

# TEST REPORT

Applicant Name: JEM ACCESSORIES INC.  
Address: 32 Brunswick Avenue, Edison, New Jersey, United States,  
08817  
Report Number: SZ3240321-14530E-RF-00  
FCC ID: 2AHAS-MLW71004

## Test Standard (s)

FCC PART 15.247

## Sample Description

Product Type: MN LED RGB+IC WIFI 100FT MLW7-1004-ICM  
Model No.: MLW7-1004-ICM  
Multiple Model(s) No.: MLW7-1004  
Trade Mark: N/A  
Date Received: 2024/03/21  
Issue Date: 2024/04/18

Test Result:	Pass <sup>▲</sup>
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▲ In the configuration tested, the EUT complied with the standards above.

## Prepared and Checked By:

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Jojo Guo  
RF Engineer

## Approved By:

*Jimmy Xiao*

Jimmy Xiao  
RF Supervisor

Note: The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

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## TABLE OF CONTENTS

<b>DOCUMENT REVISION HISTORY .....</b>	<b>4</b>
<b>GENERAL INFORMATION.....</b>	<b>5</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
OBJECTIVE .....	5
TEST METHODOLOGY .....	5
MEASUREMENT UNCERTAINTY.....	6
TEST FACILITY .....	6
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>7</b>
DESCRIPTION OF TEST CONFIGURATION .....	7
EQUIPMENT MODIFICATIONS .....	7
EUT EXERCISE SOFTWARE .....	8
SUPPORT EQUIPMENT LIST AND DETAILS .....	8
EXTERNAL I/O CABLE.....	8
BLOCK DIAGRAM OF TEST SETUP .....	9
<b>SUMMARY OF TEST RESULTS .....</b>	<b>10</b>
<b>TEST EQUIPMENT LIST .....</b>	<b>11</b>
<b>FCC §15.247 (I), §1.1307(B) &amp; 2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE) .....</b>	<b>13</b>
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>14</b>
APPLICABLE STANDARD .....	14
ANTENNA CONNECTOR CONSTRUCTION .....	14
<b>FCC §15.207 (A) – AC LINE CONDUCTED EMISSIONS .....</b>	<b>15</b>
APPLICABLE STANDARD .....	15
EUT SETUP.....	15
EMI TEST RECEIVER SETUP.....	15
TEST PROCEDURE .....	15
FACTOR & OVER LIMIT CALCULATION.....	16
TEST DATA .....	16
<b>FCC §15.209, §15.205 &amp; §15.247(D) - SPURIOUS EMISSIONS.....</b>	<b>21</b>
APPLICABLE STANDARD .....	21
EUT SETUP .....	21
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP .....	22
TEST PROCEDURE .....	23
FACTOR & OVER LIMIT/MARGIN CALCULATION .....	23
TEST DATA .....	23
<b>FCC §15.247(A) (2) – 6 DB EMISSION BANDWIDTH .....</b>	<b>48</b>
APPLICABLE STANDARD .....	48
TEST PROCEDURE .....	48
TEST DATA .....	48
<b>FCC §15.247(B) (3) - MAXIMUM CONDUCTED OUTPUT POWER .....</b>	<b>49</b>
APPLICABLE STANDARD .....	49
TEST PROCEDURE .....	49
TEST DATA .....	49

**FCC §15.247(D) – 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE .....50**  
    APPLICABLE STANDARD .....50  
    TEST PROCEDURE .....50  
    TEST DATA .....50

**FCC §15.247(E) - POWER SPECTRAL DENSITY.....51**  
    APPLICABLE STANDARD .....51  
    TEST PROCEDURE .....51  
    TEST DATA .....51

**EUT PHOTOGRAPHS.....52**

**TEST SETUP PHOTOGRAPHS .....53**

**APPENDIX .....54**  
    BLE .....54  
    APPENDIX A: DTS BANDWIDTH .....54  
    APPENDIX B: OCCUPIED CHANNEL BANDWIDTH .....58  
    APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER .....61  
    APPENDIX D: MAXIMUM POWER SPECTRAL DENSITY .....64  
    APPENDIX E: BAND EDGE MEASUREMENTS.....67  
    APPENDIX F: DUTY CYCLE .....69  
    2.4G Wi-Fi.....70  
    APPENDIX A: DTS BANDWIDTH .....70  
    APPENDIX B: OCCUPIED CHANNEL BANDWIDTH .....77  
    APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER .....84  
    APPENDIX D: MAXIMUM POWER SPECTRAL DENSITY .....85  
    APPENDIX E: BAND EDGE MEASUREMENTS.....92  
    APPENDIX F: DUTY CYCLE .....96

### DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	SZ3240321-14530E-RF-00	Original Report	2024/04/18

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	MN LED RGB+IC WIFI 100FT MLW7-1004-ICM
Tested Model	MLW7-1004-ICM
Multiple Model(s)	MLW7-1004
Frequency Range	BLE: 2402-2480MHz Wi-Fi: 2412-2462MHz
Maximum Conducted Output Peak Power	BLE: 5.85dBm Wi-Fi: 22.09dBm
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification <sup>#</sup>	0dBi (provided by the applicant)
Voltage Range	DC 24V from adapter
Sample serial number	2IZF-1 for Conducted and Radiated Emissions Test/ RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	Model: HH0024Z-240100-AU Input: AC 100-240V, 50/60Hz, 0.8A, max Output: DC 24.0V, 1.0A
Note: The Multiple models are electrically identical with the test model except for model number. Please refer to the declaration letter <sup>#</sup> for more detail, which was provided by manufacturer.	

### Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

**Measurement Uncertainty**

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz~150 kHz	3.94dB(k=2, 95% level of confidence)
	150 kHz ~30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1°C
Humidity		±1%
Supply voltages		±0.4%

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

For Wi-Fi mode, total 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

802.11b, 802.11g and 802.11n-HT20 mode was tested with Channel 1, 6 and 11.  
802.11n-HT40 mode was tested with Channel 3, 6 and 9.

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

### Equipment Modifications

No modification was made to the EUT tested.

**EUT Exercise Software**

“ESPRF TEST TOOL-V3.6-MANUA7.EXE”<sup>#</sup> exercise software was used.

The device was tested with the worst case was performed as below:

Mode	Data rate	Power Level <sup>#</sup>		
		Low Channel	Middle Channel	High Channel
802.11b	1Mbps	33 *0.25dB	33 *0.25dB	33 *0.25dB
802.11g	6Mbps	13 *0.25dB	13 *0.25dB	13 *0.25dB
802.11n-HT20	MCS0	7 *0.25dB	7 *0.25dB	7 *0.25dB
802.11n-HT40	MCS0	19 *0.25dB	19 *0.25dB	19 *0.25dB
BLE	1Mbps	10	10	10
BLE	2Mbps	11	11	11

Note: the power level was provided by applicant.

**Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
/	/	/	/

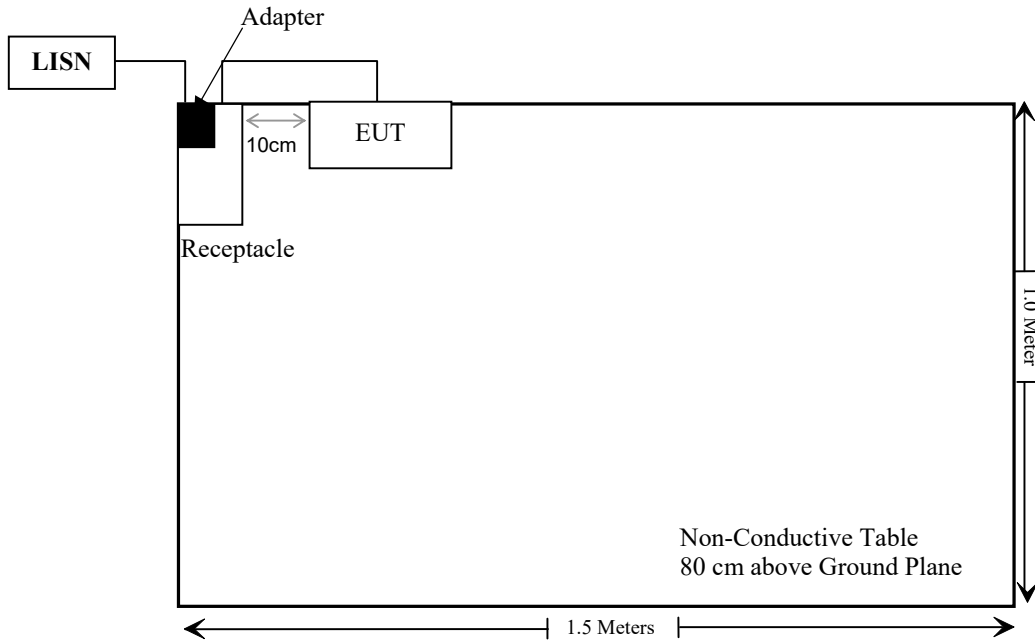
**External I/O Cable**

Cable Description	Length (m)	From Port	To
Un-shielding Un-detachable DC Cable	1.0	EUT	Adapter

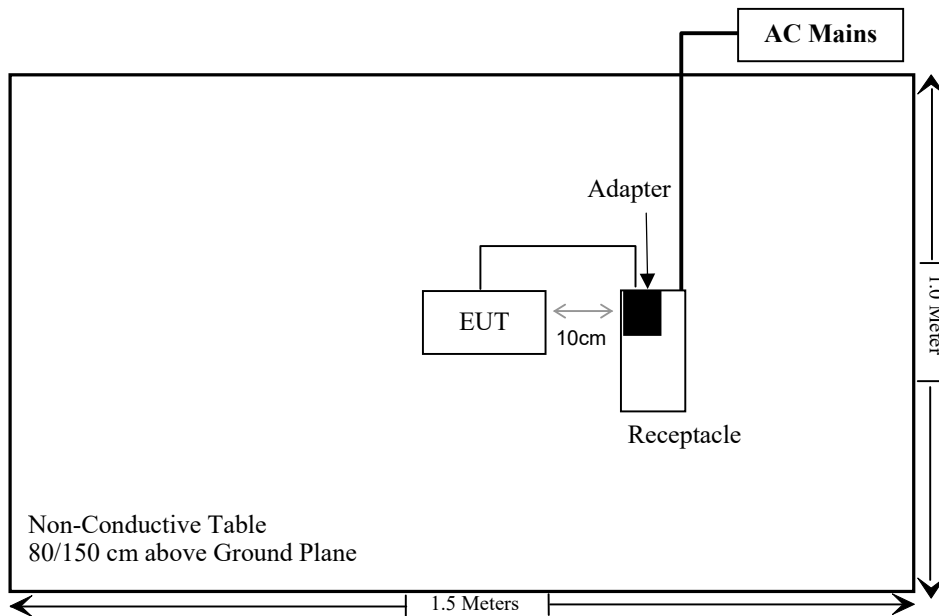


### Block Diagram of Test Setup

For Conducted Emissions:



For Radiated Emissions



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.247 (i), §1.1307 (b) & §2.1091	Maximum Permissible Exposure-MPE	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/01/16	2025/01/15
Rohde & Schwarz	LISN	ENV216	101613	2024/01/16	2025/01/15
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2023/08/03	2024/08/02
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2023/08/03	2024/08/02
Audix	EMI Test software	E3	191218	NCR	NCR
<b>Radiated Emission Test</b>					
R&S	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2023/06/08	2024/06/07
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2024/07/19
ETS	Passive Loop Antenna	6512	29604	2023/07/07	2024/07/06
Unknown	Cable	Chamber Cable 1	F-03-EM236	2023/08/03	2024/08/02
Unknown	Cable	Chamber Cable 4	EC-007	2023/08/03	2024/08/02
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2023/04/18	2024/04/17
COM-POWER	Pre-amplifier	PA-122	181919	2023/06/29	2024/06/28
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2024/07/25
Unknown	RF Cable	KMSE	0735	2023/10/08	2024/10/07
Unknown	RF Cable	UFA147	219661	2023/10/08	2024/10/07
Unknown	RF Cable	XH750A-N	J-10M	2023/10/08	2024/10/07
SNSD	2.4G Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2023/08/03	2024/08/02
A.H.System	Pre-amplifier	PAM-1840VH	190	2023/08/03	2024/08/02
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>RF Conducted Test</b>					
Tonscend	RF control Unit	JS0806-2	19D8060154	2023/09/06	2024/09/05
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2024/01/16	2025/01/15
Unknown	10dB Attenuator	Unknown	F-03-EM190	2023/07/04	2024/07/03
ANRITSU	Microwave peak power sensor	MA24418A	12622	2023/08/08	2024/08/07
Unknown	RF Cable	65475	01670515	2023/07/04	2024/07/03

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

**FCC §15.247 (i), §1.1307(b) & 2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

**Result**

**Calculated Formulary:**

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

**Result**

**For worst case:**

Mode	Frequency (MHz)	Antenna Gain <sup>#</sup>	Tune up conducted power <sup>#</sup>	Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(dBm)			
BLE	2402-2480	0	6.0	20	0.0008	1.0
Wi-Fi	2412-2462	0	22.5	20	0.035	1.0

Note 1: The tune-up power and antenna gain was declared by the applicant.

Note 2: The BLE can't transmit with the Wi-Fi at the same time.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

**Result: Compliant.**

## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **Antenna Connector Construction**

The EUT has one internal PCB antenna arrangement which was permanently attached, the antenna gain<sup>#</sup> is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

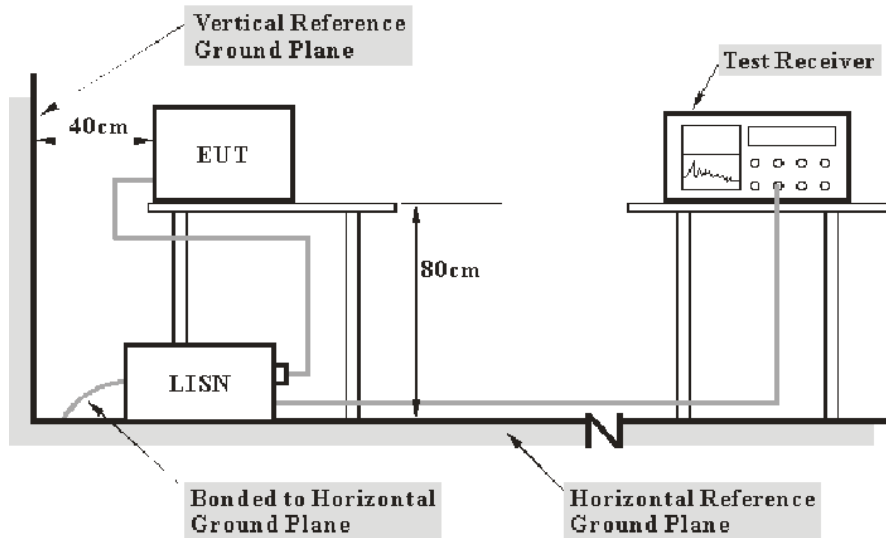
### **Result: Compliant**

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC§15.207

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

## Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

$$\text{Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The “**Over limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

$$\begin{aligned}\text{Over Limit} &= \text{Level} - \text{Limit} \\ \text{Level} &= \text{Read Level} + \text{Factor}\end{aligned}$$

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

## Test Data

### Environmental Conditions

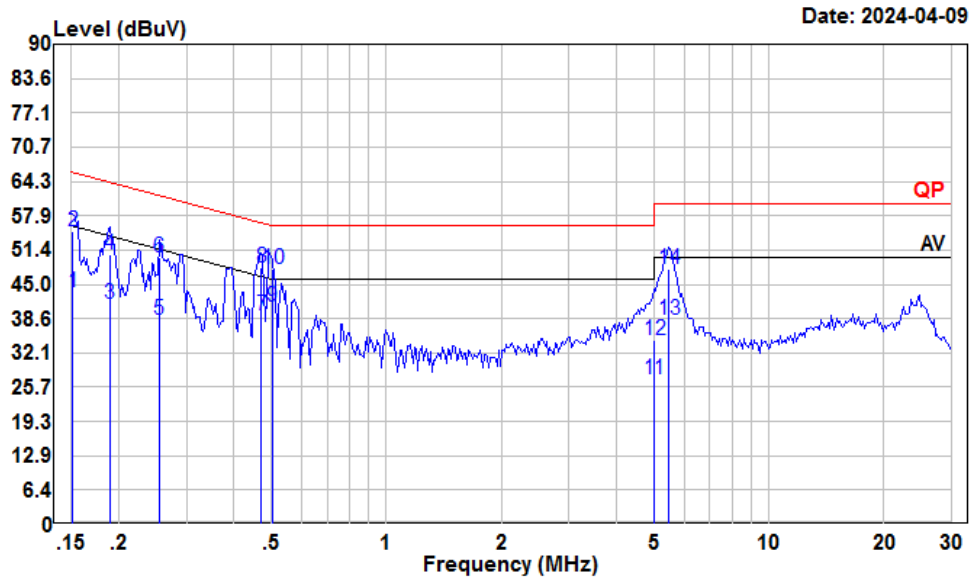
<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	60 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Macy Shi from 2024-03-28 to 2024-04-09.*



**BLE (Maximum output power mode: BLE\_1M Low channel)**

AC 120V/60 Hz, Line



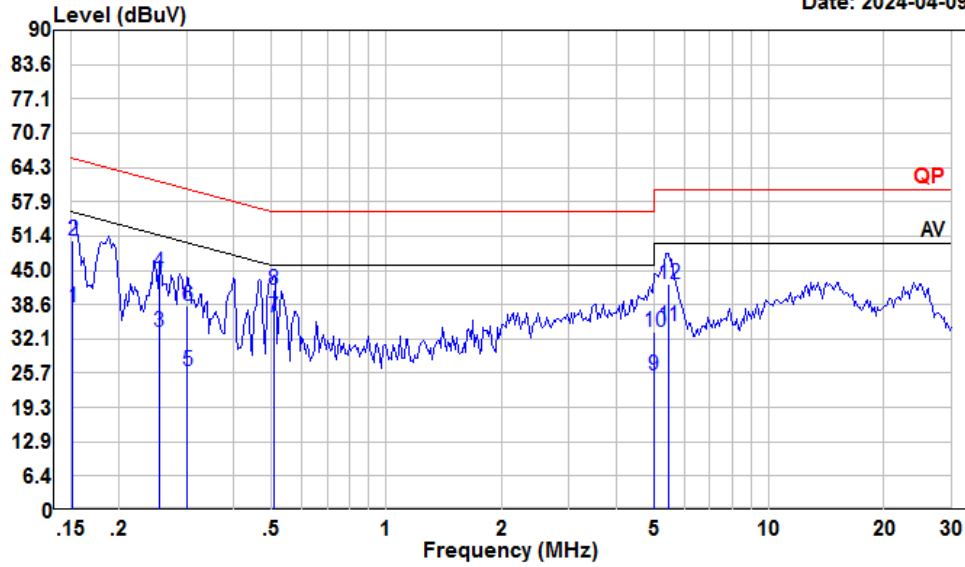
Date: 2024-04-09

Condition: Line  
 Project : SZ3240321-14530E-RF  
 Tester : Macy shi  
 Note : BLE 1M

	Read Freq	Read Level	LISN Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	22.42	43.47	10.90	10.15	55.91	-12.44	Average
2	0.15	33.94	54.99	10.90	10.15	65.91	-10.92	QP
3	0.19	20.50	41.43	10.82	10.11	54.06	-12.63	Average
4	0.19	29.60	50.53	10.82	10.11	64.06	-13.53	QP
5	0.25	17.47	38.39	10.72	10.20	51.60	-13.21	Average
6	0.25	29.01	49.93	10.72	10.20	61.60	-11.67	QP
7	0.47	18.60	39.29	10.52	10.17	46.49	-7.20	Average
8	0.47	27.40	48.09	10.52	10.17	56.49	-8.40	QP
9	0.50	20.11	40.76	10.50	10.15	46.00	-5.24	Average
10	0.50	27.24	47.89	10.50	10.15	56.00	-8.11	QP
11	5.01	6.52	27.12	10.38	10.22	50.00	-22.88	Average
12	5.01	13.81	34.41	10.38	10.22	60.00	-25.59	QP
13	5.45	17.72	38.35	10.41	10.22	50.00	-11.65	Average
14	5.45	27.18	47.81	10.41	10.22	60.00	-12.19	QP

AC 120V/60 Hz, Neutral

Date: 2024-04-09

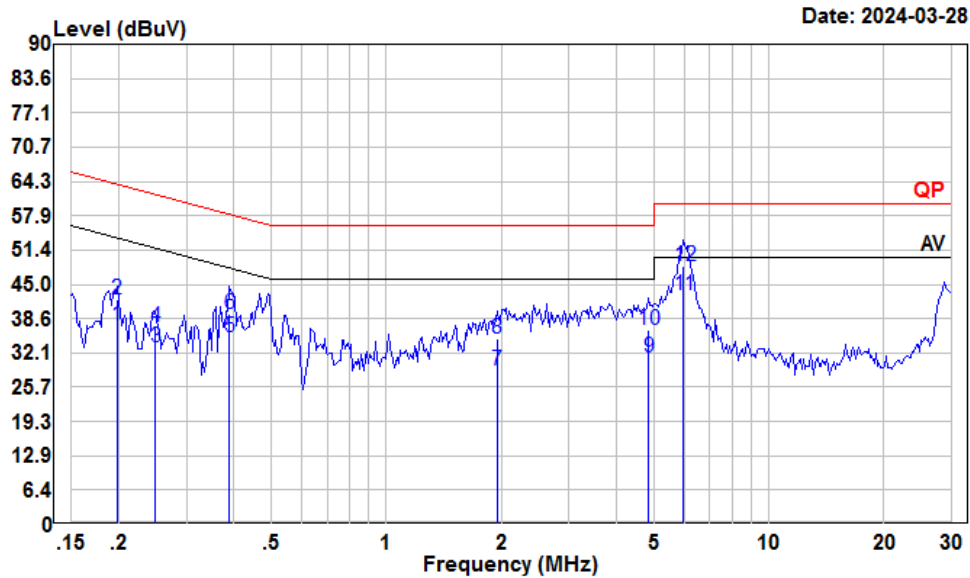


Condition: Neutral  
 Project : SZ3240321-14530E-RF  
 Tester : Macy shi  
 Note : BLE 1M

	Read Freq	Read Level	LISN Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	17.40	38.14	10.59	10.15	55.91	-17.77	Average
2	0.15	29.91	50.65	10.59	10.15	65.91	-15.26	QP
3	0.25	12.69	33.37	10.48	10.20	51.60	-18.23	Average
4	0.25	24.03	44.71	10.48	10.20	61.60	-16.89	QP
5	0.30	5.52	26.17	10.53	10.12	50.19	-24.02	Average
6	0.30	17.67	38.32	10.53	10.12	60.19	-21.87	QP
7	0.51	15.25	36.11	10.70	10.16	46.00	-9.89	Average
8	0.51	20.50	41.36	10.70	10.16	56.00	-14.64	QP
9	5.00	4.57	25.31	10.52	10.22	50.00	-24.69	Average
10	5.00	12.71	33.45	10.52	10.22	60.00	-26.55	QP
11	5.45	13.62	34.41	10.57	10.22	50.00	-15.59	Average
12	5.45	21.75	42.54	10.57	10.22	60.00	-17.46	QP

**EUT operation mode: Transmitting (Maximum output power mode: 802.11g, Low channel)**

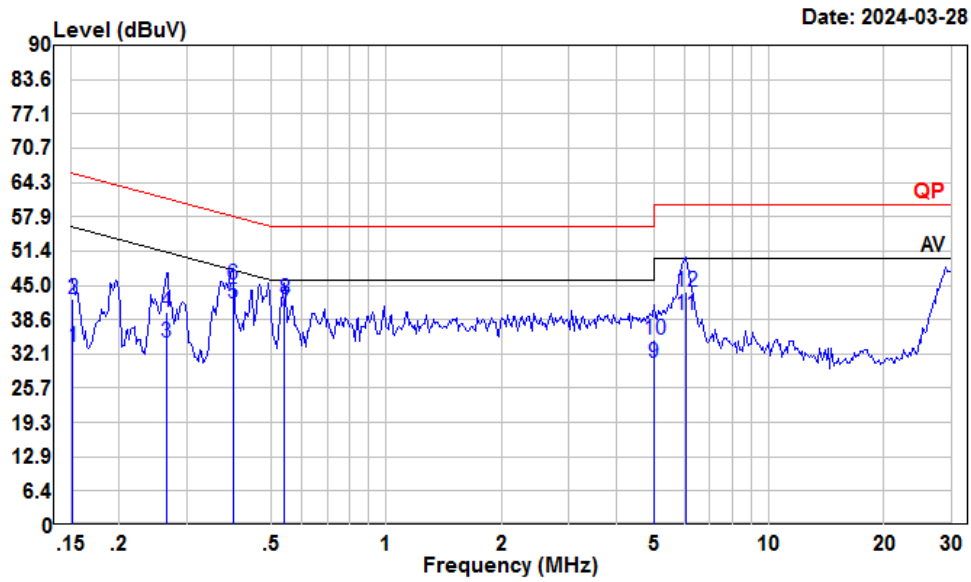
**AC 120V/60 Hz, Line**



Condition: Line  
 Project : SZ3240321-14530E-RF  
 Tester : Macy shi  
 Note : 2.4G WIFI

	Read Freq	Read Level	LISN Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.20	16.39	37.28	10.80	10.09	53.71	-16.43	Average
2	0.20	21.38	42.27	10.80	10.09	63.71	-21.44	QP
3	0.25	12.12	33.06	10.73	10.21	51.78	-18.72	Average
4	0.25	15.93	36.87	10.73	10.21	61.78	-24.91	QP
5	0.39	14.35	35.14	10.58	10.21	48.08	-12.94	Average
6	0.39	18.64	39.43	10.58	10.21	58.08	-18.65	QP
7	1.95	8.17	28.94	10.59	10.18	46.00	-17.06	Average
8	1.95	14.07	34.84	10.59	10.18	56.00	-21.16	QP
9	4.85	10.58	31.18	10.37	10.23	46.00	-14.82	Average
10	4.85	15.76	36.36	10.37	10.23	56.00	-19.64	QP
11	5.99	22.19	42.85	10.44	10.22	50.00	-7.15	Average
12	5.99	27.68	48.34	10.44	10.22	60.00	-11.66	QP

AC 120V/60 Hz, Neutral



Condition: Neutral  
 Project : SZ3240321-14530E-RF  
 Tester : Macy shi  
 Note : 2.4G WIFI

	Read	LISN	Cable	Limit	Over		
Freq	Level	Level	Factor	Loss	Line	Limit	Remark
MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.15	12.66	33.40	10.59	10.15	55.91	-22.51 Average
2	0.15	21.72	42.46	10.59	10.15	65.91	-23.45 QP
3	0.27	13.67	34.34	10.49	10.18	51.25	-16.91 Average
4	0.27	19.20	39.87	10.49	10.18	61.25	-21.38 QP
5	0.40	20.81	41.65	10.62	10.22	47.90	-6.25 Average
6	0.40	24.30	45.14	10.62	10.22	57.90	-12.76 QP
7	0.54	19.37	40.25	10.70	10.18	46.00	-5.75 Average
8	0.54	21.60	42.48	10.70	10.18	56.00	-13.52 QP
9	5.00	9.69	30.43	10.52	10.22	50.00	-19.57 Average
10	5.00	14.17	34.91	10.52	10.22	60.00	-25.09 QP
11	6.06	18.69	39.53	10.62	10.22	50.00	-10.47 Average
12	6.06	23.03	43.87	10.62	10.22	60.00	-16.13 QP

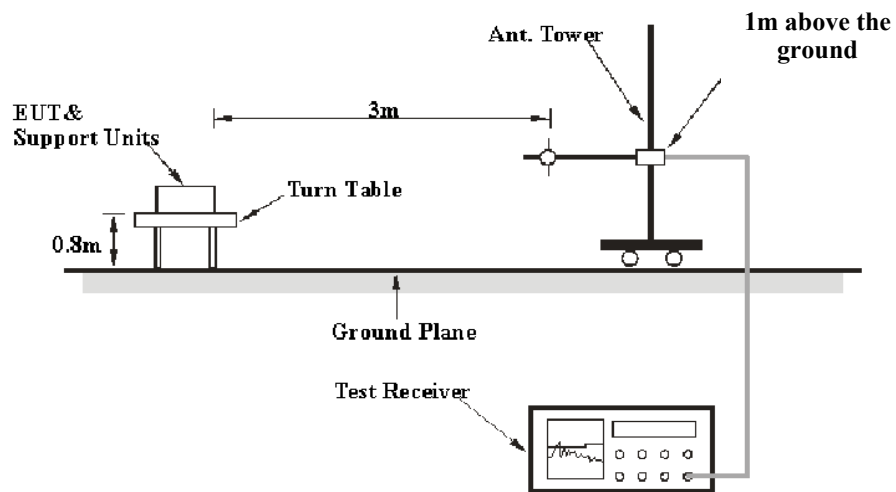
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

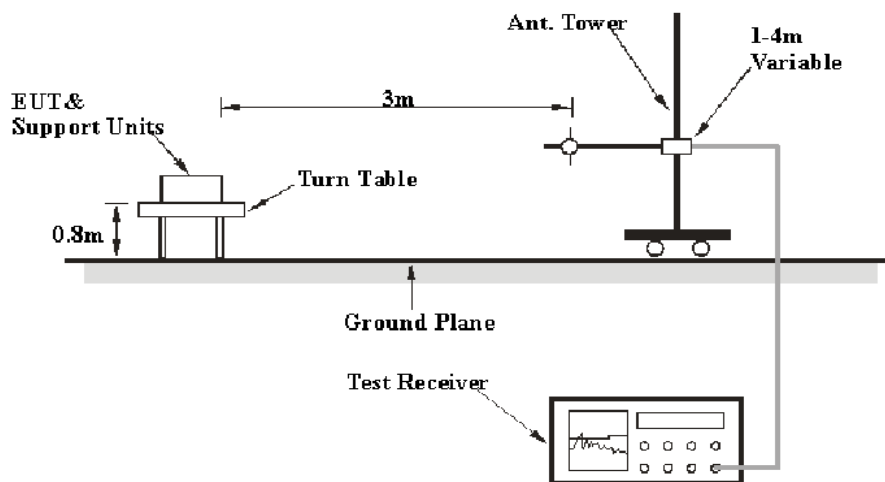
FCC §15.247 (d); §15.209; §15.205;

### EUT Setup

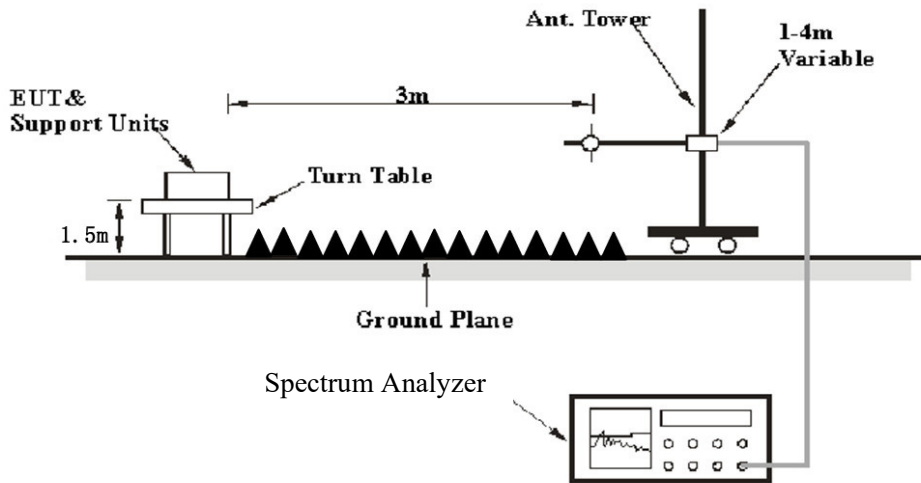
9 kHz-30MHz:



30MHz-1GHz:



**Above 1GHz:**



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 9 kHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

9 kHz-1GHz:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK

1-25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	≥1/Ton

Note: Ton is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

**Test Procedure**

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

All emissions under the average limit and under the noise floor have not recorded in the report.

**Factor & Over Limit/Margin Calculation**

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Over Limit/Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

$$\begin{aligned} \text{Over Limit/Margin} &= \text{Level/Corrected Amplitude} - \text{Limit} \\ \text{Level / Corrected Amplitude} &= \text{Read Level} + \text{Factor} \end{aligned}$$

**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	23~25.3 °C
<b>Relative Humidity:</b>	50~55 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Warren Huang on 2024-04-09 for below 1GHz and Tyler Wu on 2024-04-10 for above 1GHz.*

*EUT operation mode: Transmitting*

*Note: Pre-scan in the X, Y and Z axes of orientation, the worst case X-axis of orientation was recorded.*

**BLE**

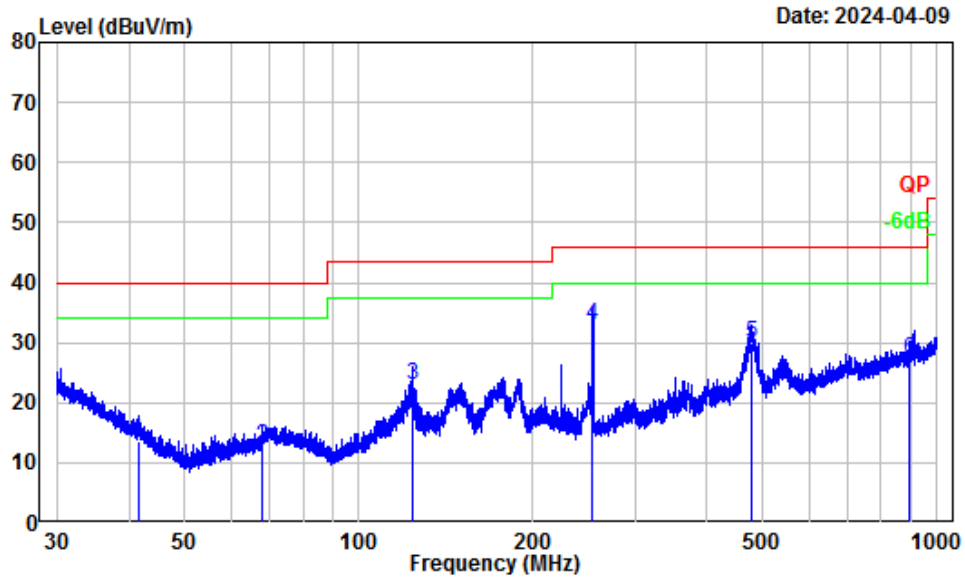
**9k-30 MHz (Maximum output power mode: BLE\_1M Low channel):**

For the radiated spurious emission below 30MHz, the emissions are 20dB below the limit or the noise floor which are not recorded.



**30MHz-1GHz (Maximum output power mode: BLE\_1M Low channel):**

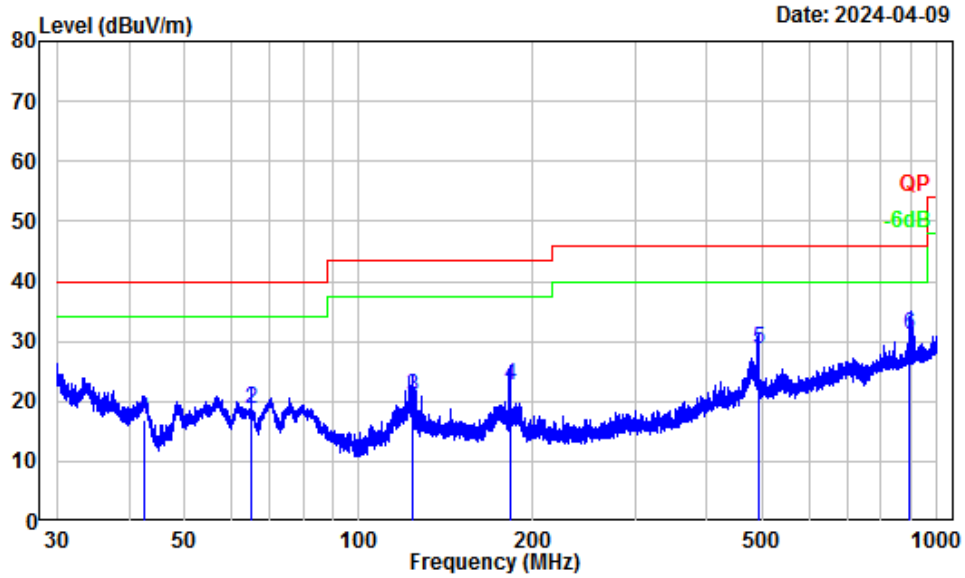
**Horizontal**



Site : Chamber A  
 Condition : 3m Horizontal  
 Project Number: SZ3240321-14530E-RF  
 Note : BLE  
 Tester : Warren Huang

	Freq Factor		Read Level		Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	41.46	-11.32	24.97	13.65	40.00	-26.35	QP
2	68.21	-16.26	28.95	12.69	40.00	-27.31	QP
3	123.48	-10.33	33.20	22.87	43.50	-20.63	QP
4	252.62	-11.76	44.71	32.95	46.00	-13.05	QP
5	479.06	-5.29	35.25	29.96	46.00	-16.04	QP
6	896.60	0.96	26.10	27.06	46.00	-18.94	QP

Vertical



Site : Chamber A  
 Condition : 3m Vertical  
 Project Number: SZ3240321-14530E-RF  
 Note : BLE  
 Tester : Warren Huang

	Freq	Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB
1	42.41	-13.26	30.15	40.00	-23.11	QP
2	65.14	-17.44	36.30	40.00	-21.14	QP
3	123.59	-10.76	31.50	43.50	-22.76	QP
4	182.40	-12.66	35.37	43.50	-20.79	QP
5	490.31	-5.42	33.97	46.00	-17.45	QP
6	896.60	0.56	30.62	46.00	-14.82	QP

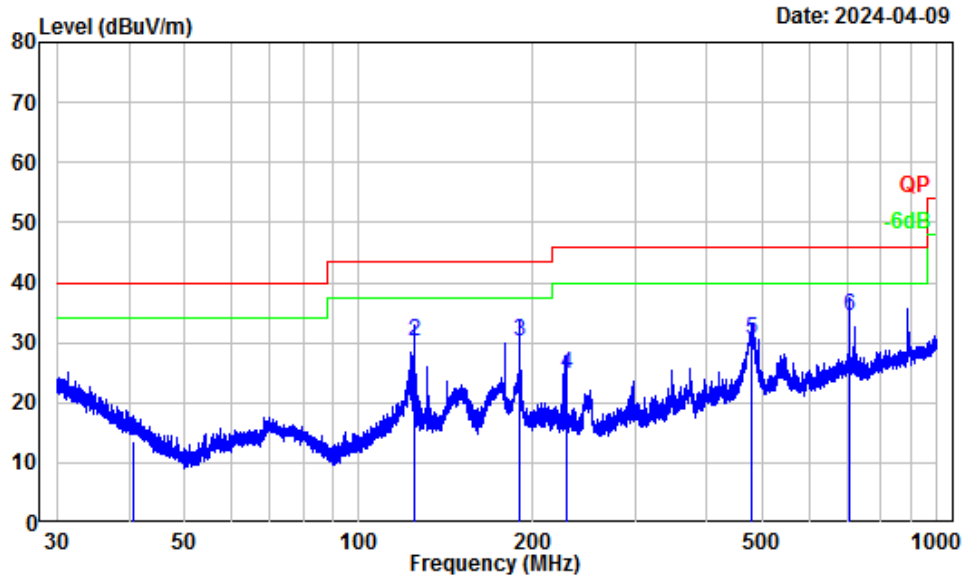
**Wi-Fi:**

**9kH-30 MHz (Maximum output power: 802.11g Low channel):**

For the radiated spurious emission below 30MHz, the emissions are 20dB below the limit or the noise floor which are not recorded.

**30 MHz-1 GHz: (Maximum output power: 802.11g Low channel)**

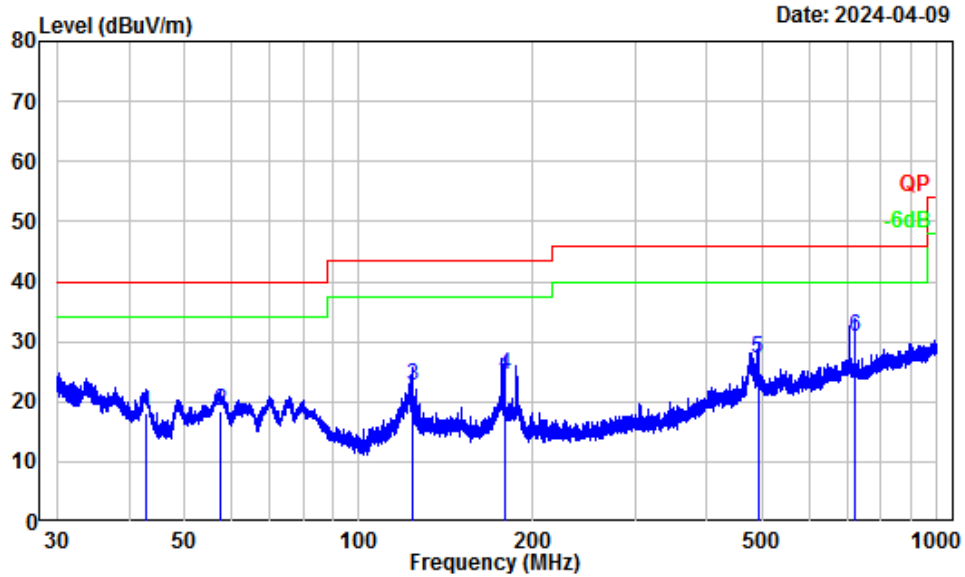
**Horizontal**



Site : Chamber A  
 Condition : 3m Horizontal  
 Project Number: SZ3240321-14530E-RF  
 Note : 2.4G WIFI  
 Tester : Warren Huang

	Freq Factor		Read Level		Limit	Over	Remark
	MHz	dB/m	dBuV	dBuV/m	Line	Limit	
1	40.65	-10.81	24.46	13.65	40.00	-26.35	QP
2	124.62	-10.32	40.60	30.28	43.50	-13.22	QP
3	189.82	-12.31	42.59	30.28	43.50	-13.22	QP
4	228.39	-11.50	36.29	24.79	46.00	-21.21	QP
5	477.80	-5.31	35.79	30.48	46.00	-15.52	QP
6	706.39	-1.53	35.92	34.39	46.00	-11.61	QP

Vertical



Site : Chamber A  
 Condition : 3m Vertical  
 Project Number: SZ3240321-14530E-RF  
 Note : 2.4G WIFI  
 Tester : Warren Huang

	Freq	Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	42.69	-13.42	31.48	18.06	40.00	-21.94	QP
2	57.42	-17.56	36.04	18.48	40.00	-21.52	QP
3	123.64	-10.76	33.50	22.74	43.50	-20.76	QP
4	178.60	-12.56	36.89	24.33	43.50	-19.17	QP
5	490.10	-5.42	32.49	27.07	46.00	-18.93	QP
6	721.09	-2.02	32.88	30.86	46.00	-15.14	QP

**1-25 GHz:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/AV					
BLE 1M							
Low Channel 2402MHz							
2373.27	55.37	PK	H	-2.93	52.44	74	-21.56
2373.27	42.58	AV	H	-2.93	39.65	54	-14.35
2383.76	55.03	PK	V	-2.93	52.10	74	-21.90
2383.76	42.15	AV	V	-2.93	39.22	54	-14.78
4804.00	49.54	PK	H	2.42	51.96	74	-22.04
4804.00	40.73	AV	H	2.42	43.15	54	-10.85
4804.00	49.16	PK	V	2.42	51.58	74	-22.42
4804.00	40.32	AV	V	2.42	42.74	54	-11.26
Middle Channel 2440MHz							
4880.00	51.36	PK	H	2.58	53.94	74	-20.06
4880.00	42.61	AV	H	2.58	45.19	54	-8.81
4880.00	50.82	PK	V	2.58	53.40	74	-20.60
4880.00	42.17	AV	V	2.58	44.75	54	-9.25
High Channel 2480MHz							
4960.00	52.26	PK	H	2.68	54.94	74	-19.06
4960.00	44.82	AV	H	2.68	47.50	54	-6.50
4960.00	51.75	PK	V	2.68	54.43	74	-19.57
4960.00	44.03	AV	V	2.68	46.71	54	-7.29

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
BLE 2M							
Low Channel 2402MHz							
2384.38	55.63	PK	H	-2.93	52.70	74	-21.30
2384.38	42.78	AV	H	-2.93	39.85	54	-14.15
2387.74	55.21	PK	V	-2.93	52.28	74	-21.72
2387.74	42.15	AV	V	-2.93	39.22	54	-14.78
4804.00	50.38	PK	H	2.42	52.80	74	-21.20
4804.00	40.73	AV	H	2.42	43.15	54	-10.85
4804.00	49.64	PK	V	2.42	52.06	74	-21.94
4804.00	39.25	AV	V	2.42	41.67	54	-12.33
Middle Channel 2440MHz							
4880.00	52.47	PK	H	2.58	55.05	74	-18.95
4880.00	42.81	AV	H	2.58	45.39	54	-8.61
4880.00	52.06	PK	V	2.58	54.64	74	-19.36
4880.00	42.13	AV	V	2.58	44.71	54	-9.29
High Channel 2480MHz							
4960.00	55.49	PK	H	2.68	58.17	74	-15.83
4960.00	46.57	AV	H	2.68	49.25	54	-4.75
4960.00	55.13	PK	V	2.68	57.81	74	-16.19
4960.00	46.02	AV	V	2.68	48.70	54	-5.30

**Note:**

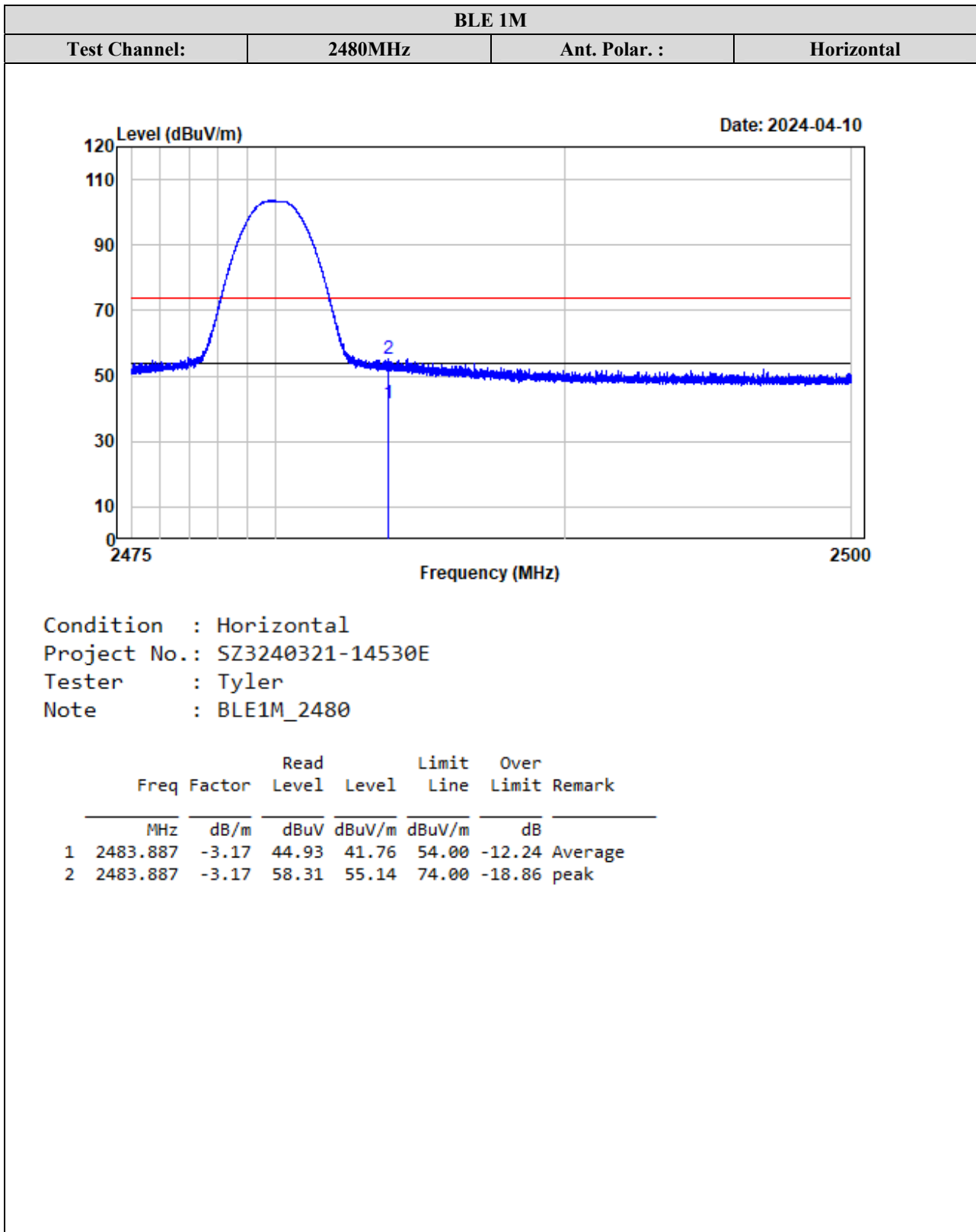
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

Margin = Corrected. Amplitude - Limit

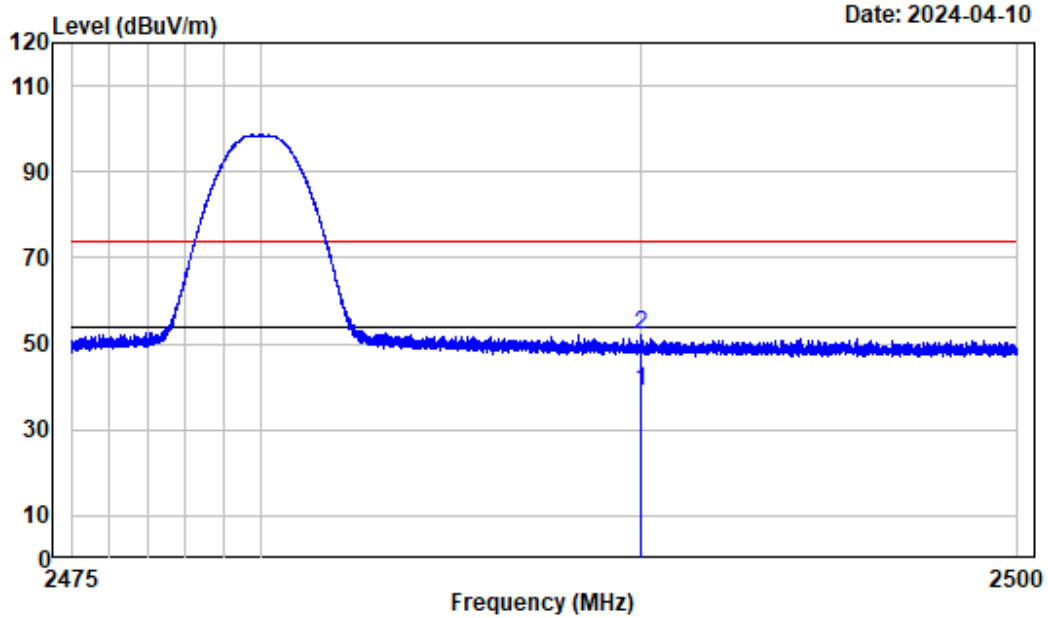
The other spurious emission which is in the noise floor level was not recorded.

**Test plots for Band Edge Measurements (Radiated):**





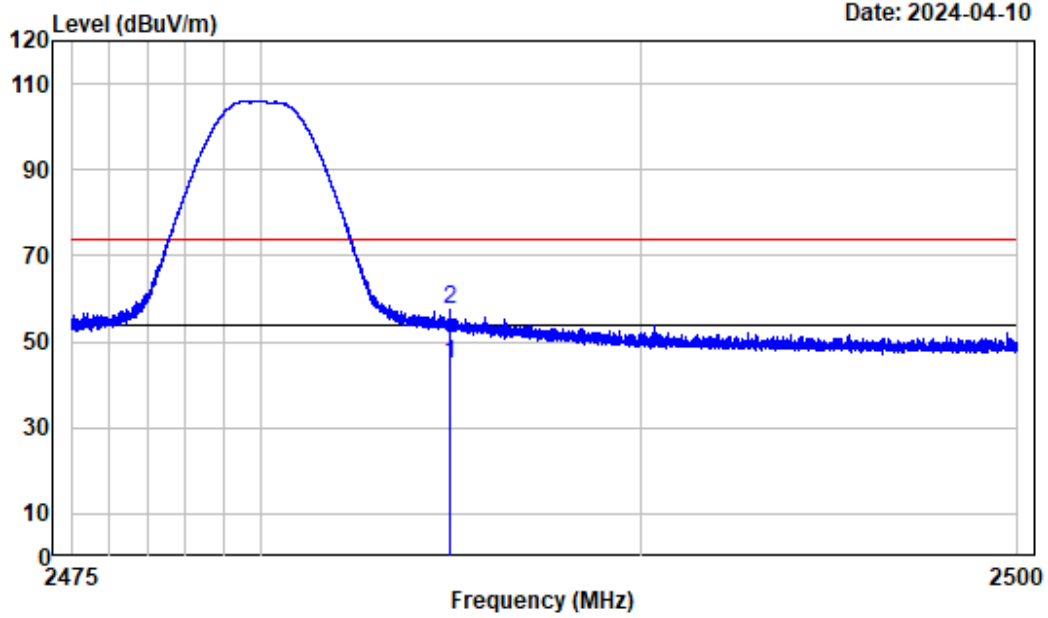
BLE 1M			
Test Channel:	2480MHz	Ant. Polar. :	Vertical



Condition : Vertical  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : BLE1M\_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2490.038	-3.18	42.31	39.13	54.00	-14.87	Average
2	2490.038	-3.18	55.31	52.13	74.00	-21.87	peak

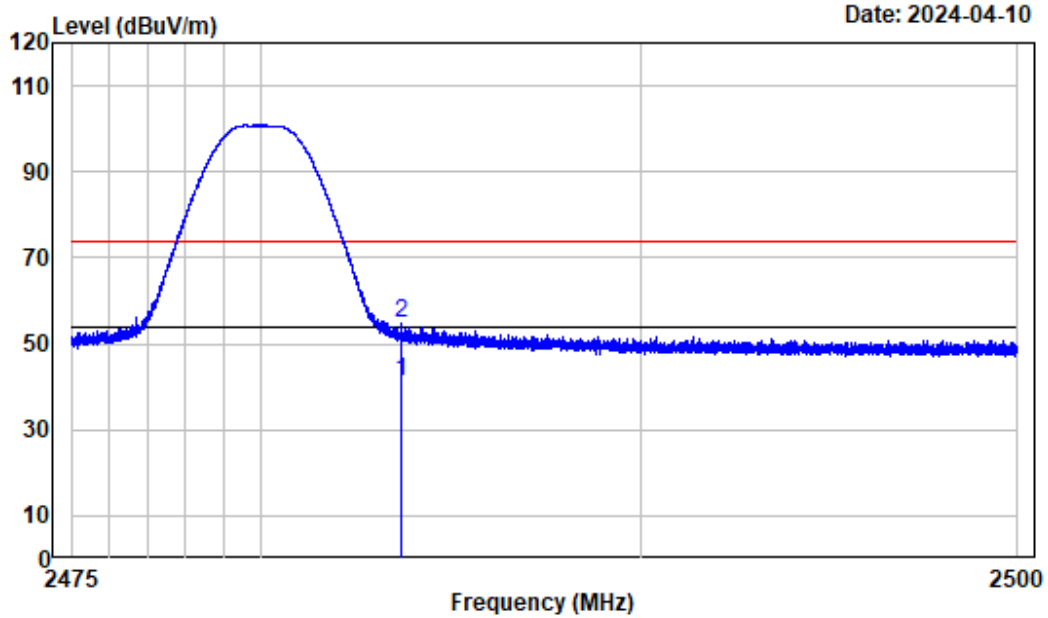
BLE 2M			
Test Channel:	2480MHz	Ant. Polar. :	Horizontal



Condition : Horizontal  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : BLE2M\_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2484.966	-3.17	47.79	44.62	54.00	-9.38	Average
2	2484.966	-3.17	60.47	57.30	74.00	-16.70	peak

BLE 2M			
Test Channel:	2480MHz	Ant. Polar. :	Vertical



Condition : Vertical  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : BLE2M\_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.703	-3.17	44.19	41.02	54.00	-12.98	Average
2	2483.703	-3.17	57.85	54.68	74.00	-19.32	peak

**Wi-Fi**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
<b>802.11b</b>							
Low Channel 2412MHz							
2359.38	55.69	PK	H	-2.93	52.76	74	-21.24
2359.38	42.54	AV	H	-2.93	39.61	54	-14.39
2343.17	55.16	PK	V	-3.03	52.13	74	-21.87
2343.17	42.31	AV	V	-3.03	39.28	54	-14.72
4824.00	50.83	PK	H	2.45	53.28	74	-20.72
4824.00	41.71	AV	H	2.45	44.16	54	-9.84
4824.00	50.26	PK	V	2.45	52.71	74	-21.29
4824.00	40.52	AV	V	2.45	42.97	54	-11.03
Middle Channel 2437MHz							
4874.00	54.34	PK	H	2.56	56.90	74	-17.10
4874.00	44.72	AV	H	2.56	47.28	54	-6.72
4874.00	53.61	PK	V	2.56	56.17	74	-17.83
4874.00	43.68	AV	V	2.56	46.24	54	-7.76
High Channel 2462MHz							
4924.00	56.73	PK	H	2.63	59.36	74	-14.64
4924.00	48.32	AV	H	2.63	50.95	54	-3.05
4924.00	55.81	PK	V	2.63	58.44	74	-15.56
4924.00	47.64	AV	V	2.63	50.27	54	-3.73

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	PK/Ave					
<b>802.11g</b>							
Low Channel 2412MHz							
2389.71	72.56	PK	H	-2.93	69.63	74	-4.37
2389.71	51.34	AV	H	-2.93	48.41	54	-5.59
2389.02	71.28	PK	V	-2.93	68.35	74	-5.65
2389.02	51.17	AV	V	-2.93	48.24	54	-5.76
4824.00	56.19	PK	H	2.45	58.64	74	-15.36
4824.00	41.78	AV	H	2.45	44.23	54	-9.77
4824.00	55.23	PK	V	2.45	57.68	74	-16.32
4824.00	40.02	AV	V	2.45	42.47	54	-11.53
Middle Channel 2437MHz							
4874.00	59.23	PK	H	2.56	61.79	74	-12.21
4874.00	45.65	AV	H	2.56	48.21	54	-5.79
4874.00	58.42	PK	V	2.56	60.98	74	-13.02
4874.00	44.06	AV	V	2.56	46.62	54	-7.38
High Channel 2462MHz							
2483.51	73.94	PK	H	-3.10	70.84	74	-3.16
2483.51	53.39	AV	H	-3.10	50.29	54	-3.71
2483.78	72.13	PK	V	-3.10	69.03	74	-4.97
2483.78	52.61	AV	V	-3.10	49.51	54	-4.49
4924.00	62.35	PK	H	2.63	64.98	74	-9.02
4924.00	47.78	AV	H	2.63	50.41	54	-3.59
4924.00	61.07	PK	V	2.63	63.70	74	-10.30
4924.00	46.52	AV	V	2.63	49.15	54	-4.85

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
<b>802.11n20</b>							
Low Channel 2412MHz							
2389.94	68.74	PK	H	-2.93	65.81	74	-8.19
2389.94	50.76	AV	H	-2.93	47.83	54	-6.17
2389.83	67.83	PK	V	-2.93	64.90	74	-9.10
2389.83	49.28	AV	V	-2.93	46.35	54	-7.65
4824.00	54.58	PK	H	2.45	57.03	74	-16.97
4824.00	41.52	AV	H	2.45	43.97	54	-10.03
4824.00	54.15	PK	V	2.45	56.60	74	-17.40
4824.00	40.37	AV	V	2.45	42.82	54	-11.18
Middle Channel 2437MHz							
4874.00	58.34	PK	H	2.56	60.90	74	-13.10
4874.00	44.93	AV	H	2.56	47.49	54	-6.51
4874.00	57.62	PK	V	2.56	60.18	74	-13.82
4874.00	43.17	AV	V	2.56	45.73	54	-8.27
High Channel 2462MHz							
2483.51	71.53	PK	H	-3.10	68.43	74	-5.57
2483.51	53.59	AV	H	-3.10	50.49	54	-3.51
2484.37	70.49	PK	V	-3.10	67.39	74	-6.61
2484.37	52.38	AV	V	-3.10	49.28	54	-4.72
4924.00	61.52	PK	H	2.63	64.15	74	-9.85
4924.00	47.78	AV	H	2.63	50.41	54	-3.59
4924.00	60.83	PK	V	2.63	63.46	74	-10.54
4924.00	46.36	AV	V	2.63	48.99	54	-5.01

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave					
<b>802.11n40</b>							
Low Channel 2422MHz							
2389.94	63.95	PK	H	-2.93	61.02	74	-12.98
2389.94	48.66	AV	H	-2.93	45.73	54	-8.27
2389.59	62.37	PK	V	-2.93	59.44	74	-14.56
2389.59	47.34	AV	V	-2.93	44.41	54	-9.59
4844.00	49.63	PK	H	2.47	52.10	74	-21.90
4844.00	36.02	AV	H	2.47	38.49	54	-15.51
4844.00	48.57	PK	V	2.47	51.04	74	-22.96
4844.00	35.19	AV	V	2.47	37.66	54	-16.34
Middle Channel 2437MHz							
4874.00	51.63	PK	H	2.56	54.19	74	-19.81
4874.00	38.15	AV	H	2.56	40.71	54	-13.29
4874.00	51.27	PK	V	2.56	53.83	74	-20.17
4874.00	37.69	AV	V	2.56	40.25	54	-13.75
High Channel 2452MHz							
2485.04	66.95	PK	H	-3.10	63.85	74	-10.15
2485.04	53.86	AV	H	-3.10	50.76	54	-3.24
2485.25	65.47	PK	V	-3.10	62.37	74	-11.63
2485.25	52.71	AV	V	-3.10	49.61	54	-4.39
4904.00	54.93	PK	H	2.64	57.57	74	-16.43
4904.00	39.92	AV	H	2.64	42.56	54	-11.44
4904.00	53.87	PK	V	2.64	56.51	74	-17.49
4904.00	38.79	AV	V	2.64	41.43	54	-12.57

**Note:**

Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

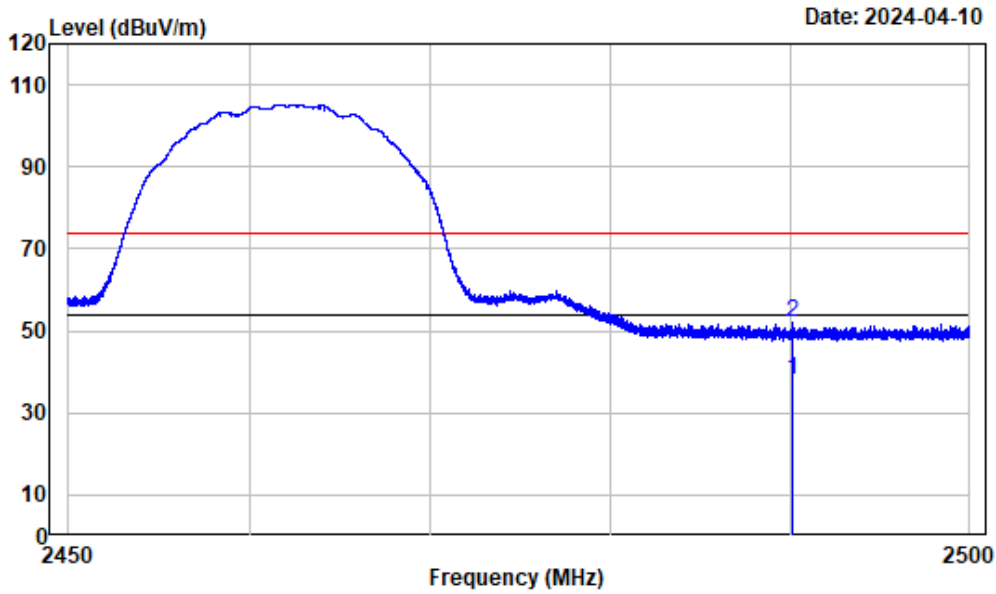
Corrected Amplitude = Factor + Reading

Margin = Corrected. Amplitude - Limit

The other spurious emission which is in the noise floor level was not recorded.

**Test plots for Band Edge Measurements (Radiated):**

802.11b			
Test Channel:	2462MHz	Ant. Polar. :	Horizontal

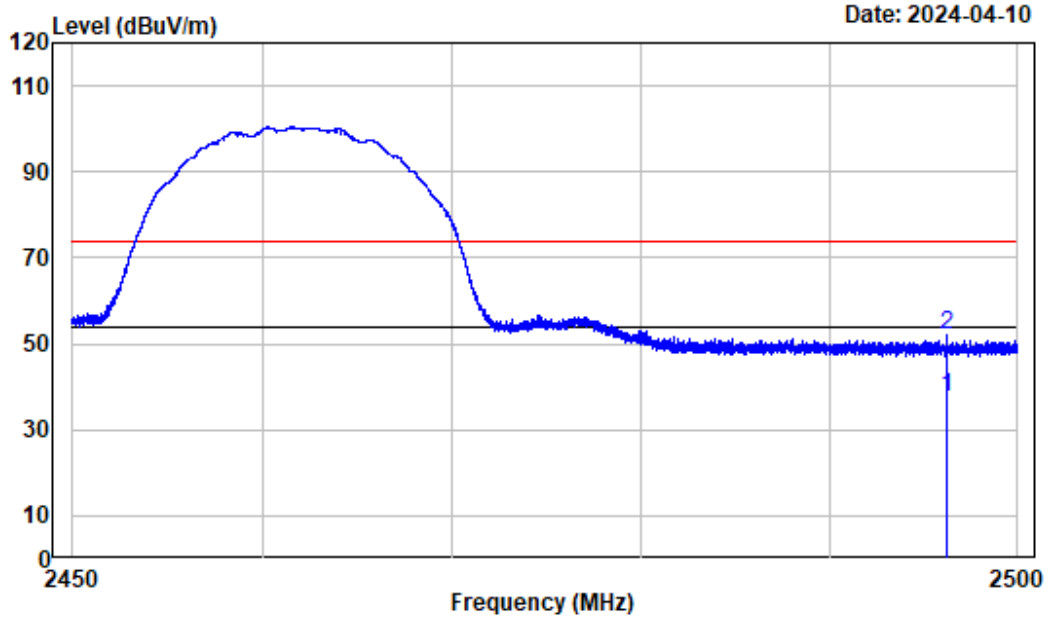


Condition : Horizontal  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

	Freq	Factor	Read		Limit	Over	Remark
			Level	Level			
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2490.081	-3.18	41.43	38.25	54.00	-15.75	Average
2	2490.081	-3.18	55.22	52.04	74.00	-21.96	peak



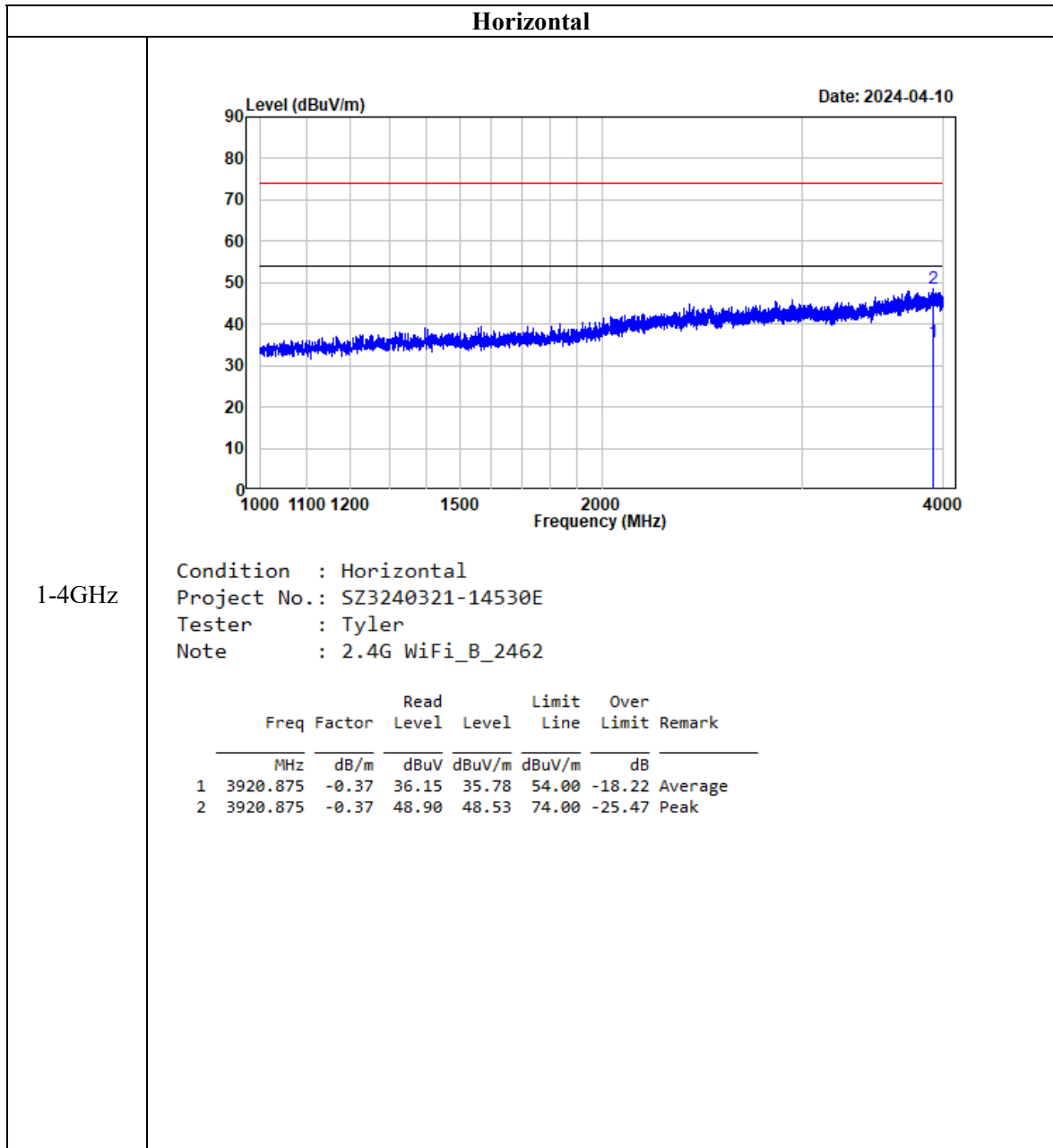
802.11b			
Test Channel:	2462MHz	Ant. Polar. :	Vertical



Condition : Vertical  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

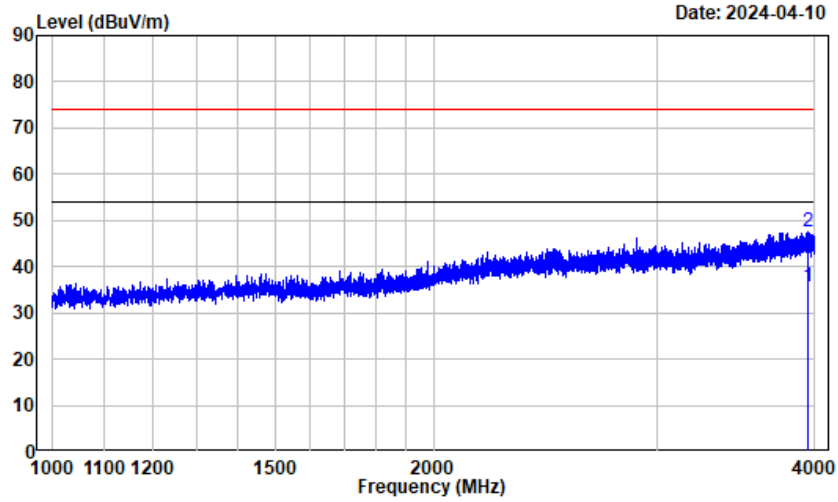
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2496.225	-3.19	40.82	37.63	54.00	-16.37	Average
2	2496.225	-3.19	55.16	51.97	74.00	-22.03	peak

**Spurious Emission Plots:**



**Vertical**

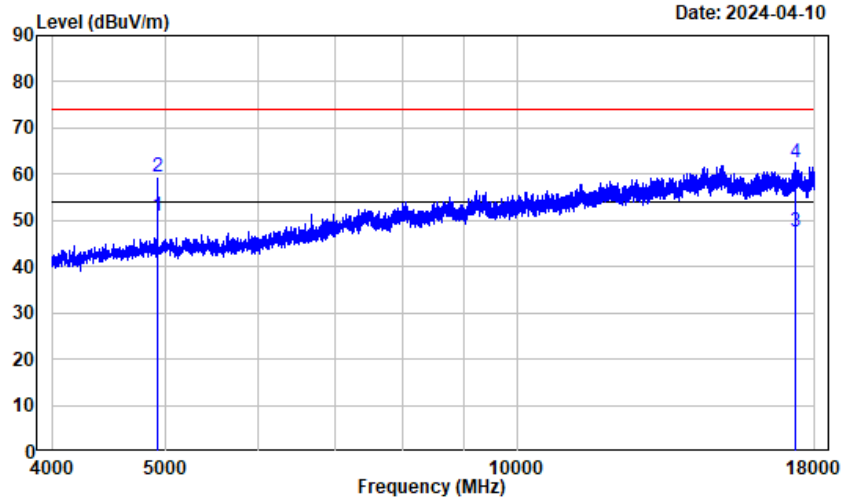
1-4GHz



Condition : Vertical  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3953.500	-0.17	35.88	35.71	54.00	-18.29	Average
2	3953.500	-0.17	47.80	47.63	74.00	-26.37	Peak

**Horizontal**



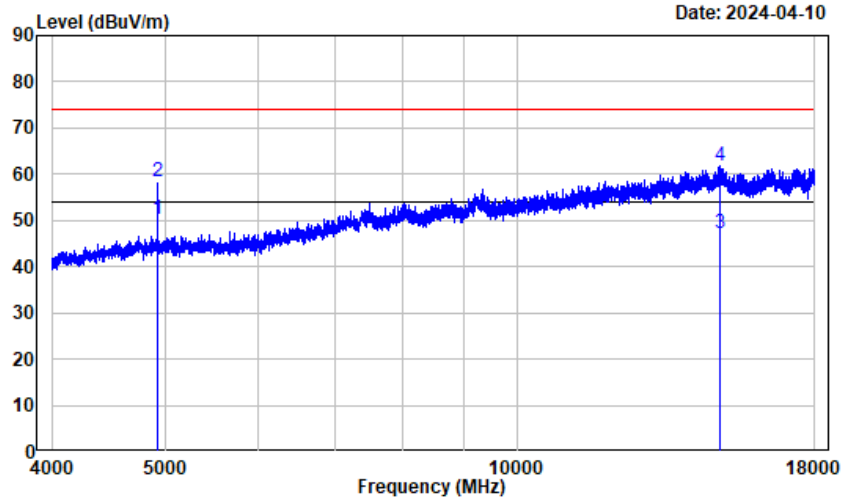
4-18GHz

Condition : Horizontal  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4924.000	2.63	48.32	50.95	54.00	-3.05	Average
2	4924.000	2.63	56.73	59.36	74.00	-14.64	Peak
3	17338.500	19.53	27.85	47.38	54.00	-6.62	Average
4	17338.500	19.53	42.89	62.42	74.00	-11.58	Peak

**Vertical**

4-18GHz

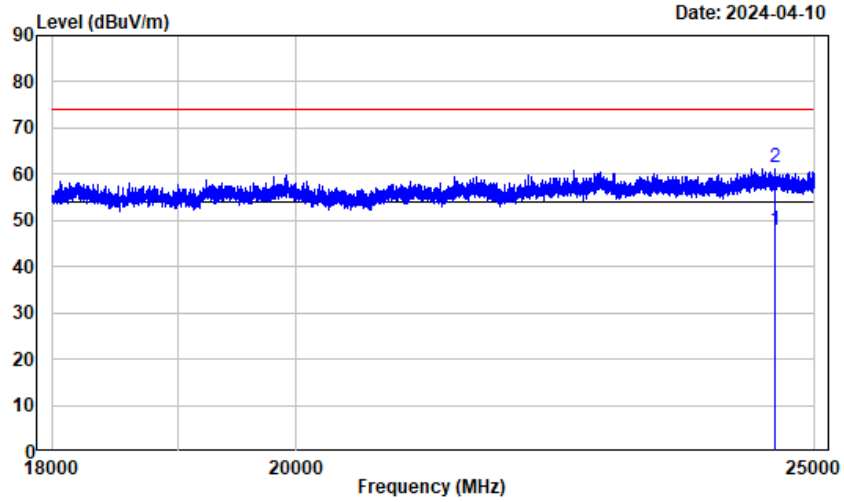


Condition : Vertical  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4924.000	2.63	47.64	50.27	54.00	-3.73	Average
2	4924.000	2.63	55.81	58.44	74.00	-15.56	Peak
3	14914.750	16.53	30.71	47.24	54.00	-6.76	Average
4	14914.750	16.53	45.31	61.84	74.00	-12.16	Peak

**Horizontal**

18-25GHz

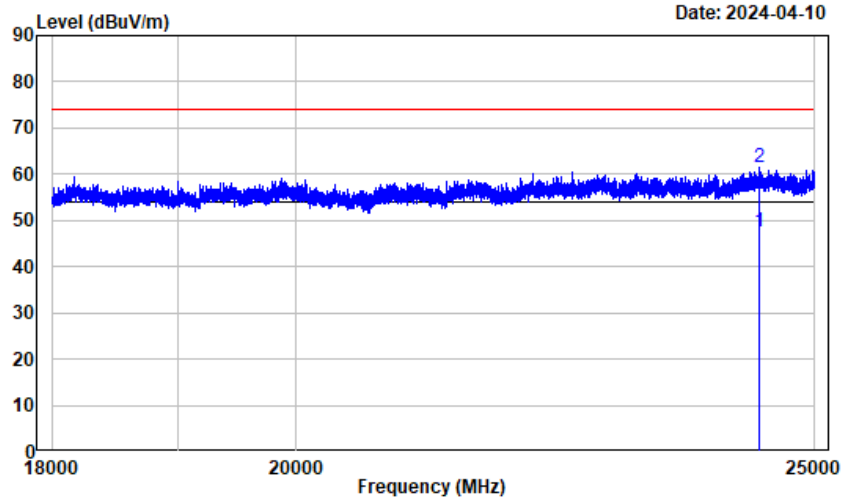


Condition : Horizontal  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	24574.660	18.90	28.83	47.73	54.00	-6.27	Average
2	24574.660	18.90	42.41	61.31	74.00	-12.69	Peak

**Vertical**

18-25GHz



Condition : Vertical  
 Project No.: SZ3240321-14530E  
 Tester : Tyler  
 Note : 2.4G WiFi\_B\_2462

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	24408.490	18.79	28.83	47.62	54.00	-6.38	Average
2	24408.490	18.79	42.68	61.47	74.00	-12.53	Peak

## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### Applicable Standard

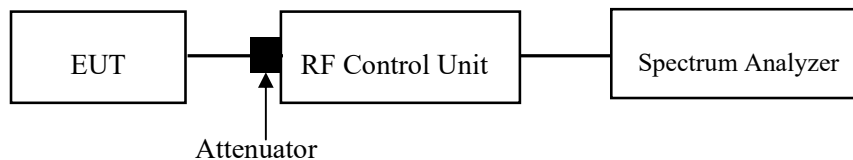
According to FCC §15.247(a) (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.8.1 & Clause 6.9.3

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	101 kPa

*The testing was performed by Lee Li on 2024-04-12.*

*EUT operation mode: Transmitting*

***Test Result: Compliant. Please refer to the Appendix.***



## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### Applicable Standard

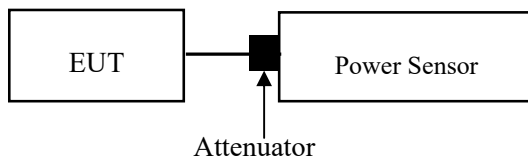
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

### Test Procedure

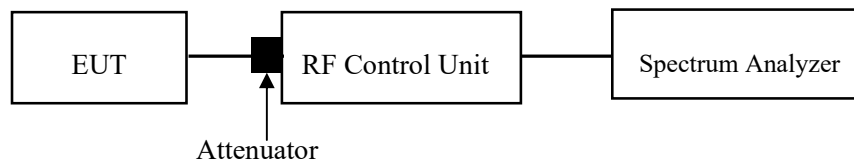
Test Method: ANSI C63.10-2013 Clause 11.9.1.1 for BLE & Clause 11.9.2.3.2 for Wi-Fi

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

For Wi-Fi mode:



For BLE mode:



### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	101 kPa

The testing was performed by Lee Li on 2024-04-12.

EUT operation mode: Transmitting

**Test Result: Compliant. Please refer to the Appendix.**

## FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

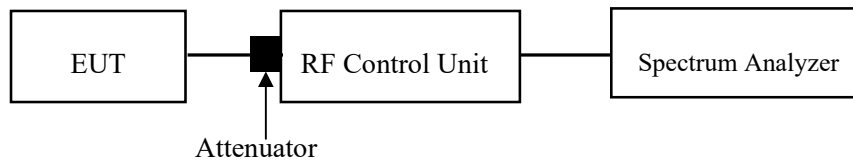
### Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.11

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101 kPa

The testing was performed by Lee Li on 2024-04-12.

EUT operation mode: Transmitting

**Test Result: Compliant. Please refer to the Appendix.**

## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

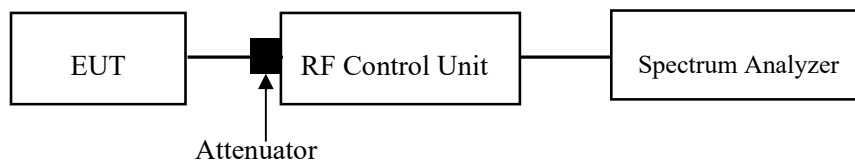
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.10.2

Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

1. Set the RBW to:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
2. Set the VBW  $\geq 3 \times \text{RBW}$ .
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	101 kPa

*The testing was performed by Lee Li on 2024-04-12.*

*EUT operation mode: Transmitting*

**Test Result: Compliant. Please refer to the Appendix.**

## **EUT PHOTOGRAPHS**

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Please refer to the attachment SZ3240321-14530E-RF External photo and SZ3240321-14530E-RF Internal photo.

## **TEST SETUP PHOTOGRAPHS**

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Please refer to the attachment SZ3240321-14530E-RF Test Setup photo.

## APPENDIX

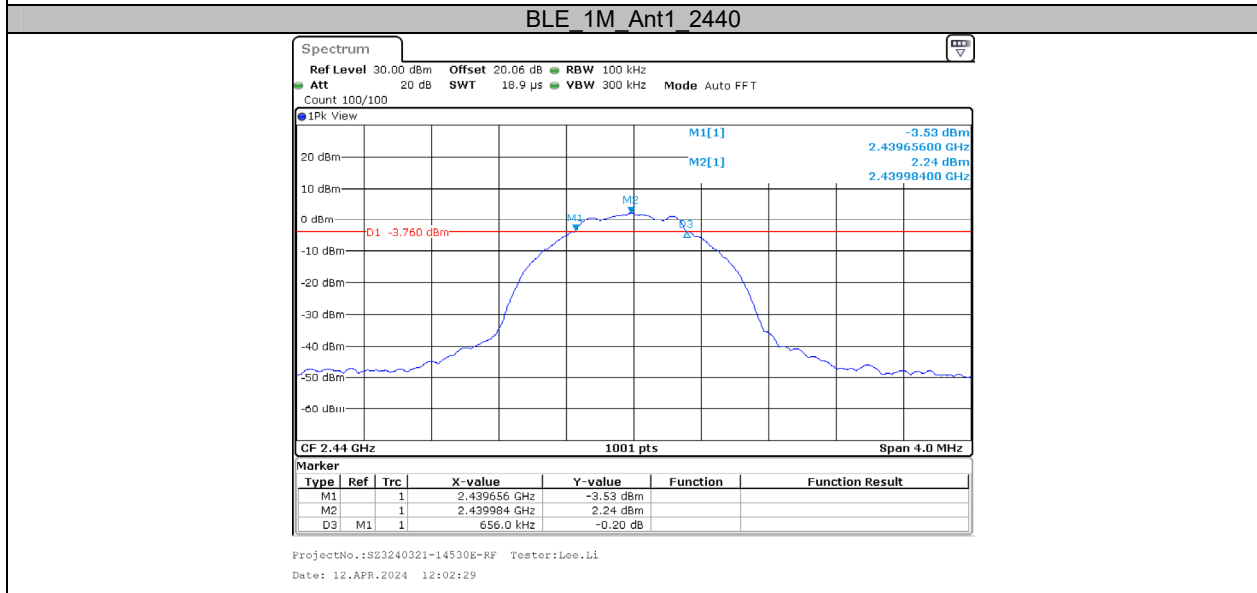
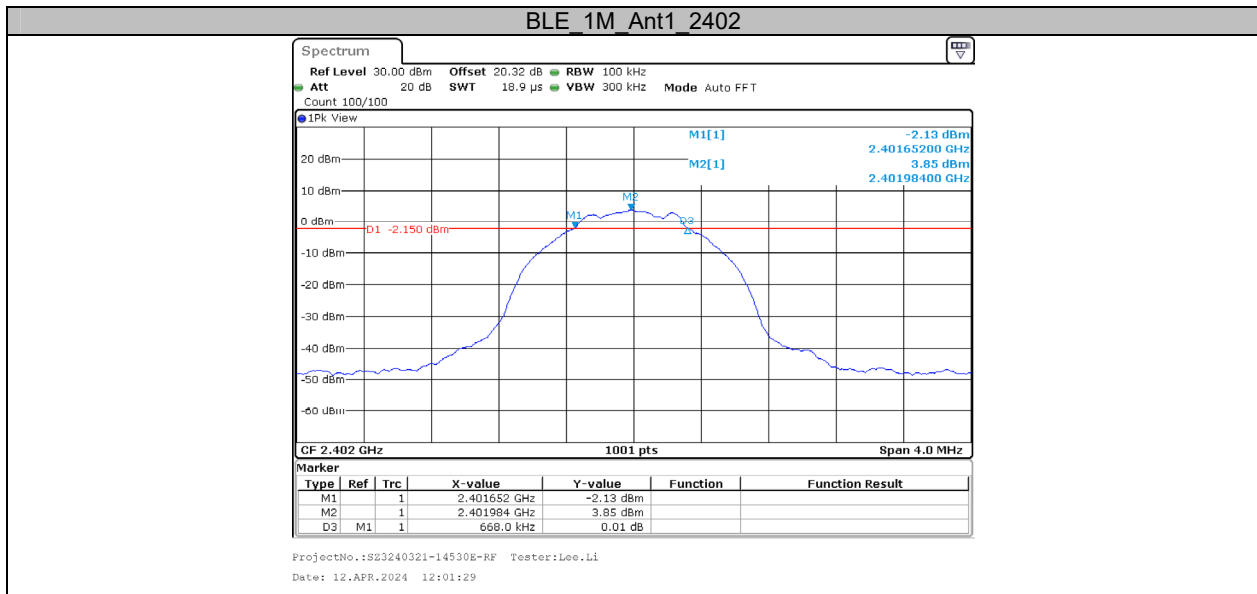
### BLE

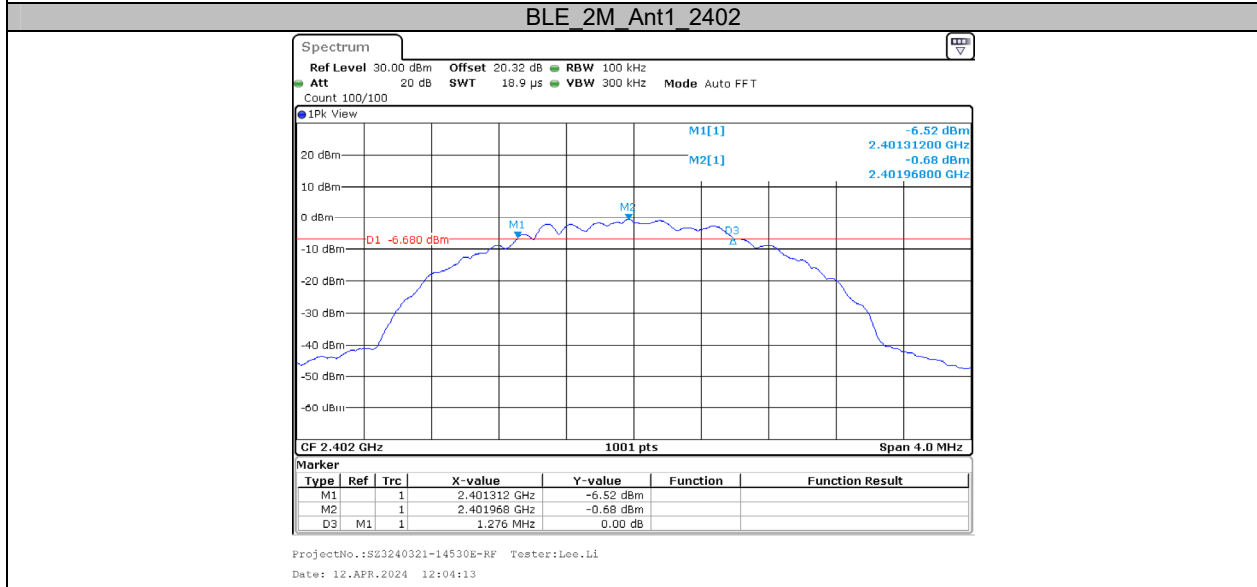
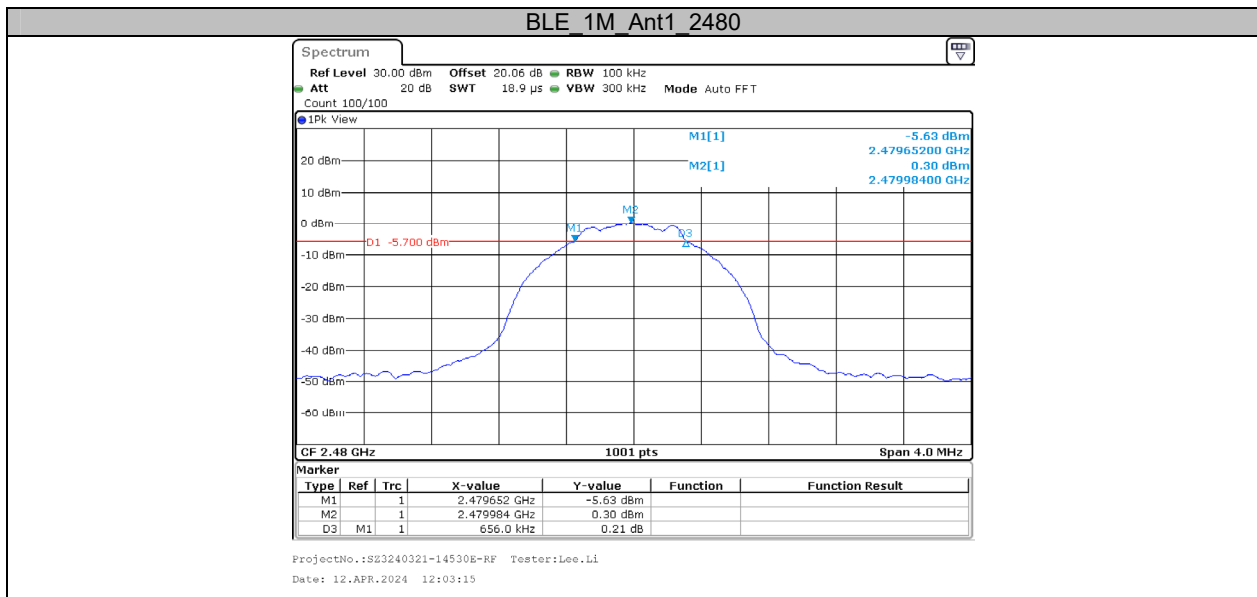
#### Appendix A: DTS Bandwidth

##### Test Result

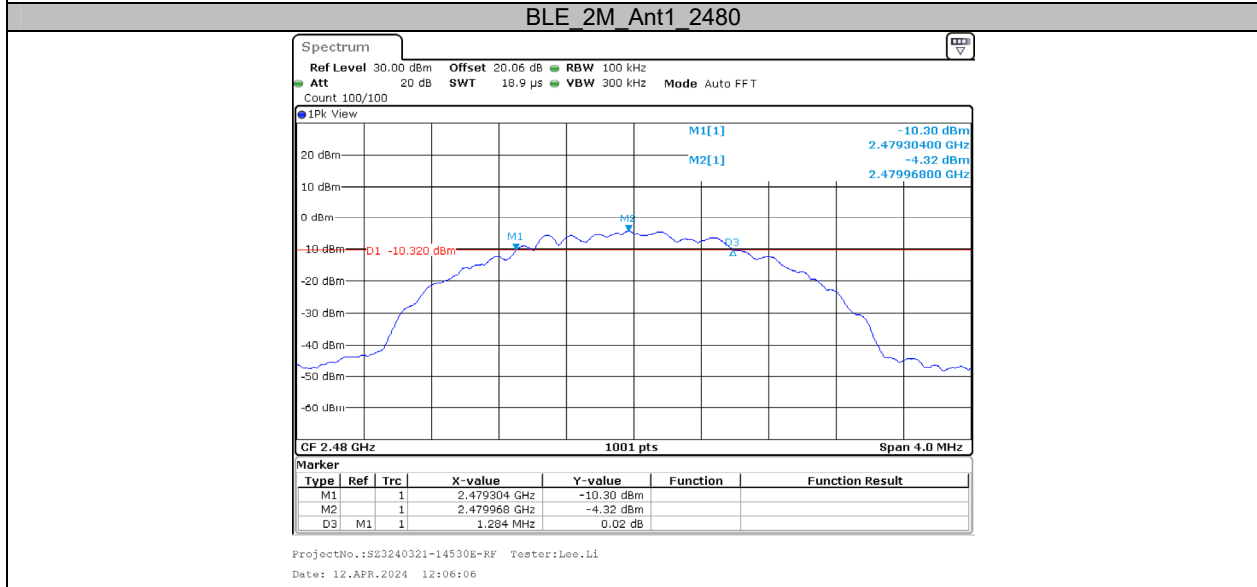
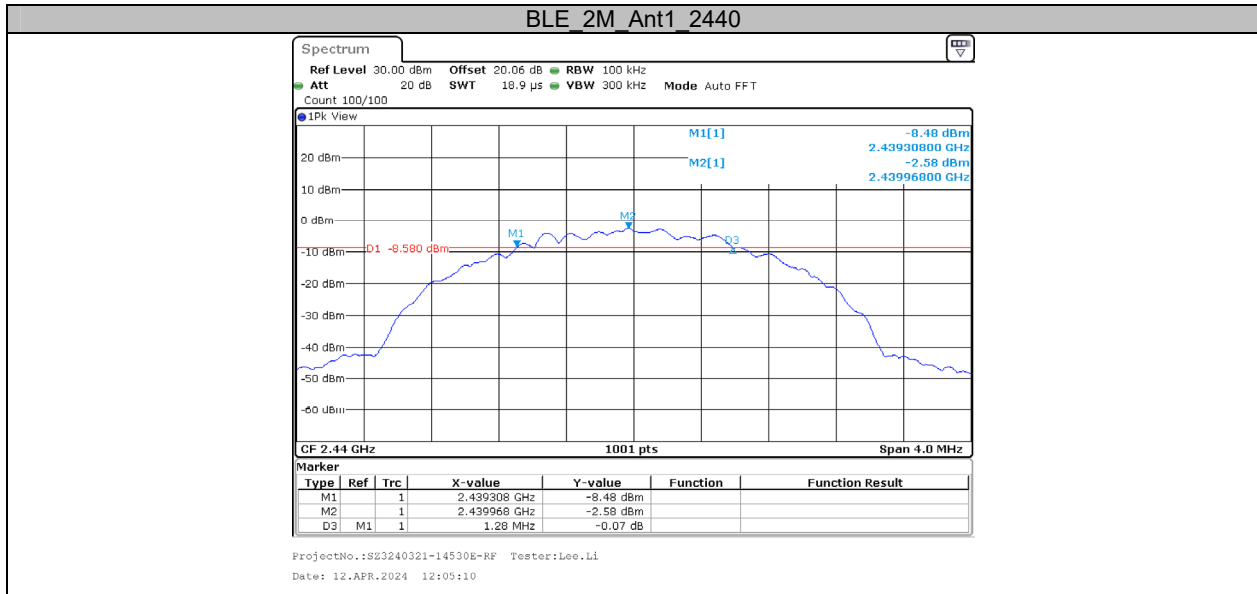
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.67	2401.65	2402.32	0.5	PASS
		2440	0.66	2439.66	2440.31	0.5	PASS
		2480	0.66	2479.65	2480.31	0.5	PASS
BLE_2M	Ant1	2402	1.28	2401.31	2402.59	0.5	PASS
		2440	1.28	2439.31	2440.59	0.5	PASS
		2480	1.28	2479.30	2480.59	0.5	PASS

### Test Graphs







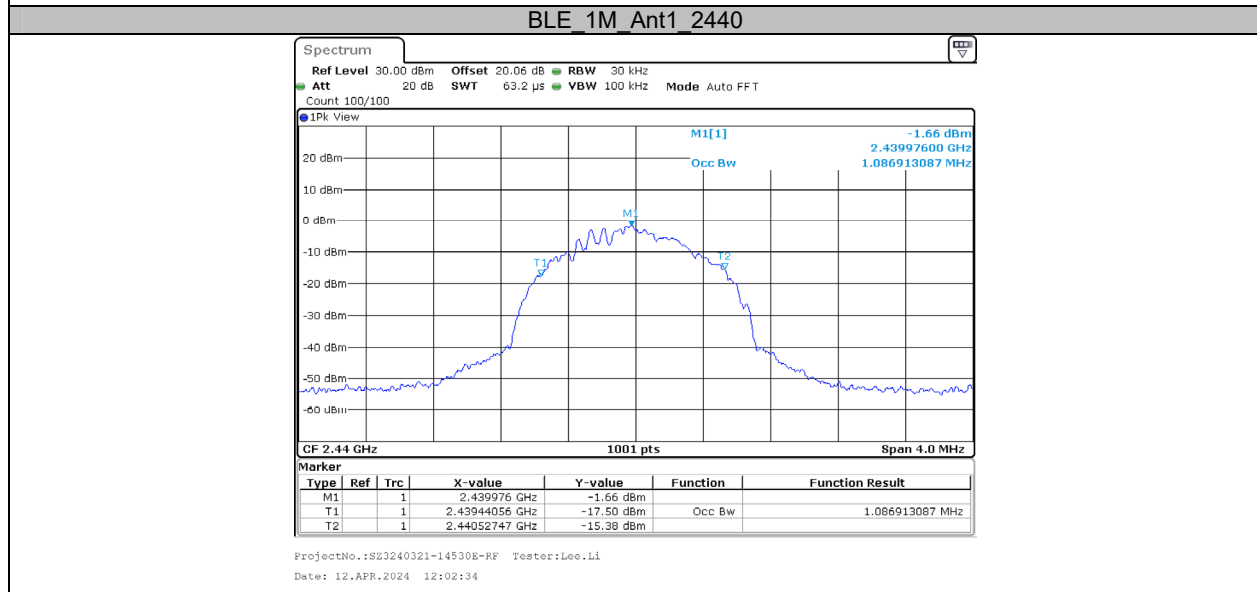
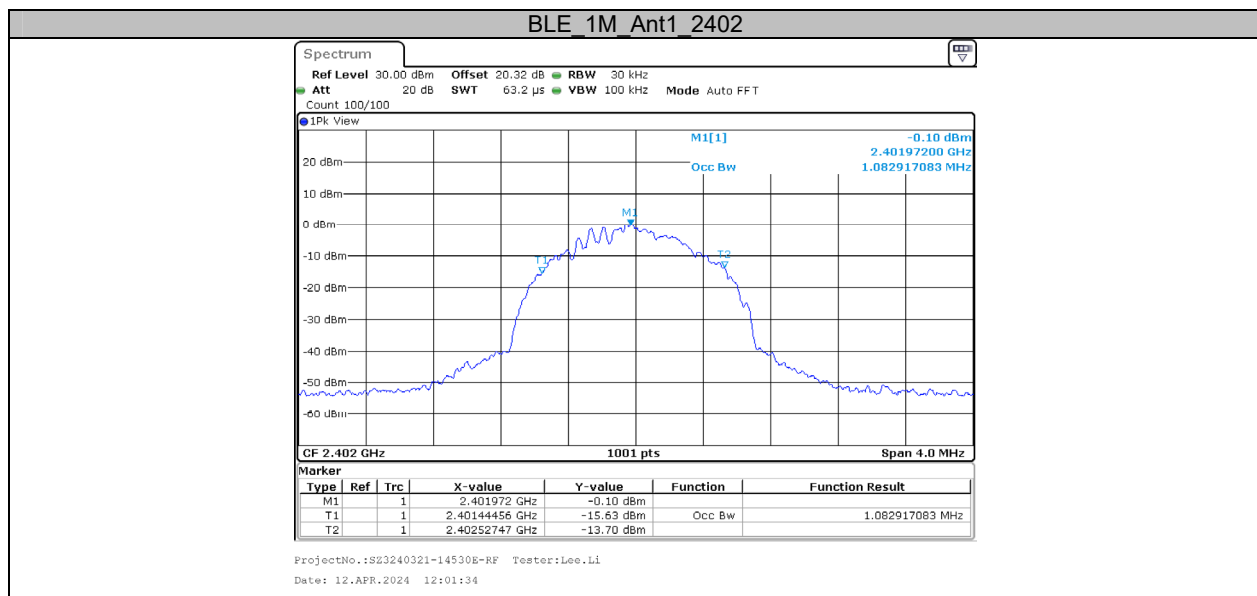


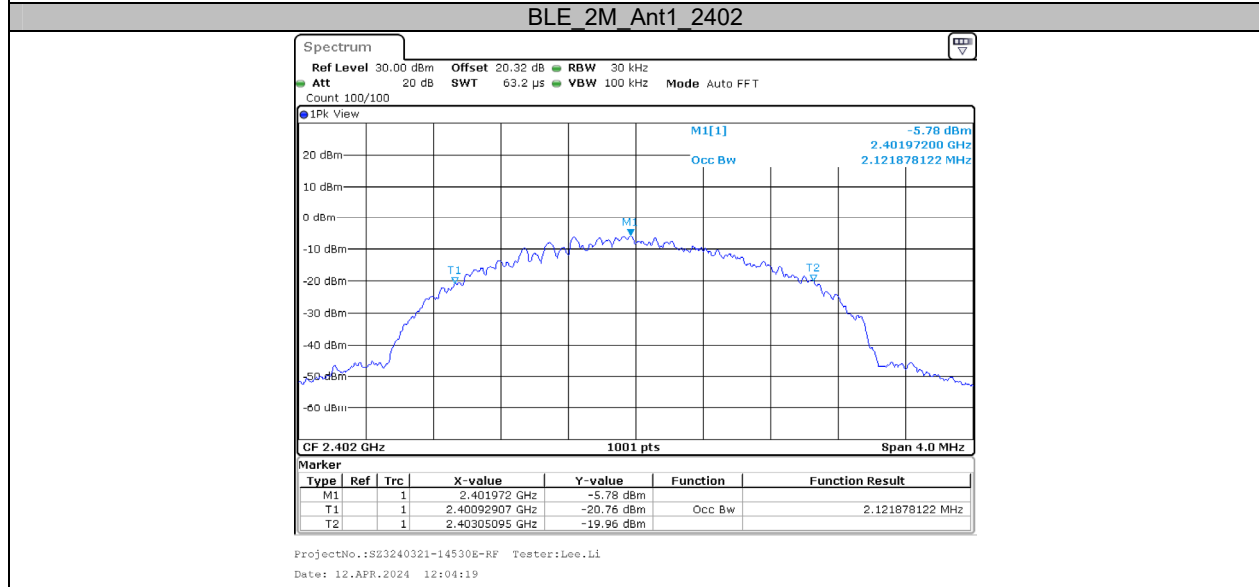
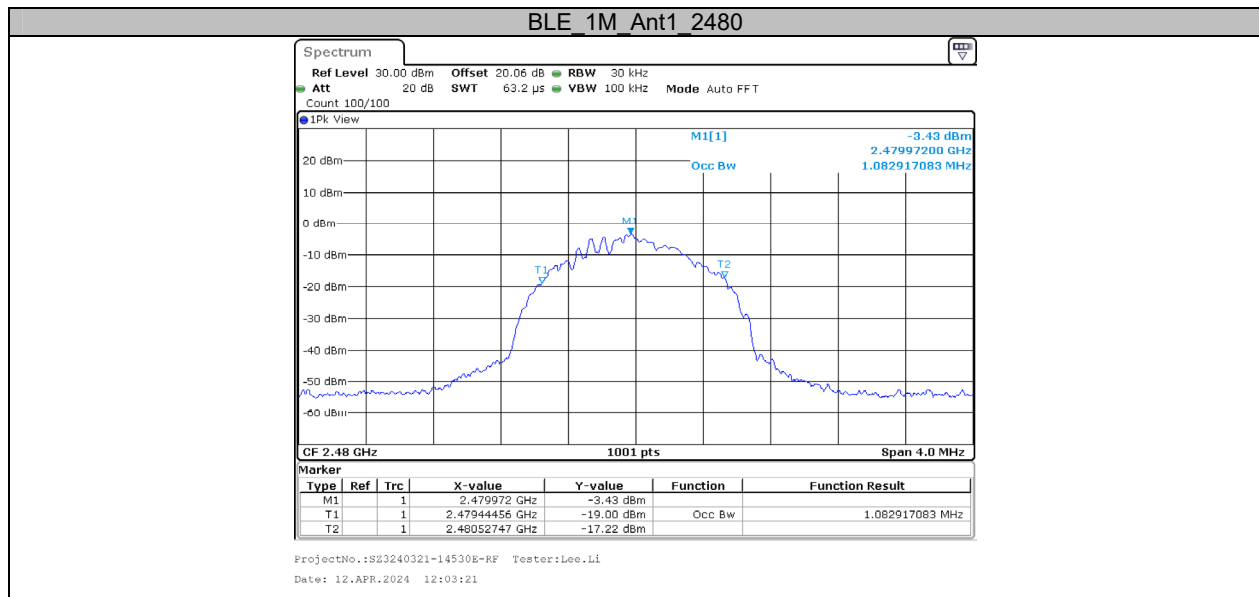
### Appendix B: Occupied Channel Bandwidth

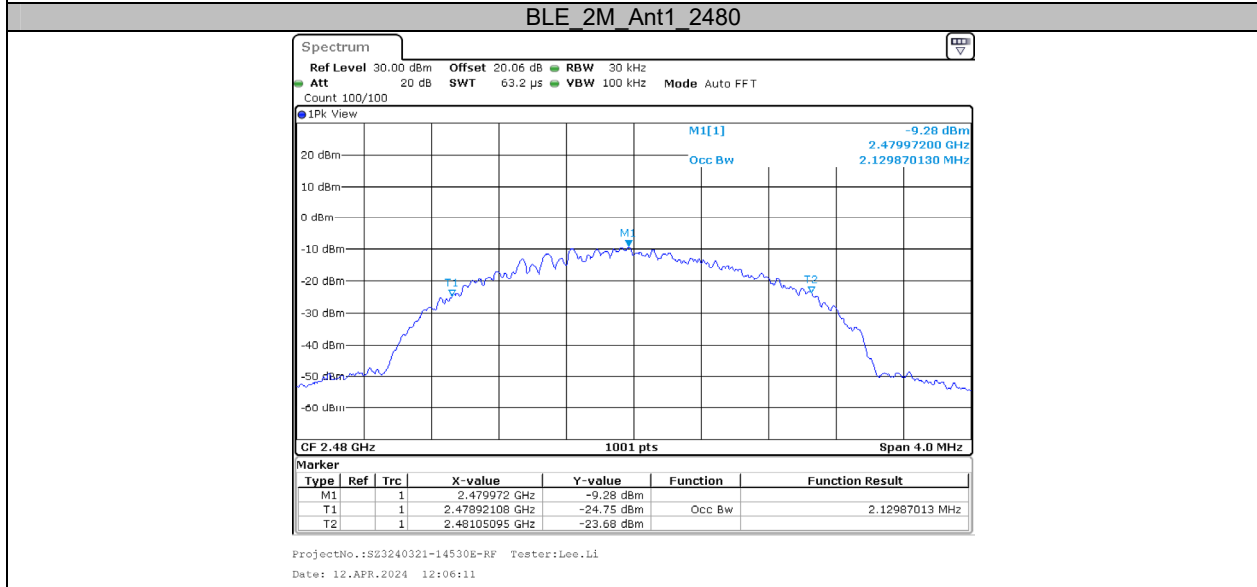
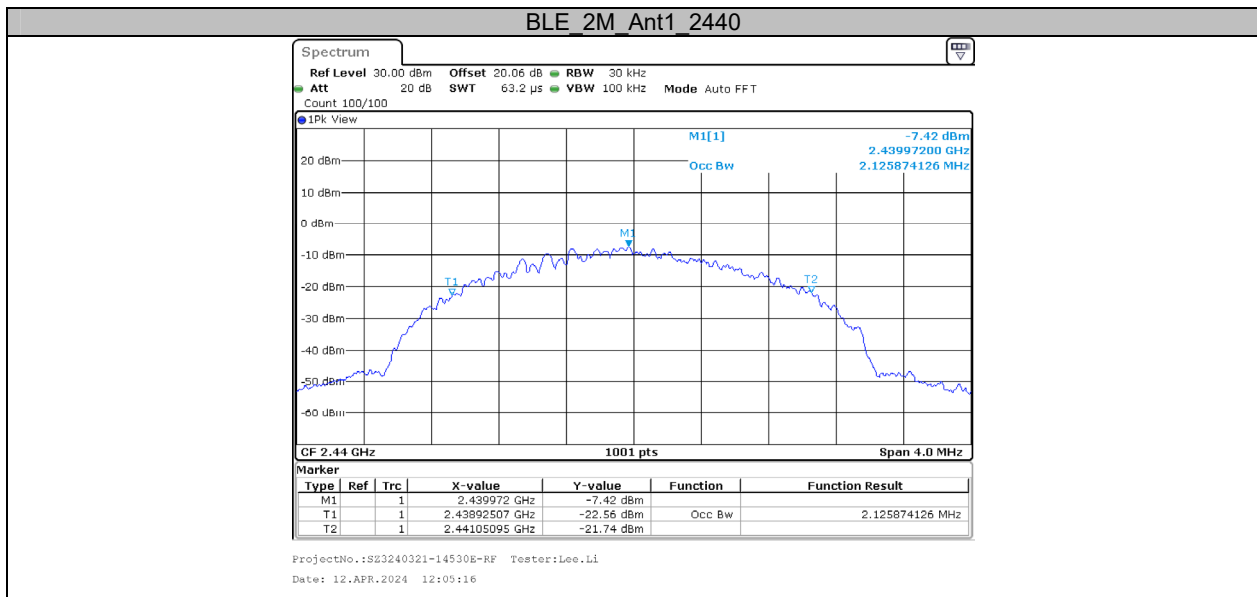
#### Test Result

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.083	2401.4446	2402.5275	---	---
		2440	1.087	2439.4406	2440.5275	---	---
		2480	1.083	2479.4446	2480.5275	---	---
BLE_2M	Ant1	2402	2.122	2400.9291	2403.0509	---	---
		2440	2.126	2438.9251	2441.0509	---	---
		2480	2.130	2478.9211	2481.0509	---	---

#### Test Graphs





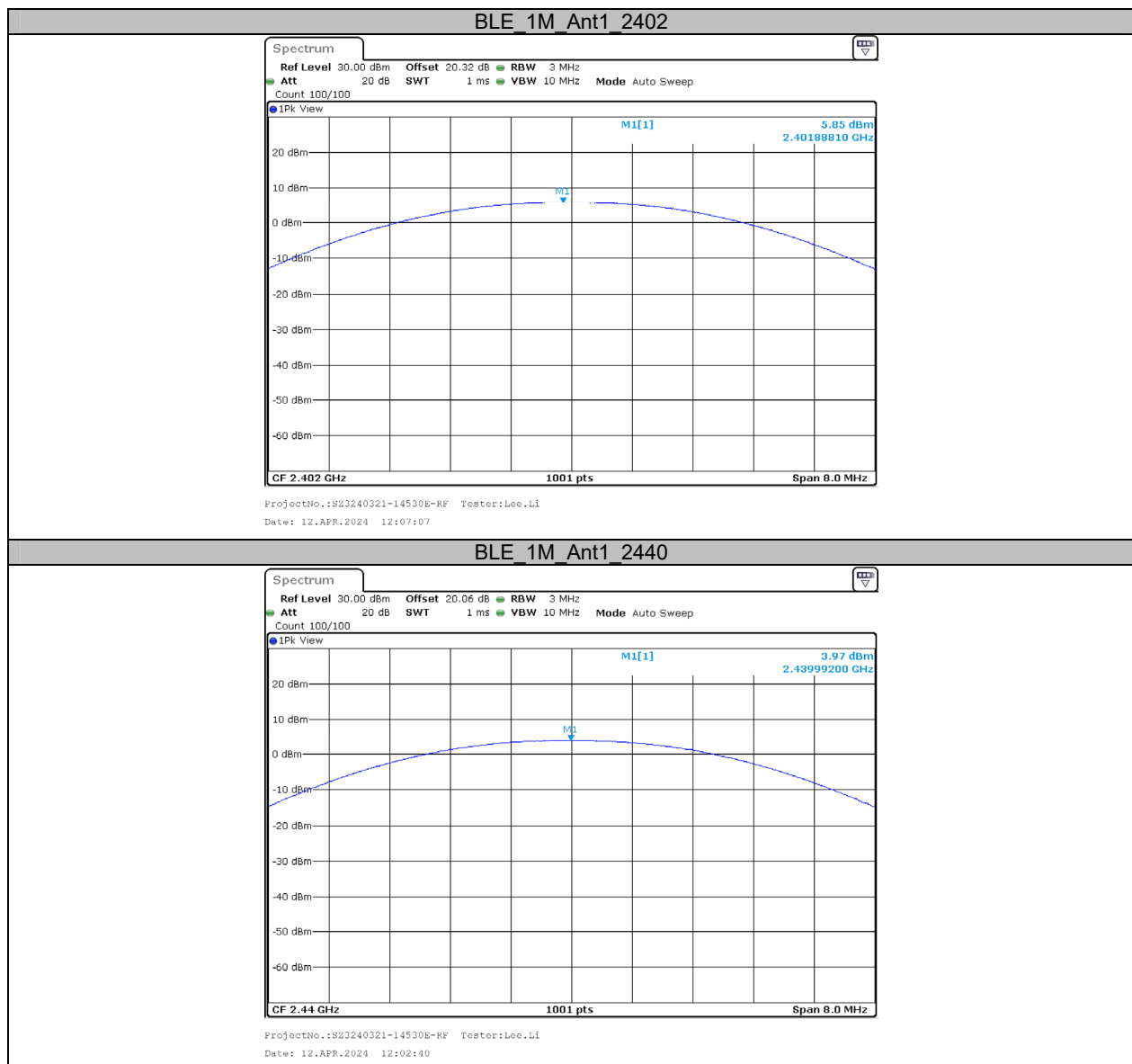


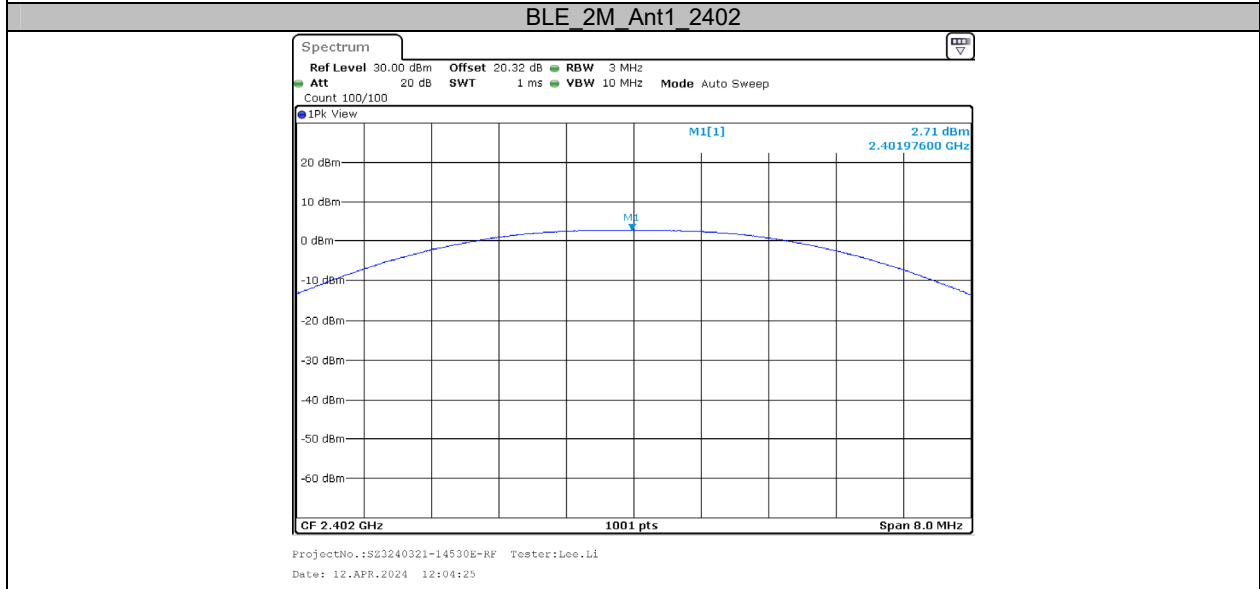
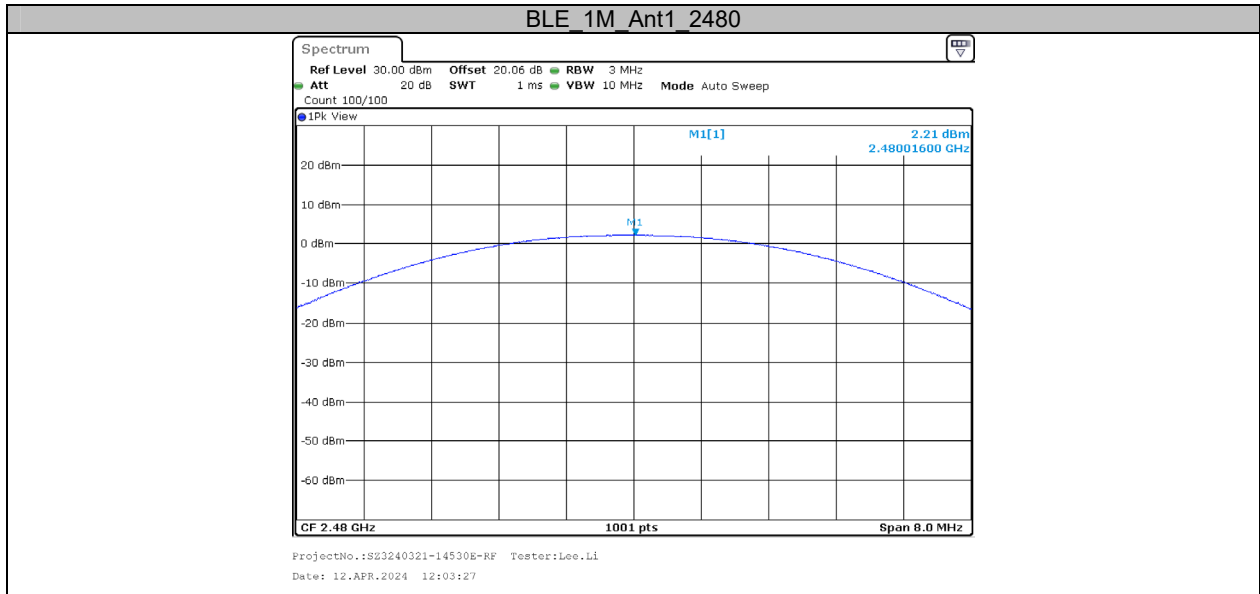
### Appendix C: Maximum conducted output power

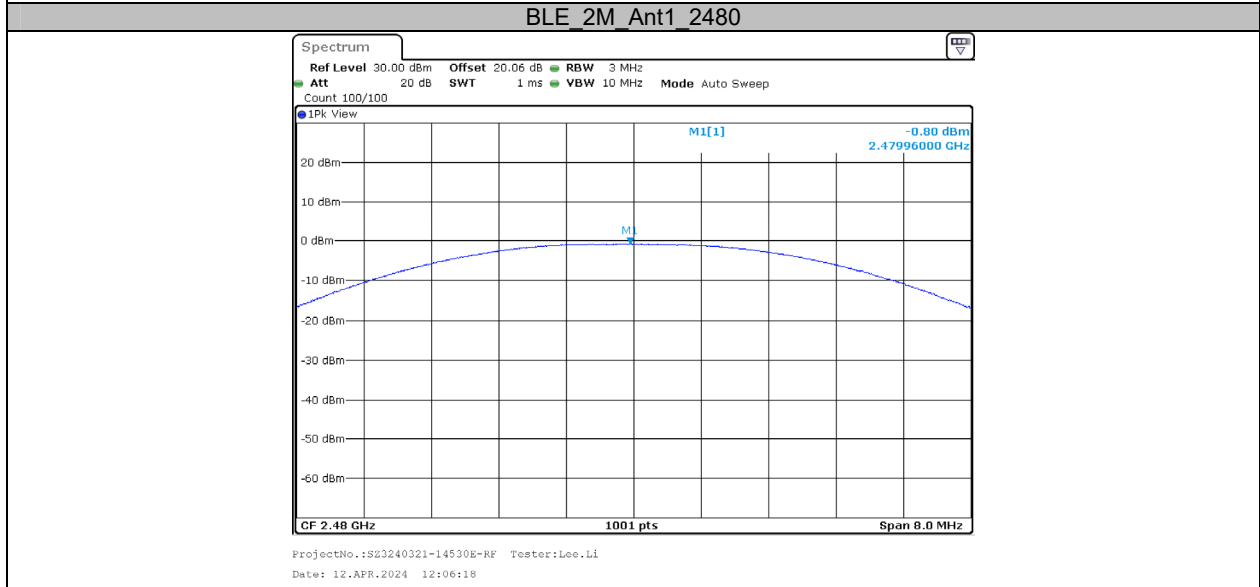
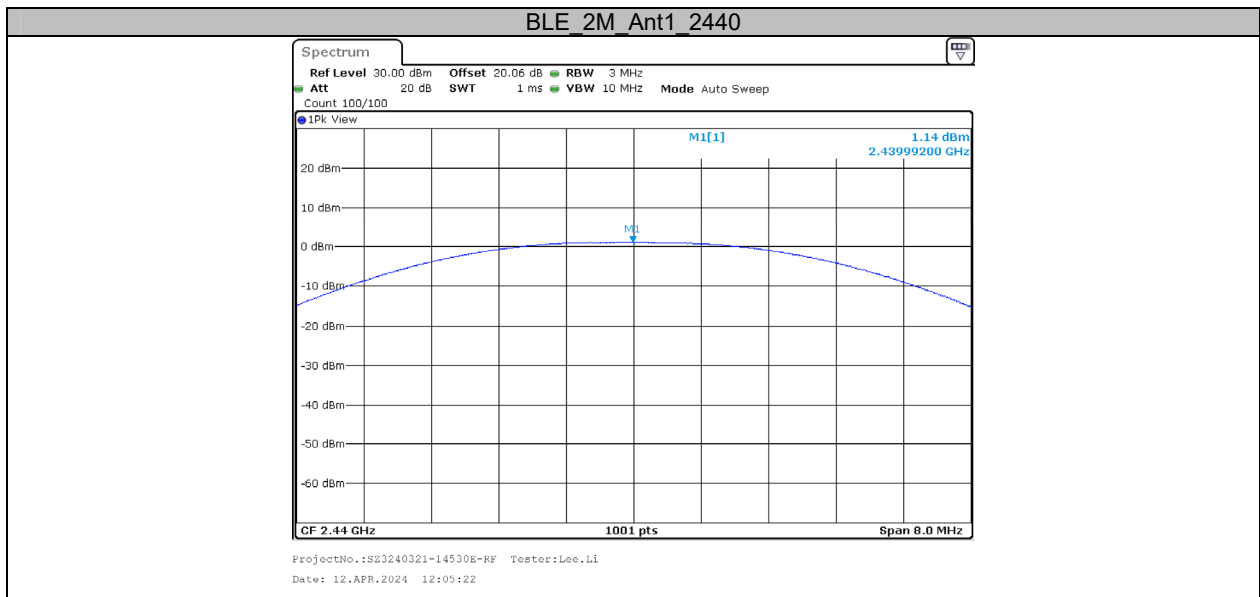
#### Test Result Peak

Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power [dBm]	Limit [dBm]	Verdict
BLE_1M	Ant1	2402	5.85	≤30	PASS
		2440	3.97	≤30	PASS
		2480	2.21	≤30	PASS
BLE_2M	Ant1	2402	2.71	≤30	PASS
		2440	1.14	≤30	PASS
		2480	-0.8	≤30	PASS

#### Test Graphs Peak





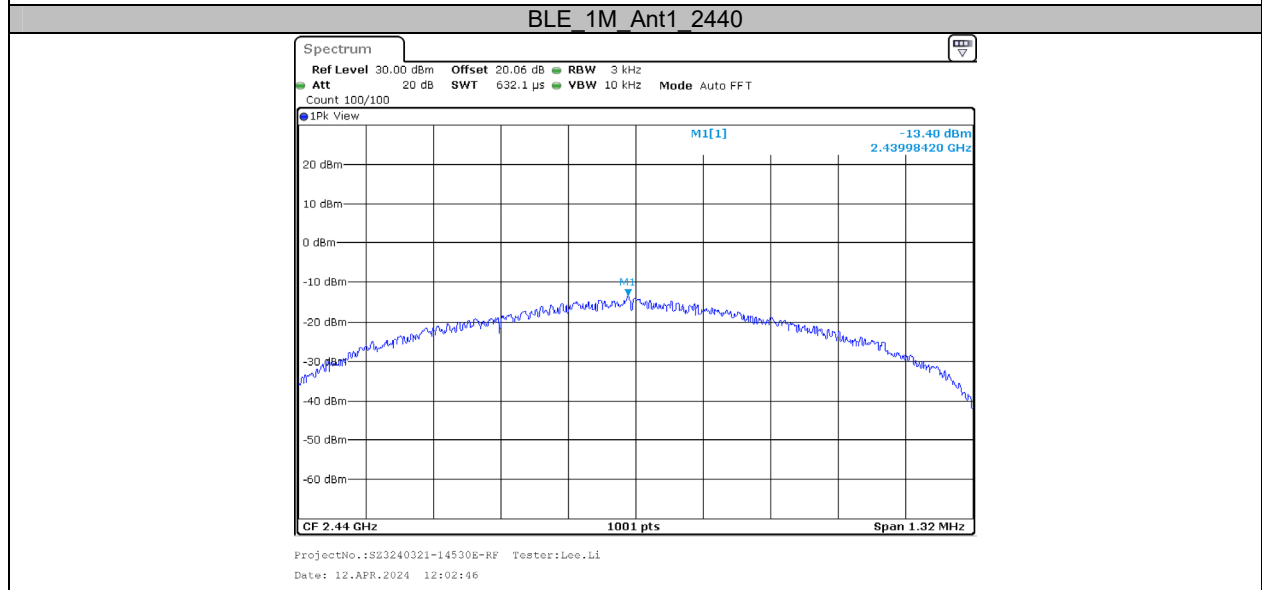
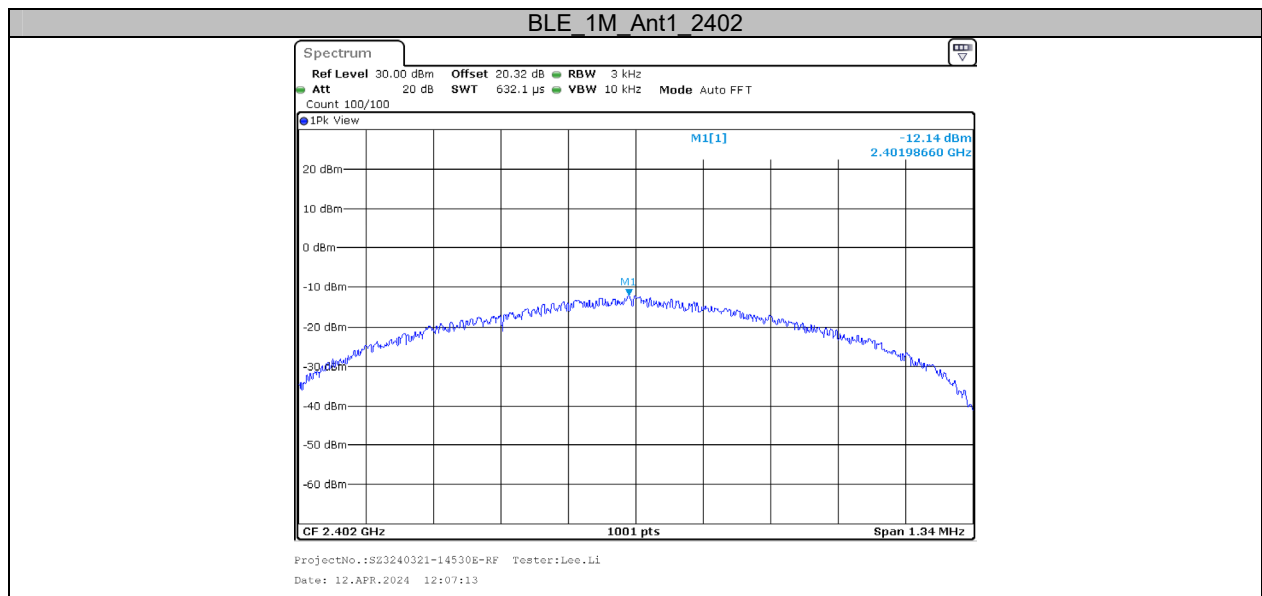


### Appendix D: Maximum power spectral density

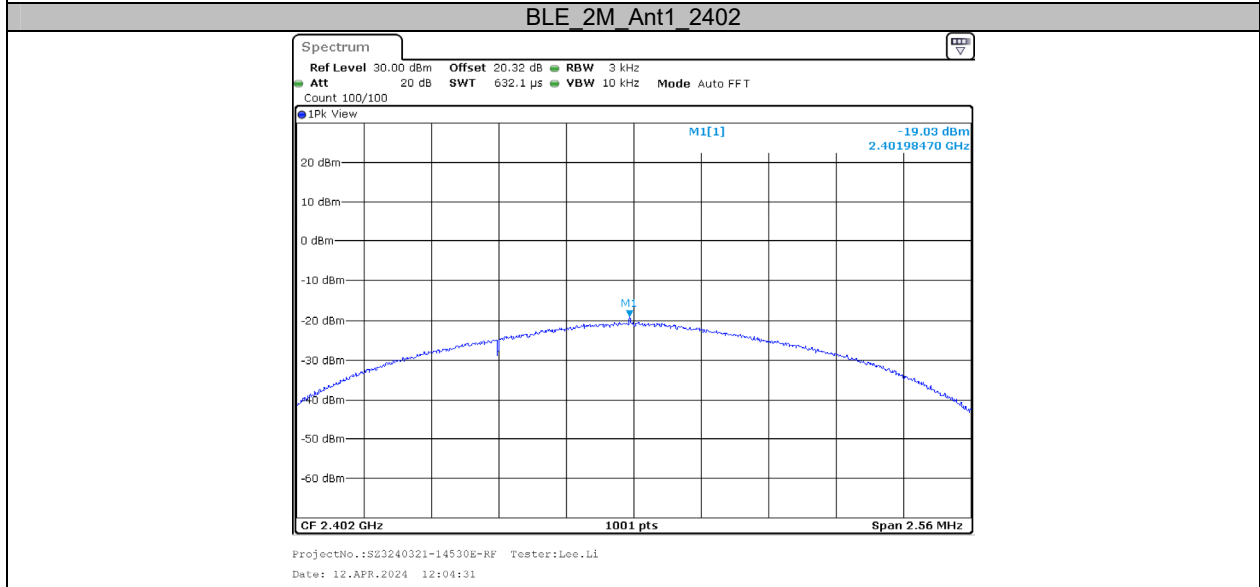
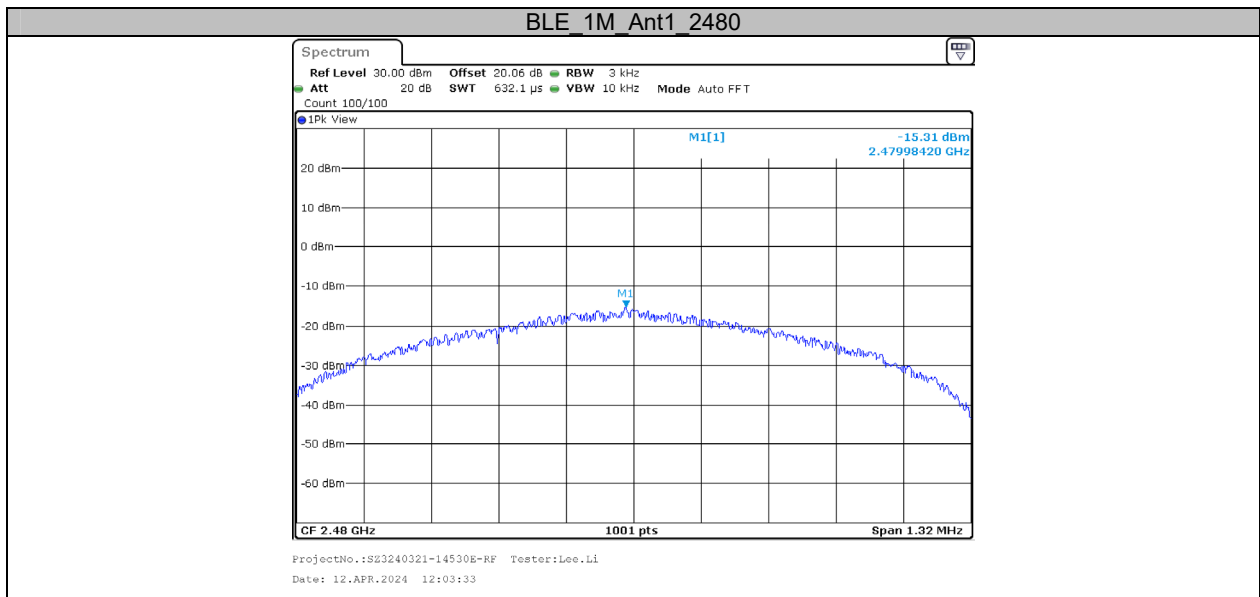
#### Test Result

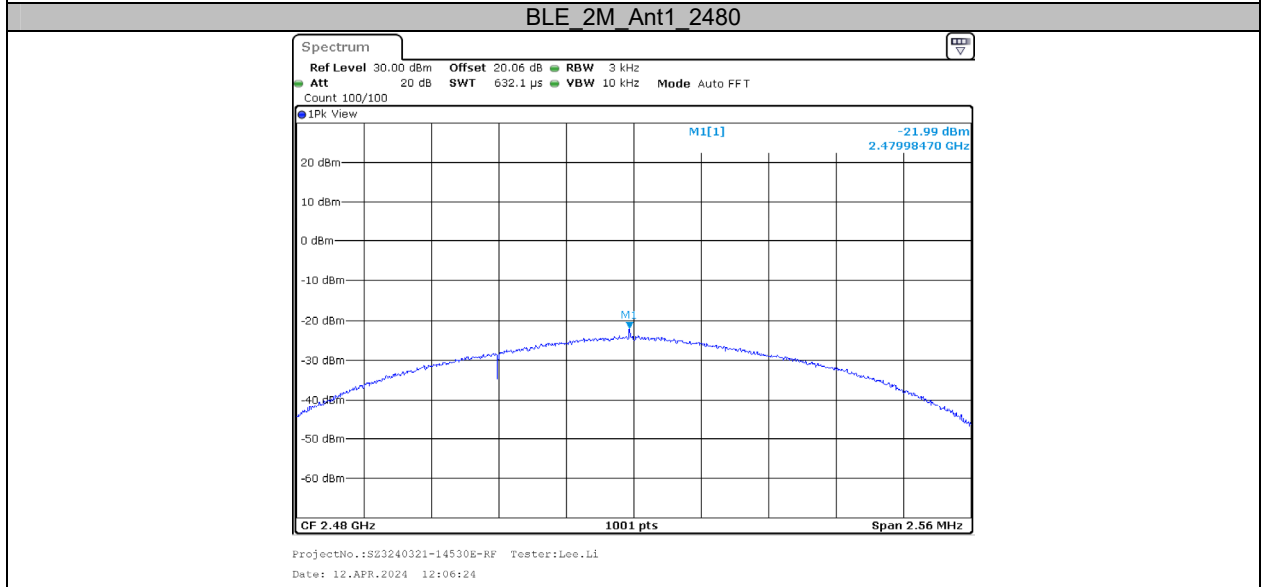
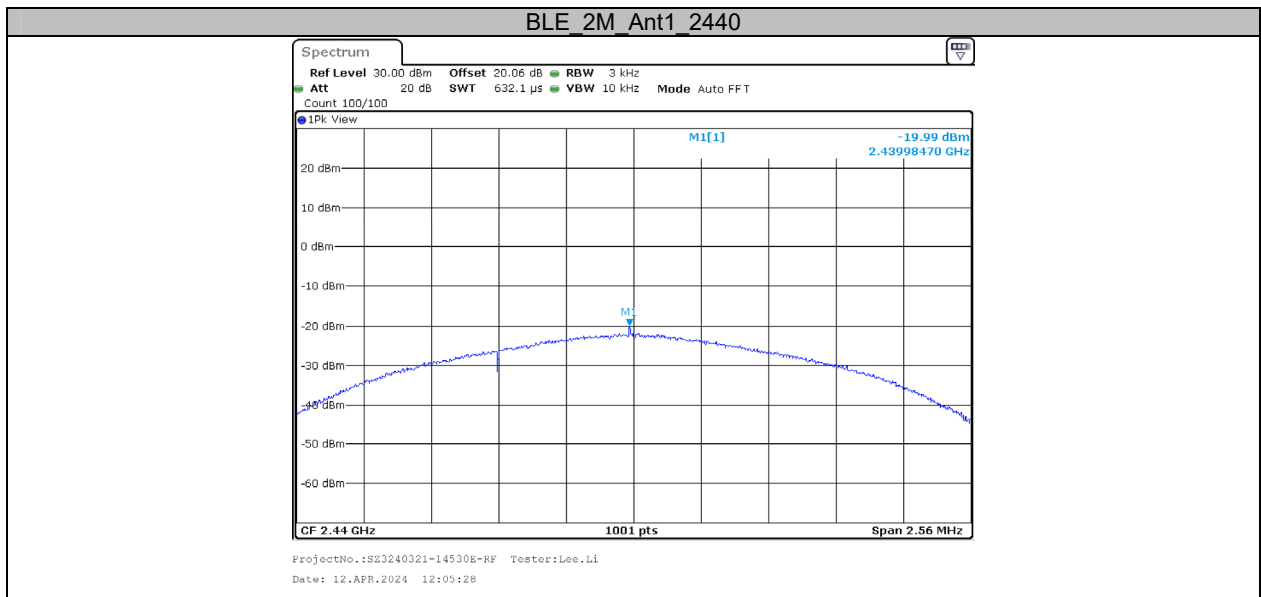
Test Mode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-12.14	≤8.00	PASS
		2440	-13.40	≤8.00	PASS
		2480	-15.31	≤8.00	PASS
BLE_2M	Ant1	2402	-19.03	≤8.00	PASS
		2440	-19.99	≤8.00	PASS
		2480	-21.99	≤8.00	PASS

#### Test Graphs



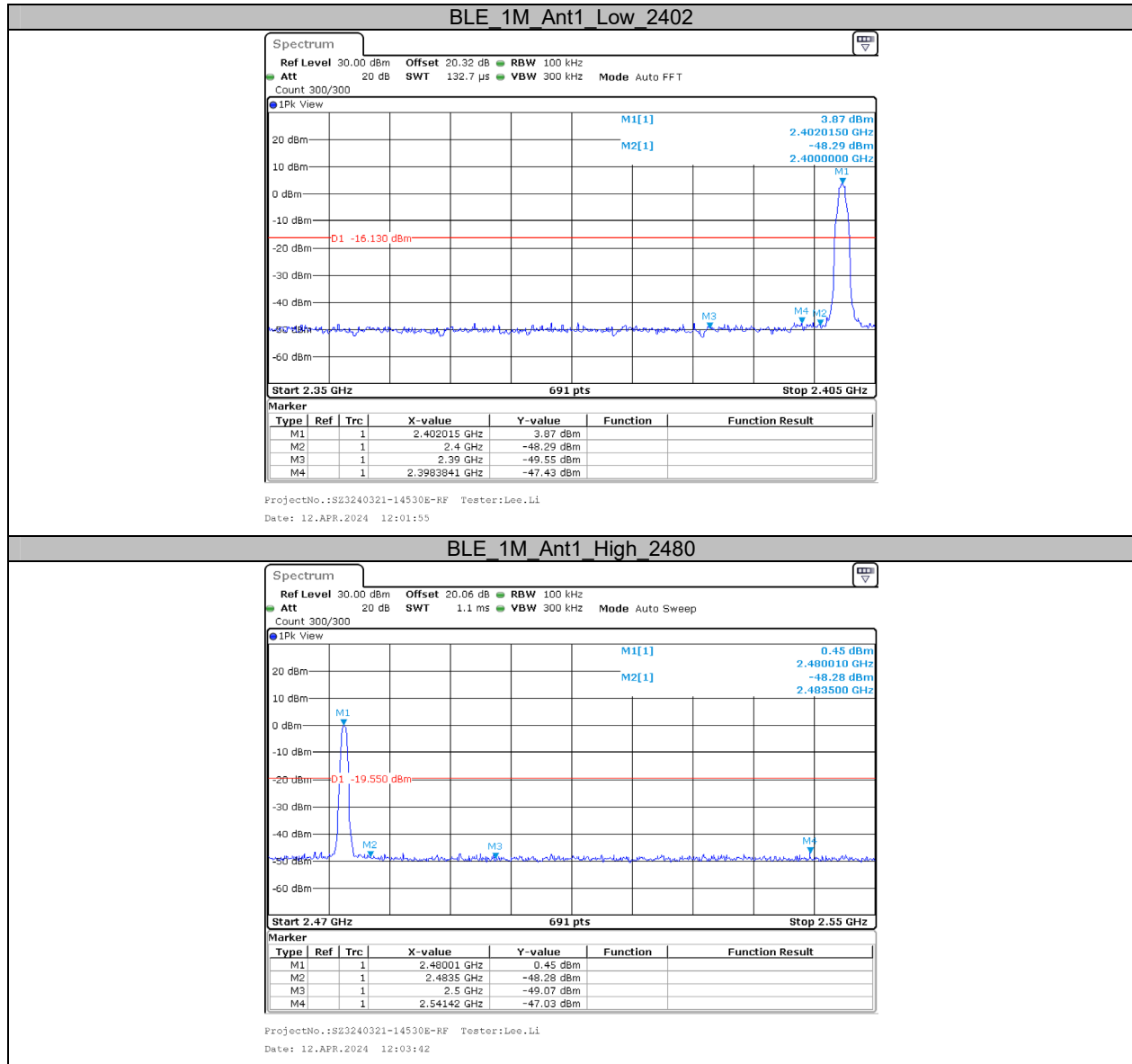


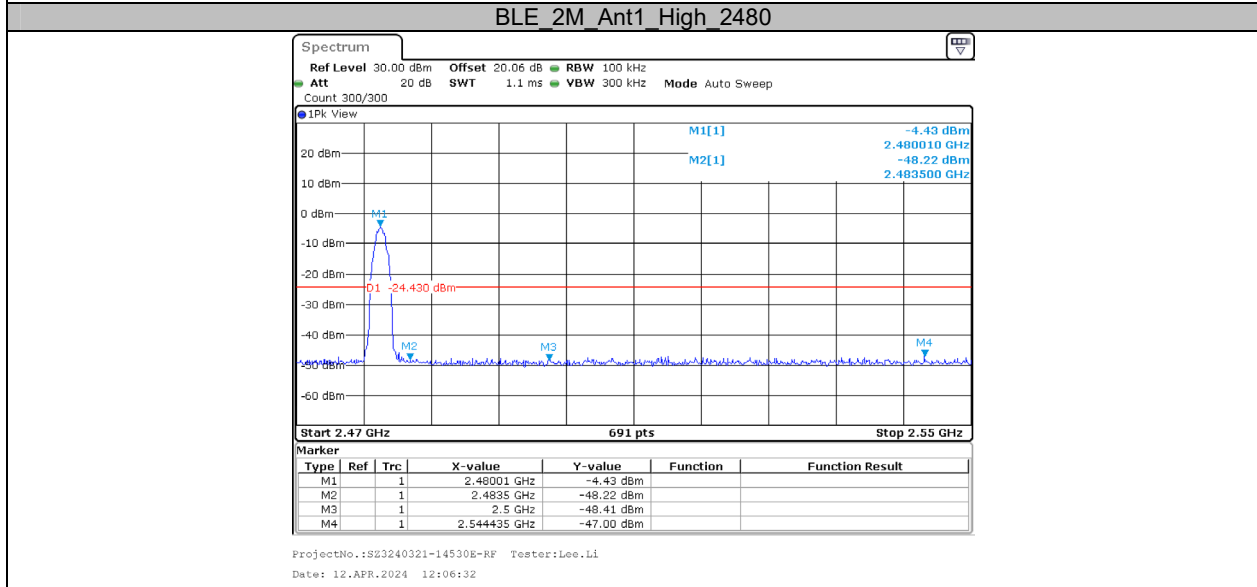
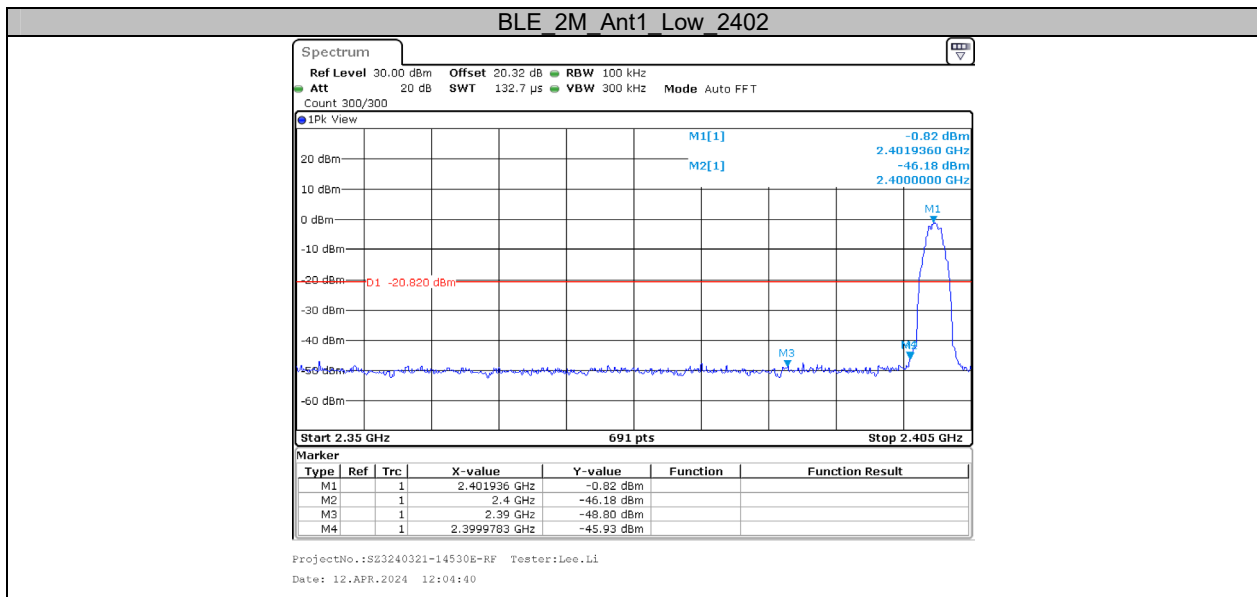




### Appendix E: Band edge measurements

#### Test Graphs



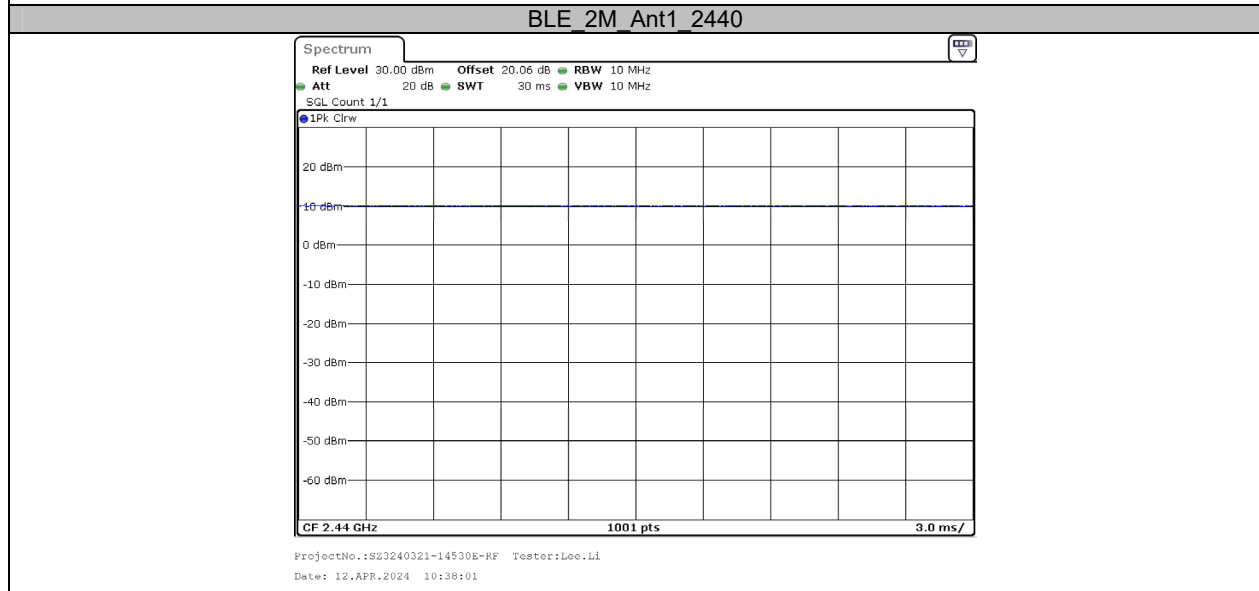
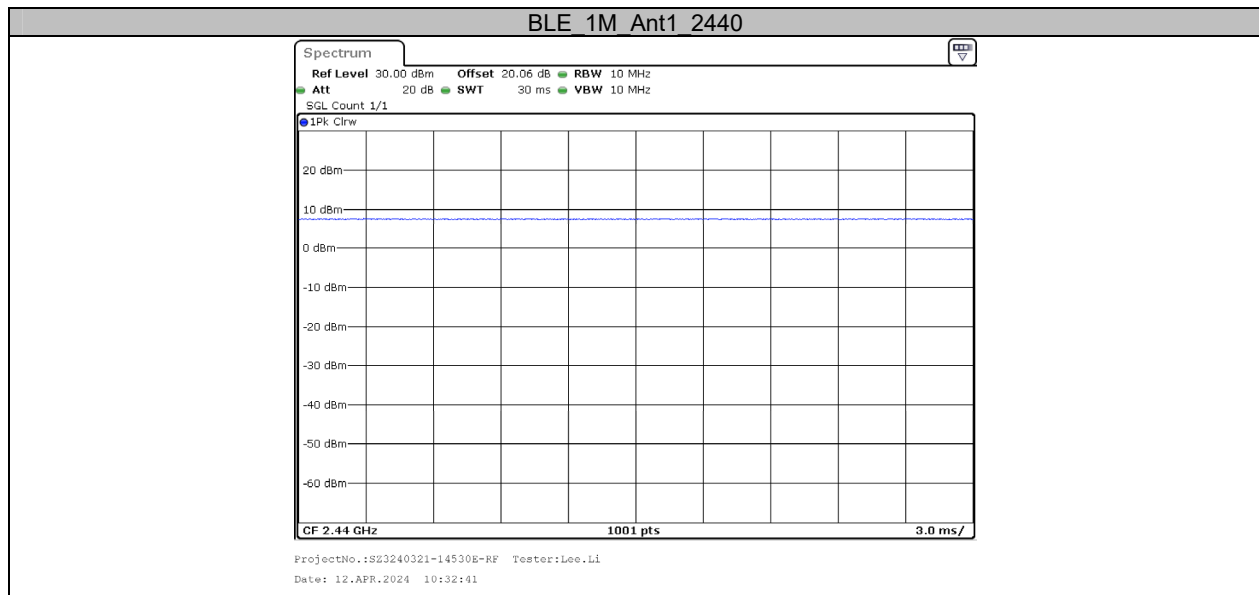


### Appendix F: Duty Cycle

#### Test Result

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	VBW Setting [Hz]
BLE_1M	Ant1	2440	30	30	100	10
BLE_2M	Ant1	2440	30	30	100	10

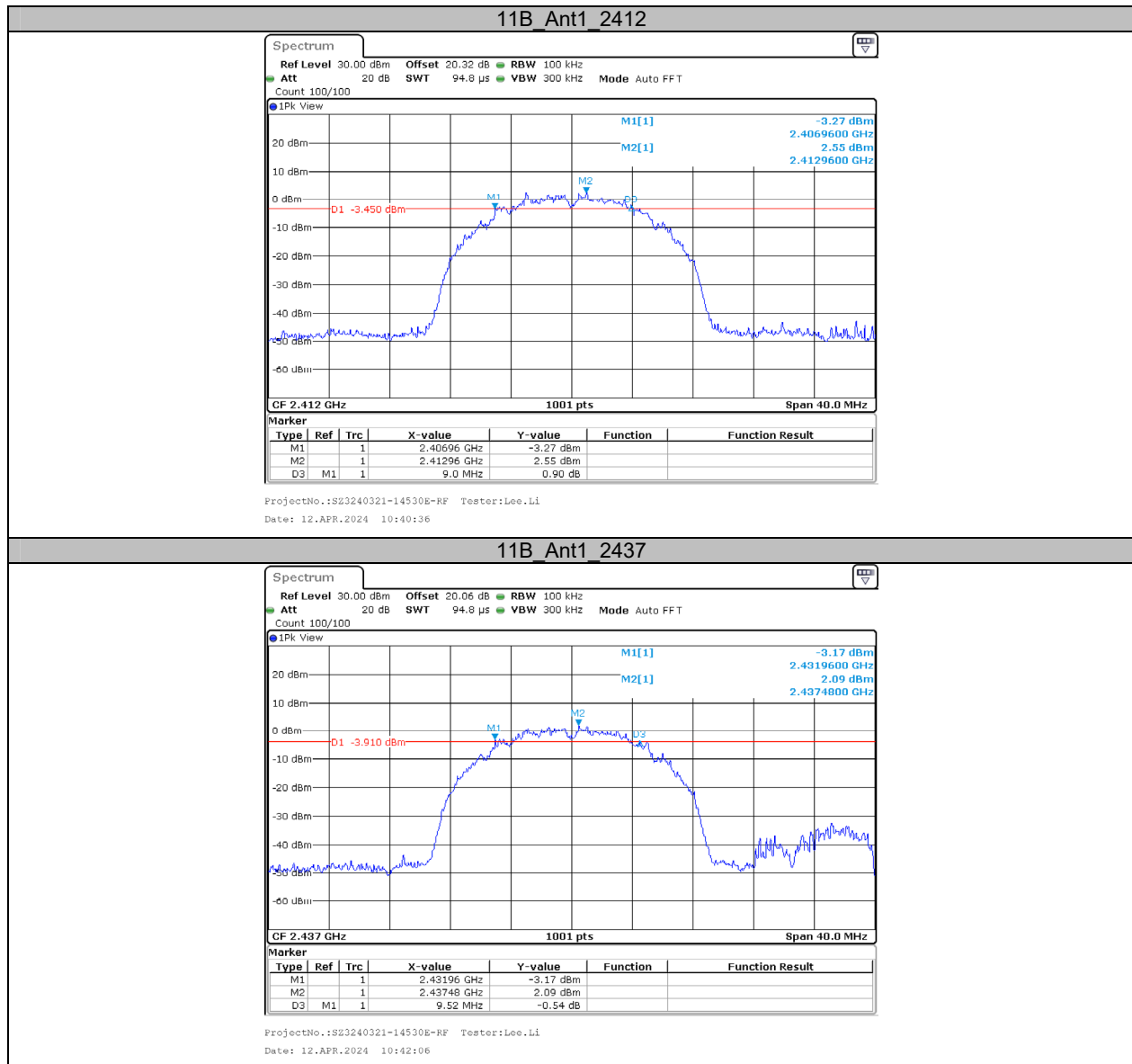
#### Test Graphs

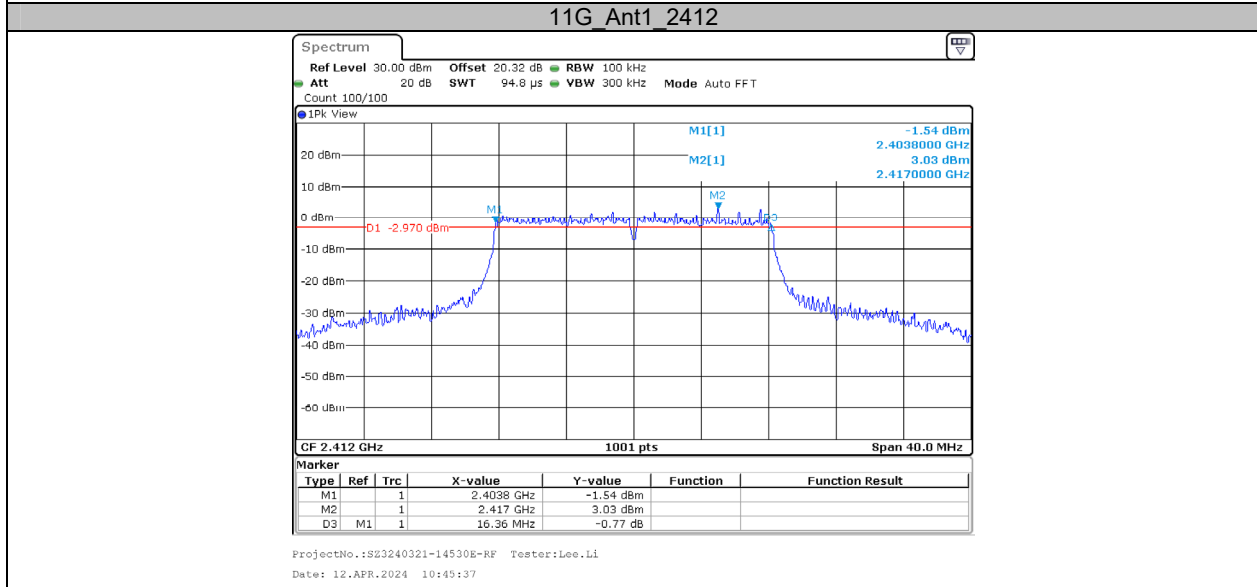
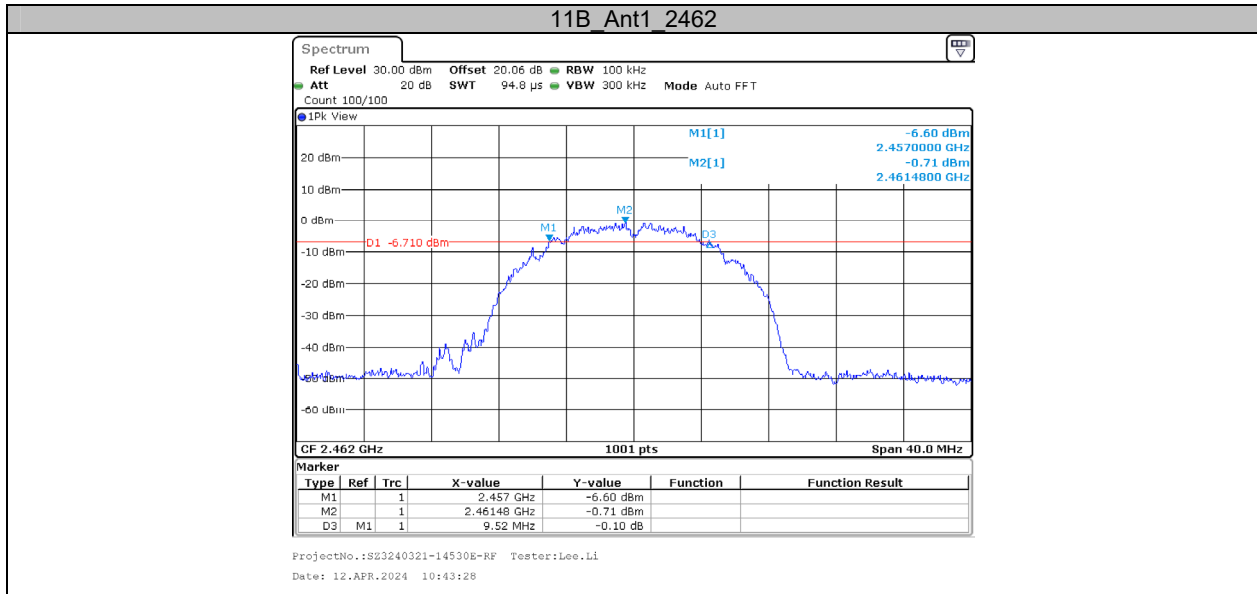


**2.4G Wi-Fi****Appendix A: DTS Bandwidth****Test Result**

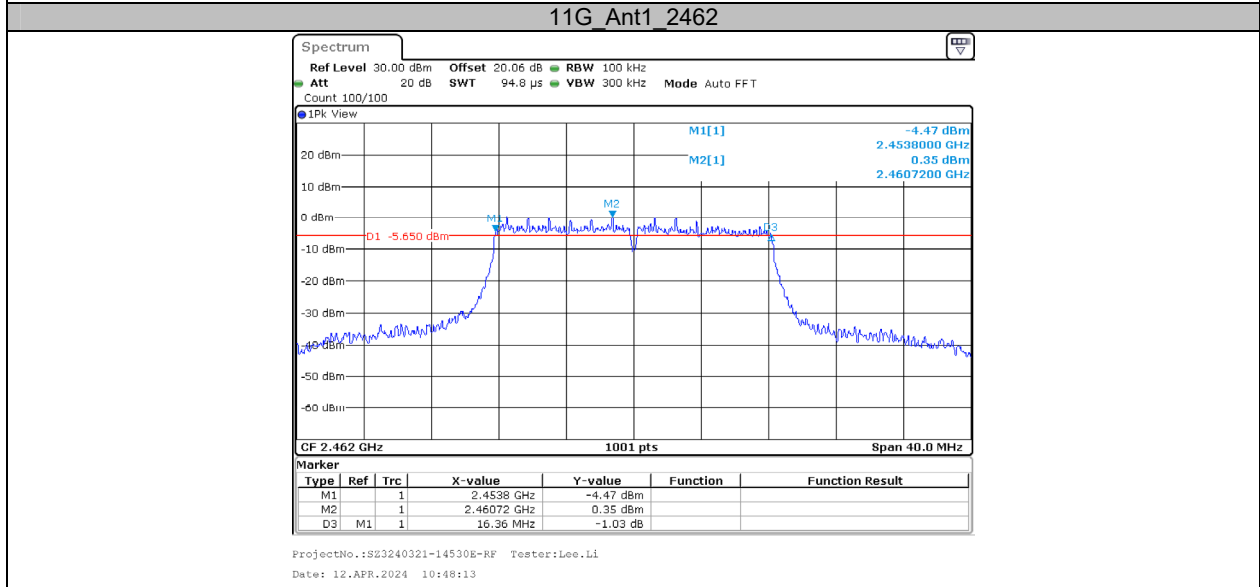
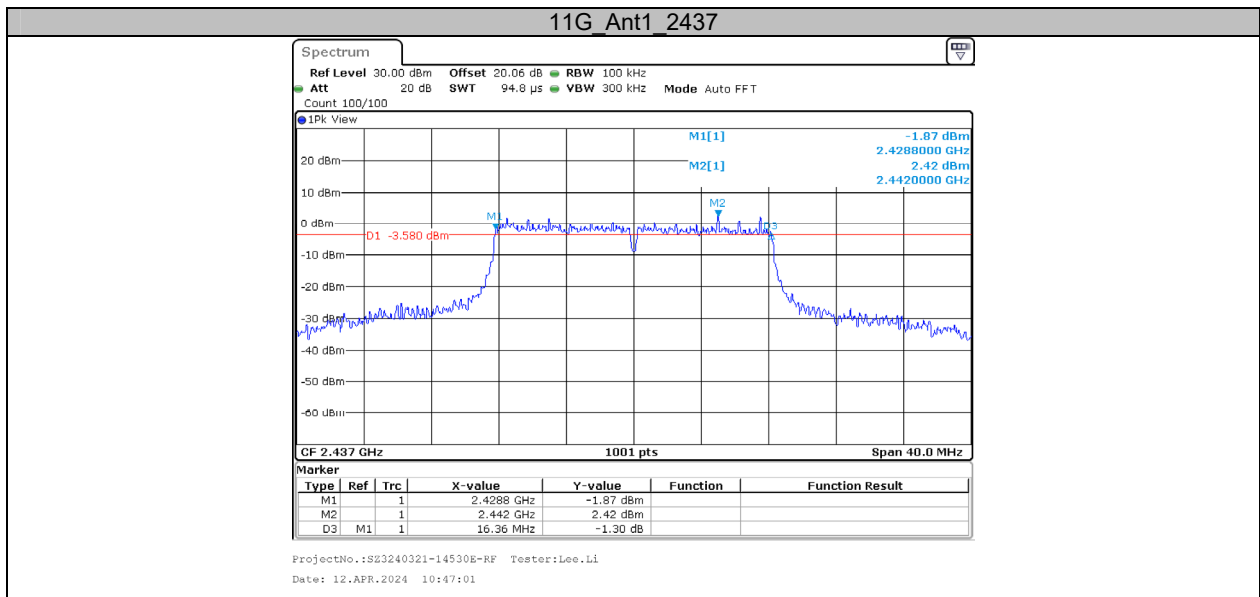
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.00	2406.96	2415.96	0.5	PASS
		2437	9.52	2431.96	2441.48	0.5	PASS
		2462	9.52	2457.00	2466.52	0.5	PASS
11G	Ant1	2412	16.36	2403.80	2420.16	0.5	PASS
		2437	16.36	2428.80	2445.16	0.5	PASS
		2462	16.36	2453.80	2470.16	0.5	PASS
11N20SISO	Ant1	2412	16.96	2403.44	2420.40	0.5	PASS
		2437	16.68	2428.48	2445.16	0.5	PASS
		2462	16.72	2453.44	2470.16	0.5	PASS
11N40SISO	Ant1	2422	35.04	2404.48	2439.52	0.5	PASS
		2437	35.12	2419.40	2454.52	0.5	PASS
		2452	35.04	2434.48	2469.52	0.5	PASS

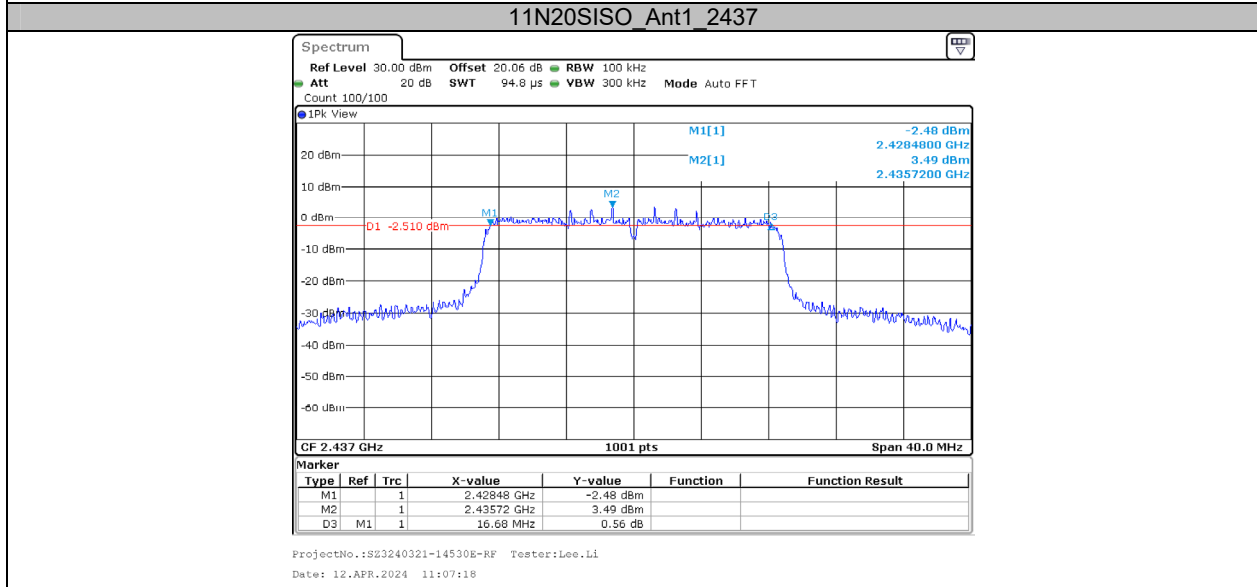
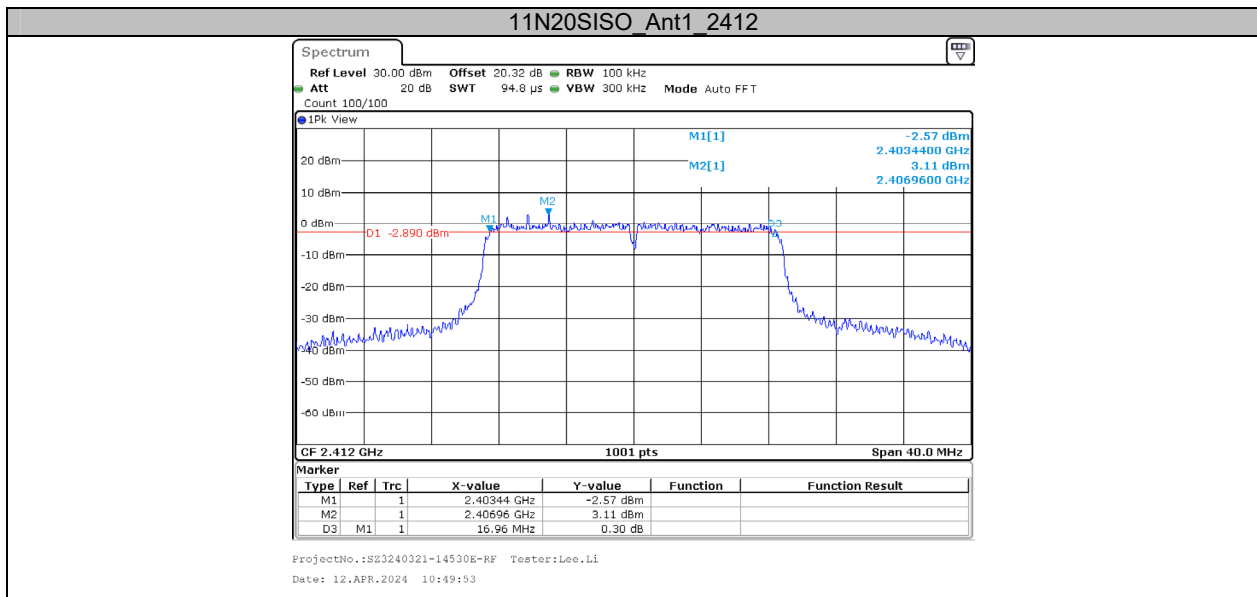
### Test Graphs

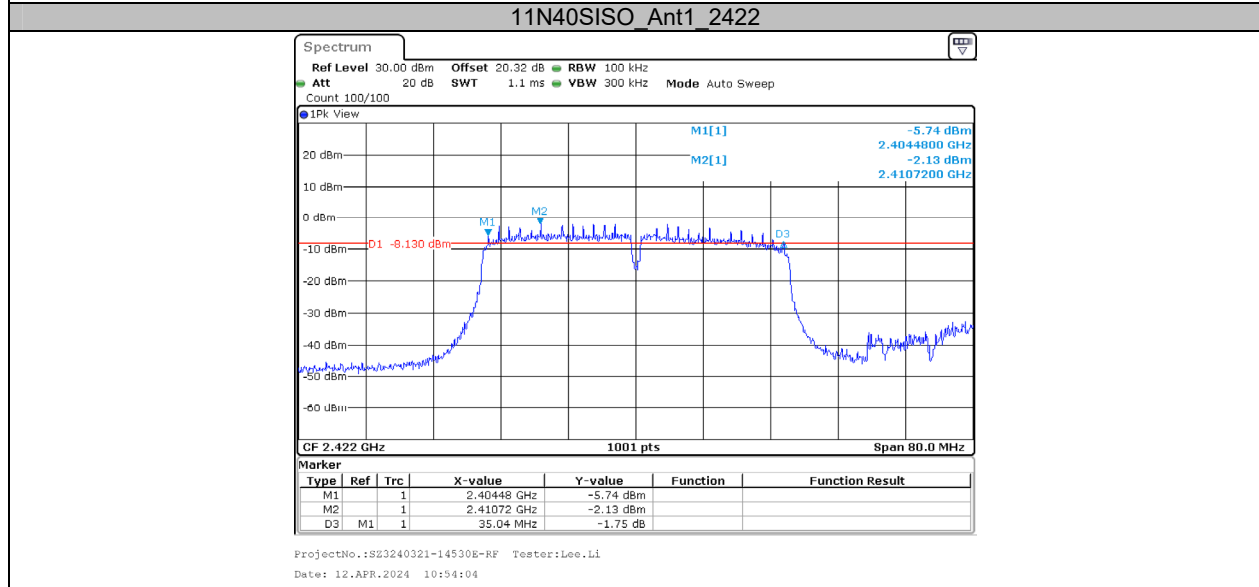
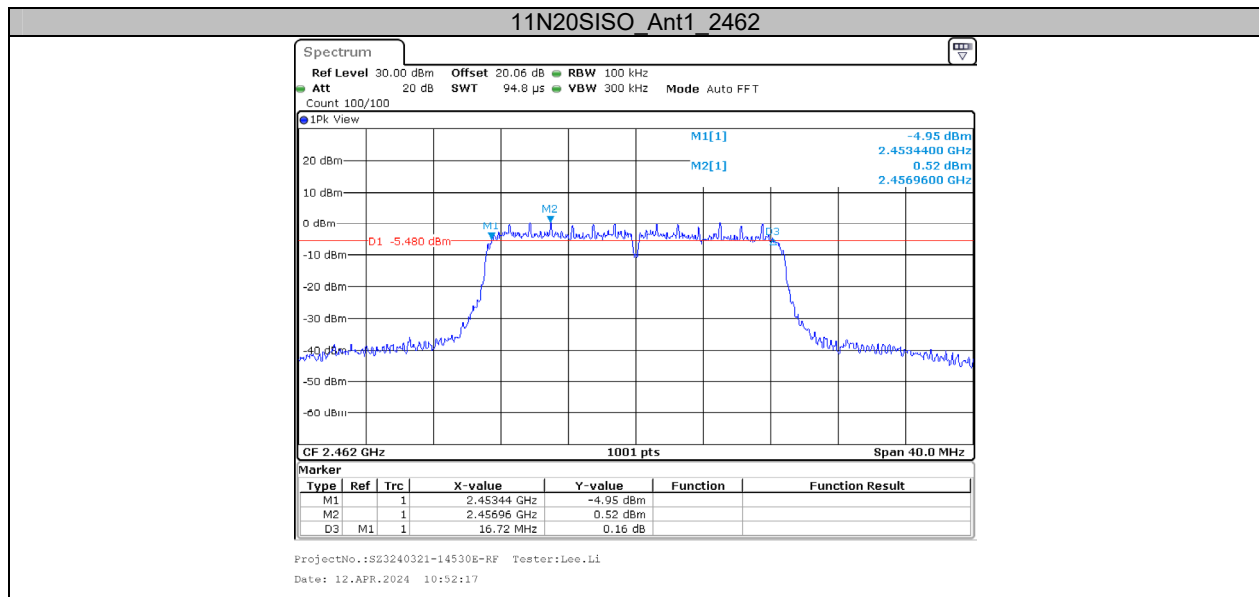


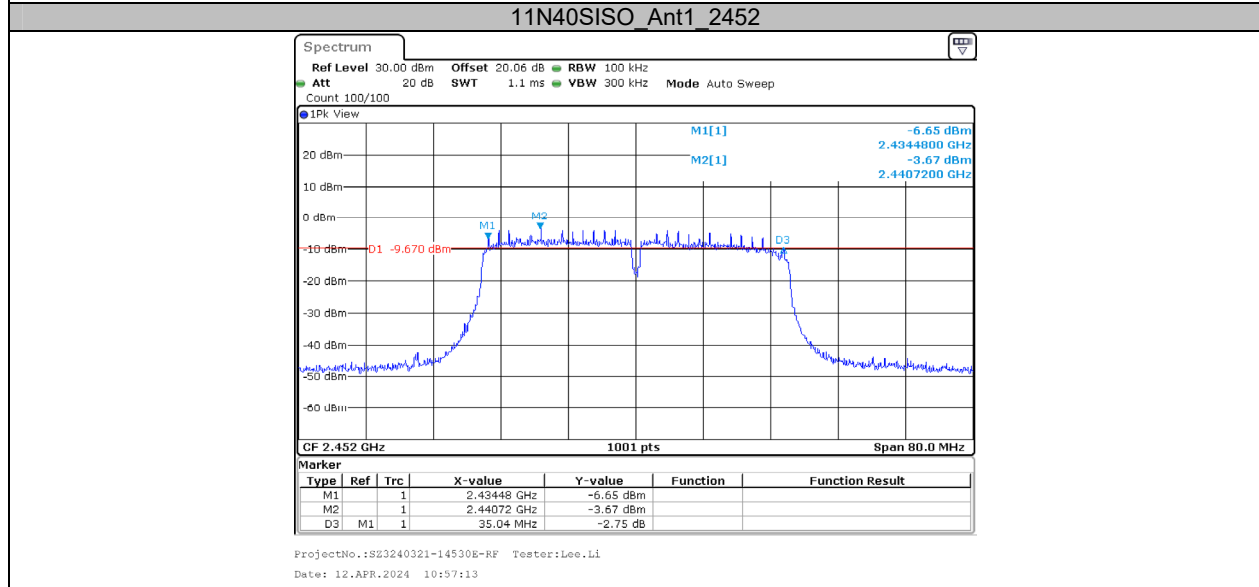
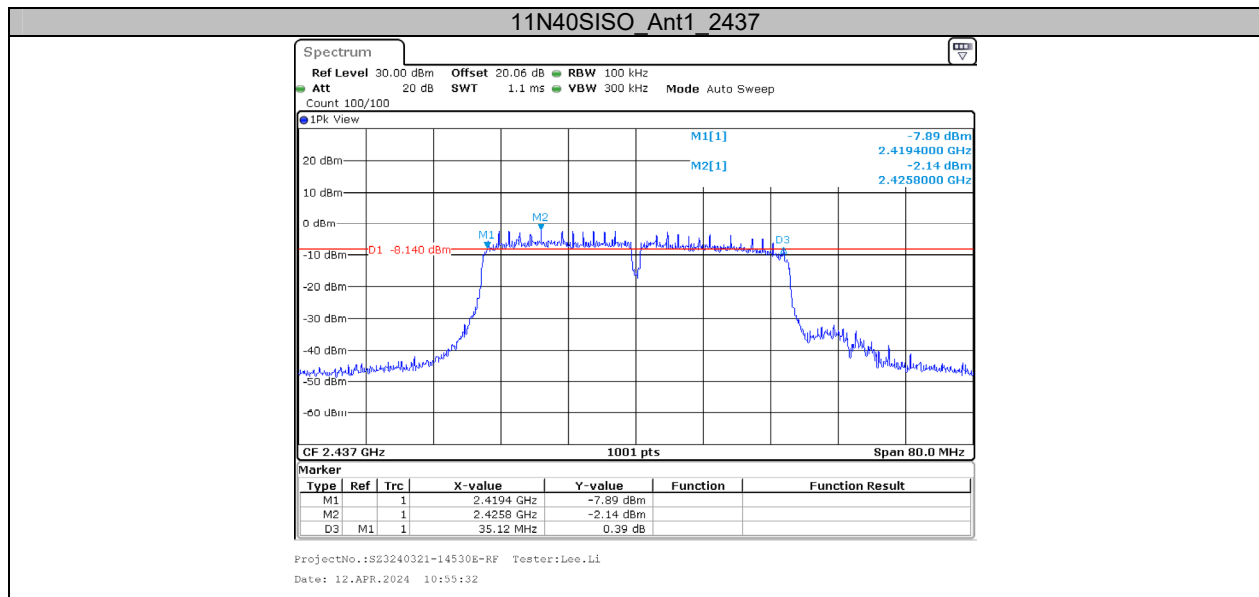










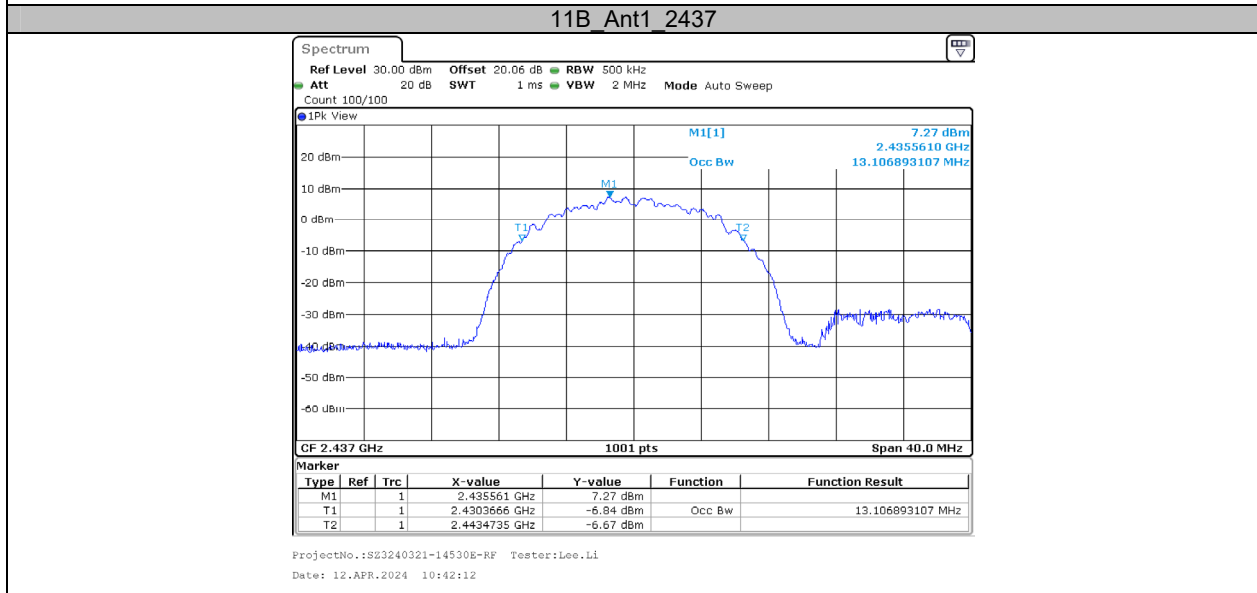
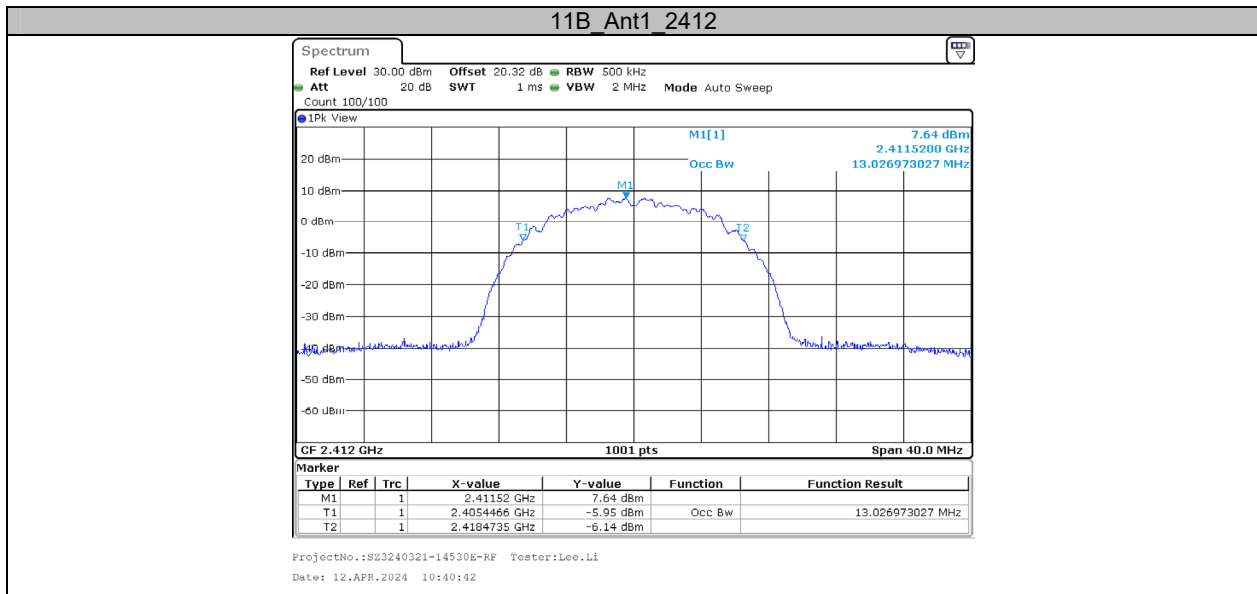


**Appendix B: Occupied Channel Bandwidth**

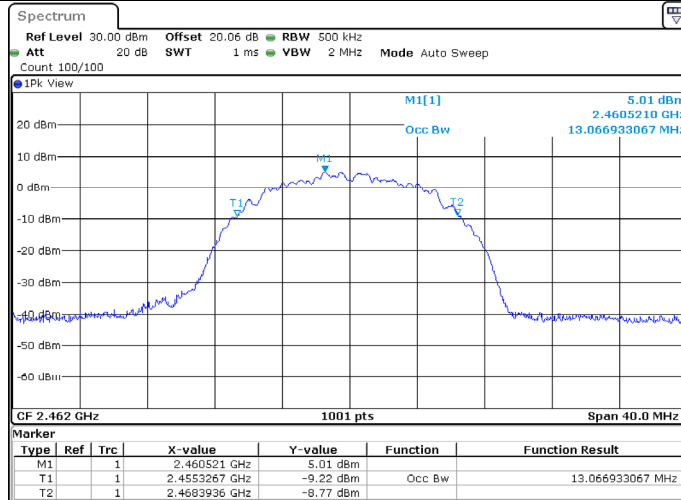
**Test Result**

Test Mode	Antenna	Channel Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.027	2405.4466	2418.4735	---	---
		2437	13.107	2430.3666	2443.4735	---	---
		2462	13.067	2455.3267	2468.3936	---	---
11G	Ant1	2412	17.023	2403.4885	2420.5115	---	---
		2437	17.183	2428.3686	2445.5514	---	---
		2462	16.983	2453.4486	2470.4316	---	---
11N20SISO	Ant1	2412	17.582	2403.2088	2420.7912	---	---
		2437	17.662	2428.1289	2445.7912	---	---
		2462	17.502	2453.2088	2470.7113	---	---
11N40SISO	Ant1	2422	35.804	2404.0180	2439.8222	---	---
		2437	36.044	2418.8581	2454.9021	---	---
		2452	35.964	2433.8581	2469.8222	---	---

### Test Graphs

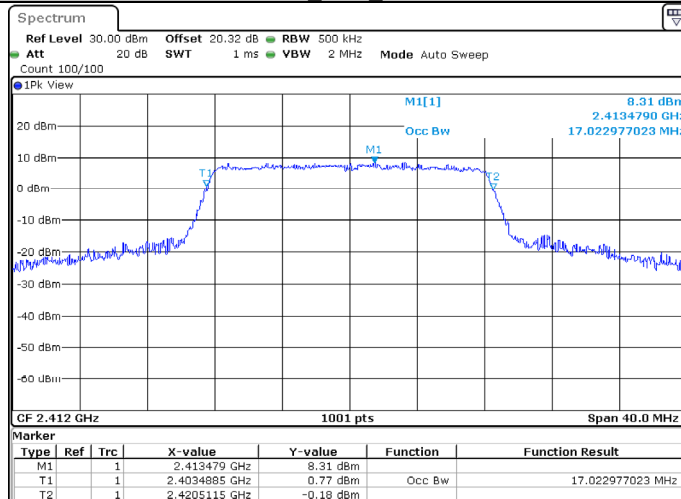


11B\_Ant1\_2462



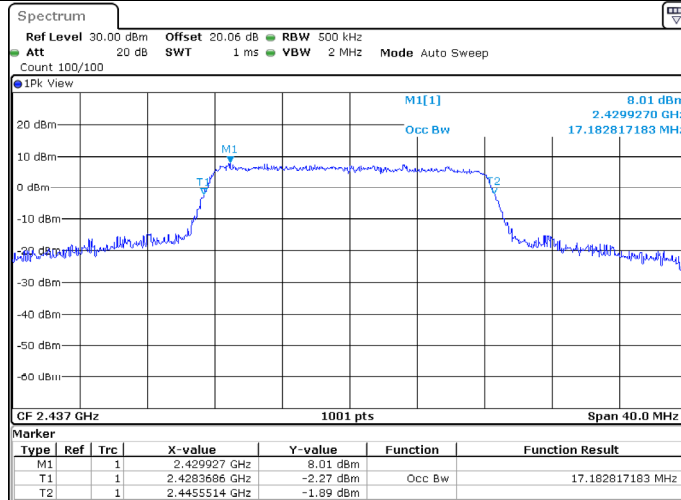
ProjectNo.:SZ3240321-14530E-RF Tester:Lee.Li  
 Date: 12.APR.2024 10:43:33

11G\_Ant1\_2412



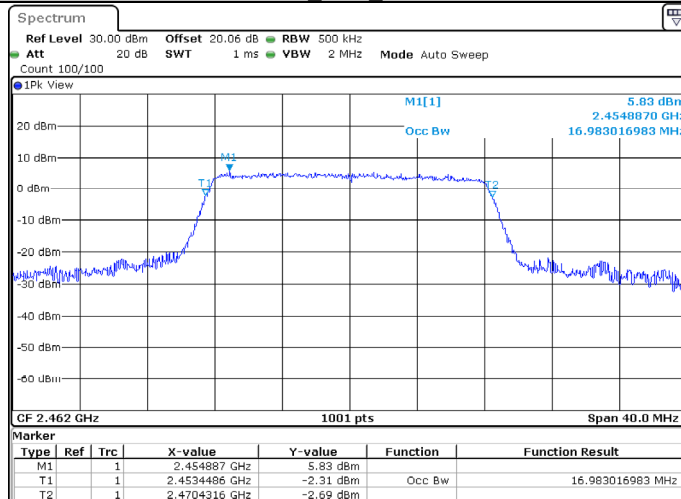
ProjectNo.:SZ3240321-14530E-RF Tester:Lee.Li  
 Date: 12.APR.2024 10:45:43

11G Ant1\_2437



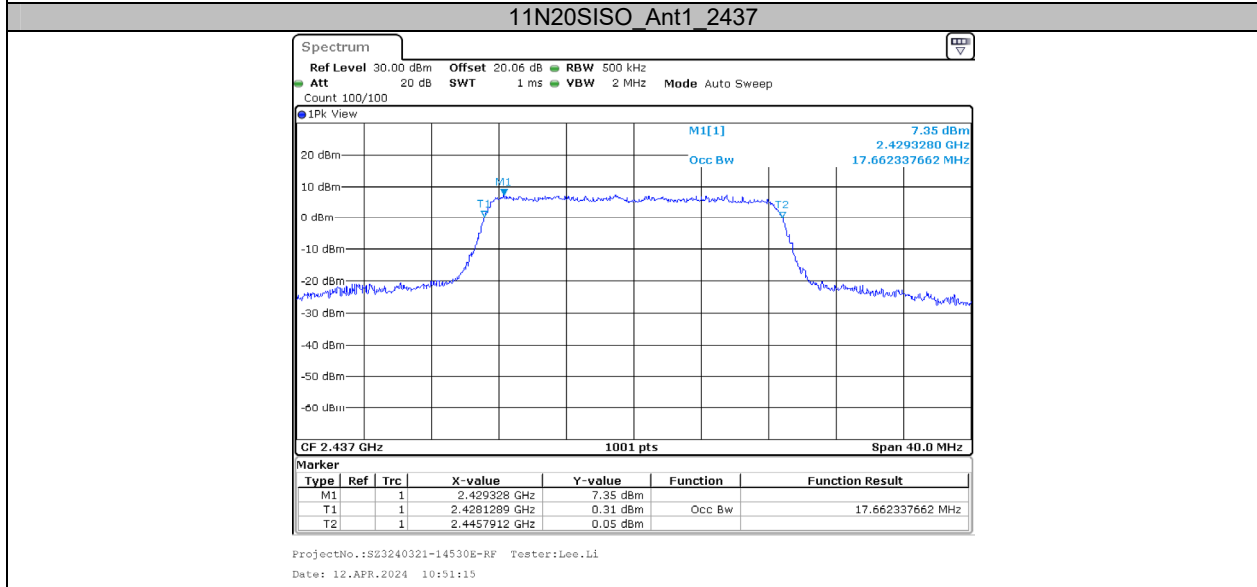
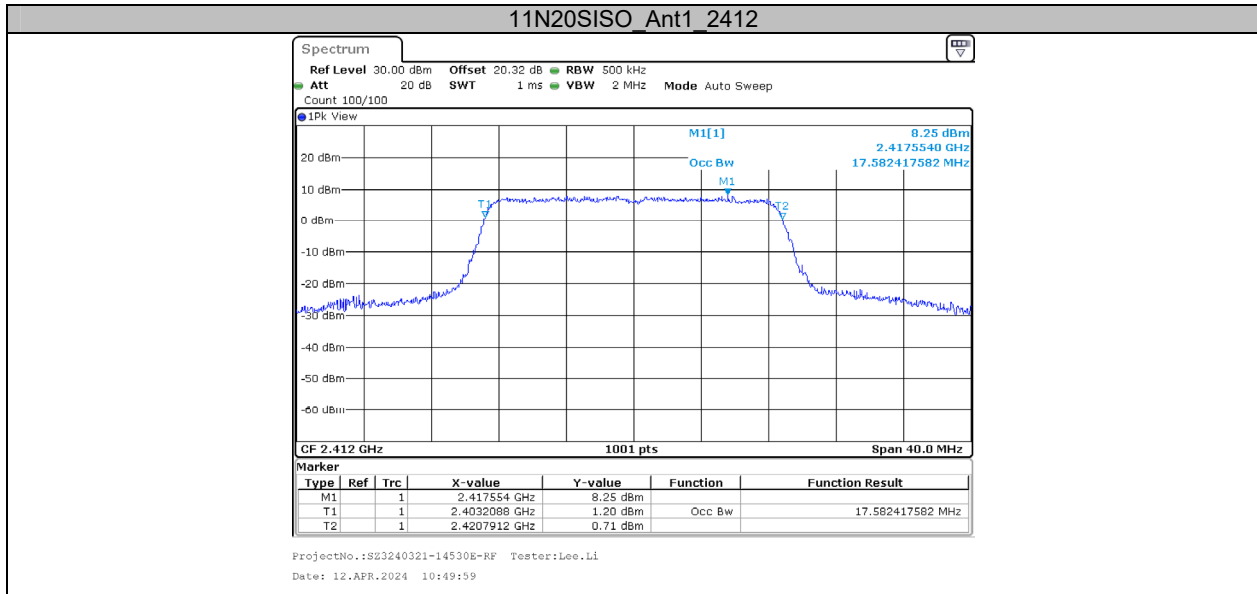
ProjectNo.:SZ3240321-14530E-RF Tester:Lee.Li  
 Date: 12.APR.2024 10:47:06

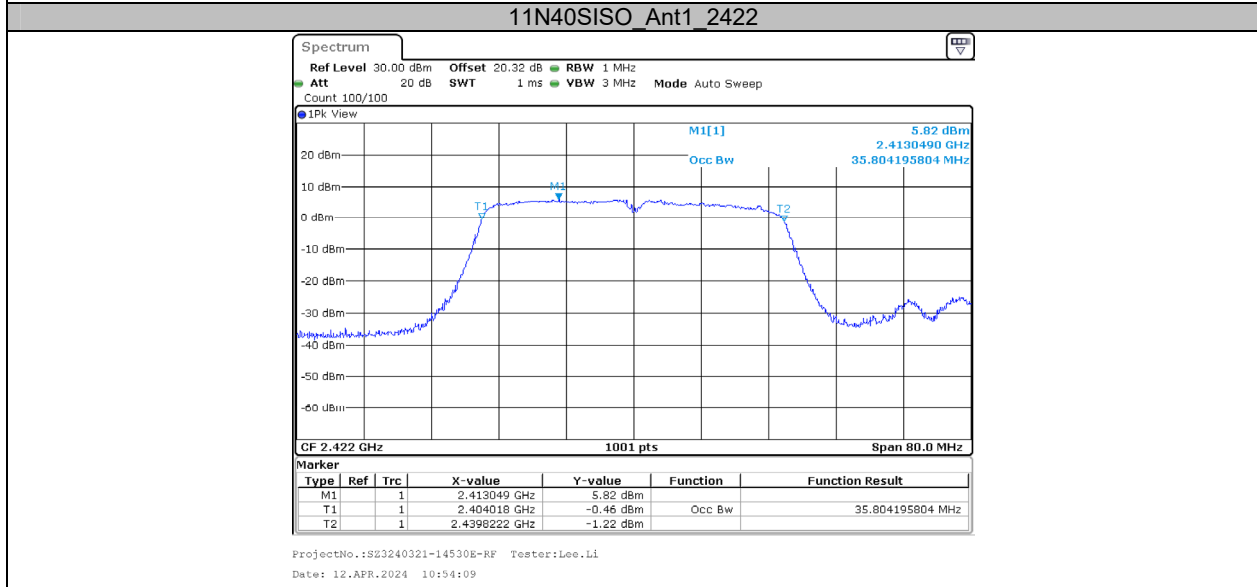
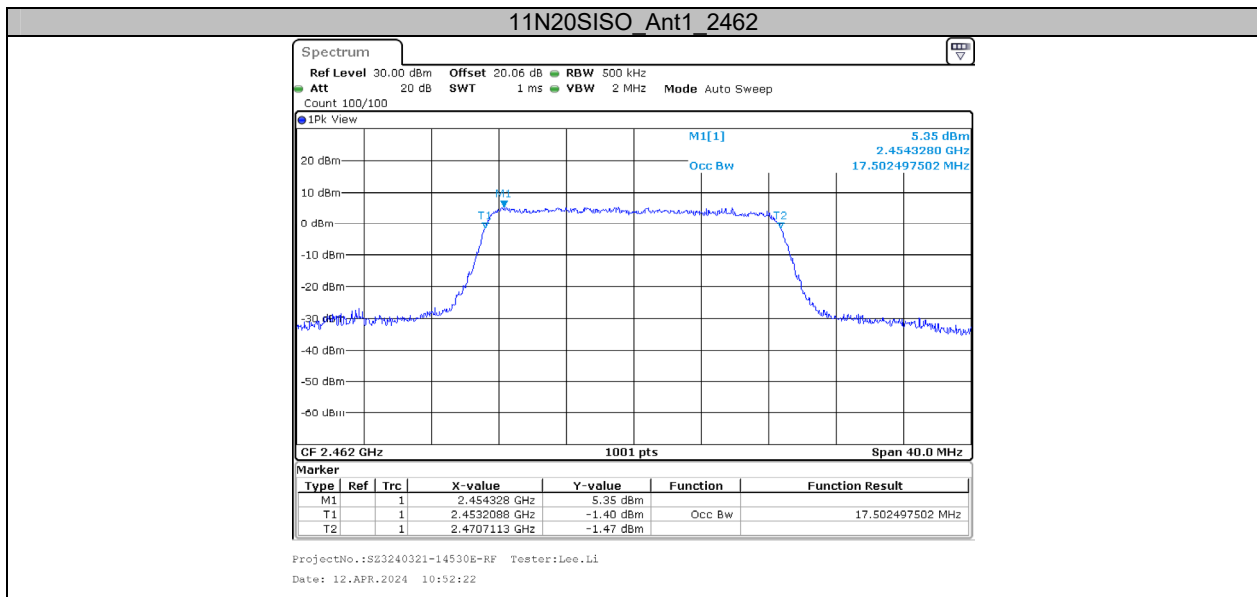
11G Ant1\_2462

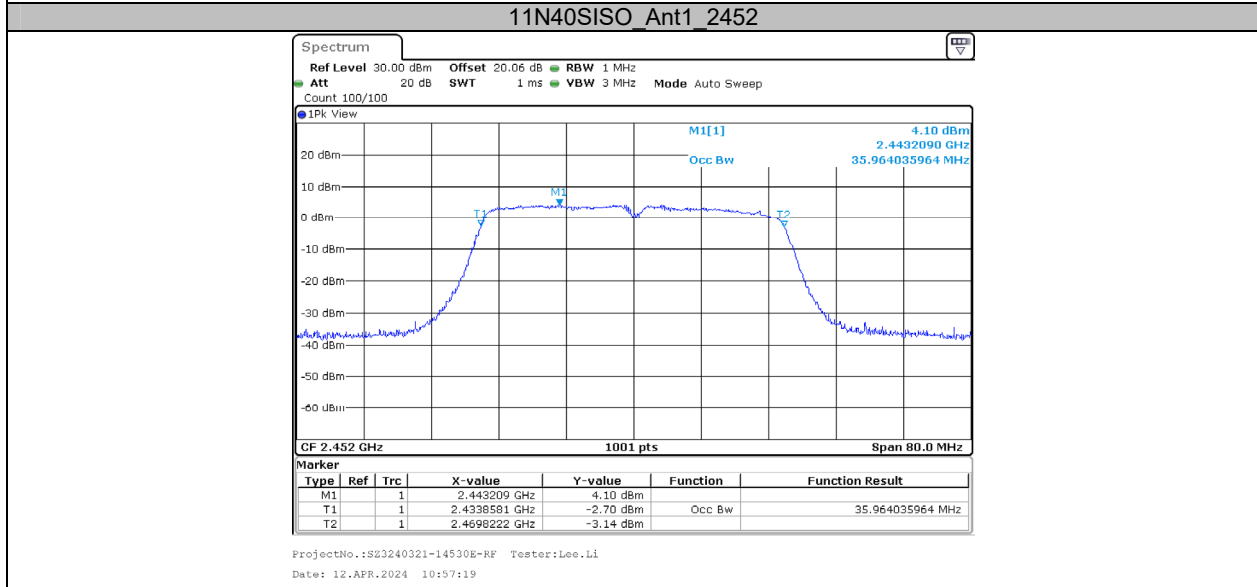
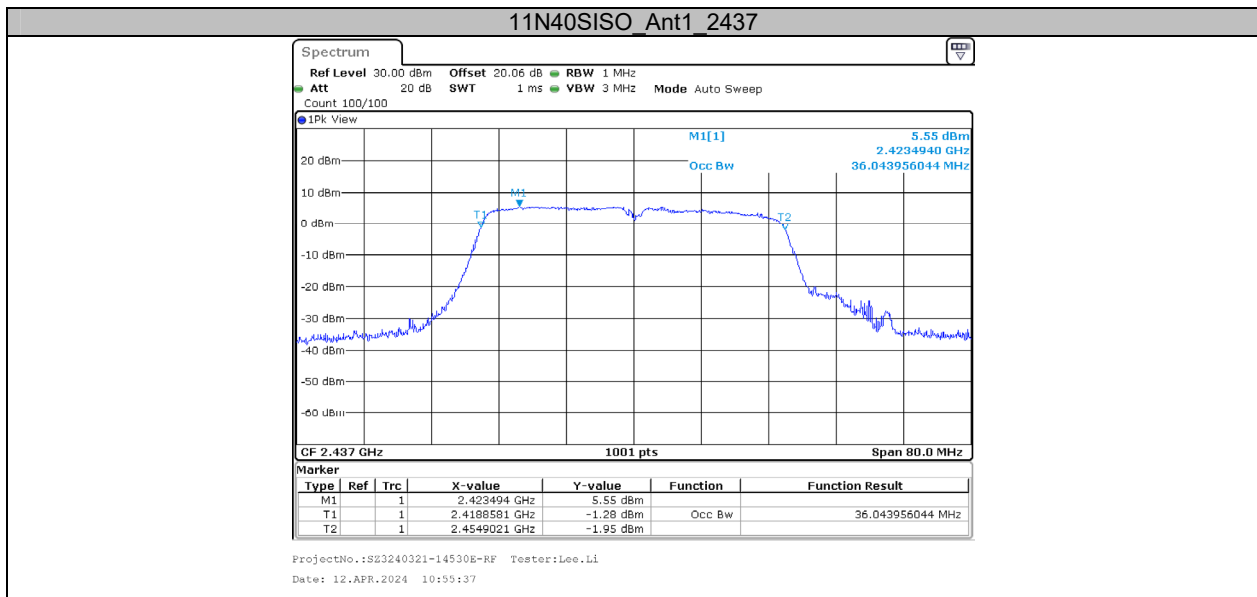


ProjectNo.:SZ3240321-14530E-RF Tester:Lee.Li  
 Date: 12.APR.2024 10:48:19









**Appendix C: Maximum conducted output power**

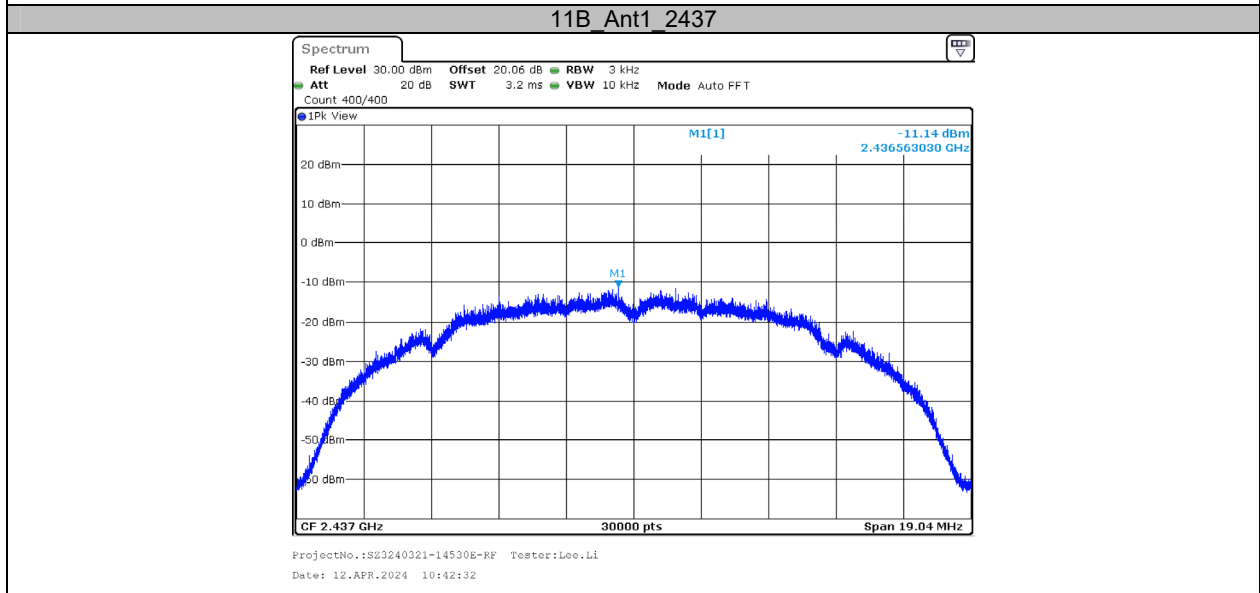
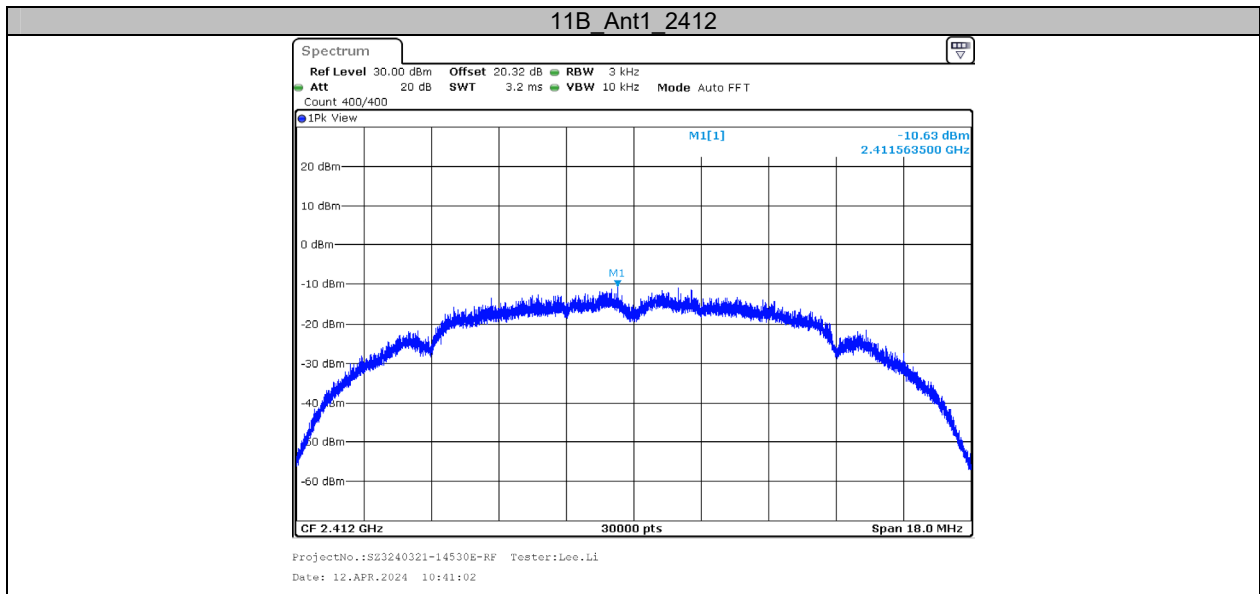
**Test Result Peak**

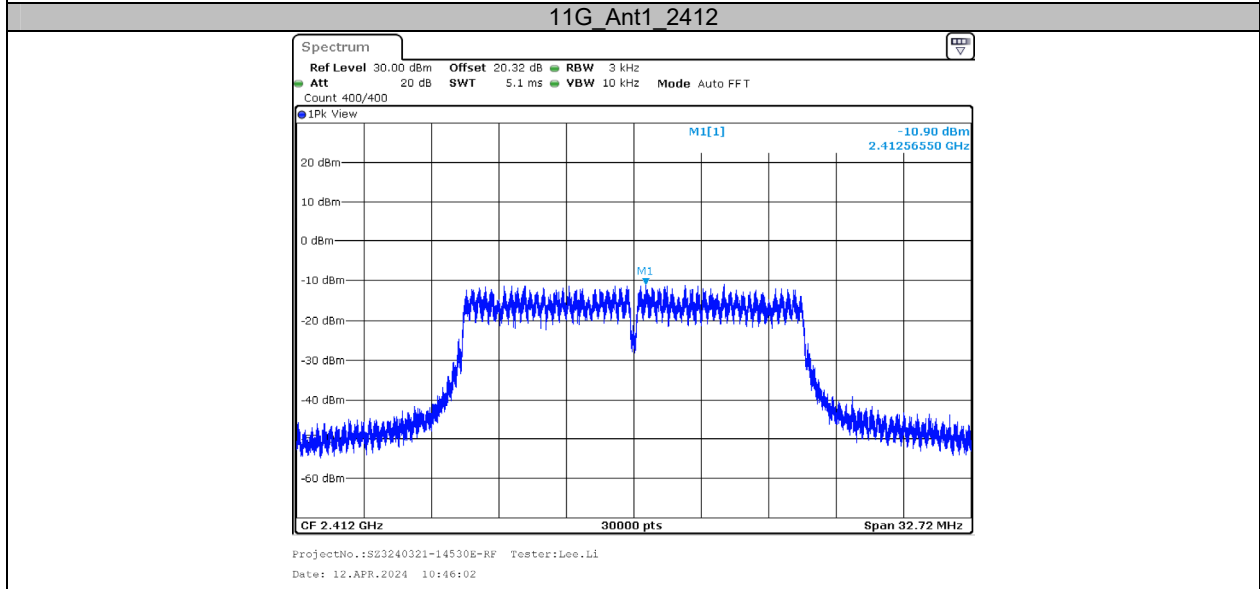
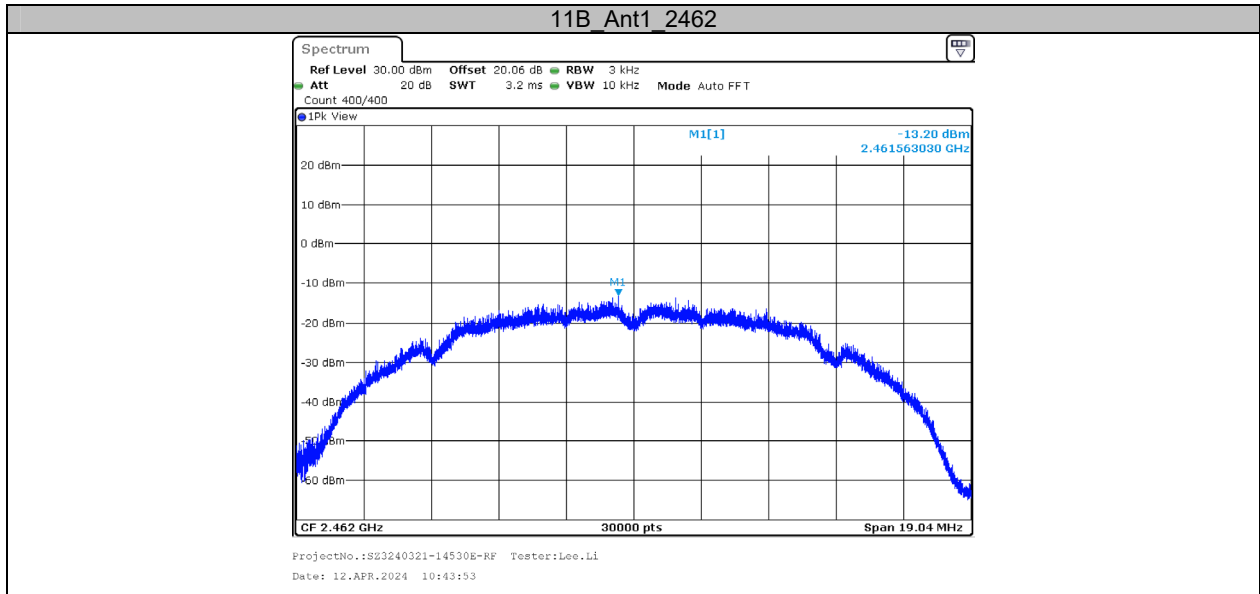
Test Mode	Antenna	Frequency [MHz]	Conducted Output Peak Power [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	17.50	≤30.00	PASS
		2437	17.04	≤30.00	PASS
		2462	14.82	≤30.00	PASS
11G	Ant1	2412	22.09	≤30.00	PASS
		2437	21.24	≤30.00	PASS
		2462	19.27	≤30.00	PASS
11N20SISO	Ant1	2412	22.09	≤30.00	PASS
		2437	21.40	≤30.00	PASS
		2462	19.45	≤30.00	PASS
11N40SISO	Ant1	2422	19.26	≤30.00	PASS
		2437	19.05	≤30.00	PASS
		2452	17.64	≤30.00	PASS

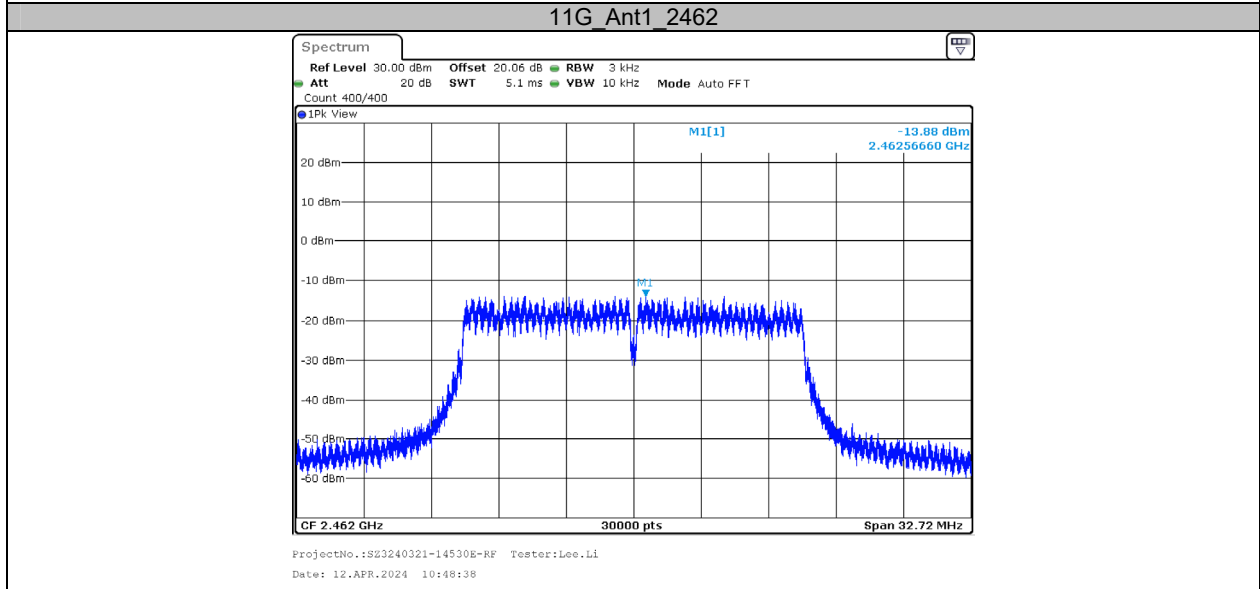
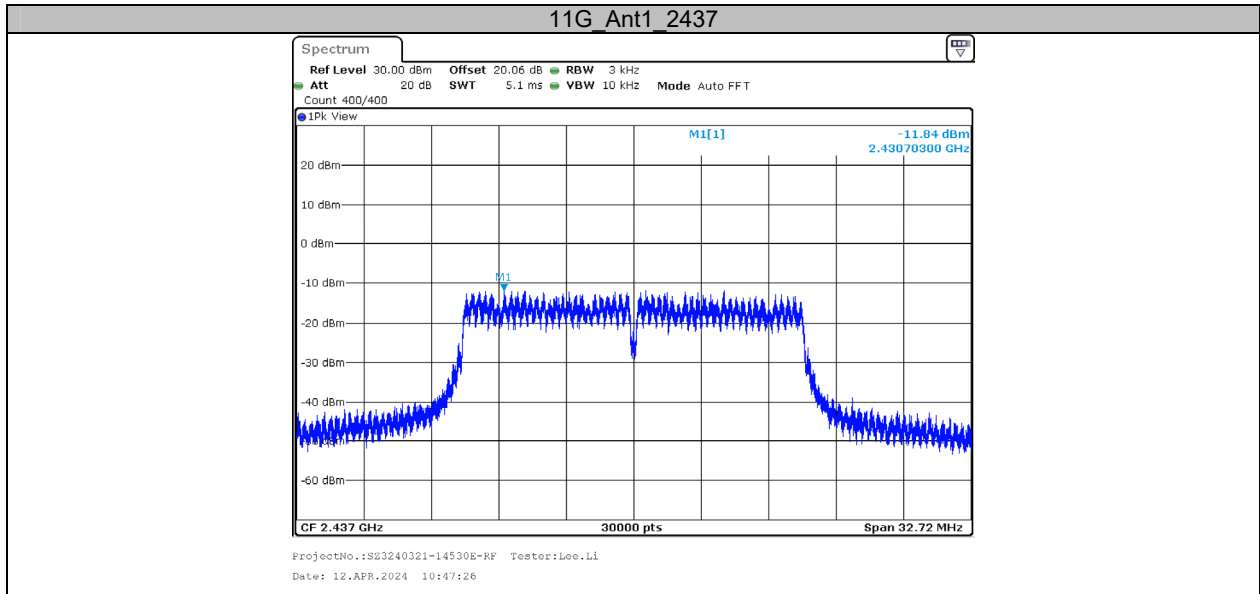
**Appendix D: Maximum power spectral density****Test Result**

Test Mode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-10.63	≤8.00	PASS
		2437	-11.14	≤8.00	PASS
		2462	-13.20	≤8.00	PASS
11G	Ant1	2412	-10.90	≤8.00	PASS
		2437	-11.84	≤8.00	PASS
		2462	-13.88	≤8.00	PASS
11N20SISO	Ant1	2412	-9.88	≤8.00	PASS
		2437	-10.69	≤8.00	PASS
		2462	-12.59	≤8.00	PASS
11N40SISO	Ant1	2422	-15.66	≤8.00	PASS
		2437	-16.22	≤8.00	PASS
		2452	-17.44	≤8.00	PASS

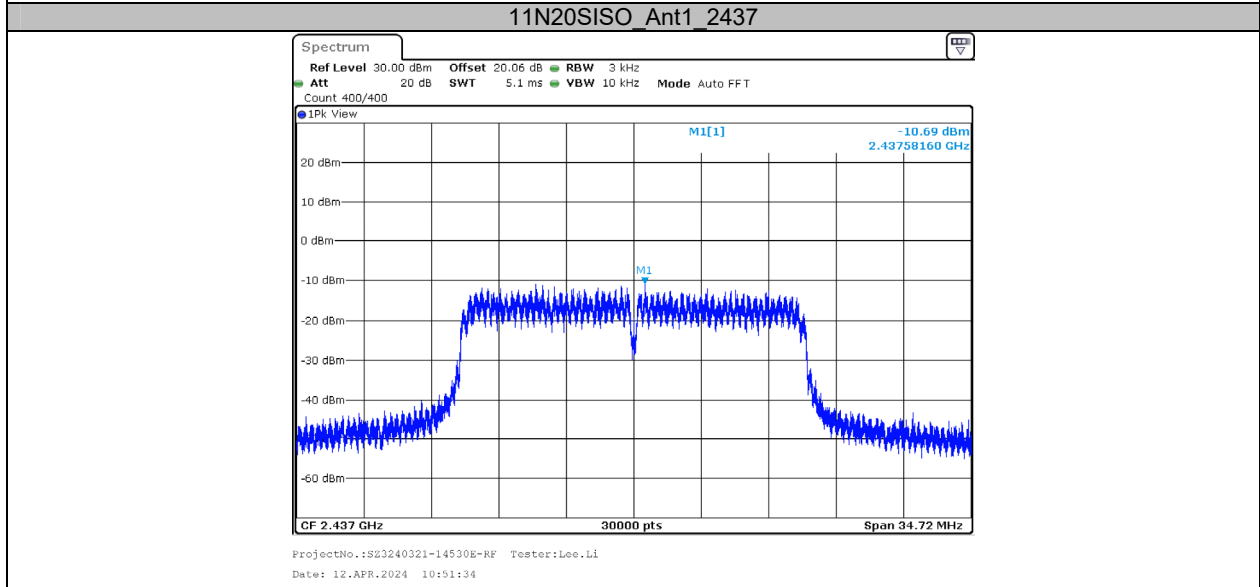
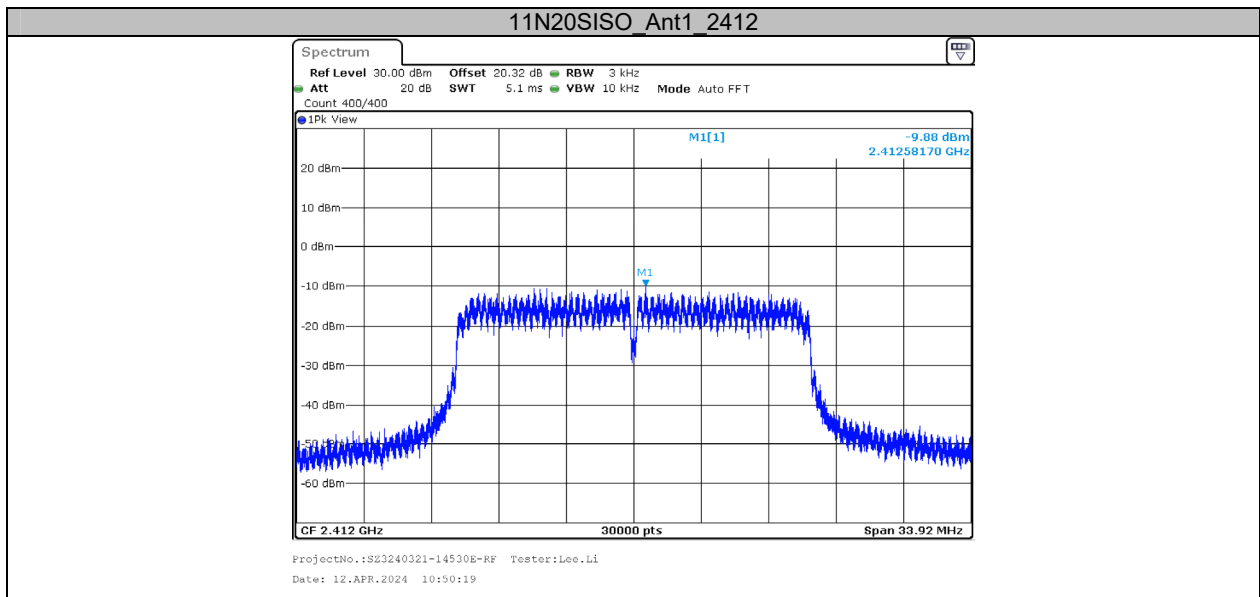
### Test Graphs

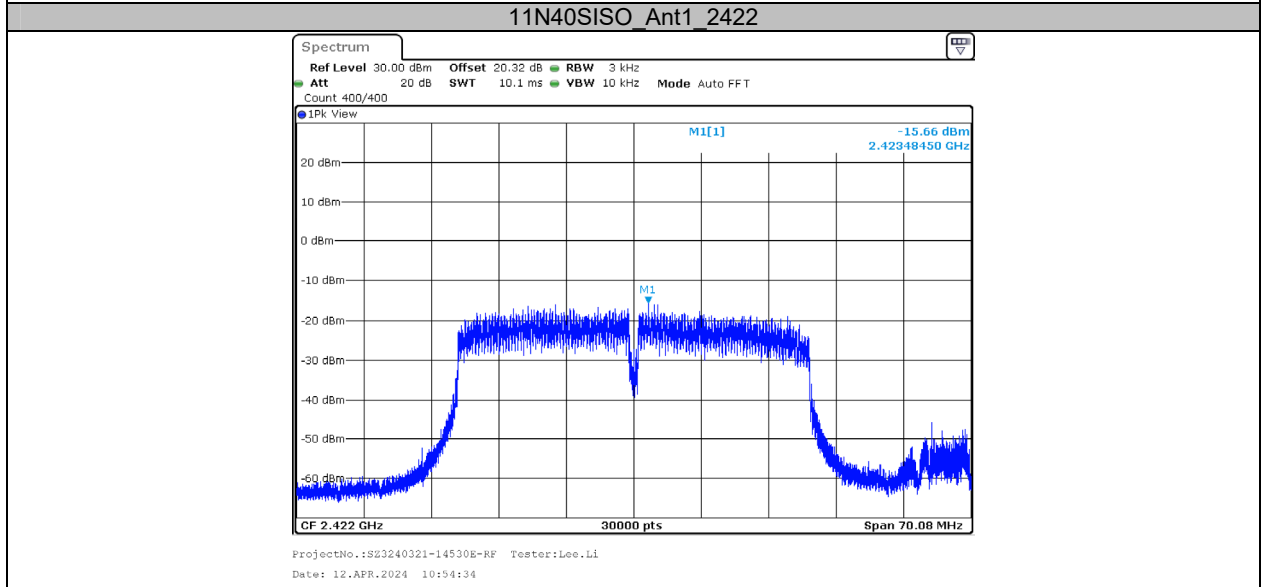
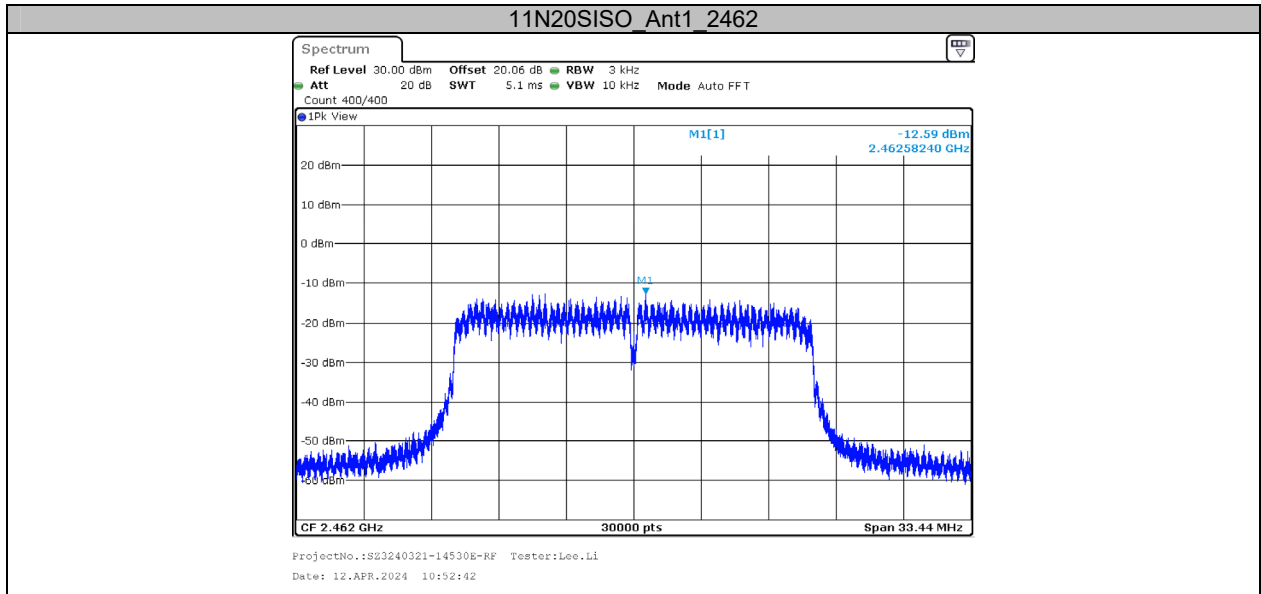


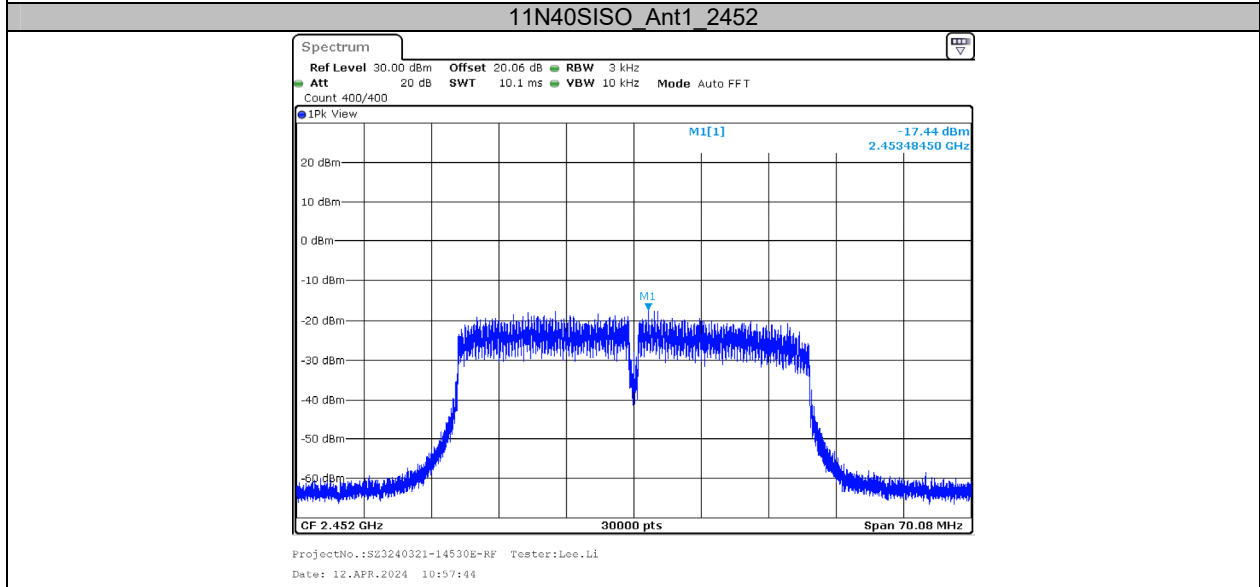
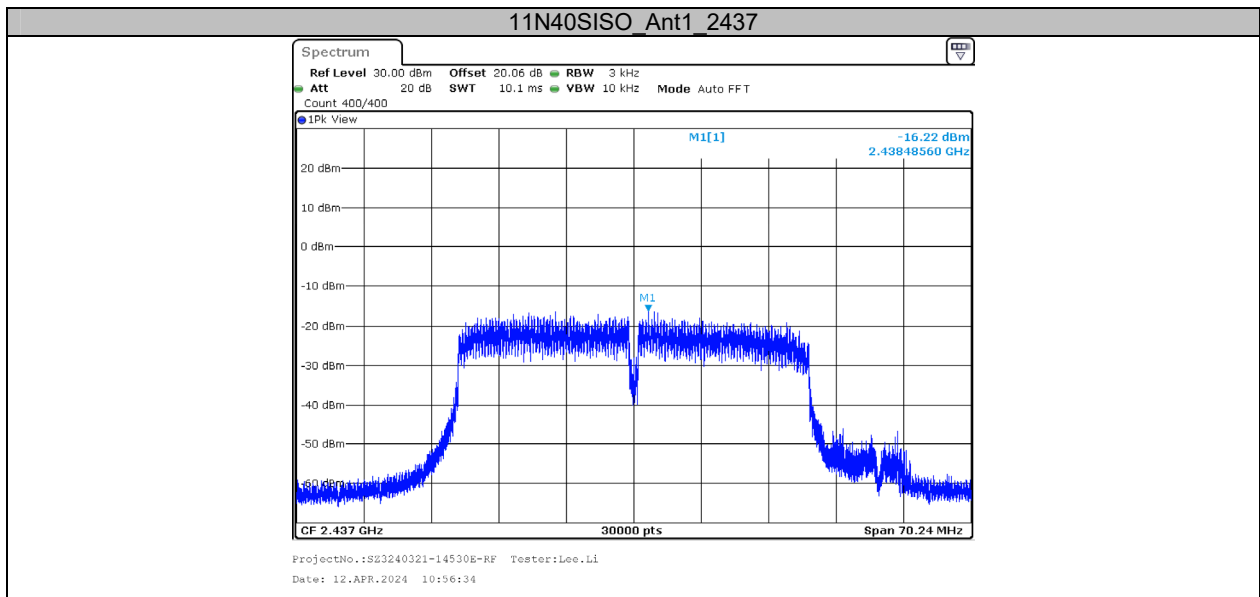






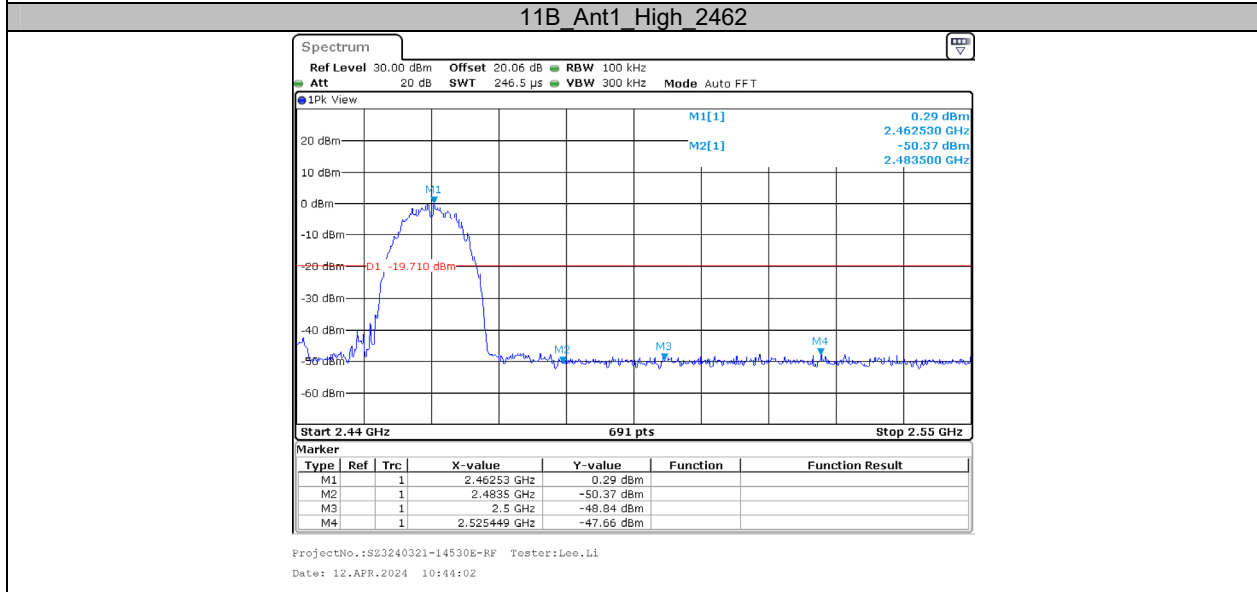
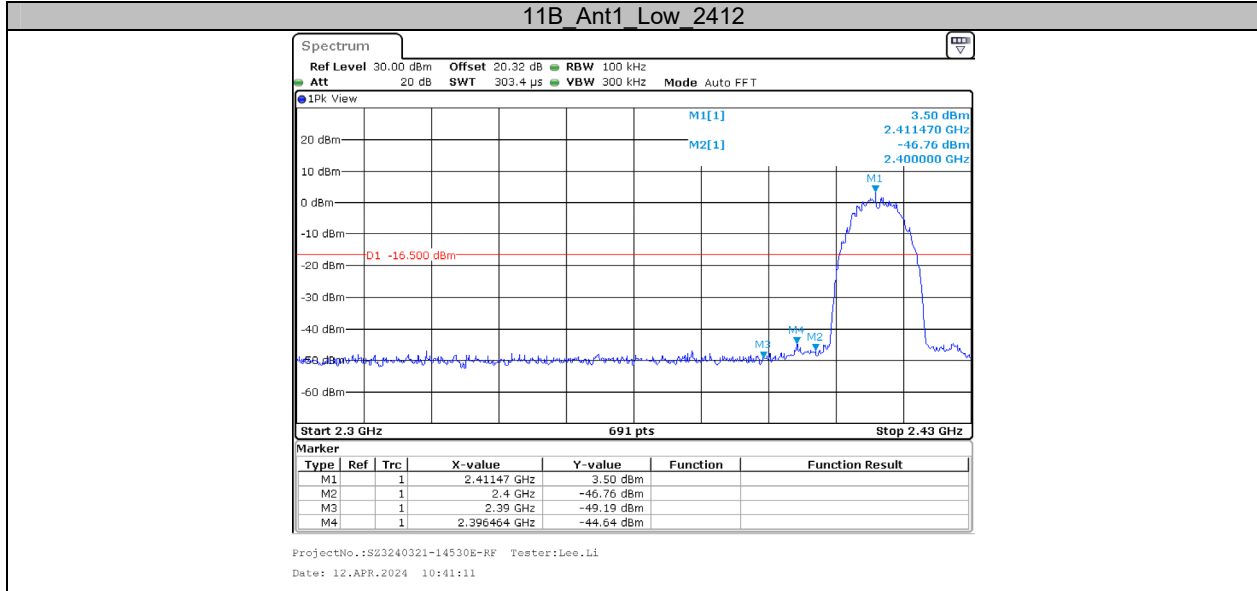




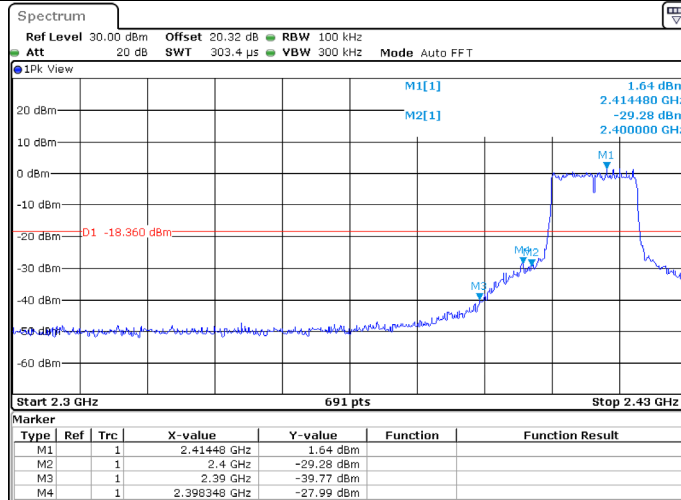


### Appendix E: Band edge measurements

#### Test Graphs

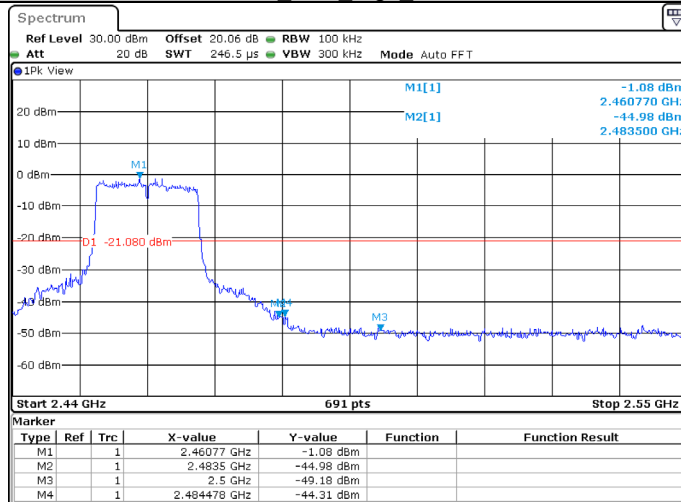


11G Ant1 Low 2412

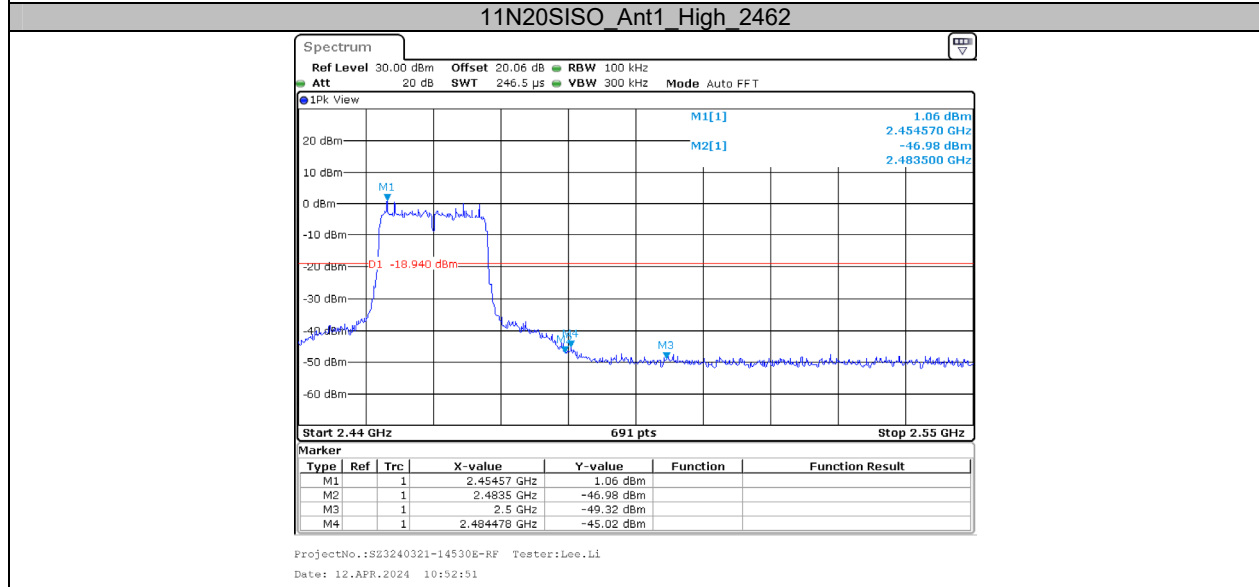
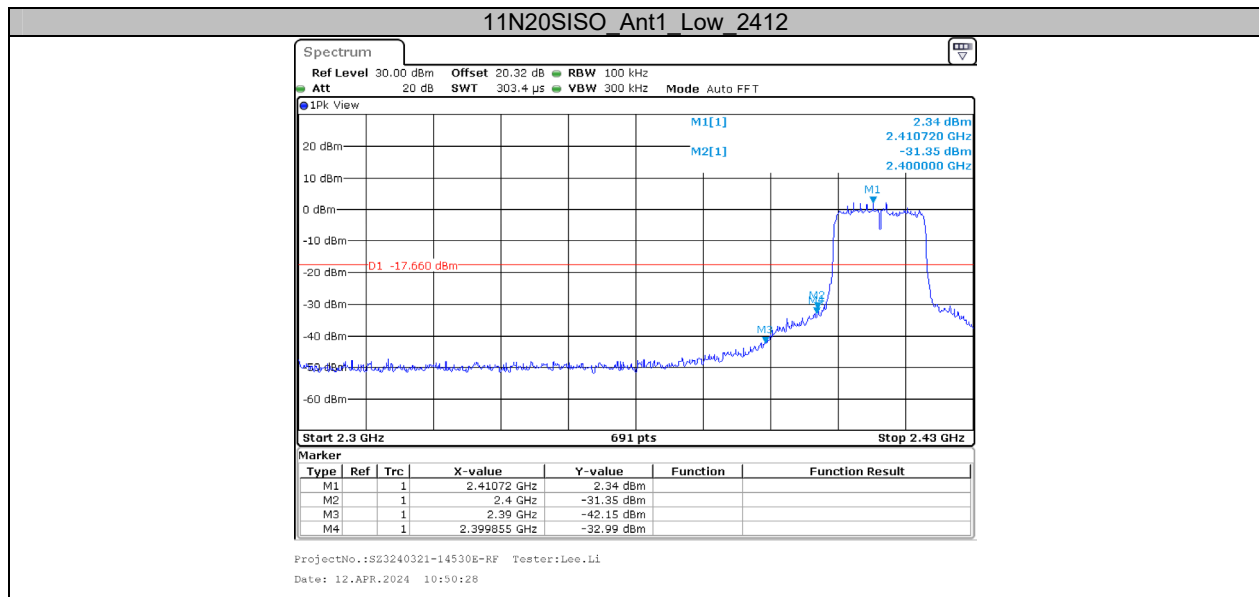


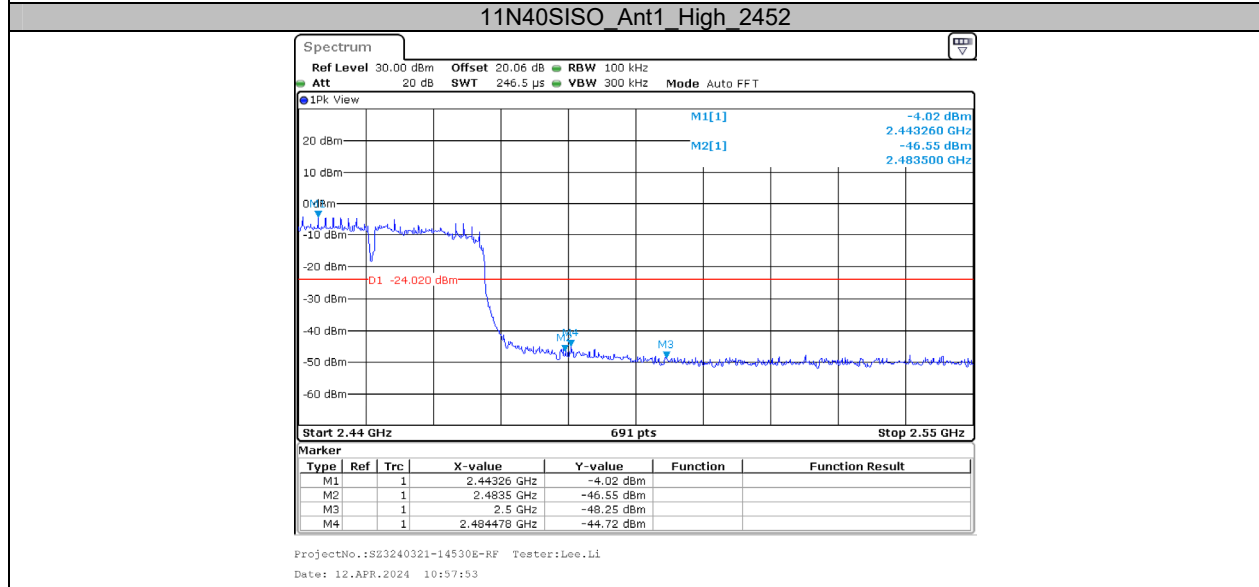
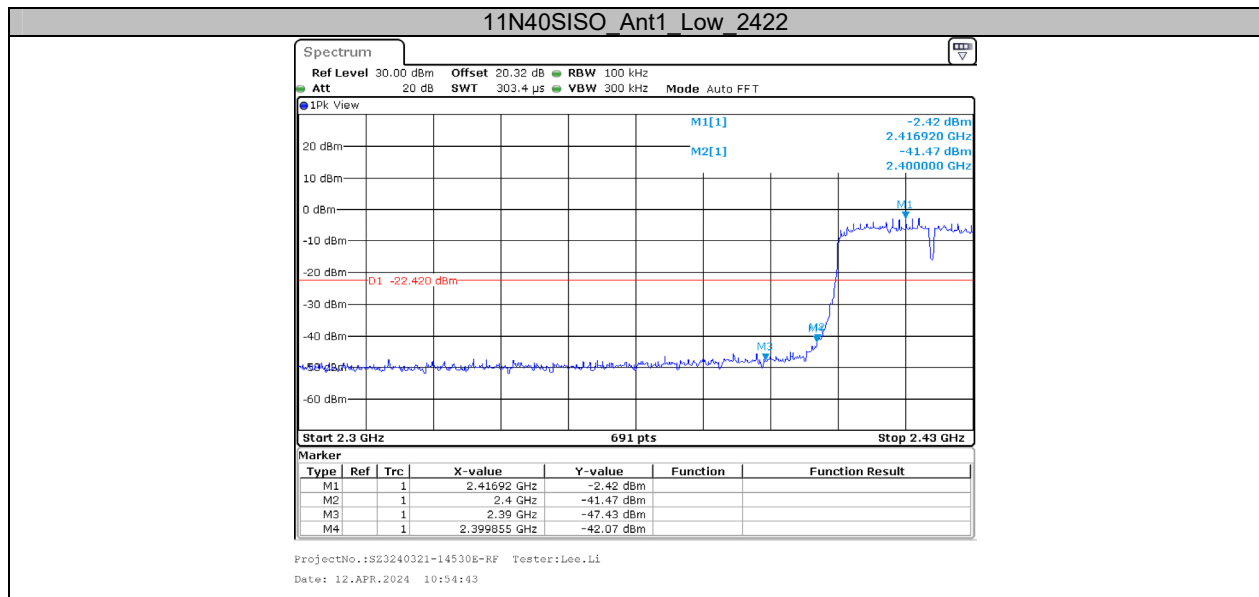
ProjectNo.:SZ3240321-14530E-RF Tester:Lee.Li  
 Date: 12.APR.2024 10:46:11

11G Ant1 High 2462



ProjectNo.:SZ3240321-14530E-RF Tester:Lee.Li  
 Date: 12.APR.2024 10:48:47



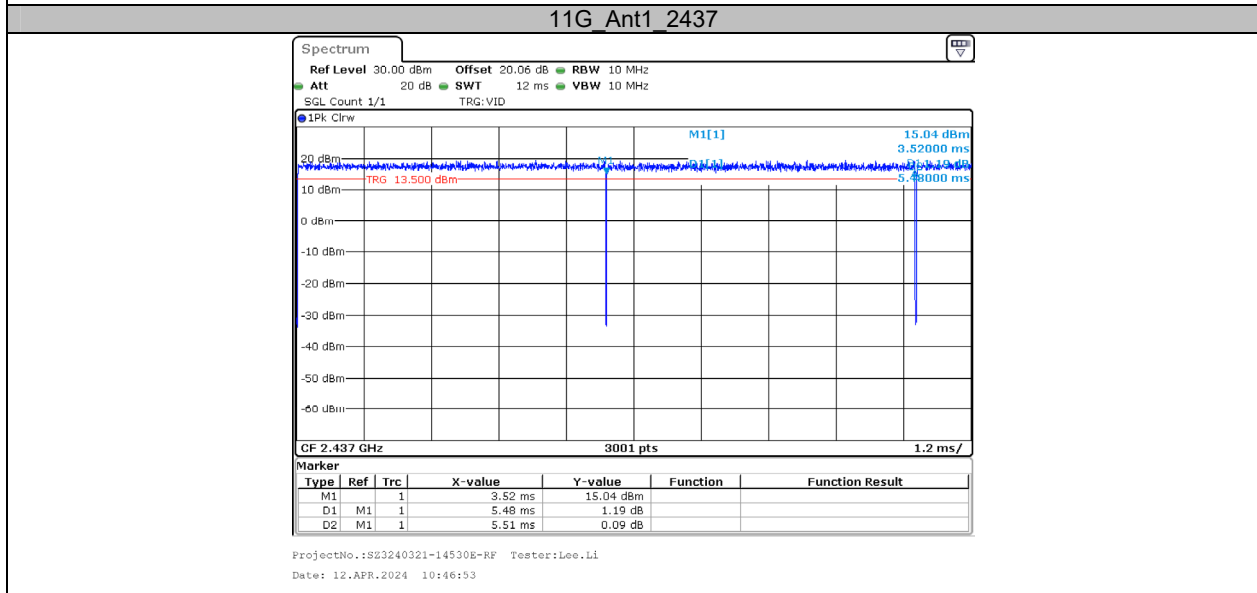
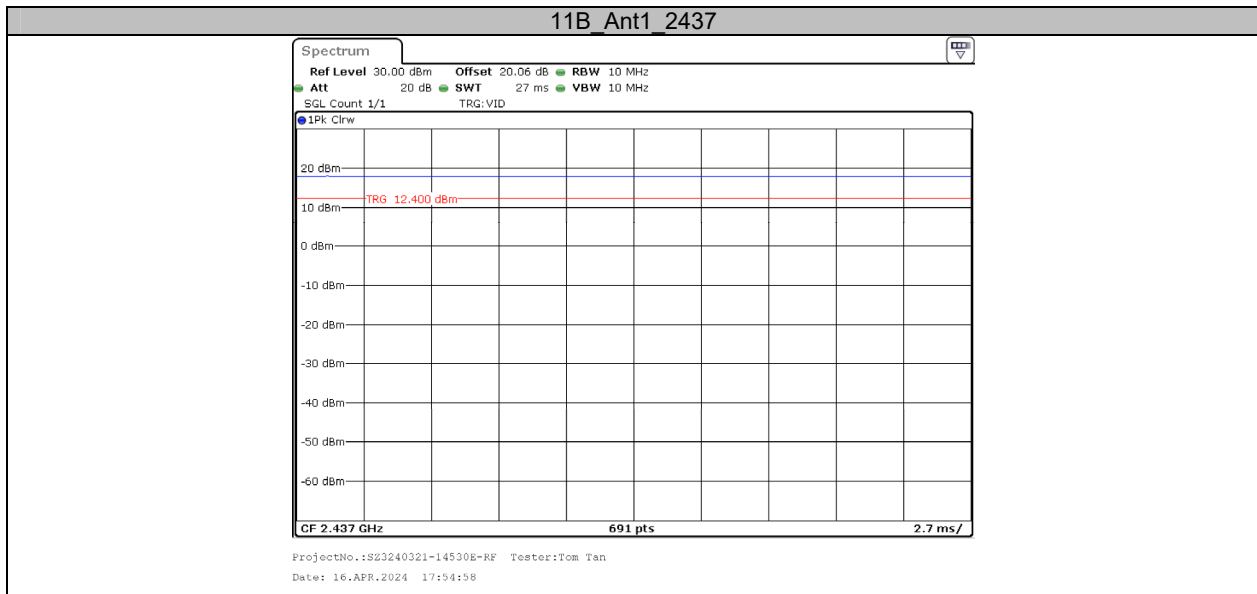


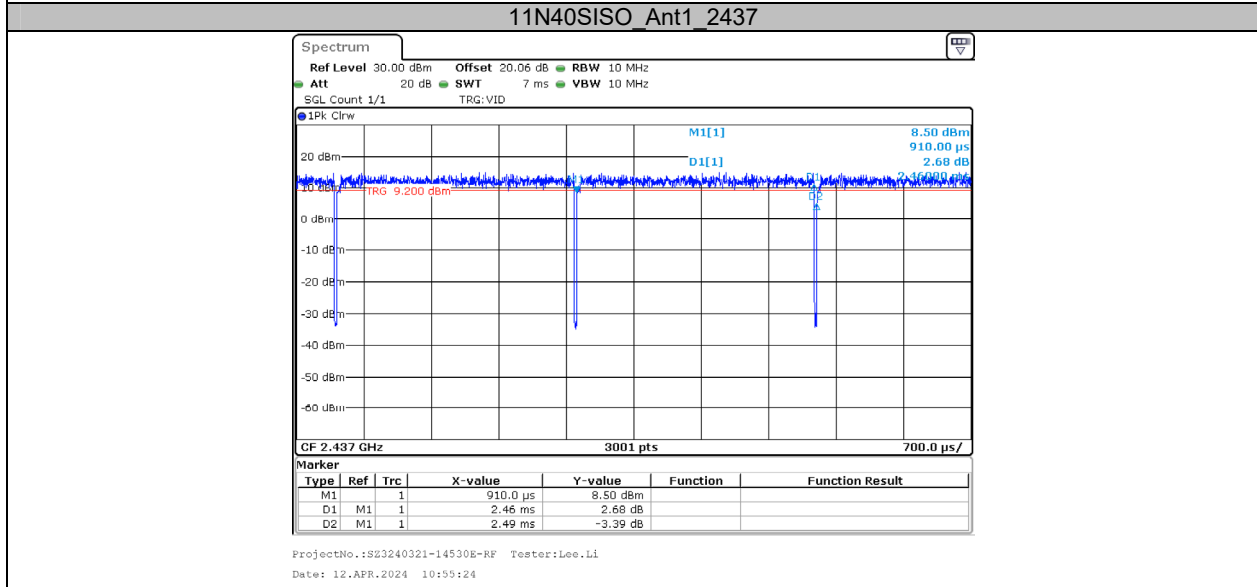
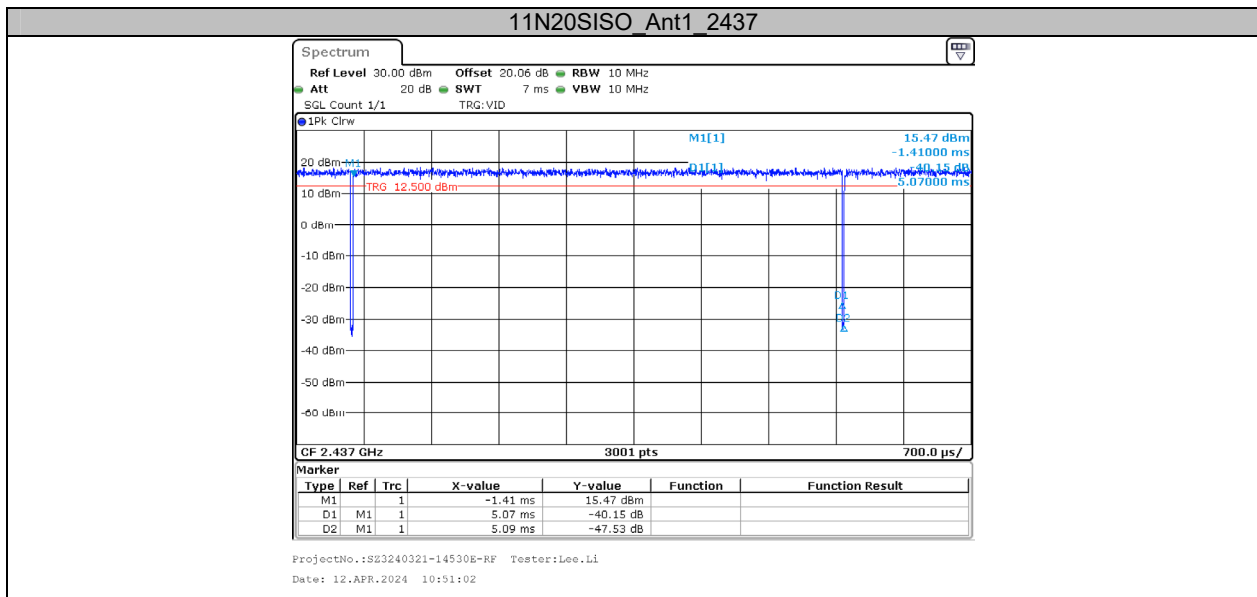
**Appendix F: Duty Cycle****Test Result**

Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	VBW Setting (Hz)
802.11b	Ant1	2437	27	27	100.00	10
802.11g	Ant1	2437	5.48	5.51	99.46	10
11N20SISO	Ant1	2437	5.07	5.09	99.61	10
11N40SISO	Ant1	2437	2.46	2.49	98.80	10



### Test Graphs





\*\*\*\*\* END OF REPORT \*\*\*\*\*