

Specification

- Part No. : **MA1060.A.LBCT.001**
- Product Name : Raptor I MA1060 Sharkfin
4in1 Next Generation
Permanent Mount External Antenna
with LTE, GNSS, Wi-Fi and AM/FM
- Features : High Efficiency
Omnidirectional
4G/3G/2G Antenna
698~960MHz, 1710~2170MHz, 2300~2700MHz
GPS/GLONASS/GALILEO/BeiDou L1 Antenna
1561/1575.42/1602MHz
Wi-Fi Antenna 2.4GHz/5.8GHz Antenna
AM/FM Antenna
IP67 Waterproof
SMA(M) connector (Fakra optional)
RG-316 30cm length
Cable Length and Connectors Customizable
RoHS Compliant



1. Introduction

The Raptor I MA1060.A Sharkfin antenna is a next generation 4in1, vehicle roof permanent mount solution. Fully IP67 waterproof, it has a distinctive high quality, glossy and robust ABS+PC housing. A hardened polished finish is used according to the strictest OEM automotive standards.

The Raptor I supports GNSS (GPS/GLONASS/GALILEO/BeiDou), Wi-Fi (2.4/5.8GHz), LTE (4G/3G/2G) and a powered AM/FM radio. This sleek antenna is first tier TS16949 automotive approved and is an ideal choice for:

- OEM automotive
- Trucks
- Other vehicles and heavy equipment
- General Telematics

The antenna comes with 30cm RG-316 coaxial pigtail cables as standard, terminating in SMA(M) for GNSS, LTE and AM/FM and with RP SMA(M) for Wi-Fi.

The LTE antenna provides highest efficiency on all common worldwide LTE bands and also works great if the system falls back to 3G and 2G as it also covers these cellular bands.

The AM/FM antenna has an in-built amplifier to increase receive signal sensitivity. The antenna works in conjunction with a 12v DC power source to ensure that improved AM/FM radio signals are delivered to the audio system via an SMA(M) connector.

The antennas inside can be completely customized according to requirements, to work on other applications, such as ISM bands or DSRC. Where more than 4 antennas are needed, we recommend the Raptor II, which can combine 6 antennas in one housing due to its dual-fin design.



Cable length and connector types are customizable. Gain and efficiency depend on cable length. Peak gain will be lower with longer cable lengths. Use of low loss CFD200 cable extensions is recommended but higher loss RG316 can be used up to approximately 1 meter without significant impact on performance.

The Taoglas Raptor antenna series is manufactured in TS16949 automotive approved facilities. Contact your regional Taoglas Sales office for support.

2. Specifications

| 4G/3G/2G LTE | | | | | | | | |
|-----------------------|--|---------|---------|-----------|-----------|-----------|---------------|-------|
| In Free Space | | | | | | | | |
| Band | LTE 700 | GSM 850 | GSM 900 | DCS | PCS | UMTS1 | LTE 2300/2600 | |
| Frequency (MHz) | 698-824 | 824-894 | 880-960 | 1710-1880 | 1850-1990 | 1920-2170 | 2300-2690 | |
| Peak Gain (dBi) | 0.3M | 3.52 | 1.45 | 1.92 | 3.10 | 2.88 | 3.32 | 4.36 |
| | 1M | 3.32 | 1.25 | 1.72 | 2.70 | 2.48 | 3.02 | 3.96 |
| | 2M | 3.02 | 0.95 | 1.32 | 2.20 | 1.98 | 2.42 | 3.26 |
| | 3M | 2.62 | 0.55 | 0.92 | 1.70 | 1.48 | 1.82 | 2.66 |
| | 5M | 2.22 | 0.15 | 0.52 | 1.20 | 0.98 | 1.22 | 2.06 |
| Average Gain (dBi) | 0.3M | -2.83 | -3.25 | -3.10 | -1.92 | -2.11 | -2.18 | -1.59 |
| | 1M | -3.07 | -3.45 | -3.30 | -2.32 | -2.51 | -2.54 | -1.99 |
| | 2M | -3.37 | -3.83 | -3.70 | -2.82 | -3.07 | -3.12 | -2.62 |
| | 3M | -3.71 | -4.15 | -4.03 | -3.33 | -3.60 | -3.65 | -3.23 |
| | 5M | -4.04 | -4.48 | -4.36 | -3.84 | -4.14 | -4.18 | -3.84 |
| Efficiency (%) | 0.3M | 53.95 | 47.50 | 49.20 | 64.50 | 61.77 | 60.96 | 69.48 |
| | 1M | 51.15 | 45.38 | 47.01 | 58.80 | 56.33 | 56.03 | 63.38 |
| | 2M | 47.74 | 41.70 | 42.87 | 52.40 | 49.61 | 49.12 | 54.91 |
| | 3M | 44.13 | 38.63 | 39.73 | 46.58 | 43.85 | 43.40 | 47.69 |
| | 5M | 40.80 | 35.79 | 36.82 | 41.41 | 38.77 | 38.35 | 41.43 |
| On 50*50cm Metal Base | | | | | | | | |
| Peak Gain (dBi) | 0.3M | 2.74 | 1.98 | 2.19 | 5.67 | 5.67 | 5.78 | 6.51 |
| | 1M | 2.54 | 1.78 | 1.99 | 5.27 | 5.27 | 5.48 | 6.11 |
| | 2M | 2.24 | 1.38 | 1.59 | 4.77 | 4.77 | 4.88 | 5.41 |
| | 3M | 1.84 | 1.08 | 1.29 | 4.27 | 4.27 | 4.38 | 4.81 |
| | 5M | 1.44 | 0.78 | 0.99 | 3.77 | 3.77 | 3.88 | 4.21 |
| Average Gain (dBi) | 0.3M | -2.52 | -3.76 | -4.24 | -1.81 | -1.50 | -1.52 | -1.29 |
| | 1M | -2.76 | -3.96 | -4.44 | -2.21 | -1.90 | -1.89 | -1.69 |
| | 2M | -3.06 | -4.33 | -4.84 | -2.71 | -2.46 | -2.46 | -2.31 |
| | 3M | -3.39 | -4.66 | -5.16 | -3.22 | -2.99 | -3.00 | -2.93 |
| | 5M | -3.72 | -4.98 | -5.49 | -3.73 | -3.53 | -3.53 | -3.54 |
| Efficiency (%) | 0.3M | 57.06 | 42.44 | 37.81 | 66.52 | 71.06 | 70.79 | 74.46 |
| | 1M | 54.03 | 40.53 | 36.11 | 60.66 | 64.82 | 65.08 | 67.90 |
| | 2M | 50.43 | 37.25 | 32.93 | 54.06 | 57.08 | 57.04 | 58.82 |
| | 3M | 46.68 | 34.49 | 30.55 | 48.04 | 50.46 | 50.41 | 51.10 |
| | 5M | 43.21 | 31.95 | 28.34 | 42.69 | 44.60 | 44.55 | 44.39 |
| Return loss (dB) * | <-6 | <-6 | <-6 | <-6 | <-6 | <-6 | <-6 | <-4 |
| Polarization | Linear | | | | | | | |
| Impedance | 50Ω | | | | | | | |
| Cable | 30cm RG-316 standard, fully customizable on cable length | | | | | | | |
| Connector | SMA(M) Straight, fully customizable | | | | | | | |

| GPS/GLONASS/GALILEO/BeiDou | | | |
|----------------------------|---|----------------|---------------|
| Center Frequency fc | 1561.098 ± 2MHz | 1575.42 ± 3MHz | 1602 ± 0.5MHz |
| Average Gain (dBi) | -4.69 | -3.16 | -3.11 |
| Efficiency (%) | 33.98 | 48.35 | 48.83 |
| Peak Gain (dBi) | 0.45 | 1.4 | 2.3 |
| VSWR(@Center Frequency) | < -10 dB | | |
| Polarization | RHCP | | |
| Impedance | 50Ω | | |
| Antenna size | 25*25*4mm | | |
| Cable | 30cm RG-316 standard, fully customizable cable length | | |
| Connector | SMA Male Straight, fully customizable | | |

| LNA ELECTRICAL PROPERTIES | | | |
|---------------------------|--------------|------|------|
| Frequency | 1558~1610MHz | | |
| DC Power Input | 1.8V | 3V | 5V |
| Gain | 24dB | 28dB | 30dB |
| Noise Figure | 2.7 | 2.8 | 2.8 |
| Power Consumption | 10mA @ DC 3V | | |

| AM/FM ANTENNA | | |
|---------------------|-------------------|----------------|
| Application Bands | AM Radio Bands | FM Radio Bands |
| Operation Frequency | 535~1605KHz | 88~108MHz |
| Integration | Module Integrated | |
| Power In | DC 12V | |

| Wi-Fi 2.4GHz/5.8GHz | | | |
|-------------------------|------------------------------|---------|-----------|
| Free Space | | | |
| Frequency (GHz) | | 2.4~2.5 | 5.15~5.85 |
| Peak Gain (dBi) | 0.3M | 5.62 | 7.22 |
| | 1M | 5.22 | 6.52 |
| | 2M | 4.62 | 5.62 |
| | 3M | 4.02 | 4.72 |
| | 5M | 2.82 | 2.82 |
| Average Gain (dBi) | 0.3M | -1.34 | -1.93 |
| | 1M | -1.74 | -2.58 |
| | 2M | -2.34 | -3.50 |
| | 3M | -2.94 | -4.41 |
| | 5M | -4.14 | -6.23 |
| Efficiency (%) | 0.3M | 73.45 | 65.19 |
| | 1M | 67.00 | 56.10 |
| | 2M | 58.35 | 45.50 |
| | 3M | 50.82 | 36.90 |
| | 5M | 38.55 | 24.26 |
| On 50*50cm Metal Center | | | |
| Peak Gain (dBi) | 0.3M | 6.53 | 8.85 |
| | 1M | 6.13 | 8.25 |
| | 2M | 5.53 | 7.35 |
| | 3M | 4.93 | 6.45 |
| | 5M | 3.73 | 4.75 |
| Average Gain (dBi) | 0.3M | -1.66 | -2.05 |
| | 1M | -2.06 | -2.70 |
| | 2M | -2.66 | -3.61 |
| | 3M | -3.26 | -4.52 |
| | 5M | -4.46 | -6.35 |
| Efficiency (%) | 0.3M | 68.30 | 63.30 |
| | 1M | 62.30 | 54.47 |
| | 2M | 54.26 | 44.17 |
| | 3M | 47.26 | 35.83 |
| | 5M | 35.85 | 23.55 |
| Return Loss | <-8 (When Cable Length 30cm) | | |
| Polarization | Linear | | |
| Impedance | 50Ω | | |
| Cable | RG316 | | |
| Connector | SMA Male | | |

| MECHANICAL | |
|---------------------------------|----------------------------|
| Antenna Dimensions | 176*85*72mm (L*W*H) |
| Casing | PC+ABS |
| Waterproof | IP67 |
| Base and thread | Zinc Alloy |
| Thread diameter | M20*1.5P |
| Nut | Nickel Plated Steel |
| Rubber | Silicone Rubber |
| Weight | 350g |
| Recommended Torque for Mounting | 29.4 N-m |
| Max Torque for Mounting | 39.2 N-m |
| ENVIRONMENTAL | |
| Operation Temperature | -40°C to 85°C |
| Storage Temperature | -40°C to 90°C |
| Humidity | Non-condensing 65°C 95% RH |

* All measurements were conducted with a 30cm cable length. Longer cable lengths will result in lower efficiencies and gain, Taoglas recommend to use CFD-200 Low loss coaxial cable for the cable extension.

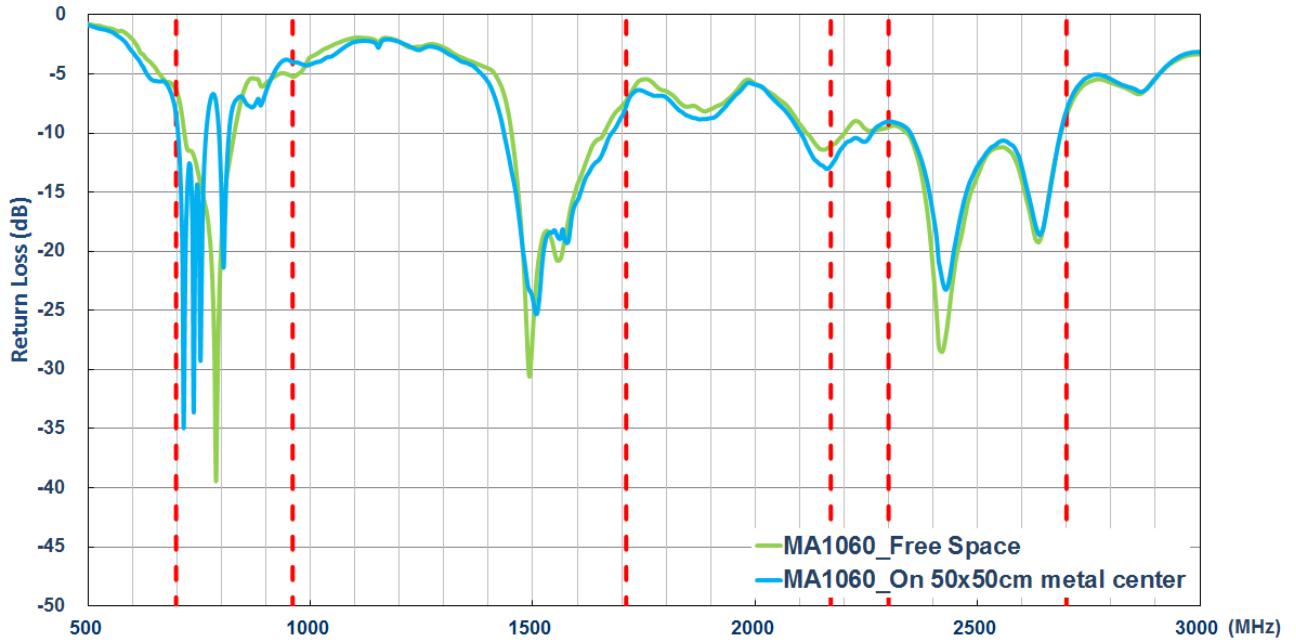
| LTE BANDS | | | |
|-------------|--|-------------------------------|---------|
| Band Number | LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA | | |
| | Uplink | Downlink | Covered |
| 1 | UL: 1920 to 1980 | DL: 2110 to 2170 | ✓ |
| 2 | UL: 1850 to 1910 | DL: 1930 to 1990 | ✓ |
| 3 | UL: 1710 to 1785 | DL: 1805 to 1880 | ✓ |
| 4 | UL: 1710 to 1755 | DL: 2110 to 2155 | ✓ |
| 5 | UL: 824 to 849 | DL: 869 to 894 | ✓ |
| 7 | UL: 2500 to 2570 | DL: 2620 to 2690 | ✓ |
| 8 | UL: 880 to 915 | DL: 925 to 960 | ✓ |
| 9 | UL: 1749.9 to 1784.9 | DL: 1844.9 to 1879.9 | ✓ |
| 11 | UL: 1427.9 to 1447.9 | DL: 1475.9 to 1495.9 | ✗ |
| 12 | UL: 699 to 716 | DL: 729 to 746 | ✓ |
| 13 | UL: 777 to 787 | DL: 746 to 756 | ✓ |
| 14 | UL: 788 to 798 | DL: 758 to 768 | ✓ |
| 17 | UL: 704 to 716 | DL: 734 to 746 (LTE only) | ✓ |
| 18 | UL: 815 to 830 | DL: 860 to 875 (LTE only) | ✓ |
| 19 | UL: 830 to 845 | DL: 875 to 890 | ✓ |
| 20 | UL: 832 to 862 | DL: 791 to 821 | ✓ |
| 21 | UL: 1447.9 to 1462.9 | DL: 1495.9 to 1510.9 | ✗ |
| 22 | UL: 3410 to 3490 | DL: 3510 to 3590 | ✗ |
| 23 | UL: 2000 to 2020 | DL: 2180 to 2200 (LTE only) | ✓ |
| 24 | UL: 1625.5 to 1660.5 | DL: 1525 to 1559 (LTE only) | ✓ |
| 25 | UL: 1850 to 1915 | DL: 1930 to 1995 | ✓ |
| 26 | UL: 814 to 849 | DL: 859 to 894 | ✓ |
| 27 | UL: 807 to 824 | DL: 852 to 869 (LTE only) | ✓ |
| 28 | UL: 703 to 748 | DL: 758 to 803 (LTE only) | ✓ |
| 29 | UL: - | DL: 717 to 728 (LTE only) | ✓ |
| 30 | UL: 2305 to 2315 | DL: 2350 to 2360 (LTE only) | ✓ |
| 31 | UL: 452.5 to 457.5 | DL: 462.5 to 467.5 (LTE only) | ✗ |
| 32 | UL: - | DL: 1452 - 1496 | ✗ |
| 35 | | 1850 to 1910 | ✓ |
| 38 | | 2570 to 2620 | ✓ |
| 39 | | 1880 to 1920 | ✓ |
| 40 | | 2300 to 2400 | ✓ |
| 41 | | 2496 to 2690 | ✓ |
| 42 | | 3400 to 3600 | ✗ |
| 43 | | 3600 to 3800 | ✗ |

*Covered bands represent an efficiency greater than 20%

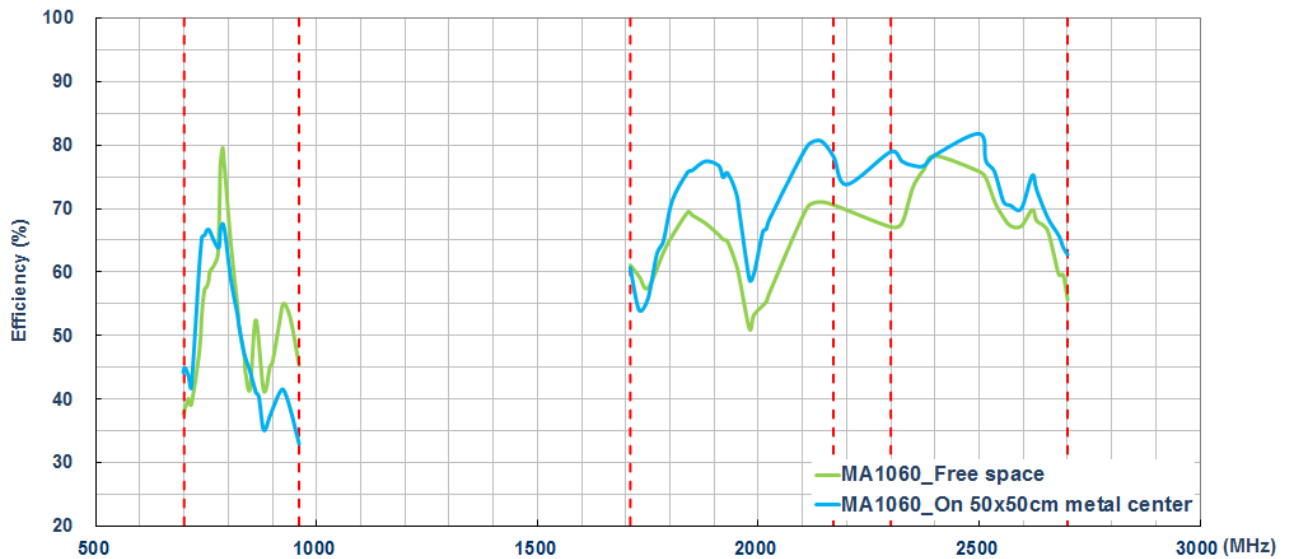
3. 4G/3G/2G LTE Antenna

3.1. LTE Characteristics

3.1.1. Return Loss

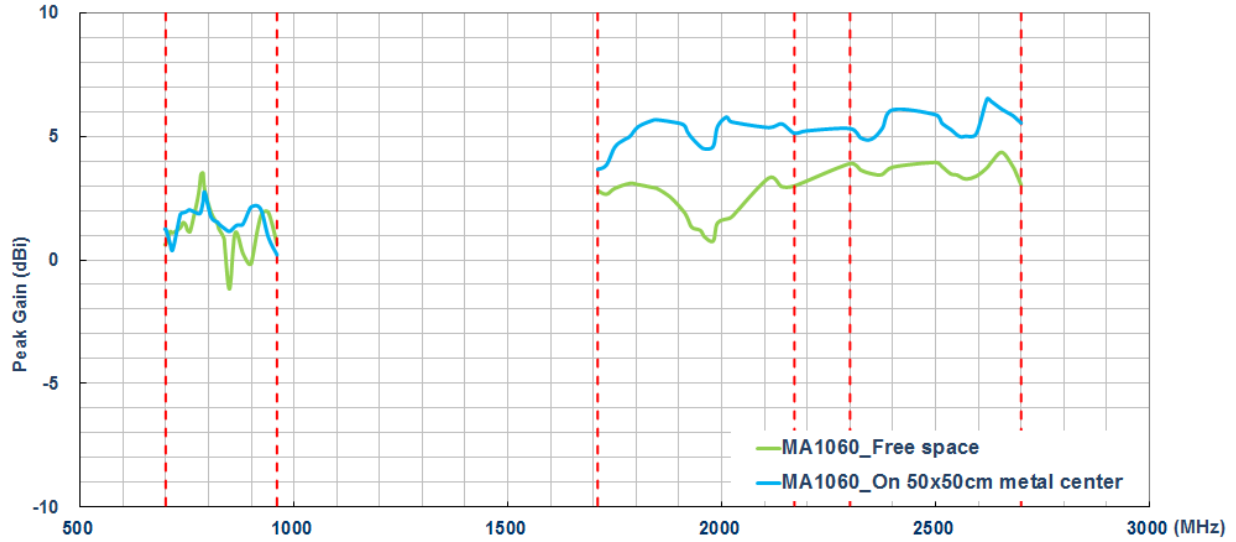


3.1.2. Efficiency

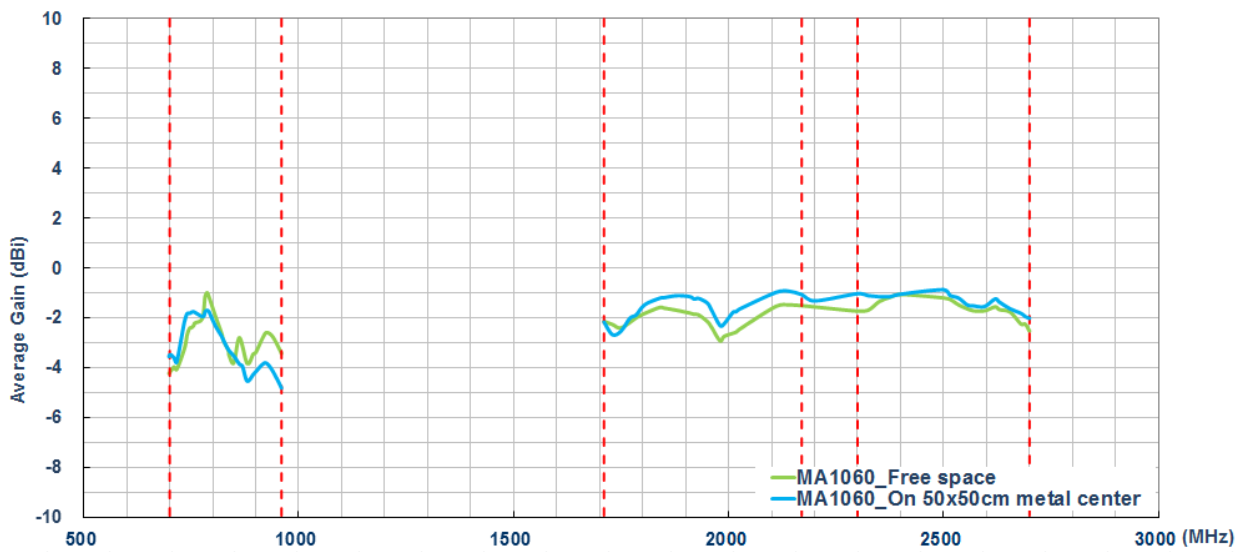




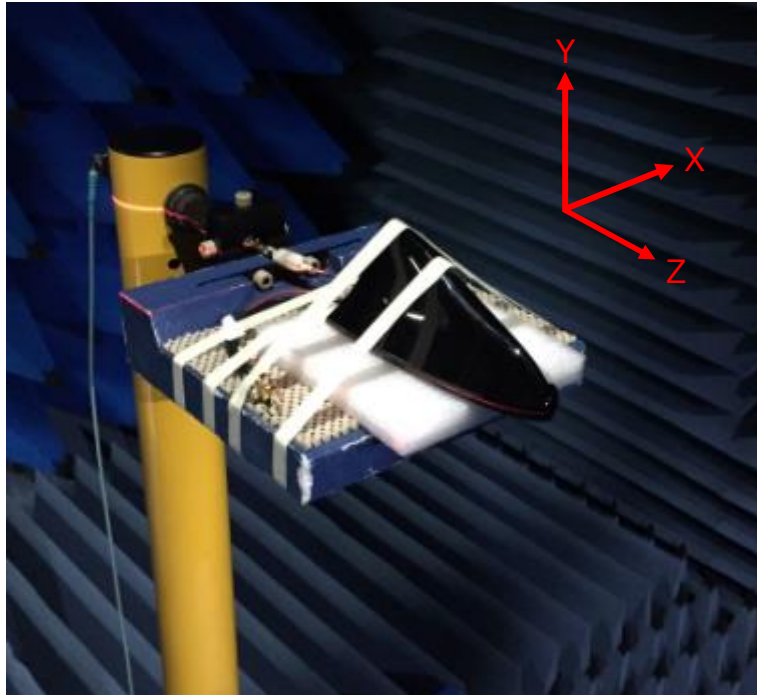
3.1.3. Peak Gain



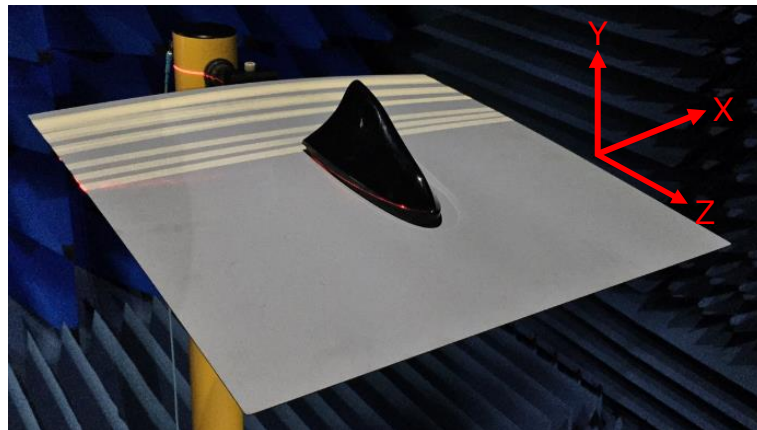
3.1.4. Average Gain



3.2. Radiation Pattern Measurement Setup



Free Space

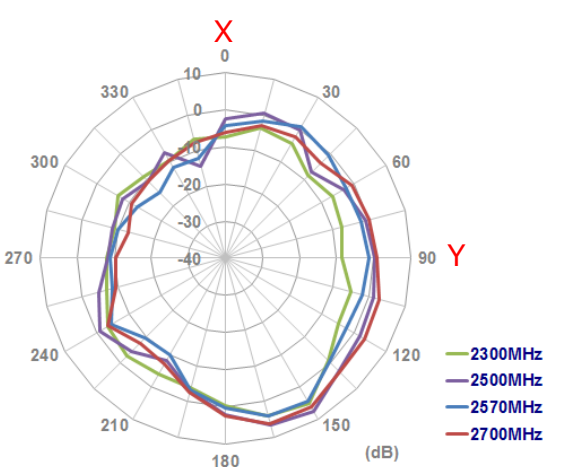
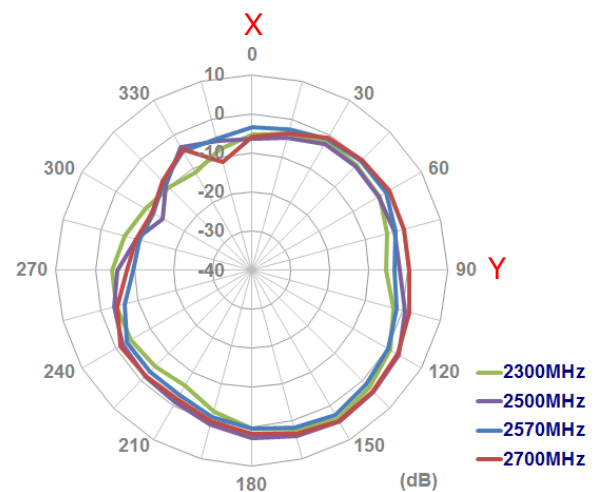
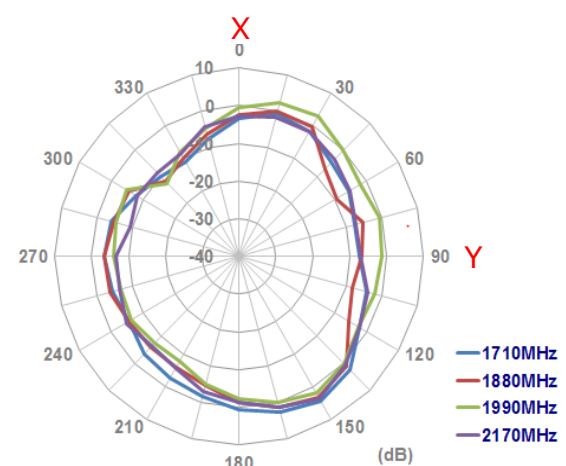
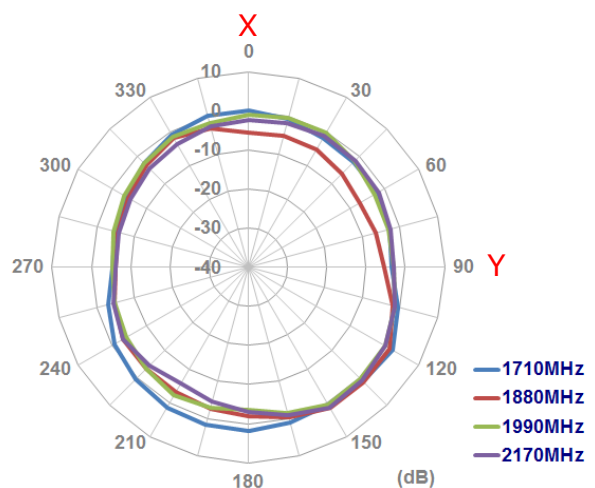
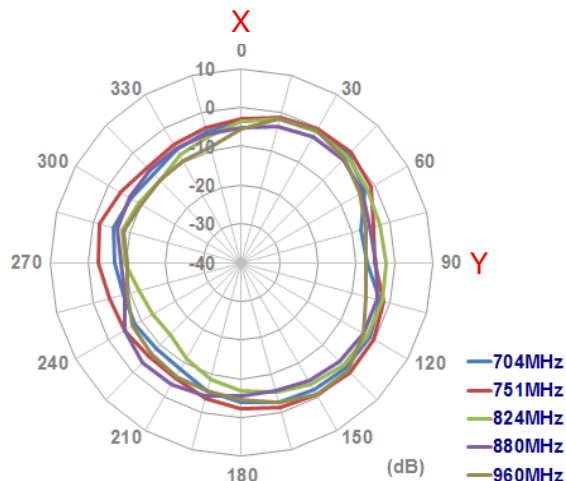
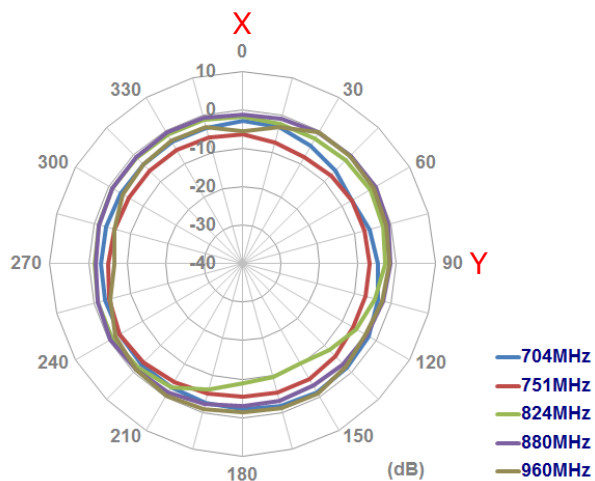


On 50*50cm Metal Base



3.2.1. LTE 2D Radiation Pattern

XY Plane



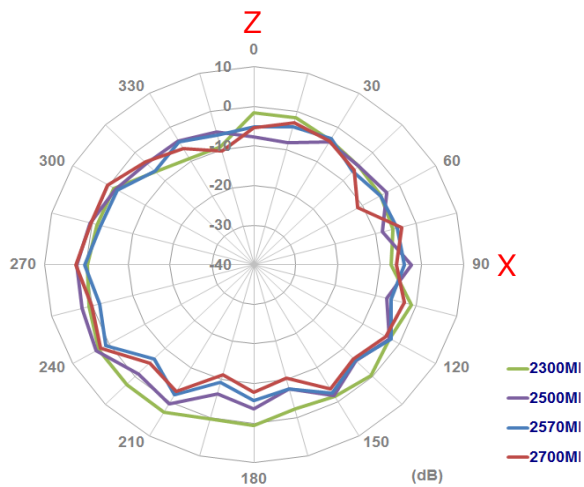
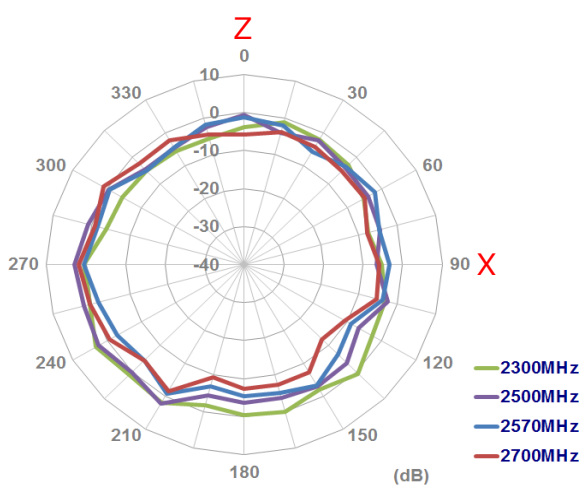
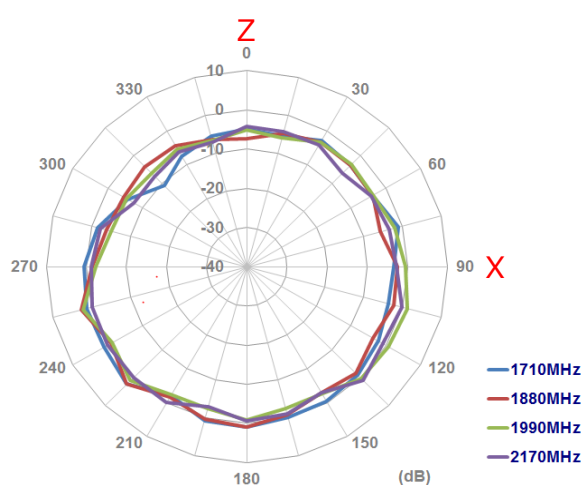
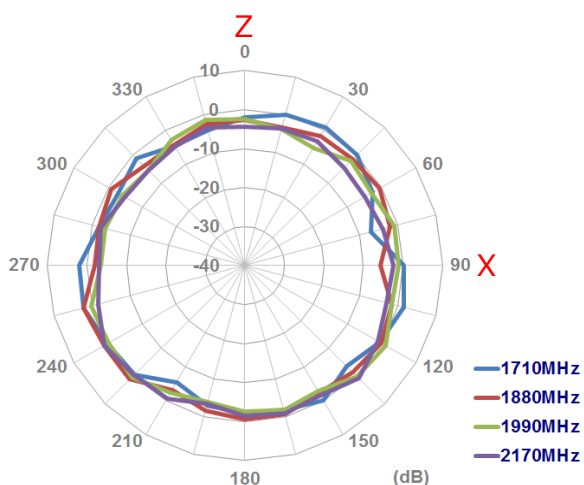
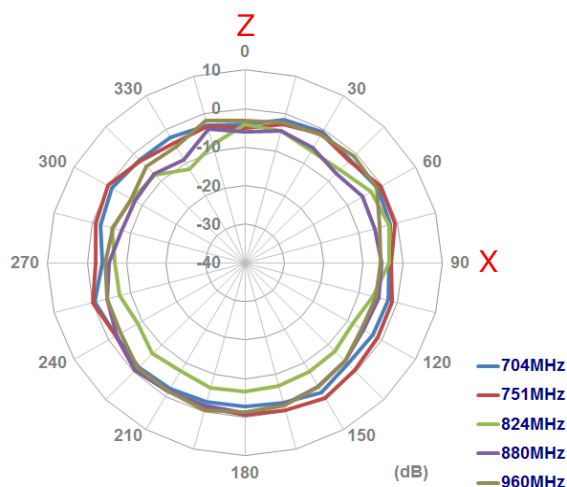
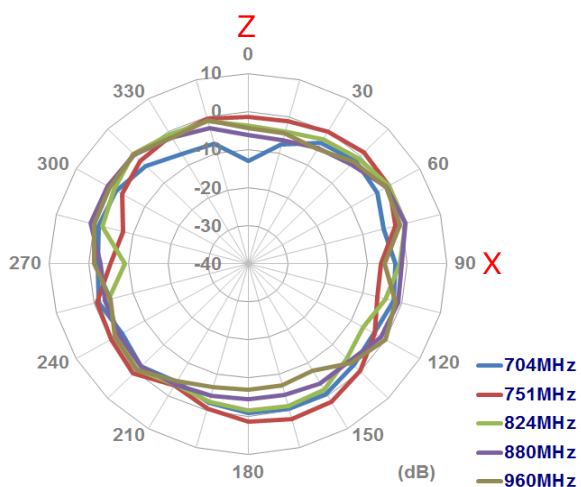
Free Space

On 50*50cm Metal Base



TAOGLAS®

XZ Plane



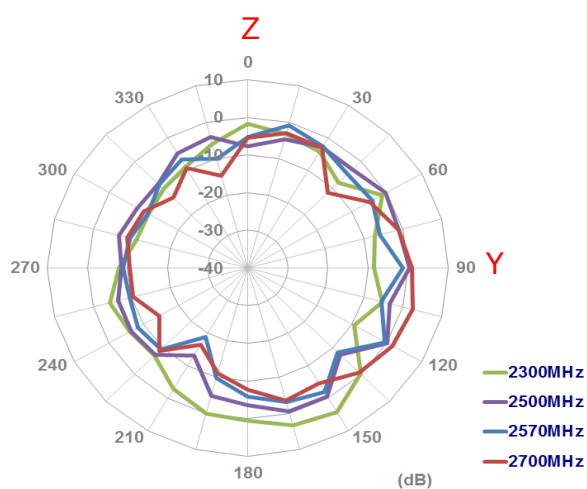
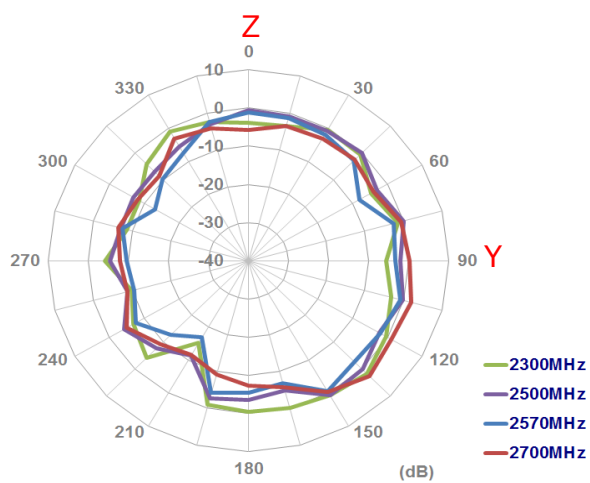
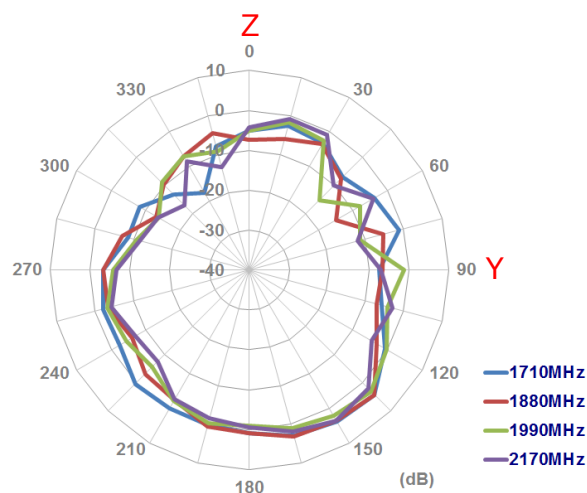
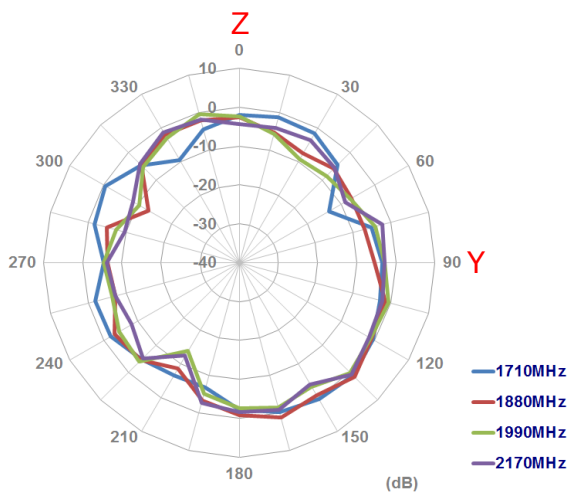
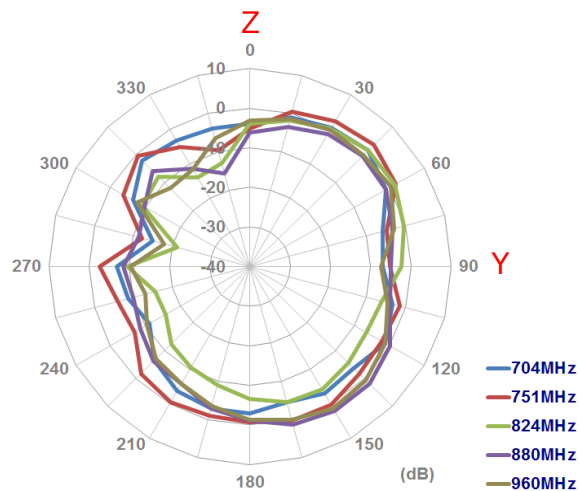
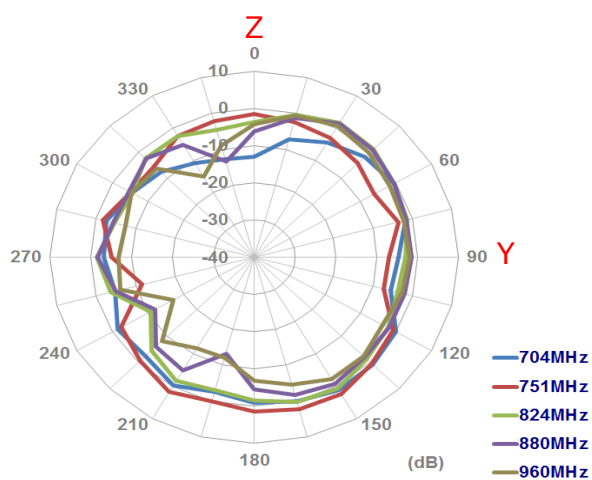
Free Space

On 50*50cm Metal Base



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YZ Plane



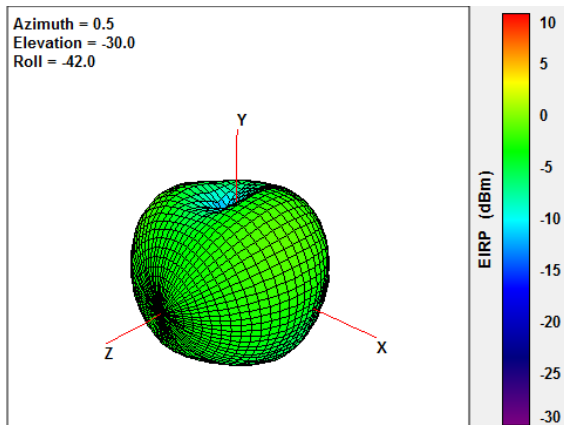
Free Space

On 50*50cm Metal Base

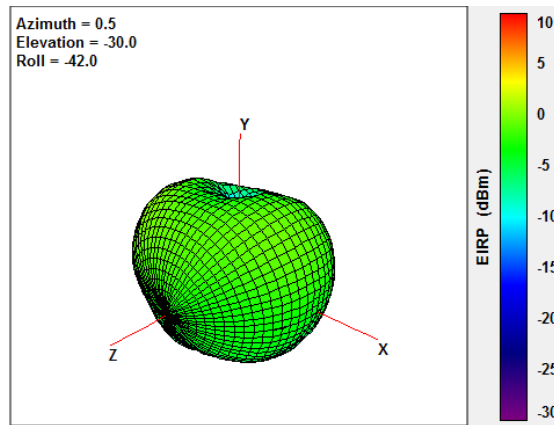


3.3. 3D Radiation Pattern

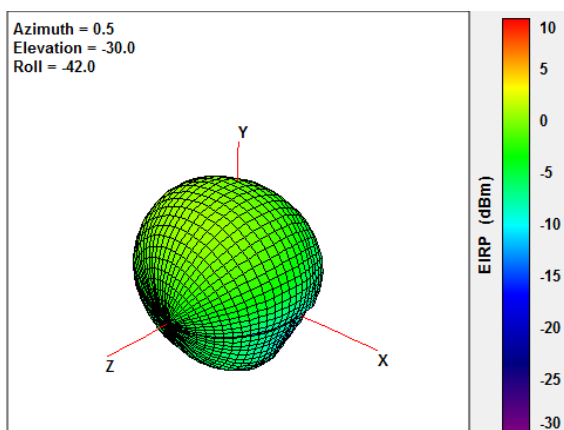
3.3.1 LTE 3D Radiation Pattern



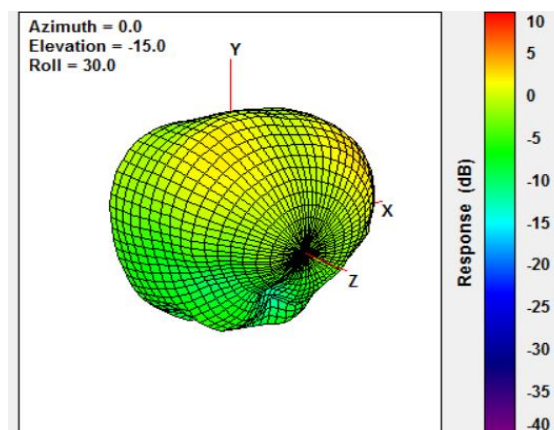
@756MHz



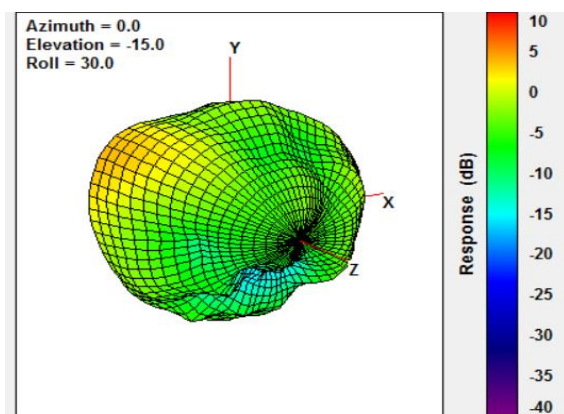
@824MHz



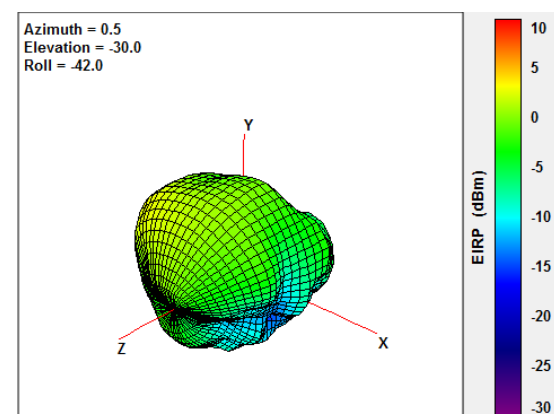
@880MHz



@960MHz



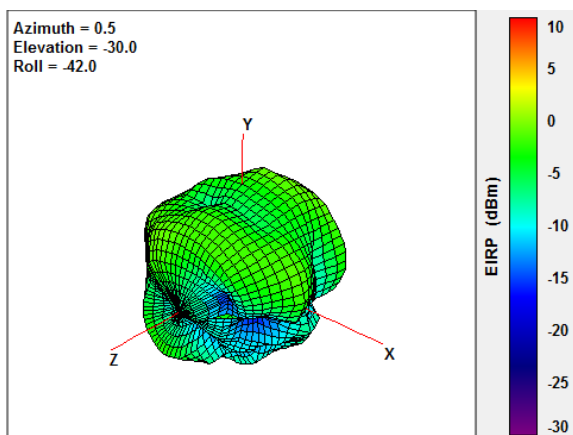
@1710MHz



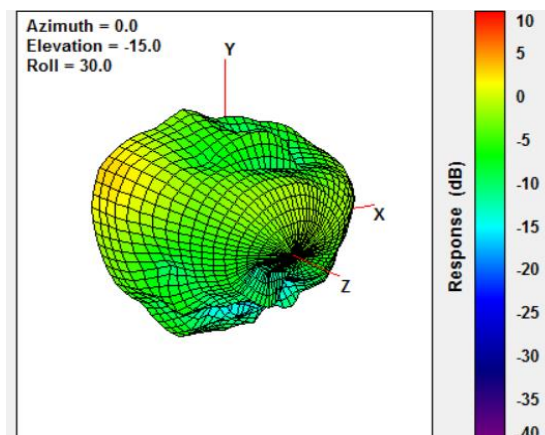
@1880MHz



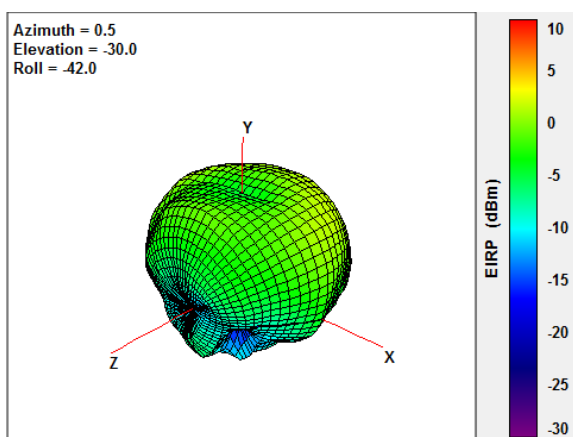
TAOGLAS®



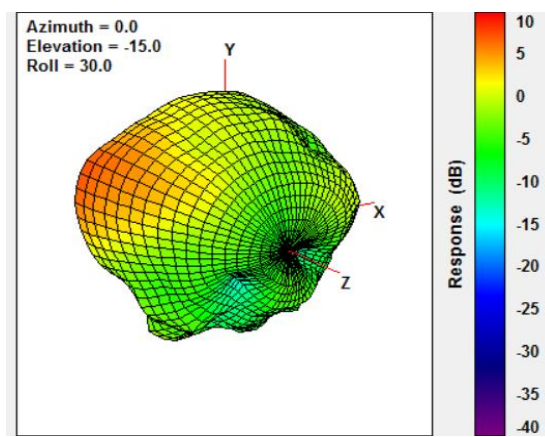
@1990MHz



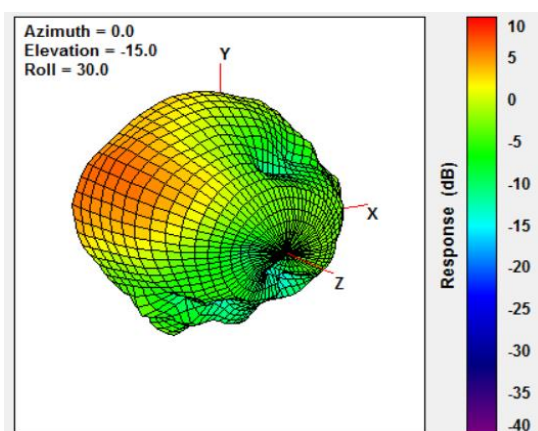
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@2500MHz



@2300MHz

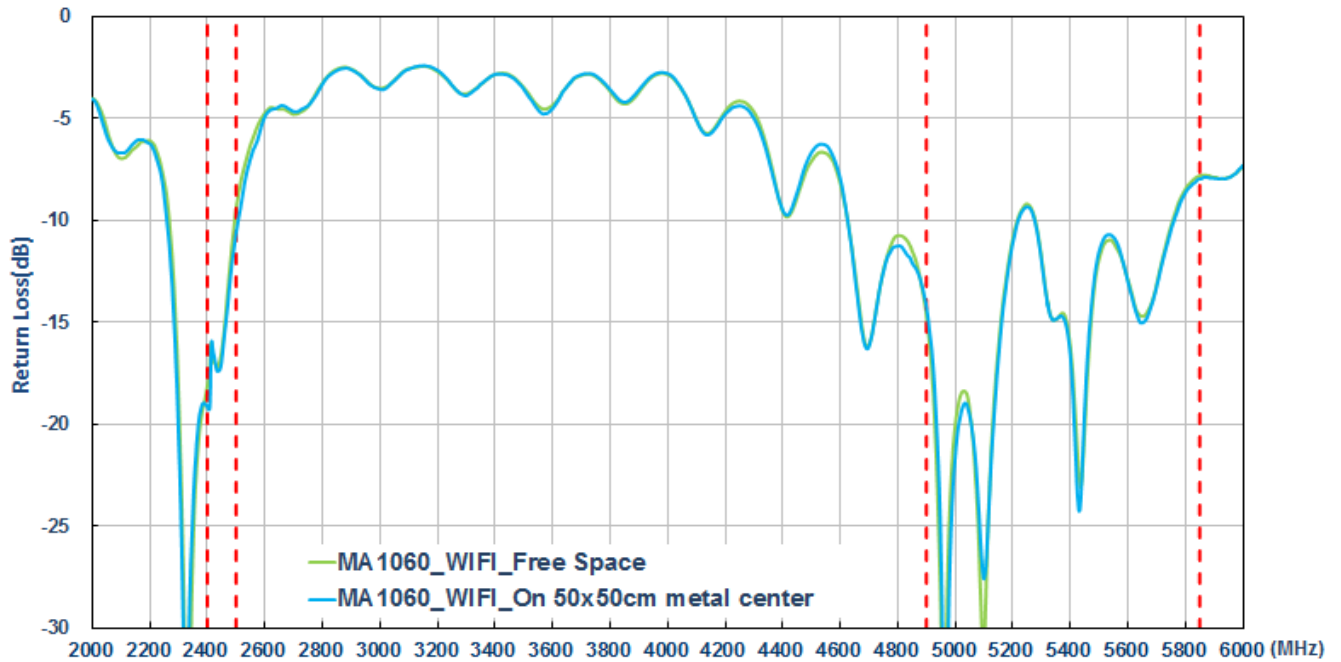


@2690MHz

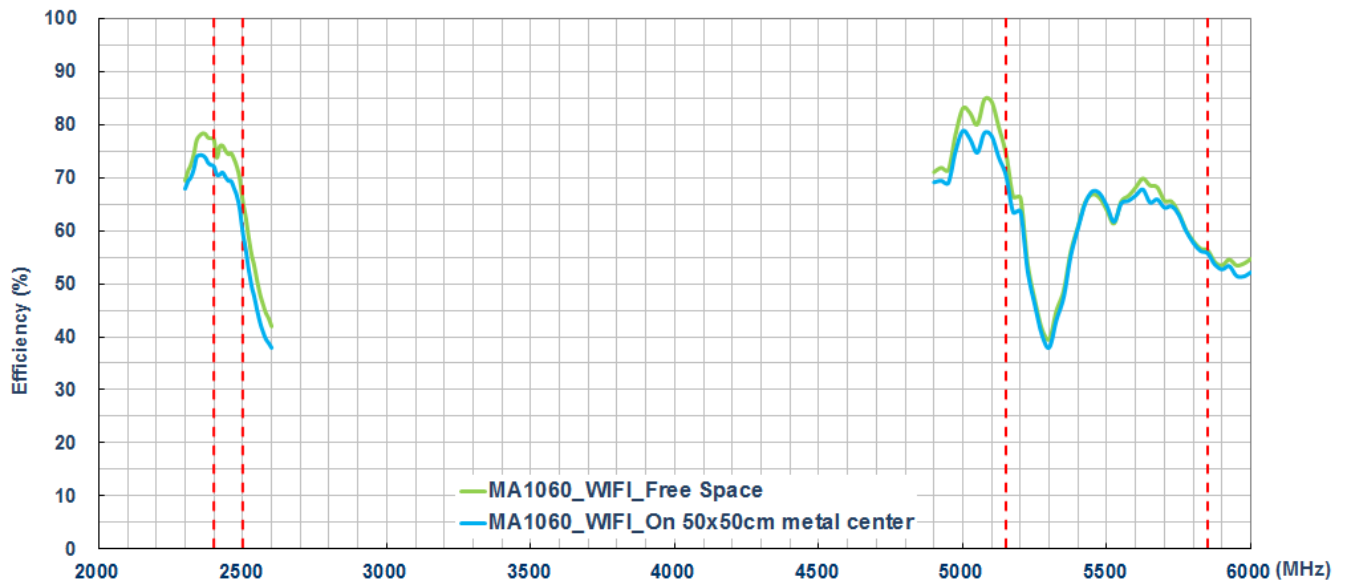
4. Wi-Fi 2.4/5.8GHz

4.1. 2.4/5.8GHz Characteristics

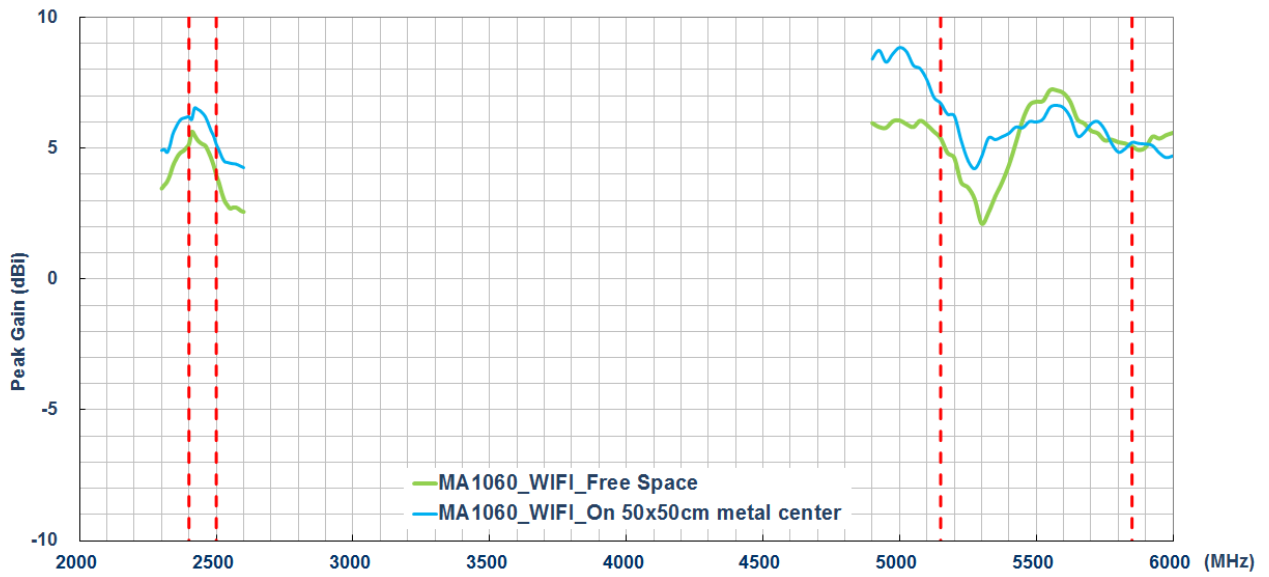
4.1.1. Return Loss



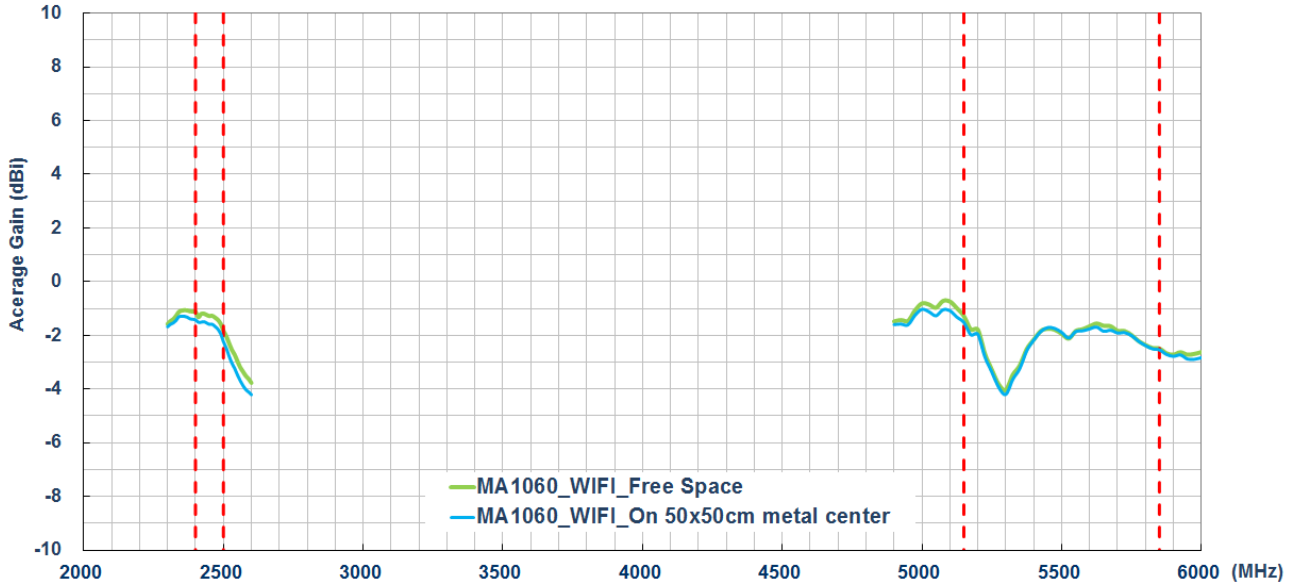
4.1.2. Efficiency



4.1.3. Peak Gain

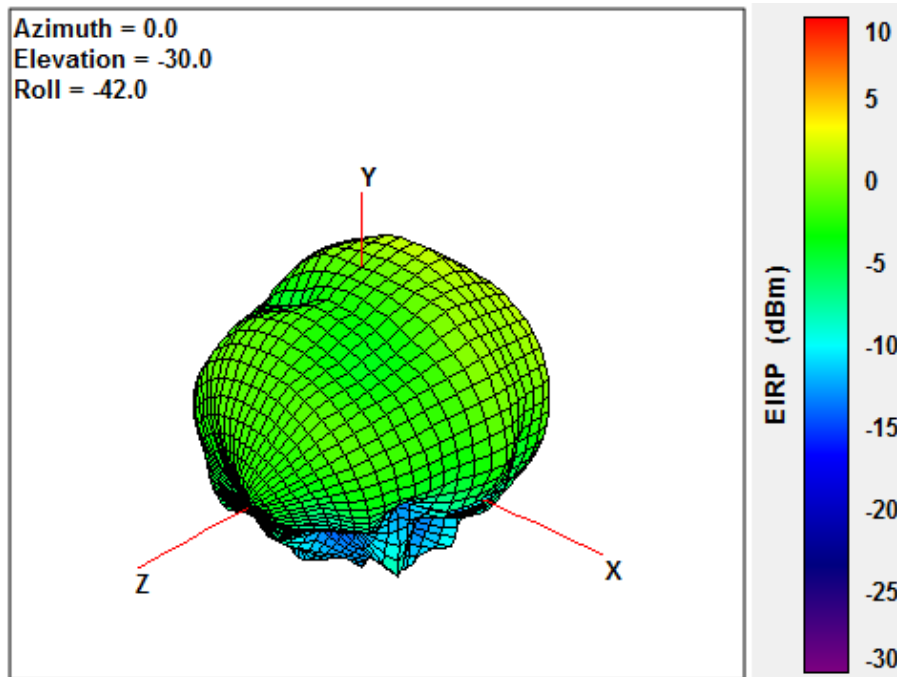


4.1.4. Average Gain

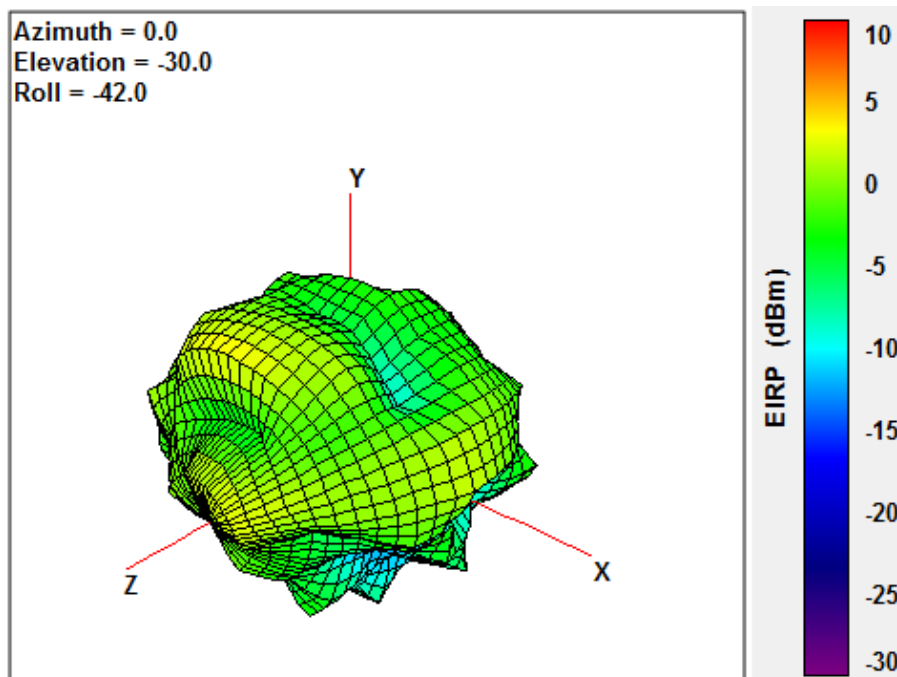


4.2. 3D Radiation Patterns

4.2.1. 2.4/5.8GHz 3D Radiation Pattern



@2450MHz



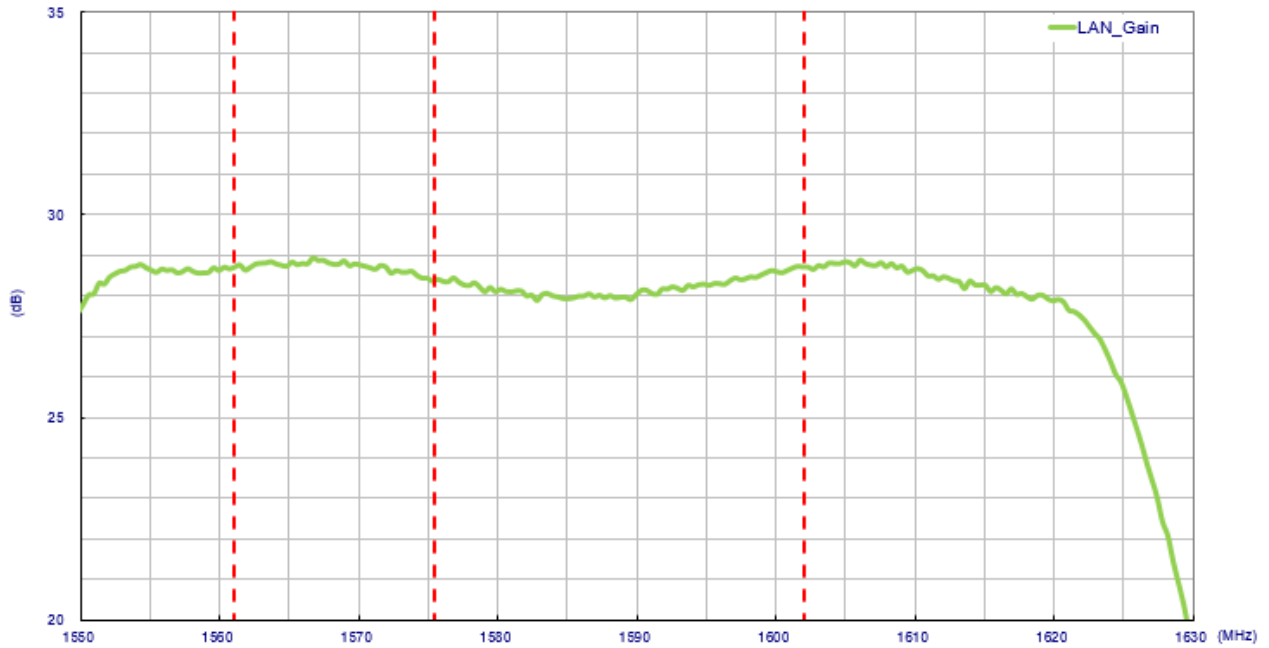
@5550MHz



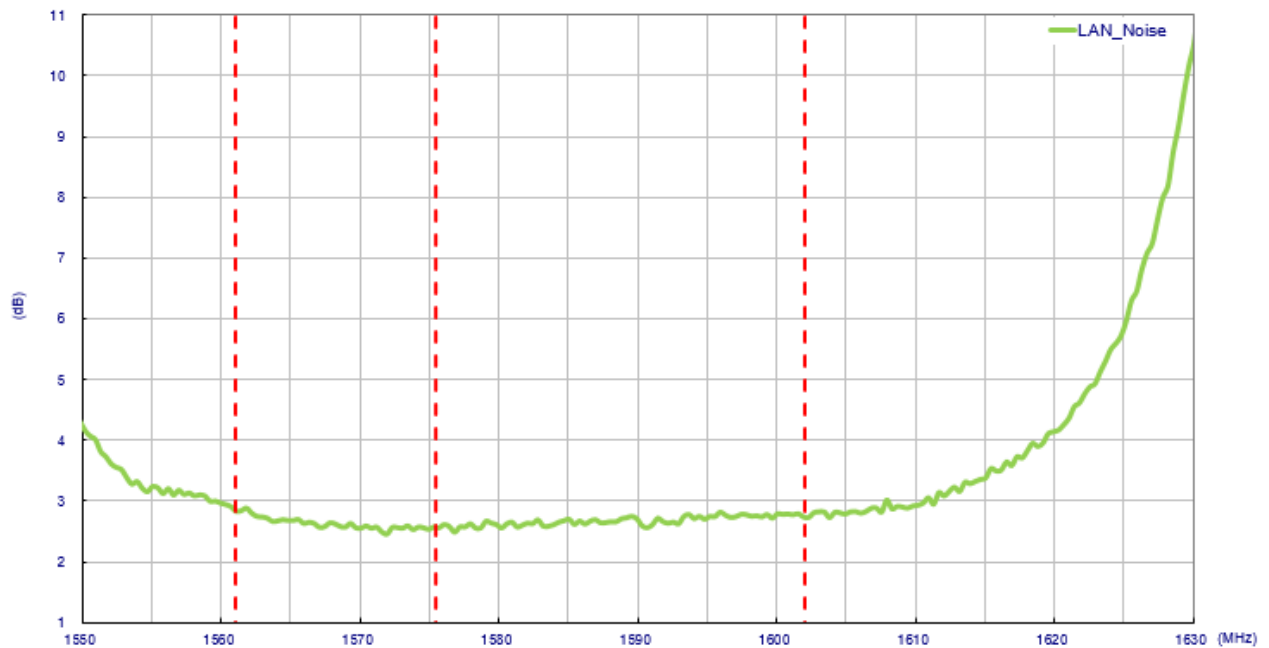
5. GPS/GLONASS/GALILEO/BeiDou

5.1. Characteristics

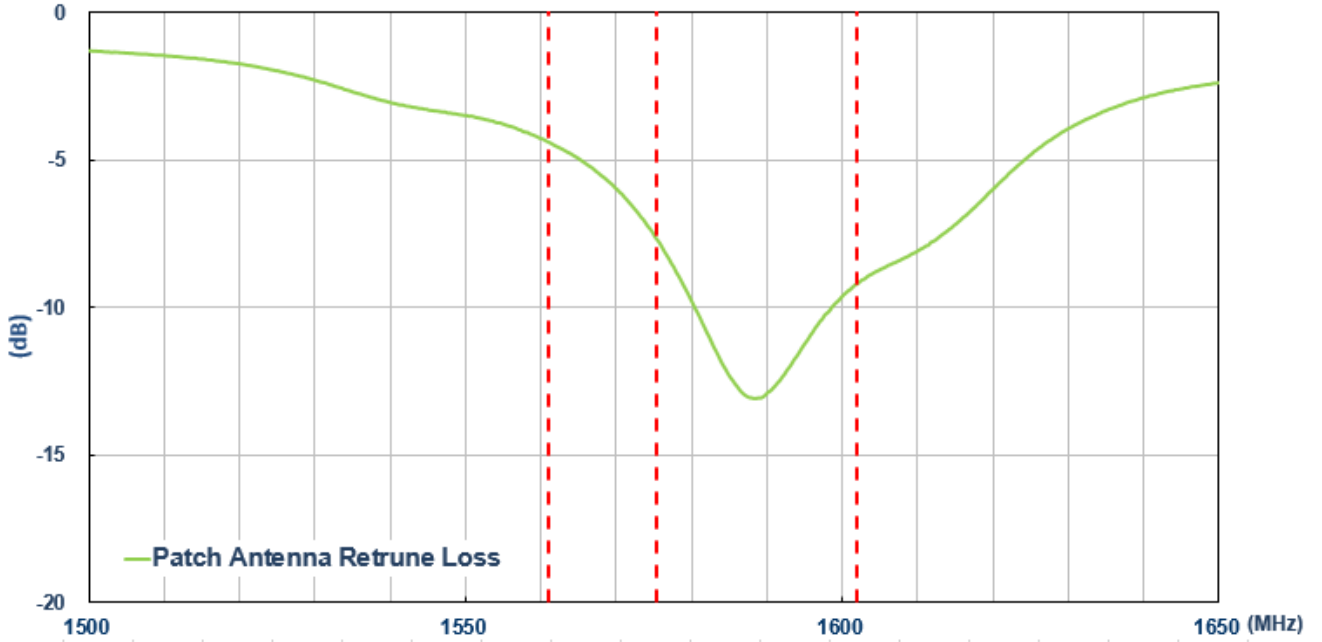
5.1.1. LNA Gain



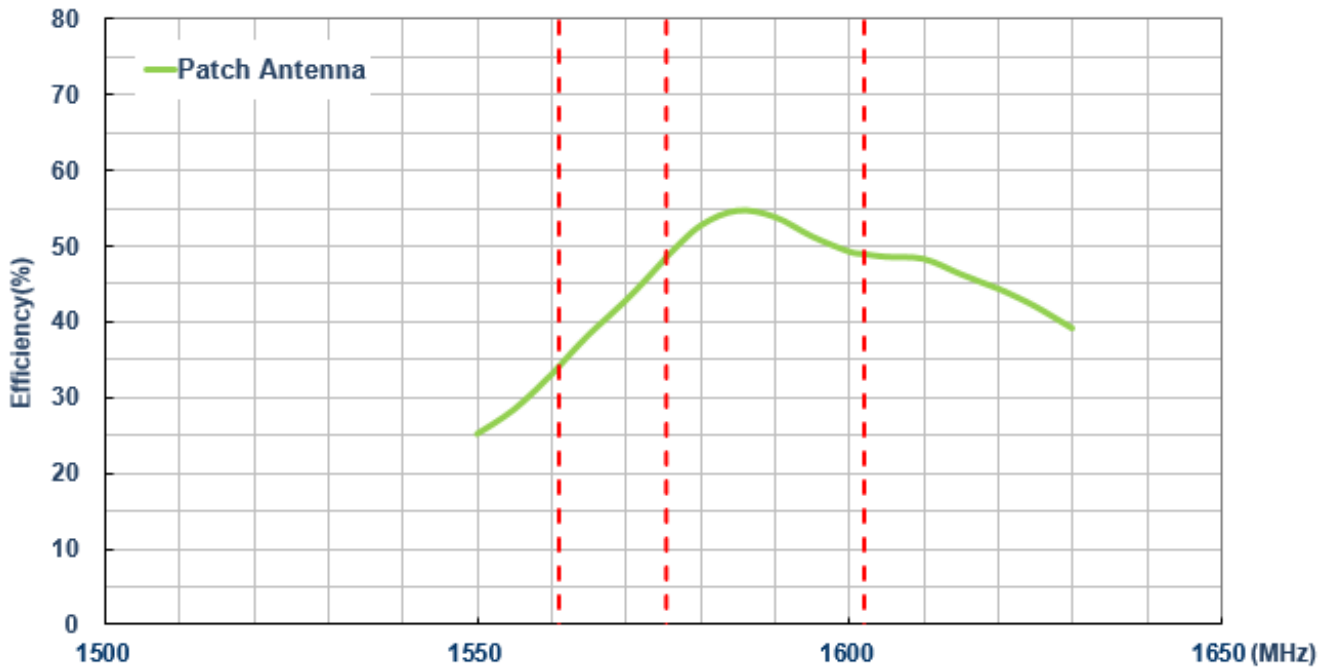
5.1.2. Noise Figure



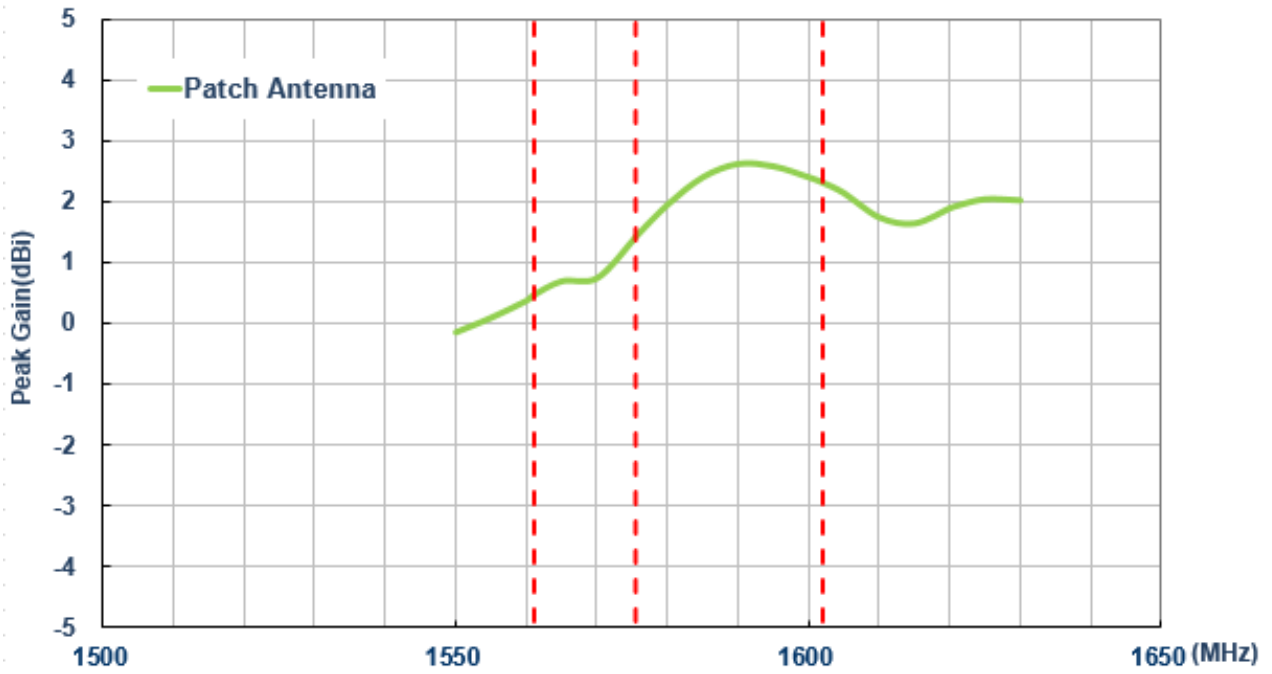
5.1.3. Patch Antenna Passive Return Loss



5.1.4. Patch Antenna Passive Efficiency

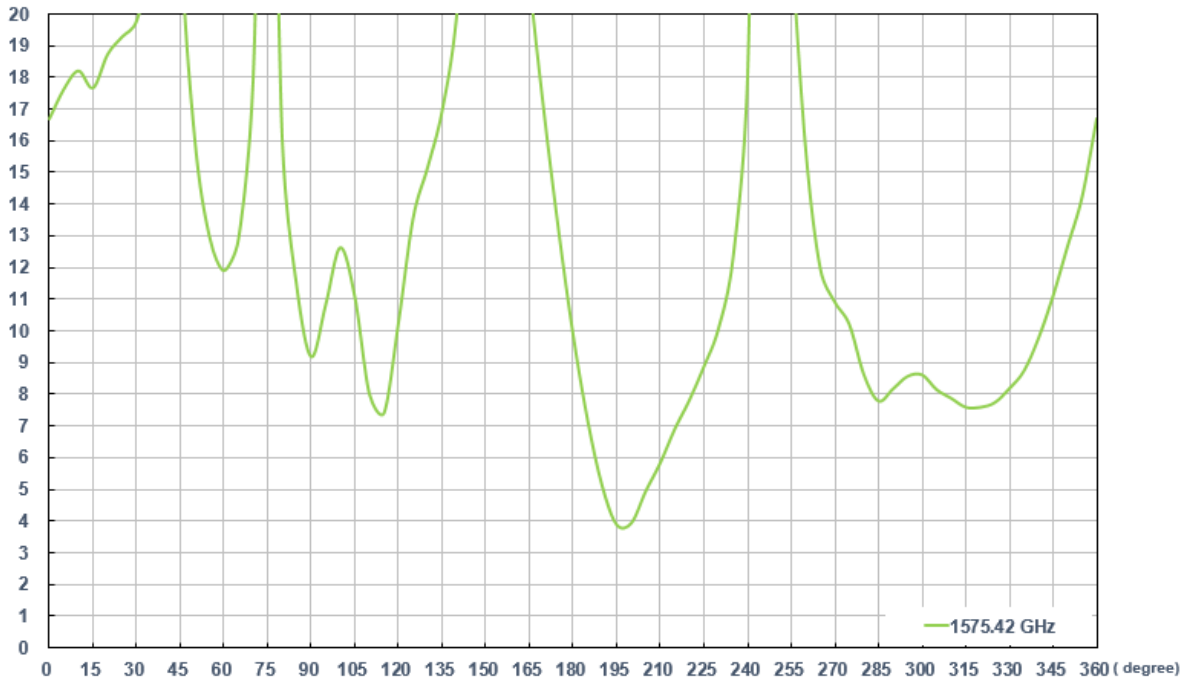


5.1.5. Patch Antenna Passive Peak Gain

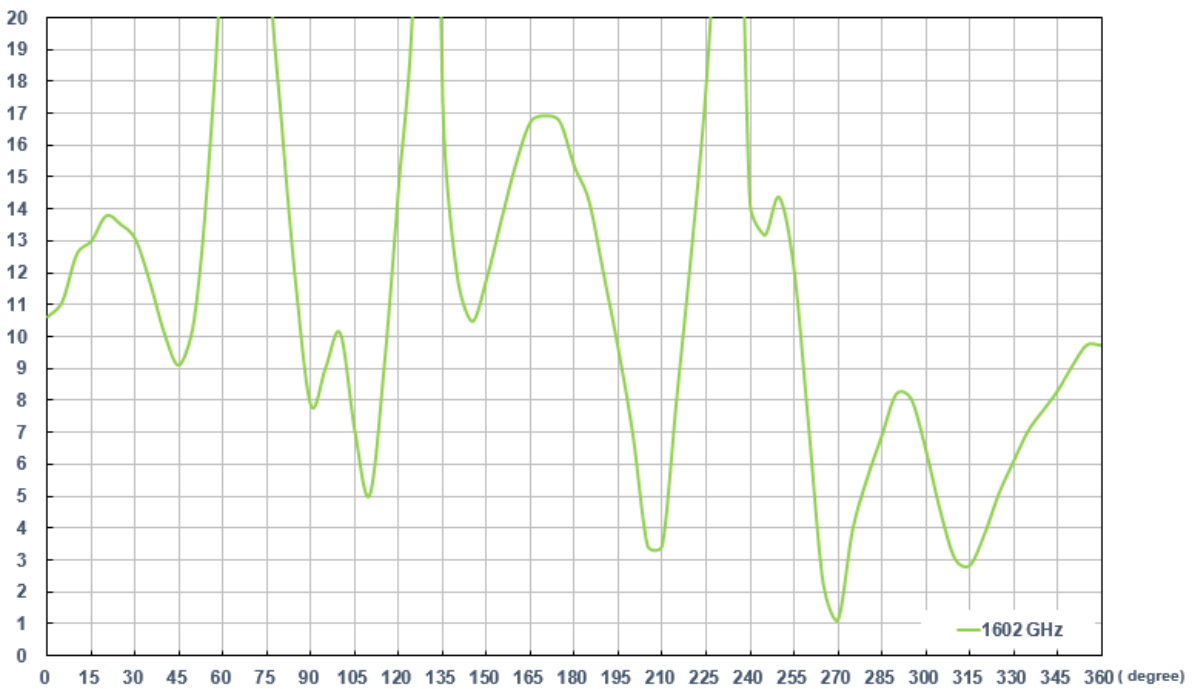




5.1.6. Axial Ratio



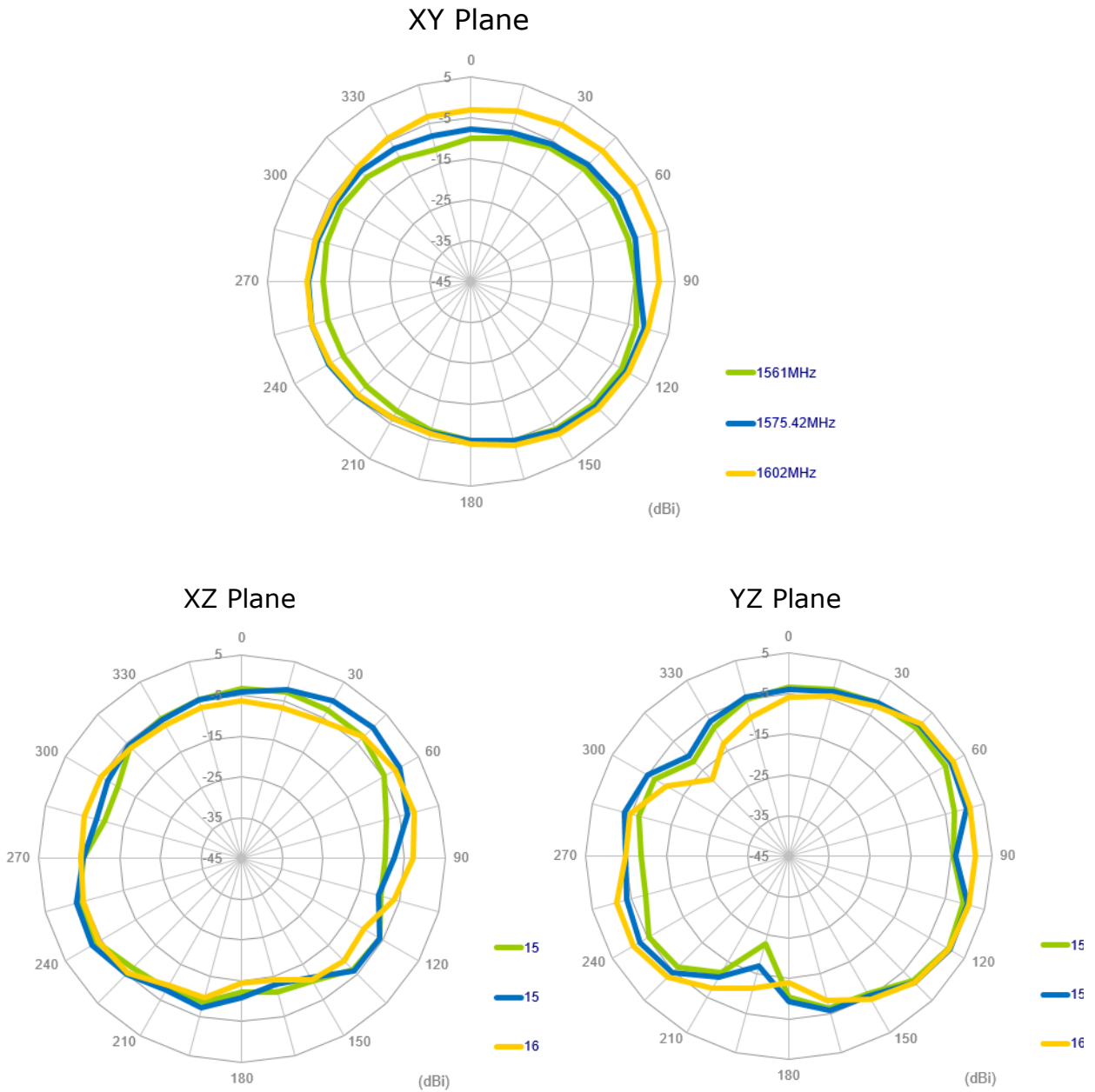
*At 0 degree (antenna Zenith)



*At 0 degree (antenna Zenith)

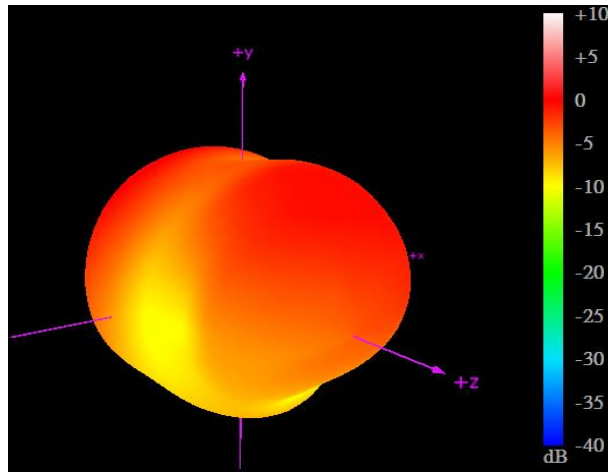
5.2. Radiation Pattern Measurement Setup

5.2.1. GNSS 2D Radiation Pattern

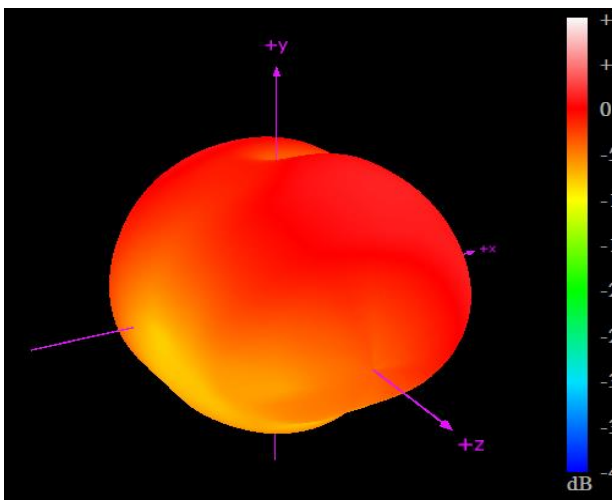


Free Space

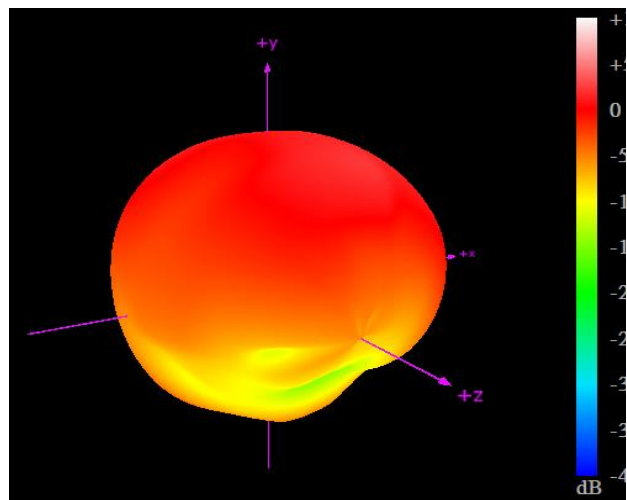
5.2.2. GNSS 3D Radiation Pattern



@ 1561MHz



@1575.42

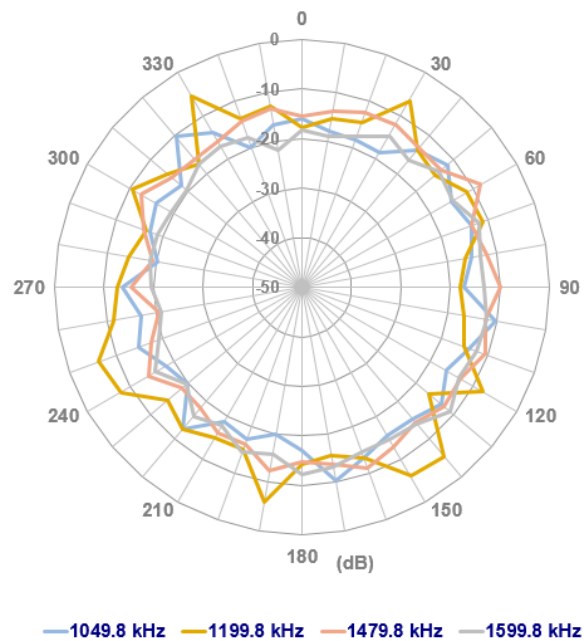
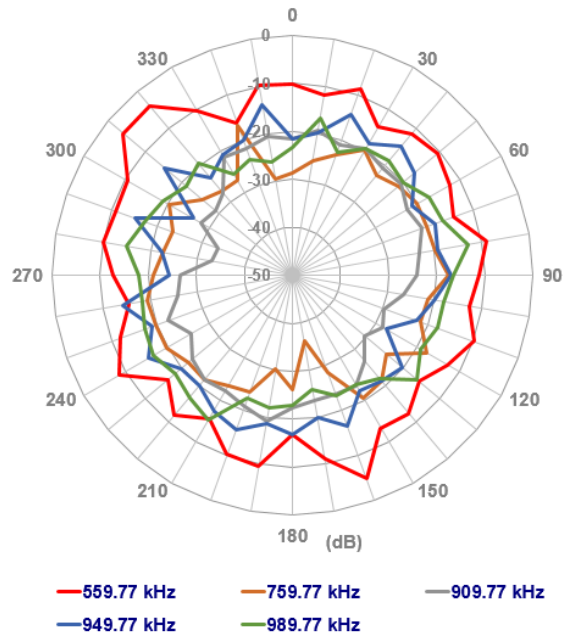


@ 1602MHz

6. AM/FM Antenna

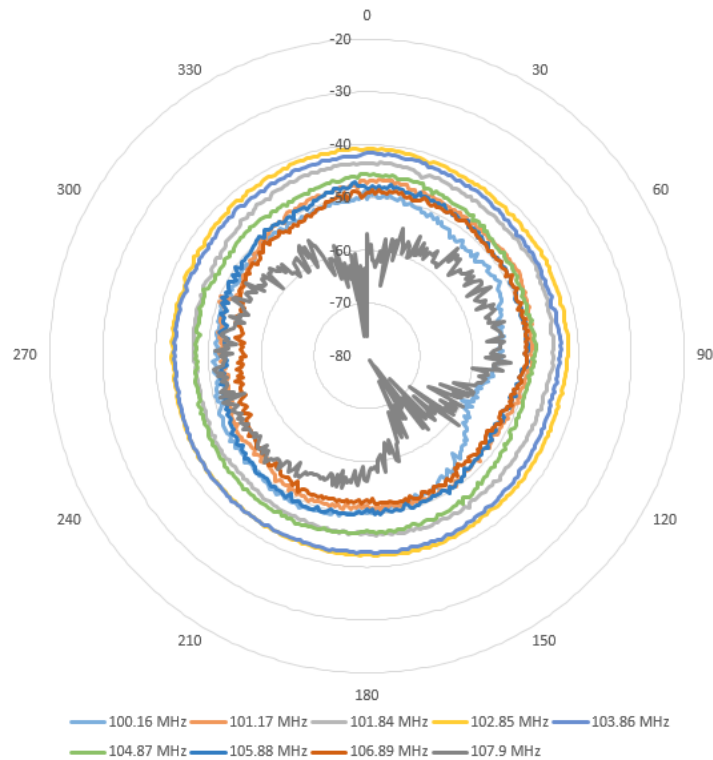
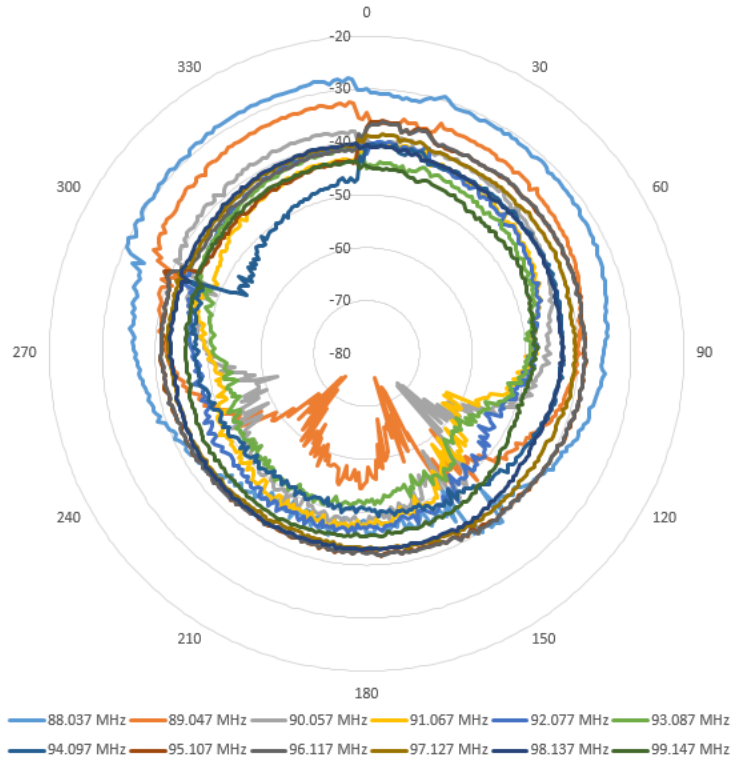
6.1. AM Antenna Radiation Pattern

6.1.1. V-Cut



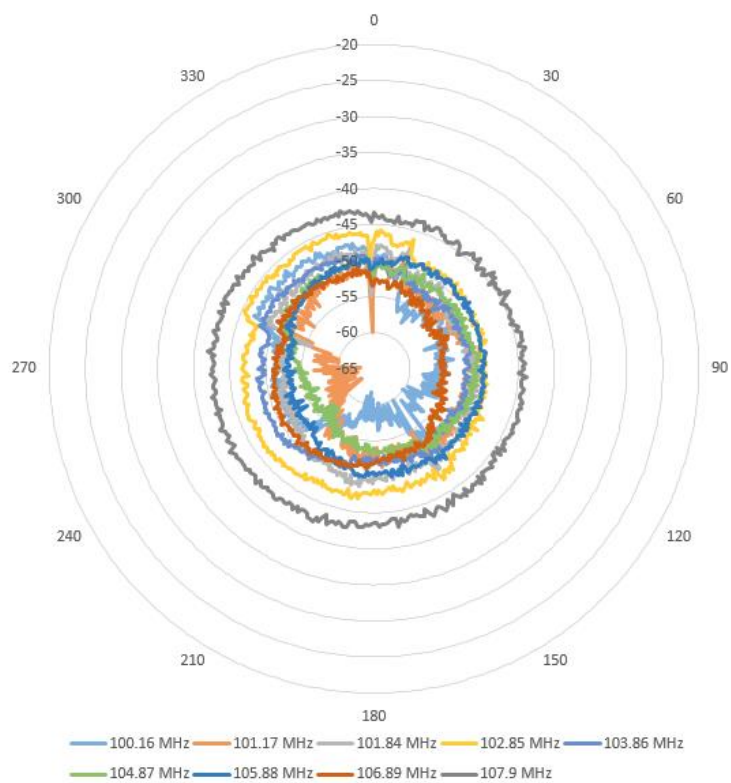
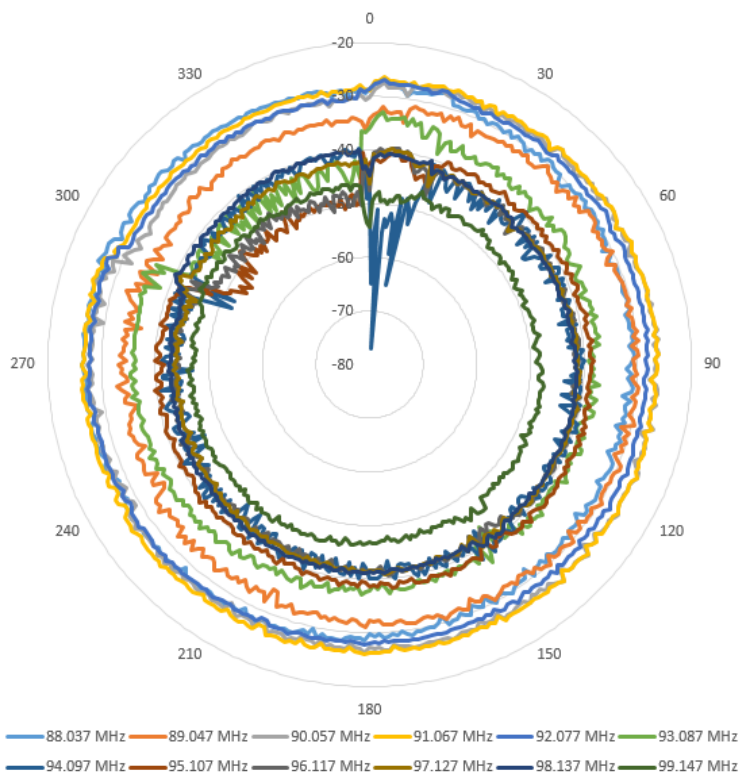
6.2. FM Antenna Radiation Pattern

6.2.1. V-Cut





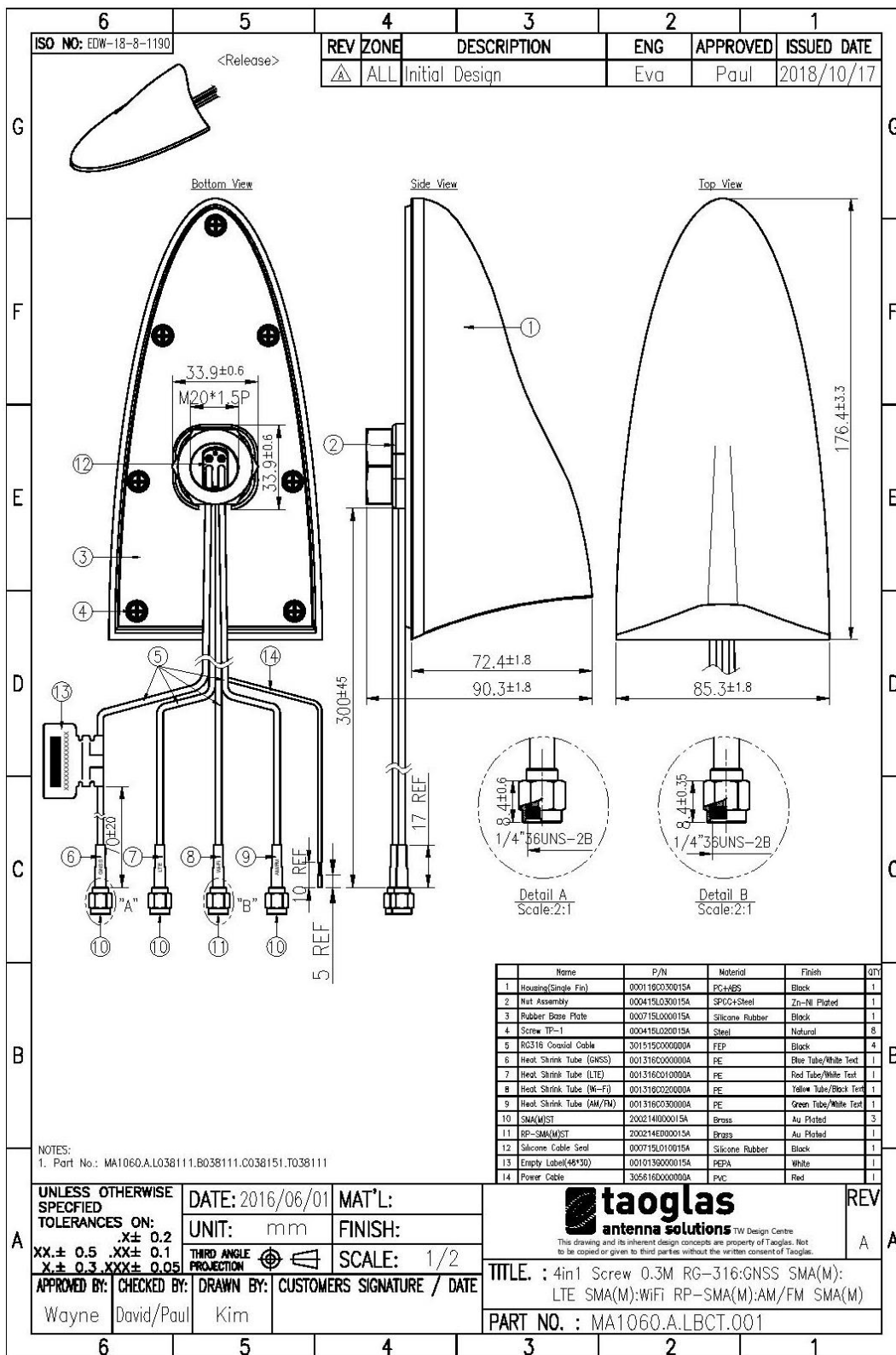
6.2.2. H-Cut





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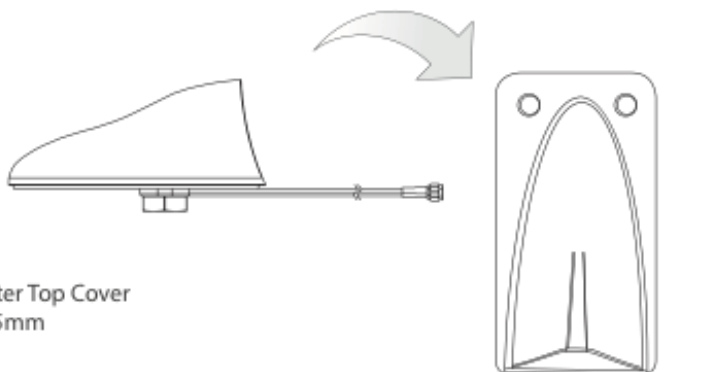
7. Drawing (Unit: mm)



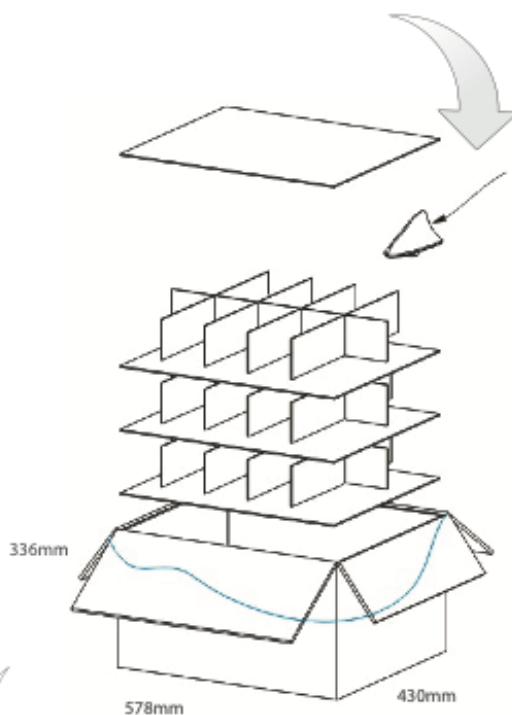


TAOGLAS®

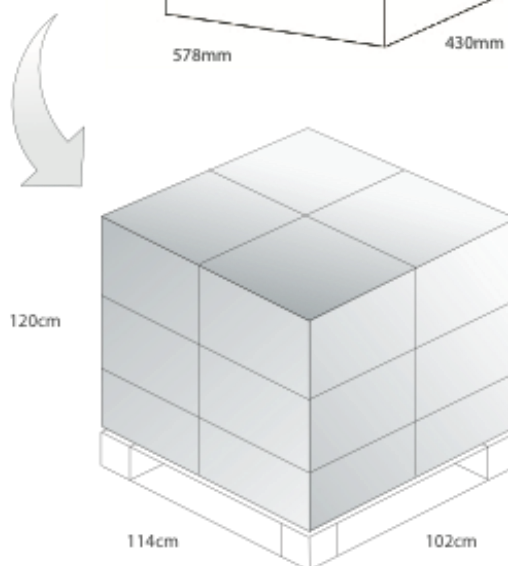
8. Packaging



1pc MA1060.A.LBCT.001 per Blister Top Cover
Carton Dimensions - 211*110*85mm
Total Weight - 410g



10 pcs MA1060.A.LBCT.001 per layer
3 layers in a carton
Carton Dimensions - 578 x 430 x 336mm
Total 30pcs per carton.
Total Weight - 10.5kg

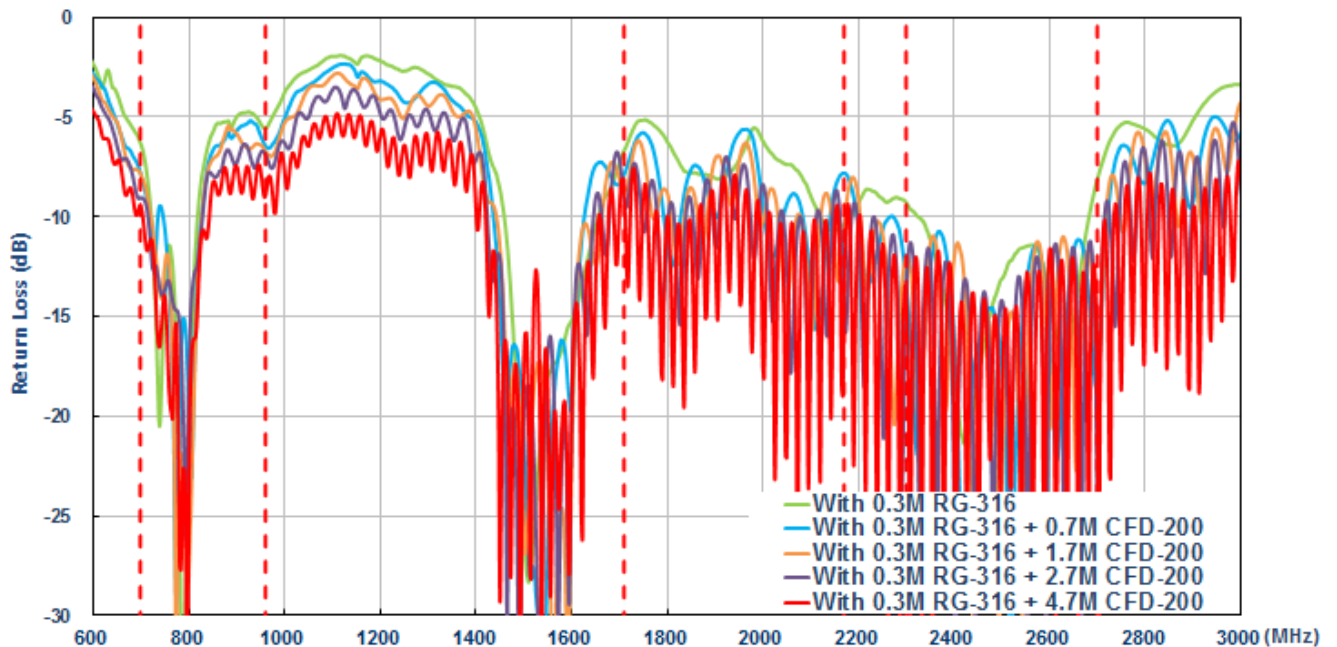


Pallet Dimensions 114cm*102cm*120cm
12 Cartons per pallet
4 Cartons per layer
3 Layers

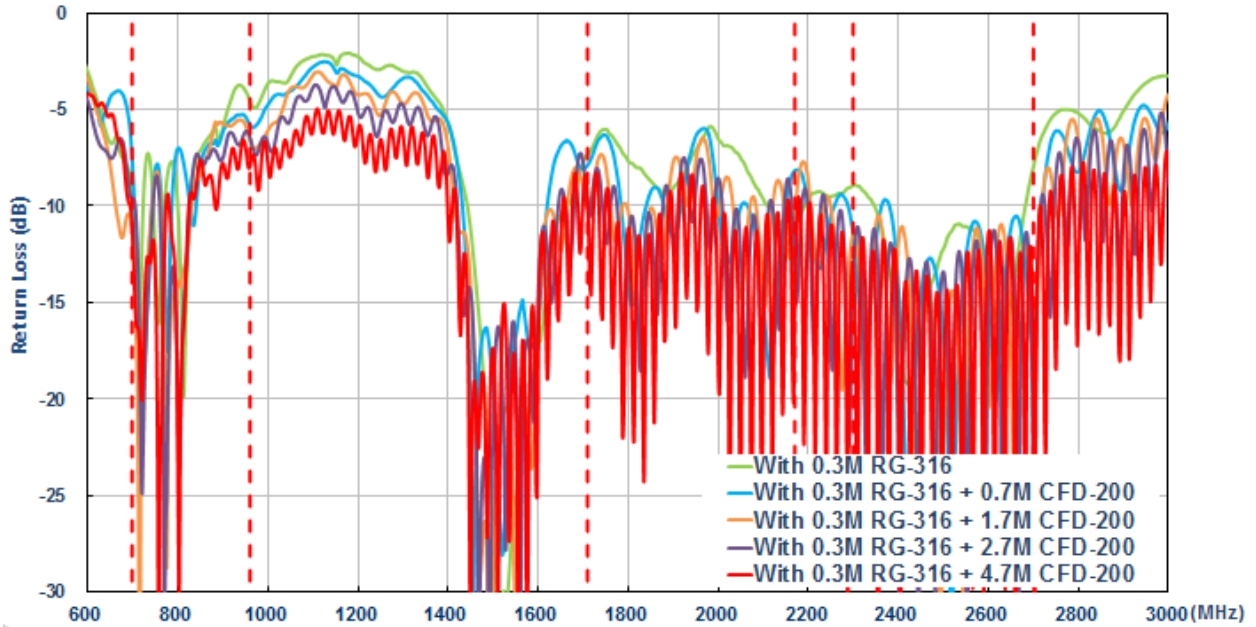
9. Application Note

Taoglas offers customers different cable length antenna performance comparison. The standard part of MA1060 is with 30cm RG316 coaxial cable. If customers need to extend cable length, we would recommend CFD200 low loss coaxial cable to maintain antenna performance for applications. The detailed antenna performance is shown below:

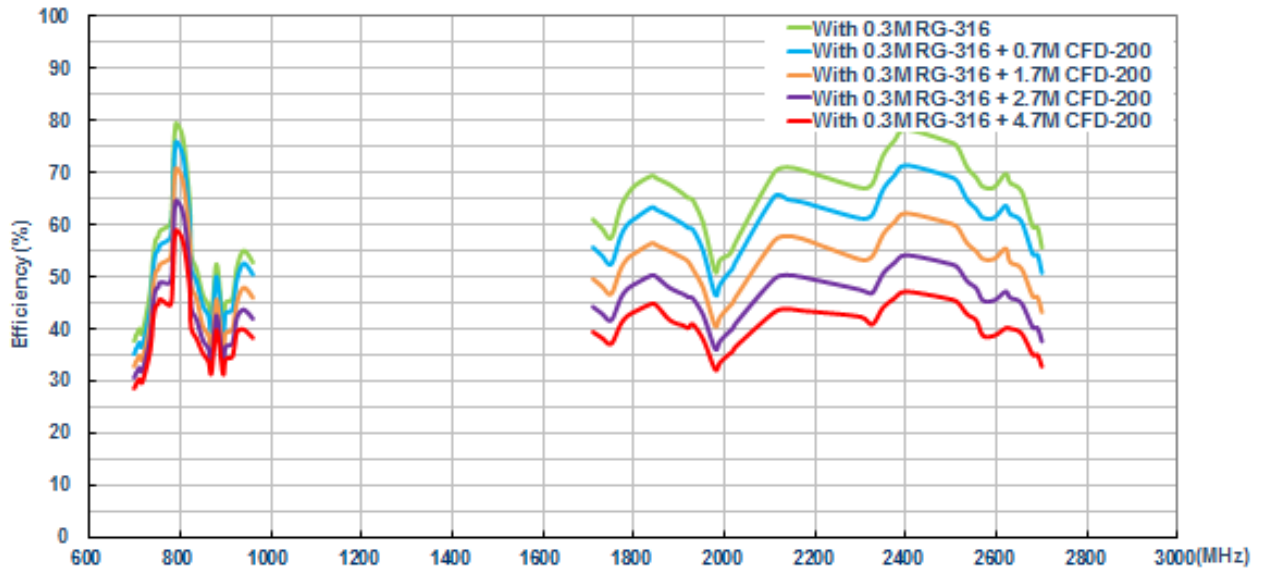
9.1.1. Return Loss in free space



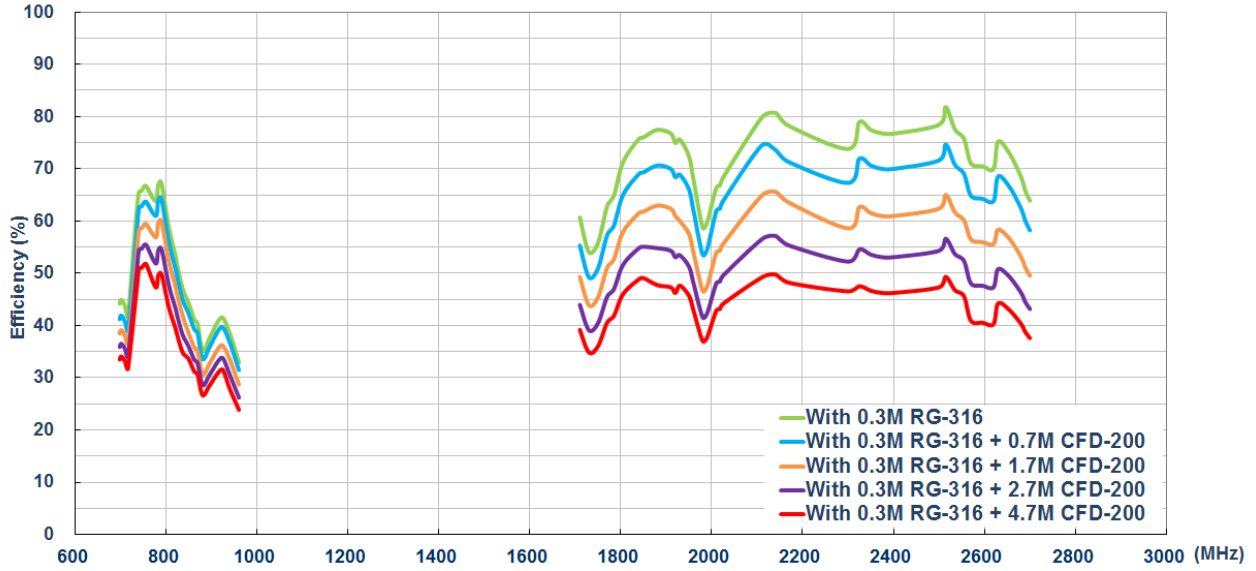
9.1.2. Return Loss on 50*50cm metal base



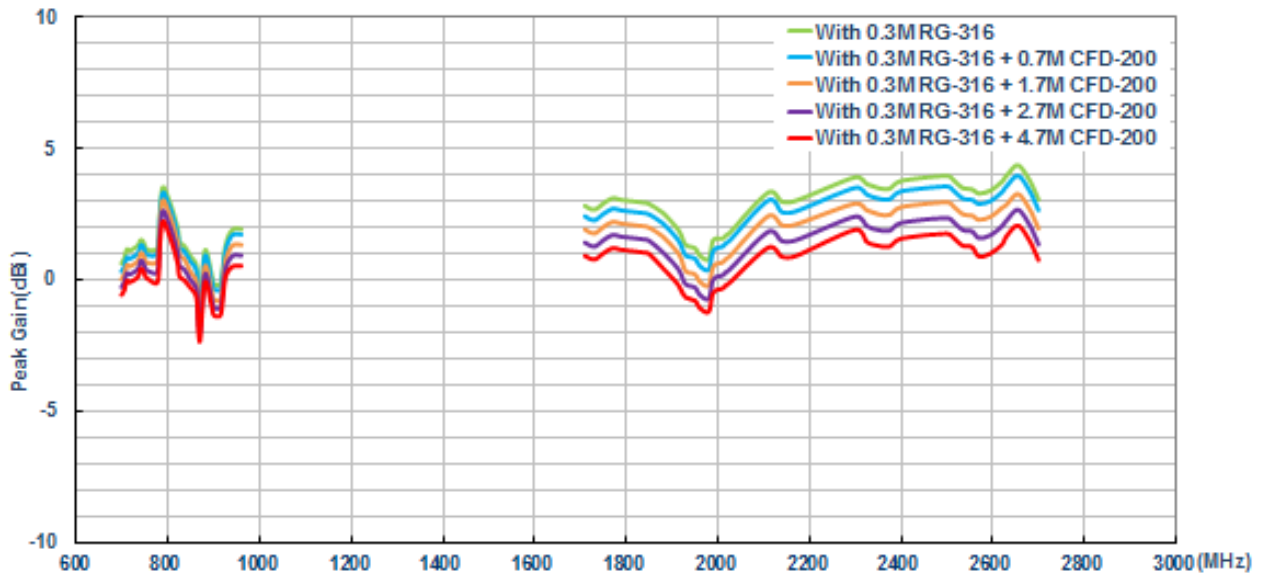
9.1.3. Efficiency in free space



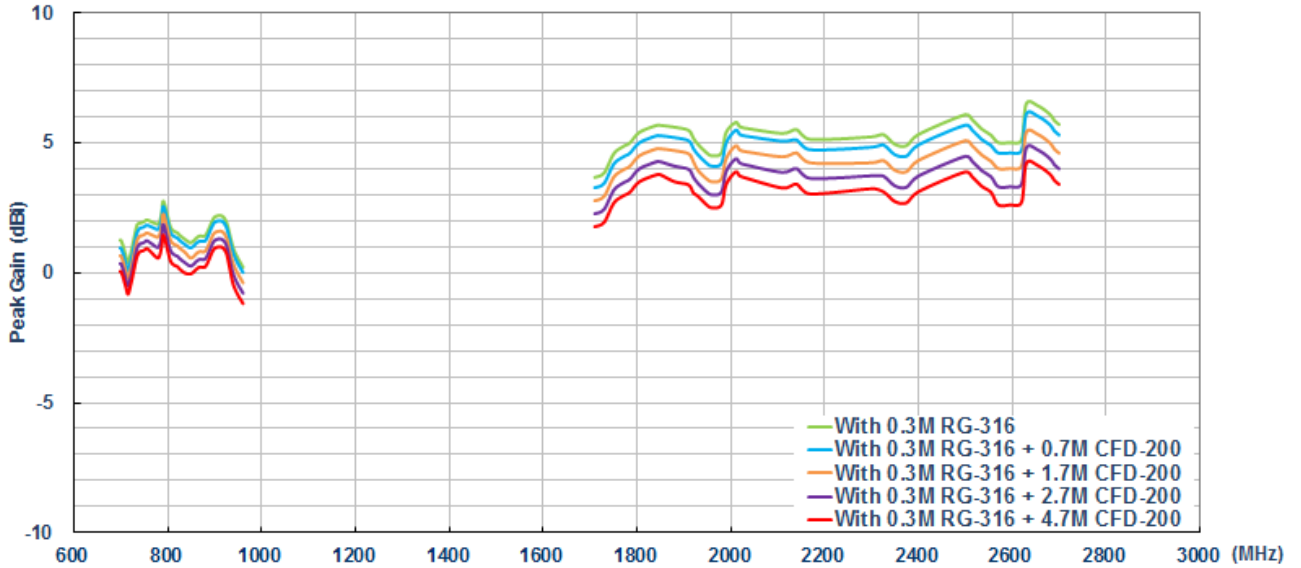
9.1.4. Efficiency on 50*50cm metal base



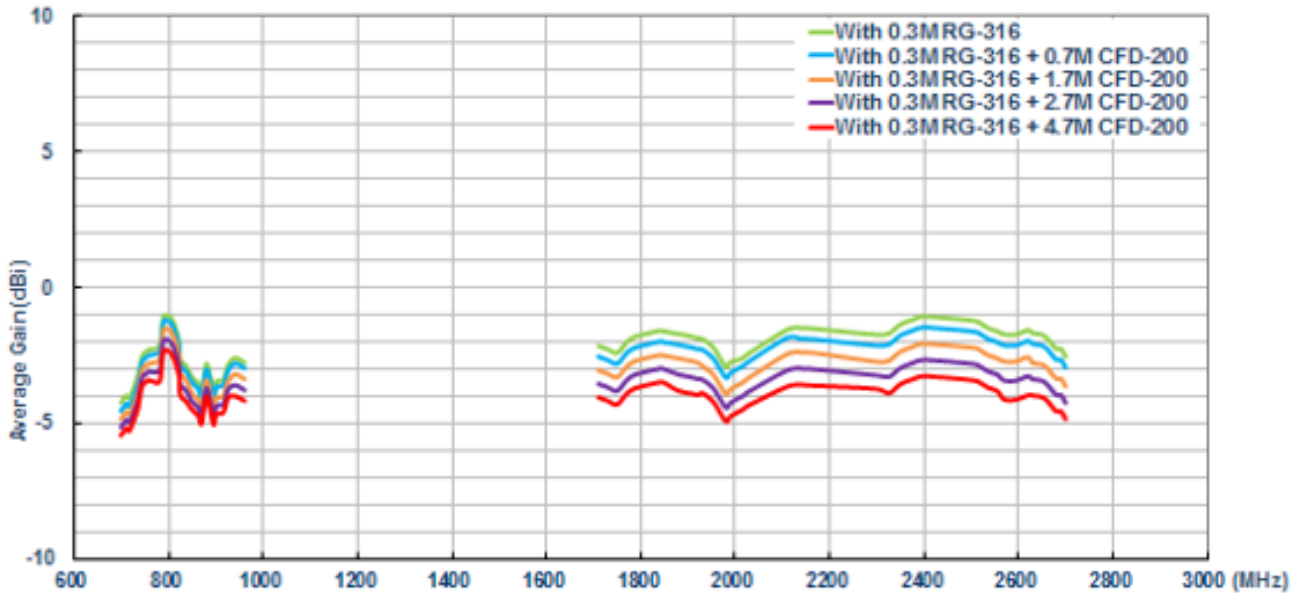
9.1.5. Peak Gain in free space



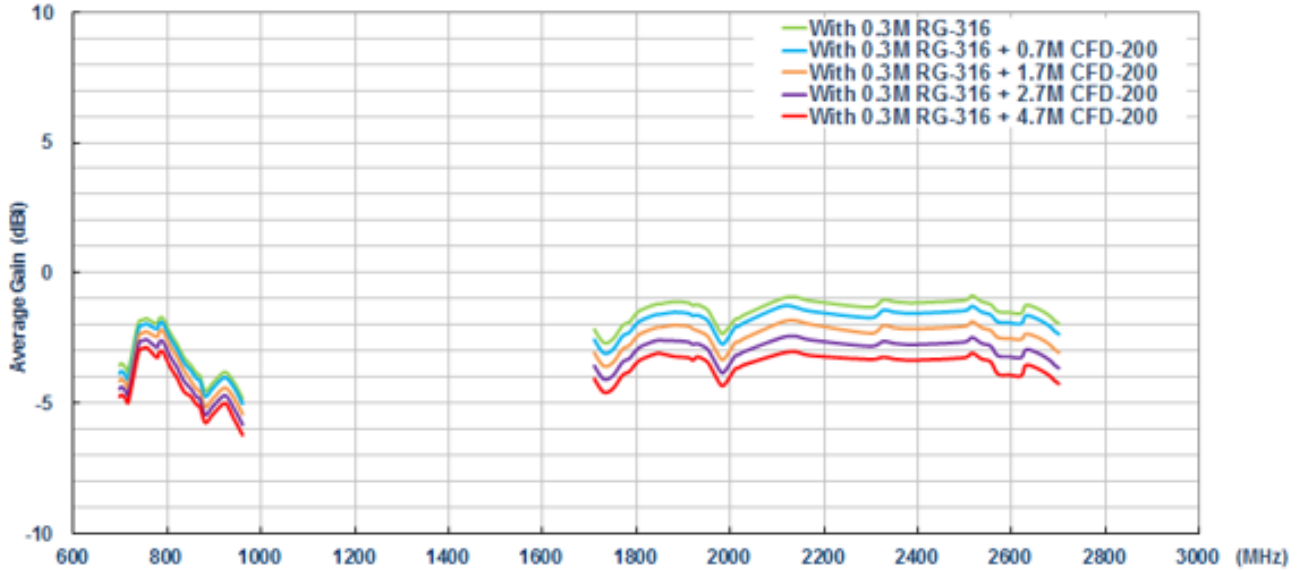
9.1.6. Peak Gain on 50*50cm metal base



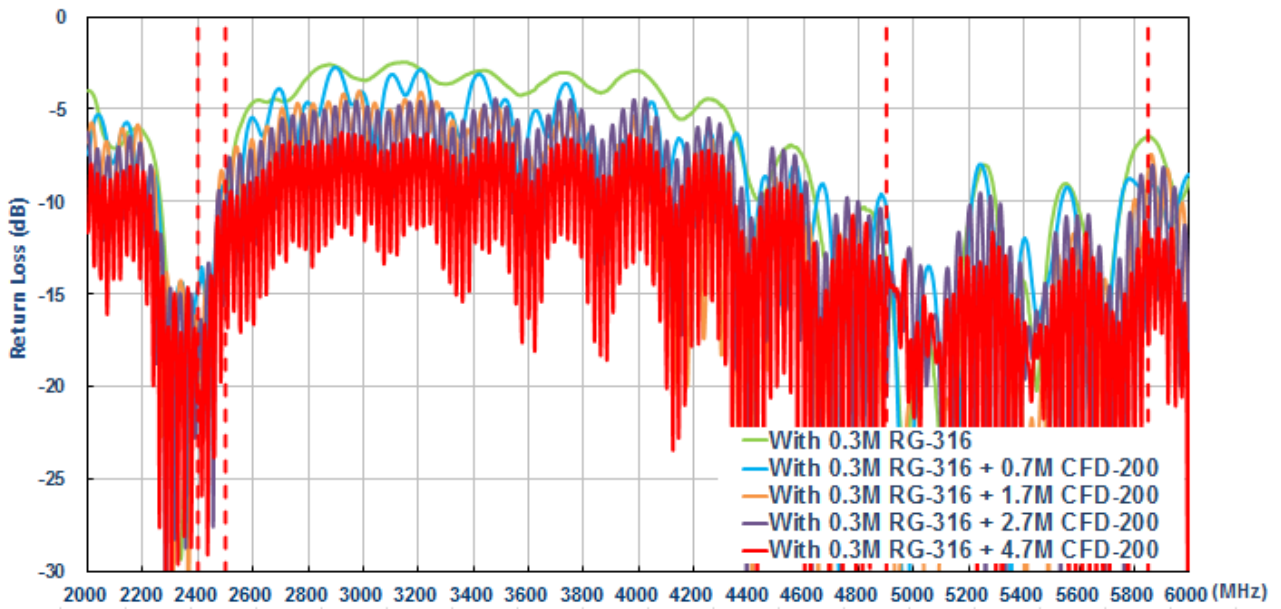
9.1.7. Average Gain in free space



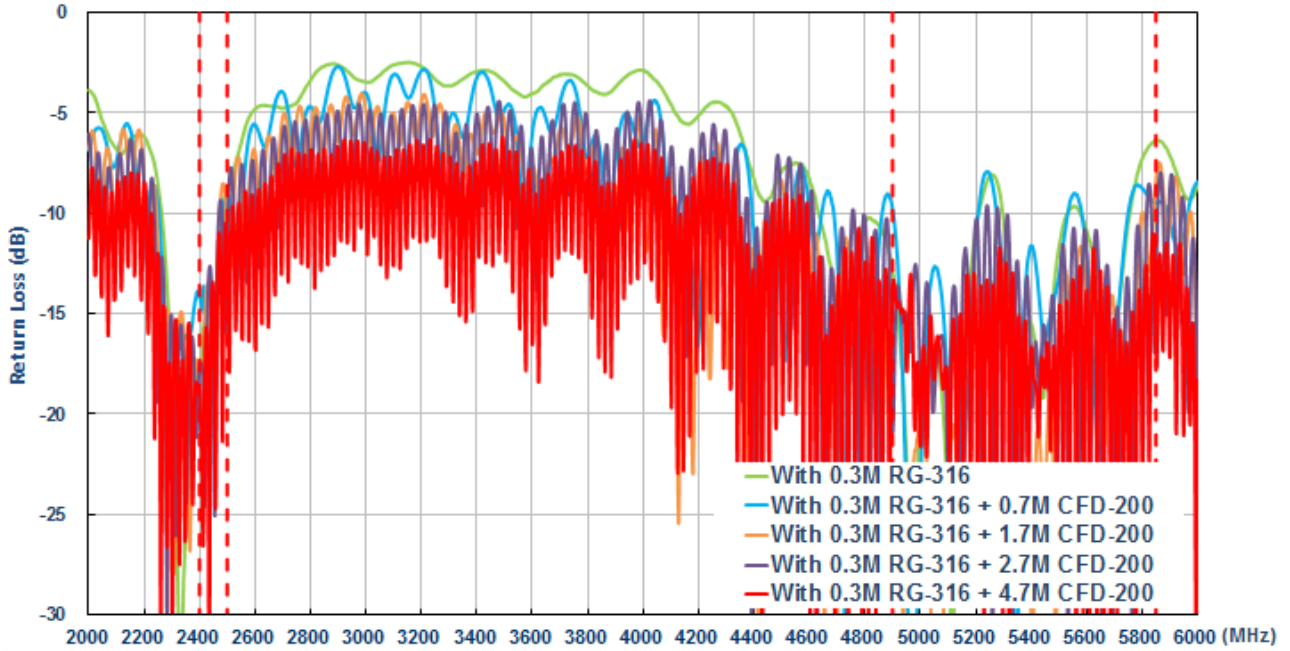
9.1.8. Average Gain on 50*50cm metal base



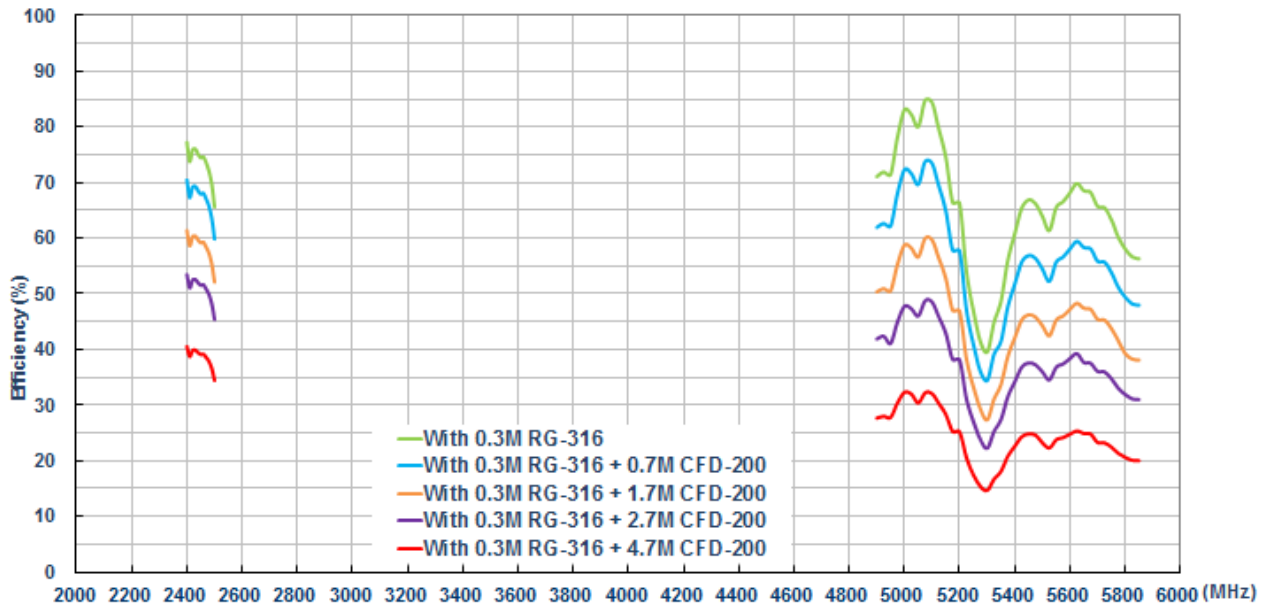
9.1.9. Return Loss in free space



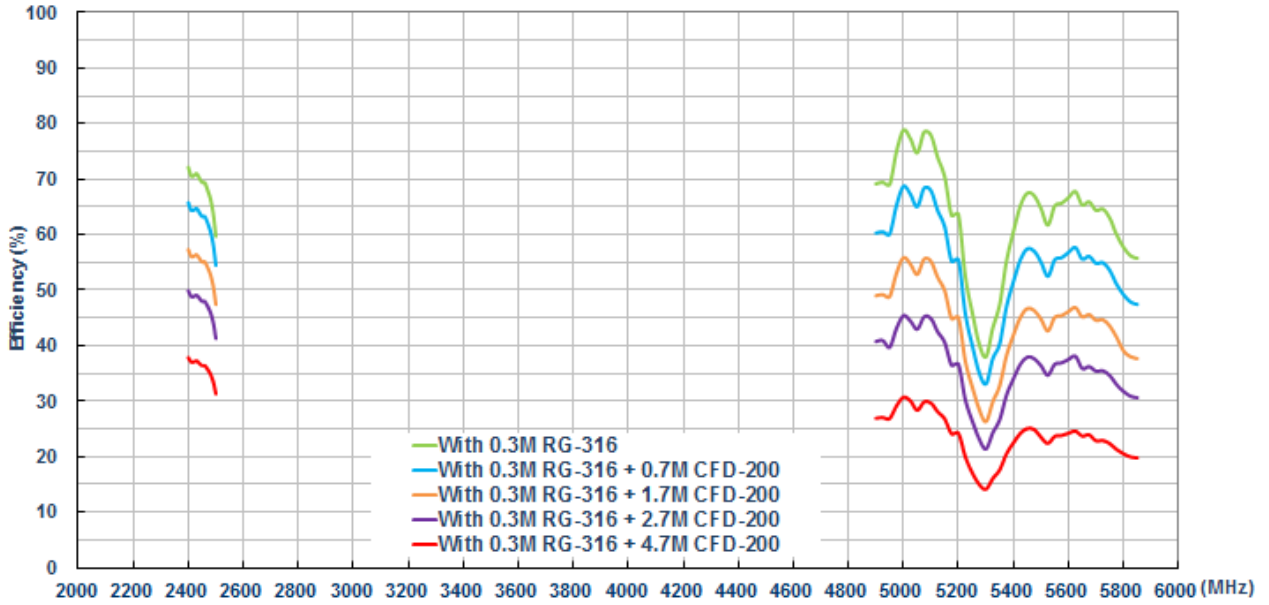
9.1.10. Return Loss on 50*50cm metal base



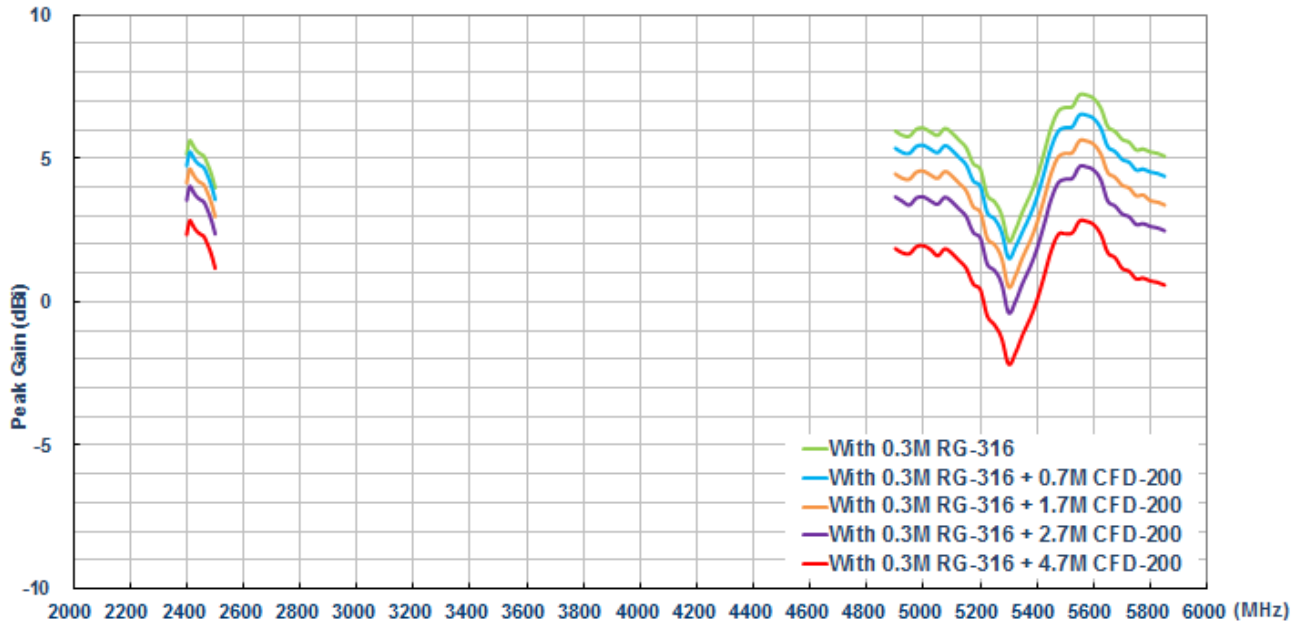
9.1.11. Efficiency in free space



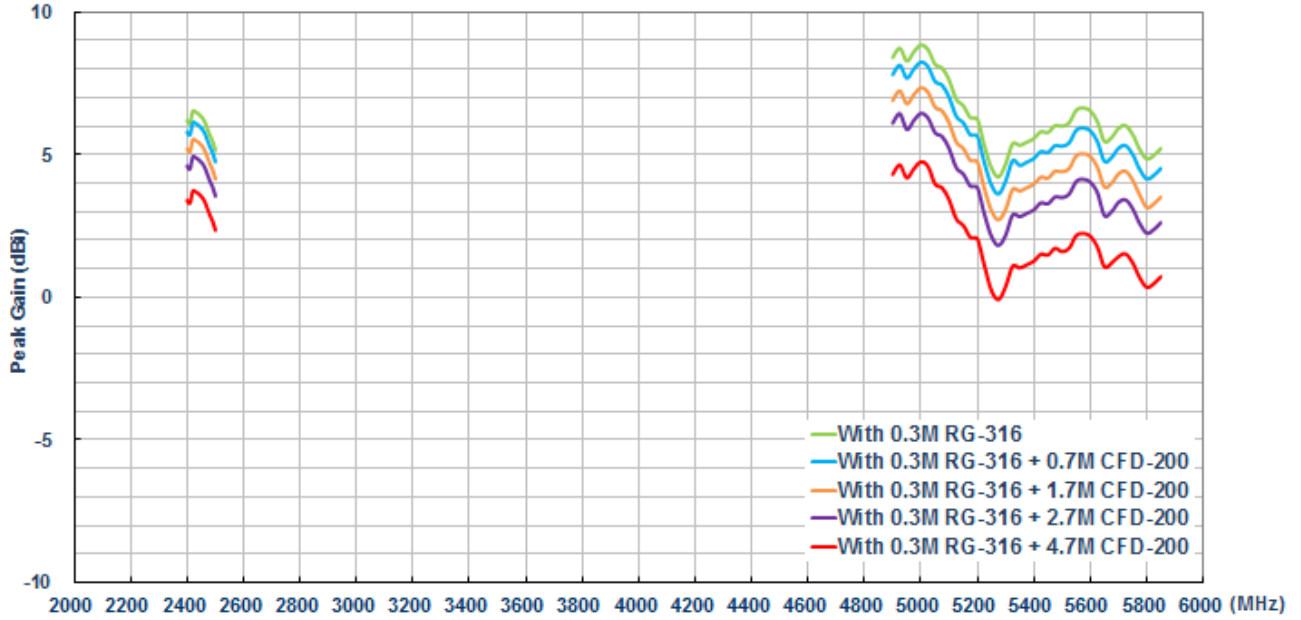
9.1.12. Efficiency on 50*50cm metal base



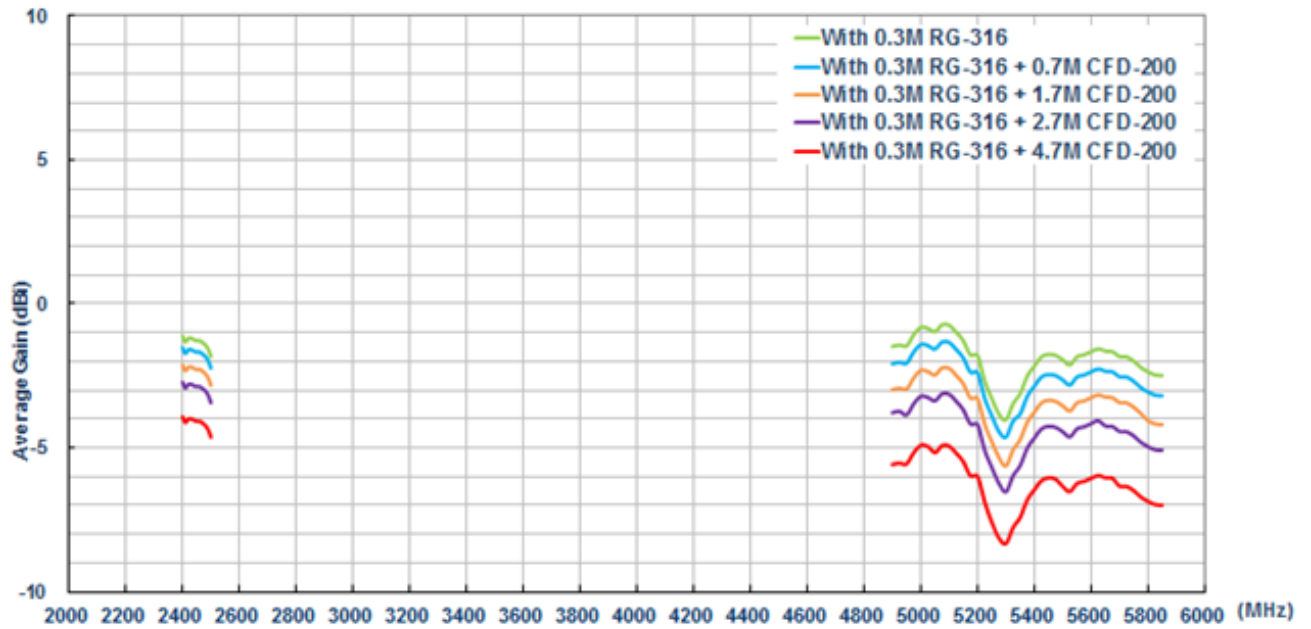
9.1.13. Peak Gain in free space



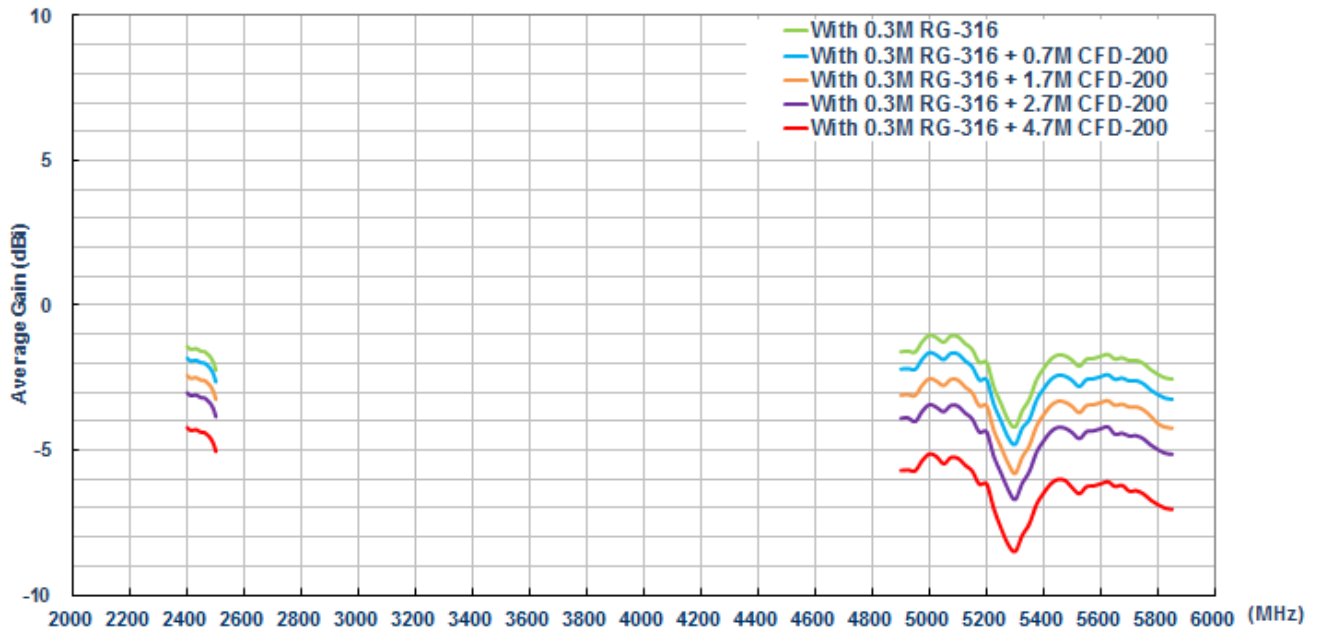
9.1.14. Peak Gain on 50*50cm metal base



9.1.15. Average Gain in free space



9.1.16. Average Gain on 50*50cm metal base



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