

# Antenna Testing Report

**Customer:** apical Technology

**Project Name:** BM04-TX

**Report Number:** SZ24407IA57/SZ23107IA70

**Manufacturer:** Sunnyway Technology(CHINA)

**Address:** Floor 6, Building 5, Nam Tai Inno Park, Guangming District, Shenzhen

**Report version:** Nov.26, 2024

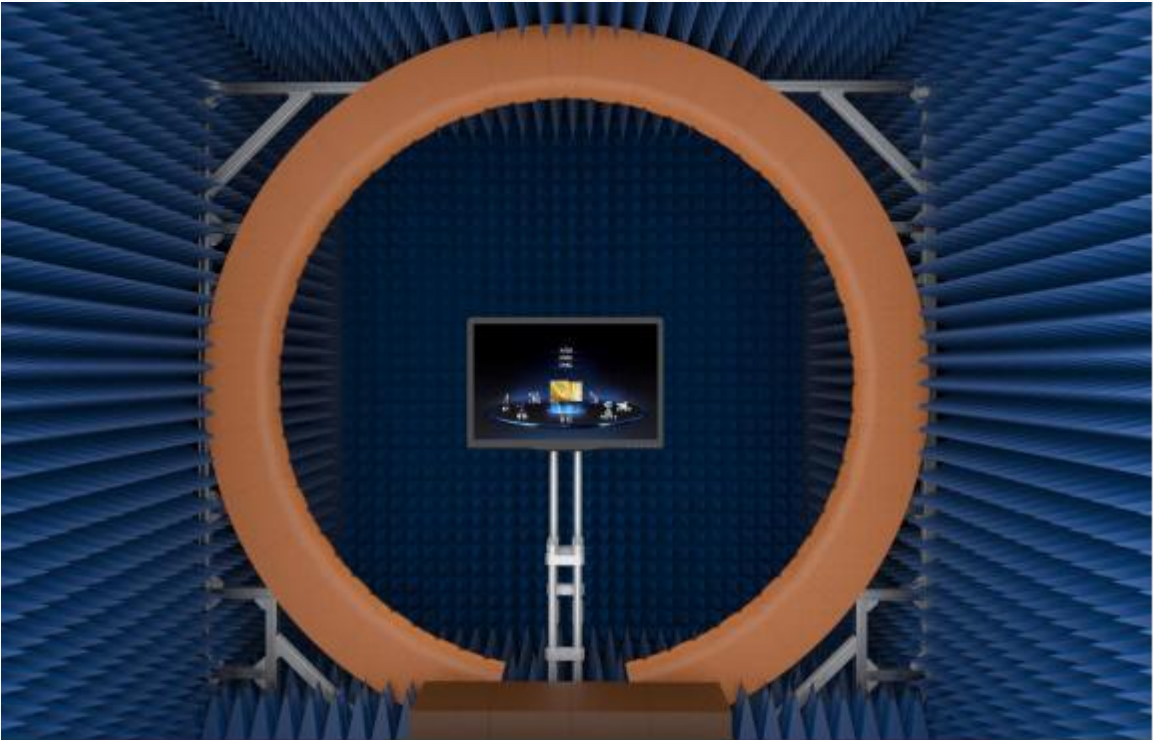
**Author:** Li Jia Bin

| Version | Report date | Remark           |
|---------|-------------|------------------|
| A0      | 2024.11.26  | Latest test data |
| A1      |             |                  |
| A2      |             |                  |
| A3      |             |                  |
| A4      |             |                  |
| A5      |             |                  |
| A6      |             |                  |
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|                        |                                          |
|------------------------|------------------------------------------|
| Prototype status       | Debugging machine                        |
| Device type            | IPC The camera is equipped with a tablet |
| Number of antennas     | WIFI antenna                             |
| Frequency band         | 2.4 B/G/N                                |
|                        |                                          |
|                        |                                          |
|                        |                                          |
|                        |                                          |
| Structural style       | Copper Tube Antenna+Steel Plate Antenna  |
| Environment adjustment | No change                                |
| Matching modification  | No change                                |





The industry's top 64 sensors OTA chamber

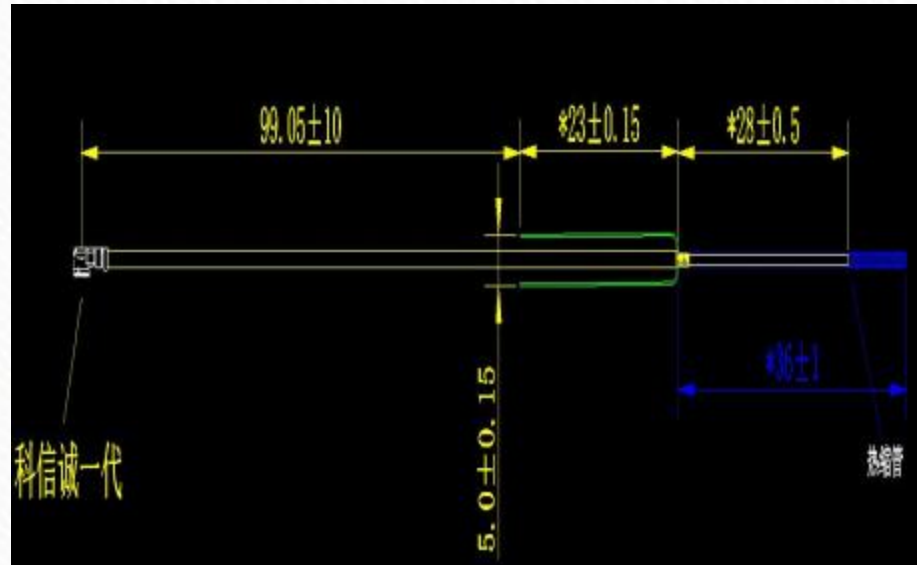
Frequency range: 400MHz-11GHz

Device Llimitation: 2M

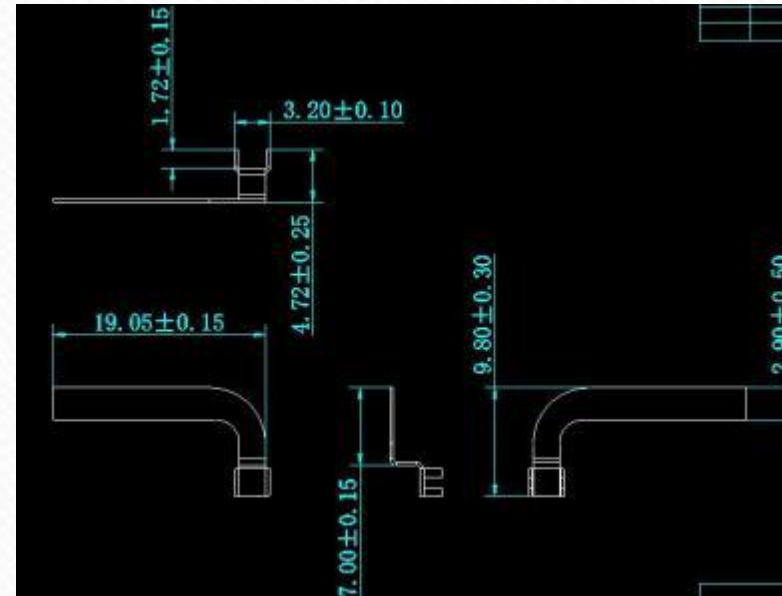
Load-bearing limitation:100KG

| Equipments Items                        | Total Quantity | Quantity for Shanghai R&D | Quantity for Shenzhen R&D | Quantity for ChongQing R&D |
|-----------------------------------------|----------------|---------------------------|---------------------------|----------------------------|
| OTA chamber                             | 10             | 4                         | 5                         | 1                          |
| 5G Tester（SP9500-CTS）                   | 3              | 1                         | 1                         | 1                          |
| R & S Tester（high configuration CMW500） | 6              | 3                         | 2                         | 1                          |
| Japan Anritsu Tester（Dual Channel 8820） | 4              | 2                         | 2                         | --                         |
| NB-IoT Tester (SP8315)                  | 3              | 1                         | 1                         | 1                          |
| Agilent Tester（8960）                    | 9              | 4                         | 4                         | --                         |
| Agilent Network Analyzer（E5062A）        | 7              | 3                         | 3                         | 1                          |
| Agilent Network Analyzer（E5071C 8.5GHZ） | 11             | 5                         | 5                         | 1                          |
| Agilent Network Analyzer（E5071B 8.5GHZ） | 7              | 3                         | 3                         | 1                          |
| R & S Network Analyzer（ZND）             | 9              | 4                         | 4                         | 1                          |
| R & S Network Analyzer（ZVB）             | 3              | 1                         | 1                         | 1                          |
| OTA head hand / ear hand / arm hand     | 5              | 2                         | 2                         | 1                          |
| GPS/WIFI active test equipment          | 5              | 2                         | 2                         | 1                          |

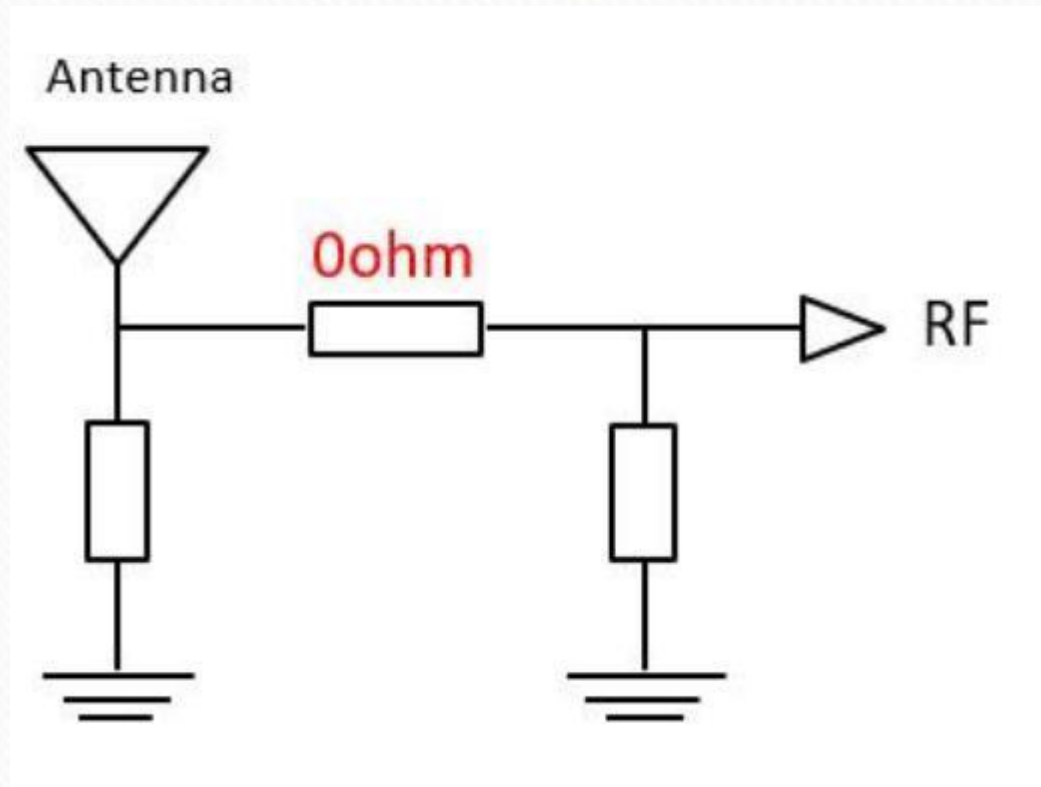
Copper Tube Antenna



Steel Plate Antenna



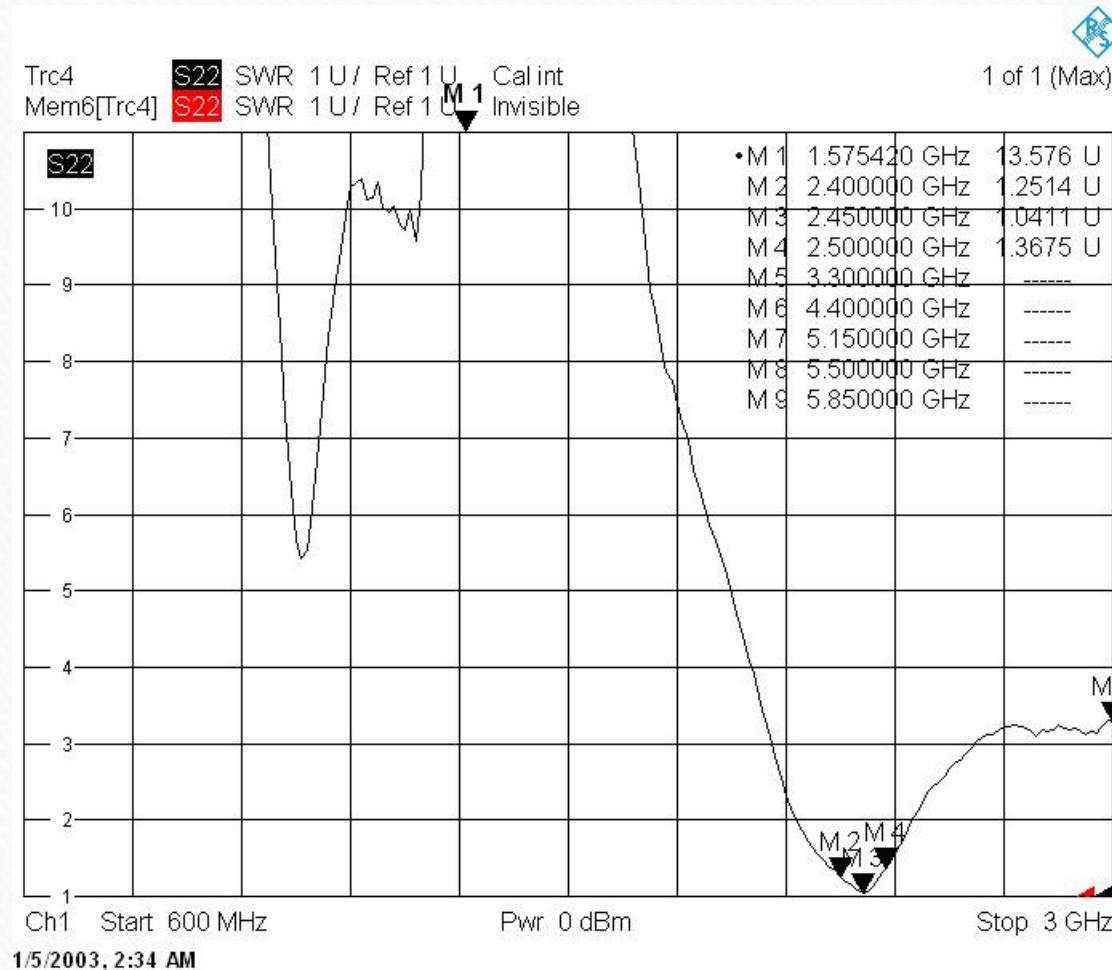
## Matching Circuit





# S11 Antenna Standing Wave Ratio (Copper Tube Antenna)

| frequency | 2400 | 2450 | 2500 |
|-----------|------|------|------|
| SWR       | 1.25 | 1.04 | 1.36 |

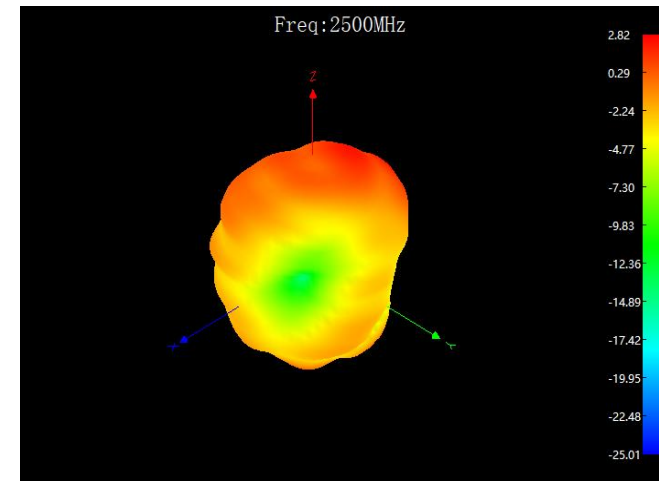
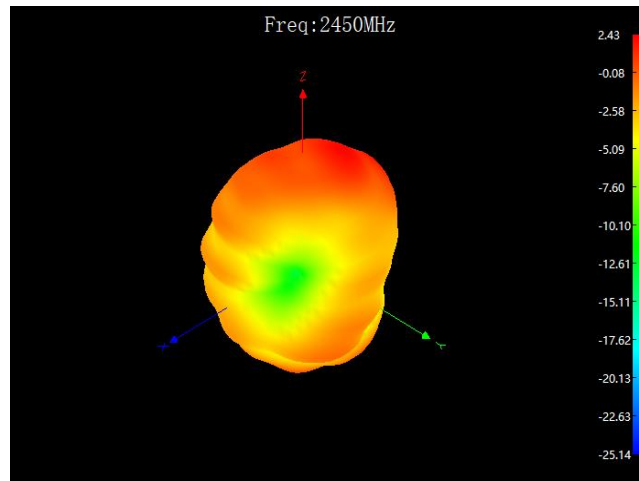
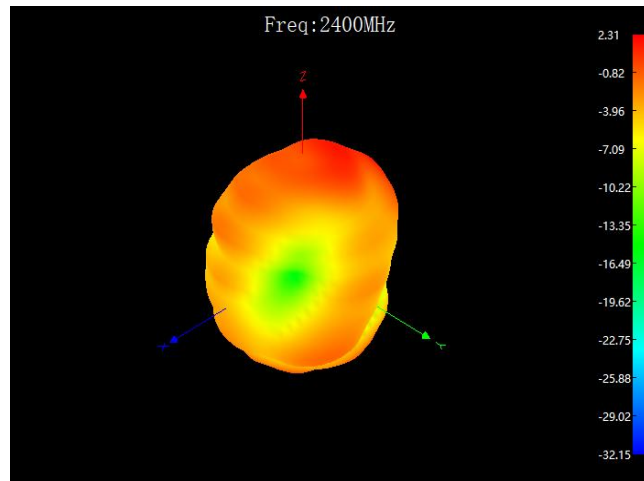
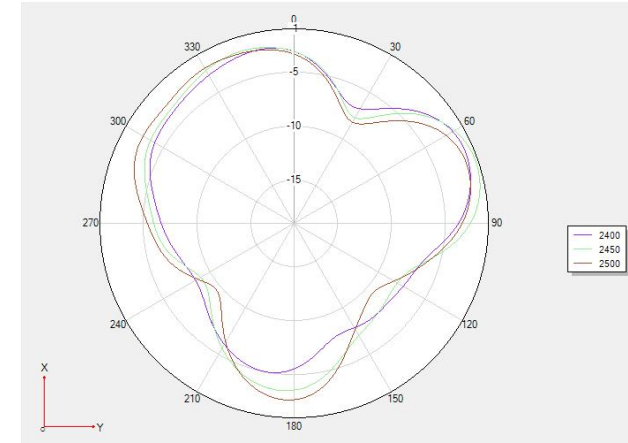
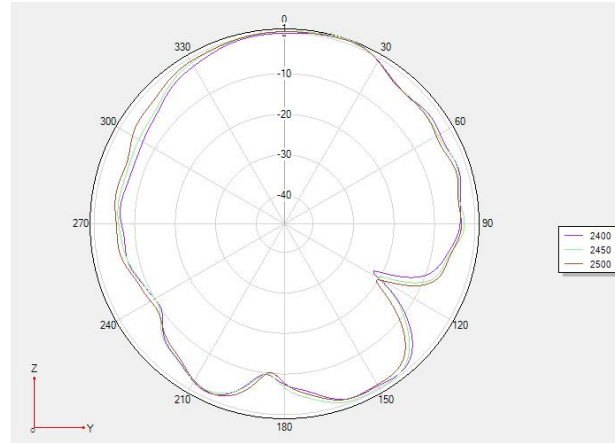
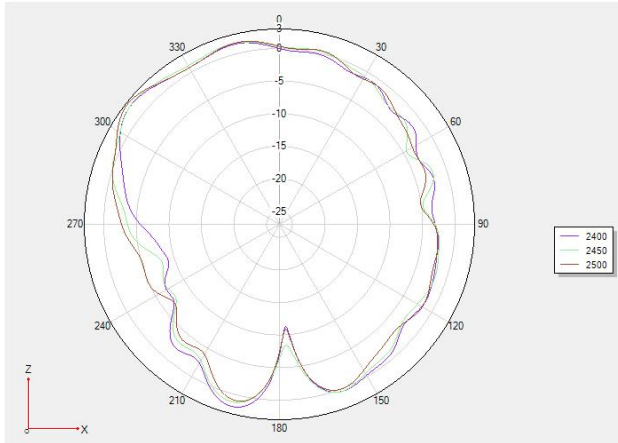




# Passive efficiency (Copper Tube Antenna)

| Frequency/Mhz | Efficiency / % | MaxGain/dBi | AvgGain/dBi |
|---------------|----------------|-------------|-------------|
| 2400          | 55.34          | 2.31        | -2.57       |
| 2410          | 54.58          | 2.11        | -2.63       |
| 2420          | 55.46          | 2.39        | -2.56       |
| 2430          | 55.21          | 2.24        | -2.58       |
| 2440          | 56.23          | 2.51        | -2.5        |
| 2450          | 57.28          | 2.43        | -2.42       |
| 2460          | 57.68          | 2.75        | -2.39       |
| 2470          | 58.08          | 2.63        | -2.36       |
| 2480          | 58.88          | 2.81        | -2.3        |
| 2490          | 58.88          | 2.75        | -2.3        |
| 2500          | 57.54          | 2.82        | -2.4        |

# directiondiagram (Copper Tube Antenna)



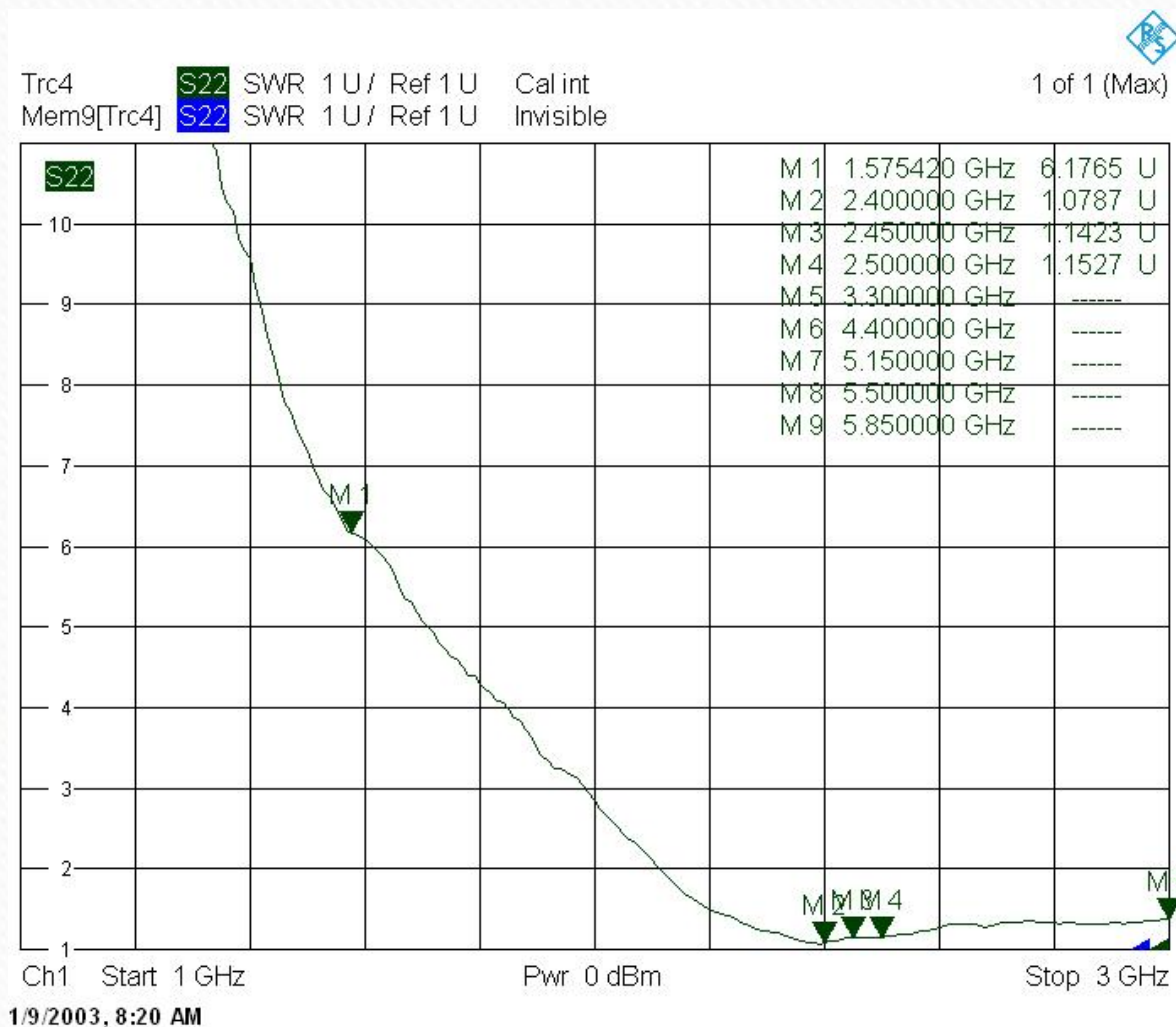
## Wi Fi Active Data (Copper Tube Antenna)

| Measurement | Standard  | Band             | Channel | Frequency | Total  |
|-------------|-----------|------------------|---------|-----------|--------|
| TRP         | WIFI (AP) | WIFI_B (11M)     | 1       | 2412      | 18.92  |
| TRP         | WIFI (AP) | WIFI_B (11M)     | 6       | 2437      | 18.96  |
| TRP         | WIFI (AP) | WIFI_B (11M)     | 11      | 2462      | 19.79  |
| TIS(EIRP)   | WIFI (AP) | WIFI_B (11M)     | 11      | 2462      | -83.06 |
| TRP         | WIFI (AP) | WIFI_G (54M)     | 1       | 2412      | 12.29  |
| TRP         | WIFI (AP) | WIFI_G (54M)     | 6       | 2437      | 13.18  |
| TRP         | WIFI (AP) | WIFI_G (54M)     | 11      | 2462      | 14.32  |
| TIS(EIRP)   | WIFI (AP) | WIFI_G (54M)     | 11      | 2462      | -70.94 |
| TRP         | WIFI (AP) | WIFI_N_ISM (65M) | 1       | 2412      | 19.99  |
| TRP         | WIFI (AP) | WIFI_N_ISM (65M) | 6       | 2437      | 21.9   |
| TRP         | WIFI (AP) | WIFI_N_ISM (65M) | 11      | 2462      | 21.86  |
| TIS(EIRP)   | WIFI (AP) | WIFI_N_ISM (65M) | 11      | 2462      | -70.84 |

# S11 Antenna Standing Wave Ratio

(Steel Plate Antenna)

| frequency | 2400 | 2450 | 2500 |
|-----------|------|------|------|
| SWR       | 1.07 | 1.14 | 1.15 |

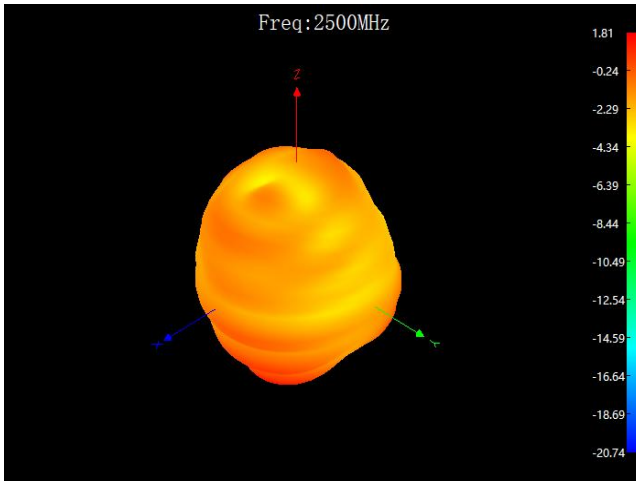
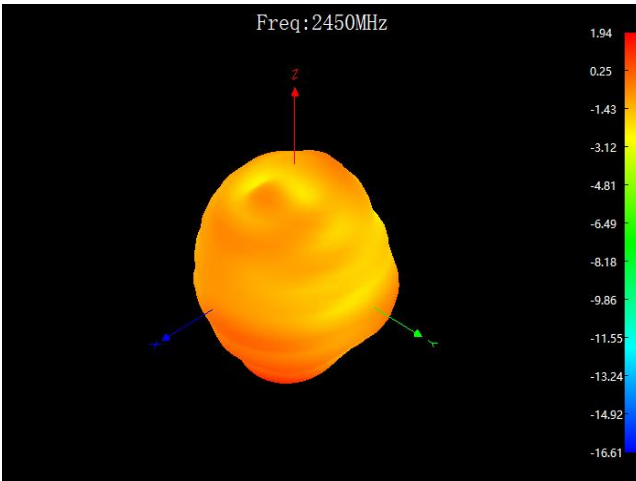
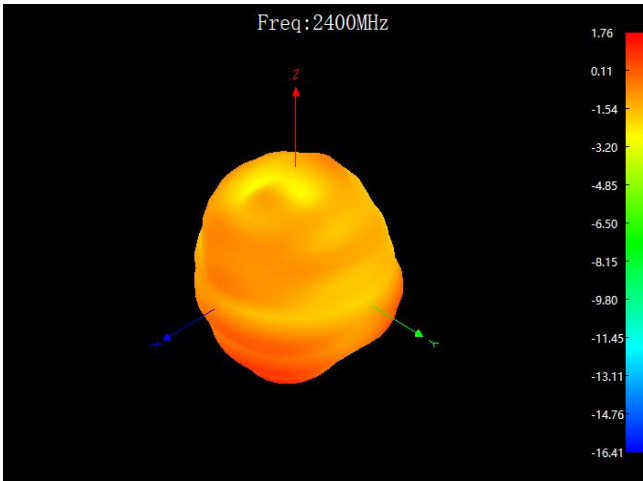
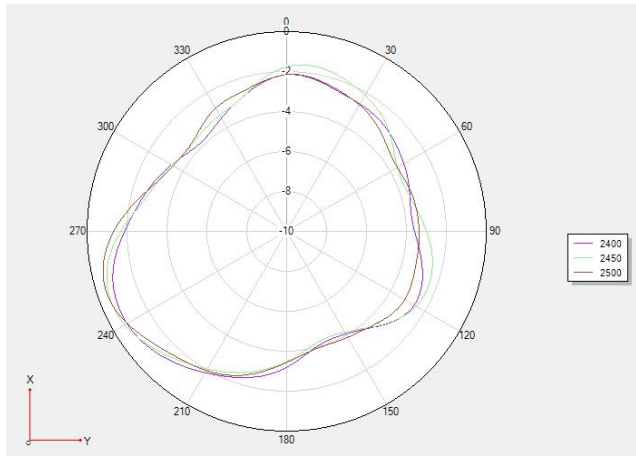
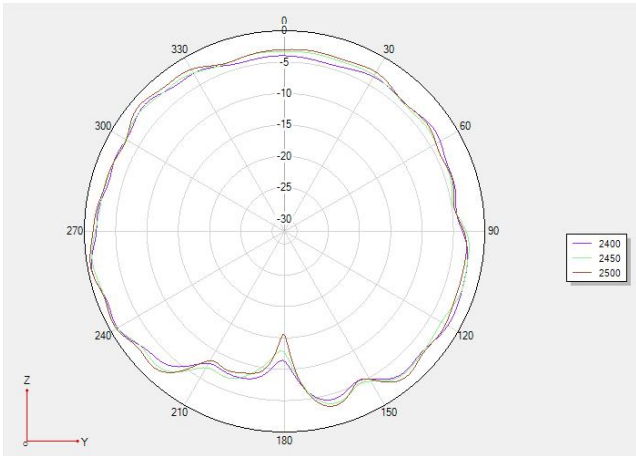
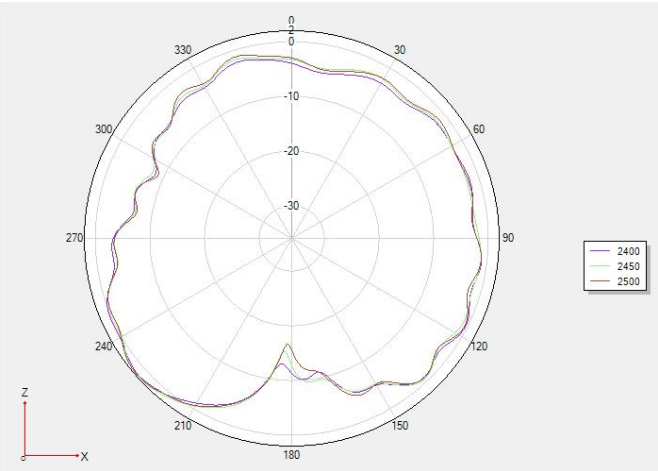




## Passive efficiency (Steel Plate Antenna)

| Frequency/Mhz | Efficiency / % | MaxGain/dBi | AvgGain/dBi |
|---------------|----------------|-------------|-------------|
| 2400          | 63.83          | 1.76        | -1.95       |
| 2410          | 63.1           | 2.12        | -2          |
| 2420          | 63.24          | 1.74        | -1.99       |
| 2430          | 62.37          | 1.96        | -2.05       |
| 2440          | 63.68          | 1.79        | -1.96       |
| 2450          | 63.97          | 1.94        | -1.94       |
| 2460          | 64.42          | 1.71        | -1.91       |
| 2470          | 64.71          | 1.84        | -1.89       |
| 2480          | 66.37          | 1.88        | -1.78       |
| 2490          | 65.61          | 1.83        | -1.83       |
| 2500          | 65.77          | 1.81        | -1.82       |

# directiondiagram (Steel Plate Antenna)



(Steel Plate Antenna)

| Measurement | Standard  | Band             | Channel | Frequency | Total  |
|-------------|-----------|------------------|---------|-----------|--------|
| TRP         | WIFI (AP) | WIFI_B (11M)     | 1       | 2412      | 18.65  |
| TRP         | WIFI (AP) | WIFI_B (11M)     | 6       | 2437      | 18.32  |
| TRP         | WIFI (AP) | WIFI_B (11M)     | 11      | 2462      | 19.07  |
| TIS(EIRP)   | WIFI (AP) | WIFI_B (11M)     | 11      | 2462      | -75.62 |
| TRP         | WIFI (AP) | WIFI_G (54M)     | 1       | 2412      | 18.44  |
| TRP         | WIFI (AP) | WIFI_G (54M)     | 6       | 2437      | 18.43  |
| TRP         | WIFI (AP) | WIFI_G (54M)     | 11      | 2462      | 19.66  |
| TIS(EIRP)   | WIFI (AP) | WIFI_G (54M)     | 11      | 2462      | -64.93 |
| TRP         | WIFI (AP) | WIFI_N_ISM (65M) | 1       | 2412      | 18     |
| TRP         | WIFI (AP) | WIFI_N_ISM (65M) | 6       | 2437      | 19.61  |
| TRP         | WIFI (AP) | WIFI_N_ISM (65M) | 11      | 2462      | 19.33  |
| TIS(EIRP)   | WIFI (AP) | WIFI_N_ISM (65M) | 11      | 2462      | -60.59 |



The power cord is wrapped in copper foil, grounded with a conductive cloth, and fixed on the shield cover to keep it away from the antenna



The above is the latest validation test data.

# Thank You

**Shanghai R&D Center:** 1F, Building 4, No.99, Lane 215, Gaoguang Road, Qingpu District, Shanghai, 201799, PRC

**Shenzhen R&D Center:** Floor 6, Building 5, Nam Tai Inno Park, Guangming District, Shenzhen, 518057, PRC

**ChongQing R&D Center:** 1F, ARM Ecological Industrial Park, 19 East Datugu Road, Xiantao, Yubei District, Chongqing, 401120, PRC

**Huizhou Factory:** F4-6, Building 8, Xiongtao Tech Park, No.15, Qingli 2nd Rd, Huicheng Dist, Huizhou City, 516255, PRC

TEL: 021-60835368      E-mail: [sales@sunnyway-iot.com](mailto:sales@sunnyway-iot.com)

[www.sunnyway-iot.com](http://www.sunnyway-iot.com)

