



Shenzhen Foruo Technology Co., Ltd. SHENZHEN FROG TECHNOLOGY CO., LTD

Sample approval letter

No.: X12NFT-20231214

material code	FD. 42. X12NYE11	name of	main antenna	
Applicable model	X12NFT	Specificati on description	X12NFT / Main antenna / FPC + same-axis / wire length: 68mm / screen printing: X12NFT-YST-GSM-V1.0	
Material category	☒ Structure, electronics, and packaging categories ☐ ☐			
Supplier		supplier	Renesola	
Recognize the	☐ New project ☐ New supplier ☐ cost reduction ☐ material change ☐ Planning change ☐			
Material validation	Structural Engineer and Product Manager (concurrently: ID, Engineer)			
	▽MD	☐ Recognition ☐ does not approve ☐ others	Confirm content	structure size
	▽ID	☐ Recognition ☐ does not approve ☐ others	Confirm content	1. Color difference
				2. Gloss
				3. Silk-printed LOGO
				4. Light transmittance
	▽ Attachment	☐ Material specification ☐ Structure full size report ☐ Others:		
	remarks			
	Structural Engineer (signature)		Product Manager (signatu	
	Device engineer			
	▽ electrical	☐ Recognition ☐ does not approve ☐ others	▽ESD	☐ Recognition ☐ does not approve ☐ others
	▽ function	☐ Recognition ☐ does not approve ☐ others		
	▽ Attachment	☐ Material specification ☐ Electrical test report ☐ Functional test report ☐ Others:		
	remarks			
	Device Engineer		examine and	
	Quality engineer			
	▽ reliability	☐ Recognition ☐ does not approve ☐ others	▽ function	☐ Recognition ☐ does not approve ☐ others
	▽ surface	☐ Recognition ☐ does not approve ☐ others		
	▽ Attachment	☐ Reliability test report ☐ Quality control plan (QC drawing) ☐ ROHS test report ☐ Cpk report / process yield report, etc		
	remarks			
DQE, Engineer (signature)		examine and verify		
project manager				
ensemble	☐ Recognition ☐ does not approve ☐ others	else	☐ Recognition ☐ does not approve ☐ others	
remarks				
Project Manager		exami ne		
comprehensive assessment:				
☐ Approval ☐ Limited approval (quantity:) ☐ Non-approval:				

X12NFT Project antenna material requirements specification

Customer name: Forog

Customer product name: X12NFT

Product name: FPC antenna

Product specification: See the BOM table for more details

material code: FD. 42. X12NYE11

Change Content CV:

order number	edition	state	Start and end date	person liable	page number	remarks
1	editio princeps	editio princeps	2024-02-24	Li Jieyi	17	

The Supplier acknowledges the signature of the following documents:

Responsible person / date		IQC/ date	Review / Date	Approval / Date
MD	Feng jiwu	Su guangfeng	Chen kehong	
RF	Xiao jinbao			

The demander acknowledges the signature (please send it back after the confirmation):

The demander's judgment result: ☐ qualified ☐ unqualified			
Development & Design Engineer / Date	SQE Engineer / Date	Purchasing Leader / Date	Development Manager approval / date

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1. Overview

1.1 Scope of application

This requirement specifies the antenna technical requirements and material requirements specifications for X12NFT products.

This requirement is applicable to the antenna selection, testing and acceptance of X12NFT products.

1.2 Project basic information

Antenna name:	<u>X12NFT</u>
Antenna frequency:	2G: GSM850/900/1800/1900 3G: WCDMA B1/2/5/8 4G: LTE B2/3/4/5/7/8/17/28/38/66 GWB: 1575.42MHz/2.4G DRX : 1700MHz-2700MHz
Antenna material:	FPC+ coaxial cable

2. Technical index requirements

2.1 Introduction of test items and equipment

inventory	test item	equipment
S11 parameter	Standing wave ratio, echo loss	network analyzer
Active test	TRP,TIS	Integrated tester, microwave darkroom
Passive test	Gain, efficiency	network analyzer

2.2 Active Reporting

2.2.1 Test instructions

Test tools: Agilent8960 instrument, R & S CMW500, full wave far field ETS dark room, high precision positioning system and its controller and computer with automatic test program

Test environment: temperature $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$, humidity $50\% \pm 15\%$

Test method: DUT is fixed in the center of the turntable with the H plane, on the same horizontal line as the center of the horn antenna. The positioning system enables DUT to rotate in the whole sphere to meet the high precision 3 D positioning. Each RF instrument and turntable controller communicate with the PC with automatic test software through the GPIB interface

2.2.2 Antenna active parameters

	frequent	CH	TRP (db)	TIS (dbm) the screen is off	TIS (dbm) brighten the screen	frequent	CH	TRP (db)	TIS (dbm) the screen is off	TIS (dbm) brighten the screen
2G/ 3G	850	CH(low)	24.53			WCDMA B1	CH(low)	16.24		
		CH(in)	24.47				CH(in)	15.79		
		CH(tall)	23.64	-98.54	-97.86		CH(tall)	15.72	-101.41	-101.25
	900	CH(low)	23.21			WCDMA B2	CH(low)	17.54		
		CH(in)	22.46				CH(in)	17.38		
		CH(tall)	22.42	-96.14	-95.26		CH(tall)	17.16	-103.30	-103.02
	1800	CH(low)	23.31			WCDMA B5	CH(low)	16.20		
		CH(in)	24.18				CH(in)	15.75		
		CH(tall)	25.34	-103.48	-92.62		CH(tall)	15.43	-100.11	-99.52
	1900	CH(low)	24.85			WCDMA B8	CH(low)	13.59		
		CH(in)	24.51				CH(in)	12.82		
		CH(tall)	23.15	-101.65	-100.83		CH(tall)	12.34	-97.76	-97.14

	频段	CH	TRP (db)	TIS (dbm) 灭屏	TIS (dbm) 亮屏	频段	CH	TRP (db)	TIS (dbm) 灭屏	TIS (dbm) 亮屏
LTE	B2	CH(低)	17.88			B8	CH(低)	15.69		
		CH(中)	17.71				CH(中)	15.69		
		CH(高)	17.32	-92.17	-91.89		CH(高)	14.69	-86.08	-85.08
	B3	CH(低)	17.16			B17	CH(低)	14.27		
		CH(中)	17.98				CH(中)	15.15		
		CH(高)	18.83	-86.64	-85.64		CH(高)	15.42	-90.50	-89.14
	B4	CH(低)	16.25			B28a	CH(低)	14.45		
		CH(中)	16.80				CH(中)	15.08		
		CH(高)	17.37	-86.54	-86.21		CH(高)	15.21	-91.23	-90.18
	B5	CH(低)	16.21			B28b	CH(低)	15.04		
		CH(中)	16.10				CH(中)	15.20		
		CH(高)	15.27	-87.91	-86.75		CH(高)	15.36	-91.58	-90.21
	B7	CH(低)	17.36			B28b	CH(低)	15.04		
		CH(中)	16.82				CH(中)	15.20		
		CH(高)	16.45	-86.12	-85.73		CH(高)	15.36	-91.58	-90.21

	fre que nt	CH	TRP (db)	TIS (dbm) the screen is off	TIS (dbm) brighten the screen
LTE	B38	CH (low)	17.15		
		CH (in)	16.76		
		CH (tall)	16.21	-88.28	-87.56
	B66	CH (low)	16.23		
		CH (in)	17.17		
		CH (tall)	17.65	-89.18	-88.79

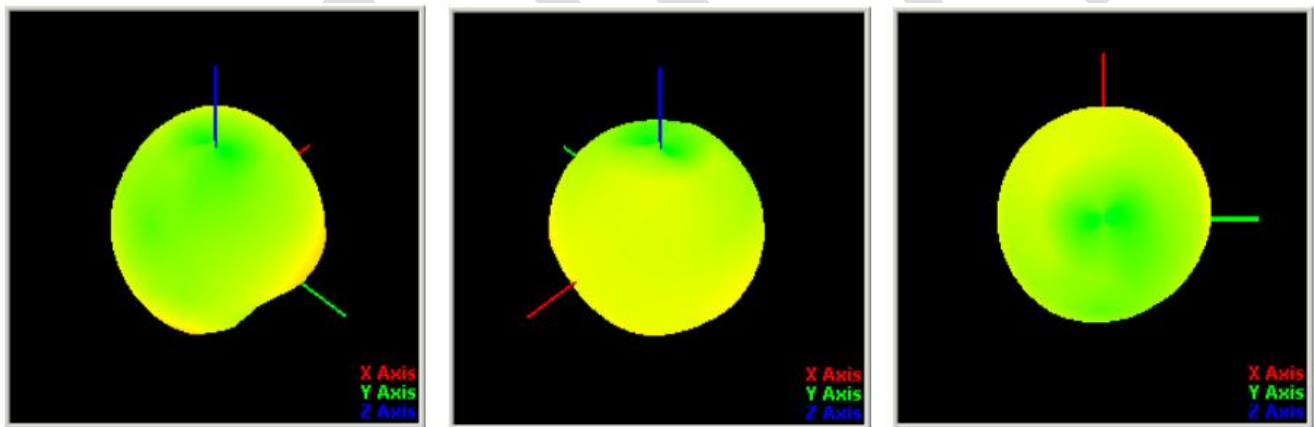
2.2.3 Efficiency of the main antenna

Freq (MHz)	Effi (%)	Freq (MHz)	Effi (%)	Freq (MHz)	Effi (%)
720	15.5	1700	33.8	2250	33.0
760	16.8	1750	34.2	2300	34.4
800	18.2	1800	34.9	2350	34.2
840	21.6	1850	35.4	2400	32.3
880	20.5	1900	36.6	2450	33.1
920	18.8	1950	37.2	2500	34.5
960	17.2	2000	35.3	2550	35.2
		2050	34.6	2600	34.9
		2100	33.1	2650	34.1
		2150	32.6	2690	33.5
		2200	32.4		

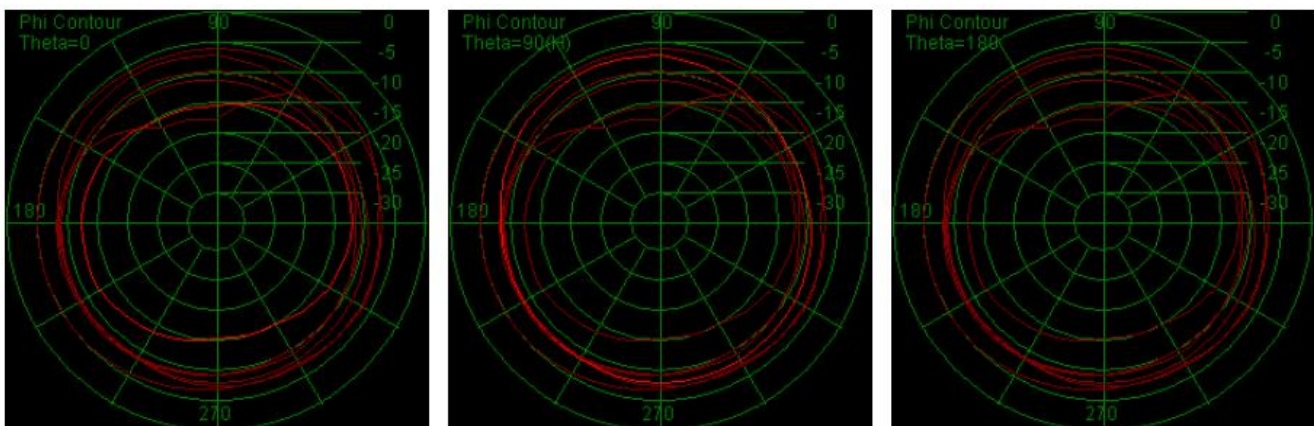
2.2.4 Antenna gain

Band	Gain (dBi)	Band	Gain (dBi)	Band	Gain (dBi)
GSM850	0.63	B2	1.26	2.4G	1.35
EGSM900	0.45	B4	1.18	5G	1.10
		B3	1.20		
DCS1800	1.22	B5	0.63	GPS	1.12
PCS1900	1.26	B7	1.08		
		B8	0.63		
W1	1.17	B17	0.52		
W2	1.26	B28ab	0.52		
W5	0.63	B38	1.08		
W8	0.45	B66	1.23		

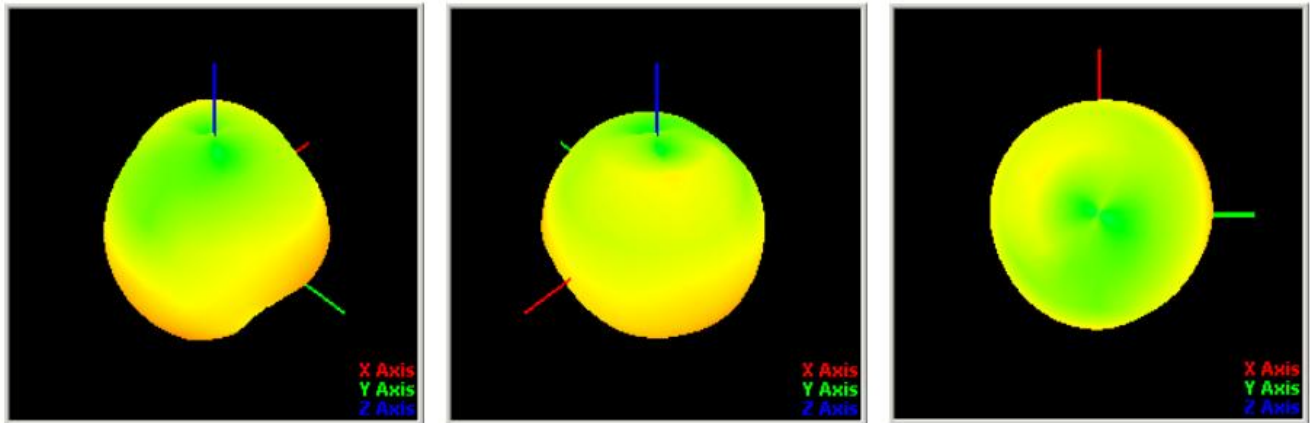
2.2.5 Antenna direction diagram — 700 MHz



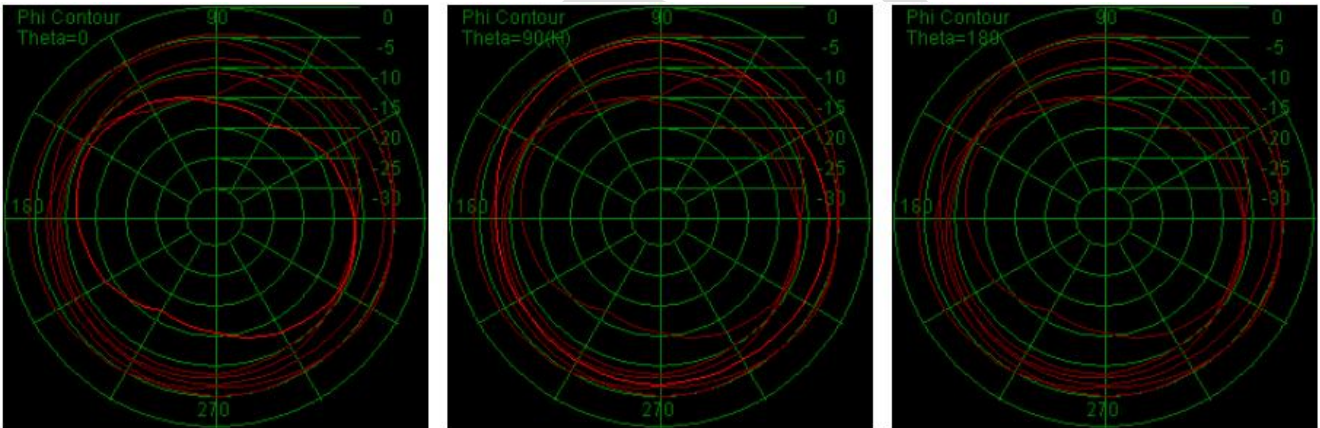
2.2.6 Antenna horizontal diagram — 700 MHz



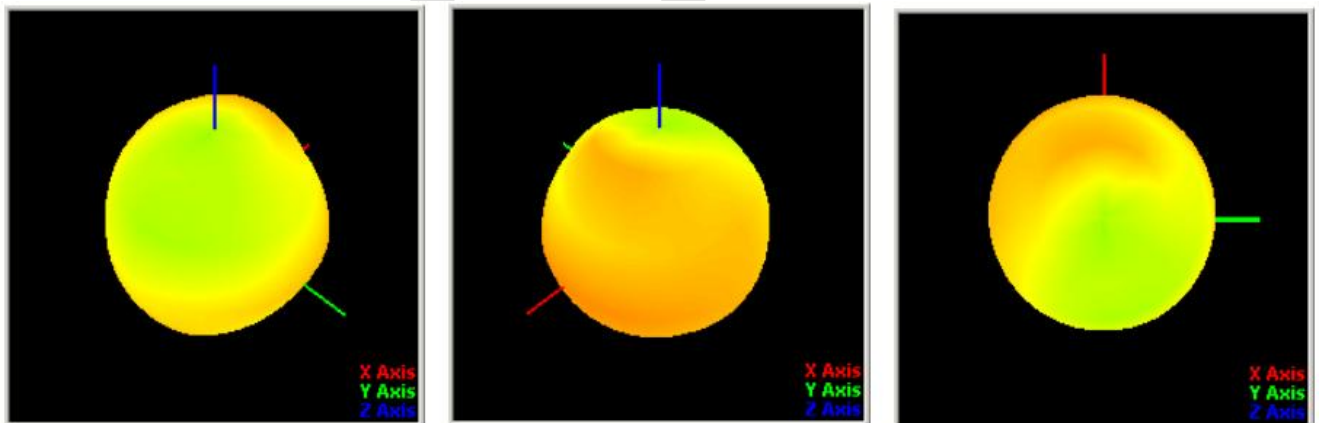
2.2.7 Antenna direction diagram — 800 MHz



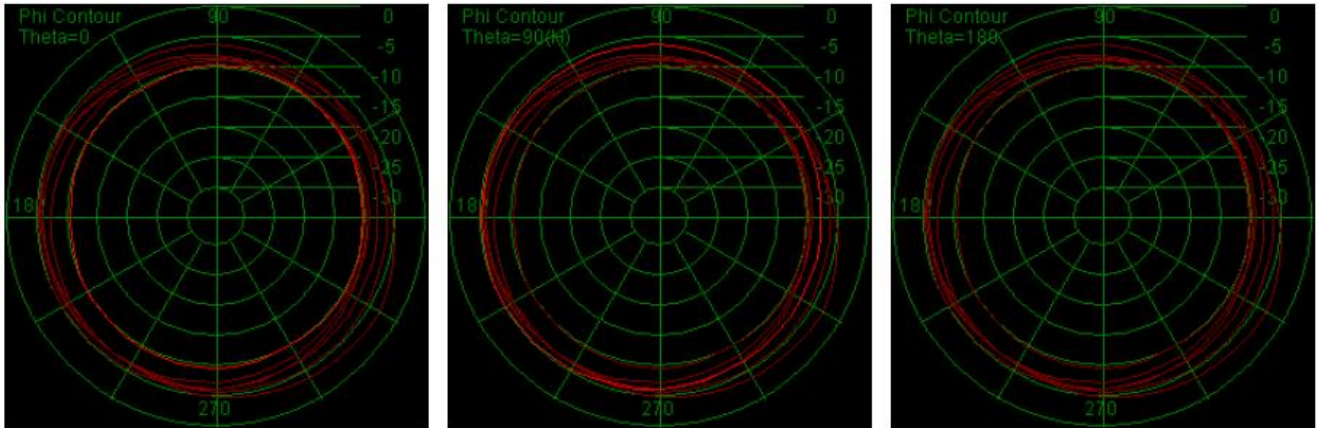
2.2.8 antenna antenna antenna — 800 MHz



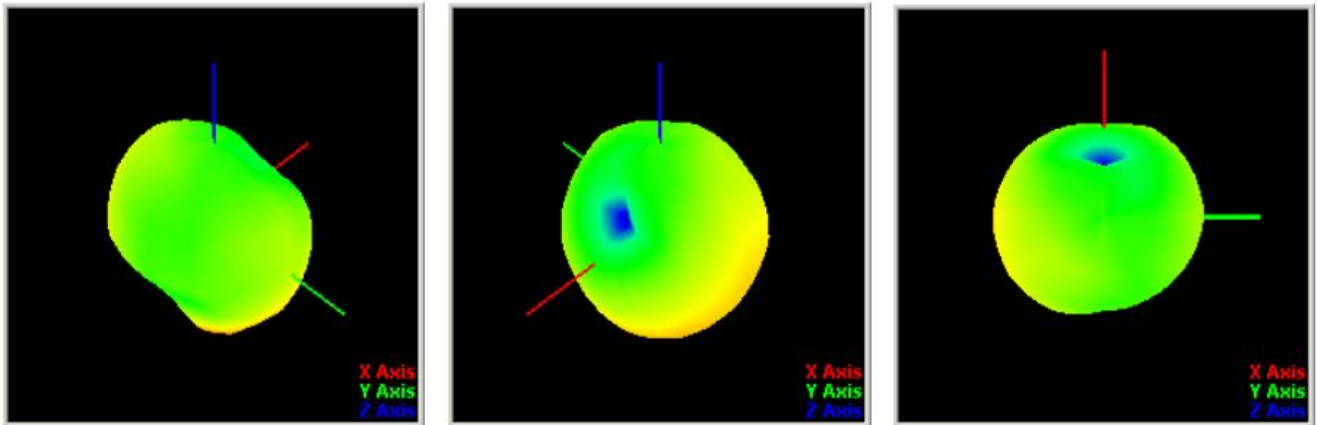
2.2.9 Antenna direction diagram — 900 MHz



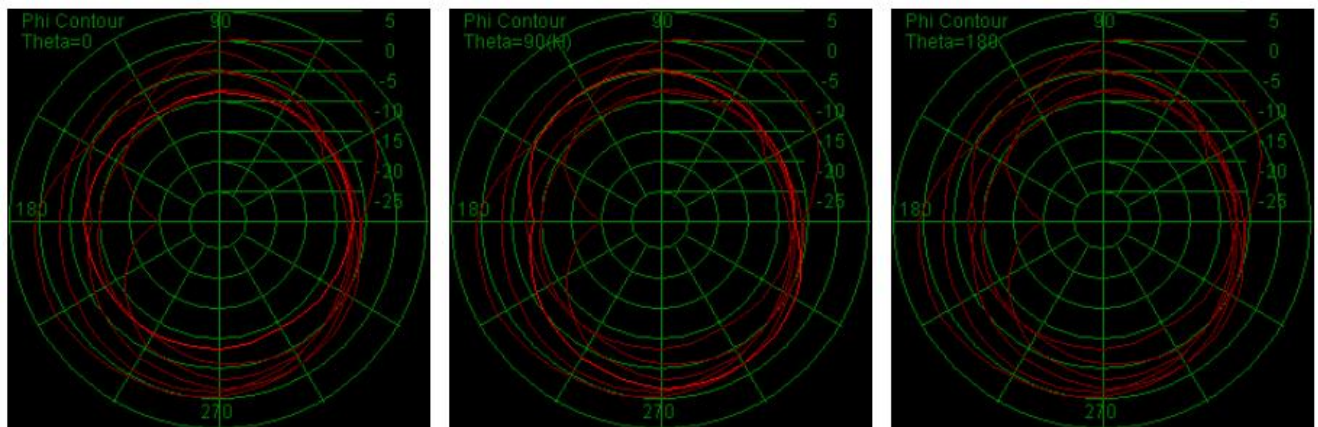
2.2.10 Antenna plan drawing — 900 MHz



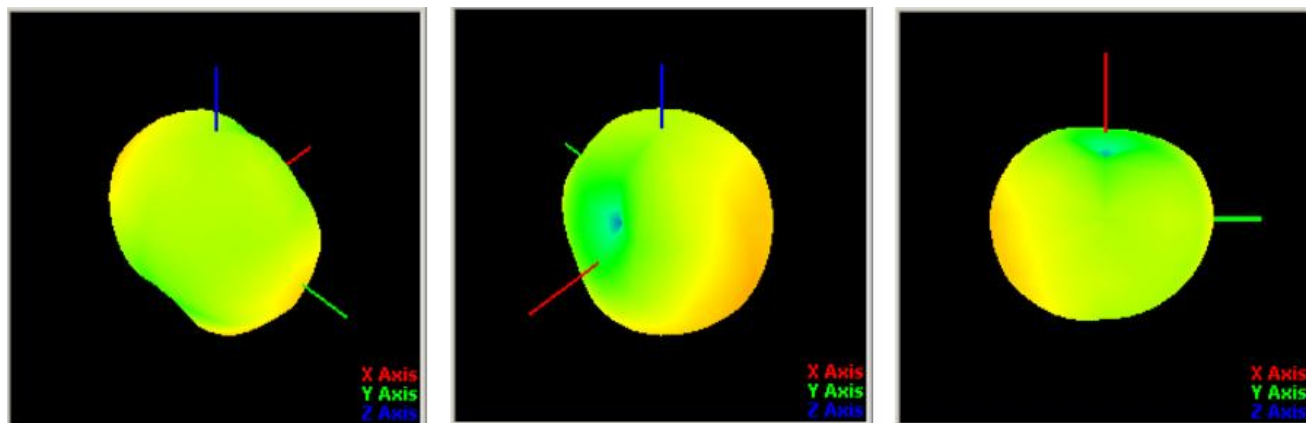
2.2.11 Antenna direction diagram — 1700 MHz



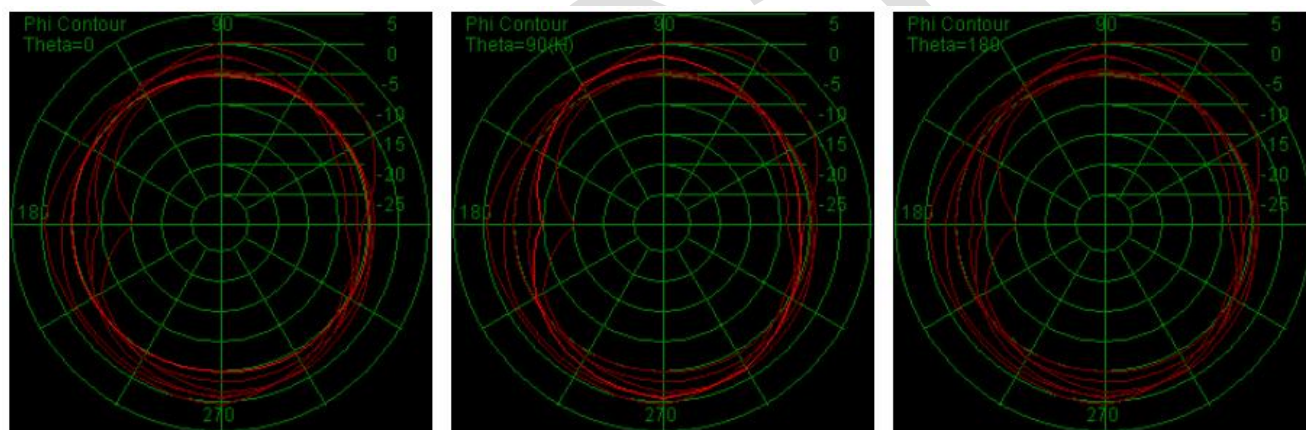
2.2.12 Antenna level diagram — 1700 MHz



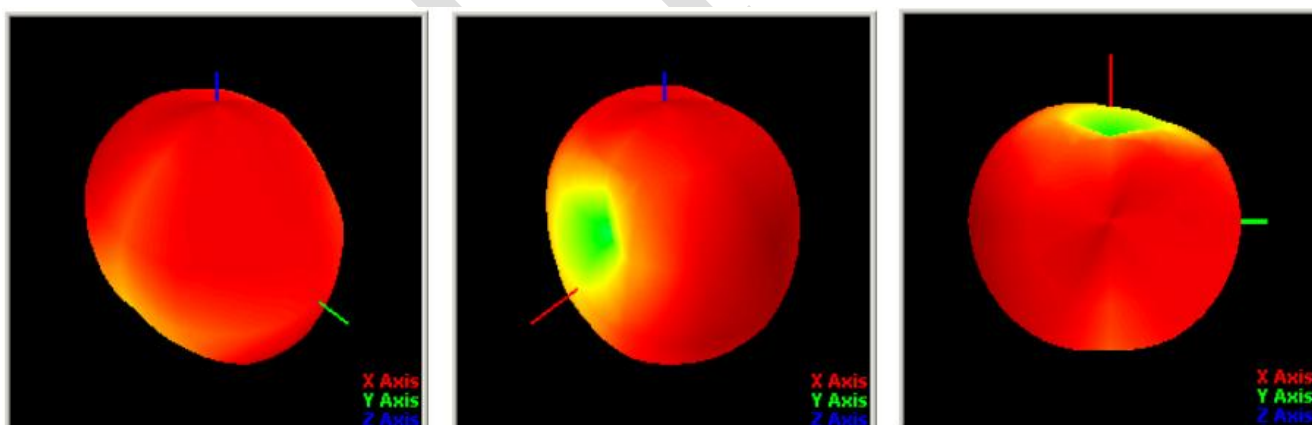
2.2.13 Antenna direction diagram — 1800 MHz



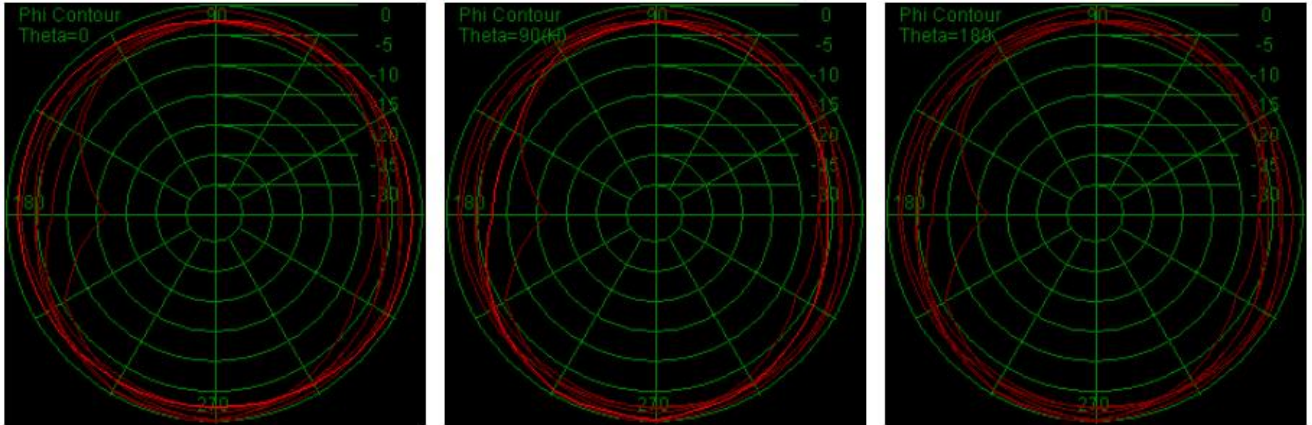
2.2.14 Antenna level diagram — 1800 MHz



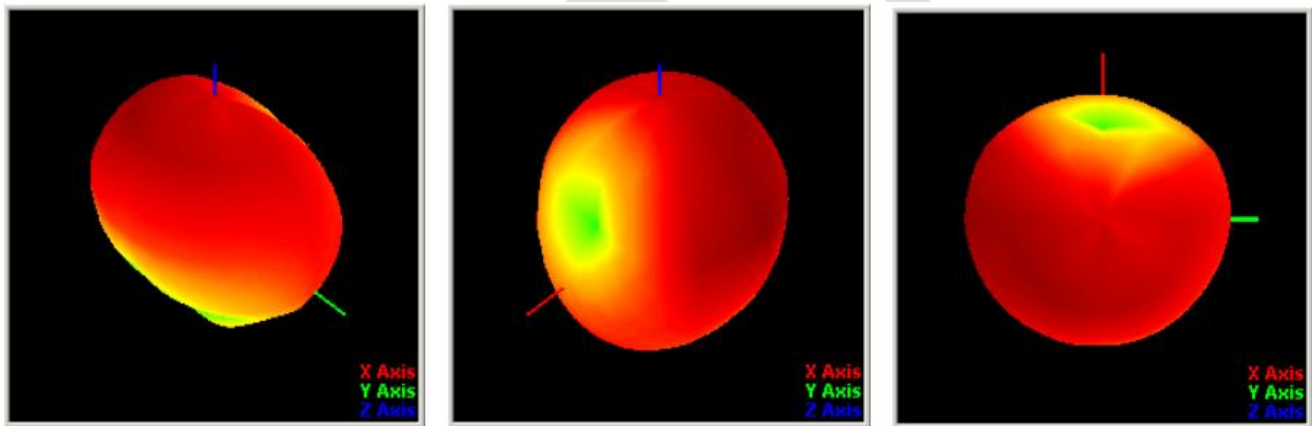
2.2.15 Antenna direction diagram — 1900 MHz



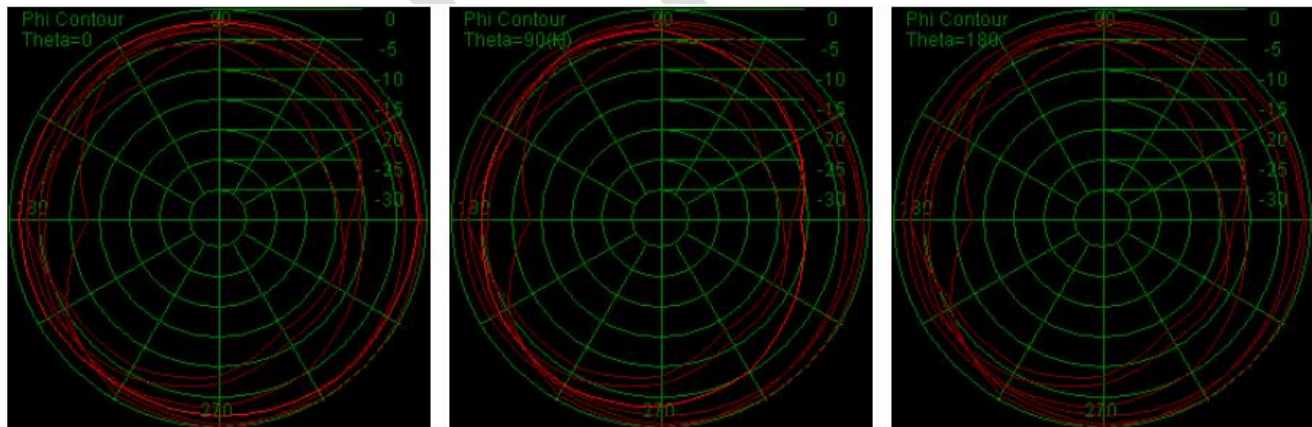
2.2.16 Antenna level diagram — 1900 MHz



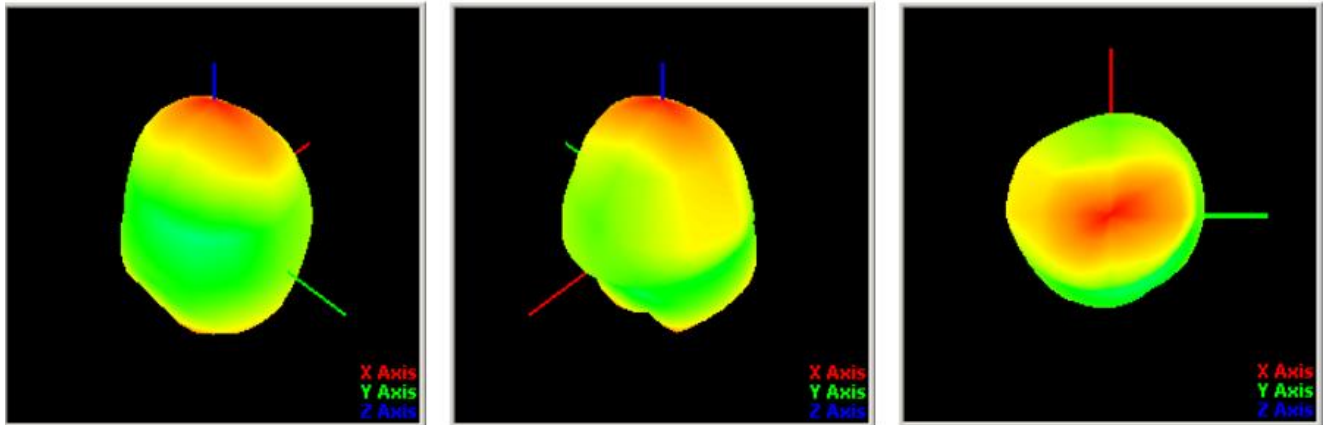
2.2.17 Antenna direction diagram — 2100 MHz



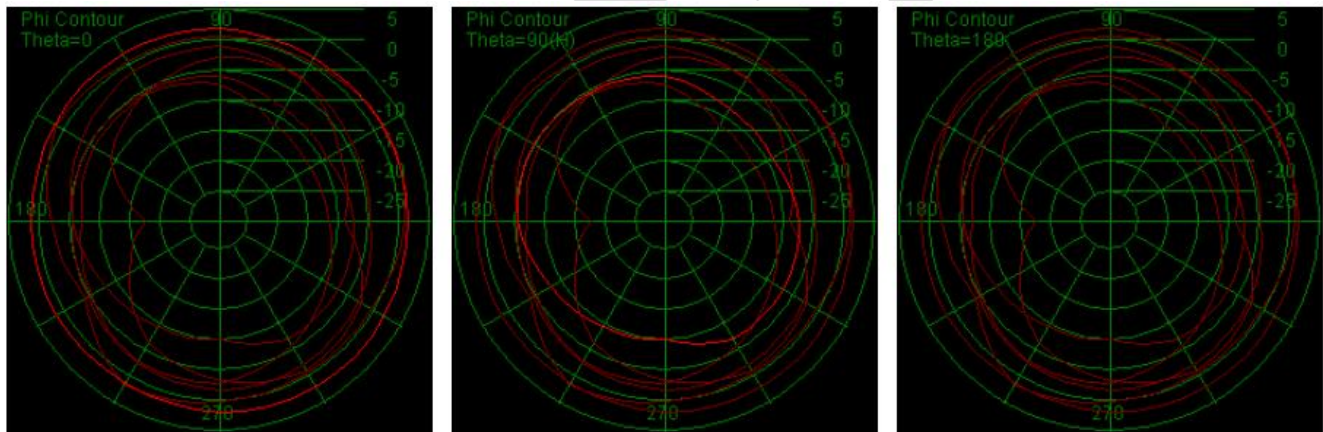
2.2.18 Antenna flat diagram — 2100 MHz



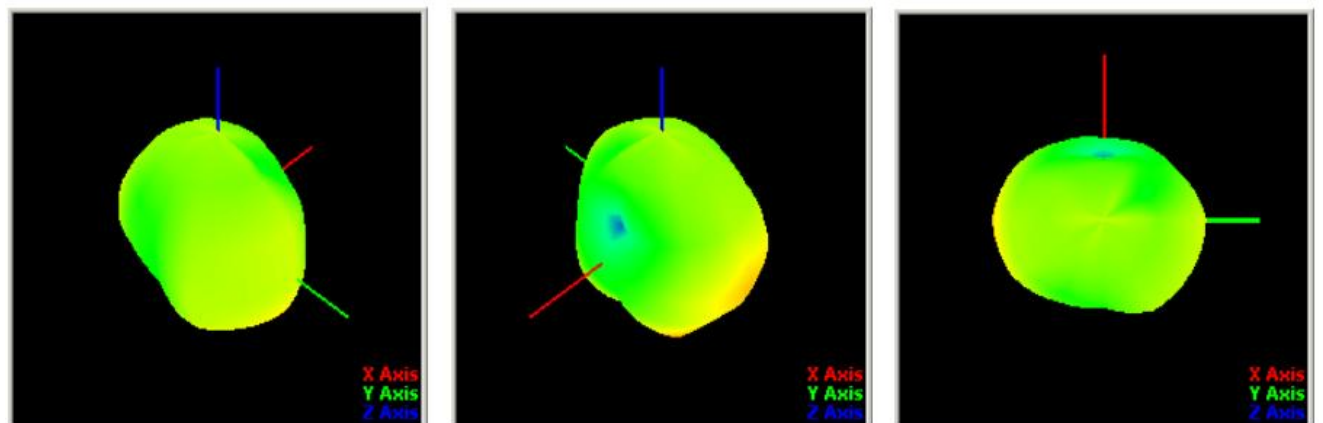
2.2.19 Antenna direction diagram — 2300 MHz



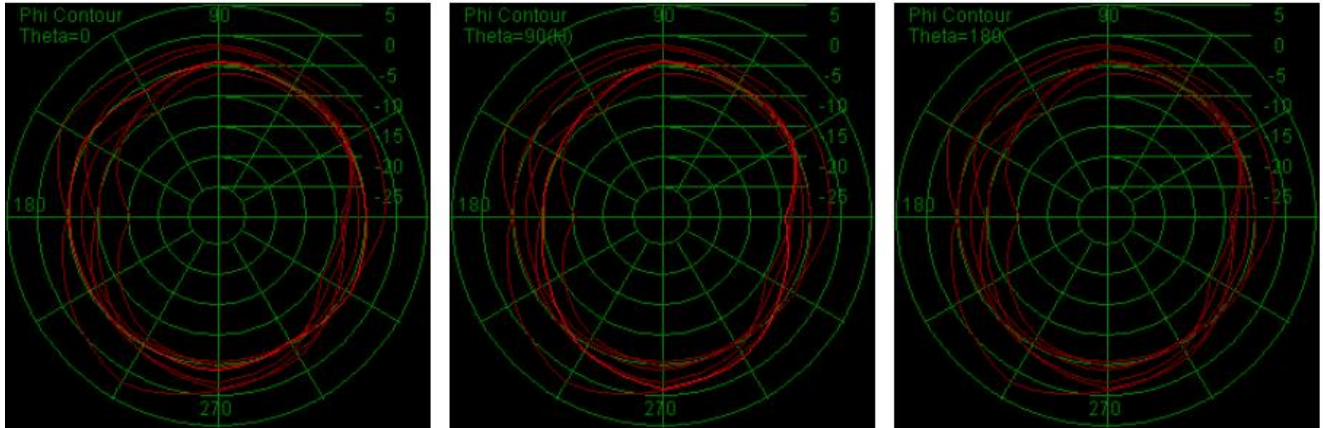
2.2.20 Antenna horizontal diagram— 2300 MHz



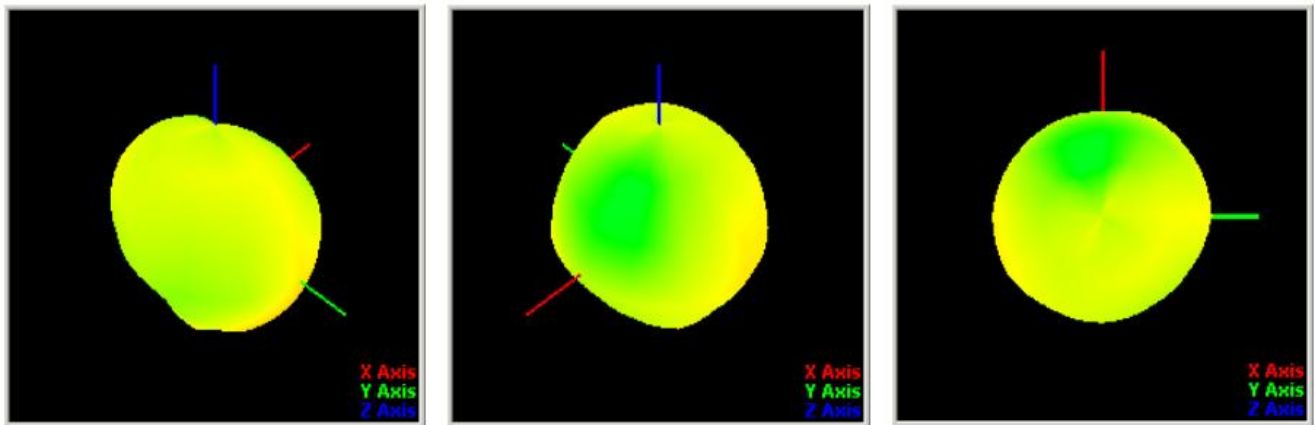
2.2.21 Antenna direction diagram — 2500 MHz



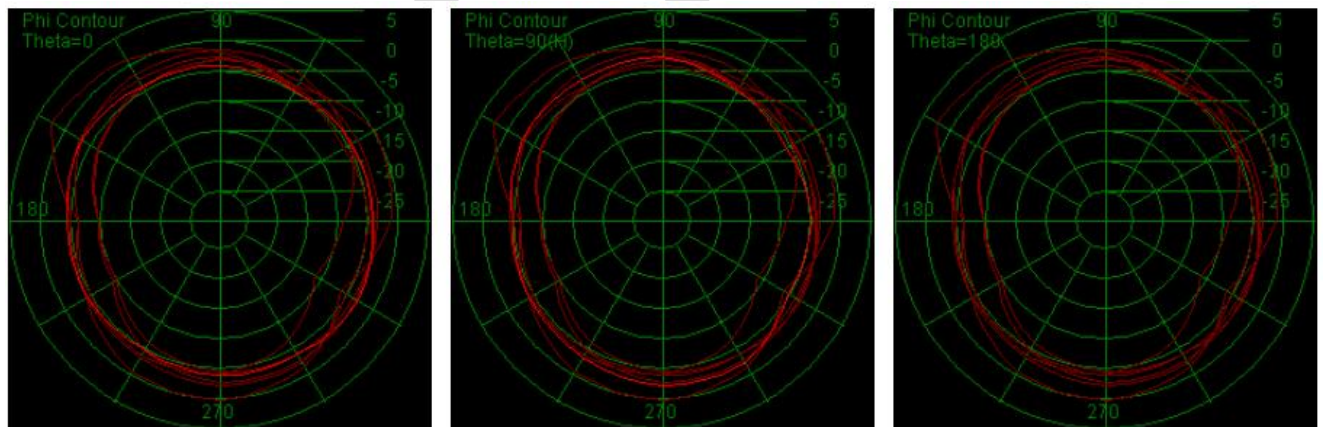
2.2.22 Antenna level diagram — 2500 MHz



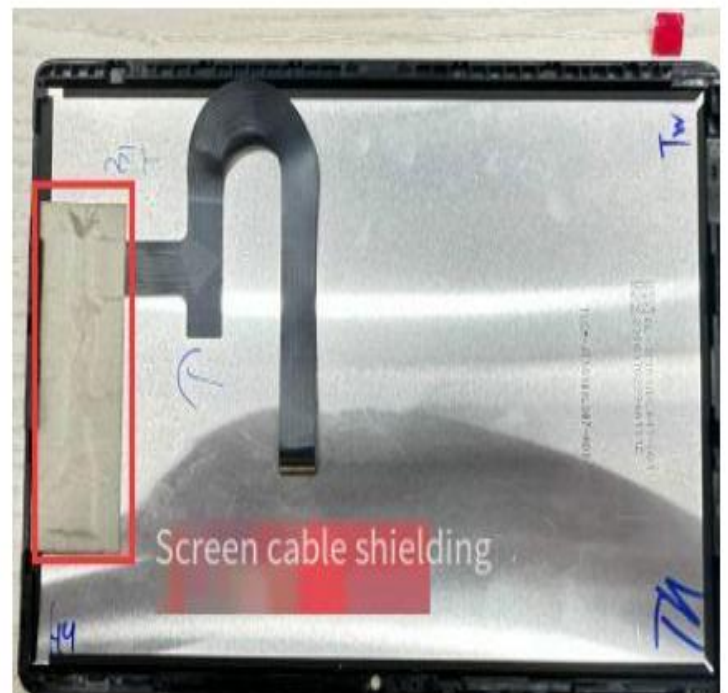
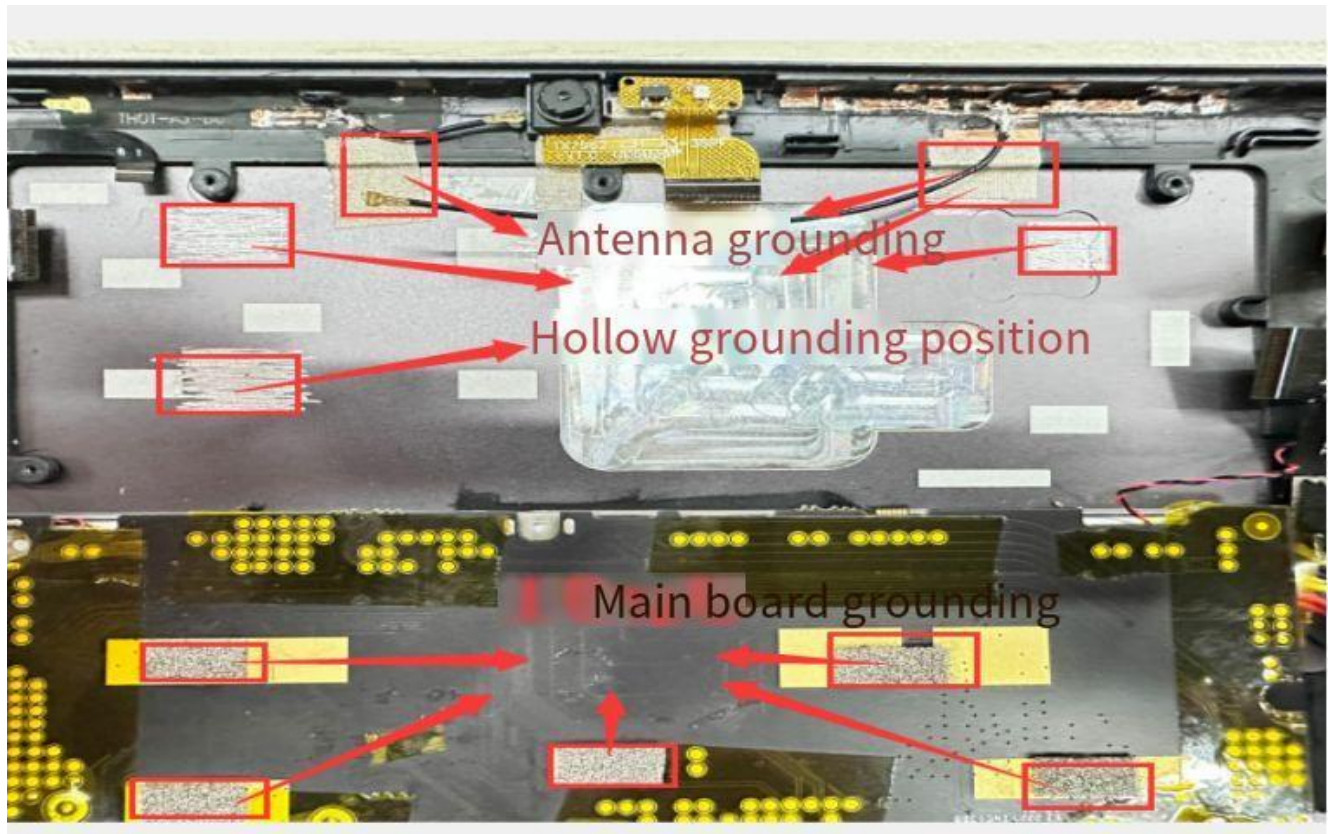
2.2.23 Antenna direction diagram — 2700 MHz

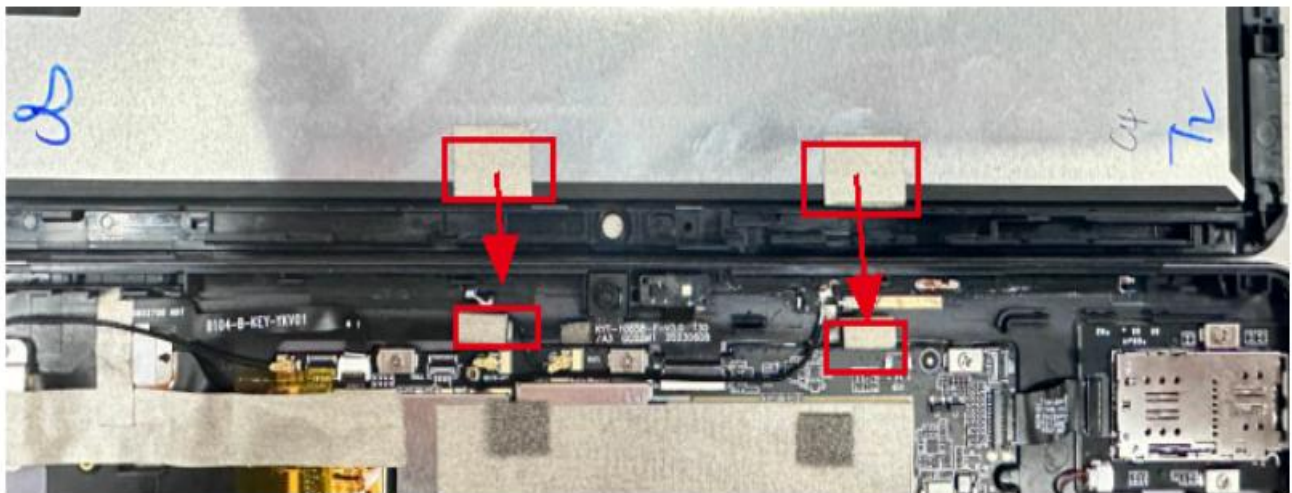
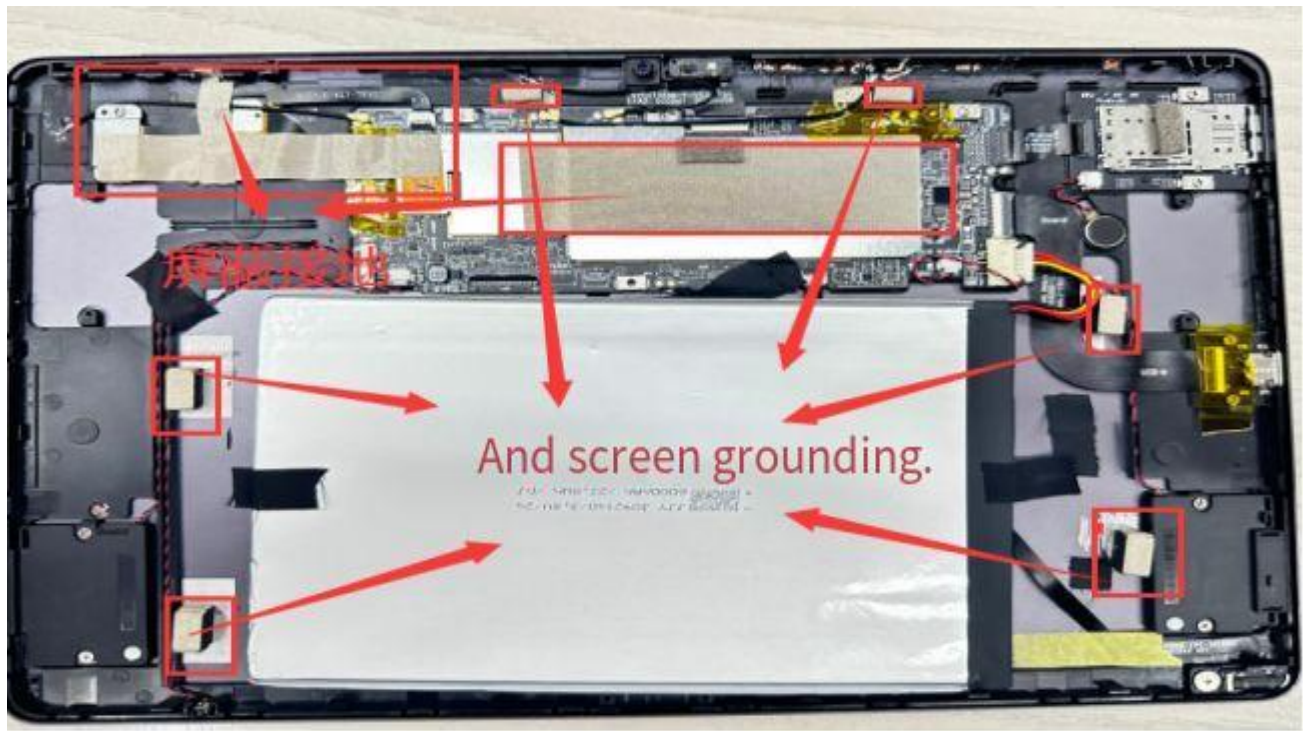


2.2.24 Antenna level diagram — 2700 MHz



2.2.25 Environmental treatment

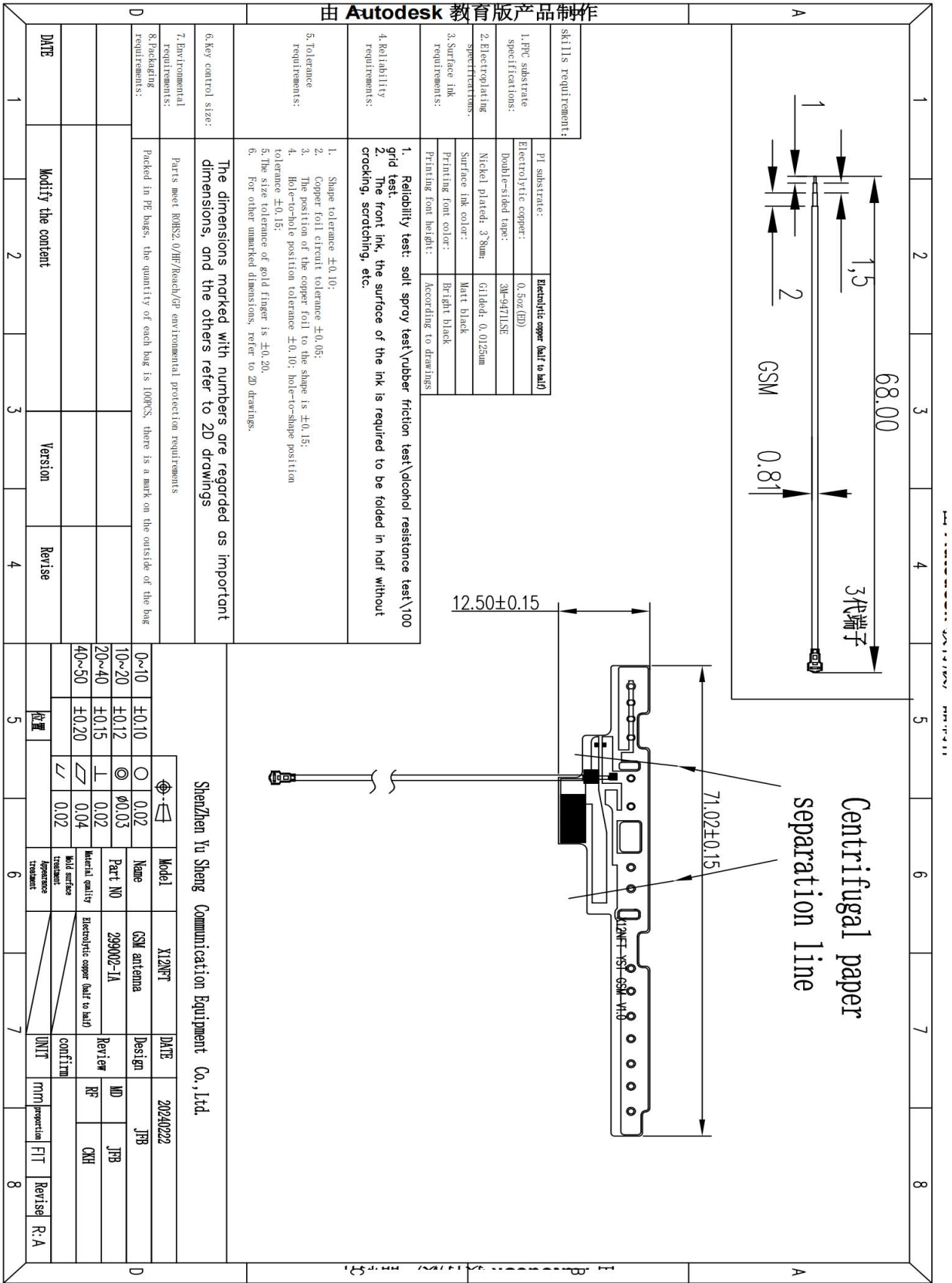




Screen edge increase and
antenna ground position

3. Engineering drawings

GSM antenna



由 Autodesk 教育版产品制作

4. List of materials

299002 (X12NFT) BOM

Edition: R:A

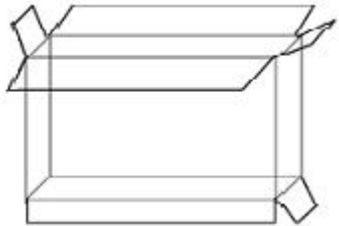
client:299

Model: 299002

date: 20240222

Item	Part No	Name	Types of	version	specification	colour	unit	Quantity	Craft
1	299002-IA-RA	GSM antenna		X12NFT	black GSM-FPC + CABLE	black	PCS	1	
1.1	299002-IA-01-RA	GSM -FPC		X12NFT	black GSM-FPC 71.02*12.50*0.12MM	black	PCS	1	
1.2	299002-IA-02-RA	GSM-CABLE		X12NFT	black 3代 0.81*68.00MM	black	PCS	1	
1.3	299002-IA-03-RA	6.8 NH 0402		X12NFT	6.8 NH 0402	black	PCS	1	
2	299002-IB-RA	DIV antenna		X12NFT	black DIV-FPC + CABLE	black	PCS	1	
2.1	299002-IB-01-RA	DIV -FPC		X12NFT	black DIV-FPC 20.00*9.00*0.12MM	black	PCS	1	
2.2	299002-IB-02-RA	DIV-CABLE		X12NFT	black 3代 0.81*64.00MM	black	PCS	1	
3	299002-IC-RA	BGW antenna		X12NFT	black BGW-FPC + CABLE	black	PCS	1	
3.1	299002-IC-01-RA	BGW -FPC		X12NFT	black BGW-FPC 20.00*9.00*0.12MM	black	PCS	1	
3.2	299002-IC-02-RA	BGW-CABLE		X12NFT	black 3代 0.81*23.00MM	black	PCS	1	
Confirmation:			Review:			Production: FJW			

5. Package schematic diagram

Packaging method diagram		
product name	FPC antenna	
P / N	299002	
Project model	X12NFT	
File details	Carton Size 1: 270*260*200MM Carton Size 2: 260*200*200MM Carton Size 3: Depending on the order quantity / volume	
	Boating method	Packaging by order quantity
	Total number of binning	Packaging by order quantity
labeling requirement	Tag Size 1: Universal use 100 * 100mm Tag Size 2: According to customer requirements	
matters need attention		
1. Due to the limitation of order quantity, the packing method of each material is the size of the box according to the total quantity of the order or the physical volume		
2. Storage temperature: room temperature		
3. Preservation conditions: store them in a cool and dry place		