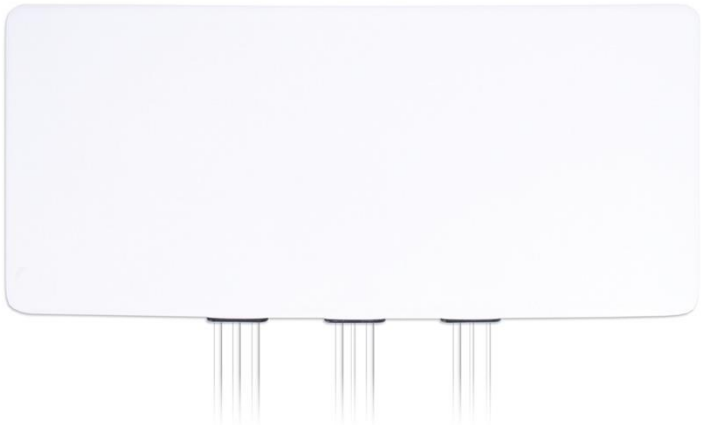
Specification

Part No.	:	**MA9909.W.A.002**
Product Name	:	GuardianX 9in1 GNSS & 8*LTE MIMO Antenna 1*Active GNSS with RG-174 & SMA(M) 8*LTE MIMO with TGC-200 & SMA(M)
Features	:	Low-profile Wall Mount Multi-antenna 1* GPS-GLONASS Antenna 8* LTE MIMO 698 to 960MHz/1710 to 2170MHz/ 2490 to 2690MHz/ 3300 to 3600MHz Worldwide 4G Bands including 3G and 2G Cables: 3M Low Loss TGC-200 and RG174 Connectors: SMA(M) IP67 Rated Waterproof Enclosure Dimensions: 360 * 160 * 16.5mm **RoHS Compliant**



1. Introduction

The Taoglas GuardianX MA9909.W.A.002 is a low profile heavy duty, fully IP67 waterproof external antenna. Combining 9 elements into one antenna, 1 GPS/GLONASS/Galileo, 8* LTE MIMO (698 to 960MHz/1710 to 2170MHz/ 2490 to 2690MHz/ 3300 to 3600MHz. This unique product delivers powerful worldwide 4G LTE MIMO antenna technology at 700MHz/800MHz/1700MHz/1800MHz/2600MHz and GNSS.

Typical applications include:

- Passenger Bus / Rail / Air Applications.
- Automotive and Heavy Equipment Vehicle Tracking and Telematics
- Remote Asset and Pipeline Monitoring
- HD Video over LTE
- First Responder and Emergency Services
- M2M Applications/IoT

LTE 4G 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, increased number of drops, and may indeed not make a system connection at all.

Cable length and connector types are customizable. Contact your regional Taoglas sales office for support.

2. Specification

2G/3G/4G MIMO Antenna								
Frequency (MHz)		LTE700	GSM850	GSM900	DCS	PCS	UMTS1	LTE2600
		698~806	824~894	880~960	1710~1880	1850~1990	1920~2170	2490~2690
Efficiency (%)								
LTE1	0.3M	40.43	46.11	55.89	48.39	52.24	59.34	48.34
	1M	38.32	44.05	53.36	44.13	47.66	54.74	44.09
	2M	35.76	40.36	48.67	39.33	42.11	47.96	38.32
	3M	33.11	37.49	45.22	34.96	37.09	42.41	33.39
	5M	30.67	34.83	42.02	31.08	32.68	37.51	29.10
LTE2	0.3M	29.45	29.73	31.73	17.97	54.87	67.07	68.57
	1M	27.95	28.40	30.30	16.77	50.04	61.15	63.21
	2M	26.09	26.03	27.64	14.95	44.60	54.04	55.36
	3M	24.14	24.17	25.69	13.44	39.64	47.58	48.97
	5M	22.34	22.45	23.88	12.09	35.23	41.90	43.31
LTE3	0.3M	42.76	53.50	53.81	56.38	63.42	65.38	46.32
	1M	40.55	51.09	51.38	51.41	57.85	60.26	42.24
	2M	37.84	46.81	46.86	45.82	51.13	52.79	36.70
	3M	35.02	43.49	43.58	40.73	45.02	46.68	31.95
	5M	32.42	40.40	40.53	36.20	39.64	41.28	27.82
LTE4	0.3M	34.69	38.21	33.37	44.24	40.48	39.12	54.81
	1M	32.90	36.49	31.86	40.36	36.93	36.03	49.99
	2M	30.70	33.44	29.06	35.97	32.67	31.60	43.44
	3M	28.42	31.06	27.04	31.98	28.75	27.90	37.83
	5M	26.31	28.85	25.15	28.43	25.30	24.64	32.95
LTE5	0.3M	33.63	37.30	33.06	44.90	39.93	38.90	54.66
	1M	31.89	35.63	31.57	40.96	36.40	35.82	49.84
	2M	29.76	32.65	28.80	36.51	32.21	31.43	43.30
	3M	27.54	30.32	26.78	32.46	28.34	27.74	37.71
	5M	25.49	28.16	24.91	28.86	24.94	24.49	32.84
LTE6	0.3M	43.09	51.93	52.88	55.26	64.68	66.42	45.37
	1M	40.85	49.59	50.50	50.41	58.99	61.21	41.39
	2M	38.13	45.43	46.06	44.93	52.14	53.63	35.95
	3M	35.29	42.21	42.83	39.93	45.90	47.42	31.30
	5M	32.67	39.21	39.83	35.49	40.42	41.94	27.26
LTE7	0.3M	29.19	30.19	32.01	49.76	66.45	65.00	36.72
	1M	27.72	28.84	30.58	45.38	60.59	59.89	33.48
	2M	25.87	26.43	27.89	40.44	53.56	52.47	29.09
	3M	23.93	24.55	25.92	35.93	47.15	46.40	25.34
	5M	22.14	22.80	24.09	31.92	41.51	41.04	22.07
LTE8	0.3M	38.75	50.32	54.81	45.83	52.11	59.53	46.12
	1M	36.71	48.07	52.34	41.79	47.53	54.90	42.07
	2M	34.26	44.05	47.74	37.25	41.99	48.09	36.57

	3M	31.73	40.91	44.38	33.11	36.99	42.53	31.86
	5M	29.39	38.01	41.26	29.43	32.59	37.62	27.77
Average Gain (dB)								
LTE1	0.3M	-3.93	-3.36	-2.53	-3.15	-2.82	-2.27	-3.16
	1M	-4.17	-3.56	-2.73	-3.55	-3.22	-2.62	-3.56
	2M	-4.47	-3.94	-3.13	-4.05	-3.76	-3.19	-4.17
	3M	-4.80	-4.26	-3.45	-4.56	-4.31	-3.73	-4.76
	5M	-5.13	-4.58	-3.77	-5.08	-4.86	-4.26	-5.36
LTE2	0.3M	-5.31	-5.27	-4.99	-7.46	-2.61	-1.73	-1.64
	1M	-5.54	-5.47	-5.19	-7.75	-3.01	-2.14	-1.99
	2M	-5.84	-5.85	-5.59	-8.25	-3.51	-2.67	-2.57
	3M	-6.17	-6.17	-5.90	-8.72	-4.02	-3.23	-3.10
	5M	-6.51	-6.49	-6.22	-9.18	-4.53	-3.78	-3.63
LTE3	0.3M	-3.69	-2.72	-2.69	-2.49	-1.98	-1.85	-3.34
	1M	-3.92	-2.92	-2.89	-2.89	-2.38	-2.20	-3.74
	2M	-4.22	-3.30	-3.29	-3.39	-2.91	-2.77	-4.35
	3M	-4.56	-3.62	-3.61	-3.90	-3.47	-3.31	-4.96
	5M	-4.89	-3.94	-3.92	-4.41	-4.02	-3.84	-5.56
LTE4	0.3M	-4.60	-4.18	-4.77	-3.54	-3.93	-4.08	-2.61
	1M	-4.83	-4.38	-4.97	-3.94	-4.33	-4.43	-3.01
	2M	-5.13	-4.76	-5.37	-4.44	-4.86	-5.00	-3.62
	3M	-5.46	-5.08	-5.68	-4.95	-5.41	-5.54	-4.22
	5M	-5.80	-5.40	-5.99	-5.46	-5.97	-6.08	-4.82
LTE5	0.3M	-4.73	-4.28	-4.81	-3.48	-3.99	-4.10	-2.62
	1M	-4.96	-4.48	-5.01	-3.88	-4.39	-4.46	-3.02
	2M	-5.26	-4.86	-5.41	-4.38	-4.92	-5.03	-3.63
	3M	-5.60	-5.18	-5.72	-4.89	-5.48	-5.57	-4.24
	5M	-5.94	-5.50	-6.04	-5.40	-6.03	-6.11	-4.84
LTE6	0.3M	-3.66	-2.85	-2.77	-2.58	-1.89	-1.78	-3.43
	1M	-3.89	-3.05	-2.97	-2.97	-2.29	-2.13	-3.83
	2M	-4.19	-3.43	-3.37	-3.47	-2.83	-2.71	-4.44
	3M	-4.52	-3.75	-3.68	-3.99	-3.38	-3.24	-5.04
	5M	-4.86	-4.07	-4.00	-4.50	-3.93	-3.77	-5.65
LTE7	0.3M	-5.35	-5.20	-4.95	-3.03	-1.77	-1.87	-4.35
	1M	-5.57	-5.40	-5.15	-3.43	-2.18	-2.23	-4.75
	2M	-5.87	-5.78	-5.55	-3.93	-2.71	-2.80	-5.36
	3M	-6.21	-6.10	-5.86	-4.45	-3.27	-3.33	-5.96
	5M	-6.55	-6.42	-6.18	-4.96	-3.82	-3.87	-6.56
LTE8	0.3M	-4.12	-2.98	-2.61	-3.39	-2.83	-2.25	-3.36
	1M	-4.35	-3.18	-2.81	-3.79	-3.23	-2.60	-3.76
	2M	-4.65	-3.56	-3.21	-4.29	-3.77	-3.18	-4.37
	3M	-4.99	-3.88	-3.53	-4.80	-4.32	-3.71	-4.97
	5M	-5.32	-4.20	-3.85	-5.31	-4.87	-4.25	-5.56

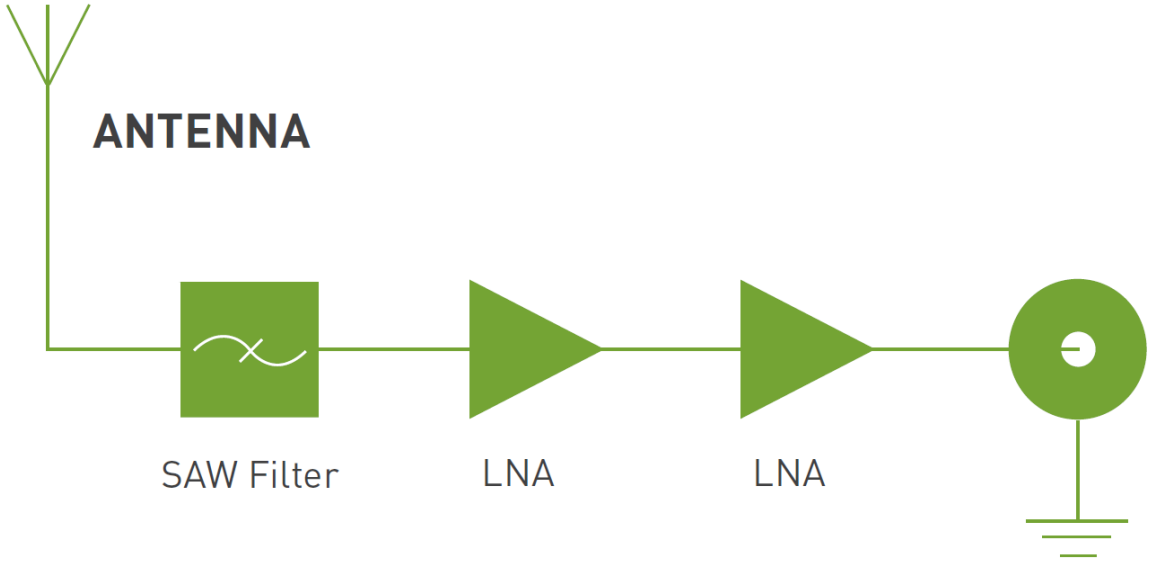
Peak Gain (dBi)								
LTE1	0.3M	1.5	1.6	1.92	-4.21	3.2	3.15	3.27
	1M	1.2	1.4	1.72	-4.51	2.8	2.75	2.97
	2M	0.9	1	1.32	-5.01	2.3	2.15	2.37
	3M	0.6	0.7	1.02	-5.51	1.8	1.65	1.87
	5M	0.3	0.4	0.72	-6.01	1.3	1.15	1.37
LTE2	0.3M	-1.01	-1.44	-0.5	-0.96	1.38	3.07	3.42
	1M	-1.21	-1.64	-0.7	-1.26	0.98	2.67	3.12
	2M	-1.51	-2.04	-1.1	-1.76	0.48	2.07	2.52
	3M	-1.85	-2.34	-1.4	-2.26	-0.02	1.57	2.02
	5M	-2.15	-2.64	-1.7	-2.76	-0.52	1.07	1.52
LTE3	0.3M	0.5	1.65	1.77	3.23	3.93	4.12	2.35
	1M	0.26	1.45	1.57	2.83	3.53	3.82	1.95
	2M	-0.04	1.05	1.17	2.33	2.93	3.22	1.25
	3M	-0.4	0.75	0.87	1.83	2.43	2.72	0.65
	5M	-0.7	0.45	0.57	1.33	1.93	2.22	0.05
LTE4	0.3M	1.48	1.25	0.66	2.18	2.18	2.08	3.75
	1M	1.28	1.05	0.46	1.78	1.78	1.68	3.35
	2M	0.98	0.65	0.06	1.28	1.28	1.18	2.75
	3M	0.68	0.35	-0.24	0.78	0.78	0.58	2.15
	5M	0.38	0.05	-0.54	0.28	0.28	0.05	1.55
LTE5	0.3M	2.02	1.11	0.45	2.16	3.03	3.03	4.11
	1M	1.72	0.91	0.25	1.76	2.63	2.63	3.71
	2M	1.42	0.51	-0.15	1.26	2.03	2.03	3.11
	3M	1.12	0.21	-0.45	0.76	1.53	1.53	2.51
	5M	0.82	-0.09	-0.75	0.26	1.03	1.03	1.91
LTE6	0.3M	0.83	1.5	1.65	2.69	3.73	3.73	2.67
	1M	0.63	1.3	1.45	2.29	3.33	3.33	2.27
	2M	0.33	0.9	1.05	1.79	2.73	2.73	1.57
	3M	-0.07	0.6	0.75	1.29	2.23	2.23	0.97
	5M	-0.41	0.3	0.45	0.79	1.73	1.73	0.37
LTE7	0.3M	-0.98	-1.6	-0.76	1.77	2.66	3.15	0.99
	1M	-1.18	-1.8	-0.96	1.37	2.26	2.85	0.59
	2M	-1.48	-2.2	-1.36	0.87	1.66	2.25	-0.01
	3M	-1.78	-2.5	-1.66	0.37	1.16	1.65	-0.51
	5M	-2.08	-2.8	-1.96	-0.13	0.66	1.05	-1.01
LTE8	0.3M	2.32	1.55	2.78	3.07	2.73	2.35	2.46
	1M	2.02	1.35	2.58	2.67	2.33	2.05	2.06
	2M	1.72	0.95	2.18	2.17	1.83	1.45	1.36
	3M	1.42	0.65	1.88	1.67	1.33	0.95	0.76
	5M	1.12	0.35	1.58	1.17	0.83	0.45	0.16
Impedance	50 Ω							
Polarization	Vertical							

CERAMIC PATCH			
Frequency	1574~1610MHz		
Gain @ Zenith	1575.42MHz 1.5 dBic Typ. @ Zenith 1602MHz +0 dBic Typ. @ Zenith		
Gain at 90° with LNA	1575.42MHz: 31 ± 3dBic 1602MHz: 30 ± 3dBic		
Polarization	RHCP		
Axial Ratio	6.0dB max. @ 1575.42MHz Zenith 14.0dB max. @ 1602MHz Zenith		
Patch Dimension	25.1*25.1*4mm		
LNA			
Frequency	1574~1610MHz		
Outer Band Attenuation	1592±140MHz 15dB min.		
Output Impedance	50Ω		
Output VSWR	2.0 Max		
Pout at 1dB Gain Compression point	Typ. -2dBm		
	Min. -6dBm		
Input Voltage	Min:1.8V Typ. 3.0V Max:5V		
LNA Gain, Power Consumption and Noise Figure			
Input Voltage	Min:1.8V	Typ. 3.0V	Max: 5.5V
Total Gain @ Zenith	25dBic	31dBic	34dBic
Current Consumption	5mA	10mA	23mA
Noise Figure	3dB	3dB	3.3dB
Cable	3m RG174 standard, fully customizable		
Connector	SMA(M) standard, standard, fully customizable		

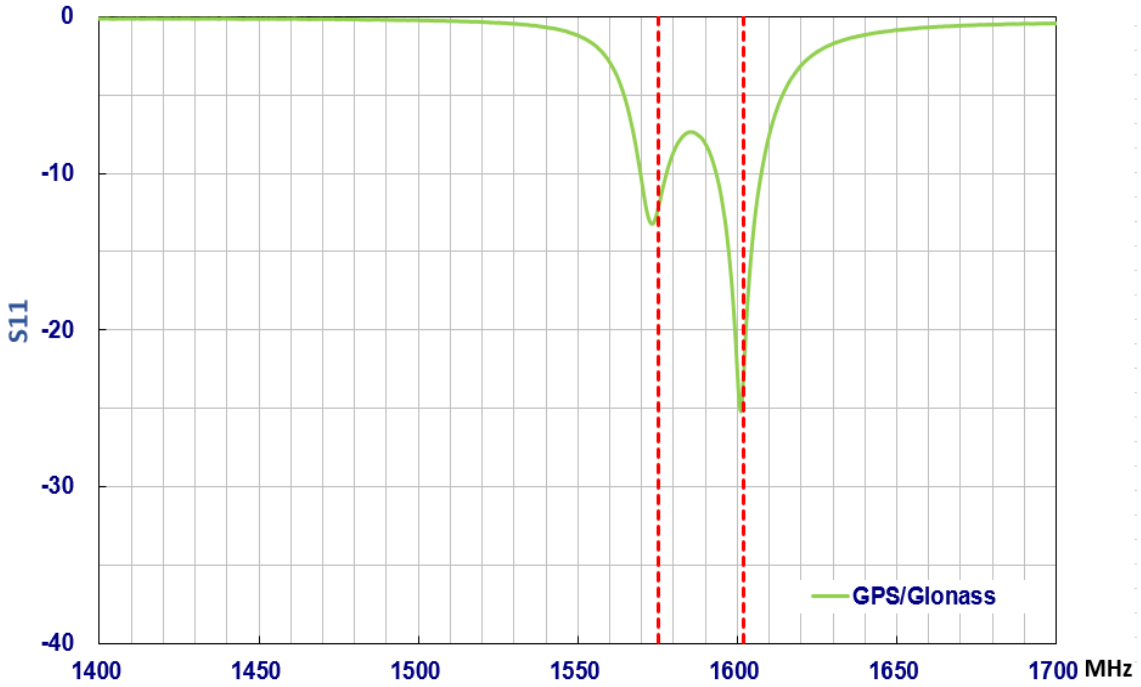
MECHANICAL	
Dimensions	360mm * 160mm * 16.5mm
Cable	1M TGC-200 for LTE Antenna – Fully Customizable 1M RF174 for GPS Antenna – Fully Customizable
Connector	SMA-Male – Fully Customizable
Casing	UV Resistant PC
Sealant	Rubber O-Ring
Weight	1300g
ENVIRONMENTAL	
Protection	IP67
Temperature Range	-40°C to +85°C
Thermal Shock	100 cycles -40°C to +85°C
Humidity	Non-condensing 65°C 95% RH

3. Antenna Characteristics

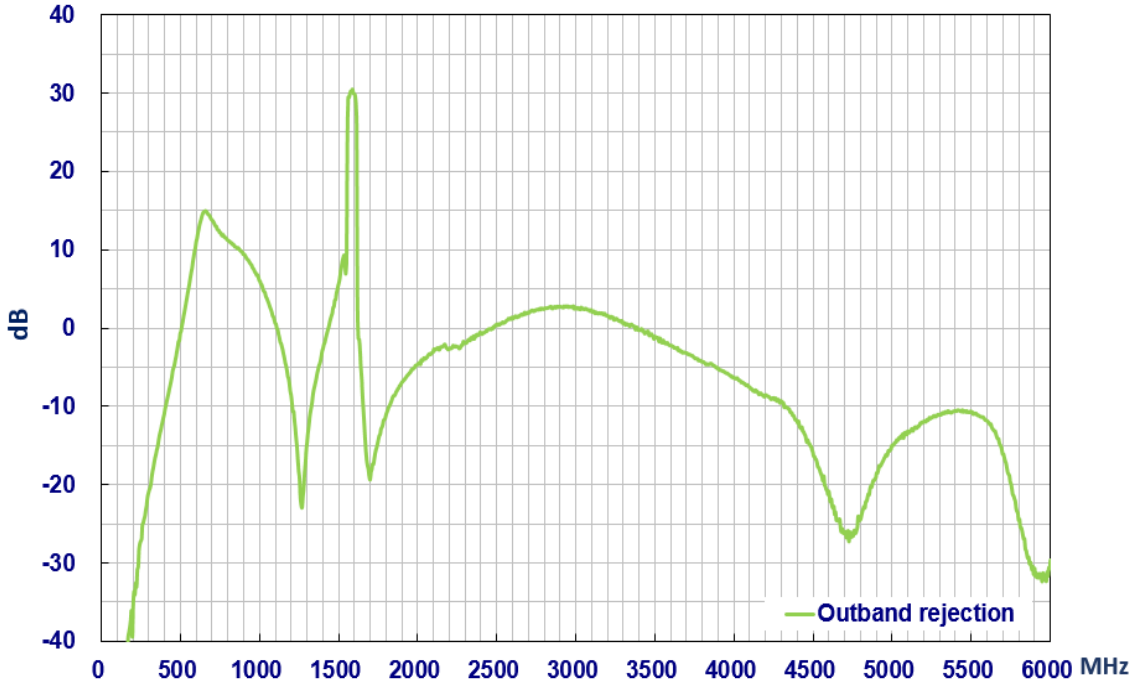
3.1 Block Diagram (Active antenna)



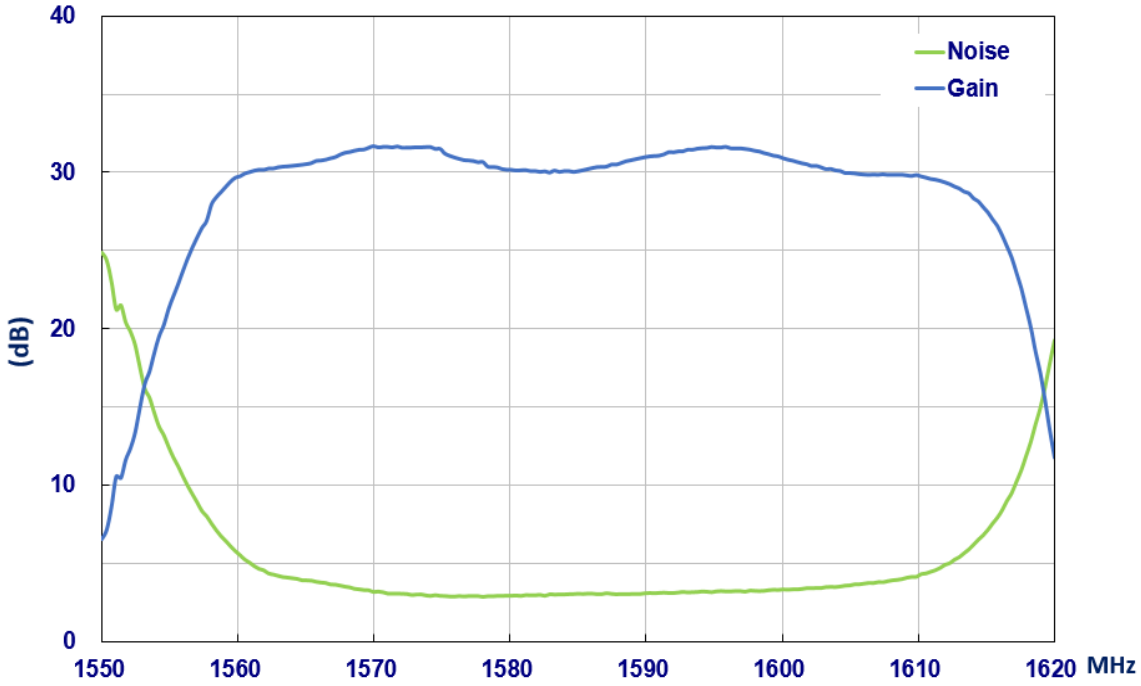
3.1.1 Return Loss



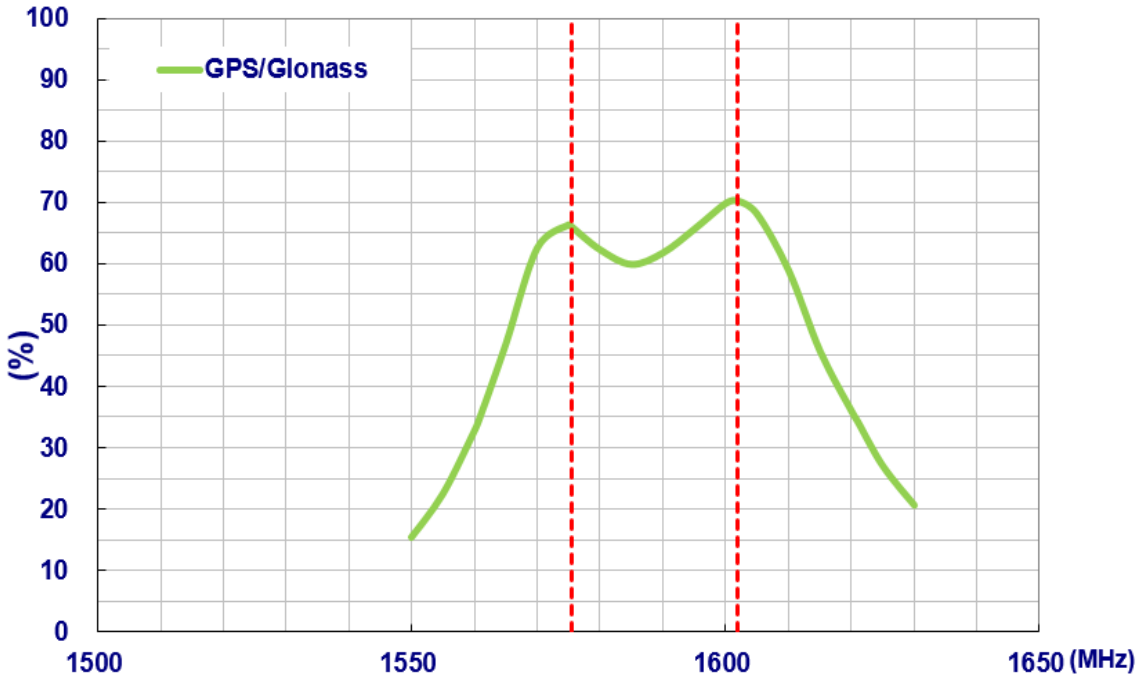
3.1.2 Out Band Rejection @3V



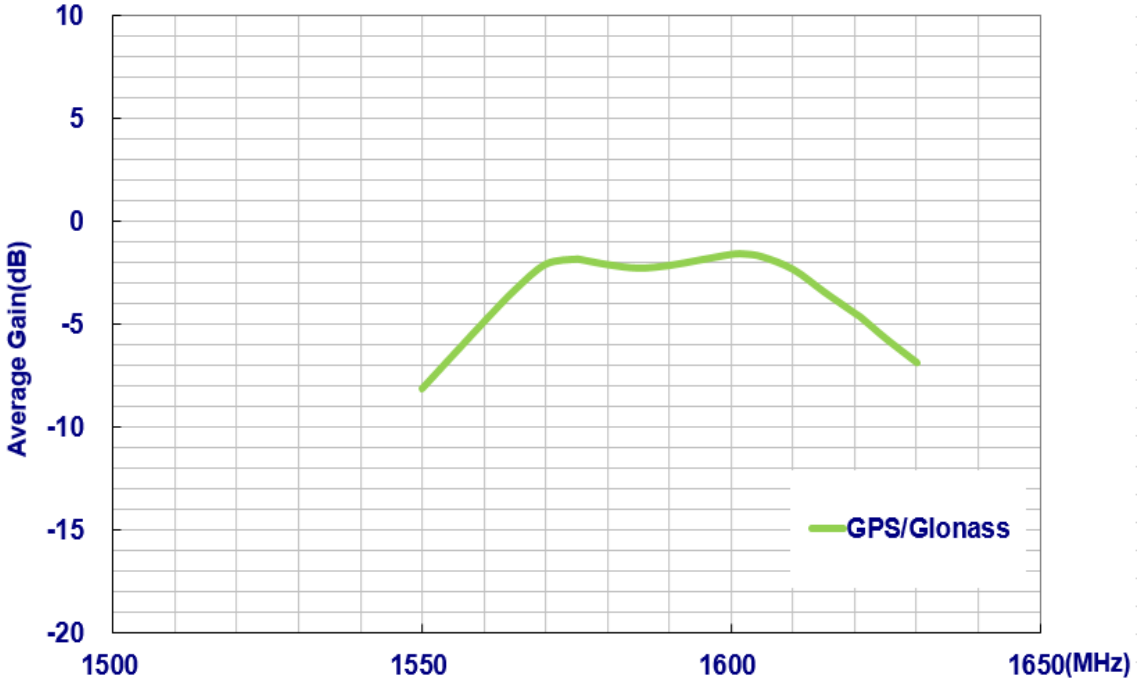
3.1.3 LNA Noise Figure and Gain @3V



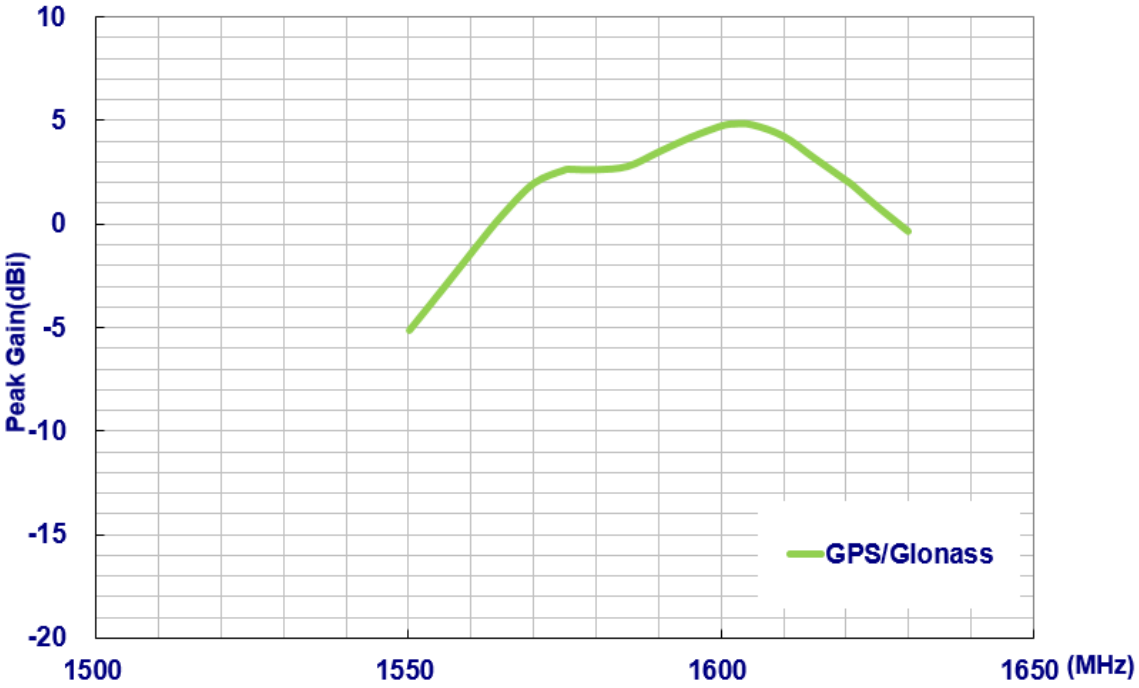
3.1.4 Efficiency



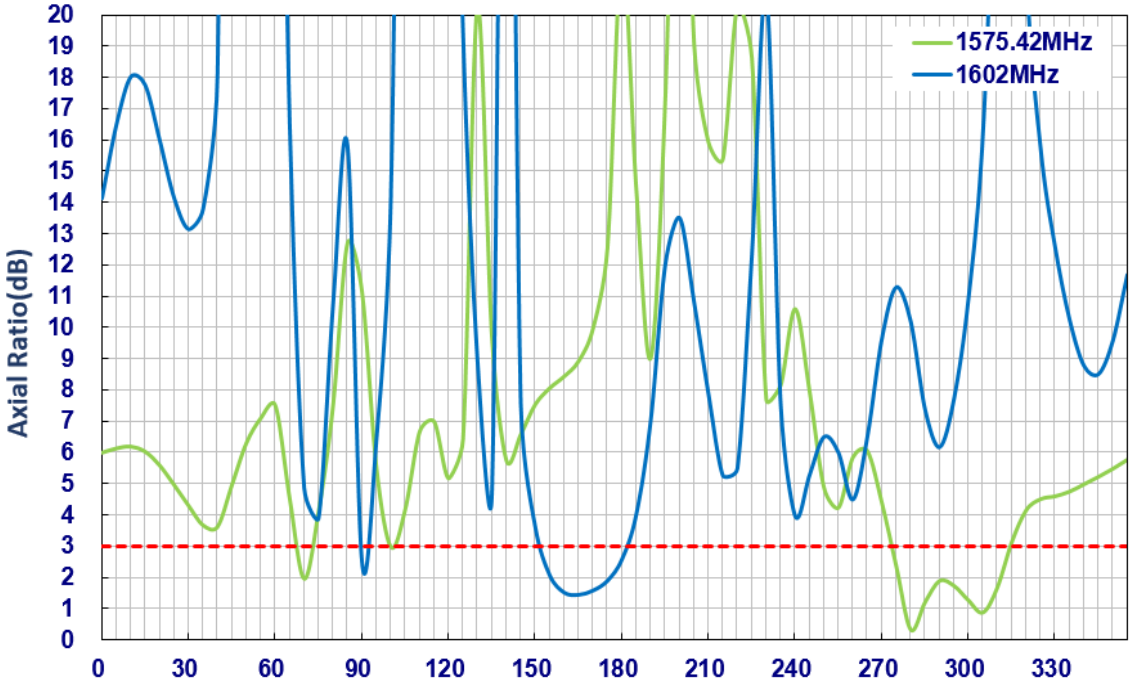
3.1.5 Average Gain



3.1.6 Peak Gain

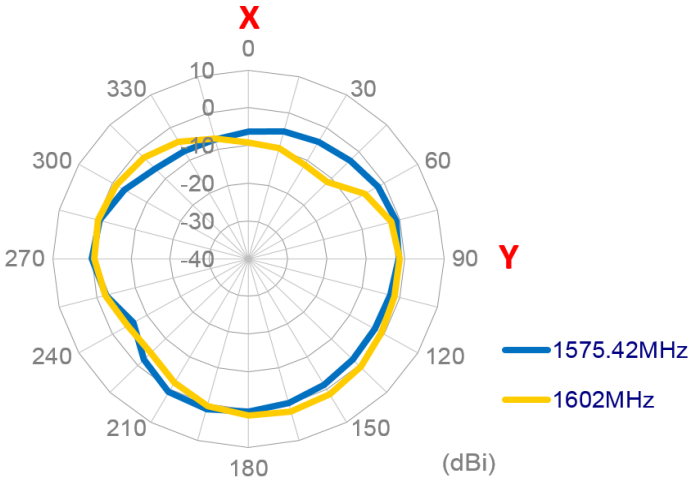


3.1.7 Axial Ratio

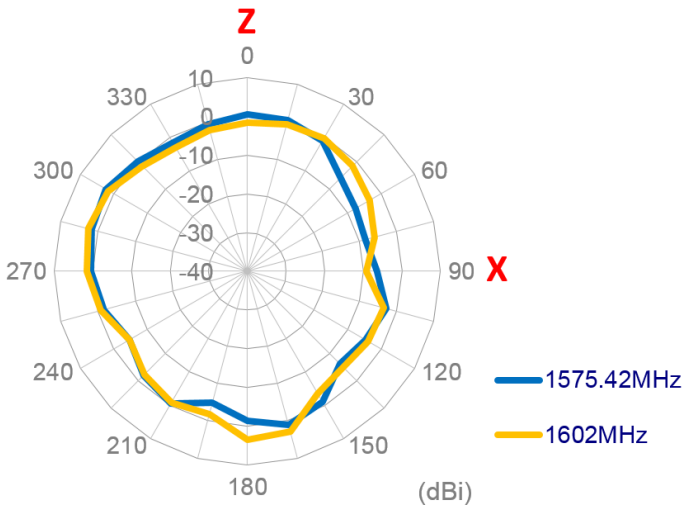


3.1.8 2D Radiation Patterns

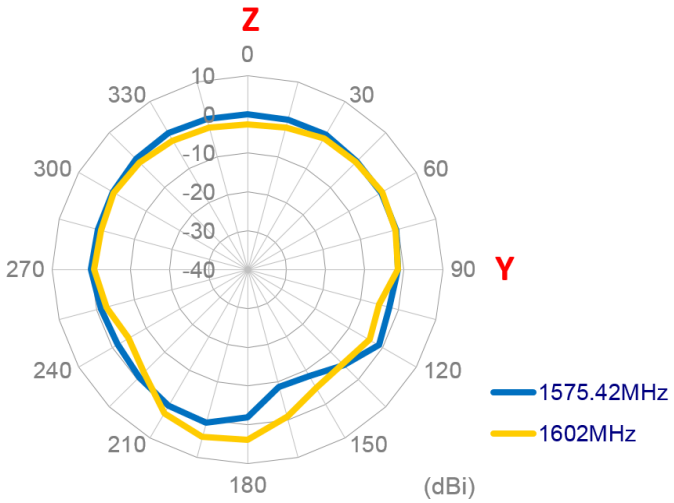
XY Plane



ZX Plane

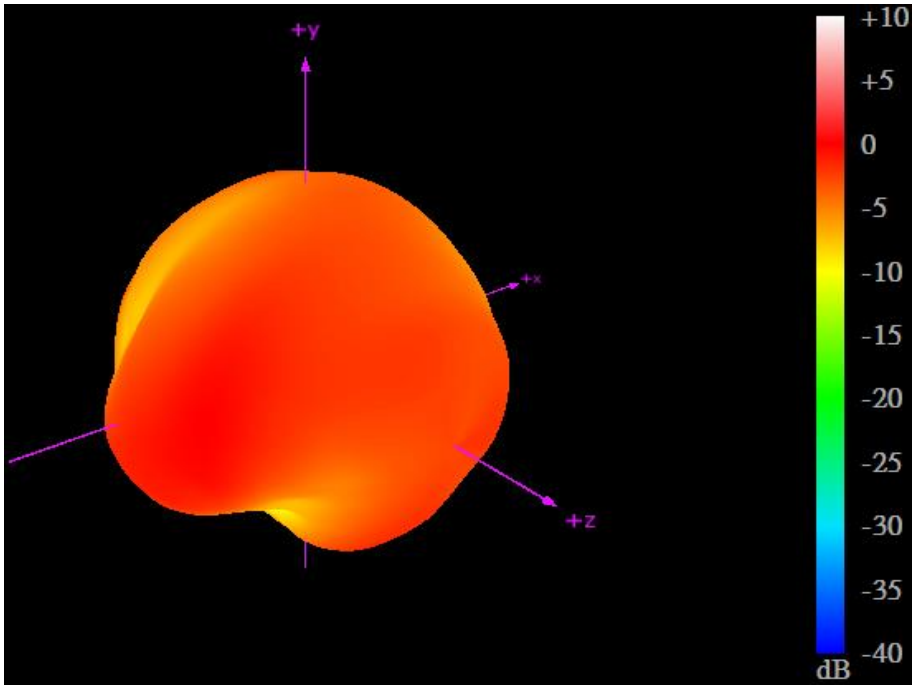


ZY Plane

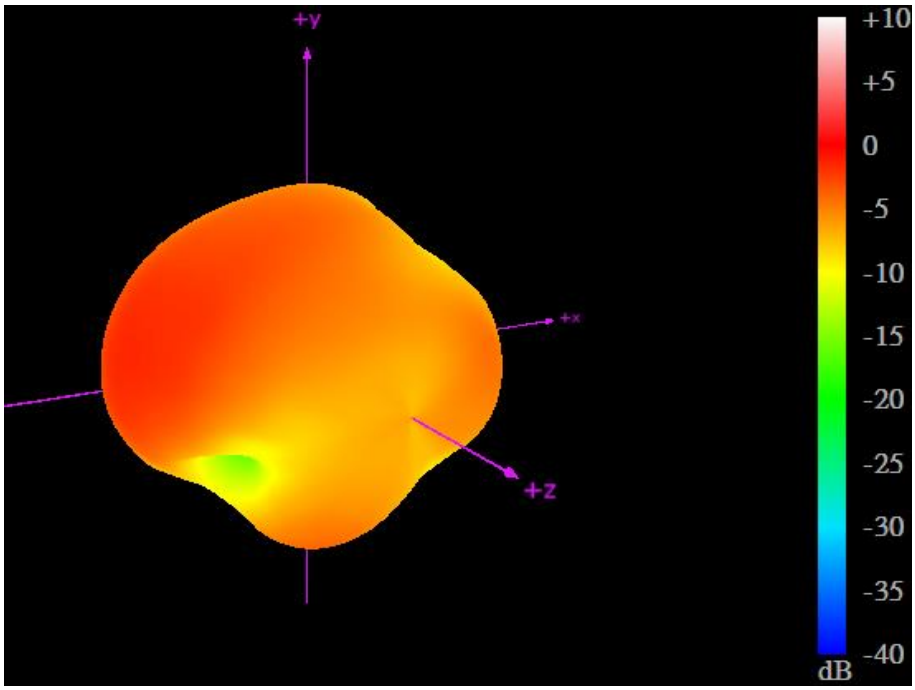


3.1.9 3D Radiation Patterns

1575.42MHz

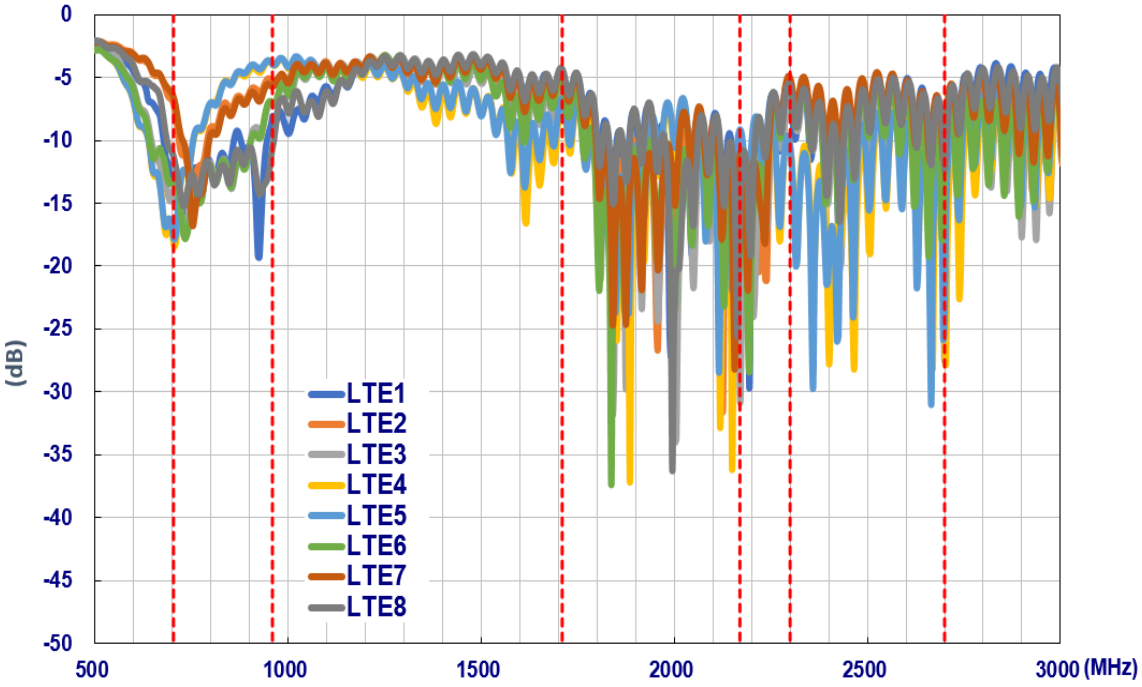


1602MHz

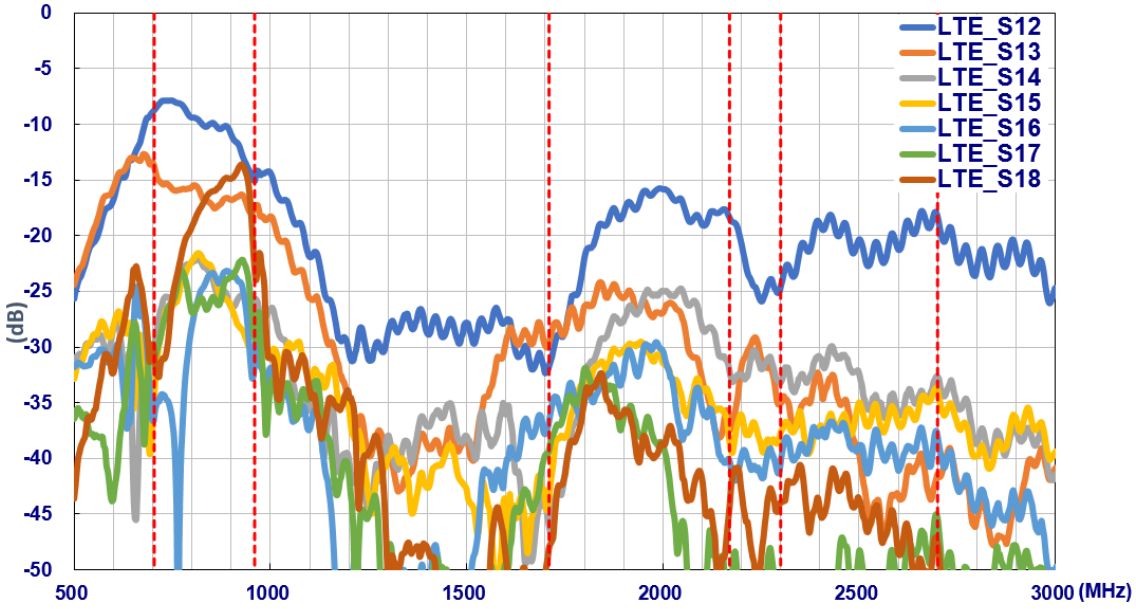


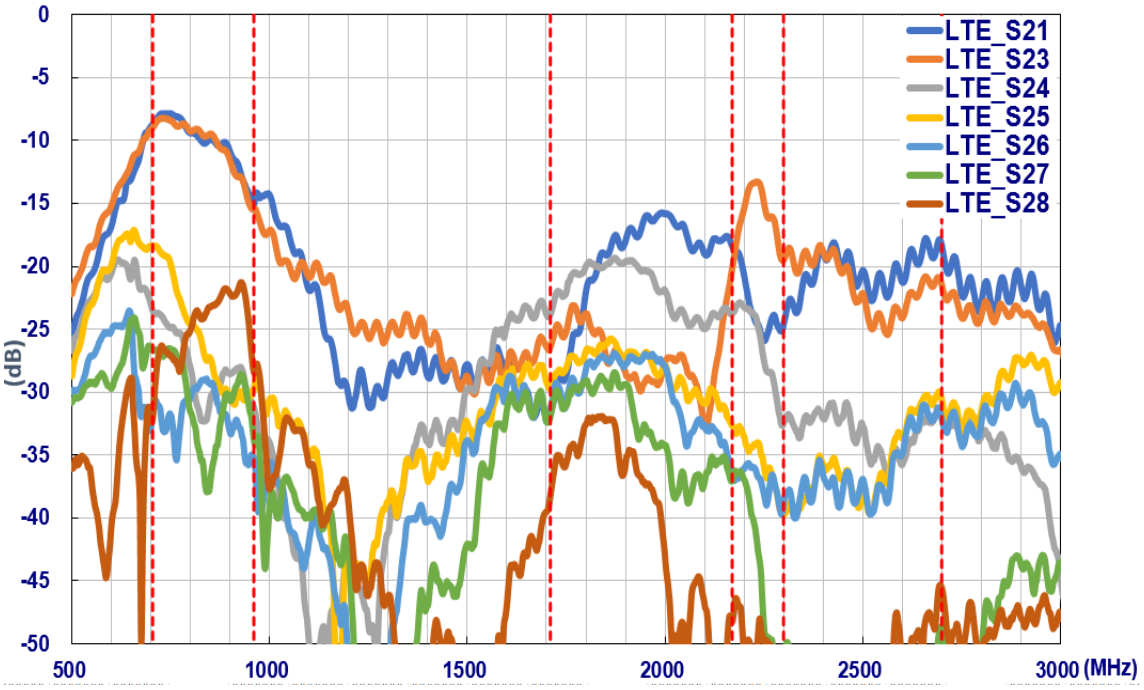
3.2 LTE Antenna

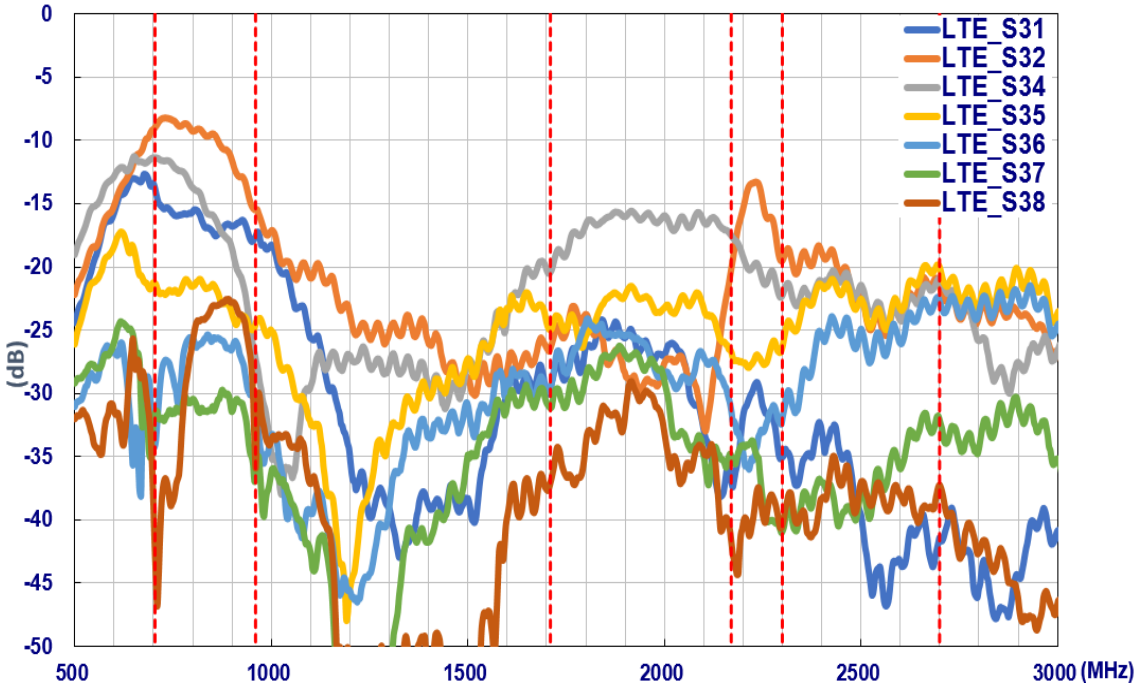
3.2.1 Return Loss

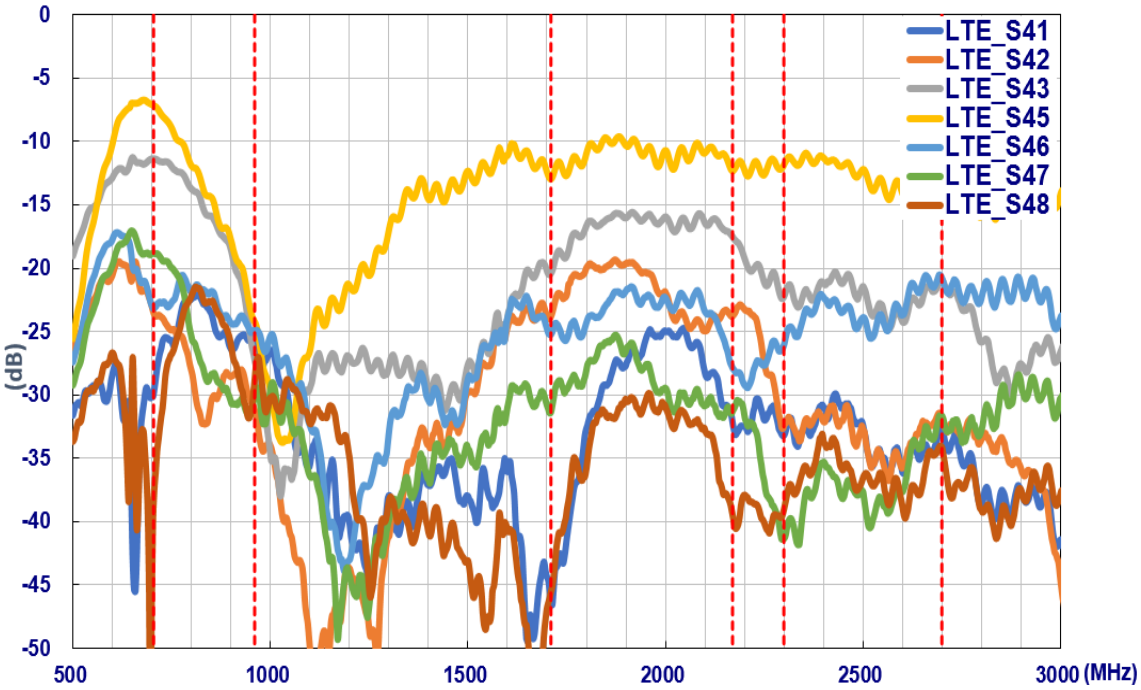


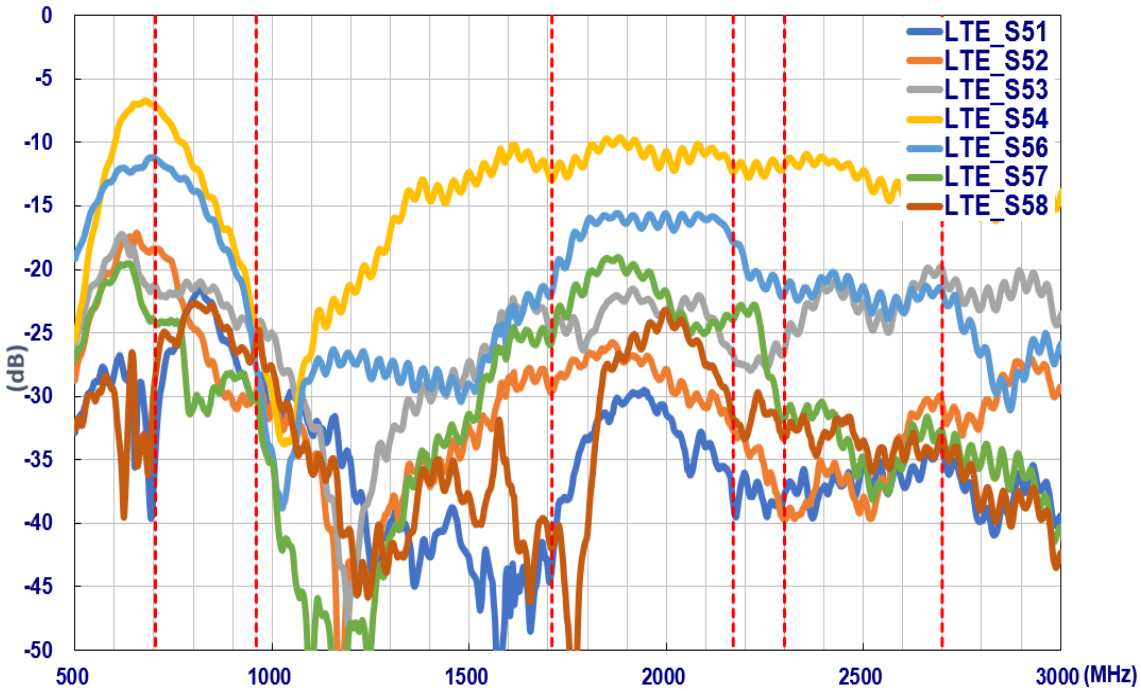
3.2.2 Isolation

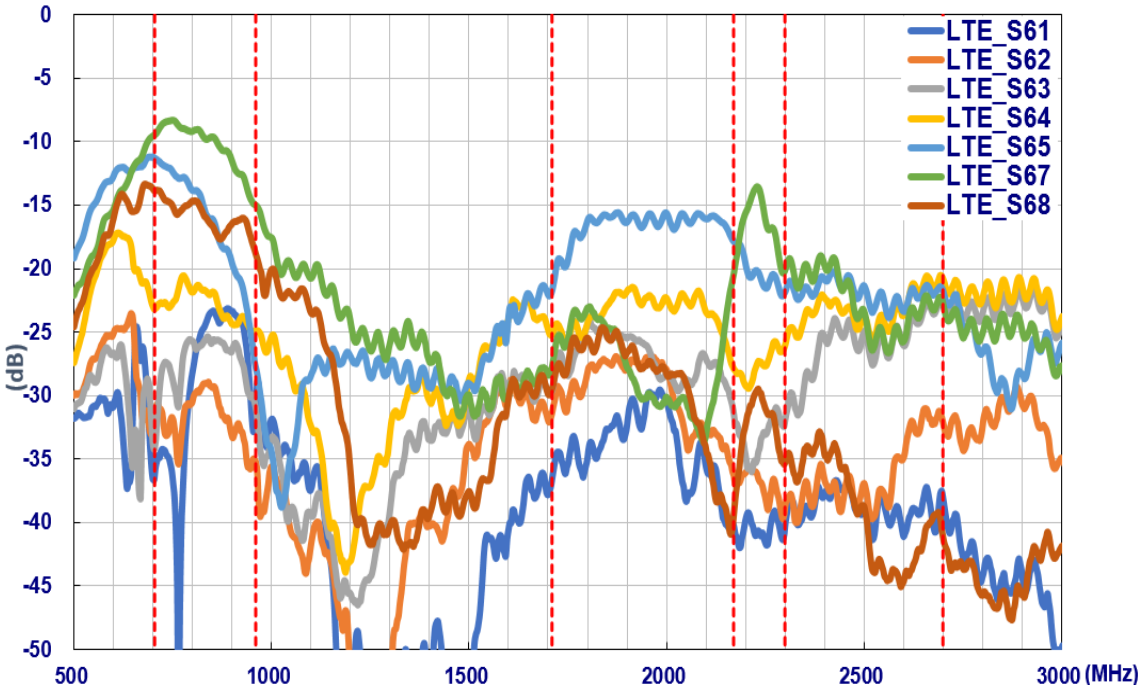


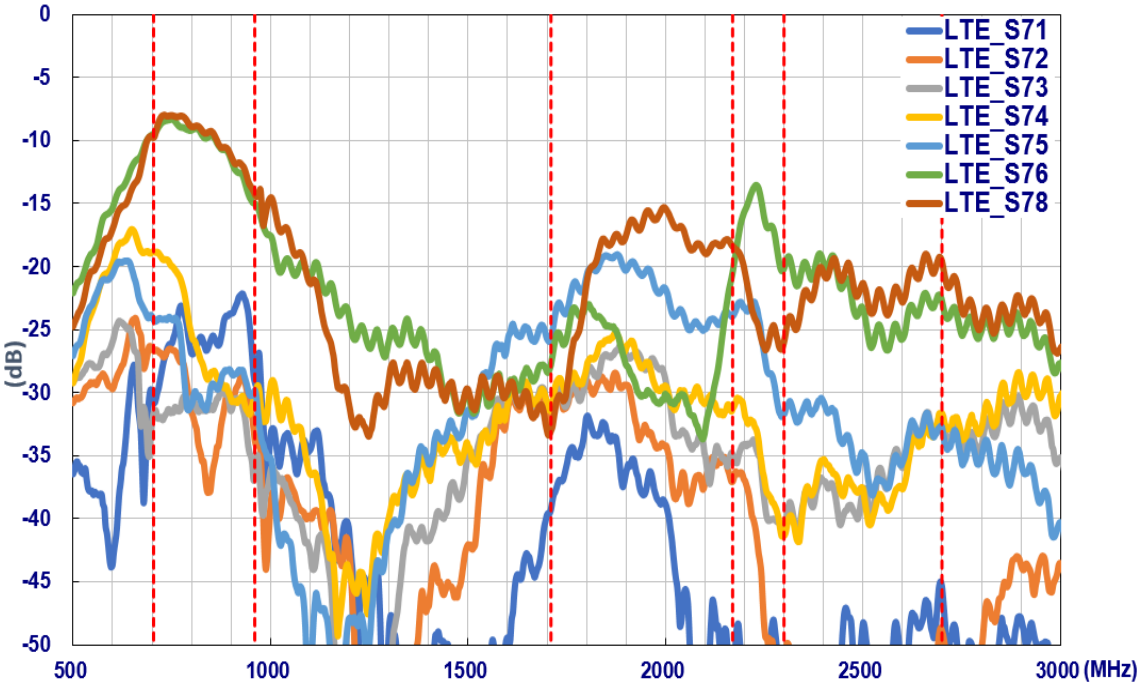

0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
(dB)
500
1000
1500
2000
2500
3000 (MHz)
LTE_S21
LTE_S23
LTE_S24
LTE_S25
LTE_S26
LTE_S27
LTE_S28

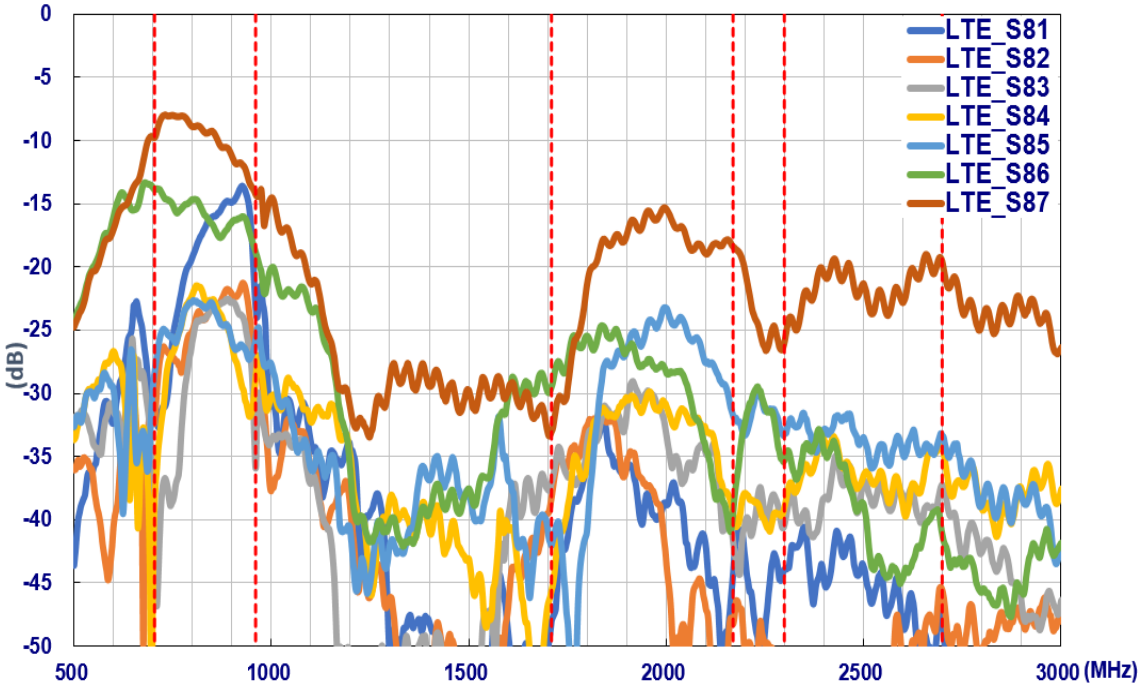

0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
(dB)
500
1000
1500
2000
2500
3000 (MHz)
LTE_S31
LTE_S32
LTE_S34
LTE_S35
LTE_S36
LTE_S37
LTE_S38


0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
(dB)
500
1000
1500
2000
2500
3000 (MHz)
LTE_S41
LTE_S42
LTE_S43
LTE_S45
LTE_S46
LTE_S47
LTE_S48

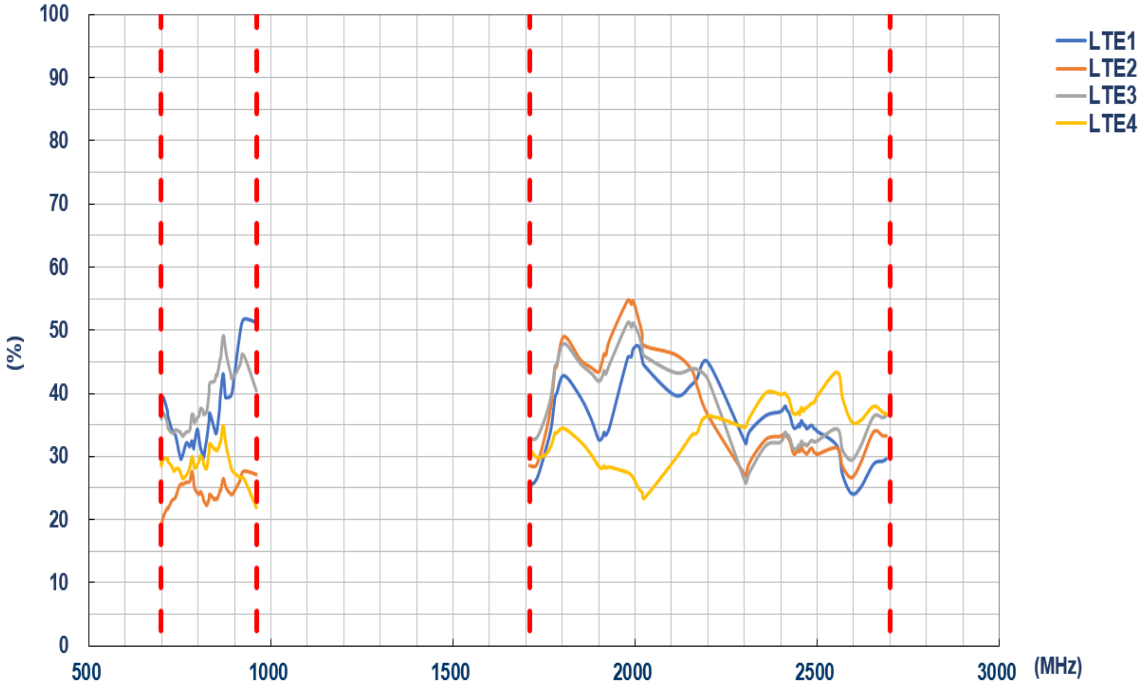

0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
(dB)
500
1000
1500
2000
2500
3000 (MHz)
LTE_S51
LTE_S52
LTE_S53
LTE_S54
LTE_S56
LTE_S57
LTE_S58

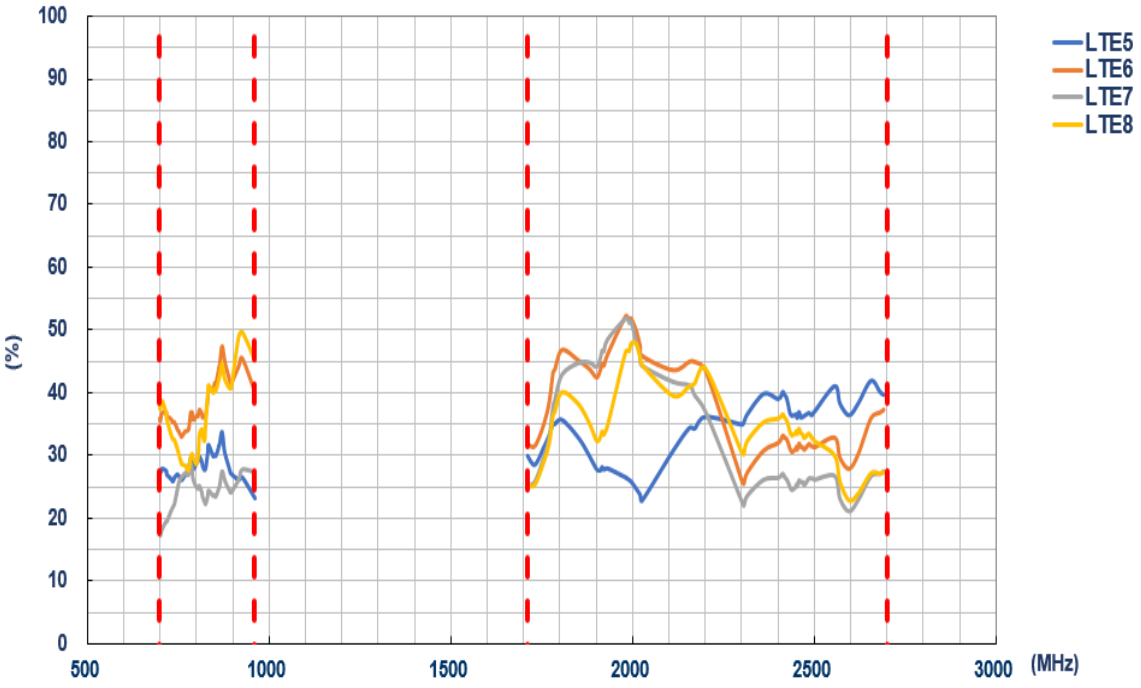

0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
(dB)
500
1000
1500
2000
2500
3000 (MHz)
LTE_S61
LTE_S62
LTE_S63
LTE_S64
LTE_S65
LTE_S67
LTE_S68


0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
(dB)
500
1000
1500
2000
2500
3000 (MHz)
LTE_S71
LTE_S72
LTE_S73
LTE_S74
LTE_S75
LTE_S76
LTE_S78

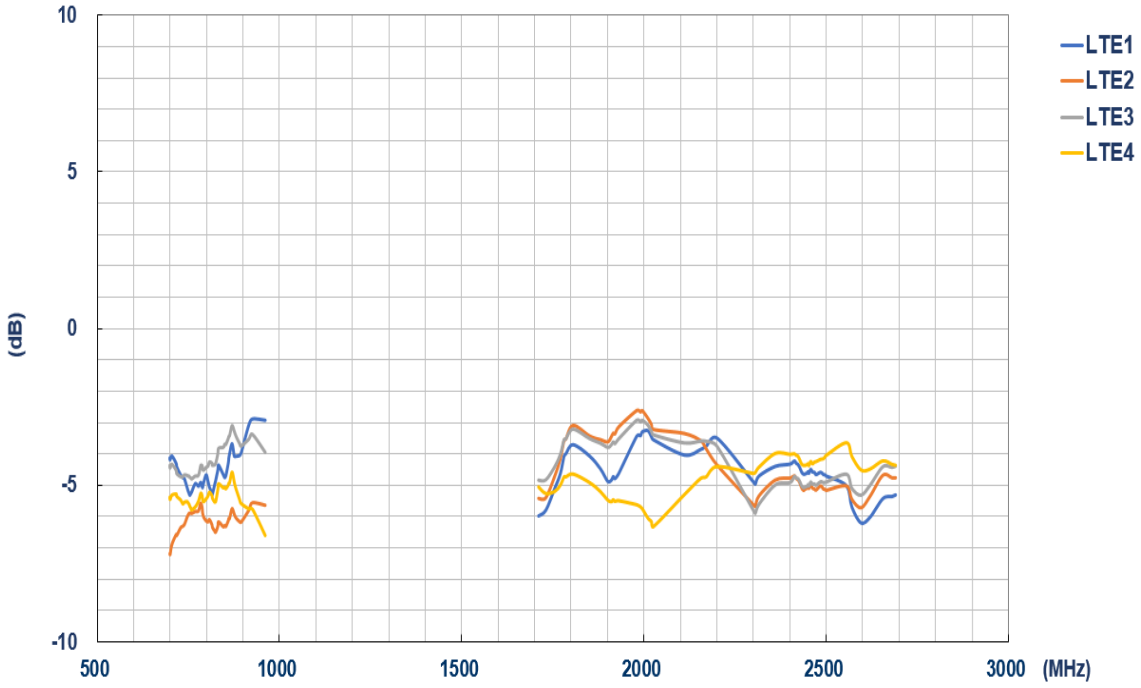


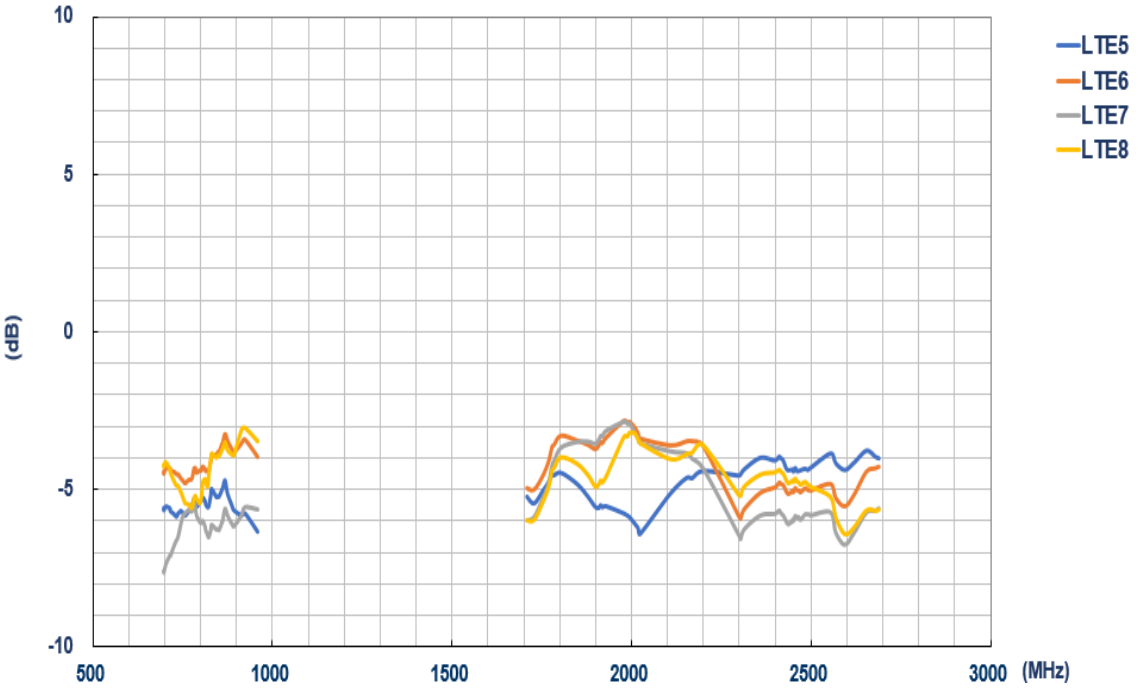
3.2.3 Efficiency



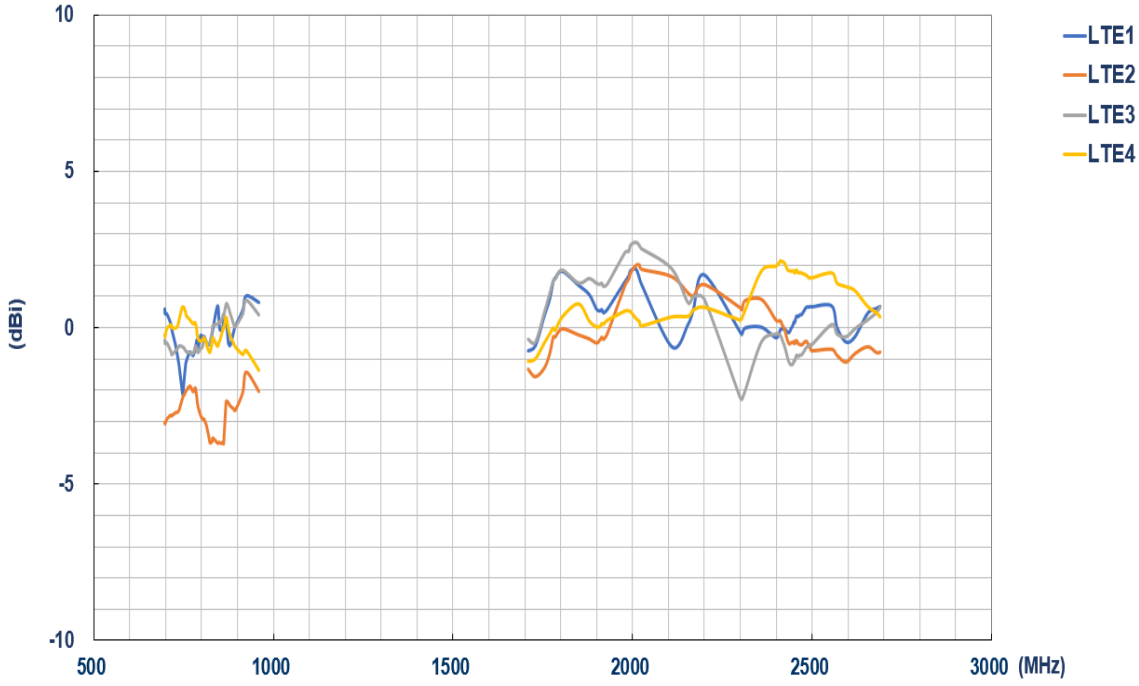


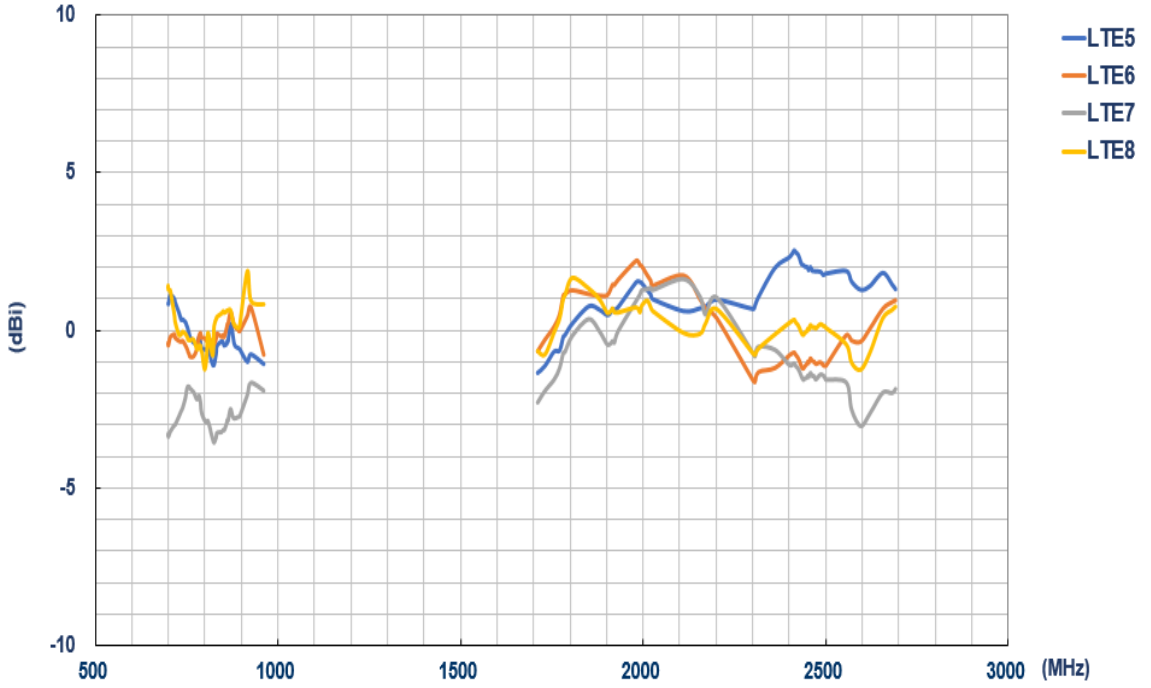
3.2.4 Average Gain





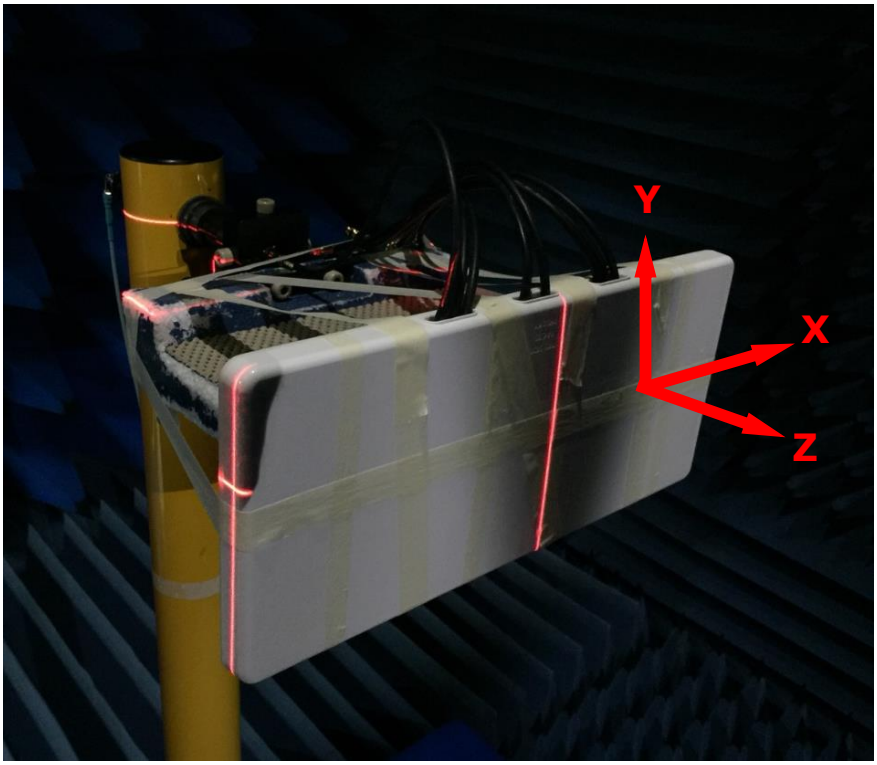
3.2.5 Peak Gain




10
5
0
-5
-10
(dBi)
500
1000
1500
2000
2500
3000
(MHz)
LTE5
LTE6
LTE7
LTE8

4. Antenna Radiation Patterns

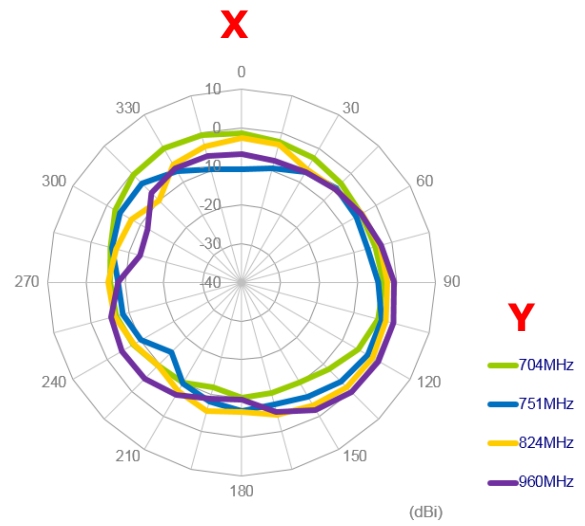
4.1 Antenna Setup (Antenna Test Setup in Anechoic Chamber)

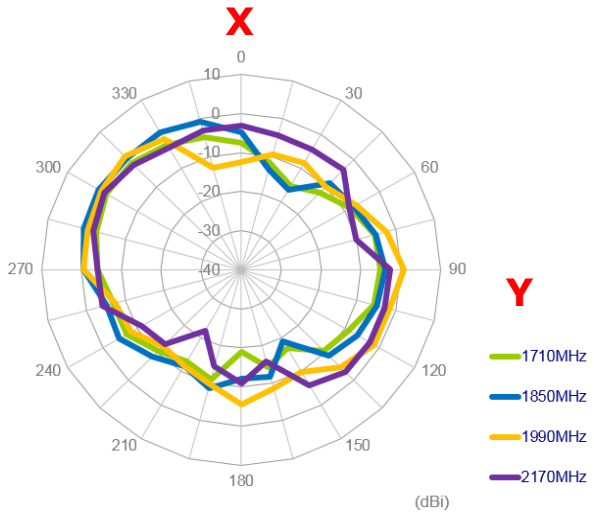


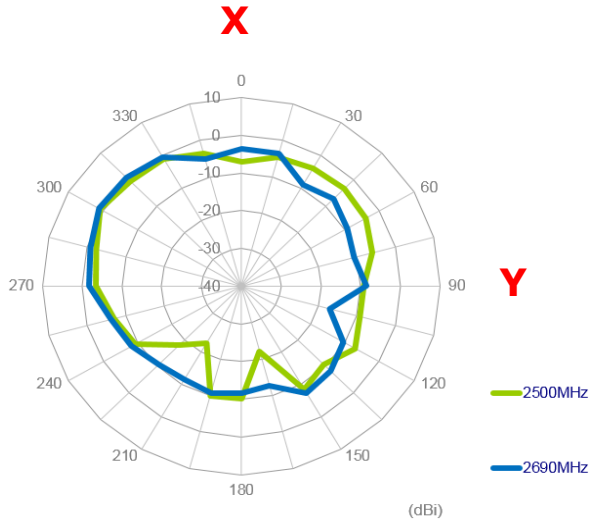
4.2 2D Radiation Patterns

4.2.1 LTE 1

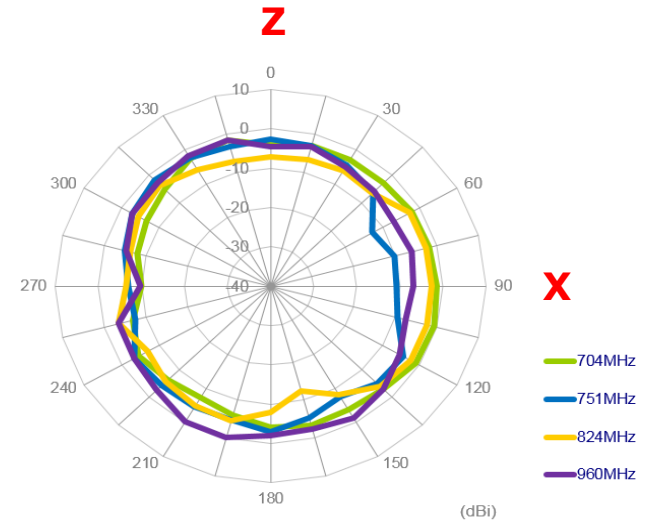
XY Plane

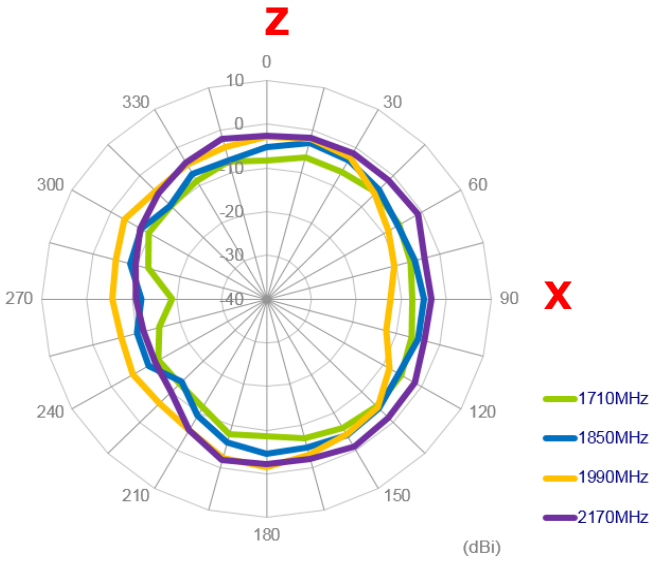


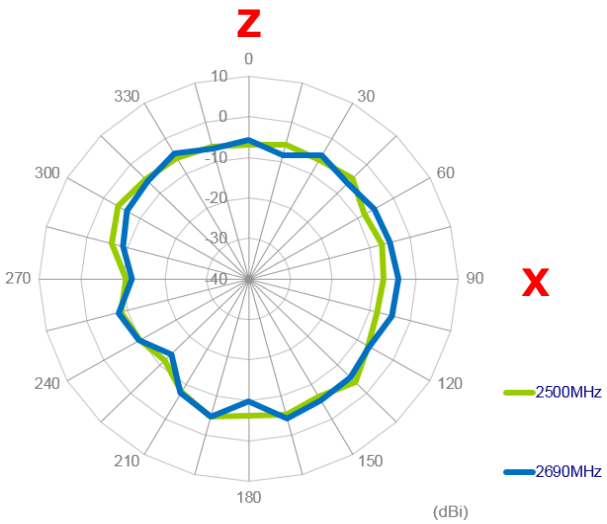




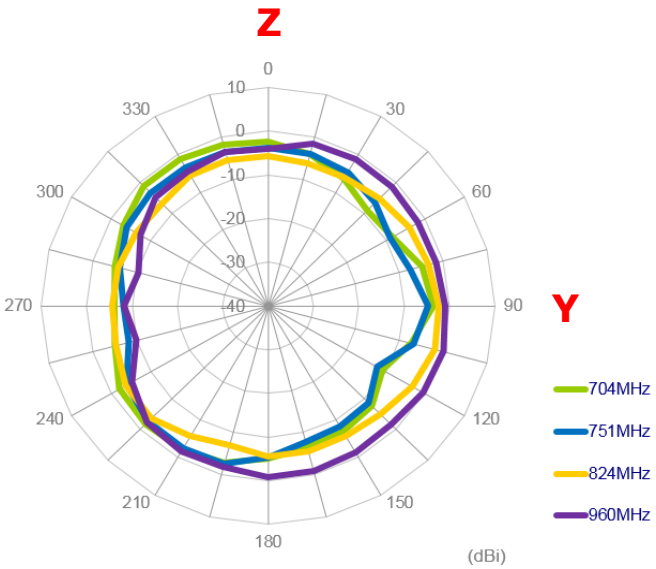
XZ Plane

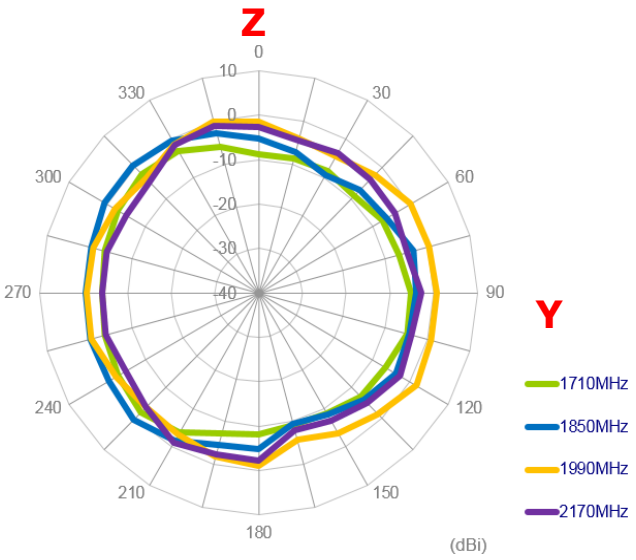

Z
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
X
704MHz
751MHz
824MHz
960MHz
(dBi)

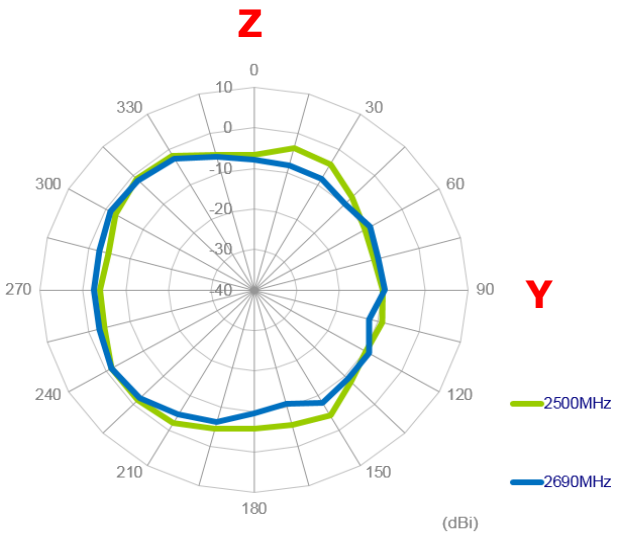

Z
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
X
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
X
2500MHz
2690MHz
(dBi)

YZ Plane

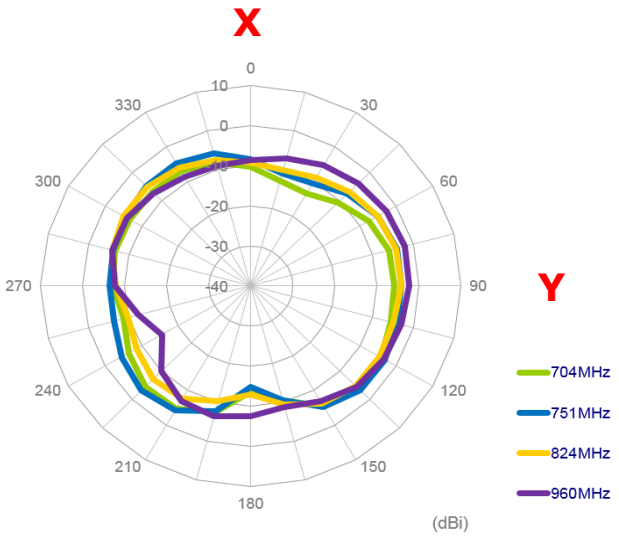

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

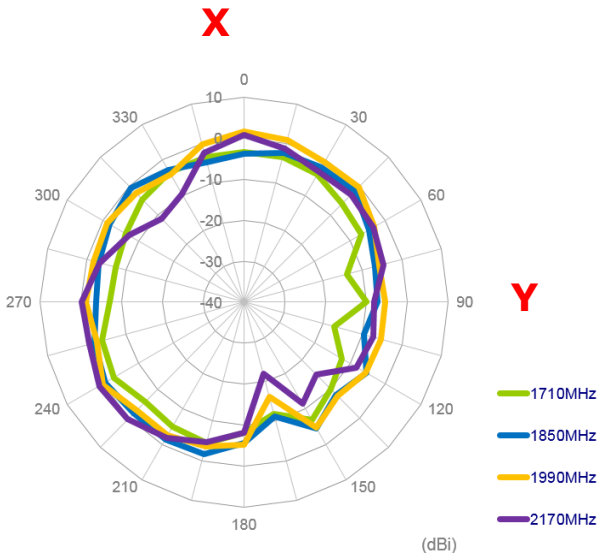

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

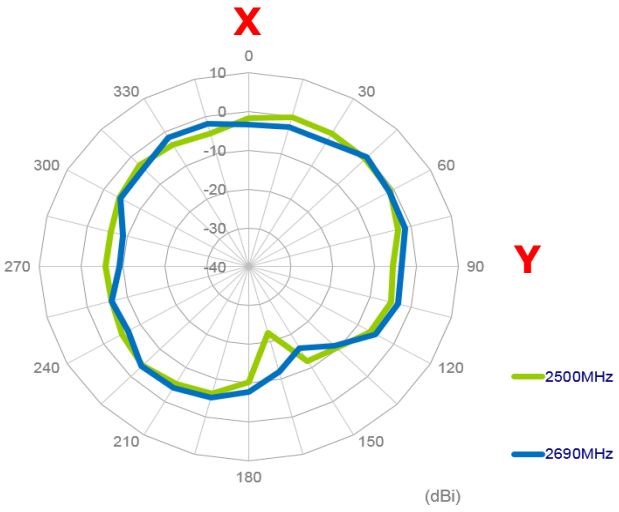

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.2.2 LTE 2

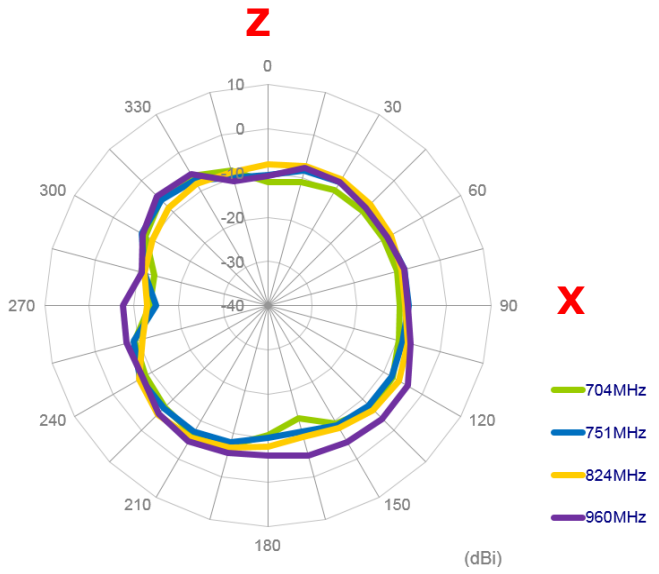
XY Plane

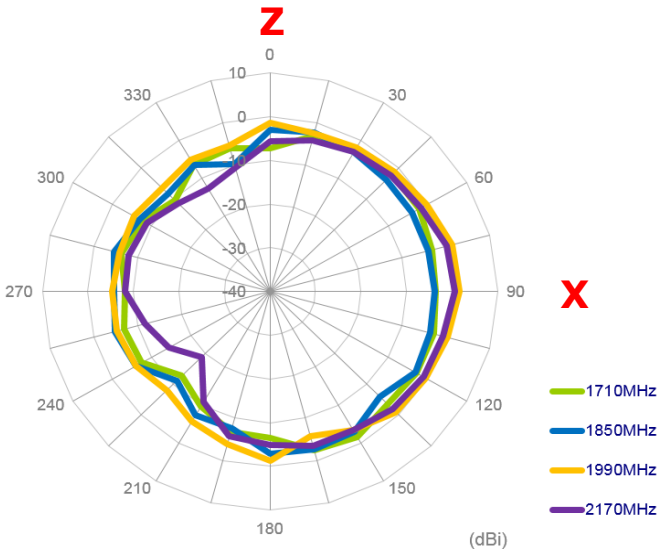


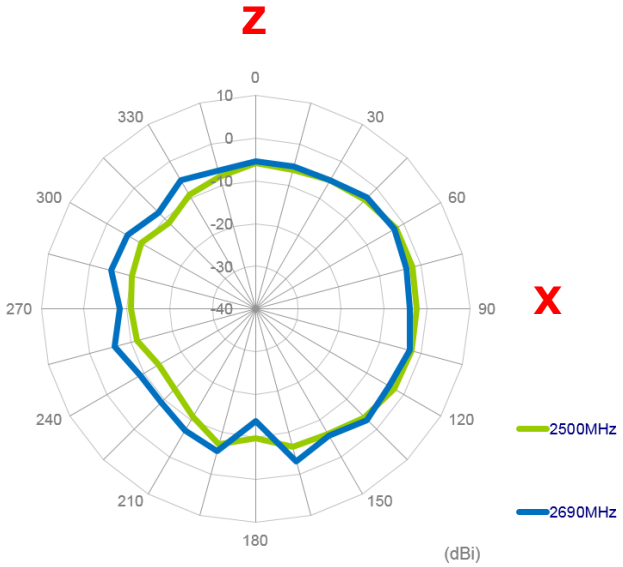




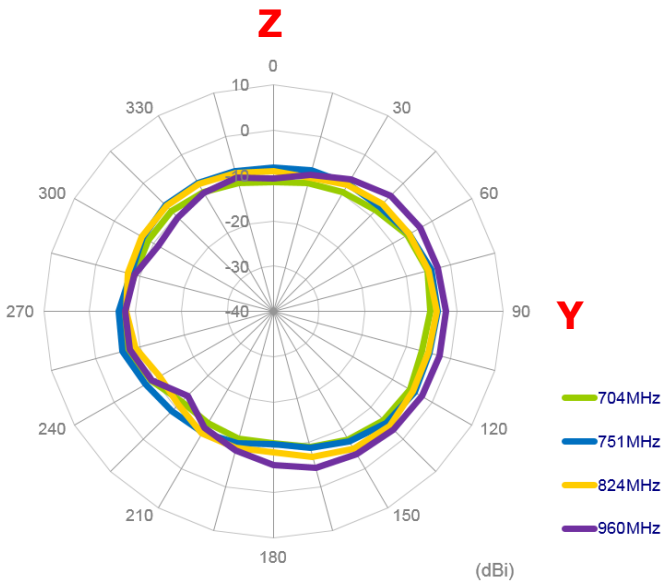
XZ Plane

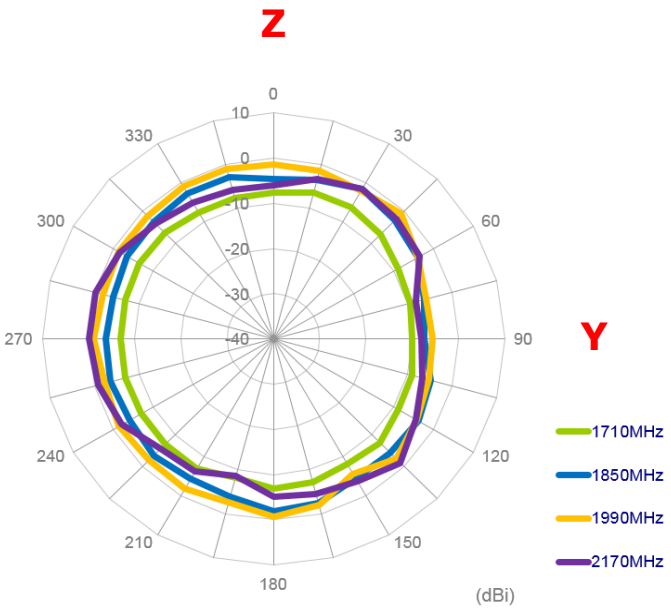

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

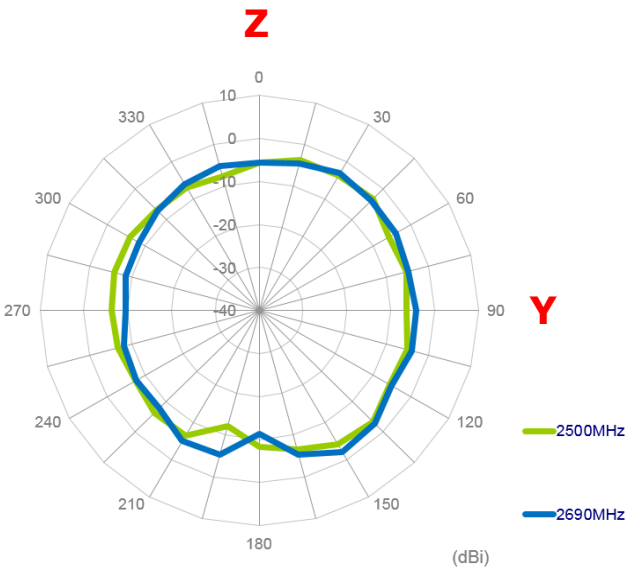

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

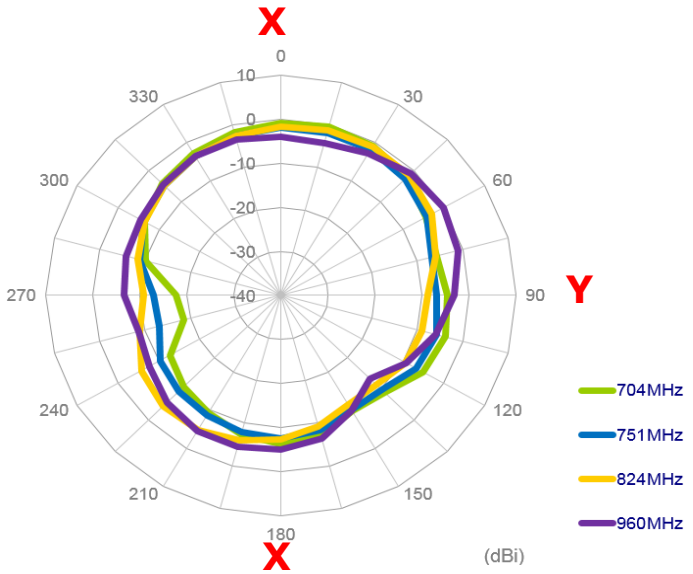

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

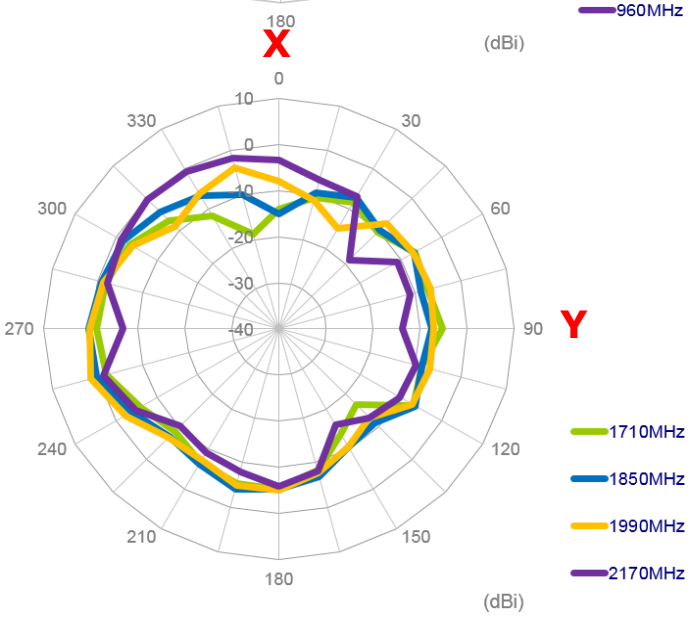

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

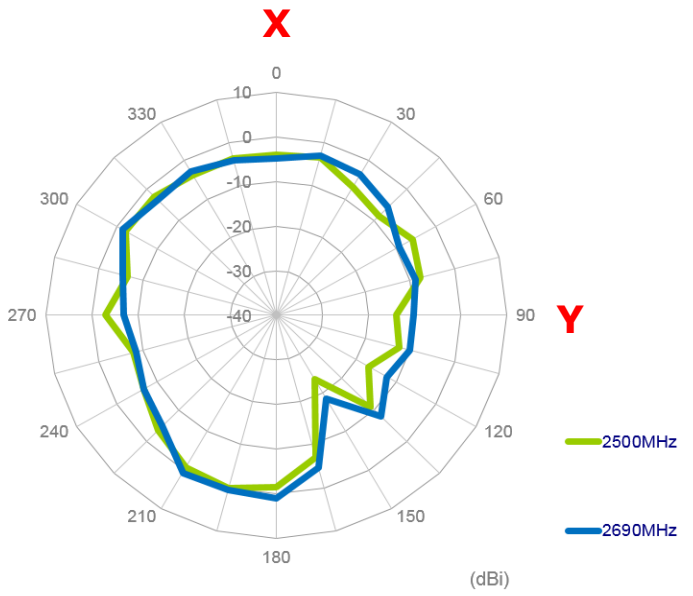

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.2.3 LTE 3

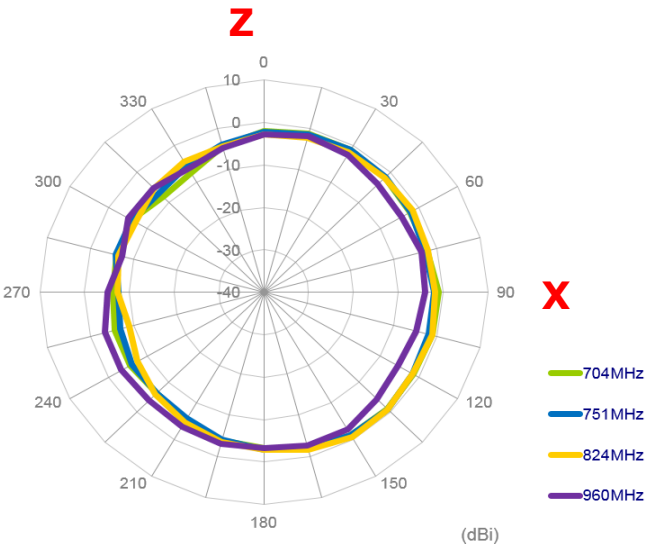
XY Plane

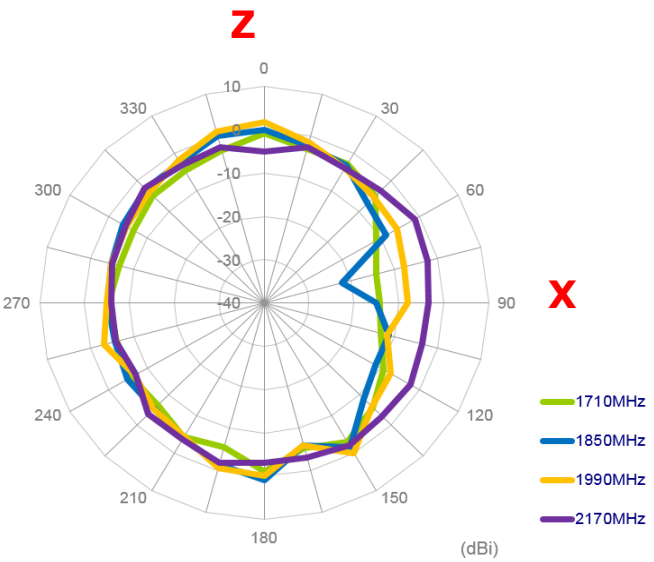


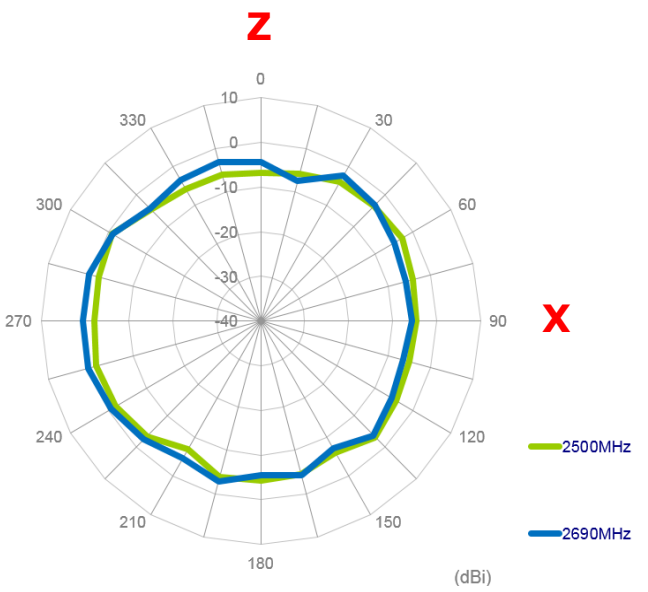




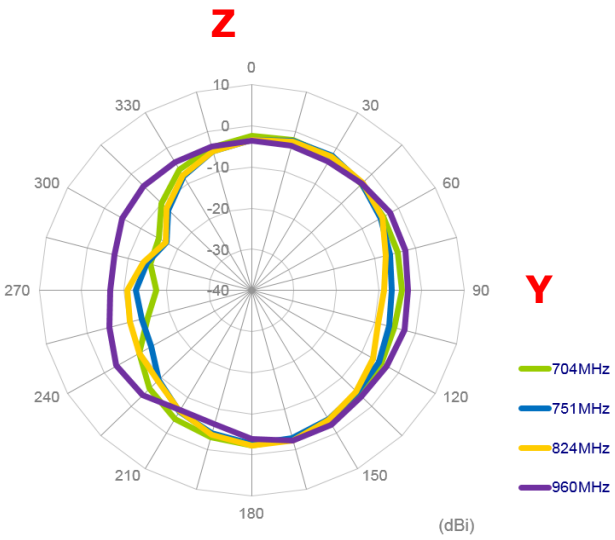
XZ Plane

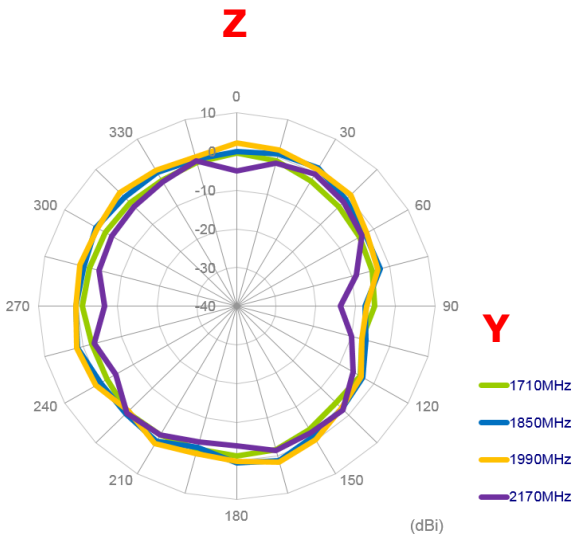

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

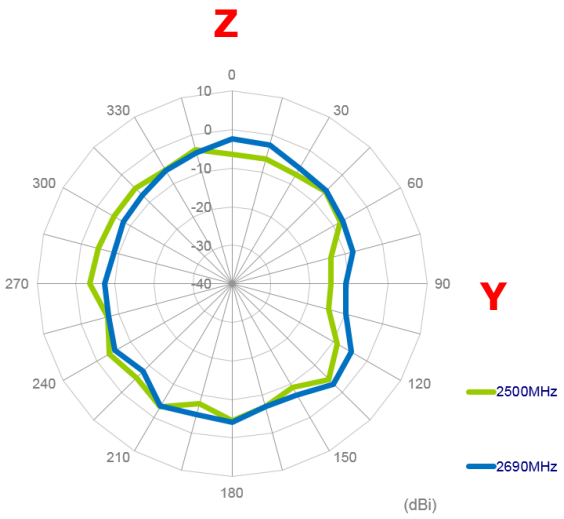

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

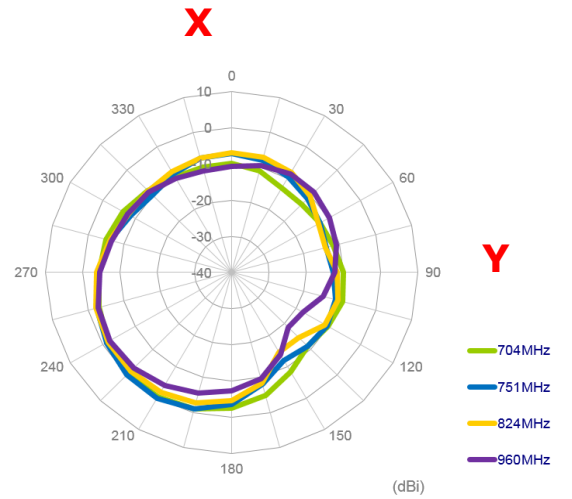

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

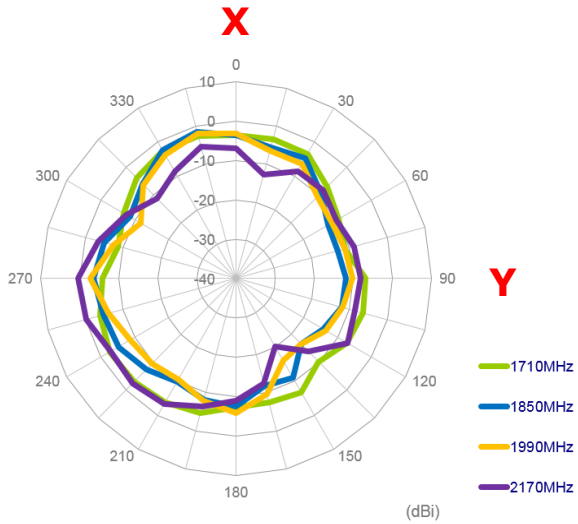

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

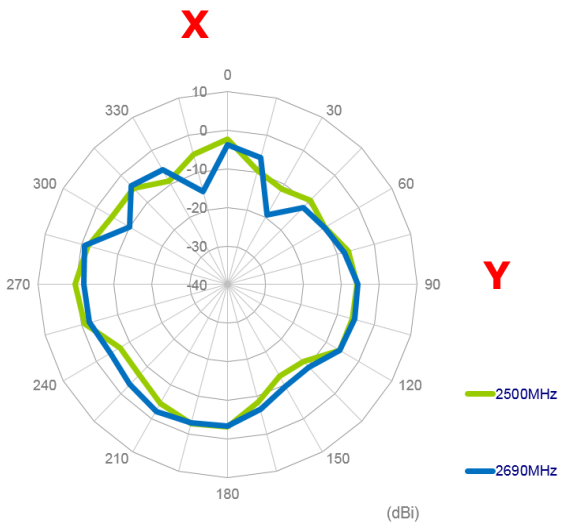

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.2.4 LTE 4

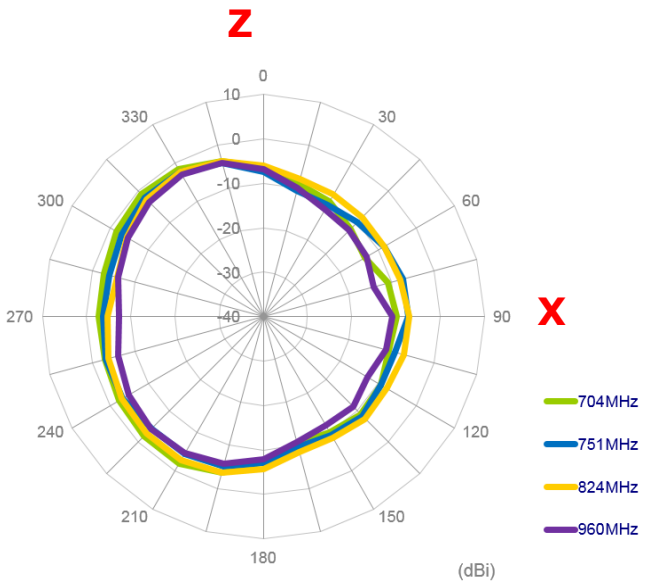
XY Plane

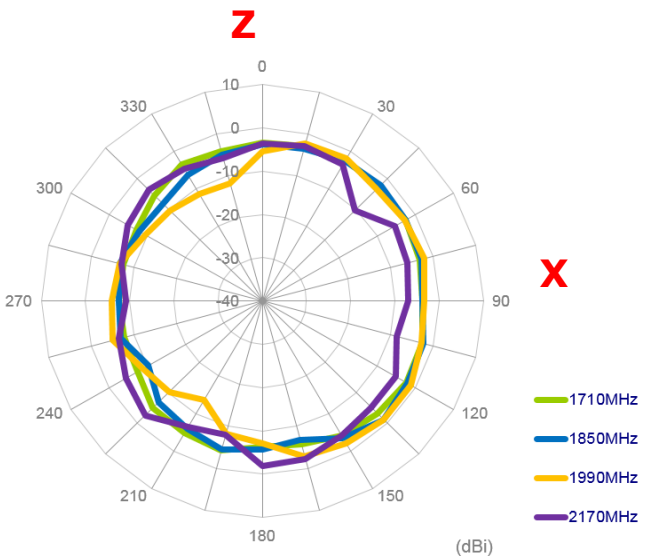


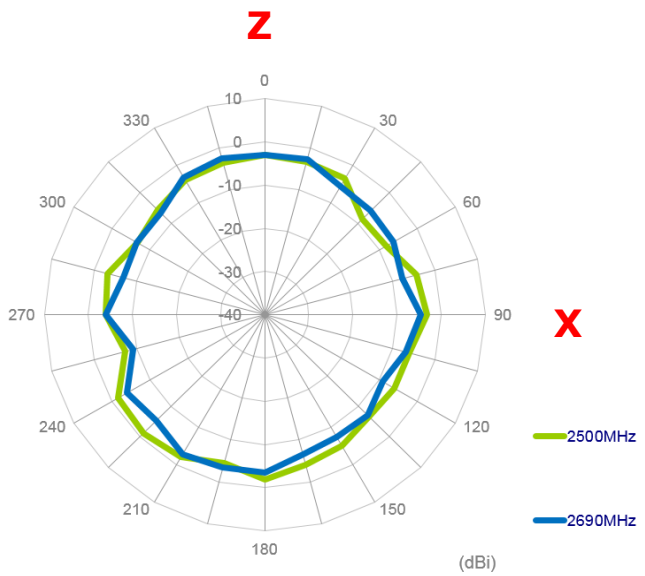




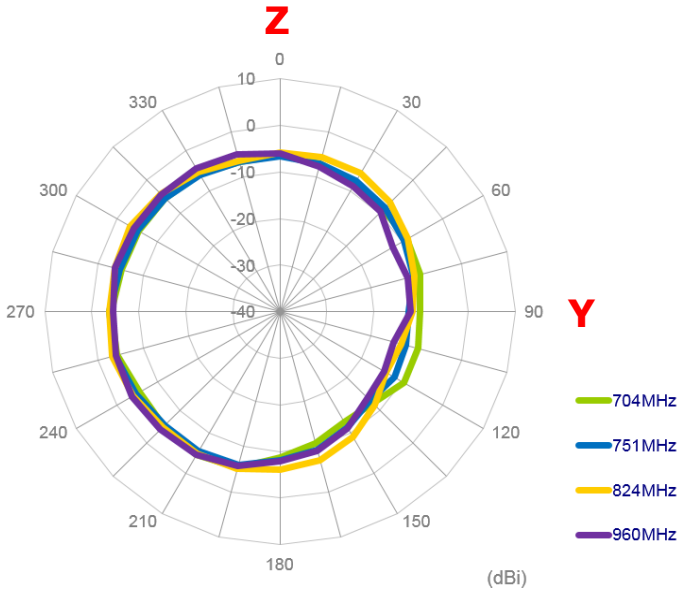
XZ Plane

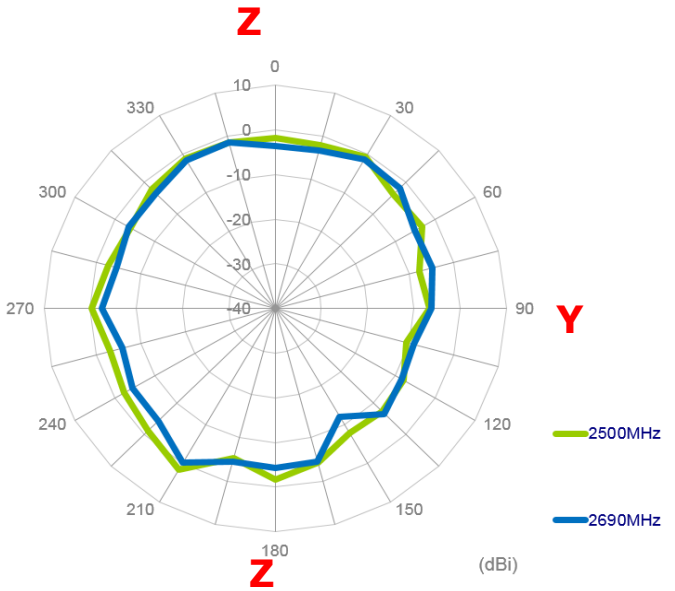

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

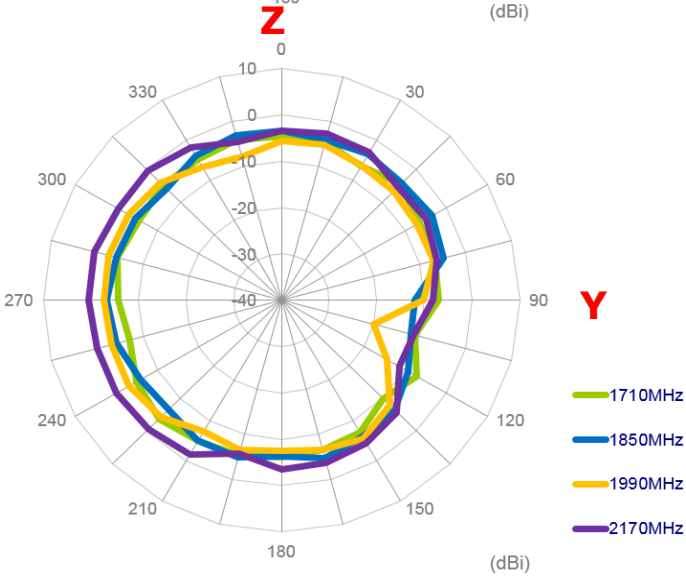

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

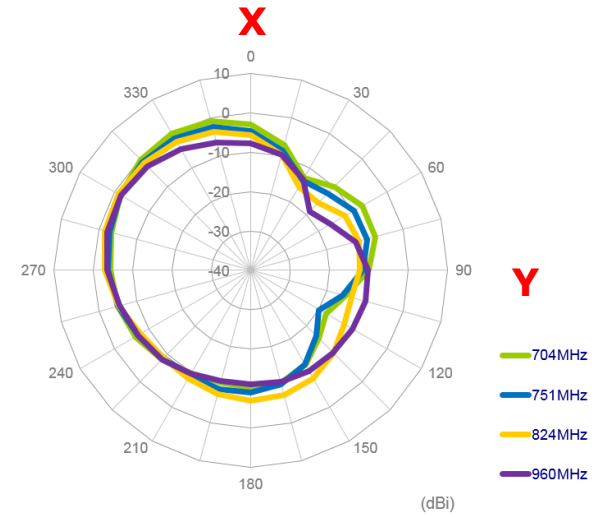

Z
0
10
30
330
0
60
-10
300
-20
-30
270
-40
90
Y
240
120
210
150
180
(dBi)
704MHz
751MHz
824MHz
960MHz

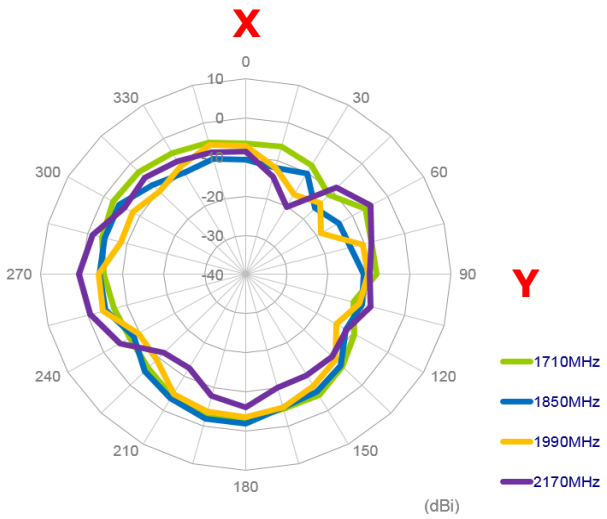

Z
0
10
330
30
0
60
-10
300
-20
-30
270
-40
90
Y
240
120
210
150
180
(dBi)
2500MHz
2690MHz

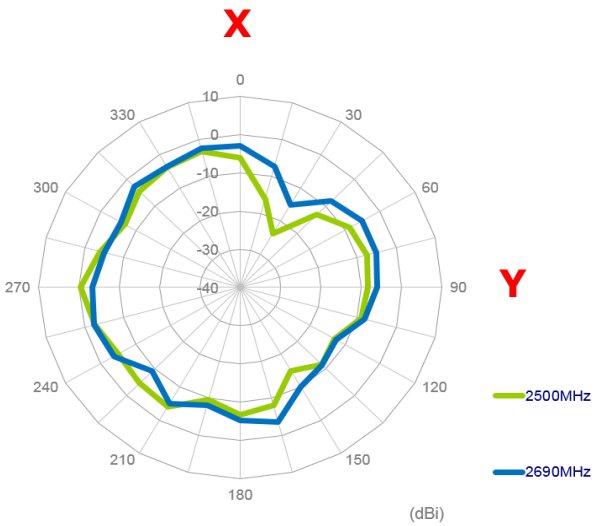

Z
0
10
330
30
0
60
-10
300
-20
-30
270
-40
90
Y
240
120
210
150
180
(dBi)
1710MHz
1850MHz
1990MHz
2170MHz

4.2.5 LTE 5

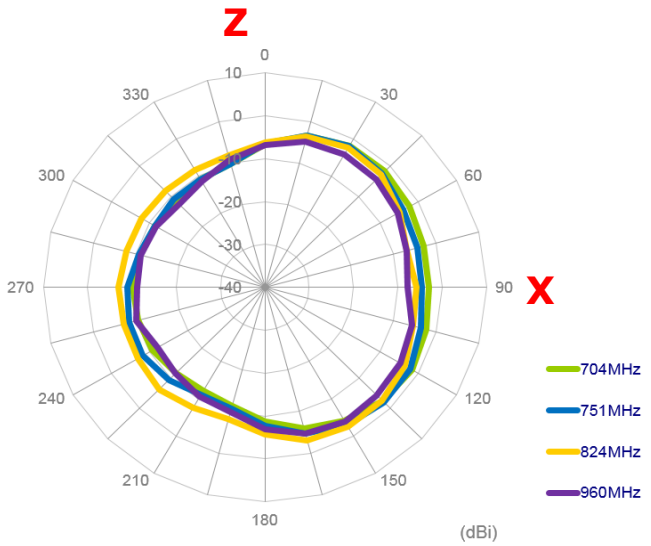
XY Plane

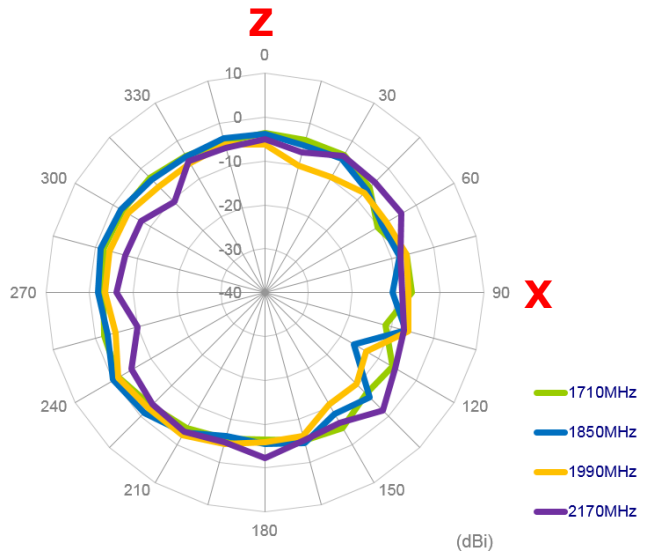


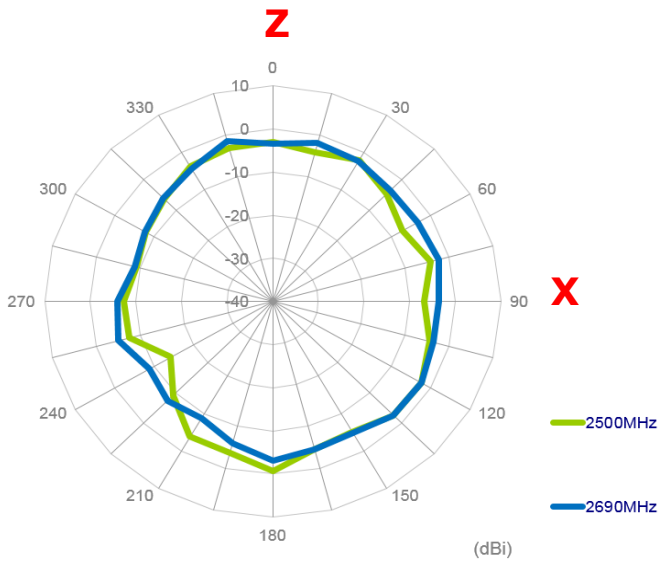




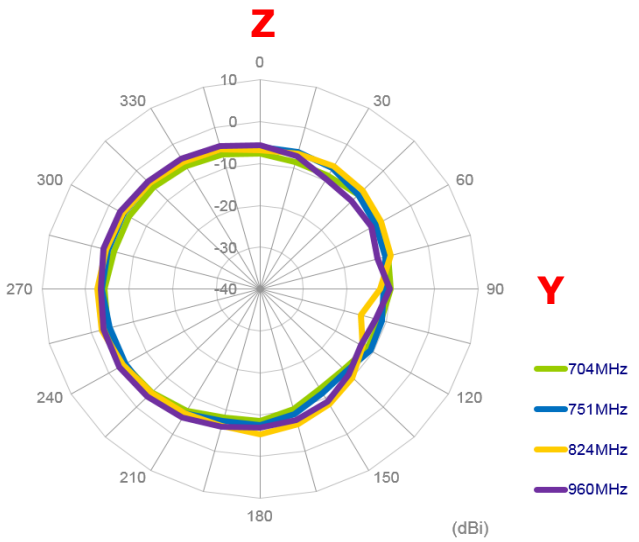
Z-X Plane

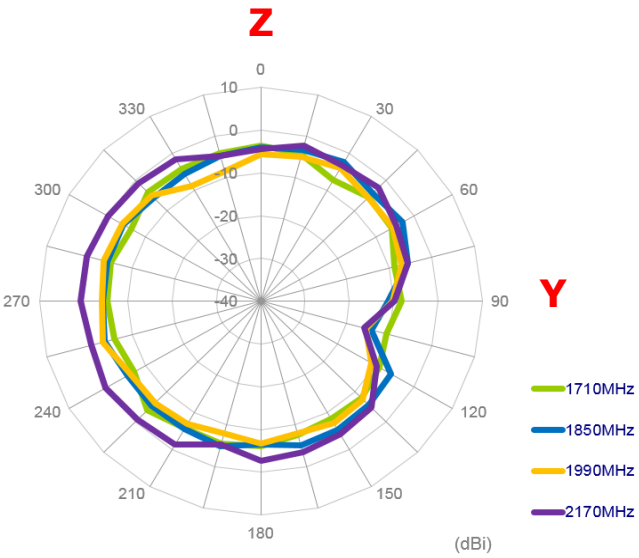

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

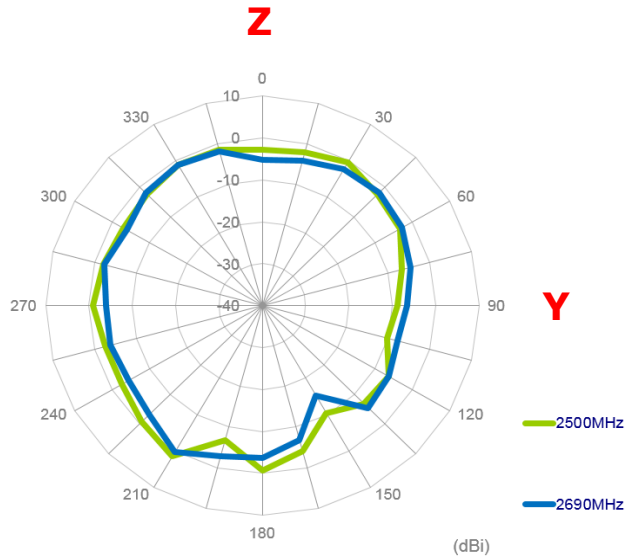

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

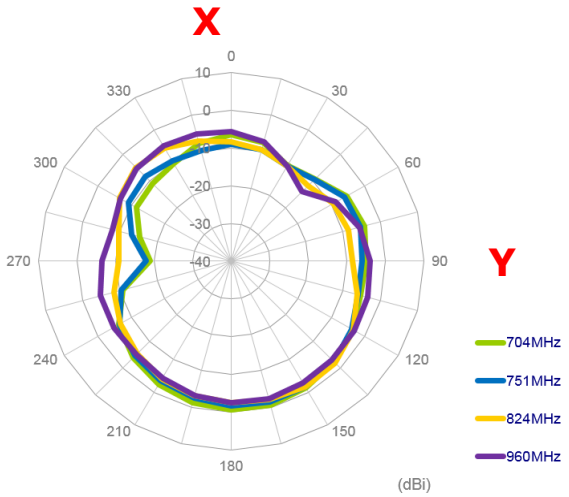

Z
Y
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180
210
240
270
300
330
10
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-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

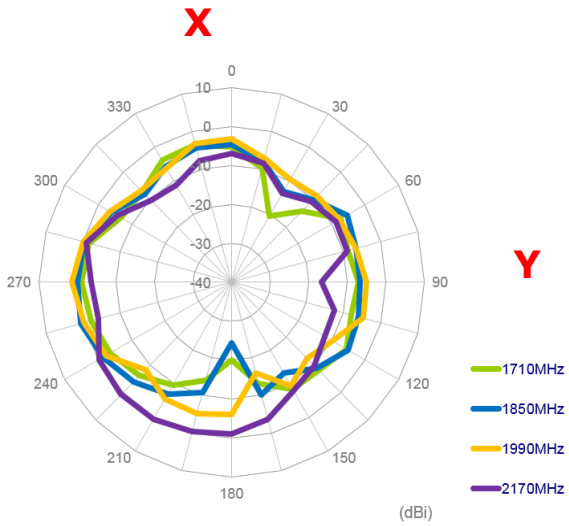

Z
Y
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60
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120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

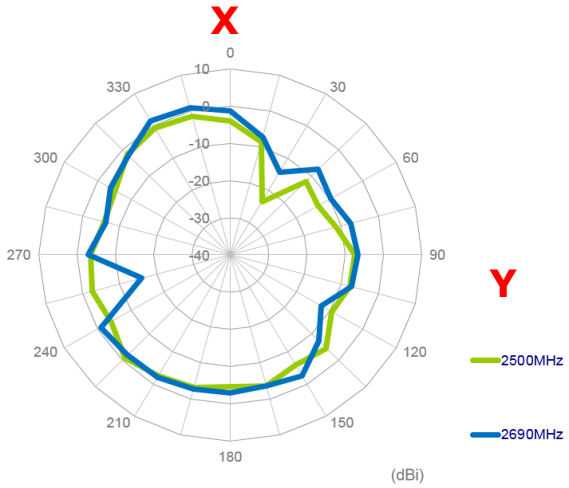

Z
Y
0
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60
90
120
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180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.2.6 LTE 6

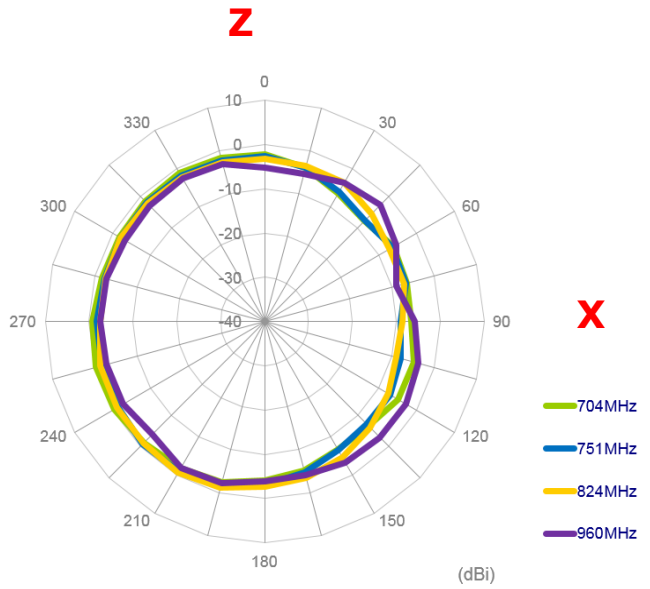
XY Plane

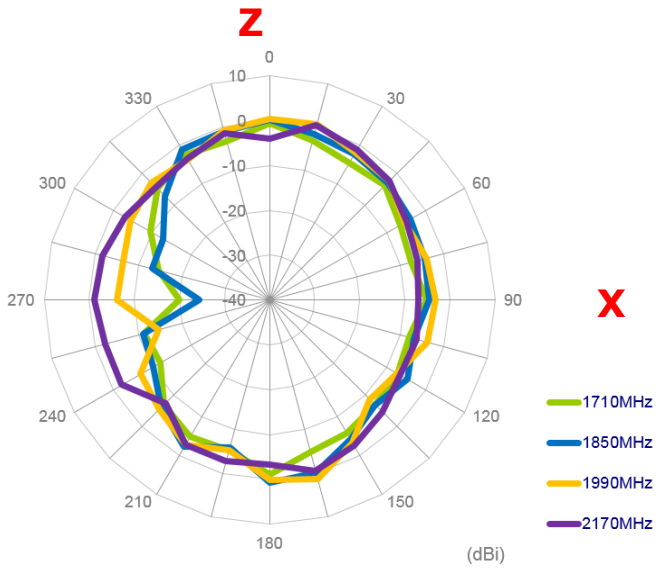


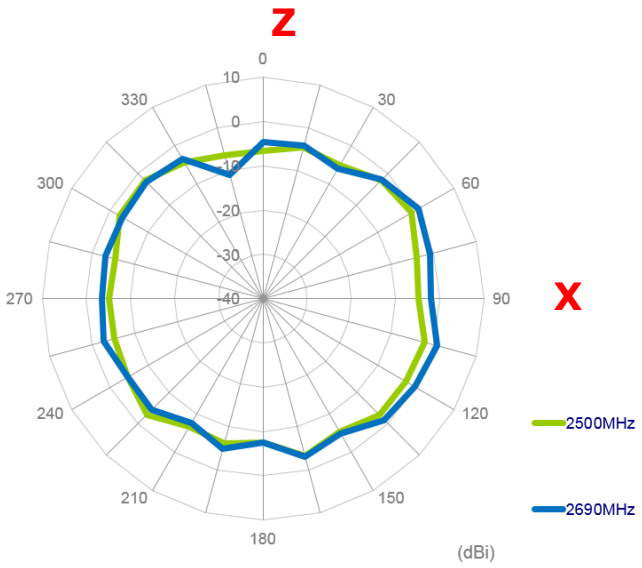




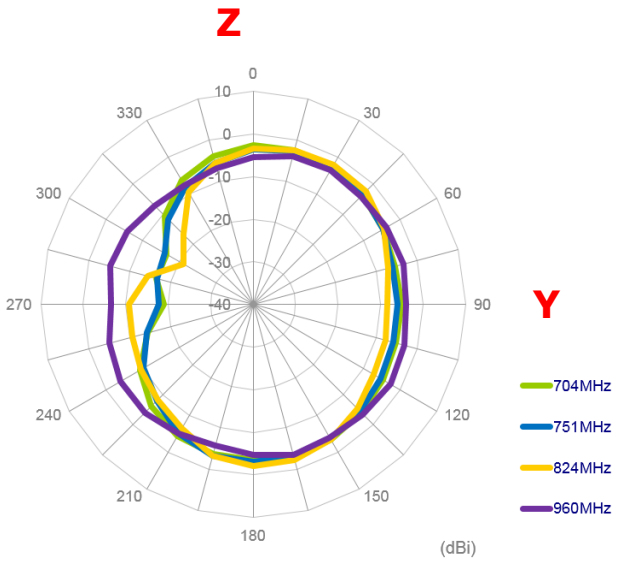
XZ Plane

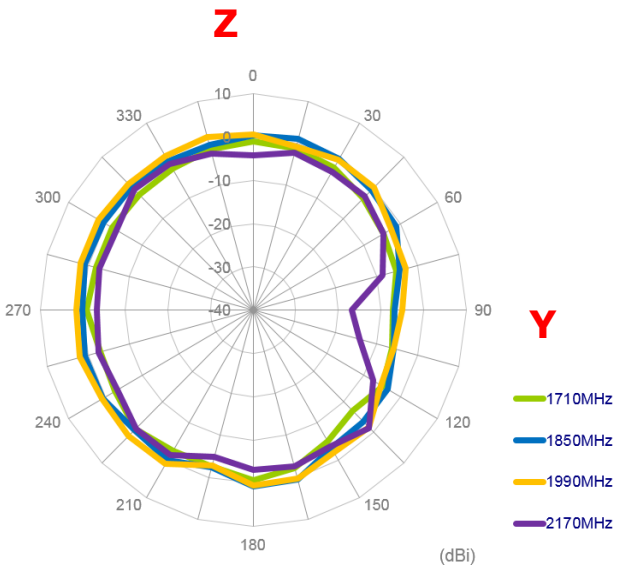

Z
X
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180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

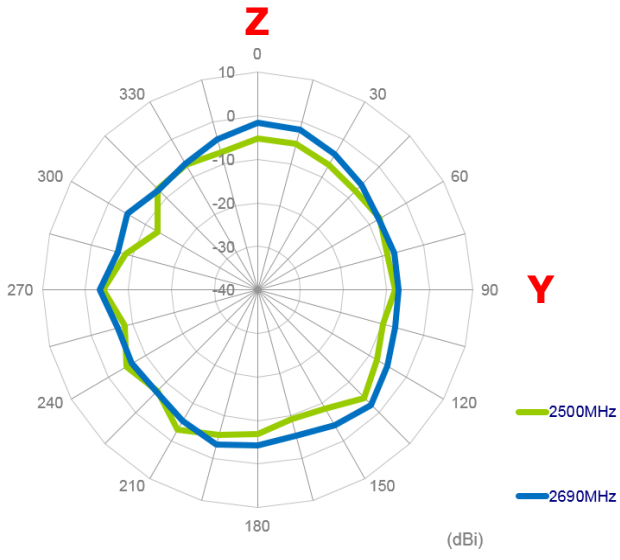

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

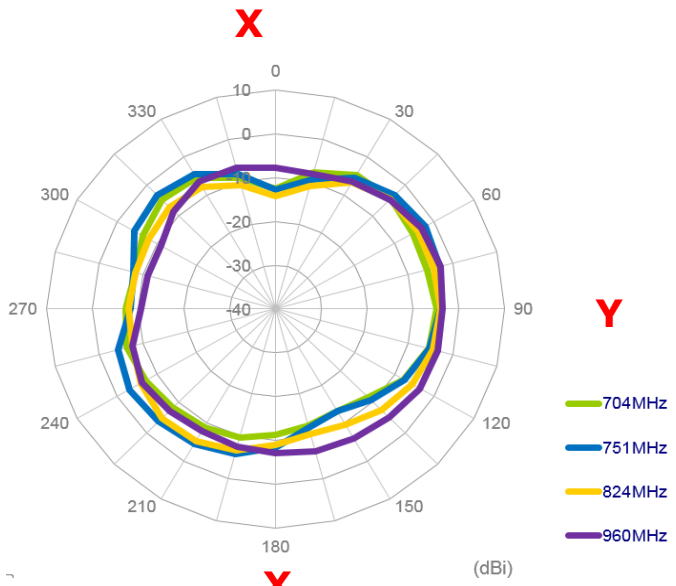

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

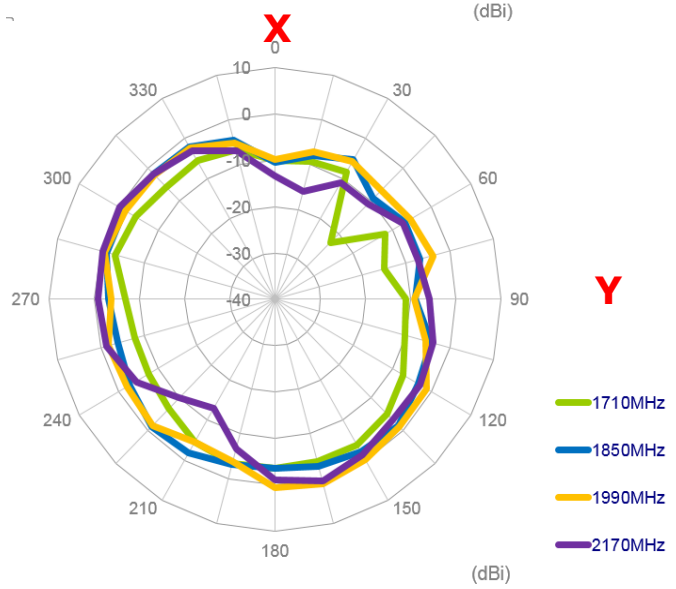

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

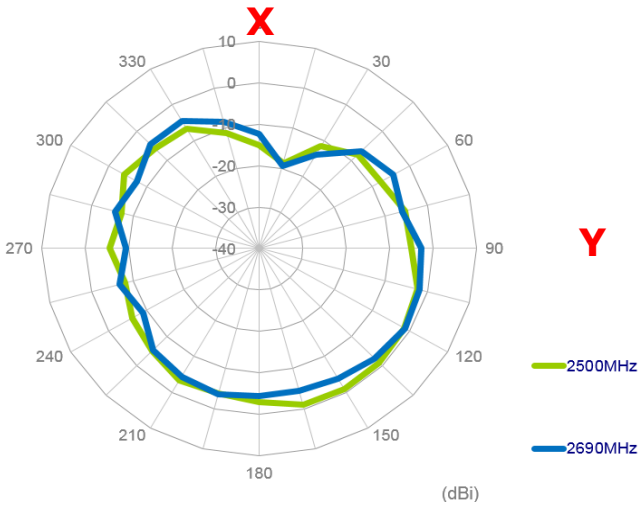

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.2.7 LTE 7

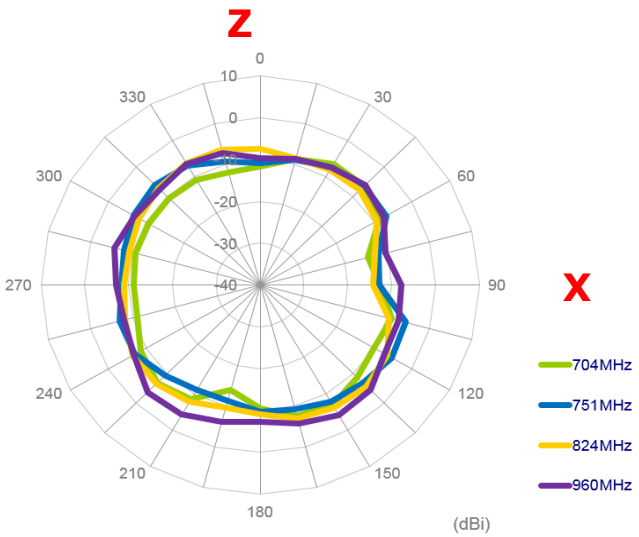
XY Plane

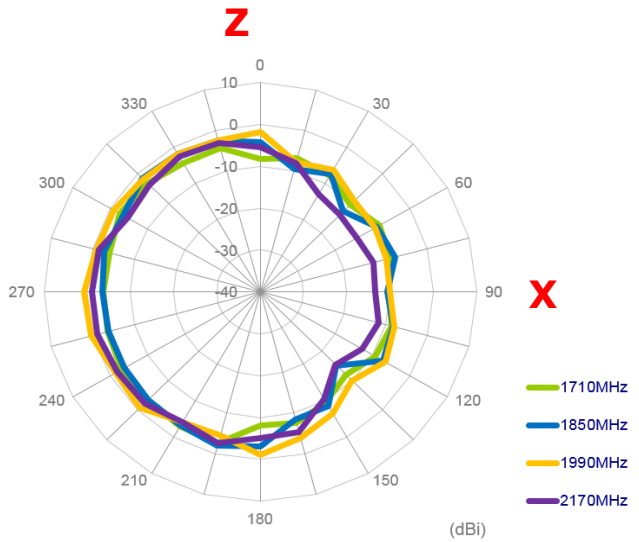


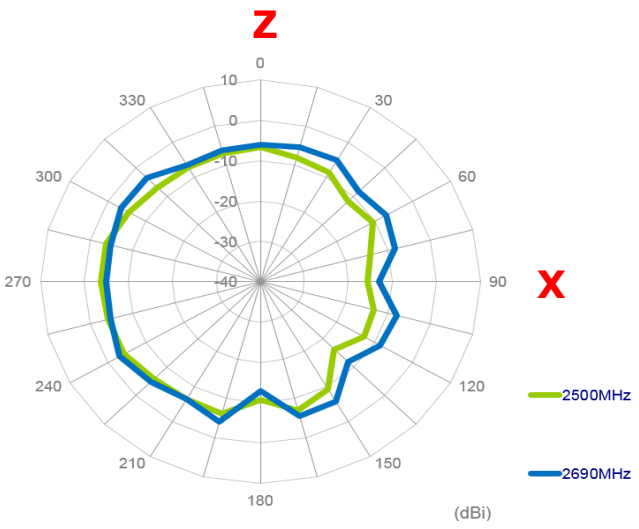




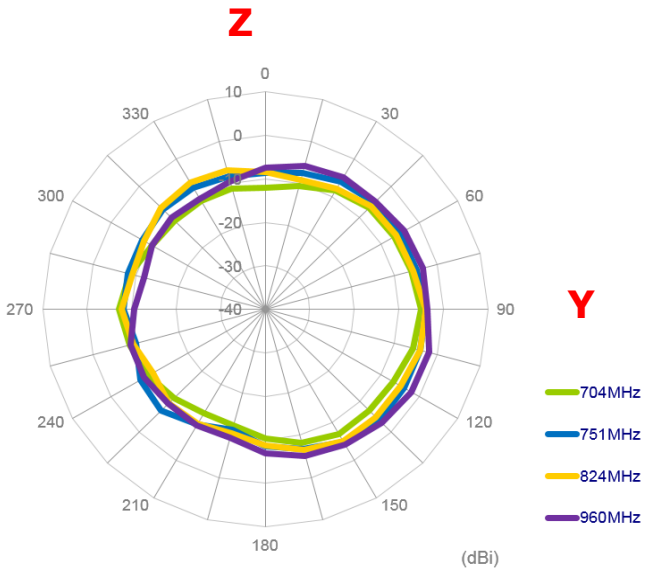
XZ Plane

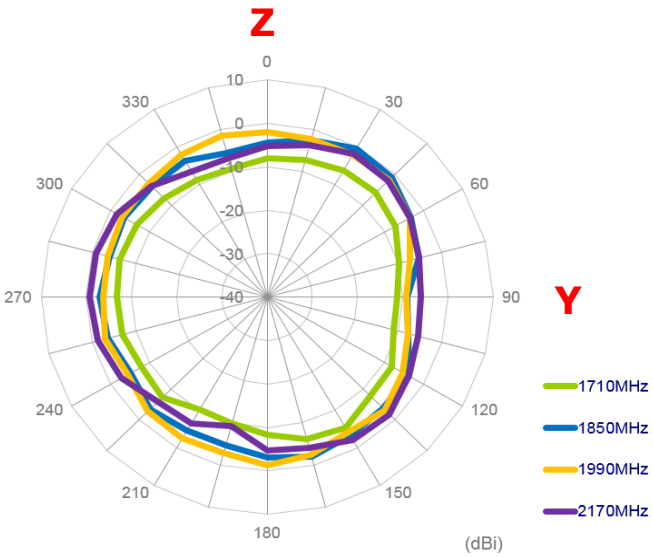

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

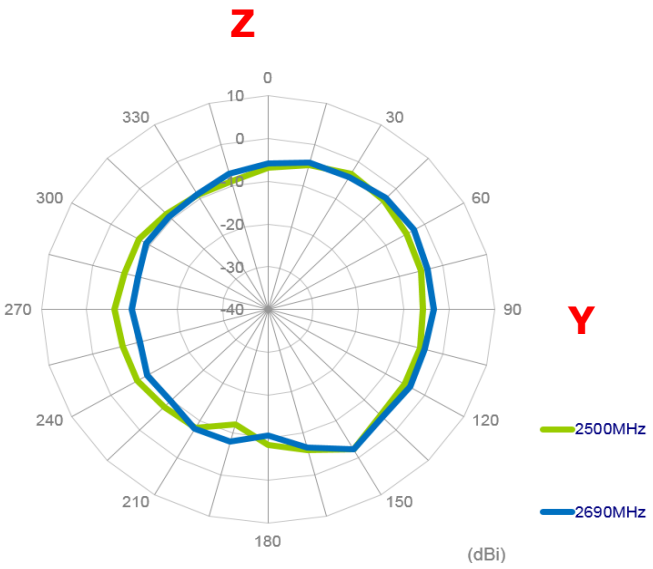

Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

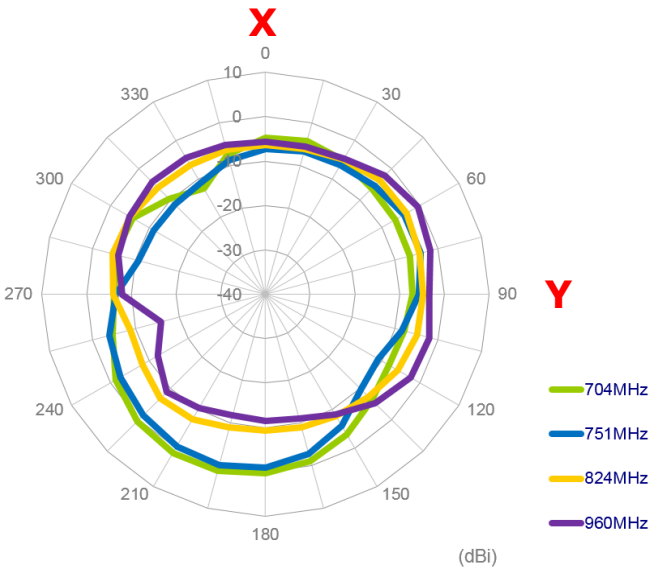

Z
Y
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60
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120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

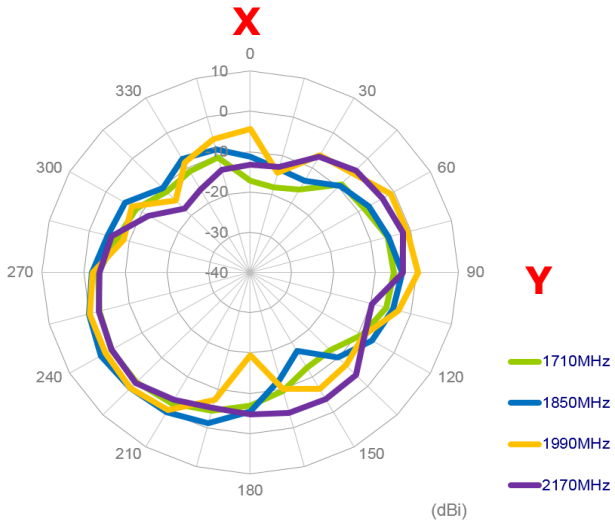

Z
Y
0
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60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

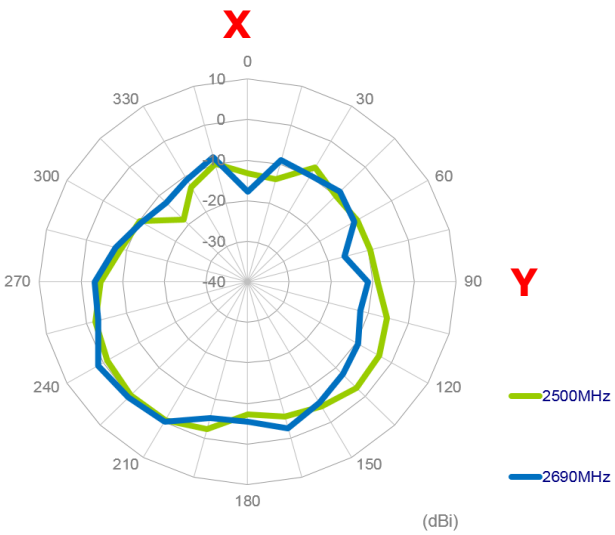

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.2.8 LTE 8

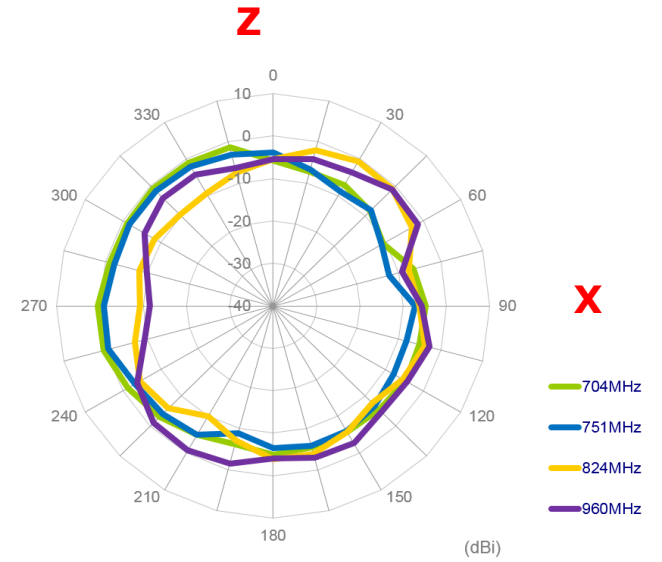
XY Plane

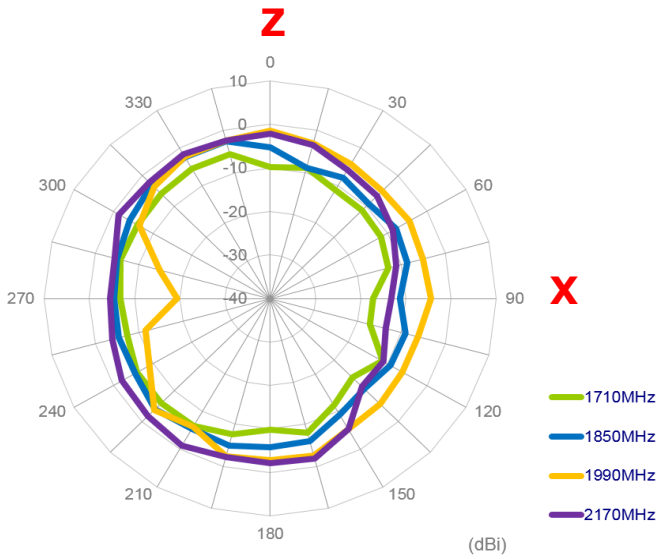


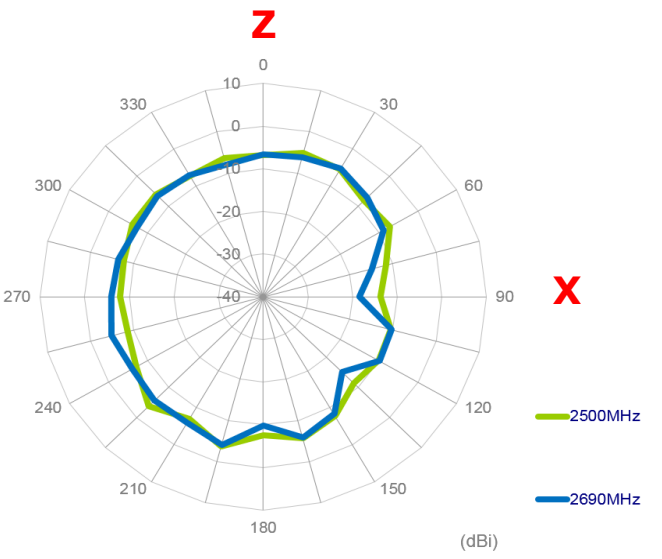




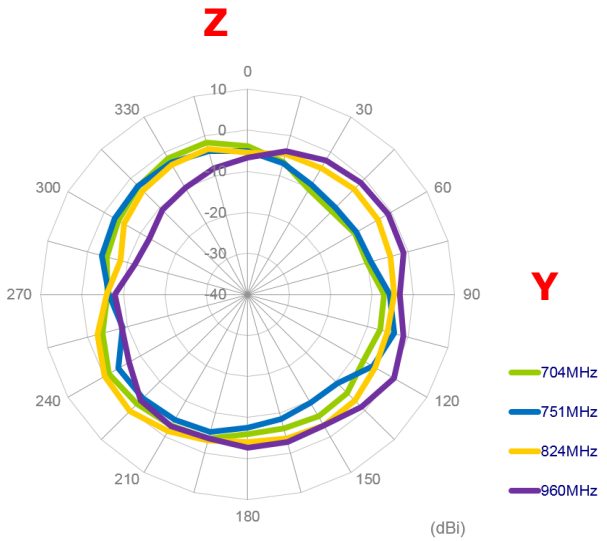
XZ Plane

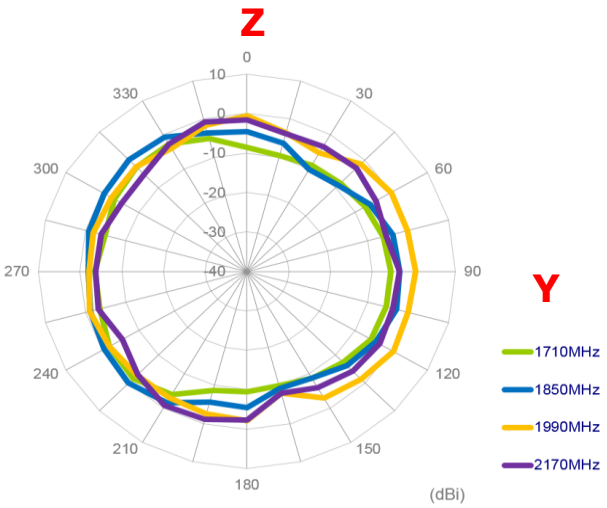

Z
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270
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330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)

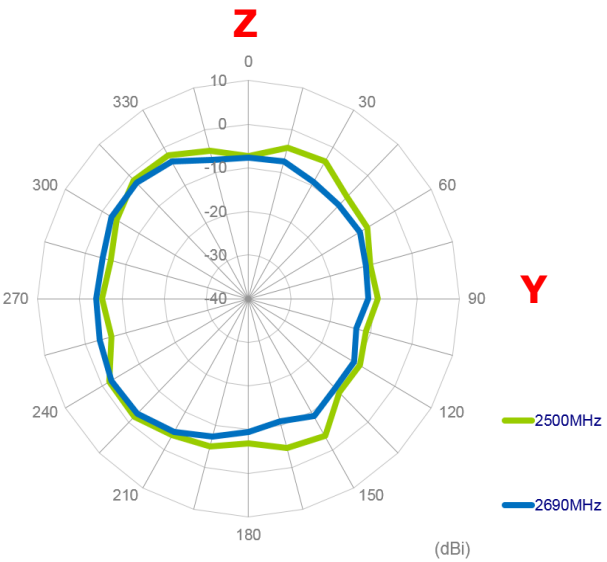

Z
X
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90
120
150
180
210
240
270
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330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)


Z
X
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30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

YZ Plane

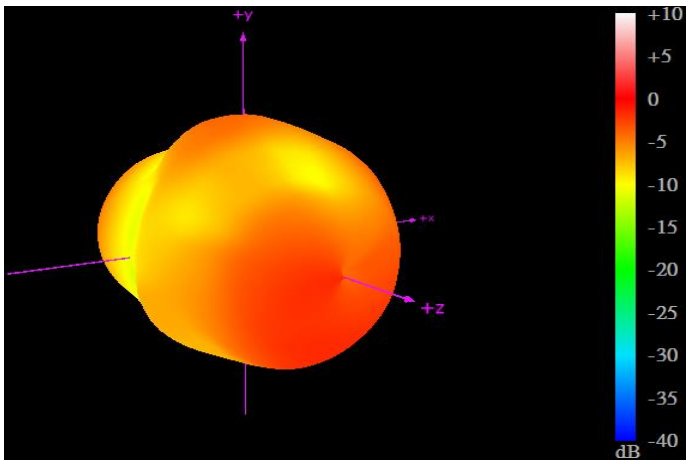

Z
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120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
704MHz
751MHz
824MHz
960MHz
(dBi)


Z
Y
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30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
1710MHz
1850MHz
1990MHz
2170MHz
(dBi)

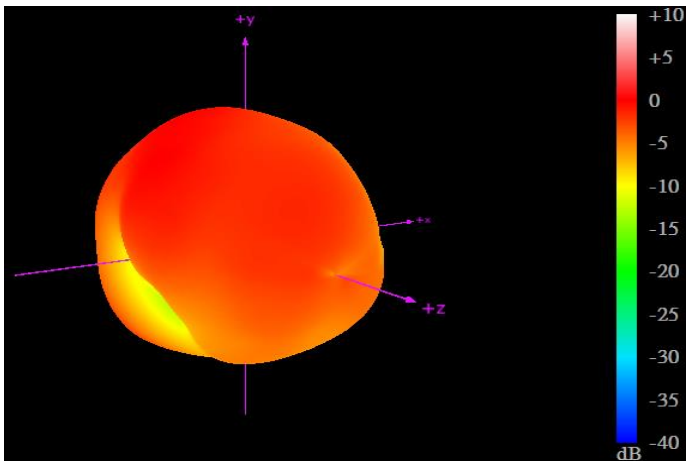

Z
Y
0
30
60
90
120
150
180
210
240
270
300
330
10
0
-10
-20
-30
-40
2500MHz
2690MHz
(dBi)

4.3 3D Radiation Patterns

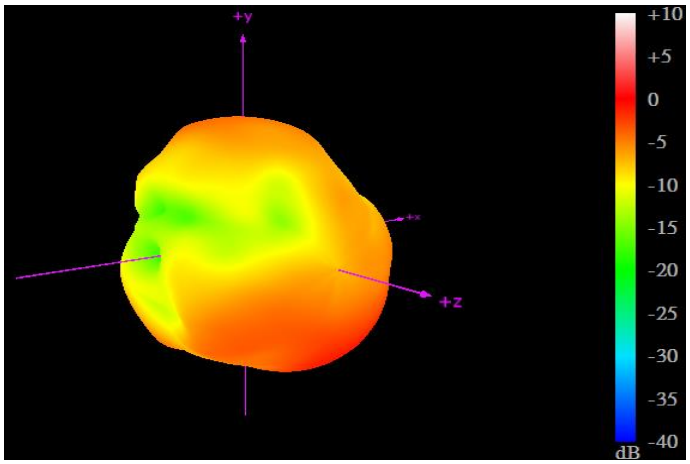
4.3.1 LTE 1



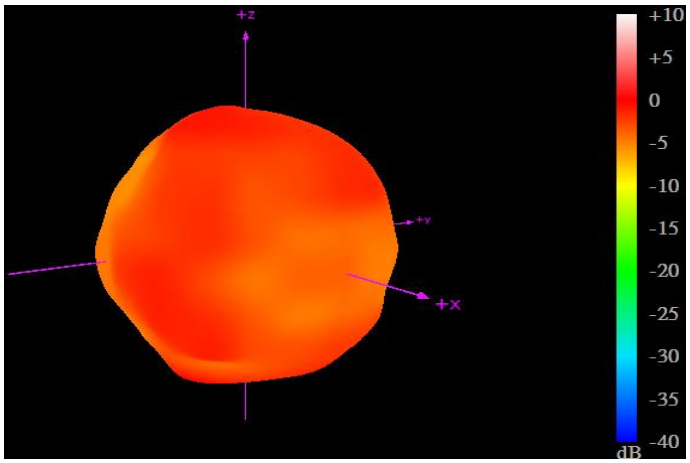
704MHz



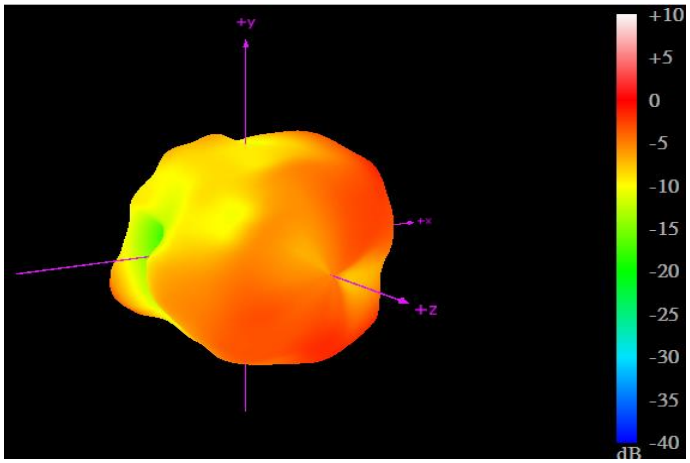
960MHz



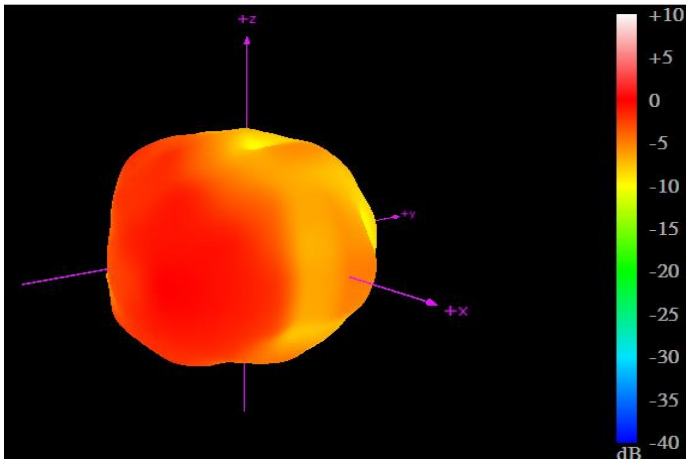
1710MHz



2170MHz

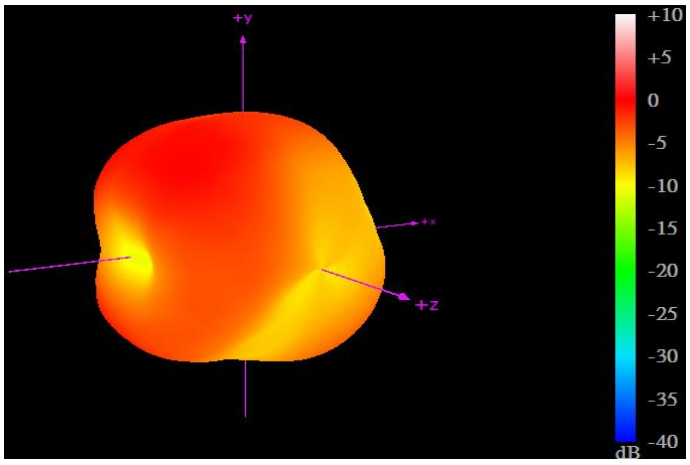


2300MHz

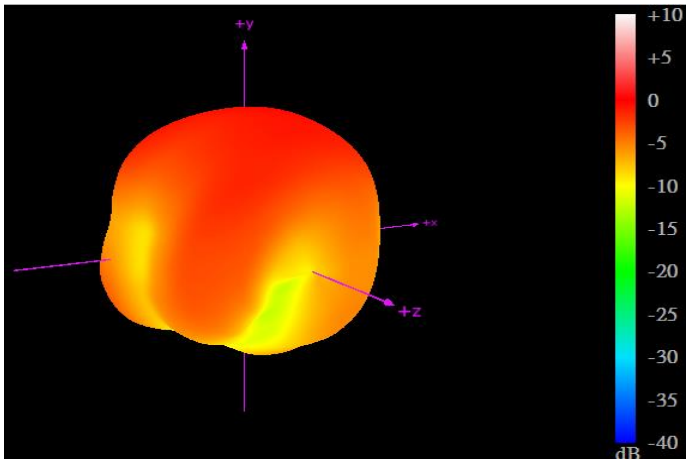


2690MHz

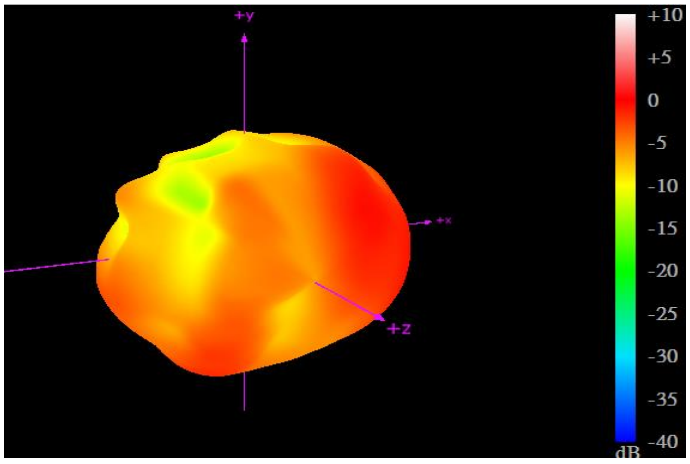
4.3.2 LTE 2



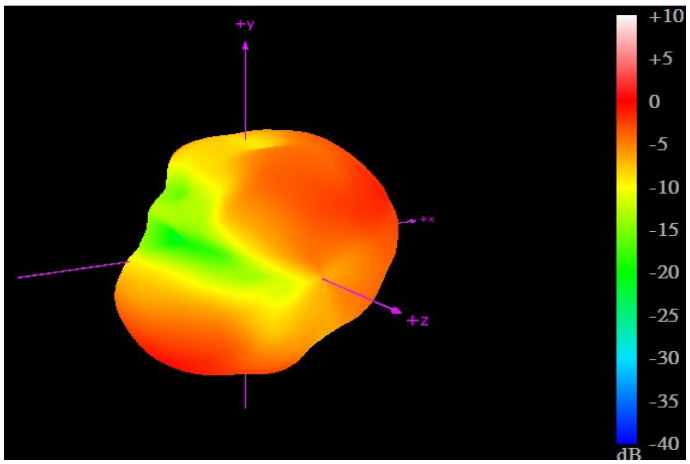
704MHz



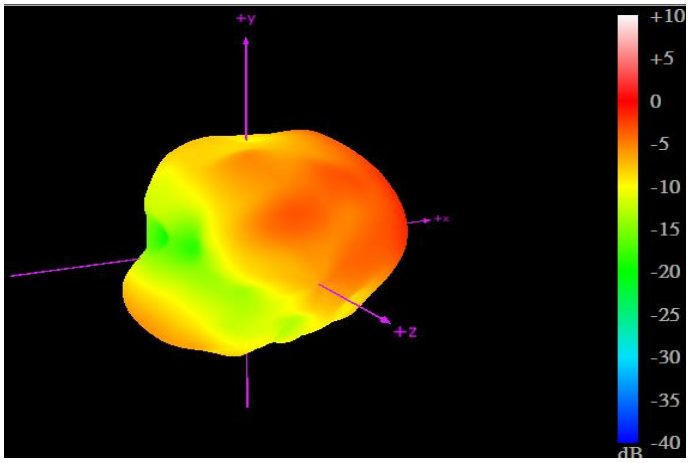
960MHz



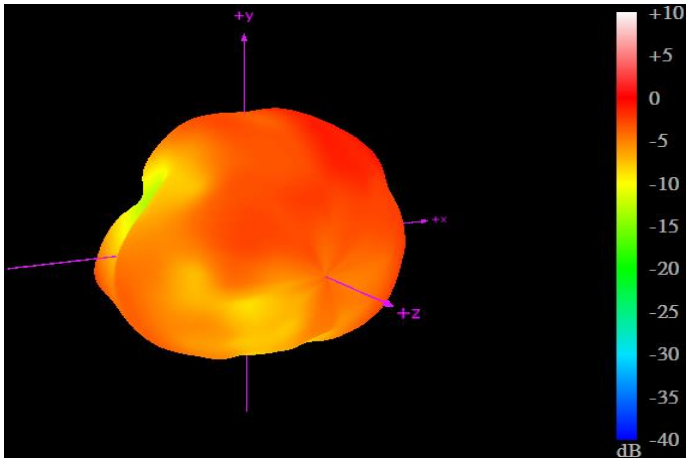
1710MHz



2170MHz

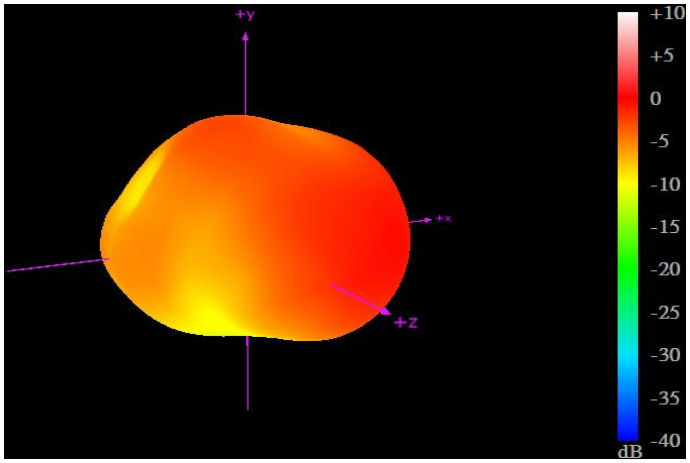


2300MHz

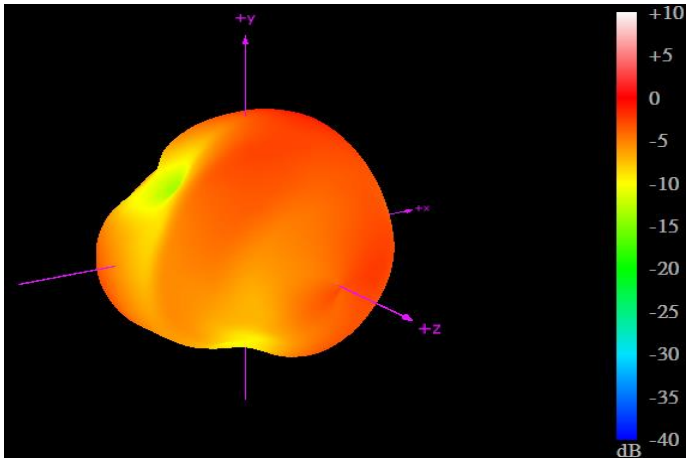


2690MHz

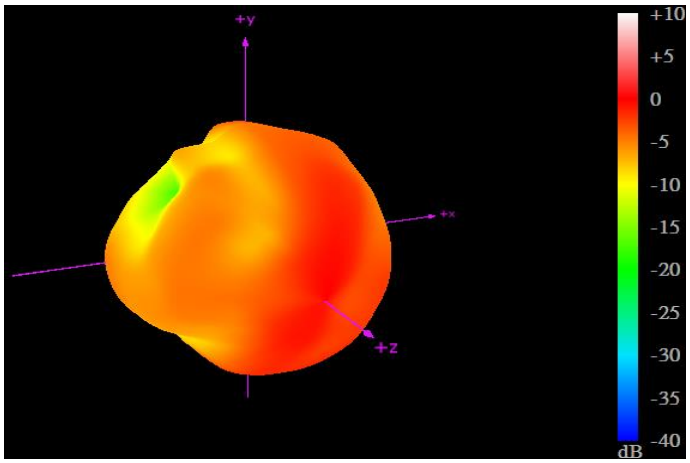
4.3.3 LTE 3



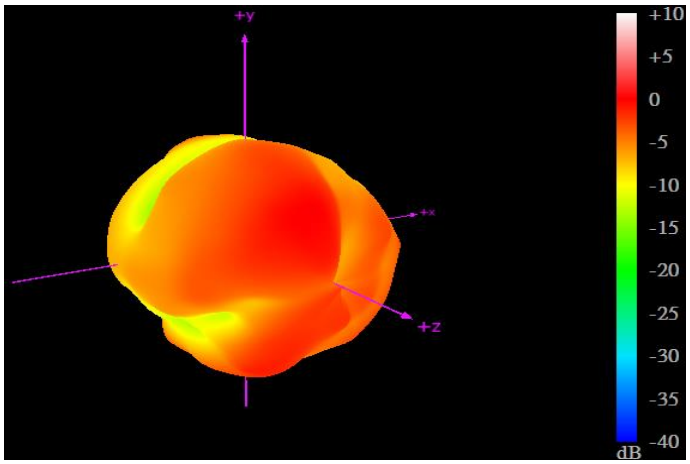
704MHz



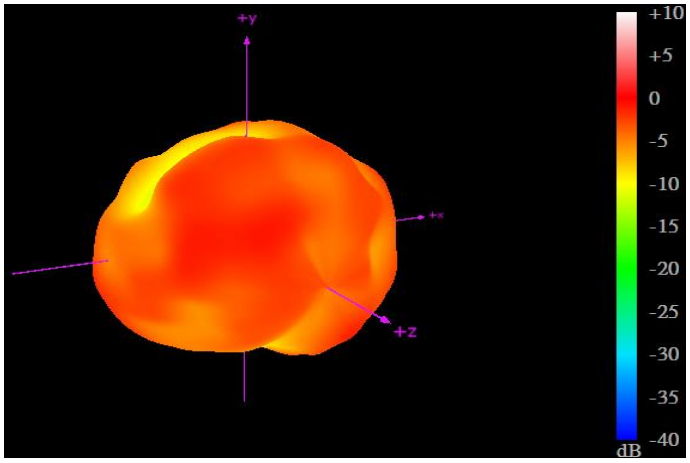
960MHz



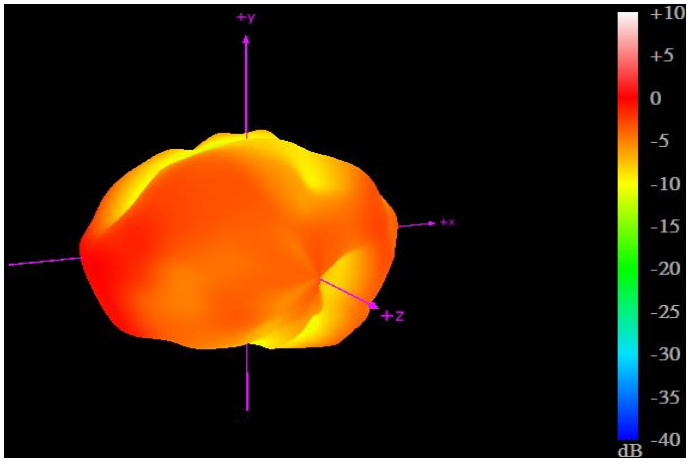
1710MHz



2170MHz

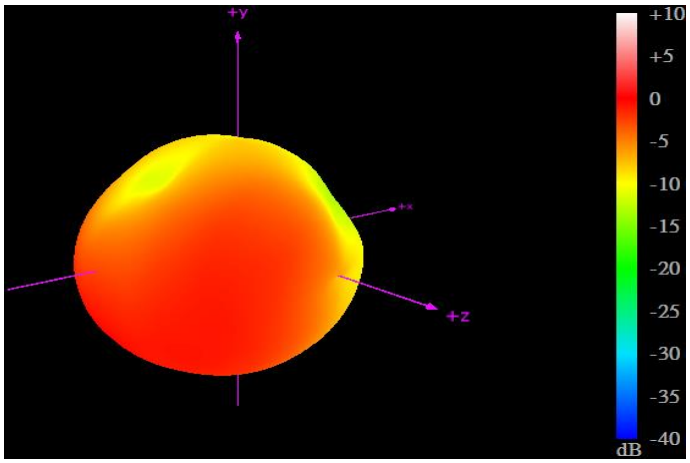


2300MHz

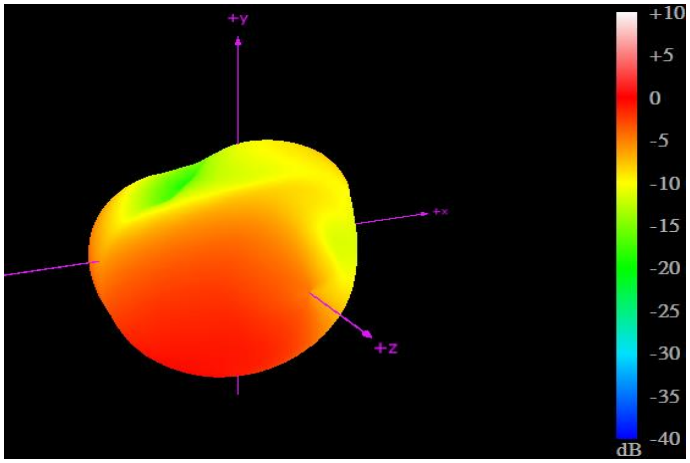


2690MHz

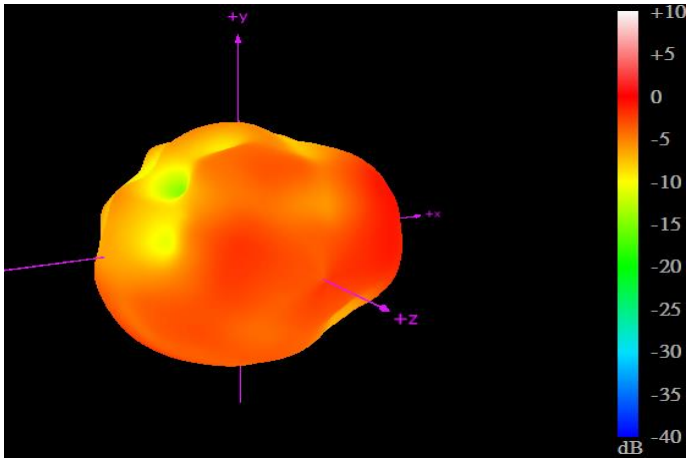
4.3.4 LTE 4



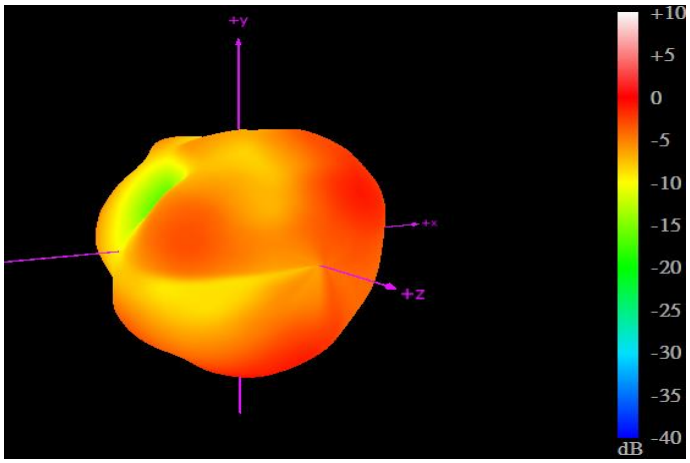
704MHz



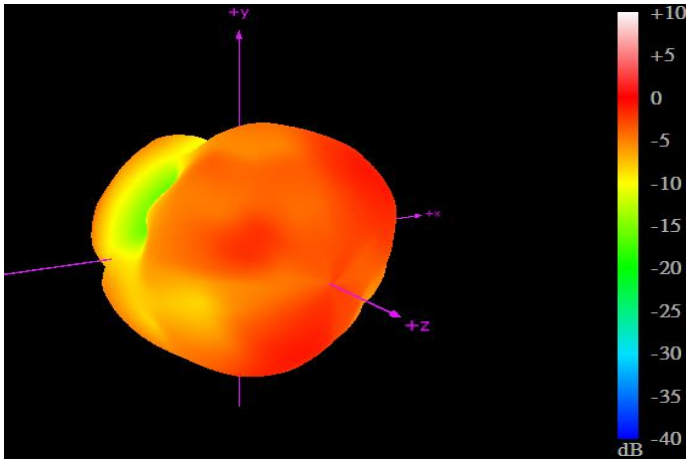
960MHz



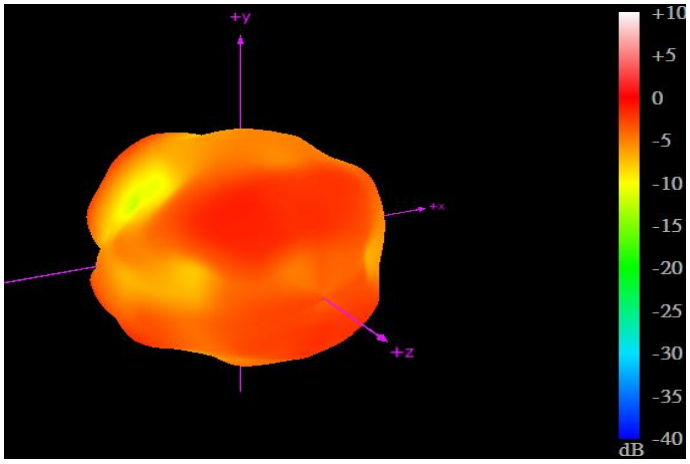
1710MHz



2170MHz

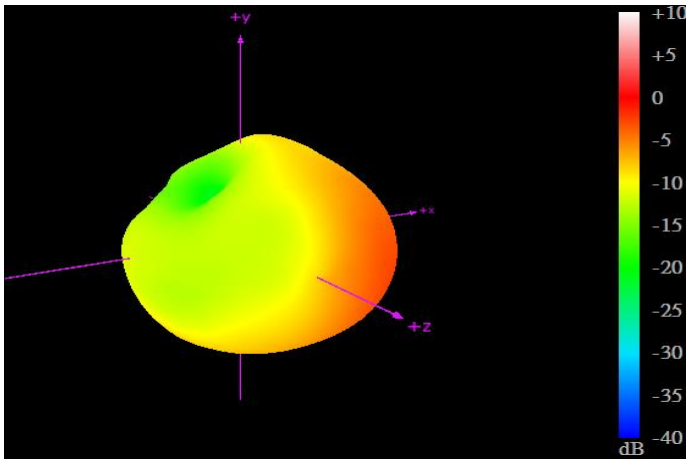


2300MHz

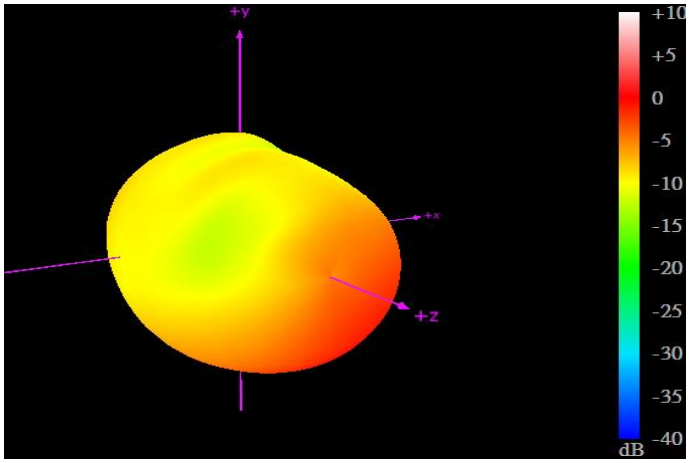


2690MHz

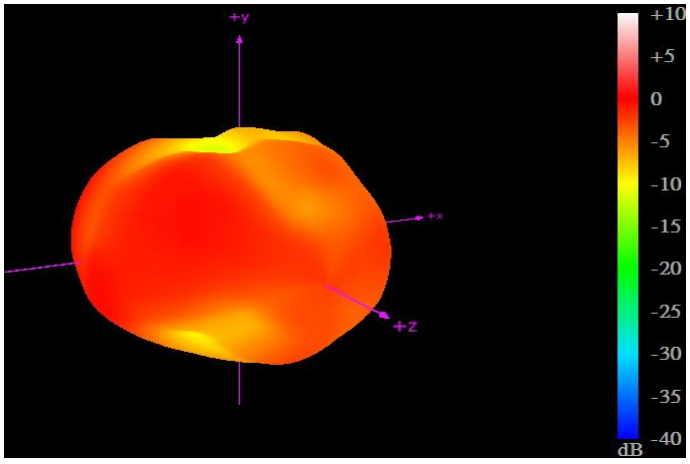
4.3.5 LTE5



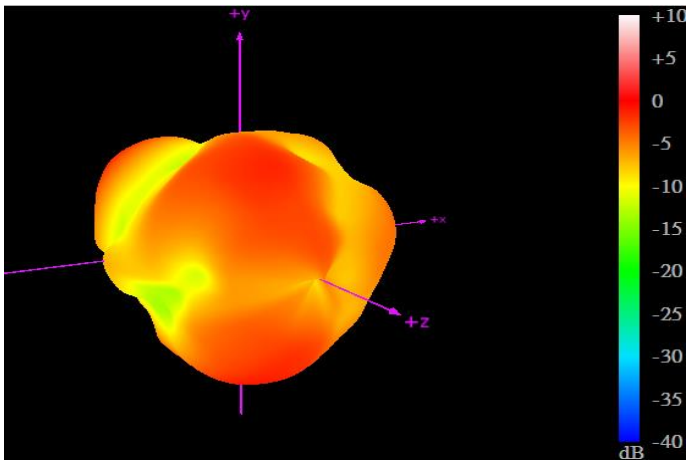
704MHz



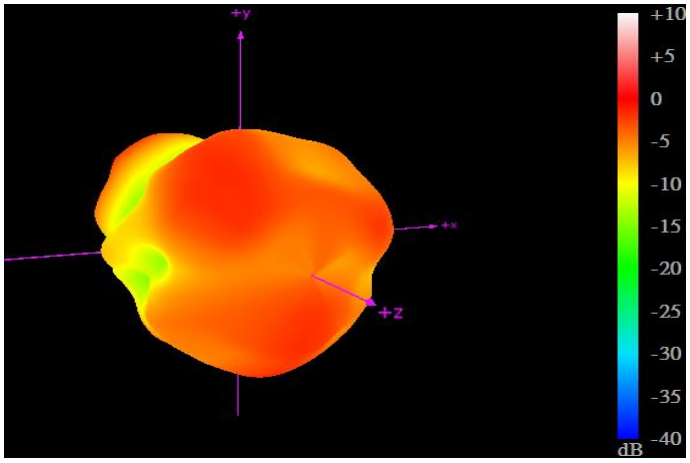
960MHz



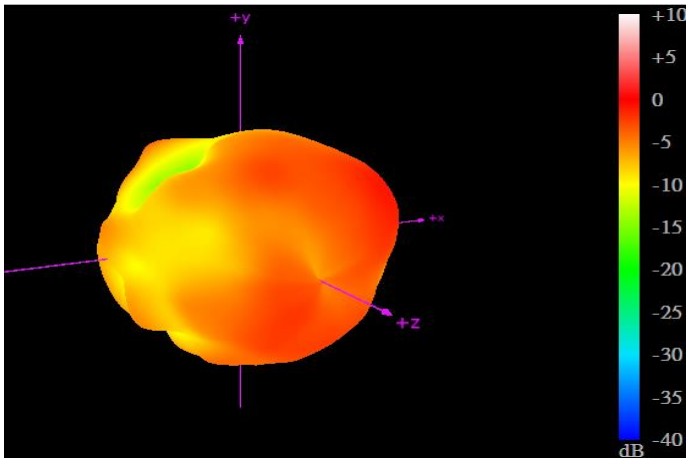
1710MHz



2170MHz

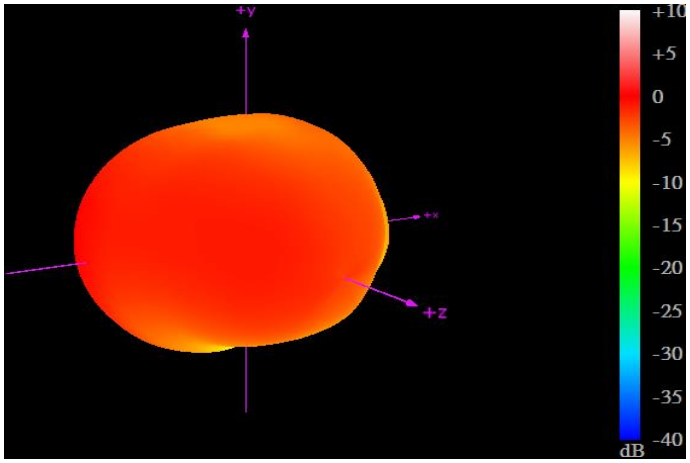


2300MHz

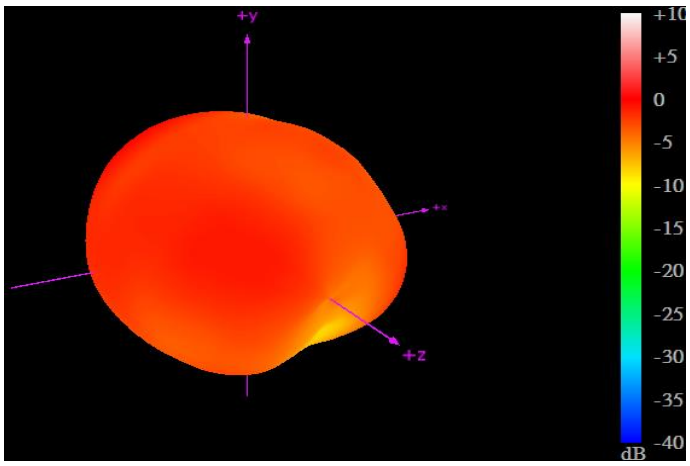


2690MHz

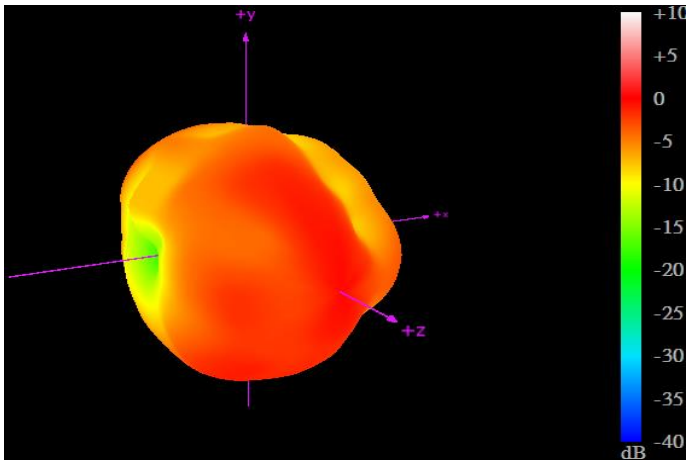
4.3.6 LTE 6



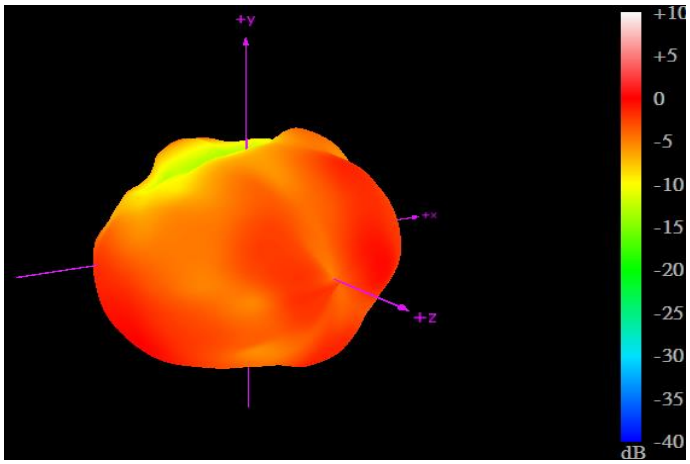
704MHz



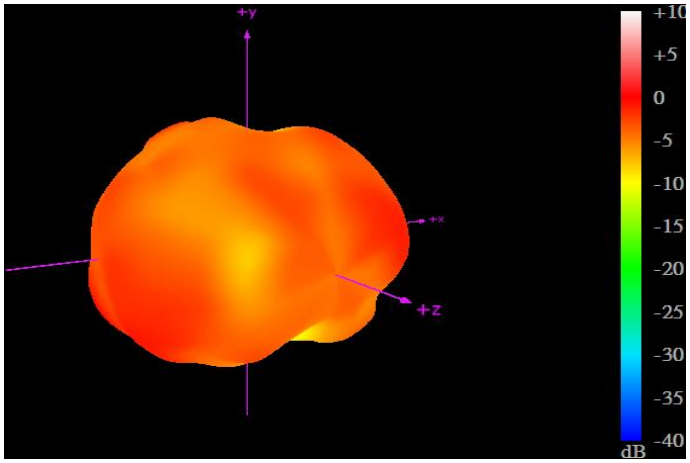
960MHz



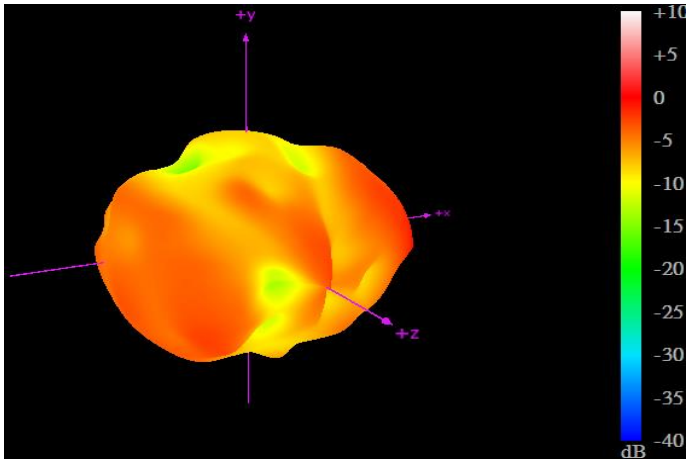
1710MHz



2170MHz

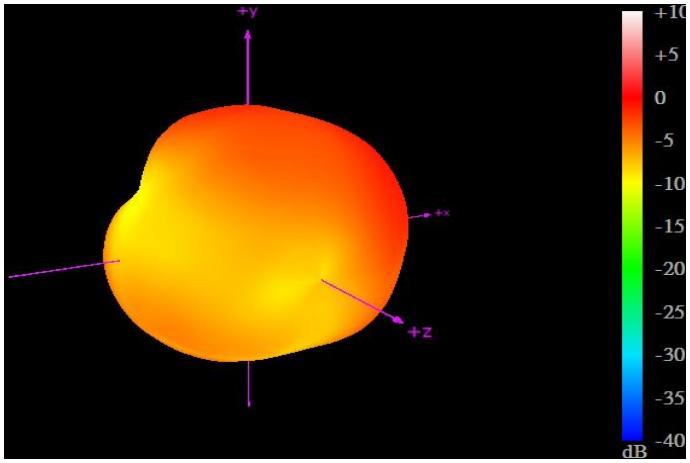


2300MHz

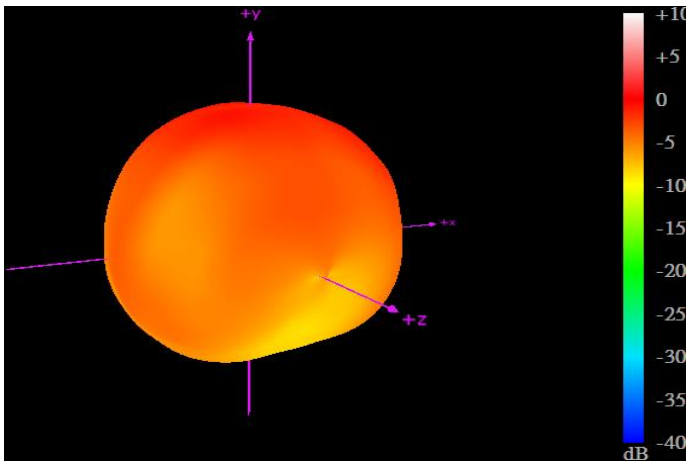


2690MHz

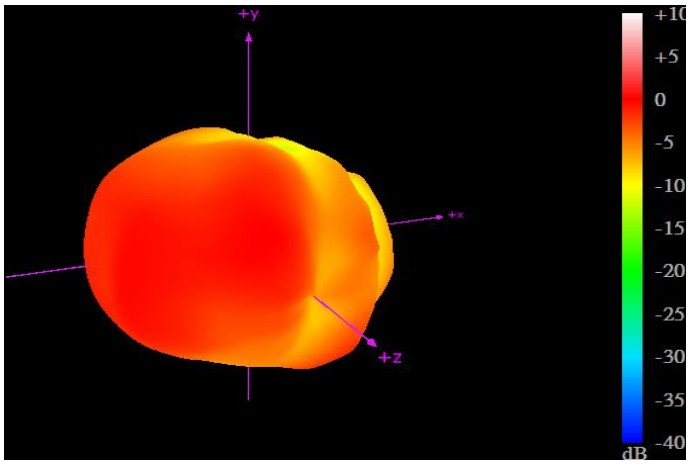
4.3.7 LTE 7



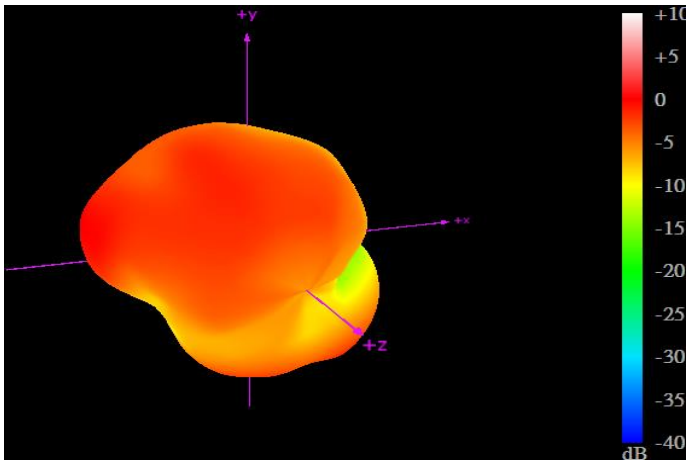
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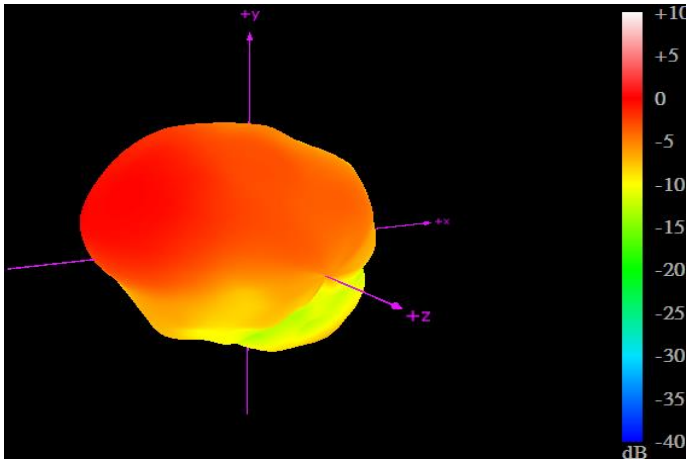
960MHz



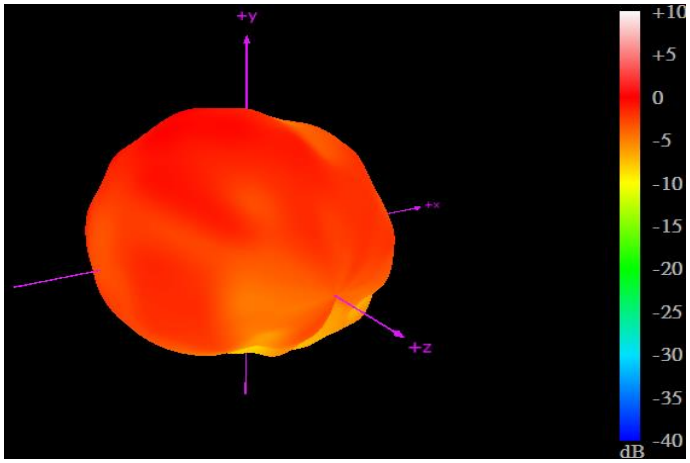
1710MHz



2170MHz

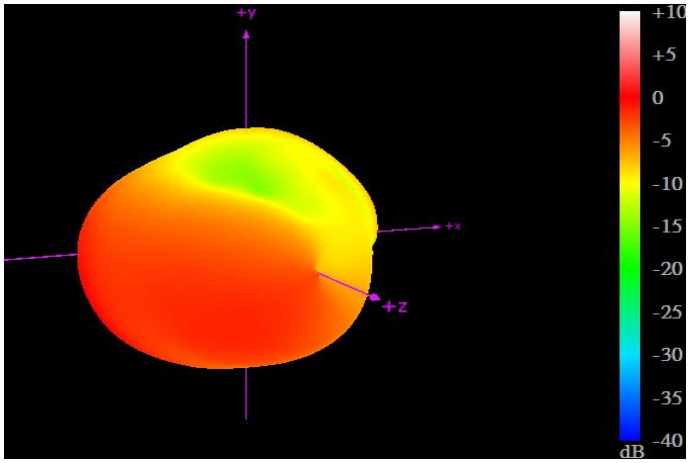


2300MHz

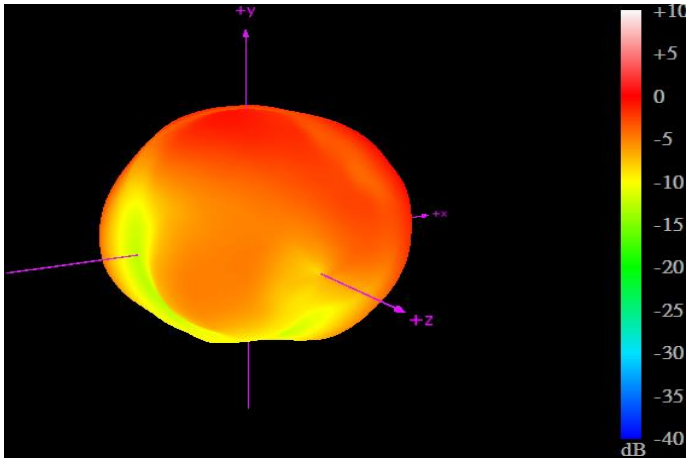


2690MHz

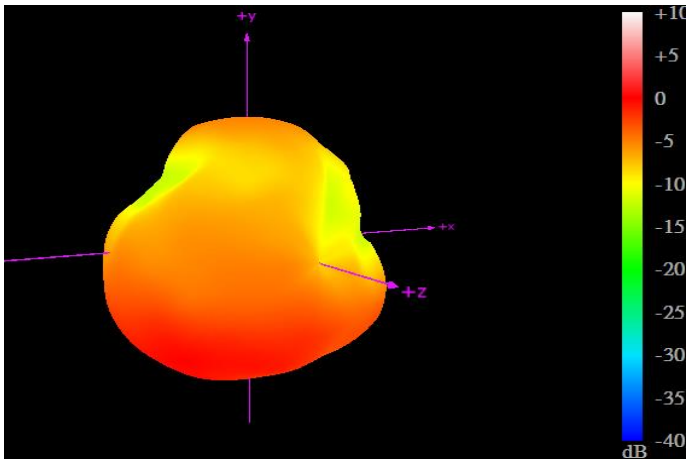
4.3.8 LTE 8



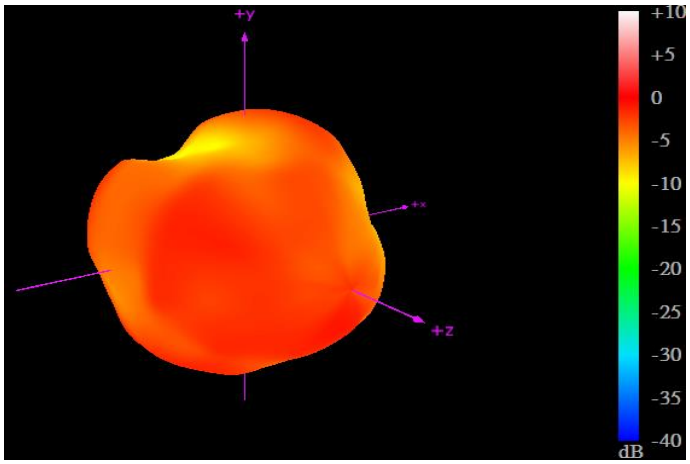
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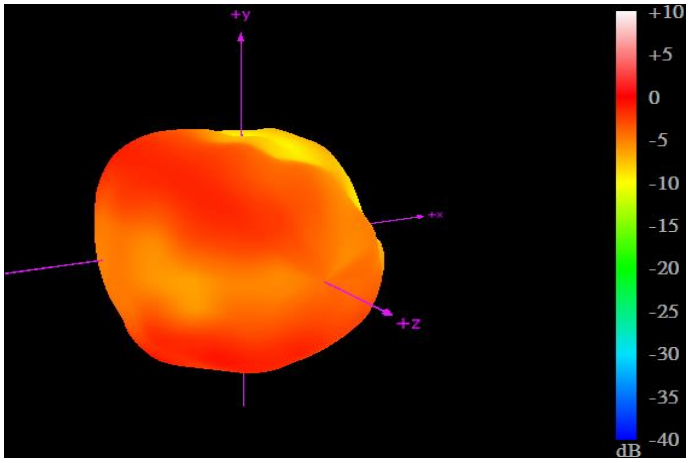
960MHz



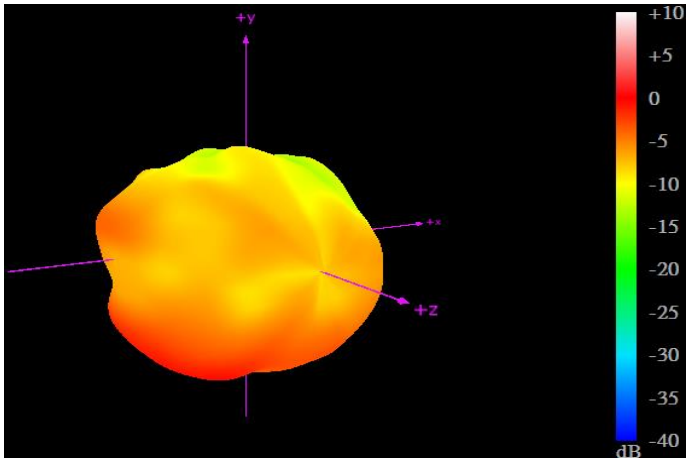
1710MHz



2170MHz

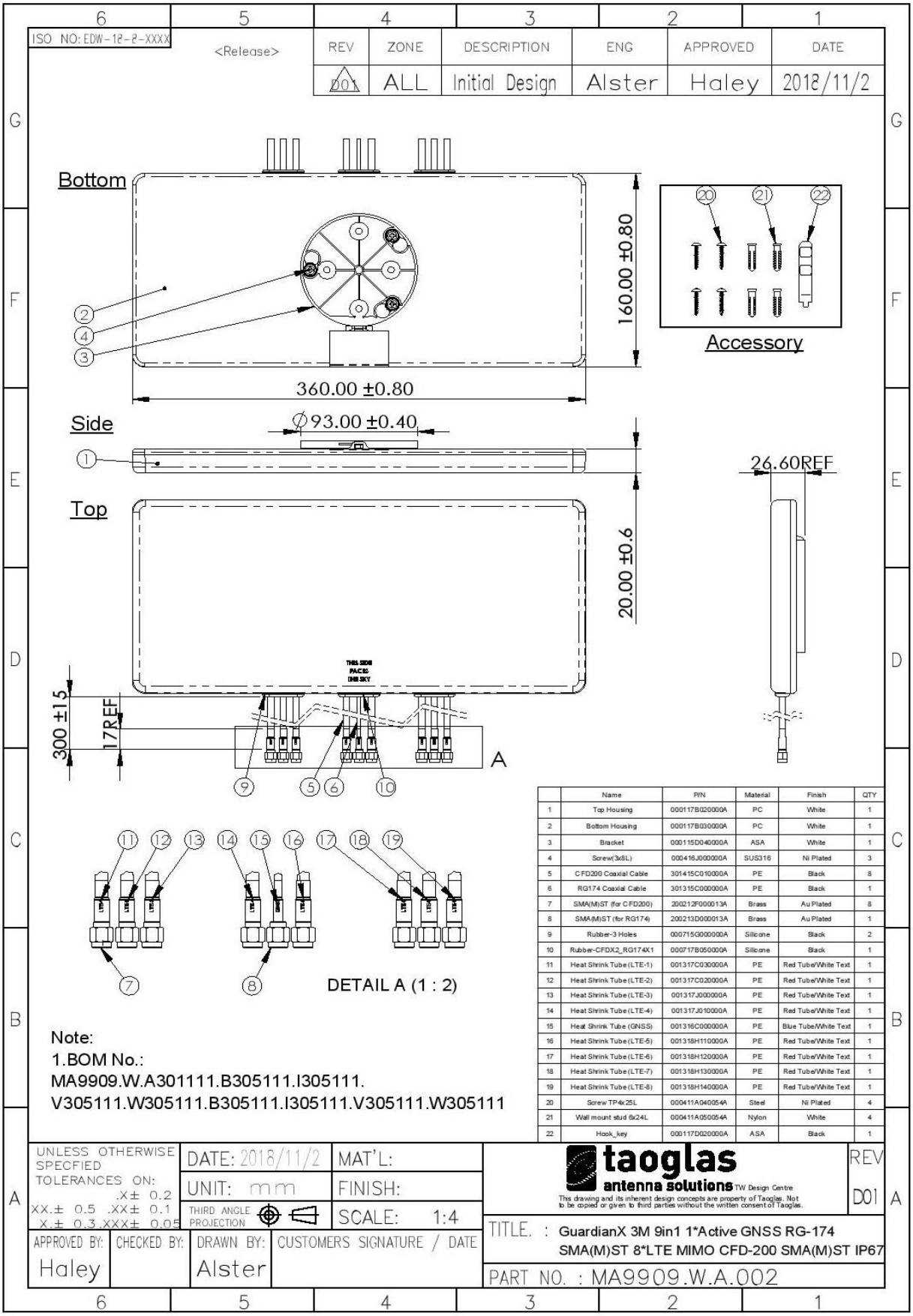


2300MHz



2690MHz

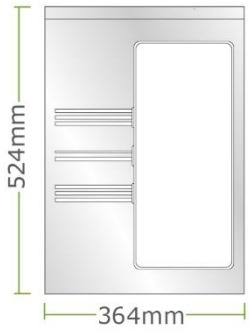
5. Mechanical Drawing (Unit: mm)



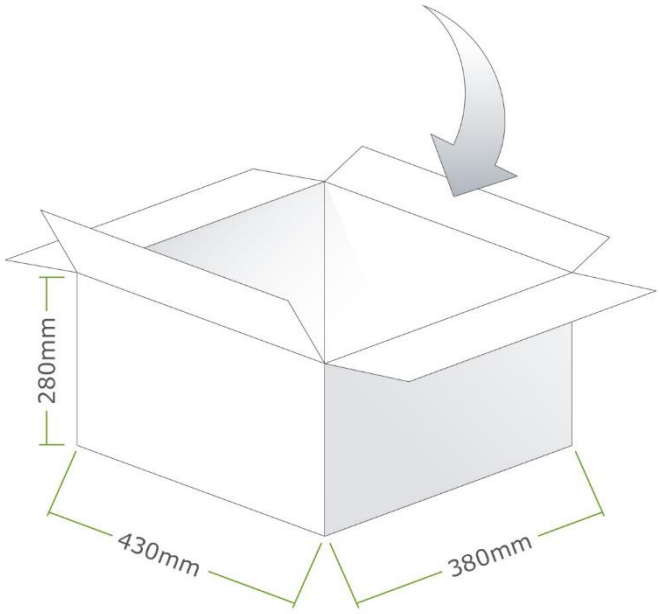
	Name	P/N	Material	Finish	QTY
1	Top Housing	000117B020000A	PC	White	1
2	Bottom Housing	000117B030000A	PC	White	1
3	Bracket	000115D040000A	ASA	White	1
4	Screw(3x8L)	000416J000000A	SUS316	Ni Plated	3
5	CFD200 Coaxial Cable	301415C010000A	PE	Black	8
6	RG174 Coaxial Cable	301315C000000A	PE	Black	1
7	SMA(M)ST (for CFD200)	200212F000013A	Brass	Au Plated	8
8	SMA(M)ST (for RG174)	200213D000013A	Brass	Au Plated	1
9	Rubber-3 Holes	000715G000000A	Silicone	Black	2
10	Rubber-CFDX2_RG174X1	000717B050000A	Silicone	Black	1
11	Heat Shrink Tube (LTE-1)	001317C030000A	PE	Red Tube/White Text	1
12	Heat Shrink Tube (LTE-2)	001317C020000A	PE	Red Tube/White Text	1
13	Heat Shrink Tube (LTE-3)	001317J000000A	PE	Red Tube/White Text	1
14	Heat Shrink Tube (LTE-4)	001317J010000A	PE	Red Tube/White Text	1
15	Heat Shrink Tube (GNSS)	001316C000000A	PE	Blue Tube/White Text	1
16	Heat Shrink Tube (LTE-5)	001318H110000A	PE	Red Tube/White Text	1
17	Heat Shrink Tube (LTE-6)	001318H120000A	PE	Red Tube/White Text	1
18	Heat Shrink Tube (LTE-7)	001318H130000A	PE	Red Tube/White Text	1
19	Heat Shrink Tube (LTE-8)	001318H140000A	PE	Red Tube/White Text	1
20	Screw TP4x25L	000411A040054A	Steel	Ni Plated	4
21	Wall mount stud 6x24L	000411A050054A	Nylon	White	4
22	Hook_key	000117D020000A	ASA	Black	1

6. Packaging

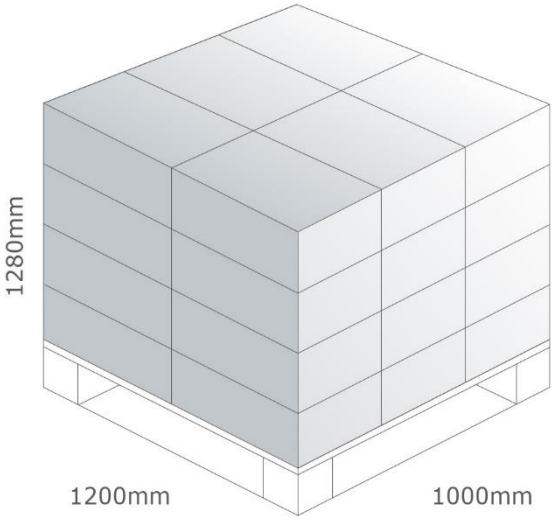
1pc MA9909.W.A.002 per PE Bag
Bag Dimensions - 364*524mm
Weight - 1.068Kg



10pcs MA9909.W.A.002 per Carton
Carton Dimensions - 430*380*280mm
Weight - 11.6Kg



Pallet Dimensions:
1200mm*1000mm*1280mm
24 Cartons per Pallet
6 Cartons per Layer, 4 Layers

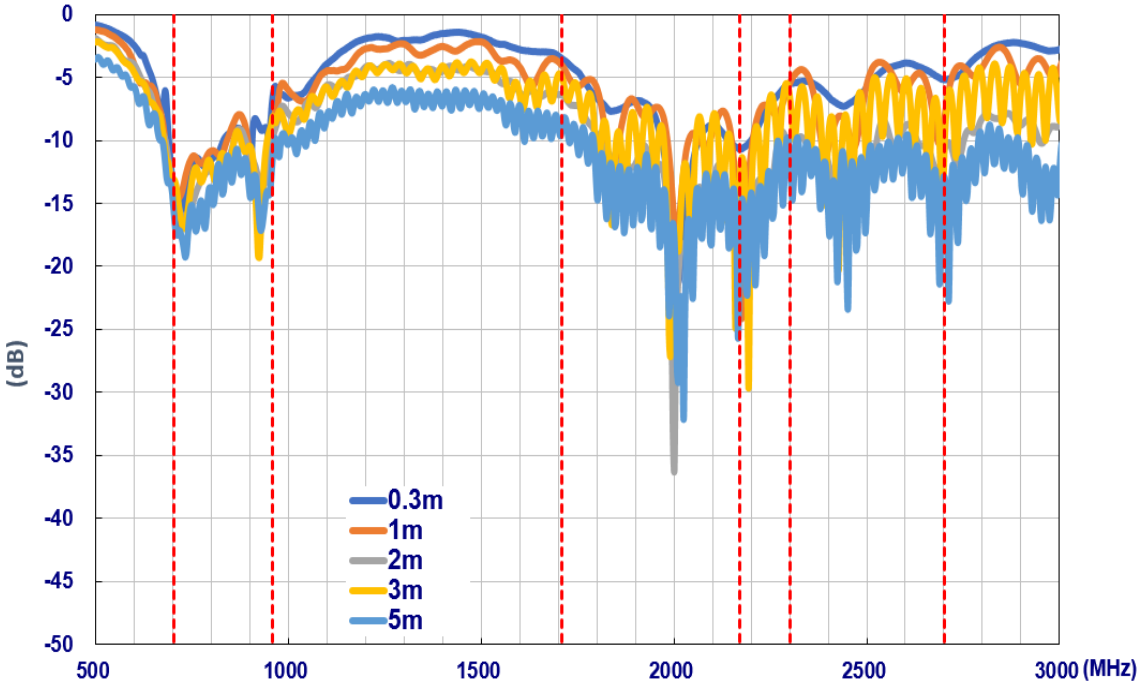


7. Application Note

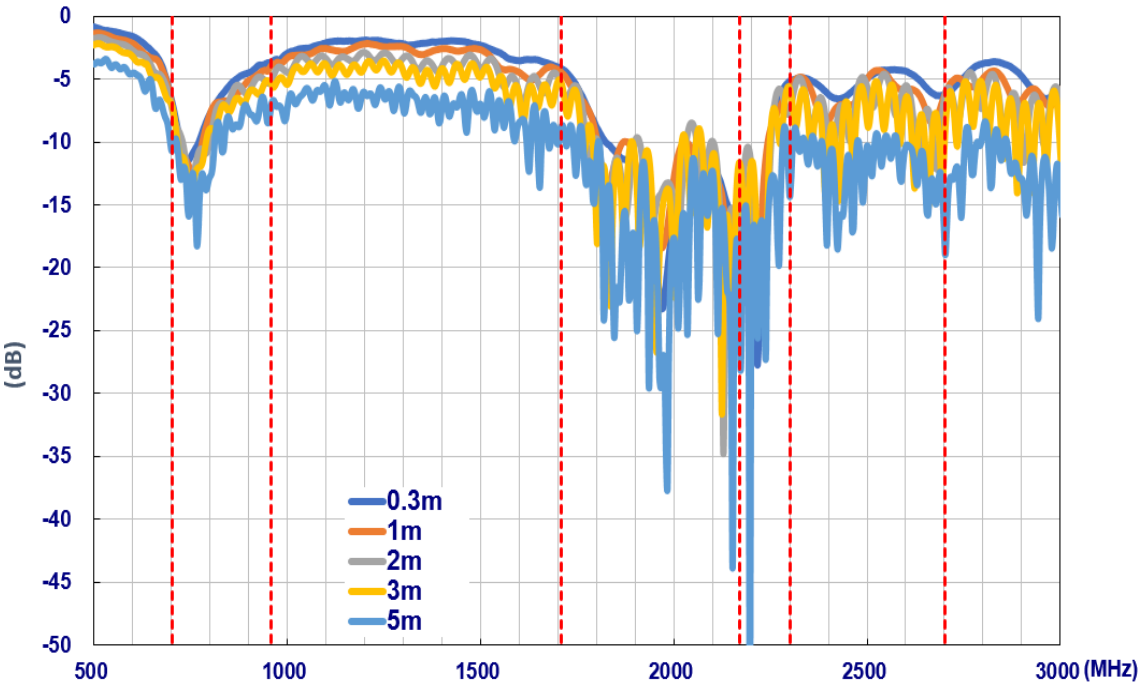
The MA9909 antenna performance with different cable lengths is shown below.

7.1. Return Loss

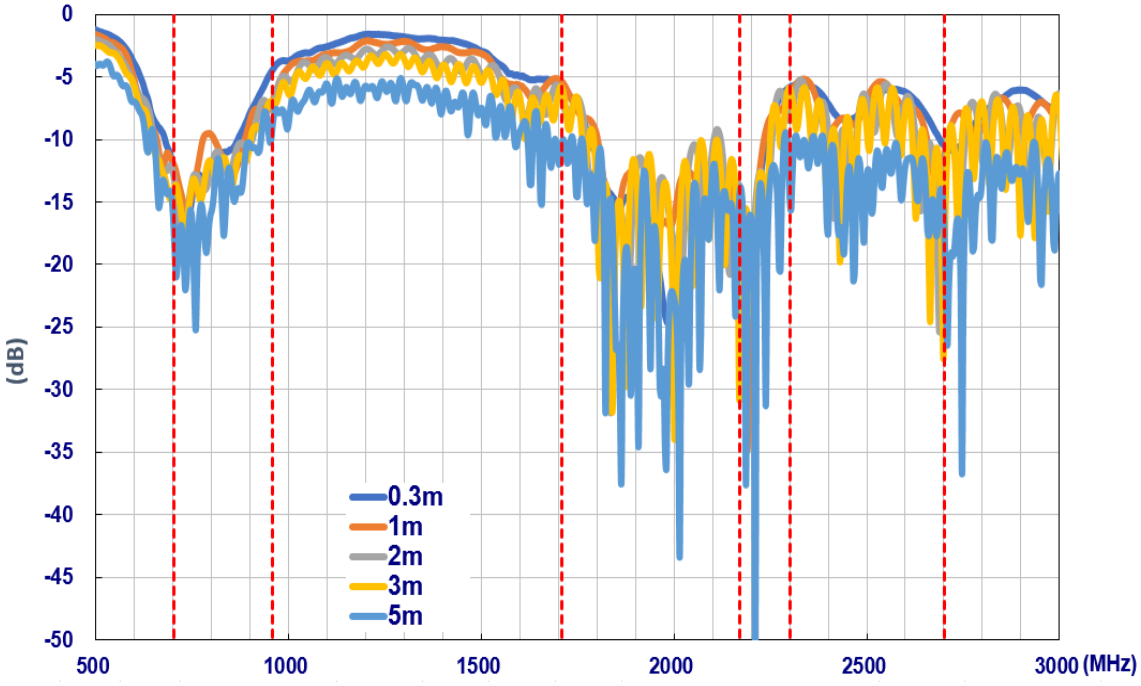
7.1.1 LTE 1



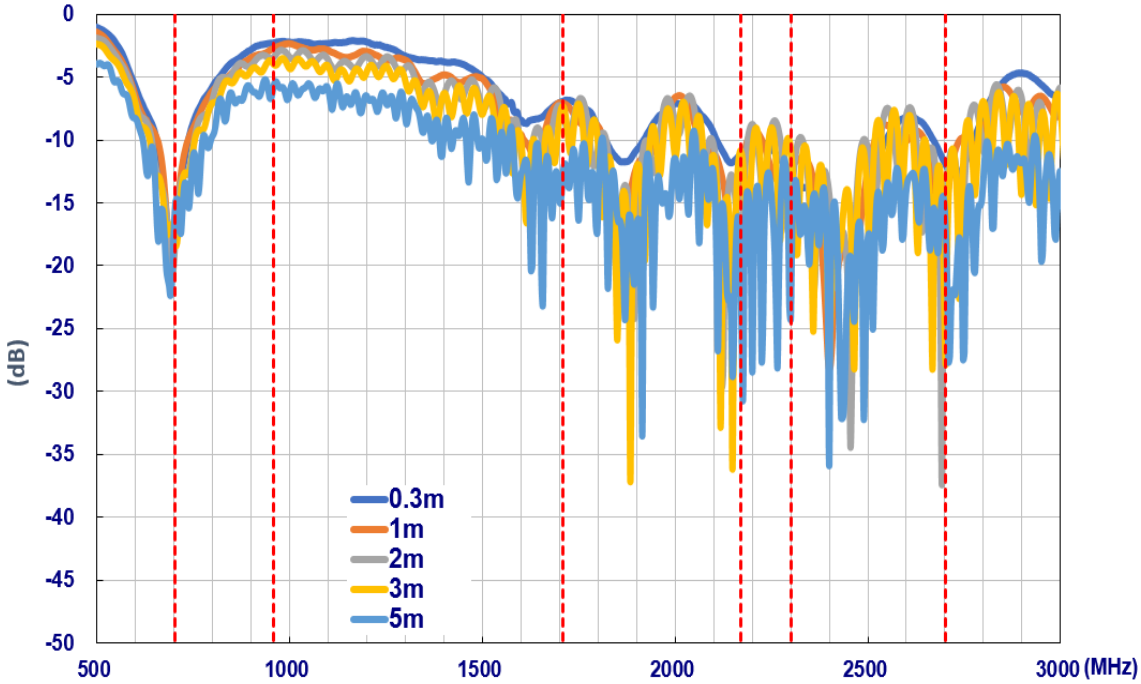
7.1.2 LTE 2



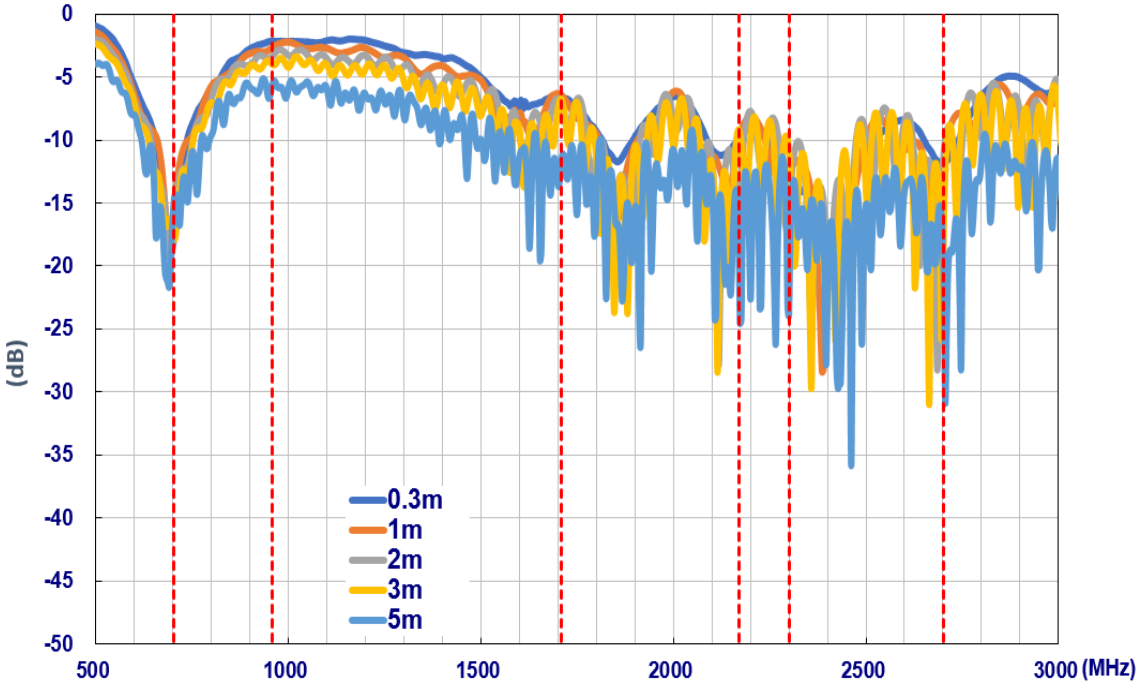
7.1.3 LTE 3



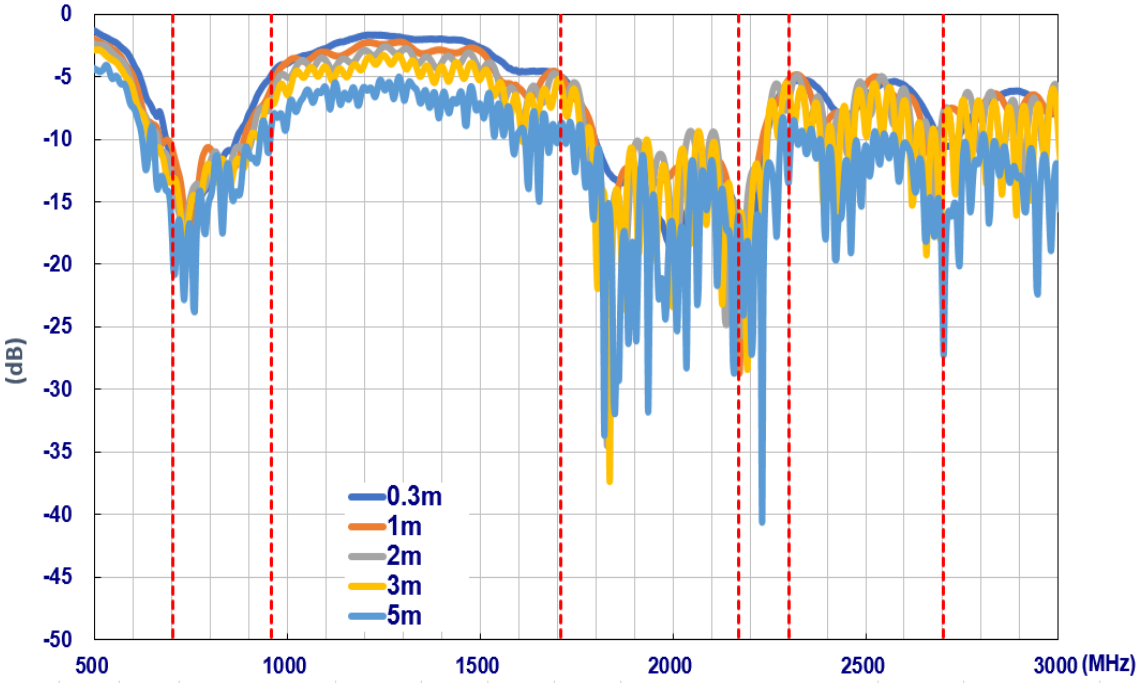
7.1.4 LTE 4



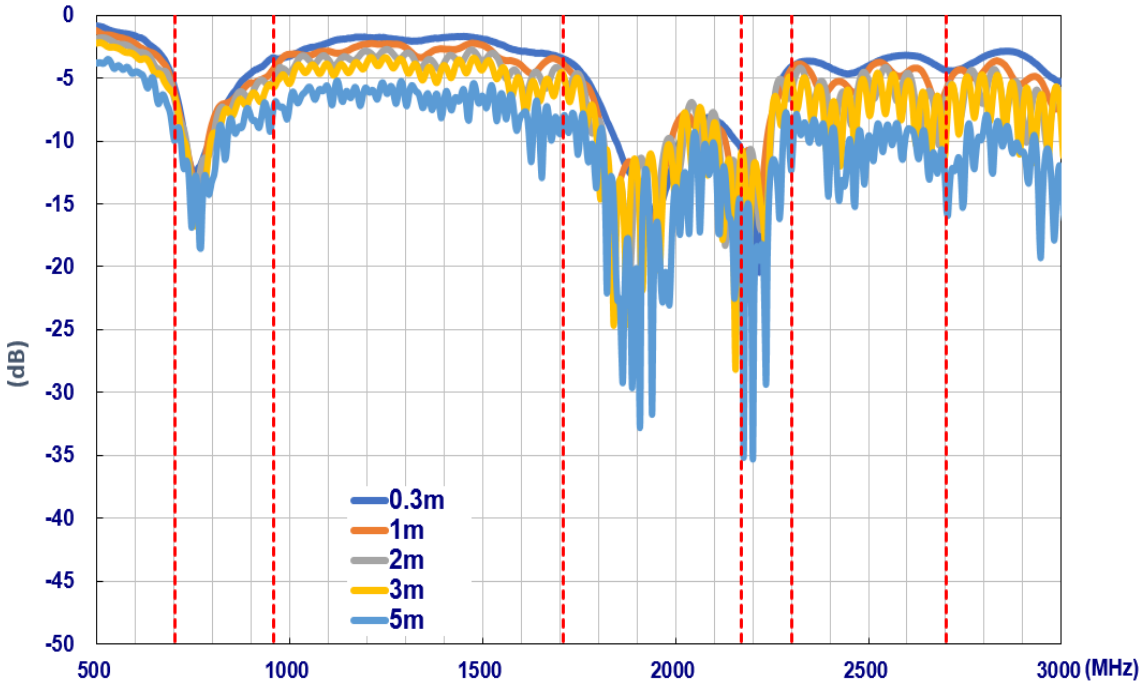
7.1.5 LTE 5



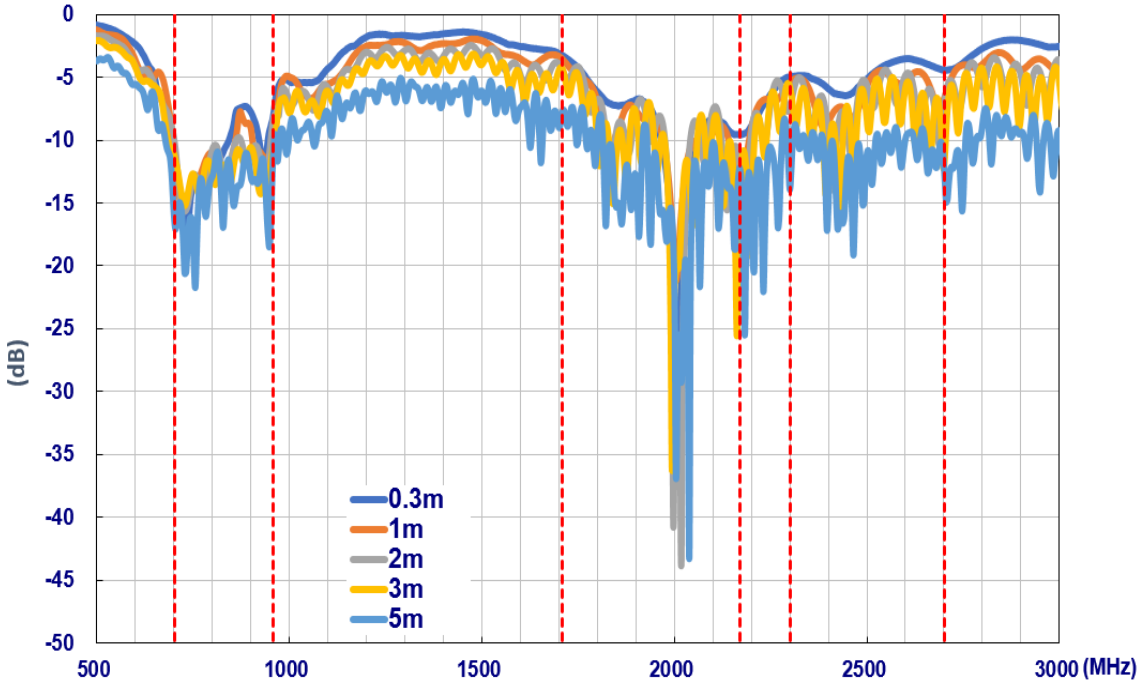
7.1.6 LTE 6



7.1.7 LTE 7

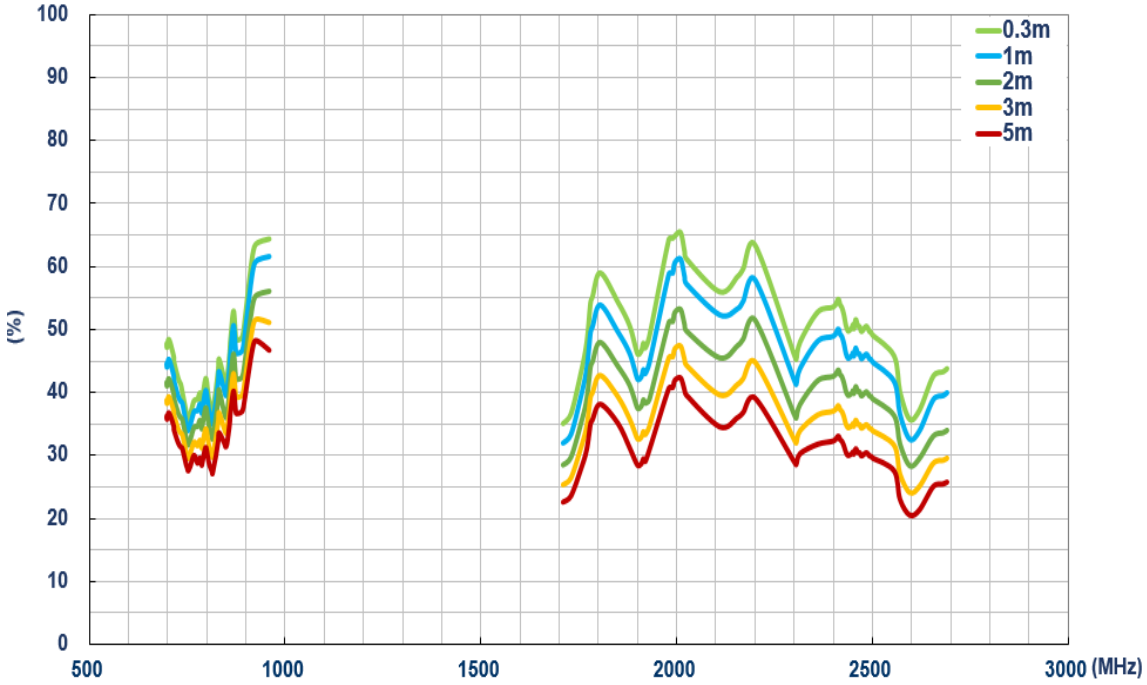


7.1.8 LTE 8

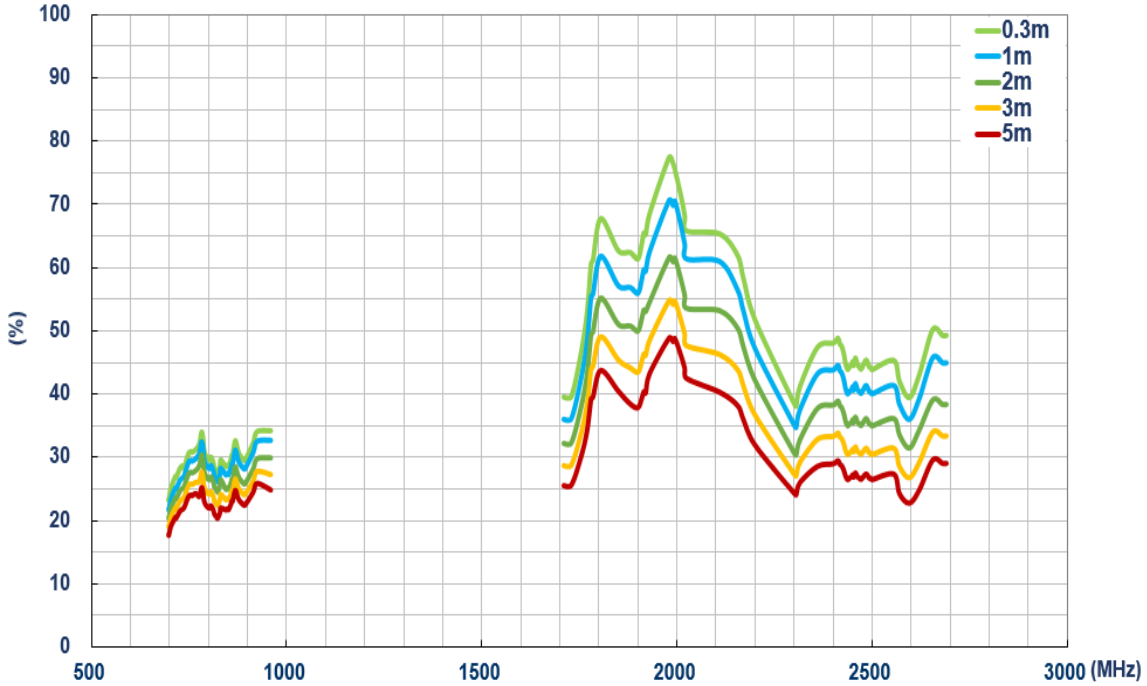


7.2. Efficiency

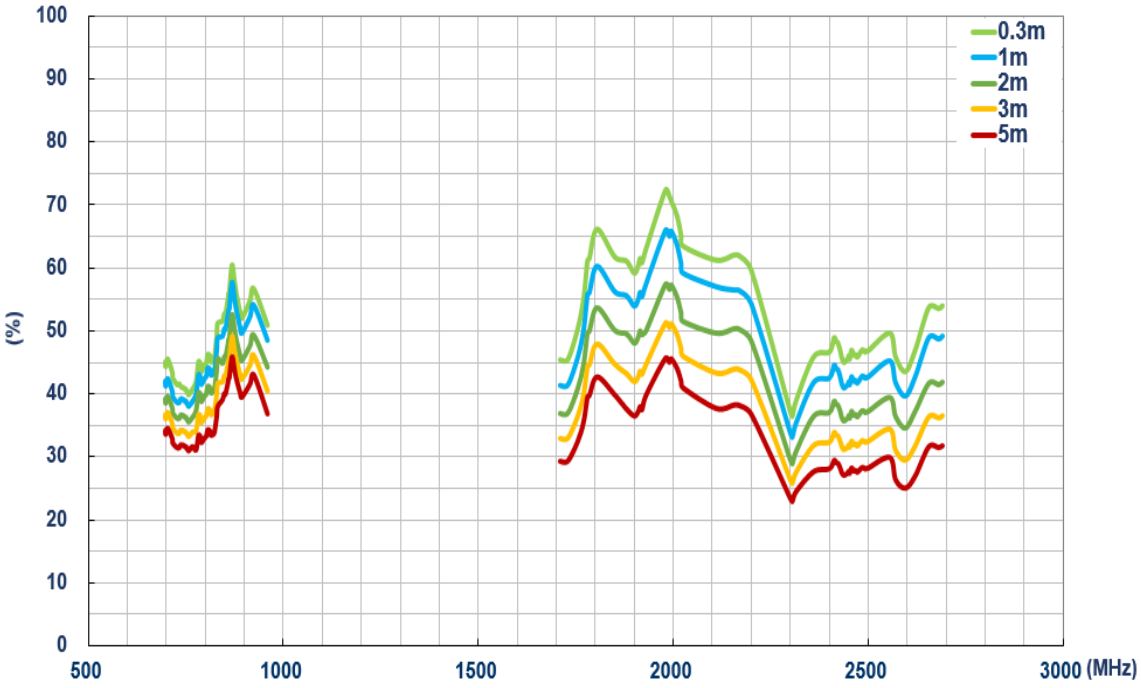
7.2.1 LTE 1



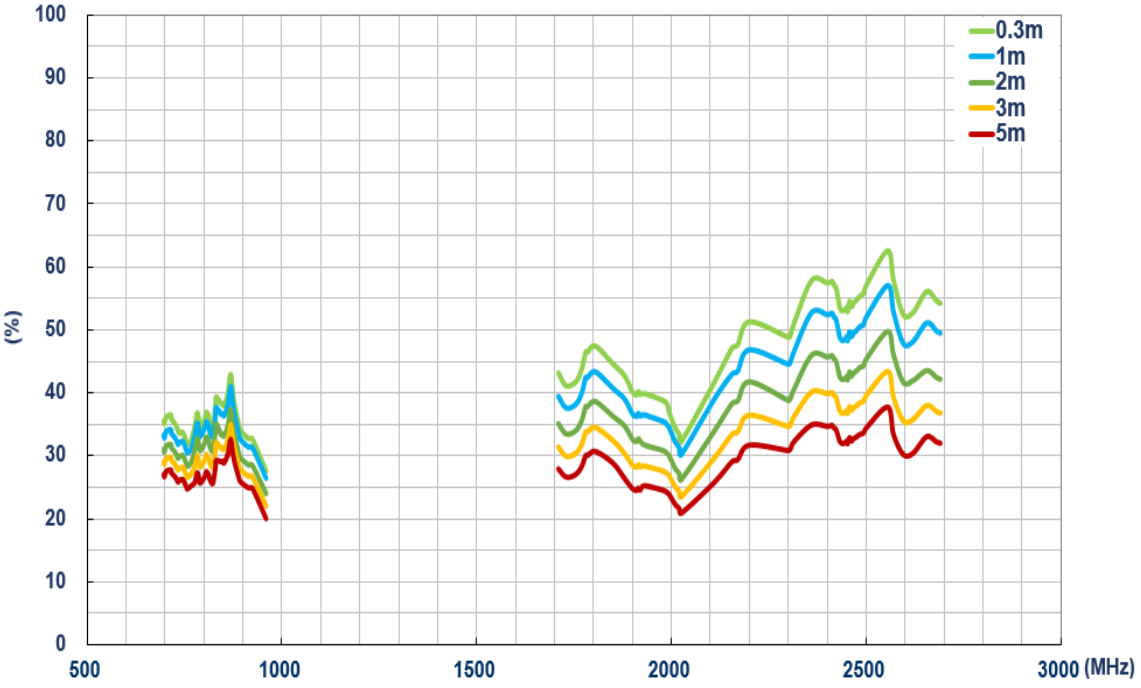
7.2.2 LTE 2



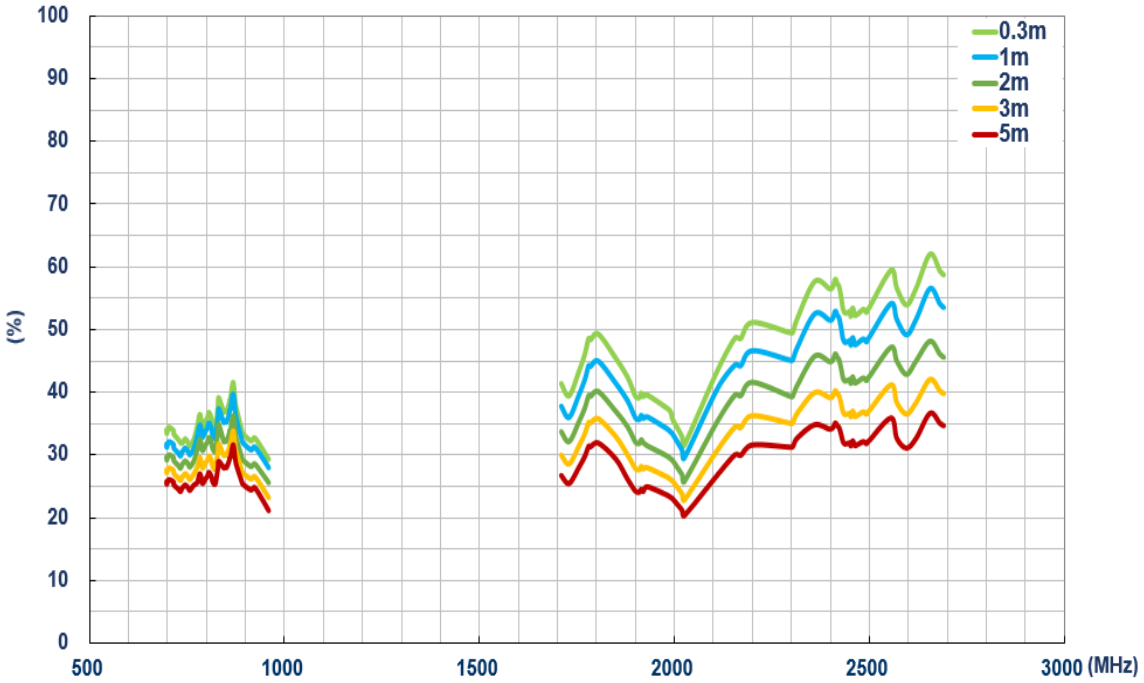
7.2.3 LTE 3



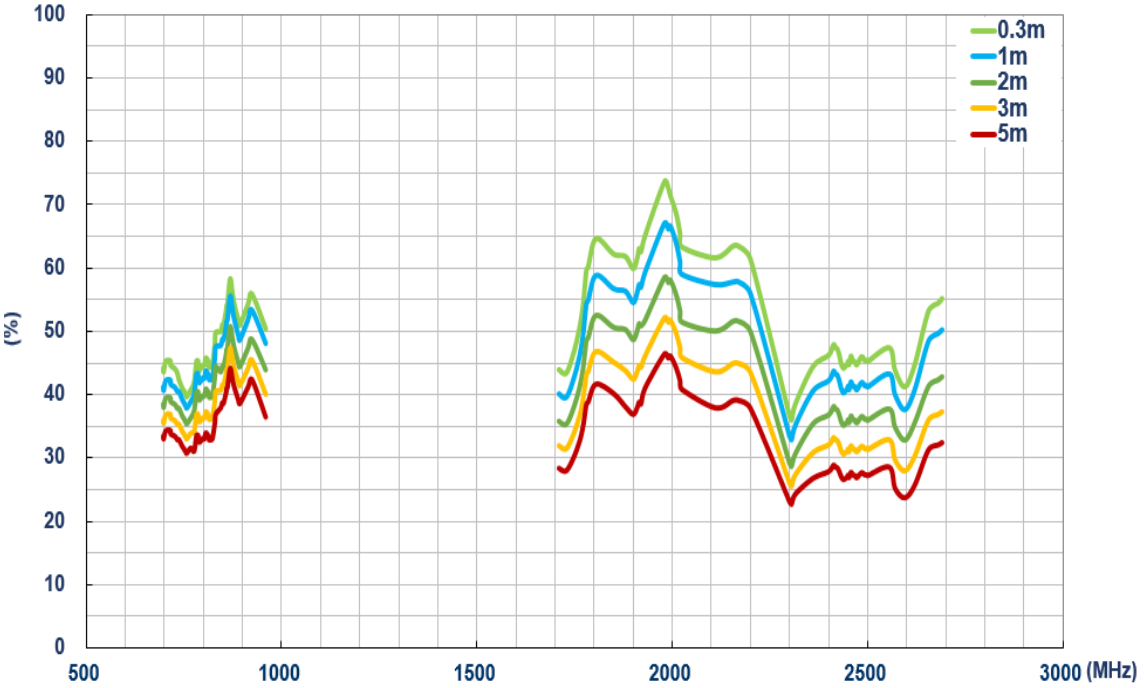
7.2.4 LTE 4



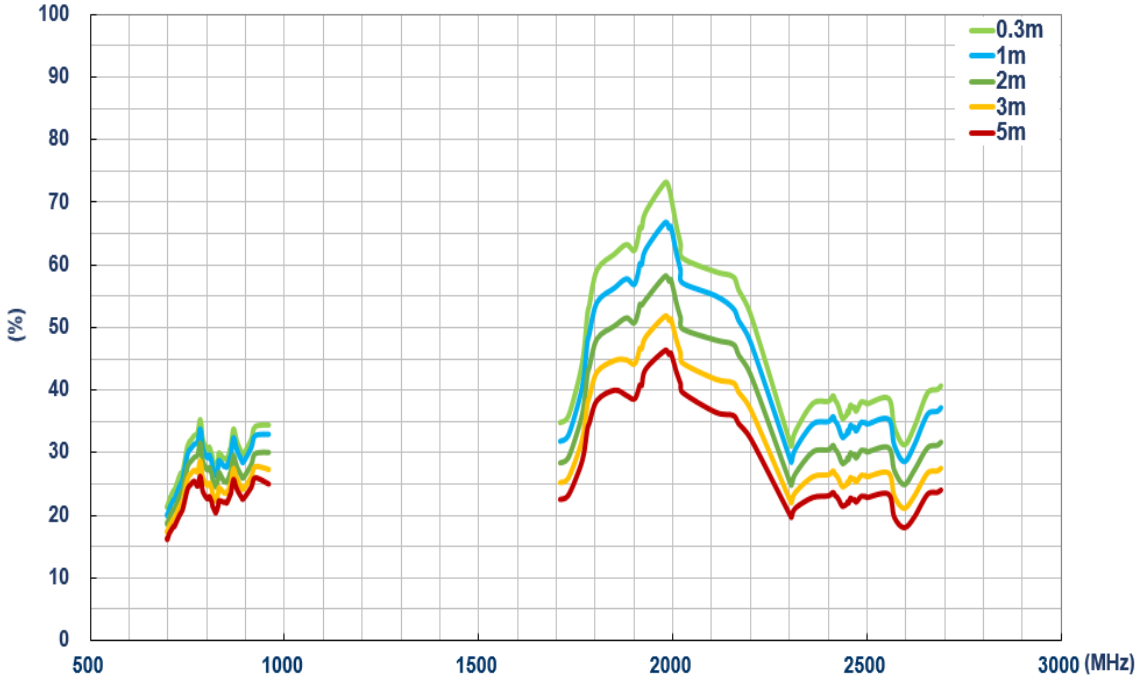
7.2.5 LTE 5



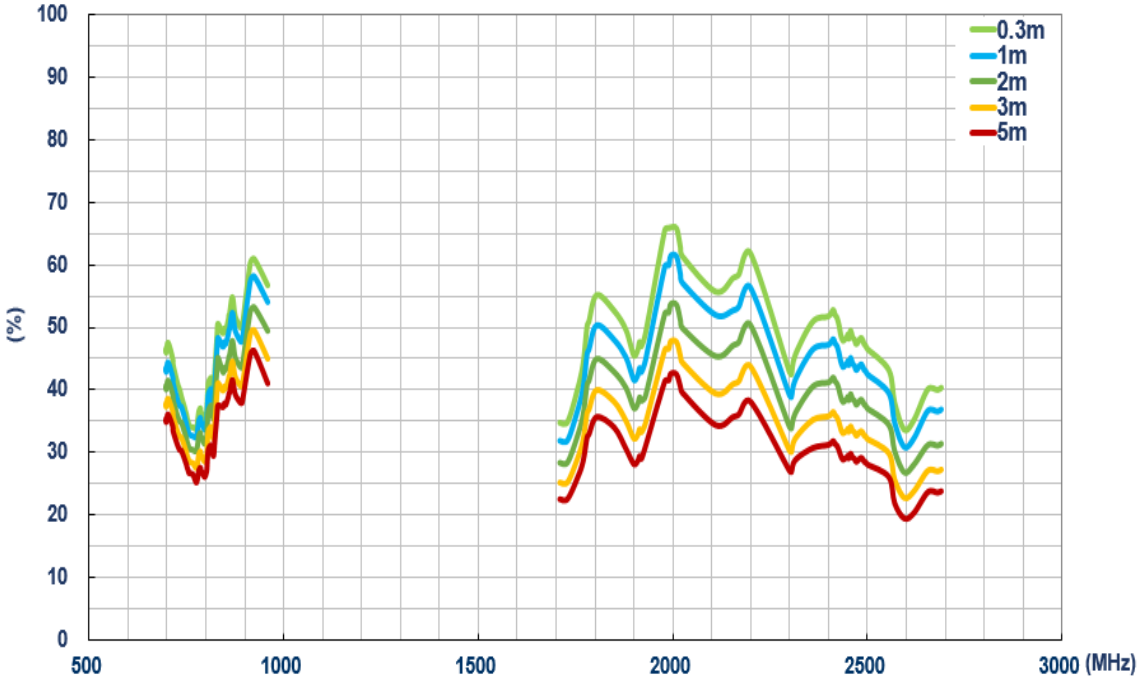
7.2.6 LTE 6



7.2.7 LTE 7

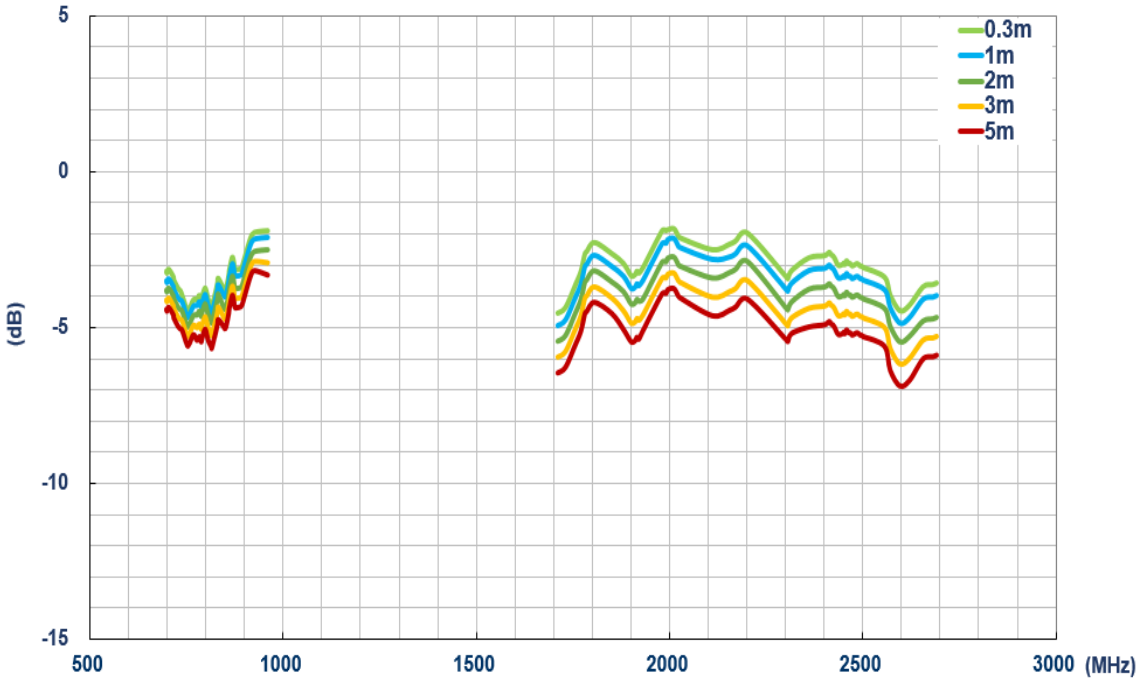


7.2.8 LTE 8

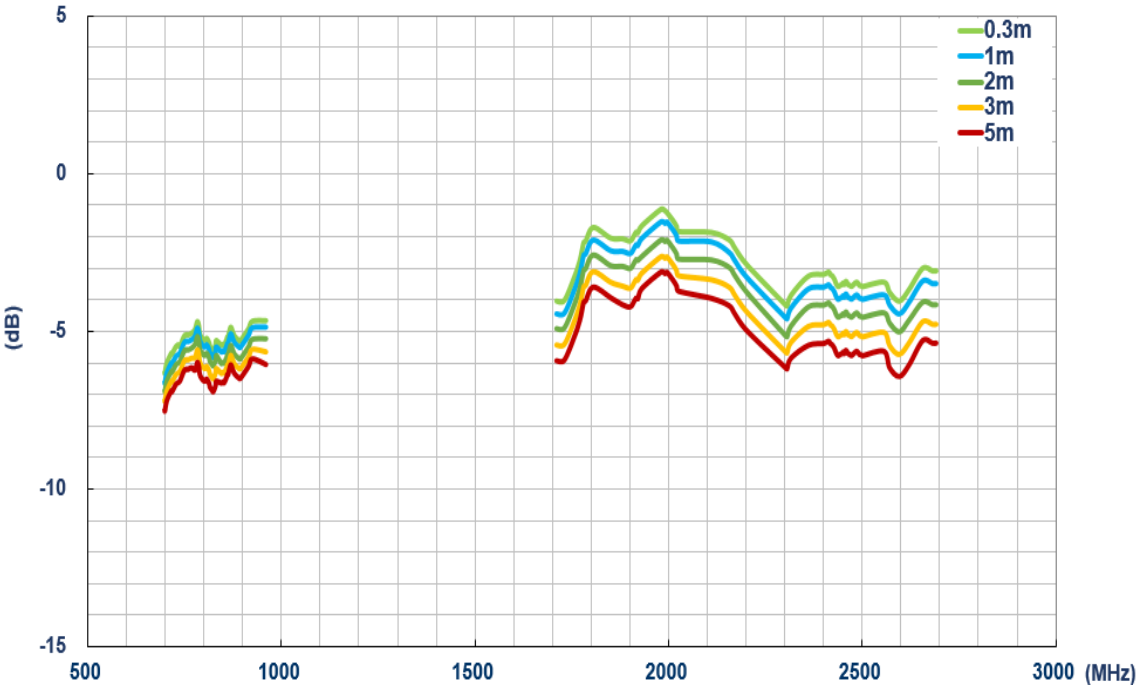


7.3. Average Gain

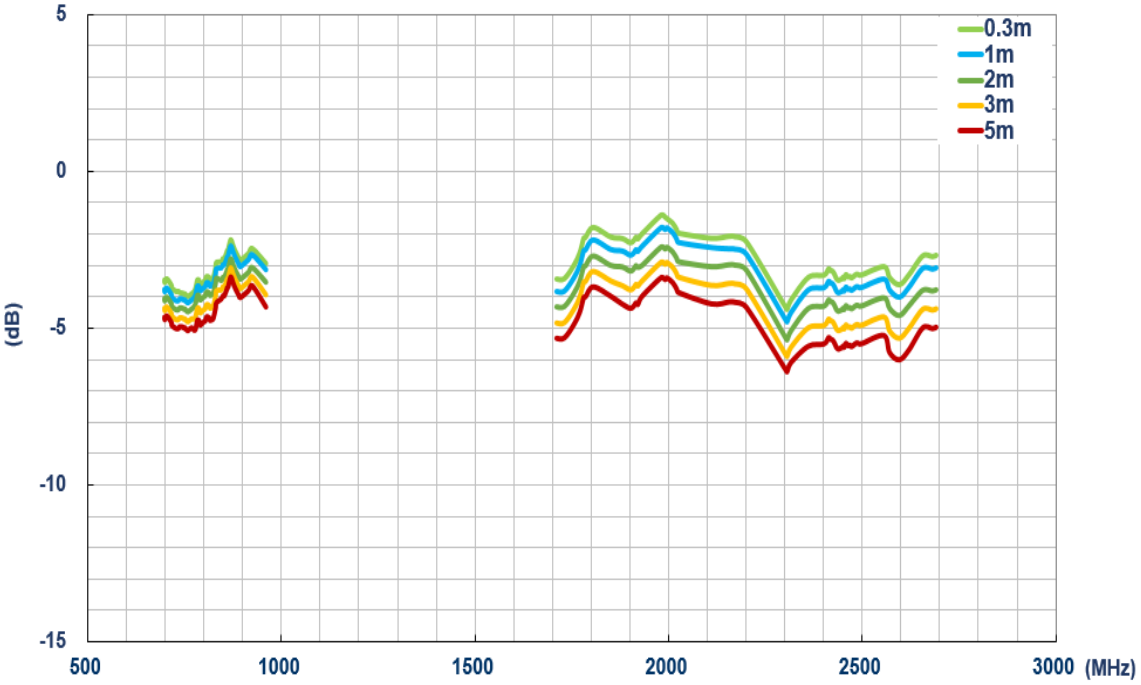
7.3.1 LTE 1



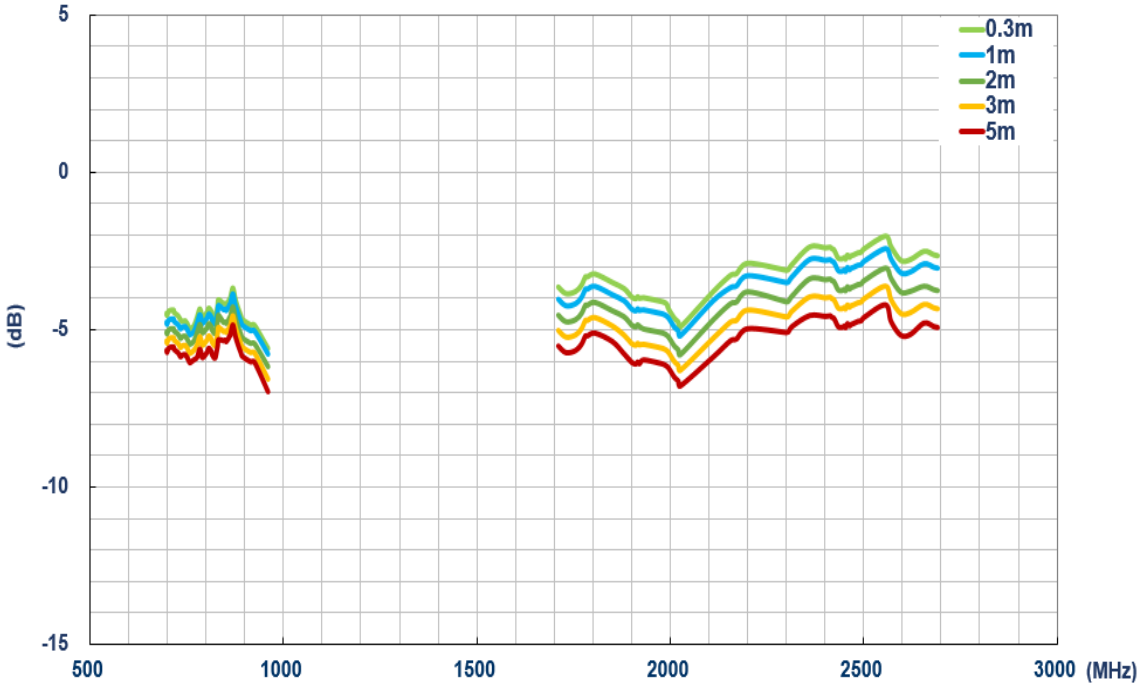
7.3.2 LTE 2



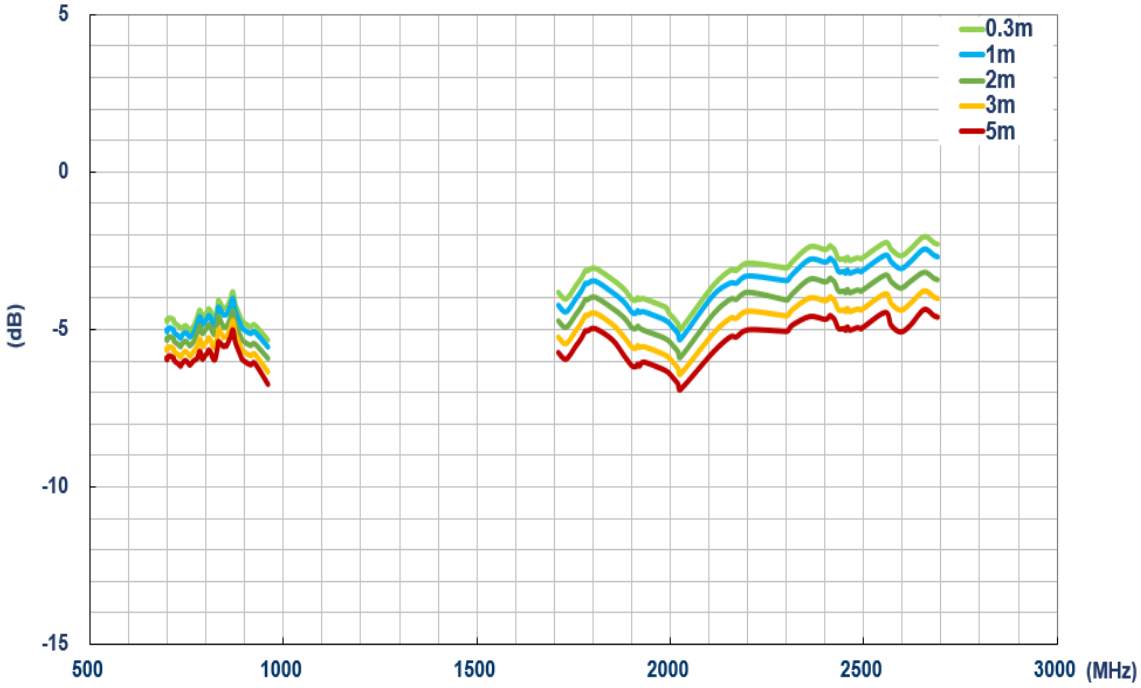
7.3.3 LTE 3



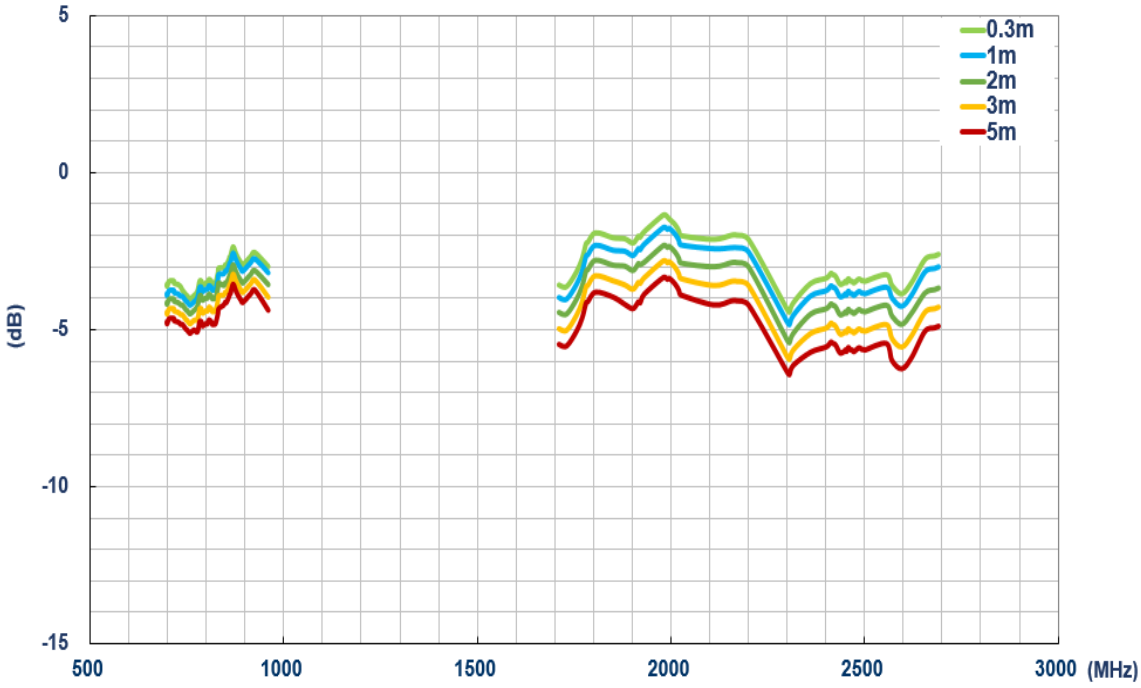
7.3.4 LTE 4



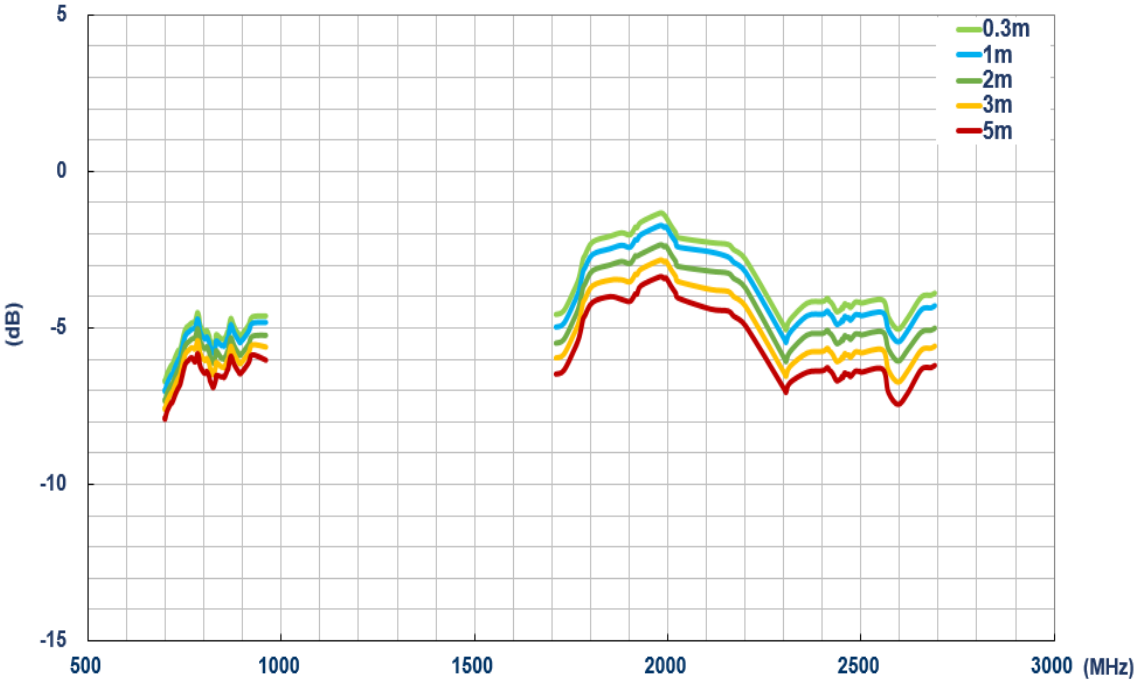
7.3.5 LTE 5



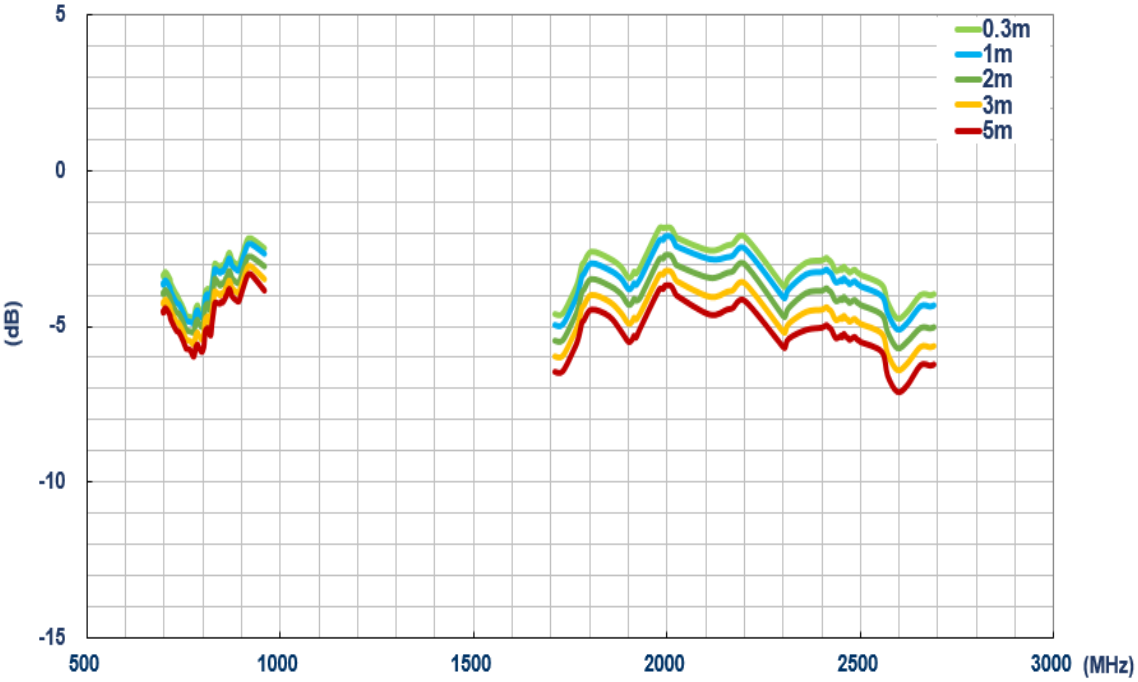
7.3.6 LTE 6



7.3.7 LTE 7

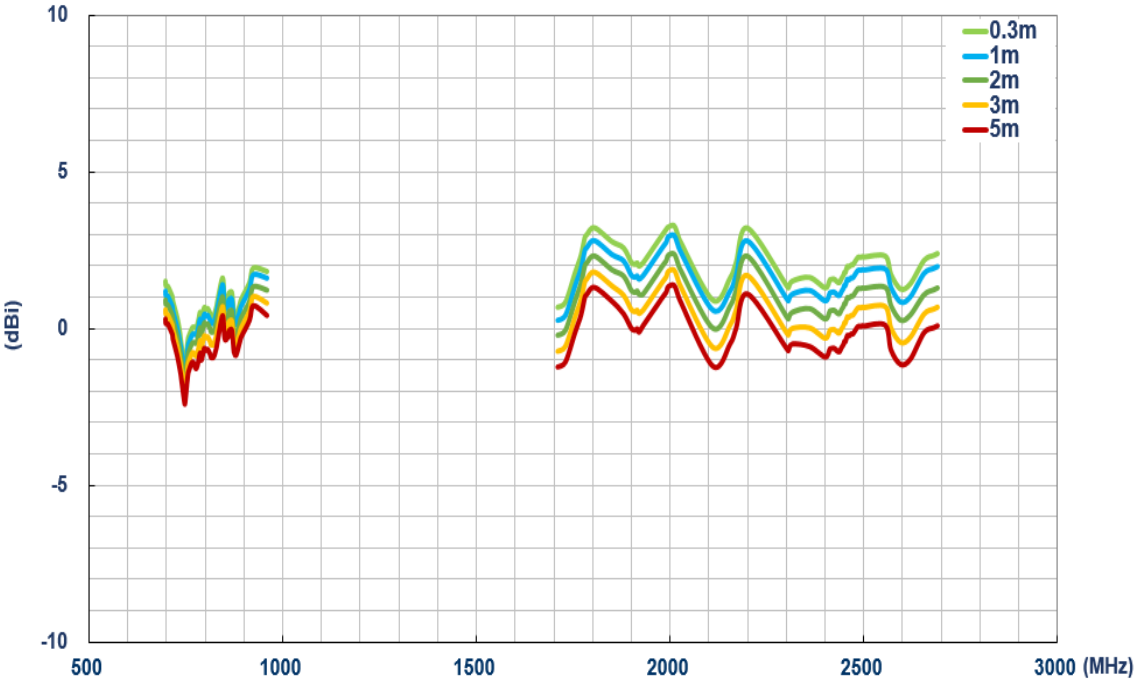


7.3.8 LTE 8

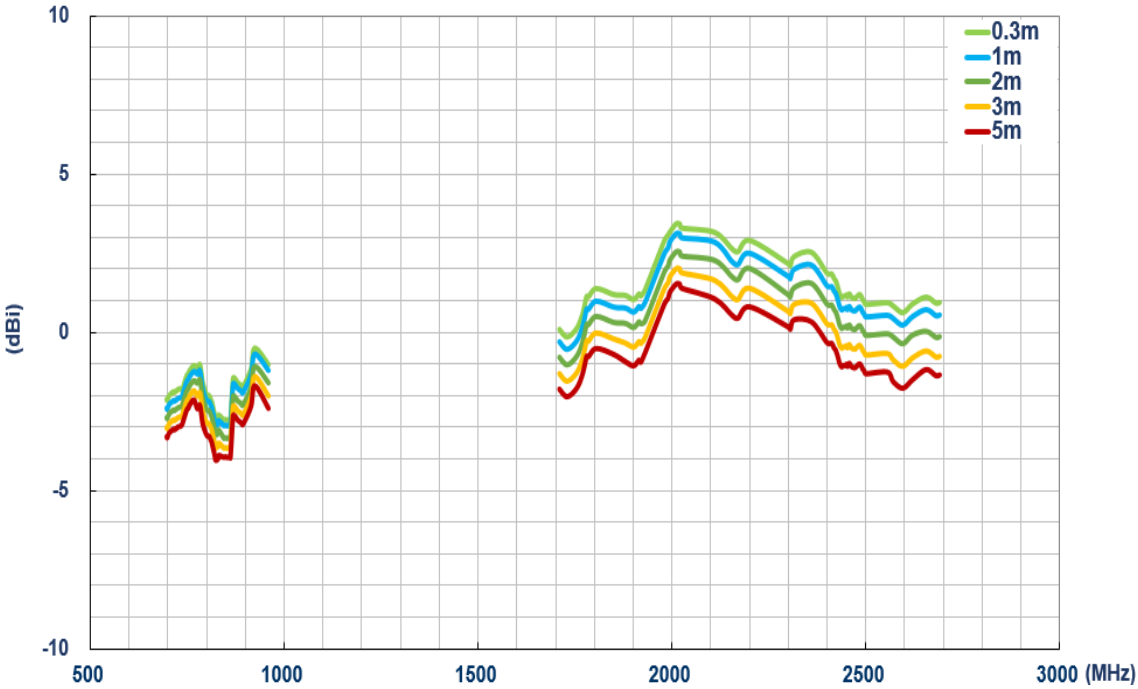


7.4. Peak Gain

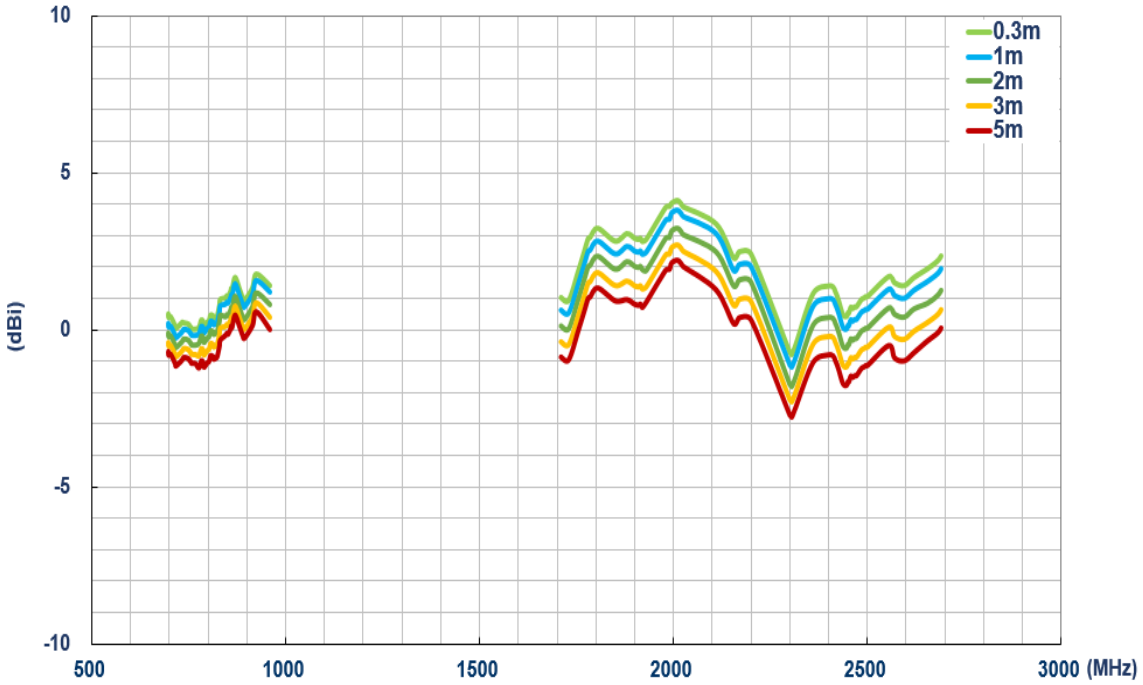
7.4.1 LTE 1



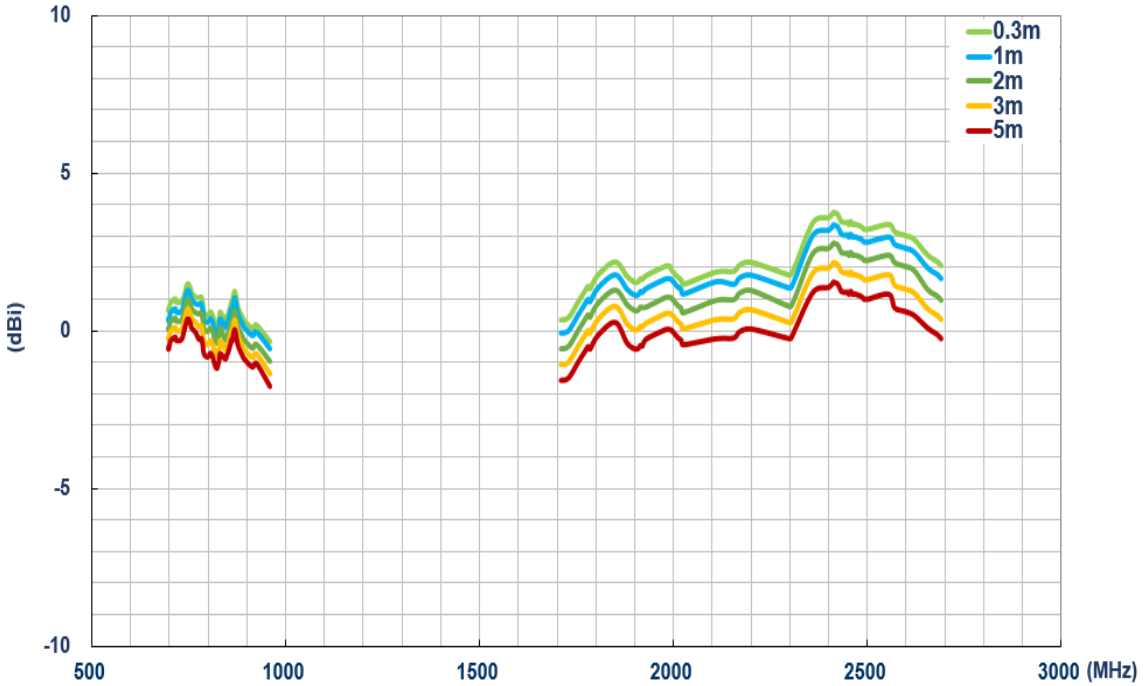
7.4.2 LTE 2



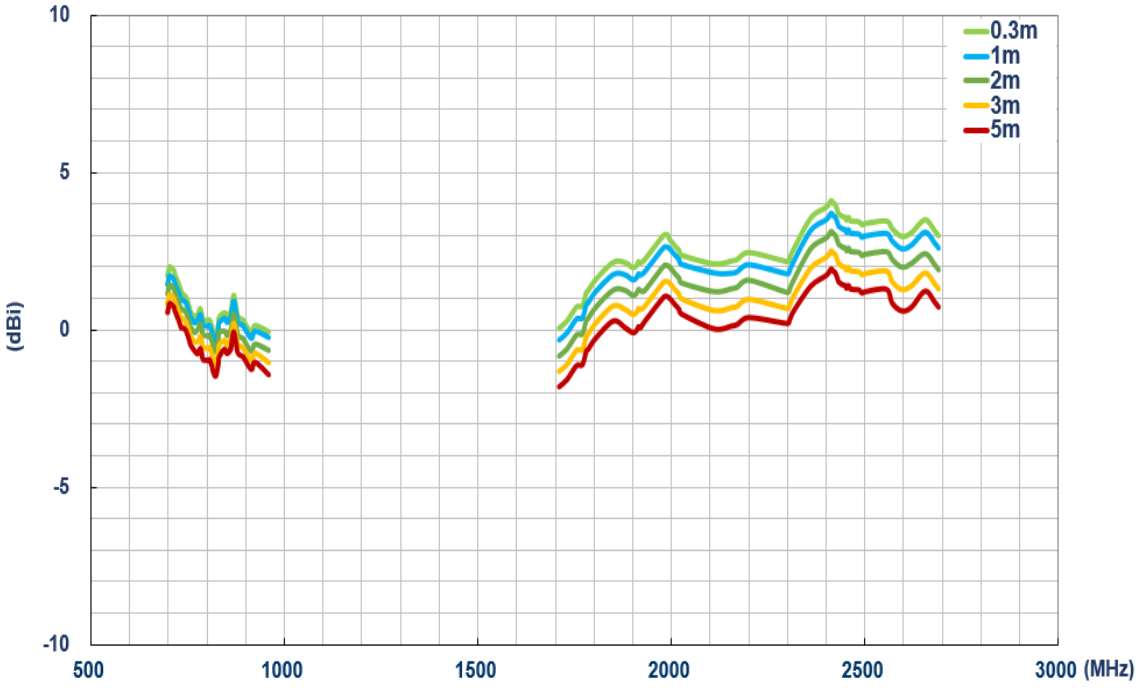
7.4.3 LTE 3



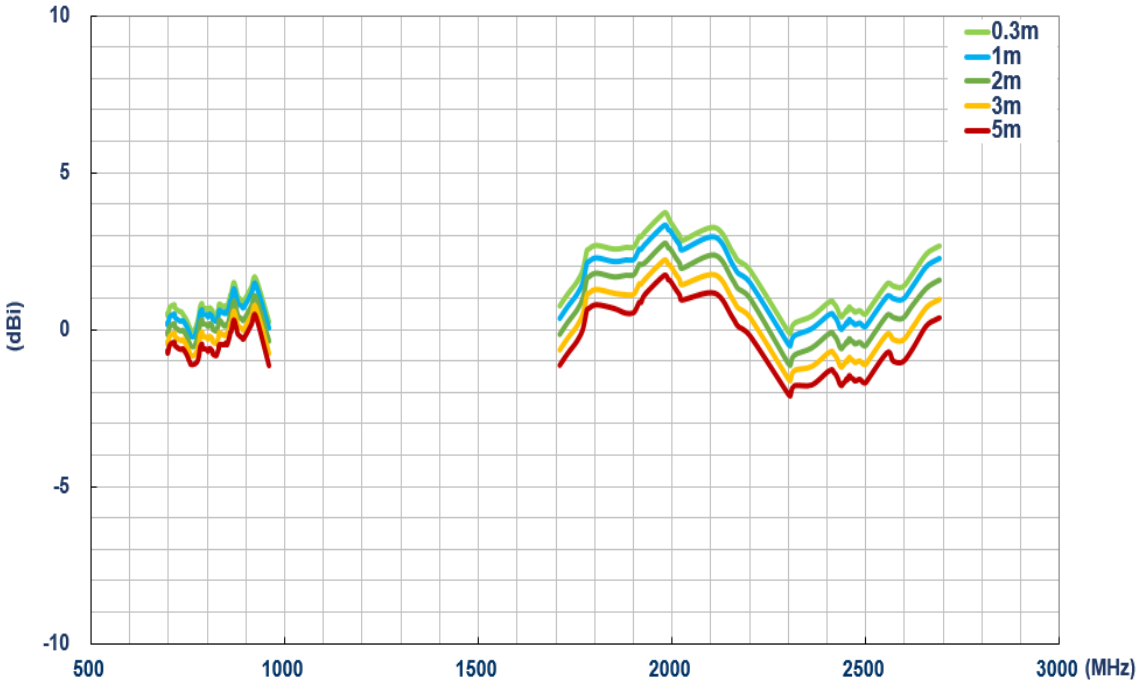
7.4.4 LTE 4



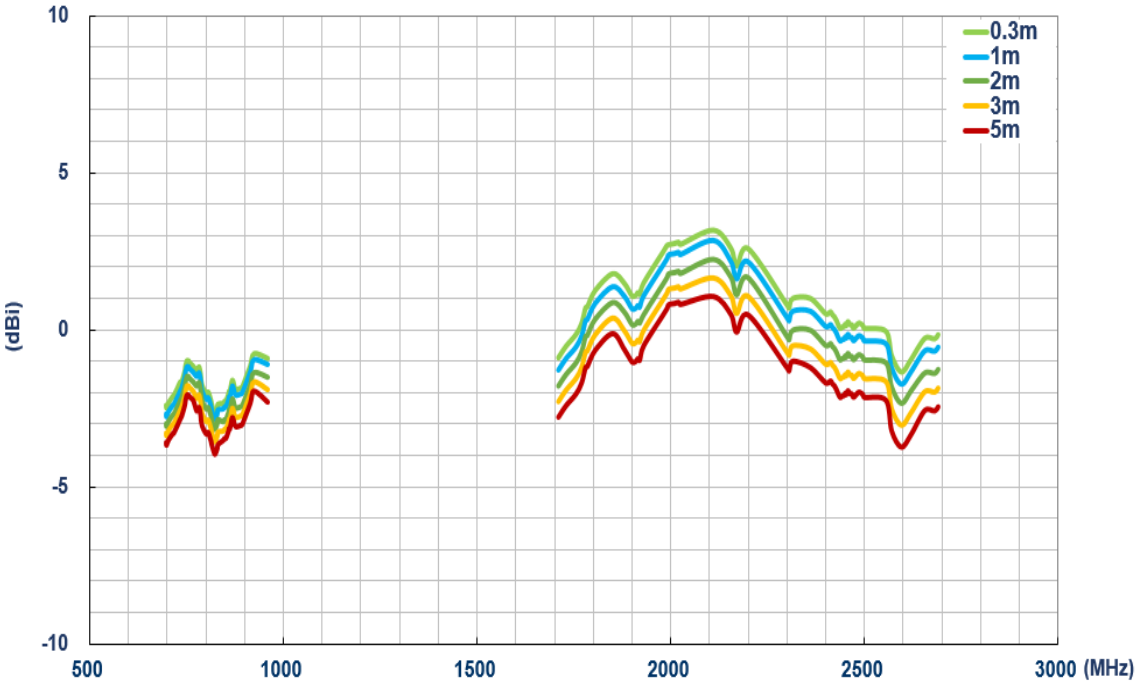
7.4.5 LTE 5



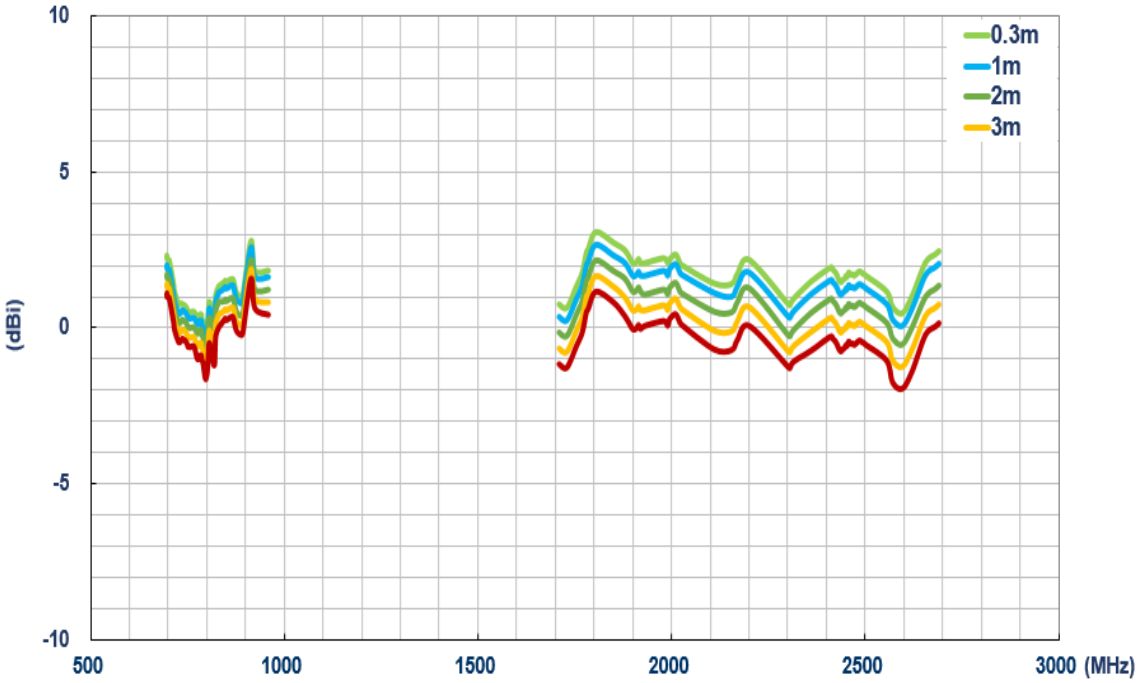
7.4.6 LTE 6



7.4.7 LTE 7



7.4.8 LTE 8



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