



深圳市千目通讯科技有限公司

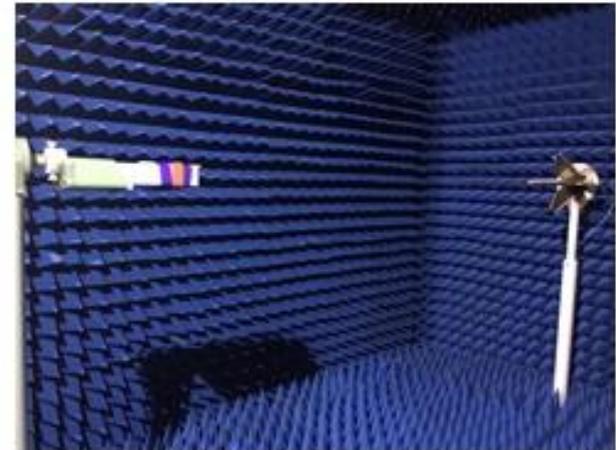
Shenzhen Qianmu Communication Technology Co., Ltd.

专注天线方案、设计与生产

客 户：圆周率
项 目：P223
日 期：2023.6.13
射 频：QIU ZHI YUAN

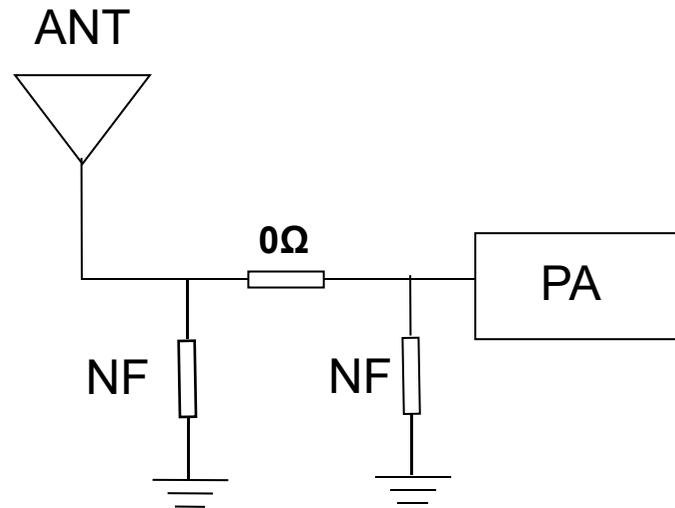
测试环境

| | 测试项目 | 设备 |
|----------------------|--|---|
| 1. S参数 (S-parameter) | 1. 回波损耗 (Return Loss) 2. 电压驻波比 (VSWR) | 网络分析仪: Agilent E5071B HP 8753D |
| 2. 有源测试 (Active) | 1. 发射功率 (TRP) 2. 接收灵敏度 (TIS) 3. 频率误差 4. 屏灭、屏亮 | 1. 暗室: ETS 7x4x3 m (3D) Chamber ETS 5x3x3 m (3D) Chamber 2. 综合测试仪: Agilent 8960 E5515B ×2 StarPoint SP6011 |
| 3. 无源测试 (Passive) | 1. 天线增益 (Gain) 2. 天线效率 (Efficiency) | 1. 暗室: ETS 7x4x3 m (3D) Chamber ETS 5x3x3 m (3D) Chamber 2. 网络分析仪: Agilent E5071B HP 8753D |





匹配电路-WIFI天线



原始匹配电路未更改



WIFI天线 2400-2500MHz/5000-5800MHz有源数据

| 天线状态 | FPC样品 | | |
|---------|----------------------------------|--------|------|
| | WIFI 2400~2500MHz 802.11b 11Mbps | | |
| Channel | 1 | 6 | 11 |
| TRP | 9.1 | 9.28 | 9.53 |
| TIS | -76.11 | -76.34 | -76 |

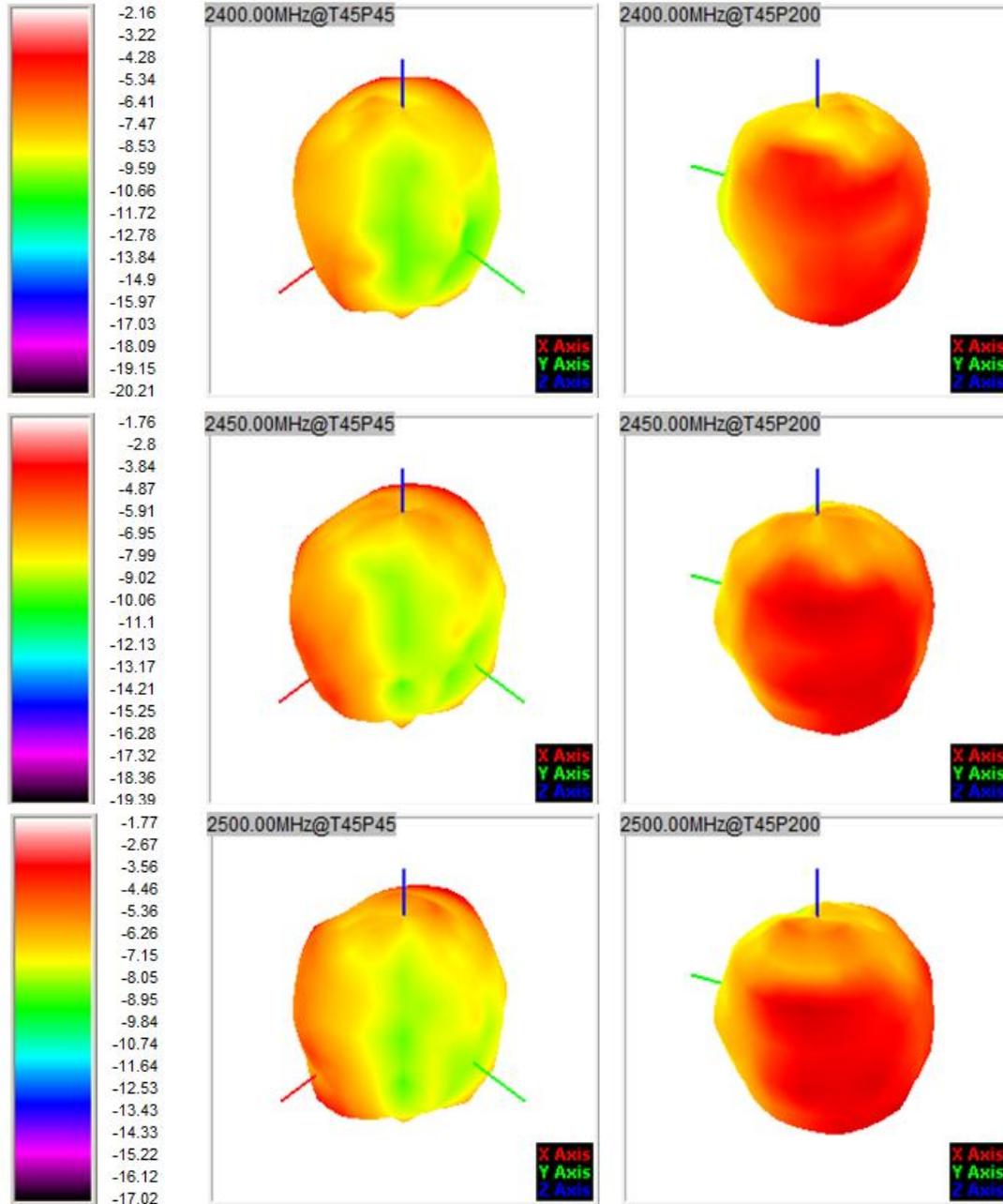
| 天线状态 | FPC样品 | | |
|---------|----------------------------------|--------|-------|
| | WIFI 5000~5800MHz 802.11a 54Mbps | | |
| Channel | 36 | 161 | 165 |
| TRP | 10.91 | 11.28 | 11.31 |
| TIS | -67.36 | -67.82 | -66.4 |

WIFI 1(R)天线效率

| FEITUKEJI | | | | | | | | | | | |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Frequency ID | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Frequency (MHz) | 2400.0 | 2410.0 | 2420.0 | 2430.0 | 2440.0 | 2450.0 | 2460.0 | 2470.0 | 2480.0 | 2490.0 | 2500.0 |
| Point Values | | | | | | | | | | | |
| Ant. Port Input Pwr. (dBm) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Tot. Rad. Pwr. (dBm) | -6.41 | -6.42 | -6.39 | -6.17 | -6.14 | -5.87 | -5.99 | -6.21 | -6.18 | -6.01 | -5.88 |
| Peak EIRP (dBm) | -2.16 | -2.22 | -2.16 | -1.90 | -1.88 | -1.76 | -2.02 | -2.13 | -2.18 | -2.02 | -1.77 |
| Directivity (dBi) | 4.25 | 4.21 | 4.23 | 4.27 | 4.26 | 4.10 | 3.98 | 4.08 | 4.00 | 3.99 | 4.10 |
| Efficiency (dB) | -6.41 | -6.42 | -6.39 | -6.17 | -6.14 | -5.87 | -5.99 | -6.21 | -6.18 | -6.01 | -5.88 |
| Efficiency (%) | 22.80 | 22.80 | 23.00 | 24.20 | 24.30 | 25.90 | 25.20 | 24.00 | 24.10 | 25.10 | 25.90 |
| Gain (dBi) | -2.16 | -2.22 | -2.16 | -1.90 | -1.88 | -1.76 | -2.02 | -2.13 | -2.18 | -2.02 | -1.77 |
| NHPRP $\pm\pi/4$ (dBm) | -7.78 | -7.76 | -7.71 | -7.47 | -7.43 | -7.15 | -7.26 | -7.47 | -7.43 | -7.25 | -7.10 |
| NHPRP $\pm\pi/6$ (dBm) | -9.24 | -9.21 | -9.14 | -8.88 | -8.84 | -8.55 | -8.68 | -8.89 | -8.86 | -8.66 | -8.50 |
| NHPRP $\pm\pi/8$ (dBm) | -10.27 | -10.24 | -10.16 | -9.90 | -9.85 | -9.57 | -9.70 | -9.92 | -9.89 | -9.69 | -9.51 |
| Upper Hem. PRP (dBm) | -9.04 | -9.04 | -8.99 | -8.74 | -8.71 | -8.42 | -8.55 | -8.77 | -8.77 | -8.62 | -8.50 |
| Lower Hem. PRP (dBm) | -9.84 | -9.86 | -9.86 | -9.66 | -9.64 | -9.38 | -9.50 | -9.71 | -9.67 | -9.46 | -9.30 |
| Upper Hem. PRP (%) | 12.47 | 12.46 | 12.63 | 13.36 | 13.46 | 14.38 | 13.95 | 13.26 | 13.28 | 13.73 | 14.12 |
| Lower Hem. PRP (%) | 10.37 | 10.32 | 10.32 | 10.82 | 10.87 | 11.53 | 11.21 | 10.70 | 10.80 | 11.33 | 11.74 |



天线方向图和苹果图



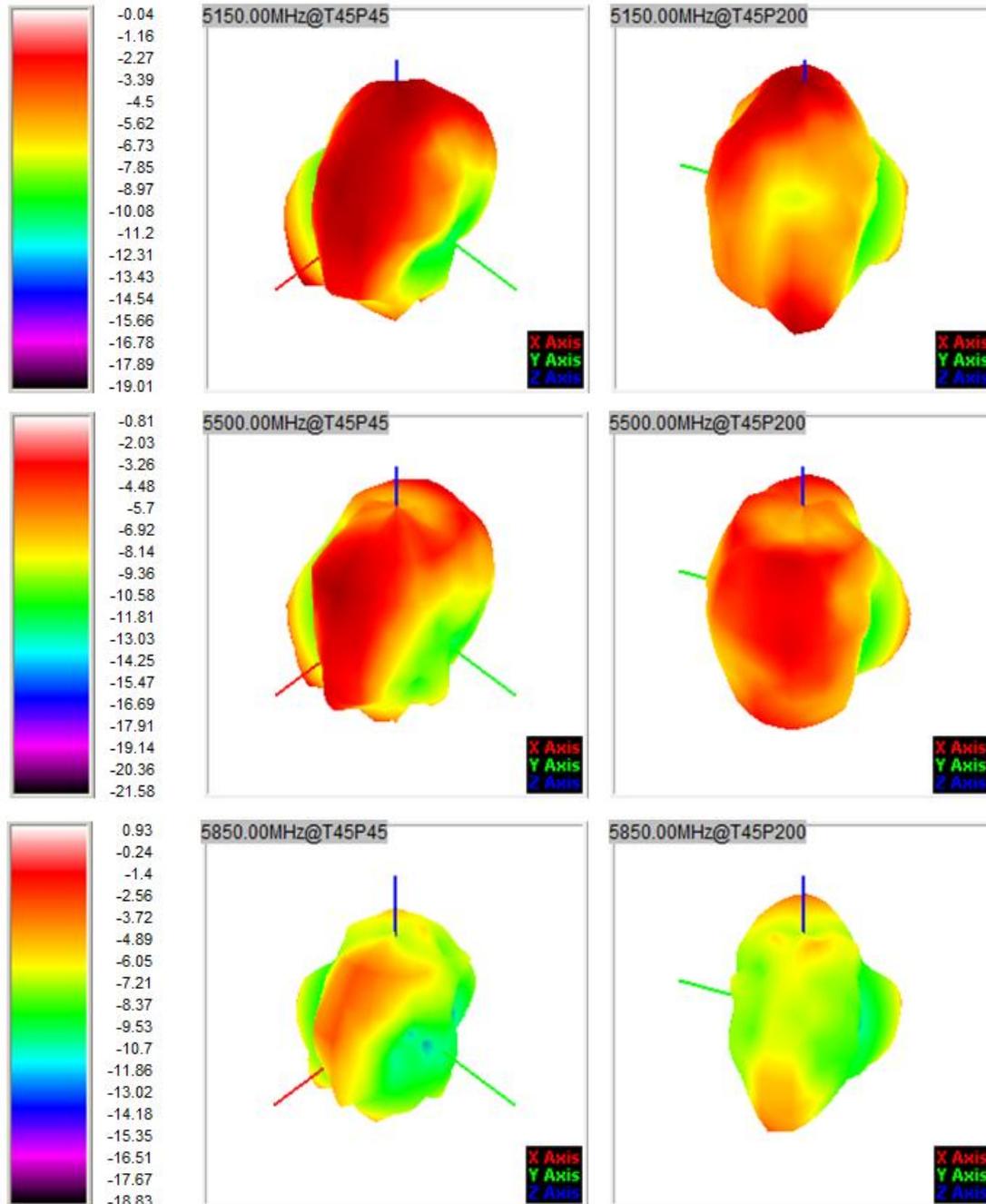


WIFI 1(R)天线效率

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 5150.0 | 5200.0 | 5250.0 | 5300.0 | 5350.0 | 5400.0 | 5450.0 | 5500.0 | 5550.0 | 5600.0 | 5650.0 | 5700.0 | 5750.0 | 5800.0 | 5850.0 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| -5.71 | -5.97 | -6.10 | -6.22 | -6.22 | -6.00 | -6.03 | -6.15 | -5.79 | -5.28 | -5.52 | -5.30 | -5.00 | -4.94 | -4.87 |
| -0.04 | -0.22 | -0.56 | -0.92 | -0.56 | -0.62 | -1.74 | -0.81 | 0.17 | 0.19 | 0.68 | 0.76 | 0.53 | 0.94 | 0.93 |
| 5.67 | 5.76 | 5.55 | 5.29 | 5.66 | 5.38 | 4.29 | 5.34 | 5.96 | 5.48 | 6.20 | 6.05 | 5.53 | 5.88 | 5.79 |
| -5.71 | -5.97 | -6.10 | -6.22 | -6.22 | -6.00 | -6.03 | -6.15 | -5.79 | -5.28 | -5.52 | -5.30 | -5.00 | -4.94 | -4.87 |
| 26.90 | 25.30 | 24.50 | 23.90 | 23.90 | 25.10 | 24.90 | 24.30 | 26.40 | 29.60 | 28.00 | 29.50 | 31.60 | 32.10 | 32.60 |
| -0.04 | -0.22 | -0.56 | -0.92 | -0.56 | -0.62 | -1.74 | -0.81 | 0.17 | 0.19 | 0.68 | 0.76 | 0.53 | 0.94 | 0.93 |
| -7.66 | -7.92 | -8.10 | -8.10 | -8.09 | -7.97 | -7.83 | -7.95 | -7.59 | -6.97 | -7.26 | -7.08 | -6.77 | -6.80 | -6.70 |
| -9.38 | -9.64 | -9.90 | -9.93 | -9.99 | -9.91 | -9.62 | -9.75 | -9.36 | -8.62 | -8.97 | -8.82 | -8.45 | -8.53 | -8.42 |
| -10.66 | -10.94 | -11.29 | -11.35 | -11.48 | -11.39 | -10.96 | -11.06 | -10.60 | -9.75 | -10.16 | -10.04 | -9.60 | -9.71 | -9.62 |
| -8.50 | -8.64 | -8.67 | -8.88 | -8.80 | -8.47 | -8.64 | -8.66 | -8.37 | -8.13 | -8.32 | -8.21 | -8.02 | -7.79 | -7.83 |
| -8.95 | -9.36 | -9.60 | -9.61 | -9.71 | -9.62 | -9.48 | -9.72 | -9.28 | -8.46 | -8.76 | -8.41 | -8.01 | -8.11 | -7.93 |
| 14.11 | 13.69 | 13.57 | 12.94 | 13.20 | 14.21 | 13.68 | 13.61 | 14.56 | 15.37 | 14.72 | 15.11 | 15.79 | 16.62 | 16.48 |
| 12.74 | 11.59 | 10.96 | 10.95 | 10.69 | 10.91 | 11.26 | 10.66 | 11.80 | 14.26 | 13.31 | 14.44 | 15.81 | 15.47 | 16.12 |



天线方向图和苹果图

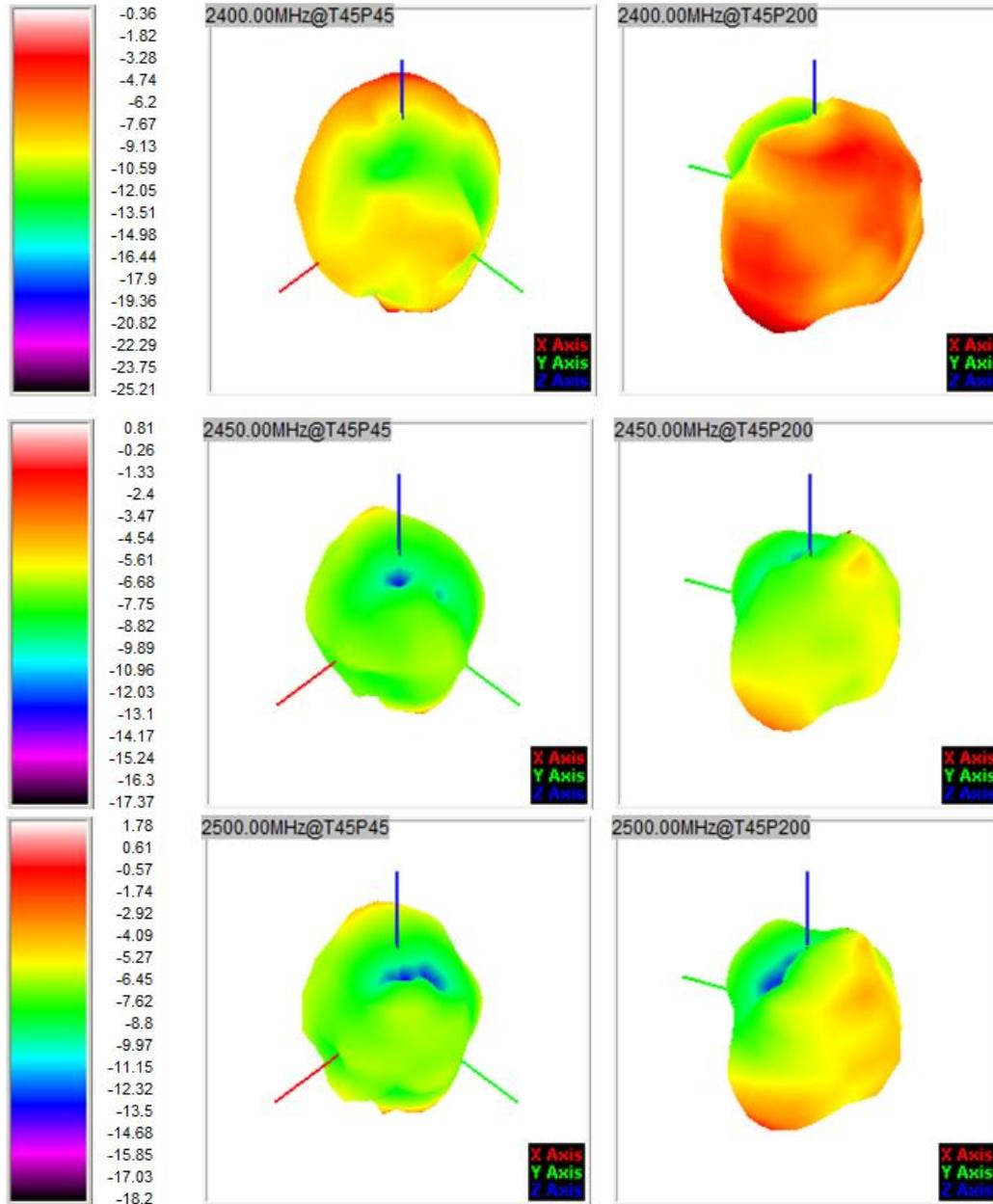




WIFI 1(L)天线效率

| FETUKEJI | | | | | | | | | | | |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Frequency ID | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Frequency (MHz) | 2400.0 | 2410.0 | 2420.0 | 2430.0 | 2440.0 | 2450.0 | 2460.0 | 2470.0 | 2480.0 | 2490.0 | 2500.0 |
| Point Values | | | | | | | | | | | |
| Ant. Port Input Pwr. (dBm) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Tot. Rad. Pwr. (dBm) | -6.02 | -5.95 | -5.93 | -5.49 | -5.61 | -5.05 | -5.14 | -5.03 | -4.83 | -4.32 | -4.19 |
| Peak EIRP (dBm) | -0.36 | -0.14 | -0.08 | 0.39 | 0.27 | 0.81 | 0.64 | 0.76 | 1.10 | 1.68 | 1.78 |
| Directivity (dBi) | 5.67 | 5.81 | 5.85 | 5.88 | 5.88 | 5.86 | 5.78 | 5.79 | 5.93 | 6.00 | 5.97 |
| Efficiency (dB) | -6.02 | -5.95 | -5.93 | -5.49 | -5.61 | -5.05 | -5.14 | -5.03 | -4.83 | -4.32 | -4.19 |
| Efficiency (%) | 25.00 | 25.40 | 25.50 | 28.30 | 27.50 | 31.30 | 30.60 | 31.40 | 32.90 | 37.00 | 38.10 |
| Gain (dBi) | -0.36 | -0.14 | -0.08 | 0.39 | 0.27 | 0.81 | 0.64 | 0.76 | 1.10 | 1.68 | 1.78 |
| NHPRP $\pm\pi/4$ (dBm) | -7.81 | -7.69 | -7.64 | -7.18 | -7.31 | -6.76 | -6.86 | -6.74 | -6.53 | -6.01 | -5.88 |
| NHPRP $\pm\pi/6$ (dBm) | -9.48 | -9.32 | -9.23 | -8.73 | -8.84 | -8.29 | -8.40 | -8.29 | -8.10 | -7.60 | -7.50 |
| NHPRP $\pm\pi/8$ (dBm) | -10.80 | -10.59 | -10.45 | -9.91 | -9.99 | -9.41 | -9.51 | -9.40 | -9.21 | -8.74 | -8.68 |
| Upper Hem. PRP (dBm) | -9.66 | -9.59 | -9.62 | -9.24 | -9.45 | -9.01 | -9.23 | -9.23 | -9.09 | -8.60 | -8.46 |
| Lower Hem. PRP (dBm) | -8.49 | -8.41 | -8.36 | -7.86 | -7.92 | -7.28 | -7.29 | -7.10 | -6.87 | -6.35 | -6.22 |
| Upper Hem. PRP (%) | 10.81 | 10.99 | 10.91 | 11.90 | 11.35 | 12.55 | 11.93 | 11.94 | 12.34 | 13.79 | 14.24 |
| Lower Hem. PRP (%) | 14.17 | 14.42 | 14.60 | 16.36 | 16.15 | 18.72 | 18.68 | 19.49 | 20.56 | 23.19 | 23.89 |

天线方向图和苹果图



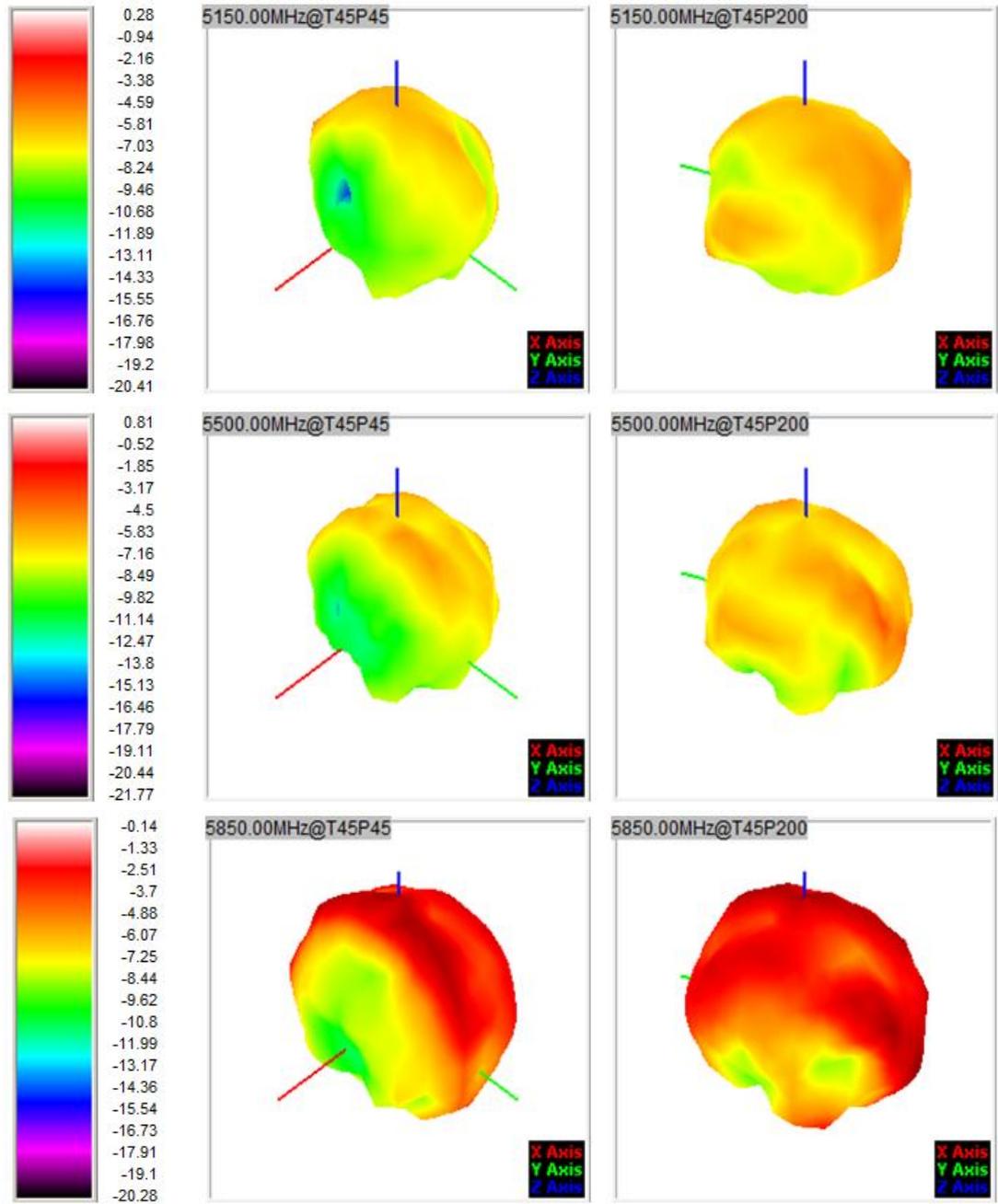


WIFI 1(L)天线效率

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 5150.0 | 5200.0 | 5250.0 | 5300.0 | 5350.0 | 5400.0 | 5450.0 | 5500.0 | 5550.0 | 5600.0 | 5650.0 | 5700.0 | 5750.0 | 5800.0 | 5850.0 |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| -4.22 | -4.00 | -3.96 | -3.72 | -3.56 | -3.32 | -3.69 | -4.34 | -4.77 | -4.36 | -4.82 | -5.48 | -5.49 | -5.53 | -5.54 |
| 0.28 | 0.46 | 0.68 | 1.16 | 1.61 | 1.89 | 1.47 | 0.81 | 0.54 | 0.64 | 0.25 | -0.46 | -0.38 | -0.45 | -0.14 |
| 4.50 | 4.45 | 4.64 | 4.88 | 5.17 | 5.21 | 5.16 | 5.15 | 5.31 | 5.01 | 5.07 | 5.02 | 5.11 | 5.08 | 5.39 |
| -4.22 | -4.00 | -3.96 | -3.72 | -3.56 | -3.32 | -3.69 | -4.34 | -4.77 | -4.36 | -4.82 | -5.48 | -5.49 | -5.53 | -5.54 |
| 37.80 | 39.80 | 40.10 | 42.50 | 44.10 | 46.60 | 42.70 | 36.80 | 33.30 | 36.60 | 33.00 | 28.30 | 28.20 | 28.00 | 28.00 |
| 0.28 | 0.46 | 0.68 | 1.16 | 1.61 | 1.89 | 1.47 | 0.81 | 0.54 | 0.64 | 0.25 | -0.46 | -0.38 | -0.45 | -0.14 |
| -5.67 | -5.49 | -5.47 | -5.08 | -4.98 | -4.84 | -5.14 | -5.80 | -6.25 | -5.77 | -6.34 | -7.08 | -7.05 | -7.12 | -7.08 |
| -7.08 | -6.93 | -6.93 | -6.50 | -6.45 | -6.36 | -6.56 | -7.29 | -7.78 | -7.26 | -7.87 | -8.58 | -8.52 | -8.64 | -8.60 |
| -8.19 | -8.06 | -8.09 | -7.61 | -7.62 | -7.57 | -7.69 | -8.50 | -9.02 | -8.47 | -9.14 | -9.79 | -9.68 | -9.83 | -9.80 |
| -6.23 | -5.88 | -5.84 | -5.71 | -5.41 | -5.14 | -5.65 | -6.20 | -6.61 | -6.30 | -6.61 | -7.27 | -7.37 | -7.37 | -7.49 |
| -8.54 | -8.54 | -8.52 | -8.05 | -8.15 | -7.97 | -8.10 | -8.92 | -9.38 | -8.80 | -9.53 | -10.18 | -10.03 | -10.16 | -9.95 |
| 23.82 | 25.85 | 26.08 | 26.84 | 28.75 | 30.62 | 27.23 | 23.97 | 21.82 | 23.44 | 21.84 | 18.73 | 18.32 | 18.34 | 17.84 |
| 14.01 | 13.99 | 14.06 | 15.65 | 15.31 | 15.98 | 15.48 | 12.82 | 11.52 | 13.17 | 11.13 | 9.59 | 9.93 | 9.63 | 10.11 |



天线方向图和苹果图





WIFI实测图

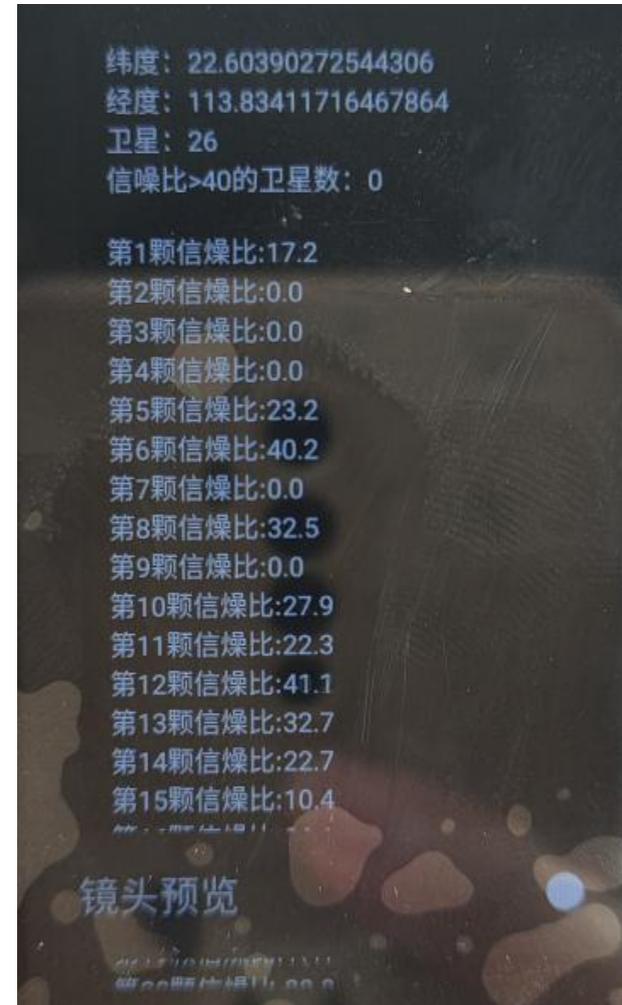


环境处理说明

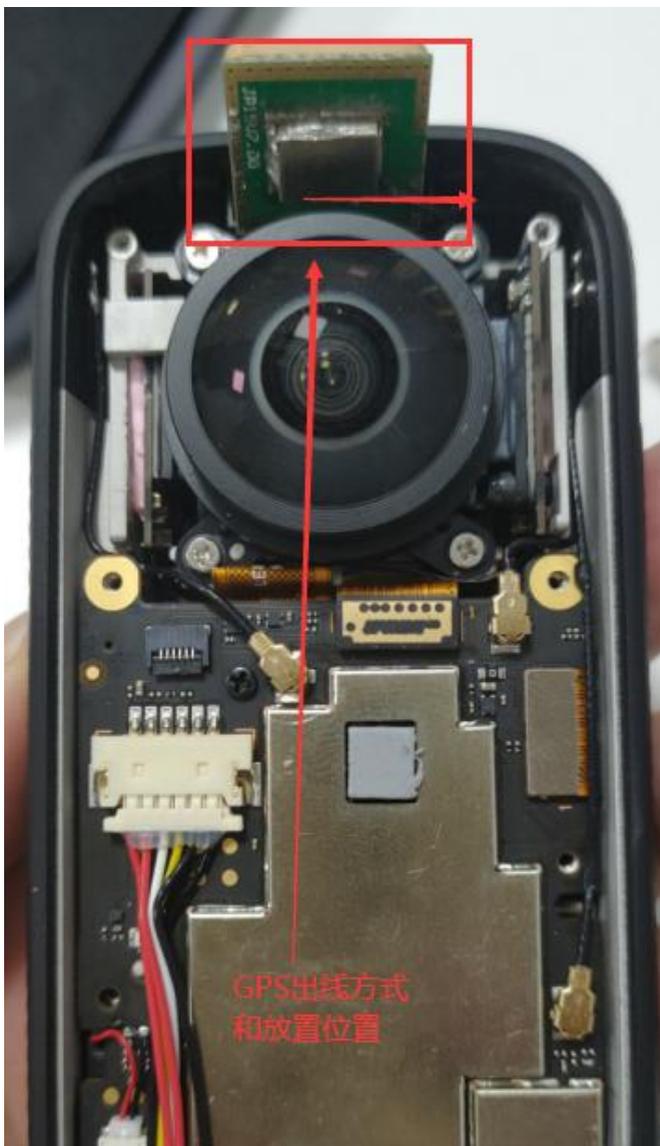
按贵司所给样机环境处理去做



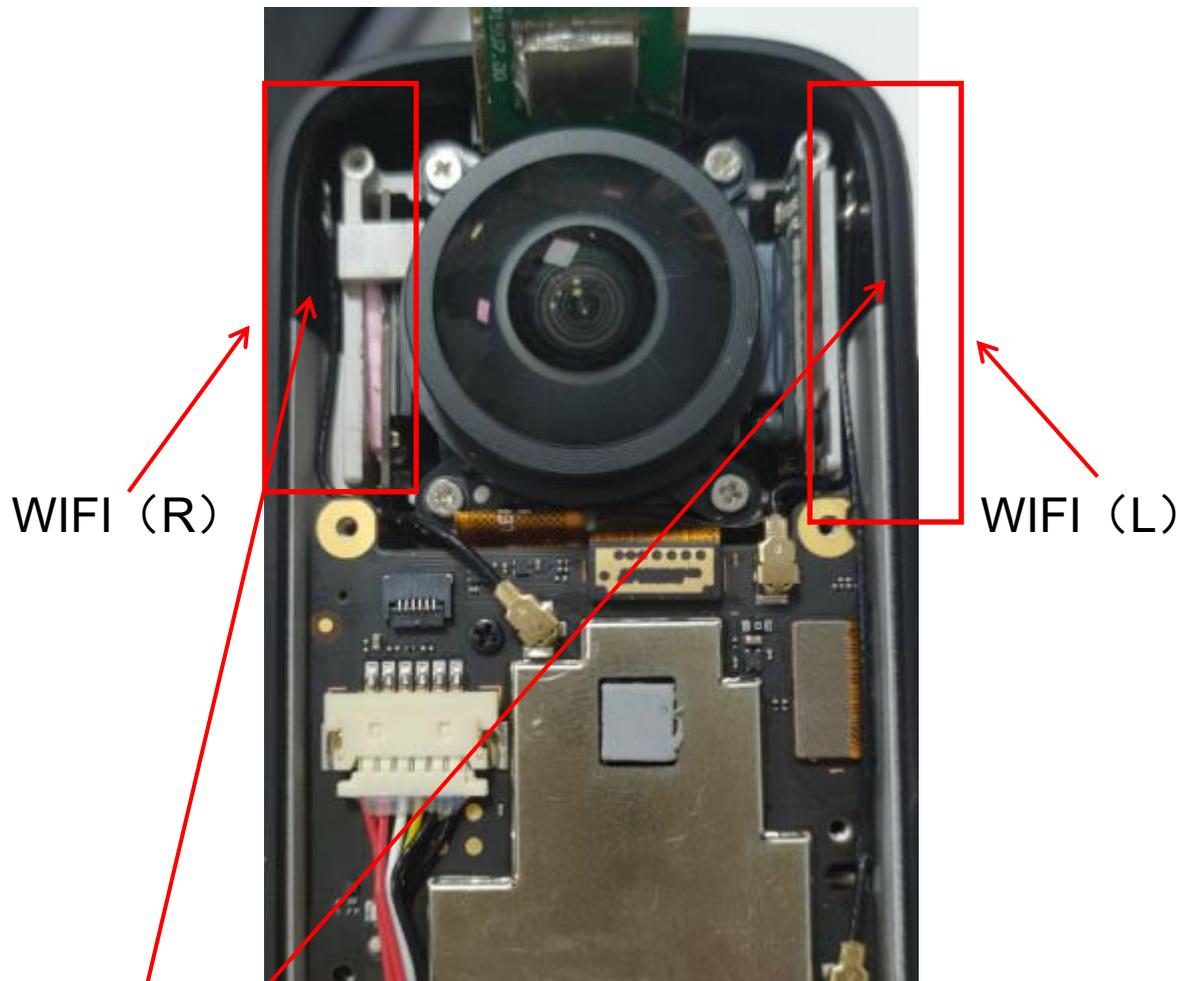
WIFI实测图



GPS实测图



GPS出线方式和放置位置



WIFI (R)

WIFI (L)

WIFI天线位置

焊点位置旁天线打胶固定



提示说明

提示：

- 一、此数据只针对客户提供样机所产生的数据，不代表客户最终量产状态；
- 二、请客户仔细确认我司报告中，匹配电路修改及环境处理说明；
- 三、量产前请配合提供试产样机来我司二次验证；如有更换物料、更新软件及环境处理等，请提前告知；
- 四、如客户需要第三方复测，或者送客户测试，请到我司验证后再送样机；防止机器与调试机有差异；
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