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

Table of Contents

1. Antenna Specification

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	PR5642	1/10/2023	HW

FIGURE 1. ATENNA SYSTEM DIAGRAM

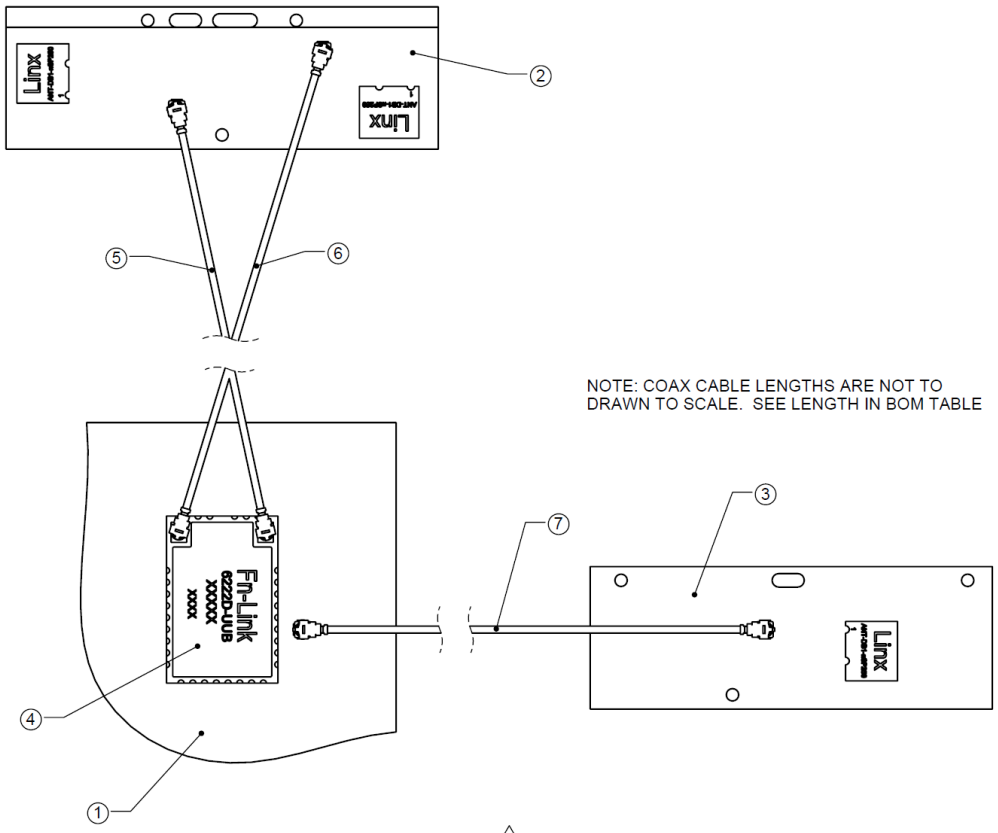

TABLE 1. BOM △1

ITEM	PART NUMBER	DESCRIPTION
7	7722563000	CABLE ASSY COAX 1.13mm U.FL 355mm BLU
6	7721823000	CABLE ASSY COAX 1.13mm U.FL 60mm WHT
5	7721824000	CABLE ASSY COAX 1.13mm U.FL 60mm BLK
4	FN-LINK 6222D-UUC	WiFi DUAL-BAND 2x12 11ac + BLUETOOTH 5.0 COMBO MODULE
3	7721496000	PCB ASSY TONE MASTER PRO BLUETOOTH
2	7719958000	PCB ASSY TONE MASTER PRO WIFI
1	7719941000	PCB ASSY TONE MASTER PRO MAIN-UI

NOTES:
△1. SEE FENDER ARCHIVE FOR MOST RECENT VERSION OF SPECIFICATIONS AND DRAWINGS.

ANY PART SUPPLIED FOR USE IN ANY FENDER PRODUCT MUST CONFORM TO THE EUROPEAN RoHS DIRECTIVE.

GENERAL TOLERANCES
UNLESS OTHERWISE SPECIFIED

	ENGLISH	METRIC
WOOD FRACT	±1/32	
X		±1
X	±.050	±0.5
XX	±.020	±0.25
XXX	±.010	
HOLE DIA	+.005 -.001	+0.013 -0.03
WOOD HOLE DIA	±.005	±0.13

ANGLES
ANGLES ±0.5°
UNMARKED ANGLES--90°

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

ENGINEER	H. WONG	DATE 12/1/2022
DRAWN	H. WONG	DATE 12/1/2022
CHKD		DATE
S.M.E. (OPT)		DATE
MGR/DIR		DATE
P.E.		DATE

FENDER MUSICAL INSTRUMENTS CORP.
RESEARCH & DEVELOPMENT
CORONA, CALIFORNIA U.S.A.

TITLE: 2.4/5 GHz MODULE AND ANTENNA SYSTEM

SIZE	PART NUMBER	REV
A	7727252000 MASTER/ASSY	A

FILE NAME: 7727252000 | SCALE: 1:5 | SHEET: 1 of 8

TITLEBLOCK REVISION: 2.1

THIS DOCUMENT CONTAINS INFORMATION OF A PROPRIETARY NATURE TO FENDER MUSICAL INSTRUMENTS AND IS SUBMITTED TO YOU IN CONFIDENCE AND SHALL NOT BE DISCLOSED OR TRANSMITTED TO OTHERS WITHOUT AUTHORIZATION FROM FENDER MUSICAL INSTRUMENTS CORP.	REV	DESCRIPTION	CHKD	BY	DATE
	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)

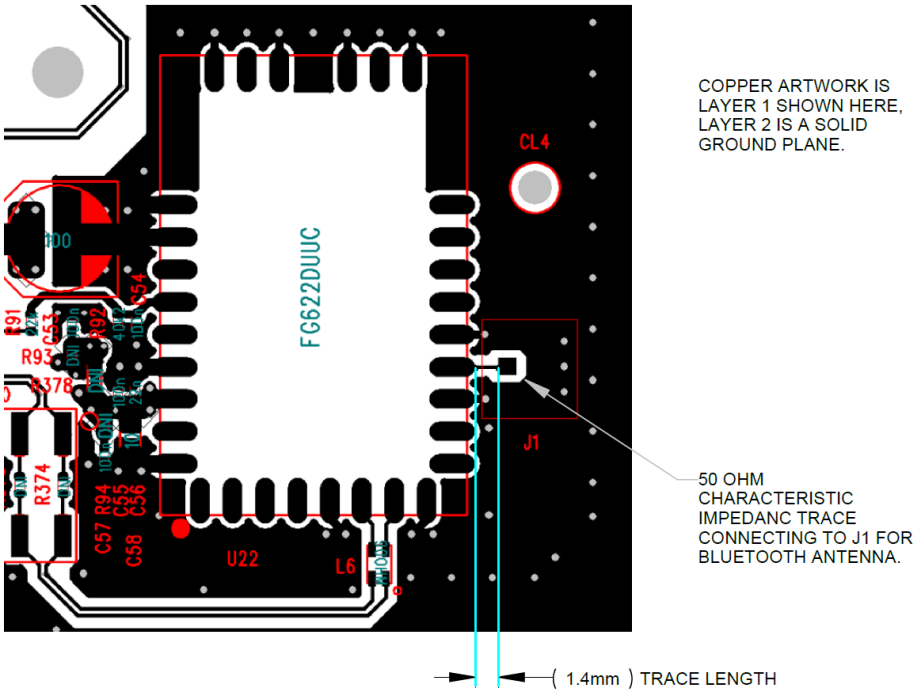

FIGURE 3. TYPICAL PCB STACKUP

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.

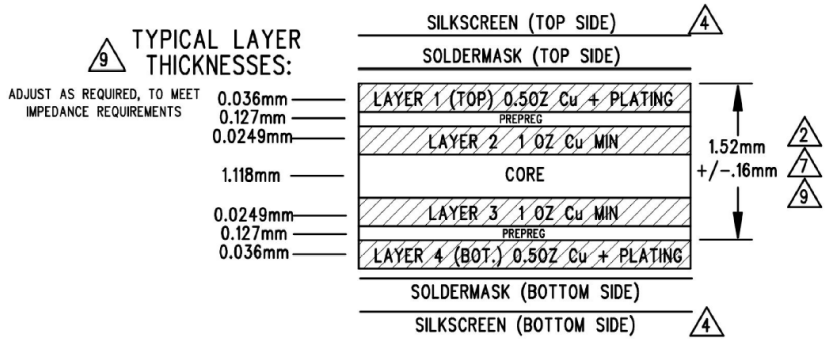

TABLE 2. IMPEDANCE REQURIEMENTS

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

FENDER MUSICAL INSTRUMENTS CORP. RESEARCH AND DEVELOPMENT CORONA, CALIFORNIA U.S.A.	DRAWN H. WONG	SIZE A	PART NUMBER 7727252000 MASTER/ASSY	REV A
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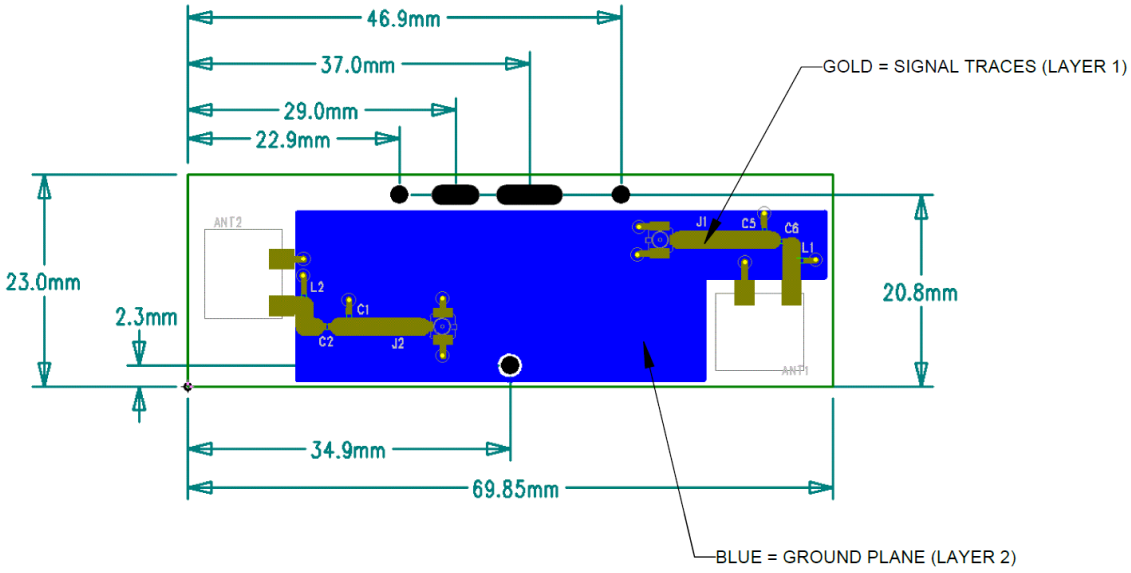
TITLEBLOCK REVISION: 2.1

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

TABLE 3. Wi-Fi ANTENNA SPECIFICATION

SPECIFICATION	VALUE	NOTES
MANFUACTURER 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 @ 2.4-2.5GH < -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	
OPEARATING 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)



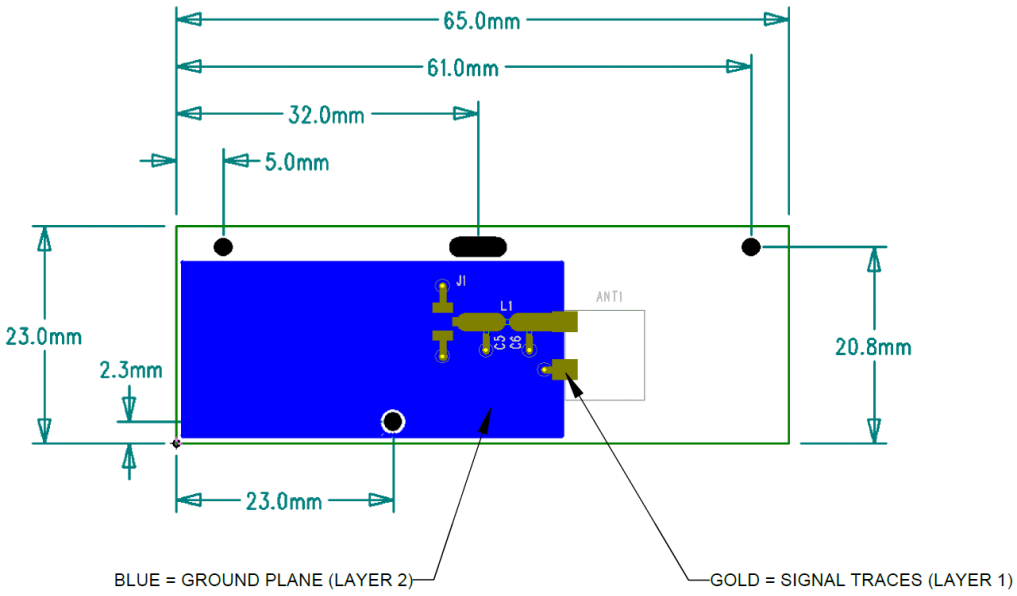
FENDER MUSICAL INSTRUMENTS CORP. RESEARCH AND DEVELOPMENT CORONA, CALIFORNIA U.S.A.	DRAWN: H. WONG DATE: 12/1/2022	SIZE: A	PART NUMBER: 7727252000 MASTER/ASSY	REV: A
COPYRIGHT -1/10/2023- FMIC		FILE NAME: 7727252000	SCALE: 1:5	SHEET: 3 of 8

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

TABLE 4. BLUETOOOTH ANTENNA SPECIFICATION

SPECIFICATION	VALUE	NOTES
MANFUACTURER 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	
OPEARATING 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)



FENDER MUSICAL INSTRUMENTS CORP. RESEARCH AND DEVELOPMENT CORONA, CALIFORNIA U.S.A.	DRAWN: H. WONG DATE: 12/1/2022	SIZE: A	PART NUMBER: 7727252000 MASTER/ASSY	REV: A
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TITLEBLOCK REVISION: 2.1

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

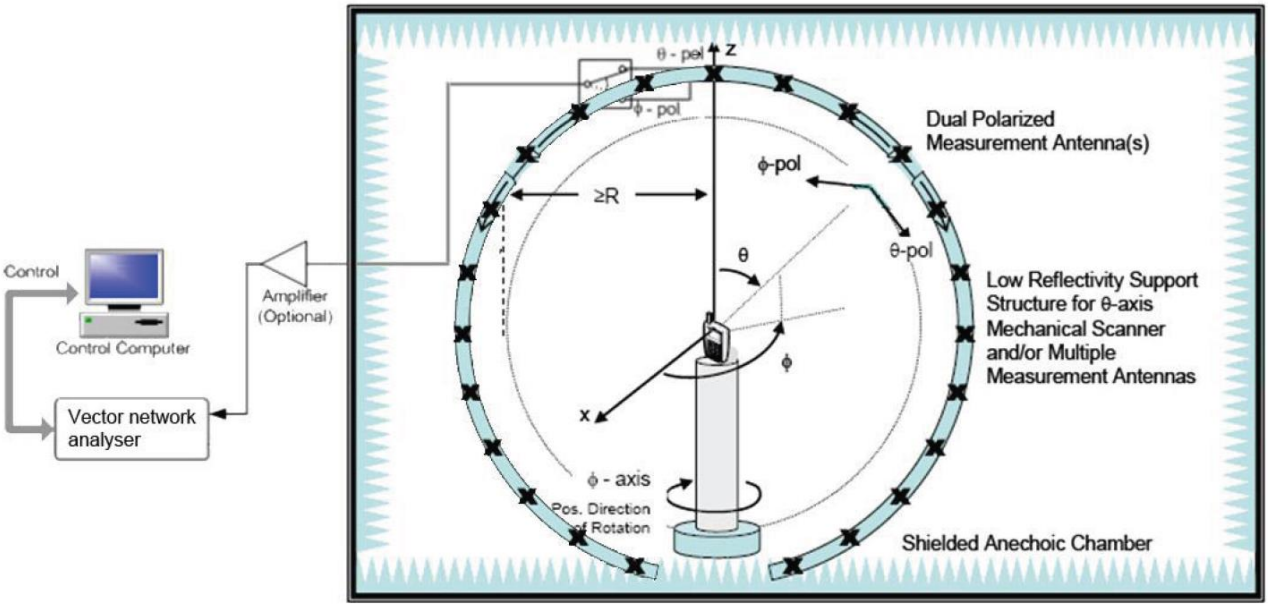
5. Test Environment Conditions

Relative Humidity	**25 ~ 75 %**
Temperature	**+10℃ ~ 30℃**

6. Measurement Uncertainty

Item	Measurement Uncertainty (dB)
Conducted Emission	±0.5
Radiated Emission	±0.2
Measurement Uncertainly (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

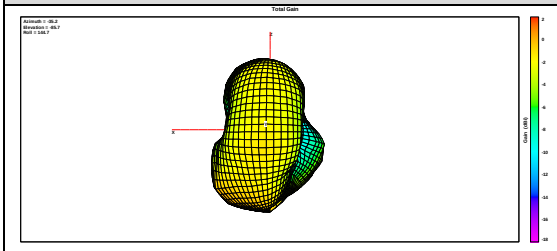
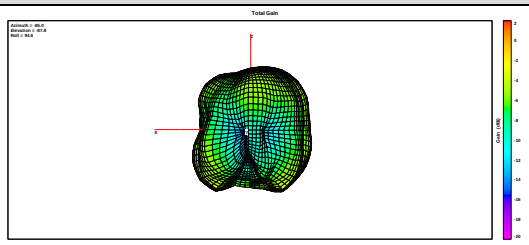
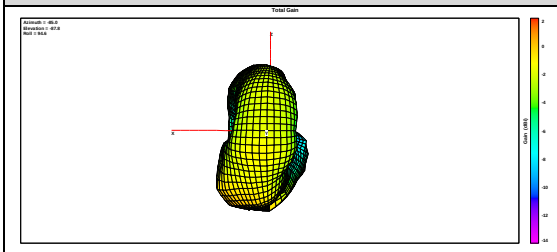
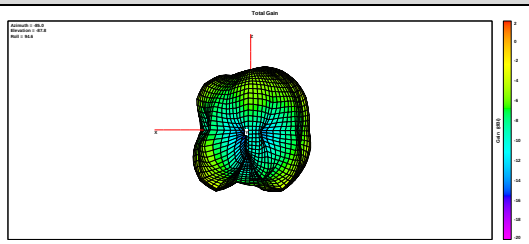
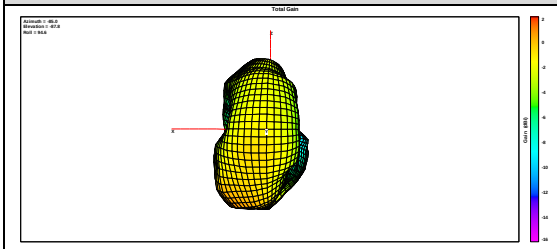
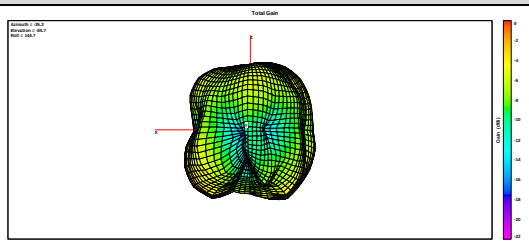
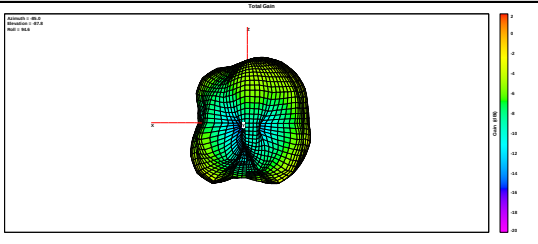
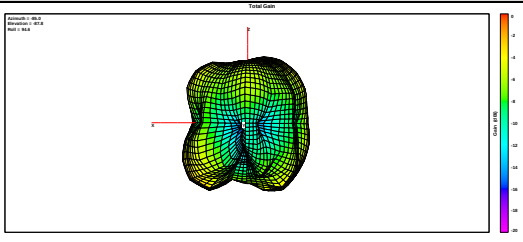
Gain

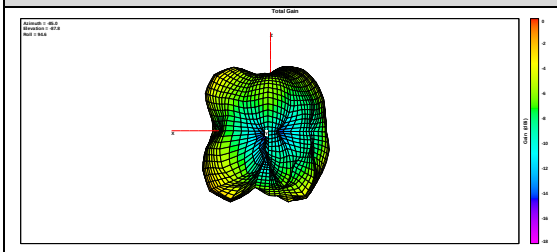
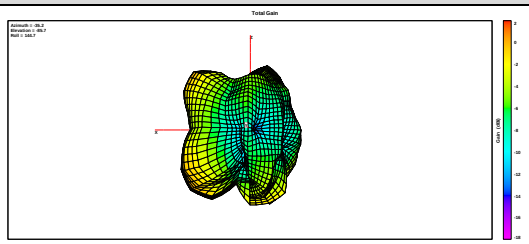
WIFI Antenna #2	7721823000 / Cable ASSY COAX 1.13 U.FL 60mm WHT		
Frequency (MHz)	The First Round Test	The Second Round Test	Maximum Peak Gain
	Gain (dBi)	Gain (dBi)	Gain (dBi)
2400	-3.43	-3.72	-3.43
2450	-6.93	-7.00	-6.93
2500	-9.10	-9.34	-9.10
5150	-1.76	-1.73	-1.73
5200	-1.71	-2.09	-1.71
5250	-1.25	-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 / 2400MHz	3D Pattern / 5200MHZ
	
3D Pattern / 2450MHz	3D Pattern / 5250MHz
	
3D Pattern / 2500MHz	3D Pattern / 5300MHz
	
3D Pattern / 5150MHz	3D Pattern / 5350MHz
	

WIFI Antenna #1 - The First Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHZ
	
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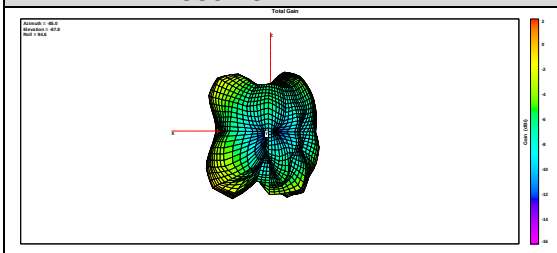	
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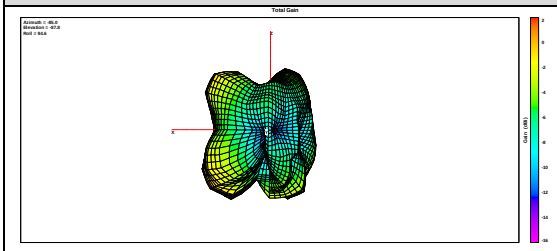
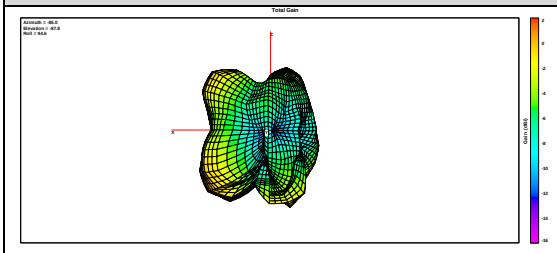
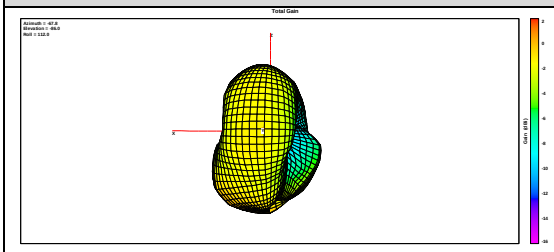
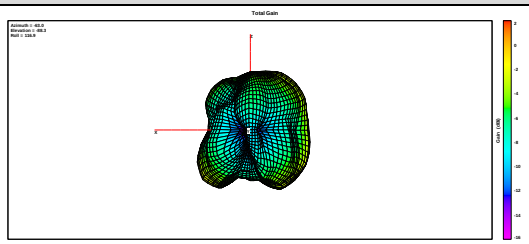
	
3D Pattern / 5787.5MHz	
	

WIFI Antenna #1 - The Second Round	
3D Pattern / 2400MHz	3D Pattern / 5200MHZ
	
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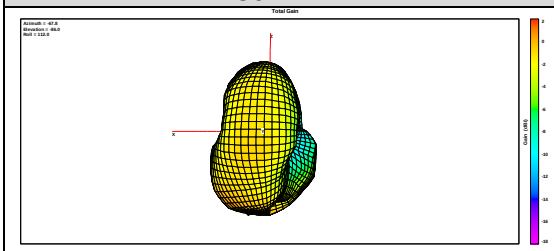
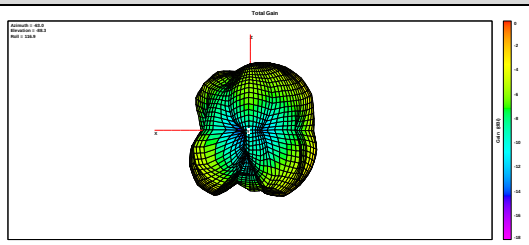
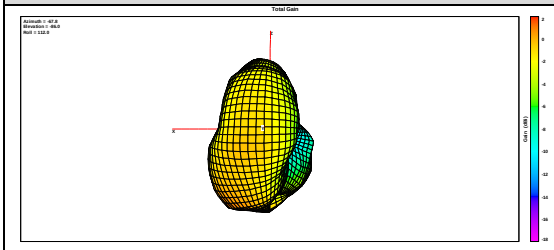
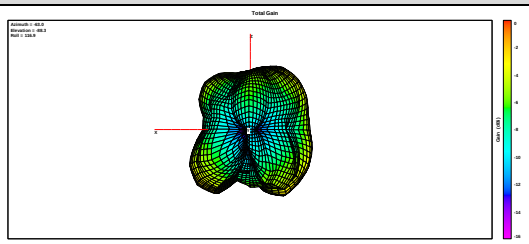
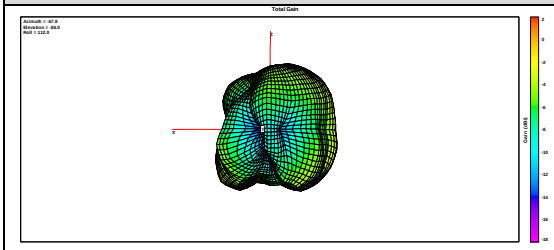
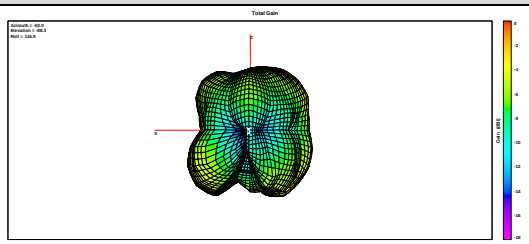
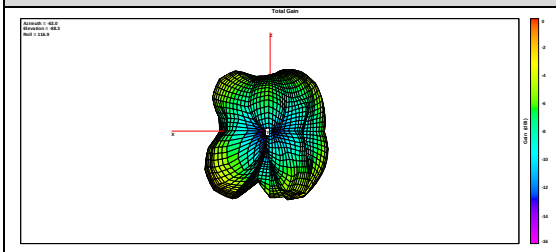
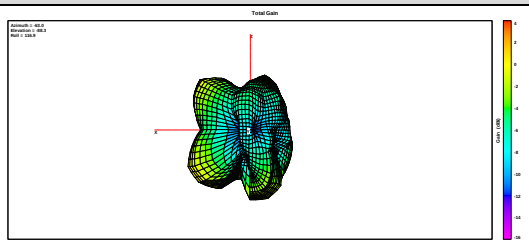
	
3D Pattern / 2500MHz	3D Pattern / 5300MHz
	
3D Pattern / 5150MHz	3D Pattern / 5350MHz
	

WIFI Antenna #1 - The Second Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHZ
	
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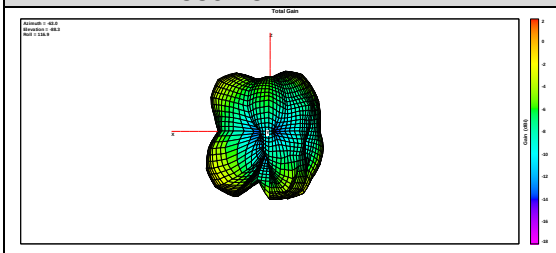	
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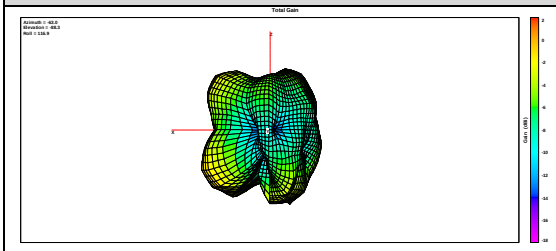	
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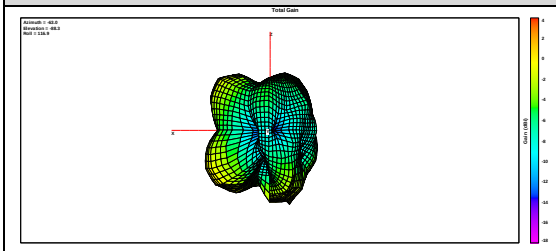
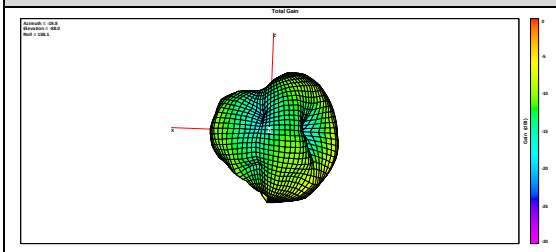
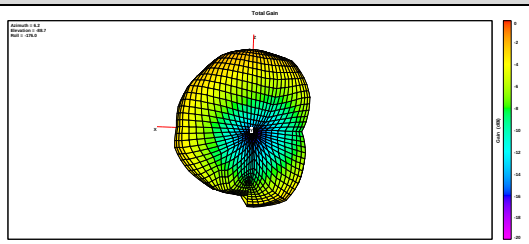
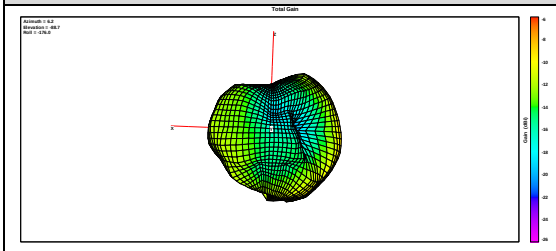
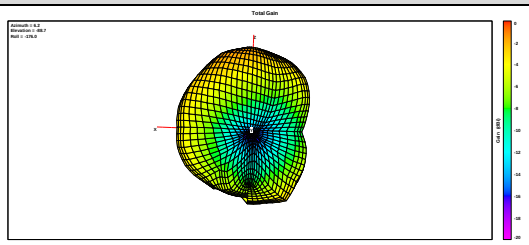
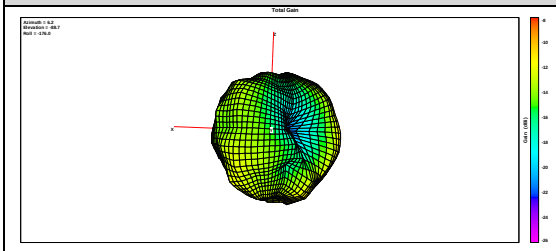
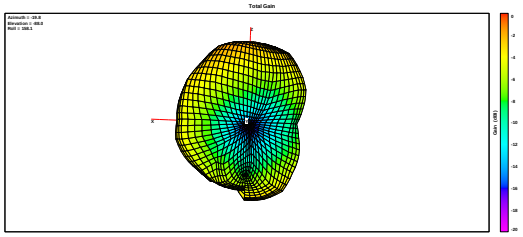
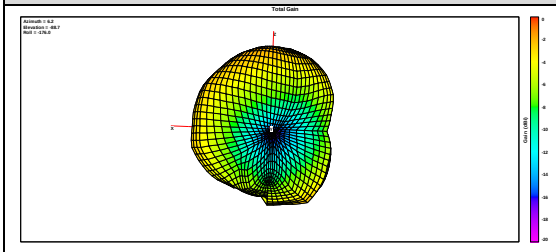
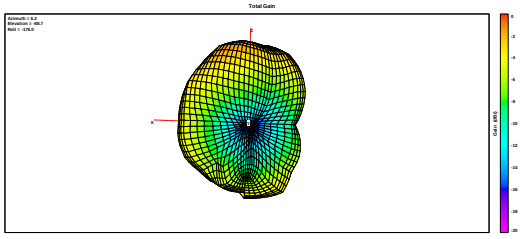
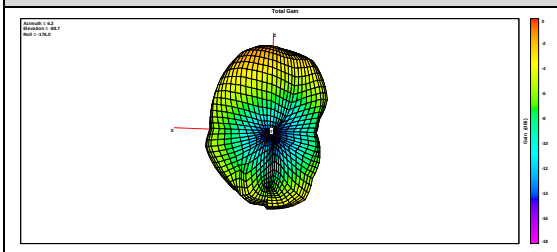
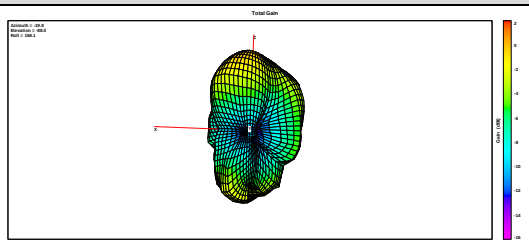
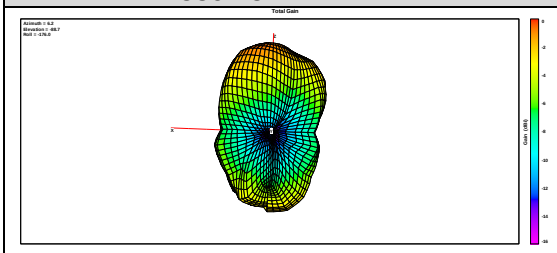
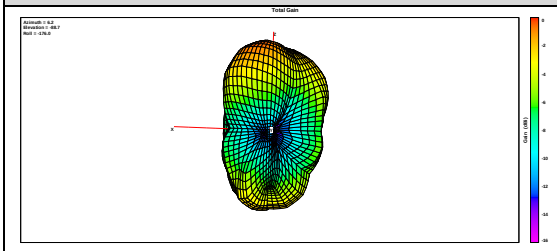
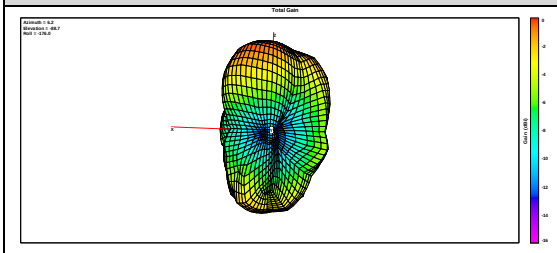
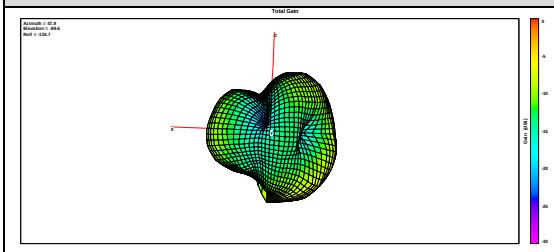
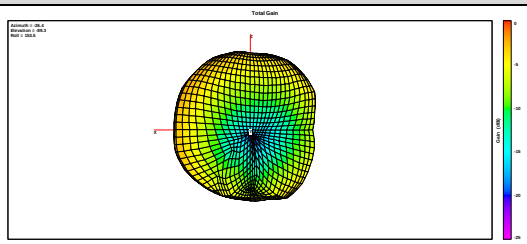
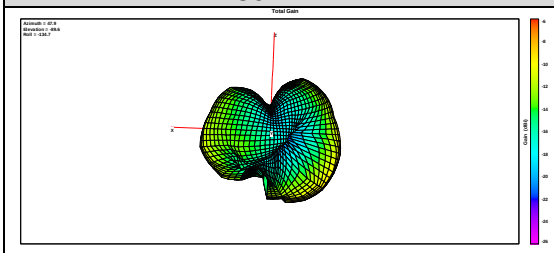
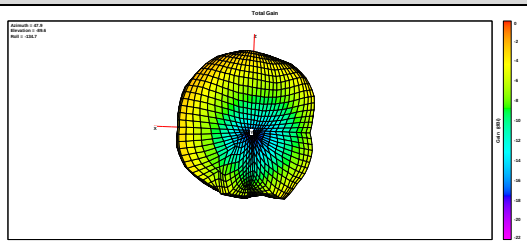
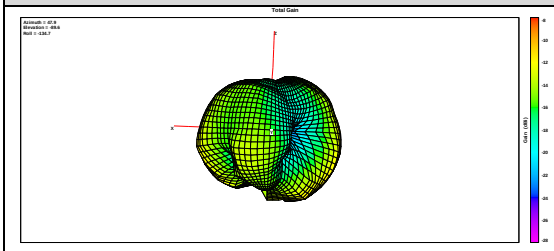
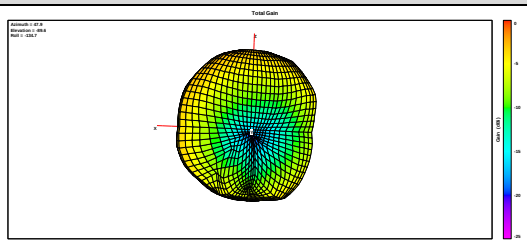
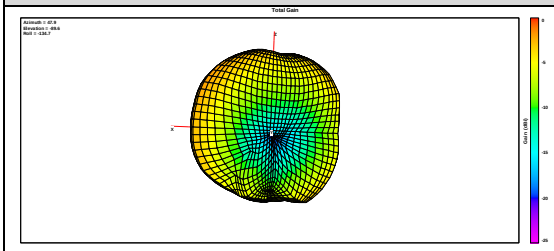
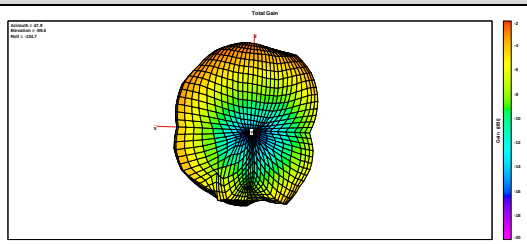
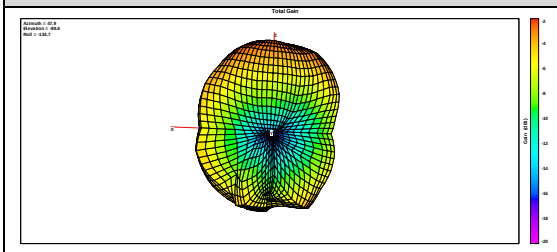
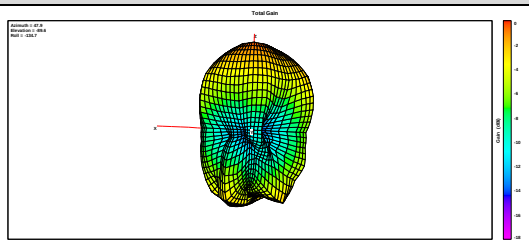
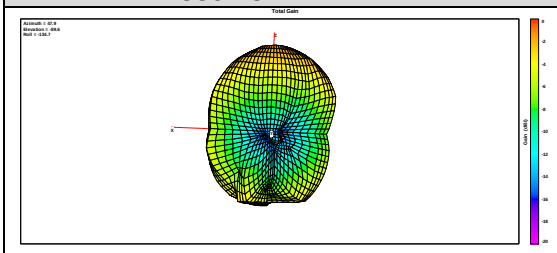
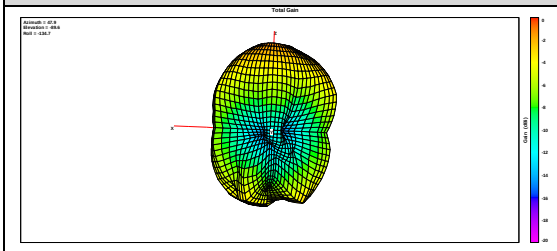
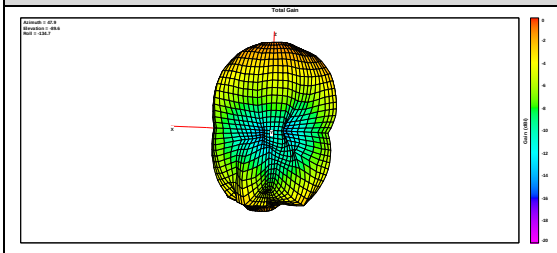
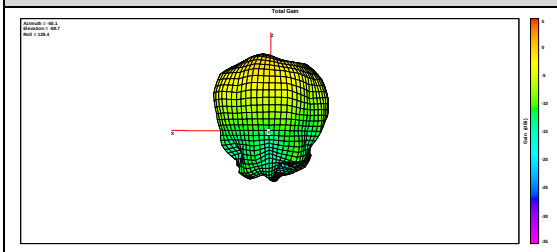
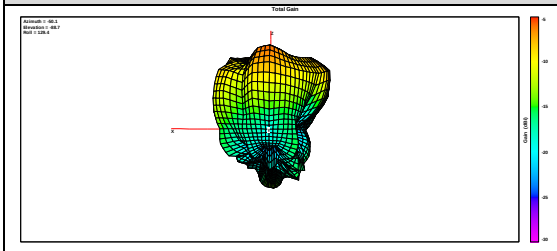
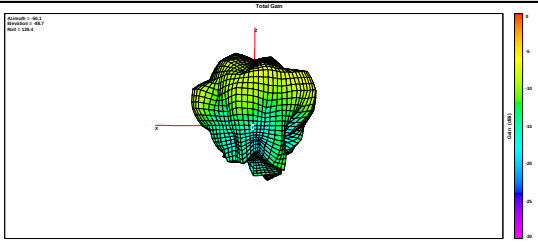
	

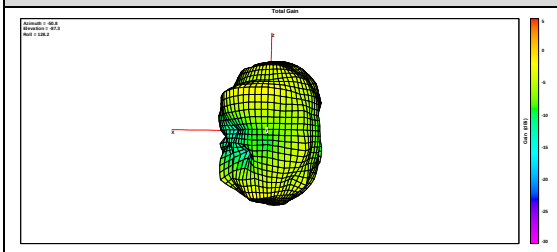
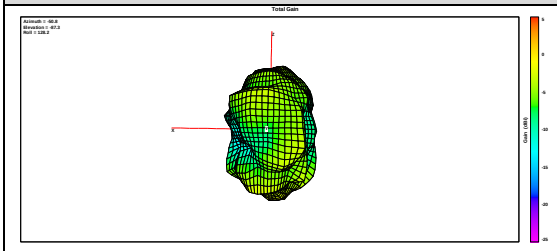
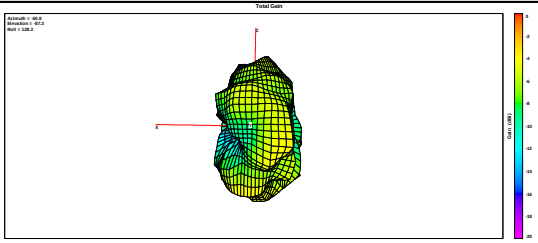
WIFI Antenna #2 - The First Round	
3D Pattern / 2400MHz	3D Pattern / 5200MHZ
	
3D Pattern / 2450MHz	3D Pattern / 5250MHz
	
3D Pattern / 2500MHz	3D Pattern / 5300MHz
	
3D Pattern / 5150MHz	3D Pattern / 5350MHz
	

WIFI Antenna #2 - The First Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHZ
	
3D Pattern / 5597.5MHz	
	
3D Pattern / 5725MHz	
	
3D Pattern / 5787.5MHz	
	

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
	

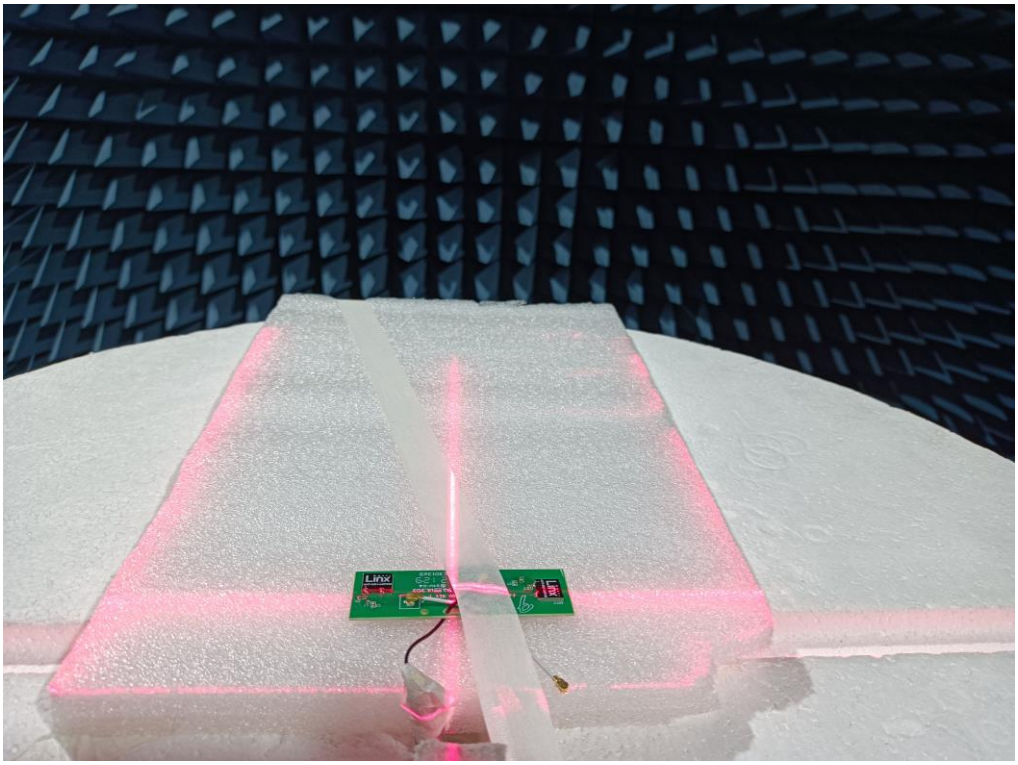
WIFI Antenna #2 - The Second Round	
3D Pattern / 5470MHz	3D Pattern / 5850MHZ
	
3D Pattern / 5597.5MHz	
	
3D Pattern / 5725MHz	
	
3D Pattern / 5787.5MHz	
	

Bluetooth Antenna - The First Round	
3D Pattern / 2400MHz	
	
3D Pattern / 2450MHz	
	
3D Pattern / 2500MHz	
	

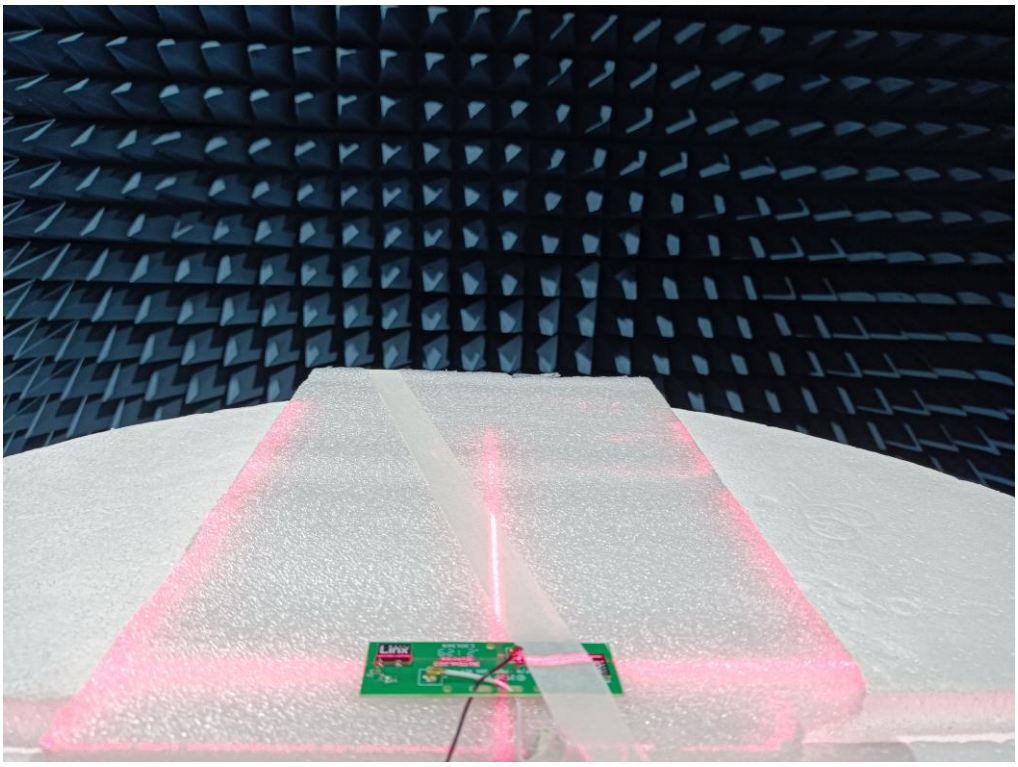
Bluetooth Antenna - The Second Round	
3D Pattern / 2400MHz	
	
3D Pattern / 2450MHz	
	
3D Pattern / 2500MHz	
	

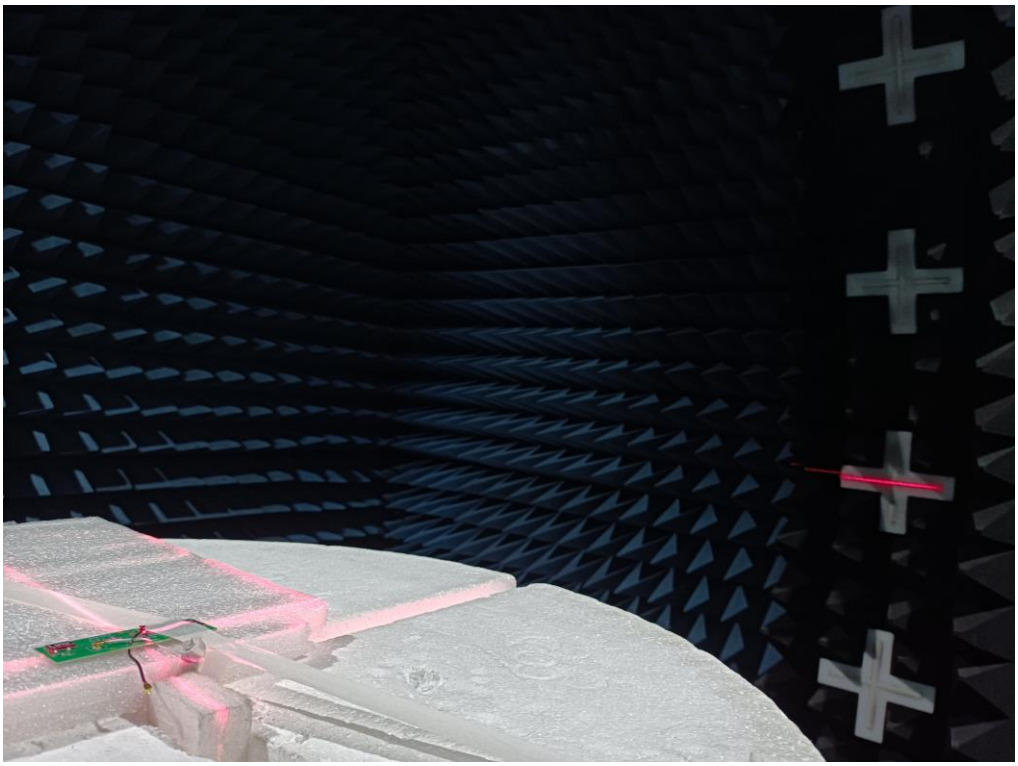
10. Test Setup Photo

WIFI Antenna #1

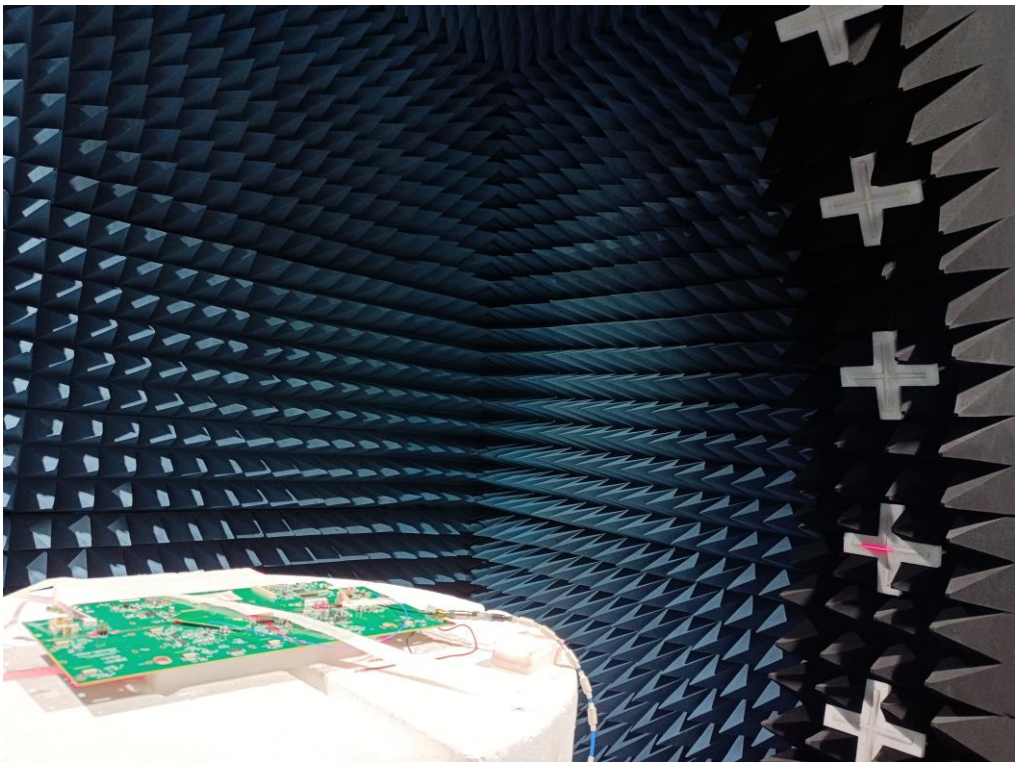


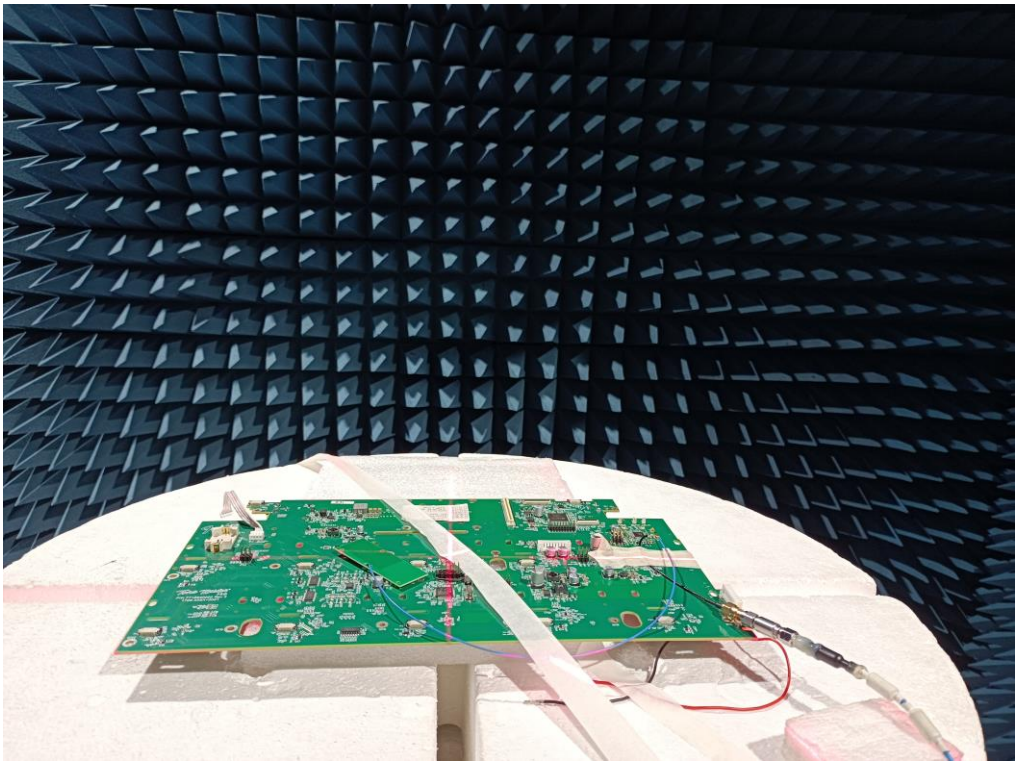
WIFI Antenna #2





Bluetooth Antenna





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