

# Testing Report

Customer Name: Bestgreen Novelties Company Limited

Product Name: 433 module

Sample Model: DX-433RF-2140

Reference Standard: *GB/T 9410-2008; ANSI/IEEE Std 149-2021*

Issue Date: 2023.01.10

|                   |                 |
|-------------------|-----------------|
| Engineer: Jackson | Date: 2023.1.10 |
| Auditor: Eason    | Date: 2023.1.10 |
| Approver: Amon    | Date: 2023.1.10 |



### Version

| Version No. | Date       | Description                   | Formulate | Approval |
|-------------|------------|-------------------------------|-----------|----------|
| A0          | 2023.01.10 | For the first time, formulate | Jackson   | Eason    |
|             |            |                               |           |          |
|             |            |                               |           |          |

### Contents

1.General Information ..... 3

    1.1 General information of testing institutions ..... 3

    1.2 Testing principle ..... 3

    1.3 Test equipment ..... 4

    1.4 Test environment ..... 4

    1.5 Statement ..... 4

2.Sample Information ..... 5

    2.1 Client information ..... 5

    2.2 Description of EUT(S) ..... 5

    2.3 EUT appearance ..... 6

    2.4 EUT setup photo of free space OTA testing ..... 6

3. Test Results ..... 7

    3.1 Test standard ..... 7

    3.2 Test uncertainty ..... 7

    3.3 Test data ..... 7

        3.3.1 Typical free space efficiency and gain ..... 7

        3.3.2 Typical free space radiation pattern ..... 8

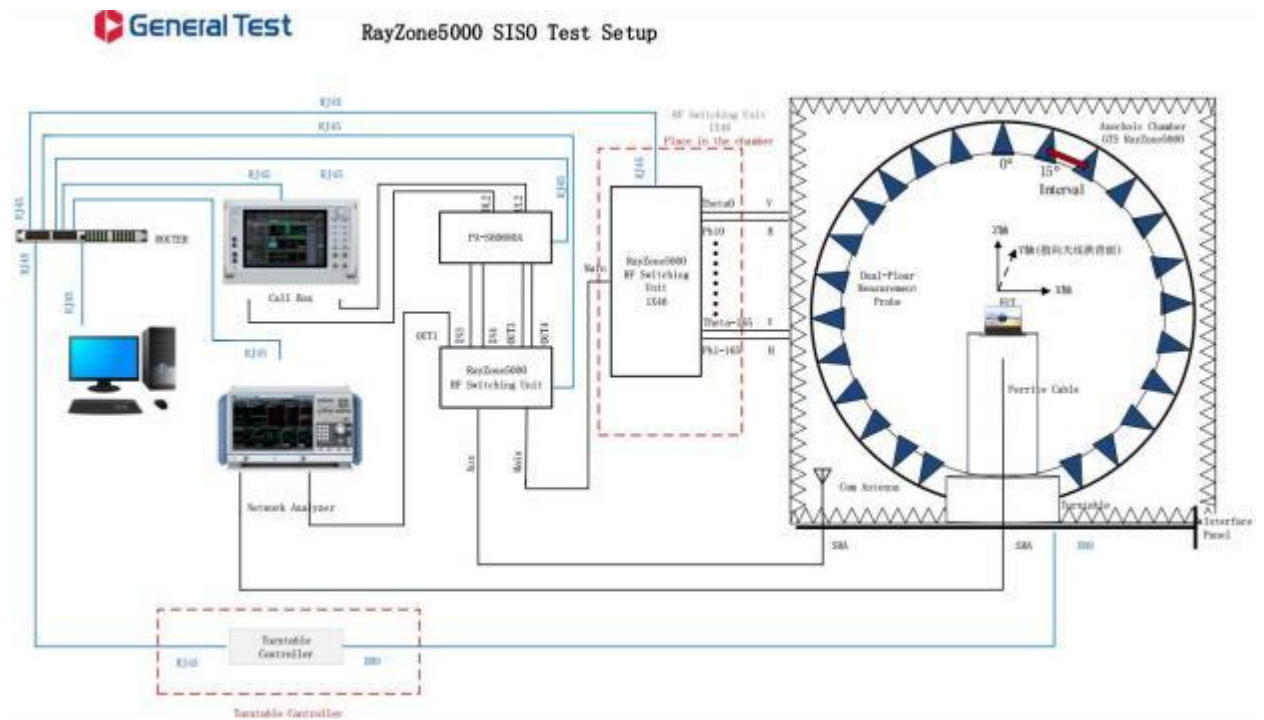
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# 1. General Information

## 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>       | 13682621346   |
| <b>E-mail</b>    | rfi-lab@tech-now.com  |
| <b>Equipment</b> | All the equipment used in the report is fixed in Zone B, West Side of 1/F, Building 1, Tingwei Industrial Park, No.6 Liufang Road, Bao 'an District, Shenzhen |

## 1.2 Testing principle



### 1.3 Test equipment

| Equipment        | Model No.    | Serial No.     | Manufacturer | Calibration date | Next calibration date |
|------------------|--------------|----------------|--------------|------------------|-----------------------|
| OTA Test System  | RayZone-5000 | RFI-LAB-RF-D00 | GTS          | 2021.3.15        | 2023.3.14             |
| Network Analyzer | E5071C       | RFI-LAB-RF-D01 | KEYSIGHT     | 2022.5.13        | 2023.5.12             |

### 1.4 Test environment

|             |           |
|-------------|-----------|
| Temperature | 23.8°C    |
| Humidity    | 57%RH     |
| Pressure    | 100.15kPa |

### 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

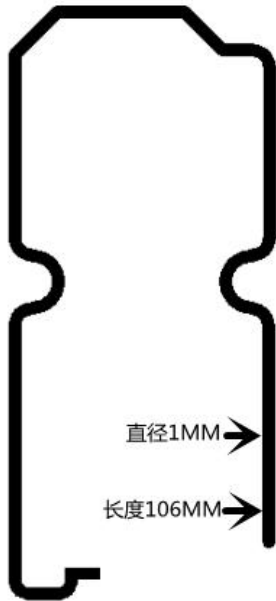
### 2.1 Client information

|                     |   |
|---------------------|---|
| <b>Name</b>         | Bestgreen Novelties Company Limited   |
| <b>Address</b>      | 22 Ke Kan Road, Dakan Cun, XiLi, Nan Shan District, Shenzhen, Guangdong, China 518055 |
| <b>Contacts</b>     | /   |
| <b>Tel</b>          | /   |
| <b>E-mail</b>       | /   |
| <b>Manufacturer</b> | /   |

### 2.2 Description of EUT(S)

|                        |   |
|------------------------|---|
| <b>Product Name</b>    | 433 module                                  |
| <b>Sample Model</b>    | DX-433RF-2140                               |
| <b>Antenna Size</b>    | /   |
| <b>Serial No.</b>      | /   |
| <b>Antenna Type</b>    | External Antenna                            |
| <b>Test Item</b>       | Antenna gain; Efficiency; Radiation pattern |
| <b>Frequency Range</b> | 428-438MHz                                  |
| <b>Received Date</b>   | 2023.01. 10                                 |
| <b>Test Date</b>       | 2023.01. 10                                 |
| <b>Remark</b>          | The length of the RF cable is 45mm          |

### 2.3 EUT appearance

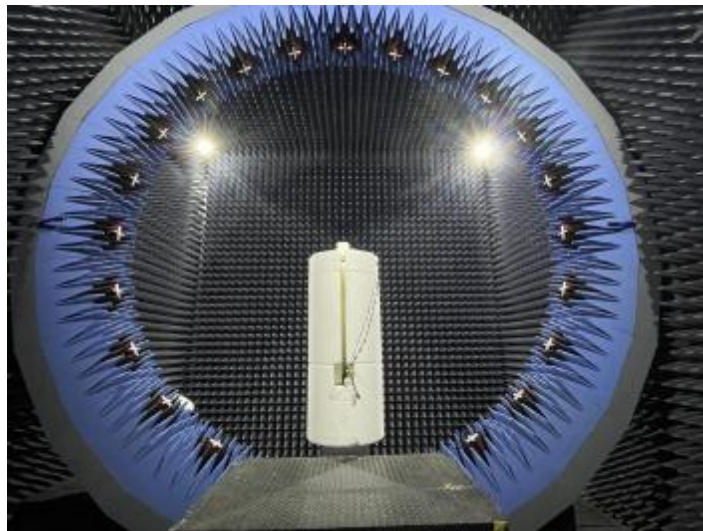


433.92MHz, antenna, material: Copper

The antenna is whip with a width of 1mm, a thickness of 1 oz, and a total straightening length of 106mm.

### 2.4 EUT setup photo of free space OTA testing

Front view



## 3. Test Results

### 3.1 Test standard

| Name                         | Parameter            | Method   | Standard no.           |
|------------------------------|----------------------|--|------------------------|
| Mobile communication antenna | Antenna gain         | Generic specification for antennas used in the mobile communications | GB/T 9410-2008         |
|                              | Radiation pattern    |  |                        |
| Antenna                      | Radiation efficiency | IEEE Standard Test Procedures for Antennas                           | ANSI/IEEE Std 149-2021 |
|                              | Gain and directivity |  |                        |

### 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         |
|----------------------|---------------------|
| Antenna gain         | $\pm 0.72\text{dB}$ |
| Radiation efficiency | $\pm 0.72\text{dB}$ |

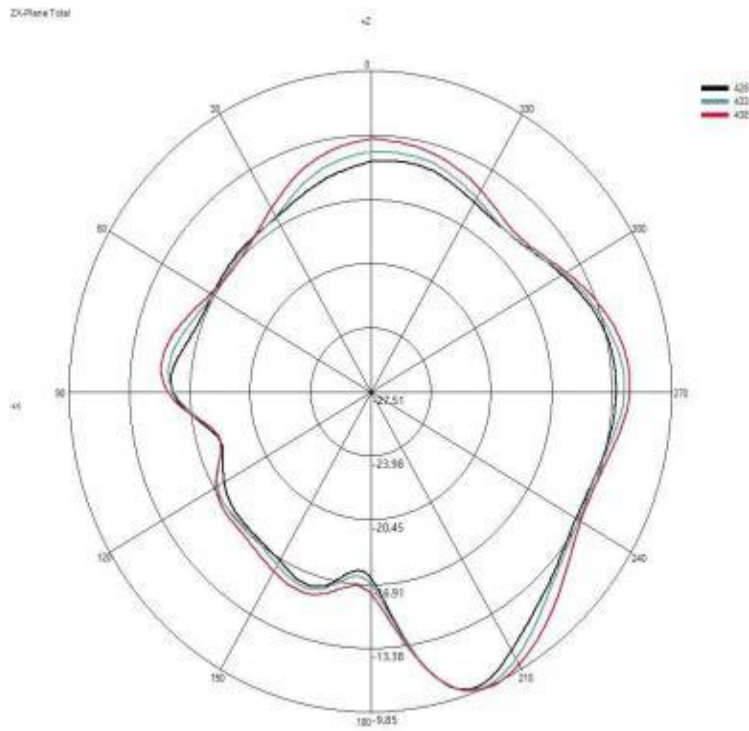
### 3.3 Test data

#### 3.3.1 Typical free space efficiency and gain

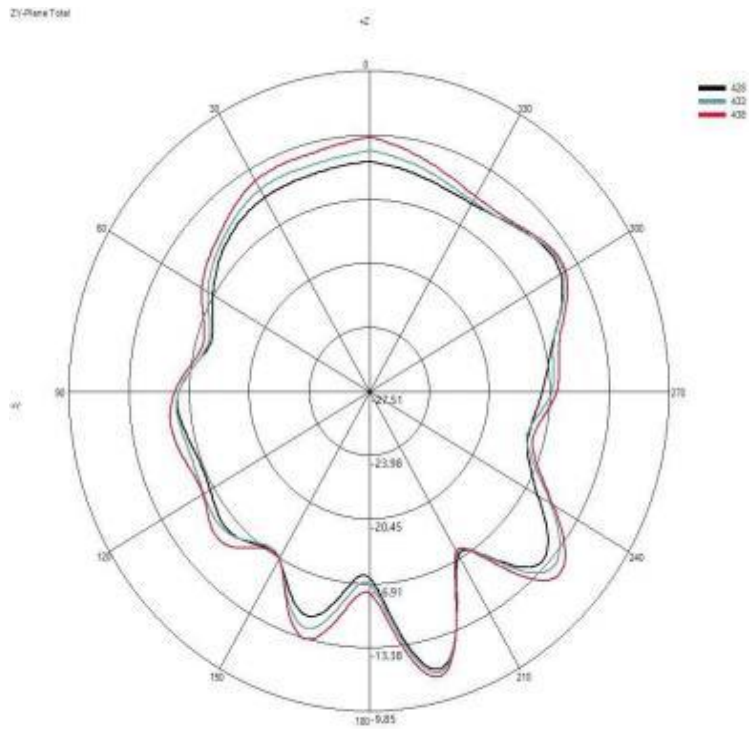
| Frequency/ MHz | 428    | 429    | 430    | 431    | 432    | 433    | 434    | 435    | 436    | 437    | 438    |
|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Peak Gain/dBi  | -10.67 | -10.85 | -10.71 | -10.73 | -10.58 | -10.61 | -10.52 | -10.39 | -10.38 | -10.31 | -10.21 |
| Efficiency/%   | 2.97   | 3.00   | 3.04   | 3.06   | 3.08   | 3.14   | 3.17   | 3.20   | 3.24   | 3.32   | 3.37   |

### 3.3.2 Typical free space radiation pattern

(1) X-Z Plane (unit:dBi):

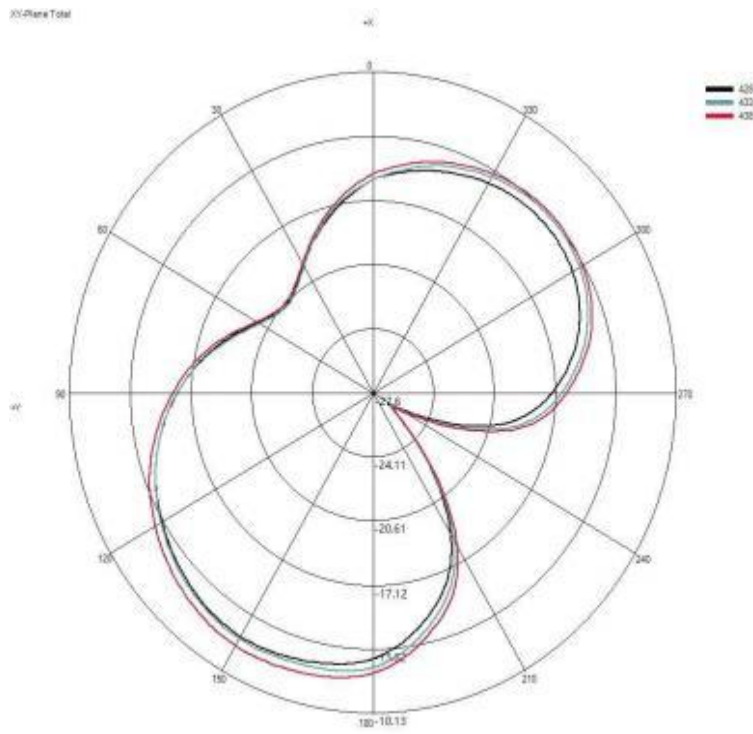


(2) Y-Z Plane (unit:dBi):

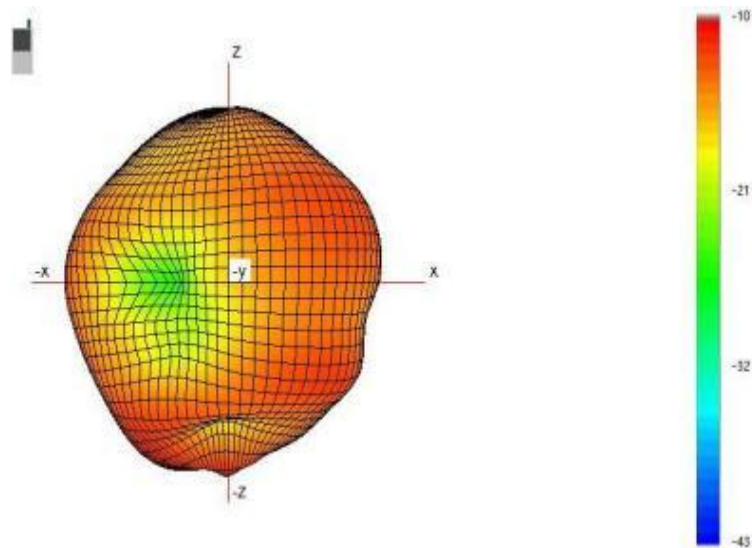




(3) X-Y Plane (unit:dBi):



(4) Typical Free Space 3D Radiation Pattern at 433MHz (unit:dBi):



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