



**APPROVAL SHEET  
FOR ANTENNA**

**CUSTOMER:** xiaomi

---

FA-MAIN-SZ0204

FA-DIV-SZ0205

**AAC P/N:** FA-3IN1-SZ0206

---

**CUSTOMER P/N:** C3S F 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 B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO.	0	Issue:	x4	Revision Date:	2022/6/15	Page:	2/24
-----	---	--------	----	----------------	-----------	-------	------

## 1. Scope

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

## 2. Environmental Requirement

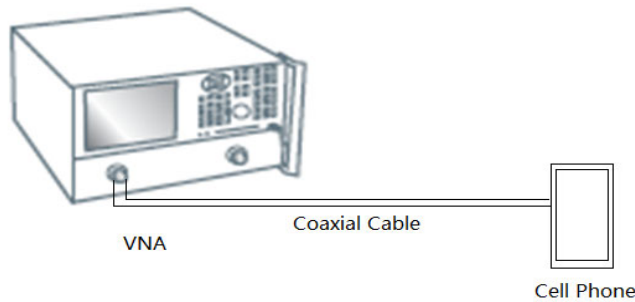
all components must be free from lead (Pb) and other banned or restricted substances according to customer's requirements.

## 3. Electrical Characteristic Measurement Method

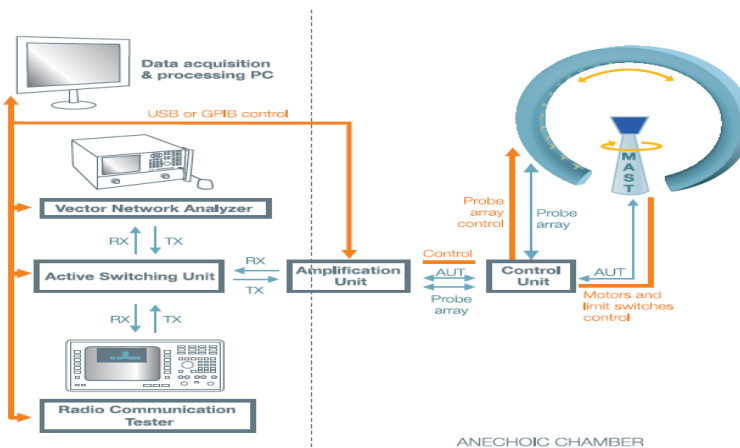
### 3.1 Measurement method

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

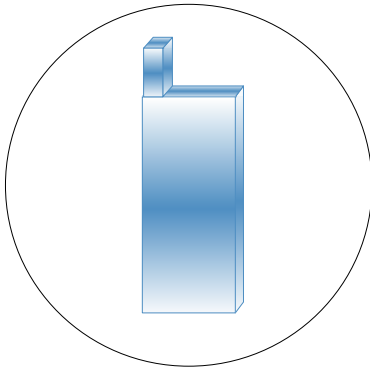




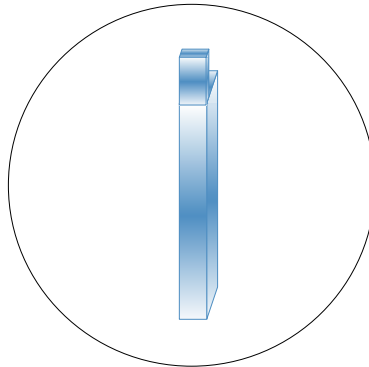
Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 3/24

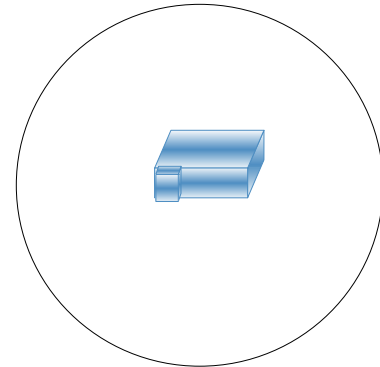
### 3.1.3 Cutting plane and polarization



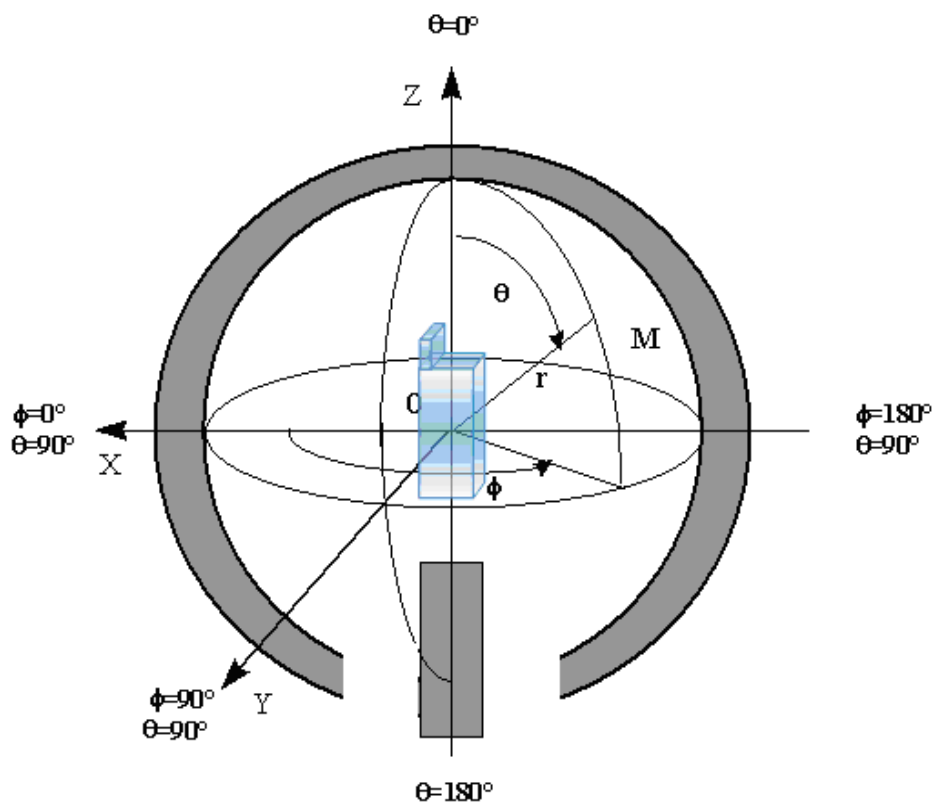
Phi=0deg



Phi=90deg



Theta=90deg



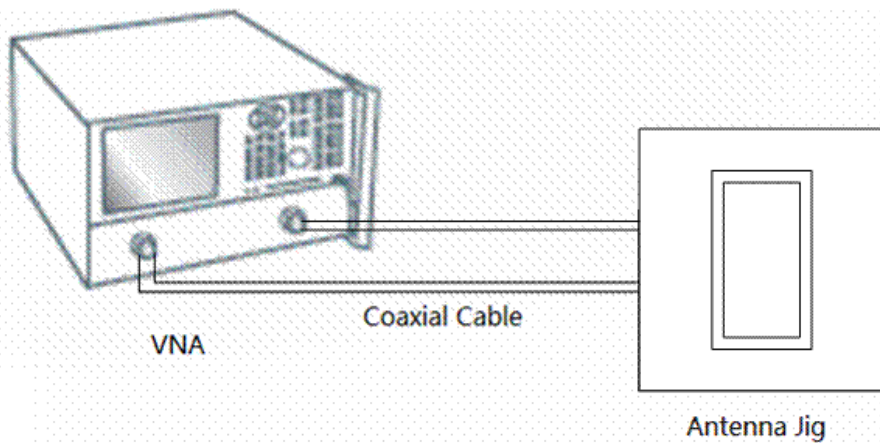
**AAC Confidential Information**

Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 4/24

### 3.1.4 RF Jig

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 be correlated to the performance in the real phone.



### 4. Pictures of prototype and antenna environment



Main ant



DIV ant

**AAC Confidential Information**

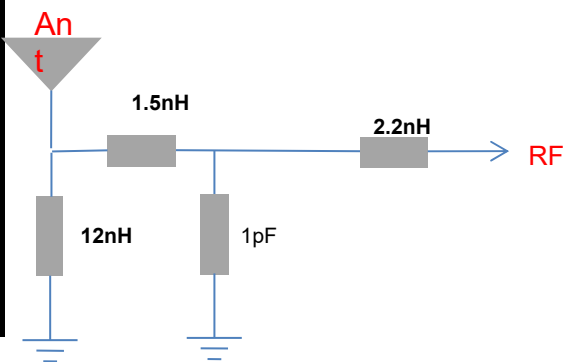
Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0 | Issue: x4 | Revision Date: 2022/6/15 | Page: 5/24

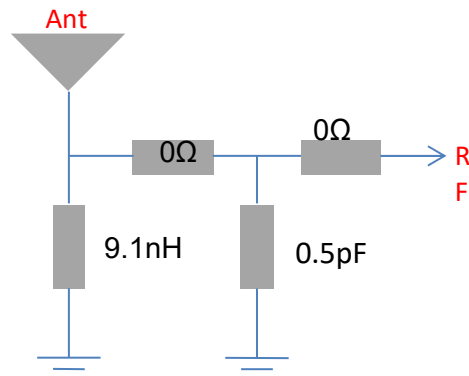


GPS/WIFI

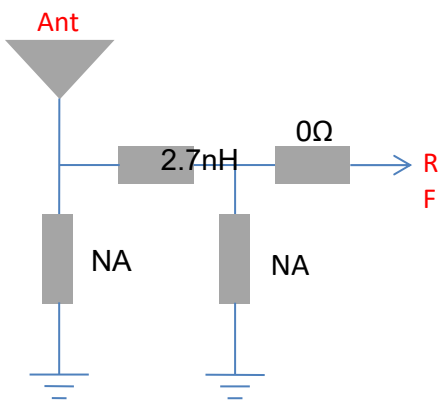
5. Matching Circuit



Main ant



Diversity ant



GPS/WIFI

AAC Confidential Information

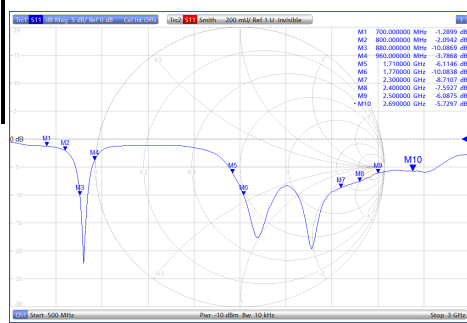


**Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;**

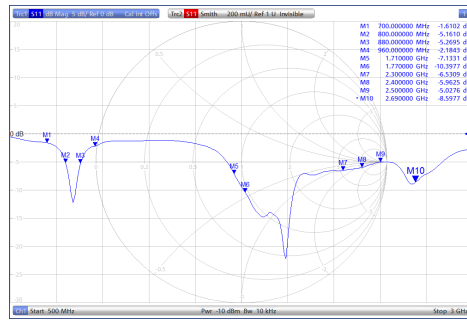
**NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 6/24**

## 6. Passive Measurement Data

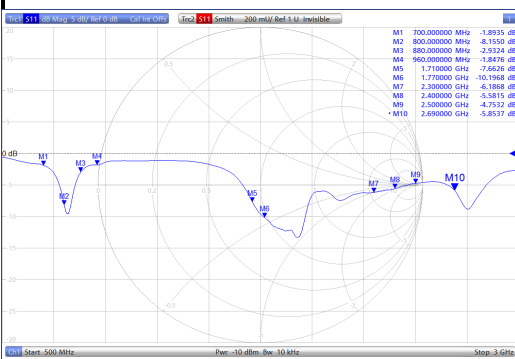
### 6.1 Main Ant



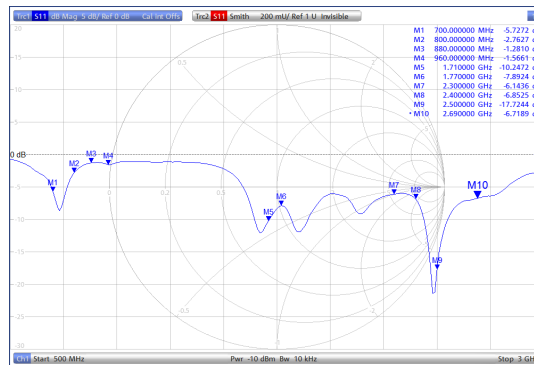
状态1



状态2



状态3



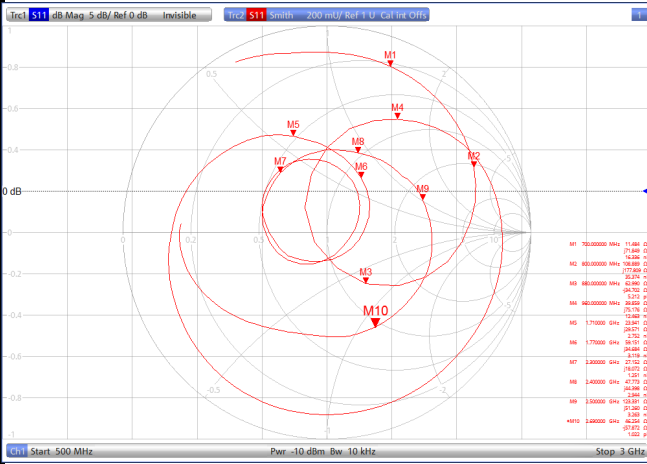
状态4

Fig. 1 Return Loss

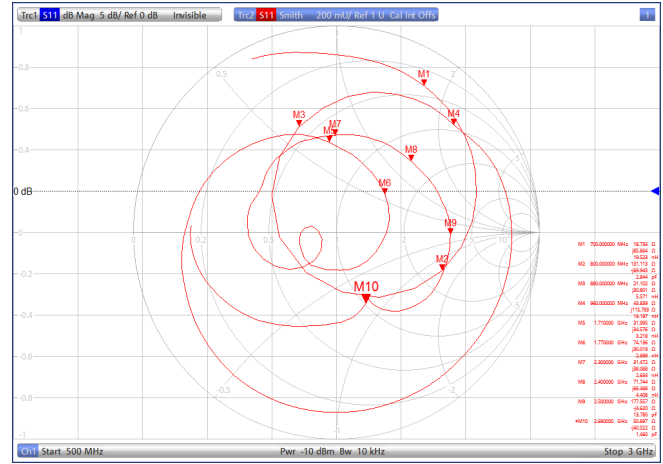
**AAC Confidential  
Information**

**Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;**

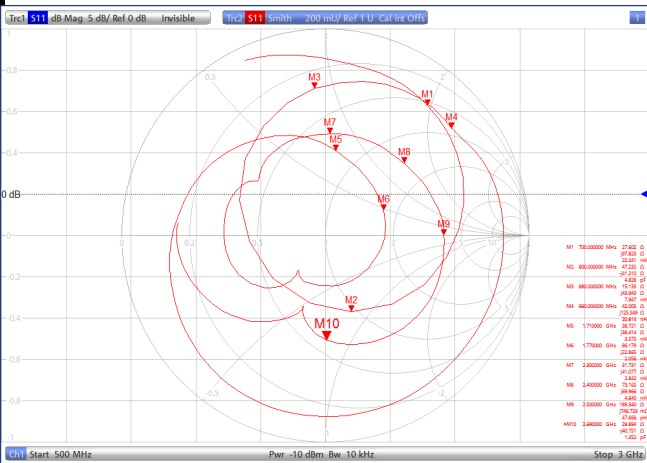
**NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 7/24**



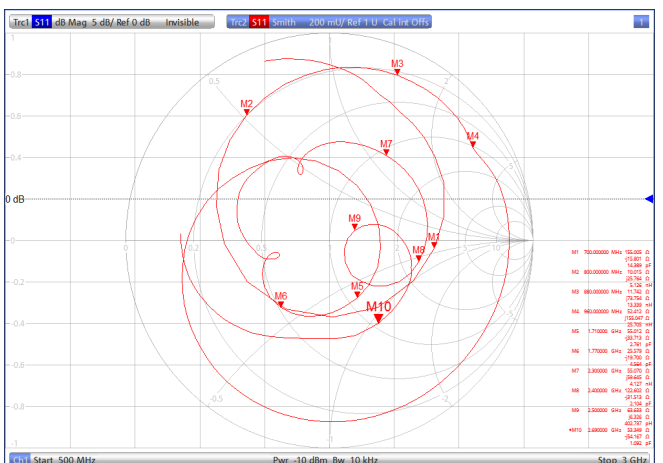
状态1



状态2



状态3



状态4

Fig.2 Smith Chart

**AAC Confidential Information**



**DIV antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;**

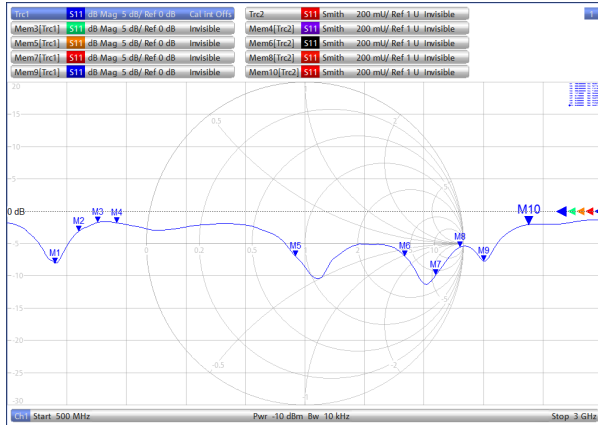
**NO. 0**

**Issue: x4**

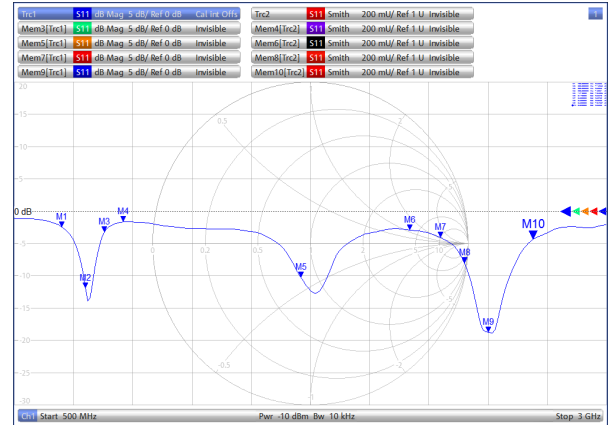
**Revision Date: 2022/6/15**

**Page: 8/24**

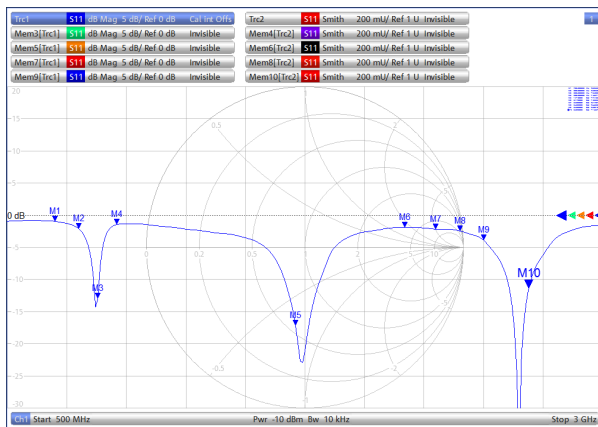
**6.2 Diversity antenna**



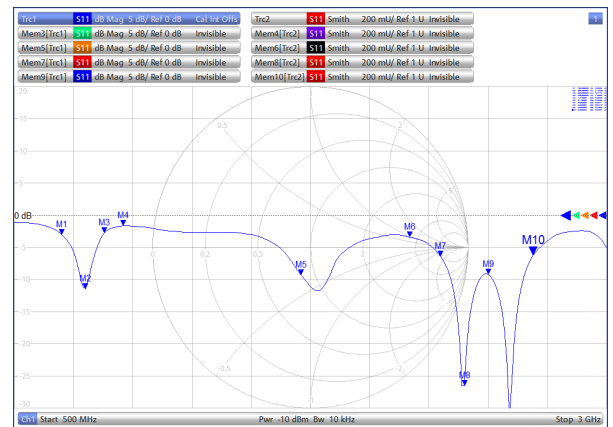
**状态1**



**状态2**



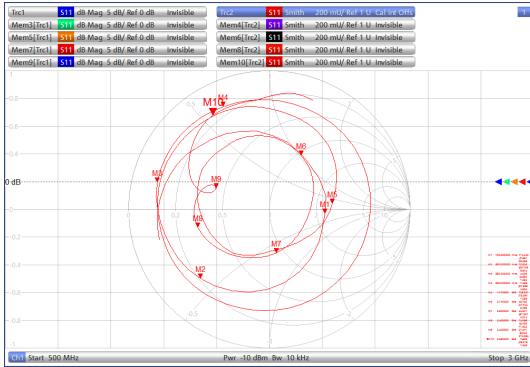
**状态3**



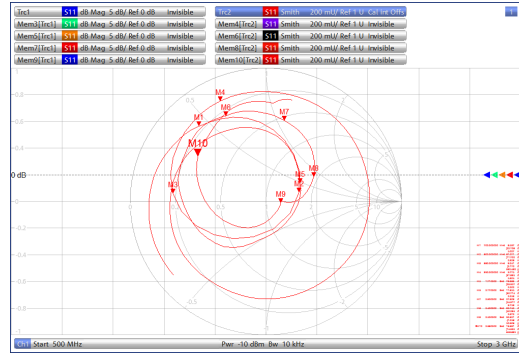
**状态4**

**Fig.1 Return Loss**

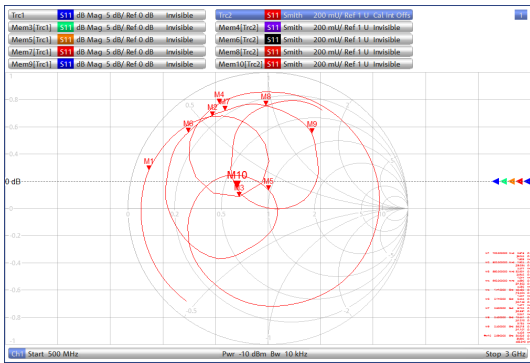
**AAC Confidential Information**



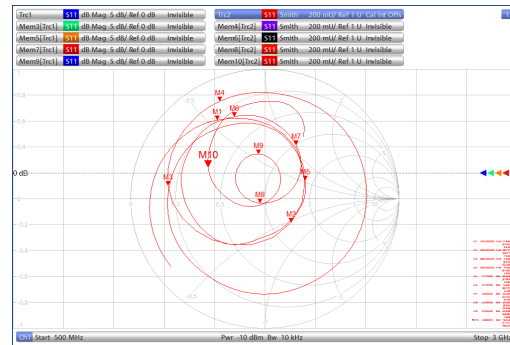
状态1



状态2



状态3



状态4

Fig. 2 smith chart

GPS&WIFI antenna:GPS,WIFI 2.4G;

NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 10/24

6.3 GPS/BT/WIFI Ant

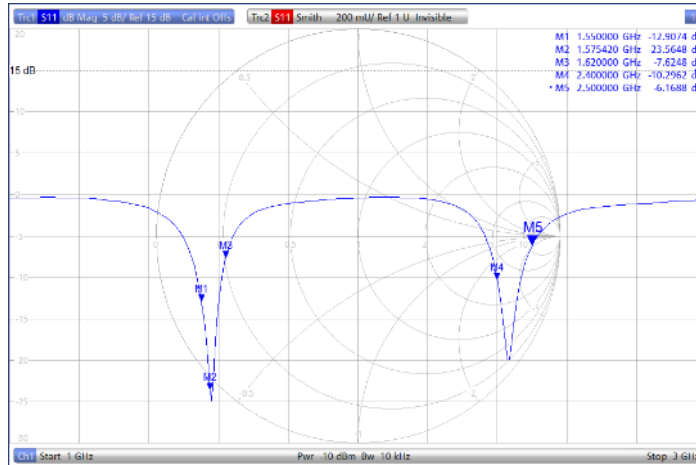


Fig.1 Return Loss

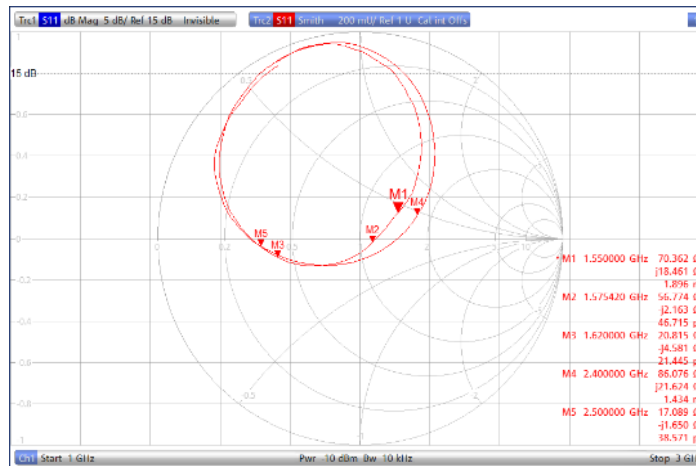


Fig.2 smith chart

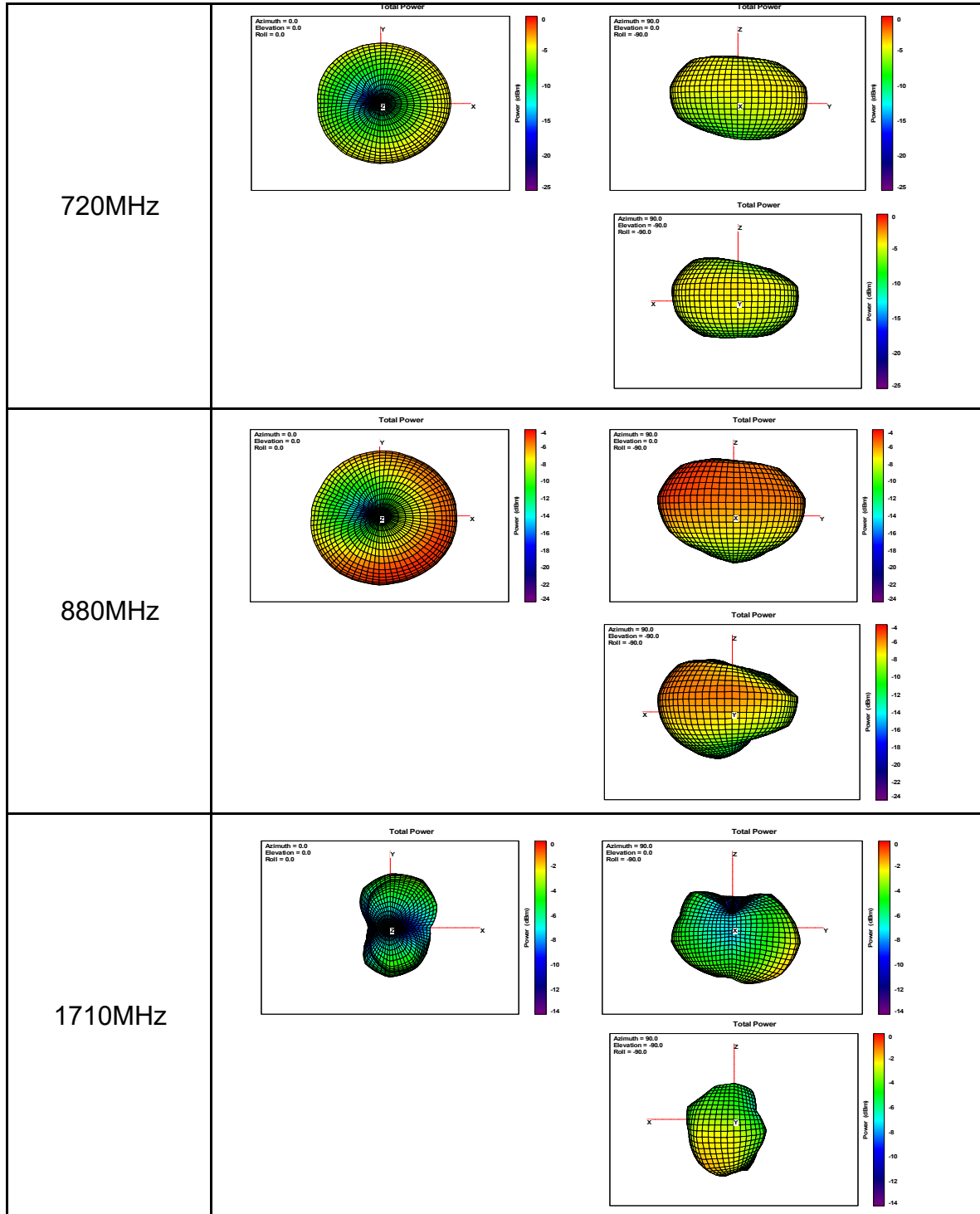
AAC Confidential Information

Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 11/24

6.4 Radiation Pattern

Main ant



AAC Confidential  
Information



Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO.

0

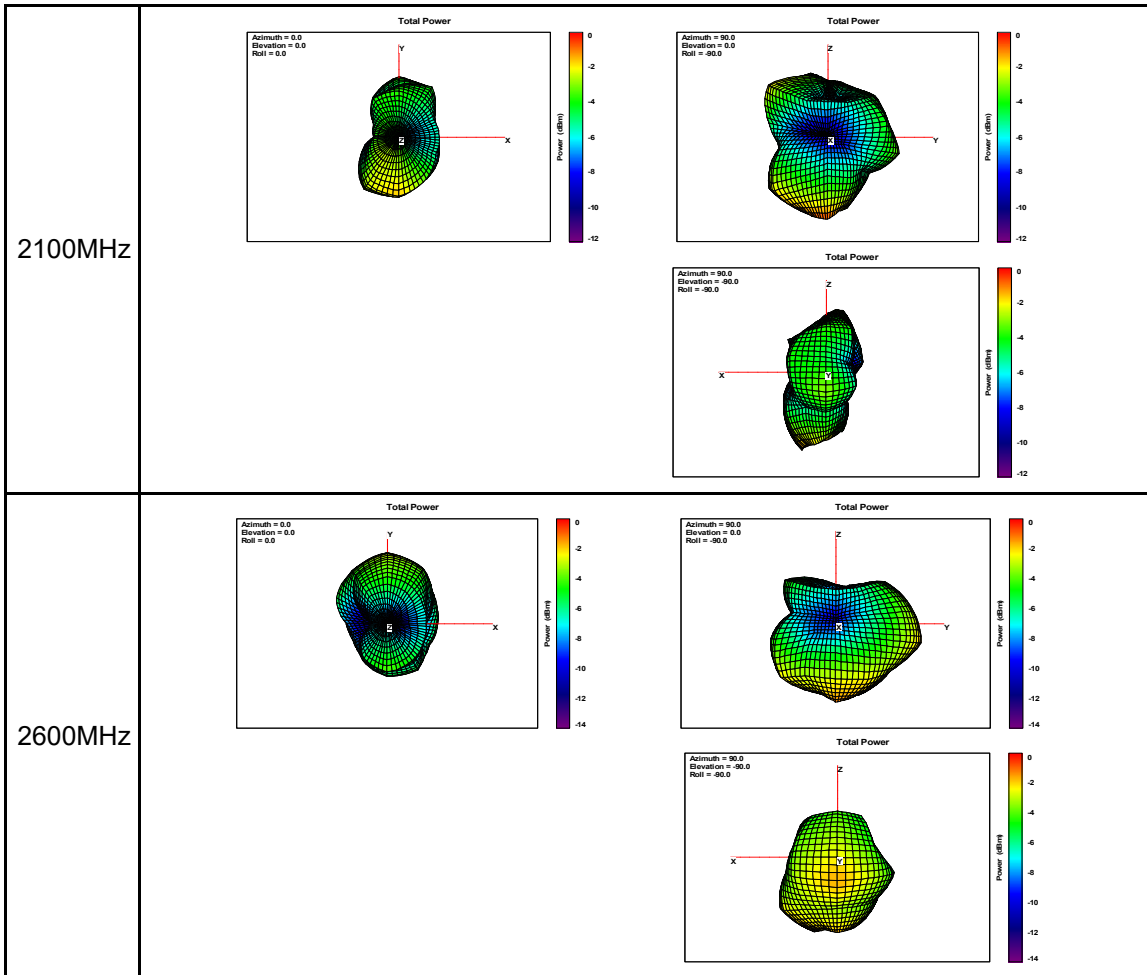
Issue: x4

Revision Date: 2022/6/15

Page: 12/24

## 6.4 Radiation Pattern

Main ant





DIV antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41

NO.

0

Issue: x4

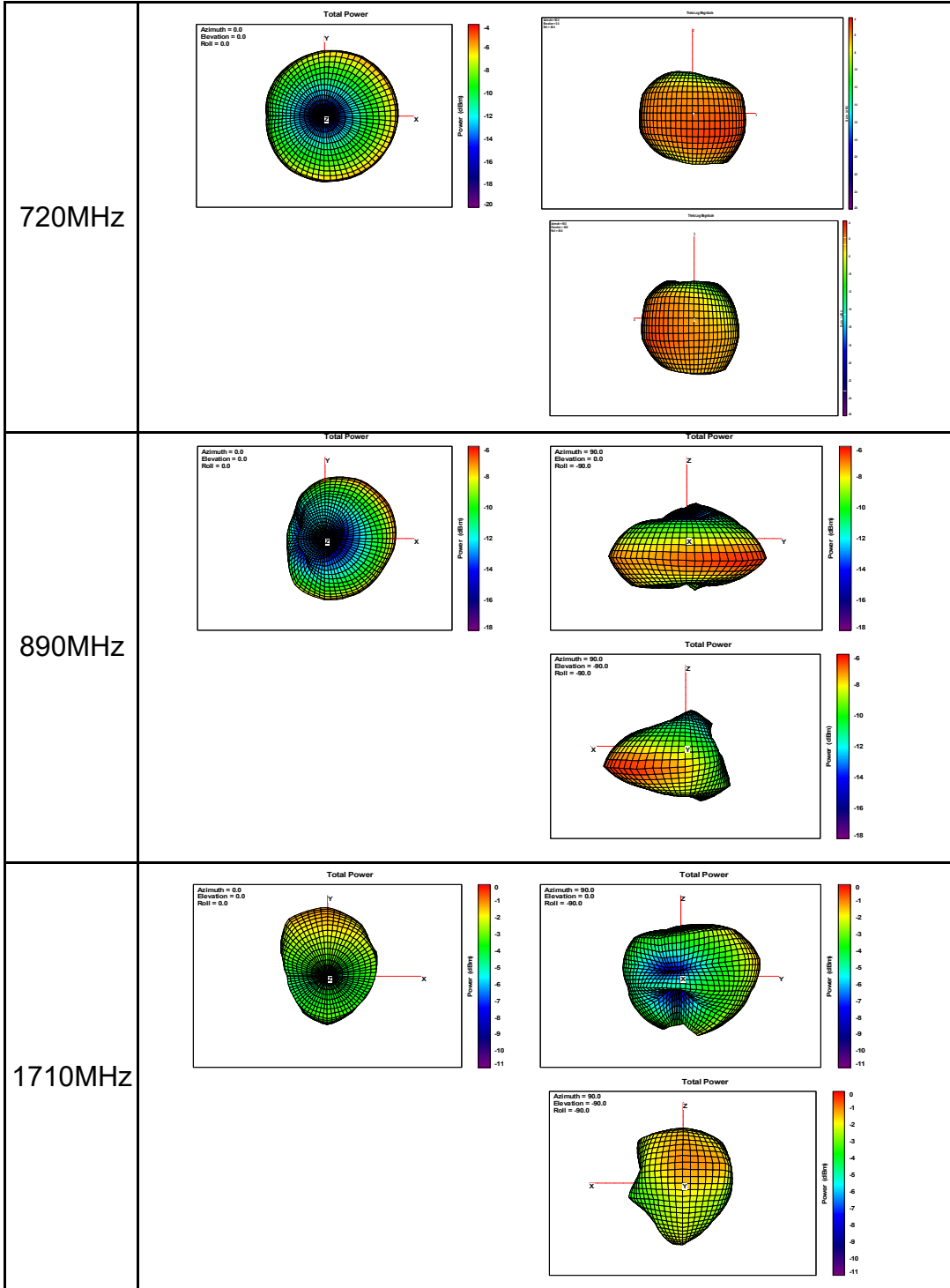
Revision Date:

2022/6/15

Page: 13/24

## 6.4 Radiation Pattern

### Diversity ant





DIV antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0

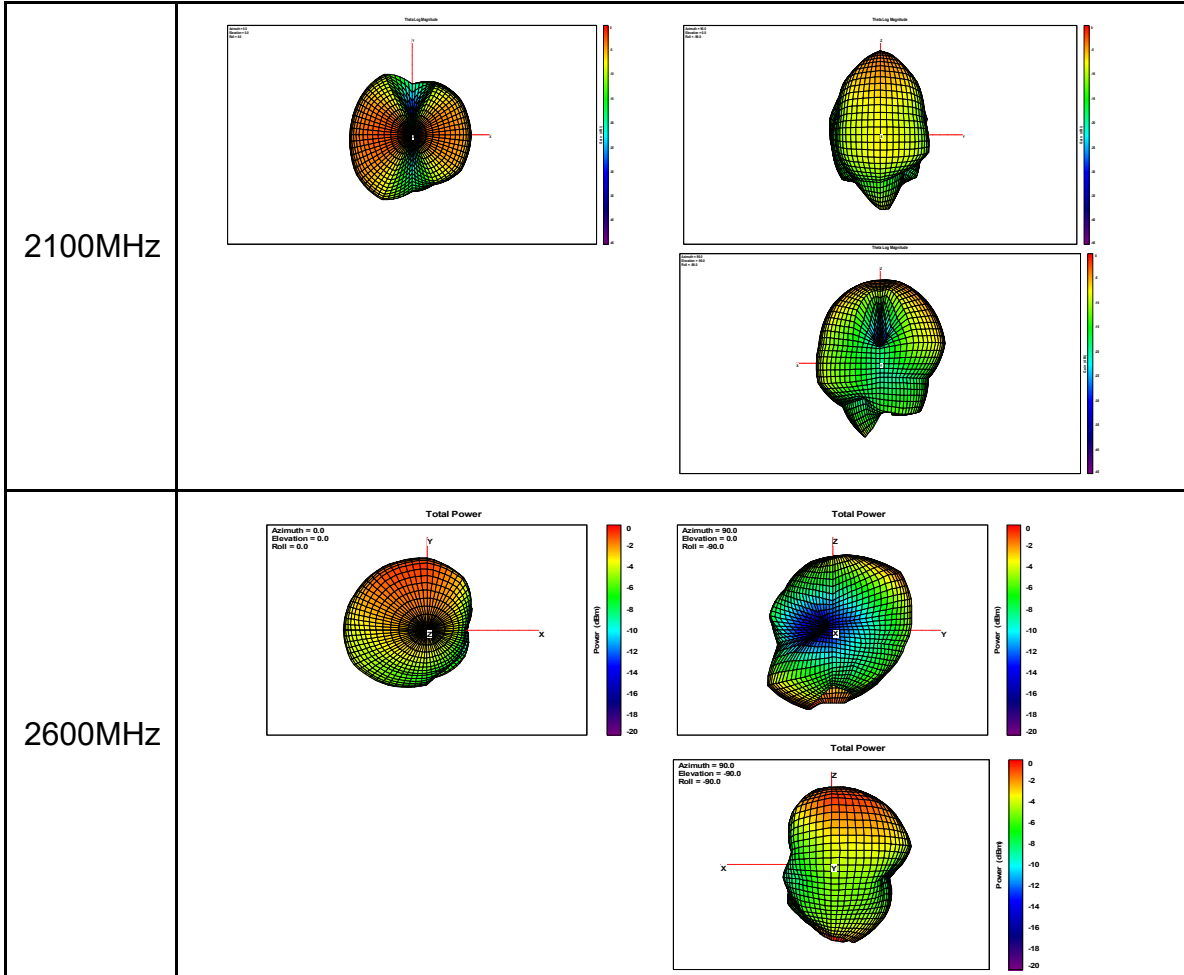
Issue: x4

Revision Date: 2022/6/15

Page: 14/24

### 6.4 Radiation Pattern

Diversity ant



**AAC Confidential  
Information**



## GPS&WIFI antenna:GPS,WIFI 2.4G;

NO.

0

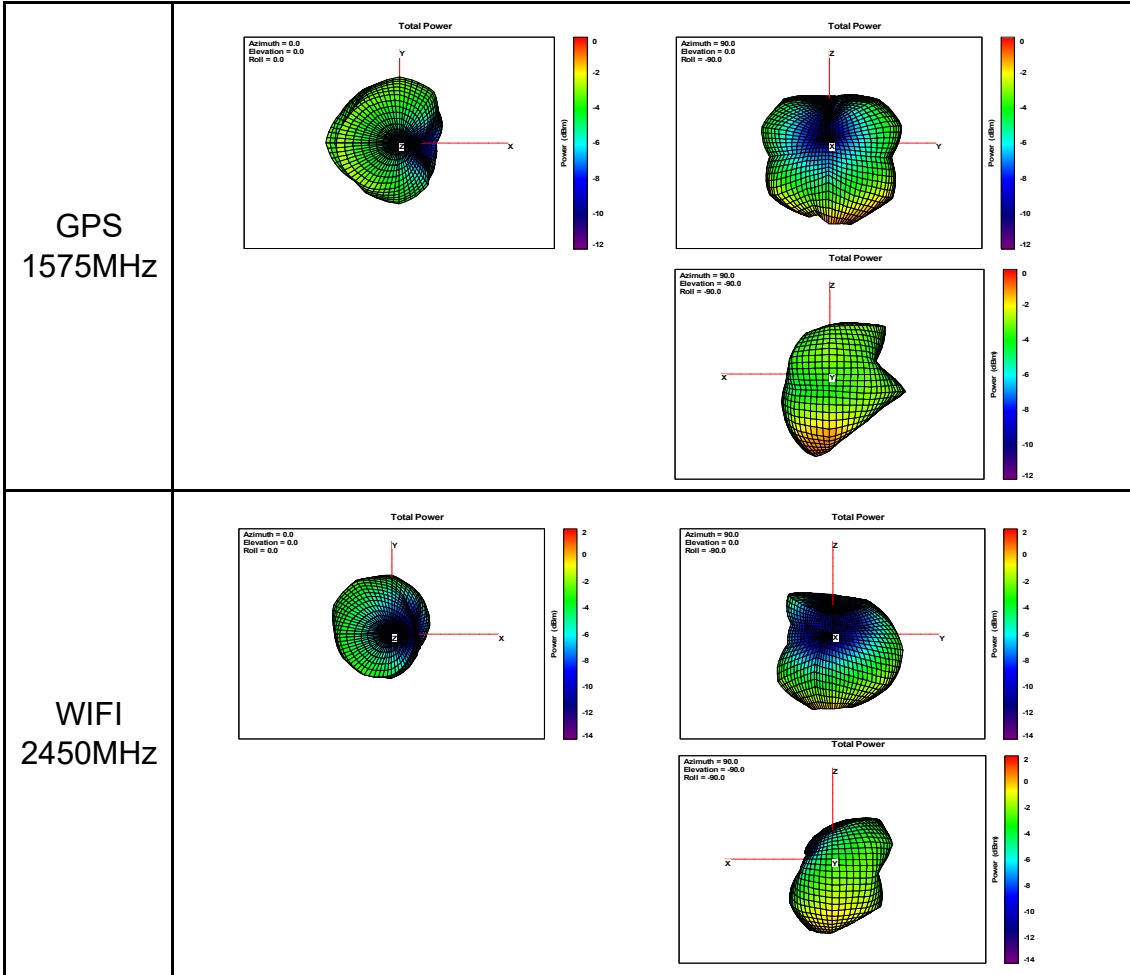
Issue: x4

Revision Date: 2022/6/15

Page: 15/24

### 6.4 Radiation Pattern

GPS&wifi ant



**AAC Confidential  
Information**







Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0 Issue: x4 Revision Date 2022/6/15 Page: 16/24

**6.5 Efficiency**

main ant

Fre (MHz)	Eff (dB)	Eff (%)	Peak Gain
700	-7.7	17.2	-4.6
720	-6.3	23.3	-3.7
740	-7.0	20.2	-4.3
760	-7.9	16.3	-5.2
780	-8.0	15.8	-4.8
800	-9.9	10.2	-6.8
820	-8.4	14.4	-4.7
840	-7.8	16.7	-4.4
860	-7.3	18.6	-4.2
880	-7.7	16.9	-4.3
900	-8.8	13.2	-5.3
920	-8.2	15.0	-4.7
940	-8.7	13.5	-5.1
960	-10.0	9.9	-6.3
1710	-5.6	27.7	-1.3
1730	-5.6	27.6	-1.3
1750	-5.3	29.7	-1.2
1770	-4.9	32.6	-0.7
1790	-5.1	30.7	-0.9
1810	-5.3	29.6	-1.0
1830	-5.3	29.8	-1.1
1850	-5.2	30.2	-0.9
1870	-5.3	29.8	-0.9
1890	-4.6	34.8	-0.5
1910	-4.9	32.3	-0.7
1930	-4.7	33.9	-0.3
1950	-4.7	34.3	-0.4
1970	-4.5	35.3	-0.4
1990	-4.5	35.8	-0.1
2010	-4.4	36.4	0.3
2030	-4.0	39.4	0.6
2050	-4.2	37.8	0.3
2070	-4.7	33.8	-0.4
2090	-5.2	30.1	-0.6
2110	-5.8	26.5	-0.7
2130	-5.6	27.4	0.3
2150	-5.7	27.0	0.9
2170	-5.3	29.2	1.6

Fre (MHz)	Eff (dB)	Eff (%)	Peak Gain
2190	-5.3	29.3	1.4
2210	-5.0	31.5	1.3
2230	-4.5	35.2	1.8
2250	-4.5	35.1	1.3
2270	-4.5	35.3	0.5
2290	-4.2	37.8	0.2
2310	-4.6	34.7	-0.6
2330	-4.9	32.0	-1.1
2350	-5.1	31.2	-1.5
2370	-5.3	29.8	-2.0
2390	-5.1	31.0	-1.6
2410	-5.0	31.5	-1.7
2430	-5.0	31.9	-1.6
2450	-5.6	27.7	-2.1
2470	-5.6	27.7	-2.2
2490	-5.6	27.5	-2.1
2510	-5.2	30.0	-0.9
2530	-5.2	30.3	-0.9
2550	-5.3	29.5	-1.3
2570	-5.4	28.6	-1.3
2590	-5.8	26.3	-1.9
2610	-5.9	26.0	-2.5
2630	-5.9	25.5	-2.9
2650	-6.3	23.6	-3.1
2670	-6.2	23.8	-3.3
2690	-6.2	23.7	-2.9

**AAC Confidential Information**

**DIV antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;**
**NO. 0 Issue: x4 Revision Date 2022/6/15 Page: 17/24**

## 6.5 Efficiency

### Diversity ant

Frequency (MHz)	Eff. (Db)	Eff. (%)	Peak Gain
700	-8.4	14.5	-5.4
720	-7.6	17.2	-4.5
740	-8.3	14.9	-4.9
760	-9.2	12.0	-5.8
780	-7.8	16.8	-4.7
800	-7.7	16.9	-4.1
820	-7.2	19.0	-3.2
840	-7.9	16.3	-4.3
860	-8.1	15.4	-4.4
880	-7.1	19.5	-3.4
900	-7.6	17.3	-3.9
920	-9.7	10.7	-6.1
940	-12.1	6.1	-8.5
960	-13.9	4.0	-10.4
1710	-4.1	39.1	-0.9
1730	-4.0	40.1	-0.4
1750	-3.8	41.8	-0.2
1770	-3.7	42.8	-0.4
1790	-4.1	38.6	-0.9
1810	-4.9	32.7	-1.0
1830	-5.3	29.8	-1.4
1850	-5.9	25.9	-1.4
1870	-5.9	25.9	-1.2
1890	-5.2	30.4	-1.0
1910	-5.4	29.1	-1.4
1930	-5.1	31.0	-1.5
1950	-5.2	30.4	-1.5
1970	-5.2	30.0	-1.6
1990	-5.4	29.0	-1.8
2010	-5.4	29.0	-1.6
2030	-5.0	31.5	-1.3
2050	-5.1	30.8	-1.3
2070	-5.4	28.7	-1.5
2090	-5.6	27.8	-1.5
2110	-5.6	27.4	-1.6
2130	-5.1	30.7	-1.1
2150	-5.1	31.0	-0.7
2170	-5.0	31.7	-0.6

Frequency	Eff. (Db)	Eff. (%)	Peak Gain
2190	-5.2	30.0	-0.6
2210	-5.2	30.1	-0.6
2230	-5.0	31.4	-0.5
2250	-5.4	29.0	-0.3
2270	-5.7	26.7	-1.0
2290	-6.3	23.4	-1.1
2310	-6.6	22.0	-1.5
2330	-6.8	20.9	-1.5
2350	-6.7	21.3	-1.5
2370	-6.8	20.8	-2.1
2390	-6.6	21.9	-2.0
2410	-6.5	22.1	-2.0
2430	-6.7	21.5	-1.8
2450	-7.7	17.2	-2.7
2470	-8.0	15.7	-3.1
2490	-7.1	19.3	-2.2
2510	-6.8	21.1	-1.5
2530	-6.3	23.4	-0.9
2550	-5.9	25.5	-0.6
2570	-5.6	27.5	-0.4
2590	-5.4	29.1	-0.1
2610	-5.0	31.5	0.2
2630	-4.8	33.5	0.7
2650	-5.0	32.0	0.8
2670	-4.9	32.1	1.0
2690	-5.1	31.0	1.1

**AAC Confidential Information**

**GPS&WIFI antenna:GPS,WIFI 2.4G;**
**NO. 0 Issue: x4 Revision Date 2022/6/15 Page: 18/24**

## 6.5 Efficiency

### GPS/WIFI

Frequency/MHZ	Eff (dB)	Eff (%)	Gain (dB)	Upper Hem. Total Radiated Pwr (dBm)
1550	-4.6	34.6	-1.1	-5.0
1560	-4.2	37.8	-0.4	-4.7
1570	-4.3	36.8	-0.4	-4.9
1580	-4.5	35.4	-0.7	-5.2
1590	-4.8	33.5	-0.6	-5.6
1600	-4.9	32.1	-1.1	-5.9
1610	-4.9	32.3	-0.8	-6.1
1620	-4.8	32.8	-0.7	-6.0

2400	-6.0	25.2	-0.6	-7.1
2410	-5.6	27.7	-0.4	-6.7
2420	-5.2	30.2	0.0	-6.3
2430	-4.9	32.5	0.5	-5.9
2440	-4.9	32.7	0.5	-5.9
2450	-5.2	30.4	0.0	-6.2
2460	-5.2	30.3	0.1	-6.2
2470	-5.1	30.6	0.2	-6.1
2480	-5.2	30.5	0.0	-6.1
2490	-5.2	30.3	-0.1	-6.1
2500	-5.2	30.3	-0.2	-6.1



Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO.

0

Issue: x4

Revision Date

2022/6/15

Page: 19/24

**7.Active Measurement Data**

BAND	CH	TRP	TIS	BAND	CH	TRP	TIS
GSM850	128	23.3	-106.7	DCS1800	512	23.9	-106.7
	190	24.4	-106.8		699	24.8	-107.8
	251	25.0	-104.3		885	24.1	-106.4
GSM900	975	21.9	-104.7	PCS1900	512	24.4	-105.4
	38	23.5	-106.0		661	24.1	-104.9
	124	23.9	-104.0		810	24.3	-104.6
BAND	CH	TRP	TIS	BAND	CH	TRP	TIS
WCDMA B1	9612	18.5	-111.3	WCDMA B8	2712	14.1	-106.5
	9750	18.3	-111.6		2788	15.3	-107.6
	9888	17.9	-109.9		2863	15.7	-106.3
WCDMA B5	4132	15.6	-108.4				
	4183	15.5	-108.9				
	4233	15.7	-107.4				

**AAC Confidential Information**



Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO. 0 Issue: x4 Revision Date 2022/6/15 Page: 20/24

**7.Active Measurement Data**

BAND	CH	TRP	TIS	BAND	CH	TRP	TIS
LTE B1 (10M)	18050	18.5	-98.8	LTE B38 (20M)	37850	17.6	-93.7
	18300	18.2	-98.8		38000	17.8	-92.5
	18550	18.0	-97.7		38150	17.8	-92.3
LTE B3 (10M)	19250	17.7	-97.3	LTE B40 (20M)	38750	18.5	-93.7
	19575	18.1	-97.8		39150	18.8	-93.9
	19900	17.3	-96.4		39550	17.3	-92.9
LTE B5 (10M)	20450	15.1	-93.6	LTE B41 (20M)	39750	17.7	-93.5
	20525	15.3	-94.4		40620	17.9	-93.8
	20600	15.5	-93.7		41490	17.9	-91.8
LTE B7 (10M)	20850	17.6	-97.1				
	21100	17.5	-96.2				
	21350	17.7	-97.4				
LTE B8 (10M)	21500	13.9	-95.6				
	21625	15.3	-95.4				
	21750	15.5	-93.9				
LTE B20 (10M)	24200	16.2	-93.2				
	24300	16.0	-93.8				
	24400	14.9	-94.3				
LTE B28 (10M)	27260	13.6	-94.9				
	27410	15.6	-93.4				
	27610	16.6	-92.7				



DIV antenna:GSM850/900/1800/1900,WCDMA B1/5/8,FDD-LTE B1/3/5/7/8/20/28,TDD-LTE B38/40/41;

NO.

0

Issue: x4

revision De

2022/6/15

Page: 21/24

**7.Active Measurement Data**

BAND	CH	TRP	TIS	BAND	CH	TRP	TIS
GSM850	128	23.9	-106.1	DCS1800	512	24.0	-107.1
	190	24.0	-105.9		699	24.9	-108.0
	251	24.2	-103.4		885	24.8	-107.0
GSM900	975	25.2	-103.1	PCS1900	512	25.1	-104.7
	38	25.7	-104.0		661	25.2	-104.9
	124	24.9	-101.9		810	24.8	-104.2
BAND	CH	TRP	TIS	BAND	CH	TRP	TIS
WCDMA B1	9612	17.3	-110.6	WCDMA B8	2712	15.1	-104.6
	9750	17.2	-110.4		2788	16.2	-105.6
	9888	17.1	-108.8		2863	16.0	-104.6
WCDMA B5	4132	15.0	-107.8				
	4183	15.8	-108.3				
	4233	16.7	-106.4				

**AAC Confidential Information**



DIV antenna:GSM850/900/1800/1900,WCDMA B1/5/8,FDD-LTE B1/3/5/7/8/20/28,TDD-LTE B38/40/41;

NO. 0 Issue: x4 Revision Date: 2022/6/15 Page: 22/24

**7.Active Measurement Data**

BAND	CH	TRP	TIS	BAND	CH	TRP	TIS
LTE B1 (10M)	18050	17.2	-97.4	LTE B38 (20M)	37850	19.6	-93.7
	18300	17.1	-97.7		38000	19.3	-92.8
	18550	17.1	-96.4		38150	19.1	-92.3
LTE B3 (10M)	19250	17.6	-97.3	LTE B40 (20M)	38750	18.5	-93.7
	19575	18.2	-97.6		39150	18.9	-93.3
	19900	17.9	-96.5		39550	17.9	-92.5
LTE B5 (10M)	20450	15.1	-92.5	LTE B41 (20M)	39750	19.6	-94.1
	20525	16.0	-93.2		40620	19.5	-94.3
	20600	16.7	-92.9		41490	18.0	-92.3
LTE B7 (10M)	20850	19.6	-94.9				
	21100	19.7	-94.4				
	21350	19.8	-95.5				
LTE B8 (10M)	21500	16.1	-94.0				
	21625	16.6	-94.0				
	21750	15.6	-92.0				
LTE B20 (10M)	24200	16.7	-93.5				
	24300	16.4	-94.0				
	24400	15.5	-94.7				
LTE B28 (10M)	27260	13.8	-94.4				
	27410	15.3	-93.4				
	27610	15.4	-92.6				





GPS&WIFI antenna:GPS,WIFI 2.4G;

NO. 0 Issue: x4 Revision Date 2022/6/15 Page: 23/24

**7.Active Measurement Data**

GPS/BT/WIFI ant

BAND	CH	TRP	TIS
		11M	11M
B	1	12.71	-81.99
	7	12.68	-81.46
	13	12.5	-81.5
		6M	54M
G	1	11.27	-69.35
	7	11.31	-68.57
	13	11.19	-68.91

GPS	
TIS	-151.5
TICN	42.2
UHS	-148.1

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

Test band	Reference frequency(MHz)	Spec(MHz)
MAIN	952 / 1067	±15
	1946 / 2622	±25
	3078 / 3499	±35
DIV	981 / 1028	±15
	2185 / 2240	±25
GPS & WIFI2.4 G	1636 / 1738	±15
	2930 / 3101	±25



Main antenna: GSM850/900/1800/1900, WCDMA B1/5/8, FDD-LTE B1/3/5/7/8/20/28, TDD-LTE B38/40/41;

NO.

0

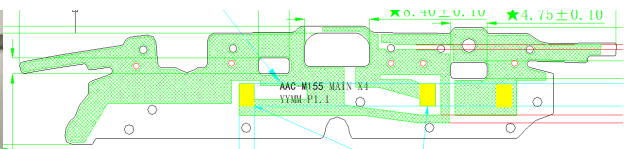
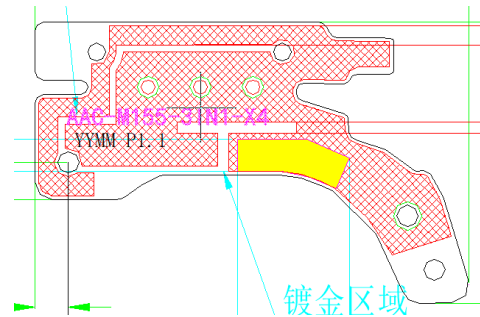
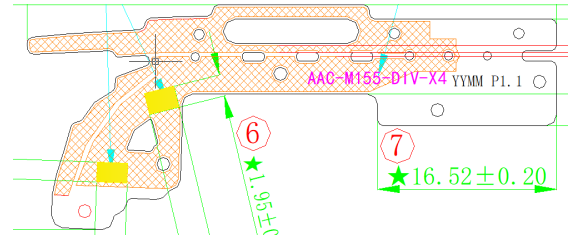
Issue: x4

Revision Date: 2022/6/15

Page: 24/24

## 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.

**AAC Confidential Information**