



Product specification acknowledgment.

Shenzhen Maya antenna lab

R&D center in ShenZhen

The mobile communication terminal antenna

PRODUCT NAME A33WOR FD.04.A33011

CUSTOMER NAME SHENZHEN FROG TECHNOLOGY CO.,LTD

account party	Development party		
Customer acknowledges	Quality Department	R&D Department	approved by
	Xiabin	ME: Liwenmin RF: Zhuqiangqin	Fengguojun
Date: 年 月 日	Date: 2022 年 9 月 13 日		

Shenzhen Maya communication equipment Co., LTD

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1. aim

For the Production from shenzhen maya communication equipment co., LTD. That mobile communication terminal antenna product specifications and test methods for specification, avoid the test conditions, the error caused by different methods

2.Antenna debug design requirement frequency band.

frequency	frequency band
2G	GSM B2/B3/B5/B8
3G	WCDMA B2/B4/B5
4G	LTE: B2/B4/B5/B12/B13/B17/B25/B26/B41/B66/B71
2G	GSM B2/B3/B5/B8
other	GPS/WIFI

3.Product cell phone and sky chart.



The antenna



4.electrical

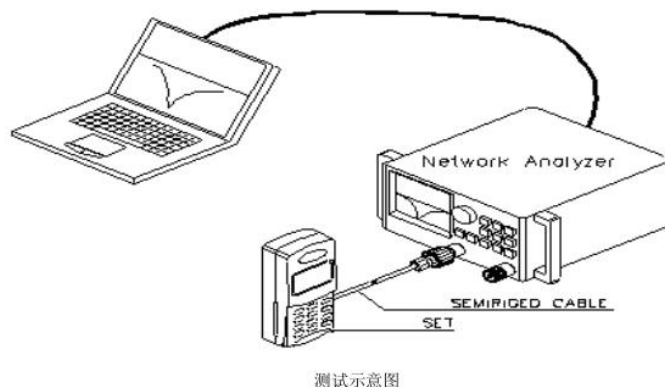
4.1Test method description and data.

Device name	use
Vector Network Analyzer	S11/Impedance/ Passive Test
Agilent 8960 SP6010 R&S CMU200	GSM, GPRS, EDGE, CDMA2000, 1xev-do, td-scdma, WCDMA, HSDPA mobile phone mobile communication equipment test.
R&S CMW500 MT8820C	Including td-scdma, WCDMA, HSDPA, LTE, WIFI, GPS mobile phone mobile communication equipment test.
SP9500E	Contains 5G, SA, NSA
Agilent E4438C	Test active GPS
MVG Chamber	Passive Test / OTA active Test / Efficiency/Gain

4.2Passive Test Report

Test equipment: network analyzer.

Test method: with a 50 ohm CABLE CABLE from the instrument test port is derived, using the calibration after a calibration mechanism of SMA connector, connecting hand records related to the frequency points corresponding return loss and standing wave ratio data.





4.3 Active Test Report

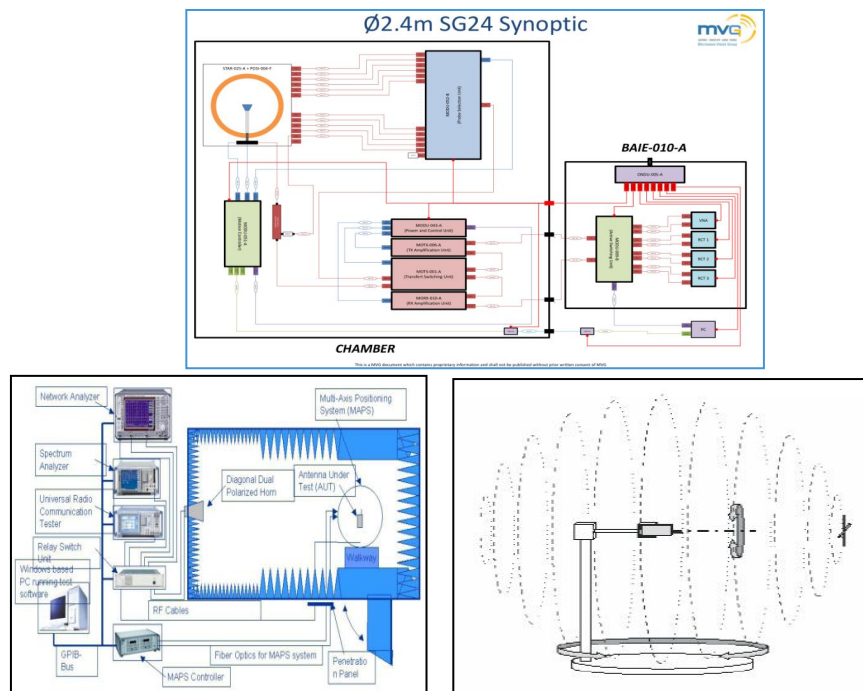
TRP/TIS

From testing tools, measuring, network analyzer, full waves far field ETS, French MVG SG24LT (Satmio) near field 3 d microwave dark room, the high precision positioning system and its controller and the computer with automatic test procedure test environment: the temperature of $22\text{ }^{\circ}\text{C} + 3\text{ }^{\circ}\text{C}$, humidity 60% plus or minus 60% test methods: Using EST or 24 It Satimo system software Test method and calculation of TRP when tested TRP, DUT (Device Under Test) is in a state of maximum transmitted power, including three to choose channel Test, by positioning system control the location of the DUT, with 15 degrees for step length, measuring three dimensional space, the effective radiated power (EIRP) at various points through the average of the integral sphere, computation formula is as follows

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

In TIS test, the DUT at the maximum transmission power of the state, including three to choose channel test, by controlling the location of the DUT, at 30 degrees for the step length, measuring the three dimensional space each point receiving sensitivity, the average of the sphere by integral calculation, calculation formula is as follows:

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



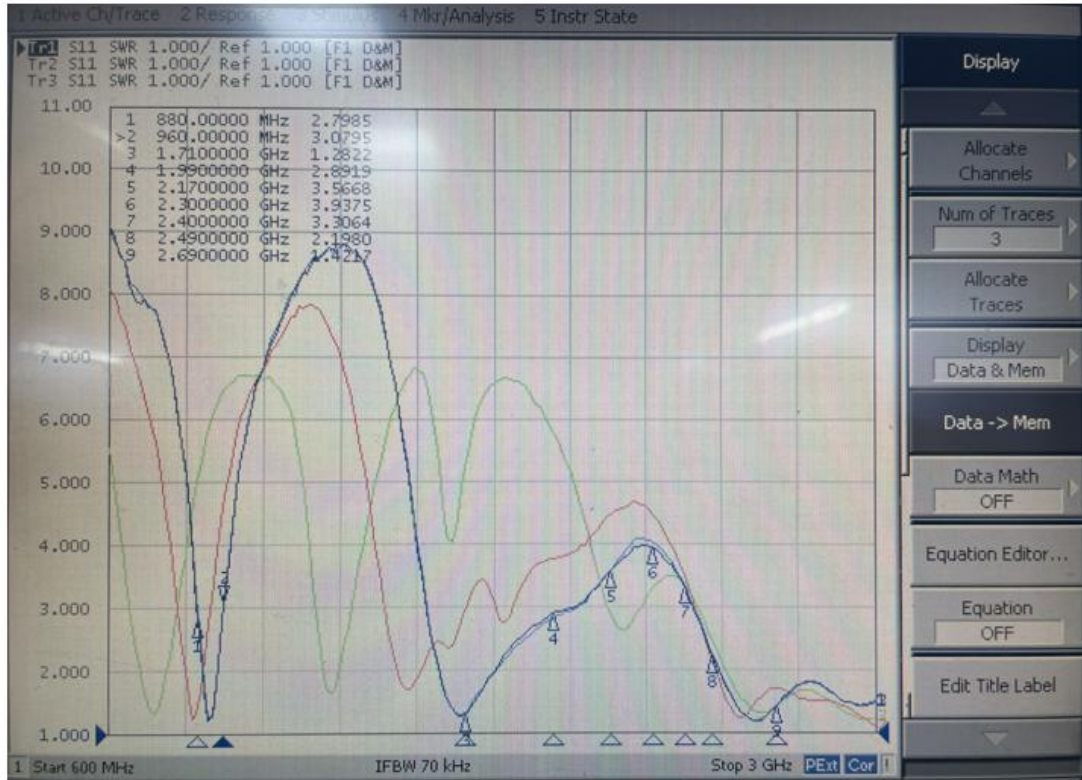


Model:A33WOR

4.4 Passive Test Report

VSWR of main antenna

主天线VSWR



Efficiency gain of main antenna

主天线无源效率增益

1			1			1			1		
Frequency	Efficiency	Efficiency .dB	Frequency	Gain .dB		Frequency	Efficiency	Efficiency .dB	Frequency	Gain .dB	
700000000	23.03%	-6.376186452	700000000	-2.434249993		1710000000	36.13%	-4.421289647	1710000000	0.769115073	
711111111	25.18%	-5.989956588	711111111	-0.999918032		1759500000	35.93%	-4.445983635	1759500000	1.180091374	
722222222	27.52%	-5.603502048	722222222	-0.528868724		1809000000	34.93%	-4.568222448	1809000000	1.014185042	
733333333	31.98%	-4.950679103	733333333	-0.405430626		1858500000	34.30%	-4.646463288	1858500000	0.585328576	
744444444	37.04%	-4.313196487	744444444	-0.53832532		1908000000	34.25%	-4.652843759	1908000000	-0.320178294	
755555555	36.65%	-4.35895481	755555555	-0.548745335		1957500000	34.98%	-4.561911225	1957500000	-0.431652124	
766666666	31.90%	-4.962770723	766666666	-0.521760492		2007000000	30.80%	-5.114910259	2007000000	-0.433748685	
777777777	27.18%	-5.657884924	777777777	-0.314850829		2056500000	29.27%	-5.335731837	2056500000	-0.068831882	
788888888	23.93%	-6.210915122	788888888	-0.199288337		2106000000	27.93%	-5.53865986	2106000000	-0.347653341	
800000000	21.06%	-6.766254268	800000000	-0.700494963		2155500000	26.35%	-5.792192297	2155500000	-0.641102602	
824000000	23.15%	-6.353789773	824000000	-0.239079135		2205000000	27.84%	-5.553476179	2205000000	-1.459308439	
859000000	31.59%	-5.00409693	859000000	0.935589916		2254500000	27.58%	-5.59360836	2254500000	-1.40735666	
880000000	19.71%	-7.052606729	880000000	-2.177510696		2353500000	25.65%	-5.908875333	2353500000	-1.7162553	
888000000	23.30%	-6.326486519	888000000	-1.837031279		2403000000	27.55%	-5.598832336	2403000000	-0.838597743	
896000000	26.53%	-5.763256239	896000000	-1.100005408		2452500000	29.28%	-5.3343081	2452500000	-0.663741346	
904000000	29.76%	-5.263980126	904000000	-0.179358798		2502000000	34.94%	-4.566213116	2502000000	0.195212165	
912000000	29.93%	-5.238774303	912000000	0.266838442		2551500000	38.76%	-4.11567807	2551500000	0.809622716	
920000000	29.82%	-5.25551148	920000000	0.295907042		2601000000	37.72%	-4.234680924	2601000000	1.022464213	
928000000	30.00%	-5.228790199	928000000	0.144092796		2650500000	35.47%	-4.501169157	2650500000	1.595812113	
936000000	28.66%	-5.427444051	936000000	-0.354201662		2700000000	33.27%	-4.779325649	2700000000	2.301240166	
944000000	26.17%	-5.821797777	944000000	-1.160294061							
952000000	21.91%	-6.593644718	952000000	-2.195344265							
960000000	17.69%	-7.521749196	960000000	-3.400545312							

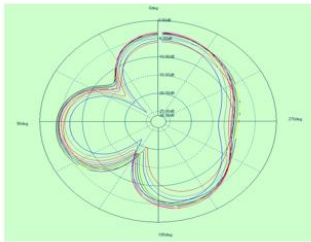


Model:A33WOR

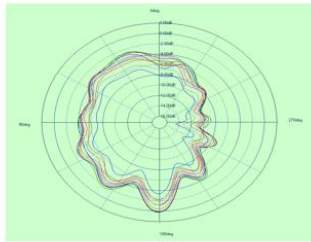
Directional pattern of main antenna

主天线无源方向图

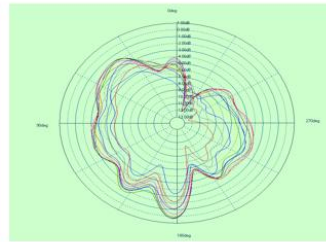
Azimuth 0°



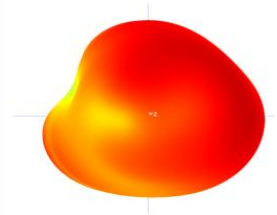
Azimuth 90°



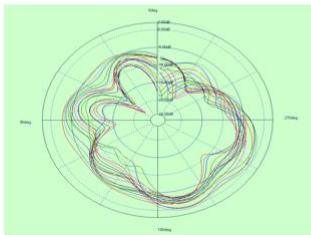
H-Plane (Elevation 90°)



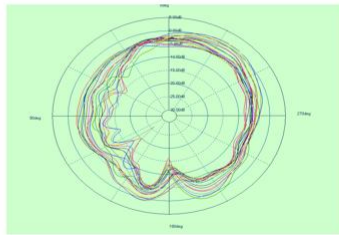
3D view Frequency
920MHz



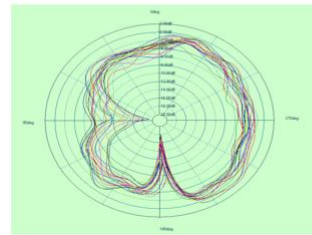
Azimuth 0°



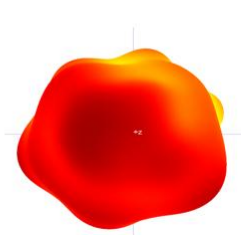
Azimuth 90°



H-Plane (Elevation 90°)



3D view Frequency
2210MHz

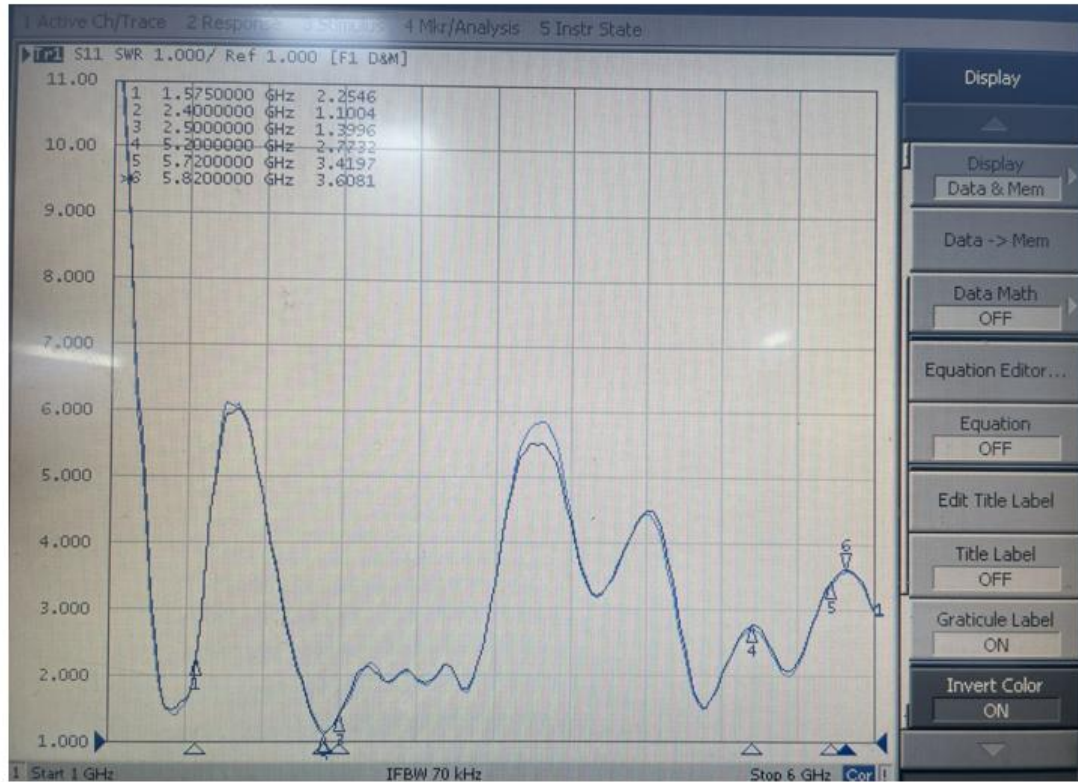




Model:A33WOR

VSWR of three-in-one antenna

三合一天线VSWR



Efficiency gain of three-in-one antenna

三合一天线无源效率增益

1			1			1			1		
Frequency	Efficiency	Efficiency . dB	Frequency	Gain . dB		Frequency	Efficiency	Efficiency . dB		Frequency	Gain .dB
1570000000	23.14%	-6.356004791	1570000000	-1.145305331		5200000000	47.02%	-3.277540166		5200000000	4.178233895
1571000000	22.93%	-6.395834379	1571000000	-1.222477365		5230000000	41.94%	-3.773428046		5230000000	4.402726112
1572000000	22.68%	-6.443997899	1572000000	-1.308859196		5260000000	39.32%	-4.053423841		5260000000	4.050351227
1573000000	22.39%	-6.500215212	1573000000	-1.388583866		5290000000	35.99%	-4.438571115		5290000000	3.885215565
1574000000	22.09%	-6.558165297	1574000000	-1.441664611		5320000000	31.33%	-5.040260201		5320000000	3.18839194
1575000000	21.84%	-6.607452074	1575000000	-1.474652353		5350000000	25.74%	-5.893409088		5350000000	2.117402647
1576000000	21.65%	-6.64573692	1576000000	-1.475542745		5380000000	25.34%	-5.961114528		5380000000	1.985656958
1577000000	21.52%	-6.671327237	1577000000	-1.48391512		5410000000	27.38%	-5.626207012		5410000000	2.234794287
1578000000	21.43%	-6.690776736	1578000000	-1.490984206		5440000000	29.02%	-5.372500031		5440000000	2.120097156
1579000000	21.30%	-6.71720915	1579000000	-1.528380352		5470000000	27.32%	-5.634607157		5470000000	1.823822465
1580000000	21.09%	-6.760023944	1580000000	-1.605336501		5500000000	26.73%	-5.730528901		5500000000	2.026927361
1			1			1			1		
Frequency	Efficiency	Efficiency . dB	Frequency	Gain .dB		5530000000 <td>26.20%</td> <td>-5.816348233</td> <td></td> <th>5530000000</th> <td>1.764582563</td>	26.20%	-5.816348233		5530000000	1.764582563
2400000000	27.89%	-5.545443512	2400000000	-1.16255293		5560000000	23.88%	-6.219658079		5560000000	1.561285877
2410000000	27.23%	-5.648936515	2410000000	-0.924741145		5590000000	19.92%	-7.00714086		5590000000	0.929462221
2420000000	26.24%	-5.811164852	2420000000	-0.780454317		5620000000	17.94%	-7.461614756		5620000000	0.259211891
2430000000	26.62%	-5.748317332	2430000000	-0.925065288		5650000000	16.44%	-7.839756065		5650000000	-0.066154096
2440000000	26.25%	-5.809236965	2440000000	-1.325598022		5680000000	16.31%	-7.875974001		5680000000	-0.531998952
2450000000	25.63%	-5.912020129	2450000000	-1.351789125		5710000000	15.39%	-8.128192864		5710000000	-1.360052471
2460000000	25.53%	-5.928932753	2460000000	-1.303564371		5740000000	16.34%	-7.868174533		5740000000	-1.086692389
2470000000	26.17%	-5.821924361	2470000000	-0.916164731		5770000000	17.80%	-7.496919982		5770000000	-0.616108826
2480000000	26.09%	-5.835928875	2480000000	-0.843815053		5800000000	18.12%	-7.418756902		5800000000	-0.351371901
2490000000	26.11%	-5.83120203	2490000000	-0.790490773							
2500000000	26.59%	-5.752092759	2500000000	-0.653104507							



Model:A33WOR

Directional pattern of GPS

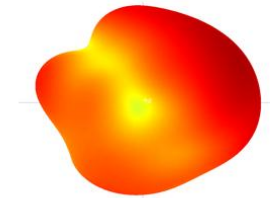
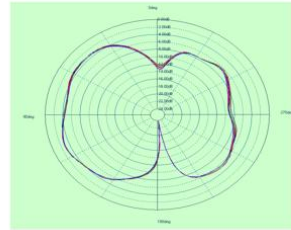
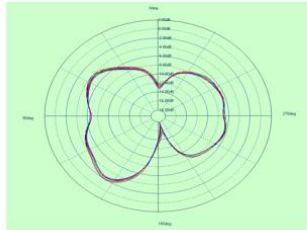
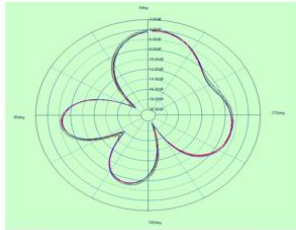
GPS无源方向图

Azimuth 0°

Azimuth 90°

H-Plane (Elevation 90°)

3D view Frequency
1575MHz



Directional pattern of WIFI

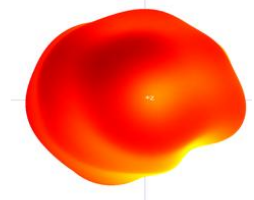
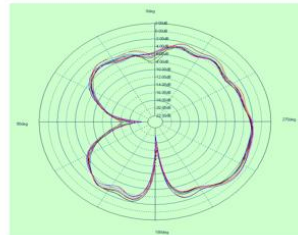
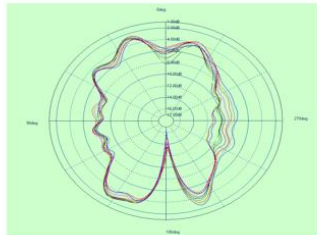
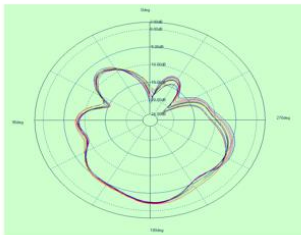
WIFI无源方向图

Azimuth 0°

Azimuth 90°

H-Plane (Elevation 90°)

3D view Frequency
2450MHz



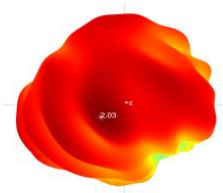
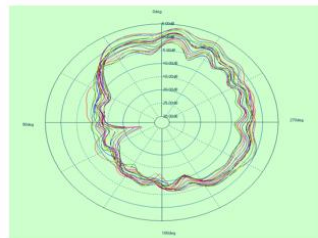
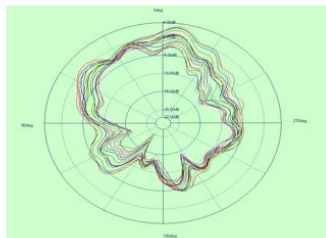
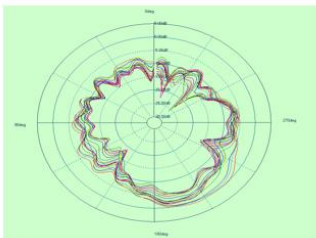
WIFI无源方向图

Azimuth 0°

Azimuth 90°

H-Plane (Elevation 90°)

3D view Frequency
5500MHz





4.5 OTA TRP/TIS Test Report

标准	BAND	GSM900			DCS1800		
自由空间	CHANNEL	1	62	124	512	699	885
	TRP	28.48	28.18	27.74	25.48	26.14	26.46
	TIS	--	--	-99.19	--	--	-104.39
	BAND	GSM850			PCS1900		
	CHANNEL	128	190	251	512	661	810
	TRP	27.83	27.79	27.69	26.13	26.46	26.04
	TIS	--	--	-101.83	--	--	-104.65
备注：3D数据							

标准	BAND	WCDMA-2			WCDMA-4		
自由空间	CHANNEL	L	M	H	L	M	H
	TRP	20.13	19.9	19.71	19.59	20.49	20.35
	TIS	--	--	-106.51	--	--	-106.29
	BAND	WCDMA-5					
	CHANNEL	L	M	H			
	TRP	19.06	19.26	19.29			
	TIS	--	--	-104.9	--	--	
备注：3D数据							

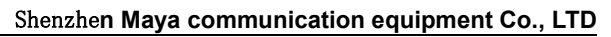
标准	BAND	LTE-B2			LTE-B4		
自由空间	CHANNEL	L	M	H	L	M	H
	TRP	19.93	20.03	19.86	17.4	17.82	17.57
	TIS	--	--	-92.42	--	--	-92.31
	BAND	LTE-B5			LTE-B12		
	CHANNEL	L	M	H	L	M	H
	TRP	18.34	19.37	19.16	17.31	17.24	17.51
	TIS	--	--	-91.36	--	--	-91.58
备注：3D数据							

标准	BAND	LTE-B13			LTE-B25		
自由空间	CHANNEL	L	M	H	L	M	H
	TRP	16.65	16.52	17.13	19.35	19.15	18.81
	TIS	--	--	-91.42	--	--	-93.47
	BAND	LTE-B26			LTE-66		
	CHANNEL	L	M	H	L	M	H
	TRP	18.71	19.33	19.41	19.1	19.31	19.03
	TIS	--	--	-90.13	--	--	-93.37
备注：3D数据							

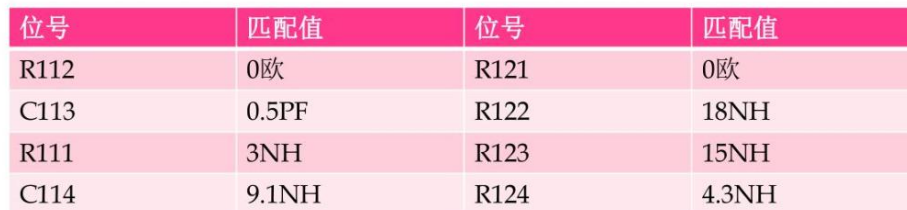


Model:A33WOR

标准	BAND	LTE-B71			LTE-B41		
自由空间	CHANNAL	L	M	H	L	M	H
	TRP	17.31	17.97	18.18	16.48	16.51	16.18
	TIS	--	--	-90.59	--	--	-90.22
	BAND	LTE-B17					
	CHANNAL	L	M	H			
	TRP	17.5	17.57	17.85			
	TIS	--	--	-91.52			
	备注：3D数据						

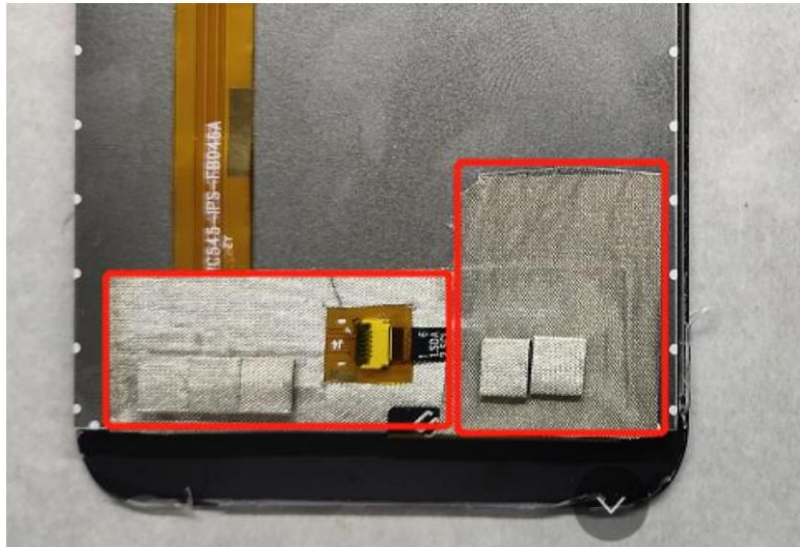


5. Matching circuit description

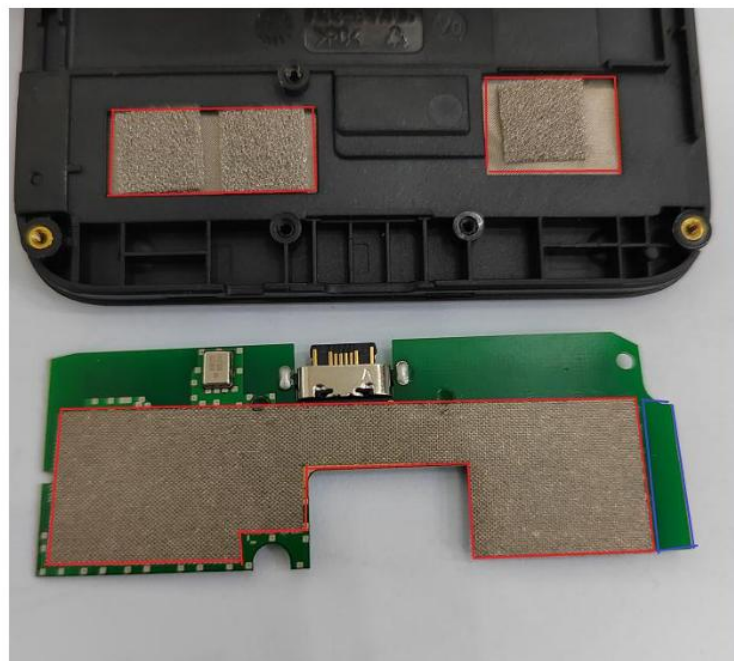
Date: 2022. 9. 13



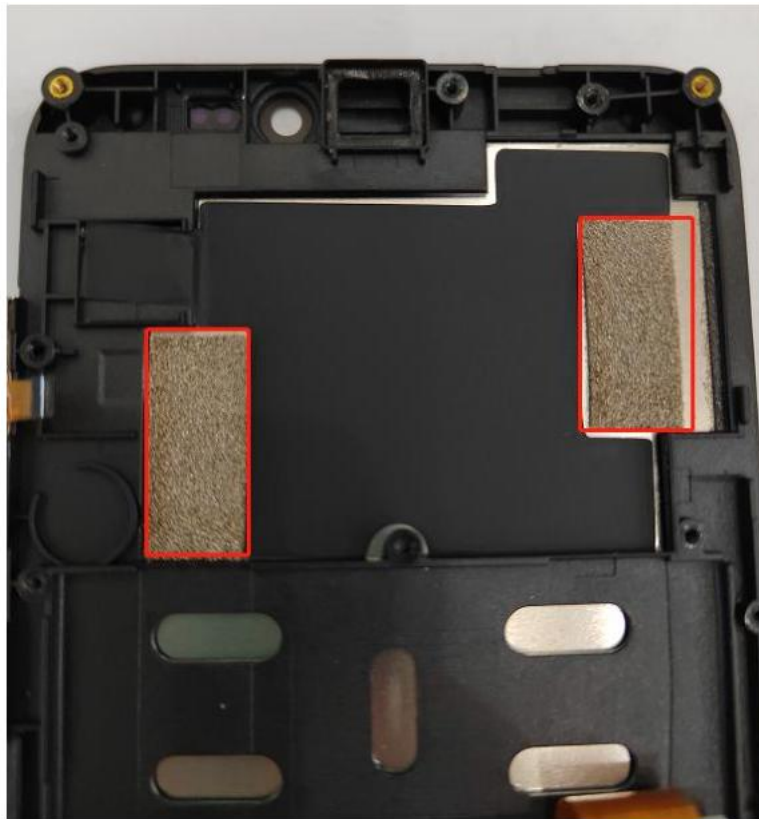
6.Environmental treatment



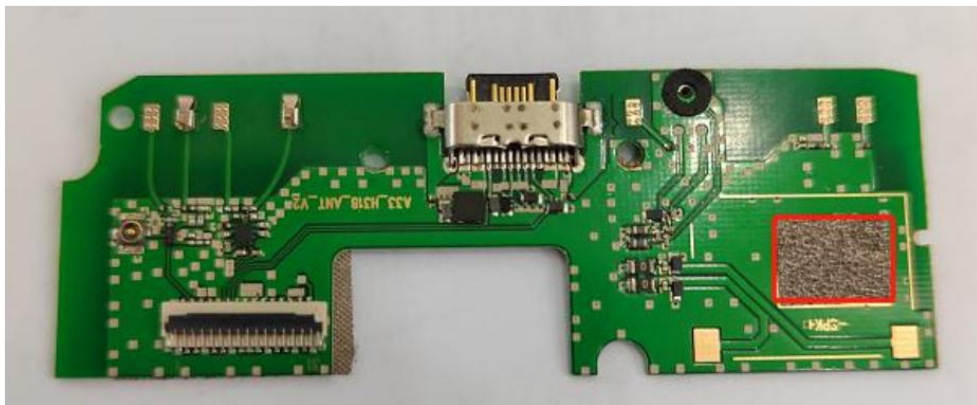
The screen and IC need to be grounded with a conductive cloth, as shown in the red box above



The panel should be grounded with a conductive cloth and cotton, as shown in the red box above. The right-most clearance area of the panel should be exposed, as shown in the blue box above



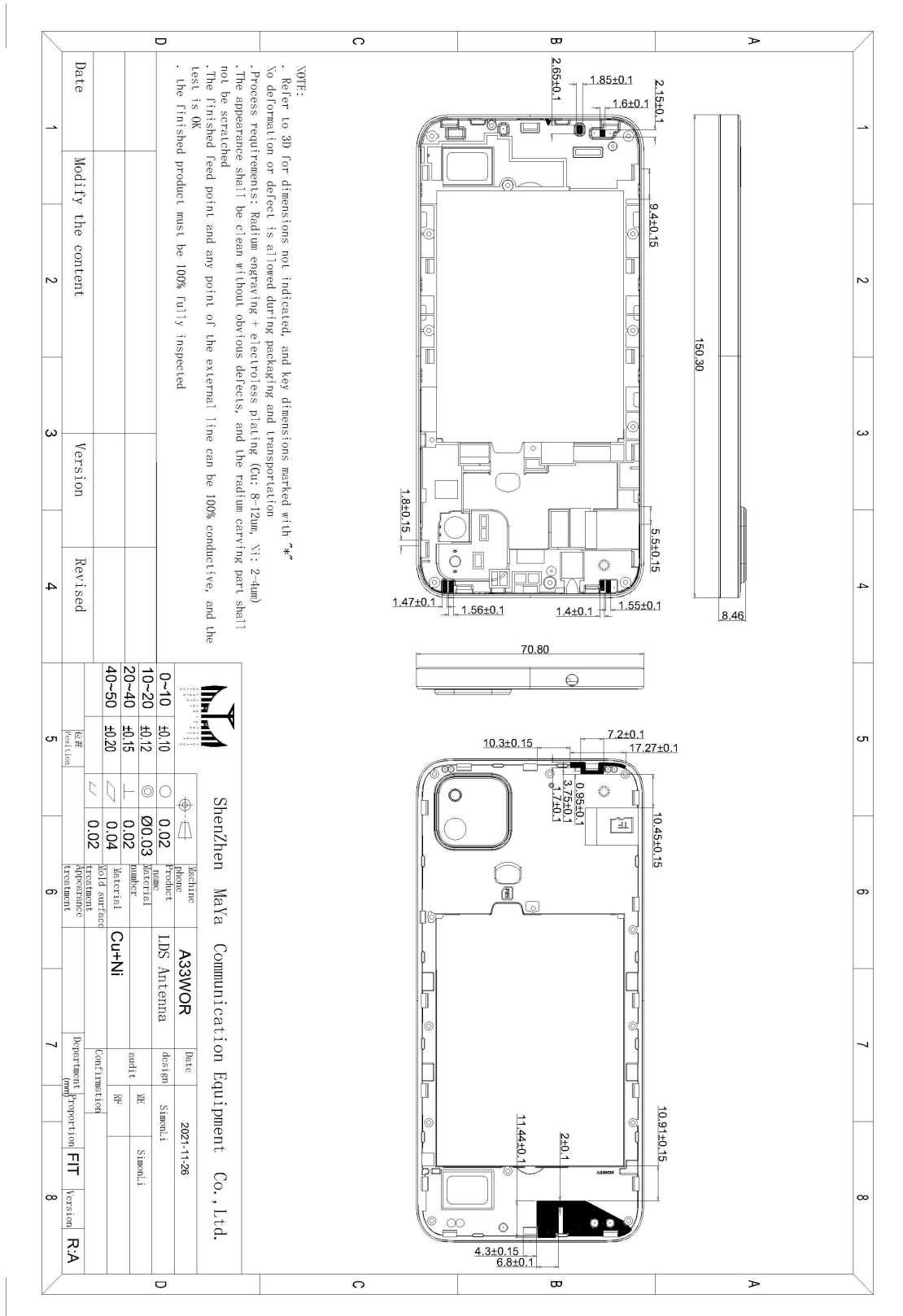
The motherboard needs to be grounded with conductive cotton, as shown in the red box above



The horn needs to be grounded with conductive cotton, as shown in the red box above



7. structural drawings





8.Warning Sign

1. The section on performance and structure validation

★Please confirm the appearance and performance of the product before you sign the acknowledgement.

★Please be sure to provide the final mass production trial production machine to our company or take back our company verification before mass production

★As the product of this acknowledgement is a highly sensitive object, please be sure to keep the testing machine for follow-up

★As this product is a custom-made object, the use of the targeted, customers in material replacement or for non-designated items, please be sure to change the material or non-designated items of the machine sent to our company to verify the radio-frequency performance, otherwise, may cause the use state and the design state inconsistent serious hidden danger, to our company sealed debugging sample function confirmation, ensure our company debugging sample function completely normal, prevent function abnormal to the antenna performance error caused by the antenna performance

2. About product storage

★As this product has printing ink on the surface, adhesive on the back and electroplate, please make sure the temperature is between 23 ° c-27 ° C and the relative humidity is below 60% during storage or transportation, no strong acid, no sulfur, no oxygen storage or transport environment

★As the product back glue on the environment requirements are more stringent, please customers must be received after the product, in the product quality guarantee period to ensure the reliability of the product

3. Tips for using the product

★Due to the special structure of this product, please use this product must be in full contact with the pasted objects, and pasted objects must not be residual chemicals (release agent, etc.) or as far as possible do not use the raw materials with release agent, to ensure that the product is in good working condition, please clean the surface of the pasted article before using the product to ensure that there is no chemical residue on the surface of the pasted article

4. Statement of Quality Assurance for this product

★This product quality guarantee period is 12 months, if your use and storage environment to meet the above requirements, in the valid guarantee period of any quality problems, and determined that our products are abnormal, our company can provide free replacement services, after 12 months, our products provide life-long consultation and paid replacement services

★This product is a special custom device, please receive the product must within 3 working days of the product quantity confirmation