

## Revision record

Date	Revision version	Change Description	Author
2020.12.22	V1.0	Initial version	ZZY
2021.02.04	V2.0	Optimization antenna and drawing	ZZY
2021.02.06	V3.0	Update structure drawing , add detail size and add dimension inspection report	ZZY
2022.09.7	V4.0	Add Peak Gain	ZXX
2022.10.10	V5.0	Add radiation pattern	GJJ

## 1 Project Overview

This document is the specifications of the Overseas version Law enforcement instrument with 4G main antenna. The antenna solution is to make LDS wiring on the outside of the exterior surface bracket. The installation position is shown in Figure 1 :

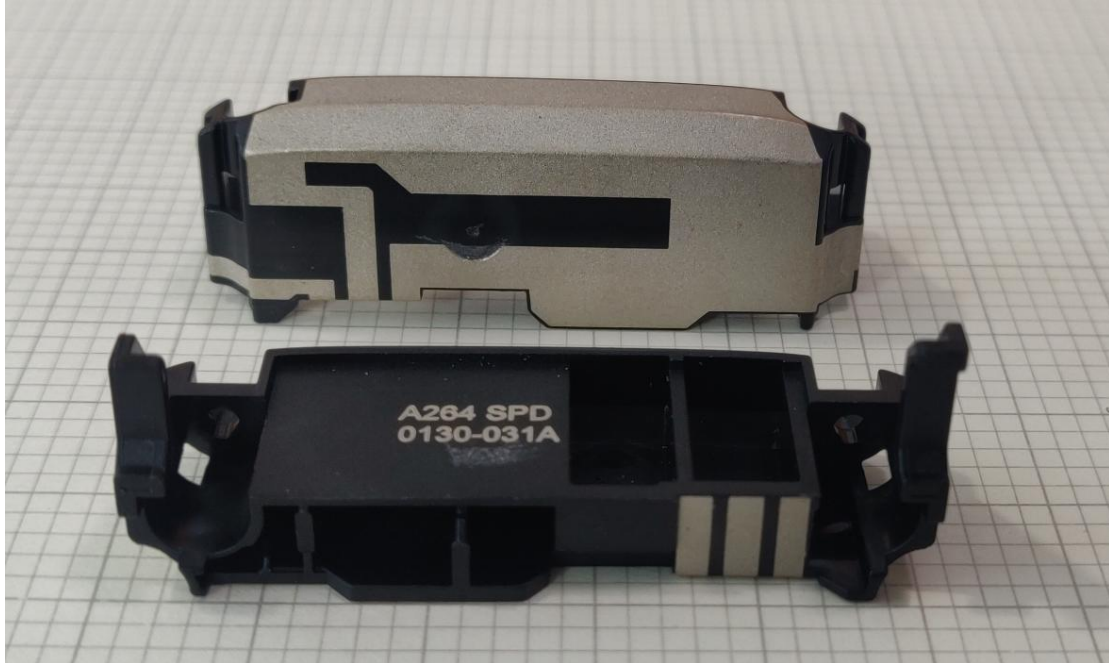


Figure 1 Antenna picture

## 2 Antenna Specification

### 2.1 Specification index

Antenna Form	Plastic Stent+LDS
Working Bands	704-960MHz, 1710-2690MHz
Peak Gain	-7dBi~2dBi
Efficiency	10%-40%
VSWR	$\leq 4$
Impedance	50ohm
Polarization	Linear polarization
A/R	N/A
Radiation Pattern	Omnidirectional
Feed Mode	Pin contact
power capacity	33dBm
Size(L*W*H)	18.68mm*48.6mm*16.9mm
Weight	N/A
Operating temperature	-40 °C to +80 °C
Storage temperature	-40 °C to +80 °C

### 2.2 Antenna matching and Switch status

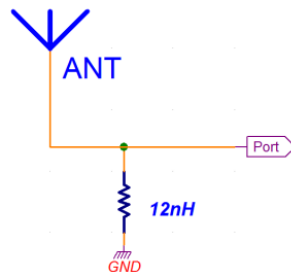


Figure 2 Antenna feed point matching

SP4T		
RF1(00)	0R	B28
RF2(01)	3.3pF	B20
RF3(10)	3.9pF	B5
RF4(11)	2.2pF	B8

### 3 Test Environment

The measuring equipment for antenna return loss, voltage standing wave ratio and isolation is Keysight E5071C vector network analyzer. As shown below:



Figure 3 Keysight E5071C vector network analyzer

The efficiency, gain, and pattern of the antenna are all tested in a dark room at Satimo, France. The darkroom uses 64 probes to electronically scan the antenna's radiation performance, collect data, and then analyze and organize it through a computer, which can provide antenna testing in the 400MHz to 8.5GHz frequency.



Figure4 Satimo Darkroom

## 4 Test Results

### 4.1 VSWR

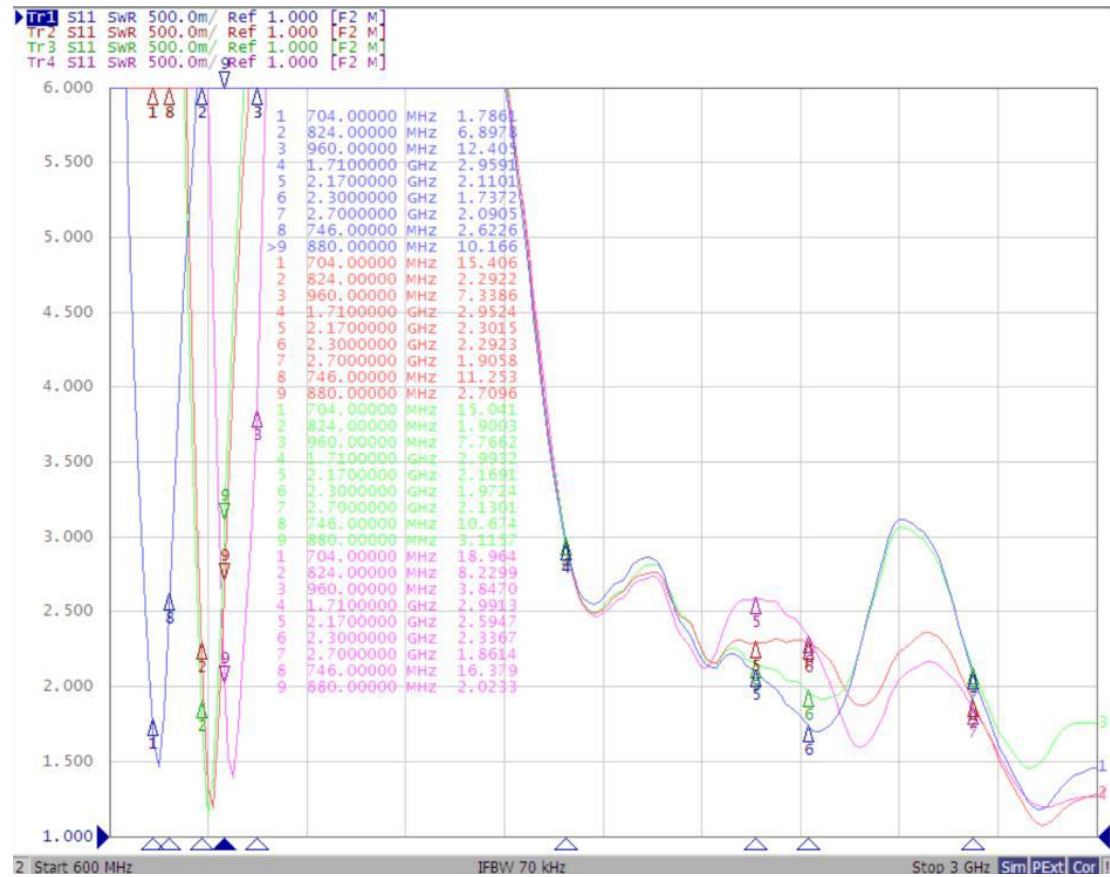


Figure 5 VSWR

## 4.2 Passive Efficiency and Peak Gain

Efficiency:

Frequency(MHz)	Switch status			
	RF1(00)	RF2(01)	RF3(10)	RF4(11)
700	11%	1%	1%	0%
710	13%	1%	1%	0%
720	15%	1%	1%	0%
730	16%	1%	2%	0%
740	15%	2%	2%	0%
750	14%	2%	3%	1%
760	13%	3%	4%	1%
770	12%	4%	5%	1%
780	10%	5%	6%	1%
790	9%	7%	8%	2%
800	8%	9%	10%	2%
810	8%	12%	13%	3%
820	7%	15%	17%	4%
830	7%	20%	21%	6%
840	7%	24%	24%	8%
850	7%	26%	26%	11%
860	6%	26%	24%	15%
870	6%	25%	23%	19%
880	6%	23%	21%	24%
890	6%	21%	19%	29%
900	6%	19%	17%	31%
910	6%	17%	16%	31%
920	5%	16%	14%	29%
930	5%	14%	13%	26%
940	5%	13%	12%	23%
950	4%	10%	9%	18%
960	3%	7%	7%	13%
1710	29%	29%	29%	29%
1730	30%	31%	30%	31%
1750	30%	32%	31%	32%
1770	30%	32%	31%	32%
1790	30%	31%	31%	32%
1810	29%	30%	30%	31%
1830	29%	31%	30%	32%
1850	28%	30%	29%	30%

## Antenna Specifications

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1870	28%	29%	28%	30%
1890	27%	29%	28%	29%
1910	27%	28%	27%	28%
1930	27%	28%	27%	28%
1950	27%	27%	27%	28%
1970	26%	26%	25%	26%
1990	24%	24%	24%	25%
2010	25%	25%	25%	26%
2030	24%	24%	24%	25%
2050	23%	23%	23%	23%
2070	23%	23%	22%	22%
2090	23%	23%	23%	23%
2110	25%	24%	24%	24%
2130	26%	24%	25%	24%
2150	26%	25%	26%	24%
2170	27%	25%	26%	24%
2300	29%	27%	27%	29%
2320	28%	26%	25%	28%
2340	28%	26%	25%	29%
2360	28%	25%	24%	29%
2380	26%	24%	23%	29%
2400	25%	24%	22%	30%
2420	23%	23%	20%	31%
2440	21%	23%	19%	31%
2460	19%	23%	17%	31%
2480	19%	22%	17%	31%
2500	19%	23%	18%	30%
2520	20%	24%	19%	31%
2540	21%	25%	20%	31%
2560	23%	27%	23%	31%
2580	25%	29%	25%	32%
2600	28%	32%	28%	34%
2620	30%	33%	30%	35%
2640	34%	37%	33%	38%
2660	36%	39%	36%	39%
2680	39%	41%	39%	41%
2700	42%	43%	41%	43%

**Peak Gain:**

Frequency(MHz)	Switch status			
	RF1(00)/dBi	RF2(01)/dBi	RF3(10)/dBi	RF4(11)/dBi
700	-5.82	-19.16	-18.65	-25.72
710	-4.93	-17.98	-17.47	-24.55
720	-4.38	-16.63	-16.10	-23.11
730	-3.96	-15.13	-14.58	-21.75
740	-3.95	-13.66	-13.09	-20.38
750	-4.42	-12.50	-11.92	-19.12
760	-5.02	-11.31	-10.70	-17.87
770	-5.74	-10.37	-9.76	-16.89
780	-6.12	-9.06	-8.41	-15.81
790	-6.42	-7.69	-7.05	-14.36
800	-6.65	-6.32	-5.71	-12.78
810	-6.74	-5.08	-4.53	-11.27
820	-7.21	-4.08	-3.63	-10.12
830	-7.53	-3.21	-2.91	-8.89
840	-7.98	-2.64	-2.50	-7.60
850	-8.19	-2.25	-2.31	-6.12
860	-8.49	-2.21	-2.44	-4.72
870	-8.65	-2.48	-2.81	-3.56
880	-9.18	-3.24	-3.62	-2.95
890	-9.18	-3.68	-4.07	-2.40
900	-9.19	-3.95	-4.35	-1.85
910	-9.08	-4.18	-4.56	-1.67
920	-9.24	-4.63	-5.00	-1.98
930	-9.56	-5.26	-5.61	-2.67
940	-9.68	-5.73	-6.10	-3.26
950	-10.32	-6.41	-6.79	-3.89
960	-11.55	-7.64	-7.96	-5.04
1710	-0.50	-0.52	-0.84	-0.71
1730	-0.31	0.05	-0.44	-0.15
1750	-0.20	0.23	-0.43	0.15
1770	-0.15	0.23	-0.38	0.23
1790	0.10	0.17	-0.07	0.18
1810	-0.14	0.02	-0.21	0.10
1830	-0.43	-0.23	-0.40	-0.18
1850	-0.58	-0.35	-0.43	-0.29

# Antenna Specifications

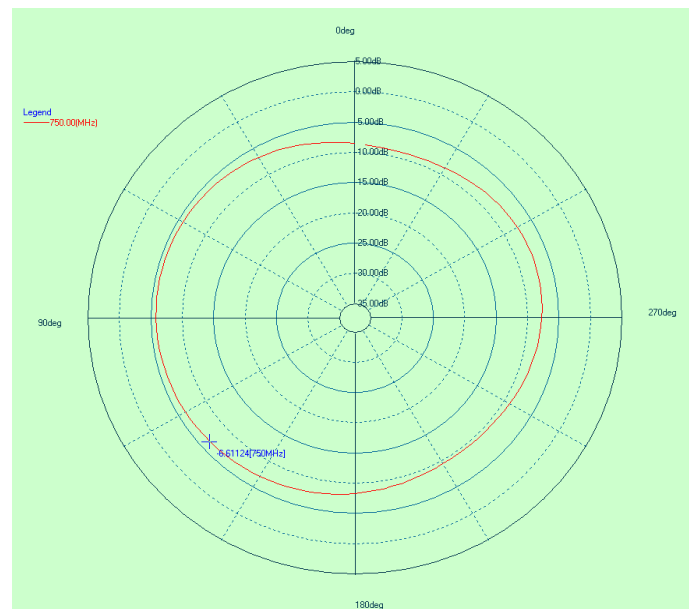
Frequency(MHz)	Switch status			
	RF1(00)/dBi	RF2(01)/dBi	RF3(10)/dBi	RF4(11)/dBi
1870	-0.49	-0.24	-0.31	-0.23
1890	-1.10	-0.88	-0.95	-0.84
1910	-1.21	-1.27	-1.36	-1.26
1930	-1.08	-1.23	-1.12	-1.23
1950	-1.12	-1.31	-1.26	-1.15
1970	-1.19	-1.34	-1.33	-1.16
1990	-1.56	-1.67	-1.71	-1.51
2010	-1.90	-1.92	-1.95	-1.83
2030	-2.46	-2.28	-2.34	-2.24
2050	-2.87	-2.83	-2.92	-2.91
2070	-2.71	-3.01	-2.97	-3.14
2090	-2.24	-2.72	-2.34	-2.54
2110	-1.65	-2.14	-1.78	-1.98
2130	-1.17	-1.80	-1.39	-1.73
2150	-1.63	-2.13	-1.78	-2.14
2170	-2.05	-2.52	-2.32	-2.43
2300	-1.21	-0.29	-1.24	0.02
2320	-1.26	-0.63	-1.82	-0.32
2340	-1.02	0.00	-1.31	0.37
2360	-0.85	-0.43	-1.49	0.09
2380	-0.56	-0.62	-1.34	0.20
2400	-0.52	-0.14	-0.77	0.63
2420	-0.48	-0.22	-0.72	0.67
2440	-0.62	-0.62	-0.87	0.49
2460	-1.35	-1.19	-1.52	0.00
2480	-1.91	-0.98	-1.93	-0.48
2500	-2.12	-0.78	-2.45	-0.69
2520	-1.68	-0.61	-2.06	-0.40
2540	-1.68	-0.41	-1.91	-0.34
2560	-1.30	-0.35	-1.49	-0.11
2580	-0.61	-0.30	-0.74	0.07
2600	-0.26	-0.11	-0.42	0.29
2620	-0.07	-0.09	-0.23	0.38
2640	0.64	0.38	0.49	0.50
2660	0.57	0.34	0.41	0.44
2680	1.02	0.73	0.76	0.52
2700	1.27	1.11	0.89	0.86

### 4.3 Antenna TRP Test

B1	1.92E+09	18.24	B20	8.34E+08	17.06
	1.95E+09	18.16		8.47E+08	17.21
	1.98E+09	17.73		8.60E+08	16.86
B2	1.85E+09	18.59	B28	7.05E+08	14.31
	1.88E+09	18.64		7.26E+08	14.89
	1.91E+09	17.70		7.46E+08	14.08
B3	1.71E+09	19.23	B38	2.57E+09	19.03
	1.75E+09	19.10		2.60E+09	19.61
	1.78E+09	20.30		2.62E+09	19.75
B4	1.71E+09	19.29	B39	1.88E+09	18.82
	1.73E+09	19.36		1.90E+09	18.27
	1.75E+09	19.22		1.92E+09	18.50
B5	8.26E+08	16.75	B40	2.30E+09	17.69
	8.37E+08	16.65		2.35E+09	18.03
	8.47E+08	16.24		2.40E+09	16.84
B8	8.82E+08	14.97	B41	2.55E+09	18.42
	8.98E+08	15.29		2.61E+09	19.80
	9.13E+08	16.05		2.66E+09	20.21

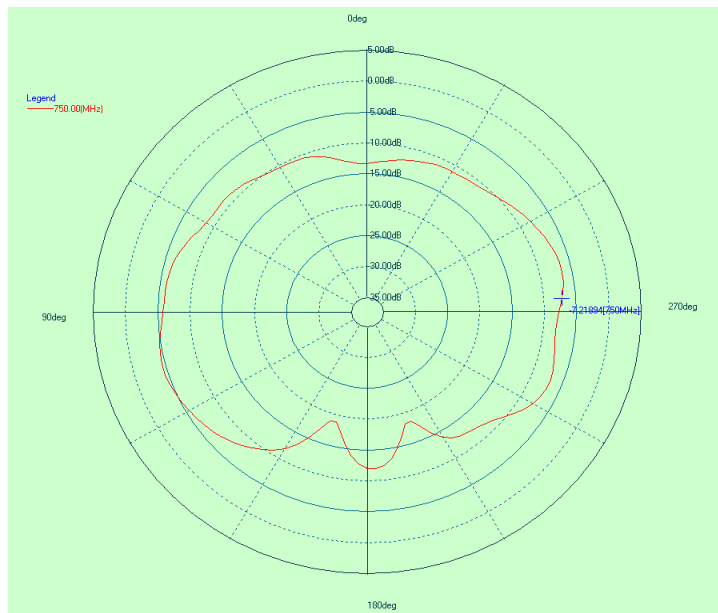
### 4.4 Radiation pattern

750MHz:

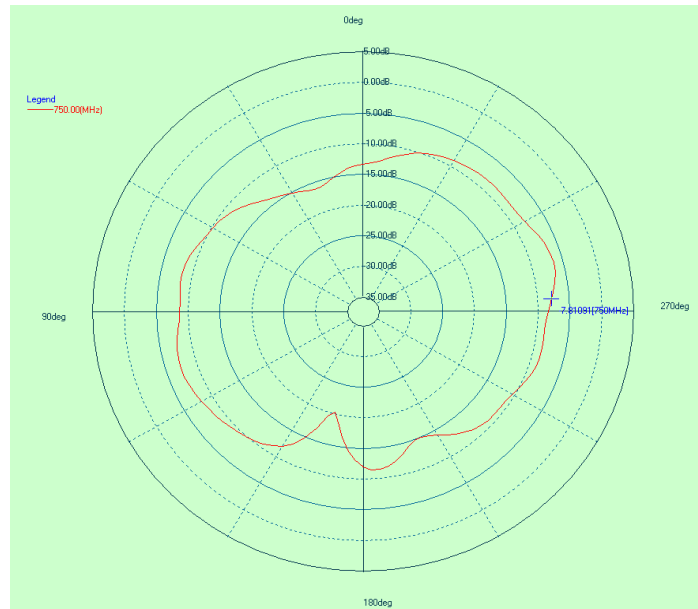


Theta=90°

## Antenna Specifications

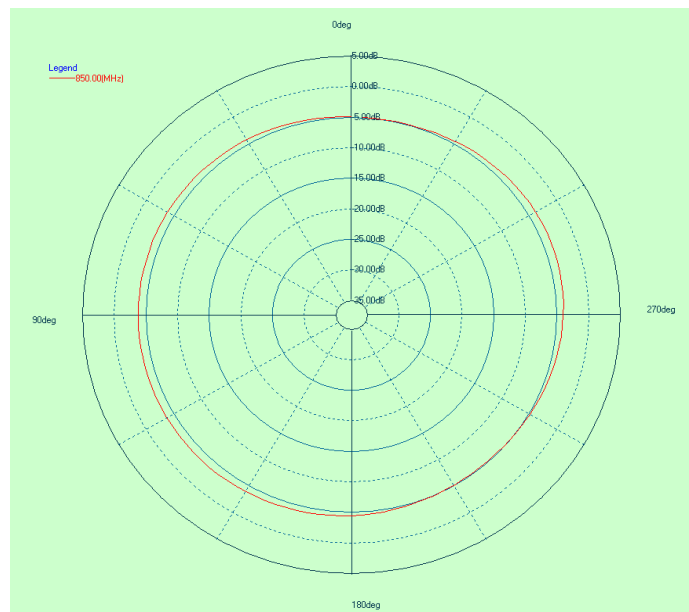


**$\Phi = 90^\circ$**

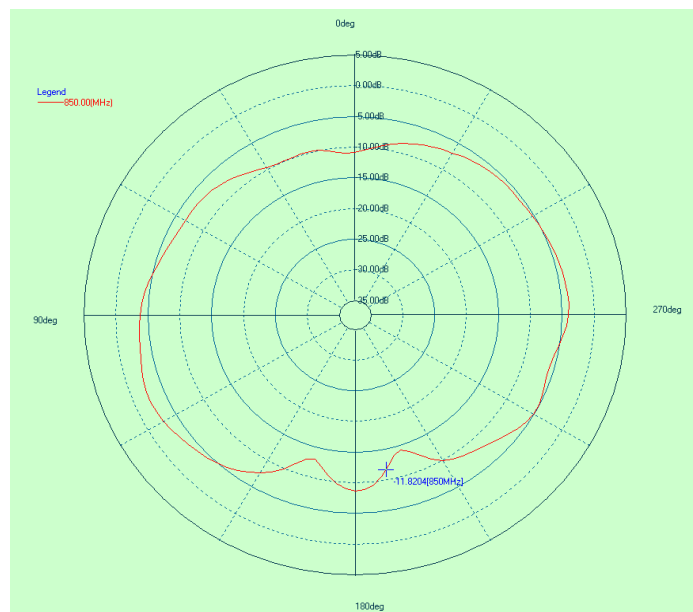


**$\Phi = 0^\circ$**

850MHz:

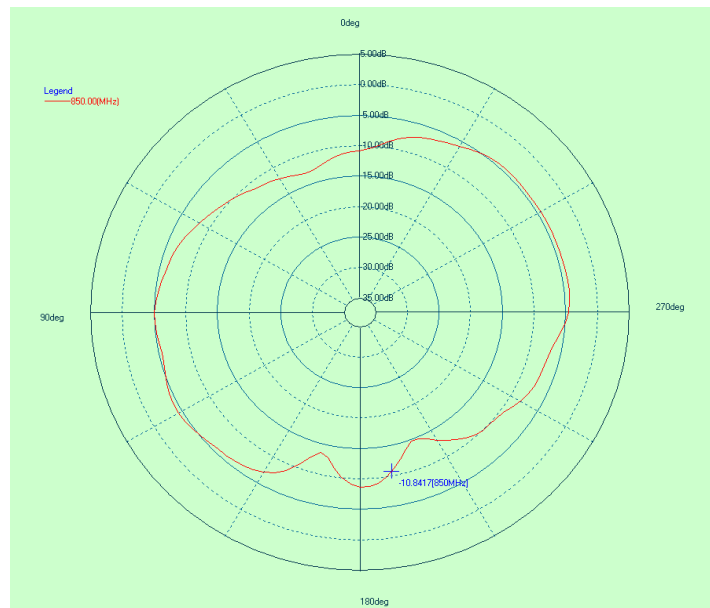


Theta=90°



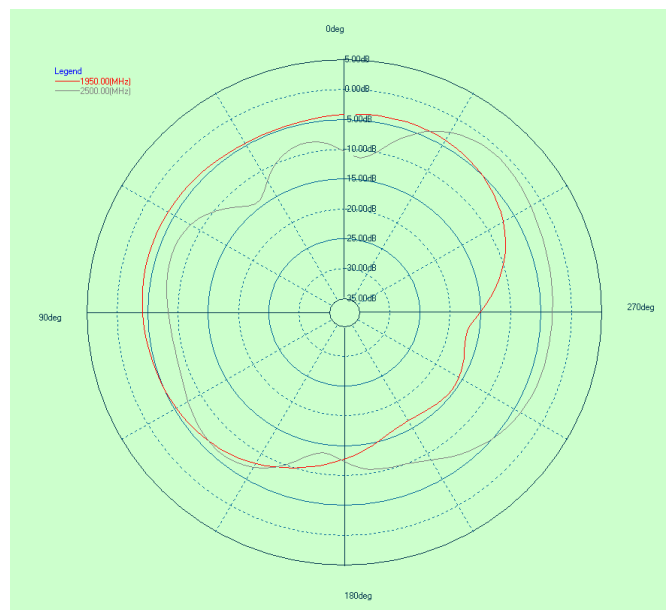
Phi=90°

## Antenna Specifications



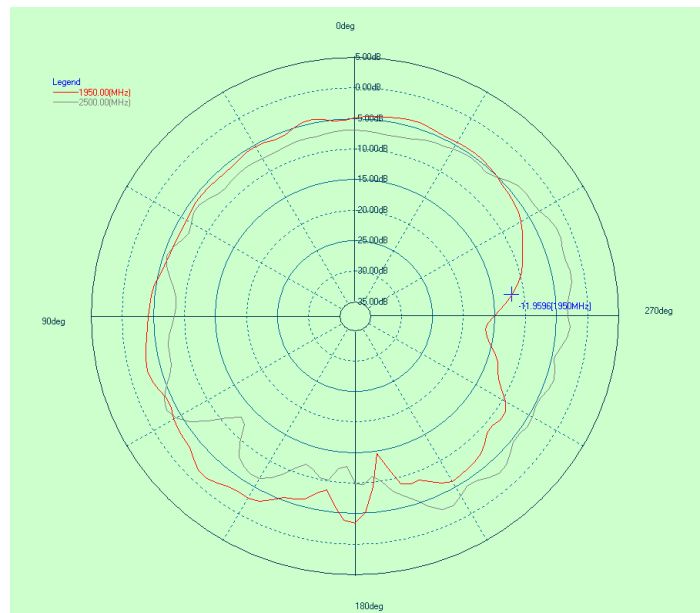
**$\Phi = 0^\circ$**

**1950&2500MHz**

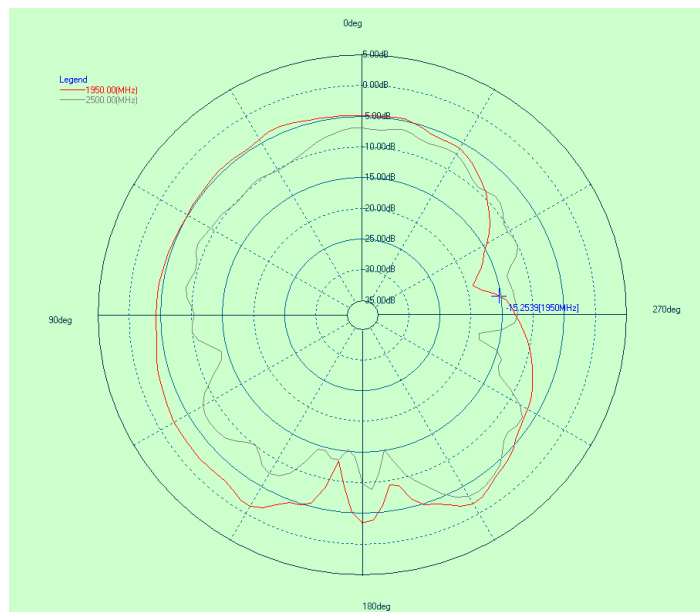


**$\Theta = 90^\circ$**

## Antenna Specifications



**$\Phi = 90^\circ$**



**$\Phi = 0^\circ$**

## 5 Structure Diagram

