

**1. Antenna Specification/天线标准**
**LTE Antenna Specification/LTE 天线技术参数**
**Electrical Specification/电气特性**

Item/目录	Specification/规格	Comment/备注
Freq. Range/频段范围	880MHz-960 MHz 1710 MHz -2690 MHz	
Impedance/阻抗	50 ( $\Omega$ )	
VSWR/驻波比	880MHz-960 MHz $\leq$ 5 1710 MHz -2690 MHz $\leq$ 3	
Directional/辐射方向	Omni directional	
Polarization/极化形式	Linear	
Peak Gain/峰值增益	3.41(dBi)/3.59(dBi)/	
Test condition/测试条件	passive test ( 无源测试 )	
Total Efficiency/无源效率	880MHz-960 MHz > 20% 1710 MHz -2690 MHz > 30%	

**Mechanical Specification/机械指标**

Antenna type/天线类型	Vehicle antenna	
Connector Type/连接器类型	FAKRA	
RF Cable Type/射频线型号	1.5DS-QFB	
Connector Torque Test/连接器扭力	N/A	
Connector Pull Test/连接器拉力	$\geq$ 3Kgf	
Salt Spray/盐雾测试	48 H	

**Environmental Specification /环境指标**

Operating temp/工作温度	-40°C ~ +85°C	
Storage temp/存储温度	-40°C ~ +85°C	

**GPS Antenna Specification/GPS 天线技术参数**
**Electrical Specification/电气特性**

Item/目录	Specification/规格	Comment/备注
Freq. Range/频段范围	1575.42 MHz±1.023 MHz 1602.5625 MHz±4 MHz	
Impedance/阻抗	50 (Ω)	
VSWR/驻波比	1575.42 MHz≤2 1602.5625 MHz≤2	
Directional/辐射方向	Omni directional	
Polarization/极化形式	RHCP	
Gain/增益	1575.42 MHz≥2.96(dBi) 1602.5625 MHz≥0.74(dBi)	天线接 1.6M 长 1.5DS 低损线加 70*70mm <sup>2</sup> 反射板
Axial Ratio/轴比	≤3dB	
<b>GPS LNA/低噪声放大器</b>		
Gain/增益	15±3dB	
Noise Figure/噪声系数	≤1.5dB	
VSWR/驻波比	<2	
Inband Spectrum ripple/带内平坦度	±1dB	
1dB Compression Point/输出 1dB 压缩点	≥-10dBm	
Out-band Rejection/带外抑制	0~1400MHz:34dBc min	
	1400~1475MHz:24dBc min	
	1475~1525MHz:20dBc min	
	1625~3000MHz:30dBc min	
Operating Voltage/工作电压	3±0.3V	
Operating Current/工作电流	9mA	

## 2. Antenna Picture/天线图片



REV.	ECN NUMBER	DESCRIPTION	DATE	DRAWN	CHECKED	APPROVED
A	ECN201896	正式发行	07/28/20	刘晓峰	丁第斌	张英杰
B	ECN210032	*5 变更线材，标签：前增加，修正接头图面外观；增加1个9号标识位；修改QC驻波比范围	01/06/21	刘晓峰	丁第斌	牛宝星

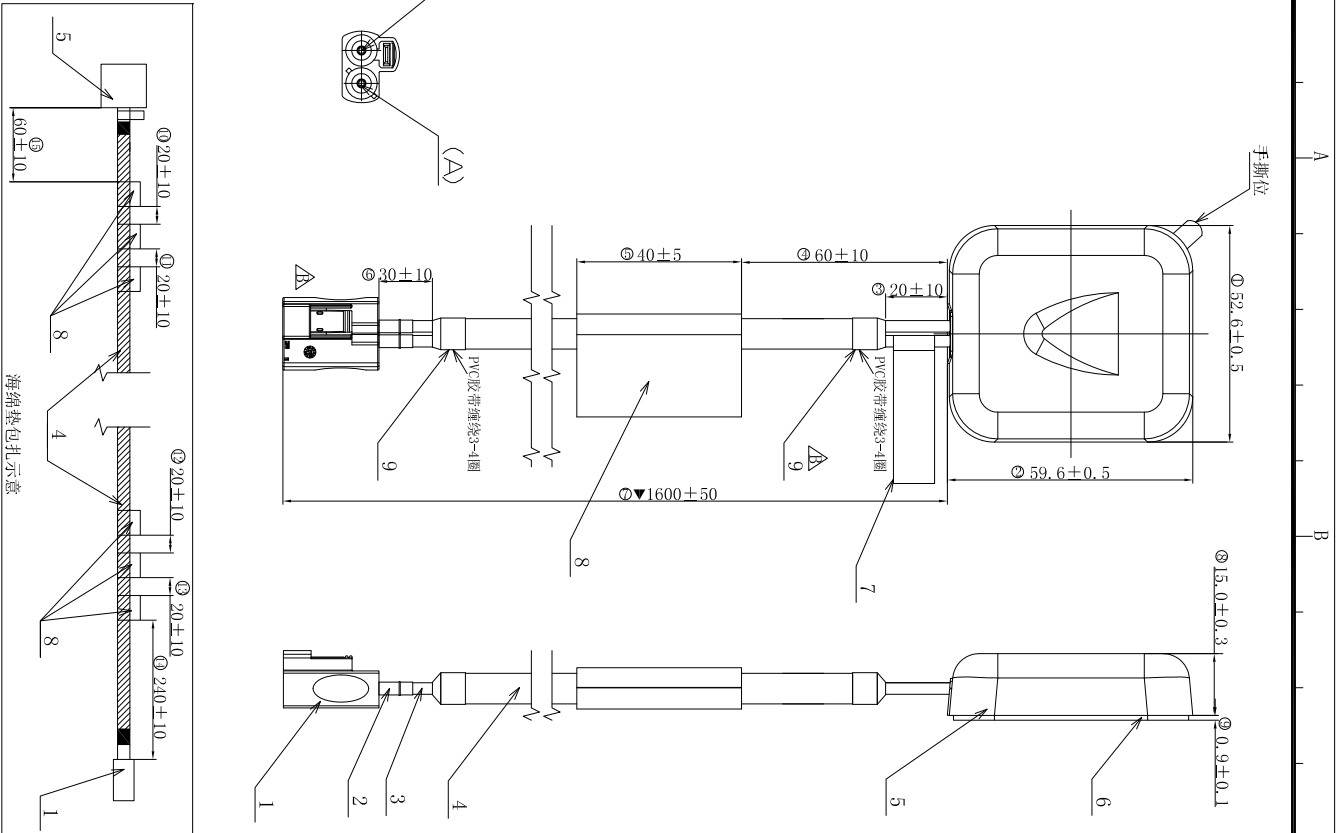
**标贴规则**

<b>TOYOTA</b> <small>广汽丰田电子技术有限公司 TICO00012200 Add: 20# Huanfumin, Panou, Guangdong DC: XX XX XX MADE IN CHINA</small>	<b>TOYOTA</b> <small>广汽丰田电子技术有限公司 TICO0012200 Add: 20# Huanfumin, Panou, Guangdong DC: XX XX XX MADE IN CHINA</small>
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制造日期  
XX XX XX  
日 (9表示01)  
月 (3表示00)  
年 (2020表示B0)

0	1	2	3	4	5	6	7	8	9
A	B	C	D	E	F	G	H	I	

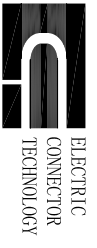
- 说明：
- 测试要求：全检SWR测试，矩阵测试一致性。  
频率范围：880MHz-960 MHz ≤5.0  
1710 MHz -2690 MHz ≤3.0  
1575.42 MHz ≤2  
1602.5625 MHz ≤2
  - 外观要求：产品表面不能明显压痕、划伤、脏污等不良。
  - 标有“▼”为QC重点检测尺寸。
  - 有害物质须符合ECT《QE-Q-19-001环境有害物质管理基准》管控标准；无“IF”要求。



ITEM	PART NAME	Q'TY	MATERIAL / FINISH
9	胶带	2	PVC, 黑色, 19mm*18mm
8	海绵垫	6	PU海绵(自带胶); L*W*T=60*40*3mm, 黑色, 无卤
7	产品标贴	1	撕标签/40#合成PVC; 80*10*0.08mm
6	3M双面胶	1	3M4229, 红色离型膜
5	模块本体总成	1	4G+GPS_ANT, 59.5*52.6mm
4	PVC保护管	1	PVC套管, 内径Φ7.0mm; 壁厚0.5mm; 黑色, 环保, 阻燃; 无印字
3	双模馈线	2	1.5DS-QFB-FOAM PE 同轴线, 黑色PVC外披 OD: 3.0mm
2	热缩套管	2	黑色皮料, Φ4.0mm 无磷
1	FAKRA 连接器	1	双联母头, 蓝色

GENERAL TOLERANCE		SCALE: 1:1	DRAWN: 刘晓峰	DATE: 01/06'21
XX ± 1.00	XX ° ± 2°	UNIT: mm	CHECK:	DATE:
X ± 0.50	X ° ± 1°	SIZE: A4	APPROVE:	DATE:
.X ± 0.20	.X ° ± 0.5°			
.XX ± 0.10				

DMG. NO.: 600-U569-01	TITLE: ANT_EX_GPS_4G_AN05_S-1.5DS_BK_L1600MM	REV. B
PARTS NO. (INTENDED USE): 81800U569	客户图	SHEET: 1/1

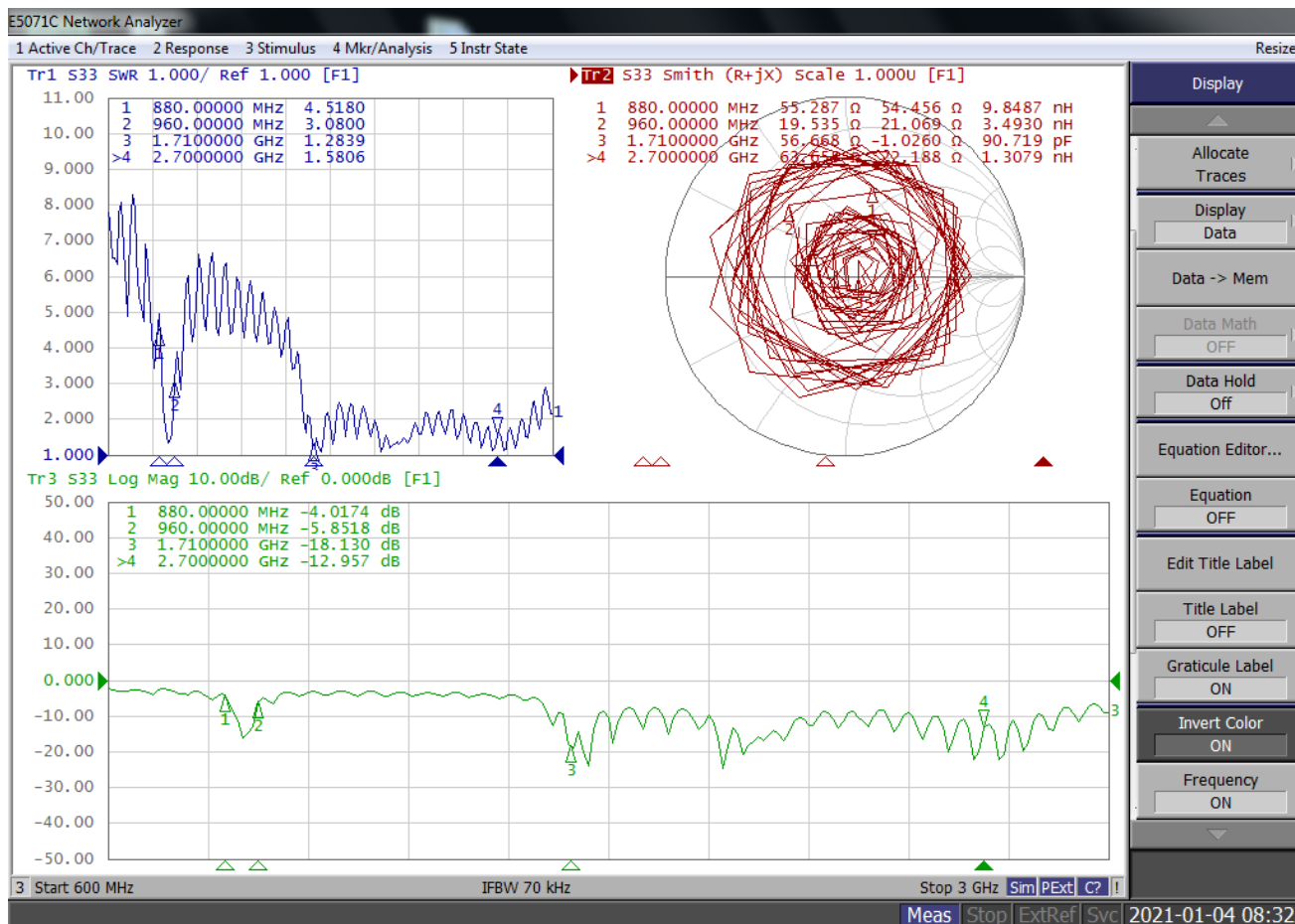


ELECTRIC  
CONNECTOR  
TECHNOLOGY

## 4. Antenna test result/测试结果

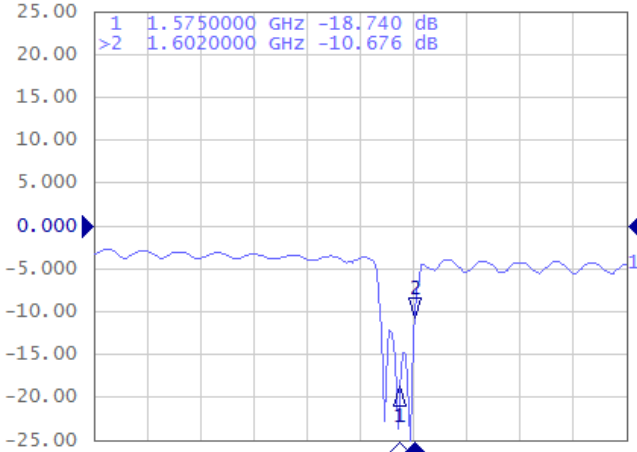
### 4.1 Return loss/Smith chart/VSWR/回波损耗/史密斯图/驻波比

4G LTE

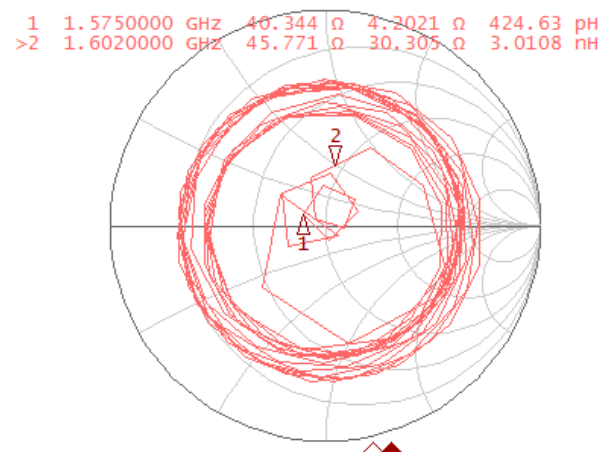


## GPS&GLANASS

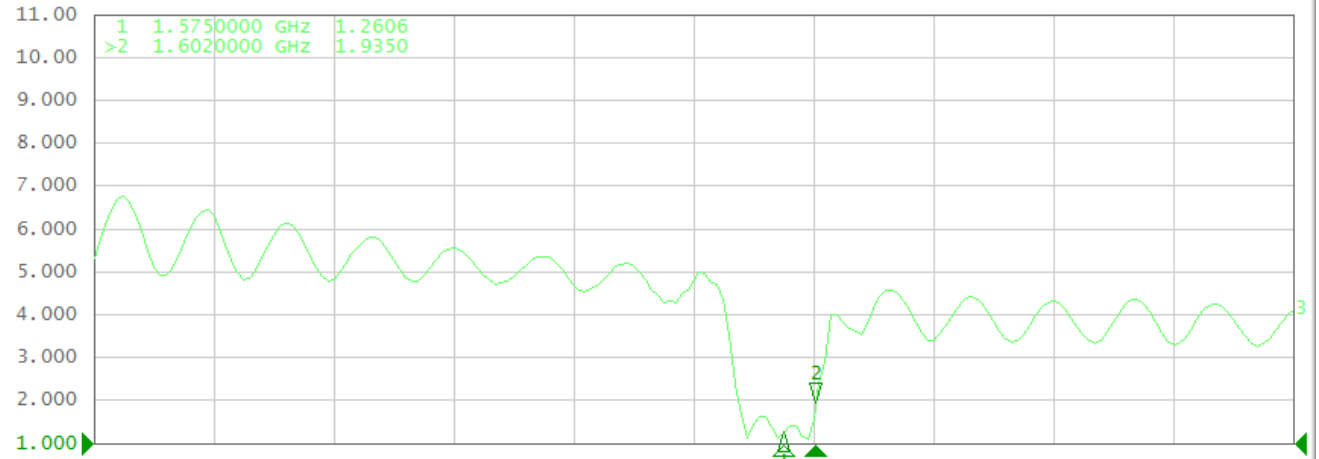
Tr1 S33 Log Mag 5.000dB/ Ref 0.000dB [F1 M]



Tr2 S33 Smith (R+jX) Scale 1.000U [F1 M]

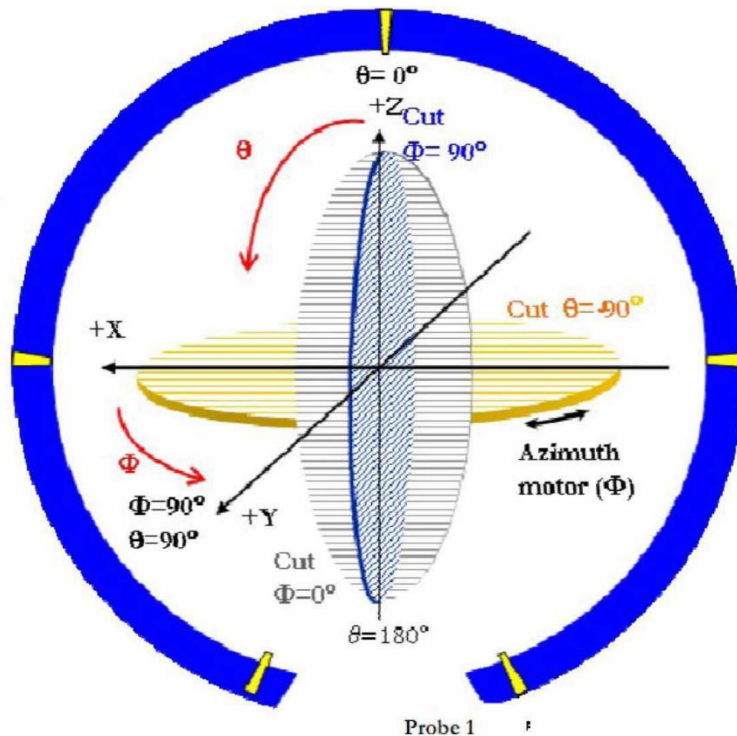


Tr3 S33 SWR 1.000/ Ref 1.000 [F1 M]

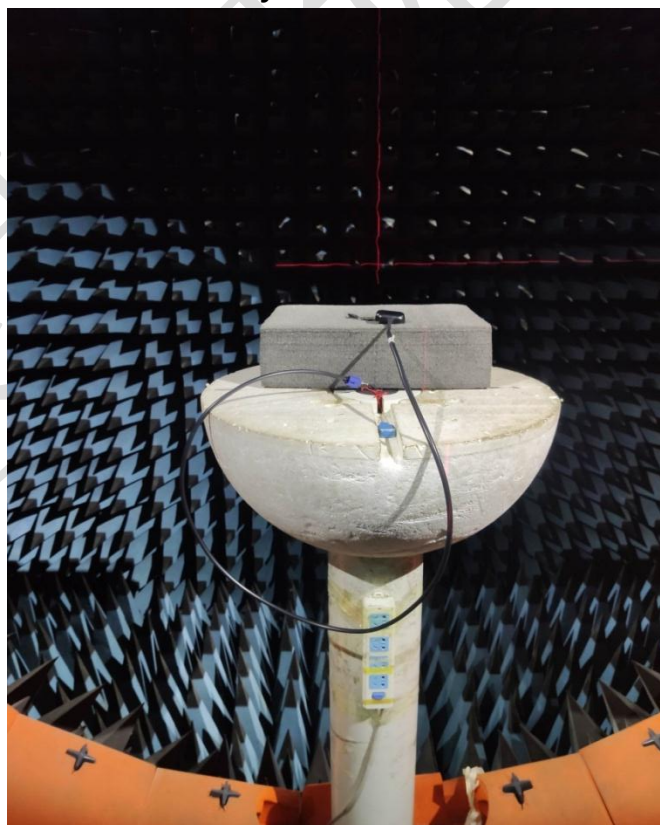


**4.2 The gain and total efficiency test/增益和效率测试**

**4.2.1 The definition of coordinate system/坐标系定义-Satimo SG24**



The coordinate system of Chamber/暗室坐标系



The production test position/天线测试放置位置

**4.2.2 The test result of total efficiency and total gain/天线效率及增益测试结果**
**4G LTE**
**880MHz-960MHz**

Frequency	Efficiency	E Total. dB(dB)
880MHz	18%	0.17
890MHz	21%	-0.26
900MHz	30%	1.31
910MHz	35%	1.63
920MHz	28%	1.61
930MHz	43%	3.41
940MHz	42%	2.07
950MHz	50%	1.39
960MHz	34%	0.17
AVG	34%	1.42

**1710MHz-2170MHz**

Frequency	Efficiency	E Total. dB(dB)
1710MHz	33%	-0.61
1730MHz	34%	-0.65
1750MHz	31%	-0.41
1770MHz	28%	-1.16
1790MHz	28%	-1.94
1810MHz	36%	-0.85
1830MHz	24%	-2.32
1850MHz	23%	-3.37
1870MHz	32%	-1.48
1890MHz	26%	-0.92
1910MHz	24%	-1.99
1930MHz	32%	-0.35
1950MHz	31%	-0.25
1970MHz	26%	-0.24
1990MHz	28%	-1.24
2010MHz	28%	-1.26
2030MHz	25%	-0.20
2050MHz	31%	0.44
2070MHz	39%	1.78
2090MHz	38%	3.08
2110MHz	29%	2.62

2130MHz	35%	1.98
2150MHz	40%	3.59
2170MHz	36%	3.09
AVG	31%	-0.11

**2300MHz-2400MHz**

Frequency	Efficiency	E Total. dB(dB)
2300MHz	30%	2.64
2310MHz	29%	2.41
2320MHz	29%	2.16
2330MHz	31%	2.09
2340MHz	32%	2.17
2350MHz	33%	2.81
2360MHz	29%	2.38
2370MHz	29%	2.35
2380MHz	27%	1.71
2390MHz	30%	1.25
2400MHz	31%	2.59
AVG	30%	2.23

**2500MHz-2700MHz**

Frequency	Efficiency	E Total. dB(dB)
2500MHz	31%	1.85
2520MHz	32%	2.38
2540MHz	35%	3.22
2560MHz	33%	3.14
2580MHz	34%	3.27
2600MHz	34%	3.51
2620MHz	33%	3.34
2640MHz	31%	2.82
2660MHz	34%	3.12
2680MHz	36%	3.36
2700MHz	35%	3.31
AVG	33%	3.03

## GPS&GLONASS 1560MHz-1590MHz

Frequency	Efficiency	E Total. dB(dB)
1560MHz	40%	1.44
1565MHz	47%	2.41
1570MHz	52%	2.80
1575MHz	51%	2.96
1580MHz	50%	2.82
1585MHz	49%	2.68
1590MHz	48%	2.59
AVG	48%	2.53

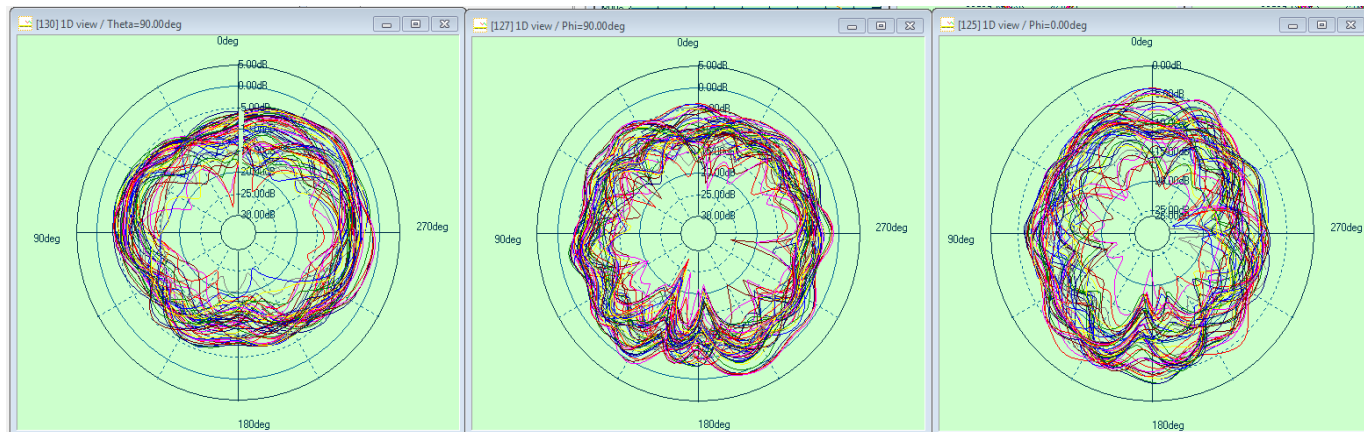
## 1596MHz-1608MHz

Frequency	Efficiency	E Total. dB(dB)
1596MHz	44%	2.00
1598MHz	41%	1.71
1600MHz	38%	1.25
1602MHz	34%	0.74
1604MHz	33%	0.27
1606MHz	32%	0.20
1608MHz	31%	0.12
AVG	36%	0.90

## 4.2.3 The antenna radiation pattern(2D)/天线辐射方向图 ( 2D )

### 4G LTE

880 MHz-2690MHz



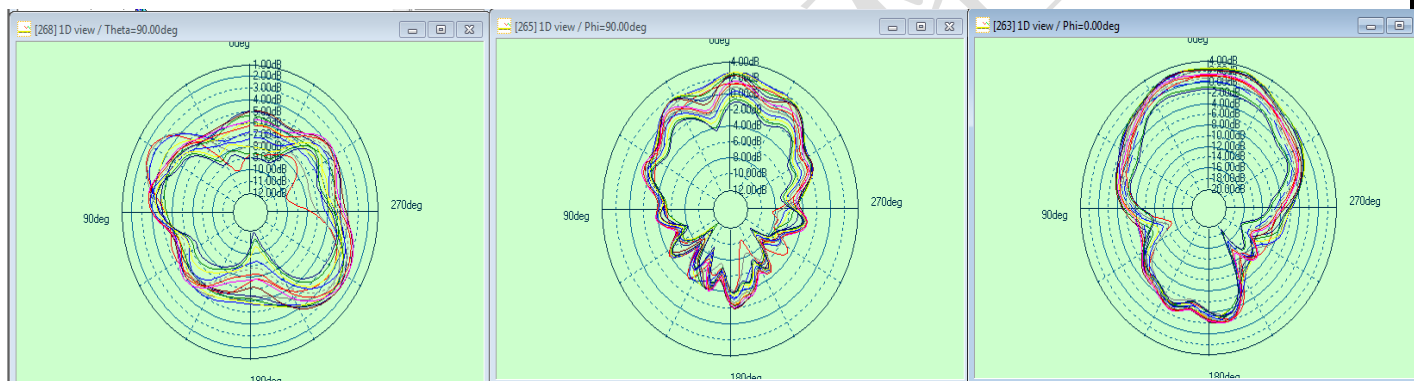
**XOY**

**YOZ**

**XOZ**

### GPS&GLONASS

1560MHz-1608MHz



**XOY**

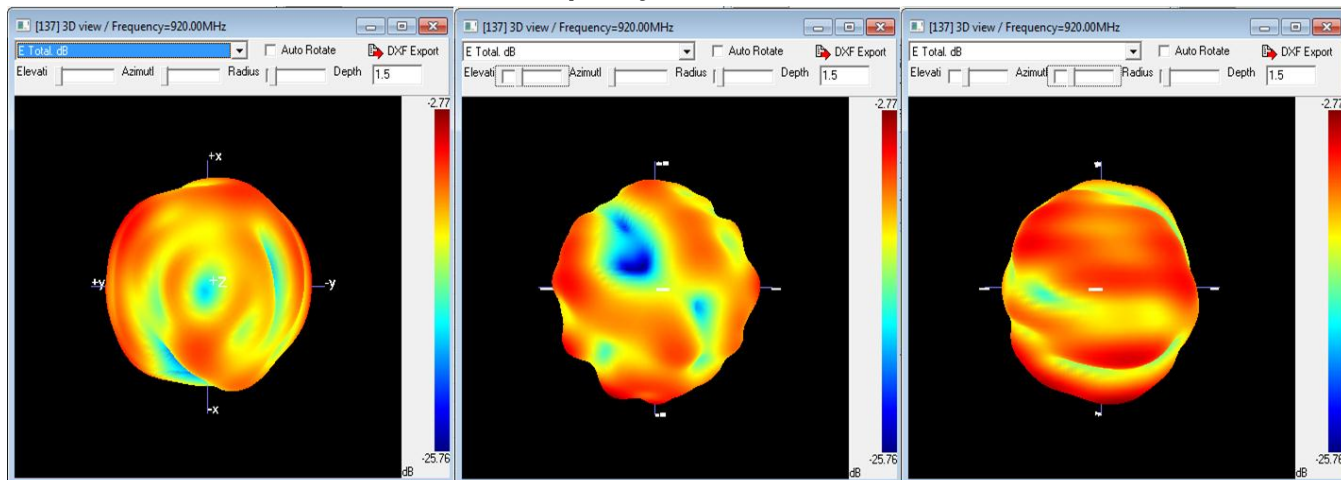
**YOZ**

**XOZ**

## 4.2.4 The antenna radiation pattern(3D)/天线辐射方向图 ( 3D )

4G LTE

Frequency/频点 920MHz

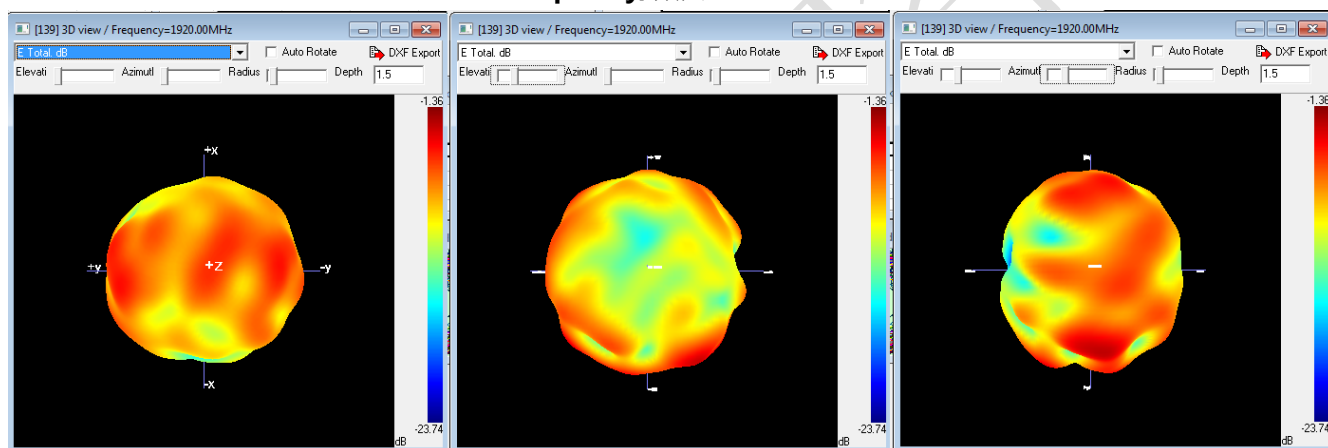


XOY

YOZ

XOZ

Frequency/频点 1920MHz

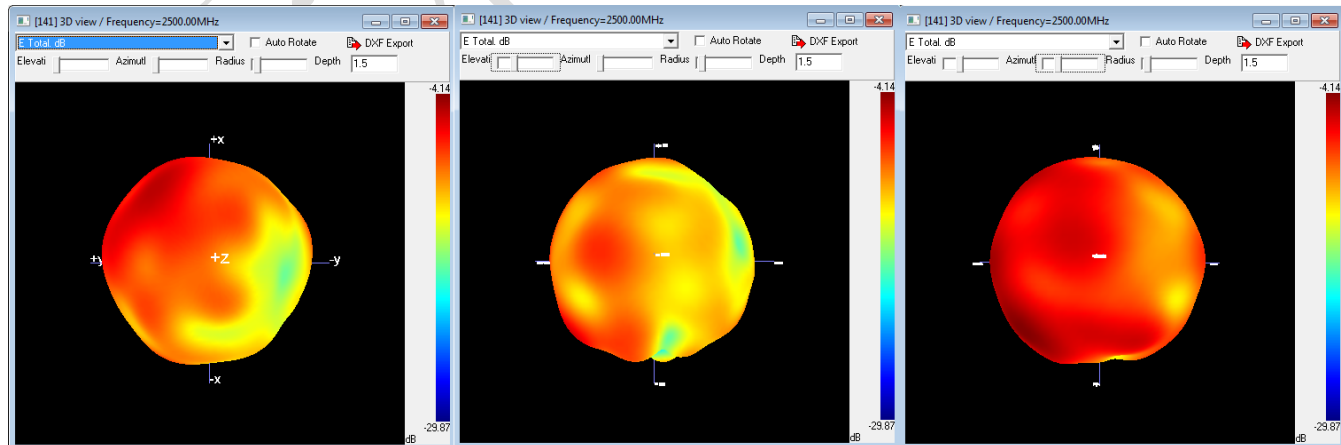


XOY

YOZ

XOZ

Frequency/频点 2500MHz

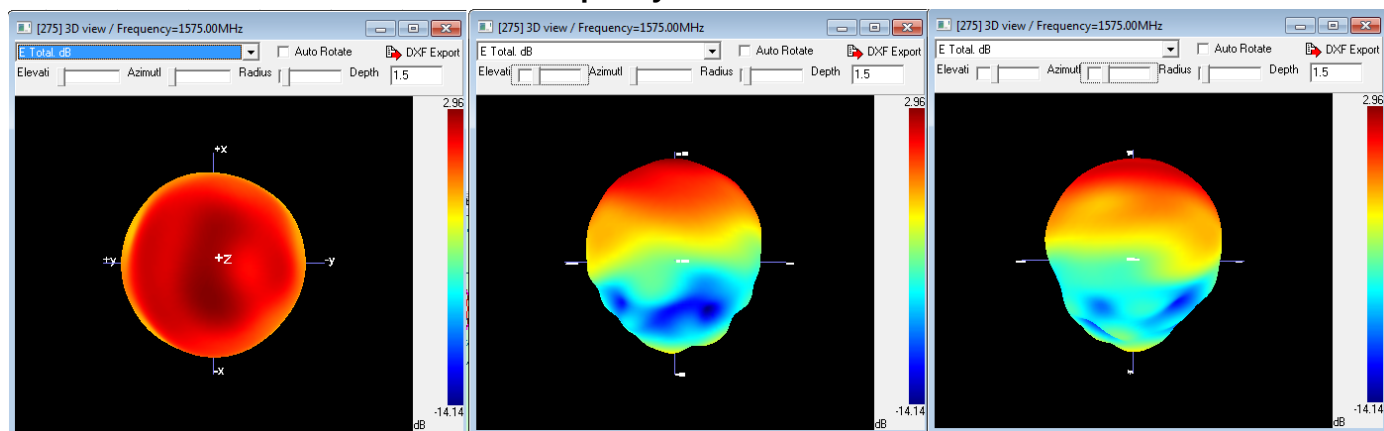


XOY

YOZ

XOZ

## GPS&GLONASS Frequency/频点 1575MHz

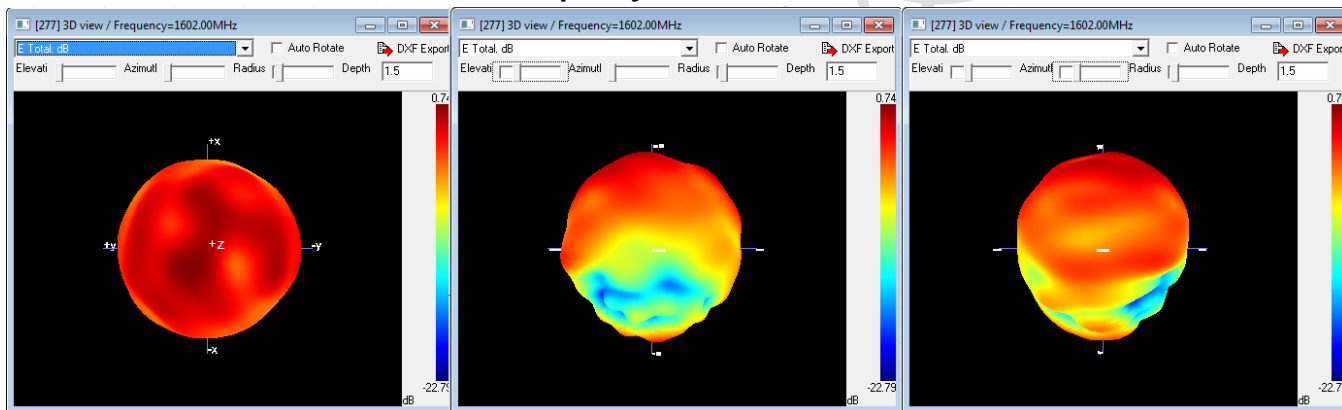


XOY

YOZ

XOZ

## Frequency/频点 1602MHz



XOY

YOZ

XOZ