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

1.	Introduction	3
2.	Specifications	4
3.	Antenna Characteristics	7
4.	Radiation Patterns	12
5.	Mechanical Drawing	28
6.	Installation	29
7.	Packaging	30
8.	Application Note	31
	Changelog	38

Taoglas makes no warranties based on the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Taoglas reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permission is strictly prohibited.

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 fight 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							

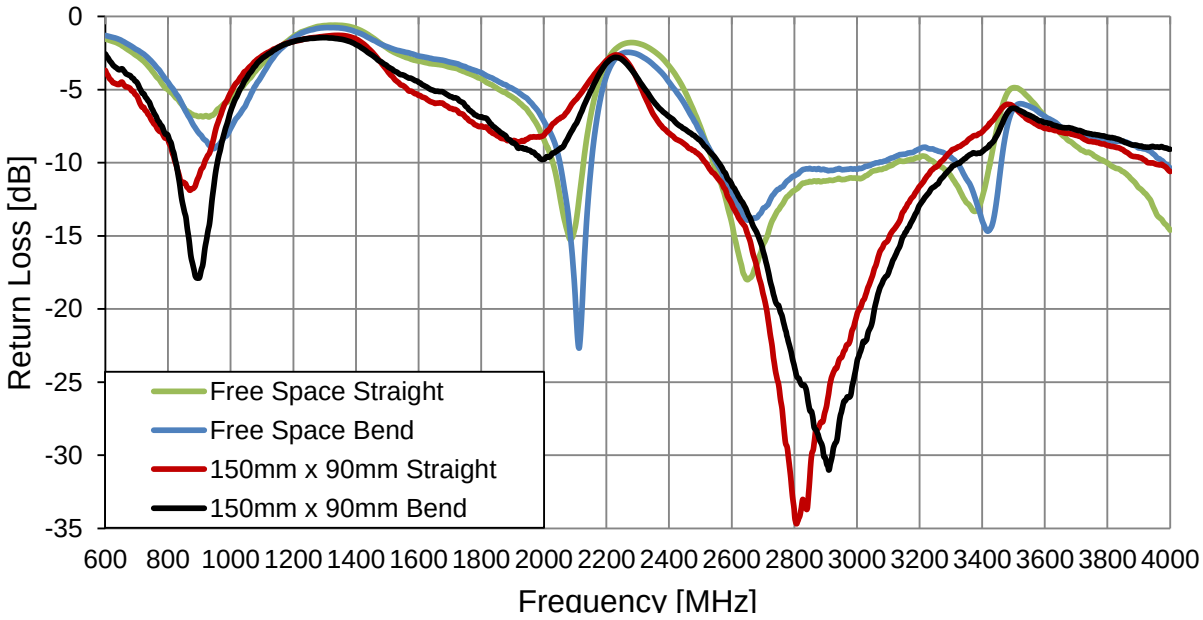
Mechanical	
Antenna Length	72mm
Antenna Diameter	10mm
Casing	POM
Connector	SMA Male Hinged
Weight	8g
Environmental	
Temperature Range	-40°C to +85°C
Humidity	Non-condensing 65°C 95% RH

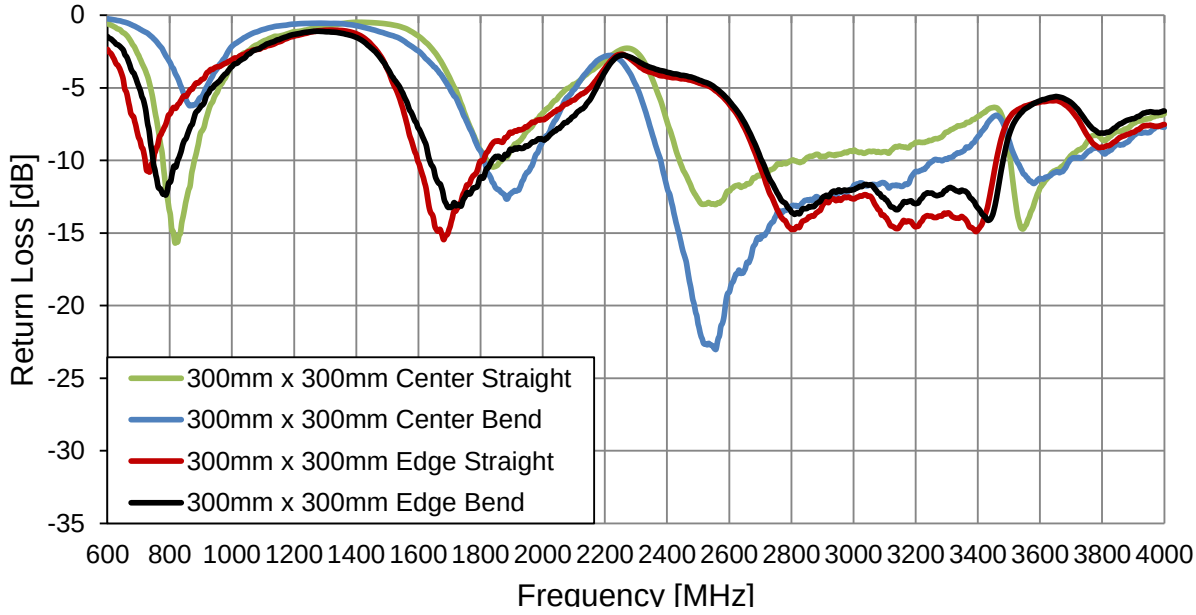
5G/4G Bands			
Band Number	5GNR / FR1 / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA		
	Uplink	**Downlink**	**Covered**
1	UL: 1920 to 1980	DL: 2110 to 2170	✓
2	UL: 1850 to 1910	DL: 1930 to 1990	✓
3	UL: 1710 to 1785	DL: 1805 to 1880	✓
4	UL: 1710 to 1755	DL: 2110 to 2155	✓
5	UL: 824 to 849	DL: 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

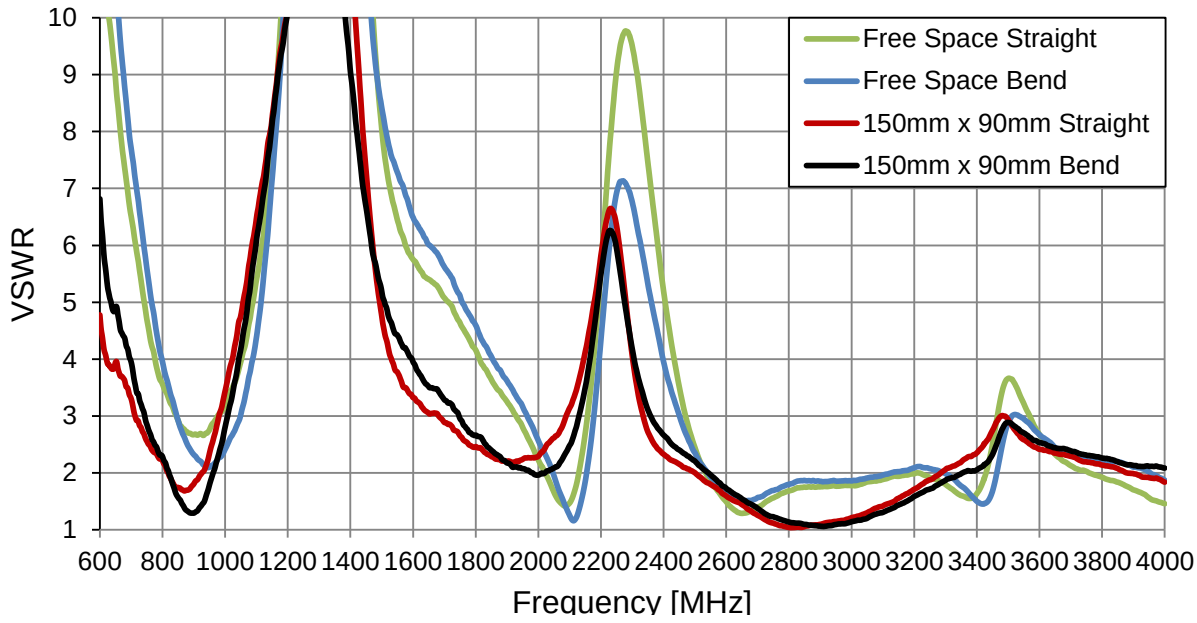
3. Antenna Characteristics

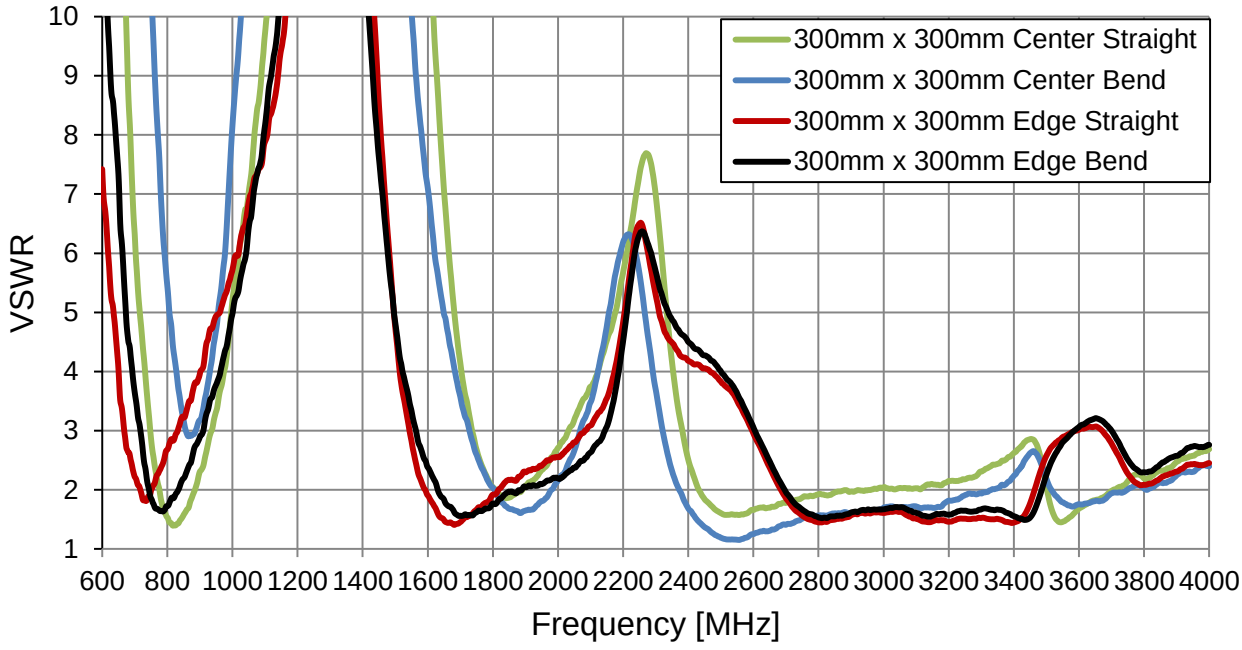
3.1 Return Loss



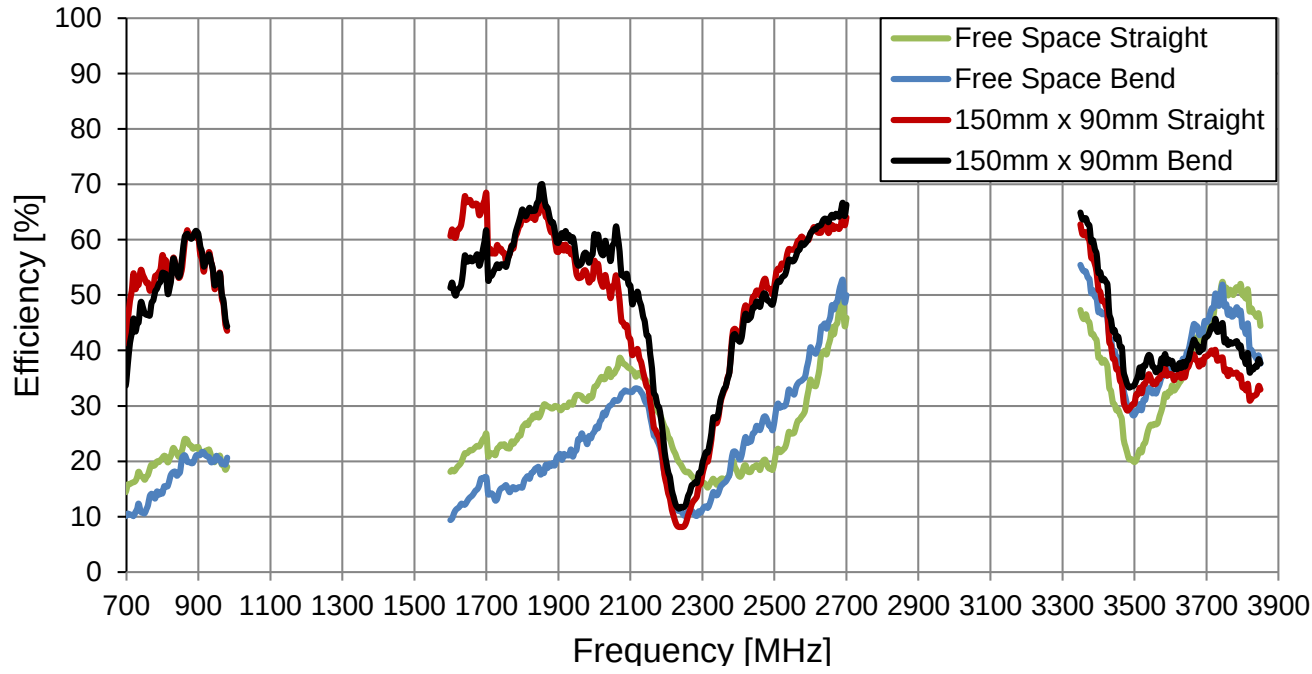


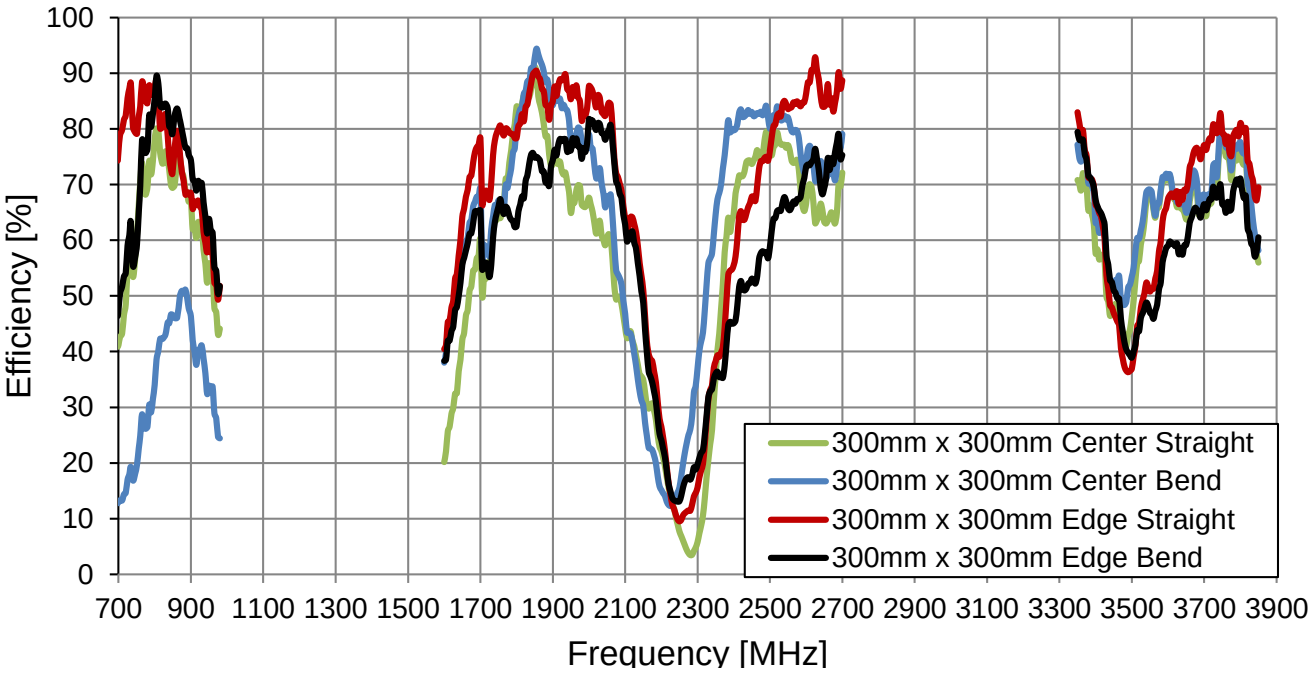
3.2 VSWR


Free Space Straight
Free Space Bend
150mm x 90mm Straight
150mm x 90mm Bend
VSWR
Frequency [MHz]

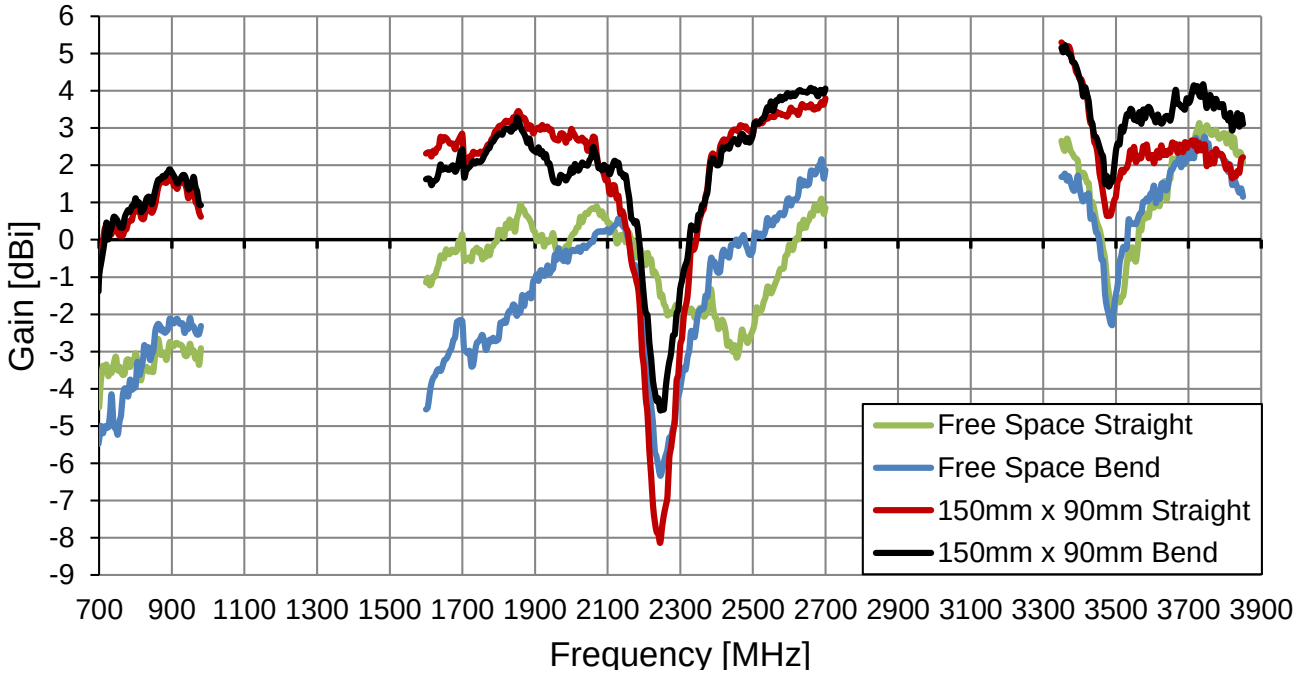

300mm x 300mm Center Straight
300mm x 300mm Center Bend
300mm x 300mm Edge Straight
300mm x 300mm Edge Bend
VSWR
Frequency [MHz]

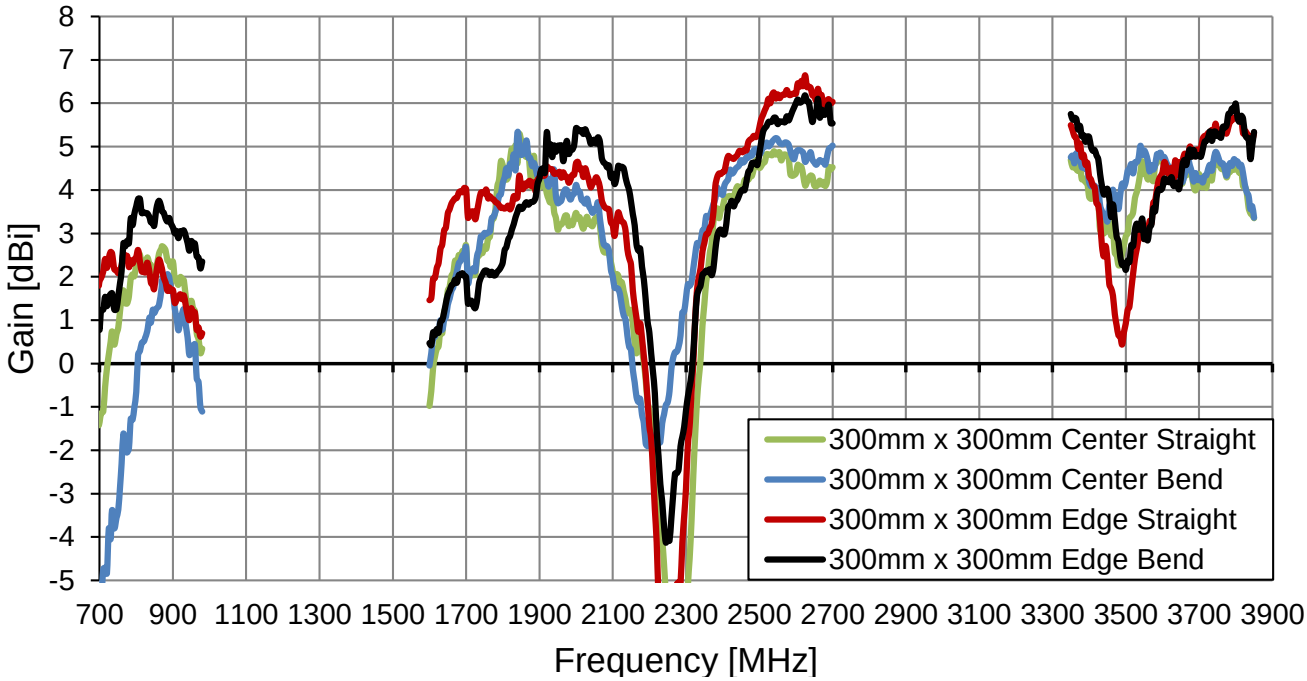
3.3 Efficiency



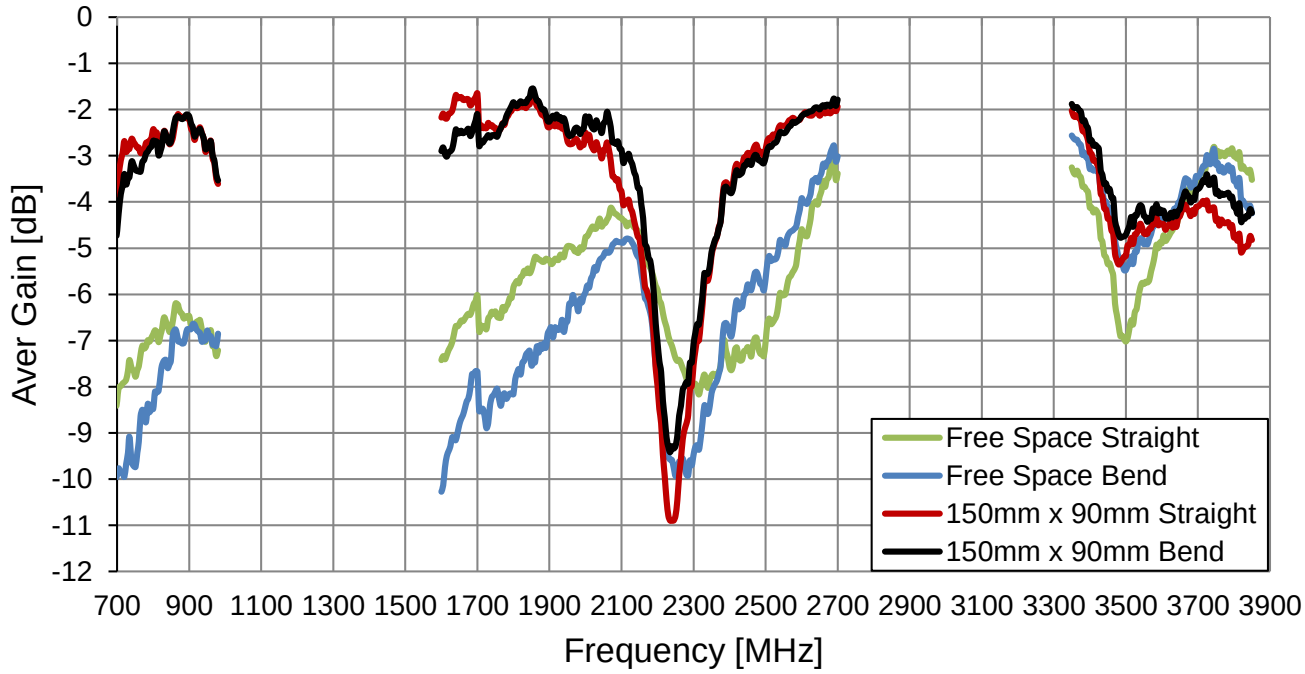


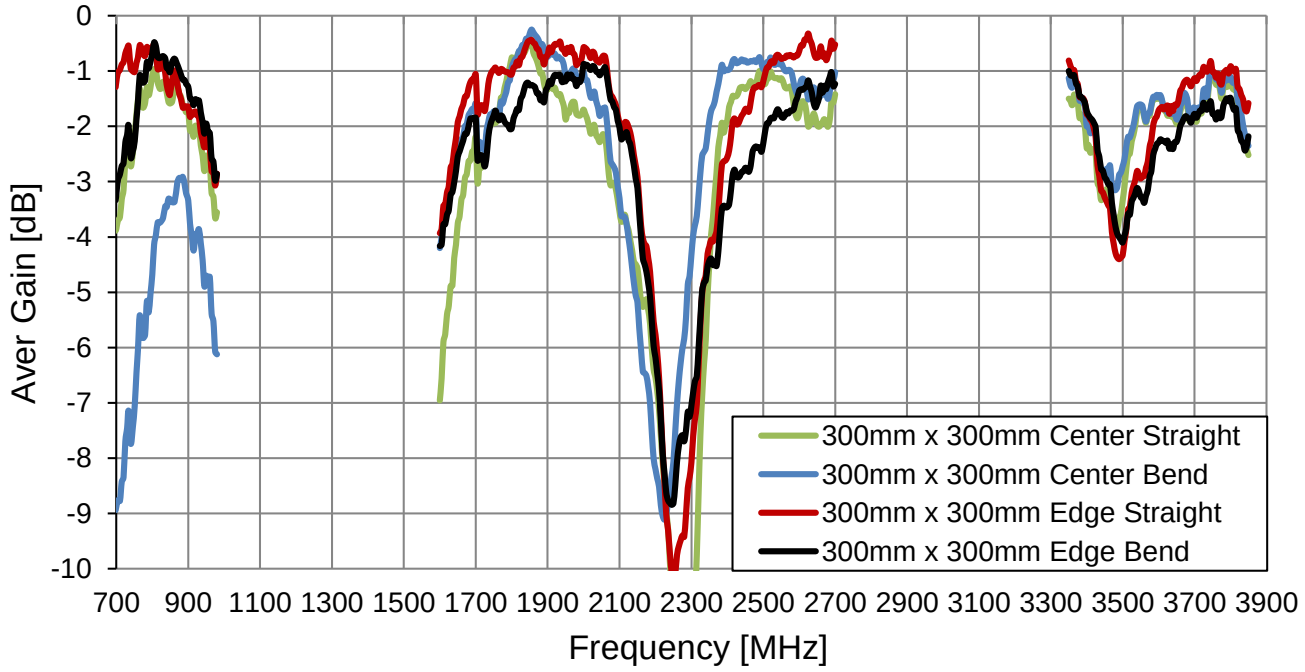
3.4 Peak Gain


Gain [dBi]
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
700 900 1100 1300 1500 1700 1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900
Frequency [MHz]
Free Space Straight
Free Space Bend
150mm x 90mm Straight
150mm x 90mm Bend


Gain [dBi]
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
700 900 1100 1300 1500 1700 1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900
Frequency [MHz]
300mm x 300mm Center Straight
300mm x 300mm Center Bend
300mm x 300mm Edge Straight
300mm x 300mm Edge Bend

3.5 Average Gain

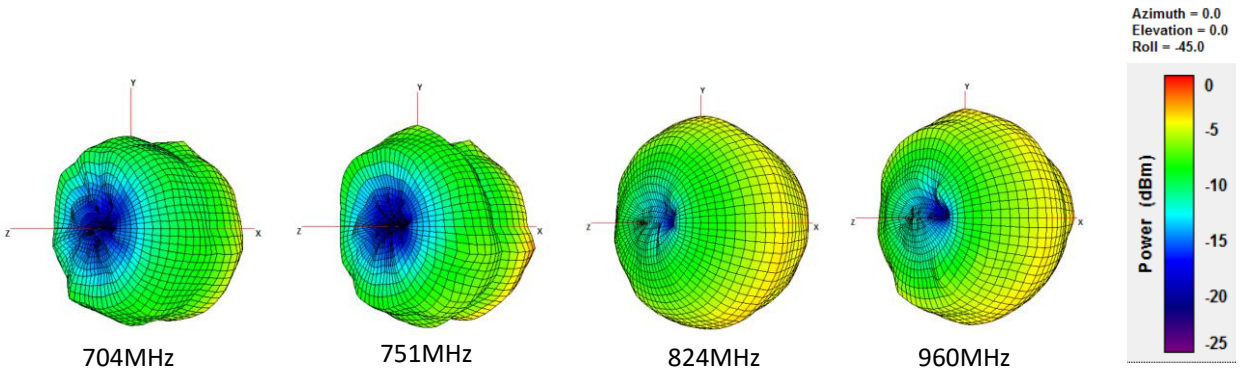




4. Radiation Patterns

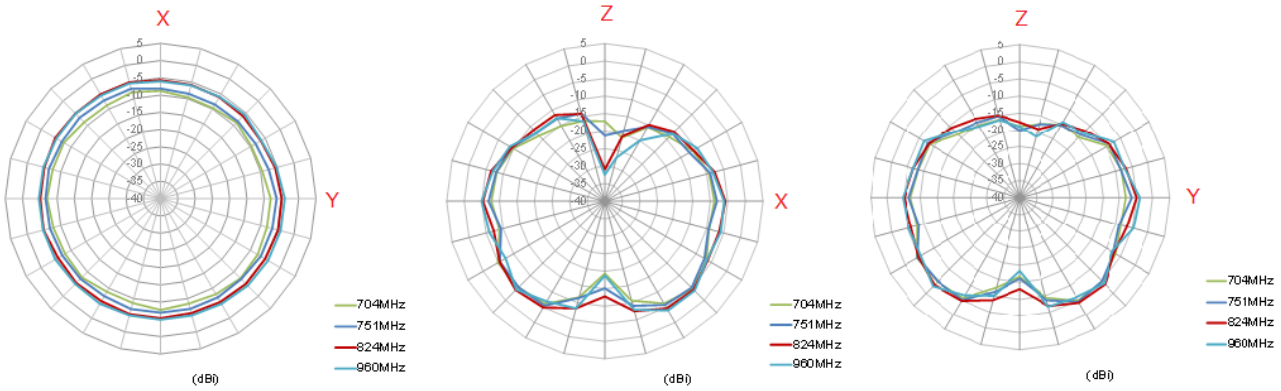
4.1 Free Space – Straight 3D and 2D Radiation Patterns

704-960MHz

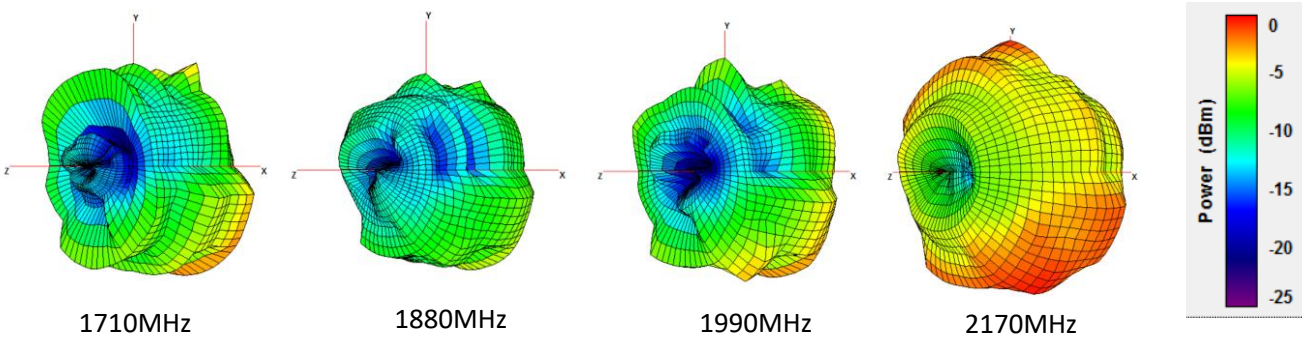


704MHz 751MHz 824MHz 960MHz

XY Plane	XZ Plane	YZ Plane

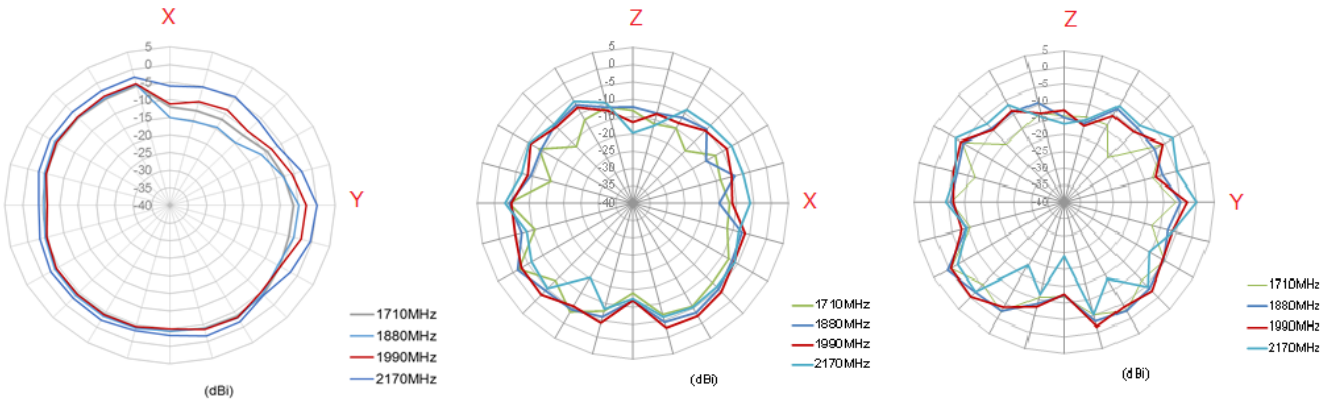


1710-2170MHz

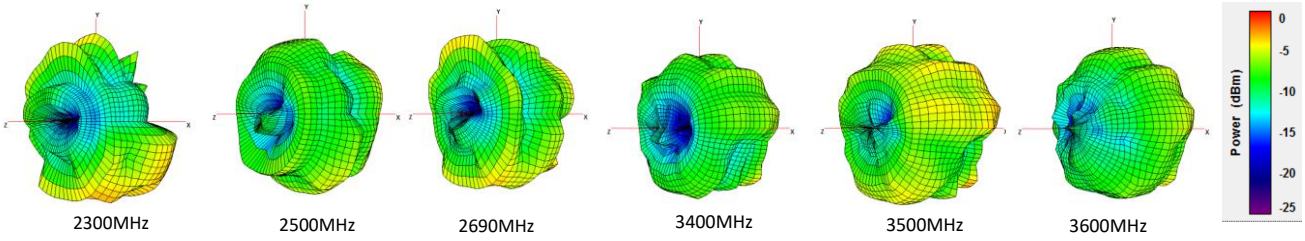


1710MHz 1880MHz 1990MHz 2170MHz

XY Plane	XZ Plane	YZ Plane

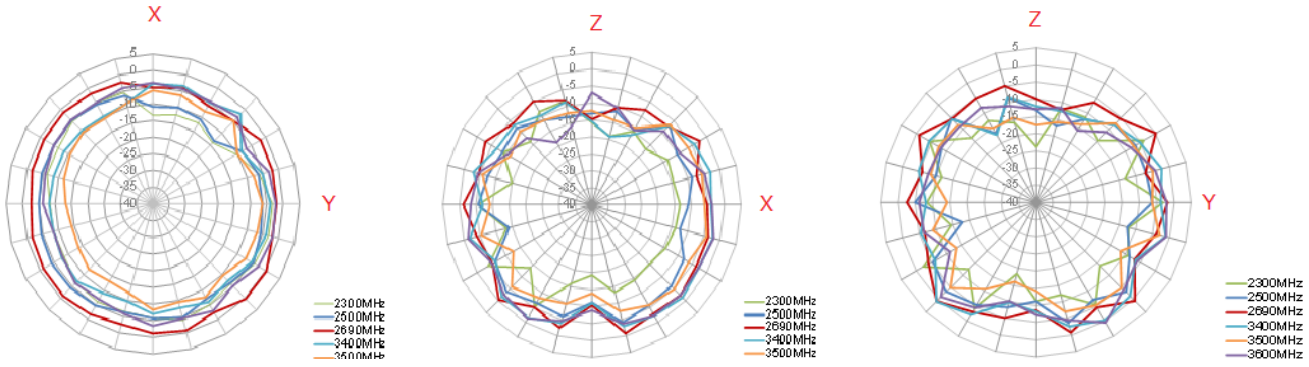


2300-3600MHz



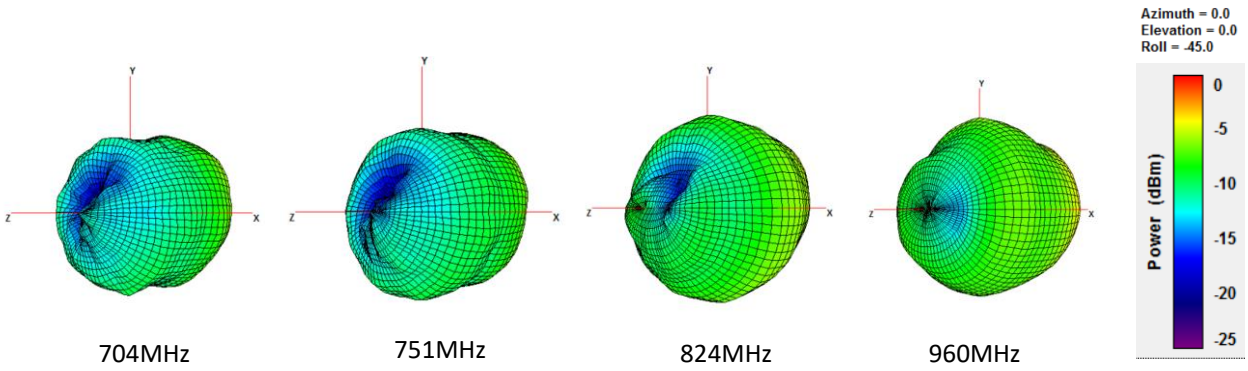
2300MHz 2500MHz 2690MHz 3400MHz 3500MHz 3600MHz

XY Plane	XZ Plane	YZ Plane



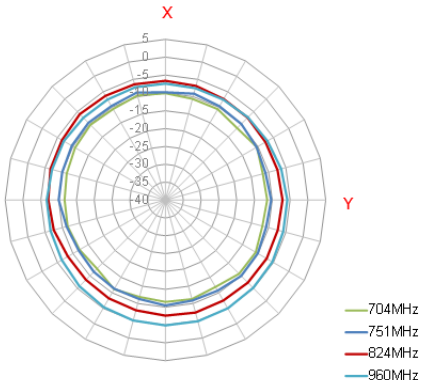
4.2 Free Space – Bent 3D and 2D Radiation Patterns

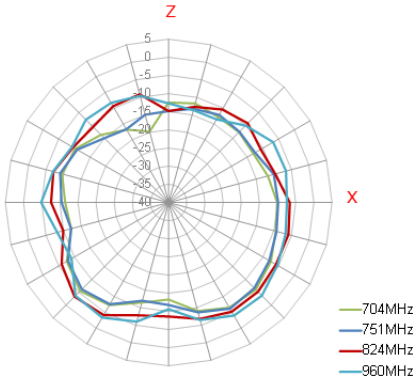
704-960MHz

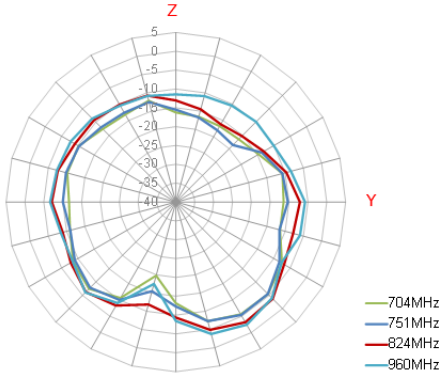


704MHz | 751MHz | 824MHz | 960MHz

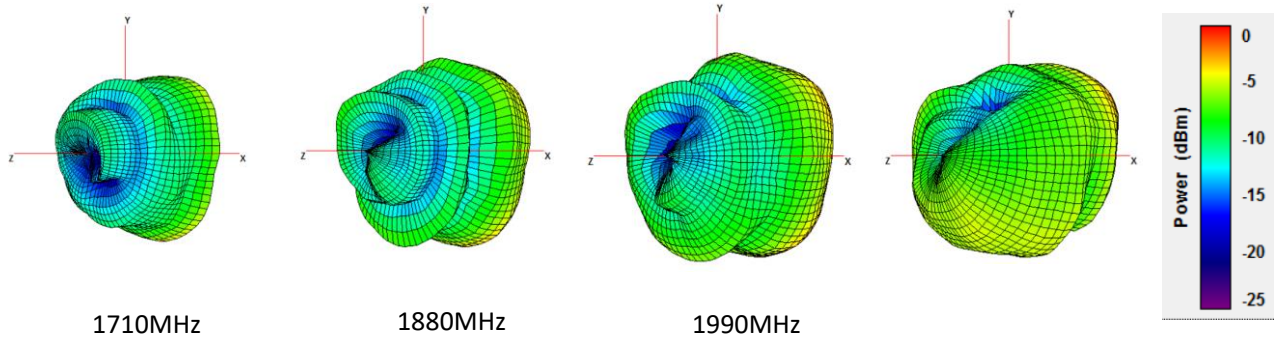
XY Plane	XZ Plane	YZ Plane





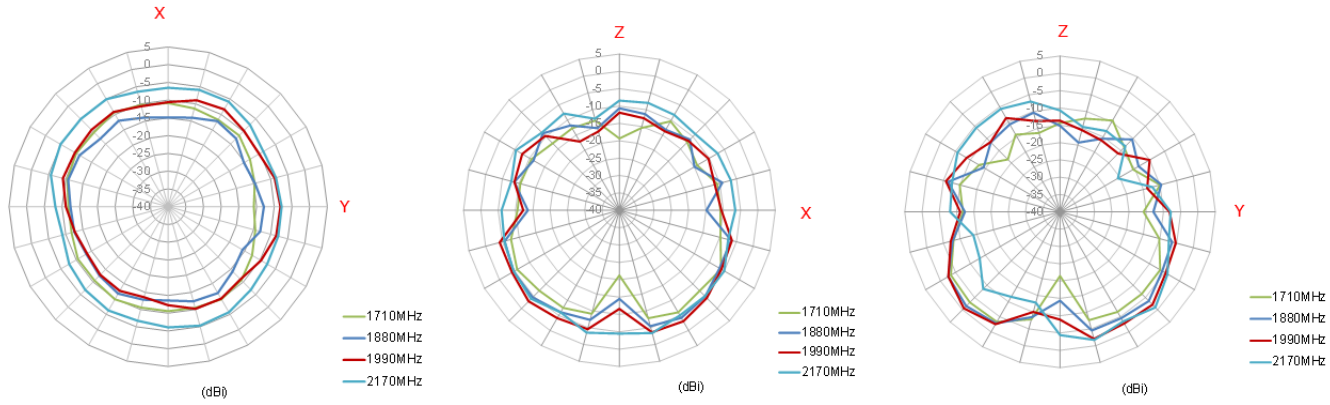


1710-2170MHz

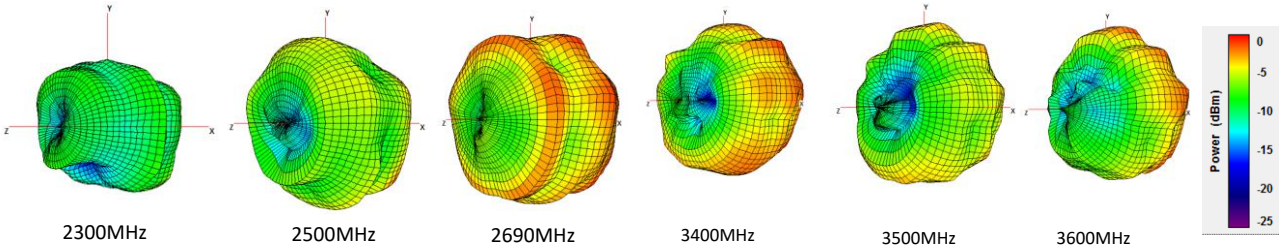


1710MHz 1880MHz 1990MHz

XY Plane	XZ Plane	YZ Plane

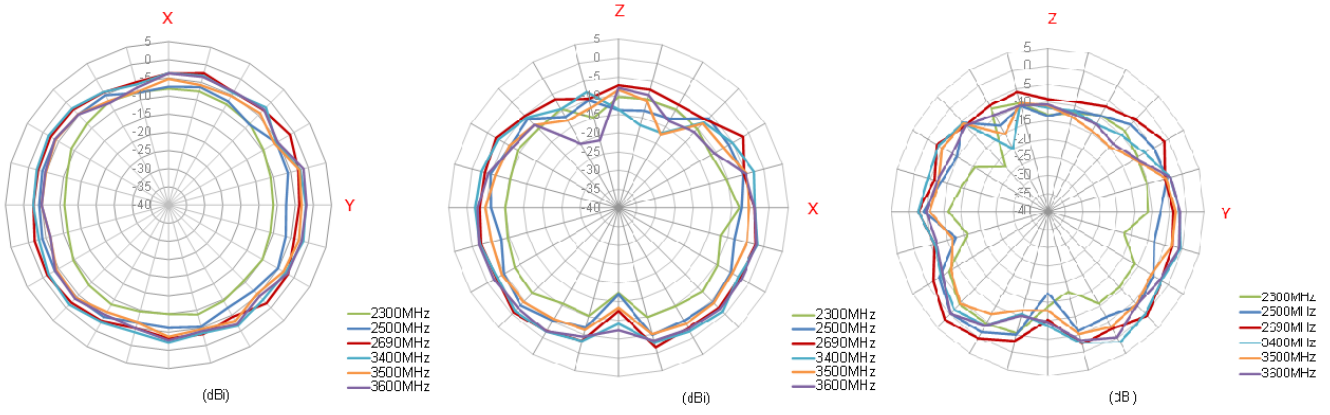


2300-3600MHz



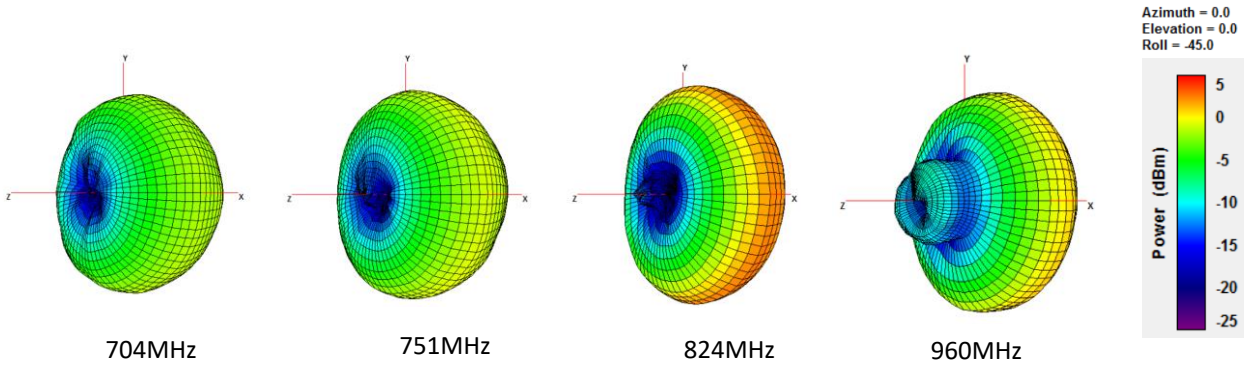
2300MHz 2500MHz 2690MHz 3400MHz 3500MHz 3600MHz

XY Plane	XZ Plane	YZ Plane

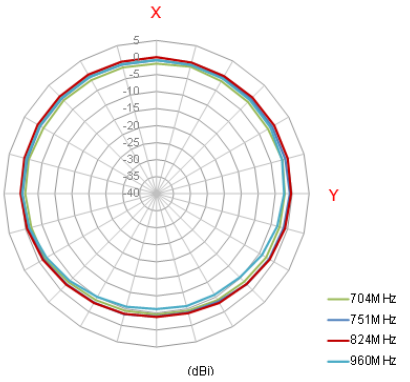
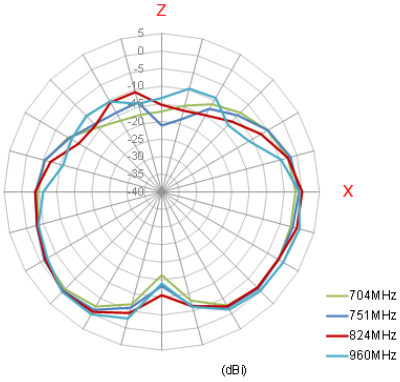
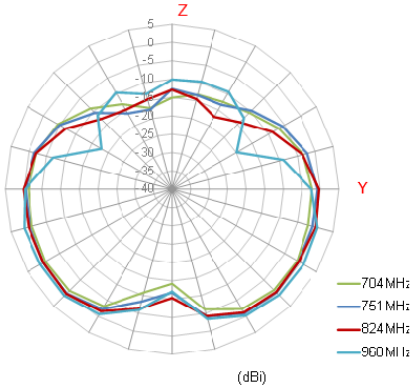


4.3 150*90mm – Straight 3D and 2D Radiation Patterns

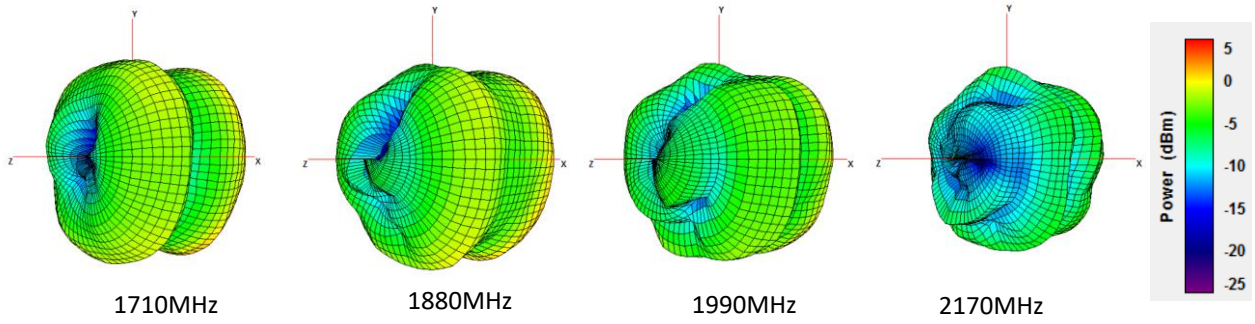
704-960MHz



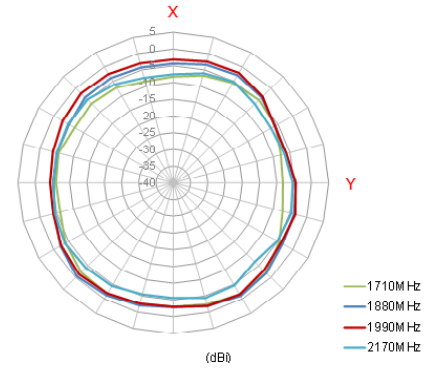
704MHz 751MHz 824MHz 960MHz

XY Plane	XZ Plane	YZ Plane
		

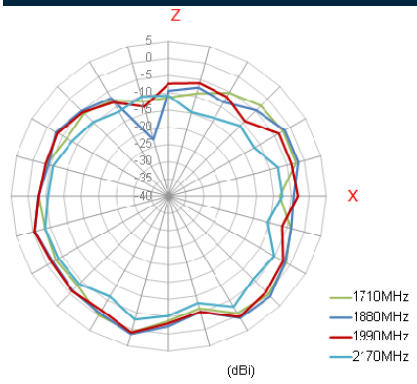
1710-2170MHz



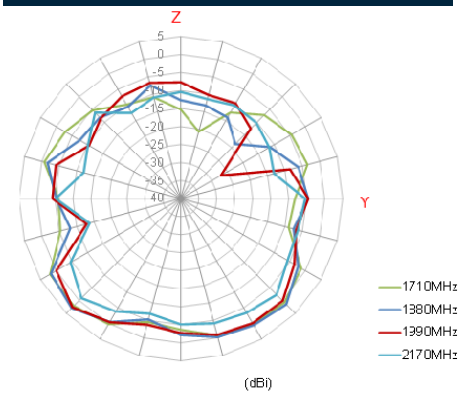
XY Plane



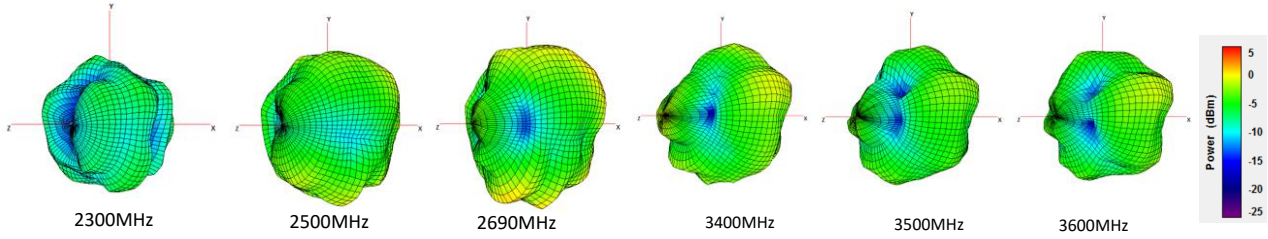
XZ Plane



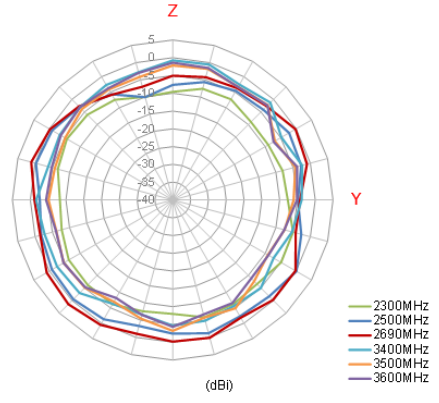
YZ Plane



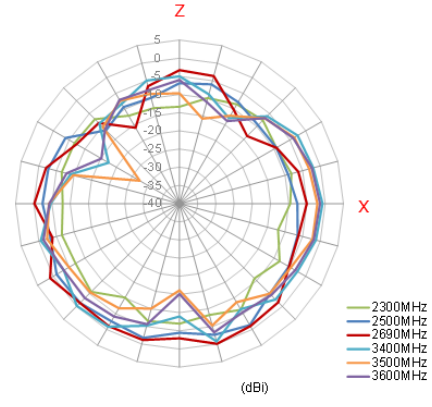
2300-3600MHz



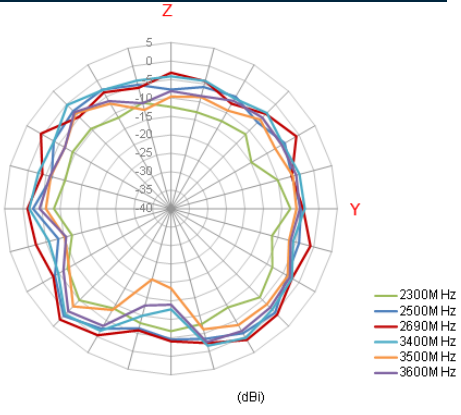
XY Plane



XZ Plane

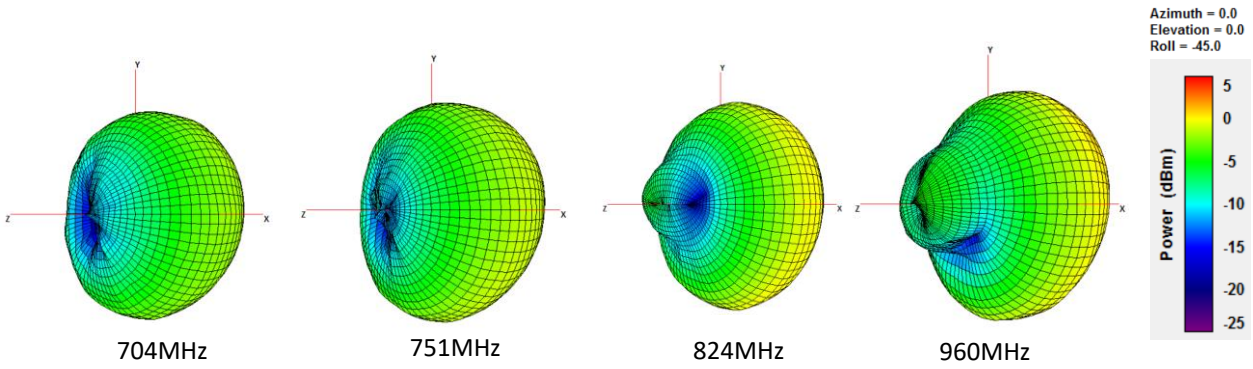


YZ Plane



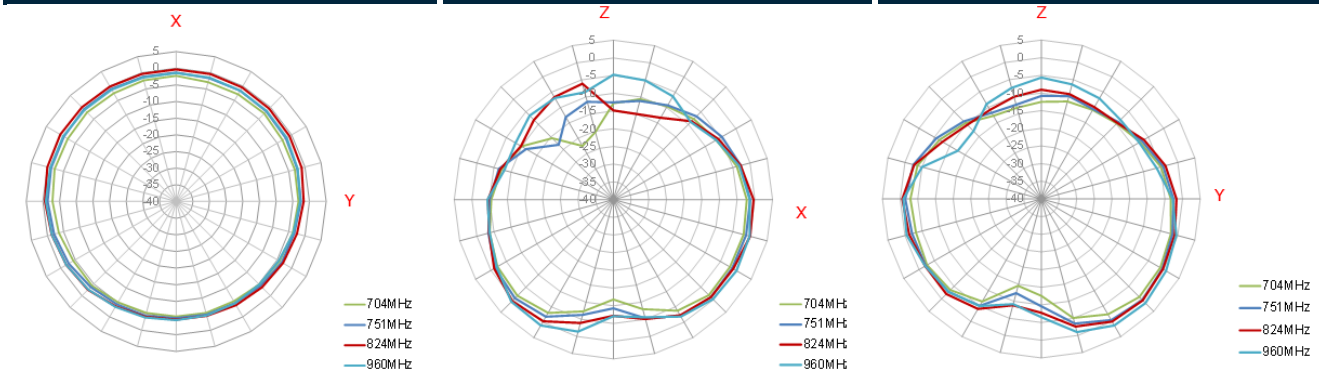
4.4 150*90mm – Bent3D and 2D Radiation Patterns

704-960MHz

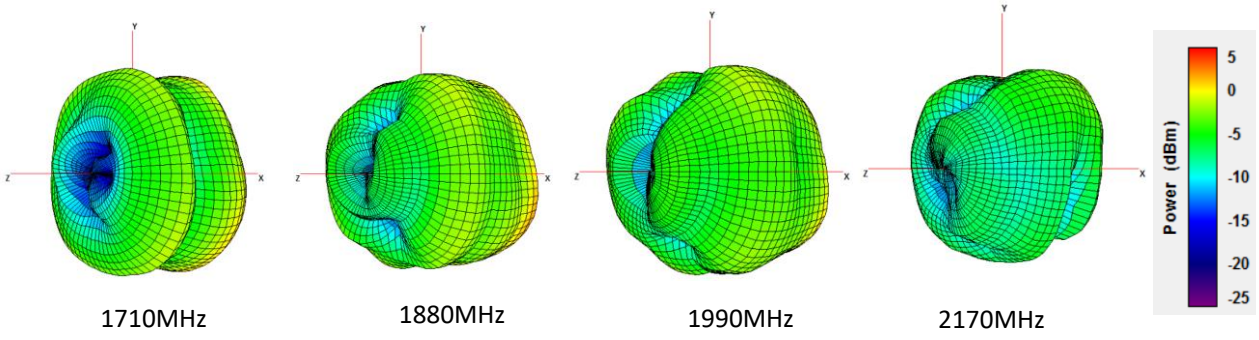


704MHz 751MHz 824MHz 960MHz

XY Plane	XZ Plane	YZ Plane

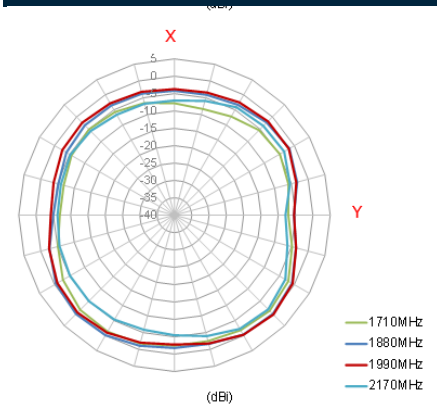


1710-2170MHz

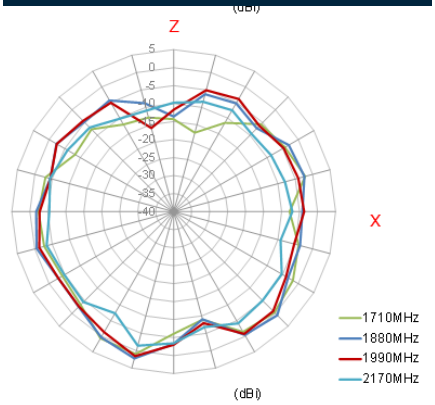


1710MHz 1880MHz 1990MHz 2170MHz

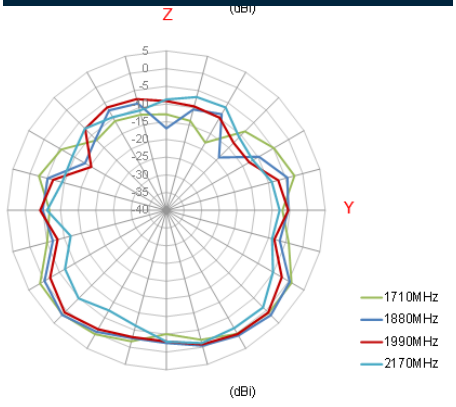
XY Plane



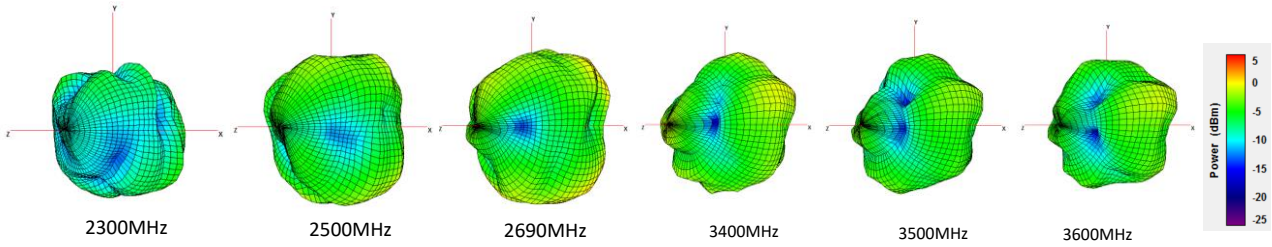
XZ Plane



YZ Plane

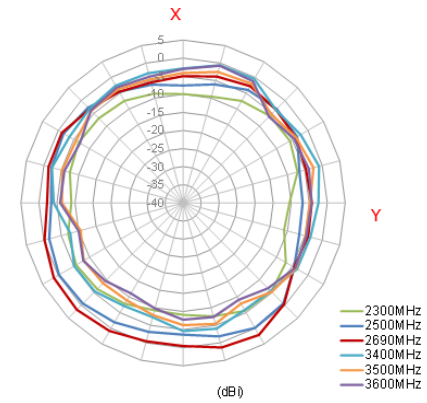


2300-3600MHz

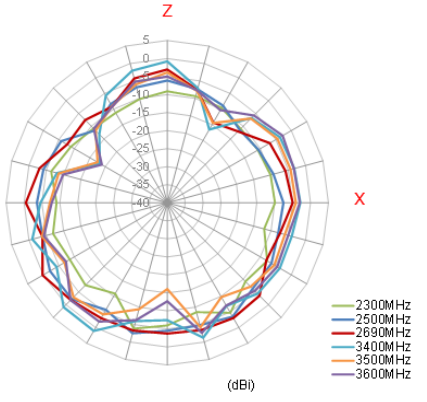


2300MHz 2500MHz 2690MHz 3400MHz 3500MHz 3600MHz

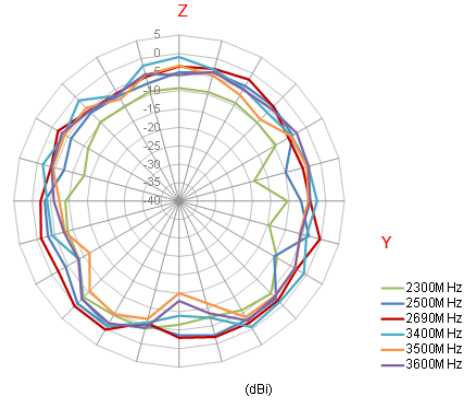
XY Plane



XZ Plane

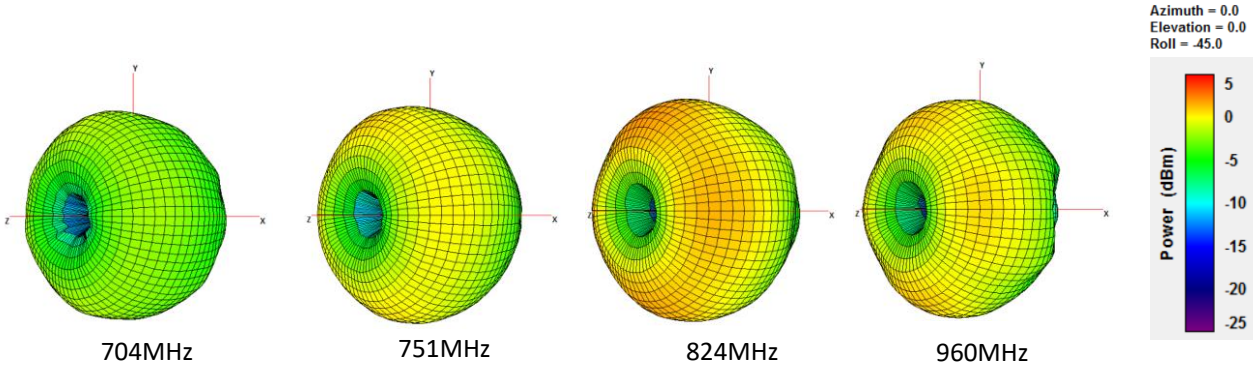


YZ Plane



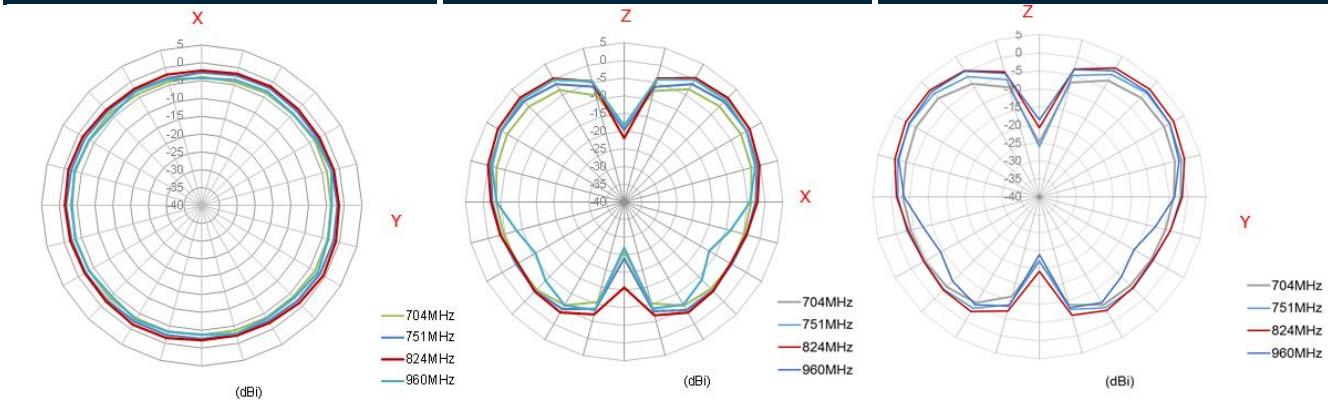
4.5 300*300mm Center – Straight 3D and 2D Radiation Patterns

704-960MHz

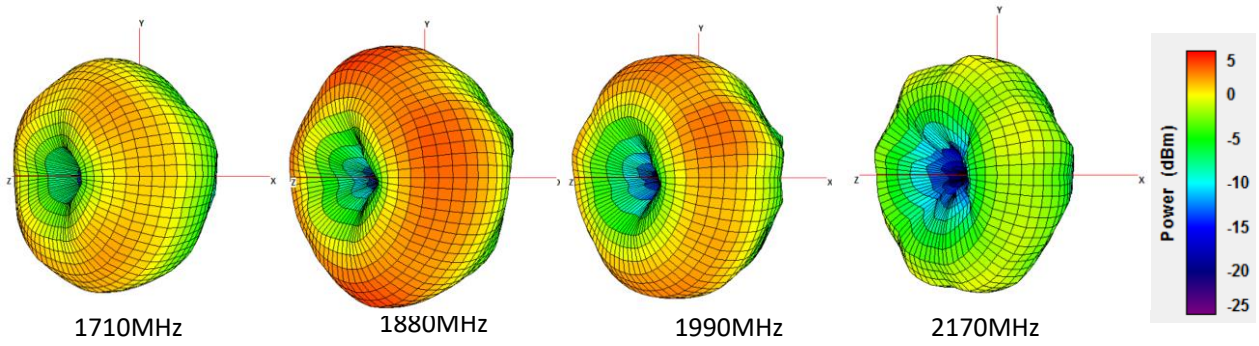


704MHz 751MHz 824MHz 960MHz

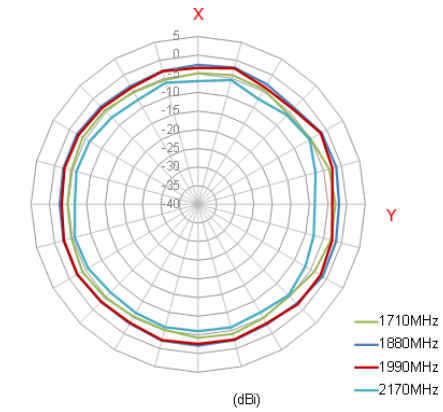
XY Plane	XZ Plane	YZ Plane



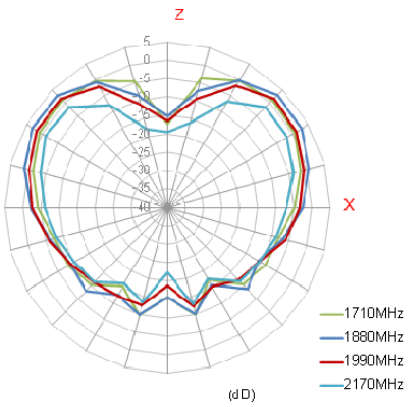
1710-2170MHz



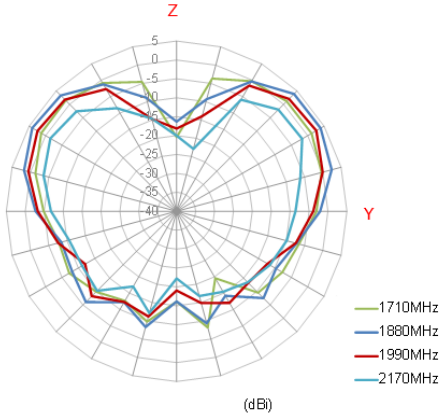
XY Plane



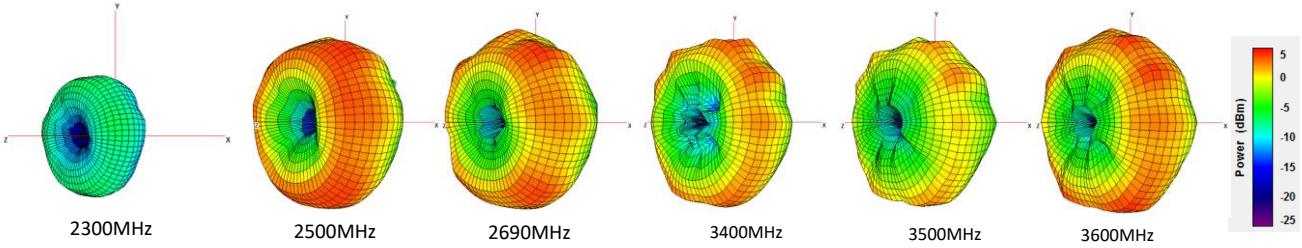
XZ Plane



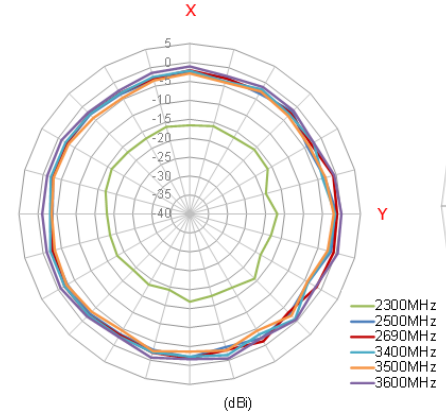
YZ Plane



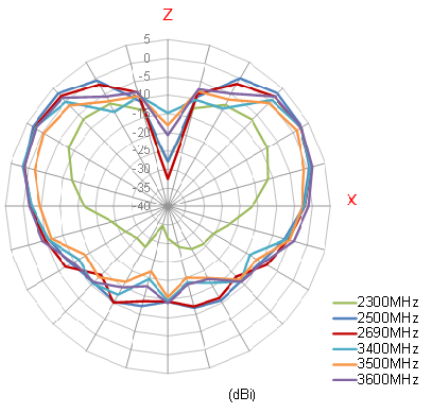
2300-3600MHz



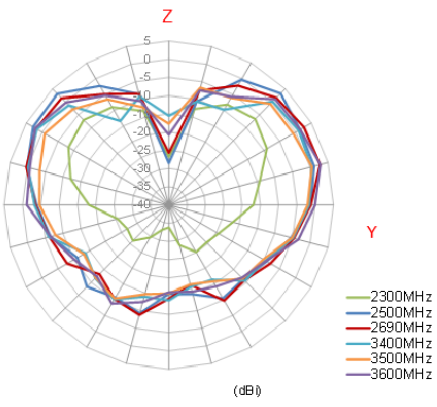
XY Plane



XZ Plane

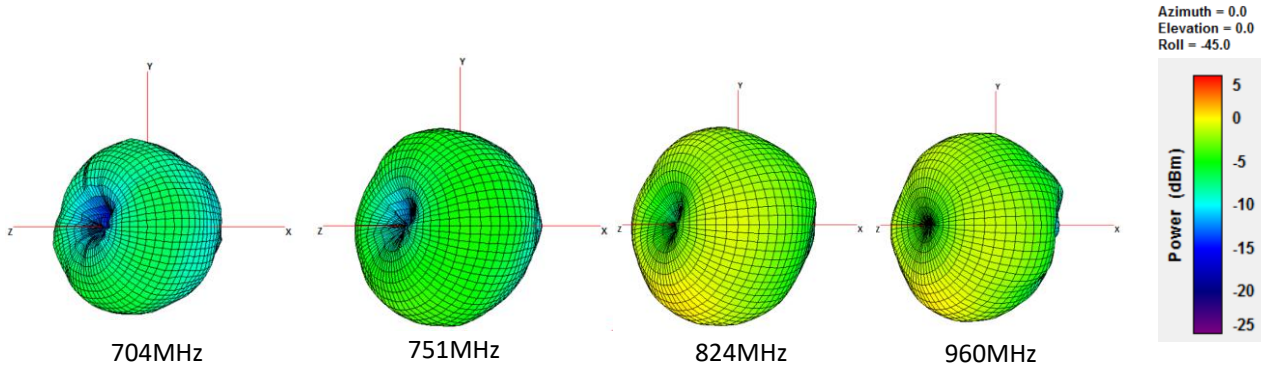


YZ Plane



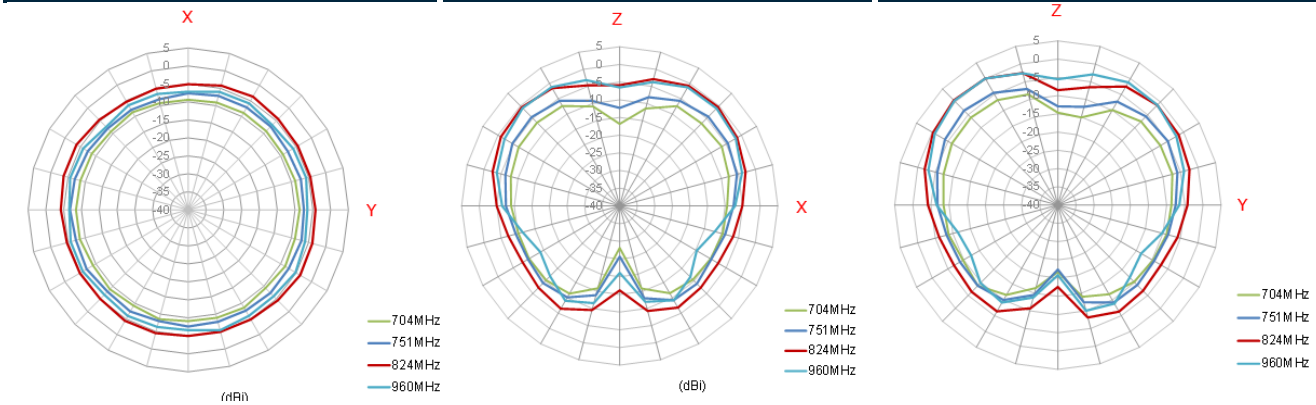
4.6 300*300mm Center – Bent 3D and 2D Radiation Patterns

704-960MHz

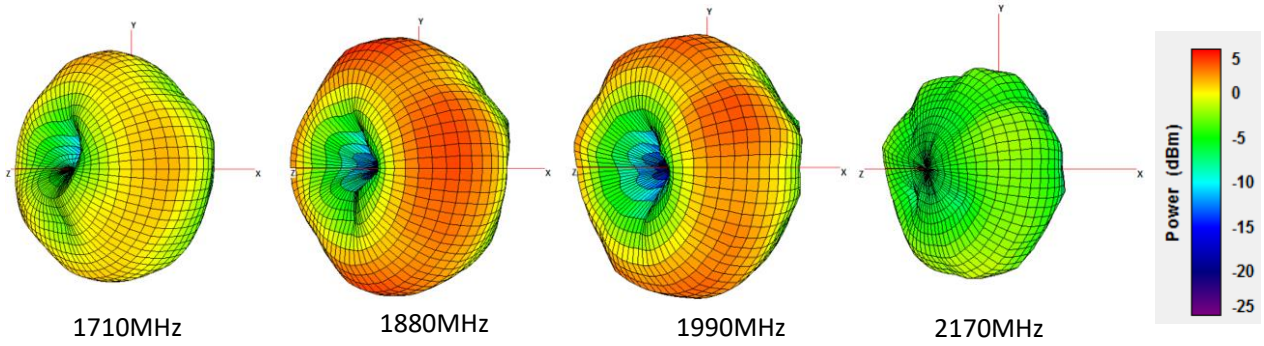


704MHz 751MHz 824MHz 960MHz

XY Plane	XZ Plane	YZ Plane

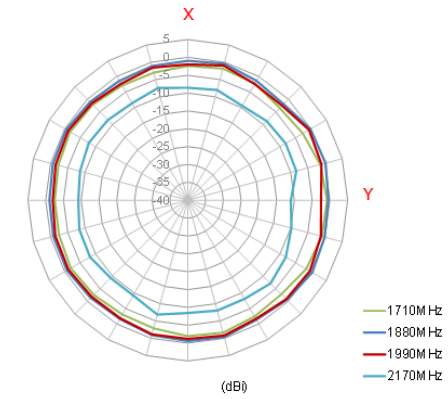


1710-2170MHz

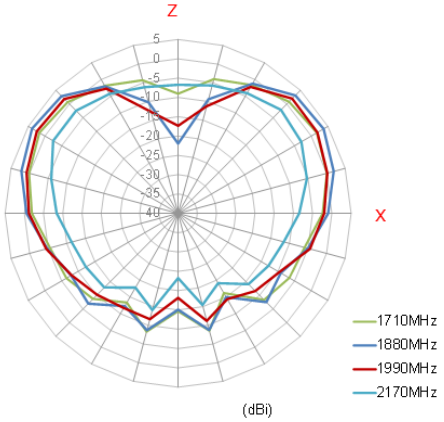


1710MHz 1880MHz 1990MHz 2170MHz

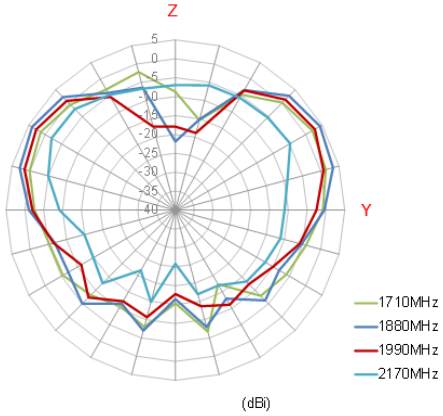
XY Plane



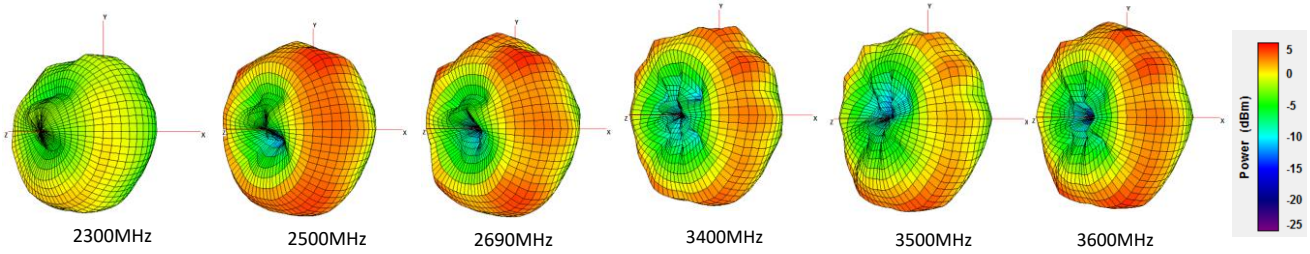
XZ Plane



YZ Plane

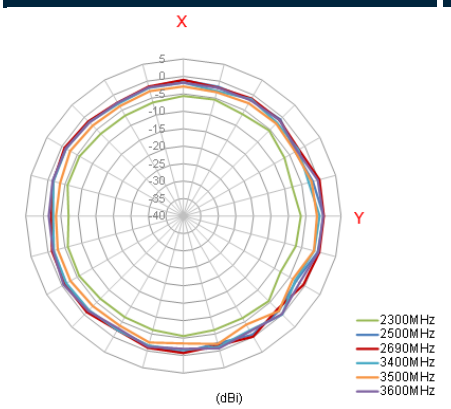


2300-3600MHz

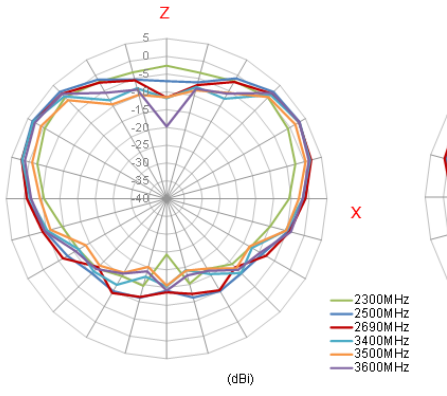


2300MHz 2500MHz 2690MHz 3400MHz 3500MHz 3600MHz

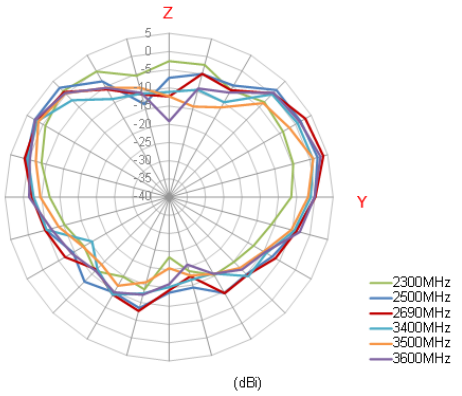
XY Plane



XZ Plane

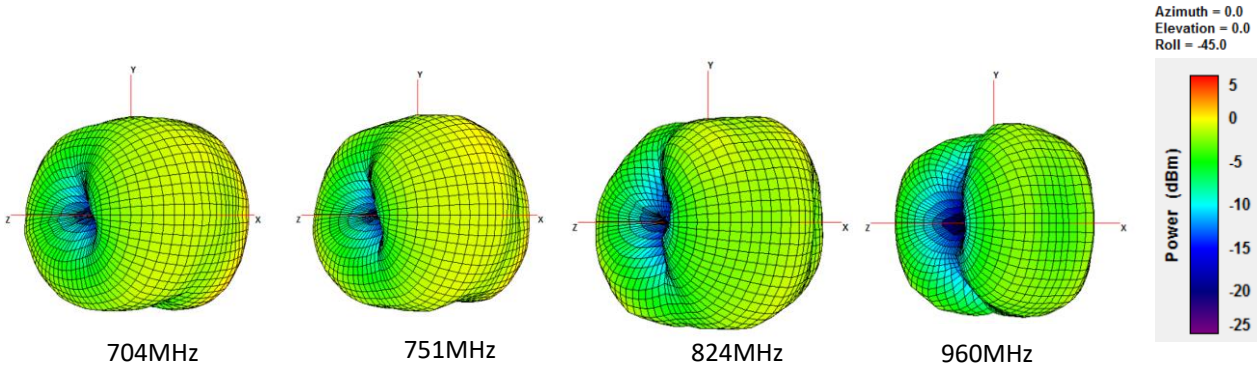


YZ Plane



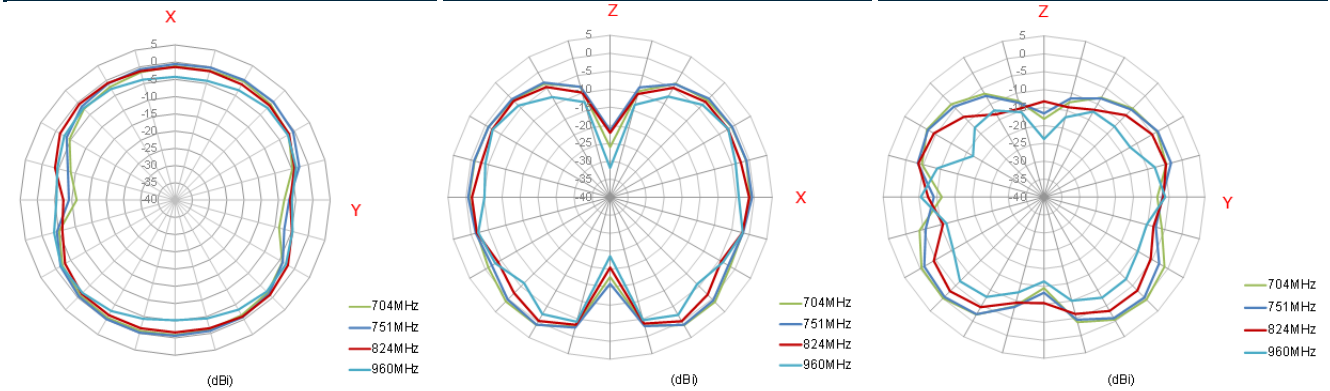
4.7 300*300mm Edge – Straight 3D and 2D Radiation Patterns

704-960MHz

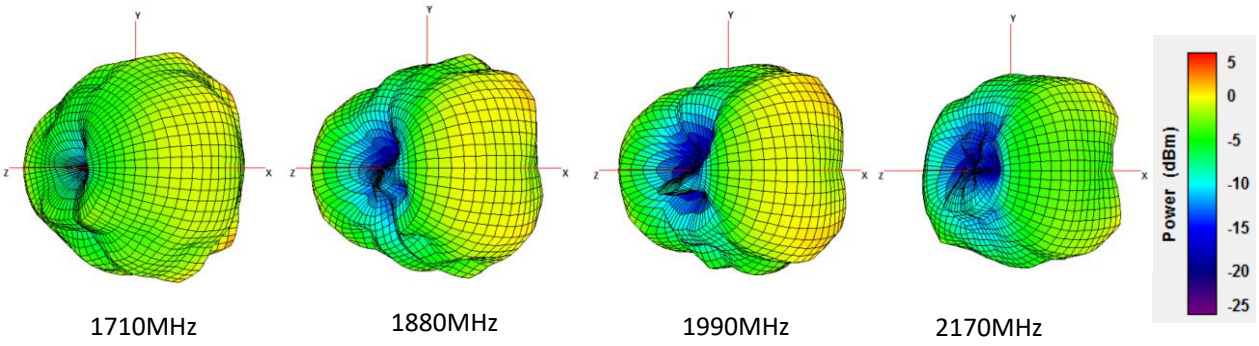


704MHz 751MHz 824MHz 960MHz

XY Plane	XZ Plane	YZ Plane

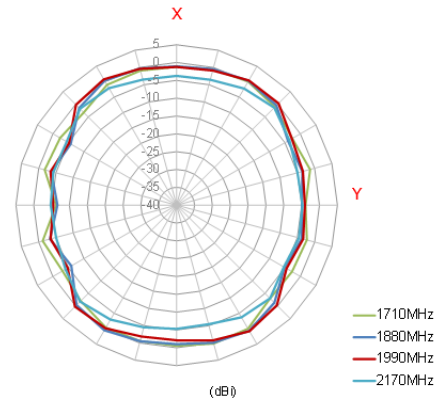


1710-2170MHz

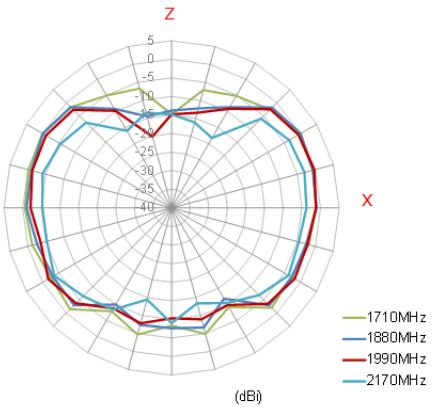


1710MHz 1880MHz 1990MHz 2170MHz

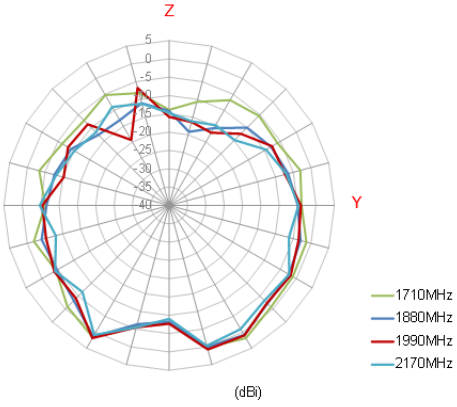
XY Plane



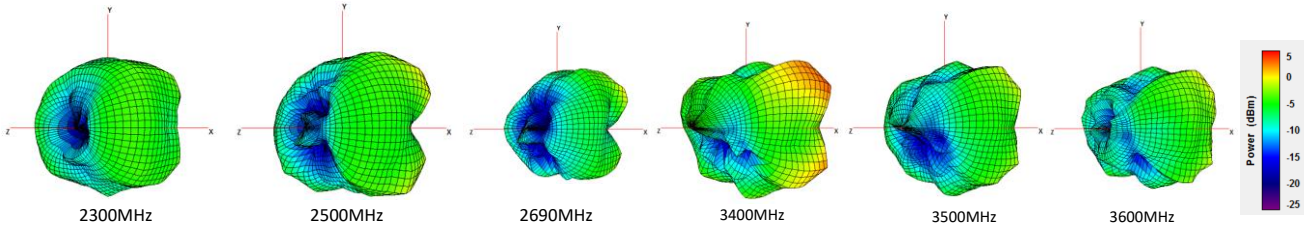
XZ Plane



YZ Plane

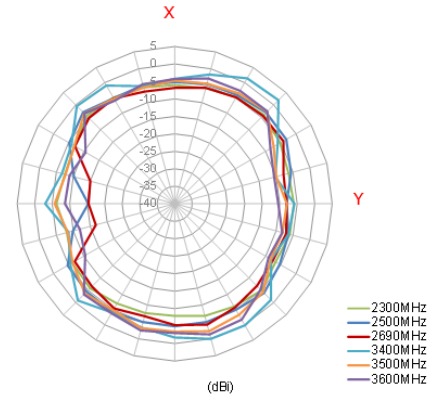


2300-3600MHz

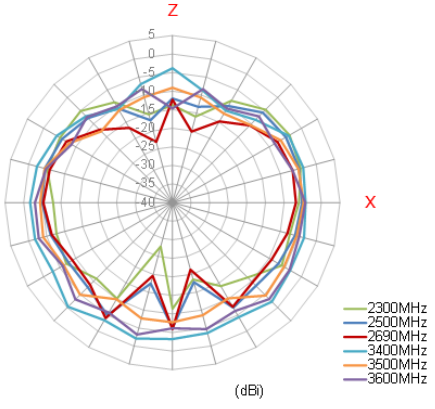


2300MHz 2500MHz 2690MHz 3400MHz 3500MHz 3600MHz

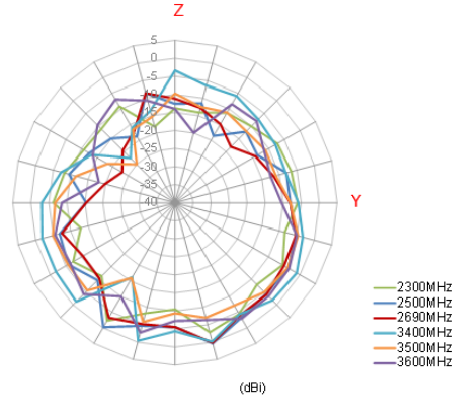
XY Plane



XZ Plane

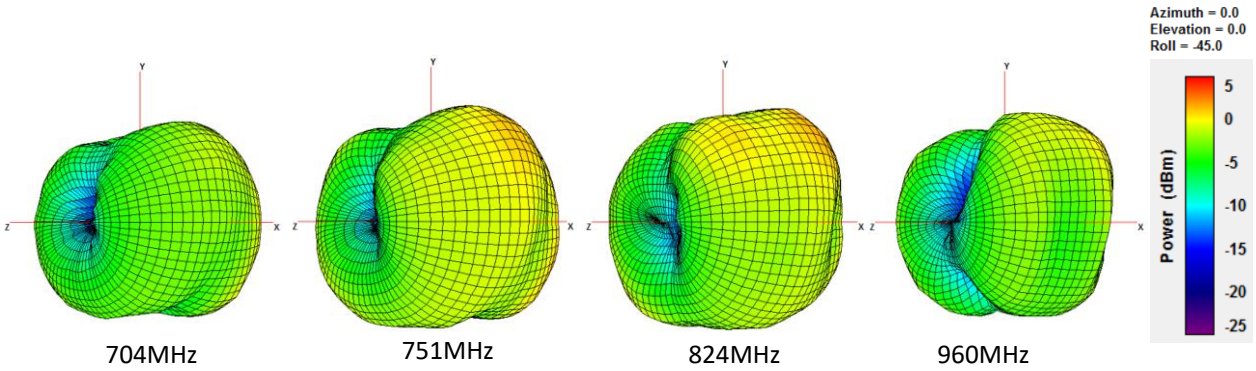


YZ Plane

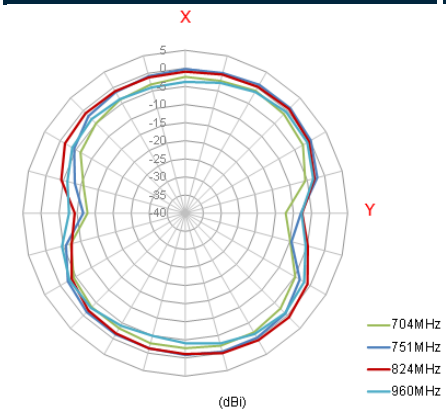
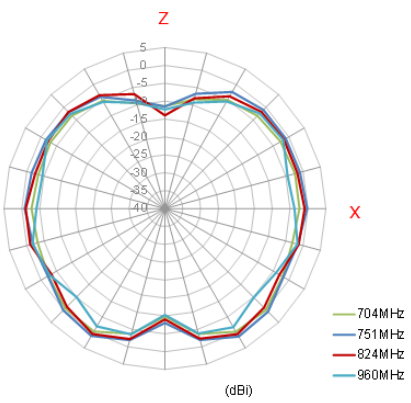
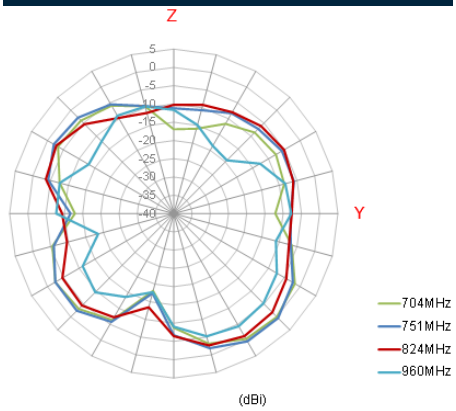


4.8 300*300mm Edge – Bent 3D and 2D Radiation Patterns

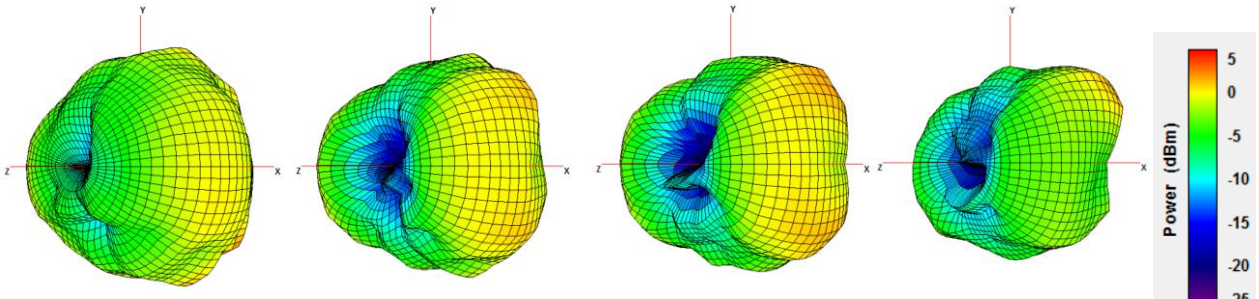
704-960MHz



704MHz 751MHz 824MHz 960MHz

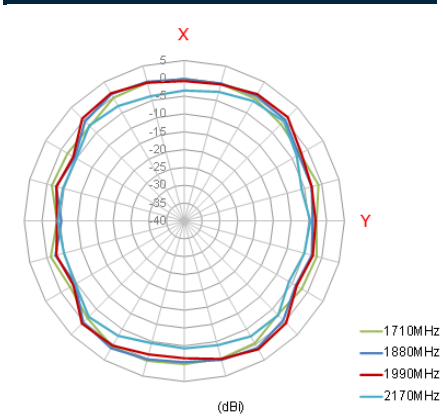
XY Plane	XZ Plane	YZ Plane
		

1710-2170MHz

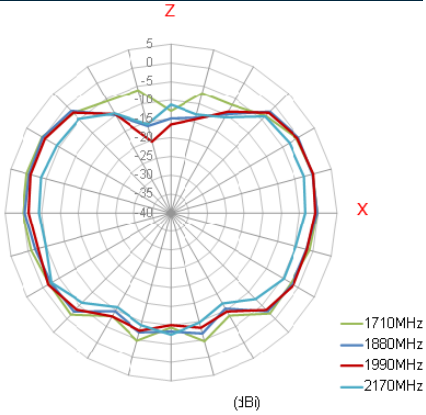


1710MHz 1880MHz 1990MHz 2170MHz

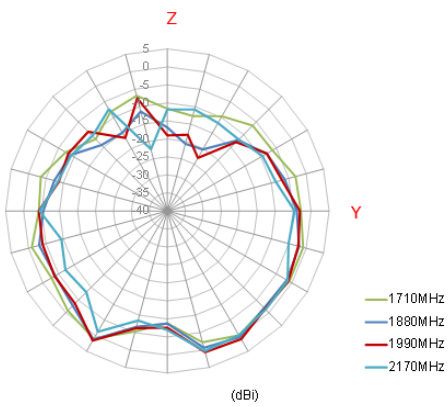
XY Plane



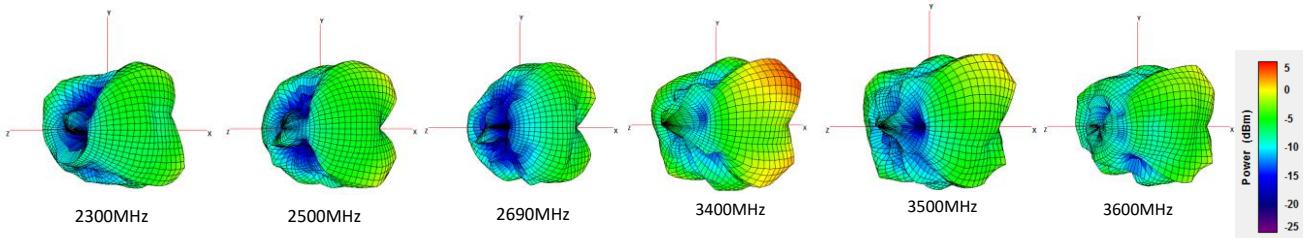
XZ Plane



YZ Plane

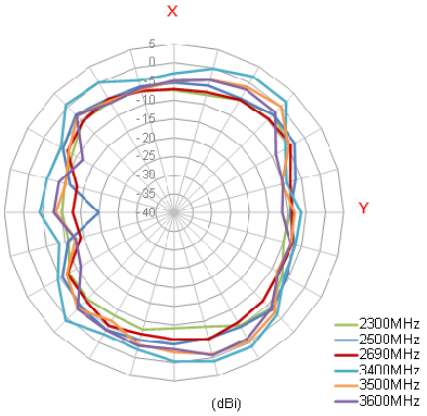


2300-3600MHz

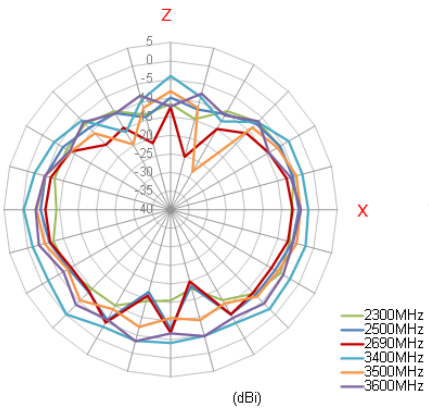


2300MHz 2500MHz 2690MHz 3400MHz 3500MHz 3600MHz

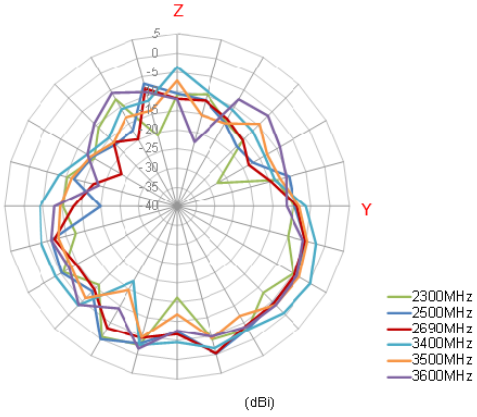
XY Plane



XZ Plane



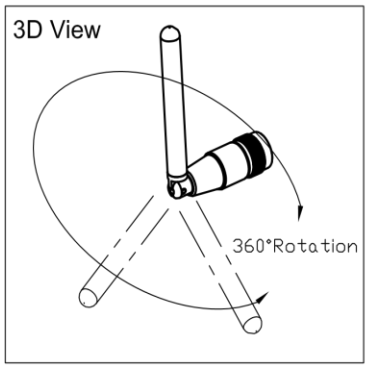
YZ Plane

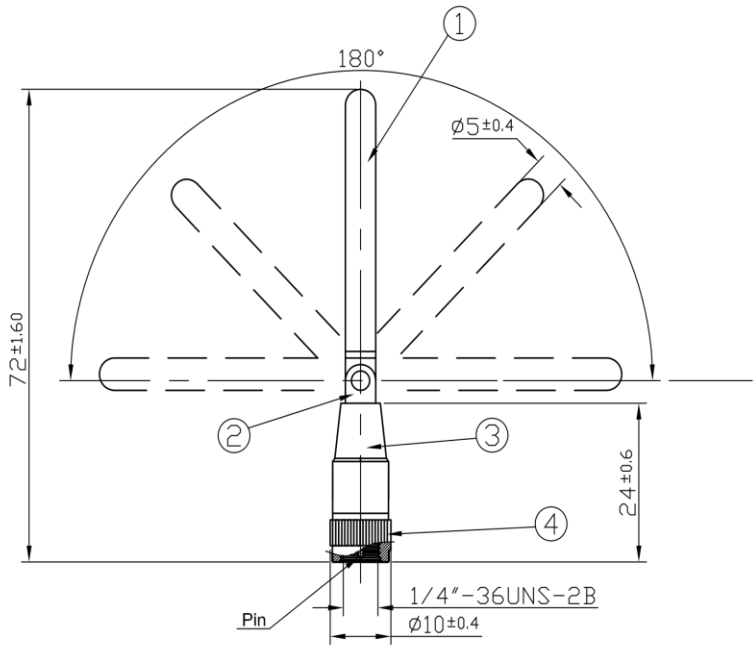


5. Mechanical Drawing (Units: mm)

REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
A	ALL	Initial Design	Sandy	Joanna	2012/08/30

ISO NO:EDW-12-8-0541 <Release>





	Name	Material	Finish	QTY
1	Housing	POM	White	1
2	Hinge	Brass	Ni Plated	1
3	Cap	POM	White	1
4	SMA(M) ST	Brass	Ni Plated	1

UNLESS OTHERWISE SPECFIED TOLERANCES ON:
.X ± 1.0
XX. ± 5.0 .XX ± 0.5
X. ± 3.0 .XXX ± 0.1

DATE: 2012/08/30 | MAT'L:
UNIT: mm | FINISH:
THIRD ANGLE PROJECTION | SCALE: 1/1

taoglas antenna solutions TW Design Centre
This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.

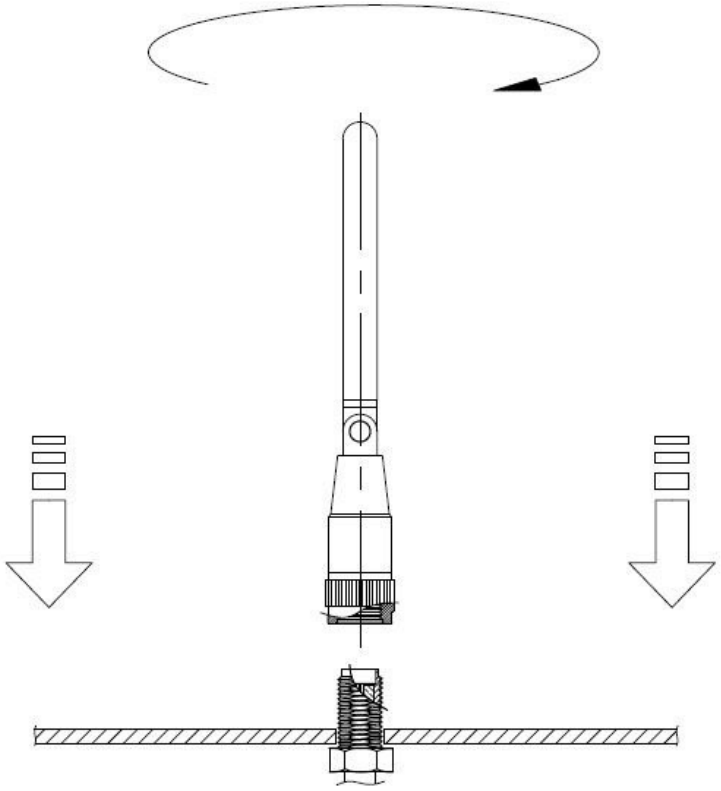
REV A

APPROVED BY:	CHECKED BY:	DRAWN BY:	CUSTOMERS SIGNATURE/DATE
Joanna	Wayne	Sandy	

TITLE: Penta-band Cellular 900/1800/1900 Hinged SMA Male White

PART NO.: TG.09.0113W

6. Installation

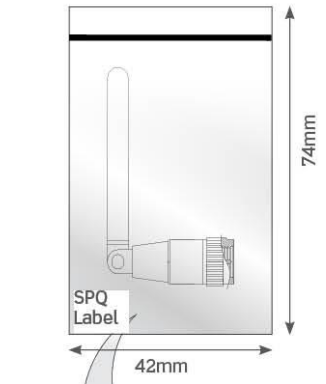


Recommended torque for mounting is 0.9 N·m

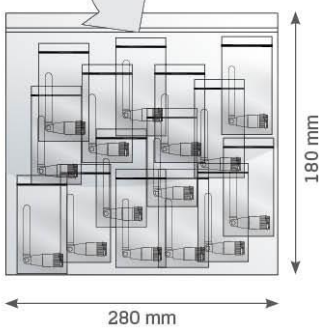
Maximum torque for mounting is 1.176 N·m

7. Packaging

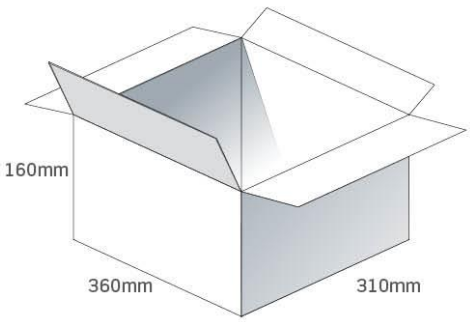
1 pcs TG.09.0113W per PE bag
PE Bag Dimensions - 74 x 42mm
Weight - 8.6g



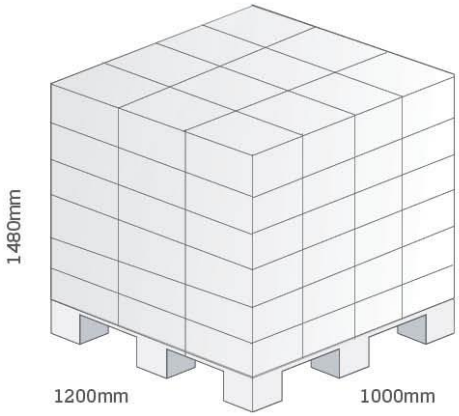
100 pcs TG.09.0113W per large PE bags
Large PE bags Dimensions - 280 x 180mm
Weight - 0.88kg



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



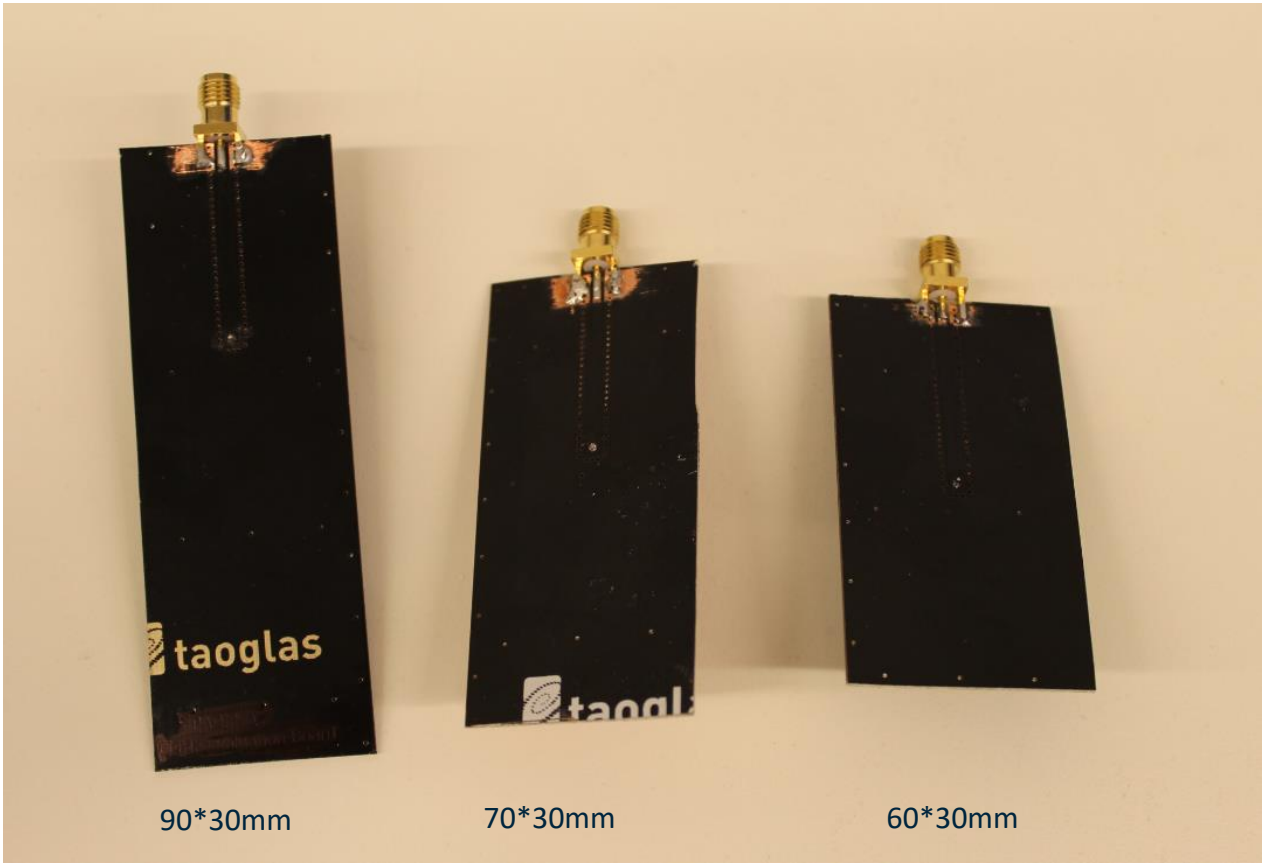
Pallet Dimensions 1200*1000*1480mm
72 Cartons per Pallet
9 Cartons per layer
8 Layers



8. Application Note

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

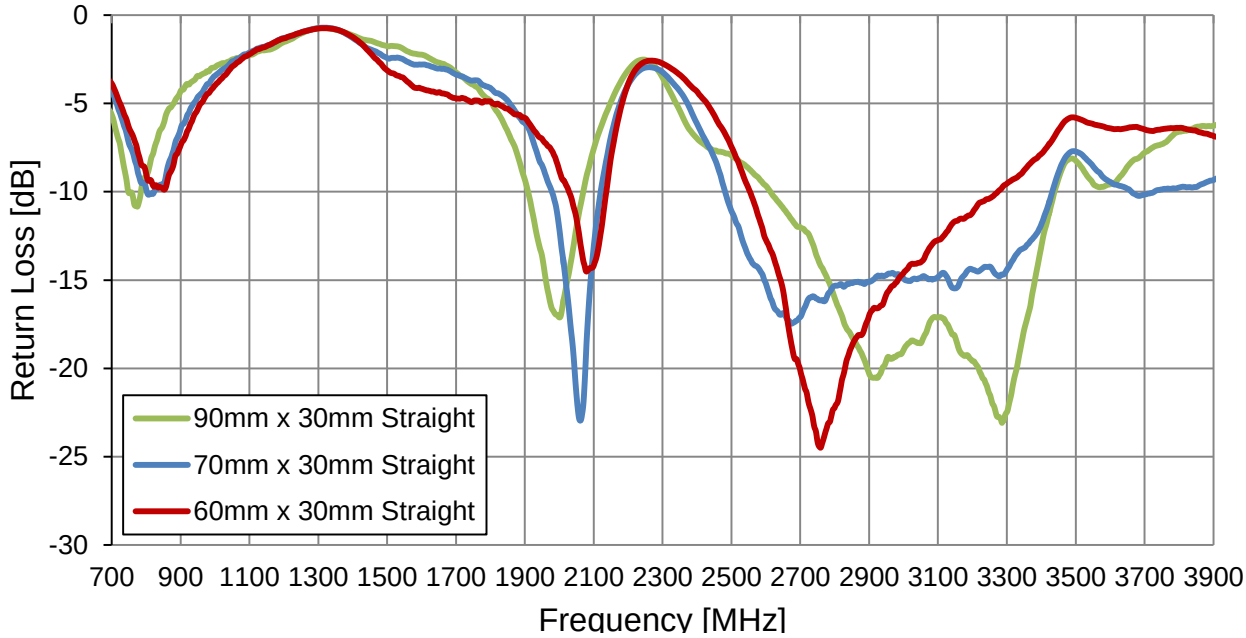
Three different ground planes were chosen. They were all 30mm wide and the lengths were varied beginning at 90mm then 70mm and finally 60mm

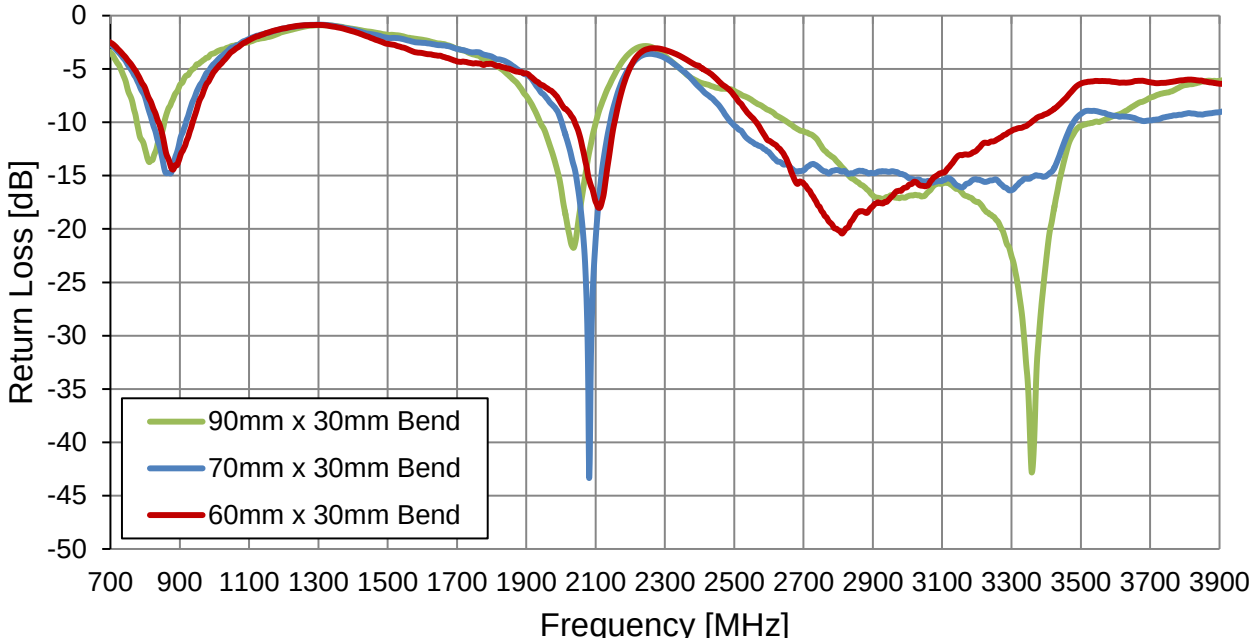


It was also considered whether the TG.09 antenna was positioned straight or at an angle of 90°.
The antenna was positioned on the edge of the Ground Plane for all tests.

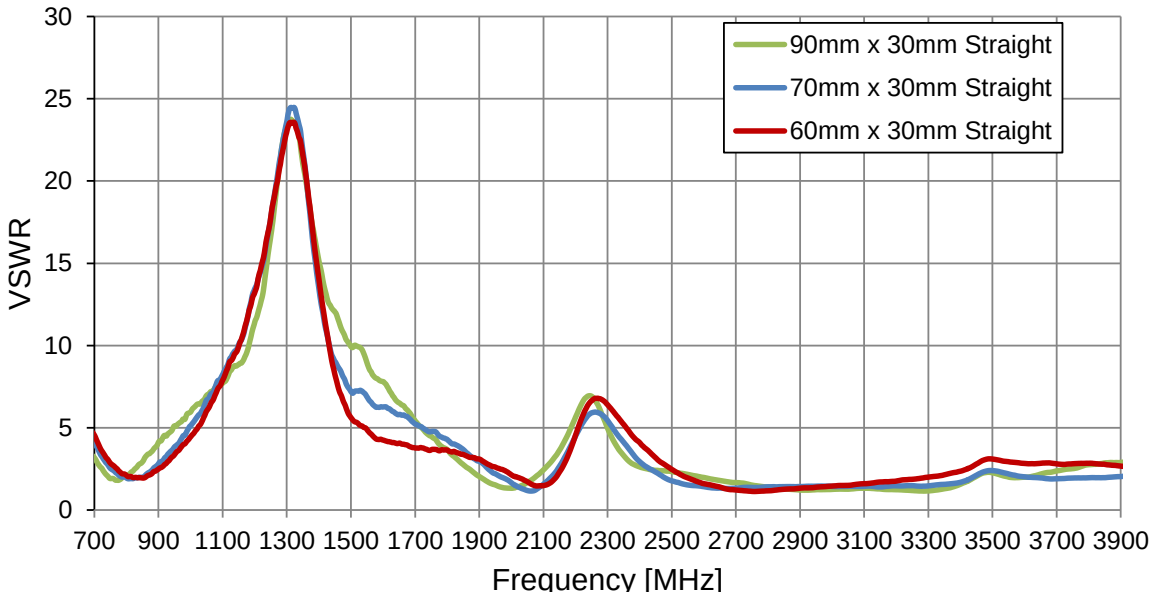
Parameter									
Straight Pose									
Frequency (MHz)		703~803	824~960	1710~1880	1850~1990	1920~2170	2300~2400	2490~2690	3300~3800
Average Gain (dBi)	90mm x 30mm Ground	-1.4	-3.2	-3.2	-1.9	-2.3	-5.1	-2.0	-3.8
Efficiency (%)		72%	49%	48%	64%	59%	31%	63%	42%
Peak Gain (dBi)		2.0	1.9	2.7	3.2	3.6	1.3	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

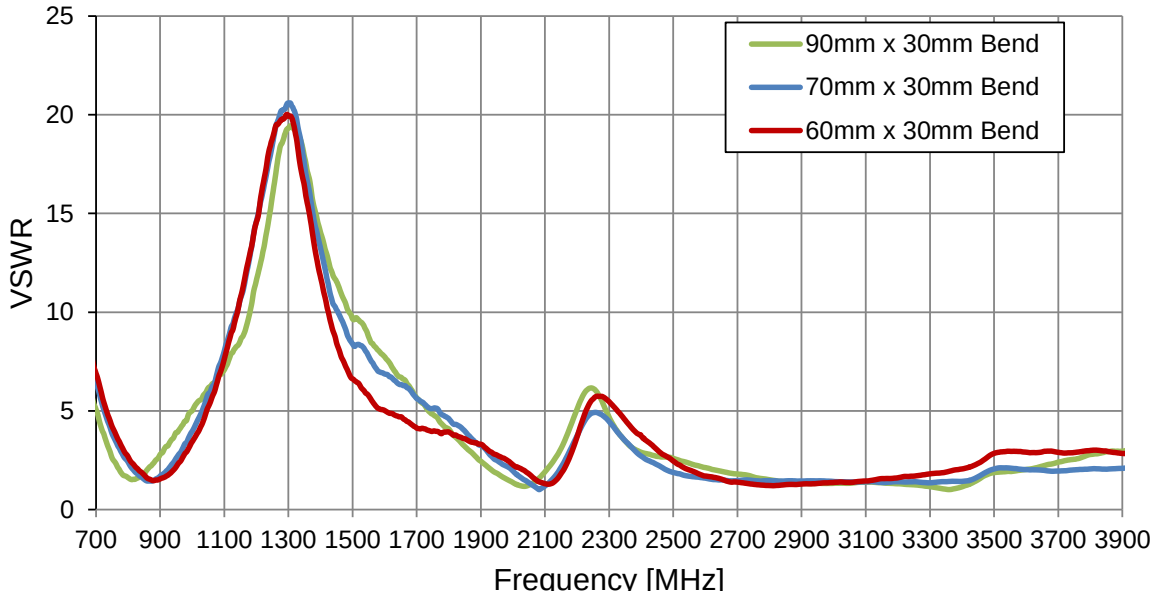
8.1 Return Loss



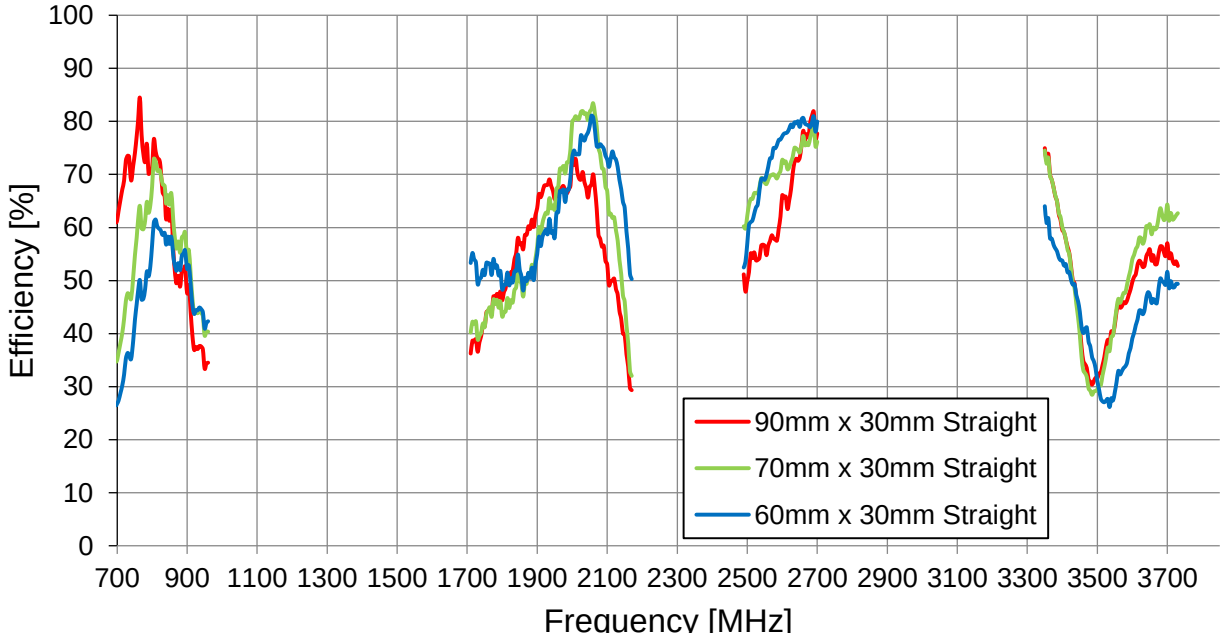


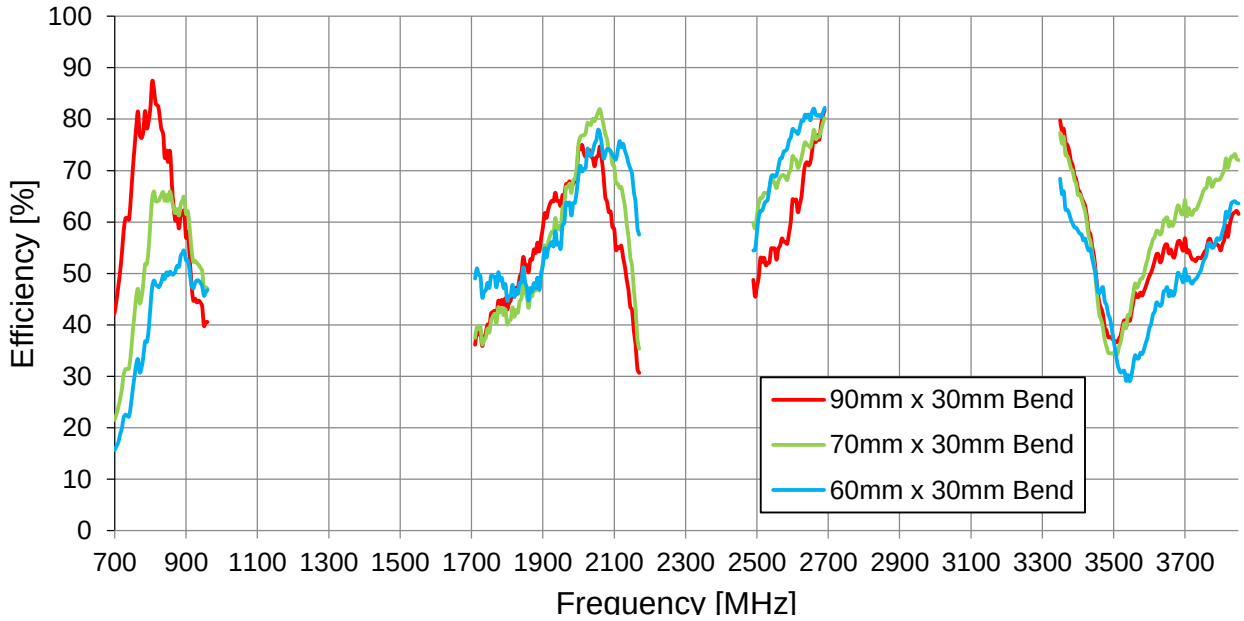
8.2 VSWR


90mm x 30mm Straight
70mm x 30mm Straight
60mm x 30mm Straight
VSWR
0
5
10
15
20
25
30
700 900 1100 1300 1500 1700 1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900
Frequency [MHz]

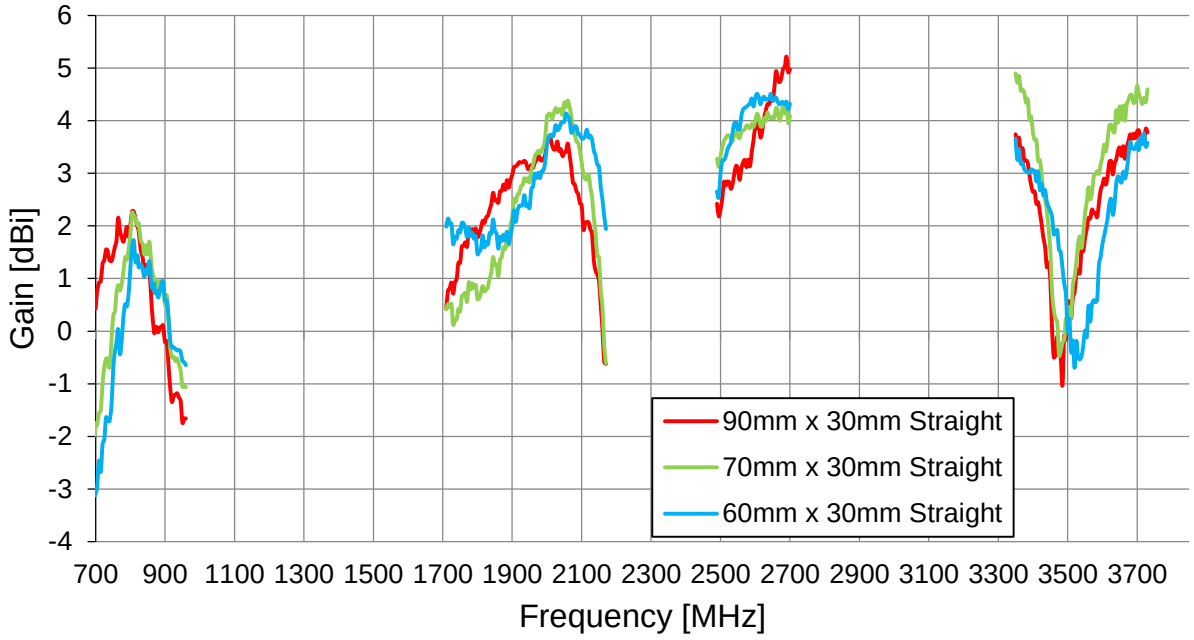

90mm x 30mm Bend
70mm x 30mm Bend
60mm x 30mm Bend
VSWR
0
5
10
15
20
25
700 900 1100 1300 1500 1700 1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900
Frequency [MHz]

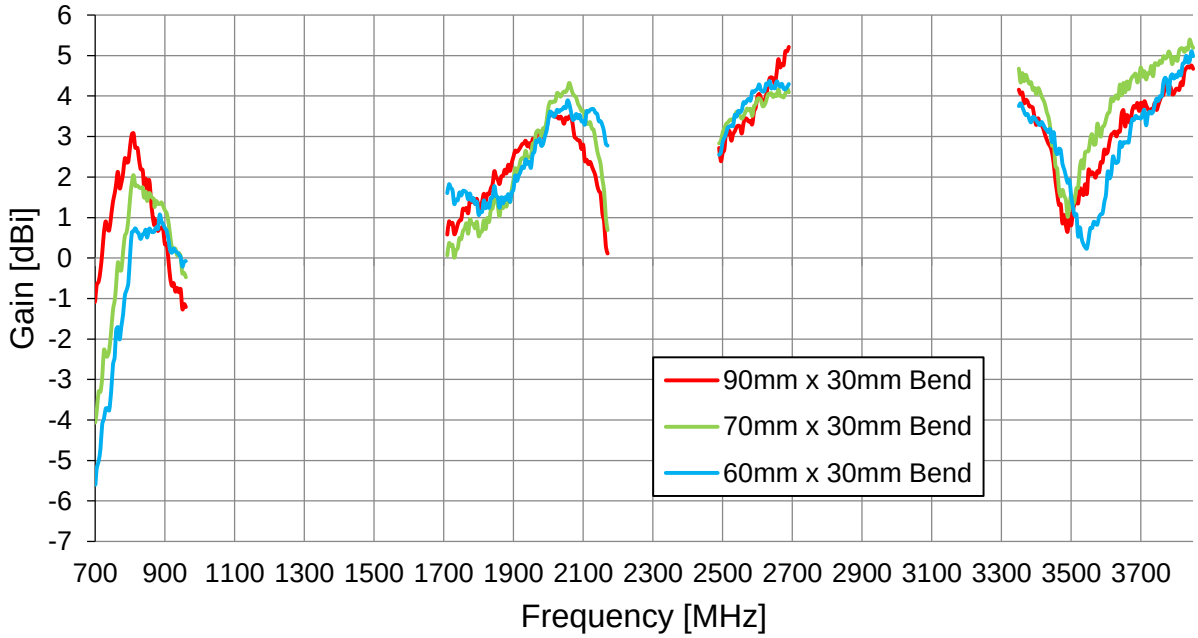
8.3 Efficiency



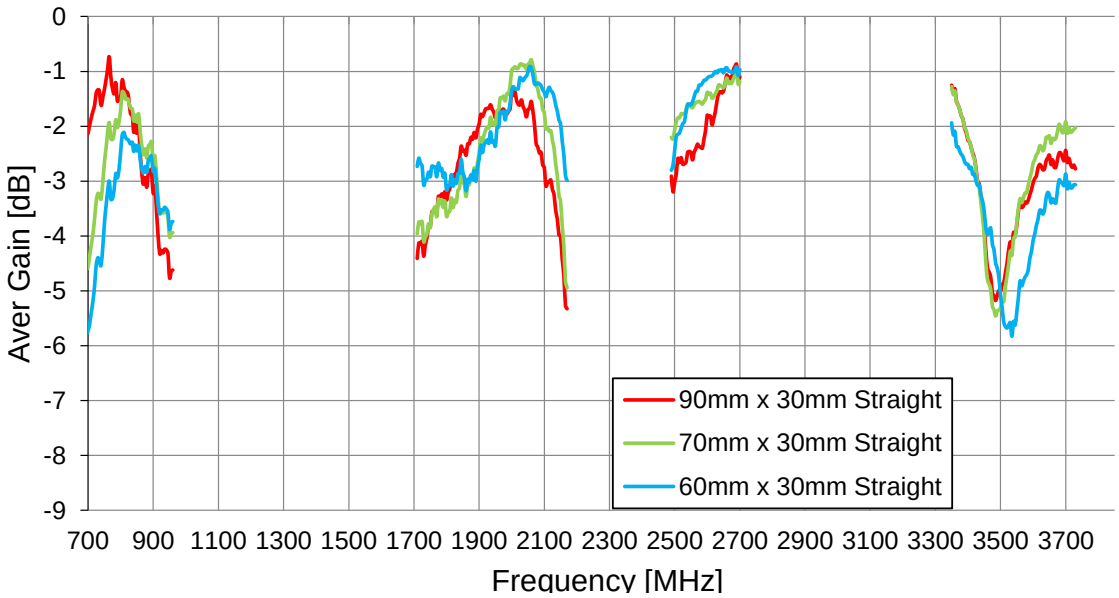


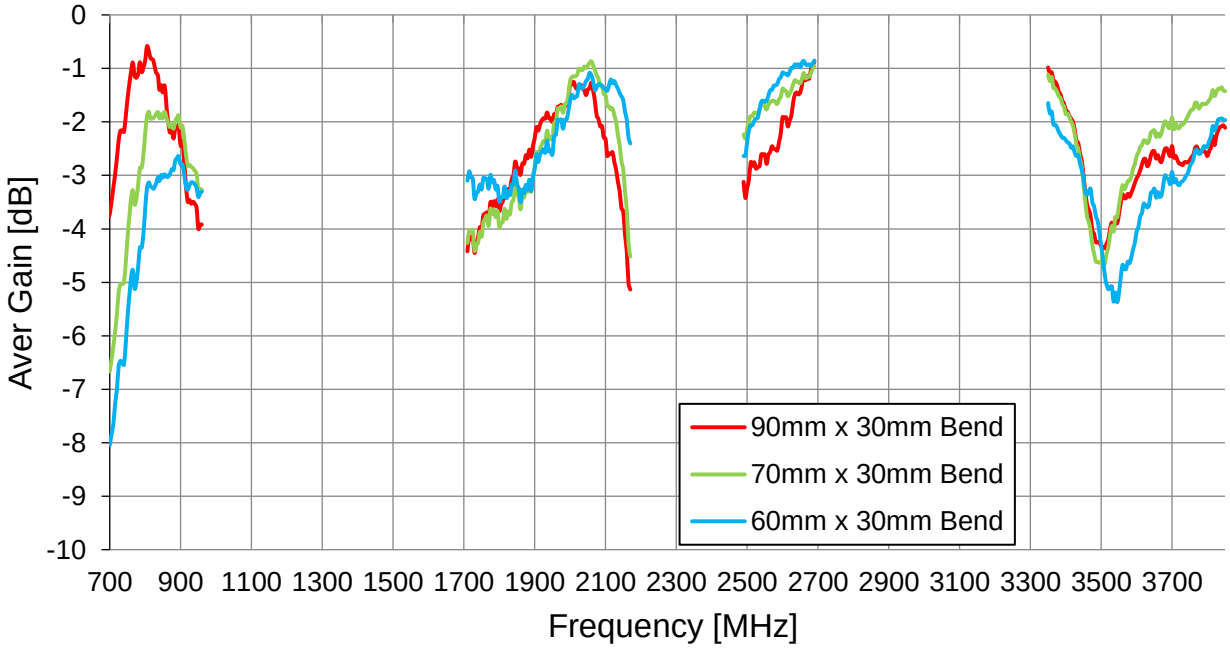
8.4 Peak Gain


Gain [dBi]
6
5
4
3
2
1
0
-1
-2
-3
-4
700 900 1100 1300 1500 1700 1900 2100 2300 2500 2700 2900 3100 3300 3500 3700
Frequency [MHz]
90mm x 30mm Straight
70mm x 30mm Straight
60mm x 30mm Straight


Gain [dBi]
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
700 900 1100 1300 1500 1700 1900 2100 2300 2500 2700 2900 3100 3300 3500 3700
Frequency [MHz]
90mm x 30mm Bend
70mm x 30mm Bend
60mm x 30mm Bend

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

TAOGLAS®

www.taoglas.com



© Taoglas

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Taoglas:

TG.09.0113w