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Catalogue

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1.Basic information

Frequency band:

GSM:850/900/1800/1900.

WCDMA:B1/B2/B4/B5/B8.

FDD LTE:

B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B18/B19/B20/B26/B28B/B28A/B6

6

TDD LTE:B38/ B40/B41.

Others:

GPS/Beidou/GLONASS/Galileo,80211.a/b/g/n/ac/AX

2.4G/5G,Bluetooth.

2.1 Test Method Description and Data

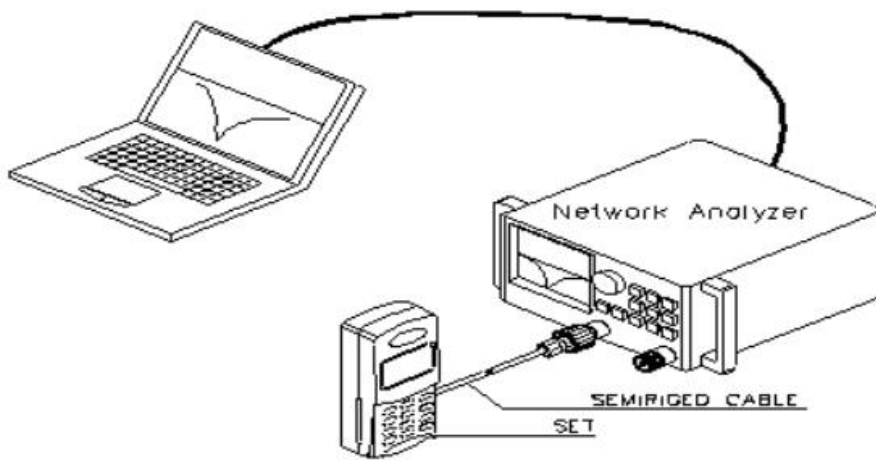
Device Name	Purpose
Vector Network Analyzer	S11/Impedance/ Passive Test
Agilent 8960 SP6010 R&S CMU200	Testing of mobile communication devices including GSM, GPRS, EDGE, CDMA2000, 1xEV-DO, TD-SCDMA, WCDMA, and HSDPA
R&S CMW500 MT8820C	Testing of mobile communication devices including TD-SCDMA, WCDMA, HSDPA, LTE, WIFI, and GPS
Agilent E4438C	Test GPS
MVG Chamber	Passive Test / OTA active Test / Efficiency/Gain

MT8000A	Testing of 5G NR mobile communication devices
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2 Passive Test Report

Test equipment: Network analyzer

Test method: Use a 50 ohm cable to lead out from the instrument test port, calibrate it with a calibration piece, then connect it to the SMA connector of the mobile phone device. Record the echo loss or standing wave ratio corresponding to relevant frequency points.



测试示意图

3 Active Test Report

TRP/TIS

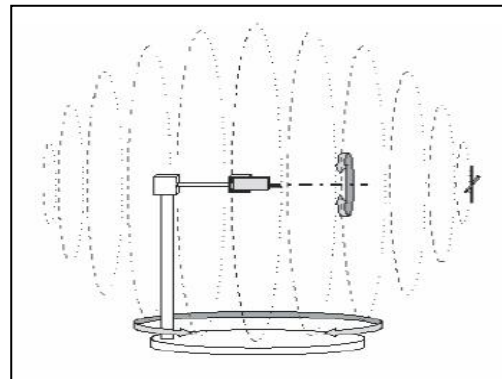
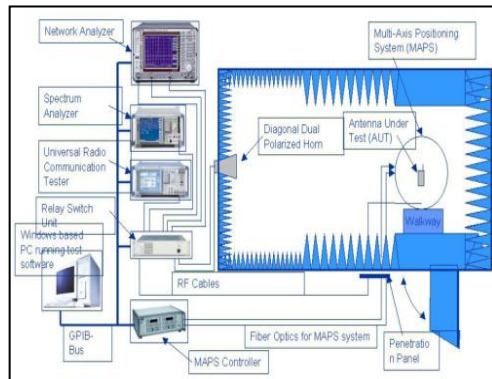
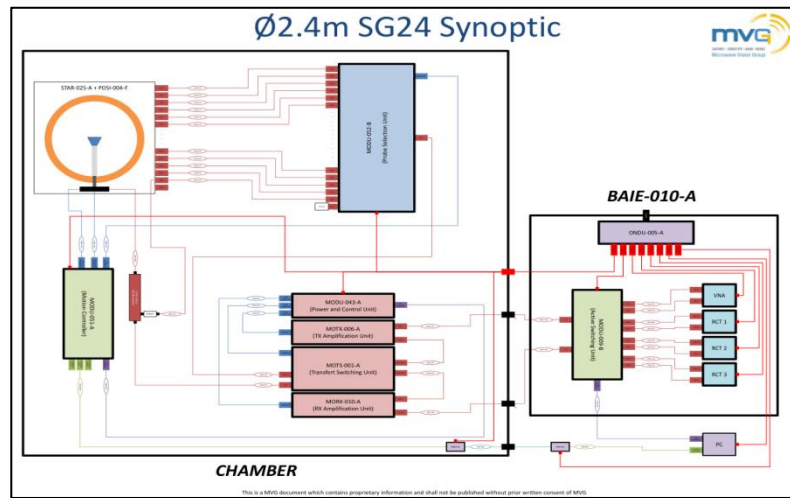
Testing Tools: Comprehensive Tester, Network Analyzer, Full-wave Far-field ETS, French MVG SG24LT (Satmio) near-field 3D microwave anechoic chamber, high-precision positioning system and its controller, and a computer test environment with automatic testing procedures: Temperature $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$, humidity $60\% \pm 15\%$. Testing Method: The testing method and calculations using the EST or Satimo 24LT system software TRP are carried out. During TRP testing, the DUT (Device Under Test) is in its maximum transmission power state. Three channels, high, medium, and low, are selected for testing. The position of the DUT is controlled by the positioning system, with a step size of 15 degrees, to measure the effective radiated power (EIRP) at each point in three-dimensional space. The average value on the spherical surface is calculated by integration, and the formula is as follows:

$$TRP \cong \frac{\pi}{2NM} \sum_{i=1}^{N-1} \sum_{j=0}^{M-1} [EiRP_{\theta}(\theta_i, \phi_j) + EiRP(\theta_i, \phi_j)] \sin(\theta_i)$$

During the TIS test, the DUT is in its maximum transmission power state. Three channels, high, medium, and low, are selected for testing. By controlling the position of the DUT and measuring

the received sensitivity at each point in three-dimensional space with a step size of 30 degrees, the average value on the spherical surface is calculated through integration. The calculation formula is as follows:

$$TIS \cong \frac{2NM}{\pi \sum_{i=1}^{N-1} \sum_{j=0}^{M-1} \left[\frac{1}{EIS_{\theta}(\theta_i, \phi_j)} + \frac{1}{EIS_{\phi}(\theta_i, \phi_j)} \right] \sin(\theta_i)}$$



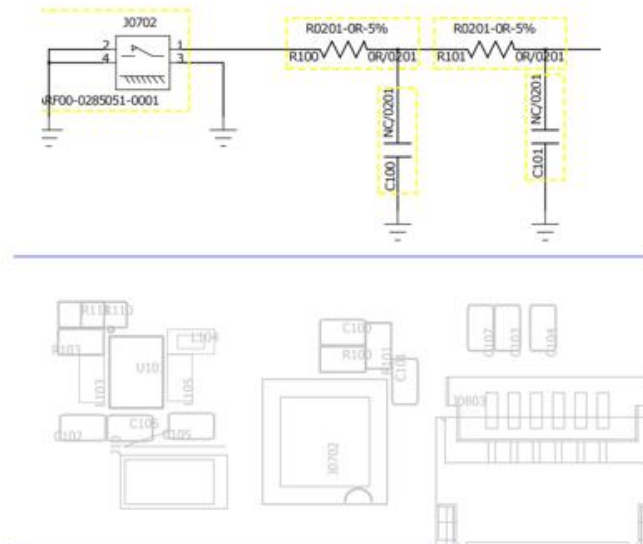
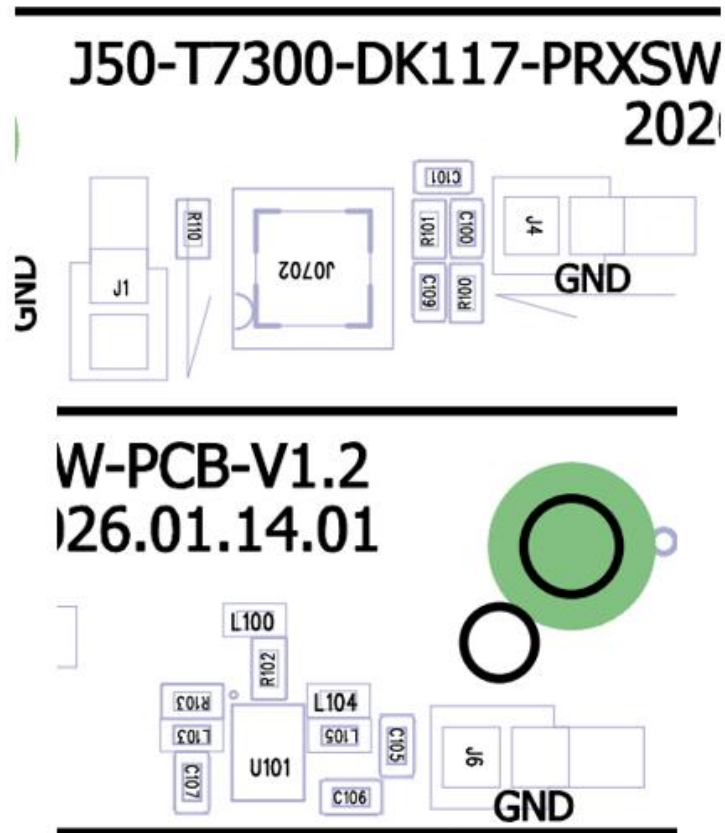
2. Matching circuit

Main Antenna

0201specifications		
Element	Value	PCB
E1 (0201)	NC	C101
E2 (0201)	0R	R101
E3 (0201)	NC	C100
E4 (0201)	8.2PF	R100
E5 (0201)	NC	C109
E5 (0201)	0R	R110
Antenna switch		
RF1 (0201)	4.3NH	R103
RF2 (0201)	9.1NH	L103
RF3 (0201)	NC	L104
RF4 (0201)	47NH	L105
E1 (0201)	NC	L100
E2 (0201)	0R	R102

Div antenna

0201specifications		
Element	Value	PCB
E1 (0201)	1.0PF	C101
E2 (0201)	5.6NH	R101
E3 (0201)	9.1NH	C100
E4 (0201)	2.2PF	R100
E5 (0201)	NC	R110
E6 (0201)	0R	R111



7

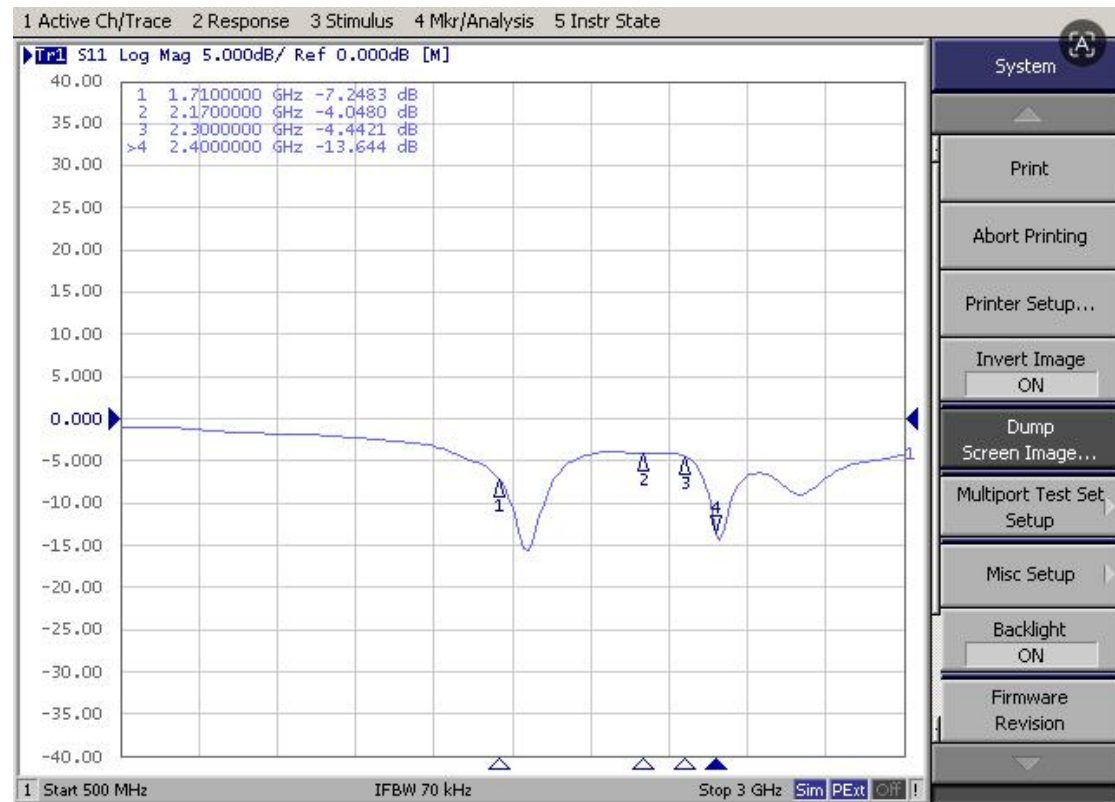
Div antenna Switch logic			
Switch position	PCB	Value	Antenna frequency band
Resident bit		OR	TRX GSM:1800/1900 TRX WCDMA: 1/2/4 TRX LTE-FDD: 1/2/3/4/66 TRX LTE-TDD: 40 RX LTE_FDD: 5/7/8/12/13/17/18/19/20/26/28A/28B/66 RX WCDMA: 5/8 RX LTE-TDD:38/41

4. Antenna return loss

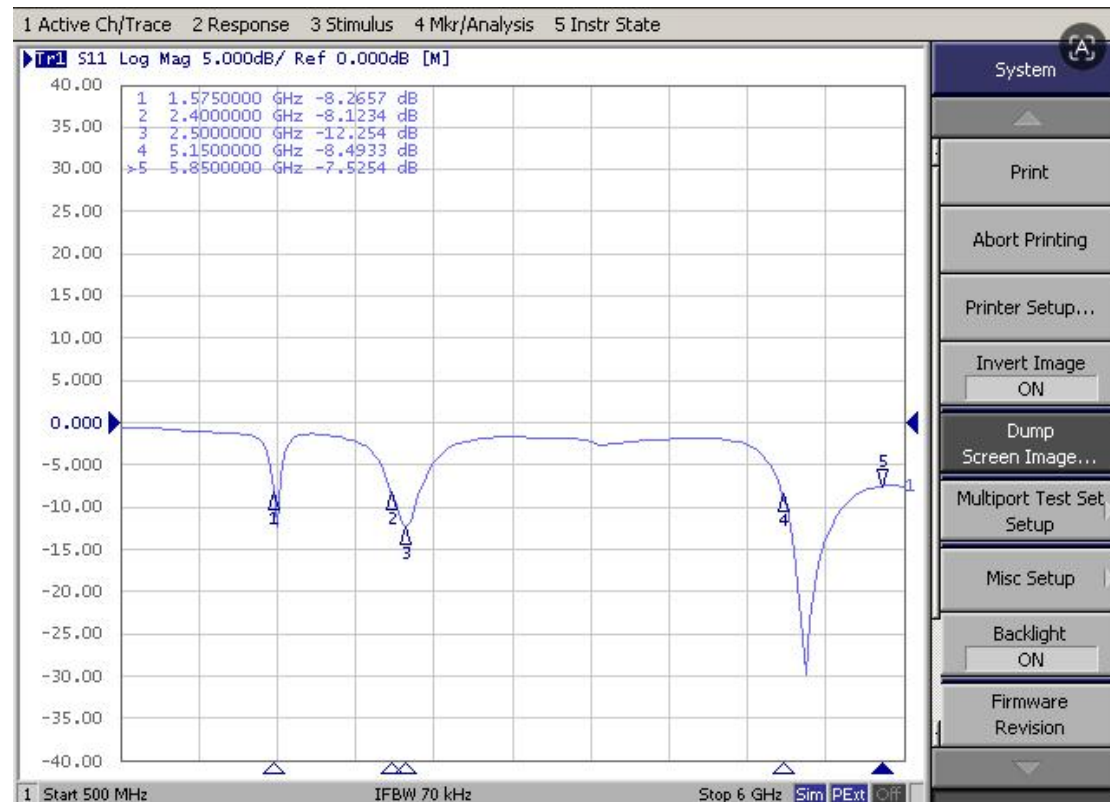
Main antenna LOSS



Div LOSS



Three in one LOSS



5.Gain

Band	Peak Gain/dBi	Band	Peak Gain/dBi
GSM850	-1.33	FDD-B13	-2.21
GSM900	-1.71	FDD-B17	-2.56
DCS1800	2.6	FDD-B18	-2.56
PCS1900	0.52	FDD-B19	-2.56
WCDMA B1	0.81	FDD-B20	-2.56
WCDMA B2	0.56	FDD-B26	-2.56
WCDMA B4	0.33	FDD-B28A	-2.43
WCDMA B5	-1.33	FDD-B28B	-2.43
WCDMA B8	-1.71	FDD-B66	0.33
FDD-B1	0.81	TDD -B38	0.62
FDD-B2	0.56	TDD- B40	0.58
FDD-B3	2.62	TDD-B41	0.47
FDD-B4	0.33	GPS	1.52
FDD-B5	-1.33	2.4G WIFI	2.13
FDD-B7	0.62	5.8GWIFI	2.51
FDD-B8	-1.71	BT	2.13
FDD-B12	-2.56		

6.OTA

6.1 Antenna OTA

PVT阶段FS			
Band	Channel	TRP	天TIS
GSM850	128	23.0	
	190	23.3	
	251	24.0	-100.2
EGSM	1	25.2	
	62	25.8	
	124	26.0	-101.7
DCS	512	24.3	
	698	24.2	
	885	24.5	-102.2
PCS	512	25.6	
	661	25.4	
	810	25.3	-101.0

PVT阶段FS			
Band	Channel	TRP	天TIS
WCDMA Band 1	10662	15.5	
	10700	15.4	
	10838	14.5	-101.9
WCDMA Band 2	9662	15.3	
	9800	15.6	
	9938	16.3	-102.1
WCDMA Band 4	1527	14.7	
	1638	15.5	
	1738	16.2	-102.2
WCDMA Band 5	4357	15.0	
	4410	15.4	
	4458	15.6	-101.2
WCDMA Band 8	5900	14.7	
	5900	15.4	
	5900	14.5	-101.7

PVT阶段FS			
Band	Channel	TRP	天TIS
B1 (10M)	50	16.7	
	300	15.5	
	550	15.1	-90.2
B2 (10M)	650	15.7	
	900	16.2	
	1150	16.5	-90.5
B3 (10M)	1250	15.8	
	1575	16.1	
	1900	16.2	-90.2
B4 (10M)	2000	15.5	
	2175	16.3	
	2350	16.7	-90.5

PVT阶段FS			
Band	Channel	TRP	天TIS
B5 (10M)	2450	15.5	
	2525	16.0	
	2600	16.2	-89.0
B7 (10M)	2800	14.6	
	3100	16.0	
	3400	16.7	-90.2
B8 (10M)	3500	16.2	
	3625	15.7	
	3750	14.6	-89.5
B12 (10M)	5060	11.8	
	5095	13.5	
	5130	13.4	-85.3
B13 (10M)			
	5230	15.1	-87.2

PVT阶段FS			
Band	Channel	TRP	天TIS
B26(10M)	8740	14.5	
	8865	15.2	
	8990	16.4	-89.3
B28A(10M)	9310	13.0	
	9360	13.3	
	9410	13.5	-85.2
B28B(10M)	9460	13.2	
	9510	13.2	
	9560	13.7	-83.5
B66(10M)	66836	15.1	
	66786	15.7	
	67036	15.9	-90.1

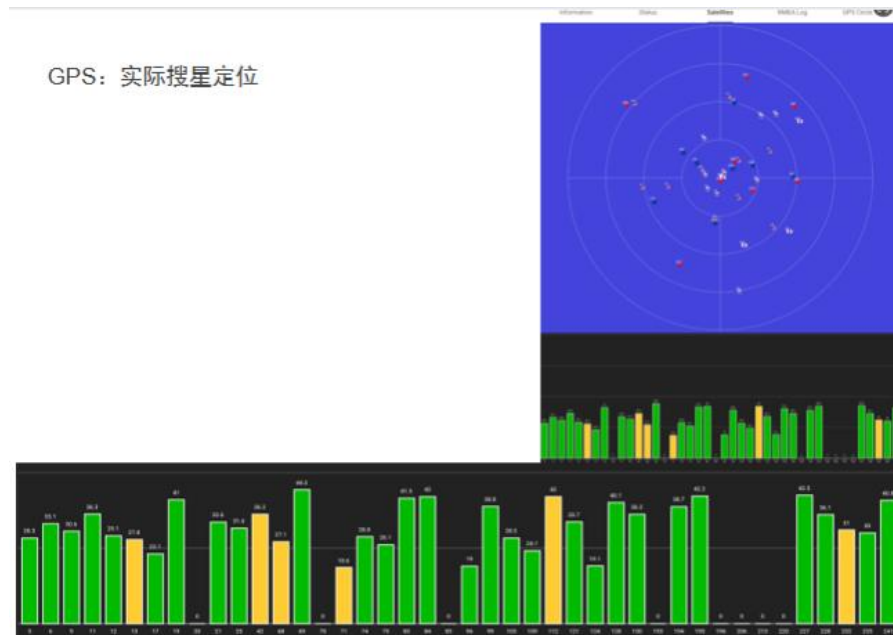
PVT阶段FS			
Band	Channel	TRP	天TIS
B17(10M)	5780	12.5	
	5790	13.6	
	5800	14	-84.0
B18(10M)	5850	14.6	
	5925	15.5	
	5999	16.1	-90.6
B19(10M)	6050	15.9	
	6075	16.1	
	6100	16.2	-90.1
B20(10M)	6200	16.2	
	6300	16.4	
	6400	15.0	-89.3

PVT阶段FS			
Band	Channel	TRP	天TIS
B38 (20M)	37850	17.5	
	38000	18.0	
	38150	17.7	-88.6
B40 (20M)	38750	15.0	
	39150	16.3	
	39550	17.3	-90.2
B41 (20M)	40620		
	40140	17.2	-88.4
	41240		

PVT阶段FS				
2.4G	Band	Channel	TRP/dBm	TIS/dBm (亮)
	b (11M)	1	13.6	
		6	13.4	
		13	12.7	-80.8
	g (54M)	1	11.8	
		6	12.2	
		13	11.8	-70.1
	n (MCS7)	1	12.2	
		6	11.9	
		13	12.5	-64.2
	AX (MCS8)	1	13.5	
		6	14.1	
		13	14.6	-63.7

PVT阶段FS				
5G	Band	Channel	TRP/dBm	TIS/dBm (亮)
	A (11M)	36	12.0	
		149	12.6	
		165	13.0	-70.1
	N (54M)	36	10.0	
		149	10.5	
		165	13.2	-64.5
	AC (MCS8)	36	10.1	
		149	10.4	
		165	12.1	-64.3
	AX (MCS8)	36	12.7	
		149	13.6	
		165	15.0	-64.4
2.4G	BT	0	3.1	
		39	4.0	
		78	4.3	-85.0

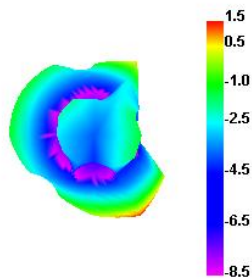
6.2 GPS testing



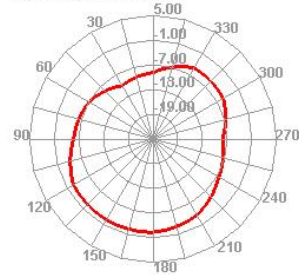
7.1Antenna radiation pattern

7.2 GPS/WIFI/BT

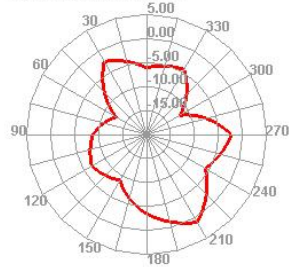
1568.888MHz



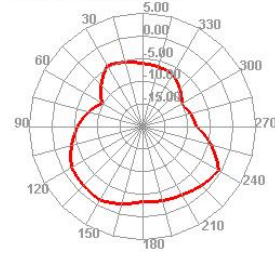
1568.888MHz H



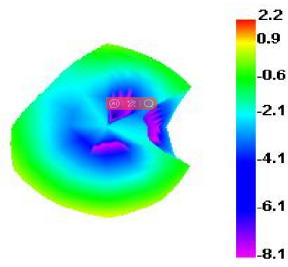
1568.888MHz E1



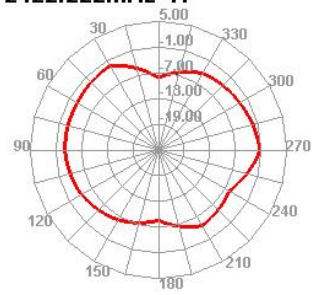
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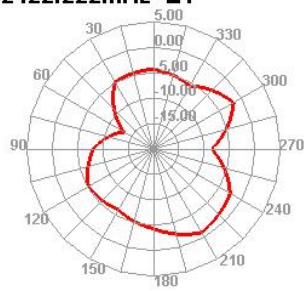
2422.222MHz



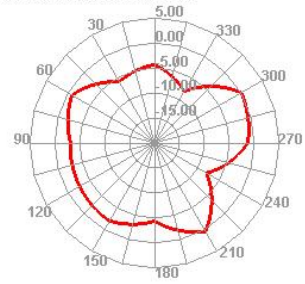
2422.222MHz H



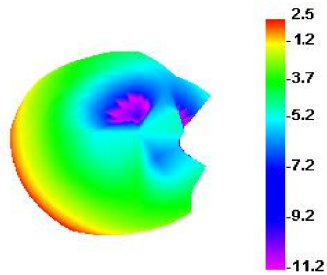
2422.222MHz E1



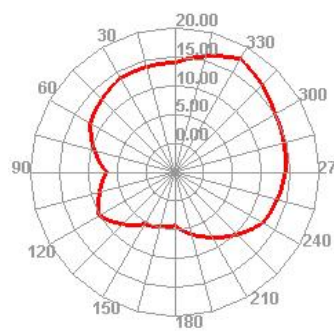
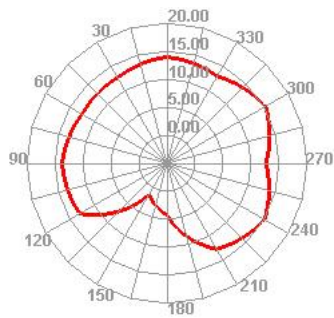
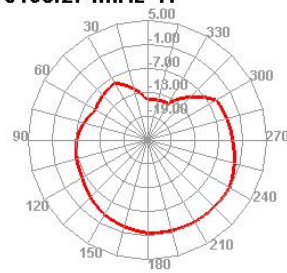
2422.222MHz E2



5198.274MHz

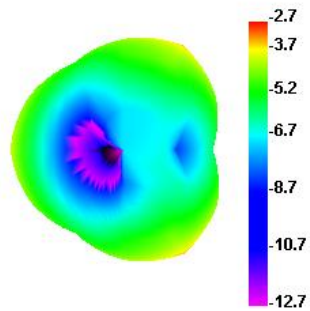


5198.274MHz H

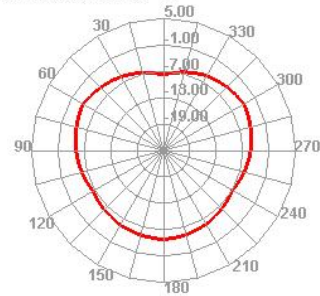


7.3.2 GSM/WCDMA/LTE

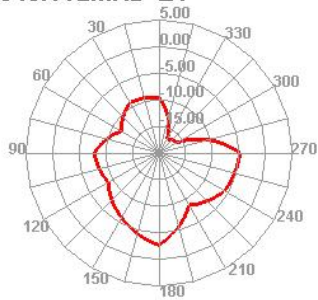
843.662MHz



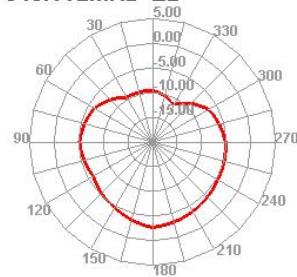
843.662MHz H



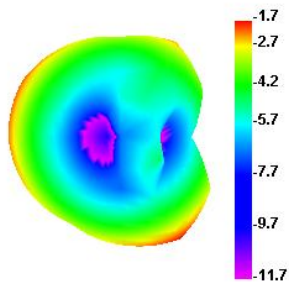
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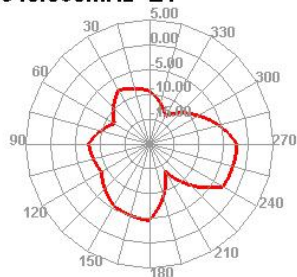
843.662MHz E2



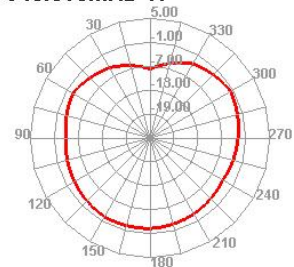
948.568MHz



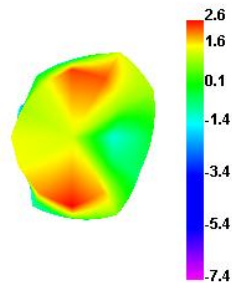
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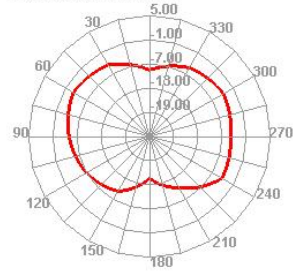
948.568MHz H



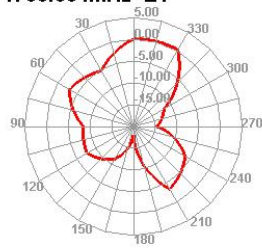
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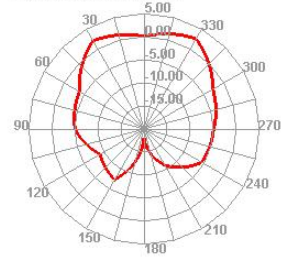
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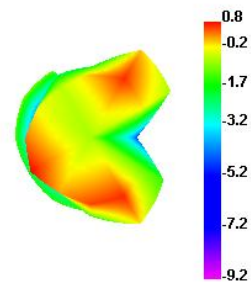
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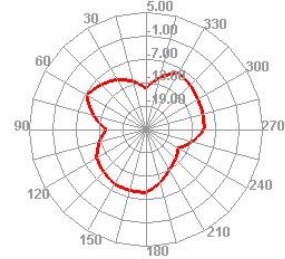
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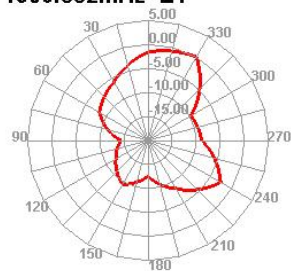
1906.332MHz



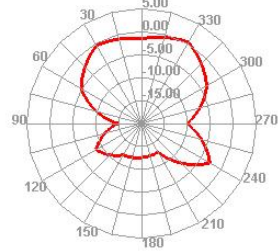
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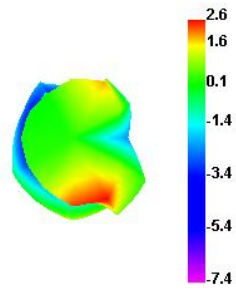
1906.332MHz E1



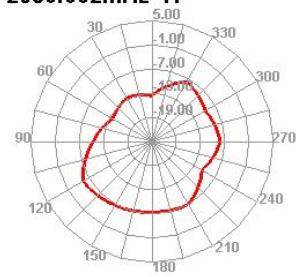
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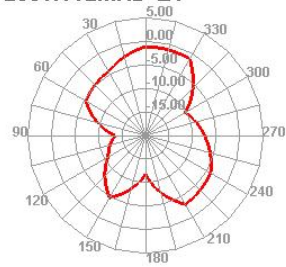
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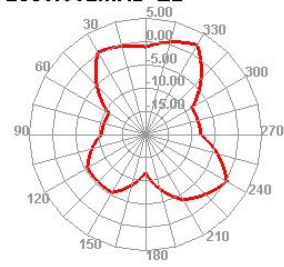
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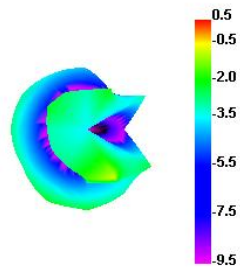
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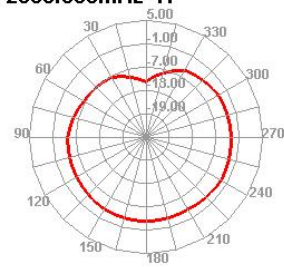
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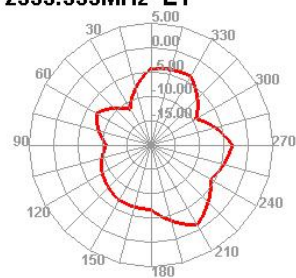
2333.333MHz



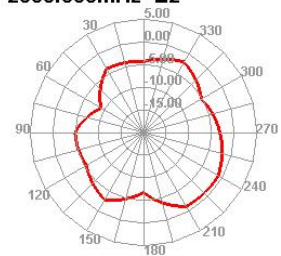
2333.333MHz H



2333.333MHz E1

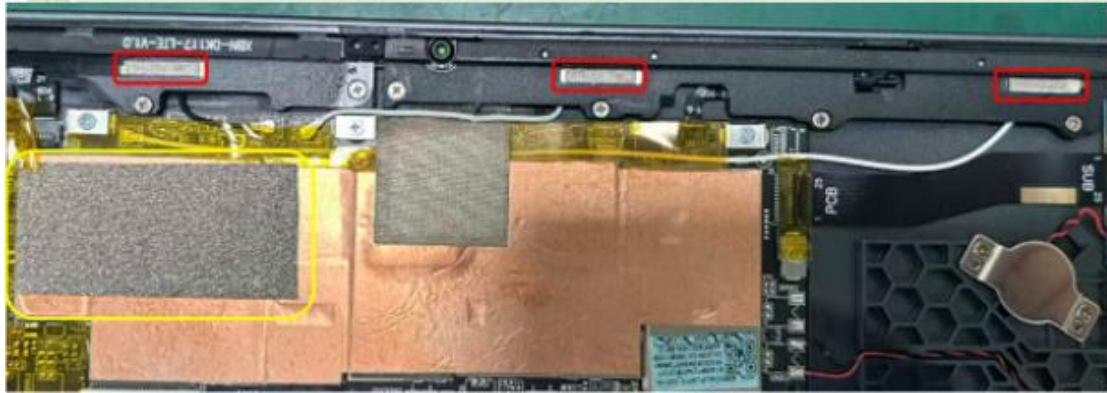


2333.333MHz E2



8.EMC optimization

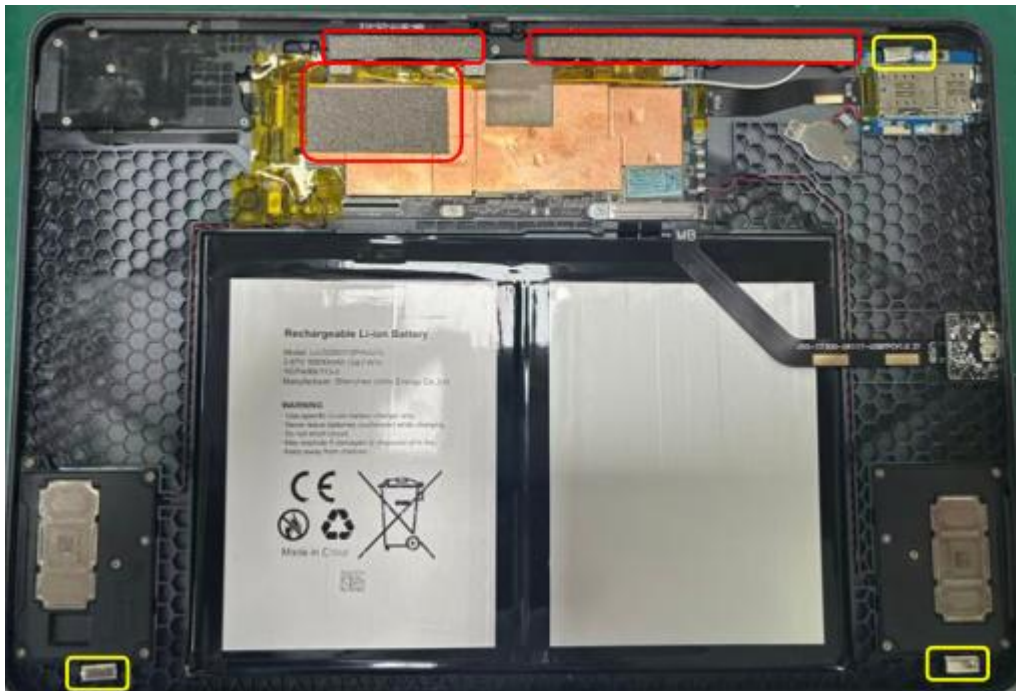
1.The conductive foam screen inside the red box in the following image.



2.The following image:

1. Add conductive sponge inside the red box to connect with the original small panel's conductive foam, reducing screen watermarks. Ensure the electrical connection between the two.

2. Add conductive foam inside the yellow box to ground the screen, reducing the impact of bright screens.



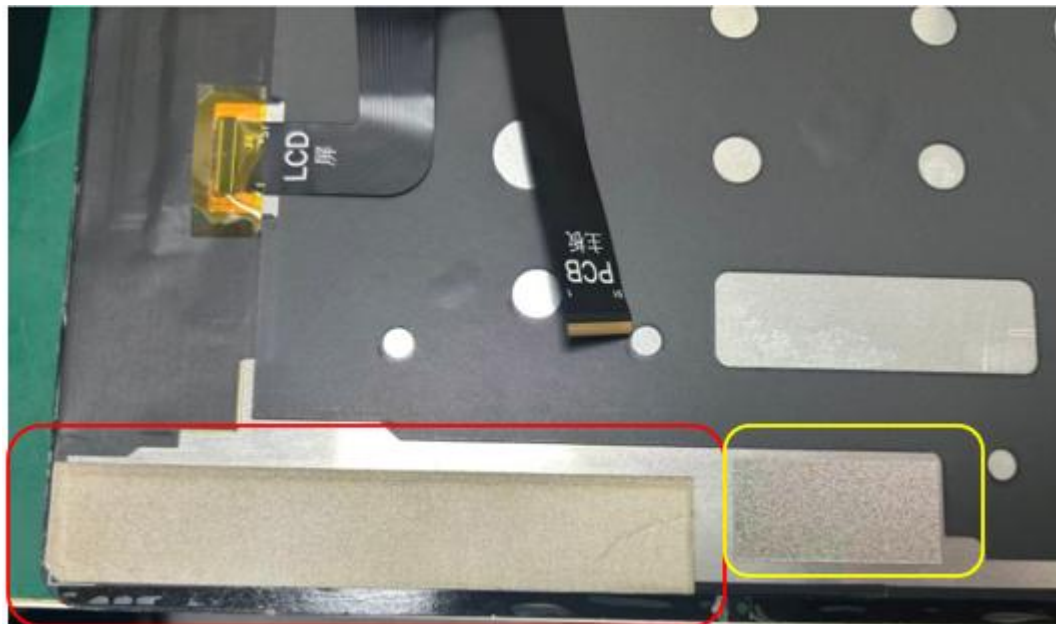
3. Below are the diagrams:

1. In the left diagram, the rear camera body is grounded to the metal rear shell with conductive fabric.
2. In the right diagram, the front camera body is grounded to the metal below with conductive foam. Additionally, conductive fabric shields the camera's wiring and socket interference.



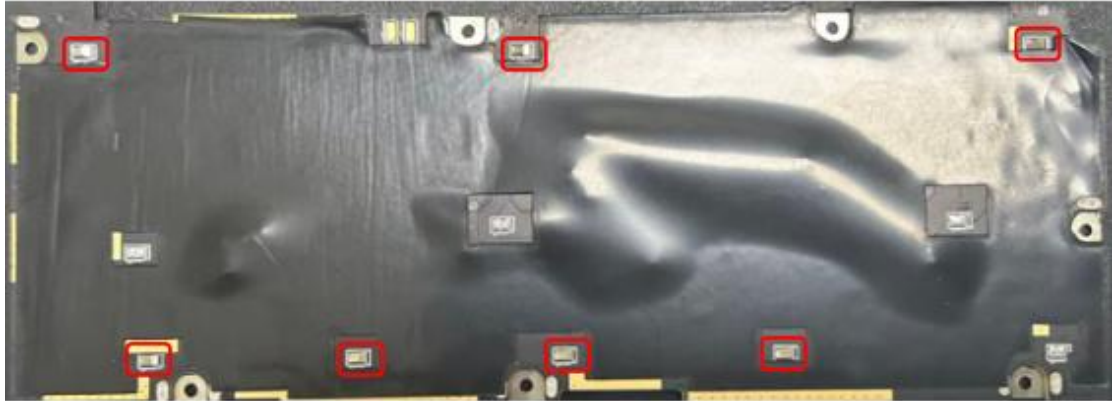
4. Below image:

1. The conductive fabric inside the red box covers the side of the screen.
2. Conductive foam is added inside the yellow box and connected to the main board below for grounding.



5. In the image below:

1. The pop-up within the red box is grounded.



9.Dimension Inspection Report(Unit:mm)

