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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/B28A/B28B/B6

6

TDD LTE:B38/ B40/B41.

Others:

GPS/Beidou/GLONASS/Galileo,80211.a/b/g/n/ac 2.4G/5G,Bluetooth.

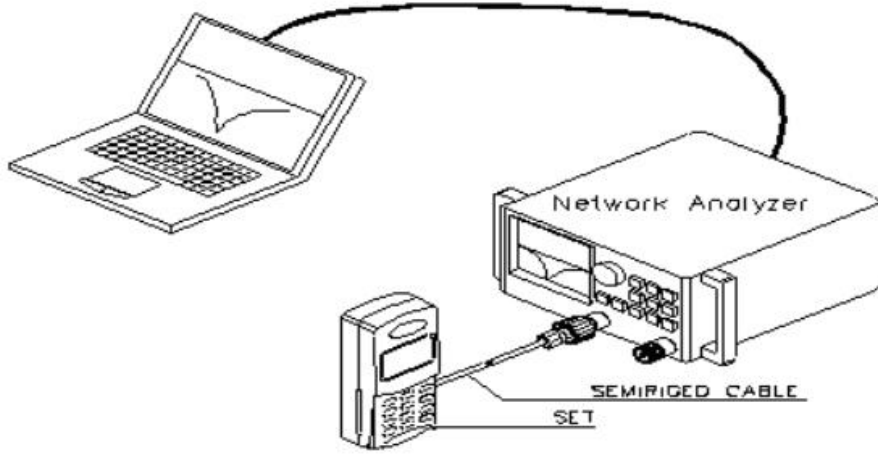
2.1 Test Method Description and Data

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

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

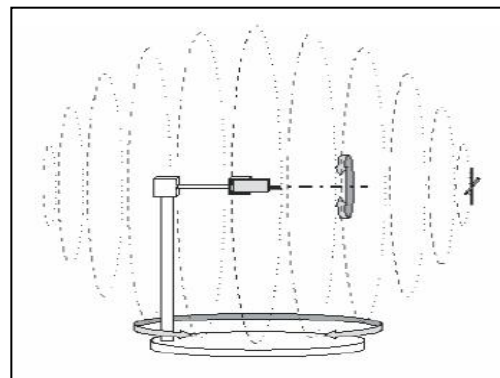
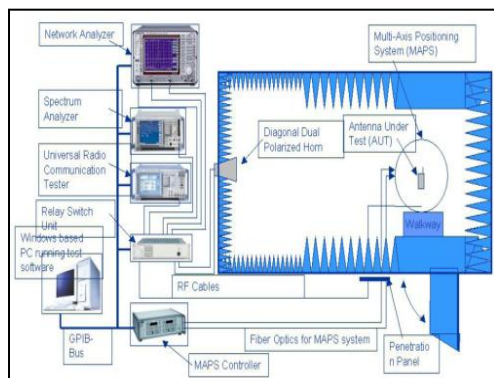
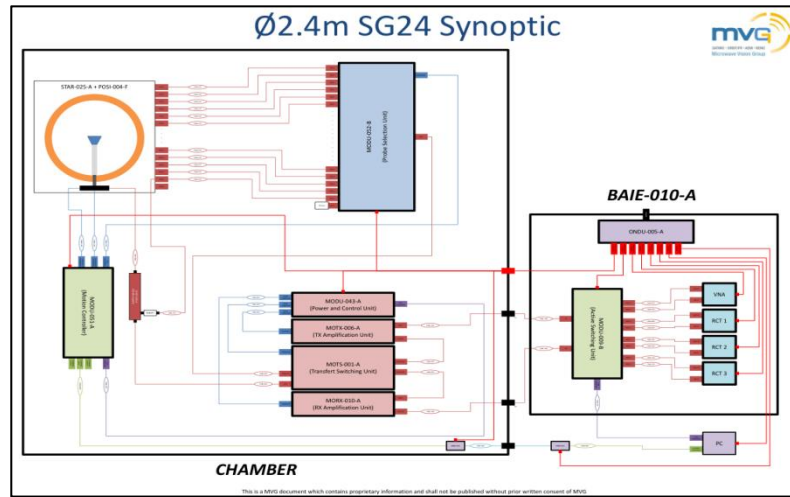
TRP/TIS

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:

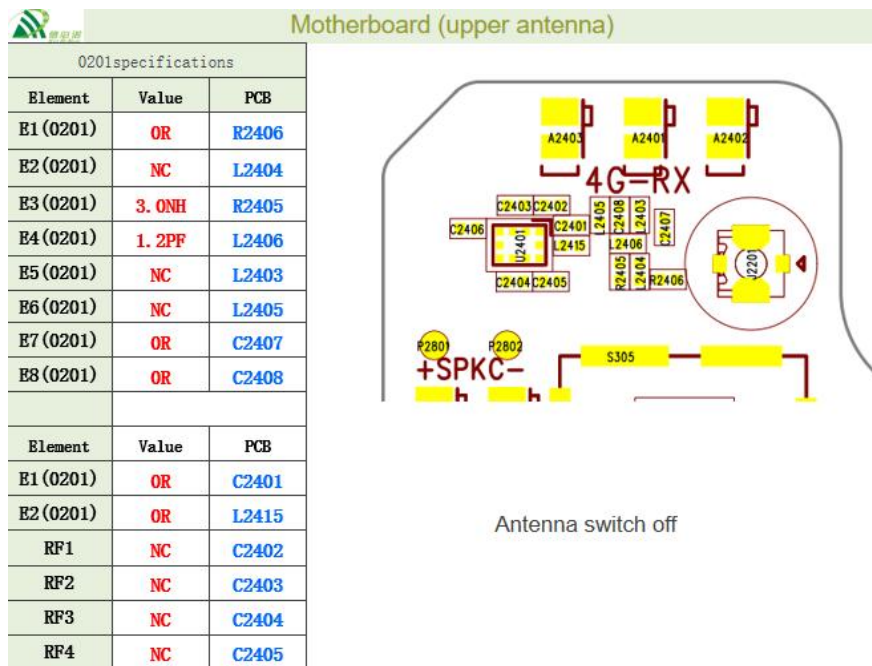
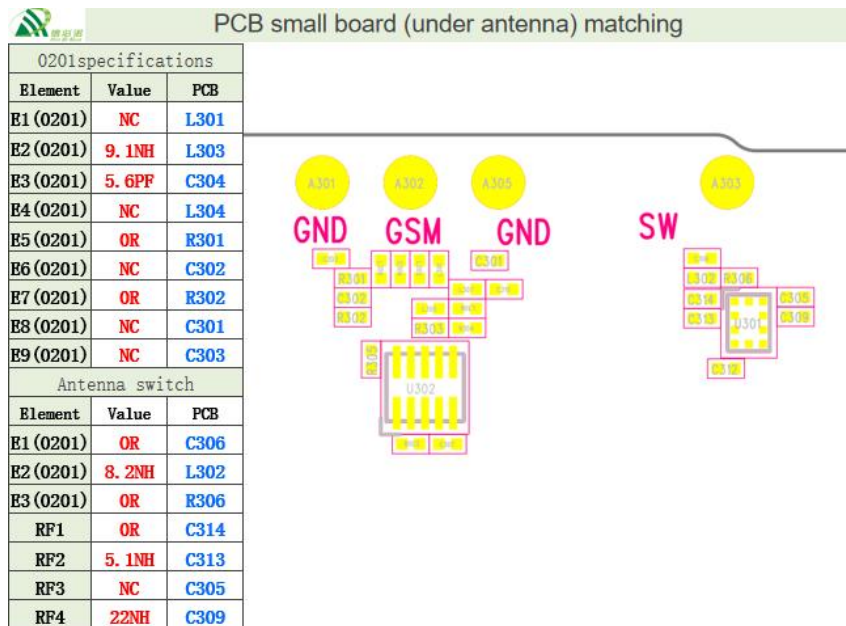
$$TRP \cong \frac{\pi}{2NM} \sum_{i=1}^{N-1} \sum_{j=0}^{M-1} [EiRP_{\theta}(\theta_i, \phi_j) + EiRP(\theta_i, \phi_j)] \sin(\theta_i)$$

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:

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



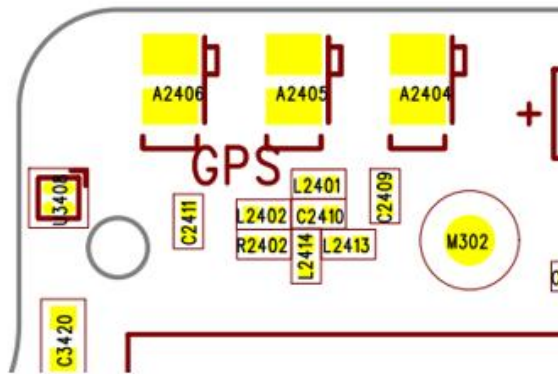
2. Matching circuit





Motherboard (Tri-band antenna)

Element	Value	PCB
E1 (0201)	OR	R2402
E2 (0201)	NC	L2414
E3 (0201)	NC	L2413
E4 (0201)	NC	L2402
E5 (0201)	NC	L2401
E6 (0201)	OR	C2409
E7 (0201)	OR	C2410
E8 (0201)	OR	C2411



Main antenna switch logic

RF1	C314	OR	TRX GSM:900 TRX WCDMA: 8 TRX LTE-FDD: 7/8 TRX LTE_TDD: 38/41 RX WCDMA: 1/2/4 RX LTE-FDD:1/2/3/4/66
RF2	C313	5.1N	TRX GSM:850 TRX WCDMA: 5 TRX CDMA:BC0 TRX FDD-LTE: 5/18/19/20/26
RF3	C305	NC	TRX LTE-FDD: 12/17/28A/28B
RF4	C309	22N	TRX LTE-FDD:B13
permanent	L302	8.2N	

Motherboard (upper antenna)

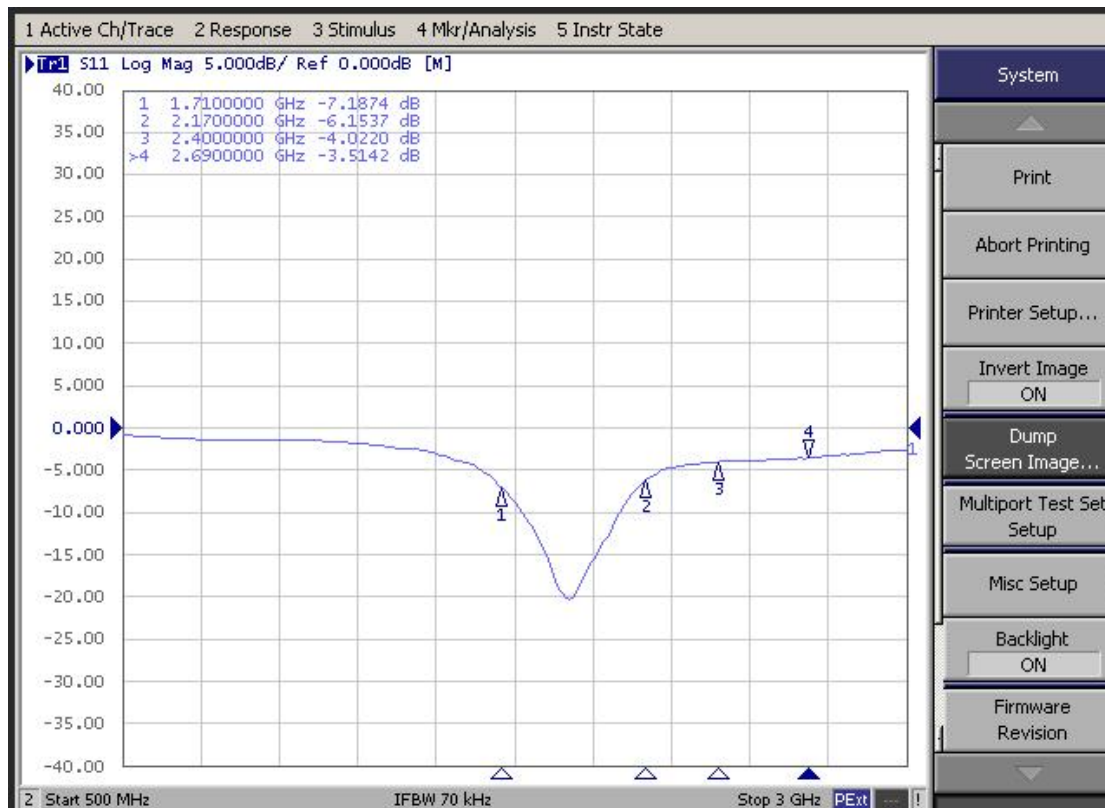
permanent	c2401	OR	TRX GSM:1800/1900 TRX WCDMA: 1/2/4 TRX CDMA:BC1/BC10 TRX LTE-FDD: 1/2/3/4/66 LTE-TDD: 40 RX LTE_FDD: 5/7/8/12/13/17/18/19/20/26/28A/28B/66 RX WCDMA: 5/8 RX LTE-TDD:38/41
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4.Antenna return loss

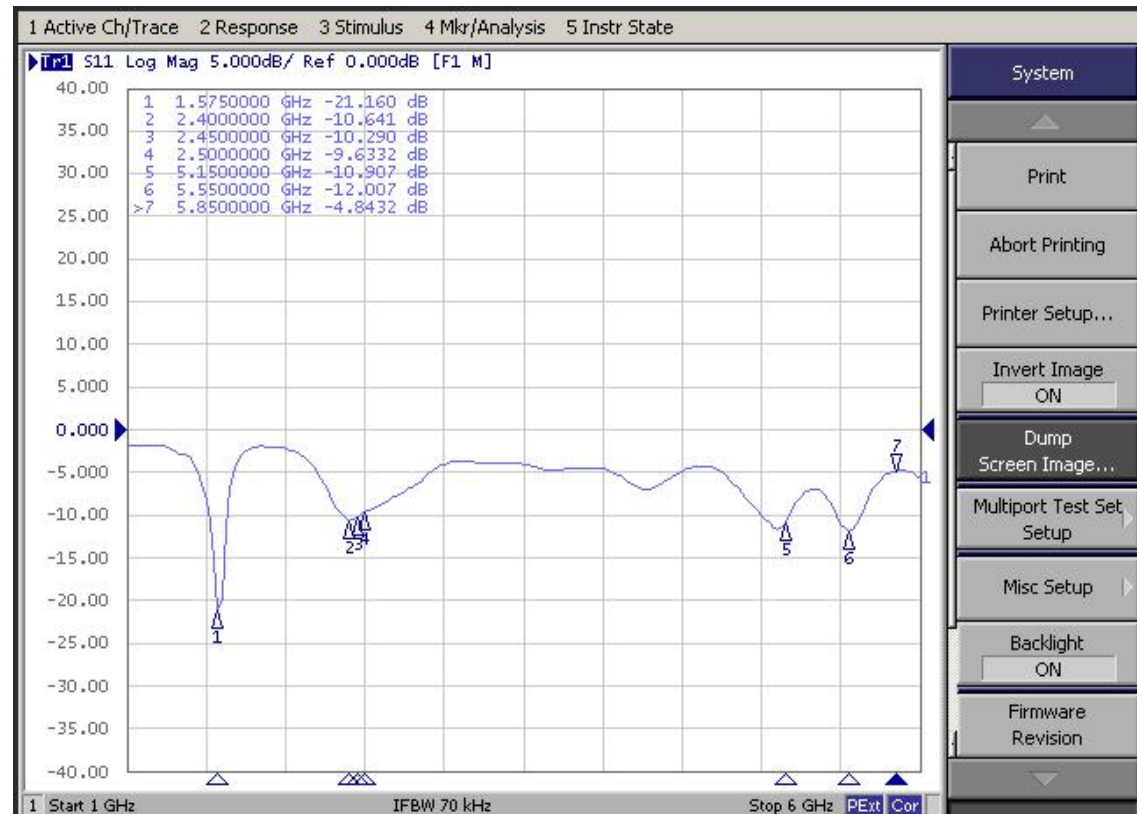
Lower antenna LOSS



upper antenna LOSS



GPS .BT.WIFI tri-band antenna LOSS



5.Gain

Band	Peak Gain/dBi	Band	Peak Gain/dBi
GSM850	-1.9	LTE B13	-2
GSM900	-1.8	LTE B17	-2.1
DCS1800	1.1	LTE B18	-1.9
PCS1900	1.2	LTE B19	-1.9
W1	1.2	LTE B20	-1.9
W2	1.1	LTE B26	-1.9
W4	1.1	LTE B28A	-2.1
W5	-1.9	LTE B28B	-2.1
W8	-1.8	LTE B66	1.1
LTE B1	1.2	LTE B38	1.2
LTE B2	1.1	LTE B40	1.4
LTE B3	1.1	LTE B41	1.2
LTE B4	1.1	GPS	0.4
LTE B5	-1.9	WIFI 2.4	1.5
LTE B7	1.2	WIFI 5.8	1.9
LTE B8	-1.8	BT	1.5
LTE B12	-2.1		

6.OTA

6.1 Antenna OTA

OTA			
Band	Channel	TRP	TIS
GSM850	128	23.9	
	190	23.8	
	251	23.6	-97.8
EGSM	1	24.1	
	62	24.0	
	124	24.5	-101.5
DCS	512	24.3	
	698	24.5	
	885	25.1	-103.2
PCS	512	25.4	
	661	25.5	
	810	25.2	-103.5

OTA			
Band	Channel	TRP	TIS
WCDMA Band 1	10562	17.6	
	10700	17.6	
	10838	17.5	-102.9
WCDMA Band 2	9662	17.5	
	9800	17.8	
	9938	18.1	-102.7
WCDMA Band 4	1637	17.3	
	1638	17.5	
	1738	17.8	-102.5
WCDMA Band 5	4257	15.0	
	4410	14.9	
	4458	15.1	-101.2
WCDMA Band 8	5900	14.1	
	5900	14.5	
	5900	14.7	-102.2

OTA			
Band	Channel	TRP	TIS
E1 (10M)	50	17.9	
	300	17.8	
	550	17.7	-90.7
E2 (10M)	650	18.0	
	900	18.3	
	1150	18.2	-90.9
E3 (10M)	1250	17.3	
	1575	17.7	
	1900	17.8	-91.8
E4 (10M)	2000	17.7	
	2175	17.9	
	2350	18.1	-92.7

OTA			
Band	Channel	TRP	TIS
B5(10M)	2450	15.2	
	2525	15.4	
	2600	16.0	-89.2
B7(10M)	2800	18.1	
	3100	18.1	
	3400	18.3	-90.8
B8(10M)	3500	15.1	
	3625	15.4	
	3750	16.0	-88.4
B12(10M)	5060	15.1	
	5095	15.3	
	5130	15.2	-90.4

OTA			
Band	Channel	TRP	TIS
B17(10M)	5780	15.05	
	5790	15.8	
	5800	15.65	-89.2
B18(10M)	5850	15.5	
	5925	15.7	
	5999	16.0	-89.0
B19(10M)	6050	15.01	
	6075	15.4	
	6100	15.71	-89.1
B20(10M)	6200	15.4	
	6300	15.7	
	6400	16.1	-88.4

OTA			
Band	Channel	TRP	TIS
B26 (10M)	8740	15.5	
	8865	15.8	
	8990	16.2	-88.5
B28A (10M)	9210	15.3	
	9360	15.1	
	9410	15.0	-88.7
B28B (10M)	9460	14.5	
	9510	14.7	
	9560	14.9	-88.8
B66 (10M)	66536	17.5	
	66786	17.5	
	67036	18.1	-91.2

OTA			
Band	Channel	TRP	TIS
B38 (20M)	37850	17.5	
	38000	17.5	
	38150	17.2	-89.1
B40 (20M)	38750	17.5	
	39150	17.9	
	39550	18.2	-90.1
B41 (20M)	40620		
	40140	16.8	-89.0
	41240		

6.2 WIFI testing

FS				
	Band	Channel	TRP/dBm	TIS/dBm
2.4G	b (11M)	1	11.5	
		6	12.8	
		13	13.2	-82.7
	g (54M)	1	11.3	
		6	12.7	
		13	13.5	-70.5
	n (MCS7)	1	12.3	
		6	13.3	
		13	13.5	-66.3
5.8G	a (54M)	36	10.9	
		149	11.4	
		165	11.9	-70.5
	n (MCS7)	36	11.1	
		149	12.8	
		165	13.2	-65.5
	ac (MCS8)	36	11.1	
		149	11.7	
		165	12.1	-64.5

6.3 BT testing

FS			
		DH5	
Band	Channels	TRP/dBm	TIS/dBm
BT	2.4GHz	3.5	
	2.44GHz	3.7	
	2.48GHz	4.2	-82.9

6.4 NFC testing

NFC:

NFC matching is based on the original motherboard matching.

NFC	
Tag	Card reading distance (mm)
card 1	35
card 2	38
card 3	32
card 4	23

6.2 GPS testing

Average CNR

G:36.8/-/-/-/- R:33.4/-/-/-/- B:30.4/-/-/-/- E:28.7/-/-/-/-
Q:18.7/-/-/-/- L:-/-/-/-/- I:-/-/-/-/- S:36.0/-/-/-/-

☒ Show in single page

ID	CNR	ID	CNR	ID	CNR
G3	25.7/-/-/-/-	G10	38.3/-/-/-/-	G16	40.1/-/-/-/-
G23	0.0/-/-/-/-	G25	34.5/-/-/-/-	G26	39.4/-/-/-/-
G28	41.4/-/-/-/-	G29	33.3/-/-/-/-	G31	43.7/-/-/-/-
G32	34.6/-/-/-/-	R70	18.5/-/-/-/-	R71	32.6/-/-/-/-
R72	33.1/-/-/-/-	R73	39.7/-/-/-/-	R74	36.0/-/-/-/-
R75	40.7/-/-/-/-	B1	0.0/-/-/-/-	B2	0.0/-/-/-/-
B3	0.0/-/-/-/-	B4	26.8/-/-/-/-	B5	31.2/-/-/-/-
B6	35.9/-/-/-/-	B7	24.5/-/-/-/-	B8	32.6/-/-/-/-
B9	38.3/-/-/-/-	B10	18.8/-/-/-/-	B13	35.9/-/-/-/-
B16	36.2/-/-/-/-	B19	25.0/-/-/-/-	B21	19.6/-/-/-/-
B22	38.4/-/-/-/-	B26	26.0/-/-/-/-	B29	0.0/-/-/-/-
B36	36.1/-/-/-/-	E7	21.7/-/-/-/-	E19	30.3/-/-/-/-
E21	32.1/-/-/-/-	E23	38.2/-/-/-/-	E26	0.0/-/-/-/-
E27	12.7/-/-/-/-	E29	29.8/-/-/-/-	E33	36.4/-/-/-/-
Q2	15.8/-/-/-/-	Q3	27.7/-/-/-/-	Q7	12.7/-/-/-/-
S37	0.0/-/-/-/-	S40	36.0/-/-/-/-	S50	0.0/-/-/-/-

6.2 wireless charging testing

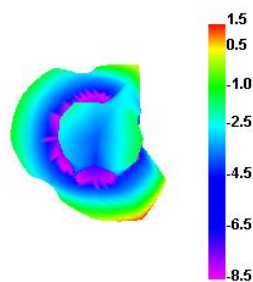
Coil parameters: Number of turns = 12 turns: LS = 8.3 μ H: Q value = 19.8



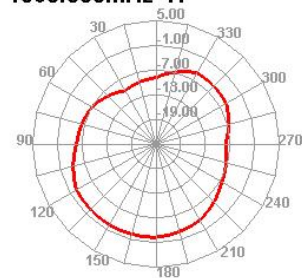
7.1Antenna radiation pattern

7.2 GPS/WIFI/BT

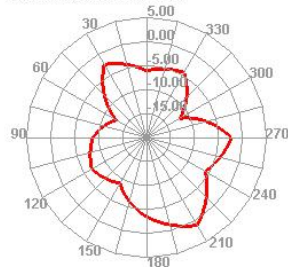
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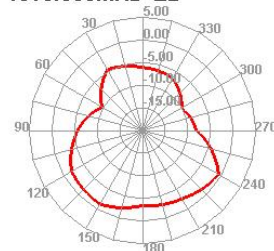
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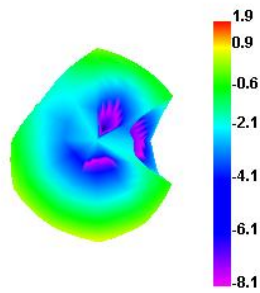
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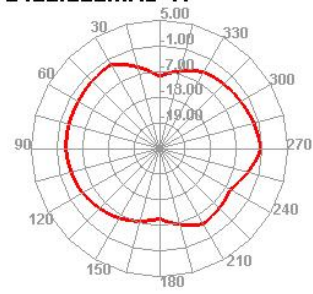
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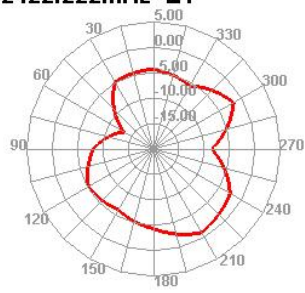
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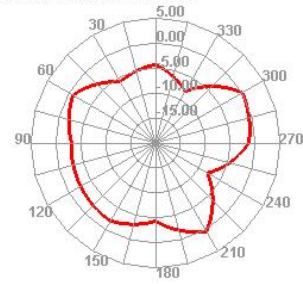
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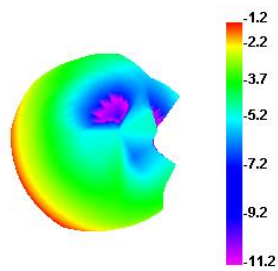
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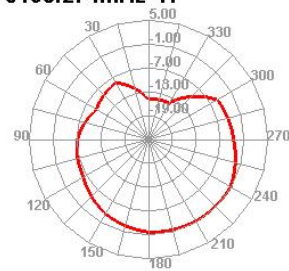
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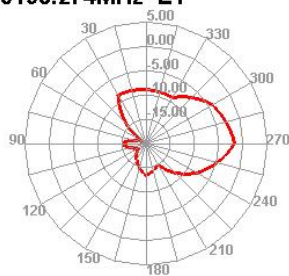
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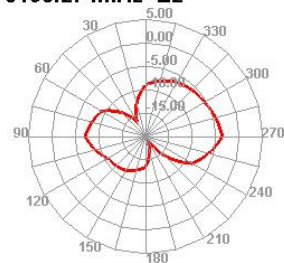
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5198.274MHz E1

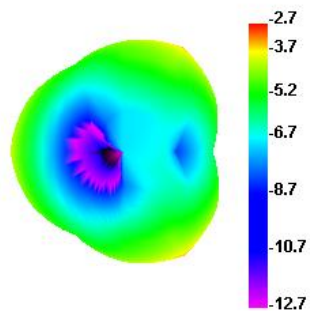


5198.274MHz E2

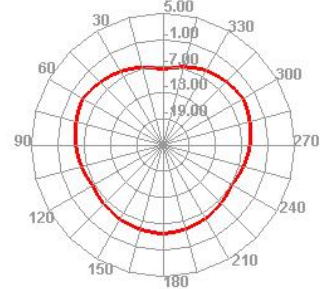


7.3.2 GSM/WCDMA/LTE

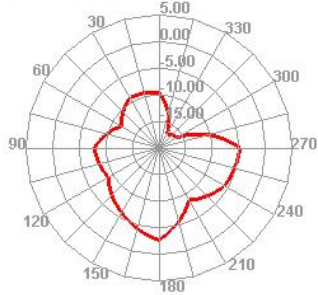
843.662MHz



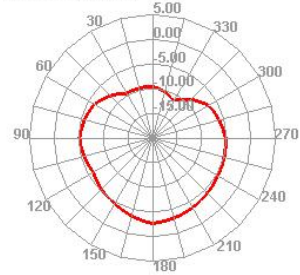
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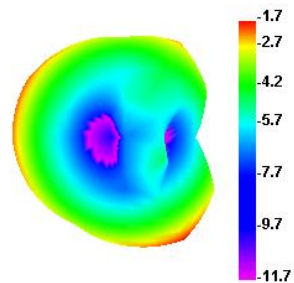
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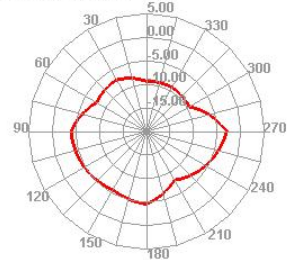
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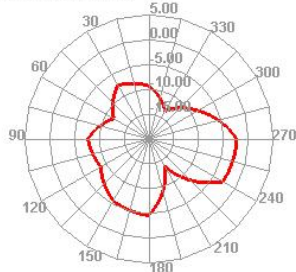
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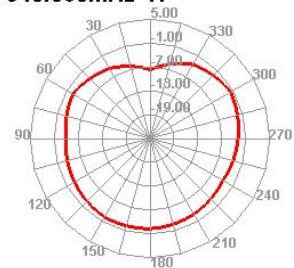
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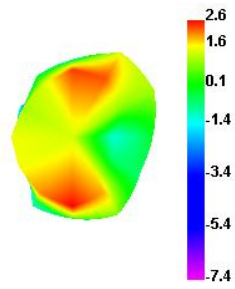
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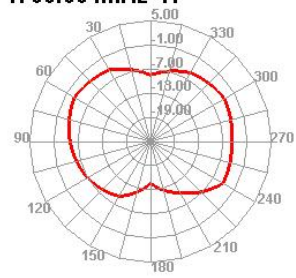
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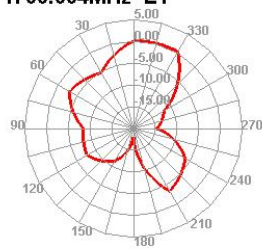
1766.664MHz



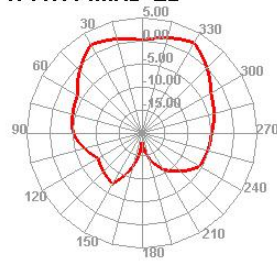
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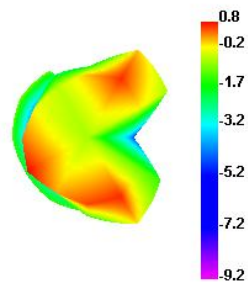
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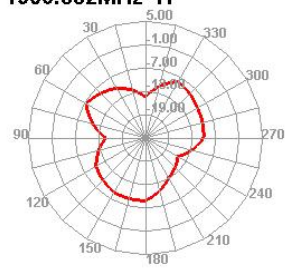
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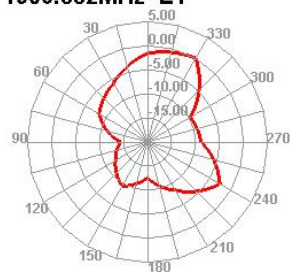
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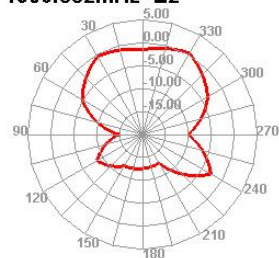
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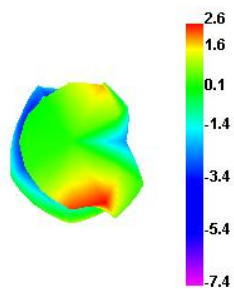
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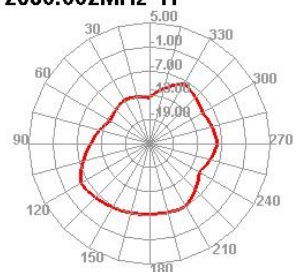
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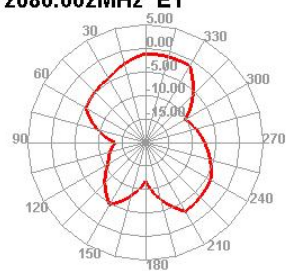
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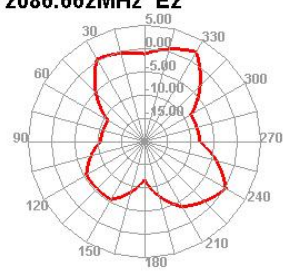
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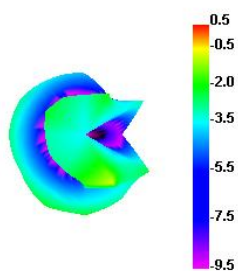
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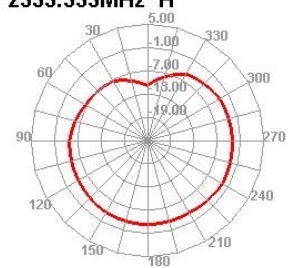
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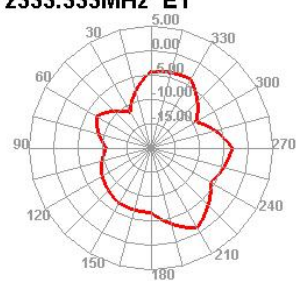
2333.333MHz



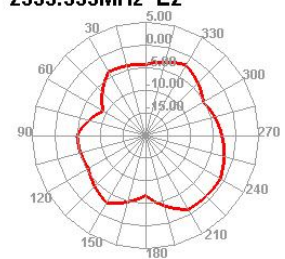
2333.333MHz H



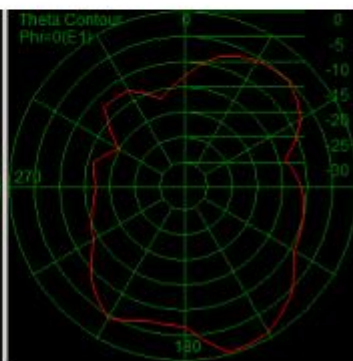
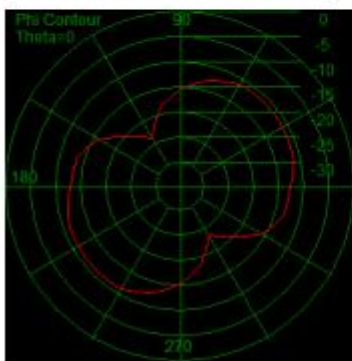
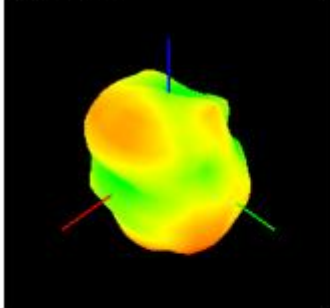
2333.333MHz E1



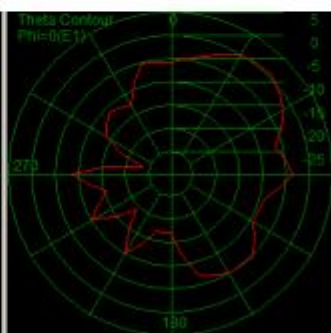
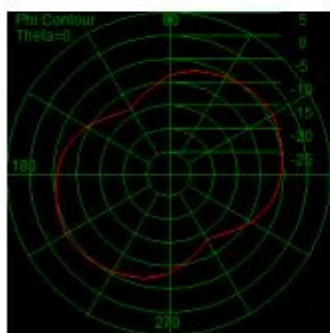
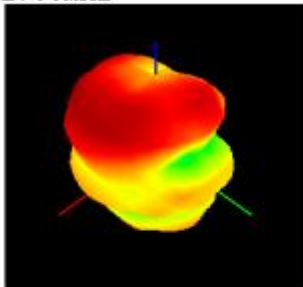
2333.333MHz E2



2400Mhz



2700Mhz



8.EMC optimization

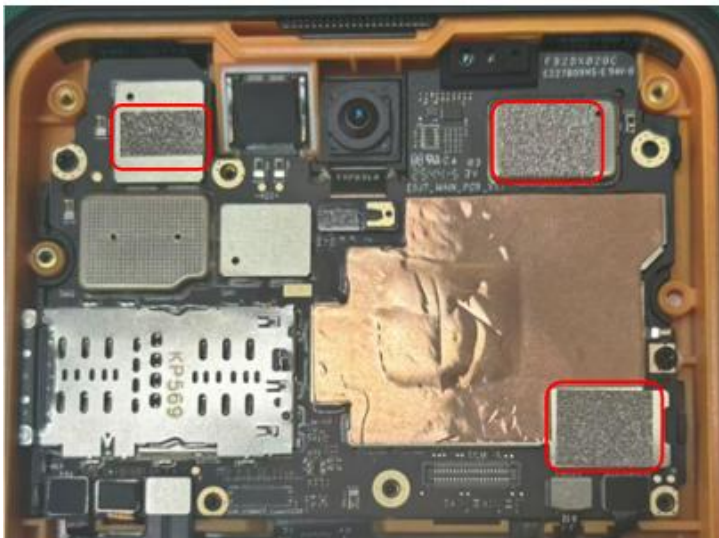
As shown in the diagram:

1. The back panel basket is connected to the middle frame with conductive sponge and zinc alloy grounding, ensuring that the sponge length does not cover the clear space of the middle frame antenna.
2. Screen cables need to be wrapped with conductive tape for shielding against bright screen interference.



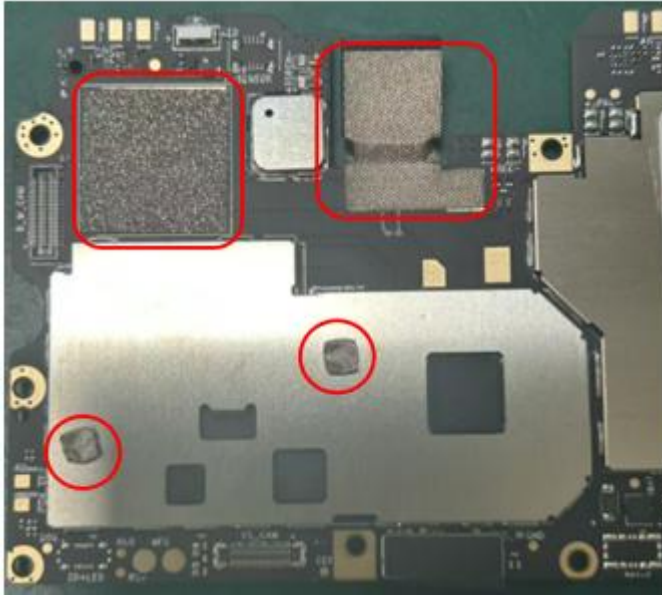
As shown in the diagram:

1. Add conductive foam inside the red box on the motherboard and connect it to the metal above for grounding.
2. The copper foil above the motherboard shielding cover is the one provided by the trial production machine and is recommended to be retained.



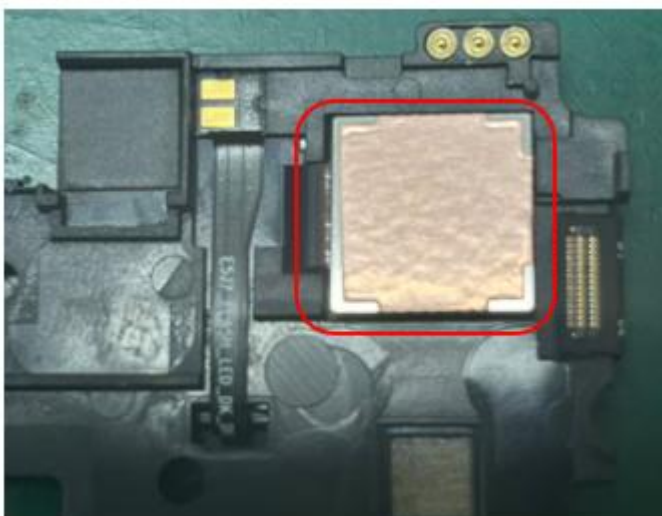
As shown in the diagram:

1. Add conductive foam inside the red box on the motherboard to ground it with the camera above.
2. The red circle in the upper image indicates the grounding point of the metal decorative piece of the corresponding camera. It is recommended to use conductive foam, as its resilience is insufficient, resulting in a larger electrical connection impedance.
3. Add conductive fabric to the front camera and ground it with the motherboard.



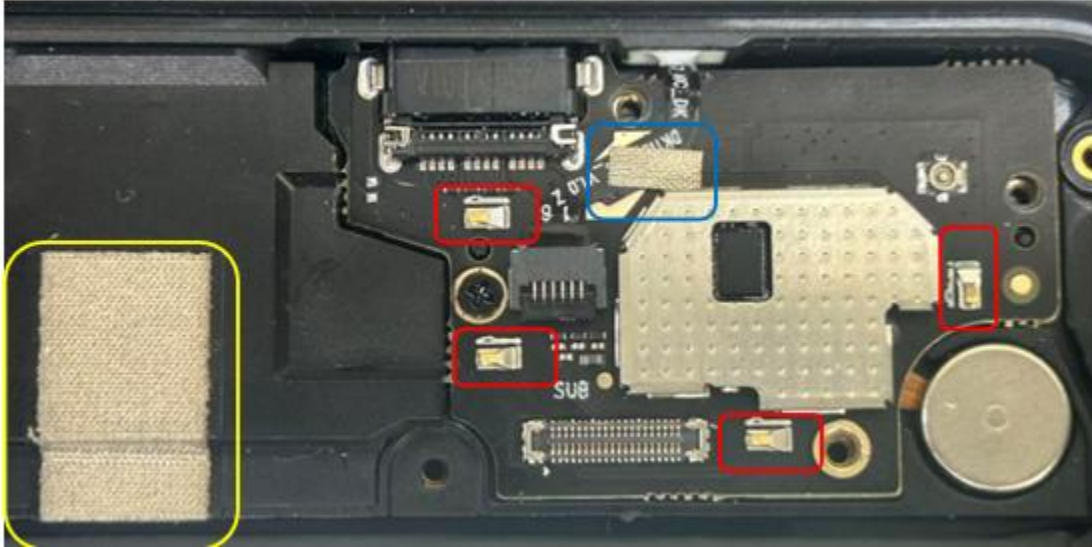
As shown in the diagram:

1. The camera is wrapped with copper foil and grounded to the lower main board.



Above image:

1. The small red box contains the small board and the metal grounding point above it.
2. At the small blue box, the MIC cable is grounded with double-sided conductive tape.
3. At the yellow box, the BOX unit is grounded with conductive tape extending out to connect to the metal middle frame above it.
4. It is recommended to engrave a laser mark on the metal middle frame corresponding to the grounding conductive tape of the small board shielding cover and the BOX unit at the top.



9.Dimension Inspection Report

