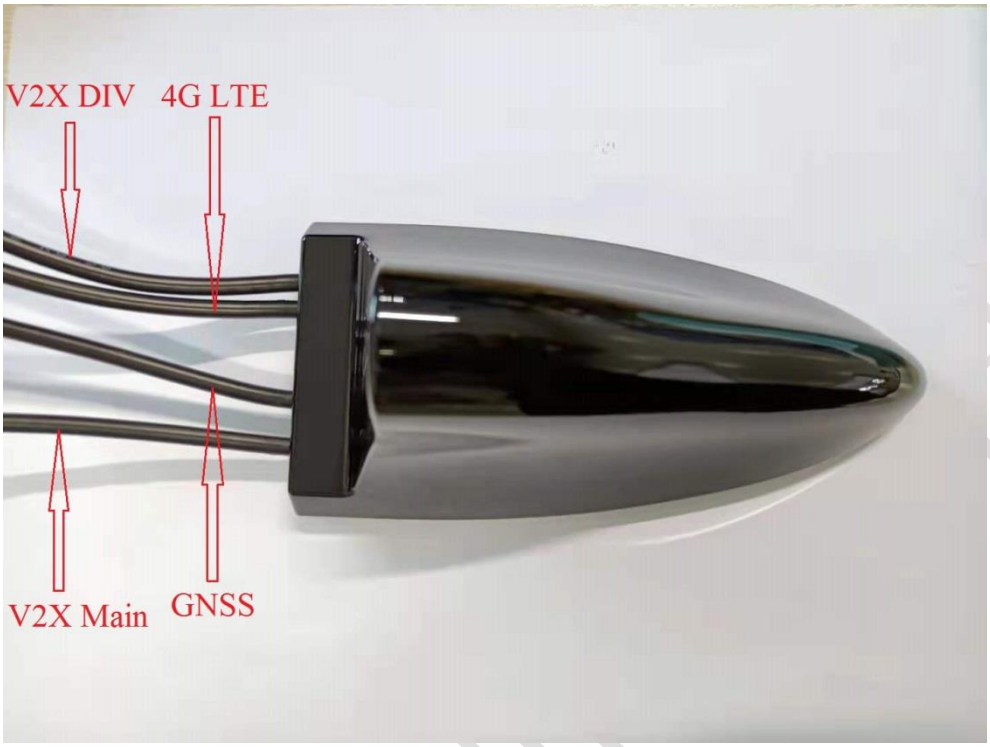
1. Antenna Specification/天线标准

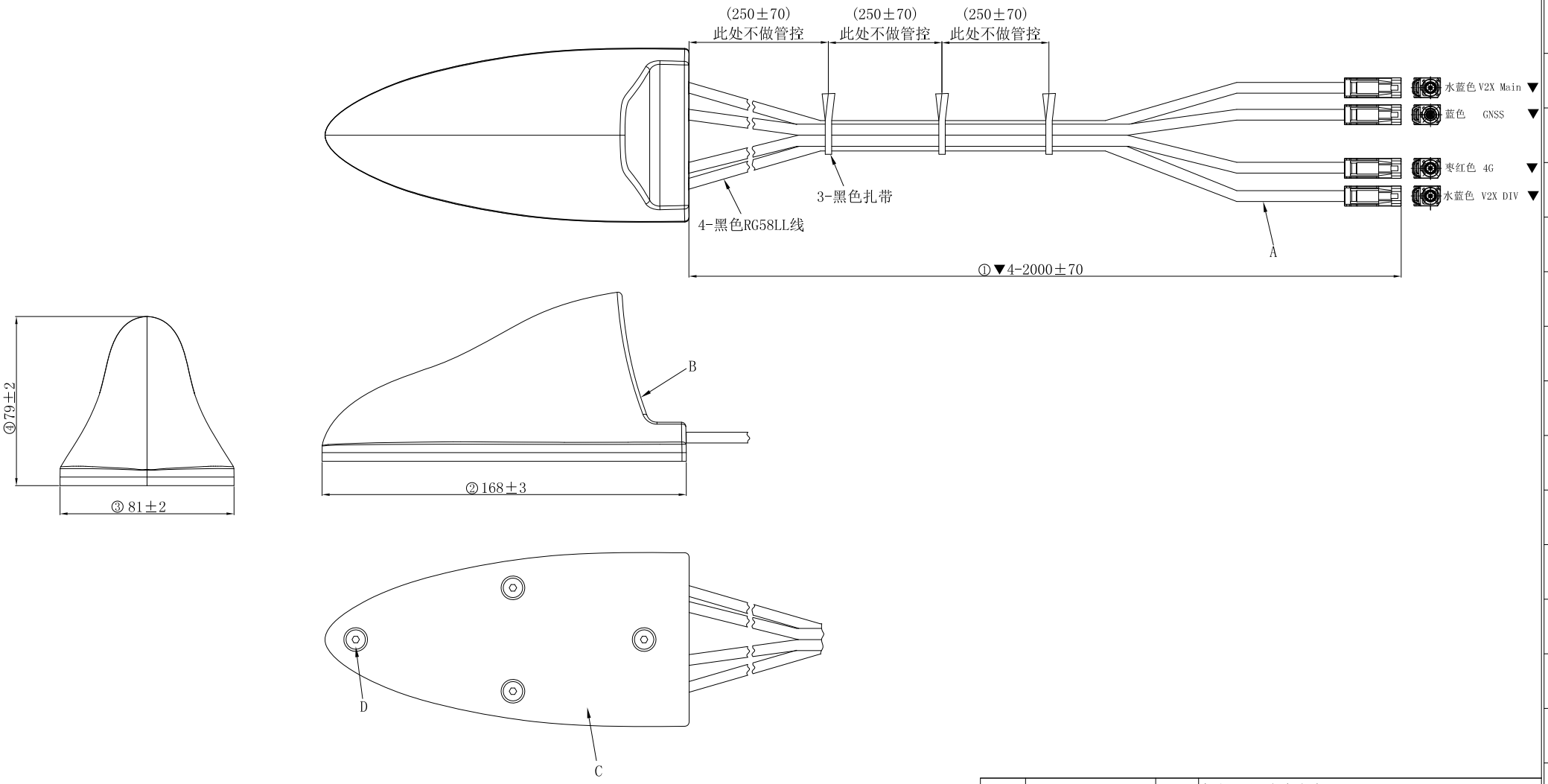
Antenna Specification/天线技术参数		
Electrical Specification/电气特性		
Item/目录	**Specification/规格**	**Comment/备注**
Freq. Range/频段范围	LTE：700-2700 (MHz) V2X1#：5855-5925(MHz) V2X2#：5855-5925(MHz) GNSS :1575.42&1227.6(±10MHz)	
Impedance/阻抗	50 (Ω)	
VSWR/驻波比	LTE：700-2700 (MHz)≤3.5 V2X1#：5855-5925(MHz)≤2 V2X2#：5855-5925(MHz)≤2 GNSS：1575.42&1227.6(MHz)≤2	
Directional/辐射方向	Omni directional	
Polarization/极化形式	Vertical	
Peak Gain/峰值增益	LTE：2500MHz@5dBi V2X DIV：5915MHz@1.6dBi V2X Main：5915MHz@3.5dBi GNSS：1575.42MHz@1.26dBi 1227.6MHz@-1.35dBi	
Test condition/测试条件	passive test（无源测试）	GNSS 天线（60mm 线）测试无源；其他天线 2 米线无源测试；
Total Efficiency/无源效率	LTE：700-2700 (MHz)平均值≥51% V2X DIV：5855-5925(MHz) 平均值≥18% V2X Main :5855-5925(MHz) 平均值≥34% GNSS：1575.42(MHz)≥54% 1227.6(MHz)≥36%	
Mechanical Specification/机械指标		

Antenna type/天线类型	外置天线	
Connector Type/连接器类型	FAKRA	
RF Cable Type/射频线型号	RG58LL	
Connector Torque Test/连接器扭力	N/A	
Connector Pull Test/连接器拉力	≥3.0Kgf	
Salt Spray/盐雾测试	48H	
EnvironmentalSpecification /环境指标		
Operating temp/工作温度	-40℃～+80℃	
Storage temp/存储温度	-40℃～+85℃	

2. Antenna Picture/天线图片



Rev.	ECN Number	Description	Date	Drawn	Checkd	Approved
A	ECN211582	初版发行	04/28'21	刘晓峰	丁第斌	牛宝星



NOTES:
1. 100%全检VSWR测试（测试方式:矩阵）；
   参考81800U844 VSWR测试标准。
2. 标有“▼”为QC重点检测尺寸。
3. 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"HF"管控。

ITEM	DESCRIPTION	Q'TY	MATERIAL/FINISH
D	M5螺钉	4	螺钉1,沉头内六角，M5*8 ， 304SUS
C	底座	1	A1,BLACK
B	外壳	1	PC+ABS，BLACK
A	FAKRA CABLE	4	FAKRA FOR RG58LL BLACK L2M

BOM LIST

ELECTRIC CONNECTOR TECHNOLOGY

GENERAL TOLERANCE	
XX.± 2.0	XX.° ± 2°
X.± 1.0	X.° ± 1°
.X± 0.50	.X° ± 0.5°
.XX± 0.30	

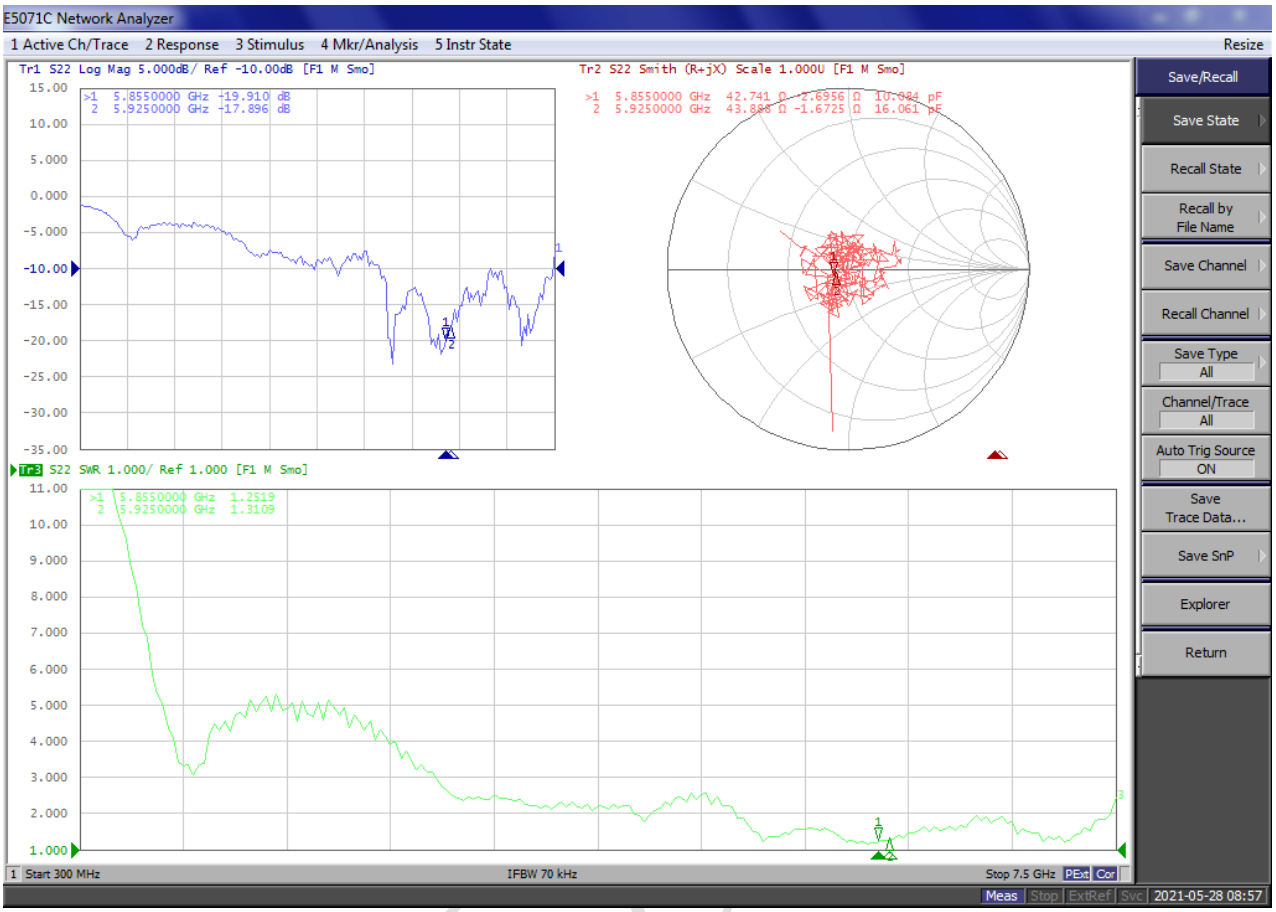
SCALE: 1:1
UNIT: mm
SIZE: A4

DRAWN	刘晓峰	DATE 04/28'21
CHECK		DATE
APPROVE		DATE

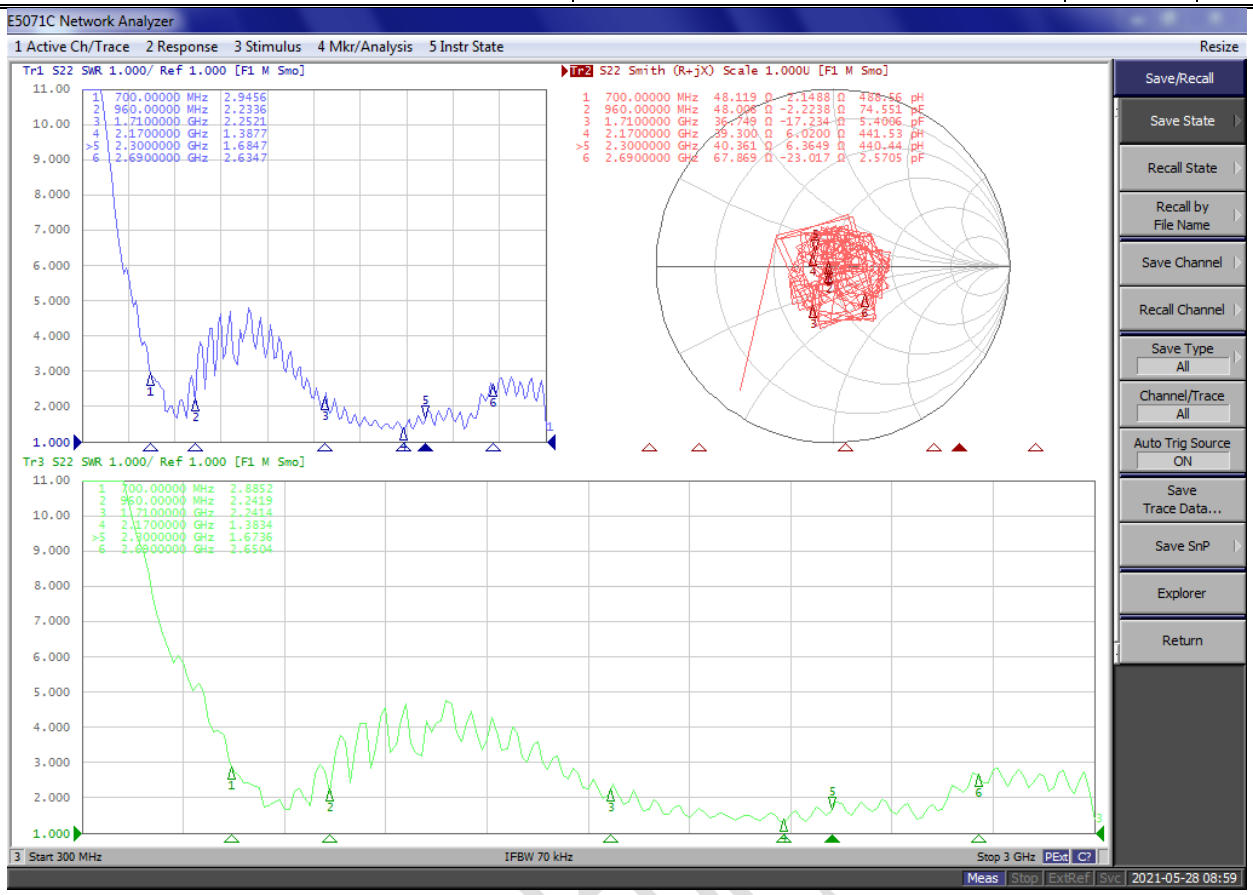
DWG. NO. 600-U844-01
PARTS NO.(INTENDED USE) 81800U844
TITLE ANT_EX_0826_ANSYQ_BK_L2M_IP67 客户图
REV. A
SHEET 1/1

4. Antenna test result/测试结果

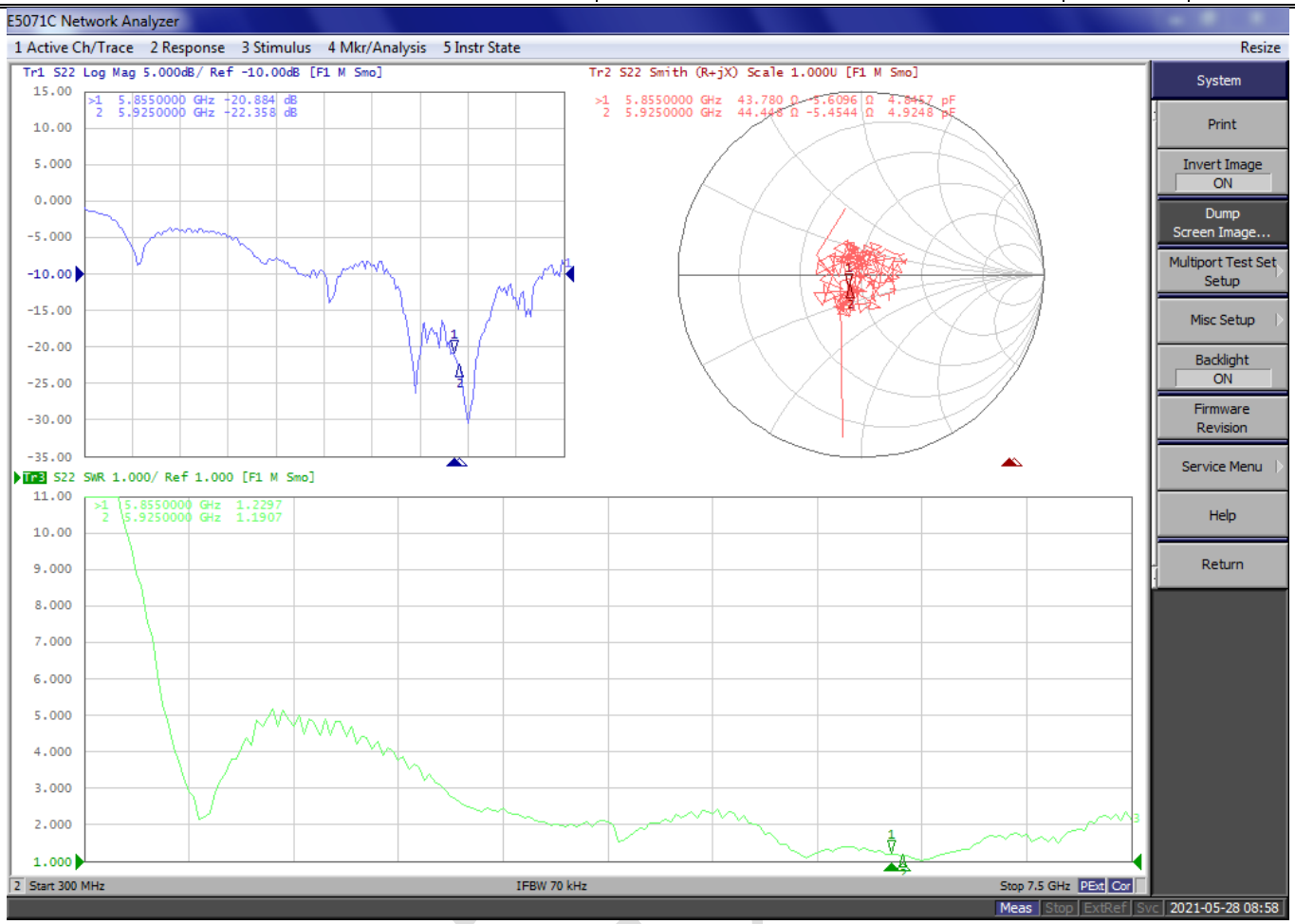
4.1Return loss/Smith chart/VSWR/回波损耗/史密斯图/驻波比



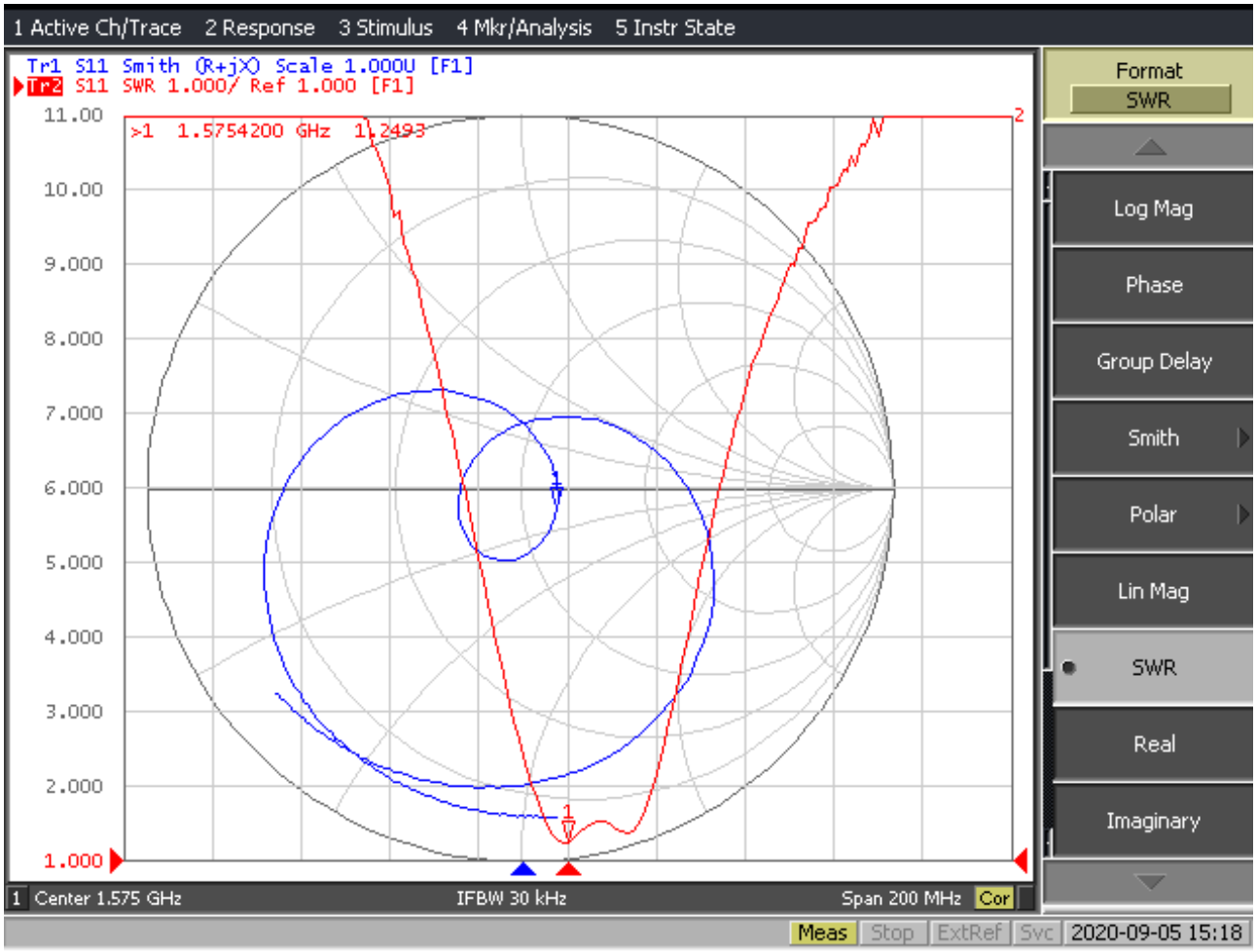
V2X DIV



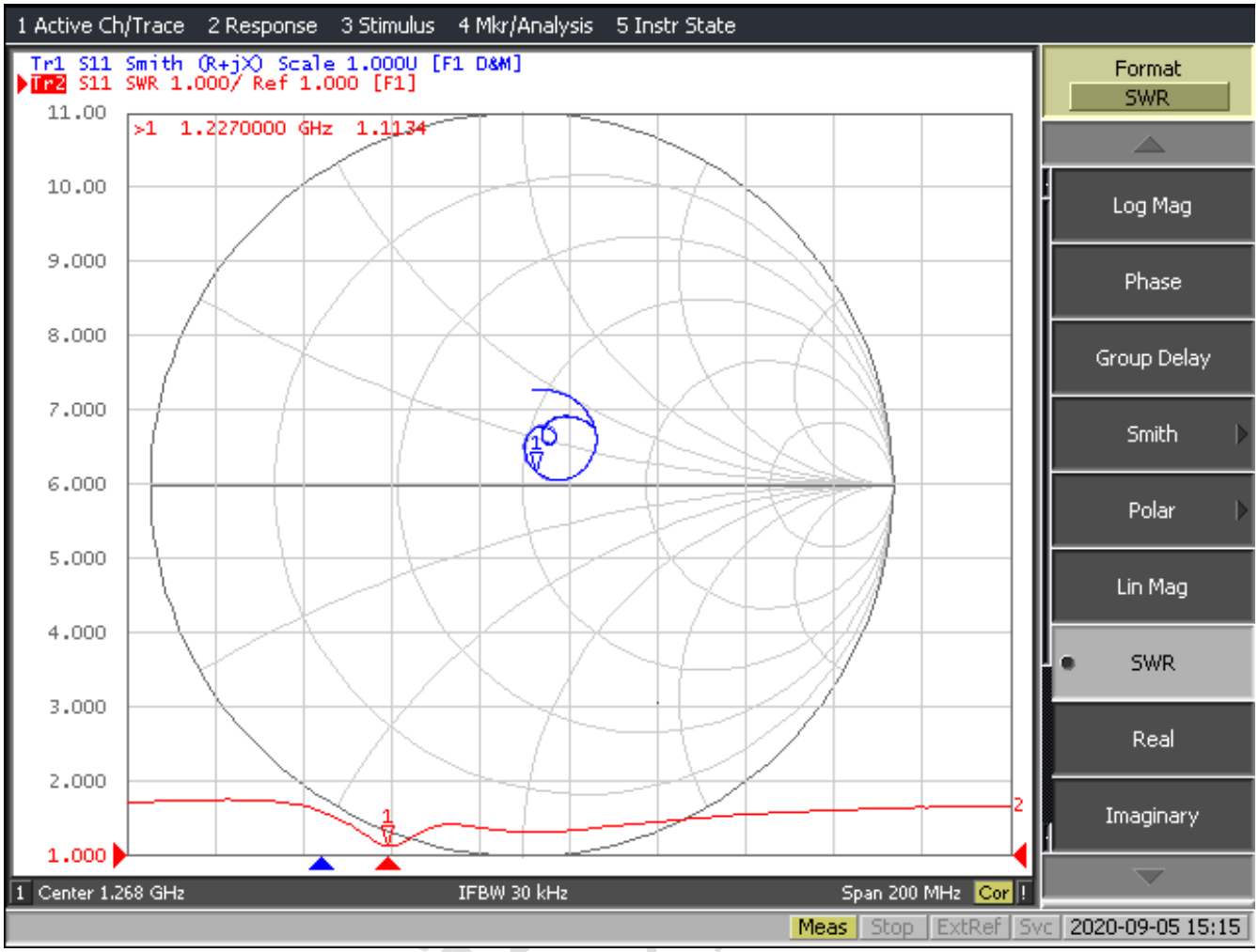
4G LTE


E5071C Network Analyzer
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Resize
Tr1 S22 Log Mag 5.000dB/ Ref -10.00dB [F1 M Smo]
>1 5.8550000 GHz +20.884 dB
2 5.9250000 GHz +22.358 dB
Tr2 S22 Smith (R+jX) Scale 1.000U [F1 M Smo]
>1 5.8550000 GHz 43.780 Ω -5.6096 Ω 4.8457 pF
2 5.9250000 GHz 44.448 Ω -5.4544 Ω 4.9248 pF
Tr3 S22 SWR 1.000/ Ref 1.000 [F1 M Smo]
>1 5.8550000 GHz 1.2297
2 5.9250000 GHz 1.1907
System
Print
Invert Image ON
Dump Screen Image...
Multiport Test Set Setup
Misc Setup
Backlight ON
Firmware Revision
Service Menu
Help
Return
Start 300 MHz
IFBW 70 kHz
Stop 7.5 GHz
PExt Cor
Meas Stop ExtRef Svc 2021-05-28 08:58

V2X Main



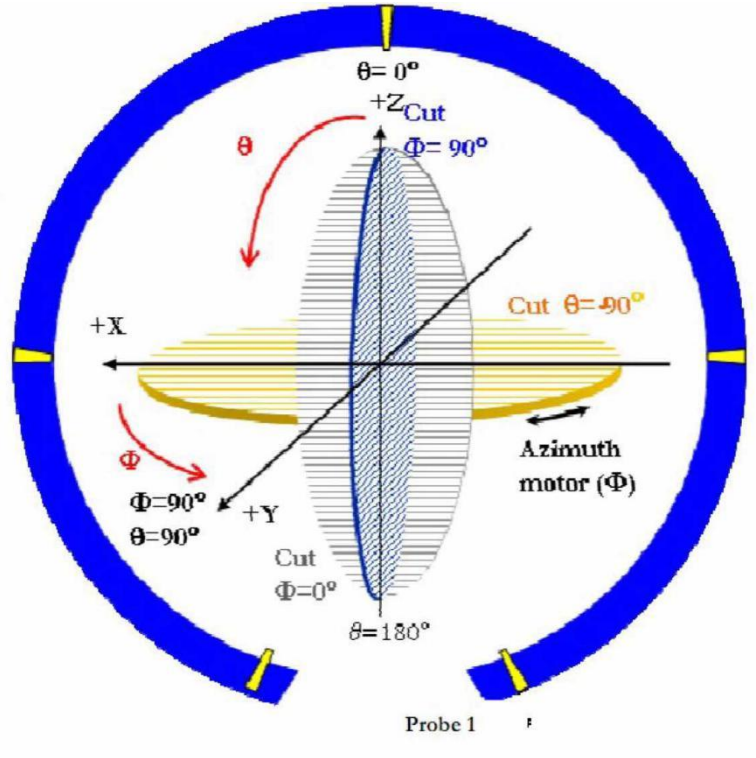
L1 1575.42MHz


1 Active Ch/Trace
2 Response
3 Stimulus
4 Mkr/Analysis
5 Instr State
Tr1 S11 Smith (R+jX) Scale 1.000U [F1 D&M]
Tr2 S11 SWR 1.000/ Ref 1.000 [F1]
>1 1.2270000 GHz 1.1134
11.00
10.00
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
Format
SWR
Log Mag
Phase
Group Delay
Smith
Polar
Lin Mag
SWR
Real
Imaginary
1 Center 1.268 GHz
IFBW 30 kHz
Span 200 MHz
Cor
Meas
Stop
ExtRef
Svc
2020-09-05 15:15

L2 1227.6MHz

4.2The 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

LTE 天线
700MHz-960MHz

Frequency	Efficiency(%)	Gain (dBi)
700MHz	55%	1.1
710MHz	56%	1.2
720MHz	48%	0.4
730MHz	46%	0.1
740MHz	49%	0.6
750MHz	56%	1.1
760MHz	58%	1.2
770MHz	57%	1.4
780MHz	58%	1.4
790MHz	63%	1.6
800MHz	64%	2.5
810MHz	68%	2.1
820MHz	73%	1.9
830MHz	71%	1.8
840MHz	71%	2.1
850MHz	72%	3.0
860MHz	68%	2.9
870MHz	56%	2.1
880MHz	48%	1.3
890MHz	49%	1.7
900MHz	53%	2.0
910MHz	56%	2.0
920MHz	52%	1.7
930MHz	41%	1.0
940MHz	36%	0.7
950MHz	41%	0.7
960MHz	47%	1.4
AVG.	56%	1.5

1710MHz-2170MHZ		
Frequency	Efficiency(%)	Gain (dBi)
1710MHz	42%	1.0
1730MHz	33%	0.5
1750MHz	40%	1.6
1770MHz	48%	2.4
1790MHz	43%	1.9
1810MHz	51%	2.9
1830MHz	52%	2.8
1850MHz	48%	2.4
1870MHz	56%	3.0
1890MHz	59%	3.4
1910MHz	55%	2.8
1930MHz	57%	2.9
1950MHz	60%	3.0
1970MHz	56%	2.7
1990MHz	58%	2.7
2010MHz	60%	2.8
2030MHz	57%	2.4
2050MHz	57%	2.4
2070MHz	59%	2.3
2090MHz	56%	2.0
2110MHz	51%	1.7
2130MHz	53%	2.0
2150MHz	55%	2.2
2170MHz	49%	1.7
AVG.	52%	2.3
2300MHz-2700MHZ		
2300MHz	47%	2.0
2310MHz	51%	2.4
2320MHz	55%	3.1
2330MHz	52%	3.0
2340MHz	46%	2.5
2350MHz	42%	2.3
2360MHz	43%	2.3
2370MHz	46%	2.6
2380MHz	48%	2.3
2390MHz	44%	1.8
2400MHz	42%	2.0
2500MHz	55%	5.0
2520MHz	51%	4.7
2540MHz	48%	4.3
2560MHz	50%	4.7
2580MHz	46%	4.5
2600MHz	42%	4.2
2620MHz	42%	4.2

2640MHz	34%	3.1
2660MHz	30%	2.3
2680MHz	30%	1.8
2700MHz	23%	0.3
AVG.	44%	3.0

V2X 天线
5855MHz-5925MHz

V2X DIV			V2X Main		
Frequency	Effi. (%)	Gain (dBi)	Frequency	Effi. (%)	Gain (dBi)
5855MHz	19%	1.0	5855MHz	34%	3.2
5865MHz	19%	1.5	5865MHz	34%	3.5
5875MHz	19%	1.6	5875MHz	34%	3.5
5885MHz	18%	1.4	5885MHz	34%	3.5
5895MHz	18%	1.0	5895MHz	34%	3.5
5905MHz	18%	1.1	5905MHz	34%	3.3
5915MHz	18%	1.4	5915MHz	35%	3.3
5925MHz	19%	1.6	5925MHz	35%	3.4
AVG.	18%	1.3	AVG.	34%	3.4

GNSS L2

Frequency ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Frequency (MHz)	1217.0	1218.0	1219.0	1220.0	1221.0	1222.0	1223.0	1224.0	1225.0	1226.0	1227.0	1228.0	1229.0	1230.0	1231.0	1232.0	1233.0	1234.0	1235.0	1236.0	1237.0
Efficiency (dBi)	-6.10	-5.88	-5.65	-5.42	-5.20	-5.00	-4.83	-4.68	-4.56	-4.44	-4.32	-4.23	-4.16	-4.15	-4.17	-4.22	-4.29	-4.35	-4.42	-4.51	-4.63
Gain (dBi)	-3.24	-3.00	-2.75	-2.54	-2.29	-2.06	-1.91	-1.74	-1.60	-1.49	-1.35	-1.27	-1.19	-1.14	-1.17	-1.22	-1.26	-1.32	-1.40	-1.48	-1.58
Efficiency (%)	24.54	25.80	27.20	28.68	30.17	31.60	32.88	34.01	35.03	36.00	36.95	37.78	38.33	38.49	38.27	37.82	37.27	36.74	36.17	35.41	34.44

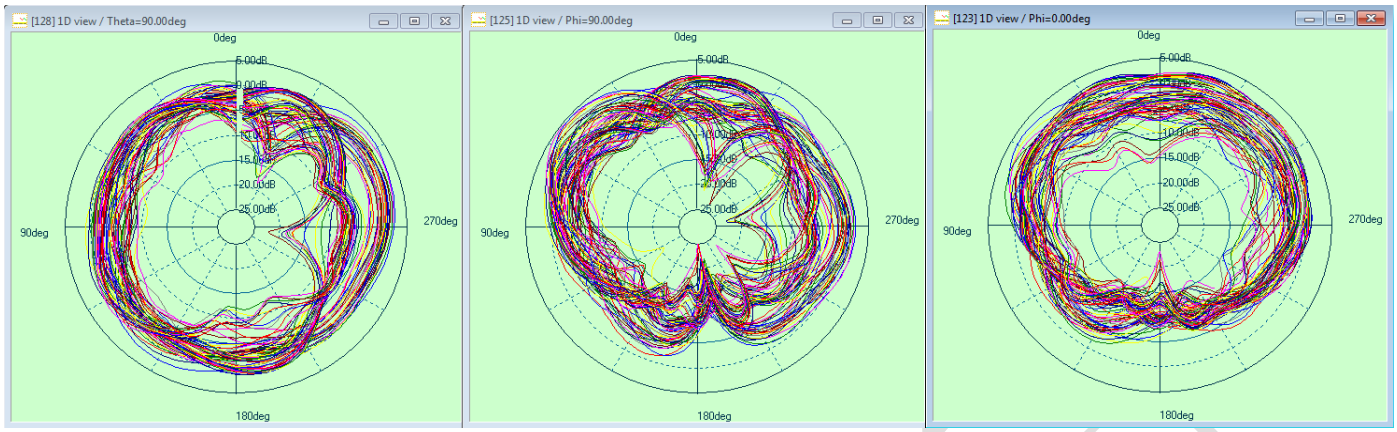
GNSS L1

Frequency ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Frequency (MHz)	1565.0	1566.0	1567.0	1568.0	1569.0	1570.0	1571.0	1572.0	1573.0	1574.0	1575.0	1576.0	1577.0	1578.0	1579.0	1580.0	1581.0	1582.0	1583.0	1584.0	1585.0
Efficiency (dBi)	-3.63	-3.41	-3.20	-3.01	-2.90	-2.88	-2.87	-2.86	-2.80	-2.71	-2.62	-2.60	-2.67	-2.79	-2.91	-2.96	-3.01	-2.99	-2.97	-2.96	-2.97
Gain (dBi)	0.46	0.67	0.85	1.03	1.12	1.13	1.11	1.09	1.10	1.17	1.26	1.39	1.43	1.38	1.37	1.38	1.39	1.45	1.51	1.56	1.60
Efficiency (%)	43.38	45.56	47.91	50.00	51.27	51.55	51.65	51.79	52.45	53.59	54.69	54.96	54.13	52.62	51.20	50.54	50.04	50.18	50.49	50.60	50.46

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

LTE 天线

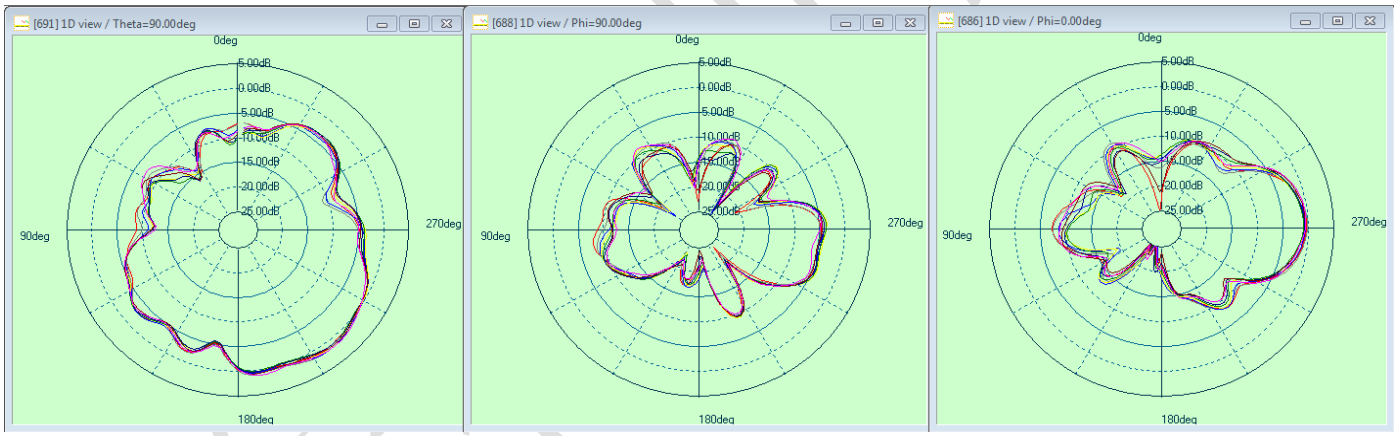
700MHz-2700MHz



XOY　　YOZ　　XOZ

V2X DIV 天线

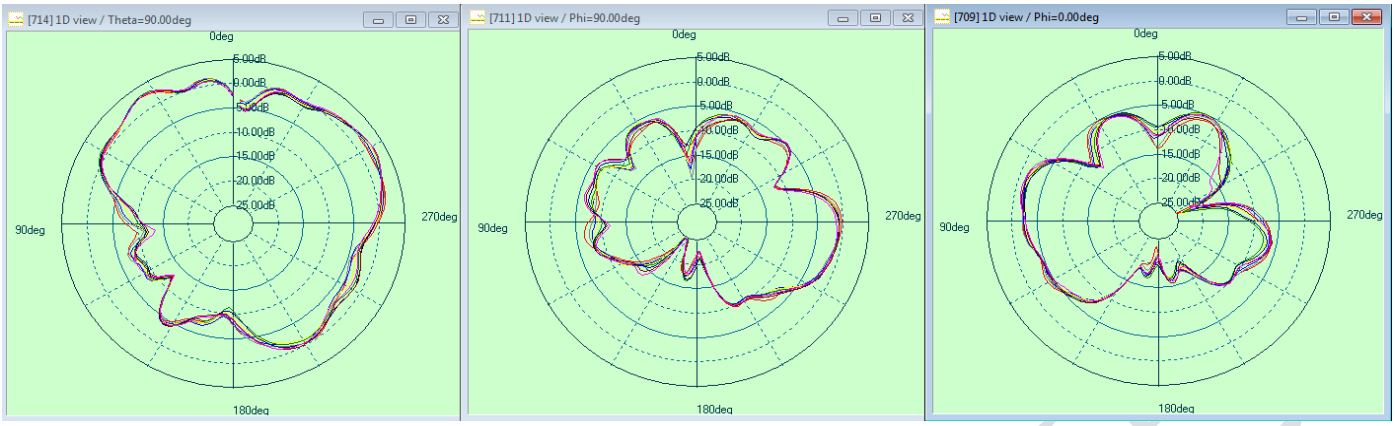
5855MHz-5925MHz



XOY　　YOZ　　XOZ

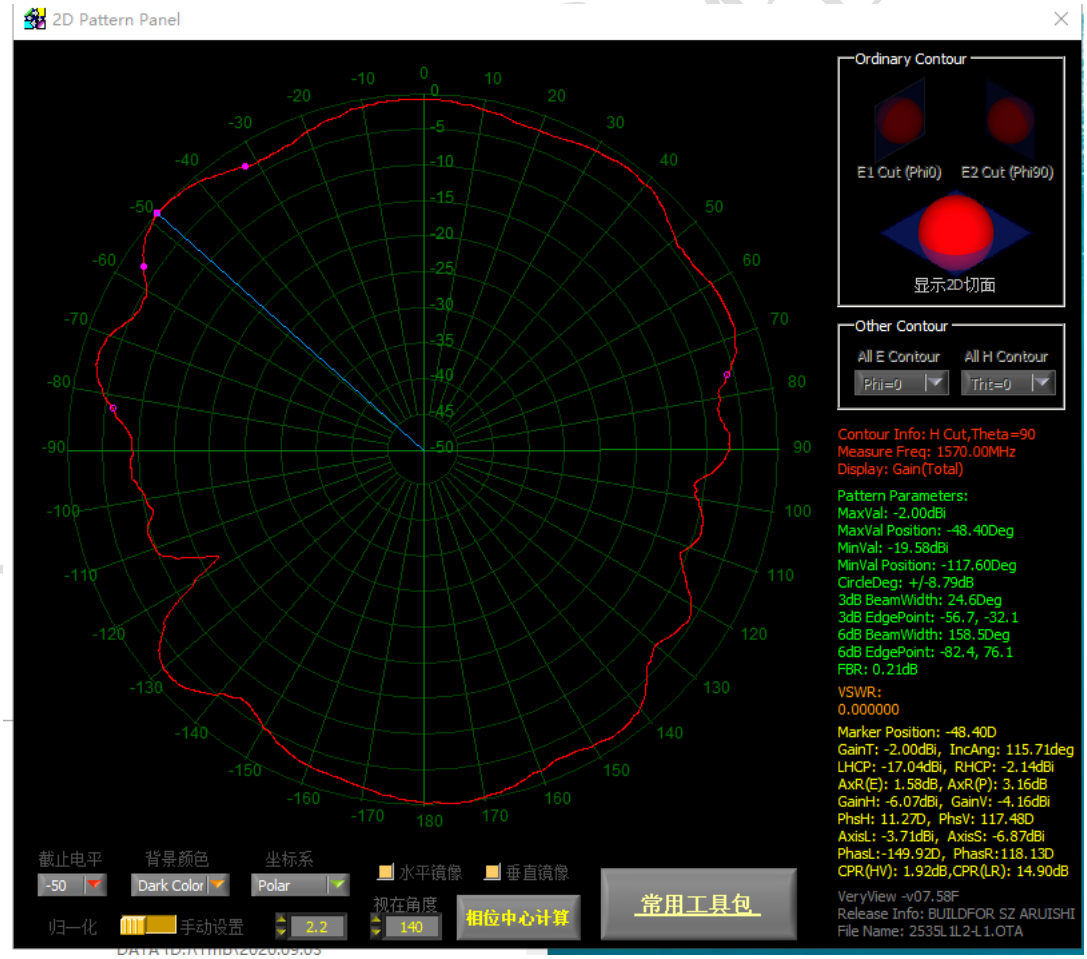
V2X Main 天线

5855MHz-5925MHz



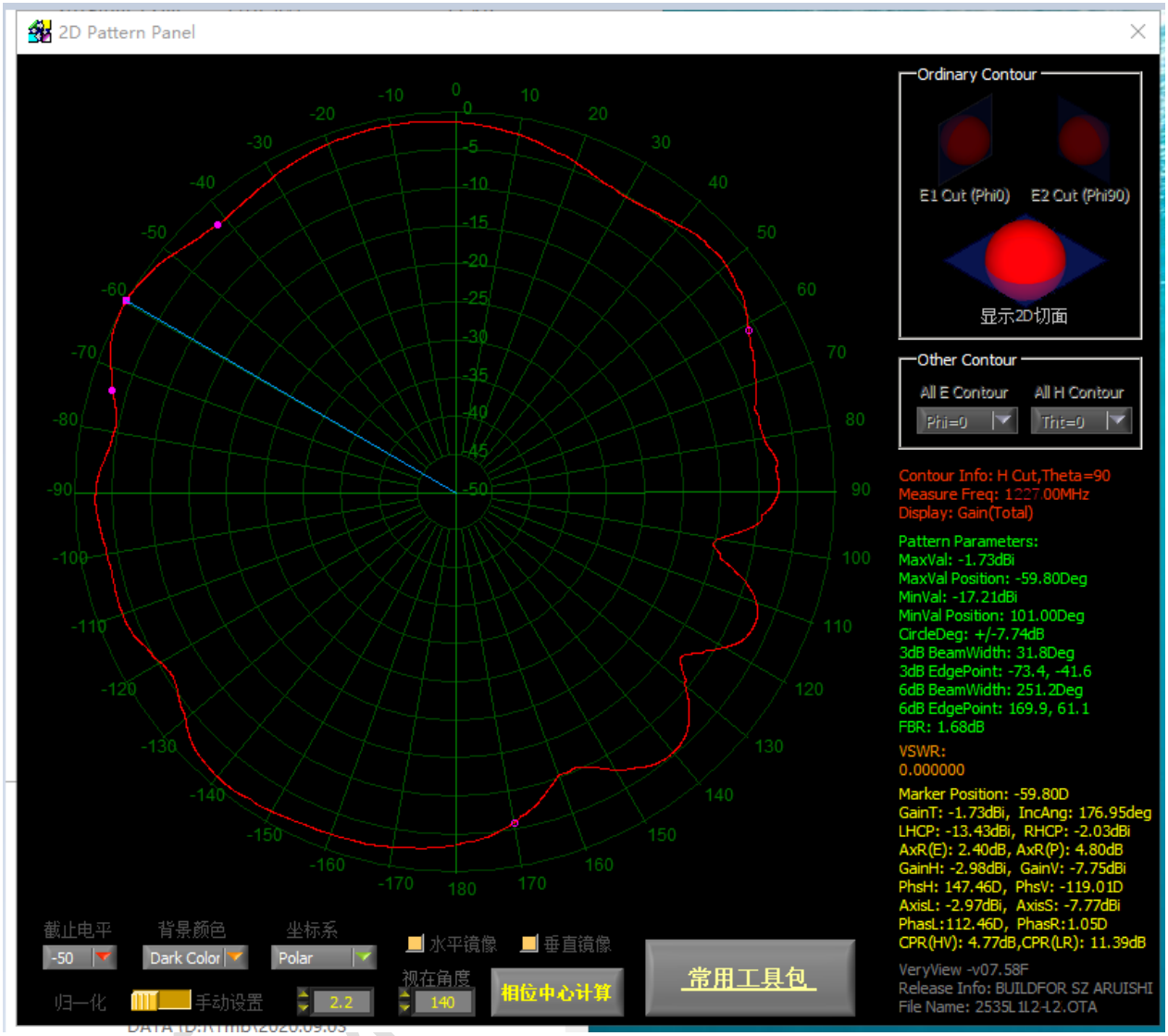
XOY YOZ XOZ

GNSS 天线
L1 1575.42MHz



GNSS 天线

L2 1227.6MHz



GNSS 天线技术指标		
技术要求	技术指标	备注
频率范围 Frequency Range	GPS L1+ GPS L2， BD B1， GLONASS L1	
极化方式 Polarization	RHCP	极化方式
天线增益 Antenna Gain	GPS L1：≥2dBi GPS L2：≥-4dBi	在 70*70 mm 接地底板上带电桥测试
输出驻波比	＜2.0	中心频率
Output VSWR		
输出阻抗	50Ω	
Output Impendance 极化方式 Polarization	右旋圆极化(RHCP)	
天线轴比	≤ 3dB	在 70*70 mm 接地底板上带电桥测试
Axis Ratio		
水平面覆盖角度	360°	
LNA 技术要求		
技术要求	技术指标	备注
LNA 增益 Gain	32±2dB	
噪声系数 Noise Figure	<1.5dB	
输出驻波比 Output VSWR	<2.0	
输出阻抗 Output Impedence	50Ω	
带内增益平坦度 Passband Ripple	±1.0dB（仅 LNA）@1575.42±5MHz	
LNA 输出 1dB 压缩点 1dB Compression Point Output	>-10dBm（仅 LNA）	
带外抑制 Out of Band Rejection	1575MHz±100MHz 1227MHz±100 MHz	30dBc min 30dBc min

供电电压 Prime Power	3.3V~5V	
工作电流 Operating Current	<20mA	

工作环境		
工作相对湿度 Relative Humidity	95%	工作相对湿度 Relative Humidity
工作温度 Operating Temperature	-40～+80℃	工作温度 Operating Temperature
储存温度 Store Temperature	-45～+85℃	储存温度 Store Temperature