



Antenna Debugging Report

Customer: Duoke

Project: DK090

Structure: Xiaoxiang-13316888409

RF: Long Yaobin -15874137313

Date: October 15, 2024



Antenna Debugging Report

Report type:

Version number: V4.0

Machine status: DVT machine

Antenna frequency band:

GSM:B2/B3/B5/B8

WCDMA:W1/W2/W4/W5/W8

FDD-LTE: B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B19/B20/B26/B28B/B28A/B66

TDD-LTE: B38/B40/B41

GPS and other satellite positioning antennas

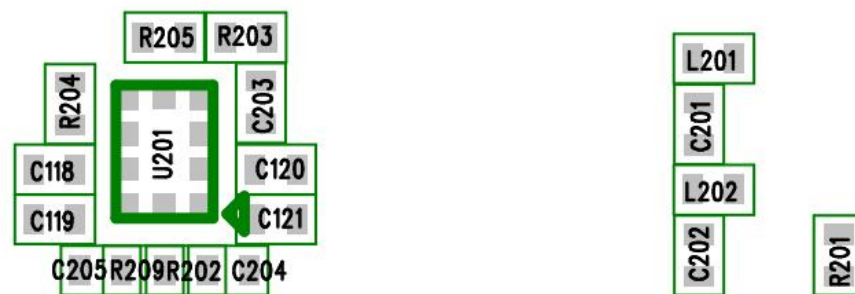
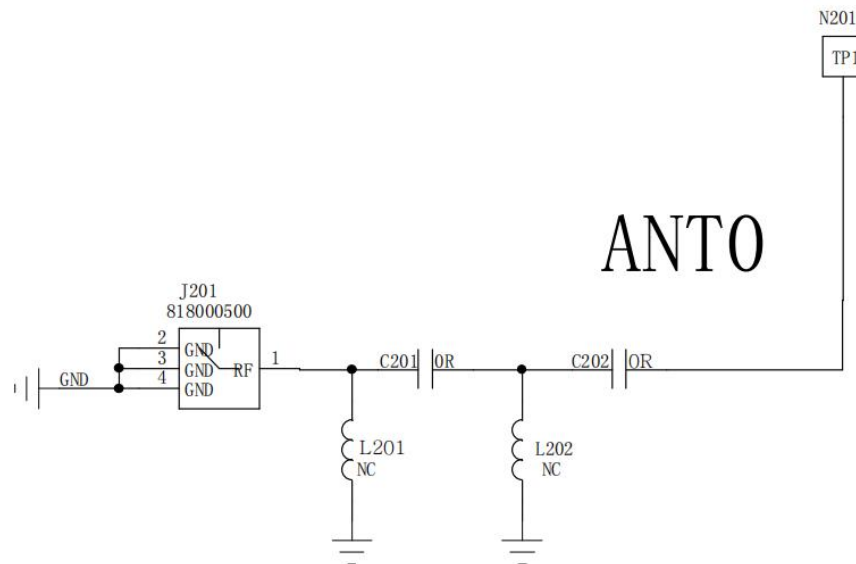
2.4G/5G WIFI

Bluetooth

PCB small board (ANT0)

0201 specification

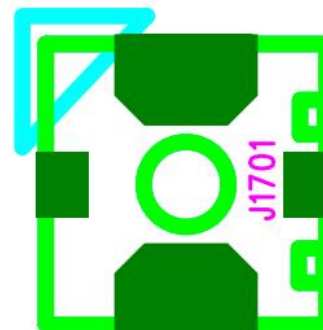
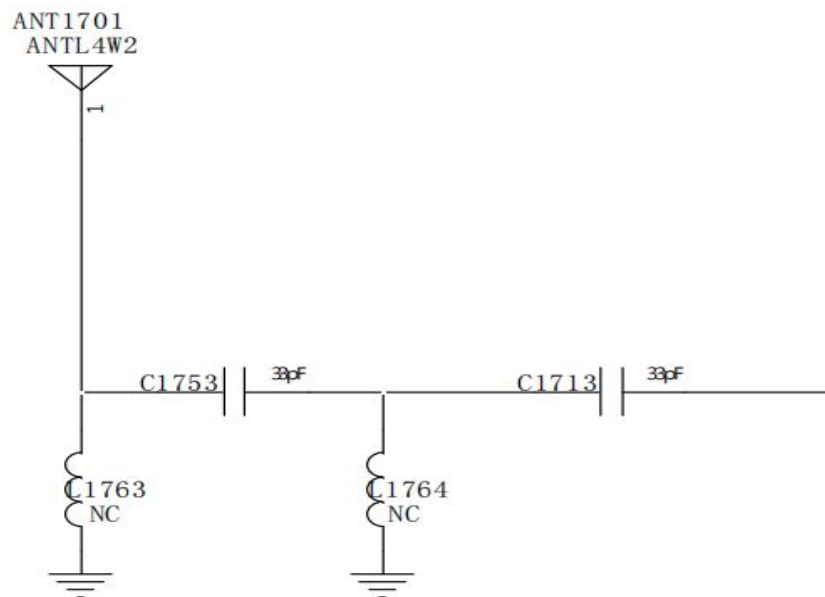
Element	Value	PCB Tag Number
E1 (0201)	0 Ω	C202
E2 (0201)	12nH	L202
E3 (0201)	0 Ω	C201
E4 (0201)	NC	L201



Motherboard (ANT1)

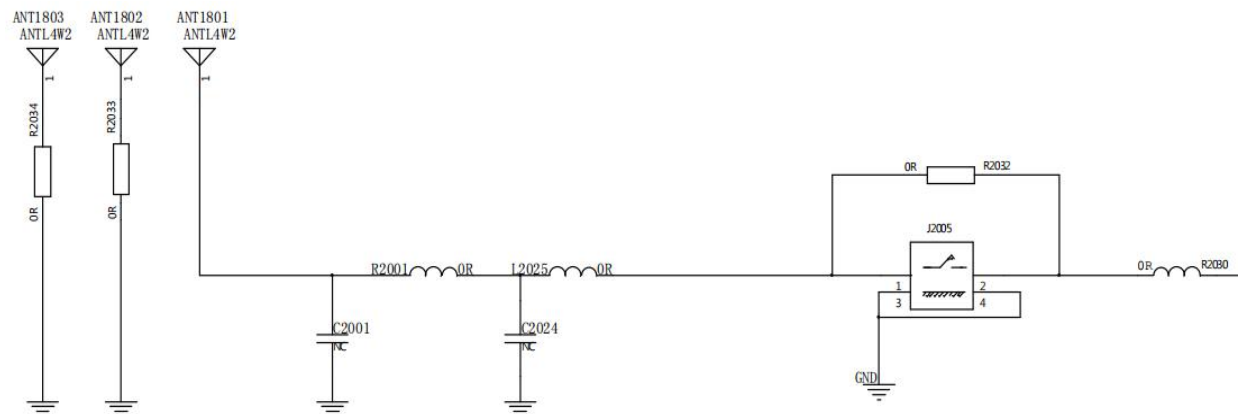
0201 specification

Element	Value	PCB Tag Number
E1 (0201)	NC	L1763
E2 (0201)	0 Ω	C1753
E3 (0201)	10nH	L1764
E4 (0201)	0 Ω	C1713



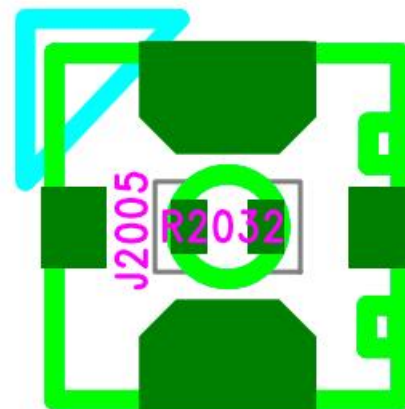
L1763
C1753
L1764
C1713

GPS/WIFI/BT antenna (motherboard):



0201 specification

Element	Value	specification
E1 (0201)	NC	C2001
E2 (0201)	5.6pF	R2001
E3 (0201)	5.1nH	C2024
E4 (0201)	0 Ω	L2025
E5 (0201)	0 Ω	R2030
E6 (0201)	0 Ω	R2033
E7 (0201)	0 Ω	R2034



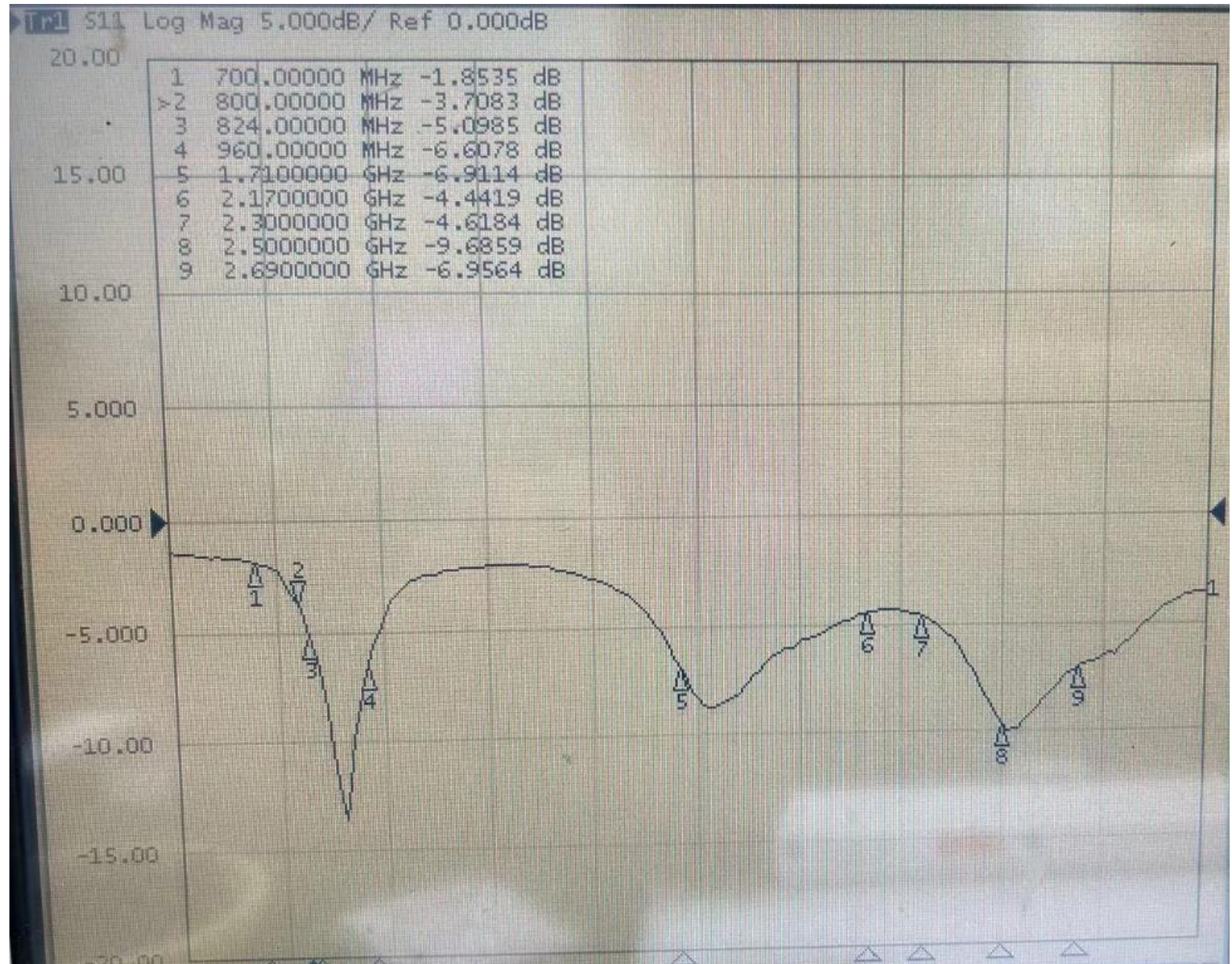
PCB small board (ANT0)

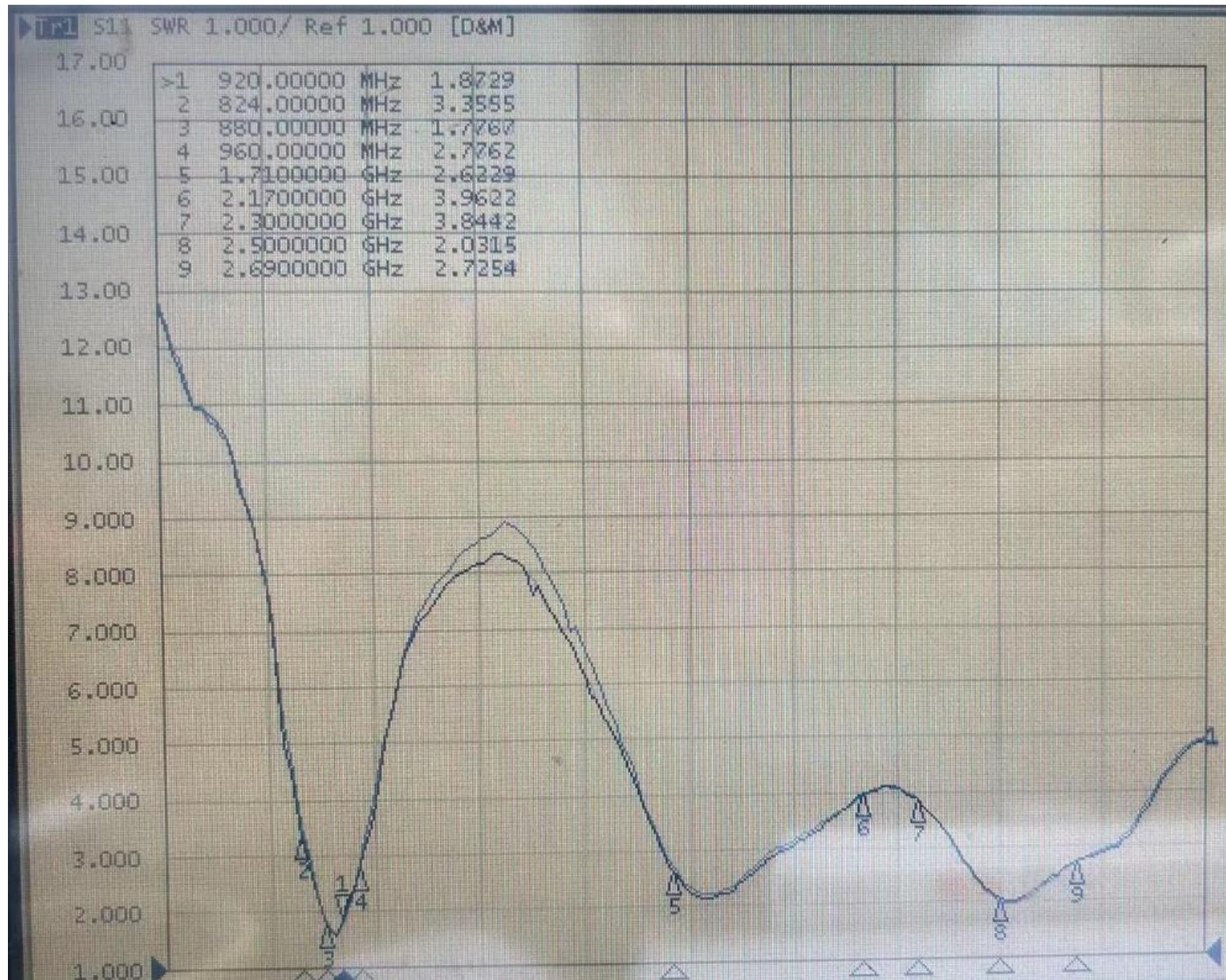
RF1 (C121)	0 Ω	GSM:850/900/1800/1900 LTE-FDD:B1/2/3/4/5/8/19/20/26/66 LTE-TDD:B38/40/41 WCDMA:B1/2/4/5/8
RF2 (C120)	33pF	LTE:B7
RF3 (C119)	15nH	LTE-FDD:B12/17/28A/28B
RF4 (C118)	12nH	LTE-FDD:B13

**Motherboard (ANT1)**

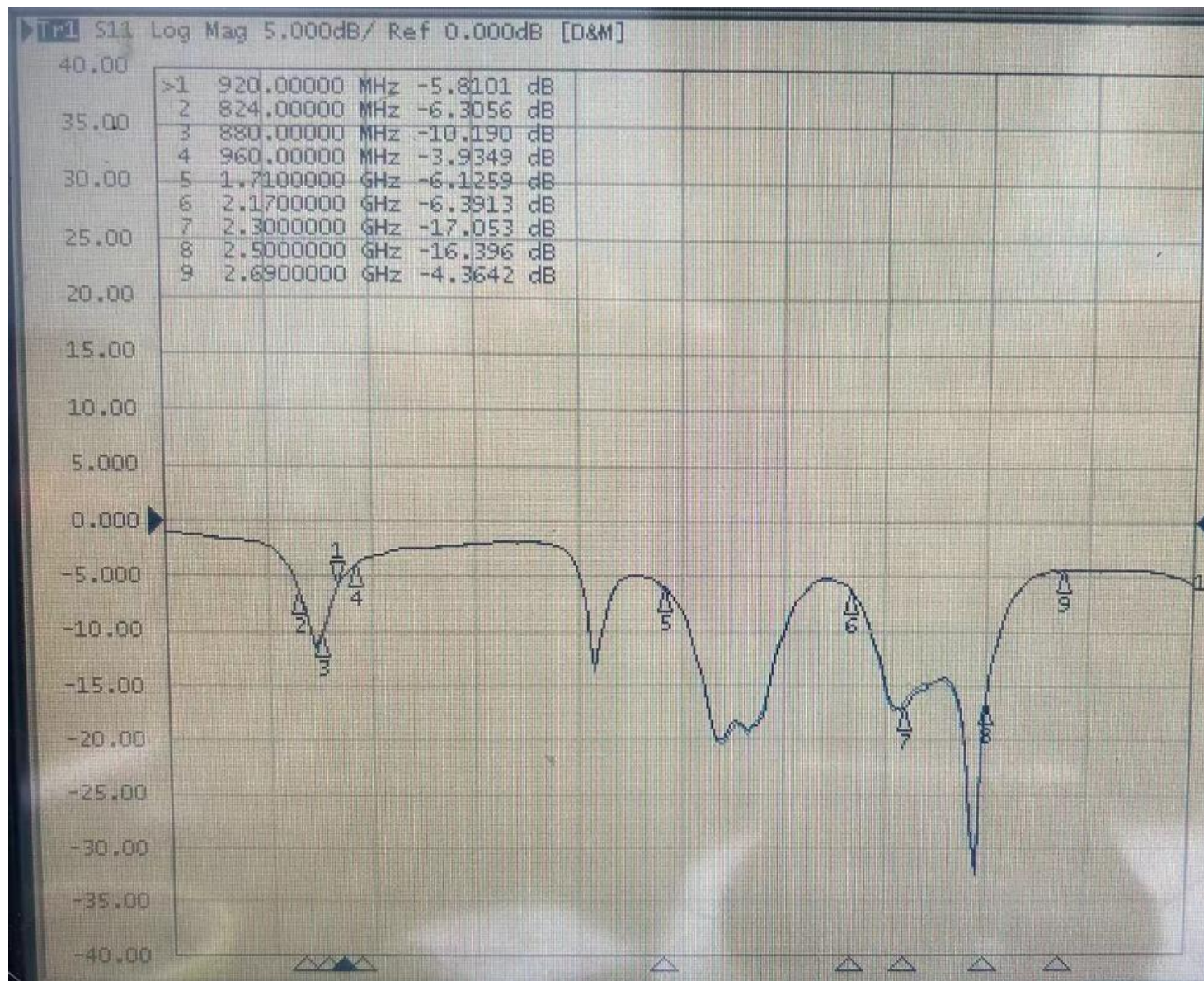
RF1 (C1562)	0 Ω	GSM:900/1800 LTE-FDD:B3/8 WCDMA:B8
RF2 (C1564)	33pF	GSM:1900 LTE-FDD:B1/2/4/7/66 LTE-TDD:B38/40/41 WCDMA:B1/2/4
RF3 (C1565)	4. 3nH	GSM:850 WCDMA:B5 FDD-LTE:B5/19/20/26
RF4 (C1566)	18nH	LTE-FDD:B12/13/17/28A/28B

ANT0 LOG MAG

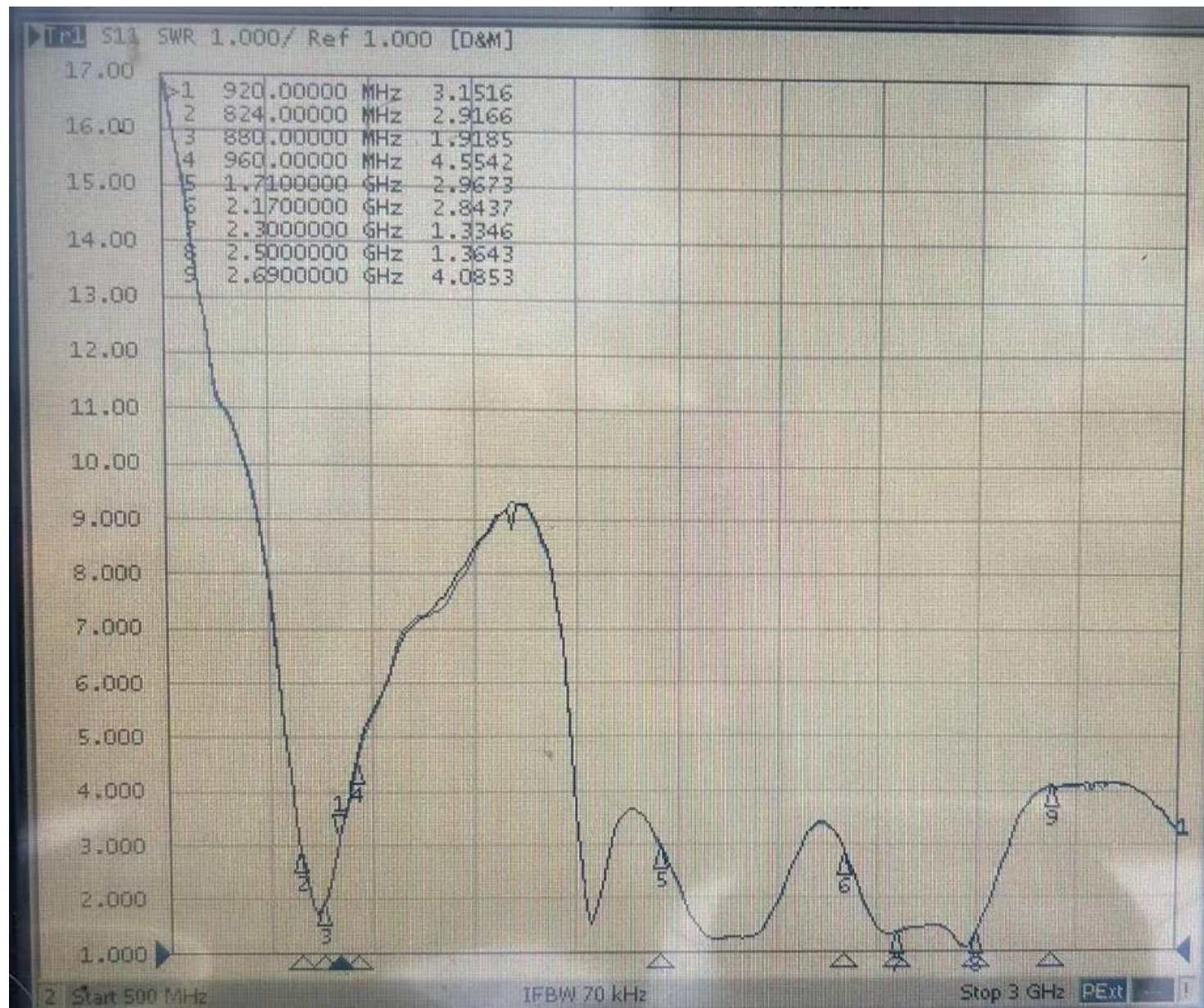


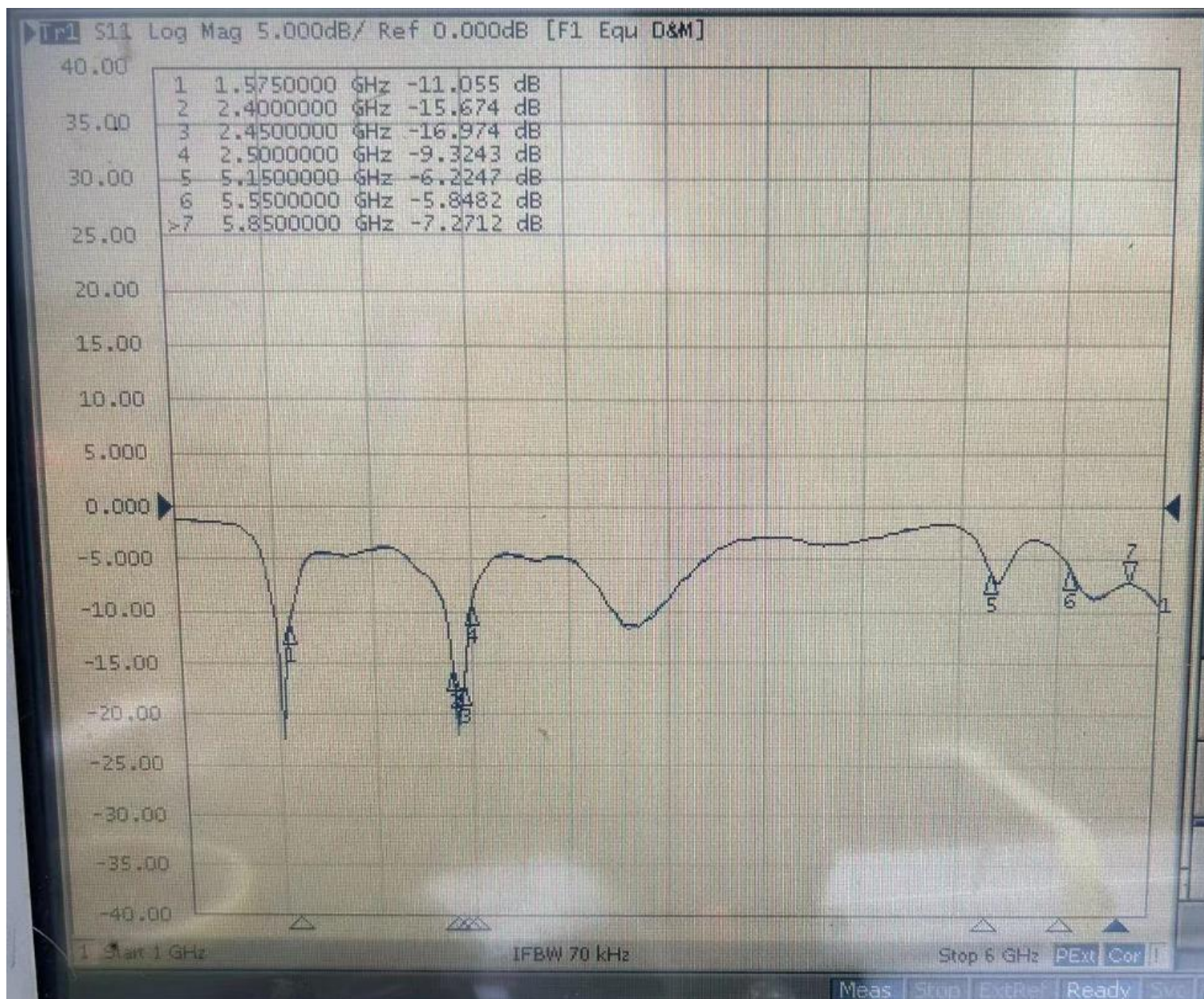


ANT1 LOG MAG

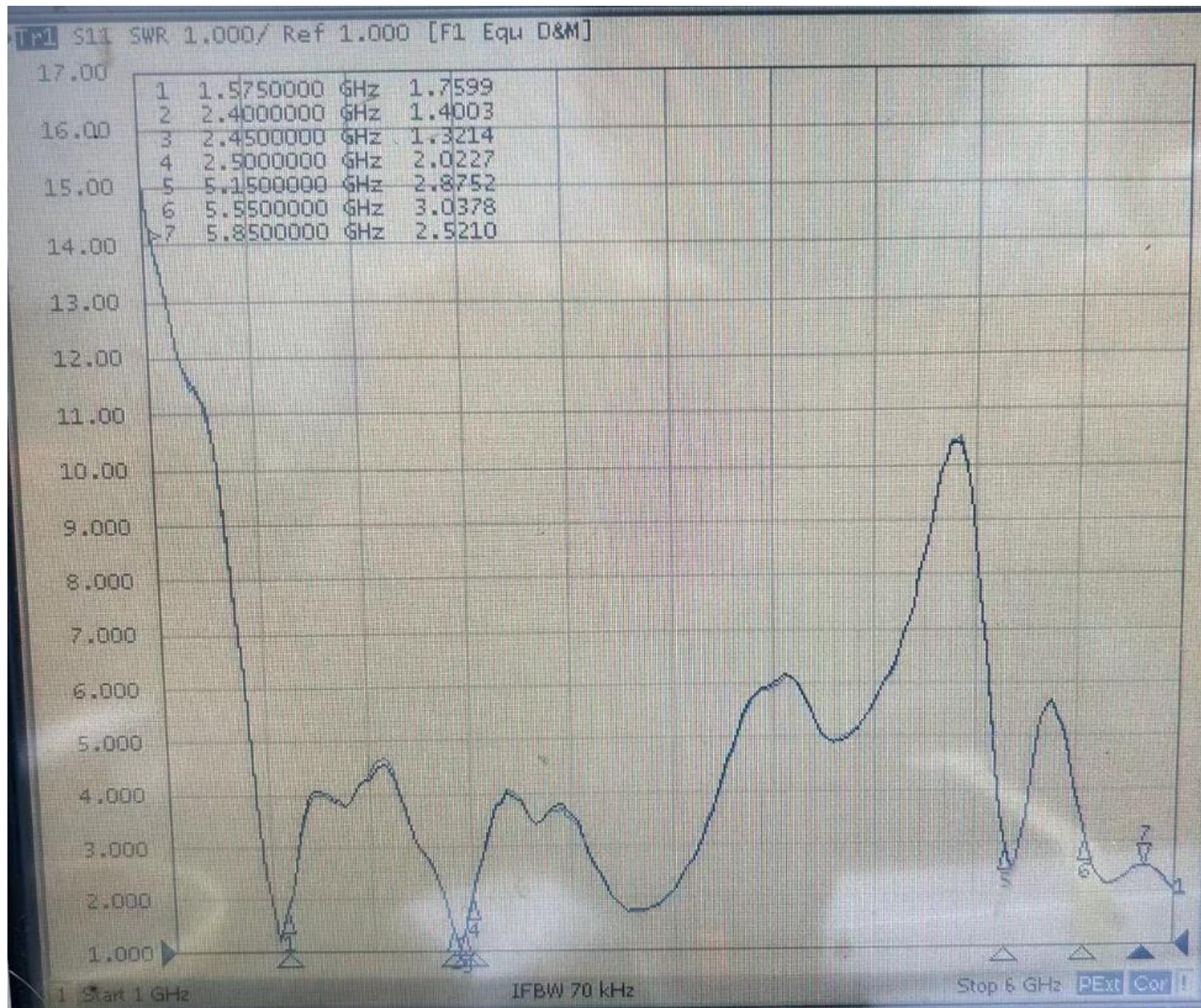


ANT1 SWR





GPS/Wifi/BT antenna SWR





Antenna gain

Frequency (MHZ)	Average Gain(dBi)	Peak Gain(dBi)	Frequency (MHZ)	Average Gain(dBi)	Peak Gain(dBi)
GSM850	-6.8	-3.7	LTE B13	-6.9	-3.8
GSM900	-5.6	-2.8	LTE B17	-6.3	-3.1
DCS1800	-4.2	1.3	LTE B19	-6.2	-3.1
PCS1900	-4.8	0.6	LTE B20	-6.1	-2.9
WCDMA B1	-4.3	1.0	LTE B26	-5.7	-2.9
WCDMA B2	-4.9	0.5	LTE B28A	-7.2	-3.9
WCDMA B4	-4.4	0.9	LTE B28B	-7.1	-3.8
WCDMA B5	-6.8	-3.7	LTE B66	-4.5	0.9
WCDMA B8	-5.6	-2.7	LTE B38	-5.2	-1.1
LTE B1	-4.3	1.0	LTE B40	-4.9	-0.2
LTE B2	-4.9	0.5	LTE B41	-5.1	-0.8
LTE B3	-4.2	1.3	WIFI 2.4G/BT	-4.9	-0.3
LTE B4	-4.4	0.9	WIFI 5.8G	-6.1	-1.8
LTE B5	-6.8	-3.7	GPS	-3.9	0.5
LTE B7	-5.6	-1.3			
LTE B8	-5.6	-2.7			
LTE B12	-6.5	-3.2			

Free Space-3D - Machine Screen Off					
Band	Channal	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
GSM850	128	24.2		25.3	
	190	24.1		25.5	
	251	24.3	-102.4	25.5	-103.2
EGSM	1	27.6		26.1	
	62	27.8		26.9	
	124	27.6	-103.6	27.1	-103.7
DCS	512	25.3		23.8	
	698	25.7		23.9	
	885	24.7	-102.6	24.1	-101.8
PCS	512	24.4		24.7	
	661	24.9		24.6	
	810	25.1	-103.1	24.6	-103.9

Free Space-3D - Machine Screen Off					
Band	Channal	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
WCDMA-B1	10562	18.3		17.2	
	10700	18.3		17.4	
	10838	17.6	-104.1	17.3	-102.9
WCDMA-B2	9662	16.5		16.6	
	9800	16.9		16.9	
	9938	17.8	-103.9	17.4	-103.5
WCDMA-B4	1538	18.5		14.1	
	1675	17.3		14.3	
	1738	17.6	-103.8	14.8	-102.1
WCDMA-B5	4357	16.8		16.7	
	4410	17.2		17.1	
	4458	17.6	-104.2	17.3	-104.5

Free Space-3D - Machine Screen Off					
Band	Channal	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
WCDMA-B8	2937	16.3		16.5	
	3013	16.7		16.1	
	3088	16.8	-103.5	14.6	-103.4
FDD-B1-10M	50	19.1		17.4	
	300	18.9		18.3	
	550	18.7	-93.5	17.9	-92.6
FDD-B2-10M	650	17.2		17.1	
	900	17.5		17.6	
	1150	18.1	-92.7	17.5	-92.8
FDD-B3-10M	1250	18.8		14.6	
	1575	18.3		15.1	
	1900	17.5	-92.9	16.3	-92.6

Free Space-3D - Machine Screen Off					
Band	Channel	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
FDD-10M-B4	2000	18.9		15.7	
	2175	18.8		16.1	
	2350	18.2	-93.5	16.2	-93.4
FDD-10M-B5	2450	17.1		16.9	
	2525	17.8		17.5	
	2600	17.5	-92.3	17.2	-92.9
FDD-10M-B7	2800	16.7		17.2	
	3100	17.1		17.5	
	3400	17.6	-92.2	17.9	-92.8
FDD-10M-B8	3500	16.8		16.8	
	3625	17.5		16.5	
	3750	17.4	-92.8	15.1	-93.1

Free Space-3D - Machine Screen Off					
Band	Channal	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
FDD-10M-B12	5060	16.3		15.2	
	5095	16.9		15.9	
	5130	16.7	-91.1	16.4	-91.2
FDD-10M-B13					
	5230	16.1	-90.3	15.8	-91.2
FDD-10M-B17	5780	16.8		15.4	
	5790	16.7		16.2	
	5800	17.1	-89.8	16.5	-90.1
FDD-10M-B19	6050	16.9		17.1	
	6075	16.8		17.3	
	6100	17.2	-92.2	17.4	-92.6



OTA test data

Free Space-3D – Machine Screen Off

Band	Channal	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
FDD-10M-B20	6200	17.5		17.3	
	6300	17.9		17.8	
	6400	17.2	-90.5	16.3	-91.3
FDD-10M-B26	8740	17.6		18.2	
	8865	17.1		17.7	
	8990	18.1	-92.2	17.9	-93.1
FDD-10M-B28a	9310	16.5		16.1	
	9360	17.1		15.9	
	9410	16.5	-90.5	16.5	-90.1
FDD-10M-B28b	9460	16.9		16.1	
	9510	16.1		16.4	
	9560	16.1	-91.1	17.1	-91.3
FDD-10M-B66	66536	18.6		15.8	
	66786	18.4		16.9	
	67036	18.2	-92.9	17.2	-92.4

Free Space-3D - Machine Screen Off					
Band	Channal	ANT0 TRP	ANT0 TIS	ANT1 TRP	ANT1 TIS
TDD-20M-B38	37850	18.4		17.5	
	38000	18.6		18.1	
	38150	18.9	-90.2	18.5	-90.4
TDD-20M-B40	38750	18.5		18.9	
	39150	18.9		19.2	
	39550	17.3	-90.5	18.1	-90.9
TDD-20M-B41					
	40620	17.2	-89.9	16.7	-90.2

Free Space-3D - Machine Screen Off				
2.4G	Band	Channel	TRP/dBm	TIS/dBm
	b (11M)	1	12.9	
		6	13.2	
		13	13.6	-83.7
	g (54M)	1	11.1	
		6	11.4	
		13	11.5	-71.4
	n (MCS7)	1	11.9	
		6	12.3	
		13	12.2	-67.3
5.8G	a (54M)	36	9.9	
		149	10.2	
		165	10.5	-71.5
	n (MCS7)	36	8.6	
		149	9.9	
		165	10.1	-67.3
	ac (MCS8)	36	8.9	
		149	10.1	
		165	10.2	-66.2

GPS antenna measurement, location: Intersection of Ping'an Avenue
Weather: Cloudy

ID	CNR	ID	CNR	ID	CNR
G2	38.8/-/-/-/-/-	G4	33.8/-/-/-/-/-	G7	23.7/-/-/-/-/-
G8	30.9/-/-/-/-/-	G9	36.3/-/-/-/-/-	G16	29.5/-/-/-/-/-
G21	40.1/-/-/-/-/-	G26	24.9/-/-/-/-/-	G27	35.9/-/-/-/-/-
G30	35.1/-/-/-/-/-	G31	0.0/-/-/-/-/-	R69	41.6/-/-/-/-/-
R70	0.0/-/-/-/-/-	R78	33.3/-/-/-/-/-	R79	36.5/-/-/-/-/-
R80	27.8/-/-/-/-/-	R81	29.7/-/-/-/-/-	R82	33.5/-/-/-/-/-
R83	25.1/-/-/-/-/-	R88	33.0/-/-/-/-/-	B1	25.8/-/-/-/-/-
B2	31.8/-/-/-/-/-	B3	30.7/-/-/-/-/-	B4	32.7/-/-/-/-/-
B5	0.0/-/-/-/-/-	B7	25.8/-/-/-/-/-	B9	29.9/-/-/-/-/-
B10	17.6/-/-/-/-/-	B11	35.7/-/-/-/-/-	B16	37.7/-/-/-/-/-
B23	32.9/-/-/-/-/-	B25	41.9/-/-/-/-/-	B27	28.5/-/-/-/-/-
B28	26.4/-/-/-/-/-	B32	30.0/-/-/-/-/-	B34	34.0/-/-/-/-/-
B37	28.7/-/-/-/-/-	B56	0.0/-/-/-/-/-	E7	0.0/-/-/-/-/-
E13	32.5/-/-/-/-/-	E15	0.0/-/-/-/-/-	E19	0.0/-/-/-/-/-
E26	0.0/-/-/-/-/-	E27	0.0/-/-/-/-/-	E29	0.0/-/-/-/-/-
E30	32.5/-/-/-/-/-	E34	0.0/-/-/-/-/-	Q2	31.0/-/-/-/-/-
Q3	38.0/-/-/-/-/-	Q4	0.0/-/-/-/-/-	Q7	0.0/-/-/-/-/-
S45	32.0/-/-/-/-/-				

ID	CNR	ID	CNR	ID	CNR
G2	28.0/-/-/-/-/-	G4	36.6/-/-/-/-/-	G7	30.5/-/-/-/-/-
G8	41.7/-/-/-/-/-	G9	22.7/-/-/-/-/-	G16	36.3/-/-/-/-/-
G21	37.4/-/-/-/-/-	G26	13.3/-/-/-/-/-	G27	34.9/-/-/-/-/-
G30	39.2/-/-/-/-/-	G31	0.0/-/-/-/-/-	R69	31.0/-/-/-/-/-
R70	0.0/-/-/-/-/-	R78	37.6/-/-/-/-/-	R79	36.3/-/-/-/-/-
R80	34.2/-/-/-/-/-	R81	19.2/-/-/-/-/-	R82	19.2/-/-/-/-/-
R83	16.4/-/-/-/-/-	R88	36.8/-/-/-/-/-	B1	23.7/-/-/-/-/-
B2	0.0/-/-/-/-/-	B3	28.3/-/-/-/-/-	B4	25.6/-/-/-/-/-
B5	0.0/-/-/-/-/-	B7	24.7/-/-/-/-/-	B9	26.0/-/-/-/-/-
B10	25.9/-/-/-/-/-	B11	36.5/-/-/-/-/-	B16	25.1/-/-/-/-/-
B23	45.4/-/-/-/-/-	B25	38.0/-/-/-/-/-	B27	23.5/-/-/-/-/-
B28	28.6/-/-/-/-/-	B32	19.1/-/-/-/-/-	B34	30.3/-/-/-/-/-
B37	32.4/-/-/-/-/-	B56	0.0/-/-/-/-/-	E7	0.0/-/-/-/-/-
E13	27.6/-/-/-/-/-	E15	0.0/-/-/-/-/-	E19	0.0/-/-/-/-/-
E21	0.0/-/-/-/-/-	E26	0.0/-/-/-/-/-	E27	0.0/-/-/-/-/-
E29	0.0/-/-/-/-/-	E30	28.2/-/-/-/-/-	E34	0.0/-/-/-/-/-
Q2	20.0/-/-/-/-/-	Q3	36.0/-/-/-/-/-	Q4	37.0/-/-/-/-/-
Q7	0.0/-/-/-/-/-	S45	0.0/-/-/-/-/-		

GPS antenna measurement, location: Intersection of Ping'an Avenue
Weather: Cloudy

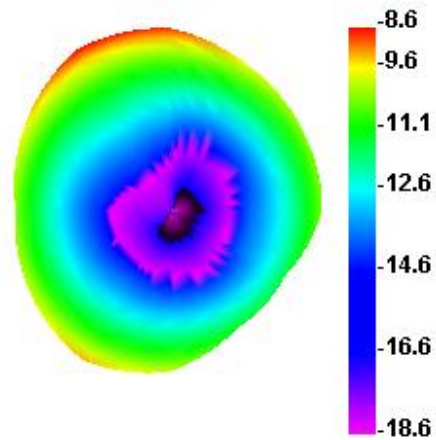
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G2	30.6/-/-/-/-/-	G4	29.3/-/-/-/-/-	G7	30.6/-/-/-/-/-
G8	20.7/-/-/-/-/-	G9	36.1/-/-/-/-/-	G16	40.5/-/-/-/-/-
G21	27.7/-/-/-/-/-	G26	20.9/-/-/-/-/-	G27	35.2/-/-/-/-/-
G30	19.3/-/-/-/-/-	G31	0.0/-/-/-/-/-	R69	29.1/-/-/-/-/-
R70	0.0/-/-/-/-/-	R78	43.9/-/-/-/-/-	R79	15.4/-/-/-/-/-
R80	23.6/-/-/-/-/-	R81	37.3/-/-/-/-/-	R82	23.5/-/-/-/-/-
R83	10.3/-/-/-/-/-	R88	21.5/-/-/-/-/-	B1	26.8/-/-/-/-/-
B2	32.6/-/-/-/-/-	B3	0.0/-/-/-/-/-	B4	0.0/-/-/-/-/-
B5	0.0/-/-/-/-/-	B7	36.8/-/-/-/-/-	B9	26.8/-/-/-/-/-
B10	36.8/-/-/-/-/-	B11	35.1/-/-/-/-/-	B16	29.3/-/-/-/-/-
B23	24.1/-/-/-/-/-	B25	38.4/-/-/-/-/-	B27	20.0/-/-/-/-/-
B28	24.5/-/-/-/-/-	B32	28.0/-/-/-/-/-	B37	28.1/-/-/-/-/-
B56	0.0/-/-/-/-/-	E7	0.0/-/-/-/-/-	E13	19.9/-/-/-/-/-
E15	0.0/-/-/-/-/-	E19	0.0/-/-/-/-/-	E21	0.0/-/-/-/-/-
E26	0.0/-/-/-/-/-	E27	0.0/-/-/-/-/-	E29	0.0/-/-/-/-/-
E30	34.7/-/-/-/-/-	E34	0.0/-/-/-/-/-	Q2	37.0/-/-/-/-/-
Q3	36.0/-/-/-/-/-	Q4	28.0/-/-/-/-/-	Q7	0.0/-/-/-/-/-
S50	0.0/-/-/-/-/-				

ID	CNR	ID	CNR	ID	CNR
G2	40.7/-/-/-/-/-	G4	35.6/-/-/-/-/-	G7	40.0/-/-/-/-/-
G8	20.1/-/-/-/-/-	G9	38.3/-/-/-/-/-	G16	30.4/-/-/-/-/-
G21	34.0/-/-/-/-/-	G26	0.0/-/-/-/-/-	G27	31.9/-/-/-/-/-
G30	28.4/-/-/-/-/-	G31	0.0/-/-/-/-/-	R69	33.0/-/-/-/-/-
R70	0.0/-/-/-/-/-	R78	19.2/-/-/-/-/-	R79	30.3/-/-/-/-/-
R80	31.8/-/-/-/-/-	R81	30.0/-/-/-/-/-	R82	33.0/-/-/-/-/-
R83	21.7/-/-/-/-/-	R88	30.8/-/-/-/-/-	B1	32.0/-/-/-/-/-
B2	33.0/-/-/-/-/-	B3	31.2/-/-/-/-/-	B4	0.0/-/-/-/-/-
B5	28.2/-/-/-/-/-	B7	21.5/-/-/-/-/-	B9	18.9/-/-/-/-/-
B10	29.7/-/-/-/-/-	B11	27.0/-/-/-/-/-	B16	25.1/-/-/-/-/-
B23	33.5/-/-/-/-/-	B25	20.9/-/-/-/-/-	B27	33.2/-/-/-/-/-
B28	43.0/-/-/-/-/-	B32	26.7/-/-/-/-/-	B34	23.4/-/-/-/-/-
B37	31.7/-/-/-/-/-	B56	0.0/-/-/-/-/-	E7	0.0/-/-/-/-/-
E13	37.2/-/-/-/-/-	E15	0.0/-/-/-/-/-	E19	0.0/-/-/-/-/-
E21	0.0/-/-/-/-/-	E26	0.0/-/-/-/-/-	E27	0.0/-/-/-/-/-
E29	0.0/-/-/-/-/-	E30	24.2/-/-/-/-/-	E34	0.0/-/-/-/-/-
Q2	21.0/-/-/-/-/-	Q3	27.0/-/-/-/-/-	Q4	28.0/-/-/-/-/-
Q7	0.0/-/-/-/-/-	S41	33.0/-/-/-/-/-		

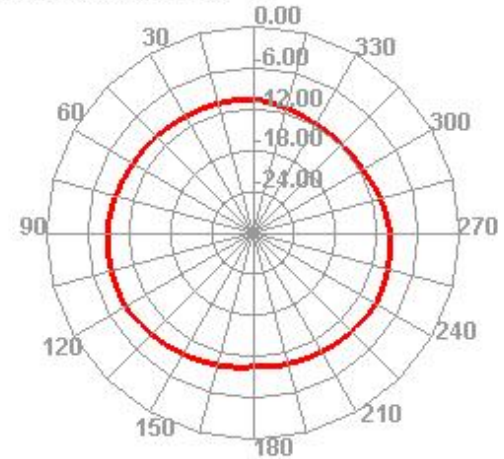
NFC antenna (motherboard):

DK090	
label	Reading distance (mm)
Card 1	38
Card 2	37
Card 3	30
Card 4	13

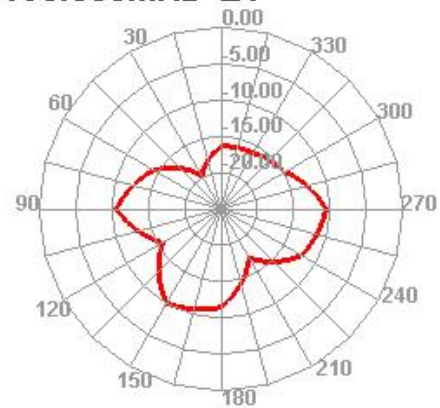
690.000MHz



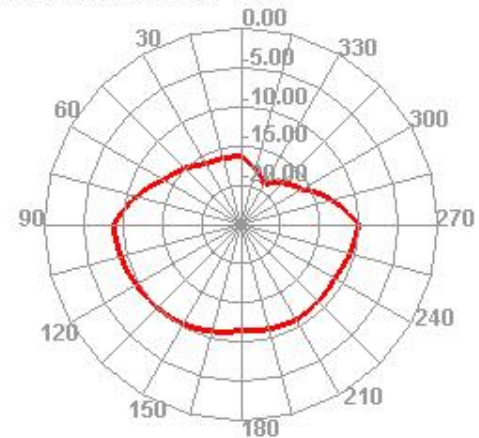
690.000MHz H



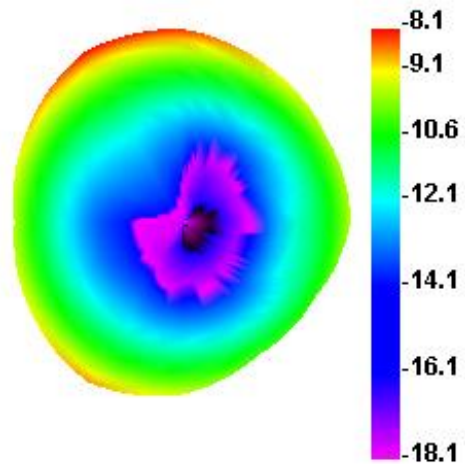
690.000MHz E1



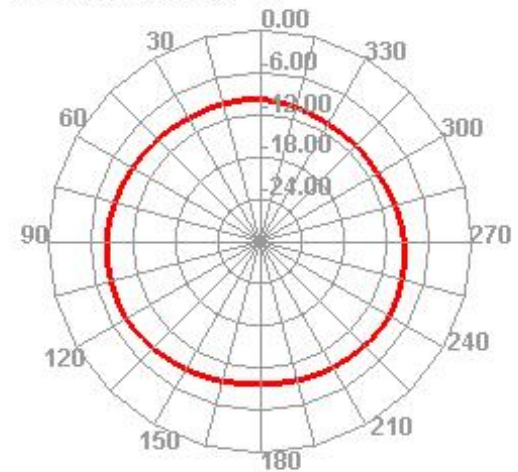
690.000MHz E2



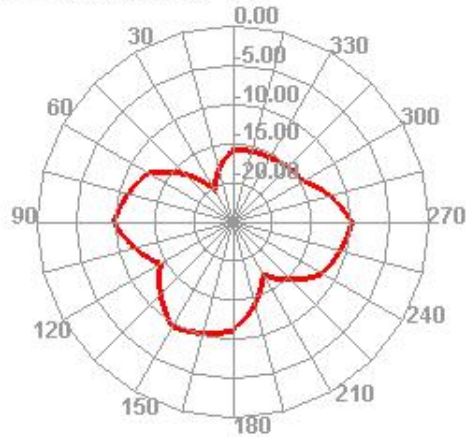
700.000MHz



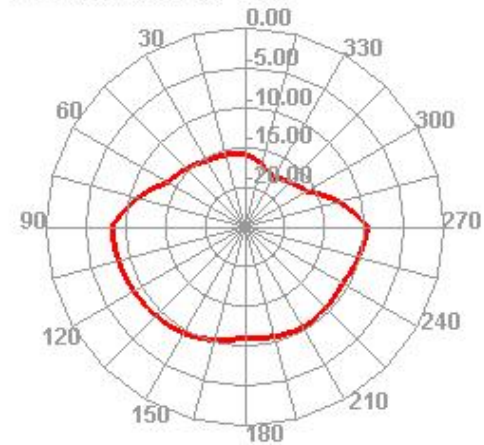
700.000MHz H



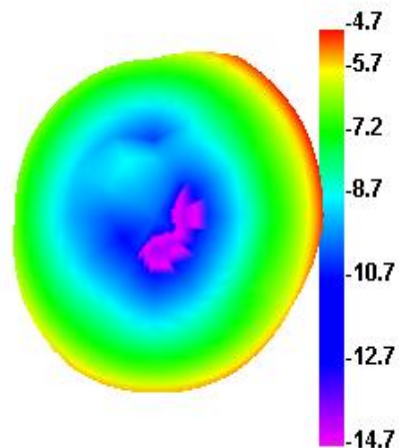
700.000MHz E1



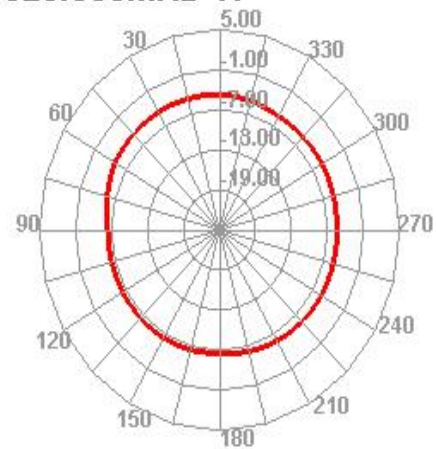
700.000MHz E2



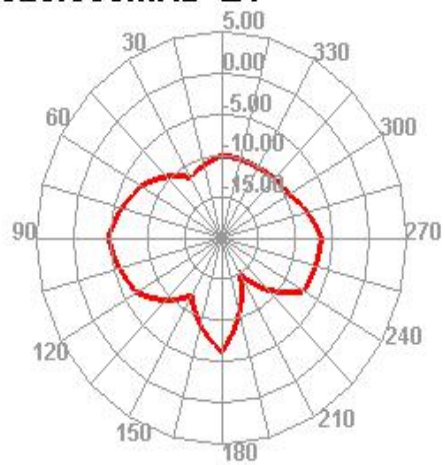
820.000MHz



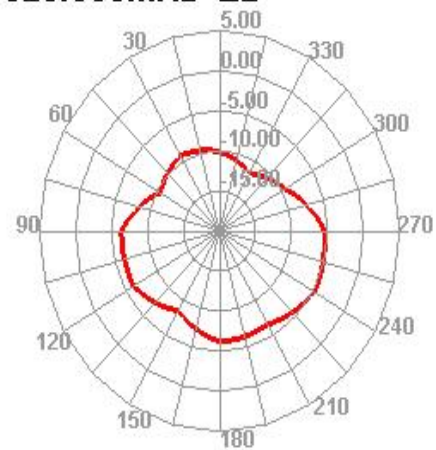
820.000MHz H



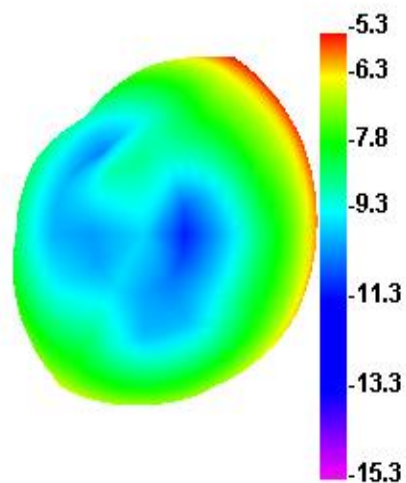
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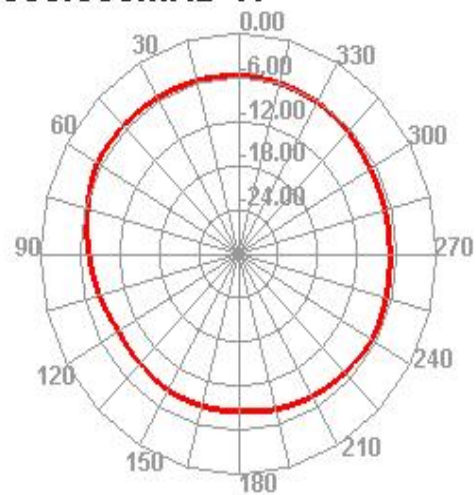
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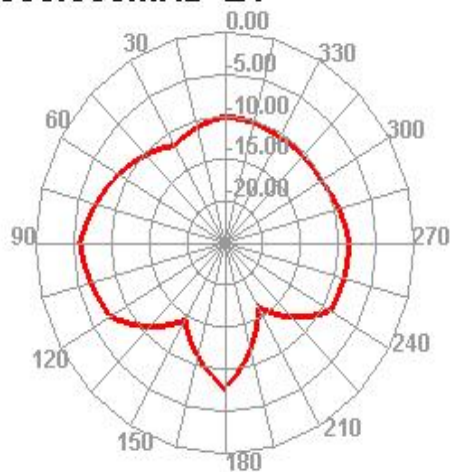
850.000MHz



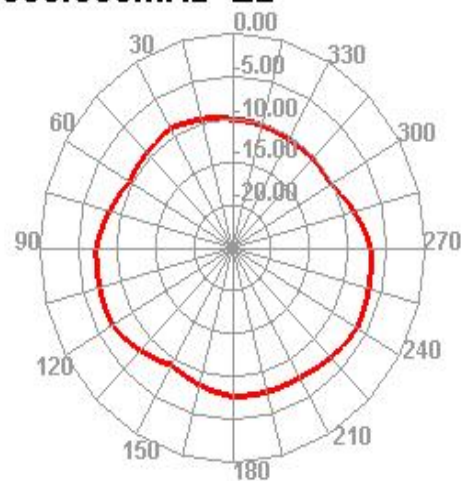
850.000MHz H



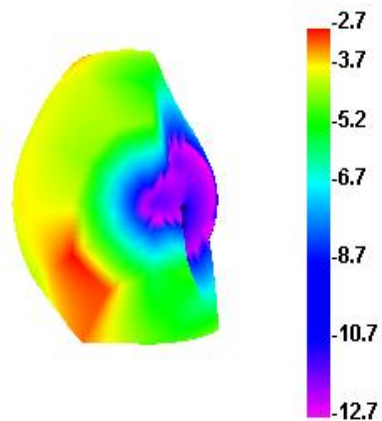
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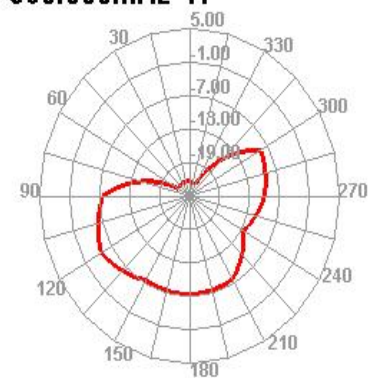
850.000MHz E2



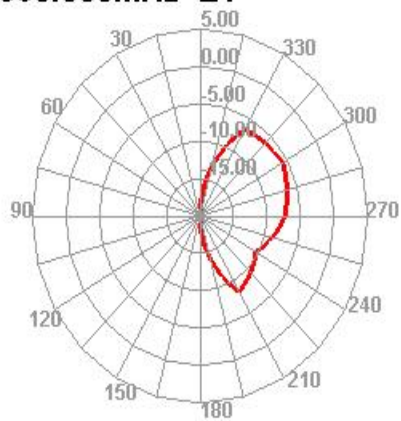
960.000MHz



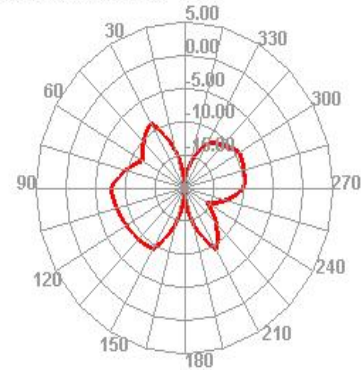
960.000MHz H



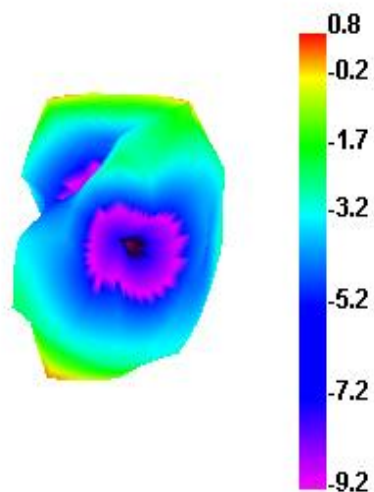
960.000MHz E1



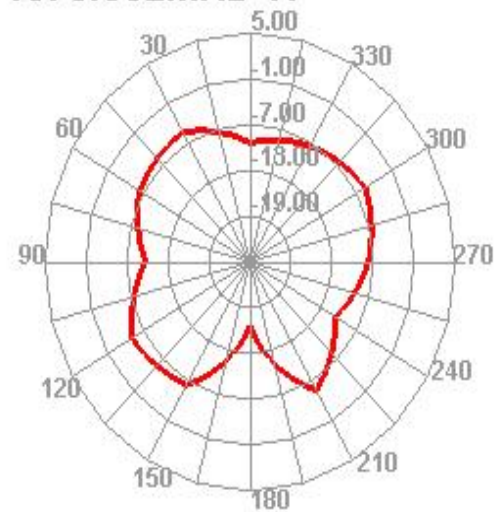
960.000MHz E2



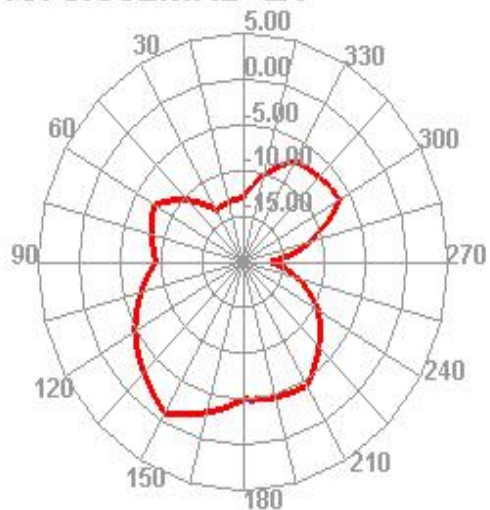
1573.332MHz



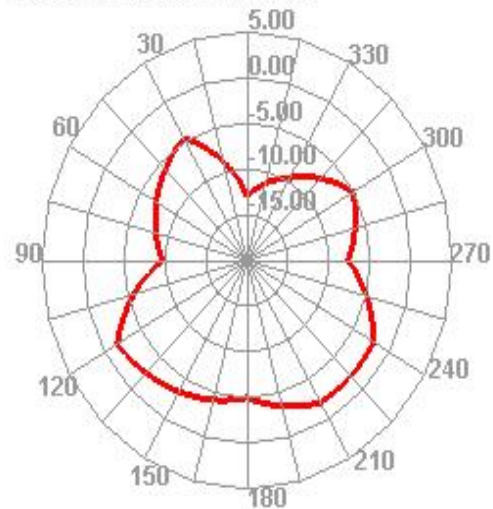
1573.332MHz H



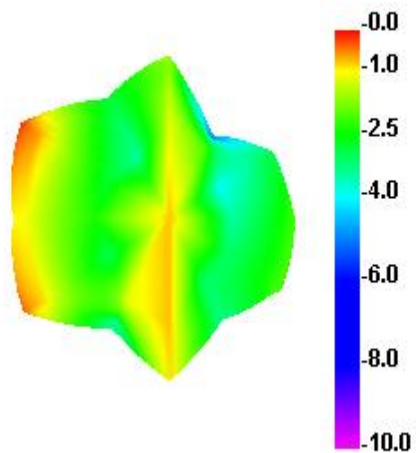
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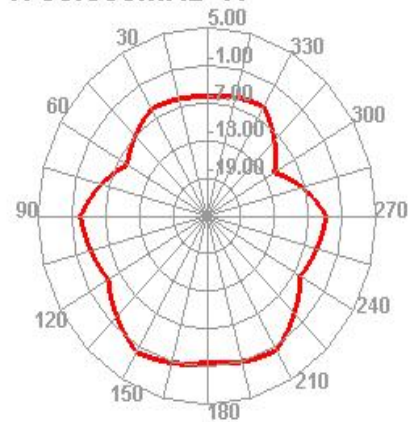
1573.332MHz E2



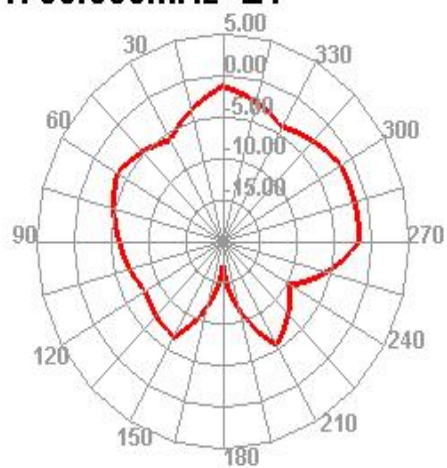
1700.000MHz



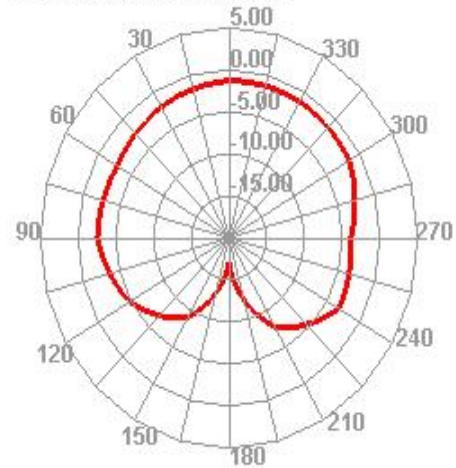
1700.000MHz H



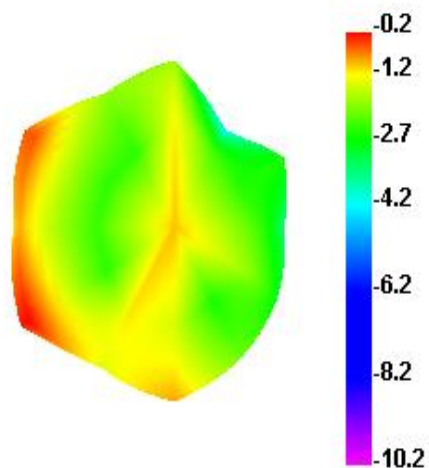
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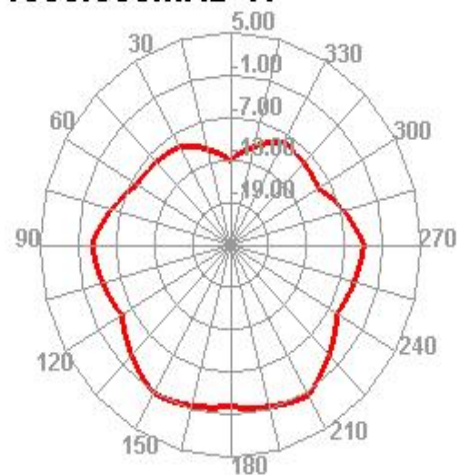
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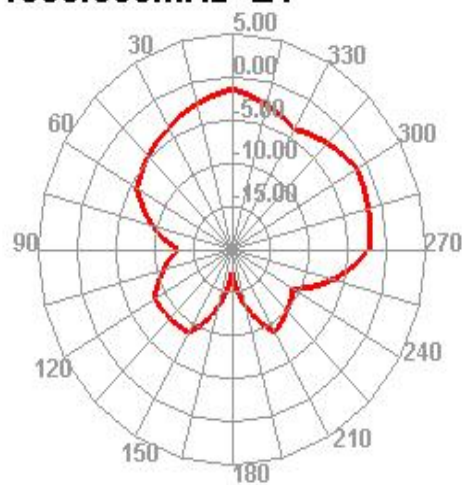
1800.000MHz



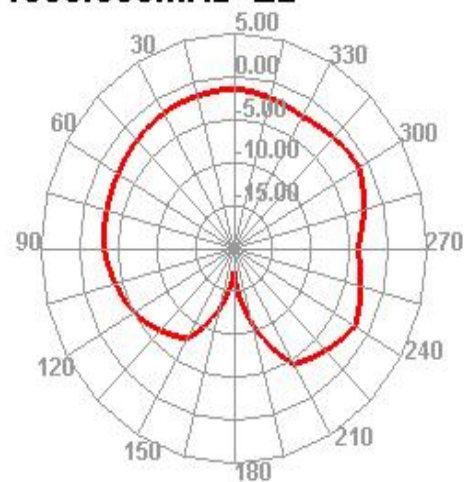
1800.000MHz H



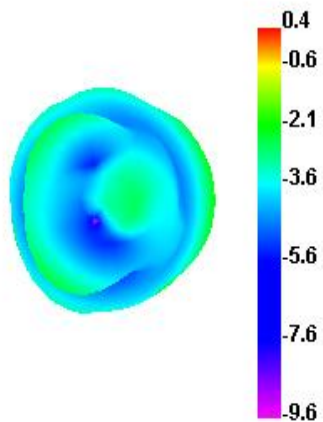
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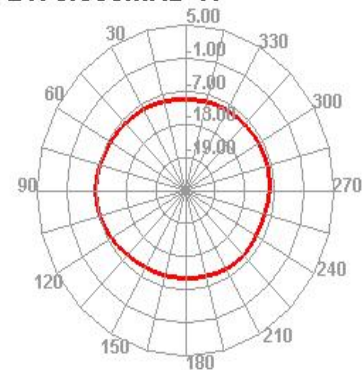
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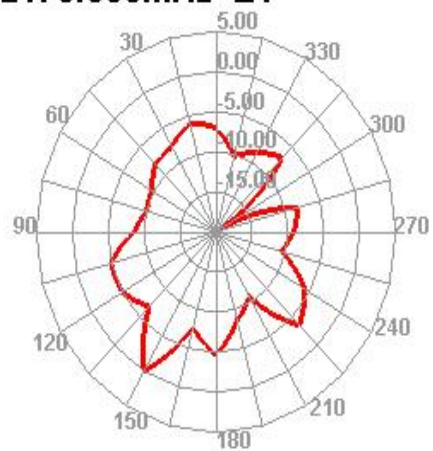
2170.000MHz



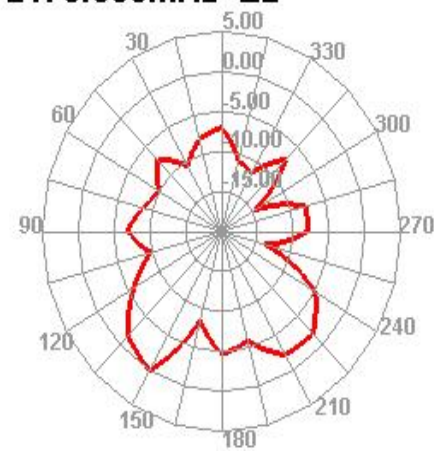
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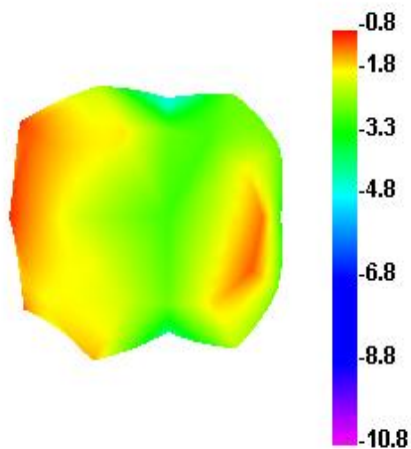
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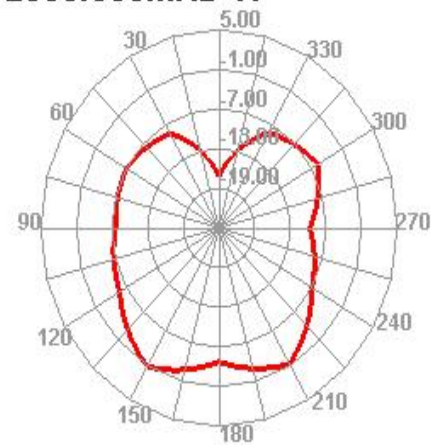
2170.000MHz E2



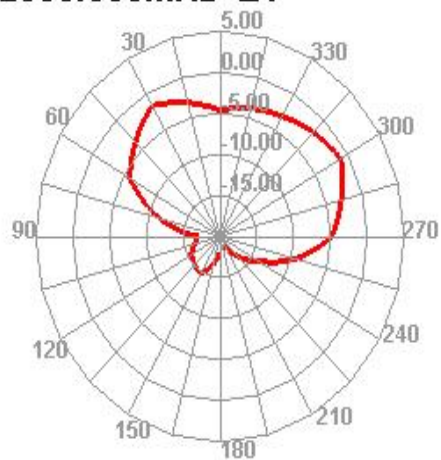
2500.000MHz



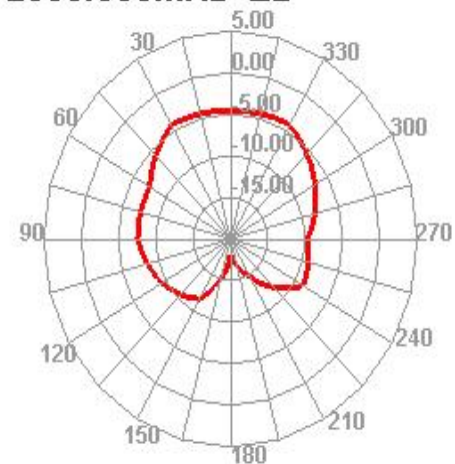
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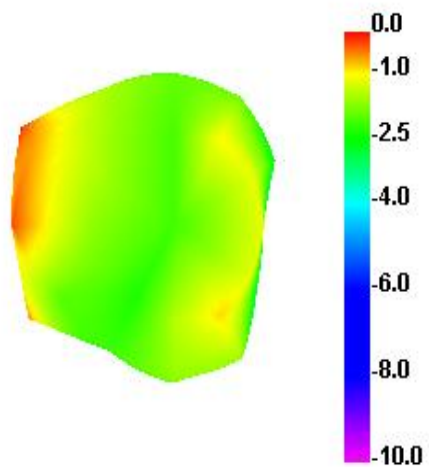
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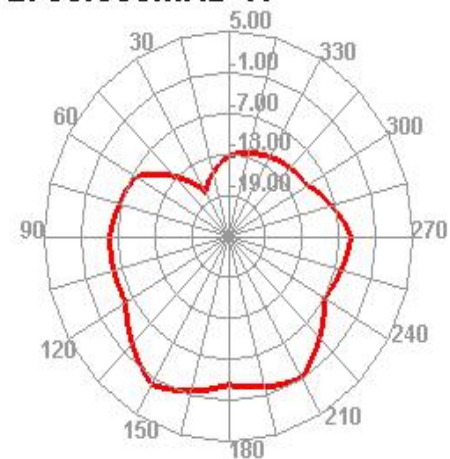
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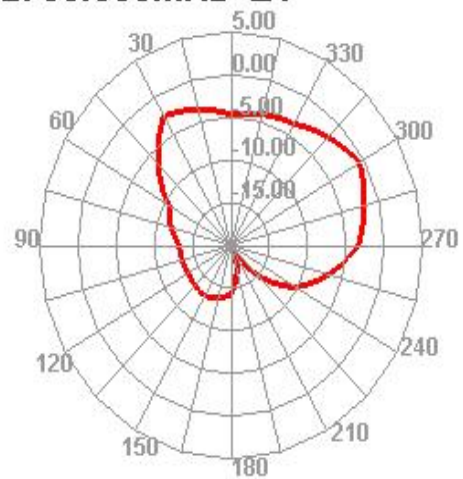
2700.000MHz



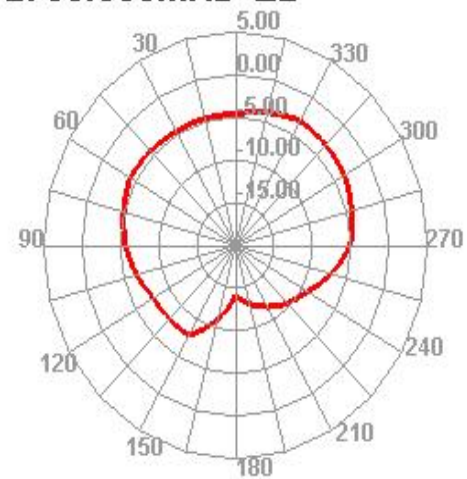
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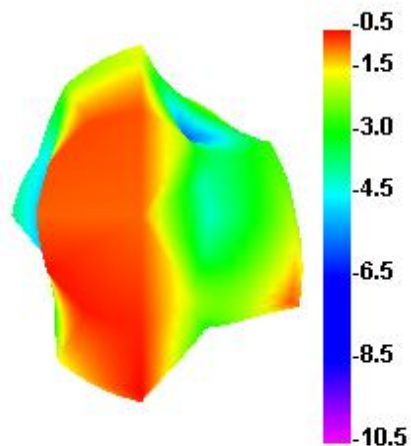
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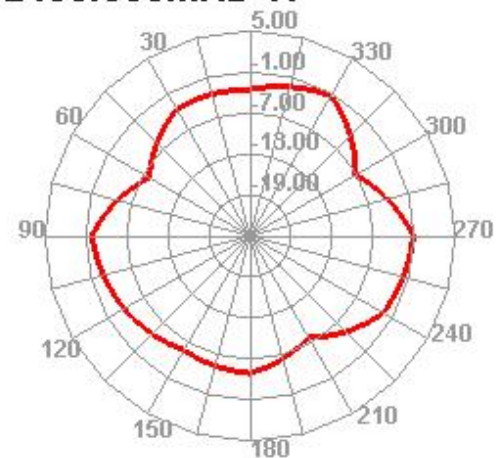
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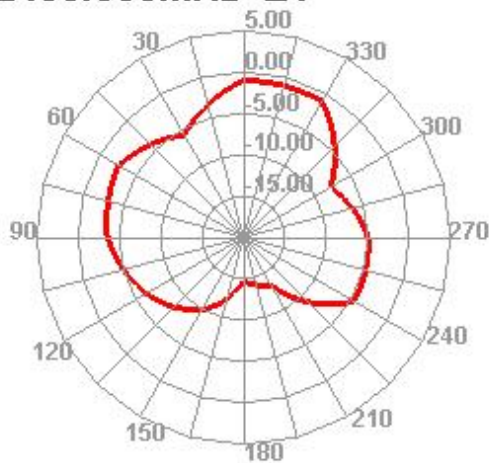
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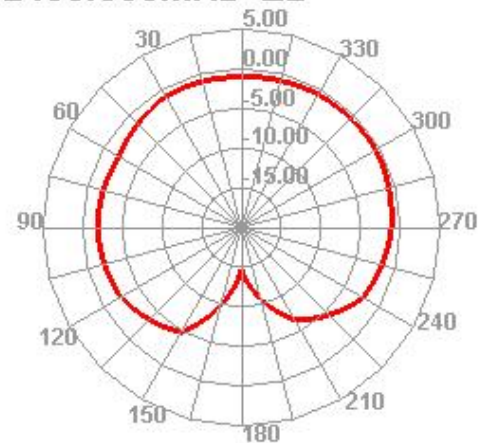
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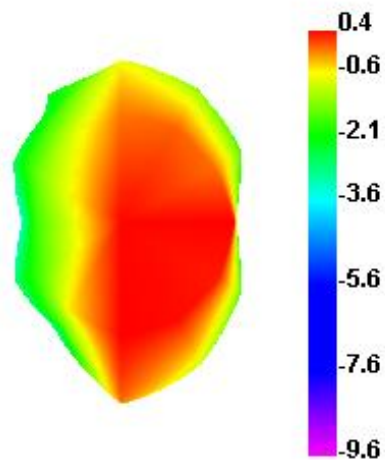
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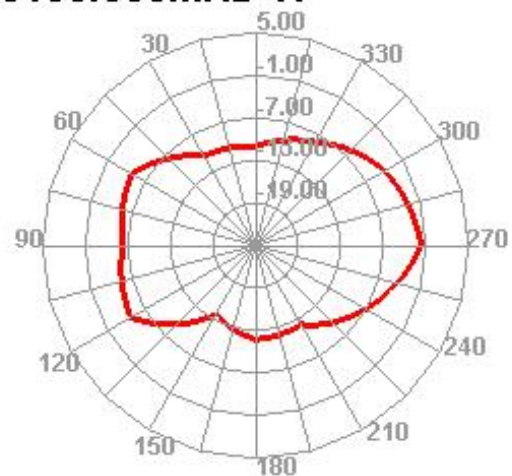
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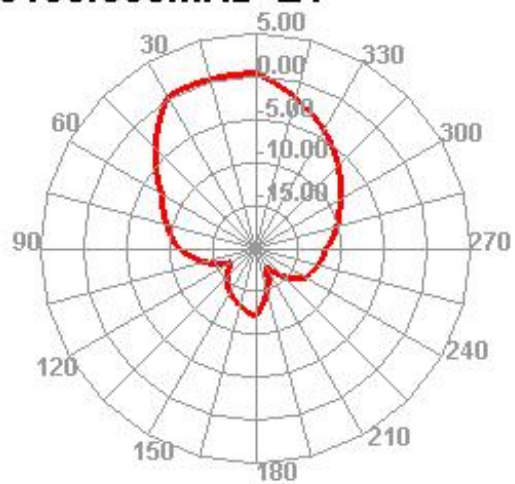
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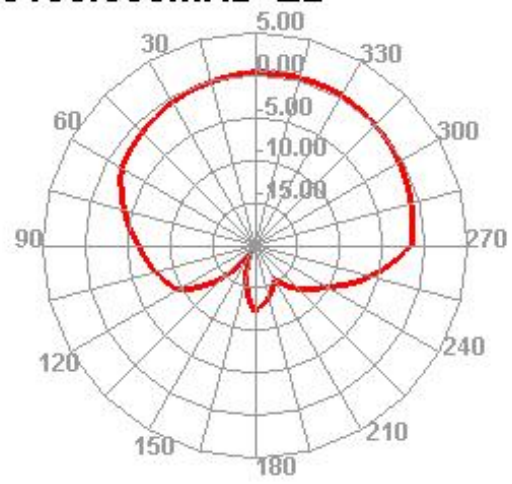
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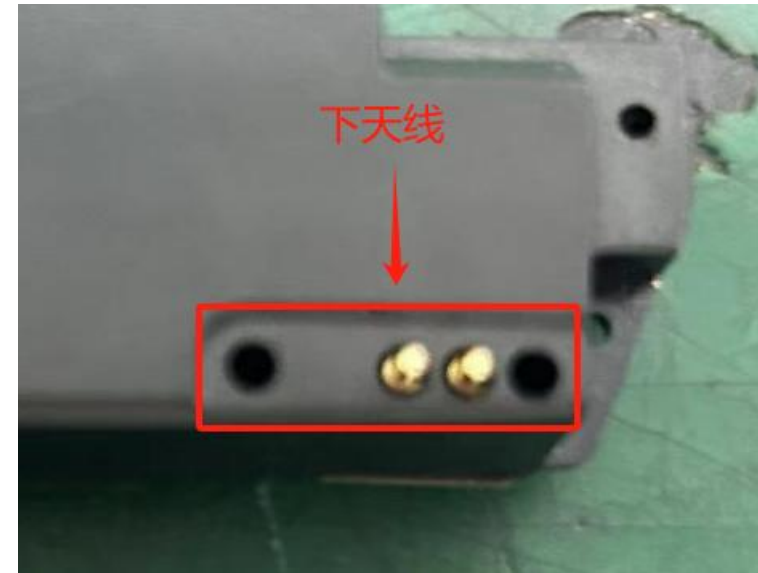
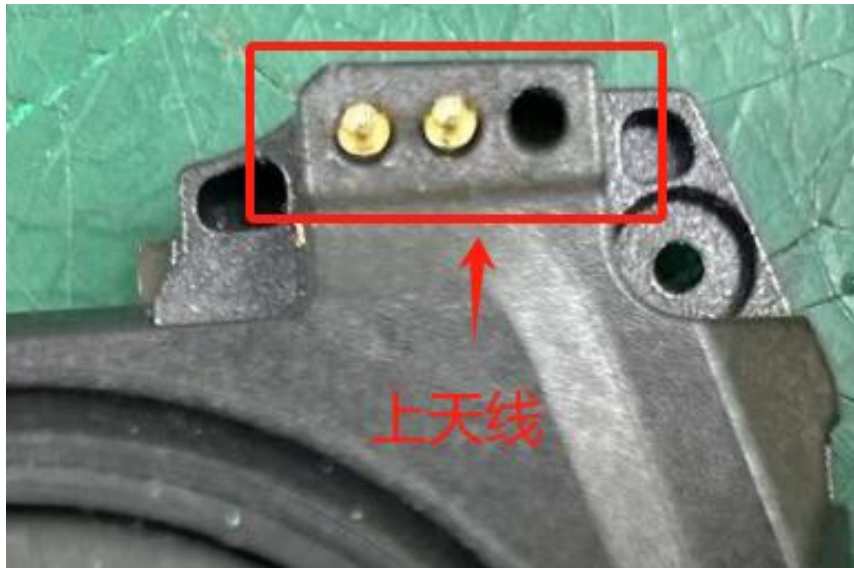


5100.000MHz E1

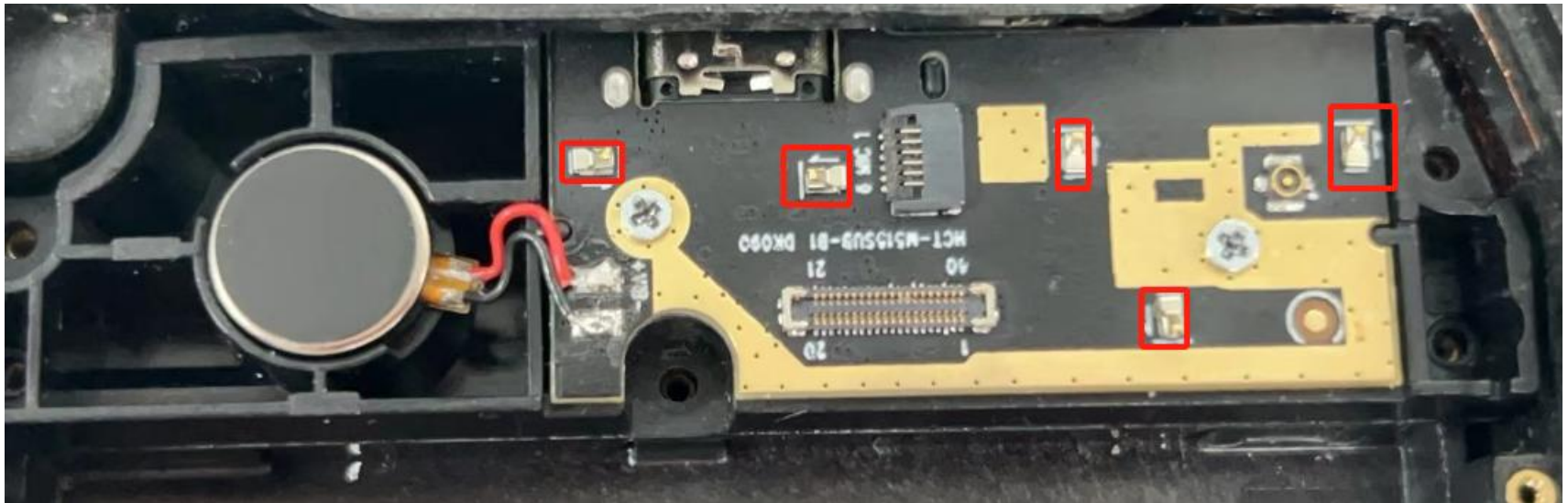


5100.000MHz E2

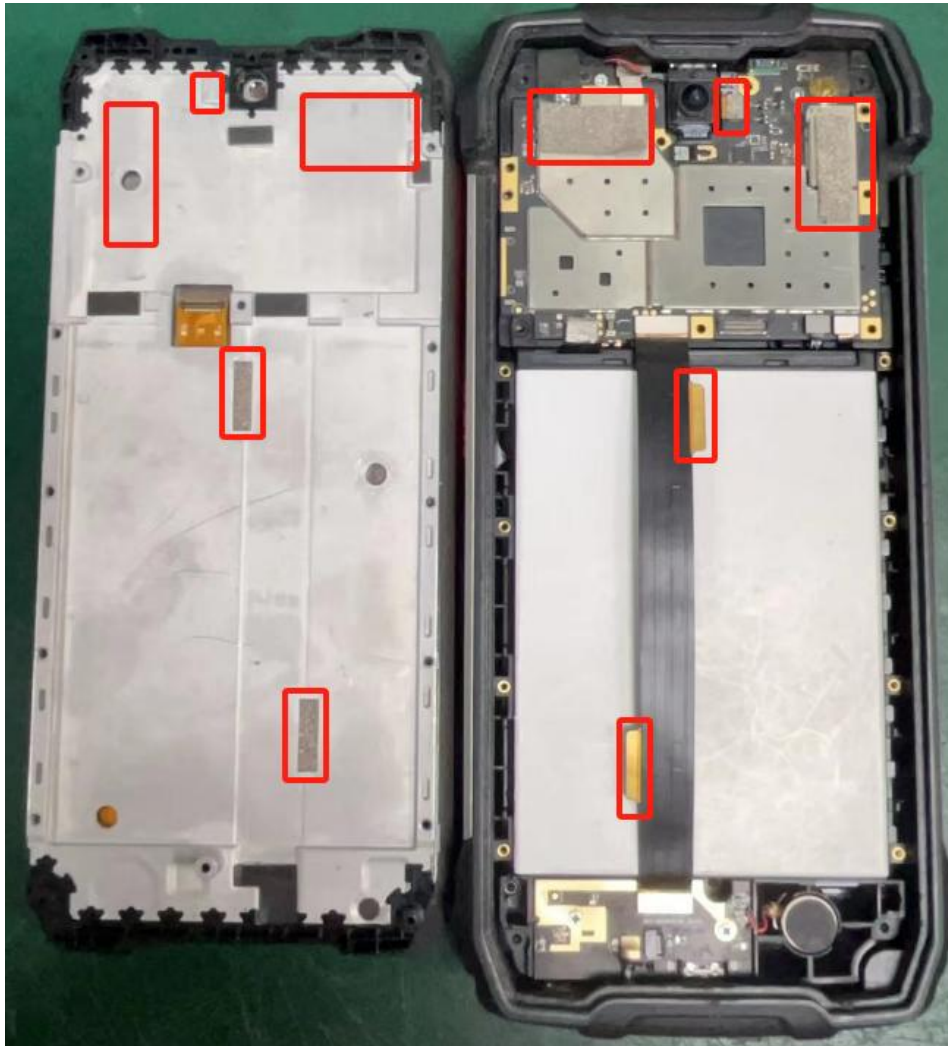




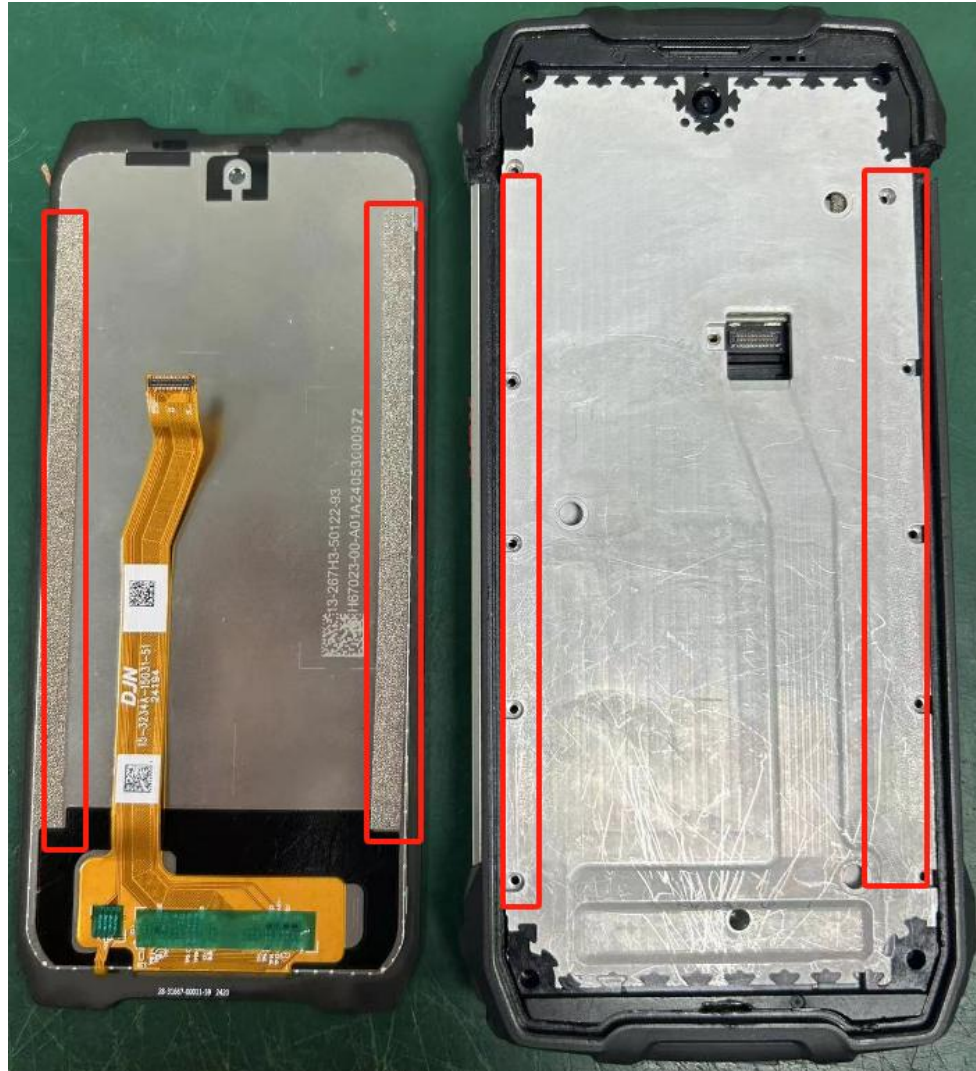
As shown in the picture, the small board is grounded at multiple points with the zinc alloy in the middle frame through shrapnel.



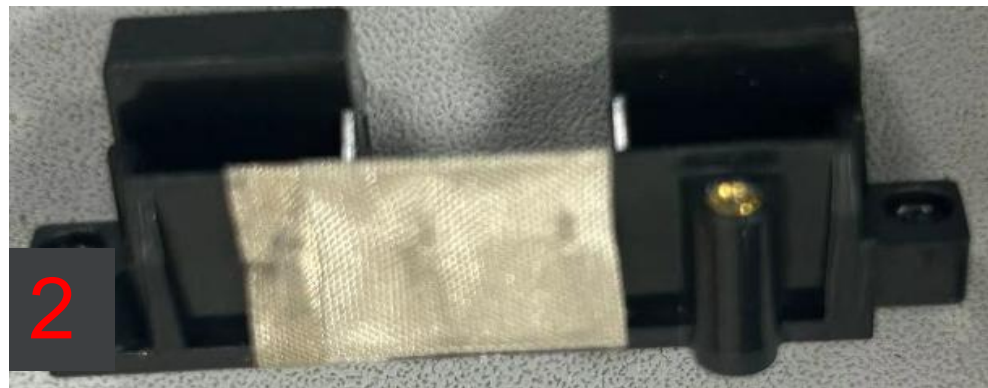
As shown in the figure, conductive sponge grounding is added to the corresponding positions of the zinc alloy in the middle frame, the shielding cover of the motherboard, and the exposed copper area of the wiring.



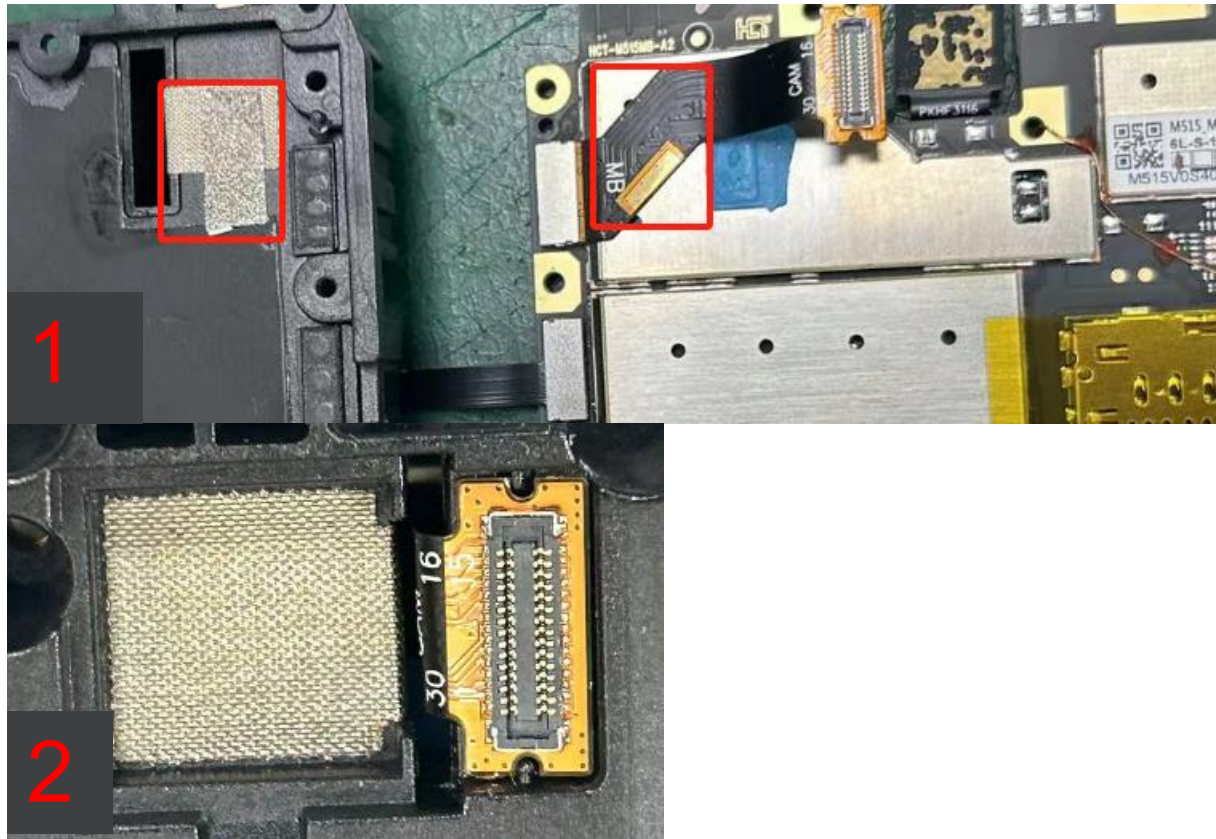
As shown in the figure, long conductive sponges are added on both sides of the screen metal and grounded with the zinc alloy in the middle frame.



As shown in Figure 1-5: Pull the conductive cloth from below the LED light base and apply it back to the back of the LED light cable. The back of the LED light cable and the metal part on the back of the LED light should be covered with conductive sponge and conductive cloth at a height sufficient for grounding.



As shown in the figure: Extend a conductive cloth from the bracket and stick it back to the bottom of the camera. Add a large strip of conductive sponge above the bracket conductive cloth and fully ground it to the exposed copper part of the camera cable and the motherboard shielding cover.



As shown in the figure, increase the height of the horn magnet to a sufficient level for the conductive sponge to be grounded to the main board shielding cover.

