# Antenna Testing Report

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

**Project Name：MR1-51**

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

**Address：The 6th floor, Building 5, Nantaiyun Innovation Valley Center, Guangming District, Shenzhen City**

**Report version： 2026/03/05 A0**

**Research staff: Jie Yang**

# Record

| Version | Report date | Remark |
|---|---|---|
| A0 | 2026.03.05 | Antenna test report |
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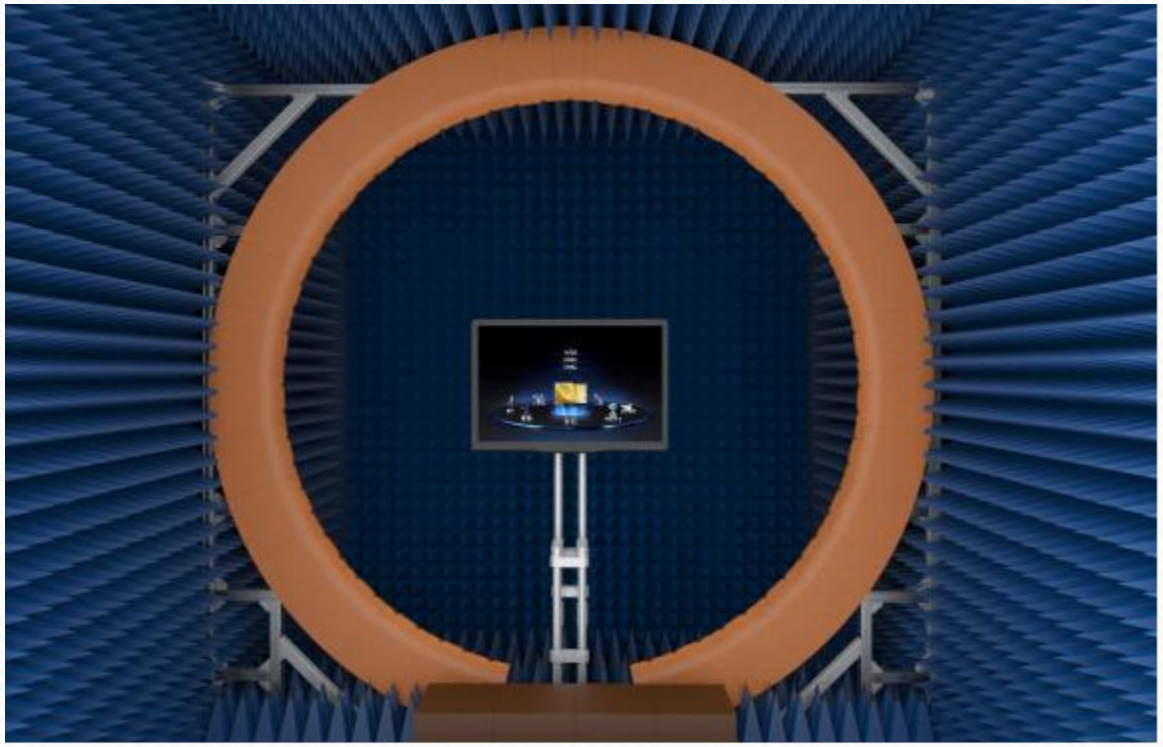
# Project Overview

| | | |
|---|---|---|
| Prototype status | Debugging machine | Project pictures |
| Device type | | |
| Number of antennas | Main antenna; diversity antenna; three-in-one antenna; NFCantenna | |
| Frequency band | GSM :850/900/1800/1900 | |
| | WCDMA : B1/2/5/8 | |
| | LTE: B 2/4/5/12/13/14/17/25/26/66/71 | |
| Structural style | FPC | |
| Environment adjustment | Change made | |
| Matching modification | Change made | |

# Equipment List



The industry's top 64 sensors OTA chamber

Frequency range: 400MHz-11GHz

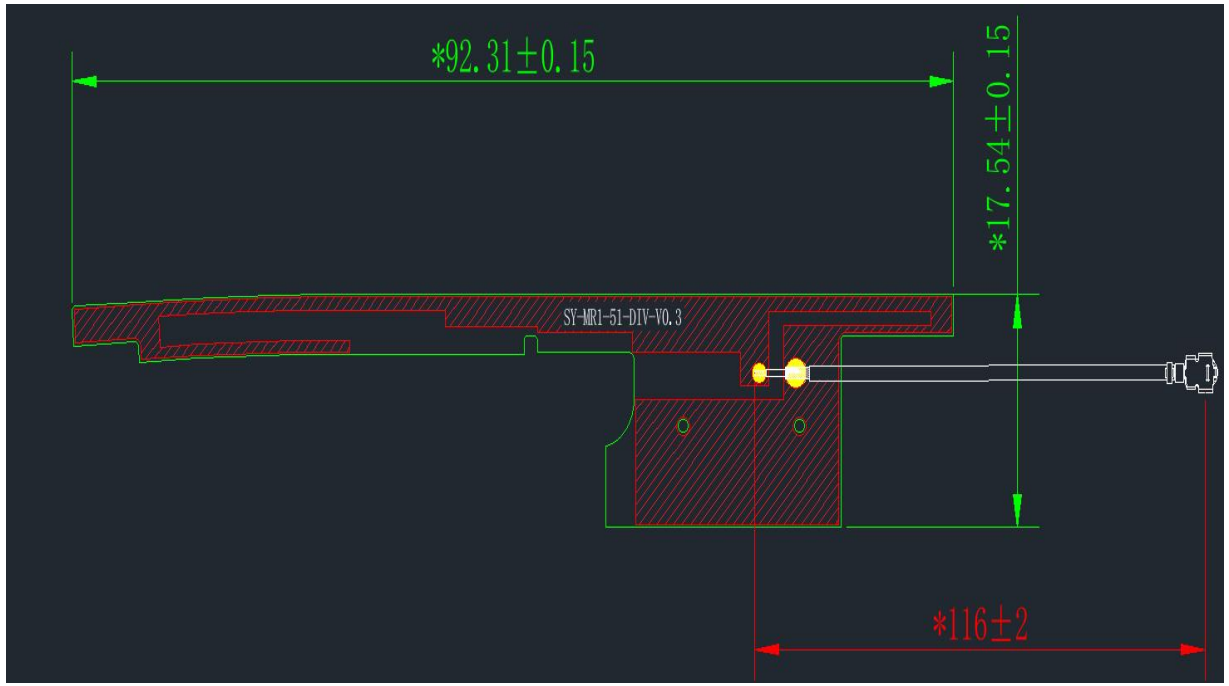
Device Llimitation: 2M

Load-bearing limitation:100KG

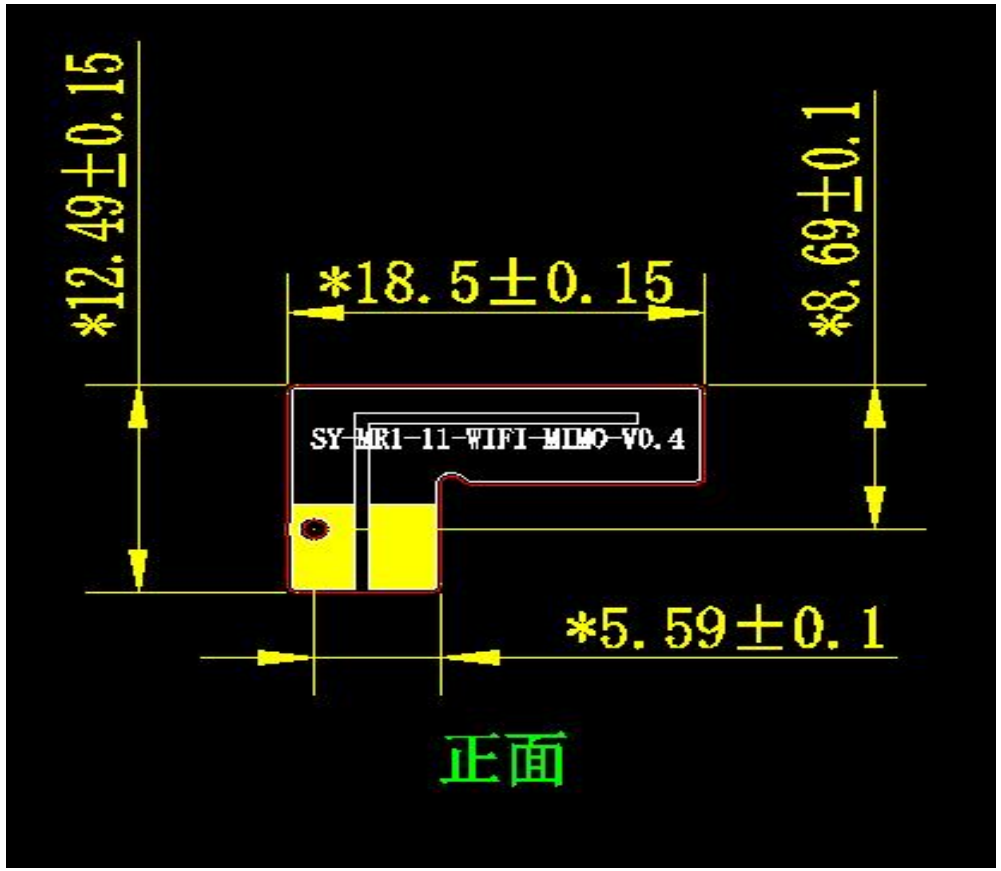
| Equipments Items | Total Quantity | Quantity for Shanghai R&D | Quantity for Shenzhen R&D | Quantity for ChongQing R&D |
|---|---|---|---|---|
| OTA chamber | 10 | 4 | 5 | 1 |
| 5G Tester（SP9500-CTS） | 3 | 1 | 1 | 1 |
| R&S Tester（high configuration CMW500） | 6 | 3 | 2 | 1 |
| Japan Anritsu Tester（Dual 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

LTE Antenna

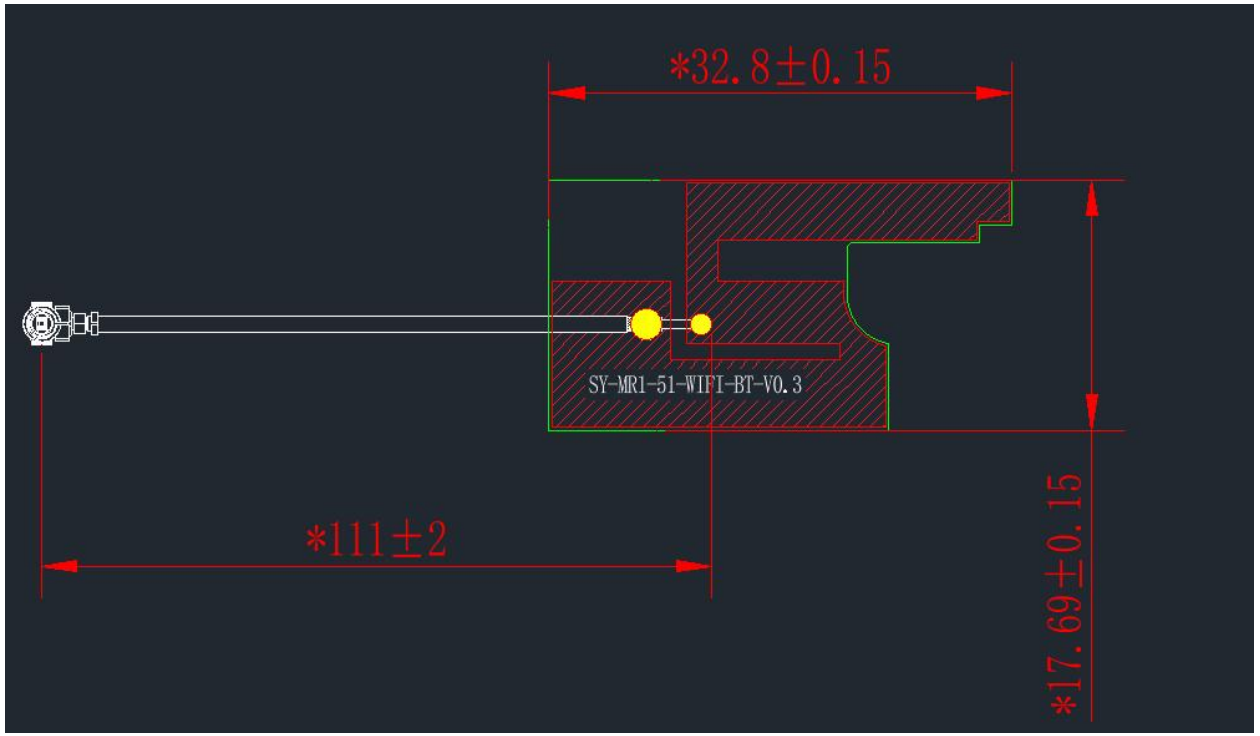



WIFI MIMO Antenna

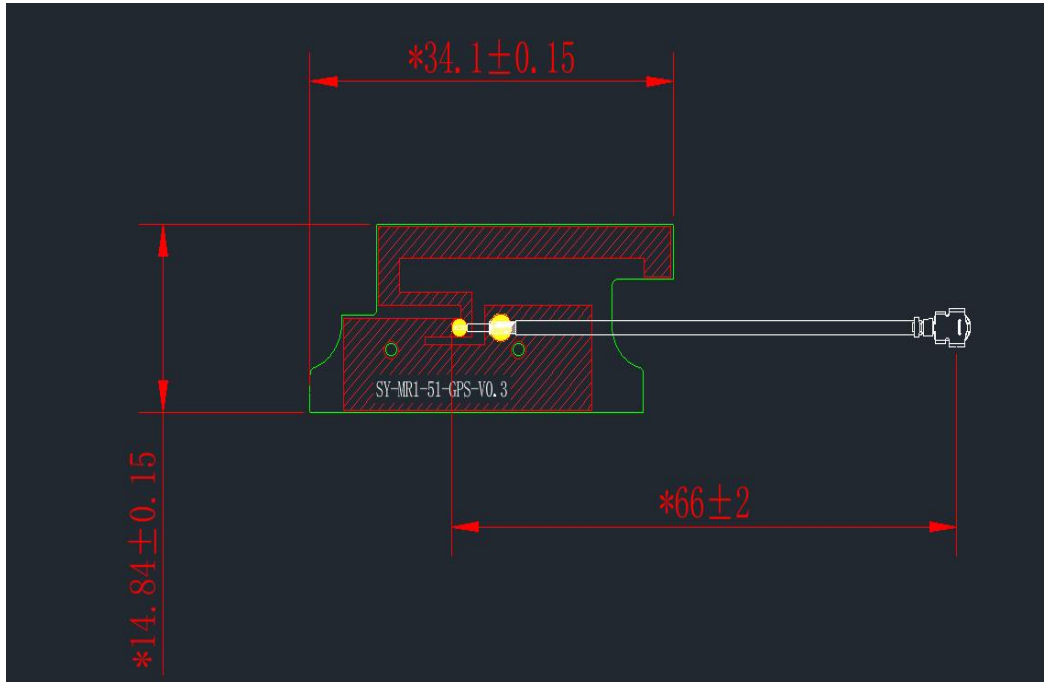


# Antenna mounting position

WIFI Antenna

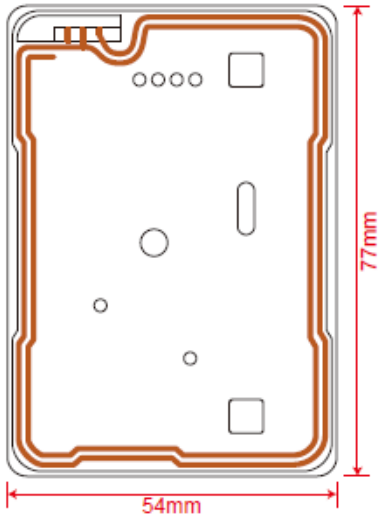



GPS Antenna



# Antenna mounting position

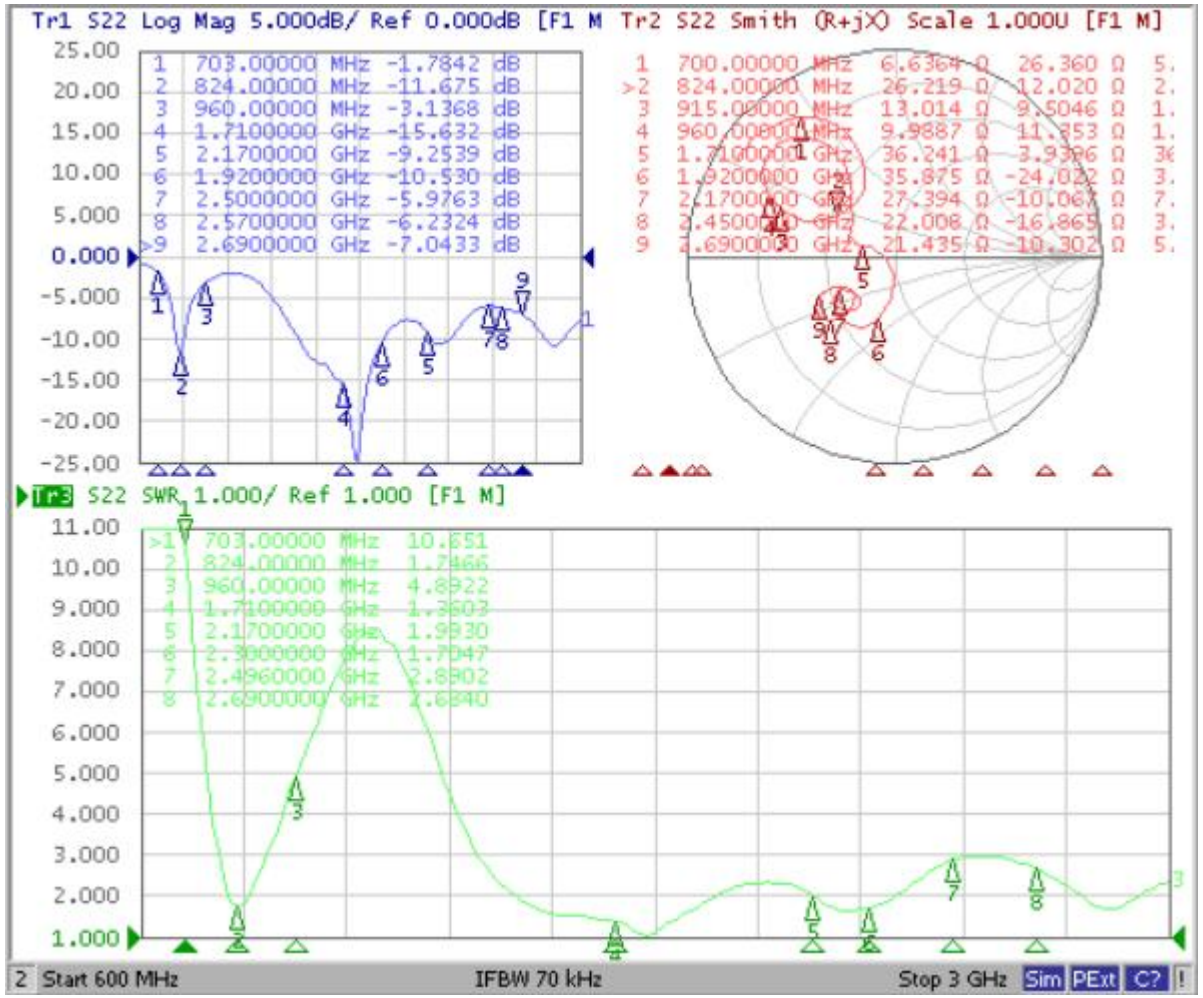
NFC antenna




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

# Main antenna data

S11-VSWR

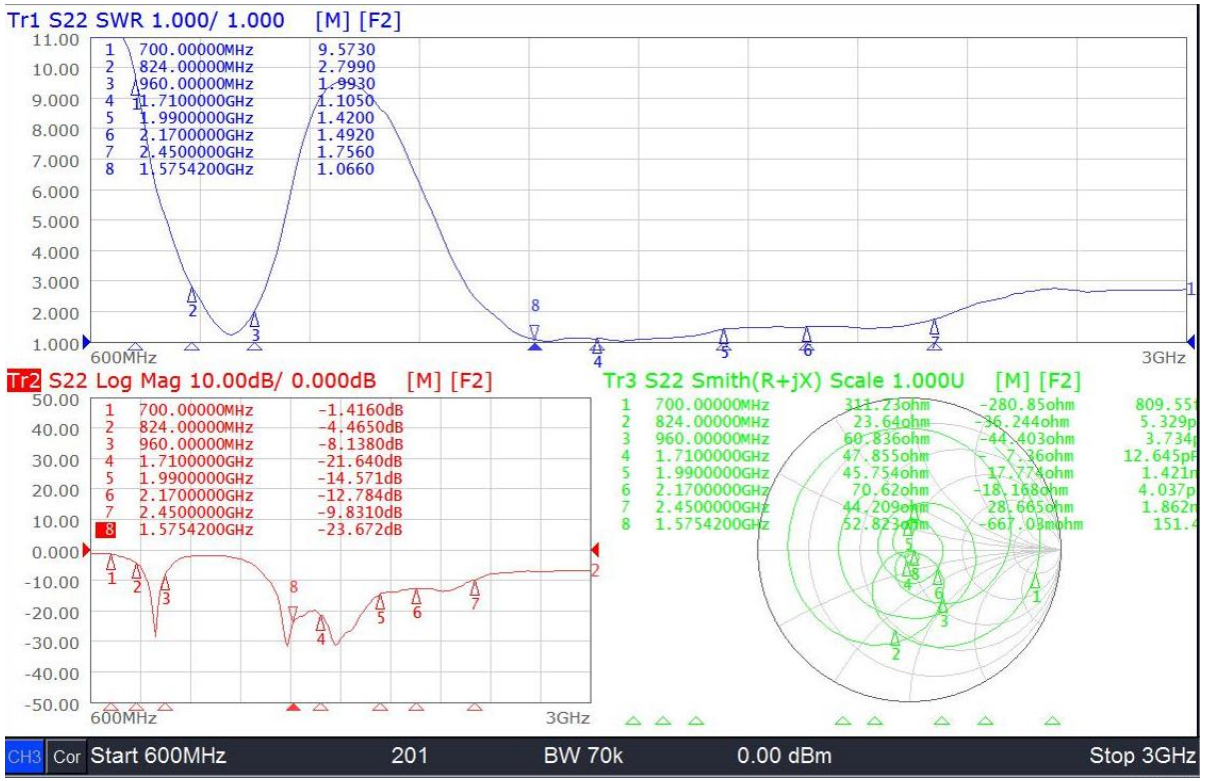


# Main antenna efficiency and gain

| Frequency/Mhz | MaxGain/dBi | Efficiency / % | Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|---|---|---|
| 650 | -1.59 | 1.96 | 1700 | 0.31 | 35.81 |
| 710 | -1.68 | 2.62 | 1720 | 0.97 | 40.74 |
| 720 | -1.75 | 3.1 | 1740 | 1.36 | 41.3 |
| 730 | -1.07 | 4.07 | 1760 | 1.12 | 39.63 |
| 740 | -1.49 | 4.84 | 1780 | 0.32 | 40.27 |
| 750 | -1.09 | 6.5 | 1800 | 0.66 | 39.81 |
| 760 | -1.25 | 7.67 | 1820 | 0.68 | 37.33 |
| 770 | -2.24 | 11.07 | 1840 | -0.37 | 33.04 |
| 780 | -1.97 | 12.65 | 1860 | -0.99 | 28.71 |
| 790 | -2.26 | 16.6 | 1880 | 1.21 | 23.44 |
| 800 | -2.82 | 18.03 | 1900 | -2.42 | 21.88 |
| 810 | -1.55 | 21.04 | 1920 | -2.1 | 26.85 |
| 820 | -1.73 | 21.73 | 1940 | -1.87 | 31.92 |
| 830 | -1.31 | 22.44 | 1960 | -2.53 | 32.51 |
| 840 | -1.75 | 23.01 | 1980 | -2.71 | 33.42 |
| 850 | -1.74 | 22.54 | 2000 | -2.54 | 36.31 |
| 860 | -1.42 | 19.86 | 2020 | -2.18 | 39.99 |
| 870 | -1.52 | 17.42 | 2040 | -1.95 | 43.95 |
| 880 | -1.62 | 15.89 | 2060 | -1.03 | 44.66 |
| 890 | -1.86 | 15 | 2080 | 0.01 | 44.95 |
| 900 | -1.5 | 11.64 | 2100 | 0.07 | 42.16 |
| | | | 2120 | -0.65 | 40.62 |
| | | | 2140 | -1.04 | 38.45 |
| | | | 2160 | -0.94 | 37.18 |
| | | | 2180 | -1.36 | 33.65 |
| | | | 2200 | -1.84 | 30.41 |

# DIV antenna data

S11-VSWR

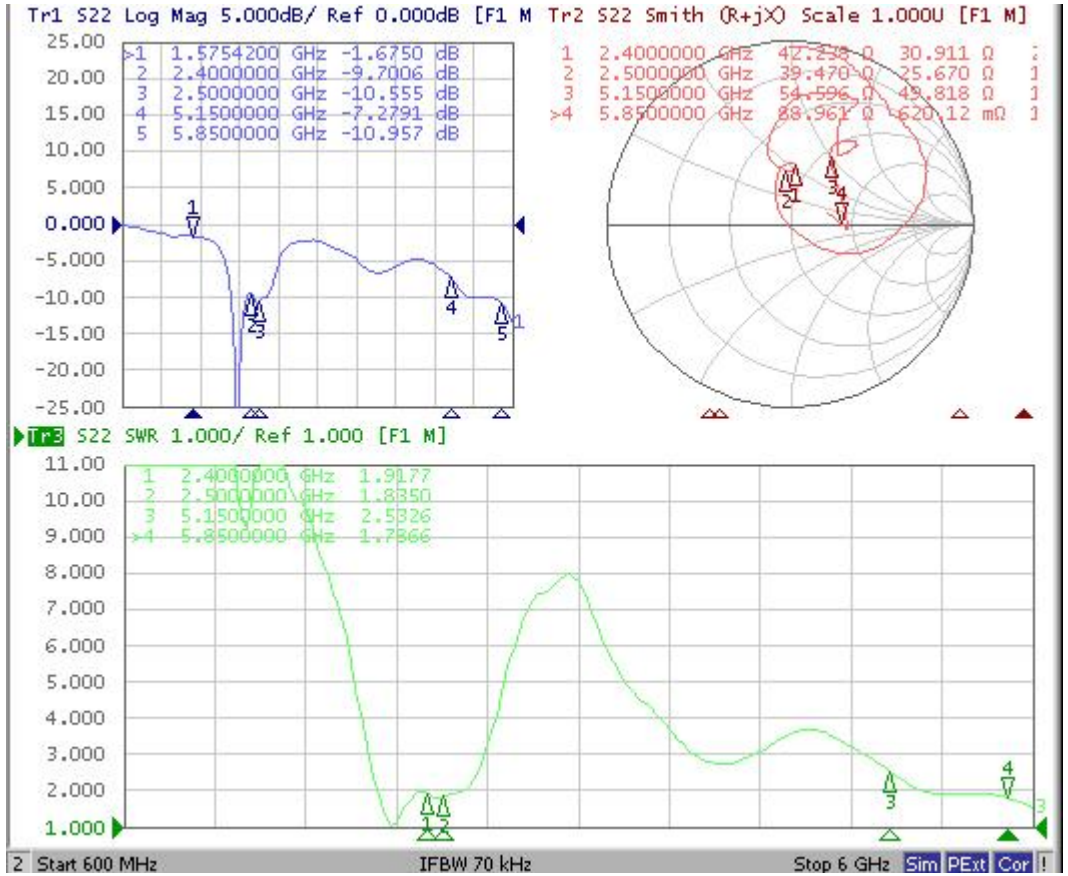


# DIV antenna efficiency and gain

| Frequency/Mhz | Efficiency / % | Frequency/Mhz | Efficiency / % |
|---|---|---|---|
| 690 | 28.84 | 1710 | 52.24 |
| 700 | 29.72 | 1745 | 55.08 |
| 710 | 29.23 | 1780 | 54.7 |
| 720 | 29.82 | 1815 | 54.58 |
| 730 | 30.5 | 1850 | 56.1 |
| 740 | 30.84 | 1885 | 51.88 |
| 750 | 30.94 | 1920 | 51.52 |
| 760 | 35.41 | 1955 | 52.48 |
| 770 | 39.04 | 1990 | 50.47 |
| 780 | 41.92 | 2025 | 47.75 |
| 790 | 44.83 | 2060 | 49.89 |
| 800 | 44.12 | 2095 | 50.47 |
| 810 | 43.04 | 2130 | 50.12 |
| 820 | 41.84 | 2165 | 51.05 |
| 830 | 41.19 | 2200 | 49.55 |
| 840 | 39.85 | 2235 | 47.86 |
| 850 | 38.18 | 2270 | 46.77 |
| 860 | 38.31 | 2305 | 44.87 |
| 870 | 38.58 | 2340 | 43.25 |
| 880 | 38.05 | 2375 | 42.56 |
| 890 | 38.58 | 2410 | 40.36 |
| 900 | 39.58 | 2445 | 38.99 |
| 910 | 39.92 | 2480 | 38.82 |
| 920 | 39.17 | 2515 | 37.33 |
| 930 | 39.04 | 2550 | 35.65 |
| 940 | 36.85 | 2585 | 34.83 |
| 950 | 35.64 | 2620 | 33.19 |
| 960 | 34.27 | 2655 | 30.69 |
| | | 2690 | 29.85 |

# WIFI-MIMO antenna data

S11-VSWR



# WIFI-MIMO efficiency and gain

| Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|
| 2400 | 2.24 | 38.73 |
| 2410 | 2.17 | 41.22 |
| 2420 | 1.57 | 35.2 |
| 2430 | 1.8 | 35.06 |
| 2440 | 2 | 36.62 |
| 2450 | 2.14 | 41.48 |
| 2460 | 2.41 | 38.96 |
| 2470 | 2.18 | 40.32 |
| 2480 | 2.37 | 40.89 |
| 2490 | 2.14 | 41.06 |
| 2500 | 2.23 | 41.31 |
| 5150 | 2.23 | 31.12 |
| 5200 | 2.53 | 33.18 |
| 5250 | 2.75 | 34.79 |
| 5300 | 2.62 | 36.48 |
| 5350 | 2.05 | 38.73 |
| 5400 | 2.43 | 39.83 |
| 5450 | 2.37 | 41.64 |
| 5500 | 2.48 | 43.19 |
| 5550 | 2.28 | 43.19 |
| 5600 | 2.33 | 44.99 |
| 5650 | 2.32 | 45.36 |
| 5700 | 2.22 | 44.99 |
| 5750 | 2.32 | 44.36 |
| 5800 | 2.29 | 44.45 |
| 5850 | 2.51 | 43.02 |

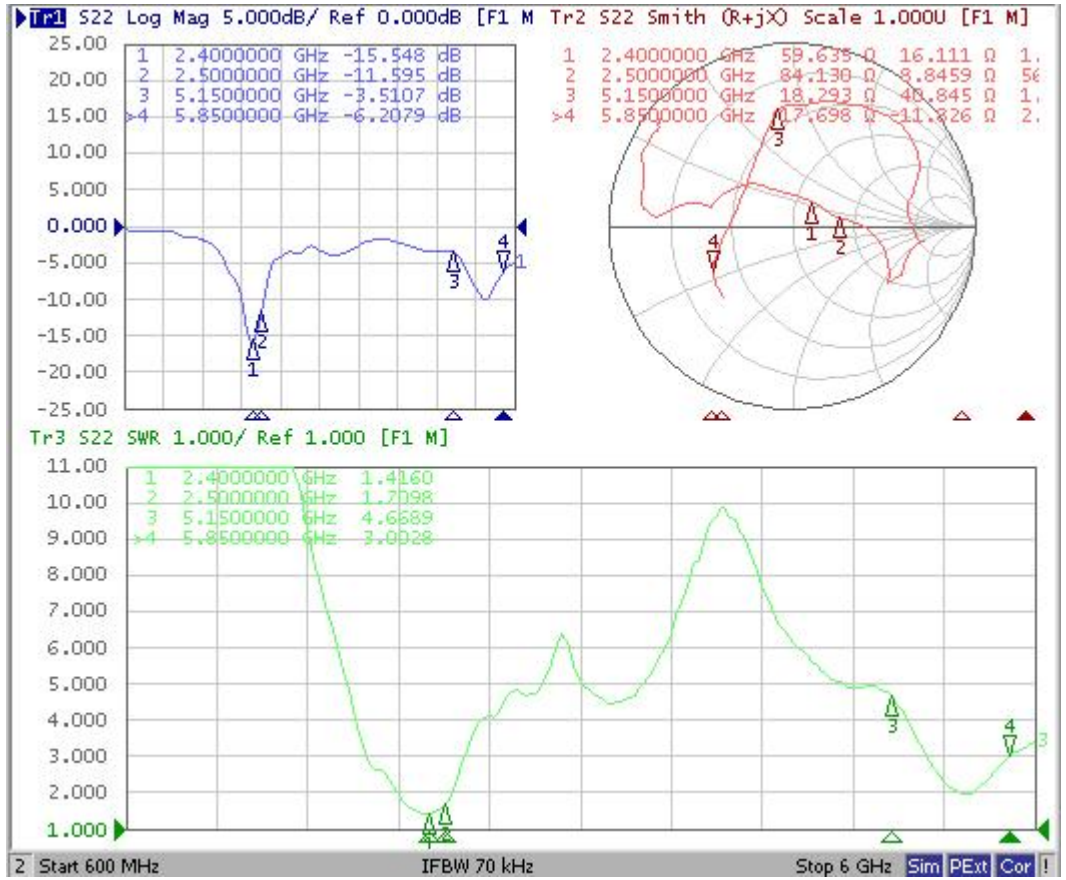
| Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|
| 5900 | 2.18 | 30.58 |
| 5950 | 2.26 | 30.35 |
| 6000 | 1.9 | 26.13 |
| 6050 | 1.49 | 23.75 |
| 6100 | 2.23 | 32.72 |
| 6150 | 2.75 | 35.98 |
| 6200 | 2.47 | 34.83 |
| 6250 | 2.08 | 28.98 |
| 6300 | 3.35 | 34.58 |
| 6350 | 3.22 | 32.48 |
| 6400 | 3.52 | 35.98 |
| 6450 | 2.86 | 31.52 |
| 6500 | 2.69 | 29.32 |
| 6550 | 2.6 | 35.85 |
| 6600 | 2.15 | 32.84 |
| 6650 | 1.4 | 24.16 |
| 6700 | 2.23 | 27.1 |
| 6750 | 2.43 | 27.1 |
| 6800 | 2.77 | 35.08 |
| 6850 | 2.41 | 31.76 |
| 6900 | 1.95 | 28.87 |
| 6950 | 1.44 | 26.77 |
| 7000 | 2.66 | 31.64 |
| 7050 | 3.71 | 35.08 |
| 7100 | 3.05 | 28.64 |
| 7150 | 3.23 | 31.17 |
| 7200 | 2.79 | 26.67 |

# WIFI-MIMO antenna OTA test data

| Item | Measurement | Band | Channel | Total |
|---|---|---|---|---|
| 1 | TRP | WIFI_B (1M) | 1 | 11.62 |
| 2 | TRP | WIFI_B (1M) | 6 | 11.21 |
| 3 | TRP | WIFI_B (1M) | 11 | 12.26 |
| 4 | TIS(EIRP) | WIFI_B (11M) | 11 | -83.54 |
| 5 | TRP | WIFI_G (6M) | 1 | 13.51 |
| 6 | TRP | WIFI_G (6M) | 6 | 13.2 |
| 7 | TRP | WIFI_G (6M) | 11 | 13.7 |
| 8 | TIS(EIRP) | WIFI_G (54M) | 11 | -69.59 |
| 9 | TRP | WIFI_N_ISM (6.5M) | 1 | 13.46 |
| 10 | TRP | WIFI_N_ISM (6.5M) | 6 | 12.6 |
| 11 | TRP | WIFI_N_ISM (6.5M) | 11 | 12.93 |
| 12 | TIS(EIRP) | WIFI_N_ISM (65M) | 11 | -68.97 |
| 13 | TRP | WIFI_A (54M) | 36 | 10.24 |
| 14 | TRP | WIFI_A (54M) | 149 | 10.57 |
| 15 | TRP | WIFI_A (54M) | 165 | 10.06 |
| 16 | TIS(EIRP) | WIFI_A (54M) | 165 | -68.24 |
| 17 | TRP | WIFI_N_UNII (65M) | 36 | 8.76 |
| 18 | TRP | WIFI_N_UNII (65M) | 149 | 9.31 |
| 19 | TRP | WIFI_N_UNII (65M) | 165 | 8.82 |
| 20 | TIS(EIRP) | WIFI_N_UNII (65M) | 165 | -64.53 |

# WIFI-1 antenna data

S11-VSWR



# WIFI-1 efficiency and gain

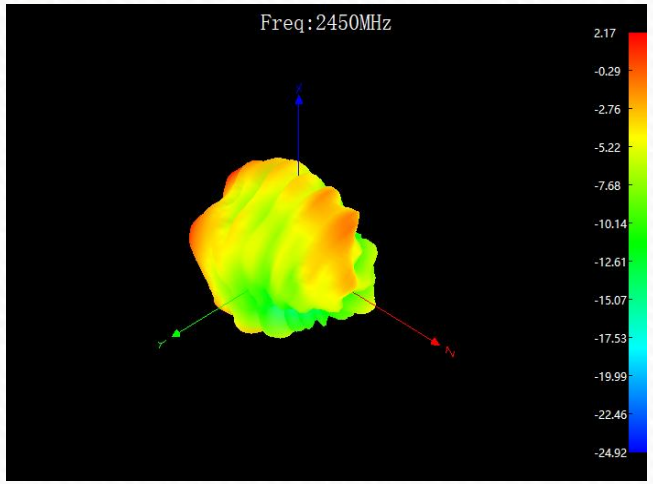
| Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|
| 2400 | 1.21 | 42.89 |
| 2410 | 1.22 | 44.39 |
| 2420 | 1.02 | 46.41 |
| 2430 | 2.2 | 48.37 |
| 2440 | 1.29 | 49.48 |
| 2450 | 1.39 | 50.6 |
| 2460 | 1.43 | 51.24 |
| 2470 | 2.41 | 52.06 |
| 2480 | 1.65 | 52.79 |
| 2490 | 1.62 | 52.23 |
| 2500 | 1.54 | 51.94 |
| 5150 | 1.29 | 33.93 |
| 5200 | 1.13 | 32.51 |
| 5250 | 1.89 | 34.59 |
| 5300 | 2.09 | 36.32 |
| 5350 | 2.58 | 37.93 |
| 5400 | 2.71 | 34.06 |
| 5450 | 2.75 | 32.89 |
| 5500 | 2.67 | 35.4 |
| 5550 | 2.31 | 35.89 |
| 5600 | 2.53 | 37.58 |
| 5650 | 2.19 | 37.24 |
| 5700 | 2.27 | 37.58 |
| 5750 | 2.15 | 37.41 |
| 5800 | 2.01 | 38.28 |
| 5850 | 2.02 | 38.73 |

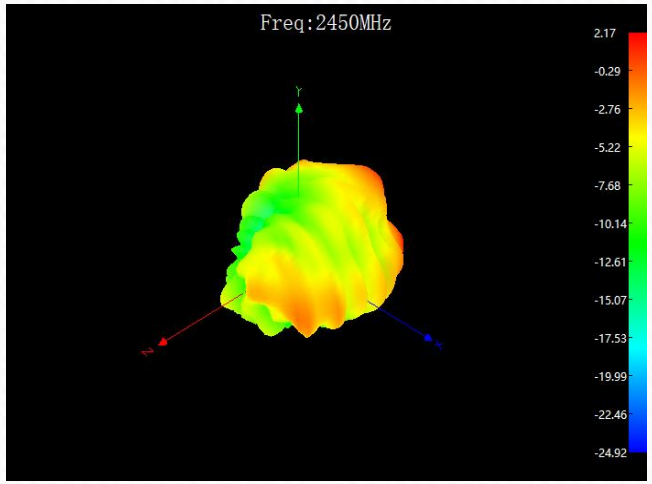
| Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|
| 5900 | 3.25 | 42.45 |
| 5950 | 3.04 | 39.4 |
| 6000 | 3.52 | 35.08 |
| 6050 | 3.31 | 31.5 |
| 6100 | 3.15 | 36.88 |
| 6150 | 3.11 | 39.2 |
| 6200 | 3.08 | 34.16 |
| 6250 | 2.19 | 28.46 |
| 6300 | 3.02 | 31.88 |
| 6350 | 2.6 | 30.18 |
| 6400 | 2.61 | 32.17 |
| 6450 | 2.22 | 26.06 |
| 6500 | 2.86 | 25.96 |
| 6550 | 2.65 | 27.76 |
| 6600 | 1.88 | 32.28 |
| 6650 | 0.99 | 26 |
| 6700 | 1.2 | 28.05 |
| 6750 | 0.65 | 25.88 |
| 6800 | 2.77 | 29.24 |
| 6850 | 0.76 | 26.61 |
| 6900 | 2.14 | 23.82 |
| 6950 | 2.09 | 20.8 |
| 7000 | 3.09 | 23.17 |
| 7050 | 3.71 | 26.61 |
| 7100 | 2.38 | 21.23 |
| 7150 | 2.3 | 23.71 |
| 7200 | 2.77 | 24.15 |

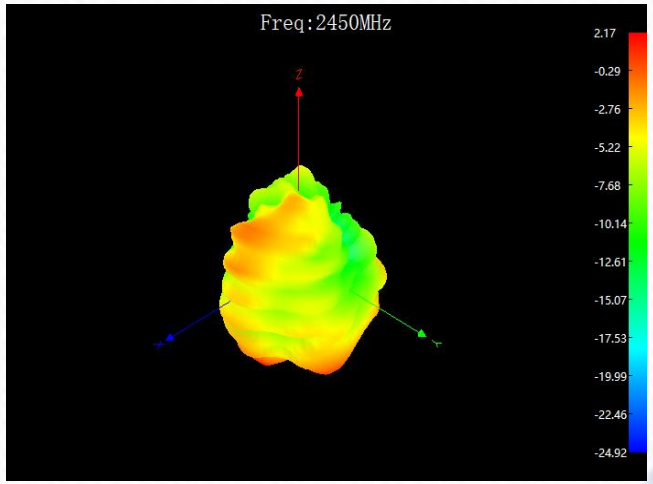
# WIFI-1 antenna OTA test data

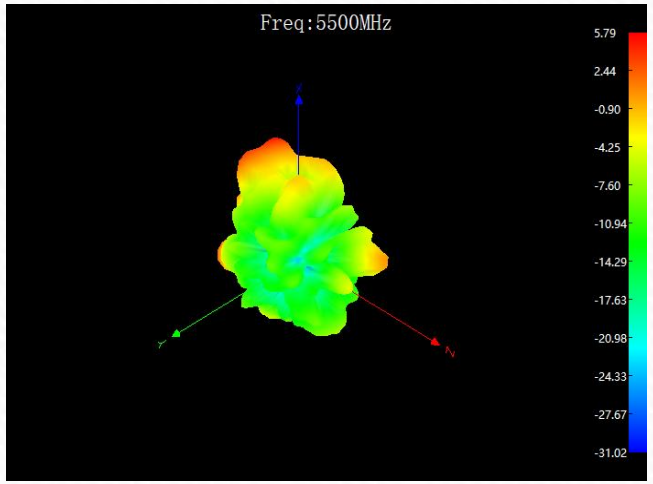
| Item | Measurement | Band | Channel | Total |
|---|---|---|---|---|
| 1 | TRP | WIFI_B (1M) | 1 | 11.53 |
| 2 | TRP | WIFI_B (1M) | 6 | 11.28 |
| 3 | TRP | WIFI_B (1M) | 11 | 11.46 |
| 4 | TIS(EIRP) | WIFI_B (11M) | 11 | -82.76 |
| 5 | TRP | WIFI_G (6M) | 1 | 14.65 |
| 6 | TRP | WIFI_G (6M) | 6 | 13.95 |
| 7 | TRP | WIFI_G (6M) | 11 | 13.71 |
| 8 | TIS(EIRP) | WIFI_G (54M) | 11 | -73.62 |
| 9 | TRP | WIFI_N_ISM (6.5M) | 1 | 13.68 |
| 10 | TRP | WIFI_N_ISM (6.5M) | 6 | 13.1 |
| 11 | TRP | WIFI_N_ISM (6.5M) | 11 | 12.87 |
| 12 | TIS(EIRP) | WIFI_N_ISM (65M) | 11 | -69.77 |
| 13 | TRP | WIFI_A (54M) | 36 | 11.06 |
| 14 | TRP | WIFI_A (54M) | 149 | 10.77 |
| 15 | TRP | WIFI_A (54M) | 165 | 10.25 |
| 16 | TIS(EIRP) | WIFI_A (54M) | 165 | -67.09 |
| 17 | TRP | WIFI_N_UNII (65M) | 36 | 9.01 |
| 18 | TRP | WIFI_N_UNII (65M) | 149 | 8.01 |
| 19 | TRP | WIFI_N_UNII (65M) | 165 | 8.69 |
| 20 | TIS(EIRP) | WIFI_N_UNII (65M) | 165 | -63.02 |

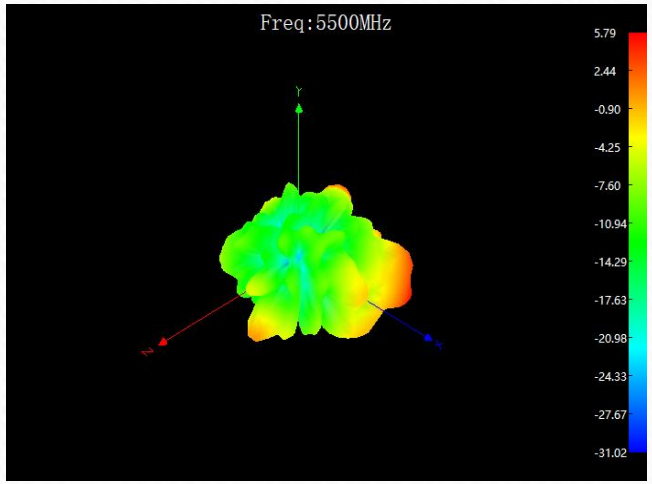
# WIFI-1 antenna directional pattern

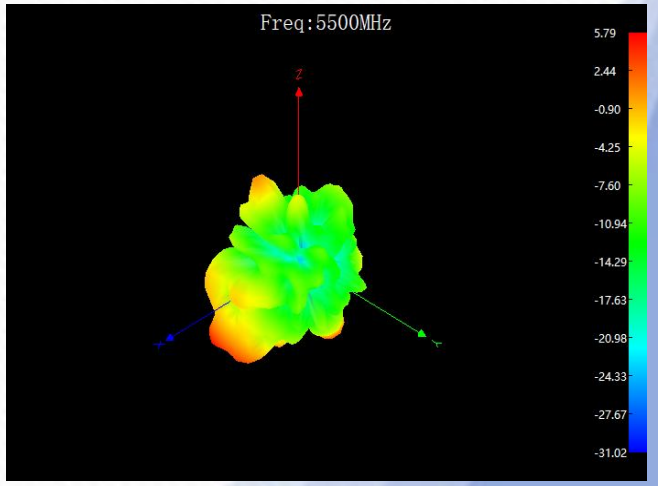


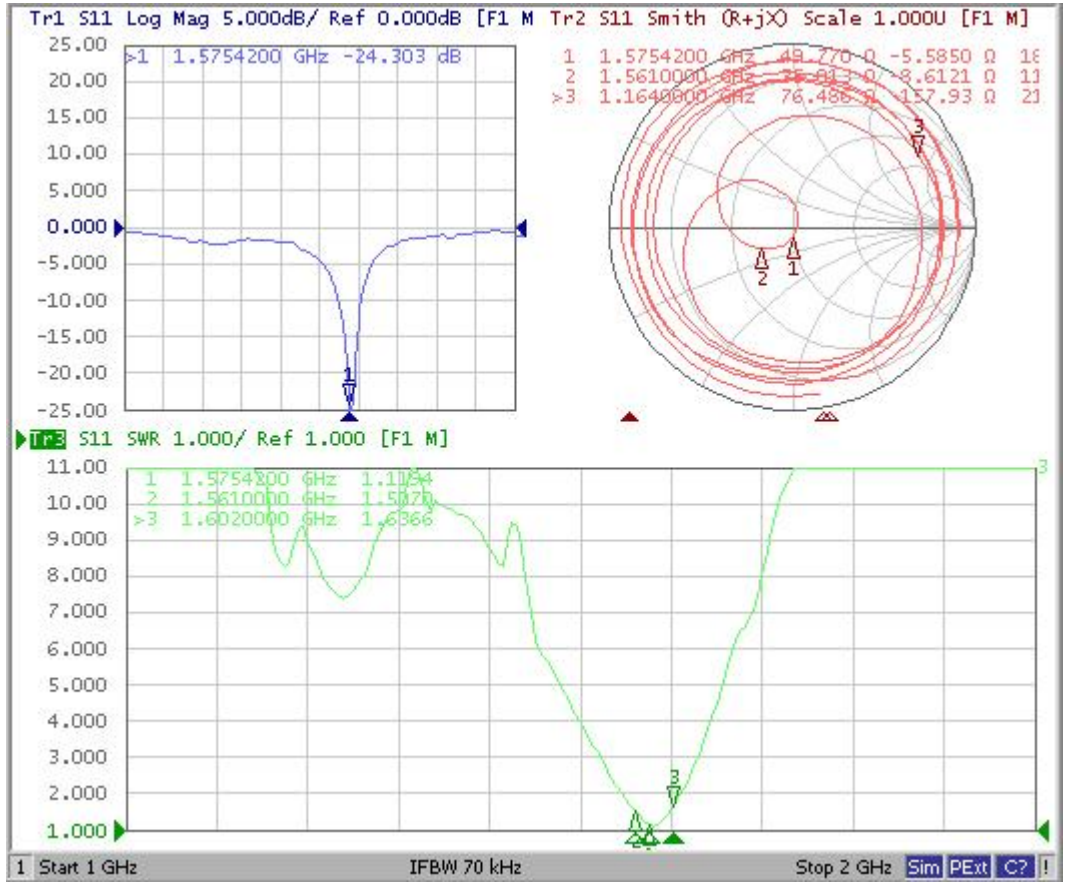



# GNSS antenna data

S11-VSWR



# GNSS efficiency and gain

| Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|
| 1555 | -1.67 | 37.77 |
| 1556 | -1.7 | 37.19 |
| 1557 | -1.73 | 36.69 |
| 1558 | -1.77 | 36.34 |
| 1559 | -1.79 | 36.2 |
| 1560 | -1.78 | 36.41 |
| 1561 | -1.67 | 36.76 |
| 1562 | -1.56 | 37.41 |
| 1563 | -1.47 | 38.14 |
| 1564 | -1.34 | 38.89 |
| 1565 | -1.22 | 39.81 |
| 1566 | -1.18 | 40.43 |
| 1567 | -1.1 | 41.08 |
| 1568 | -0.97 | 41.89 |
| 1569 | -0.81 | 42.64 |
| 1570 | -0.65 | 43.5 |
| 1571 | -0.52 | 44.19 |
| 1572 | -0.44 | 44.55 |
| 1573 | -0.44 | 44.55 |
| 1574 | -0.5 | 44.11 |
| 1575 | -0.58 | 43.24 |
| 1576 | -0.64 | 42.22 |
| 1577 | -0.72 | 41.24 |
| 1578 | -0.83 | 40.28 |
| 1579 | -0.94 | 39.65 |
| 1580 | -1.01 | 39.27 |
| 1581 | -1 | 39.11 |
| 1582 | -0.99 | 39.04 |

| Frequency/Mhz | MaxGain/dBi | Efficiency / % |
|---|---|---|
| 1583 | -0.99 | 39.11 |
| 1584 | -1.01 | 39.04 |
| 1585 | -1.04 | 38.89 |
| 1586 | -1.15 | 38.66 |
| 1587 | -1.23 | 38.28 |
| 1588 | -1.3 | 37.92 |
| 1589 | -1.33 | 37.41 |
| 1590 | -1.36 | 36.97 |
| 1591 | -1.42 | 36.55 |
| 1592 | -1.47 | 36.06 |
| 1593 | -1.56 | 35.51 |
| 1594 | -1.67 | 34.97 |
| 1595 | -1.76 | 34.44 |
| 1596 | -1.8 | 33.99 |
| 1597 | -1.84 | 33.61 |
| 1598 | -1.89 | 33.42 |
| 1599 | -1.95 | 33.42 |
| 1600 | -1.99 | 33.54 |
| 1601 | -1.95 | 33.73 |
| 1602 | -1.91 | 34.05 |
| 1603 | -1.87 | 34.44 |
| 1604 | -1.82 | 34.91 |
| 1605 | -1.75 | 35.44 |
| 1606 | -1.73 | 35.79 |
| 1607 | -1.68 | 36.27 |
| 1608 | -1.61 | 36.83 |
| 1609 | -1.56 | 37.41 |
| 1610 | -1.45 | 37.92 |

# GNSS antenna OTA test data

纬度: 22.7387253°
经度: 113.9164444°
高度: 103.6 m
高度(MSL): 103.6 m
速度: 0.0 m/s
速度精度: 0.1 m/s
PDOP: 1.0

时间: 07.27.16 上午
TTFF: 2235 sec
H/V 精度: 1.0/24.0 m
卫星数量: 9/9/10
方位: 1.3°
方位精度:
H/V DOP: 0.7/0.7

| ID | GNSS | CF | C/N0 | 标识 | 高度角 | 方位角 |
|---|---|---|---|---|---|---|
| 3 | | 1599.750 | 36.0 | EU | 15° | 240° |
| 4 | | 1599.750 | 37.0 | EU | 53° | 305° |
| 8 | | 1599.750 | 34.0 | EU | 38° | 199° |
| 9 | | 1599.750 | 36.0 | EU | 16° | 319° |
| 16 | | 1599.750 | 37.0 | EU | 56° | 348° |
| 18 | | 1599.750 | | E | 3° | 68° |
| 26 | | 1599.750 | 42.0 | EU | 34° | 36° |
| 27 | | 1599.750 | 39.0 | EU | 66° | 164° |
| 28 | | 1599.750 | 44.0 | EU | 19° | 98° |
| 31 | | 1599.750 | 47.0 | EU | 41° | 74° |

星基增强系统（SBAS）卫星不可用

# Summary

1. Latest machine test data.

2. There are changes to the match.

# Thank You

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