

ANTENNA TEST REPORT

Applicant..... : Fender Musical Instruments

Address..... : 17600 N. Perimeter Drive, Suite 100, Scottsdale, Arizona, 85255 United States

Manufacturer..... : Linx Technologies

Address..... : 159 Ort Lane, Merlin, OR, US 97532

Product Name.....: Integral Antenna

Brand Name..... : Fender

Model No. : 7727252000

Antenna Part No..... : ANT-DB1-nSP250

Measurement Standard..... : IEEE Std 149-2021

Date of Tested..... : December 21, 2022 to December 29, 2022

Date of Report..... : March 06, 2023

Tested by..... : Fang Jinshan

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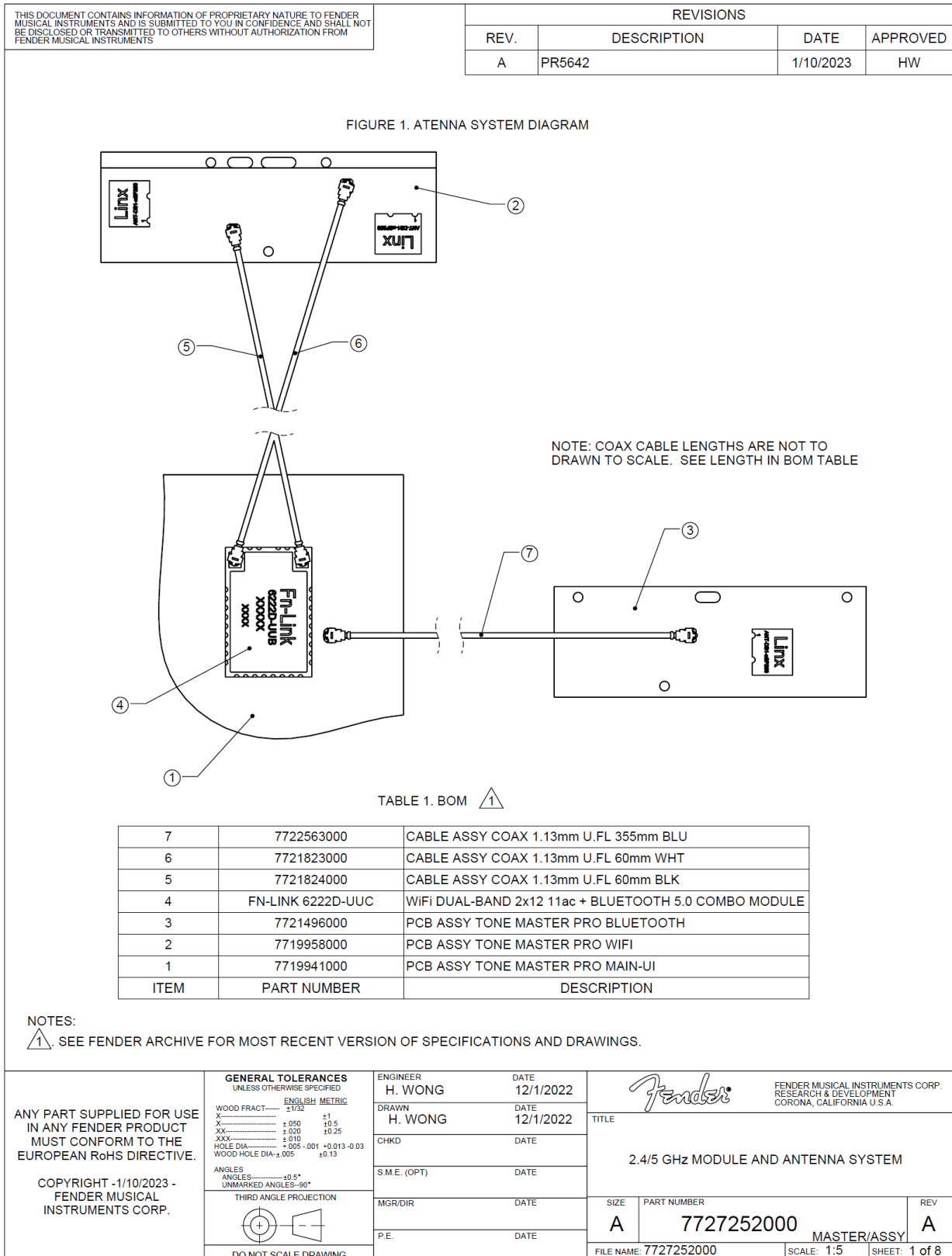
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1. Antenna Specification



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	A	SEE SHEET 1		HW	1/4/2023

FIGURE 2. RADIO MOULE MOUNTING ON MAIN PCBA
(PN 7719941000, PCB ASSY TONE MASTER PRO MAIN-UI)

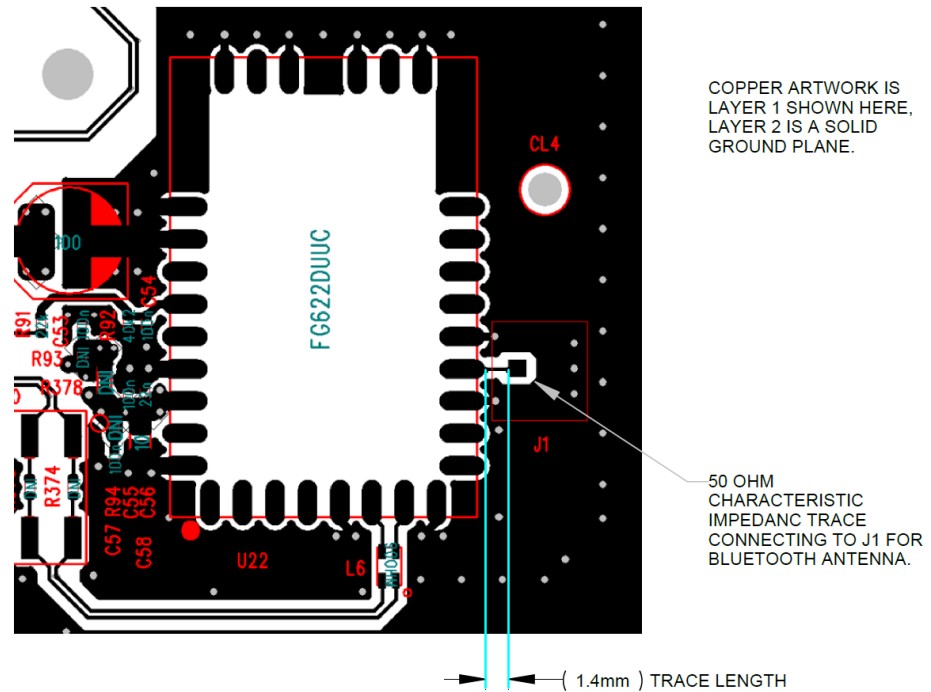


FIGURE 3. TYPICAL PCB STACKUP

TYPICAL STACKUP SHOWN HERE, BUT MAY BE MODIFIED SLIGHTLY BASED ON PCB MATERIALS, TO MAINTAIN THE SPECIFIED 50-OHM TARGET IMPEDANCE. SEE 7719940000_B_TM-PRO_MAIN-UI_Fab.pdf FOR DETAILS.

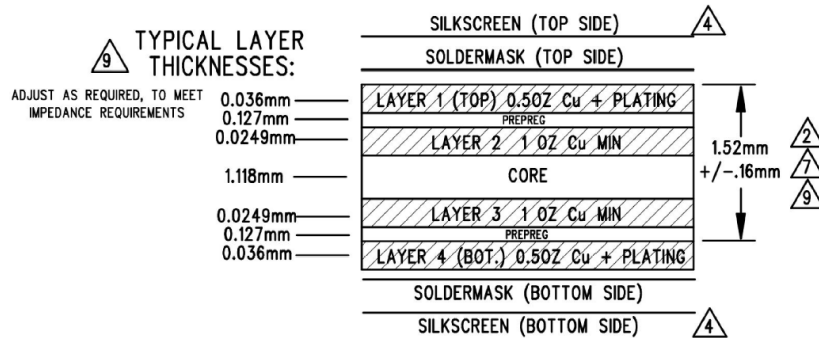


TABLE 2. IMPEDANCE REQUIREMENTS

Layer	Trace Width	Trace Space "Airgap"	Impedance Differential	Impedance Single Ended
Layer 1	0.2032 mm	0.2032 mm	90 ohms	—
Layer 1	0.2032 mm	—	—	50 ohms

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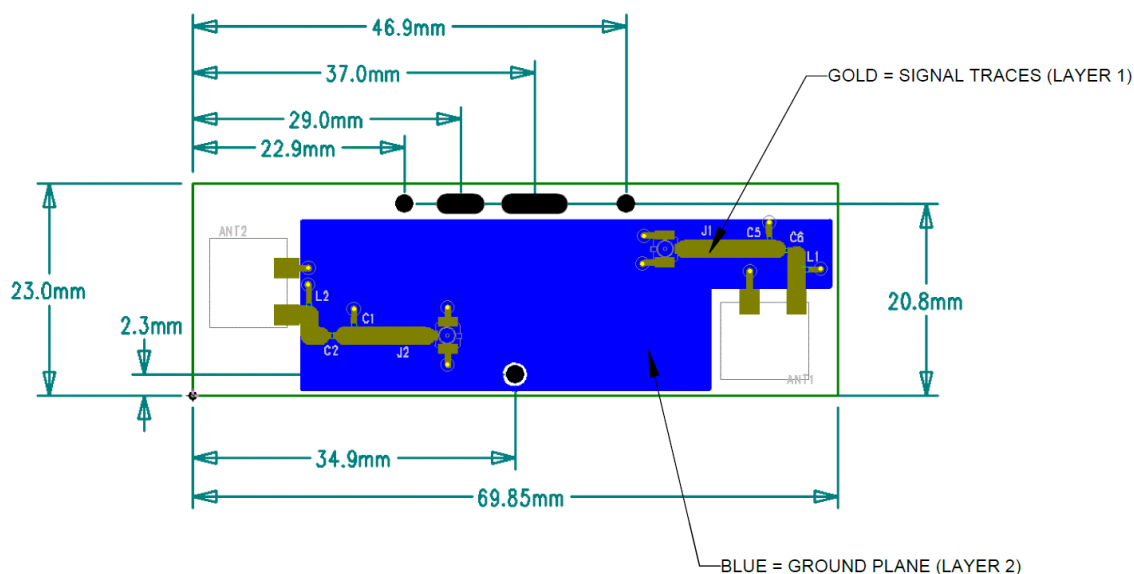
SIZE
A
PART NUMBER
7727252000
MASTER/ASSY
A
FILE NAME: 7727252000
SCALE: 1:5
SHEET: 2 of 8

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TABLE 3. Wi-Fi ANTENNA SPECIFICATION

SPECIFICATION	VALUE	NOTES
MANUFACTURER AND PART NUMBER	LINX ANT-DB1-nSP250	
FREQUENCY RANGE	2.4GHz BAND: 2.4 – 2.4835GHz 5GHz BAND: 5.125 – 5.895GHz	
VSWR HORIZONTAL	< 3.0 @ 2.4-2.5GHz < 4.0 @ 5.125 – 5.25GHz < 3.0 @ 5.25 – 5.895GHz	FROM LINX TUNING REPORT
VSWR VERTICAL	< 3.0 @ 2.4-2.5GHz < 4.0 over 5GHz band	FROM LINX TUNING REPORT
RETURN LOSS	< -10dB @ 2.4-2.5GHz < -15dB @ 5.125 - 5.350GHz < -13dB @ 5.350GHz - 5.470GHz < -8dB @ 5.470GHz - 5.875GHz	FROM ANT-DB1-nSP250 DATA SHEET
RADIATION	OMNI-DIRECTIONAL	FROM ANT-DB1-nSP250 DATA SHEET
GAIN (PEAK)	SEE DOCUMENT GAIN SECTION	FROM OTA TEST
POLARIZATION	LINEAR VERTICAL AND HORIZONTAL	FROM ANT-DB1-nSP250 DATA SHEET
CABLE	1.13mm COAXIAL CABLE	
CONNECTOR	U.FL PLUT I-EX MFH1	
OPERATING TEMPERATURE	-40°C ~ +130°C	FROM ANT-DB1-nSP250 DATA SHEET
STORAGE TEMPERATURE	-10°C ~ +70°C	FROM ANT-DB1-nSP250 DATA SHEET
IMPEDANCE	50Ω	
WAVELENGTH	1/4 -WAVE	
ELECTRICAL TYPE	MONOPOLE	

FIGURE 4. Wi-Fi PCBA LAYOUT
(7719958000 PCB ASSY TONE MASTER PRO WIFI)

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DATE		FILE NAME:	SCALE:	SHEET:
12/1/2022		7727252000	1:5	3 of 8

7719958000 PCB ASSY

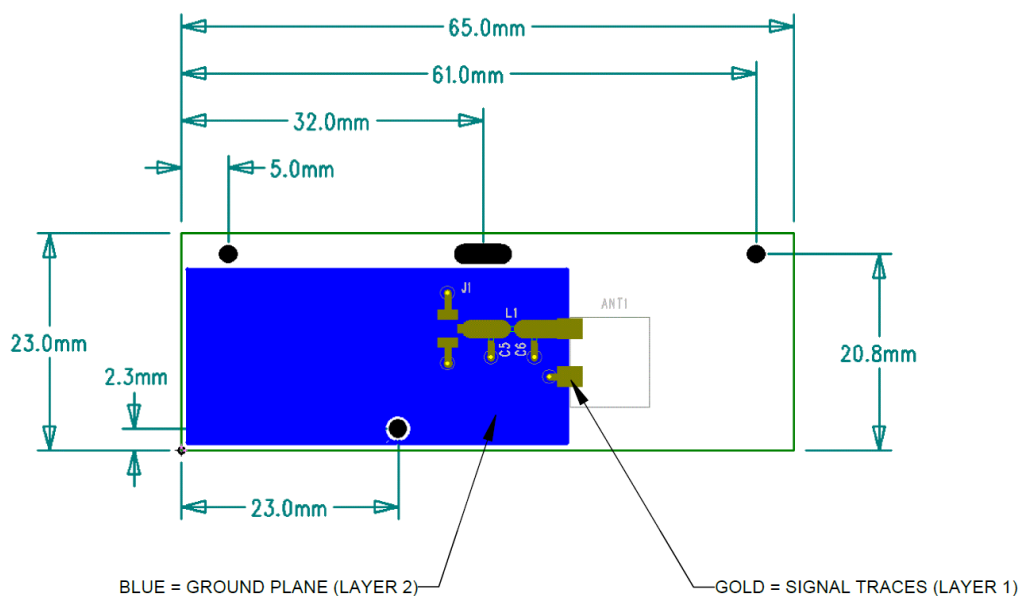
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REV	DESCRIPTION	CHKD	BY	DATE
A	SEE SHEET 1		HW	1/4/2023

TABLE 4. BLUETOOTH ANTENNA SPECIFICATION

SPECIFICATION	VALUE	NOTES
MANUFACTURER AND PART NUMBER	LINX ANT-DB1-nSP250	
FREQUENCY RANGE	2.4GHz BAND: 2.4 - 2.4835GHz	
VSWR HORIZONTAL	< 3.0 @ 2.4-2.5GHz	FROM LINX TUNING REPORT
RETURN LOSS	< -10dB @ 2.4-2.5GH	FROM ANT-DB1-nSP250 DATA SHEET
RADIATION	OMNI-DIRECTIONAL	FROM ANT-DB1-nSP250 DATA SHEET
GAIN (PEAK)	SEE DOCUMENT GAIN SECTION	FROM OTA TEST
POLARIZATION	LINEAR VERTICAL	FROM ANT-DB1-nSP250 DATA SHEET
CABLE	1.13mm COAXIAL CABLE	
CONNECTOR	U.FL PLUT I-EX MFH1	
OPERATING TEMPERATURE	-40°C ~ +130°C	FROM ANT-DB1-nSP250 DATA SHEET
STORAGE TEMPERATURE	-10°C ~ +70°C	FROM ANT-DB1-nSP250 DATA SHEET
IMPEDANCE	50Ω	
WAVELENGTH	1/4 -WAVE	
ELECTRICAL TYPE	MONOPOLE	

FIGURE 5. BLUETOOTH PCBA LAYOUT
(7721496000 PCB ASSY TONE MASTER PRO BLUETOOTH)



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SIZE A	PART NUMBER 7727252000	REV A
FILE NAME: 7727252000	SCALE: 1:5	SHEET: 4 of 8

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Size: 9.6mm*8.4mm*1.1mm

2. Test Facility

Test Site	:	SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd.
Address:	:	FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, Shenzhen, Guangdong Province, P.R. China
Tel	:	+86-755-36698555
Fax	:	+86-755-36698525
Email	:	service@morlab.cn
Website	:	www.morlab.cn

3. Test Standard

No.	Identity	Document Title
1.	IEEE Std 149-2021	IEEE Recommended Practice for Antenna Measurements

4. Test Equipment

No.	Equipment Name	Manufacturer	Model Name	Serial No.	Cal. Date	Cal. Due date
1	Network Analyzer	Agilent	E5071C	MY46110140	2022-07-04	2023-07-03
2	OTA Chamber	ETS	AMS-8923-150	TJ2235-Q1793	2020-01-06	2023-01-05
3	Antenna Measurement System	ETS	EMQuest EMQ-100 V 1.13 Build 21267	1685	N/A	N/A

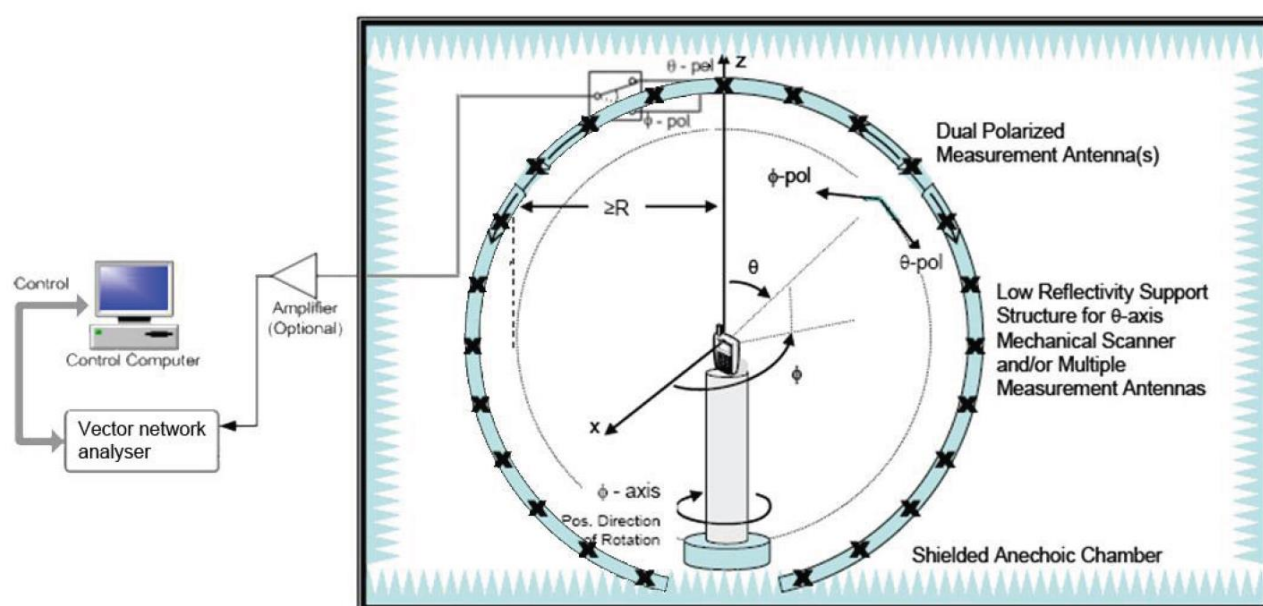
5. Test Environment Conditions

Relative Humidity	25 ~ 75 %
Temperature	+10°C ~ 30°C

6. Measurement Uncertainty

Item	Measurement Uncertainty (dB)
Conducted Emission	± 0.5
Radiated Emission	± 0.2
Measurement Uncertainty (95% Confidence Interval) K=2	

7. Test Setup Block Diagram



8. Test Results

Gain

WIFI Antenna #1		7721824000 / Cable ASSY COAX 1.13 U.FL 60mm BLK		
Frequency (MHz)	The First Round Test	The Second Round Test	Maximum Peak Gain	
	Gain (dBi)	Gain (dBi)	Gain (dBi)	
2400	0.54	0.61	0.61	
2450	0.80	1.47	1.47	
2500	1.06	1.44	1.44	
5150	0.58	0.36	0.58	
5200	0.20	0.06	0.20	
5250	0.05	-0.01	0.05	
5300	-0.31	-0.45	-0.31	
5350	-0.57	-0.63	-0.57	
5470	-0.46	-0.42	-0.42	
5597.5	0.54	0.60	0.60	
5725	1.04	1.47	1.47	
5787.5	1.75	2.02	2.02	
5850	1.96	2.12	2.12	

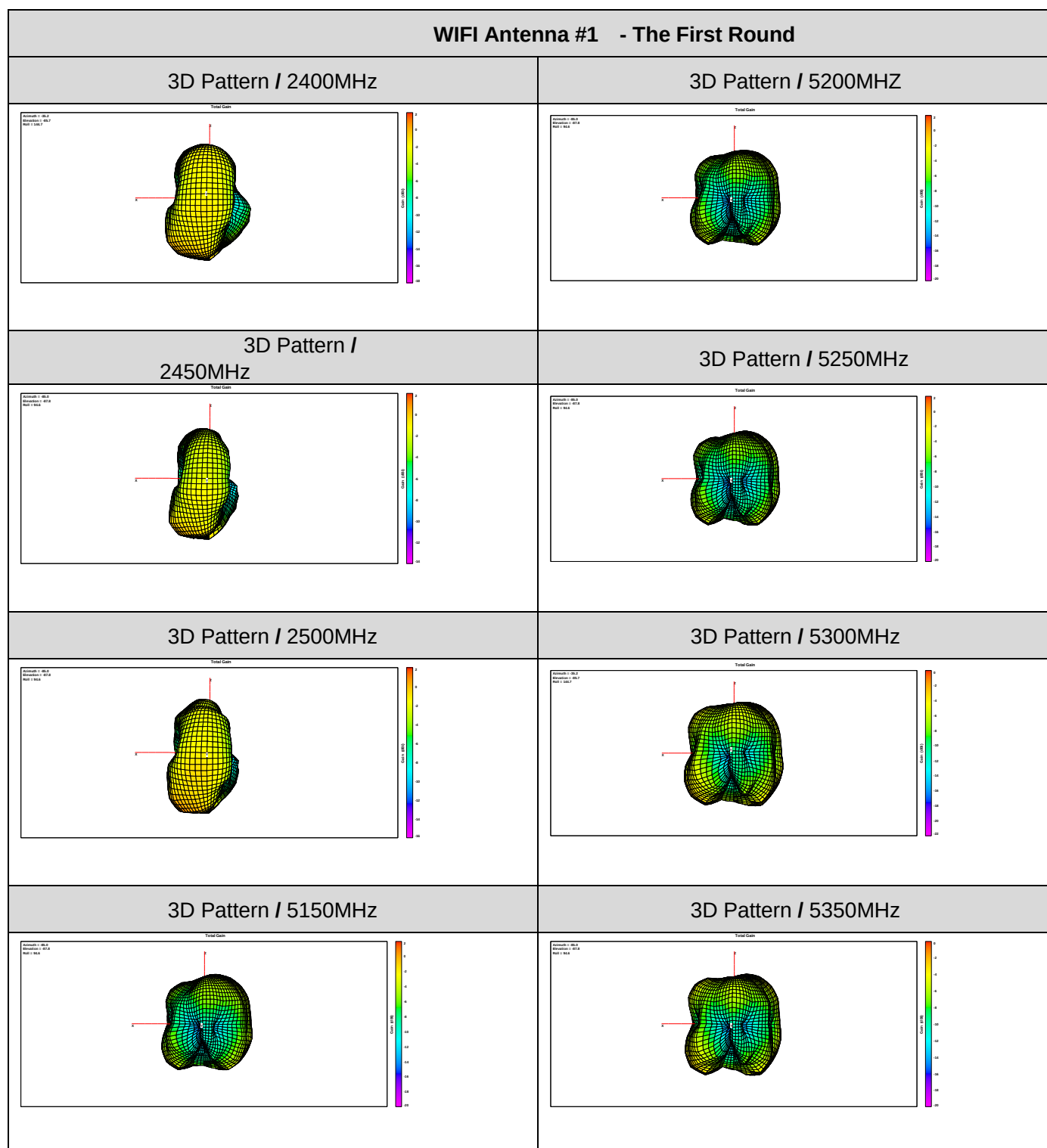
Gain

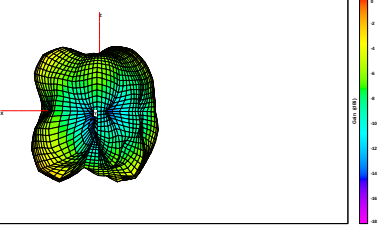
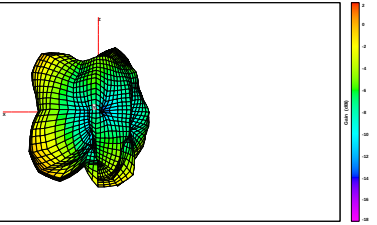
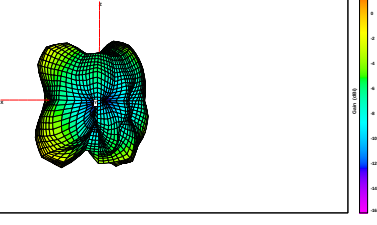
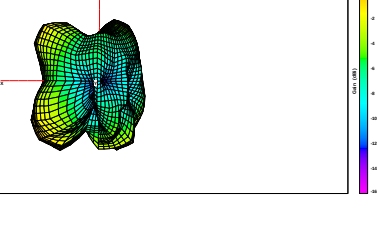
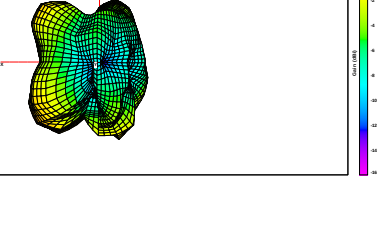
WIFI Antenna #2		7721823000 / Cable ASSY COAX 1.13 U.FL 60mm WHT		
Frequency (MHz)	The First Round Test	The Second Round Test	Maximum Peak Gain	
	Gain (dBi)	Gain (dBi)	Gain (dBi)	
2400	-3.43	-3.72	-3.43	
2450	-6.93	-7.00	-6.93	
2500	-9.10	-9.34	-9.10	
5150	-1.76	-1.73	-1.73	
5200	-1.71	-2.09	-1.71	
5250	-1.25	-1.94	-1.25	
5300	-1.31	-2.16	-1.31	
5350	-1.15	-2.15	-1.15	
5470	-1.05	-2.12	-1.05	
5597.5	-0.49	-1.05	-0.49	
5725	-0.30	-0.94	-0.30	
5787.5	-0.05	-0.46	-0.05	
5850	0.19	-0.18	0.19	

Gain

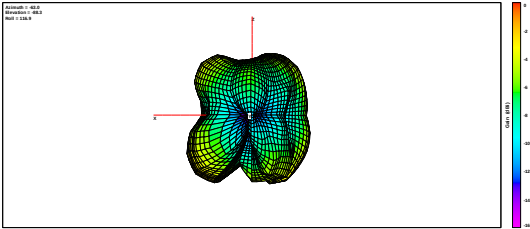
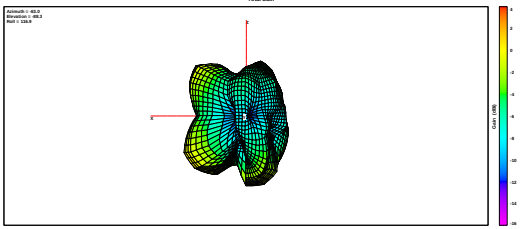
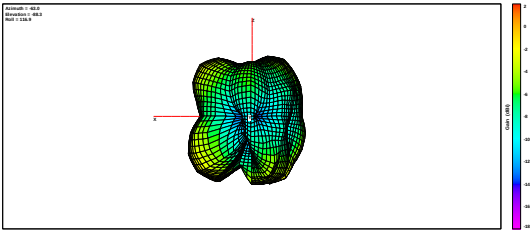
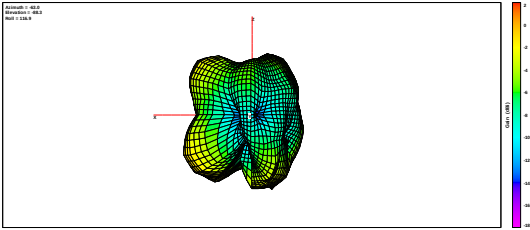
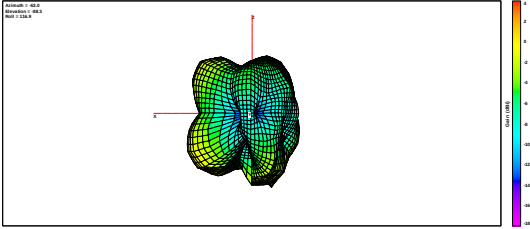
Bluetooth Antenna		7722563000 / Cable ASSY COAX 1.13 U.FL 355mm BLU		
Frequency (MHz)	The First Round Test	The Second Round Test	Maximum Peak Gain	
	Gain (dBi)	Gain (dBi)	Gain (dBi)	
2400	0.12	2.11	2.11	
2450	-5.63	0.09	0.09	
2500	-4.56	-0.48	-0.48	

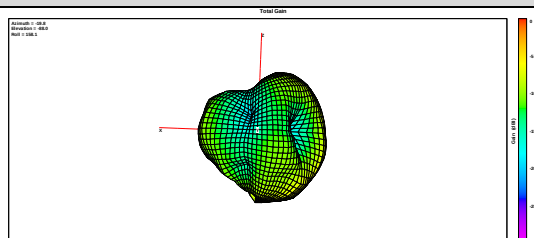
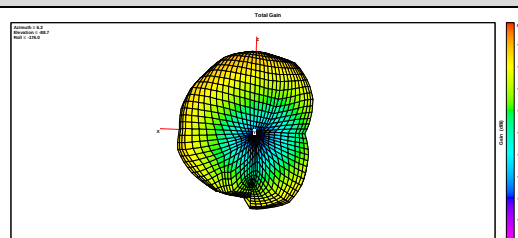
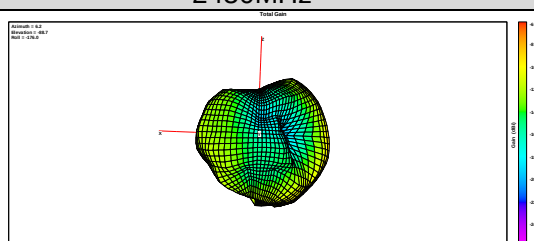
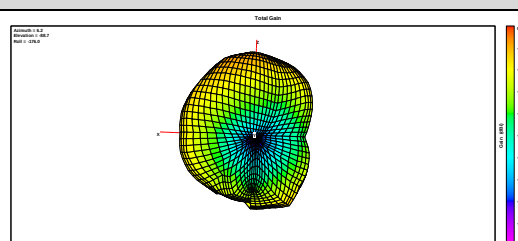
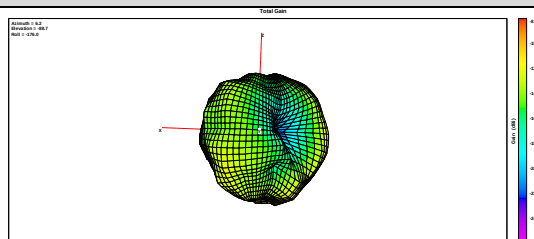
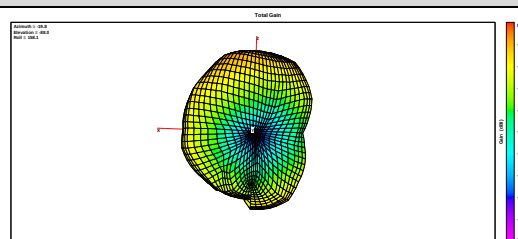
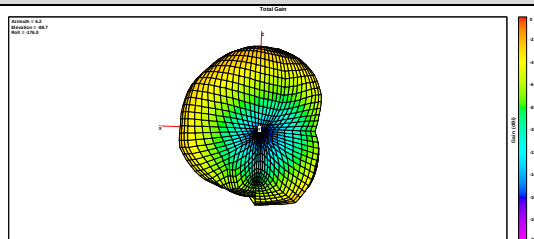
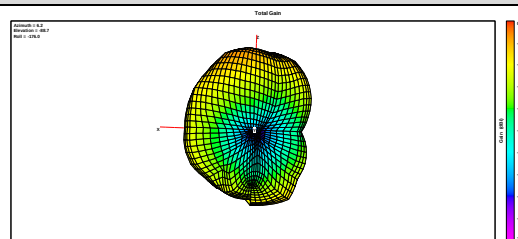
9. Radiation Test Pattern



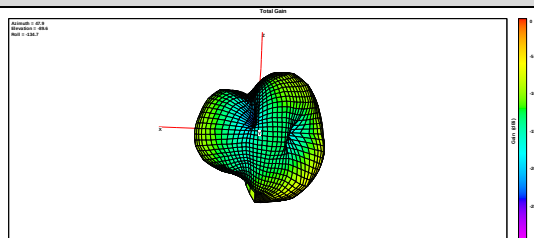
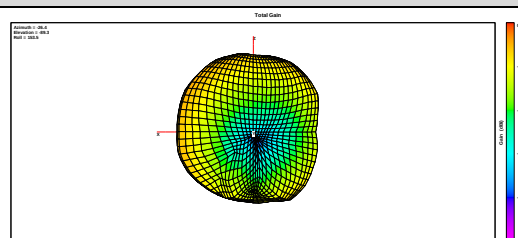
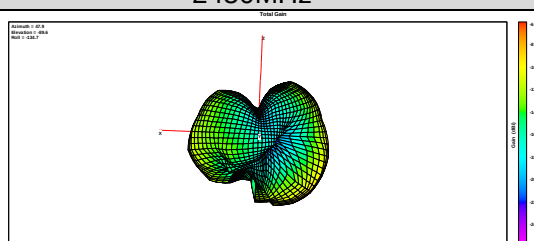
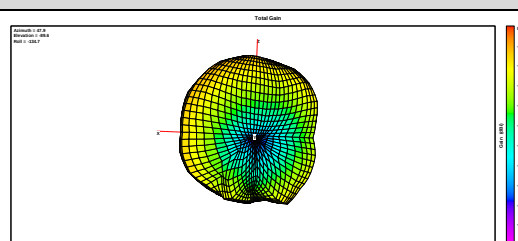
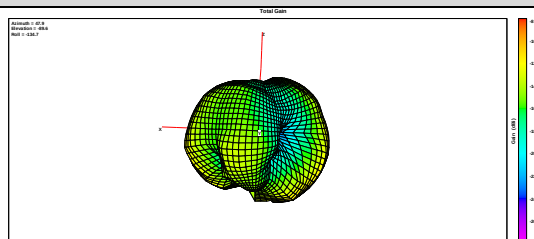
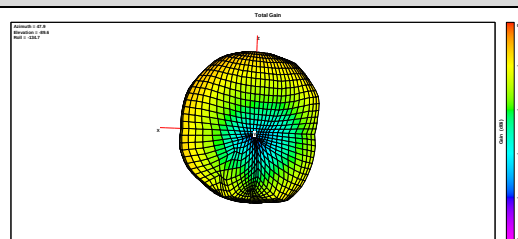
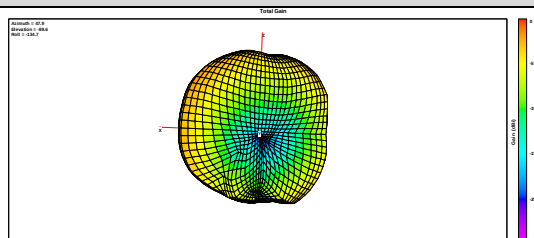
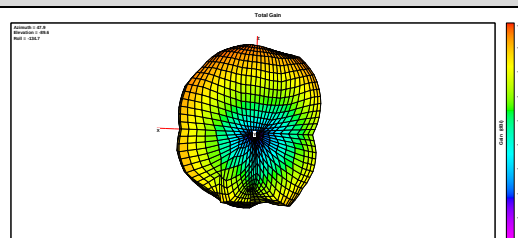
WIFI Antenna #1 - The First Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHz
Antenna 1: 5470 MaxGain: 10.0 Min: 1.0 	Antenna 1: 5850 MaxGain: 10.0 Min: 1.0 
3D Pattern / 5597.5MHz	
Antenna 1: 5597.5 MaxGain: 10.0 Min: 1.0 	
3D Pattern / 5725MHz	
Antenna 1: 5725 MaxGain: 10.0 Min: 1.0 	
3D Pattern / 5787.5MHz	
Antenna 1: 5787.5 MaxGain: 10.0 Min: 1.0 	

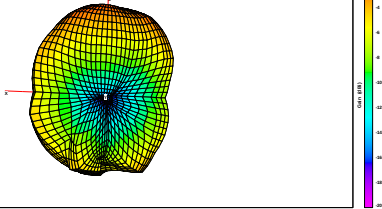
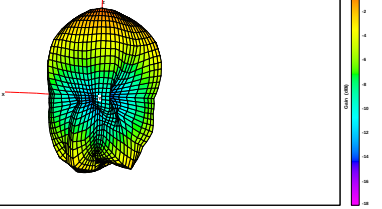
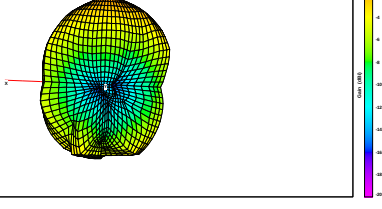
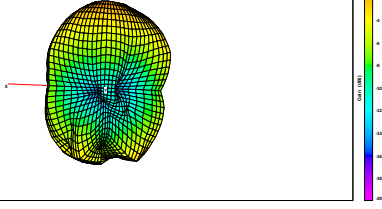
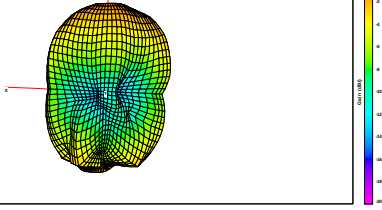
WIFI Antenna #1 - The Second Round	
3D Pattern / 2400MHz	3D Pattern / 5200MHz
Antenna 1: 40.0 Reference: 0.0 Max: 1.000	Antenna 1: 40.0 Reference: 0.0 Max: 1.000
3D Pattern / 2450MHz	3D Pattern / 5250MHz
Antenna 1: 40.0 Reference: 0.0 Max: 1.000	Antenna 1: 40.0 Reference: 0.0 Max: 1.000
3D Pattern / 2500MHz	3D Pattern / 5300MHz
Antenna 1: 40.0 Reference: 0.0 Max: 1.000	Antenna 1: 40.0 Reference: 0.0 Max: 1.000
3D Pattern / 5150MHz	3D Pattern / 5350MHz
Antenna 1: 40.0 Reference: 0.0 Max: 1.000	Antenna 1: 40.0 Reference: 0.0 Max: 1.000

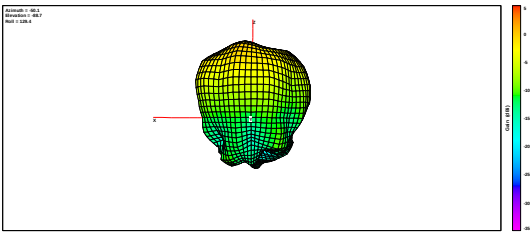
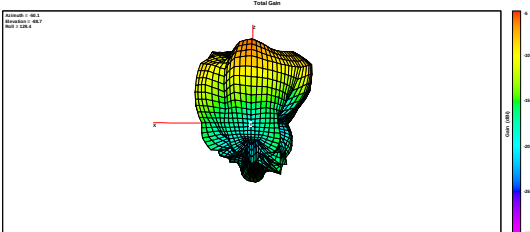
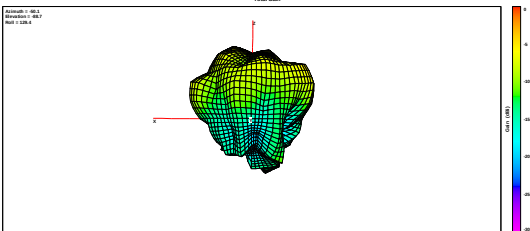
WIFI Antenna #1 - The Second Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHz
Frequency: 5.470 GHz MaxGain: 10.0 dBi MinGain: 0.0 dBi 	Frequency: 5.850 GHz MaxGain: 10.0 dBi MinGain: 0.0 dBi 
3D Pattern / 5597.5MHz	
Frequency: 5.598 GHz MaxGain: 10.0 dBi MinGain: 0.0 dBi 	
3D Pattern / 5725MHz	
Frequency: 5.725 GHz MaxGain: 10.0 dBi MinGain: 0.0 dBi 	
3D Pattern / 5787.5MHz	
Frequency: 5.788 GHz MaxGain: 10.0 dBi MinGain: 0.0 dBi 	

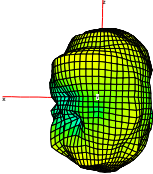
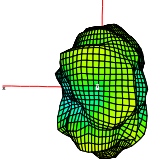
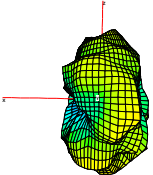
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2450MHz****3D Pattern / 5250MHz****3D Pattern / 2500MHz****3D Pattern / 5300MHz****3D Pattern / 5150MHz****3D Pattern / 5350MHz**

WIFI Antenna #2 - The First Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHz
Frequency: 5.47 MaxGain: 1.98 dBi MinGain: 0.00 dBi	Frequency: 5.85 MaxGain: 1.98 dBi MinGain: 0.00 dBi
3D Pattern / 5597.5MHz	
Frequency: 5.5975 MaxGain: 1.98 dBi MinGain: 0.00 dBi	
3D Pattern / 5725MHz	
Frequency: 5.725 MaxGain: 1.98 dBi MinGain: 0.00 dBi	
3D Pattern / 5787.5MHz	
Frequency: 5.7875 MaxGain: 1.98 dBi MinGain: 0.00 dBi	

WIFI Antenna #2 - The Second Round**3D Pattern / 2400MHz****3D Pattern / 5200MHz****3D Pattern /
2450MHz****3D Pattern / 5250MHz****3D Pattern / 2500MHz****3D Pattern / 5300MHz****3D Pattern / 5150MHz****3D Pattern / 5350MHz**

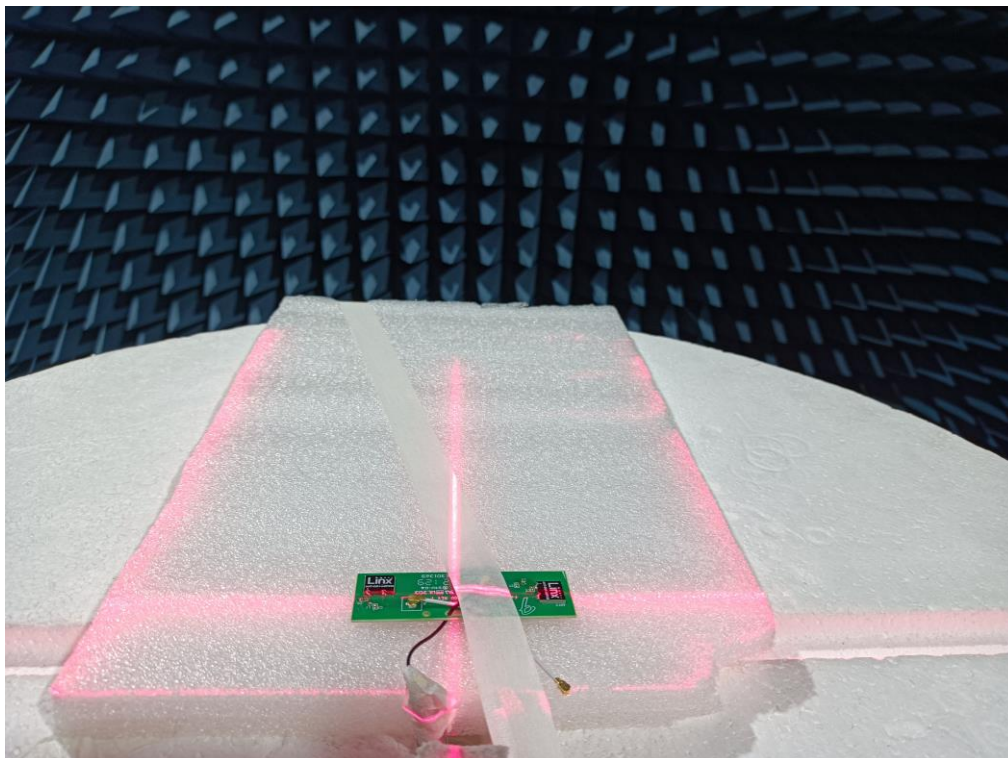
WIFI Antenna #2 - The Second Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHz
Frequency: 5.470 GHz MaxGain: 1.98 dBi MinGain: 0.00 dBi 	Frequency: 5.850 GHz MaxGain: 1.98 dBi MinGain: 0.00 dBi 
3D Pattern / 5597.5MHz	
Frequency: 5.598 GHz MaxGain: 1.98 dBi MinGain: 0.00 dBi 	
3D Pattern / 5725MHz	
Frequency: 5.725 GHz MaxGain: 1.98 dBi MinGain: 0.00 dBi 	
3D Pattern / 5787.5MHz	
Frequency: 5.788 GHz MaxGain: 1.98 dBi MinGain: 0.00 dBi 	

Bluetooth Antenna - The First Round	
3D Pattern / 2400MHz	
Bluetooth 1 - 90.2 Bluetooth 1 - 90.7 Bluetooth 1 - 90.8 	
3D Pattern / 2450MHz	
Bluetooth 1 - 90.2 Bluetooth 1 - 90.7 Bluetooth 1 - 90.8 	
3D Pattern / 2500MHz	
Bluetooth 1 - 90.2 Bluetooth 1 - 90.7 Bluetooth 1 - 90.8 	

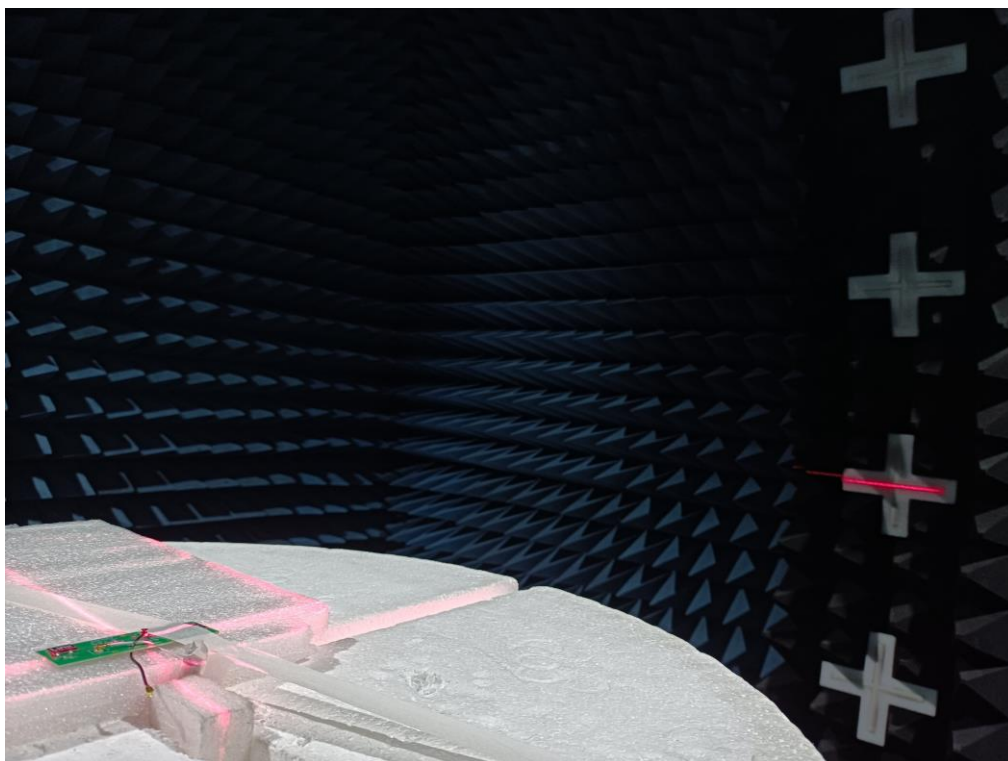
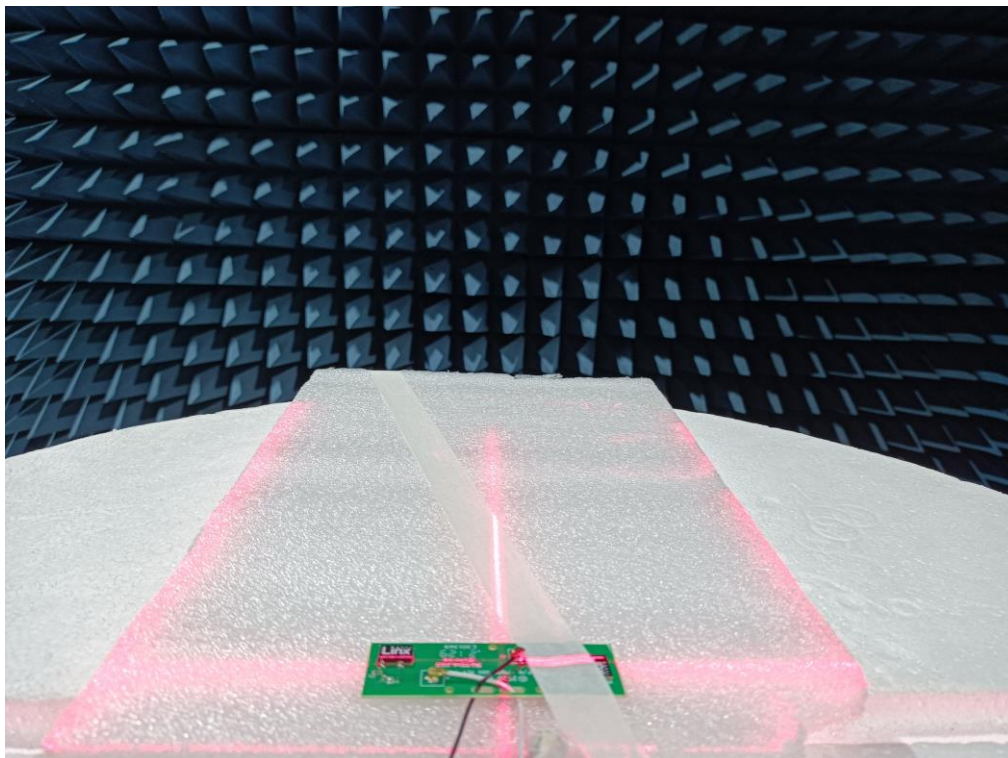
Bluetooth Antenna - The Second Round	
3D Pattern / 2400MHz	
Bluetooth - 2400.0 Maximum Gain: 97.0 Min: 1.0 dB Total Gain 	
3D Pattern / 2450MHz	
Bluetooth - 2450.0 Maximum Gain: 97.0 Min: 1.0 dB Total Gain 	
3D Pattern / 2500MHz	
Bluetooth - 2500.0 Maximum Gain: 97.0 Min: 1.0 dB Total Gain 	

10. Test Setup Photo

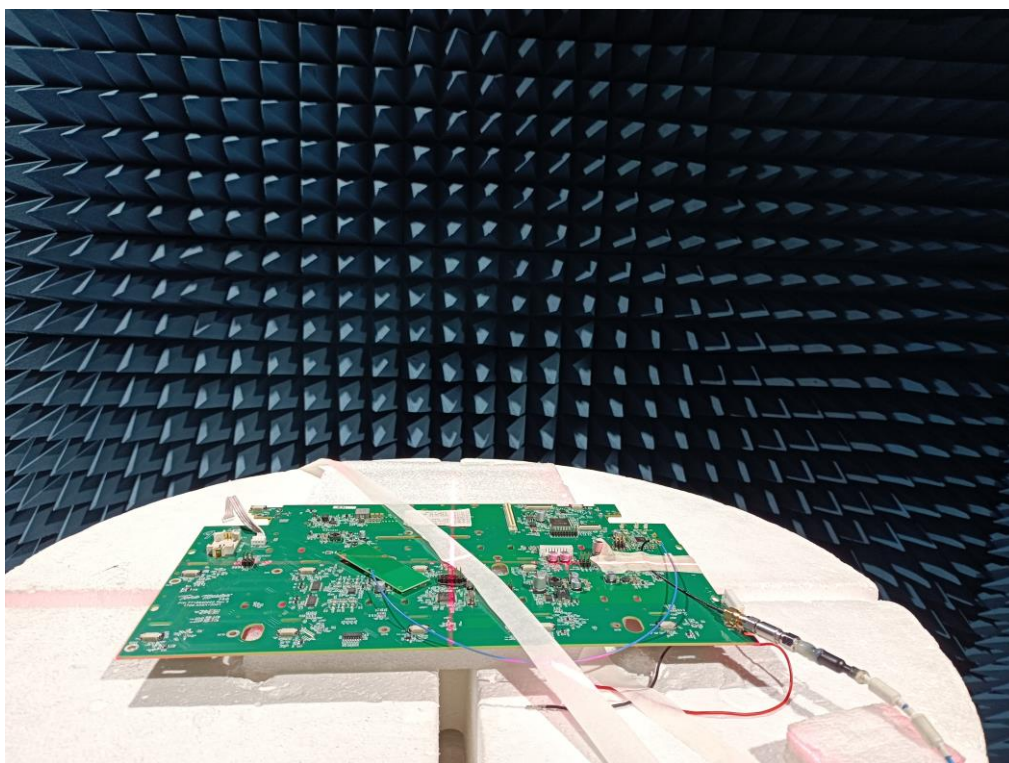
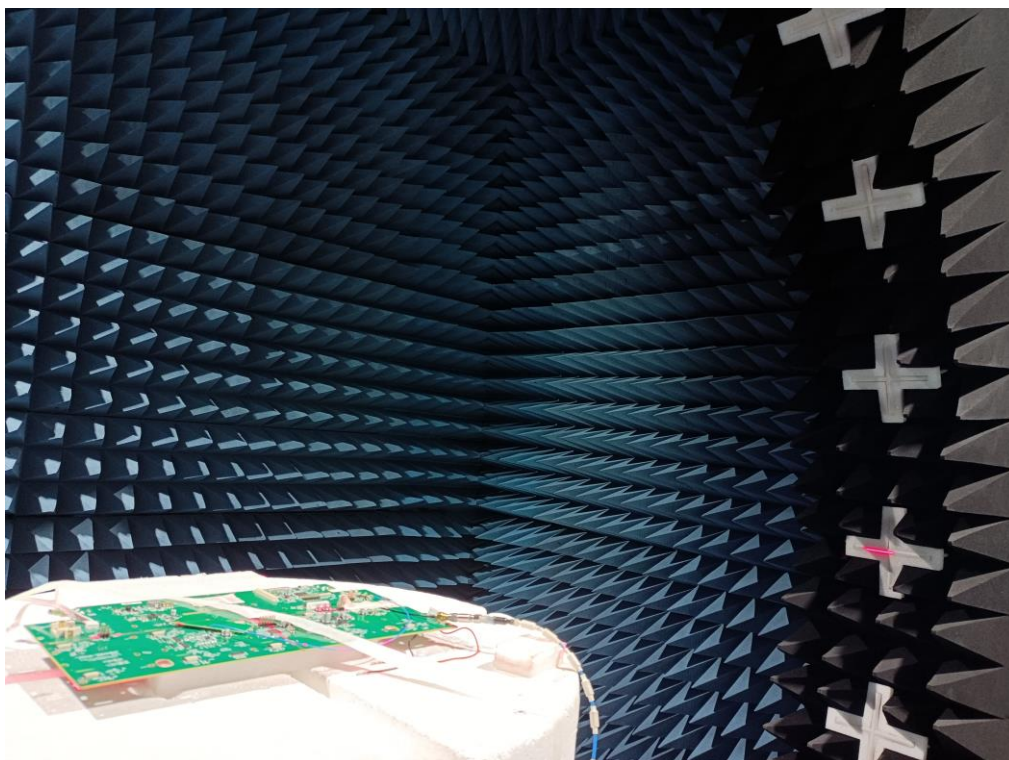
WIFI Antenna #1



WIFI Antenna #2



Bluetooth Antenna



---End---