RF TEST REPORT

For

Huizhou HuoYing Photoelectric Technology Co., Ltd.
Product Name: Projector
Test Model(s).: P50

Report Reference No.	:	**DACE240819004RF001**
FCC ID	:	**2BLCL-P50**
Applicant's Name	:	Huizhou HuoYing Photoelectric Technology Co., Ltd.
Address	:	2 F, Building 3,8 a, Yuen Fai Road, Chan Kong Street, Chung Kai high-tech development zone, Huizhou, China
Testing Laboratory	:	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
Test Specification Standard	:	**47 CFR Part 15.247** **C63.10-2013 & KDB 558074 D01 15.247 Meas Guidance v05r02**
Date of Receipt	:	August 19, 2024
Date of Test	:	August 19, 2024 to September 24, 2024
Data of Issue	:	September 24, 2024
Result	:	**Pass**

Note: This report shall not be reproduced except in full, without the written approval of Shenzhen DACE Testing Technology Co., Ltd. This document may be altered or revised by Shenzhen DACE Testing Technology Co., Ltd. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample

Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	DACE240819004RF001	September 24, 2024

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

CONTENTS

1 TEST SUMMARY 5

1.1 TEST STANDARDS 5
1.2 SUMMARY OF TEST RESULT 5

2 GENERAL INFORMATION 6

2.1 CLIENT INFORMATION 6
2.2 DESCRIPTION OF DEVICE (EUT)* 6
2.3 DESCRIPTION OF TEST MODES 7
2.4 DESCRIPTION OF SUPPORT UNITS 8
2.5 EQUIPMENTS USED DURING THE TEST 8
2.6 STATEMENT OF THE MEASUREMENT UNCERTAINTY 9
2.7 IDENTIFICATION OF TESTING LABORATORY 10
2.8 ANNOUNCEMENT 10

3 EVALUATION RESULTS (EVALUATION) 11

3.1 ANTENNA REQUIREMENT 11
3.1.1 Conclusion: 11

4 RADIO SPECTRUM MATTER TEST RESULTS (RF) 12

4.1 CONDUCTED EMISSION AT AC POWER LINE 12
4.1.1 E.U.T. Operation: 12
4.1.2 Test Setup Diagram: 12
4.1.3 Test Data: 13
4.2 OCCUPIED BANDWIDTH 15
4.2.1 E.U.T. Operation: 15
4.2.2 Test Setup Diagram: 16
4.2.3 Test Data: 16
4.3 MAXIMUM CONDUCTED OUTPUT POWER 17
4.3.1 E.U.T. Operation: 17
4.4 CHANNEL SEPARATION 17
4.4.1 E.U.T. Operation: 18
4.4.2 Test Setup Diagram: 18
4.4.3 Test Data: 18
4.4.4 Test Setup Diagram: 19
4.4.5 Test Data: 19
4.5 NUMBER OF HOPPING FREQUENCIES 20
4.5.1 E.U.T. Operation: 20
4.6 DWELL TIME 20
4.6.1 E.U.T. Operation: 21
4.6.2 Test Setup Diagram: 21
4.6.3 Test Data: 21
4.6.4 Test Setup Diagram: 22
4.6.5 Test Data: 22
4.7 EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS 23
4.7.1 E.U.T. Operation: 23
4.7.2 Test Setup Diagram: 23
4.7.3 Test Data: 23
4.8 BAND EDGE EMISSIONS (RADIATED) 24
4.8.1 E.U.T. Operation: 24

4.8.2 Test Setup Diagram: 24
4.8.3 Test Data: 25
4.9 EMISSIONS IN FREQUENCY BANDS (BELOW 1GHZ) 27
4.9.1 E.U.T. Operation: 28
4.9.2 Test Setup Diagram: 28
4.9.3 Test Data: 29
4.10 EMISSIONS IN FREQUENCY BANDS (ABOVE 1GHZ) 30
4.10.1 E.U.T. Operation: 31
4.10.2 Test Setup Diagram: 31
4.10.3 Test Data: 32
5 TEST SETUP PHOTOS 35
6 PHOTOS OF THE EUT 37
APPENDIX 45
1. PEAK OUTPUT POWER 45
2. -20DB BANDWIDTH 50
3. 99% OCCUPIED BANDWIDTH 55
4. BANDEDGE 60
5. SPURIOUS EMISSIONS 73
6. CARRIER FREQUENCIES SEPARATION (HOPPING) 83
7. NUMBER OF HOPPING CHANNEL (HOPPING) 88
8. DWELL TIME (HOPPING) 90

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 C63.10-2013 section 6.2	47 CFR 15.207(a)	Pass
Occupied Bandwidth	ANSI C63.10-2013, section 7.8.7	47 CFR 15.247(a)(1)	Pass
Maximum Conducted Output Power	ANSI C63.10-2013, section 7.8.5	47 CFR 15.247(b)(1)	Pass
Channel Separation	ANSI C63.10-2013, section 7.8.2	47 CFR 15.247(a)(1)	Pass
Number of Hopping Frequencies	ANSI C63.10-2013, section 7.8.3	47 CFR 15.247(a)(1)(iii)	Pass
Dwell Time	ANSI C63.10-2013, section 7.8.4	47 CFR 15.247(a)(1)(iii)	Pass
Emissions in non-restricted frequency bands	ANSI C63.10-2013 section 7.8.8	47 CFR 15.247(d), 15.209, 15.205	Pass
Band edge emissions (Radiated)	ANSI C63.10-2013 section 6.10	47 CFR 15.247(d), 15.209, 15.205	Pass
Emissions in frequency bands (below 1GHz)	ANSI C63.10-2013 section 6.6.4	47 CFR 15.247(d), 15.209, 15.205	Pass
Emissions in frequency bands (above 1GHz)	ANSI C63.10-2013 section 6.6.4	47 CFR 15.247(d), 15.209, 15.205	Pass

Note:1. N/A-- Not applicable to the this test clause.
2. The results of all conduction method tests include cable loss.

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : Huizhou HuoYing Photoelectric Technology Co., Ltd.
Address : 2 F, Building 3,8 a, Yuen Fai Road, Chan Kong Street, Chung Kai high-tech development zone, Huizhou, China

Manufacturer : Huizhou HuoYing Photoelectric Technology Co., Ltd.
Address : 2 F, Building 3,8 a, Yuen Fai Road, Chan Kong Street, Chung Kai high-tech development zone, Huizhou, China

2.2 Description of Device (EUT)*

Product Name:	Projector
Model/Type reference:	P50
Series Model:	P50+, H95S, H01, H02, H03, H04, H05, H06, H07, H08, H09, H26, H30, H35, H40, H45, Y01, Y02, Y03, Y04, Y05, Y06, Y07, Y08, Y09, Y26, Y30, Y35, Y40, Y45, HY26, HY30, HY35, HY40, HY45, HY50, HY200, HY350, HY400, HY450, S01, S02, S03, S04, S05, S06, S07, S08,S09, S26, S30,S35, S40, S45,M01, M02, M03, M04, M05, M06, M07, M08, M09, M26, M30, M35, M400, M450
Model difference:	There are many models of the product to meet the needs of different customers, ensuring that each customer's model is not duplicated and avoiding unnecessary disputes. The only difference between models is the model name, everything else is the same (such as PCB, BOM, etc.)
Trade Mark:	N/A
Power Supply:	AC120V 50/60Hz 55W
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	79
Modulation Type:	GFSK, π/4 DQPSK, 8DPSK
Antenna Type:	FPC ANT
Antenna Gain:	1.88dBi
Hardware Version:	V1.3
Software Version:	V1.0

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)**
	BDR/EDR
Lowest channel	2402MHz
Middle channel	2441MHz
Highest channel	2480MHz

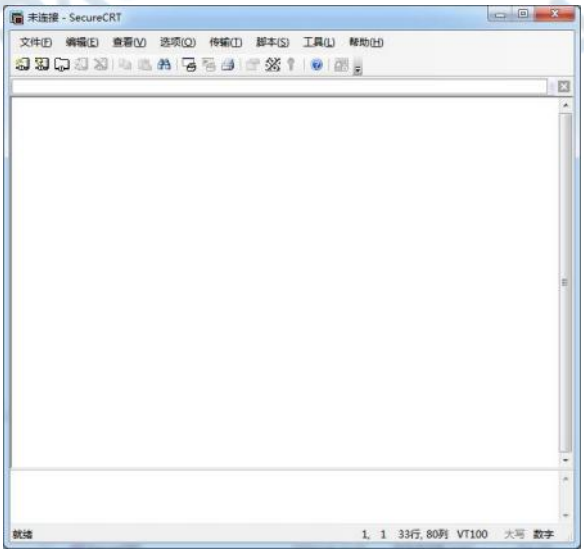
2.3 Description of Test Modes

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	TX-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	TX-8DPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation.

Description

☐ Special software is used.
☐ Through engineering command into the engineering mode.
engineering command: *#*#3646633#*#*
☒ Other method:

Special software+test command



2.4 Description of Support Units

The EUT was tested as an independent device.

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	/	/	2024-03-20	2025-03-19
Pulse Limiter	SCHWARZ BECK	VTSD 9561-F Pulse limiter 10dB Attenuation	561-G071	2023-12-12	2024-12-11
50ΩCoaxial Switch	Anritsu	MP59B	M20531	/	/
Test Receiver	Rohde & Schwarz	ESPI TEST RECEIVER	1164.6607K03 -102109-MH	2024-06-12	2025-06-11
L.I.S.N	R&S	ESH3-Z5	831.5518.52	2023-12-12	2024-12-11
L.I.S.N	SCHWARZ BECK	NSLK 8126	05055	2024-06-14	2025-06-13
Pulse Limiter	CYBERTEK	EM5010A	/	2023-09-27	2024-09-26
EMI test software	EZ -EMC	EZ	V1.1.42	/	/

Dwell Time Emissions in non-restricted frequency bands Occupied Bandwidth Maximum Conducted Output Power Channel Separation Number of Hopping Frequencies					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
RF Test Software	TACHOY	RTS-01	V1.0.0	/	/
RF Sensor Unit	TACHOY	TR1029-2	000001	/	/
Signal Generator	Keysight	N5181A	MY48180415	2023-11-09	2024-11-08
Signal Generator	Keysight	N5182A	MY50143455	2023-11-09	2024-11-08
Spectrum Analyzer	Keysight	N9020A	MY53420323	2023-12-12	2024-12-11

Band edge emissions (Radiated) Emissions in frequency bands (below 1GHz) Emissions in frequency bands (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test software	Farad	EZ -EMC	V1.1.42	/	/
Positioning Controller	/	MF-7802	/	/	/
Amplifier(18-40G)	COM-POWER	AH-1840	10100008-1	2022-04-05	2025-04-04
Horn antenna	COM-POWER	AH-1840 (18-40G)	10100008	2023-04-05	2025-04-04
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2024-06-14	2026-06-13
Cable(LF)#2	Schwarzbeck	/	/	2024-02-19	2025-02-18
Cable(LF)#1	Schwarzbeck	/	/	2024-02-19	2025-02-18
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2024-03-20	2025-03-19
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2024-03-20	2025-03-19
Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	2024-06-12	2025-06-11
Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	2024-06-12	2025-06-11
Wideband radio communication tester	R&S	CMW500	113410	2024-06-12	2025-06-11
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-jR	2024-06-12	2025-06-11
Test Receiver	R&S	ESCI 3	1166.5950K03-101431-Jq	2024-06-13	2025-06-12
Horn Antenna	Sunol Sciences	DRH-118	A091114	2023-05-13	2025-05-12
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2023-05-21	2025-05-20

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, Shiyan, 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, Shiyan, 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.

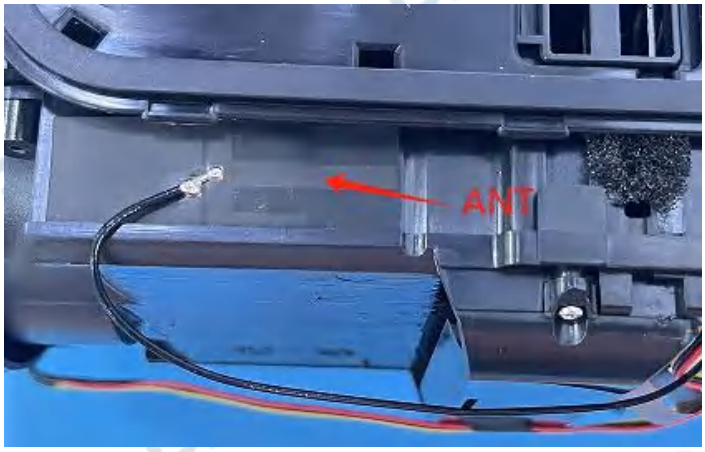
(6) We hereby declare that the laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant(information with "*" provided by applicant). the laboratory is not responsible for the accuracy of the information provided by the client. When the information 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.

3.1.1 Conclusion:



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

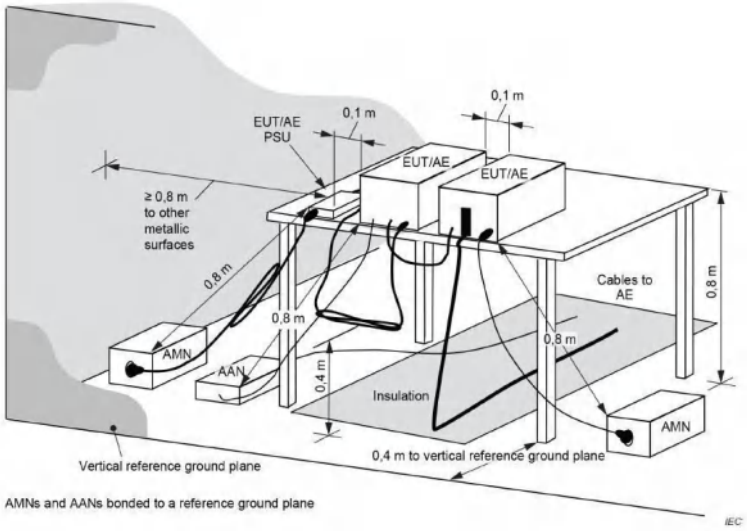
*Decreases with the logarithm of the frequency.

Test Method:	ANSI C63.10-2013 section 6.2
Procedure:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.1 E.U.T. Operation:

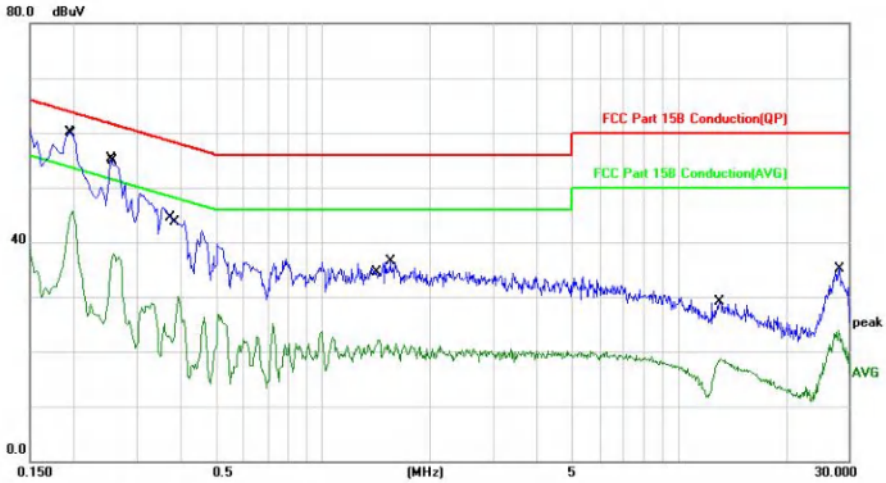
Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

4.1.2 Test Setup Diagram:



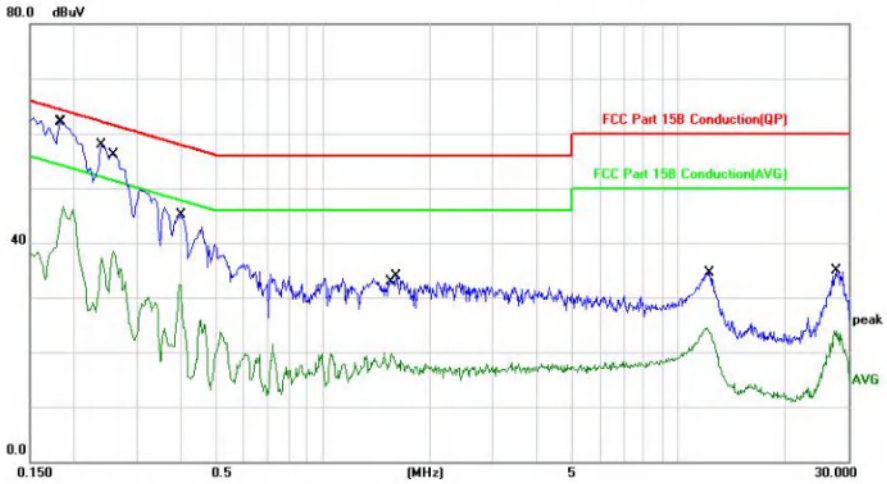
4.1.3 Test Data:

TM1 / Line: Line / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1940	50.05	10.10	60.15	63.86	-3.71	QP	
2		0.1980	35.69	10.10	45.79	53.69	-7.90	AVG	
3		0.2540	45.26	10.09	55.35	61.62	-6.27	QP	
4		0.2580	27.88	10.09	37.97	51.49	-13.52	AVG	
5		0.3780	34.19	10.08	44.27	58.32	-14.05	QP	
6		0.3899	20.02	10.08	30.10	48.06	-17.96	AVG	
7		1.4299	12.01	10.05	22.06	46.00	-23.94	AVG	
8		1.5460	26.39	10.03	36.42	56.00	-19.58	QP	
9		13.0260	18.65	10.41	29.06	60.00	-30.94	QP	
10		13.1059	8.34	10.41	18.75	50.00	-31.25	AVG	
11		28.1060	12.91	11.03	23.94	50.00	-26.06	AVG	
12		28.3700	23.98	11.05	35.03	60.00	-24.97	QP	

TM1 / Line: Neutral / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1819	52.04	10.10	62.14	64.39	-2.25	QP	
2		0.1860	36.51	10.10	46.61	54.21	-7.60	AVG	
3		0.2380	47.85	10.09	57.94	62.16	-4.22	QP	
4		0.2580	28.50	10.09	38.59	51.49	-12.90	AVG	
5		0.3980	35.05	10.08	45.13	57.89	-12.76	QP	
6		0.3980	22.26	10.08	32.34	47.89	-15.55	AVG	
7		1.5620	9.76	10.03	19.79	46.00	-26.21	AVG	
8		1.6019	23.82	10.03	33.85	56.00	-22.15	QP	
9		12.0180	14.13	10.38	24.51	50.00	-25.49	AVG	
10		12.1940	24.15	10.38	34.53	60.00	-25.47	QP	
11		27.3420	12.93	10.97	23.90	50.00	-26.10	AVG	
12		27.7180	23.96	11.01	34.97	60.00	-25.03	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= Mesurement - Limit

4.2 Occupied Bandwidth

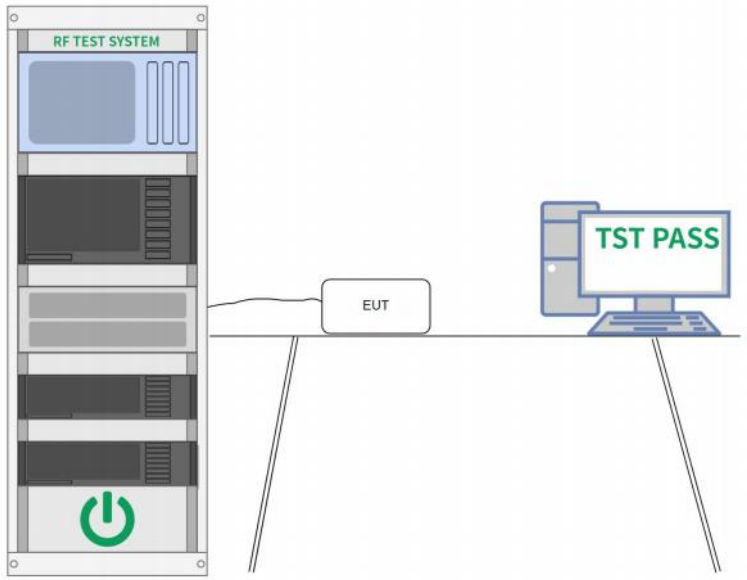
Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of 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 C63.10-2013, section 7.8.7, For occupied bandwidth measurements, use the procedure in 6.9.2.
Procedure:	a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five 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 video bandwidth (VBW) shall be approximately three times 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 4.1.5.2. d) Steps a) through c) might require iteration to adjust within the specified tolerances. e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "−xx dB down" requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value. f) Set detection mode to peak and trace mode to max hold. g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value). h) Determine the "−xx dB down amplitude" using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument. i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j). j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "−xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth. k) The occupied bandwidth shall be reported by providing 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 °C	Humidity:	46 %	Atmospheric Pressure:	101 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 C63.10-2013, section 7.8.5
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. The hopping shall be disabled for this test: a) Use the following spectrum analyzer settings: 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel. 2) RBW > 20 dB bandwidth of the emission being measured. 3) VBW >= RBW. 4) Sweep: Auto. 5) Detector function: Peak. 6) Trace: Max hold. b) Allow trace to stabilize. c) Use the marker-to-peak function to set the marker to the peak of the emission. d) The indicated level is the peak output power, after any corrections for external attenuators and cables. e) A plot of the test results and setup description shall be included in the test report. NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

4.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.4 Channel Separation

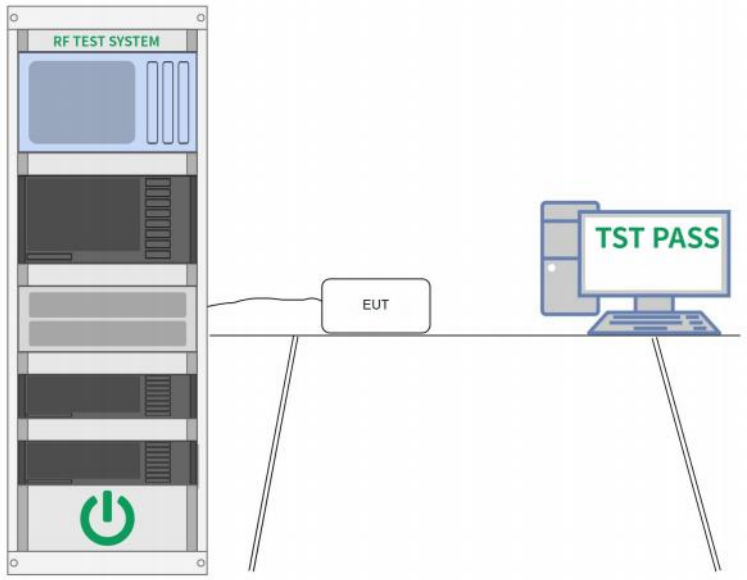
Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating 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 C63.10-2013, section 7.8.2
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: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the

	adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM4, TM5, TM6				
Final test mode:	TM4, TM5, TM6				

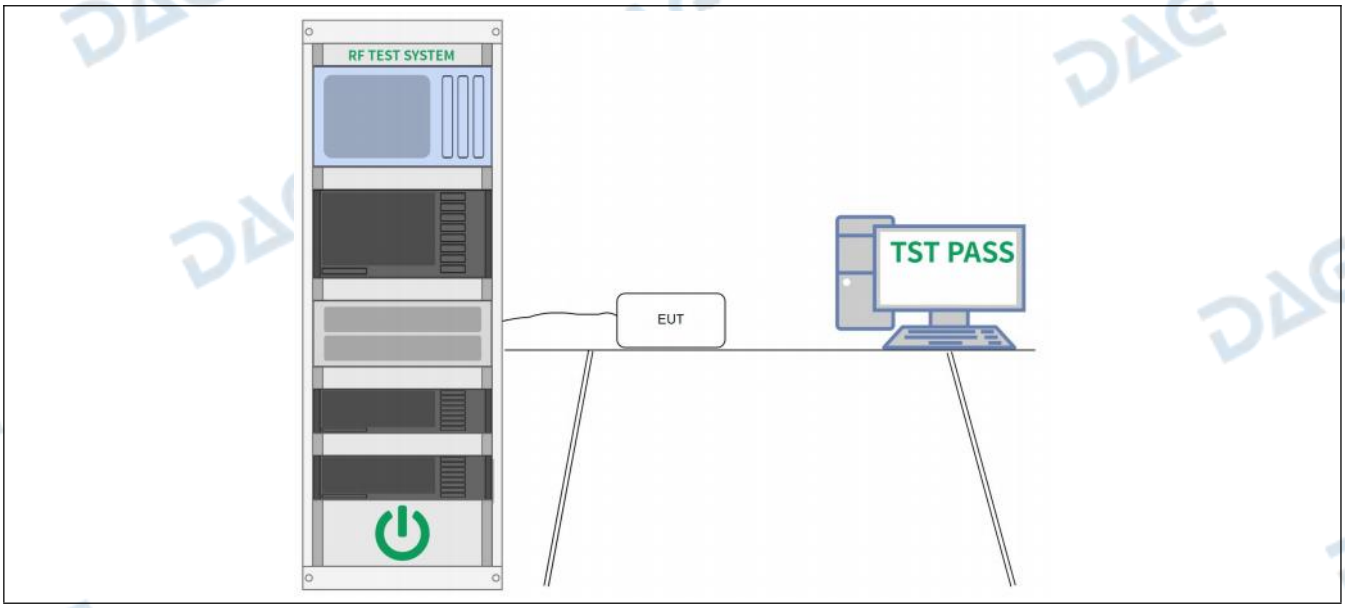
4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

4.4.4 Test Setup Diagram:



4.4.5 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 C63.10-2013, section 7.8.3
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 may 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: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

4.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM4, TM5, TM6				
Final test mode:	TM4, TM5, TM6				

4.6 Dwell Time

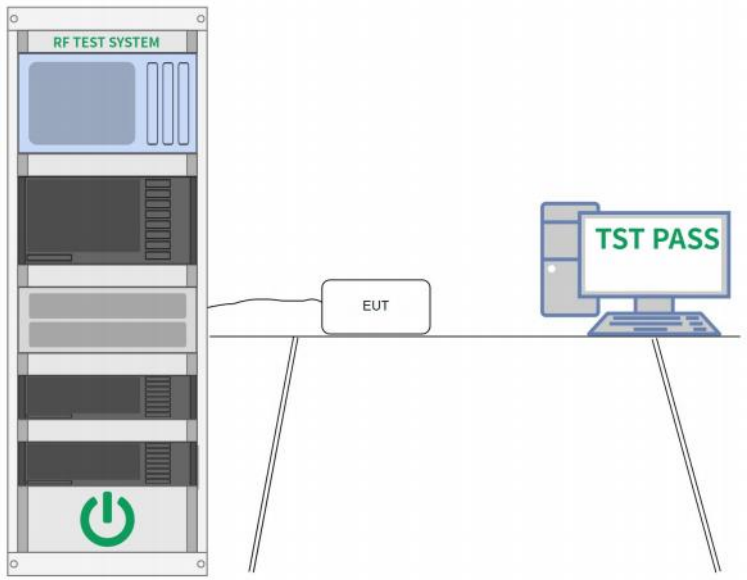
Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied 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 C63.10-2013, section 7.8.4
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: 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 dwell time per channel. c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel. d) Detector function: Peak. e) Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value

	varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation: (Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time) The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation. The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

4.6.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM4, TM5, TM6				
Final test mode:	TM4, TM5, TM6				

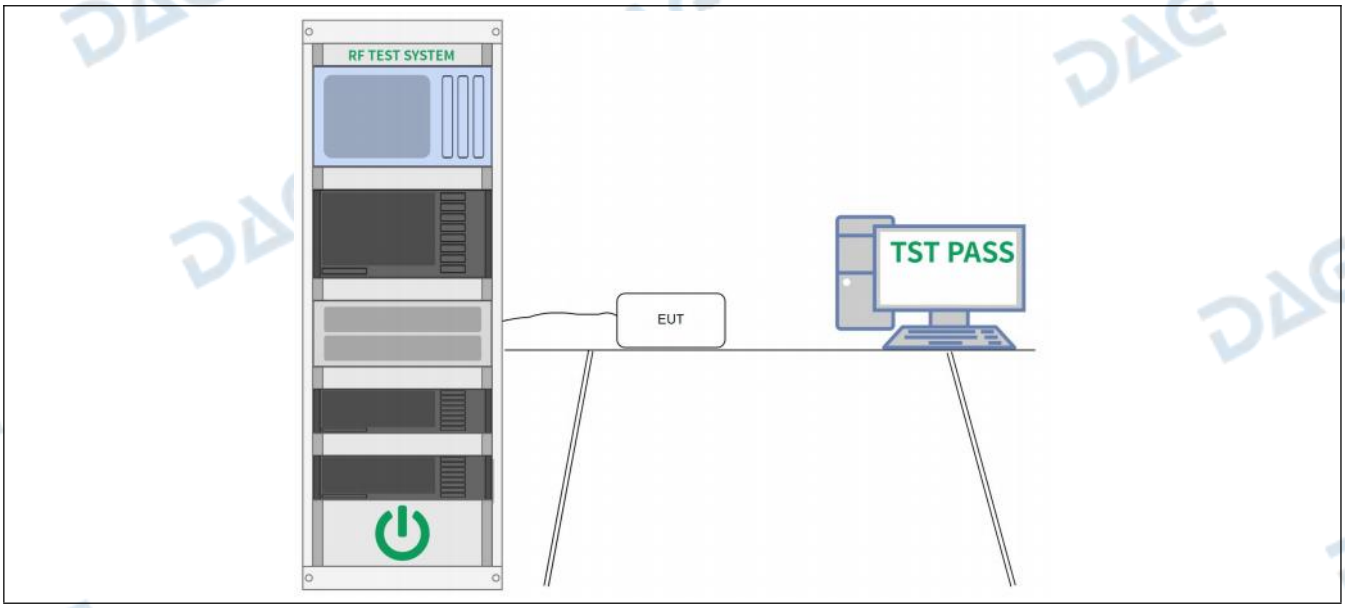
4.6.2 Test Setup Diagram:



4.6.3 Test Data:

Please Refer to Appendix for Details.

4.6.4 Test Setup Diagram:



4.6.5 Test Data:

Please Refer to Appendix for Details.

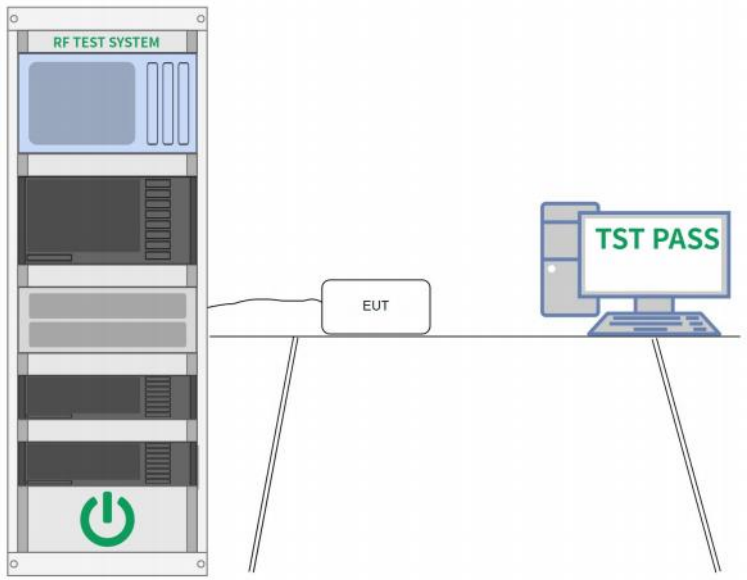
4.7 Emissions in non-restricted frequency bands

Test Requirement:	47 CFR 15.247(d), 15.209, 15.205
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 C63.10-2013 section 7.8.8
Procedure:	Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers. 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 instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

4.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

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

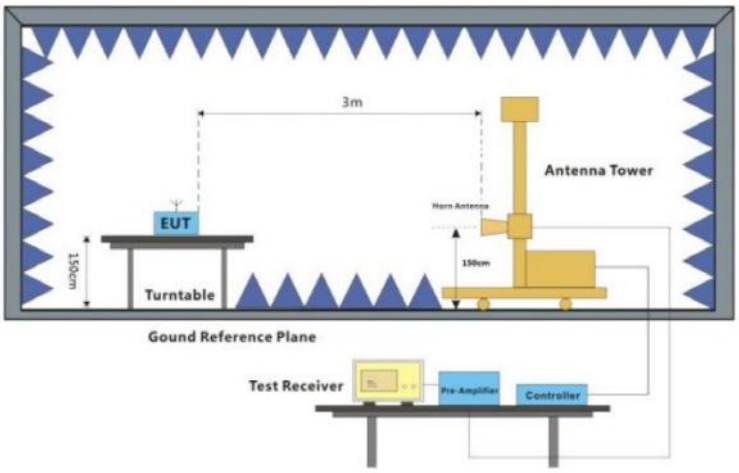
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this 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 C63.10-2013 section 6.10
Procedure:	ANSI C63.10-2013 section 6.10.5.2

4.8.1 E.U.T. Operation:

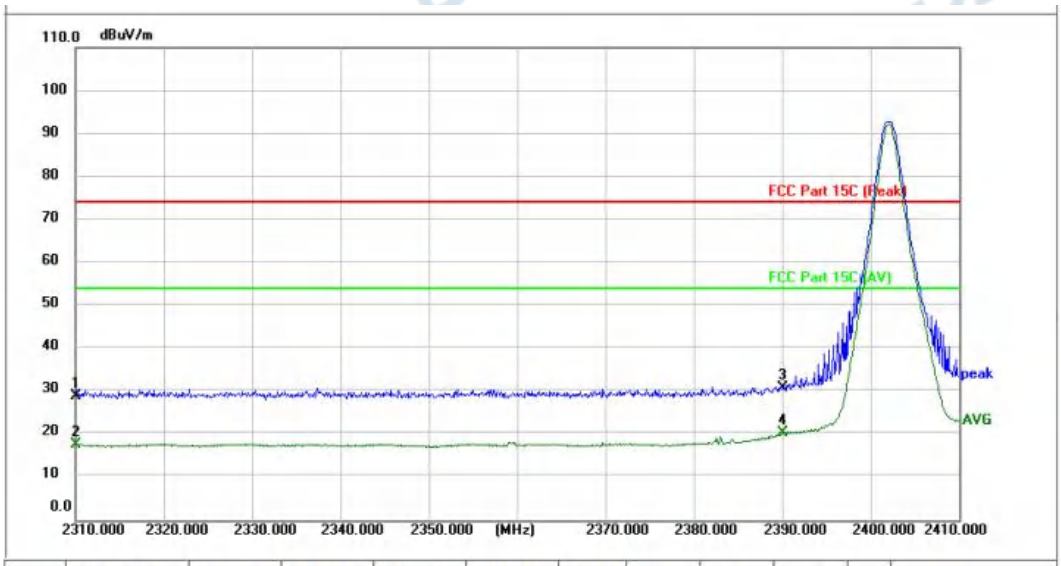
Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1				

4.8.2 Test Setup Diagram:



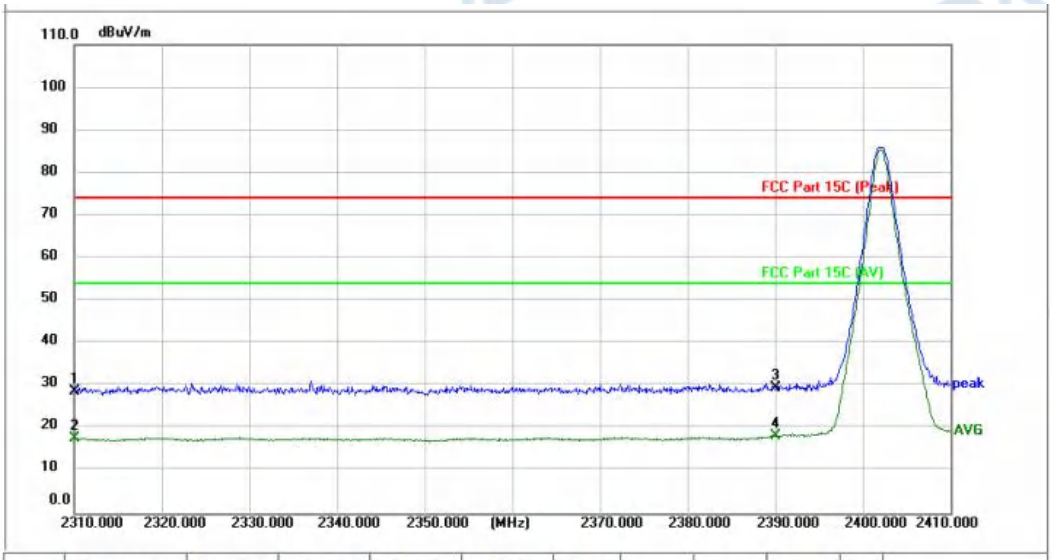
4.8.3 Test Data:

TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



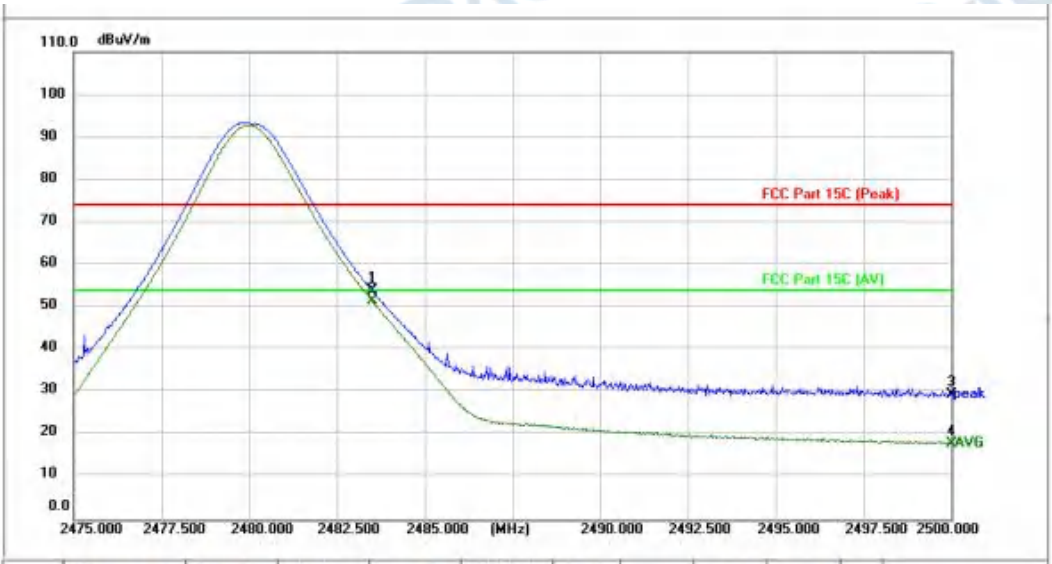
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	35.53	-6.63	28.90	74.00	-45.10	peak	150		P	
2	2310.000	24.32	-6.63	17.69	54.00	-36.31	AVG	150		P	
3	2390.000	37.44	-6.42	31.02	74.00	-42.98	peak	150		P	
4 *	2390.000	26.79	-6.42	20.37	54.00	-33.63	AVG	150		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



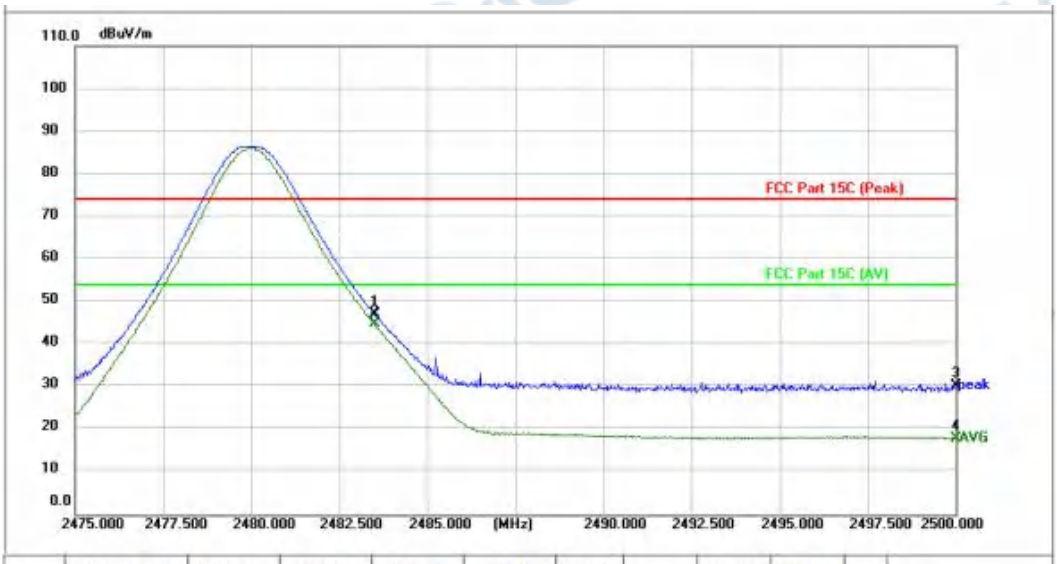
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	35.26	-6.63	28.63	74.00	-45.37	peak	150		P	
2	2310.000	24.34	-6.63	17.71	54.00	-36.29	AVG	150		P	
3	2390.000	36.06	-6.42	29.64	74.00	-44.36	peak	150		P	
4 *	2390.000	24.71	-6.42	18.29	54.00	-35.71	AVG	150		P	

TM1 / 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	60.14	-6.17	53.97	74.00	-20.03	peak	150		P	
2 *	2483.500	57.78	-6.17	51.61	54.00	-2.39	AVG	150		P	
3	2500.000	35.62	-6.13	29.49	74.00	-44.51	peak	150		P	
4	2500.000	24.27	-6.13	18.14	54.00	-35.86	AVG	150		P	

TM1 / 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	53.42	-6.17	47.25	74.00	-26.75	peak	150		P	
2 *	2483.500	51.00	-6.17	44.83	54.00	-9.17	AVG	150		P	
3	2500.000	36.46	-6.13	30.33	74.00	-43.67	peak	150		P	
4	2500.000	24.19	-6.13	18.06	54.00	-35.94	AVG	150		P	

1. Margin = Measurement Level - Limit ; Measurement Level=Test receiver reading + correction factor

2.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)

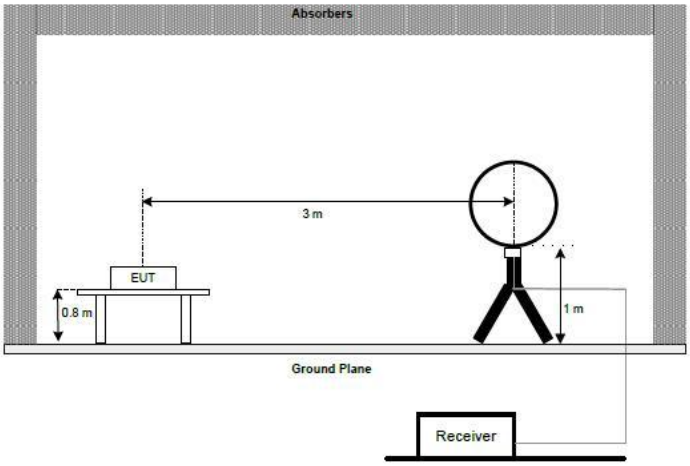
<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<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 C63.10-2013 section 6.6.4</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.
2) The field strength is calculated by adding the Antenna Factor, Cable Factor &</td></tr>
</table>

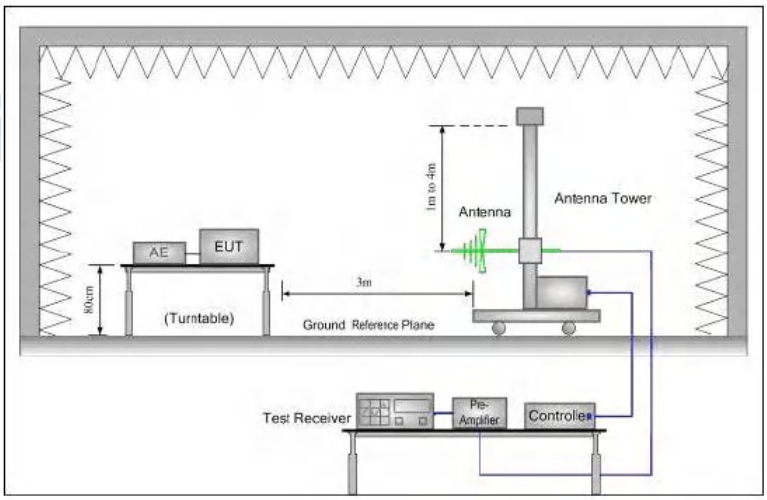
	Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level =Receiver Reading + Antenna Factor + Cable Factor ¨C Preamplifier Factor 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest 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:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1				

4.9.2 Test Setup Diagram:





4.9.3 Test Data:

TM1 / 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	30.2110	26.16	0.69	26.85	40.00	-13.15	QP			P	
2	106.3850	37.06	-6.55	30.51	43.50	-12.99	QP			P	
3 *	392.0950	44.29	-3.92	40.37	46.00	-5.63	QP			P	
4	434.0650	40.44	-2.14	38.30	46.00	-7.70	QP			P	
5	869.1300	30.34	4.51	34.85	46.00	-11.15	QP			P	
6	916.0683	27.15	5.50	32.65	46.00	-13.35	QP			P	

TM1 / 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	48.5247	41.74	-11.28	30.46	40.00	-9.54	QP			P	
2 *	106.5200	46.94	-6.53	40.41	43.50	-3.09	QP			P	
3	130.1133	42.01	-5.42	36.59	43.50	-6.91	QP			P	
4	394.4873	43.78	-3.86	39.92	46.00	-6.08	QP			P	
5	529.7645	38.30	-1.01	37.29	46.00	-8.71	QP			P	
6	935.4840	32.81	5.77	38.58	46.00	-7.42	QP			P	

Remark: 1.Margin= Mesurement Level- Limit; Measurement Level=Test receiver reading + correction factor

2.The EMC 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)

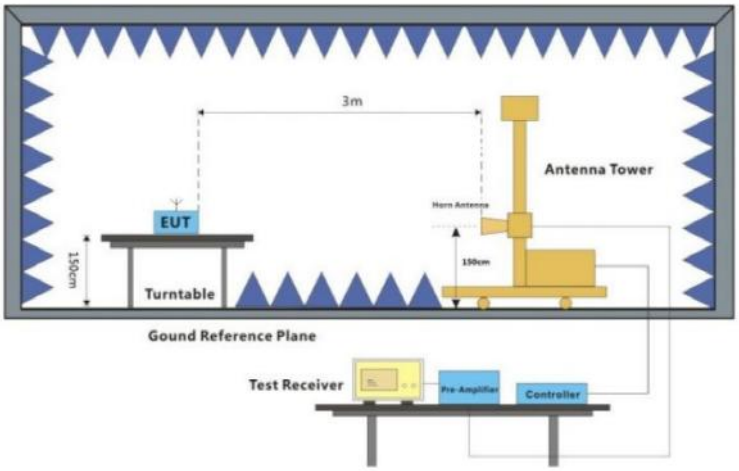
<table>
<tr><td>Test Requirement:</td><td>In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</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 C63.10-2013 section 6.6.4</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.
2) The field strength is calculated by adding the Antenna Factor, Cable Factor &</td></tr>
</table>

	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:

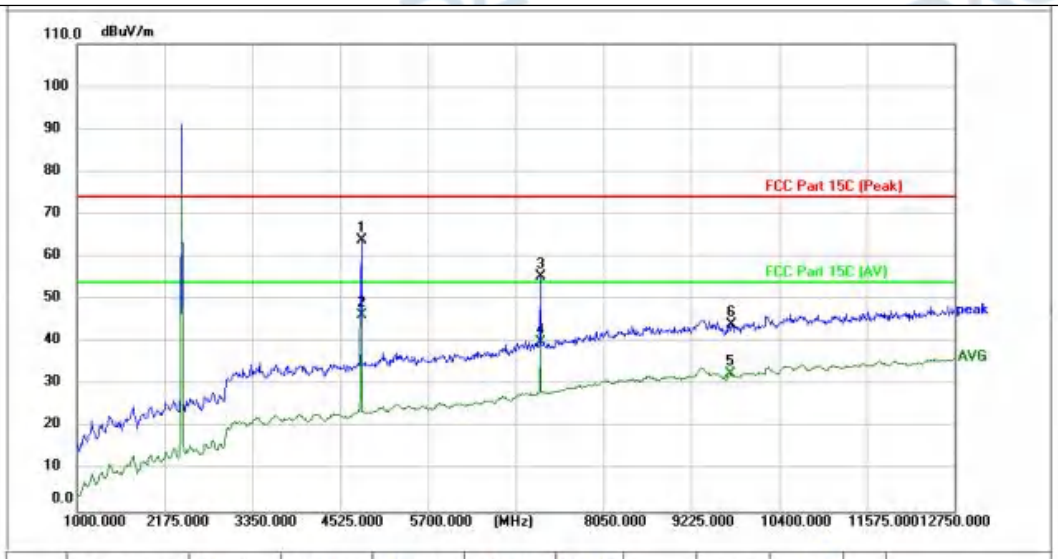
Operating Environment:					
Temperature:	23 °C	Humidity:	46 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.10.2 Test Setup Diagram:



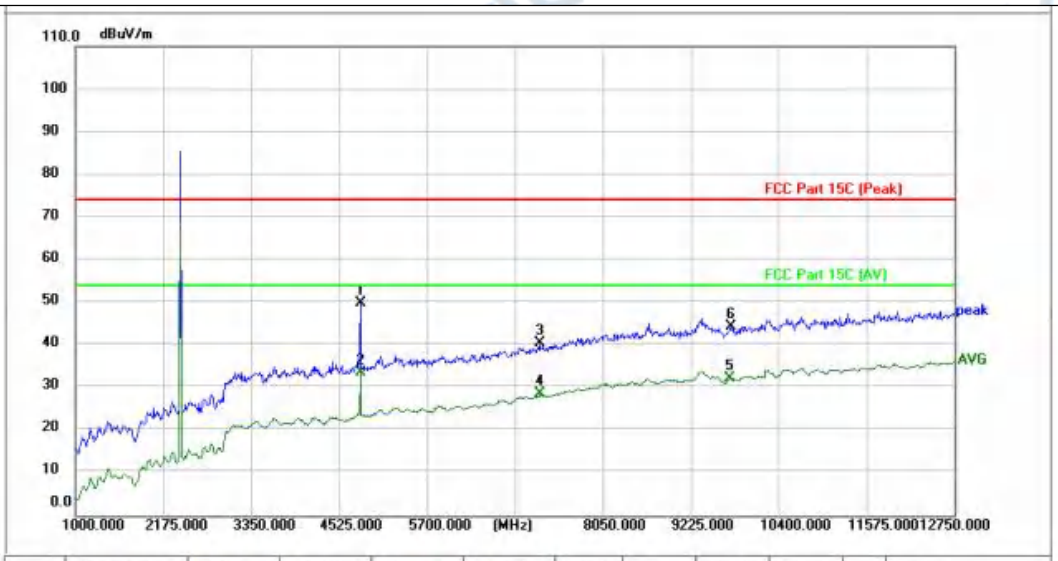
4.10.3 Test Data:

TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



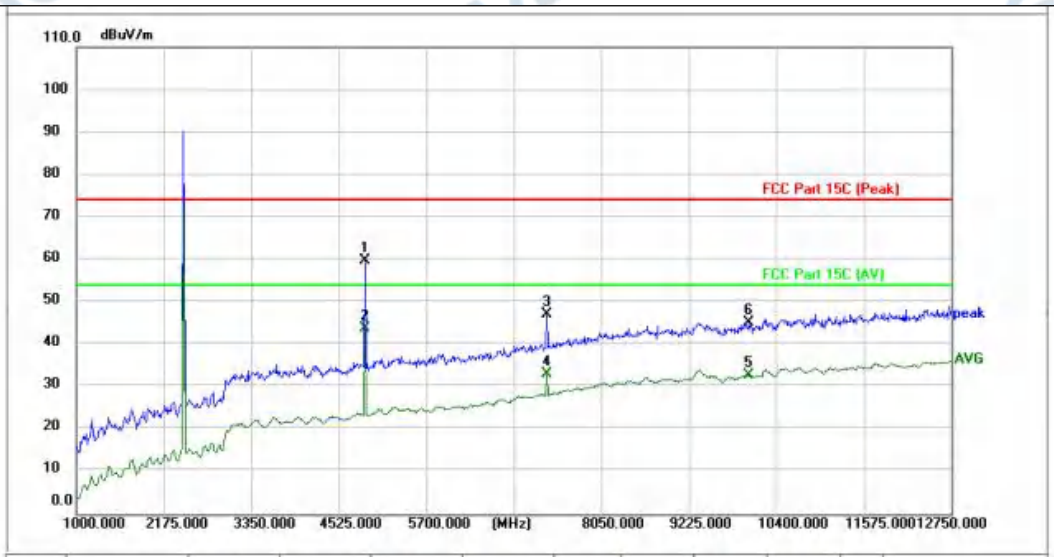
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4807.000	64.50	-0.69	63.81	74.00	-10.19	peak	150		P	
2 *	4807.000	46.97	-0.69	46.28	54.00	-7.72	AVG	150		P	
3	7204.000	51.13	4.37	55.50	74.00	-18.50	peak	150		P	
4	7204.000	35.73	4.37	40.10	54.00	-13.90	AVG	150		P	
5	9753.750	24.49	8.09	32.58	54.00	-21.42	AVG	150		P	
6	9765.500	36.18	8.09	44.27	74.00	-29.73	peak	150		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



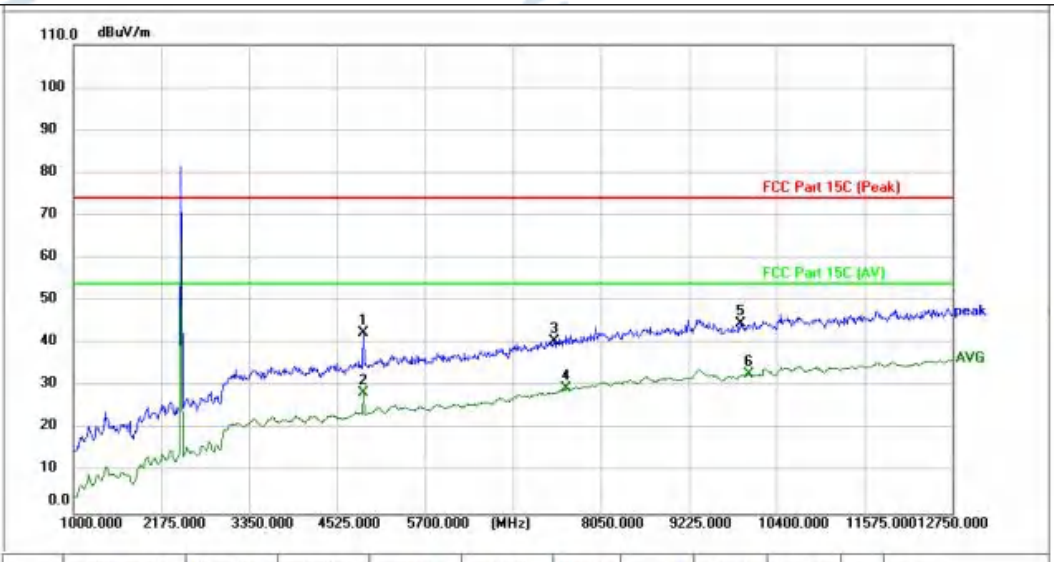
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4807.000	50.74	-0.69	50.05	74.00	-23.95	peak	150		P	
2 *	4807.000	34.47	-0.69	33.78	54.00	-20.22	AVG	150		P	
3	7204.000	36.19	4.37	40.56	74.00	-33.44	peak	150		P	
4	7204.000	24.43	4.37	28.80	54.00	-25.20	AVG	150		P	
5	9742.000	24.27	8.10	32.37	54.00	-21.63	AVG	150		P	
6	9765.500	36.24	8.09	44.33	74.00	-29.67	peak	150		P	

TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: M



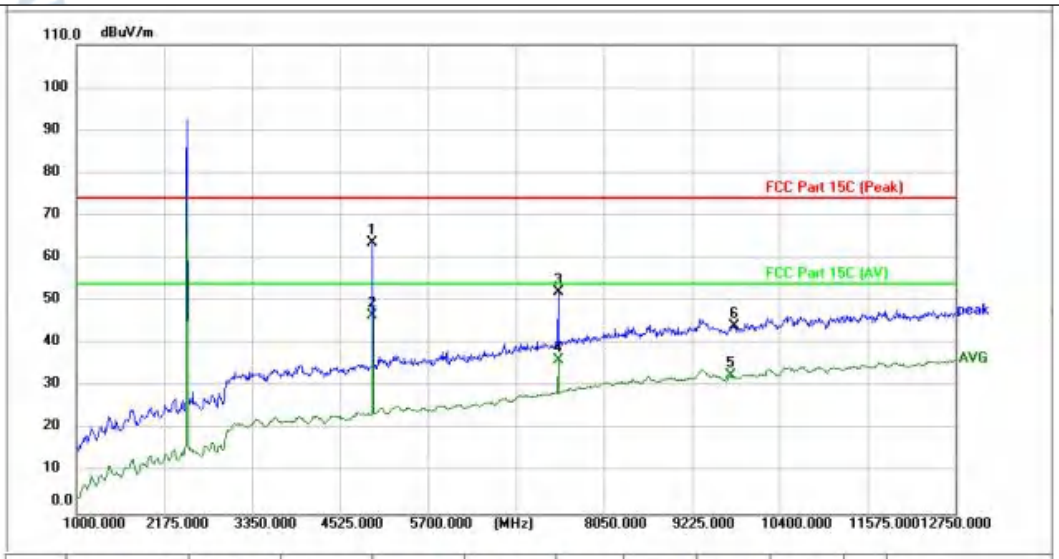
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4877.500	60.17	-0.45	59.72	74.00	-14.28	peak	150		P	
2 *	4877.500	44.24	-0.45	43.79	54.00	-10.21	AVG	150		P	
3	7321.500	42.67	4.57	47.24	74.00	-26.76	peak	150		P	
4	7321.500	28.59	4.57	33.16	54.00	-20.84	AVG	150		P	
5	10024.000	24.70	8.13	32.83	54.00	-21.17	AVG	150		P	
6	10035.750	37.16	8.15	45.31	74.00	-28.69	peak	150		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: M



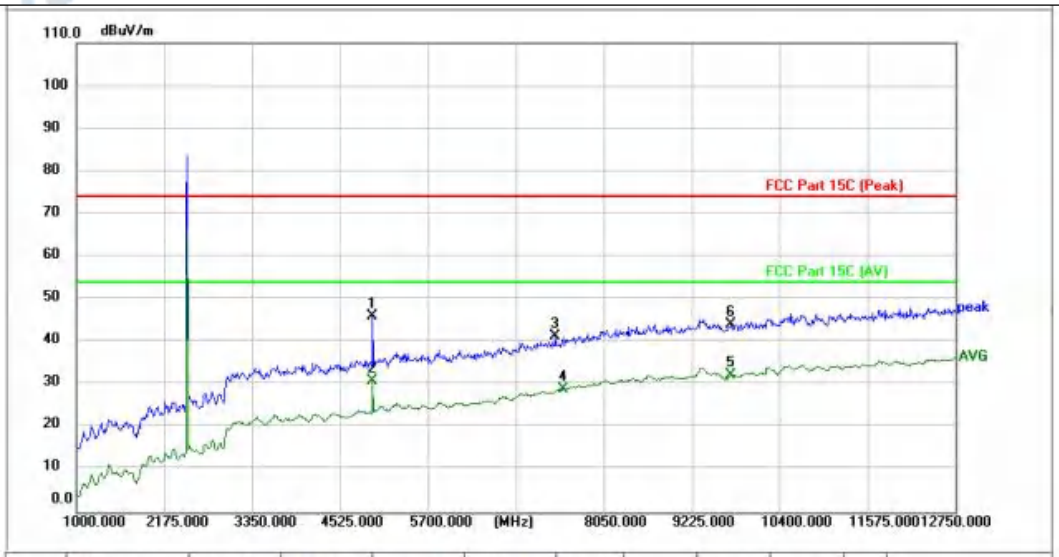
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4877.500	42.93	-0.45	42.48	74.00	-31.52	peak	150		P	
2	4877.500	28.82	-0.45	28.37	54.00	-25.63	AVG	150		P	
3	7427.250	35.79	4.76	40.55	74.00	-33.45	peak	150		P	
4	7580.000	24.29	5.17	29.46	54.00	-24.54	AVG	150		P	
5	9918.250	36.74	8.08	44.82	74.00	-29.18	peak	150		P	
6 *	10024.000	24.70	8.13	32.83	54.00	-21.17	AVG	150		P	

TM1 / 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	63.83	-0.17	63.66	74.00	-10.34	peak	150		P	
2 *	4959.750	46.86	-0.17	46.69	54.00	-7.31	AVG	150		P	
3	7439.000	47.26	4.78	52.04	74.00	-21.96	peak	150		P	
4	7439.000	31.42	4.78	36.20	54.00	-17.80	AVG	150		P	
5	9753.750	24.39	8.09	32.48	54.00	-21.52	AVG	150		P	
6	9800.750	35.97	8.09	44.06	74.00	-29.94	peak	150		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: H



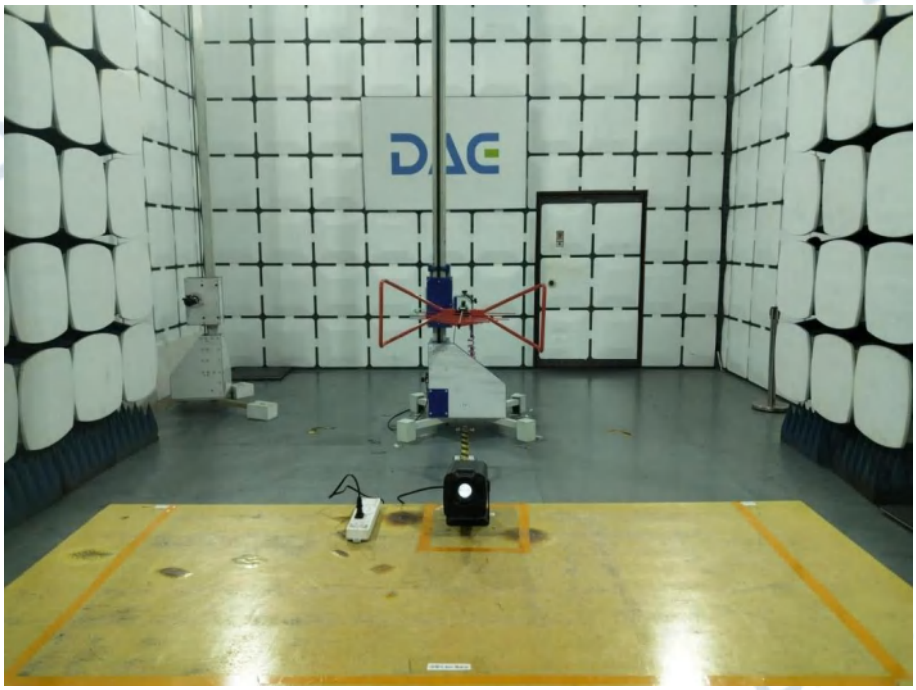
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4959.750	46.16	-0.17	45.99	74.00	-28.01	peak	150		P	
2	4959.750	31.19	-0.17	31.02	54.00	-22.98	AVG	150		P	
3	7403.750	36.59	4.71	41.30	74.00	-32.70	peak	150		P	
4	7509.500	24.09	4.92	29.01	54.00	-24.99	AVG	150		P	
5 *	9742.000	24.27	8.10	32.37	54.00	-21.63	AVG	150		P	
6	9753.750	36.14	8.09	44.23	74.00	-29.77	peak	150		P	

Remark: 1.Margin= Level – Limit; Level=Test receiver reading + correction factor

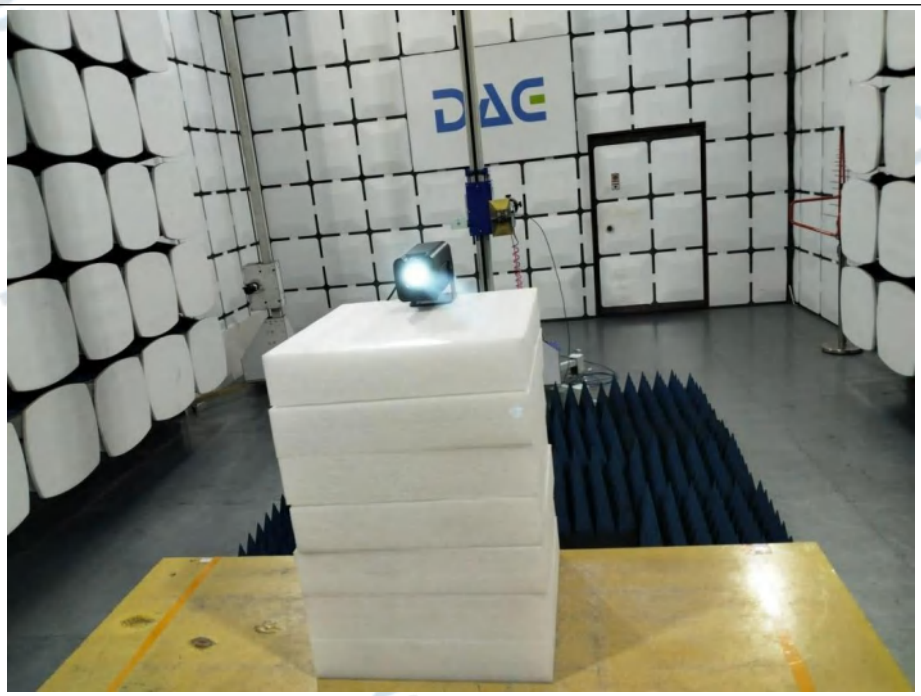
2. The test software will only record the worst test angle and height, and only the worst case will be recorded in the test report.

5 TEST SETUP PHOTOS

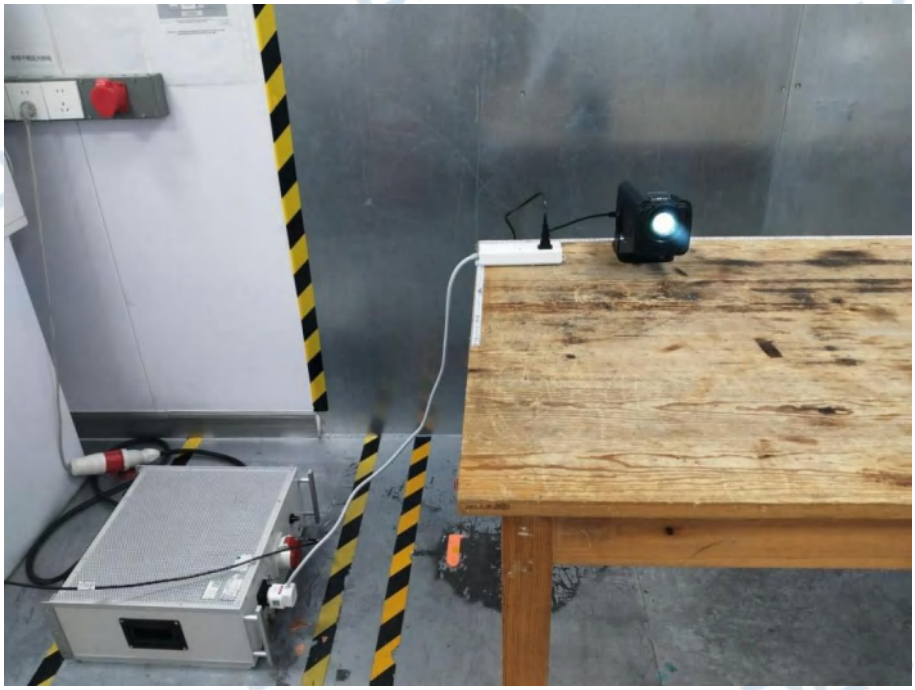
Emissions in frequency bands (below 1GHz)



Emissions in frequency bands (above 1GHz)



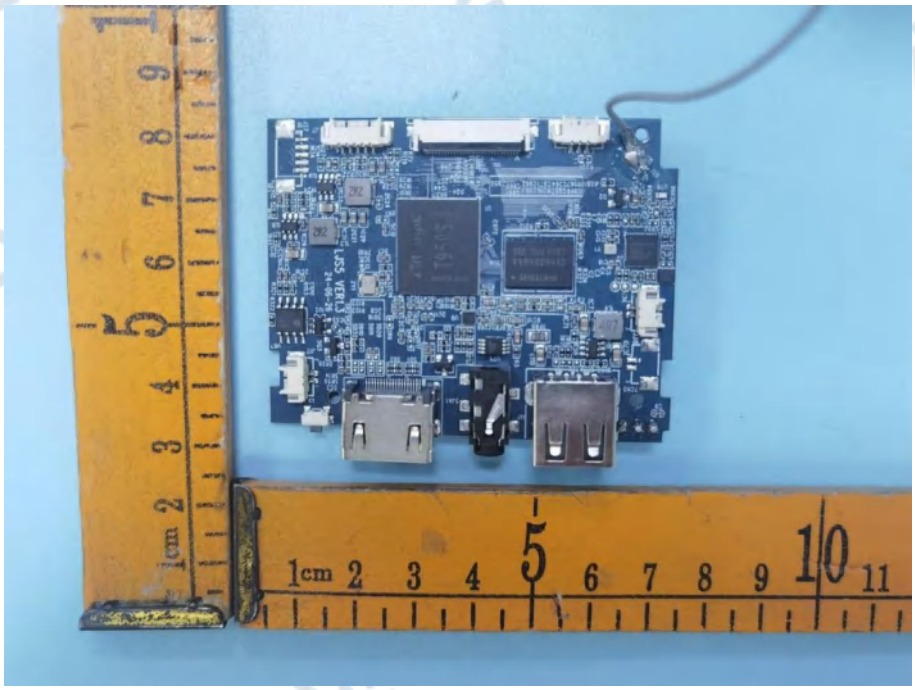
Conducted Emission at AC power line

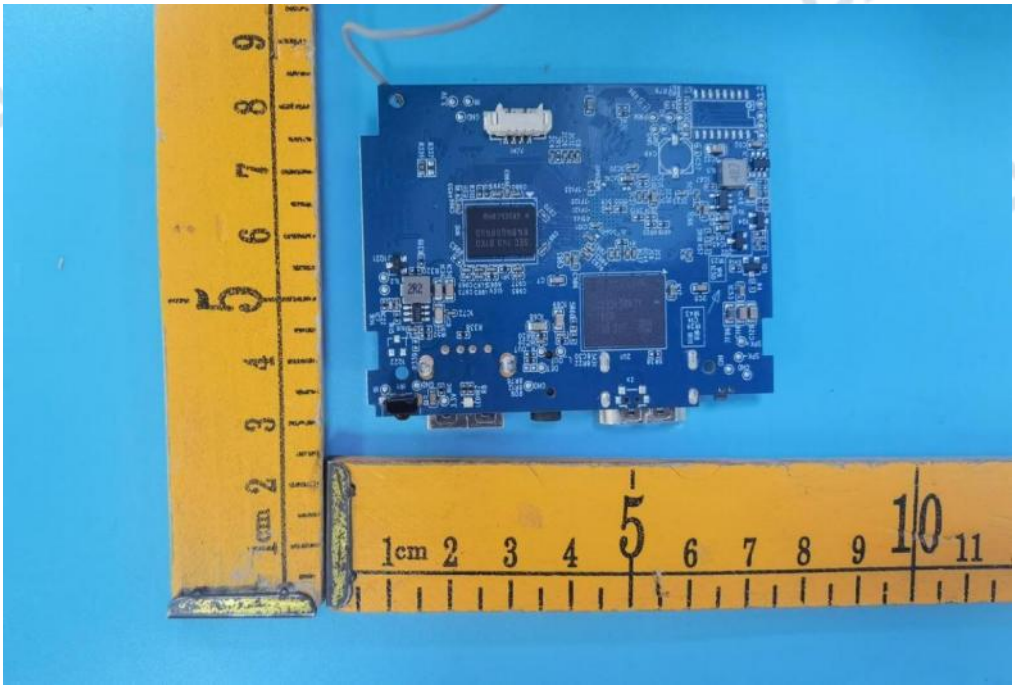


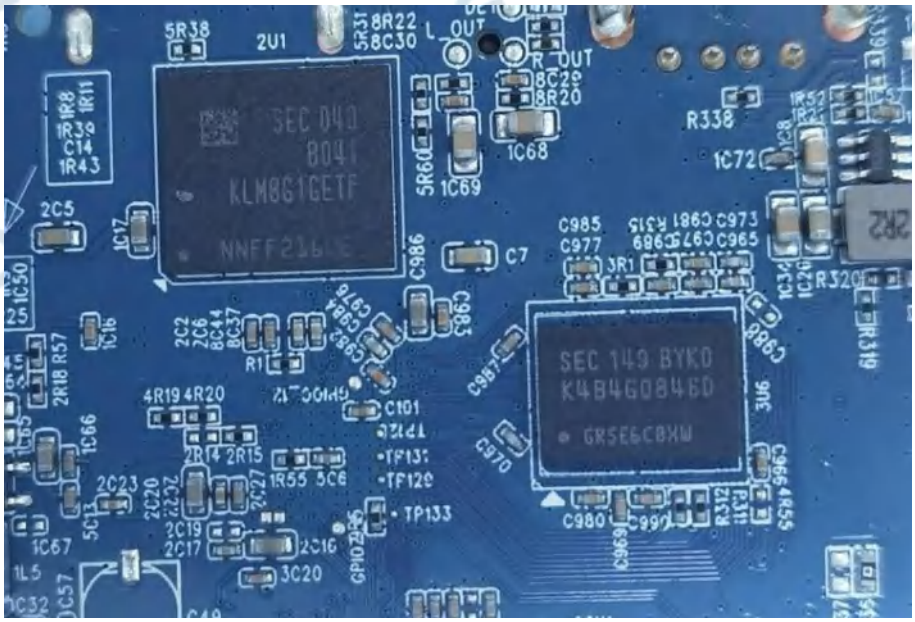
6 PHOTOS OF THE EUT

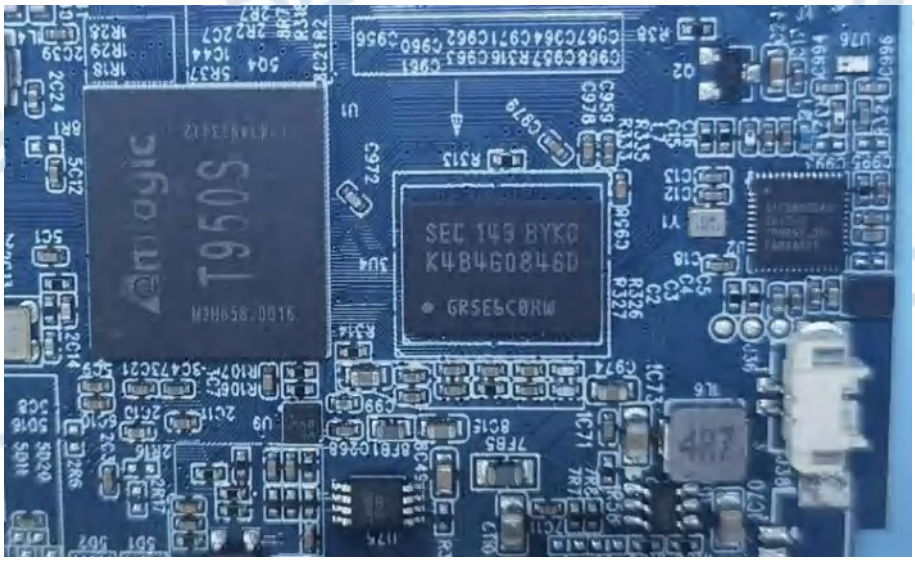
External

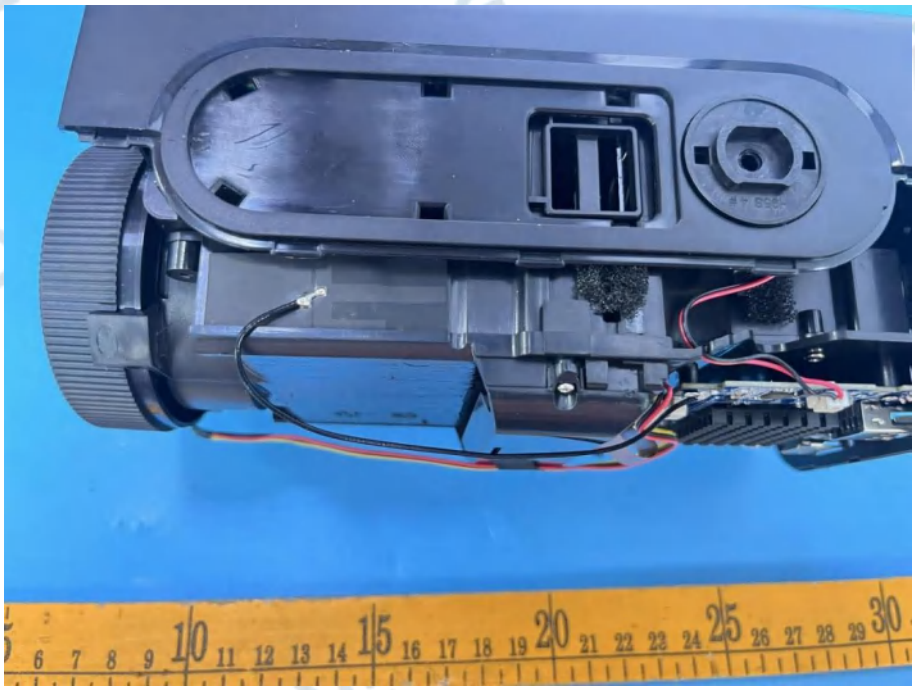
Internal

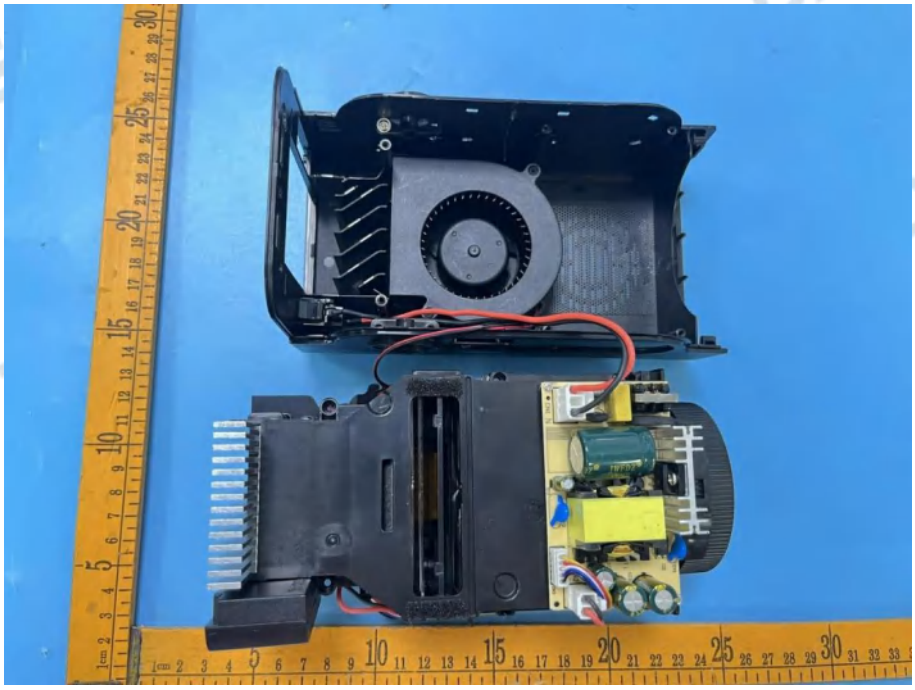


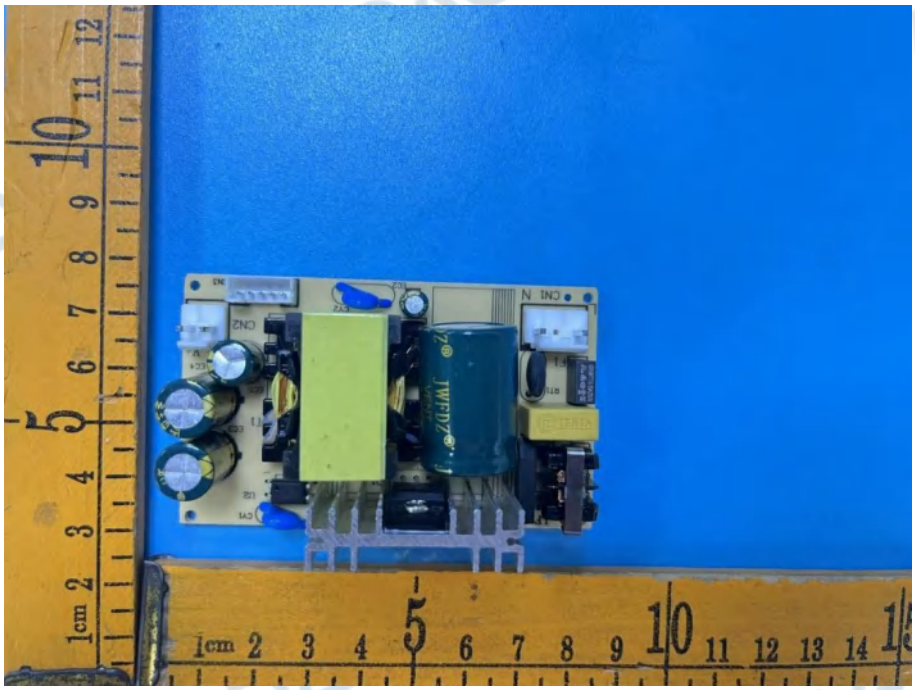


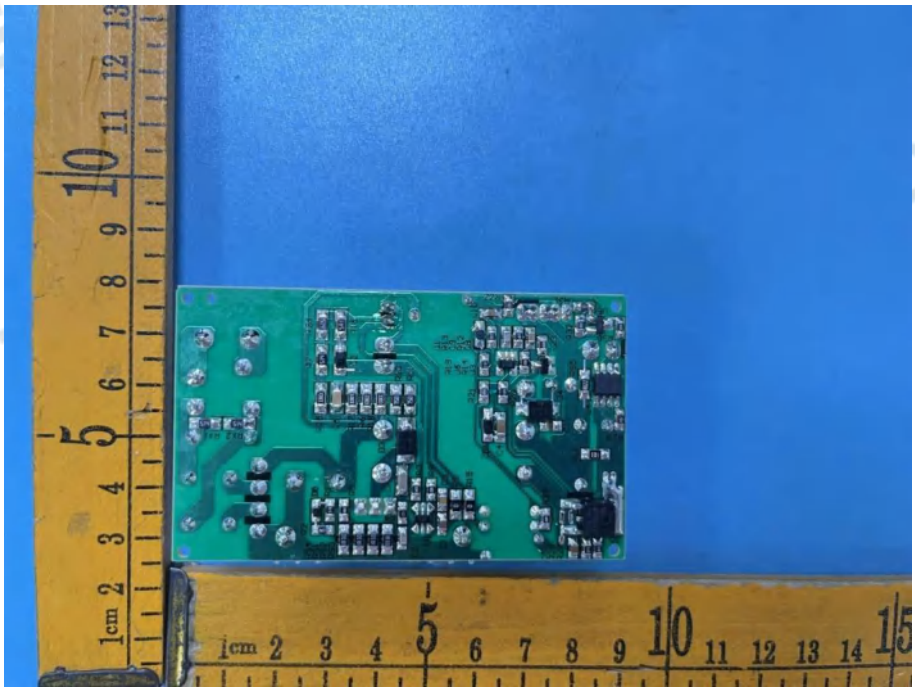

KLM8G1GETF
SEC 149 BYKO
K4B4G0846D
GR5E6C0KW


T950S
SEC 149 BYKO
K4B4G0846D
GR5E6C0KW









Appendix

1. Peak Output Power

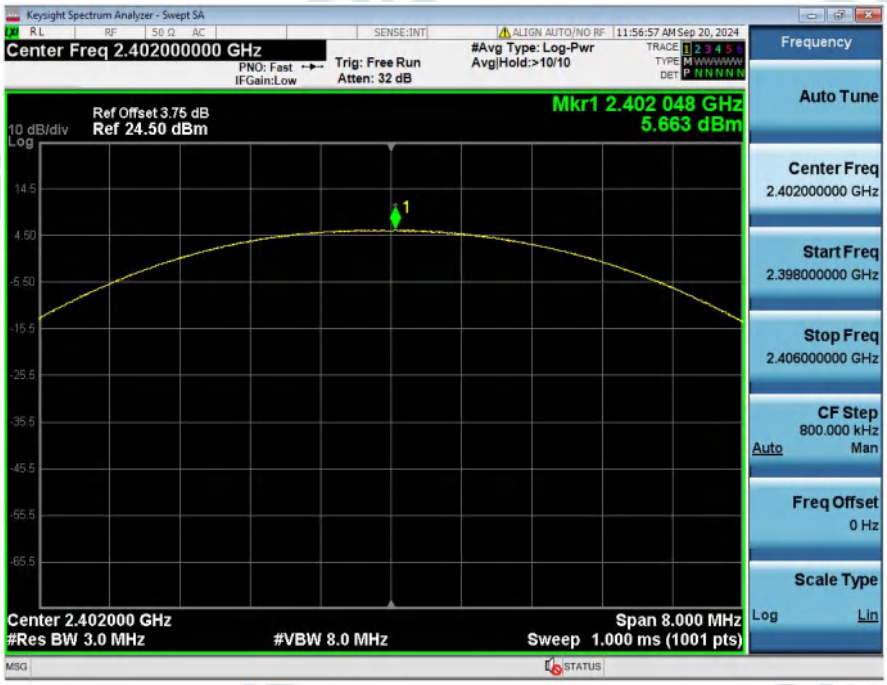
Condition	Antenna	Modulation	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1-DH5	2402.00	5.89	3.88	125	Pass
NVNT	ANT1	1-DH5	2441.00	5.78	3.78	125	Pass
NVNT	ANT1	1-DH5	2480.00	6.25	4.22	125	Pass
NVNT	ANT1	2-DH5	2402.00	5.66	3.68	125	Pass
NVNT	ANT1	2-DH5	2441.00	5.64	3.67	125	Pass
NVNT	ANT1	2-DH5	2480.00	6.17	4.14	125	Pass
NVNT	ANT1	3-DH5	2402.00	5.79	3.79	125	Pass
NVNT	ANT1	3-DH5	2441.00	5.70	3.72	125	Pass
NVNT	ANT1	3-DH5	2480.00	6.24	4.21	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

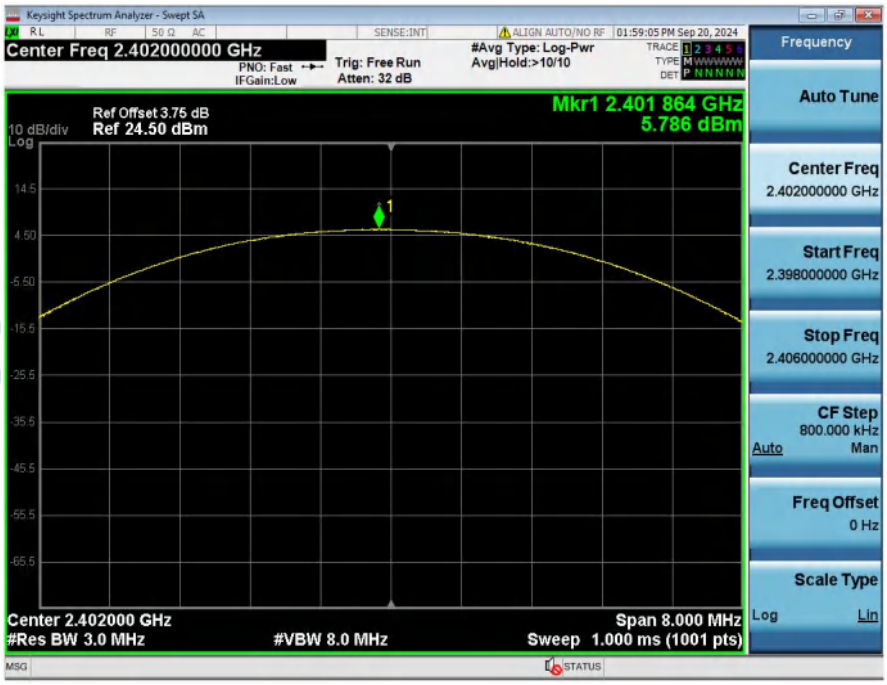
Peak_Output_Power_NVNT_ANT1_2-DH5_2402_00



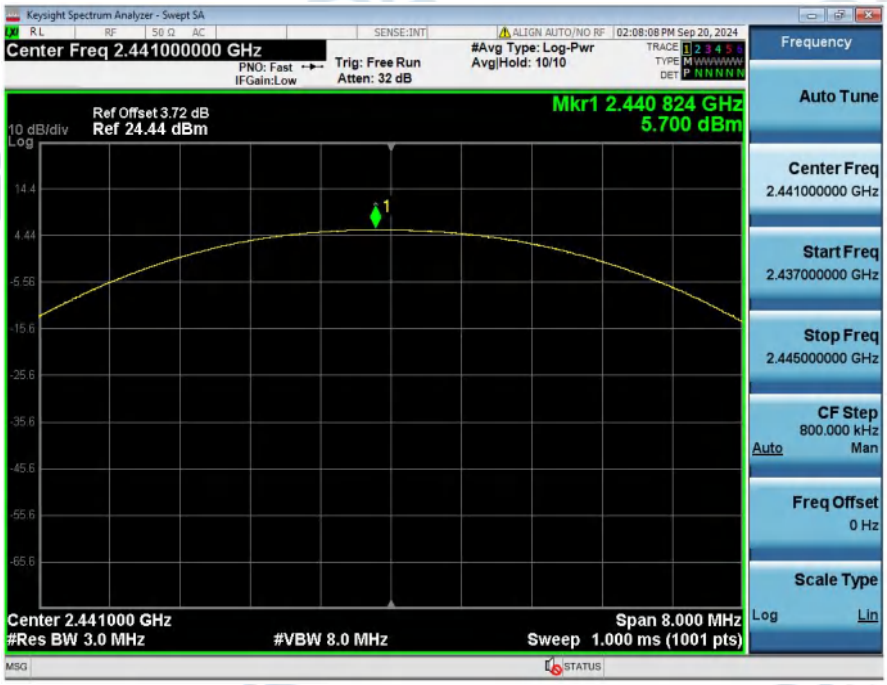
Peak_Output_Power_NVNT_ANT1_2-DH5_2441_00

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

2. -20dB Bandwidth

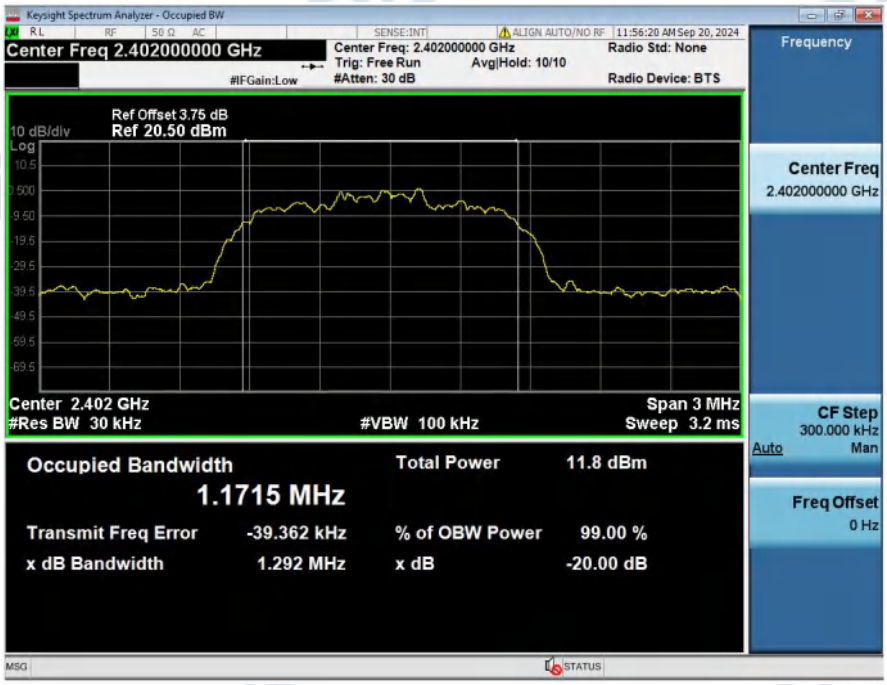
Condition	Antenna	Modulation	Frequency (MHz)	-20dB BW(MHz)	if larger than CFS
NVNT	ANT1	1-DH5	2402.00	1.034	Yes
NVNT	ANT1	1-DH5	2441.00	1.028	Yes
NVNT	ANT1	1-DH5	2480.00	1.034	Yes
NVNT	ANT1	2-DH5	2402.00	1.292	Yes
NVNT	ANT1	2-DH5	2441.00	1.289	Yes
NVNT	ANT1	2-DH5	2480.00	1.290	Yes
NVNT	ANT1	3-DH5	2402.00	1.291	Yes
NVNT	ANT1	3-DH5	2441.00	1.295	Yes
NVNT	ANT1	3-DH5	2480.00	1.305	Yes

-20dB_Bandwidth_NVNT_ANT1_1-DH5_2402_00

-20dB_Bandwidth_NVNT_ANT1_1-DH5_2441_00

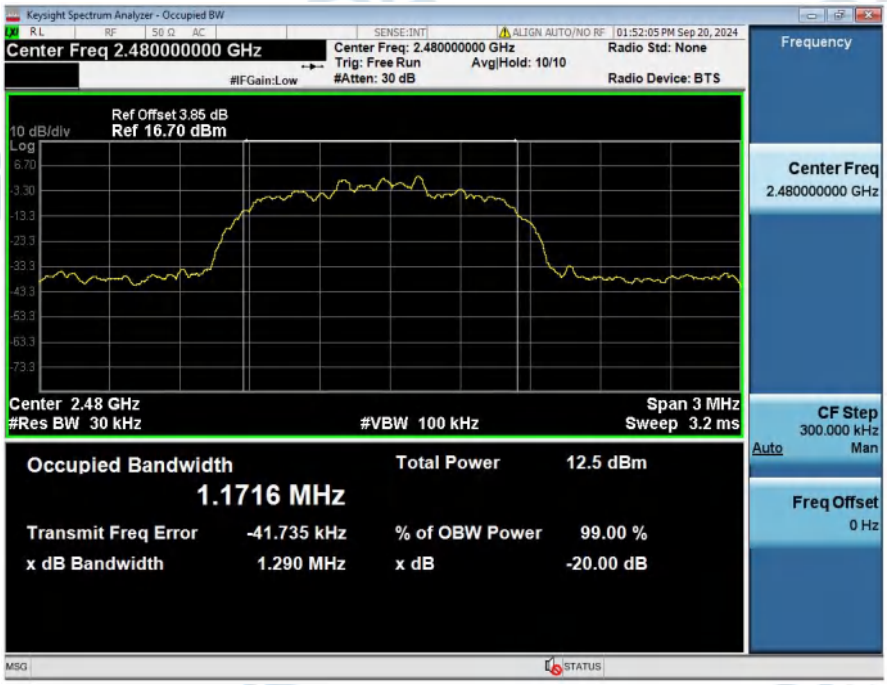
-20dB_Bandwidth_NVNT_ANT1_1-DH5_2480_00

-20dB_Bandwidth_NVNT_ANT1_2-DH5_2402_00

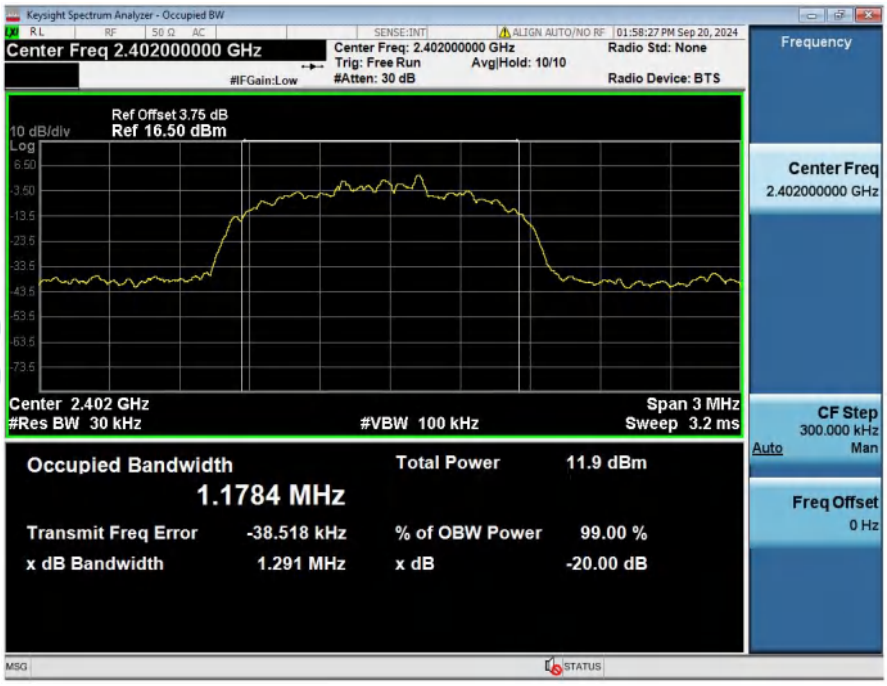


-20dB_Bandwidth_NVNT_ANT1_2-DH5_2441_00

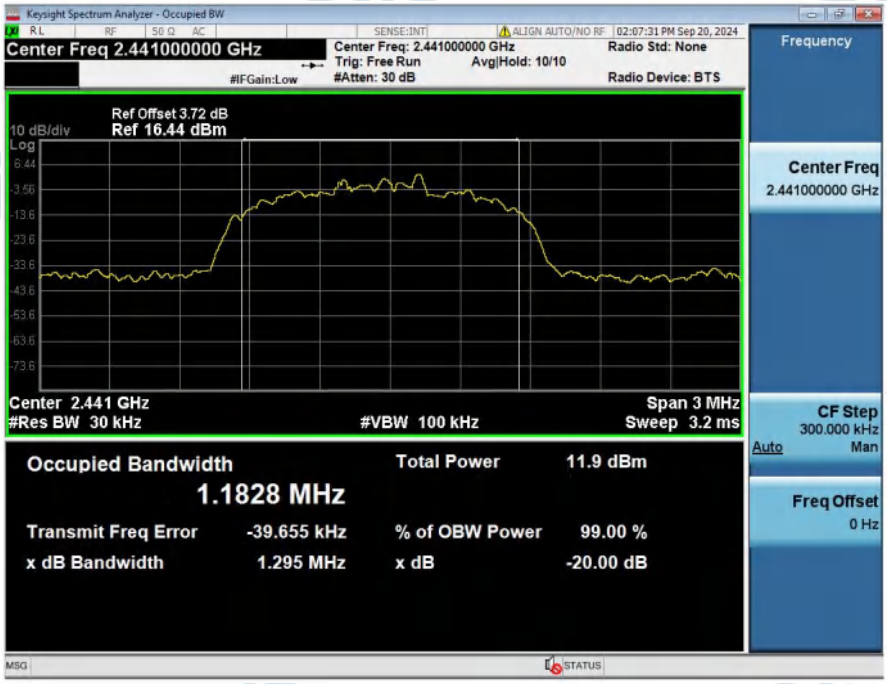
-20dB_Bandwidth_NVNT_ANT1_2-DH5_2480_00



-20dB_Bandwidth_NVNT_ANT1_3-DH5_2402_00



-20dB_Bandwidth_NVNT_ANT1_3-DH5_2441_00



-20dB_Bandwidth_NVNT_ANT1_3-DH5_2480_00

3. 99% Occupied Bandwidth

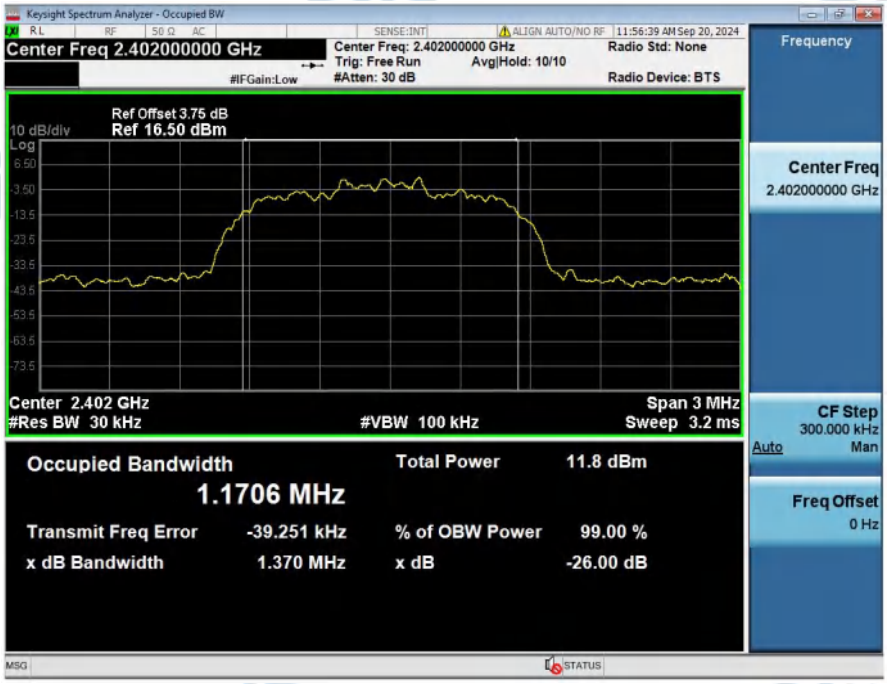
Condition	Antenna	Modulation	Frequency (MHz)	99%%BW(MHz)
NVNT	ANT1	1-DH5	2402.00	0.897
NVNT	ANT1	1-DH5	2441.00	0.891
NVNT	ANT1	1-DH5	2480.00	0.893
NVNT	ANT1	2-DH5	2402.00	1.171
NVNT	ANT1	2-DH5	2441.00	1.175
NVNT	ANT1	2-DH5	2480.00	1.175
NVNT	ANT1	3-DH5	2402.00	1.178
NVNT	ANT1	3-DH5	2441.00	1.183
NVNT	ANT1	3-DH5	2480.00	1.185

99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2402_00

99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2441_00

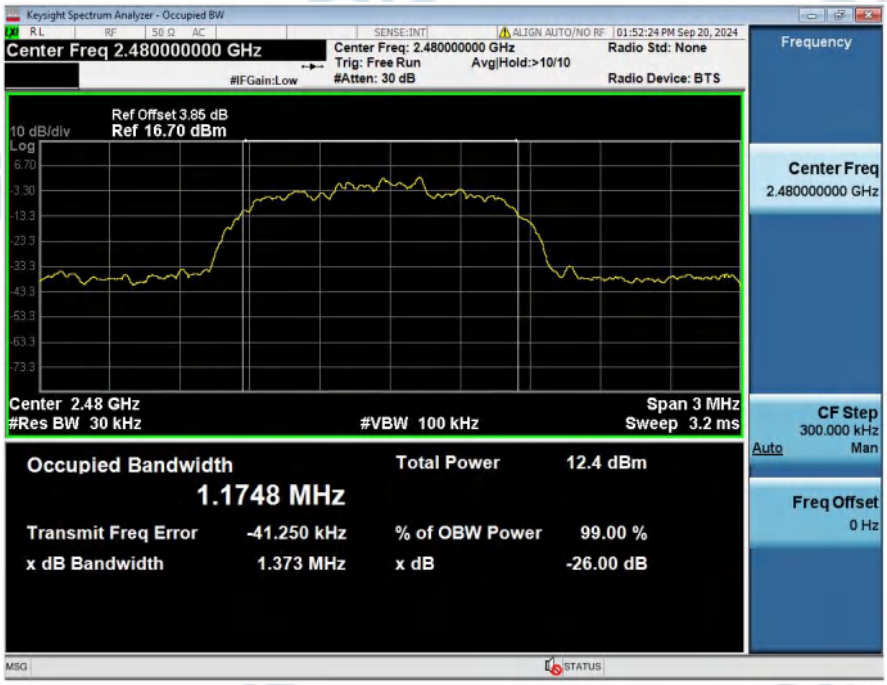
99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2480_00

99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2402_00

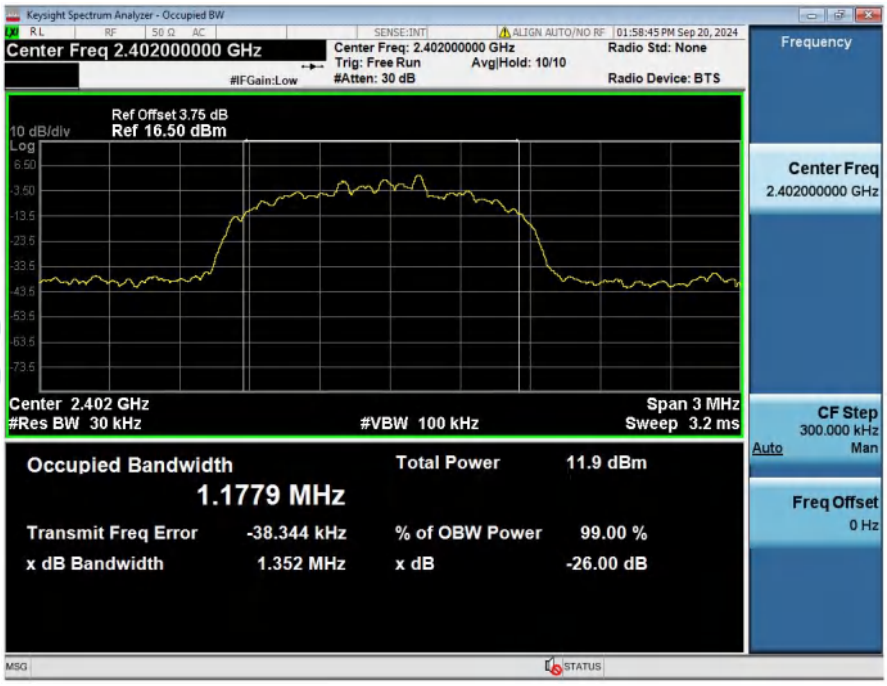


99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2441_00

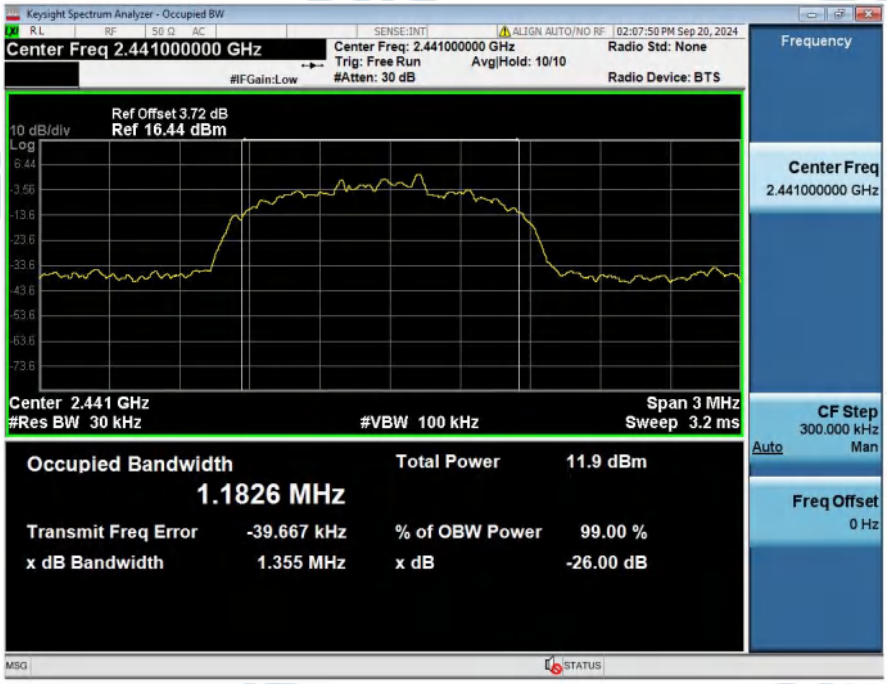
99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2480_00



99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2402_00



99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2441_00



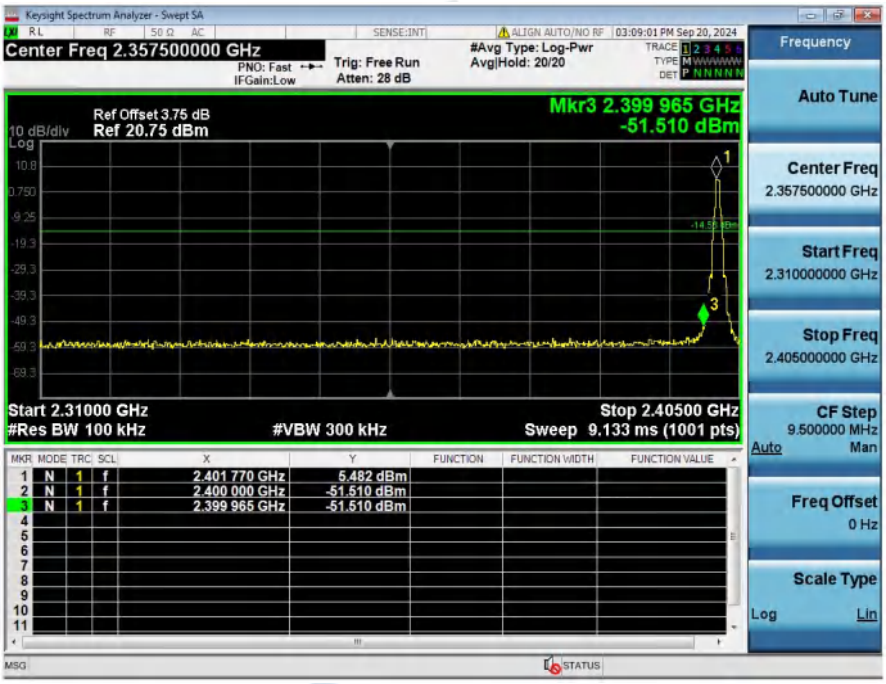
99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2480_00

4. Bandedge

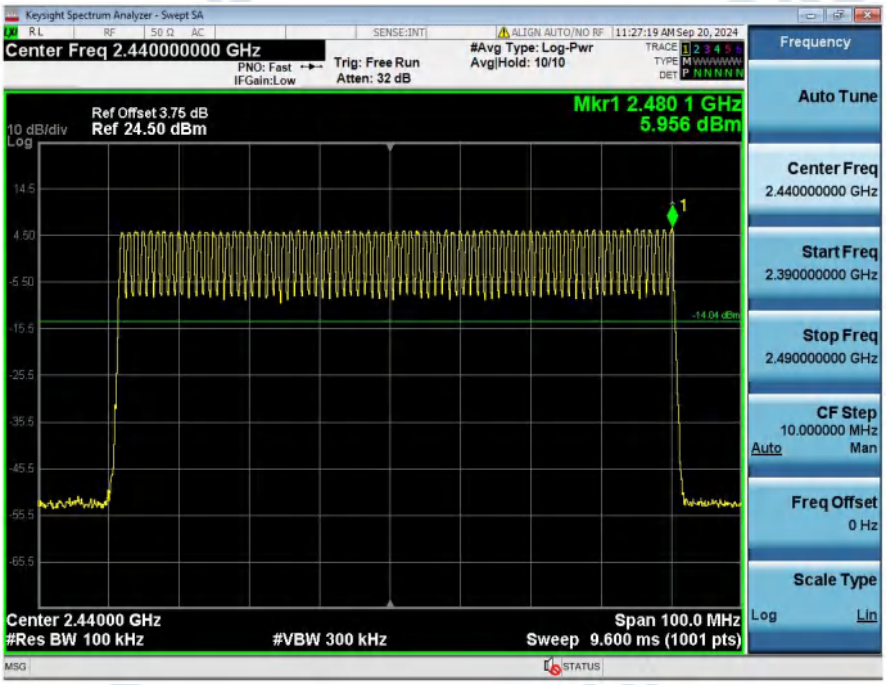
Condition	Antenna	Modulation	TX Mode	Bandedge MAX.Value	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-51.510	-14.533	Pass
NVNT	ANT1	1-DH5	Hopping_LCH	-55.693	-14.044	Pass
NVNT	ANT1	1-DH5	2480.00	-53.838	-14.046	Pass
NVNT	ANT1	1-DH5	Hopping_HCH	-54.853	-14.087	Pass
NVNT	ANT1	2-DH5	2402.00	-49.935	-15.437	Pass
NVNT	ANT1	2-DH5	Hopping_LCH	-50.847	-14.951	Pass
NVNT	ANT1	2-DH5	2480.00	-54.618	-14.804	Pass
NVNT	ANT1	2-DH5	Hopping_HCH	-54.359	-14.774	Pass
NVNT	ANT1	3-DH5	2402.00	-50.109	-15.202	Pass
NVNT	ANT1	3-DH5	Hopping_LCH	-51.207	-15.064	Pass
NVNT	ANT1	3-DH5	2480.00	-54.402	-14.786	Pass
NVNT	ANT1	3-DH5	Hopping_HCH	-58.497	-14.880	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402_00

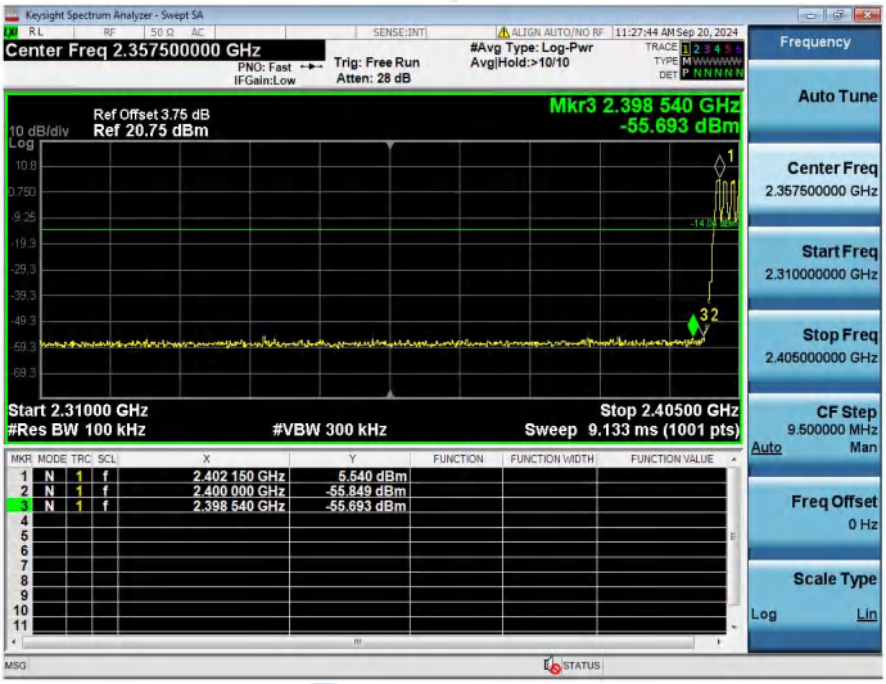
2_Bandedge_NVNT_ANT1_1-DH5_2402_00



1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

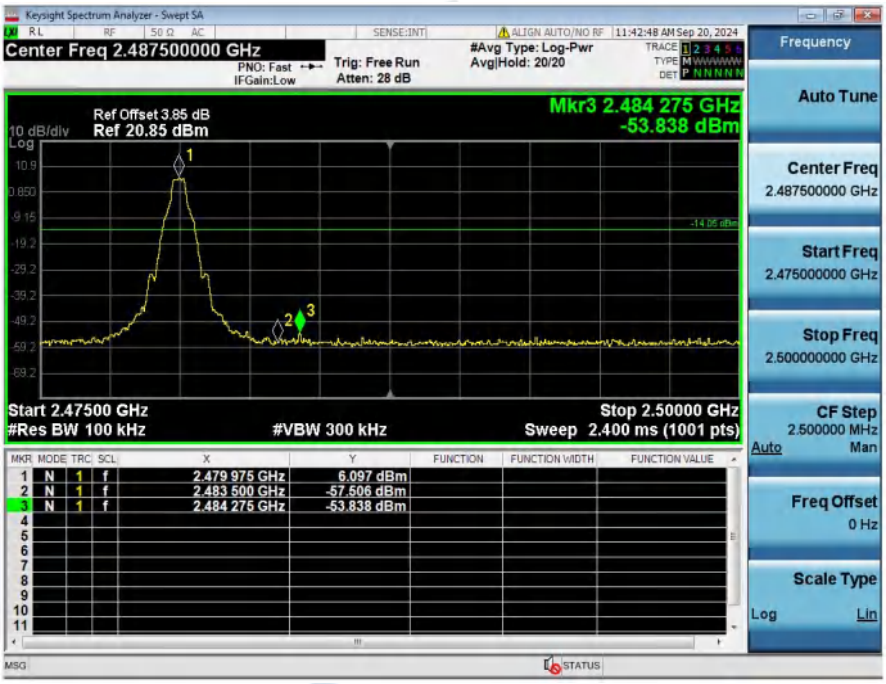


2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping

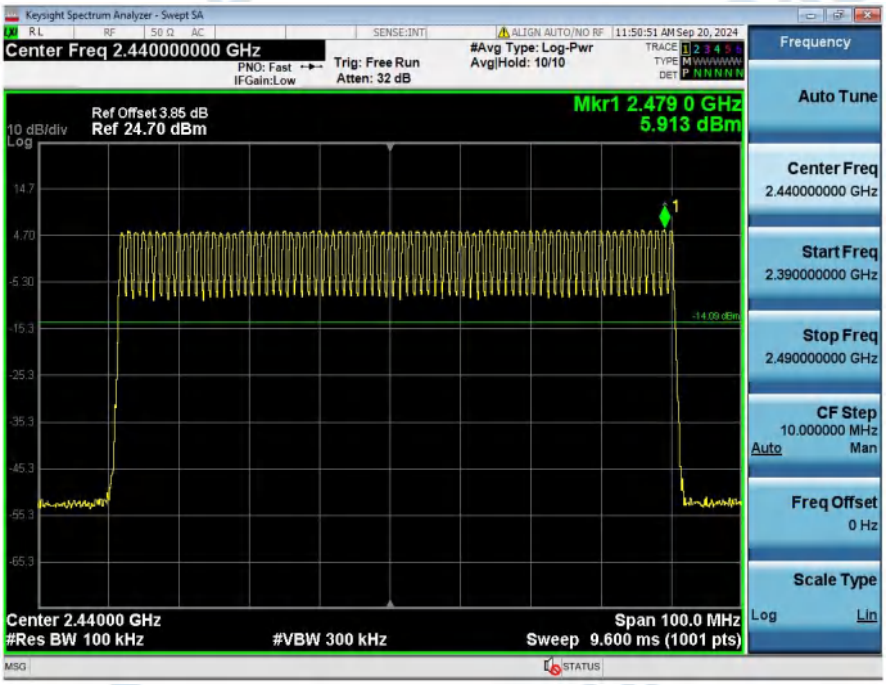


1_Reference_Level_NVNT_ANT1_1-DH5_2480_00

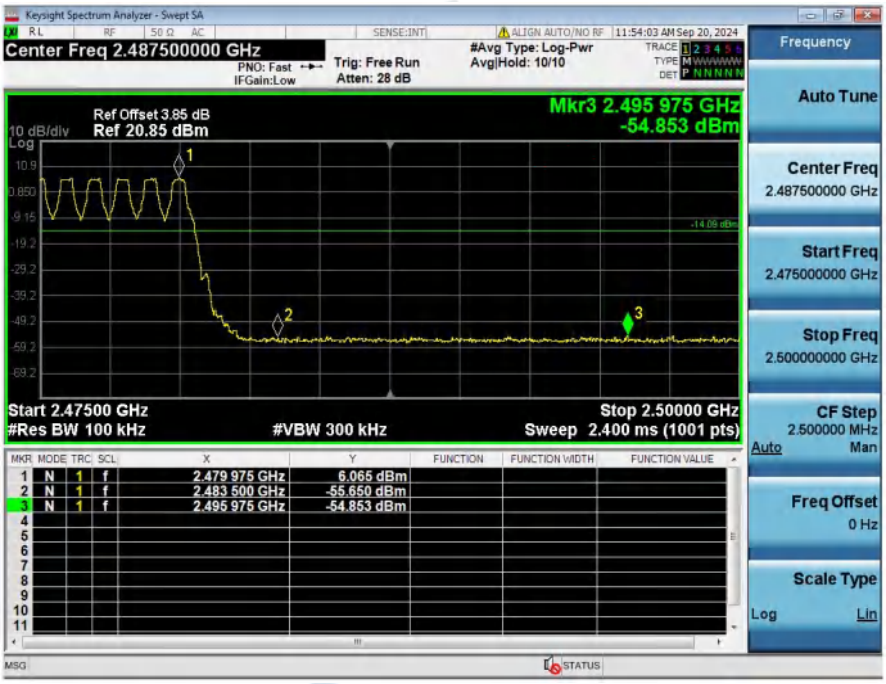
2_Bandedge_NVNT_ANT1_1-DH5_2480_00



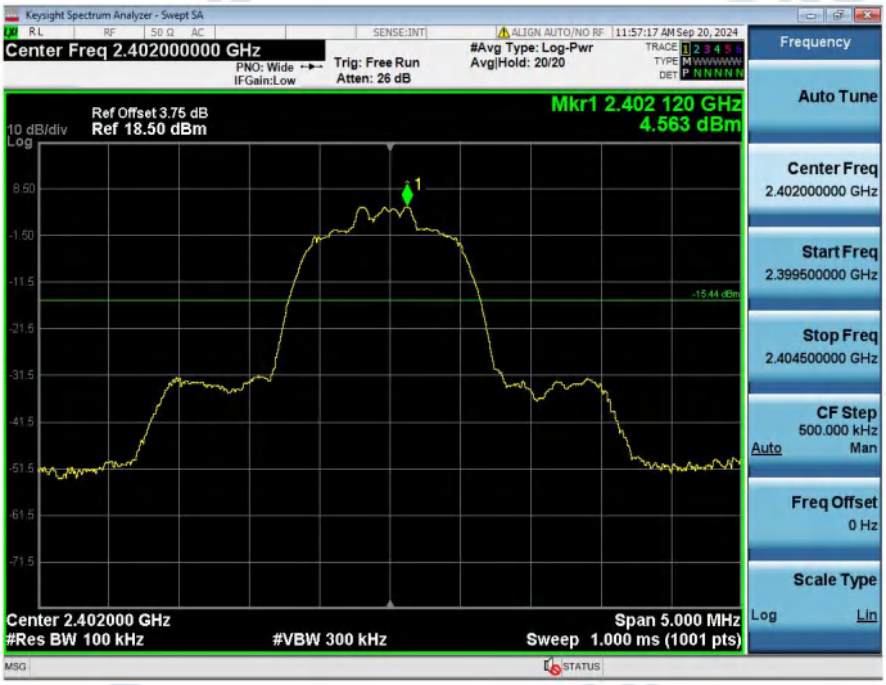
1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping



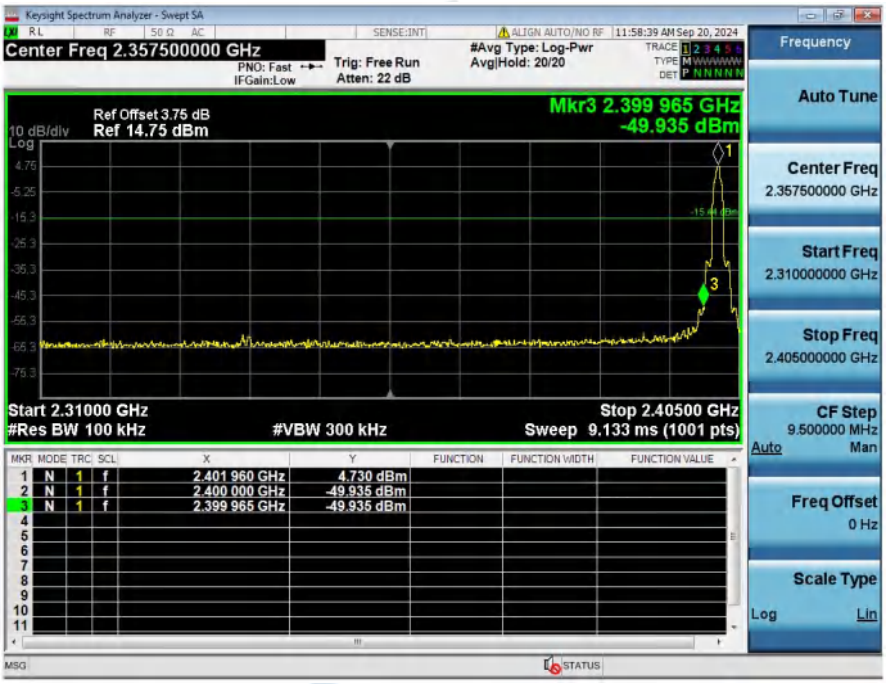
2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



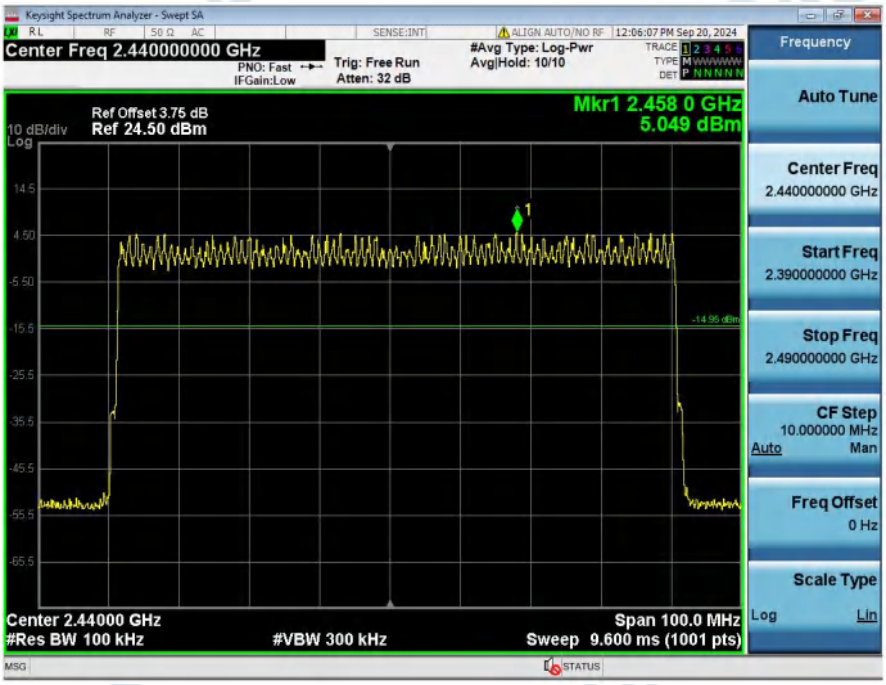
1_Reference_Level_NVNT_ANT1_2-DH5_2402_00



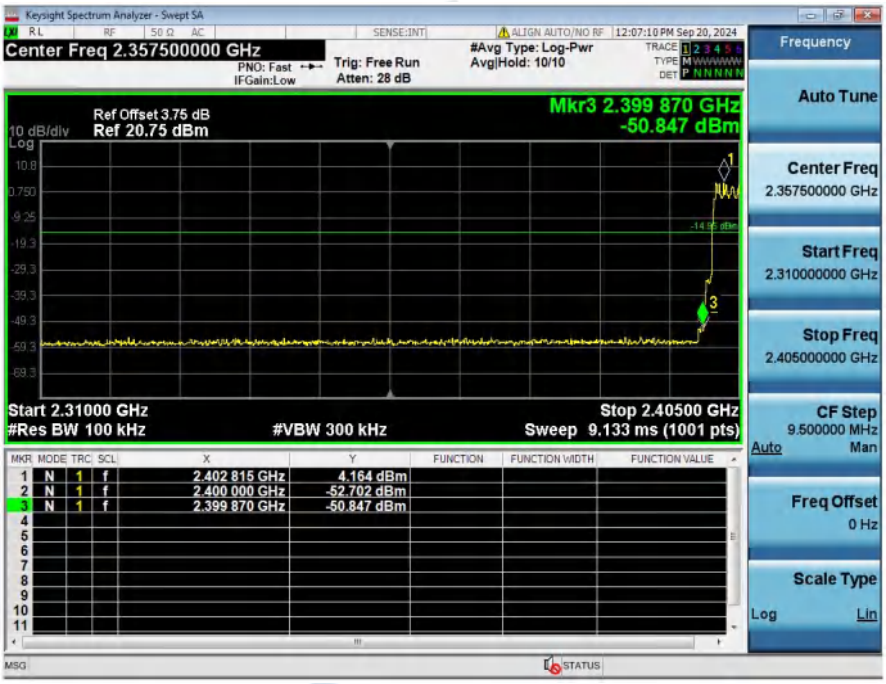
2_Bandedge_NVNT_ANT1_2-DH5_2402_00



1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping

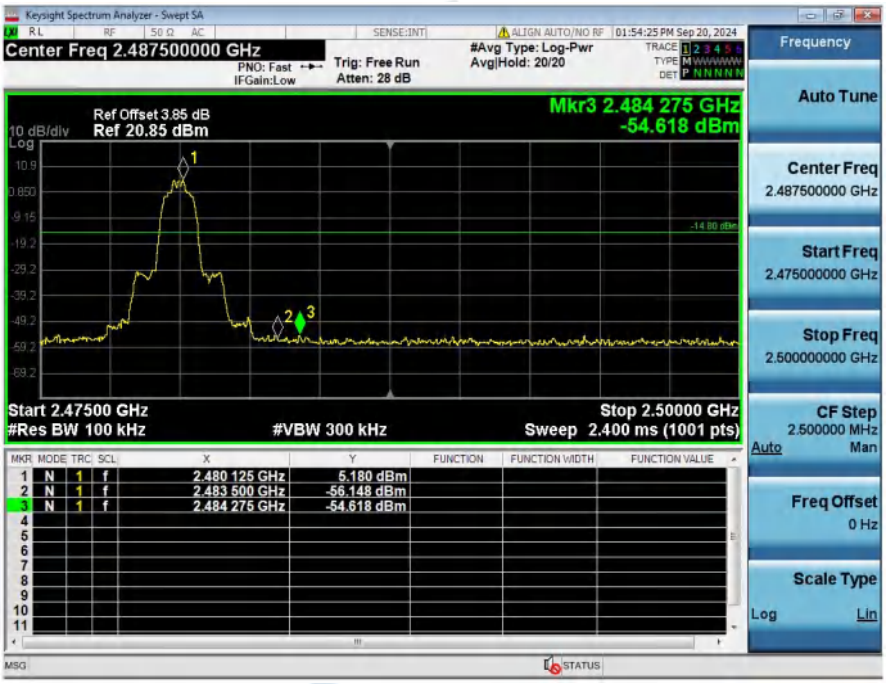


2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



1_Reference_Level_NVNT_ANT1_2-DH5_2480_00

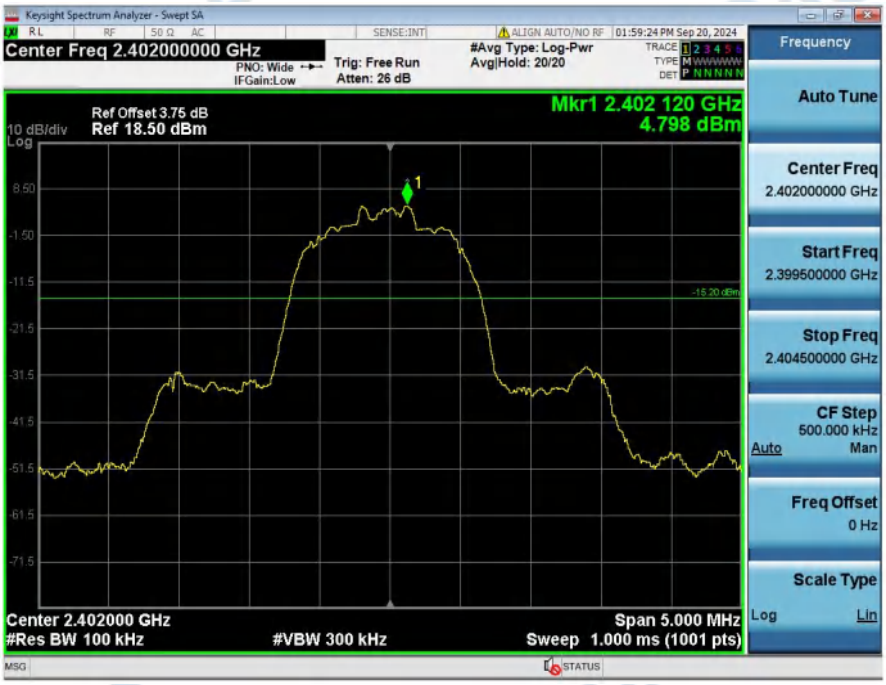
2_Bandedge_NVNT_ANT1_2-DH5_2480_00



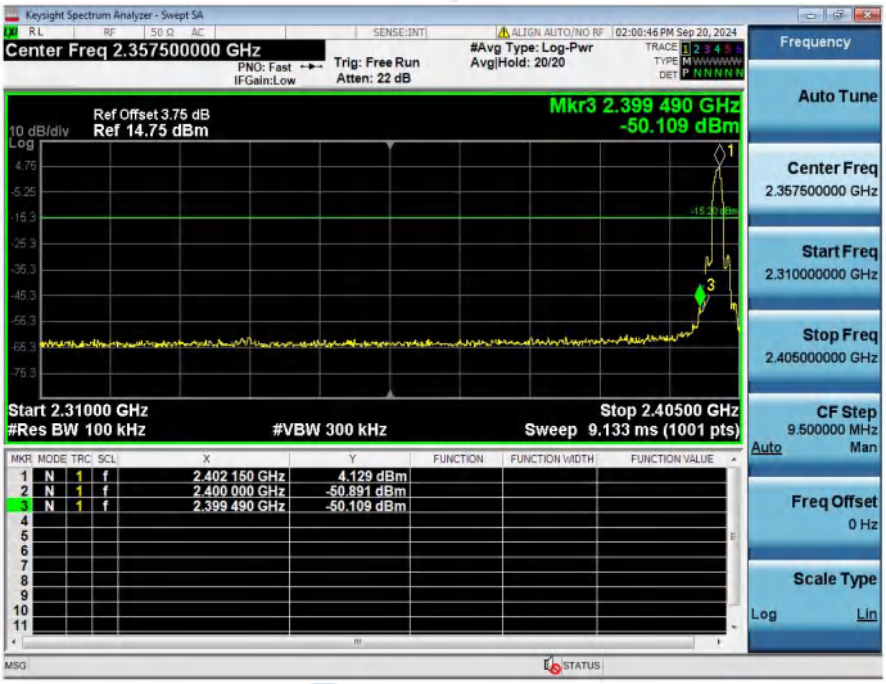
1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping

2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping

1_Reference_Level_NVNT_ANT1_3-DH5_2402_00

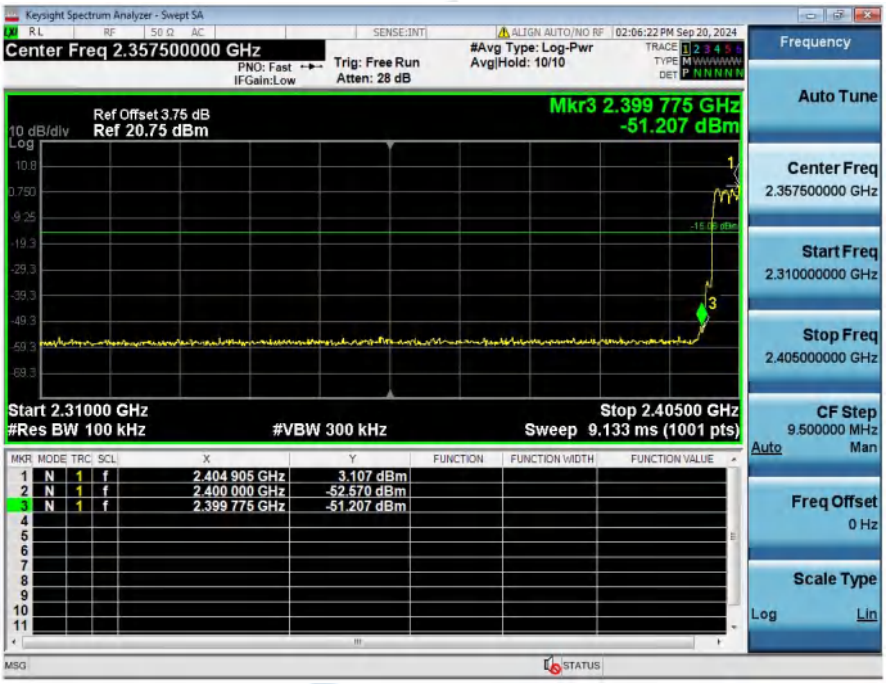


2_Bandedge_NVNT_ANT1_3-DH5_2402_00

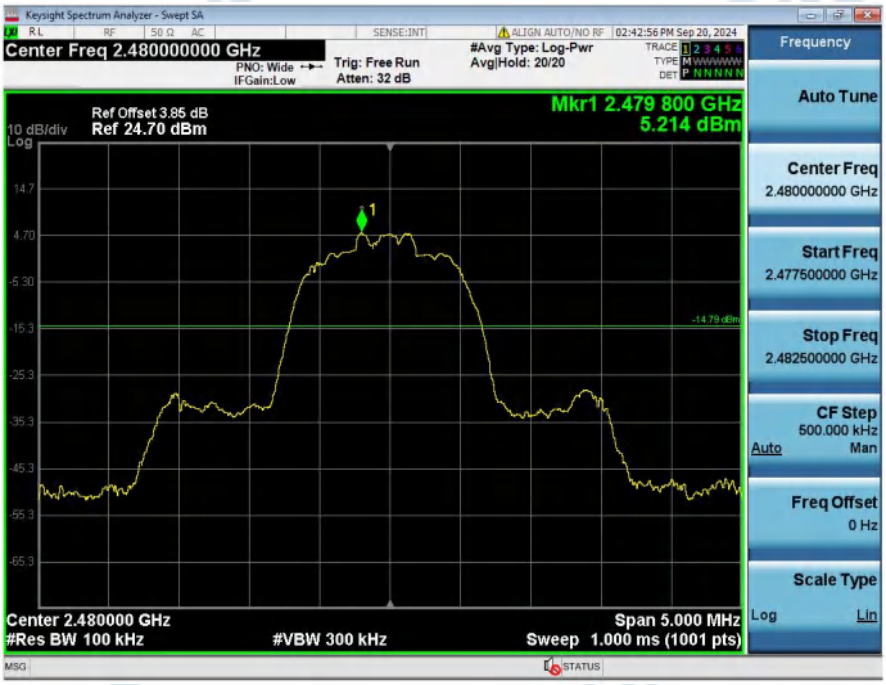


1_Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping

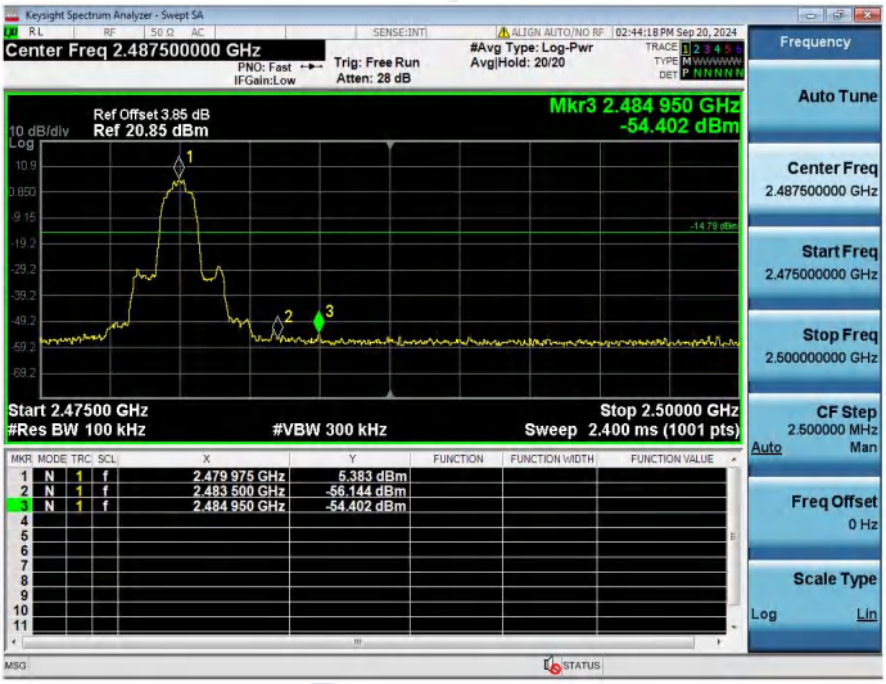
2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping



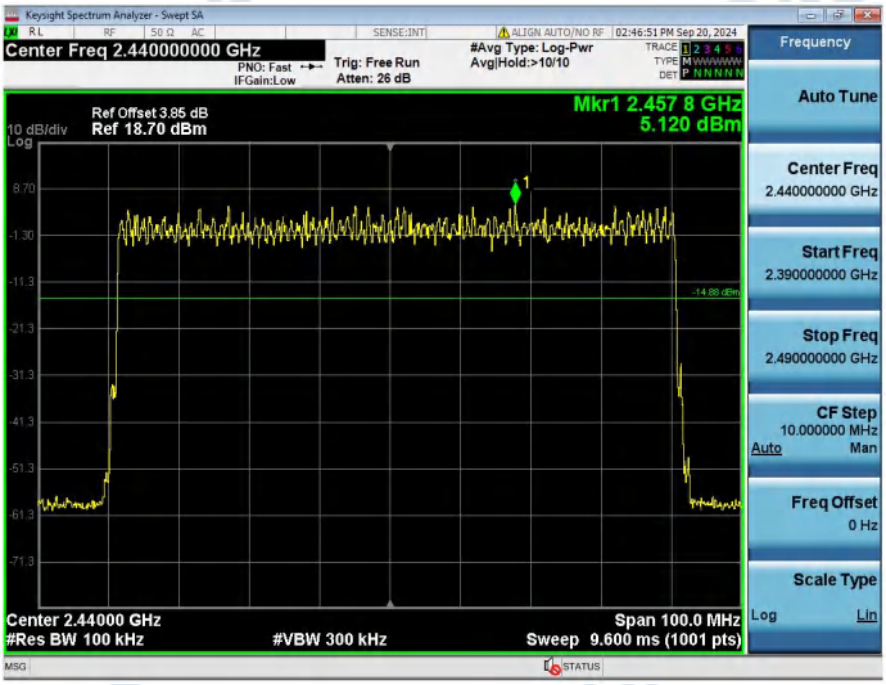
1_Reference_Level_NVNT_ANT1_3-DH5_2480_00



2_Bandedge_NVNT_ANT1_3-DH5_2480_00



1_Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping



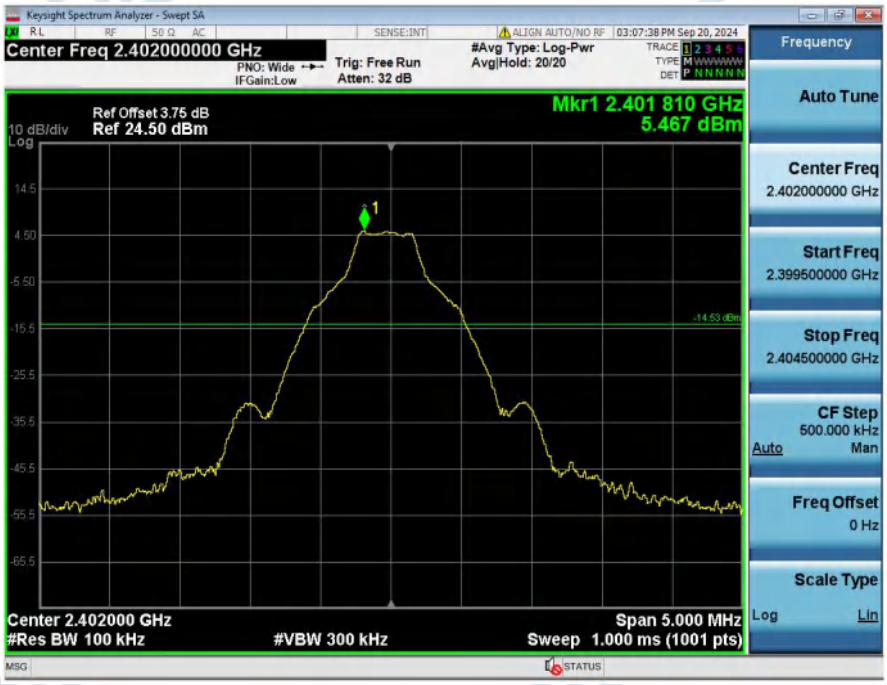
2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.487500000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 22 dB
#Avg Type: Log-Pwr
Avg|Hold: 10/10
Ref Offset 3.85 dB
10 dB/div
Ref 14.85 dBm
Mkr3 2.483 575 GHz
-58.497 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 2.476 825 GHz 5.139 dBm
2 N 1 f 2.483 500 GHz -59.733 dBm
3 N 1 f 2.483 575 GHz -58.497 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

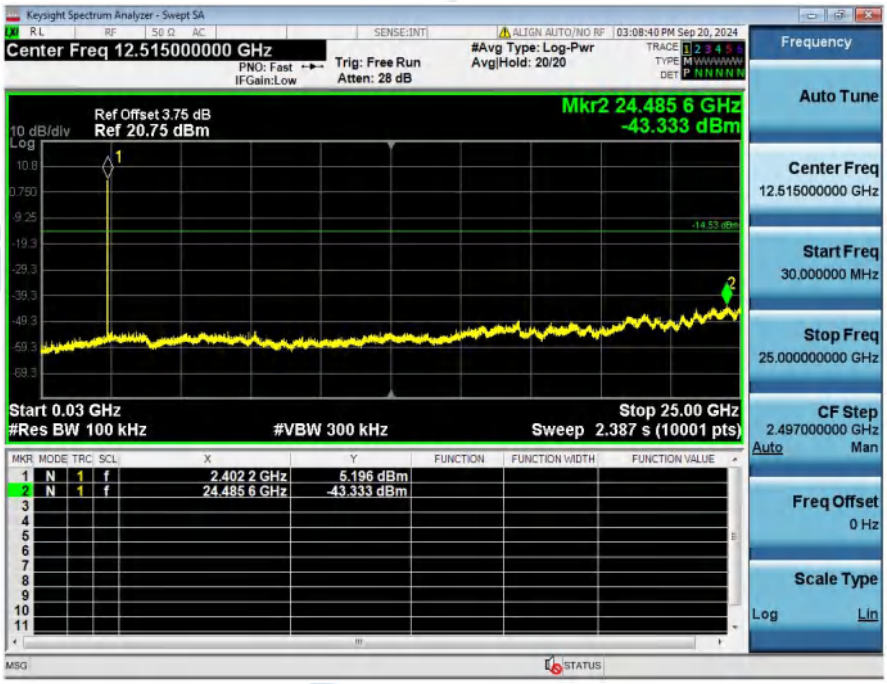
5. Spurious Emissions

Condition	Antenna	Modulation	TX Mode	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-43.333	-14.533	Pass
NVNT	ANT1	1-DH5	2441.00	-43.216	-14.536	Pass
NVNT	ANT1	1-DH5	2480.00	-42.784	-14.046	Pass
NVNT	ANT1	2-DH5	2402.00	-48.480	-15.437	Pass
NVNT	ANT1	2-DH5	2441.00	-49.603	-15.386	Pass
NVNT	ANT1	2-DH5	2480.00	-43.205	-14.804	Pass
NVNT	ANT1	3-DH5	2402.00	-48.777	-15.202	Pass
NVNT	ANT1	3-DH5	2441.00	-43.326	-15.316	Pass
NVNT	ANT1	3-DH5	2480.00	-43.100	-14.786	Pass

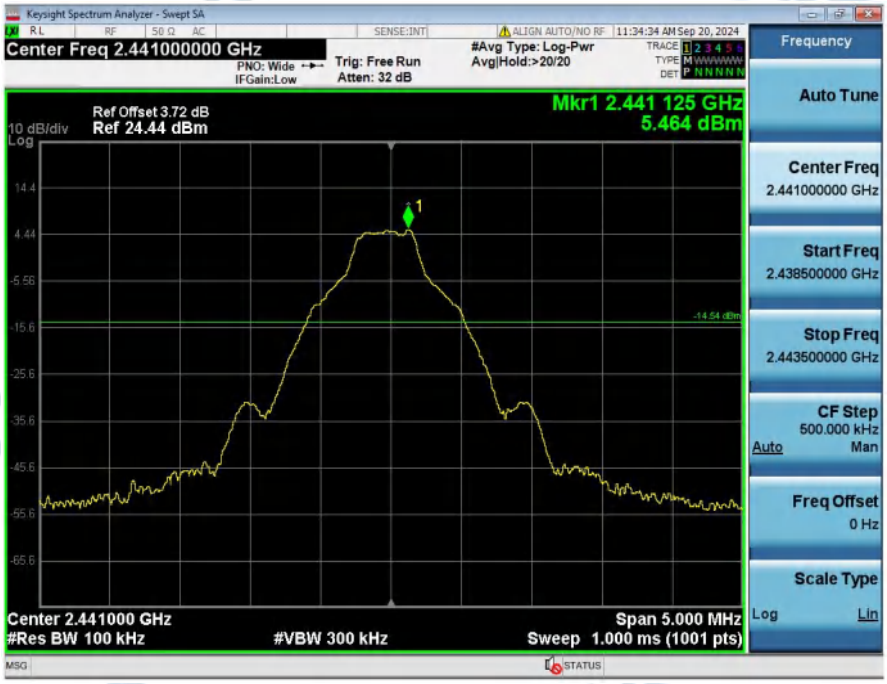
1_Reference_Level_NVNT_ANT1_1-DH5_2402_00



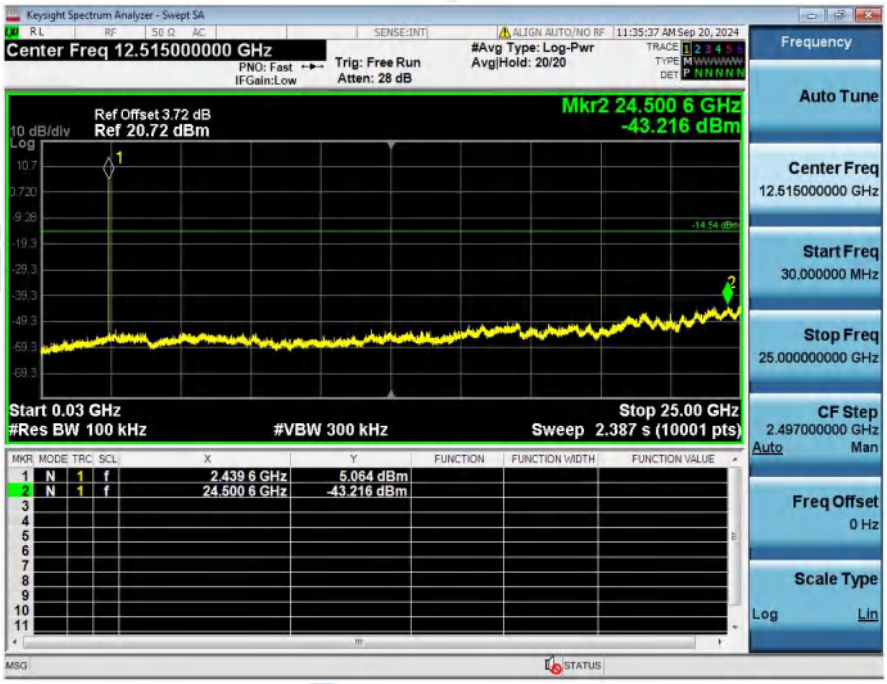
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2402_00



1_Reference_Level_NVNT_ANT1_1-DH5_2441_00

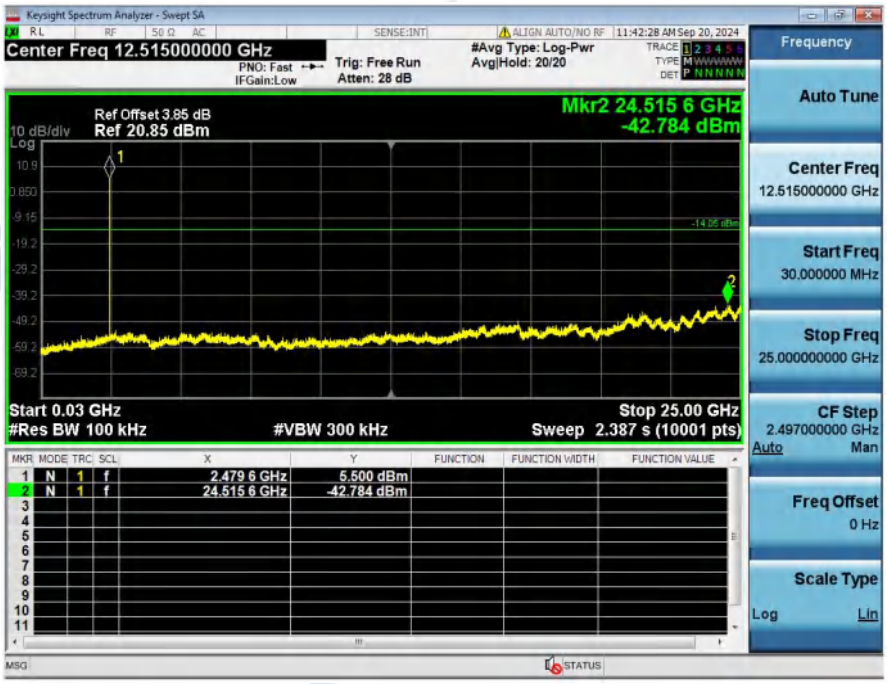


2_Spurious_Emissions_NVNT_ANT1_1-DH5_2441_00

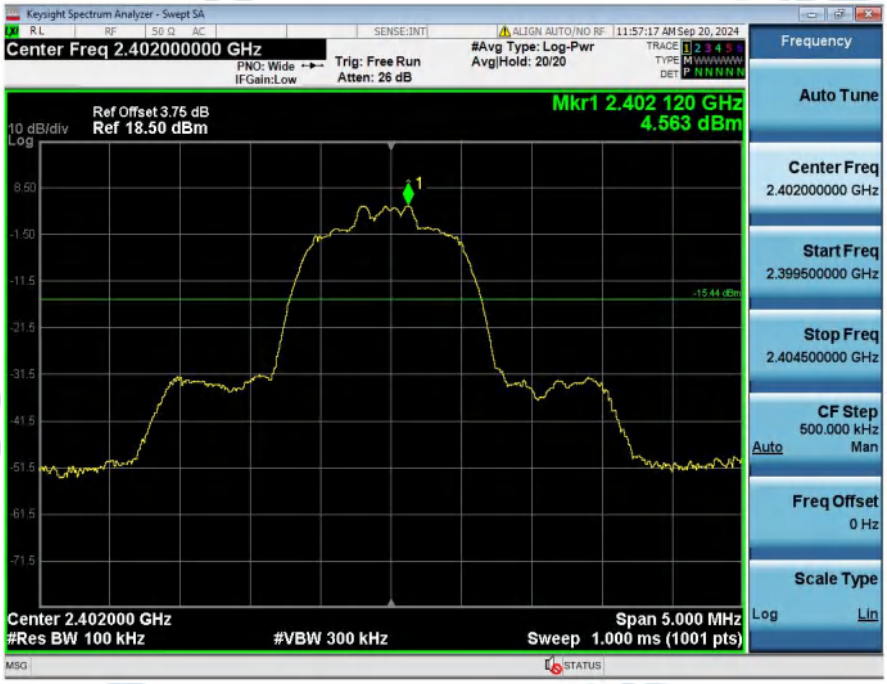


1_Reference_Level_NVNT_ANT1_1-DH5_2480_00

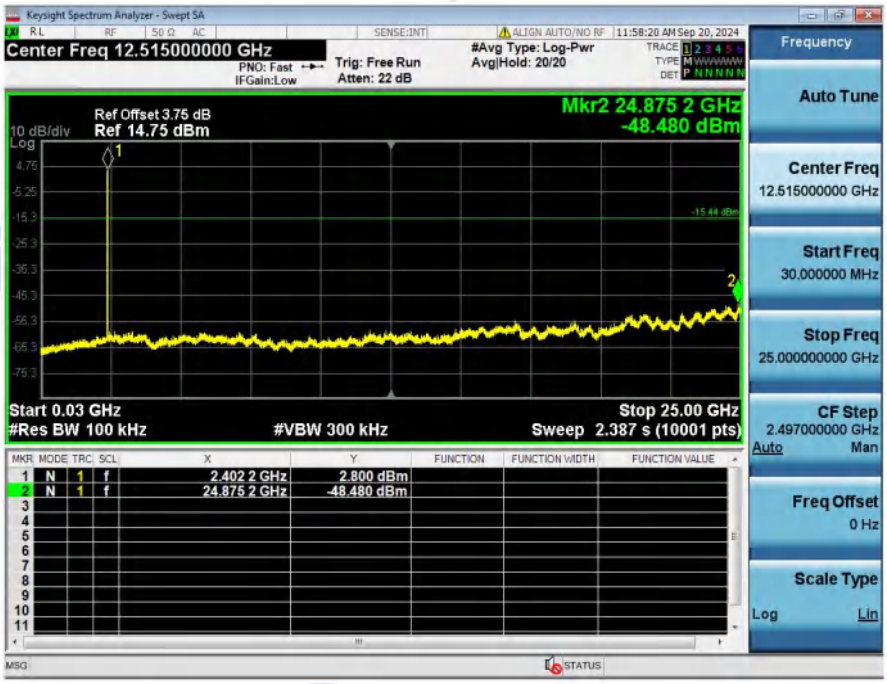
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480_00



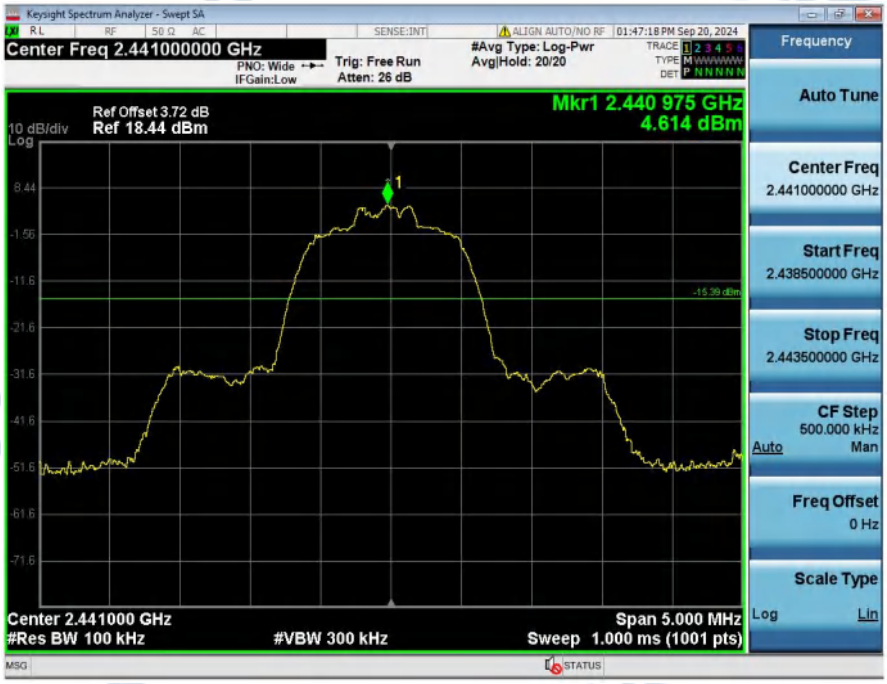
1_Reference_Level_NVNT_ANT1_2-DH5_2402_00



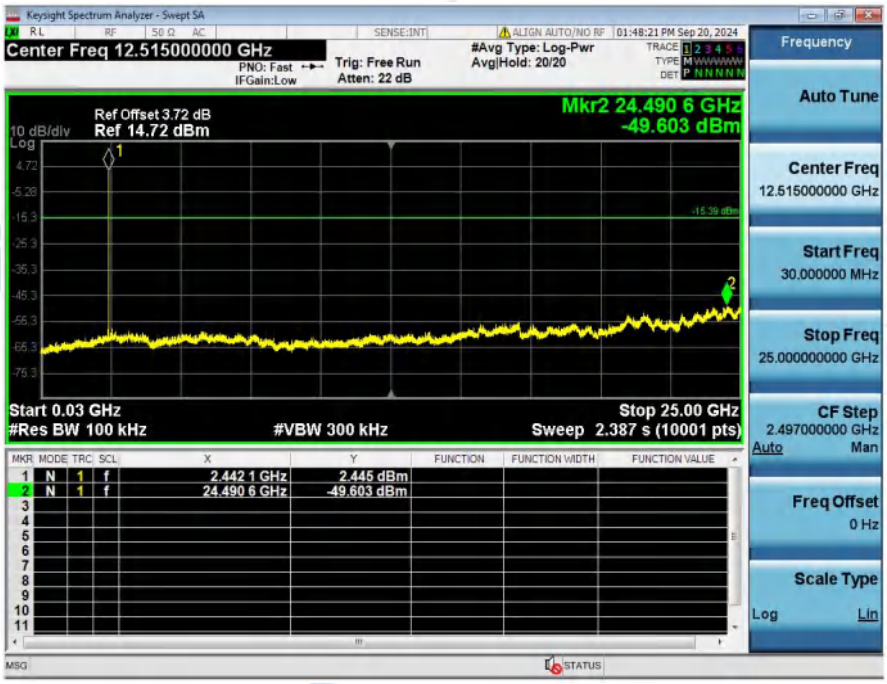
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402_00



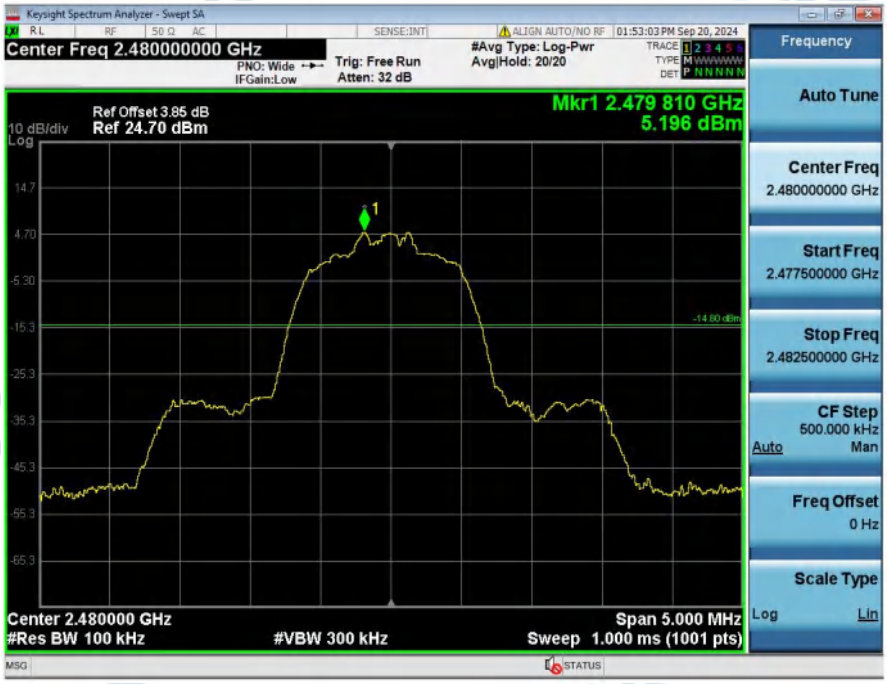
1_Reference_Level_NVNT_ANT1_2-DH5_2441_00



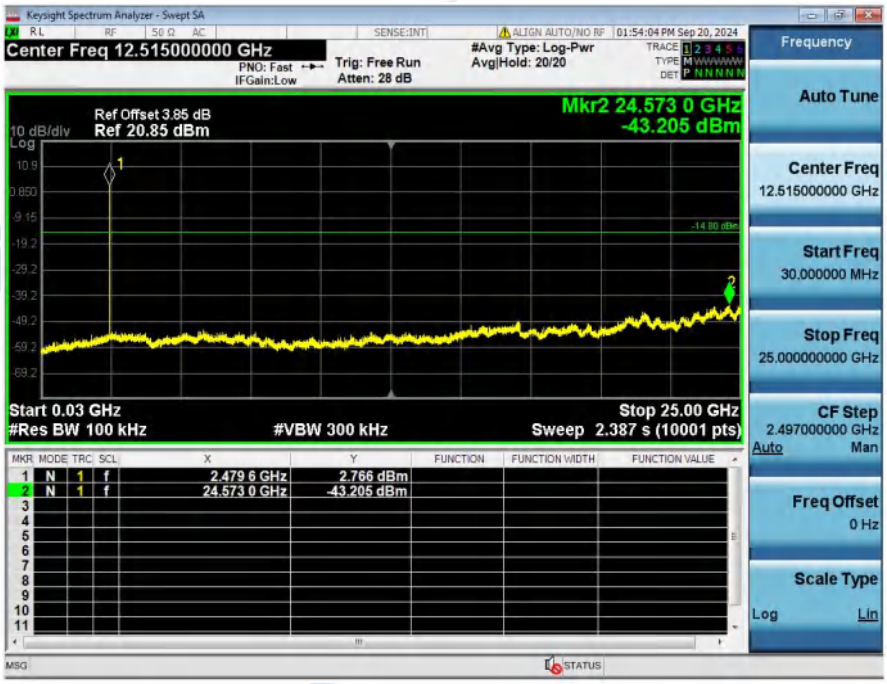
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441_00



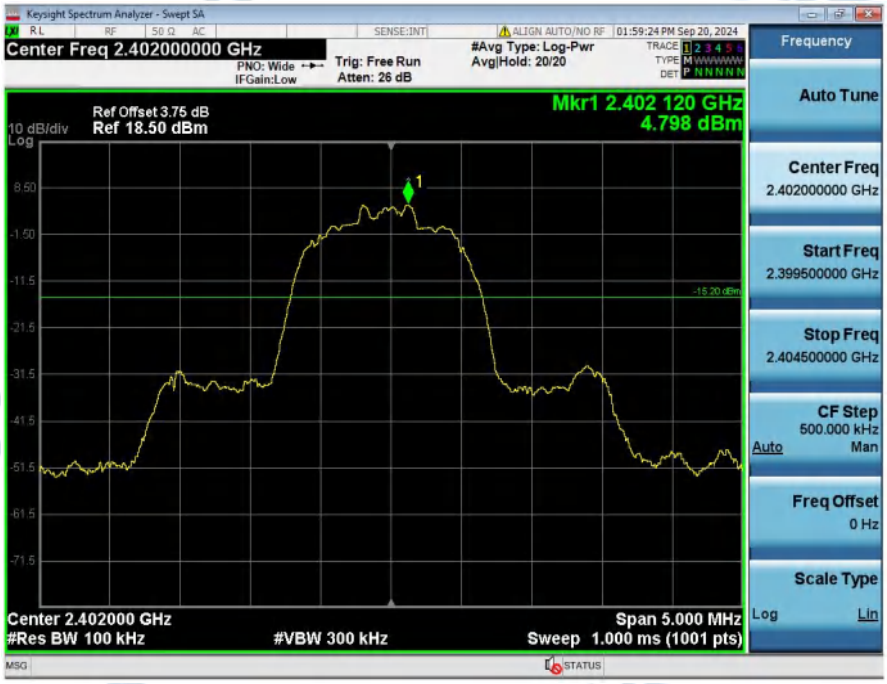
1_Reference_Level_NVNT_ANT1_2-DH5_2480_00



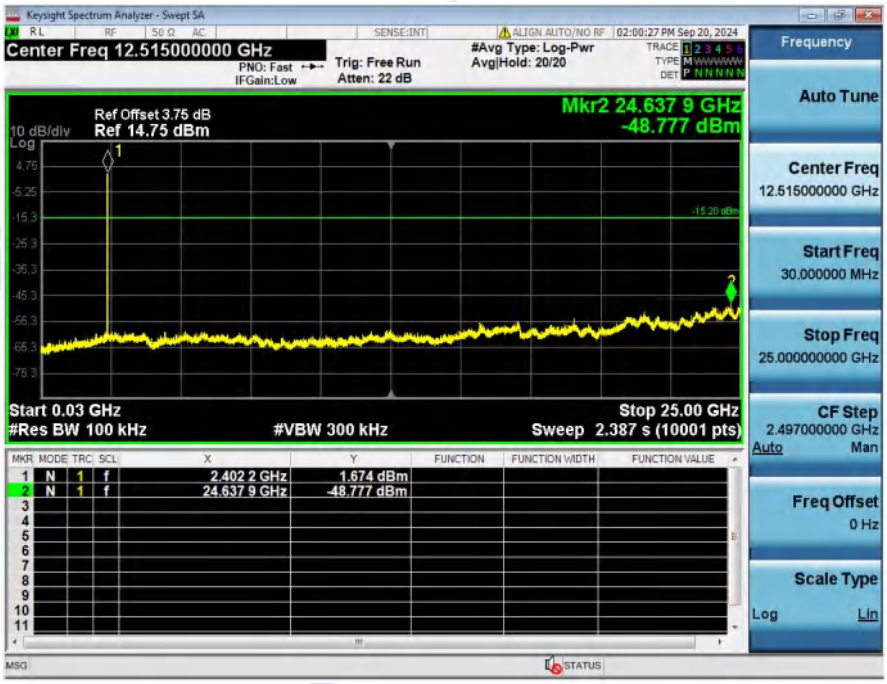
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480_00



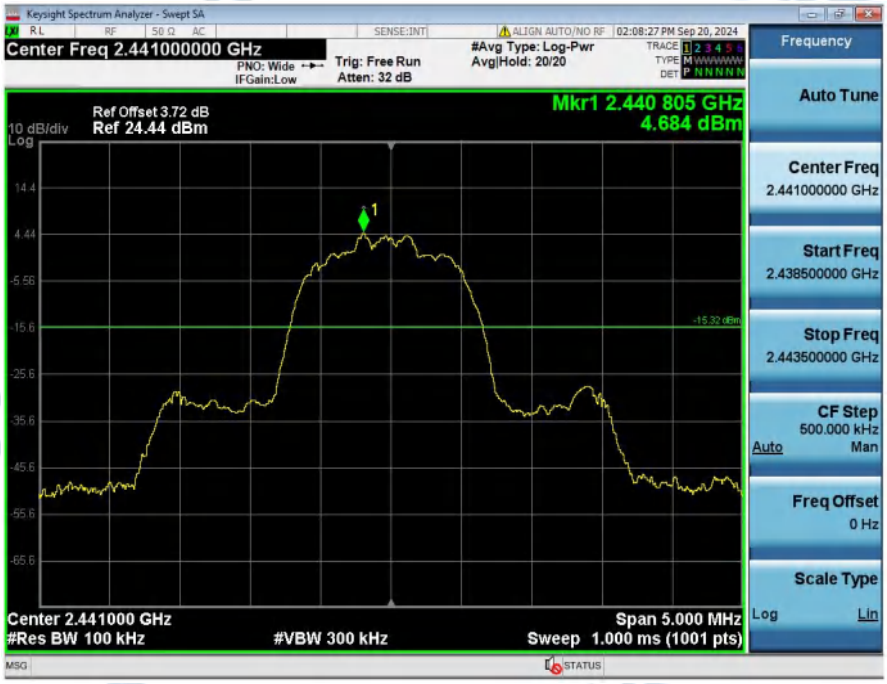
1_Reference_Level_NVNT_ANT1_3-DH5_2402_00



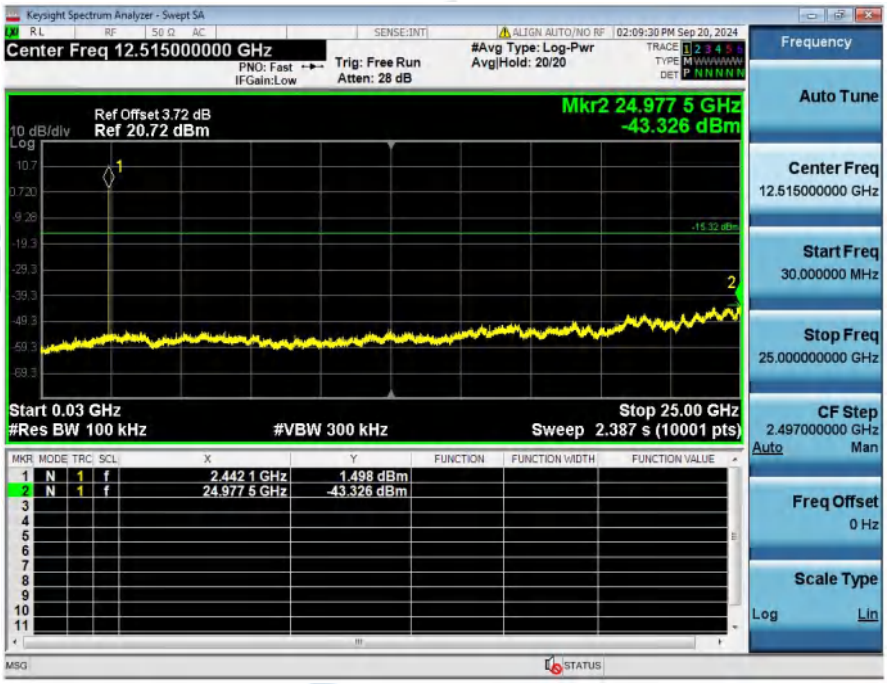
2_Spurious_Emissions_NVNT_ANT1_3-DH5_2402_00



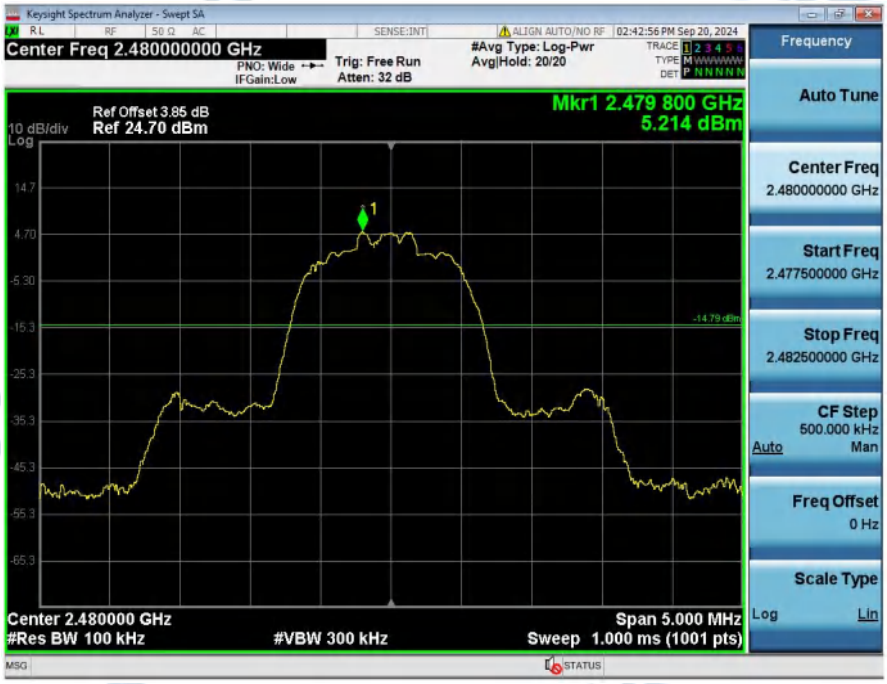
1_Reference_Level_NVNT_ANT1_3-DH5_2441_00



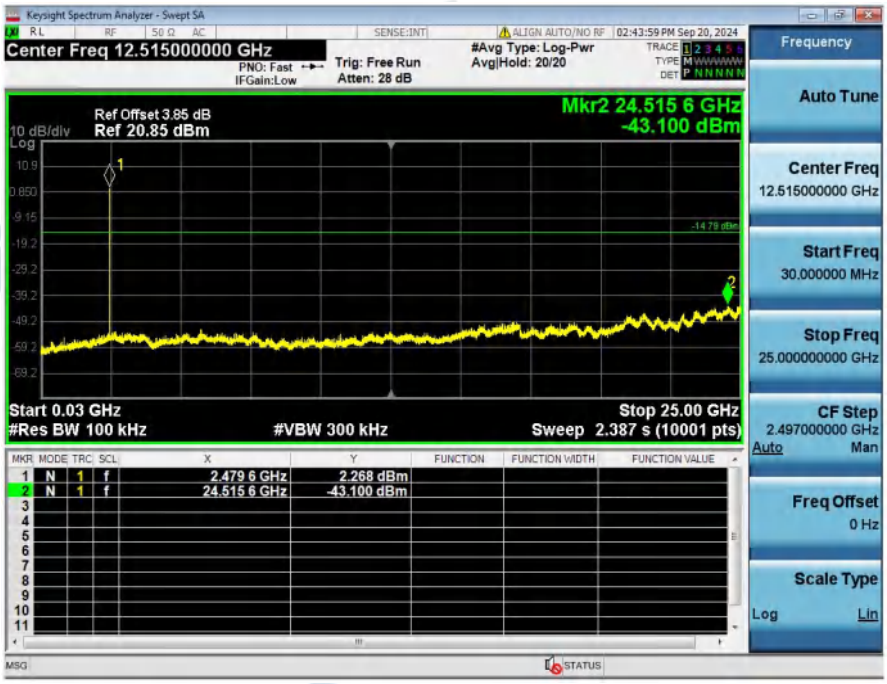
2_Spurious_Emissions_NVNT_ANT1_3-DH5_2441_00



1_Reference_Level_NVNT_ANT1_3-DH5_2480_00



2_Spurious_Emissions_NVNT_ANT1_3-DH5_2480_00

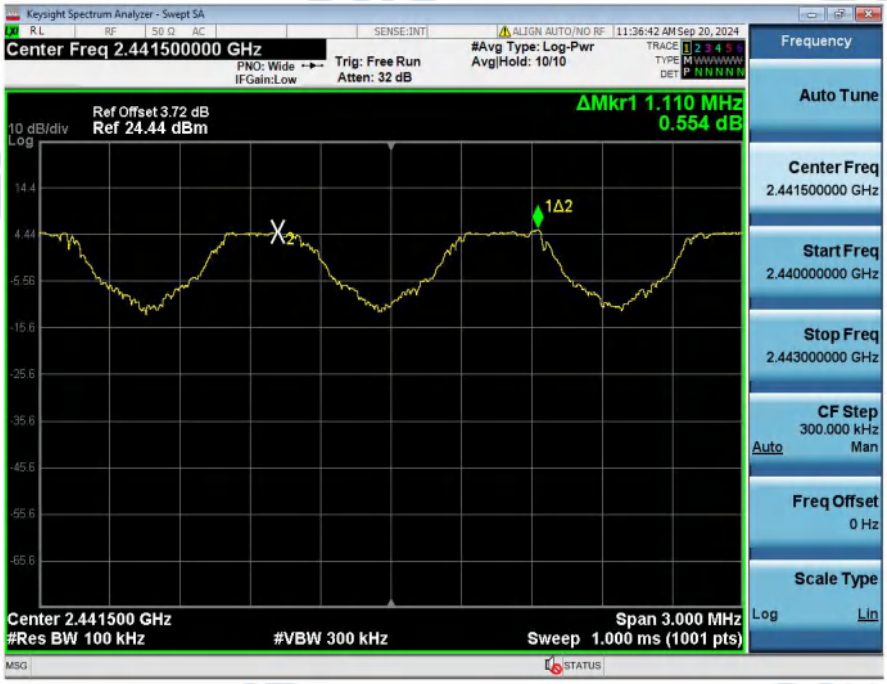

Keysight Spectrum Analyzer - Swept SA
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 28 dB
#Avg Type: Log-Pwr
Avg|Hold: 20/20
02:43:59 PM Sep 20, 2024
Ref Offset 3.85 dB
10 dB/div Ref 20.85 dBm
Log
Mkr2 24.515 6 GHz
-43.100 dBm
Start 0.03 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (10001 pts)
1 N 1 f 2.479 6 GHz 2.268 dBm
2 N 1 f 24.515 6 GHz -43.100 dBm
Frequency
Auto Tune
Center Freq
12.515000000 GHz
Start Freq
30.000000 MHz
Stop Freq
25.000000000 GHz
CF Step
2.497000000 GHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin

6. Carrier Frequencies Separation (Hopping)

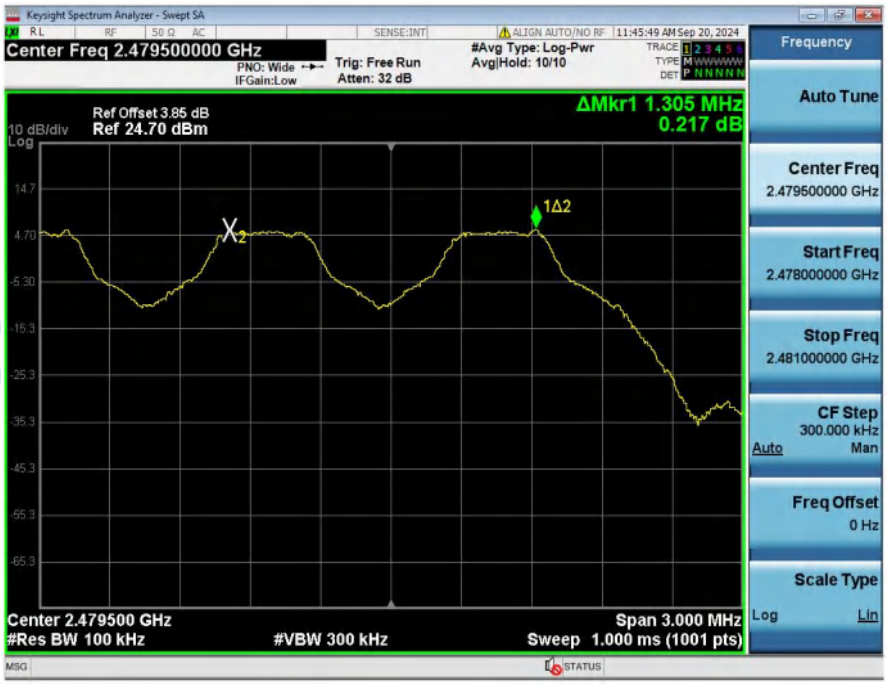
Condition	Antenna	Modulation	Frequency(MHz)	Hopping NO.0 (MHz)	Hopping NO.1 (MHz)	Carrier Frequencies Separation(MHz)	Limit(MHz)	Result
NVNT	ANT1	1-DH5	2402.00	2401.807	2402.965	1.16	0.660	Pass
NVNT	ANT1	1-DH5	2441.00	2441.017	2442.127	1.11	0.662	Pass
NVNT	ANT1	1-DH5	2480.00	2478.813	2480.118	1.30	0.660	Pass
NVNT	ANT1	2-DH5	2402.00	2402.110	2403.112	1.00	0.899	Pass
NVNT	ANT1	2-DH5	2441.00	2440.795	2442.115	1.32	0.899	Pass
NVNT	ANT1	2-DH5	2480.00	2479.137	2480.115	0.98	0.899	Pass
NVNT	ANT1	3-DH5	2402.00	2401.951	2403.109	1.16	0.901	Pass
NVNT	ANT1	3-DH5	2441.00	2440.804	2442.121	1.32	0.901	Pass
NVNT	ANT1	3-DH5	2480.00	2479.122	2480.133	1.01	0.901	Pass

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_1-DH5_Hopping

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_1-DH5_Hopping

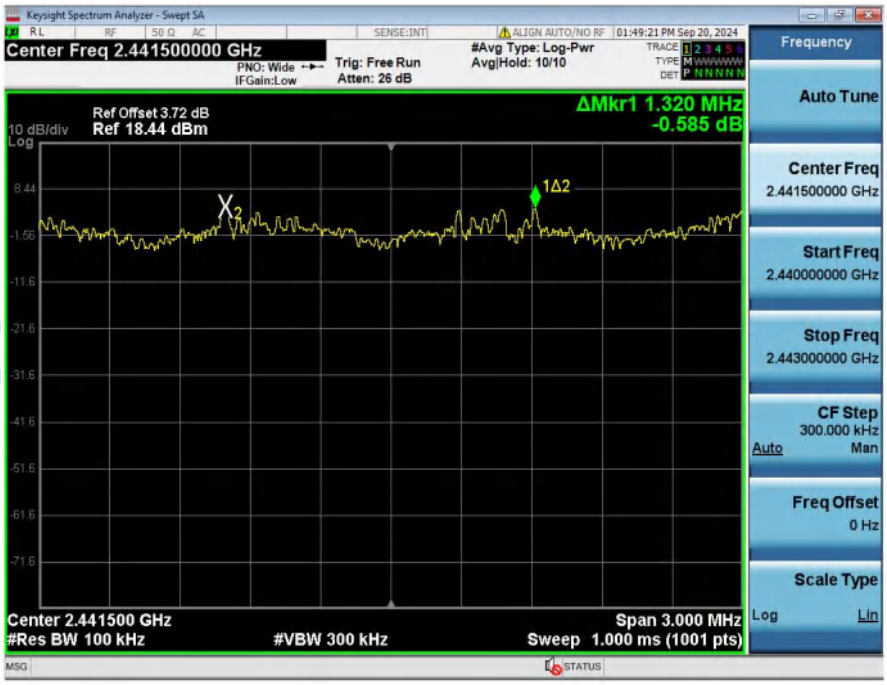


Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_1-DH5_Hopping

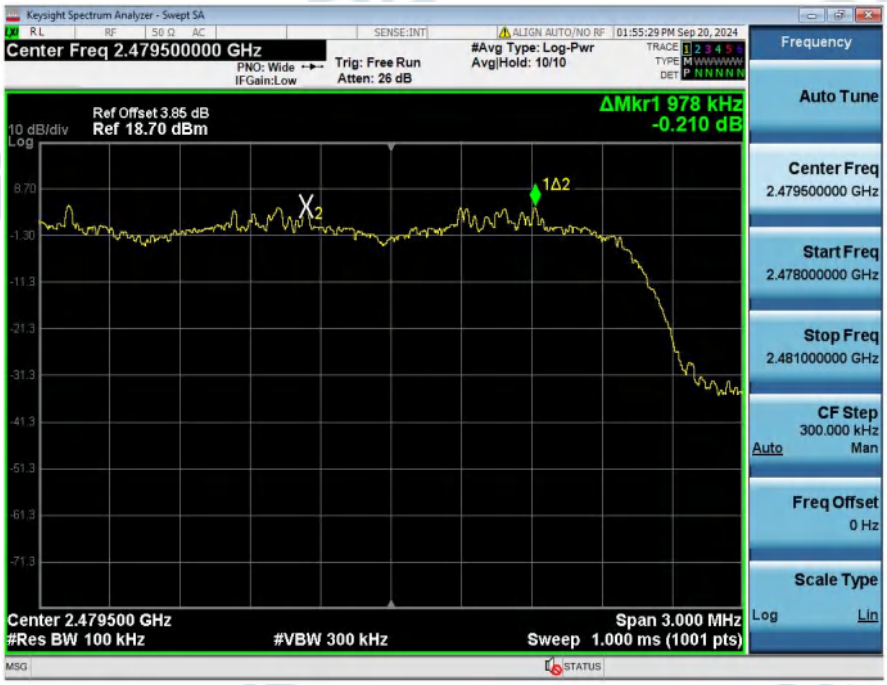


Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_2-DH5_Hopping

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_2-DH5_Hopping

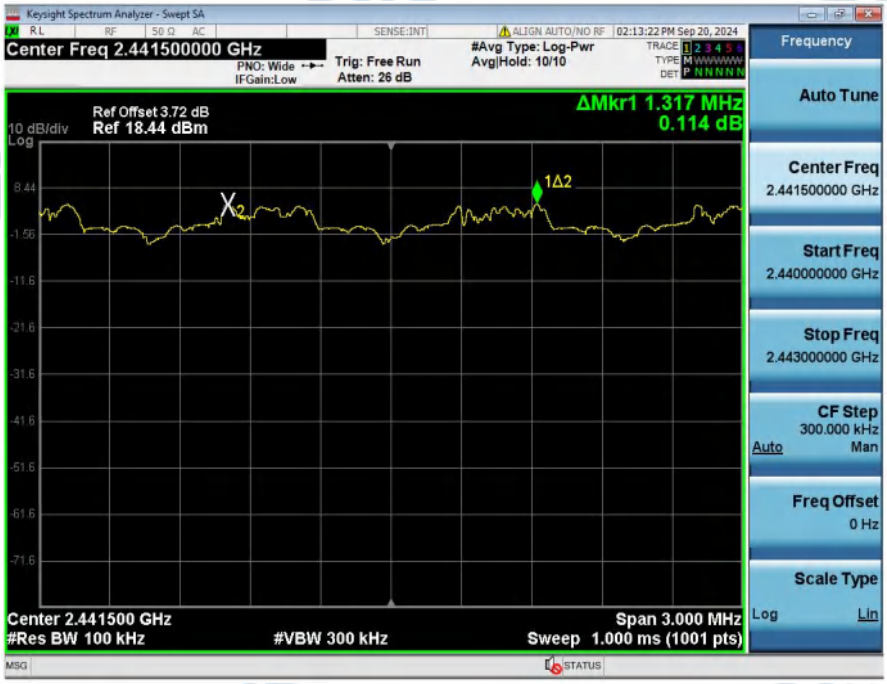


Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_2-DH5_Hopping



Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_3-DH5_Hopping

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_3-DH5_Hopping

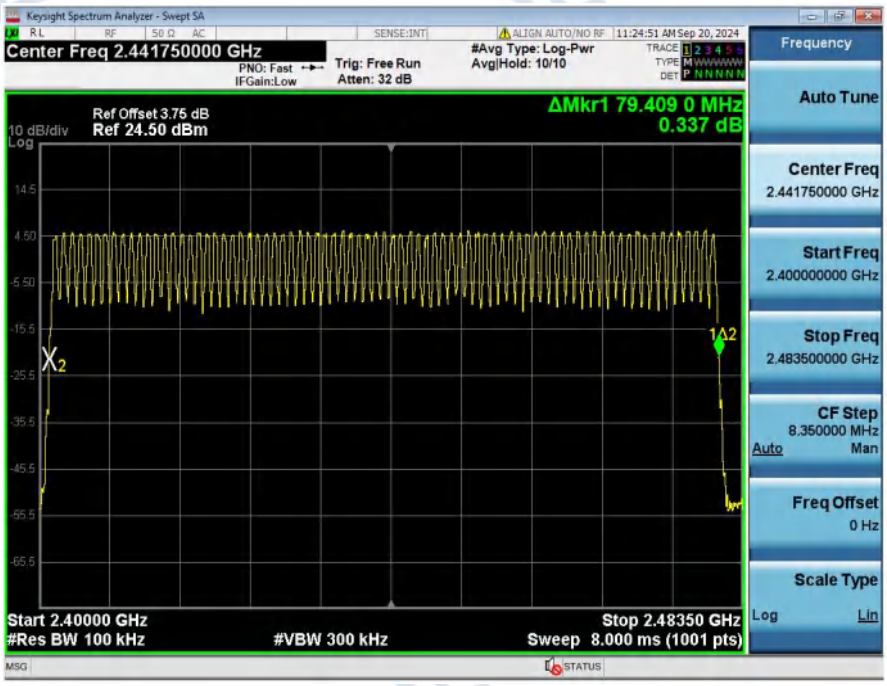


Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_3-DH5_Hopping

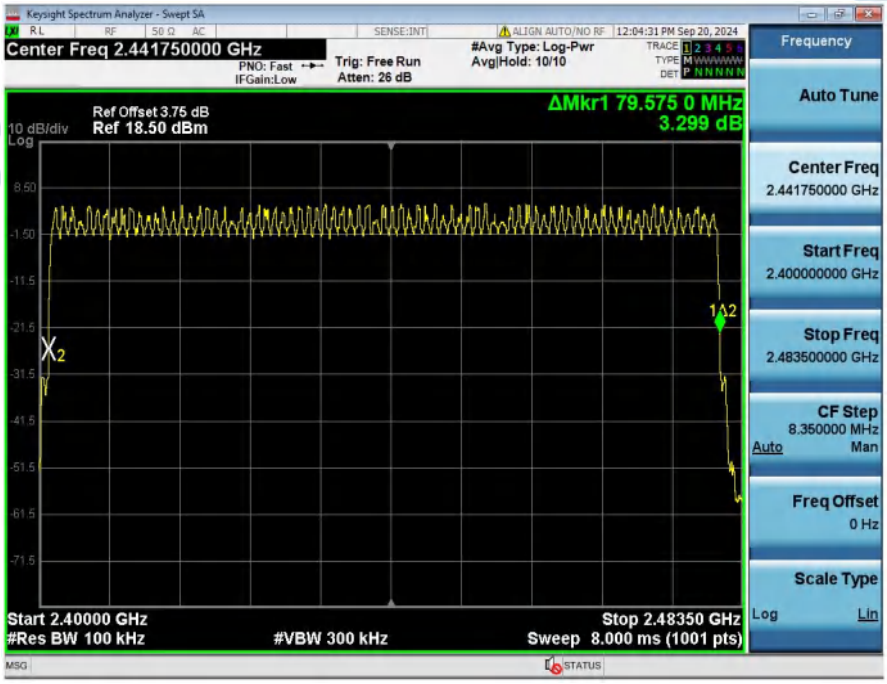
7. Number of Hopping Channel (Hopping)

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

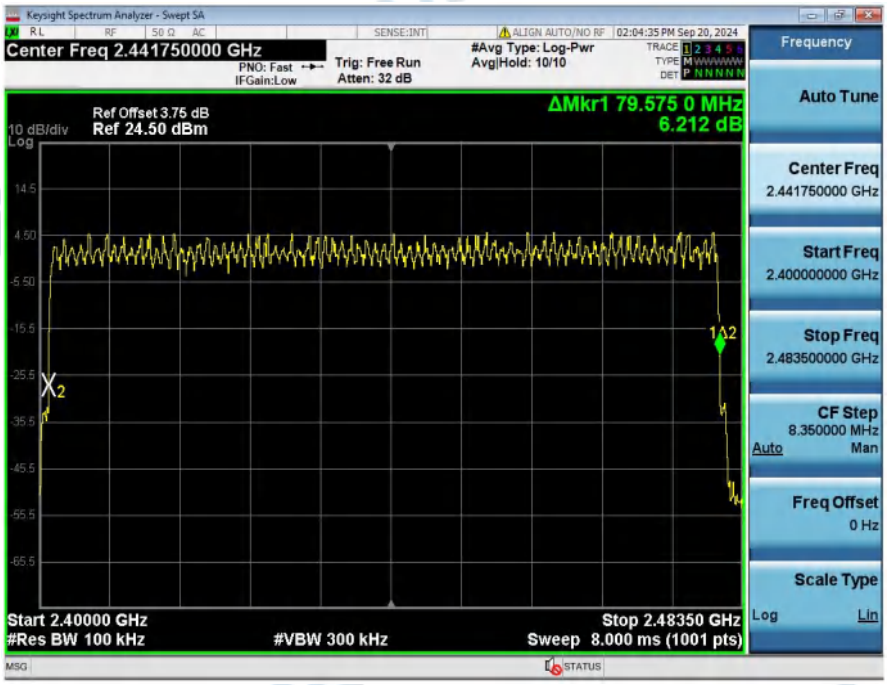
Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_1-DH5_Hopping



Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_2-DH5_Hopping



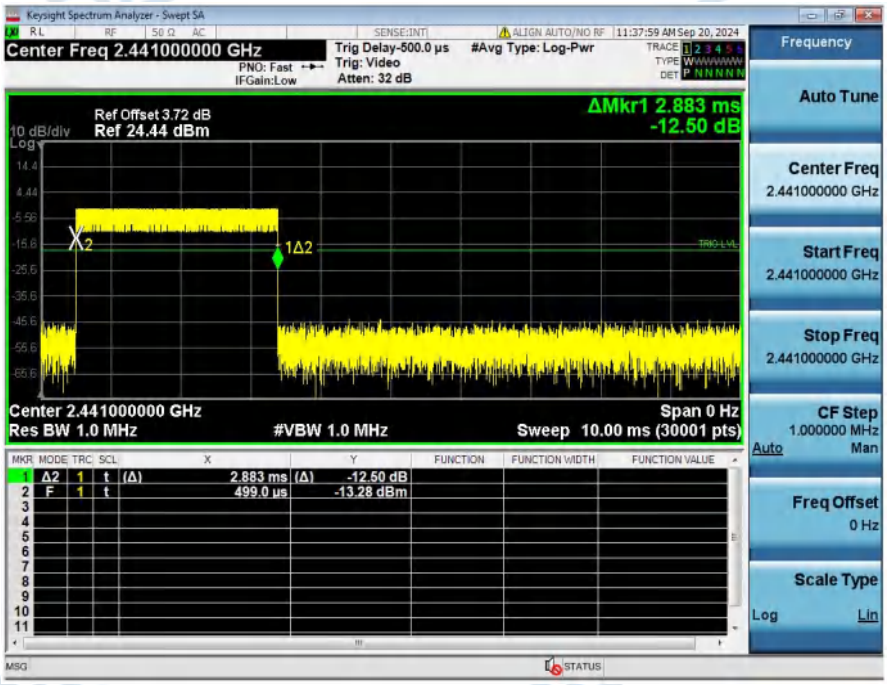
Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_3-DH5_Hopping



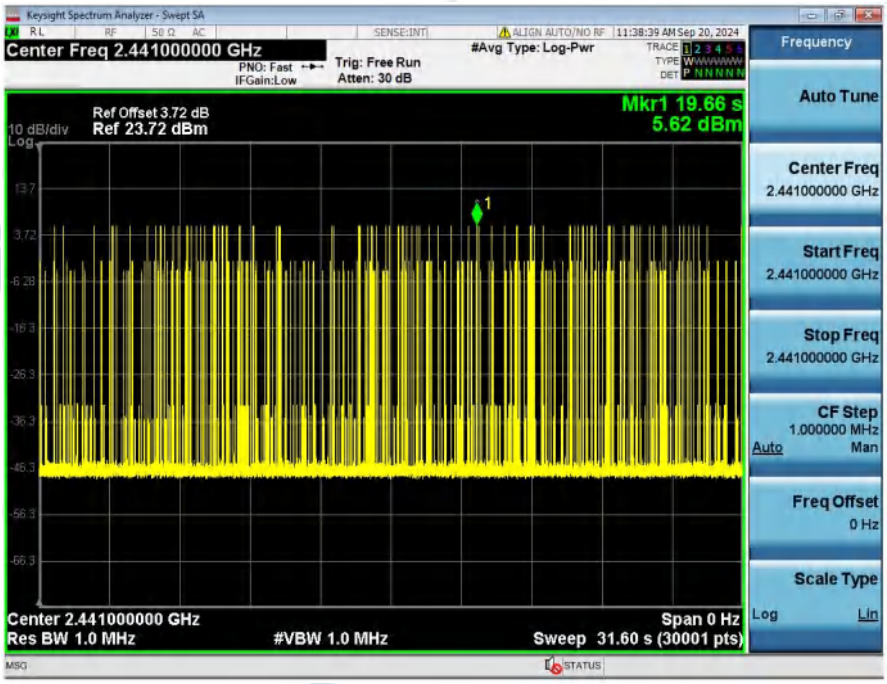
8. Dwell Time (Hopping)

Condition	Antenna	Packet Type	Pulse Time(ms)	Hops	Dwell Time(ms)	Limit(s)	Result
NVNT	ANT1	1-DH5	2.883	93.00	268.119	0.40	Pass
NVNT	ANT1	2-DH5	2.886	111.00	320.346	0.40	Pass
NVNT	ANT1	3-DH5	2.888	112.00	323.456	0.40	Pass
NVNT	ANT1	1-DH1	0.379	320.00	121.280	0.40	Pass
NVNT	ANT1	1-DH3	1.635	155.00	253.425	0.40	Pass
NVNT	ANT1	2-DH1	0.386	320.00	123.520	0.40	Pass
NVNT	ANT1	2-DH3	1.639	162.00	265.518	0.40	Pass
NVNT	ANT1	3-DH1	0.387	320.00	123.840	0.40	Pass
NVNT	ANT1	3-DH3	1.638	163.00	266.994	0.40	Pass

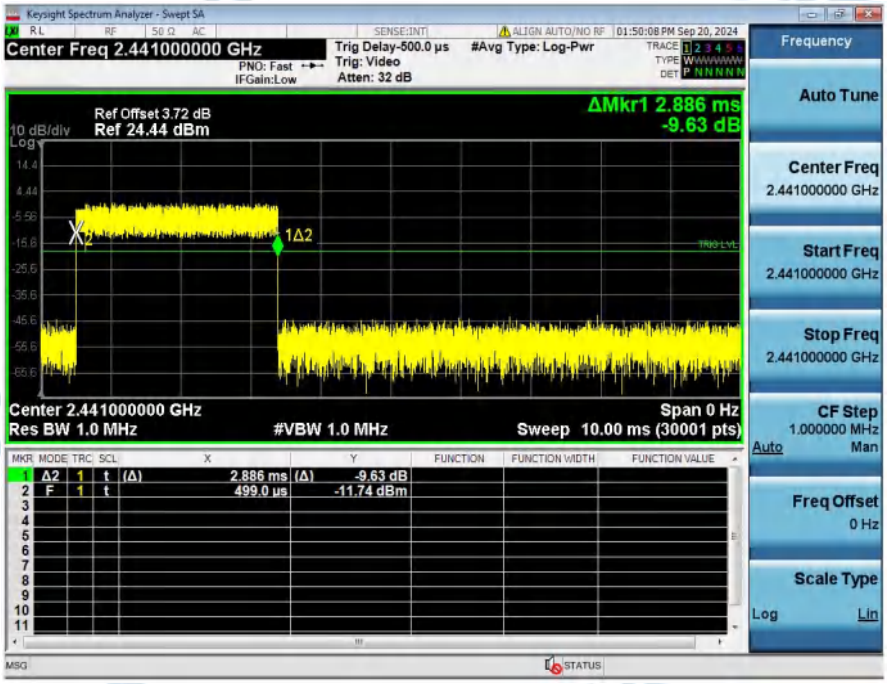
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_00_One_Burst_Time



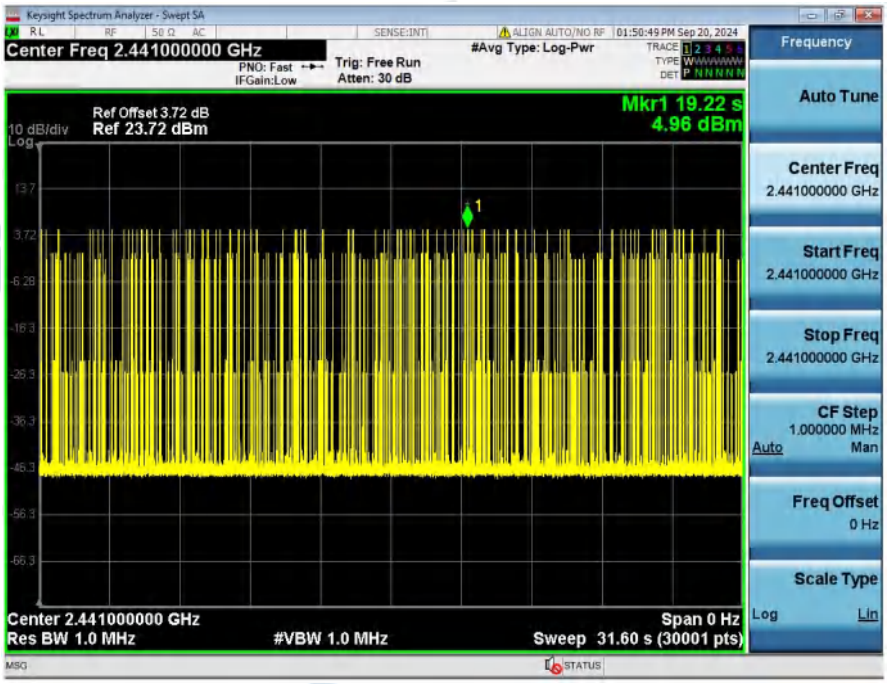
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_00_Accumulated



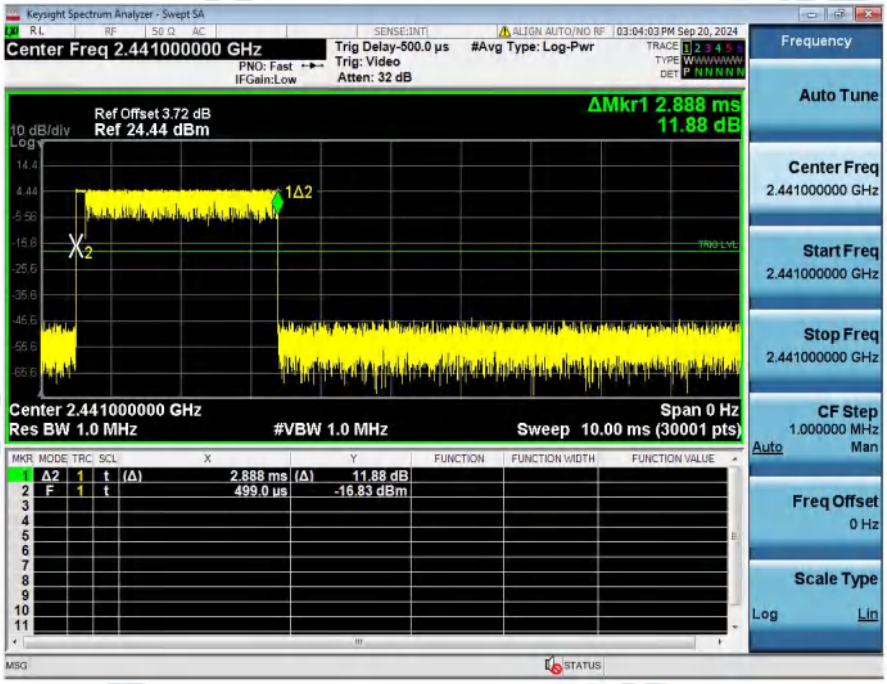
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_00_One_Burst_Time



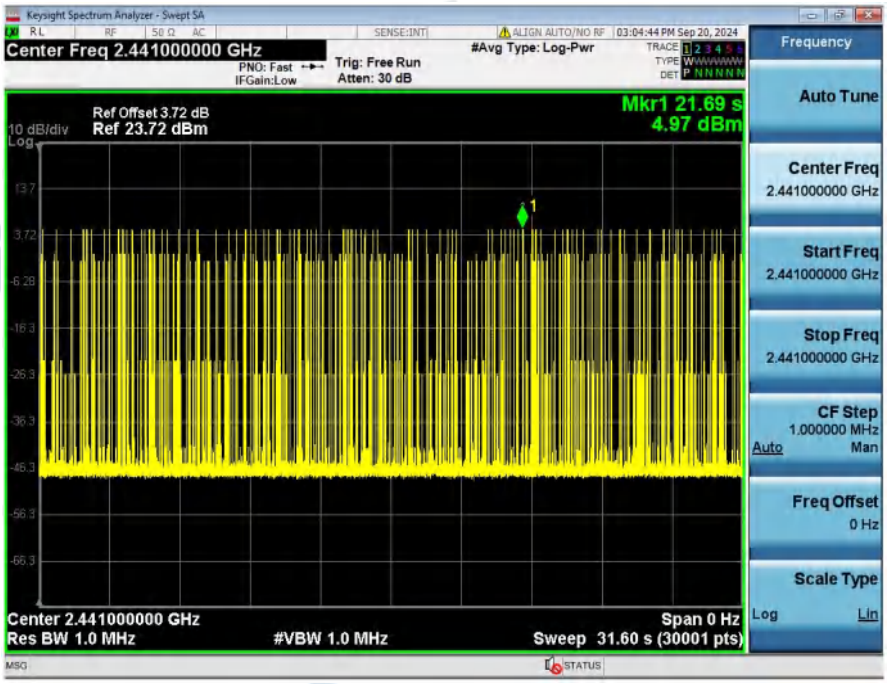
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_00_Accumulated



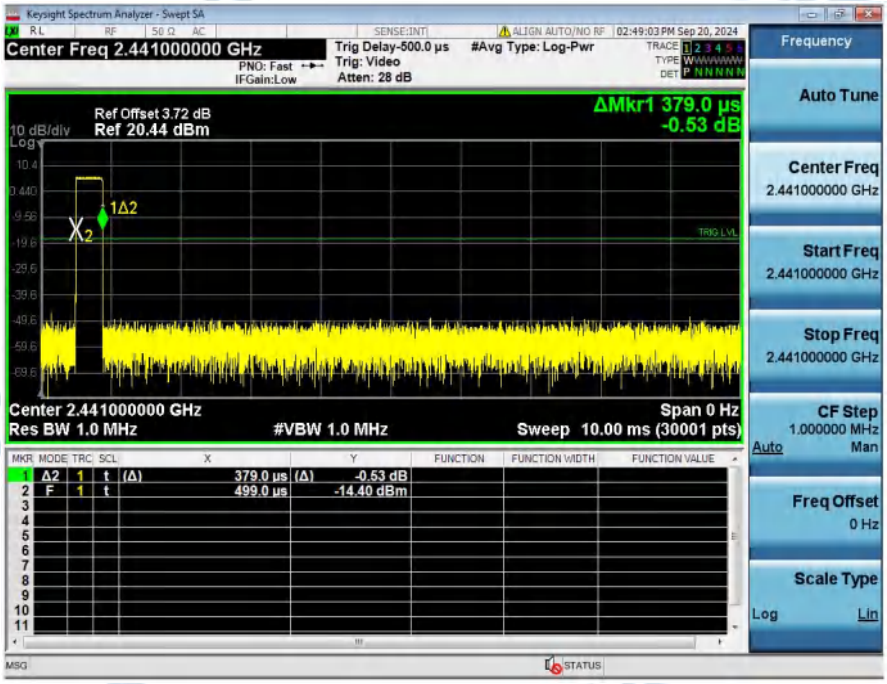
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH5_2441_00_One_Burst_Time



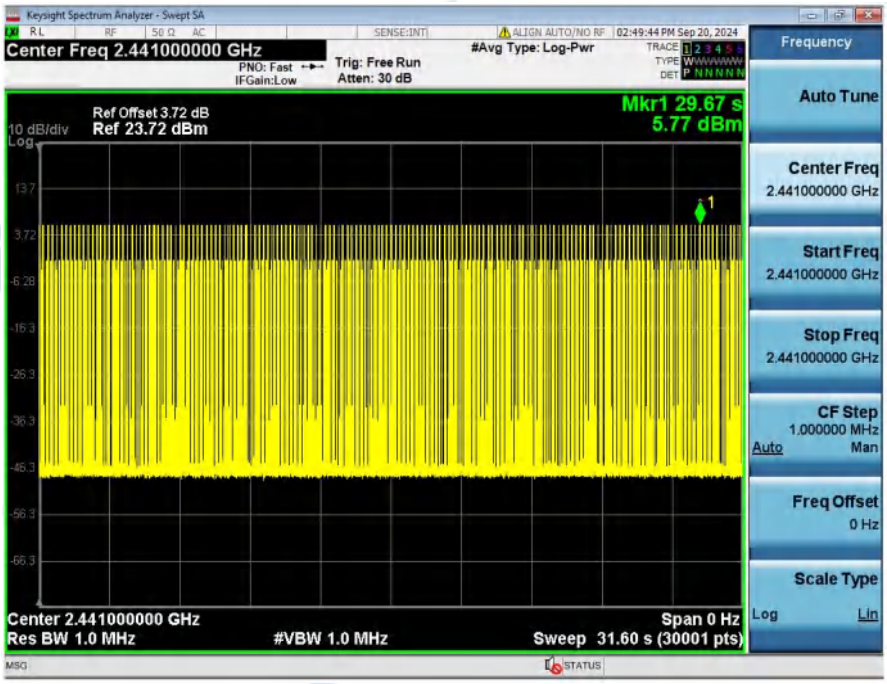
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH5_2441_00_Accumulated



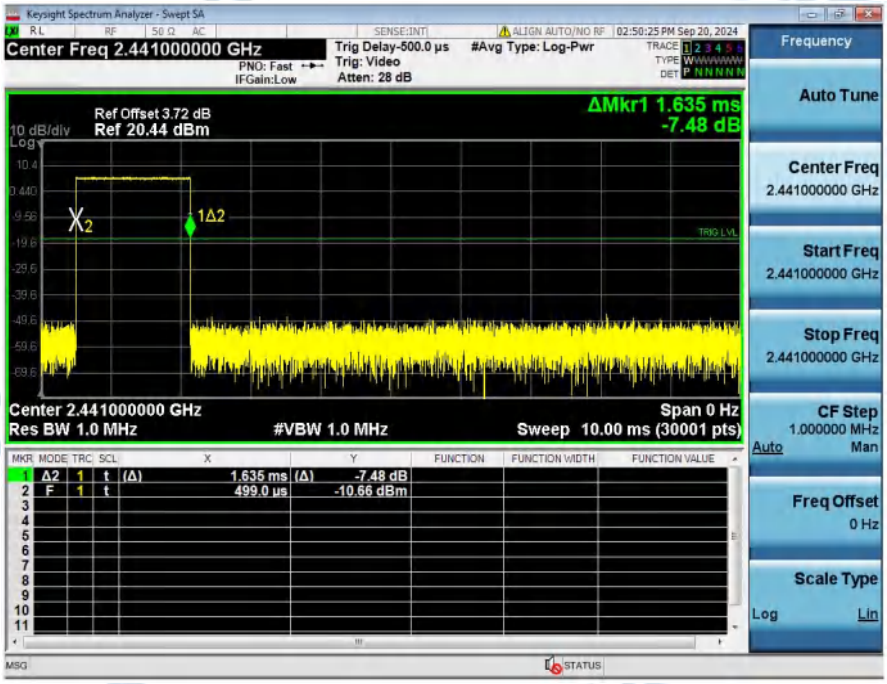
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_00_One_Burst_Time



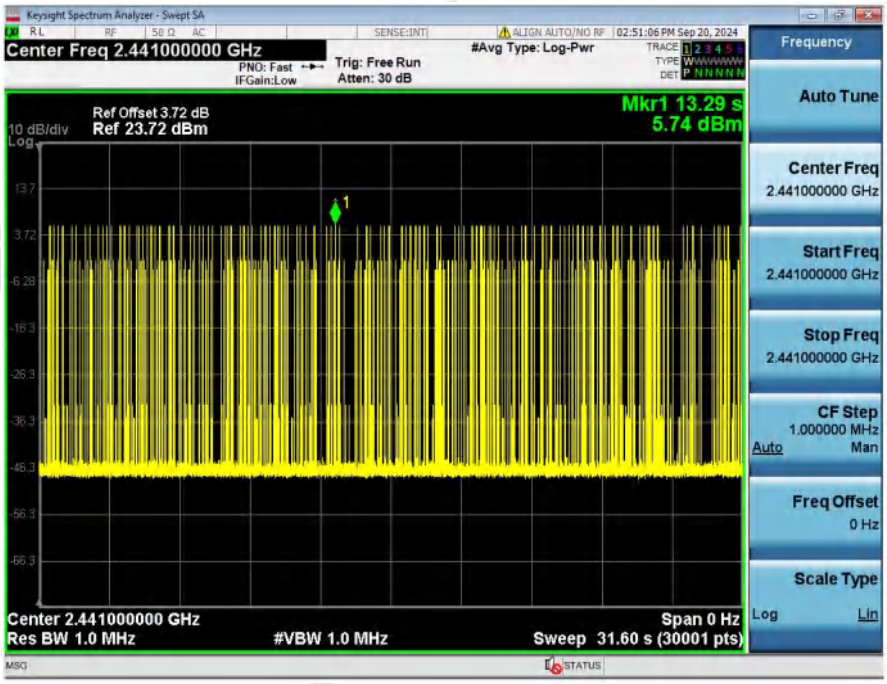
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_00_Accumulated



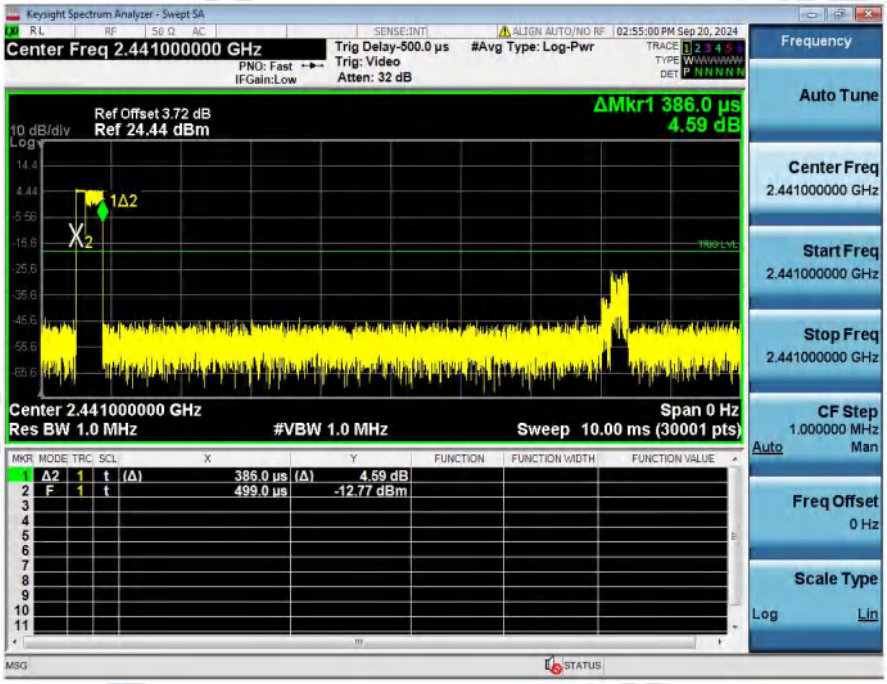
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_00_One_Burst_Time



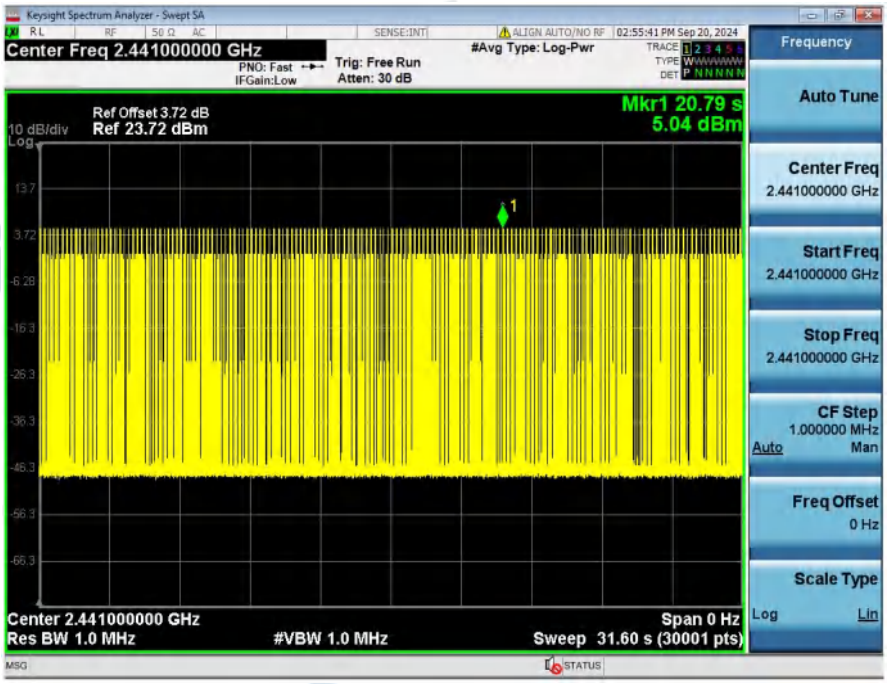
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_00_Accumulated



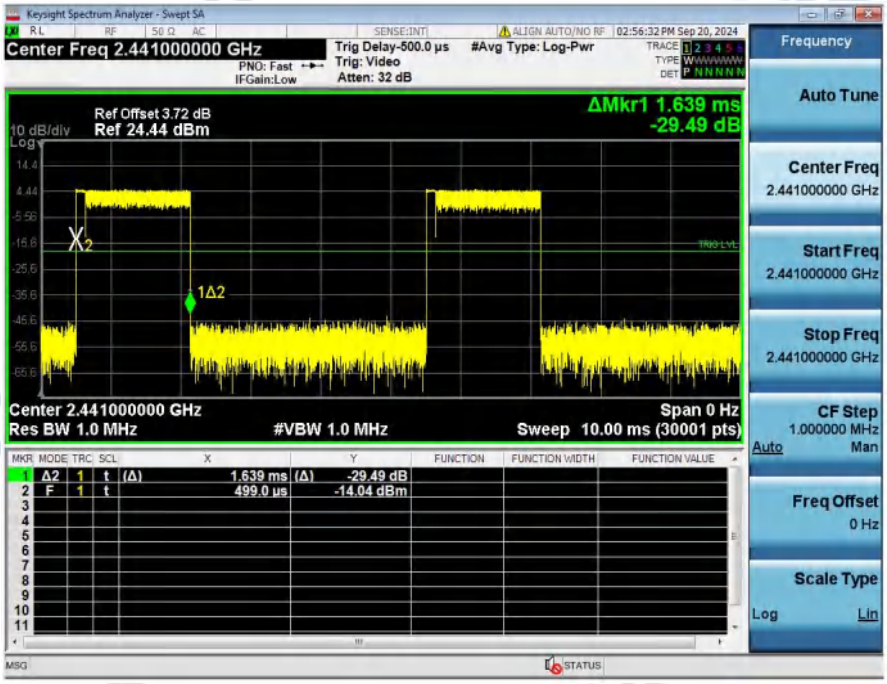
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_00_One_Burst_Time



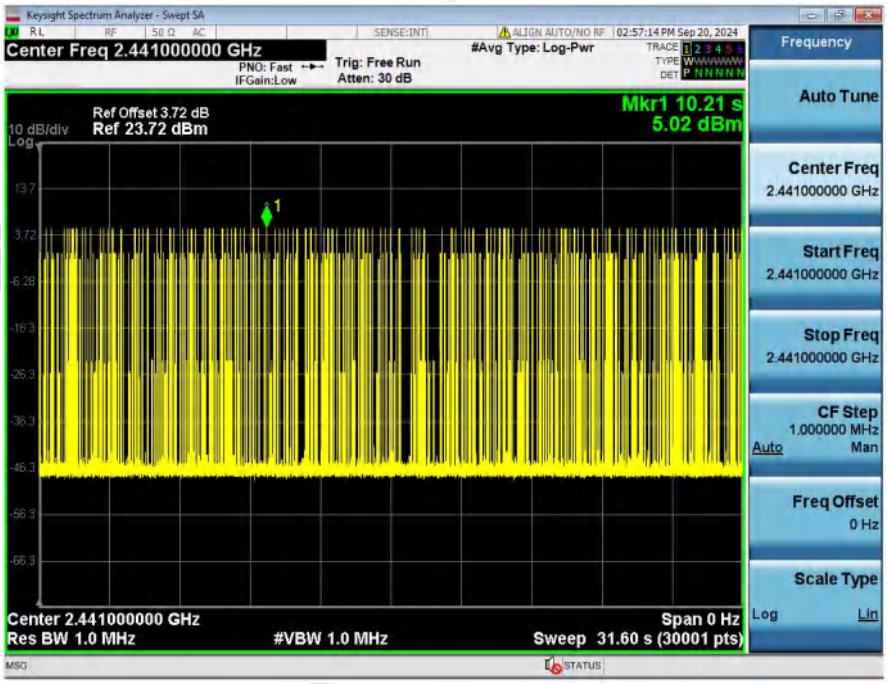
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_00_Accumulated



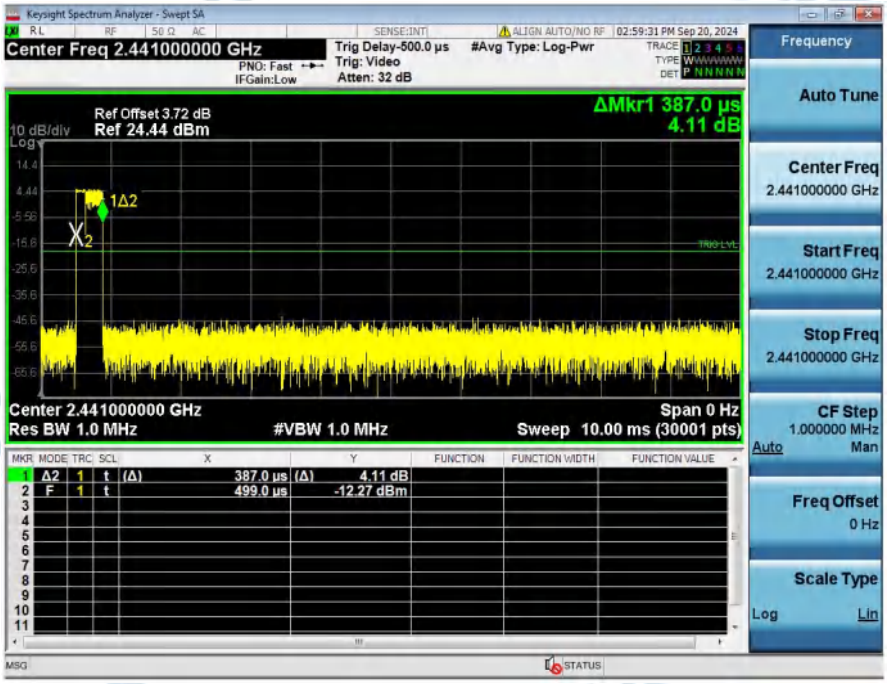
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_00_One_Burst_Time



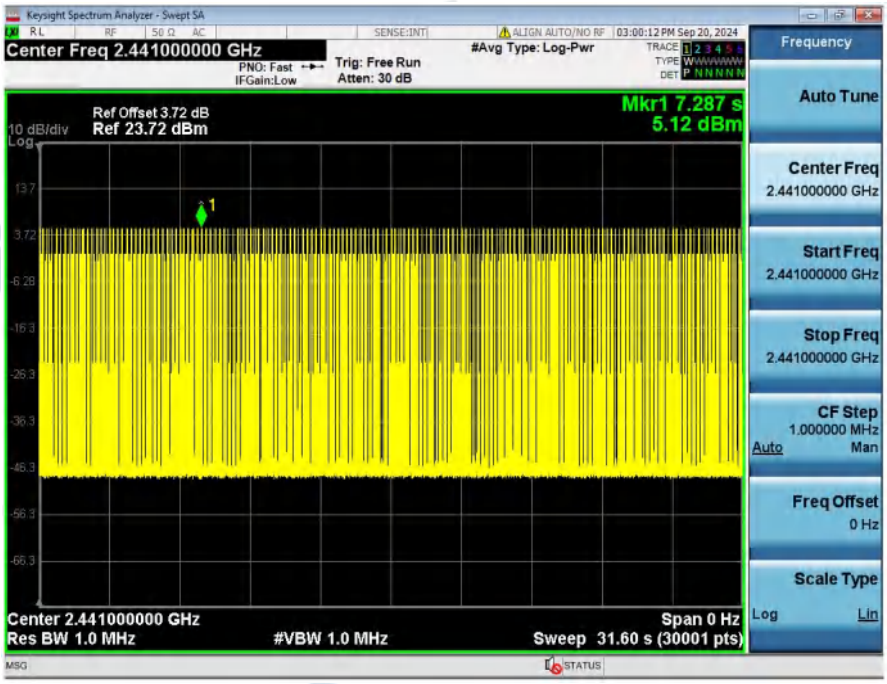
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_00_Accumulated



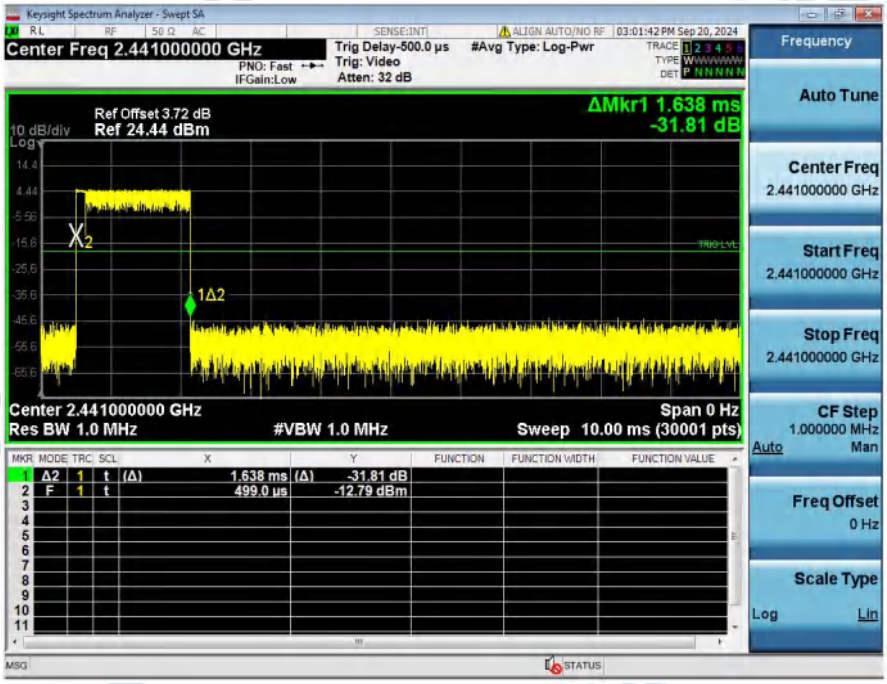
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH1_2441_00_One_Burst_Time



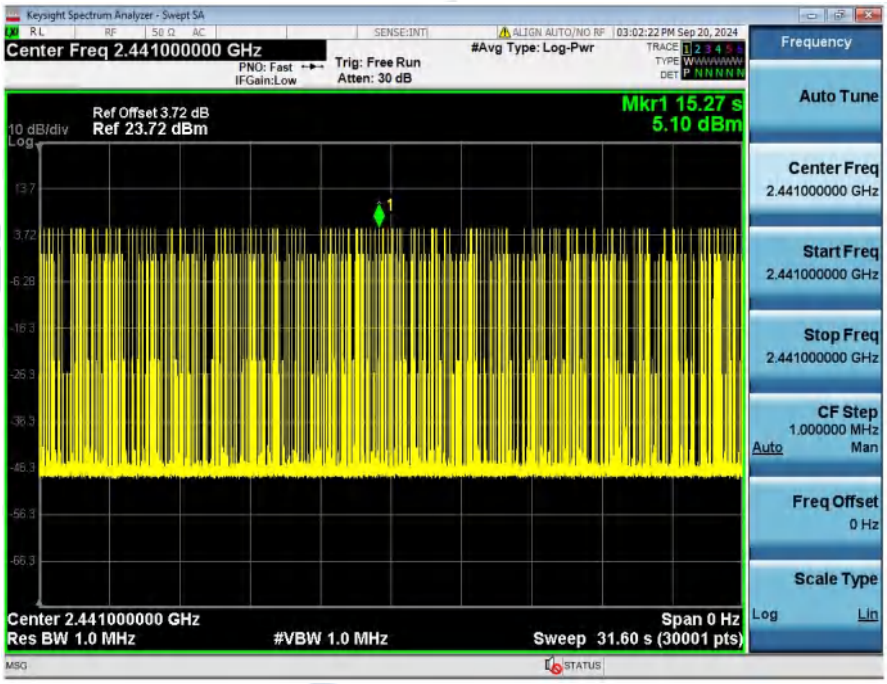
Dwell_Time_(Hopping)_NVNT_ANT1_3-DH1_2441_00_Accumulated



Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_00_One_Burst_Time



Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_00_Accumulated



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