

RF TEST REPORT

For

Chengdu Hotack Technology Co., Ltd.

Product Name: PROJECTOR

Test Model(s): X5AD

Report Reference No. : DACE260409008RL001

FCC ID : 2BFIZ-X5AD

Applicant's Name : Chengdu Hotack Technology Co., Ltd.

Address : 501-502, Unit 3, Building 13, No. 666 Jinfenghuang Avenue, High-tech Industry Park, Jinniu District, Chengdu City, Si Chuan Province, China

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 : April 9, 2026

Date of Test : April 9, 2026 to June 30, 2026

Date of Issue : June 30, 2026

Result : **Pass**

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Apply for company information

Applicant's Name	:	Chengdu Hotack Technology Co., Ltd.
Address	:	501-502, Unit 3, Building 13, No. 666 Jinfenghuang Avenue, High-tech Industry Park, Jinniu District, Chengdu City, Si Chuan Province, China
Product Name	:	PROJECTOR
Test Model(s)	:	X5AD
Series Model(s)	:	X5Max, X5MAX, X5GTV, AC1069, X5, X5DD, X5BD, X5CD, X5ED, QV3000, WV3000, SDT2602
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.

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June 30, 2026

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June 30, 2026

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June 30, 2026

Revision History Of Report

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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	Standard	Method	Requirement	Result
Antenna requirement	47 CFR Part 15.247	---	47 CFR 15.203	Pass
Conducted Emission at AC power line	47 CFR Part 15.247	ANSI C63.10-2020 section 6.2	47 CFR 15.207(a)	Pass
20dB Bandwidth	47 CFR Part 15.247	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	47 CFR Part 15.247	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	47 CFR Part 15.247	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	47 CFR Part 15.247	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	47 CFR Part 15.247	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	47 CFR Part 15.247	ANSI C63.10-2020 section 7.8.7 ANSI C63.10-2020+Cor 1-2023 section 7.8.7 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d)	Pass
Band edge emissions (Radiated)	47 CFR Part 15.247	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)	47 CFR Part 15.247	ANSI C63.10-2020 section 6.5.4 KDB 558074 D01	47 CFR 15.247(d), 15.209, 15.205	Pass

		15.247 Meas Guidance v05r02		
Emissions in frequency bands (above 1GHz)	47 CFR Part 15.247	ANSI C63.10-2020 section 6.5.4 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : Chengdu Hotack Technology Co., Ltd.
Address : 501-502, Unit 3, Building 13, No. 666 Jinfenghuang Avenue, High-tech Industry Park, Jinniu District, Chengdu City, Si Chuan Province, China

Manufacturer : Chengdu Hotack Technology Co., Ltd.
Address : 501-502, Unit 3, Building 13, No. 666 Jinfenghuang Avenue, High-tech Industry Park, Jinniu District, Chengdu City, Si Chuan Province, China

2.2 Description of Device (EUT)

Product Name:	PROJECTOR
Model/Type reference:	X5AD
Series Model:	X5Max, X5MAX, X5GTV, AC1069, X5, X5DD, X5BD, X5CD, X5ED, QV3000, WV3000, SDT2602
Model Difference:	All the model are the same circuit and RF module, only the model name, appearance color and appearance are different. Test sample model: X5AD
Trade Mark:	N/A
Power Supply:	100-240V~, 50/60Hz, 2.5A
Operation Frequency:	2402-2480MHz
Number of Channels:	79CH
Modulation Type:	GFSK, ($\pi/4$)DQPSK, 8DPSK
Antenna Type:	PCB Antenna
Antenna Gain:	2.03dBi
Hardware Version:	V1.0
Software Version:	V1.0

2.3 Description of Test Modes

No	Title	Description
TM1	TX mode	Keep the EUT in TX mode
Test Environment		Normal Voltage(AC): 120V

2.4 Description of Support Units

The EUT was tested as an independent device.

2.5 Operation Frequency each of channel

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	/	/

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)
	GFSK, ($\pi/4$)DQPSK, 8DPSK
Lowest channel	2402MHz
Middle channel	2441MHz
Highest channel	2480MHz

2.6 Equipments Used During The Test

Conducted Emission at AC power line						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Date	Cal Due Date
Power absorbing clamp	SCHWARZ BECK	MESS-ELEKTRONIK	/	2025-03-24	2026-04-14	2027-04-13
Electric Network	SCHWARZ BECK	CAT5 8158	CAT5 8158#207	2025-03-24	2026-04-14	2027-04-13
Cable	SCHWARZ BECK	/	/	2025-03-19	2026-04-14	2027-04-13
Pulse Limiter	SCHWARZ BECK	VTSD 9561-F Pulse limiter 10dB Attenuation	561-G071	2025-12-05	2025-12-02	2026-12-01
Test Receiver	Rohde & Schwarz	ESPI TEST RECEIVER	1164.6607K03-102109-MH	2025-06-11	2026-04-14	2027-04-13
L.I.S.N	R&S	ESH3-Z5	831.5518.52	2025-12-11	2026-04-14	2027-04-13
L.I.S.N	SCHWARZ BECK	NSLK 8126	05055	2025-06-13	2026-04-14	2027-04-13
Pulse Limiter	CYBERTEK	EM5010A	/	2025-09-26	2026-04-14	2027-04-13
EMI test software	EZ -EMC	EZ	V1.1.42	/	/	/

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

Equipment	Manufacturer	Model No	Inventory No	Cal Date	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	2025-06-11	2026-04-14	2027-04-13
Vector Signal Generator	Keysight	N5181A	MY50143455	2024-12-06	2025-12-02	2026-12-01
Signal Generator	Keysight	N5182A	MY48180415	2024-12-06	2025-12-02	2026-12-01
Spectrum Analyzer	Keysight	N9020A	MY53420323	2024-12-06	2025-12-02	2026-12-01

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 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	2024-06-14	2026-04-14	2027-04-13
Cable(LF)#2	Schwarzbeck	/	/	2025-02-18	2026-04-13	2027-04-12
Cable(LF)#1	Schwarzbeck	/	/	2025-02-18	2026-04-14	2027-04-13
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2025-03-19	2026-04-14	2027-04-13
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2025-03-19	2026-04-14	2027-04-13
Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	2025-06-11	2026-04-14	2027-04-13
Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	2025-06-11	2026-04-14	2027-04-13
Wideband radio communication tester	R&S	CMW500	113410	2025-06-11	2026-04-14	2027-04-13
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-JR	2025-06-11	2026-04-14	2027-04-13
Test Receiver	R&S	ESCI 3	1166.5950K03-101431-Jq	2025-06-12	2026-04-14	2027-04-13
Horn Antenna	Sunol Sciences	DRH-118	A091114	2025-05-12	2026-04-14	2027-04-13
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	/	2024-09-28	2026-09-27

2.7 Statement Of The Measurement Uncertainty

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

2.8 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 Community, Shiyao 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 Community, Shiyao 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

2.9 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.
Test Method:	---

3.1.1 Conclusion:



4 Radio Spectrum Matter Test Results (RF)

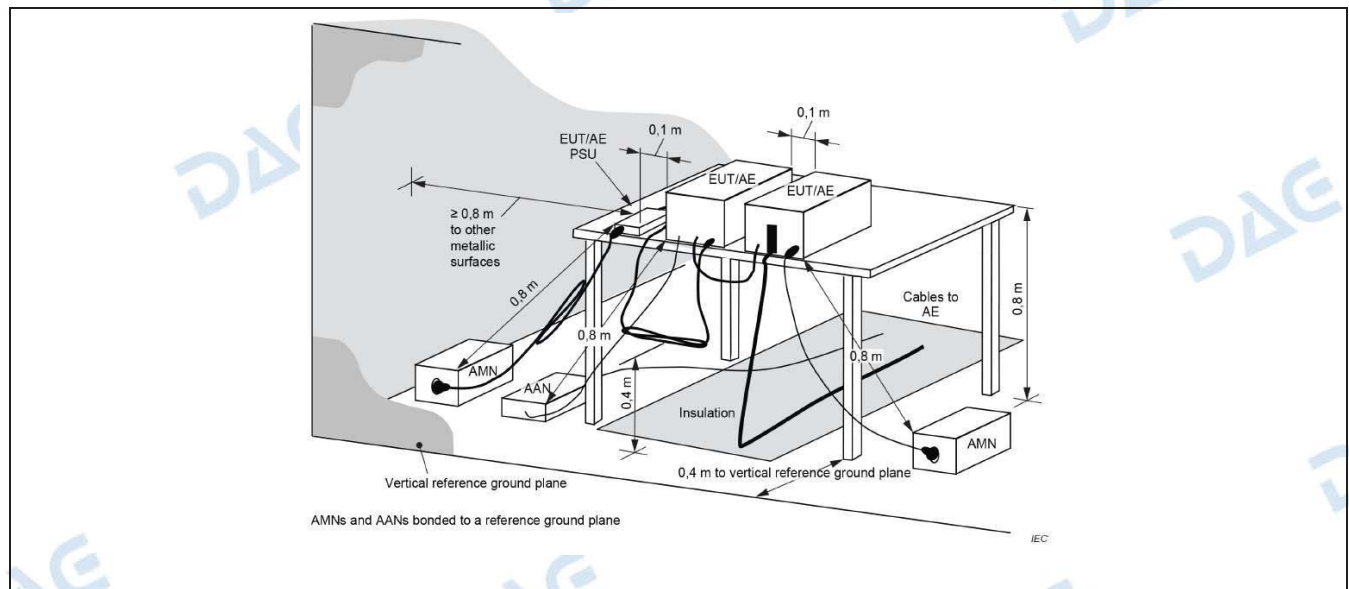
4.1 Conducted Emission at AC power line

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 μ H/50 ohms line impedance stabilization network (LISN).		
Test Limit:	Frequency of emission (MHz)	Conducted limit (dB μ V)	
		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:

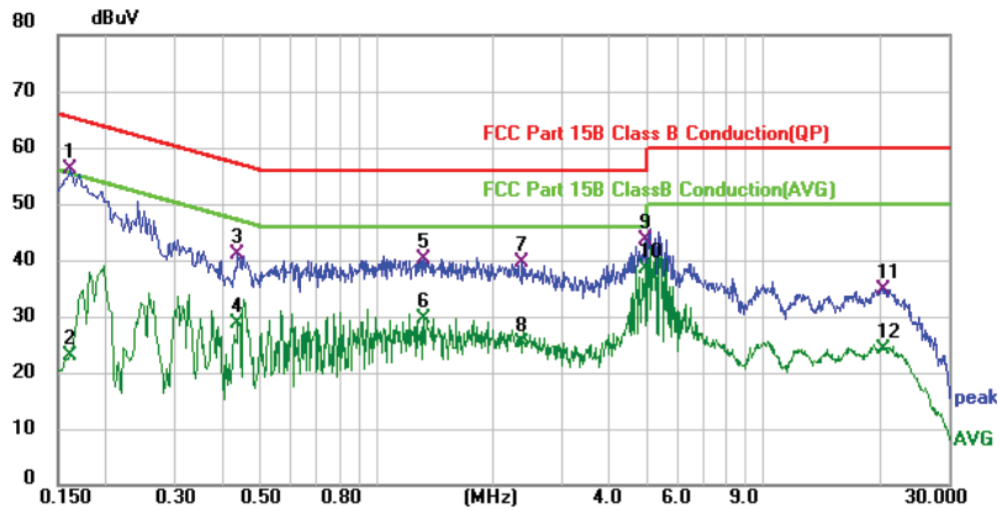
Operating Environment:					
Temperature:	22.9 °C	Humidity:	49 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:		TM1			
Final test mode:		TM1			

4.1.2 Test Setup Diagram:



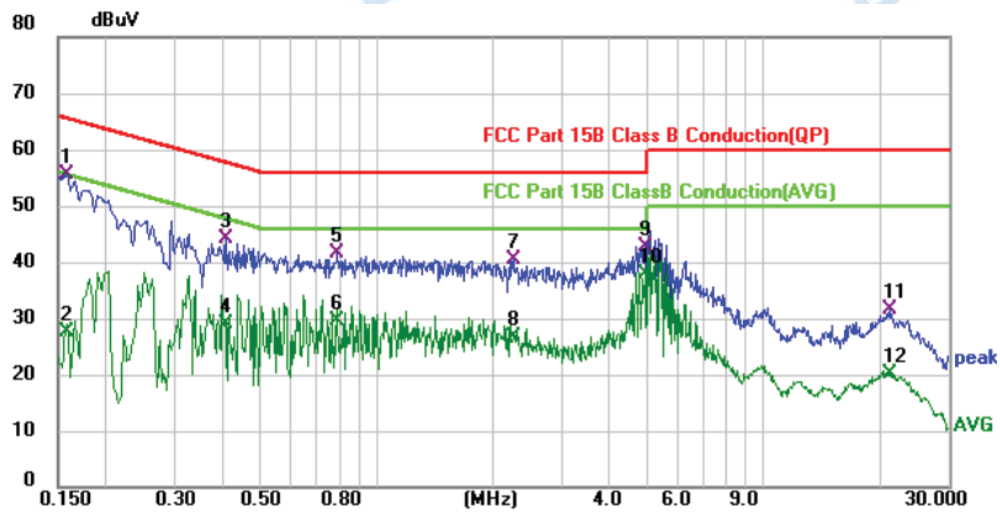
4.1.3 Test Data:

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



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1620	46.18	10.00	56.18	65.36	-9.18	QP	
2		0.1620	13.09	10.00	23.09	55.36	-32.27	AVG	
3		0.4380	31.07	10.00	41.07	57.10	-16.03	QP	
4		0.4380	18.71	10.00	28.71	47.10	-18.39	AVG	
5		1.3180	30.22	9.95	40.17	56.00	-15.83	QP	
6		1.3180	19.60	9.95	29.55	46.00	-16.45	AVG	
7		2.3780	29.74	9.80	39.54	56.00	-16.46	QP	
8		2.3780	15.57	9.80	25.37	46.00	-20.63	AVG	
9		4.9460	33.84	9.75	43.59	56.00	-12.41	QP	
10	*	4.9460	28.66	9.75	38.41	46.00	-7.59	AVG	
11		20.3460	27.12	7.67	34.79	60.00	-25.21	QP	
12		20.3460	16.39	7.67	24.06	50.00	-25.94	AVG	

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



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1580	45.54	9.98	55.52	65.57	-10.05	QP	
2		0.1580	17.63	9.98	27.61	55.57	-27.96	AVG	
3		0.4060	34.10	9.98	44.08	57.73	-13.65	QP	
4		0.4060	19.03	9.98	29.01	47.73	-18.72	AVG	
5		0.7940	31.57	9.99	41.56	56.00	-14.44	QP	
6		0.7940	19.50	9.99	29.49	46.00	-16.51	AVG	
7		2.2500	30.61	9.80	40.41	56.00	-15.59	QP	
8		2.2500	16.91	9.80	26.71	46.00	-19.29	AVG	
9		4.9460	32.78	9.89	42.67	56.00	-13.33	QP	
10	*	4.9460	28.10	9.89	37.99	46.00	-8.01	AVG	
11		21.2900	23.61	7.85	31.46	60.00	-28.54	QP	
12		21.2900	12.18	7.85	20.03	50.00	-29.97	AVG	

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. Measurement Level = Reading level + Correct Factor, Over = Limit - Measurement

4.2 20dB Bandwidth

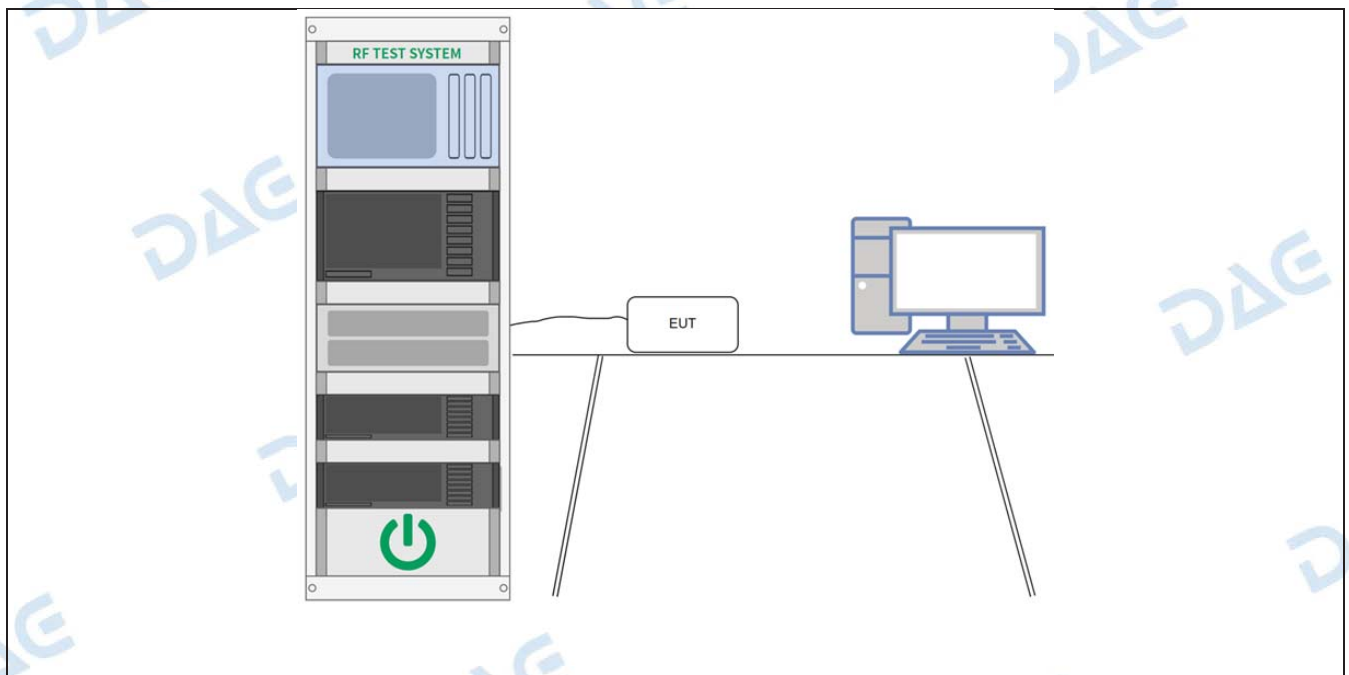
Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of 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:	23.4 °C	Humidity:	51 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

4.2.2 Test Setup Diagram:

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4.2.3 Test Data:

Please Refer to Appendix for Details.

4.3 Maximum Conducted Output Power

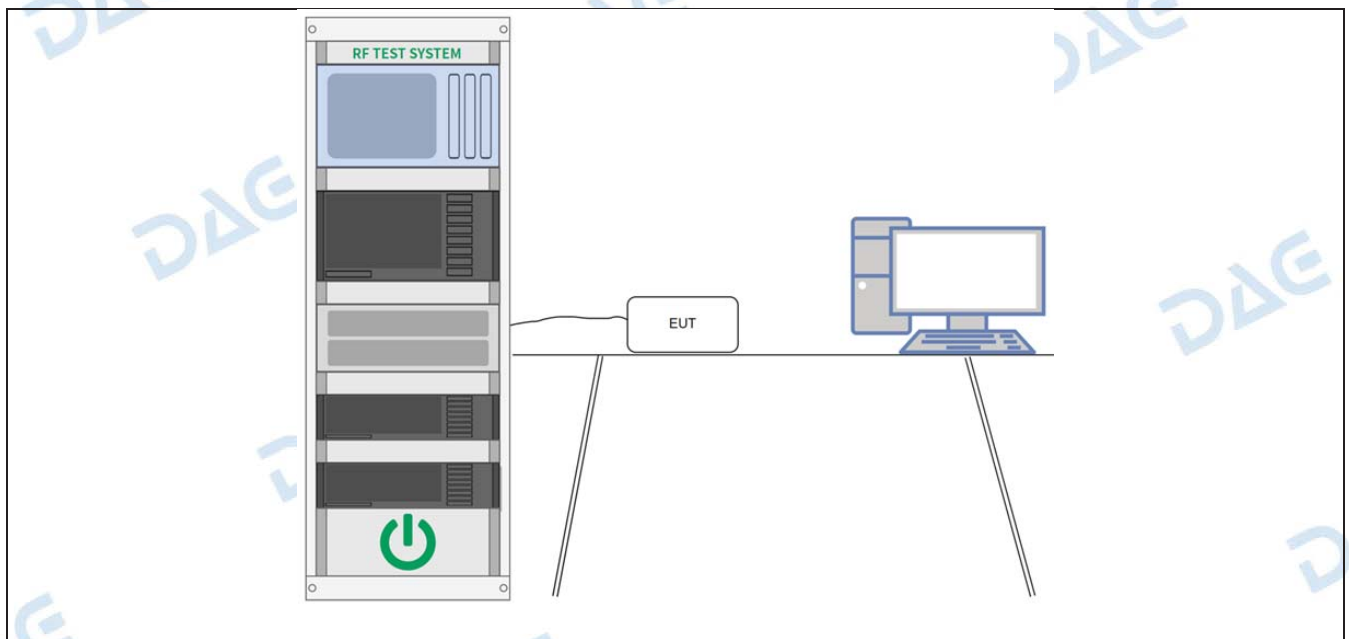
Test Requirement:	47 CFR 15.247(b)(1)
Test Limit:	Refer to 47 CFR 15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping 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. 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:	22 °C	Humidity:	54 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

4.3.2 Test Setup Diagram:

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4.3.3 Test Data:

Please Refer to Appendix for Details.

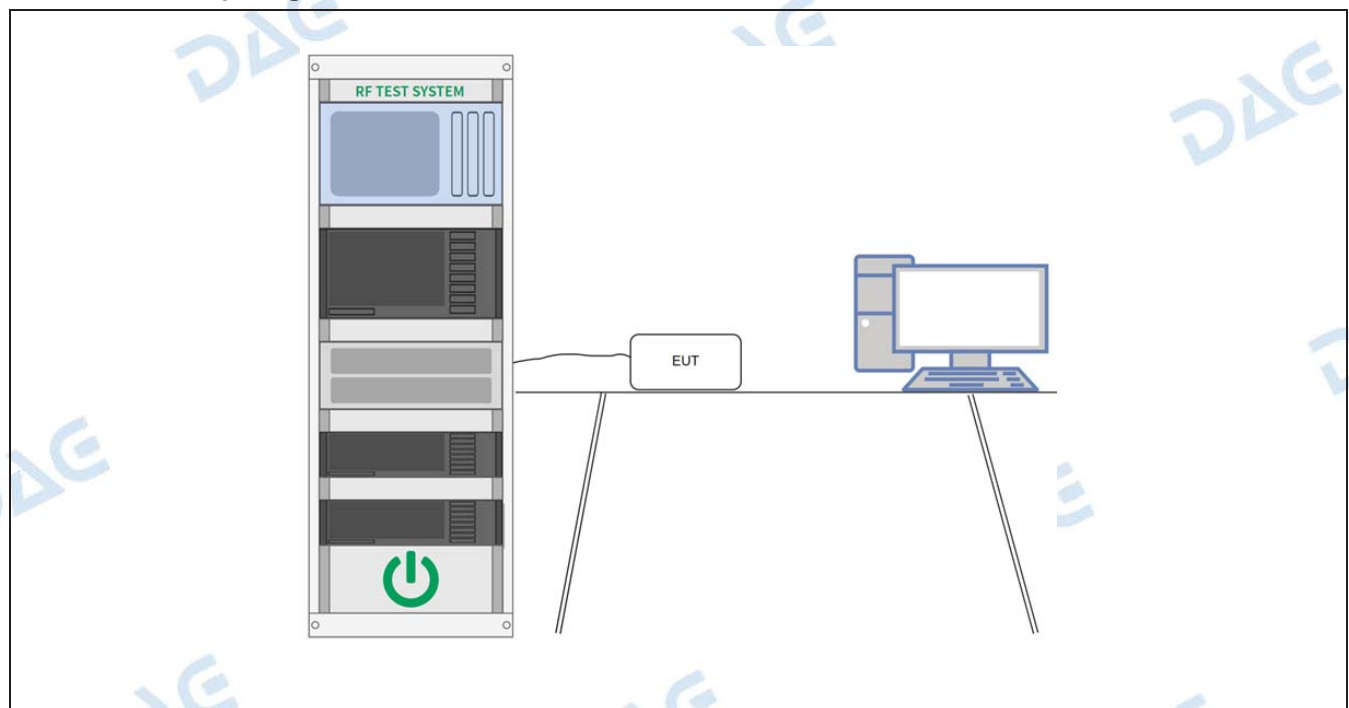
4.4 Channel Separation

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) $\geq$ RBW. d) Sweep: No faster than coupled (auto) time. 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 spectral plot of the data shall be included in the test report.

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23.9 °C	Humidity:	50 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

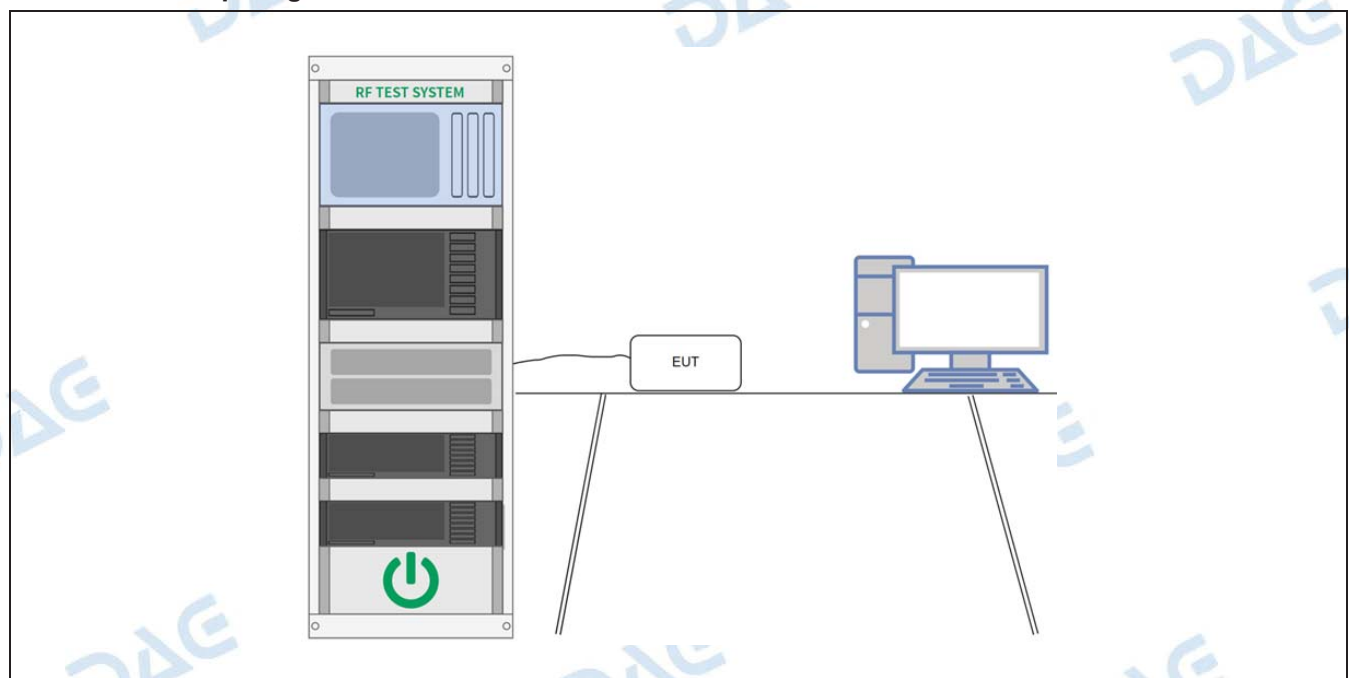
4.5 Number of Hopping Frequencies

Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), 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 7.8.3 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 $\geq$ RBW. d) Sweep: No faster than coupled (auto) time. 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 spectral plot of the data shall be included in the test report.

4.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.8 °C	Humidity:	46 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

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 then 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 $\leq$ channel spacing and where possible RBW should be set $\gg 1/T$, 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 = $1/\text{hopping rate}$) 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

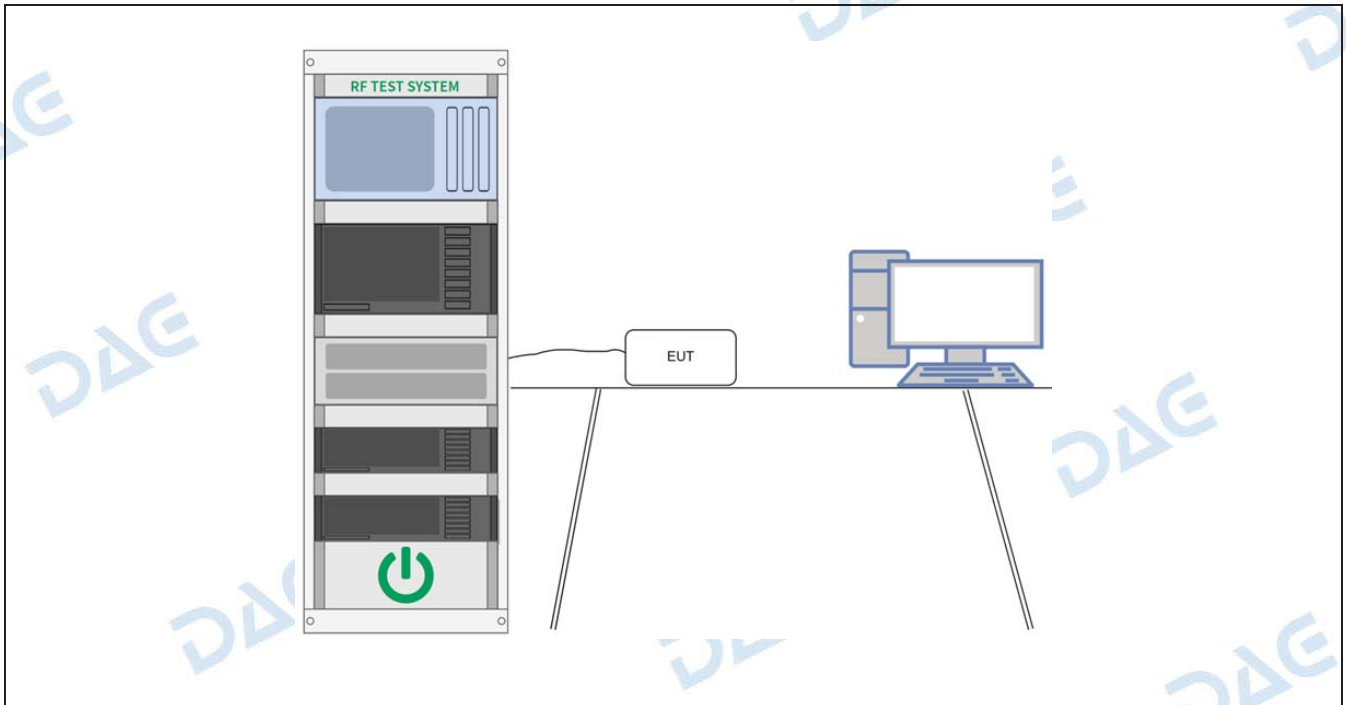
period is calculated from the number of hops on the channel divided by the spectrum analyzer sweep time multiplied by the regulatory observation period. For example, if three hops are counted with an analyzer sweep time of 500 ms and the regulatory observation period is 10 s, then the number of hops in that ten seconds is $3 / 0.5 \times 10$, 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:	50 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

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

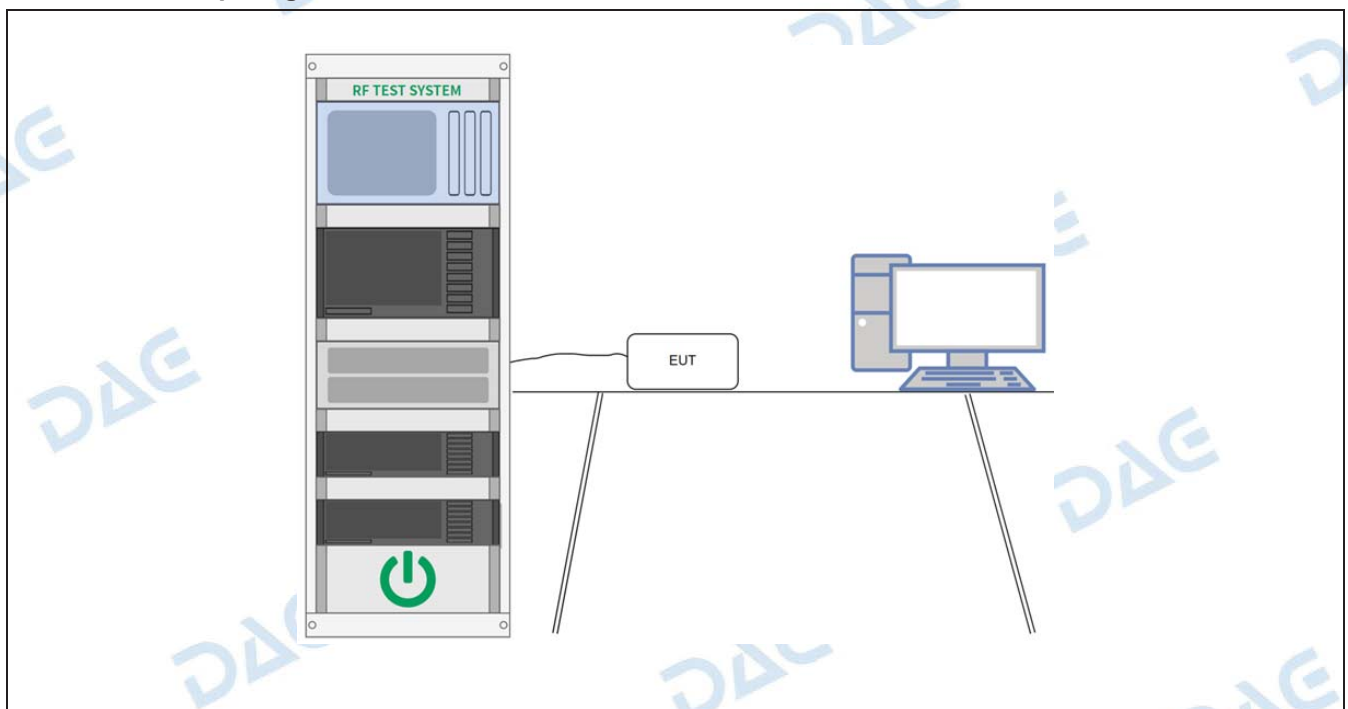
Test Requirement:	47 CFR 15.247(d)
Test Limit:	Refer to 47 CFR 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 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 ANSI C63.10-2020+Cor 1-2023 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.
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4.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	23 °C	Humidity:	50 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

4.7.2 Test Setup Diagram:



4.7.3 Test Data:

Please Refer to Appendix for Details.

4.8 Band edge emissions (Radiated)

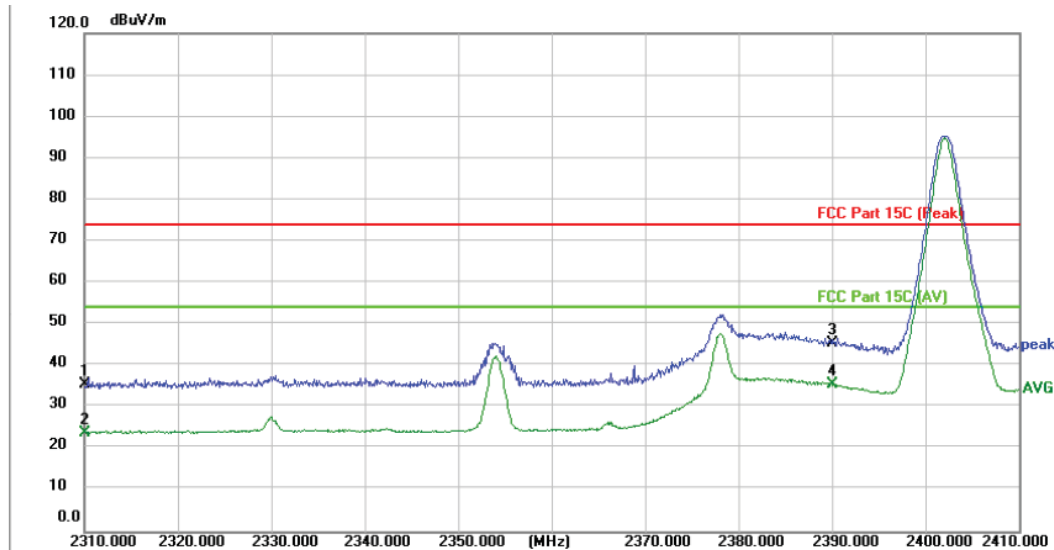
Test Requirement:	Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).		
Test Limit:	Frequency (MHz)	Field strength (microvolts/meter)	Measurement 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:	22.2 °C	Humidity:	50 %
Atmospheric Pressure:	101.2 kPa		
Pretest mode:	TM1		
Final test mode:	TM1		

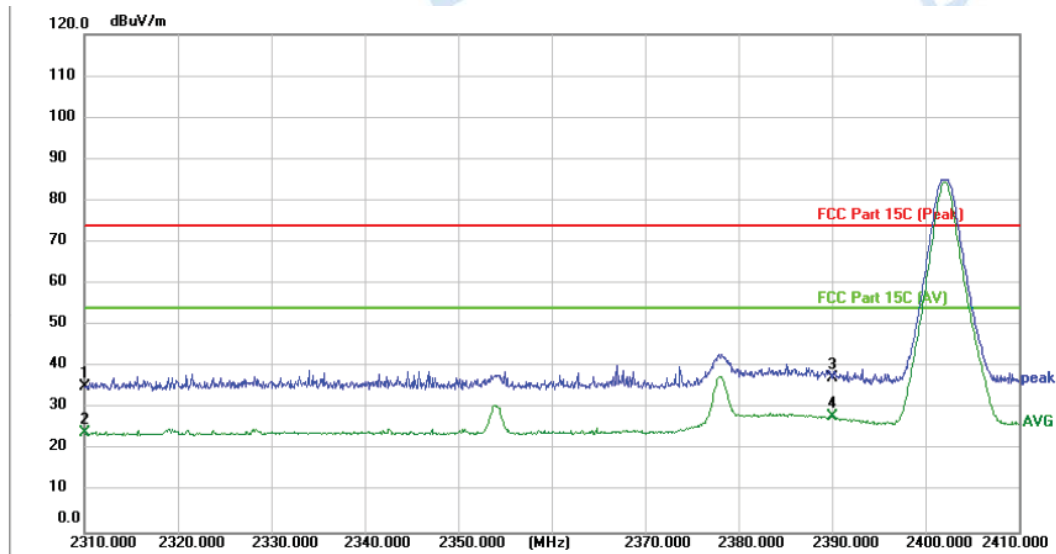
4.8.2 Test Data:

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



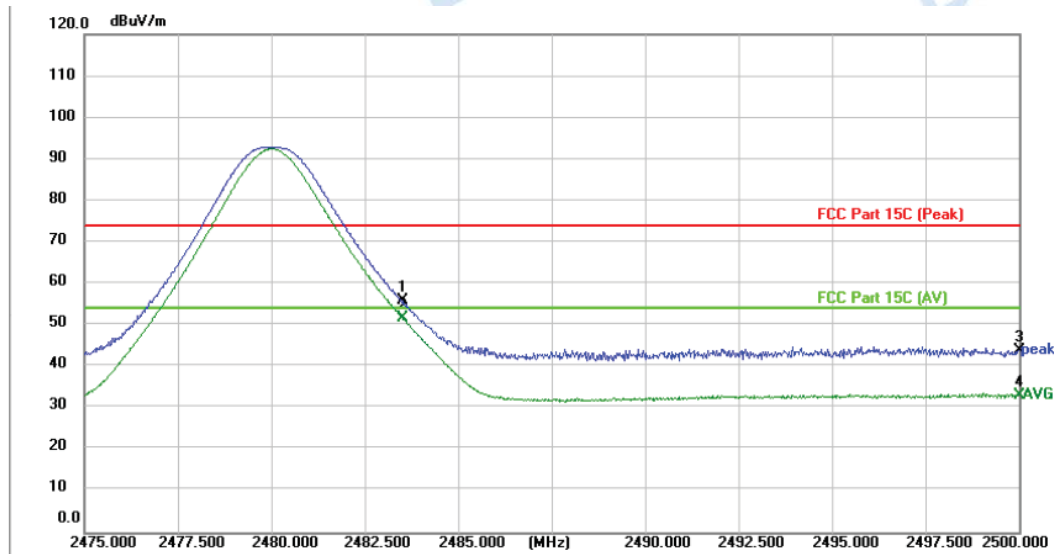
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		P/F	Remark
1	2310.000	42.27	-6.63	35.64	74.00	-38.36	peak		P	
2	2310.000	30.61	-6.63	23.98	54.00	-30.02	AVG		P	
3	2390.000	51.82	-6.42	45.40	74.00	-28.60	peak		P	
4 *	2390.000	42.11	-6.42	35.69	54.00	-18.31	AVG		P	

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



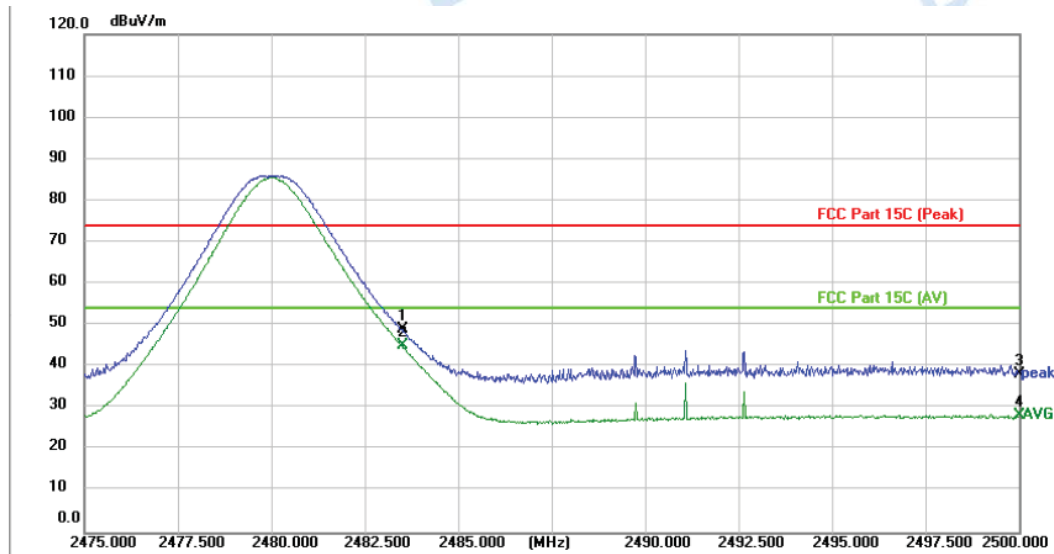
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		P/F	Remark
1	2310.000	41.99	-6.63	35.36	74.00	-38.64	peak		P	
2	2310.000	30.64	-6.63	24.01	54.00	-29.99	AVG		P	
3	2390.000	43.89	-6.42	37.47	74.00	-36.53	peak		P	
4 *	2390.000	34.44	-6.42	28.02	54.00	-25.98	AVG		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			P/F	Remark
1	2483.500	62.00	-6.17	55.83	74.00	-18.17	peak			P	
2 *	2483.500	58.05	-6.17	51.88	54.00	-2.12	AVG			P	
3	2500.000	50.02	-6.13	43.89	74.00	-30.11	peak			P	
4	2500.000	39.15	-6.13	33.02	54.00	-20.98	AVG			P	

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



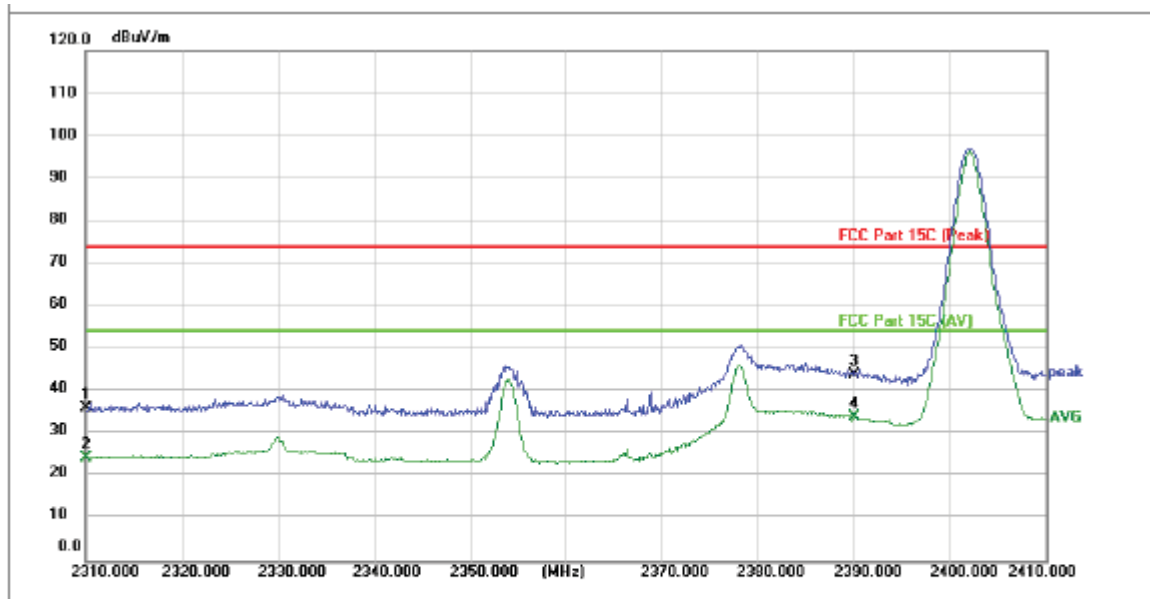
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			P/F	Remark
1	2483.500	55.15	-6.17	48.98	74.00	-25.02	peak			P	
2 *	2483.500	51.19	-6.17	45.02	54.00	-8.98	AVG			P	
3	2500.000	44.46	-6.13	38.33	74.00	-35.67	peak			P	
4	2500.000	34.41	-6.13	28.28	54.00	-25.72	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.

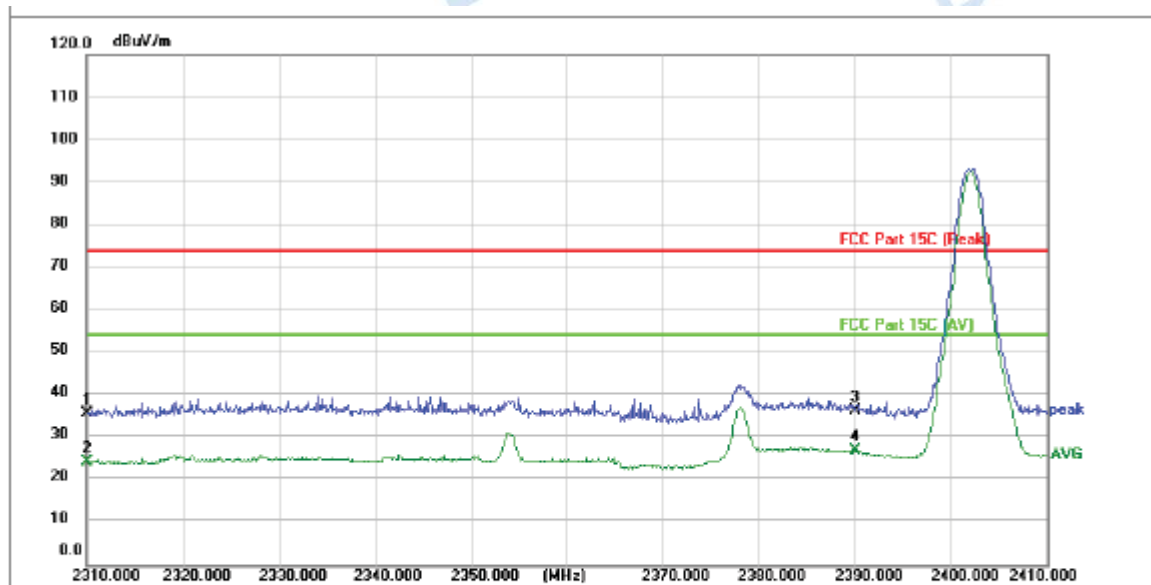
Module 1+ Module 2 simultaneous transmission:

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



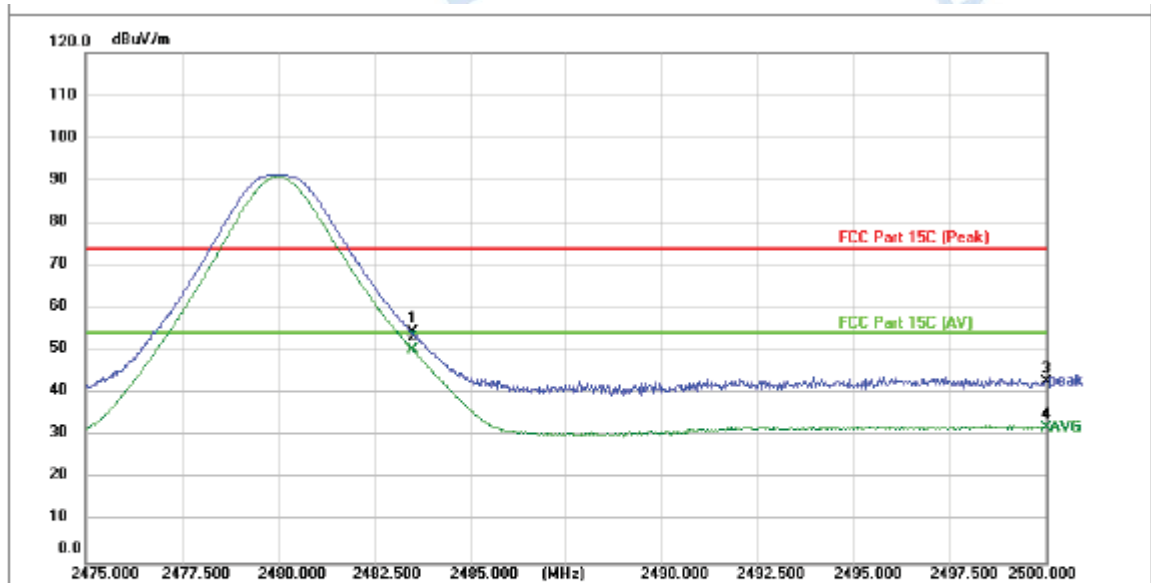
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		P/F	Remark
1	2310.000	42.77	-6.63	36.14	74.00	-37.86	peak		P	
2	2310.000	31.11	-6.63	24.48	54.00	-29.52	AVG		P	
3	2390.000	50.32	-6.42	43.90	74.00	-30.10	peak		P	
4 *	2390.000	40.61	-6.42	34.19	54.00	-19.81	AVG		P	

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



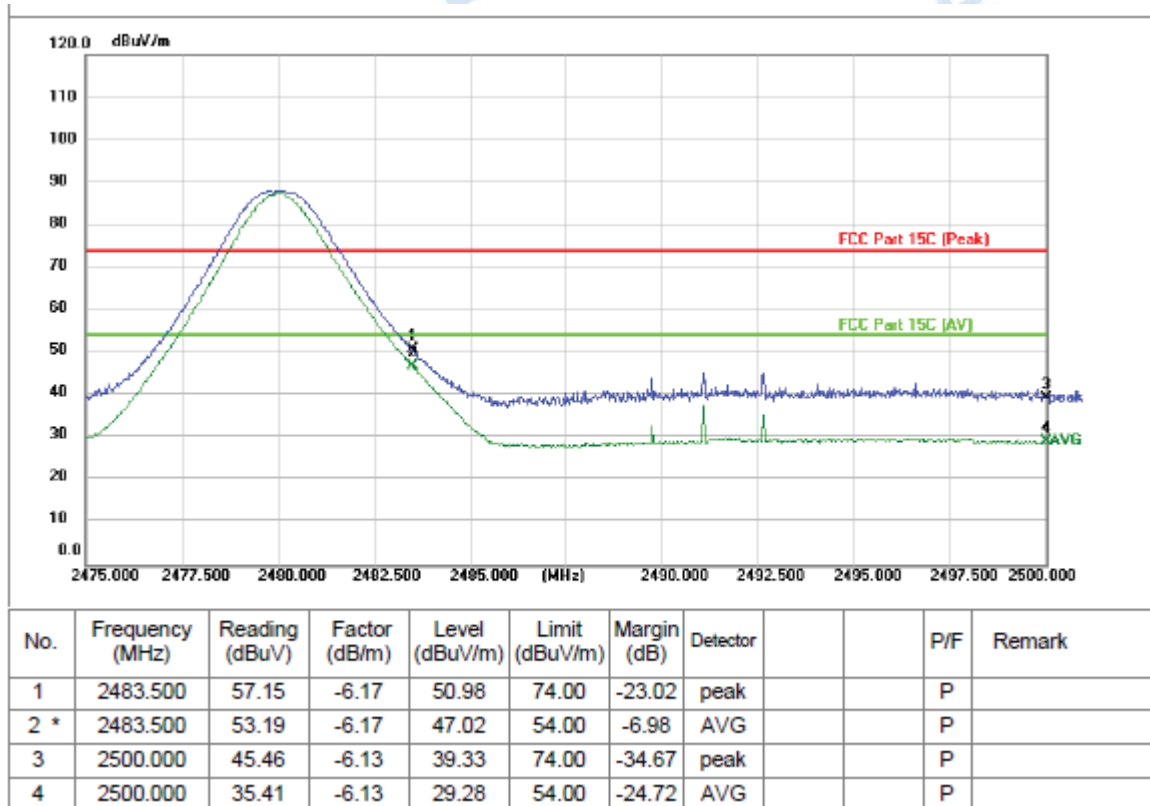
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		P/F	Remark
1	2310.000	42.49	-6.63	35.86	74.00	-38.14	peak		P	
2	2310.000	31.14	-6.63	24.51	54.00	-29.49	AVG		P	
3	2390.000	42.89	-6.42	36.47	74.00	-37.53	peak		P	
4 *	2390.000	33.44	-6.42	27.02	54.00	-26.98	AVG		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		P/F	Remark
1	2483.500	60.50	-6.17	54.33	74.00	-19.67	peak		P	
2 *	2483.500	56.55	-6.17	50.38	54.00	-3.62	AVG		P	
3	2500.000	49.02	-6.13	42.89	74.00	-31.11	peak		P	
4	2500.000	38.15	-6.13	32.02	54.00	-21.98	AVG		P	

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



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)

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 6.5.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	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		

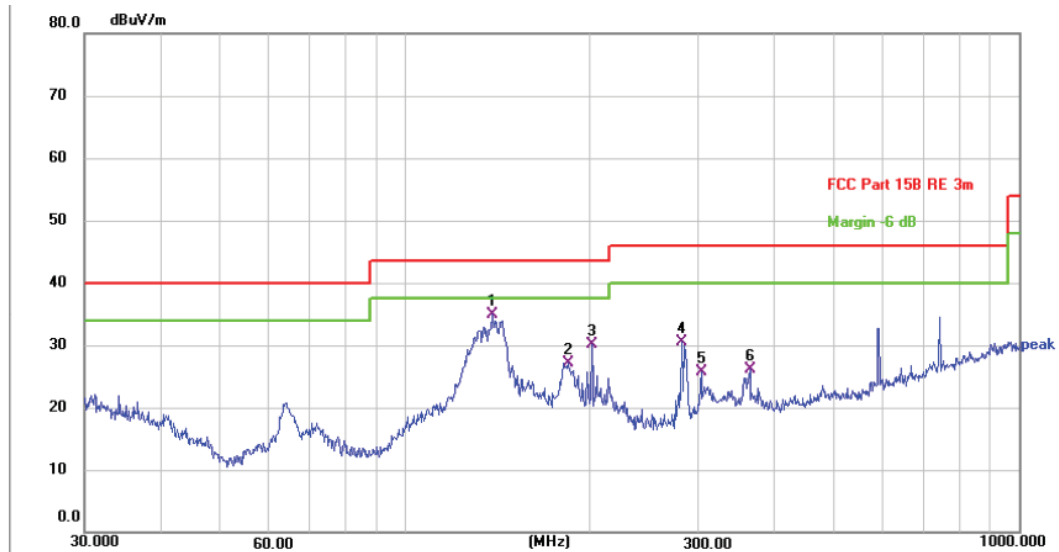
	channel. Only the worst case is recorded in the report. 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level = Receiver Reading + Antenna Factor + Cable Factor + Preamplifier Factor 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.
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4.9.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	46 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

4.9.2 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 *	138.3873	42.09	-7.26	34.83	43.50	-8.67	QP	100		P	
2	184.4898	36.73	-9.57	27.16	43.50	-16.34	QP	100		P	
3	201.3930	39.89	-9.71	30.18	43.50	-13.32	QP	100		P	
4	281.9946	38.45	-7.93	30.52	46.00	-15.48	QP	100		P	
5	303.5437	33.88	-8.14	25.74	46.00	-20.26	QP	100		P	
6	364.2595	32.65	-6.61	26.04	46.00	-19.96	QP	100		P	

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



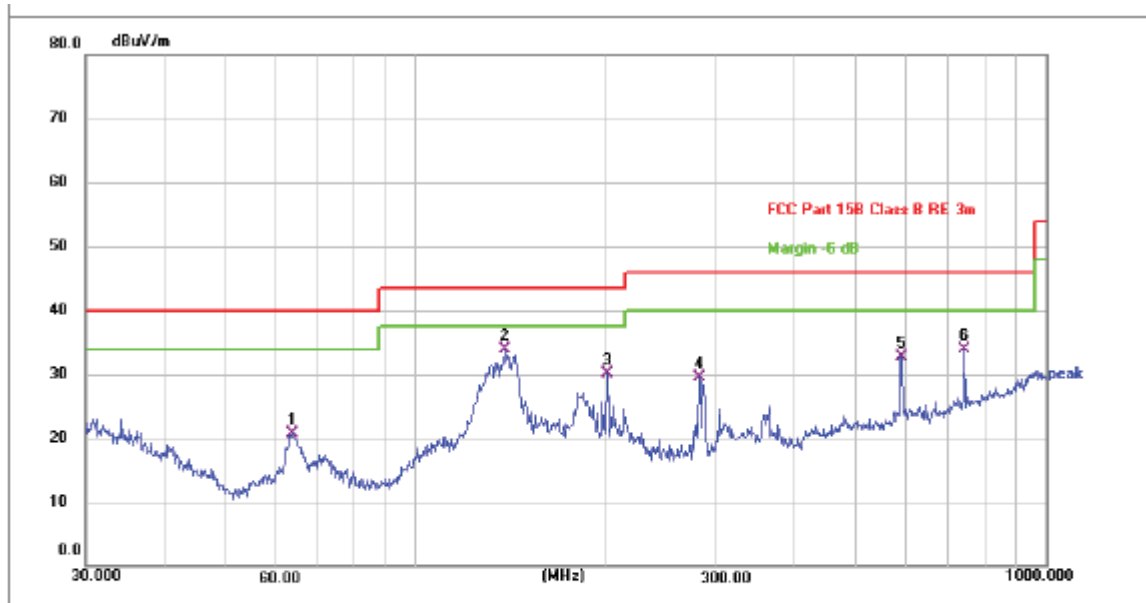
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 *	140.3421	44.09	-7.33	36.76	43.50	-6.74	QP	100		P	
2	168.4138	36.04	-8.78	27.26	43.50	-16.24	QP	100		P	
3	281.9946	38.26	-8.17	30.09	46.00	-15.91	QP	100		P	
4	364.2595	32.20	-6.76	25.44	46.00	-20.56	QP	100		P	
5	444.8514	32.27	-4.62	27.65	46.00	-18.35	QP	100		P	
6	588.9051	35.81	-1.81	34.00	46.00	-12.00	QP	100		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 of GFSK 1MHz recorded in the test report.

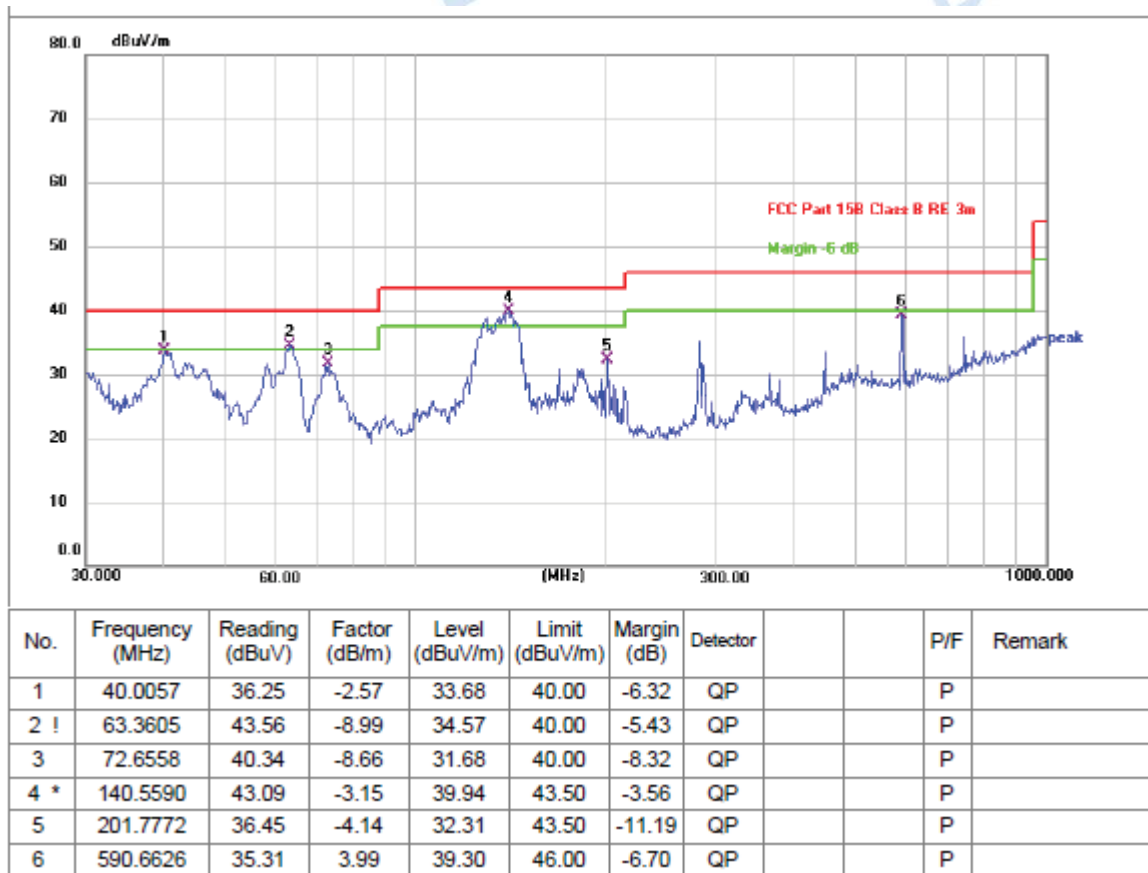
Module 1+ Module 2 simultaneous transmission:

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		P/F	Remark
1	63.7588	34.70	-13.95	20.75	40.00	-19.25	QP		P	
2 *	138.3873	41.09	-7.26	33.83	43.50	-9.67	QP		P	
3	201.3930	39.89	-9.71	30.18	43.50	-13.32	QP		P	
4	281.9945	37.45	-7.93	29.52	46.00	-16.48	QP		P	
5	590.9737	34.53	-1.77	32.76	46.00	-13.24	QP		P	
6	742.2586	32.74	1.25	33.99	46.00	-12.01	QP		P	

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



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 of GFSK 1MHz recorded in the test report.

4.10 Emissions in frequency bands (above 1GHz)

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 6.5.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	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:		

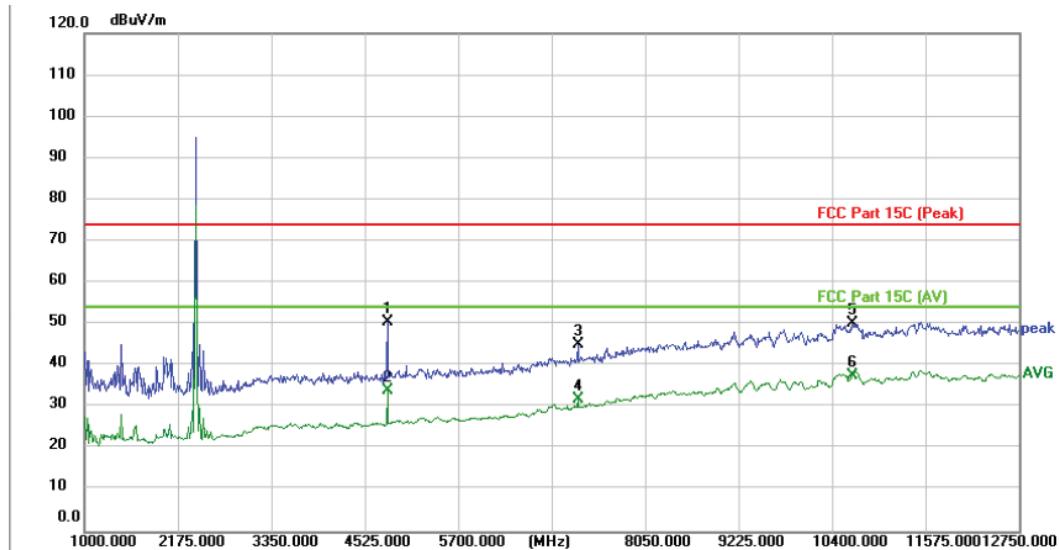
	1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report. 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level = Receiver Reading + Antenna Factor + Cable Factor + 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.
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4.10.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.2 °C	Humidity:	49 %	Atmospheric Pressure:	101.2 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

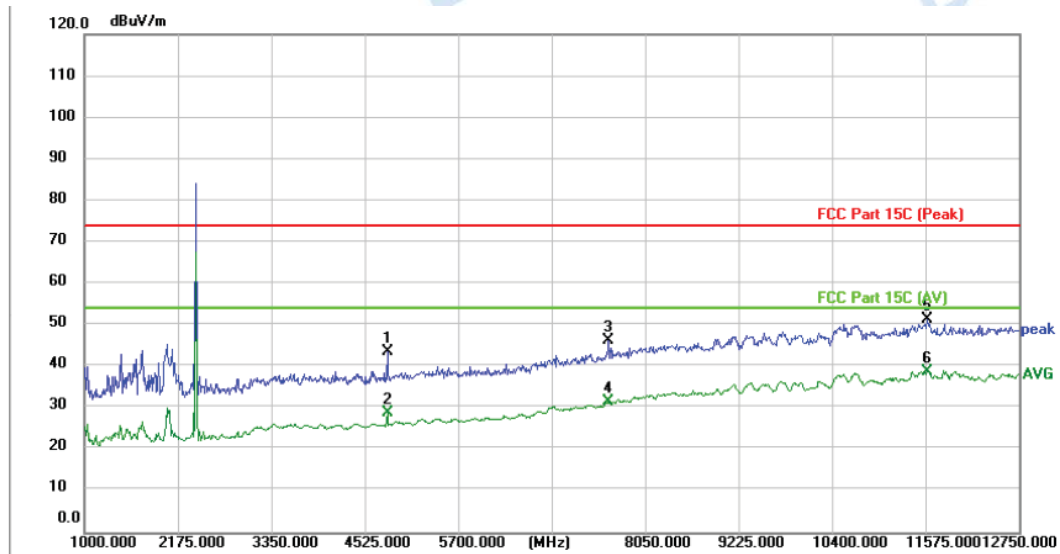
4.10.2 Test Data:

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



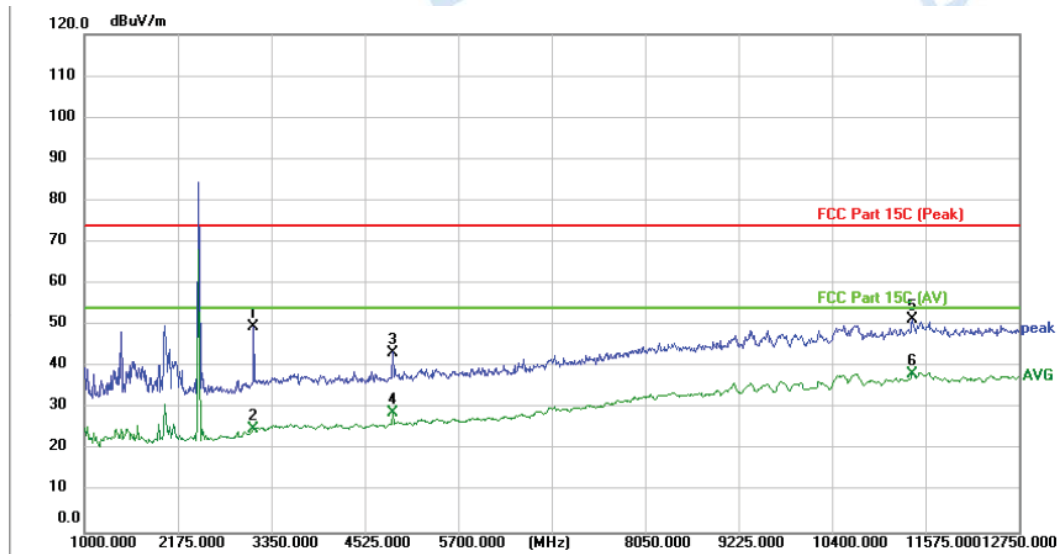
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		P/F	Remark
1	4807.000	51.30	-0.69	50.61	74.00	-23.39	peak		P	
2	4807.000	34.75	-0.69	34.06	54.00	-19.94	AVG		P	
3	7204.000	40.72	4.37	45.09	74.00	-28.91	peak		P	
4	7204.000	27.66	4.37	32.03	54.00	-21.97	AVG		P	
5	10658.500	41.14	9.12	50.26	74.00	-23.74	peak		P	
6 *	10658.500	28.68	9.12	37.80	54.00	-16.20	AVG		P	

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



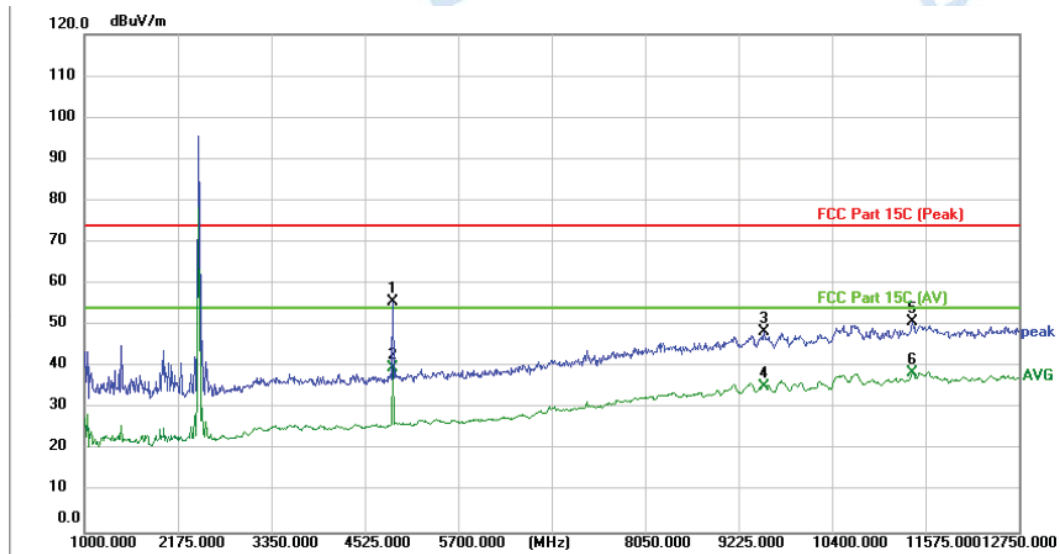
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			P/F	Remark
1	4807.000	44.25	-0.69	43.56	74.00	-30.44	peak			P	
2	4807.000	29.57	-0.69	28.88	54.00	-25.12	AVG			P	
3	7591.750	40.99	5.22	46.21	74.00	-27.79	peak			P	
4	7591.750	26.31	5.22	31.53	54.00	-22.47	AVG			P	
5	11598.500	41.67	9.73	51.40	74.00	-22.60	peak			P	
6 *	11598.500	29.01	9.73	38.74	54.00	-15.26	AVG			P	

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



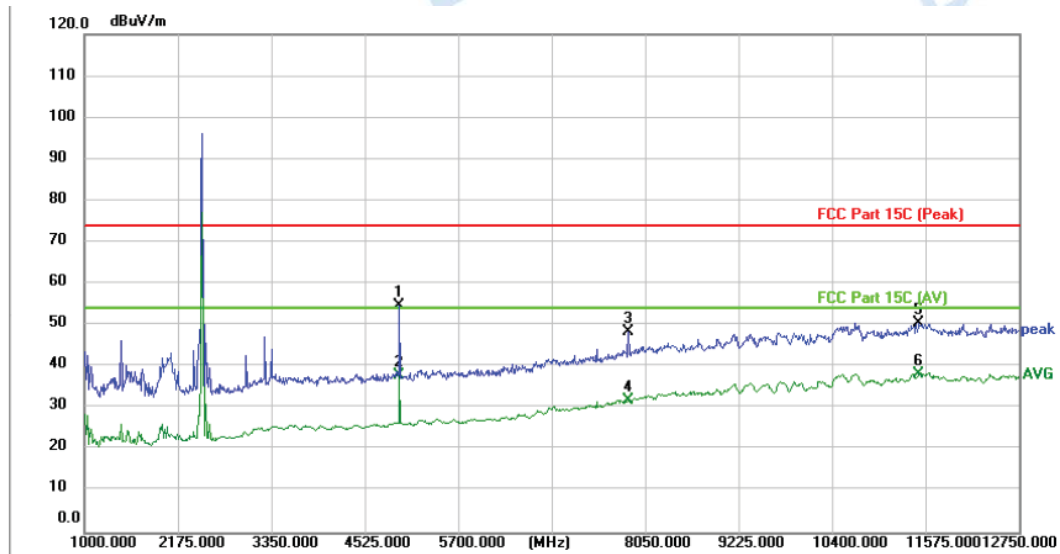
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			P/F	Remark
1	3126.750	54.49	-4.87	49.62	74.00	-24.38	peak			P	
2	3126.750	29.92	-4.87	25.05	54.00	-28.95	AVG			P	
3	4877.500	43.95	-0.45	43.50	74.00	-30.50	peak			P	
4	4877.500	29.44	-0.45	28.99	54.00	-25.01	AVG			P	
5	11410.500	41.79	9.61	51.40	74.00	-22.60	peak			P	
6 *	11410.500	28.72	9.61	38.33	54.00	-15.67	AVG			P	

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



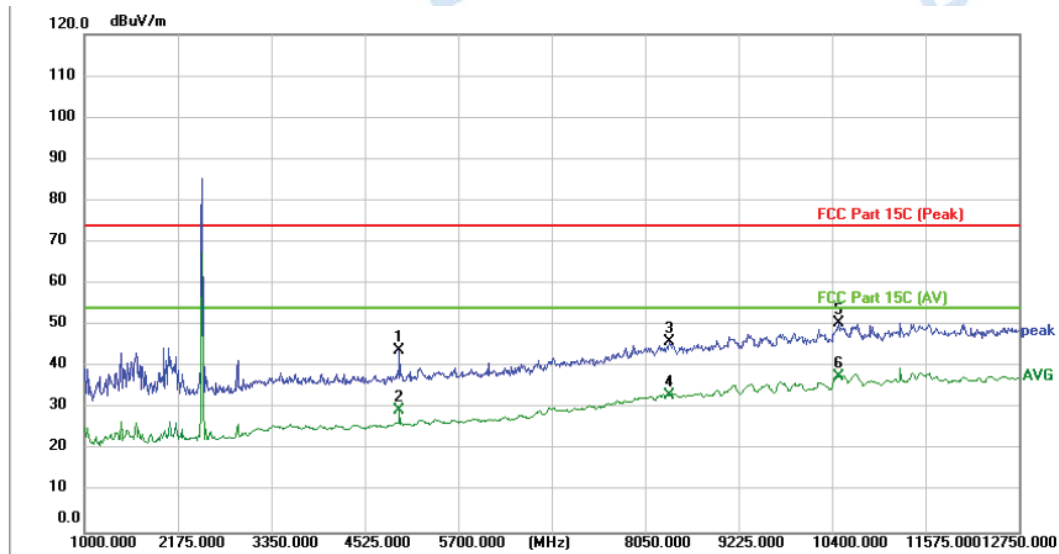
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			P/F	Remark
1	4877.500	56.04	-0.45	55.59	74.00	-18.41	peak			P	
2 *	4877.500	40.06	-0.45	39.61	54.00	-14.39	AVG			P	
3	9542.250	40.29	8.10	48.39	74.00	-25.61	peak			P	
4	9542.250	27.30	8.10	35.40	54.00	-18.60	AVG			P	
5	11410.500	41.19	9.61	50.80	74.00	-23.20	peak			P	
6	11410.500	28.84	9.61	38.45	54.00	-15.55	AVG			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			P/F	Remark
1	4959.750	55.04	-0.17	54.87	74.00	-19.13	peak			P	
2	4959.750	38.11	-0.17	37.94	54.00	-16.06	AVG			P	
3	7838.500	42.45	6.10	48.55	74.00	-25.45	peak			P	
4	7838.500	25.77	6.10	31.87	54.00	-22.13	AVG			P	
5	11492.750	40.92	9.66	50.58	74.00	-23.42	peak			P	
6 *	11492.750	28.71	9.66	38.37	54.00	-15.63	AVG			P	

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



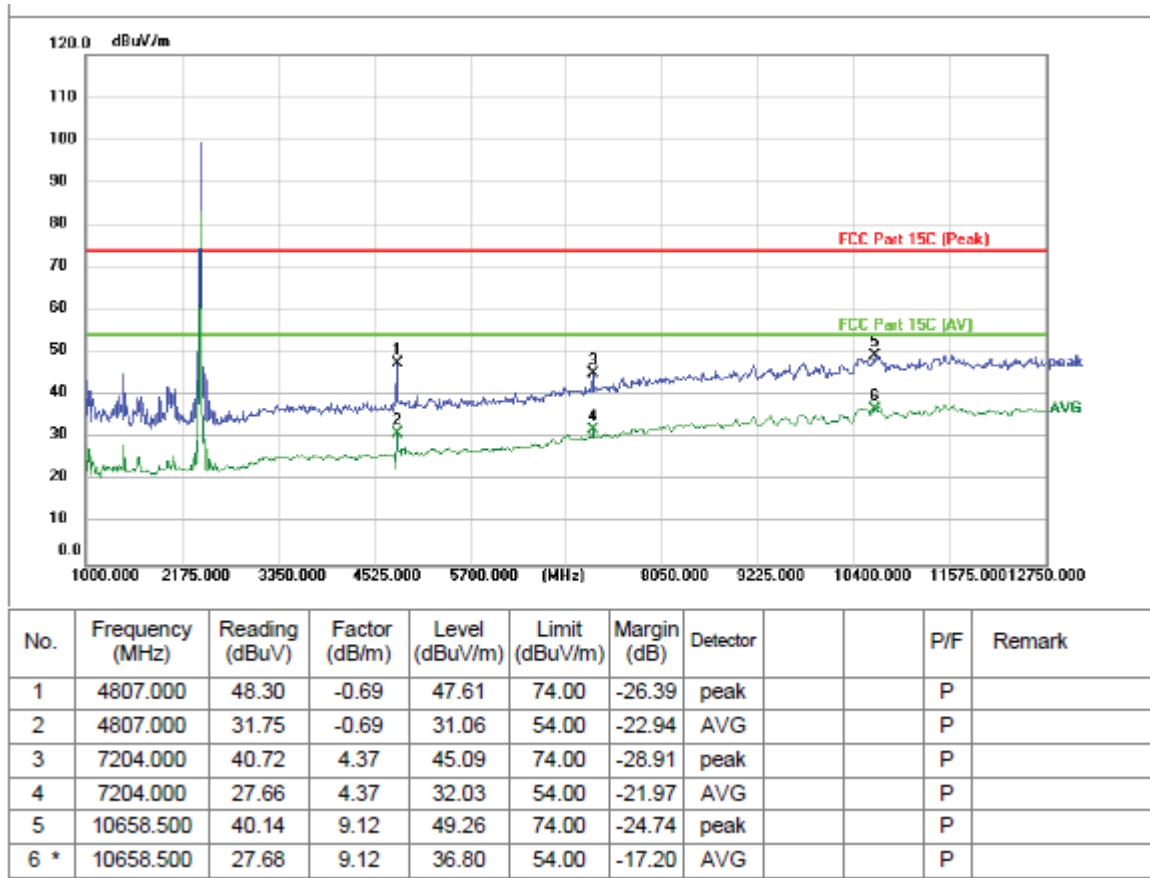
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector		P/F	Remark
1	4959.750	44.26	-0.17	44.09	74.00	-29.91	peak		P	
2	4959.750	29.66	-0.17	29.49	54.00	-24.51	AVG		P	
3	8355.500	38.70	7.21	45.91	74.00	-28.09	peak		P	
4	8355.500	26.06	7.21	33.27	54.00	-20.73	AVG		P	
5	10482.250	41.53	8.97	50.50	74.00	-23.50	peak		P	
6 *	10482.250	28.82	8.97	37.79	54.00	-16.21	AVG		P	

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

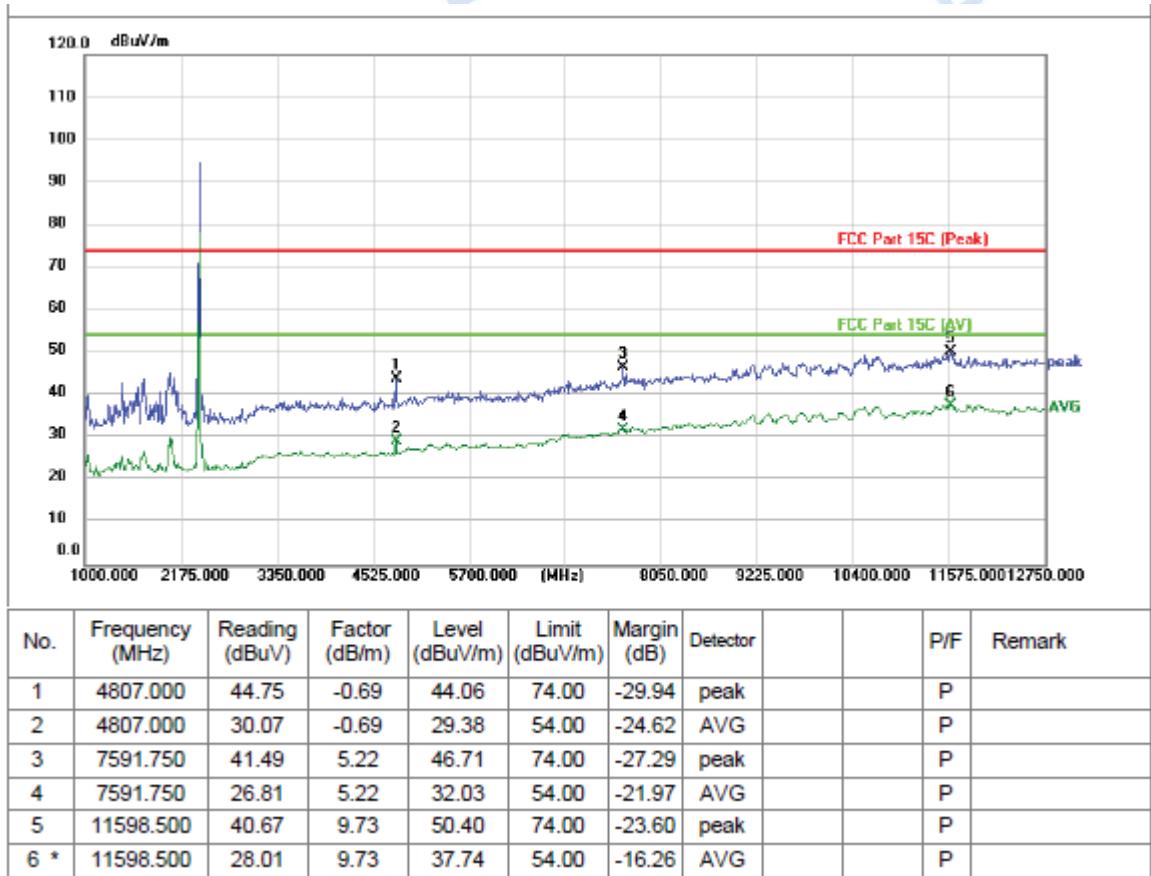
The test software will only record the worst test angle and height, and only the worst case will be recorded in the test report.

Module 1+ Module 2 simultaneous transmission:

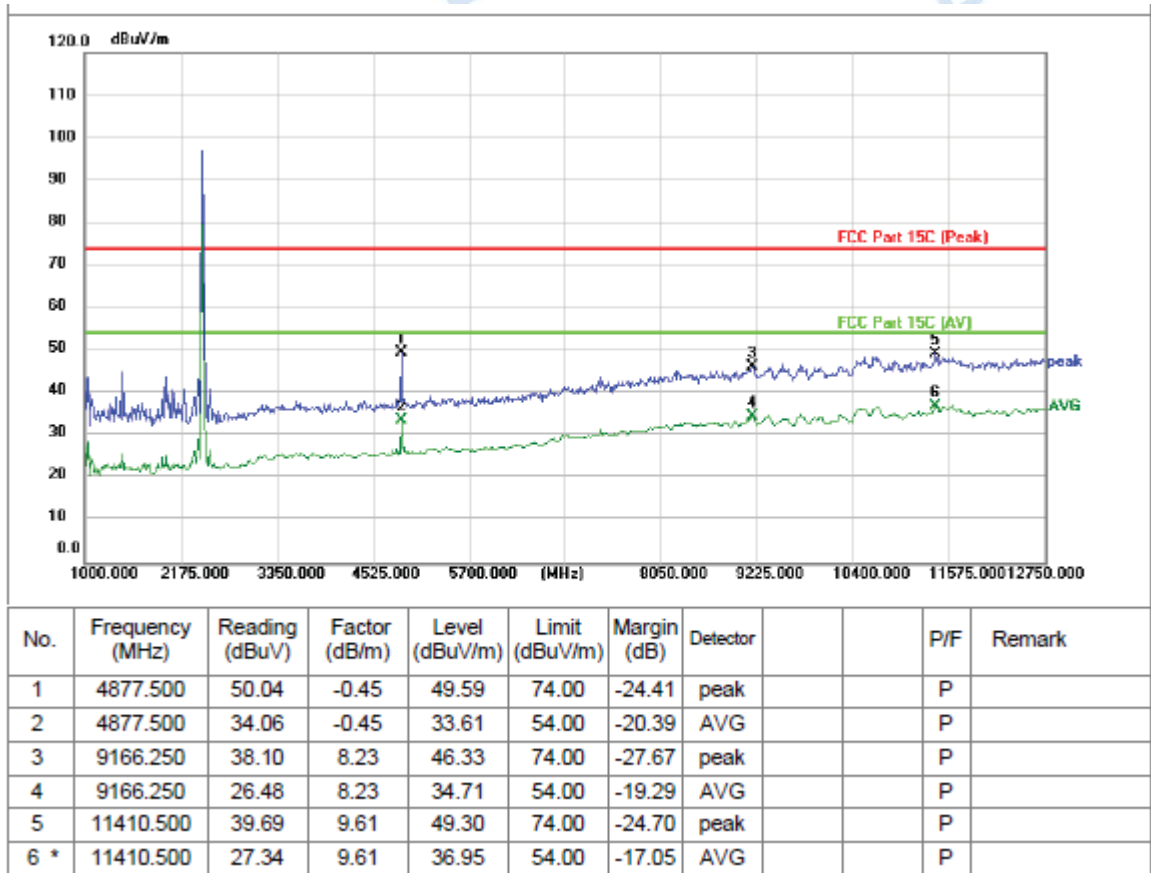
TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



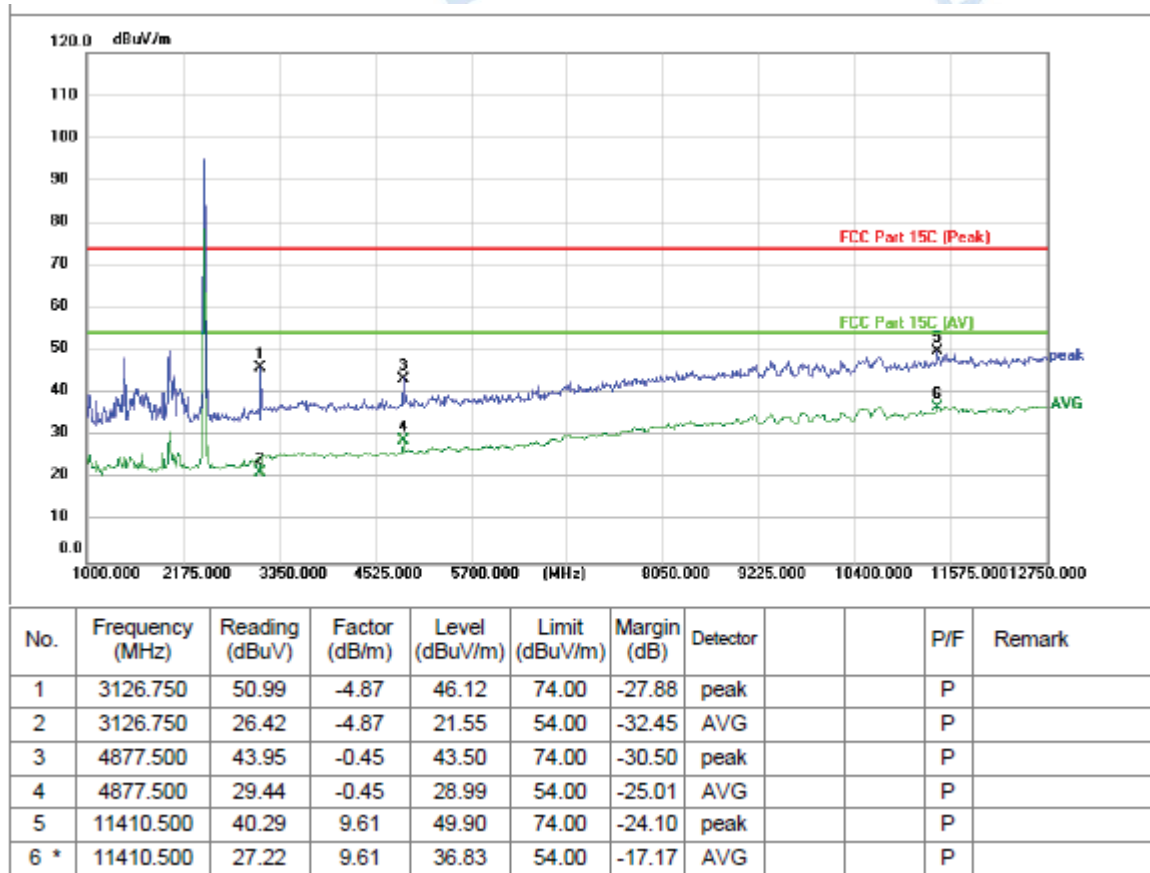
TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



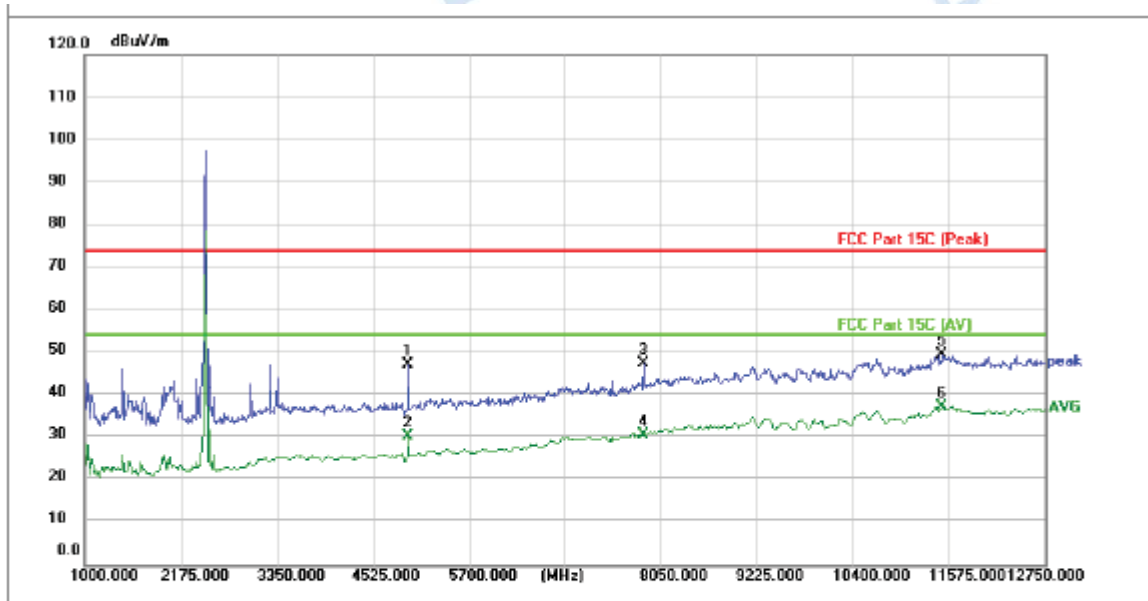
TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: M



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

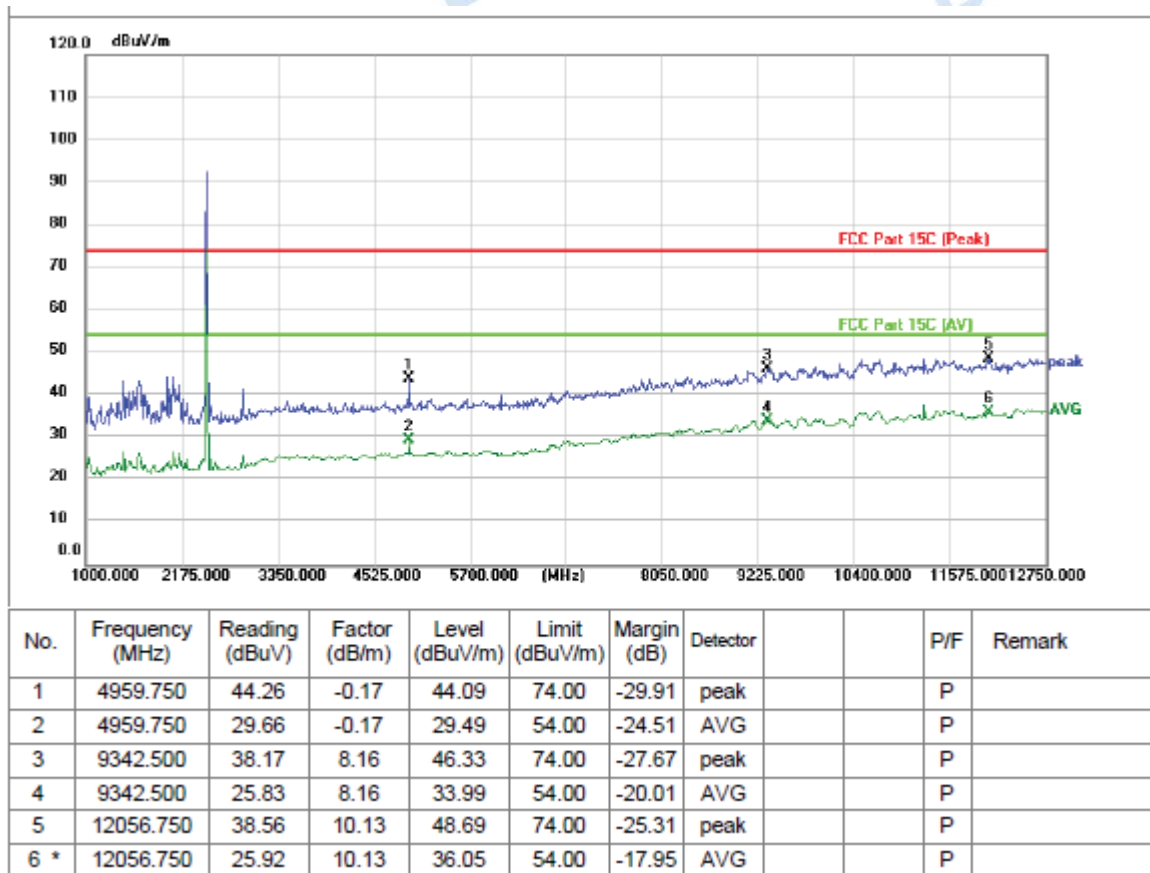


TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector			P/F	Remark
1	4959.750	47.54	-0.17	47.37	74.00	-26.63	peak			P	
2	4959.750	30.61	-0.17	30.44	54.00	-23.56	AVG			P	
3	7838.500	41.45	6.10	47.55	74.00	-26.45	peak			P	
4	7838.500	24.77	6.10	30.87	54.00	-23.13	AVG			P	
5	11492.750	39.92	9.66	49.58	74.00	-24.42	peak			P	
6 *	11492.750	27.71	9.66	37.37	54.00	-16.63	AVG			P	

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



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

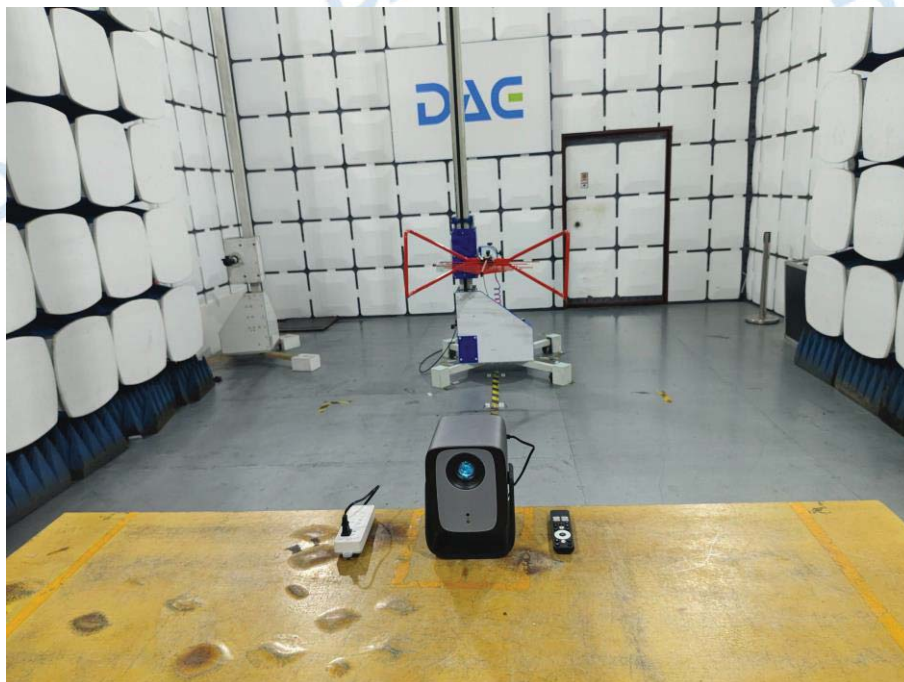
The test software will only record the worst test angle and height, and only the worst case will be recorded in the test report.

5 TEST SETUP PHOTOS

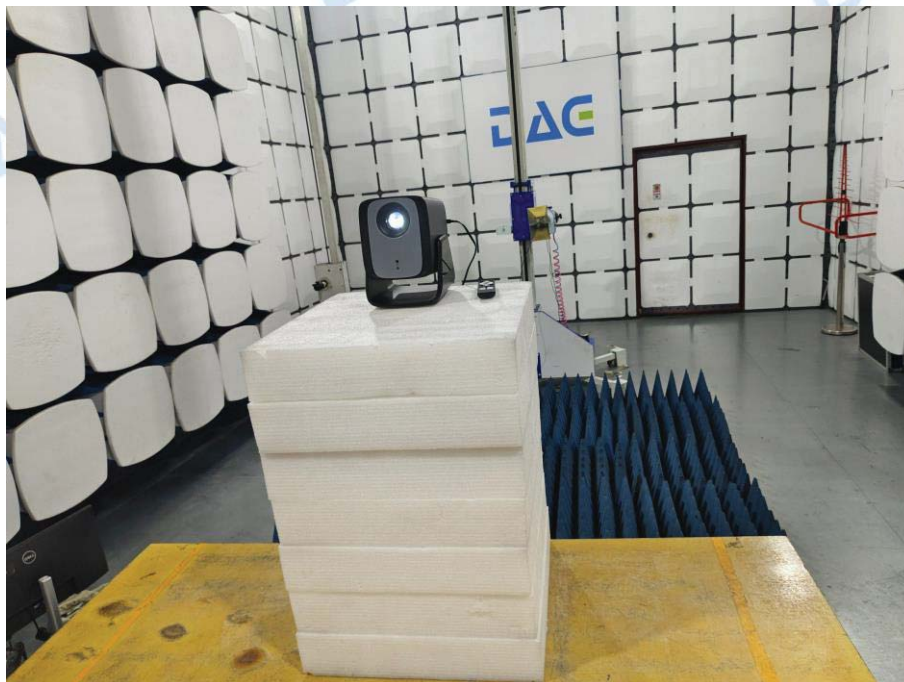
Conducted Emission at AC power line



Emissions in frequency bands (below 1GHz)



Emissions in frequency bands (above 1GHz)



6 PHOTOS OF THE EUT

Refer to Appendix - EUT Photos for EUT External Photo and Internal Photo.

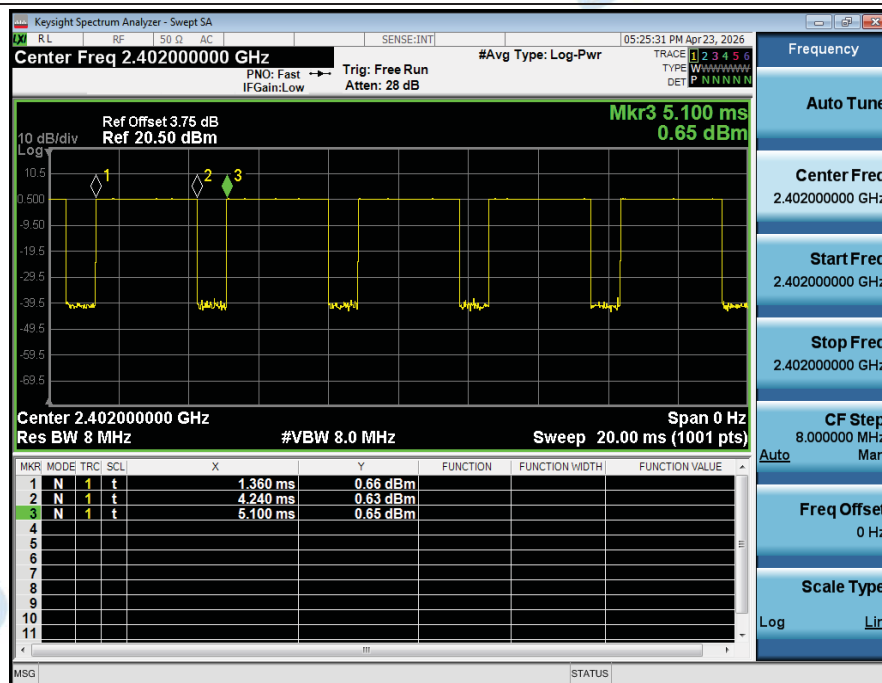
Appendix

FCC_BT (Part15.247) Test Data

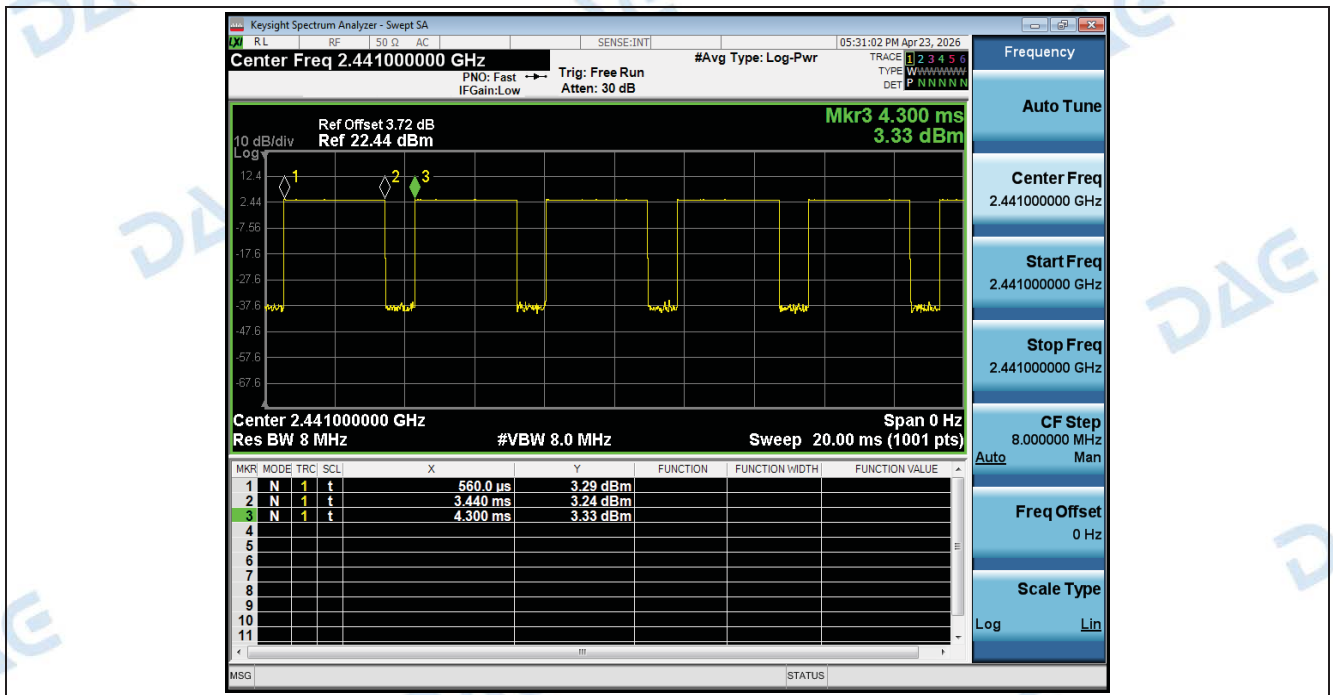
1. Duty Cycle

Condition	Antenna	Rate	Frequency (MHz)	Dutycycle(%)	Duty_factor
NVNT	ANT1	1-DH5	2402.00	77.54	1.10
NVNT	ANT1	1-DH5	2441.00	77.01	1.13
NVNT	ANT1	1-DH5	2480.00	77.01	1.13
NVNT	ANT1	2-DH5	2402.00	77.13	1.13
NVNT	ANT1	2-DH5	2441.00	77.01	1.13
NVNT	ANT1	2-DH5	2480.00	77.54	1.10
NVNT	ANT1	3-DH5	2402.00	24.47	6.11
NVNT	ANT1	3-DH5	2441.00	23.94	6.21
NVNT	ANT1	3-DH5	2480.00	24.47	6.11

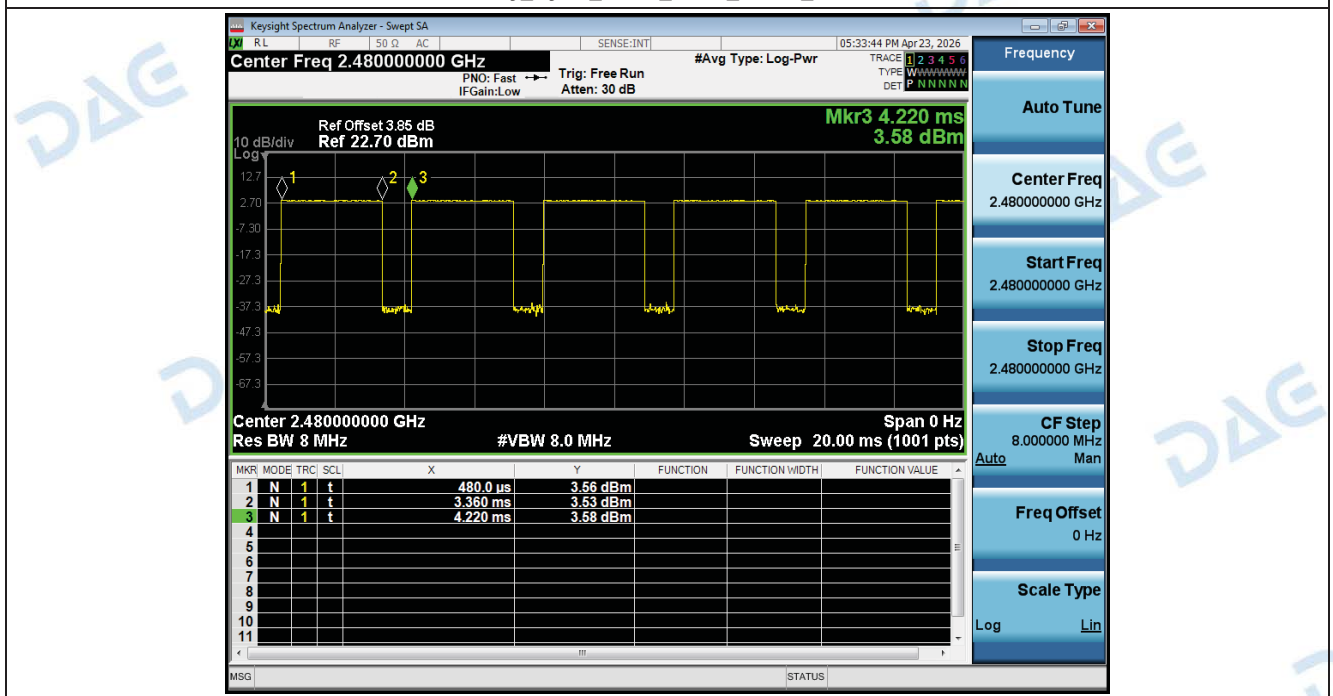
Duty_Cycle_NVNT_ANT1_1-DH5_2402



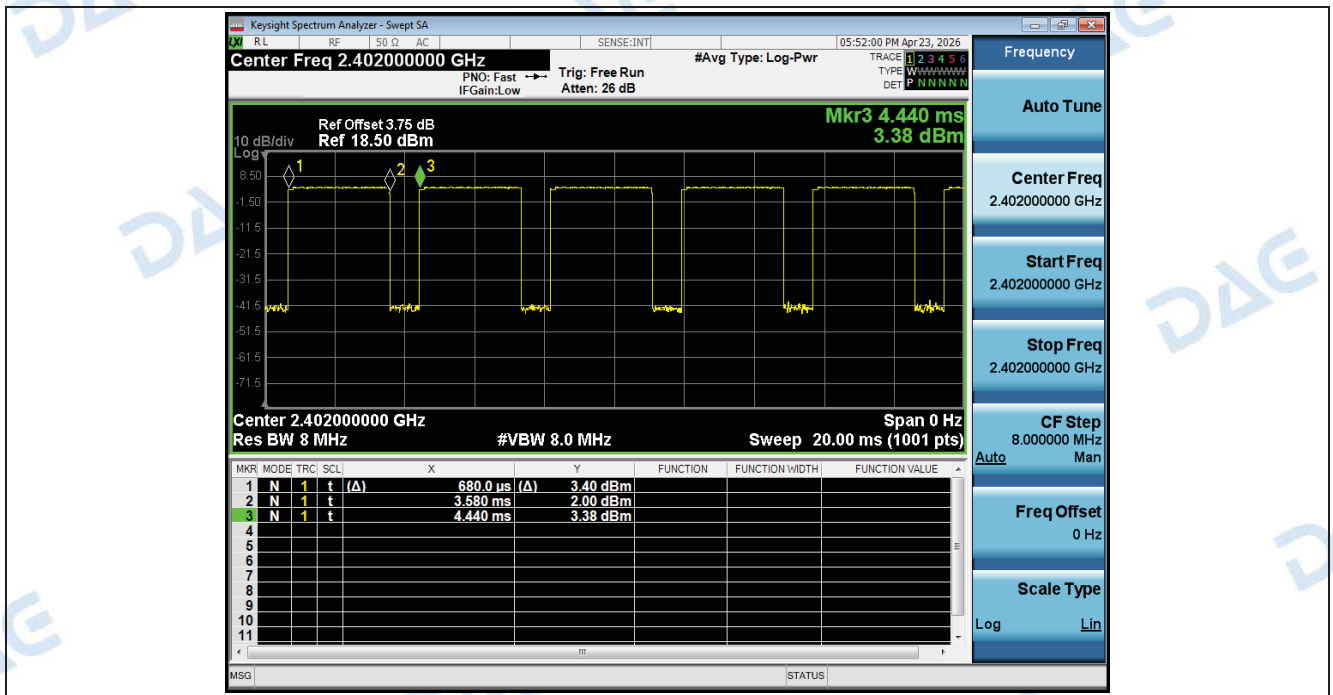
Duty_Cycle_NVNT_ANT1_1-DH5_2441



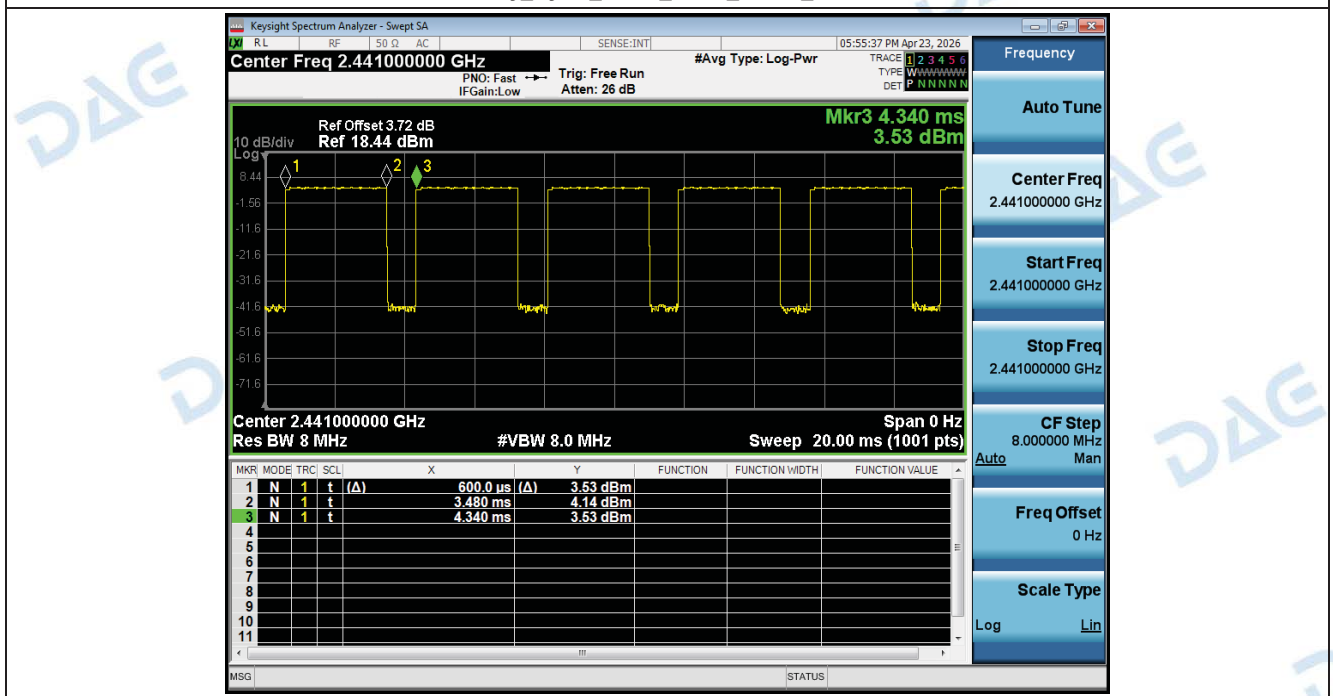
Duty Cycle NVNT_ANT1_1-DH5_2480



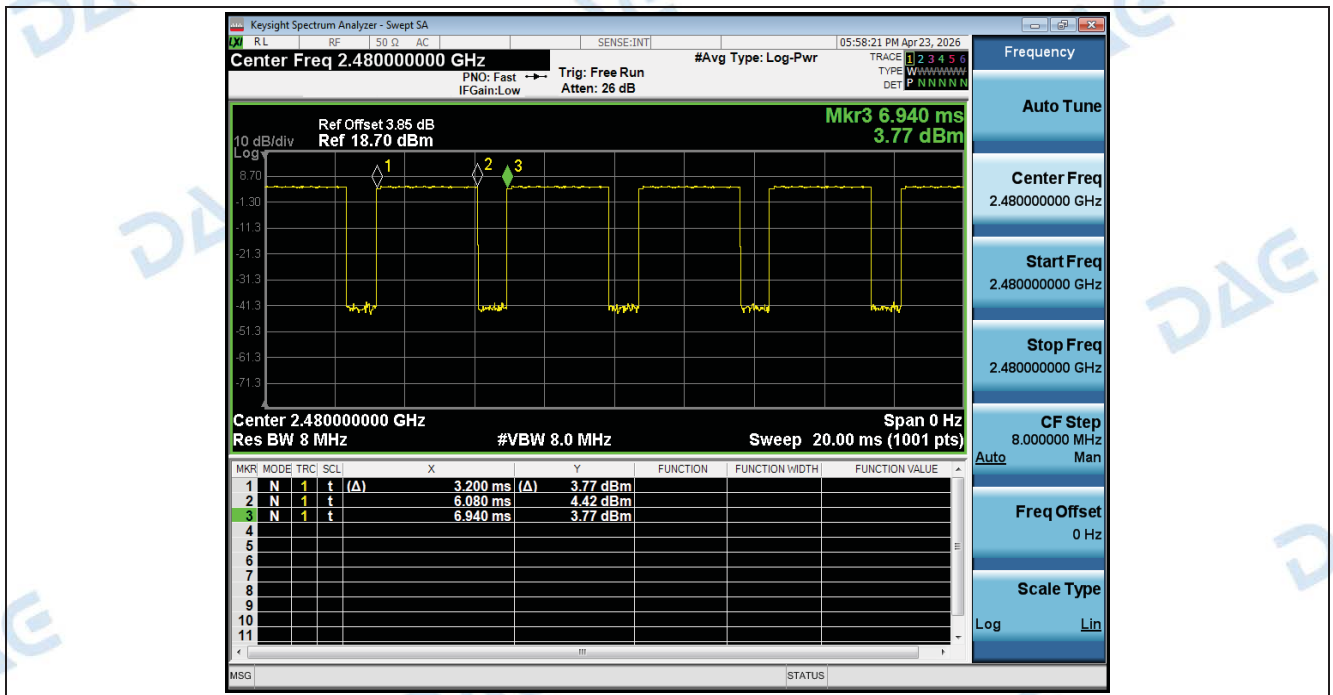
Duty Cycle NVNT_ANT1_2-DH5_2402



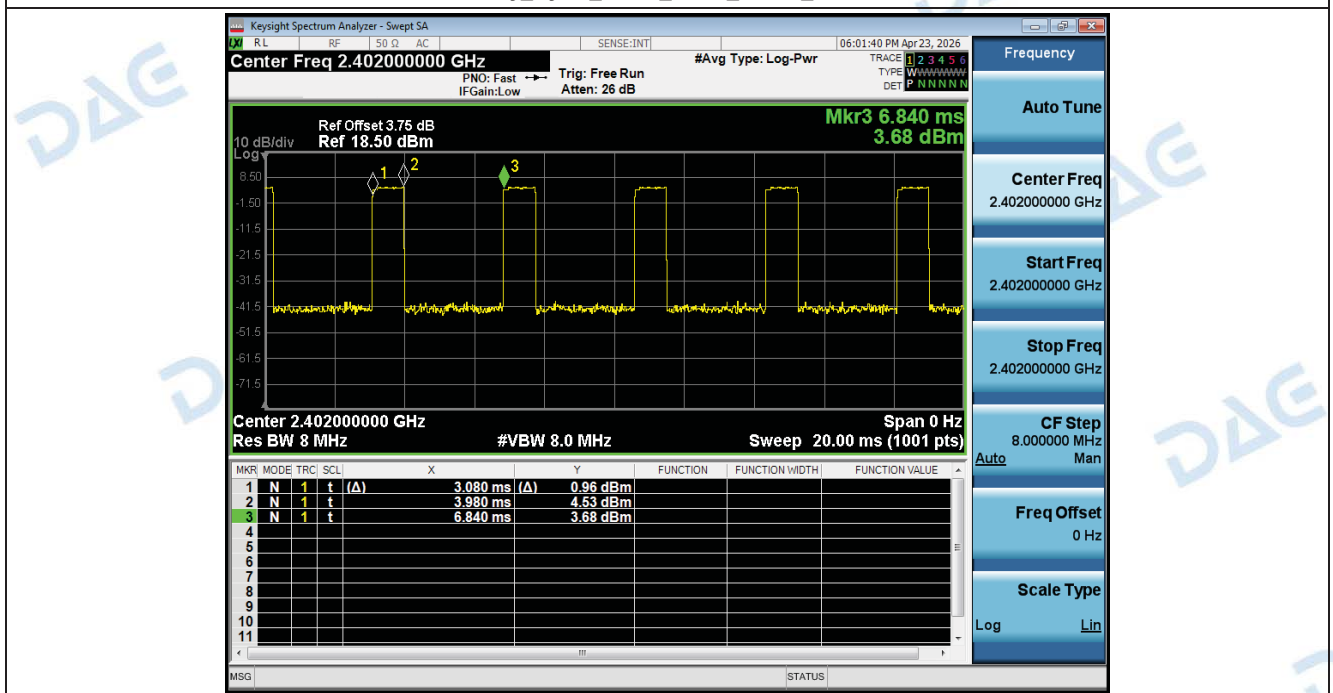
Duty_Cycle_NVNT_ANT1_2-DH5_2441



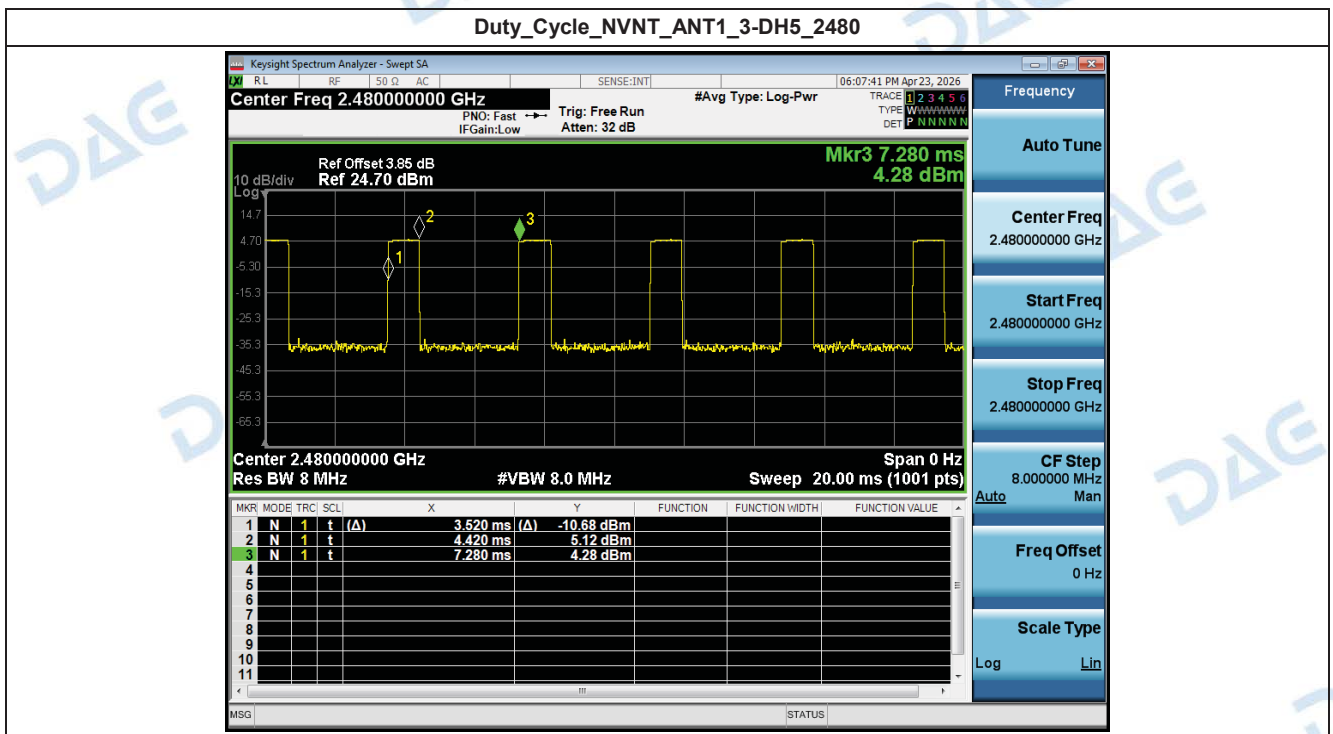
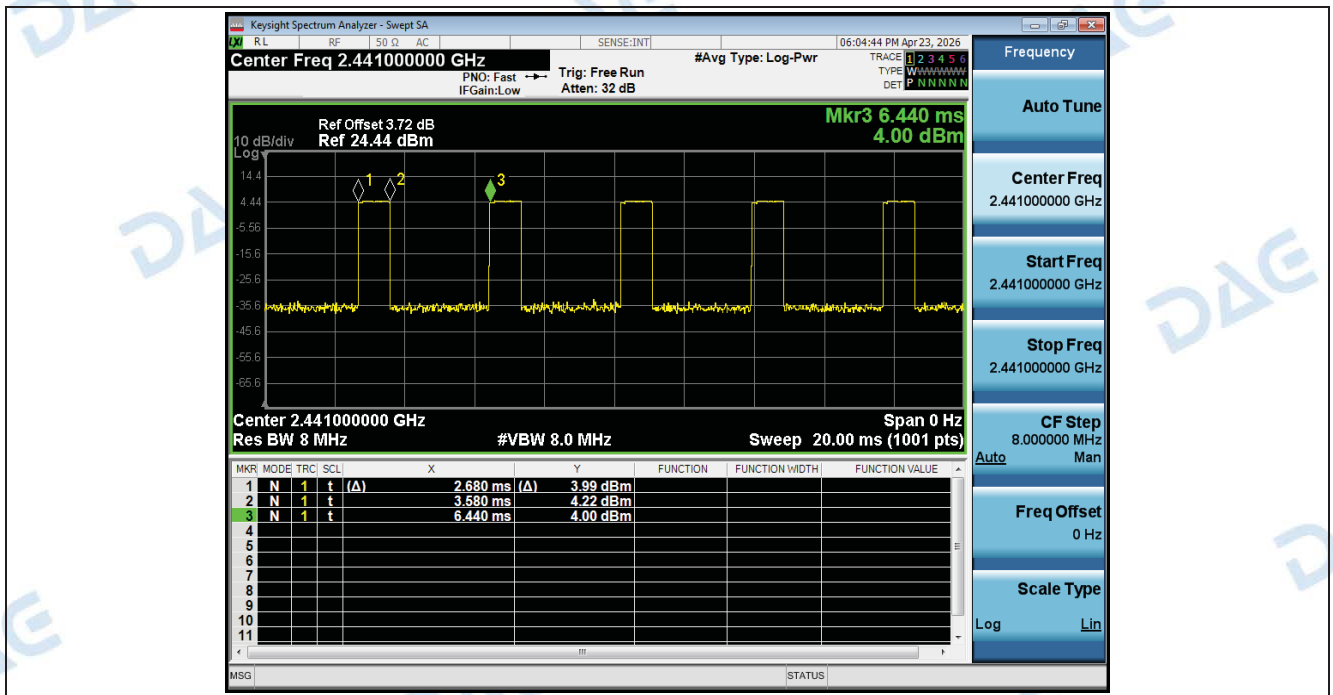
Duty_Cycle_NVNT_ANT1_2-DH5_2480



Duty_Cycle_NVNT_ANT1_3-DH5_2402



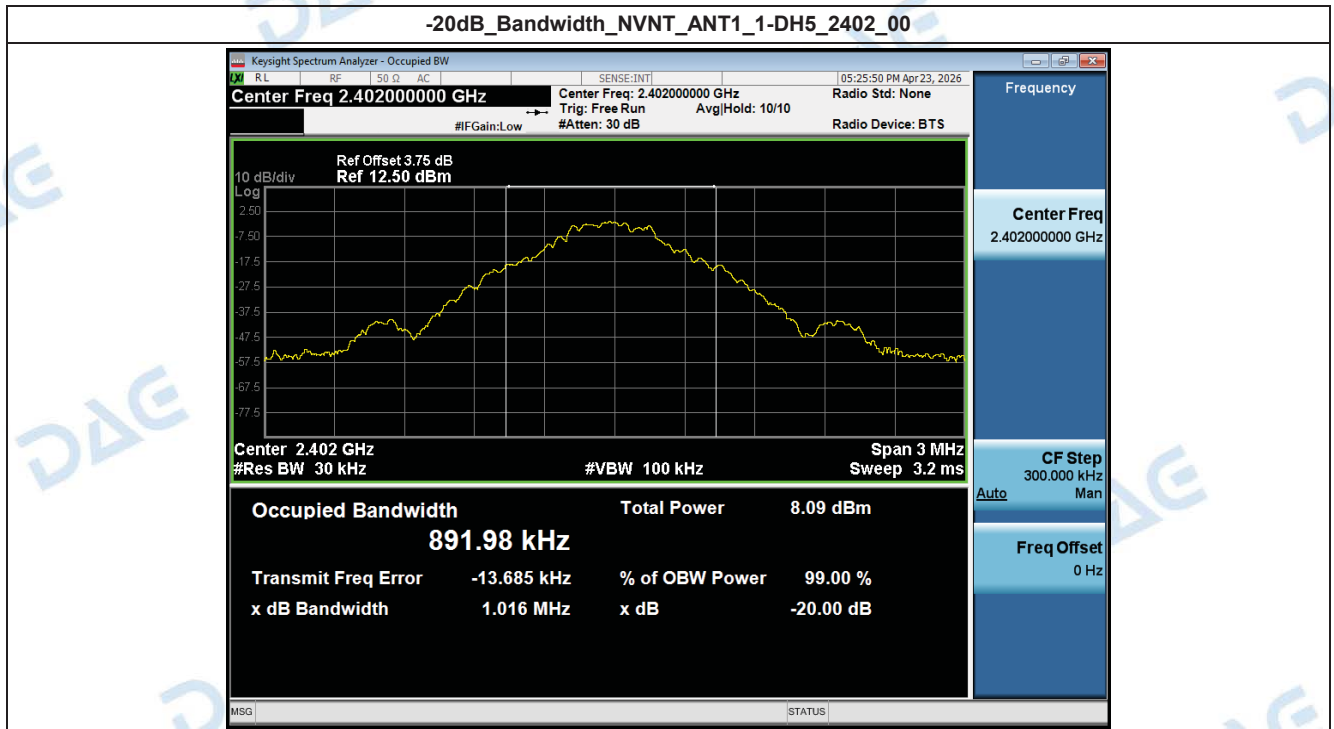
Duty_Cycle_NVNT_ANT1_3-DH5_2441



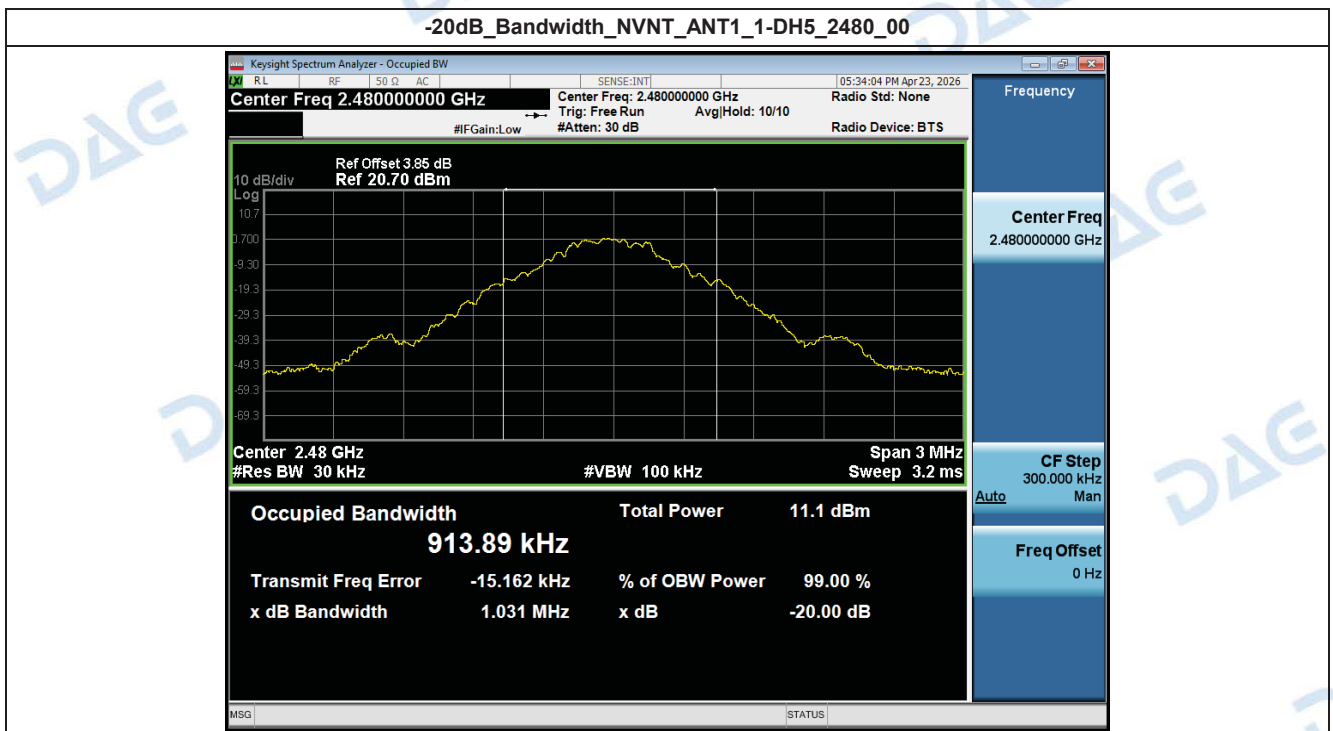
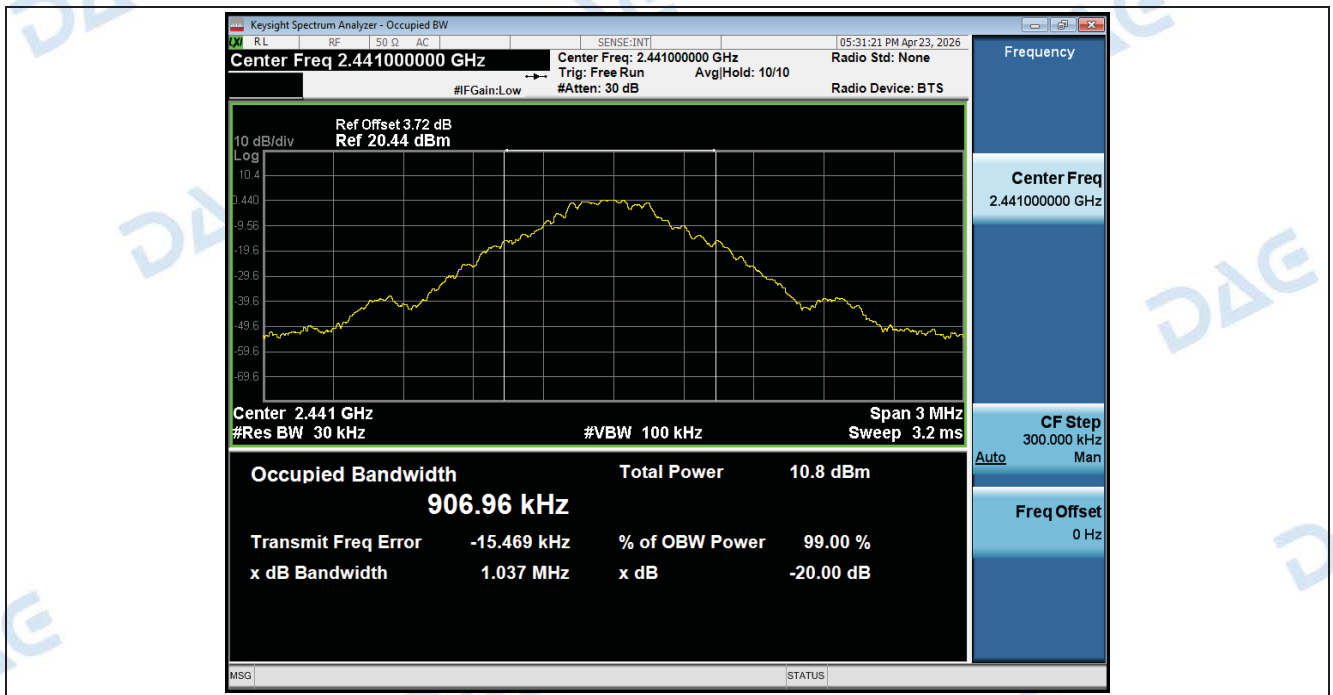
2. -20dB Bandwidth

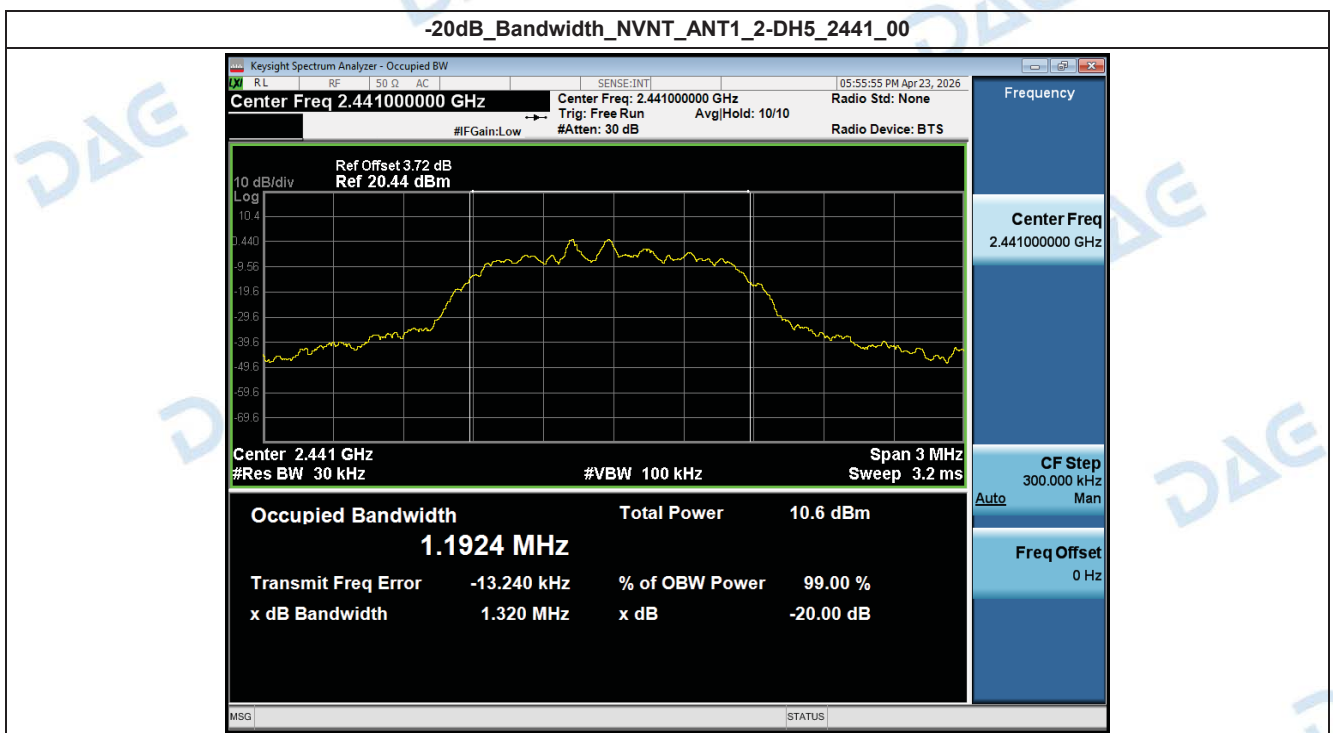
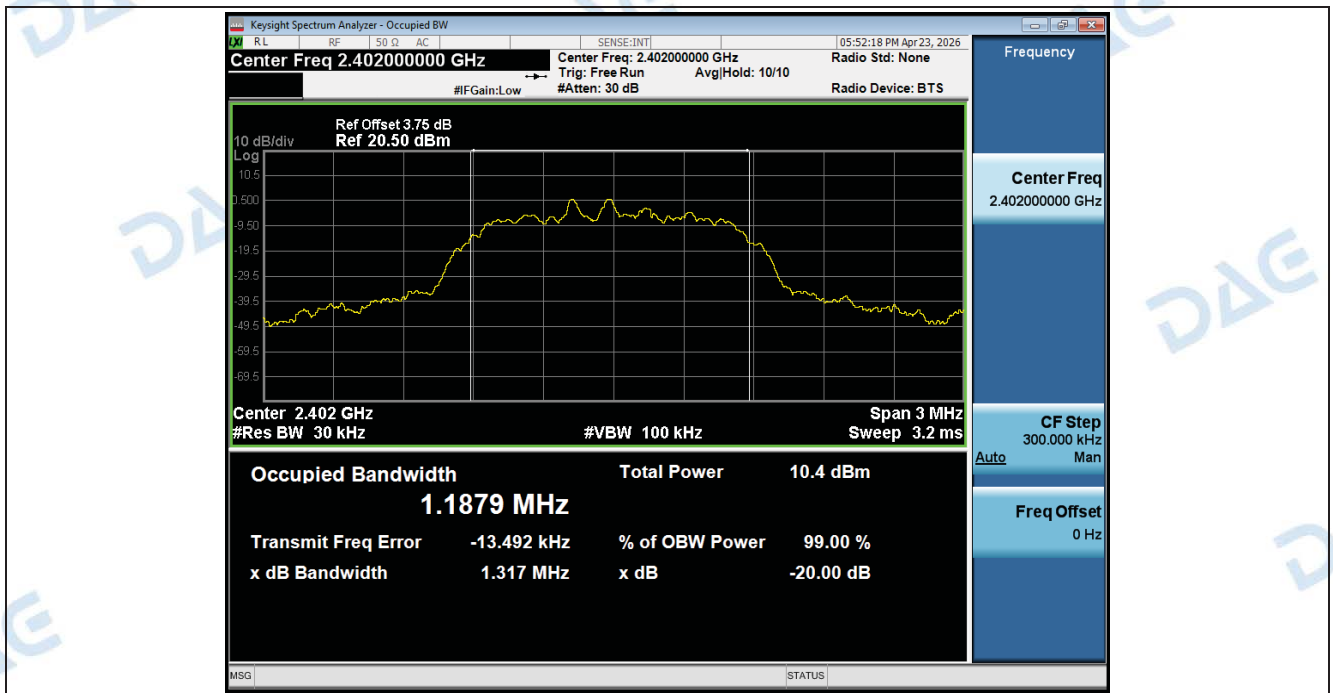
Condition	Antenna	Modulation	Frequency (MHz)	-20dB BW(MHz)	If larger than CFS
NVNT	ANT1	1-DH5	2402.00	1.016	Yes
NVNT	ANT1	1-DH5	2441.00	1.037	Yes
NVNT	ANT1	1-DH5	2480.00	1.031	Yes
NVNT	ANT1	2-DH5	2402.00	1.317	Yes
NVNT	ANT1	2-DH5	2441.00	1.320	Yes
NVNT	ANT1	2-DH5	2480.00	1.324	Yes
NVNT	ANT1	3-DH5	2402.00	1.280	Yes
NVNT	ANT1	3-DH5	2441.00	1.307	Yes
NVNT	ANT1	3-DH5	2480.00	1.307	Yes

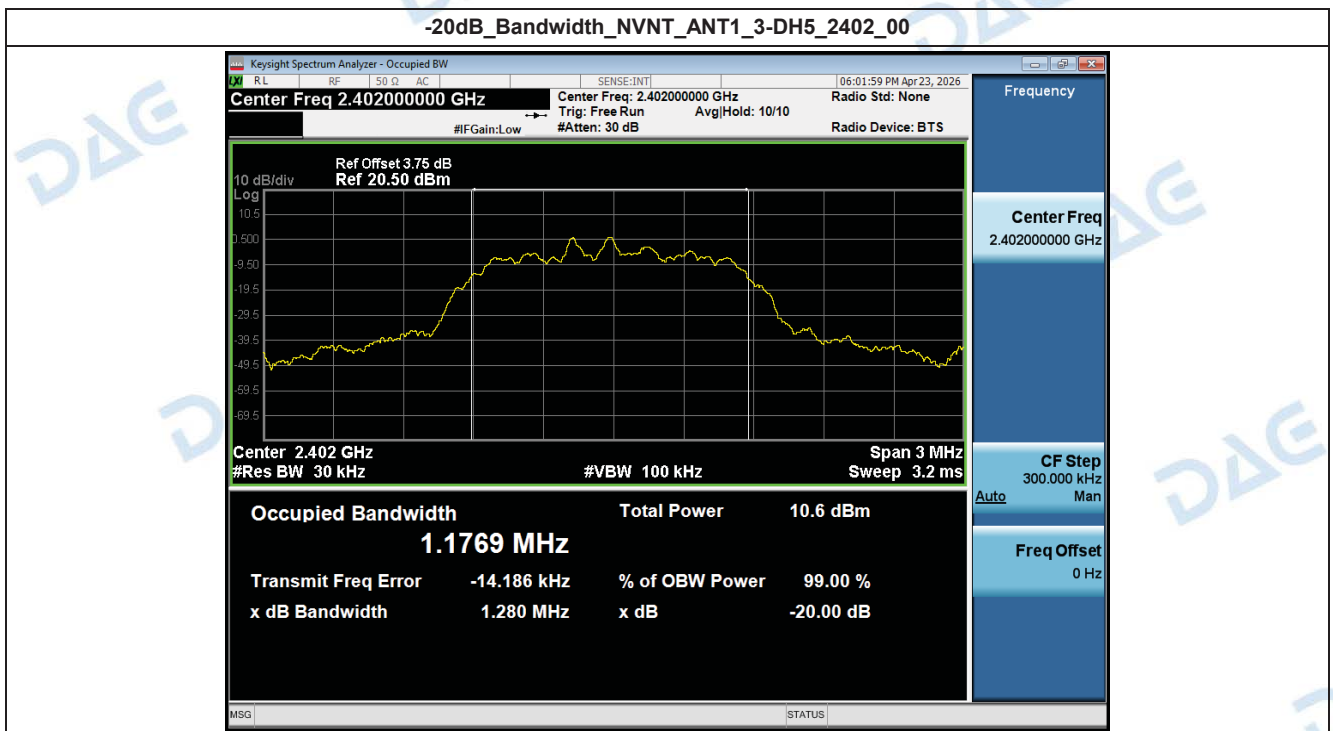
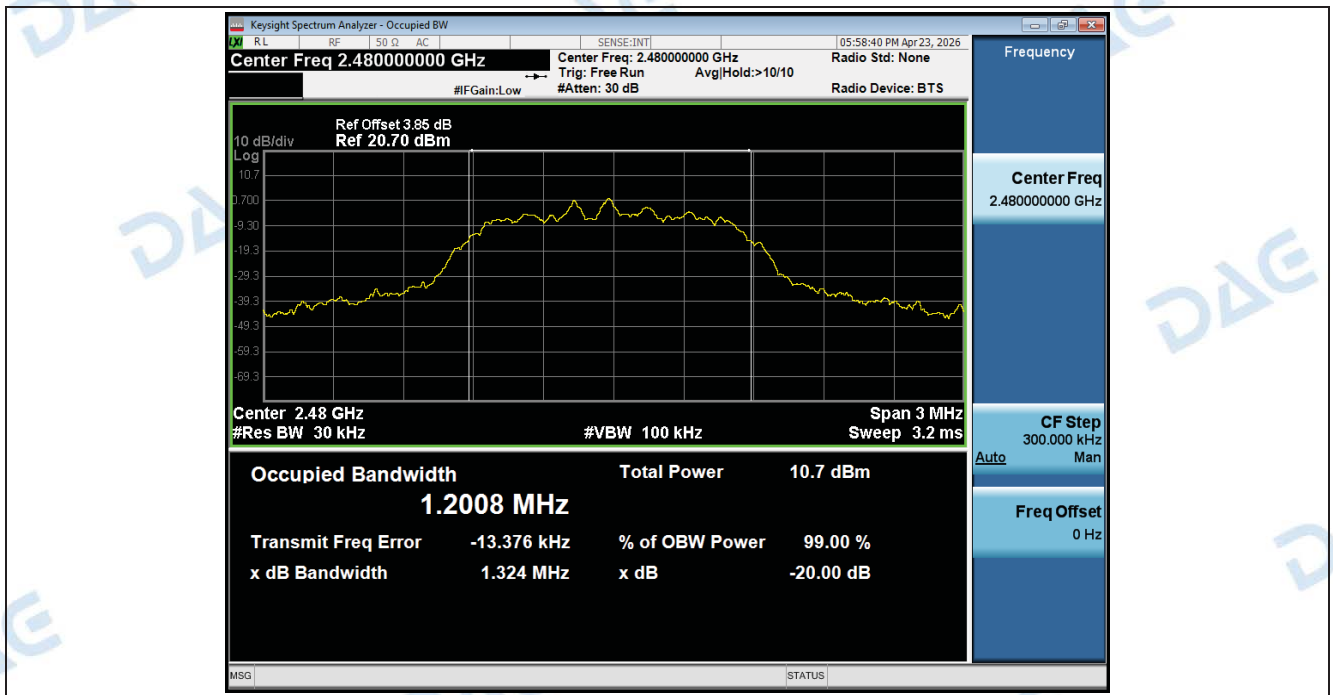
-20dB_Bandwidth_NVNT_ANT1_1-DH5_2402_00

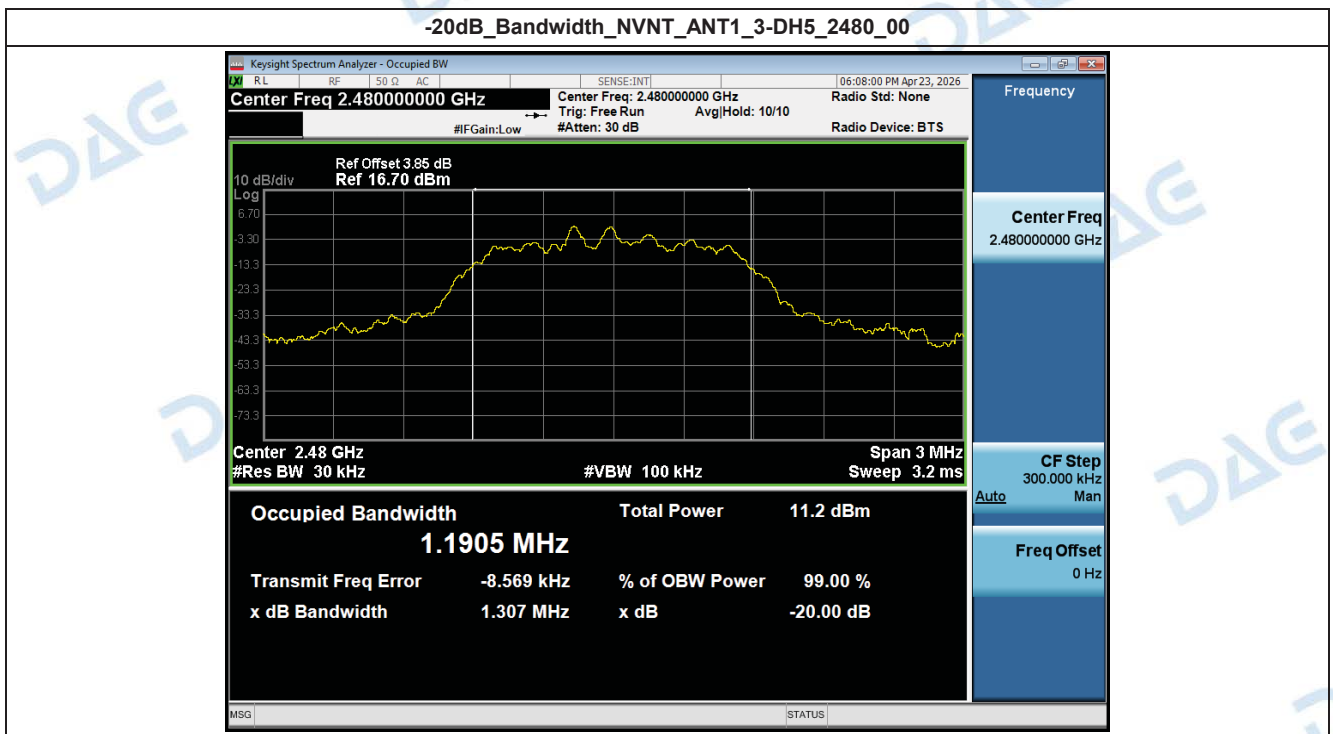
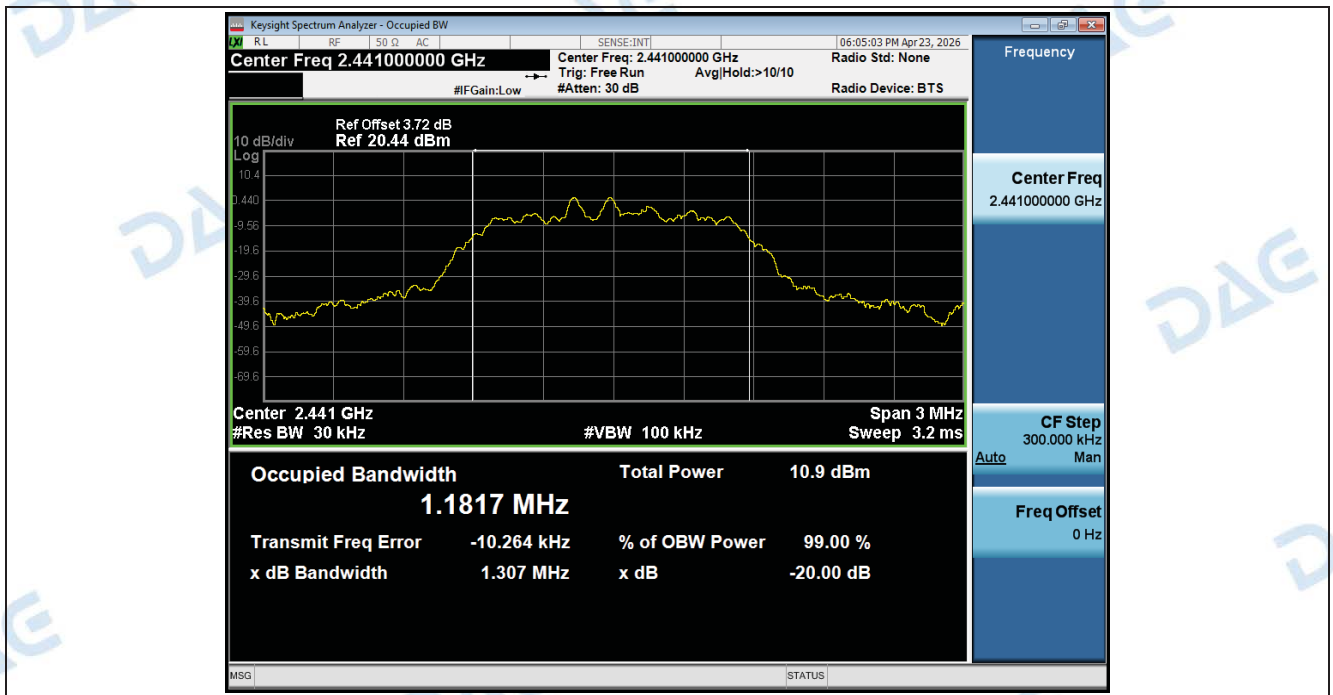


-20dB_Bandwidth_NVNT_ANT1_1-DH5_2441_00









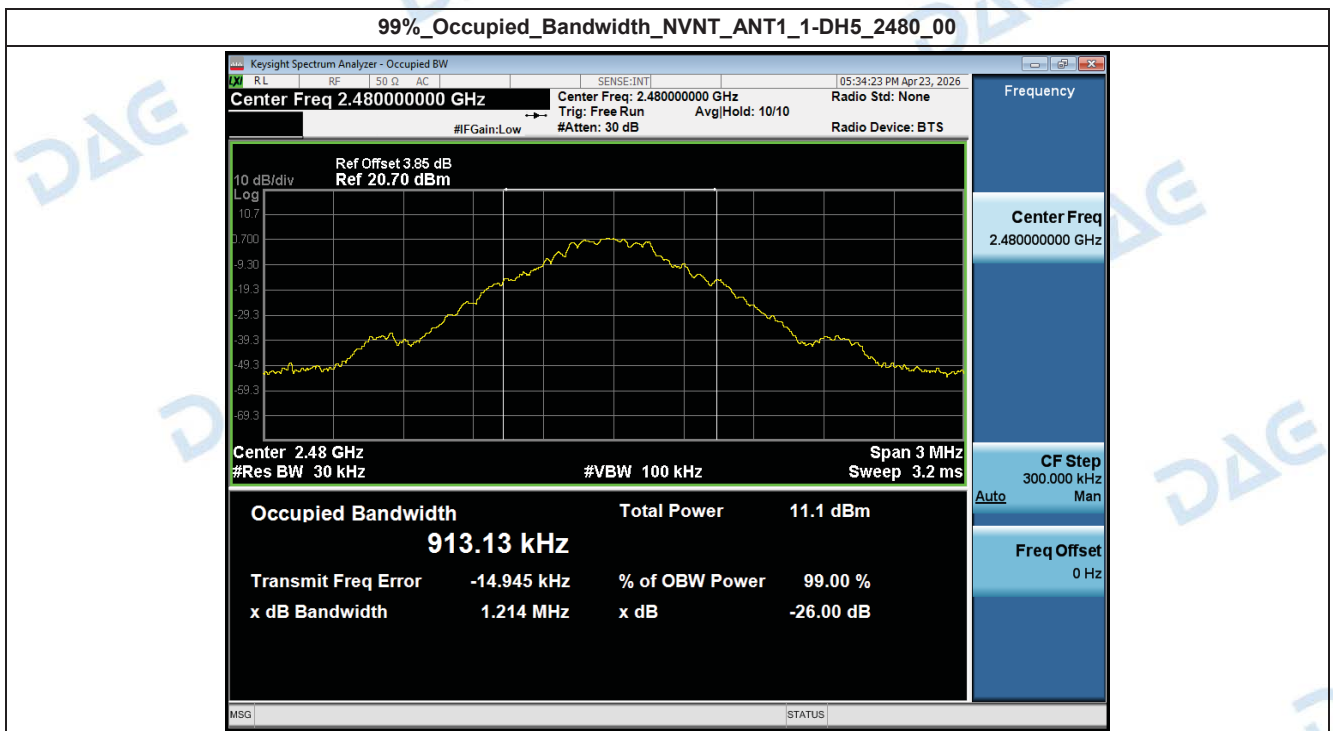
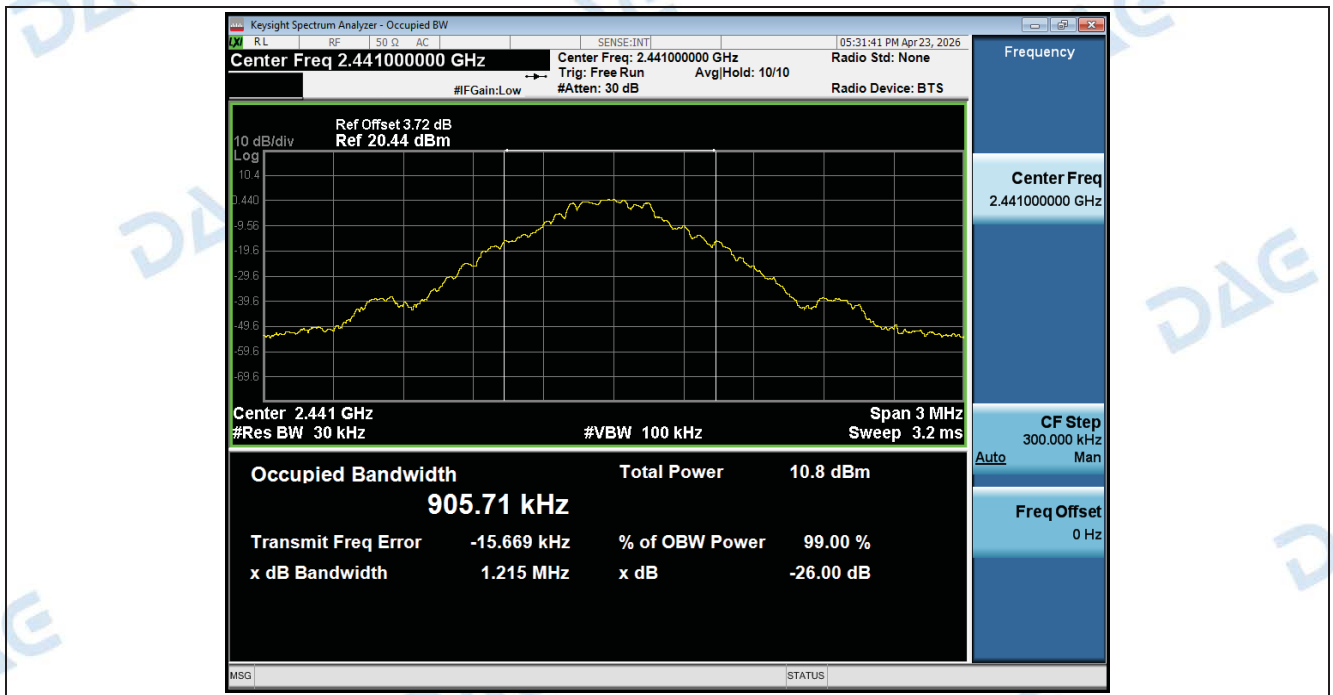
3. 99% Occupied Bandwidth

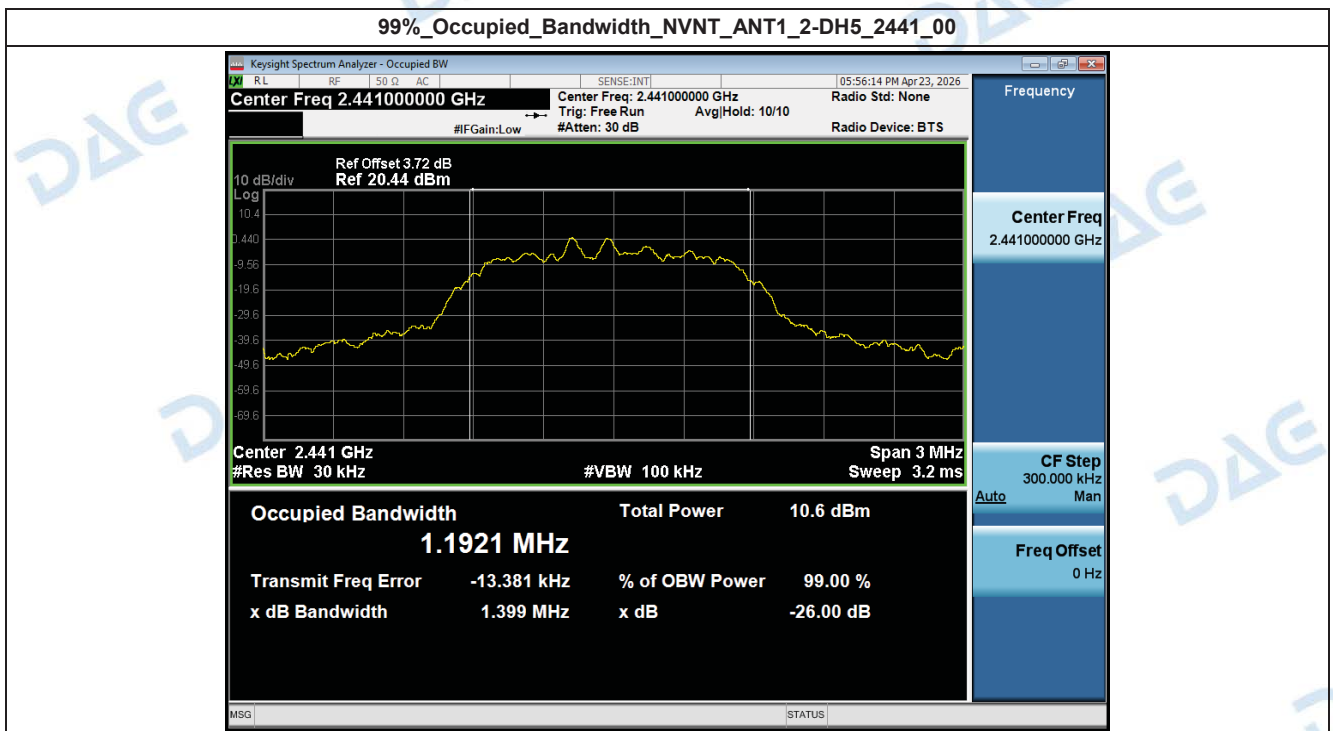
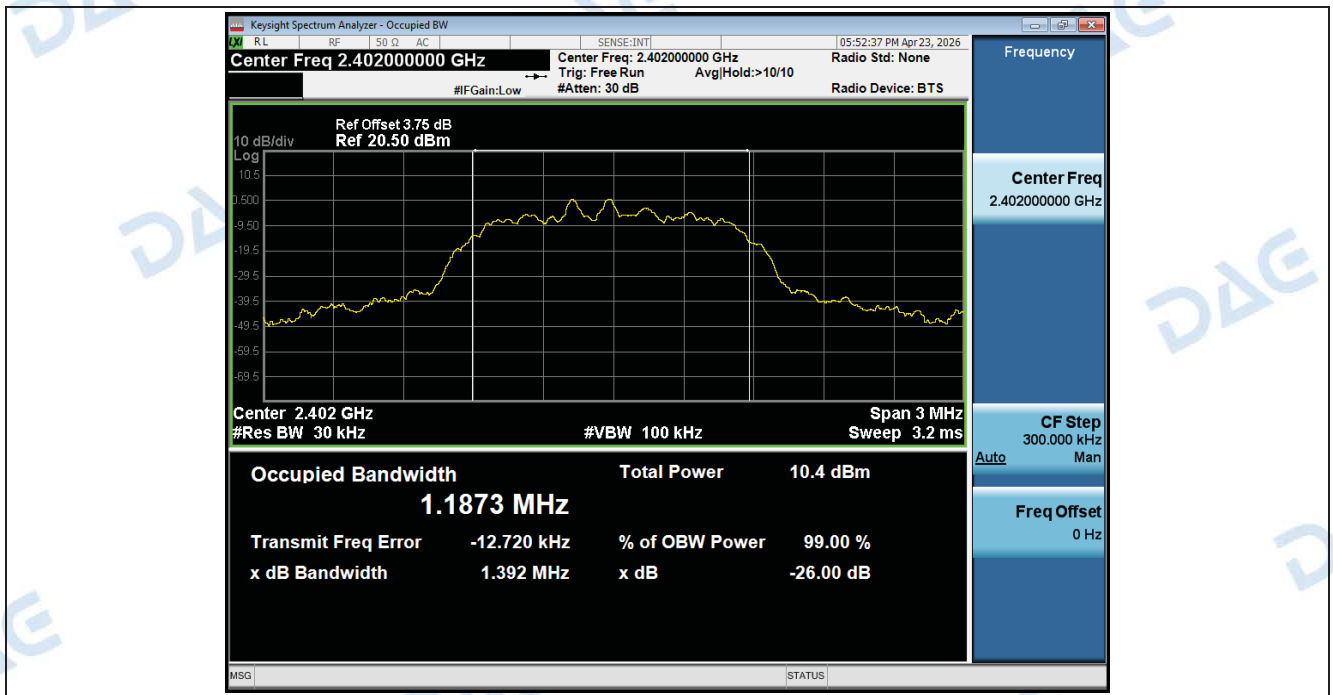
Condition	Antenna	Modulation	Frequency (MHz)	99% BW (MHz)
NVNT	ANT1	1-DH5	2402.00	0.891
NVNT	ANT1	1-DH5	2441.00	0.906
NVNT	ANT1	1-DH5	2480.00	0.913
NVNT	ANT1	2-DH5	2402.00	1.187
NVNT	ANT1	2-DH5	2441.00	1.192
NVNT	ANT1	2-DH5	2480.00	1.199
NVNT	ANT1	3-DH5	2402.00	1.173
NVNT	ANT1	3-DH5	2441.00	1.183
NVNT	ANT1	3-DH5	2480.00	1.190

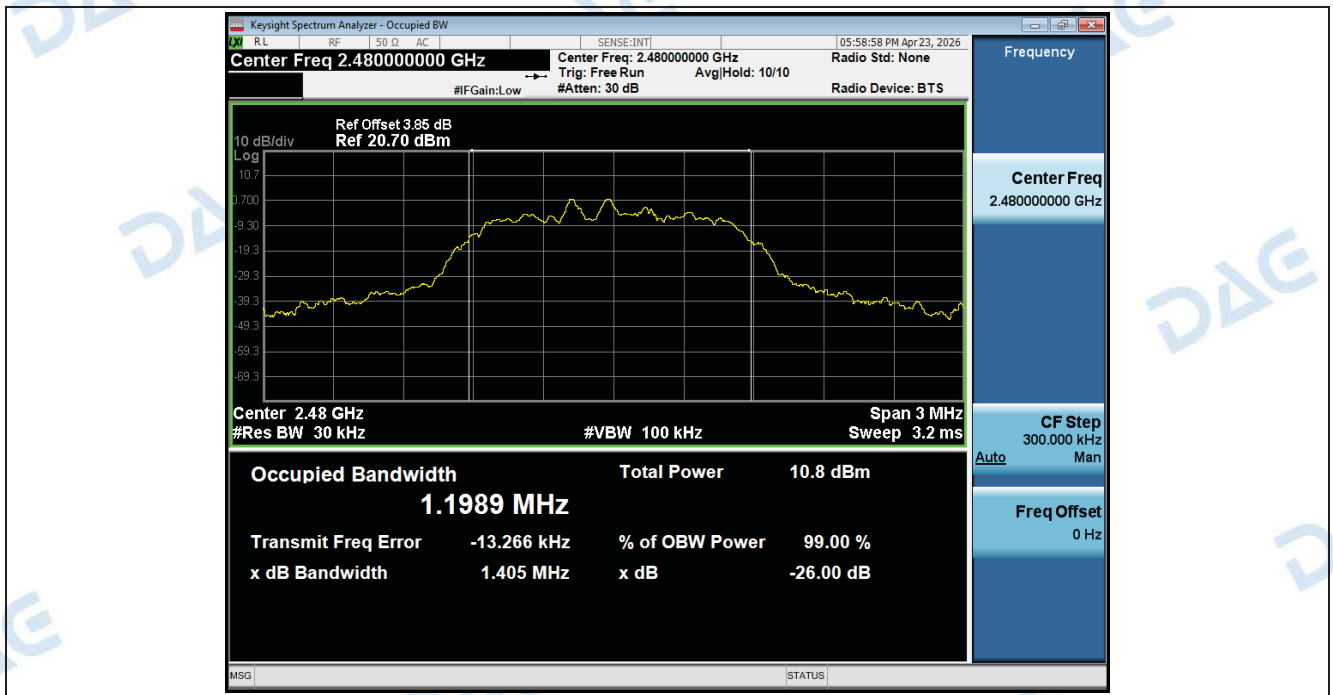
99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2402_00



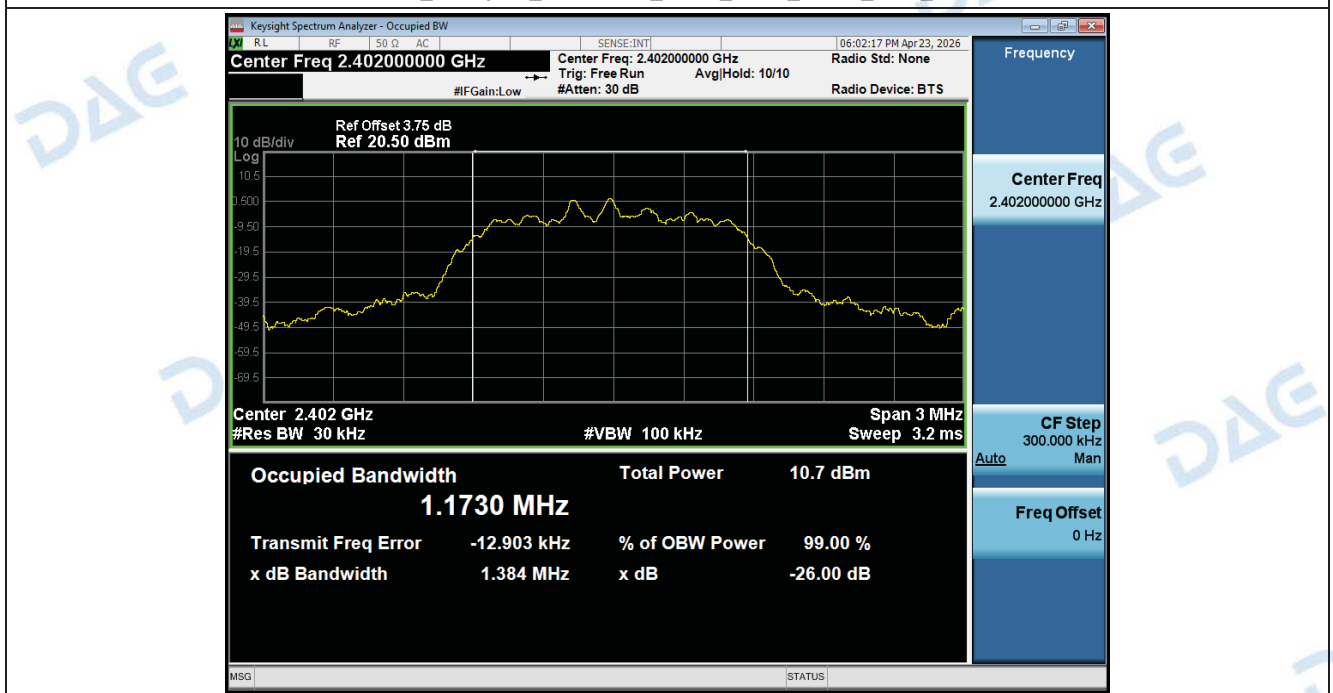
99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2441_00



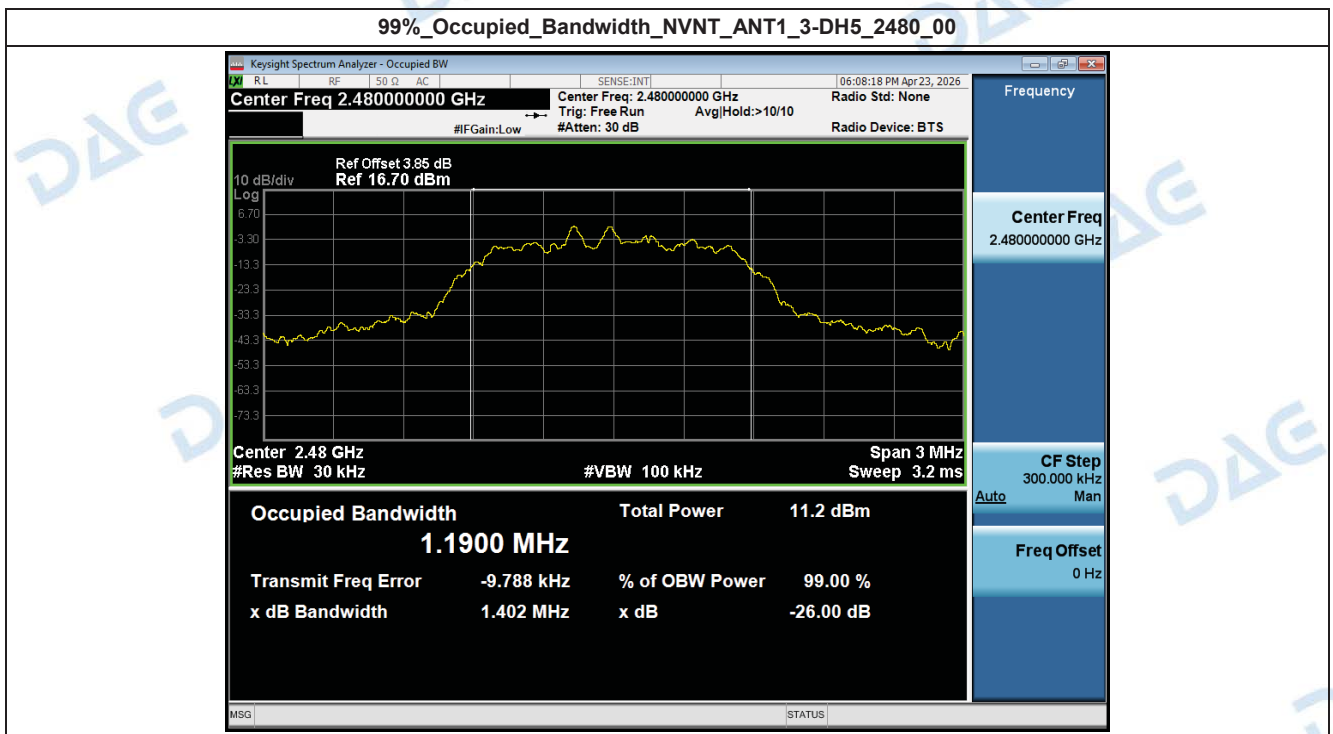
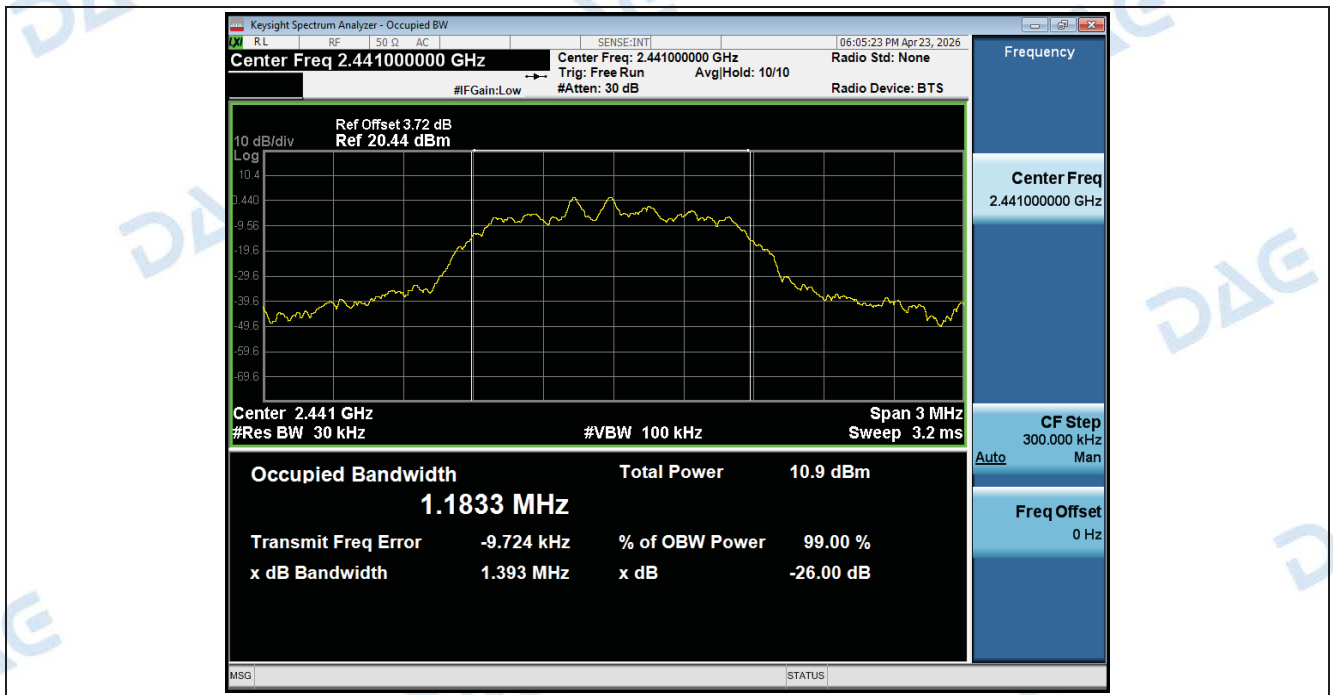




99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2402_00



99%_Occupied_Bandwidth_NVNT_ANT1_3-DH5_2441_00



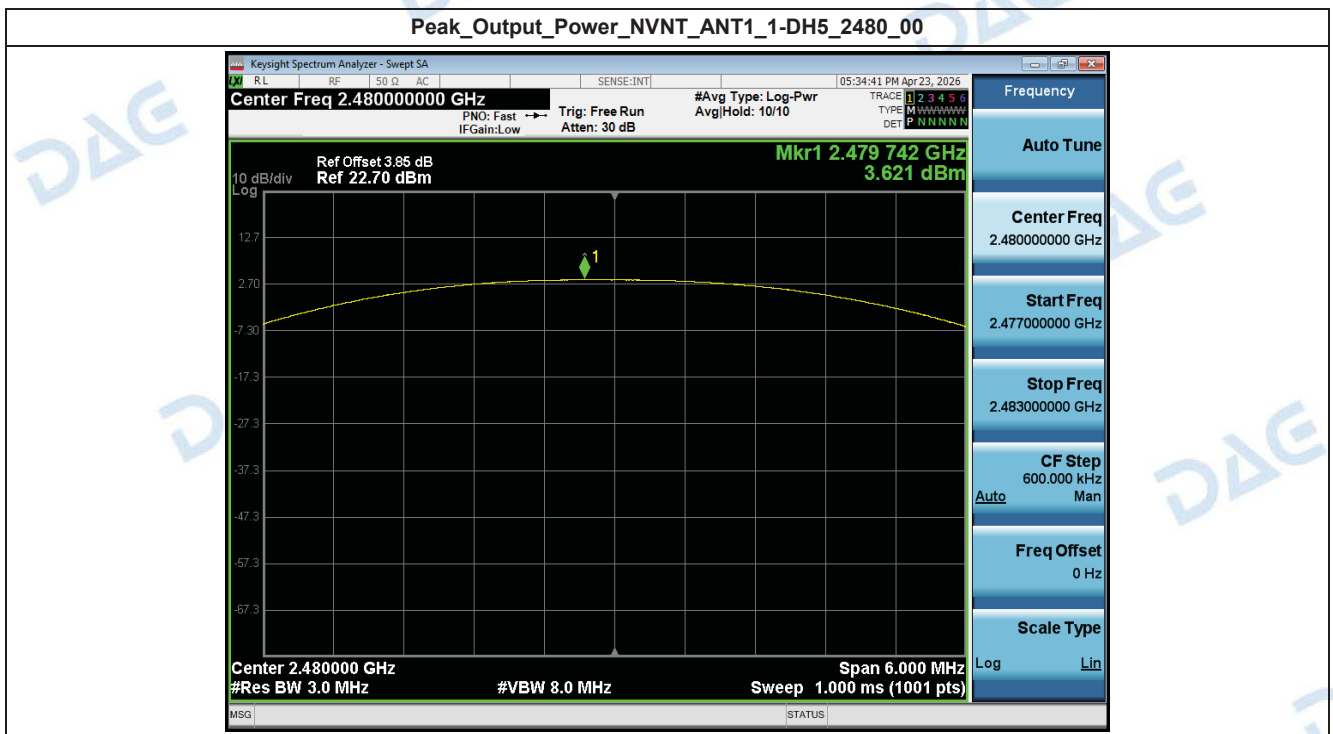
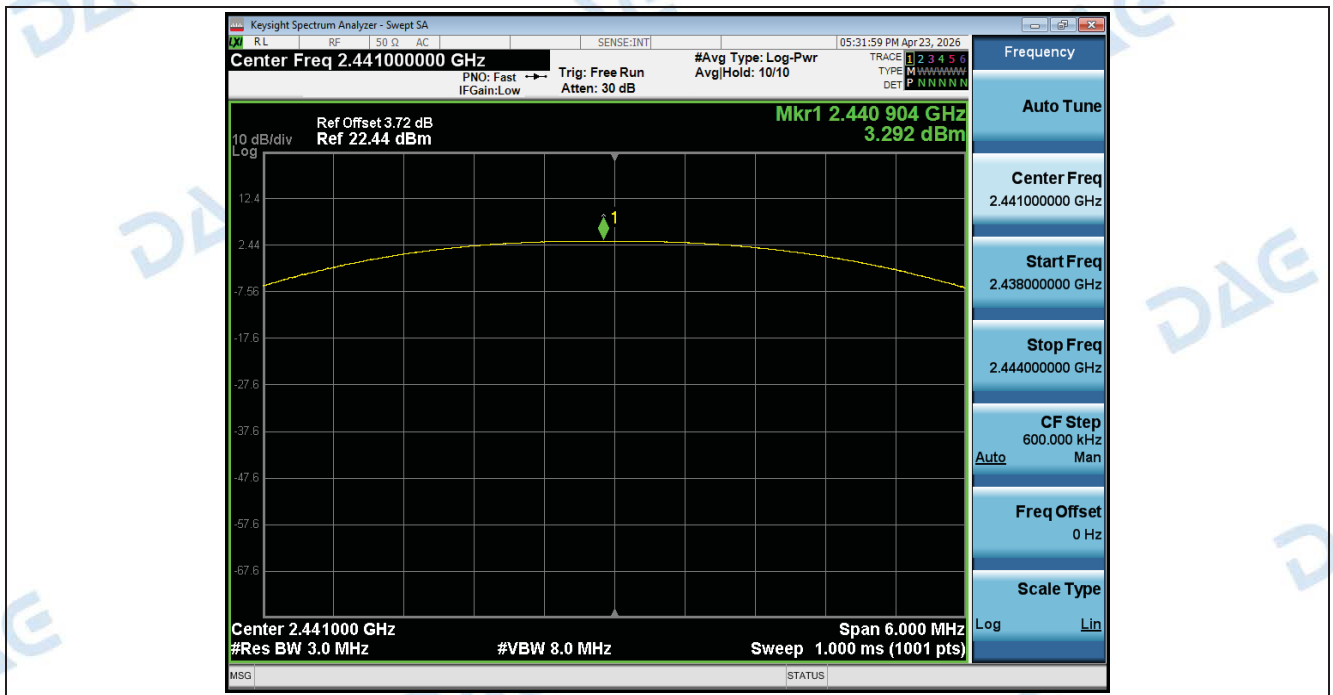
4. Peak Output Power

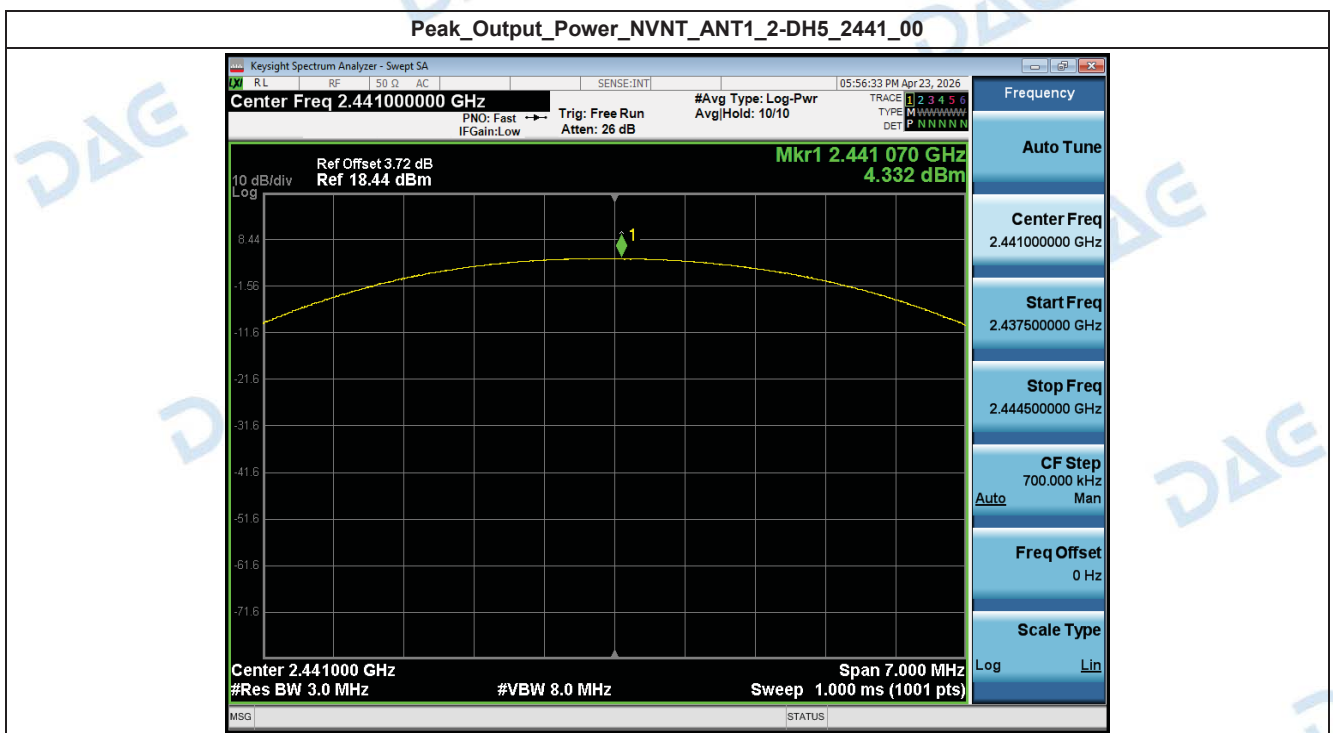
Condition	Antenna	Modulation	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1-DH5	2402.00	3.22	2.10	125	Pass
NVNT	ANT1	1-DH5	2441.00	3.29	2.13	125	Pass
NVNT	ANT1	1-DH5	2480.00	3.62	2.30	125	Pass
NVNT	ANT1	2-DH5	2402.00	4.25	2.66	125	Pass
NVNT	ANT1	2-DH5	2441.00	4.33	2.71	125	Pass
NVNT	ANT1	2-DH5	2480.00	4.54	2.85	125	Pass
NVNT	ANT1	3-DH5	2402.00	4.57	2.86	125	Pass
NVNT	ANT1	3-DH5	2441.00	4.77	3.00	125	Pass
NVNT	ANT1	3-DH5	2480.00	5.03	3.19	125	Pass

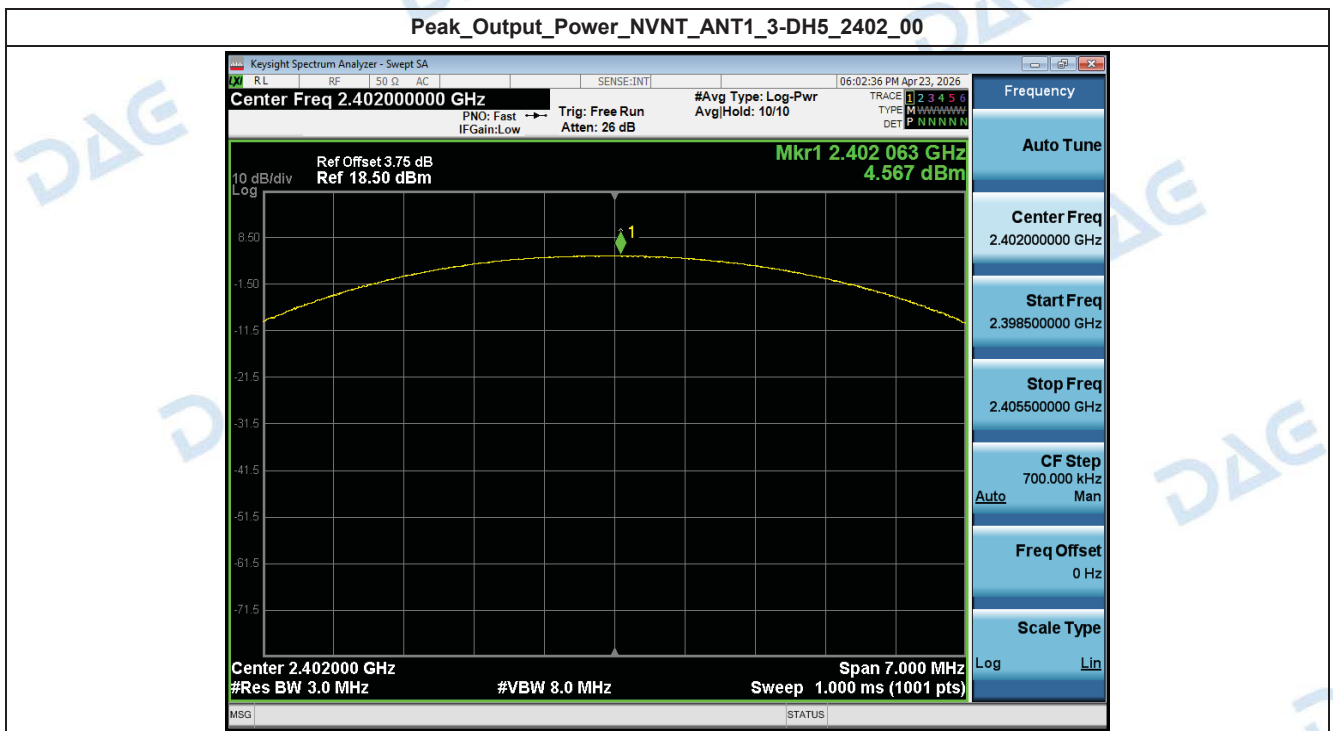
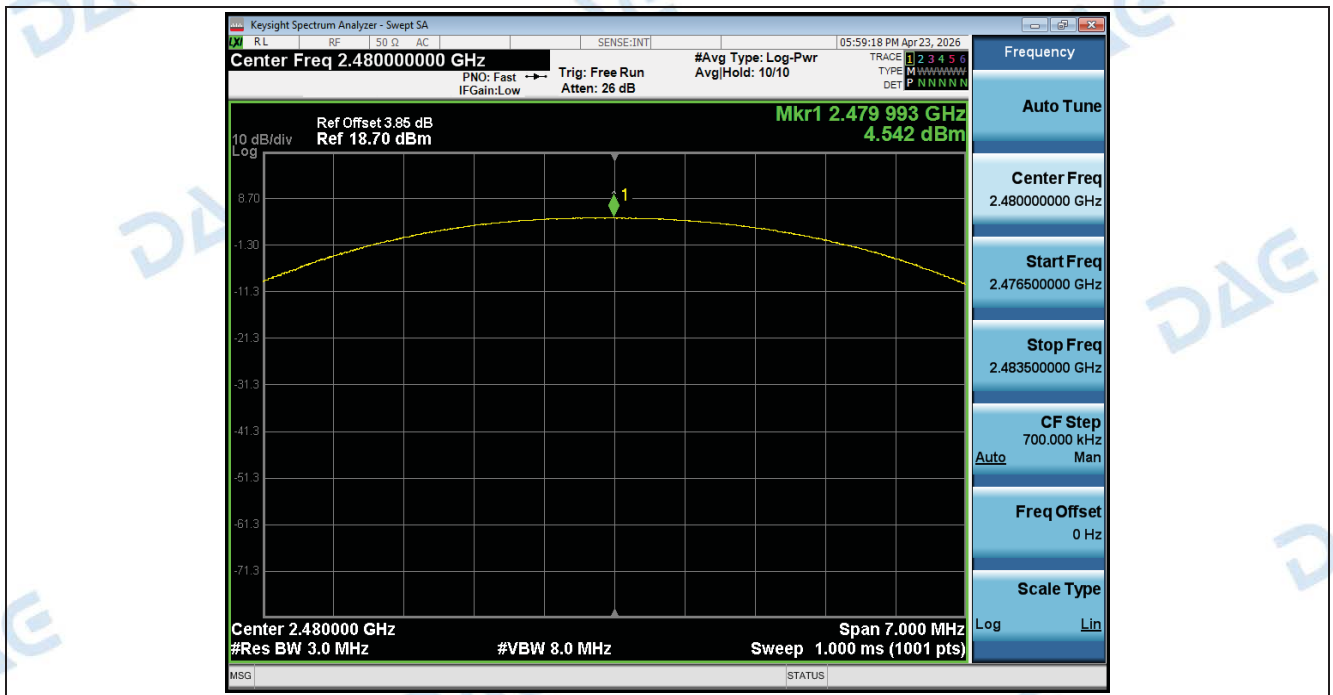
Peak_Output_Power_NVNT_ANT1_1-DH5_2402_00

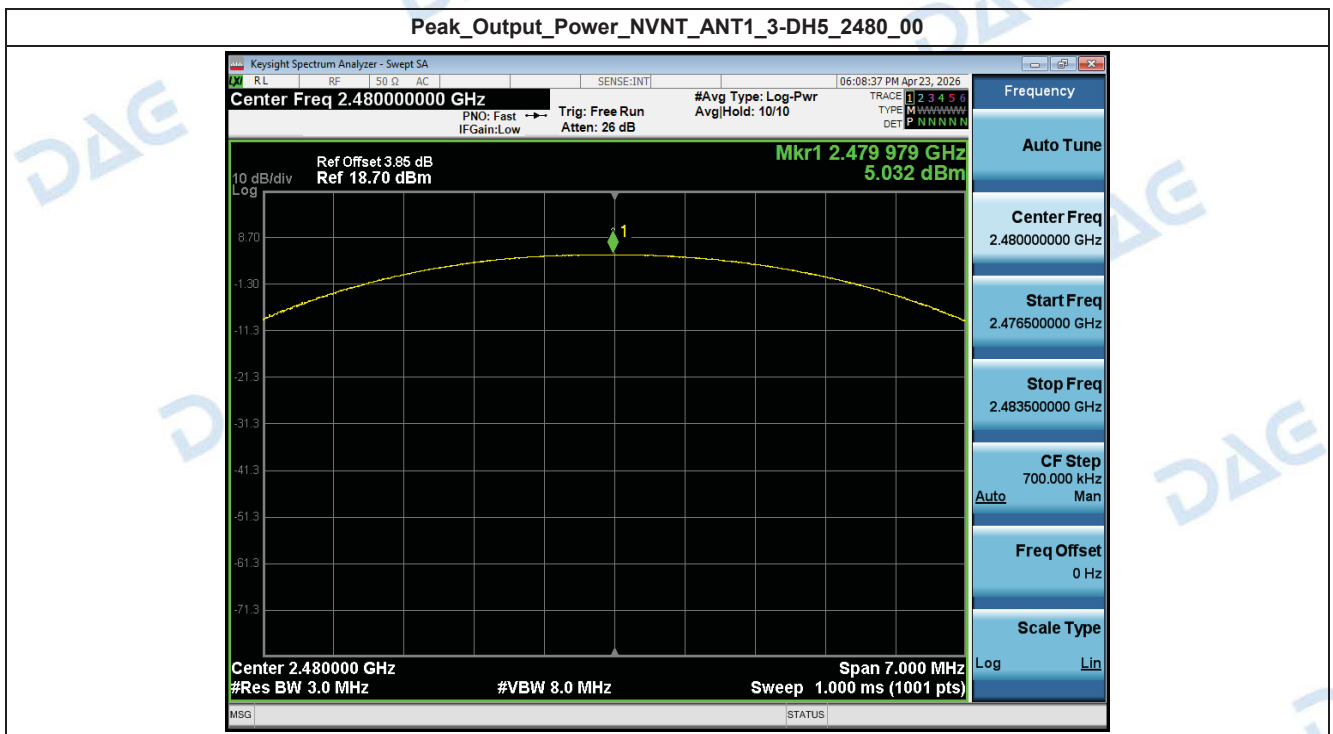
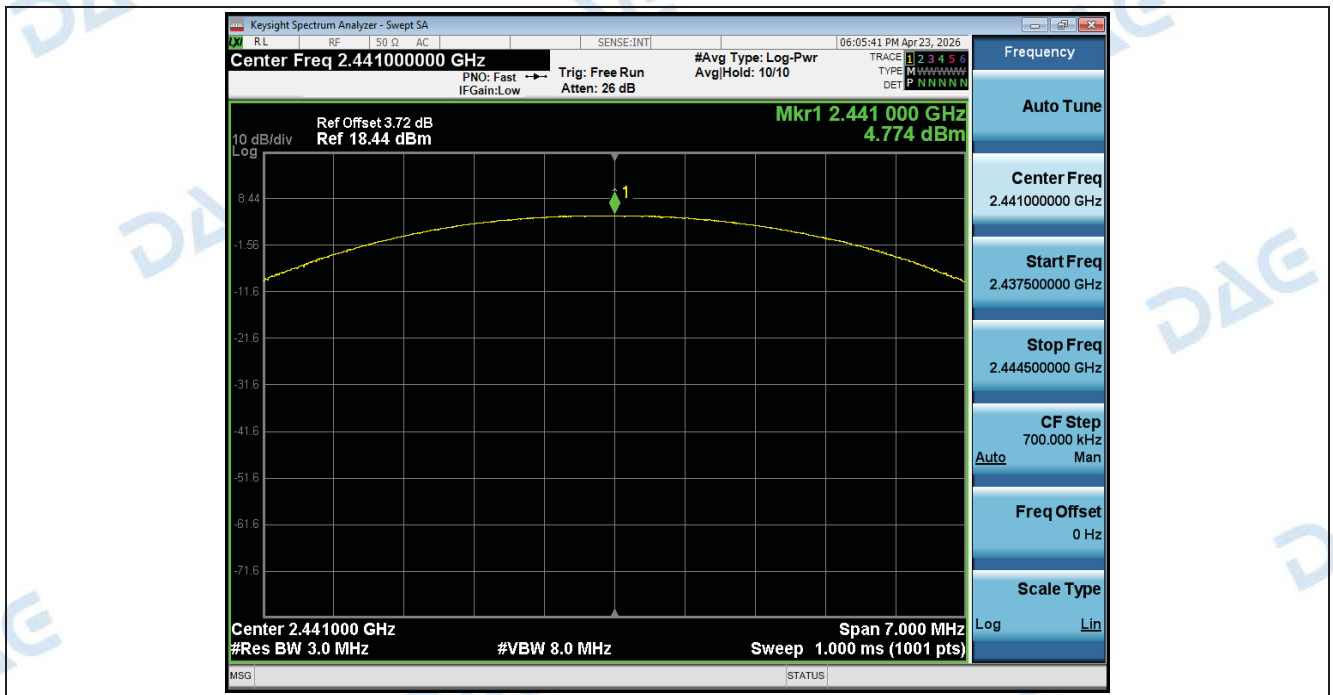


Peak_Output_Power_NVNT_ANT1_1-DH5_2441_00









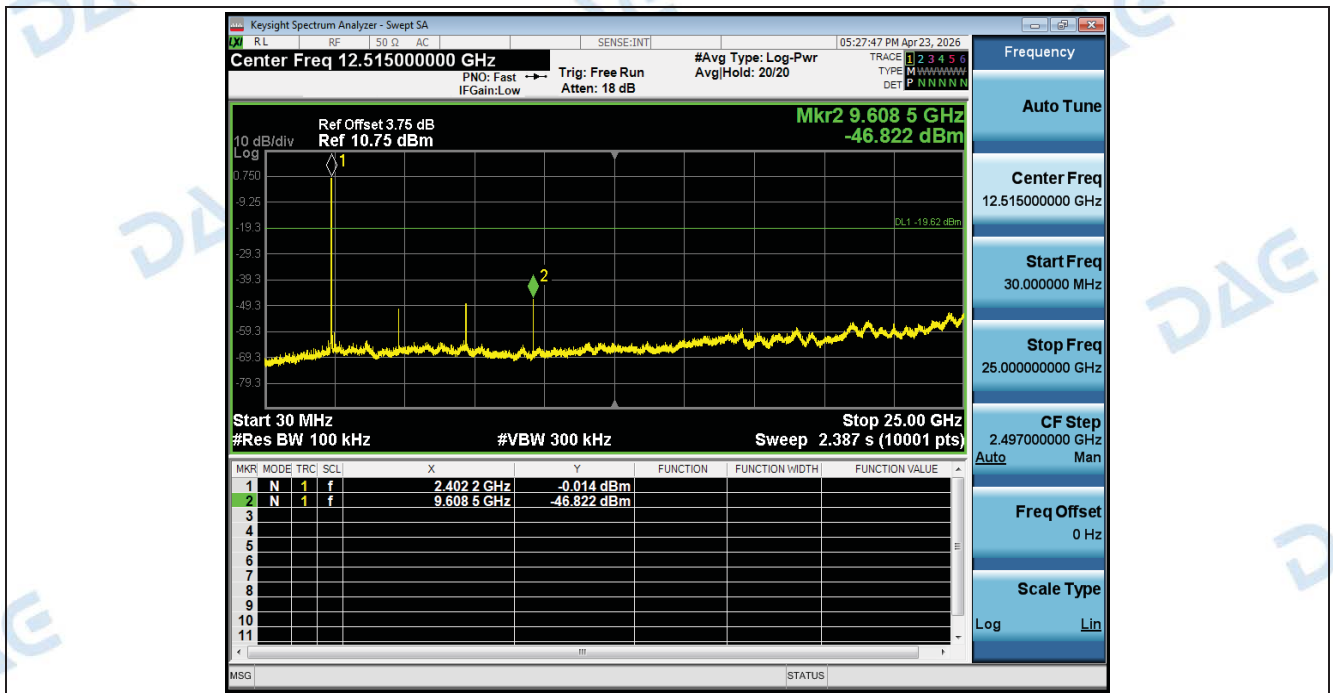
5. Spurious Emissions

Condition	Antenna	Modulation	TX Mode	Ref_level(dBm)	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1-DH5	2402.00	0.379	-46.822	-19.621	Pass
NVNT	ANT1	1-DH5	2441.00	3.092	-42.939	-16.908	Pass
NVNT	ANT1	1-DH5	2480.00	3.442	-43.400	-16.558	Pass
NVNT	ANT1	2-DH5	2402.00	3.239	-42.650	-16.761	Pass
NVNT	ANT1	2-DH5	2441.00	3.364	-43.442	-16.636	Pass
NVNT	ANT1	2-DH5	2480.00	3.538	-43.462	-16.462	Pass
NVNT	ANT1	3-DH5	2402.00	3.512	-43.308	-16.488	Pass
NVNT	ANT1	3-DH5	2441.00	3.778	-45.522	-16.222	Pass
NVNT	ANT1	3-DH5	2480.00	4.019	-44.930	-15.981	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402_00



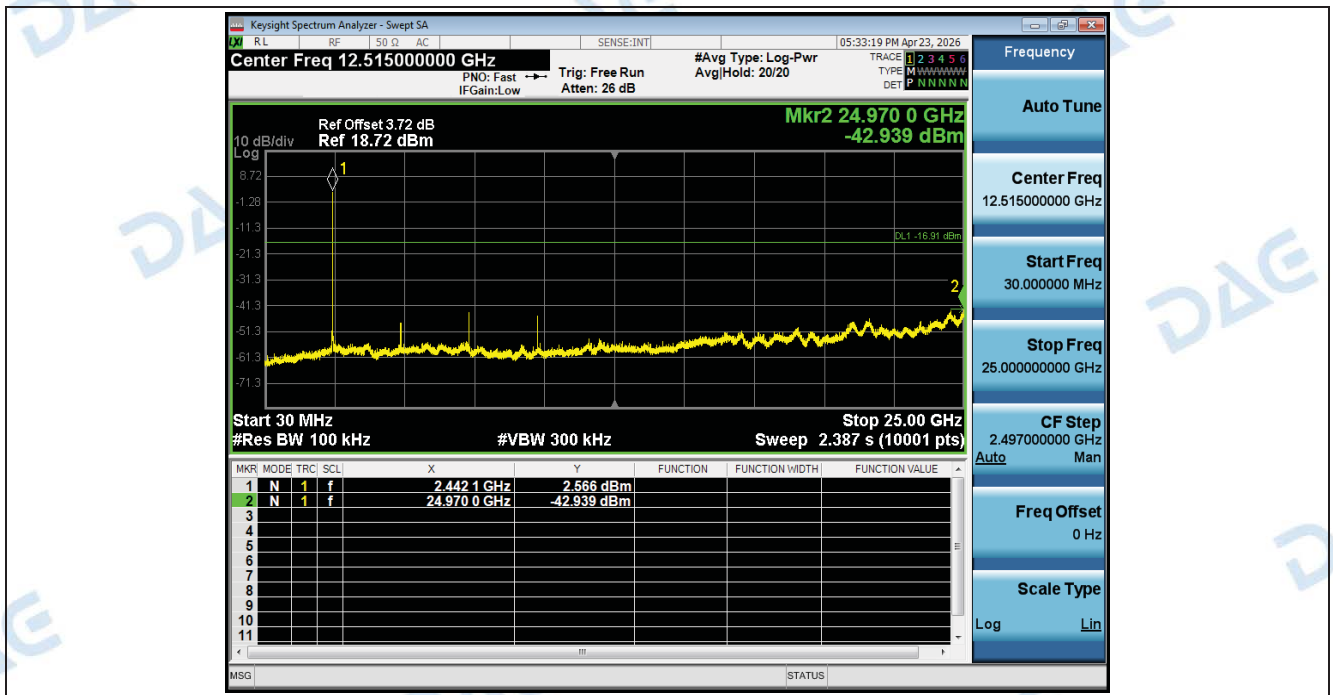
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2402_00



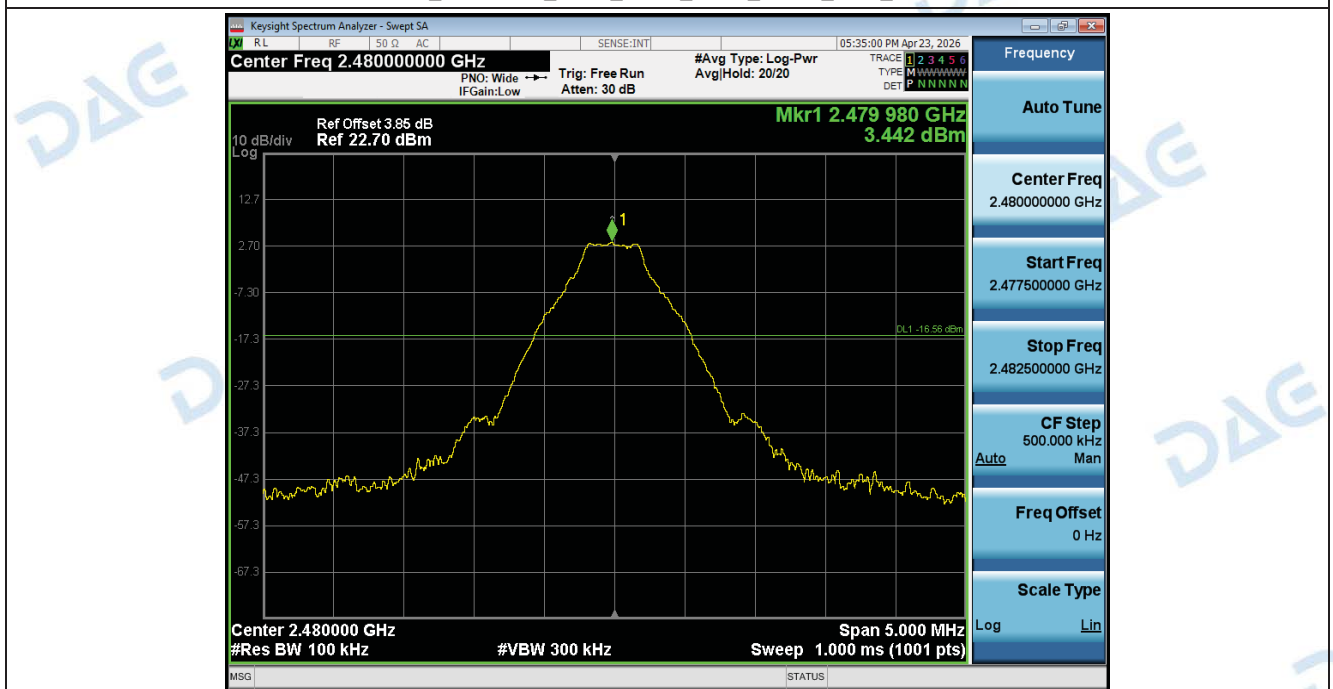
1_Reference_Level_NVNT_ANT1_1-DH5_2441_00



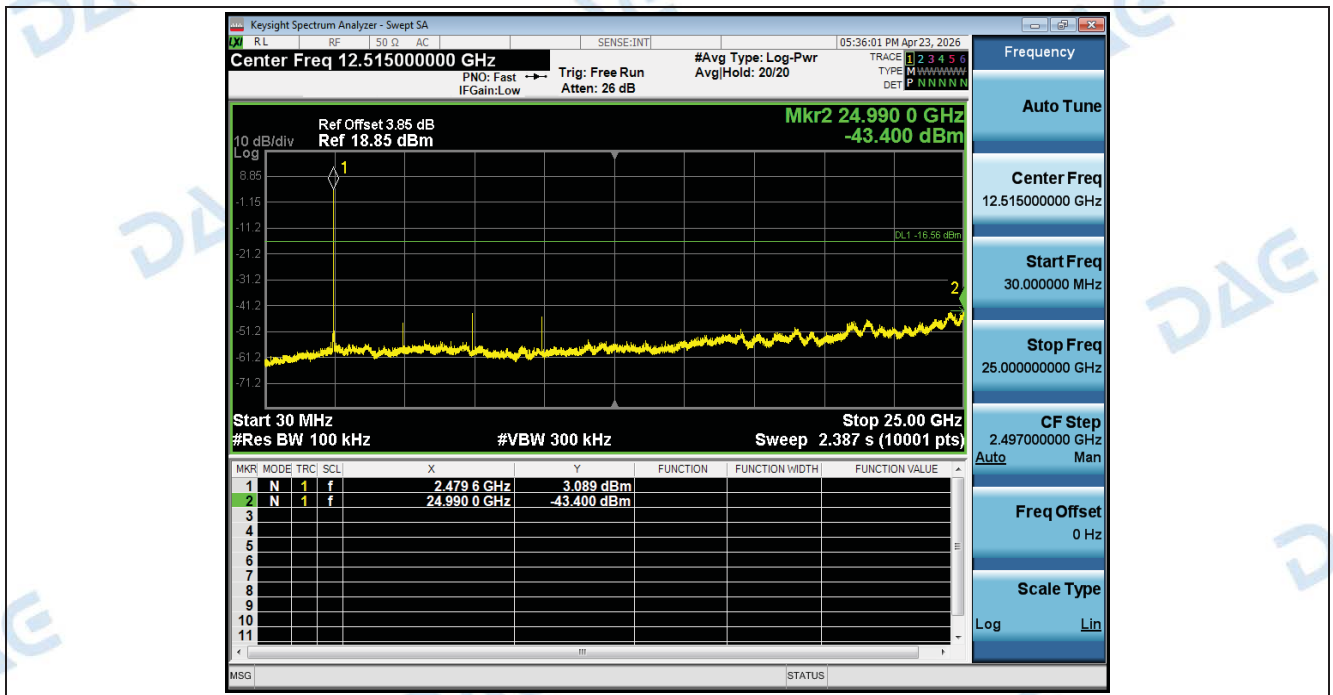
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2441_00



1_Reference_Level_NVNT_ANT1_1-DH5_2480_00



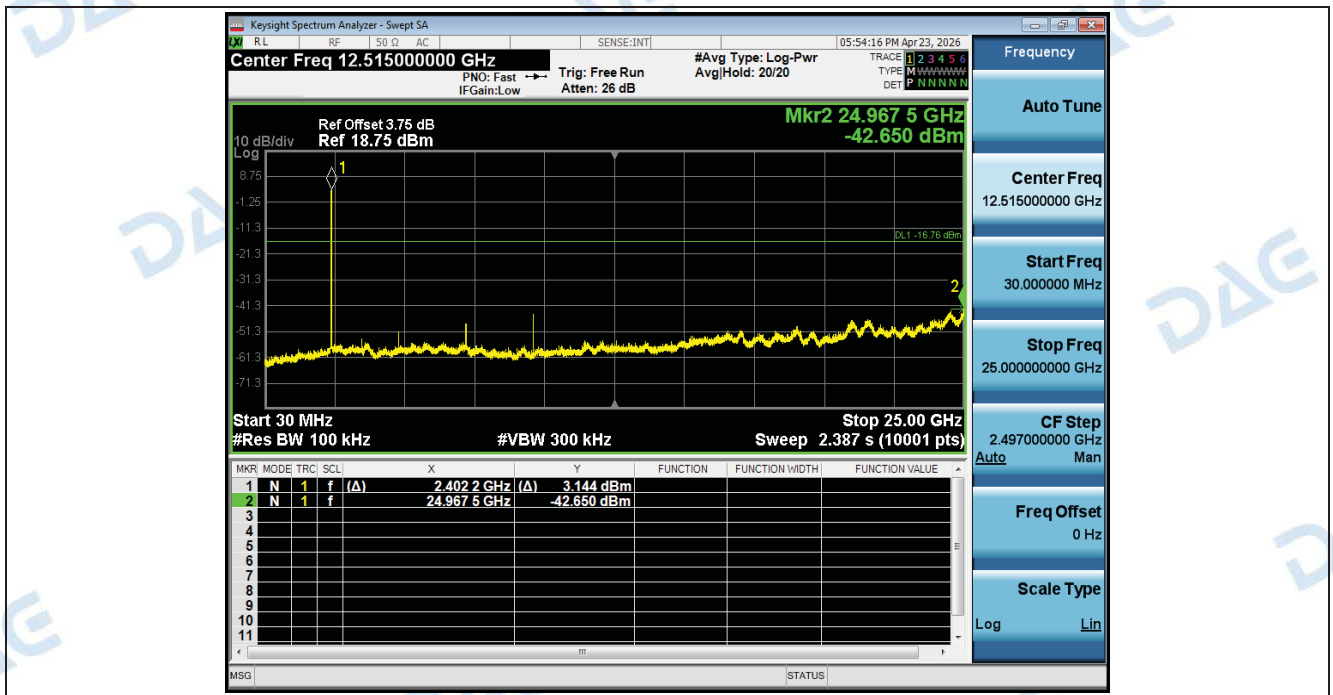
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480_00



1_Reference_Level_NVNT_ANT1_2-DH5_2402_00



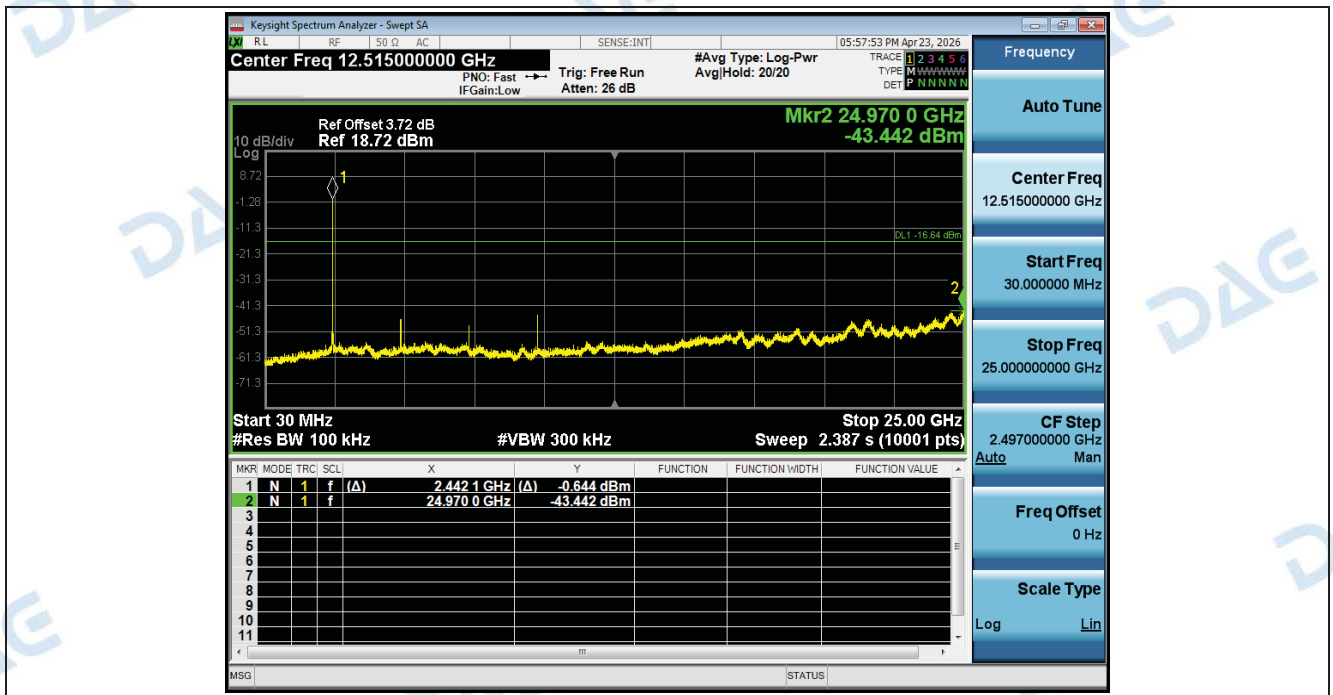
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402_00



1_Reference_Level_NVNT_ANT1_2-DH5_2441_00



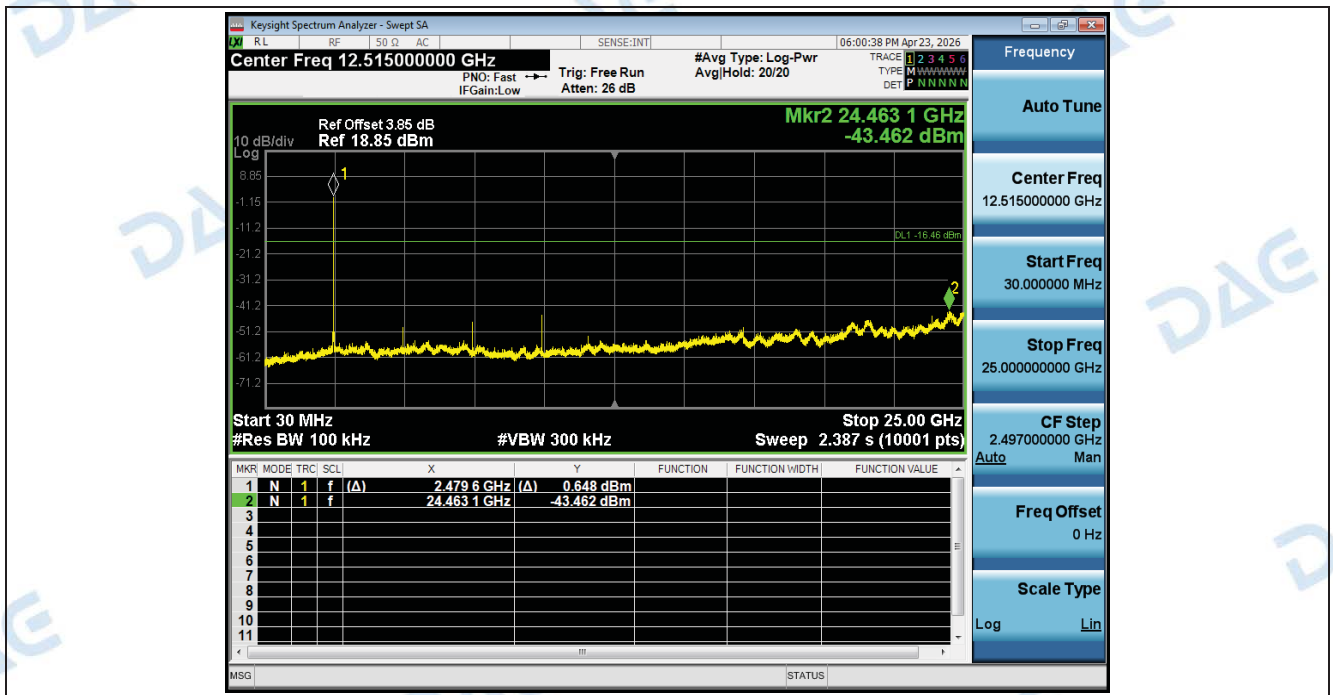
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441_00



1_Reference_Level_NVNT_ANT1_2-DH5_2480_00



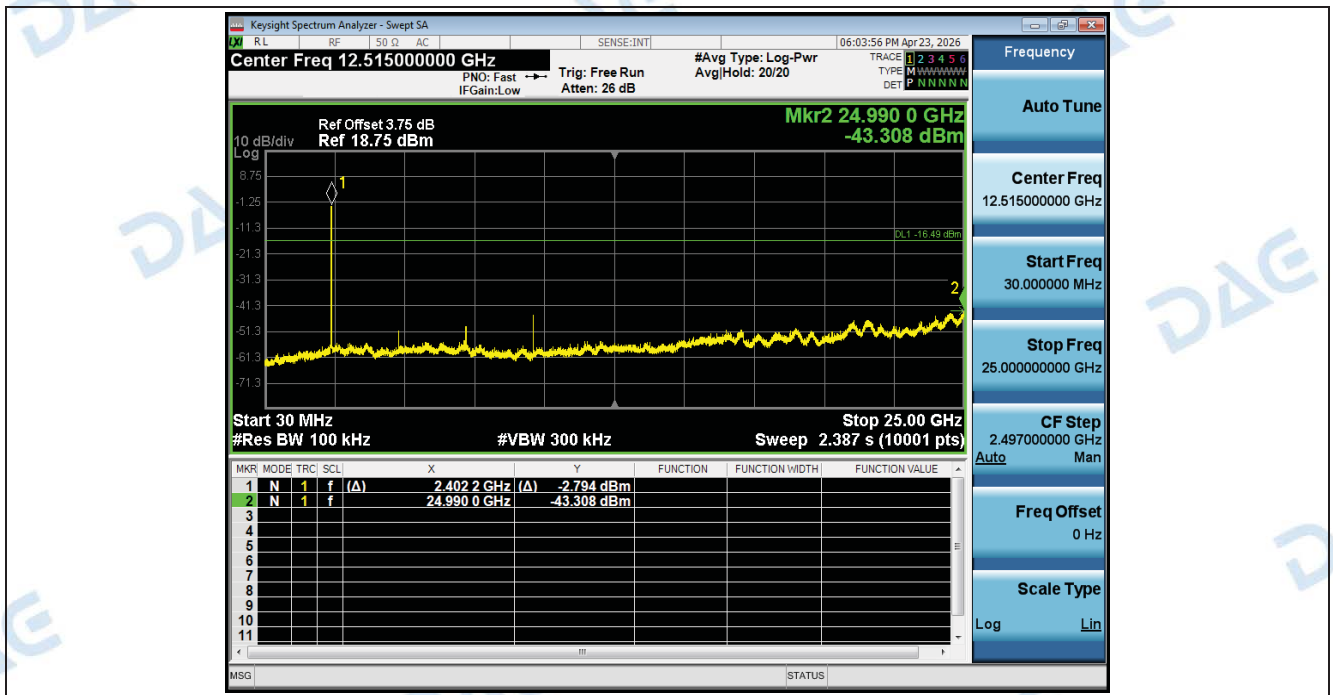
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480_00



1_Reference_Level_NVNT_ANT1_3-DH5_2402_00



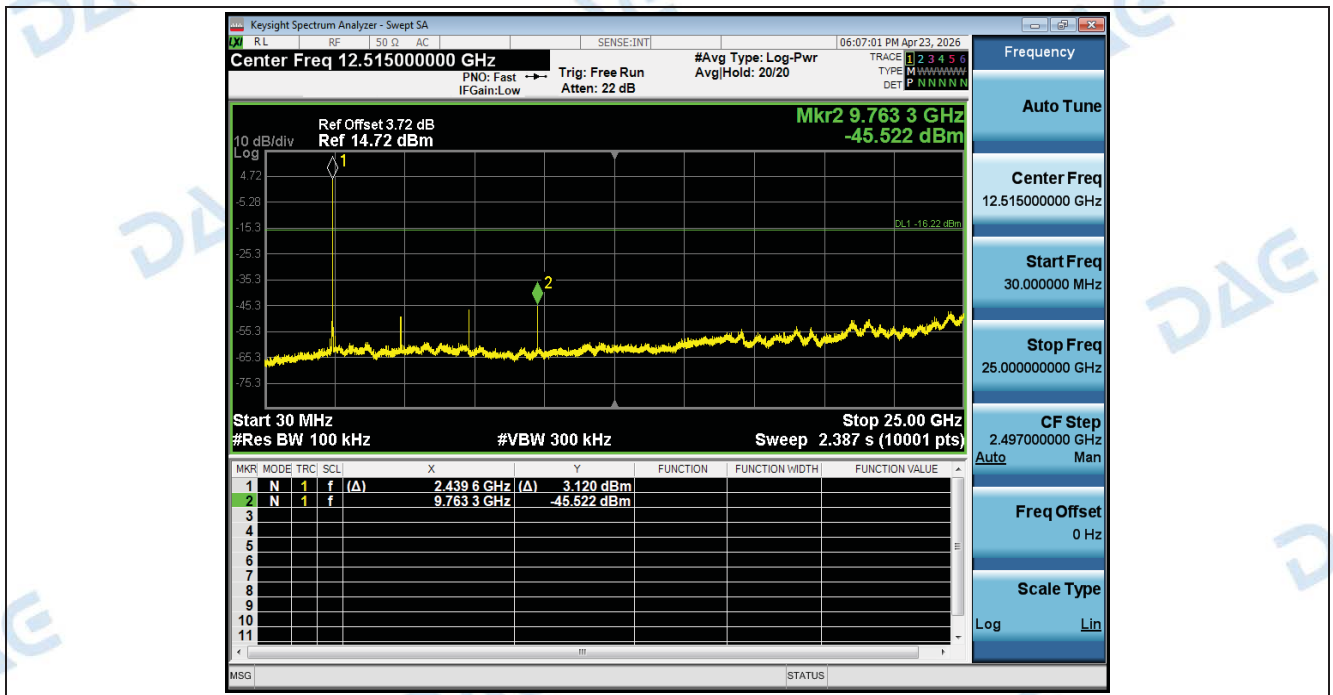
2_Spurious_Emissions_NVNT_ANT1_3-DH5_2402_00



1_Reference_Level_NVNT_ANT1_3-DH5_2441_00



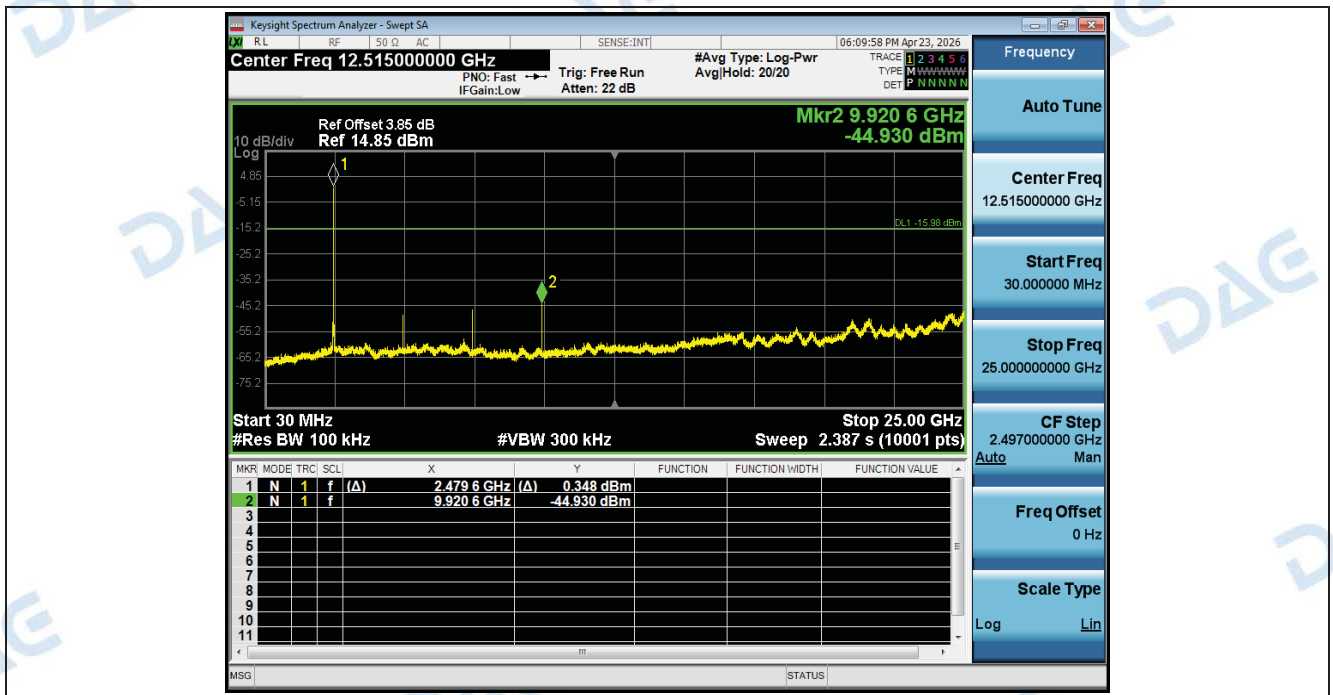
2_Spurious_Emissions_NVNT_ANT1_3-DH5_2441_00



1_Reference_Level_NVNT_ANT1_3-DH5_2480_00



2_Spurious_Emissions_NVNT_ANT1_3-DH5_2480_00



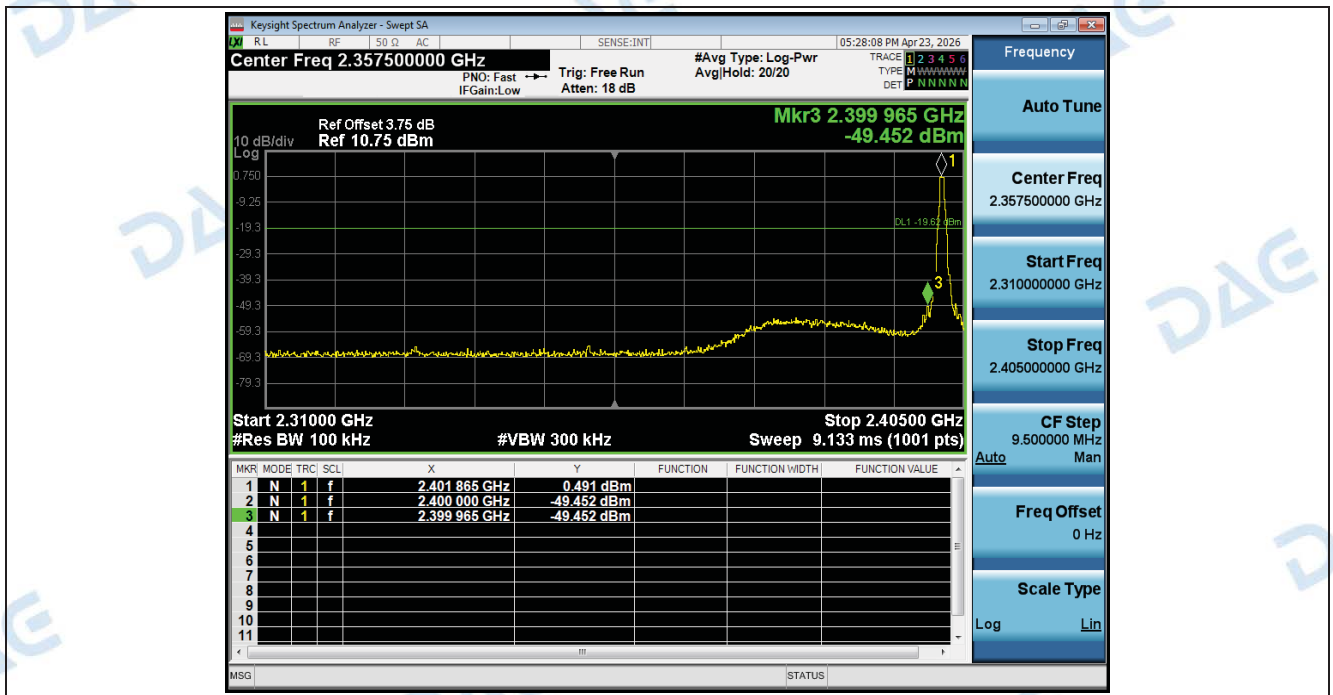
6. Bandedge

Condition	Antenna	Modulation	TX Mode	Ref_level(dBm)	Bandedge MAX.Value	Limit	Result
NVNT	ANT1	1-DH5	2402.00	0.379	-49.452	-19.621	Pass
NVNT	ANT1	1-DH5	Hopping_LCH	3.363	-52.203	-16.637	Pass
NVNT	ANT1	1-DH5	2480.00	3.442	-50.298	-16.558	Pass
NVNT	ANT1	1-DH5	Hopping_HCH	3.580	-50.610	-16.420	Pass
NVNT	ANT1	2-DH5	2402.00	3.239	-46.398	-16.761	Pass
NVNT	ANT1	2-DH5	Hopping_LCH	3.473	-51.052	-16.527	Pass
NVNT	ANT1	2-DH5	2480.00	3.538	-50.158	-16.462	Pass
NVNT	ANT1	2-DH5	Hopping_HCH	3.625	-50.989	-16.375	Pass
NVNT	ANT1	3-DH5	2402.00	3.512	-46.884	-16.488	Pass
NVNT	ANT1	3-DH5	Hopping_LCH	3.908	-51.913	-16.092	Pass
NVNT	ANT1	3-DH5	2480.00	4.019	-50.564	-15.981	Pass
NVNT	ANT1	3-DH5	Hopping_HCH	4.031	-50.446	-15.969	Pass

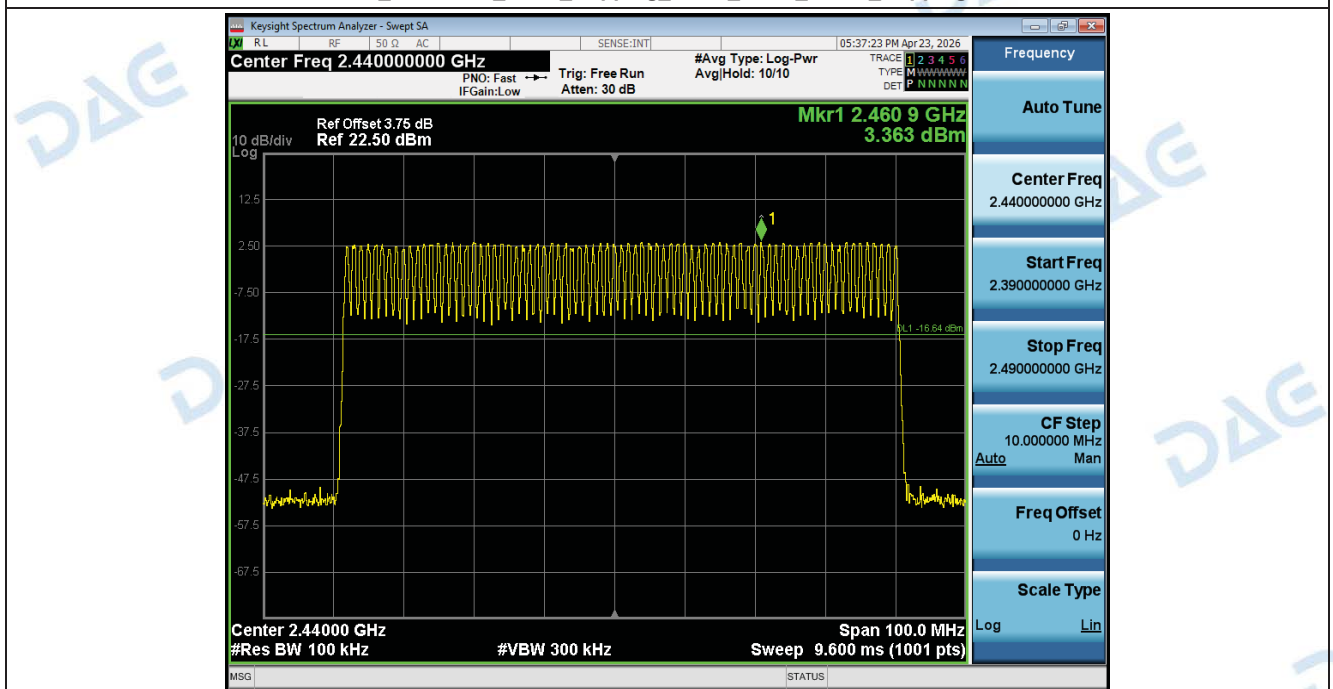
1_Reference_Level_NVNT_ANT1_1-DH5_2402_00



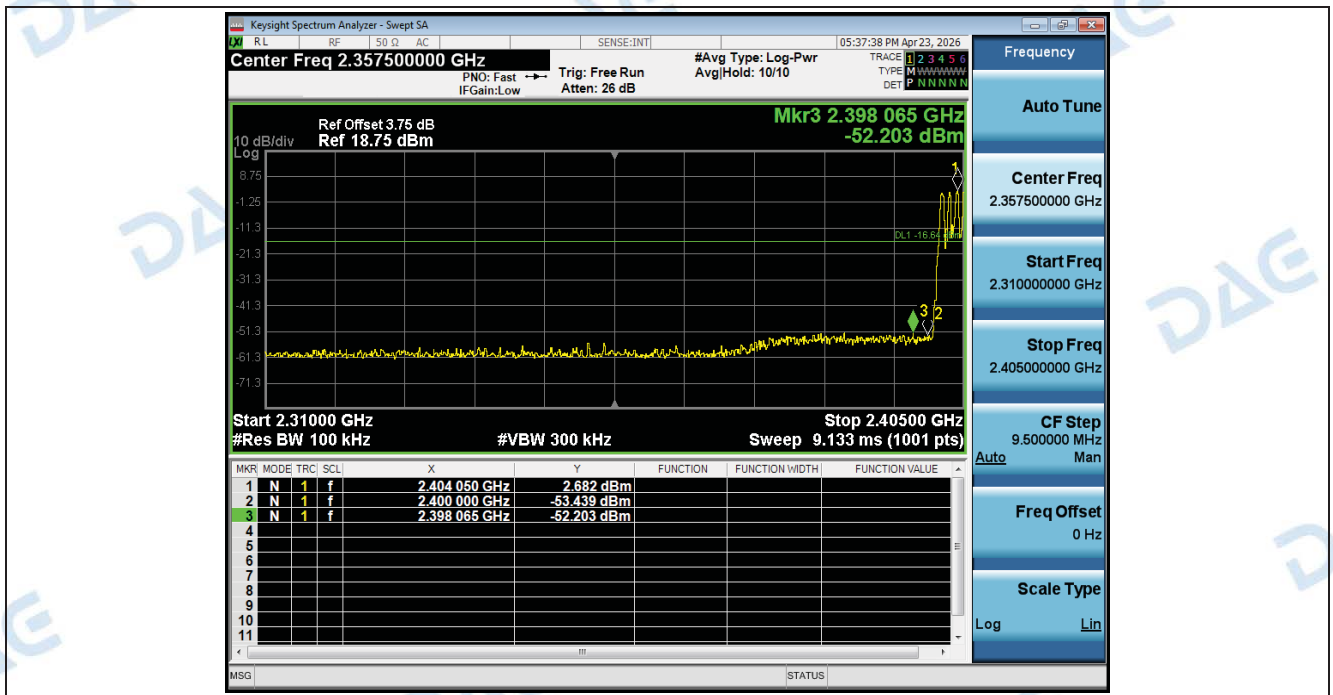
2_Bandedge_NVNT_ANT1_1-DH5_2402_00



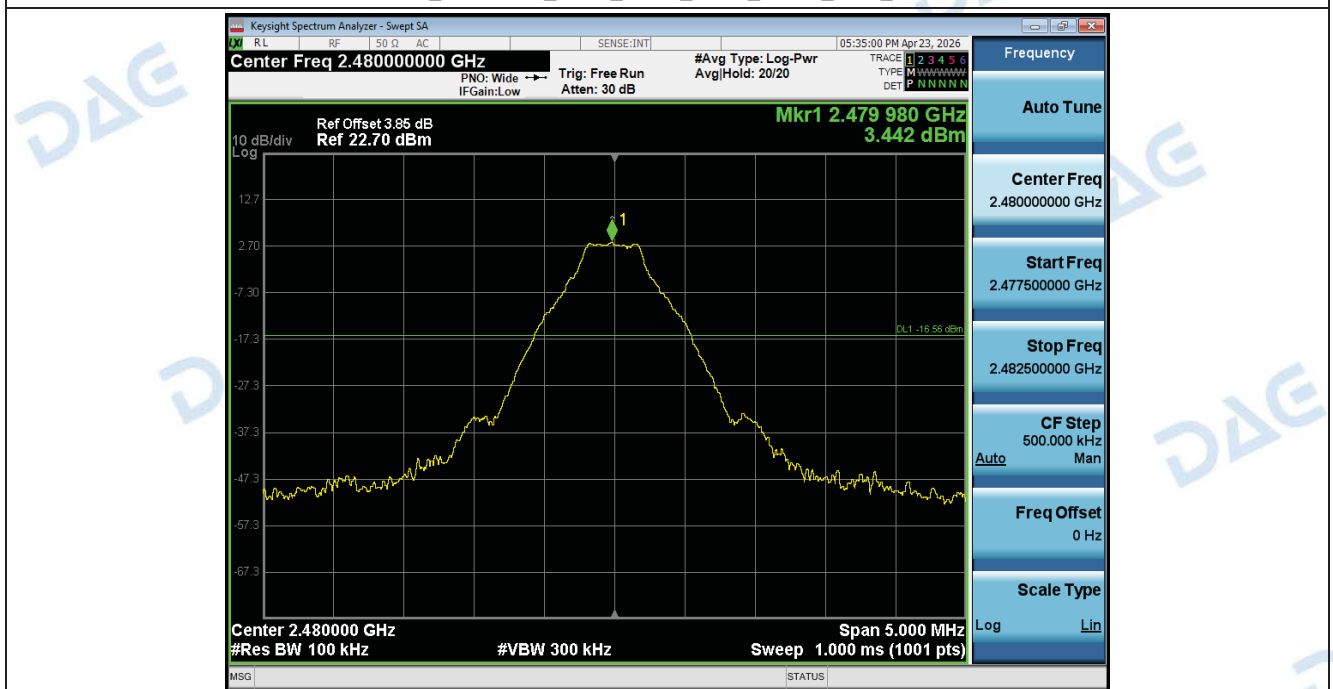
1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping



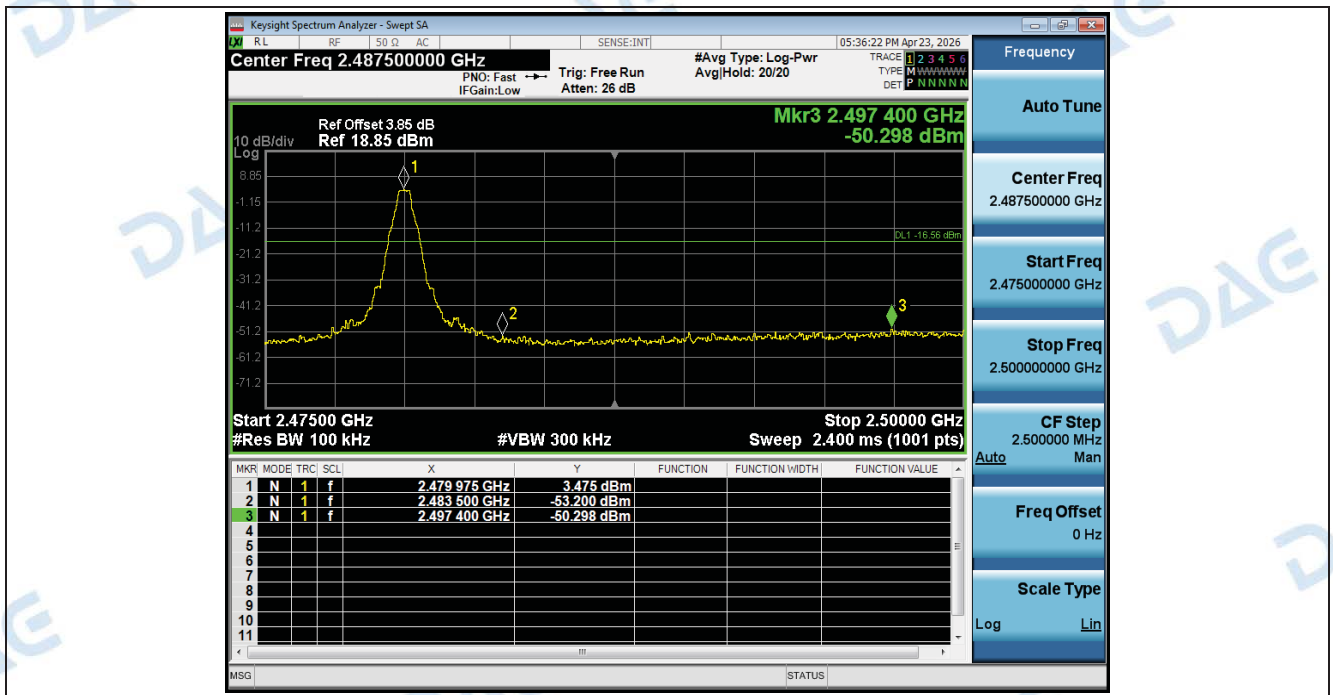
2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



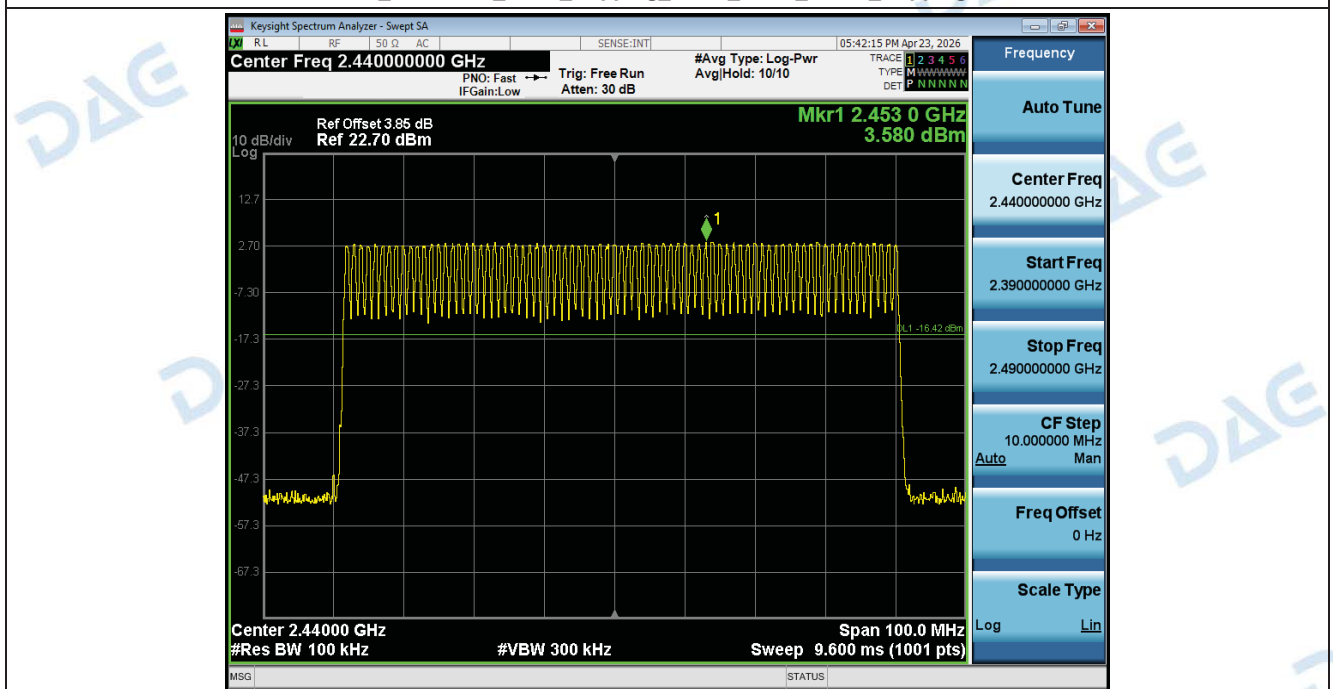
1_Reference_Level_NVNT_ANT1_1-DH5_2480_00



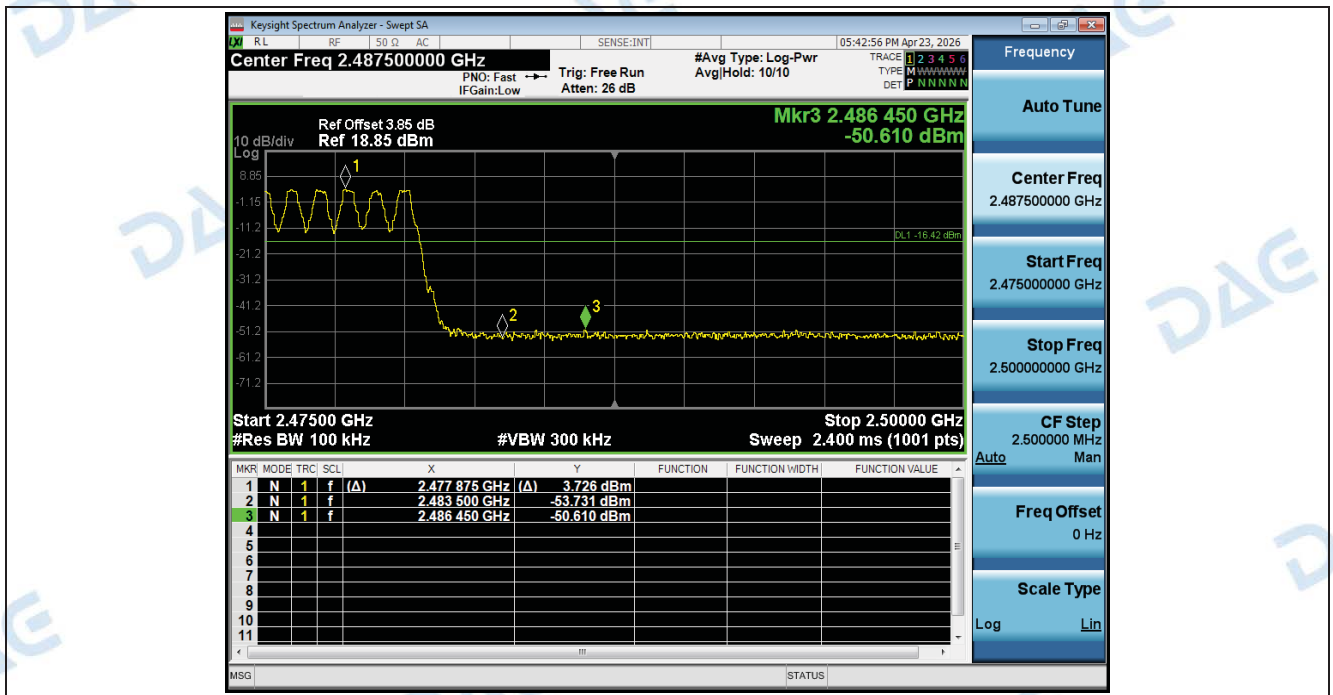
2_Bandedge_NVNT_ANT1_1-DH5_2480_00



1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping



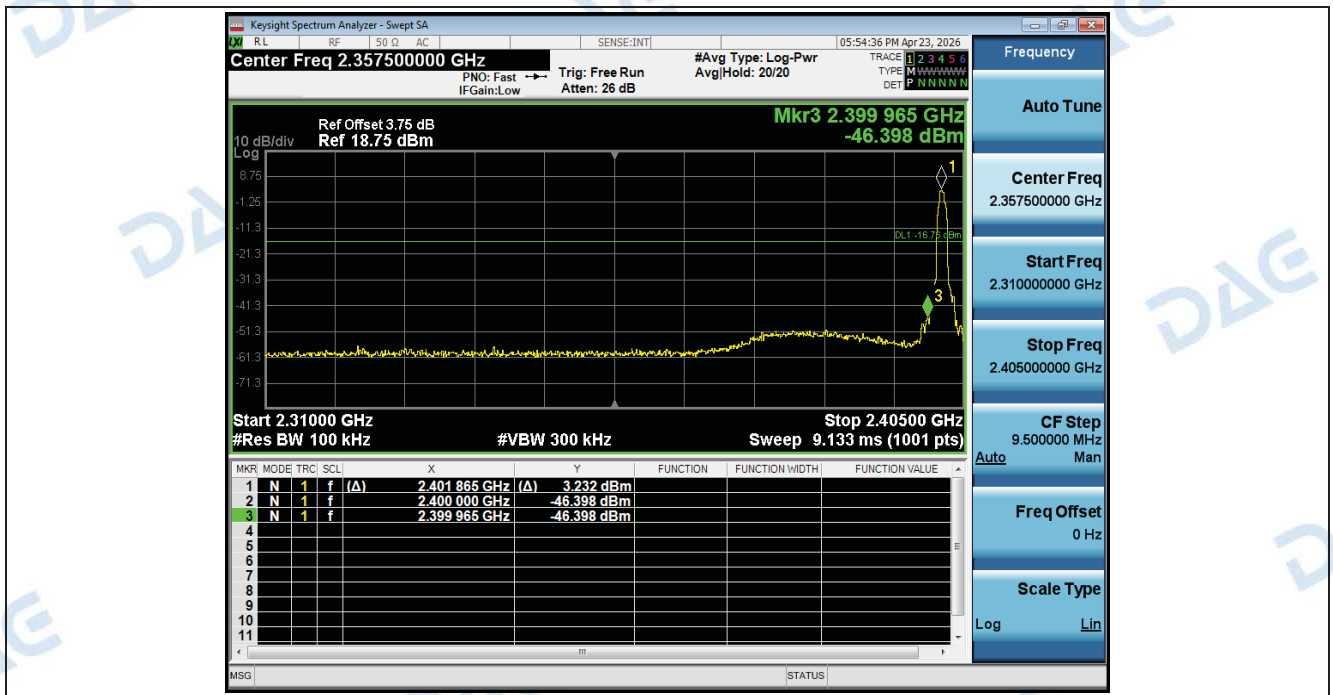
2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



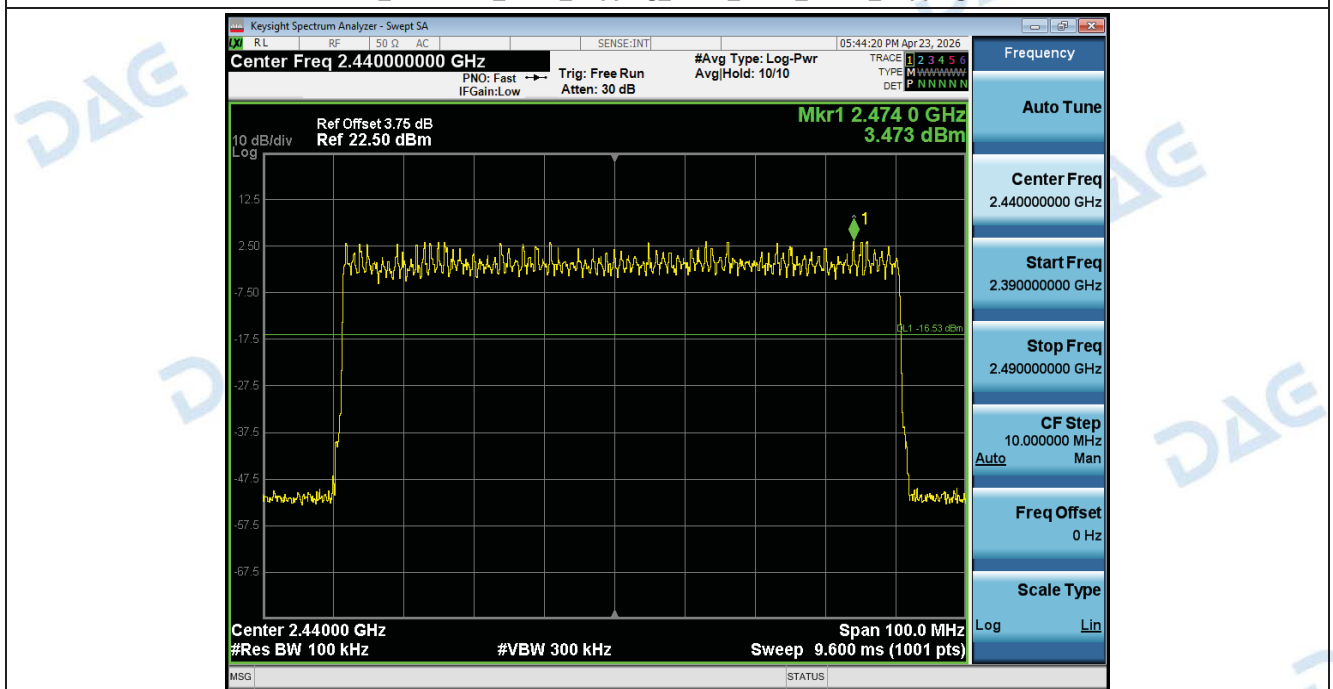
1_Reference_Level_NVNT_ANT1_2-DH5_2402_00



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