Huizhou SPEED AutoIN Technology Co., Ltd.

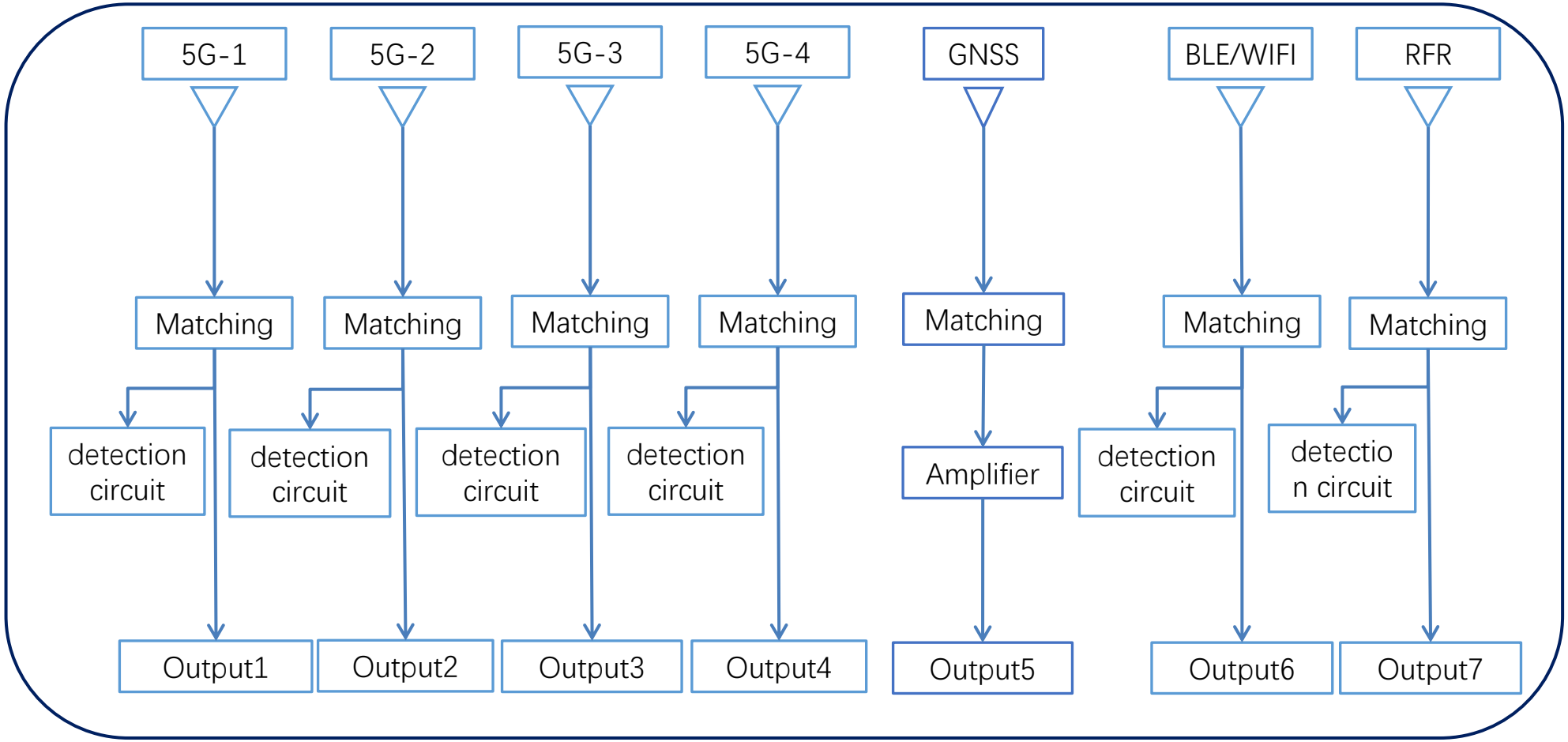
Polestar-5G Antenna Module Technical Proposal

版本：Rev 01

编制：　　日期：

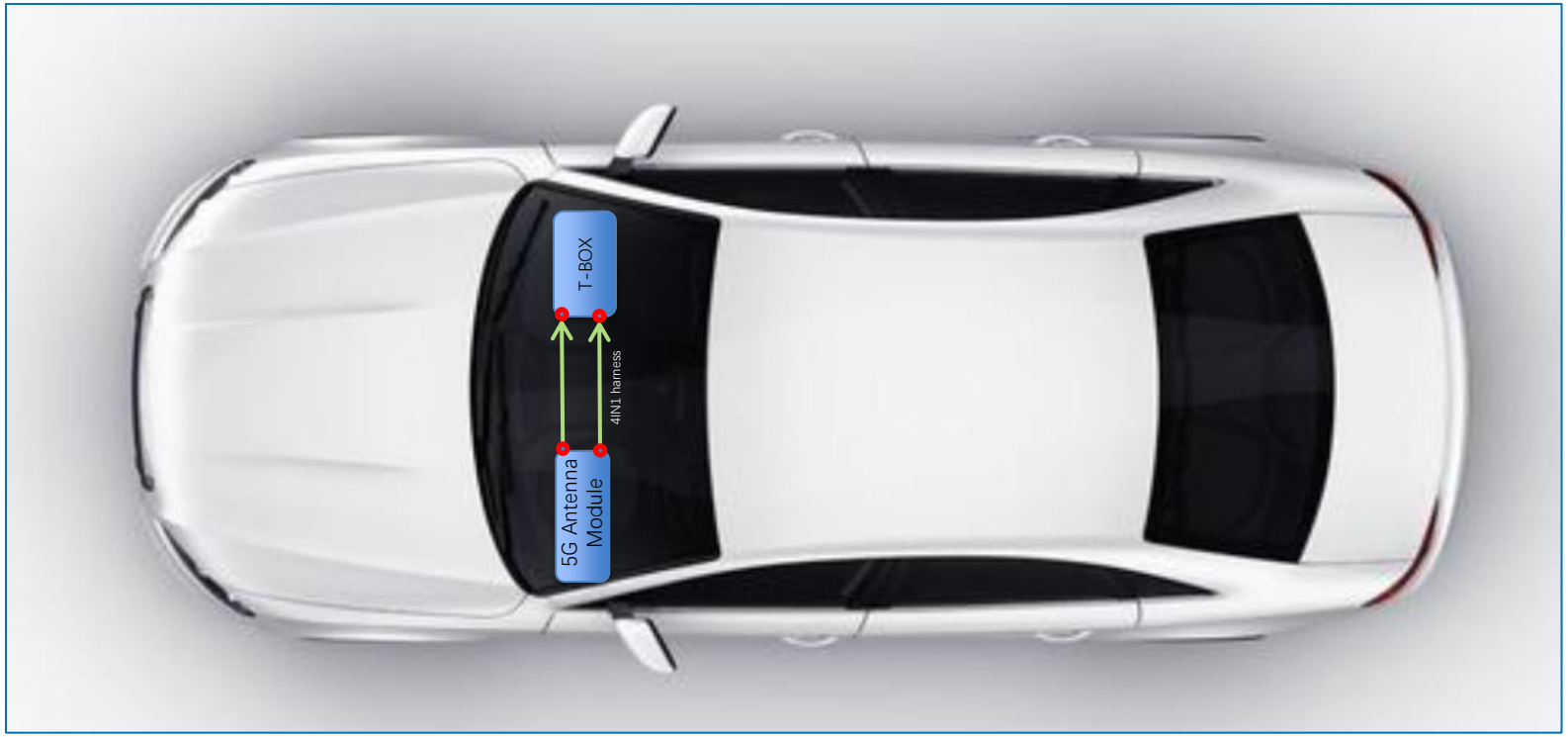
Design Concept

System Block Diagram



Design Concept

Antenna position （5G Antenna Module)



Wire harness type

Dacar302

Illustrate：
1、IP：5G Antenna Module、T-BOX
*Non silver plated glass for front and rear windshields

Design Concept

5G antenna performance index

5G antenna performance index		
Performance	**Condition**	**Performance index**
Frequency band	/	698-960MHz 1452-1496MHz 1710-2690MHz 3300-5000MHz
VSWR	/	≤3
Gain		698-960MHz：≥-1dB 1452-1496、1710-2690MHz：≥1.5dB 3300-5000MHz：≥2.5dB
Isolation	/	698-960MHz：≥13dB 1452-1496、1710-2690MHz：≥20dB 3300-5000MHz：≥20dB

Design Concept

GNSS-1 performance index

GNSS performance index		
Performance	**Condition**	**Performance index**
Frequency band	/	L1：1559-1606MHz L5：1164-1217MHz
Polarization	/	RHCP
Gain	/	0°：≥0dBic 60°：≥-5dBic 87.5°：≥-18dBic
Axial ratio	/	0°：≤6dB 60°：≤15dB 87.5°：≤28dB
Impedance	/	50Ω
S_{11}	/	≤-9.54dB
Noise figure	/	≤2.5dB
LNA Gain (LNA Gain)	/	17±2dB
Efficiency	/	≥50%
current	/	≤60mA
Out of band rejection	/	F0±50MHz：≥25dB

Design Concept

BLE performance index

BLE performance index		
Performance	**Condition**	**Performance index**
Frequency band	/	2400-2500MHz
Gain	/	> 2dBi
Efficiency	/	⩾50%
VSWR	/	⩽2
S_{11}	/	⩽-9.54dB

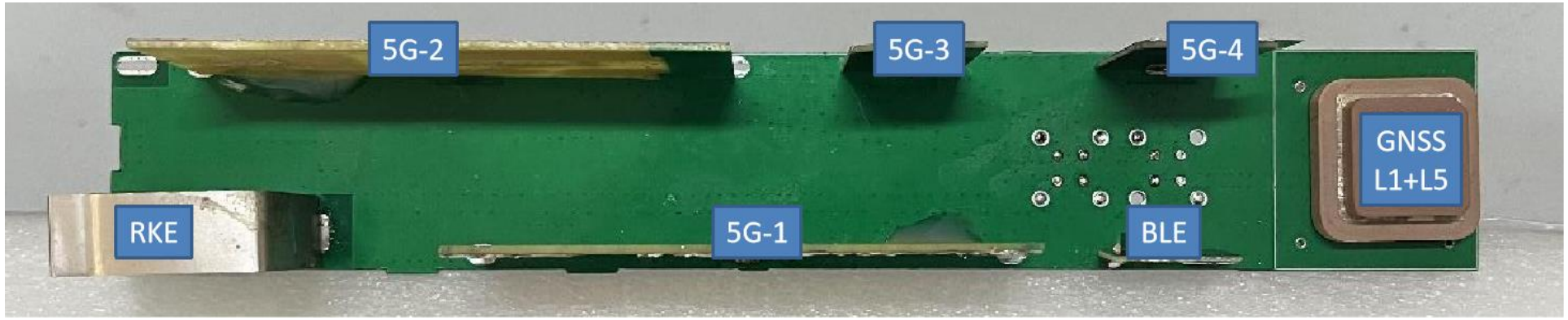
Design Concept

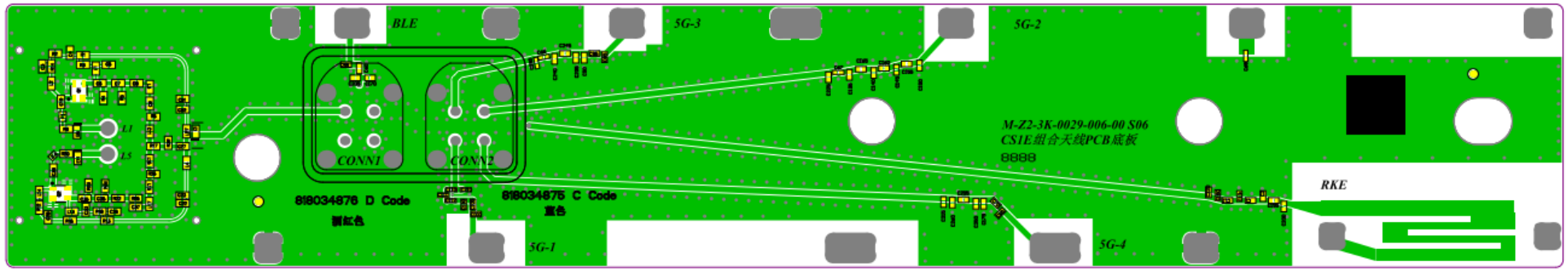
RFR performance index

RFR performance index		
Performance	**Condition**	**Performance index**
Frequency band	/	433±1MHz
Efficiency	/	30%
VSWR	/	≤2
S_{11}	/	≤-9.54

Design Concept

5G Antenna Module （Demo）

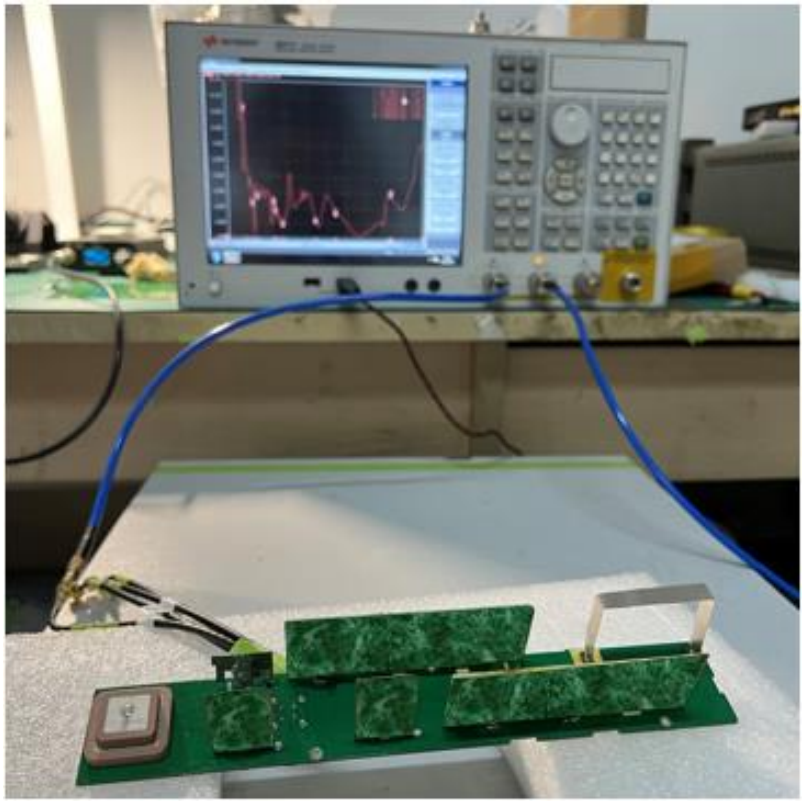




Design Concept

5G Antenna Module （SETUP）

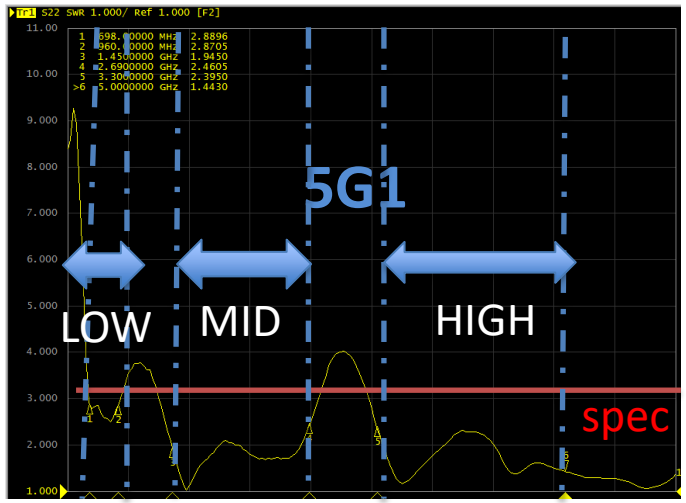
Anechoic Chamber

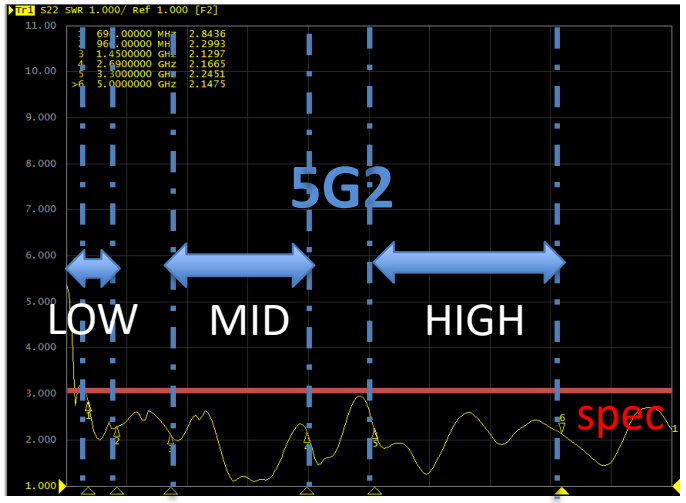


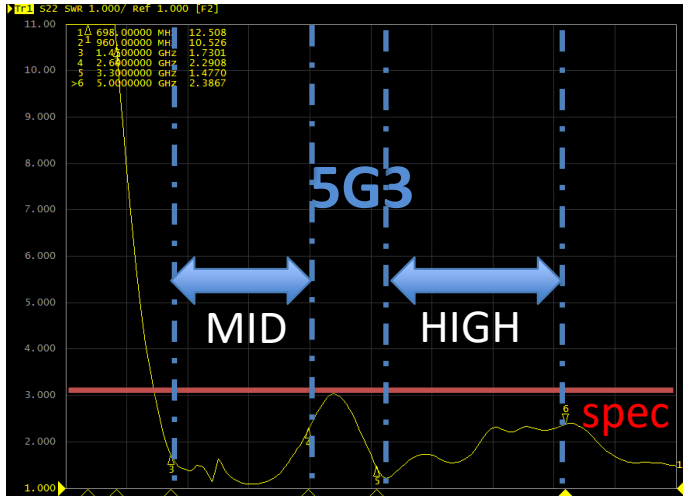
Network Analyzer

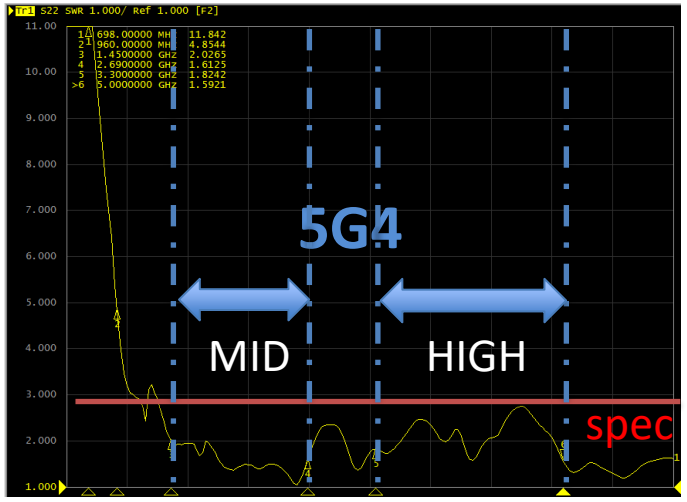
Design Concept

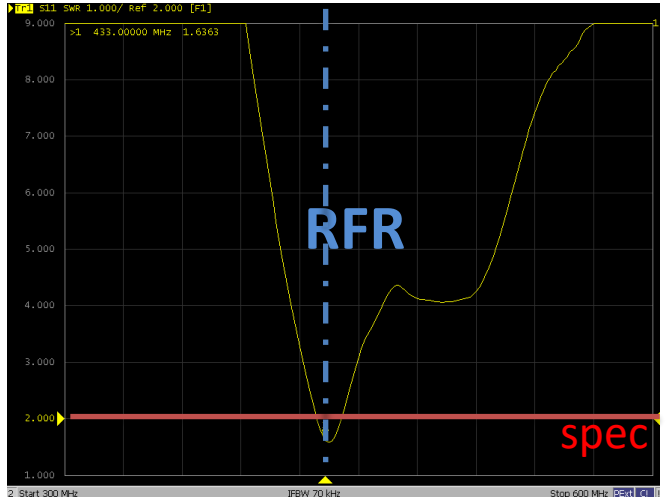
5G Antenna Module test data（VSWR）





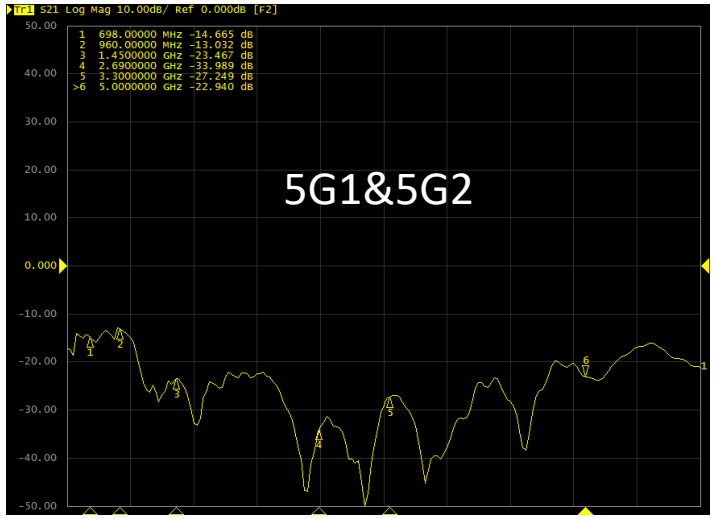


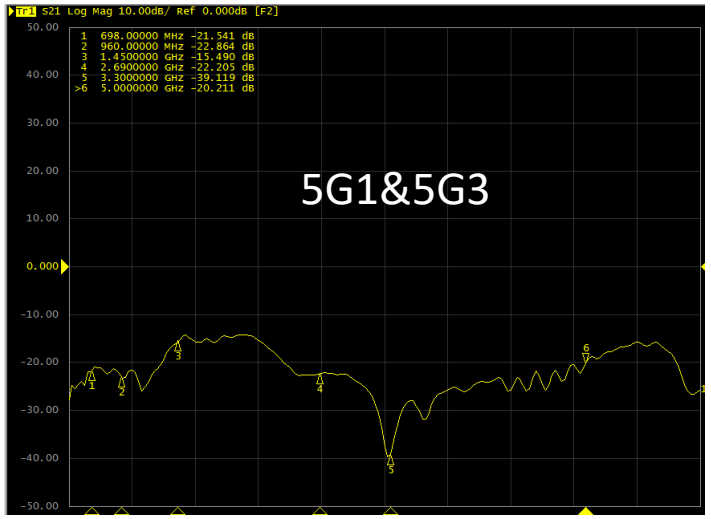


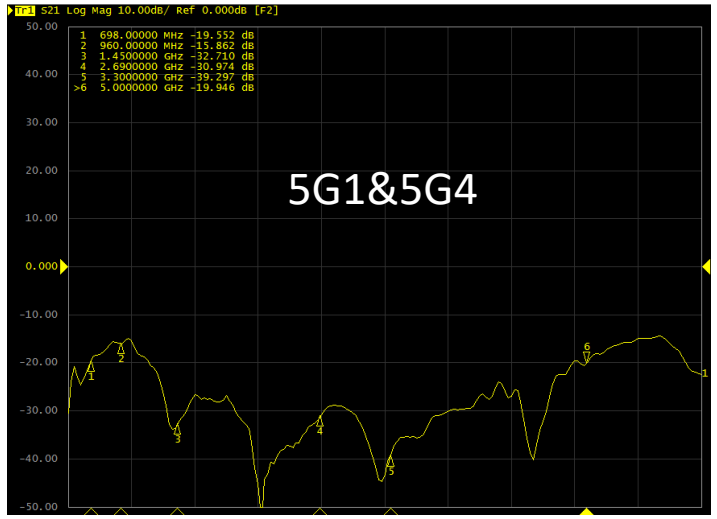


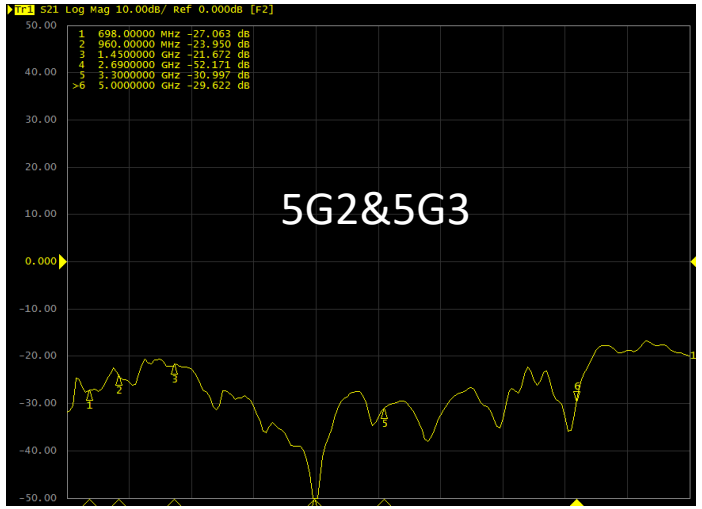
Design Concept

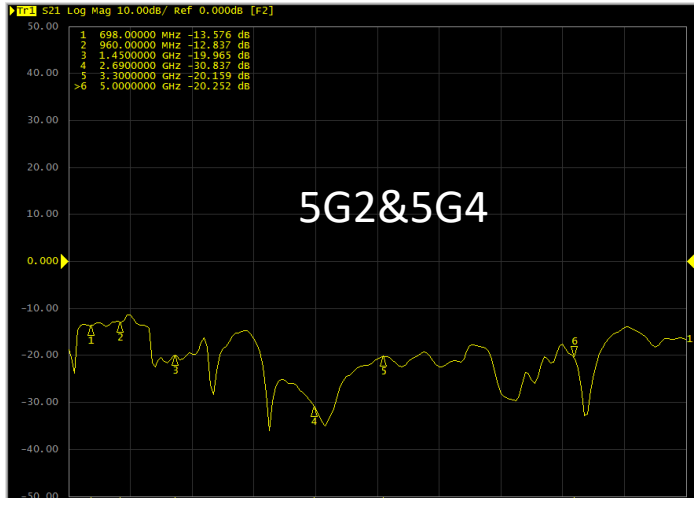
5G Antenna Module test data（Isolation）

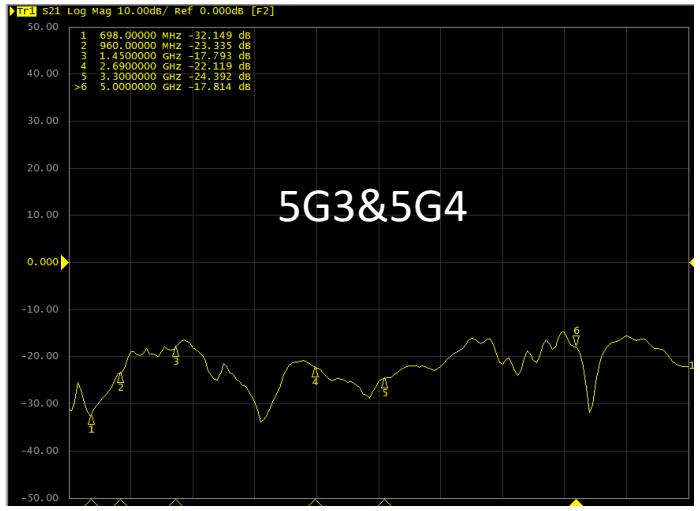








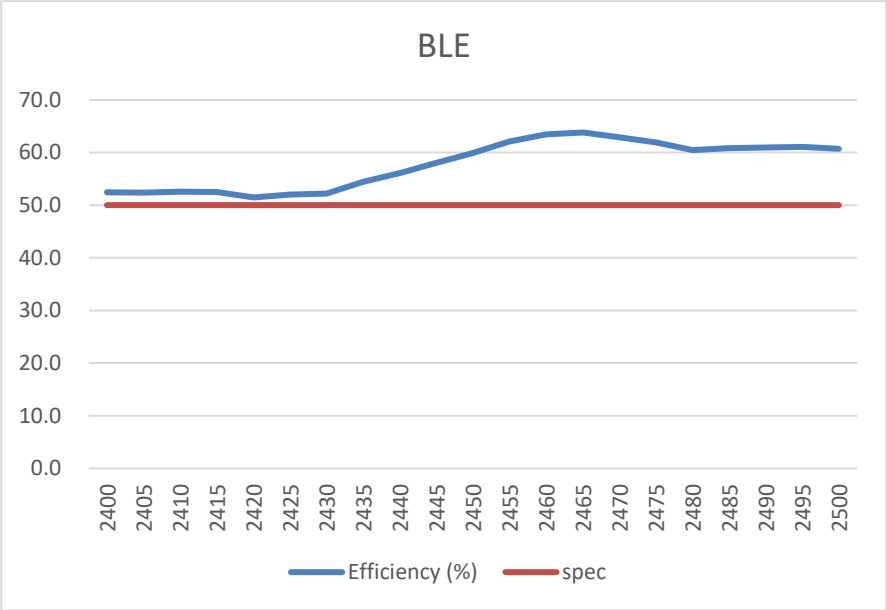




Design Concept

5G Antenna Module test data（BLE Efficiency & Gain）

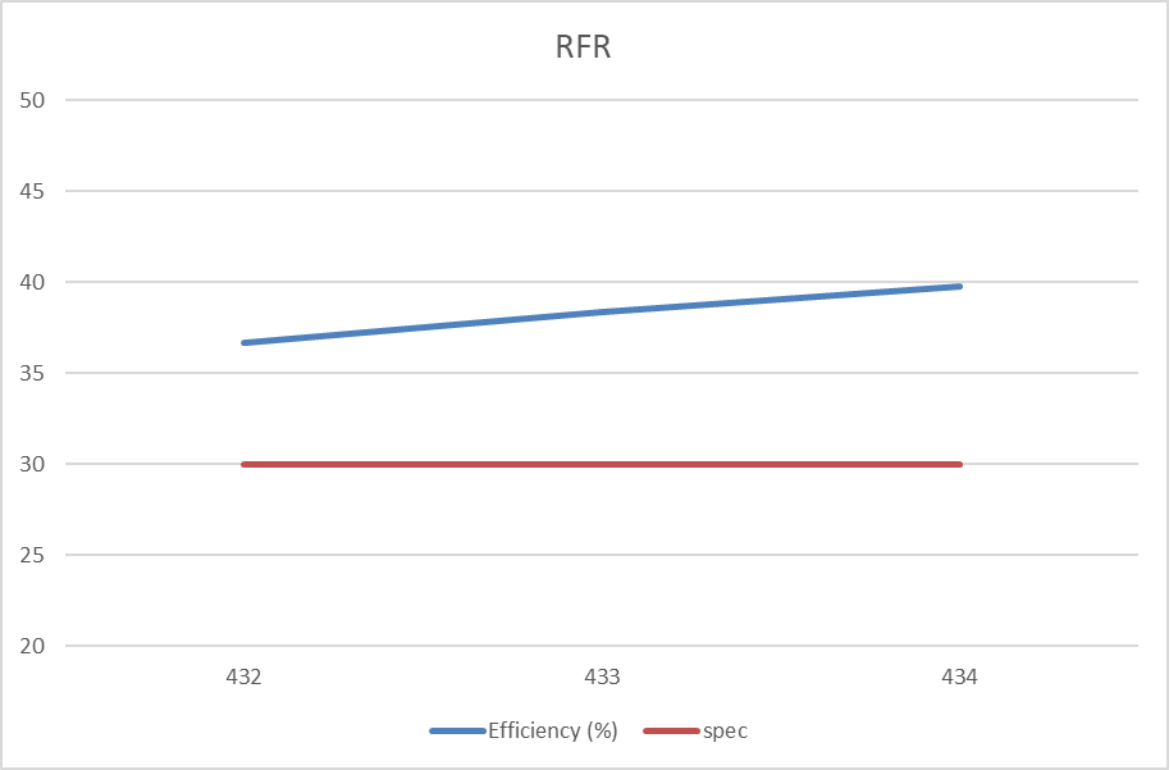
Frequency (MHz)	Efficiency (dB)	Efficiency (%)	Gain (dBi)
2400	-2.8	52.4	3.0
2410	-2.8	52.6	3.2
2420	-2.9	51.5	3.2
2430	-2.8	52.2	3.4
2440	-2.5	56.1	3.3
2450	-2.2	59.9	3.5
2460	-2.0	63.5	3.6
2470	-2.0	62.9	3.8
2480	-2.2	60.5	4.0
2490	-2.2	60.9	4.3
2500	-2.2	60.7	4.4



Design Concept

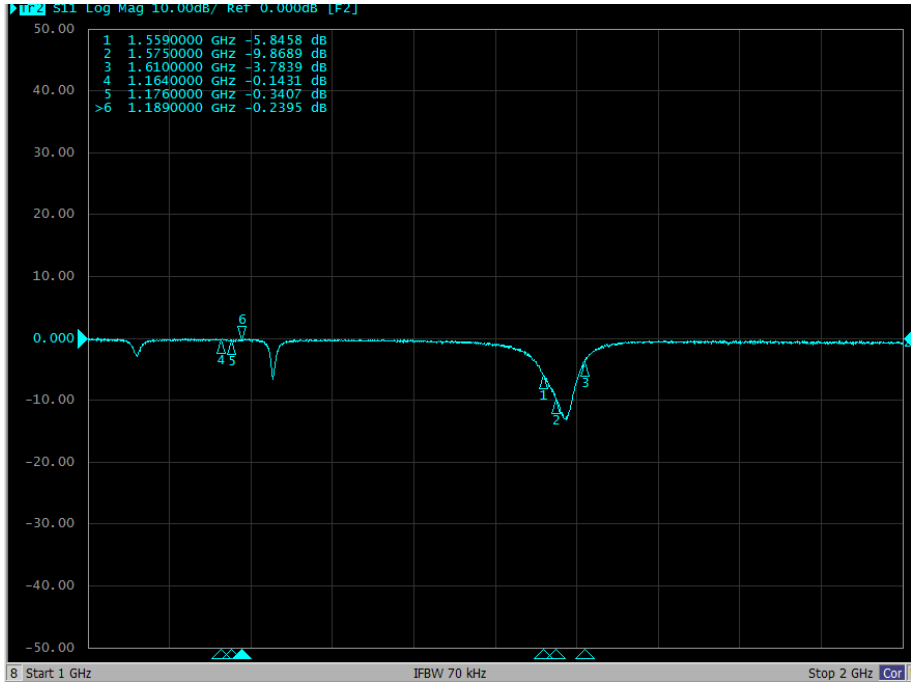
5G Antenna Module test data（RFR Efficiency & Gain）

Frequency（MHz)	Efficiency (dB)	Efficiency (%)	Gain (dBi)
432	-4.4	36.7	1.6
433	-4.2	38.4	1.8
434	-4.0	39.8	2.1

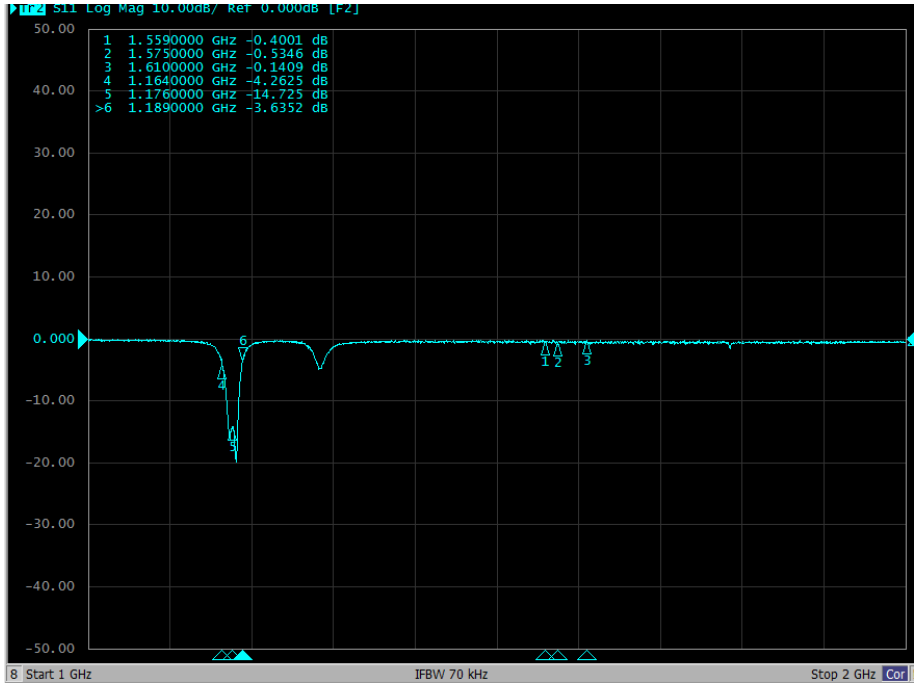


Design Concept

5G Antenna Module test data（GNSS S11）



L1

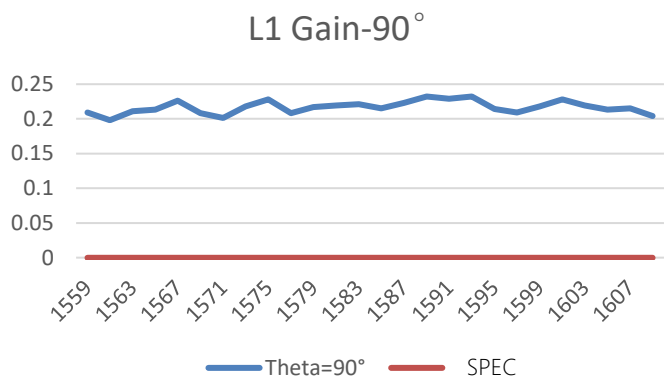


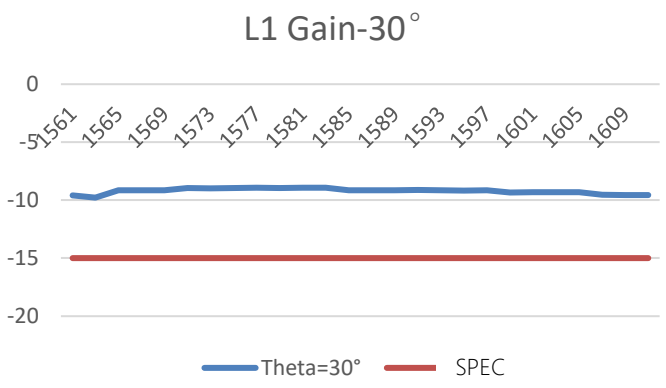
L5

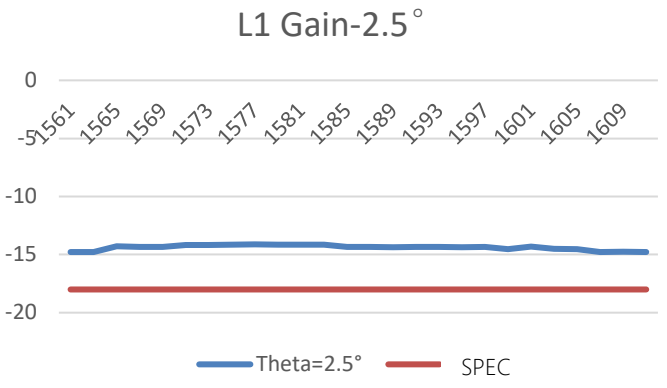
Frequency band	S11	Spec	Remark
1575MHz	-9.86dB	< -9.54dB	OK
1176MHz	-14dB	< -9.54dB	OK

Design Concept

5G Antenna Module test data（GNSS L1 Gain）



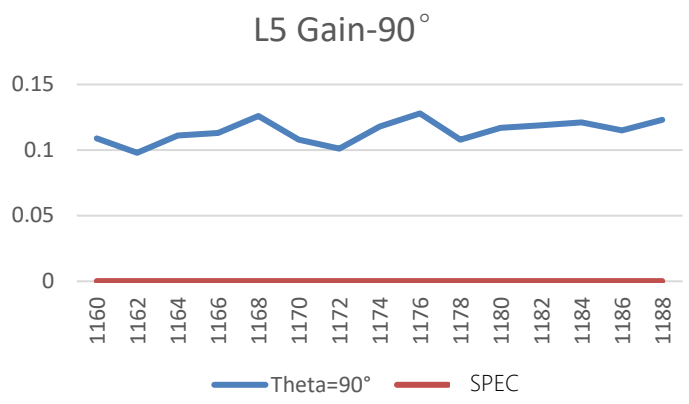


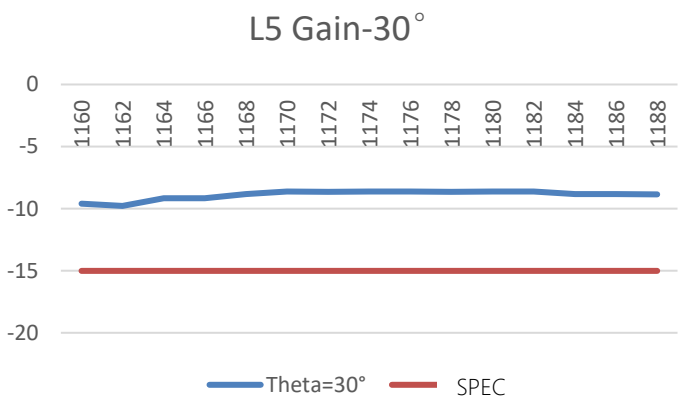


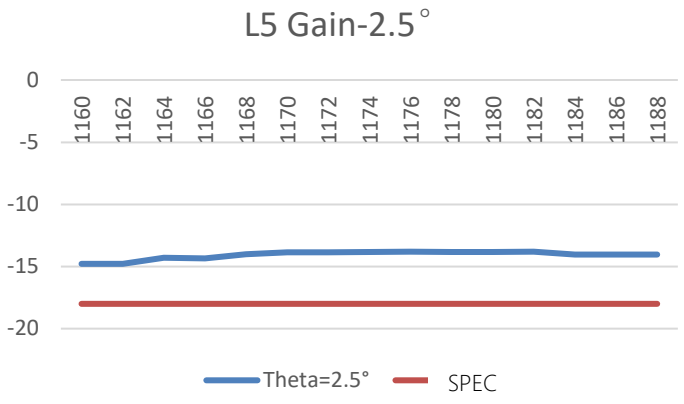
Frequency band	Angle	Specification	Remark
L1	90°	≥0	OK
	30°	≥-15	OK
	2.5°	≥-18	OK

Design Concept

5G Antenna Module test data（GNSS L5 Gain）



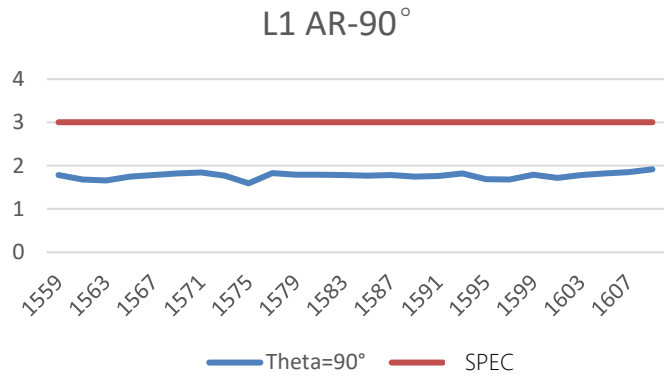


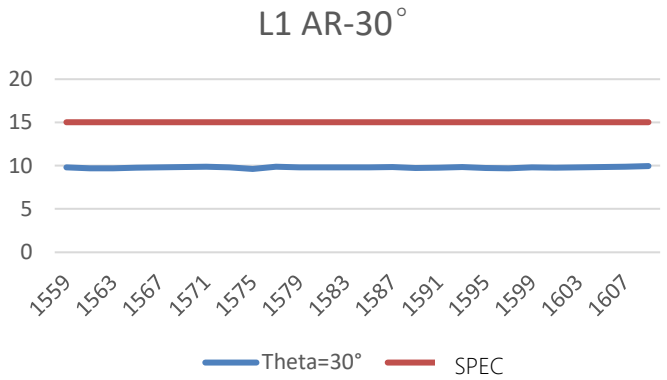


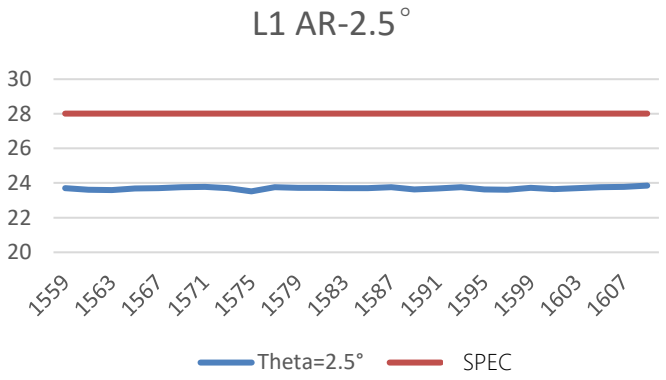
Frequency band	Angle	Specification	Remark
L5	90°	≥0	OK
	30°	≥-15	OK
	2.5°	≥-18	OK

Design Concept

5G Antenna Module test data（GNSS L1 AR）



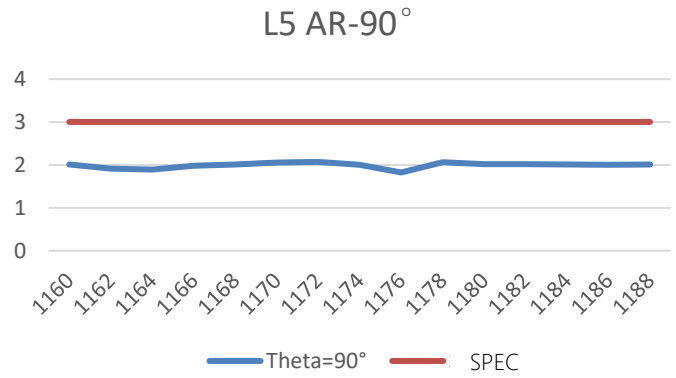


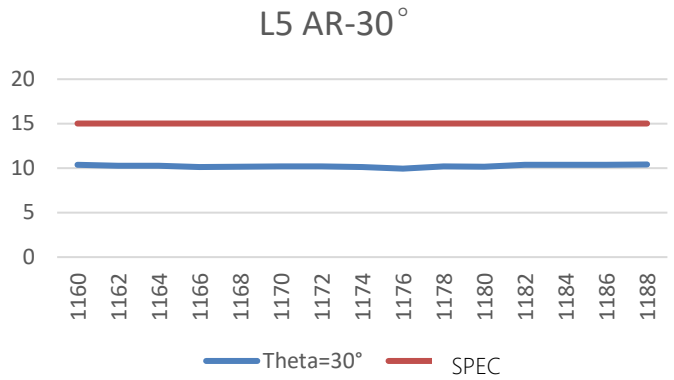


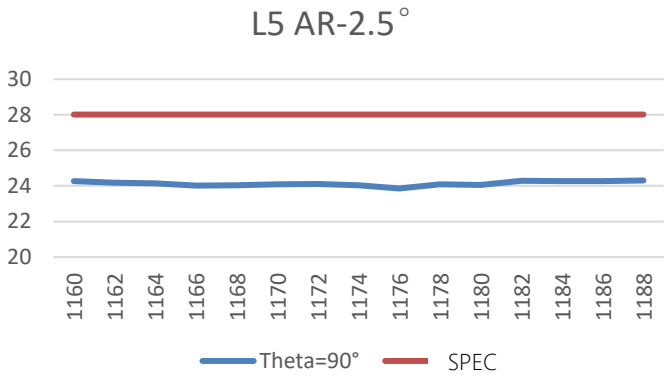
Frequency band	Angle	Specification	Remark
L1	90°	≤3	OK
	30°	≤15	OK
	2.5°	≤28	OK

Design Concept

5G Antenna Module test data（GNSS L5 AR）



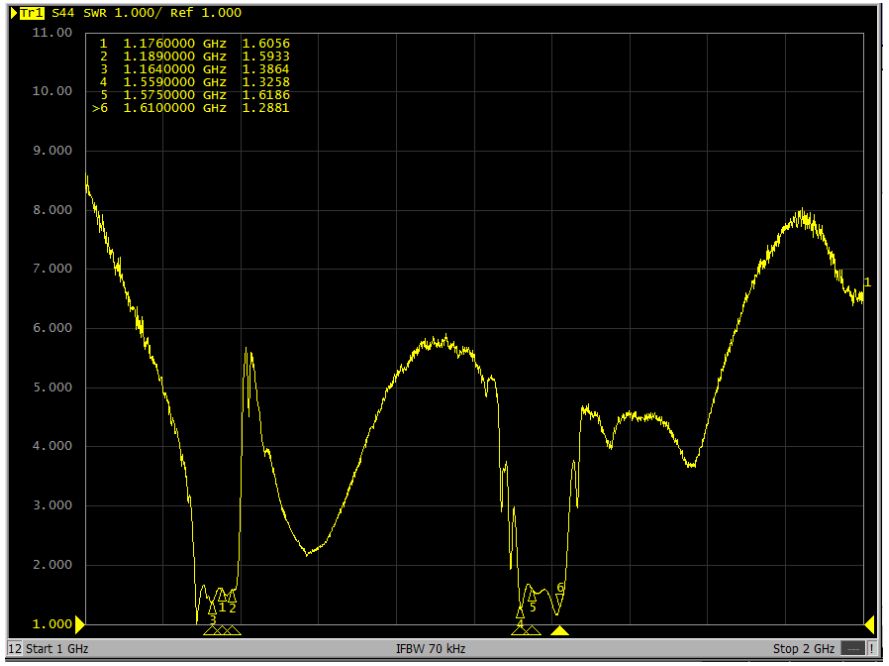




Frequency band	Angle	Specification	Remark
L5	90°	≤3	OK
	30°	≤15	OK
	2.5°	≤28	OK

Design Concept

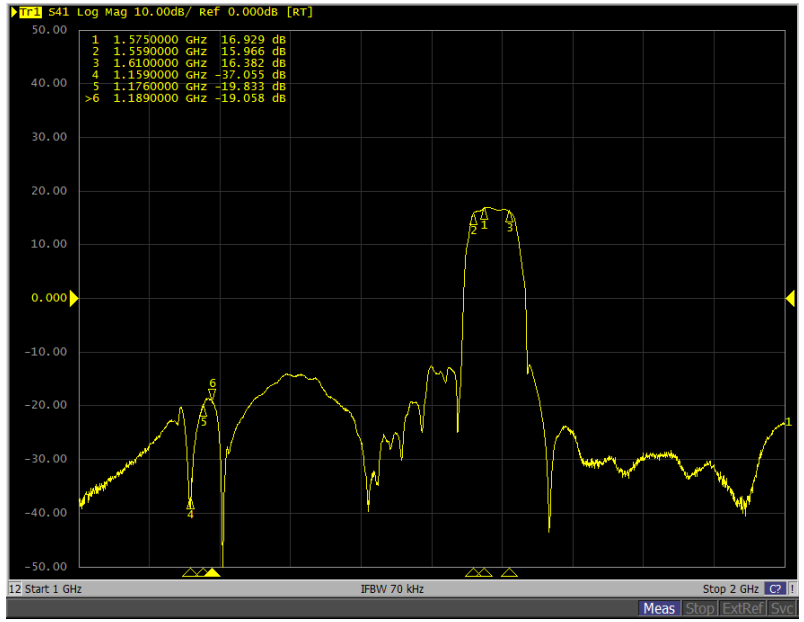
5G Antenna Module test data（GNSS LNA VSWR）



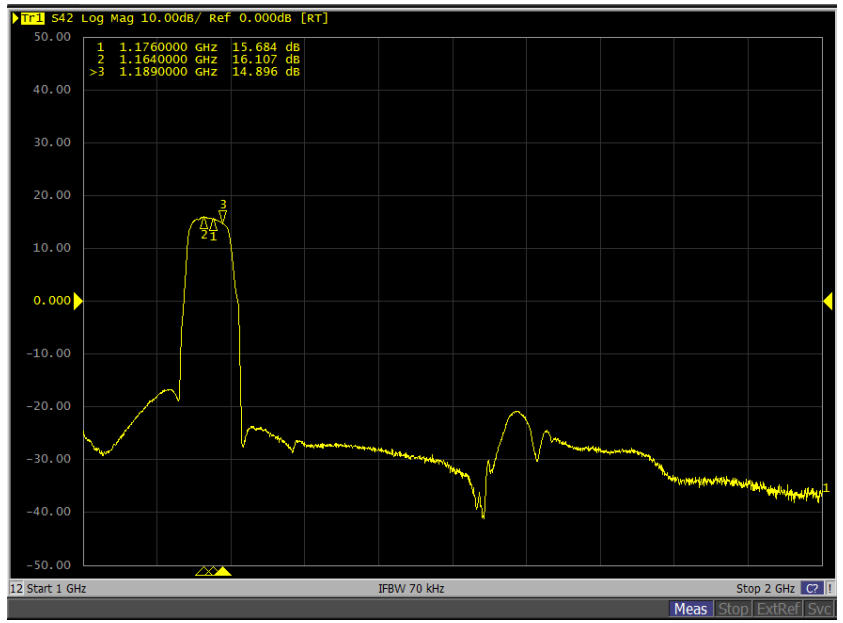
Frequency band	Frequency (MHz)	VSWR	Specification	Remark
L1	1575	1.62	<1.9	OK
	1559	1.32		OK
	1664	1.38		OK
L5	1161	1.28		OK
	1176	1.60		OK
	1189	1.59		OK

Design Concept

5G Antenna Module test data（GNSS LNA Gain）



L1

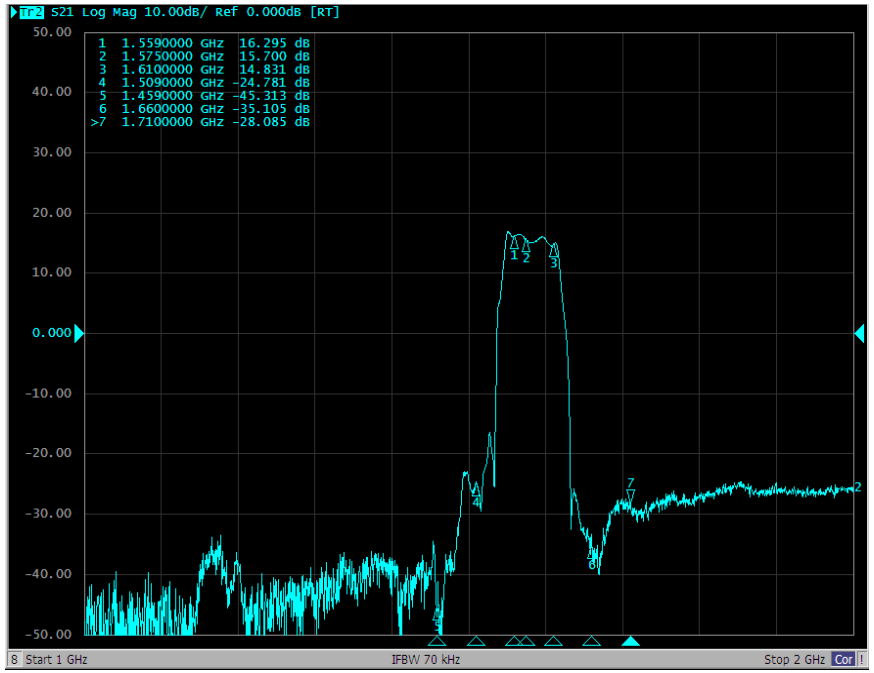


L5

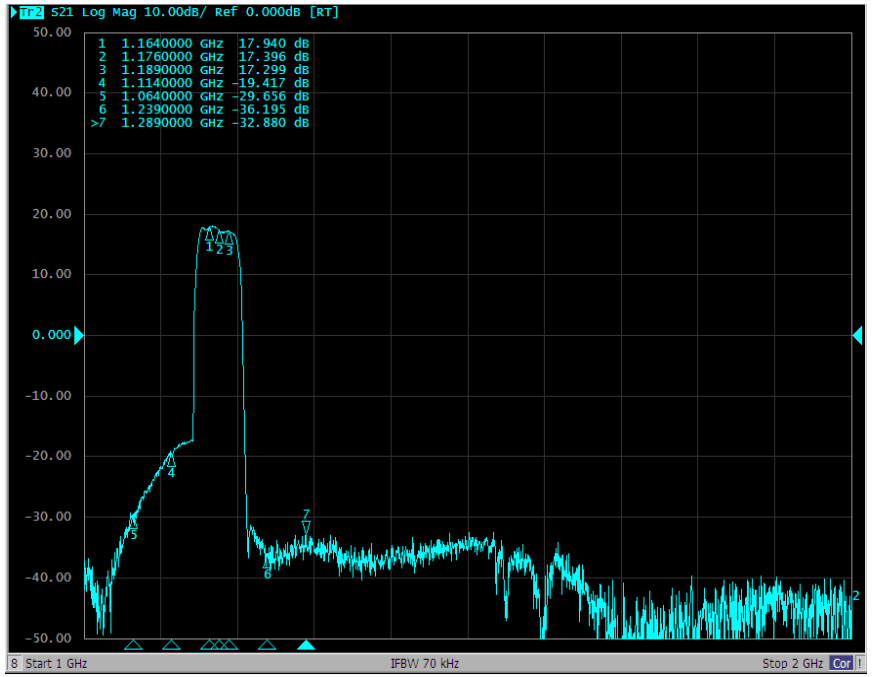
Frequency band	Frequency (MHz)	Gain	Specification	Remark
L1	1575	16.9	17±3	OK
	1559	15.9		OK
	1610	16.4		OK
L5	1159	16.1		OK
	1176	15.9		OK
	1189	14.9		OK

Design Concept

5G Antenna Module test data（GNSS LNA Out of band rejection）



L1

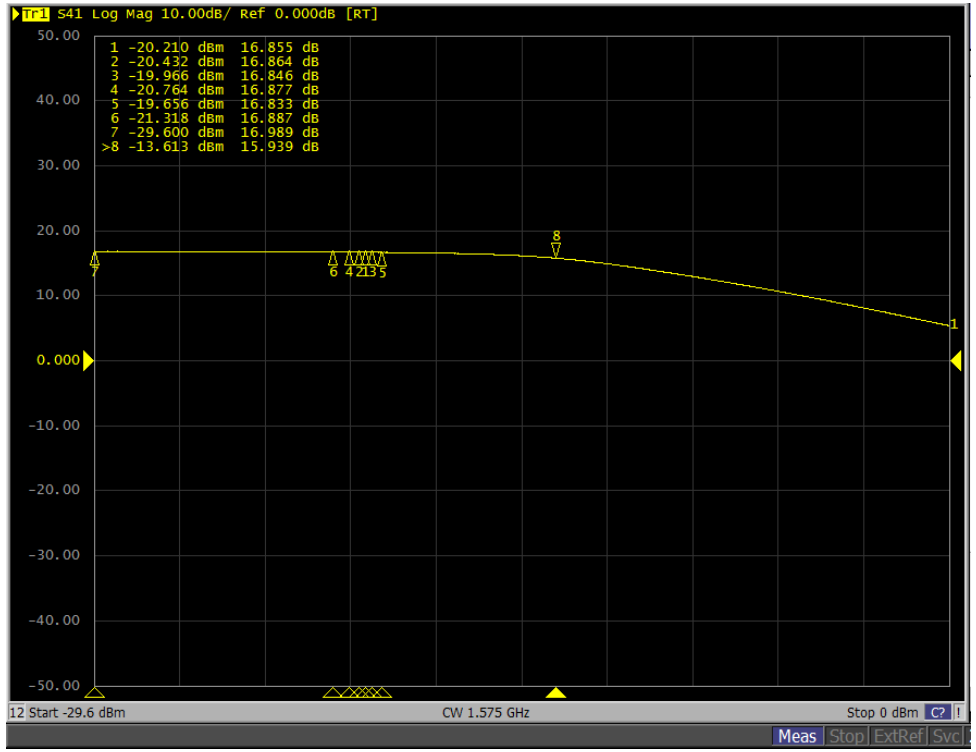


L5

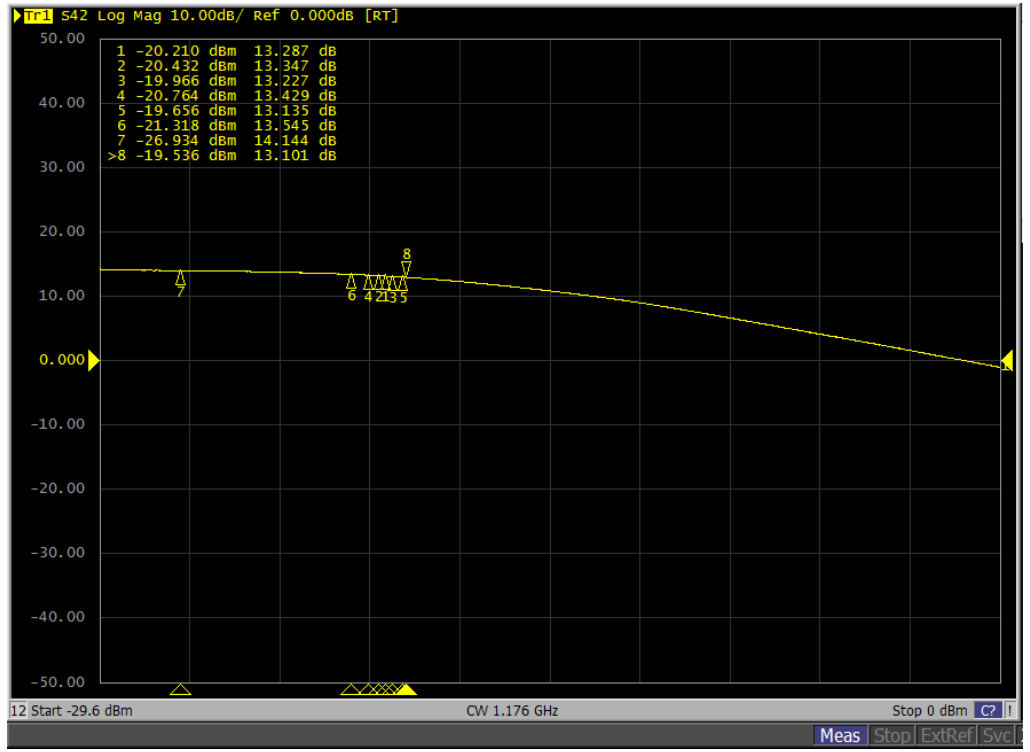
Frequency band	Specification	Out of band rejection（dB）	Remark
L1	> 25dB	40	OK
	> 25dB	42	OK
L5	> 25dB	36	OK
	> 25dB	46	OK

Design Concept

5G Antenna Module test data（GNSS LNA P1dB）



L1

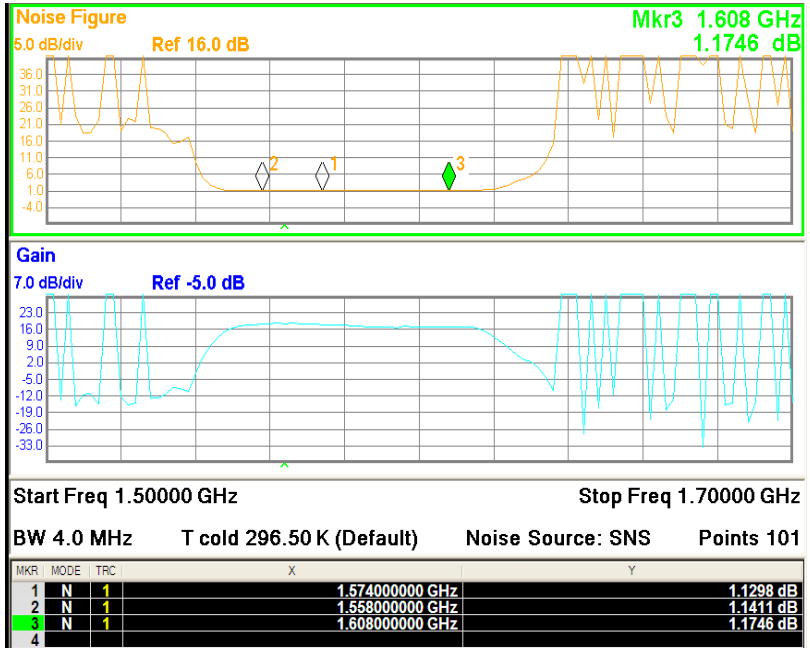


L5

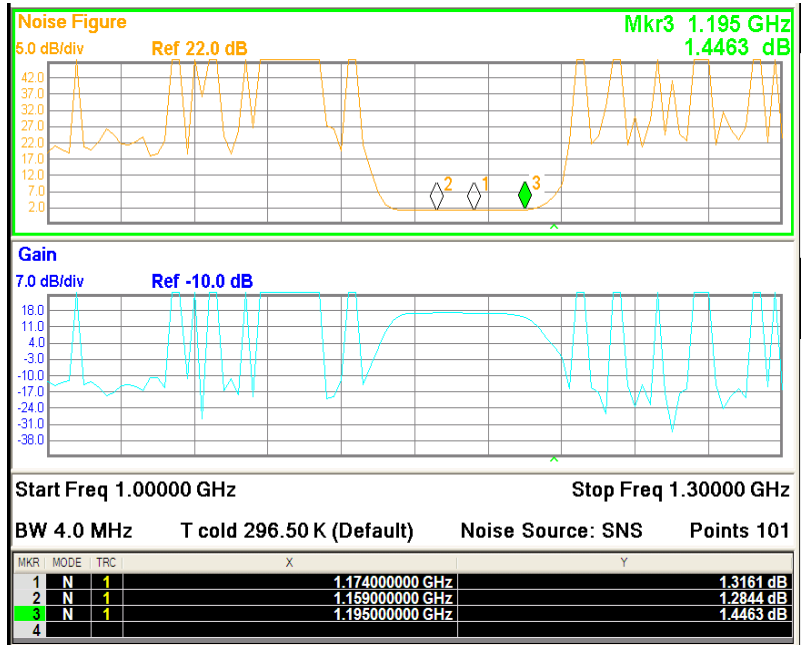
Frequency band	P1dB	Specification	Remark
L1	-13.6	>-20	OK
L5	-19.5		OK

Design Concept

5G Antenna Module test data（GNSS Noise Figure）



L1

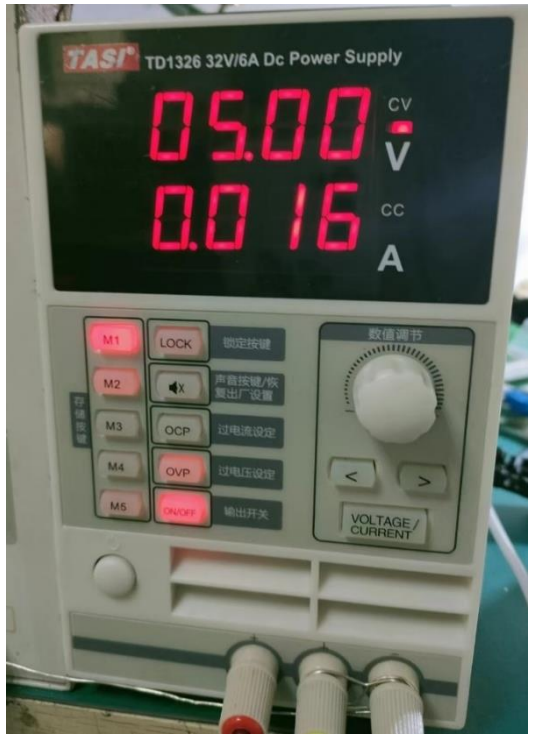


L5

Frequency band	Frequency (MHz)	Noise Figure	Specification	Remark
L1	1558	1.14	<2.5	OK
	1574	1.12		OK
	1608	1.17		OK
L5	1159	1.28		OK
	1174	1.31		OK
	1195	1.44		OK

Design Concept

5G Antenna Module test data（GNSS LNA Current consumption Setup）



Voltage(V)	Current (mA)
5	16

THANK YOU !