



**APPROVAL SHEET  
FOR ANTENNA**

CUSTOMER: xiaomi

AAC P/N:

CUSTOMER P/N: N7 Antenna

CUSTOMER	APPROVER	CHECKER

**AAC ACOUSTIC TECHNOLOGIES HOLDINGS INC.**

**Add: AAC Technology Building, NO.18., Xixi Road, North Hi-Tech  
Industrial Park, Nanshan District, Shenzhen, P.R. China 518057**

**Tel : 0086 755 26054538**

**AAC Confidential Information**





Main antenna: GSM850/900/1800/1900, WCDMA band1/2/5/8, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1

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## 1. Scope

This document contains required environmental, electrical characteristic, mechanical, package and reliability test requirements.

## 2. Environmental Requirement

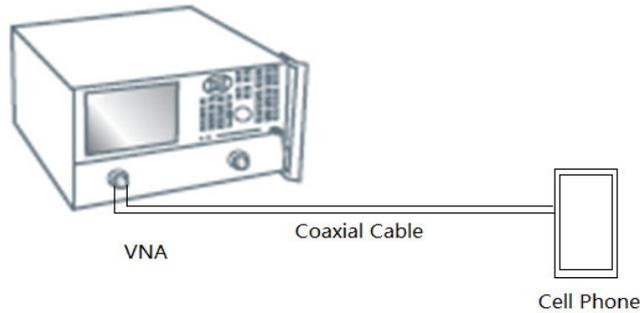
all components must be free from lead (Pb) and other banned or restricted substances according to customer's requirements.

## 3. Electrical Characteristic Measurement Method

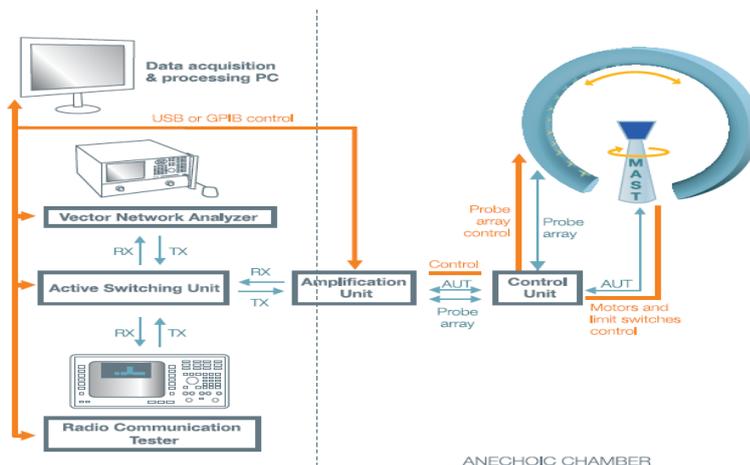
### 3.1 Measurement method

To measure the Return Loss and VSWR, Smith Chart, Vector Network Analyzer Agilent E5071C was used. Satimo SG24 Anechoic chamber was used to measure the Efficiency, Gain, TRP and TIS.

#### 3.1.1 Return Loss and VSWR



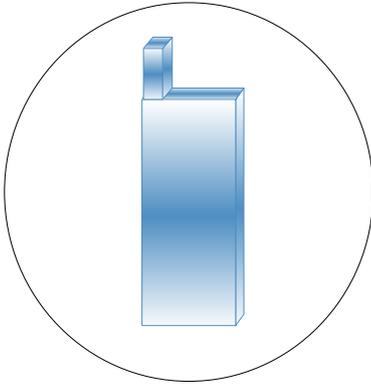
#### 3.1.2 Efficiency, Gain, OTA measurement



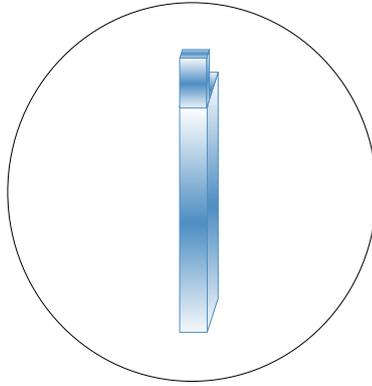


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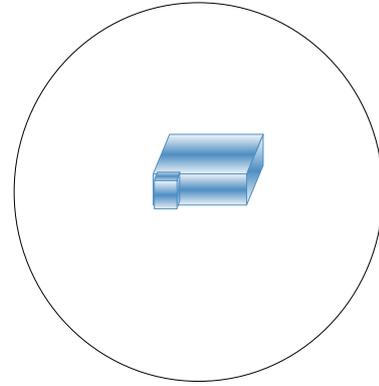
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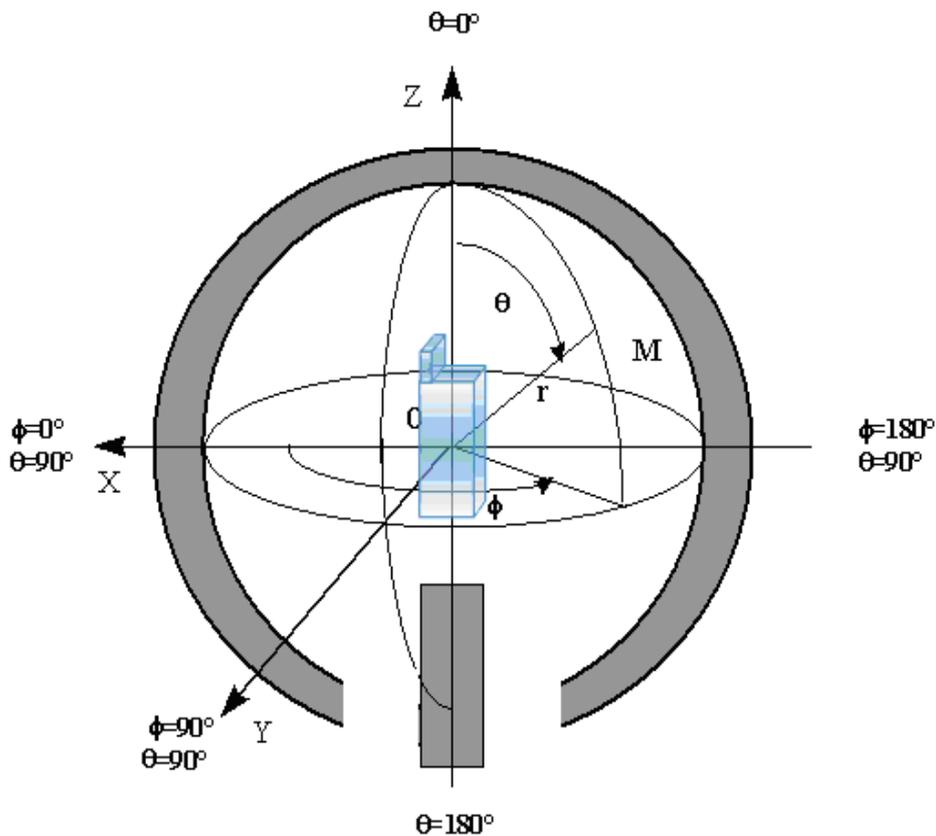
Phi=0deg



Phi=90deg



Theta=90deg



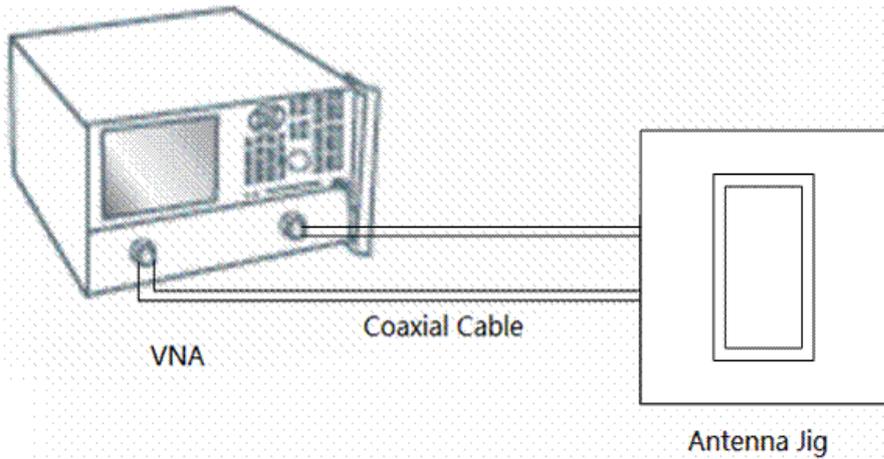
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AAC designs a special S11 RF test jig for antenna test in mass production line. The antenna with average frequency in line is selected as reference antenna, and the results of the test jig is going to correlated to the performance in the real phone.



#### 4. Pictures of prototype and antenna environment

Main ant

DIV ant

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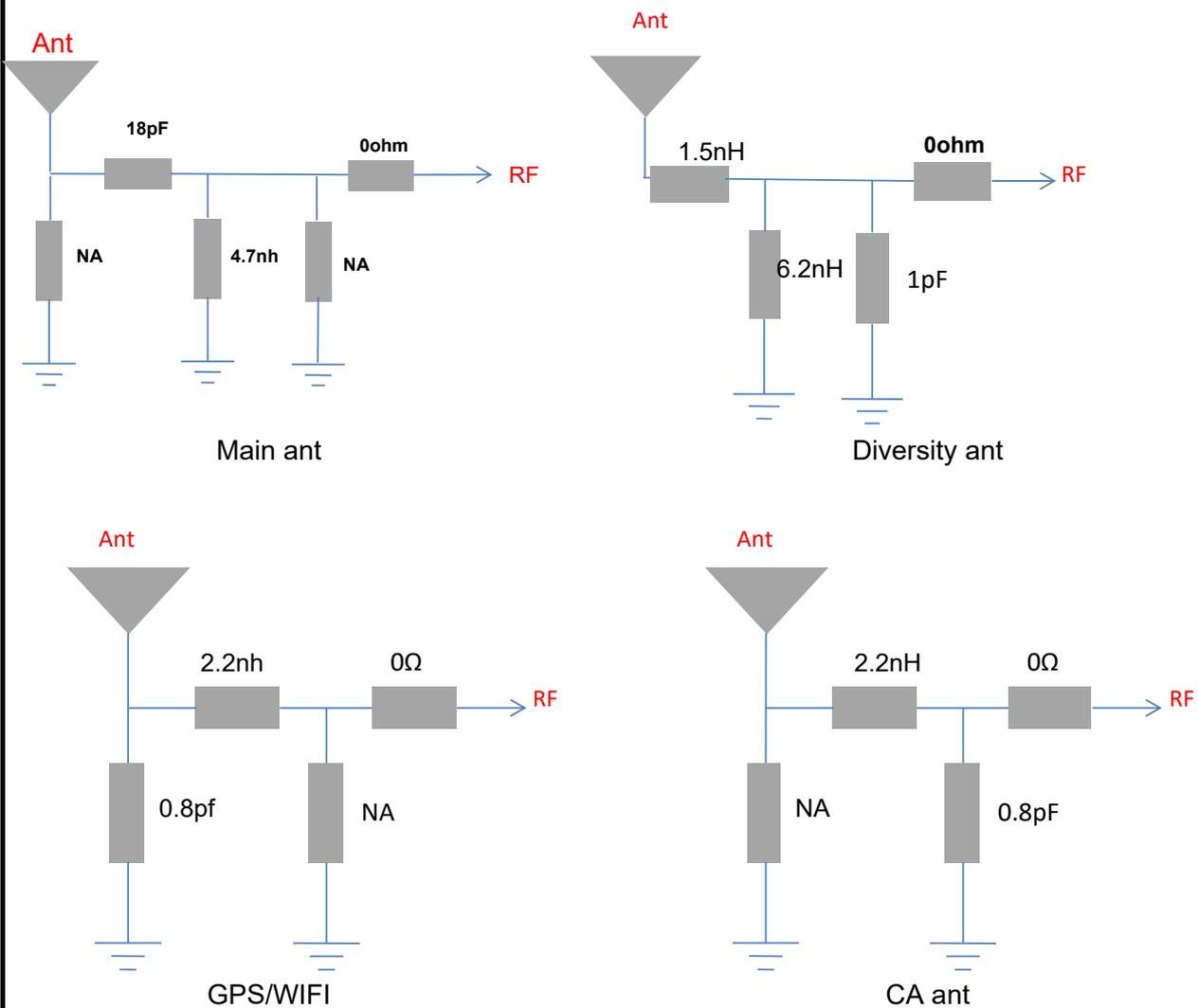
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GPS/WIFI ant

5. Matching Circuit



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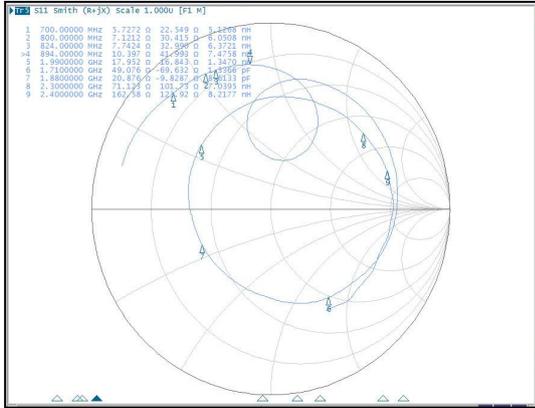
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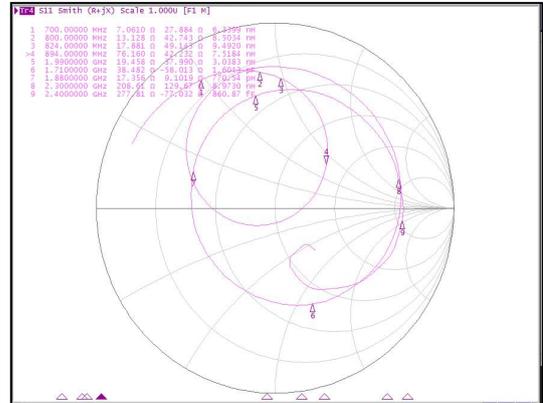
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2023/9/20

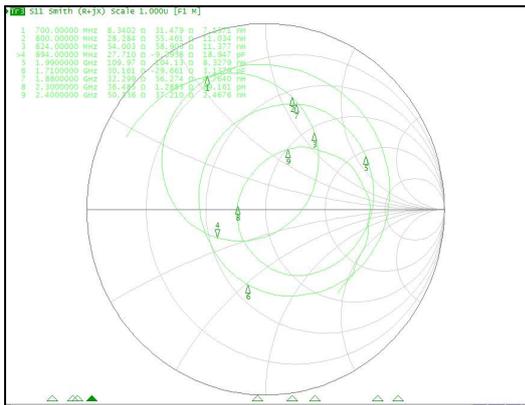
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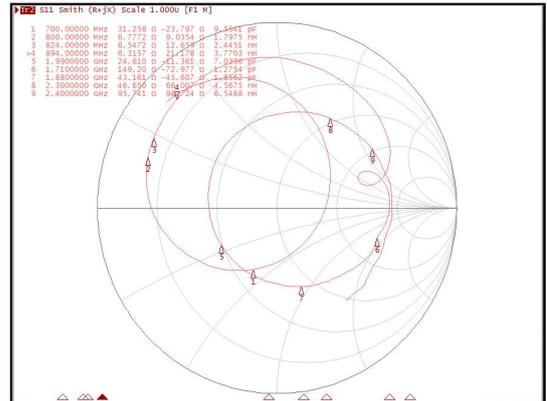
状态1



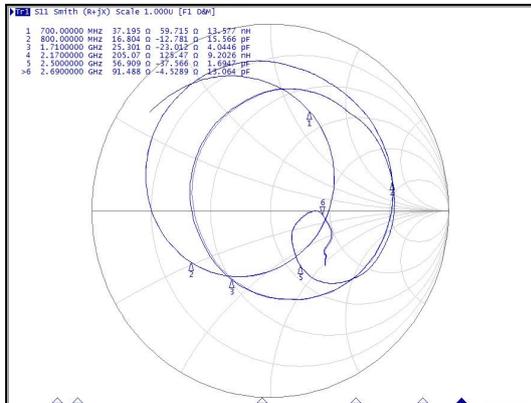
状态2



状态3



状态4



状态5

Fig.2 Smith Chart

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Diversity antenna: GSM900/1800, WCDMA band1, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3/7;

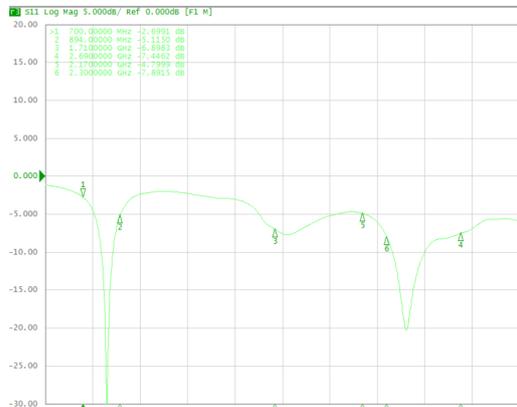
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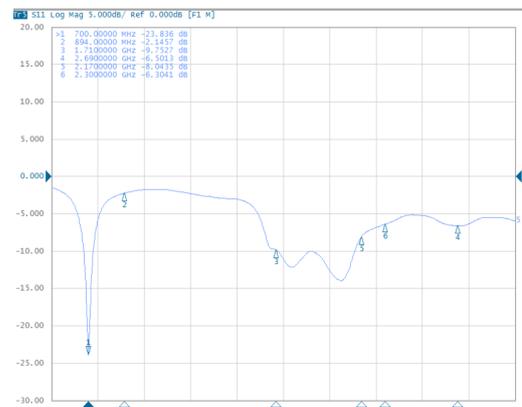
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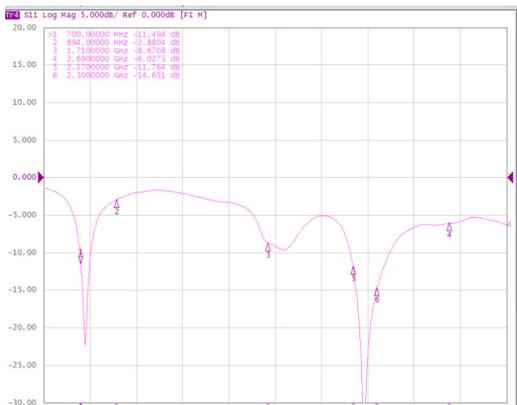
## 6.2 Diversity antenna



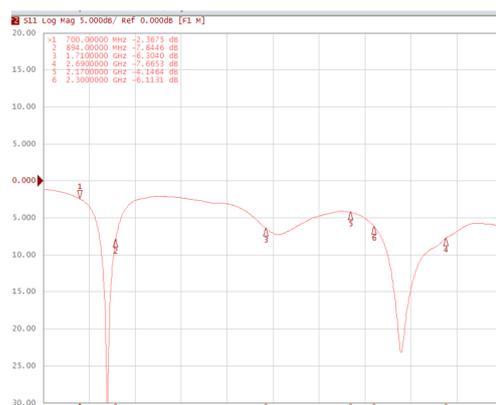
状态1



状态2



状态3



状态4

Fig.1 Return Loss

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Diversity antenna: GSM900/1800, WCDMA band1, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3/7;

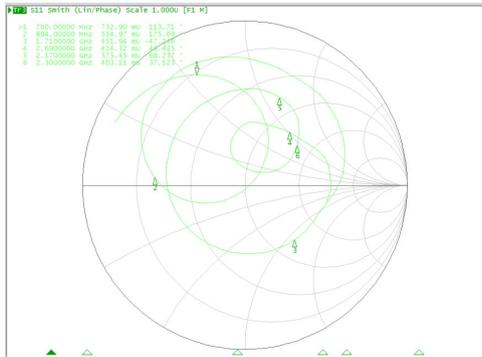
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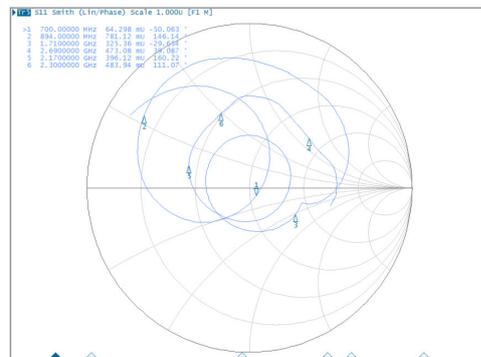
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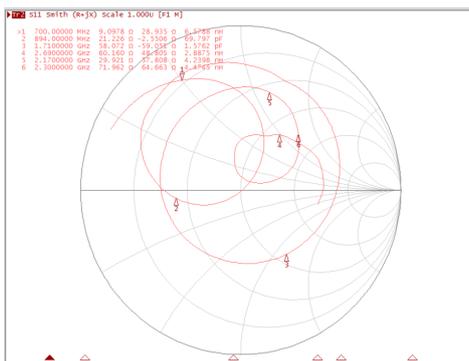
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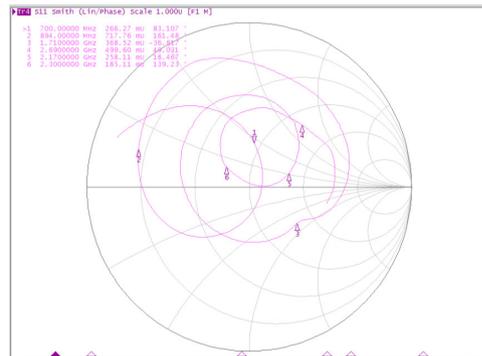
状态1



状态2



状态3



状态4

Fig. 2 Return Loss Smith chart



GPS&WIFI antenna

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6.3 mimo Ant

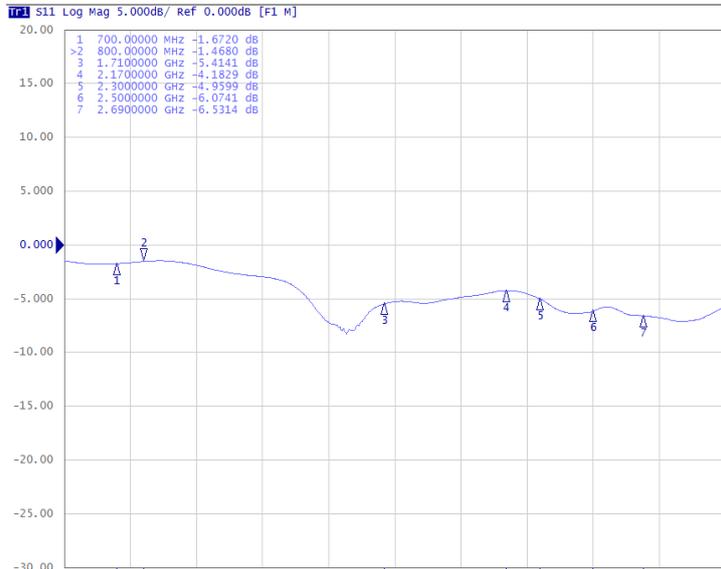


Fig.1 Return Loss

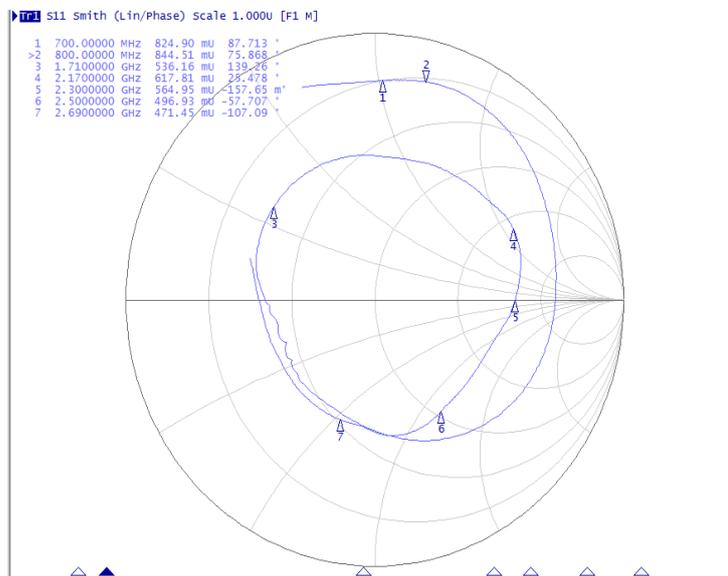


Fig.2 smith chart

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GPS&WIFI antenna

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6.4 GPS/BT/WIFI Ant

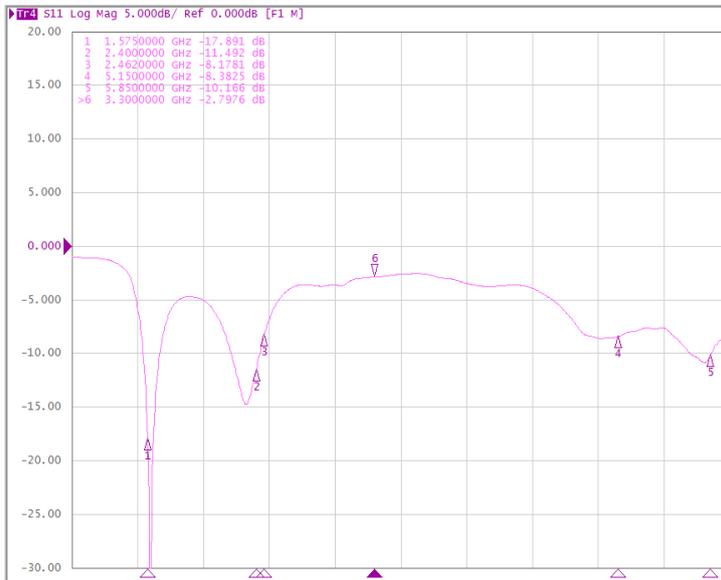


Fig.1 Return Loss

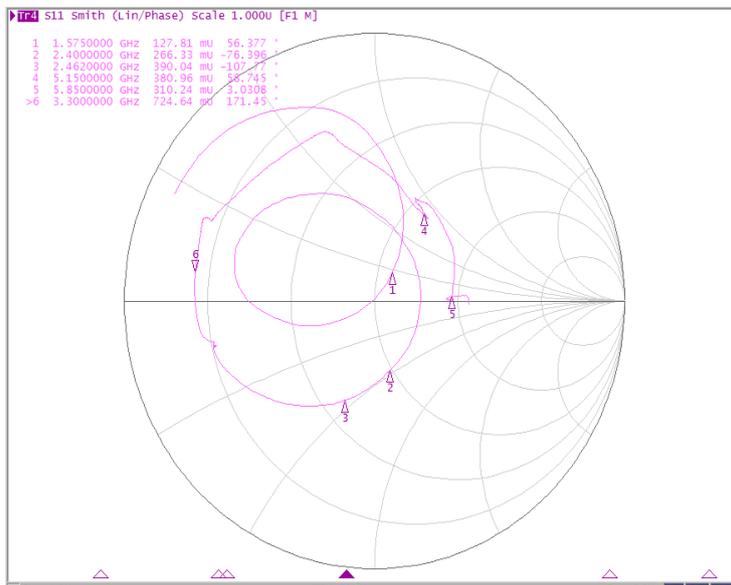


Fig.2 smith chart

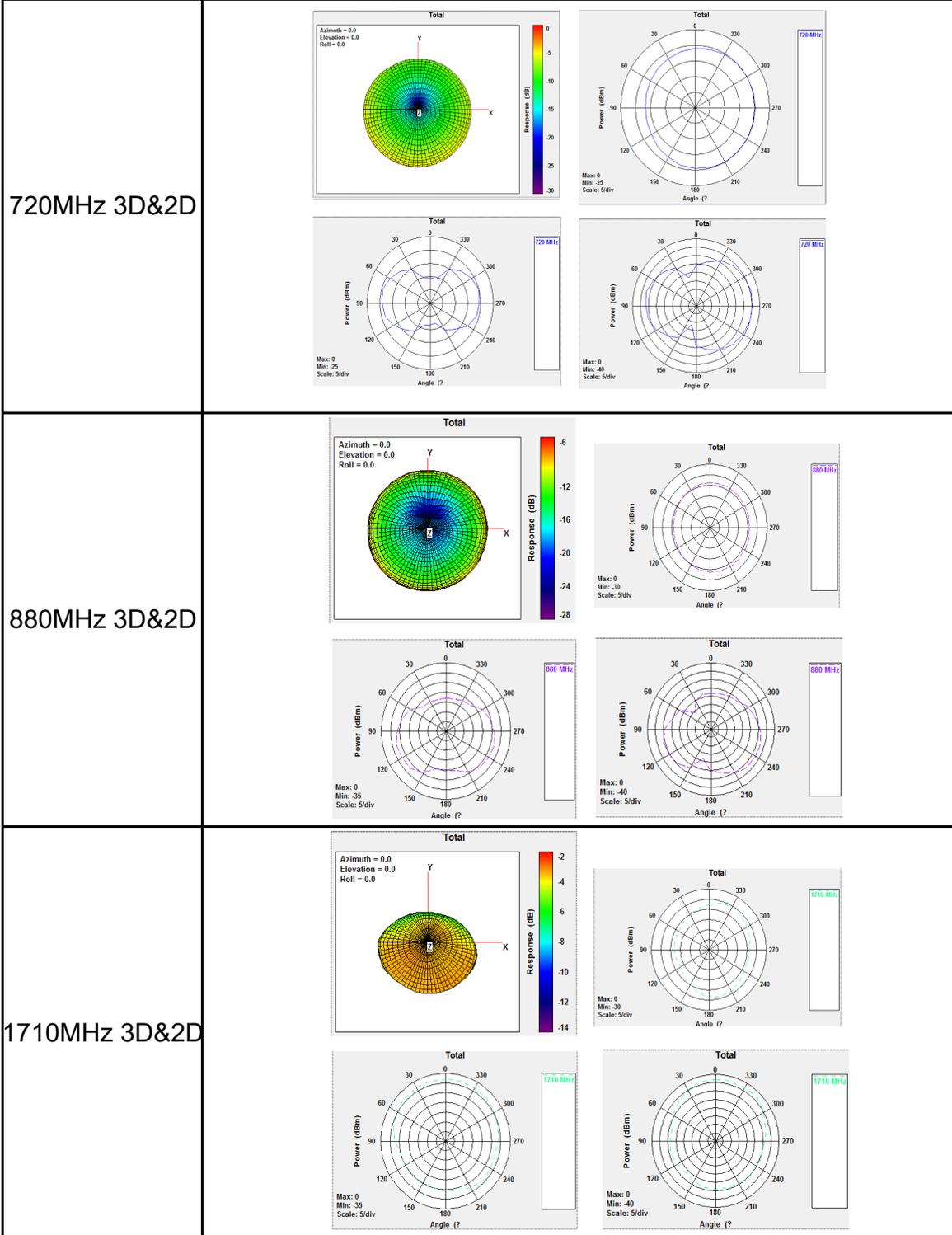
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**6.4 Radiation Pattern**

Main ant



Diversity antenna:GSM900/1800,WCDMA band1,TD-SCDMA A/F,TDD-LTE band38/39/40/41,FDD-LTE band1/3/7;

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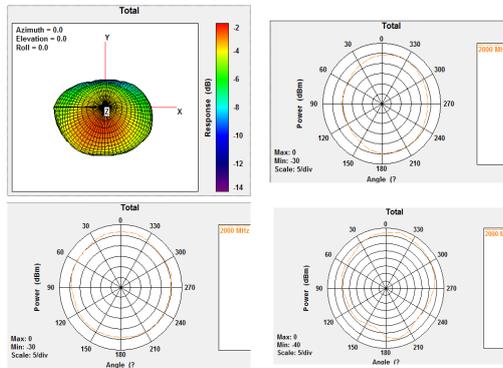
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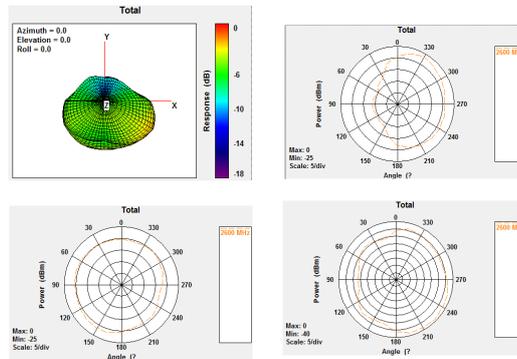
6.4 Radiation Pattern

Main ant

2100MHz 3D3D&2D



2600MHz 3D3D&2D



Main antenna: GSM850/900/1800/1900, WCDMA band1/2/5/8, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3

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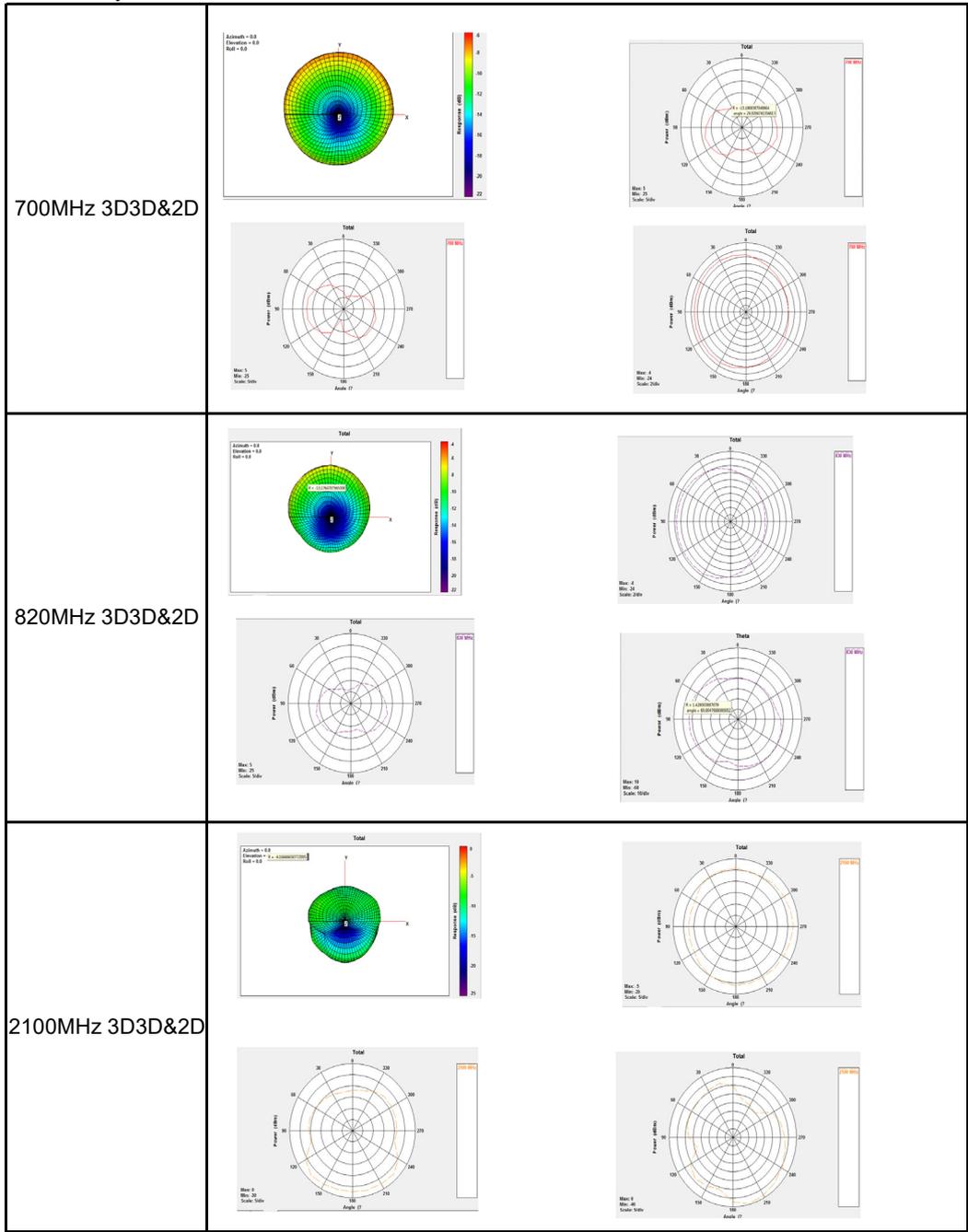
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6.4 Radiation Pattern

Diversity ant

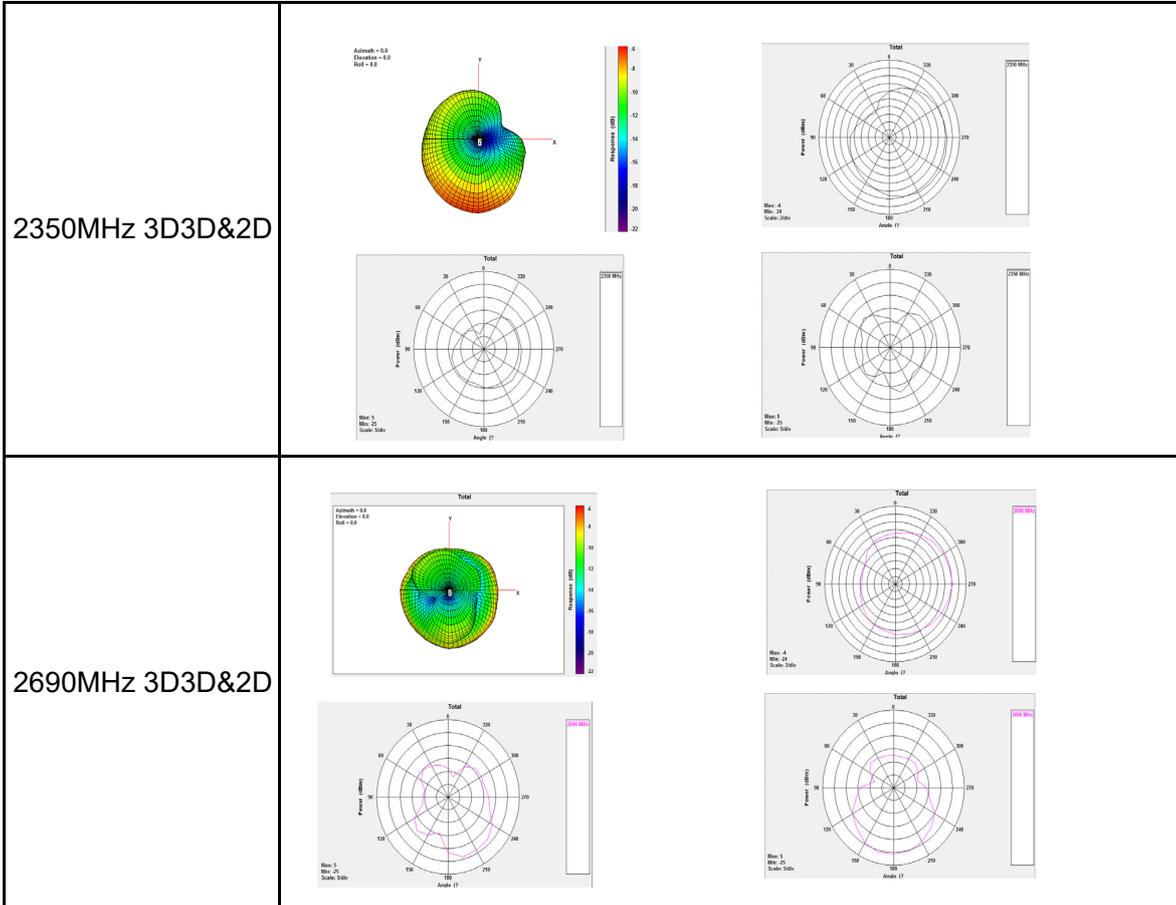


Diversity antenna:GSM900/1800,WCDMA band1,TD-SCDMA A/F,TDD-LTE band38/39/40/41,FDD-LTE band1/3/7;

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**6.4 Radiation Pattern**

Diversity ant

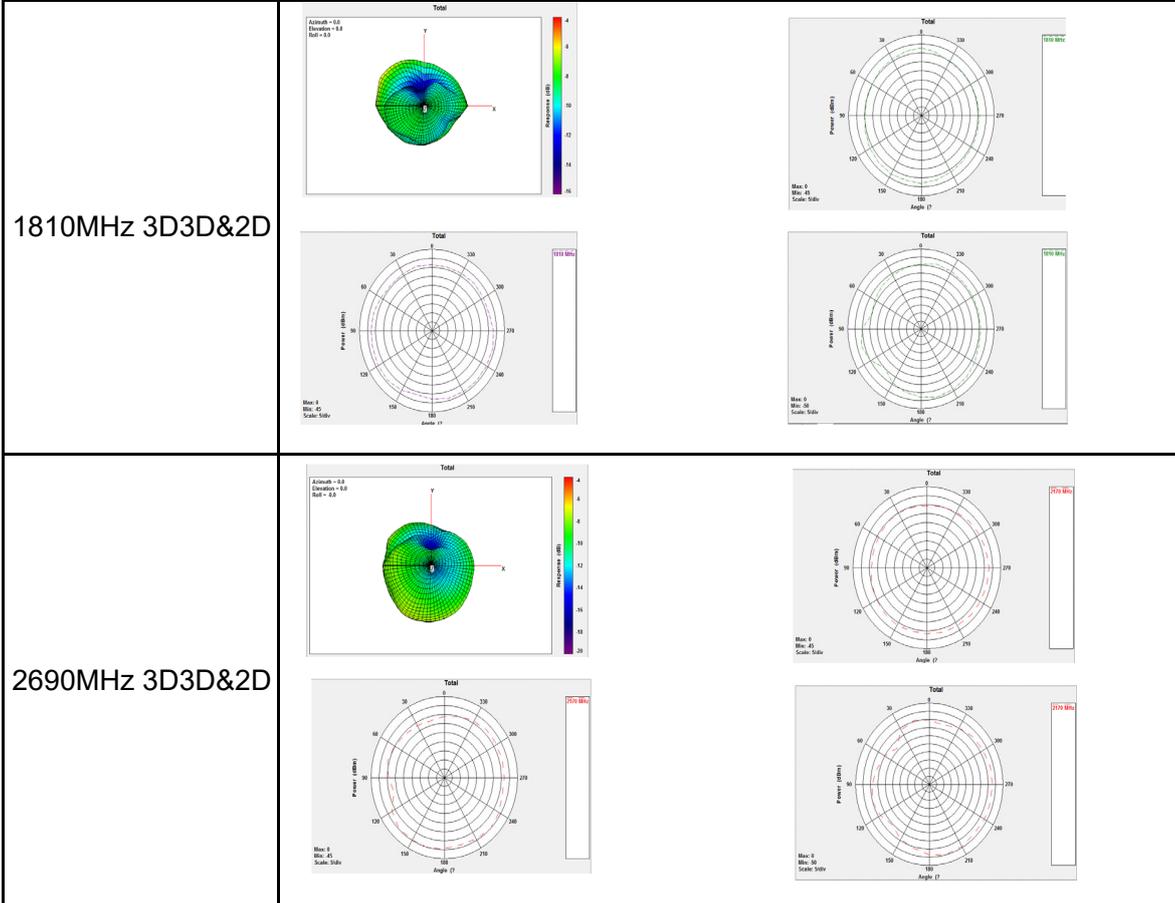


Diversity antenna:GSM900/1800,WCDMA band1,TD-SCDMA A/F,TDD-LTE band38/39/40/41,FDD-LTE band1/3/7;

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6.4 Radiation Pattern

mimo ant

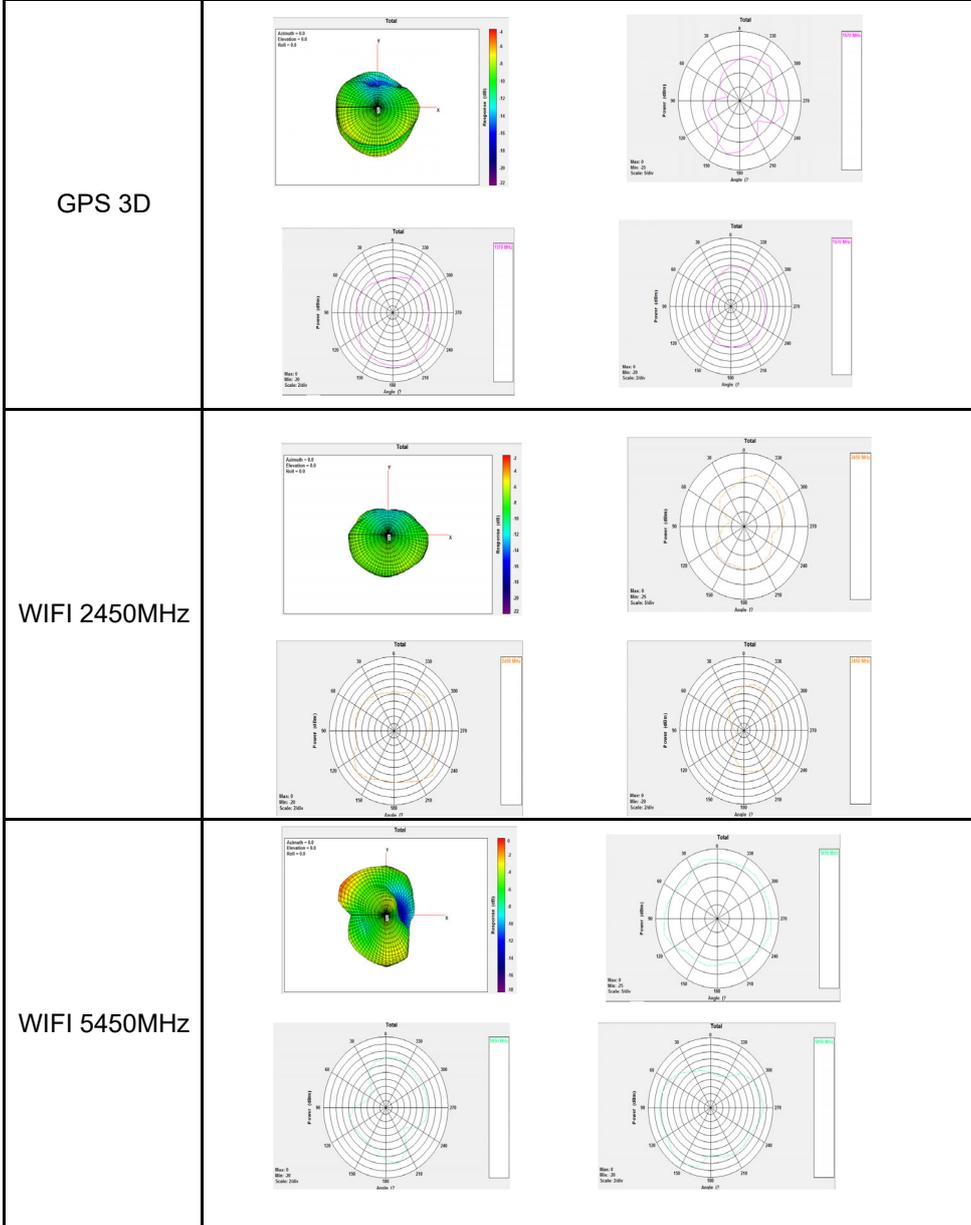


GPS&WIFI antenna

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6.4 Radiation Pattern

GPS&wifi ant



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**Main antenna: GSM850/900/1800/1900, WCDMA band1/2/5/8, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3/7;**
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**6.5 Efficiency  
main ant**

Freq.	Eff. (%)	Eff. (dB)	peak gain. (dB)
700	13%	-8.87	-5.57
710	14%	-8.59	-5.05
720	15%	-8.13	-4.71
730	17%	-7.65	-4.23
740	19%	-7.27	-4.10
750	19%	-7.26	-4.25
760	18%	-7.45	-4.43
770	17%	-7.79	-5.13
780	14%	-8.44	-5.74
790	12%	-9.19	-6.26
800	10%	-9.92	-7.05
810	8%	-10.95	-7.23
820	10%	-9.97	-6.43
830	12%	-9.25	-5.94
840	13%	-8.86	-5.66
850	13%	-8.71	-5.65
860	13%	-8.83	-5.89
870	13%	-8.97	-5.96
880	12%	-9.28	-6.77
890	11%	-9.70	-6.66
900	13%	-8.76	-5.74
910	14%	-8.60	-5.62
920	14%	-8.53	-5.32
930	12%	-9.05	-5.74
940	11%	-9.59	-6.09
950	10%	-10.13	-6.90
960	8%	-10.75	-7.19
1710	23%	-6.36	-3.2
1730	22%	-6.54	-3.3
1750	22%	-6.66	-3.3
1770	23%	-6.40	-2.9
1790	23%	-6.32	-2.8
1810	23%	-6.40	-2.9
1830	23%	-6.39	-2.8
1850	20%	-7.07	-4.1

Freq.	Eff. (%)	Eff. (dB)	peak gain. (dB)
1870	22%	-6.6	-3.9
1890	23%	-6.4	-3.6
1910	23%	-6.3	-3.1
1930	23%	-6.3	-2.8
1950	24%	-6.2	-3.2
1970	24%	-6.3	-2.9
1990	24%	-6.1	-2.8
2010	26%	-5.8	-2.1
2030	26%	-5.9	-1.9
2050	25%	-5.9	-2.1
2070	24%	-6.1	-2.1
2090	23%	-6.3	-2.1
2110	21%	-6.8	-2.6
2130	20%	-6.9	-2.6
2150	20%	-7.0	-2.8
2170	19%	-7.2	-3.1
2300	25%	-6.0	-3.0
2320	25%	-6.0	-3.2
2340	23%	-6.3	-3.8
2360	22%	-6.6	-3.9
2380	22%	-6.6	-4.2
2400	20%	-6.9	-4.1
2500	27%	-5.7	-1.9
2520	28%	-5.5	-1.5
2540	29%	-5.3	-1.3
2560	30%	-5.2	-1.1
2580	30%	-5.2	-1.2
2600	29%	-5.3	-1.0
2620	30%	-5.2	-1.1
2640	30%	-5.2	-0.7
2660	30%	-5.3	-0.9
2680	30%	-5.3	-0.8
2690	30%	-5.28	-0.82

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**Diversity antenna: GSM900/1800, WCDMA band1, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3/7;**
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## 6.5 Efficiency

### Diversity ant

Freq.	Eff. (%)	Eff. (dB)	peak gain. (dB)
700	11%	-9.5	-6.2
710	12%	-9.2	-5.8
720	13%	-8.8	-5.5
730	14%	-8.5	-5.2
740	14%	-8.5	-5.2
750	13%	-8.7	-5.4
760	13%	-8.9	-5.5
770	13%	-8.8	-5.8
780	13%	-8.8	-6.2
790	12%	-9.2	-6.5
800	11%	-9.6	-6.6
810	12%	-9.3	-6.4
820	12%	-9.0	-5.9
830	13%	-9.0	-5.8
840	12%	-9.1	-5.8
850	12%	-9.1	-5.7
860	12%	-9.2	-5.7
870	11%	-9.5	-5.9
880	11%	-9.7	-5.9
890	11%	-9.5	-6.0
900	13%	-8.9	-5.4
910	13%	-8.9	-5.2
920	12%	-9.1	-5.3
930	12%	-9.2	-5.6
940	11%	-9.5	-5.8
950	10%	-10.0	-6.2
960	9%	-10.3	-6.6
1710	17%	-7.6	-3.0
1730	17%	-7.6	-2.9
1750	17%	-7.7	-3.0
1770	17%	-7.8	-3.2
1790	16%	-7.9	-3.3
1810	17%	-7.7	-3.3
1830	17%	-7.6	-3.4
1850	17%	-7.8	-3.4

Freq.	Eff. (%)	Eff. (dB)	peak gain.
1870	16%	-7.8	-1.2
1890	17%	-7.8	-0.8
1910	17%	-7.7	-0.6
1930	18%	-7.5	-0.4
1950	18%	-7.4	-0.2
1970	18%	-7.4	-0.2
1990	18%	-7.6	-0.3
2010	18%	-7.5	-0.2
2030	18%	-7.5	-0.1
2050	17%	-7.6	-0.2
2070	17%	-7.6	0.0
2090	17%	-7.7	-0.2
2110	16%	-7.9	-0.4
2130	16%	-7.9	-0.4
2150	15%	-8.1	-0.6
2170	15%	-8.2	-0.6
2310	21%	-6.8	-0.7
2330	21%	-6.8	-0.6
2350	22%	-6.7	-0.2
2370	22%	-6.6	-0.2
2390	22%	-6.6	0.0
2410	22%	-6.5	0.1
2430	23%	-6.4	0.4
2450	24%	-6.2	0.9
2470	25%	-6.1	1.1
2490	25%	-5.9	1.3
2510	25%	-6.1	1.2
2530	24%	-6.1	1.3
2550	25%	-6.1	1.5
2570	24%	-6.2	1.2
2590	24%	-6.2	1.1
2610	23%	-6.3	1.1
2630	22%	-6.6	0.9
2650	21%	-6.8	0.8
2670	20%	-7.1	0.5
2690	19%	-7.2	0.5



## 6.5 Efficiency

### GPS/BT/WIFI ant

Frequency/MHZ	Efficiency	Efficiency .	Peak Gain. dB
1555	26%	-5.81	-0.87
1560	27%	-5.73	-0.94
1565	27%	-5.74	-1.07
1570	27%	-5.73	-1.39
1575	28%	-5.57	-0.79
1580	28%	-5.60	-1.18
1585	26%	-5.81	-1.66
1590	27%	-5.67	-1.26

2412	28%	-5.53	0.38
2417	29%	-5.44	0.57
2422	29%	-5.33	0.56
2427	29%	-5.44	0.46
2432	28%	-5.49	0.38
2437	27%	-5.62	0.18
2442	27%	-5.67	-1.26
2447	26%	-5.86	-1.42
2452	26%	-5.81	-0.20
2457	25%	-5.99	-0.67
2462	25%	-6.09	-0.96
2467	24%	-6.20	-1.18
2472	23%	-6.43	-1.60

5150	19%	-7.13	-1.72
5200	20%	-6.96	-1.56
5250	21%	-6.71	-1.51
5300	22%	-6.57	-1.25
5350	21%	-6.83	-1.50
5400	21%	-6.88	-1.83
5450	21%	-6.79	-1.75
5500	20%	-7.08	-1.98
5550	19%	-7.16	-2.58
5600	20%	-6.94	-2.43
5650	21%	-6.80	-2.21
5700	21%	-6.68	-2.20
5750	23%	-6.44	-1.97
5800	23%	-6.37	-1.89
5850	24%	-6.29	-1.79

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## 7.Active Measurement Data

Band	channel	TRP	TIS
<b>GSM850</b>	128	23.8	-103.0
	190	24.6	-102.9
	251	24.8	-101.7
<b>GSM900</b>	975	23.7	-103.1
	37	24.8	-102.9
	124	24.8	-101.4
<b>DCS</b>	512	23.6	-105.7
	698	24.8	-105.8
	885	24.2	-104.7
<b>PCS</b>	512	23.9	-105.1
	661	23.6	-105.2
	810	23.1	-103.4

Band	channel	TRP	TIS	Band	channel	TRP	TIS
<b>WCDMA band 1</b>	9612	17.6	-106.1	<b>WCDMA band 4</b>	1312	19.6	-106.5
	9750	17.8	-106.7		1412	18.6	-105.8
	9888	18.1	-105.8		1513	17.5	-104.4
<b>WCDMA band 2</b>	9262	18.1	-107.4				
	9400	18.3	-106.6				
	9538	17.7	-105.6				
<b>WCDMA band 5</b>	4132	15.8	-105.4				
	4183	16.2	-105.6				
	4233	16.3	-105.2				
<b>WCDMA band 8</b>	2712	15.9	-105.8				
	2788	15.9	-105.2				
	2863	16.0	-104.4				

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**Main antenna: GSM850/900/1800/1900, WCDMA band1/2/5/8, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3/7;**
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## 7. Active Measurement Data

Band	channel	TRP	TIS	Band	channel	TRP	TIS
LTE 38	37850	20.1	-91.1	LTE 40	38750	18.6	-91.0
	38000	19.8	-91.2		39150	18.9	-91.6
	38150	18.7	-92.4		39550	17.9	-91.4
LTE 41	39750	18.6	-90.7				
	40620	18.9	-91.3				
	41490	17.6	-91.7				

Band	channel	TRP	TIS	Band	channel	TRP	TIS
LTE 1	18050	18.3	-94.5	LTE 7	20750	19.4	-94.2
	18300	17.9	-94.2		21100	19.6	-94.8
	18549	18.4	-93.8		21449	18.6	-94.5
LTE 2	18650	18.0	-94.6	LTE 8	21500	14.5	-92.5
	18900	17.8	-94.4		21625	14.9	-92.0
	19150	17.3	-93.9		21750	14.8	-91.5
LTE 3	19250	18.4	-98.0	LTE 28	27260	16.5	-90.7
	19575	18.9	-97.2		27435	16.3	-90.3
	19900	19.0	-95.8		27610	15.3	-91.0
LTE 4	20000	18.0	-91.4				
	20175	18.7	-91.4				
	20350	19.0	-91.5				
LTE 5	20450	15.3	-92.0				
	20525	15.1	-91.3				
	20600	14.3	-91.1				

## 8. Antenna measurement spec on RF test jig

Test band	Reference frequency(MHz)	Spec(MHz)
MAIN	818/842	±10
	1719/1772	±20
	2502/2595	±20
diversity	1463/1545	±20
	2124/2209	±20
GPS&WIFI2.4	1439/1479	±20
	2229/2335	±20



Main antenna: GSM850/900/1800/1900, WCDMA band1/2/5/8, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE band1/3/

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**7.Active Measurement Data**

GPS/BT/WIFI ant

Band	channel	TRP	TIS
<b>WIFI G</b>	<b>1</b>	13.6	-69.2
	<b>6</b>	13.8	-69.3
	<b>11</b>	13.7	-68.2
<b>WIFI A</b>	<b>44</b>	11.9	-68.1
	<b>60</b>	12.7	-68.4
	<b>157</b>	11.5	-68.5

**8. Antenna measurement spec on RF test jig**

Test band	Reference frequency(MHz)	Spec(MHz)
MAIN	818/842	± 10
	1719/1772	± 20
	2502/2595	± 20
diversity	1463/1545	± 20
	2124/2209	± 20
GPS&WIFI2	1439/1479	± 20
	2229/2335	± 20



Main antenna: GSM850/900/1800/1900, WCDMA band1/2/5/8, TD-SCDMA A/F, TDD-LTE band38/39/40/41, FDD-LTE b

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## 9. Mechanical Layout and Dimensions

### 9.1 Antenna holder mechanical layout and dimensions

\*\* RL spec presented in the table is only valid in AAC measurement condition. The measurement result can be different according to measurement conditions such as place, cable, tester and network analyzer etc. If the measurement condition is changed, make sure that reference frequency should be adjusted again by the provided reference antenna.

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