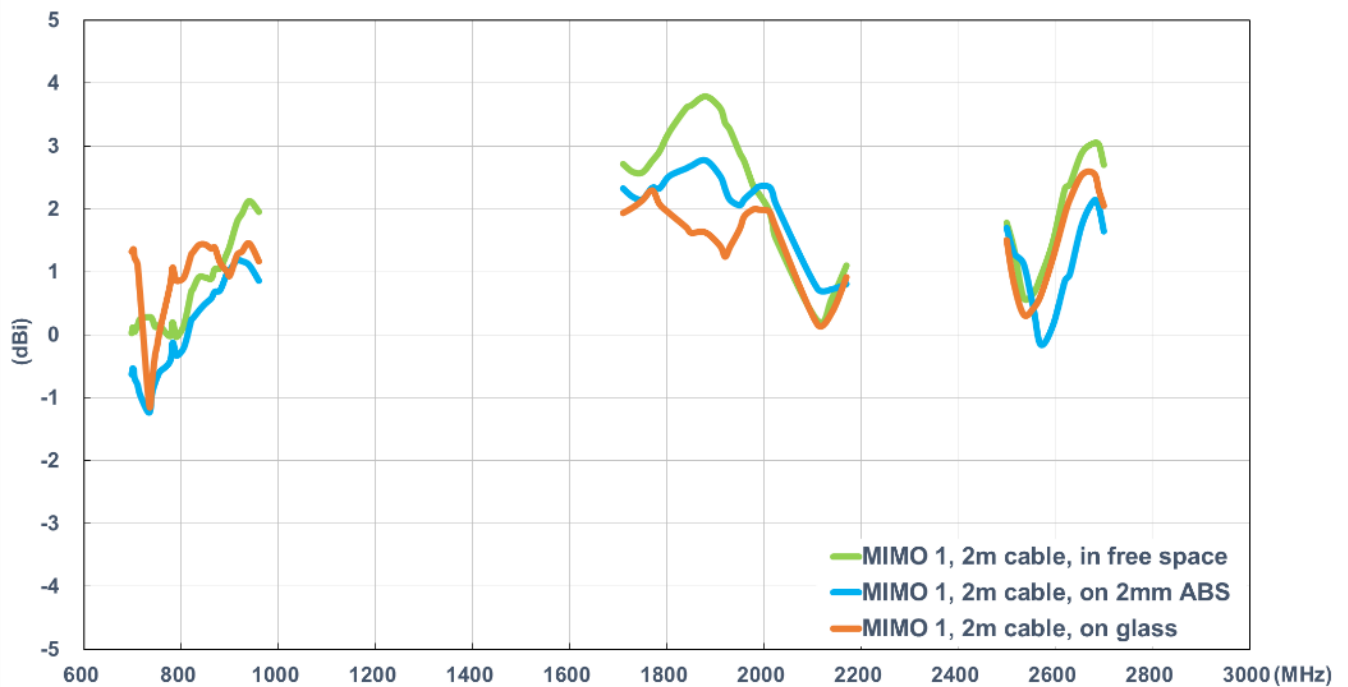
3.10 Average Gain – 4G MIMO 2



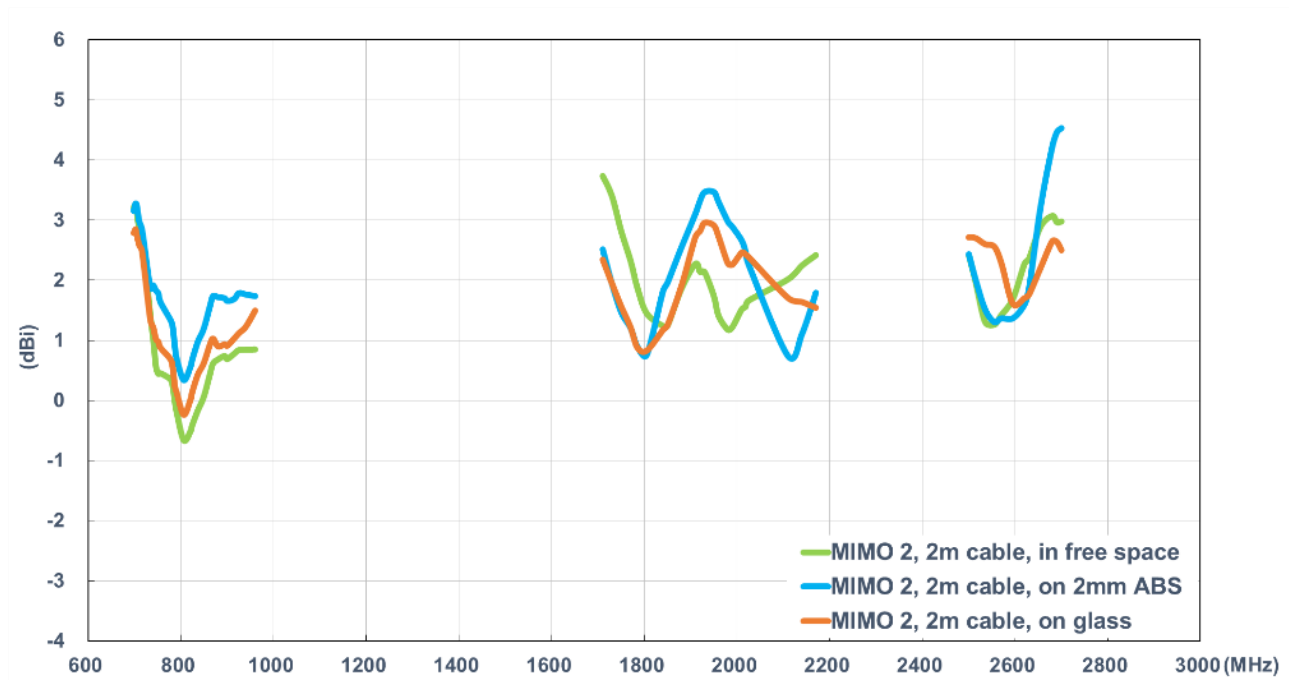
3.11 Peak Gain – GNSS



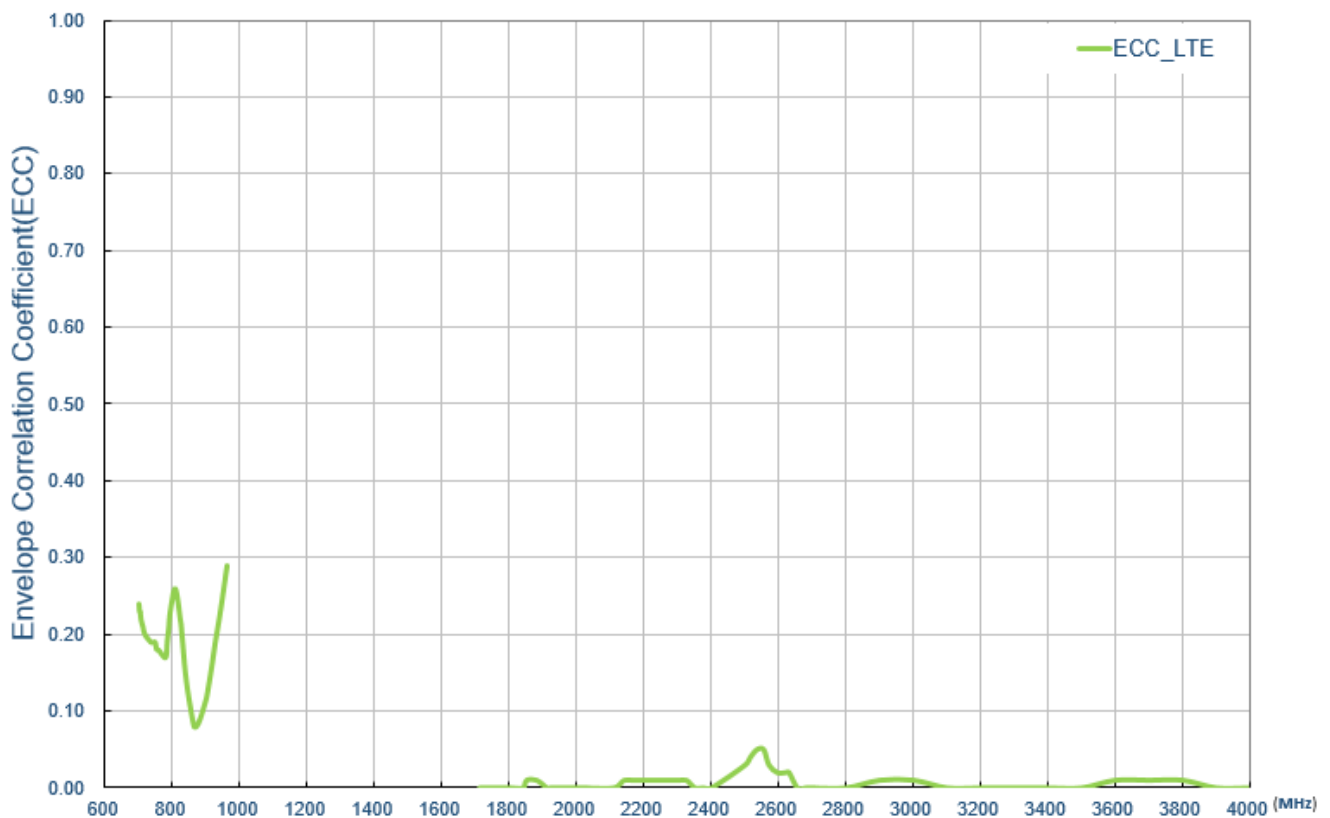
3.12 Peak Gain – 4G MIMO 1



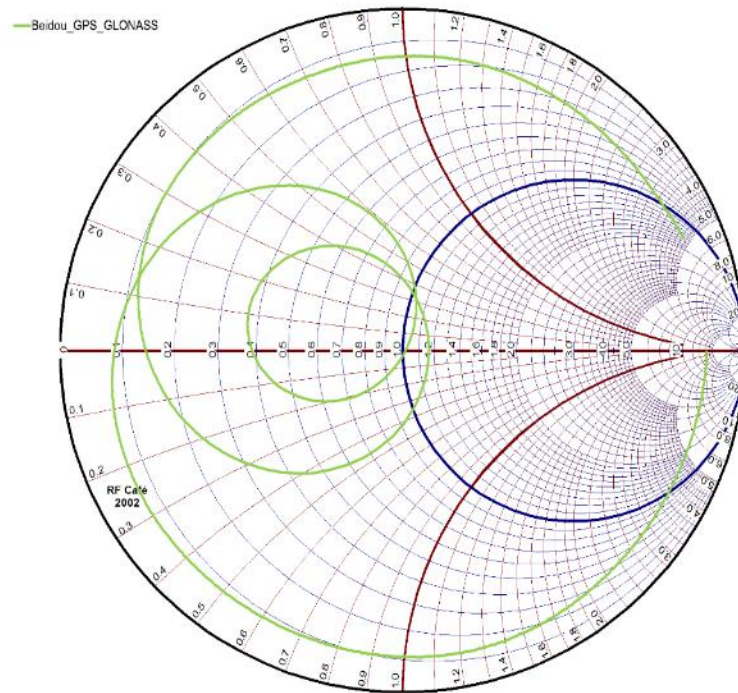
3.13 Peak Gain – 4G MIMO 2



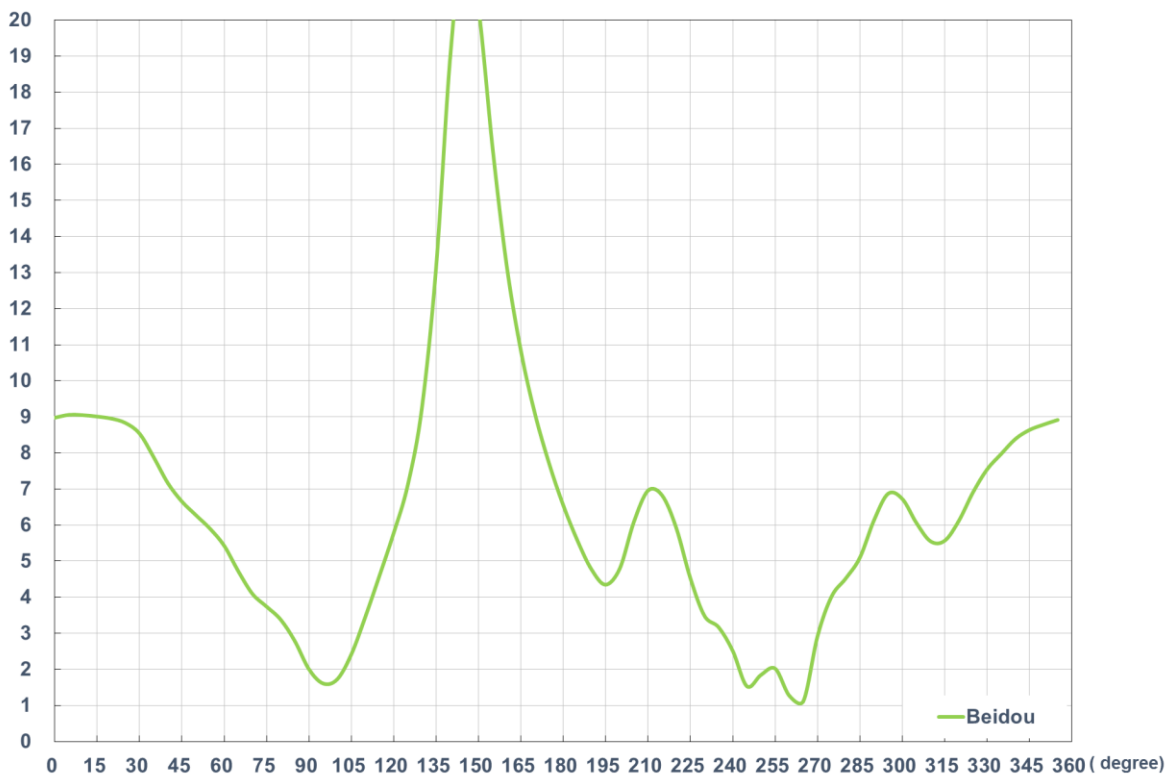
3.14 Envelope Correlation Coefficient



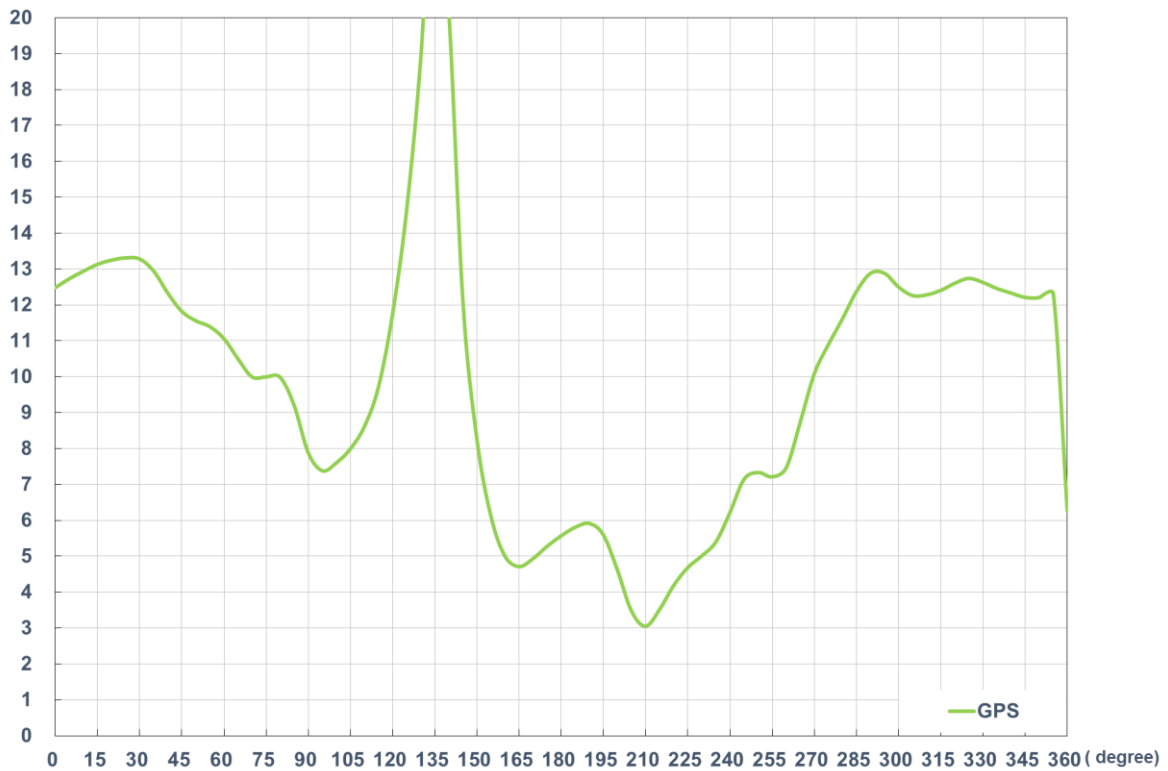
3.15 Smith Chart – GNSS



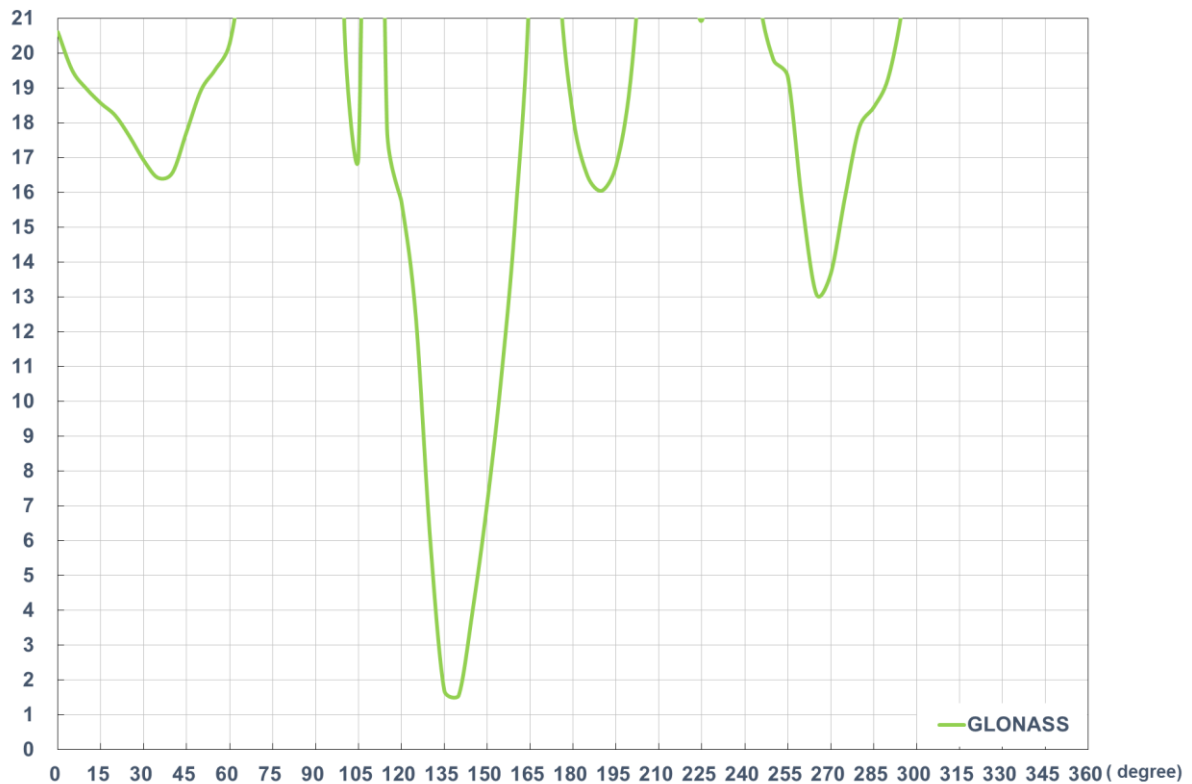
3.16 Axial Ratio – BeiDou



3.17 Axial Ratio – GPS/Galileo

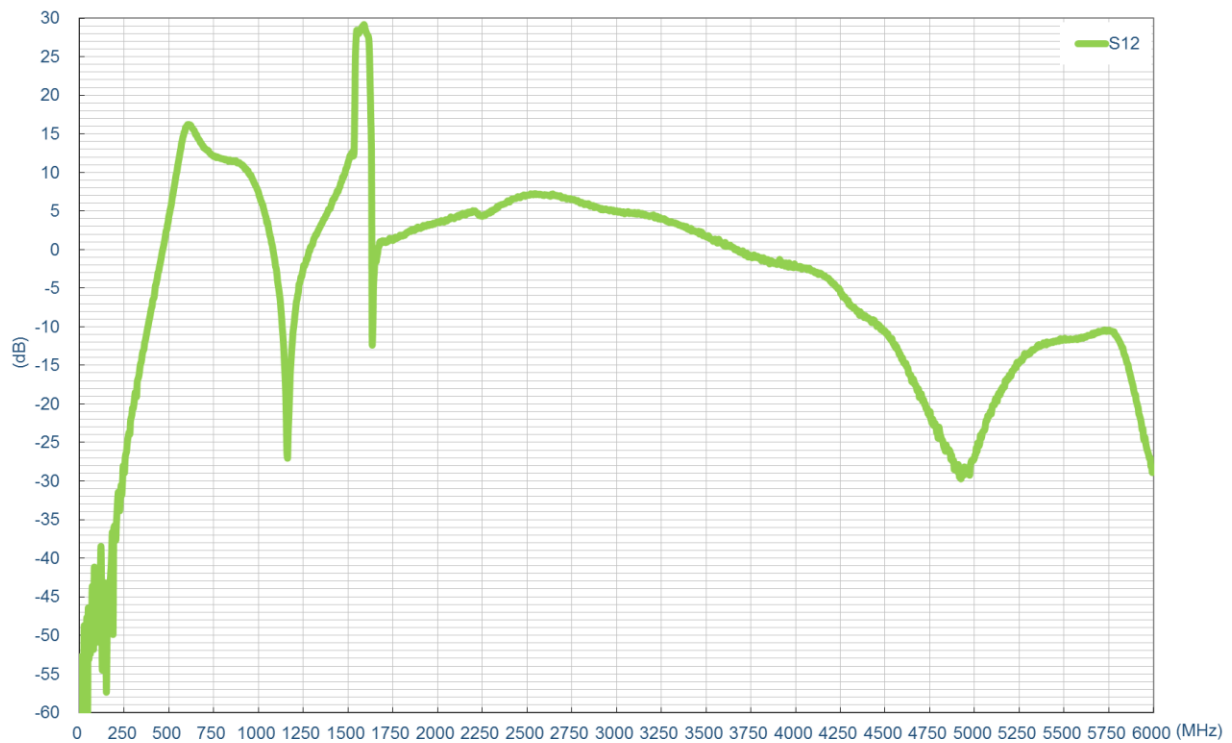


3.18 Axial Ratio – GLONASS

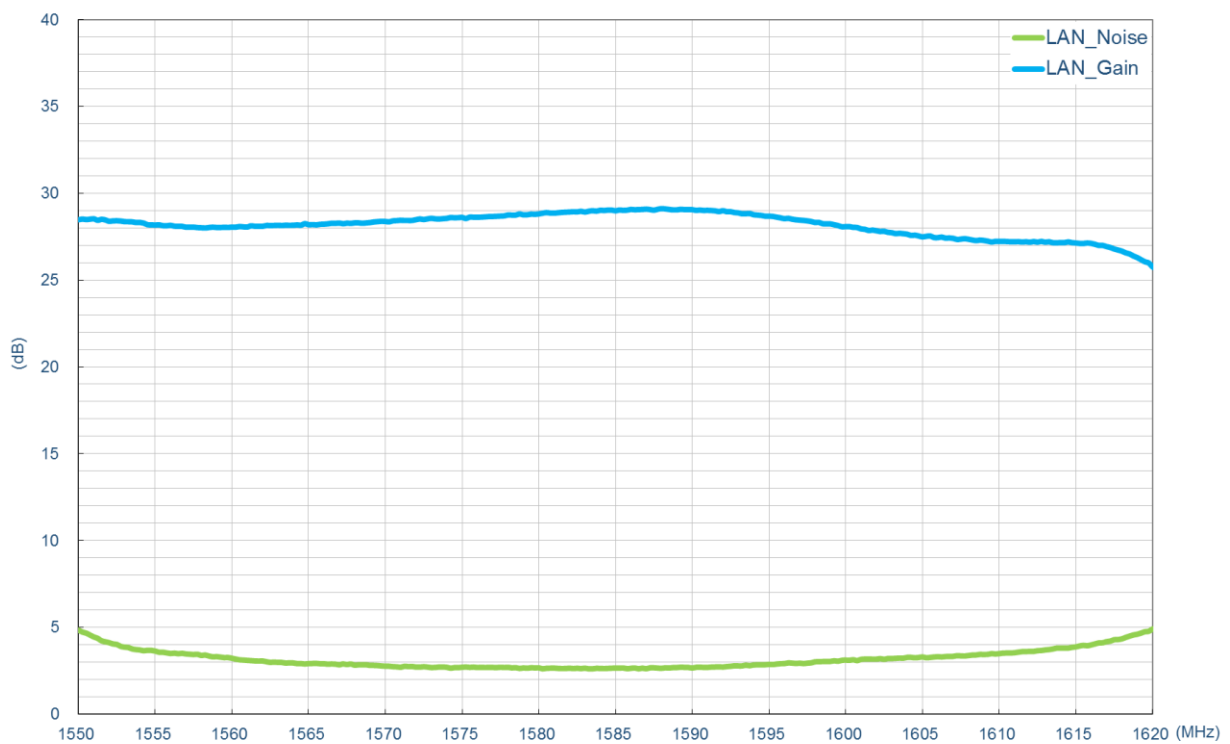


3.19 LNA Gain and Noise Figure @ 3V

LNA Gain @ 3V

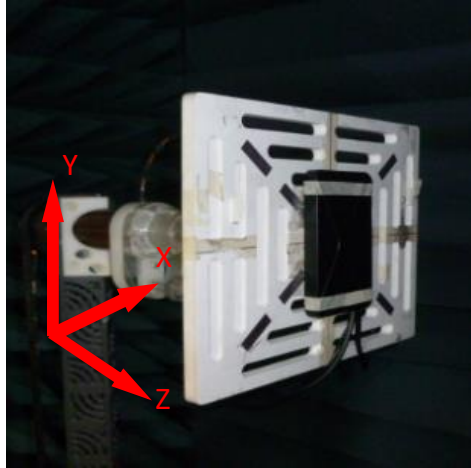


LNA Noise @ 3V

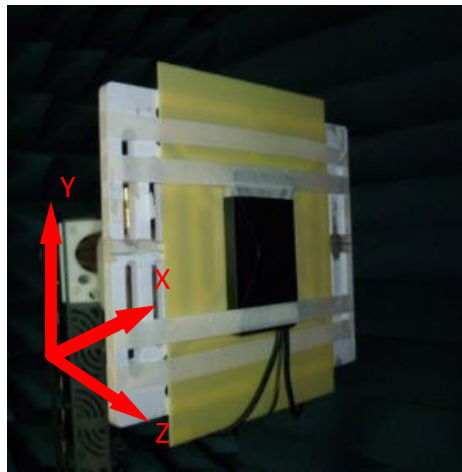


4. Radiation Patterns

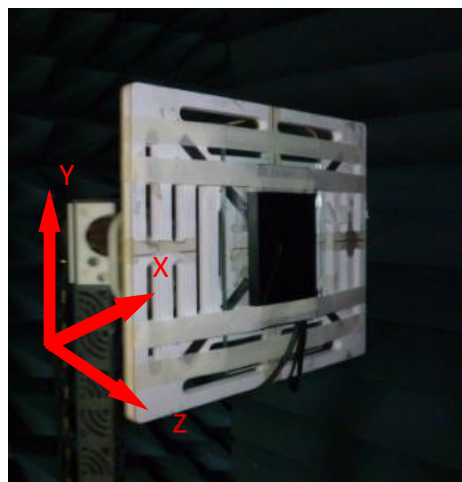
4.1 Test Setup



Free Space



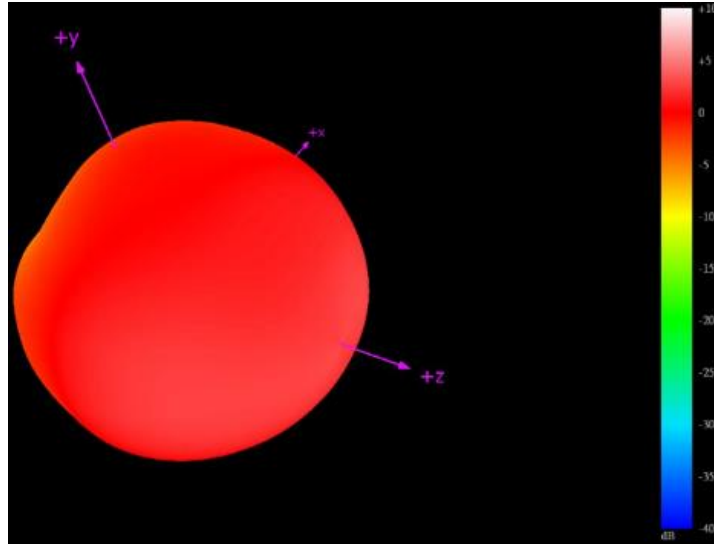
2mm ABS



On Glass Base

4.2 GNSS 3D and 2D Radiation Patterns

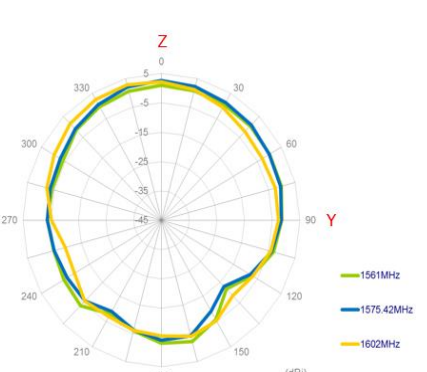
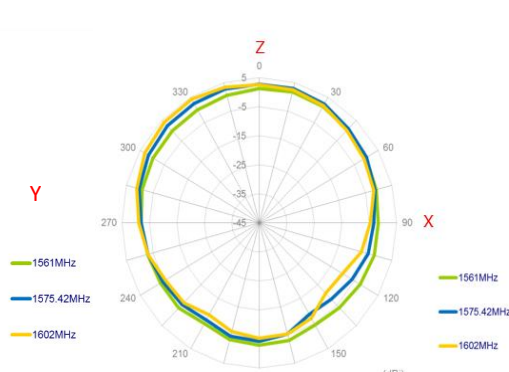
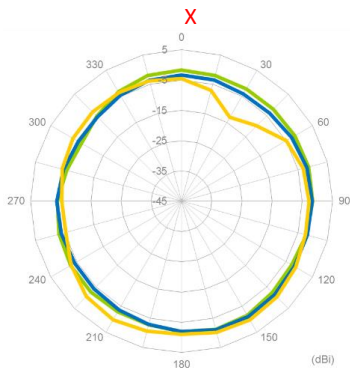
1575.42MHz



XY Plane

XZ Plane

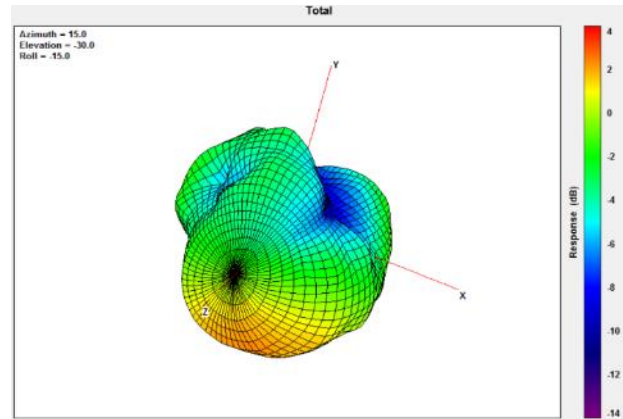
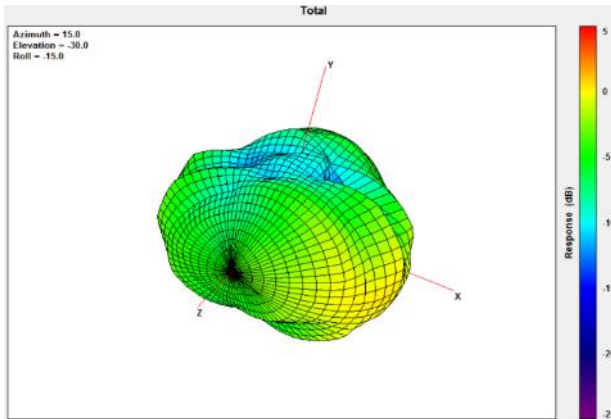
YZ Plane



4.3 4G MIMO 1 3D and 2D Radiation Patterns – Free Space

704MHz

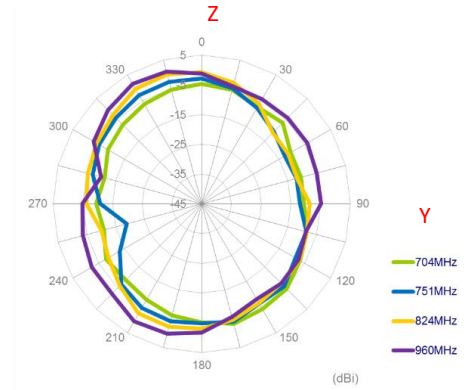
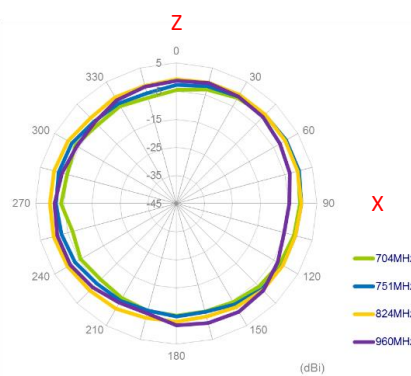
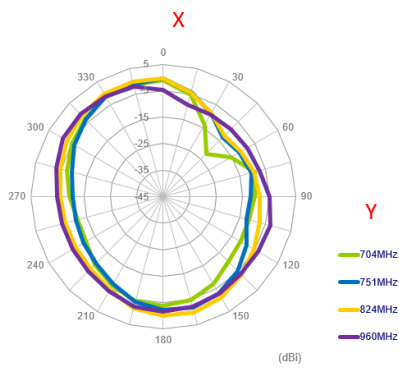
960MHz



XY Plane

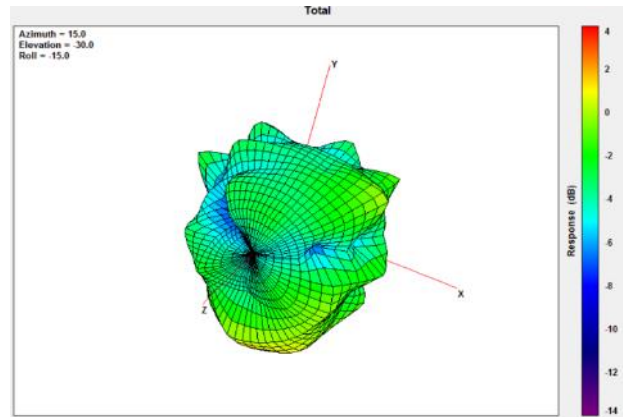
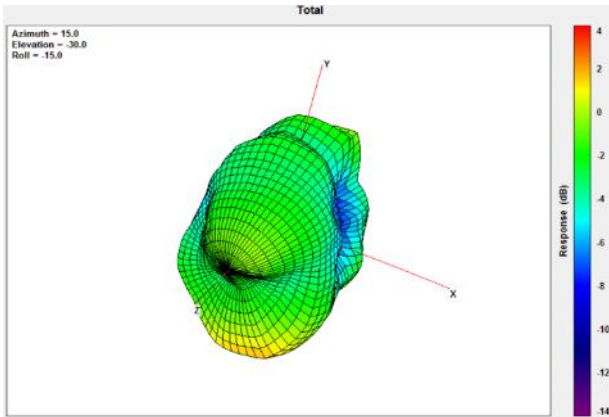
XZ Plane

YZ Plane



1710MHz

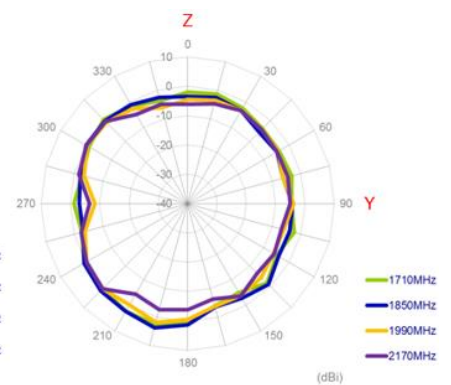
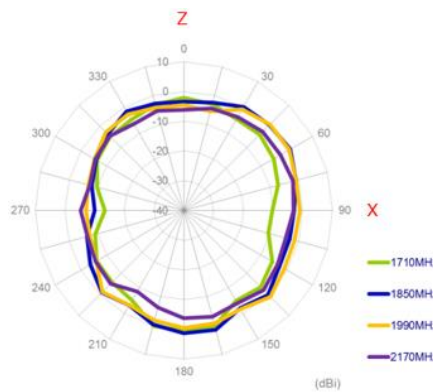
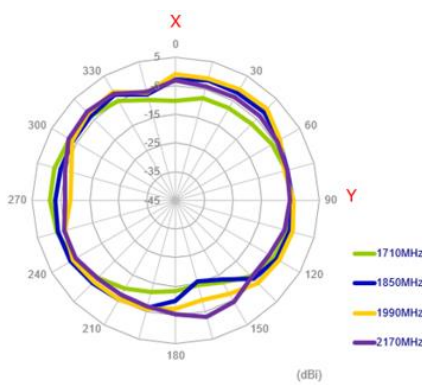
2170MHz



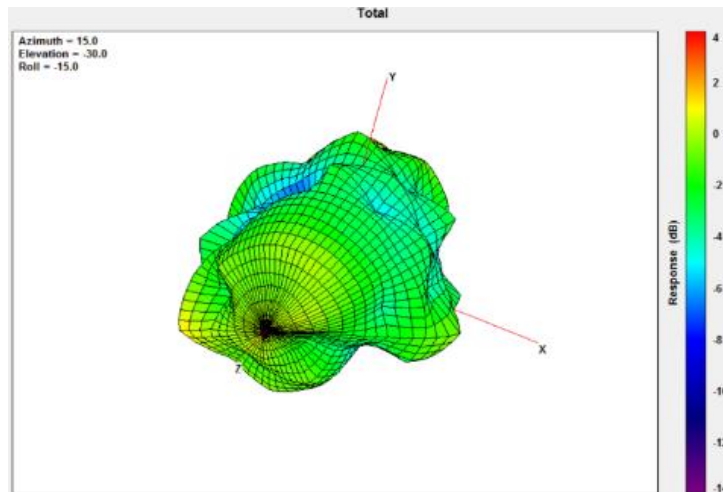
XY Plane

XZ Plane

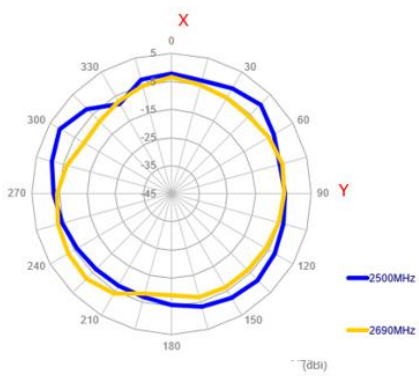
YZ Plane



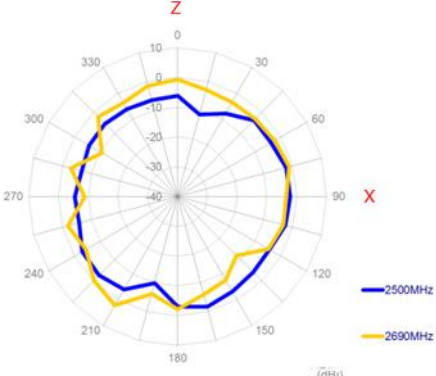
2690MHZ



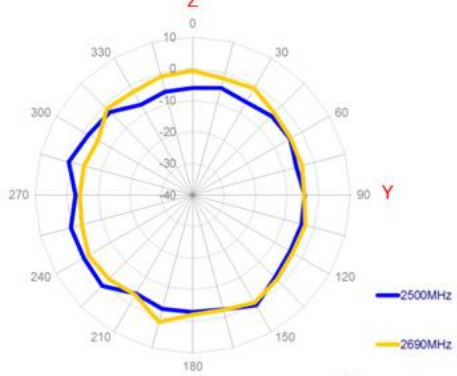
XY Plane



XZ Plane



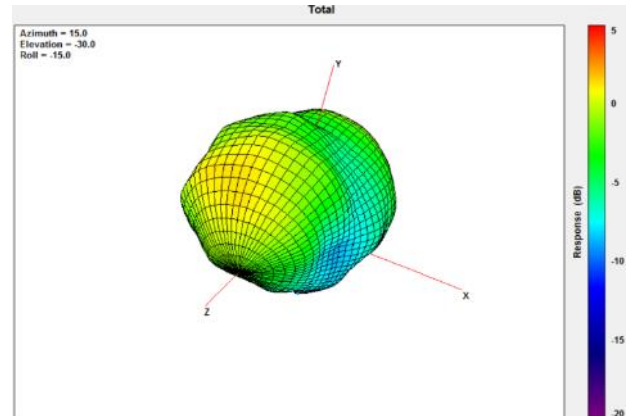
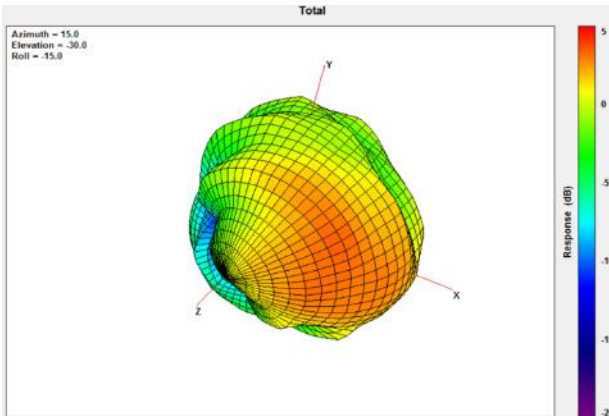
YZ Plane



4.4 4G MIMO 2 3D and 2D Radiation Patterns – Free Space

704MHz

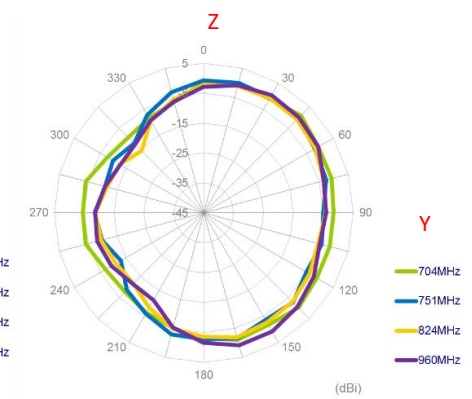
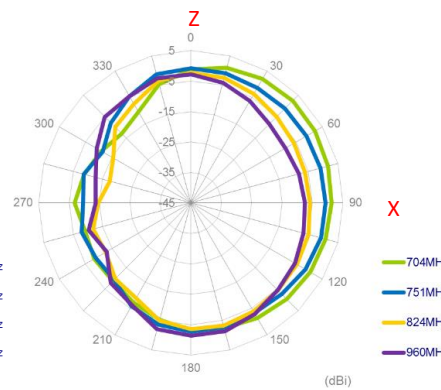
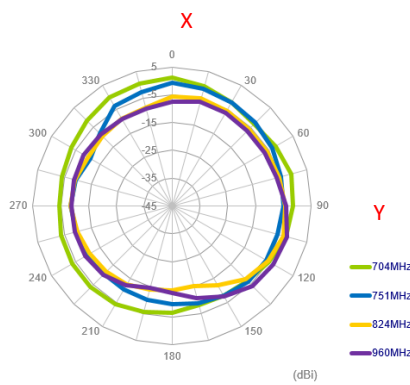
960MHz



XY Plane

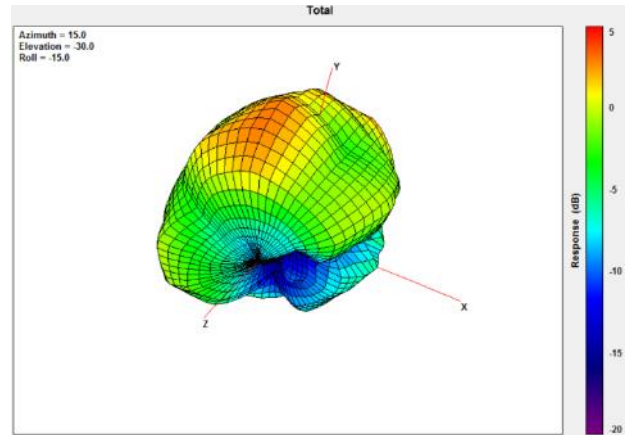
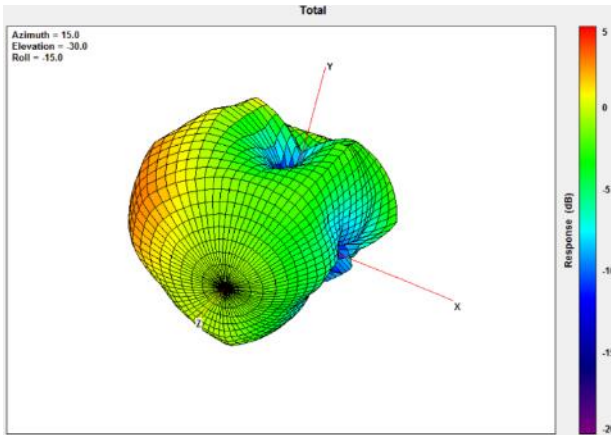
XZ Plane

YZ Plane



1710MHz

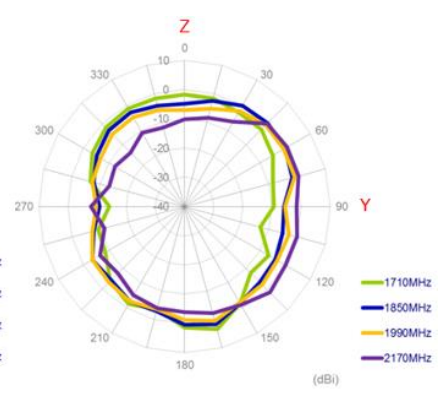
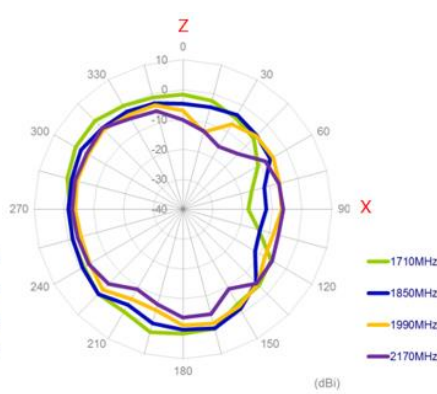
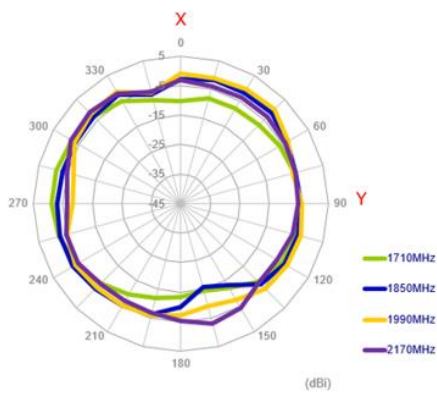
2170MHz



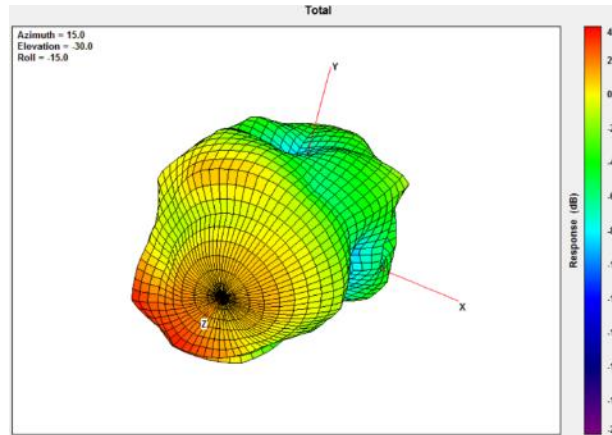
XY Plane

XZ Plane

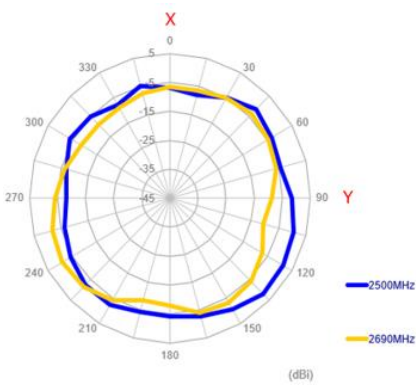
YZ Plane



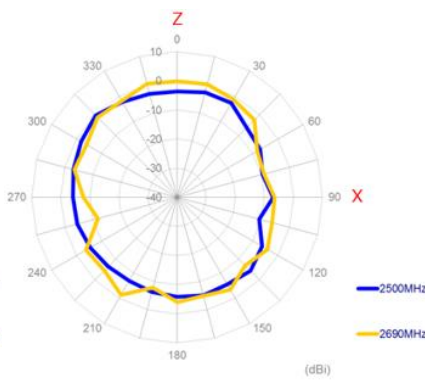
2690MHZ



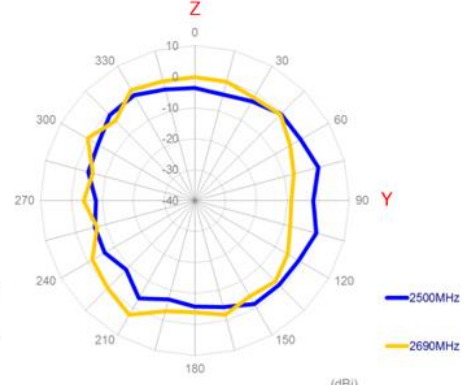
XY Plane



XZ Plane



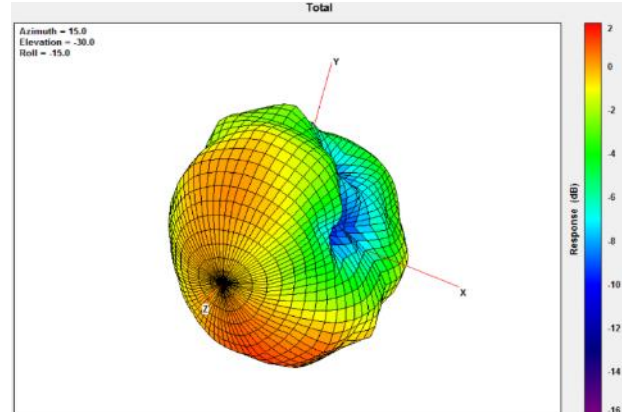
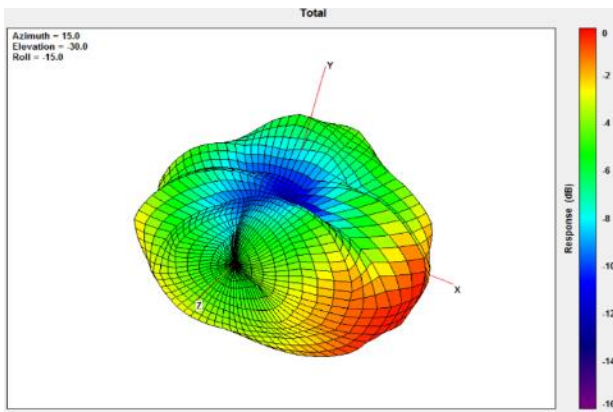
YZ Plane



4.3 4G MIMO 1 3D and 2D Radiation Patterns – 2mm ABS

704MHz

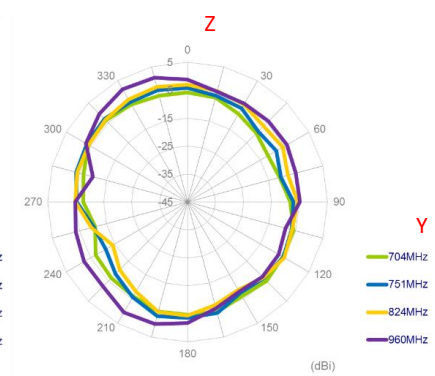
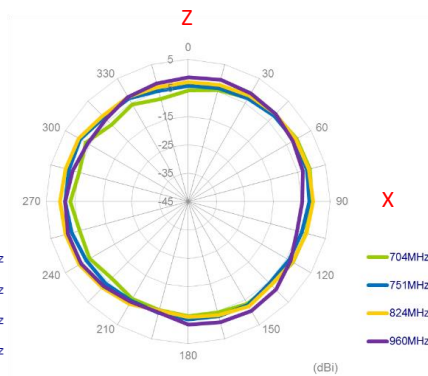
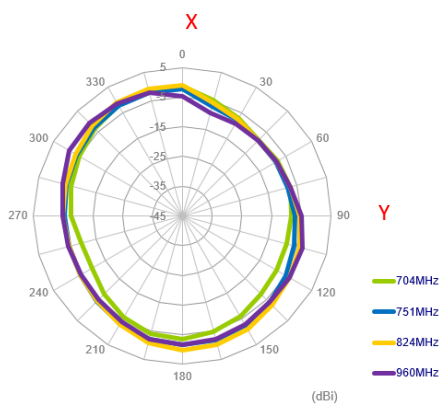
960MHz



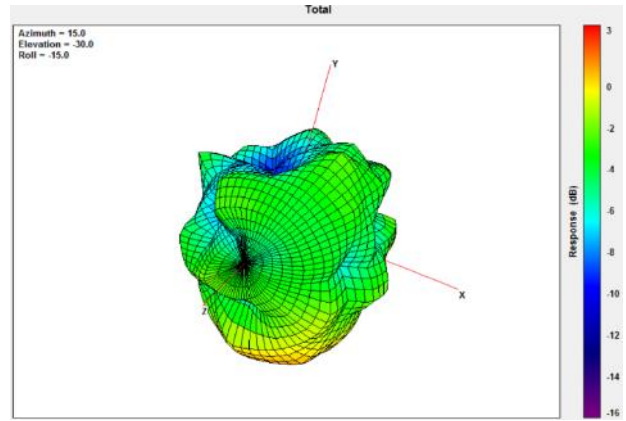
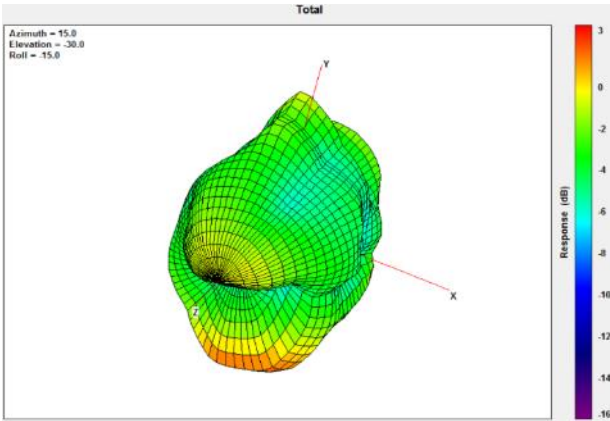
XY Plane

XZ Plane

YZ Plane



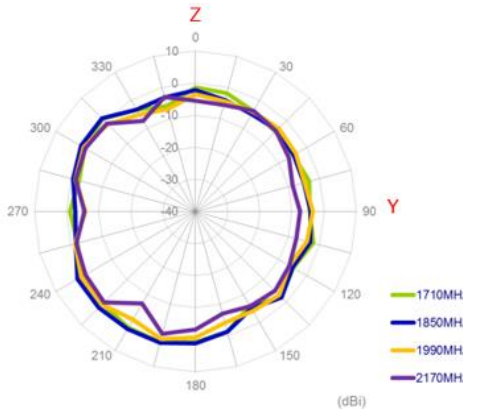
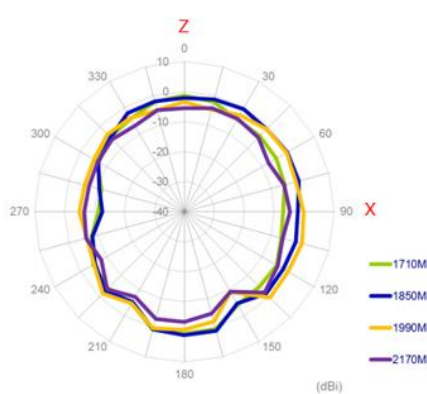
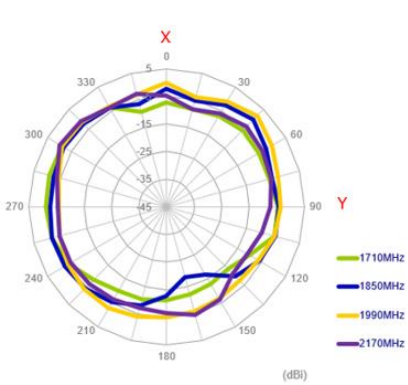
1710MHz **2170MHz**



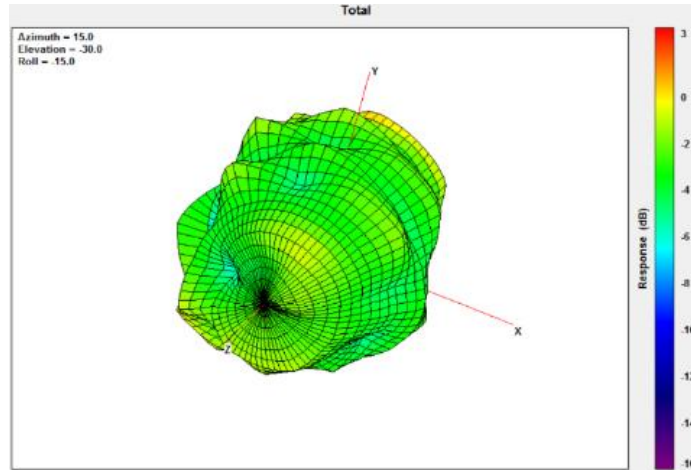
XY Plane

XZ Plane

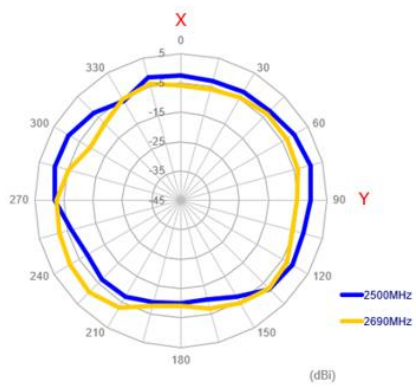
YZ Plane



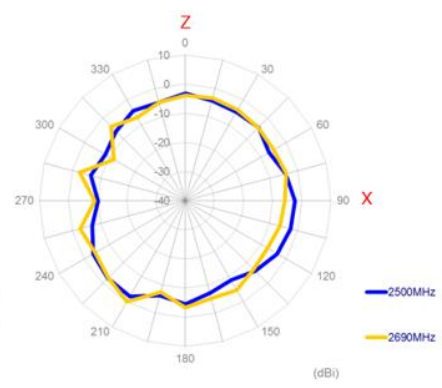
2690MHZ



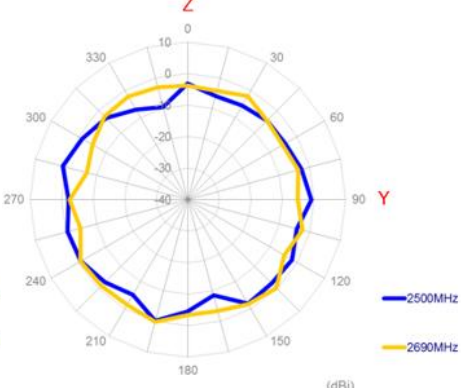
XY Plane



XZ Plane



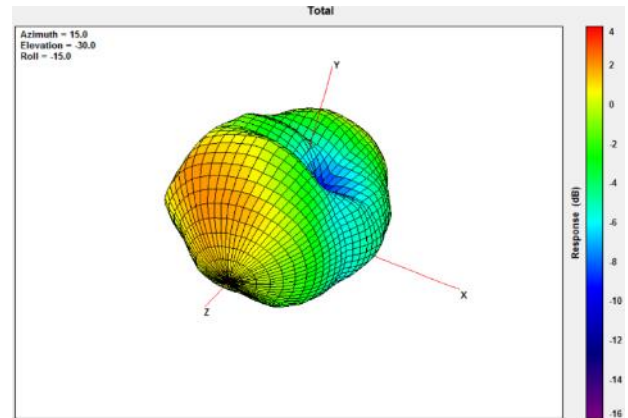
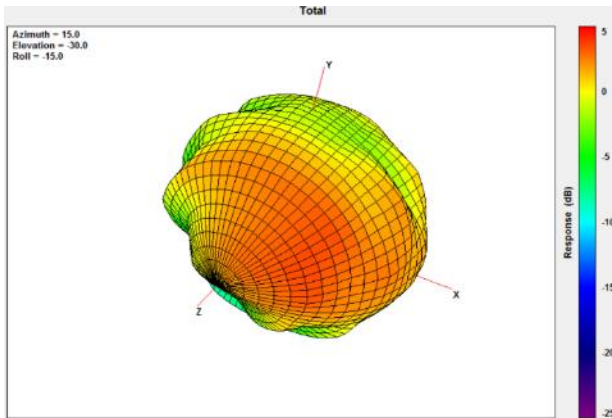
YZ Plane



4.4 4G MIMO 2 3D and 2D Radiation Patterns – 2mm ABS

704MHz

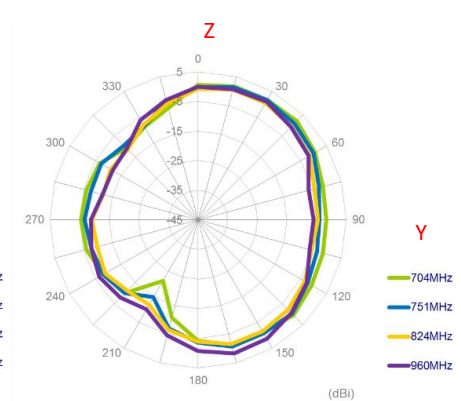
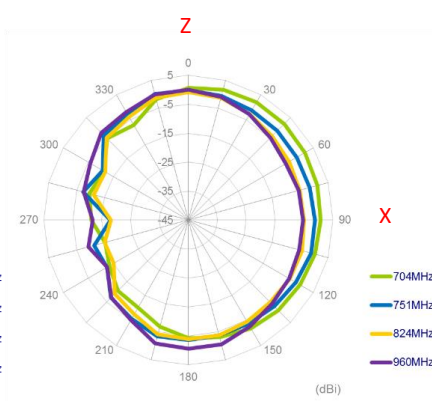
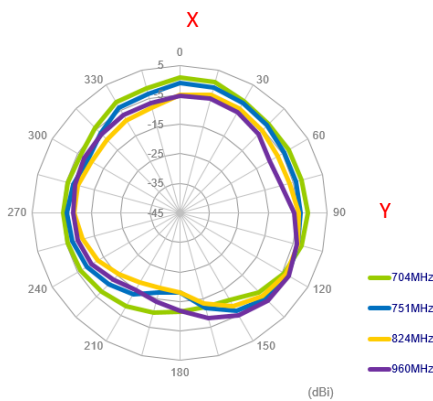
960MHz



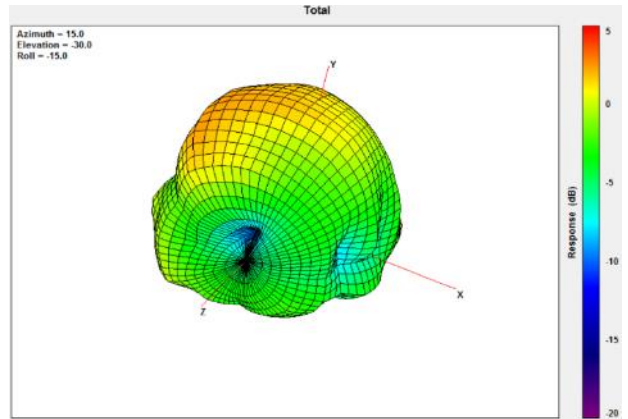
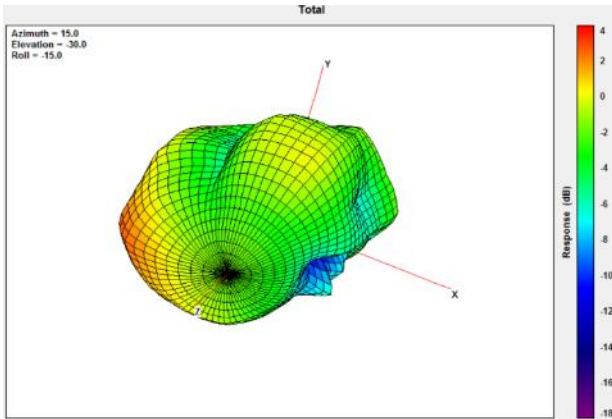
XY Plane

XZ Plane

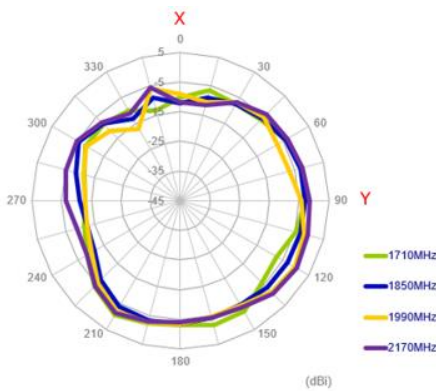
YZ Plane



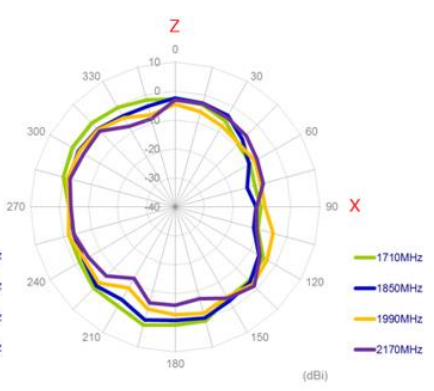
1710MHz 2170MHz



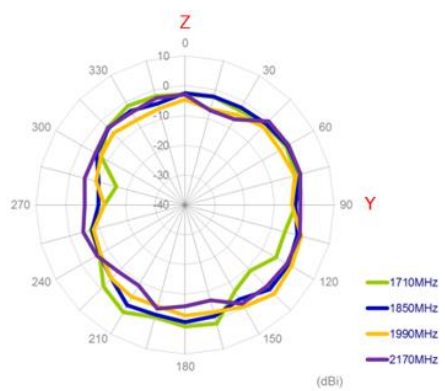
XY Plane



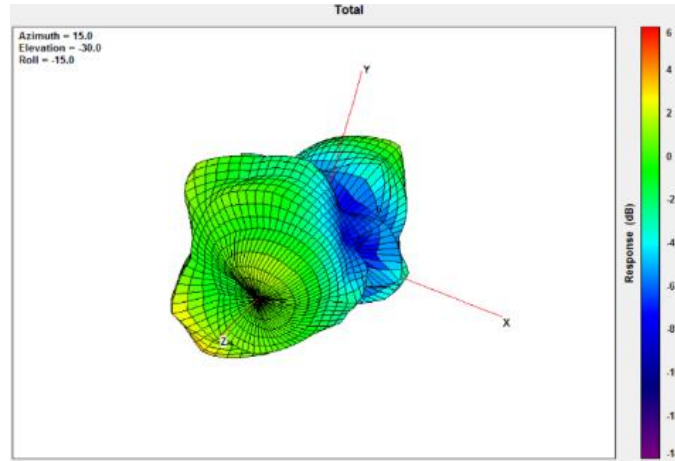
XZ Plane



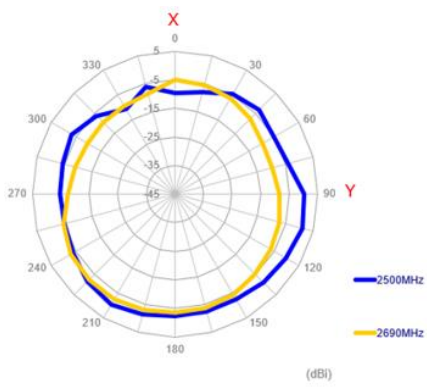
YZ Plane



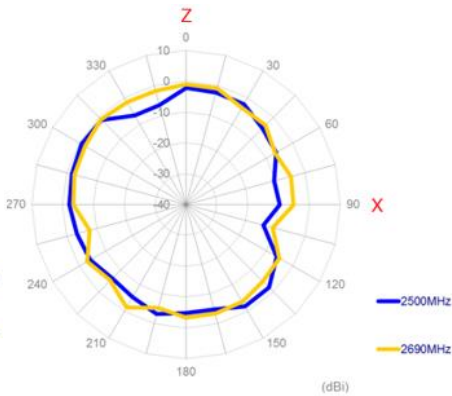
2690MHZ



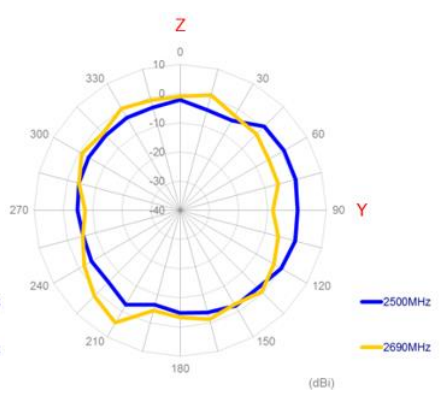
XY Plane



XZ Plane



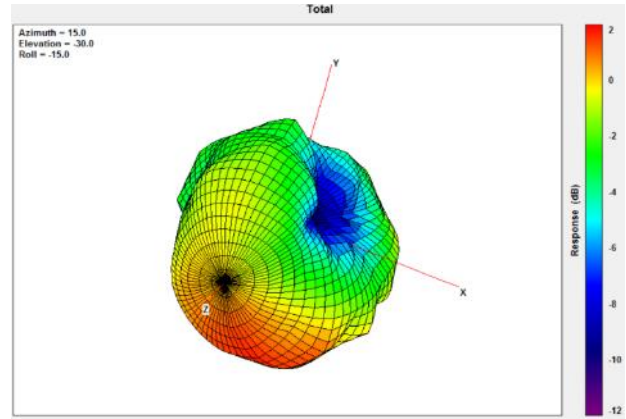
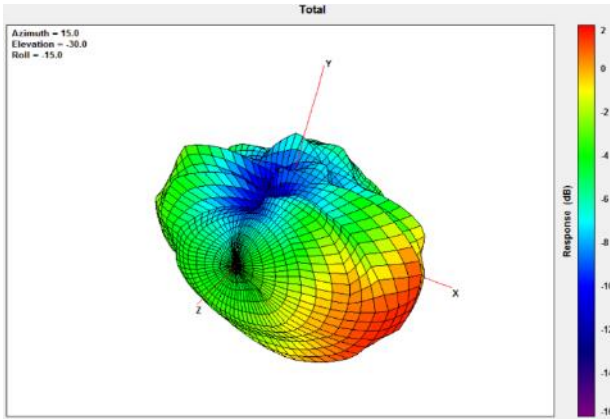
YZ Plane



4.3 4G MIMO 1 3D and 2D Radiation Patterns – On Glass

704MHz

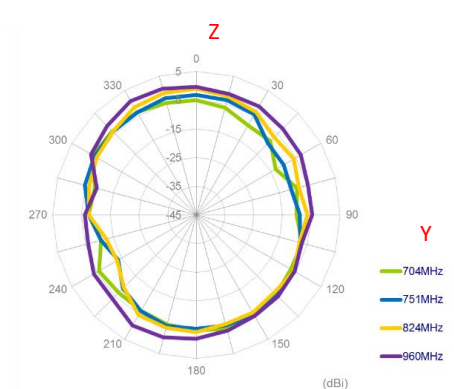
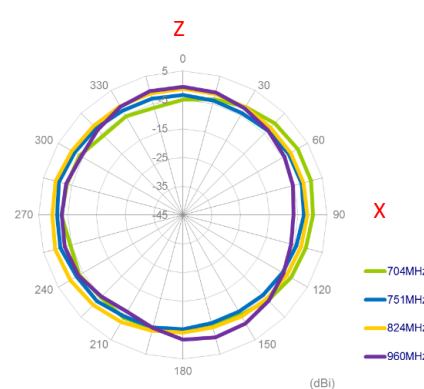
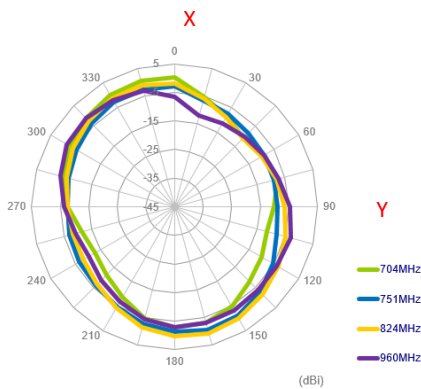
960MHz



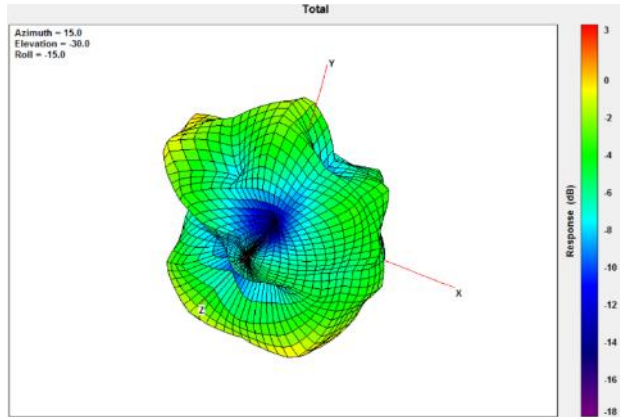
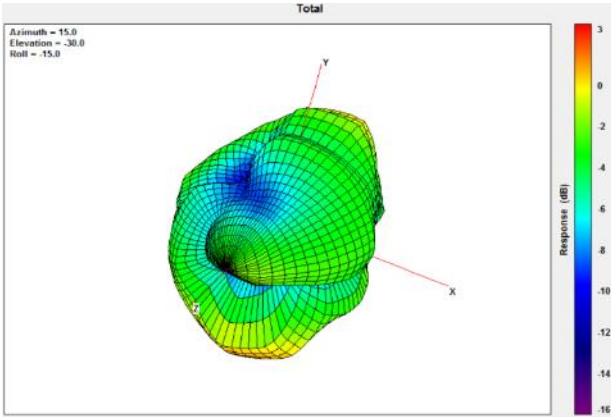
XY Plane

XZ Plane

YZ Plane



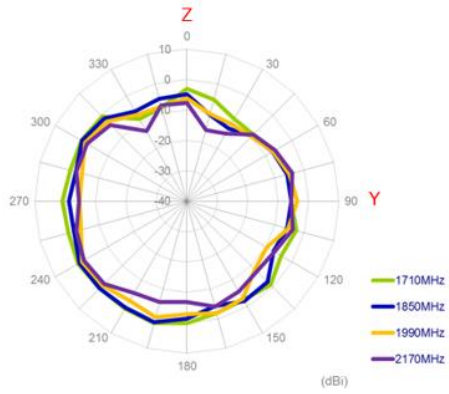
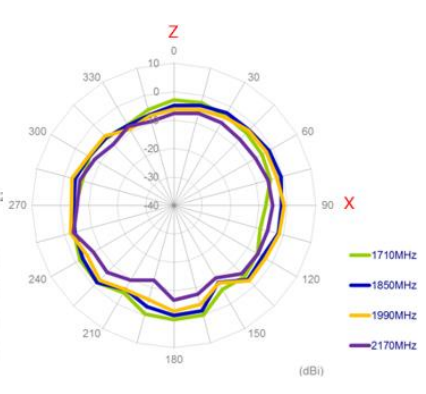
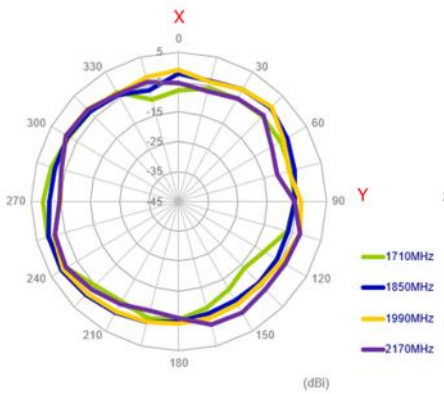
1710MHz **2170MHz**



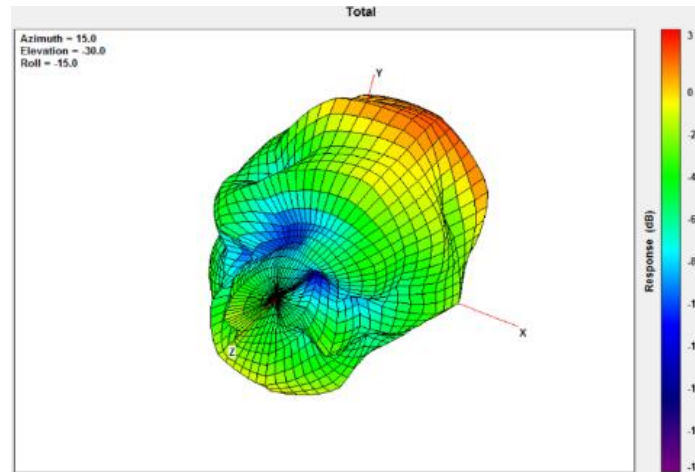
XY Plane

XZ Plane

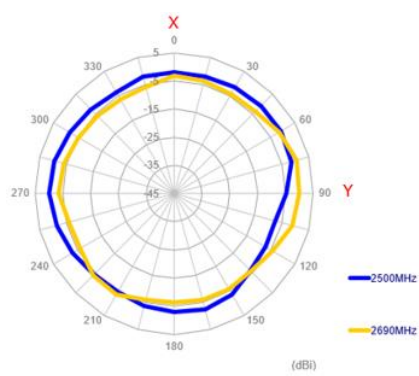
YZ Plane



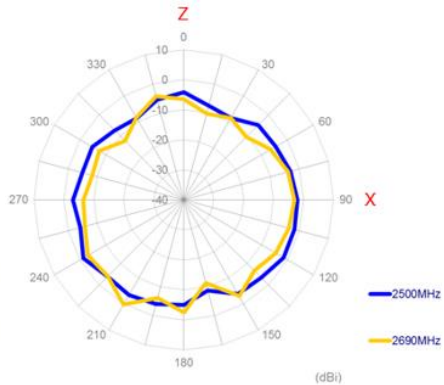
2690MHZ



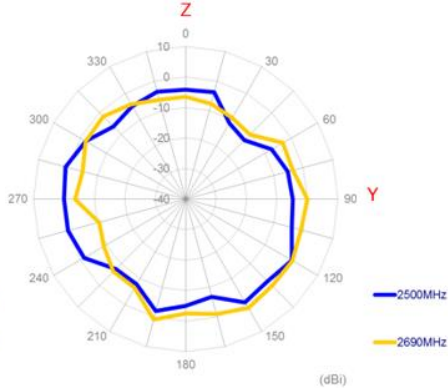
XY Plane



XZ Plane



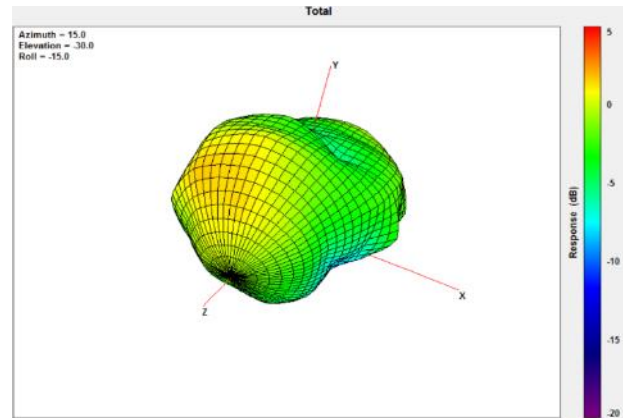
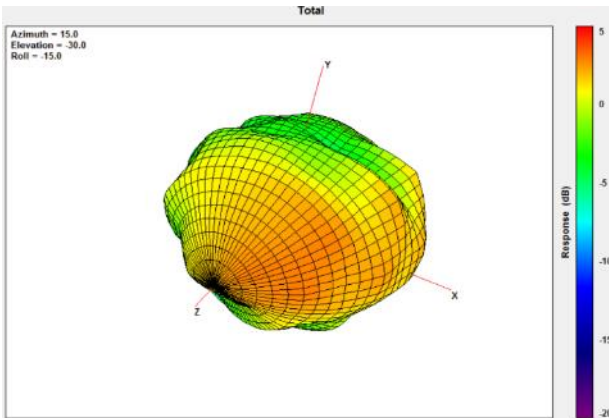
YZ Plane



4.4 4G MIMO 2 3D and 2D Radiation Patterns – 2mm ABS

704MHz

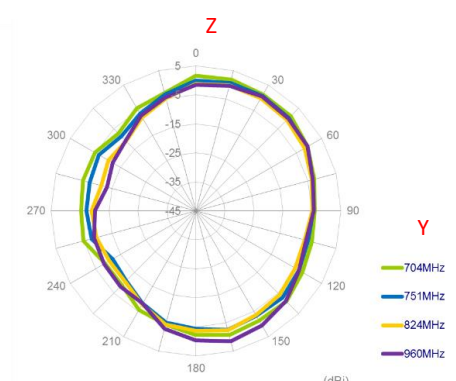
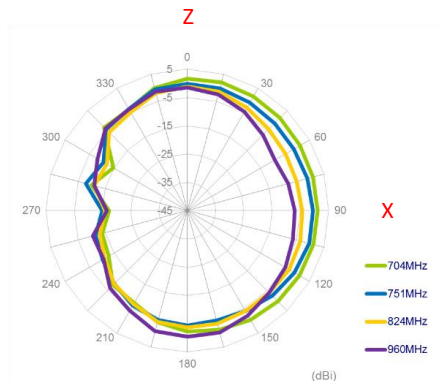
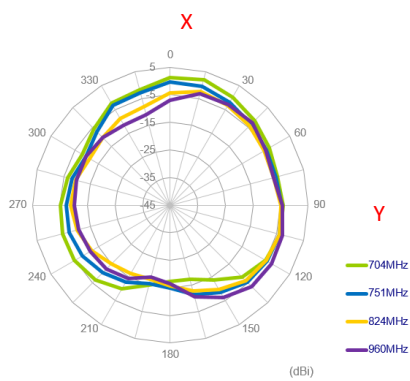
960MHz



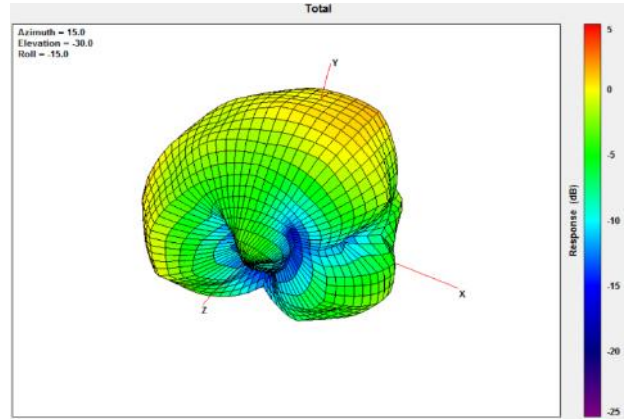
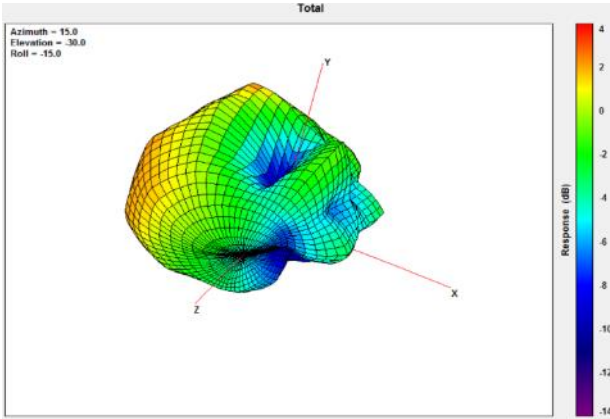
XY Plane

XZ Plane

YZ Plane



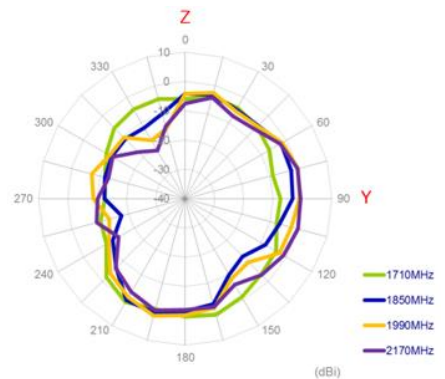
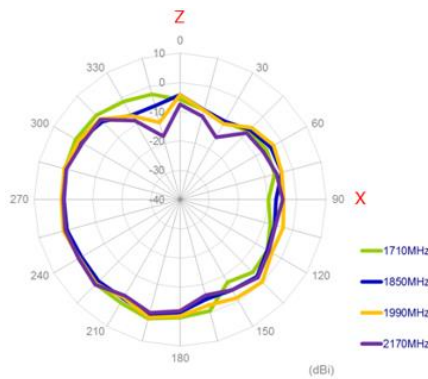
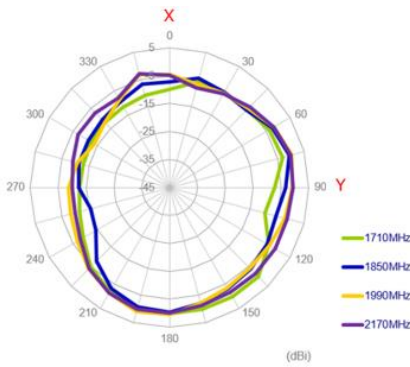
1710MHz 2170MHz



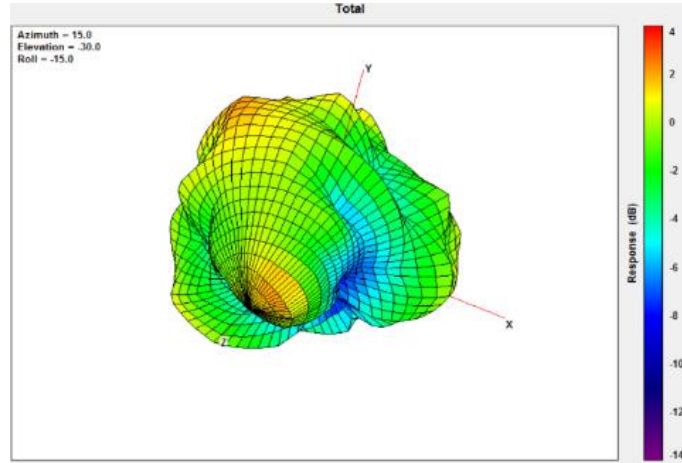
XY Plane

XZ Plane

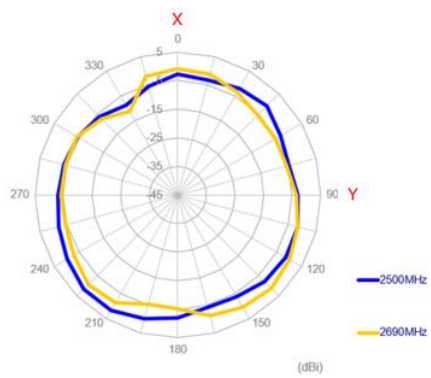
YZ Plane



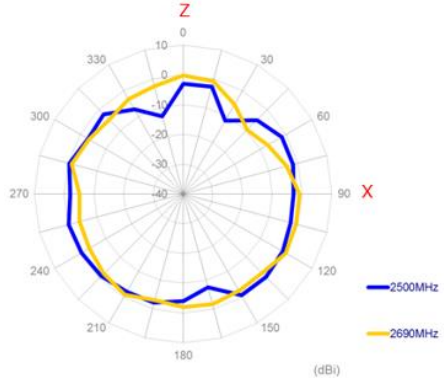
2690MHZ



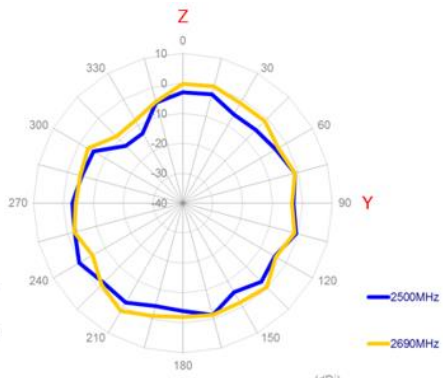
XY Plane



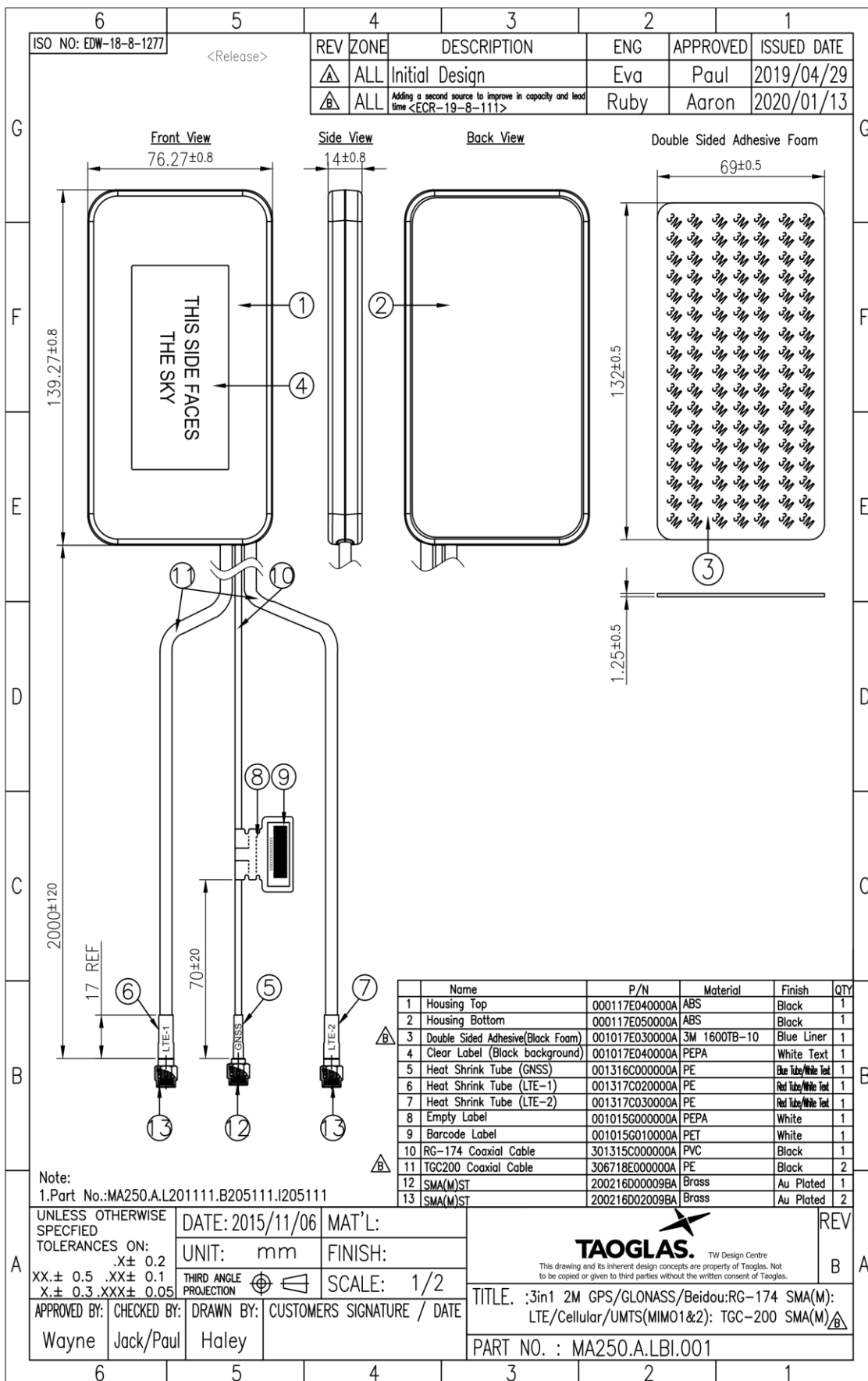
XZ Plane



YZ Plane

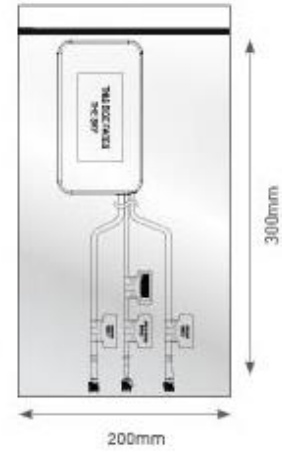


5. Mechanical Drawing (Units: mm)

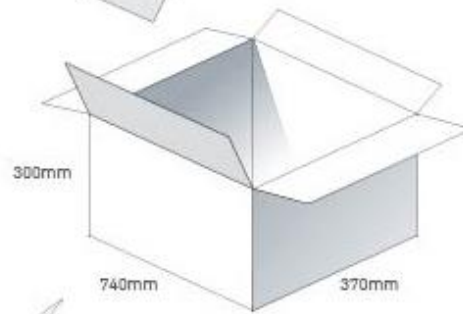


6. Packaging

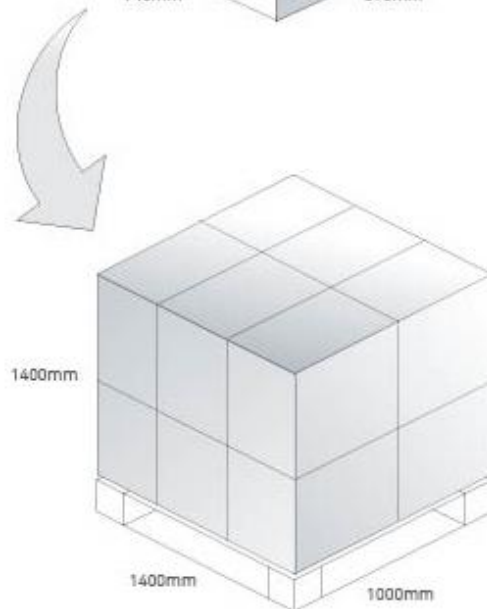
1 pc MA250.A.LBI.003 per PE bag
 Dimensions - 300*200mm
 Total Weight - 410g



20 pcs MA250.A.LBI.003 per carton
 Carton Dimensions - 740*370*300mm
 Weight - 8.7kg



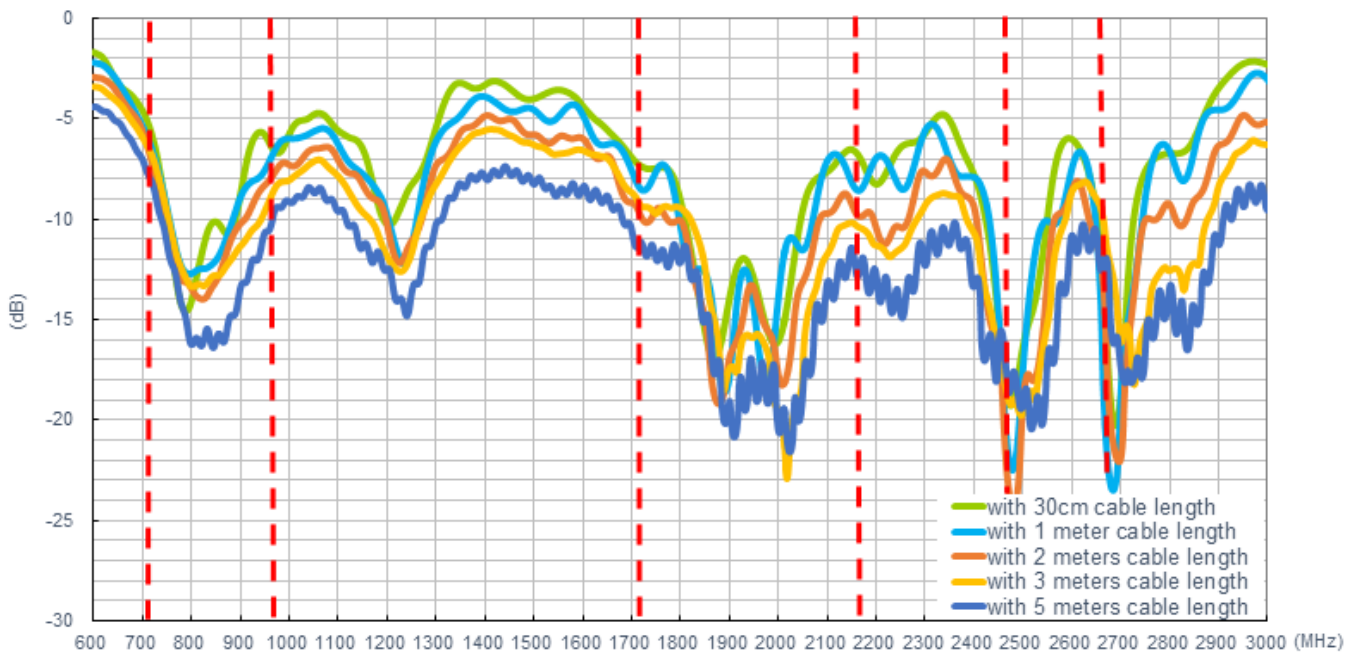
Pallet Dimensions 1200*1000*1400mm
 12 Cartons per pallet
 6 Cartons per layer
 2 Layers



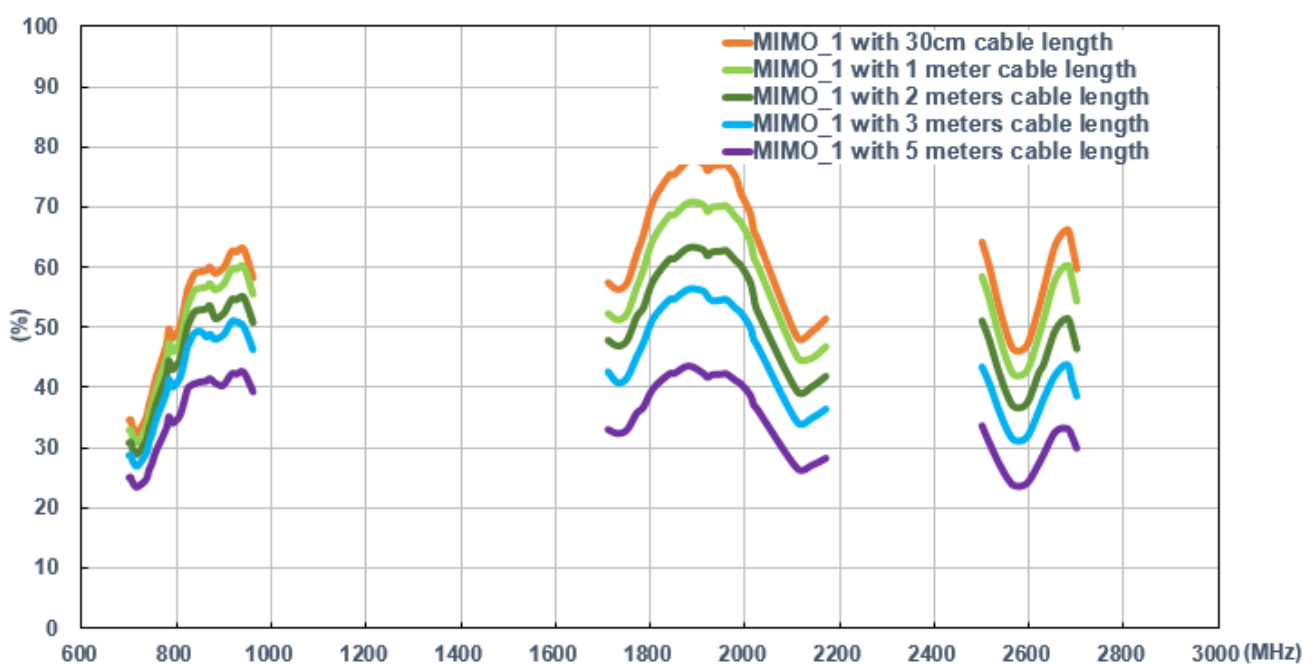
7. Application Note

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

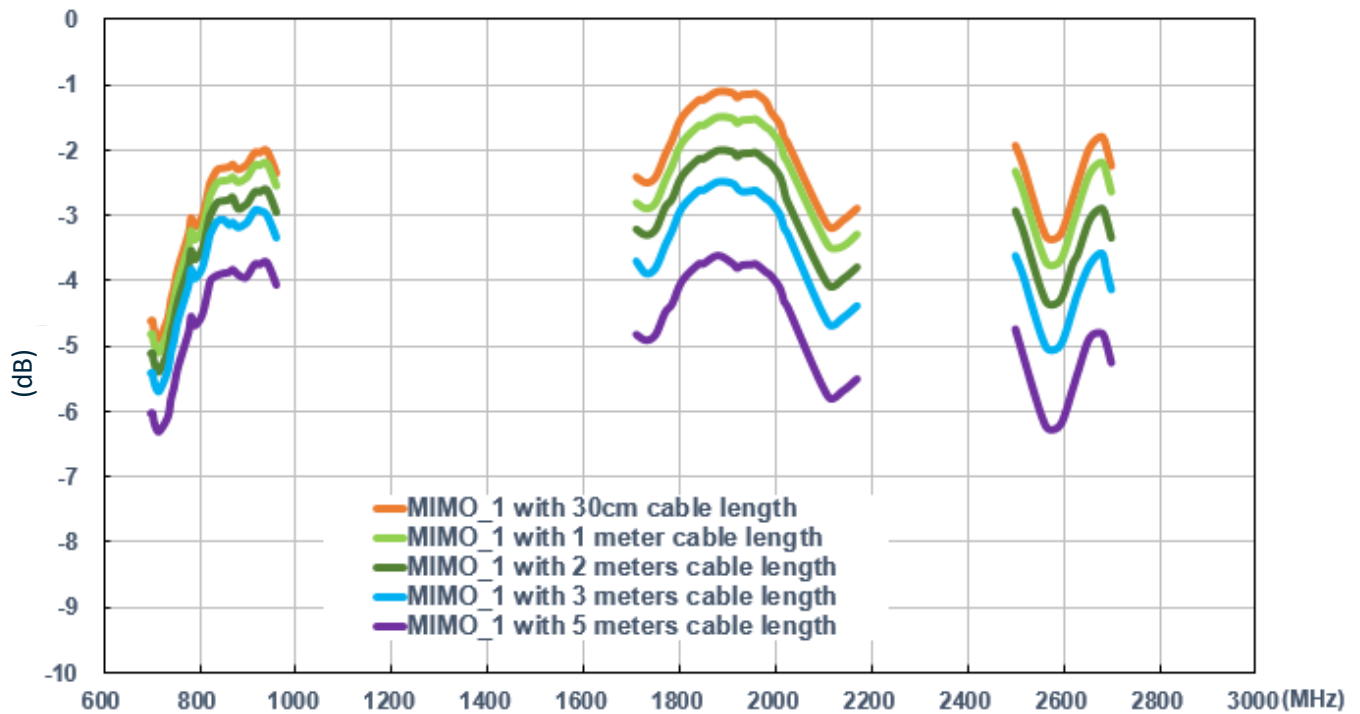
7.1 Return Loss – Free Space MIMO 1



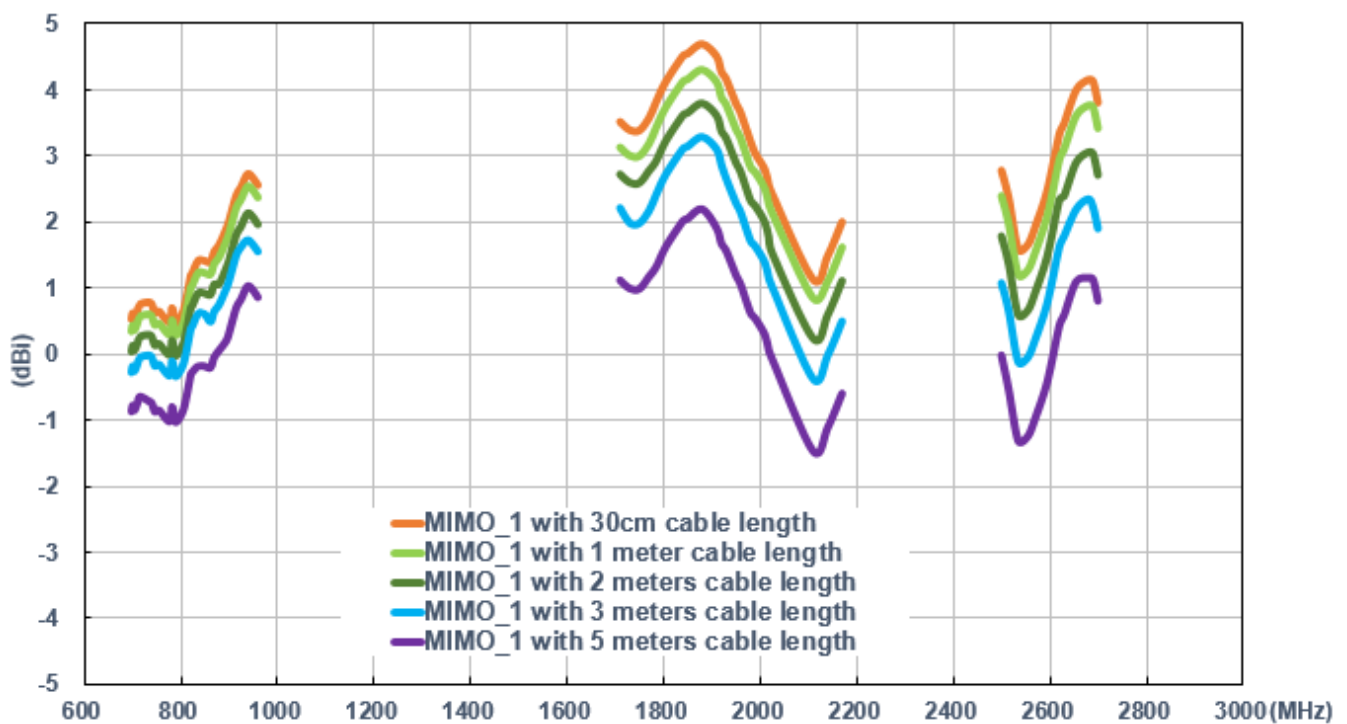
7.2 Efficiency – Free Space MIMO 1



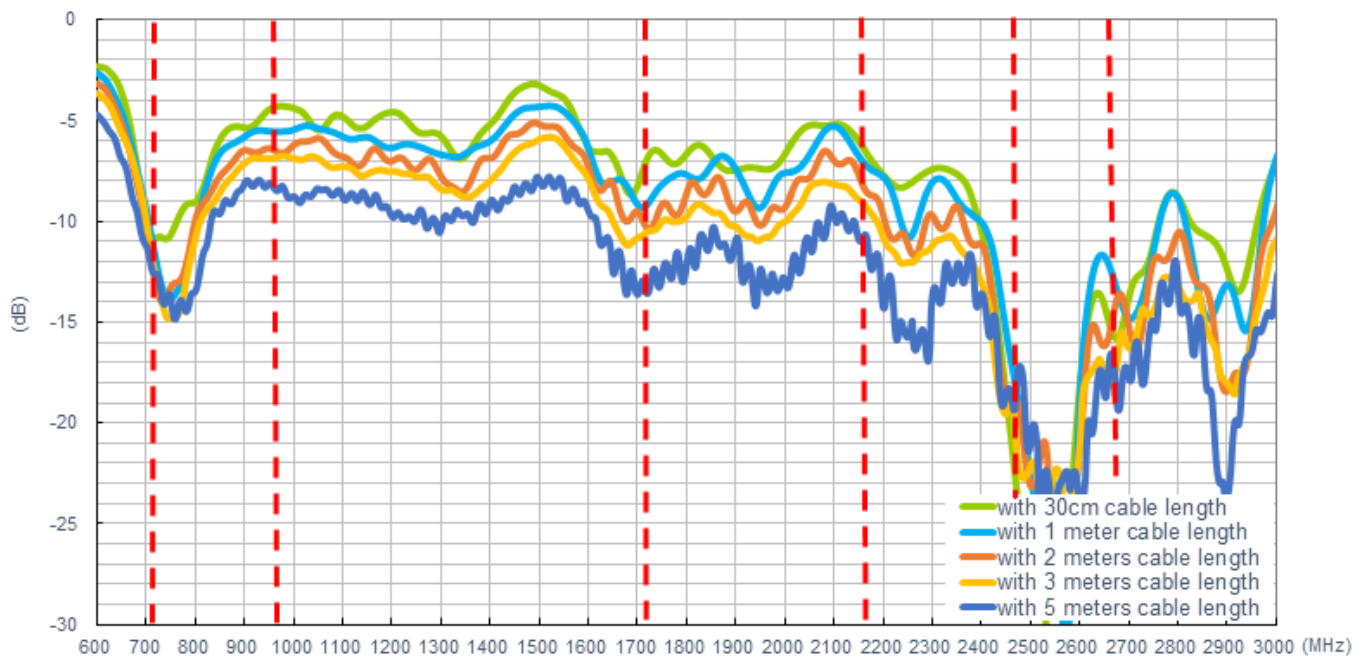
7.3 Average Gain – Free Space MIMO 1



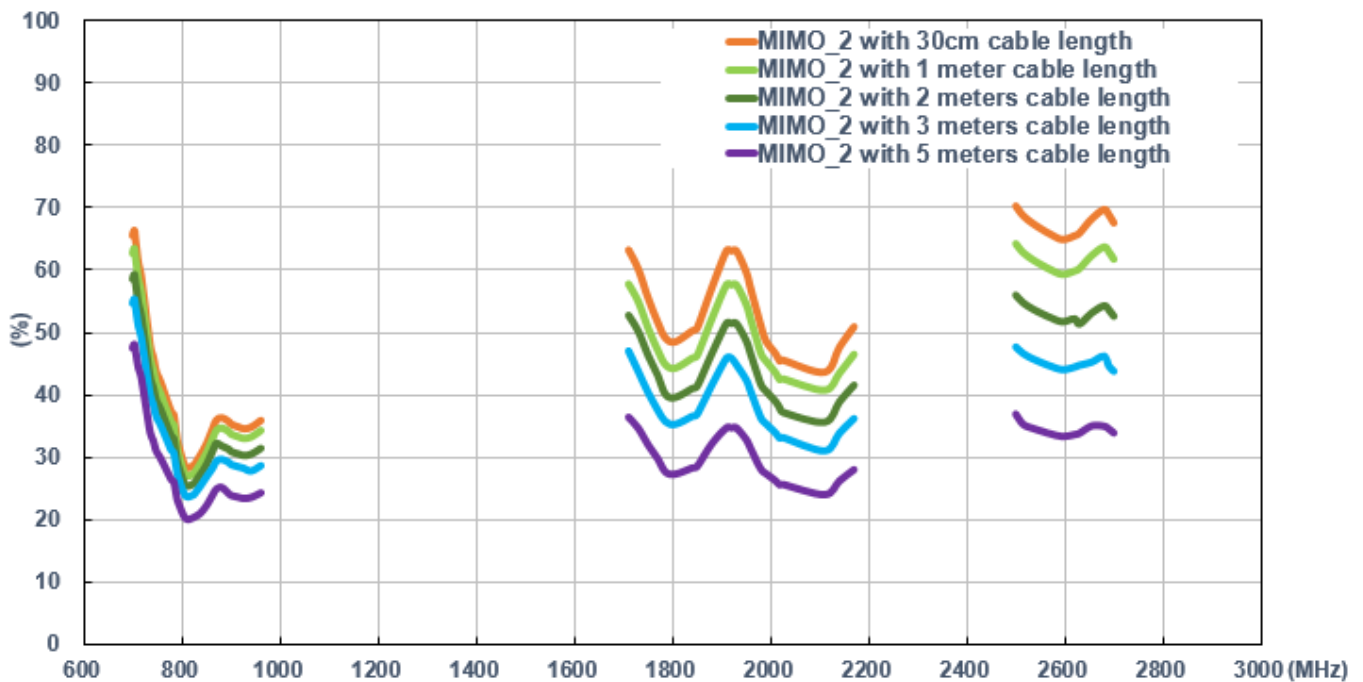
7.4 Peak Gain – Free Space MIMO 1



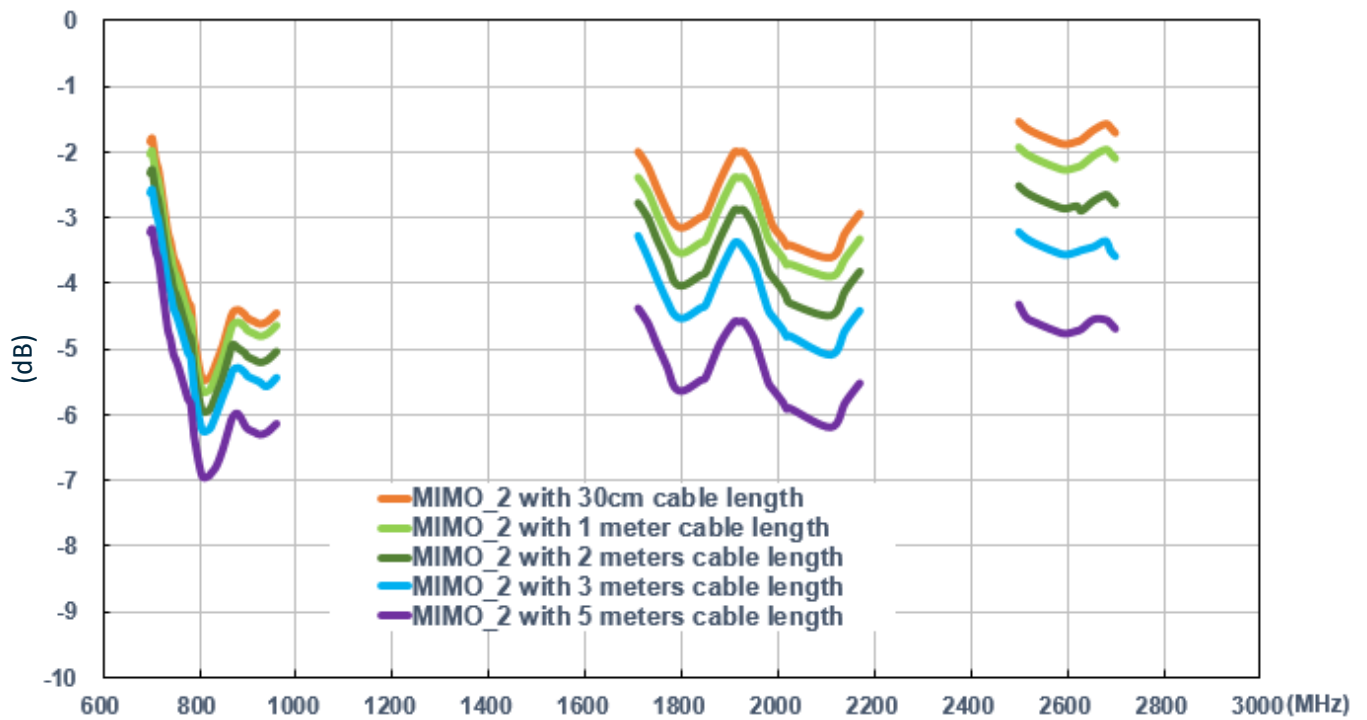
7.5 Return Loss – Free Space MIMO 2



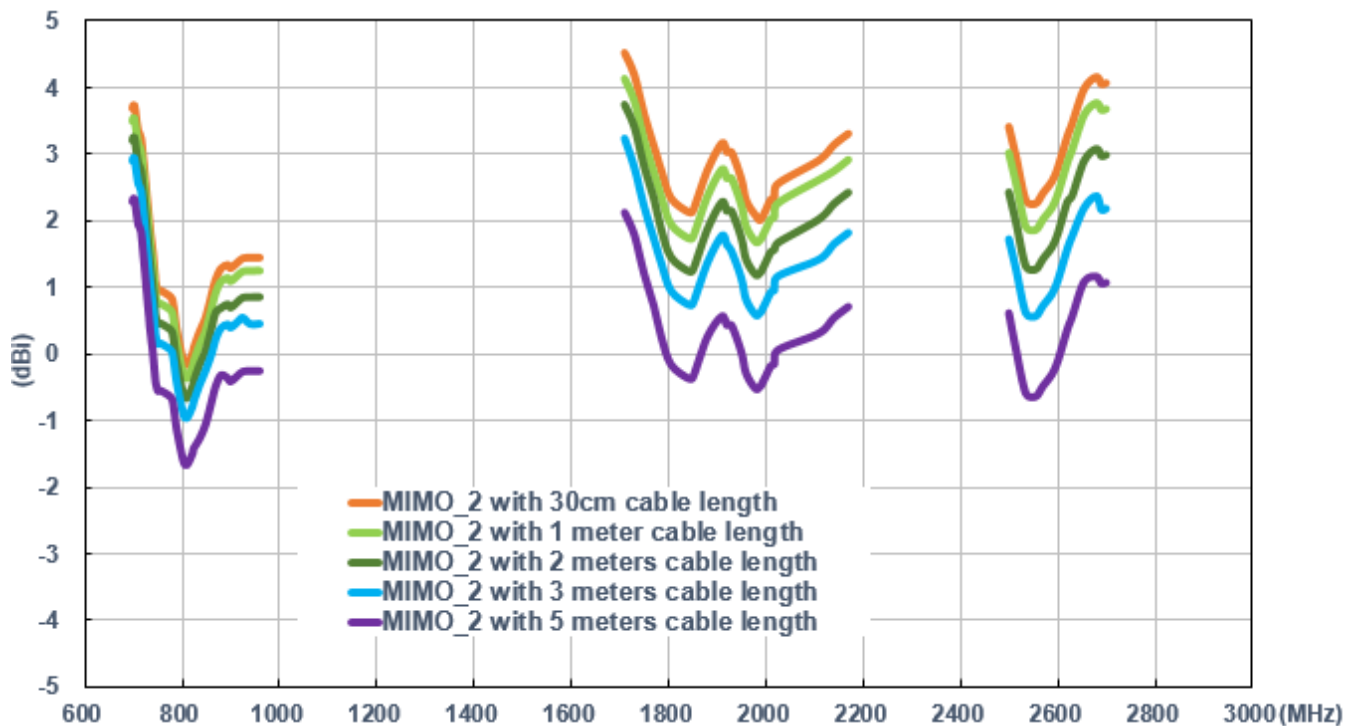
7.6 Efficiency – Free Space MIMO 2



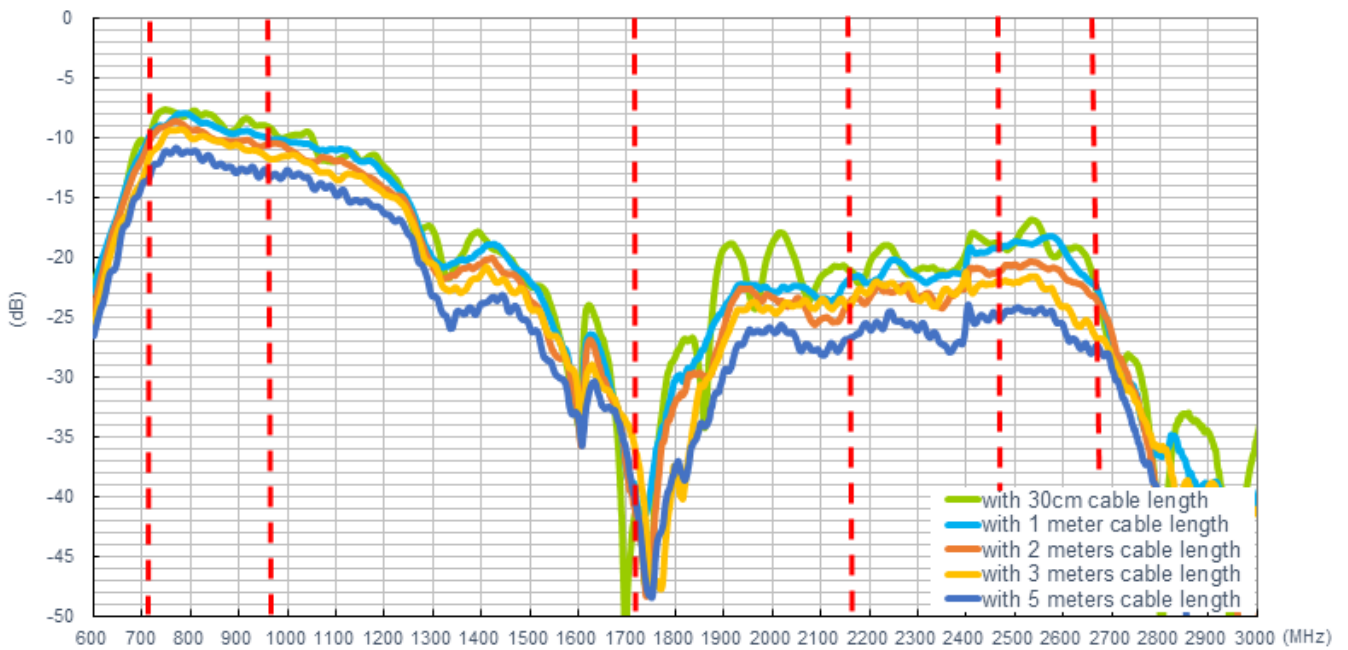
7.7 Average Gain – Free Space MIMO 2



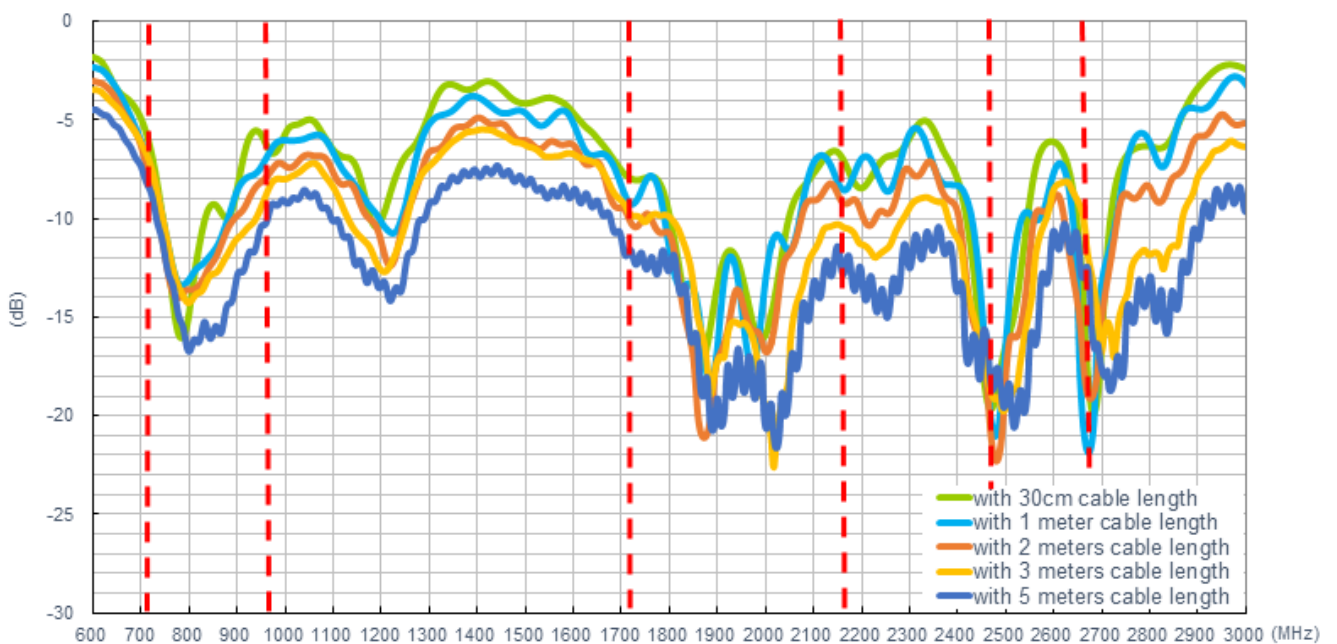
7.8 Peak Gain – Free Space MIMO 2



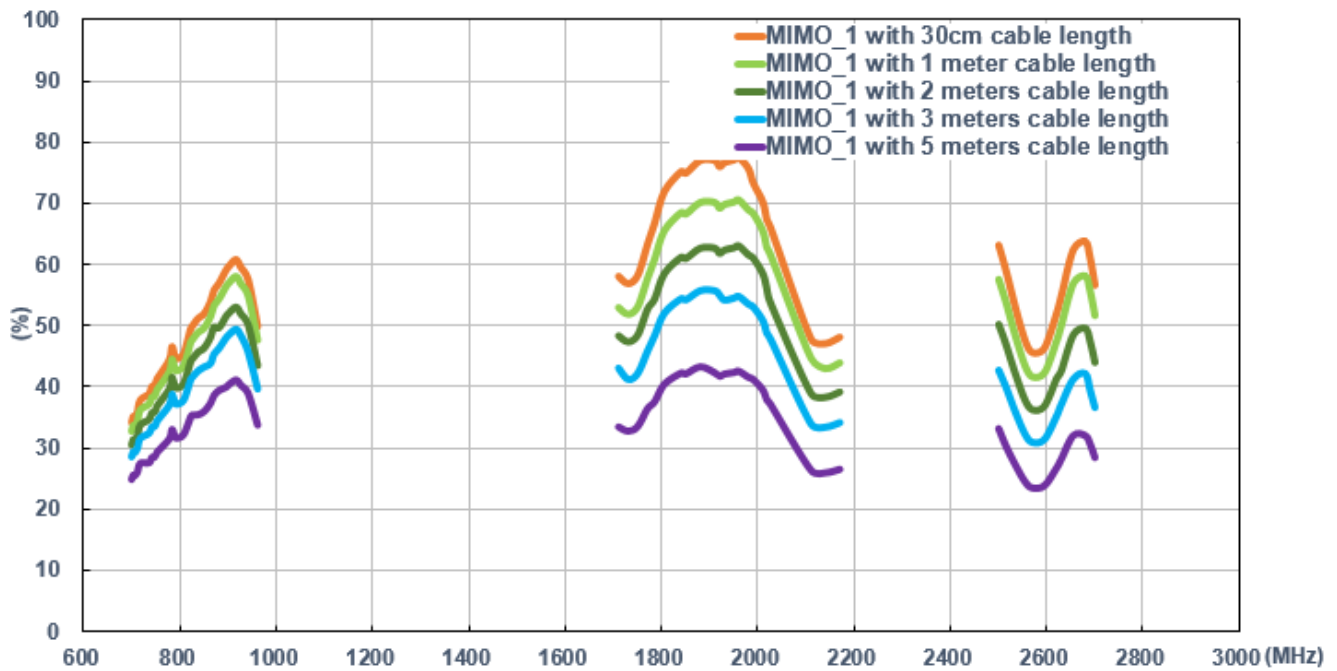
7.9 Isolation of MIMO 1 & 2



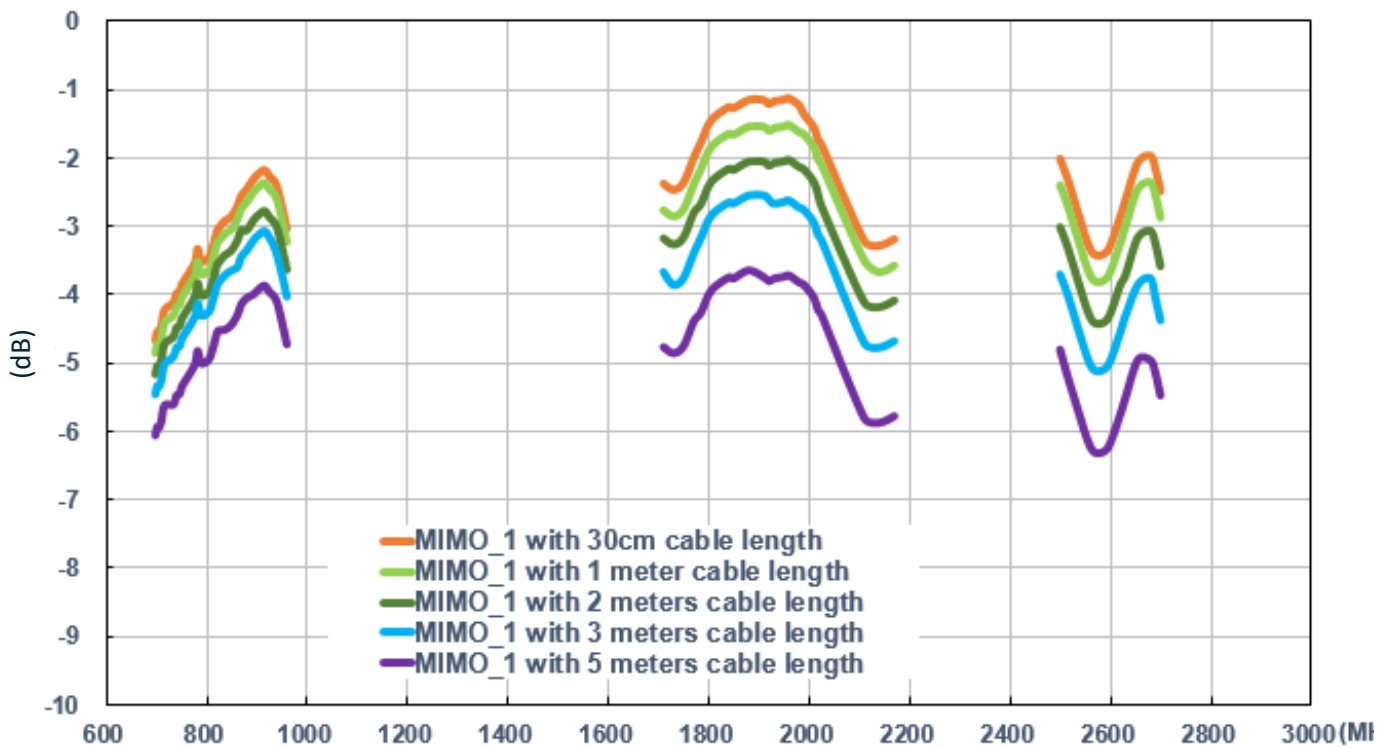
7.10 Return Loss – 2mm ABS MIMO 1



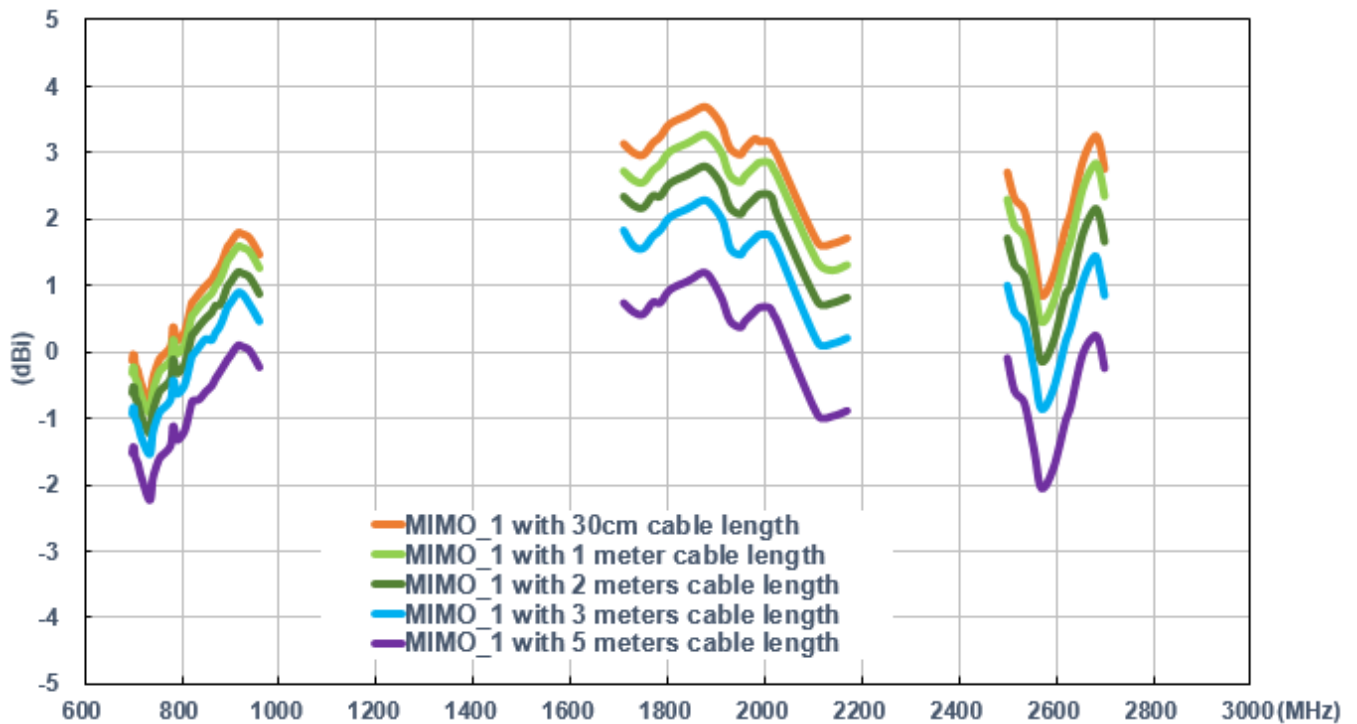
7.11 Efficiency – 2mm ABS MIMO 1



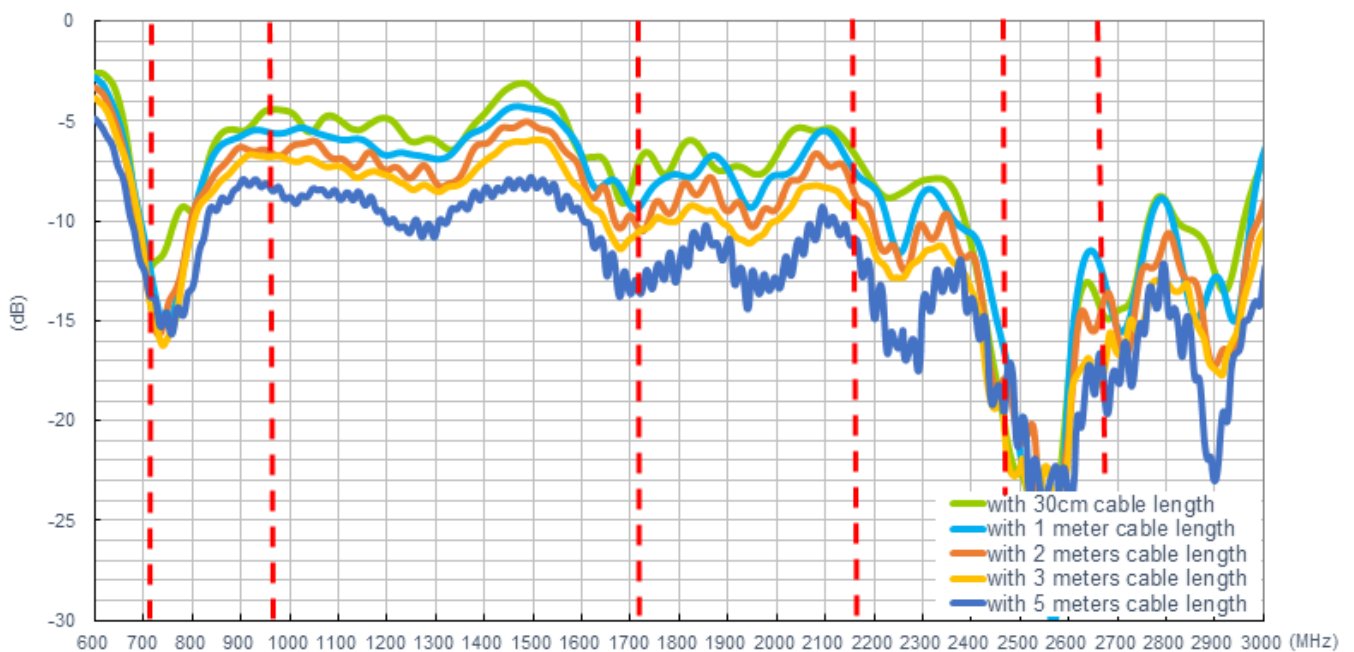
7.12 Average Gain – 2mm ABS MIMO 1



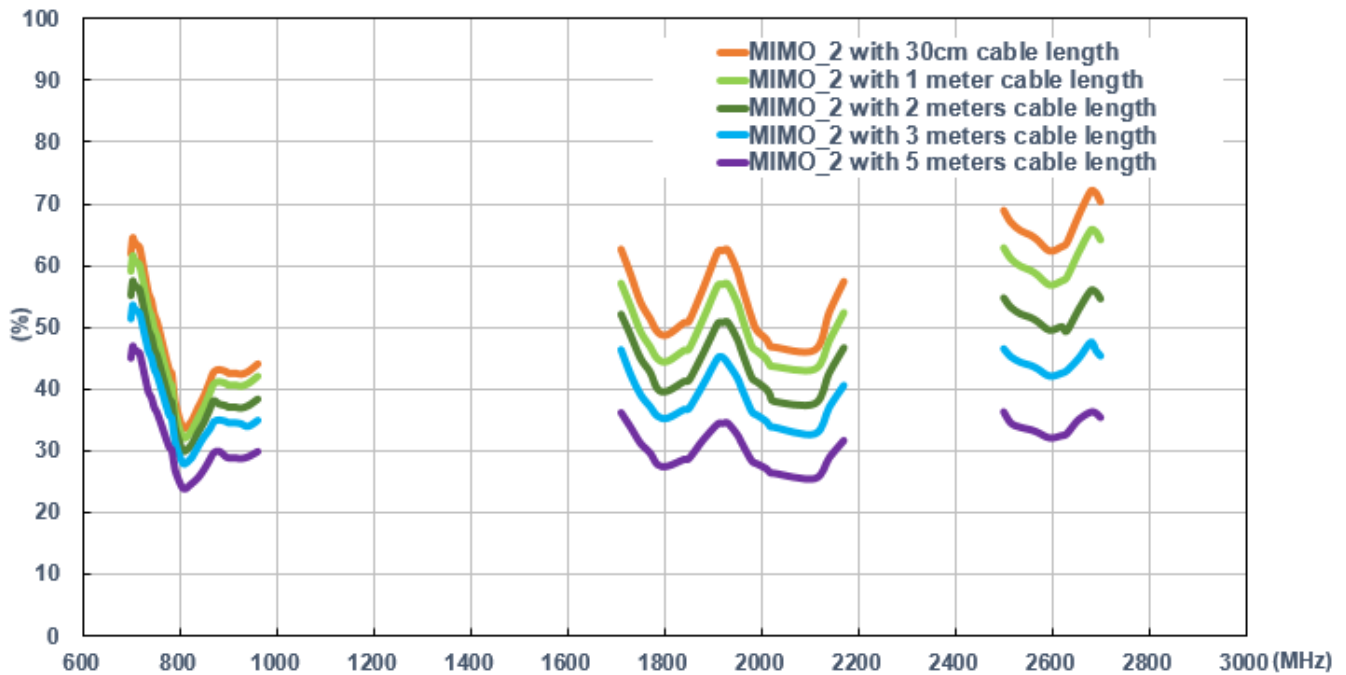
7.13 Peak Gain – 2mm ABS MIMO 1



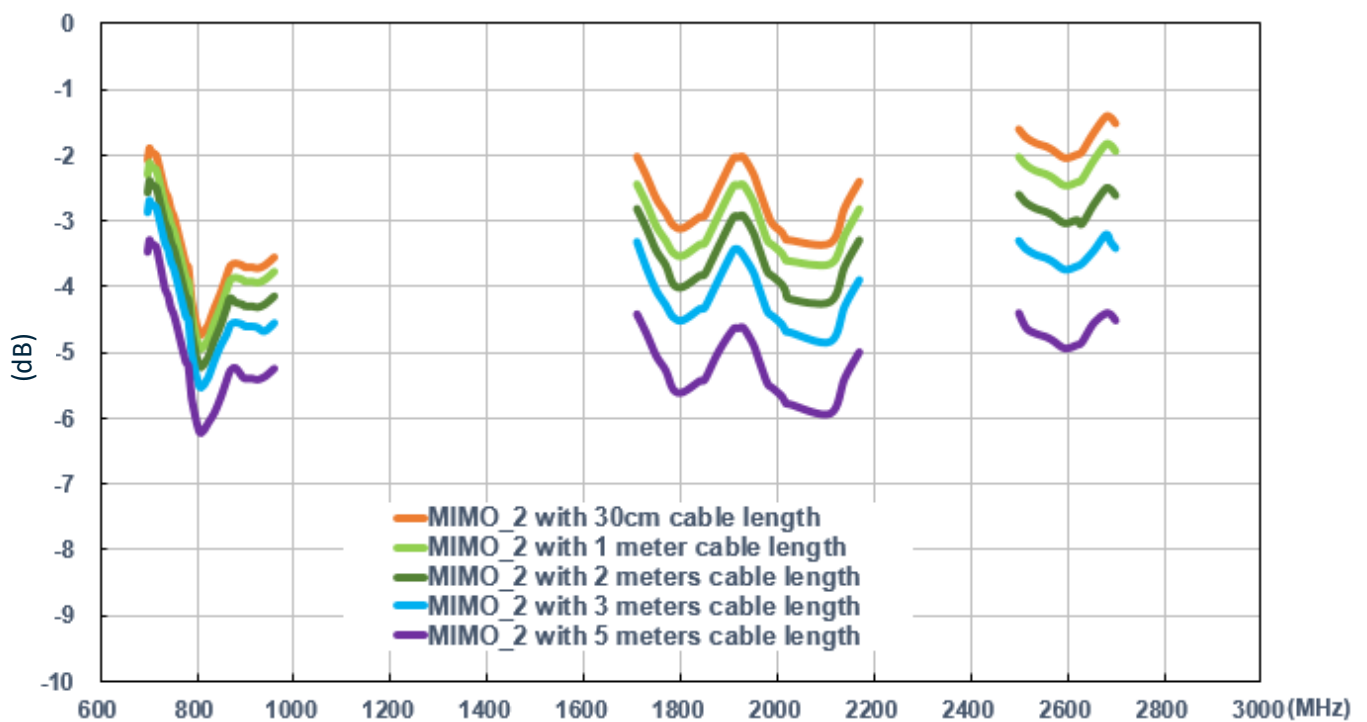
7.14 Return Loss – 2mm ABS MIMO 2



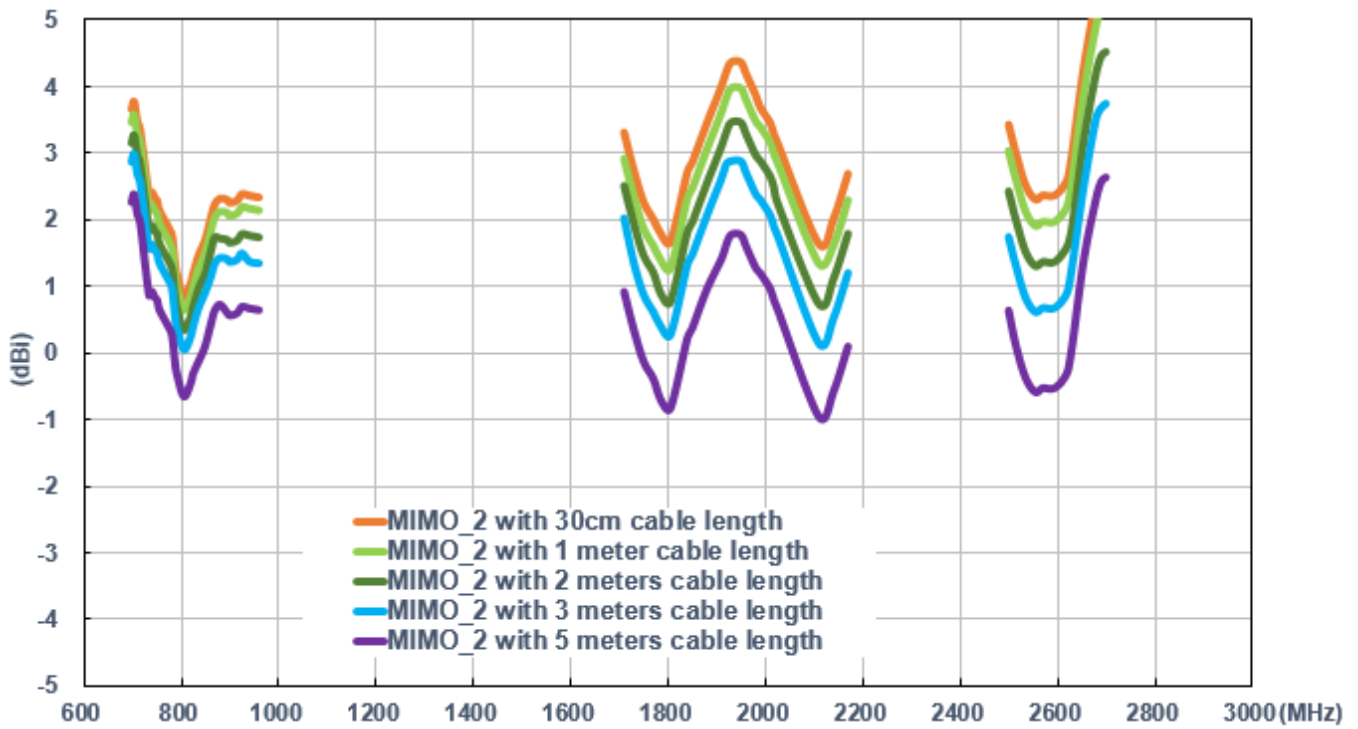
7.15 Efficiency – 2mm ABS MIMO 2



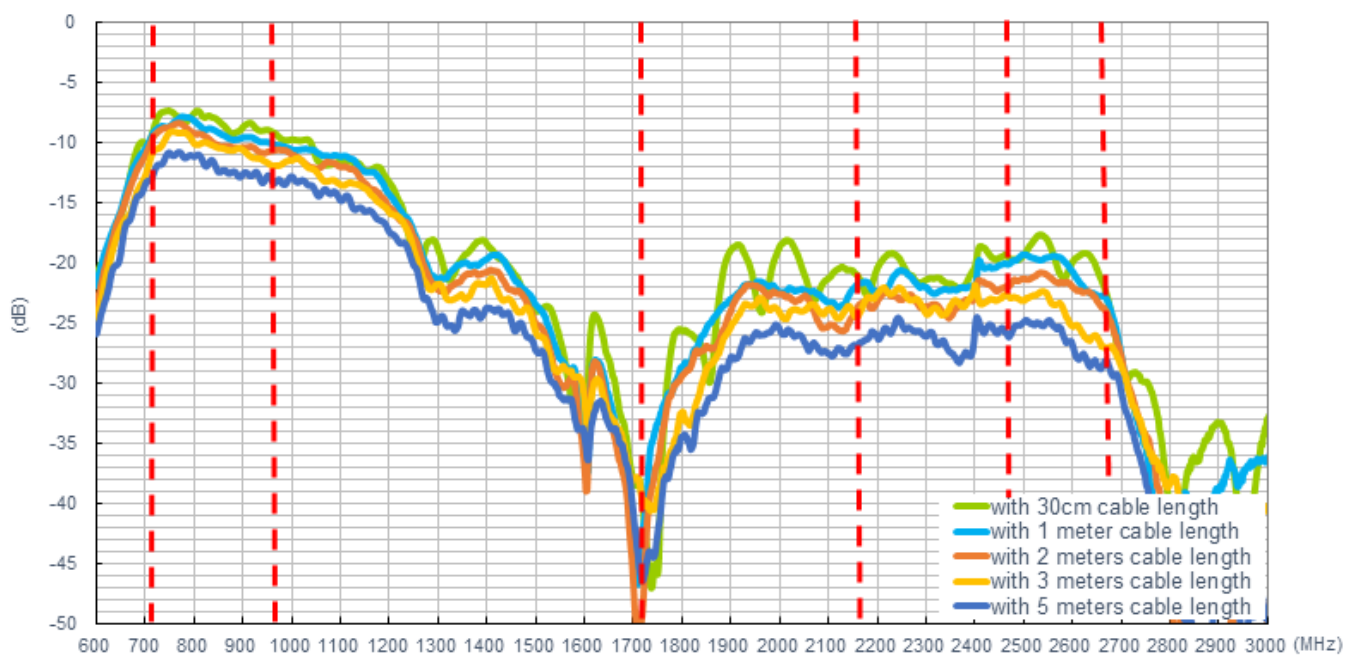
7.16 Average Gain – 2mm ABS MIMO 2



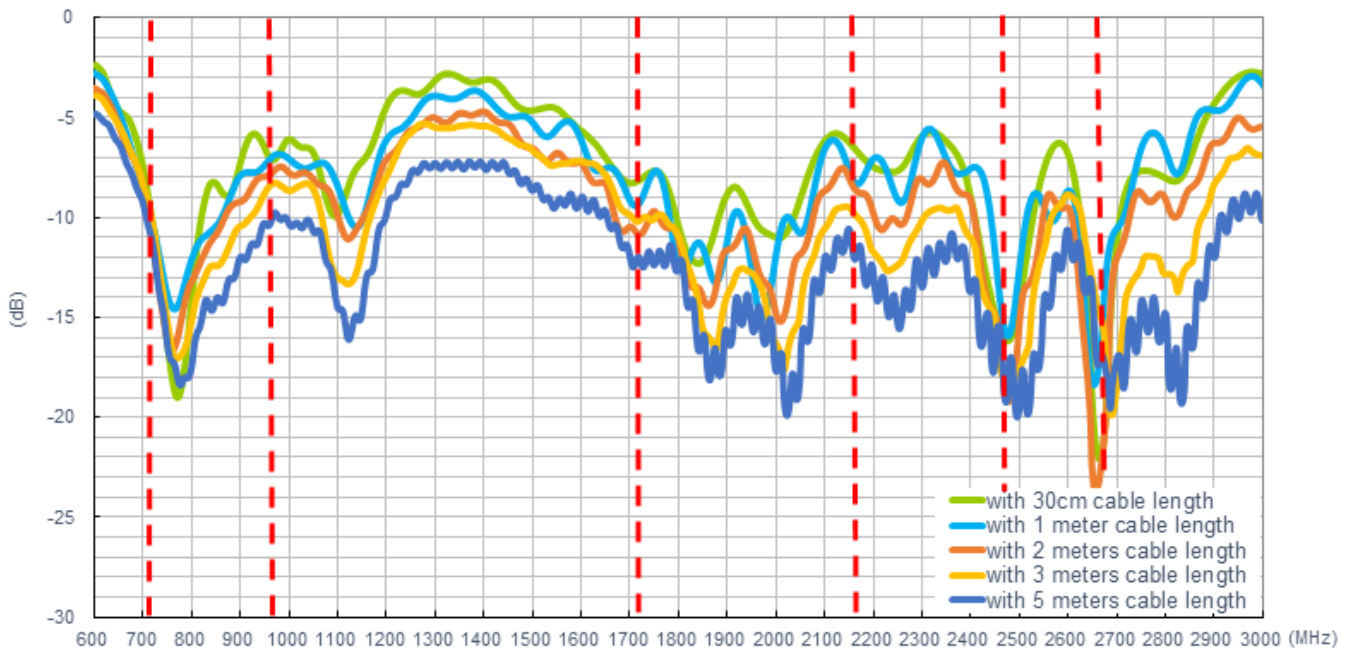
7.17 Peak Gain – 2mm ABS MIMO 2



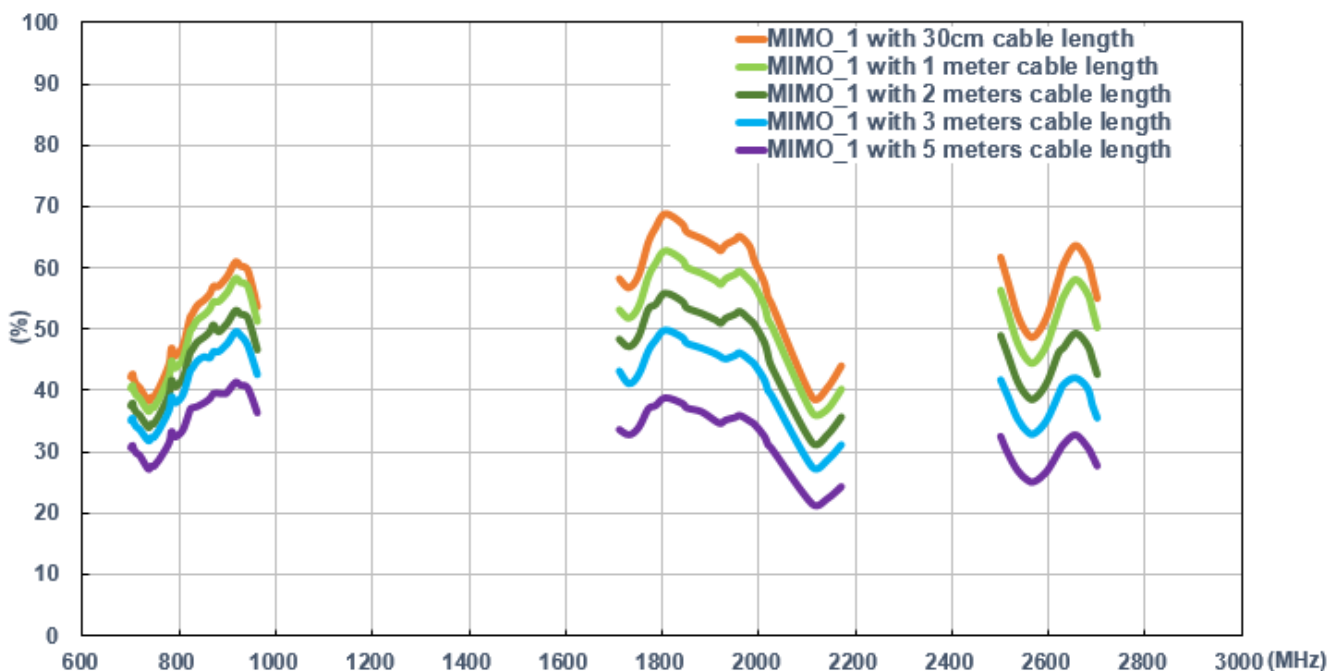
7.18 Isolation of MIMO 1 & 2 - 2mm ABS



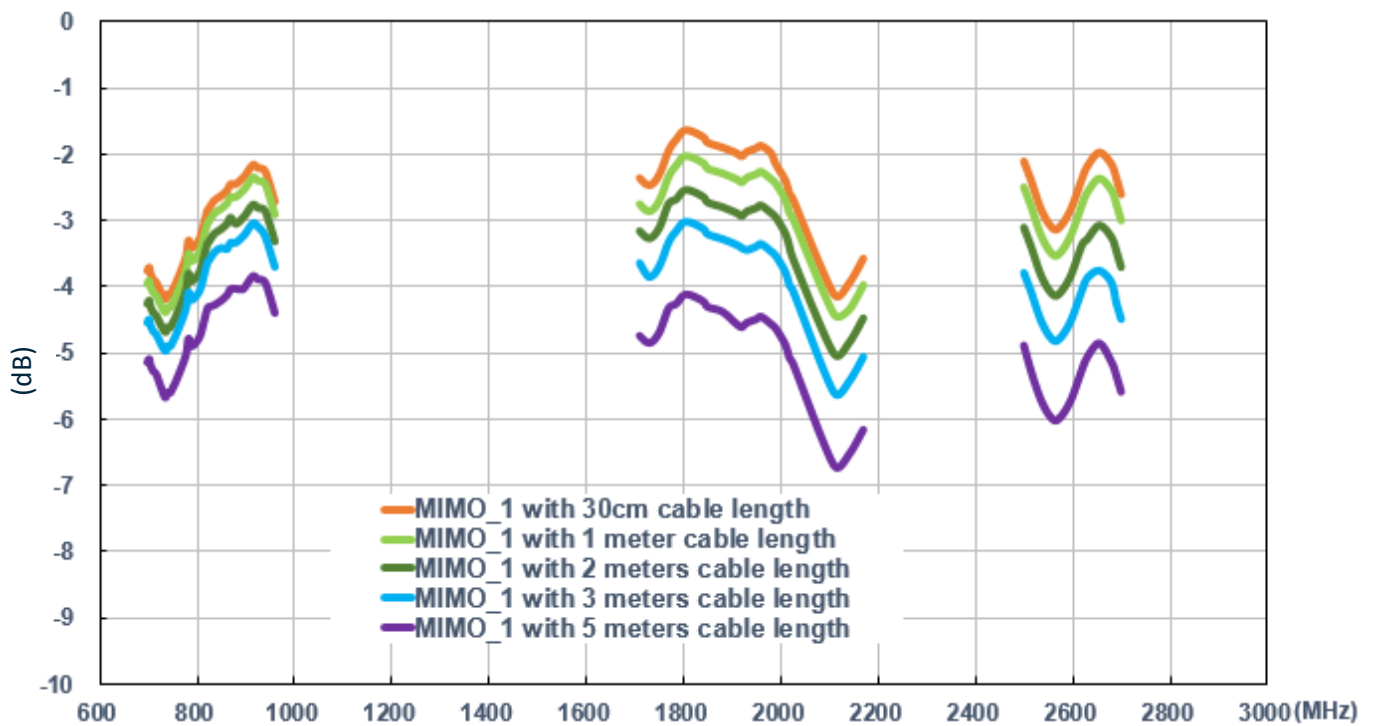
7.19 Return Loss – On Glass MIMO 1



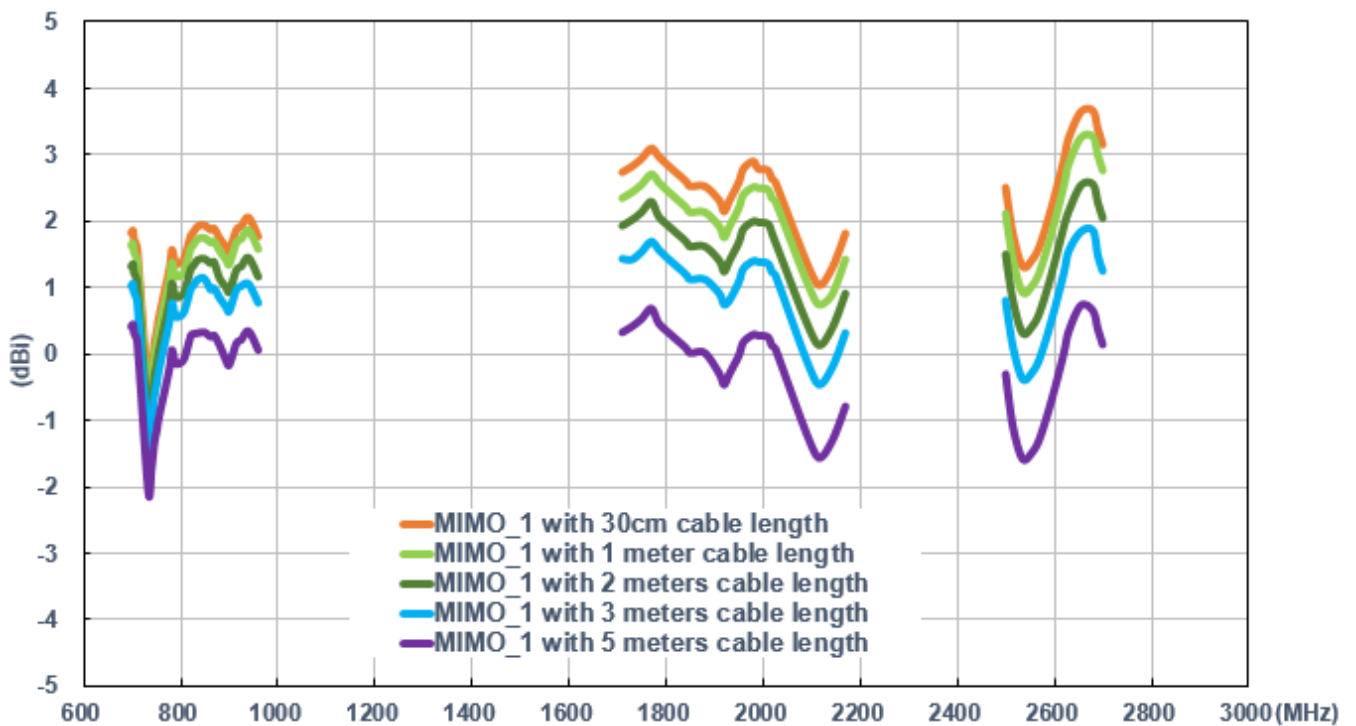
7.20 Efficiency – On Glass MIMO 1



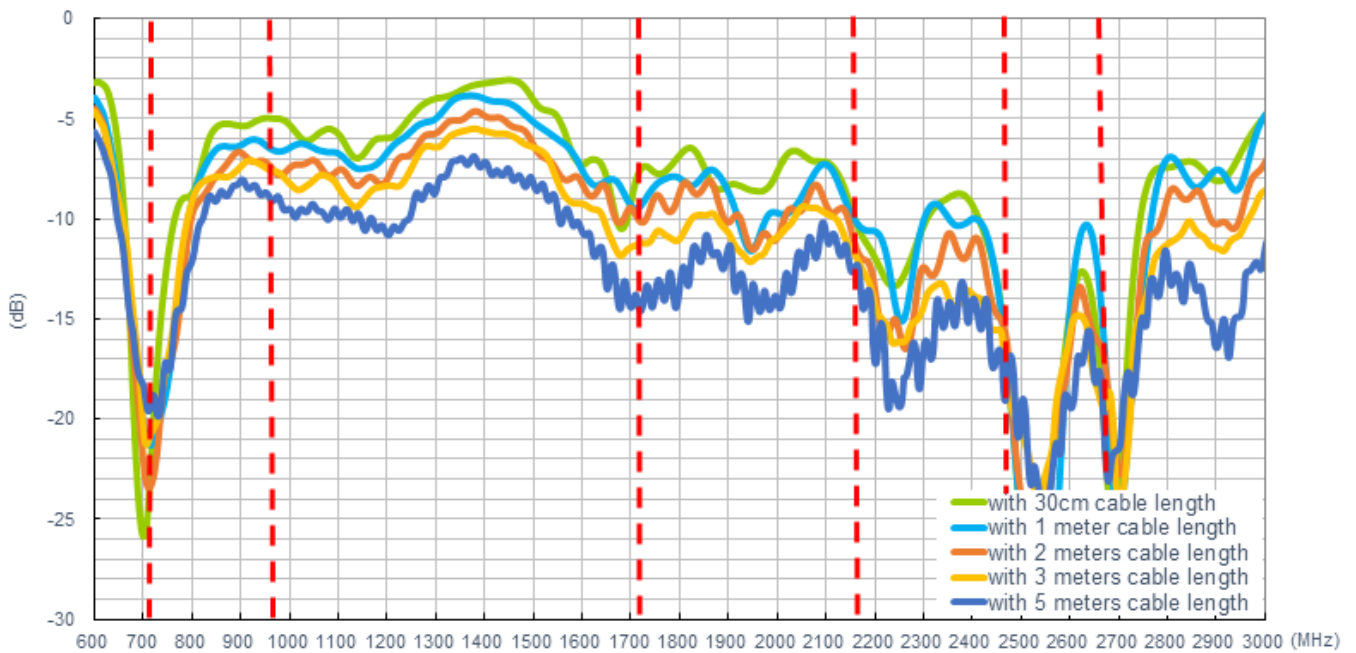
7.21 Average Gain – On Glass MIMO 1



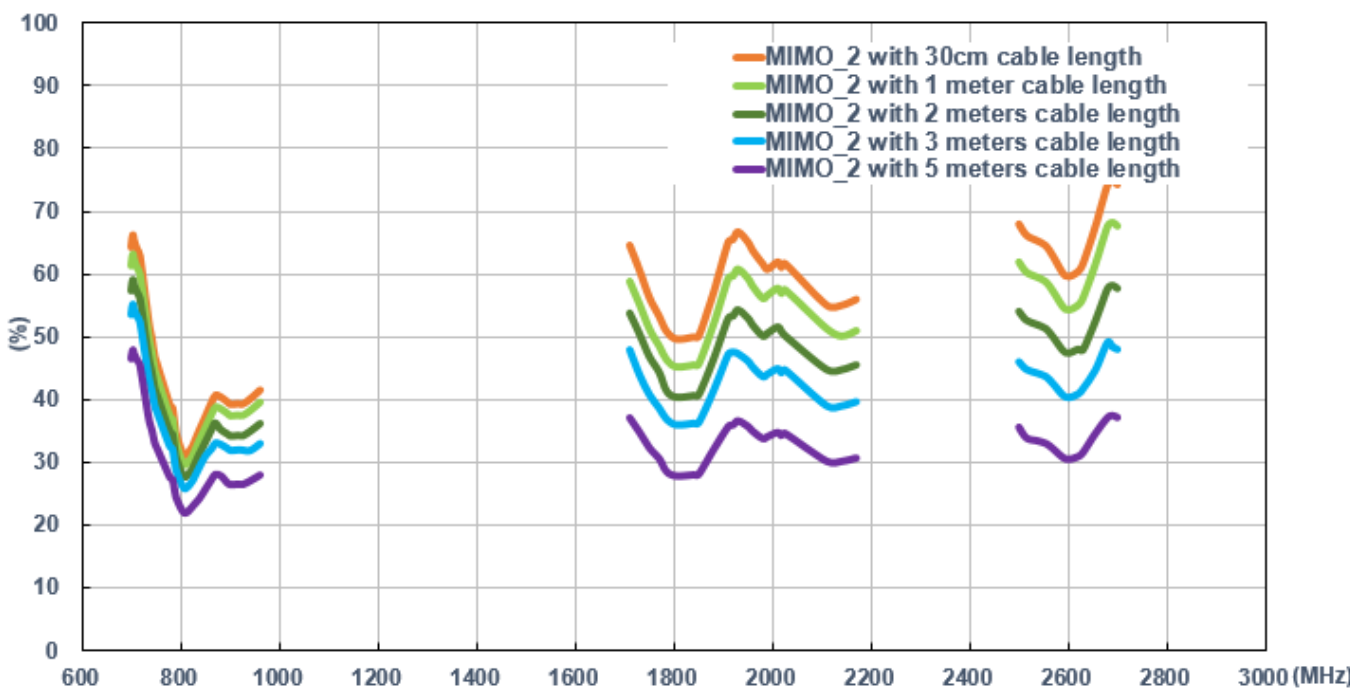
7.22 Peak Gain – On Glass MIMO 1



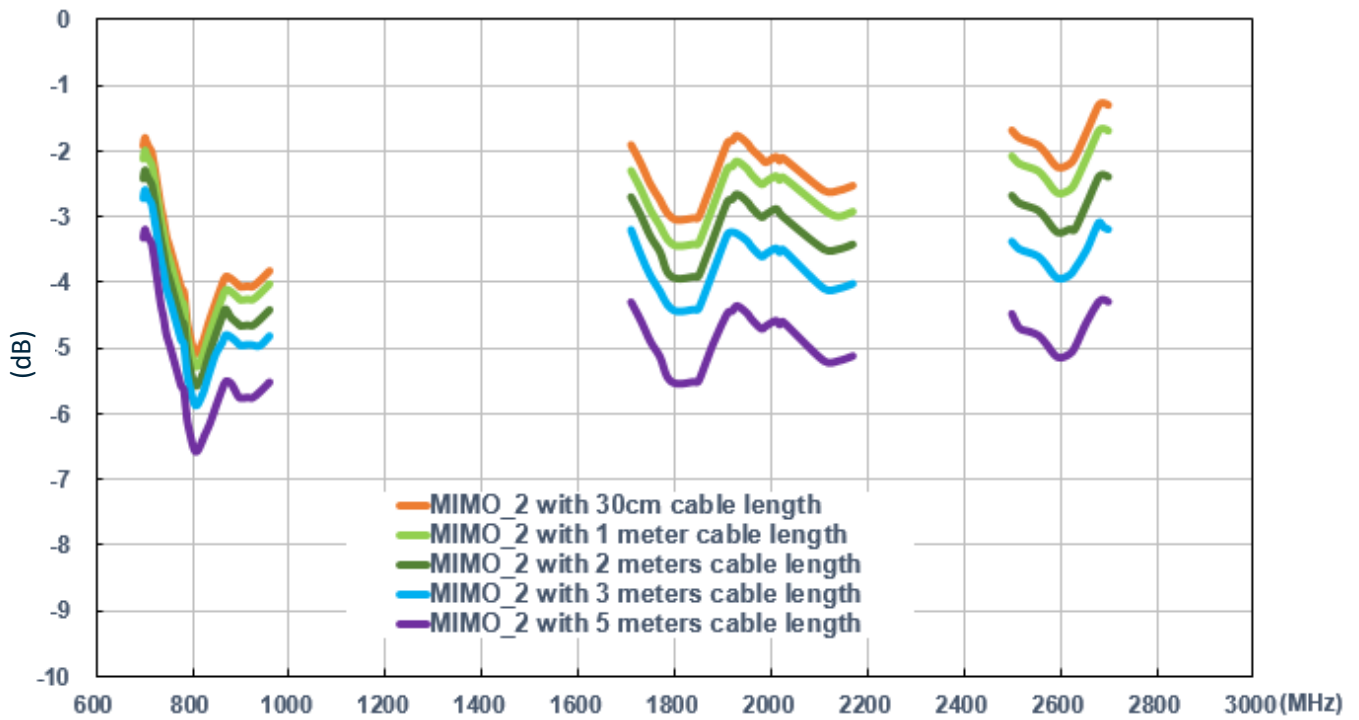
7.23 Return Loss – On Glass MIMO 2



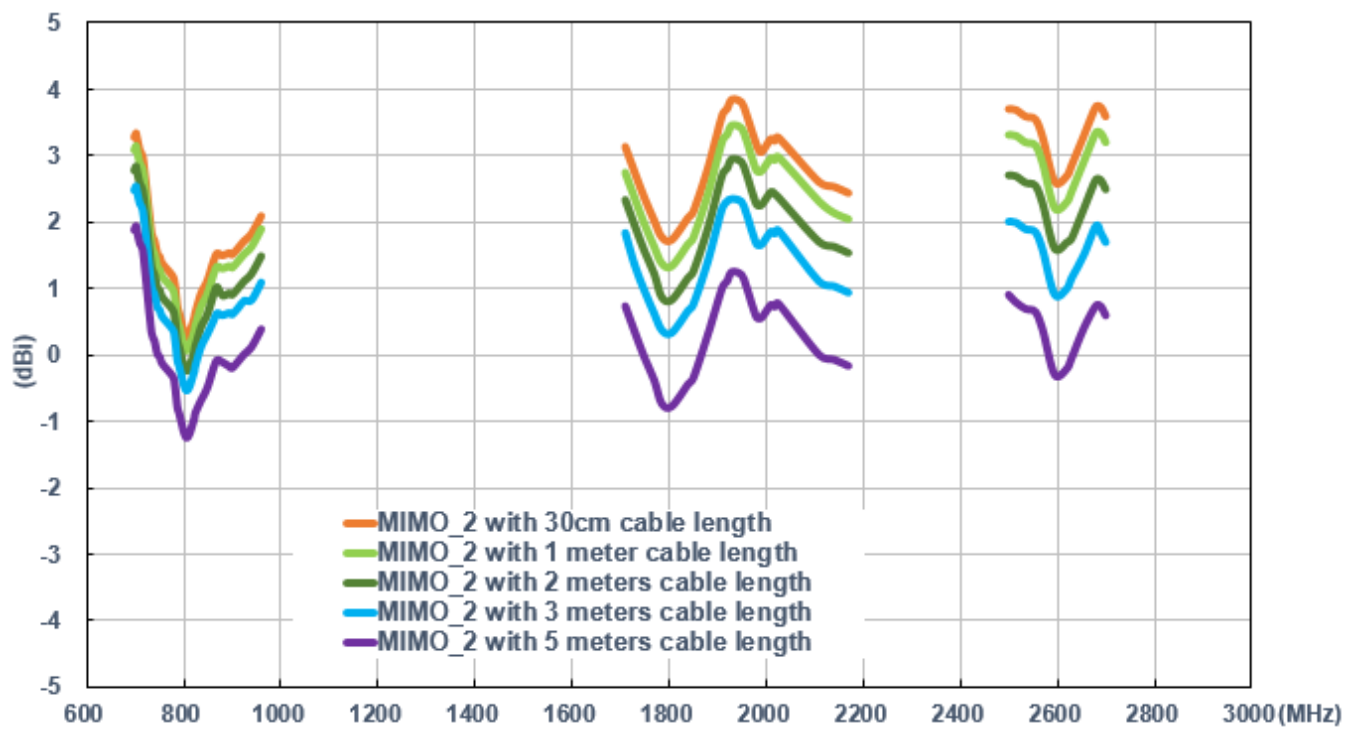
7.24 Efficiency – On Glass MIMO 2



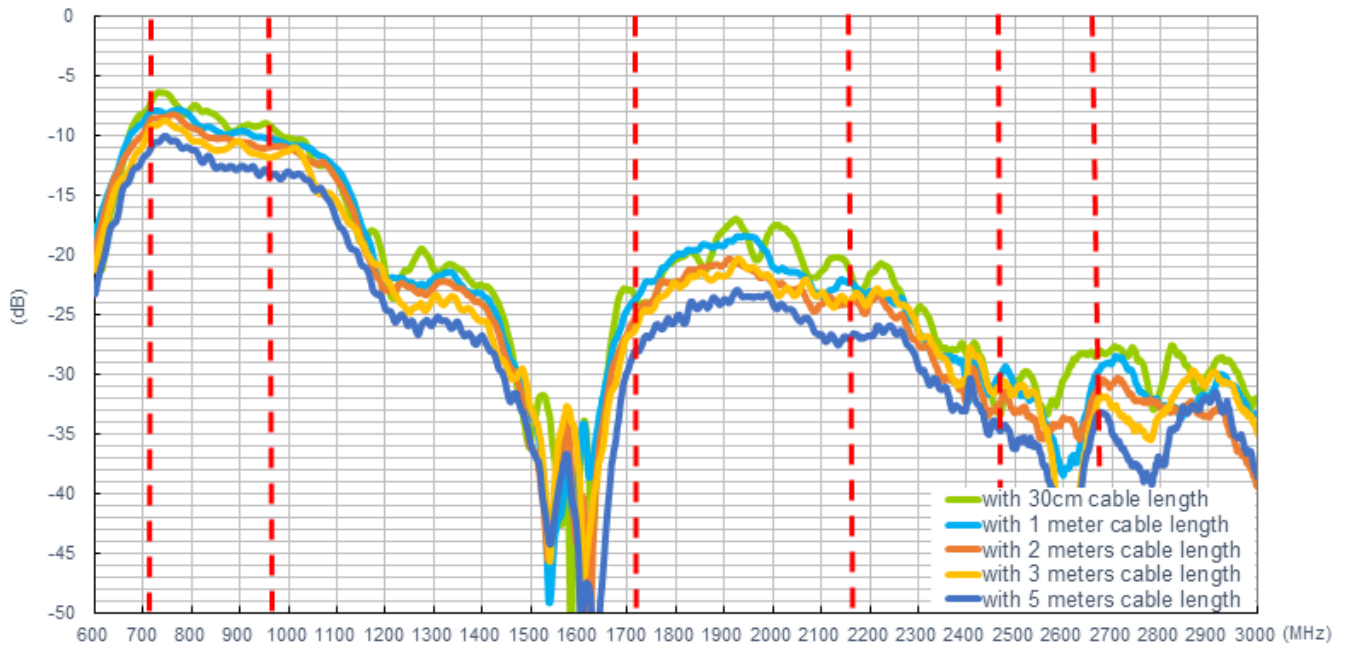
7.25 Average Gain – On Glass MIMO 2



7.26 Peak Gain – On Glass MIMO 2



7.27 Isolation of MIMO 1 & 2 - On Glass





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- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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