

SPECIFICATION

Part No. : **MA240.LBI.001**

Product Name : MA240 Genesis LTE MIMO/GNSS 3in1
Adhesive Mount Combination Antenna
1* GNSS – GPS-GLONASS
2* 4G MIMO LTE 698 to 896/1710 to 2700MHz
Supports 3G Fall-back

Features : IP67 Antenna
1* GPS-GLONASS: 2 meter RG-174 SMA(M)
2 * LTE: 2 meter Low loss NFC-200 SMA(M)ST
Dimensions: 205.8mm x 58mm x 12.4mm
RoHS Compliant



1. Introduction

The MA.240 4G Genesis antenna is an omni-directional, fully IP67 waterproof external M2M antenna for use in telematics, transportation and remote monitoring applications worldwide. It is designed to be mounted directly on glass or plastic in the interior of vehicles.

Typical applications

- HD Video over LTE
- First Responder and Emergency Services
- Automotive Vehicle Tracking and Telematics

This unique antenna delivers powerful MIMO antenna technology for worldwide 4G LTE bands at 700MHz/800MHz/1700MHz/1800MHz/2600MHz, plus GPS-GLONASS for next generation location accuracy.

4G wireless applications demand high speed data uplink and downlink. High efficiency and high gain MIMO antennas are necessary to achieve the required signal to noise ratio and throughput required to solve these challenges. Taoglas also takes care to have high isolation between the two MIMO antennas to prevent self-interference. Low loss cables are used to keep efficiency high over long cable lengths. In contrast, smaller MIMO antennas with poorer quality thinner cables will have much reduced efficiency and isolation, which would lead to a large drop in system throughput or drops, and may indeed not make a system connection at all.

The GPS-Glonass antenna has been carefully designed to work equally well on both GPS and Glonass bands, leading to higher location accuracy and stability of tracking in urban environments.

Finally, if your device requires USA LTE certification with an external antenna then the MA240 is the ideal solution to pass approvals.

Cable length and connector types are customizable. [Contact](#) your regional Taoglas sales office for support.

2. Specification

GPS-GLONASS	
Center Frequency	GPS:1575.42±3 MHz GLONASS:1602±0.5 MHz
Passive Antenna Gain	GPS: 1.67dBi GLONASS: 0.37dBi
VSWR	1.5:1 Max
Impedance	50Ω
Cable	2 meters RG174 standard, fully customizable
Connector	SMA(M), standard, fully customizable
LNA Electrical Properties	
Center Frequency	GPS:1575.42±3 MHz GLONASS:1602±0.5 MHz
Impedance	50 Ohm
VSWR	< 1.5:1
Return Loss	10 dB Min.
Gain	3.3V 30dB
DC Power Input	3.3V
Noise Figure @3.3V	1.7dB

4G/3G MIMO1 Antenna									
Frequency (MHz)		698~803	824~894	880~960	1710~1880	1850~1990	1920~2170	2490~2690	3410~3490
Efficiency (%)									
In free space	30cm	72.01	45.99	34.09	73.58	68.59	33.44	63.58	38.76
	1M	70.55	56.19	39.21	66.54	52.25	45.40	59.01	33.16
	2M	64.18	42.21	29.69	60.55	33.71	27.32	50.17	29.20
	3M	59.38	37.78	27.57	53.47	29.71	23.89	42.78	24.46
	5M	51.25	31.84	23.14	41.89	22.94	18.50	32.70	17.59
On the 2mm ABS base	30cm	65.93	36.48	26.86	60.26	38.12	30.54	56.90	32.33
	1M	71.92	52.85	31.51	62.46	48.02	42.26	59.79	34.38
	2M	58.76	34.28	23.40	49.55	31.05	24.95	44.87	24.37
	3M	56.15	31.80	21.72	44.39	29.14	22.18	38.32	20.40
	5M	46.95	25.27	18.25	34.28	21.13	16.89	29.24	14.68
On the glass base	30cm	43.02	18.05	11.86	37.76	27.71	27.15	58.38	30.74
	1M	49.79	15.28	8.64	38.20	35.24	37.66	63.96	32.37
	2M	38.34	17.81	10.33	31.05	22.58	22.19	46.02	23.13
	3M	36.20	16.54	9.59	27.82	20.43	18.90	39.31	18.78
	5M	30.66	12.52	8.06	21.48	15.35	15.02	29.99	13.94
Average Gain(dBi)									
In free space	30cm	-1.46	-3.39	-4.75	-1.44	-1.67	-4.84	-1.98	-4.45
	1M	-1.52	-2.53	-4.23	-1.82	-2.84	-3.49	-2.31	-4.98
	2M	-1.96	-3.76	-5.35	-2.29	-4.79	-5.72	-3.01	-5.70
	3M	-2.30	-4.25	-5.68	-2.83	-5.34	-6.30	-3.70	-6.45
	5M	-2.94	-4.99	-6.43	-3.89	-6.47	-7.41	-4.87	-7.90
On the 2mm ABS base	30cm	-1.86	-4.41	-5.79	-2.24	-4.27	-5.21	-2.46	-5.34
	1M	-1.44	-2.83	-5.26	-2.10	-3.21	-3.79	-2.25	-4.80
	2M	-2.36	-4.67	-6.39	-3.10	-5.16	-6.09	-3.49	-6.59
	3M	-2.54	-5.00	-6.72	-3.57	-5.45	-6.61	-4.18	-7.34
	5M	-3.34	-6.01	-7.47	-4.70	-6.84	-7.78	-5.35	-8.79
On the glass base	30cm	-3.76	-7.54	-9.36	-4.28	-5.59	-5.70	-2.35	-5.32
	1M	-3.12	-8.39	-10.74	-4.24	-4.55	-4.27	-1.95	-4.90
	2M	-4.26	-7.59	-9.96	-5.13	-6.48	-6.58	-3.38	-6.57
	3M	-4.51	-7.92	-10.29	-5.61	-6.92	-7.25	-4.07	-7.53
	5M	-5.24	-9.14	-11.05	-6.73	-8.16	-8.27	-5.24	-8.77

Frequency (MHz)		698~803	824~894	880~960	1710~1880	1850~1990	1920~2170	2490~2690	3410~3490
Peak Gain(dBi)									
In free space									
	30cm	3.61	1.20	-0.05	3.31	3.41	-0.63	3.01	0.43
	1M	2.84	2.15	0.02	2.61	1.74	1.08	3.26	-0.68
	2M	3.11	0.98	-0.65	2.46	-0.33	-1.50	1.98	-0.82
	3M	2.78	0.35	-0.98	1.92	-0.89	-2.09	1.28	-1.57
	5M	2.14	-0.40	-1.74	0.86	-2.01	-3.19	0.12	-3.02
On the 2mm ABS base	30cm	3.09	-0.25	-0.95	2.34	0.42	-0.30	2.97	-0.92
	1M	2.30	2.38	-0.13	2.12	1.09	0.81	3.11	-0.32
	2M	2.59	-0.57	-1.55	1.49	-0.47	-1.17	1.94	-2.17
	3M	2.49	-0.90	-1.88	1.08	-0.77	-1.79	1.26	-2.92
	5M	1.62	-1.85	-2.64	-0.11	-2.15	-2.87	0.08	-4.37
On the glass base	30cm	1.04	-3.36	-5.33	0.57	-0.37	0.31	3.15	0.82
	1M	0.78	-3.92	-6.55	1.42	0.67	1.21	4.22	1.80
	2M	0.54	-3.22	-5.93	0.99	-1.26	-0.57	2.12	-0.43
	3M	0.27	-3.55	-6.25	-0.72	-1.76	-1.37	1.43	-0.97
	5M	-0.43	-4.96	-7.01	-1.89	-2.94	-2.26	0.26	-2.63

4G/3G MIMO2 Antenna									
Frequency (MHz)		698~803	824~894	880~960	1710~1880	1850~1990	1920~2170	2490~2690	3410~3490
Efficiency (%)									
In free space	30cm	58.24	56.13	53.67	76.47	68.59	62.96	74.88	56.10
	1M	64.65	57.39	48.73	62.52	53.06	48.63	50.84	30.29
	2M	51.90	46.53	46.74	62.79	55.87	51.48	59.06	42.12
	3M	47.88	45.93	43.42	55.53	49.19	45.01	50.66	35.40
	5M	41.47	38.78	36.45	43.44	38.00	34.87	38.49	25.38
On the 2mm ABS base	30cm	63.50	33.06	39.97	69.58	59.05	54.39	61.78	39.33
	1M	73.97	51.78	44.03	63.30	48.55	46.18	52.15	27.82
	2M	56.60	29.34	34.82	57.11	48.11	44.46	48.71	29.50
	3M	53.49	27.18	32.32	50.22	44.24	38.88	41.62	30.25
	5M	45.23	22.87	27.09	39.51	32.73	30.11	31.75	17.78
On the glass base	30cm	66.98	26.43	29.96	63.52	59.22	60.07	71.14	38.27
	1M	52.66	47.32	35.07	53.47	52.02	50.64	64.75	29.52
	2M	59.70	23.27	26.09	52.25	48.25	49.10	56.09	28.70
	3M	57.47	21.58	23.80	46.05	42.08	42.68	47.91	26.90
	5M	47.72	18.28	20.30	36.15	32.78	33.26	36.55	17.29
Average Gain(dBi)									
In free space	30cm	-2.37	-2.71	-2.88	-1.17	-1.67	-2.04	-1.27	-2.53
	1M	-1.92	-2.46	-3.24	-2.05	-2.83	-3.19	-2.96	-5.19
	2M	-2.87	-3.52	-3.48	-2.03	-2.55	-2.91	-2.30	-3.78
	3M	-3.22	-3.56	-3.81	-2.56	-3.11	-3.50	-2.97	-4.53
	5M	-3.85	-4.31	-4.56	-3.63	-4.23	-4.61	-4.16	-5.98
On the 2mm ABS base	30cm	-2.01	-4.90	-4.04	-1.59	-2.32	-2.65	-2.10	-4.05
	1M	-1.32	-2.92	-3.62	-2.03	-3.21	-3.41	-2.85	-5.56
	2M	-2.51	-5.42	-4.64	-2.44	-3.21	-3.53	-3.13	-5.30
	3M	-2.75	-5.74	-4.97	-3.00	-3.58	-4.11	-3.82	-5.26
	5M	-3.49	-6.50	-5.73	-4.04	-4.89	-5.22	-4.99	-7.50
On the glass base	30cm	-1.88	-5.81	-5.27	-2.02	-2.29	-2.22	-1.48	-4.17
	1M	-2.95	-3.28	-4.57	-2.81	-2.87	-2.98	-1.90	-5.30
	2M	-2.38	-6.36	-5.87	-2.88	-3.18	-3.09	-2.52	-5.42
	3M	-2.51	-6.69	-6.29	-3.43	-3.78	-3.70	-3.20	-5.73
	5M	-3.36	-7.41	-6.96	-4.48	-4.86	-4.79	-4.38	-7.62

Peak Gain(dBi)									
In free space	30cm	1.57	1.71	1.59	3.04	3.41	3.21	4.82	4.81
	1M	2.41	2.17	1.33	2.00	2.14	1.94	2.16	1.29
	2M	1.07	0.83	0.99	2.19	2.52	2.33	3.78	3.56
	3M	0.74	0.85	0.66	1.65	1.96	1.75	3.14	2.81
	5M	0.10	0.11	-0.09	0.59	0.84	0.64	1.92	1.36
On the 2mm ABS base	30cm	3.44	-0.13	0.28	2.23	2.06	2.09	2.56	2.44
	1M	2.26	0.96	0.89	1.98	2.03	2.04	2.58	0.93
	2M	2.94	-0.50	-0.32	1.38	1.17	1.22	1.53	1.19
	3M	2.75	-0.83	-0.58	0.75	0.69	0.59	0.84	1.11
	5M	1.96	-1.73	-1.41	-0.22	-0.50	-0.47	-0.33	-1.01
On the glass base	30cm	2.66	-1.47	-0.30	3.37	2.59	2.92	5.87	3.50
	1M	0.85	1.65	-0.30	1.95	2.45	2.45	4.25	-0.01
	2M	2.16	-2.19	-0.90	2.51	1.70	2.05	4.84	2.25
	3M	2.10	-2.51	-1.43	2.09	1.11	1.31	4.16	0.65
	5M	1.18	-3.07	-1.99	0.91	0.02	0.35	2.98	0.05

MECHANICAL	
Antenna Dimensions	205.8 x 58 x 12.4mm
Housing	PC+ABS Alloy
Ingress Protection Rating	IP67
Weight	250g
ENVIRONMENTAL	
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 90°C
Humidity	Non-condensing 65°C 95% RH

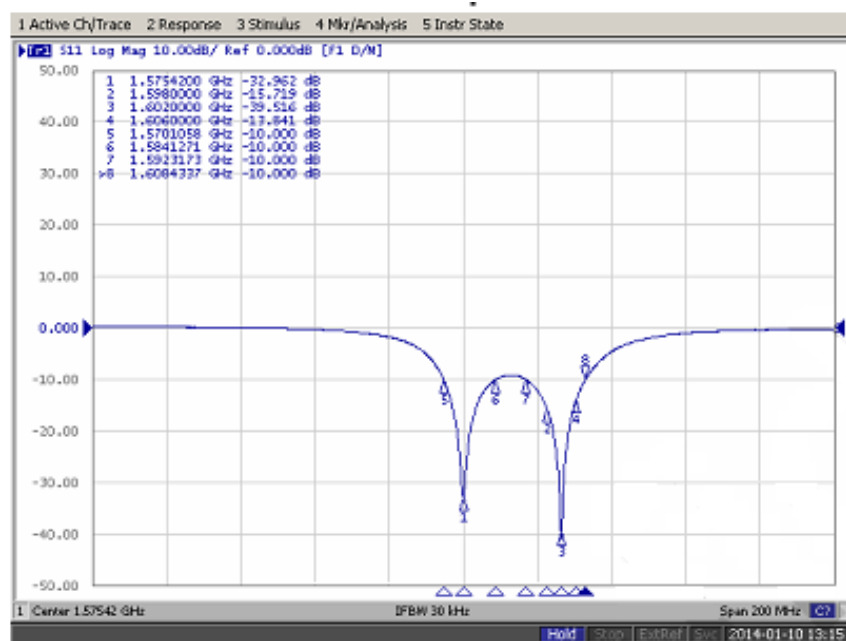
3. Antenna Characteristics

3.1 GPS-GLONASS Antenna

3.1.1 Test Setup



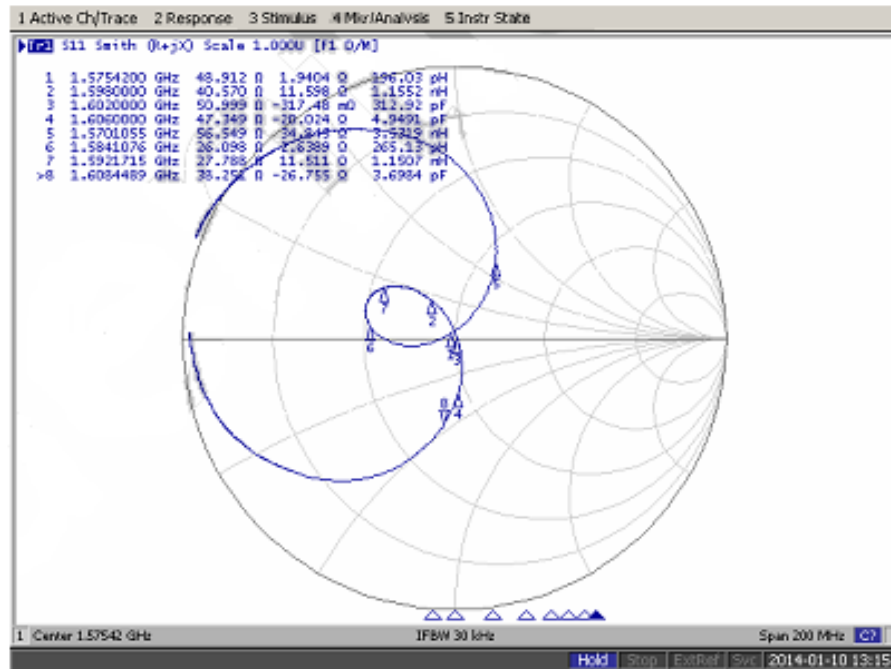
3.1.2 GPS-GLONASS Return Loss



Return Loss : -32.9 dB @ 1575.42MHz

Return Loss : -39.5 dB @ 1602MHz

3.1.3 GPS-GLONASS Smith Chart

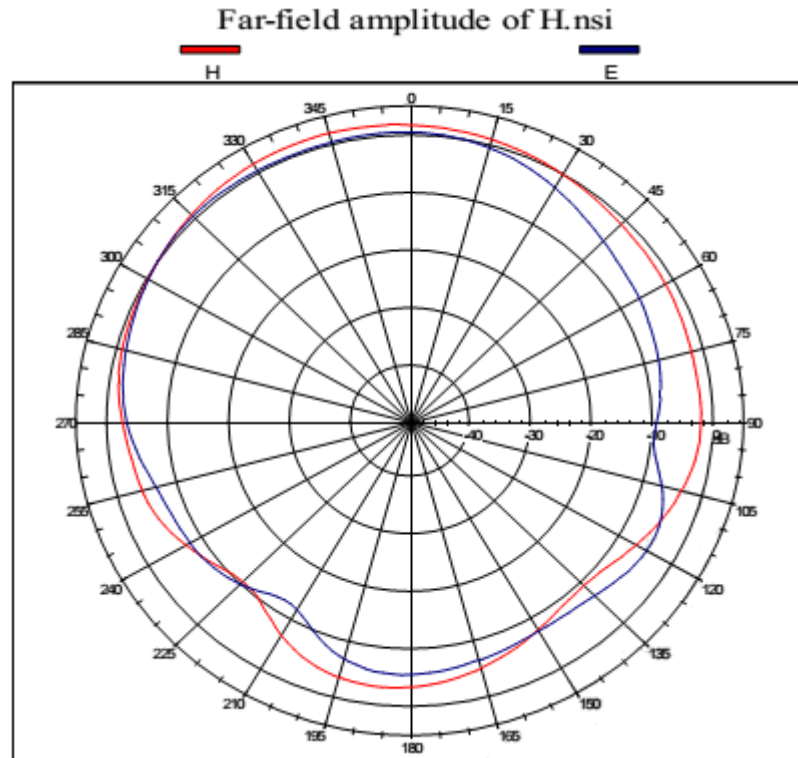


Impedance : $48.9 + j1.9$ Ohm@ 1575.42MHz

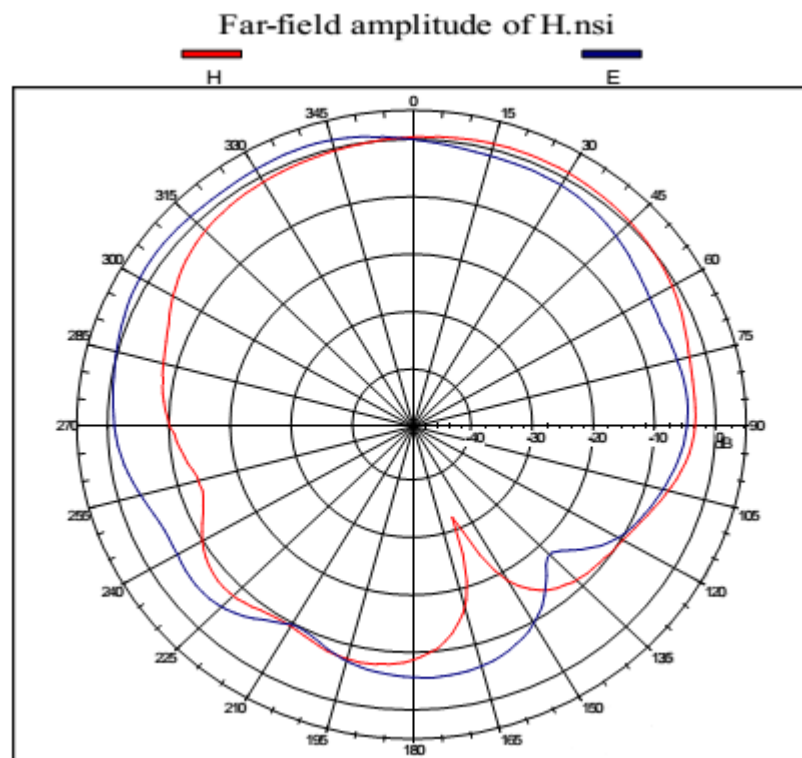
Impedance : $50.9 - j0.3$ Ohm@ 1602MHz

3.1.4 GPS-GLONASS Gain Pattern

Gain pattern @ 1575.42MHz

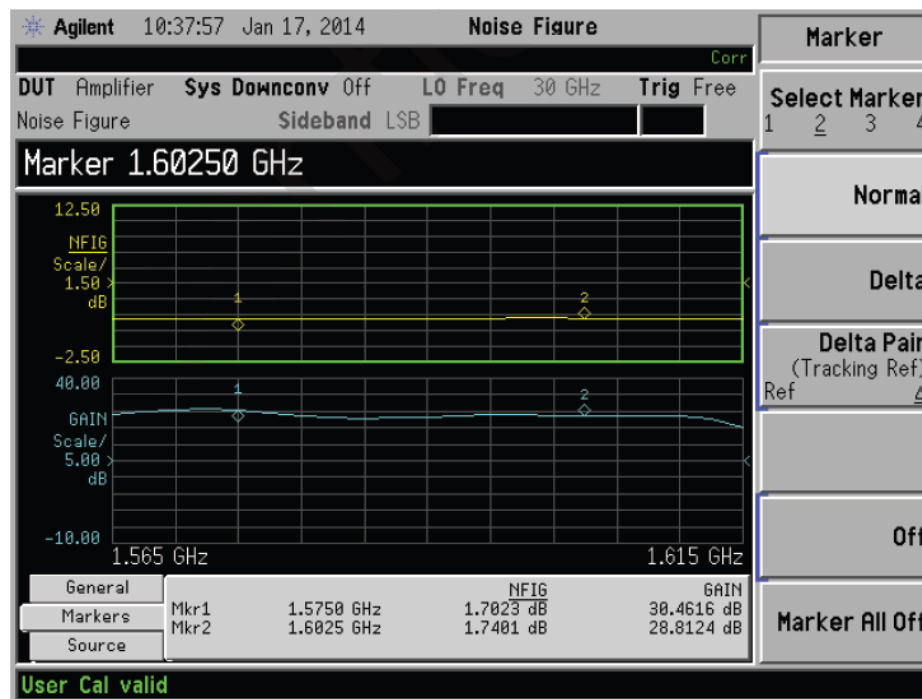


Gain pattern @ 1602MHz



Gain Pattern Data				
Angle(°)	1575.42 MHz		1602 MHz	
	H	E	H	E
-90	-2.65	-3.35	-10.17	-1.12
-76	-0.98	-1.65	-7.82	0.16
-60	-0.15	-0.23	-4.64	1.65
-46	0.94	0.64	-2.01	1.62
-30	1.85	0.49	-0.90	1.59
-16	2.03	0.39	-0.39	1.63
0	1.67	0.44	0.37	-0.10
16	0.82	-0.69	0.90	-1.31
30	-0.23	-2.91	0.89	-1.56
46	-1.38	-5.56	0.16	-3.28
60	-1.90	-6.83	-1.12	-5.34
76	-2.49	-9.09	-3.33	-5.26
90	-2.50	-9.82	-3.93	-5.24

3.1.5 GPS-GLONASS LNA Noise Figure



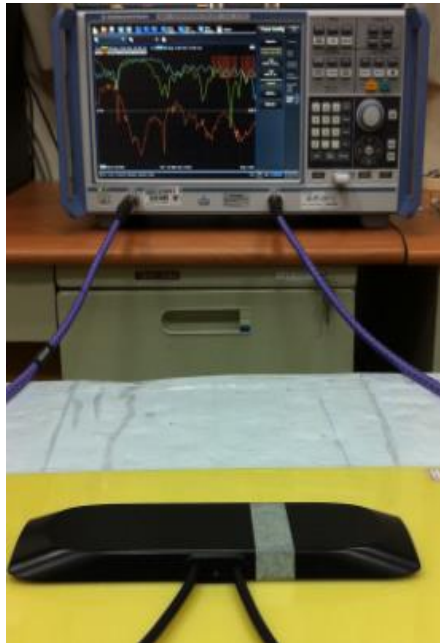
3.2 LTE MIMO Antenna

3.2.1 Test Setup

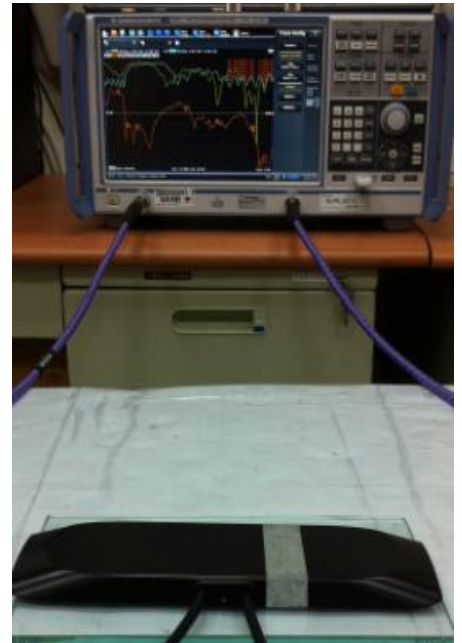
In free space



On 2mm ABS base

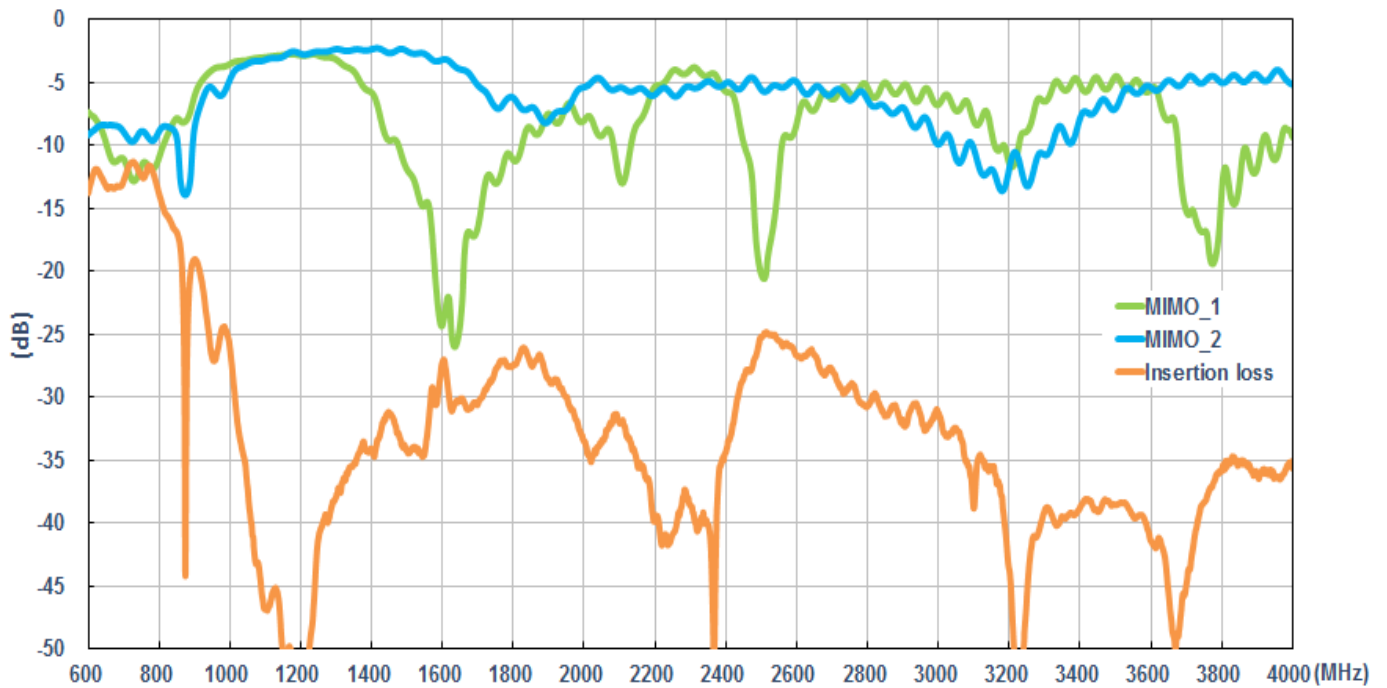


On the glass base

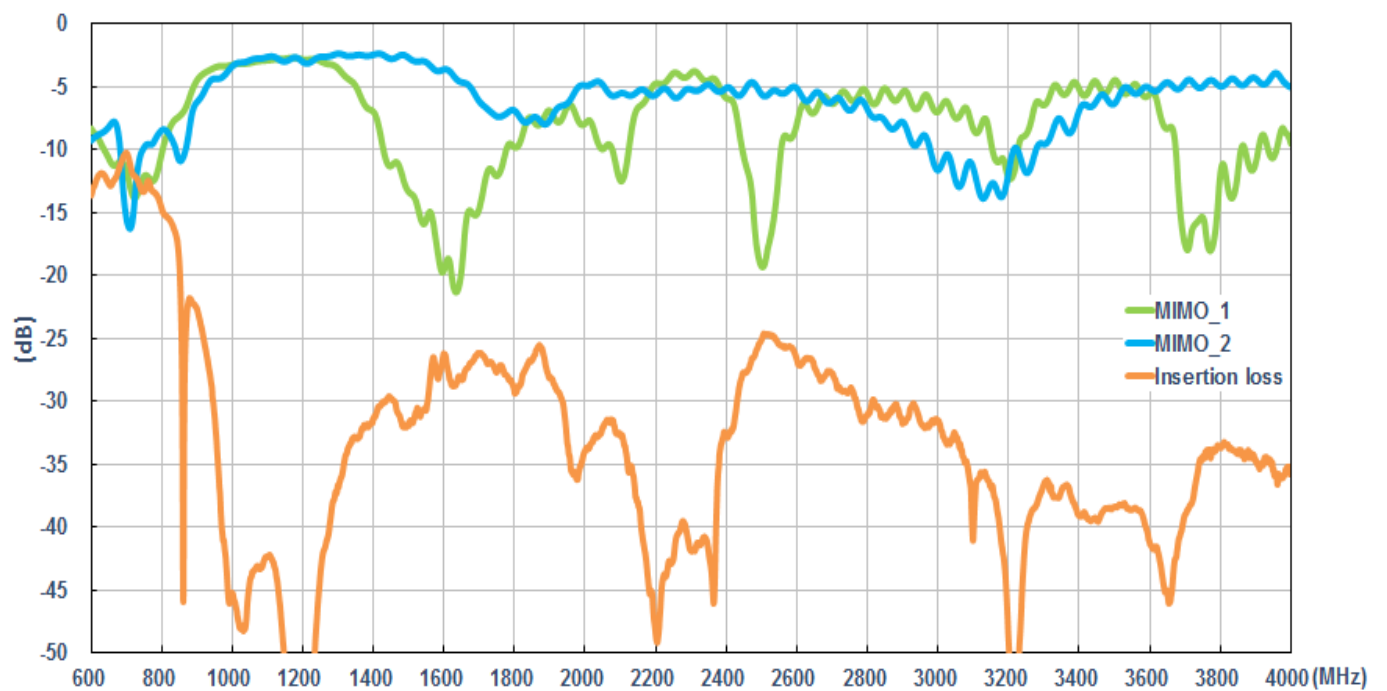


3.2.2 LTE Antenna Return Loss

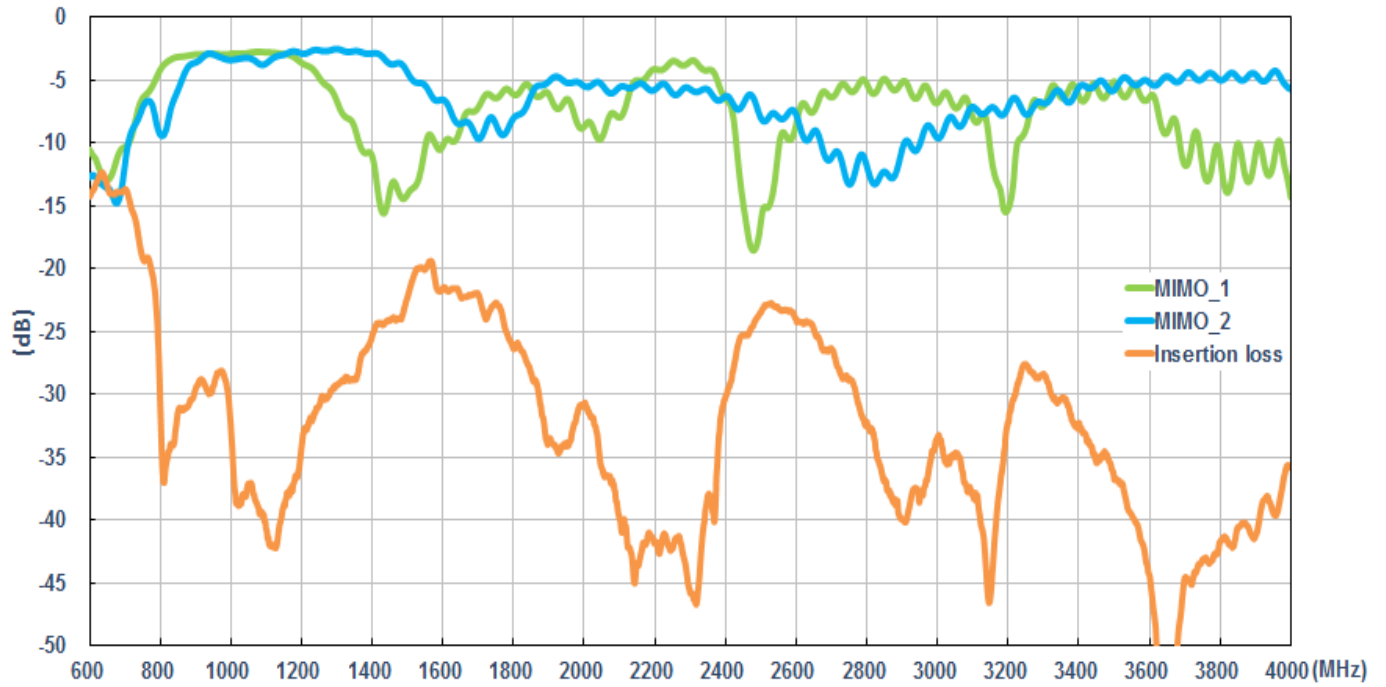
Setup in the free space with 2 meters cable length



Setup on the 2mm ABS base with 2 meters cable length

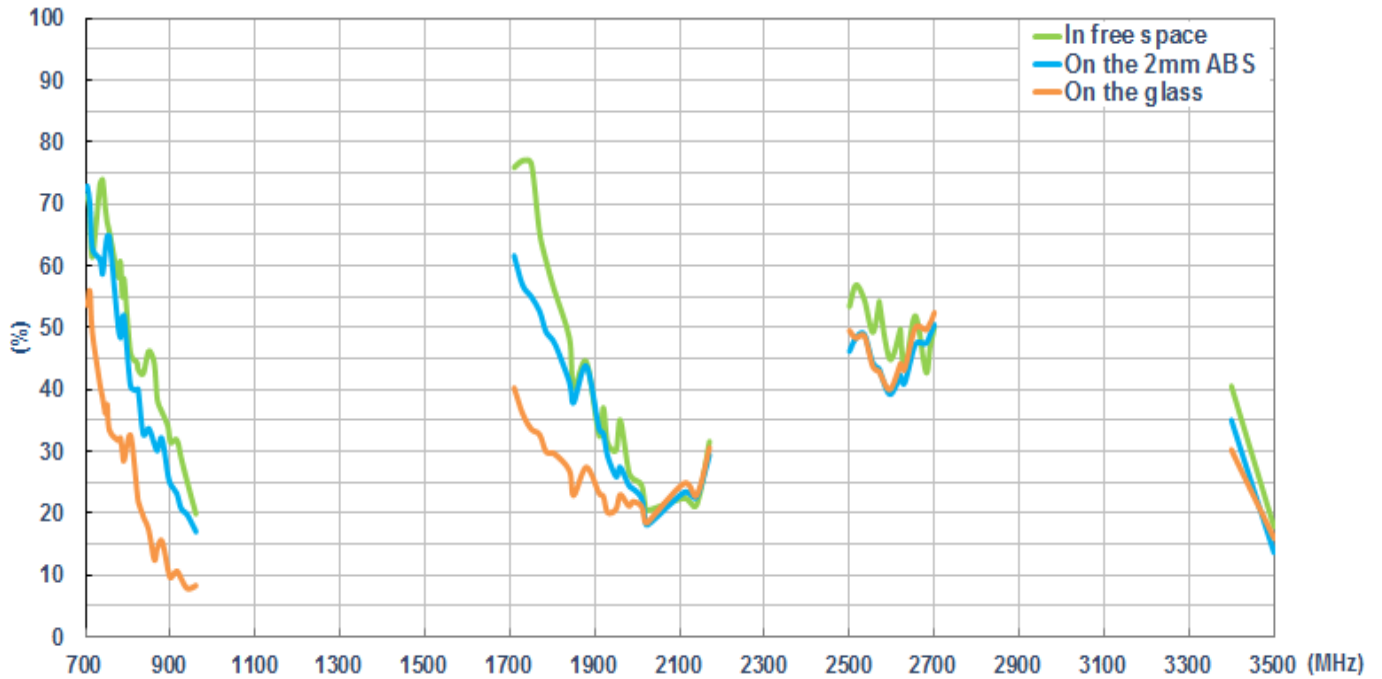


Setup on the glass base with 2 meters cable length

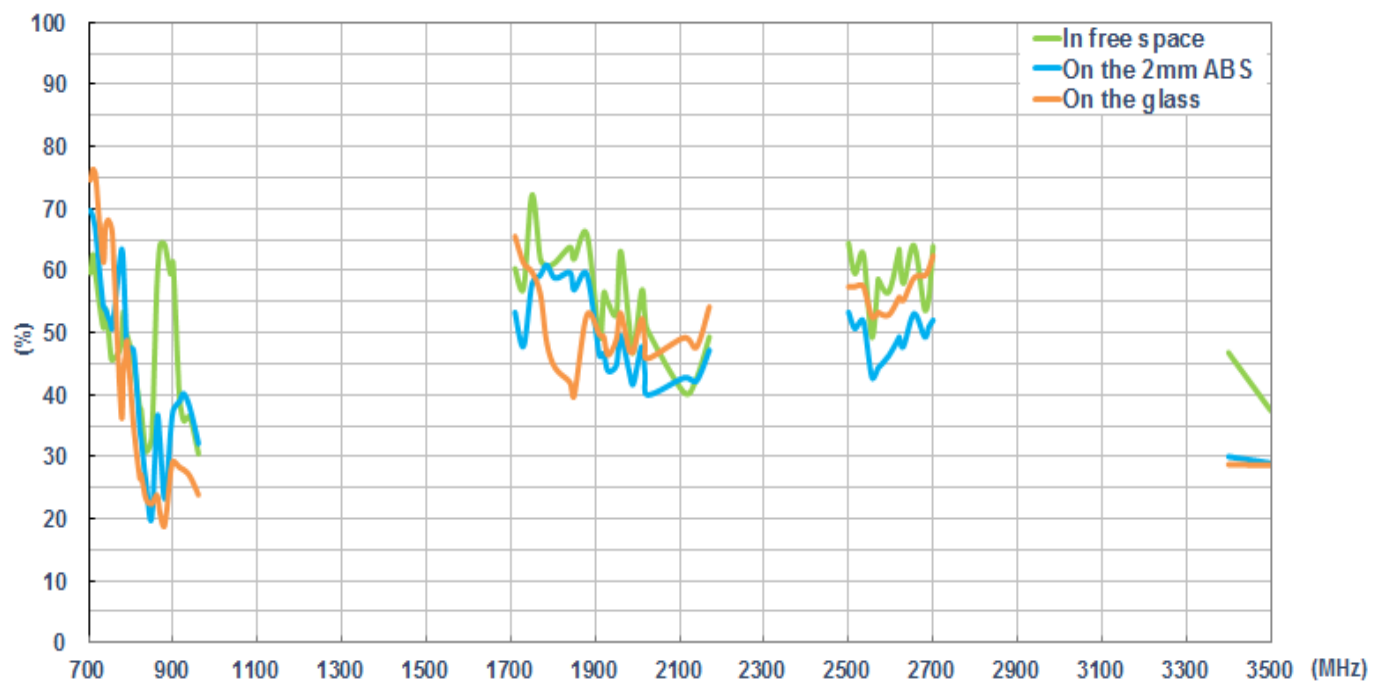


3.2.3 LTE Antenna Efficiency

MIMO_1

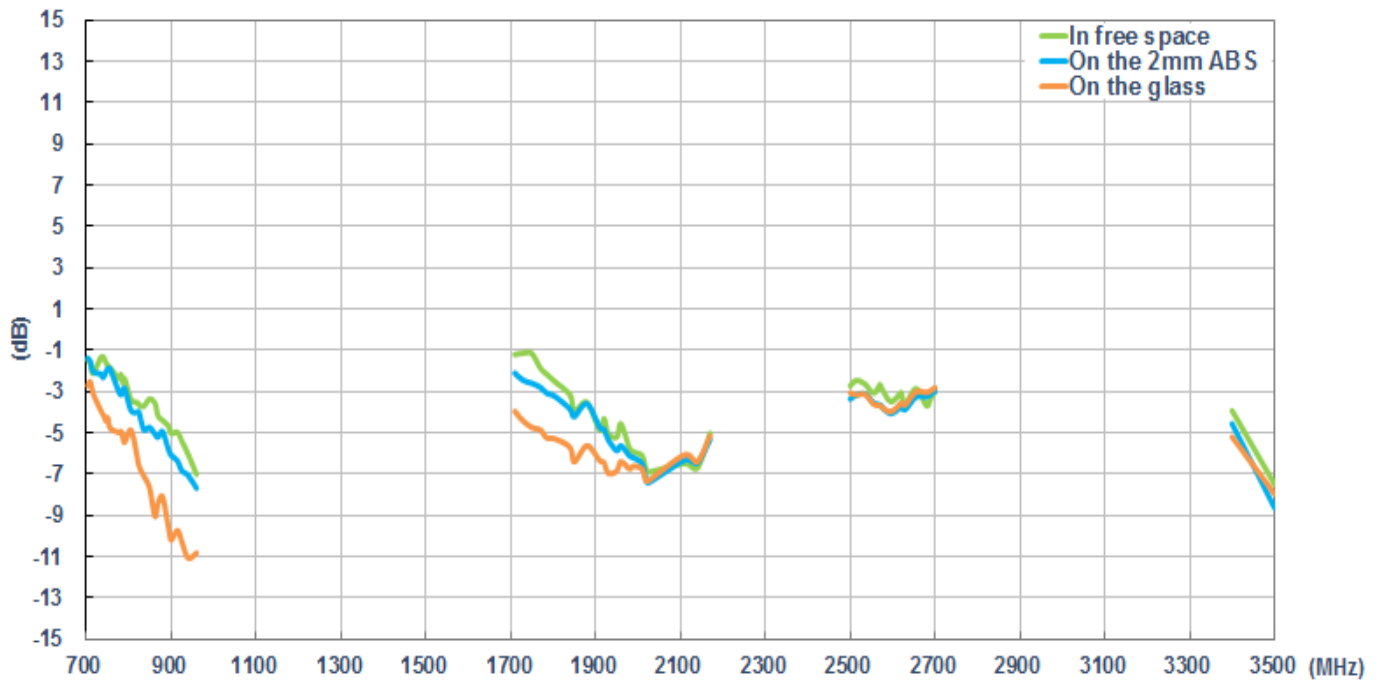


MIMO_2

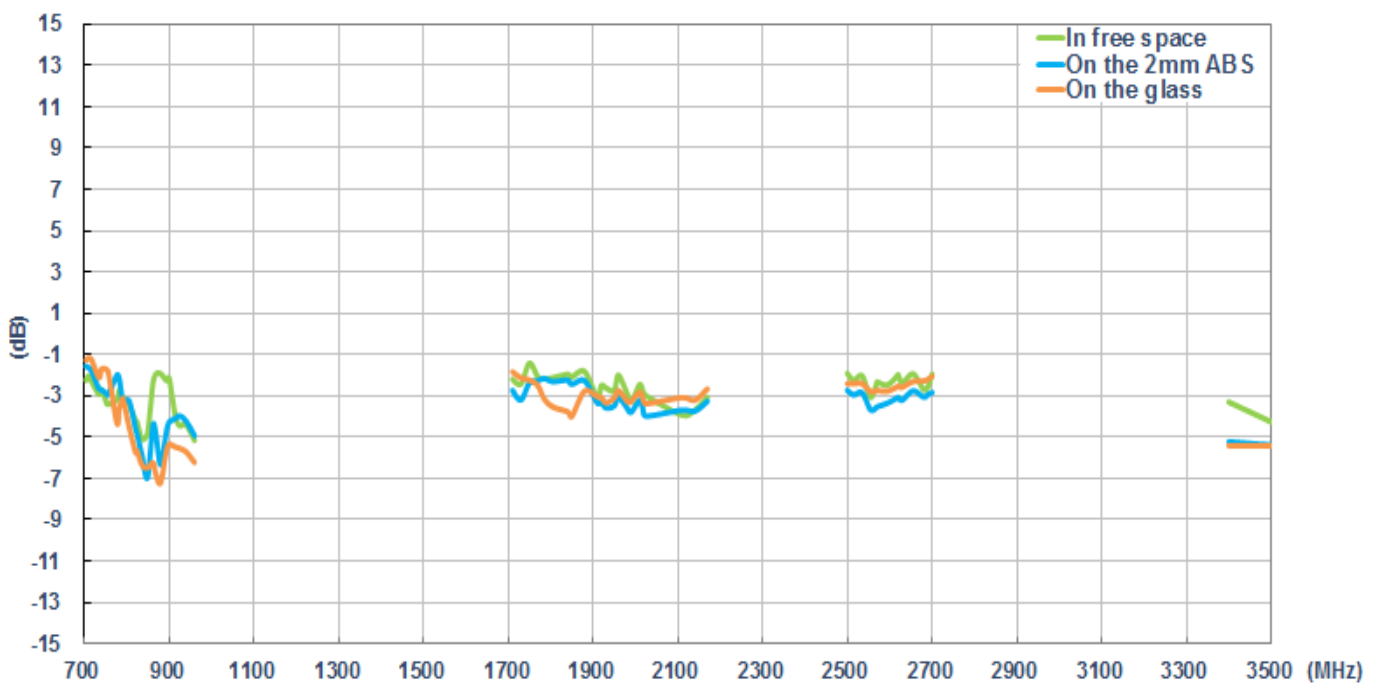


3.2.4 LTE Antenna Average Gain

MIMO_1

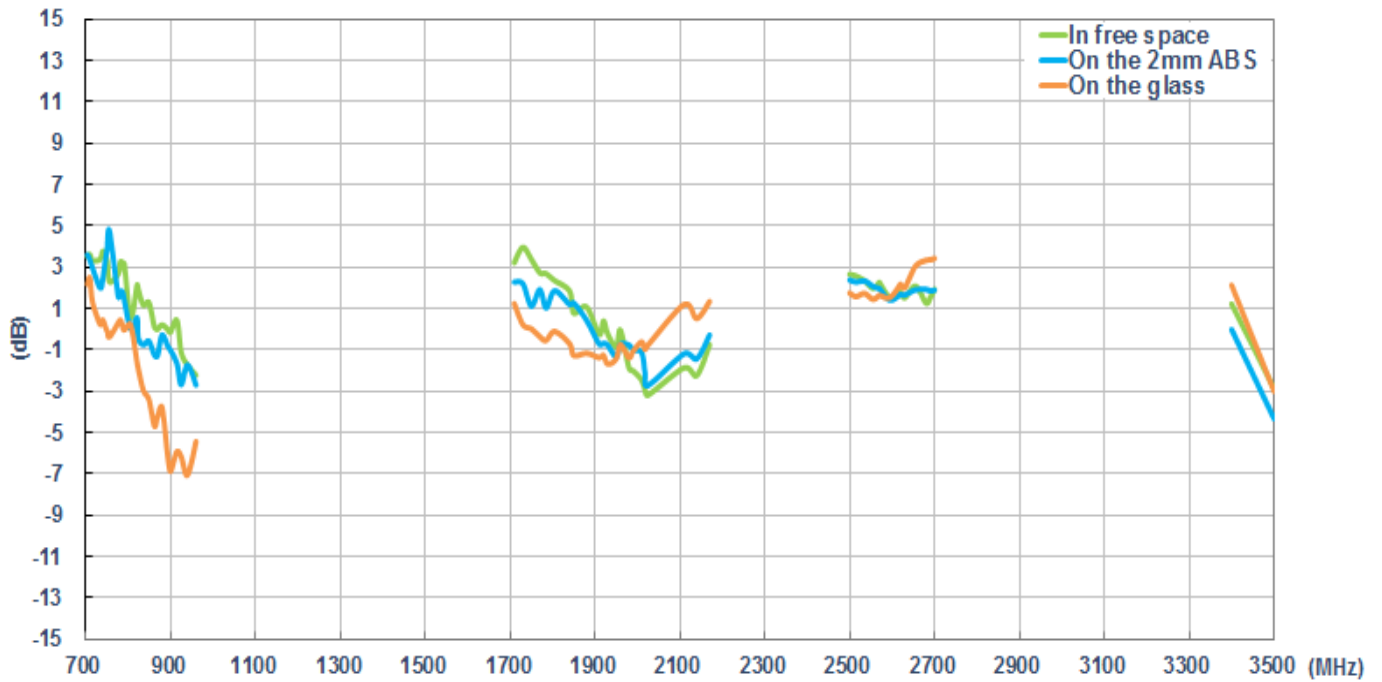


MIMO_2

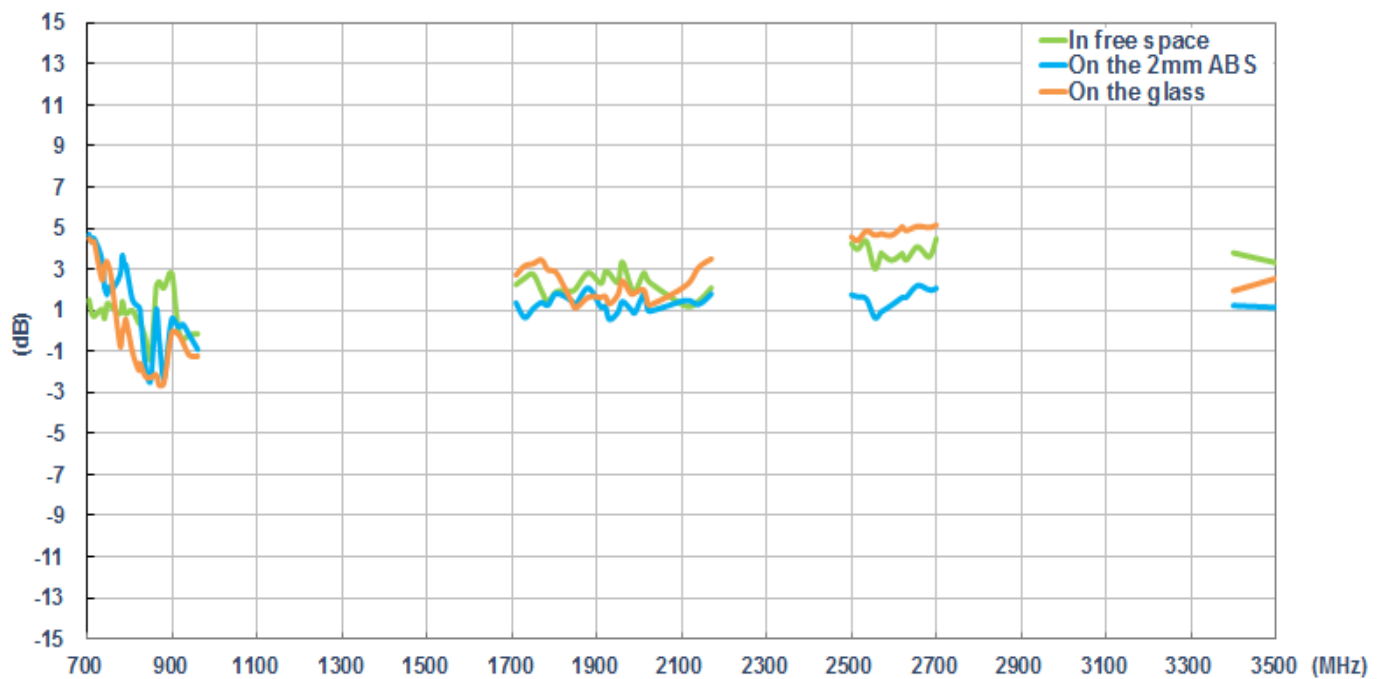


3.2.5 LTE Antenna Peak Gain

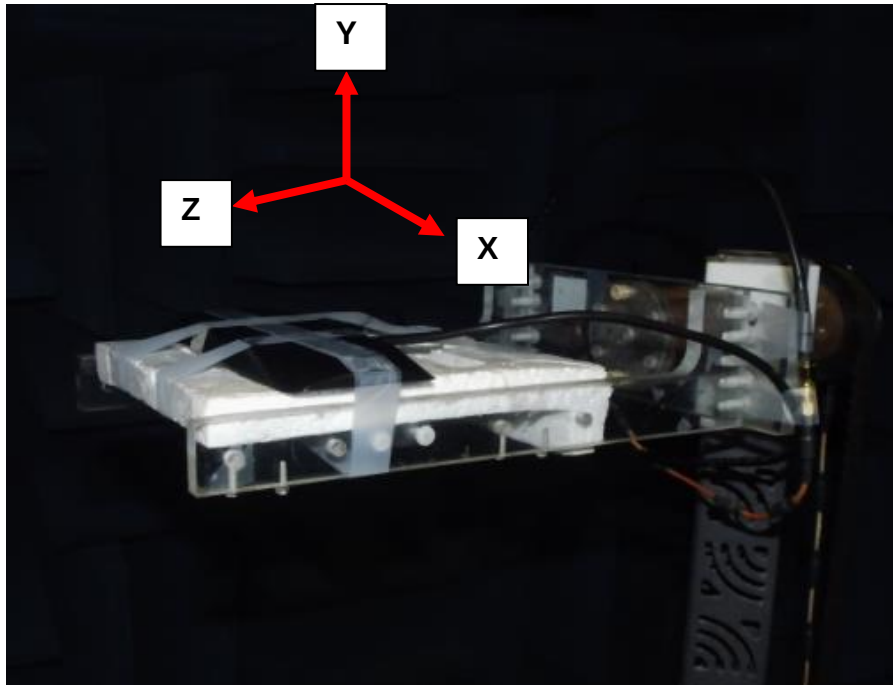
MIMO_1



MIMO_2



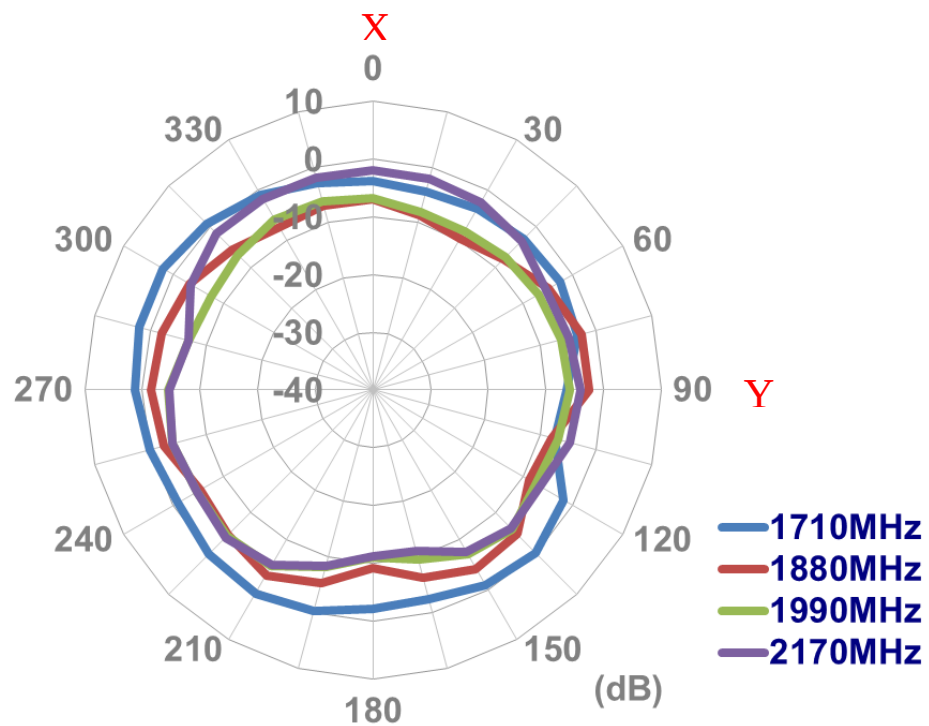
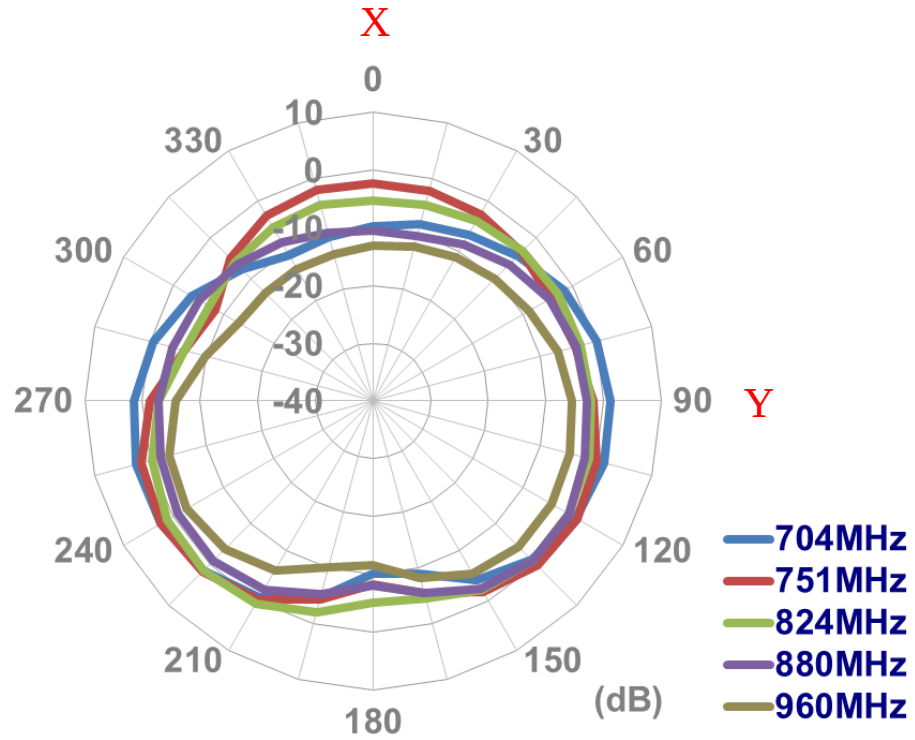
3.2.6 Test Setup For Antenna Radiation Pattern (ETS Anechoic chamber)

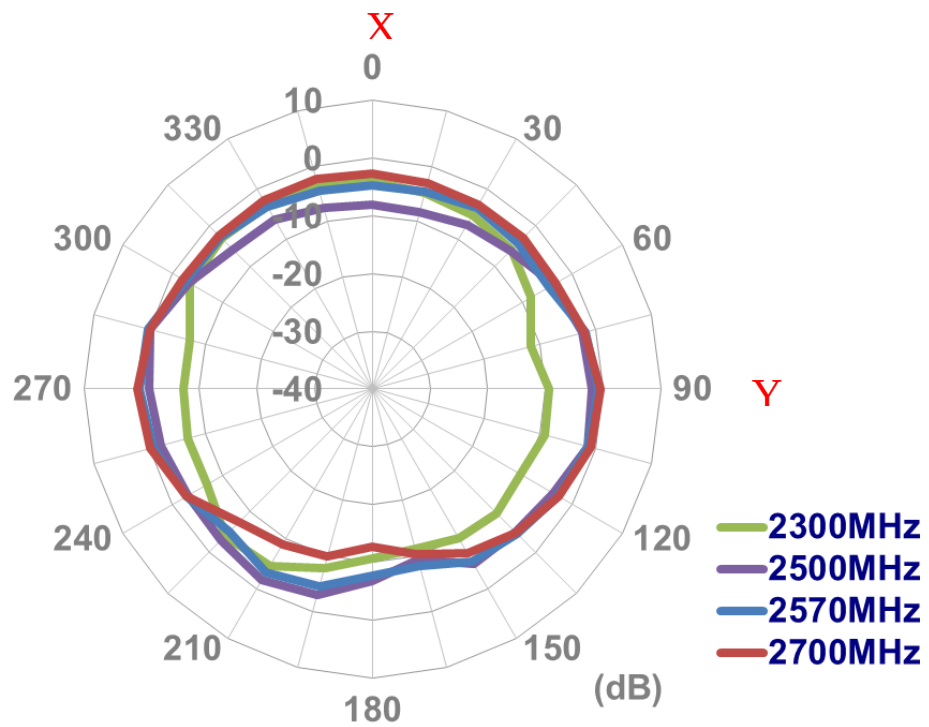


In free space

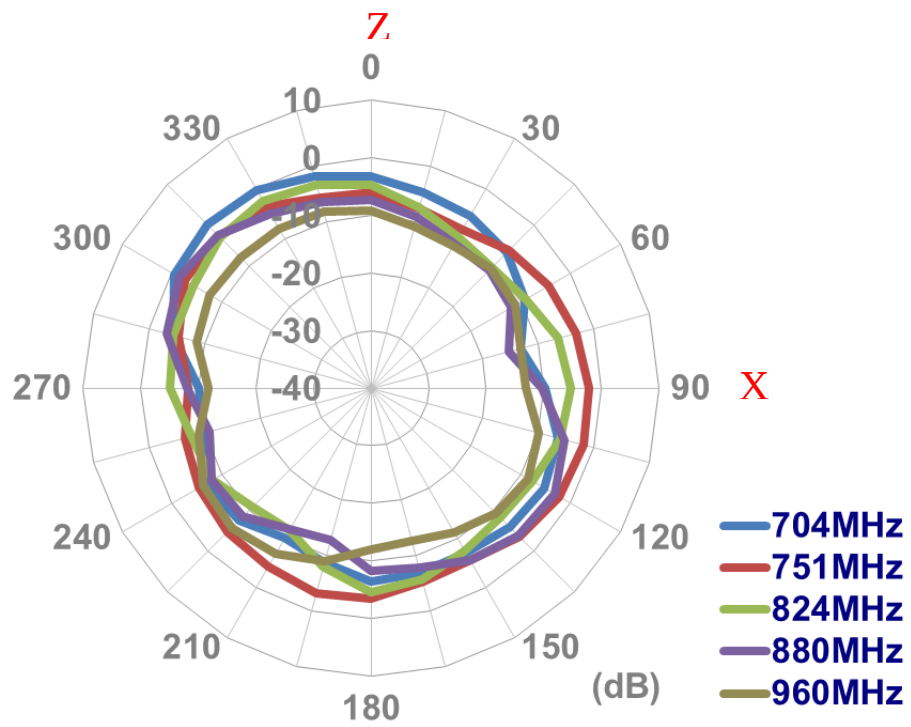
3.2.7 2D Radiation pattern (MIMO1 with 2M cable length in free space)

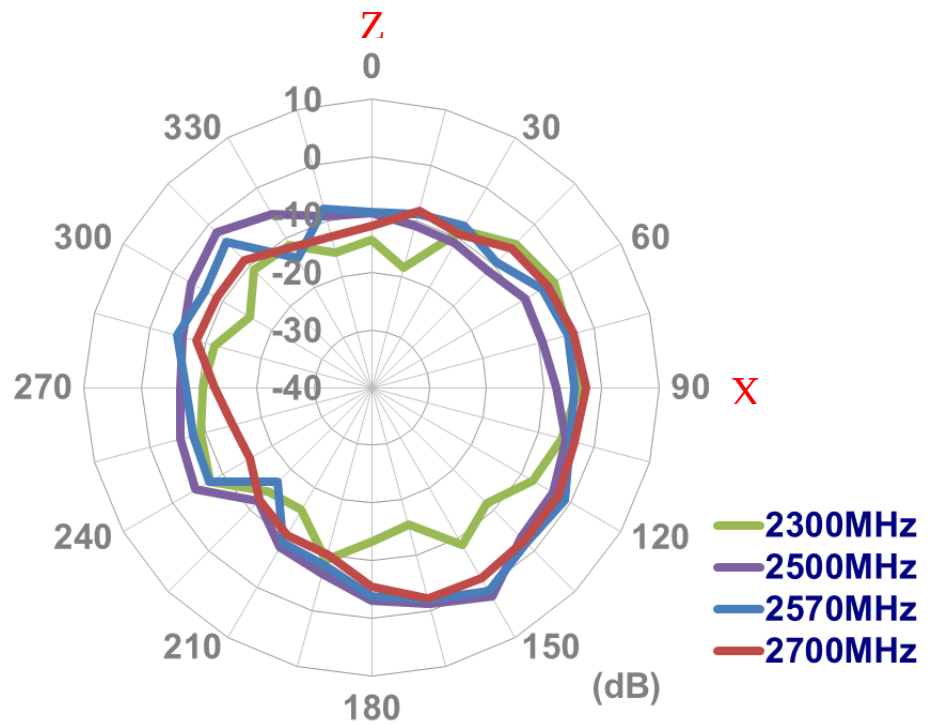
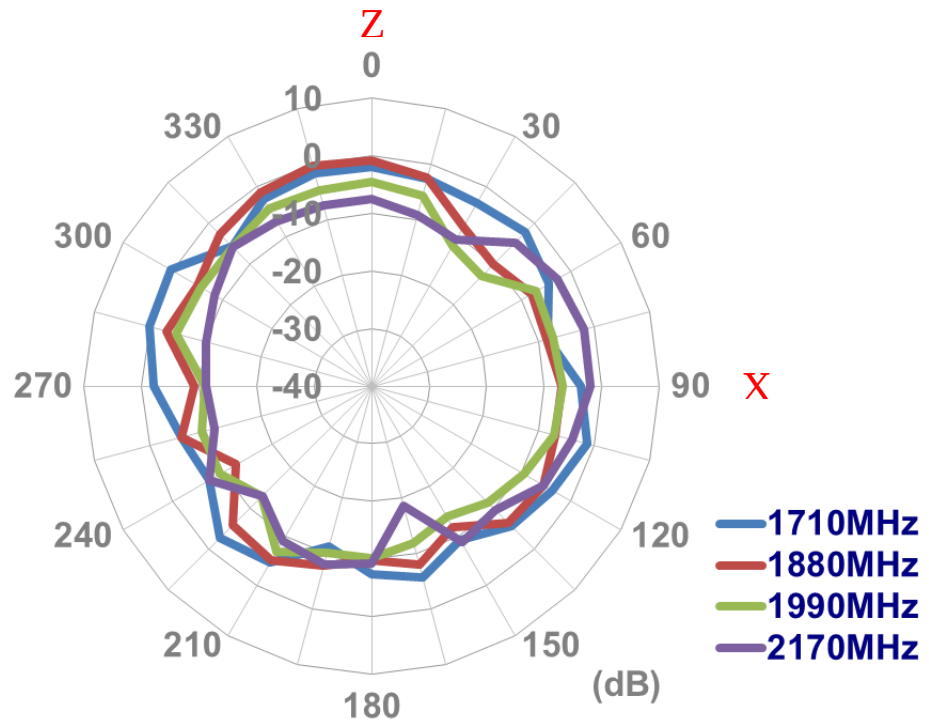
XY Plane



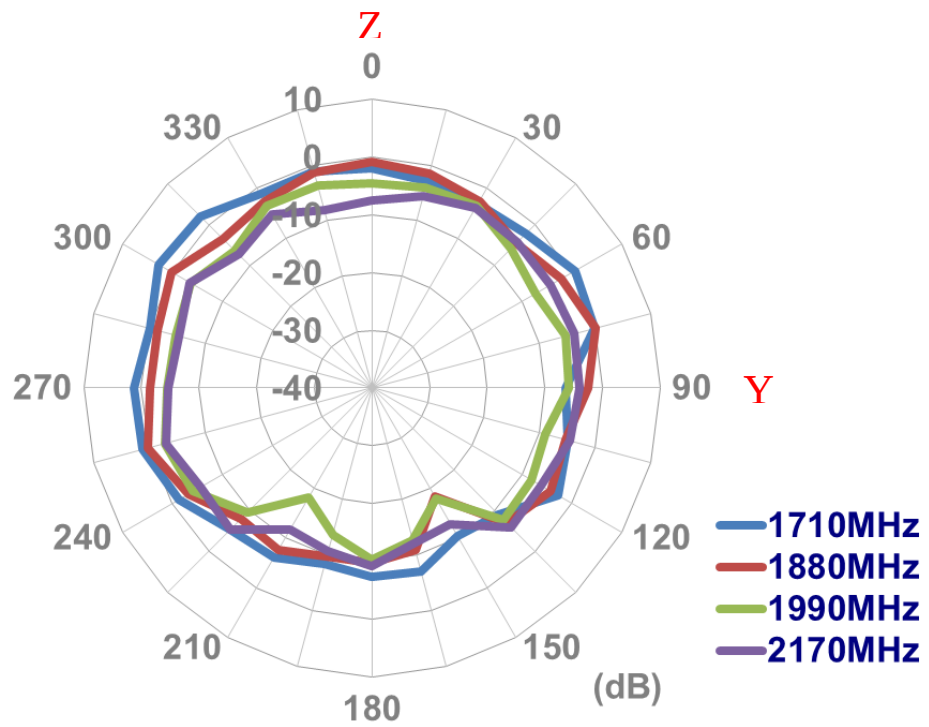
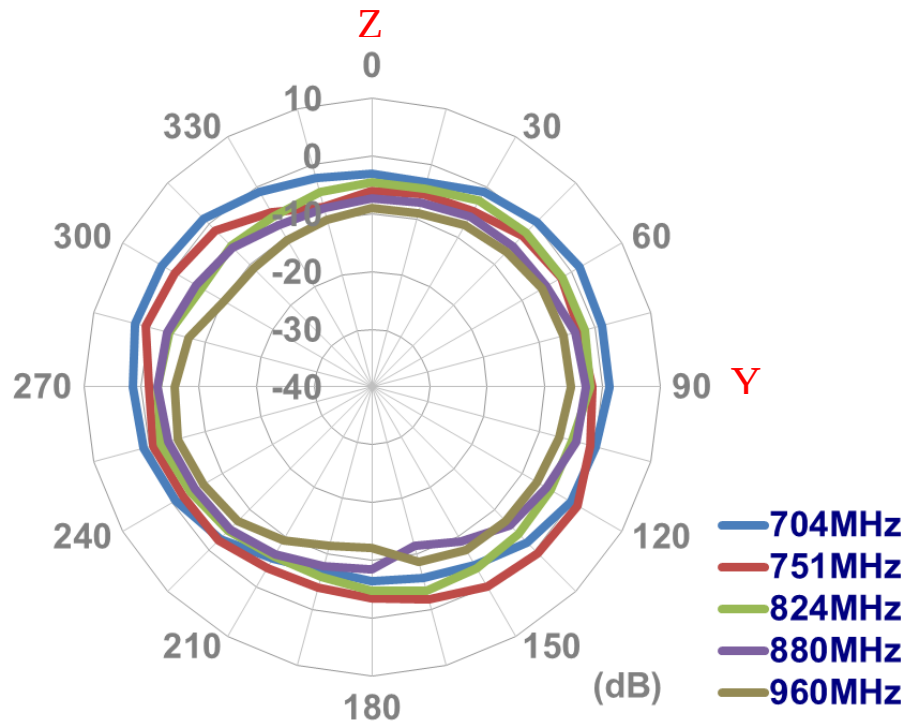


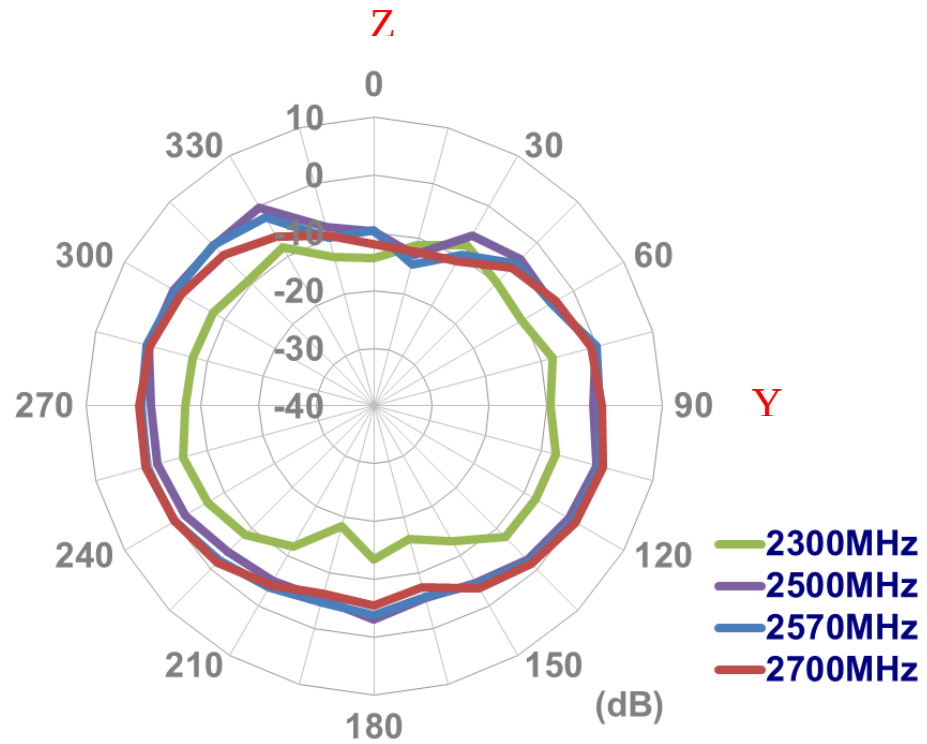
XZ Plane



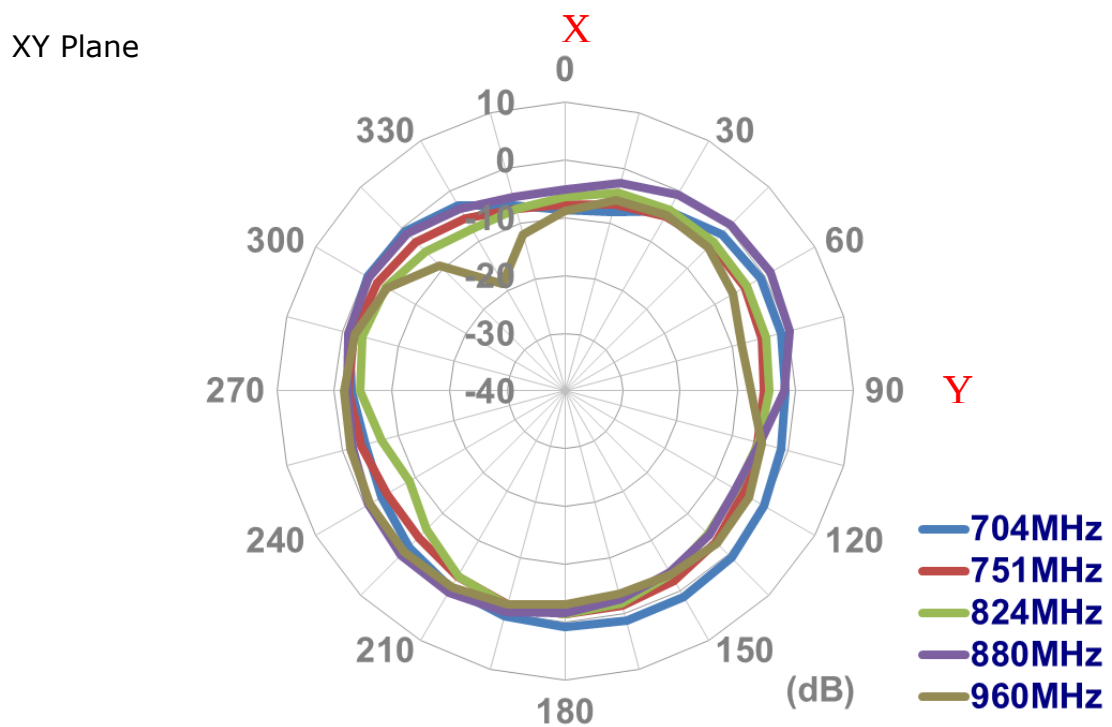


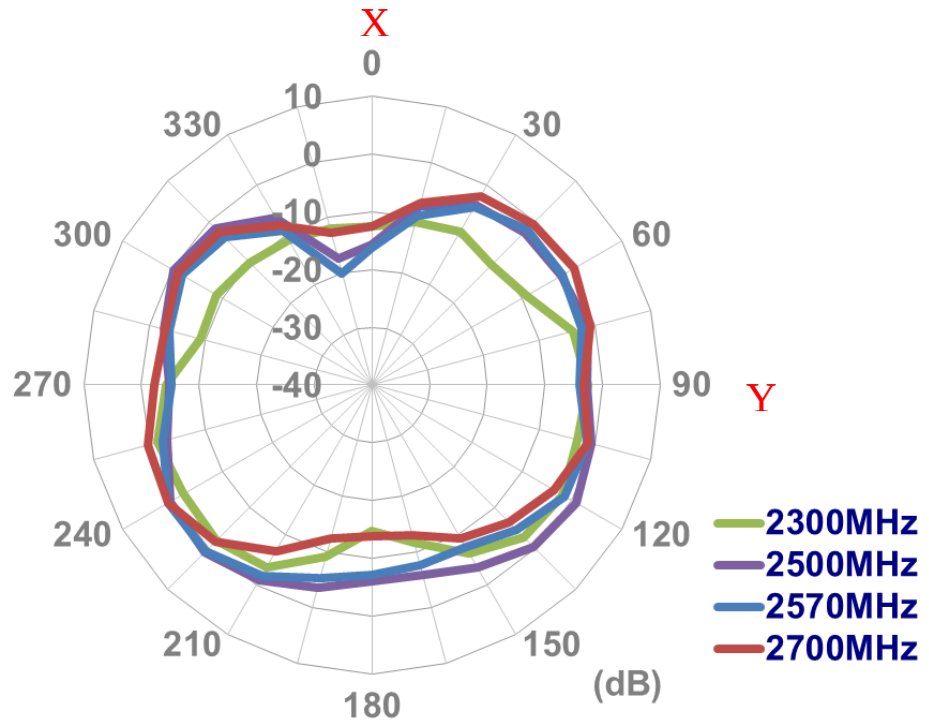
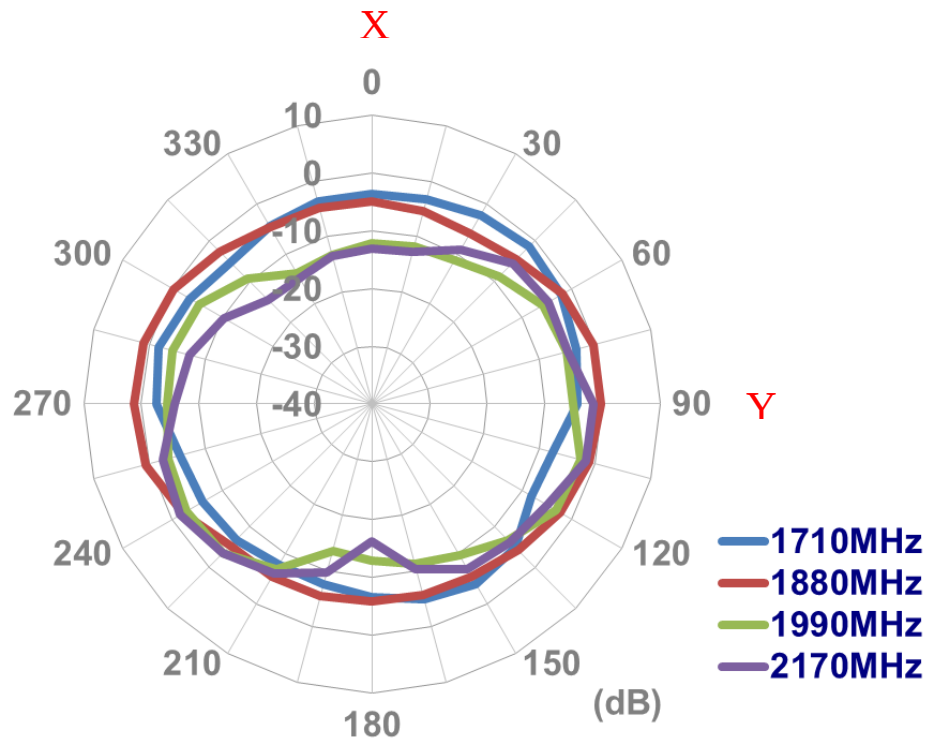
YZ Plane



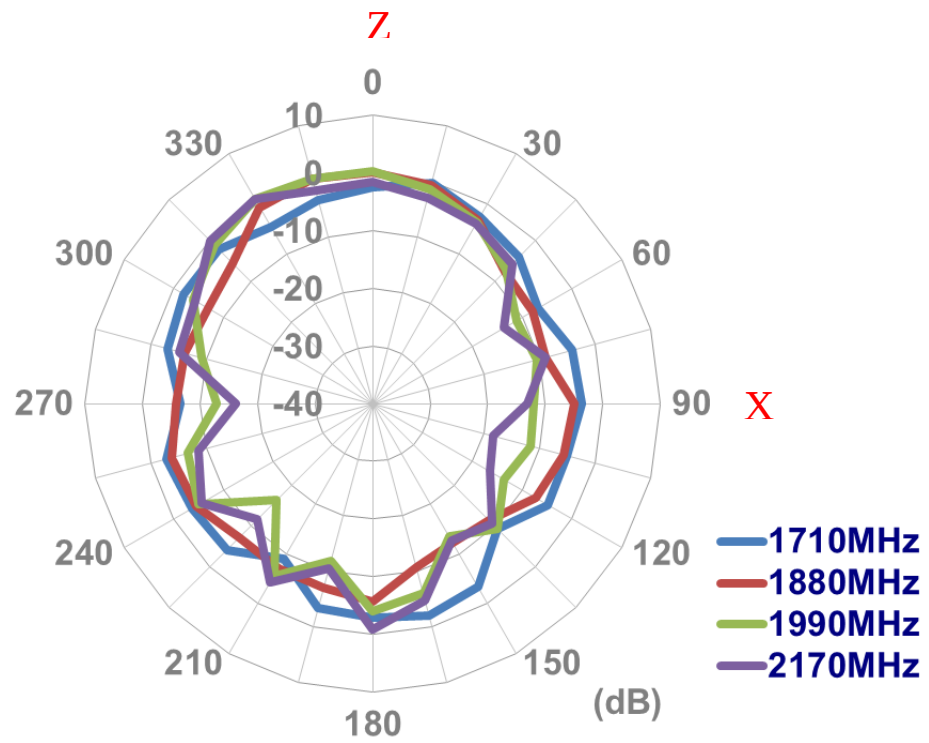
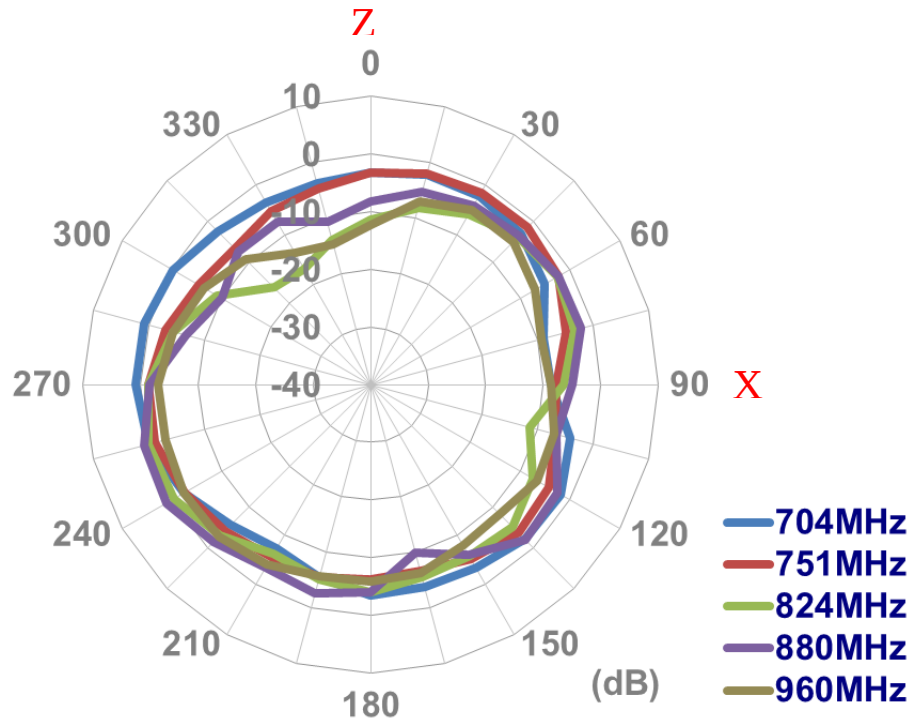


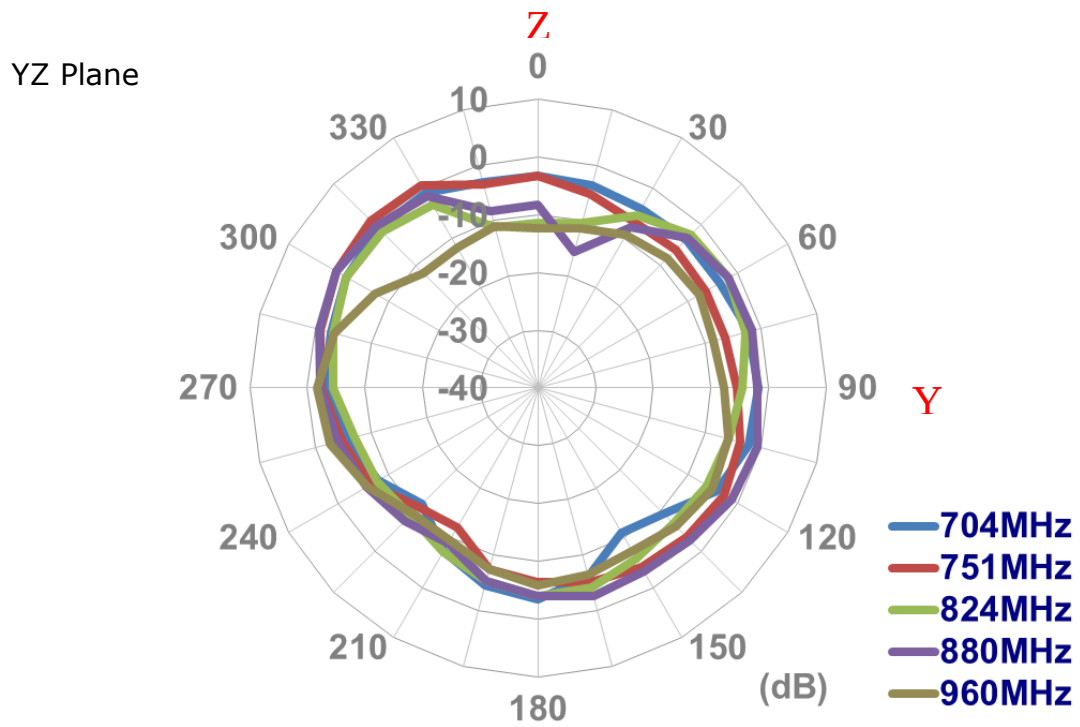
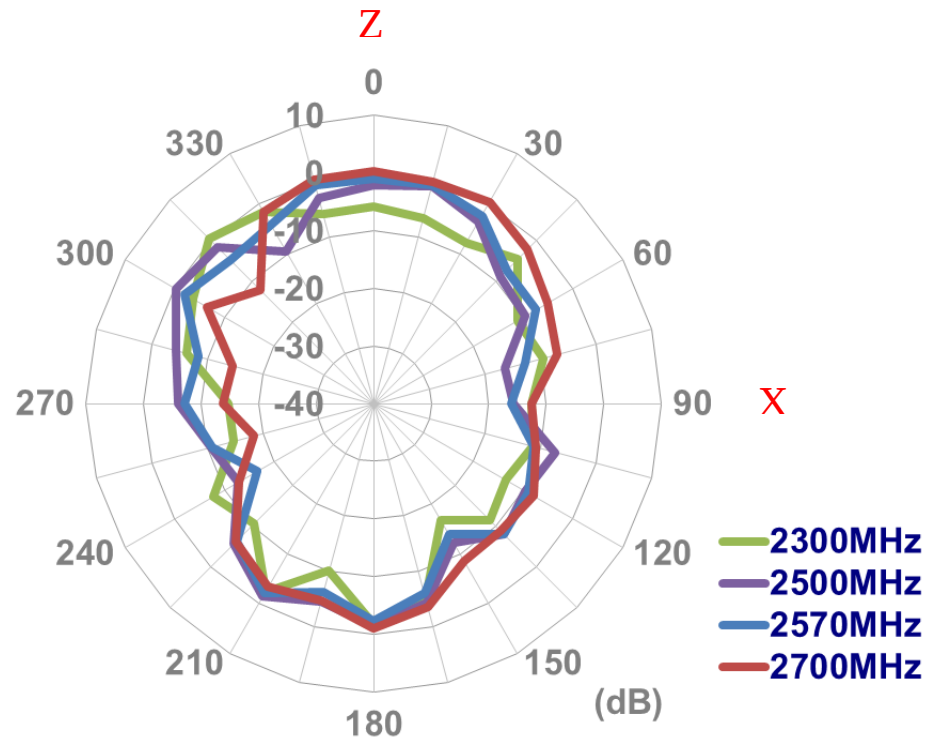
3.2.8 2D Radiation pattern (MIMO2 with 2M cable length in free space)

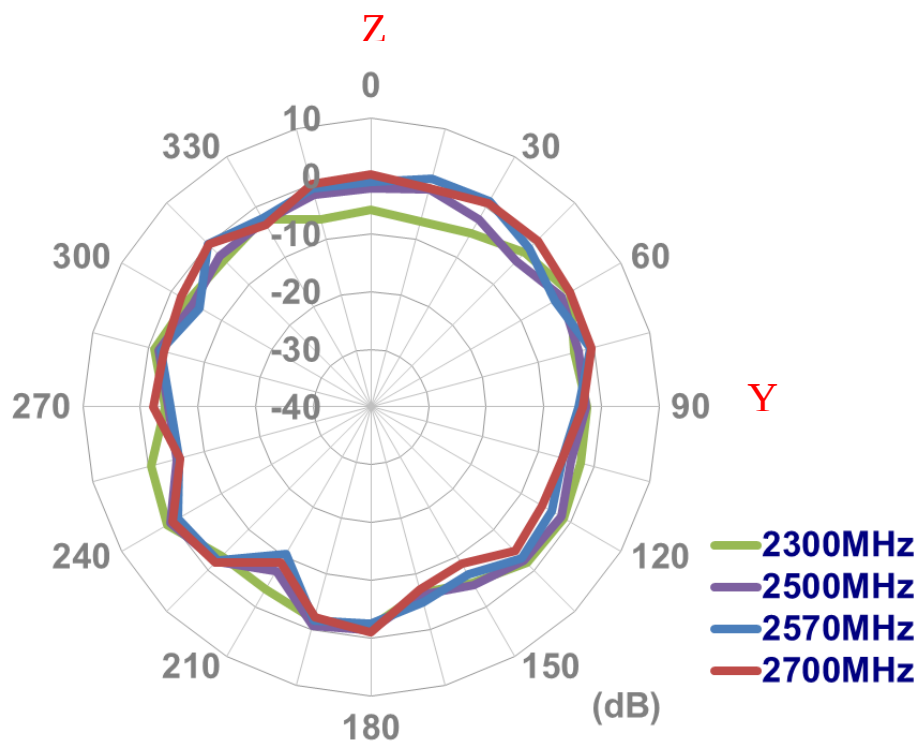
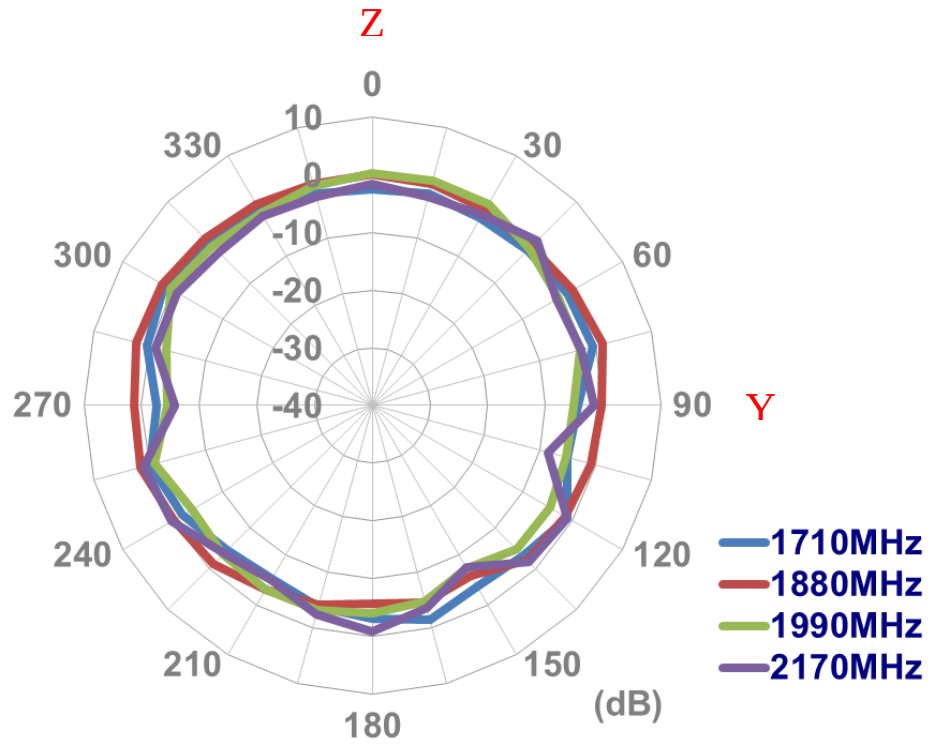




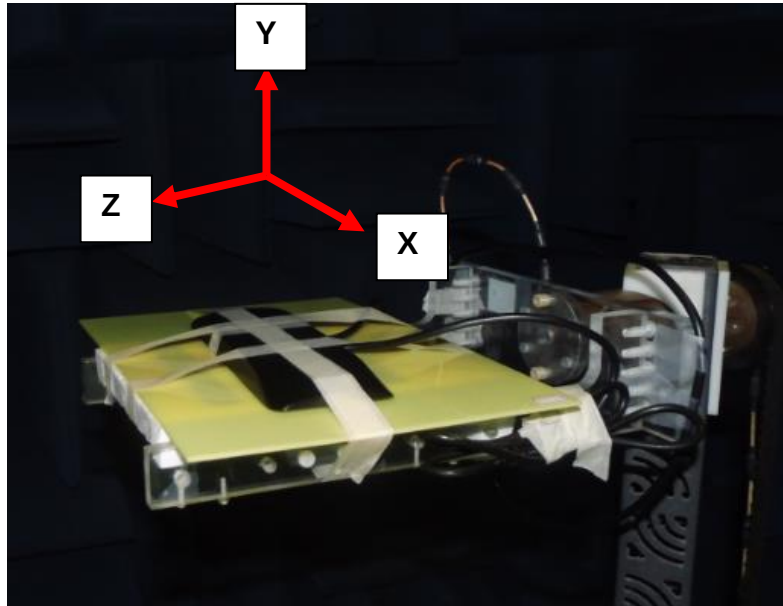
XZ Plane







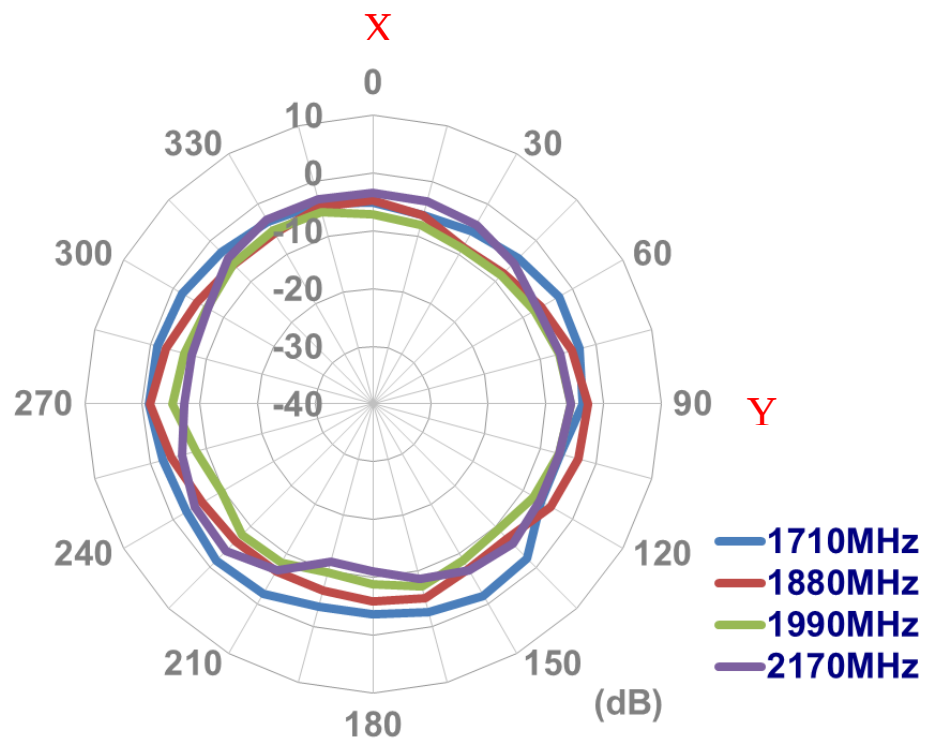
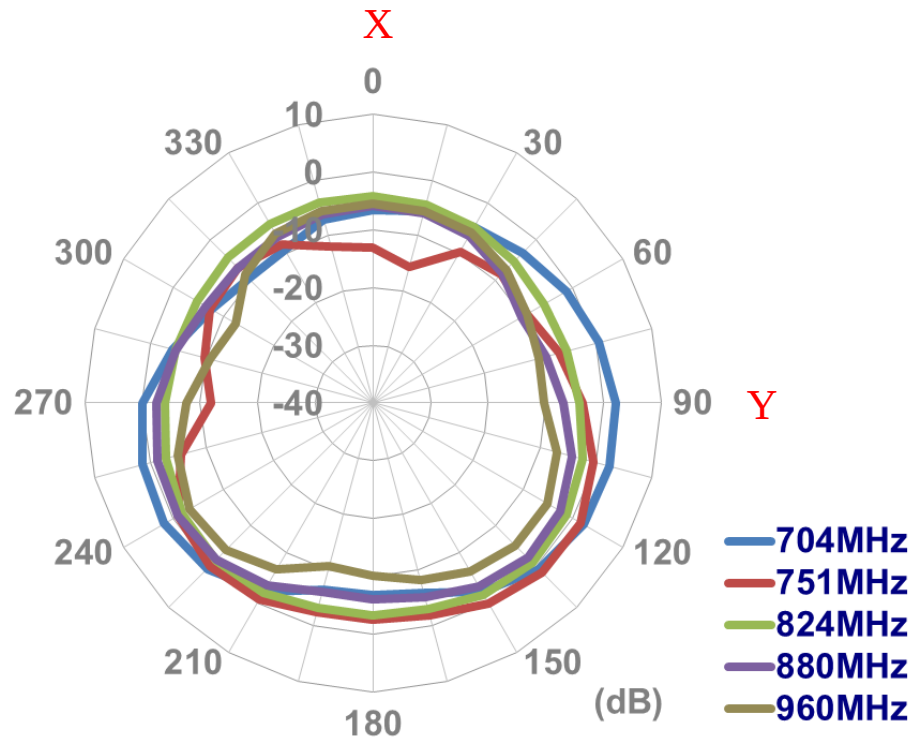
3.2.9 Test Setup For Antenna Radiation Pattern (ETS Anechoic chamber)

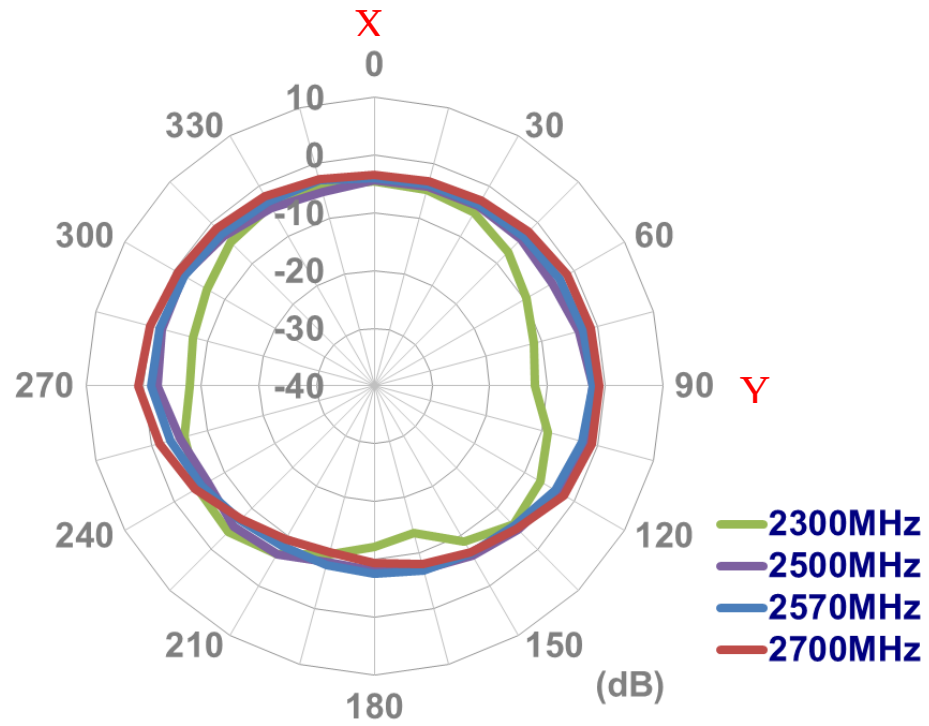


On the 2mm ABS base

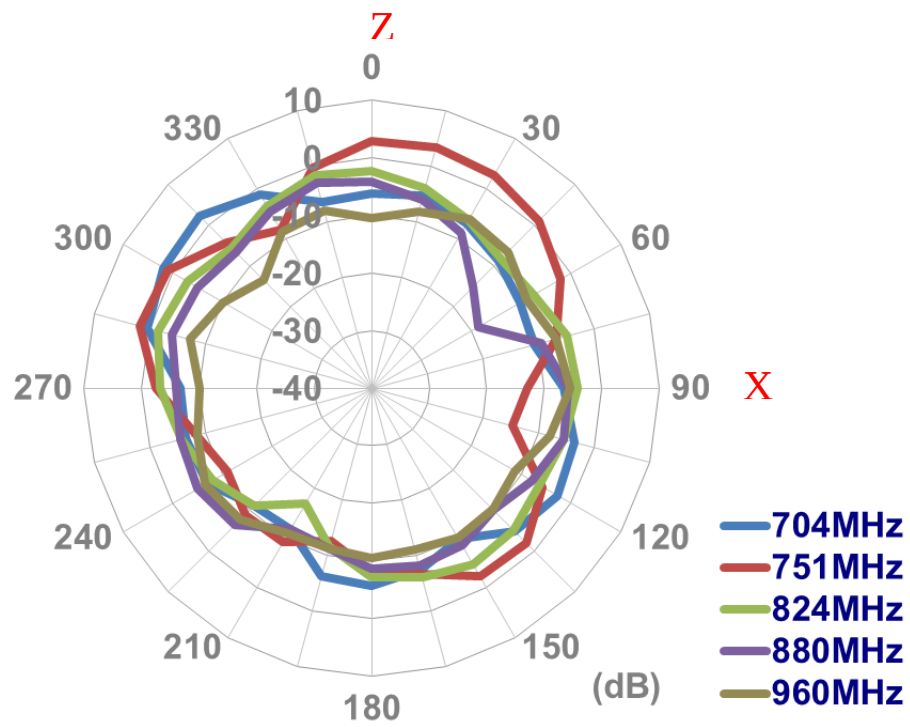
3.2.10 2D Radiation pattern (MIMO1 with 2M cable length on the 2mm ABS)

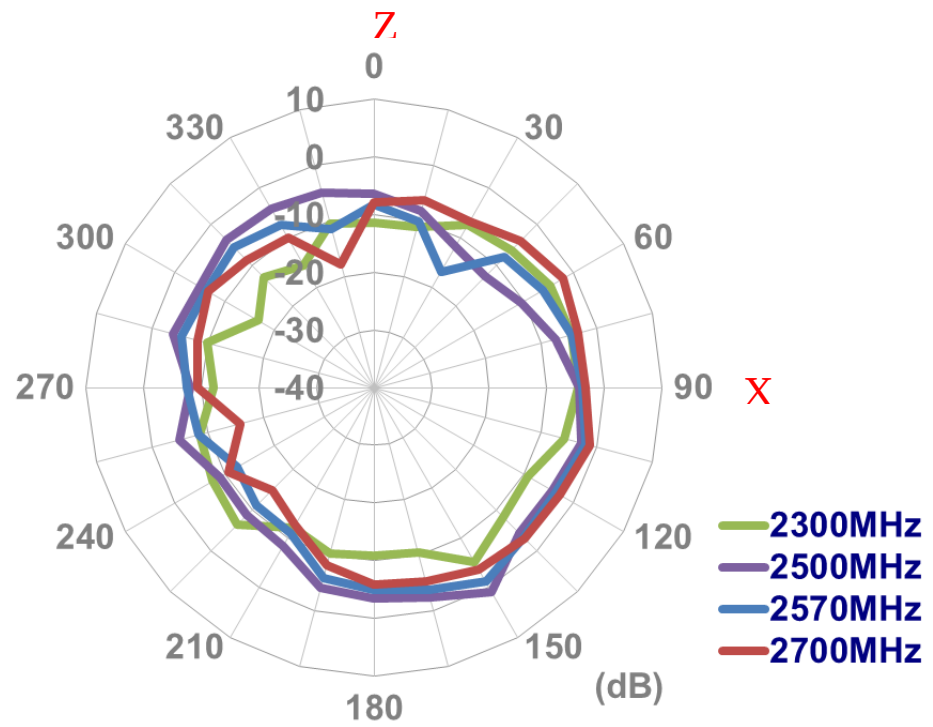
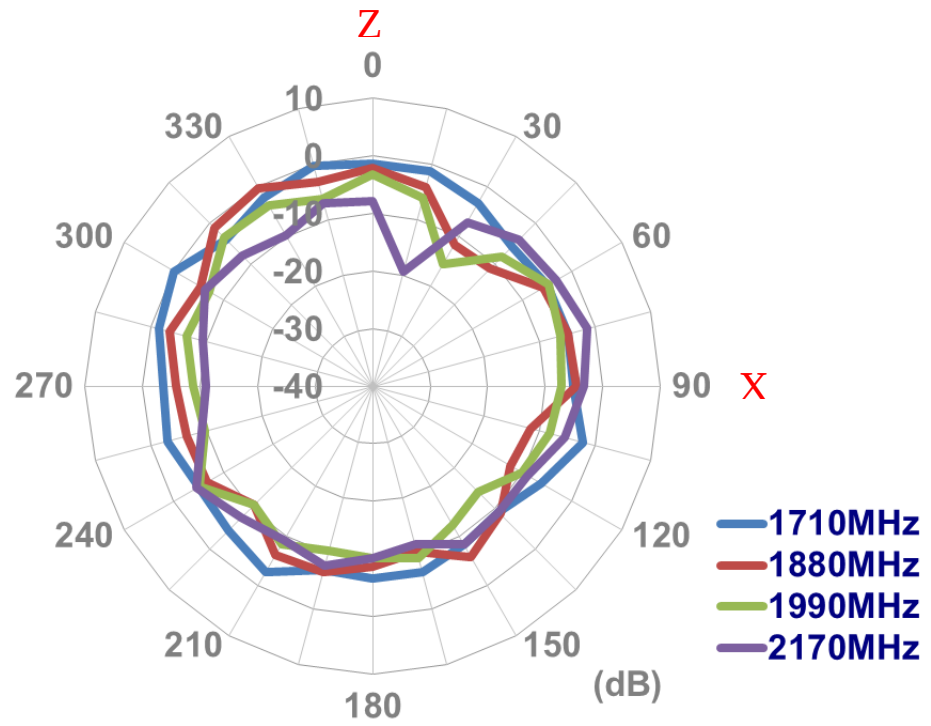
XY Plane



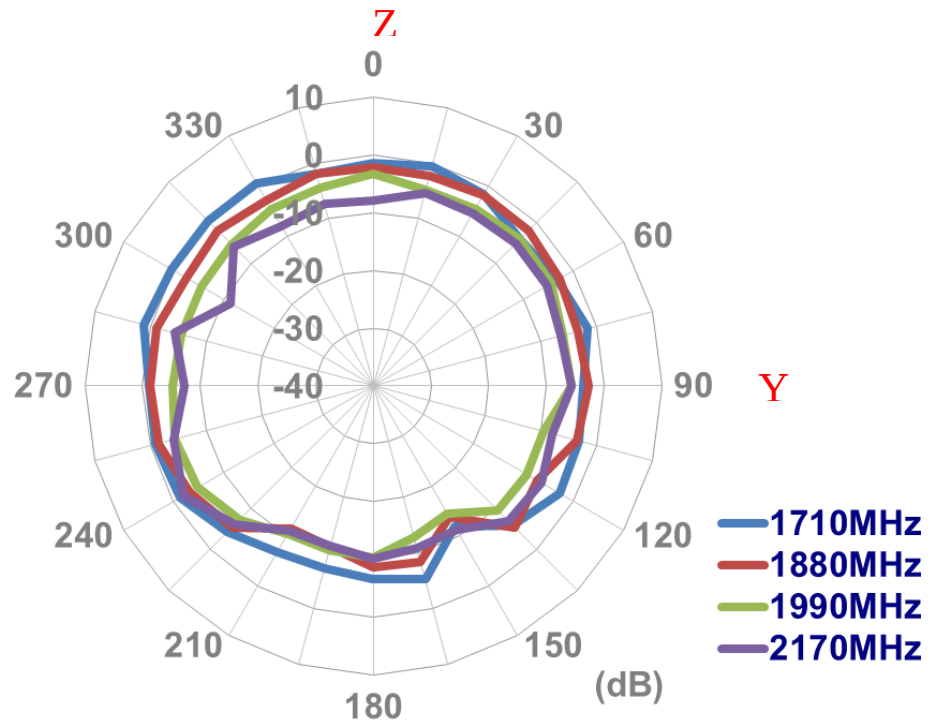
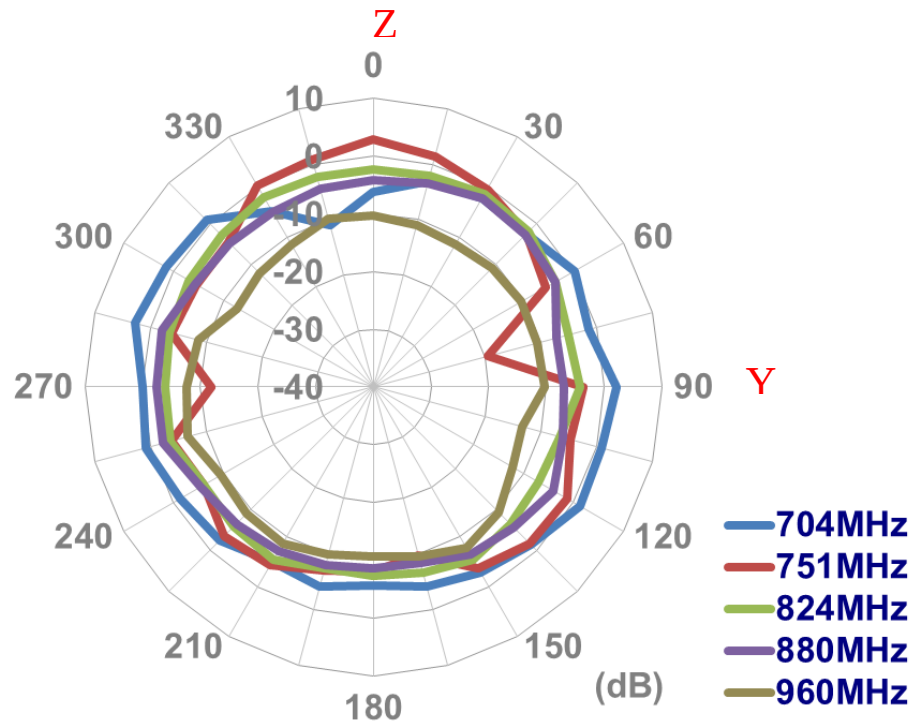


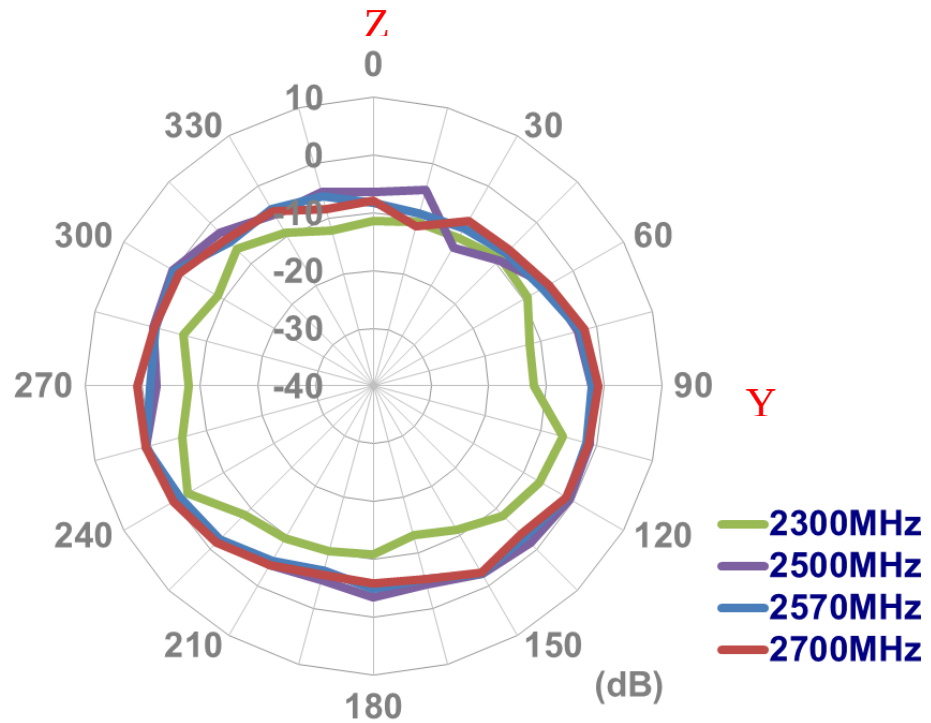
XZ Plane



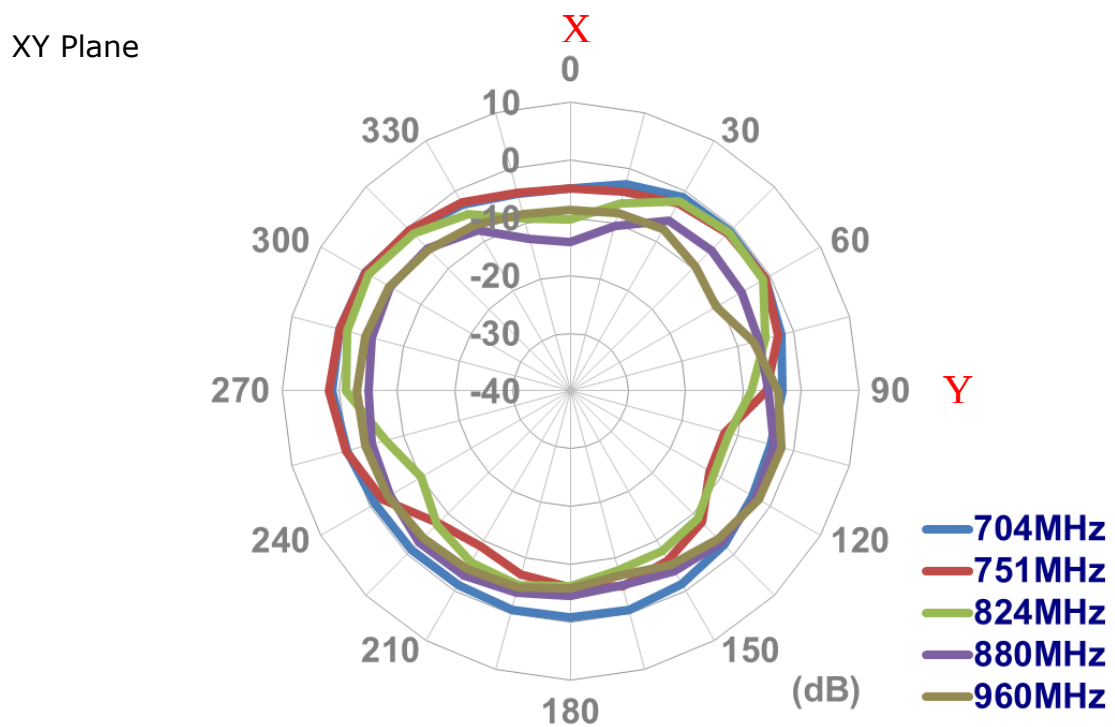


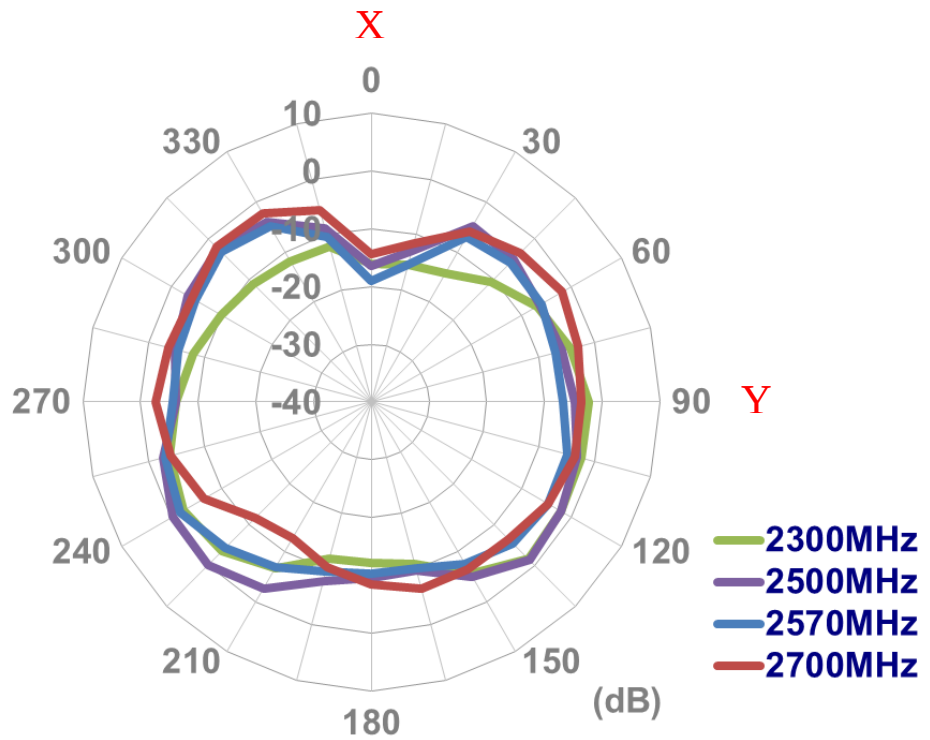
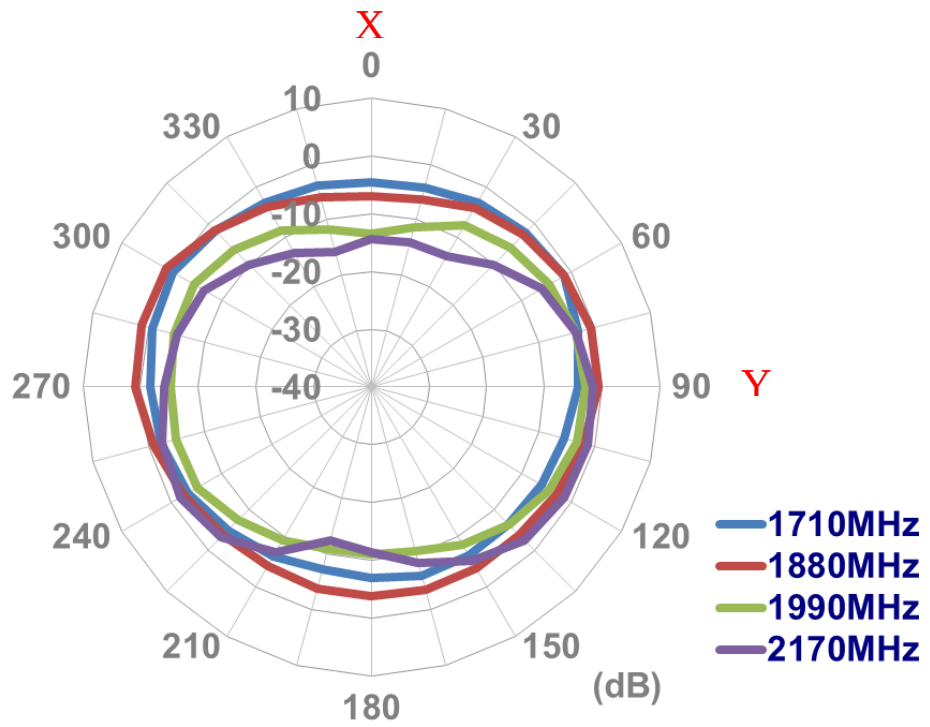
YZ Plane



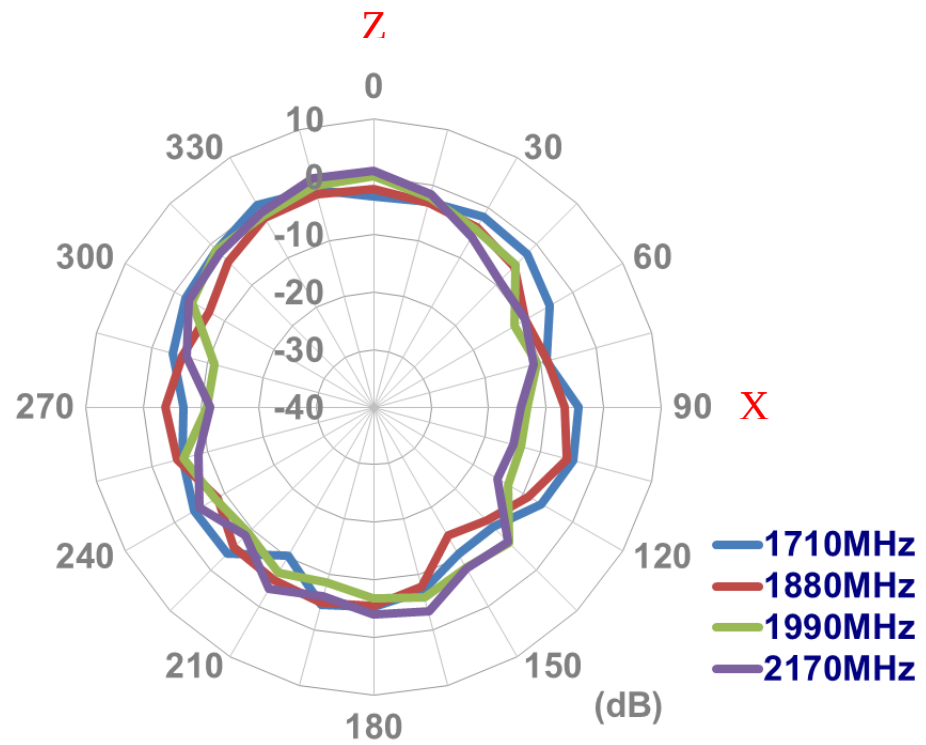
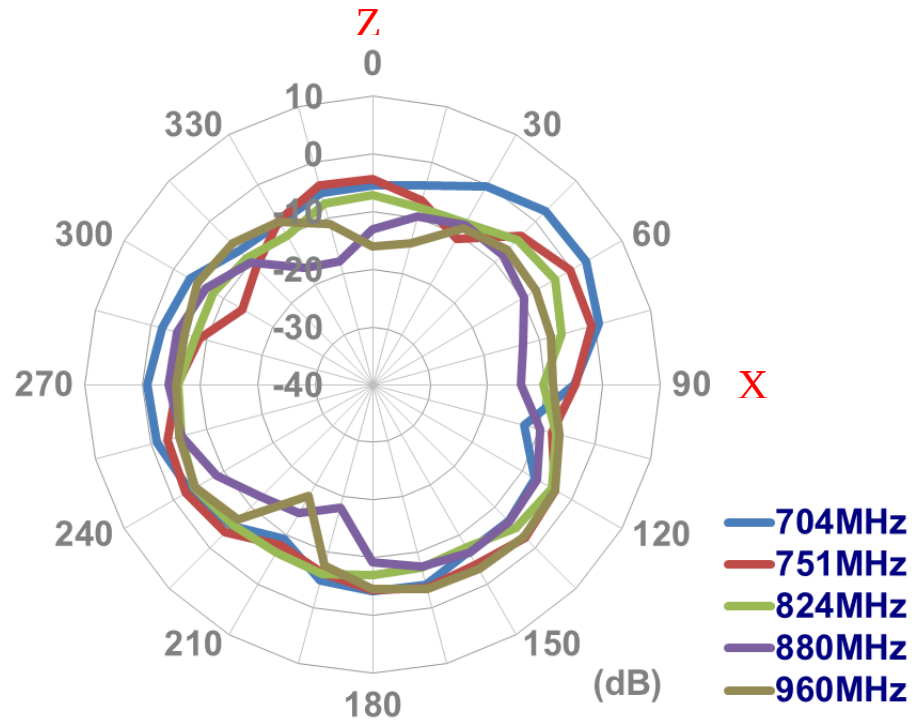


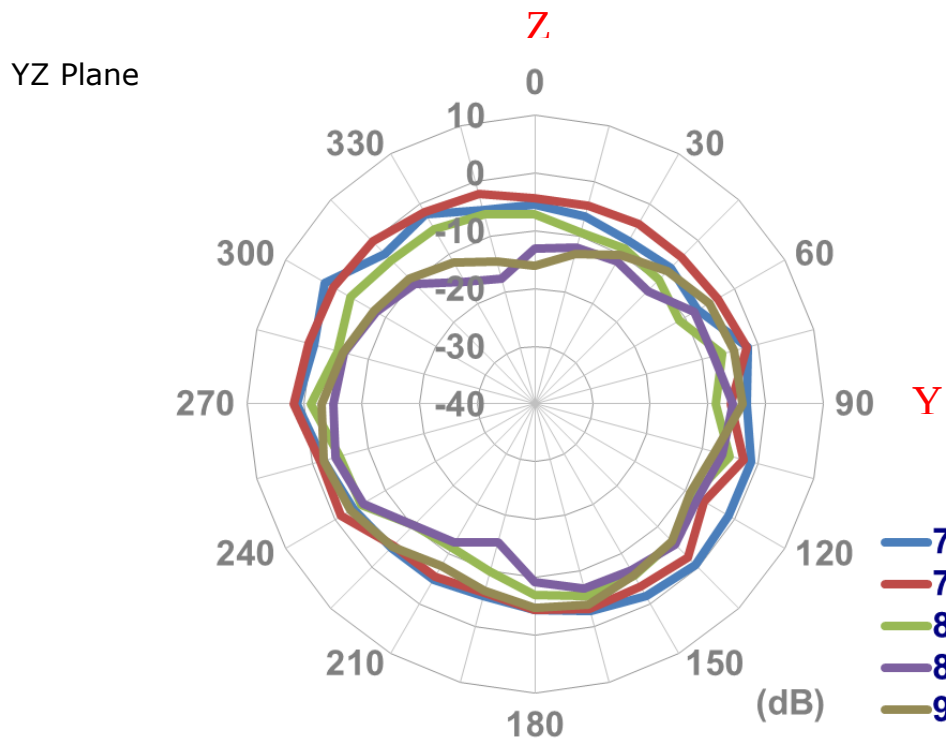
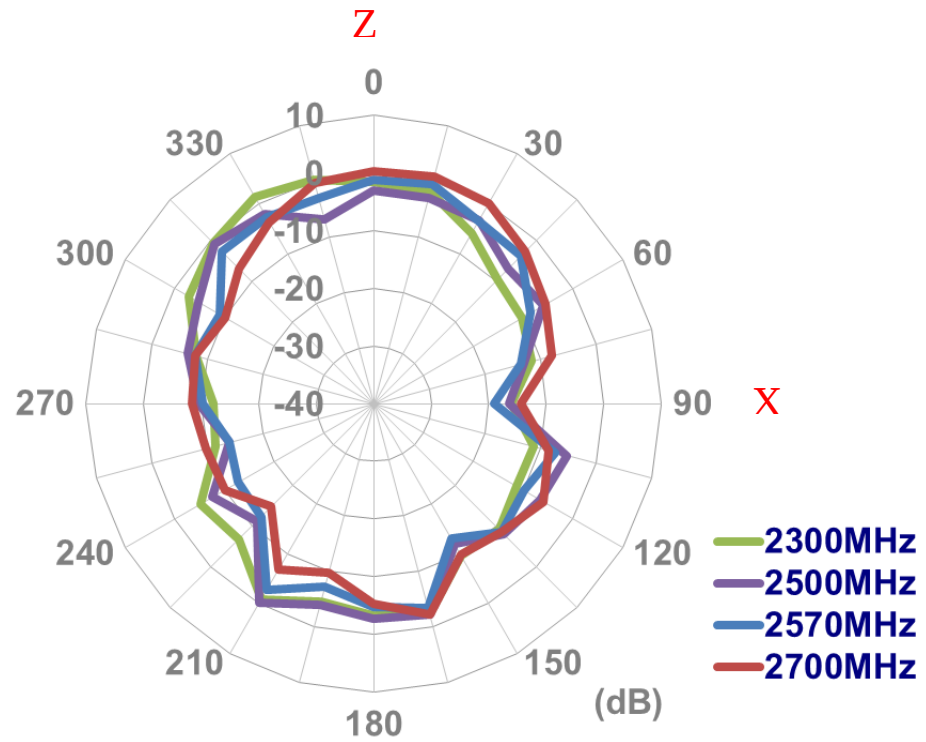
3.2.11 2D Radiation pattern (MIMO2 with 2M cable length on the 2mm ABS)

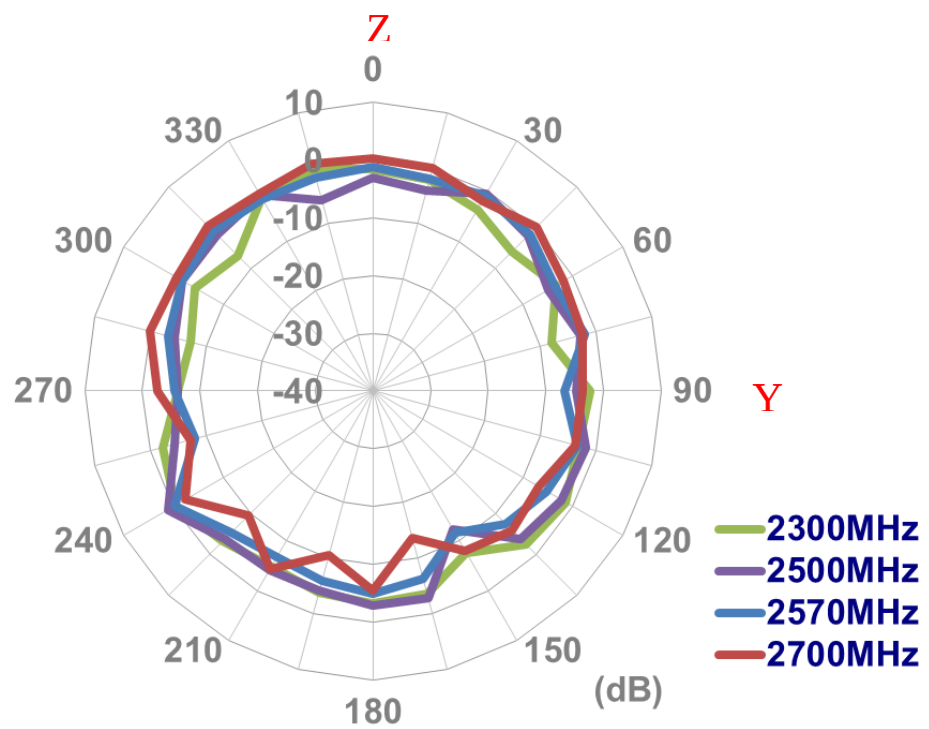
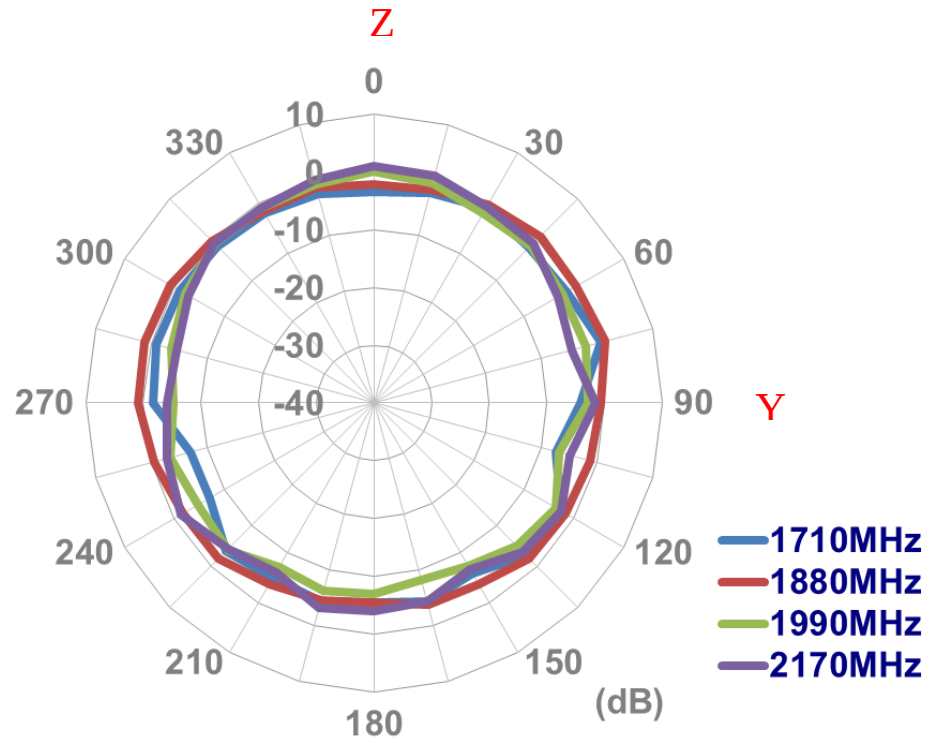




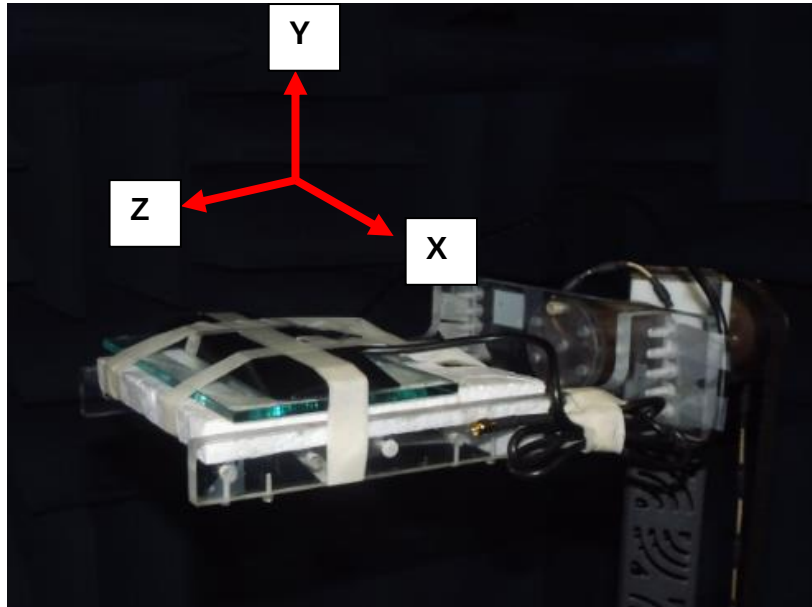
XZ Plane







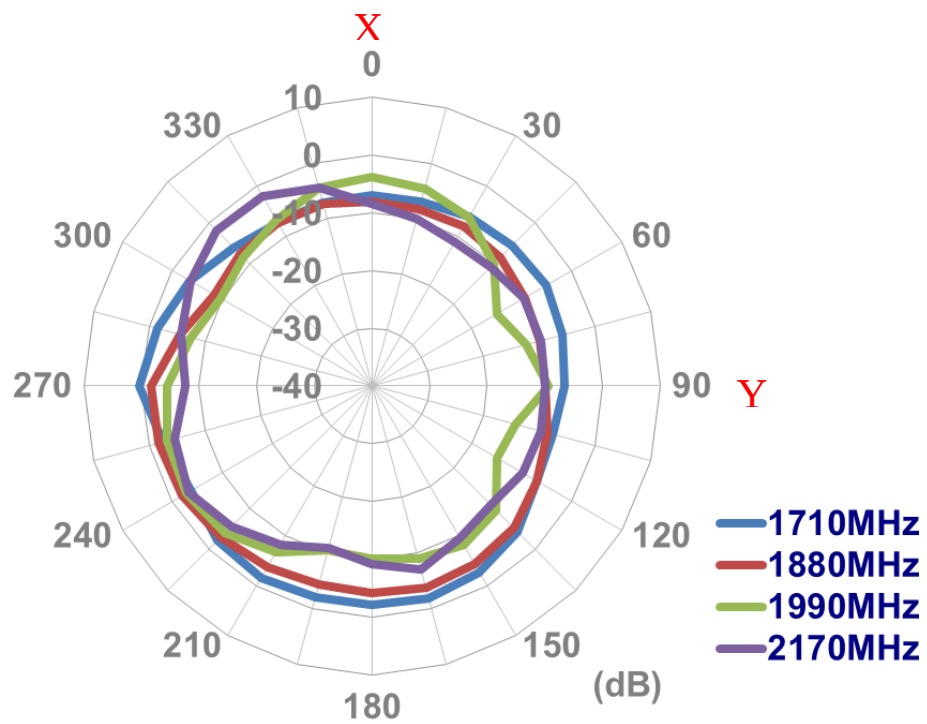
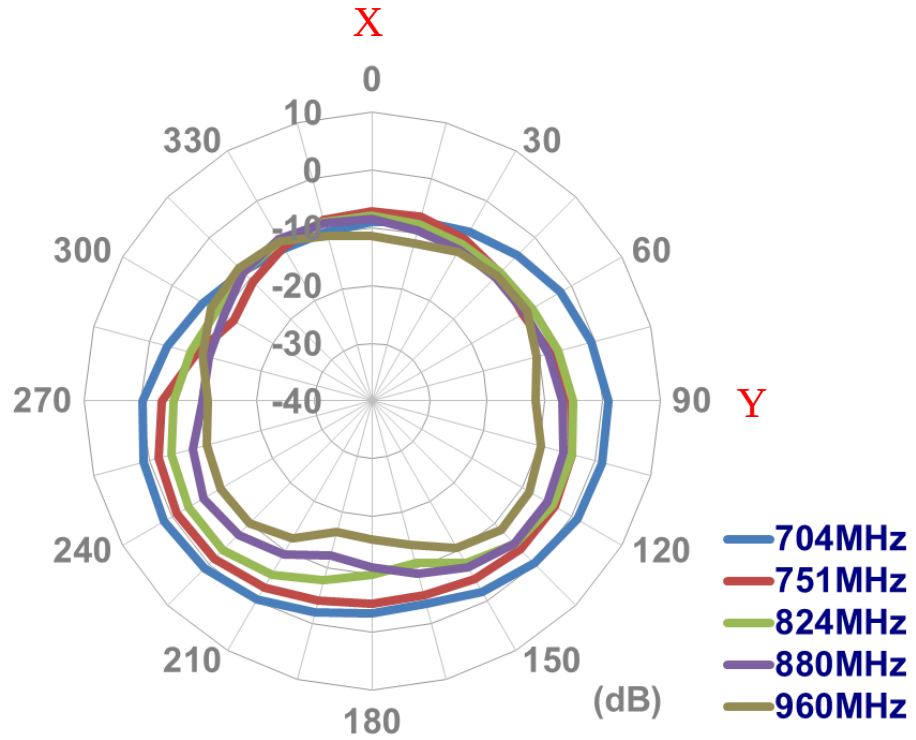
3.2.12 Test Setup For Antenna Radiation Pattern (ETS Anechoic chamber)

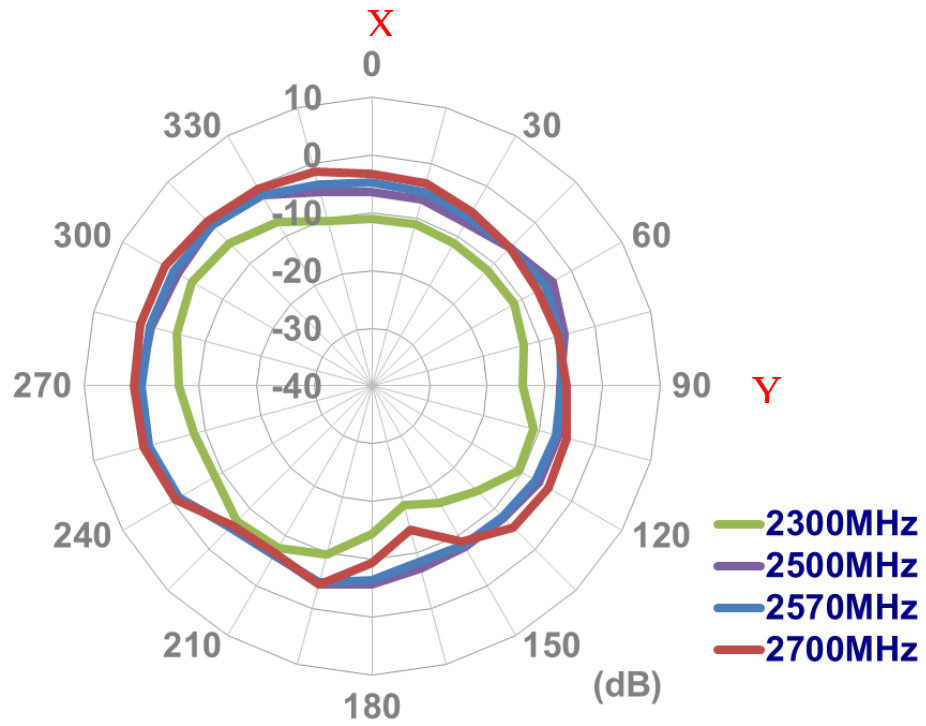


On the glass base

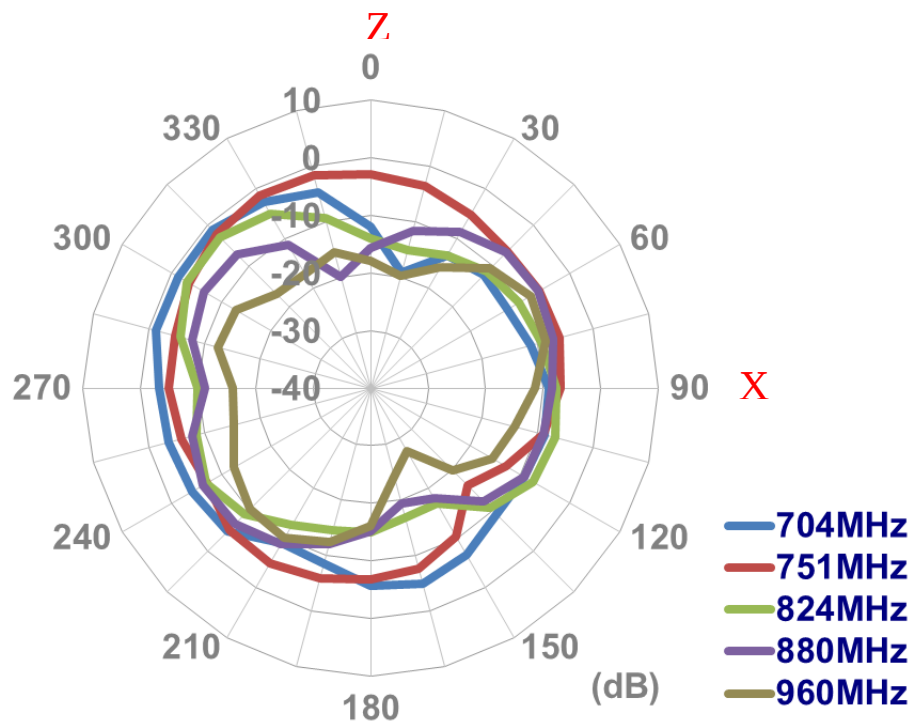
3.2.13 2D Radiation pattern (MIMO1 with 2M cable length on the glass)

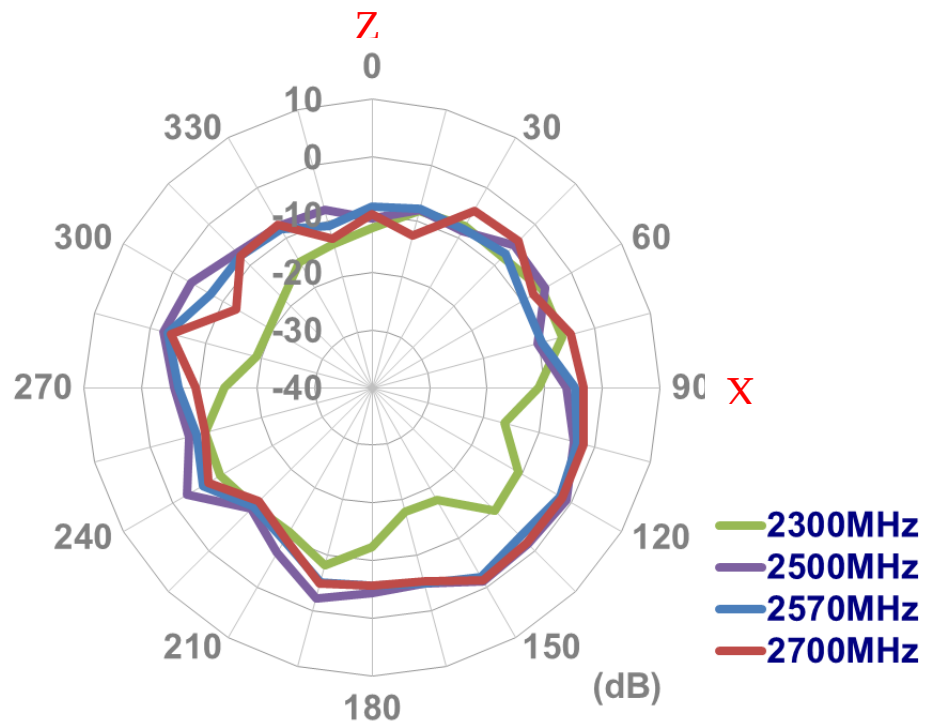
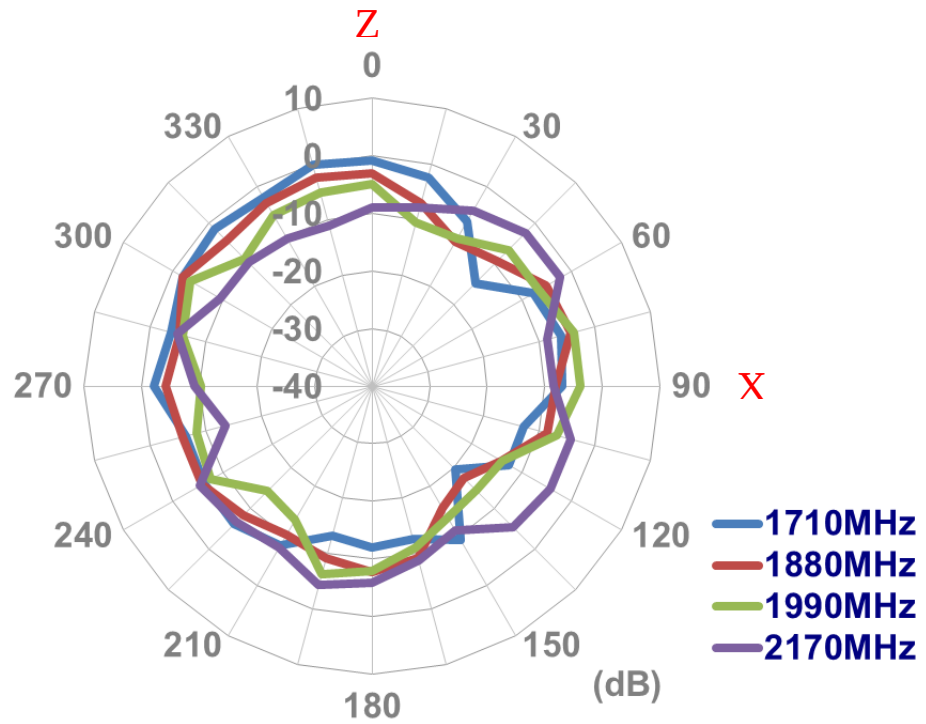
XY Plane



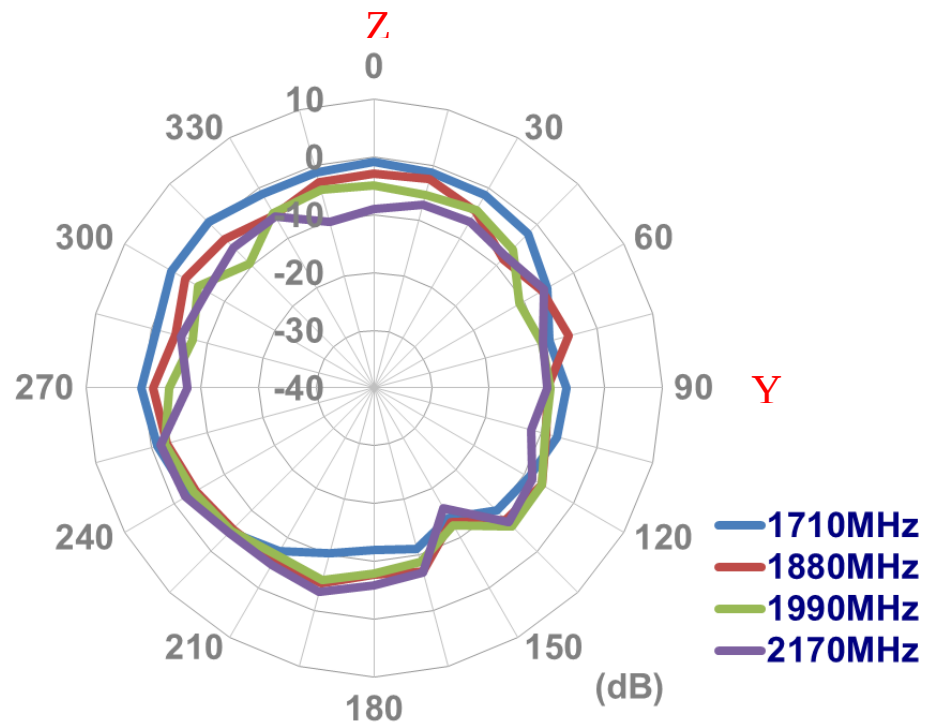
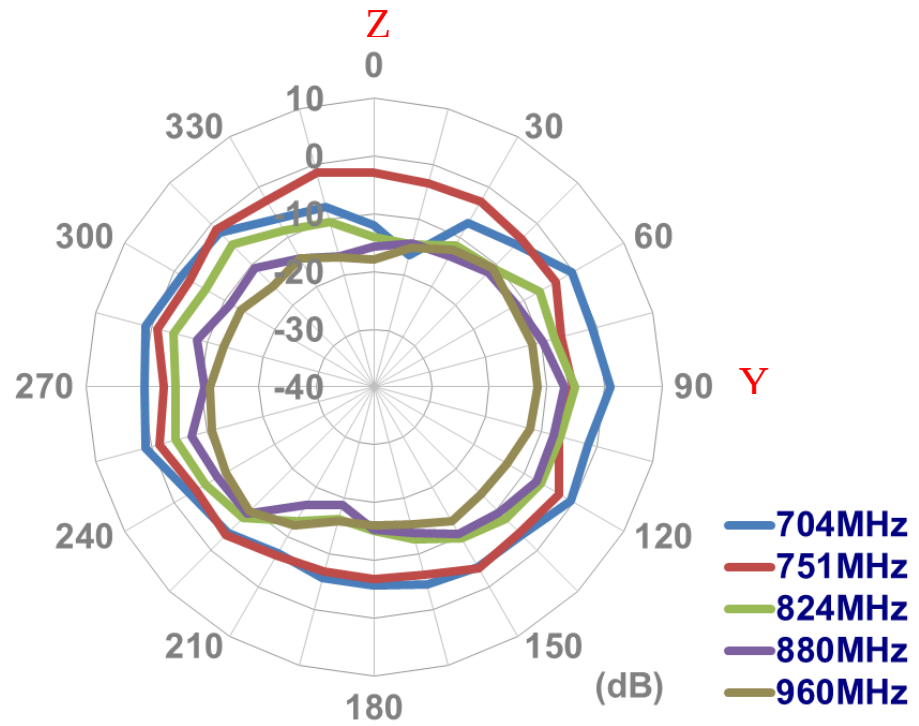


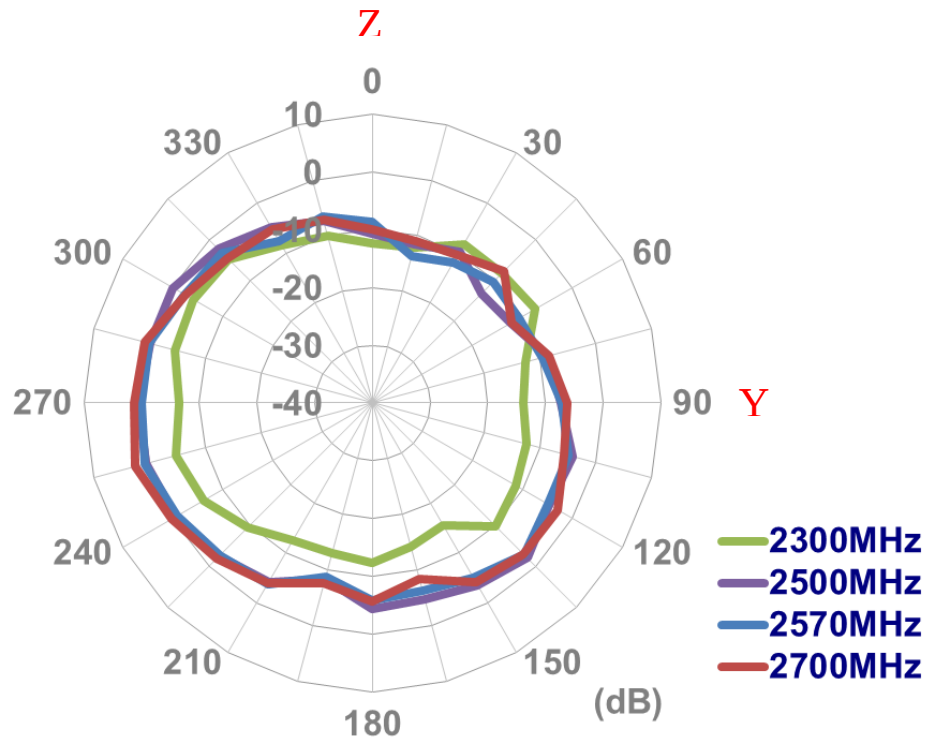
XZ Plane



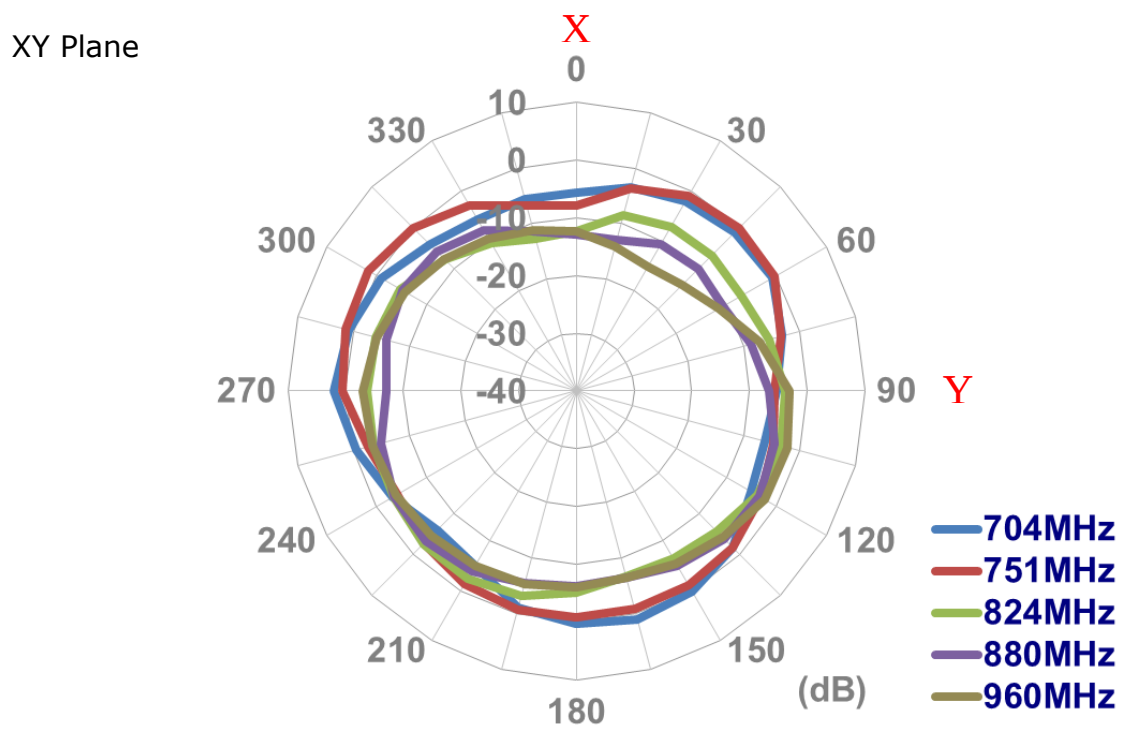


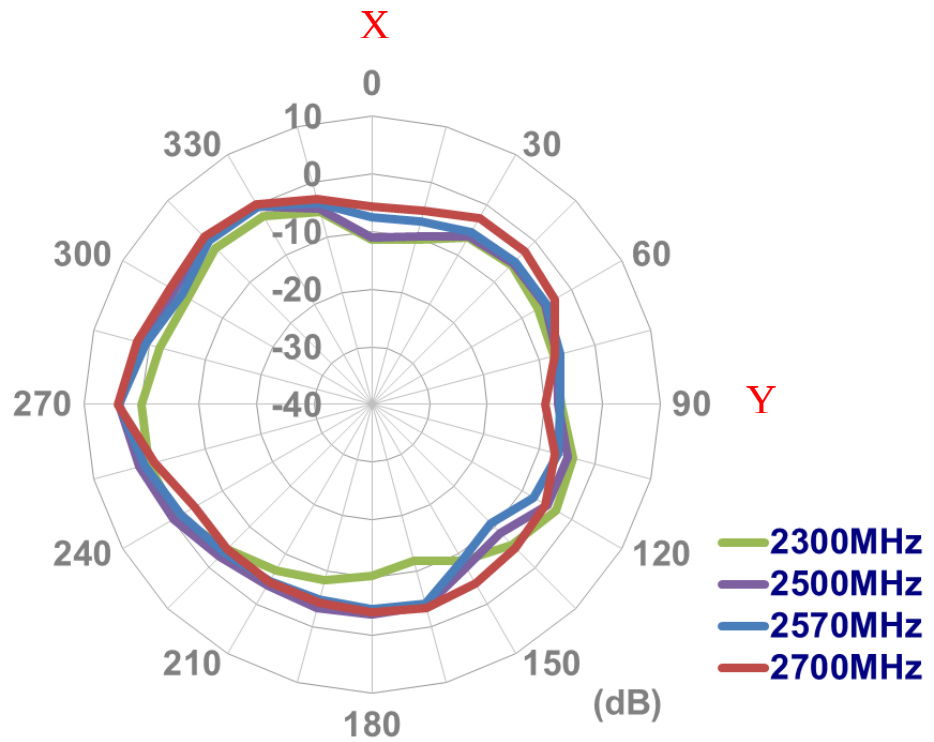
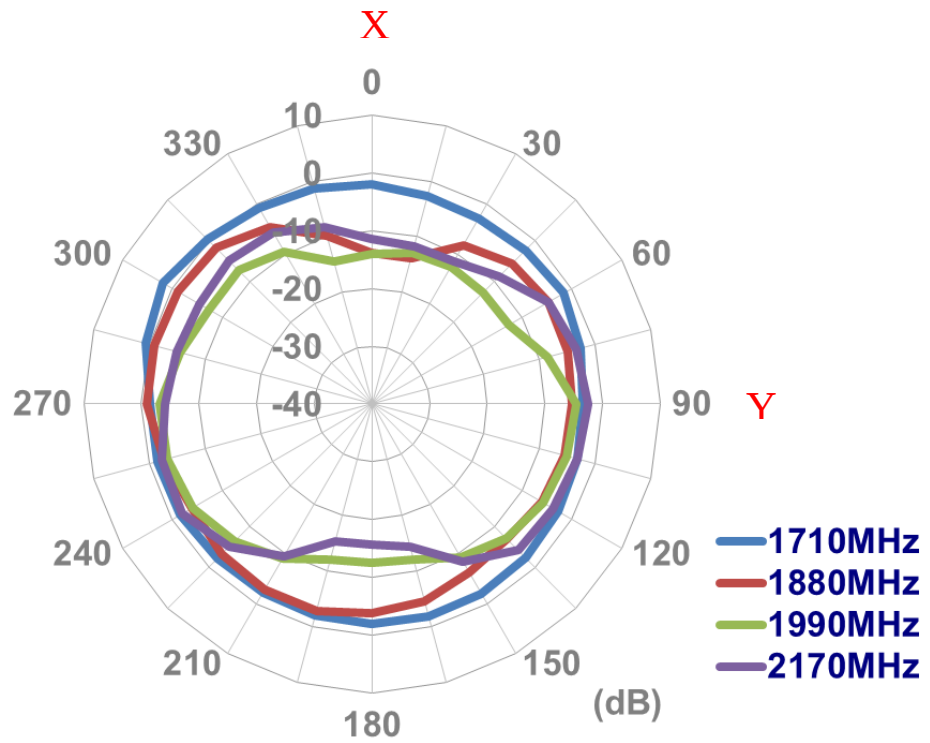
YZ Plane





3.2.14 2D Radiation pattern (MIMO2 with 2M cable length on the glass)





XZ Plane

