

# Antenna Testing Report

**Customer :** Shenzhen sangge'er Polytron Technologies Inc

**Project Name :** MS2

**Antenna Manufacturer:** Sunnyway Technology(CHINA)

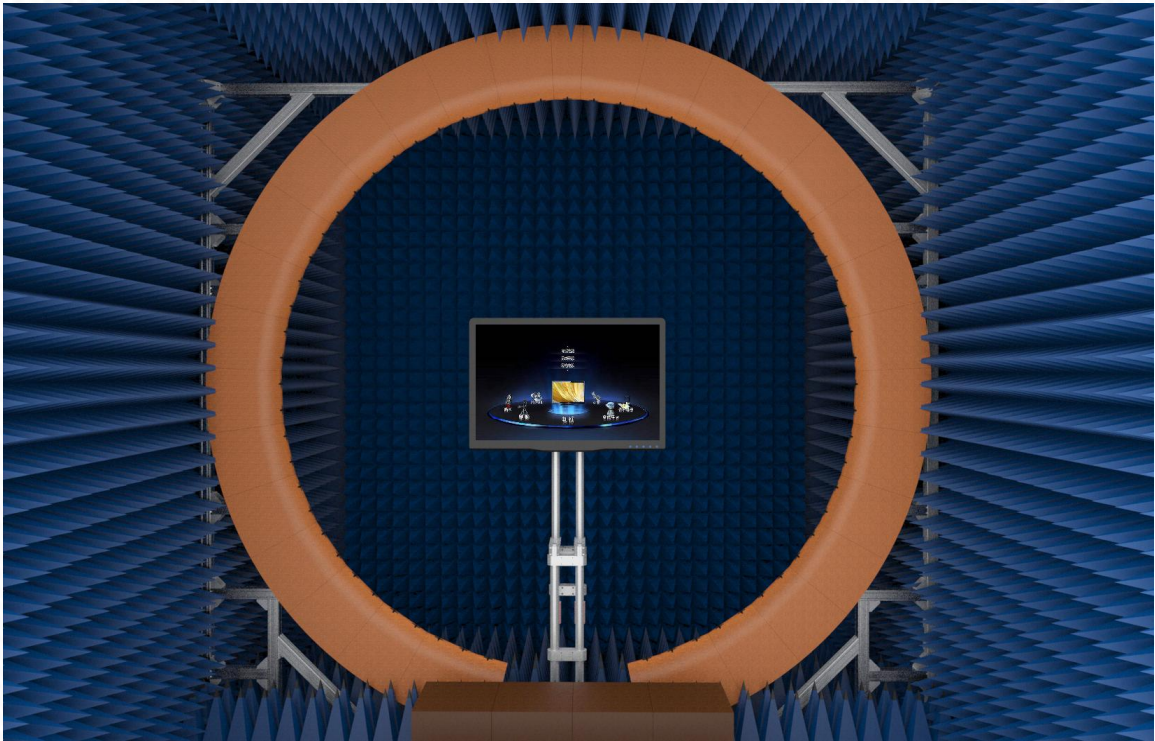
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Guangming District, Shenzhen City

**Report version:** November 16, 2023 A0  
**Research staff:** Huang Xiong

| Version | Report date | Remark              |
|---------|-------------|---------------------|
| A0      | 2023.11.16  | Antenna test report |
| A1      |             |                     |
| A2      |             |                     |
| A3      |             |                     |
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|                               |       |
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|                        |                                                                           |                                                                                                                  |
|------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Prototype status       | Debugging machine                                                         | <div>Project pictures</div>  |
| Device type            | POS machine                                                               |                                                                                                                  |
| Number of antennas     | Main antenna; diversity antenna; three-in-one antenna; NFC antenna        |                                                                                                                  |
| Frequency band         | 2G: GSM850/900/1800/1900                                                  |                                                                                                                  |
|                        | 3G: WCDMA B1/2/5/8      4G-LTE: B1/2/3/4/5/7/8/12/14/17/25/26/38/40/41/66 |                                                                                                                  |
|                        | NFC (13.56MHz)                                                            |                                                                                                                  |
|                        | WIFI 802.11 a/b/g/n+GPS/BT                                                |                                                                                                                  |
| Structural style       | FPC                                                                       |                                                                                                                  |
| 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                          |

# Antenna mounting position

Main antenna



three-in-one antenna

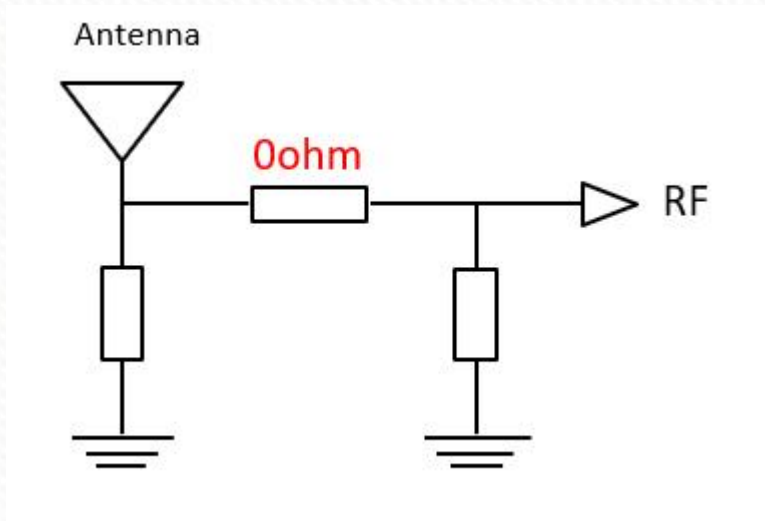


diversity antenna

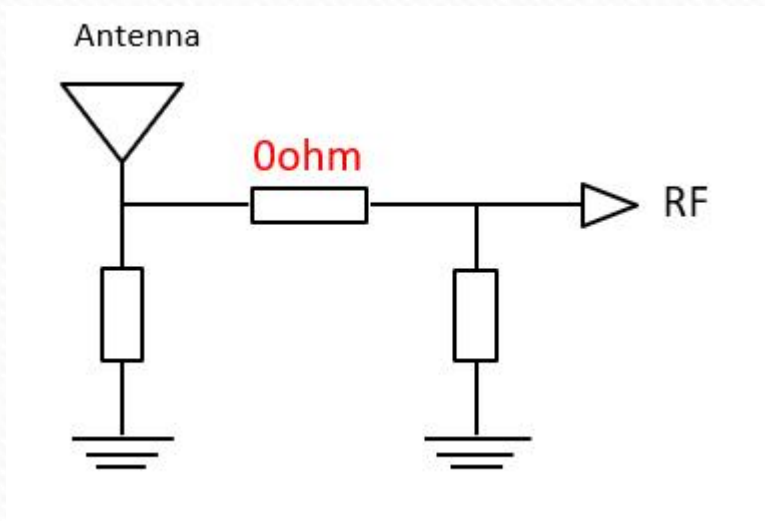
## Antenna mounting position



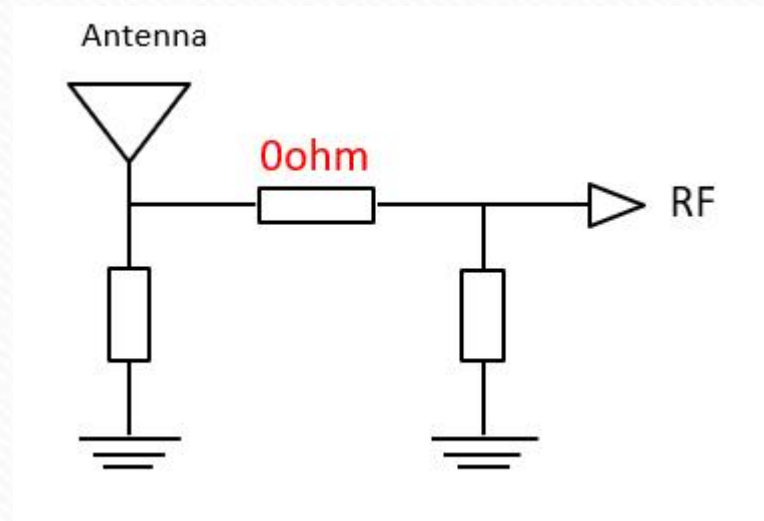
Main antenna :



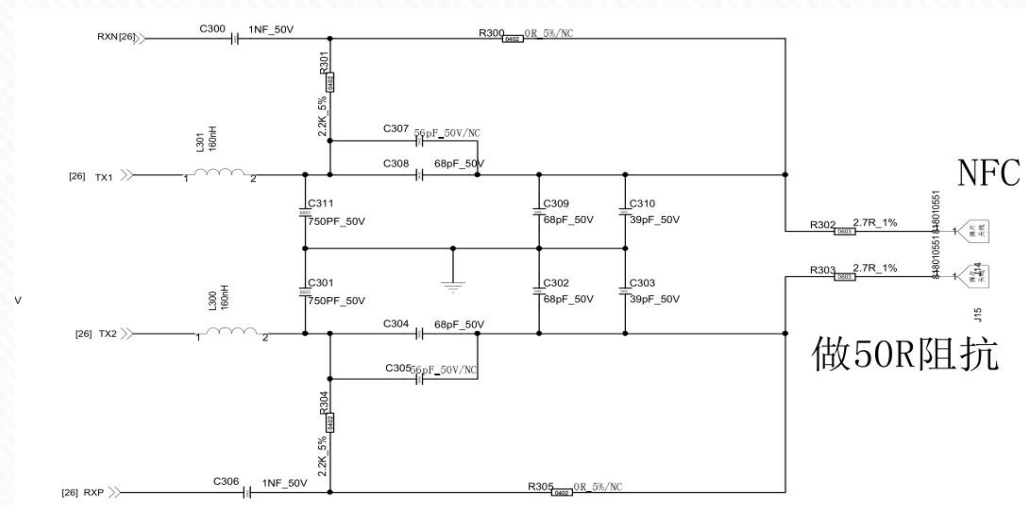
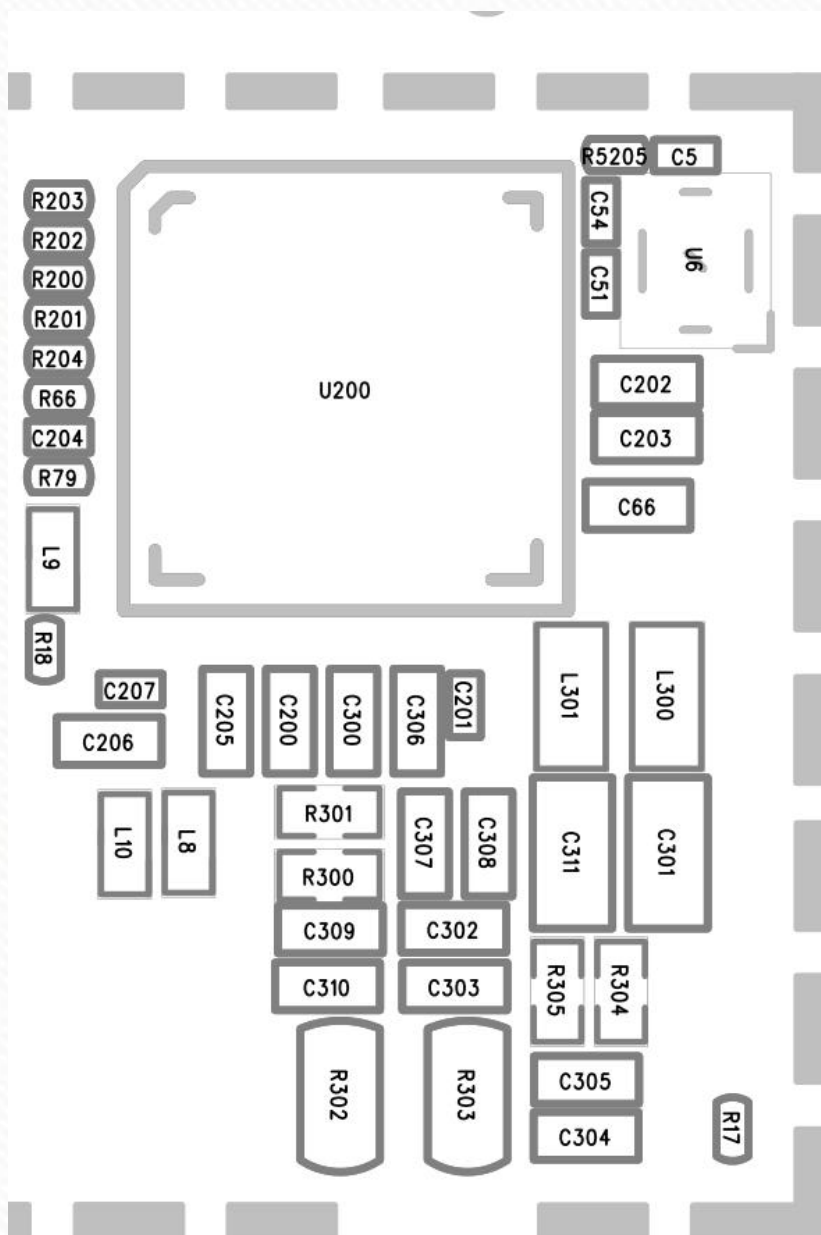
three-in-one antenna :



diversity antenna antenna :

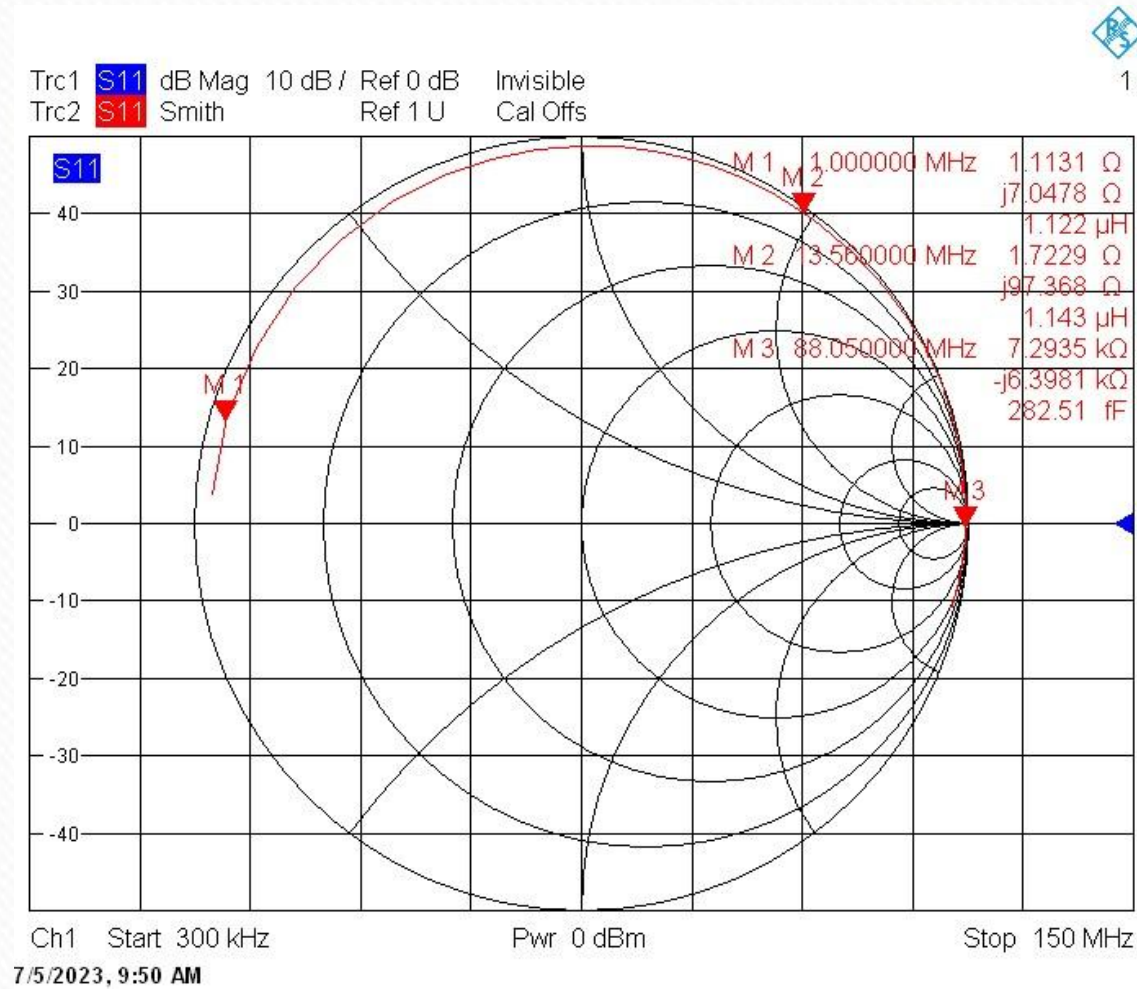


# NFC matching circuitl

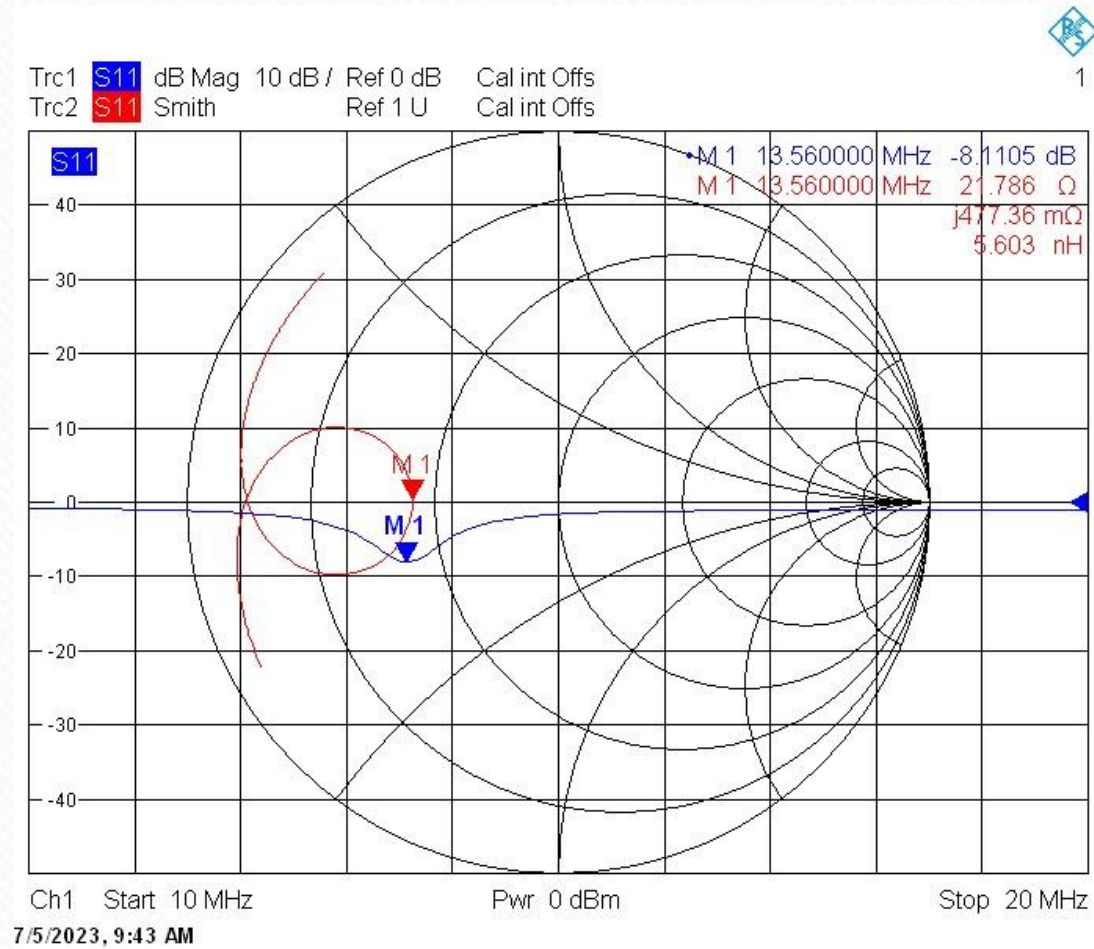


| position  | specifications and models |              |
|-----------|---------------------------|--------------|
| C301/C311 | 750pF                     | 0603 50V/±5% |
| C304/C308 | 68pF                      | 0402 50V/±5% |
| C305/C307 | NC                        | 0402 50V/±5% |
| C309/C302 | 68pF                      | 0402 50V/±5% |
| C310/C303 | 39pF                      | 0402 50V/±5% |
| R301/R304 | 2.2KΩ                     | 0402 ±1%     |
| R302/R303 | 2.7Ω                      | 0603 ±1%     |

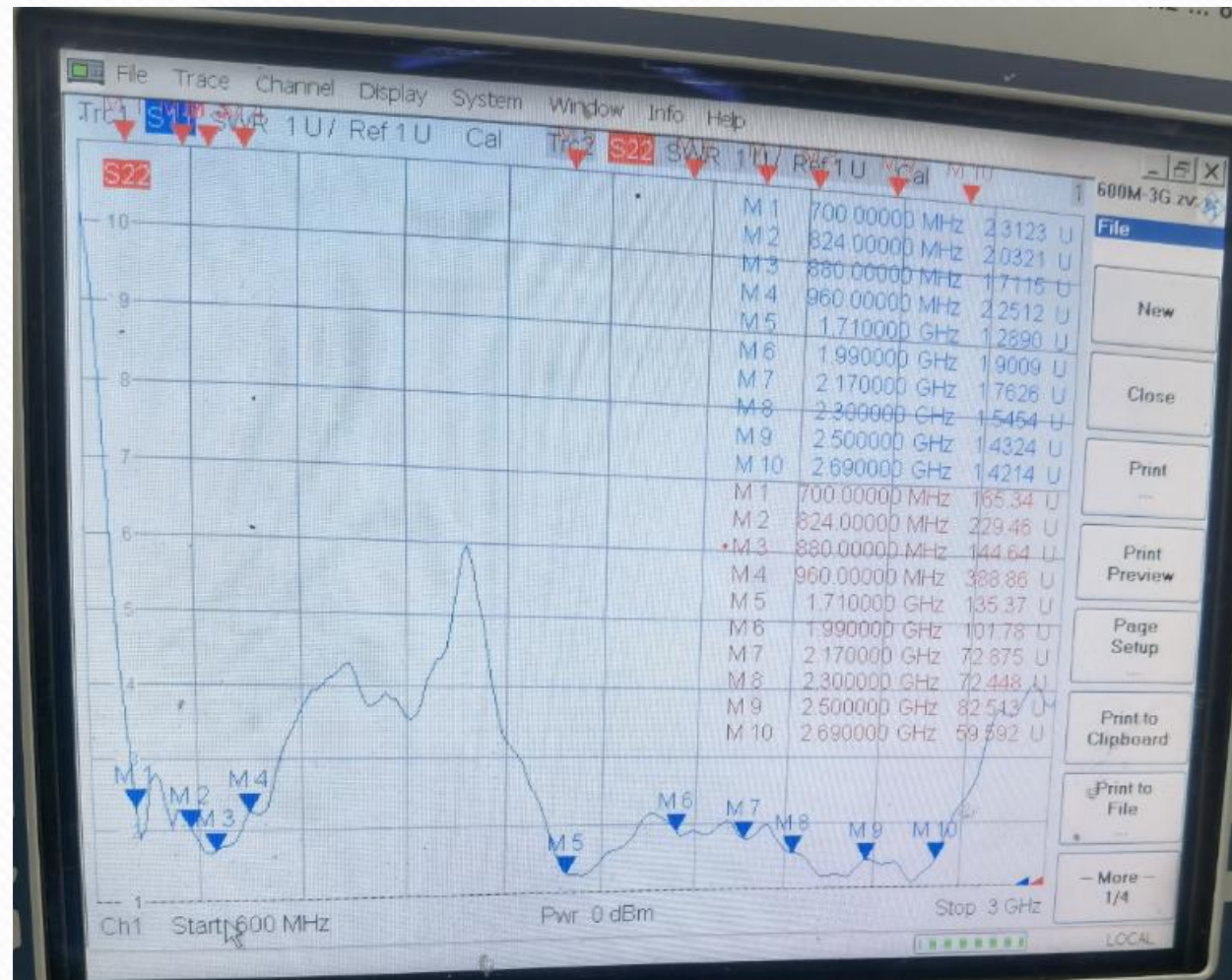
## Antenna ontology data



TX impedance:  $21.7\Omega + j0.47\Omega$



## S11-VSWR



# Main antenna efficiency and gain

| Frequency/Mhz | Efficiency / % | MaxGain/dBi | Frequency/Mhz | Efficiency / % | MaxGain/dBi | Frequency/Mhz | Efficiency / % | MaxGain/dBi |
|---------------|----------------|-------------|---------------|----------------|-------------|---------------|----------------|-------------|
| 700           | 24.21          | -1.24       | 1700          | 46.03          | 1.56        | 2240          | 48.75          | 0.52        |
| 710           | 27.93          | -0.08       | 1720          | 49.2           | 2.04        | 2260          | 49.55          | 0.51        |
| 720           | 29.85          | -0.34       | 1740          | 49.43          | 2.14        | 2280          | 48.98          | 0.5         |
| 730           | 34.36          | -0.61       | 1760          | 50.82          | 1.97        | 2300          | 49.66          | 1.23        |
| 740           | 33.81          | -1.65       | 1780          | 52.24          | 1.52        | 2320          | 49.09          | 0.88        |
| 750           | 33.65          | -1.57       | 1800          | 52.97          | 1.43        | 2340          | 49.09          | 0.63        |
| 760           | 36.06          | -0.76       | 1820          | 51.76          | 0.99        | 2360          | 50.58          | 0.94        |
| 770           | 40.83          | -0.32       | 1840          | 49.66          | 0.83        | 2380          | 51.52          | 1.68        |
| 780           | 40.64          | -0.46       | 1860          | 44.77          | 0.64        | 2400          | 53.83          | 2.12        |
| 790           | 40.18          | -0.61       | 1880          | 42.17          | 0.6         | 2420          | 53.95          | 1.74        |
| 800           | 40.27          | -0.02       | 1900          | 41.3           | 0.62        | 2440          | 51.52          | 1.3         |
| 810           | 41.02          | 0.18        | 1920          | 38.02          | -0.07       | 2460          | 50.35          | 1.39        |
| 820           | 41.69          | 0.31        | 1940          | 38.02          | 0.37        | 2480          | 48.53          | 2.01        |
| 830           | 42.07          | 0.38        | 1960          | 37.33          | 1.14        | 2500          | 48.19          | 2.5         |
| 840           | 43.85          | 0.73        | 1980          | 39.17          | 1.38        | 2520          | 47.75          | 2.28        |
| 850           | 42.46          | 0.76        | 2000          | 48.75          | 1.59        | 2540          | 46.34          | 1.71        |
| 860           | 41.69          | 0.62        | 2020          | 46.45          | -0.46       | 2560          | 44.26          | 1.08        |
| 870           | 38.73          | 0.53        | 2040          | 47.97          | 0.81        | 2580          | 45.6           | 1           |
| 880           | 36.06          | 0.03        | 2060          | 48.31          | 1.3         | 2600          | 41.98          | 1.22        |
| 890           | 34.91          | -0.17       | 2080          | 47.75          | 0.28        | 2620          | 38.82          | 0.77        |
| 900           | 35.24          | -0.64       | 2100          | 46.67          | -0.48       | 2640          | 36.56          | 0.22        |
| 910           | 36.39          | -0.3        | 2120          | 45.81          | -0.09       | 2660          | 36.81          | 0.05        |
| 920           | 35.65          | -0.38       | 2140          | 46.45          | -0.01       | 2680          | 34.43          | -0.89       |
| 930           | 37.84          | -0.12       | 2160          | 46.77          | 0.4         | 2700          | 30.55          | -1.38       |
| 940           | 36.31          | -0.37       | 2180          | 47.64          | 0.85        |               |                |             |
| 950           | 34.99          | -0.63       | 2200          | 49.55          | 0.52        |               |                |             |
| 960           | 33.11          | -0.89       | 2220          | 48.31          | 0.61        |               |                |             |

# Main antenna OTA test data

1#

| Measurement | Band     | Channel | Total-Bright screen | Total-Out of the screen | D-value | Measurement | Band          | Channel | Total-Bright screen | Total-Out of the screen | D-value |
|-------------|----------|---------|---------------------|-------------------------|---------|-------------|---------------|---------|---------------------|-------------------------|---------|
| TRP         | GSM850   | 128     | 26.65               |                         |         | TRP         | WCDMA_B8      | 2712    | 17.23               |                         |         |
| TRP         | GSM850   | 190     | 27                  |                         |         | TRP         | WCDMA_B8      | 2787    | 17.8                |                         |         |
| TRP         | GSM850   | 251     | 27.54               |                         |         | TRP         | WCDMA_B8      | 2863    | 17.86               |                         |         |
| TIS(RSSI)   | GSM850   | 251     | -104.96             | -104.16                 | 0.8     | TIS(RSSI)   | WCDMA_B8      | 3088    | -104.57             | -104.62                 | -0.05   |
| TRP         | GSM900   | 1       | 25.99               |                         |         | TRP         | FDD_B1(10MHz) | 18050   | 19.9                |                         |         |
| TRP         | GSM900   | 62      | 25.52               |                         |         | TRP         | FDD_B1(10MHz) | 18300   | 18.25               |                         |         |
| TRP         | GSM900   | 124     | 25.35               |                         |         | TRP         | FDD_B1(10MHz) | 18550   | 18.41               |                         |         |
| TIS(RSSI)   | GSM900   | 124     | -101.64             | -101.48                 | 0.16    | TIS(RSSI)   | FDD_B1(10MHz) | 550     | -93.45              | -93.89                  | -0.44   |
| TRP         | PCS1900  | 512     | 26.68               |                         |         | TRP         | FDD_B2(10MHz) | 18650   | 19.34               |                         |         |
| TRP         | PCS1900  | 661     | 27.62               |                         |         | TRP         | FDD_B2(10MHz) | 18900   | 19.37               |                         |         |
| TRP         | PCS1900  | 810     | 27.25               |                         |         | TRP         | FDD_B2(10MHz) | 19150   | 20                  |                         |         |
| TIS(RSSI)   | PCS1900  | 810     | -104.79             | -104.3                  | 0.49    | TIS(RSSI)   | FDD_B2(10MHz) | 1150    | -93.88              | -94.15                  | -0.27   |
| TRP         | WCDMA_B1 | 9612    | 20.02               |                         |         | TRP         | FDD_B3(10MHz) | 19250   | 18.44               |                         |         |
| TRP         | WCDMA_B1 | 9750    | 19.83               |                         |         | TRP         | FDD_B3(10MHz) | 19575   | 18.61               |                         |         |
| TRP         | WCDMA_B1 | 9888    | 19.91               |                         |         | TRP         | FDD_B3(10MHz) | 19900   | 19.71               |                         |         |
| TIS(RSSI)   | WCDMA_B1 | 10838   | -103.58             | -103.53                 | 0.05    | TIS(RSSI)   | FDD_B3(10MHz) | 1900    | -96.89              | -97.17                  | -0.28   |
| TRP         | WCDMA_B2 | 9262    | 19.77               |                         |         | TRP         | FDD_B4(10MHz) | 20000   | 18.7                |                         |         |
| TRP         | WCDMA_B2 | 9400    | 19.38               |                         |         | TRP         | FDD_B4(10MHz) | 20175   | 18.57               |                         |         |
| TRP         | WCDMA_B2 | 9538    | 19.71               |                         |         | TRP         | FDD_B4(10MHz) | 20350   | 18.12               |                         |         |
| TIS(RSSI)   | WCDMA_B2 | 9938    | -103.14             | -103.2                  | -0.06   | TIS(RSSI)   | FDD_B4(10MHz) | 2350    | -91.58              | -91.56                  | 0.02    |
| TRP         | WCDMA_B5 | 4132    | 15.58               |                         |         | TRP         | FDD_B5(10MHz) | 20450   | 15.66               |                         |         |
| TRP         | WCDMA_B5 | 4183    | 15.52               |                         |         | TRP         | FDD_B5(10MHz) | 20525   | 15.61               |                         |         |
| TRP         | WCDMA_B5 | 4233    | 15.62               |                         |         | TRP         | FDD_B5(10MHz) | 20600   | 15.41               |                         |         |
| TIS(RSSI)   | WCDMA_B5 | 4458    | -104.16             | -104.5                  | -0.34   | TIS(RSSI)   | FDD_B5(10MHz) | 2600    | -93.44              | -93.2                   | 0.24    |

# Main antenna OTA test data

1#

| Measurement | Band           | Channel | Total-Bright screen | Total-Out of the screen | D-value | Measurement | Band           | Channel | Total-Bright screen | Total-Out of the screen | D-value |
|-------------|----------------|---------|---------------------|-------------------------|---------|-------------|----------------|---------|---------------------|-------------------------|---------|
| TRP         | FDD_B7(10MHz)  | 20800   | 19.72               |                         |         | TRP         | FDD_B26(10MHz) | 26740   | 15.8                |                         |         |
| TRP         | FDD_B7(10MHz)  | 21100   | 19.95               |                         |         | TRP         | FDD_B26(10MHz) | 26865   | 15.45               |                         |         |
| TRP         | FDD_B7(10MHz)  | 21400   | 20.19               |                         |         | TRP         | FDD_B26(10MHz) | 26990   | 15.33               |                         |         |
| TIS(RSSI)   | FDD_B7(10MHz)  | 3400    | -93.19              | -94.28                  | -1.09   | TIS(RSSI)   | FDD_B26(10MHz) | 8990    | -92.73              | -92.91                  | -0.18   |
| TRP         | FDD_B8(10MHz)  | 21500   | 17.89               |                         |         | TRP         | FDD_B66(10MHz) | 132022  | 18.66               |                         |         |
| TRP         | FDD_B8(10MHz)  | 21625   | 17.25               |                         |         | TRP         | FDD_B66(10MHz) | 132322  | 18.75               |                         |         |
| TRP         | FDD_B8(10MHz)  | 21750   | 17.17               |                         |         | TRP         | FDD_B66(10MHz) | 132622  | 19.58               |                         |         |
| TIS(RSSI)   | FDD_B8(10MHz)  | 3750    | -89.56              | -88.03                  | 1.53    | TIS(RSSI)   | FDD_B66(10MHz) | 67036   | -92.1               | -92.02                  | 0.09    |
| TRP         | FDD_B12(10MHz) | 23060   | 19.22               |                         |         | TRP         | TDD_B38(20MHz) | 37850   | 16.86               |                         |         |
| TRP         | FDD_B12(10MHz) | 23095   | 20.17               |                         |         | TRP         | TDD_B38(20MHz) | 38000   | 14.98               |                         |         |
| TRP         | FDD_B12(10MHz) | 23130   | 19.55               |                         |         | TRP         | TDD_B38(20MHz) | 38150   | 14.04               |                         |         |
| TIS(RSSI)   | FDD_B12(10MHz) | 5130    | -91.69              | -92                     | -0.31   | TIS(RSSI)   | TDD_B38(20MHz) | 38150   | -88.98              | -89.15                  | -1.3    |
| TRP         | FDD_B14(10MHz) | 23330   | 17.25               |                         |         | TRP         | TDD_B40(20MHz) | 38750   | 20.83               |                         |         |
| TIS(RSSI)   | FDD_B14(10MHz) | 5330    | -90.43              | -91.56                  | -1.13   | TRP         | TDD_B40(20MHz) | 39150   | 20.7                |                         |         |
| TRP         | FDD_B17(10MHz) | 23780   | 18.49               |                         |         | TRP         | TDD_B40(20MHz) | 39550   | 20.77               |                         |         |
| TRP         | FDD_B17(10MHz) | 23790   | 19                  |                         |         | TIS(RSSI)   | TDD_B40(20MHz) | 39550   | -94.12              | -95.42                  | -0.17   |
| TRP         | FDD_B17(10MHz) | 23800   | 18.64               |                         |         | TRP         | TDD_B41(20MHz) | 40340   | 19.11               |                         |         |
| TIS(RSSI)   | FDD_B17(10MHz) | 5800    | -91.59              | -92.91                  | -1.32   | TRP         | TDD_B41(20MHz) | 40620   | 15.26               |                         |         |
| TRP         | FDD_B25(10MHz) | 26090   | 19.38               |                         |         | TRP         | TDD_B41(20MHz) | 41140   | 19.52               |                         |         |
| TRP         | FDD_B25(10MHz) | 26365   | 18.85               |                         |         | TIS(RSSI)   | TDD_B41(20MHz) | 41140   | -91.28              | -91.19                  | 0.08    |
| TRP         | FDD_B25(10MHz) | 26640   | 20.8                |                         |         |             |                |         |                     |                         |         |
| TIS(RSSI)   | FDD_B25(10MHz) | 8640    | -92.14              | -93.42                  | -1.28   |             |                |         |                     |                         |         |

# Main antenna OTA test data

2#

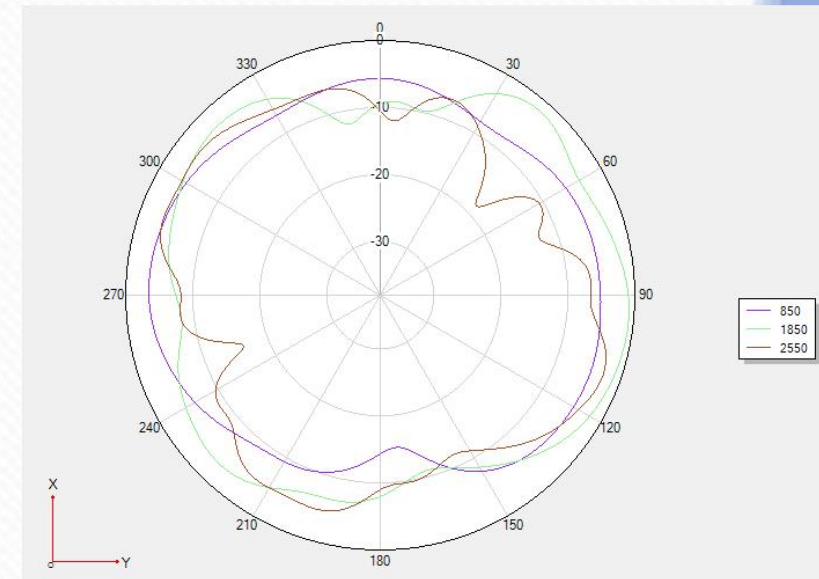
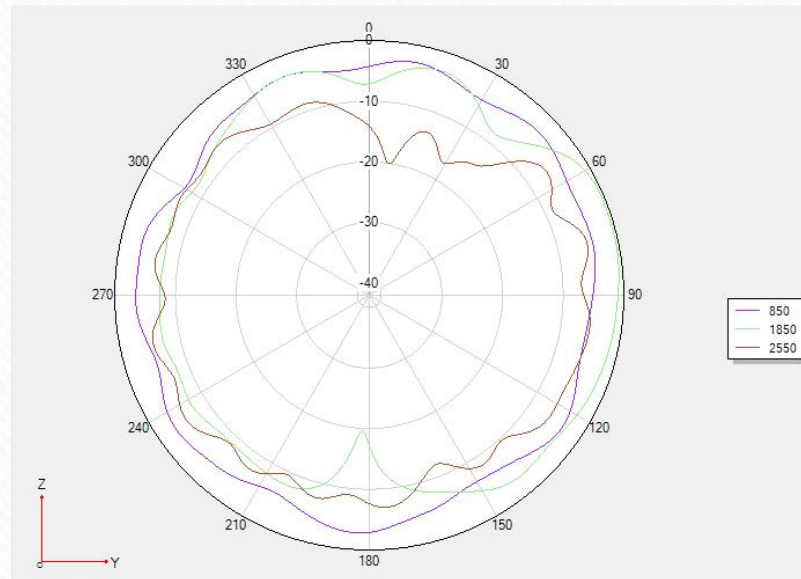
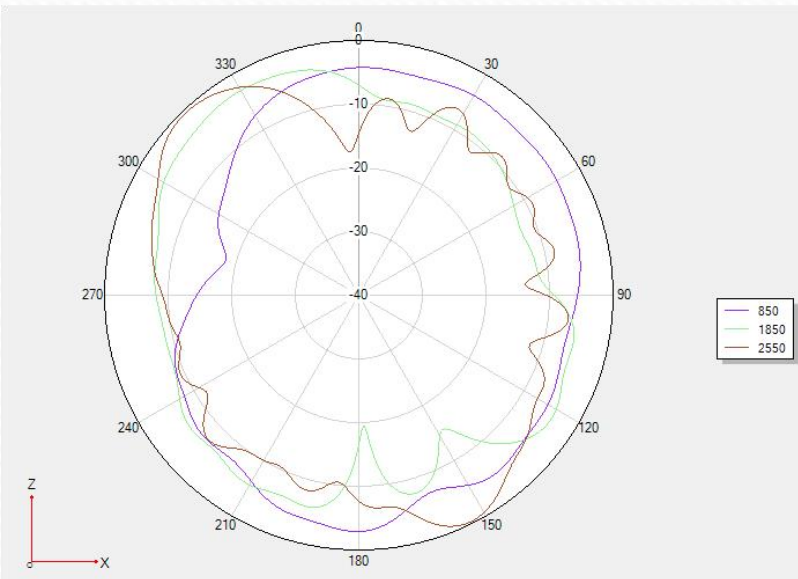
| Measurement | Band     | Channel | Total-Bright<br>screen | Total-Out of<br>the screen | D-value | Measurement | Band          | Channel | Total-Bright<br>screen | Total-Out of<br>the screen | D-value |
|-------------|----------|---------|------------------------|----------------------------|---------|-------------|---------------|---------|------------------------|----------------------------|---------|
| TRP         | GSM850   | 128     | 26.81                  |                            |         | TRP         | WCDMA_B8      | 2712    | 17.29                  |                            |         |
| TRP         | GSM850   | 190     | 27.03                  |                            |         | TRP         | WCDMA_B8      | 2787    | 17.73                  |                            |         |
| TRP         | GSM850   | 251     | 27.48                  |                            |         | TRP         | WCDMA_B8      | 2863    | 17.76                  |                            |         |
| TIS(RSSI)   | GSM850   | 251     | -104.8                 | -105.08                    | -0.28   | TIS(RSSI)   | WCDMA_B8      | 3088    | -104.02                | -103.11                    | 0.91    |
| TRP         | GSM900   | 1       | 25.81                  |                            |         | TRP         | FDD_B1(10MHz) | 18050   | 19.47                  |                            |         |
| TRP         | GSM900   | 62      | 25.25                  |                            |         | TRP         | FDD_B1(10MHz) | 18300   | 18.45                  |                            |         |
| TRP         | GSM900   | 124     | 24.97                  |                            |         | TRP         | FDD_B1(10MHz) | 18550   | 18.33                  |                            |         |
| TIS(RSSI)   | GSM900   | 124     | -101.22                | -100.42                    | 0.8     | TIS(RSSI)   | FDD_B1(10MHz) | 550     | -94.14                 | -94.75                     | -0.61   |
| TRP         | PCS1900  | 512     | 26.03                  |                            |         | TRP         | FDD_B2(10MHz) | 18650   | 20.23                  |                            |         |
| TRP         | PCS1900  | 661     | 27.06                  |                            |         | TRP         | FDD_B2(10MHz) | 18900   | 19.81                  |                            |         |
| TRP         | PCS1900  | 810     | 27.8                   |                            |         | TRP         | FDD_B2(10MHz) | 19150   | 20.85                  |                            |         |
| TIS(RSSI)   | PCS1900  | 810     | -106.89                | -107.47                    | -0.58   | TIS(RSSI)   | FDD_B2(10MHz) | 1150    | -97.85                 | -95.76                     | 2.09    |
| TRP         | WCDMA_B1 | 9612    | 20.74                  |                            |         | TRP         | FDD_B3(10MHz) | 19250   | 18.78                  |                            |         |
| TRP         | WCDMA_B1 | 9750    | 20.07                  |                            |         | TRP         | FDD_B3(10MHz) | 19575   | 18.74                  |                            |         |
| TRP         | WCDMA_B1 | 9888    | 19.86                  |                            |         | TRP         | FDD_B3(10MHz) | 19900   | 19.6                   |                            |         |
| TIS(RSSI)   | WCDMA_B1 | 10838   | -107.57                | -107.7                     | -0.13   | TIS(RSSI)   | FDD_B3(10MHz) | 1900    | -97.93                 | -98.91                     | -0.98   |
| TRP         | WCDMA_B2 | 9262    | 19.58                  |                            |         | TRP         | FDD_B4(10MHz) | 20000   | 18.66                  |                            |         |
| TRP         | WCDMA_B2 | 9400    | 18.86                  |                            |         | TRP         | FDD_B4(10MHz) | 20175   | 18.29                  |                            |         |
| TRP         | WCDMA_B2 | 9538    | 19.45                  |                            |         | TRP         | FDD_B4(10MHz) | 20350   | 18.58                  |                            |         |
| TIS(RSSI)   | WCDMA_B2 | 9938    | -107.75                | -107.83                    | -0.08   | TIS(RSSI)   | FDD_B4(10MHz) | 2350    | -93.19                 | -92.76                     | 0.43    |
| TRP         | WCDMA_B5 | 4132    | 15.64                  |                            |         | TRP         | FDD_B5(10MHz) | 20450   | 15.73                  |                            |         |
| TRP         | WCDMA_B5 | 4183    | 15.58                  |                            |         | TRP         | FDD_B5(10MHz) | 20525   | 15.54                  |                            |         |
| TRP         | WCDMA_B5 | 4233    | 15.73                  |                            |         | TRP         | FDD_B5(10MHz) | 20600   | 15.53                  |                            |         |
| TIS(RSSI)   | WCDMA_B5 | 4458    | -103.72                | -104.31                    | -0.59   | TIS(RSSI)   | FDD_B5(10MHz) | 2600    | -93.36                 | -92.71                     | 0.65    |

# Main antenna OTA test data

2#

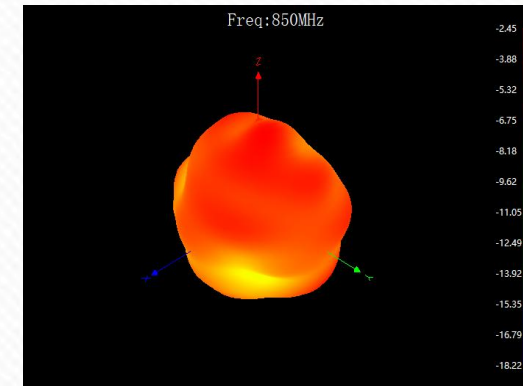
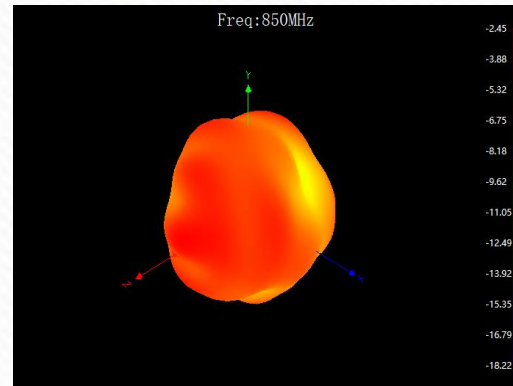
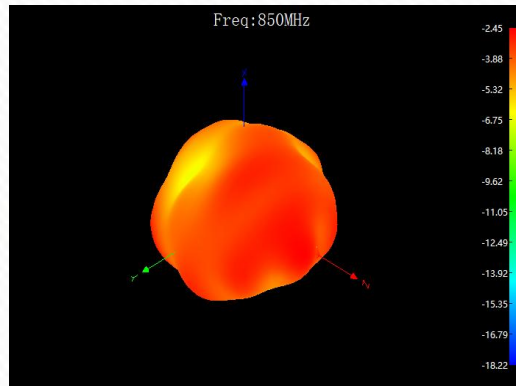
| Measurement | Band           | Channel | Total-Bright screen | Total-Out of the screen | D-value | Measurement | Band           | Channel | Total-Bright screen | Total-Out of the screen | D-value |
|-------------|----------------|---------|---------------------|-------------------------|---------|-------------|----------------|---------|---------------------|-------------------------|---------|
| TRP         | FDD_B7(10MHz)  | 20800   | 20.41               |                         |         | TRP         | FDD_B26(10MHz) | 26740   | 15.96               |                         |         |
| TRP         | FDD_B7(10MHz)  | 21100   | 20.51               |                         |         | TRP         | FDD_B26(10MHz) | 26865   | 15.57               |                         |         |
| TRP         | FDD_B7(10MHz)  | 21400   | 20.61               |                         |         | TRP         | FDD_B26(10MHz) | 26990   | 15.5                |                         |         |
| TIS(RSSI)   | FDD_B7(10MHz)  | 3400    | -93.51              | -93.85                  | -0.34   | TIS(RSSI)   | FDD_B26(10MHz) | 8990    | -92.44              | -92.28                  | 0.16    |
| TRP         | FDD_B8(10MHz)  | 21500   | 17.9                |                         |         | TRP         | FDD_B66(10MHz) | 132022  | 18.77               |                         |         |
| TRP         | FDD_B8(10MHz)  | 21625   | 17.14               |                         |         | TRP         | FDD_B66(10MHz) | 132322  | 18.48               |                         |         |
| TRP         | FDD_B8(10MHz)  | 21750   | 16.96               |                         |         | TRP         | FDD_B66(10MHz) | 132622  | 18.53               |                         |         |
| TIS(RSSI)   | FDD_B8(10MHz)  | 3750    | -88.98              | -89.73                  | -0.75   | TIS(RSSI)   | FDD_B66(10MHz) | 67036   | -93.03              | -93.87                  | -0.84   |
| TRP         | FDD_B12(10MHz) | 23060   | 20.15               |                         |         | TRP         | TDD_B38(20MHz) | 37850   | 16.82               |                         |         |
| TRP         | FDD_B12(10MHz) | 23095   | 20.63               |                         |         | TRP         | TDD_B38(20MHz) | 38000   | 15.21               |                         |         |
| TRP         | FDD_B12(10MHz) | 23130   | 20.38               |                         |         | TRP         | TDD_B38(20MHz) | 38150   | 15.18               |                         |         |
| TIS(RSSI)   | FDD_B12(10MHz) | 5130    | -93.69              | -94.03                  | -0.34   | TIS(RSSI)   | TDD_B38(20MHz) | 38150   | -88.7               | -88.95                  | -0.25   |
| TRP         | FDD_B14(10MHz) | 23330   | 17.54               |                         |         | TRP         | TDD_B40(20MHz) | 38750   | 20.74               |                         |         |
| TIS(RSSI)   | FDD_B14(10MHz) | 5330    | -91.8               | -92.19                  | -0.39   | TRP         | TDD_B40(20MHz) | 39150   | 20.87               |                         |         |
| TRP         | FDD_B17(10MHz) | 23780   | 18.93               |                         |         | TRP         | TDD_B40(20MHz) | 39550   | 20.35               |                         |         |
| TRP         | FDD_B17(10MHz) | 23790   | 19.71               |                         |         | TIS(RSSI)   | TDD_B40(20MHz) | 39550   | -94.24              | -95.18                  | -0.94   |
| TRP         | FDD_B17(10MHz) | 23800   | 19.47               |                         |         | TRP         | TDD_B41(20MHz) | 40340   | 19.17               |                         |         |
| TIS(RSSI)   | FDD_B17(10MHz) | 5800    | -92.15              | -93.41                  | -1.26   | TRP         | TDD_B41(20MHz) | 40620   | 15.31               |                         |         |
| TRP         | FDD_B25(10MHz) | 26090   | 19.8                |                         |         | TRP         | TDD_B41(20MHz) | 41140   | 20.97               |                         |         |
| TRP         | FDD_B25(10MHz) | 26365   | 19.74               |                         |         | TIS(RSSI)   | TDD_B41(20MHz) | 41140   | -91.87              | -90.42                  | 1.45    |
| TRP         | FDD_B25(10MHz) | 26640   | 20                  |                         |         |             |                |         |                     |                         |         |
| TIS(RSSI)   | FDD_B25(10MHz) | 8640    | -92.48              | -93.08                  | -0.6    |             |                |         |                     |                         |         |

# Main antenna Directional pattern

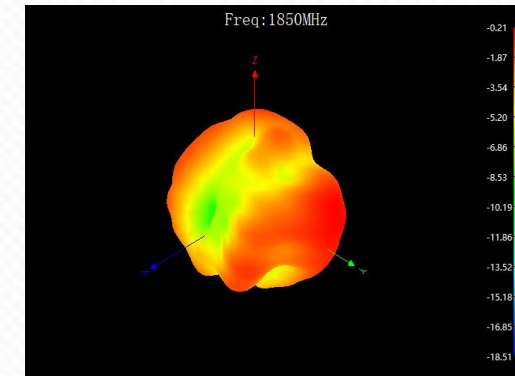
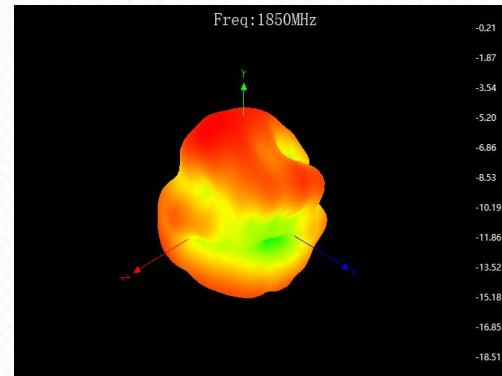
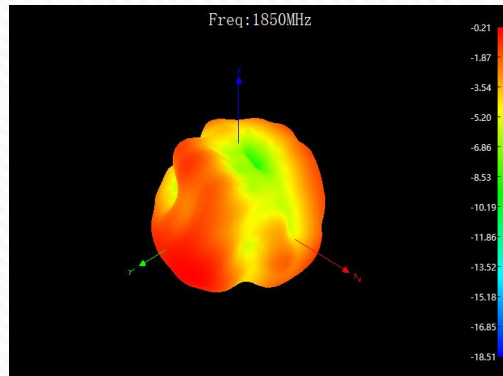


# Main antenna Directional pattern

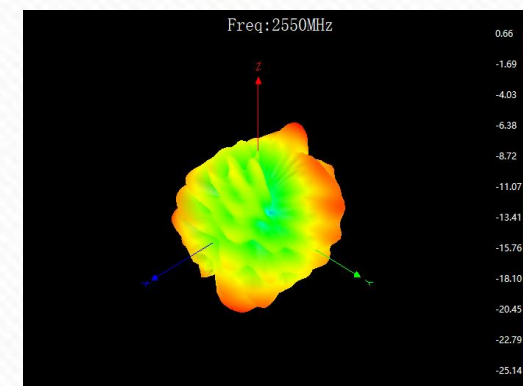
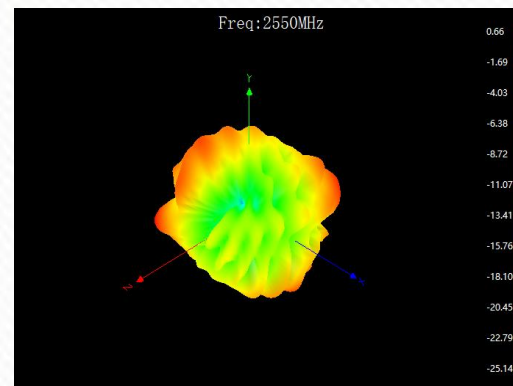
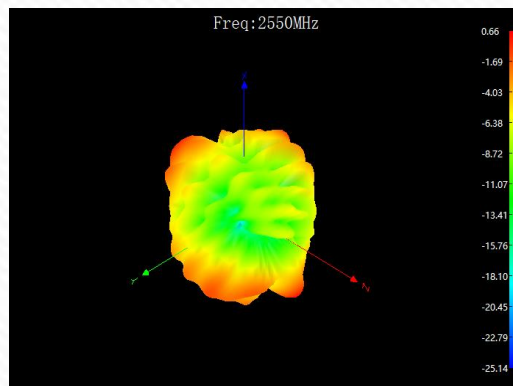
850Mhz



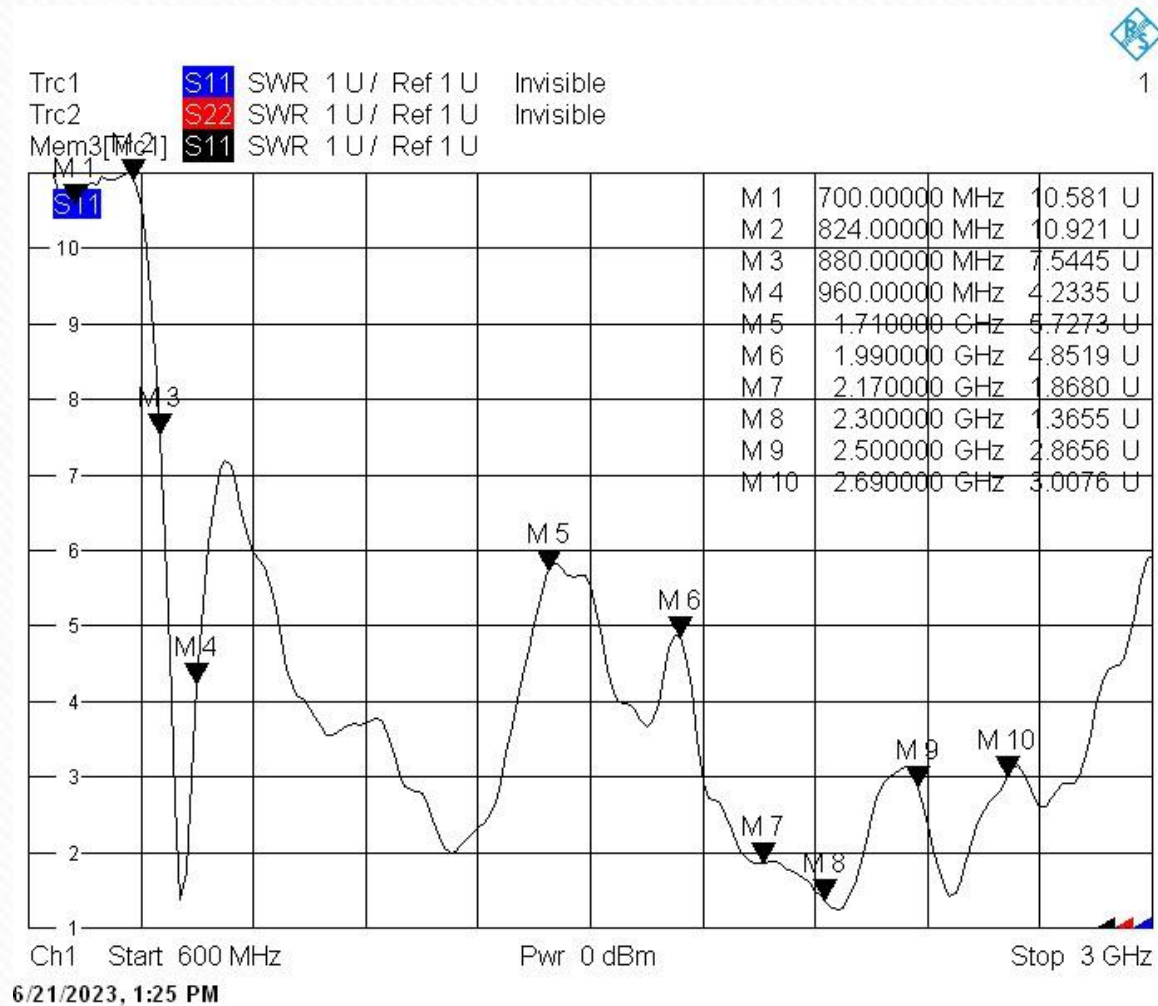
1850MHz



2550MHz

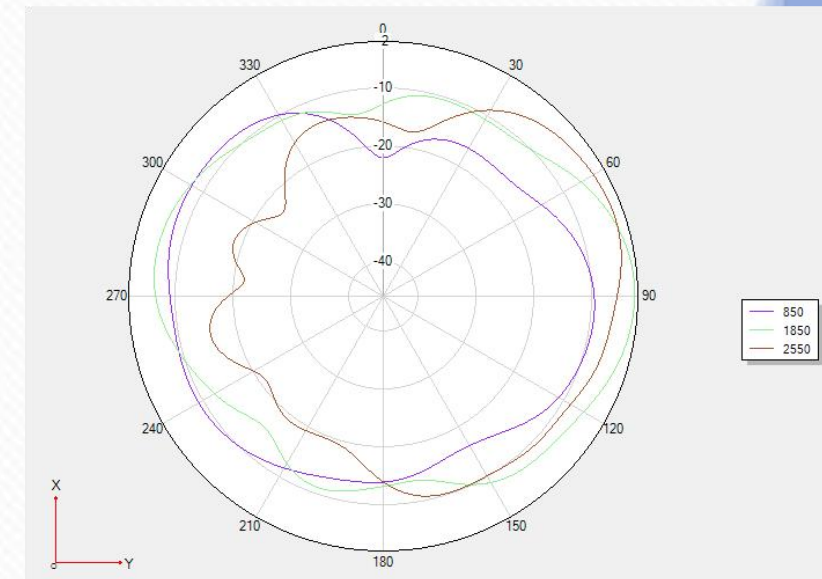
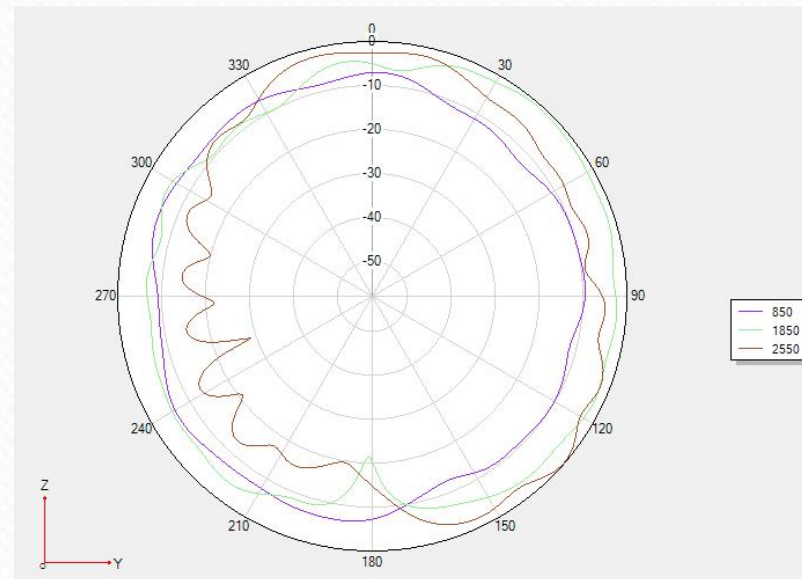
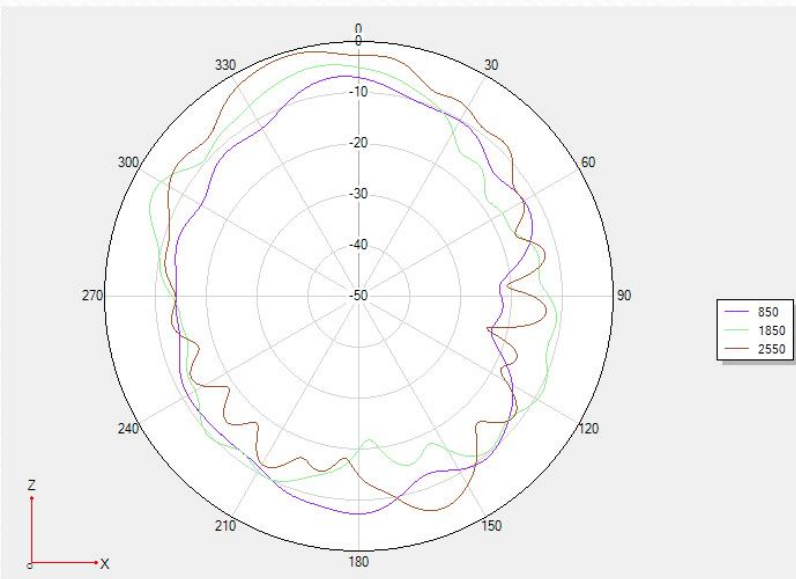


## S11-VSWR



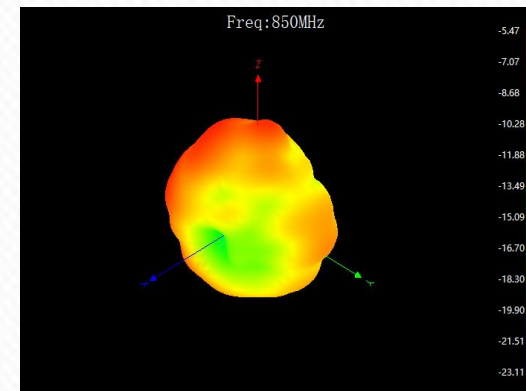
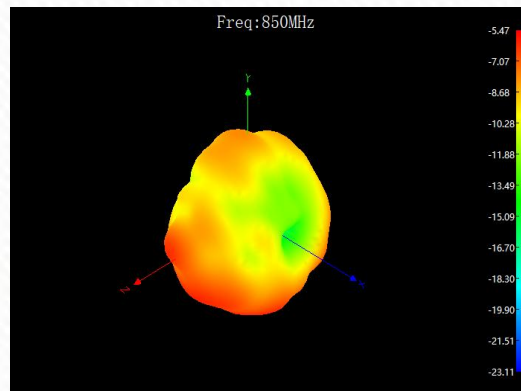
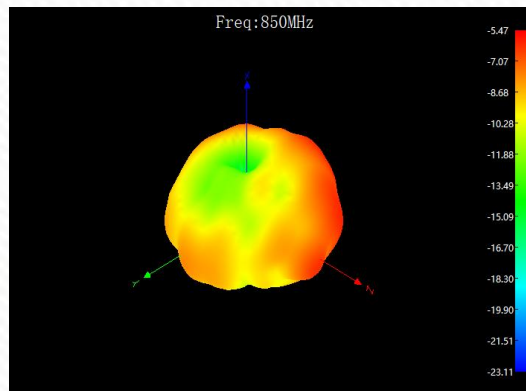
# Diversity antenna efficiency and gain

| Frequency/Mhz | Efficiency / % | MaxGain/dBi | Frequency/Mhz | Efficiency / % | MaxGain/dBi | Frequency/Mhz | Efficiency / % | MaxGain/dBi |
|---------------|----------------|-------------|---------------|----------------|-------------|---------------|----------------|-------------|
| 700           | 0.06           | -22.49      | 1710          | 10.52          | -3.22       | 2220          | 22.86          | 0.18        |
| 720           | 0.06           | -22.37      | 1740          | 8.2            | -5.19       | 2250          | 25.94          | 0.36        |
| 740           | 0.07           | -22.95      | 1770          | 7.01           | -6.77       | 2280          | 28.31          | 0.83        |
| 760           | 0.13           | -21.21      | 1800          | 5.62           | -6.62       | 2310          | 28.12          | 0.94        |
| 780           | 0.23           | -20.06      | 1830          | 5.45           | -5.93       | 2340          | 28.05          | 1.23        |
| 800           | 0.35           | -19.81      | 1860          | 6.08           | -4.49       | 2370          | 24.55          | 0.63        |
| 820           | 0.56           | -17.33      | 1890          | 6.81           | -4.22       | 2400          | 19.82          | -0.9        |
| 840           | 0.93           | -15.13      | 1920          | 7.18           | -5.04       | 2430          | 16.6           | -1.53       |
| 860           | 1.75           | -12.17      | 1950          | 6.76           | -6.37       | 2460          | 15.49          | -0.56       |
| 880           | 3.37           | -9.31       | 1980          | 6.46           | -7.04       | 2490          | 19.1           | 1.77        |
| 900           | 7.82           | -5.65       | 2010          | 6.07           | -6.55       | 2520          | 22.8           | 2.93        |
| 920           | 16.11          | -1.92       | 2040          | 14.19          | -2.81       | 2550          | 27.48          | 4.48        |
| 940           | 14.49          | -1.42       | 2070          | 20.32          | -1.03       | 2580          | 29.17          | 5.23        |
| 960           | 8.17           | -4.2        | 2100          | 20.75          | -0.28       | 2610          | 26.3           | 4.94        |
|               |                |             | 2130          | 20.42          | -0.35       | 2640          | 22.13          | 4.48        |
|               |                |             | 2160          | 20             | -0.68       | 2670          | 19.68          | 3.97        |
|               |                |             | 2190          | 20.61          | -0.41       |               |                |             |

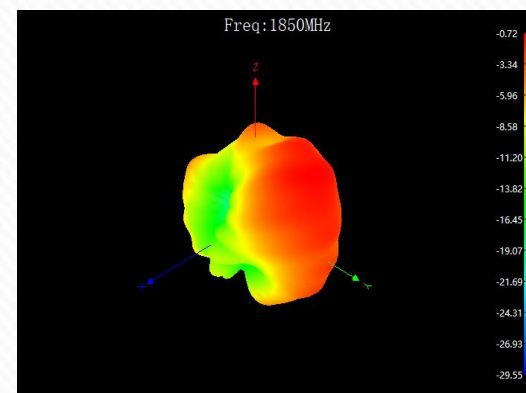
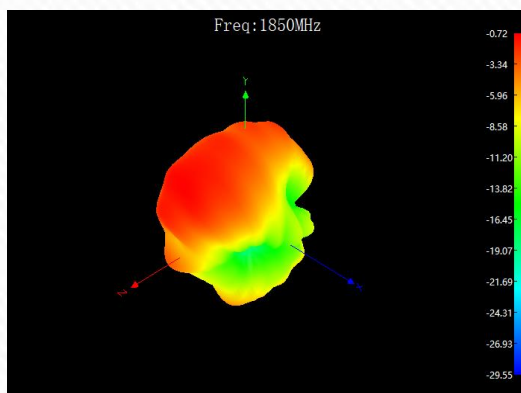
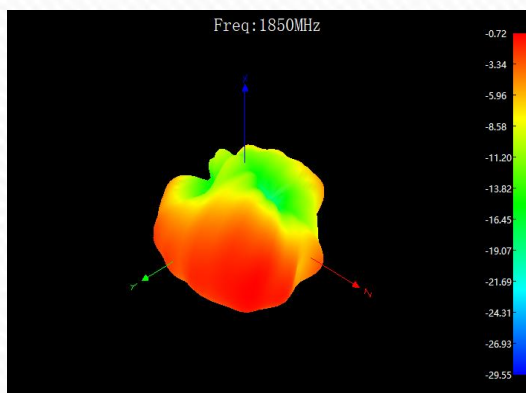


# Directional pattern Directional pattern

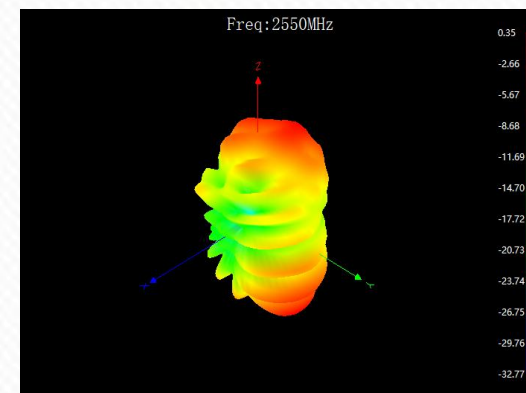
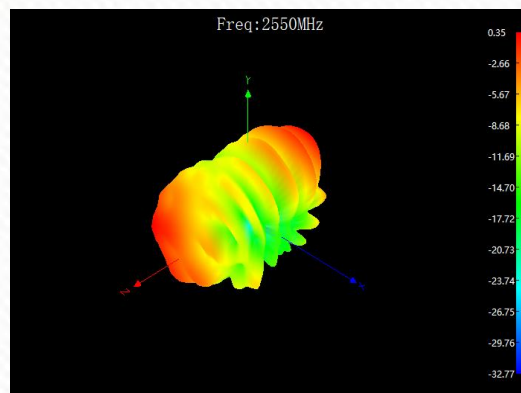
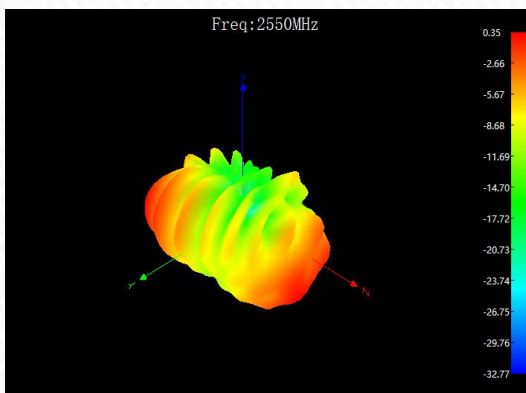
850Mhz



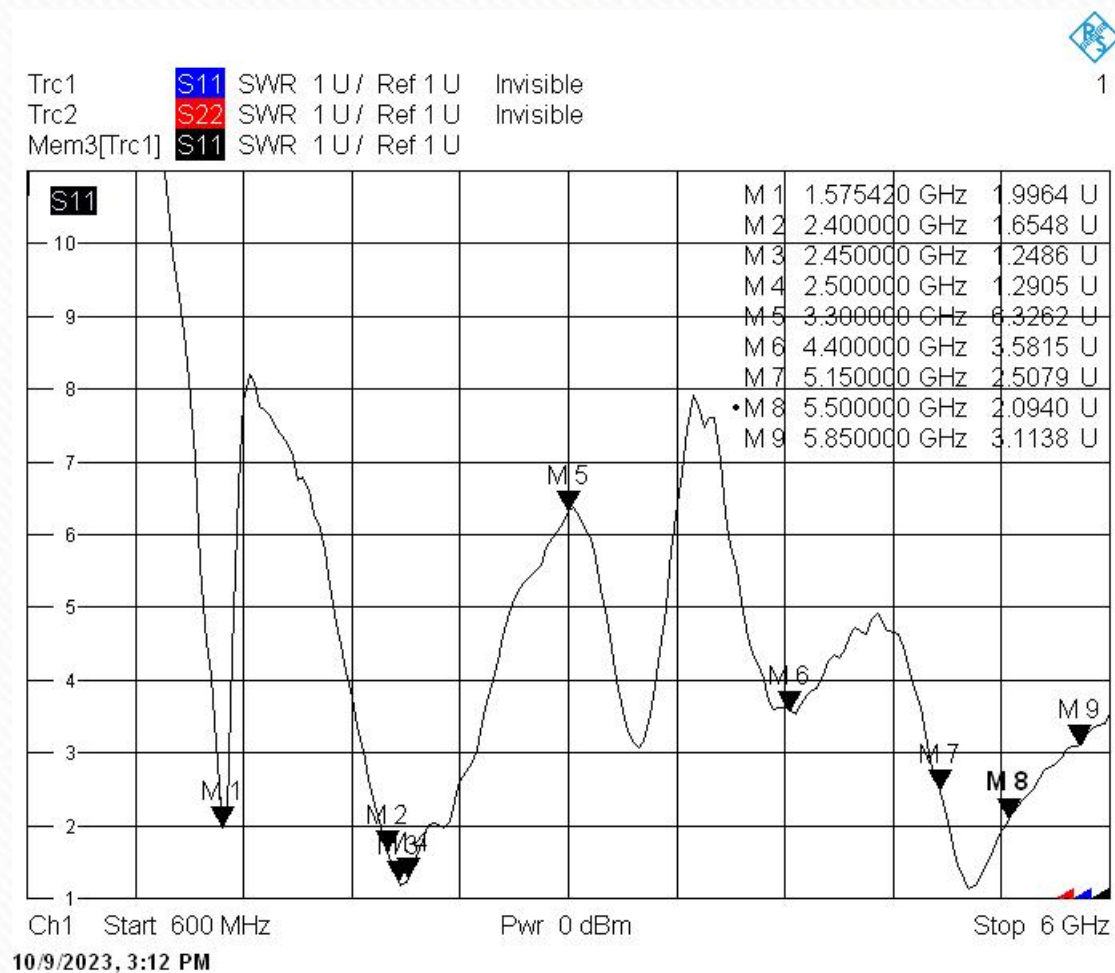
1850MHz



2550MHz



## S11-VSWR



# Three-in-one antenna efficiency and gain

| Frequency/Mhz | Efficiency / % | MaxGain/dBi | Frequency/Mhz | Efficiency / % | MaxGain/dBi |
|---------------|----------------|-------------|---------------|----------------|-------------|
| 1550          | 38.28          | 0.28        | 5150          | 36.9           | 2.14        |
| 1555          | 39.08          | 0.78        | 5200          | 40.46          | 3.14        |
| 1560          | 39.63          | 1.29        | 5250          | 44.87          | 4.3         |
| 1565          | 39.81          | 1.42        | 5300          | 47.53          | 4.47        |
| 1570          | 40.18          | 1.4         | 5350          | 48.42          | 4.35        |
| 1575          | 39.08          | 1.02        | 5400          | 48.08          | 3.8         |
| 1580          | 38.28          | 0.81        | 5450          | 45.39          | 3.18        |
| 1585          | 36.48          | 0.46        | 5500          | 43.25          | 2.75        |
| 1590          | 34.91          | 0.03        | 5550          | 38.55          | 2.22        |
| 2400          | 46.53          | 2.63        | 5600          | 34.36          | 2.02        |
| 2410          | 46.68          | 2.18        | 5650          | 31.26          | 2.73        |
| 2420          | 48.08          | 2.88        | 5700          | 28.97          | 2.22        |
| 2430          | 49.18          | 2.67        | 5750          | 26.85          | 2.23        |
| 2440          | 50.31          | 2.92        | 5800          | 24.1           | 1.93        |
| 2450          | 50.63          | 3.15        | 5850          | 20.75          | 1.19        |
| 2460          | 49.5           | 2.64        |               |                |             |
| 2470          | 49.18          | 2.83        |               |                |             |
| 2480          | 47.61          | 2.72        |               |                |             |
| 2490          | 47.92          | 2.87        |               |                |             |
| 2500          | 48.55          | 3.36        |               |                |             |

# WIFI antenna OTA data

1#

|             |                      |         | Total-Bright<br>screen | Total-Out of<br>the screen | D-value |                 |                    |         | Total-Bright<br>screen | Total-Out of<br>the screen | D-value |
|-------------|----------------------|---------|------------------------|----------------------------|---------|-----------------|--------------------|---------|------------------------|----------------------------|---------|
| Measurement | Band                 | Channel | Total                  | Total                      |         | Measureme<br>nt | Band               | Channel | Total                  | Total                      |         |
| TRP         | WIFI_B (1M)          | 1       | 14.46                  |                            |         | TRP             | WIFI_A (6M)        | 36      | 9.26                   |                            |         |
| TRP         | WIFI_B (1M)          | 7       | 14.18                  |                            |         | TRP             | WIFI_A (6M)        | 149     | 11.45                  |                            |         |
| TRP         | WIFI_B (1M)          | 13      | 14.47                  |                            |         | TRP             | WIFI_A (6M)        | 165     | 9.56                   |                            |         |
| TIS(EIRP)   | WIFI_B (11M)         | 13      | -86.38                 | -86.23                     | 0.15    | TIS(EIRP)       | WIFI_A (54M)       | 165     | -73.6                  | -73.12                     | 0.48    |
| TRP         | WIFI_G (6M)          | 1       | 14.31                  |                            |         | TRP             | WIFI_N_UNII (6.5M) | 36      | 7.4                    |                            |         |
| TRP         | WIFI_G (6M)          | 7       | 13.96                  |                            |         | TRP             | WIFI_N_UNII (6.5M) | 149     | 9.87                   |                            |         |
| TRP         | WIFI_G (6M)          | 13      | 14.18                  |                            |         | TRP             | WIFI_N_UNII (6.5M) | 165     | 8.55                   |                            |         |
| TIS(EIRP)   | WIFI_G (54M)         | 13      | -72.42                 | -72.86                     | -0.44   | TIS(EIRP)       | WIFI_N_UNII (65M)  | 165     | -69.46                 | -69.75                     | -0.29   |
| TRP         | WIFI_N_ISM<br>(6.5M) | 1       | 13.27                  |                            |         |                 |                    |         |                        |                            |         |
| TRP         | WIFI_N_ISM<br>(6.5M) | 7       | 11.58                  |                            |         |                 |                    |         |                        |                            |         |
| TRP         | WIFI_N_ISM<br>(6.5M) | 13      | 12.33                  |                            |         |                 |                    |         |                        |                            |         |
| TIS(EIRP)   | WIFI_N_ISM<br>(65M)  | 13      | -68.1                  | -68.53                     | -0.43   |                 |                    |         |                        |                            |         |

# WIFI antenna OTA data

2#

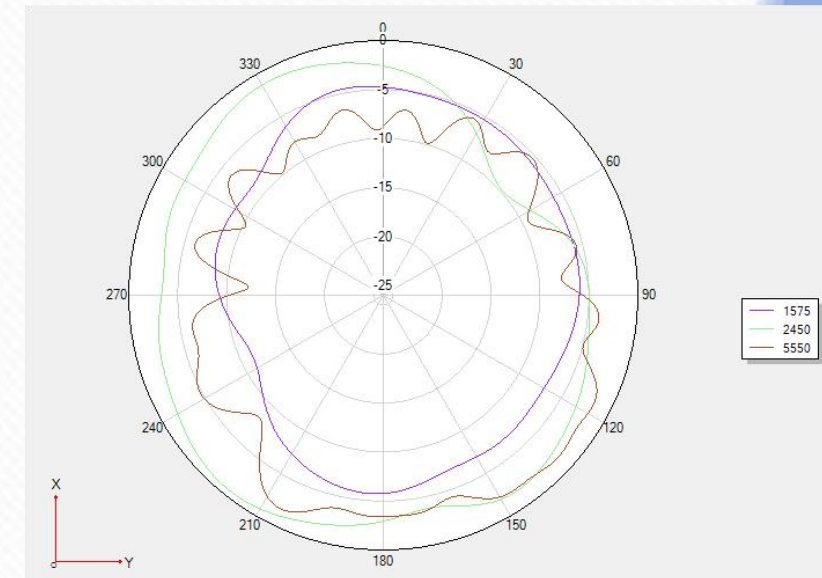
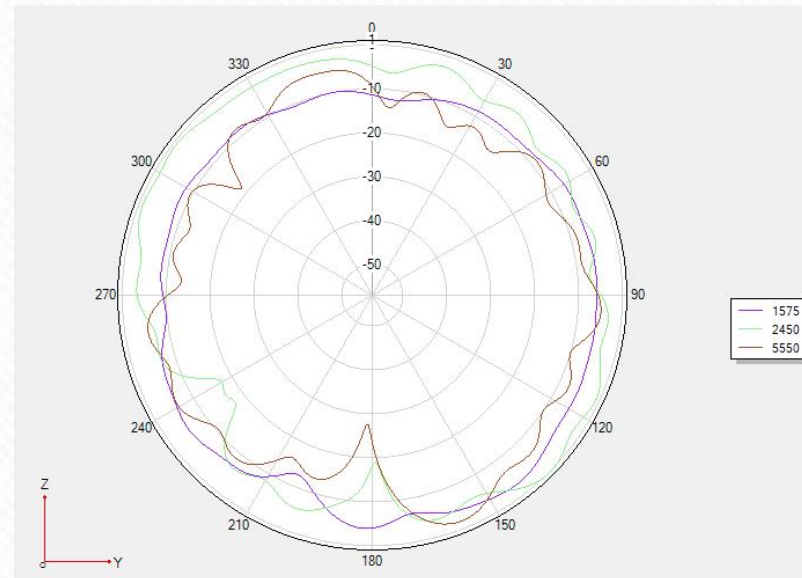
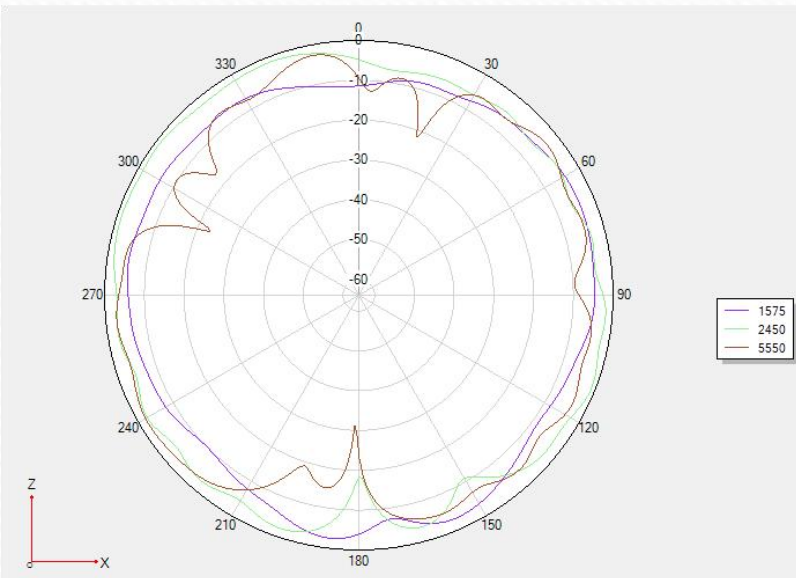
|             |                      |         | Total-Bright<br>screen | Total-Out of<br>the screen | D-value |             |                    |         | Total-Bright<br>screen | Total-Out of<br>the screen | D-value |
|-------------|----------------------|---------|------------------------|----------------------------|---------|-------------|--------------------|---------|------------------------|----------------------------|---------|
| Measurement | Band                 | Channel | Total                  | Total                      |         | Measurement | Band               | Channel | Total                  | Total                      |         |
| TRP         | WIFI_B (1M)          | 1       | 14.28                  |                            |         | TRP         | WIFI_A (6M)        | 36      | 10.09                  |                            |         |
| TRP         | WIFI_B (1M)          | 7       | 13.74                  |                            |         | TRP         | WIFI_A (6M)        | 149     | 11.59                  |                            |         |
| TRP         | WIFI_B (1M)          | 13      | 14.51                  |                            |         | TRP         | WIFI_A (6M)        | 165     | 10.9                   |                            |         |
| TIS(EIRP)   | WIFI_B (11M)         | 13      | -86.57                 | -86.5                      | 0.07    | TIS(EIRP)   | WIFI_A (54M)       | 165     | -74.05                 | -74.35                     | -0.3    |
| TRP         | WIFI_G (6M)          | 1       | 14.52                  |                            |         | TRP         | WIFI_N_UNII (6.5M) | 36      | 7.12                   |                            |         |
| TRP         | WIFI_G (6M)          | 7       | 14.04                  |                            |         | TRP         | WIFI_N_UNII (6.5M) | 149     | 10.08                  |                            |         |
| TRP         | WIFI_G (6M)          | 13      | 14.69                  |                            |         | TRP         | WIFI_N_UNII (6.5M) | 165     | 8.91                   |                            |         |
| TIS(EIRP)   | WIFI_G (54M)         | 13      | -72.57                 | -72.4                      | 0.17    | TIS(EIRP)   | WIFI_N_UNII (65M)  | 165     | -70.04                 | -69.06                     | 0.98    |
| TRP         | WIFI_N_ISM<br>(6.5M) | 1       | 13.45                  |                            |         |             |                    |         |                        |                            |         |
| TRP         | WIFI_N_ISM<br>(6.5M) | 7       | 11.73                  |                            |         |             |                    |         |                        |                            |         |
| TRP         | WIFI_N_ISM<br>(6.5M) | 13      | 12.95                  |                            |         |             |                    |         |                        |                            |         |
| TIS(EIRP)   | WIFI_N_ISM<br>(65M)  | 13      | -68.35                 | -68.54                     | -0.19   |             |                    |         |                        |                            |         |

4:43

### YGPS

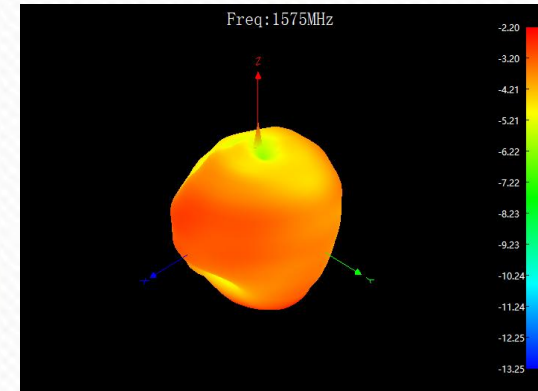
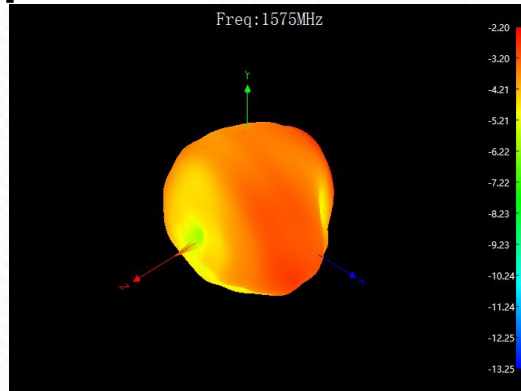
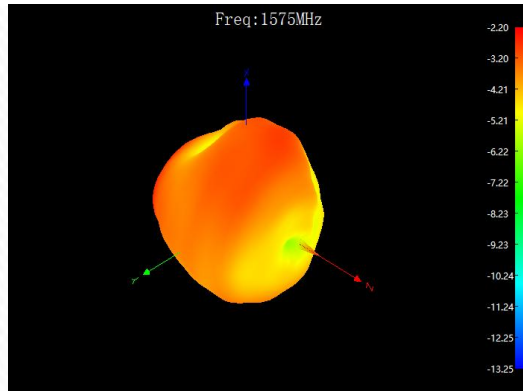
| SAT#<br>LITE<br>CNR                                     | SatEL<br>ELEV<br>AZI | RPRF<br>SPEED<br>M | MAGN<br>CON | GPD<br>REF | BPP<br>STATUS |
|---------------------------------------------------------|----------------------|--------------------|-------------|------------|---------------|
| <b>G GPS ROLN B BD E GAL D QZ9 L L S I H NBS S SBAS</b> |                      |                    |             |            |               |
| <b>Average Chir</b>                                     |                      |                    |             |            |               |
| GALILEO: R21 1122.4 - 8.47227 C27 9.4433                |                      |                    |             |            |               |
| GPS Average Position: Lat/Lon: 36.43 104.444            |                      |                    |             |            |               |
| <input type="checkbox"/> Show in single page            |                      |                    |             |            |               |
| SatID                                                   | Fq                   | CNR                | Elevation   | Azi-muth   |               |
| 5 LI                                                    | 40.1                 | 15.00              | 221.00      |            |               |
| 9 LI                                                    | 23.8                 | 27.00              | 86.00       |            |               |
| 11 LI                                                   | 42.5                 | 40.00              | 301.00      |            |               |
| 12 LI                                                   | 44.8                 | 24.00              | 312.00      |            |               |
| 17 LI                                                   | 39.7                 | 49.00              | 93.00       |            |               |
| 19 LI                                                   | 37.0                 | 62.00              | 54.00       |            |               |
| 20 LI                                                   | 25.4                 | 48.00              | 234.00      |            |               |
| 22 LI                                                   | 39.3                 | 38.00              | 178.00      |            |               |
| 28 LI                                                   | 26.3                 | 32.00              | 47.00       |            |               |
| 59 LI                                                   | 23.2                 | 54.00              | 115.00      |            |               |
| 70 LI                                                   | 0.0                  | 15.00              | 184.00      |            |               |
| 73 LI                                                   | 35.4                 | 24.00              | 219.00      |            |               |
| 74 LI                                                   | 24.4                 | 31.00              | 270.00      |            |               |
| 75 LI                                                   | 29.1                 | 9.00               | 321.00      |            |               |
| 62 LI                                                   | 0.0                  | 22.00              | 57.00       |            |               |
| 64 LI                                                   | 24.0                 | 33.00              | 346.00      |            |               |
| 7 LI                                                    | 0.0                  | 6.00               | 180.00      |            |               |
| 8 LI                                                    | 0.0                  | 31.00              | 140.00      |            |               |
| 15 LI                                                   | 0.0                  | 40.00              | 28.00       |            |               |

# Three-in-one antenna directional pattern

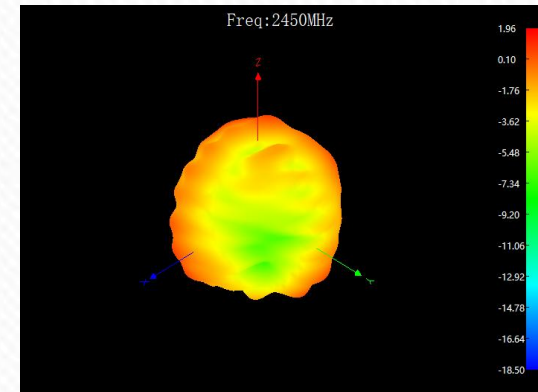
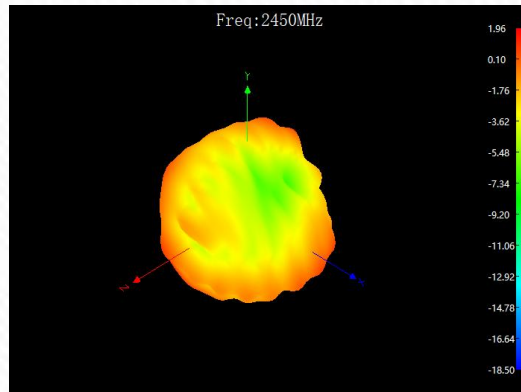
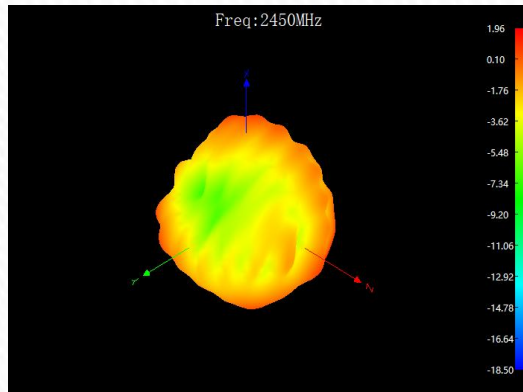


# Three-in-one antenna directional pattern

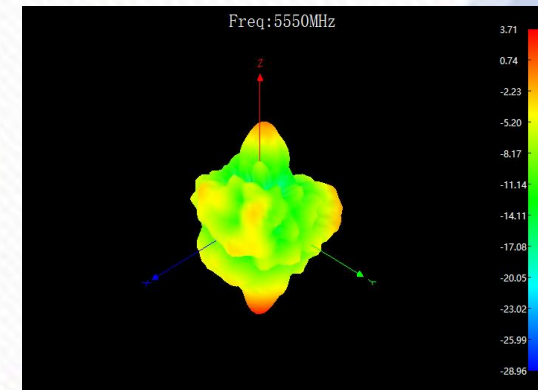
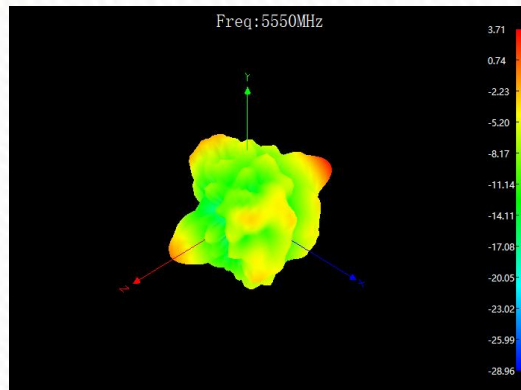
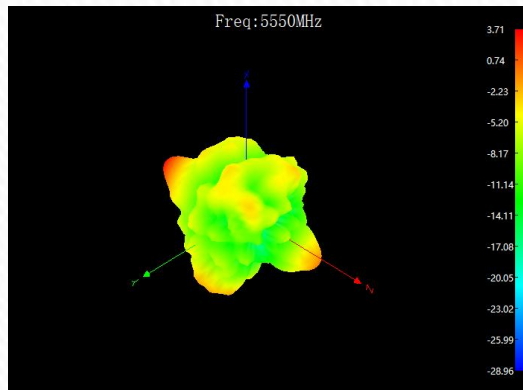
1575Mhz



2450MHz

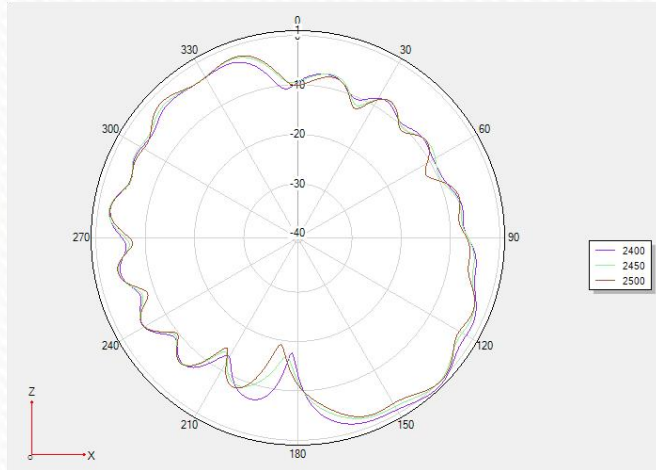


5550Mhz

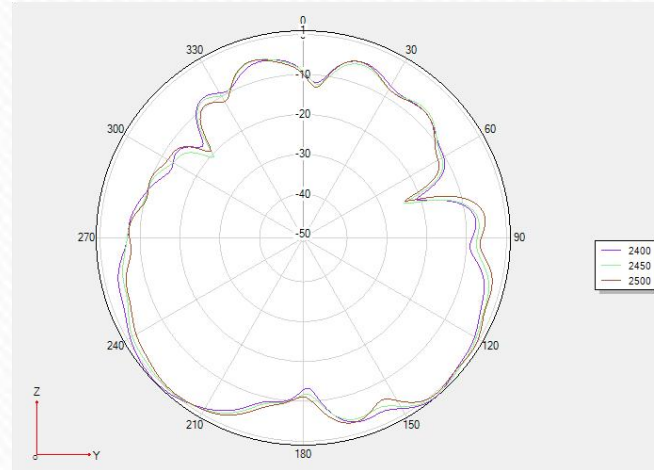


# Three-in-one antenna directional pattern

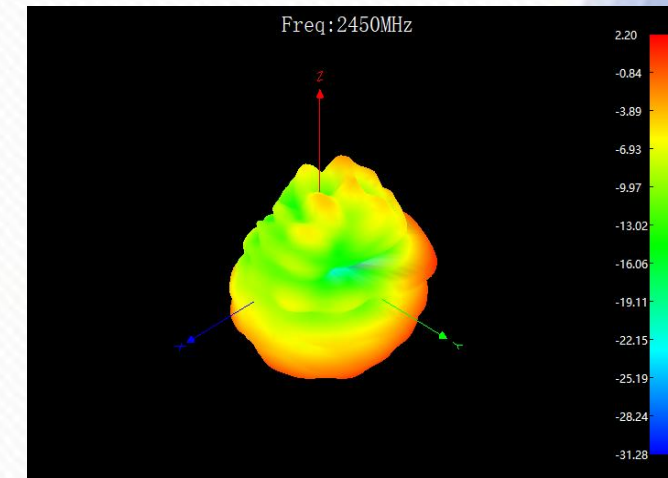
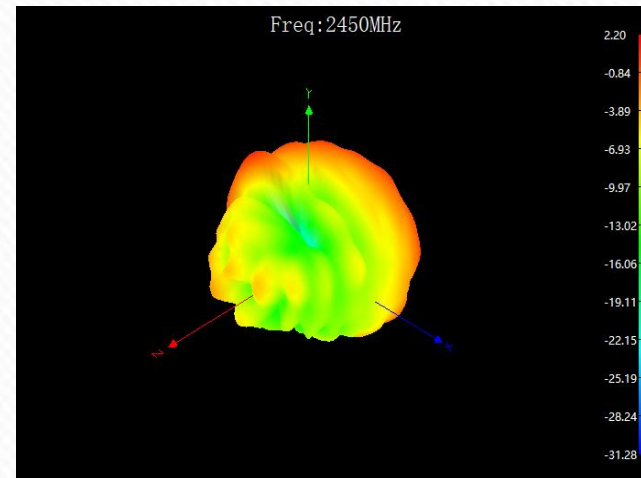
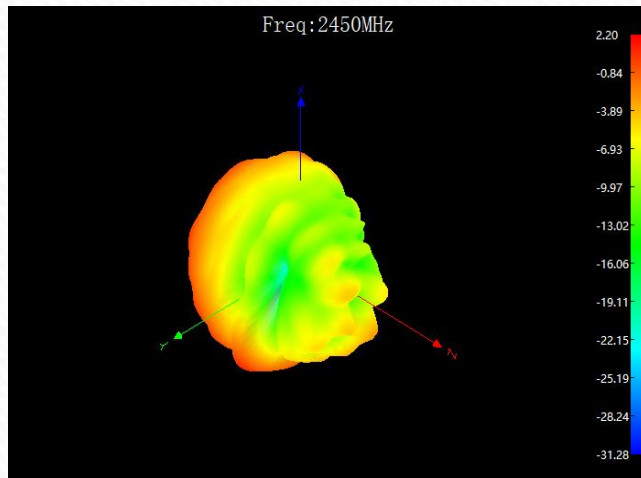
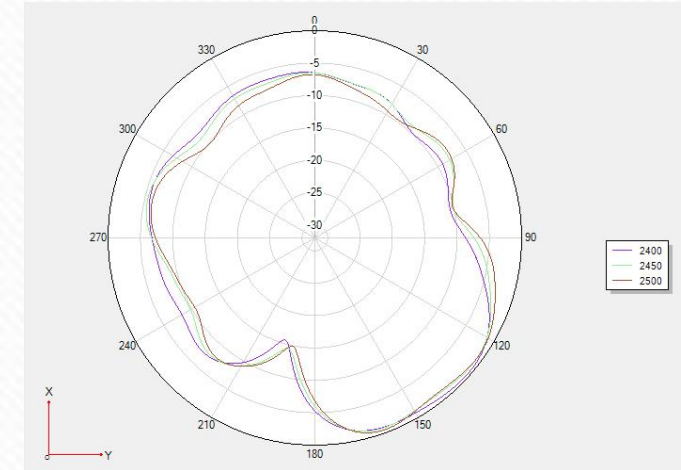
phi 0°



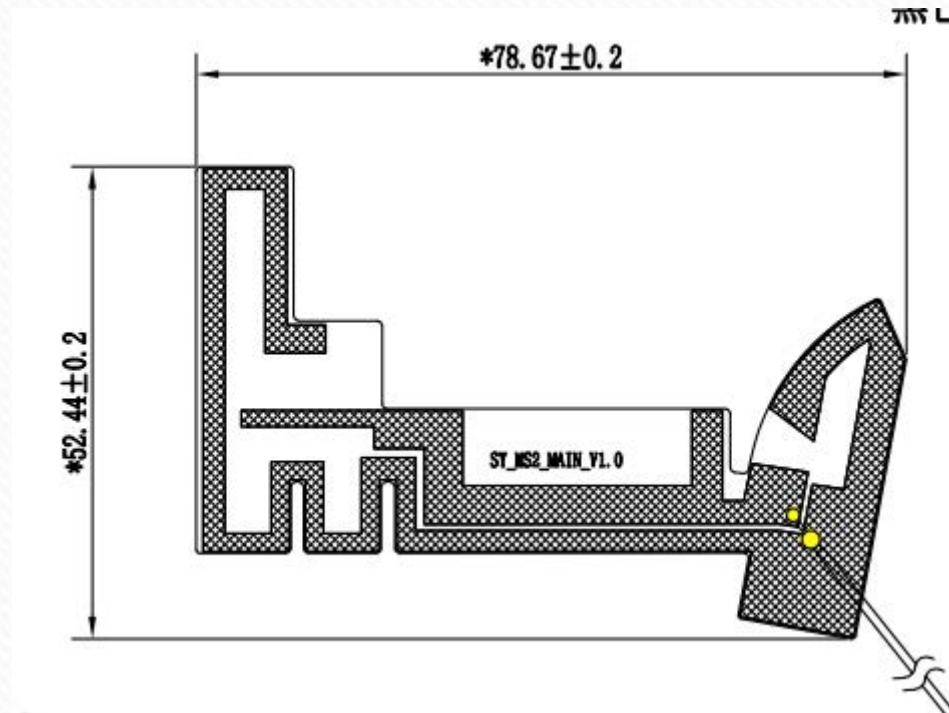
phi 90°



theta 90°

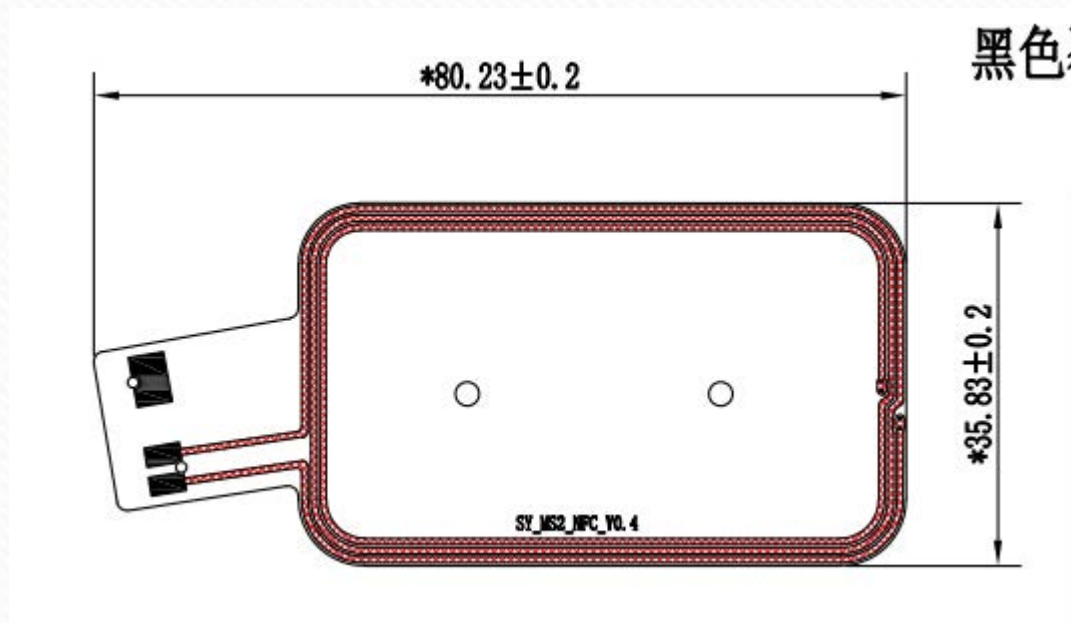


## 4G main ANT

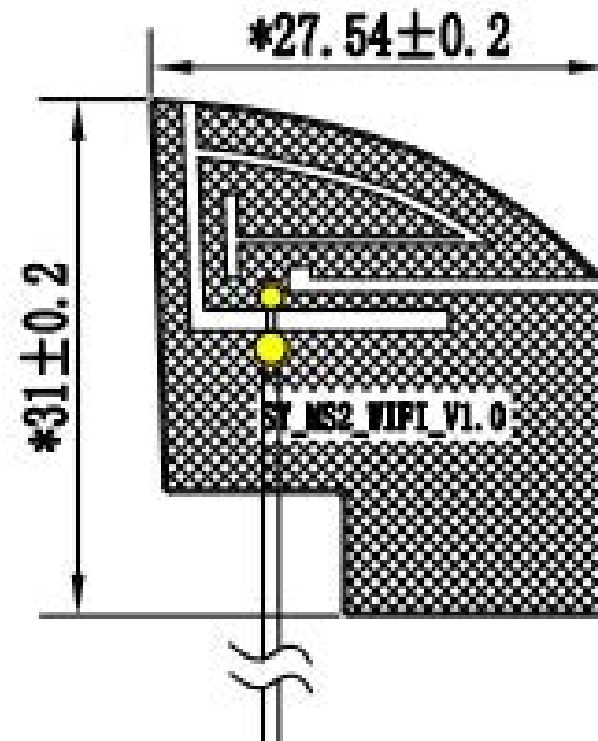


## NFC ANT

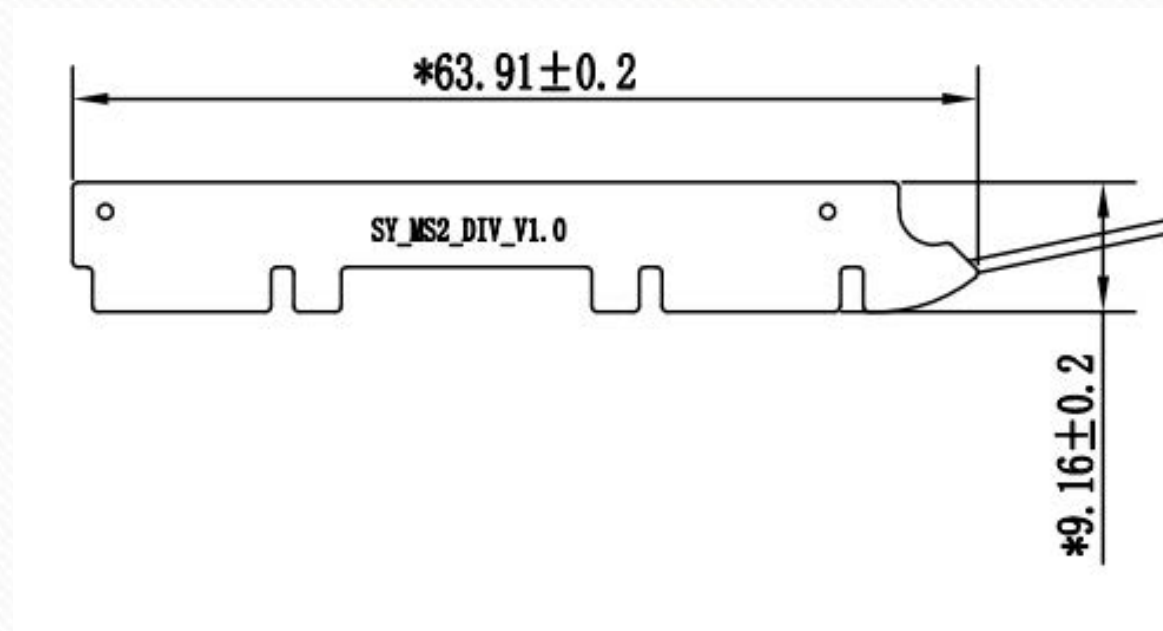
We statement that All measurements were performed radiated and therefore additional antenna gain documentation is not required.



BT&WLAN&GPS ANT



4G DIV ANT



1. The antenna matching is not changed.
2. The antenna environment is not increased.
3. The antenna performance test is OK.

# Thank You

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