

TNP-23006

Antenna Test Report

Version: V 1.03

Released Date: 2024/02/19

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Reviewed By: Xiaodong

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Revision History

Released Date	Version	Record
2023/12/20	1.00	Antenna Testing Report NEW Project
2024/01/22	1.01	增加ECC及5G频率加宽至5905MHz
2024/02/01	1.02	更新图片及数据格式
2024/02/19	1.03	更新图片及数据格式

Specification

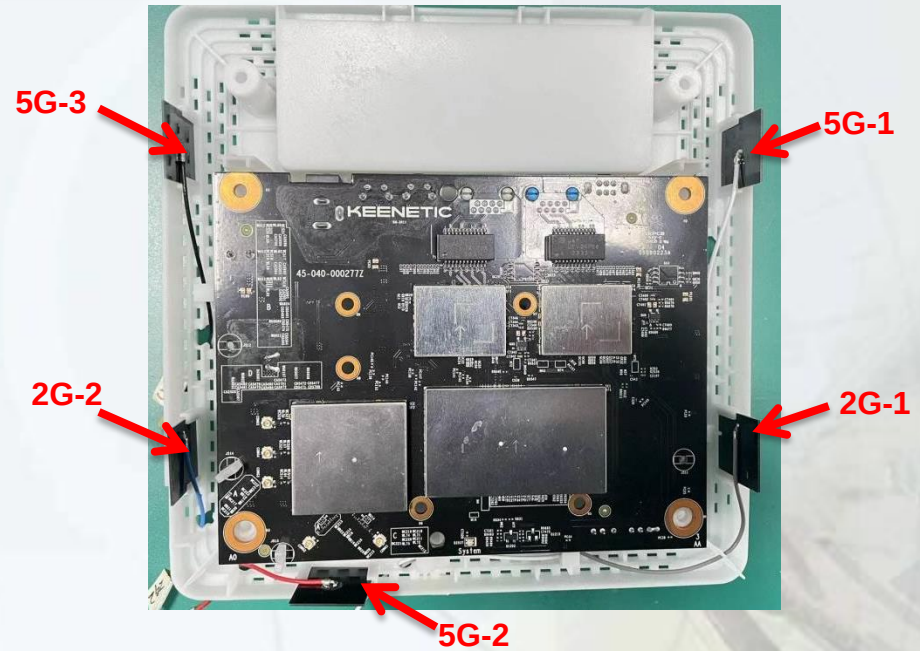
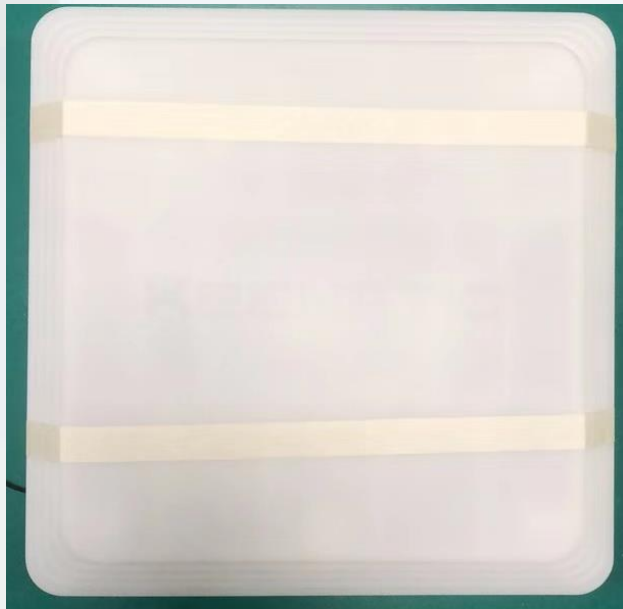
Requirements of Antenna Design

RF Function	Number of ANT	Frequency Band	Remark
WIFI	2	2400~2500 MHz	
WIFI	3	5150~5905 MHz	

Requirements of Measurement

Test Item	Specification	Remark
Return loss	Over :11.7dB	
Efficiency(with cable)	Over :60 %	
ECC	Under :0.3	
Isolation	2.4G> 23 dB; 5G> 25 dB;	

Antenna Placement & Solution



Antenna	ANT Type	Size (L * W * H)	Cable Length (mm)	Cable Type
2.4G-1	Dipole	20*20.3*0.6mm	线材总长：150mm	Ø1.13 Cable;Gray
2.4G-2	Dipole	20*20.3*0.6mm	线材总长：69mm	Ø1.13 Cable;Blue
5G-1	Dipole	20*20.3*0.6mm	线材总长：257mm	Ø1.13 Cable;White
5G-2	Dipole	20*20.3*0.6mm	线材总长：72mm	Ø1.13 Cable;Red
5G-3	Dipole	20*20.3*0.6mm	线材总长：86mm	Ø1.13 Cable;Black

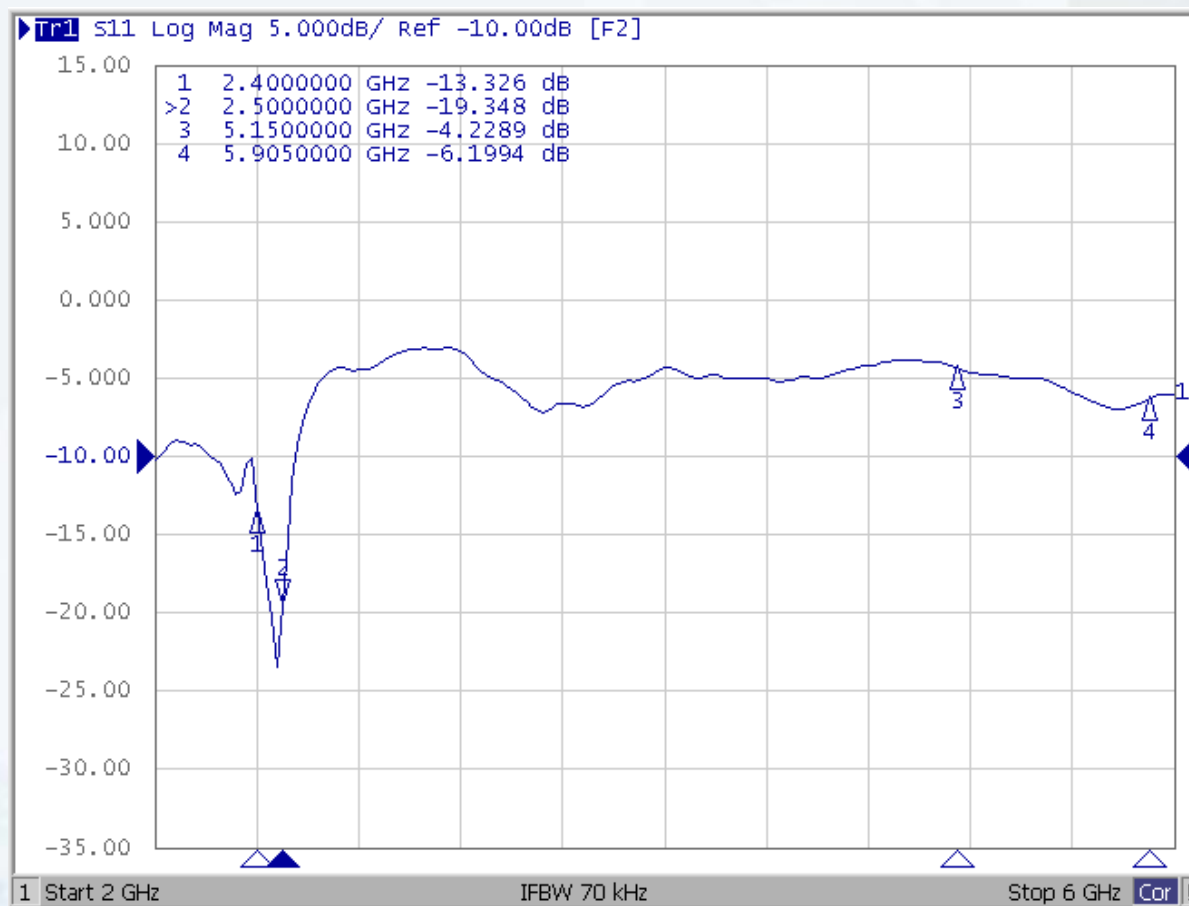
Test Setup for S-parameter Measurement



Equipment	Brand	Model	S/N
Network Analyzer	Keysight	E5071C	MY46107744

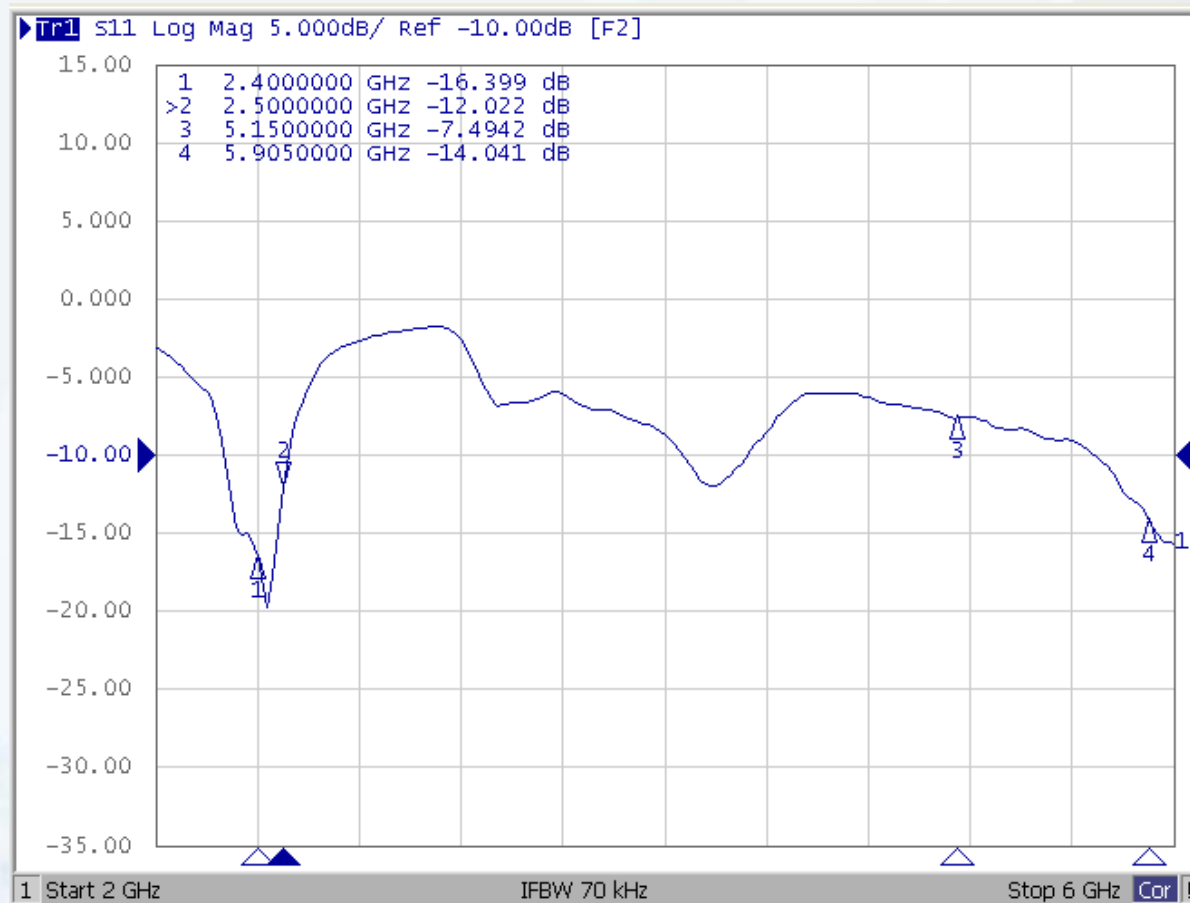
Return loss Results

2G-1(2400~2500 MHz)



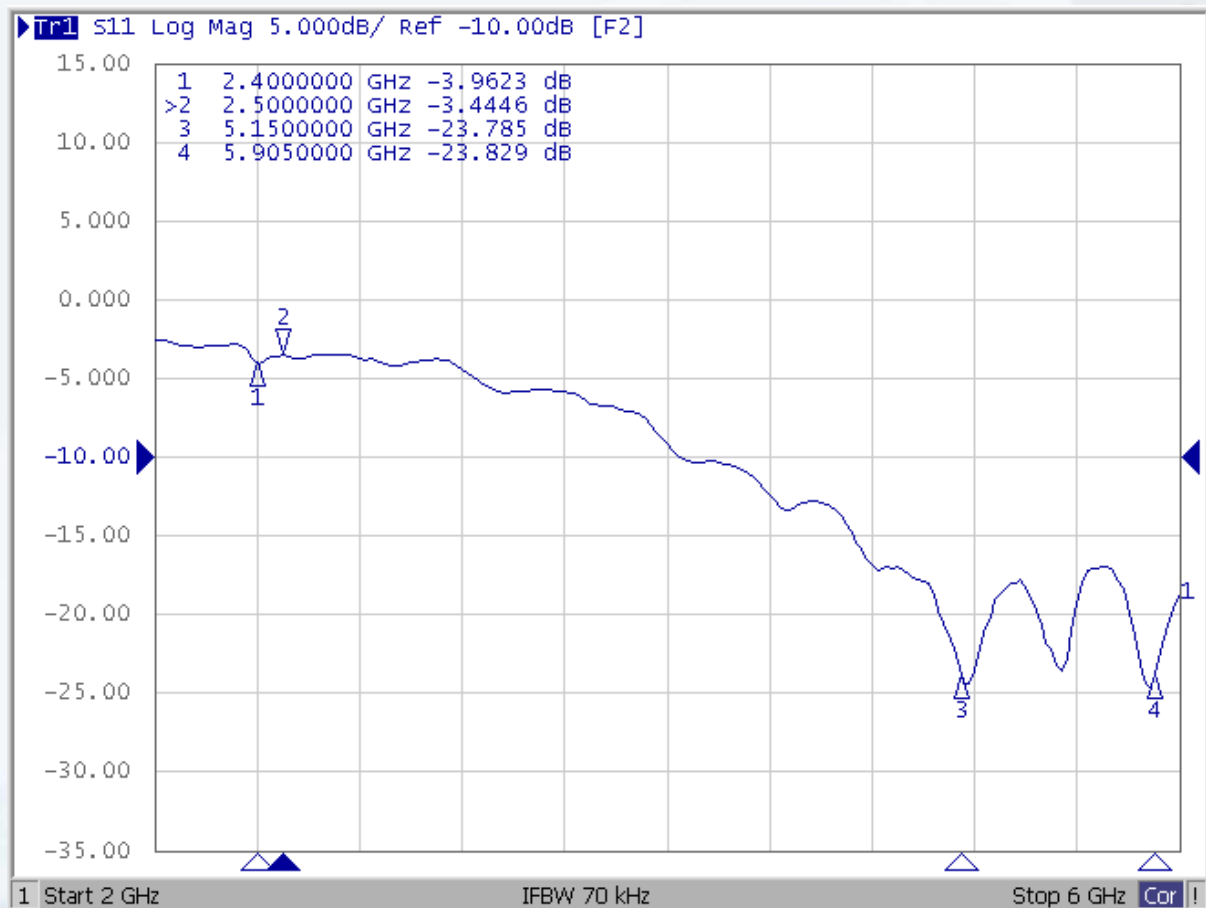
Return loss Results

2G-2(2400~2500 MHz)



Return loss Results

5G-1(5150~5905 MHz)



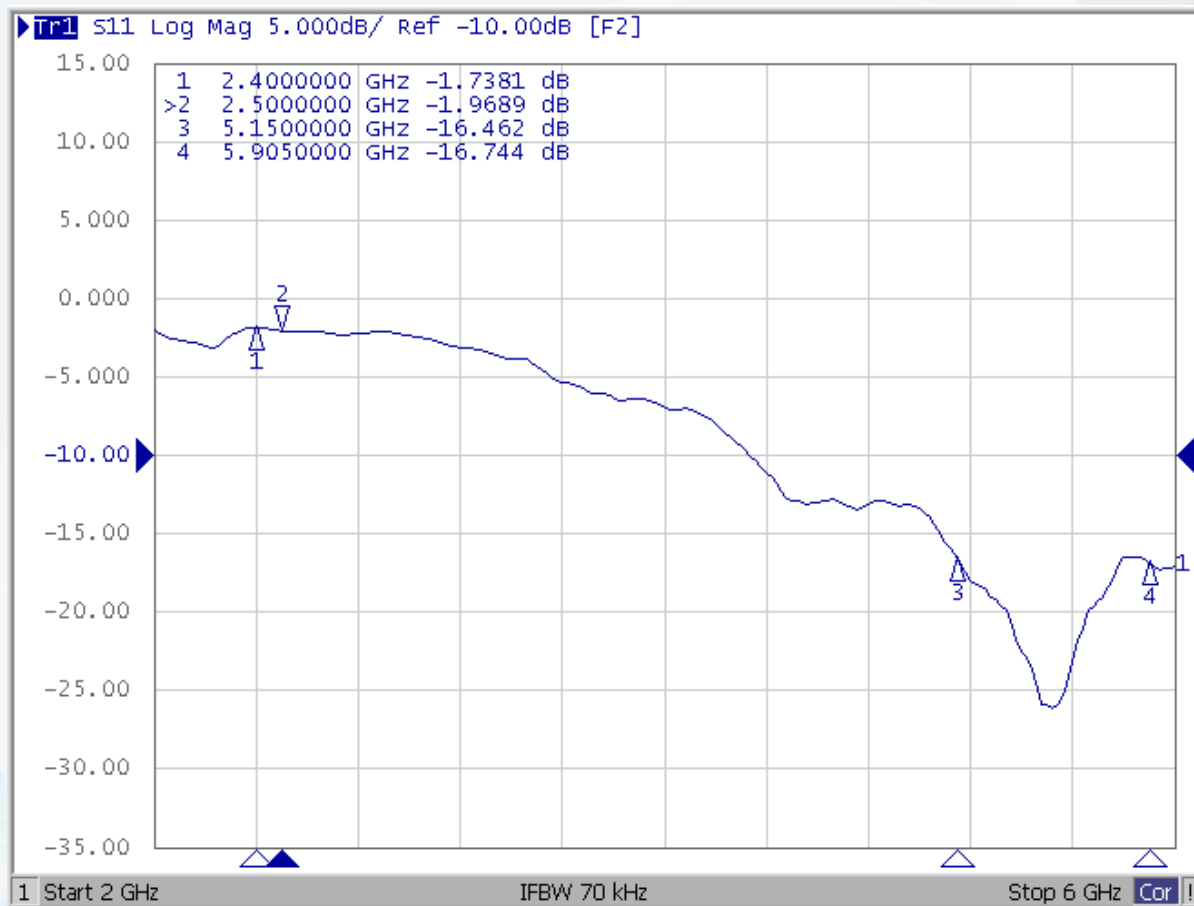
Return loss Results

5G-2(5150~5905 MHz)



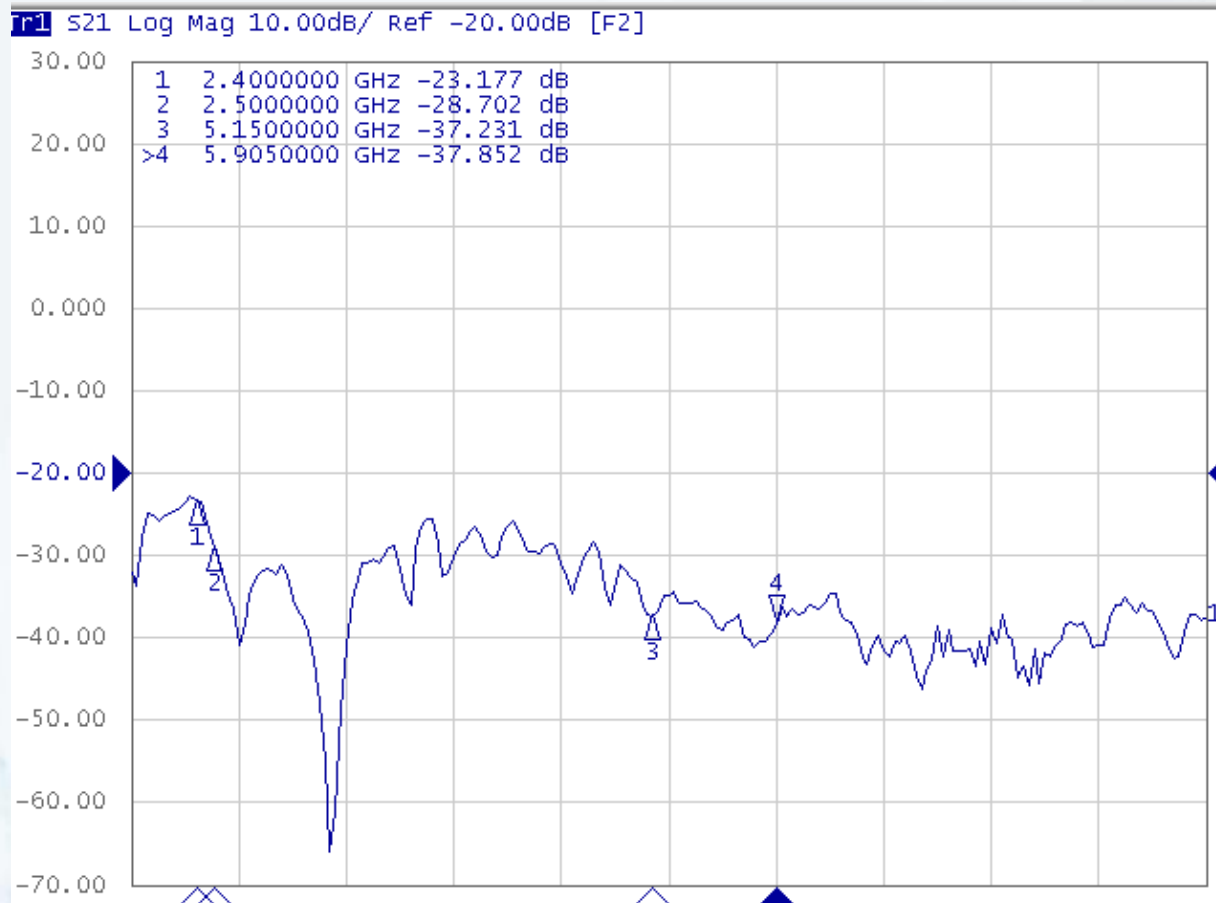
Return loss Results

5G-3(5150~5905 MHz)



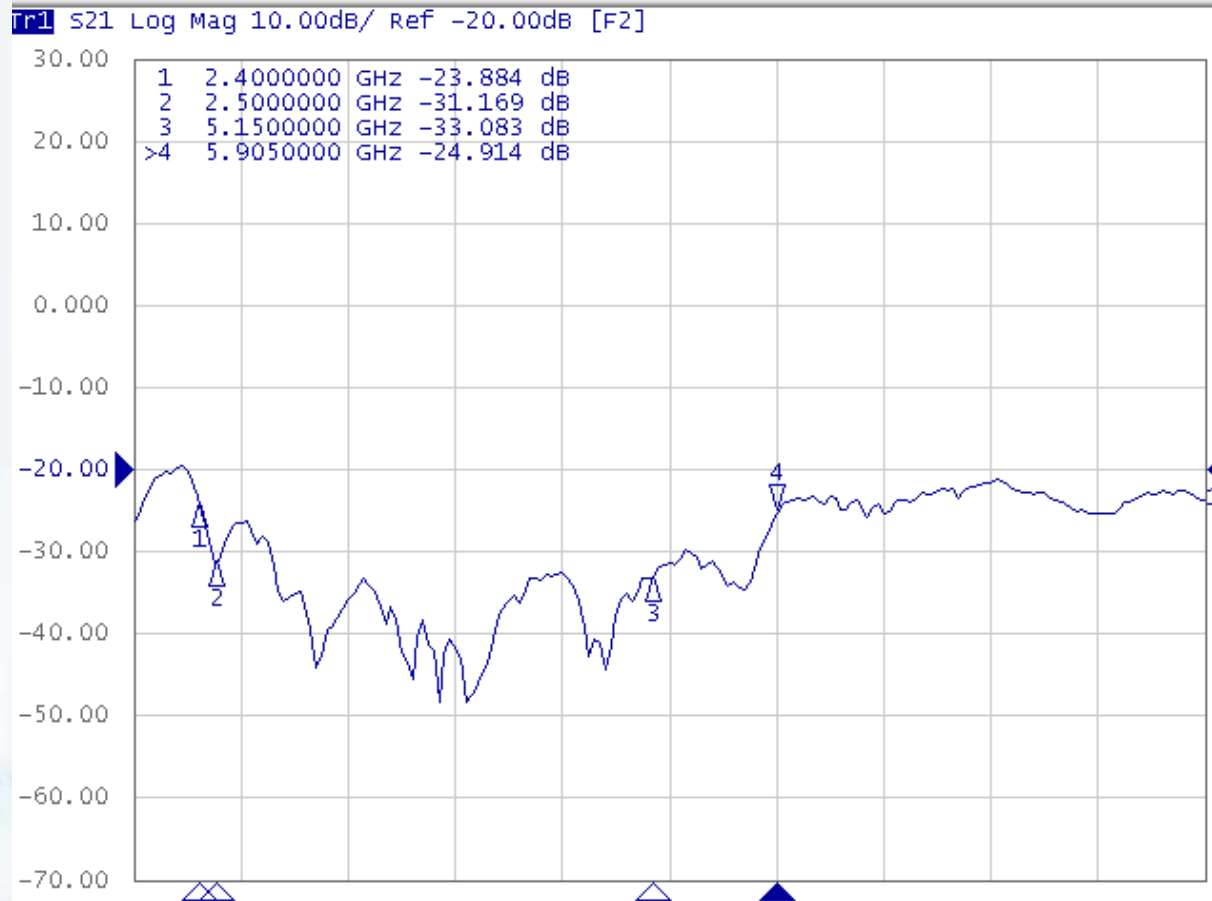
Isolation Results

2G-1/2G-2



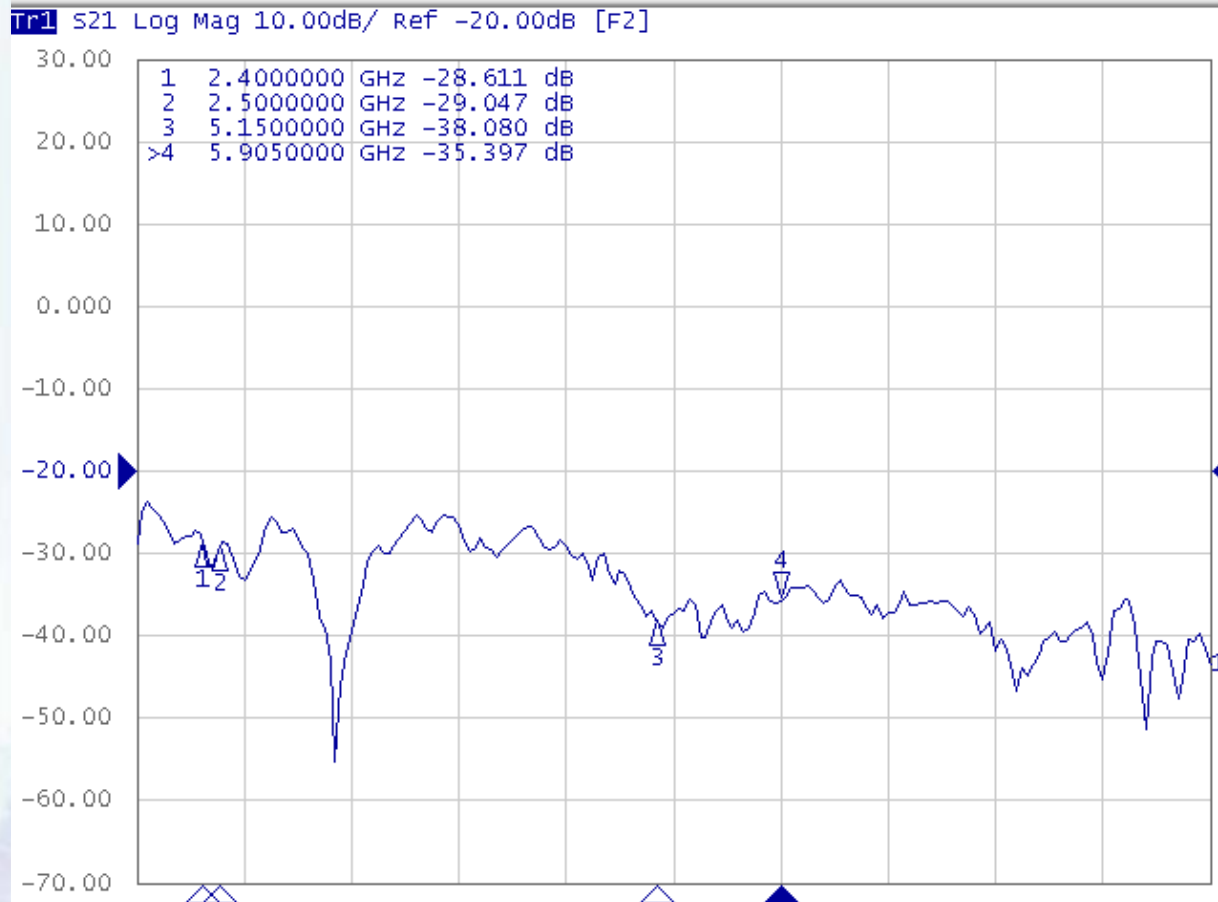
Isolation Results

2G-1/5G-1



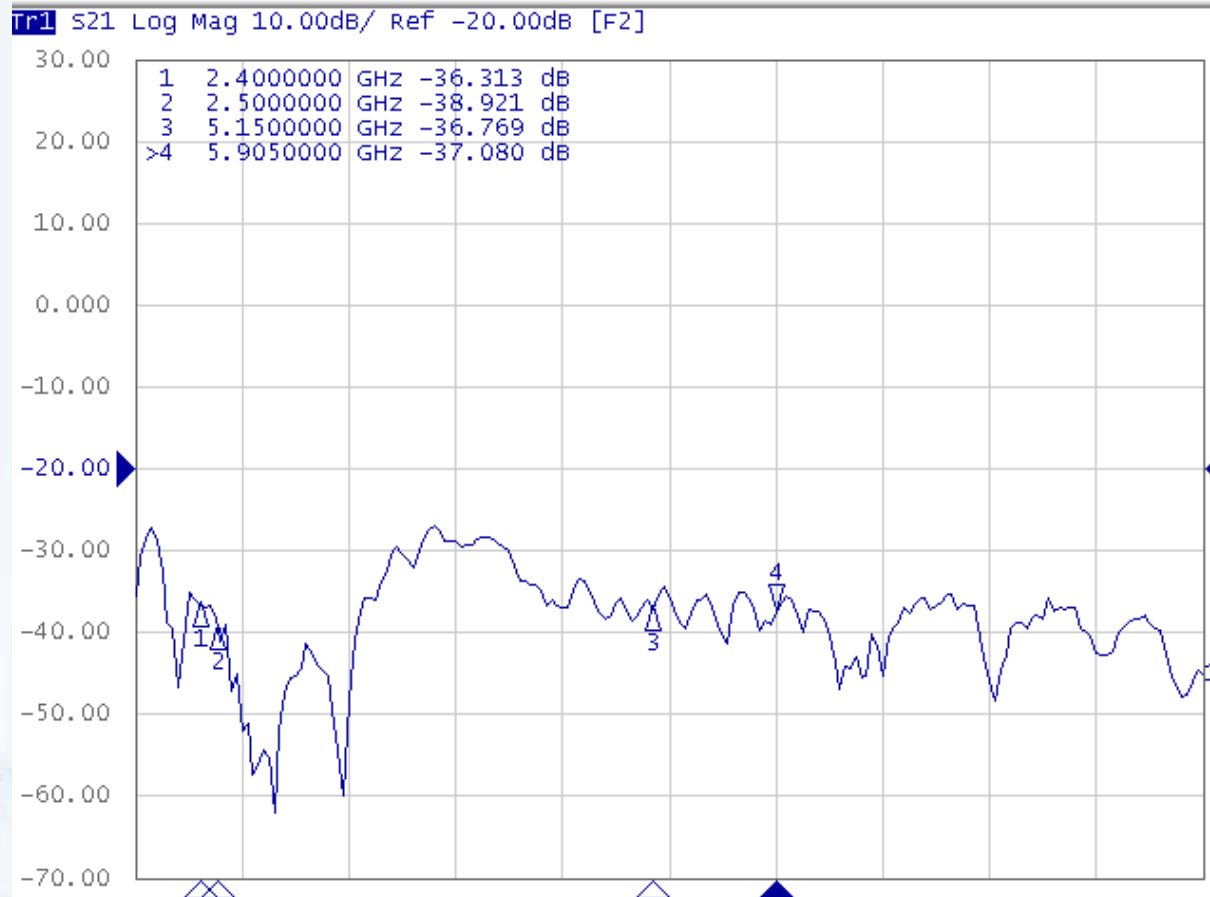
Isolation Results

2G-1/5G-2



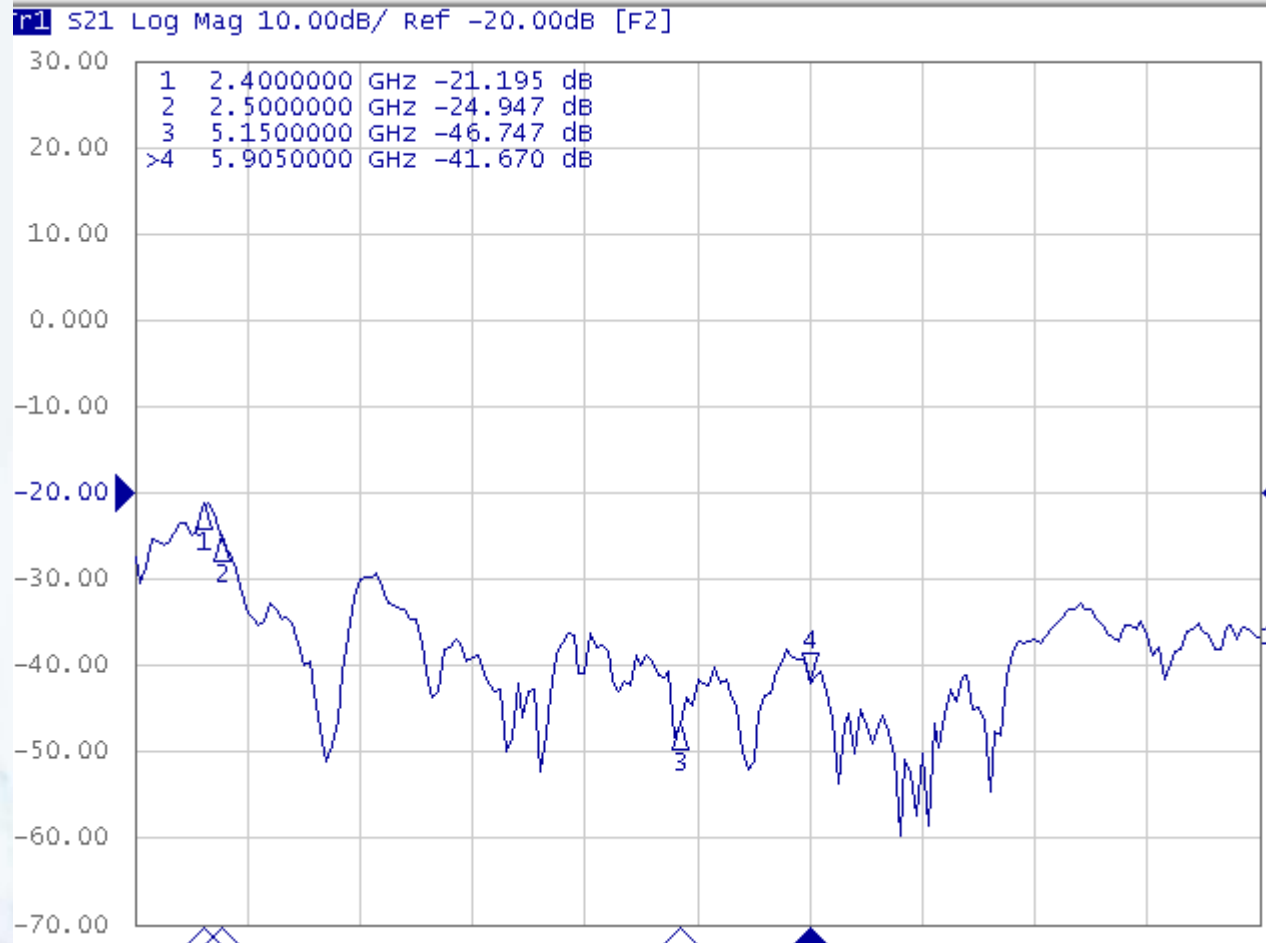
Isolation Results

2G-1/5G-3



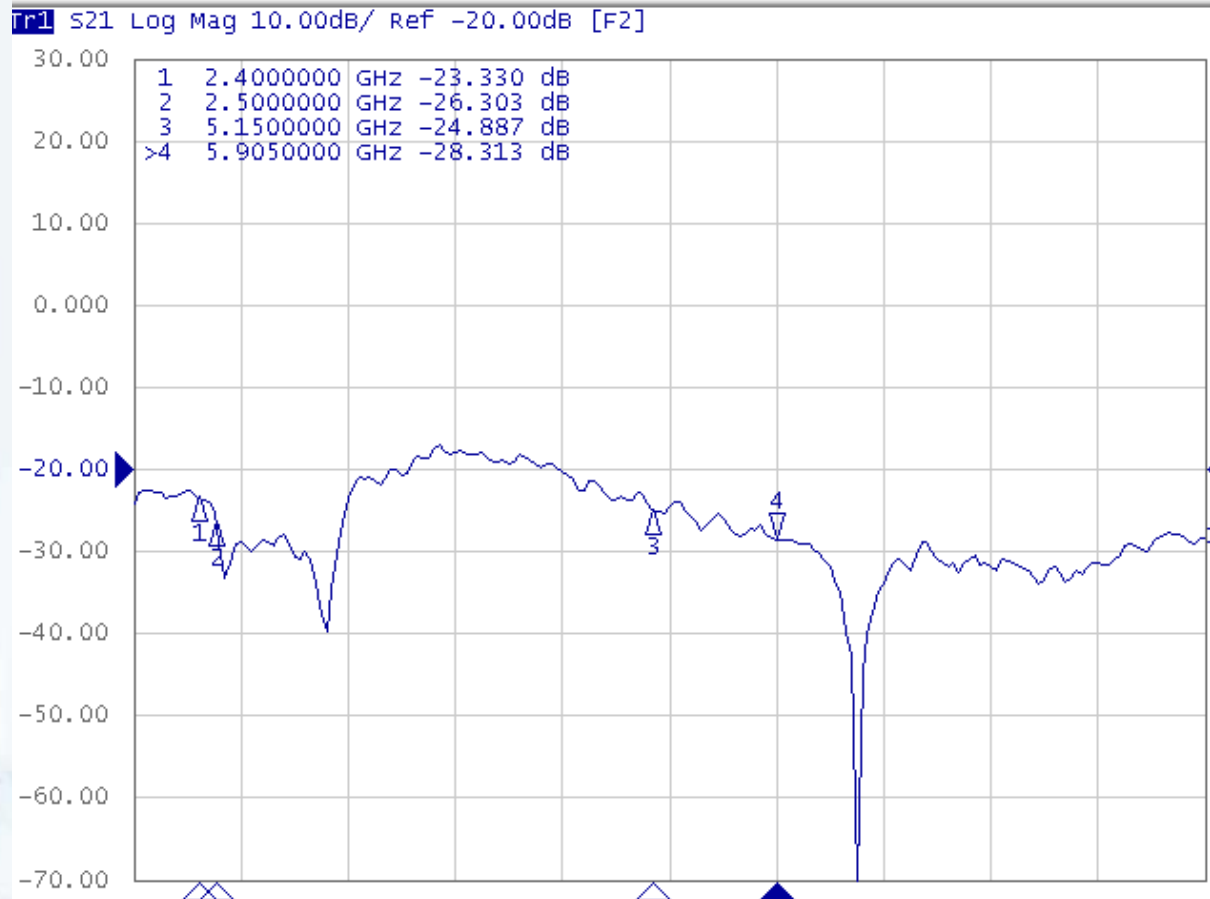
Isolation Results

2G-2/5G-1



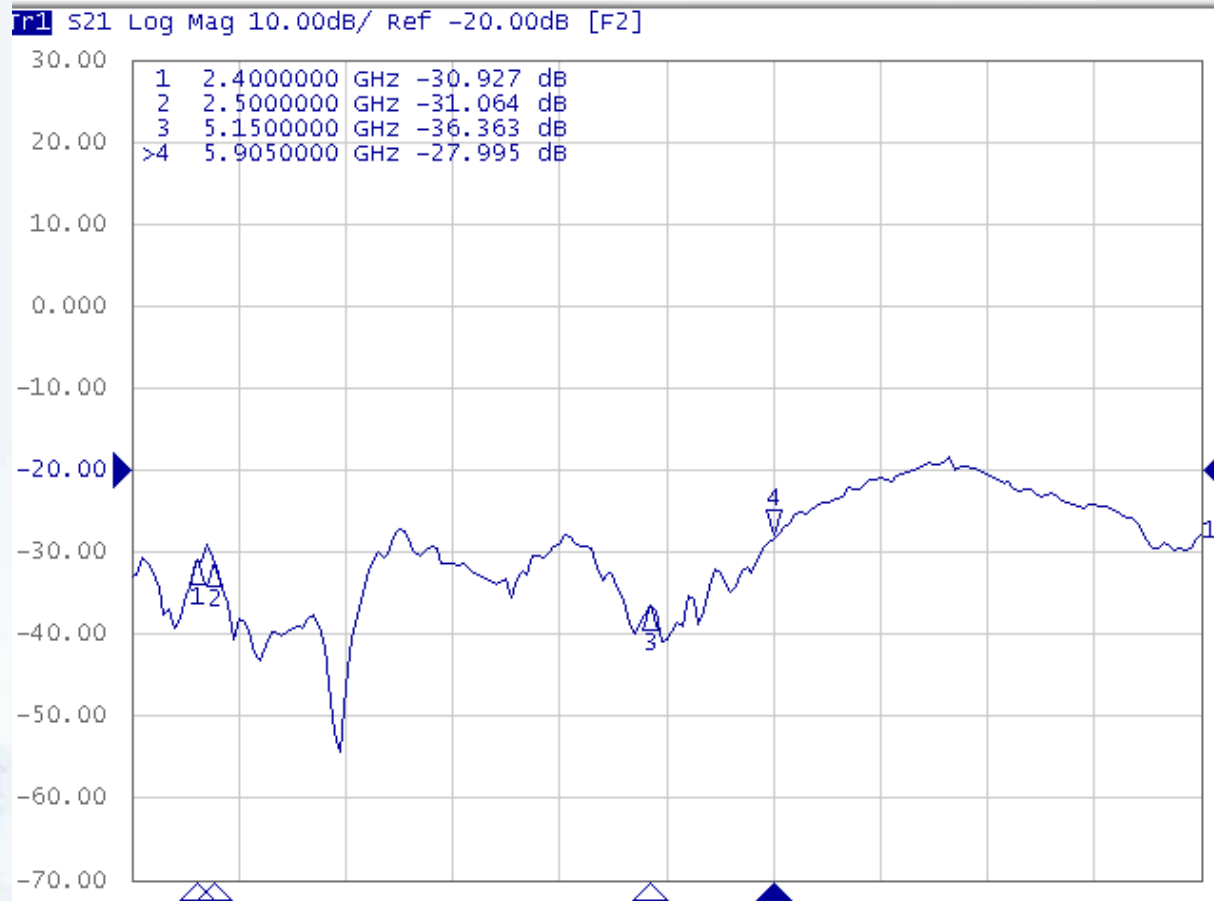
Isolation Results

2G-2/5G-2



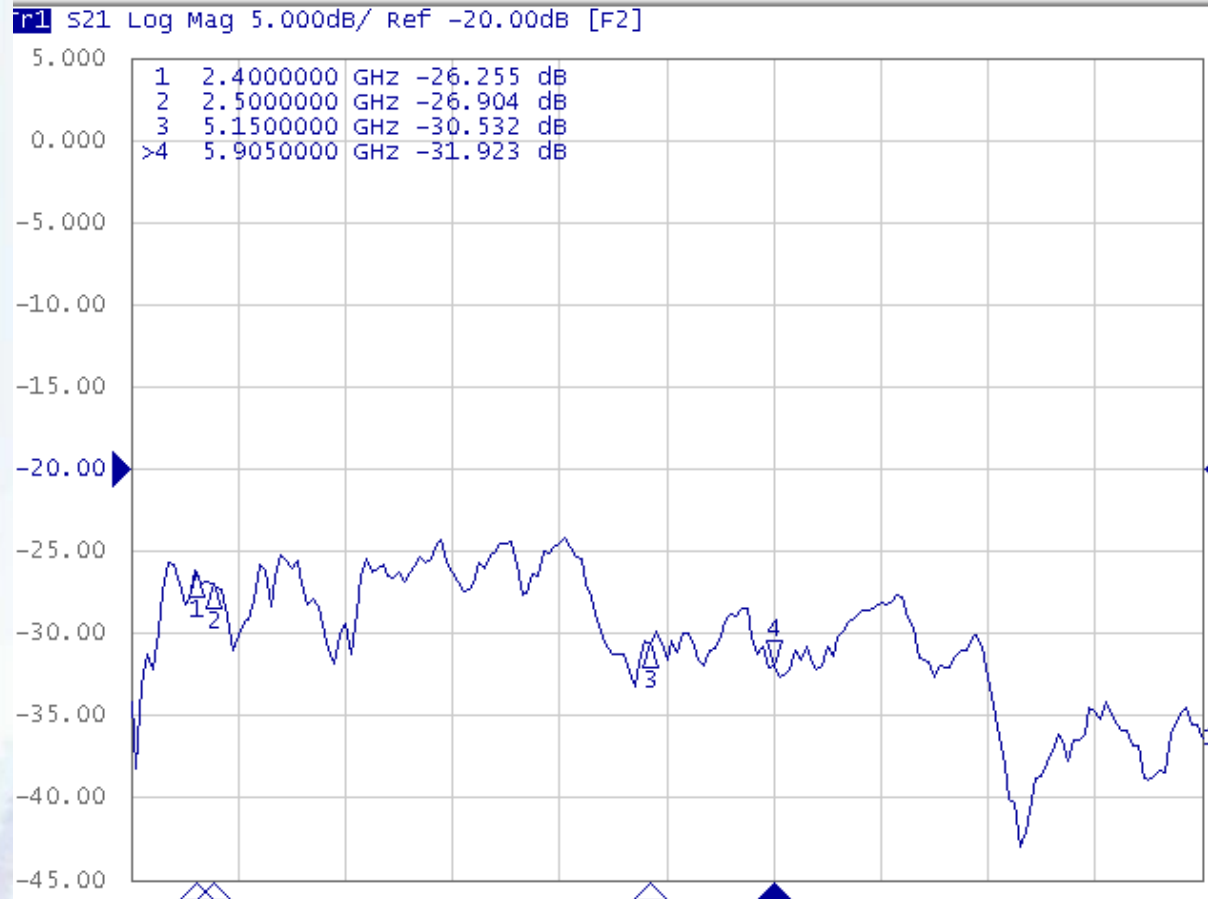
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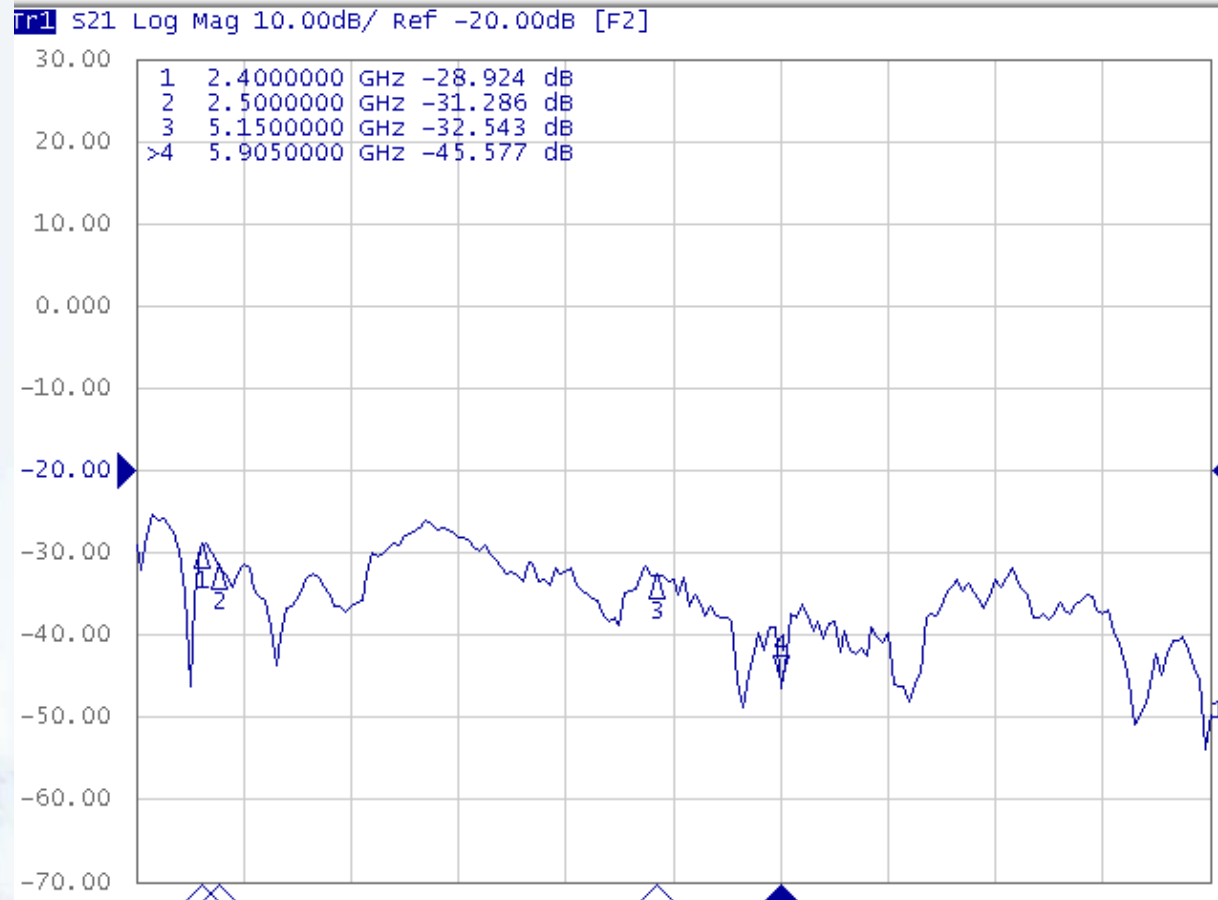
Isolation Results

5G-1/5G-2



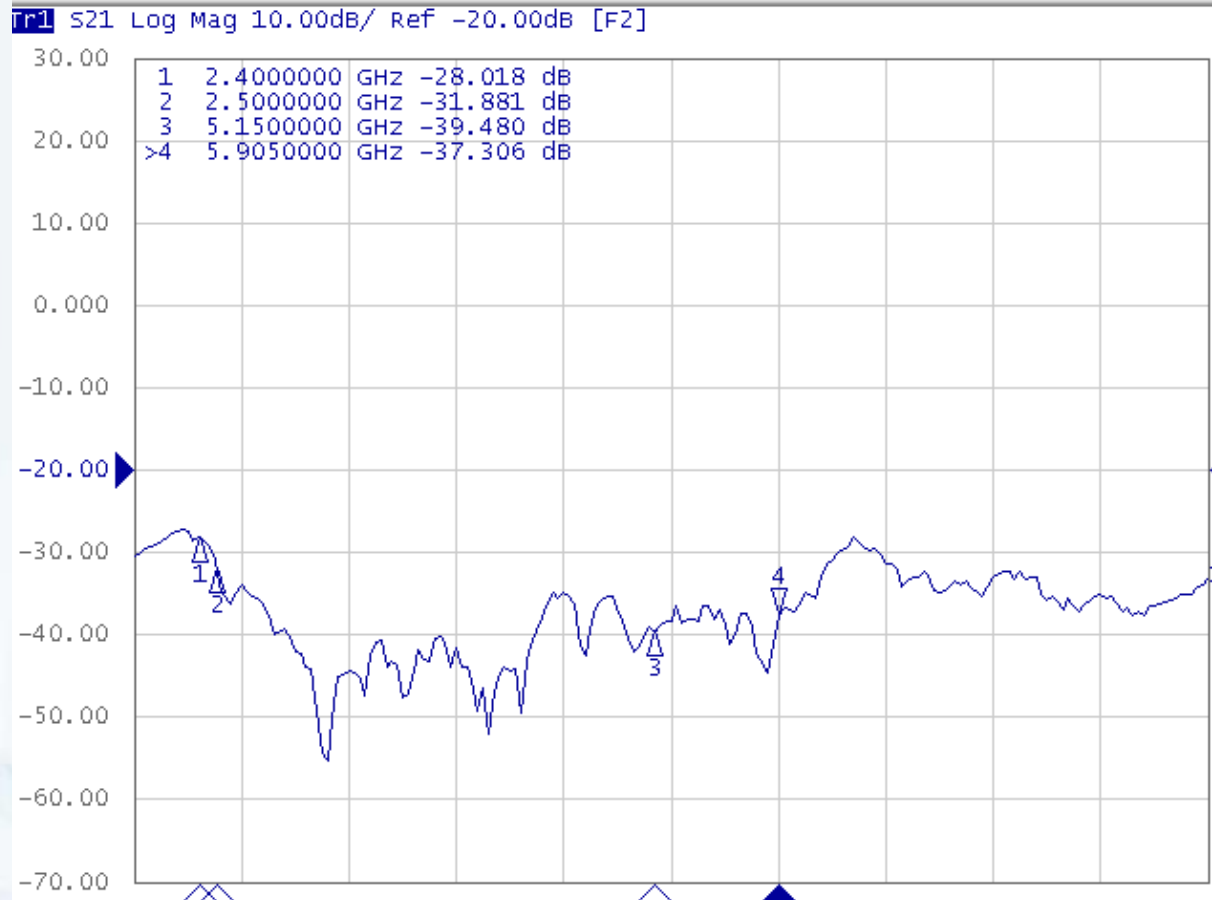
Isolation Results

5G-1/5G-3

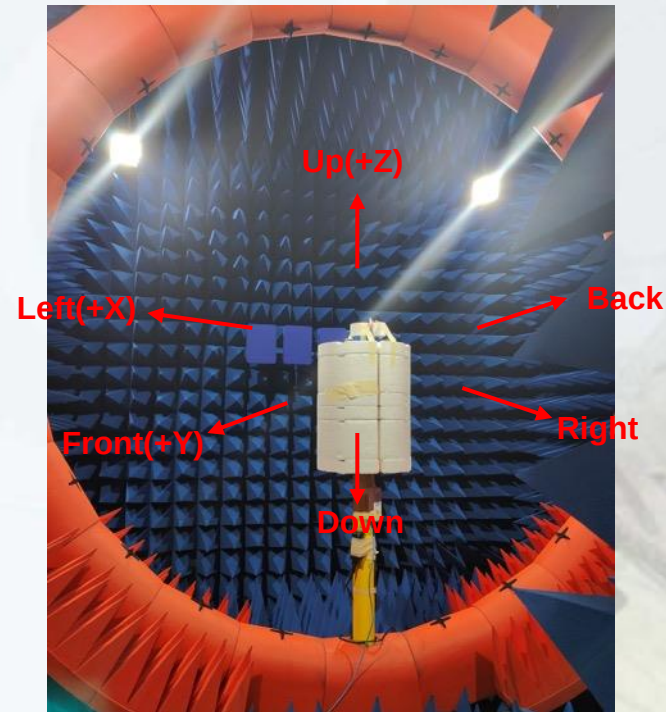
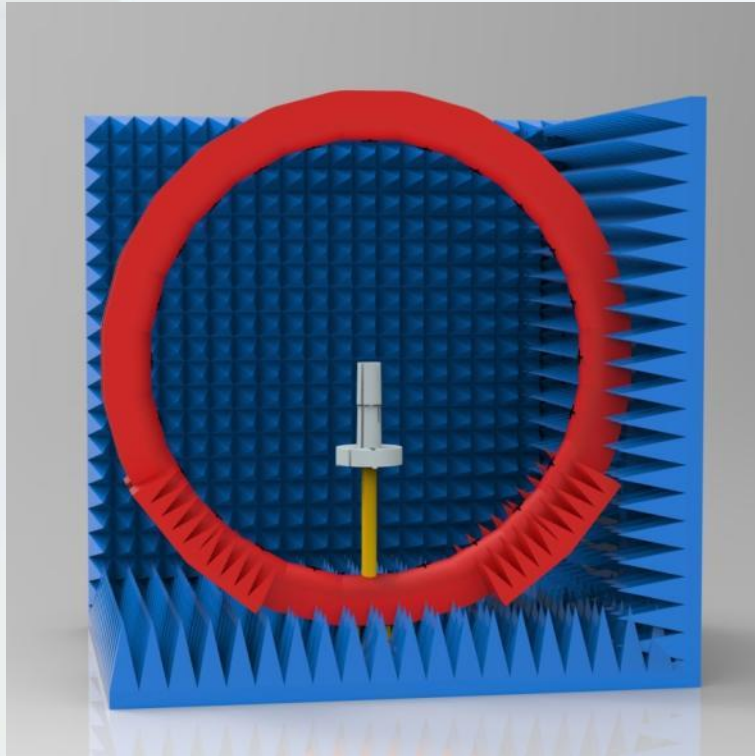


Isolation Results

5G-2/5G-3

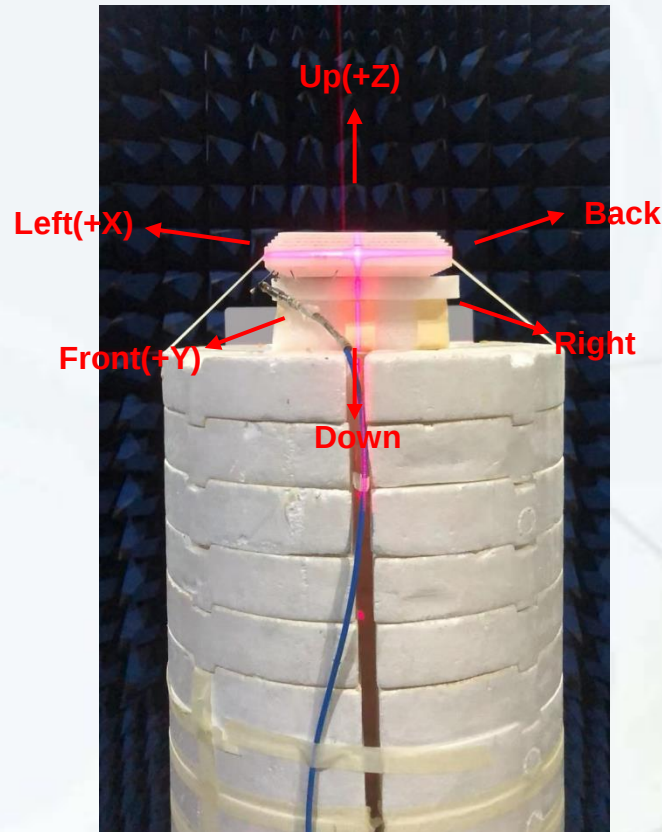


Chamber Information



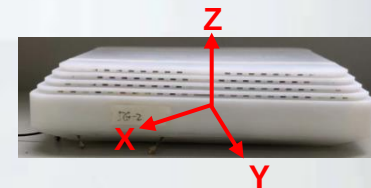
Chamber	Brand	Model	Location
飞图	飞图	飞图24探头	Suzhou TLSZ

Test Setup for Radiation Pattern Measurement



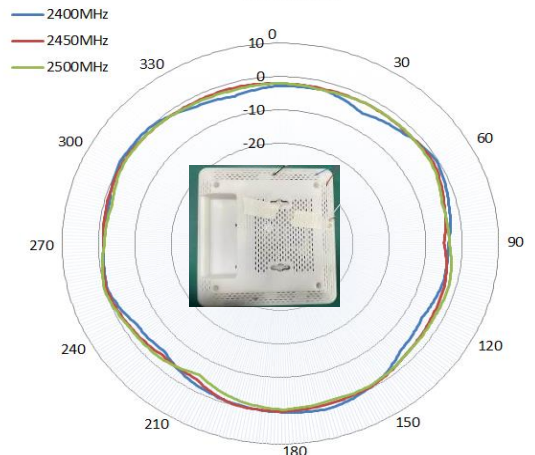
2D Radiation Pattern Results

2G-1(2400~2500MHz)



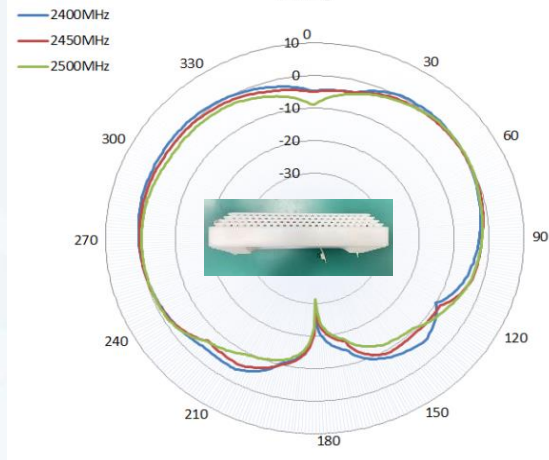
X

Theta90



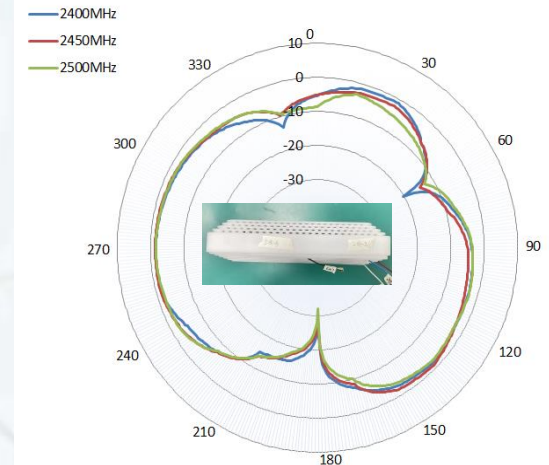
Z

Phi 0



Z

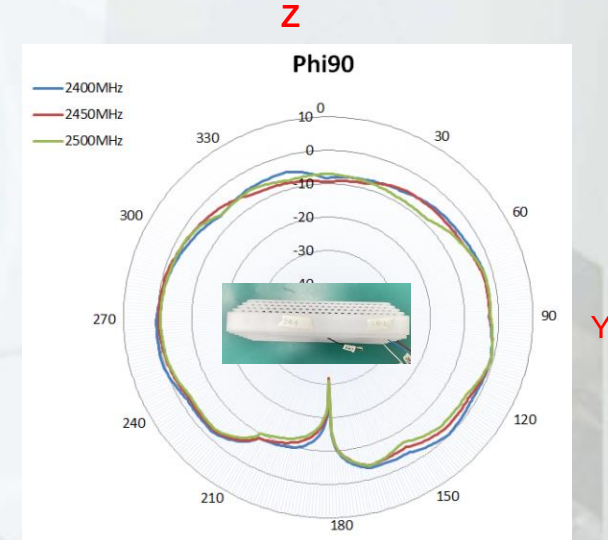
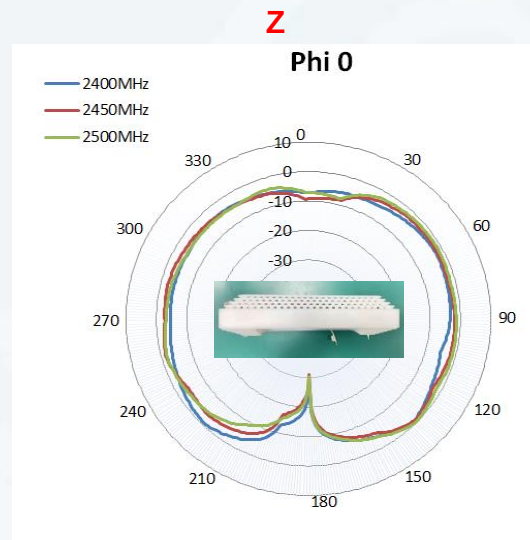
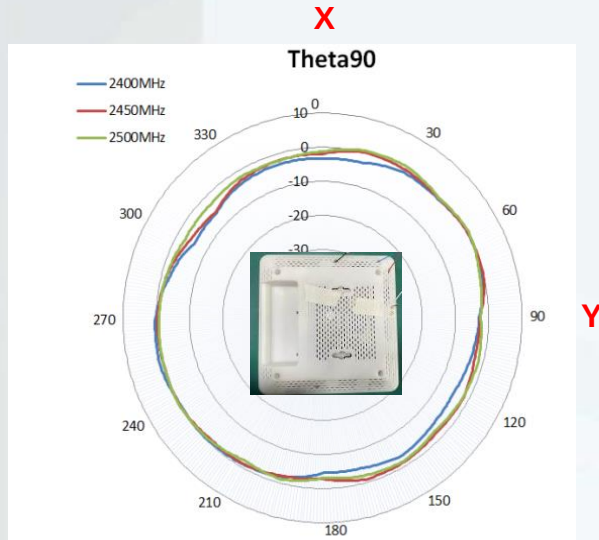
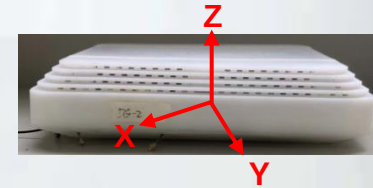
Phi90



	XY Plane	XZ Plane	YZ Plane	Peak Gain (dBi)	Efficiency (%)
Frequency	Max Value(dBi)	Max Value(dBi)	Max Value(dBi)		
2400MHz	1.14	1.11	1.17	2.55	61
2450MHz	0.27	0.53	1.07	2.08	70
2500MHz	5.19	0.47	1.53	1.23	64

2D Radiation Pattern Results

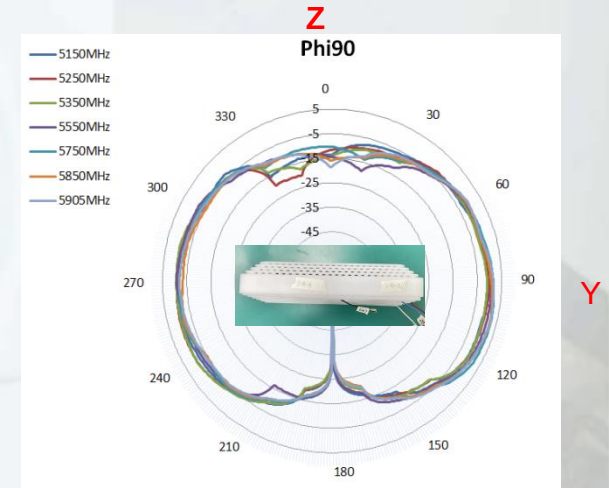
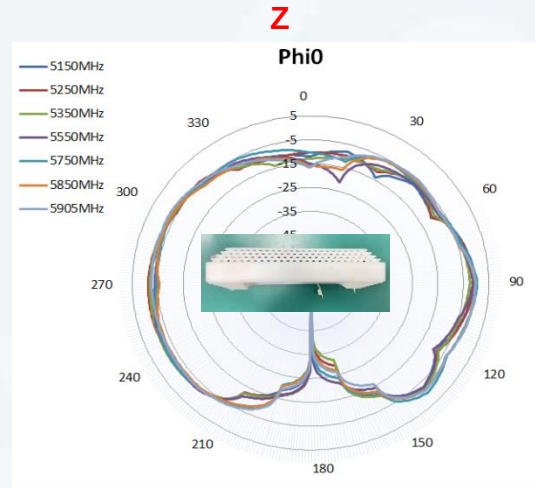
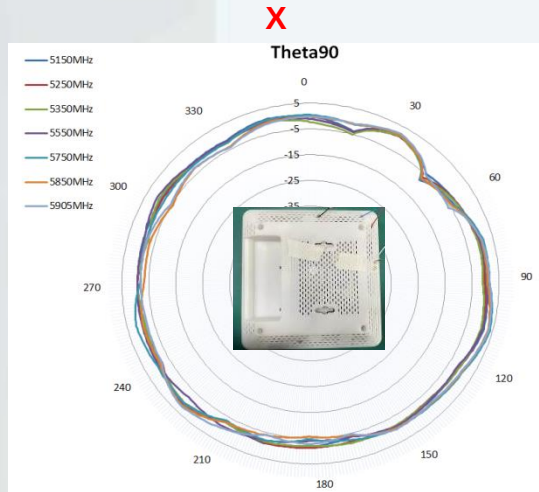
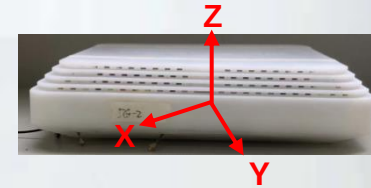
2G-2(2400~2500MHz)



	XY Plane	XZ Plane	YZ Plane	Peak Gain (dBi)	Efficiency (%)
Frequency	Max Value(dBi)	Max Value(dBi)	Max Value(dBi)		
2400MHz	0.79	0.55	0.61	0.89	63
2450MHz	0.25	0.80	0.21	1.19	68
2500MHz	1.09	0.16	0.58	1.09	73

2D Radiation Pattern Results

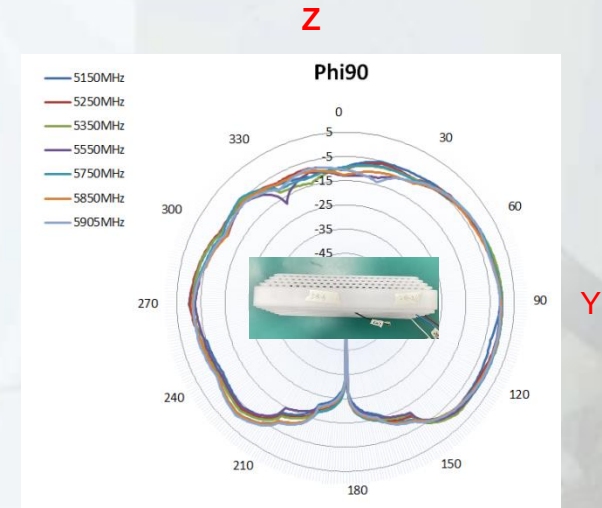
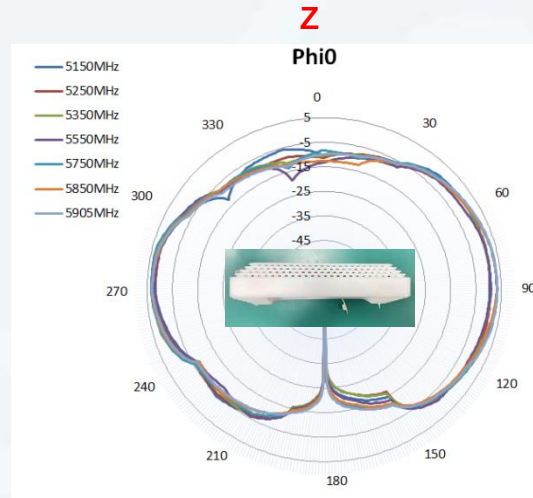
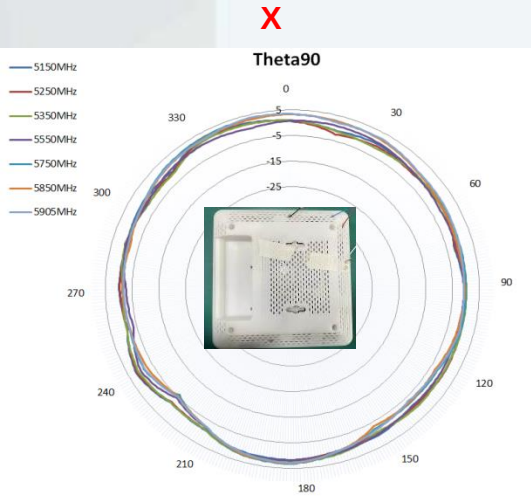
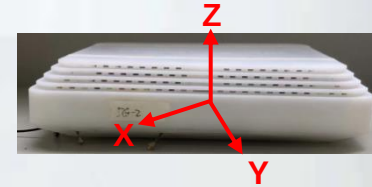
5G-1(5150~5905MHz)



	XY Plane	XZ Plane	YZ Plane	Peak Gain (dBi)	Efficiency (%)
Frequency	Max Value(dBi)	Max Value(dBi)	Max Value(dBi)		
5150MHz	1.68	0.13	0.45	1.68	79
5250MHz	2.49	0.59	0.41	2.49	79
5350MHz	1.69	0.83	0.29	1.69	76
5550MHz	2.58	-0.63	1.44	2.58	72
5750MHz	3.57	-0.01	2.25	3.57	86
5850MHz	2.81	-0.75	1.90	2.81	69
5905MHz	3.05	-0.59	2.03	3.05	69

2D Radiation Pattern Results

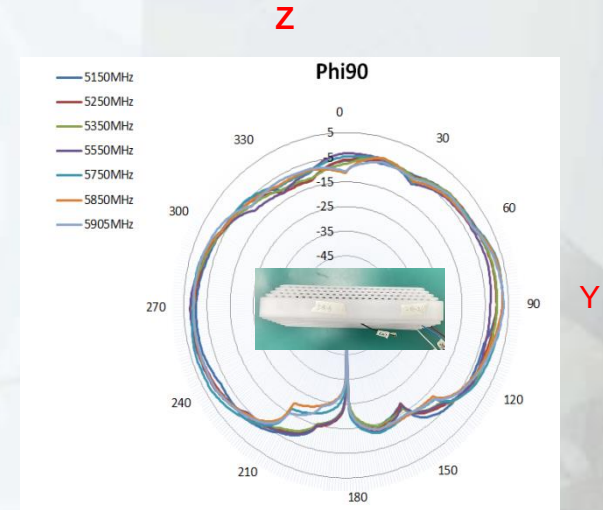
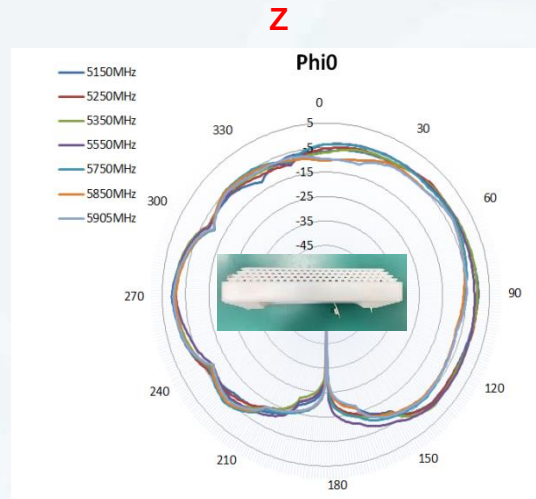
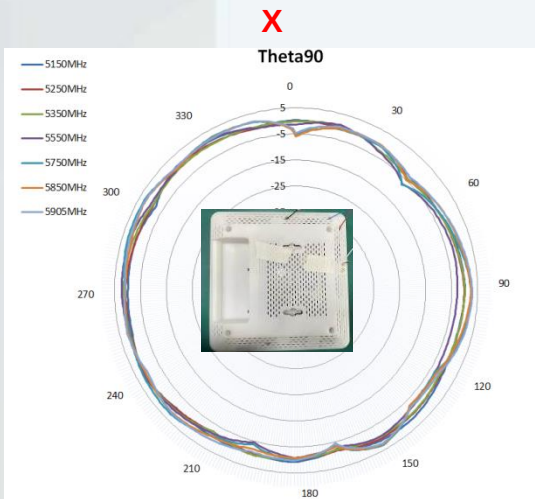
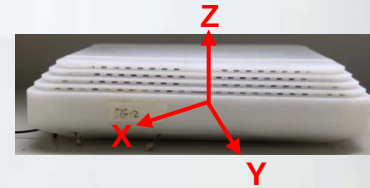
5G-2(5150~5905MHz)



	XY Plane	XZ Plane	YZ Plane	Peak Gain (dBi)	Efficiency (%)
Frequency	Max Value(dBi)	Max Value(dBi)	Max Value(dBi)		
5150MHz	2.88	1.80	-0.11	2.88	89
5250MHz	3.13	2.48	0.49	3.13	89
5350MHz	3.20	3.20	1.02	3.20	83
5550MHz	2.44	3.10	0.94	3.10	80
5750MHz	2.92	3.03	-0.07	3.03	83
5850MHz	2.92	2.92	-0.33	2.92	81
5905MHz	3.32	3.02	-0.23	3.32	81

2D Radiation Pattern Results

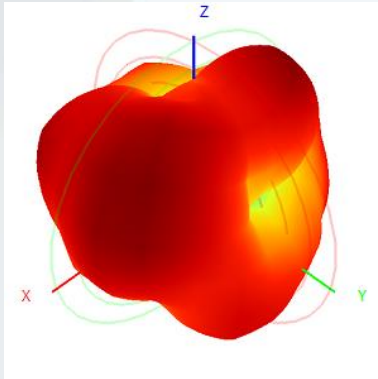
5G-3(5150~5905MHz)



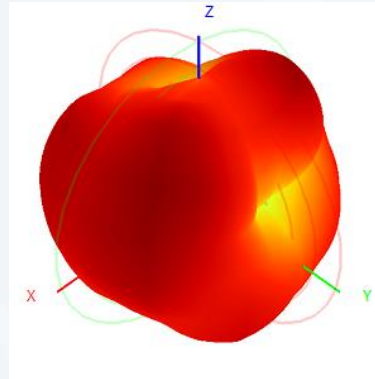
	XY Plane	XZ Plane	YZ Plane	Peak Gain (dBi)	Efficiency (%)
Frequency	Max Value(dBi)	Max Value(dBi)	Max Value(dBi)		
5150MHz	2.07	0.90	0.20	2.07	87
5250MHz	2.16	0.55	1.75	2.50	87
5350MHz	1.98	0.36	2.15	2.55	84
5550MHz	2.78	0.01	2.78	2.78	78
5750MHz	2.71	-0.38	2.51	2.71	88
5850MHz	2.36	-1.17	2.00	2.36	73
5905MHz	2.54	-0.18	2.54	2.54	73

3D Pattern

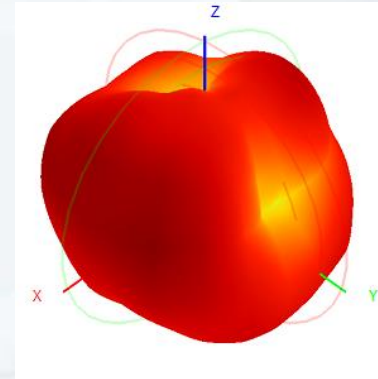
2G-1/2400MHz



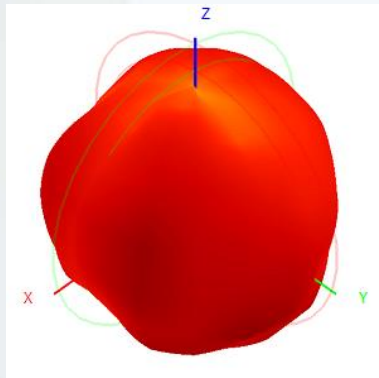
2G-1/2450MHz



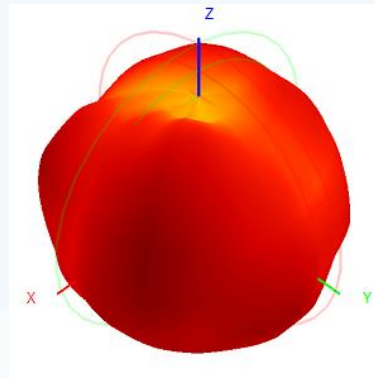
2G-1/2500MHz



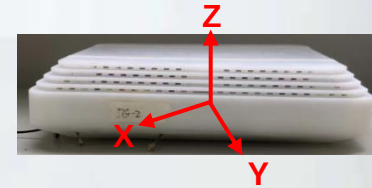
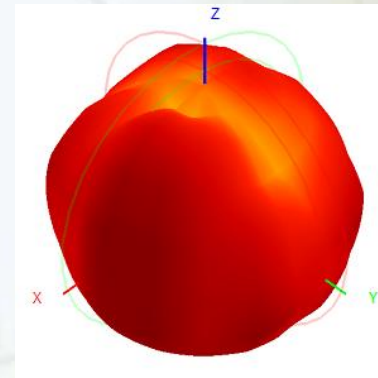
2G-2/2400MHz



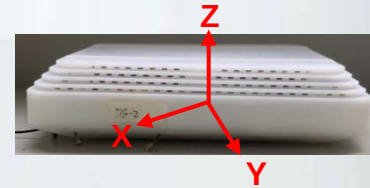
2G-2/2450MHz



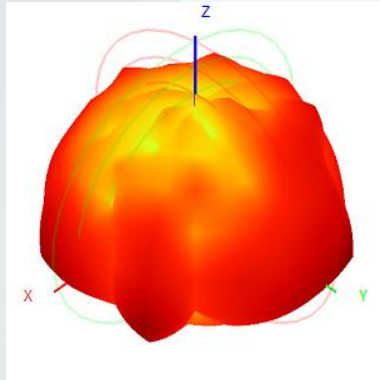
2G-2/2500MHz



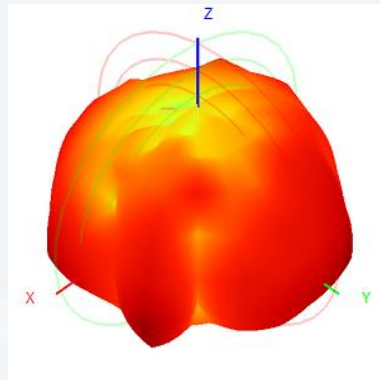
3D Pattern



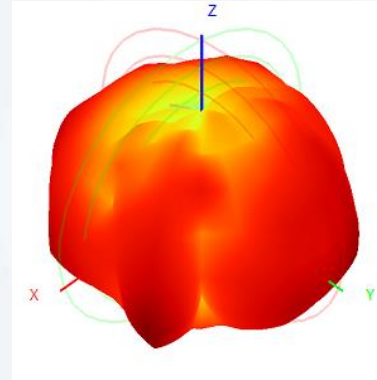
5G-1/5150MHz



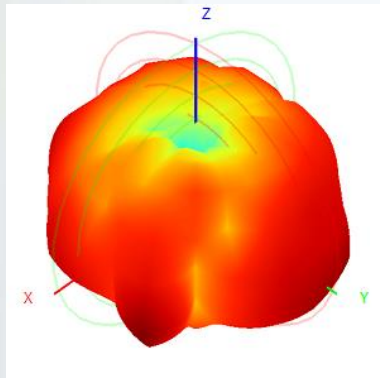
5G-1/5250MHz



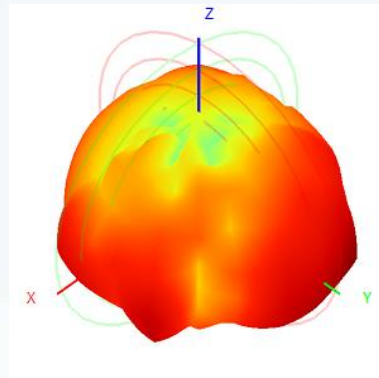
5G-1/5350MHz



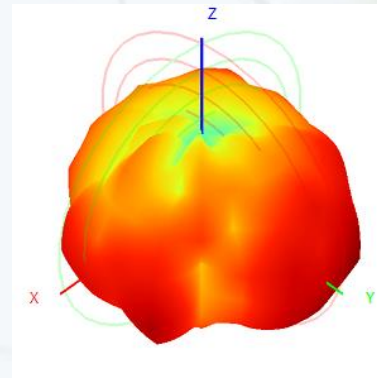
5G-1/5550MHz



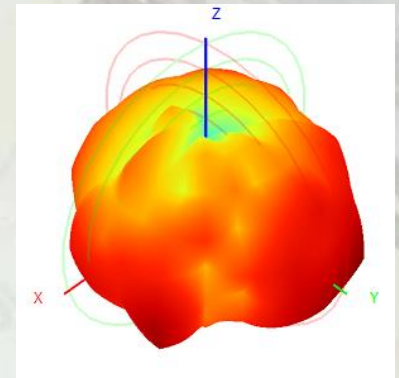
5G-1/5750MHz



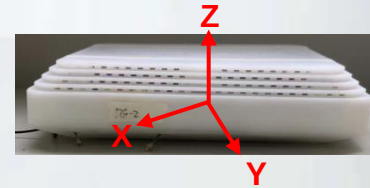
5G-1/5850MHz



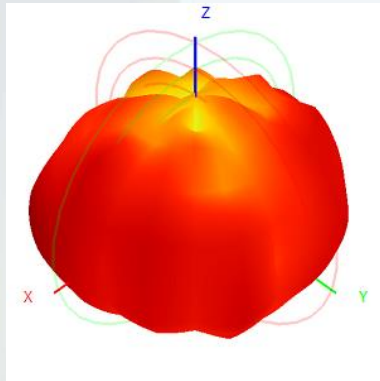
5G-1/5905MHz



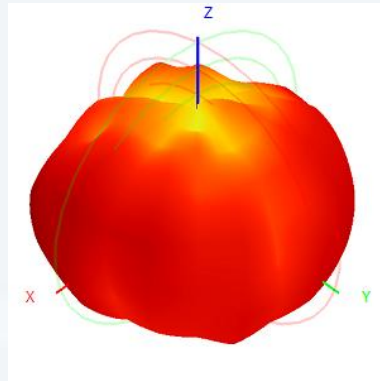
3D Pattern



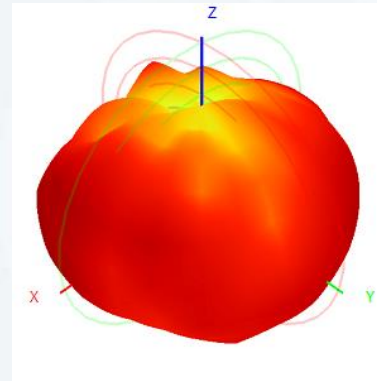
5G-2/5150MHz



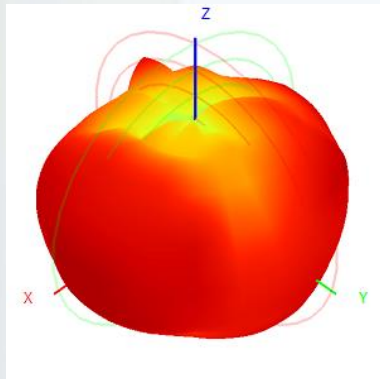
5G-2/5250MHz



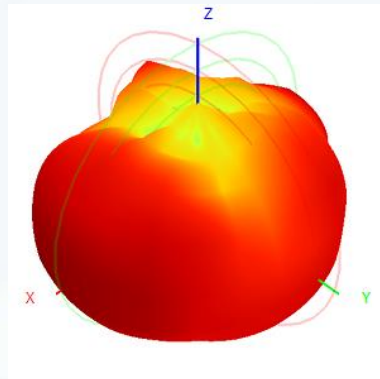
5G-2/5350MHz



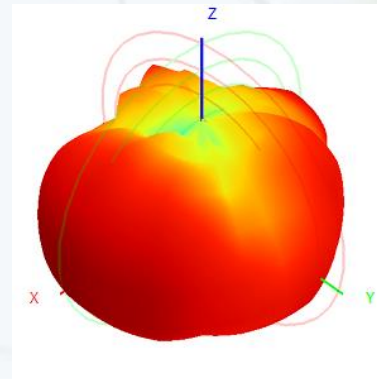
5G-2/5550MHz



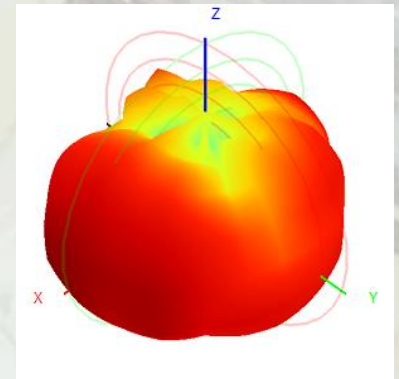
5G-2/5750MHz



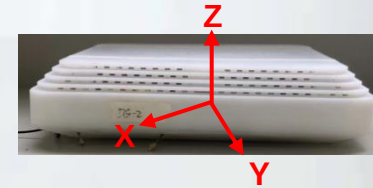
5G-2/5850MHz



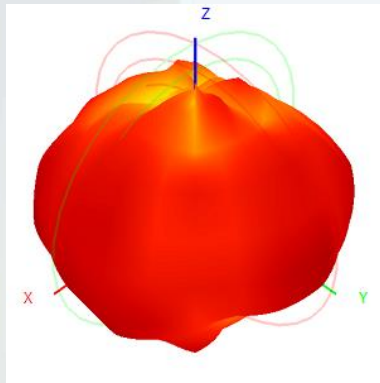
5G-2/5905MHz



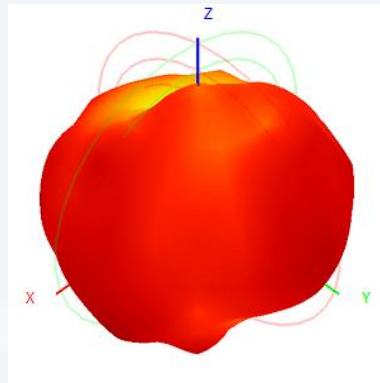
3D Pattern



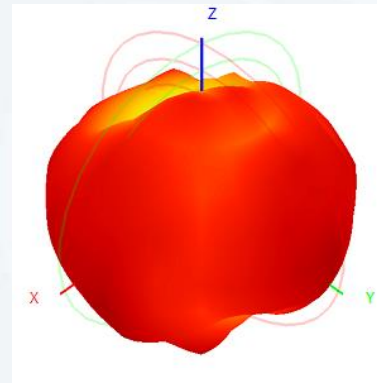
5G-3/5150MHz



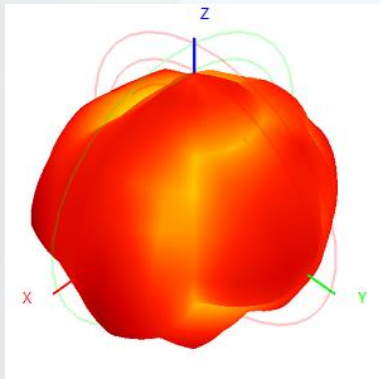
5G-3/5250MHz



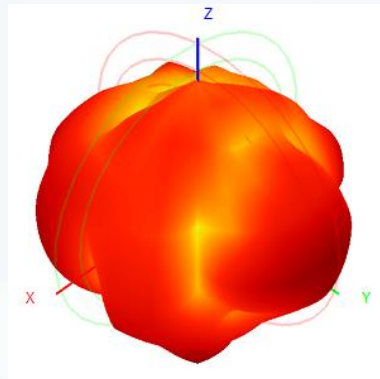
5G-3/5350MHz



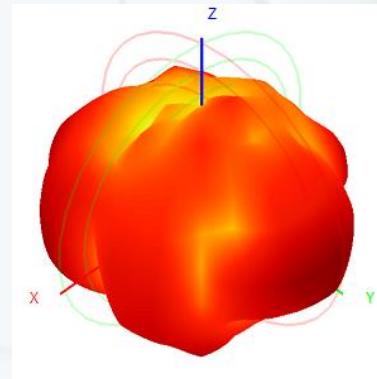
5G-3/5550MHz



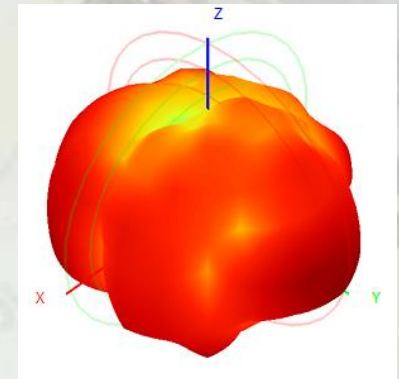
5G-3/5750MHz



5G-3/5850MHz



5G-3/5905MHz



Results Summary

Return loss

Frequency	2.4G-1	2.4G-2	5G-1	5G-2	5G-3
2400MHz	13.32	16.39	NA	NA	NA
2500MHz	19.34	12.02	NA	NA	NA
5150MHz	NA	NA	23.78	17.79	16.46
5905MHz	NA	NA	23.82	16.12	16.74

Results Summary

Isolation

Frequency	2.4G-1&2.4G-2	2.4G-1&5G-1	2.4G-1&5G-2	2.4G-1&5G-3	2.4G-2&5G-1
2400MHz	23.17	23.88	28.61	36.31	21.19
2500MHz	28.70	31.16	29.04	38.92	24.94
5150MHz	37.23	33.08	38.08	36.76	46.74
5905MHz	37.85	24.91	35.39	37.08	41.67

Frequency	2.4G-2&5G-2	2.4G-2&5G-3	5G-1&5G-2	5G-1&5G-3	5G-2&5G-3
2400MHz	23.33	30.92	26.25	28.92	28.01
2500MHz	26.30	31.66	26.90	31.28	31.88
5150MHz	24.88	36.36	30.53	32.54	39.48
5905MHz	28.31	27.99	31.92	45.57	37.30

Results Summary

Peak gain & Efficiency

Frequency	Peak Gain (dBi)	
	2G-1	2G-2
2400MHz	2.55	0.89
2450MHz	2.08	1.19
2500MHz	1.23	1.09

Frequency	Efficiency (%)	
	2G-1	2G-2
2400MHz	61	63
2450MHz	70	68
2500MHz	64	73

Frequency	Peak Gain (dBi)		
	5G-1	5G-2	5G-3
5150MHz	1.68	2.88	2.07
5250MHz	2.49	3.13	2.50
5350MHz	1.69	3.20	2.55
5550MHz	2.58	3.10	2.78
5750MHz	3.57	3.03	2.71
5850MHz	2.81	2.92	2.36
5905MHz	3.05	3.32	2.54

Frequency	Efficiency (%)		
	5G-1	5G-2	5G-3
5150MHz	79	89	87
5250MHz	79	89	87
5350MHz	76	83	84
5550MHz	72	80	78
5750MHz	86	83	88
5850MHz	69	81	73
5905MHz	69	81	73

Results Summary

2G ECC

Frequency	ECC
	2G-1&2G-2
2400MHz	0.0184
2450MHz	0.0065
2500MHz	0.0233

Results Summary

5G ECC

Frequency	ECC		
	5G-1&5G-2	5G-1&5G-3	5G-2&5G-3
5150MHz	0.0006	0.0001	0.001
5350MHz	0.0027	0	0.0012
5550MHz	0.0069	0	0.0029
5750MHz	0.002	0.0022	0.0146
5850MHz	0.0022	0.0045	0.0099
5905MHz	0.0034	0.0017	0.0042