RF TEST REPORT

For

Shenzhen Boshike Microelectronics Co., Ltd.
Product Name: Projector speaker
Test Model(s): M3P

Report Reference No.	:	**DACE251010009RL001**
FCC ID	:	**2BS9F-M3P**
Applicant's Name	:	Shenzhen Boshike Microelectronics Co., Ltd.
Address	:	402 Hengtai Yungu Creative Park, No.77-3 Shangwei New Village, Songyuanxia Community, Guanhu Street, Longhua District, Shenzhen
Testing Laboratory	:	Shenzhen DACE Testing Technology Co., Ltd.
Address	:	102, Building H1, & 1/F., Building H, Hongfa Science & Technology Park, Tangtou Community, Shiyan Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Test Specification Standard	:	**47 CFR Part 15.247**
Date of Receipt	:	October 10, 2025
Date of Test	:	October 10, 2025, 2025 to October 27, 2025
Data of Issue	:	October 27, 2025
Result	:	**Pass**

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Apply for company information

Applicant's Name	:	Shenzhen Boshike Microelectronics Co., Ltd.
Address	:	402 Hengtai Yungu Creative Park, No.77-3 Shangwei New Village, Songyuanxia Community, Guanhu Street, Longhua District, Shenzhen
Product Name	:	Projector speaker
Test Model(s)	:	M3P
Series Model:	:	M1P, M2P, M4P, M5P, M6P, M7P, M8P, M9P, S1P, S2P, S3P, S4P, S5P, S6P, S7P, S8P, S9P, T1P, T2P, T3P, T4P, T5P, T6P, T7P, T8P, T9P, G1P, G2P, G3P, G4P, G5P, G6P, G7P, , G8P, G9P, E10P, E11P, E12P, E13P, S10P, S20P, S30P, S40P, C3P, Y30P, C6, C6P
Test Specification Standard(s)	:	47 CFR Part 15.247

NOTE1:

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

Compiled by:	Supervised by:	Approved by:
Keren Huang	Stone Yin	Tom Chen
Keren Huang / Test Engineer	Stone Yin / Project Engineer	Tom Chen / Manager
October 27, 2025	October 27, 2025	October 27, 2025

Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	DACE251010009RL001	October 27, 2025

CONTENTS

1 TEST SUMMARY 6

1.1 TEST STANDARDS 6
1.2 SUMMARY OF TEST RESULT 6

2 GENERAL INFORMATION 7

2.1 CLIENT INFORMATION 7
2.2 DESCRIPTION OF DEVICE (EUT) 7
2.3 DESCRIPTION OF TEST MODES 8
2.4 DESCRIPTION OF SUPPORT UNITS 9
2.5 EQUIPMENTS USED DURING THE TEST 9
2.6 STATEMENT OF THE MEASUREMENT UNCERTAINTY 11
2.7 IDENTIFICATION OF TESTING LABORATORY 12
2.8 ANNOUNCEMENT 12

3 EVALUATION RESULTS (EVALUATION) 13

3.1 ANTENNA REQUIREMENT 13

4 RADIO SPECTRUM MATTER TEST RESULTS (RF) 14

4.1 CONDUCTED EMISSION AT AC POWER LINE 14
4.1.1 E.U.T. Operation: 14
4.1.2 Test Setup Diagram: 14
4.1.3 Test Data: 15
4.2 20DB BANDWIDTH 17
4.2.1 E.U.T. Operation: 17
4.2.2 Test Setup Diagram: 17
4.2.3 Test Data: 18
4.3 MAXIMUM CONDUCTED OUTPUT POWER 19
4.3.1 E.U.T. Operation: 19
4.3.2 Test Setup Diagram: 19
4.3.3 Test Data: 19
4.4 CHANNEL SEPARATION 20
4.4.1 E.U.T. Operation: 20
4.4.2 Test Setup Diagram: 20
4.4.3 Test Data: 20
4.5 NUMBER OF HOPPING FREQUENCIES 21
4.5.1 E.U.T. Operation: 21
4.5.2 Test Setup Diagram: 21
4.5.3 Test Data: 21
4.6 DWELL TIME 22
4.6.1 E.U.T. Operation: 23
4.6.2 Test Setup Diagram: 23
4.6.3 Test Data: 23
4.7 EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS 24
4.7.1 E.U.T. Operation: 25
4.7.2 Test Setup Diagram: 25
4.7.3 Test Data: 25
4.8 BAND EDGE EMISSIONS (RADIATED) 26
4.8.1 E.U.T. Operation: 26
4.8.2 Test Setup Diagram: 26

4.8.3 Test Data: 26
4.9 EMISSIONS IN FREQUENCY BANDS (BELOW 1GHZ) 29
4.9.1 E.U.T. Operation: 30
4.9.2 Test Setup Diagram: 30
4.9.3 Test Data: 30
4.10 EMISSIONS IN FREQUENCY BANDS (ABOVE 1GHZ) 32
4.10.1 E.U.T. Operation: 33
4.10.2 Test Setup Diagram: 33
4.10.3 Test Data: 33
5 TEST SETUP PHOTOS 37
6 PHOTOS OF THE EUT 39
APPENDIX 47
1. -20DB BANDWIDTH 47
2. PEAK OUTPUT POWER 52
3. CARRIER FREQUENCIES SEPARATION (HOPPING) 57
4. NUMBER OF HOPPING CHANNEL (HOPPING) 59
5. DWELL TIME (HOPPING) 61
6. BANDEDGE 71
7. SPURIOUS EMISSIONS 84

1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

1.2 Summary of Test Result

Item	Method	Requirement	Result
Antenna requirement	/	47 CFR 15.203	Pass
Conducted Emission at AC power line	ANSI C63.10-2020 section 6.2	47 CFR 15.207(a)	Pass
20dB Bandwidth	ANSI C63.10-2020, section 7.8.6 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(a)(1)	Pass
Maximum Conducted Output Power	ANSI C63.10-2020, section 7.8.5 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(b)(1)	Pass
Channel Separation	ANSI C63.10-2020, section 7.8.2 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(a)(1)	Pass
Number of Hopping Frequencies	ANSI C63.10-2020, section 7.8.3 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(a)(1)(iii)	Pass
Dwell Time	ANSI C63.10-2020, section 7.8.4 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(a)(1)(iii)	Pass
Emissions in non-restricted frequency bands	ANSI C63.10-2020 section 7.8.7 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d)	Pass
Band edge emissions (Radiated)	ANSI C63.10-2020 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass
Emissions in frequency bands (below 1GHz)	ANSI C63.10-2020 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass
Emissions in frequency bands (above 1GHz)	ANSI C63.10-2020 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass

Note: 1.N/A -this device(EUT) is not applicable to this testing item
2. RF-conducted test results including cable loss.

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : Shenzhen Boshike Microelectronics Co., Ltd.
Address : 402 Hengtai Yungu Creative Park, No.77-3 Shangwei New Village, Songyuanxia Community, Guanhu Street, Longhua District, Shenzhen

Manufacturer : Shenzhen Boshike Microelectronics Co., Ltd.
Address : 402 Hengtai Yungu Creative Park, No.77-3 Shangwei New Village, Songyuanxia Community, Guanhu Street, Longhua District, Shenzhen

2.2 Description of Device (EUT)

Product Name:	Projector speaker
Model/Type reference:	M3P
Series Model:	M1P, M2P, M4P, M5P, M6P, M7P, M8P, M9P, S1P, S2P, S3P, S4P, S5P, S6P, S7P, S8P, S9P, T1P, T2P, T3P, T4P, T5P, T6P, T7P, T8P, T9P, G1P, G2P, G3P, G4P, G5P, G6P, G7P, , G8P, G9P, E10P, E11P, E12P, E13P, S10P, S20P, S30P, S40P, C3P, Y30P, C6, C6P
Model Difference:	There are three models of the product, customer requirements for different models in the market, resulting in multiple models. However, the internal circuit boards, PCBs, BOMs, and other electrical structures of these models are the same, and these differences will not affect RF&EMC performance.
Trade Mark:	n/a
Product Description:	Projector speaker
Power Supply:	DC15V from adapter
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	79
Modulation Type:	GFSK, π/4 DQPSK, 8DPSK
Antenna Type:	PCB ANT
Antenna Gain:	-0.58dBi
Hardware Version:	V2.0
Software Version:	V0.3.2

Operation Frequency each of channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz

10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz	/	/

Note: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:

Test channel	**Frequency (MHz)**
	BR/EDR
Lowest channel	2402MHz
Middle channel	2441MHz
Highest channel	2480MHz

2.3 Description of Test Modes

No	**Title**	**Description**
TM1	TX-GFSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation at lowest, middle and highest channel.
TM2	TX-Pi/4DQPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with Pi/4DQPSK modulation at lowest, middle and highest channel.
TM3	8DPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with 8DPSK modulation at lowest, middle and highest channel.
TM4	TX-GFSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.
TM5	TX-Pi/4DQPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with Pi/4DQPSK modulation.
TM6	8DPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation.
Test soft ware:		

2.4 Description of Support Units

Title	Manufacturer	Model No.	Serial No.
Adapter	/	Model:HYT-1503000 INPUT:100-240V 50/60Hz OUTPUT: 15V -3A	/

2.5 Equipments Used During The Test

Conducted Emission at AC power line					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Cable	SCHWARZ BECK	/	/	2025-04-18	2026-04-17
Pulse Limiter	SCHWARZ BECK	VTSD 9561-F Pulse limiter 10dB Attenuation	561-G071	2024-12-06	2025-12-05
50ΩCoaxial Switch	Anritsu	MP59B	M20531	/	/
Test Receiver	Rohde & Schwarz	ESPI TEST RECEIVER	1164.6607K03 -102109-MH	2025-04-25	2026-04-24
L.I.S.N	R&S	ESH3-Z5	831.5518.52	2025-04-18	2026-04-17
L.I.S.N	SCHWARZ BECK	NSLK 8126	05055	2025-04-18	2026-04-17
Pulse Limiter	CYBERTEK	EM5010A	/	2025-04-25	2026-04-24
EMI test software	EZ -EMC	EZ	V1.1.42	/	/

20dB Bandwidth
Maximum Conducted Output Power
Channel Separation
Number of Hopping Frequencies
Dwell Time
Emissions in non-restricted frequency bands

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Test Software	Tachoy Information Technology(shenzhen) Co.,Ltd.	RTS-01	V1.0.0	/	/
RF Sensor Unit	Tachoy Information Technology(shenzhen) Co.,Ltd.	TR1029-2	000001	/	/
Wideband radio communication tester	R&S	CMW500	113410	2025-04-25	2026-04-24
Vector Signal Generator	Keysight	N5181A	MY50143455	2024-12-06	2025-12-05
Signal Generator	Keysight	N5182A	MY48180415	2024-12-06	2025-12-05
Spectrum Analyzer	Keysight	N9020A	MY53420323	2024-12-06	2025-12-05
Spectrum Analyzer	Keysight	N9020A	MY55338111	2025-09-16	2026-09-15

Emissions in frequency bands (above 1GHz) Band edge emissions (Radiated) Emissions in frequency bands (below 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test software	Farad	EZ -EMC	V1.1.42	/	/
Positioning Controller	MF	MF-7802	/	/	/
Amplifier(18-40G)	COM-POWER	AH-1840	10100008-1	2024-04-26	2027-04-25
Horn antenna	COM-POWER	AH-1840 (18-40G)	10100008	2024-04-26	2027-04-25
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2025-04-28	2026-04-27
Cable(LF)#2	Schwarzbeck	/	/	2024-12-19	2025-12-18
Cable(LF)#1	Schwarzbeck	/	/	2024-12-19	2025-12-18
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2025-04-25	2026-04-24
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2025-04-25	2026-04-24
Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	2025-04-29	2026-04-28
Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	2025-04-29	2026-04-28
Wideband radio communication tester	R&S	CMW500	113410	2025-04-25	2026-04-24
Spectrum Analyzer	R&S	FSP30	1321.3008K40 -101729-jR	2025-04-18	2026-04-17
Test Receiver	R&S	ESCI 3	1166.5950K03 -101431-Jq	2025-04-18	2026-04-17
Horn Antenna	Sunol Sciences	DRH-118	A091114	2025-04-21	2026-04-20
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2024-09-28	2026-09-27

2.6 Statement Of The Measurement Uncertainty

Test Item	**Measurement Uncertainty**
Conducted Disturbance (0.15~30MHz)	±3.41dB
Occupied Bandwidth	±3.63%
RF conducted power	±0.733dB
Duty cycle	±3.1%
Conducted Spurious emissions	±1.98dB
Radiated Emission (Above 1GHz)	±5.46dB
Radiated Emission (Below 1GHz)	±5.79dB
Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

2.7 Identification of Testing Laboratory

Company Name:	Shenzhen DACE Testing Technology Co., Ltd.
Address:	102, Building H1, & 1/F., Building H, Hongfa Science & Technology Park, Tangtou Connunity, Shiyan Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252

Identification of the Responsible Testing Location

Company Name:	Shenzhen DACE Testing Technology Co., Ltd.
Address:	102, Building H1, & 1/F., Building H, Hongfa Science & Technology Park, Tangtou Connunity, Shiyan Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252
FCC Registration Number:	0032847402
Designation Number:	CN1342
Test Firm Registration Number:	778666
A2LA Certificate Number:	6270.01

2.8 Announcement

(1) The test report reference to the report template version v0.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) This document may not be altered or revised in any way unless done so by DACE and all revisions are duly noted in the revisions section.

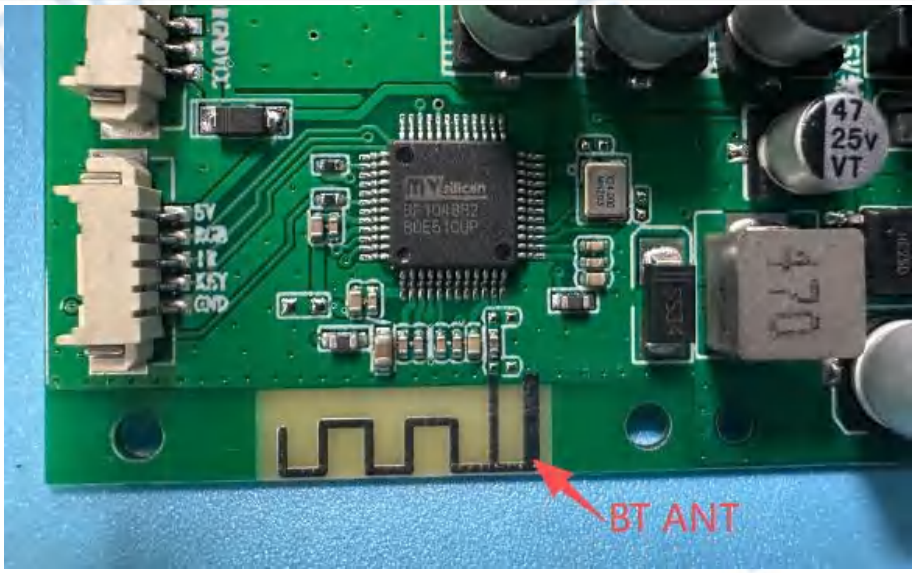
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

(6) We hereby declare that the laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant. the laboratory is not responsible for the accuracy of the information provided by the client(item 2.2). When the information provided by the customer may affect the effectiveness of the results, the responsibility lies with the customer, and the laboratory does not assume any responsibility.

3 Evaluation Results (Evaluation)

3.1 Antenna requirement

Test Requirement:	Refer to 47 CFR Part 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.



4 Radio Spectrum Matter Test Results (RF)

4.1 Conducted Emission at AC power line

Test Requirement:	Refer to 47 CFR 15.207(a), Except as shown in paragraphs (b)and (c)of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).
Test Limit:	

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

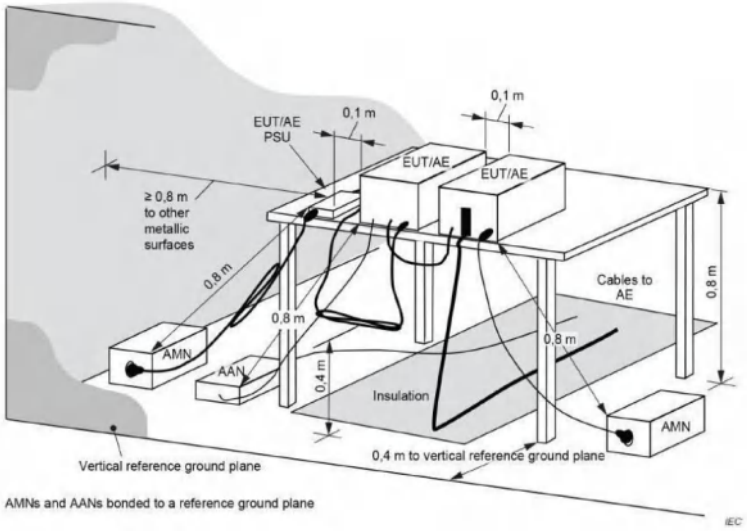
*Decreases with the logarithm of the frequency.

Test Method:	ANSI C63.10-2020 section 6.2
Procedure:	Refer to ANSI C63.10-2020 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.1 E.U.T. Operation:

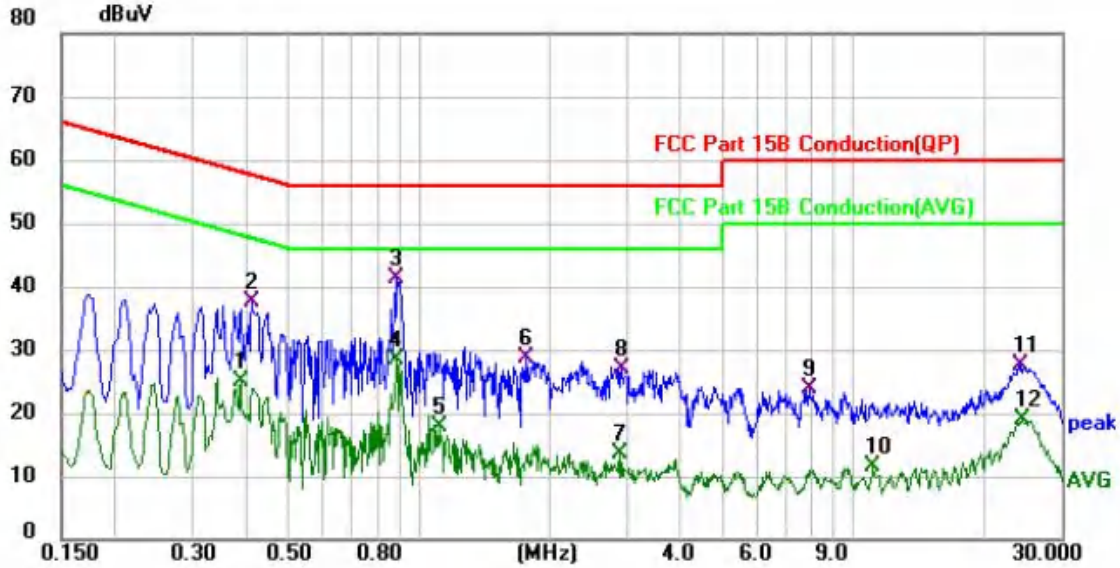
Operating Environment:					
Temperature:	22.8 °C	Humidity:	51 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM6				
Final test mode:	TM6				

4.1.2 Test Setup Diagram:



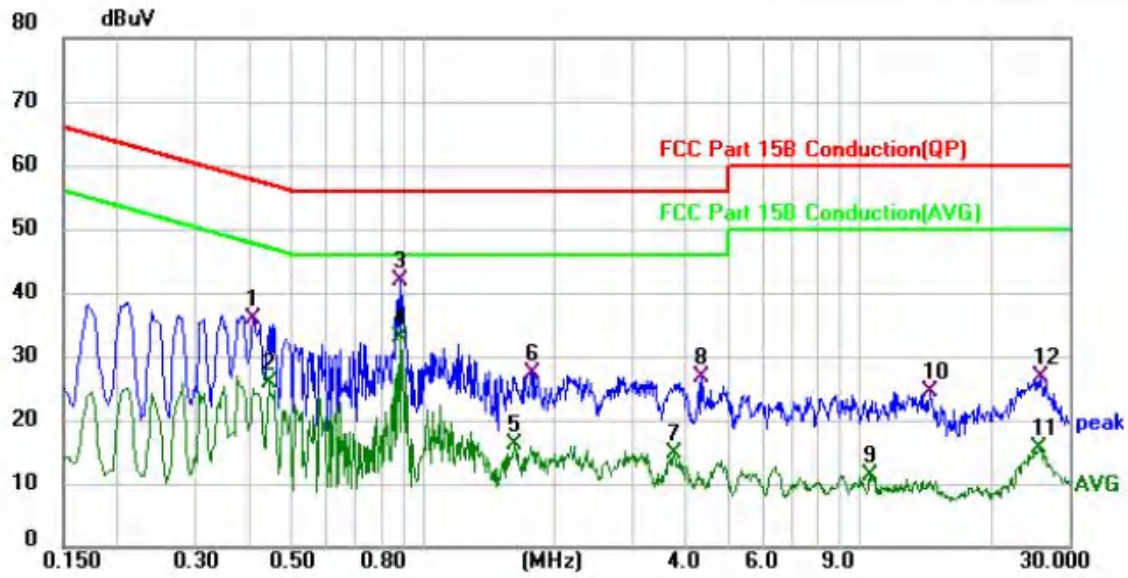
4.1.3 Test Data:

TM6 / Line: Line / Band: 2400-2483.5 MHz / BW: 1 / CH: L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3860	14.87	10.09	24.96	48.15	-23.19	AVG	
2		0.4100	27.41	10.10	37.51	57.65	-20.14	QP	
3	*	0.8860	31.08	10.10	41.18	56.00	-14.82	QP	
4		0.8860	18.43	10.10	28.53	46.00	-17.47	AVG	
5		1.1140	7.70	10.11	17.81	46.00	-28.19	AVG	
6		1.7540	18.65	10.03	28.68	56.00	-27.32	QP	
7		2.8940	3.54	10.06	13.60	46.00	-32.40	AVG	
8		2.9260	17.04	10.07	27.11	56.00	-28.89	QP	
9		7.9100	13.66	10.26	23.92	60.00	-36.08	QP	
10		11.0860	1.17	10.35	11.52	50.00	-38.48	AVG	
11		24.3980	16.80	10.74	27.54	60.00	-32.46	QP	
12		24.5660	8.35	10.75	19.10	50.00	-30.90	AVG	

TM6 / Line: Neutral / Band: 2400-2483.5 MHz / BW: 1 / CH: L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4060	25.86	10.08	35.94	57.73	-21.79	QP	
2		0.4420	15.81	10.08	25.89	47.02	-21.13	AVG	
3		0.8860	31.71	10.08	41.79	56.00	-14.21	QP	
4	*	0.8860	22.93	10.08	33.01	46.00	-12.99	AVG	
5		1.6260	6.10	10.03	16.13	46.00	-29.87	AVG	
6		1.7860	17.30	10.03	27.33	56.00	-28.67	QP	
7		3.7580	4.60	10.15	14.75	46.00	-31.25	AVG	
8		4.3300	16.63	10.18	26.81	56.00	-29.19	QP	
9		10.5940	0.83	10.35	11.18	50.00	-38.82	AVG	
10		14.4820	14.05	10.47	24.52	60.00	-35.48	QP	
11		25.8060	4.65	10.91	15.56	50.00	-34.44	AVG	
12		25.9660	15.83	10.92	26.75	60.00	-33.25	QP	

NOTE:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor, Over=Limit- Mesurement

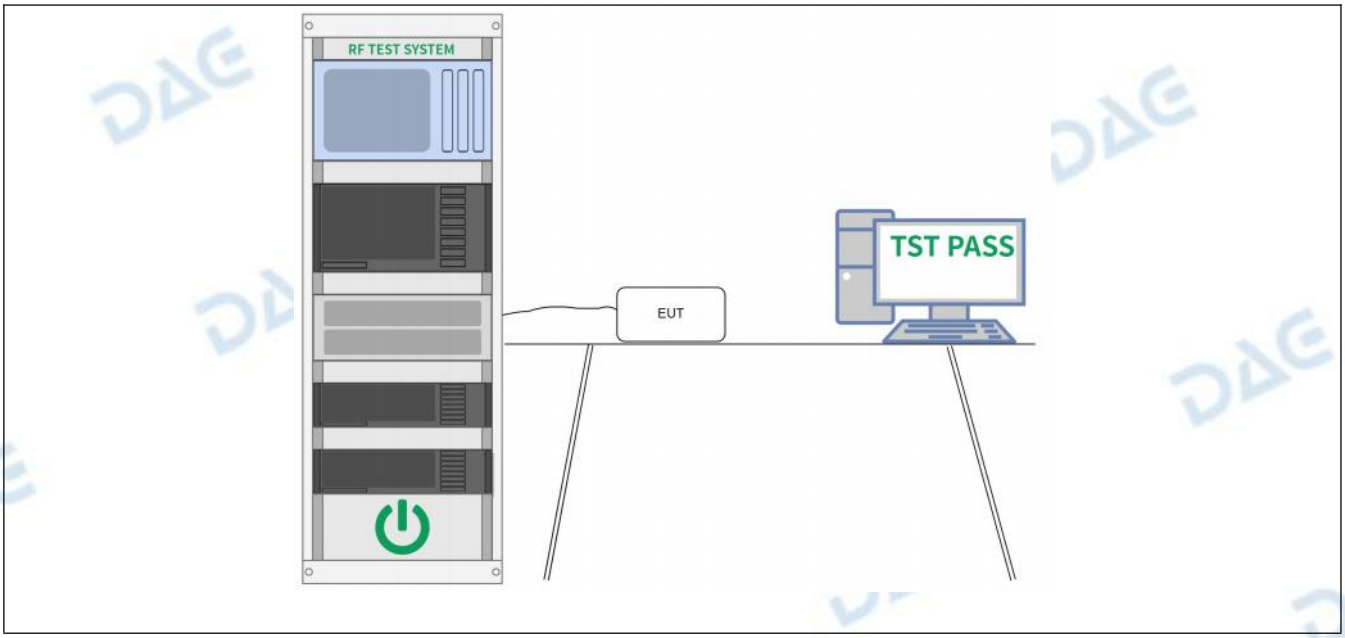
4.2 20dB Bandwidth

Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method:	ANSI C63.10-2020, section 7.8.6, For occupied bandwidth measurements, use the procedure in 6.9.3. Frequency hopping shall be disabled for this test. KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth: a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW. b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be at least three times the RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.6.2. d) Step a) through step c) might require iteration to adjust within the specified range. e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max-hold mode (until the trace stabilizes) shall be used. f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth. g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies. h) The occupied bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

4.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23.9 °C	Humidity:	55 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.2.2 Test Setup Diagram:



4.2.3 Test Data:

Please Refer to Appendix for Details.

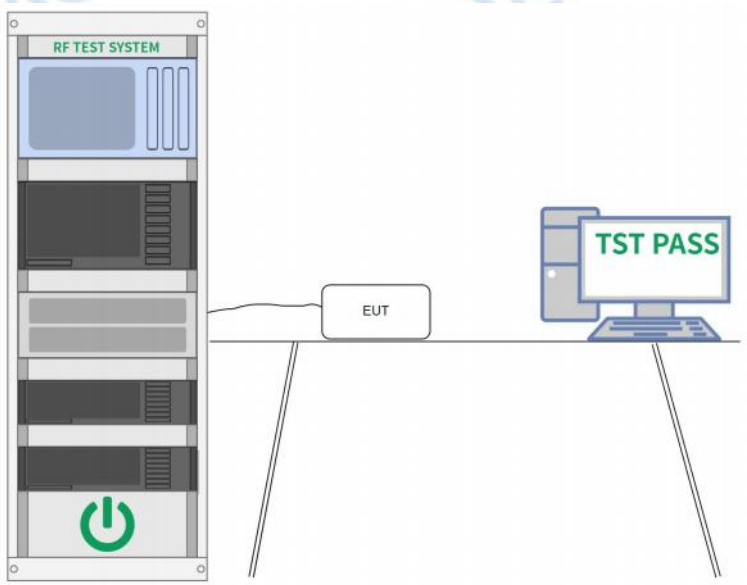
4.3 Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(1)
Test Limit:	Refer to 47 CFR 15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Method:	ANSI C63.10-2020, section 7.8.5 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. Frequency hopping shall be disabled for this test. Use the following spectrum analyzer settings: a) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel. b) RBW > 20 dB bandwidth of the emission being measured. c) VBW ≥ RBW. d) Sweep: No faster than coupled (auto) time. e) Detector function: Peak. f) Trace: Max-hold. g) Allow trace to stabilize. h) Use the marker-to-peak function to set the marker to the peak of the emission. i) The indicated level is the peak output power, after any corrections for external attenuators and cables. j) A spectral plot of the test results and setup description shall be included in the test report.

4.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	50 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.3.2 Test Setup Diagram:



4.3.3 Test Data:

Please Refer to Appendix for Details.

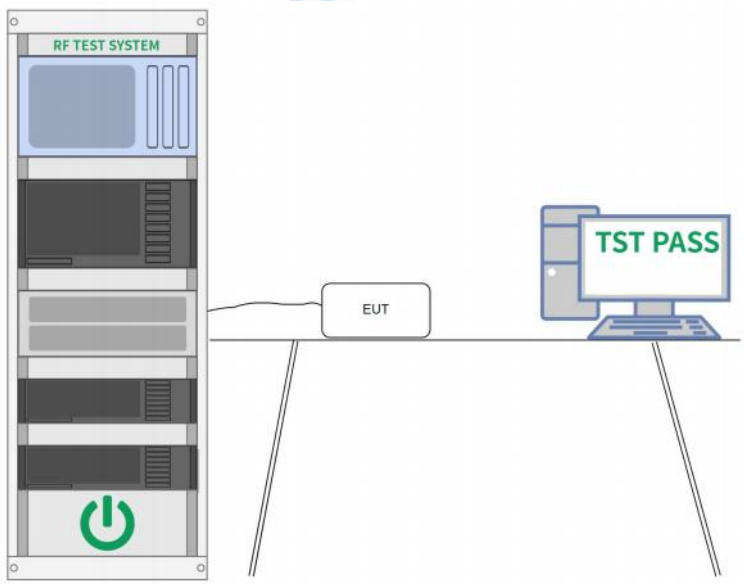
4.4 Channel Separation

Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Method:	ANSI C63.10-2020, section 7.8.2 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: No faster than coupled (auto) time. e) Detector function: Peak. f) Trace: Max-hold. g) Allow the trace to stabilize.

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	49 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM3, TM4				
Final test mode:	TM3, TM4, TM5				

4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

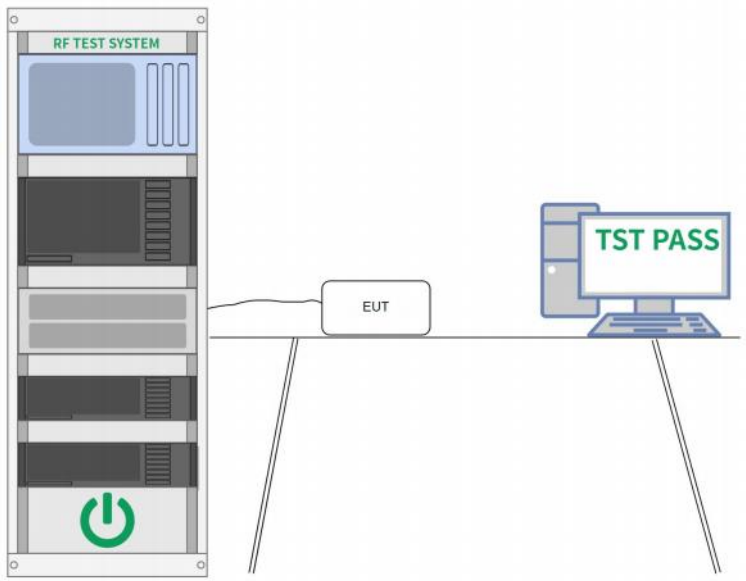
4.5 Number of Hopping Frequencies

Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	ANSI C63.10-2020, section 7.8.3 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: The frequency band of operation. Depending on the number of channels the device supports, it could be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. c) VBW ≥ RBW. d) Sweep: No faster than coupled (auto) time. e) Detector function: Peak. f) Trace: Max-hold. g) Allow the trace to stabilize.

4.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.1 °C	Humidity:	51 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM3, TM4				
Final test mode:	TM3, TM4				

4.5.2 Test Setup Diagram:



4.5.3 Test Data:

Please Refer to Appendix for Details.

4.6 Dwell Time

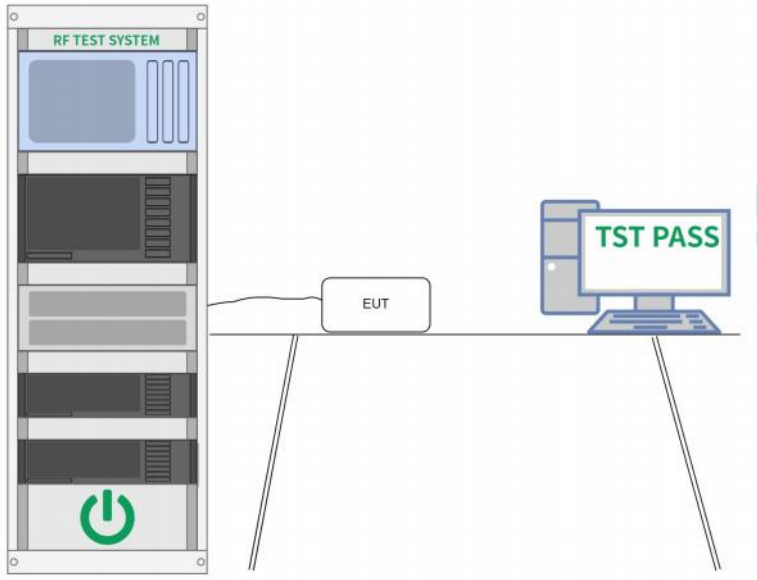
Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	ANSI C63.10-2020, section 7.8.4 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	The dwell time per hop on a channel is the time from the start of the first transmission to the end of the last transmission for that hop. If the device has a single transmission per hop then the dwell time is the duration of that transmission. If the device has a multiple transmissions per hop then the dwell time is measured from the start of the first transmission to the end of the last transmission. The time of occupancy is the total time that the device dwells on a channel over an observation period specified in the regulatory requirement. To determine the time of occupancy the spectrum analyzer will be configured to measure both the dwell time per hop and the number of times the device transmits on a specific channel in a given period. The EUT shall have its hopping function enabled. Compliance with the requirements shall be made with the minimum and with the maximum number of channels enabled. If the dwell time per channel does not vary with the number of channels than compliance with the requirements may be based on the minimum number of channels. If the device supports different dwell times per channel (example Bluetooth devices can dwell on a channel for 1, 3 or 5 time slots) then measurements can be limited to the longest dwell time with the minimum number of channels. Use the following spectrum analyzer settings to determine the dwell time per hop: a) Span: Zero span, centered on a hopping channel. b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected transmission time per hop. c) Sweep time: Set so that the start of the first transmission and end of the last transmission for the hop are clearly captured. Setting the sweep time to be slightly longer than the hopping period per channel (hopping period = 1/hopping rate) should achieve this. d) Use a video trigger, where possible with a trigger delay, so that the start of the transmission is clearly observed. The trigger level might need adjustment to reduce the chance of triggering when the system hops on an adjacent channel. e) Detector function: Peak. f) Trace: Clear-write, single sweep. g) Place markers at the start of the first transmission on the channel and at the end of the last transmission. The dwell time per hop is the time between these two markers. To determine the number of hops on a channel in the regulatory observation period repeat the measurement using a longer sweep time. When the device uses a single hopping sequence the period of measurement should be sufficient to capture at least 2 hops. When the device uses a dynamic hopping sequence, or the sequence varies, the period of measurement may need to capture multiple hops to better determine the average time of occupancy. Count the number of hops on the channel across the sweep time. The average number of hops on the same channel within the regulatory observation

	period is calculated from the number of hops on the channel divided by the spectrum analyzer sweep time multiplied by the regulatory observation period. For example, if three hops are counted with an analyzer sweep time of 500 ms and the regulatory observation period is 10 s, then the number of hops in that ten seconds is 3 / 0.5 × 10, or 60 hops. The average time of occupancy is calculated by multiplying the dwell time per hop by the number of hops in the observation period.

4.6.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.1 °C	Humidity:	55 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM3, TM4				
Final test mode:	TM3, TM4				

4.6.2 Test Setup Diagram:



4.6.3 Test Data:

Please Refer to Appendix for Details.

4.7 Emissions in non-restricted frequency bands

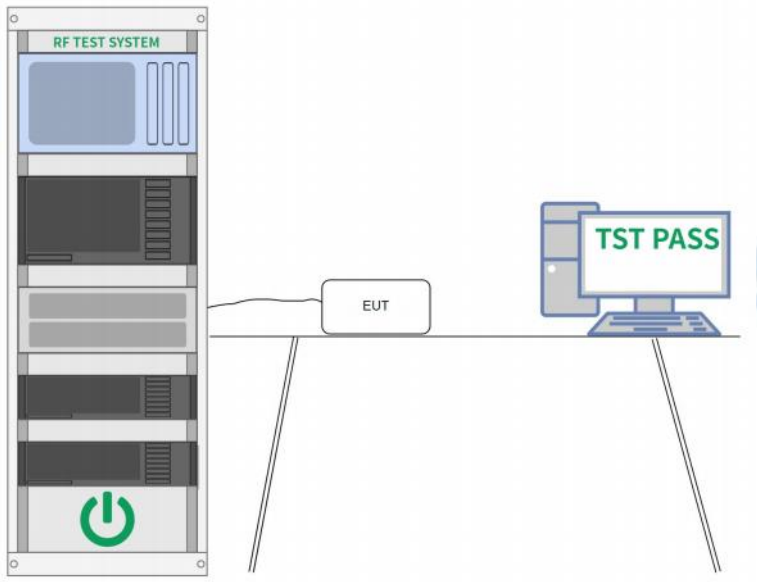
Test Requirement:	47 CFR 15.247(d)
Test Limit:	Refer to 47 CFR 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 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.
Test Method:	ANSI C63.10-2020 section 7.8.7 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	7.8.7.1 General considerations To demonstrate compliance with the relative out-of-band emissions requirements conducted spurious emissions shall be measured for the transmit frequencies, per 5.5 and 5.6, and at the maximum transmit powers. Frequency hopping shall be disabled for this test with the exception of measurements at the allocated band-edges which shall be repeated with hopping enabled. Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The frequency range of testing shall span 30 MHz to 10 times the operating frequency and this may be done in a single sweep or, to aid resolution, across a number of sweeps. The resolution bandwidth shall be 100 kHz, video bandwidth 300 kHz, and a coupled sweep time with a peak detector. The limit is based on the highest in-band level across all channels measured using the same instrument settings (resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector). To help clearly demonstrate compliance a display line may be set at the required offset (typically 20 dB) below the highest in-band level. Where the highest in-band level is not clearly identified in the out-of-band measurements a separate spectral plot showing the in-band level shall be provided. When conducted measurements cannot be made (for example a device with integrated, non-removable antenna) radiated measurements shall be used. The reference level for determining the limit shall be established by maximizing the field strength from the highest power channel and measuring using the resolution and video bandwidth settings and peak detector as described above. The field strength limit for spurious emissions outside of restricted-bands shall then be set at the required offset (typically 20 dB) below the highest in-band level. Radiated measurements will follow the standards measurement procedures described in Clause 6 with the exception that the resolution bandwidth shall be 100 kHz, video bandwidth 300 kHz, and a coupled sweep time with a peak detector. Note that use of wider measurement bandwidths are acceptable for measuring the spurious emissions provided that the peak detector is used and that the measured value of spurious emissions are compared to the highest in-band level measured with the 100 kHz / 300 kHz bandwidth settings to determine compliance. 7.8.7.2 Band-edges Compliance with a relative limit at the band-edges (e.g., −20 dBc) shall be made on the lowest and on the highest channels with frequency hopping disabled and repeated with frequency hopping enabled. For the latter test the hopping sequence shall include the lowest and highest channels.

	For measurements with the hopping disabled the analyzer screen shall clearly show compliance with the requirement within 10 MHz of the allocated band-edge. For measurements with the hopping enabled the analyzer screen shall clearly show compliance with the requirement within 10 MHz of both of the allocated band-edges. This could require separate spectral plots for each band-edge.

4.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23.9 °C	Humidity:	46 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.7.2 Test Setup Diagram:



4.7.3 Test Data:

Please Refer to Appendix for Details.

4.8 Band edge emissions (Radiated)

Test Requirement:	Refer to 47 CFR 15.247(d), 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 Limit:	

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

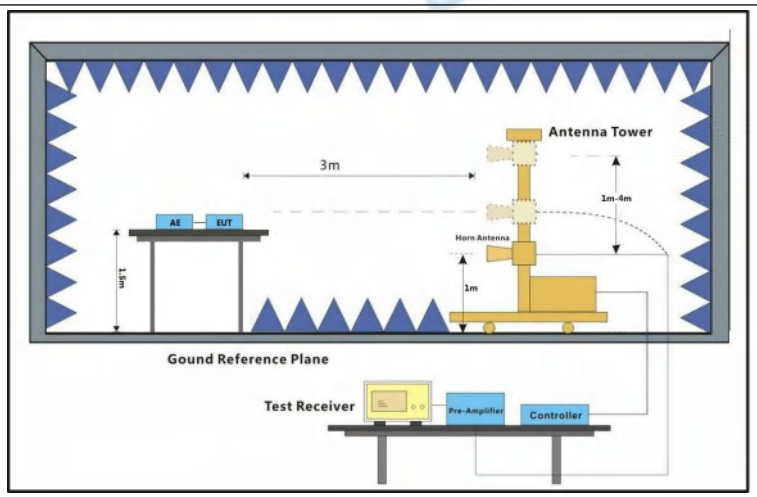
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Method:	ANSI C63.10-2020 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2020 section 6.10.5.2

4.8.1 E.U.T. Operation:

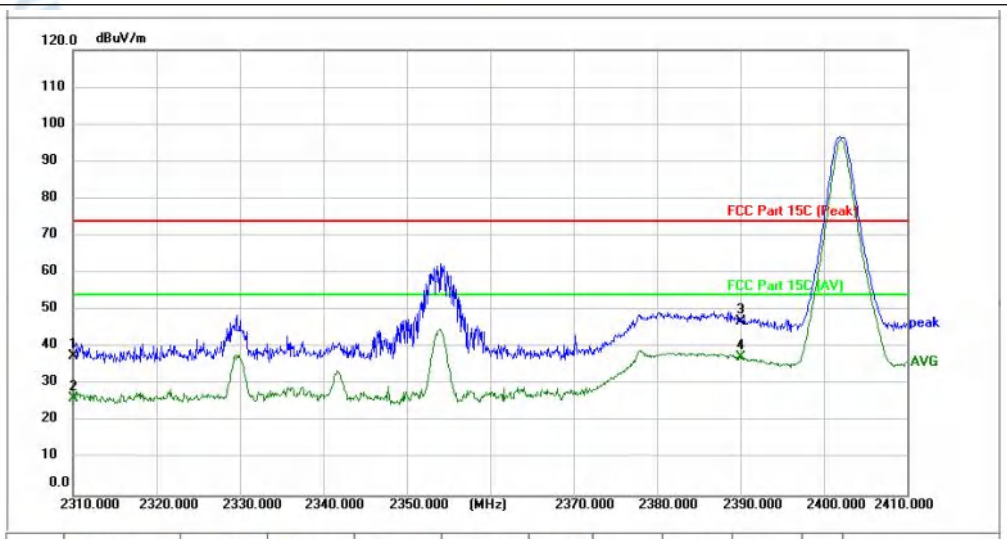
Operating Environment:					
Temperature:	23 °C	Humidity:	50 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM3				

4.8.2 Test Setup Diagram:



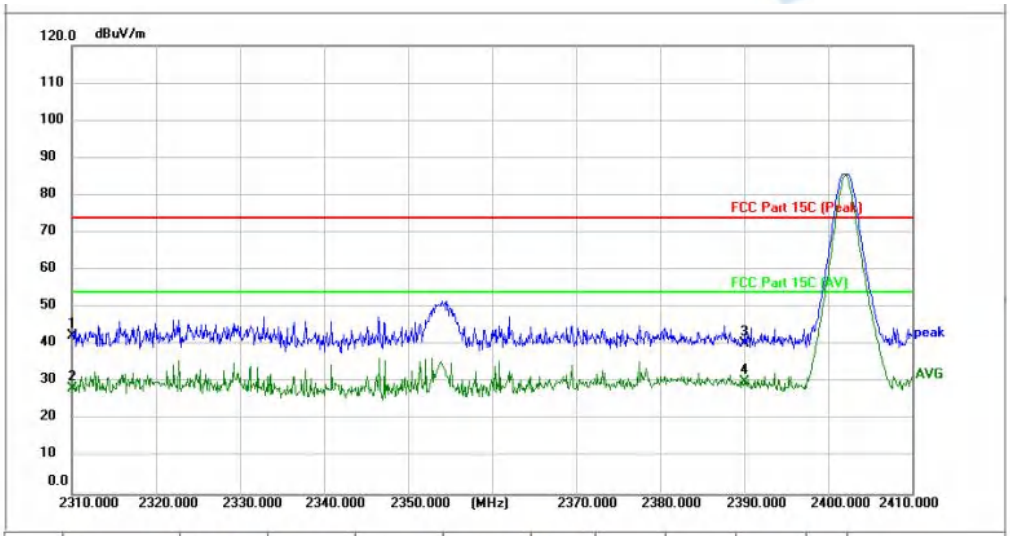
4.8.3 Test Data:

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



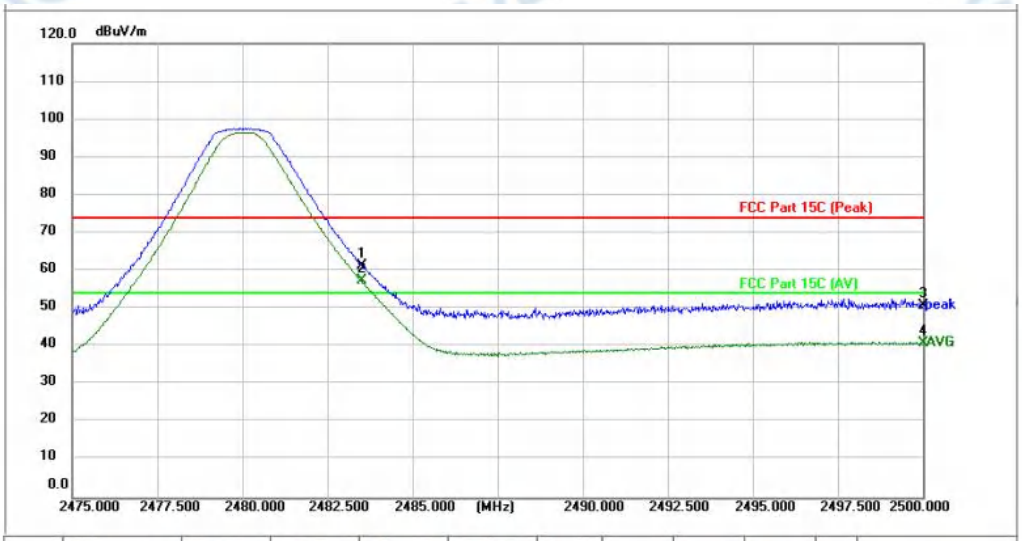
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	44.21	-6.63	37.58	74.00	-36.42	peak			P	
2	2310.000	32.96	-6.63	26.33	54.00	-27.67	AVG			P	
3	2390.000	53.40	-6.42	46.98	74.00	-27.02	peak			P	
4 *	2390.000	43.62	-6.42	37.20	54.00	-16.80	AVG			P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



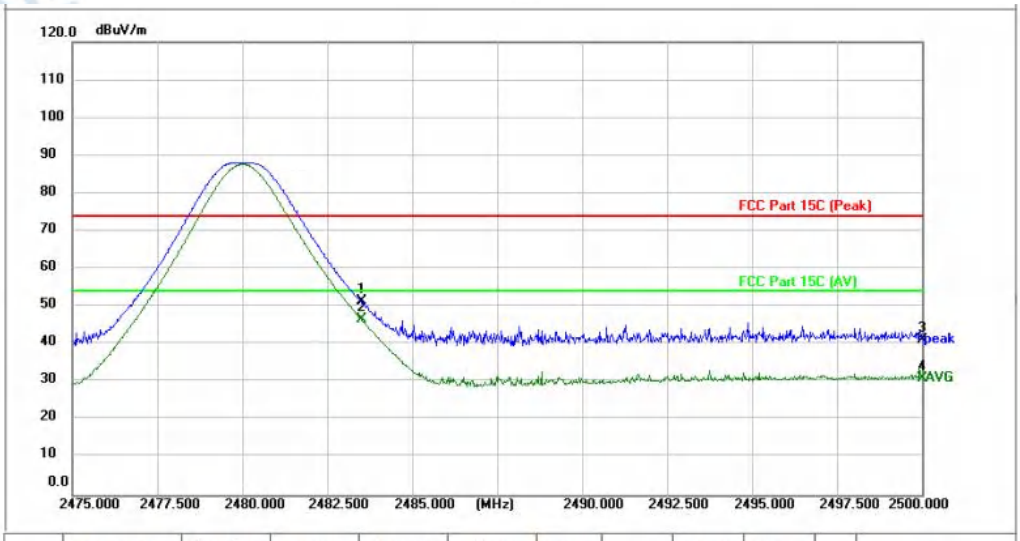
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	49.14	-6.63	42.51	74.00	-31.49	peak			P	
2	2310.000	34.90	-6.63	28.27	54.00	-25.73	AVG			P	
3	2390.000	46.73	-6.42	40.31	74.00	-33.69	peak			P	
4 *	2390.000	36.46	-6.42	30.04	54.00	-23.96	AVG			P	

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.500	67.66	-6.17	61.49	74.00	-12.51	peak			P	
2 *	2483.500	63.59	-6.17	57.42	54.00	3.42	AVG			F	
3	2500.000	57.01	-6.13	50.88	74.00	-23.12	peak			P	
4	2500.000	47.08	-6.13	40.95	54.00	-13.05	AVG			P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.500	57.61	-6.17	51.44	74.00	-22.56	peak			P	
2 *	2483.500	52.91	-6.17	46.74	54.00	-7.26	AVG			P	
3	2500.000	47.44	-6.13	41.31	74.00	-32.69	peak			P	
4	2500.000	37.31	-6.13	31.18	54.00	-22.82	AVG			P	

Remark:Margin=Level - Limit, Level=Test receiver reading + correction factor

The test software will only record the worst test angle and height, and only the worst case will be recorded in the test report.

4.9 Emissions in frequency bands (below 1GHz)

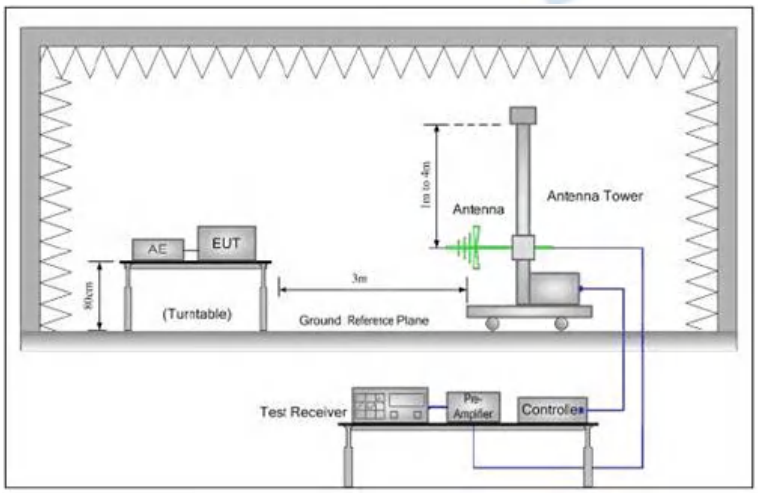
<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.6.4
KDB 558074 D01 15.247 Meas Guidance v05r02</td></tr>
<tr><td>Procedure:</td><td>a. 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.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. 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.
d. 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.
e. 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.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. 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.
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.
Remark:
1) For emission below 1GHz, through pre-scan found the worst case is the lowest</td></tr>
</table>

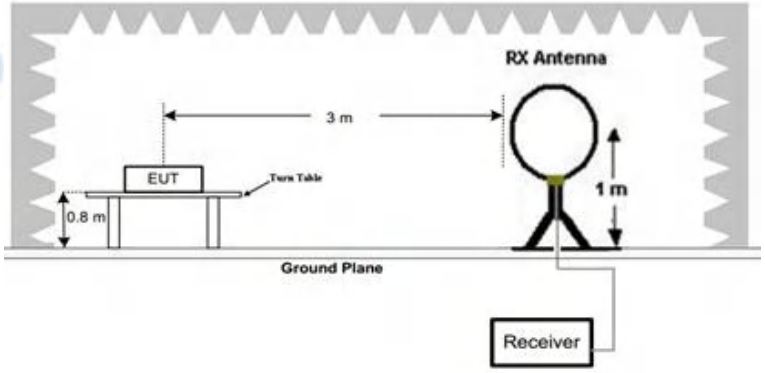
	channel. Only the worst case is recorded in the report. 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level =Receiver Reading + Antenna Factor + Cable Factor ¨C Preamplifier Factor 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.

4.9.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	51 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM1, TM2				
Final test mode:	TM2				

4.9.2 Test Setup Diagram:





4.9.3 Test Data:

TM2 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	87.7245	45.95	-12.63	33.32	40.00	-6.68	QP			P	
2	89.5899	48.64	-12.38	36.26	43.50	-7.24	QP			P	
3 *	261.0581	50.90	-9.46	41.44	46.00	-4.56	QP			P	
4	295.1467	45.45	-8.06	37.39	46.00	-8.61	QP			P	
5	387.9920	42.34	-6.26	36.08	46.00	-9.92	QP			P	
6	682.3482	34.90	0.01	34.91	46.00	-11.09	QP			P	

TM2 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 !	45.8551	46.26	-11.10	35.16	40.00	-4.84	QP			P	
2 *	87.7246	48.15	-12.82	35.33	40.00	-4.67	QP			P	
3	127.2176	39.11	-6.98	32.13	43.50	-11.37	QP			P	
4	179.3863	39.33	-8.90	30.43	43.50	-13.07	QP			P	
5	292.0582	46.94	-8.13	38.81	46.00	-7.19	QP			P	
6 !	411.8240	46.35	-5.23	41.12	46.00	-4.88	QP			P	

Remark:Margin=Level - Limit, Level=Test receiver reading + correction factor

The test software will only record the worst test angle and height, and only the worst case will be recorded in the test report.

4.10 Emissions in frequency bands (above 1GHz)

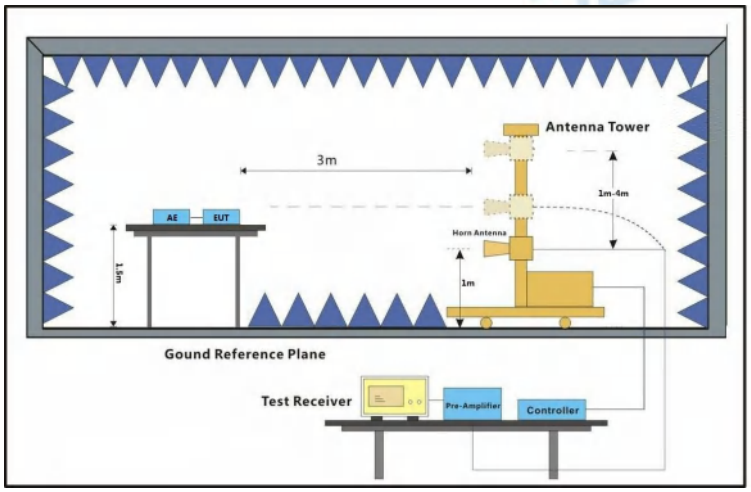
<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), in addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.6.4
KDB 558074 D01 15.247 Meas Guidance v05r02</td></tr>
<tr><td>Procedure:</td><td>a. 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.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. 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.
d. 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.
e. 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.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. 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.
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
j. Repeat above procedures until all frequencies measured was complete.
Remark:
1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.</td></tr>
</table>

	2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level =Receiver Reading + Antenna Factor + Cable Factor ¨C Preamplifier Factor 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.

4.10.1 E.U.T. Operation:

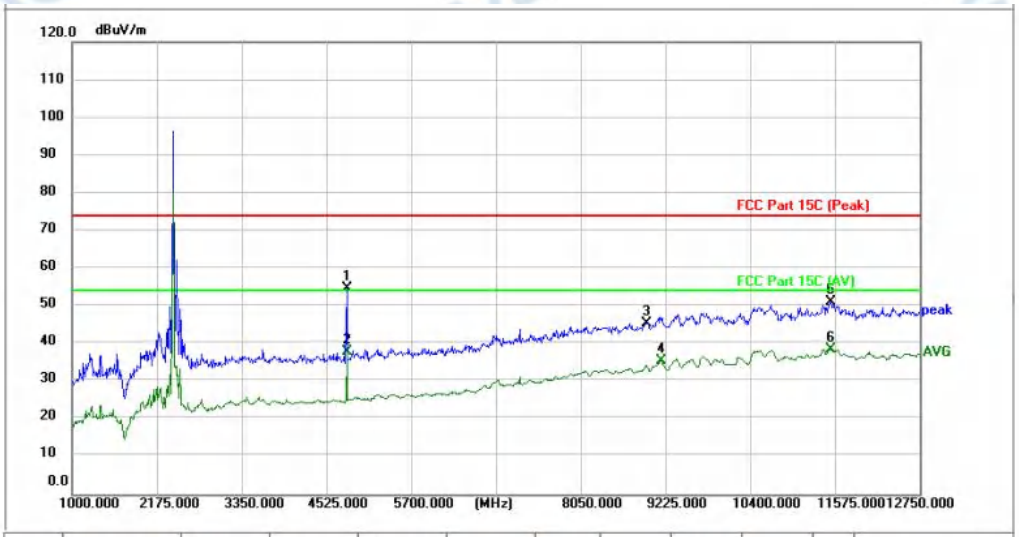
Operating Environment:					
Temperature:	22.6 °C	Humidity:	49 %	Atmospheric Pressure:	101.4 kPa
Pretest mode:	TM1, TM2,TM3				
Final test mode:	TM3				

4.10.2 Test Setup Diagram:



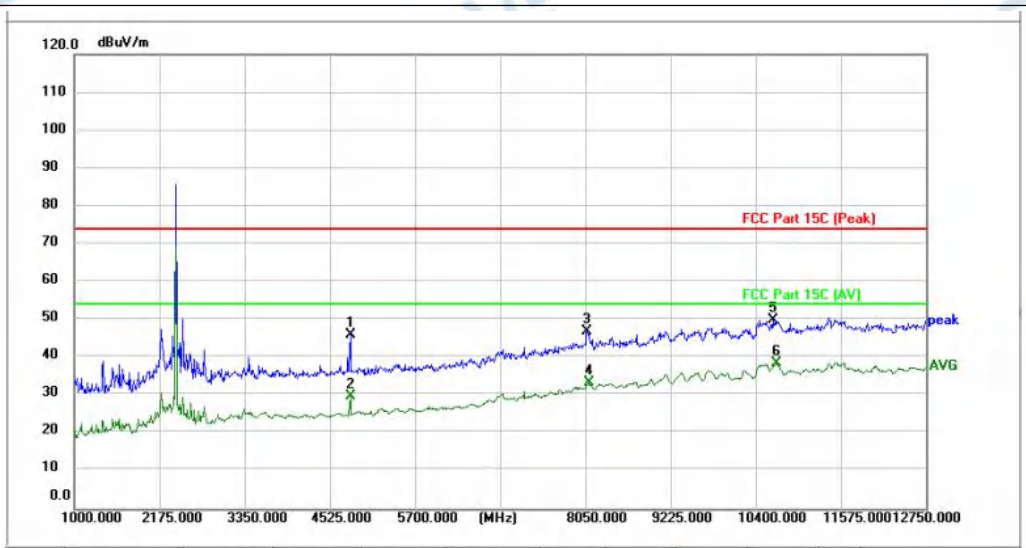
4.10.3 Test Data:

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



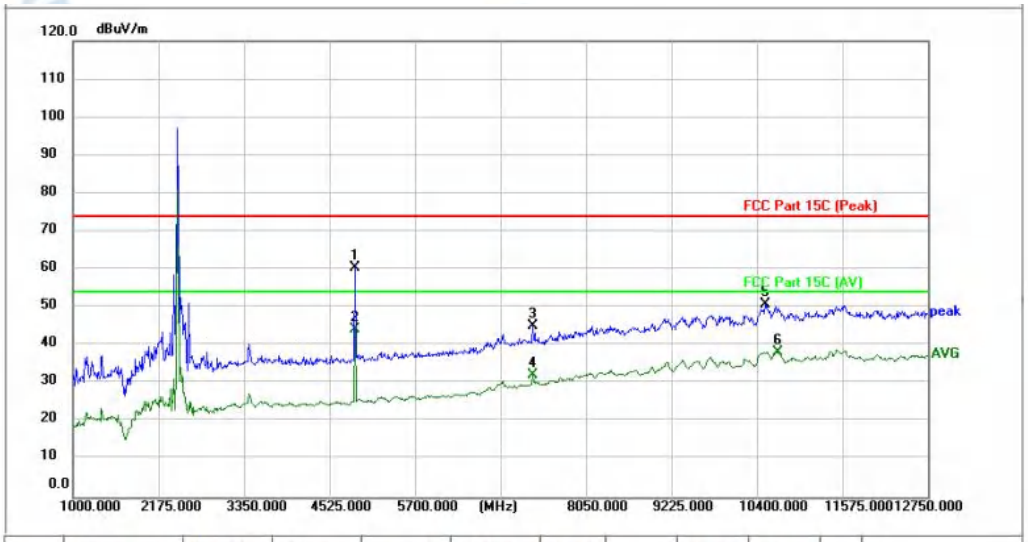
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4807.000	55.30	-0.69	54.61	74.00	-19.39	peak	149		P	
2	4807.000	38.57	-0.69	37.88	54.00	-16.12	AVG	149		P	
3	8966.500	37.32	8.24	45.56	74.00	-28.44	peak	149		P	
4	9166.250	27.46	8.23	35.69	54.00	-18.31	AVG	149		P	
5	11516.250	41.39	9.68	51.07	74.00	-22.93	peak	149		P	
6 *	11516.250	29.00	9.68	38.68	54.00	-15.32	AVG	149		P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



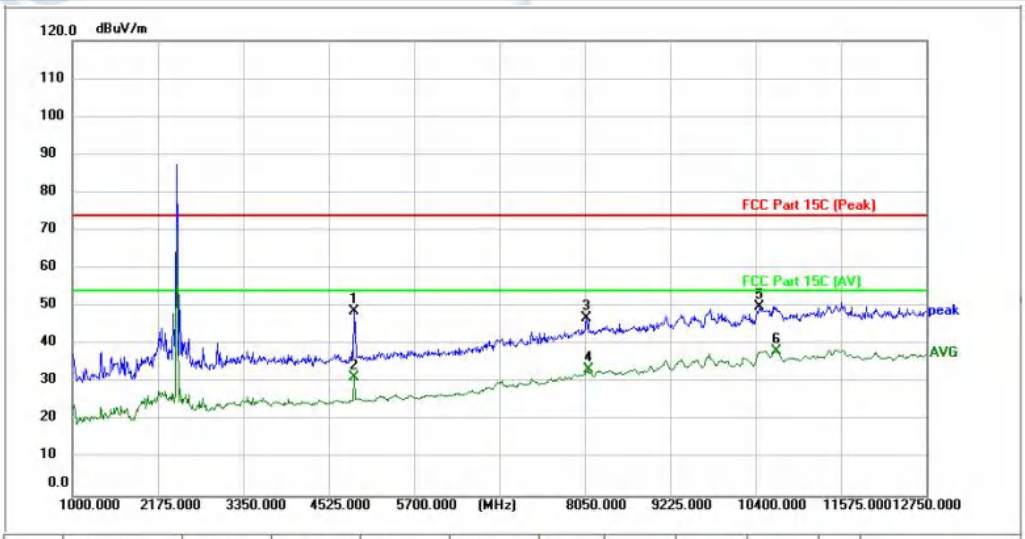
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4807.000	46.71	-0.69	46.02	74.00	-27.98	peak	149		P	
2	4807.000	30.49	-0.69	29.80	54.00	-24.20	AVG	149		P	
3	8073.500	40.07	6.79	46.86	74.00	-27.14	peak	149		P	
4	8097.000	26.51	6.83	33.34	54.00	-20.66	AVG	149		P	
5	10635.000	40.90	9.10	50.00	74.00	-24.00	peak	149		P	
6 *	10682.000	29.35	9.13	38.48	54.00	-15.52	AVG	149		P	

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: M



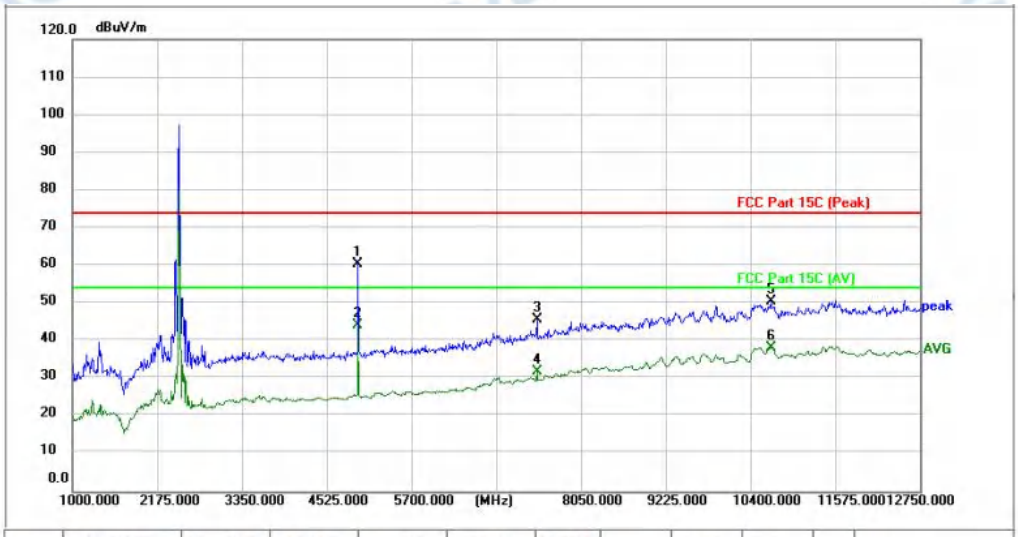
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4877.500	60.77	-0.45	60.32	74.00	-13.68	peak			P	
2 *	4877.500	44.80	-0.45	44.35	54.00	-9.65	AVG			P	
3	7321.500	40.55	4.57	45.12	74.00	-28.88	peak			P	
4	7321.500	27.82	4.57	32.39	54.00	-21.61	AVG			P	
5	10517.500	41.72	9.03	50.75	74.00	-23.25	peak			P	
6	10693.750	29.22	9.15	38.37	54.00	-15.63	AVG			P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: M



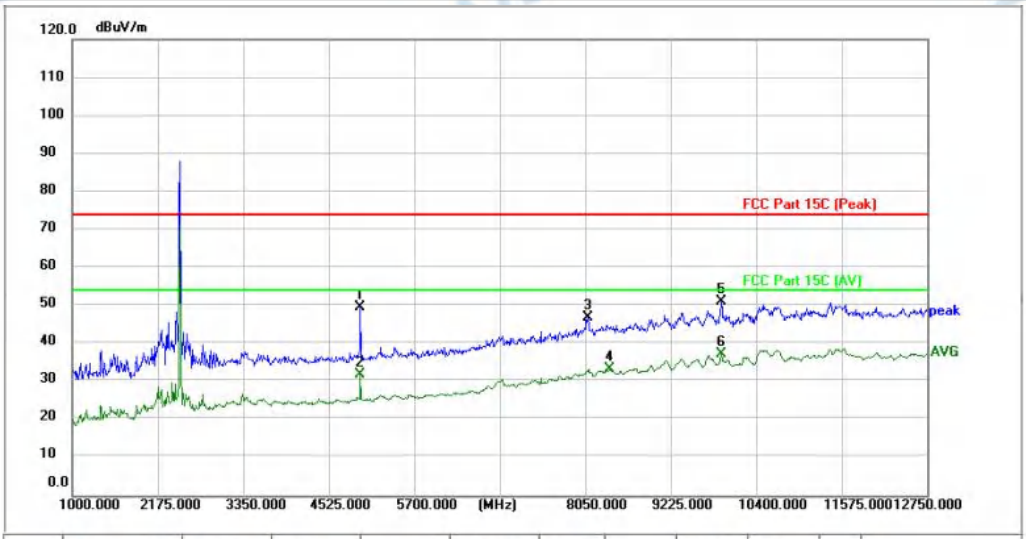
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4877.500	49.17	-0.45	48.72	74.00	-25.28	peak	149		P	
2	4877.500	31.87	-0.45	31.42	54.00	-22.58	AVG	149		P	
3	8073.500	40.30	6.79	47.09	74.00	-26.91	peak	149		P	
4	8097.000	26.70	6.83	33.53	54.00	-20.47	AVG	149		P	
5	10458.750	41.12	8.92	50.04	74.00	-23.96	peak	149		P	
6 *	10693.750	29.18	9.15	38.33	54.00	-15.67	AVG	149		P	

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4959.750	60.60	-0.17	60.43	74.00	-13.57	peak	149		P	
2 *	4959.750	44.35	-0.17	44.18	54.00	-9.82	AVG	149		P	
3	7439.000	40.95	4.78	45.73	74.00	-28.27	peak	149		P	
4	7439.000	27.30	4.78	32.08	54.00	-21.92	AVG	149		P	
5	10682.000	41.53	9.13	50.66	74.00	-23.34	peak	149		P	
6	10693.750	29.17	9.15	38.32	54.00	-15.68	AVG	149		P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4959.750	49.76	-0.17	49.59	74.00	-24.41	peak	149		P	
2	4959.750	32.17	-0.17	32.00	54.00	-22.00	AVG	149		P	
3	8085.250	40.07	6.81	46.88	74.00	-27.12	peak	149		P	
4	8390.750	26.13	7.27	33.40	54.00	-20.60	AVG	149		P	
5	9918.250	43.10	8.08	51.18	74.00	-22.82	peak	149		P	
6 *	9918.250	29.18	8.08	37.26	54.00	-16.74	AVG	149		P	

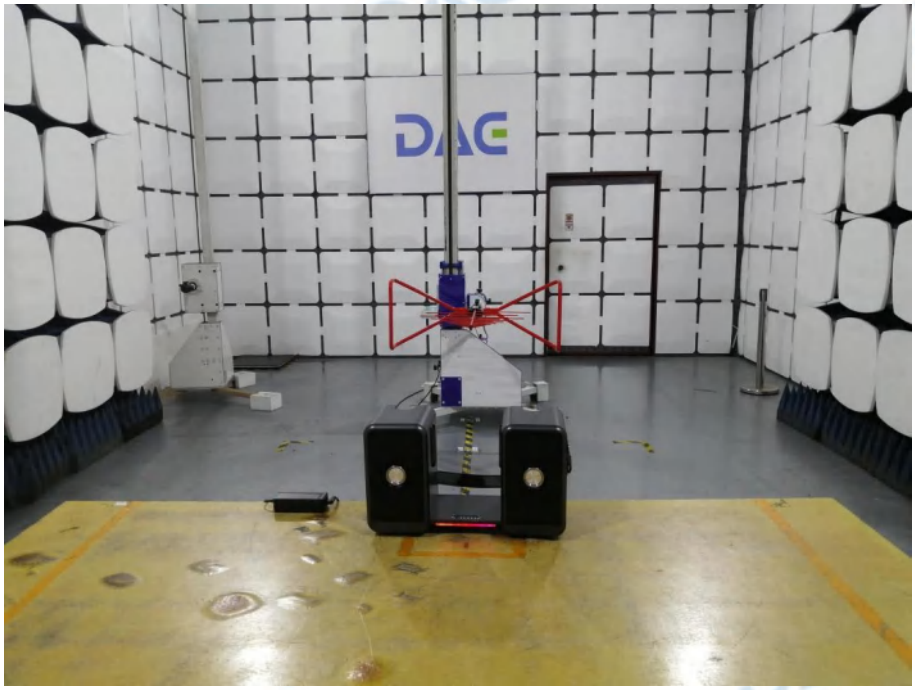
Remark:Margin=Level - Limit, Level=Test receiver reading + correction factor

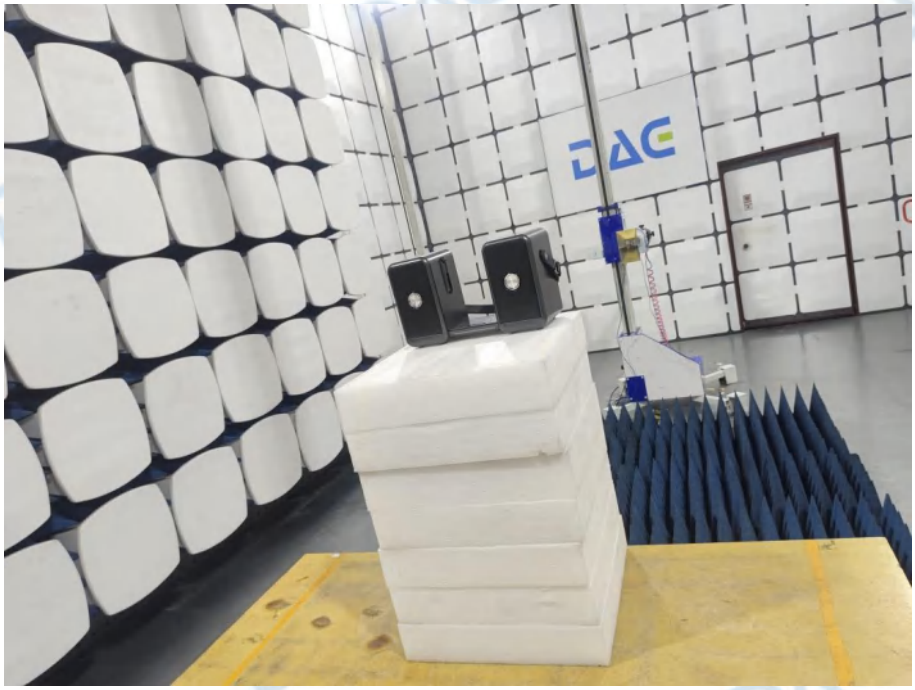
The test software will only record the worst test angle and height, and only the worst case will be recorded in the test report.

5 TEST SETUP PHOTOS

Conducted Emission at AC power line

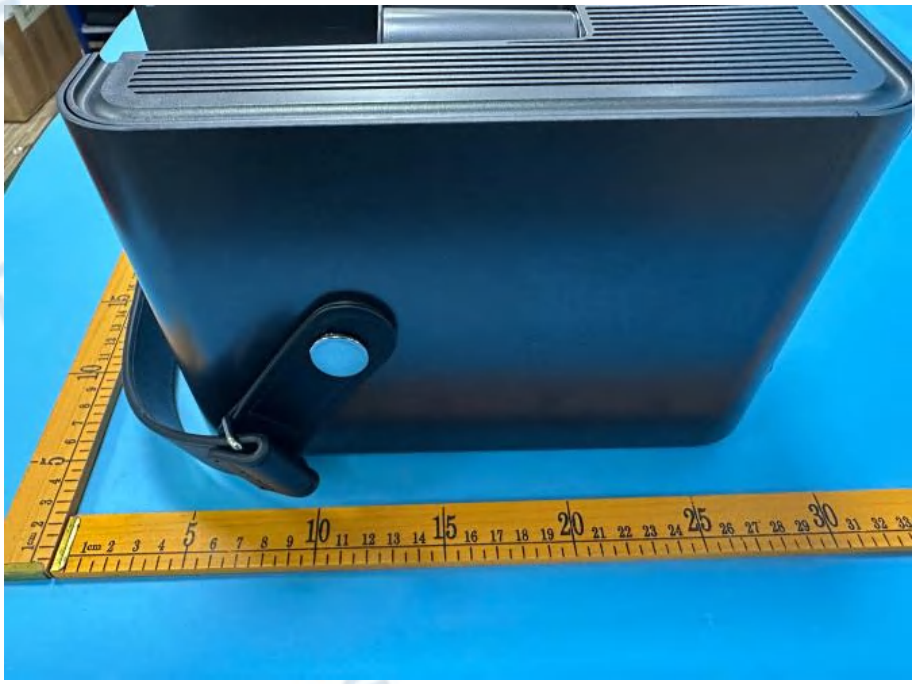
Emissions in frequency bands (below 1GHz)



Emissions in frequency bands (above 1GHz)


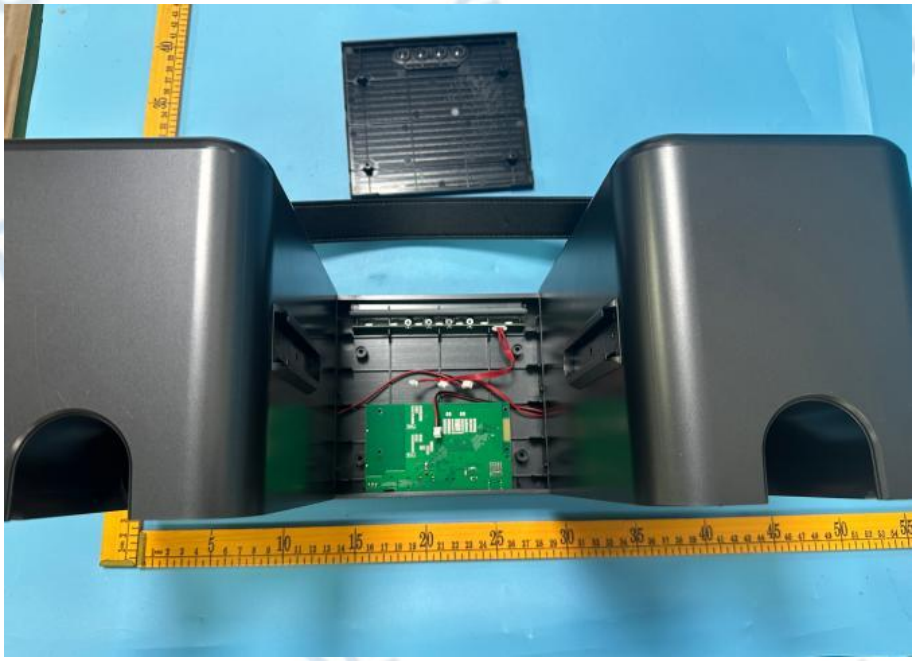
6 PHOTOS OF THE EUT

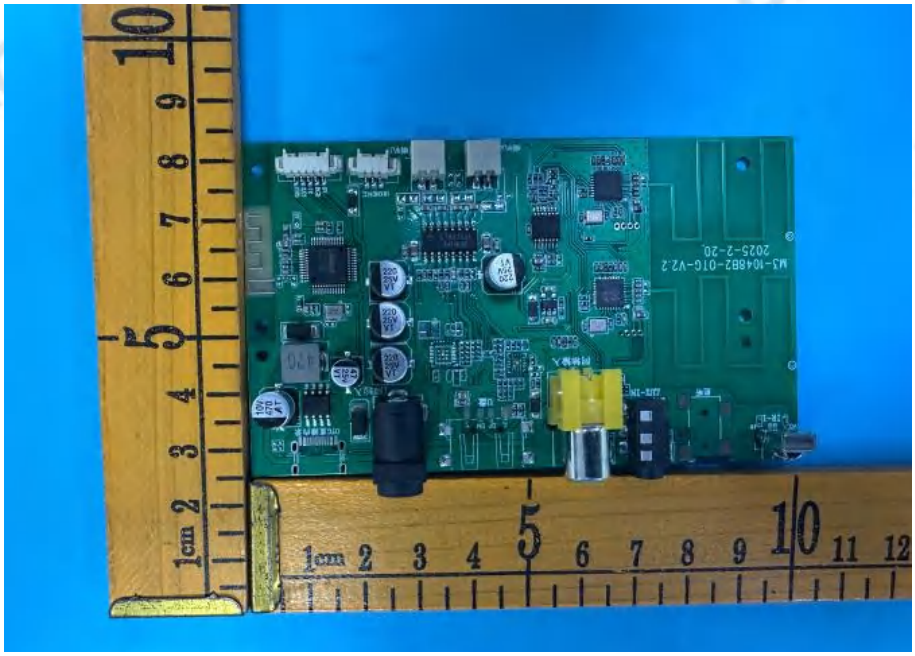
External

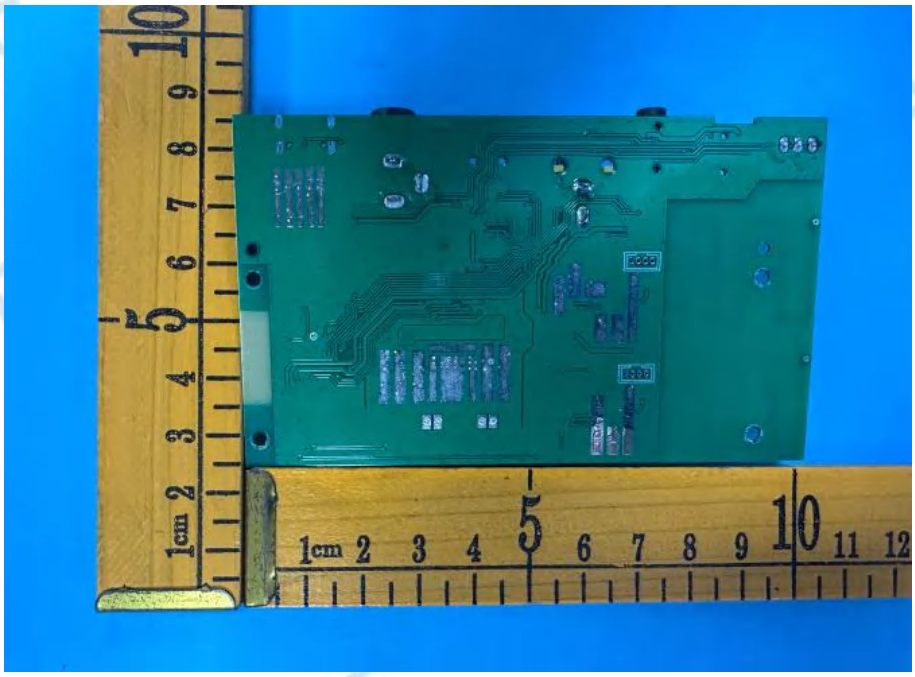


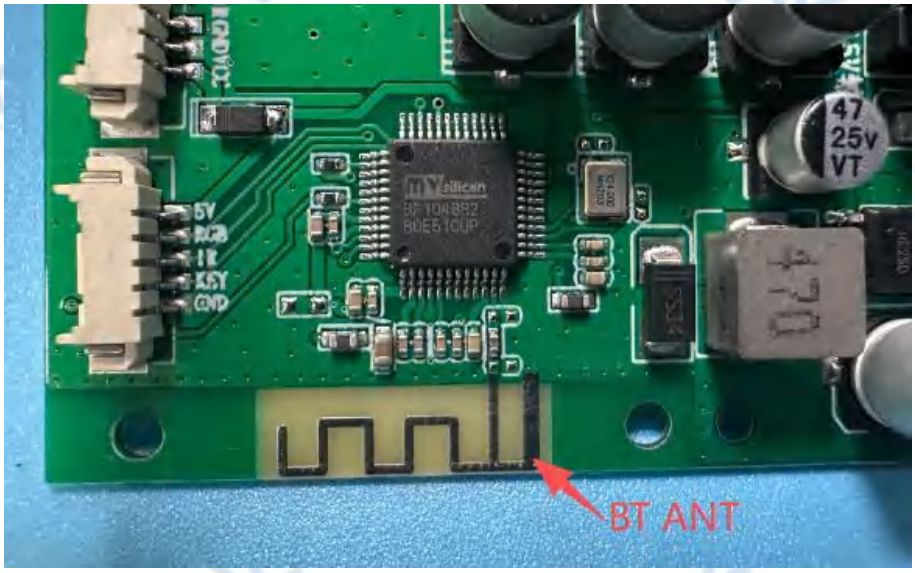
AC ADAPTER

Internal





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47
25V
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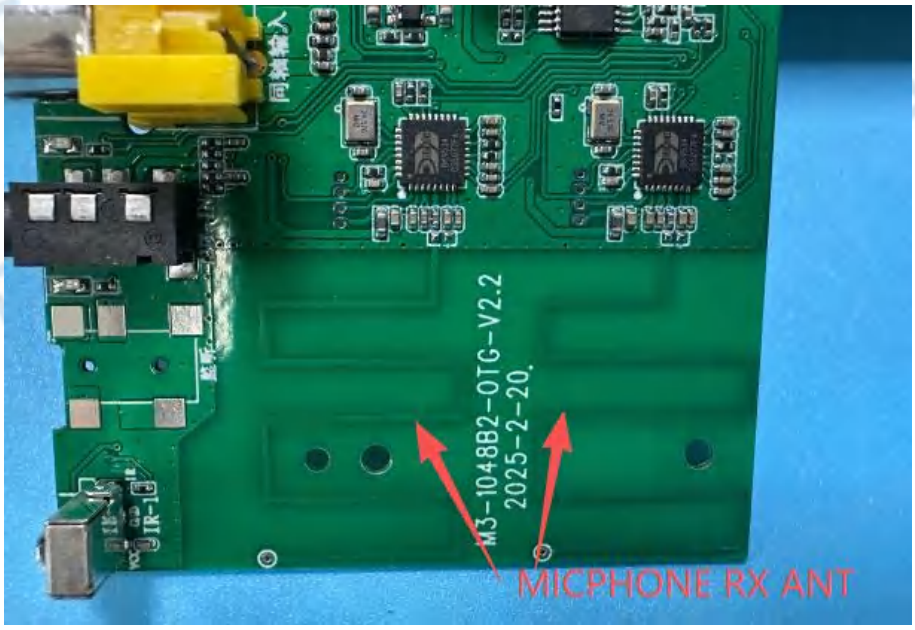
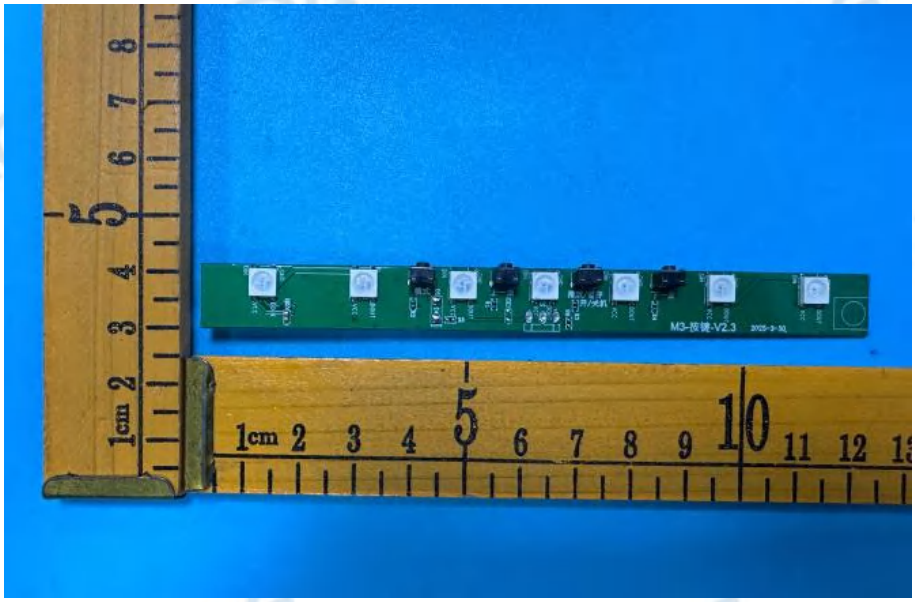
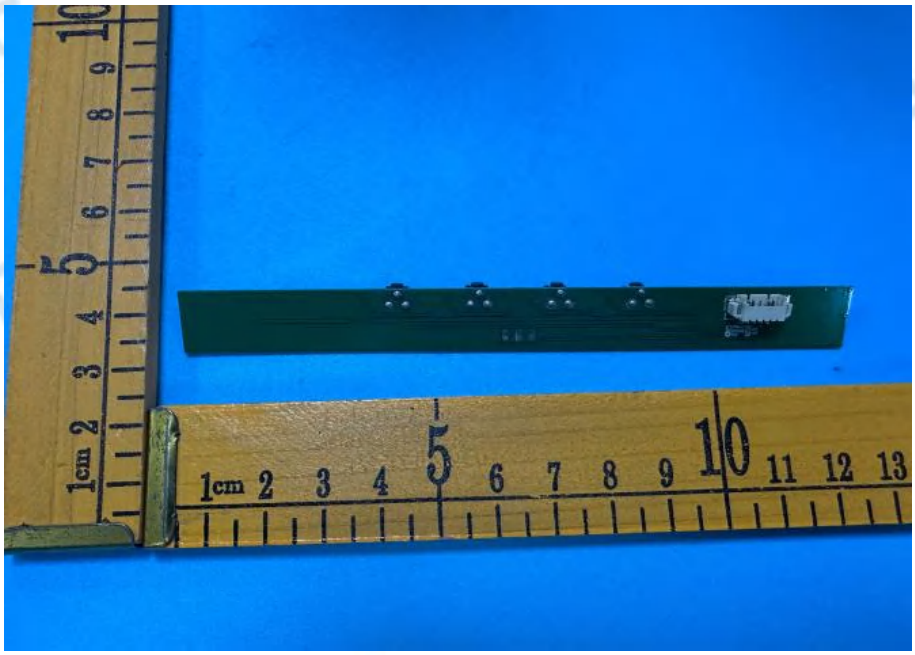

M3-1048B2-OTG-V2.2
2025-2-20
MICPHONE RX ANT



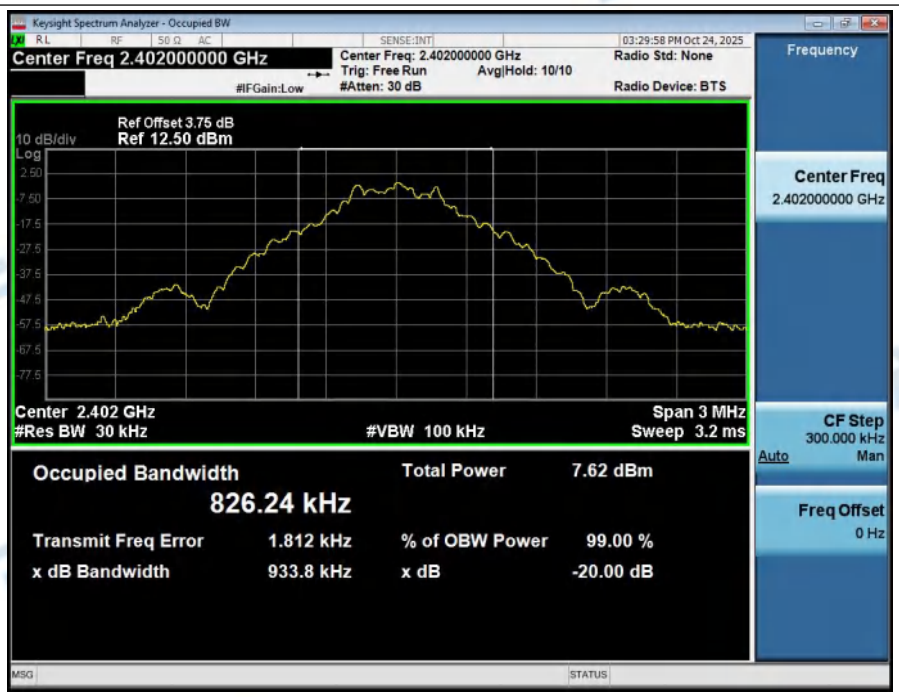

1cm 2 3 4 5 6 7 8 9 10 11 12 13

Appendix

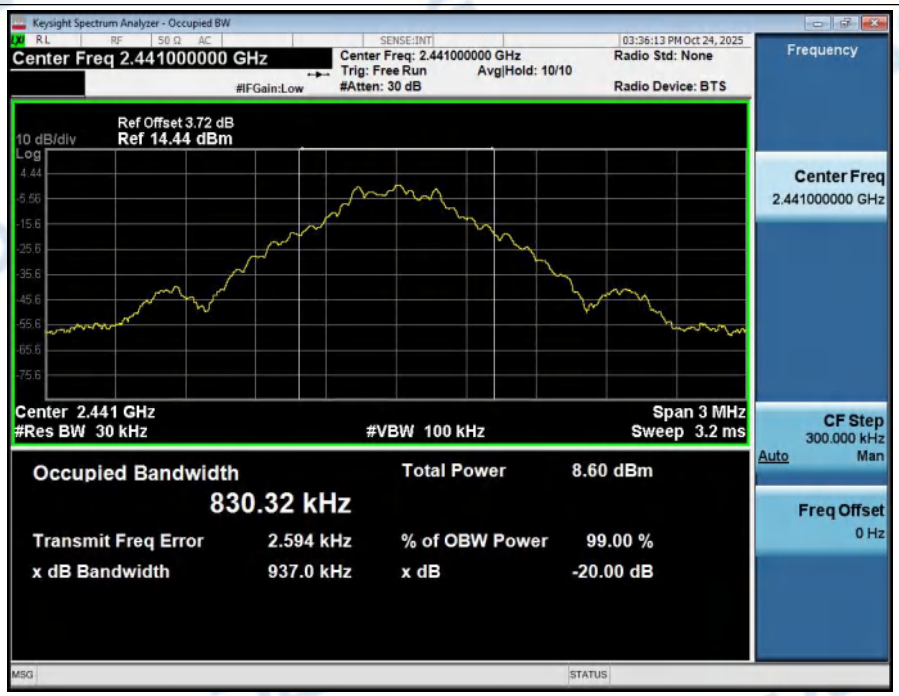
1. -20dB Bandwidth

Condition	Antenna	Modulation	Frequency (MHz)	-20dB BW(MHz)	if larger than CFS
NVNT	ANT1	1-DH5	2402.00	0.934	No
NVNT	ANT1	1-DH5	2441.00	0.937	No
NVNT	ANT1	1-DH5	2480.00	0.938	No
NVNT	ANT1	2-DH5	2402.00	1.185	Yes
NVNT	ANT1	2-DH5	2441.00	1.185	Yes
NVNT	ANT1	2-DH5	2480.00	1.183	Yes
NVNT	ANT1	3-DH5	2402.00	1.199	Yes
NVNT	ANT1	3-DH5	2441.00	1.194	Yes
NVNT	ANT1	3-DH5	2480.00	1.194	Yes

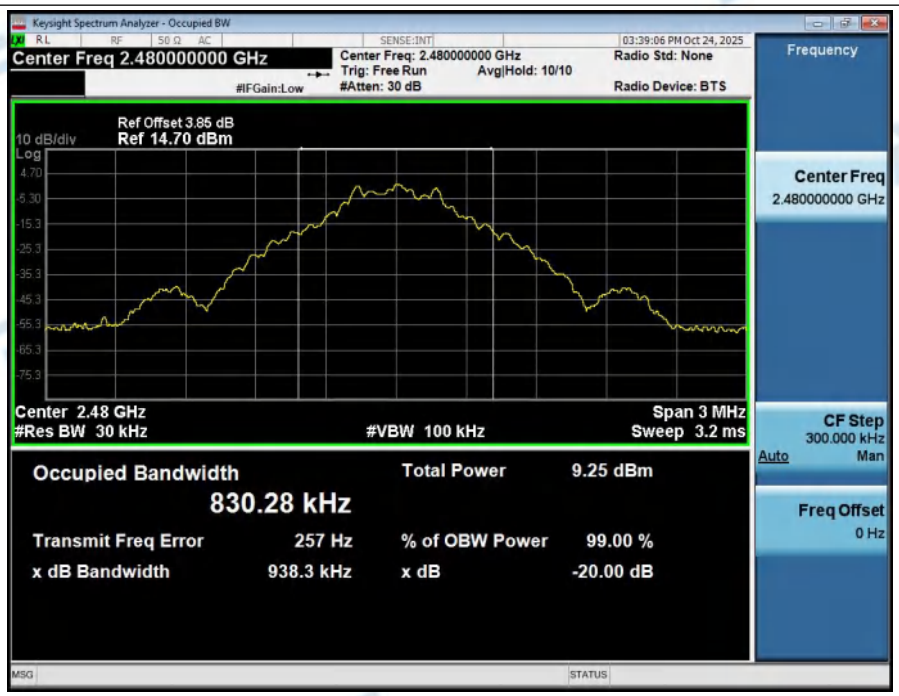
-20dB_Bandwidth_NVNT_ANT1_1-DH5_2402_00



-20dB_Bandwidth_NVNT_ANT1_1-DH5_2441_00

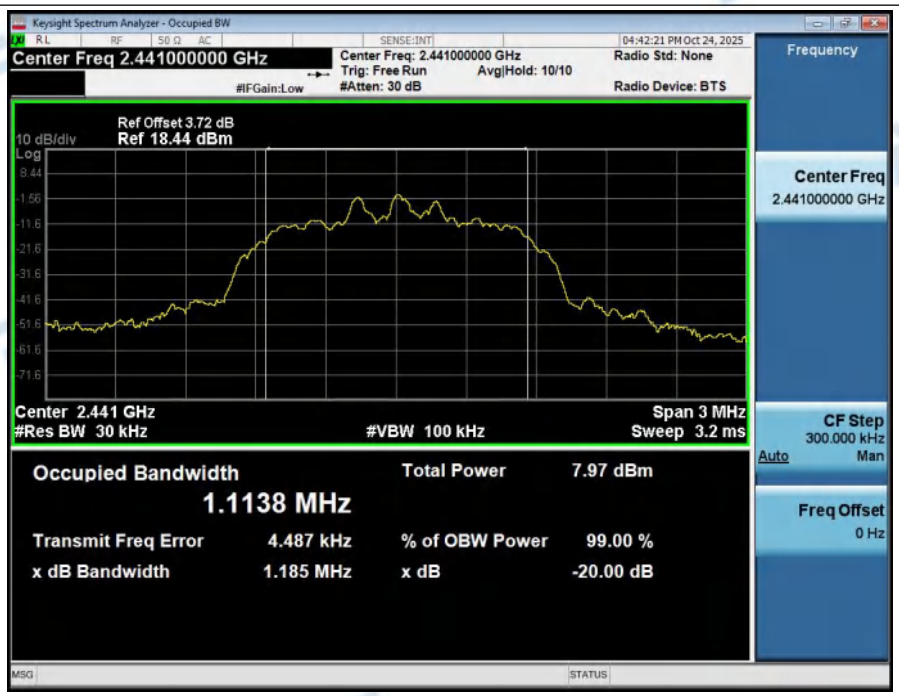


-20dB_Bandwidth_NVNT_ANT1_1-DH5_2480_00



-20dB_Bandwidth_NVNT_ANT1_2-DH5_2402_00

-20dB_Bandwidth_NVNT_ANT1_2-DH5_2441_00

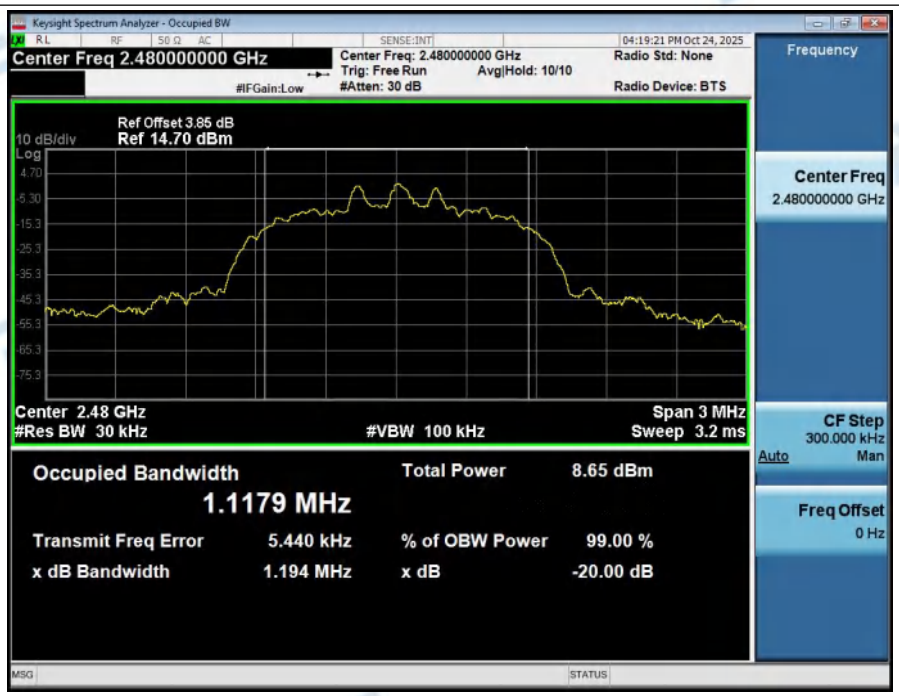


-20dB_Bandwidth_NVNT_ANT1_2-DH5_2480_00

-20dB_Bandwidth_NVNT_ANT1_3-DH5_2402_00

-20dB_Bandwidth_NVNT_ANT1_3-DH5_2441_00

-20dB_Bandwidth_NVNT_ANT1_3-DH5_2480_00



2. Peak Output Power

Condition	Antenna	Modulation	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1-DH5	2402.00	-0.44	0.90	1000	Pass
NVNT	ANT1	1-DH5	2441.00	0.65	1.16	1000	Pass
NVNT	ANT1	1-DH5	2480.00	1.38	1.37	1000	Pass
NVNT	ANT1	2-DH5	2402.00	-0.34	0.92	125	Pass
NVNT	ANT1	2-DH5	2441.00	0.74	1.19	125	Pass
NVNT	ANT1	2-DH5	2480.00	1.48	1.41	125	Pass
NVNT	ANT1	3-DH5	2402.00	-0.35	0.92	125	Pass
NVNT	ANT1	3-DH5	2441.00	0.76	1.19	125	Pass
NVNT	ANT1	3-DH5	2480.00	1.49	1.41	125	Pass

Peak_Output_Power_NVNT_ANT1_1-DH5_2402_00

Peak_Output_Power_NVNT_ANT1_1-DH5_2441_00

Peak_Output_Power_NVNT_ANT1_1-DH5_2480_00

Peak_Output_Power_NVNT_ANT1_2-DH5_2402_00

Peak_Output_Power_NVNT_ANT1_2-DH5_2441_00

Peak_Output_Power_NVNT_ANT1_2-DH5_2480_00

Peak_Output_Power_NVNT_ANT1_3-DH5_2402_00

Peak_Output_Power_NVNT_ANT1_3-DH5_2441_00

Peak_Output_Power_NVNT_ANT1_3-DH5_2480_00

3. Carrier Frequencies Separation (Hopping)

Condition	Antenna	Modulation	Frequency(MHz)	Hopping NO.0 (MHz)	Hopping NO.1 (MHz)	Carrier Frequencies Separation(MHz)	Limit(MHz)	Result
NVNT	ANT1	1-DH5	2441.00	2441.167	2442.172	1.00	0.937	Pass
NVNT	ANT1	2-DH5	2441.00	2440.852	2441.860	1.01	0.790	Fail
NVNT	ANT1	3-DH5	2441.00	2441.005	2442.004	1.00	0.796	Pass

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_1-DH5_Hopping

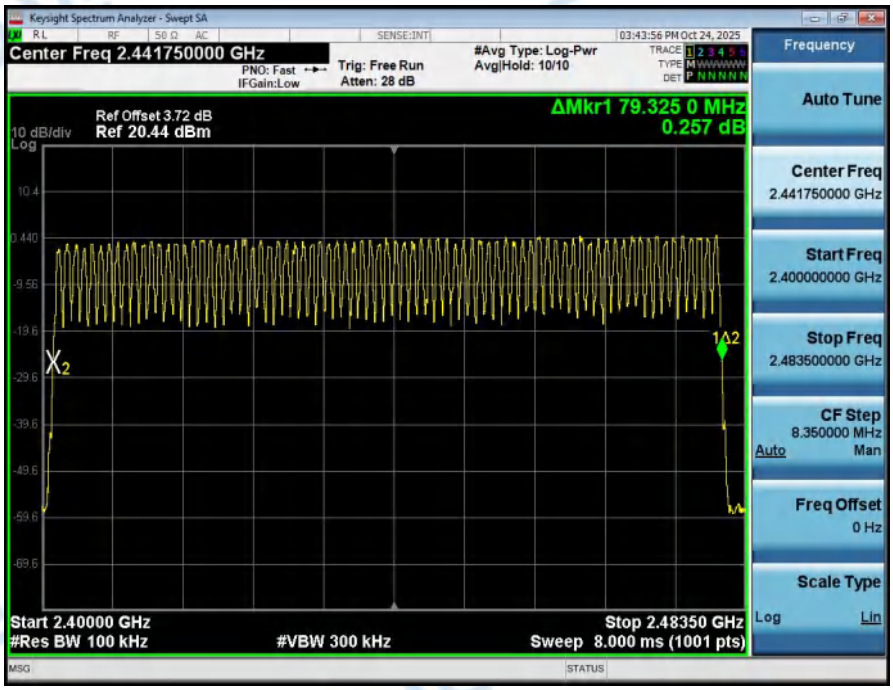
Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_2-DH5_Hopping

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_3-DH5_Hopping

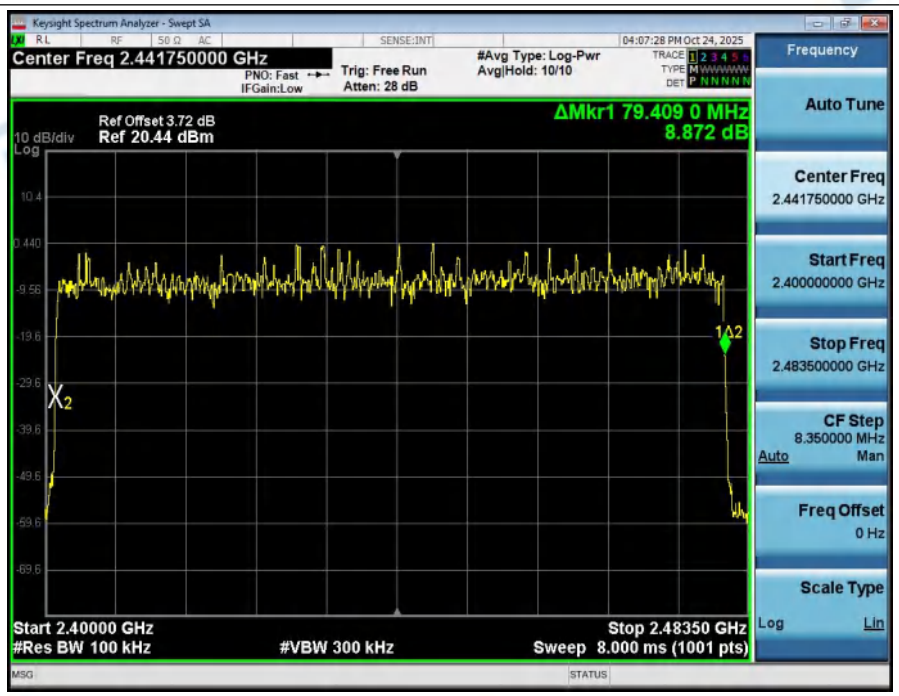
4. Number of Hopping Channel (Hopping)

Condition	Antenna	Modulation	Hopping Num	Limit	Result
NVNT	ANT1	1-DH5	79	15	Pass
NVNT	ANT1	2-DH5	79	15	Pass
NVNT	ANT1	3-DH5	79	15	Pass

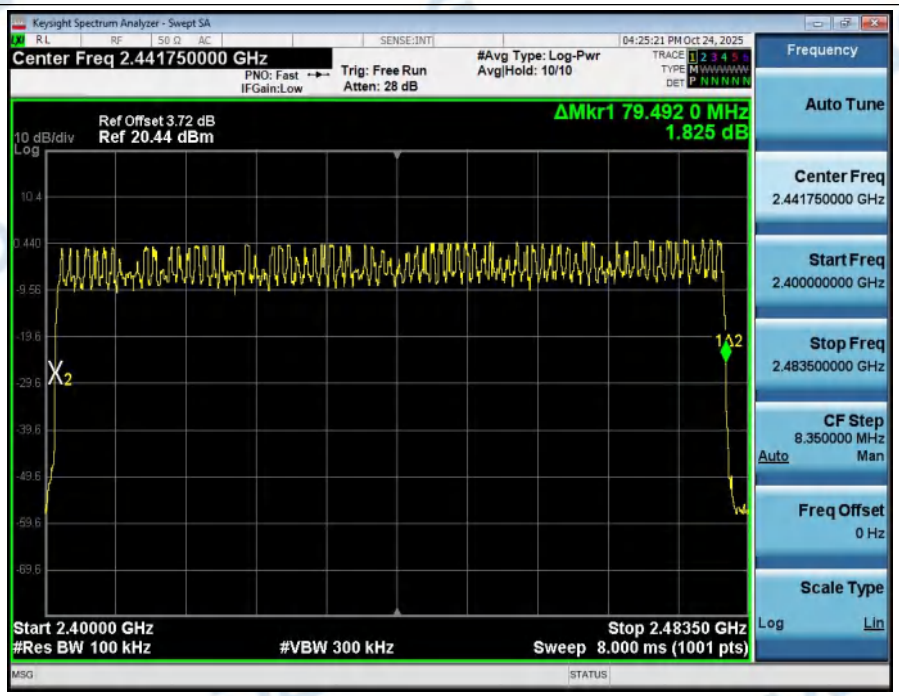
Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_1-DH5_Hopping



Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_2-DH5_Hopping



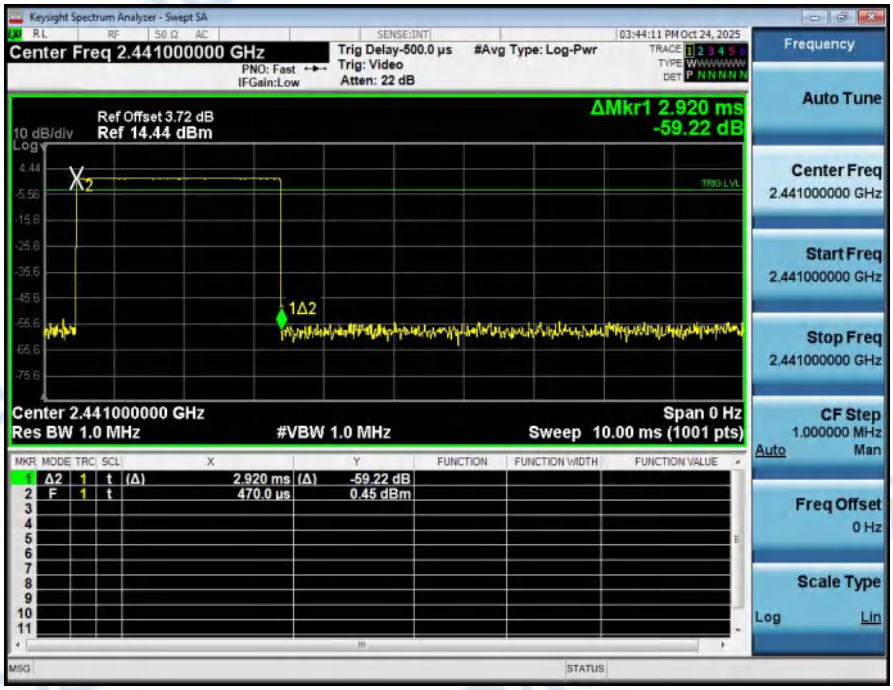
Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_3-DH5_Hopping



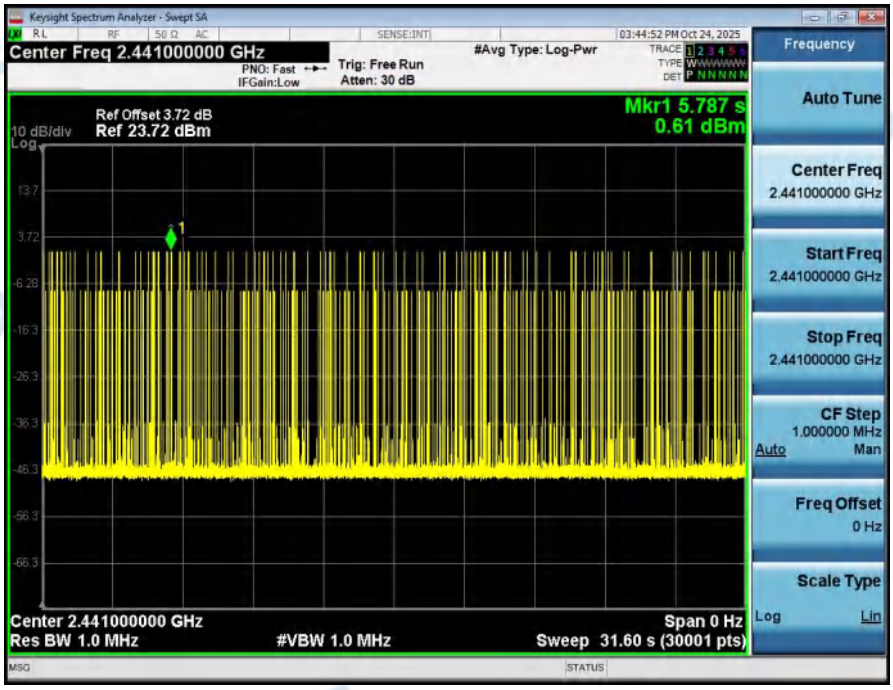
5. Dwell Time (Hopping)

Condition	Antenna	Packet Type	Pulse Time(ms)	Hops	Dwell Time(ms)	Limit(s)	Result
NVNT	ANT1	1-DH5	2.920	108.00	315.360	0.40	Pass
NVNT	ANT1	2-DH5	2.930	99.00	290.070	0.40	Pass
NVNT	ANT1	3-DH5	2.930	105.00	307.650	0.40	Pass
NVNT	ANT1	1-DH1	0.420	320.00	134.400	0.40	Pass
NVNT	ANT1	1-DH3	1.670	160.00	267.200	0.40	Pass
NVNT	ANT1	2-DH1	0.430	319.00	137.170	0.40	Pass
NVNT	ANT1	2-DH3	1.680	160.00	268.800	0.40	Pass
NVNT	ANT1	3-DH1	0.430	320.00	137.600	0.40	Pass
NVNT	ANT1	3-DH3	1.680	172.00	288.960	0.40	Pass

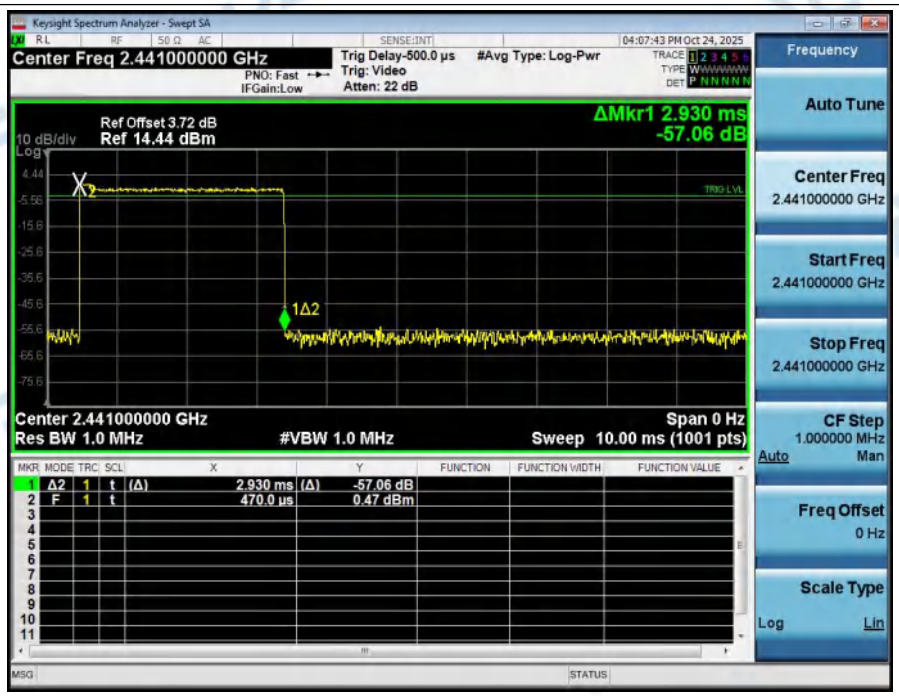
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_00_One_Burst_Time



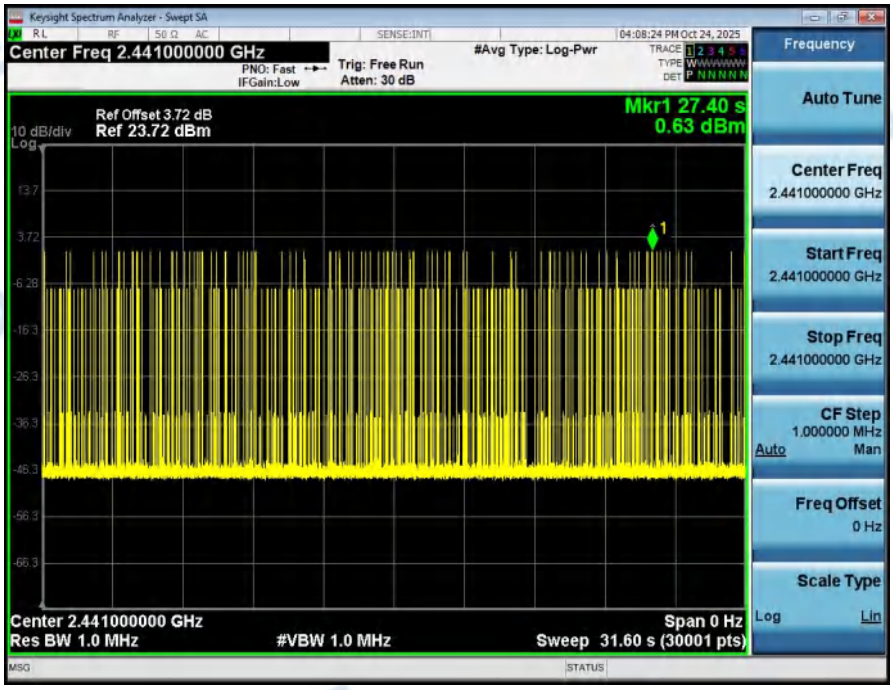
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_00_Accumulated



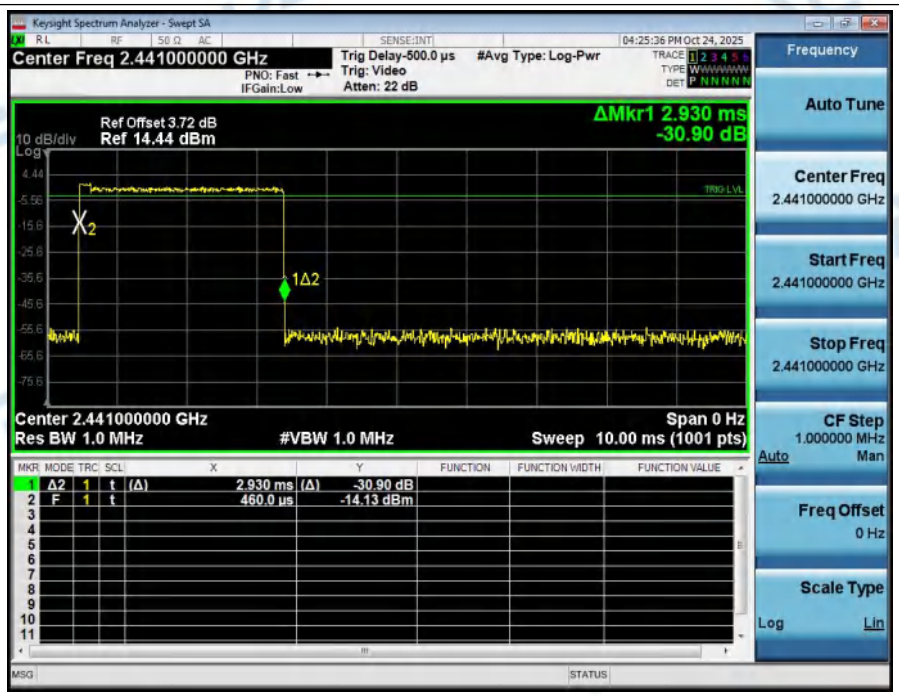
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_00_One_Burst_Time



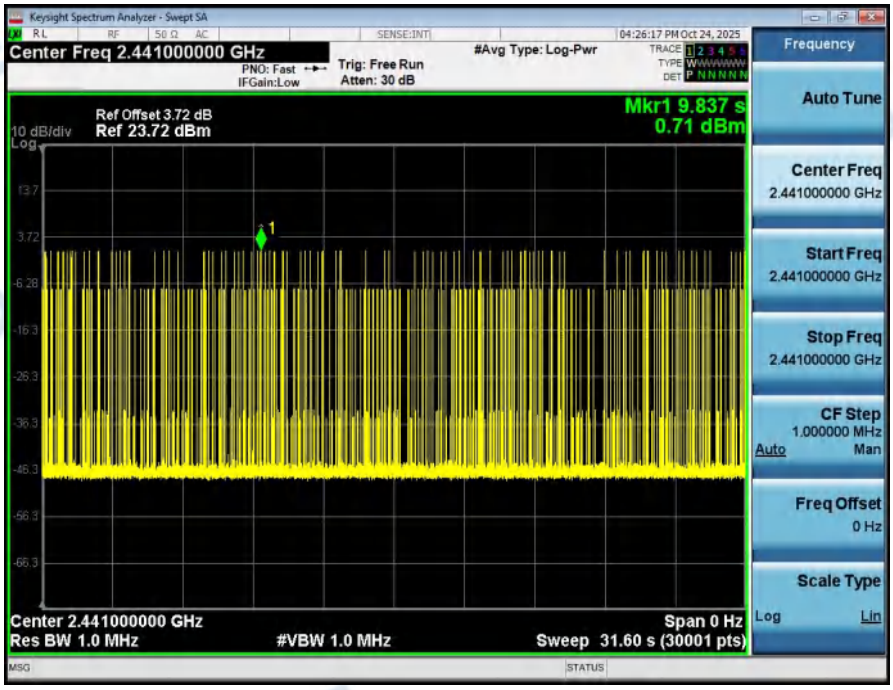
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_00_Accumulated



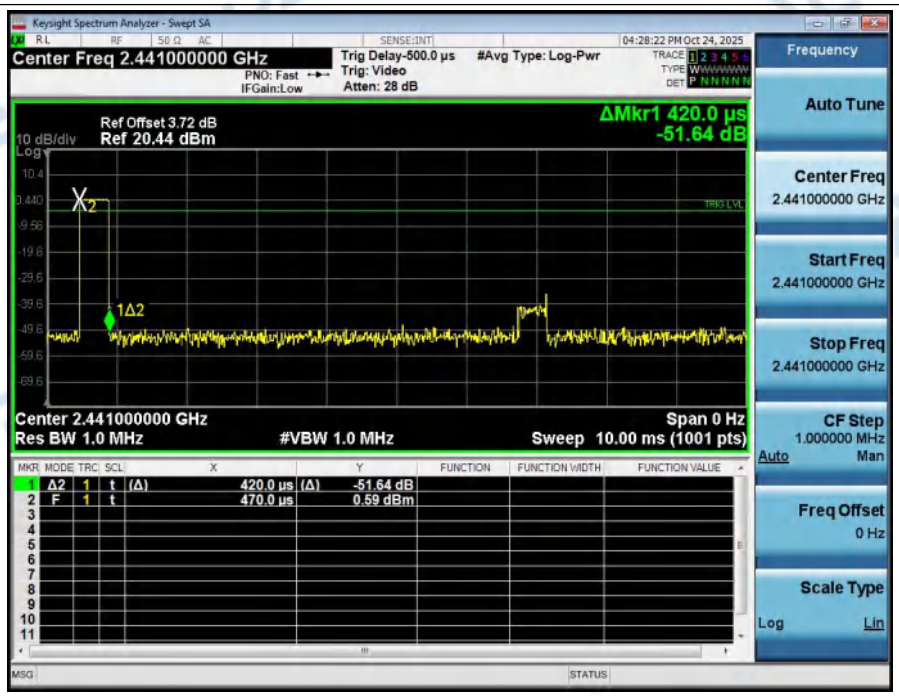
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH5_2441_00_One_Burst_Time



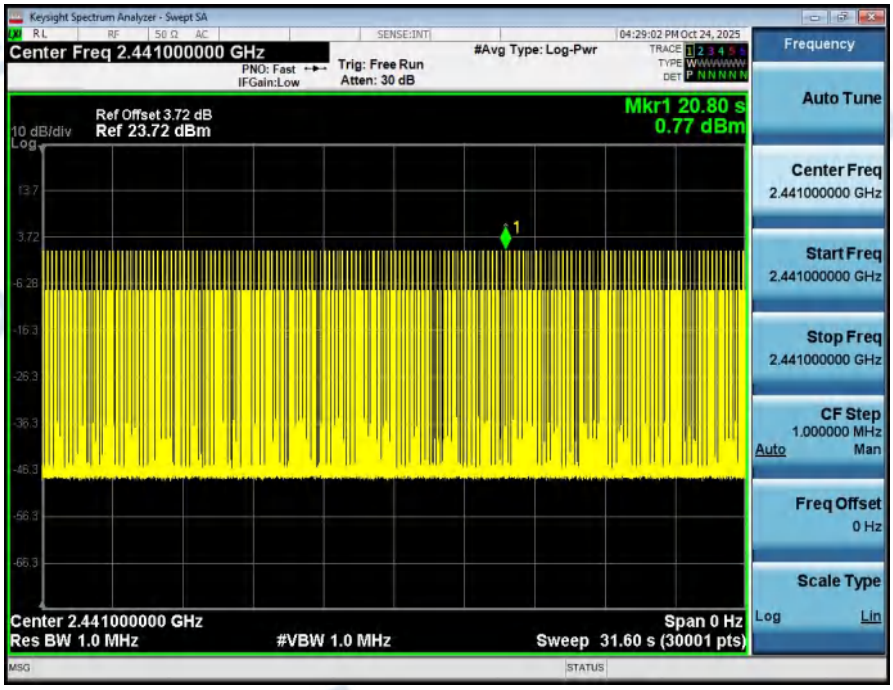
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH5_2441_00_Accumulated



Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_00_One_Burst_Time

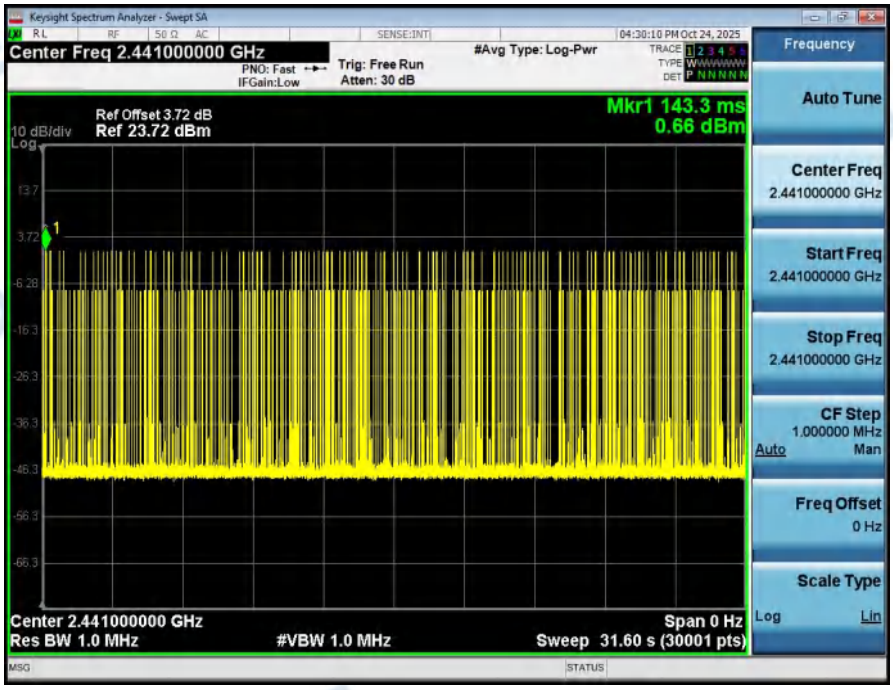


Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_00_Accumulated

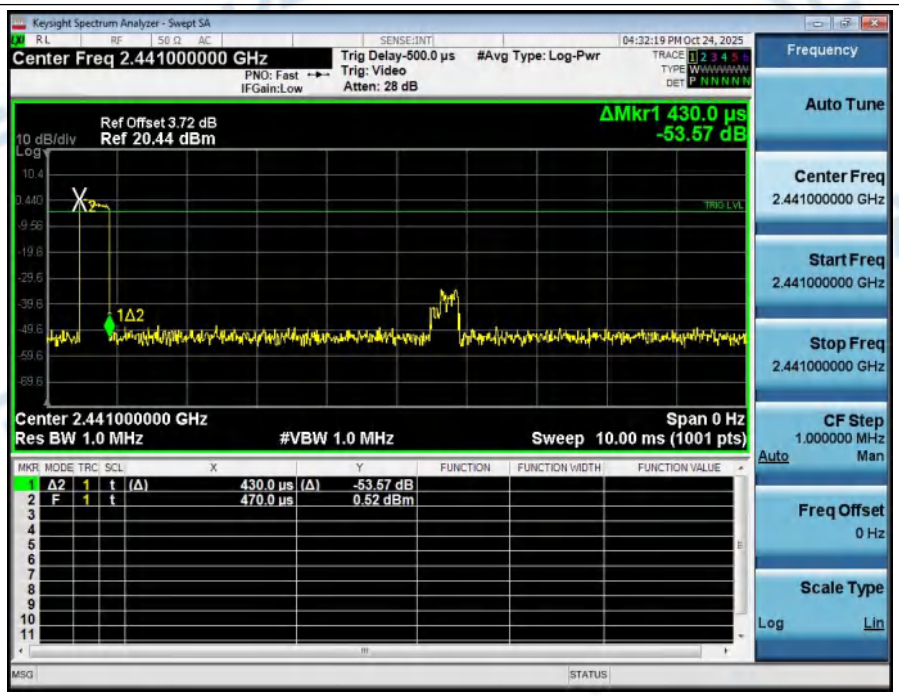


Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_00_One_Burst_Time

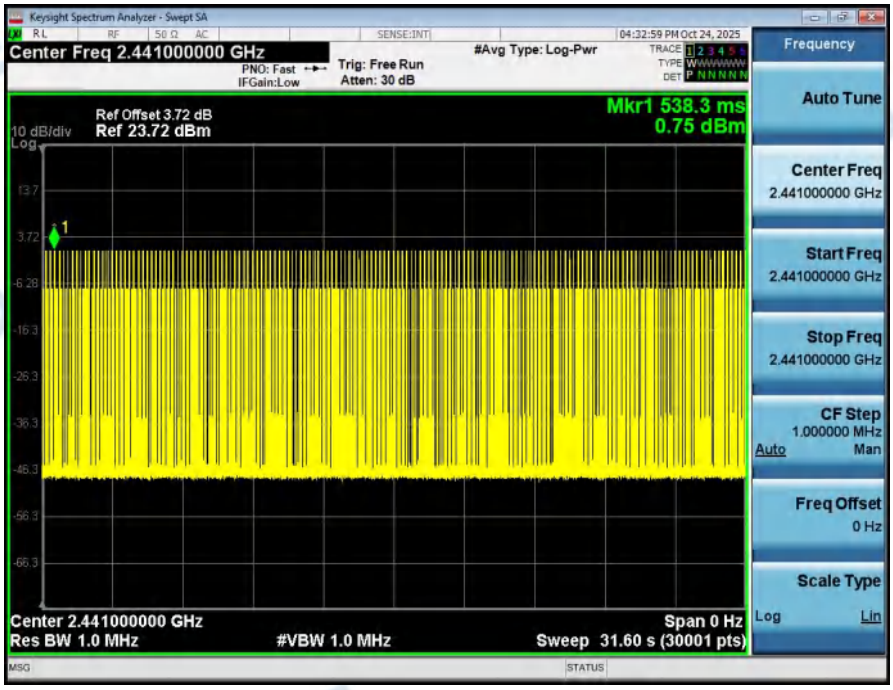
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_00_Accumulated



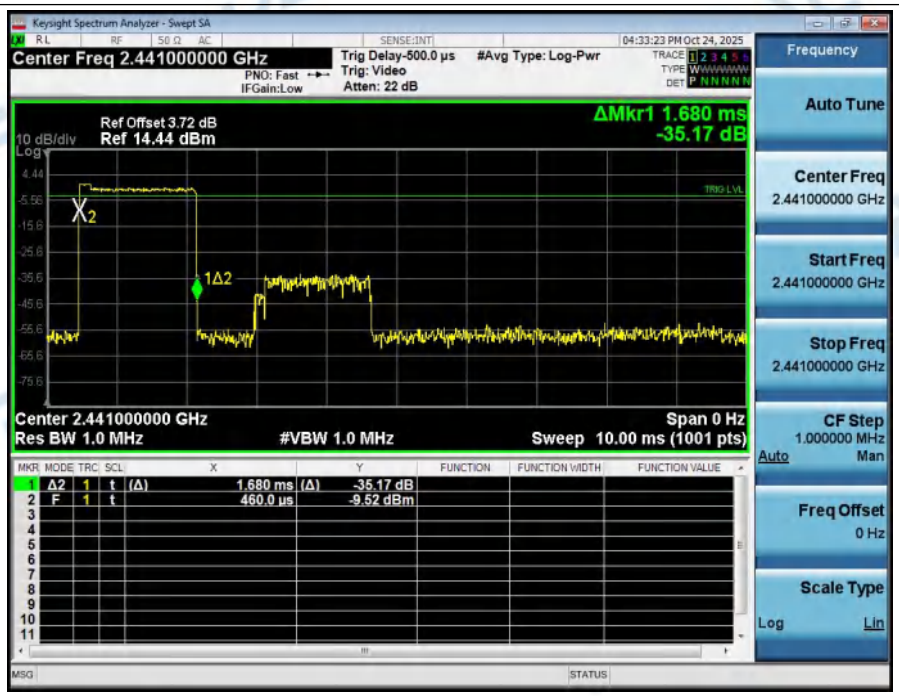
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_00_One_Burst_Time



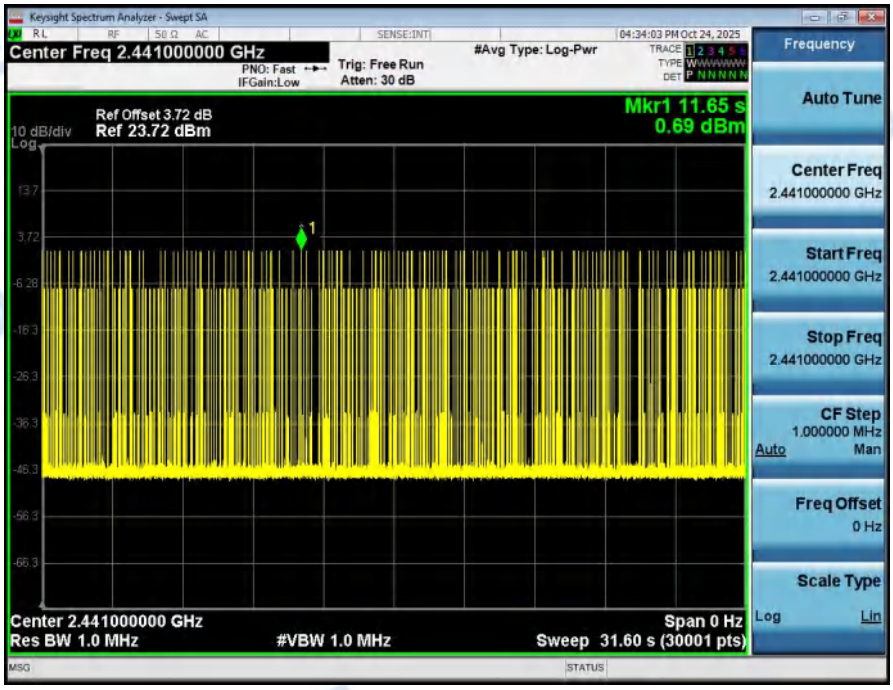
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_00_Accumulated



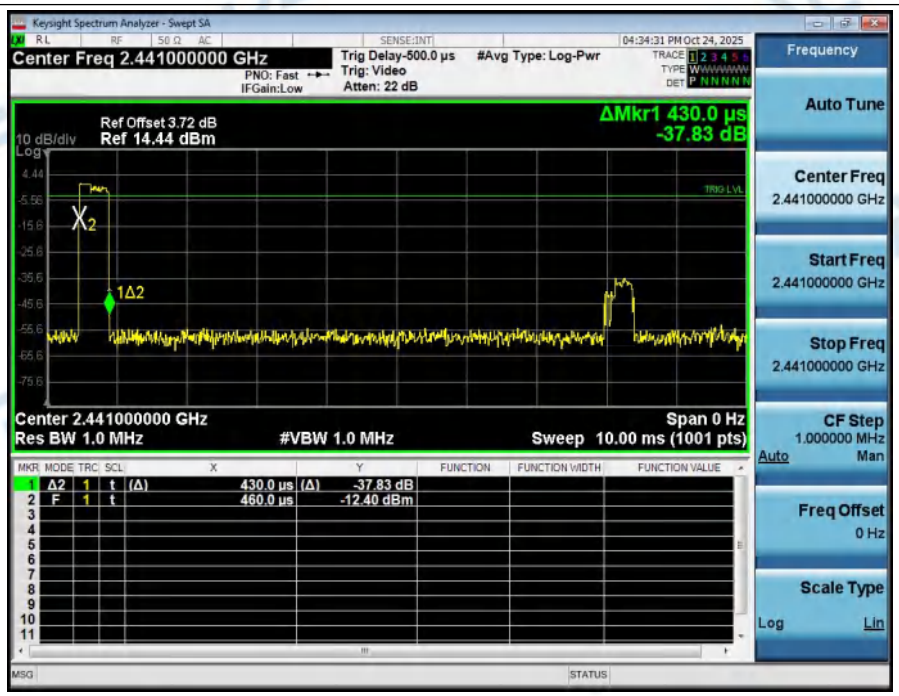
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_00_One_Burst_Time



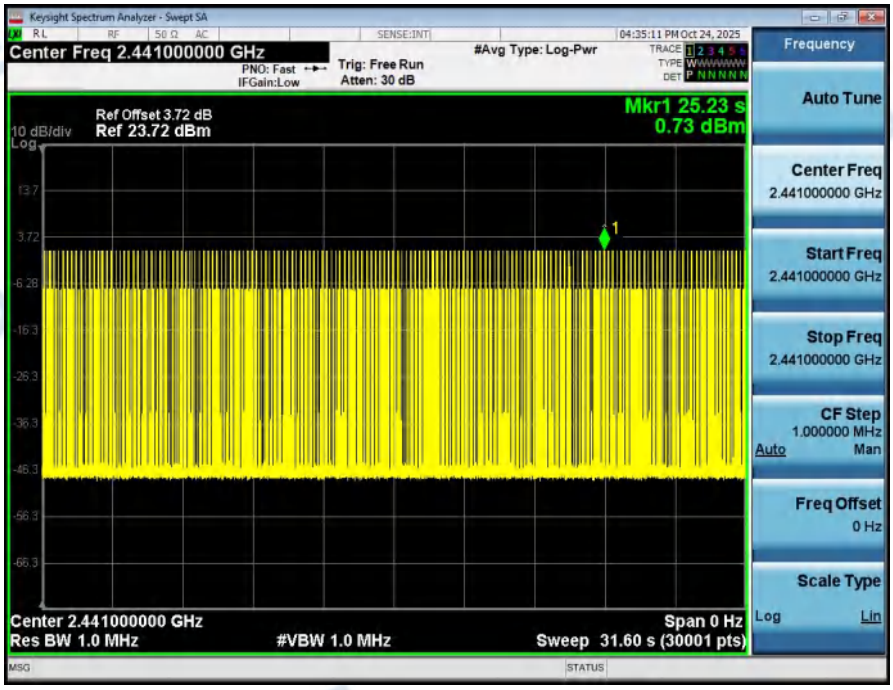
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_00_Accumulated



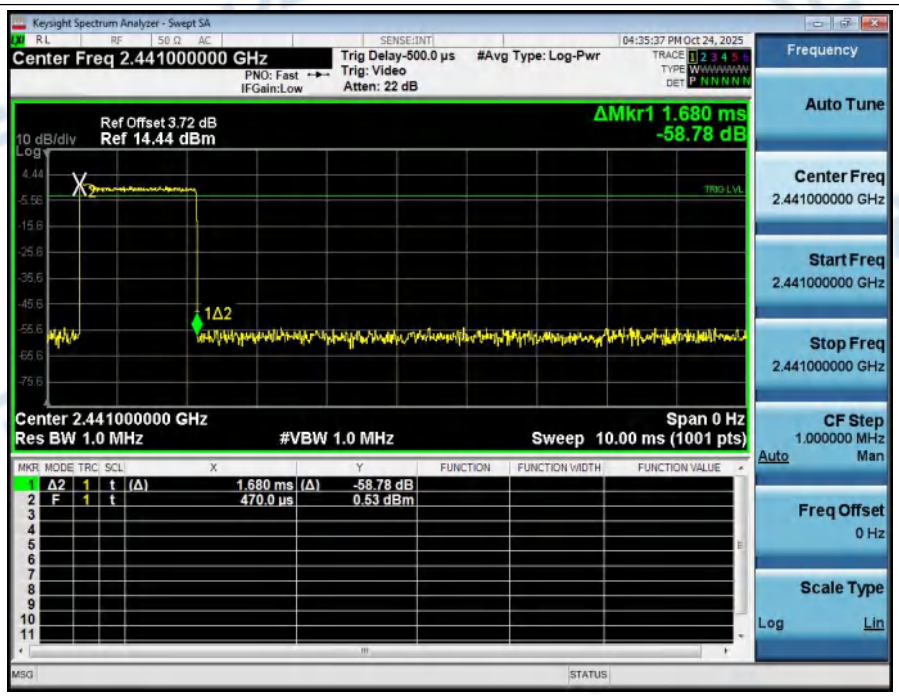
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH1_2441_00_One_Burst_Time



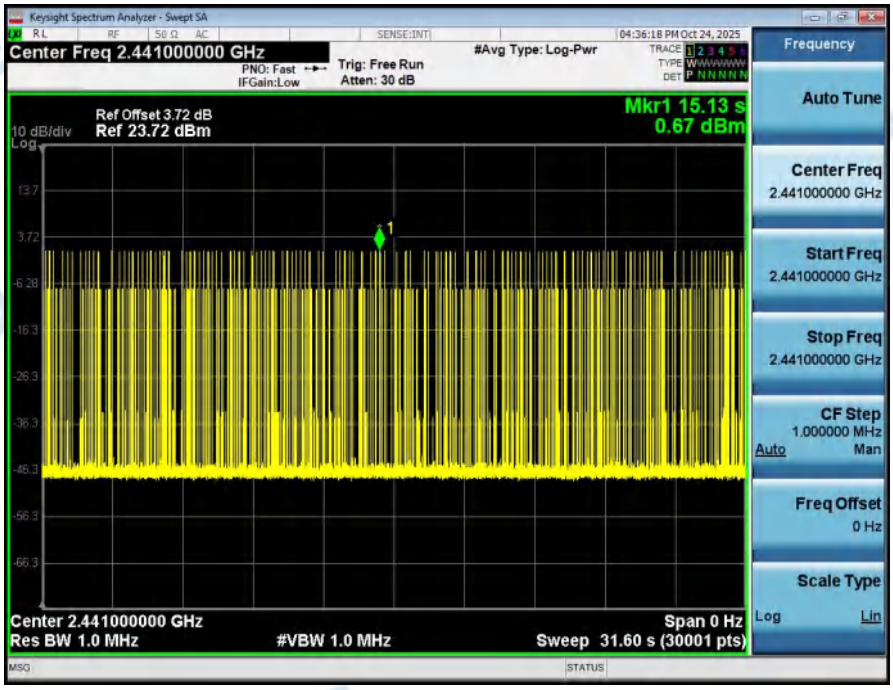
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH1_2441_00_Accumulated



Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_00_One_Burst_Time



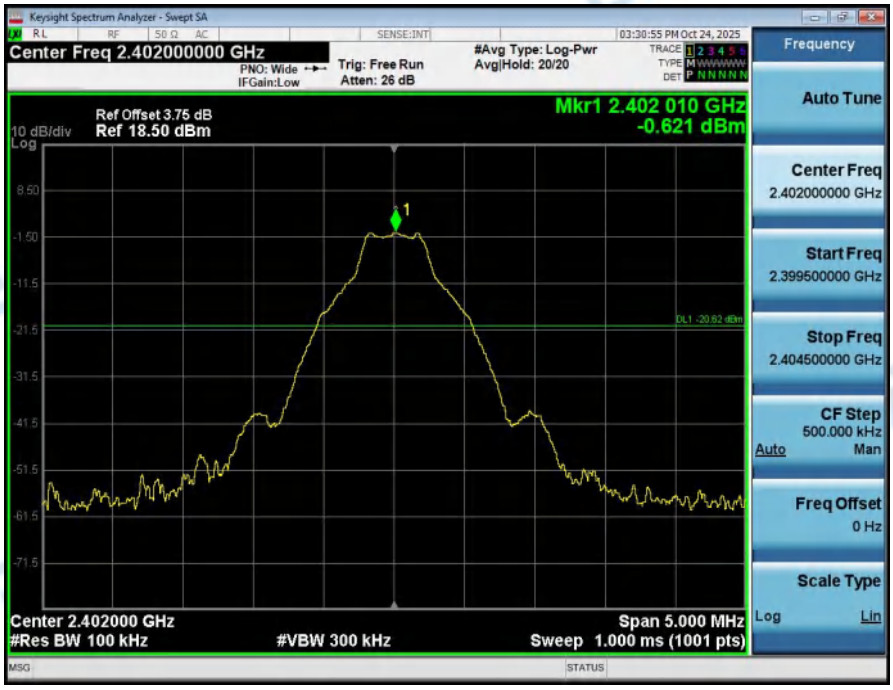
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_00_Accumulated


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
#Avg Type: Log-Pwr
04:36:18 PM Oct 24, 2025
Ref Offset 3.72 dB
10 dB/div
Ref 23.72 dBm
Log
Mkr1 15.13 s
0.67 dBm
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 31.60 s (30001 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.441000000 GHz
Stop Freq
2.441000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

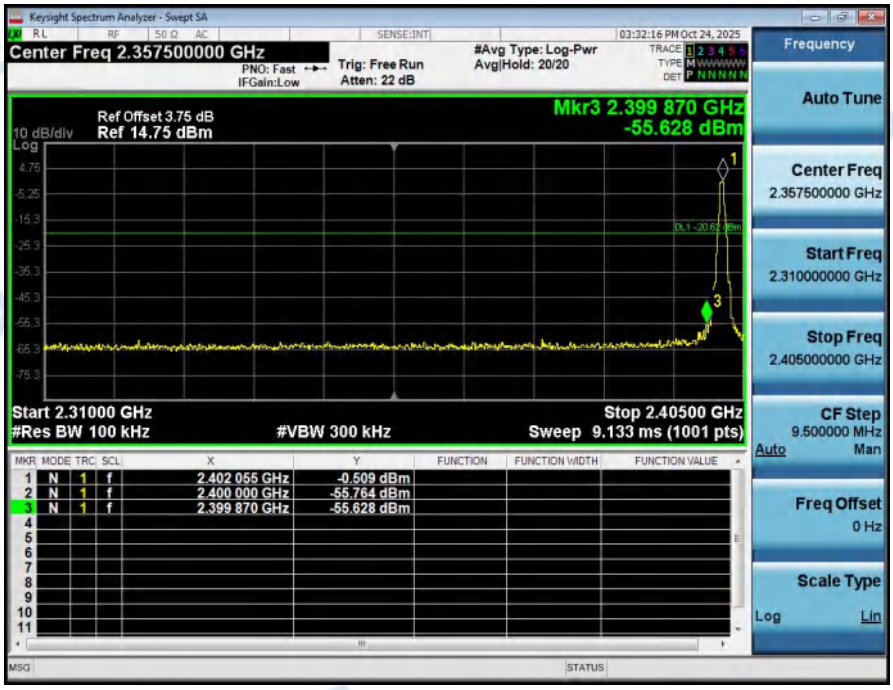
6. Bandedge

Condition	Antenna	Modulation	TX Mode	Ref_level(dBm)	Bandedge MAX.Value	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-0.621	-55.628	-20.621	Pass
NVNT	ANT1	1-DH5	Hopping_LCH	0.844	-60.423	-19.156	Pass
NVNT	ANT1	1-DH5	2480.00	1.143	-59.864	-18.857	Pass
NVNT	ANT1	1-DH5	Hopping_HCH	1.323	-59.084	-18.677	Pass
NVNT	ANT1	2-DH5	2402.00	-0.578	-57.281	-20.578	Pass
NVNT	ANT1	2-DH5	Hopping_LCH	0.935	-60.702	-19.065	Pass
NVNT	ANT1	2-DH5	2480.00	1.293	-59.696	-18.707	Pass
NVNT	ANT1	2-DH5	Hopping_HCH	0.956	-59.650	-19.044	Pass
NVNT	ANT1	3-DH5	2402.00	-0.596	-59.040	-20.596	Pass
NVNT	ANT1	3-DH5	Hopping_LCH	1.127	-59.734	-18.873	Pass
NVNT	ANT1	3-DH5	2480.00	1.177	-59.098	-18.823	Pass
NVNT	ANT1	3-DH5	Hopping_HCH	0.899	-59.025	-19.101	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402_00

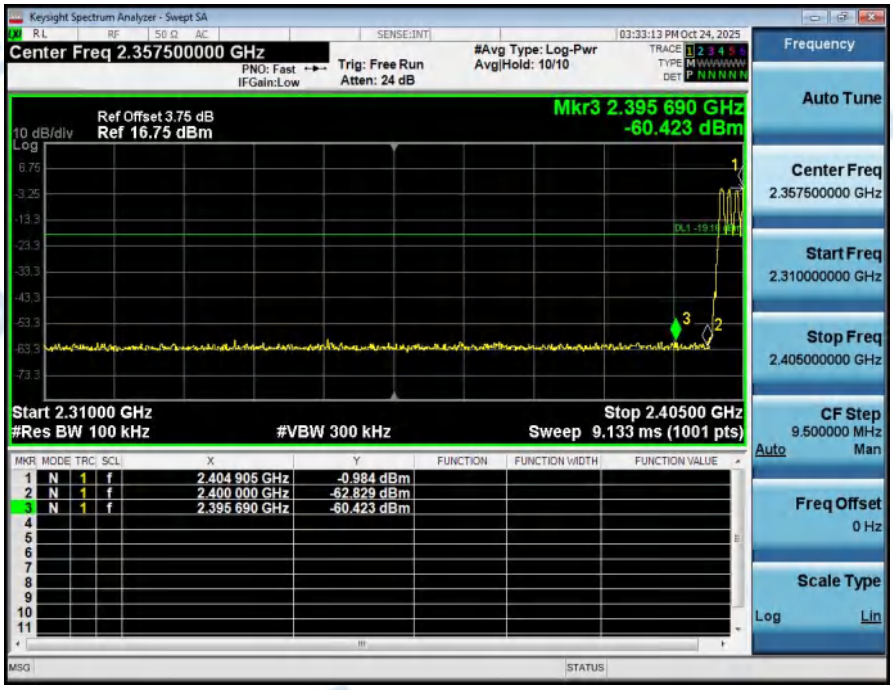


2_Bandedge_NVNT_ANT1_1-DH5_2402_00



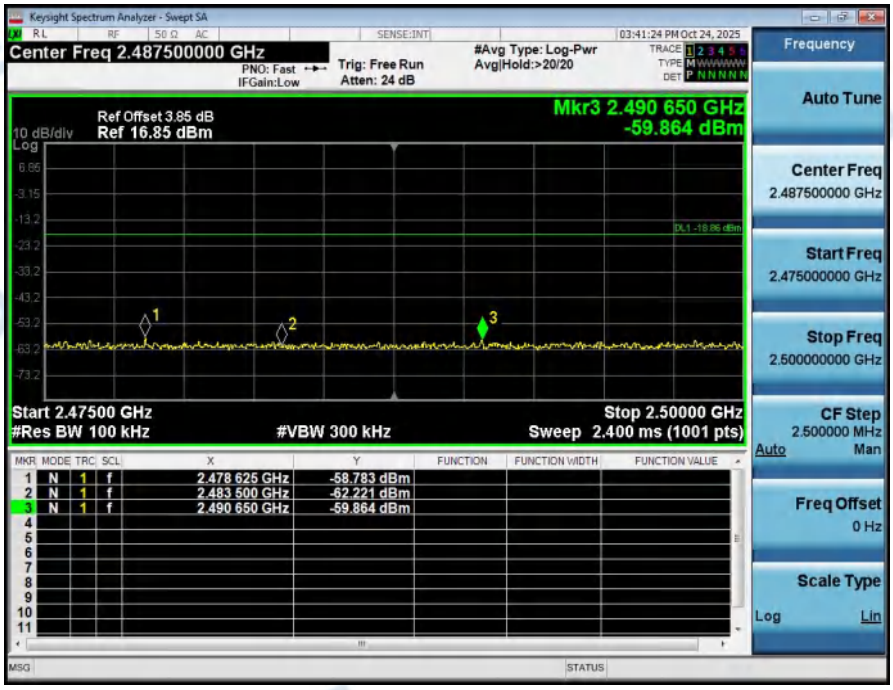
1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping

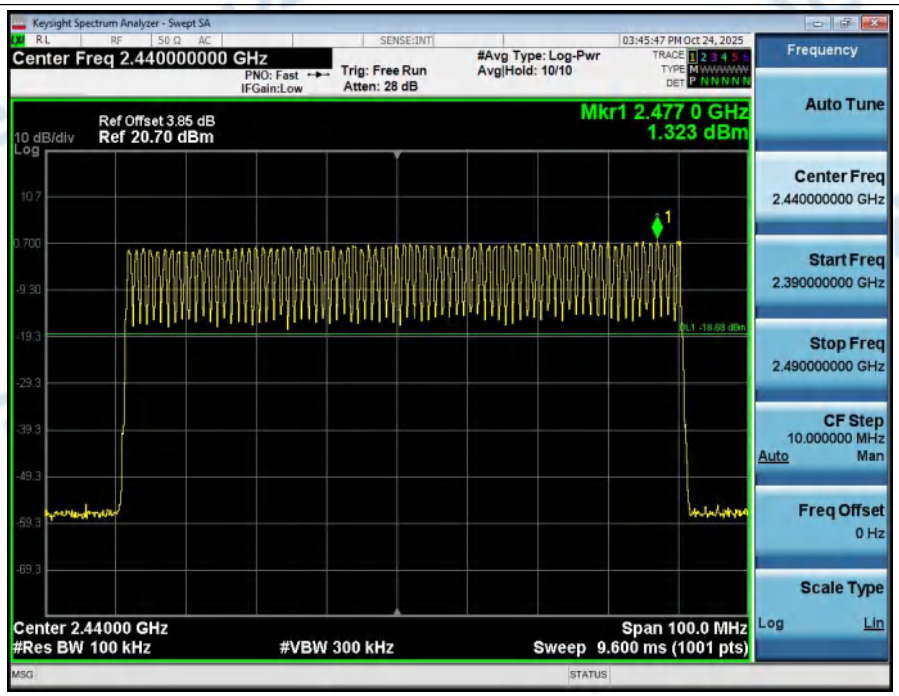


1_Reference_Level_NVNT_ANT1_1-DH5_2480_00

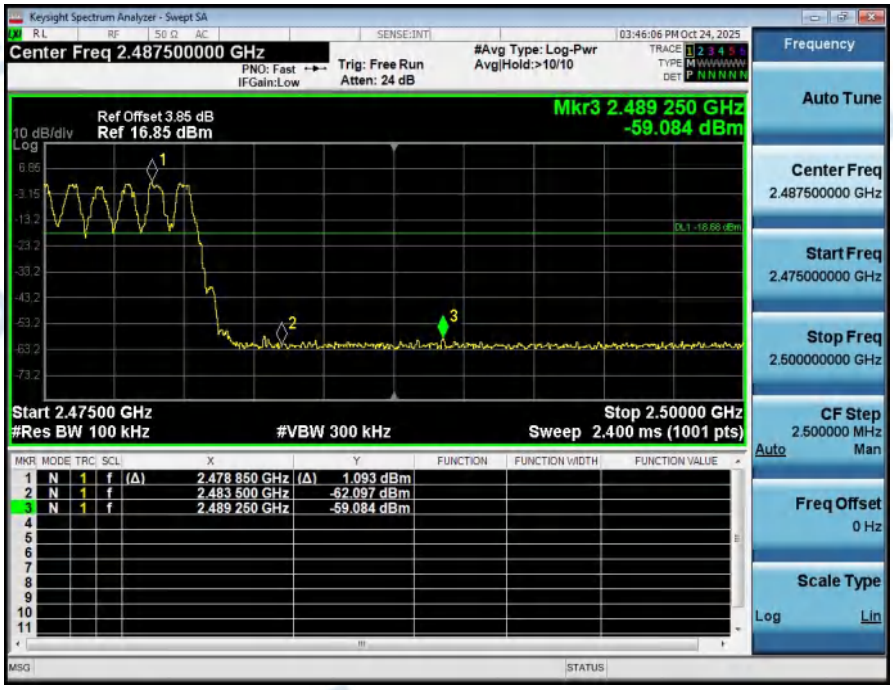
2_Bandedge_NVNT_ANT1_1-DH5_2480_00



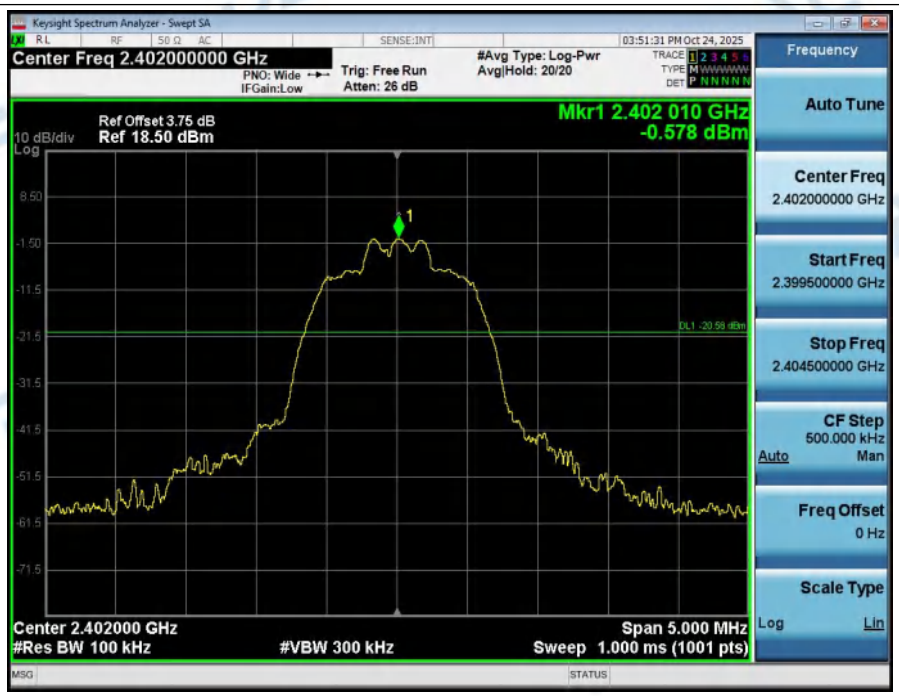
1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping



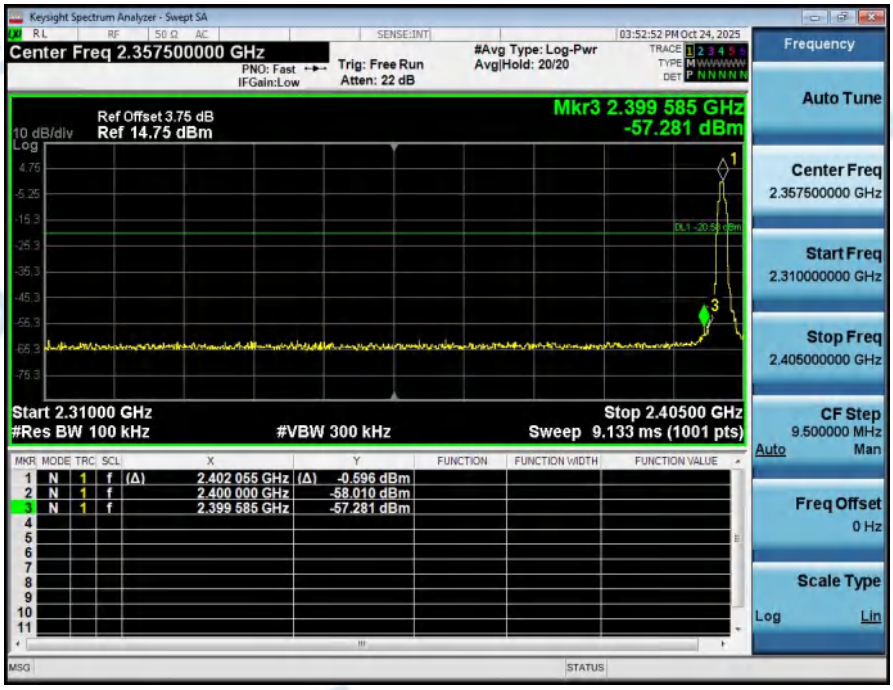
2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



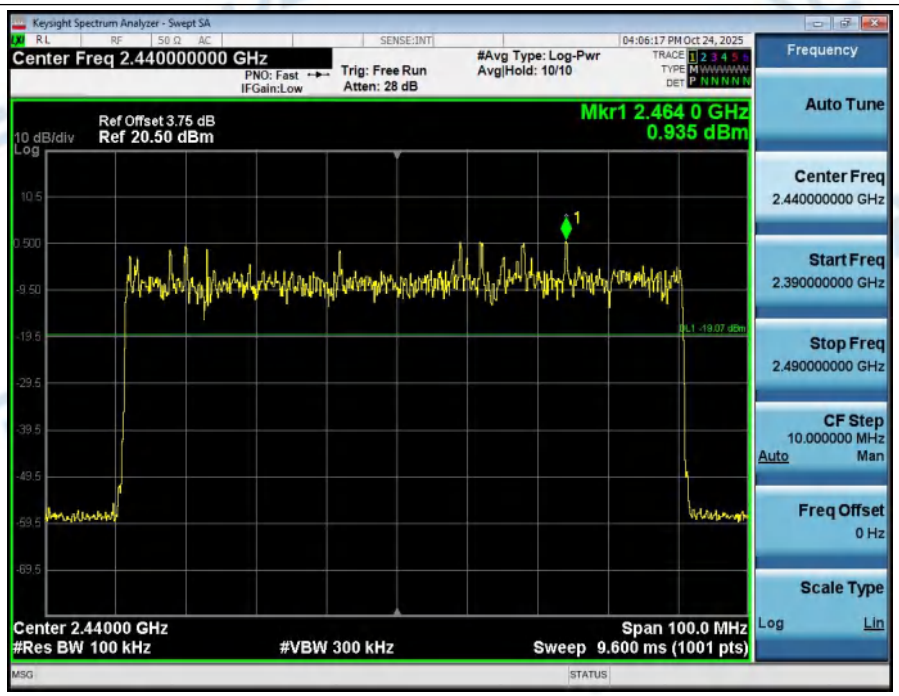
1_Reference_Level_NVNT_ANT1_2-DH5_2402_00



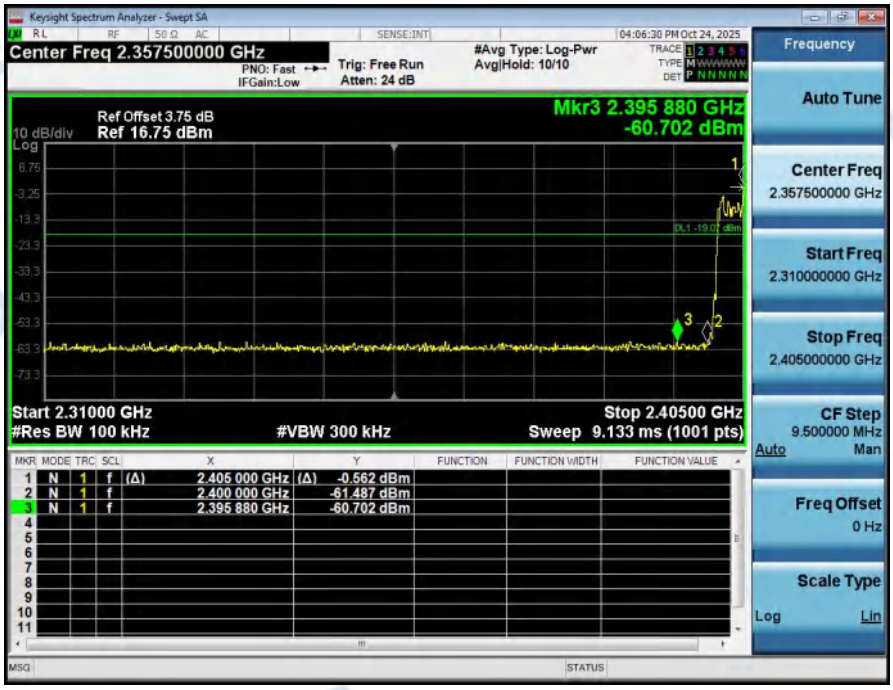
2_Bandedge_NVNT_ANT1_2-DH5_2402_00



1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping

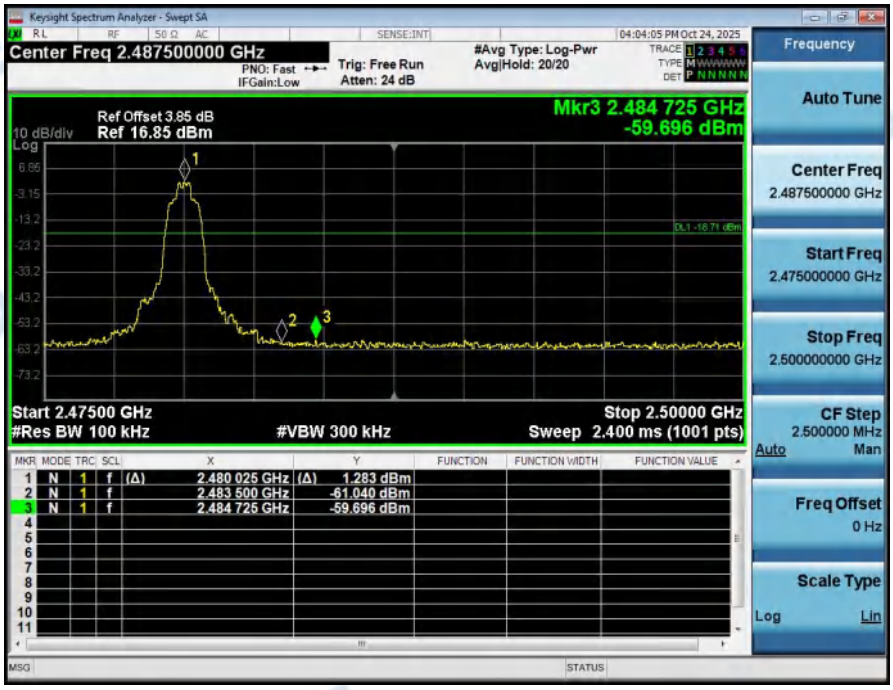


2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



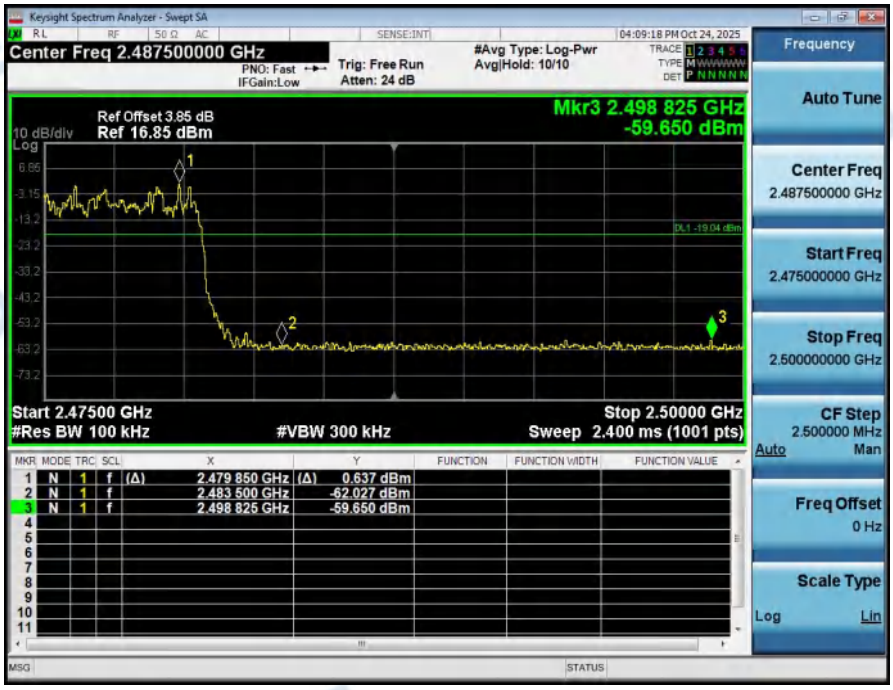
1_Reference_Level_NVNT_ANT1_2-DH5_2480_00

2_Bandedge_NVNT_ANT1_2-DH5_2480_00

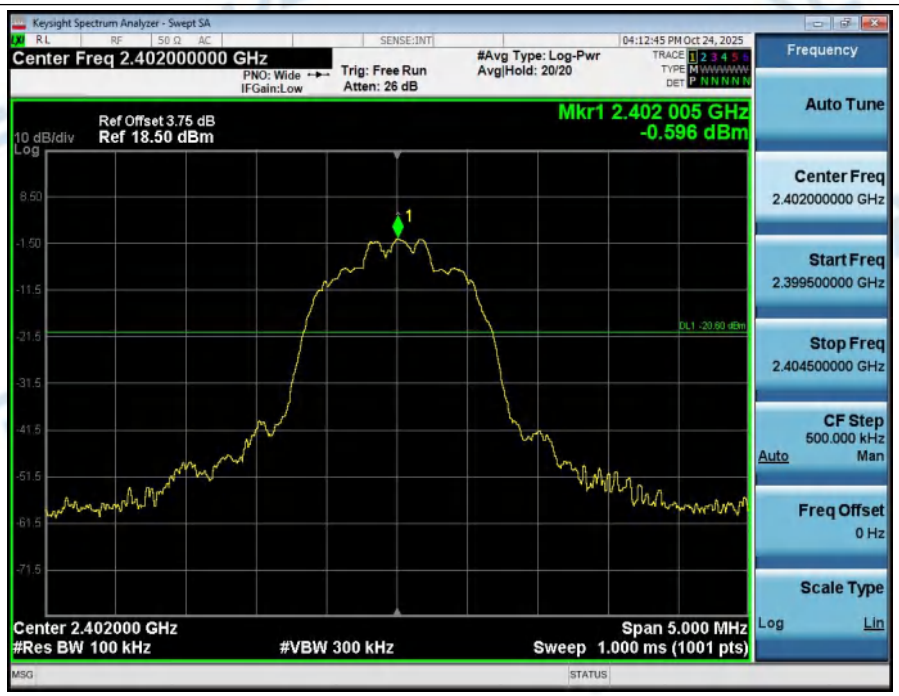


1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping

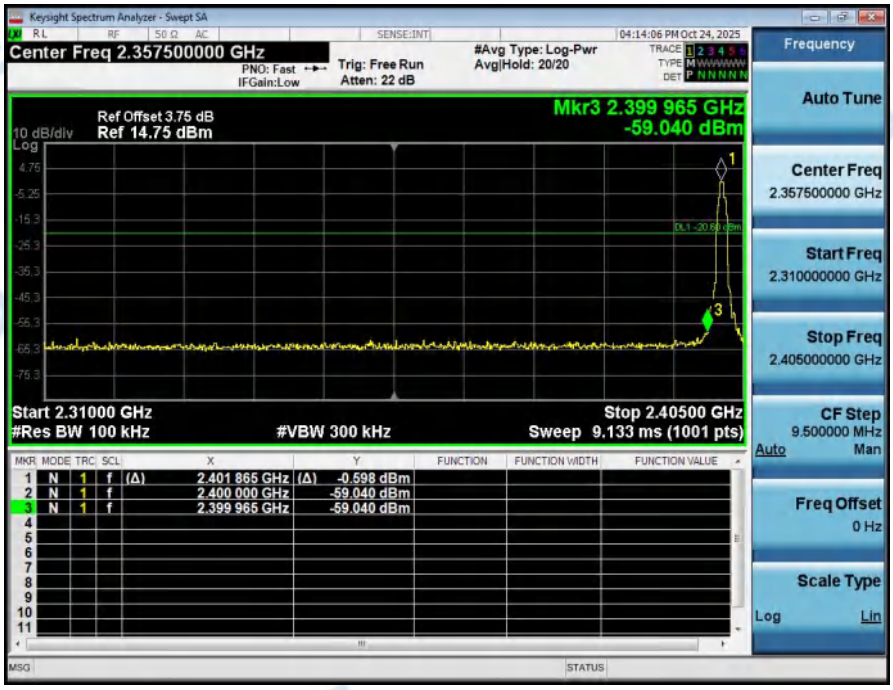
2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



1_Reference_Level_NVNT_ANT1_3-DH5_2402_00

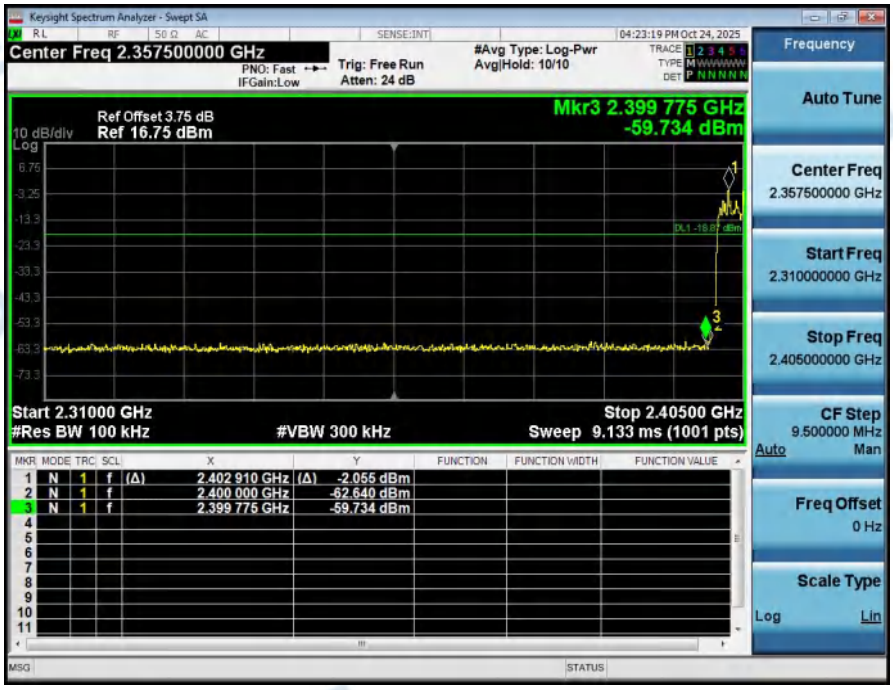


2_Bandedge_NVNT_ANT1_3-DH5_2402_00



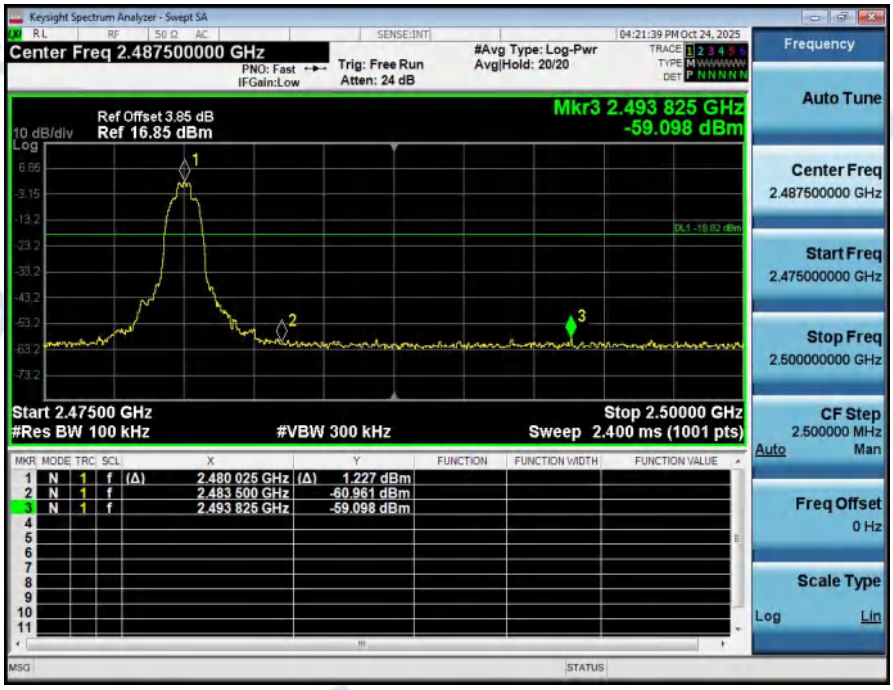
1_Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping

2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping

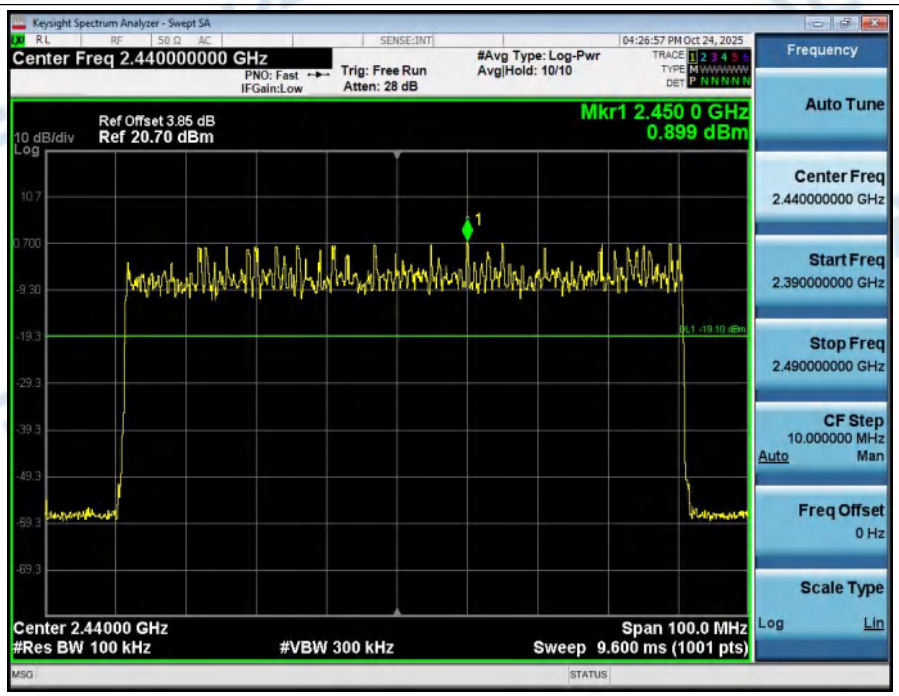


1_Reference_Level_NVNT_ANT1_3-DH5_2480_00

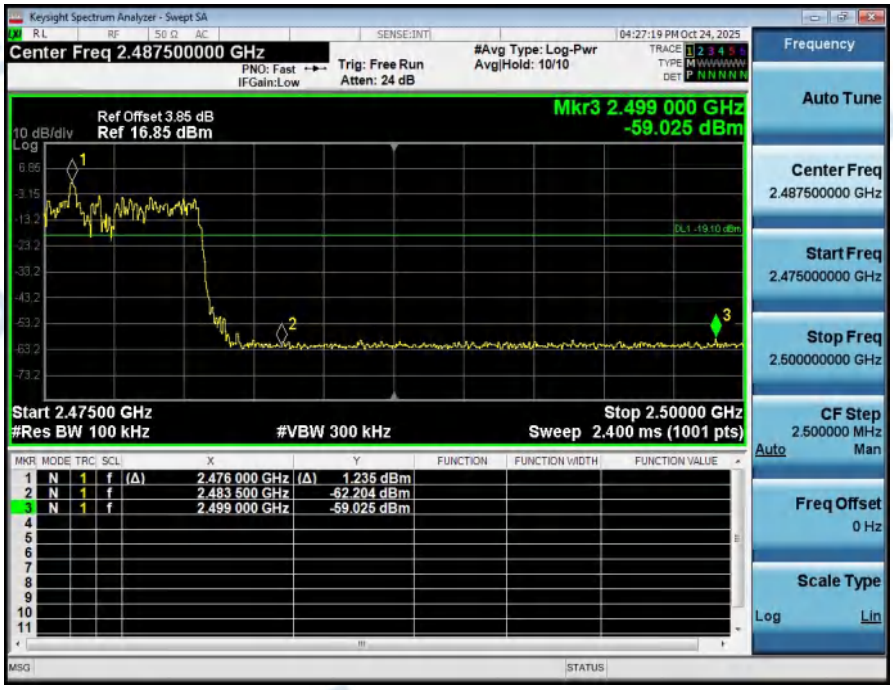
2_Bandedge_NVNT_ANT1_3-DH5_2480_00



1_Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping



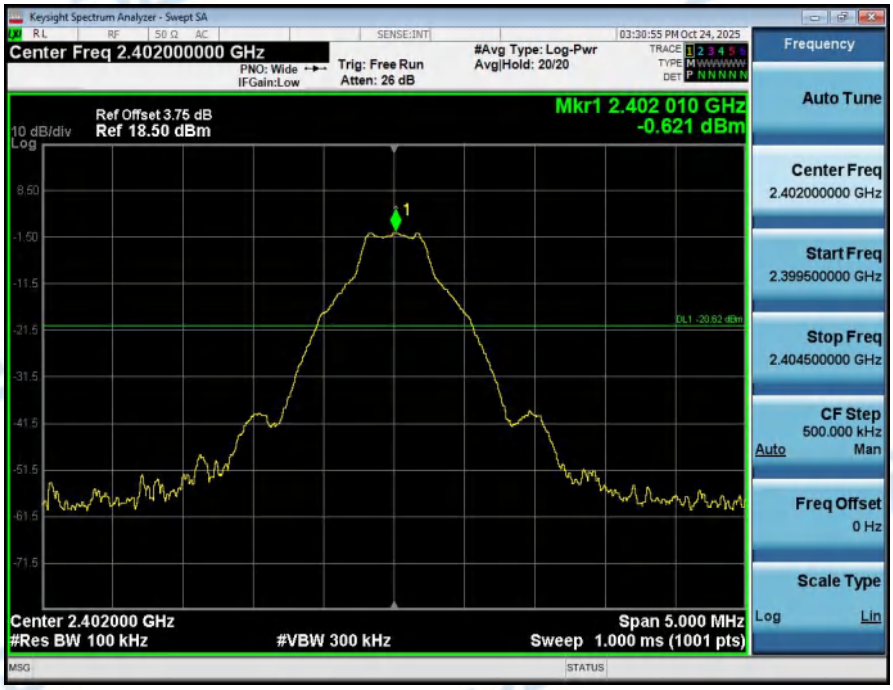
2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.487500000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 24 dB
#Avg Type: Log-Pwr
Avg|Hold: 10/10
04:27:19 PM Oct 24, 2025
Ref Offset 3.85 dB
10 dB/div
Ref 16.85 dBm
Mkr3 2.499 000 GHz
-59.025 dBm
Start 2.47500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.400 ms (1001 pts)
1 N 1 f (Δ) 2.476 000 GHz (Δ) 1.235 dBm
2 N 1 f 2.483 500 GHz -62.204 dBm
3 N 1 f 2.499 000 GHz -59.025 dBm
Frequency
Auto Tune
Center Freq
2.487500000 GHz
Start Freq
2.475000000 GHz
Stop Freq
2.500000000 GHz
CF Step
2.500000 MHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin

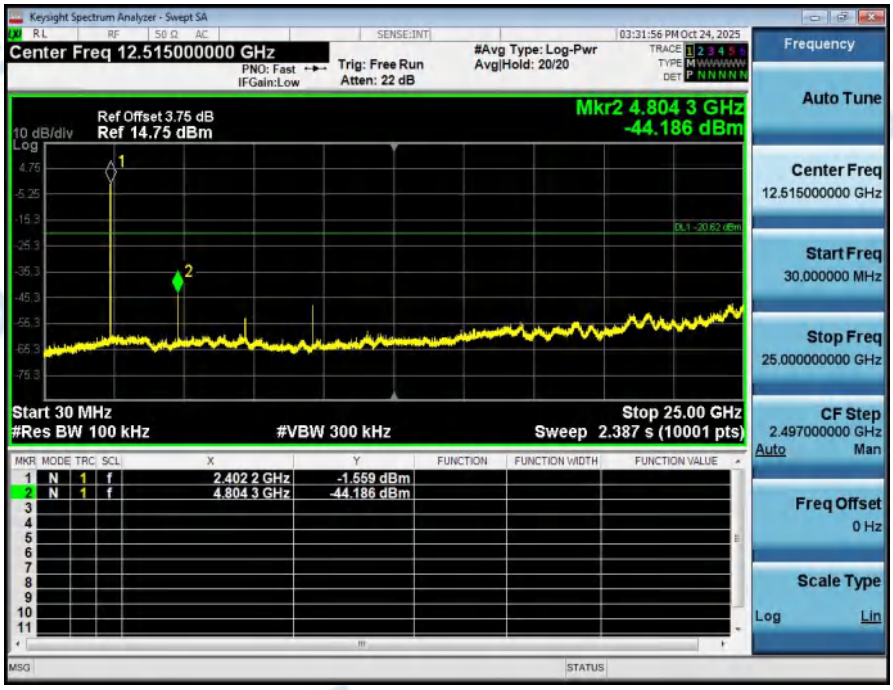
7. Spurious Emissions

Condition	Antenna	Modulation	TX Mode	Ref_level(dBm)	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-0.621	-44.186	-20.621	Pass
NVNT	ANT1	1-DH5	2441.00	0.442	-41.532	-19.558	Pass
NVNT	ANT1	1-DH5	2480.00	1.143	-43.289	-18.857	Pass
NVNT	ANT1	2-DH5	2402.00	-0.578	-43.597	-20.578	Pass
NVNT	ANT1	2-DH5	2441.00	0.495	-44.471	-19.505	Pass
NVNT	ANT1	2-DH5	2480.00	1.293	-41.784	-18.707	Pass
NVNT	ANT1	3-DH5	2402.00	-0.596	-45.663	-20.596	Pass
NVNT	ANT1	3-DH5	2441.00	0.521	-48.924	-19.479	Pass
NVNT	ANT1	3-DH5	2480.00	1.177	-45.781	-18.823	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402_00

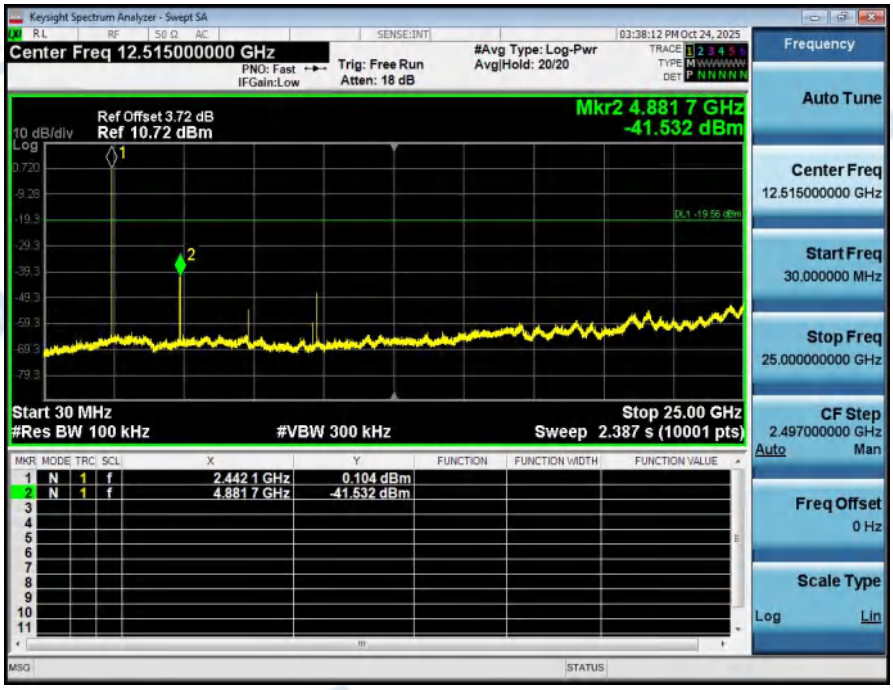


2_Spurious_Emissions_NVNT_ANT1_1-DH5_2402_00



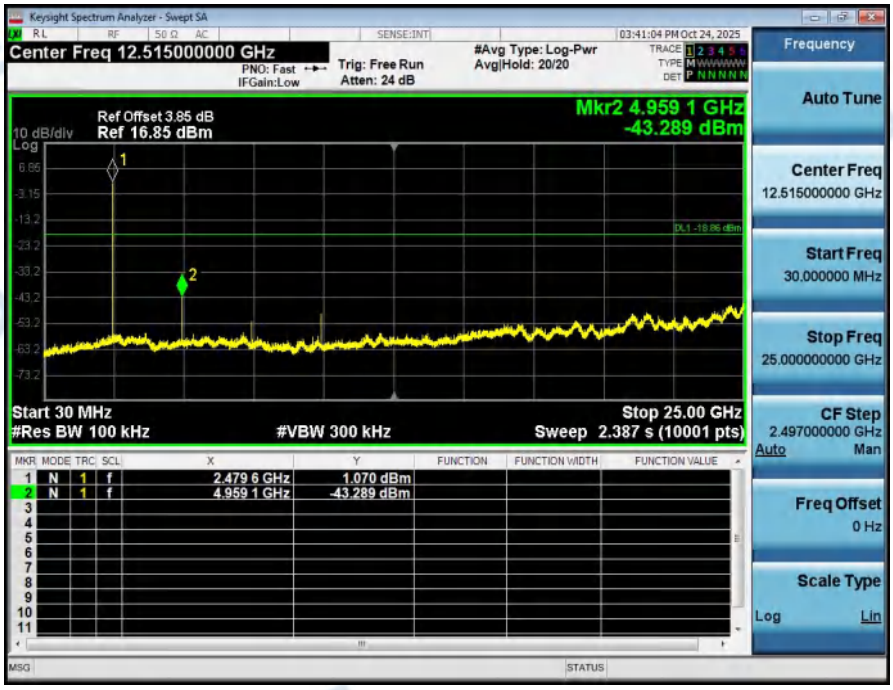
1_Reference_Level_NVNT_ANT1_1-DH5_2441_00

2_Spurious_Emissions_NVNT_ANT1_1-DH5_2441_00

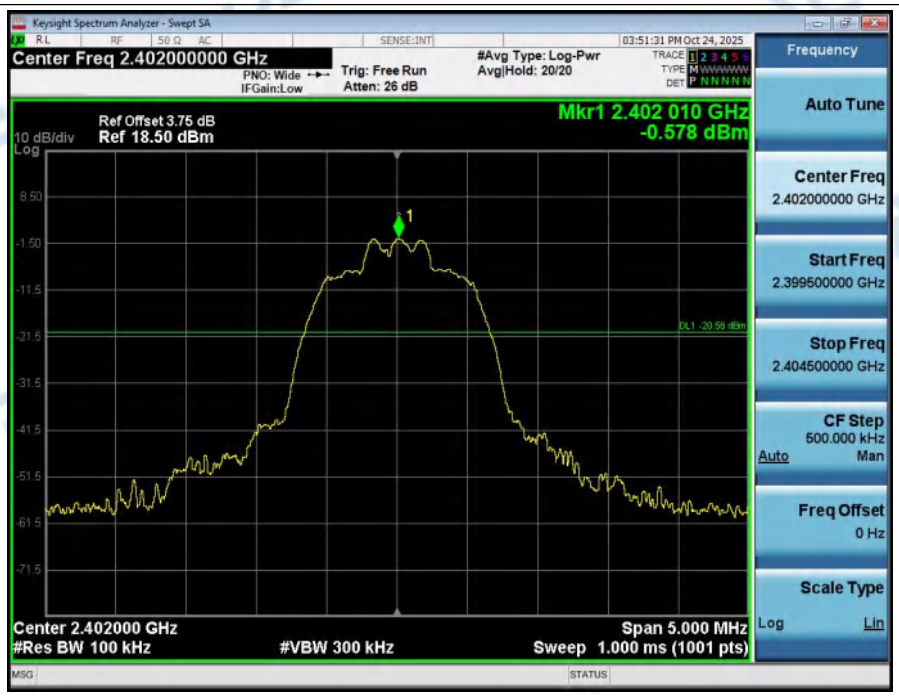


1_Reference_Level_NVNT_ANT1_1-DH5_2480_00

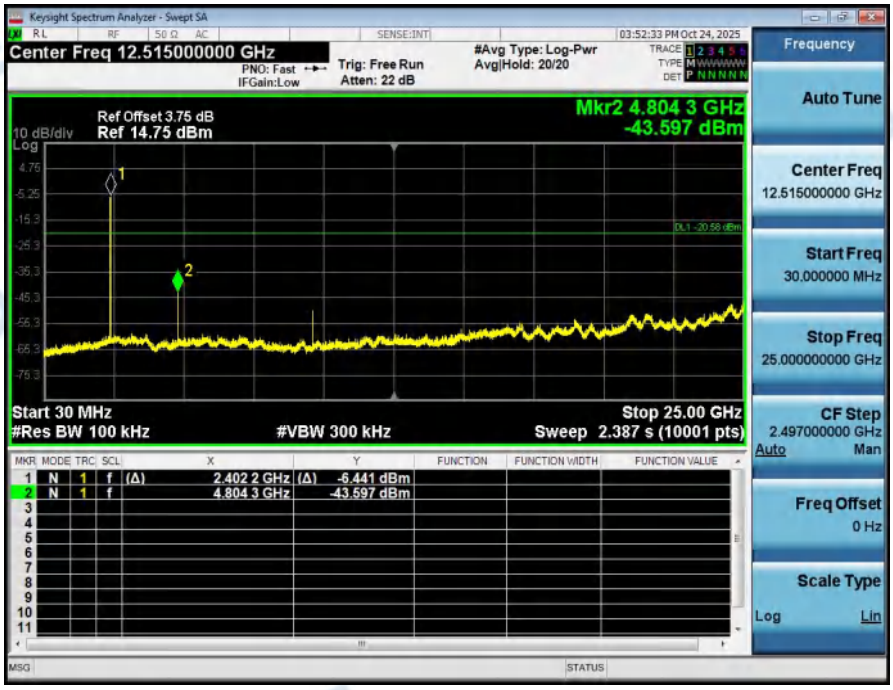
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480_00



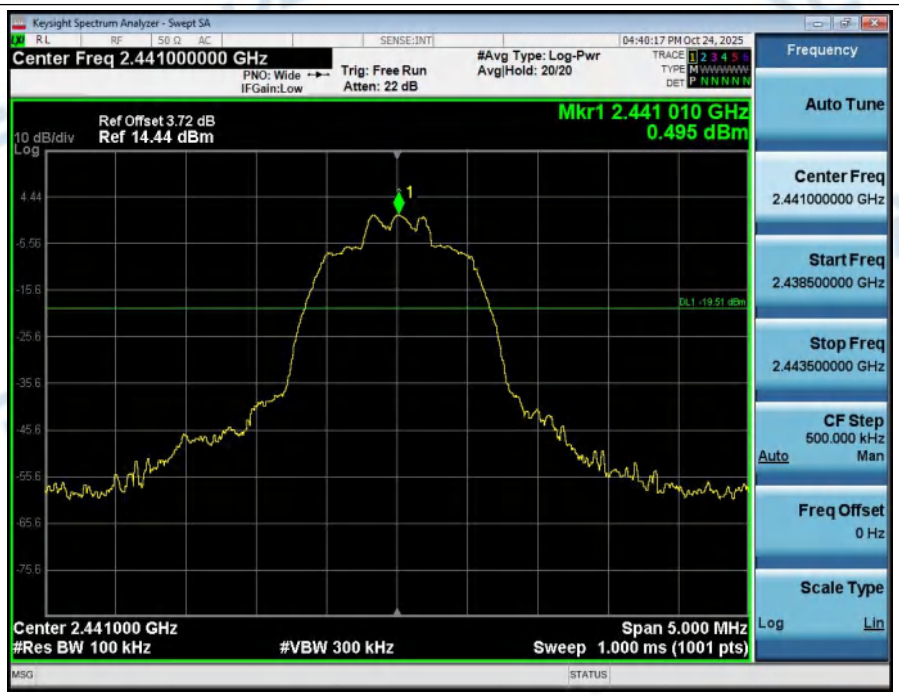
1_Reference_Level_NVNT_ANT1_2-DH5_2402_00



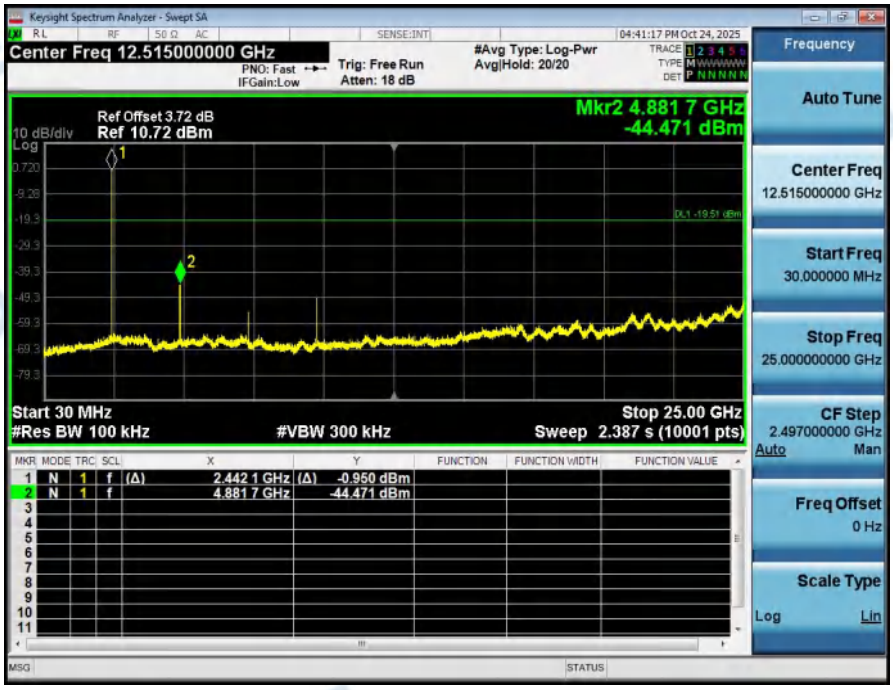
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402_00



1_Reference_Level_NVNT_ANT1_2-DH5_2441_00

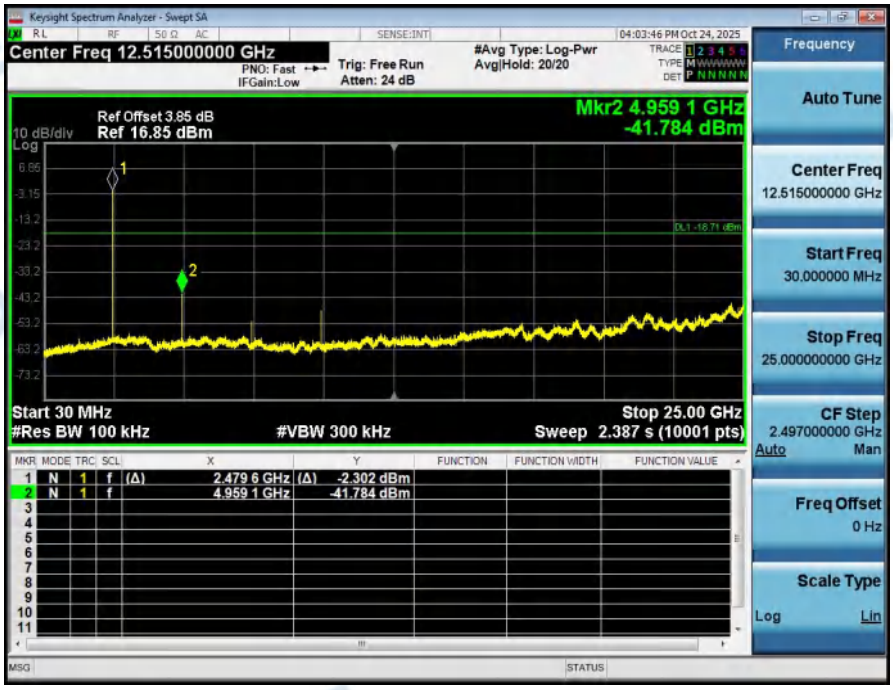


2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441_00

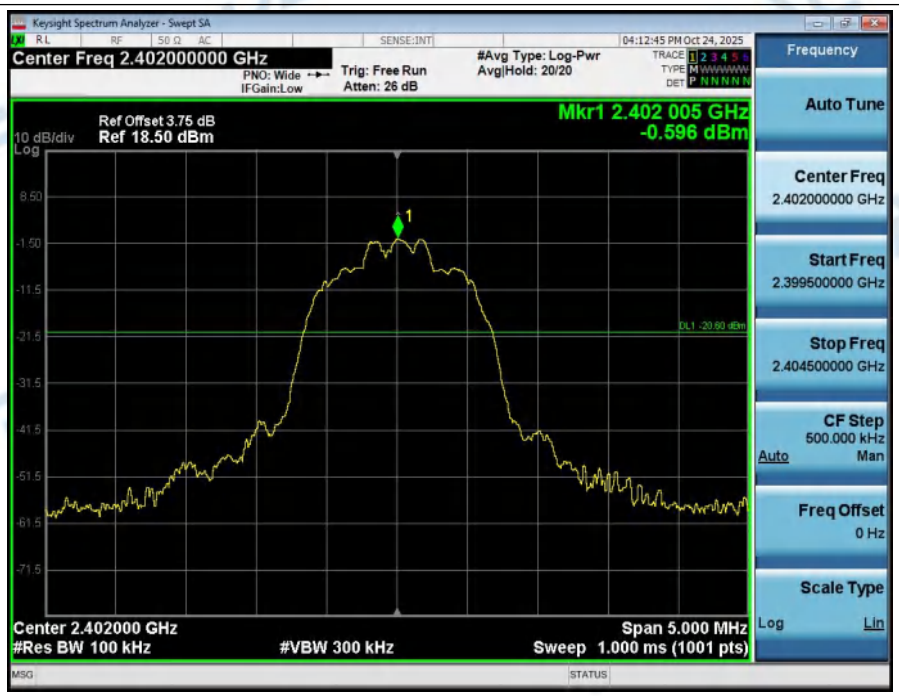


1_Reference_Level_NVNT_ANT1_2-DH5_2480_00

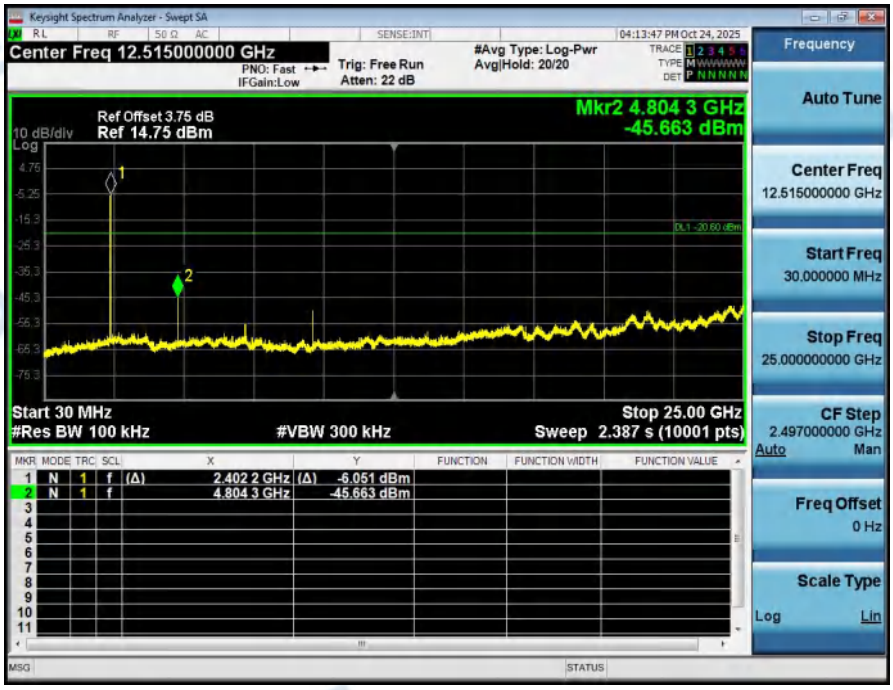
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480_00



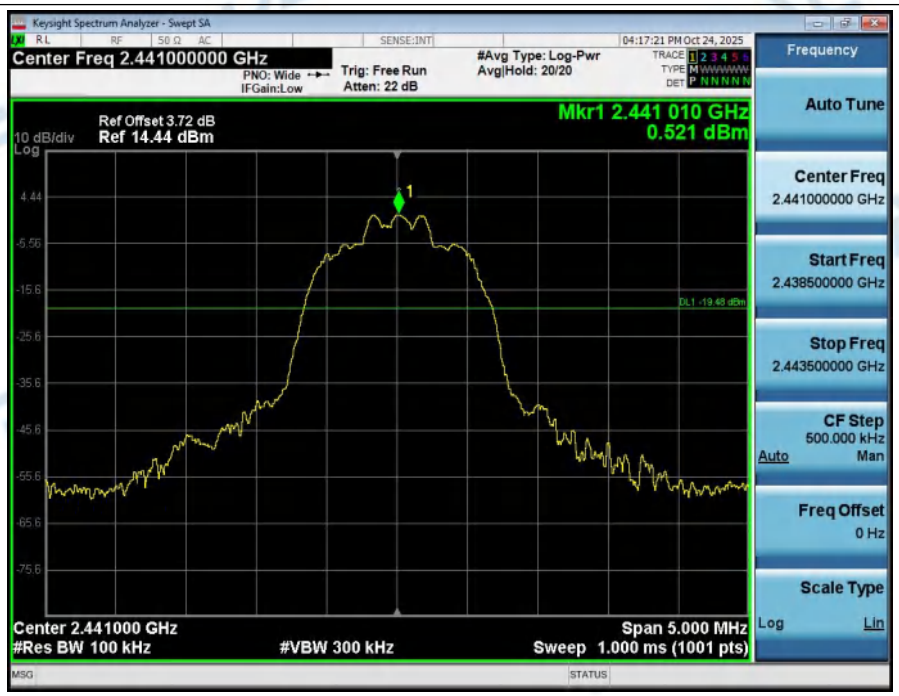
1_Reference_Level_NVNT_ANT1_3-DH5_2402_00



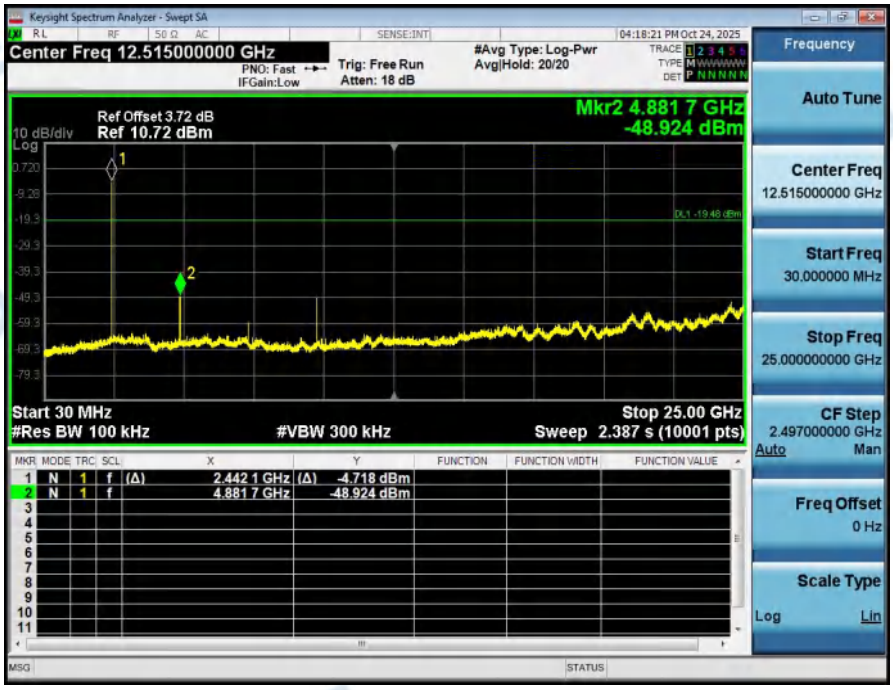
2_Spurious_Emissions_NVNT_ANT1_3-DH5_2402_00



1_Reference_Level_NVNT_ANT1_3-DH5_2441_00

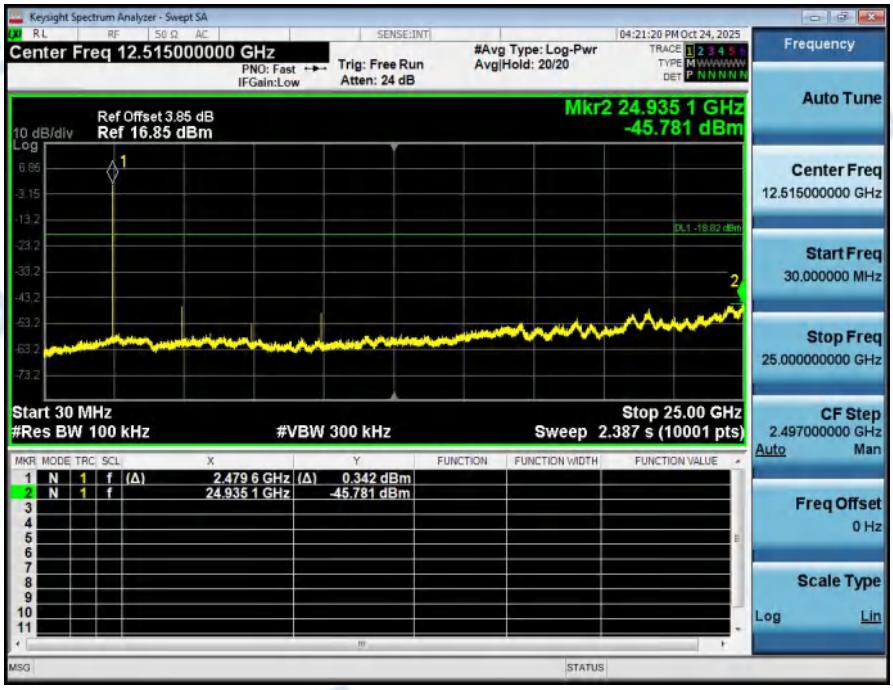


2_Spurious_Emissions_NVNT_ANT1_3-DH5_2441_00



1_Reference_Level_NVNT_ANT1_3-DH5_2480_00

2_Spurious_Emissions_NVNT_ANT1_3-DH5_2480_00



********** End of Report **********