



FCC Test Report

Application No.: DNT2501080619R0246-00217
Applicant: Sonix Technology Co., Ltd.
Address of Applicant: 10F-1.,No.36, Taiyuan St.,Zhubei City,Hsinchu County 30265,
Taiwan(R.O.C)
EUT Description: Spread spectrum transmitter module
Model No.: SNM9390-F1,SNM9390-T1,SNM9390-F1-C1,SNM9390-T1-C1
FCC ID: 2BMXW-SNM9390-F1
Power Supply DC 3.3V
Trade Mark: SONIX
Standards: 47 CFR FCC Part 2, Subpart J
47 CFR Part 15, Subpart C
ANSI C63.10: 2013
Date of Receipt: 2025/01/09
Date of Test: 2025/01/10 to 2025/04/17
Date of Issue: 2025/04/17
Test Result: **PASS**

Prepared By: Wayne Lin (Testing Engineer)
Reviewed By: Pengils Chen (Project Engineer)
Approved By: Hense Chen (Manager)



Note: If there is any objection to the results in this report, please submit a written inquiry to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp, and is issued by the company in accordance with the requirements of the "Conditions of Issuance of Test Reports" printed in the attached page. Unless otherwise stated, the results presented in this report only apply to the samples tested this time. Partial reproduction of this report is not allowed unless approved by the company in writing.

Dongguan DN Testing Co., Ltd.

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Apr.17, 2025	Valid	Original Report



1 Test Summary

Test Item	Test Requirement	Test Method	Test Result	Result
Antenna Requirement	15.203/247(b)	--	Clause 3.1	PASS
20dB Emission Bandwidth	15.247 (a)(1)	ANSI C63.10: 2013	Clause 3.2	PASS
Conducted Peak Output Power	15.247 (b)(1)	ANSI C63.10: 2013	Clause 3.3	PASS
Carrier Frequencies Separation	15.247 (a)(1)	ANSI C63.10: 2013	Clause 3.4	PASS
Dwell Time	15.247 (a)(1)	ANSI C63.10: 2013	Clause 3.5	PASS
Hopping Channel Number	15.247 (a)(1)	ANSI C63.10: 2013	Clause 3.6	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10: 2013	Clause 3.7	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10: 2013	Clause 3.8	PASS
Radiated Spurious emissions	15.247(d); 15.205/15.209	ANSI C63.10: 2013	Clause 3.9	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d); 15.205/15.209	ANSI C63.10: 2013	Clause 3.10	PASS
AC Power Line Conducted Emission	15.207	ANSI C63.10: 2013	Clause 3.11	N/A

Note:

1. "N/A" denotes test is not applicable in this test report.



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2 General Information

2.1 Test Location

Company:	Dongguan DN Testing Co., Ltd
Address:	No. 1, West Fourth Street, South Xinfu Road, Wusha Liwu, Chang 'an Town, Dongguan City, Guangdong P.R.China
Test engineer:	Wayne Lin



2.2 General Description of EUT

Manufacturer:	Shenzhen Bilian Electronic Co.,Ltd.
Address of Manufacturer:	Room 501, Building 3, No. 32, Dafu Road.Zhangge Community, Fucheng Street, Longhua District, Shenzhen City,China
EUT Description:	Spread spectrum transmitter module
Test Model No.:	SNM9390-F1
Additional Model(s):	SNM9390-T1,SNM9390-F1-C1,SNM9390-T1-C1
Power Supply	DC 3.3V
Chip Type:	SN9390
Serial number:	PR2501080619R0246
Trade Mark:	SONiX
Hardware Version:	V1.1
Software Version:	V1.1
Operation Frequency:	2410MHz-2473MHz
Date Rate:	2M & 4M
Type of Modulation:	GFSK
Sample Type:	Prototype production
Antenna Type:	☒ External, ☐ Integrated
Antenna Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
Antenna Gain*:	☒ Provided by applicant
	2.73dBi
RF Cable*:	☒ Provided by applicant
	0.5dB(0.6~1GHz); 0.8dB(1.4~2GHz); 1.0dB(2.1~2.7GHz); 1.5dB(3~4GHz); 1.8dB(4.4~6GHz);

Remark:

*Since the above data and/or information is provided by the applicant relevant results or conclusions of this report are only made for these data and/or information , DNT is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.

*All models are just color differences, motherboard, PCB circuit board, chip, electronic components, appearance is all the same.



2.3 Channel List

Operation Frequency of each channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2410MHz	9	2438MHz	17	2466MHz		
2	2413.5MHz	10	2441.5MHz	18	2469.5MHz		
3	2417MHz	11	2445MHz	19	2473MHz		
4	2420.5MHz	12	2448.5MHz				
5	2424MHz	13	2452MHz				
6	2427.5MHz	14	2455.5MHz				
7	2431MHz	15	2459MHz				
8	2434.5MHz	16	2462.5MHz				

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The Lowest channel	2410MHz
The Middle channel	2441.5MHz
The Highest channel	2473MHz



2.4 5Test Environment and Mode

Operating Environment:	
Temperature:	20~25.0 °C
Humidity:	45~56 % RH
Atmospheric Pressure:	101.0~101.30 KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.



2.5 Power Setting of Test Software

Software Name	SN9390_QATools_V1.0.0.12		
Frequency(MHz)	2410	2441.5	2473
GFSK_2M Setting	2	2	2
GFSK_4M Setting	2	2	2

2.6 Description of Support Units

The EUT has been tested independent unit.

2.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Lab A:

• FCC, USA

Designation Number: CN1348

• A2LA (Certificate No. 7050.01)

DONGGUAN DN TESTING CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 7050.01.

• Innovation, Science and Economic Development Canada

DONGGUAN DN TESTING CO., LTD. EMC Laboratory has been recognized by ISED as an accredited testing laboratory. CAB identifier is CN0149.

IC#: 30755.

**2.8 Measurement Uncertainty (95% confidence levels, k=2)**

No.	Item	Measurement Uncertainty
1	20dB Emission Bandwidth	$\pm 0.0196\%$
2	Carrier Frequency Separation	$\pm 1.9\%$
3	Number of Hopping Channel	$\pm 1.9\%$
4	Time of Occupancy	$\pm 0.028\%$
5	Max Peak Conducted Output Power	± 0.743 dB
6	Band-edge Spurious Emission	± 1.328 dB
7	Conducted RF Spurious Emission	9KHz-1GHz: ± 0.746 dB 1GHz-26GHz: ± 1.328 dB

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0 dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8 dB (Below 1GHz)
		± 4.8 dB (1GHz to 6GHz)
		± 4.5 dB (6GHz to 18GHz)
		± 5.02 dB (Above 18GHz)



2.9 Equipment List

For Connect EUT Antenna Terminal Test					
Description	Manufacturer	Model	Serial Number	Cal date	Due date
Signal Generator	Keysight	N5181A-6G	MY48180415	2024-10-23	2025-10-22
Signal Generator	Keysight	N5182B	MY57300617	2024-10-23	2025-10-22
Power supply	Keysight	E3640A	ZB2022656	2024-10-23	2025-10-22
Radio Communication Tester	R&S	CMW500	105082	2024-10-23	2025-10-22
Spectrum Analyzer	Aglient	N9010A	MY52221458	2024-10-23	2025-10-22
BT/WIFI Test Software	Tonscend	JS1120 V3.1.83	NA	NA	NA
RF Control Unit	Tonscend	JS0806-2	22F8060581	NA	NA
Power Sensor	Anritsu	ML2495A	2129005	2024-10-23	2025-10-22
Pulse Power Sensor	Anritsu	MA2411B	1911397	2024-10-23	2025-10-22
temperature and humidity box	SCOTEK	SCD-C40-80PRO	6866682020008	2024-10-23	2025-10-22

Test Equipment for Conducted Emission					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Receiver	R&S	ESCI3	101152	2024-10-23	2025-10-22
LISN	R&S	ENV216	102874	2024-10-23	2025-10-22
ISN	R&S	ENY81-CA6	1309.8590.03	2024-10-23	2025-10-22

Test Equipment for Radiated Emission(30MHz-1000MHz)					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Receiver	R&S	ESR7	102497	2024-10-23	2025-10-22
Test Software	ETS-LINDGREN	TILE-FULL	NA	NA	NA
RF Cable	ETS-LINDGREN	RFC-NMS-100-NMS-350-IN	NA	2024-10-23	2025-10-22
Log periodic antenna	ETS-LINDGREN	VULB 9168	01475	2022-11-28	2025-11-27
Pre-amplifier	Schwarzbeck	BBV9743B	00423	2024-10-23	2025-10-22



Test Equipment for Radiated Emission(Above 1000MHz)					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Frequency analyser	Keysight	N9010A	MY52221458	2024-10-23	2025-10-22
RF Cable	ETS-LINDGREN	RFC-NMS-100- NMS-350-IN	NA	2024-10-23	2025-10-22
Horn Antenna	ETS-LINDGREN	3117	00252567	2022-11-28	2025-11-27
Double ridged waveguide antenna	ETS-LINDGREN	3116C	00251780	2022-11-28	2025-11-27
Test Software	ETS-LINDGREN	TILE-FULL	NA	NA	NA
Pre-amplifier	ETS-LINDGREN	3117-PA	252567	2024-10-23	2025-10-22
Pre-amplifier	ETS-LINDGREN	3116C-PA	251780	2024-10-23	2025-10-22

2.10 Assistant equipment used for test

Code	Equipment	Manufacturer	Model No.	Equipment No.
1	Computer	acer	N22C8	EMC notebook01



3 Test results and Measurement Data

3.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.73dBi.	



3.2 20dB Emission Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10: 2013 Section 7.8.7
Test Setup:	
Instruments Used:	Refer to section 2.9 for details
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type.
Final Test Mode:	Through Pre-scan, find the worst case of all modulation type.
Limit:	NA
Test Results:	Pass

The detailed test data see: **Appendix A**



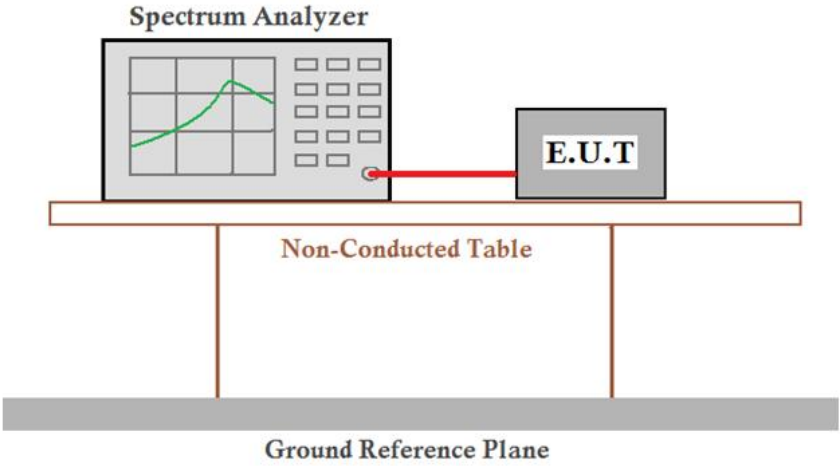
3.3 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10: 2013 Section 7.8.5
Test Setup:	
Test Instruments:	Refer to section 2.9 for details
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type.
Final Test Mode:	Through Pre-scan, find the worst case of all modulation type.
Limit:	(20.97dBm) 125mW
Test Results:	Pass

The detailed test data see: **Appendix B**



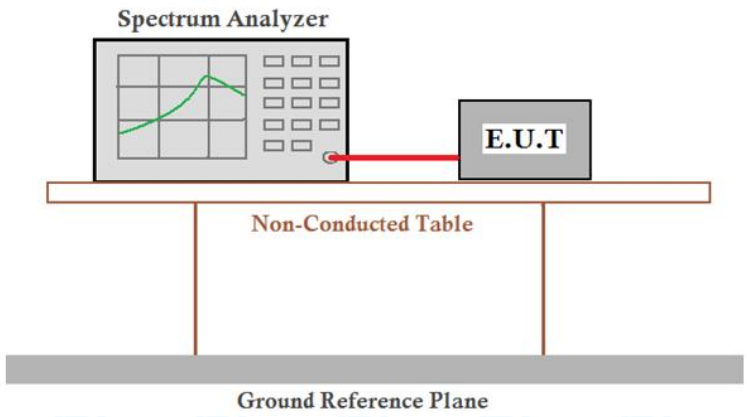
3.4 Carrier Frequencies Separationy

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10: 2013 Section 7.8.2
Test Setup:	
Test Instruments:	Refer to section 2.9 for details
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Final Test Mode:	Through Pre-scan, find the worst case of all modulation type.
Limit:	2/3 of the 20dB bandwidth
	Remark: the transmission power is less than 0.125W.
Test Results:	Pass

The detailed test data see: **Appendix C**



3.5 Dwell Time

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10: 2013 Section 7.8.4
Test Setup:	
Instruments Used:	Refer to section 2.9 for details
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Limit:	0.4 Second
Test Results:	Pass

The detailed test data see: **Appendix D**



3.6 Hopping Channel Number

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10: 2013 Section 7.8.3
Test Setup:	
Instruments Used:	Refer to section 2.9 for details
Test Mode:	Hopping transmitting with all kind of modulation
Limit:	At least 15 channels
Test Results:	Pass

The detailed test data see: **Appendix E**



3.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 7.8.6
Test Setup:	
Instruments Used:	Refer to section 2.9 for details
Exploratory Test Mode:	Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type.
Final Test Mode:	Through Pre-scan, find the worst case of all modulation type.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

The detailed test data see: **Appendix F**



3.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 2.9 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the worst case of all modulation type.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

The detailed test data see: **Appendix G**



3.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013 Section 11.12				
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz (DC $\geq$ 0.98) $\geq$ 1/T (DC<0.98)	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

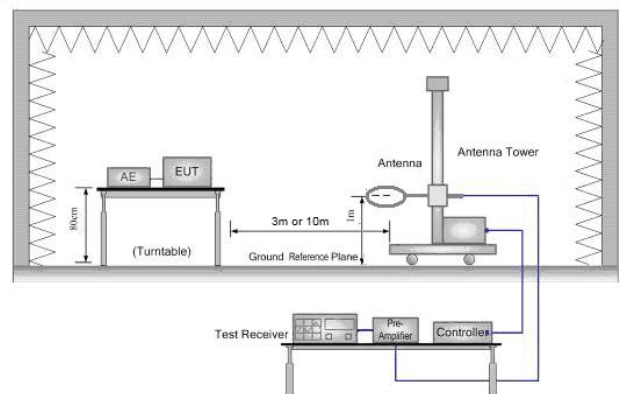
**Test Setup:**

Figure 1. Below 30MHz

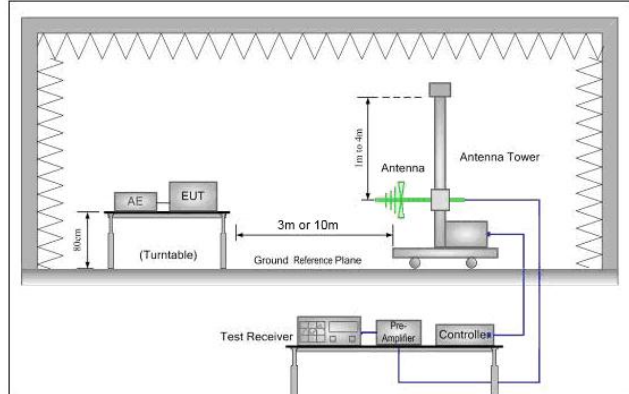


Figure 2. 30MHz to 1GHz

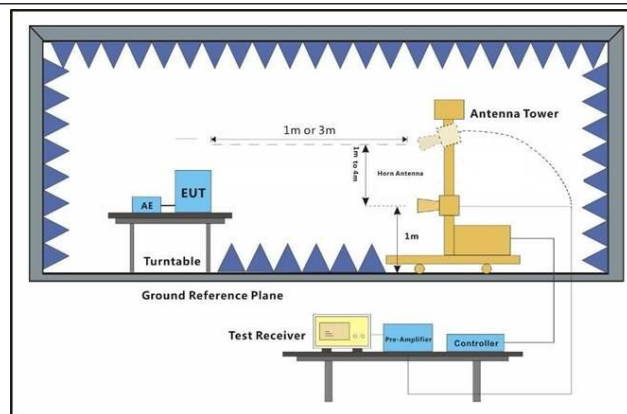


Figure 3. Above 1 GHz

Test Procedure:

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.



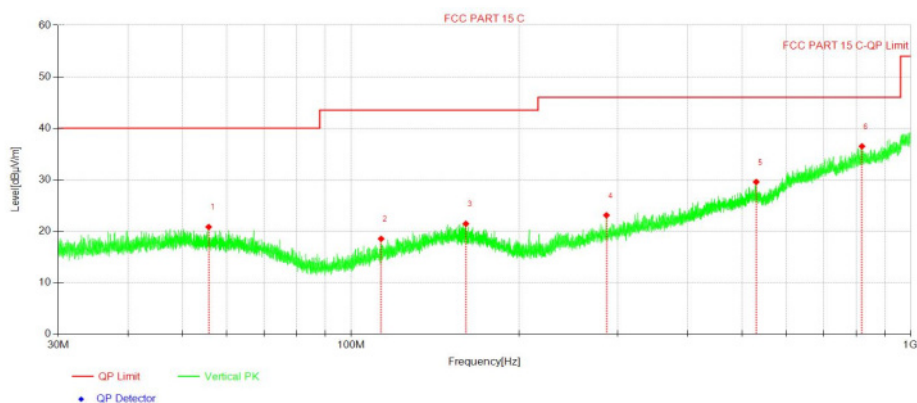
Test Configuration:	Measurements Below 1000MHz • RBW = 120 kHz • VBW = 300 kHz • Detector = Peak • Trace mode = max hold Peak Measurements Above 1000 MHz • RBW = 1 MHz • VBW $\geq$ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • VBW = 10 Hz, when duty cycle is no less than 98 percent. • VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge+Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode. Through Pre-scan, find the worst case of All modulation type.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass



Test data

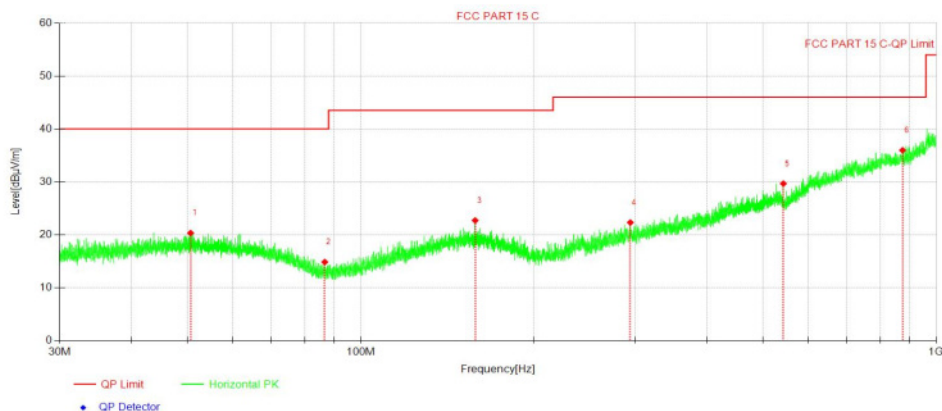
For 30-1000MHz TX

Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	55.70	29.14	-8.32	20.82	40.00	19.18	100	304	Peak
2	113.27	29.37	-10.85	18.52	43.50	24.98	100	359	Peak
3	160.51	29.24	-7.80	21.44	43.50	22.06	100	192	Peak
4	286.27	30.44	-7.34	23.10	46.00	22.90	100	342	Peak
5	530.10	30.73	-1.16	29.57	46.00	16.43	100	342	Peak
6	819.12	31.72	4.77	36.49	46.00	9.51	100	298	Peak

Horizontal:



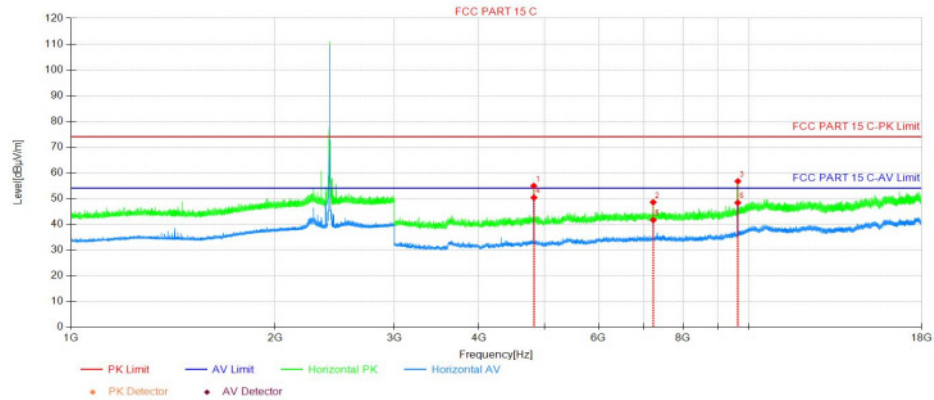
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	50.65	28.43	-8.08	20.35	40.00	19.65	100	244	Peak
2	86.65	28.66	-13.79	14.87	40.00	25.13	100	0	Peak
3	158.16	30.52	-7.79	22.73	43.50	20.77	100	360	Peak
4	294.32	29.48	-7.14	22.34	46.00	23.66	100	136	Peak
5	542.89	31.62	-1.93	29.69	46.00	16.31	100	57	Peak
6	874.63	31.45	4.53	35.98	46.00	10.02	100	0	Peak



For above 1GHz

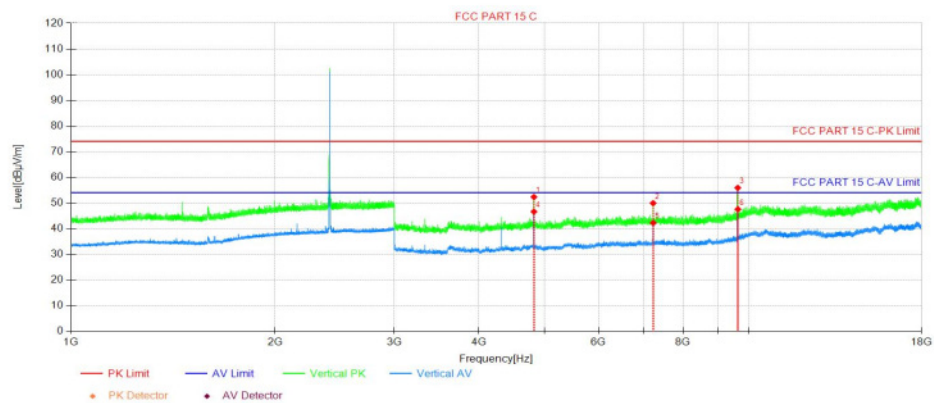
2M 2410MHz

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4818.84	59.52	-4.63	54.89	74.00	19.11	150	31	PK
2	7231.71	50.24	-1.71	48.53	74.00	25.47	150	303	PK
3	9642.33	55.64	1.04	56.68	74.00	17.32	150	45	PK
4	4821.09	54.95	-4.63	50.32	54.00	3.68	150	31	AV
5	7231.71	43.34	-1.71	41.63	54.00	12.37	150	290	AV
6	9638.58	47.31	1.02	48.33	54.00	5.67	150	45	AV

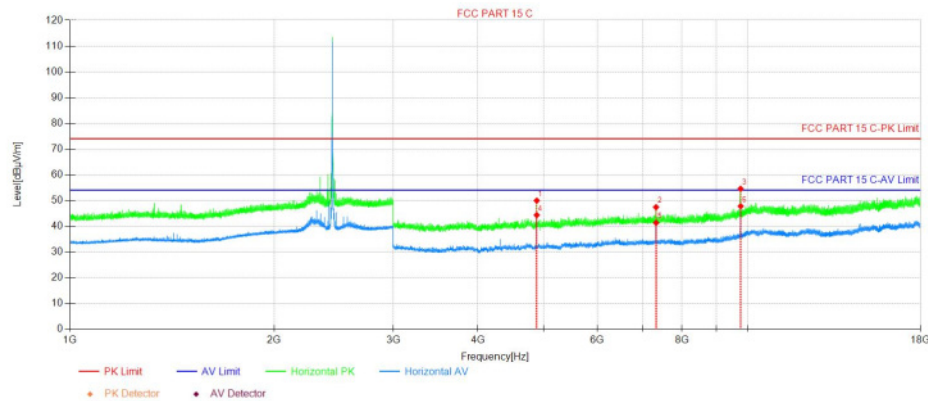
Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4821.09	56.96	-4.63	52.33	74.00	21.67	150	360	PK
2	7228.71	51.64	-1.71	49.93	74.00	24.07	150	198	PK
3	9637.83	54.87	1.02	55.89	74.00	18.11	150	360	PK
4	4821.09	51.26	-4.63	46.63	54.00	7.37	150	360	AV
5	7231.71	43.96	-1.71	42.25	54.00	11.75	150	186	AV
6	9641.58	46.51	1.03	47.54	54.00	6.46	150	352	AV

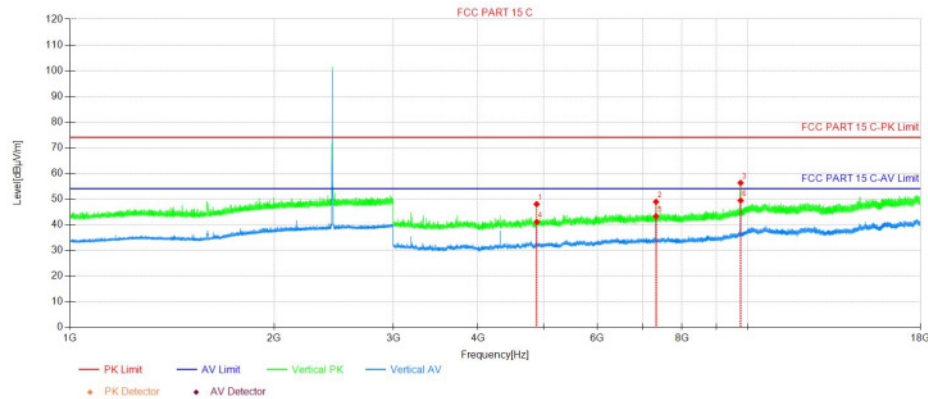
**2M 2441.5MHz**

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4884.09	54.67	-4.72	49.95	74.00	24.05	150	121	PK
2	7326.22	48.88	-1.48	47.40	74.00	26.60	150	162	PK
3	9763.84	52.92	1.64	54.56	74.00	19.44	150	121	PK
4	4883.34	49.04	-4.72	44.32	54.00	9.68	150	121	AV
5	7326.22	42.81	-1.48	41.33	54.00	12.67	150	162	AV
6	9767.59	46.10	1.66	47.76	54.00	6.24	150	134	AV

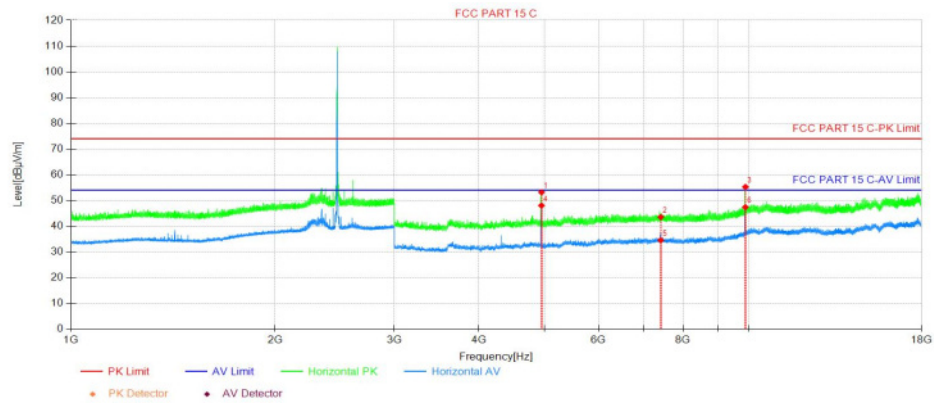
Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4881.84	52.73	-4.72	48.01	74.00	25.99	150	131	PK
2	7325.47	50.36	-1.48	48.88	74.00	25.12	150	216	PK
3	9763.84	54.63	1.64	56.27	74.00	17.73	150	274	PK
4	4884.09	45.77	-4.72	41.05	54.00	12.95	150	131	AV
5	7326.22	44.71	-1.48	43.23	54.00	10.77	150	216	AV
6	9765.34	47.75	1.65	49.40	54.00	4.60	150	257	AV

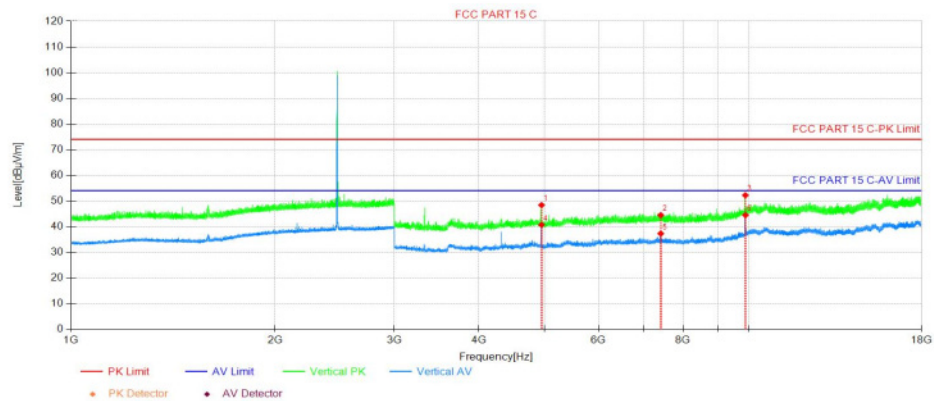
**2M 2473MHz**

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4947.10	58.03	-4.85	53.18	74.00	20.82	150	32	PK
2	7419.22	44.87	-1.31	43.56	74.00	30.44	150	172	PK
3	9893.59	53.08	2.17	55.25	74.00	18.75	150	45	PK
4	4946.35	52.87	-4.84	48.03	54.00	5.97	150	32	AV
5	7419.22	35.86	-1.31	34.55	54.00	19.45	150	45	AV
6	9890.59	45.23	2.16	47.39	54.00	6.61	150	45	AV

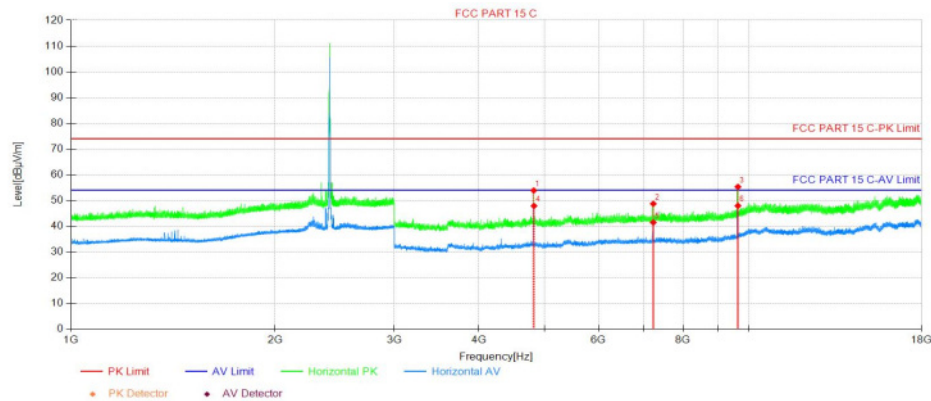
Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4947.10	53.25	-4.85	48.40	74.00	25.60	150	18	PK
2	7419.22	45.79	-1.31	44.48	74.00	29.52	150	242	PK
3	9890.59	50.07	2.16	52.23	74.00	21.77	150	3	PK
4	4947.10	45.59	-4.85	40.74	54.00	13.26	150	3	AV
5	7419.22	38.61	-1.31	37.30	54.00	16.70	150	131	AV
6	9893.59	42.32	2.17	44.49	54.00	9.51	150	3	AV

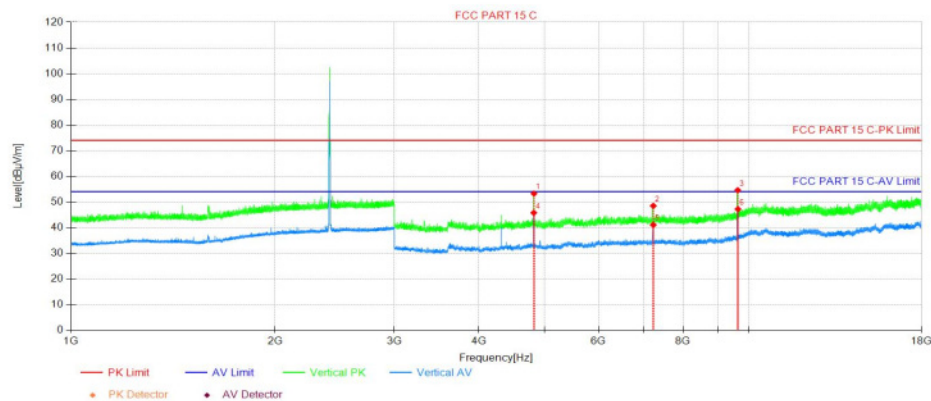
**4M 2410MHz**

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4818.09	58.51	-4.63	53.88	74.00	20.12	150	45	PK
2	7233.21	50.42	-1.70	48.72	74.00	25.28	150	281	PK
3	9643.83	54.23	1.05	55.28	74.00	18.72	150	18	PK
4	4822.59	52.50	-4.63	47.87	54.00	6.13	150	45	AV
5	7233.21	43.15	-1.70	41.45	54.00	12.55	150	45	AV
6	9644.58	46.86	1.06	47.92	54.00	6.08	150	45	AV

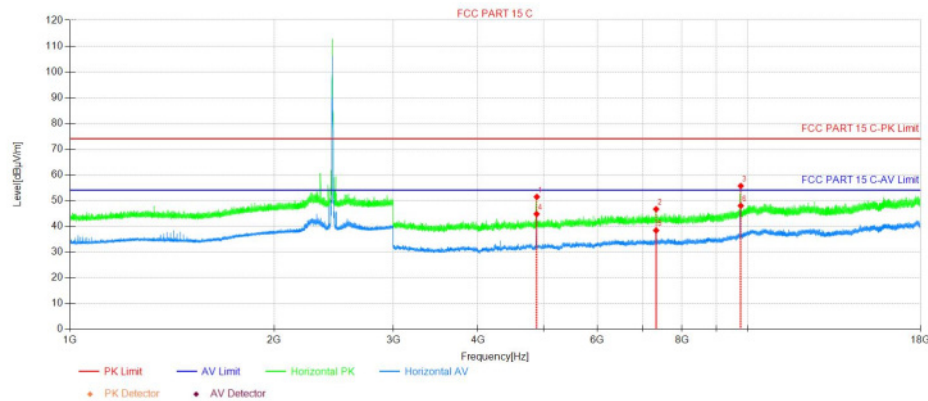
Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4821.84	57.91	-4.63	53.28	74.00	20.72	150	30	PK
2	7233.21	50.20	-1.70	48.50	74.00	25.50	150	194	PK
3	9636.33	53.57	1.01	54.58	74.00	19.42	150	357	PK
4	4818.84	50.41	-4.63	45.78	54.00	8.22	150	30	AV
5	7233.21	42.77	-1.70	41.07	54.00	12.93	150	223	AV
6	9644.58	46.13	1.06	47.19	54.00	6.81	150	357	AV

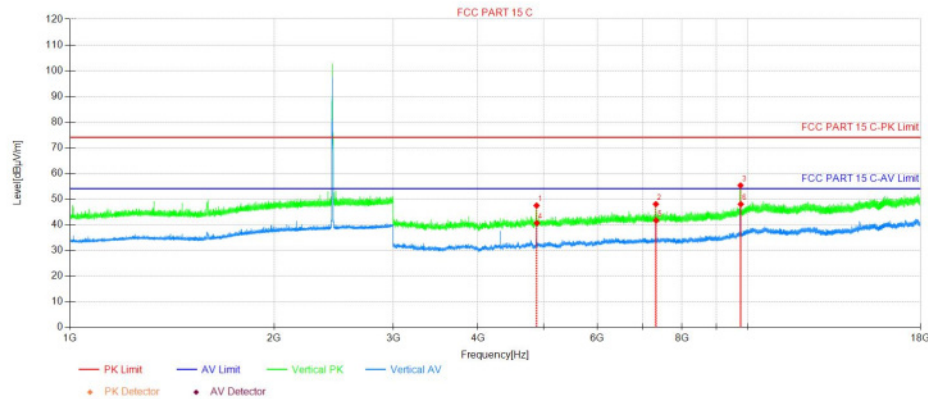
**4M 2441.5MHz**

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4884.84	56.11	-4.72	51.39	74.00	22.61	150	116	PK
2	7327.72	48.11	-1.48	46.63	74.00	27.37	150	266	PK
3	9769.84	53.98	1.67	55.65	74.00	18.35	150	142	PK
4	4881.84	49.47	-4.72	44.75	54.00	9.25	150	116	AV
5	7327.72	39.83	-1.48	38.35	54.00	15.65	150	171	AV
6	9770.59	46.26	1.68	47.94	54.00	6.06	150	142	AV

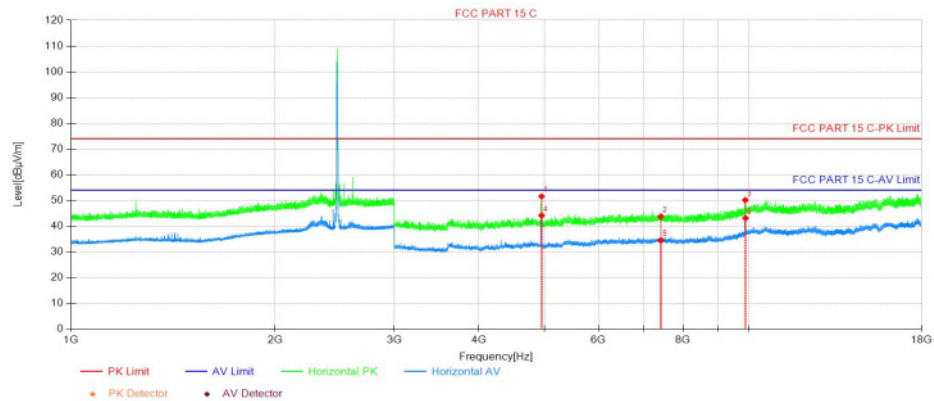
Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4881.09	52.14	-4.71	47.43	74.00	26.57	150	134	PK
2	7320.97	49.49	-1.49	48.00	74.00	26.00	150	163	PK
3	9762.34	53.66	1.63	55.29	74.00	18.71	150	259	PK
4	4885.59	45.33	-4.72	40.61	54.00	13.39	150	134	AV
5	7327.72	43.10	-1.48	41.62	54.00	12.38	150	176	AV
6	9770.59	46.27	1.68	47.95	54.00	6.05	150	273	AV

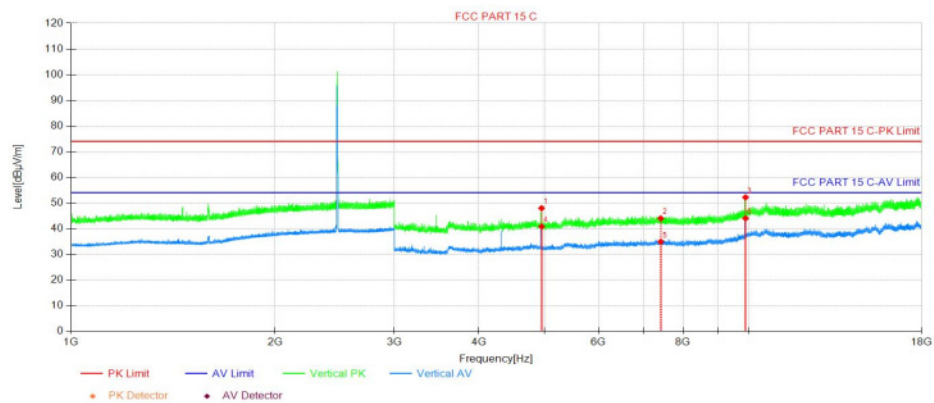
**4M 2473MHz**

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4947.85	56.44	-4.85	51.59	74.00	22.41	150	3	PK
2	7419.22	45.05	-1.31	43.74	74.00	30.26	150	58	PK
3	9888.34	48.00	2.15	50.15	74.00	23.85	150	313	PK
4	4948.60	49.01	-4.85	44.16	54.00	9.84	150	3	AV
5	7419.22	35.79	-1.31	34.48	54.00	19.52	150	256	AV
6	9896.59	40.93	2.19	43.12	54.00	10.88	150	327	AV

Vertical:



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4947.85	52.83	-4.85	47.98	74.00	26.02	150	3	PK
2	7419.22	45.31	-1.31	44.00	74.00	30.00	150	118	PK
3	9895.84	50.02	2.17	52.19	74.00	21.81	150	3	PK
4	4948.60	45.67	-4.85	40.82	54.00	13.18	150	3	AV
5	7419.22	36.20	-1.31	34.89	54.00	19.11	150	318	AV
6	9896.59	41.82	2.19	44.01	54.00	9.99	150	3	AV



Note:

1. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

Result Level= Reading Level + Correct Factor(including Ant.Factor, Cable Factor etc.)

2. The amplitude of 9KHz to 30MHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

3. The amplitude of 18GHz to 25GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be report.



3.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

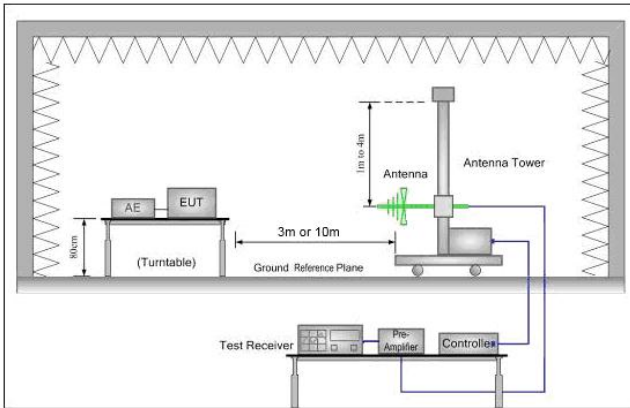


Figure 1. 30MHz to 1GHz

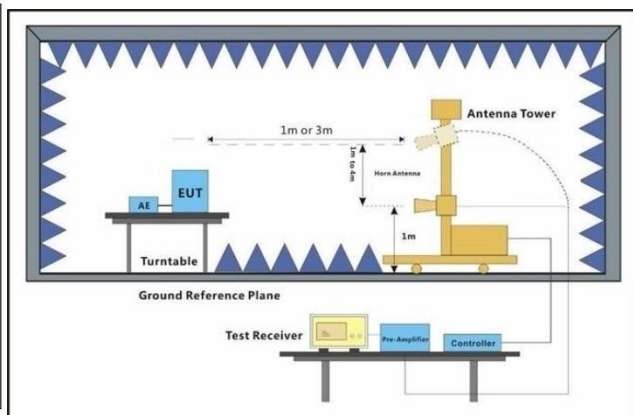


Figure 2. Above 1 GHz

Test Procedure:	- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. - For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. - The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. - The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. - For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. - The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. - Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel - Test the EUT in the lowest channel , the Highest channel - The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. - Repeat above procedures until all frequencies measured was complete.
Test Configuration:	Measurements Below 1000MHz

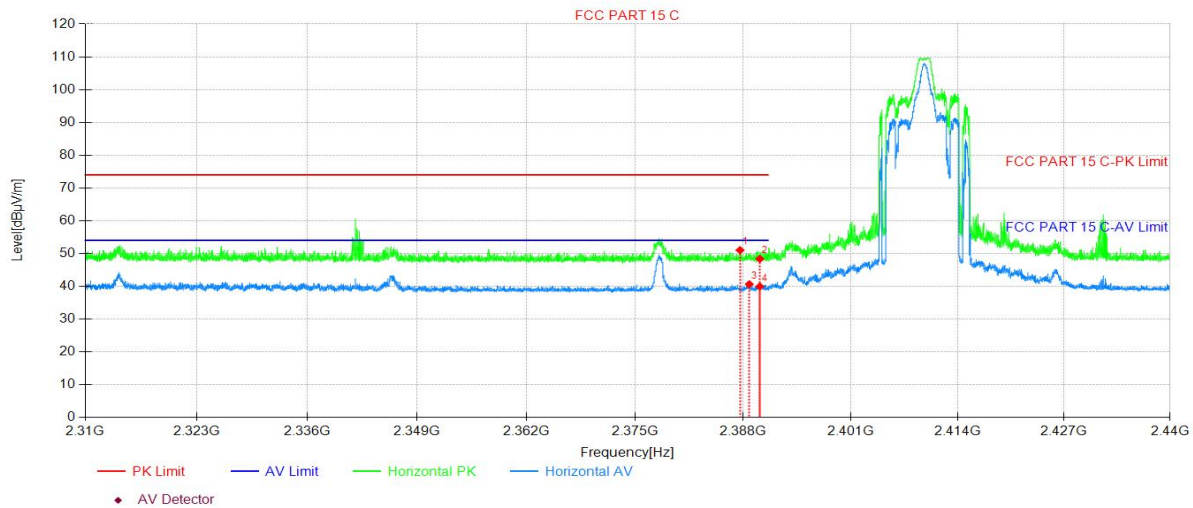


	• RBW = 120 kHz • VBW = 300 kHz • Detector = Peak • Trace mode = max hold Peak Measurements Above 1000 MHz • RBW = 1 MHz • VBW $\geq$ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • VBW = 10 Hz, when duty cycle is no less than 98 percent. • VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT Transmitting mode. Through Pre-scan, find the worst case of all modulation type. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass

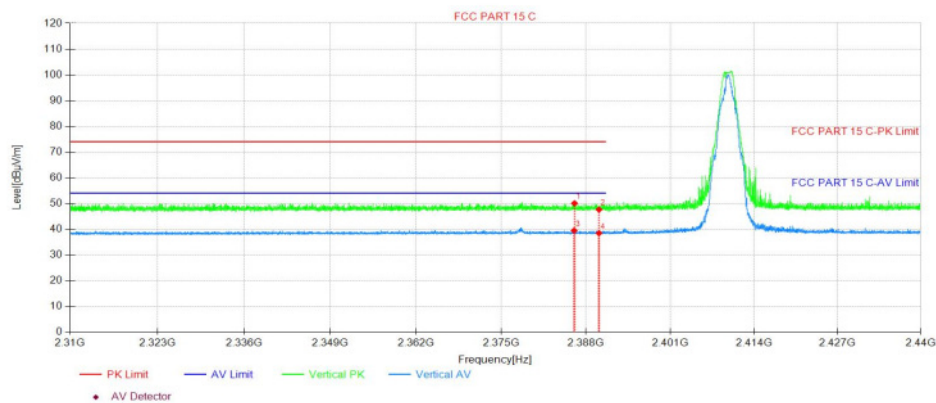


Test Date

2M 2410MHz



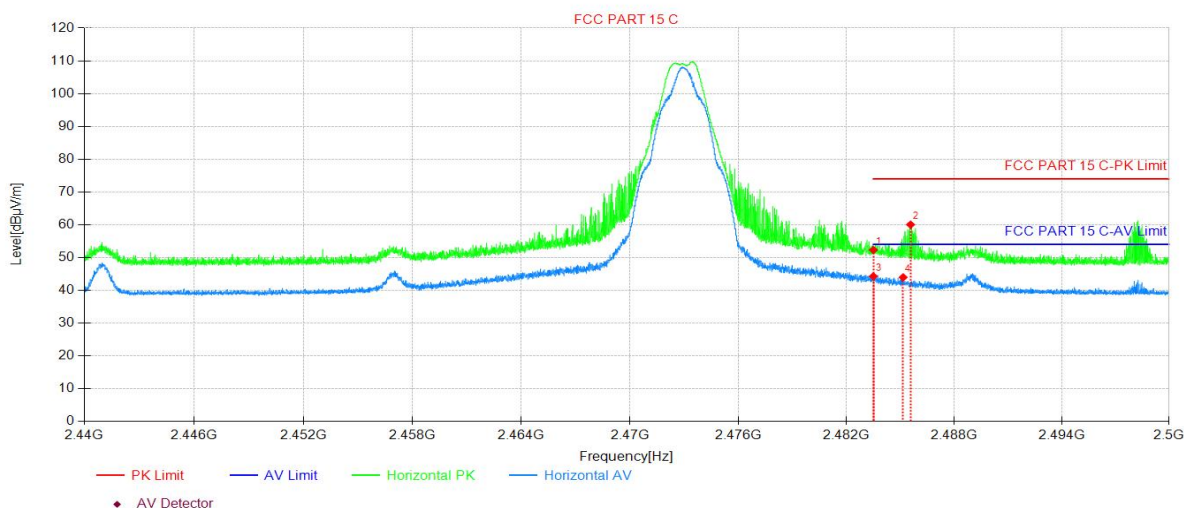
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2387.62	51.83	-0.80	51.03	74.00	22.97	150	68	PK	H
2	2390.01	49.19	-0.80	48.39	74.00	25.61	150	303	PK	H
3	2388.74	41.44	-0.80	40.64	54.00	13.36	150	281	AV	H
4	2390.01	40.76	-0.80	39.96	54.00	14.04	150	281	AV	H



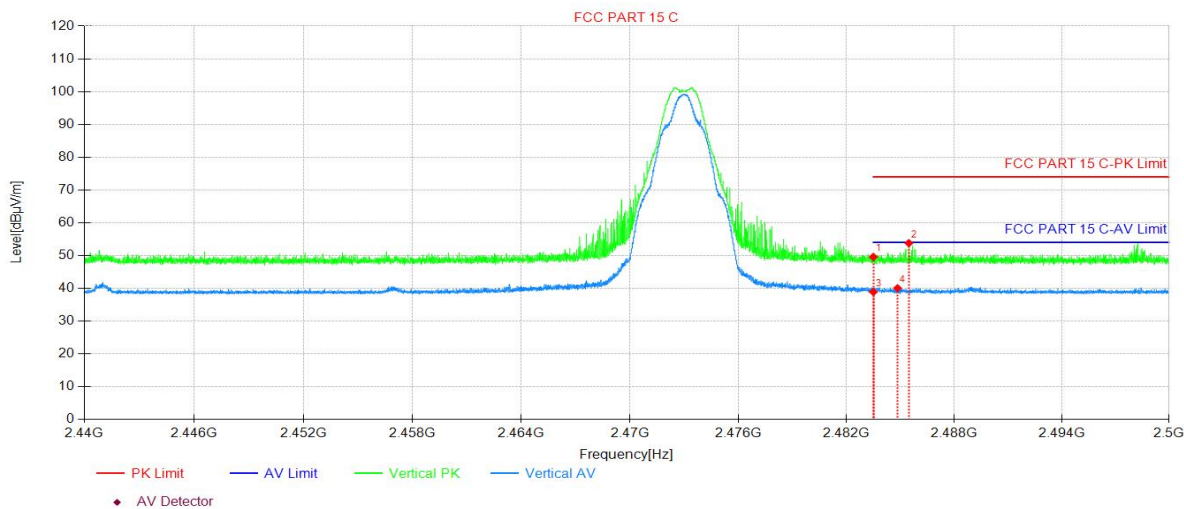
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2386.24	50.86	-0.81	50.05	74.00	23.95	150	59	PK	V
2	2390.01	48.44	-0.80	47.64	74.00	26.36	150	236	PK	V
3	2386.19	40.27	-0.81	39.46	54.00	14.54	150	82	AV	V
4	2390.01	39.26	-0.80	38.46	54.00	15.54	150	226	AV	V



2M 2473MHz



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2483.50	52.61	-0.29	52.32	74.00	21.68	150	277	PK	H
2	2485.57	60.31	-0.27	60.04	74.00	13.96	150	246	PK	H
3	2483.50	44.56	-0.29	44.27	54.00	9.73	150	277	AV	H
4	2485.16	44.23	-0.27	43.96	54.00	10.04	150	277	AV	H



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark	Polarity
1	2483.50	49.88	-0.29	49.59	74.00	24.41	150	24	PK	V
2	2485.48	54.06	-0.27	53.79	74.00	20.21	150	4	PK	V
3	2483.50	39.20	-0.29	38.91	54.00	15.09	150	304	AV	V
4	2484.85	40.32	-0.27	40.05	54.00	13.95	150	4	AV	V

Note:

1. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

Result Level= Reading Level + Correct Factor(including Ant.Factor ,Cable Factor etc.

2.All channels had been pre-test, 2M is the worst case, only the worst case was reported



3.11 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 2013 on conducted measurement.		
Test Setup:			
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.		



	Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the the worst case.
Instruments Used:	Refer to section 2.9 for details
Test Results:	NA



4 Appendix

Appendix A: 20dB Emission Bandwidth

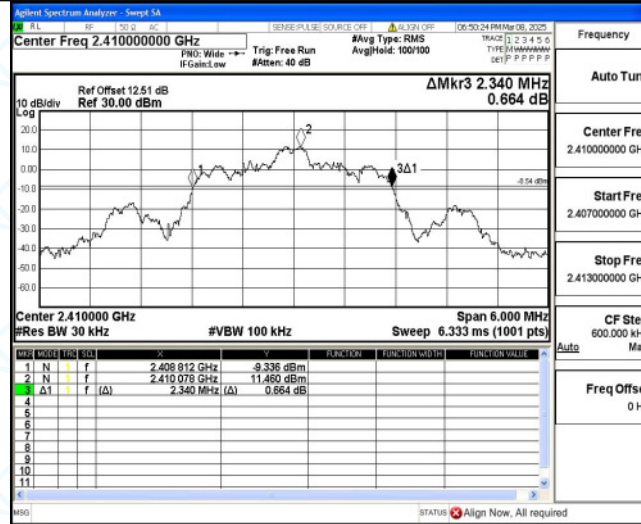
Test Result

Test Mode	Antenna	Freq(MHz)	20dB EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
2M	Ant1	2410	2.340	2408.812	2411.152	---	---
		2441.5	2.340	2440.312	2442.652	---	---
		2473	2.340	2471.818	2474.158	---	---
4M	Ant1	2410	4.668	2407.612	2412.280	---	---
		2441.5	4.512	2439.232	2443.744	---	---
		2473	4.656	2470.612	2475.268	---	---

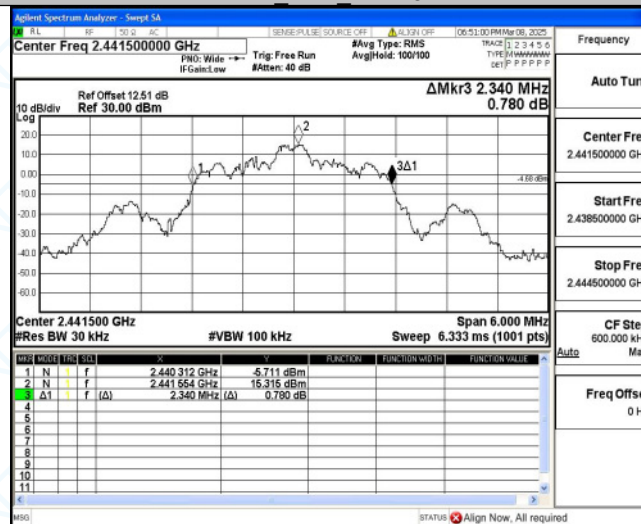


Test Graphs

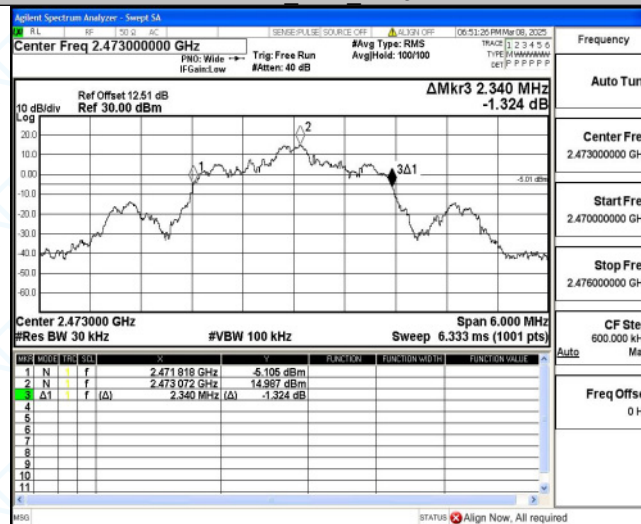
2M_Ant1_2410



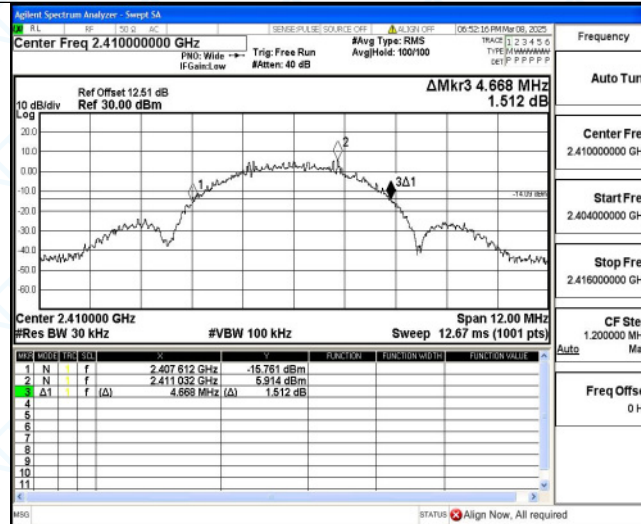
2M_Ant1_2441.5



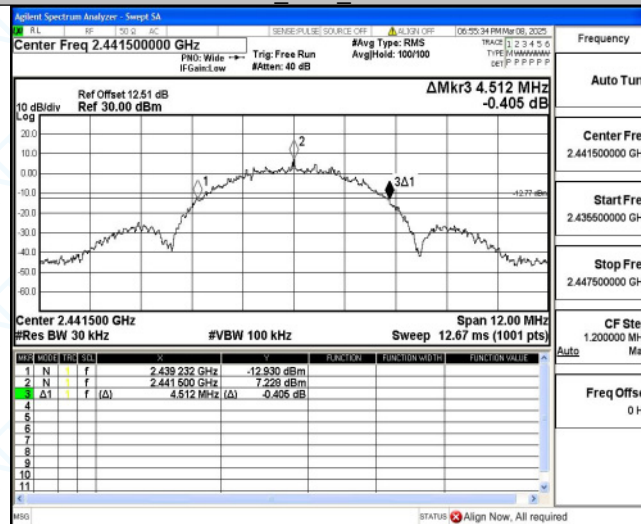
2M_Ant1_2473



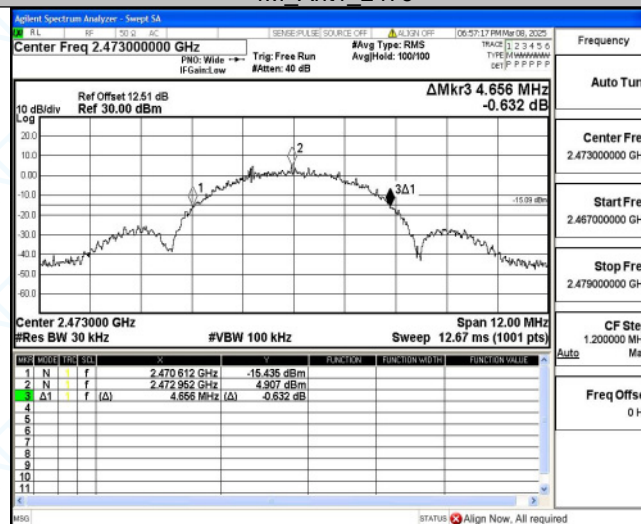
4M_Ant1_2410



4M_Ant1_2441.5



4M_Ant1_2473





Appendix B: Maximum conducted output power

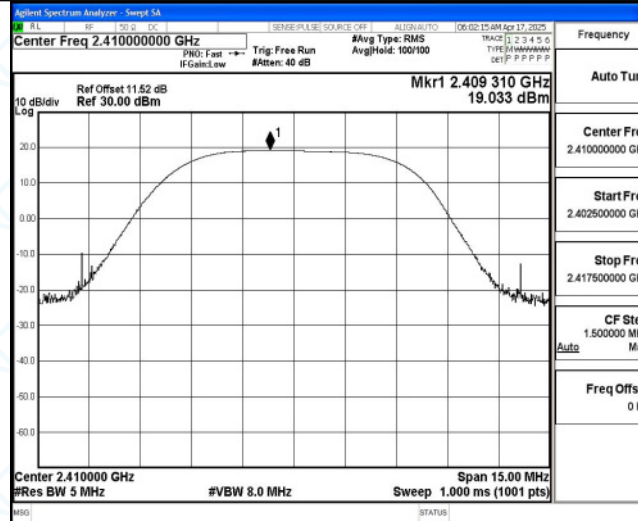
Test Result

Test Mode	Antenna	Freq(MHz)	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
2M	Ant1	2410	19.03	≤20.97	PASS
		2441.5	19.14	≤20.97	PASS
		2473	19.15	≤20.97	PASS
4M	Ant1	2410	19.05	≤20.97	PASS
		2441.5	19.13	≤20.97	PASS
		2473	19.15	≤20.97	PASS

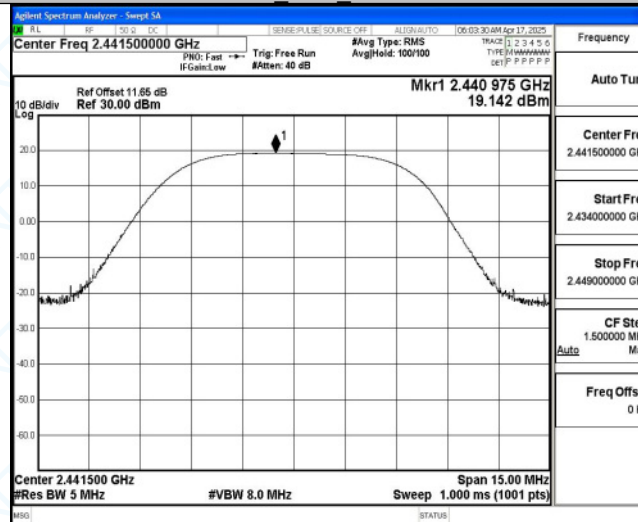


Test Graphs

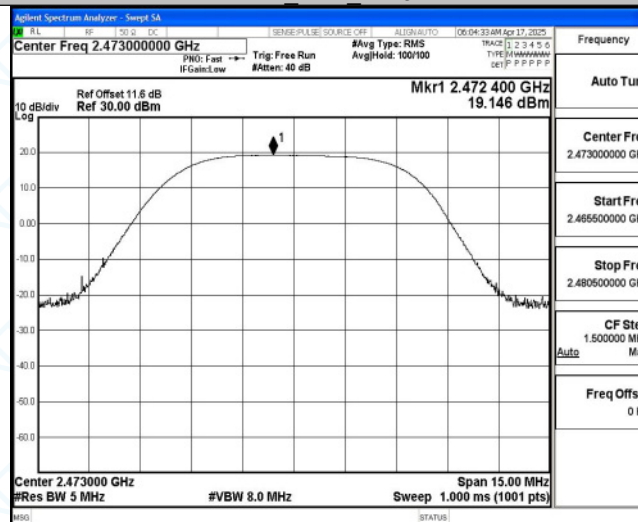
2M_Ant1_2410



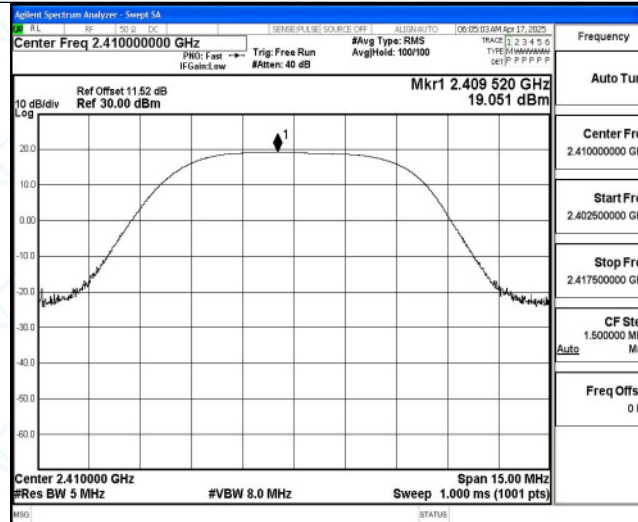
2M_Ant1_2441.5



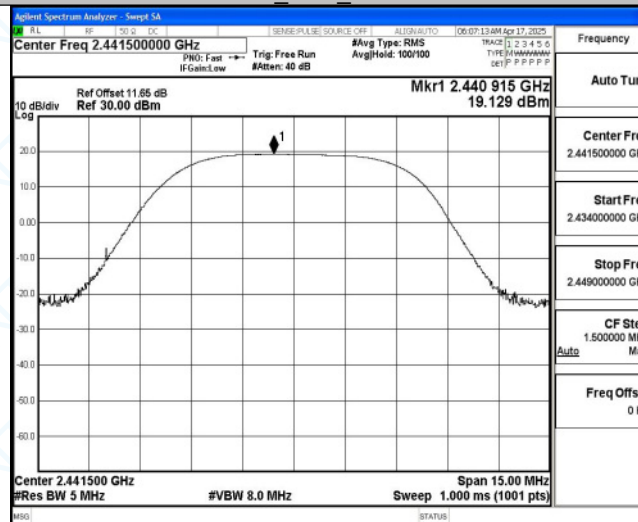
2M_Ant1_2473



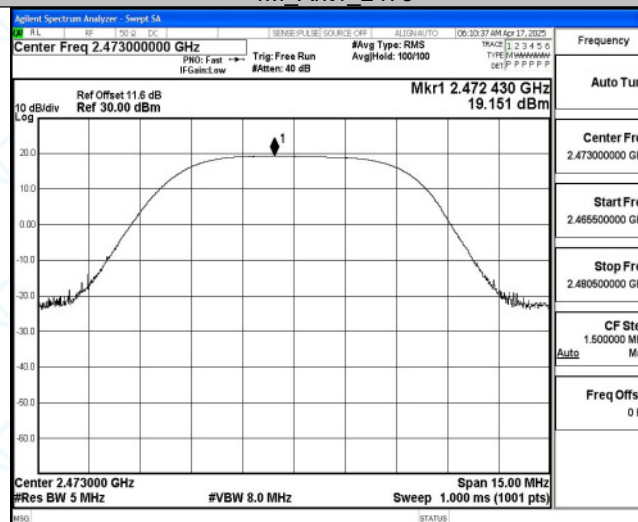
4M_Ant1_2410



4M_Ant1_2441.5



4M_Ant1_2473





Appendix C: Carrier frequency separation

Test Result

Test Mode	Antenna	Freq(MHz)	Result[MHz]	Limit[MHz]	Verdict
2M	Ant1	Hop	3.51	≥1.56	PASS
4M	Ant1	Hop	3.45	≥3.112	PASS

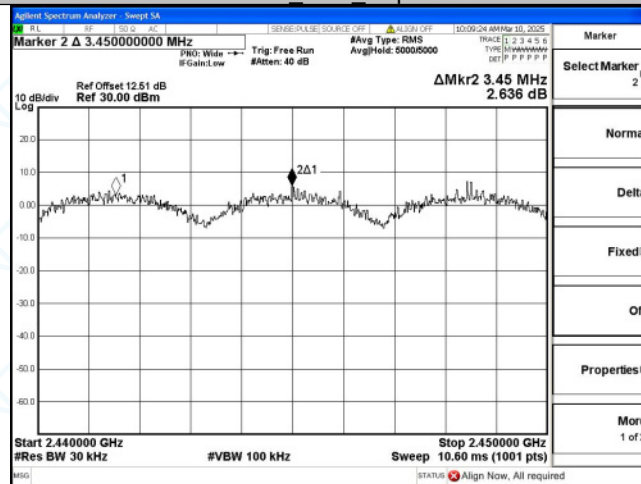


Test Graphs

2M Ant1 Hop



4M Ant1 Hop





Appendix D: Dwell Time

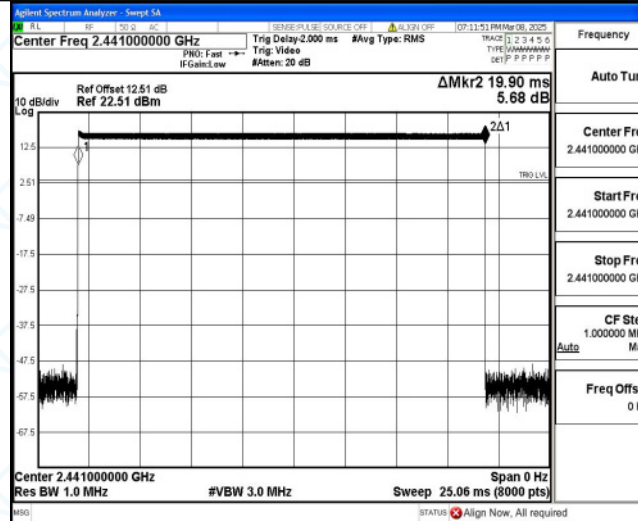
Test Result

Test Mode	Antenna	Freq(MHz)	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
2M	Ant1	Hop	19.903	10	0.199	≤0.4	PASS
4M	Ant1	Hop	19.900	10	0.199	≤0.4	PASS

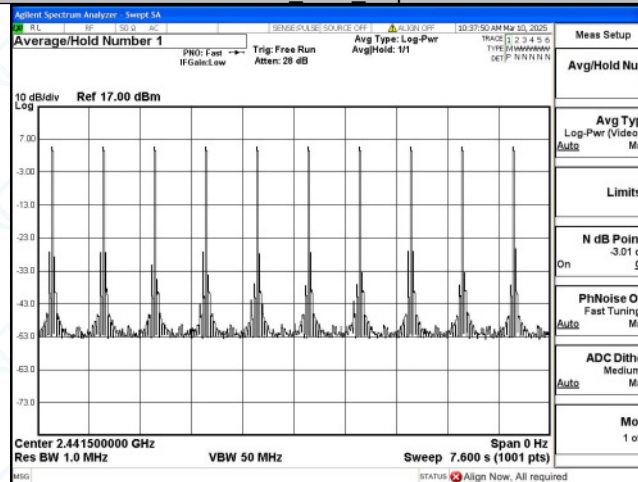


Test Graphs

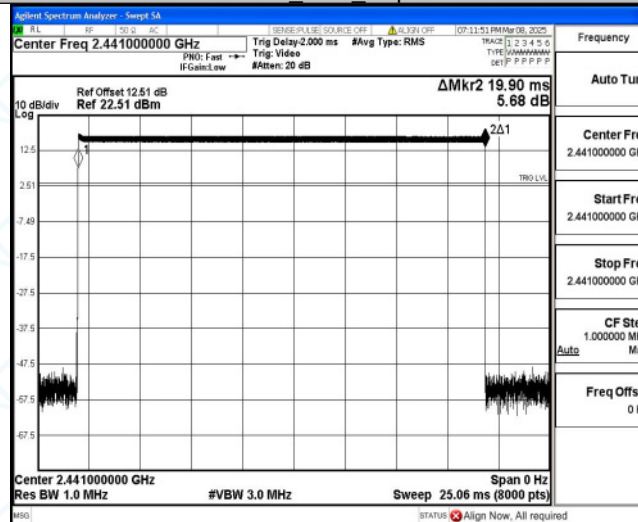
2M_Ant1_Hop



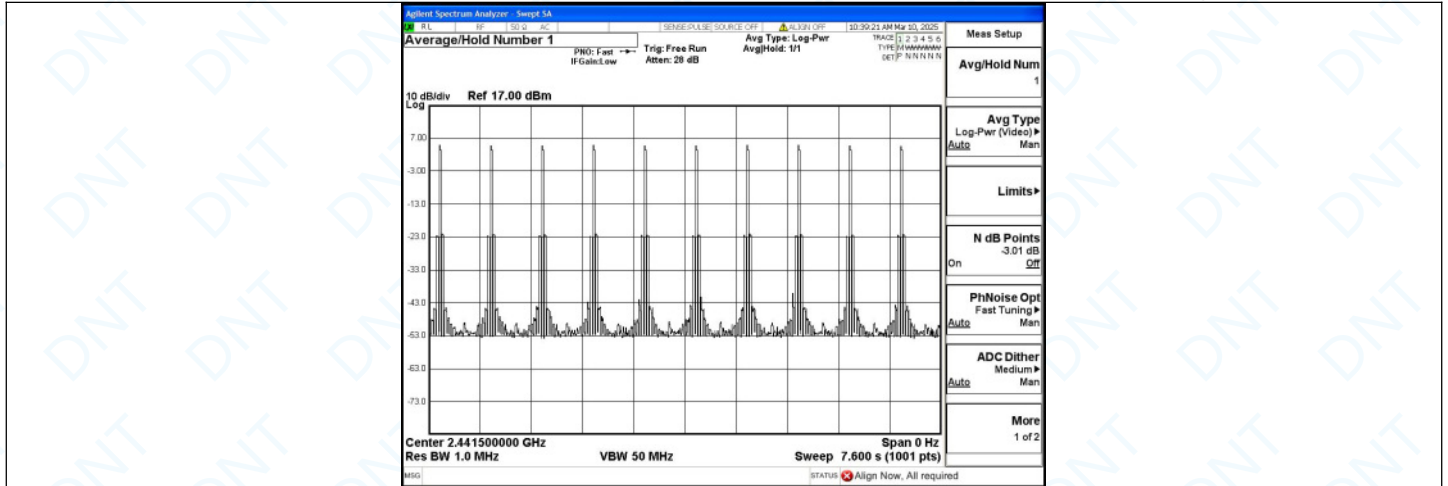
2M_Ant1_Hop



2M_Ant1_Hop



4M_Ant1_Hop





Appendix E: Number of hopping channels

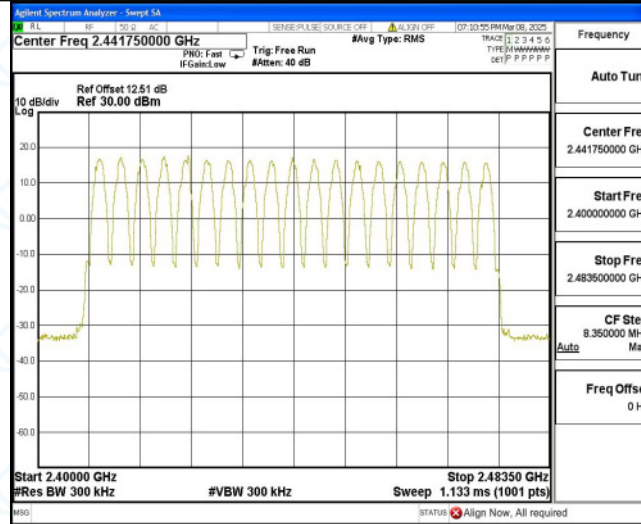
Test Result

TestMode	Antenna	Freq(MHz)	Result[Num]	Limit[Num]	Verdict
2M	Ant1	Hop	19	≥15	PASS
4M	Ant1	Hop	19	≥15	PASS

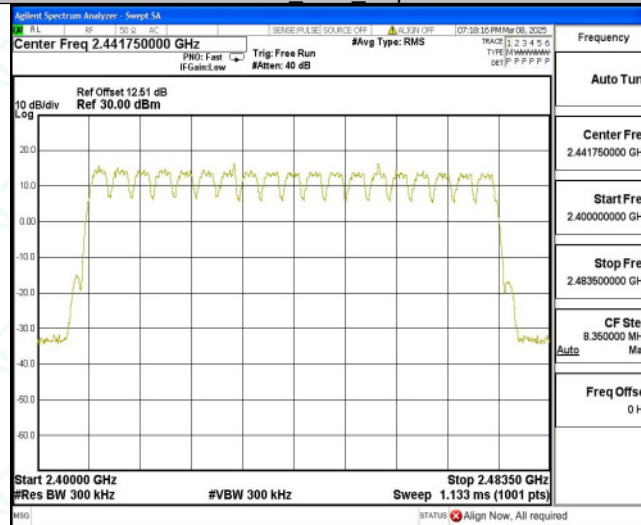


Test Graphs

2M Ant1 Hop



4M Ant1 Hop





Appendix F: Band edge measurements

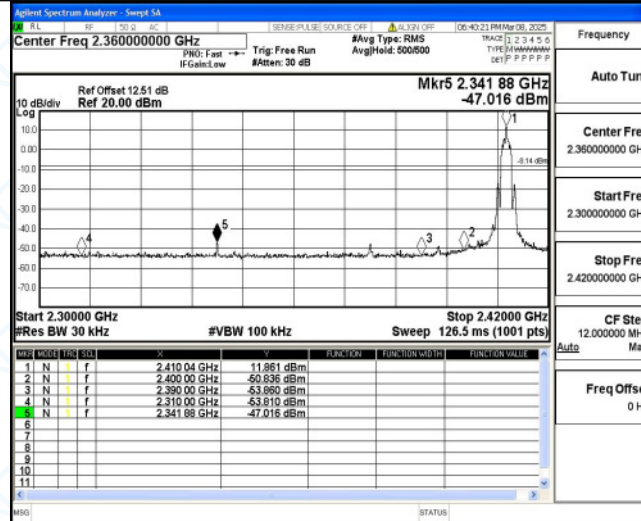
Test Result

Test Mode	Antenna	Ch Name	Freq(MHz)	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
2M	Ant1	Low	2410	11.86	-47.02	≤-8.14	PASS
		High	2473	10.67	-45.92	≤-9.33	PASS
		Low	Hop_ 2410	11.01	-48.17	≤-8.99	PASS
		High	Hop_ 2473	10.42	-50.47	≤-9.59	PASS
4M	Ant1	Low	2410	7.83	-47.04	≤-12.17	PASS
		High	2473	6.99	-47.86	≤-13.01	PASS
		Low	Hop_ 2410	5.51	-47.19	≤-14.49	PASS
		High	Hop_ 2473	3.76	-49.99	≤-16.24	PASS

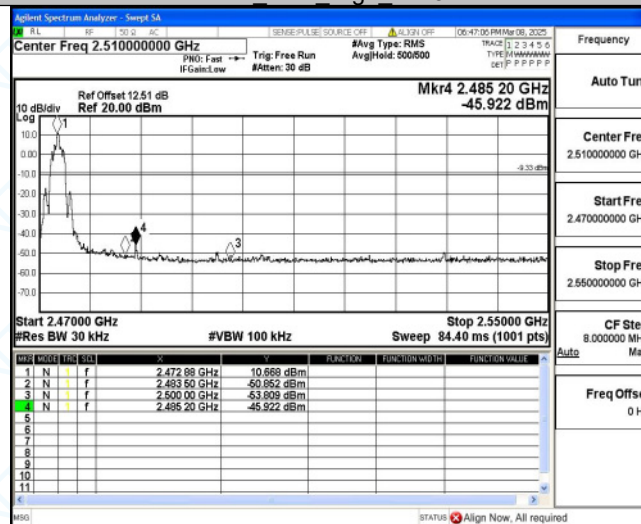


Test Graphs

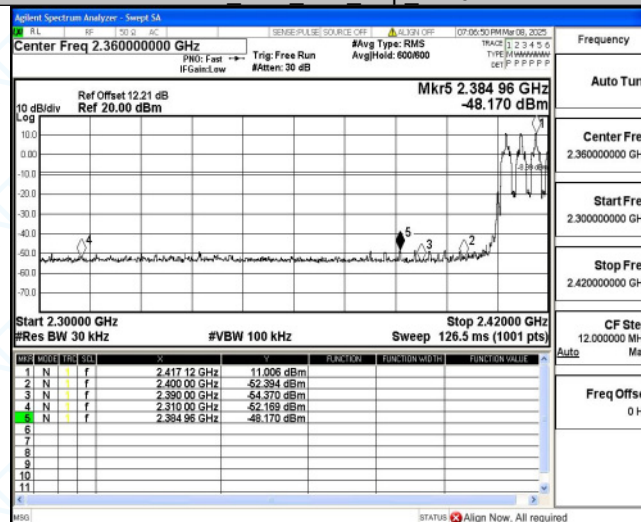
2M Ant1 Low 2410



2M Ant1 High 2473



2M Ant1 Low Hop 2410



2M Ant1 High Hop 2473