



TAOGLAS®



Datasheet

Hinged Cellular Antenna

Part No:
TG.09.0113W

Description:

White 4G Terminal Hinged Monopole Antenna
With SMA(M) Connector

Features:

Covering Worldwide 4G Bands between 700-3800MHz
Also Covers Several New 5G Sub 6GHz Bands
Rotatable Hinge Design for Optimal reception
SMA Male Connector as Standard
RoHS & Reach Compliant

| | |
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1. Introduction



The Taoglas TG.09 Terminal Mount Cellular Hinged Rotatable SMA Antenna is a high efficiency monopole antenna. Compared to other much larger antennas on the market, it has superior wide-band high efficiency characteristics over worldwide 4G frequency bands. The TG.09 can also be compatible with some 5G Sub 6GHz cellular bands between 3500-3800MHz.

The unique rotatable hinge design enables the user to rotate the antenna to the best angle to optimize cellular signal reception. As the upper antenna element can move in any direction, it also reduces damage from impact force from any angle to the antenna, compared to traditional hinged right angle or fixed right angle designs or straight antennas.

The small form factor of this antenna, coupled with excellent RF performance and an aesthetic high-end design, make it the ideal cellular antenna for routers, vehicle tracking devices, telematics devices, remote monitoring systems, and POS devices.

The TG.09, as do all monopole antennas, works best when connected directly to the ground-plane of the device main-board. Taoglas offers support services to characterize antenna efficiency on your individual device ground-plane.

The TG.09 antenna also supports LTE 700MHz band applications when it is directly connected to ground-planes with dimensions greater than 60mm.

Please contact your regional Taoglas customer support team if you wish to conduct PTCRB or network approvals with this antenna attached to your device. Taoglas can check that the RF integration is correct and we can also conduct pre-tests to ensure optimized passive and active performance and a smooth and quick certification approval process.

The TG.09 is also available with a black enclosure - TG.09.0113.

2. Specifications

| Electrical | | | | | | | | |
|-----------------------------|-----------------|-------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Frequency (MHz) | 704 ~824 | 824 ~960 | 1710 ~1880 | 1850 ~1990 | 1710 ~2170 | 2300 ~2400 | 2490 ~2690 | 3300 ~3800 |
| Efficiency (%) | | | | | | | | |
| Free Space - Straight | 5 | 8 | 10.4 | 15.6 | 15 | 25.8 | 32.8 | 47.2 |
| Free Space - Bent | 10 | 15 | 11.5 | 19.3 | 18 | 32.7 | 41.1 | 49.3 |
| 150*90mm - Straight | 63.3 | 64.5 | 70.7 | 74.5 | 68.4 | 43.2 | 35.5 | 54.1 |
| 150*90mm - Bent | 44.7 | 60.2 | 62.1 | 64.5 | 59.4 | 33.2 | 43.2 | 59.7 |
| 300*300mm – Edge Straight | 63 | 84.5 | 77.4 | 71.4 | 73.1 | 68.1 | 54 | 86.7 |
| 300*300mm – Edge Bent | 50.4 | 77 | 50.4 | 69.7 | 64.8 | 62.3 | 42.5 | 72.5 |
| 300*300mm – Center Straight | 31 | 67.5 | 60.9 | 86.7 | 78.2 | 71.1 | 50.9 | 84.3 |
| 300*300mm – Center Bent | 10.8 | 18.5 | 31.4 | 41.7 | 41 | 54.4 | 42.8 | 77.5 |
| Average Gain (dB) | | | | | | | | |
| Free Space - Straight | -13.04 | -11.3 | -9.9 | -8.1 | -8.4 | -5.9 | -5 | -3.3 |
| Free Space - Bent | -10.3 | -8.3 | -9.5 | -7.3 | -7.7 | -4.9 | -4.1 | -3.1 |
| 150*90mm - Straight | -2 | -1.9 | -1.5 | -1.3 | -1.6 | -3.7 | -4.5 | -2.7 |
| 150*90mm - Bent | -3.5 | -2.2 | -2.1 | -1.9 | -2.3 | -4.7 | -3.7 | -2.3 |
| 300*300mm – Edge Straight | -2.1 | -0.7 | -1.1 | -4 | -1.3 | -1.7 | -2.9 | -0.6 |
| 300*300mm – Edge Bent | -3.1 | -1.1 | -3 | -1.6 | -1.9 | -2.1 | -4.4 | -1.4 |
| 300*300mm – Center Straight | -5.3 | -1.7 | -2.2 | -0.6 | -1.2 | -1.5 | -3.7 | -0.8 |
| 300*300mm – Center Bent | -10.5 | -7.5 | -5 | -3.8 | -3.9 | -2.3 | -4 | -1.1 |
| Peak Gain (dBi) | | | | | | | | |
| Free Space - Straight | -7.7 | -5.9 | -4.2 | -3 | -3.2 | -0.9 | 0.2 | 1.6 |
| Free Space - Bent | -6.1 | -3.9 | -4.6 | -2.6 | -2.9 | 0.3 | 0.7 | 2.3 |
| 150*90mm - Straight | 0.7 | 1 | 3.4 | 3.7 | 3.3 | 0.8 | 0.1 | 3.1 |
| 150*90mm - Bent | -1 | 1.2 | 3.3 | 3.4 | 3 | 1 | 2 | 4.6 |
| 300*300mm – Edge Straight | 1.4 | 2.9 | 3.5 | 2.5 | 2.9 | 3.4 | 2.6 | 5.9 |
| 300*300mm – Edge Bent | 0.5 | 2.7 | 1.5 | 3 | 2.6 | 2.1 | -0.1 | 3.1 |
| 300*300mm – Center Straight | -2.4 | 2 | 2.1 | 3.7 | 3.3 | 3.3 | 1.8 | 4.7 |
| 300*300mm – Center Bent | -4.3 | -1.8 | -0.4 | 1.1 | 0.8 | 1.4 | 0.4 | 3.1 |
| Impedance | 50Ω | | | | | | | |
| Polarization | Linear | | | | | | | |
| Radiation Pattern | Omnidirectional | | | | | | | |
| Max. input power | 10W | | | | | | | |

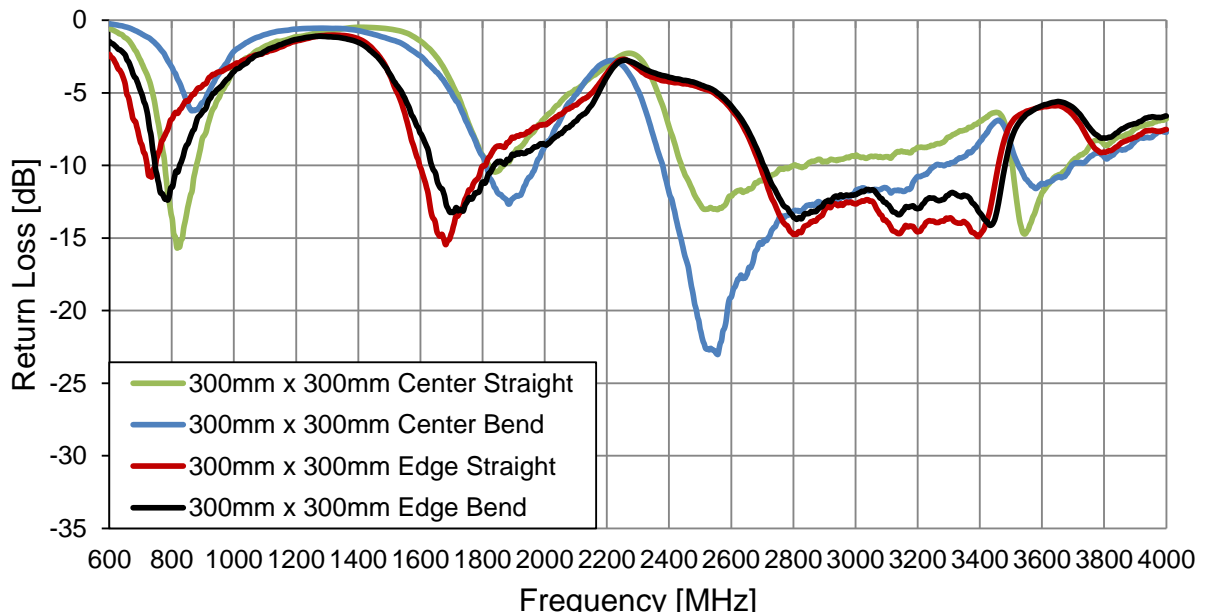
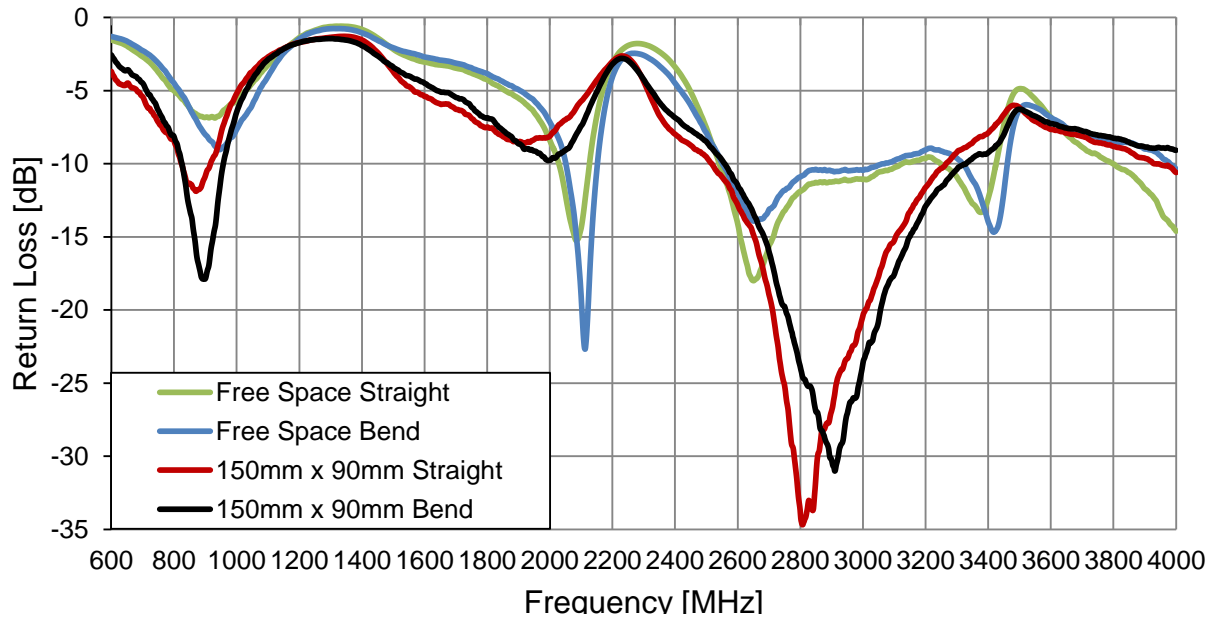
| Mechanical | |
|-------------------|----------------------------|
| Antenna Length | 72mm |
| Antenna Diameter | 10mm |
| Casing | POM |
| Connector | SMA Male Hinged |
| Weight | 8g |
| Environmental | |
| Temperature Range | -40°C to +85°C |
| Humidity | Non-condensing 65°C 95% RH |

| 5G/4G Bands | | | |
|-------------|---|----------------------|---------|
| Band Number | 5GNR / 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 | ✗ |

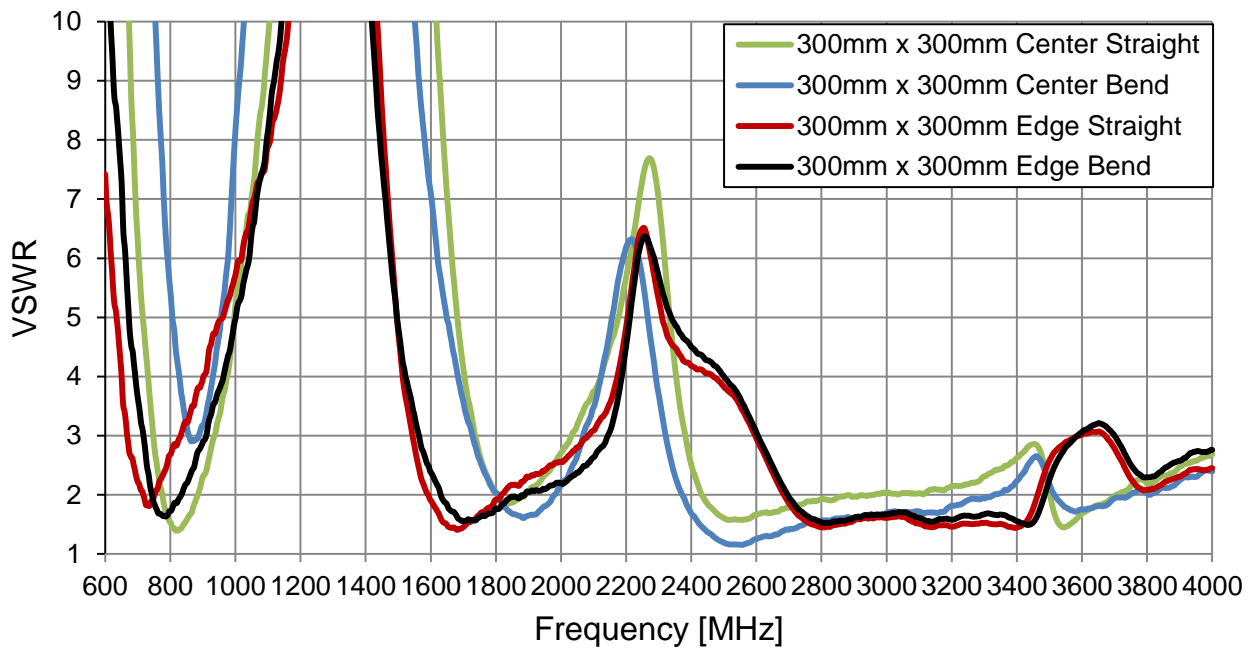
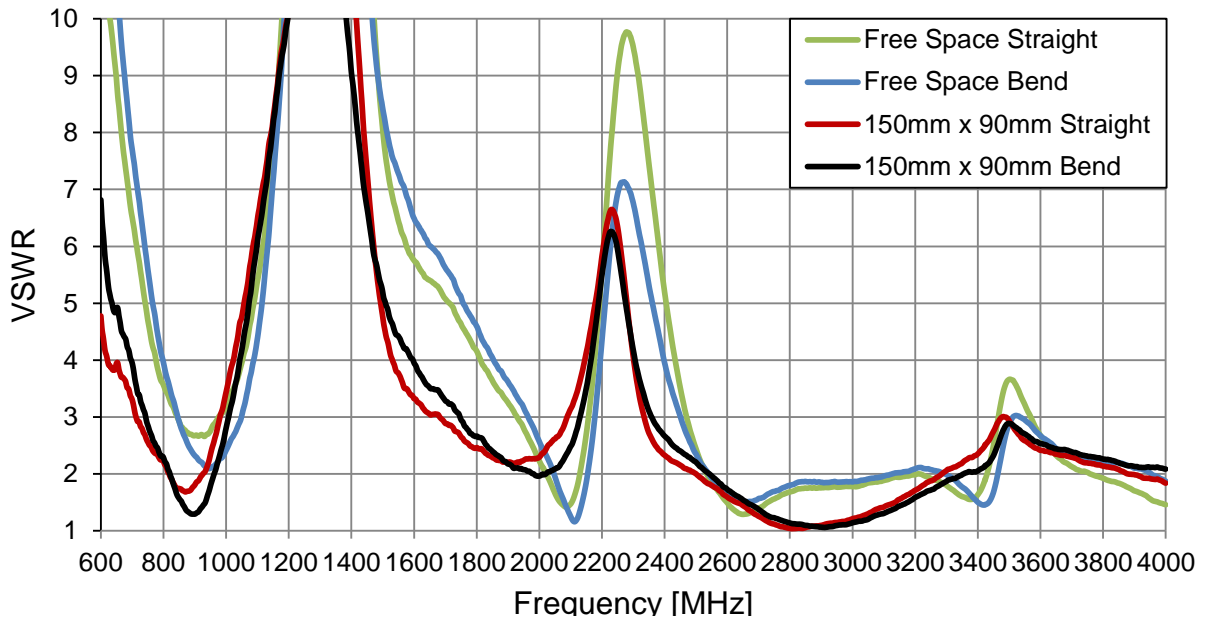
* Covered Bands represent greater than 20% efficiency

3. Antenna Characteristics

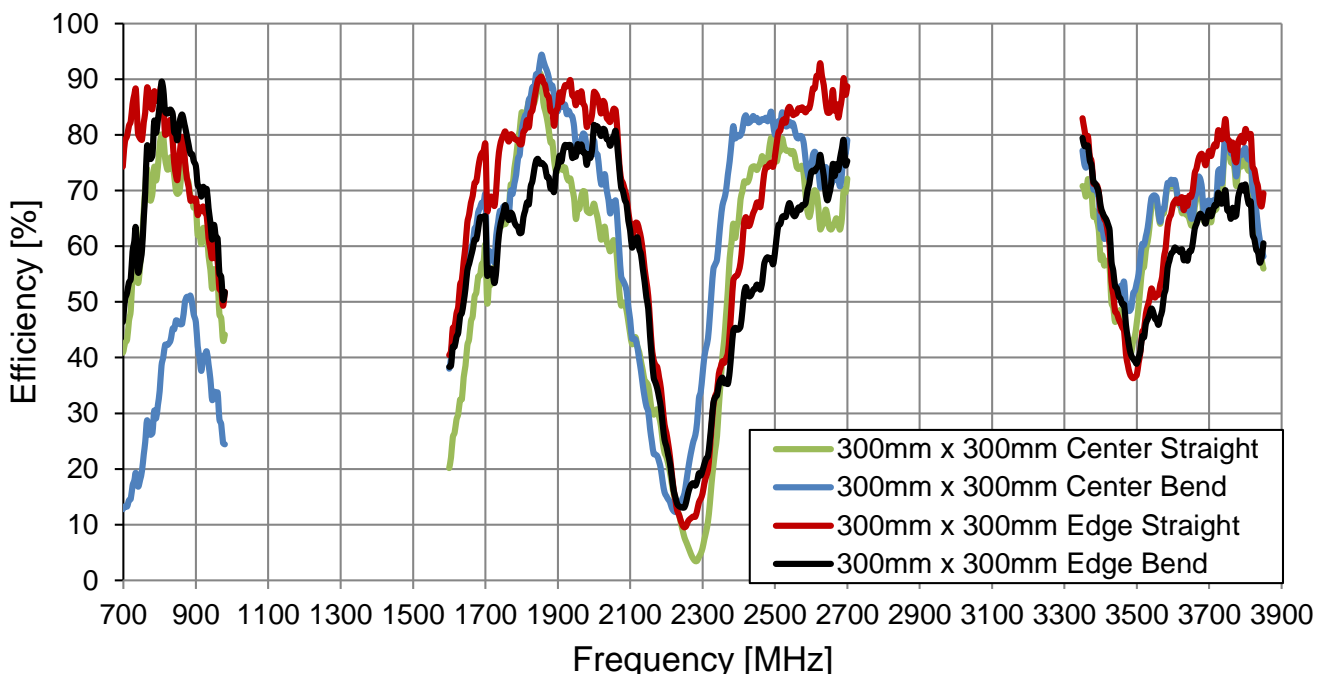
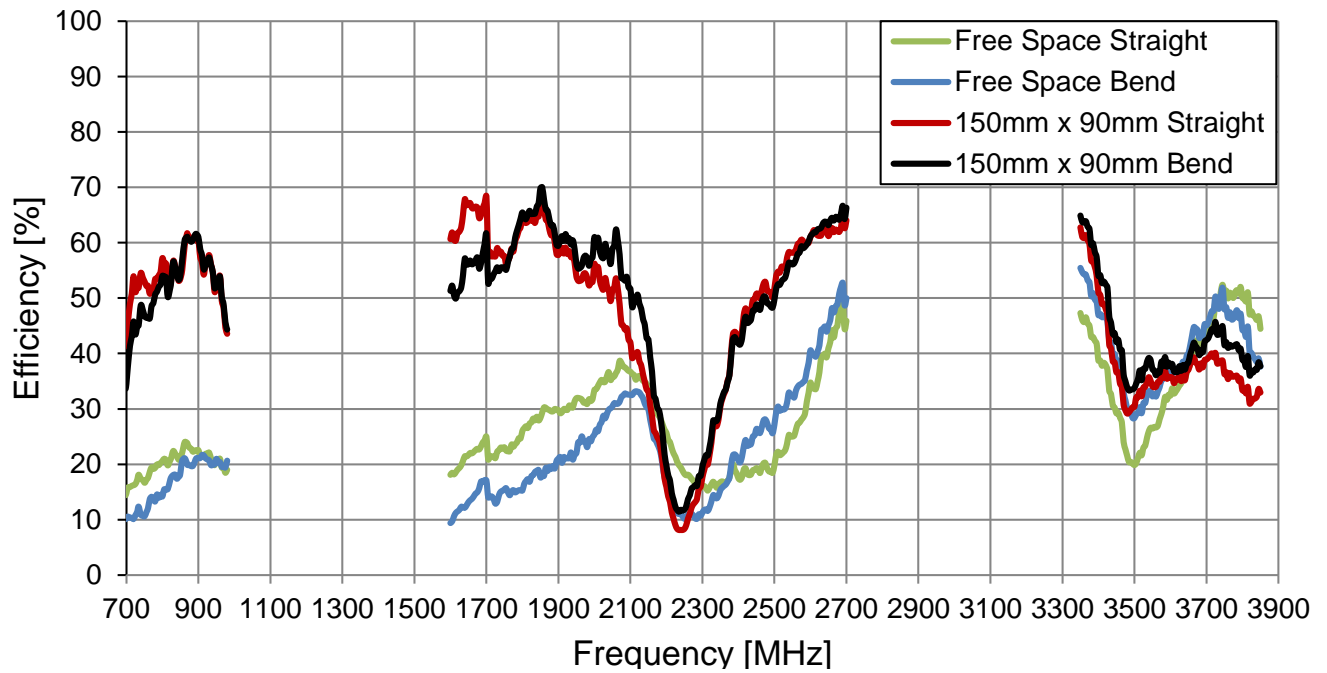
3.1 Return Loss



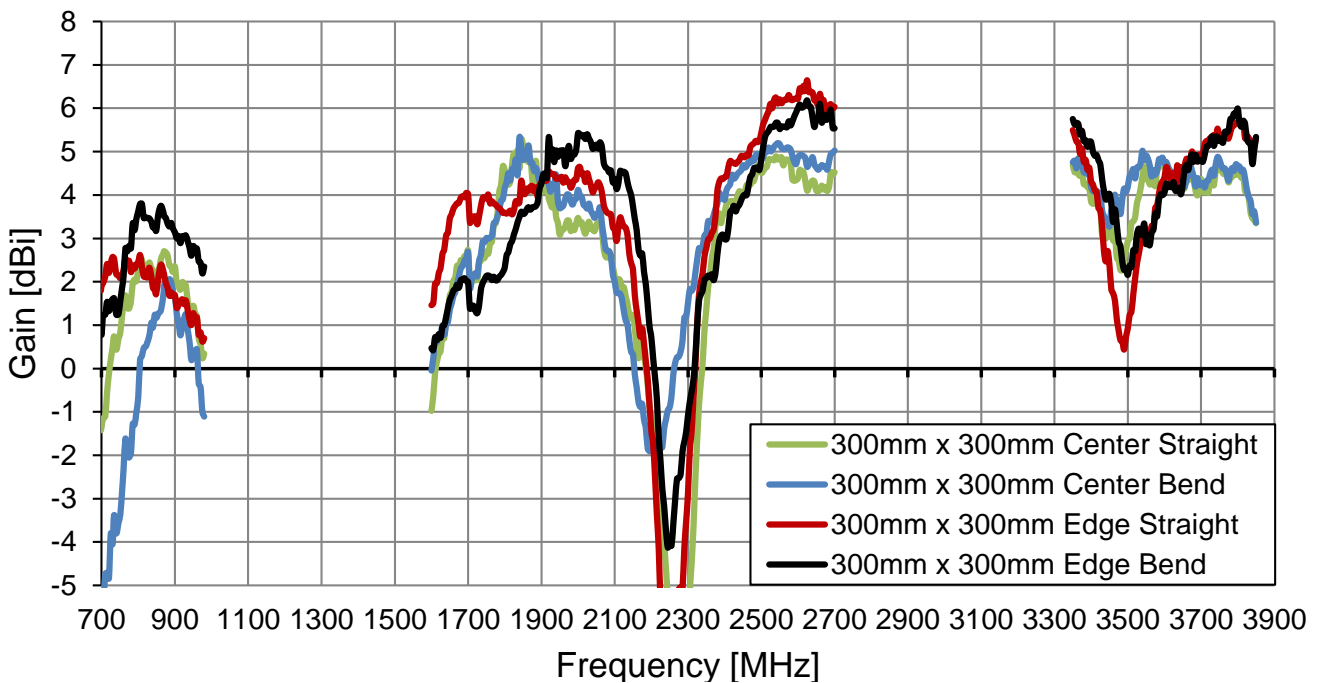
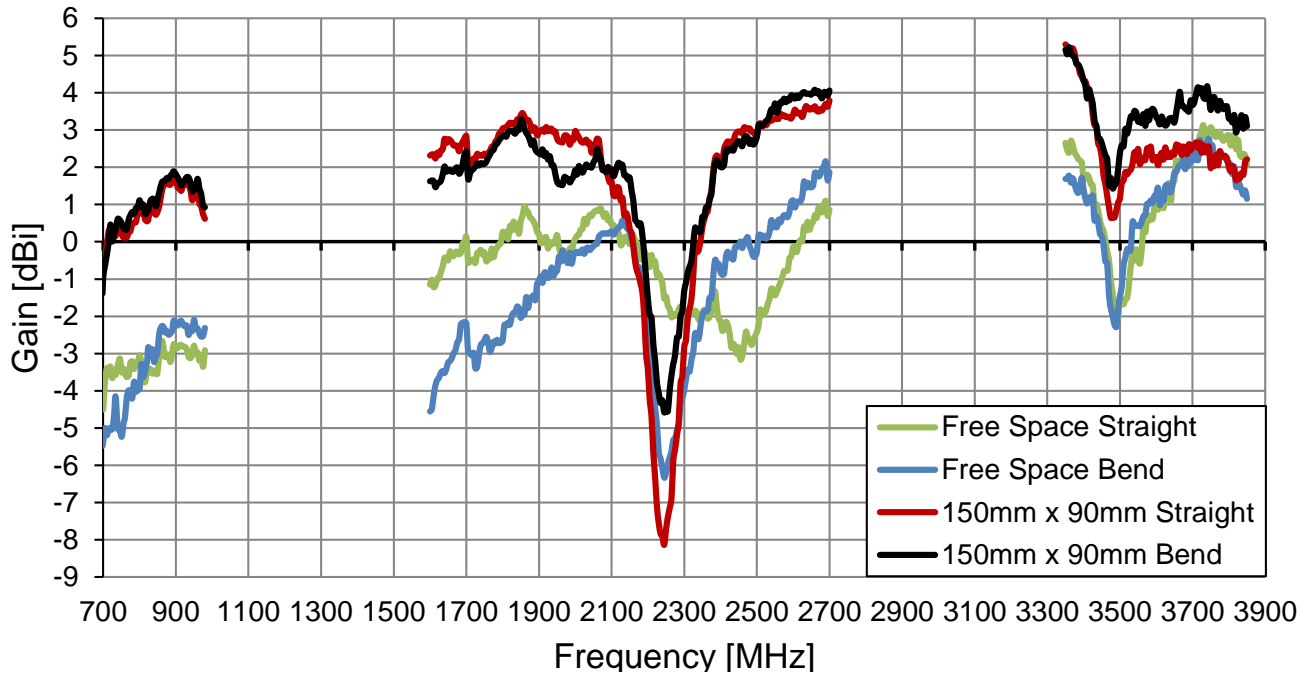
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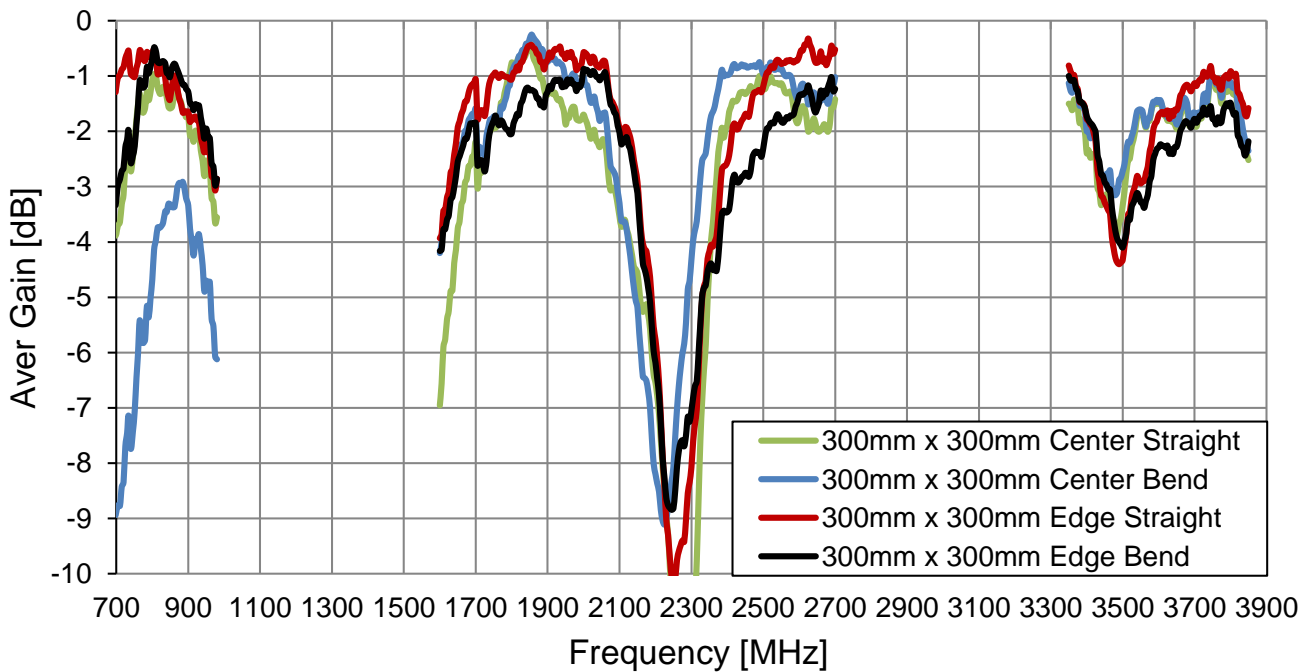
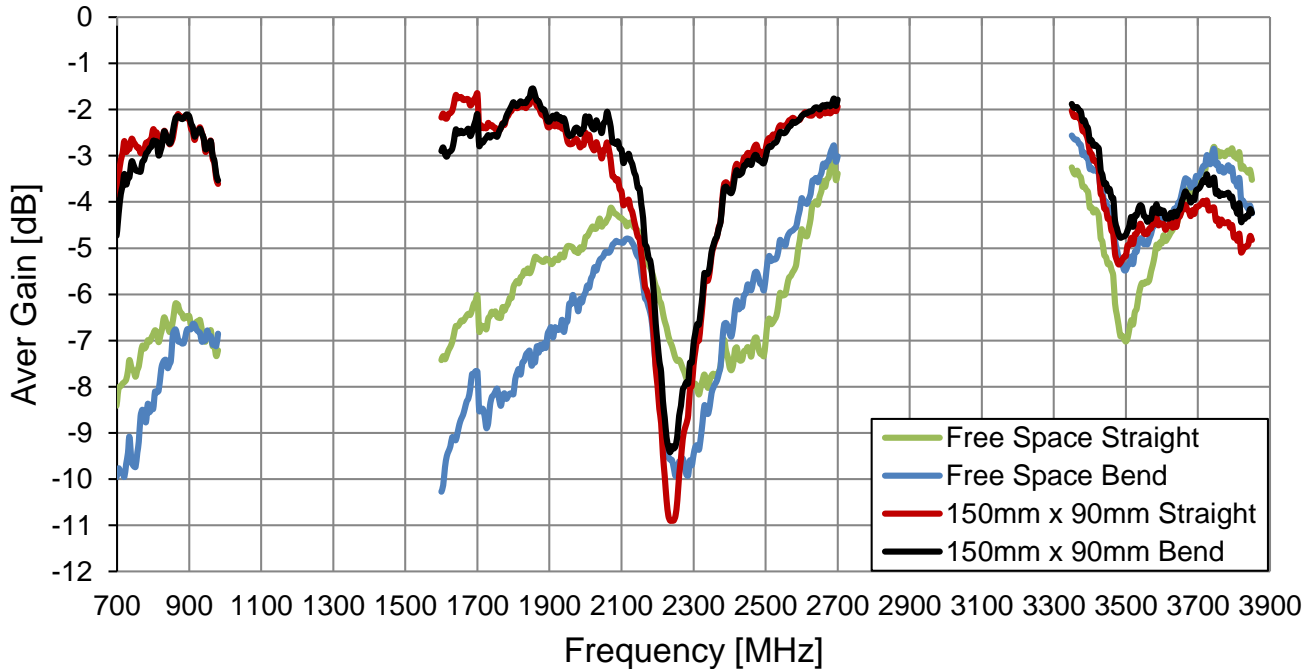
3.3 Efficiency



3.4 Peak Gain



3.5 Average Gain

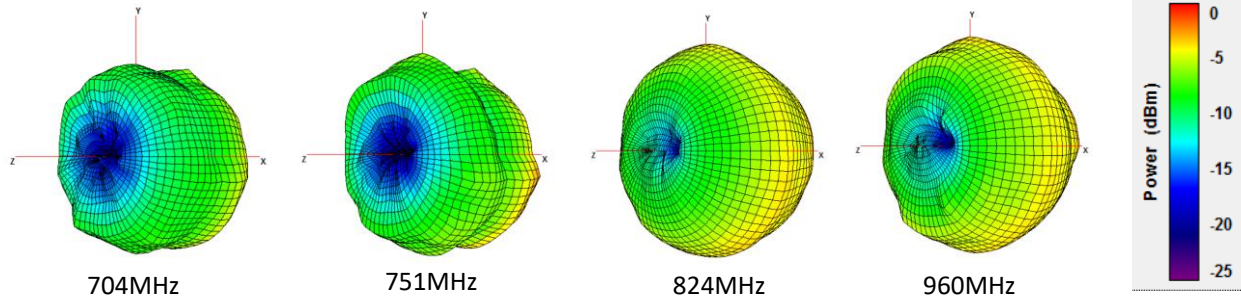


4. Radiation Patterns

4.1 Free Space – Straight 3D and 2D Radiation Patterns

704-960MHz

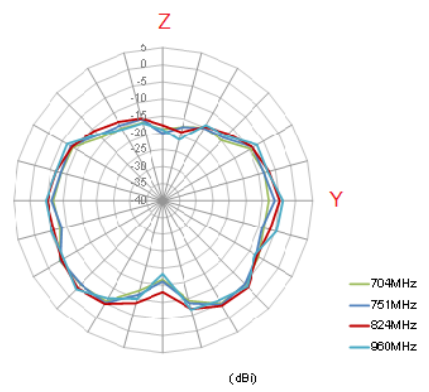
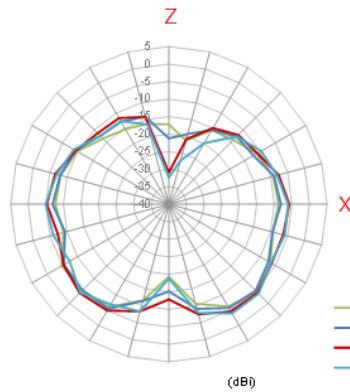
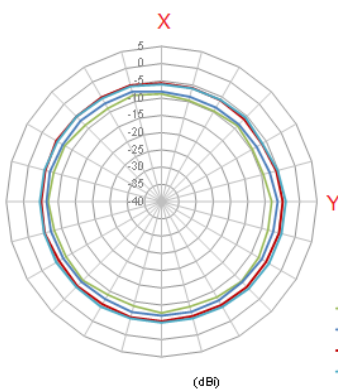
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Elevation = 0.0
Roll = -45.0



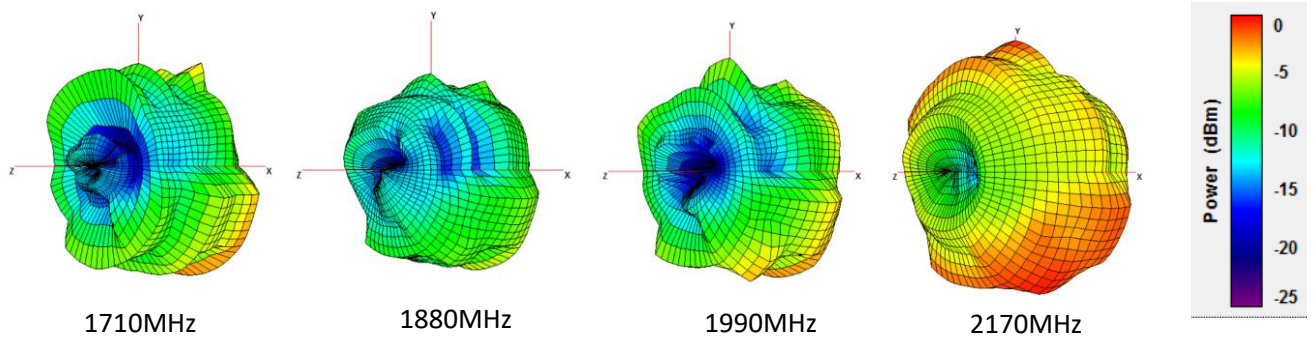
XY Plane

XZ Plane

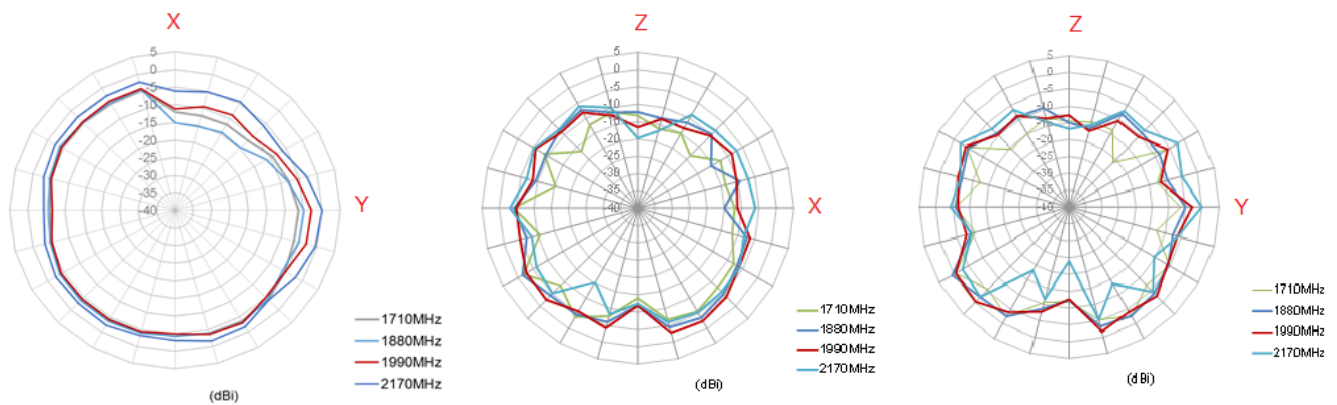
YZ Plane



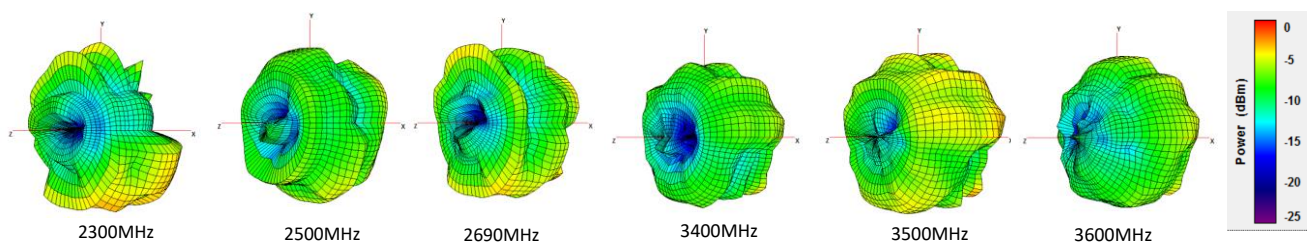
1710-2170MHz



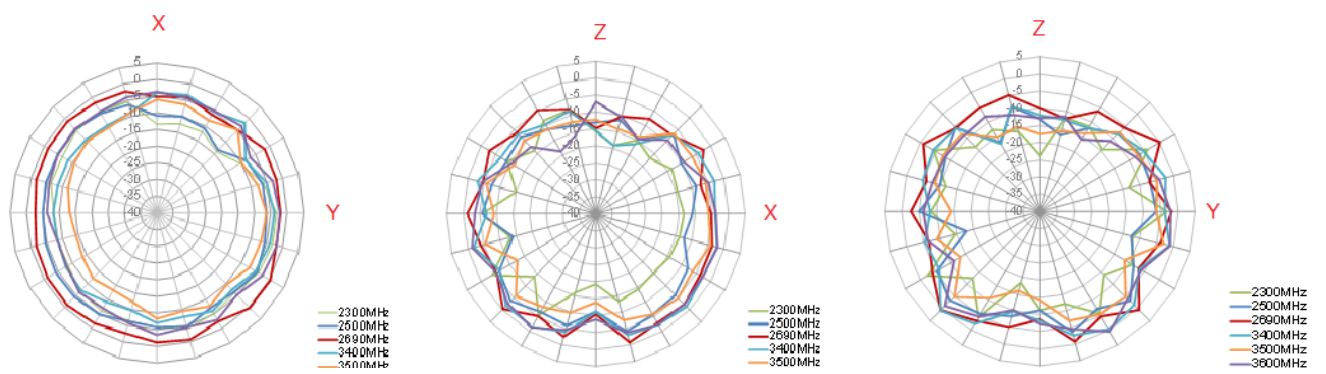
XY Plane
XZ Plane
YZ Plane



2300-3600MHz

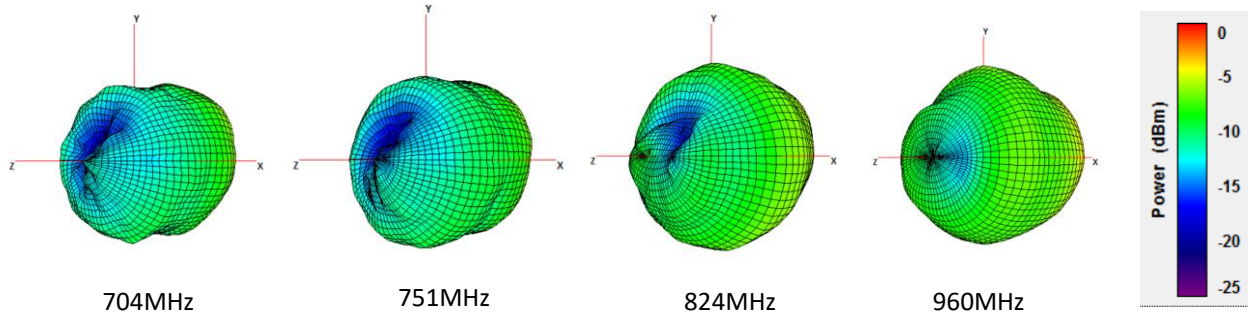


XY Plane
XZ Plane
YZ Plane



4.2 Free Space – Bent 3D and 2D Radiation Patterns

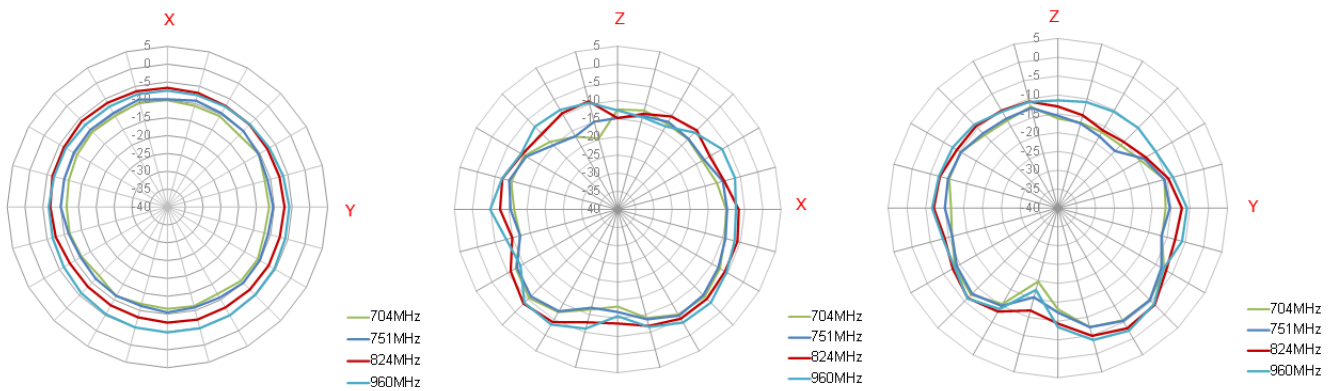
704-960MHz



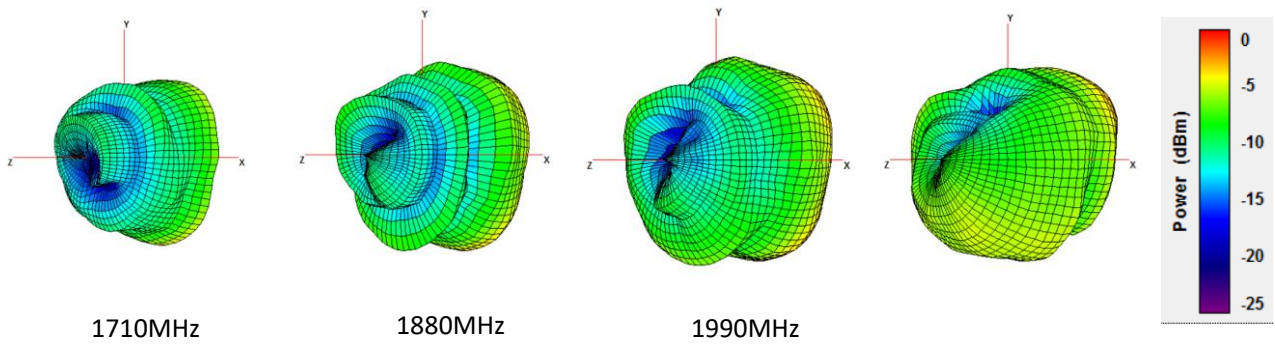
XY Plane

XZ Plane

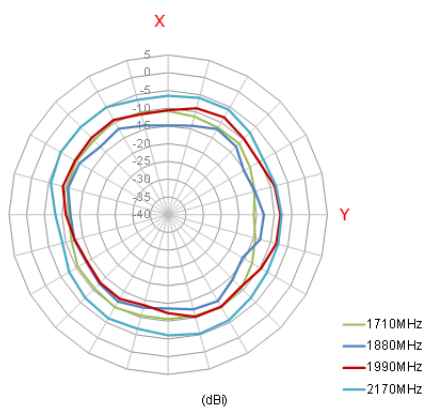
YZ Plane



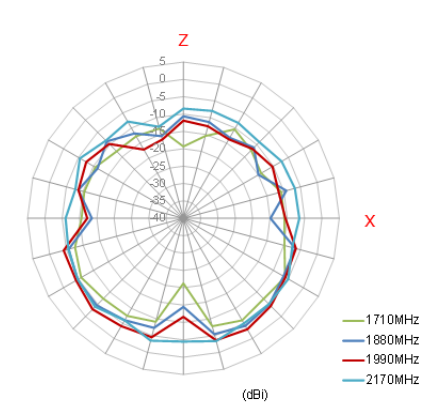
1710-2170MHz



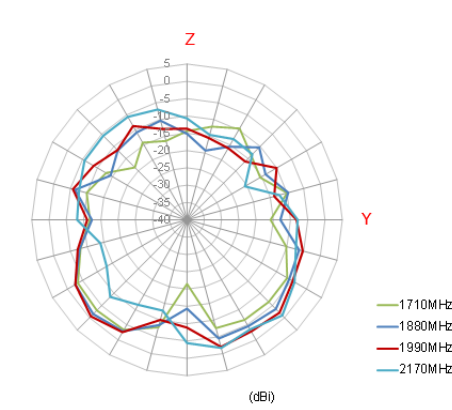
XY Plane



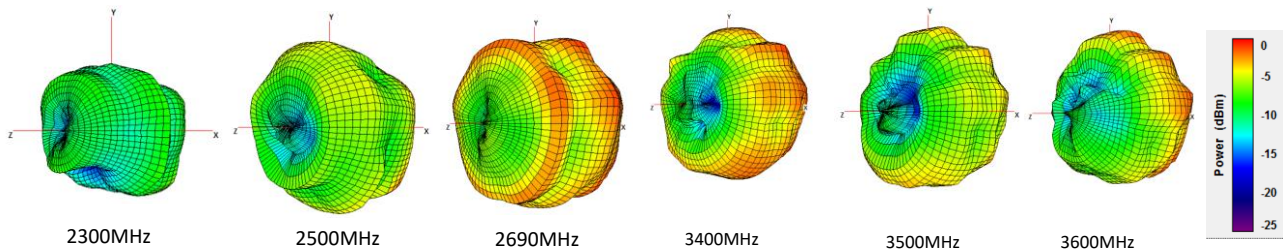
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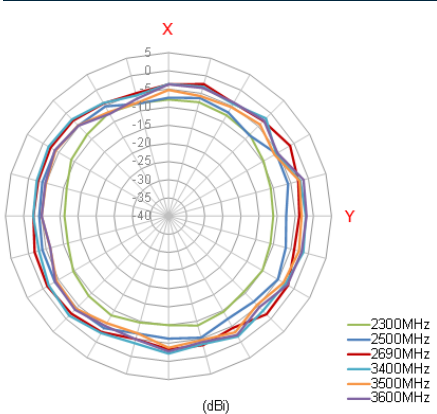
YZ Plane



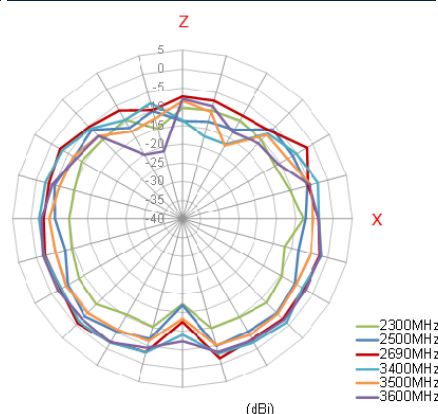
2300-3600MHz



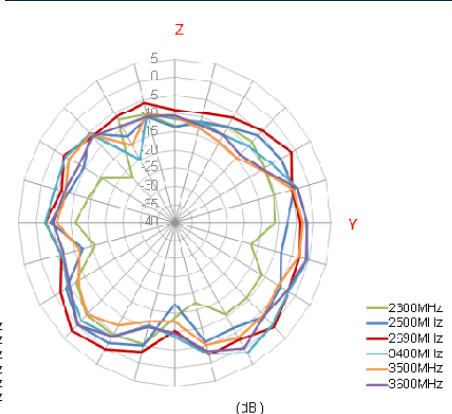
XY Plane



XZ Plane

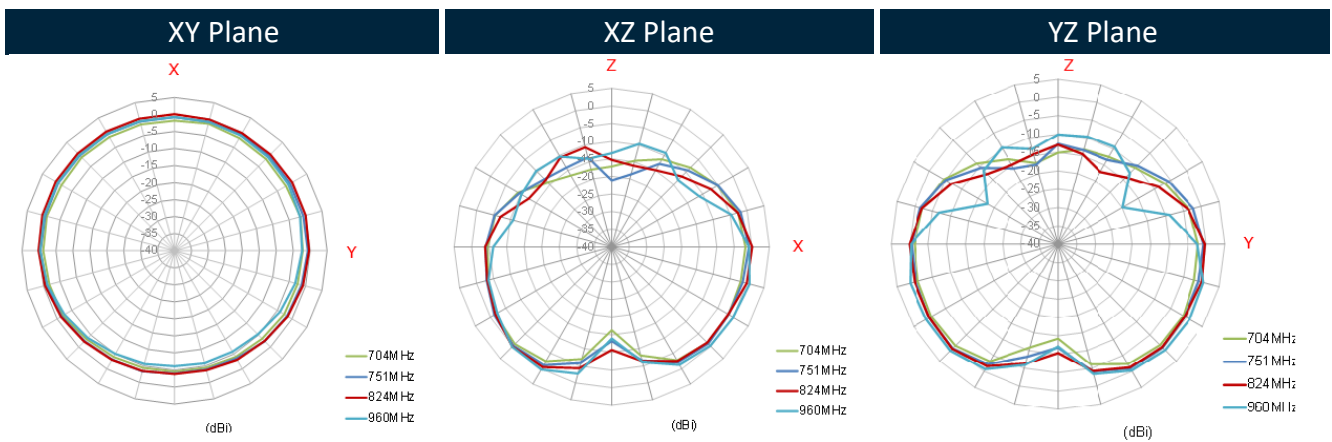
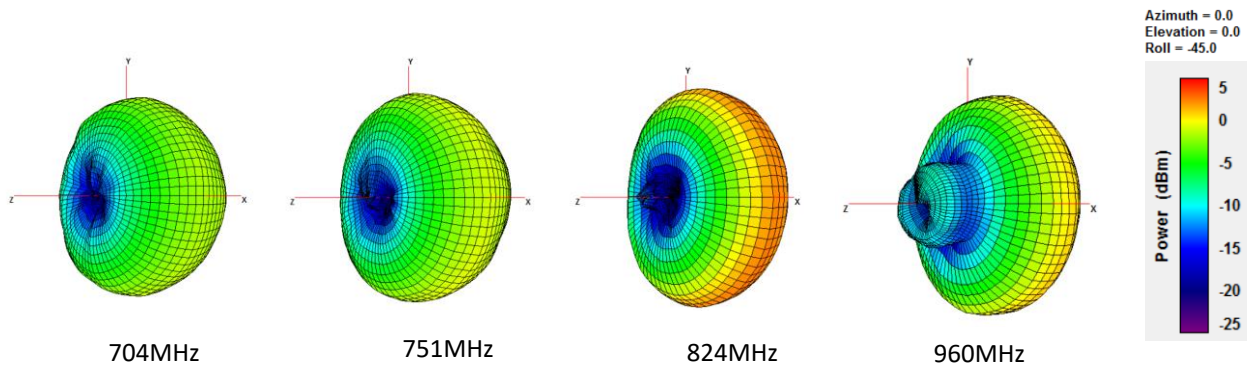


YZ Plane

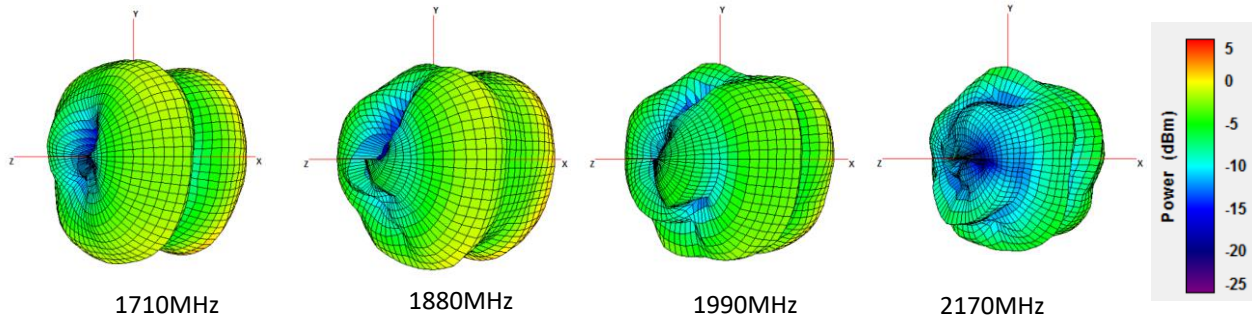


4.3 150*90mm – Straight 3D and 2D Radiation Patterns

704-960MHz



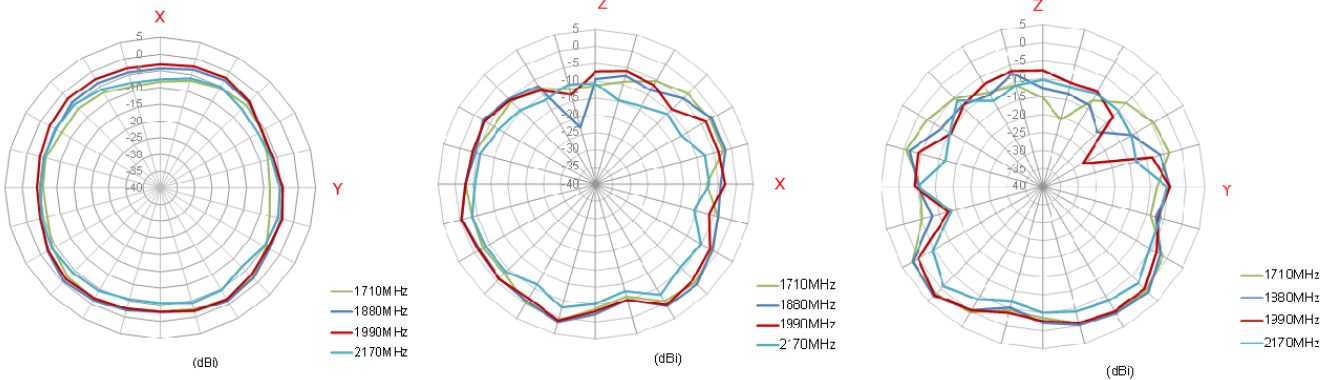
1710-2170MHz



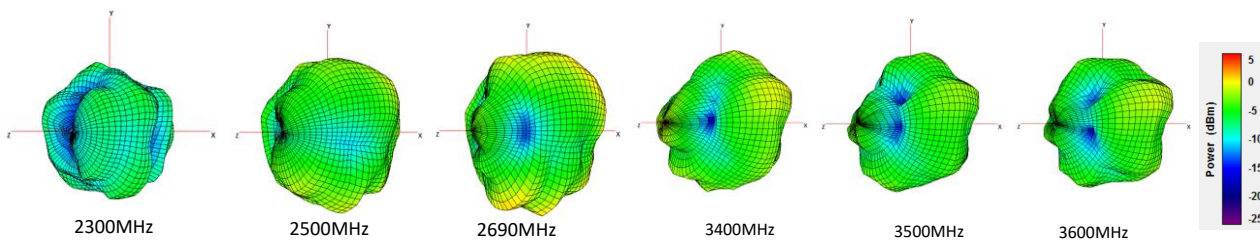
XY Plane

XZ Plane

YZ Plane



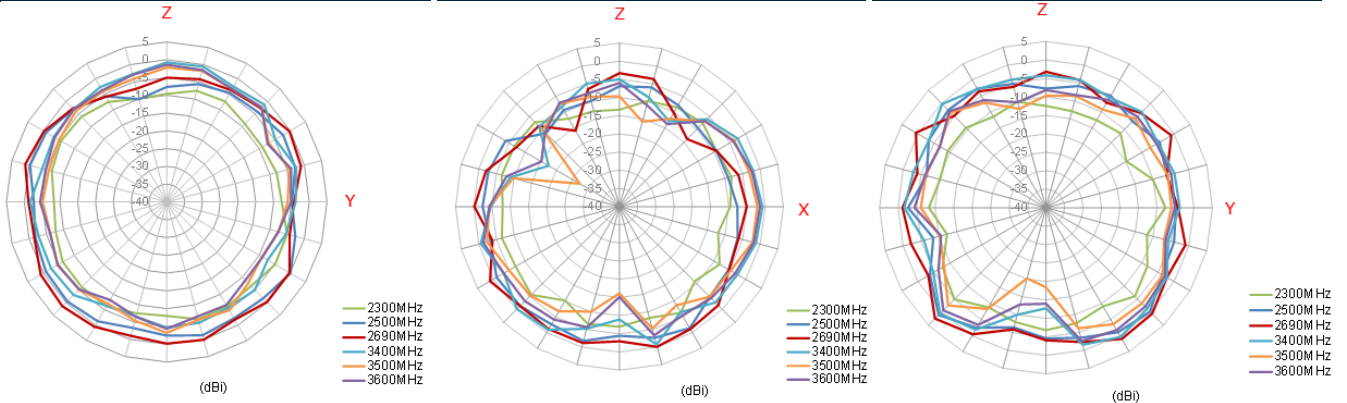
2300-3600MHz



XY Plane

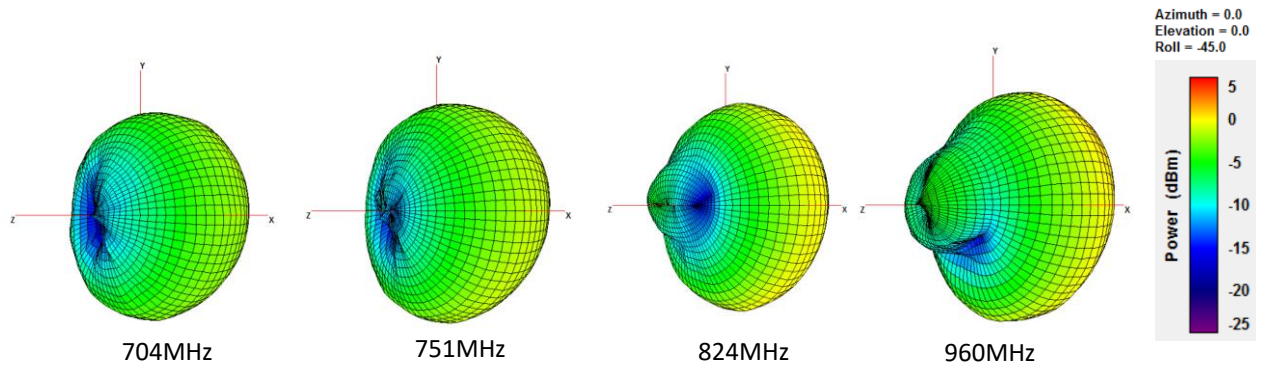
XZ Plane

YZ Plane



4.4 150*90mm – Bent3D and 2D Radiation Patterns

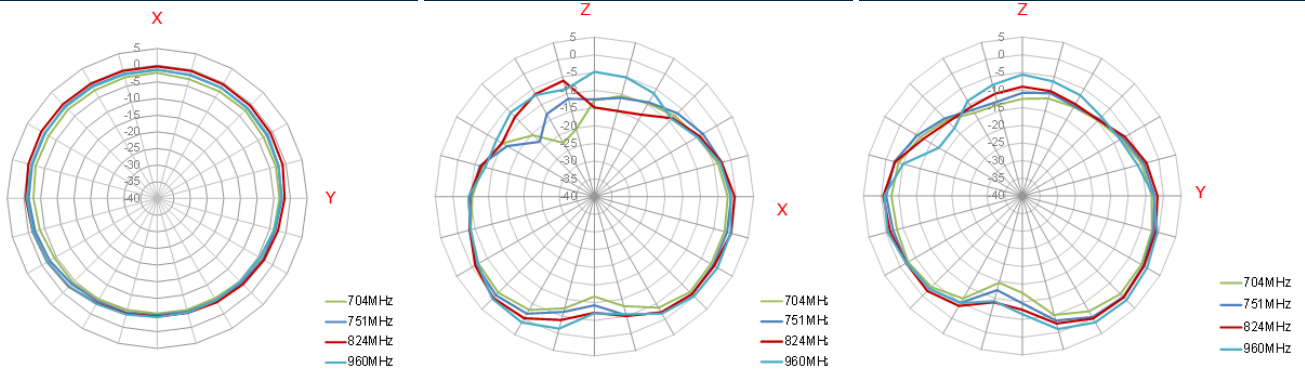
704-960MHz



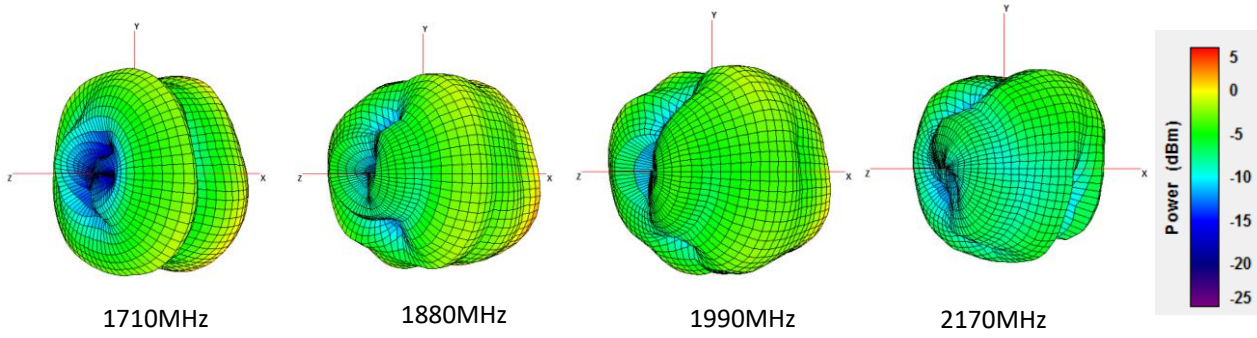
XY Plane

XZ Plane

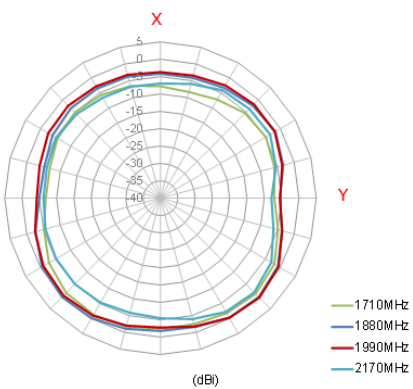
YZ Plane



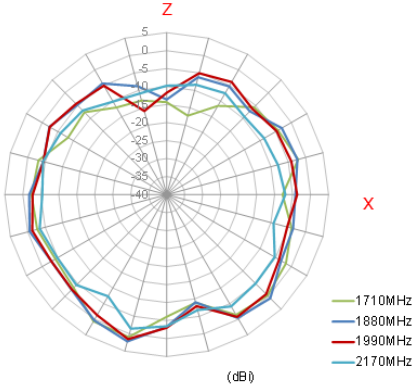
1710-2170MHz



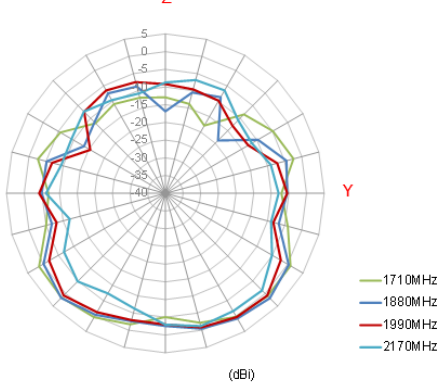
XY Plane



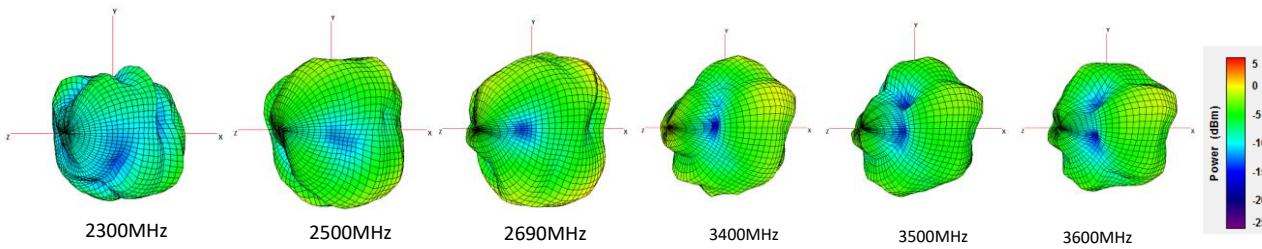
XZ Plane



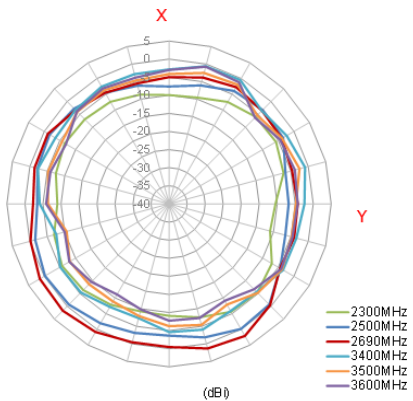
YZ Plane



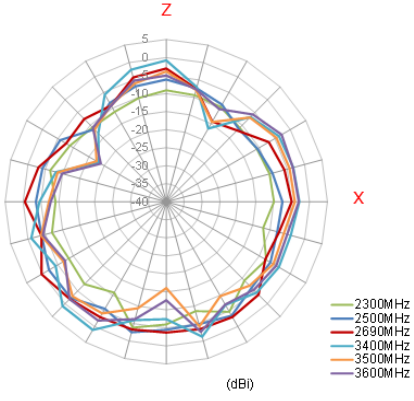
2300-3600MHz



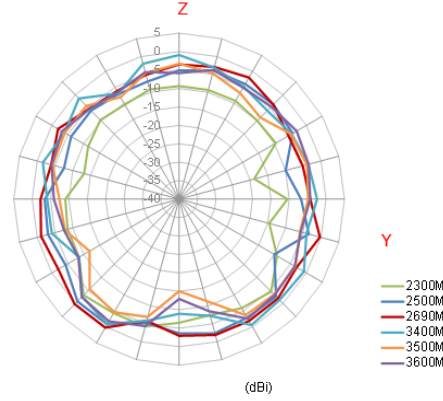
XY Plane



XZ Plane

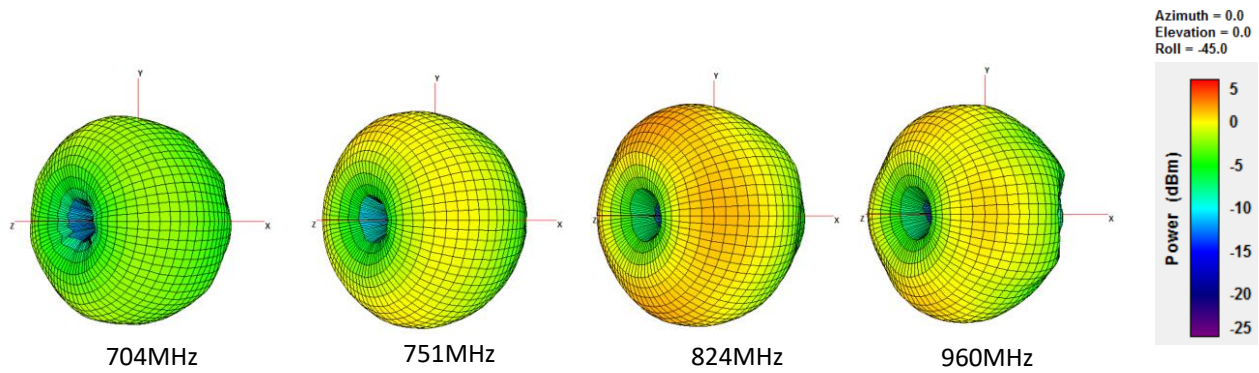


YZ Plane

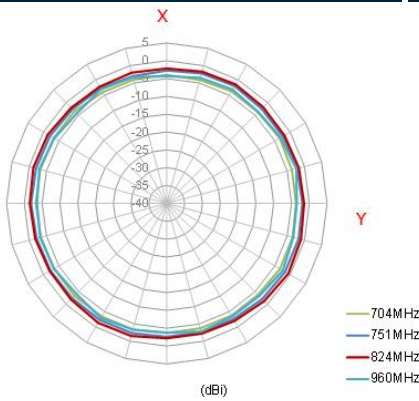


4.5 300*300mm Center – Straight 3D and 2D Radiation Patterns

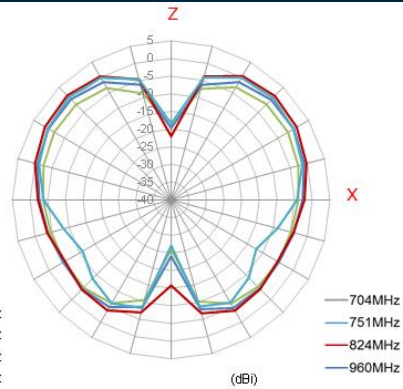
704-960MHz



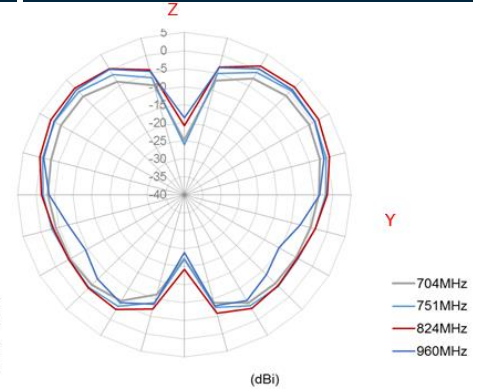
XY Plane



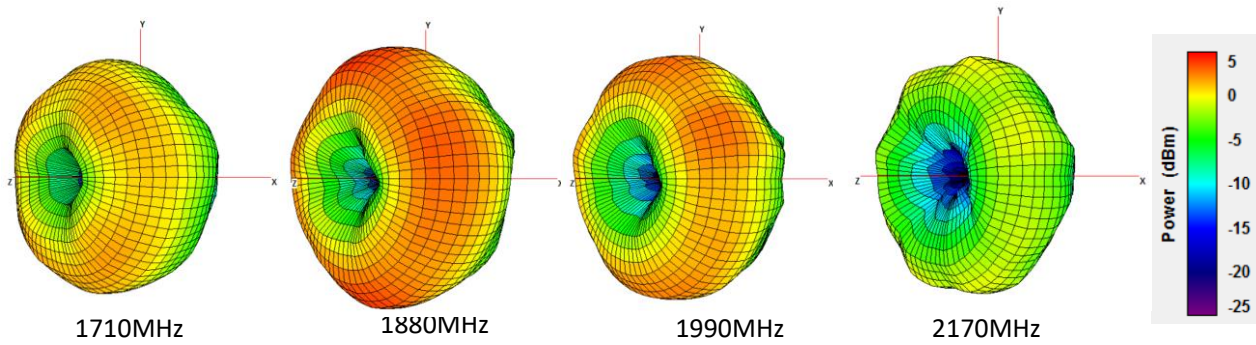
XZ Plane



YZ Plane



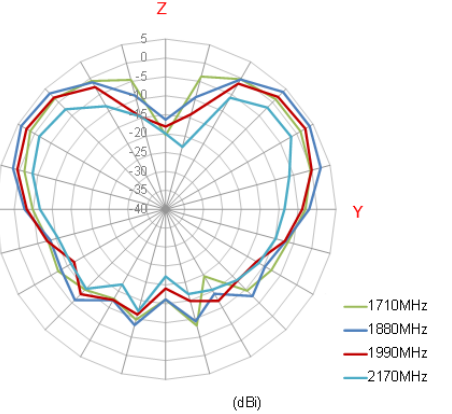
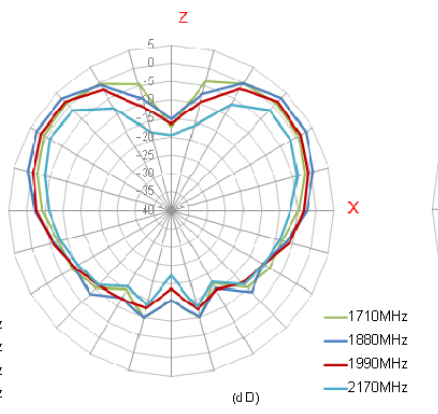
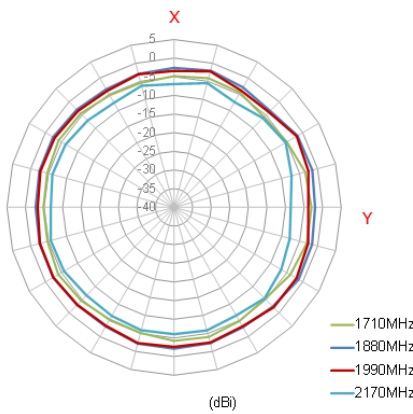
1710-2170MHz



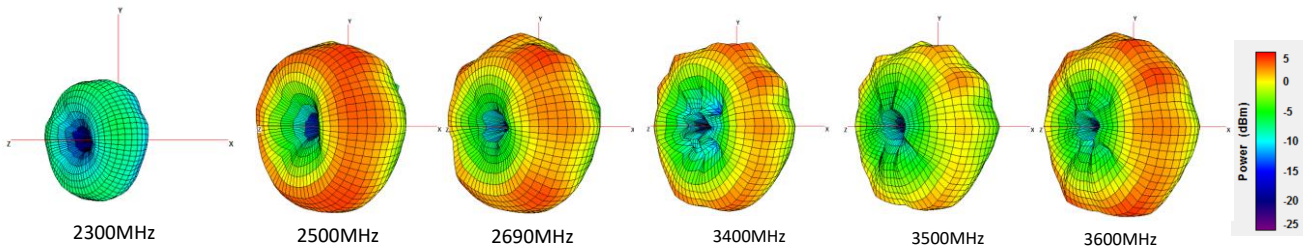
XY Plane

XZ Plane

YZ Plane



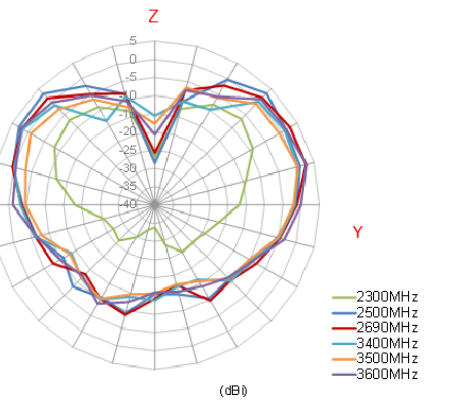
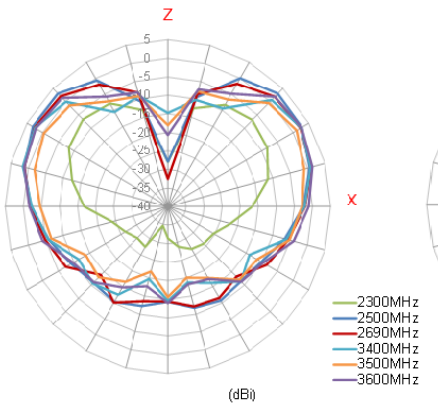
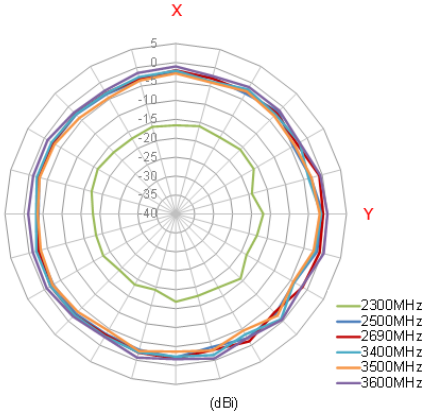
2300-3600MHz



XY Plane

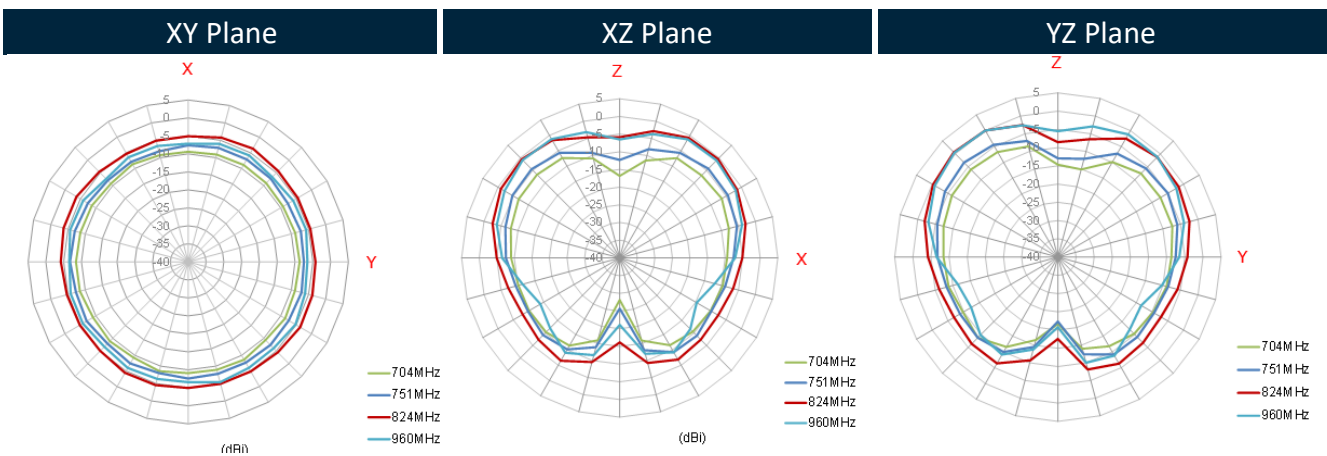
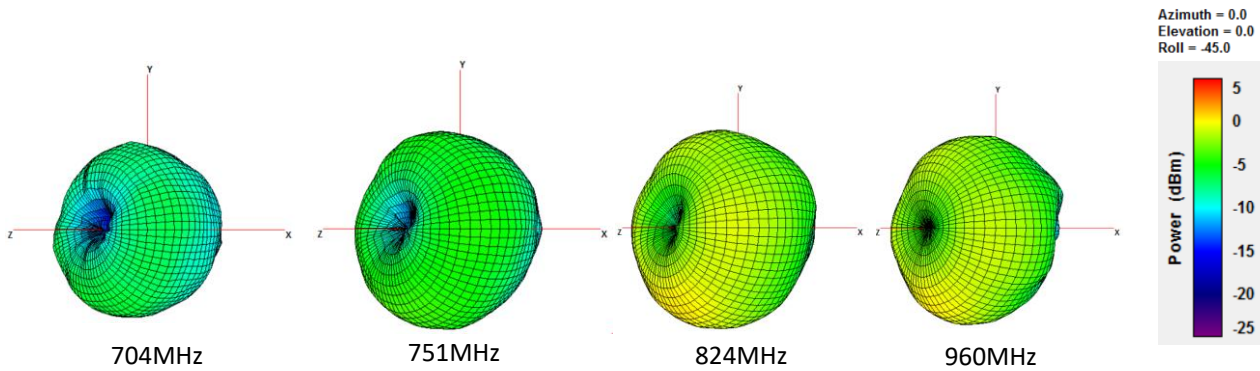
XZ Plane

YZ Plane

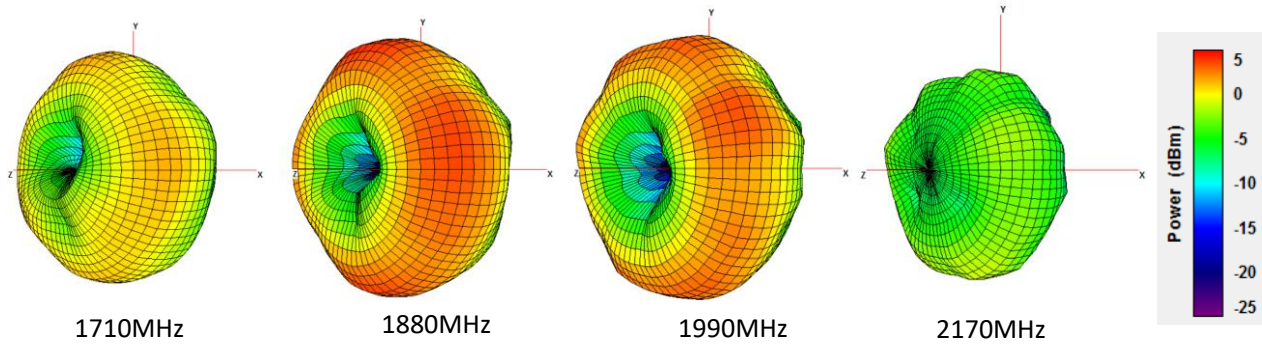


4.6 300*300mm Center – Bent 3D and 2D Radiation Patterns

704-960MHz



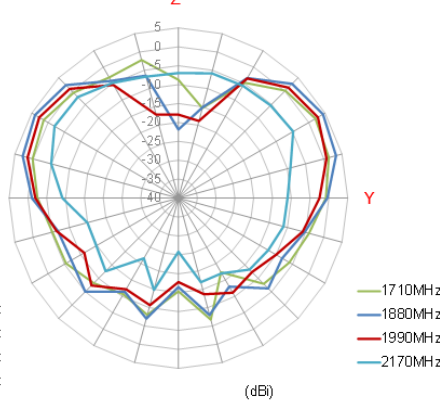
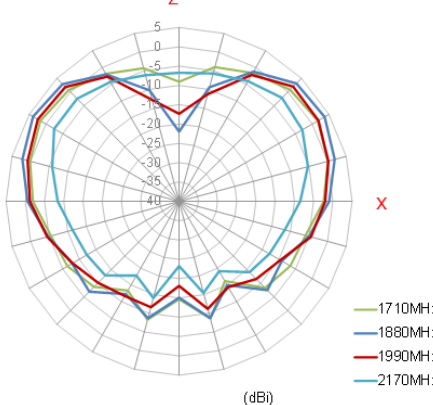
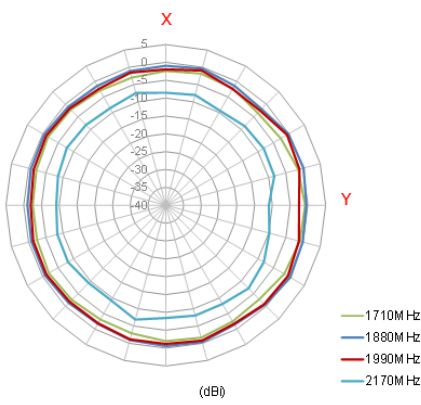
1710-2170MHz



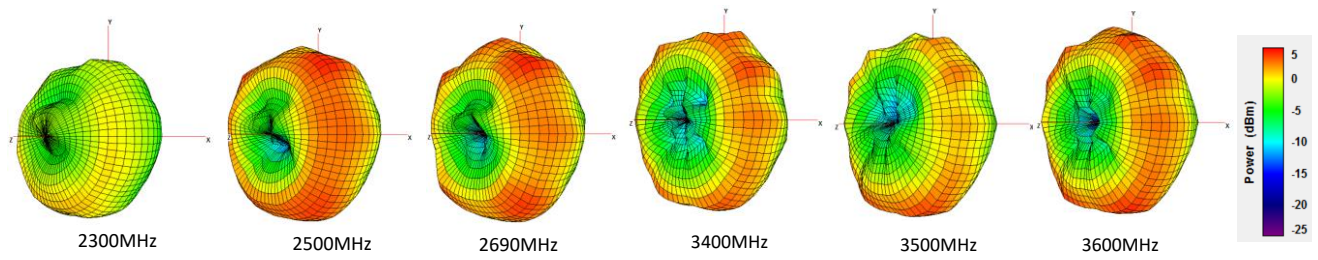
XY Plane

XZ Plane

YZ Plane



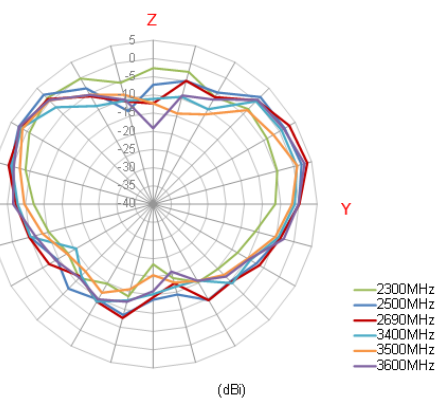
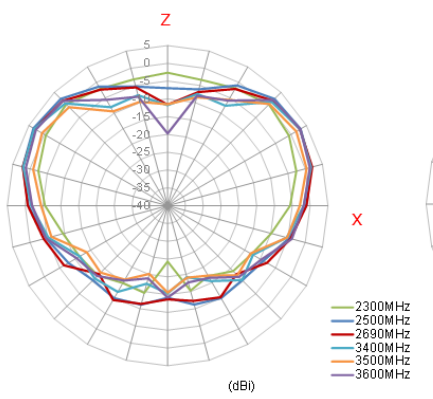
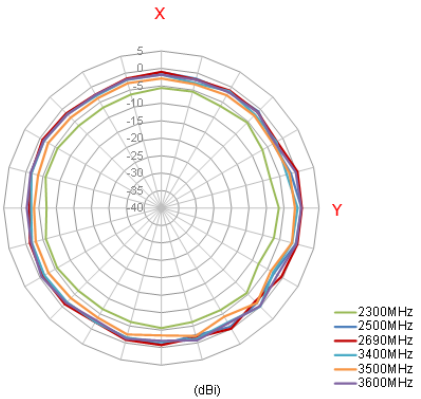
2300-3600MHz



XY Plane

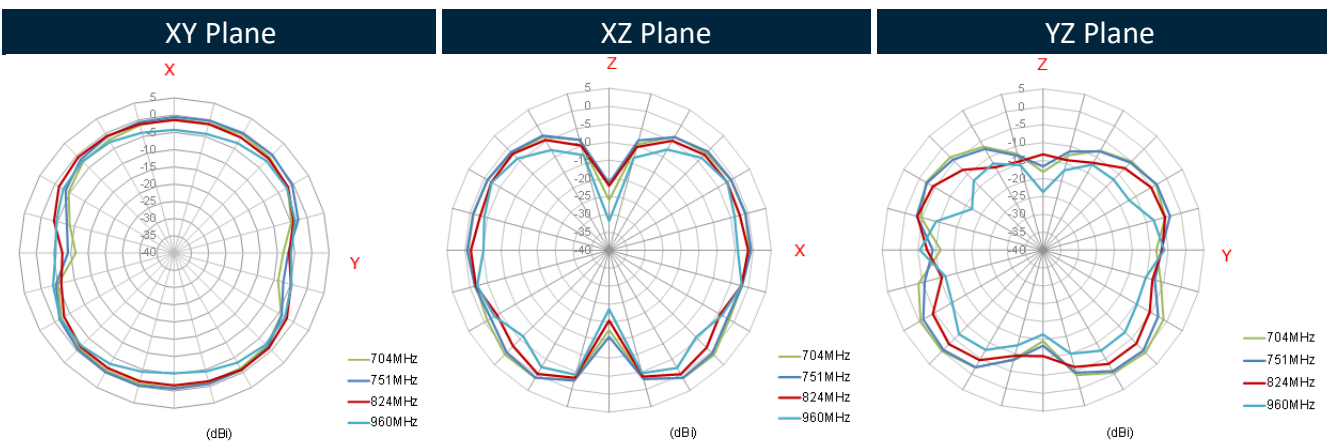
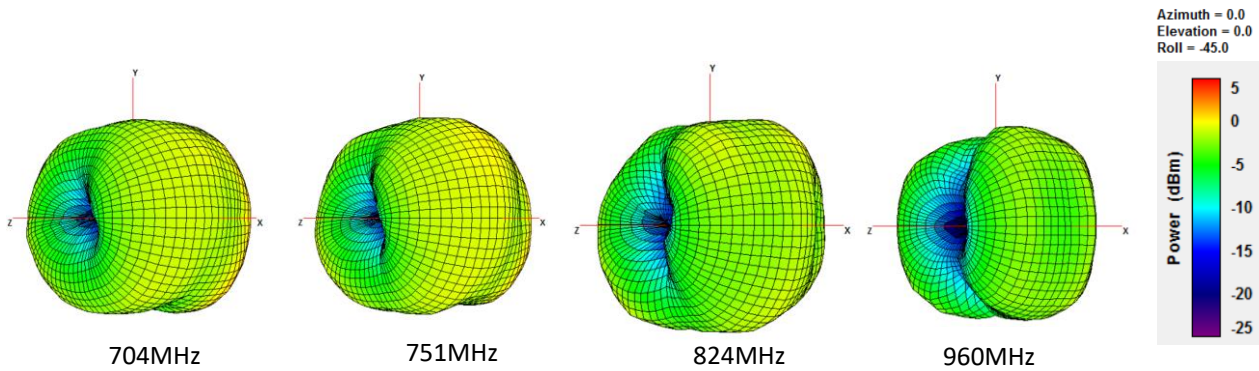
XZ Plane

YZ Plane

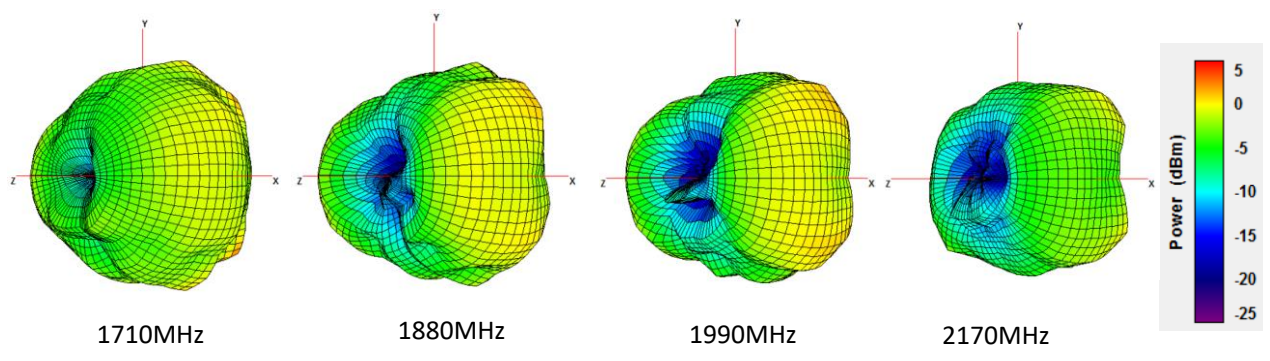


4.7 300*300mm Edge – Straight 3D and 2D Radiation Patterns

704-960MHz



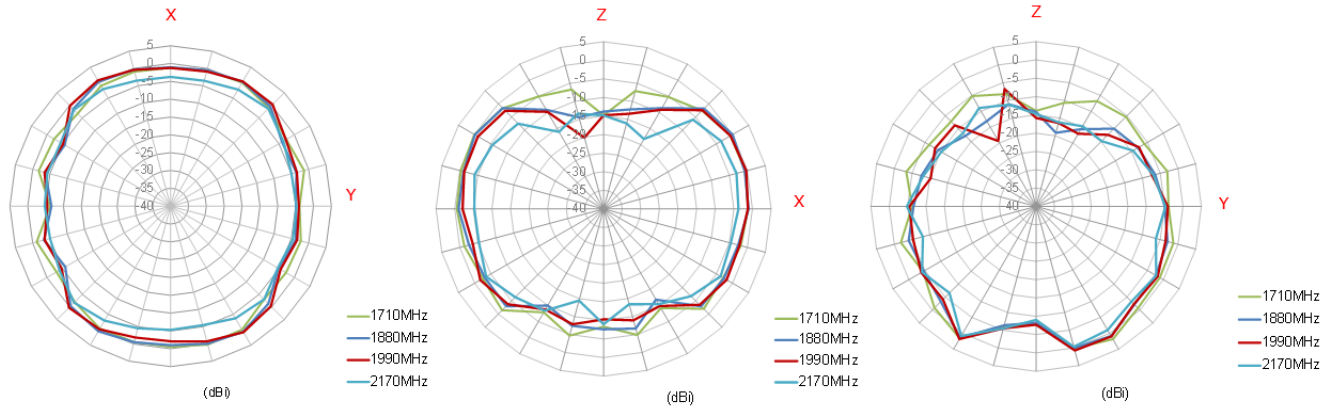
1710-2170MHz



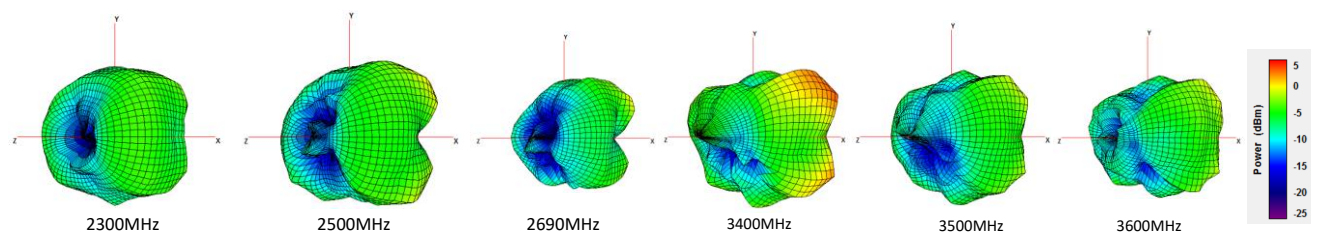
XY Plane

XZ Plane

YZ Plane



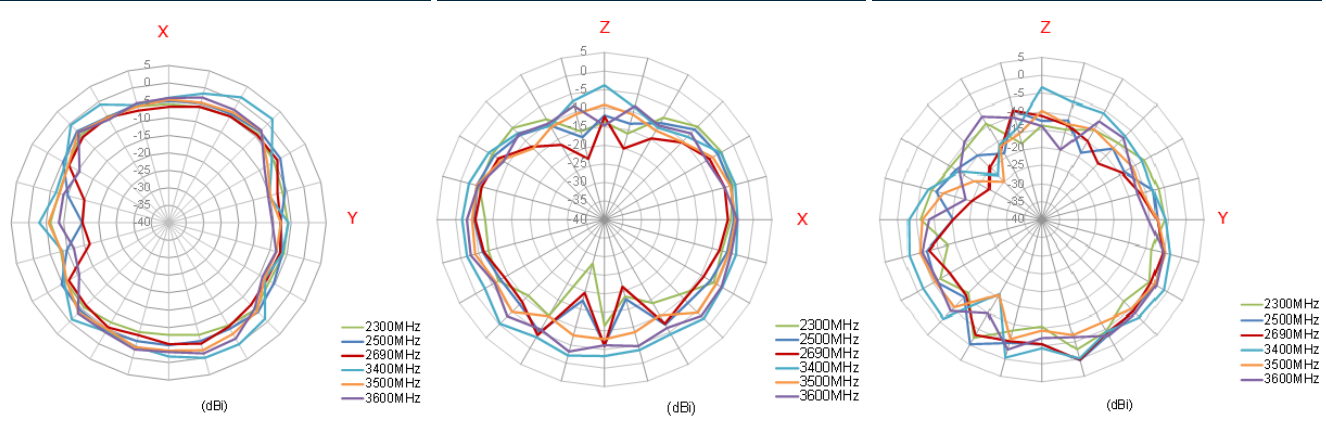
2300-3600MHz



XY Plane

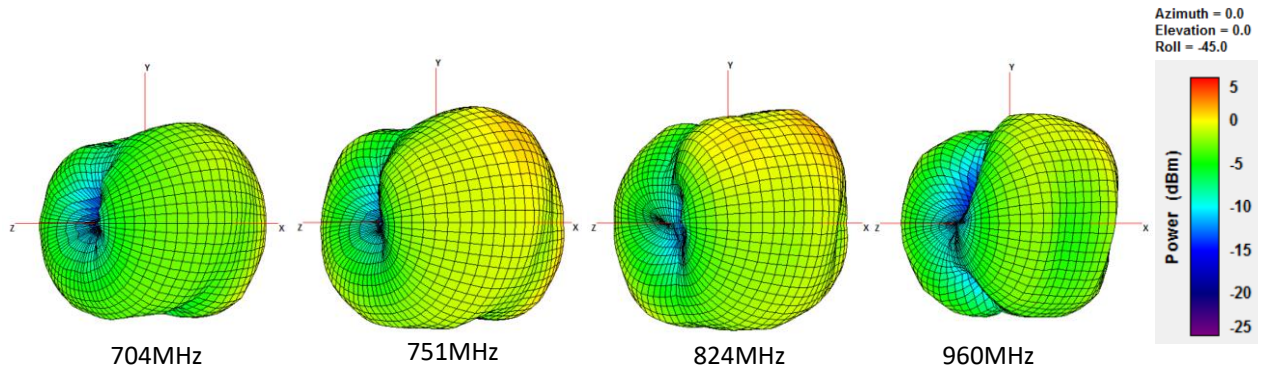
XZ Plane

YZ Plane



4.8 300*300mm Edge – Bent 3D and 2D Radiation Patterns

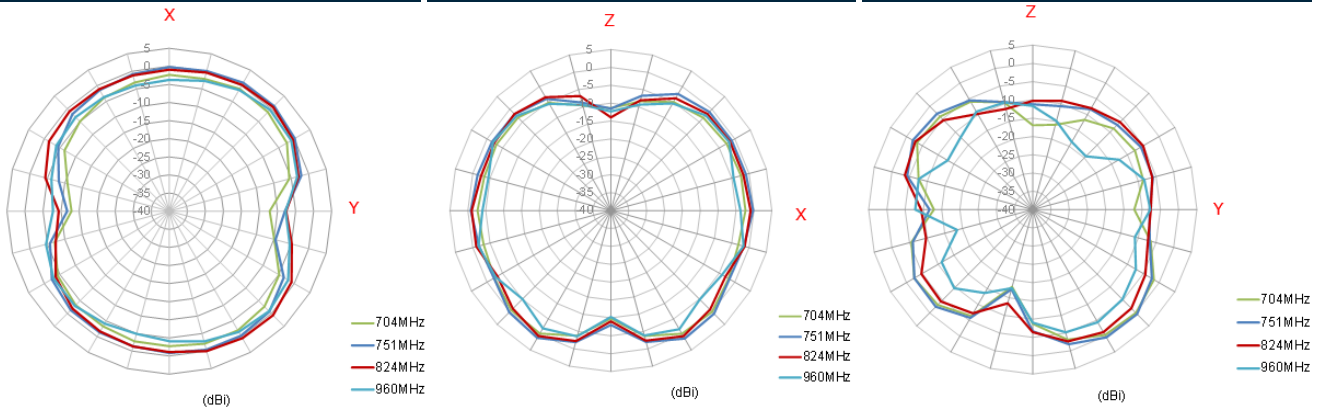
704-960MHz



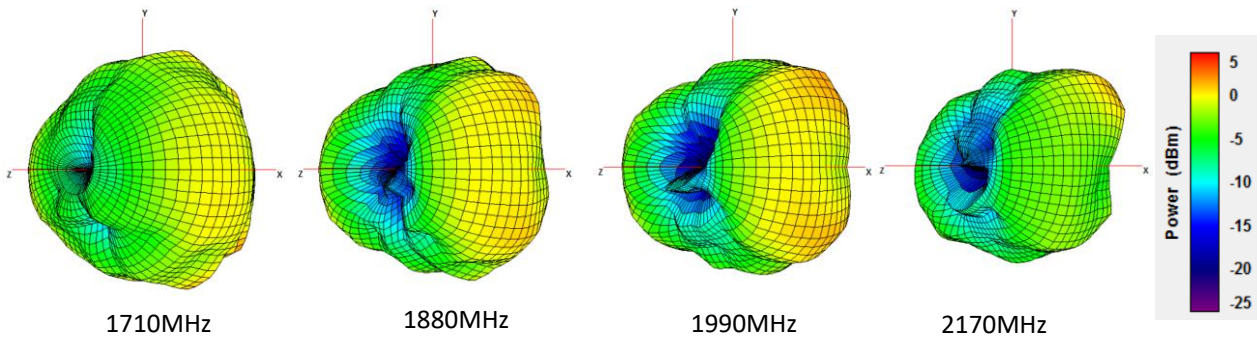
XY Plane

XZ Plane

YZ Plane



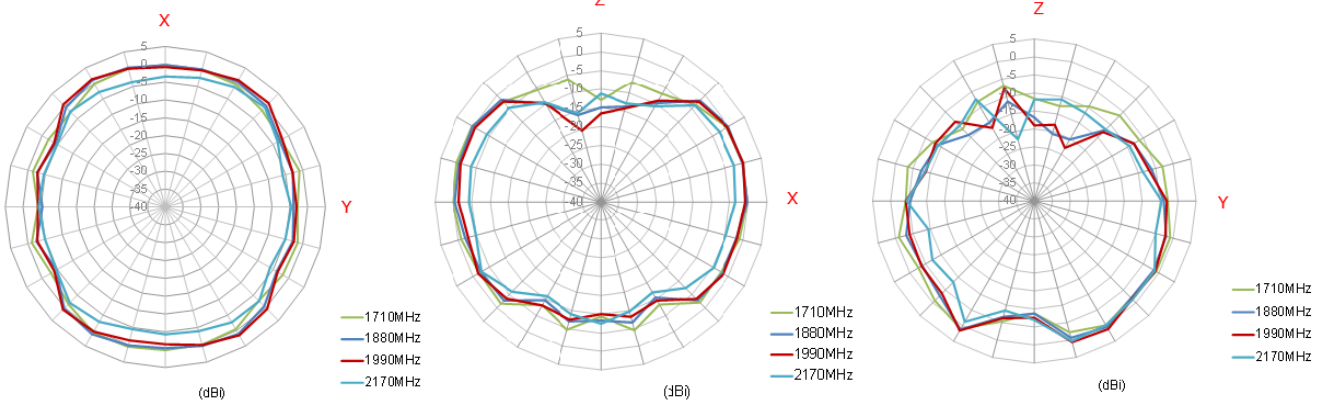
1710-2170MHz



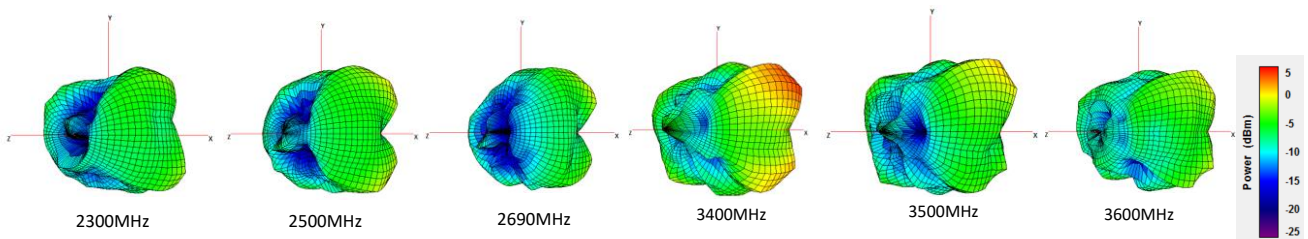
XY Plane

XZ Plane

YZ Plane



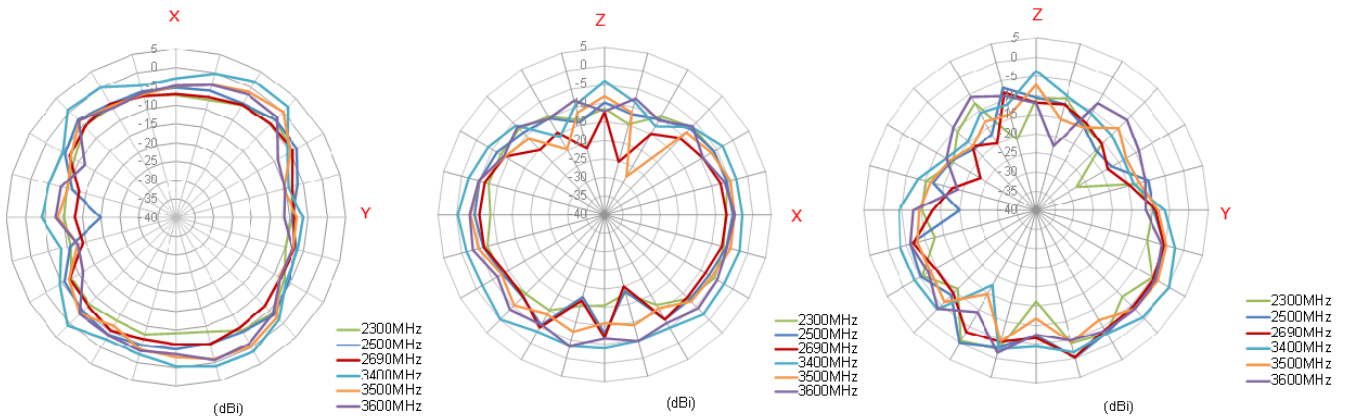
2300-3600MHz



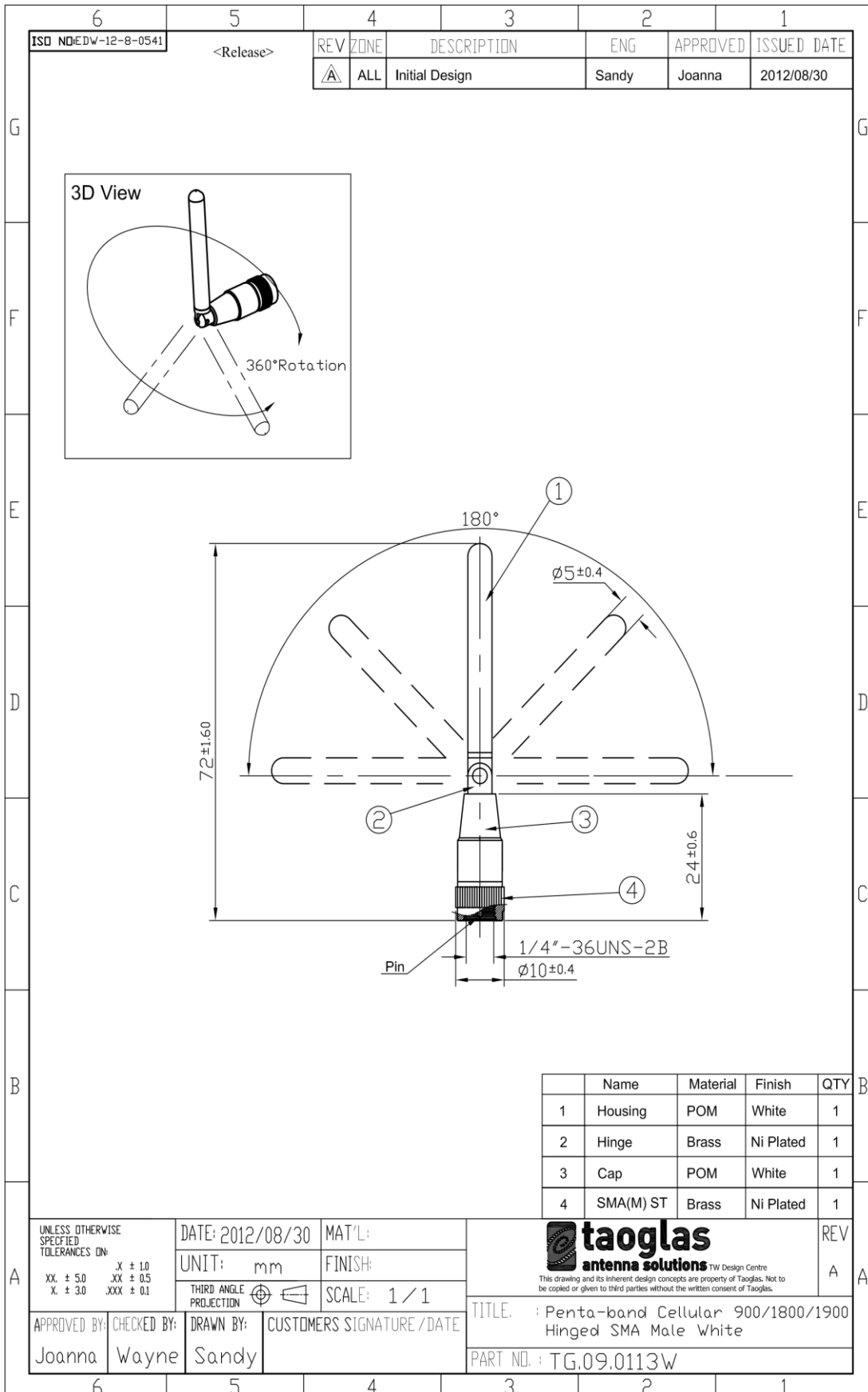
XY Plane

XZ Plane

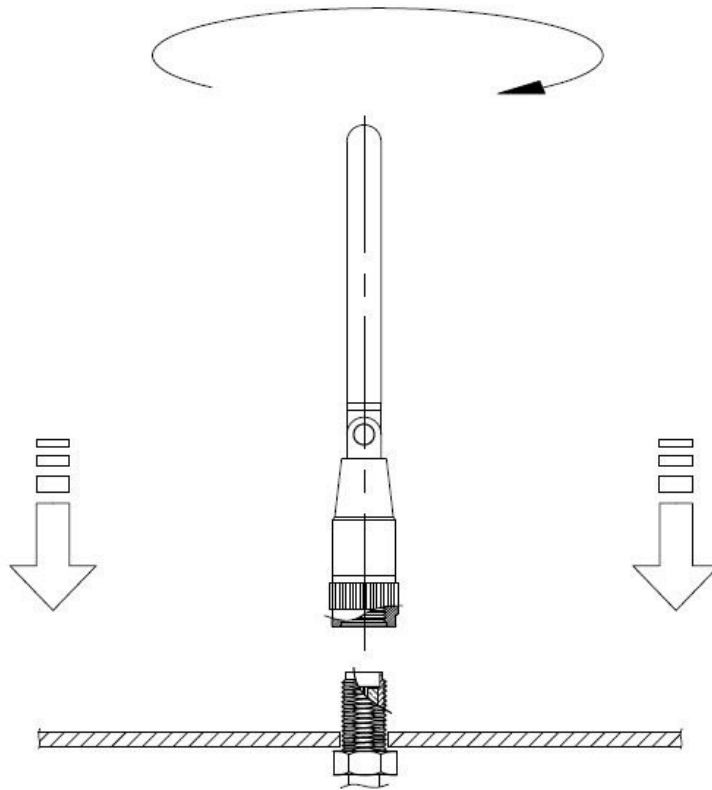
YZ Plane



5. Mechanical Drawing (Units: mm)



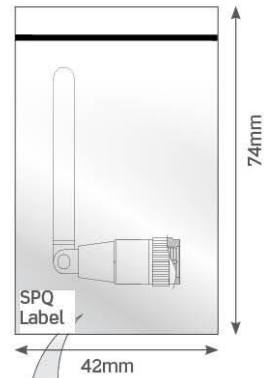
6. Installation



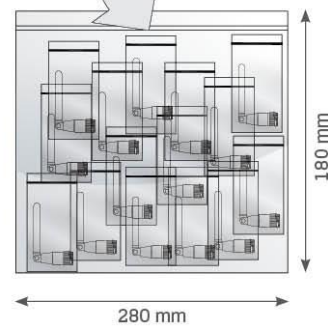
Recommended torque for mounting is 0.9 N·m
Maximum torque for mounting is 1.176 N·m

7. Packaging

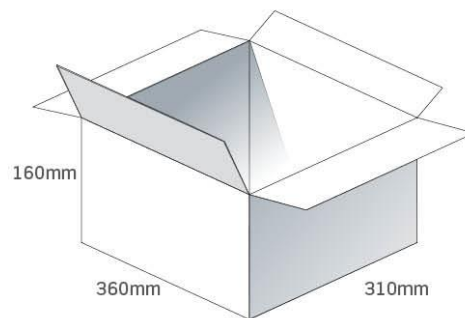
1 pcs TG.09.0113W per PE bag
 PE Bag Dimensions - 74 x 42mm
 Weight - 8.6g



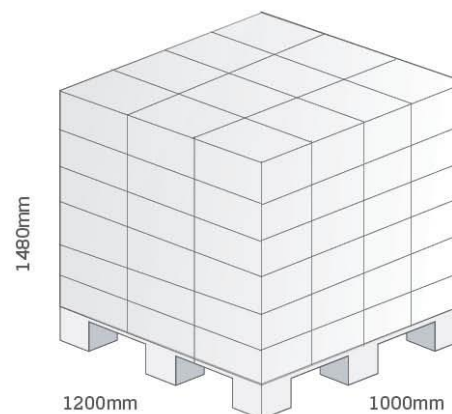
100 pcs TG.09.0113W per large PE bags
 Large PE bags Dimensions - 280 x 180mm
 Weight - 0.88kg



1500 pcs TG.09.0113W per carton
 Carton Dimensions - 360 x 310 x 160mm
 Weight - 13.5kg



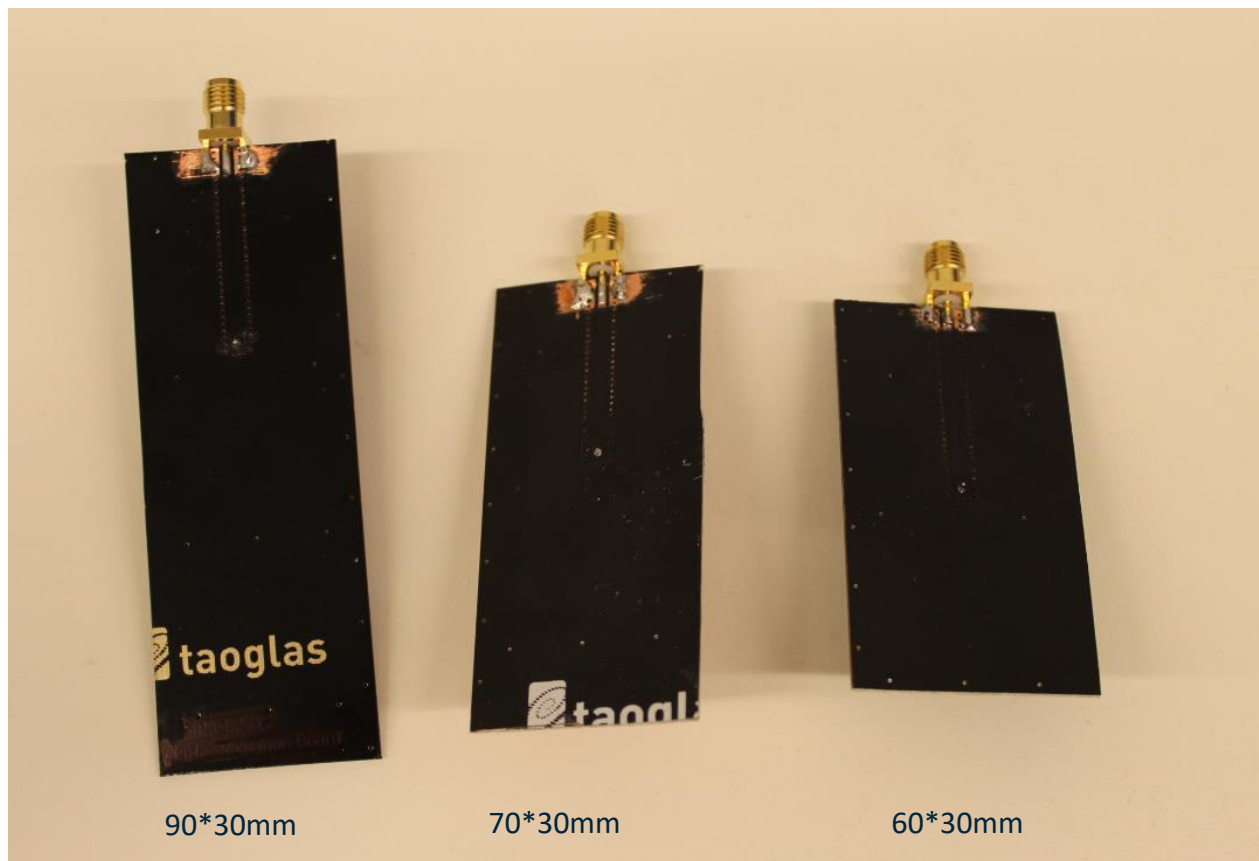
Pallet Dimensions 1200*1000*1480mm
 72 Cartons per Pallet
 9 Cartons per layer
 8 Layers



8. Application Note

Different Ground Plane lengths were considered for acceptable efficiency for LTE bands.

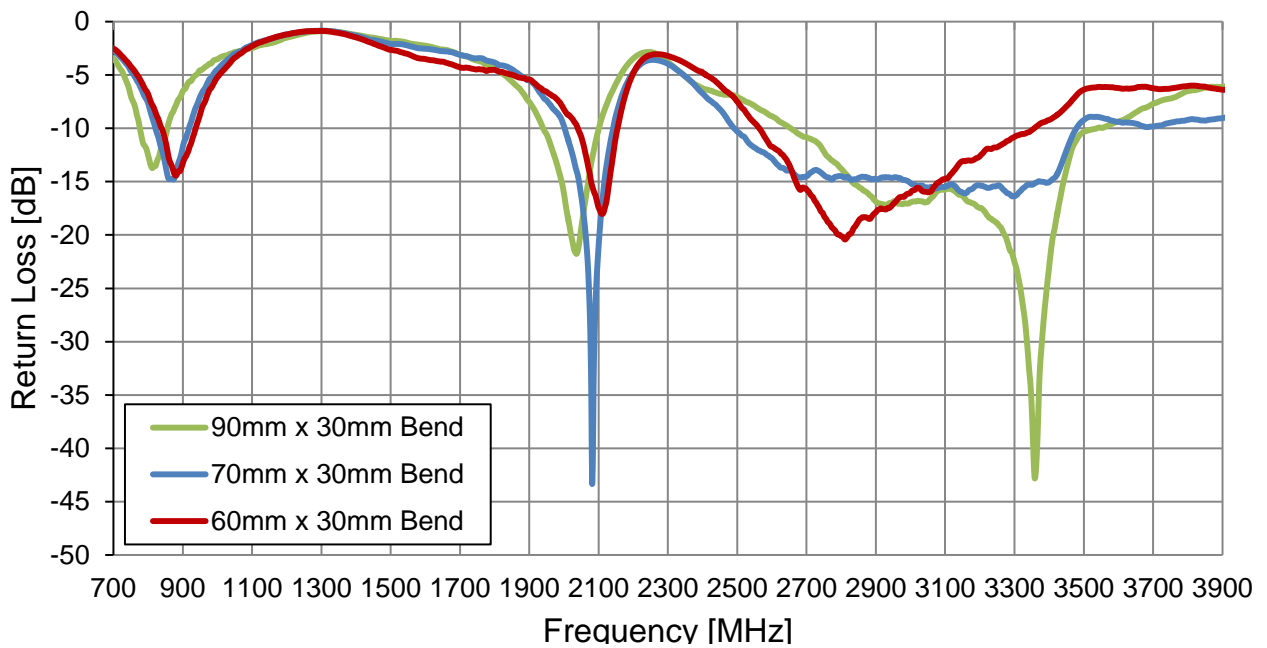
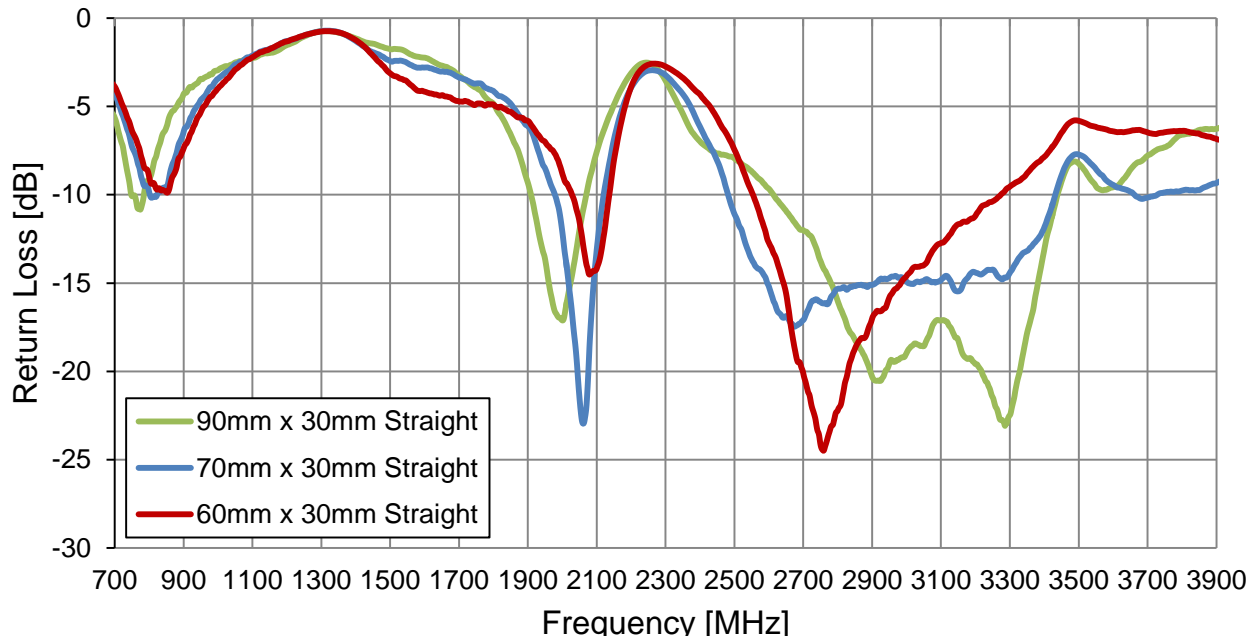
Three different ground planes were chosen. They were all 30mm wide and the lengths were varied beginning at 90mm then 70mm and finally 60mm



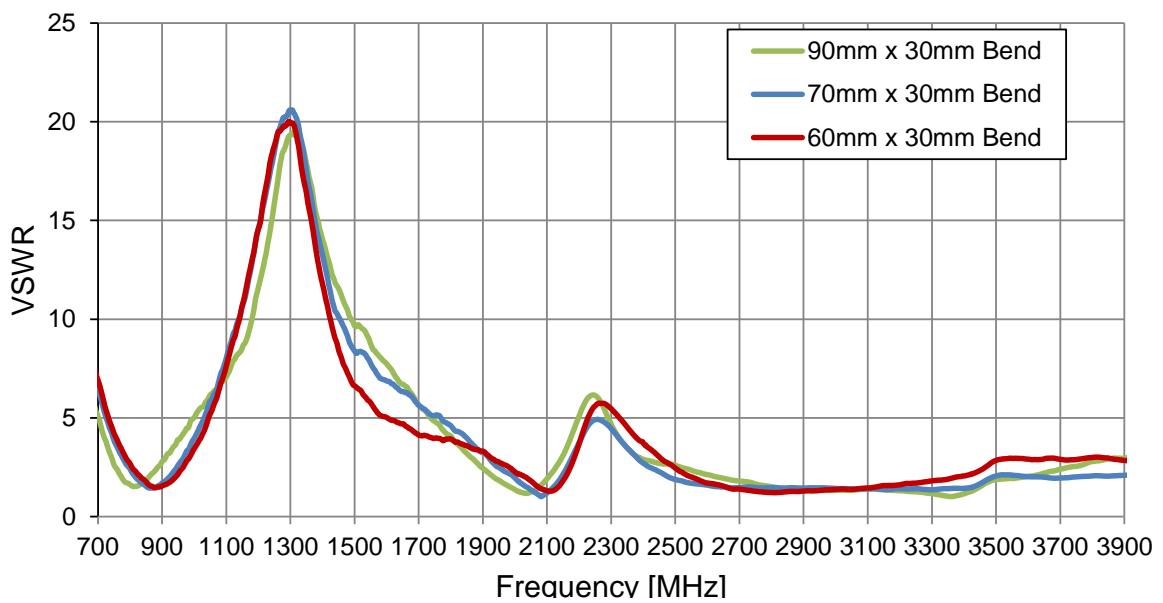
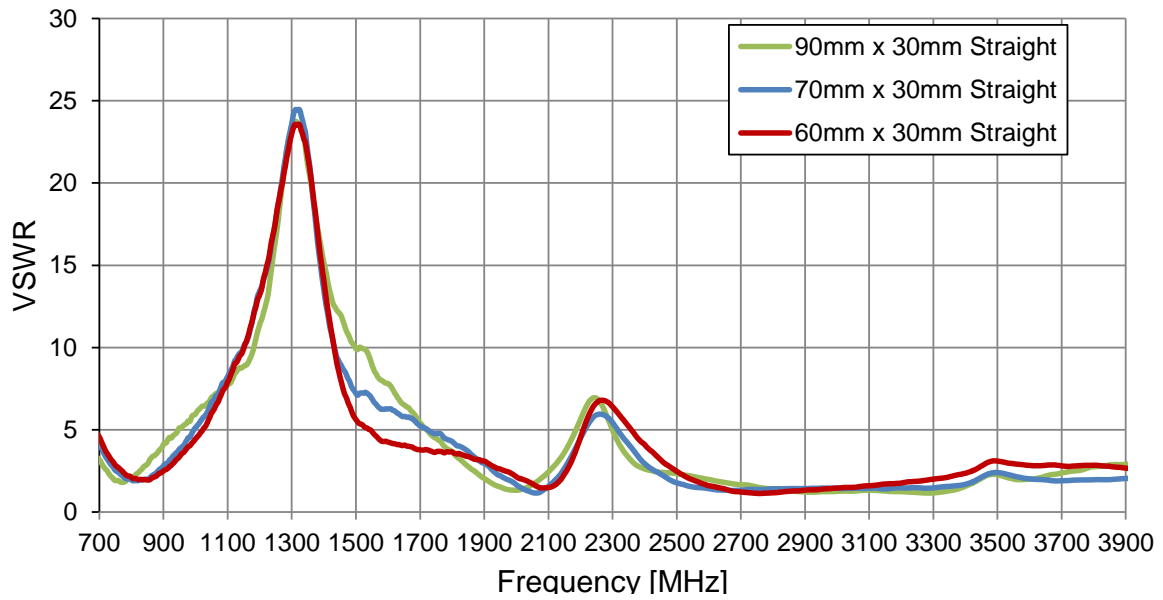
It was also considered whether the TG.09 antenna was positioned straight or at an angle of 90°. The antenna was positioned on the edge of the Ground Plane for all tests.

| Parameter | | | | | | | | | |
|--------------------|--------------------------|-------------|-------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Straight Pose | | | | | | | | | |
| Frequency (MHz) | | 703~ 803 | 824~ 960 | 1710~ 1880 | 1850~ 1990 | 1920~ 2170 | 2300~ 2400 | 2490~ 2690 | 3300~ 3800 |
| Average Gain (dBi) | 90mm x 30mm Ground | -1.4 | -3.2 | -3.2 | -1.9 | -2.3 | -5.1 | -2.0 | -3.8 |
| Efficiency (%) | | 72% | 49% | 48% | 64% | 59% | 31% | 63% | 42% |
| Peak Gain (dBi) | | 2.0 | 1.9 | 2.7 | 3.2 | 3.6 | 1.3 | 5.2 | 2.7 |
| Return Loss (dB) | | 9 | 4.8 | 5.1 | 11.4 | 11.1 | 5.3 | 9.6 | 9.5 |
| Average Gain (dBi) | 70mm x 30mm Ground | -2.7 | -2.7 | -3.4 | -2.2 | -1.8 | -5.7 | -1.5 | -3.9 |
| Efficiency (%) | | 53% | 54% | 45% | 60% | 67% | 28% | 70% | 42% |
| Peak Gain (dBi) | | 1.8 | 2.0 | 1.5 | 3.5 | 4.3 | 1.7 | 4.3 | 3.7 |
| Return Loss (dB) | | 7.3 | 7.1 | 4.2 | 7.3 | 12.4 | 4.4 | 14.7 | 8.9 |
| Average Gain (dBi) | 60mm x 30mm Ground | -3.9 | -2.9 | -2.9 | -2.4 | -1.6 | -7.3 | -1.4 | -4.3 |
| Efficiency (%) | | 41% | 50% | 51% | 58% | 69% | 20% | 72% | 37% |
| Peak Gain (dBi) | | 1.1 | 1.3 | 2.1 | 3.0 | 4.1 | 0.4 | 4.5 | 3.0 |
| Return Loss (dB) | | 6.5 | 7.7 | 5.0 | 6.4 | 9.9 | 3.4 | 12.4 | 6.3 |
| 90° Bend Pose | | | | | | | | | |
| Average Gain (dBi) | 90mm x 30mm Ground | -1.7 | -2.4 | -3.5 | -2.1 | -2.1 | -5.3 | -2.1 | -3.3 |
| Efficiency (%) | | 68% | 58% | 45% | 61% | 61% | 30% | 61% | 47% |
| Peak Gain (dBi) | | 2.7 | 2.5 | 2.1 | 3.1 | 3.5 | 1.6 | 5.2 | 3.4 |
| Return Loss (dB) | | 7.5 | 7.6 | 4.5 | 9.1 | 12.5 | 5.1 | 8.7 | 12.3 |
| Average Gain (dBi) | 70mm x 30mm Ground | -4.2 | -2.3 | -3.7 | -2.5 | -1.8 | -4.6 | -1.5 | -3.4 |
| Efficiency (%) | | 39% | 59% | 42% | 56% | 67% | 35% | 70% | 46% |
| Peak Gain (dBi) | | 1.4 | 1.7 | 1.4 | 3.2 | 4.3 | 2.1 | 4.1 | 4.1 |
| Return Loss (dB) | | 4.9 | 11.2 | 3.9 | 6.4 | 13.5 | 5.2 | 12.6 | 10.6 |
| Average Gain (dBi) | 60mm x 30mm Ground | -5.6 | -3.0 | -3.2 | -2.6 | -1.7 | -5.9 | -1.4 | -3.9 |
| Efficiency (%) | | 28% | 50% | 47% | 54% | 68% | 26% | 73% | 41% |
| Peak Gain (dBi) | | 0.0 | 1.0 | 1.8 | 3.0 | 3.8 | 1.1 | 4.3 | 3.3 |
| Return Loss (dB) | | 4.4 | 11.5 | 4.6 | 6.0 | 10.8 | 3.9 | 11.2 | 7.0 |

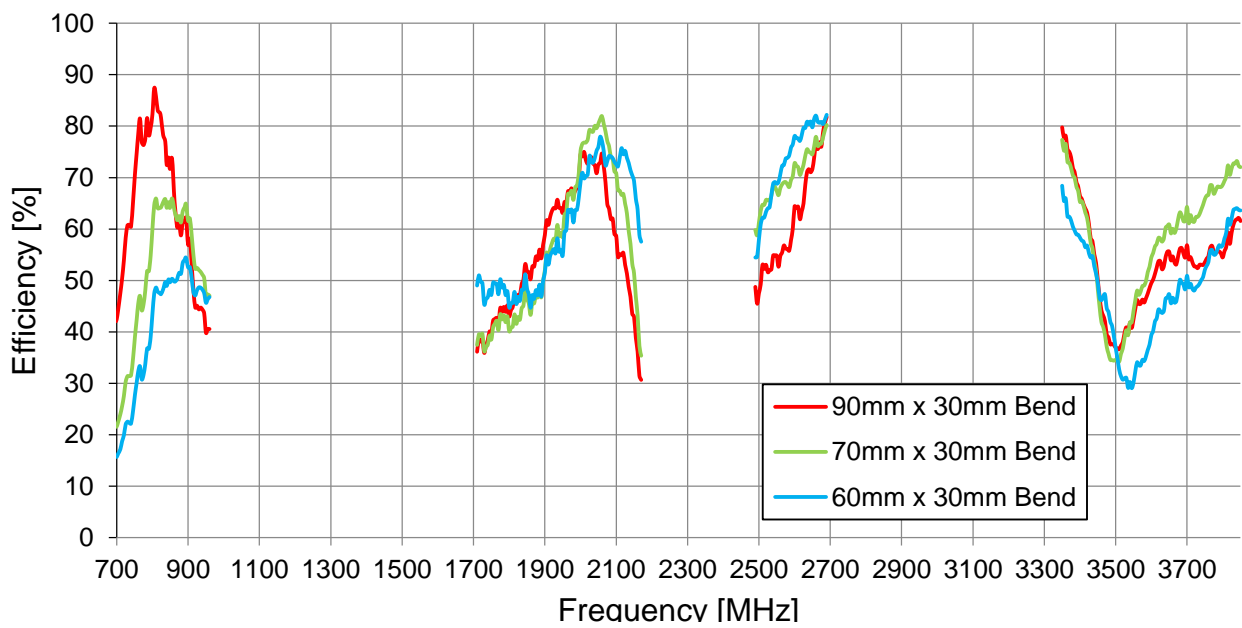
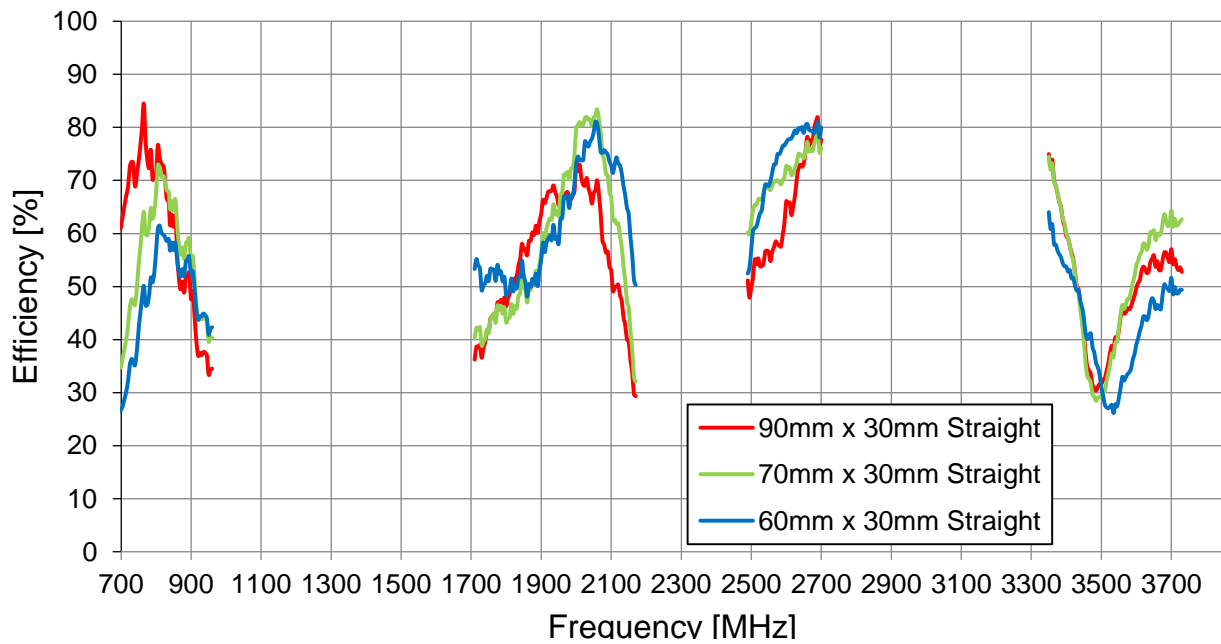
8.1 Return Loss



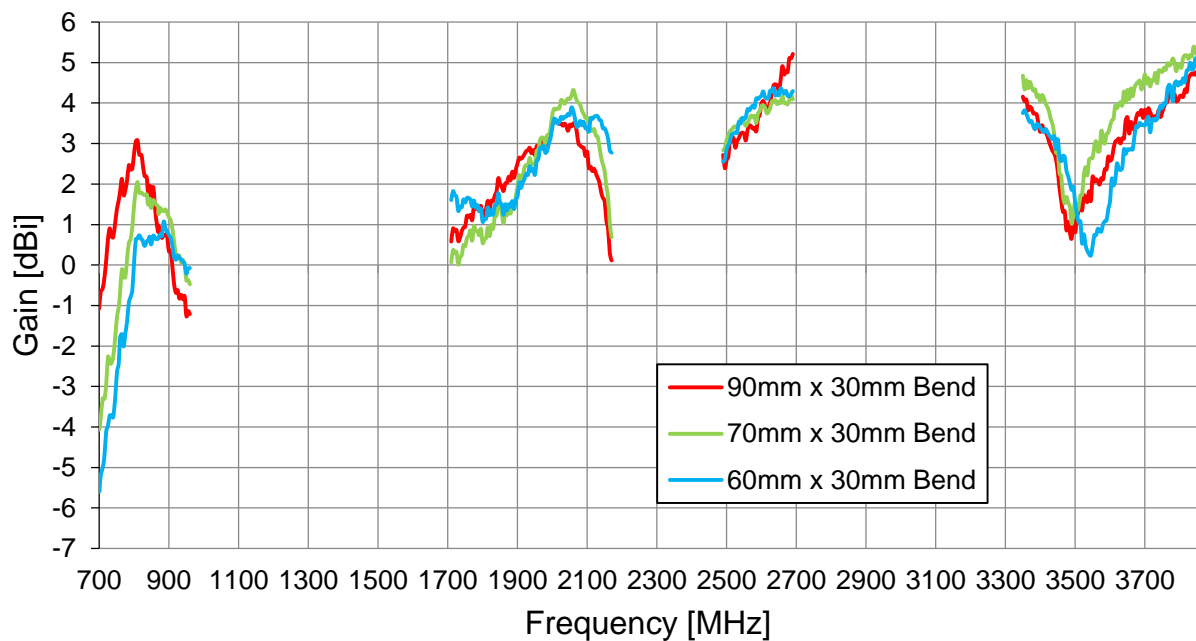
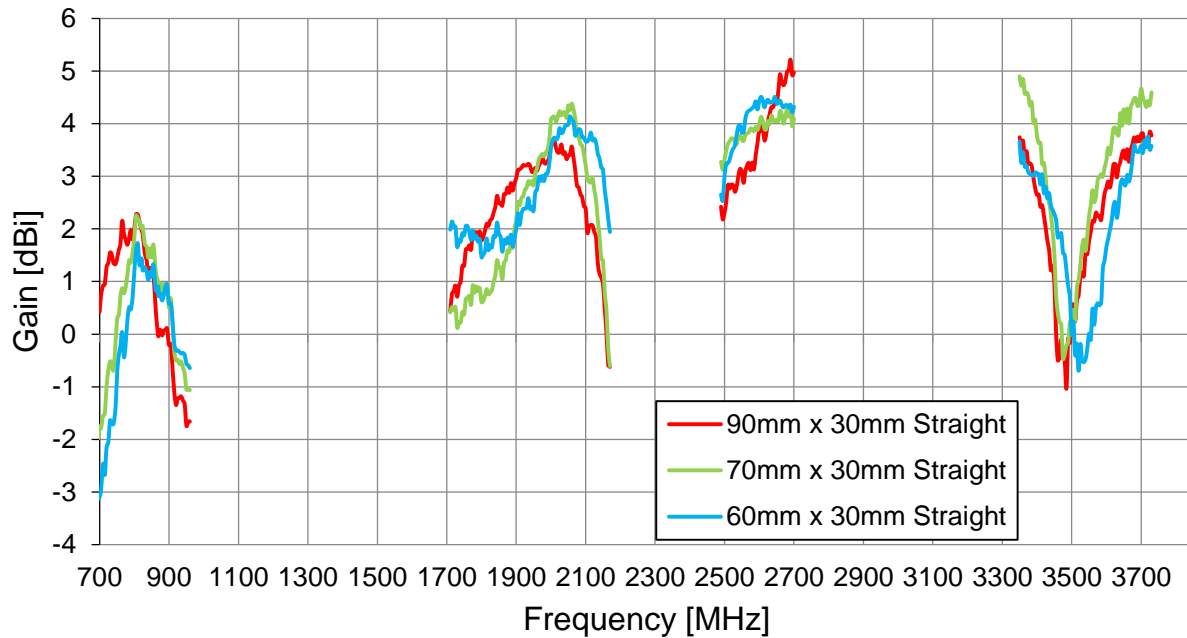
8.2 VSWR



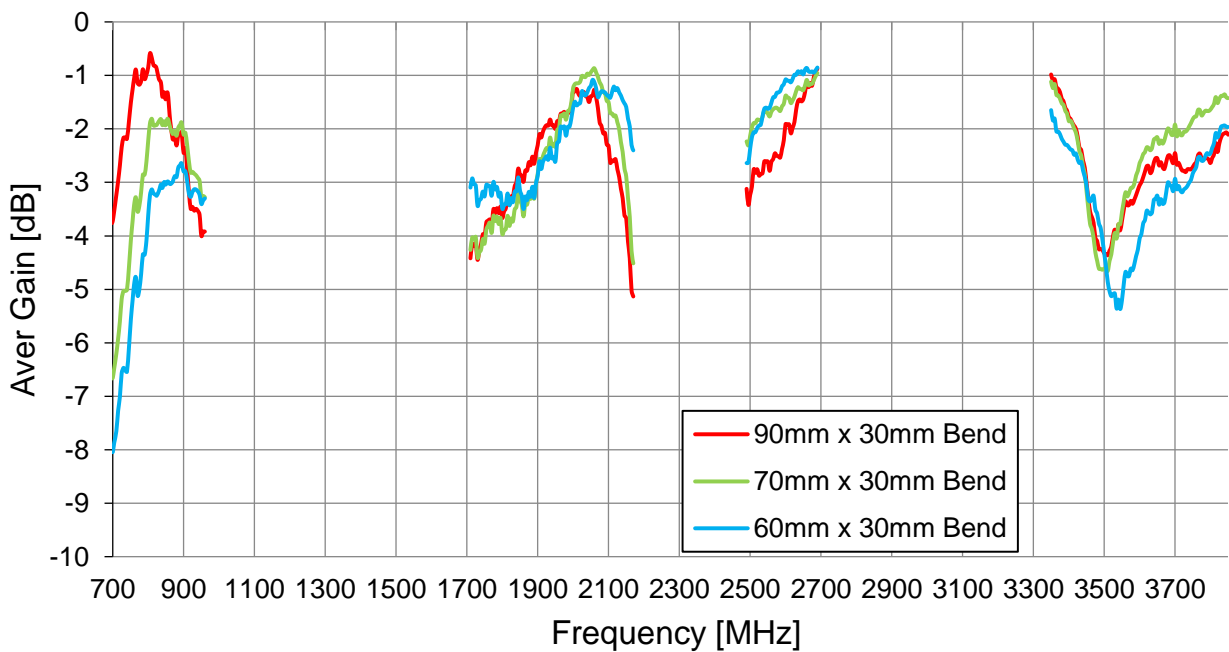
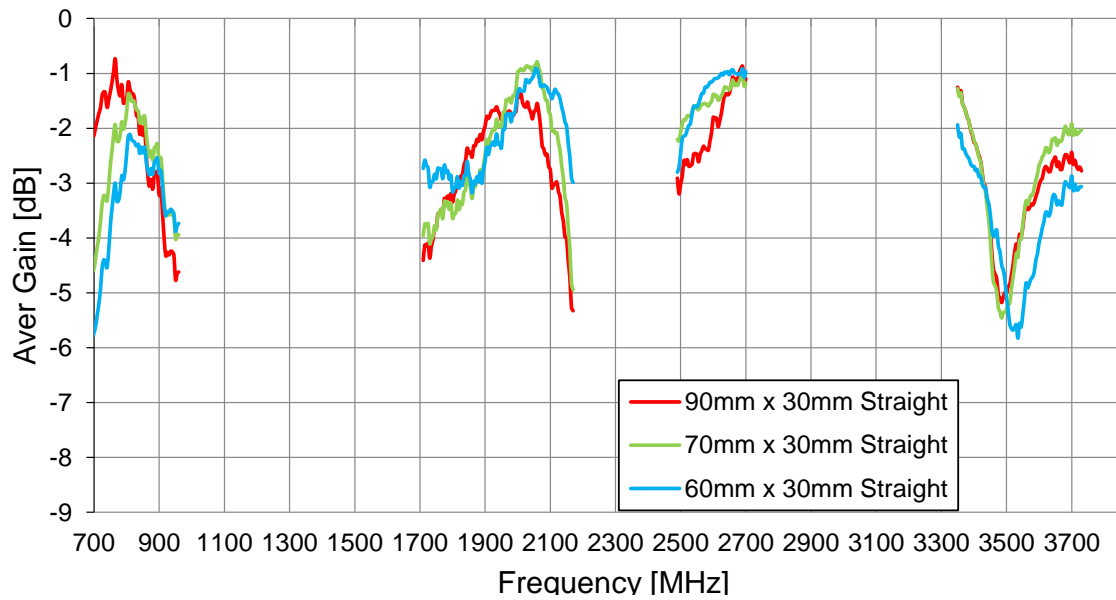
8.3 Efficiency



8.4 Peak Gain



8.5 Average Gain



Changelog for the datasheet

SPE-11-8-034 – TG.09.0113W

Revision: G (Current Version)

| | |
|------------------|--------------------------------------|
| Date: | 2020-04-09 |
| Changes: | Updated Data, Packaging and Template |
| Changes Made by: | Jack Conroy |

Previous Revisions

Revision: F

| | |
|------------------|--------------|
| Date: | 2018-11-14 |
| Changes: | Updated Data |
| Changes Made by: | Jack Conroy |

Revision: A (Original First Release)

| | |
|---------|------------------|
| Date: | 2010-03-29 |
| Notes: | |
| Author: | Technical Writer |

Revision: E

| | |
|------------------|----------------|
| Date: | 2016-10-17 |
| Changes: | Update 4G data |
| Changes Made by: | Andy Mahoney |

Revision: D

| | |
|------------------|------------|
| Date: | 2012-06-19 |
| Changes: | |
| Changes Made by: | Aine Doyle |

Revision: C

| | |
|------------------|------------------|
| Date: | 2011-08-05 |
| Changes: | |
| Changes Made by: | Technical Writer |

Revision: B

| | |
|------------------|------------------|
| Date: | 2011-07-14 |
| Changes: | |
| Changes Made by: | Technical Writer |



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