



深圳市凯普深通讯科技有限公司
Shenzhen cape deep communication technology co., LTD

天线测试报告

Antenna Test Report

客 户 Customer: 福诺格 Fu nuoge

项目名 Project Name: S61

测试工程师: Test Engineer 江长兴 Jiangchangxing

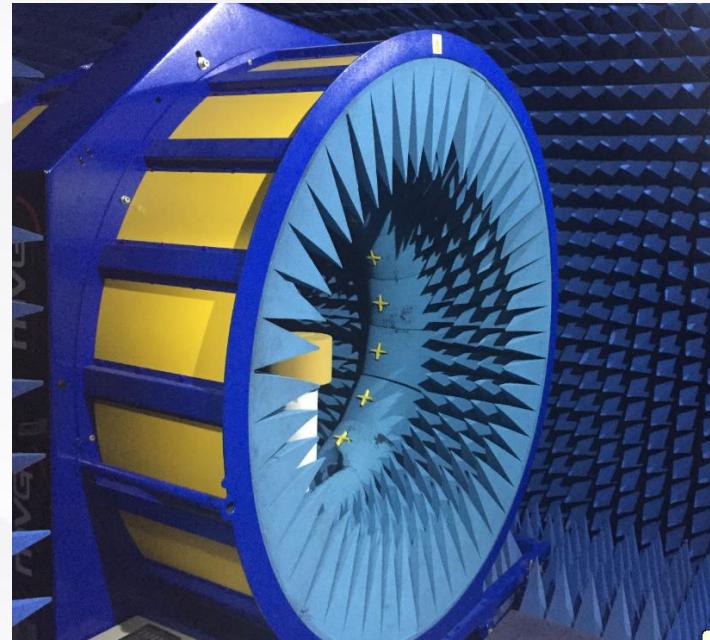
日 期 Date: 2024.8.27



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实验室测试环境及设备

Laboratory testing environment and equipment



| 测试项目Test project | 测试设备Testing equipment |
|---|---|
| S11、S12、VSWR、LOSS | 网络分析仪network analyzer E5071B、E5062A |
| Efficiency、Gain 3D Radiation Pattern | Satimo SG16暗室darkroom、GP7*4*3暗室 darkroom、E5071B |
| TRP、TIS | Satimo SG16暗室darkroom、GP7*4*3暗室 darkroom、8960、CMW500、MT8820C、 E4438C、 |



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项目调试简介

Introduction to Project Debugging

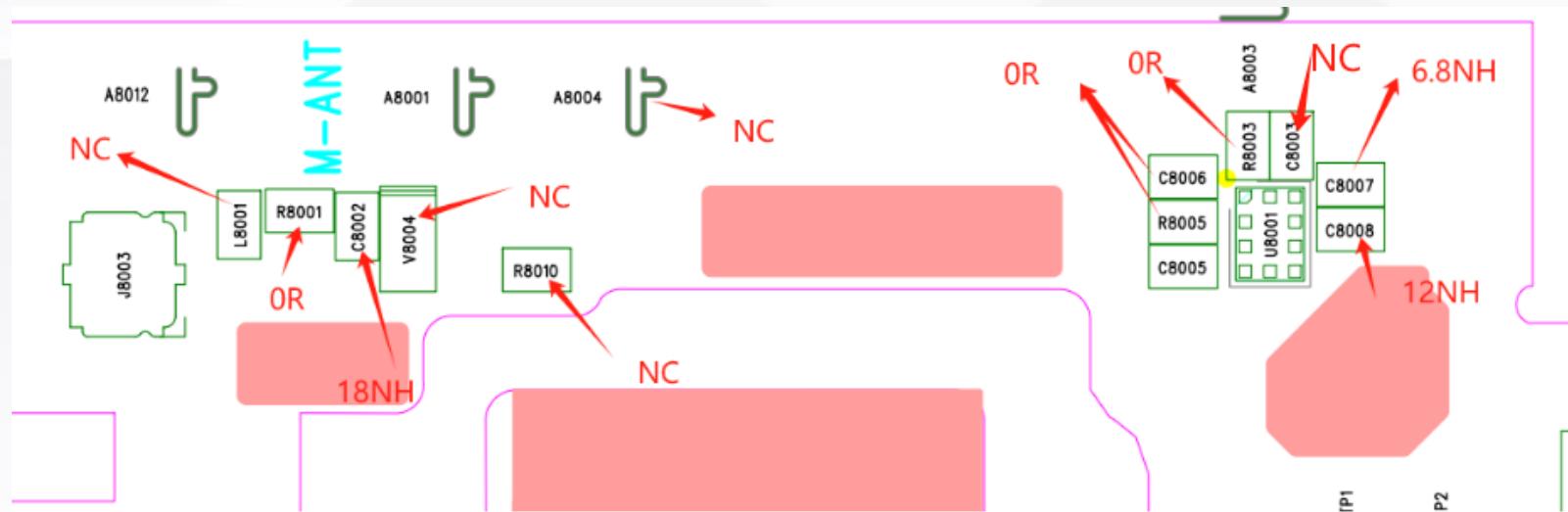
| 整机类型 Machine type | 手机mobile phone | | | |
|--|---|--|-----------------------|--|
| 天线种类及频段信息 Antenna type and frequency band information | 频段信息 Frequency band information | 天线形式 Antenna form | 匹配改动 Match changes | |
| | 主天线Main antenna | GSM850/900/1800/1900 WCDMA/2/4/5 LTE-B2/4/5/7/12/25/26 66/71/41 | PIFA | 是YES |
| | 副天线Secondary antenna | WIFI,BT,GPS (三合一Three in one) | PIFA | 否NO |
| | 分集diversity | 2000MHZ-2690MHZ | PIFA | 否NO |
| 天线材质 Antenna material | 主天线Main antenna , 副天线Secondary antenna , 分集FPCdiversity | | | 深圳市凯普深通讯科技有限公司 Shenzhen cape deep communication technology co., LTD |



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主天线开关匹配电路

Main antenna switch matching circuit





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主天线开关匹配电路

Main antenna switch matching circuit

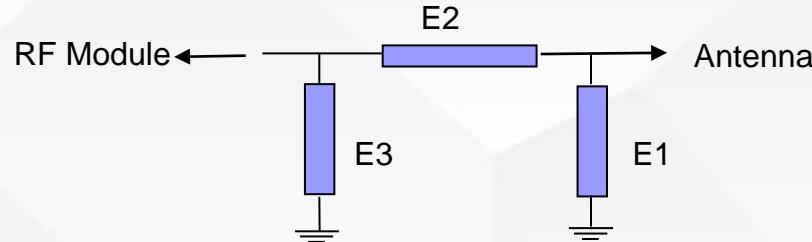
| 单刀四掷开关 Single pole four throw switch | | 匹配matching | 逻辑对应频段Logical corresponding frequency band |
|--|-----|------------|---|
| | RF1 | 0R | 2G: 850/GSM900 3G:W5 4G:5/26 |
| | RF2 | 0R | 2G:DCS1800/PCS1900 3G:W2/4 4G:LTE2/4/7/25/66/41 |
| | RF3 | 6.8NH | 4G:12 |
| | RF4 | 12NH | 4G:71 |



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三合一天线匹配电路

Three in one antenna matching circuit

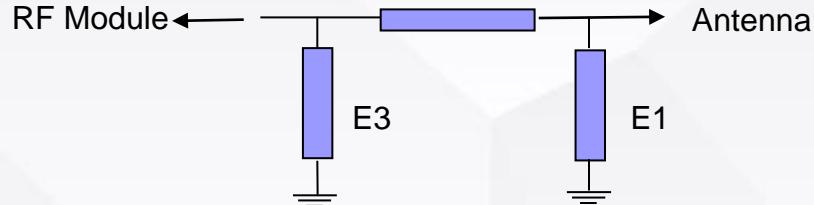


| 三合一天线 Three in one antenna | Element | Value | 附图说明 Attached image description |
|----------------------------------|----------|-------|---|
| | E1(0402) | | 主板原有匹配 Original motherboard matching |
| | E2(0402) | | |
| | E3(0402) | | |



分集天线匹配电路

Diversity antenna matching circuit



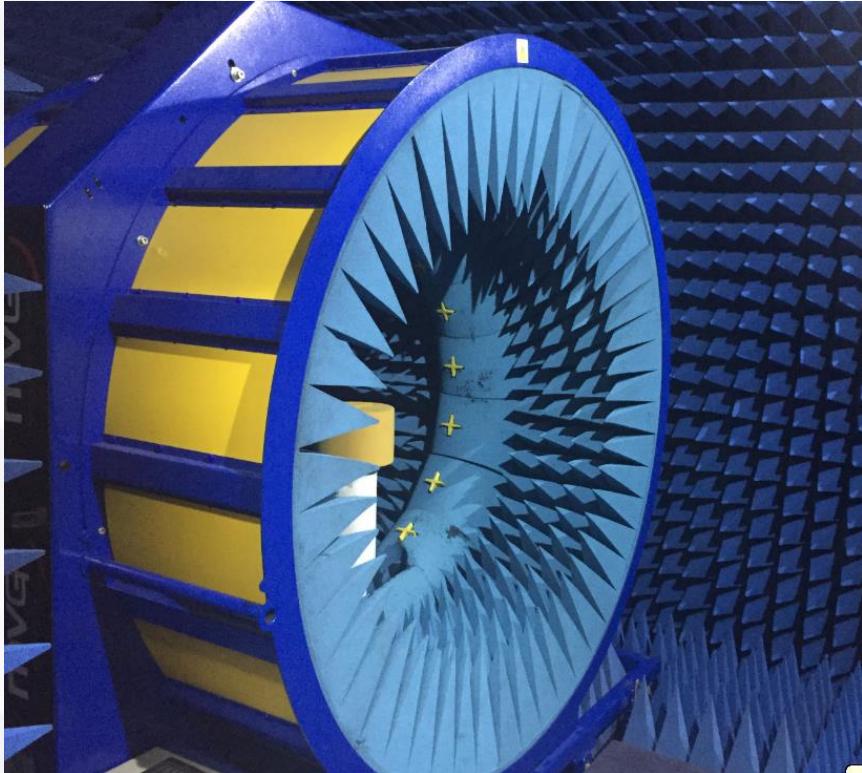
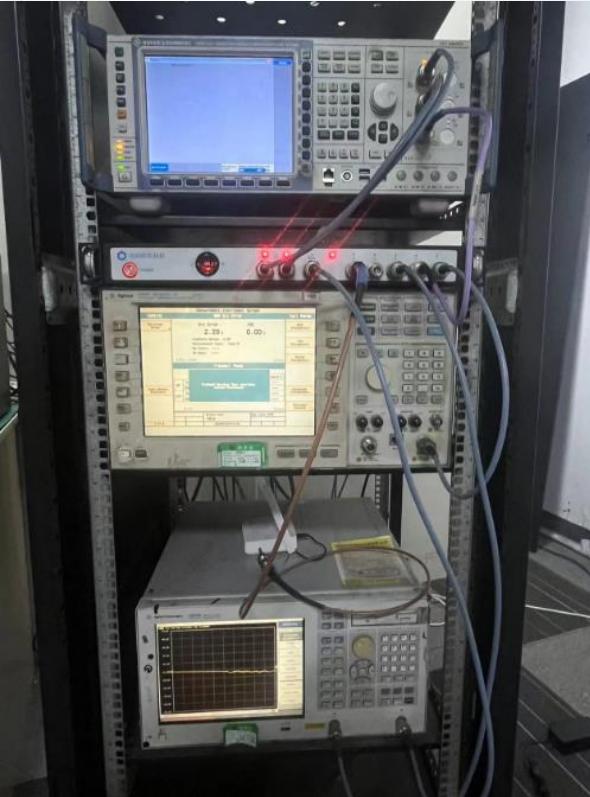
| 分集天线 Diversity antenna | Element | Value | 附图说明 Attached image description |
|---------------------------|----------|-------|---|
| | E1(0402) | | 主板原有匹配 Original motherboard matching |
| | E2(0402) | | |
| | E3(0402) | | |



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测试设备配置

Test equipment configuration





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仪器 instrument

| Equipment | Manufacturer | Model NO | Serial NO . | Last CAL | Due Date |
|-------------------------------|----------------|----------|-------------|-----------|-----------|
| 网络分析仪 Network analyzers | 安捷伦 Agilent | E5071B | | 2024.4.25 | 2025.4.24 |
| 综合测试仪 Comprehensive Tester | ROHDE SCHWARZ | CMW-500 | | 2024.4.25 | 2025.4.24 |
| 综合测试仪 Comprehensive Tester | 安捷伦 Agilent | 8960 | | 2024.4.25 | 2025.4.24 |
| | | | | | |



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测试软件 Test the software

The screenshot shows the Wave Studio 1.8.11 software interface. The main window displays a table of measurements. The columns include Status, Id, Position, Standard, Measurement, Propagation Model, and Band. The table contains numerous entries, mostly marked with a green checkmark in the Status column. The 'Measurement' column includes various types such as LTE, RSSI, Sensitivity with, Radiated Power, and Line of sight. The 'Band' column shows values ranging from 1 to 38. The top menu bar includes File, System, Edit, and Export. Below the menu is a toolbar with buttons for Settings, New, Move up, Activate, Delete, Comments, Clone, Move down, Remove, Skip, Mode, Measurement, and Result. On the left, there is a vertical sidebar with tabs for Device, Measurement, Result, and System.

| Status | Id | Position | Standard | Measurement | Propagation Model | Band |
|--------|------|----------|----------|------------------|-------------------|------|
| ✓ | #049 | 1 | LTE | RSSI | Line of sight | 1 |
| ✓ | #050 | 1 | LTE | Sensitivity with | Line of sight | 1 |
| ✓ | #052 | 1 | LTE | Radiated Power | Line of sight | 3 |
| ✓ | #053 | 1 | LTE | RSSI | Line of sight | 3 |
| ✓ | #054 | 1 | LTE | Sensitivity with | Line of sight | 3 |
| ✓ | #055 | 1 | LTE | Radiated Power | Line of sight | 5 |
| ✓ | #056 | 1 | LTE | RSSI | Line of sight | 5 |
| ✓ | #057 | 1 | LTE | Sensitivity with | Line of sight | 5 |
| ✓ | #058 | 1 | LTE | Radiated Power | Line of sight | 8 |
| ✓ | #059 | 1 | LTE | RSSI | Line of sight | 8 |
| ✓ | #060 | 1 | LTE | Sensitivity with | Line of sight | 8 |
| ✓ | #051 | 1 | LTE | Radiated Power | Line of sight | 18 |
| ✓ | #052 | 1 | LTE | RSSI | Line of sight | 18 |
| ✓ | #063 | 1 | LTE | Sensitivity with | Line of sight | 18 |
| ✓ | #064 | 1 | LTE | Radiated Power | Line of sight | 20 |
| ✓ | #065 | 1 | LTE | RSSI | Line of sight | 20 |
| ✓ | #066 | 1 | LTE | Sensitivity with | Line of sight | 20 |
| ✓ | #067 | 1 | LTE | Radiated Power | Line of sight | 40 |
| ✓ | #068 | 1 | LTE | RSSI | Line of sight | 40 |
| ✓ | #069 | 1 | LTE | Sensitivity with | Line of sight | 40 |
| ✓ | #073 | 1 | LTE | Radiated Power | Line of sight | 41 |
| ✓ | #071 | 1 | LTE | RSSI | Line of sight | 41 |
| ✓ | #072 | 1 | LTE | Sensitivity with | Line of sight | 41 |
| ✓ | #074 | 1 | LTE | Radiated Power | Line of sight | 30 |
| ✓ | #075 | 1 | LTE | Radiated Power | Line of sight | 30 |
| ✓ | #076 | 1 | LTE | Radiated Power | Line of sight | 40 |
| ✓ | #077 | 1 | LTE | Radiated Power | Line of sight | 41 |
| ✓ | #078 | 1 | LTE | Radiated Power | Line of sight | 1 |
| ✓ | #079 | 1 | LTE | Radiated Power | Line of sight | 2 |
| ✓ | #080 | 1 | LTE | Radiated Power | Line of sight | 5 |
| ✓ | #081 | 1 | LTE | Radiated Power | Line of sight | 8 |
| ✓ | #082 | 1 | LTE | RSSI | Line of sight | 8 |
| ✓ | #083 | 1 | LTE | Sensitivity with | Line of sight | 8 |
| ✓ | #084 | 1 | LTE | Radiated Power | Line of sight | 8 |
| ✓ | #085 | 1 | LTE | Sensitivity with | Line of sight | 9 |
| ✓ | #086 | 1 | LTE | Radiated Power | Line of sight | 9 |

Test the software is

软件为 Wave Studio 1.8.11



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测试方法及步骤 Testing methods and steps

1：手机插上测试卡，开机通电之后，将手机放入微波暗室中。

Insert the test card into the phone, power it on, and place it in a microwave darkroom

2：打开暗室测试软件，选择手机支持的频段，按照暗室的操作指南进行下一步

Open the darkroom testing software, select the frequency band supported by your phone, and follow the darkroom operation guide to proceed to the next step

3：待被测物连上CMW500后，关上屏蔽门即可测试

After connecting the test object to CMW500, close the shielding door to proceed with the test



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天线测试数据

Antenna test data

| FS | Channel | TRP | TIS | | Channel | TRP | TIS |
|--------|---------|------|-------|--------|---------|------|-------|
| LTE-2 | L | 18.7 | | LTE-26 | L | 15.5 | |
| | M | 18.5 | | | M | 15.6 | |
| | H | 18.5 | -94.6 | | H | 16.0 | -90.3 |
| LTE-4 | L | 17.8 | | LTE-66 | L | 17.8 | |
| | M | 17.6 | | | M | 18.2 | |
| | H | 17.6 | -91.9 | | H | 18.2 | -91.5 |
| LTE-5 | L | 15.1 | | LTE-71 | L | 16.2 | |
| | M | 15.7 | | | M | 17.4 | |
| | H | 16.0 | -92.6 | | H | 17.7 | -91 |
| LTE-12 | L | 17.3 | | LTE-41 | L | 15.2 | |
| | M | 17.5 | | | M | 14.8 | |
| | H | 17.7 | -92.5 | | H | 14.2 | -88.1 |
| LTE-25 | L | 18.9 | | | | | |
| | M | 18.6 | | | | | |
| | H | 18.4 | -94.8 | | | | |



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天线测试数据

Antenna test data

| FS | Channel | TRP | TIS | | Channel | TRP | TIS |
|-----|---------|------|--------|---------|---------|------|--------|
| W-2 | L | 18.6 | | GSM850 | L | 25.8 | |
| | M | 18.5 | | | M | 25.4 | |
| | H | 18.5 | -105.3 | | H | 25.6 | -99.4 |
| W-4 | L | 17.8 | | EGSM900 | L | 26.3 | |
| | M | 17.8 | | | M | 25.5 | |
| | H | 18.2 | -104.1 | | H | 23.3 | -98.6 |
| W-5 | L | 15.5 | | DCS1800 | L | 24.5 | |
| | M | 15.8 | | | M | 25.3 | |
| | H | 15.5 | -103.6 | | H | 25.3 | -103.7 |
| | | | | PCS1900 | L | 26.2 | |
| | | | | | M | 26.2 | |
| | | | | | H | 25.8 | -104.6 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |



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WiFi有源测试数据

WiFi active test data

WIFI2.4

| Channel | TRP(dBm) | TIS(dBm) |
|---------|----------|----------|
| Low | 10.2 | |
| Mid | 11.1 | |
| Hig | 12.4 | -79.3 |

WIFI5.8 54M

| Channel | TRP(dBm) | TIS(dBm) |
|---------|----------|----------|
| Low | 5.2 | |
| Mid | 6.8 | |
| Hig | 6.0 | -68.7 |

BT

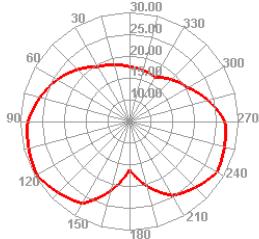
| Channel | TRP(dBm) | TIS(dBm) |
|---------|----------|----------|
| Low | 4.6 | |
| Mid | 5.1 | |
| Hig | 5.4 | -86.3 |



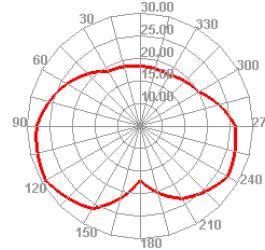
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方向图 Directions

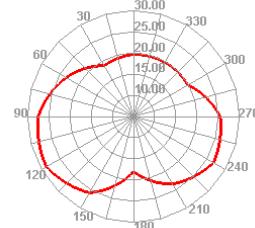
GSM850 128 TRP Phi=45



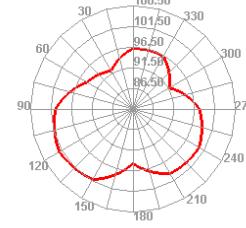
GSM850 190 TRP Phi=45



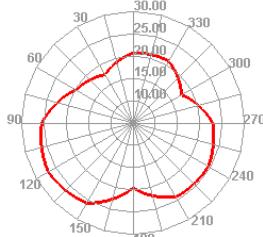
GSM850 251 TRP Phi=45



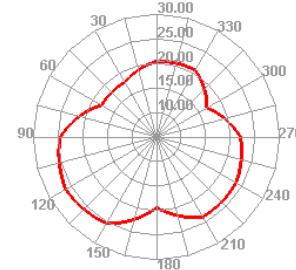
GSM850 251 TIS Phi=45



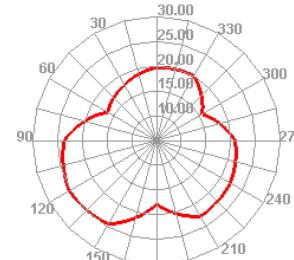
EGSM 1 TRP Phi=45



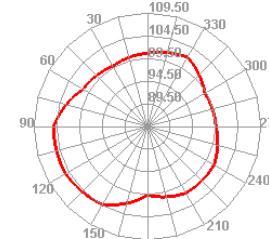
EGSM 62 TRP Phi=45



EGSM 124 TRP Phi=45



EGSM 124 TIS Phi=45

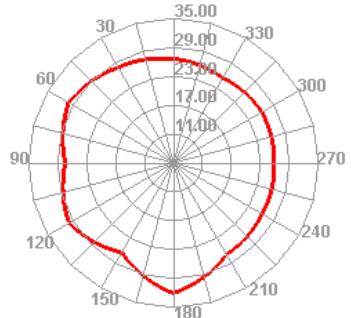




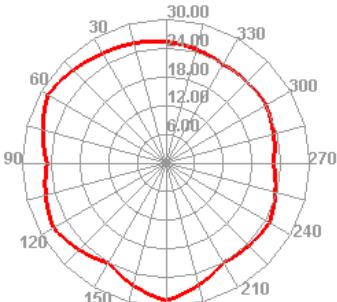
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方向图Directions

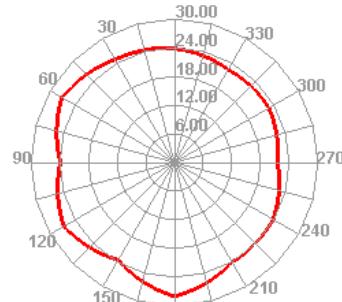
DCS 512 TRP Phi=45



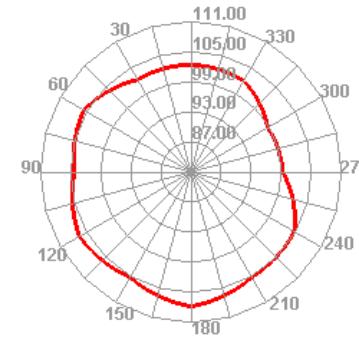
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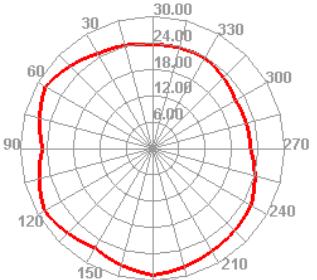
DCS 885 TRP Phi=45



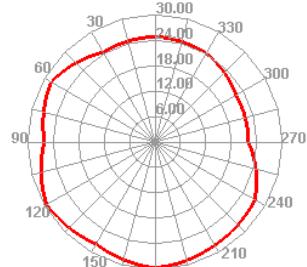
DCS 885 TIS Phi=45



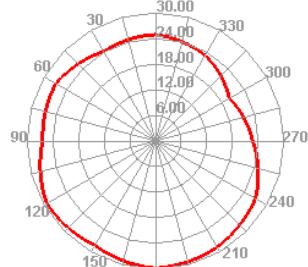
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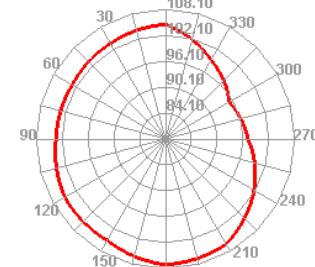
PCS 661 TRP Phi=45



PCS 810 TRP Phi=45



PCS 810 TIS Phi=45

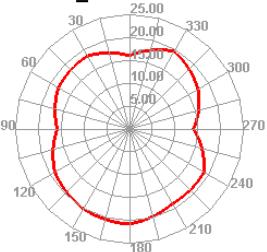




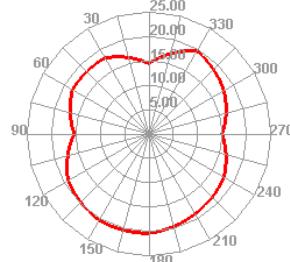
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方向图Directions

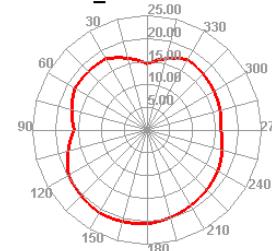
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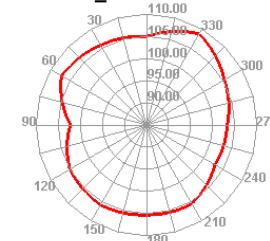
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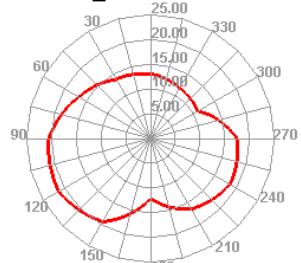
WCDMA_II 9538 TRP Phi=45



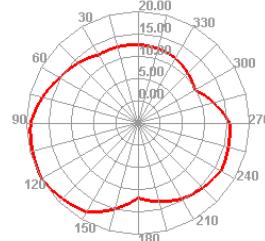
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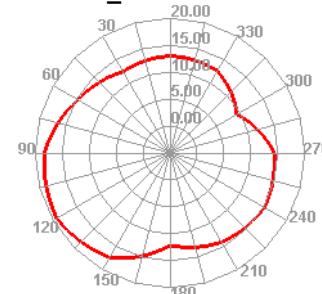
WCDMA_V 4132 TRP Phi=45



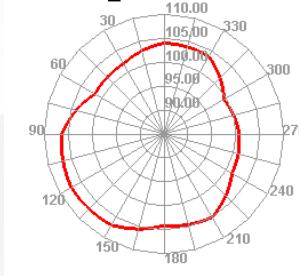
WCDMA_V 4185 TRP Phi=45



WCDMA_V 4233 TRP Phi=45



WCDMA_V 4458 TIS Phi=45

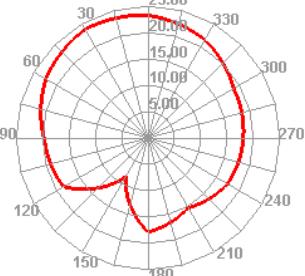




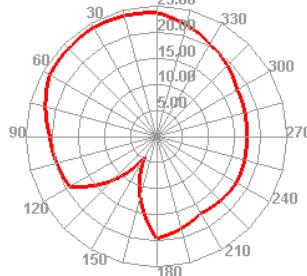
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方向图Directions

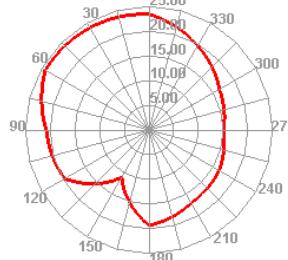
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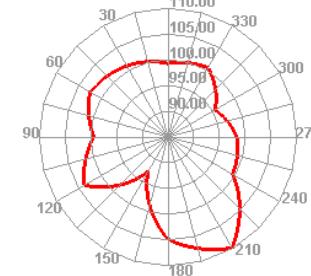
WCDMA_IV 1413 TRP Phi=45



WCDMA_IV 1513 TRP Phi=45



WCDMA_IV 1738 TIS Phi=45

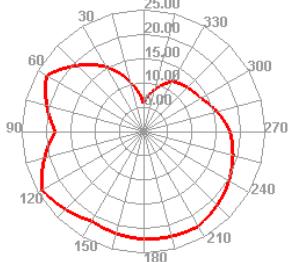




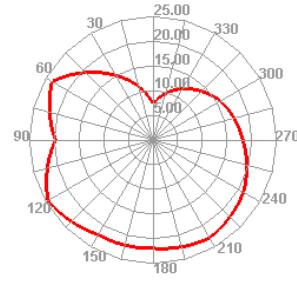
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2D方向图 2DDirections

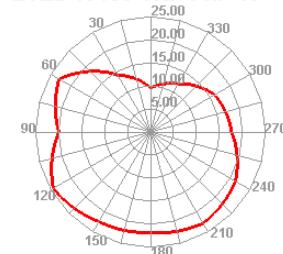
LTE2 18650 TRP Phi=45



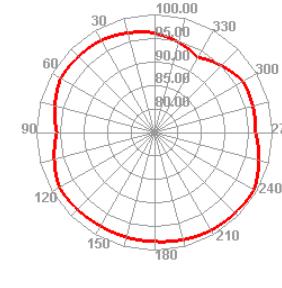
LTE2 18900 TRP Phi=45



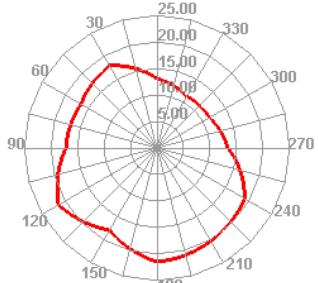
LTE2 19150 TRP Phi=45



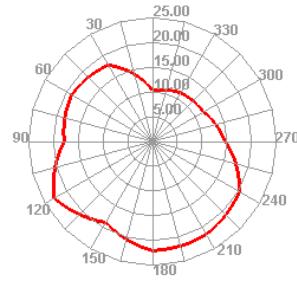
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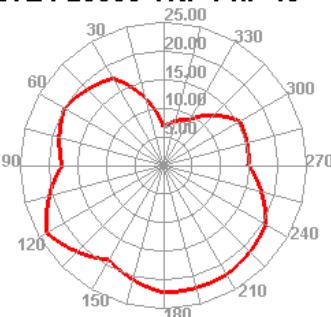
LTE4 20000 TRP Phi=45



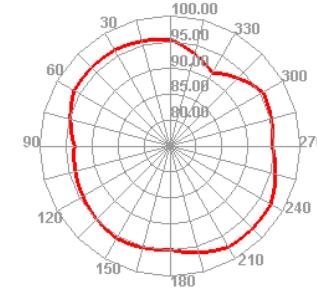
LTE4 20175 TRP Phi=45



LTE4 20350 TRP Phi=45



LTE4 2350 TIS Phi=45

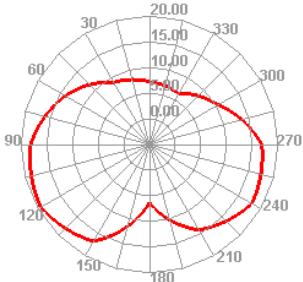




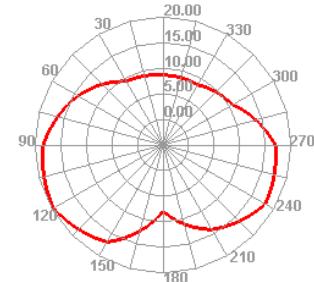
凯普深

2D方向图 2DDirections

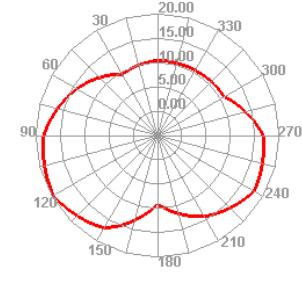
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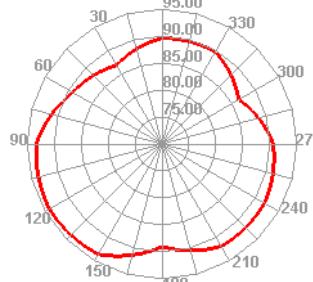
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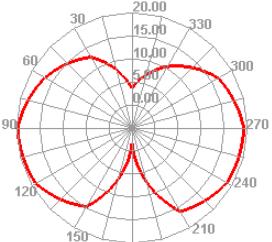
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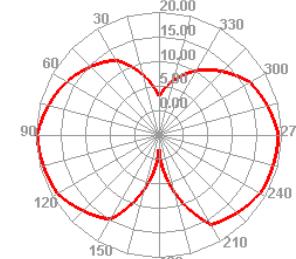
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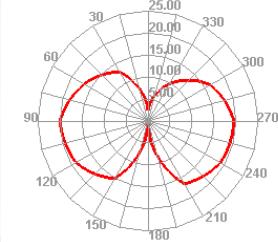
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LTE12 23130 TRP Phi=45



LTE12 5130 TIS Phi=45

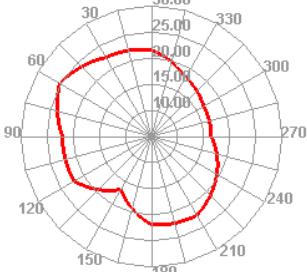




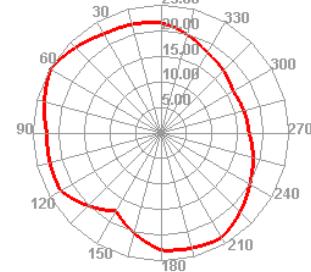
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2D方向图 2DDirections

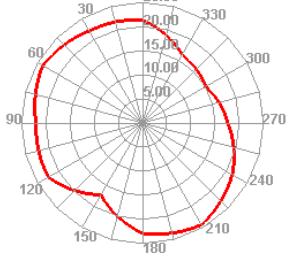
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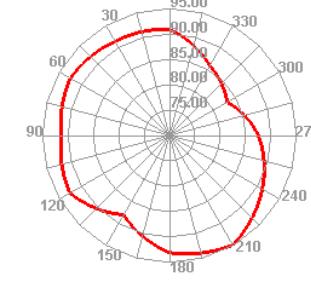
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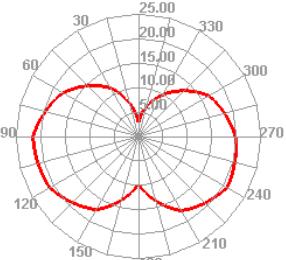
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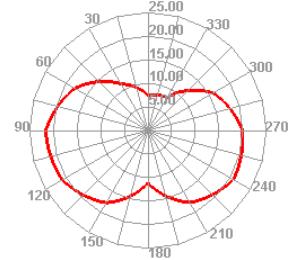
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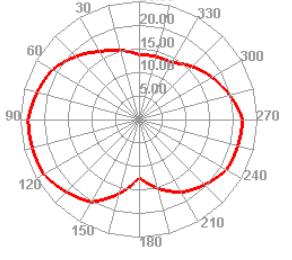
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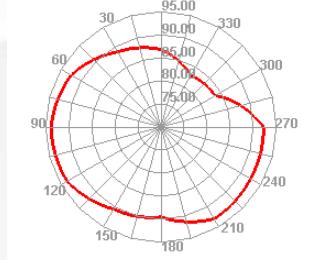
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LTE26 26990 TRP Phi=45



LTE26 8990 TIS Phi=45

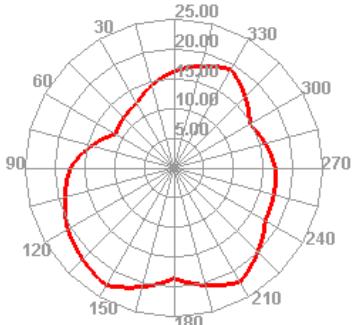




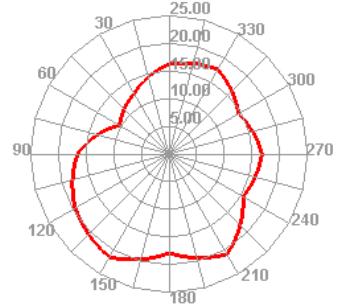
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2D方向图 2DDirections

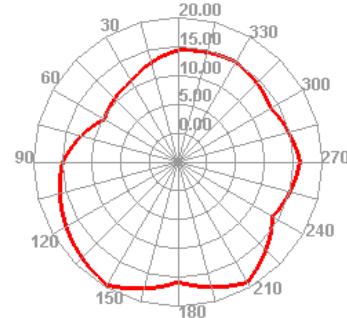
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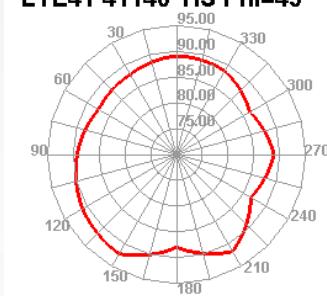
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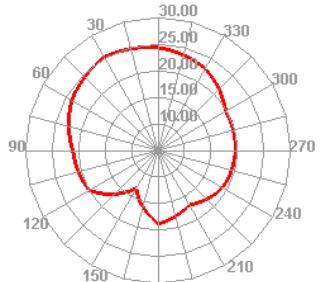
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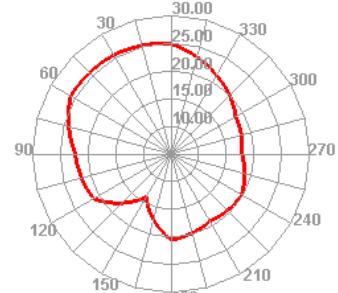
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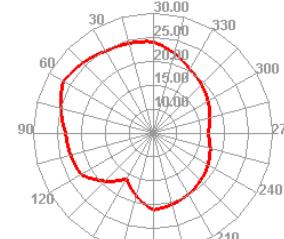
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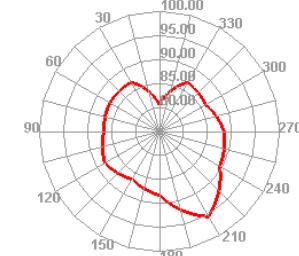
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LTE66 132622 TRP Phi=45



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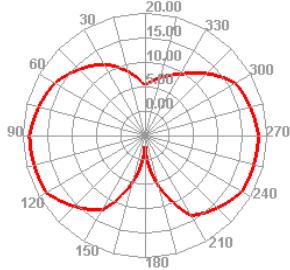




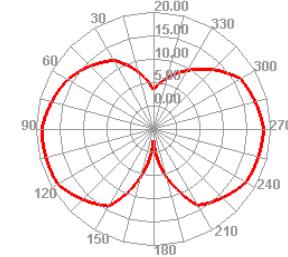
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2D方向图 2DDirections

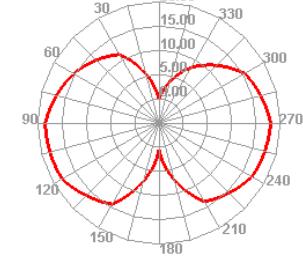
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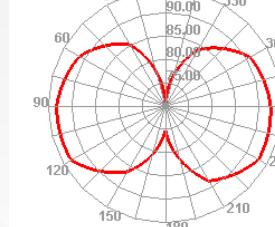
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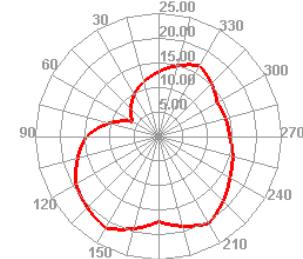
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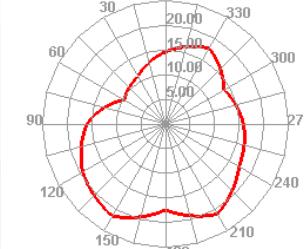
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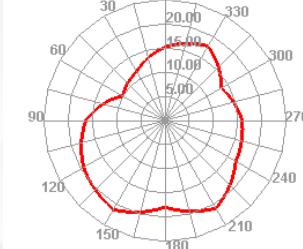
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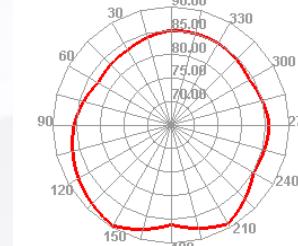
LTE7 21100 TRP Phi=45



LTE7 21400 TRP Phi=45



LTE7 3400 TIS Phi=45

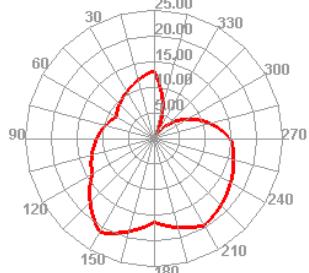




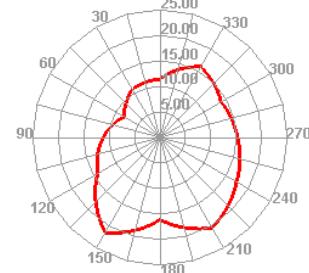
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2D方向图 2DDirections

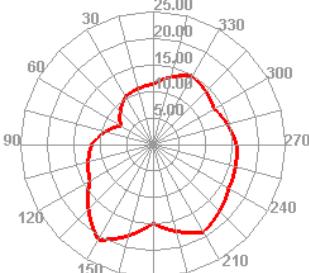
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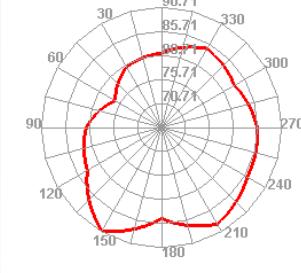
Wifi 6 TRP Phi=45



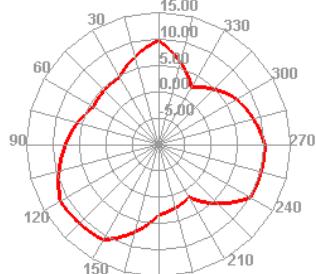
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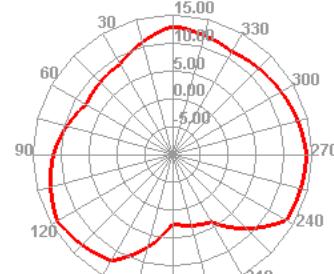
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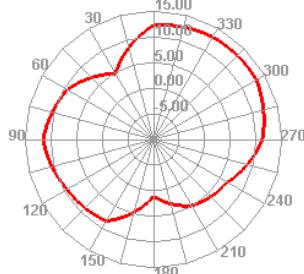
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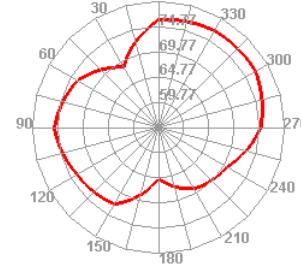
Wifi 60 TRP Phi=45



Wifi 161 TRP Phi=45



Wifi 161 TIS Phi=45





Gain test data

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| | GSM850 | EGSM900 | DCS1800 | PCS1900 | | |
|-------------------|--------------|--------------|--------------|--------------|--|--|
| peak Gain(dBi) | -4.54 | -5.32 | -2.39 | -2.56 | | |
| | W2 | W4 | W5 | | | |
| peak Gain(dBi) | -2.56 | -2.39 | -4.54 | | | |



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Gain test data

| | LTE2 | LTE4 | LTE5 | LTE12 | LTE25 | LTE26 |
|-------------------|-------|-------|-------|-------|-------|-------|
| peak Gain(dBi) | -2.56 | -2.39 | -4.54 | -3.78 | -2.49 | -4.07 |

| | LTE66 | LTE71 | LTE41 | | | |
|-------------------|-------|-------|-------|--|--|--|
| peak Gain(dBi) | -2.39 | -4.41 | -3.65 | | | |



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Gain test data

| | GPS | 2.4GWIFI | BT | 5G WIFI | | |
|-------------------|-------|----------|-------|---------|--|--|
| peak Gain(dBi) | -3.32 | -3.18 | -3.18 | -4.07 | | |
| | | | | | | |
| | | | | | | |



联系方式 contact information

联系方式: contact information

射频radio frequency : 江工Jiang Gong

电话 telephone: 15014104367

邮箱mailbox : kpsyanfa1@szkpstx.com

地址address : 龙华区龙观大道440号龙城工业区御龙办公楼二楼
2nd Floor, Yulong Office Building, Longcheng Industrial Zone, No. 440
Longguan Avenue, Longhua District



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THE END

感谢您的宝贵意见！
**Thank you for your
valuable feedback**