ROTEX
TELECOMMUNICATIONS
SUPPLY

2023

Antenna Test Instructions

Strength Behind Every Signal

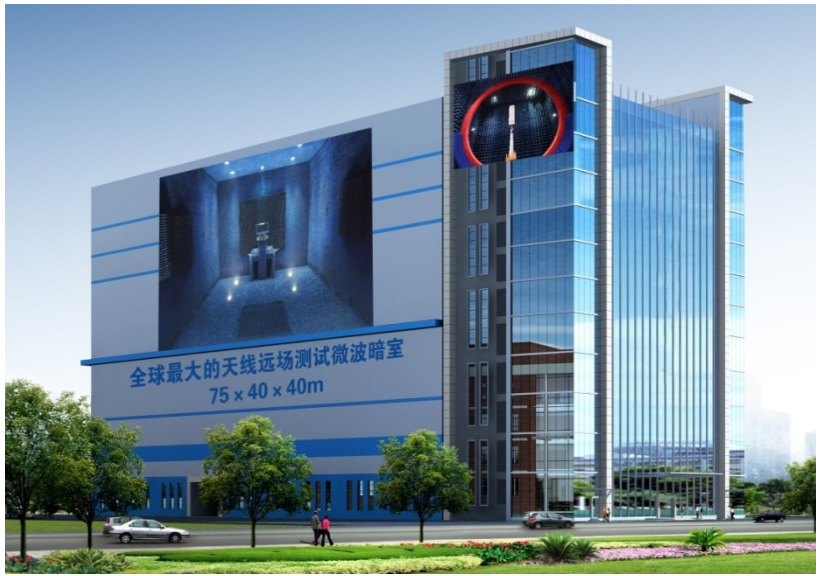
01 Test Equipments

Test field Introduction

ROTEX is using Test Laboratory which was established in May 2018 by public company in China. The test site can carry out independent testing activities, can ensure the independence and impartiality of the testing process.

Tests including

- Antenna radiation Parameters
- Electrical performance
- Environment Reliability



1

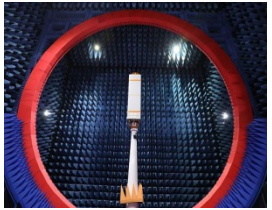
This test address is accredited by CNAS on April 23, 2018 and CMA certified on February 20, 2019.

2

Testing area of 4530㎡, with professional and technical personnel more than 19 people, equipped to meet the testing work required instruments.

75m*40m*40m
Indoor far field

168 Probe Spherical
Near field test system



Near field test system

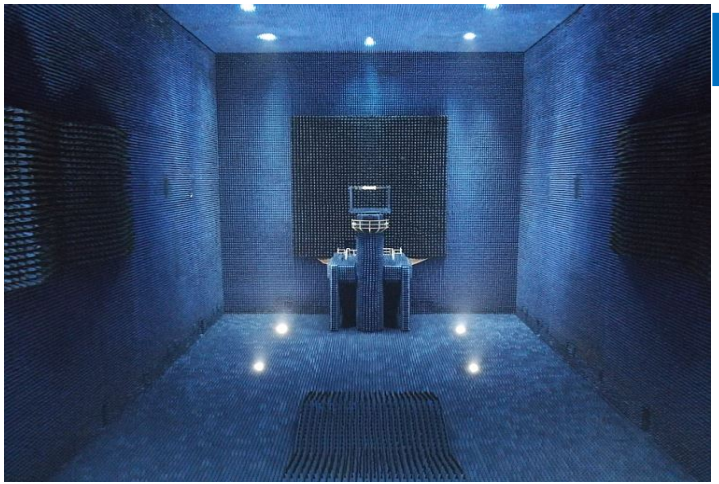
One of the largest near-field test systems

- Test static area 3m, high precision test turntable ;
- High stability of the test system and low test deviation ;
- Verified by The Thiel Lab and Kyle Experiments ;

168 Probe System Indicators			
Number of probes	167+1	Maximum weight measured	110kg
Probe angle	2°	Probe array diameter (inside/outside)	7.0m/8.2m
System frequency	400MHz~6GHz	Dimensions	L*W*H=12m*10m*10m
Dynamic range	45~70dB	Shielding Efficiency	>100dB
Maximum size of object under test	3m	Static area	≦3.m

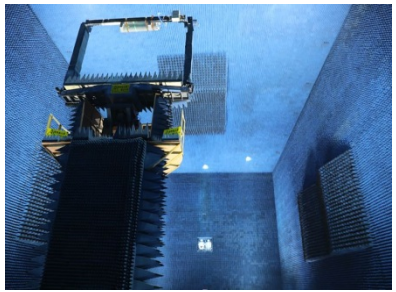
SATIMO SG128			
Number of probes	127+1	Maximum weight measured	100kg
Probe angle	2.571°	Probe array diameter (inside/outside)	6.4m/7.66m
System frequency	400MHz-6GHz	Dimensions	L*W*H=12*10*10
Dynamic range	70dB	Shielding Efficiency	>100dB
Maximum size of object under test	4.16m	Static area	3m

Indoor Far Field Chamber



The largest indoor Far Field in mobile communication industry.

75m*40m*40m



- The performance of the chamber is evaluated strictly, and the main reflection area uses 1.6 meters high absorbent material.
- The Fresnel zone uses Tchebichev wave design to optimize the performance.
- After 203 rigorous tests, the performance test results are better than the design specifications.

Far field chamber characteristics	
Dimensions	75m * 40m * 40m
Operating frequency range	500MHz-12GHz
Shielding performance	> 100dB (@0.5~12GHz)
Quiet zone	3.5m *3.5m *3.5m
Field uniformity	≤±0.25dB
Static reflection level	0.5~1GHz≤-46.4dB 1.5~2.7GHz≤-48.3dB 3~12GHz≤-50.7dB
Horizontal/vertical polarization level difference	≤0.25dB
Gain Test Stability	< ±0.15dB
Static cross-polarization level	< -40dB

Test system metrics

Operating frequency range	400~6000MHz
Maximum test antenna caliber	3.5m
Maximum test antenna weight	300KG
Mechanical test accuracy	≦0.1°
Mechanical return	<6'
Beam peak repeatability error	≤±0.2 dB

Reliability Test Equipments

Aging test chamber (High temperature)

Aging test chamber (Xenon lamp)

Salt mist testing equipment

Vibration Test Equipment

Rain Test Chamber

Simulated wind load test

Drop Test

02

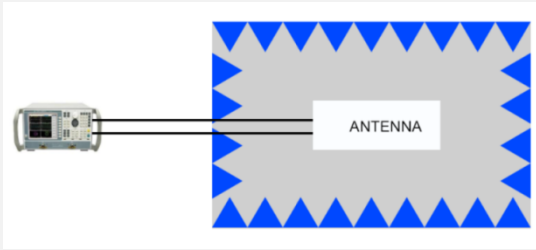
Test Items & Test Methods

Test Item & Test Method

Test Item	> VSWR & Isolation Test <		Test Criteria	YDT 2868-2015
Test Instrument	Test Equipment	Network Analyser		Mechanical Calibrator
	Equipment Type	E5080A		85032E
	Manufacturer	KEYSIGHT		KEYSIGHT
	Serial number	MY55200976		MY53201934
Test Method				

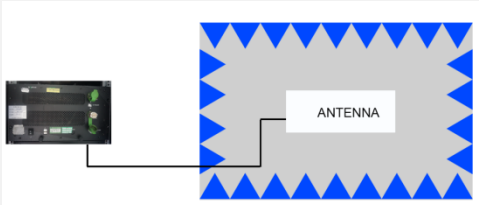
Test Items：
1. VSWR
2. Intersystem Isolation， Intrasystem Isolation；

Test Method：
1. The test was carried out in a completely reflection less anechoic microwave chamber；
2. Set corresponding test frequency band and calibrate the analyzer；
3. Connect Antenna Port 1 and Port 2, test VSWR and Intrasystem Isolation ；
4. Connect Antenna Port 3 and Port 4, test VSWR and Intrasystem Isolation ；
5. Connect Antenna Port 1 and Port 3, test Intersystem Isolation ；
6. Connect Antenna Port 1 and Port 4, test Intersystem Isolation ；
7. Connect Antenna Port 2 and Port 3, test Intersystem Isolation ；
8. Connect Antenna Port 2 and Port 4, test Intersystem Isolation ；



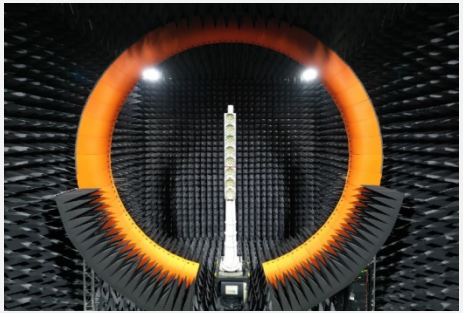
Test Item & Test Method

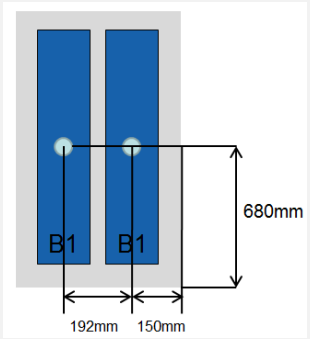
Test Items	>>> IM3 Test<<<		Testing Criteria	YDT 2868-2015 YDT 2827.6-2015
Test Instrument	Device Name	PIM Test Equipment		
	Device Type	iBA-700LB	iBA-0850B	
	Manufacturer	Kaelus	kaelus	
	Serial number	AN1163900167	AN1163800954	
Test Method	Test Items: 1. Third Order Intermodulation; Test Method: 1. The test was carried out in a completely reflection-less anechoic microwave chamber; 2. First Calibrate the PIM Test equipment at 700MHz and 850MHz; 3. The intermodulation values (IM3) of antenna ports 1, 2, 3 and 4 were measured and recorded;			



Test Item & Test Method

Test Item	>>> Pattern Test <<<	Testing Standard	YDT 2868-2015
Test Instrument	Davice Name	Spherical Near Field	
	Device Type	SG-128	
	Manufacturer	MVG	
Test Method	Test Items: 1. Directional Tests; Test Method: 1. Set test frequency points 2. When testing B1, align the B1 phase center (B1 corresponding to ports 1 and 2) 3. When testing B2, align the phase center of B2 (B2 corresponds to ports 3 and 4) 4. Record the data		

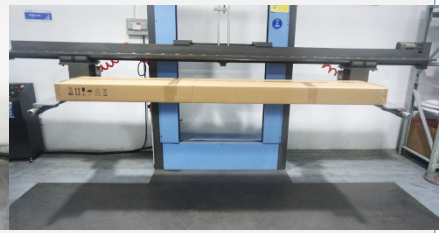




Test Item & Test Method

Test Items	>>> Reliability Testing <<<	
Drop test 【Testing Standard：IEC 60068-2-32】		
Test Instrument	Device Name	Drop Test Machine
	Device Type	YT-DX1500
	Manufacturer	Shenzhen Yutai Test Equipment Co. LTD
	Serial number	20170613736-01
Test Method		

Test Condition：
Packing Weight≤30kg Length<0.6m；
Number of tests： 6 Faces×1 then +Three Edges×1 then + Angular×1；
Drop Length: 1.5m
Only four sides outside side A and B are available for the antenna



Test Procedure：
1. Initial inspection:. Check circuit parameters before testing. Check the appearance for cracks, deformation and other abnormal phenomena, whether the function of movable parts is normal, whether the internal structure of samples and internal packaging materials are damaged
2. Prototype status: Packing according to shipping standards, sealing the tape and packing belt
3. Final inspection: After the test, all test items of the initial test are repeated

Test Item & Test Method

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Test Item	>>> Reliability Testing <<<	
Vibration (sinusoidal) Test【Testing Standard：IEC 60068-2-6】		
Test Instrument	Device Name	Electric vibration test system
	Device Type	DC-3200-36
	Manufacturer	Suzhou Sushi Testing Instrument Co., Ltd.
	Serial number	170103
Test Method		

Test Condition：
Frequency Range：5～9Hz 9～200Hz；
Range：3.1mm（5～9Hz）；
Accelerated Speed：10m/s²（9～200Hz）；
Three perpendicular axis：X、Y、Z or two axis X and Y；
Time Duration：5 Three cycles per axis；
At the resonance point，Then it needs to stay at the frequency of this point for 1 minute and at the resonance point for 1 minute；

Test Procedure：
1. Initial inspection: Before the test, the circuit parameters shall be tested to detect whether there are cracks, deformation and other abnormal phenomena in the appearance, whether the functions of movable parts are normal, and whether the parts in the sample become loose or fall off。
2. Prototype status: antenna installation should be parallel or perpendicular to the ground. Install X, Y and Z axis once each. Install in accordance with GB/T 2423.43. Tighten the mounting bolts and nuts to avoid resonance. The electrically modulated antenna shall be installed with RCU。
3. Final test: After the test, all test items of the initial test are repeated.

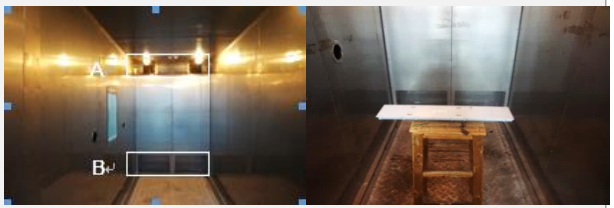
Test Item & Test Method

Test Item	>>> Reliability Testing <<<	
Raining test【Testing Standard：IEC 60068-2-18】		
Test Instrument	Device Name	Rain Test Apparatus
	Device Type	DLX-IPX4567
	Manufacturer	Guangzhou Dongzhixu Test Equipment Co. LTD
	Serial number	201610082
Test Method		

Test Condition：
Rainfall Intensity：4000±600 mm/h； Water Spray Angle：45º；
Turntable Speed：1 r/min Duration of test: 2 Hrs； Recovery Time: 1 Hrs；

Test Procedure：
1. Antenna Mounting Angle requirements： Install at normal Angle
2. Initial Inspection： Before testing, test circuit parameters. Samples with and without cracks appearance, rupture, deformation anomalies, such as moving parts function is normal, tested samples with and without leaking hole
3. Prototype status: The antenna port is completely sealed with sealant. Antenna Angle is consistent with normal engineering installation. The electrically modulated antenna is connected to RCU。
4. Carry out the test according to the above conditions
5. Restore: Dry the antenna surface and joint with a dry cloth. Restore at room temperature for 1 hour
6. Final inspection: After the test, repeat all the test items of the initial test, open the leak hole of the sample, and check whether it leaks.

Test Item & Test Method

Test Items	>>> Reliability Testing <<<	
High & Low Temperature Cycling【Testing Standard：IEC-60068-2-14】		
Test Instrument	Device Name	Rapid temperature change wet - heat test chamber
	Device Type	QW3070A1
	Manufacturer	Guangzhou Wusuo Environmental Instrument Co. LTD
	Serial number	16174101
Test Method	Test Condition： Low Temperature：-40℃±3℃; High Temperature：+65℃±2℃ Duration of test：3 hrs; Rate of change of temperature：≤1℃/min; Number of Cycles：6; Recovery Time：1 hrs; Test Procedure： 1. Initial inspection: Before the test, the circuit parameters shall be tested to detect whether there are cracks, cracks, deformation and other abnormal phenomena in the appearance, and whether the functions of movable parts are normal 2. Prototype status: not packed, connected with cable. The prototype is placed flat in the test box without extrusion and overlap. The joints are fitted with joint caps and the samples are exposed to the test environment 3. Intermediate test: The RCU functional test is required for the first and last cycles of high and low temperature 4. To restore: To restore at room temperature. 5. Final inspection: After the test, repeat all the test items of the initial test	

Test Item & Test Method

Test Items	>>> Reliability Testing <<<	
Road test【Testing Standard：IEC60721-3-2】		
Test Instrument	Device Name	Motor Transport
	Device Type	/
	Manufacturer	/
	Serial number	/
	Calibration Due Date	/
Test Method		

Test Condition：
Highway grade: Level 3; Distance: 200 km ；
Packing and loading according to actual delivery standard, with motor vehicle (1/3 rated load)
It travels at a speed of 20 ~ 40km/h for 200km on a three-tier highway.

Test Procedure：
1. At room temperature, the tested samples are tested, including appearance test, voltage standing-wave ratio, isolation degree and third-order intermodulation ；
2. The tested samples were packed and loaded into the test vehicle (with 1/3 rated load) according to the actual delivery standard, and drove for 200km at a speed of 20 ~ 40km/h on the three-level highway ；
3. Repeat all test items for the initial test。

Test Item & Test Method

Test Items	>>> Reliability Testing <<<	
Static Wind Load Experiment 【Testing Standard：YD/T 2868-2015】		
Test Instrument	Device Name	Simulated wind load test rod
	Device Type	Self Test
	Manufacturer	Self Test
	Serial number	/
	Calibration Due Date	/
Test Method	Test Condition： Wind Speed：56m/s； Wind Pressure：Measure the wind pressure as per standard； Pressure：Windward area × wind pressure； Antenna installation direction: Antenna facing up, facing down and side mounted once each； Duration of Tests：48H/surface Test Procedure： 1. Initial test: before testing, the need to test the circuit parameters. Detect the appearance of the sample for cracks, cracks, deformation and other anomalies, check the sample installation position, angle whether there is any change, installation bracket for deformation. 2. Prototype status: the antenna in accordance with the normal state of use (including tilt up, vertical, down) installed in the fixed station, should ensure that the installation is solid and reliable. 3. Final test: . After the test, repeat all the test items of the initial test.	 

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