

# Testing Report

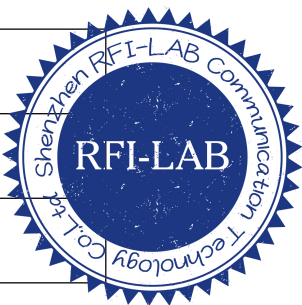
Customer Name: Robosen Robotics (ShenZhen) Co.,Ltd

Product Name: PCB antenna

Sample Model: /

Reference Standard: *GB/T 9410-2008; ANSI/IEEE Std 149-1979*

Issue Date: 2021.8.9

Engineer: <i>Amanda</i>	Date: <i>2021.8.9</i>	
Auditor: <i>Eason</i>	Date: <i>2021.8.9</i>	
Approver: <i>Amanda</i>	Date: <i>2021.8.9</i>	

## Version

Version No.	Date	Description	Formulate	Approval
A0	2021.8.9	For the first time, formulate	Amanda	Eason

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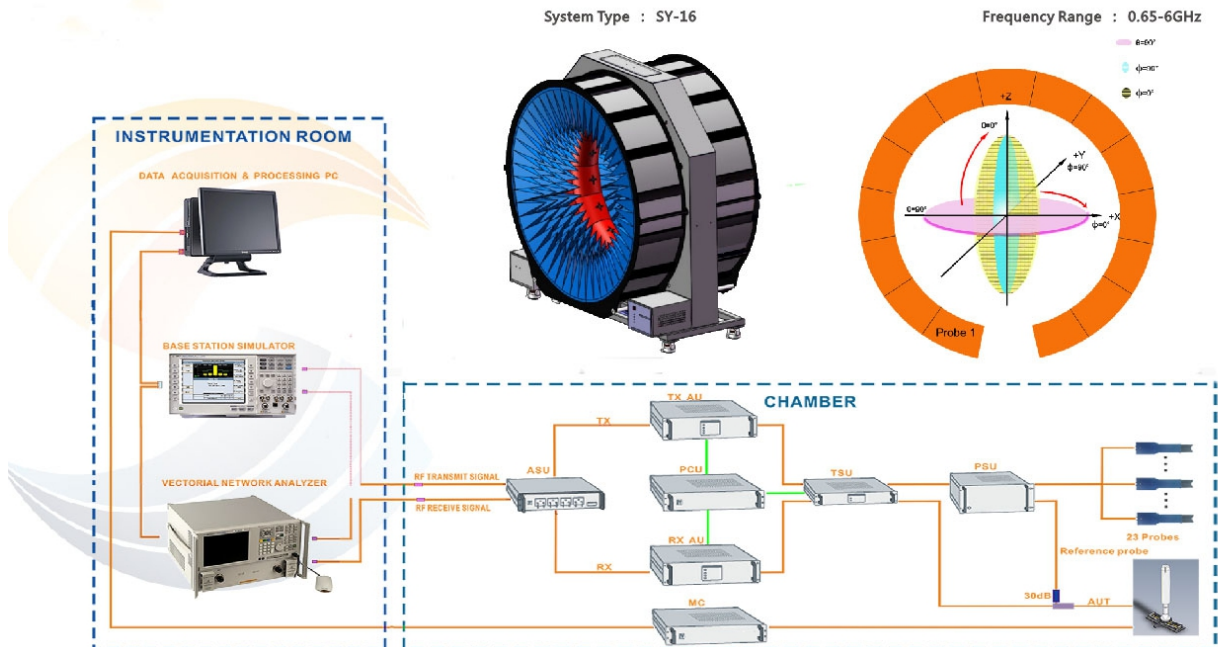
# 1.General Information

## 1.1 General information of testing institutions

<b>Name</b>	Shenzhen RFI-LAB Communication Technology Co., Ltd.
<b>Address</b>	10/F A, Lingyun Bld, Liufang Rd, Baoan District, SZ
<b>Tel</b>	13798473001
<b>E-mail</b>	lait@tech-now.com
<b>Equipment</b>	All the equipment used in the report is fixed in 10/F A, Lingyun Bld, Liufang Rd, Baoan District, SZ

## 1.2 Testing principle

### Multi-Probe OTA Measurement System



### 1.3 Test equipment

Equipment	Model No.	Serial No.	Manufacturer	Calibration date	Next calibration date
16 probe microwave chamber	3*3*2.5	RFI-LAB-RF-A00	SUNYIELD	2021.3.15	2023.3.14
Network Analyzer	E5071C	RFI-LAB-RF-A02	Agilent	2021.5.14	2022.5.13
Network Analyzer	E5071C	RFI-LAB-RF-C02	KEYSIGHT	2021.5.14	2022.5.13

### 1.4 Test environment

Temperature	24.5°C
Humidity	56%RH
Pressure	100.06kPa

### 1.5 Statement

- (1) The test results in the report are only applicable to the tested samples and the tested samples work under the environment described in the report.
- (2) Only Shenzhen RFI-LAB Communication Technology Co., Ltd. have the right to modify the report, and the modification information shall be annotated in the revision form.
- (3) Any objection to this report shall be raised within 30 days after formal confirmation of the report.
- (4) This report is invalid if there is any evidence that the sample information provided is falsified.
- (5) The report is invalid without the signature of the auditor and approver.

## 2. Sample Information

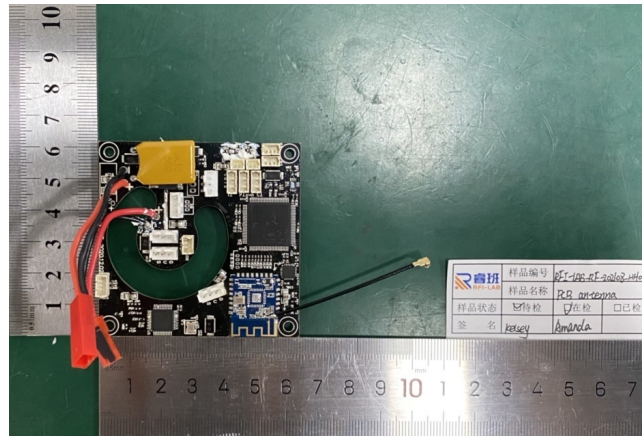
### 2.1 Client information

<b>Name</b>	Robosen Robotics (ShenZhen) Co.,Ltd
<b>Address</b>	509, Building 6, Shenzhen Bay Science and Technology Ecological Park, No. 6, Gaoxin Nanjiu Road, Gaoxin Community, Yuehai Street, Nanshan District, Shenzhen
<b>Contacts</b>	/
<b>Tel</b>	/
<b>E-mail</b>	/

### 2.2 Description of EUT(S)

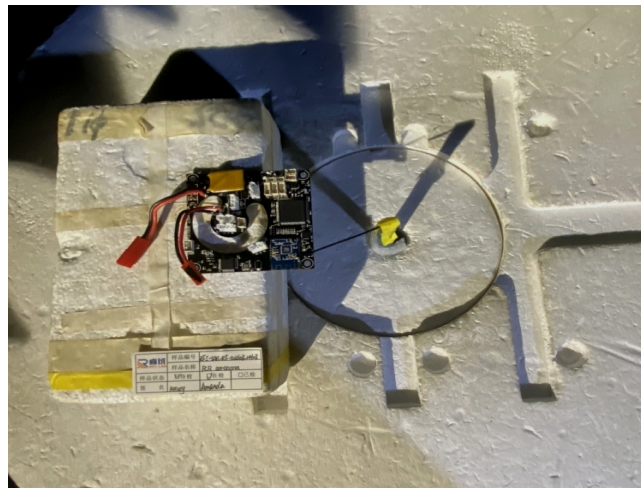
<b>Product Name</b>	PCB antenna
<b>Sample Model</b>	/
<b>Size</b>	Antenna: 15mm*5mm
<b>Serial No.</b>	/
<b>Test Item</b>	VSWR; Impedance; Return Loss; Gain; Efficiency; Radiation pattern
<b>Frequency Range</b>	2400MHz-2500MHz
<b>Received Date</b>	2021.8.5
<b>Test Date</b>	2021.8.9
<b>Remark</b>	The length of the RF cable is 50mm

## 2.3 EUT appearance

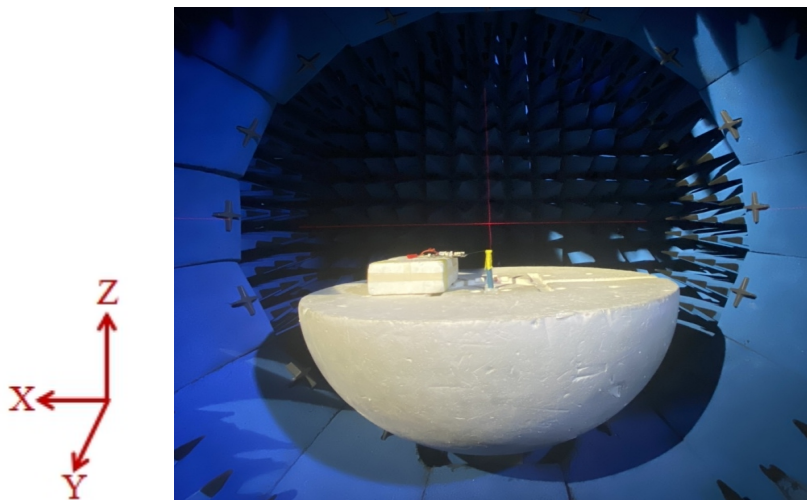


## 2.4 DUT setup photo of free space OTA testing

Planform



Front view



## 3. Test Results

### 3.1 Test standard

Name	Parameter	Method	Standard no.
Mobile communication antenna	VSWR	Generic specification for antennas used in the mobile communications	GB/T 9410-2008
	Antenna gain		
	Radiation pattern		
Antenna	Radiation efficiency	IEEE Standard Test Procedures for Antennas	ANSI/IEEE Std 149-1979
	Gain and directivity		
	Impedance		

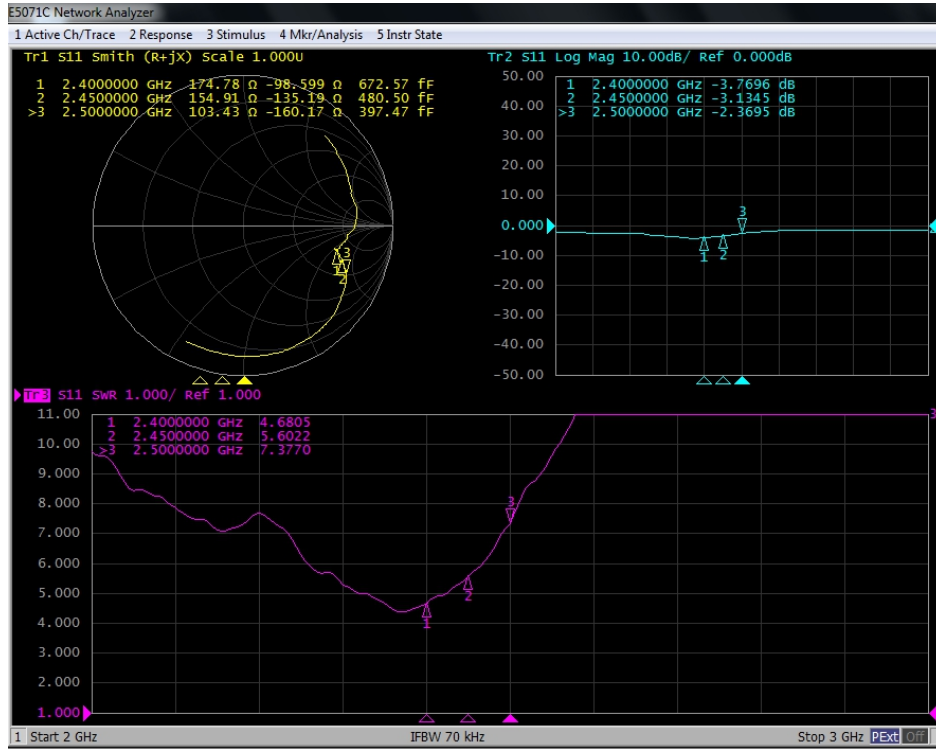
### 3.2 Test uncertainty

The uncertainty was calculated on the basis of the GUM published by ISO, using the inclusion factor of  $K=2$  and the 95% confidence level to express the extended uncertainty.

Item	Uncertainty
VSWR	$\pm 0.3$
Antenna gain	$\pm 1\text{dB}$
Radiation efficiency	$\pm 10\%$

### 3.3 Test data

#### 3.3.1 S11 parameters



#### 3.3.2 S11 test data

Frequency/MHz	2400	2450	2500
VSWR	4.6805	5.6022	7.3770

#### 3.3.3 Typical free space efficiency and gain

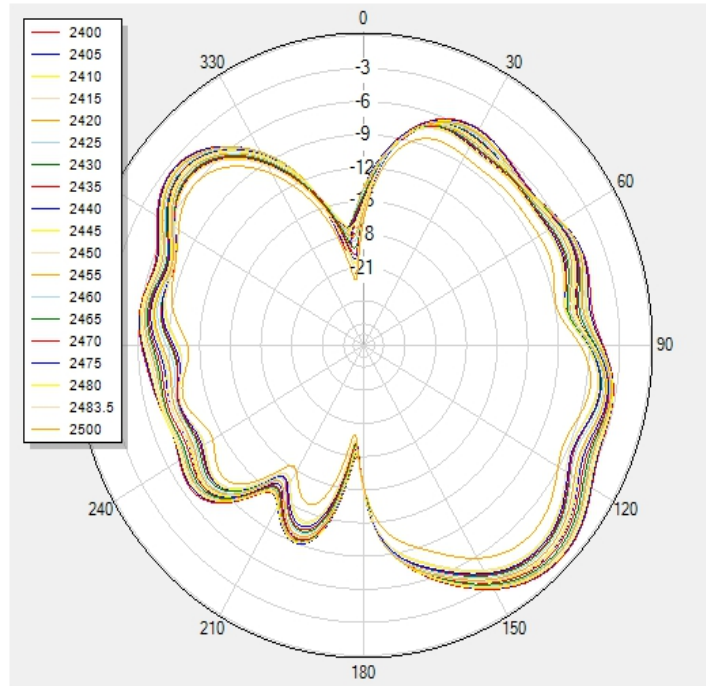
Frequency/MHz	2400	2405	2410	2415	2420	2425	2430	2435	2440	2445
Peak Gain/dBi	-0.79	-0.87	-0.95	-1.11	-1.28	-1.39	-1.53	-1.76	-1.94	-1.97
Efficiency/%	19.23	18.96	18.66	18.18	17.71	17.23	16.84	16.43	16.04	15.82
Average Gain/dBi	-8.15	-8.2	-8.26	-8.35	-8.44	-8.55	-8.64	-8.72	-8.8	-8.85
Frequency/MHz	2450	2455	2460	2465	2470	2475	2480	2483.5	2500	/
Peak Gain/dBi	-2.06	-2.28	-2.5	-2.68	-2.83	-2.96	-3.12	-3.26	-4.42	
Efficiency/%	15.52	14.93	14.22	13.65	13.31	12.98	12.57	12.24	9.94	
Average Gain/dBi	-8.92	-9.08	-9.28	-9.44	-9.54	-9.65	-9.78	-9.89	-10.81	



### 3.3.4 Typical free space radiation pattern

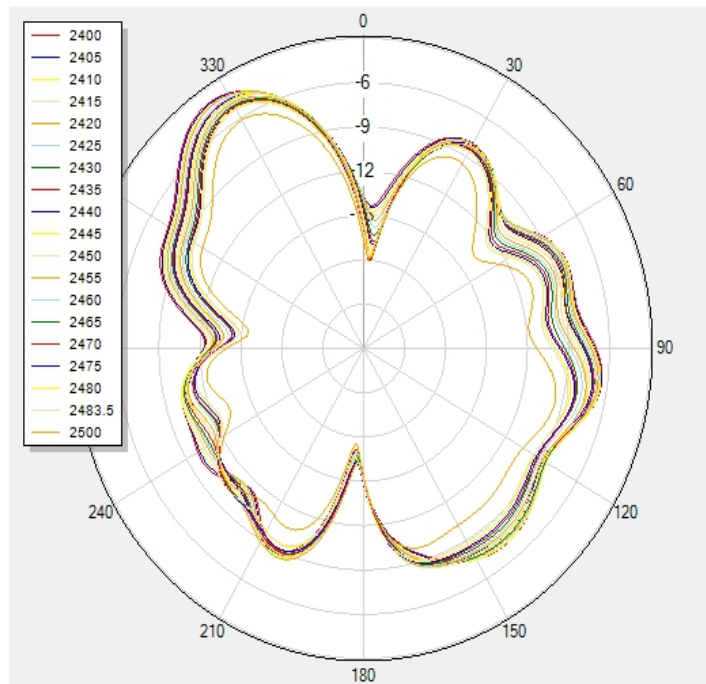
(1) X-Z Plane:

**V Phi=0**



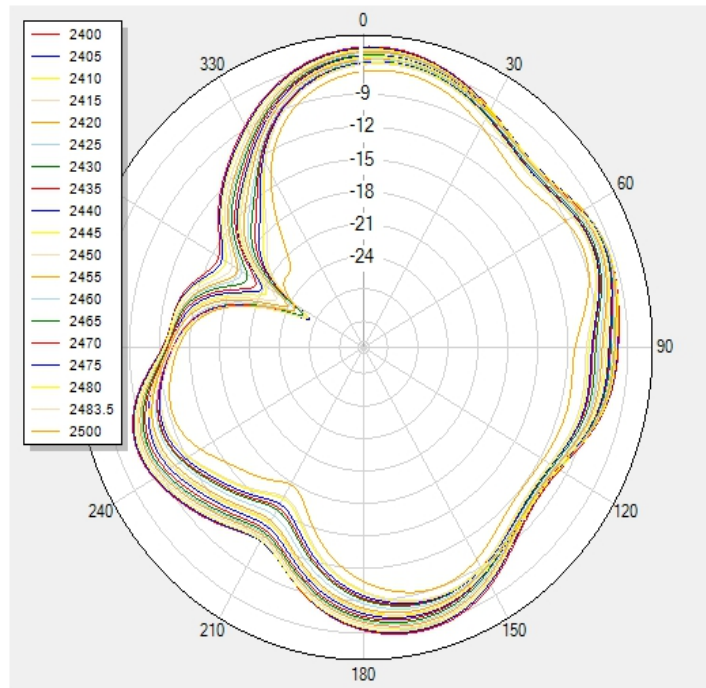
(2) Y-Z Plane:

**V Phi=90**

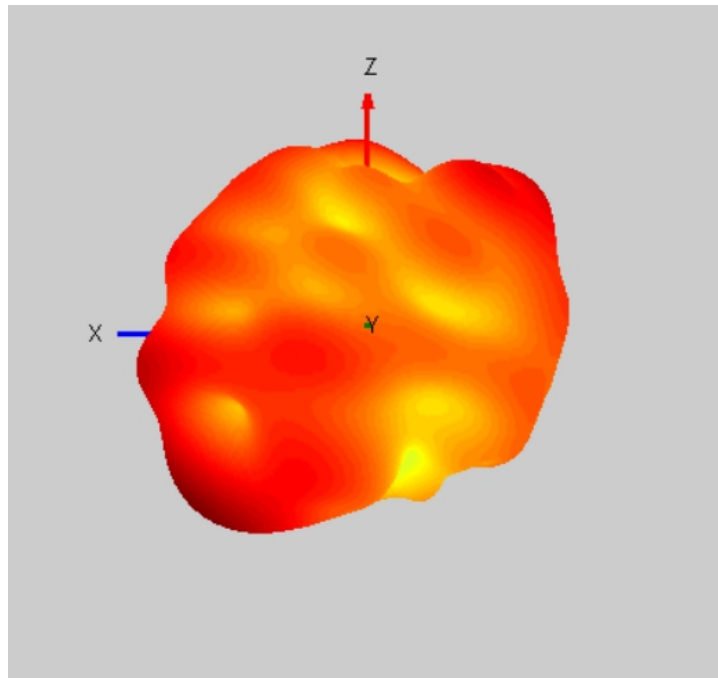


(3) X-Y Plane:

### H Theta=90



(3) Typical Free Space 3D Radiation Pattern at 2.45GHz:



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