



Datasheet

Steedan

Part No:
MA354.A.BICG.001

Description:

Steedan 4-in-1 Magnetic Mount Combination Antenna with
2*5G/4G & 2*Wi-Fi

Features:

Low Profile Magnetic Mount Enclosure
2* 5G/4G MIMO 600-6000MHz
2* Wi-Fi (including Wi-Fi 6) MIMO 2.4GHz/5.8/7.1GHz
IP65 Rated, Ruggedized PC/ABS Enclosure
LTE: 3m TGC200 Cable and SMA(M)ST Connector
Wi-Fi: 3m TGC200 Cable and RP SMA(M)ST Connector
Dimensions: 250 x 144.3 x 52.8mm
RoHS & Reach Compliant

| | |
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1. Introduction



The Taoglas Steedan MA354 is a 4-in-1 next-generation low profile magnetic mount antenna for vehicle, outdoor building and heavy equipment roof applications. It has a fully IP65 rated waterproof robust ABS enclosure and base. This is an ideal external combination antenna solution that is used where drilling a hole through the roof of a vehicle or a metal panel is not feasible. It can be mounted on steel surfaces and its ultra-strong neodymium magnets. A soft foam cushion on the base protects the mounting surface during installation and removal. Only 52.8mm high it mounts discretely to the target application out of sight of most onlookers.

This outstanding antenna delivers powerful MIMO antenna technology 5G/4G and Wi-Fi (including the newly established Wi-Fi 6) 2.4/5.8/7.1GHz. The 5 internal antennas have superior isolation. The 5G/4G antennas also include backward compatibility to work at most worldwide 3G and 2G bands.

Typical Applications:

- Next Generation OEM Automotive Connectivity
- Multimedia, Navigation and Telematics Systems
- V2V, V2X and Fleet Management Applications
- First Net Responder Routers

The MA354 is ideal for applications that require highly sophisticated antennas for real-time streaming applications that demand high-speed video uplink and downlink into the cabin of the vehicle. These challenges are resolved by the highly efficient, high gain MIMO antennas, with high isolation, all of which is necessary to achieve the required signal to noise ratio and throughput.

The MA354 can also be customized for your particular wireless application and frequency band, subject to NRE and MOQ. There are 4x 3000mm low loss TGC-200 cables, terminating in SMA(M) connectors for LTE MIMO, and RP SMA(M) for Wi-Fi MIMO. All cable lengths and connector types are customizable, for further information contact your regional Taoglas customer support team.

2. Specifications

5G/4G MIMO Free Space Electrical

| Band | Frequency (MHz) | | Efficiency (%) | Average Gain (dB) | Peak Gain (dBi) | Impedance | Max Input Power | Polarization | Radiation Pattern |
|---|-----------------|--------|----------------|-------------------|-----------------|-----------|-----------------|--------------|-------------------|
| 5G NR/4G Band 71 | 617~698 | MIMO 1 | 34.1 | -4.7 | 1.1 | 50 Ω | 10W | Linear | Omni-Directional |
| | | MIMO 2 | 21.6 | -6.7 | 0.1 | | | | |
| 4G/3G Band 12,13,14,17,28,29 | 698~824 | MIMO 1 | 32.8 | -4.8 | 3 | | | | |
| | | MIMO 2 | 47.1 | -3.3 | 3.5 | | | | |
| 4G/3G/NB-IoT/Cat M Band 5,8,18,19,20,26,27 | 824~960 | MIMO 1 | 39.7 | -4 | 4.2 | | | | |
| | | MIMO 2 | 53.2 | -2.7 | 4 | | | | |
| 5G NR/4G Band 21,32,74,75,76 | 1427~1518 | MIMO 1 | 43.2 | -3.7 | 3.1 | | | | |
| | | MIMO 2 | 54.1 | -2.7 | 3.6 | | | | |
| 4G/3G Band 1,2,3,4,9,23,25,35,39,66 | 1710~2200 | MIMO 1 | 46.8 | -3.3 | 5.5 | | | | |
| | | MIMO 2 | 38.5 | -4.1 | 5 | | | | |
| 4G/3G Band 7,38,40,41 | 2300~2690 | MIMO 1 | 41.7 | -3.8 | 4.9 | | | | |
| | | MIMO 2 | 39.5 | -4 | 5.7 | | | | |
| 5G NR Band 22,42,48,77,78,79 | 3300~4200 | MIMO 1 | 46 | -3.4 | 3.9 | | | | |
| | | MIMO 2 | 46.4 | -3.3 | 4.8 | | | | |
| LTE5200/ Wi-Fi 5800 | 5150~5925 | MIMO 1 | 23.9 | -6.2 | 1.6 | | | | |
| | | MIMO 2 | 26 | -5.8 | 1.7 | | | | |

5G/4G MIMO 30*30cm Ground Plane Electrical

| Band | Frequency (MHz) | | Efficiency (%) | Average Gain (dB) | Peak Gain (dBi) | Impedance | Max Input Power | Polarization | Radiation Pattern |
|---|-----------------|--------|----------------|-------------------|-----------------|-----------|-----------------|--------------|-------------------|
| 5G NR/4G Band 71 | 617~698 | MIMO 1 | 33.6 | -4.7 | 1.6 | 50 Ω | 10W | Linear | Omni-Directional |
| | | MIMO 2 | 22.3 | -6.5 | -1.6 | | | | |
| 4G/3G Band 12,13,14,17,28,29 | 698~824 | MIMO 1 | 35.3 | -4.5 | 2.3 | | | | |
| | | MIMO 2 | 21.5 | -6.7 | 2.1 | | | | |
| 4G/3G/NB-IoT/Cat M Band 5,8,18,19,20,26,27 | 824~960 | MIMO 1 | 44.8 | -3.5 | 5 | | | | |
| | | MIMO 2 | 34.8 | -4.6 | 4 | | | | |
| 5G NR/4G Band 21,32,74,75,76 | 1427~1518 | MIMO 1 | 26.8 | -5.7 | 3.4 | | | | |
| | | MIMO 2 | 40 | -4 | 5.1 | | | | |
| 4G/3G Band 1,2,3,4,9,23,25,35,39,66 | 1710~2200 | MIMO 1 | 41.8 | -3.8 | 6.6 | | | | |
| | | MIMO 2 | 37.9 | -4.2 | 6 | | | | |
| 4G/3G Band 7,38,40,41 | 2300~2690 | MIMO 1 | 37.9 | -4.2 | 5.9 | | | | |
| | | MIMO 2 | 40.5 | -3.9 | 6.9 | | | | |
| 5G NR Band 22,42,48,77,78,79 | 3300~4200 | MIMO 1 | 44.9 | -3.5 | 5.4 | | | | |
| | | MIMO 2 | 48.1 | -3.2 | 5.9 | | | | |
| LTE5200/ Wi-Fi 5800 | 5150~5925 | MIMO 1 | 21 | -6.8 | 3 | | | | |
| | | MIMO 2 | 23.5 | -6.3 | 3.3 | | | | |

| Wi-Fi MIMO Free Space Electrical | | | | | | | | | |
|----------------------------------|-----------------|--------|----------------|-------------------|-----------------|-----------|-----------------|--------------|-------------------|
| Band | Frequency (MHz) | Setup | Efficiency (%) | Average Gain (dB) | Peak Gain (dBi) | Impedance | Max Power Input | Polarization | Radiation Pattern |
| 2.4GHz Wi-Fi | 2400~2500 | MIMO 1 | 35.7 | -4.5 | 1.8 | 50 Ω | 10W | Linear | Omni-Directional |
| | | MIMO2 | 44.9 | -3.5 | 2.4 | | | | |
| 5.8GHz Wi-Fi | 5150~5850 | MIMO 1 | 39.3 | -4.1 | 7.7 | | | | |
| | | MIMO2 | 29.2 | -5.3 | 4.5 | | | | |
| 7.1GHz Wi-Fi 6 | 5925~7125 | MIMO 1 | 21.8 | -4.4 | 2.8 | | | | |
| | | MIMO2 | 25 | -5.9 | 2 | | | | |

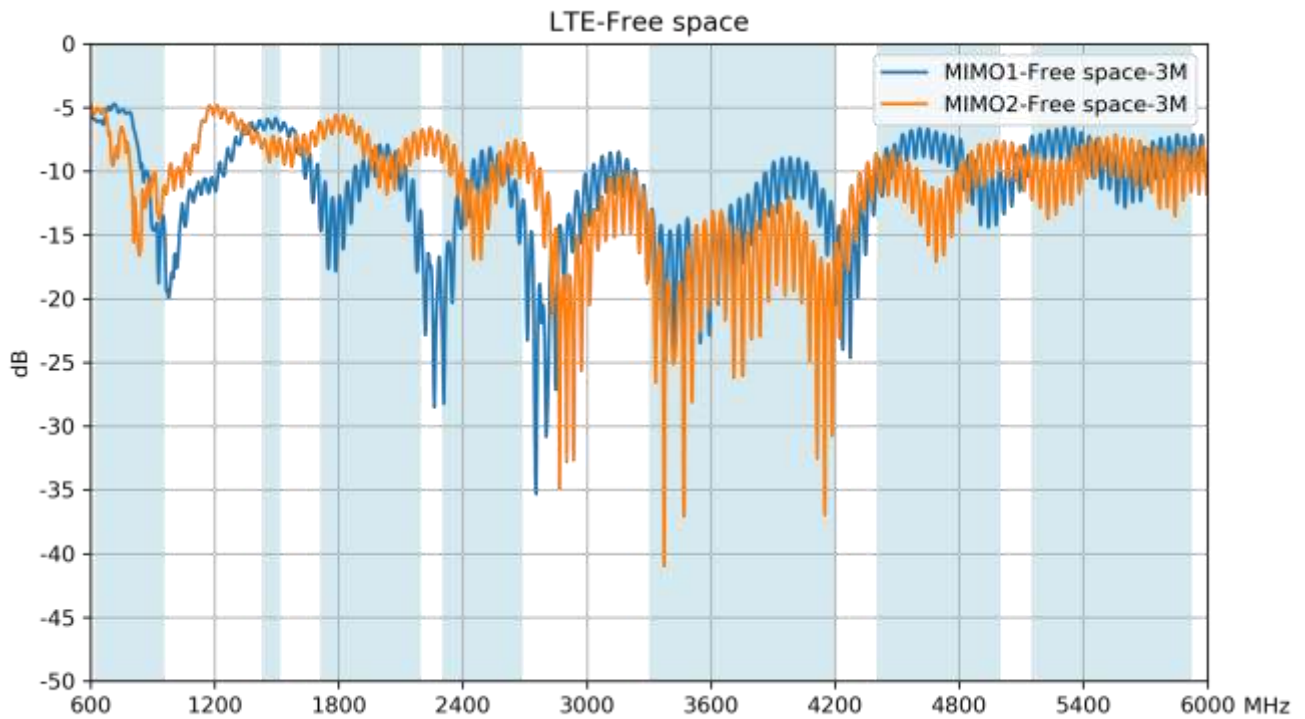
| Wi-Fi 30*30cm Ground Plane Electrical | | | | | | | | | |
|---------------------------------------|-----------------|--------|----------------|-------------------|-----------------|-----------|-----------------|--------------|-------------------|
| Band | Frequency (MHz) | Setup | Efficiency (%) | Average Gain (dB) | Peak Gain (dBi) | Impedance | Max Power Input | Polarization | Radiation Pattern |
| 2.4GHz Wi-Fi | 2400~2500 | MIMO 1 | 38.4 | -4.2 | 4.2 | 50 Ω | 10W | Linear | Omni-Directional |
| | | MIMO2 | 43.4 | -3.6 | 3.9 | | | | |
| 5.8GHz Wi-Fi | 5150~5850 | MIMO 1 | 39.9 | -4 | 7.4 | | | | |
| | | MIMO2 | 30.2 | -5.2 | 6.4 | | | | |
| 7.1GHz Wi-Fi 6 | 5925~7125 | MIMO 1 | 24.3 | -6.3 | 3.6 | | | | |
| | | MIMO2 | 26 | -5.8 | 3.9 | | | | |

| Mechanical | |
|-------------------|--|
| Dimensions | 250 x 144.3 x 52.8mm |
| Weight | 550 g |
| Material | PC+ABS |
| Connector | LTE: SMA(M) Wi-Fi: RP-SMA(M) |
| Cable | LTE MIMO 1 & 2: 3000mm TGC200 Wi-Fi MIMO & 2: 3000mm TGC200 |
| Sealant | Rubber Stopper |
| Environmental | |
| Protection | IP65 |
| Corrosion | 5% NaCl for 96hrs - Nickel plated steel base and thread |
| Temperature Range | -40°C to +85°C |
| Thermal Shock | 100 cycles -40°C to +85°C |
| Humidity | Non-condensing 65°C 95% RH |
| Shock (Drop Test) | 1m drop on concrete 6 axes |
| Cable Pull | 8 Kgf |

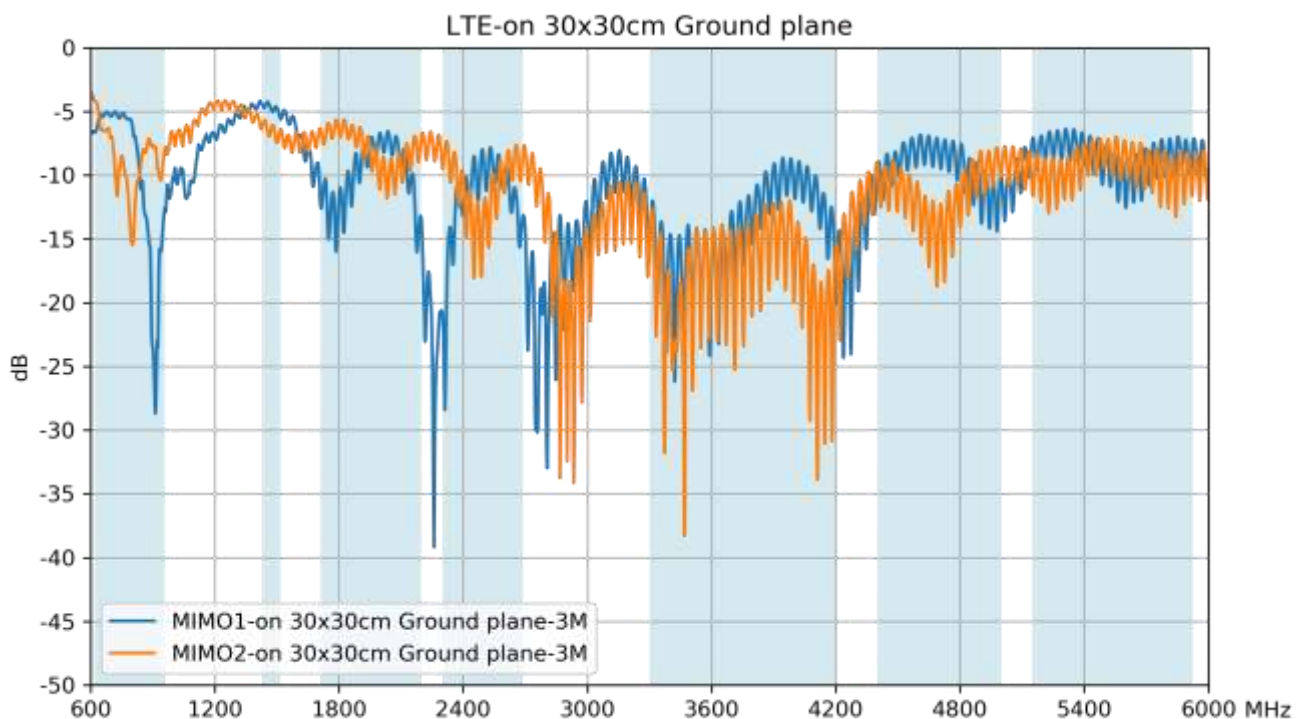
| 5G/4G Bands | | | |
|-------------|--|----------------------|---------|
| Band Number | 5G NR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA | | |
| | Uplink | Downlink | Covered |
| 1 | UL: 1920 to 1980 | DL: 2110 to 2170 | ✓ |
| 2 | UL: 1850 to 1910 | DL: 1930 to 1990 | ✓ |
| 3 | UL: 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 | ✓ |
| 78 | | 3300 to 3800 | ✓ |
| 79 | | 4400 to 5000 | ✓ |
| 126 | | 410 to 430 | ✗ |

3. Antenna Characteristics

3.1 Return Loss – 5G/4G MIMO Free Space



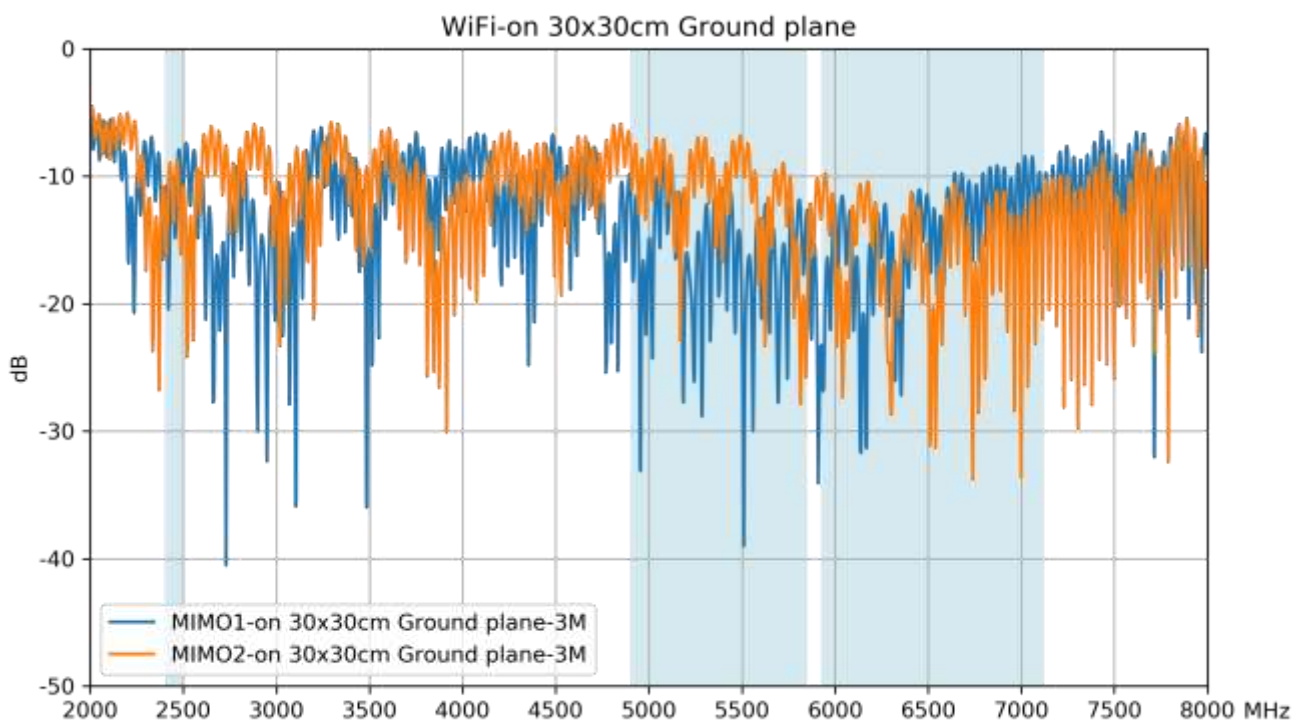
3.2 Return Loss – 5G/4G MIMO 30*30cm Ground Plane



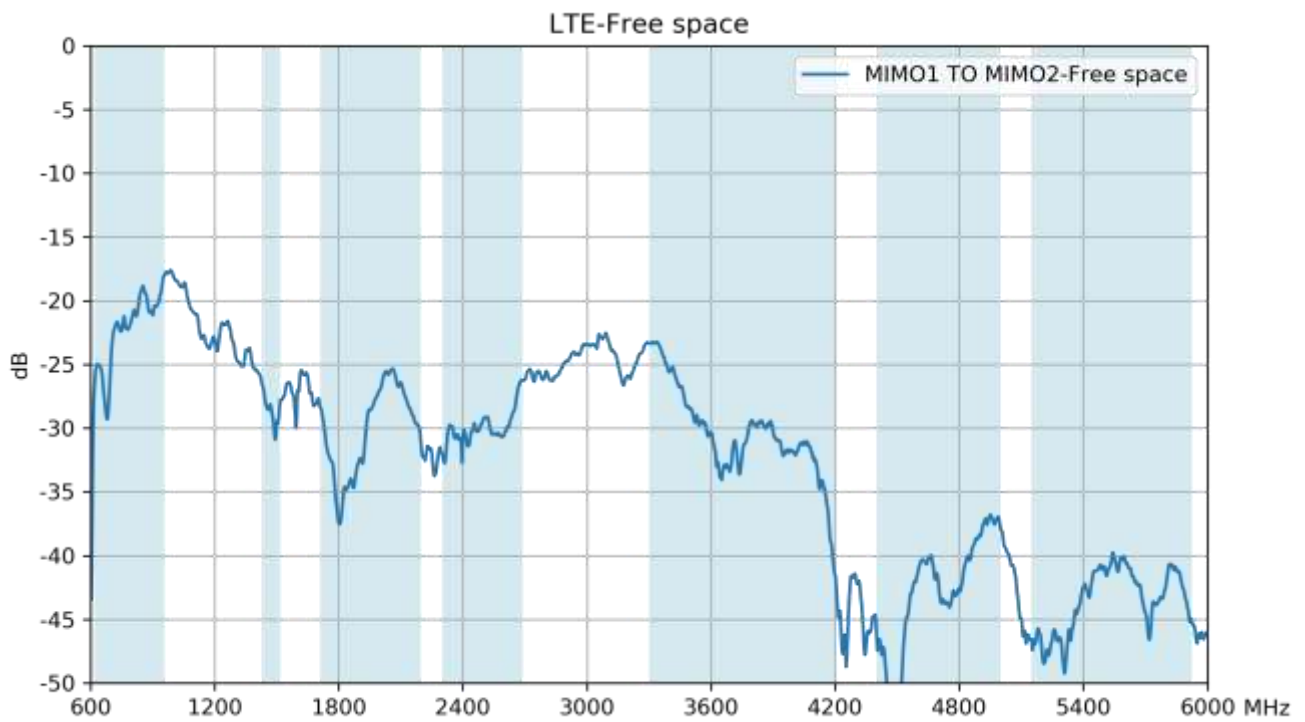
3.3 Return Loss – Wi-Fi MIMO Free Space

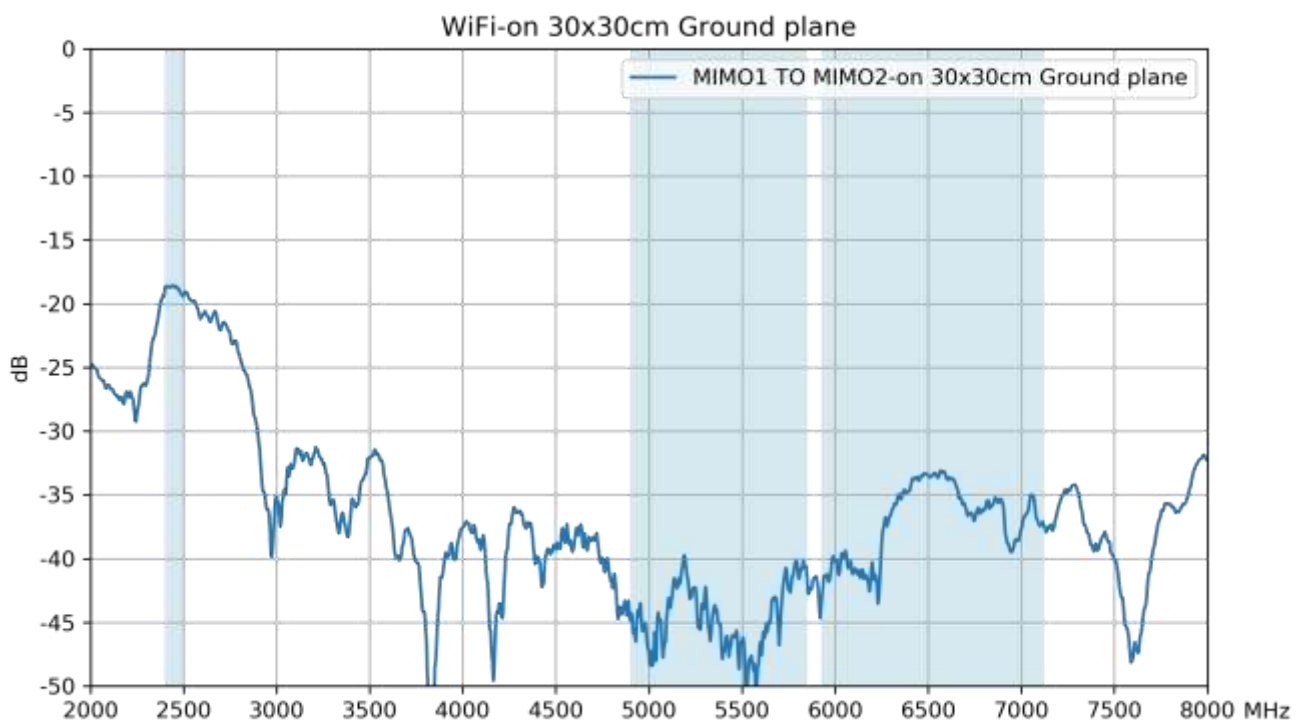
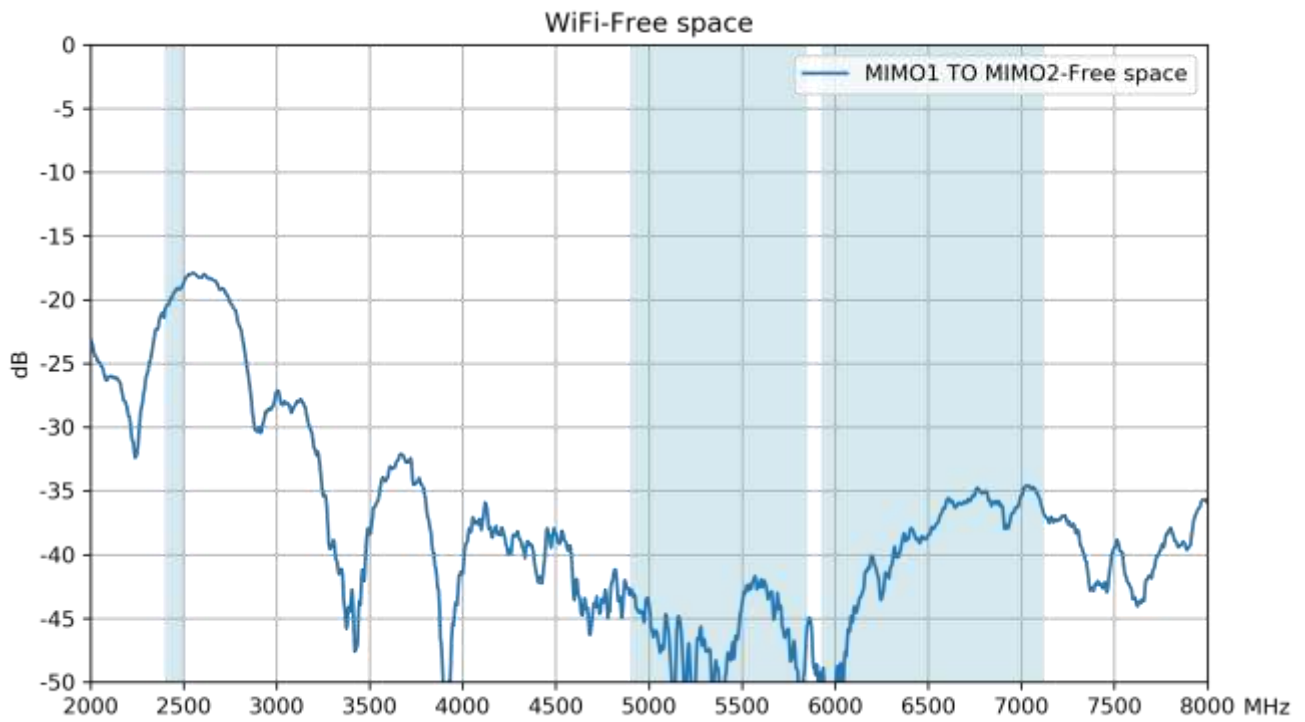


3.4 Return Loss – Wi-Fi MIMO 30*30cm Ground Plane

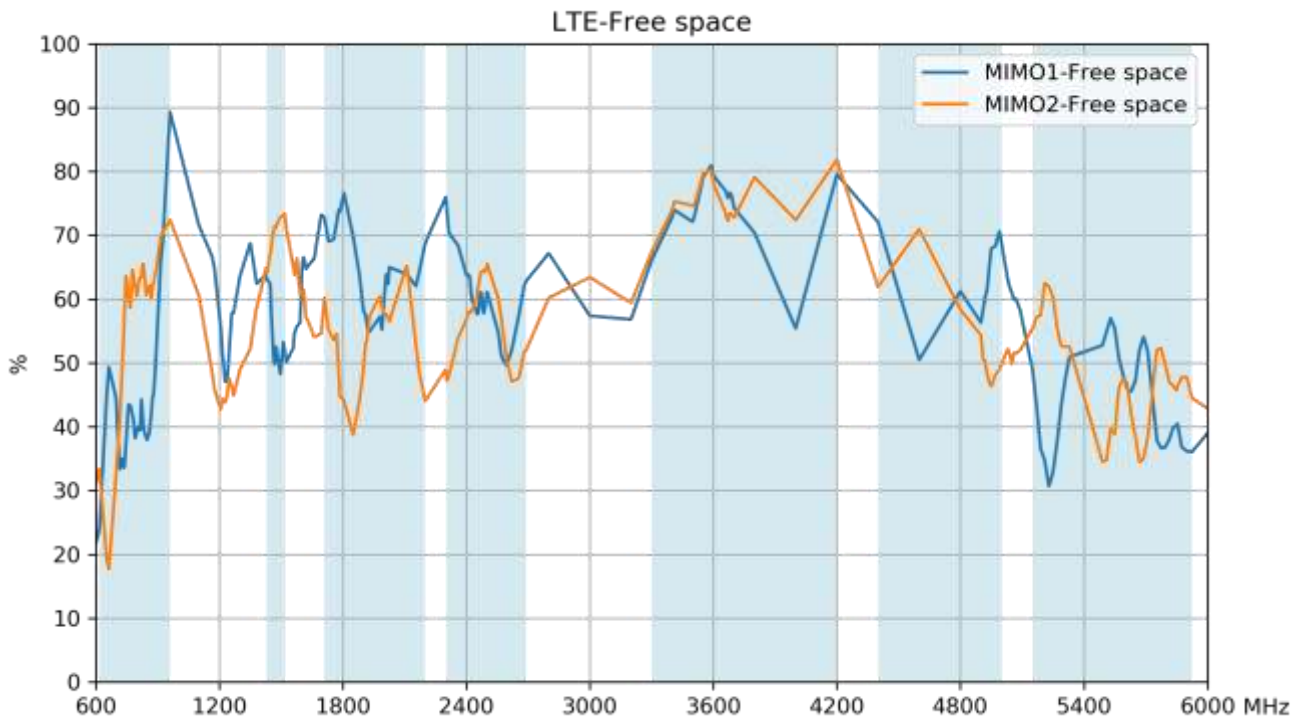


3.5 Isolation

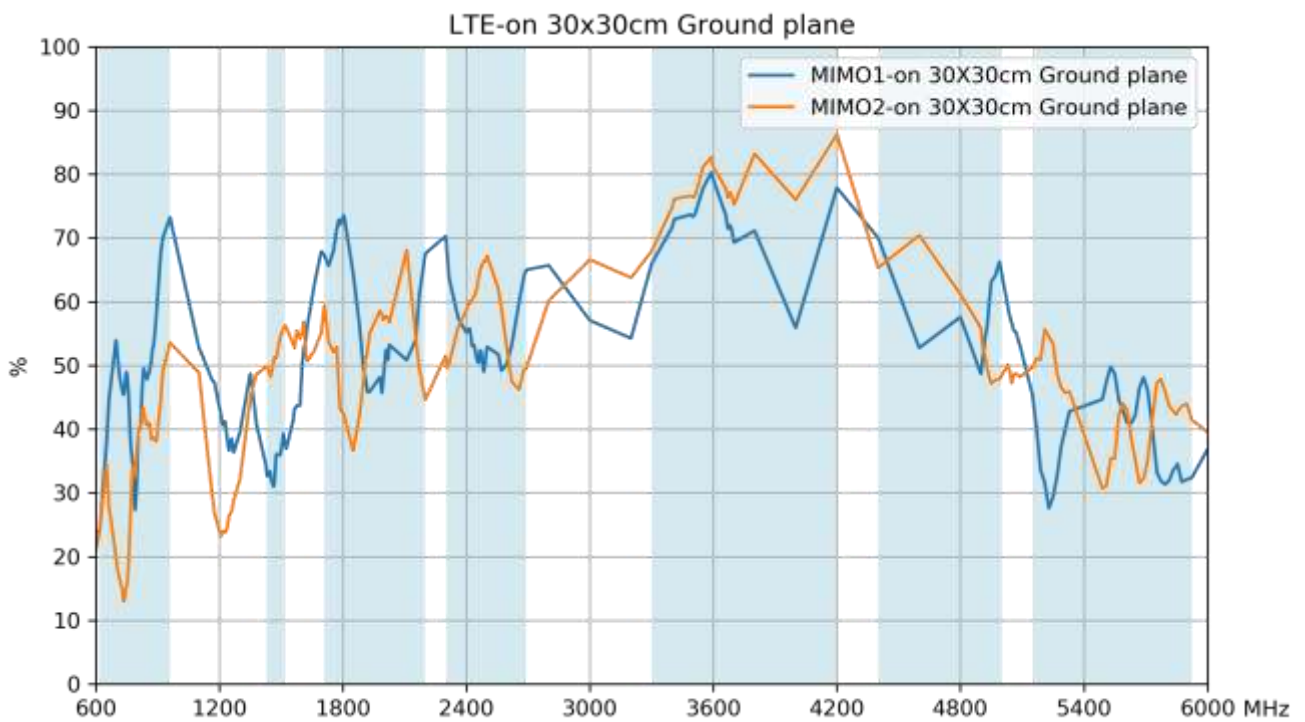




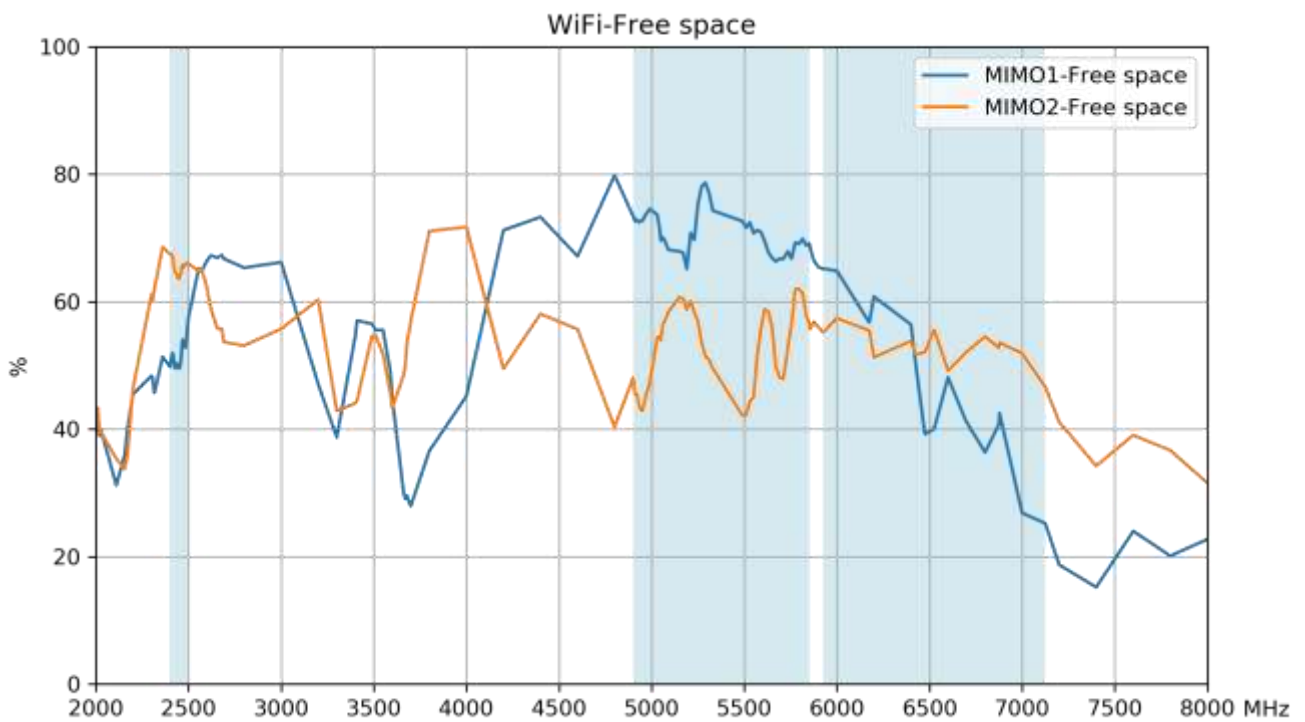
3.6 Efficiency – 5G/4G MIMO Free Space



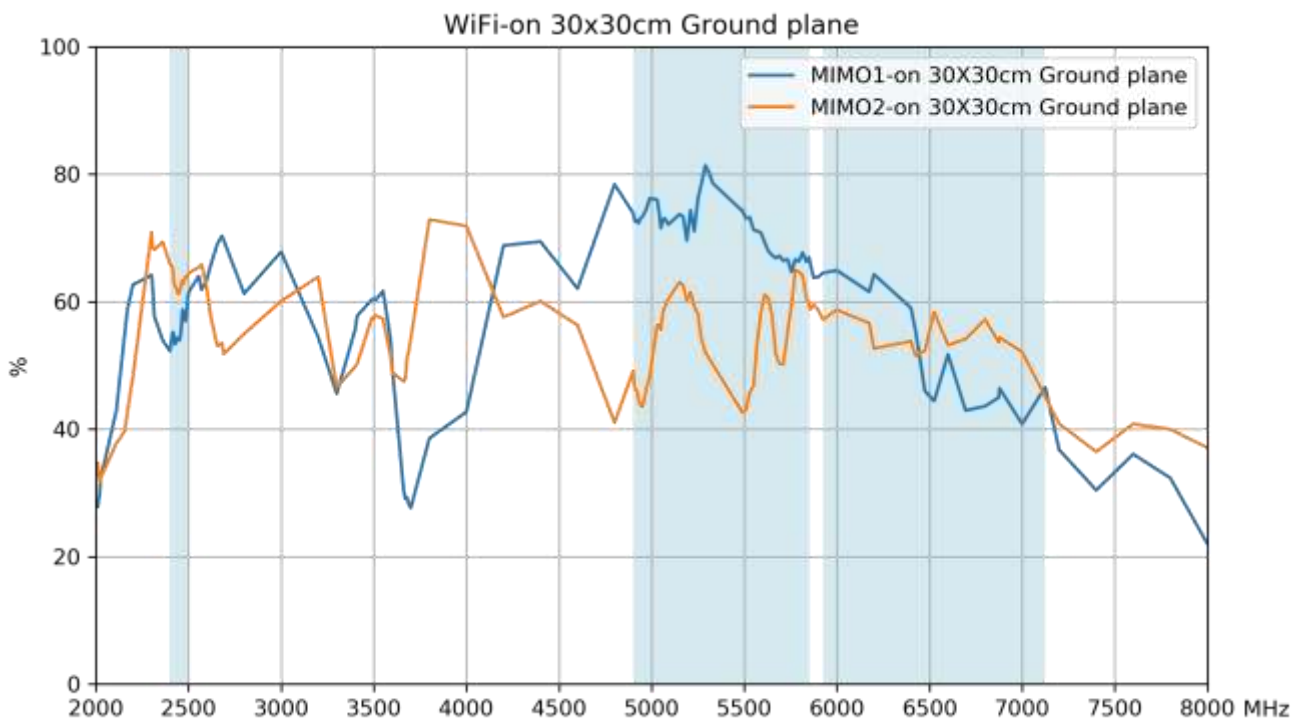
3.7 Efficiency – 5G/4G MIMO 30*30cm Ground Plane



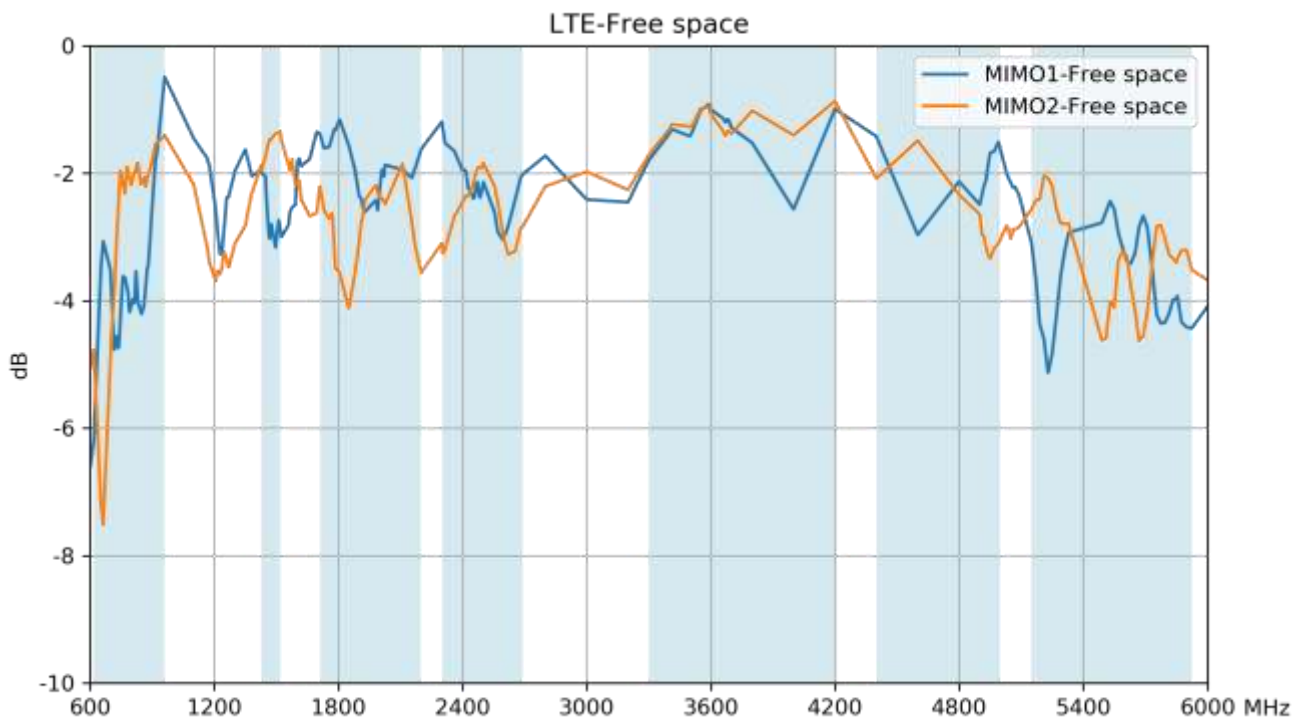
3.8 Efficiency – Wi-Fi MIMO Free Space



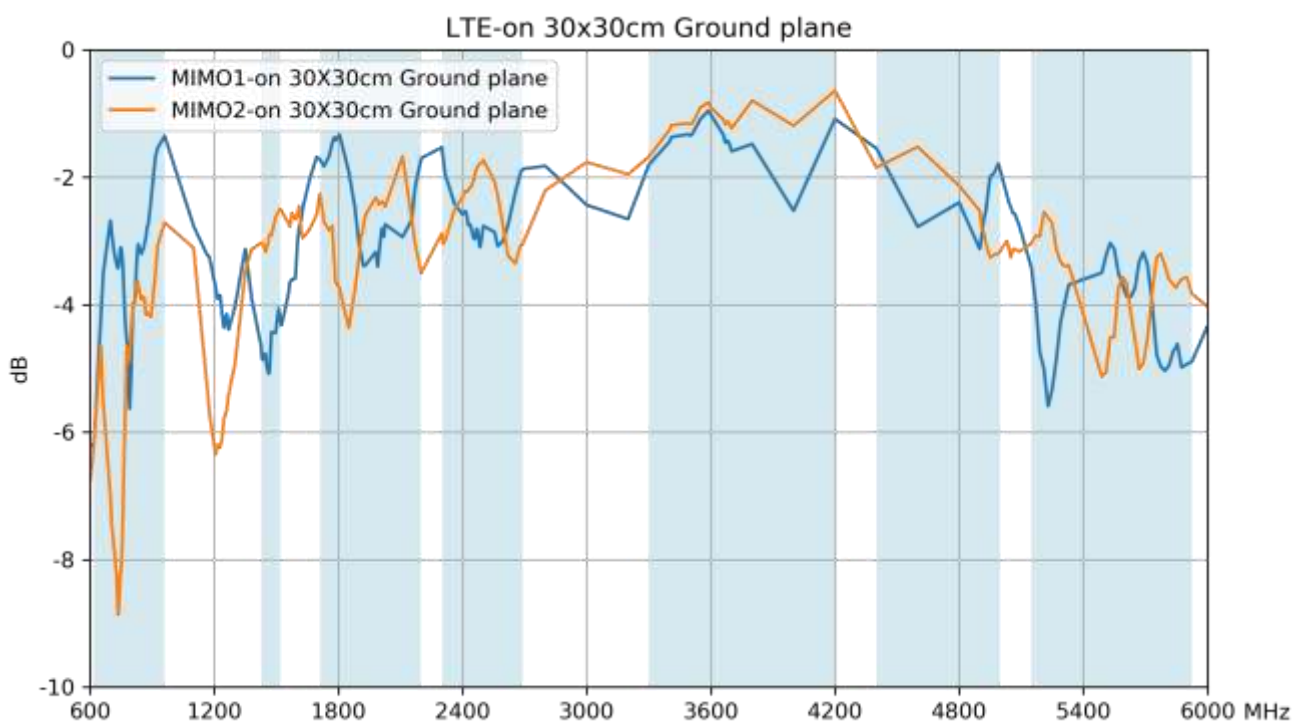
3.9 Efficiency – Wi-Fi MIMO 30*30cm Ground Plane



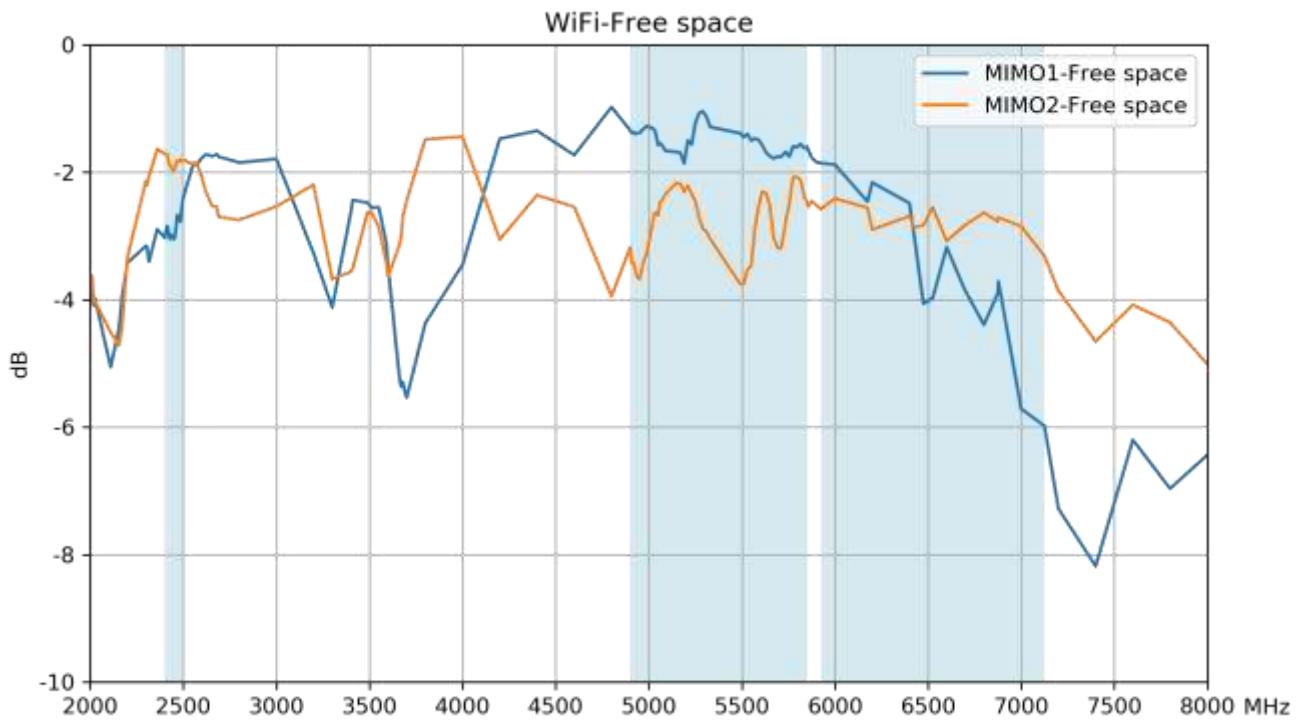
3.10 Average Gain – 5G/4G MIMO Free Space



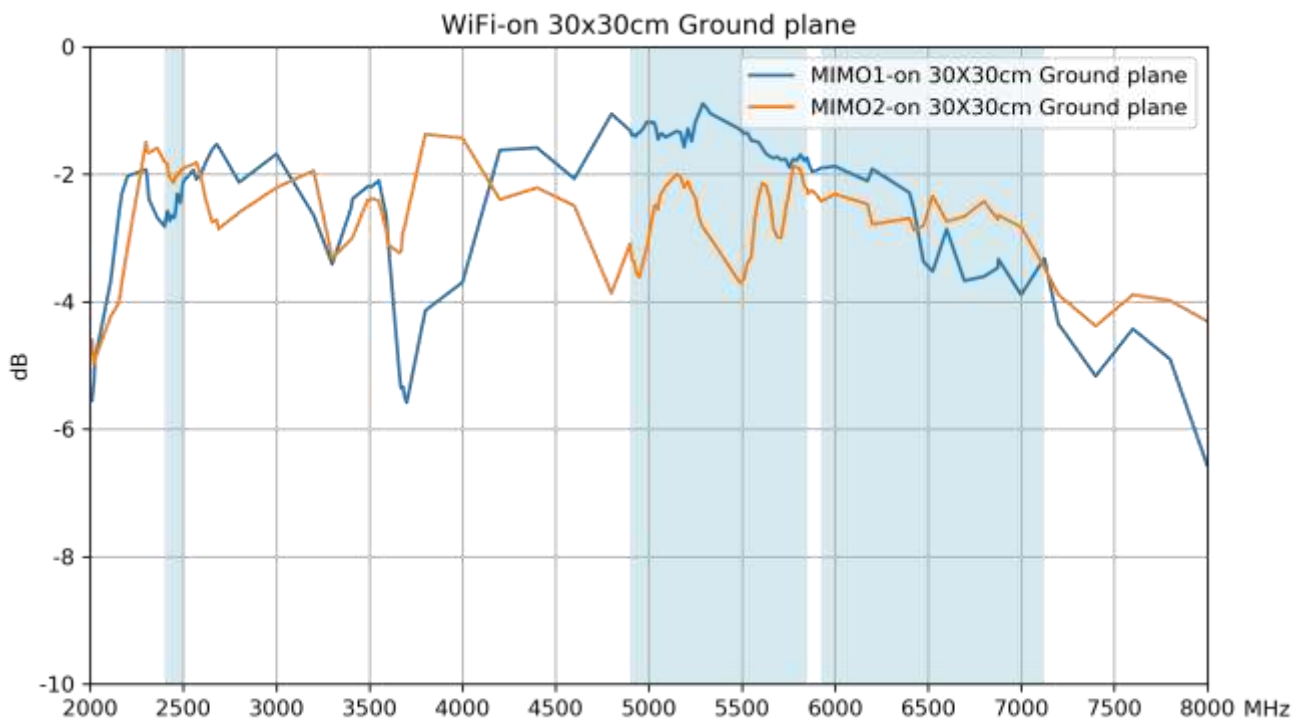
3.11 Average Gain – 5G/4G MIMO 30*30cm Ground Plane



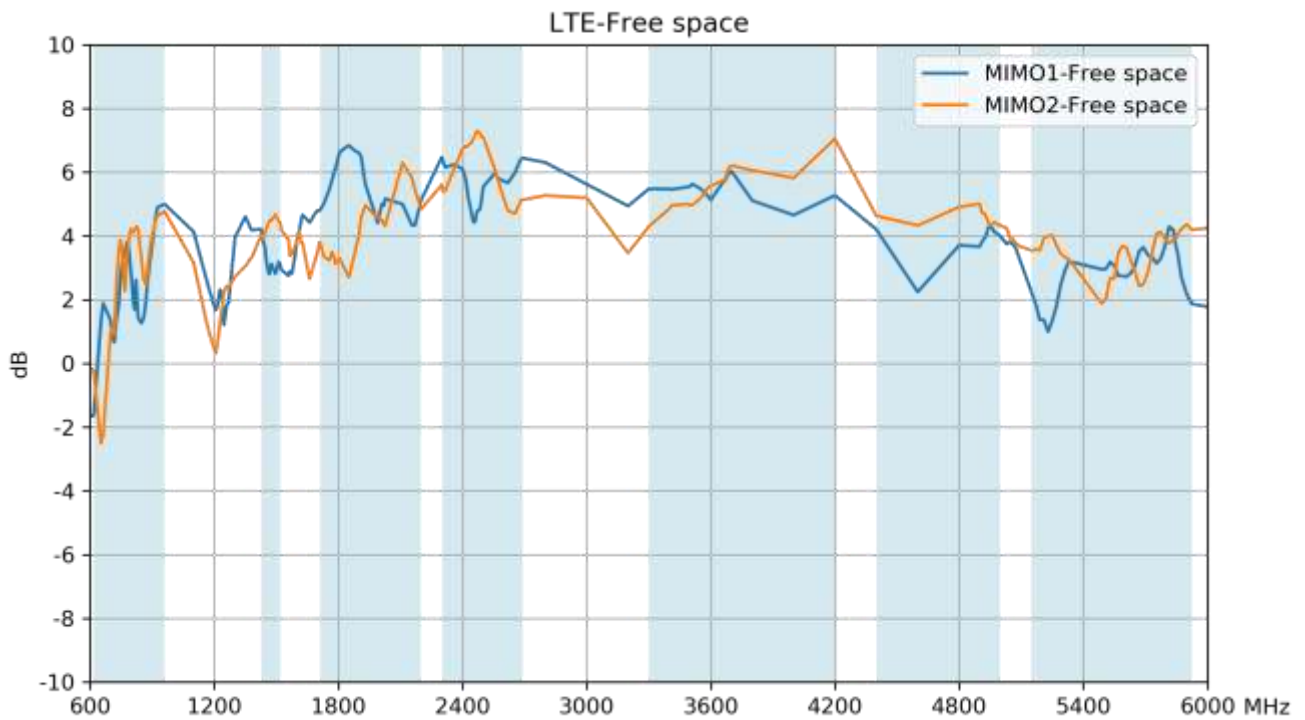
3.12 Average Gain – Wi-Fi MIMO Free Space



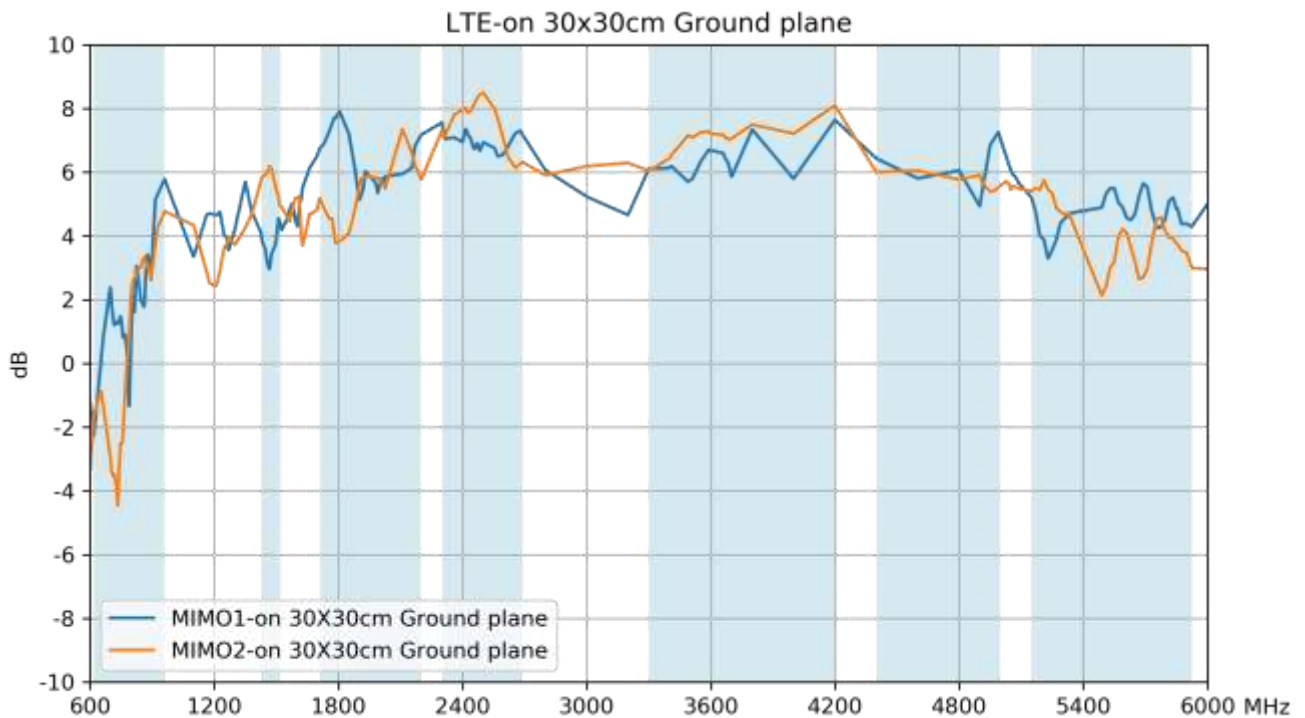
3.13 Average Gain – Wi-Fi MIMO 30*30cm Ground Plane



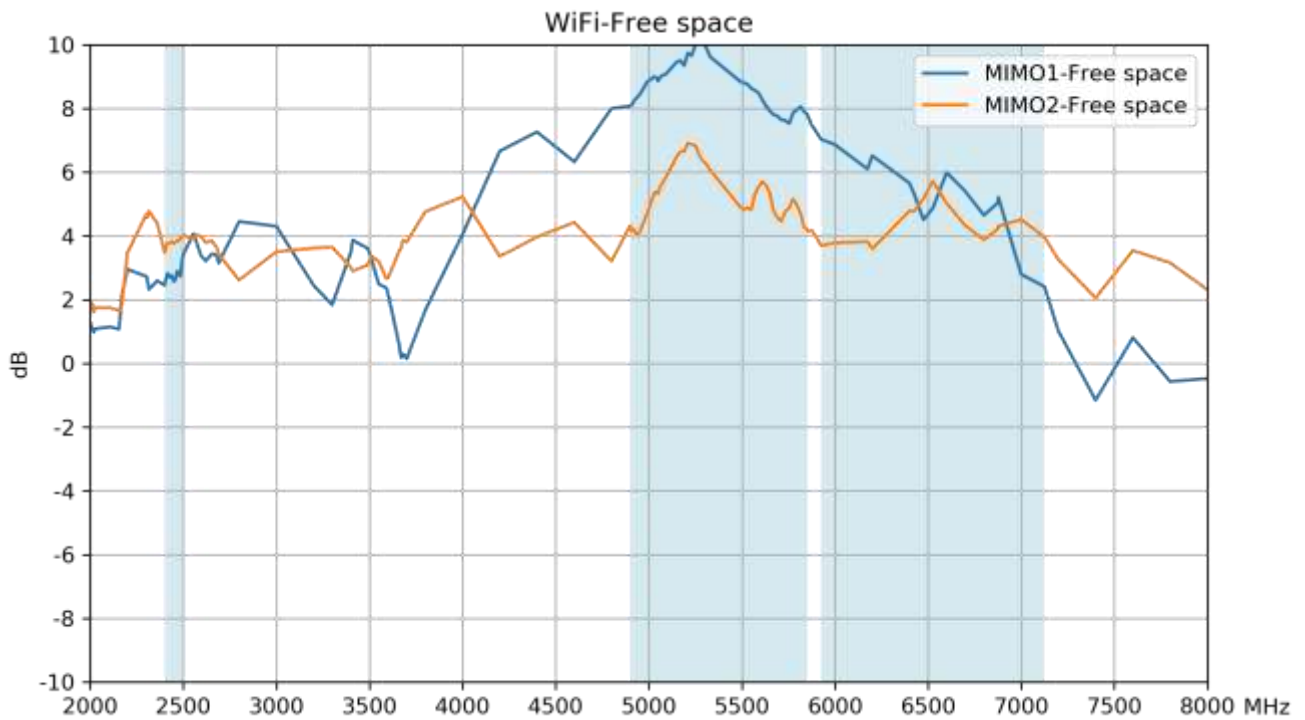
3.14 Peak Gain – 5G/4G MIMO Free Space



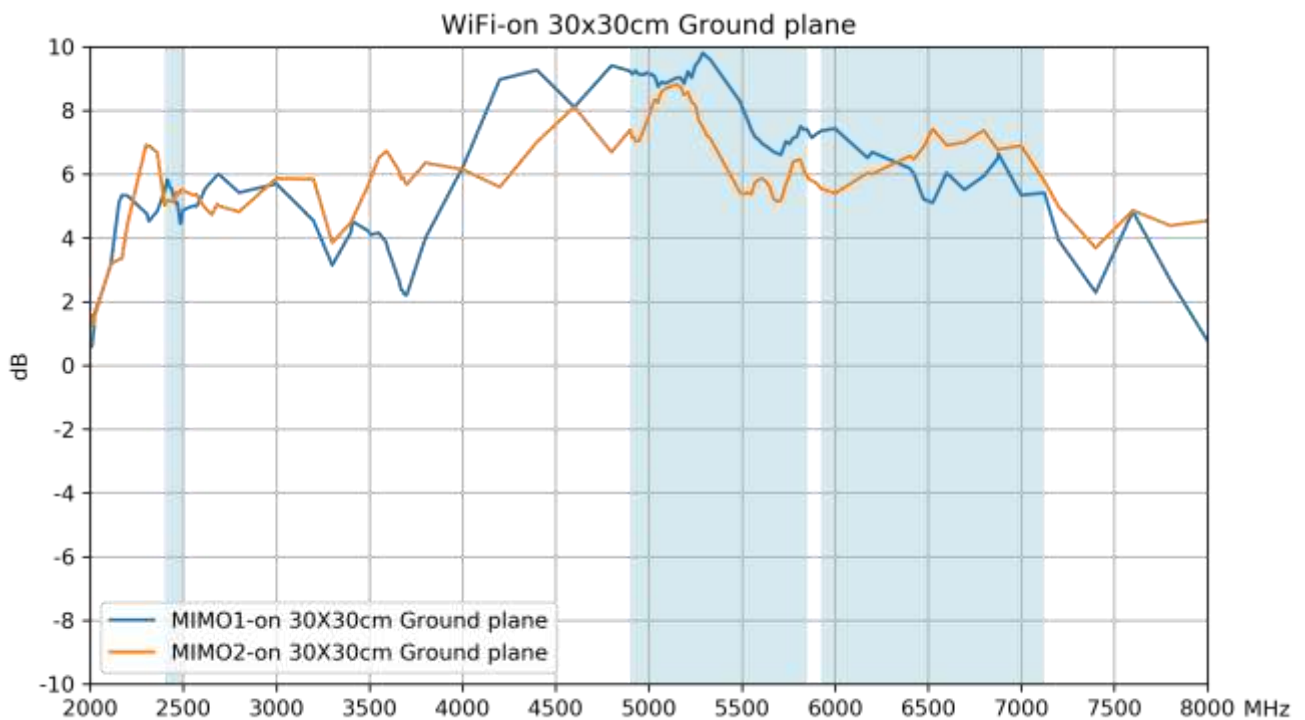
3.15 Peak Gain – 5G/4G MIMO 30*30cm Ground Plane



3.16 Peak Gain – Wi-Fi MIMO Free Space

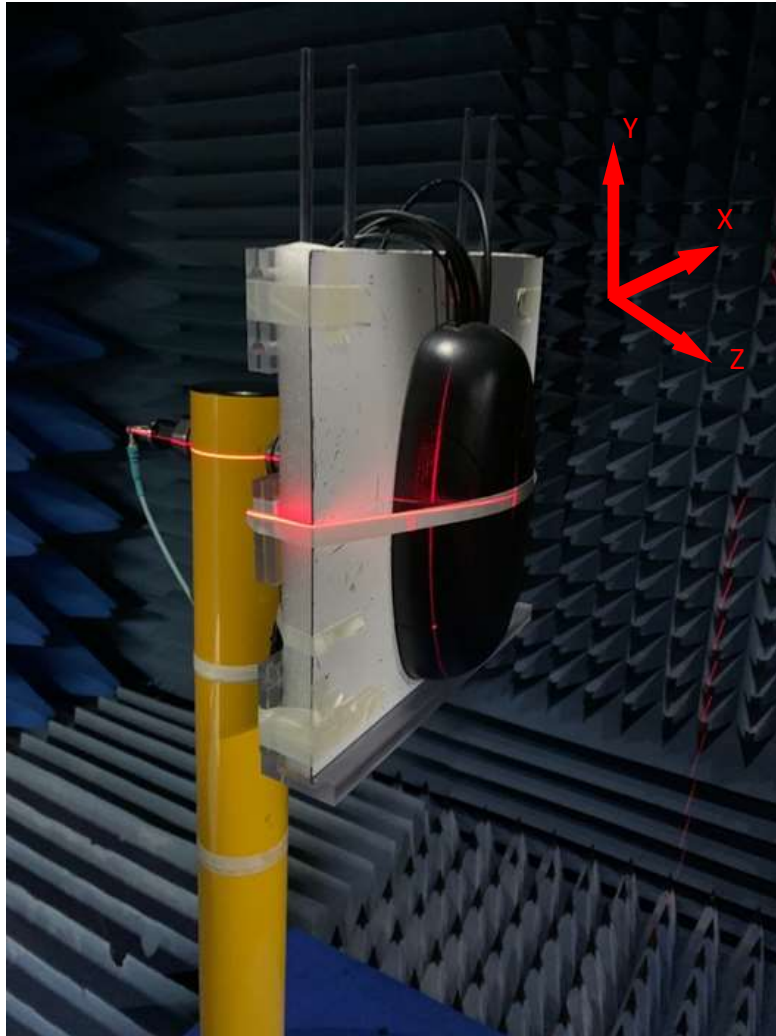


3.17 Peak Gain – Wi-Fi MIMO 30*30cm Ground Plane



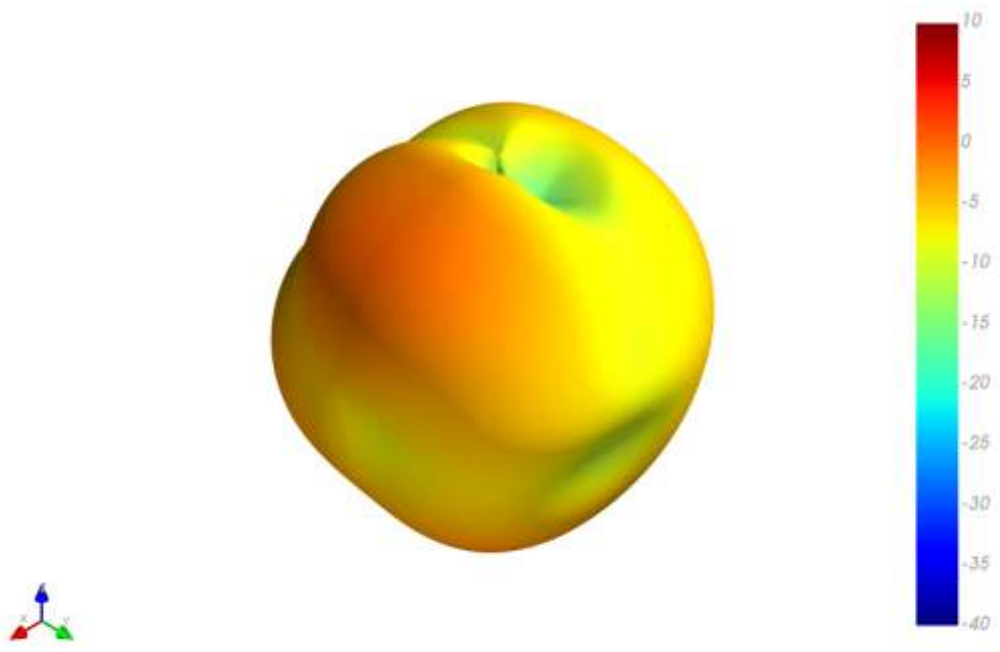
4. Radiation Patterns

4.1 Test Setup – 30*30cm Ground Plane

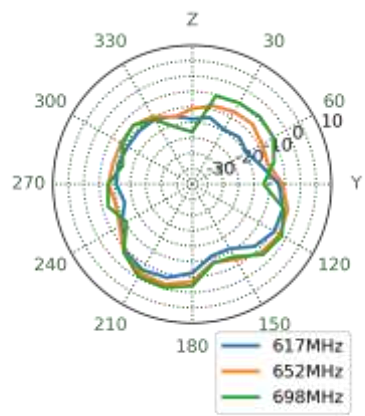
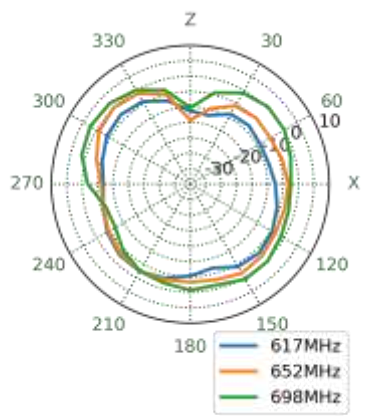
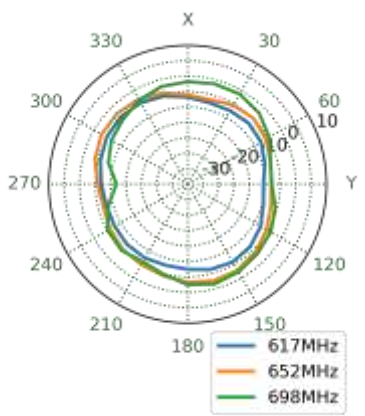


4.2 5G/4G MIMO 1 3D and 2D Radiation Patterns – 30*30cm Ground Plane

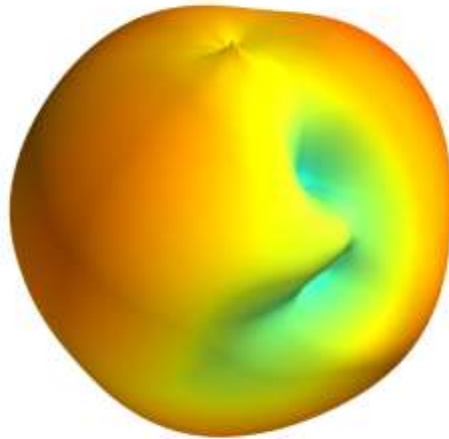
652MHz



XY Plane XZ Plane YZ Plane



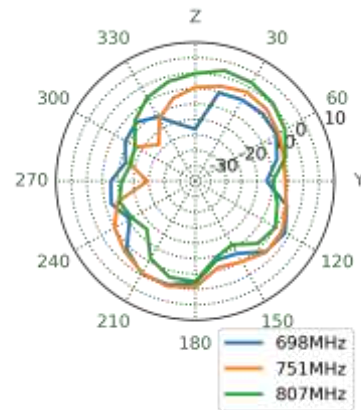
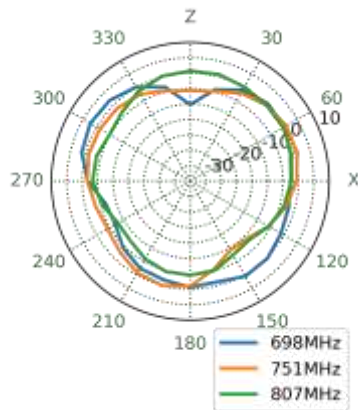
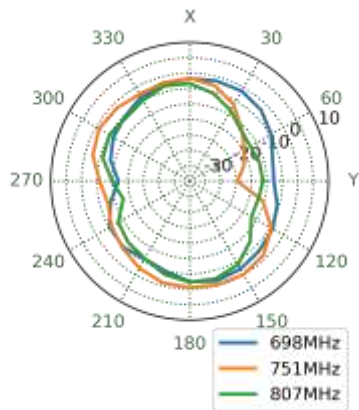
751MHz



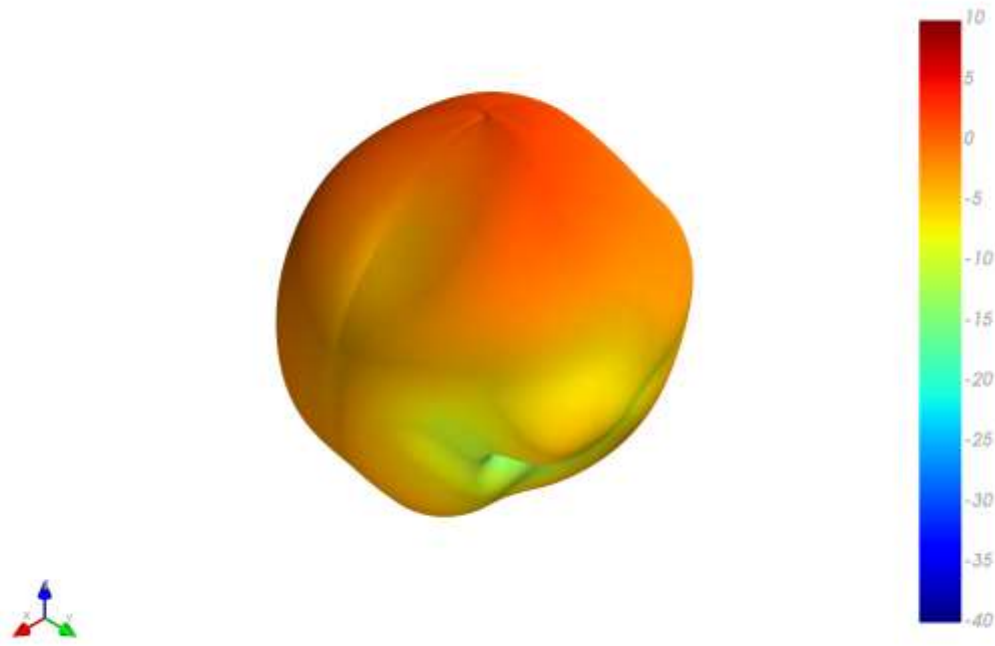
XY Plane

XZ Plane

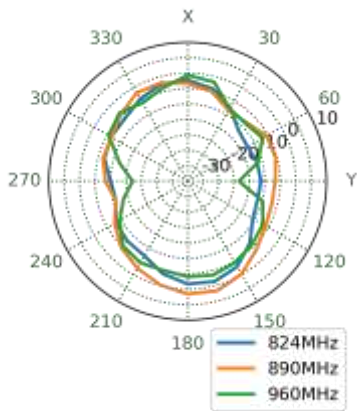
YZ Plane



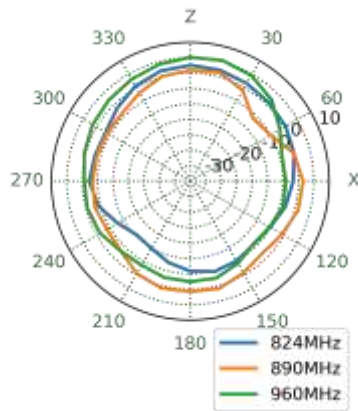
890MHz



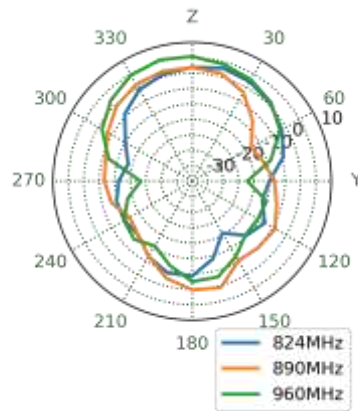
XY Plane



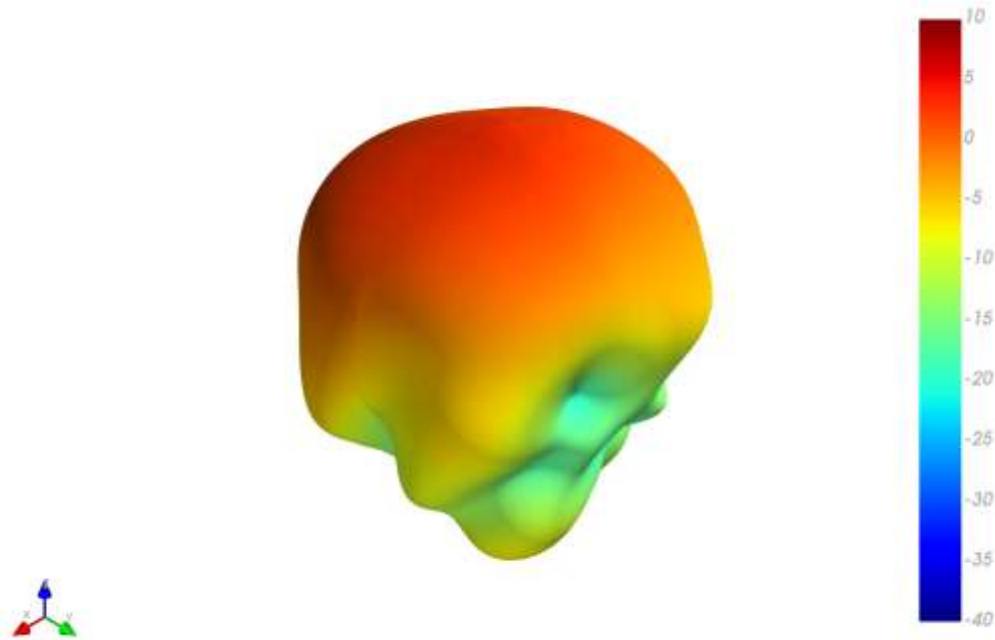
XZ Plane



YZ Plane



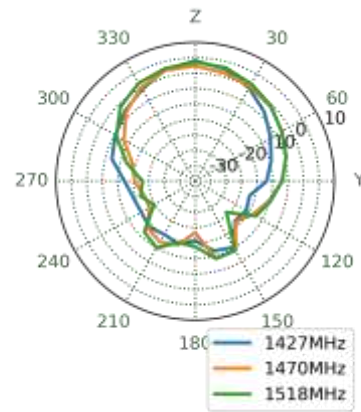
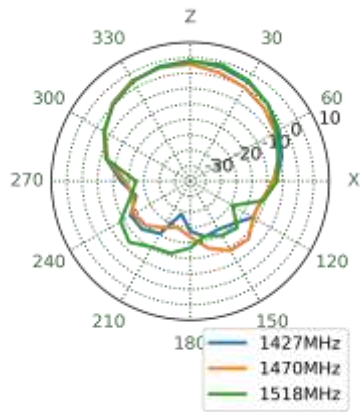
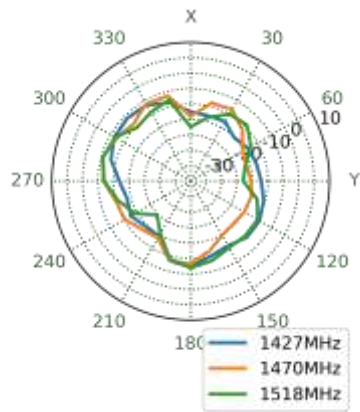
1470MHz



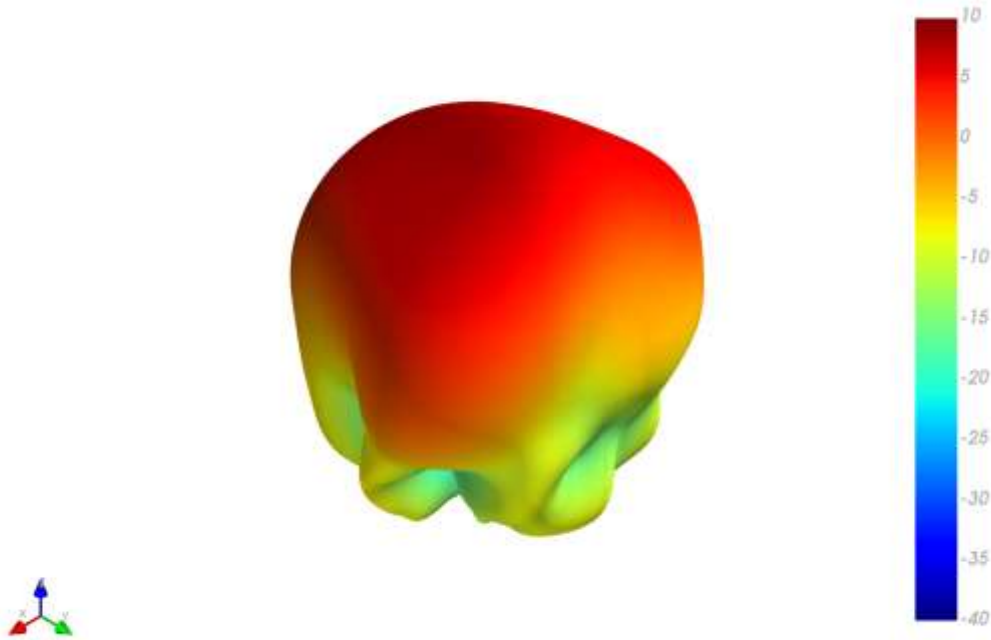
XY Plane

XZ Plane

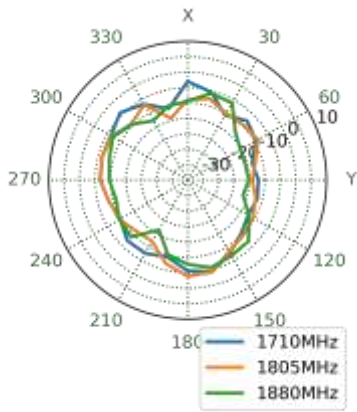
YZ Plane



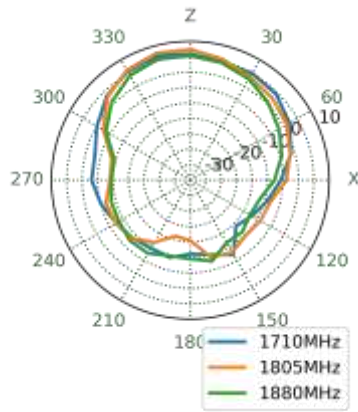
1805MHz



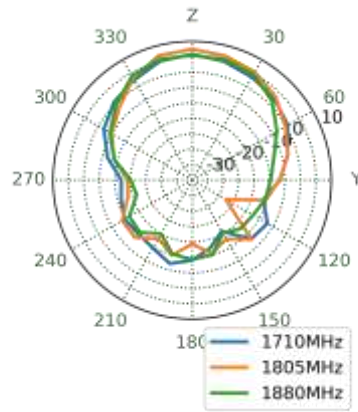
XY Plane



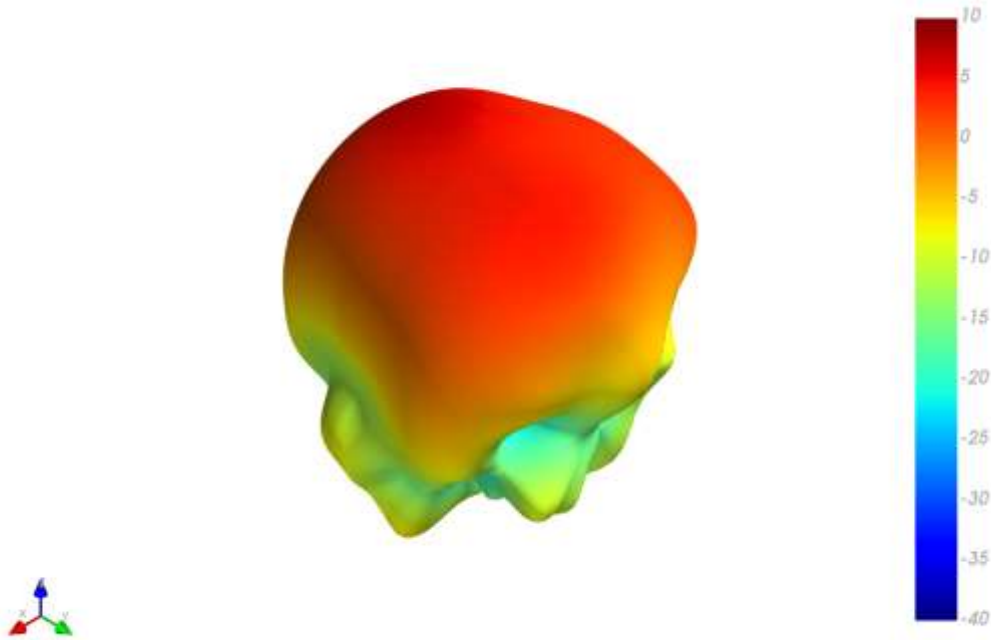
XZ Plane



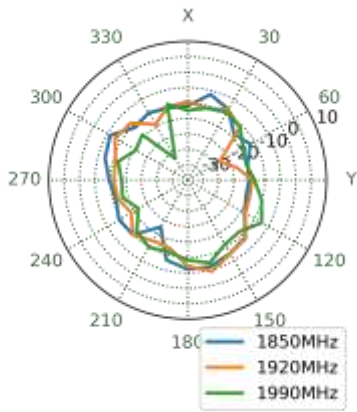
YZ Plane



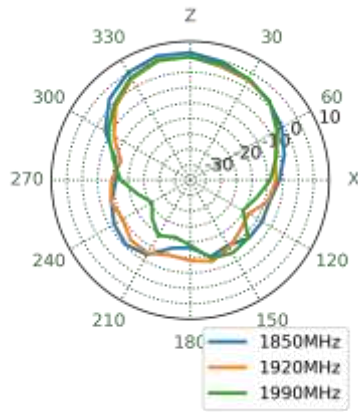
1920MHz



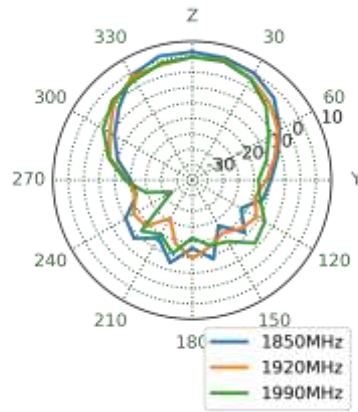
XY Plane



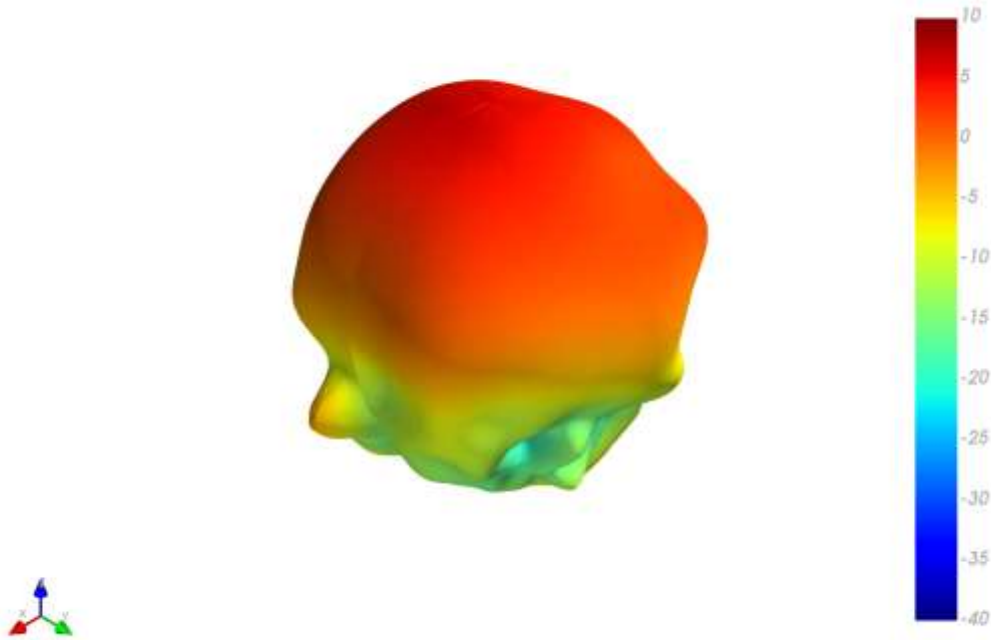
XZ Plane



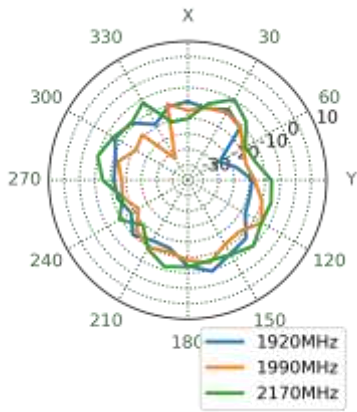
YZ Plane



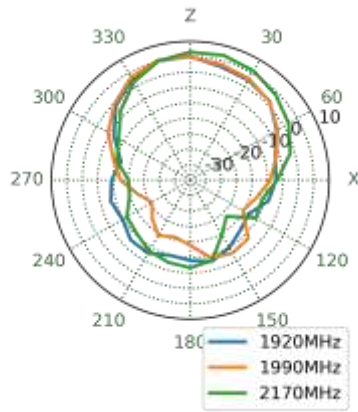
1990MHz



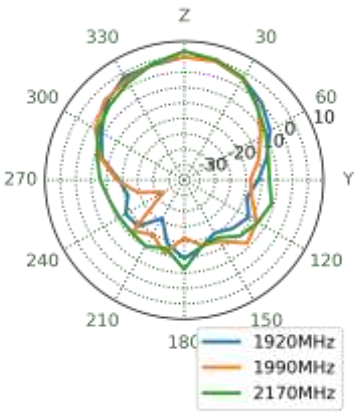
XY Plane



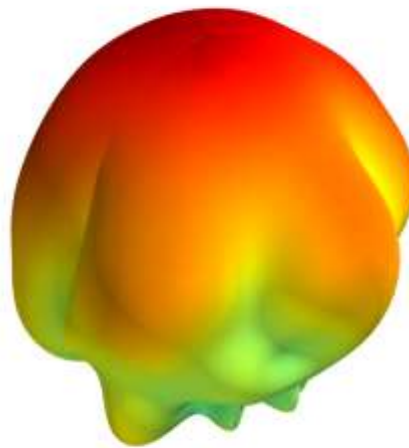
XZ Plane



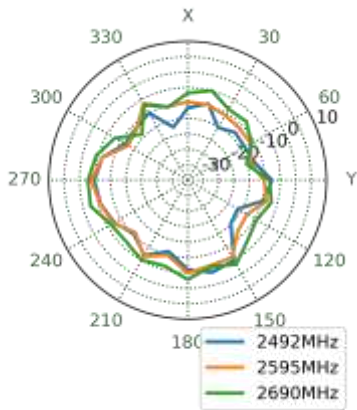
YZ Plane



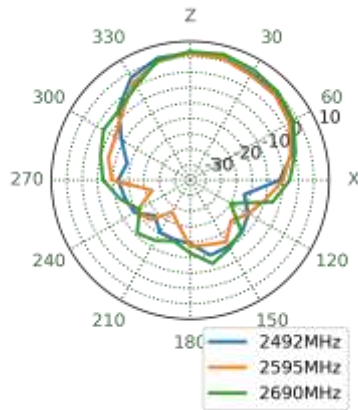
2595MHz



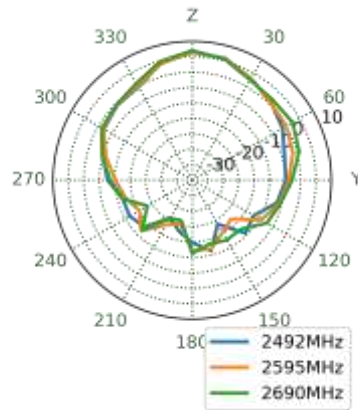
XY Plane



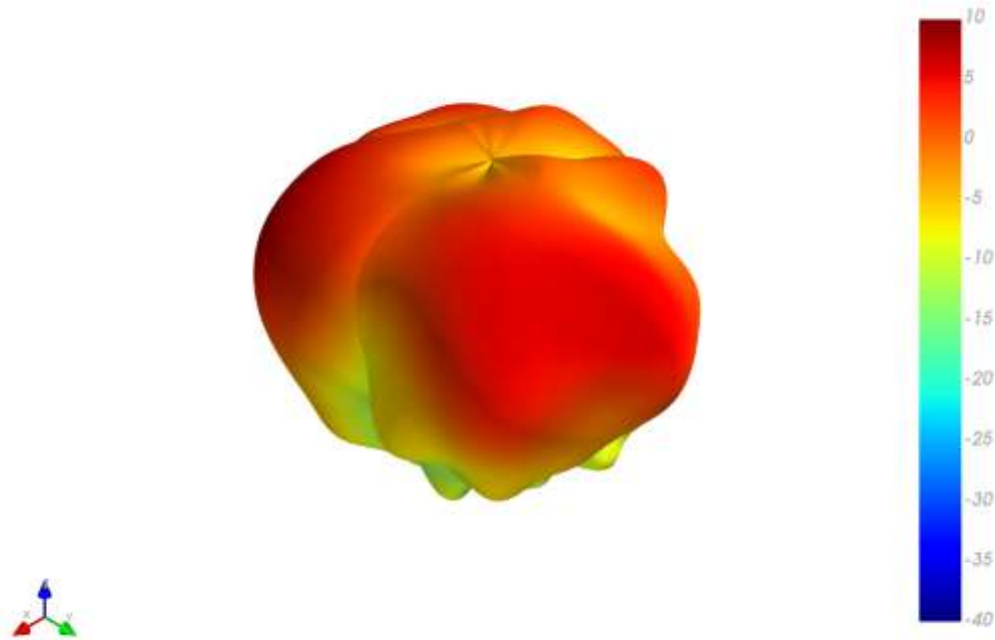
XZ Plane



YZ Plane



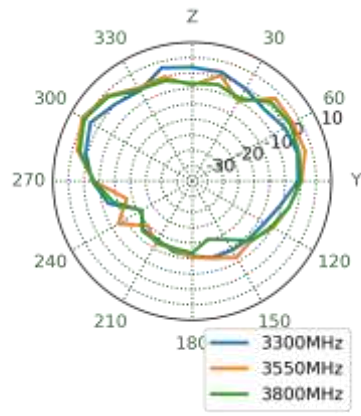
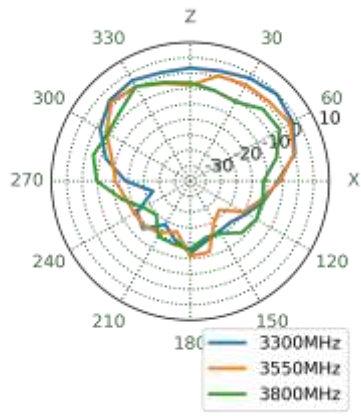
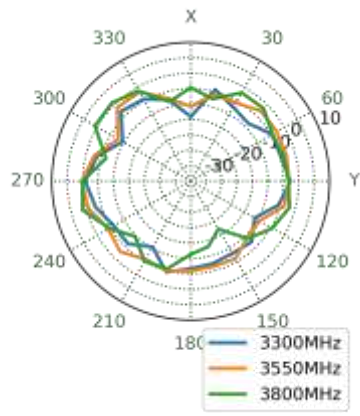
3550MHz



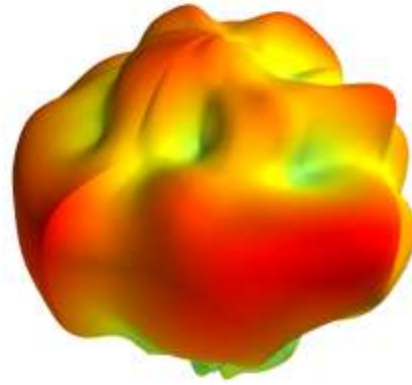
XY Plane

XZ Plane

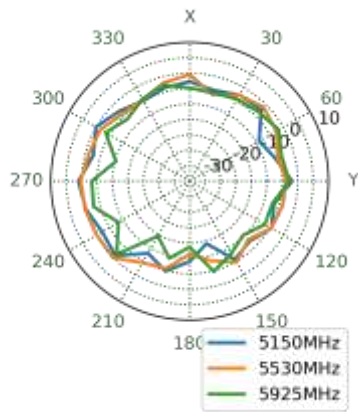
YZ Plane



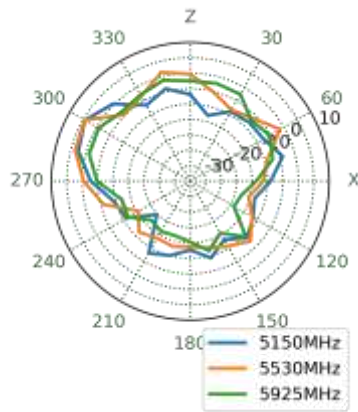
5530MHz



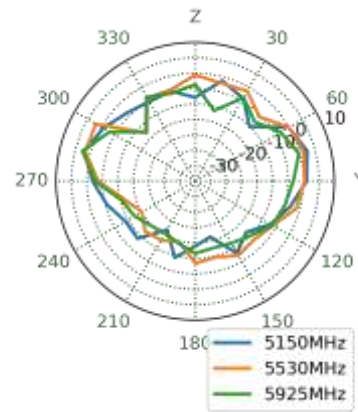
XY Plane



XZ Plane

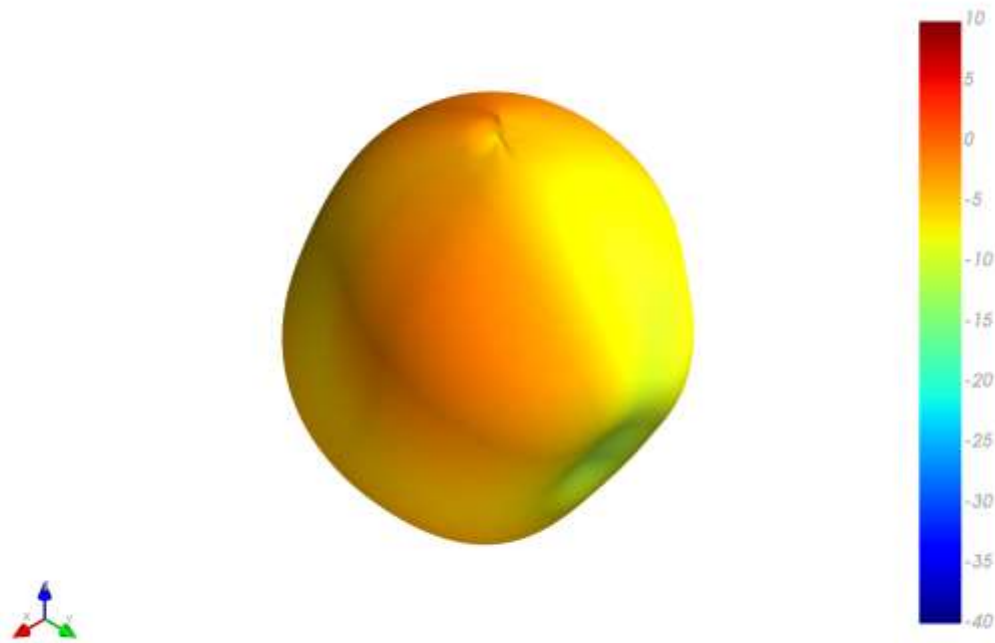


YZ Plane

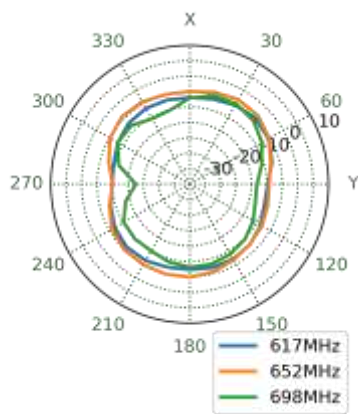


4.3 5G/4G MIMO 2 3D and 2D Radiation Patterns – 30*30cm Ground Plane

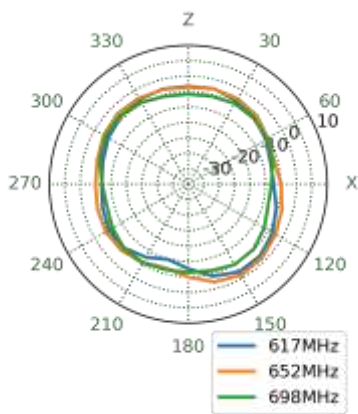
652MHz



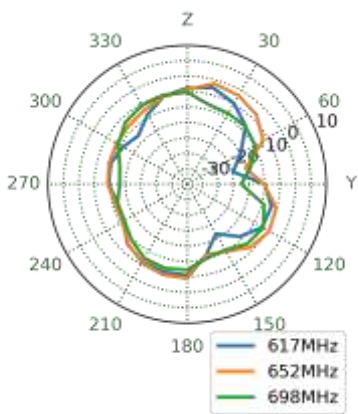
XY Plane



XZ Plane



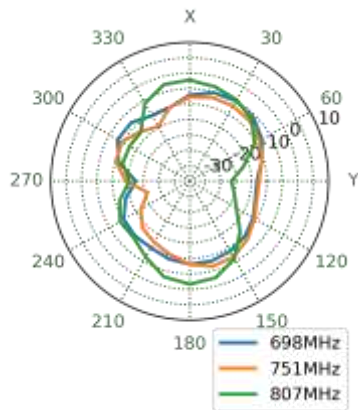
YZ Plane



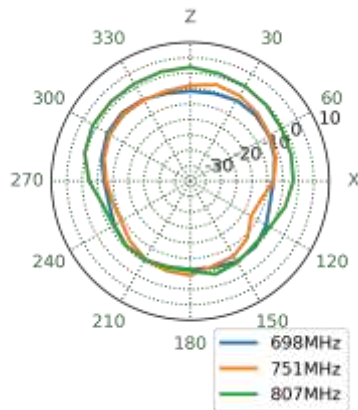
751MHz



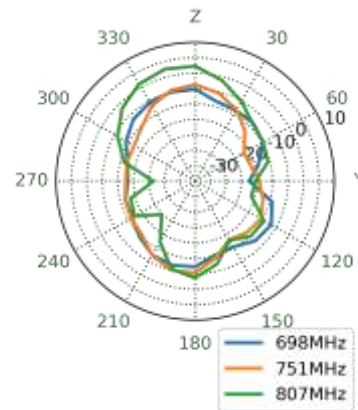
XY Plane



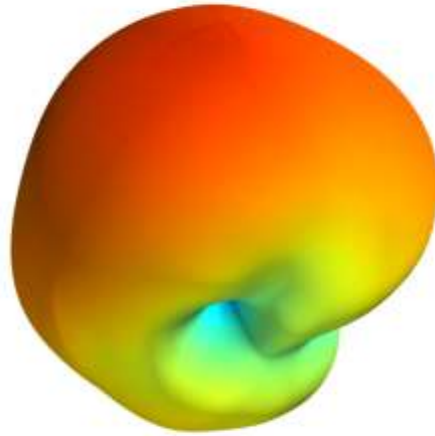
XZ Plane



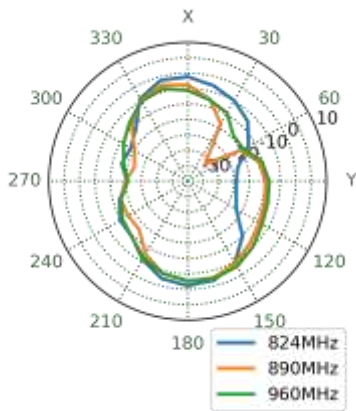
YZ Plane



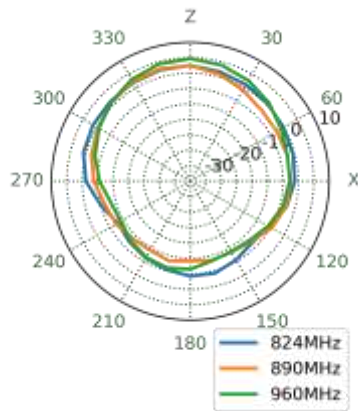
890MHz



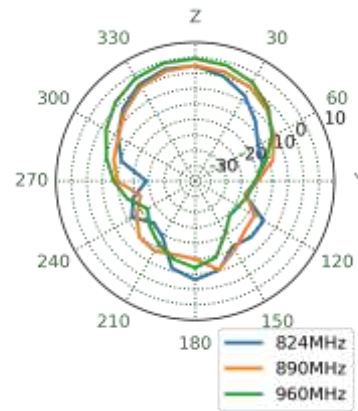
XY Plane



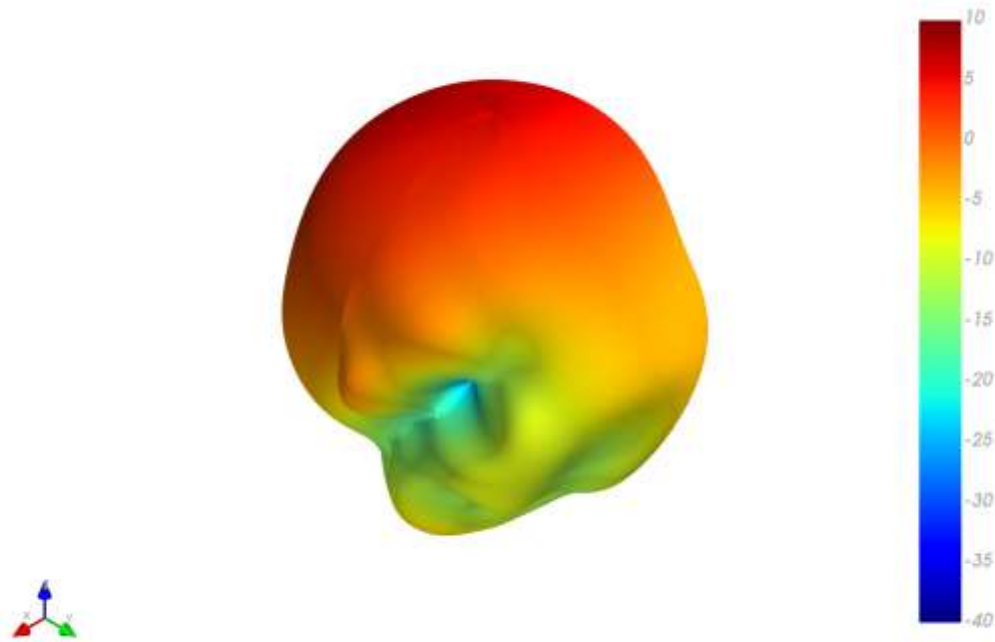
XZ Plane



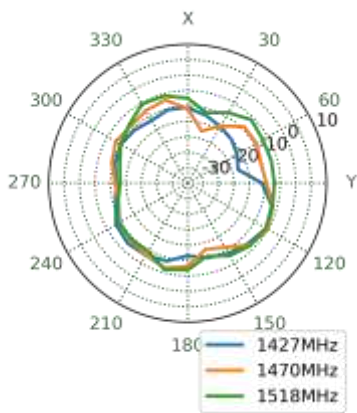
YZ Plane



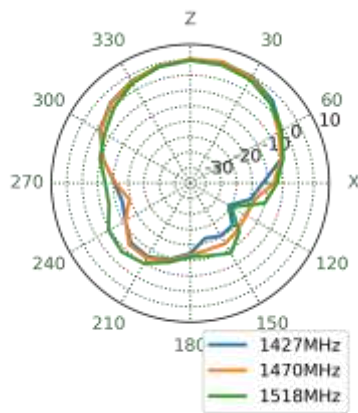
1470MHz



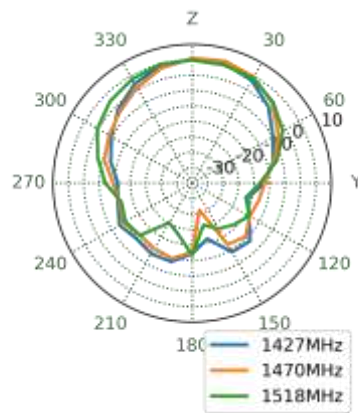
XY Plane



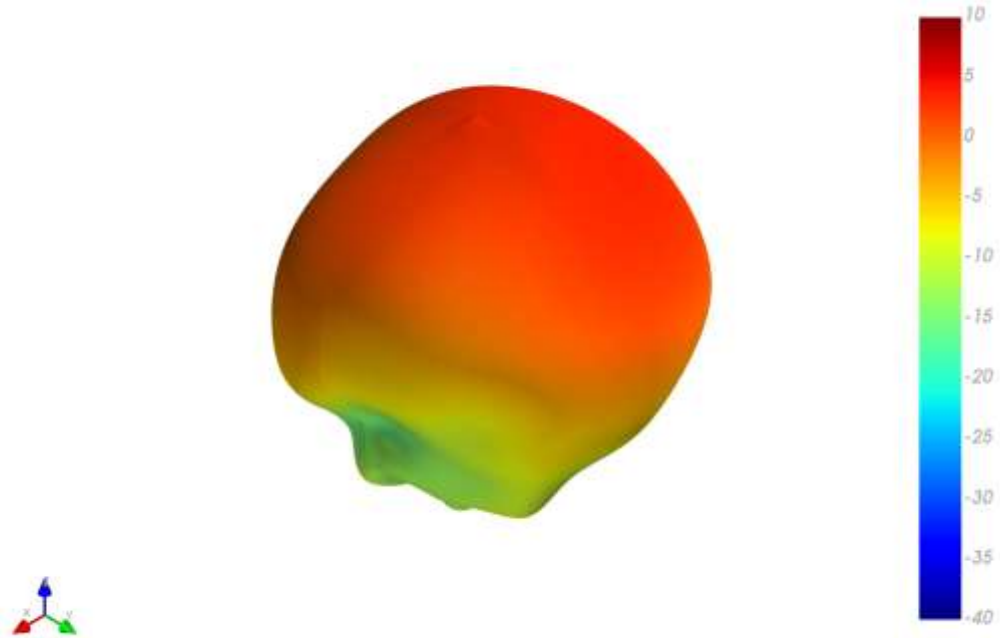
XZ Plane



YZ Plane



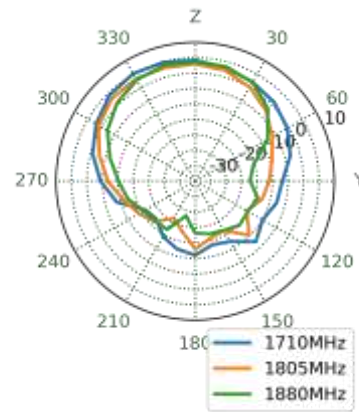
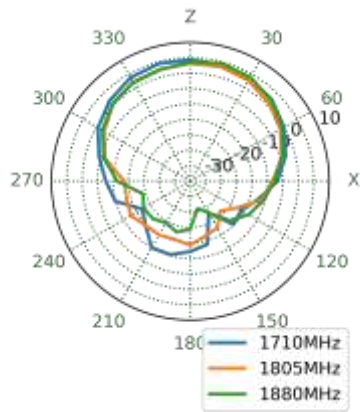
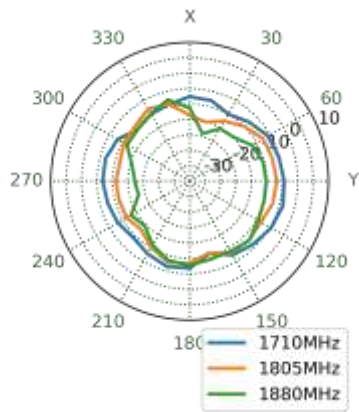
1805MHz



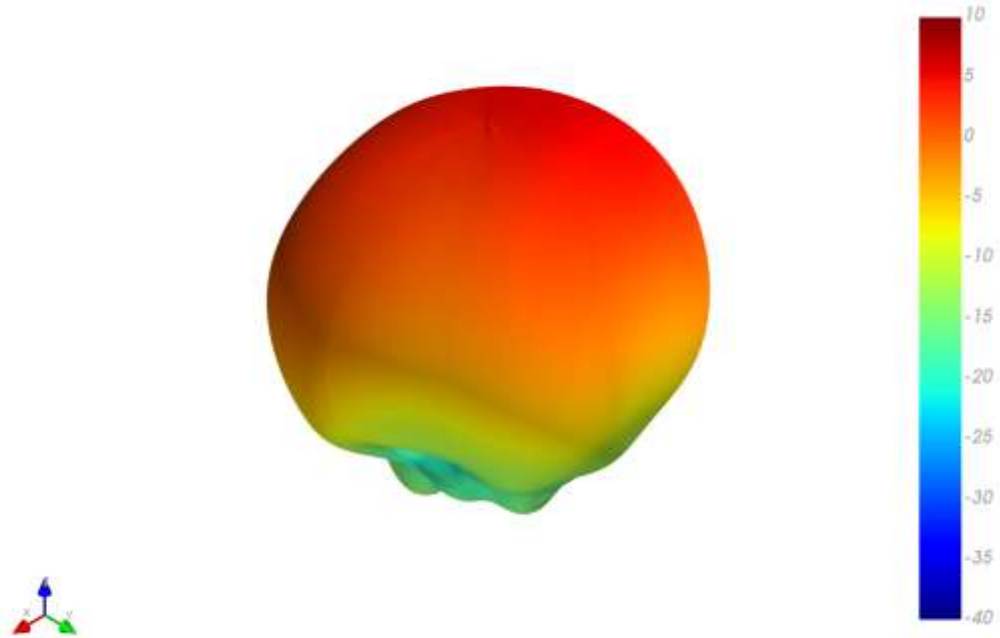
XY Plane

XZ Plane

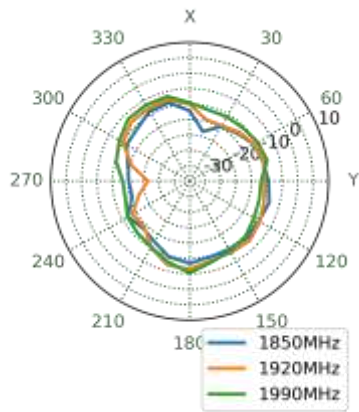
YZ Plane



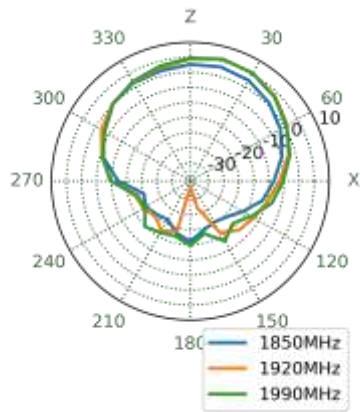
1920MHz



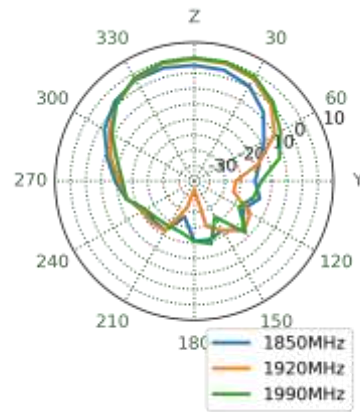
XY Plane



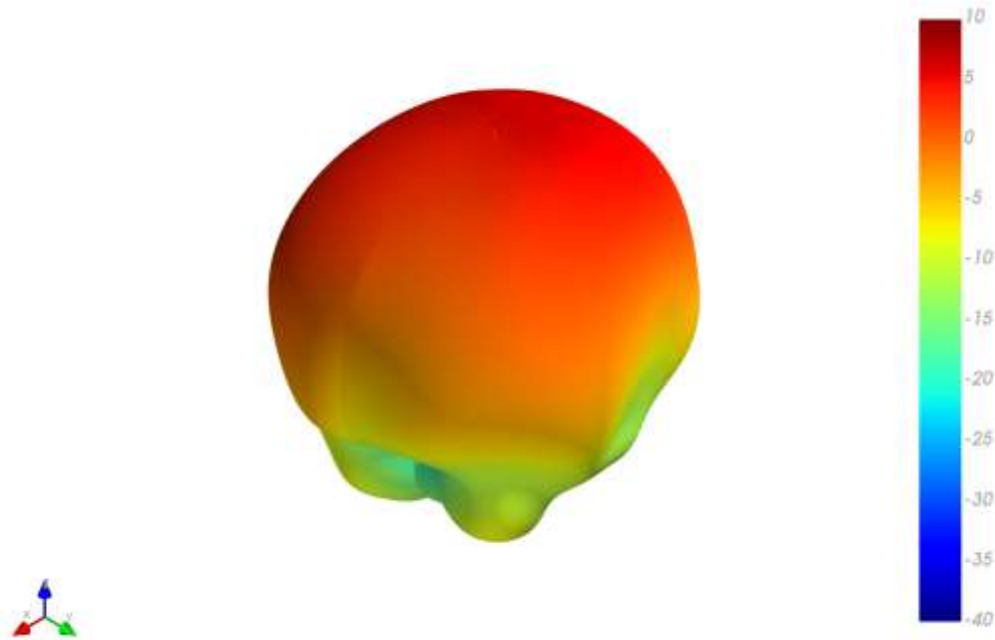
XZ Plane



YZ Plane



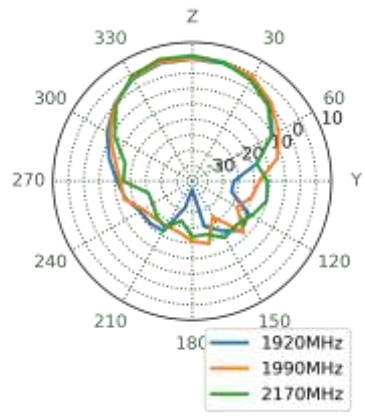
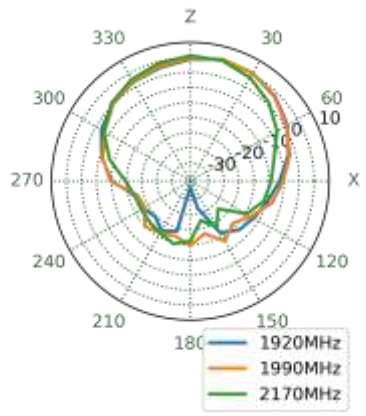
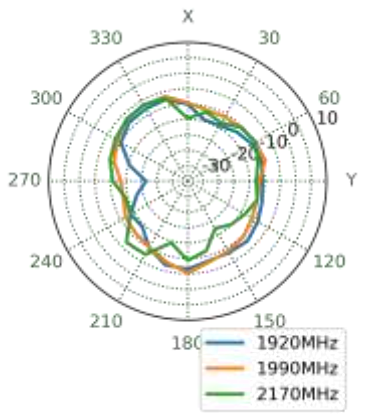
1990MHz



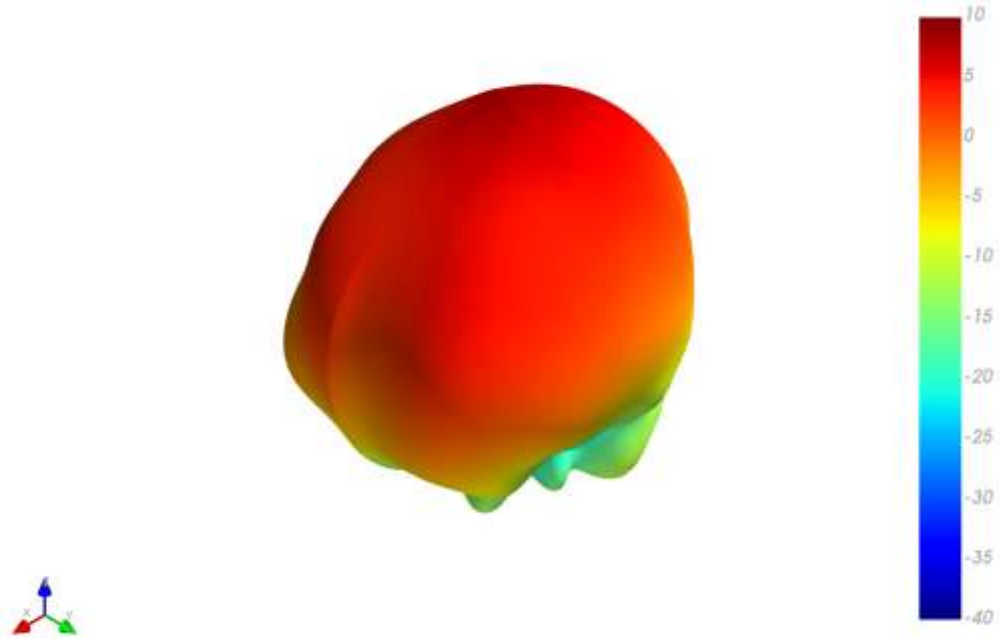
XY Plane

XZ Plane

YZ Plane



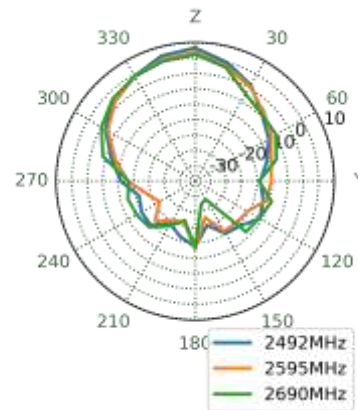
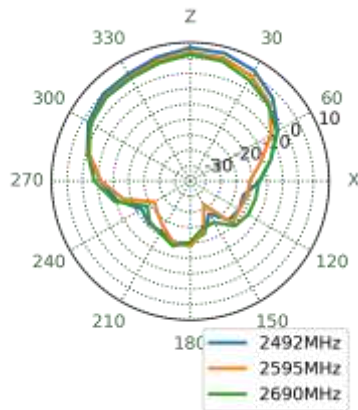
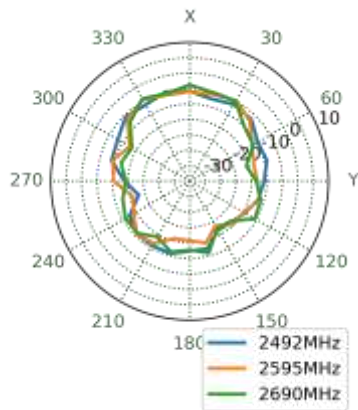
2595MHz



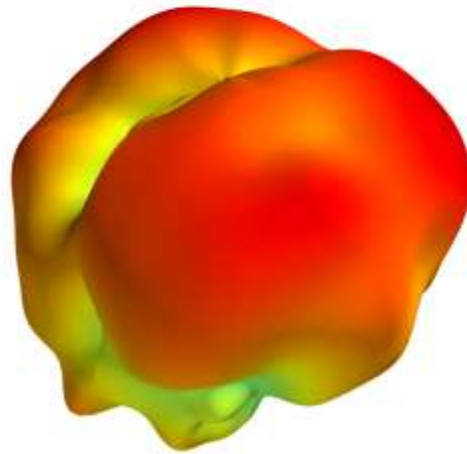
XY Plane

XZ Plane

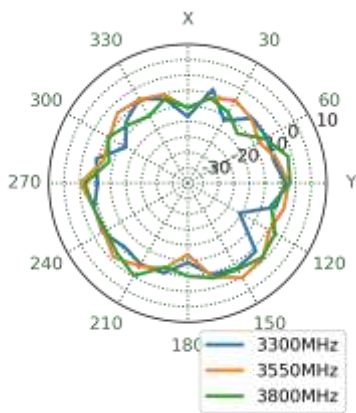
YZ Plane



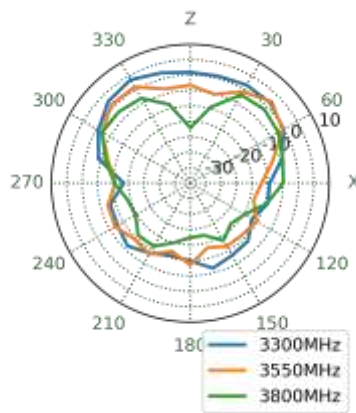
3550MHz



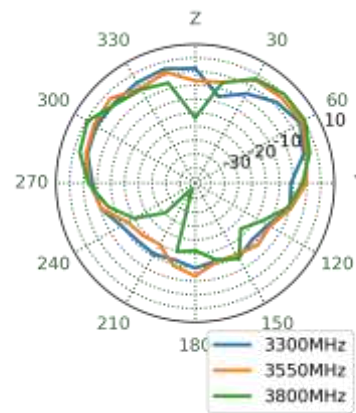
XY Plane



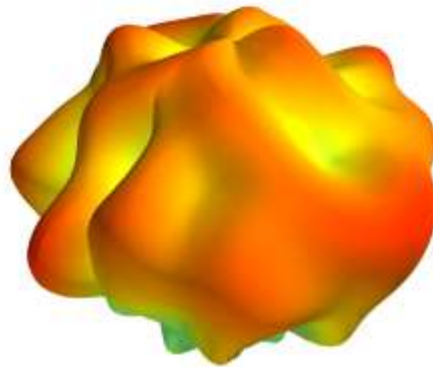
XZ Plane



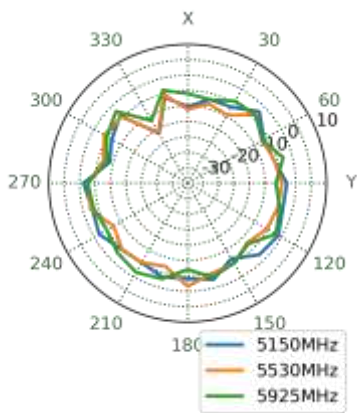
YZ Plane



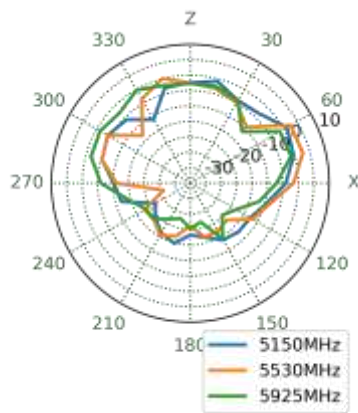
5530MHz



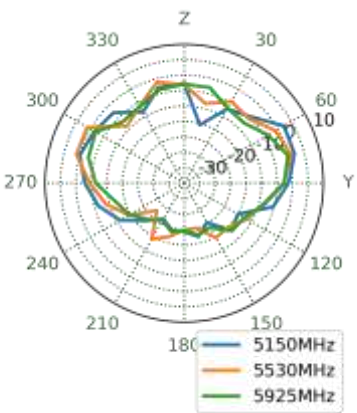
XY Plane



XZ Plane

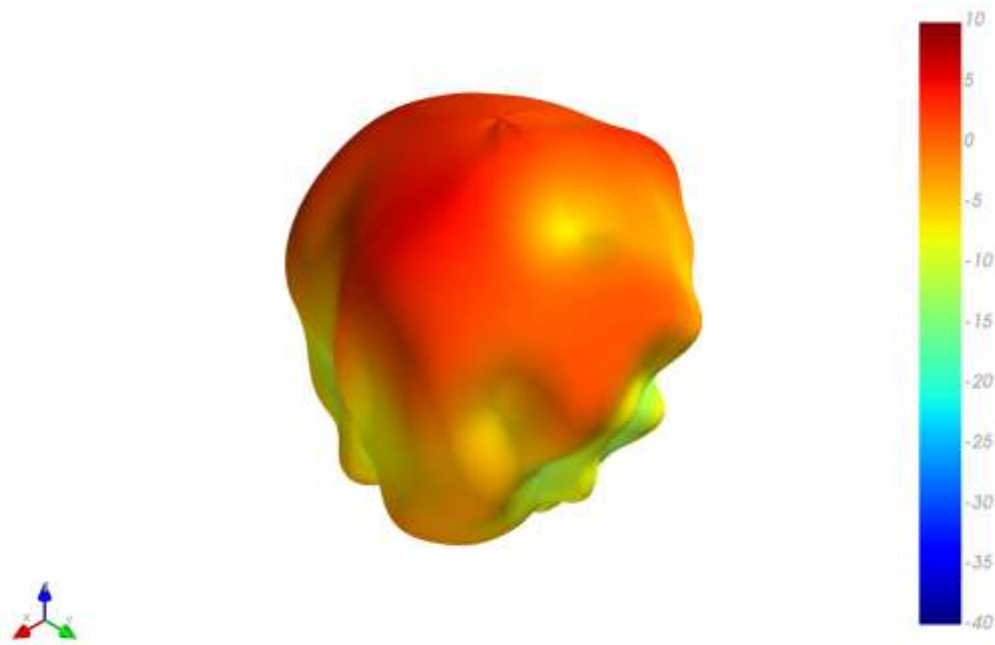


YZ Plane

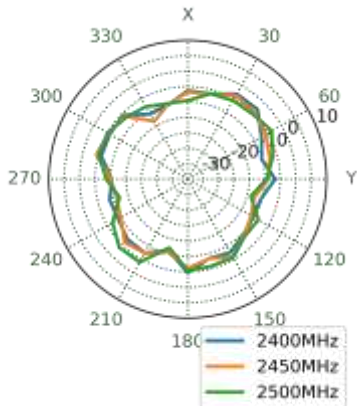


4.4 Wi-Fi MIMO 1 3D and 2D Radiation Patterns – 30*30cm Ground Plane

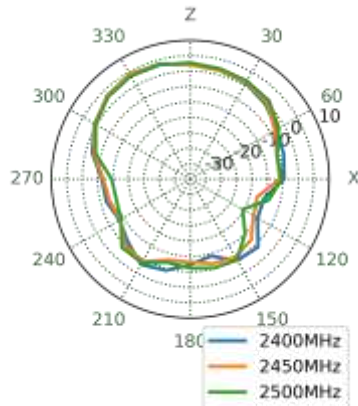
2450MHz



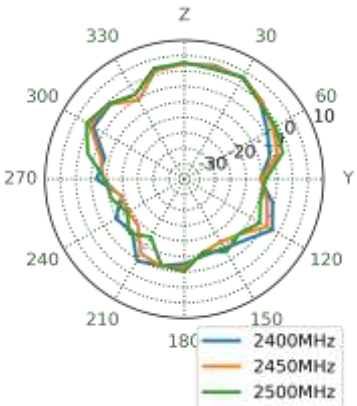
XY Plane



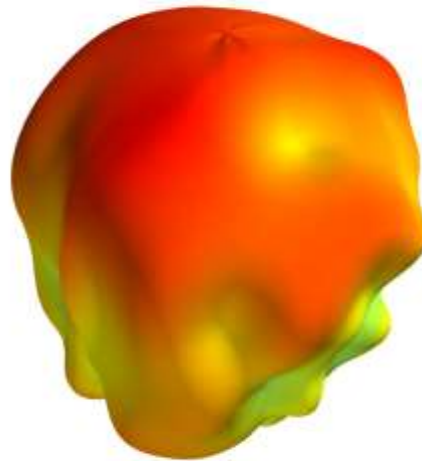
XZ Plane



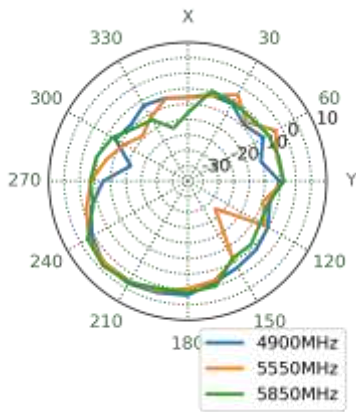
YZ Plane



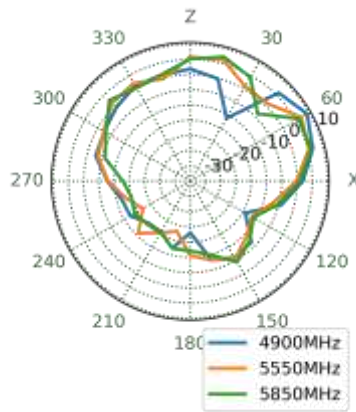
5550MHz



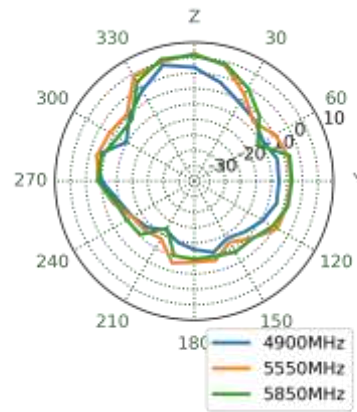
XY Plane



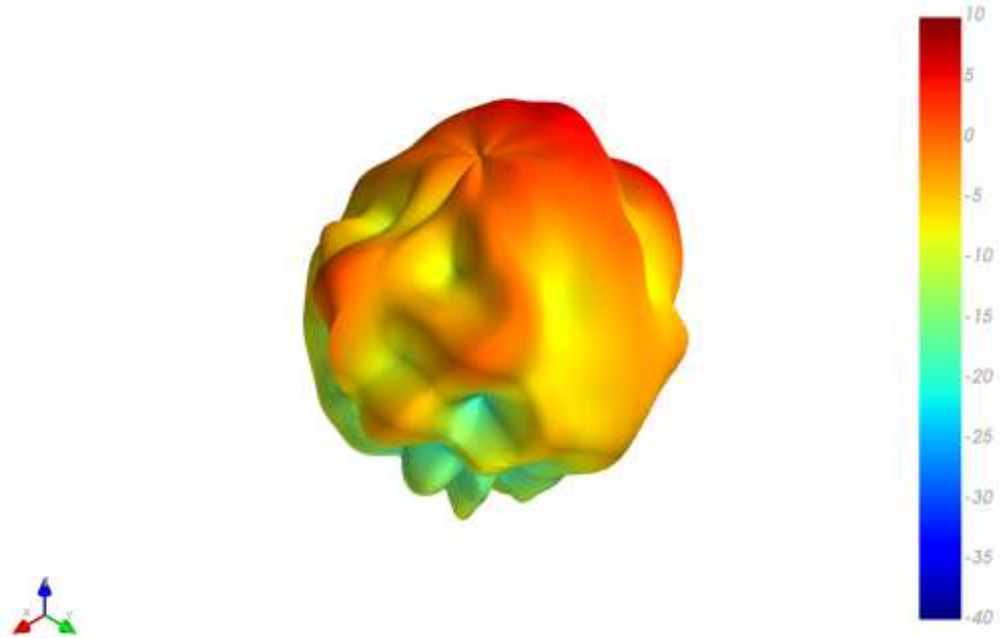
XZ Plane



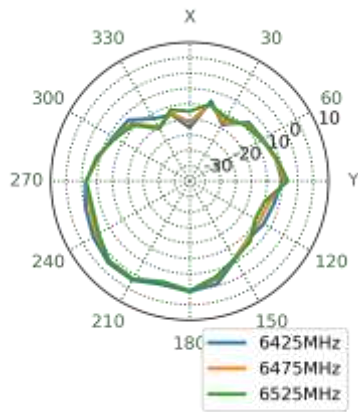
YZ Plane



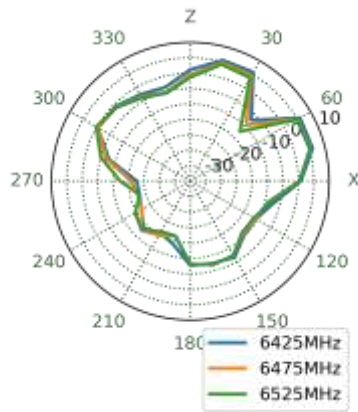
6475MHz



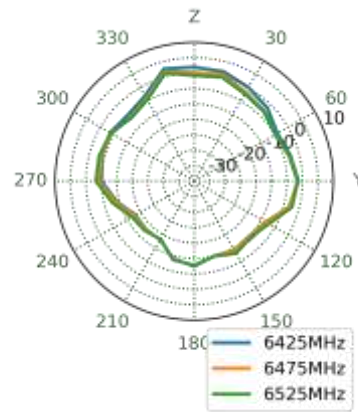
XY Plane



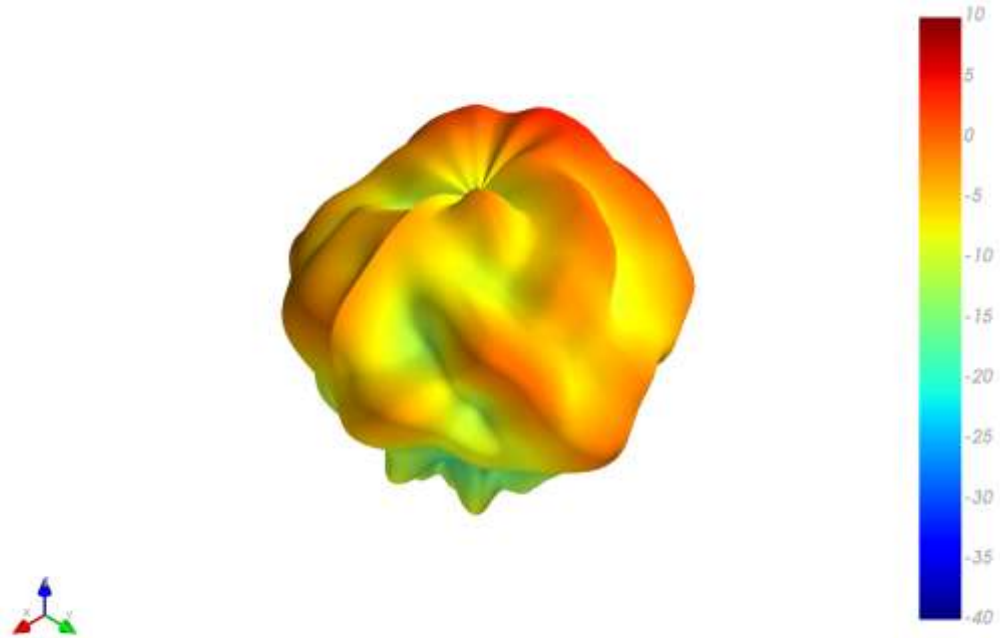
XZ Plane



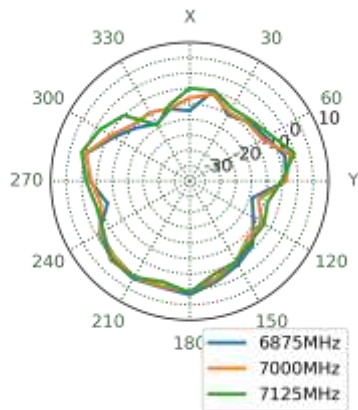
YZ Plane



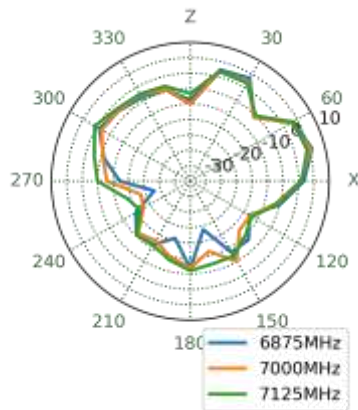
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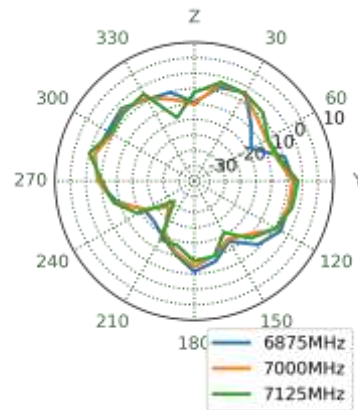
XY Plane



XZ Plane

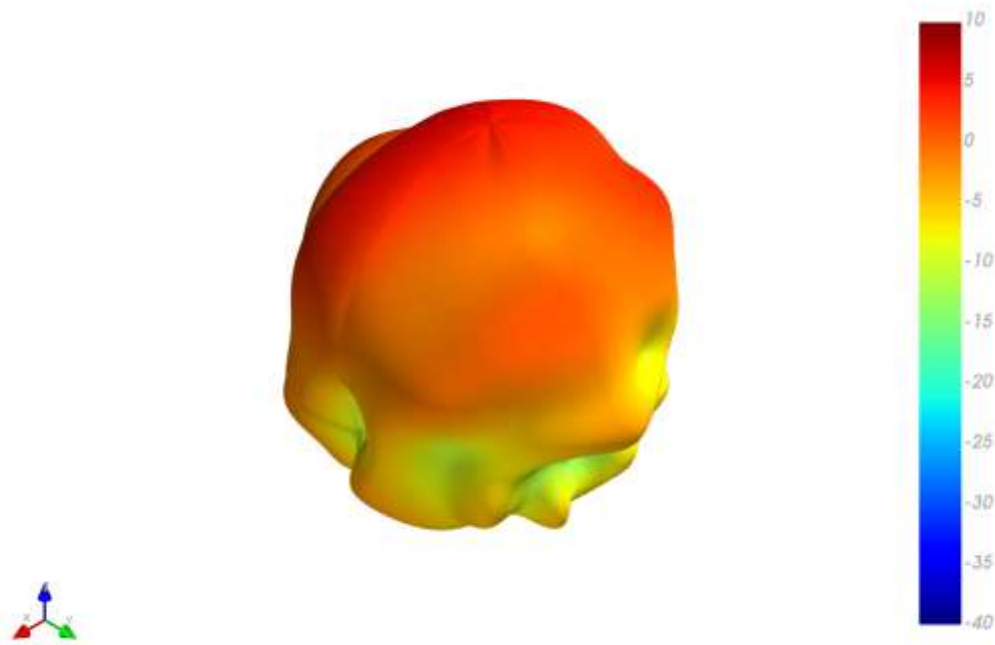


YZ Plane

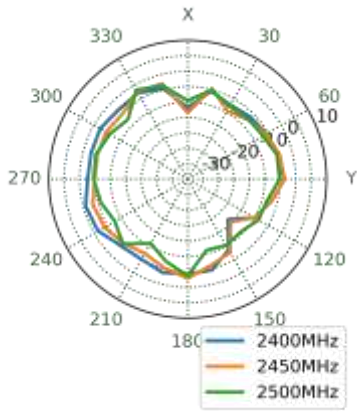


4.5 Wi-Fi MIMO 2 3D and 2D Radiation Patterns – 30*30cm Ground Plane

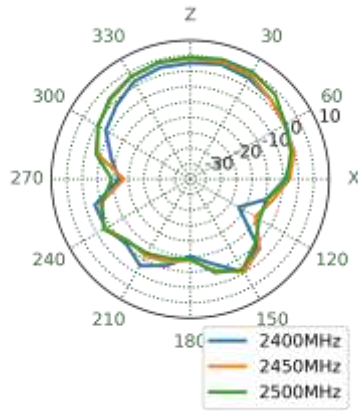
2450MHz



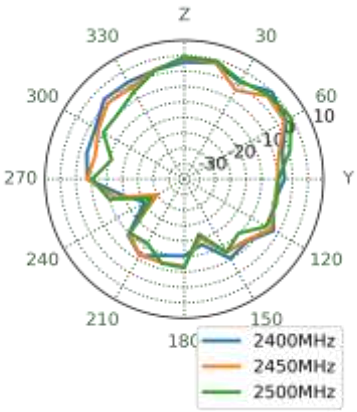
XY Plane



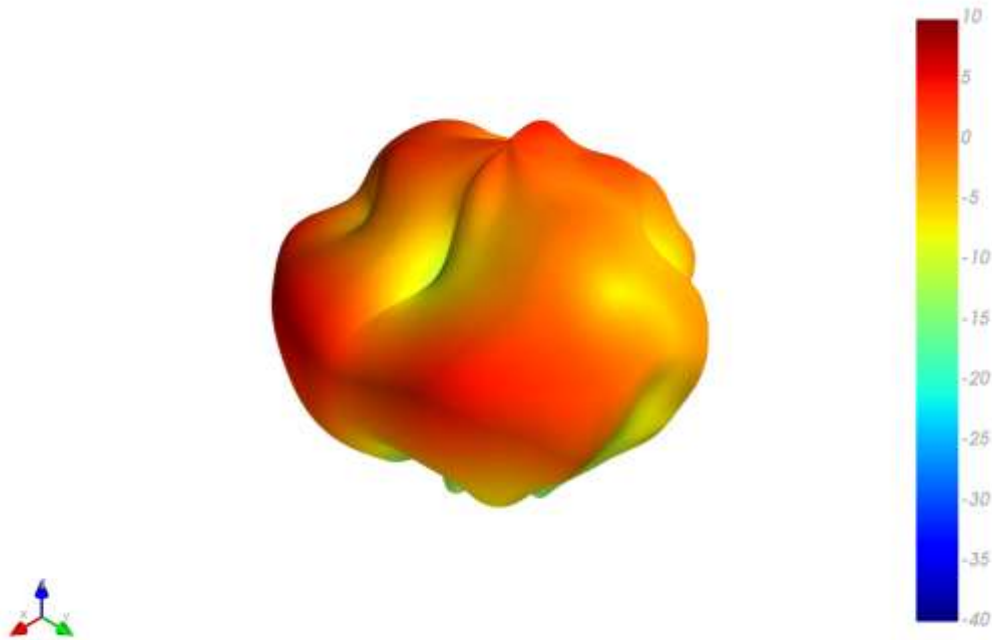
XZ Plane



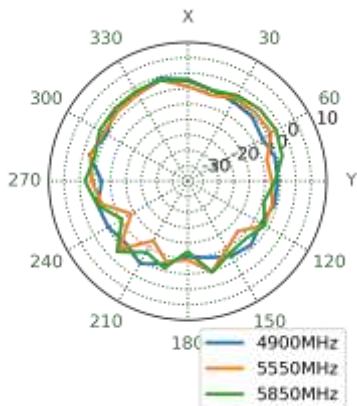
YZ Plane



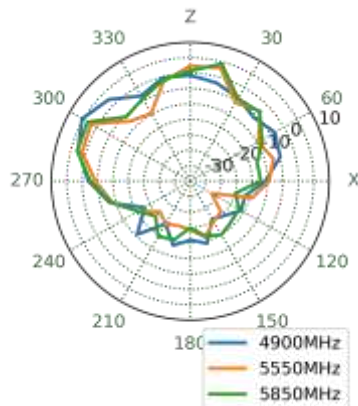
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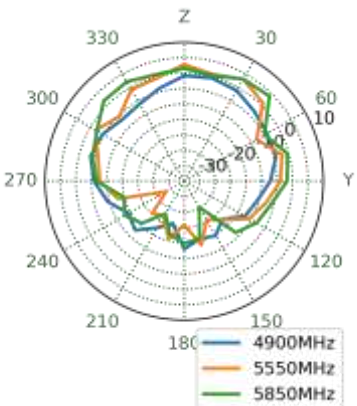
XY Plane



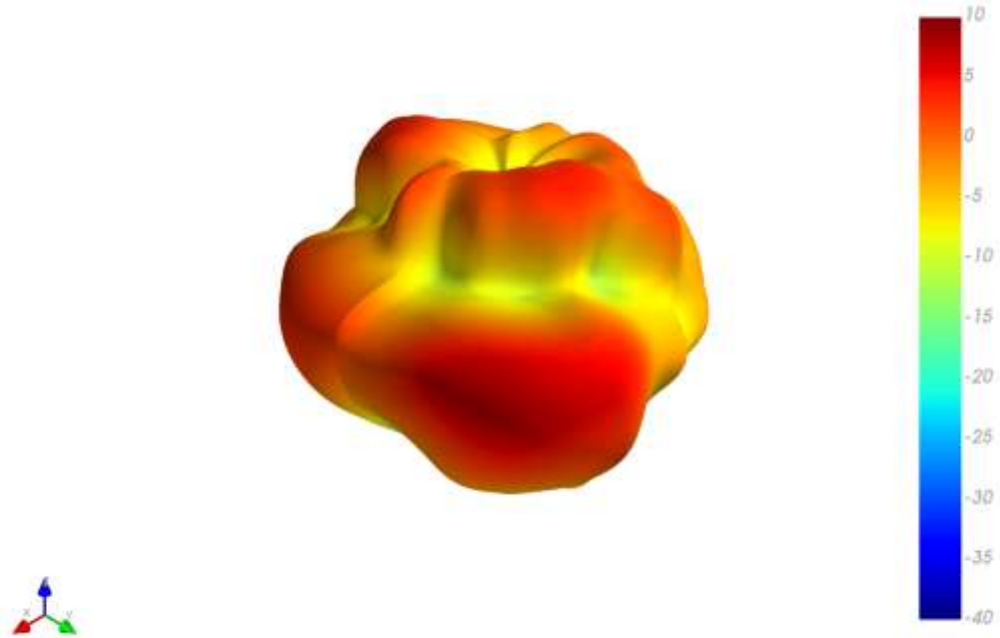
XZ Plane



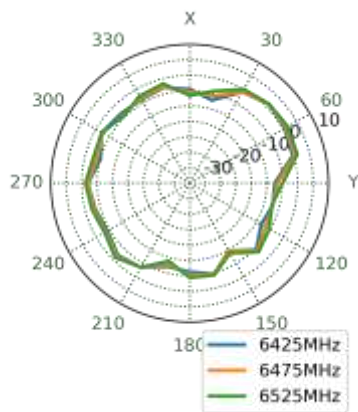
YZ Plane



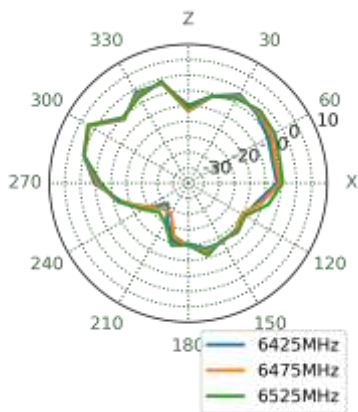
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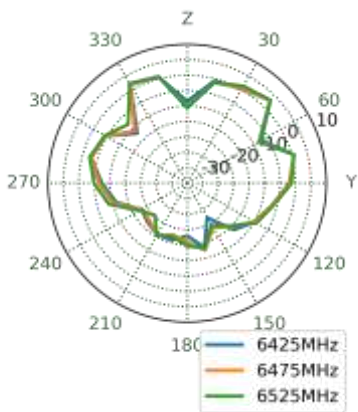
XY Plane



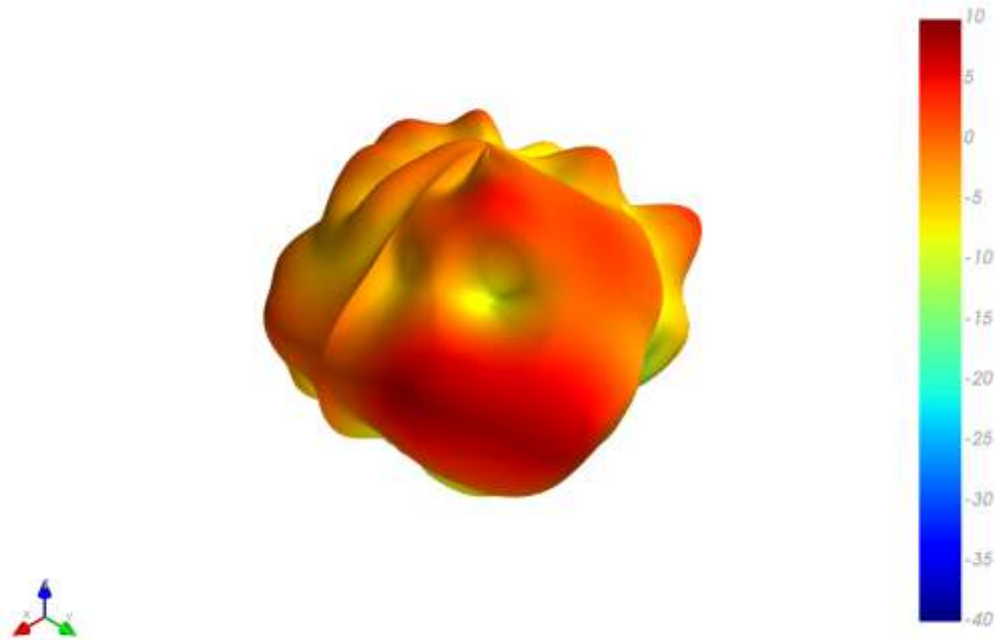
XZ Plane



YZ Plane



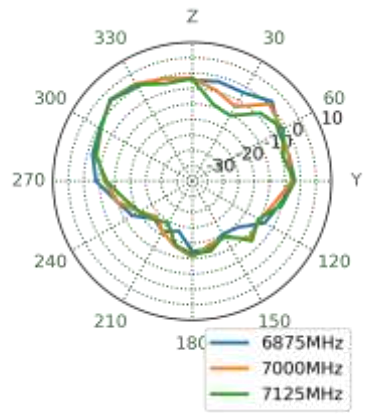
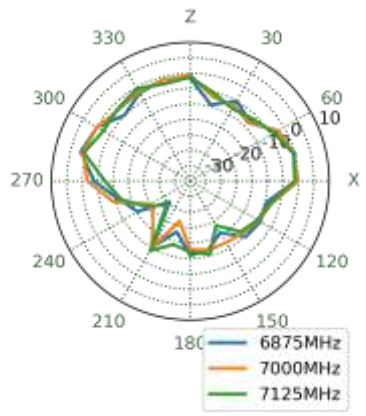
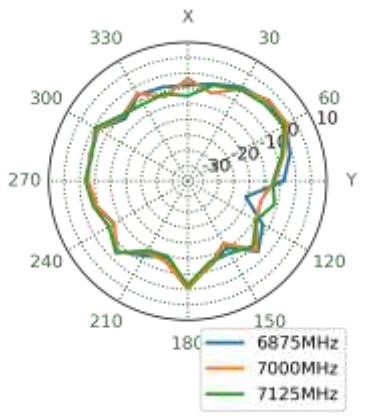
7000MHz



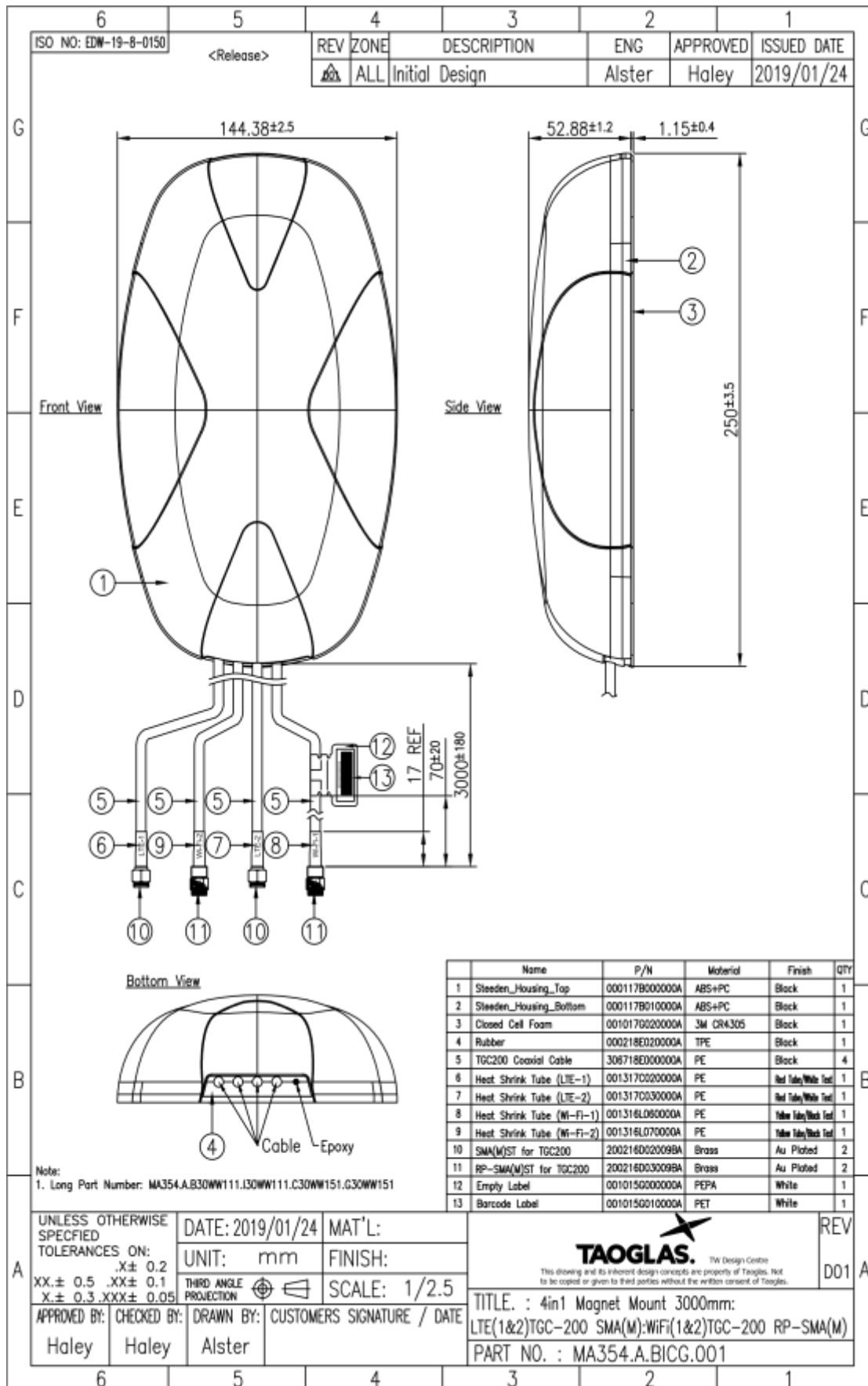
XY Plane

XZ Plane

YZ Plane

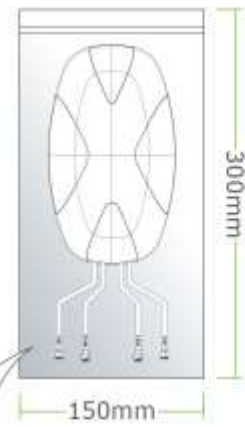


5. Mechanical Drawing (Units: mm)

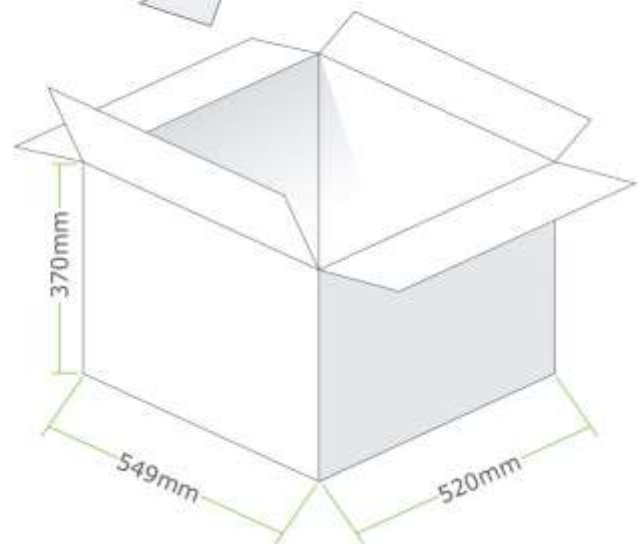


6. Packaging

1pc MA354.A.BICG.001 per PE Bag
 PE Bag Dimensions - 300*150mm
 Weight - 0.55Kg



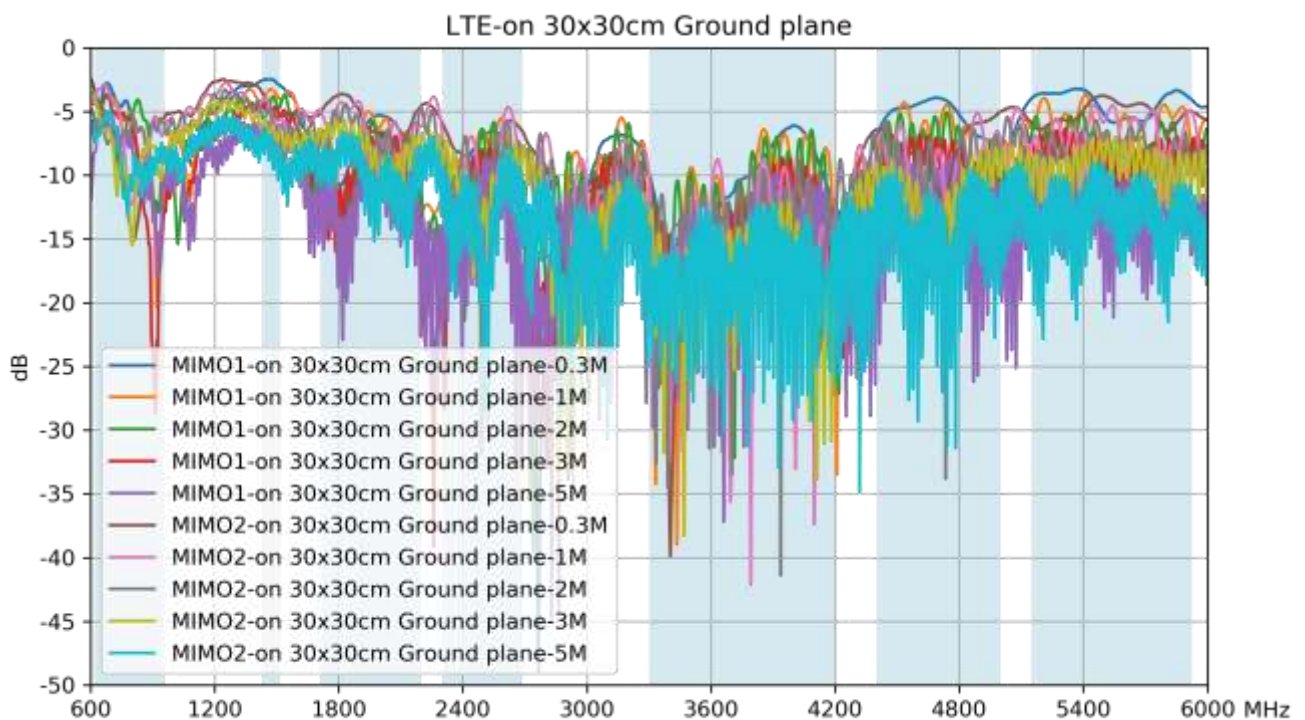
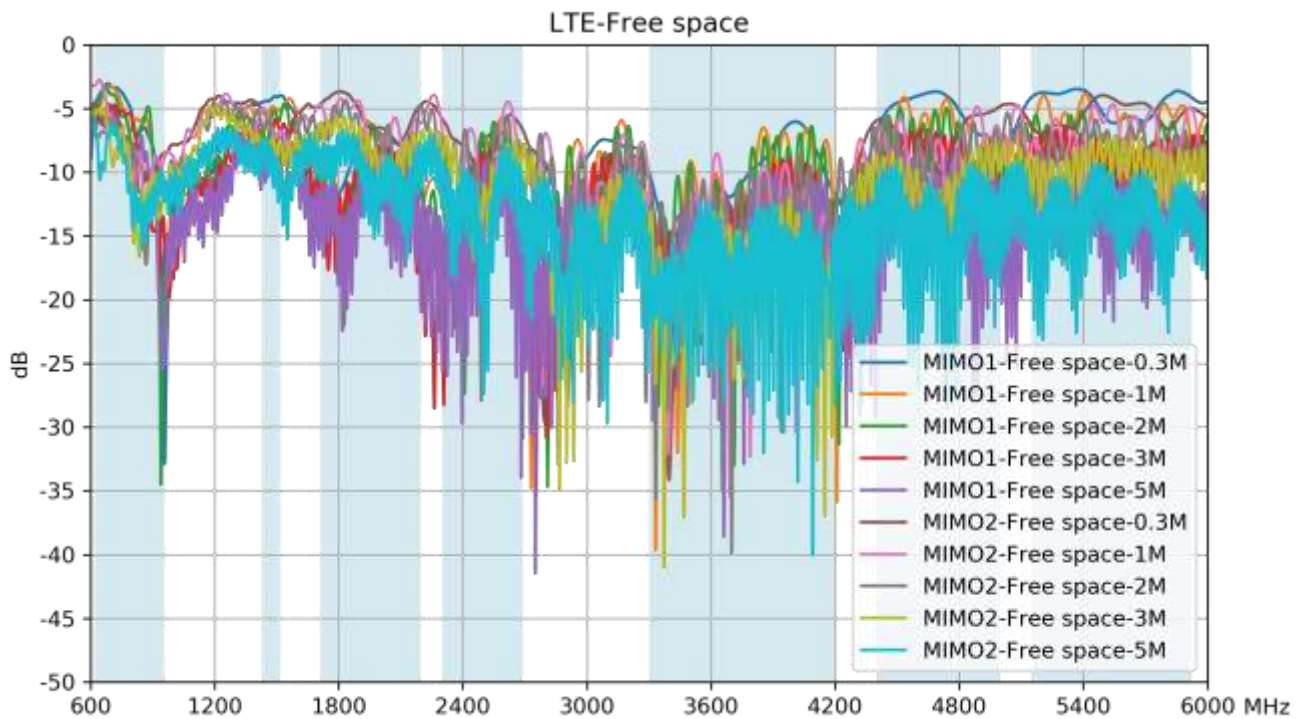
12 PE Bags per Carton
 Box Dimensions - 549*520*370mm
 Weight - 6.6Kg



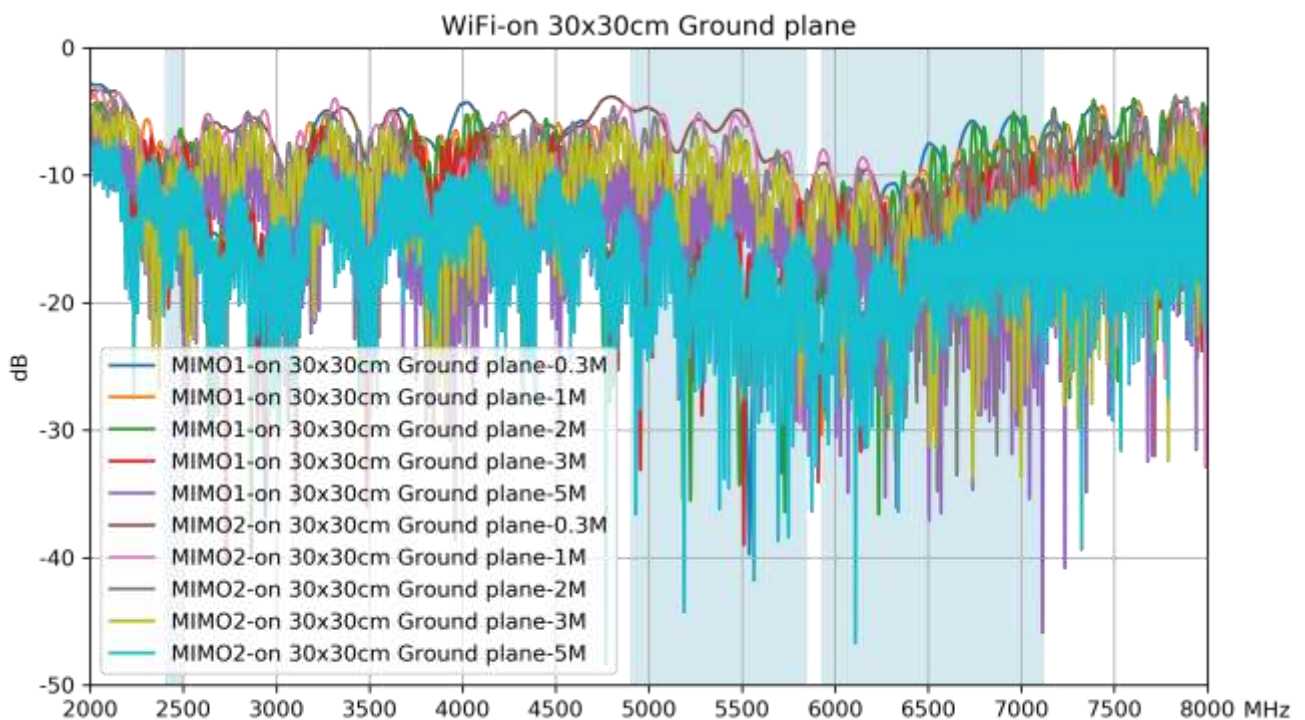
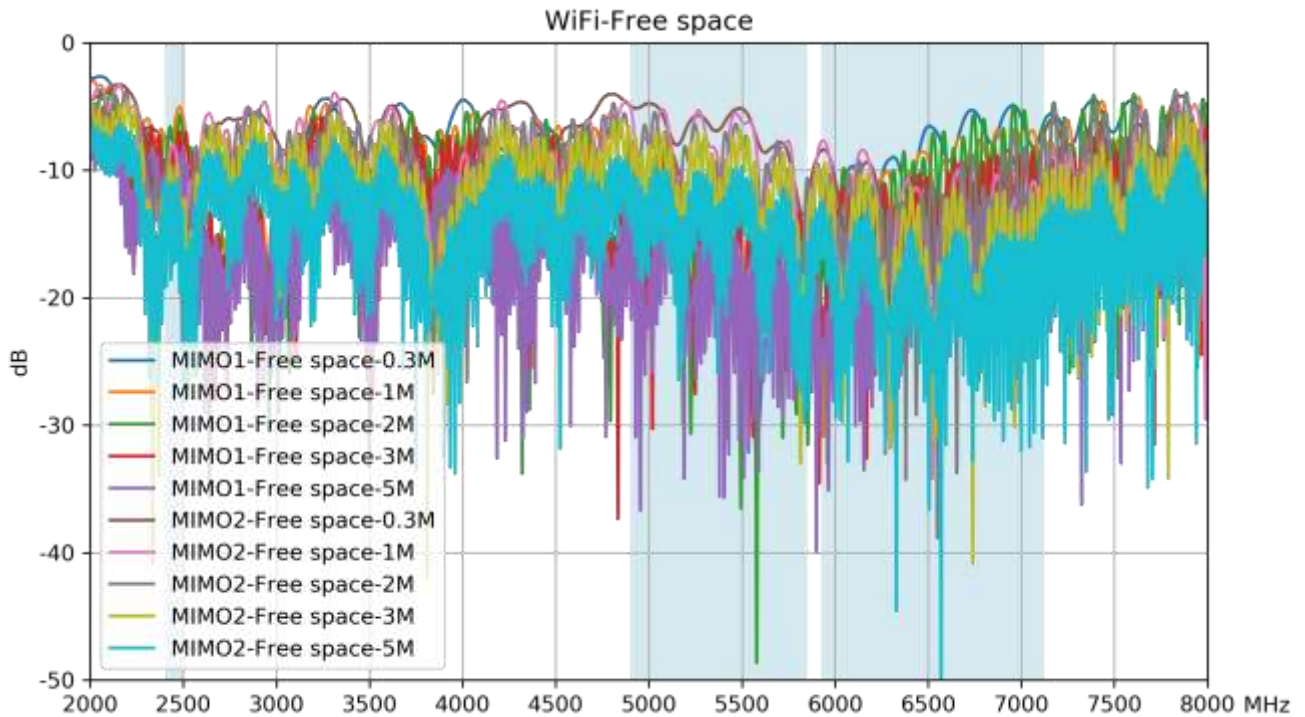
7. Application Note

The MA354's performance can be affected by the cable length chosen by a customer, below is the 5G/4G MIMO and Wi-Fi MIMO performance over different cable lengths.

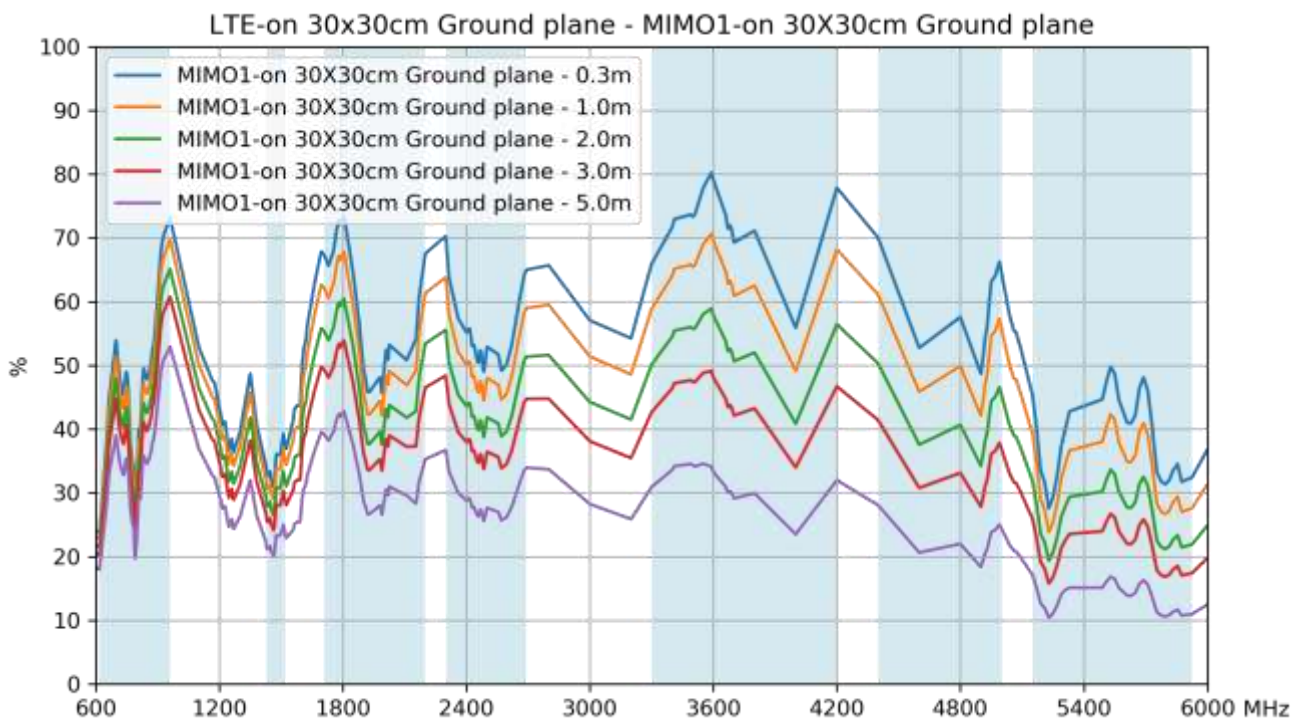
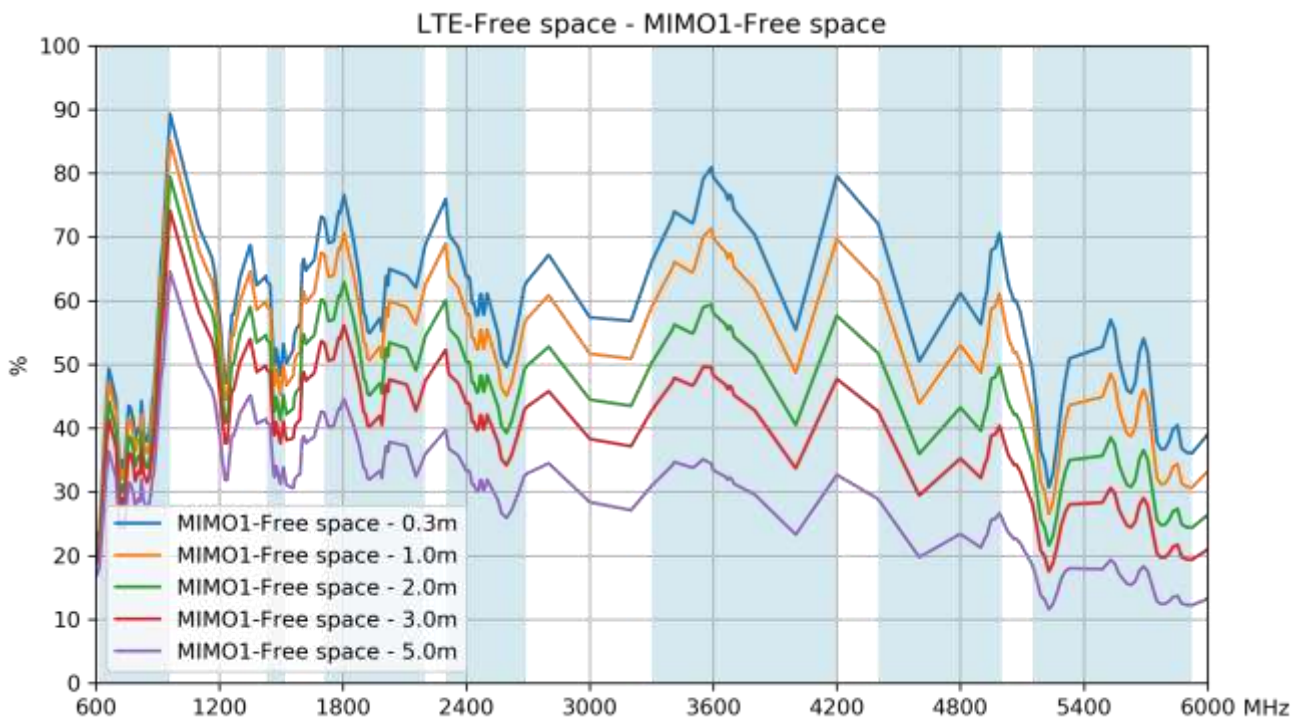
7.1 Return Loss – 5G/4G MIMO 1 & 2



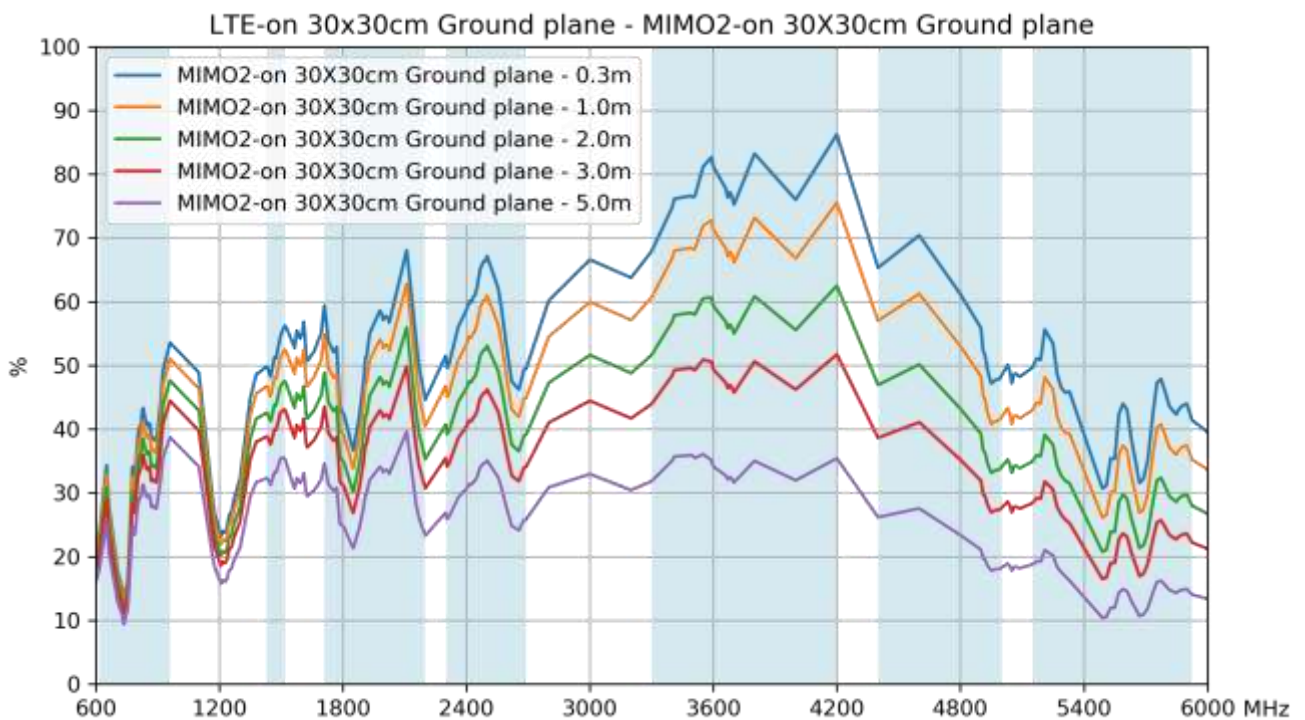
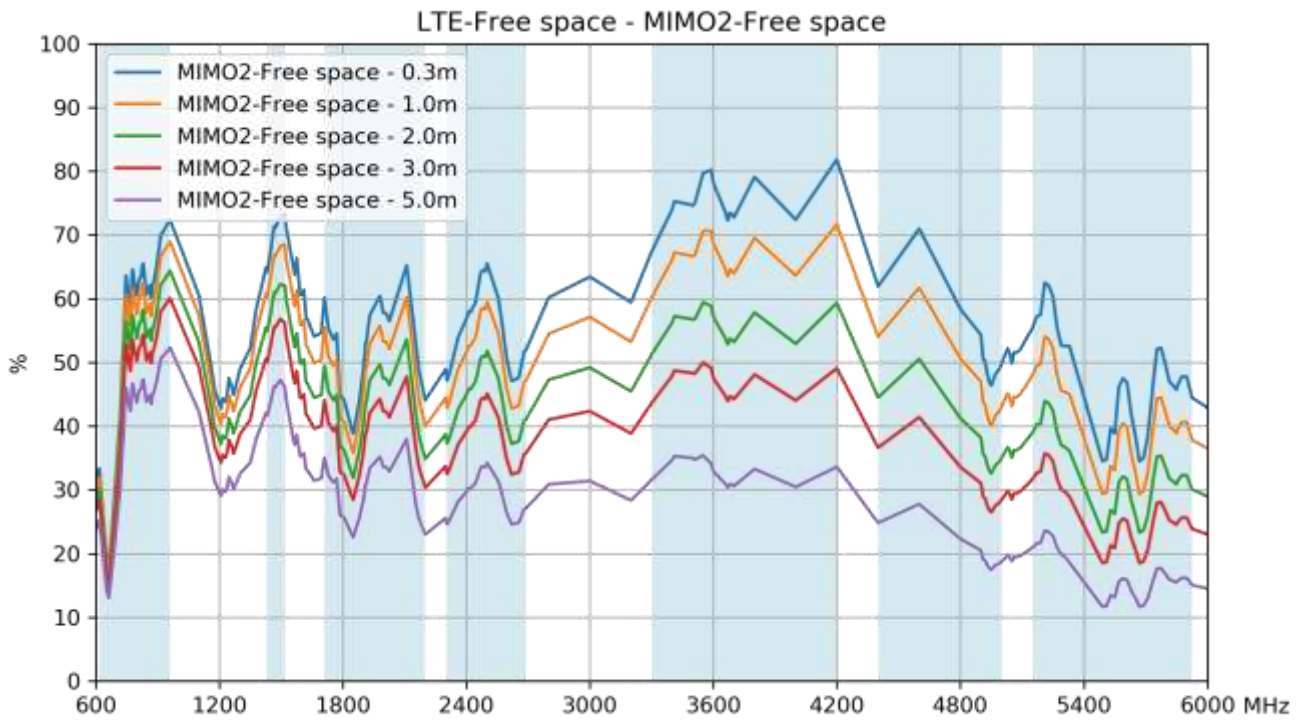
7.2 Return Loss – Wi-Fi MIMO 1 & 2



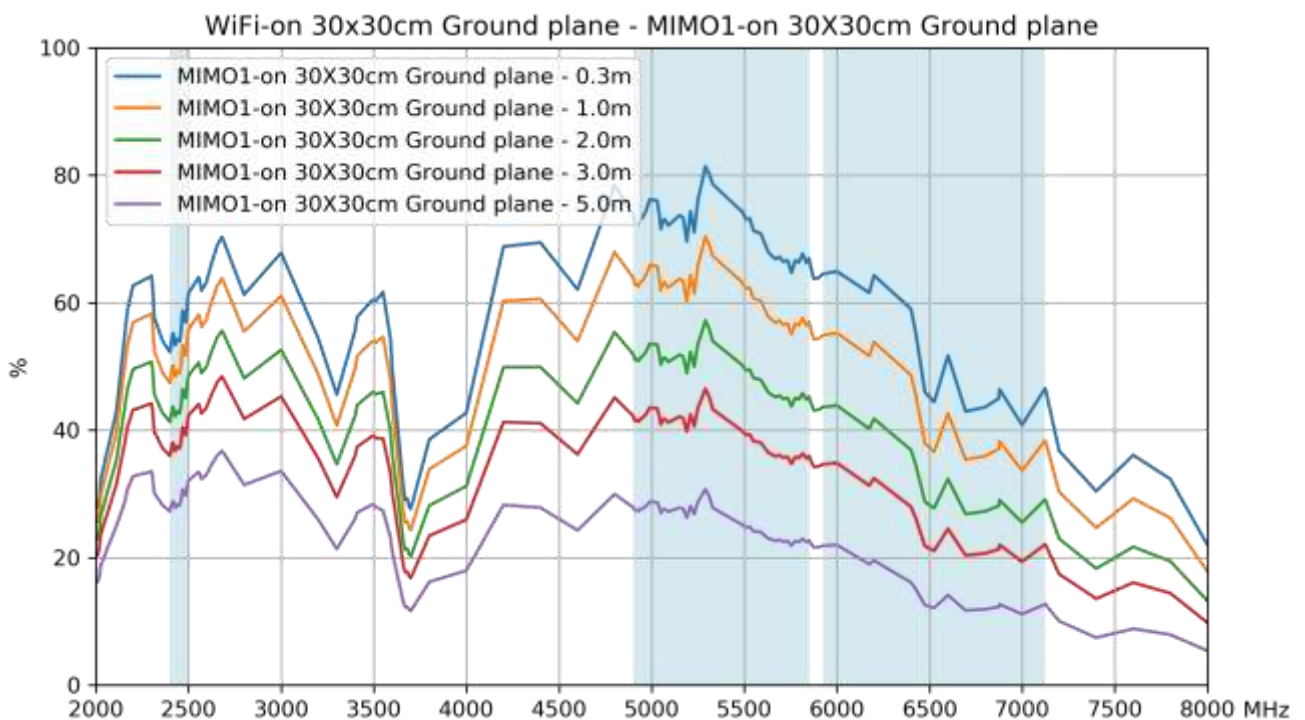
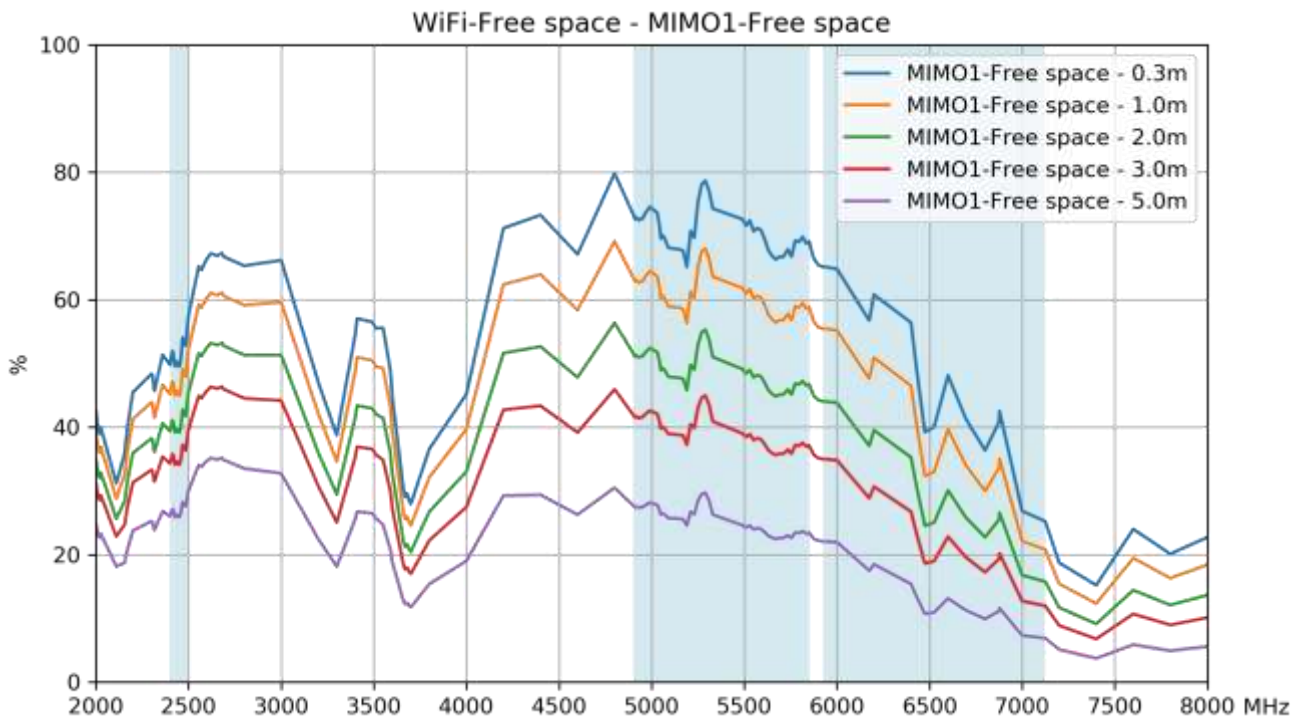
7.3 Efficiency – 5G/4G MIMO 1



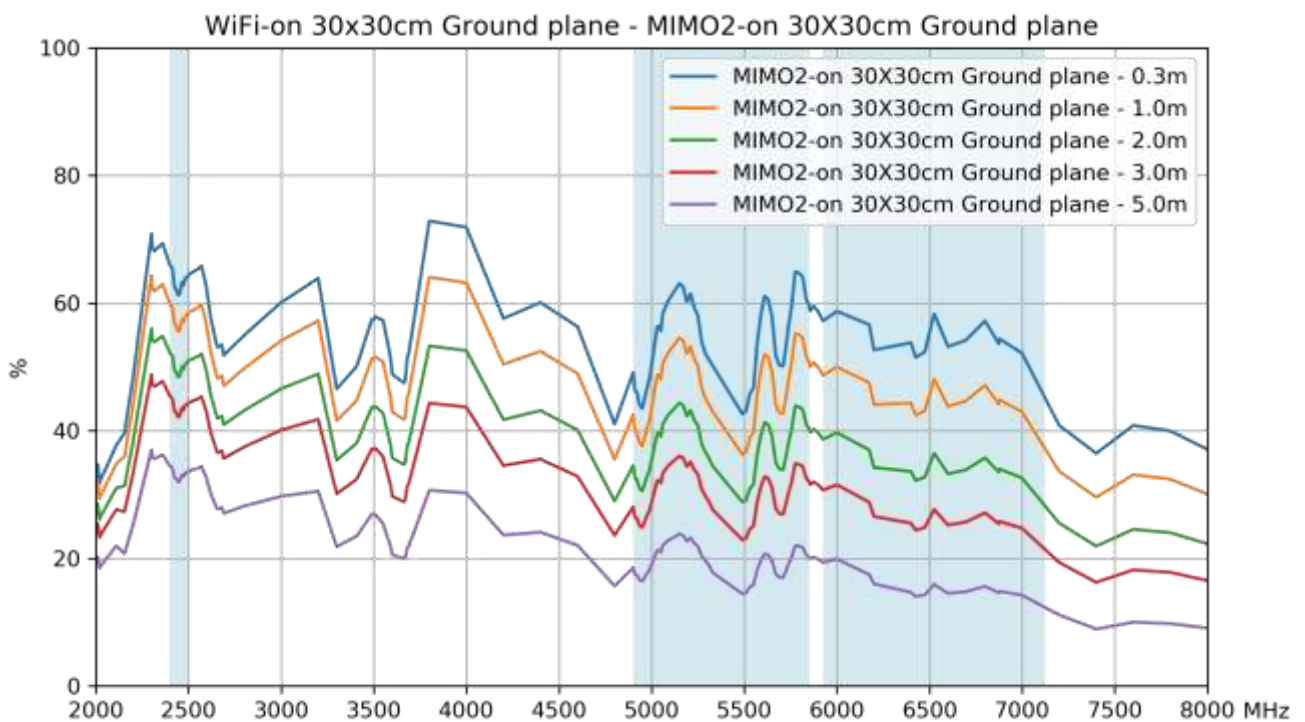
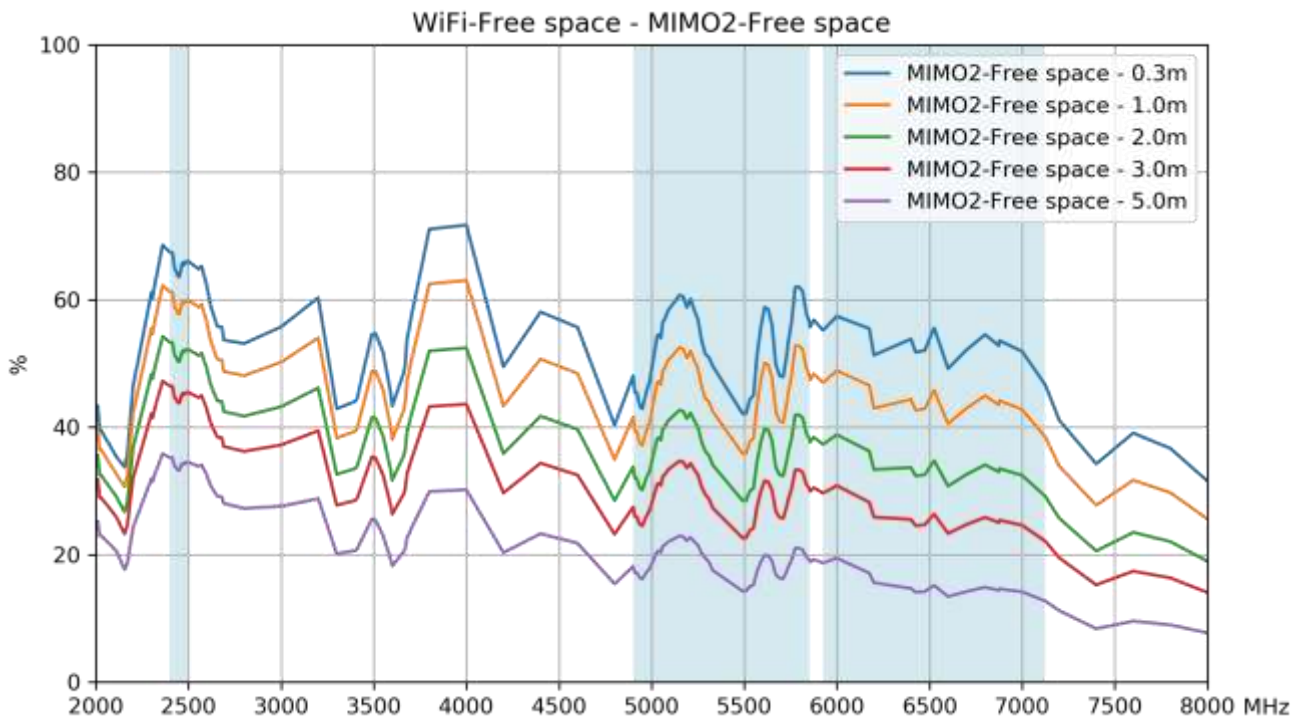
7.4 Efficiency – 5G/4G MIMO 2



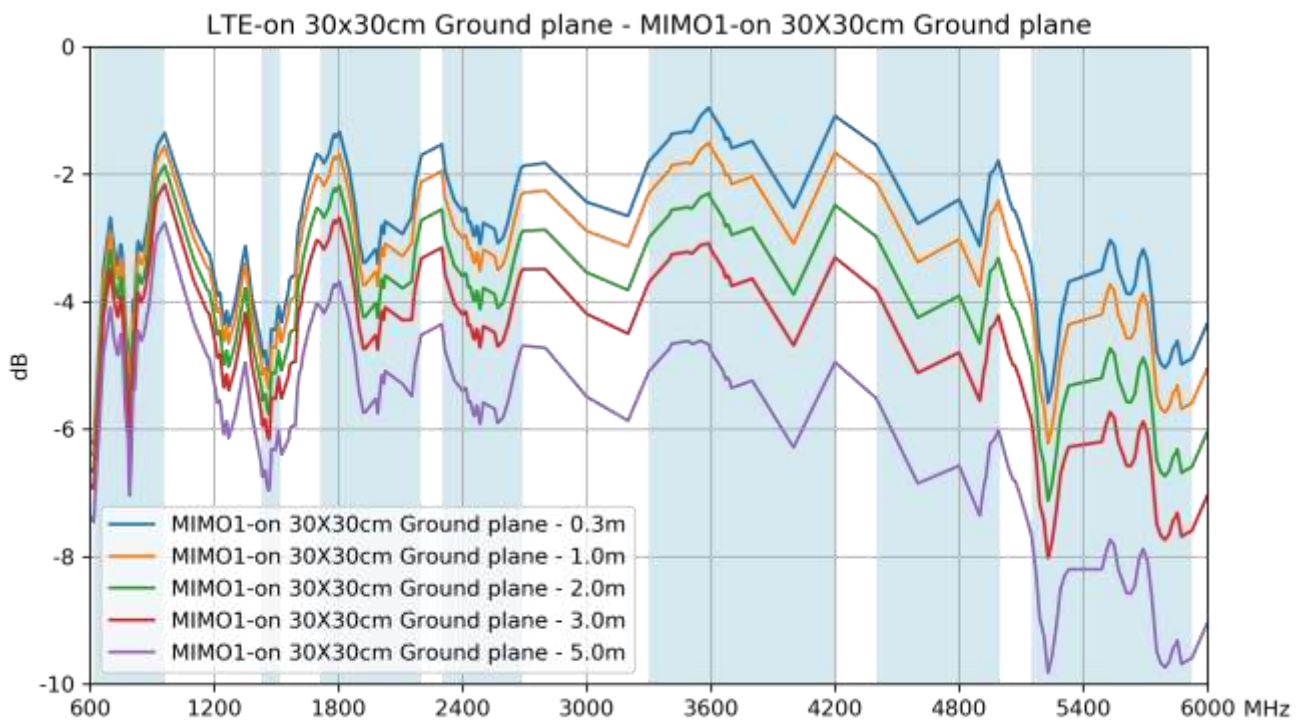
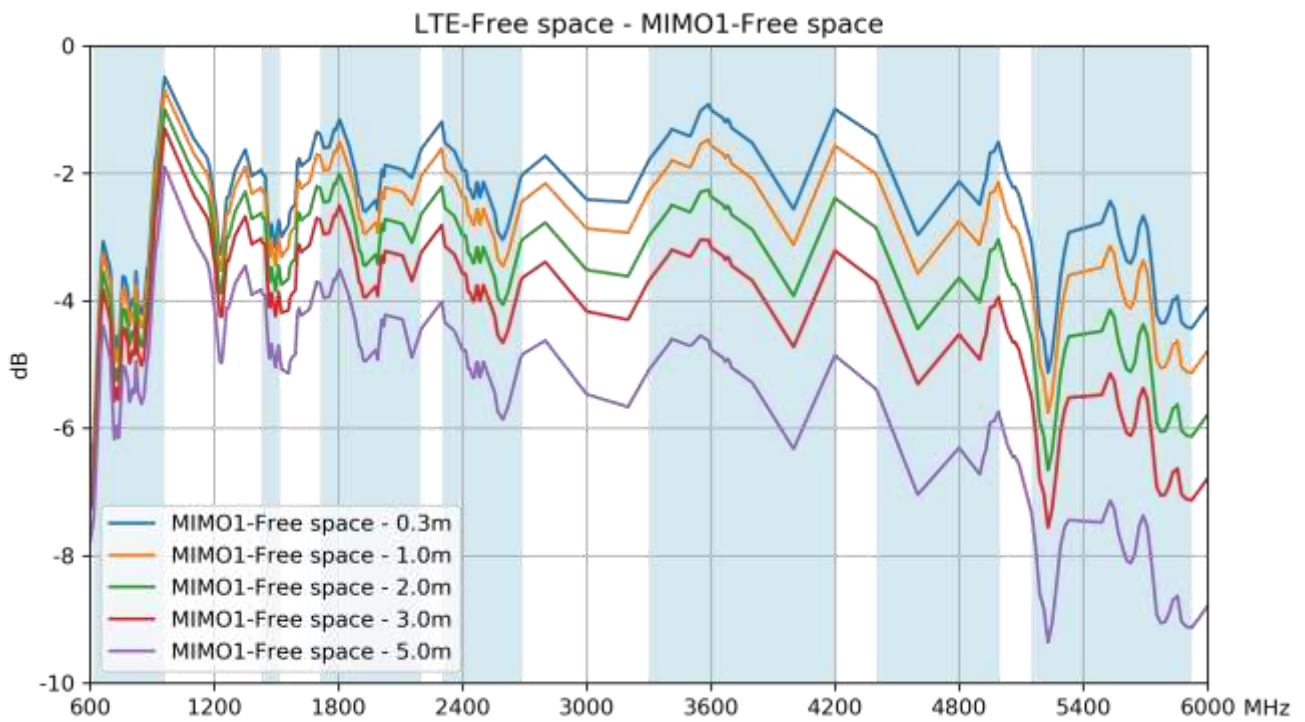
7.5 Efficiency – Wi-Fi MIMO 1



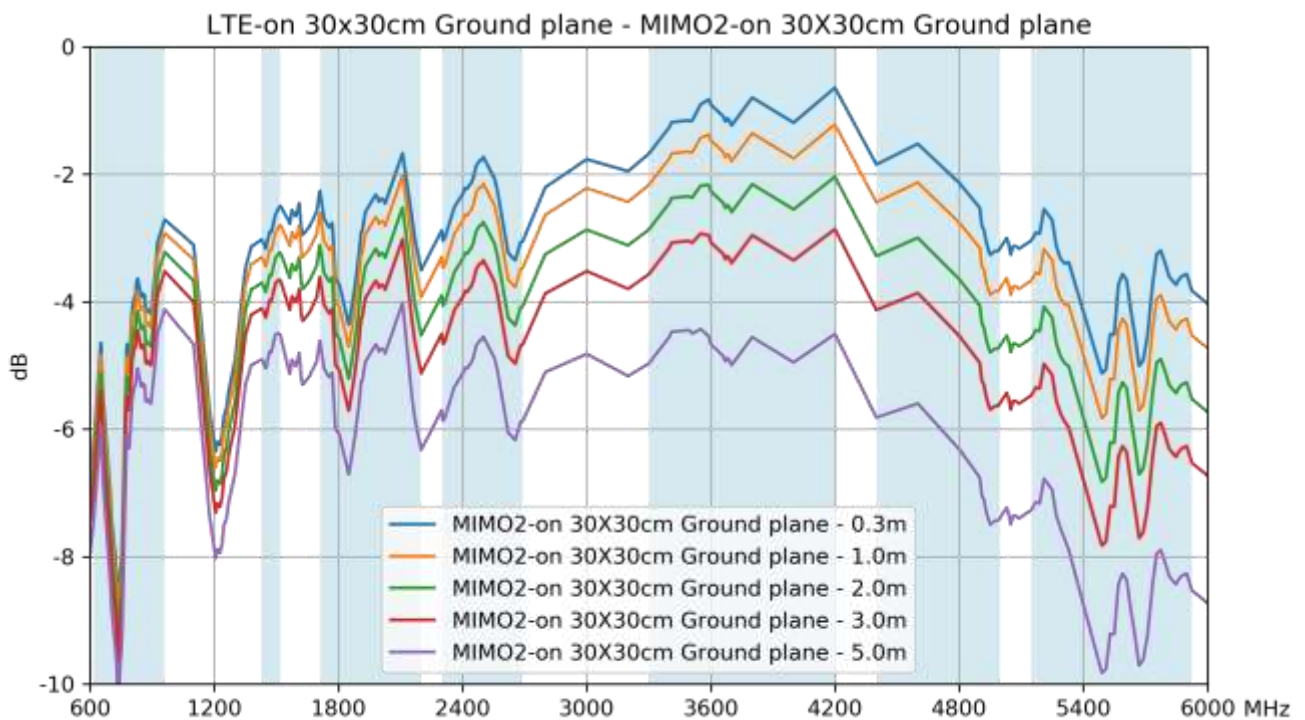
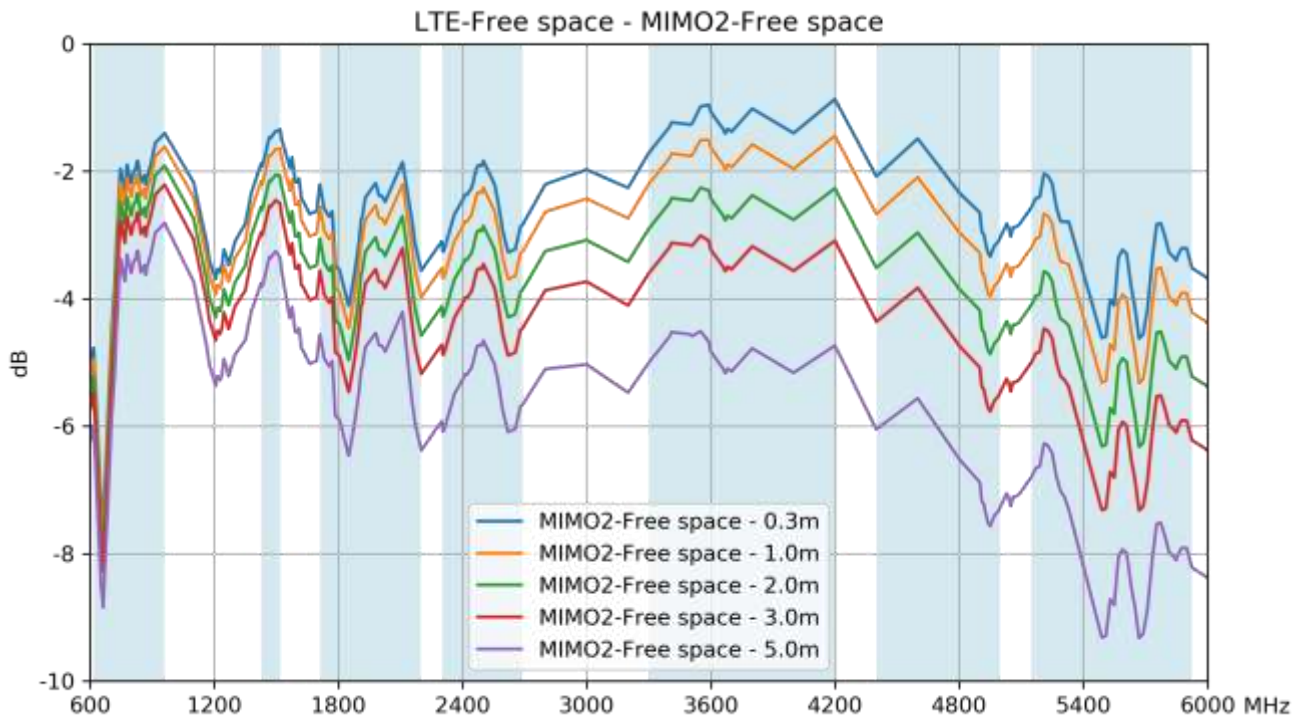
7.6 Efficiency – Wi-Fi MIMO 2



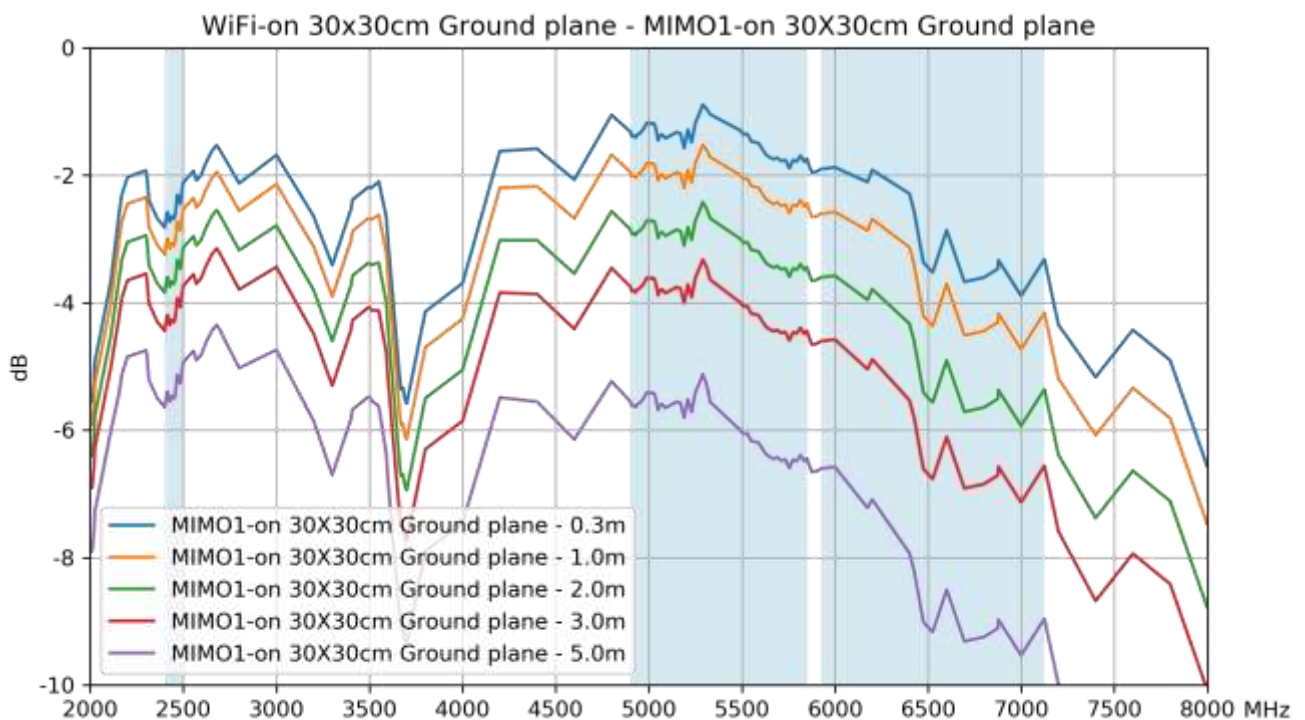
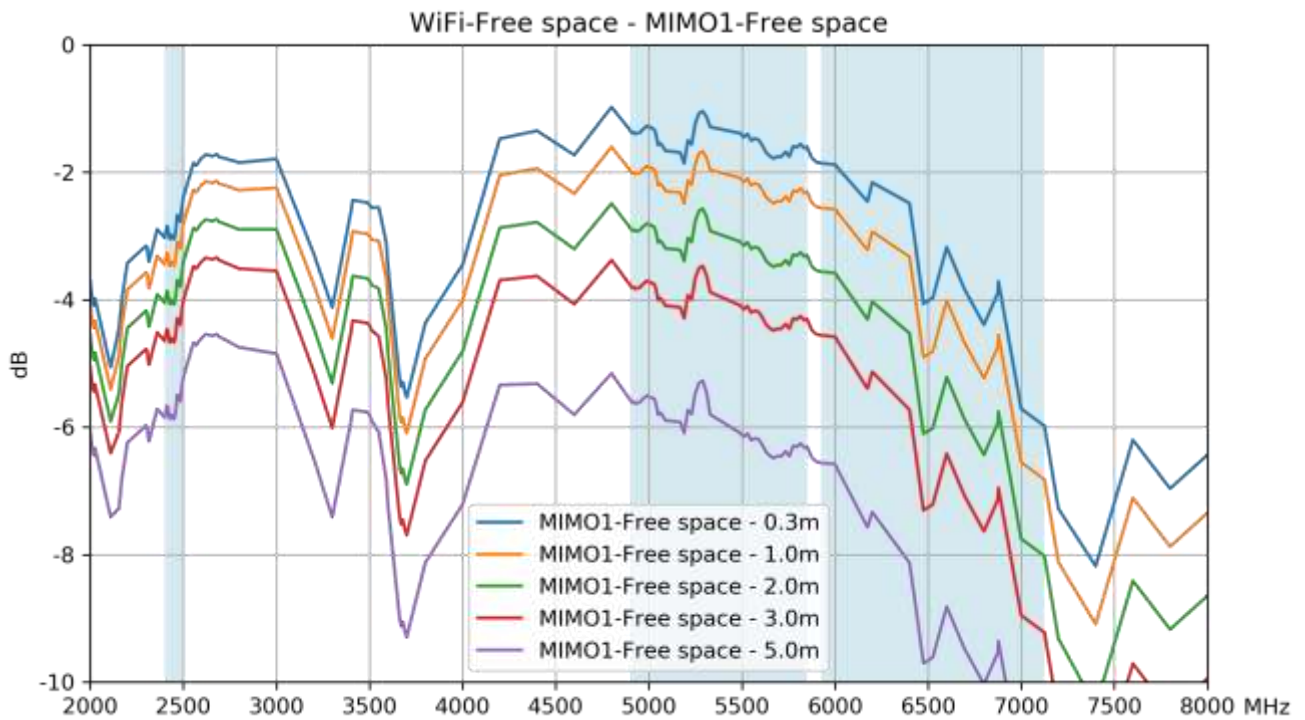
7.7 Average Gain – 5G/4G MIMO 1



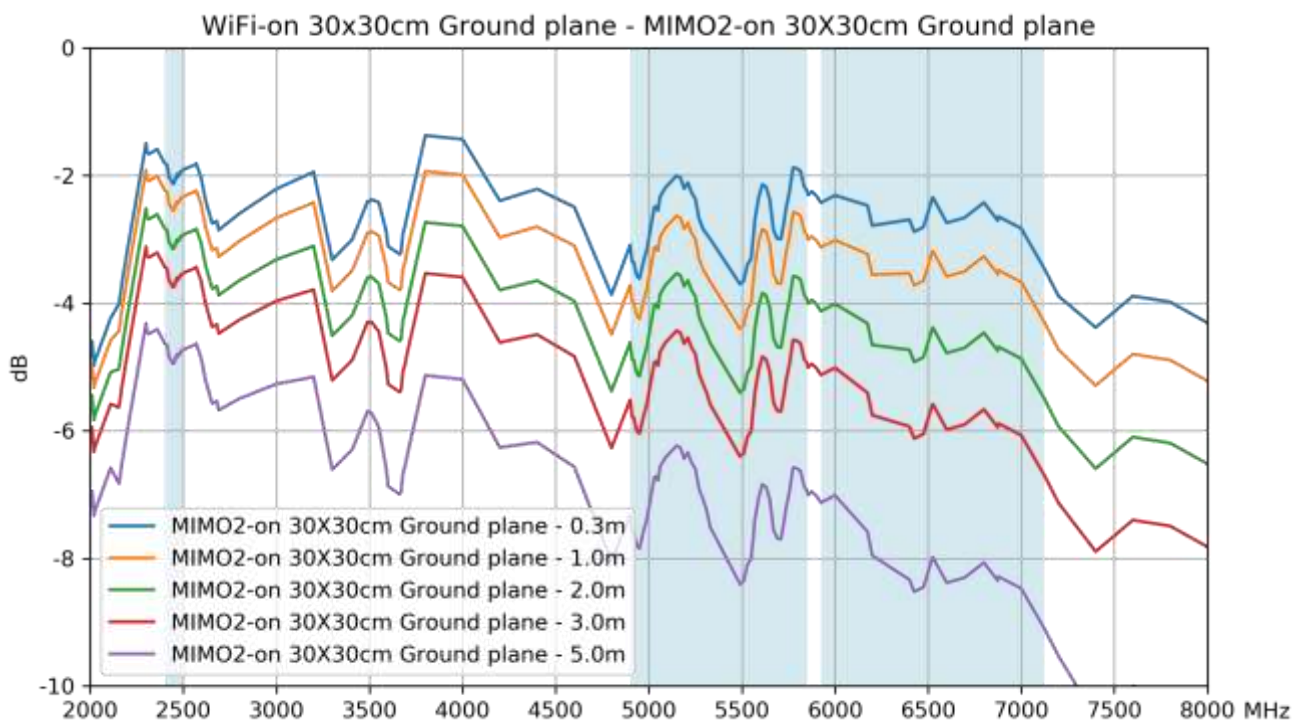
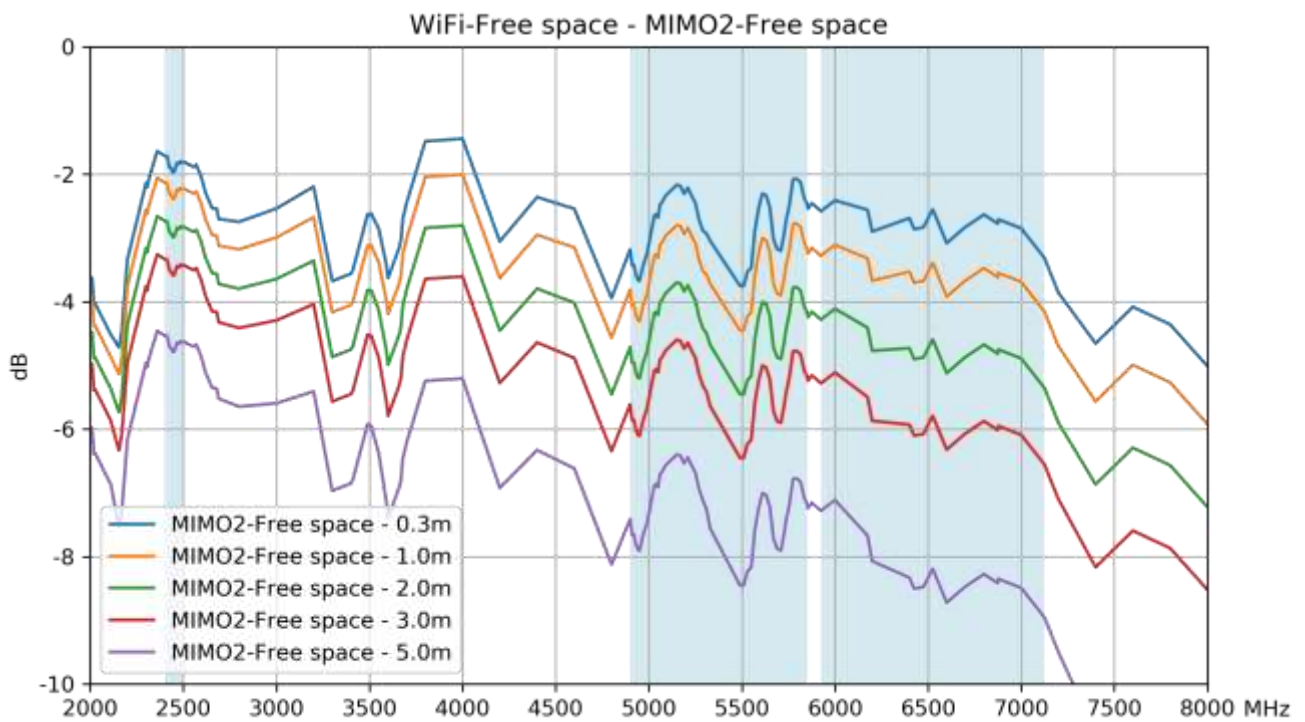
7.8 Average Gain – 5G/4G MIMO 2



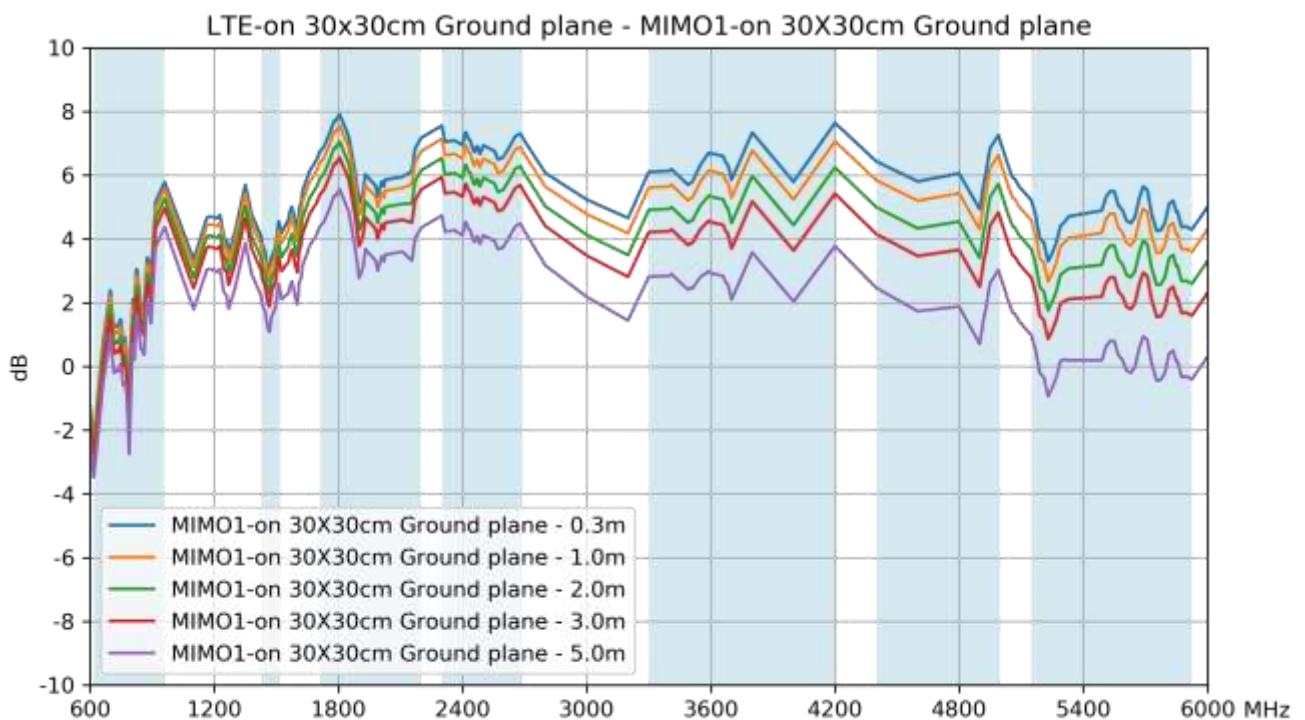
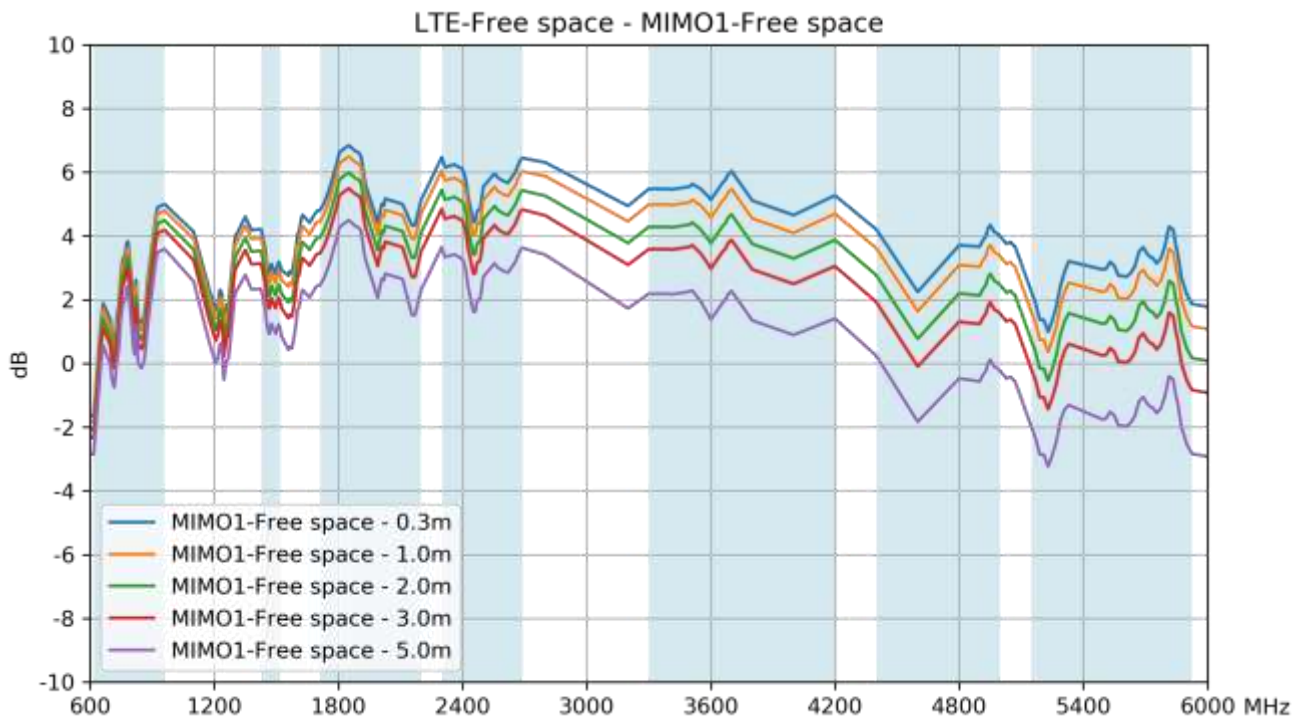
7.9 Average Gain – Wi-Fi MIMO 1



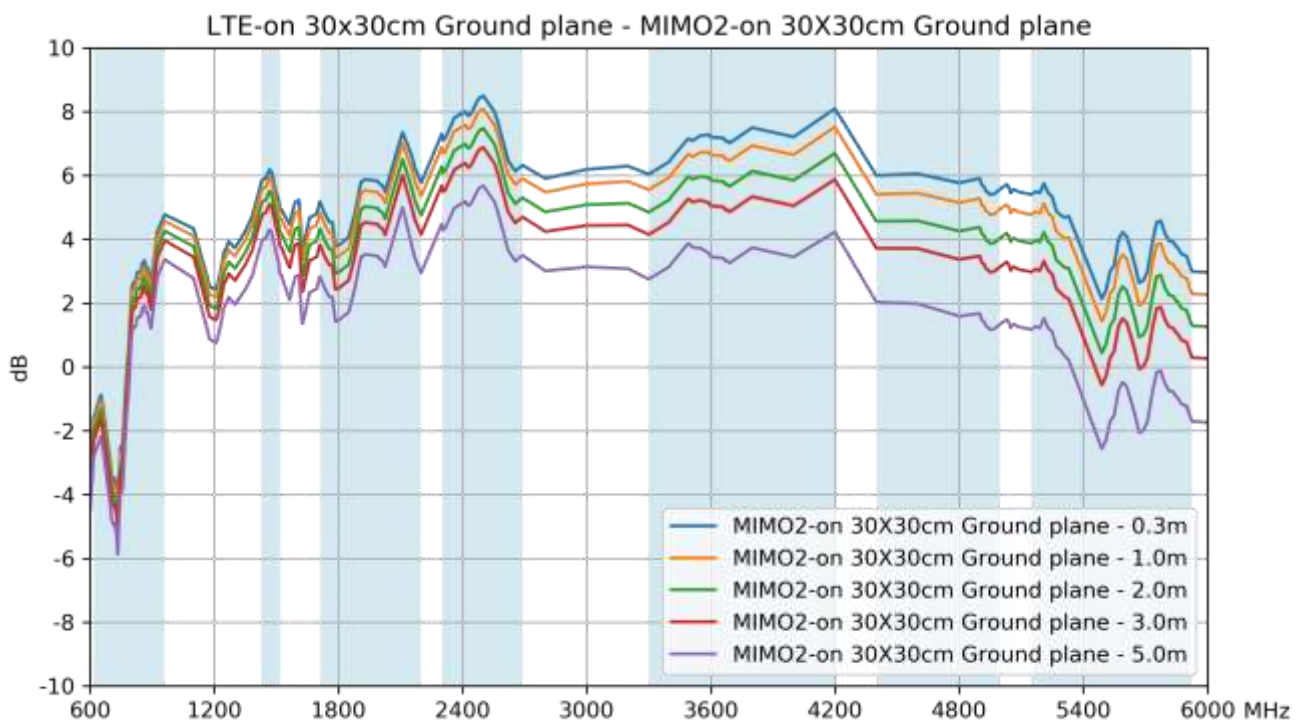
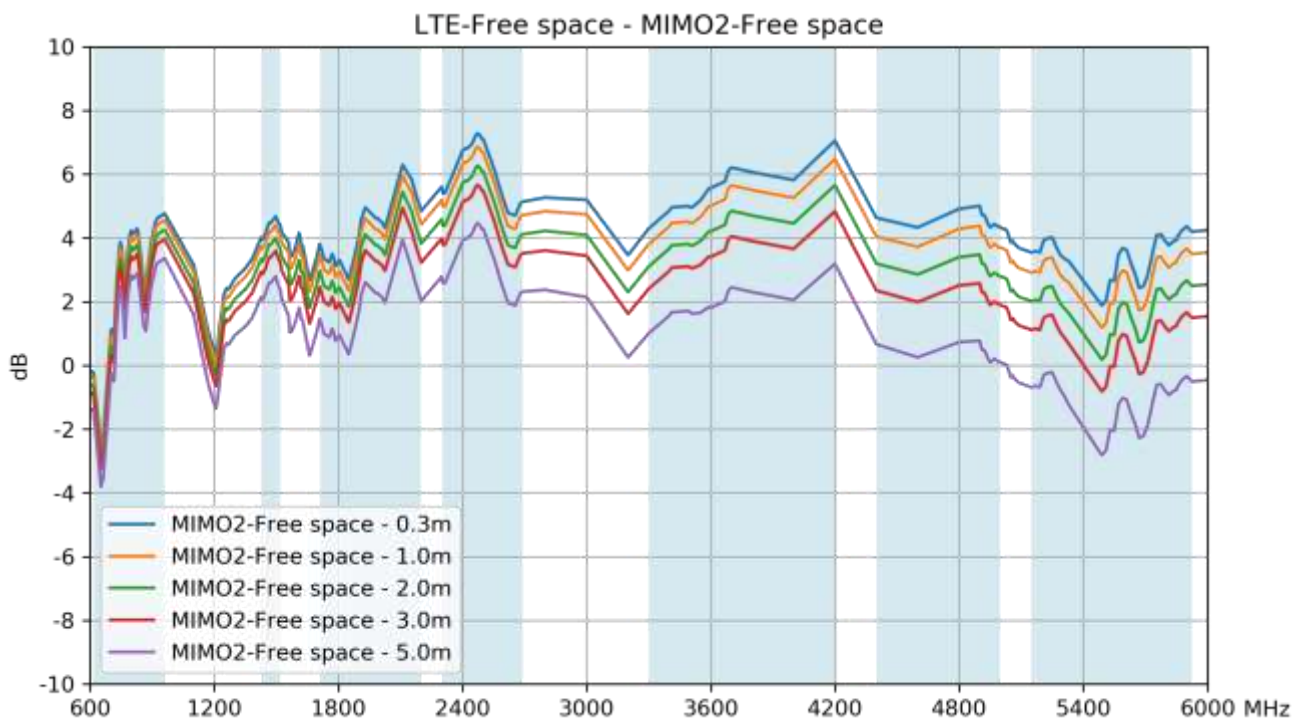
7.10 Average Gain – Wi-Fi MIMO 2



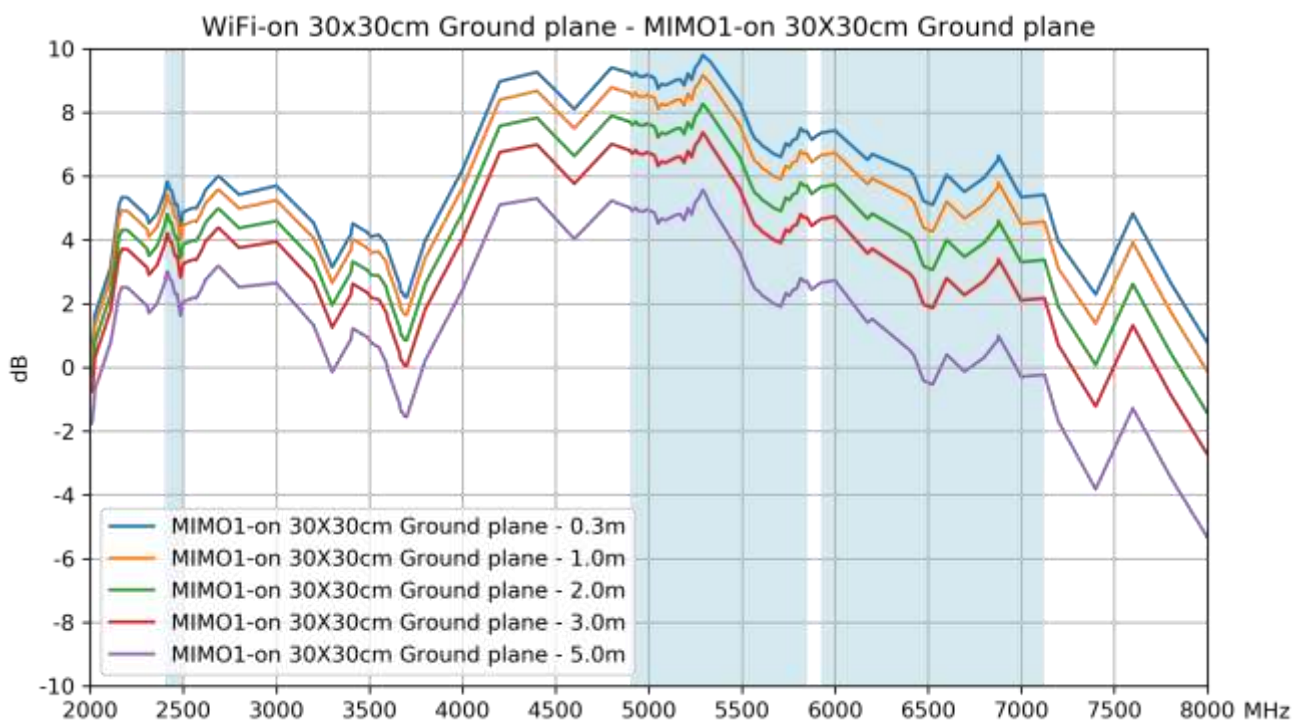
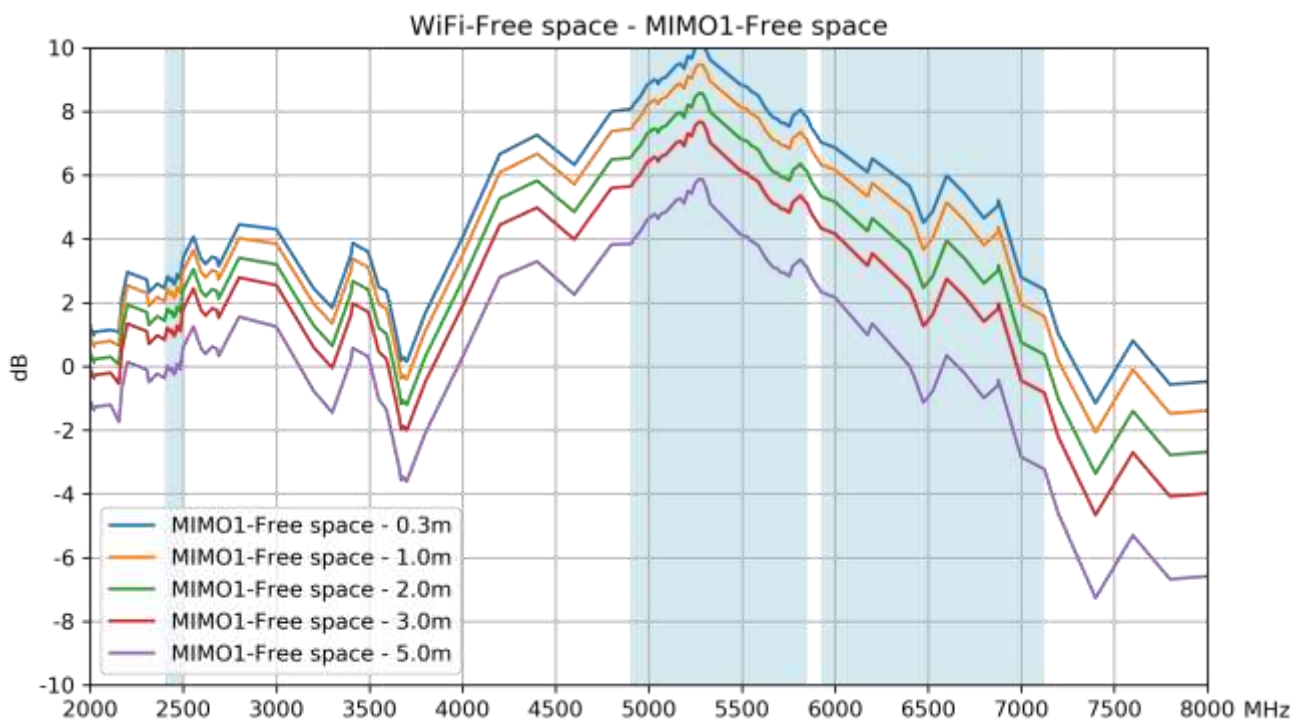
7.11 Peak Gain – 5G/4G MIMO 1



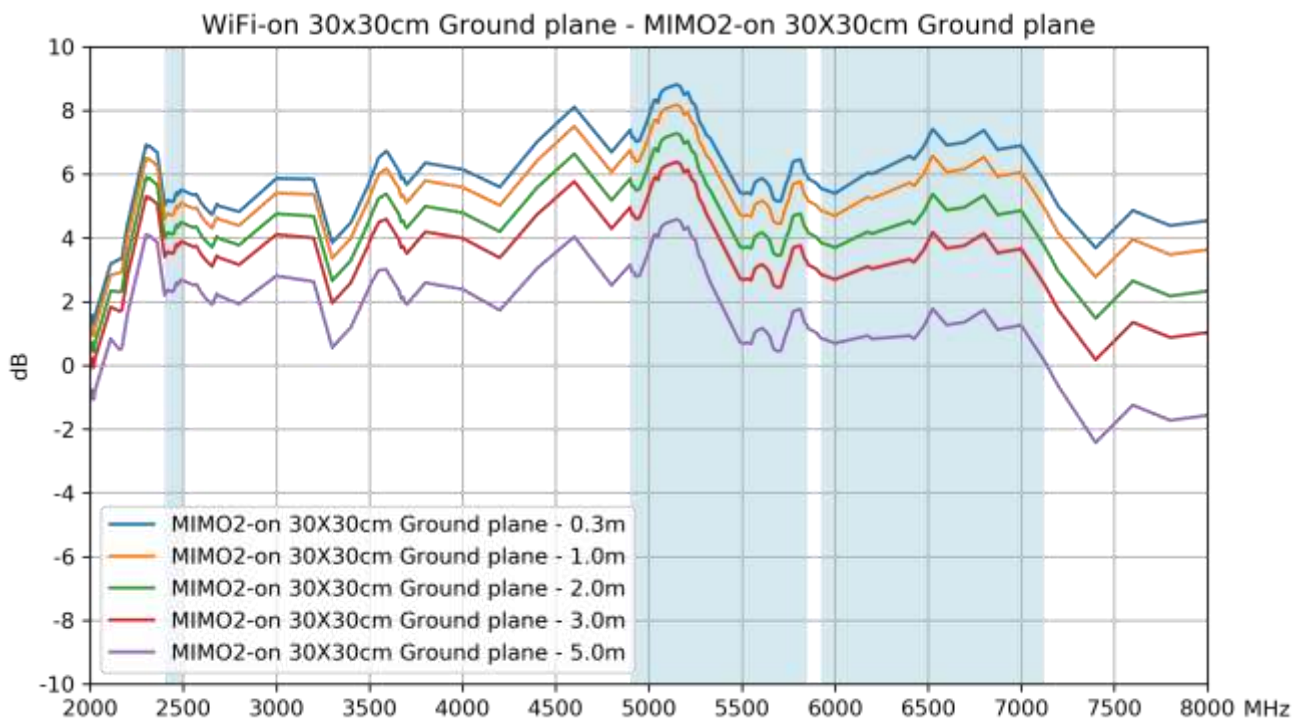
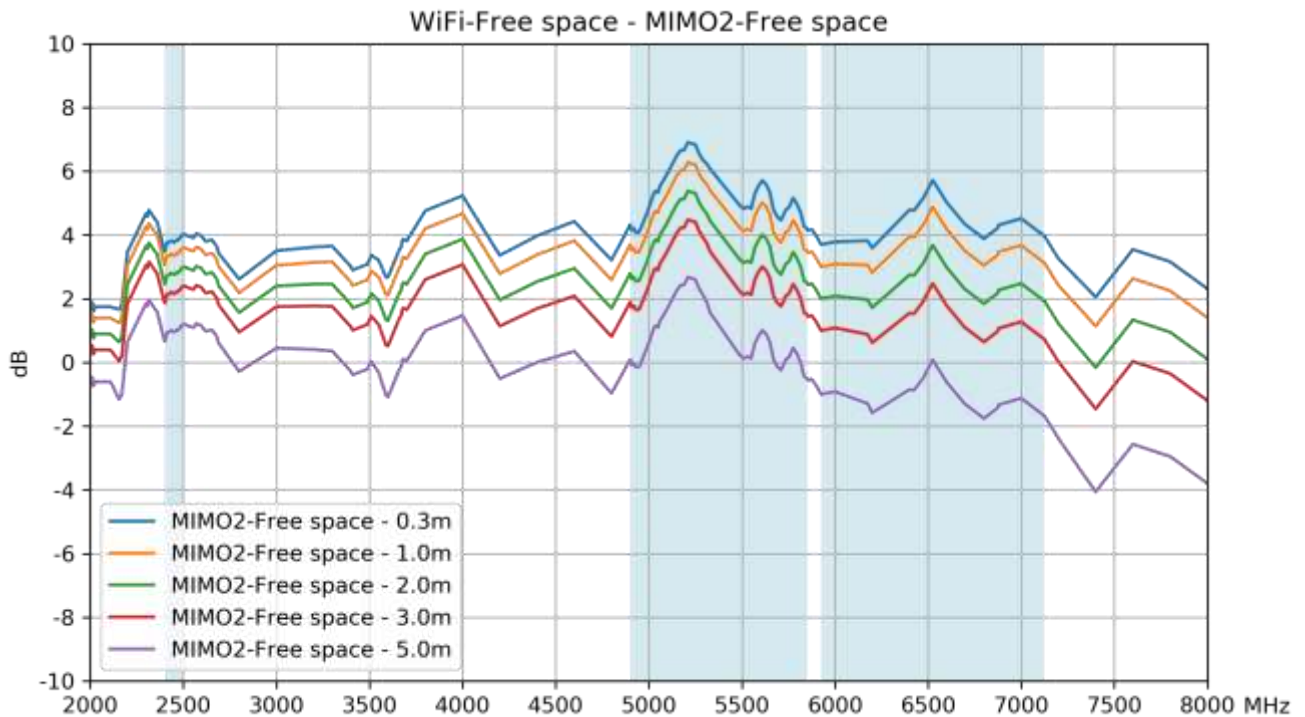
7.12 Peak Gain – 5G/4G MIMO 2



7.13 Peak Gain – Wi-Fi MIMO 1



7.14 Peak Gain – Wi-Fi MIMO 2



7.15 Comparison Table

| 5G/4G Antenna Free space | | | | | | | | | | | |
|--------------------------|---------------|---------|------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
| Frequency (MHz) | 5G NR Band 71 | LTE700 | GSM800 900 | 5G NR Band 1500 | 5G NR N66 | LTE2600 | 5G NR N77 | 5G NR N78 | 5G NR N79 | LTE5200 | |
| | 617-698 | 698-824 | 824-960 | 1427-1518 | 1710-2200 | 2300-2690 | 3300-4200 | 3300-3800 | 4400-5000 | 5150-5925 | |
| Efficiency (%) | | | | | | | | | | | |
| MIMO1- Free space | 0.3m | 40.7 | 39.5 | 47.8 | 55.5 | 64.3 | 60.6 | 74.2 | 74.9 | 62.9 | 43.8 |
| | 1.0m | 38.9 | 37.7 | 45.6 | 52.0 | 59.2 | 55.0 | 65.5 | 66.2 | 54.5 | 37.5 |
| | 2.0m | 36.4 | 35.2 | 42.5 | 47.4 | 52.6 | 47.9 | 54.9 | 55.6 | 44.4 | 29.9 |
| | 3.0m | 34.1 | 32.8 | 39.7 | 43.2 | 46.8 | 41.7 | 46.0 | 46.6 | 36.1 | 23.9 |
| | 5.0m | 30.0 | 28.6 | 34.6 | 35.8 | 37.0 | 31.7 | 32.3 | 32.8 | 24.0 | 15.3 |
| MIMO2- Free space | 0.3m | 25.7 | 56.7 | 64.2 | 69.7 | 52.9 | 57.4 | 74.8 | 74.6 | 53.2 | 47.5 |
| | 1.0m | 24.6 | 54.0 | 61.1 | 65.3 | 48.7 | 52.1 | 66.1 | 65.9 | 46.1 | 40.6 |
| | 2.0m | 23.1 | 50.4 | 57.0 | 59.4 | 43.3 | 45.4 | 55.4 | 55.3 | 37.6 | 32.5 |
| | 3.0m | 21.6 | 47.1 | 53.2 | 54.1 | 38.5 | 39.5 | 46.4 | 46.4 | 30.6 | 26.0 |
| | 5.0m | 19.0 | 41.0 | 46.4 | 44.9 | 30.4 | 30.0 | 32.6 | 32.6 | 20.3 | 16.7 |
| Average Gain (dB) | | | | | | | | | | | |
| MIMO1- Free space | 0.3m | -3.91 | -4.03 | -3.20 | -2.56 | -1.92 | -2.17 | -1.30 | -1.25 | -2.01 | -3.58 |
| | 1.0m | -4.11 | -4.24 | -3.41 | -2.84 | -2.27 | -2.59 | -1.83 | -1.79 | -2.64 | -4.26 |
| | 2.0m | -4.39 | -4.54 | -3.71 | -3.24 | -2.79 | -3.19 | -2.60 | -2.55 | -3.53 | -5.24 |
| | 3.0m | -4.67 | -4.84 | -4.01 | -3.65 | -3.30 | -3.79 | -3.37 | -3.32 | -4.42 | -6.21 |
| | 5.0m | -5.23 | -5.44 | -4.61 | -4.46 | -4.32 | -4.99 | -4.91 | -4.84 | -6.20 | -8.16 |
| MIMO2- Free space | 0.3m | -5.90 | -2.46 | -1.93 | -1.57 | -2.76 | -2.41 | -1.26 | -1.28 | -2.74 | -3.23 |
| | 1.0m | -6.09 | -2.67 | -2.14 | -1.85 | -3.12 | -2.83 | -1.80 | -1.81 | -3.36 | -3.91 |
| | 2.0m | -6.37 | -2.97 | -2.44 | -2.26 | -3.63 | -3.43 | -2.57 | -2.57 | -4.25 | -4.88 |
| | 3.0m | -6.65 | -3.27 | -2.74 | -2.66 | -4.14 | -4.03 | -3.33 | -3.34 | -5.14 | -5.84 |
| | 5.0m | -7.21 | -3.87 | -3.34 | -3.47 | -5.16 | -5.23 | -4.87 | -4.86 | -6.92 | -7.78 |
| Peak Gain (dBi) | | | | | | | | | | | |
| MIMO1- Free space | 0.3m | 1.89 | 3.84 | 5.00 | 4.21 | 6.84 | 6.48 | 6.03 | 6.03 | 4.35 | 4.30 |
| | 1.0m | 1.69 | 3.63 | 4.79 | 3.93 | 6.49 | 6.06 | 5.47 | 5.47 | 3.72 | 3.60 |
| | 2.0m | 1.41 | 3.33 | 4.49 | 3.53 | 5.99 | 5.46 | 4.67 | 4.67 | 2.82 | 2.60 |
| | 3.0m | 1.12 | 3.03 | 4.19 | 3.13 | 5.49 | 4.86 | 3.87 | 3.87 | 1.92 | 1.60 |
| | 5.0m | 0.56 | 2.43 | 3.59 | 2.33 | 4.49 | 3.66 | 2.29 | 2.29 | 0.23 | -0.40 |
| MIMO2- Free space | 0.3m | 0.94 | 4.30 | 4.77 | 4.68 | 6.30 | 7.28 | 7.05 | 6.21 | 5.01 | 4.37 |
| | 1.0m | 0.73 | 4.09 | 4.56 | 4.40 | 5.95 | 6.86 | 6.48 | 5.65 | 4.38 | 3.67 |
| | 2.0m | 0.43 | 3.79 | 4.26 | 4.00 | 5.45 | 6.26 | 5.65 | 4.85 | 3.48 | 2.67 |
| | 3.0m | 0.13 | 3.49 | 3.96 | 3.60 | 4.95 | 5.66 | 4.83 | 4.05 | 2.58 | 1.67 |
| | 5.0m | -0.47 | 2.89 | 3.36 | 2.80 | 3.95 | 4.46 | 3.19 | 2.45 | 0.78 | -0.21 |

| 5G/4G Antenna on30x30 cm Ground plane | | | | | | | | | | | |
|---------------------------------------|---------------|---------|------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|------|
| Frequency (MHz) | 5G NR Band 71 | LTE700 | GSM800 900 | 5G NR Band 1500 | 5G NR N66 | LTE2600 | 5G NR N77 | 5G NR N78 | 5G NR N79 | LTE5200 | |
| | 617-698 | 698-824 | 824-960 | 1427-1518 | 1710-2200 | 2300-2690 | 3300-4200 | 3300-3800 | 4400-5000 | 5150-5925 | |
| Efficiency (%) | | | | | | | | | | | |
| MIMO1- on 30X30cm Ground plane | 0.3m | 40.1 | 42.5 | 54.0 | 34.5 | 57.4 | 55.0 | 72.3 | 72.9 | 58.5 | 38.5 |
| | 1.0m | 38.3 | 40.5 | 51.5 | 32.3 | 52.9 | 49.9 | 63.9 | 64.5 | 50.7 | 32.9 |
| | 2.0m | 35.9 | 37.8 | 48.0 | 29.4 | 47.0 | 43.5 | 53.5 | 54.1 | 41.3 | 26.3 |
| | 3.0m | 33.6 | 35.3 | 44.8 | 26.8 | 41.8 | 37.9 | 44.9 | 45.4 | 33.7 | 21.0 |
| | 5.0m | 29.5 | 30.7 | 39.0 | 22.2 | 33.0 | 28.7 | 31.5 | 31.9 | 22.3 | 13.4 |
| MIMO2- on 30X30cm Ground plane | 0.3m | 26.5 | 25.9 | 41.9 | 51.5 | 52.0 | 58.9 | 77.6 | 77.2 | 54.3 | 43.0 |
| | 1.0m | 25.4 | 24.7 | 39.9 | 48.2 | 47.9 | 53.4 | 68.6 | 68.3 | 47.0 | 36.8 |
| | 2.0m | 23.8 | 23.1 | 37.3 | 43.9 | 42.6 | 46.5 | 57.4 | 57.3 | 38.3 | 29.4 |
| | 3.0m | 22.3 | 21.5 | 34.8 | 40.0 | 37.9 | 40.5 | 48.1 | 48.0 | 31.2 | 23.5 |
| | 5.0m | 19.6 | 18.7 | 30.3 | 33.2 | 29.9 | 30.7 | 33.8 | 33.8 | 20.8 | 15.1 |

| Average Gain (dB) | | | | | | | | | | | | | |
|--|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|--------|--|
| MIMO1-on 30X30cm Ground plane | 0.3m | -3.97 | -3.72 | -2.67 | -4.63 | -2.41 | -2.60 | -1.41 | -1.37 | -2.33 | -4.14 | | |
| | 1.0m | -4.16 | -3.93 | -2.88 | -4.91 | -2.77 | -3.02 | -1.95 | -1.91 | -2.95 | -4.82 | | |
| | 2.0m | -4.45 | -4.23 | -3.18 | -5.32 | -3.28 | -3.62 | -2.71 | -2.67 | -3.84 | -5.80 | | |
| | 3.0m | -4.73 | -4.53 | -3.48 | -5.72 | -3.79 | -4.22 | -3.48 | -3.43 | -4.73 | -6.77 | | |
| | 5.0m | -5.30 | -5.13 | -4.08 | -6.53 | -4.82 | -5.42 | -5.01 | -4.96 | -6.51 | -8.72 | | |
| MIMO2-on 30X30cm Ground plane | 0.3m | -5.76 | -5.86 | -3.78 | -2.88 | -2.84 | -2.30 | -1.10 | -1.12 | -2.65 | -3.67 | | |
| | 1.0m | -5.96 | -6.07 | -3.99 | -3.17 | -3.19 | -2.72 | -1.64 | -1.66 | -3.27 | -4.35 | | |
| | 2.0m | -6.24 | -6.37 | -4.29 | -3.57 | -3.71 | -3.32 | -2.41 | -2.42 | -4.16 | -5.31 | | |
| | 3.0m | -6.51 | -6.67 | -4.59 | -3.98 | -4.22 | -3.92 | -3.18 | -3.19 | -5.05 | -6.28 | | |
| | 5.0m | -7.07 | -7.27 | -5.19 | -4.79 | -5.24 | -5.12 | -4.71 | -4.71 | -6.83 | -8.21 | | |
| Peak Gain (dBi) | | | | | | | | | | | | | |
| MIMO1-on 30X30cm Ground plane | 0.3m | 2.42 | 3.09 | 5.78 | 4.56 | 7.91 | 7.56 | 7.64 | 7.34 | 7.26 | 5.65 | | |
| | 1.0m | 2.21 | 2.88 | 5.57 | 4.27 | 7.56 | 7.14 | 7.07 | 6.78 | 6.63 | 4.95 | | |
| | 2.0m | 1.91 | 2.58 | 5.27 | 3.85 | 7.06 | 6.54 | 6.24 | 5.98 | 5.73 | 3.95 | | |
| | 3.0m | 1.61 | 2.28 | 4.97 | 3.43 | 6.56 | 5.94 | 5.42 | 5.18 | 4.83 | 2.95 | | |
| | 5.0m | 1.01 | 1.68 | 4.37 | 2.60 | 5.56 | 4.74 | 3.78 | 3.58 | 3.03 | 0.97 | | |
| MIMO2-on 30X30cm Ground plane | 0.3m | -0.87 | 2.88 | 4.77 | 6.19 | 7.35 | 8.50 | 8.09 | 7.50 | 6.05 | 5.75 | | |
| | 1.0m | -1.07 | 2.67 | 4.56 | 5.91 | 7.00 | 8.08 | 7.52 | 6.94 | 5.44 | 5.12 | | |
| | 2.0m | -1.34 | 2.37 | 4.26 | 5.51 | 6.50 | 7.48 | 6.69 | 6.14 | 4.58 | 4.22 | | |
| | 3.0m | -1.62 | 2.07 | 3.96 | 5.11 | 6.00 | 6.88 | 5.87 | 5.34 | 3.72 | 3.32 | | |
| | 5.0m | -2.17 | 1.47 | 3.36 | 4.31 | 5.00 | 5.68 | 4.23 | 3.86 | 2.03 | 1.52 | | |
| Wi-Fi-Free space | | | | | | | | | | | | | |
| Frequency (MHz) | 2.4GHz | | 5.8GHz | | 6.175GHz | | 6.475GHz | | 6.7GHz | | 7GHz | | |
| | 2400-2500 | | 4900-5850 | | 5925-6425 | | 6425-6525 | | 6525-6875 | | 6875-7125 | | |
| Efficiency (%) | | | | | | | | | | | | | |
| MIMO1-Free space | 0.3m | 51.8 | | 70.8 | | 59.0 | | 43.2 | | 41.3 | | 33.8 | |
| | 1.0m | 47.1 | | 60.8 | | 49.5 | | 35.6 | | 34.1 | | 27.9 | |
| | 2.0m | 41.0 | | 48.9 | | 38.5 | | 27.0 | | 25.8 | | 21.2 | |
| | 3.0m | 35.7 | | 39.3 | | 30.0 | | 20.5 | | 19.6 | | 16.0 | |
| | 5.0m | 27.1 | | 25.5 | | 18.2 | | 11.8 | | 11.3 | | 9.2 | |
| MIMO2-Free space | 0.3m | 65.2 | | 52.7 | | 54.2 | | 53.1 | | 52.8 | | 51.2 | |
| | 1.0m | 59.2 | | 45.2 | | 45.4 | | 43.8 | | 43.5 | | 42.2 | |
| | 2.0m | 51.6 | | 36.4 | | 35.3 | | 33.2 | | 33.0 | | 32.0 | |
| | 3.0m | 44.9 | | 29.2 | | 27.4 | | 25.2 | | 25.0 | | 24.3 | |
| | 5.0m | 34.1 | | 18.9 | | 16.6 | | 14.5 | | 14.4 | | 14.0 | |
| Average Gain (dB) | | | | | | | | | | | | | |
| MIMO1-Free space | 0.3m | -2.85 | | -1.50 | | -2.29 | | -3.65 | | -3.84 | | -4.71 | |
| | 1.0m | -3.27 | | -2.16 | | -3.05 | | -4.49 | | -4.68 | | -5.55 | |
| | 2.0m | -3.87 | | -3.11 | | -4.14 | | -5.69 | | -5.88 | | -6.75 | |
| | 3.0m | -4.47 | | -4.05 | | -5.23 | | -6.89 | | -7.08 | | -7.95 | |
| | 5.0m | -5.67 | | -5.94 | | -7.40 | | -9.29 | | -9.48 | | -10.35 | |
| MIMO2-Free space | 0.3m | -1.86 | | -2.78 | | -2.66 | | -2.75 | | -2.77 | | -2.91 | |
| | 1.0m | -2.28 | | -3.45 | | -3.43 | | -3.59 | | -3.61 | | -3.75 | |
| | 2.0m | -2.88 | | -4.39 | | -4.52 | | -4.79 | | -4.81 | | -4.95 | |
| | 3.0m | -3.48 | | -5.34 | | -5.62 | | -5.99 | | -6.01 | | -6.15 | |
| | 5.0m | -4.68 | | -7.23 | | -7.80 | | -8.39 | | -8.41 | | -8.55 | |
| Peak Gain (dBi) | | | | | | | | | | | | | |
| MIMO1-Free space | 0.3m | 3.42 | | 10.10 | | 7.03 | | 5.32 | | 5.99 | | 5.21 | |
| | 1.0m | 3.00 | | 9.47 | | 6.33 | | 4.48 | | 5.15 | | 4.37 | |
| | 2.0m | 2.40 | | 8.57 | | 5.33 | | 3.28 | | 3.95 | | 3.17 | |
| | 3.0m | 1.80 | | 7.67 | | 4.33 | | 2.08 | | 2.75 | | 1.97 | |
| | 5.0m | 0.60 | | 5.87 | | 2.33 | | -0.32 | | 0.35 | | -0.43 | |
| MIMO2-Free space | 0.3m | 4.03 | | 6.91 | | 4.79 | | 5.72 | | 5.72 | | 4.51 | |
| | 1.0m | 3.61 | | 6.28 | | 3.95 | | 4.88 | | 4.88 | | 3.67 | |
| | 2.0m | 3.01 | | 5.38 | | 2.75 | | 3.68 | | 3.68 | | 2.47 | |
| | 3.0m | 2.41 | | 4.48 | | 1.55 | | 2.48 | | 2.48 | | 1.27 | |
| | 5.0m | 1.21 | | 2.68 | | -0.85 | | 0.08 | | 0.08 | | -1.13 | |

| Wi-Fi-on 30x30cm Ground plane | | | | | | | |
|--|------|-----------|-----------|-----------|-----------|-----------|-----------|
| Frequency (MHz) | | 2.4GHz | 5.8GHz | 6.175GHz | 6.475GHz | 6.7GHz | 7GHz |
| | | 2400-2500 | 4900-5850 | 5925-6425 | 6425-6525 | 6525-6875 | 6875-7125 |
| Efficiency (%) | | | | | | | |
| MIMO1-on 30X30cm Ground plane | 0.3m | 55.8 | 71.7 | 61.6 | 48.6 | 45.5 | 44.7 |
| | 1.0m | 50.7 | 61.6 | 51.7 | 40.1 | 37.5 | 36.8 |
| | 2.0m | 44.1 | 49.5 | 40.2 | 30.4 | 28.5 | 27.9 |
| | 3.0m | 38.4 | 39.9 | 31.3 | 23.1 | 21.6 | 21.2 |
| | 5.0m | 29.2 | 25.8 | 18.9 | 13.3 | 12.4 | 12.2 |
| MIMO2-on 30X30cm Ground plane | 0.3m | 63.1 | 54.3 | 55.1 | 54.1 | 55.3 | 51.3 |
| | 1.0m | 57.3 | 46.6 | 46.2 | 44.6 | 45.6 | 42.3 |
| | 2.0m | 49.9 | 37.5 | 35.9 | 33.8 | 34.6 | 32.1 |
| | 3.0m | 43.4 | 30.2 | 27.9 | 25.6 | 26.2 | 24.3 |
| | 5.0m | 33.0 | 19.5 | 16.9 | 14.8 | 15.1 | 14.0 |
| Average Gain (dB) | | | | | | | |
| MIMO1-on 30X30cm Ground plane | 0.3m | -2.53 | -1.44 | -2.10 | -3.13 | -3.42 | -3.50 |
| | 1.0m | -2.95 | -2.11 | -2.87 | -3.97 | -4.26 | -4.34 |
| | 2.0m | -3.55 | -3.05 | -3.96 | -5.17 | -5.46 | -5.54 |
| | 3.0m | -4.15 | -3.99 | -5.05 | -6.37 | -6.66 | -6.74 |
| | 5.0m | -5.35 | -5.88 | -7.23 | -8.77 | -9.06 | -9.14 |
| MIMO2-on 30X30cm Ground plane | 0.3m | -2.00 | -2.65 | -2.59 | -2.67 | -2.57 | -2.90 |
| | 1.0m | -2.42 | -3.31 | -3.36 | -3.51 | -3.41 | -3.74 |
| | 2.0m | -3.02 | -4.26 | -4.45 | -4.71 | -4.61 | -4.94 |
| | 3.0m | -3.62 | -5.21 | -5.54 | -5.91 | -5.81 | -6.14 |
| | 5.0m | -4.82 | -7.10 | -7.72 | -8.31 | -8.21 | -8.54 |
| Peak Gain (dBi) | | | | | | | |
| MIMO1-on 30X30cm Ground plane | 0.3m | 5.82 | 9.80 | 7.43 | 6.01 | 6.50 | 6.64 |
| | 1.0m | 5.40 | 9.17 | 6.73 | 5.17 | 5.66 | 5.80 |
| | 2.0m | 4.80 | 8.27 | 5.73 | 3.97 | 4.46 | 4.60 |
| | 3.0m | 4.20 | 7.37 | 4.73 | 2.77 | 3.26 | 3.40 |
| | 5.0m | 3.00 | 5.57 | 2.73 | 0.37 | 0.86 | 1.00 |
| MIMO2-on 30X30cm Ground plane | 0.3m | 5.51 | 8.81 | 6.57 | 7.42 | 7.42 | 6.90 |
| | 1.0m | 5.09 | 8.18 | 5.73 | 6.58 | 6.58 | 6.06 |
| | 2.0m | 4.49 | 7.28 | 4.53 | 5.38 | 5.38 | 4.86 |
| | 3.0m | 3.89 | 6.38 | 3.33 | 4.18 | 4.18 | 3.66 |
| | 5.0m | 2.69 | 4.58 | 0.93 | 1.78 | 1.78 | 1.26 |

Changelog for the datasheet

SPE-18-8-075 – MA354.A.BICG.001

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|---|-------------|
| Revision: A (Original First Release) | |
| Date: | 2020-06-25 |
| Notes: | |
| Author: | Jack Conroy |

Previous Revisions

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