



FCC TEST REPORT

FCC ID: 2BR2R-NS2410

On Behalf of

ZHONGSHAN NENGSHENG SOLAR TECHNOLOGY CO., LTD

Solar Mini Energy Storage Emergency Lighting Camping Light

Model No.: NS2409, NS2410

Prepared for : ZHONGSHAN NENGSHENG SOLAR TECHNOLOGY CO., LTD
Address : 3rd Floor, Building B, No. 2 Lelin Street, Tongyi Industrial Zone,
Guzhen Town, Zhongshan City, Guangdong Province, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

Report Number : A2508109-C01-R01
Date of Receipt : August 13, 2025
Date of Test : August 13, 2025 – August 30, 2025
Date of Report : September 4, 2025
Version Number : V0
Test Result : Pass

TABLE OF CONTENTS

<u>Description</u>	<u>Page</u>
1. Summary of Standards And Results	6
1.1. Description of Standards and Results	6
2. General Information	7
2.1. Description of Device (EUT)	7
2.2. Accessories of Device (EUT)	8
2.3. Tested Supporting System Details	8
2.4. Block Diagram of connection between EUT and simulators	8
2.5. Test Mode Description	8
2.6. Test Conditions	9
2.7. Test Facility	9
2.8. Measurement Uncertainty	9
2.9. Test Equipment List.....	10
3. Maximum Peak Output power.....	12
3.1. Limit	12
3.2. Test Procedure.....	12
3.3. Test Setup.....	12
3.4. Test Result	12
4. Bandwidth.....	13
4.1. Limit	13
4.2. Test Procedure.....	13
4.3. Test Result	13
5. Carrier Frequency Separation	21
5.1. Limit	21
5.2. Test Procedure.....	21
5.3. Test Result	21
6. Number Of Hopping Channel.....	23
6.1. Limit	23
6.2. Test Procedure.....	23
6.3. Test Result	23
7. Dwell Time.....	25
7.1. Test Limit.....	25
7.2. Test Procedure.....	25
7.3. Test Result	25
8. Radiated emissions	32
8.1. Limit	32
8.2. Block Diagram of Test Setup.....	33
8.3. Test Procedure.....	34
8.4. Test Result	34
9. RF Conducted Spurious Emissions.....	39
9.1. Block Diagram of Test Setup	39

9.2. Limits	39
9.3. Test Procedure	39
9.4. Test Result.....	39
10. Band Edge Compliance.....	46
10.1. Block Diagram of Test Setup	46
10.2. Limit	46
10.3. Test Procedure	46
10.4. Test Result	46
11. Band Edge (Conducted)	49
11.1. Block Diagram of Test Setup.....	49
11.2. Test Limits	49
11.3. Test Procedure	49
11.4. Test Results	50
12. Power Line Conducted Emissions.....	58
12.1. Block Diagram of Test Setup	58
12.2. Limit	58
12.3. Test Procedure	58
12.4. Test Result	58
13. Antenna Requirements.....	61
13.1. Limit	61
13.2. Result	61
14. Test setup photo	62
14.1. Photo of Radiated Emission Test	62
14.2. Photo of Conducted Emission Test	63
15. EUT Photo	64

TEST REPORT DECLARATION

Applicant : ZHONGSHAN NENGSHENG SOLAR TECHNOLOGY CO., LTD
Address : 3rd Floor, Building B, No. 2 Lelin Street, Tongyi Industrial Zone, Guzhen Town,
Zhongshan City, Guangdong Province, China
Manufacturer : ZHONGSHAN NENGSHENG SOLAR TECHNOLOGY CO., LTD
Address : 3rd Floor, Building B, No. 2 Lelin Street, Tongyi Industrial Zone, Guzhen Town,
Zhongshan City, Guangdong Province, China
EUT Description : Solar Mini Energy Storage Emergency Lighting Camping Light
(A) Model No. : NS2409, NS2410
(B) Trademark : N/A

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Yannis Wen
Project Engineer

Yannis Wen

Approved by (name + signature).....: Jack Xu
Project Manager

Jack Xu

Date of issue.....: September 4, 2025

Revision History

Revision	Issue Date	Revisions	Revised By
V0	September 4, 2025	Initial released Issue	Yannis Wen

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10 :2013	P
Bandwidth	FCC Part 15: 15.215 ANSI C63.10 :2013	P
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10 :2013	P
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	P
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013	P
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10 :2013	P
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.10 :2013	P
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10 :2013	P
Antenna requirement	FCC Part 15: 15.203	P
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable. 4. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.		

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description	: Solar Mini Energy Storage Emergency Lighting Camping Light
Model Number	: NS2409, NS2410
Diff	: After verification there is no difference except for the color. All tests are made with the NS2410 model.
Power supply	: DC 5V from DC port and DC 6V from solar and DV 3.7V from battery
Radio Technology	: Bluetooth BR/EDR
Operation frequency	: 2402-2480MHz
Channel No.	: 79 Channels
Channel spacing	: 1MHz
Modulation type	: GFSK, $\pi/4$ DQPSK
Antenna Type	: PCB antenna, Maximum Gain is -0.58dBi (Antenna information is provided by applicant.)
Software version	: V1.0
Hardware version	: V1.0
Intend use environment	: Residential, commercial and light industrial environment

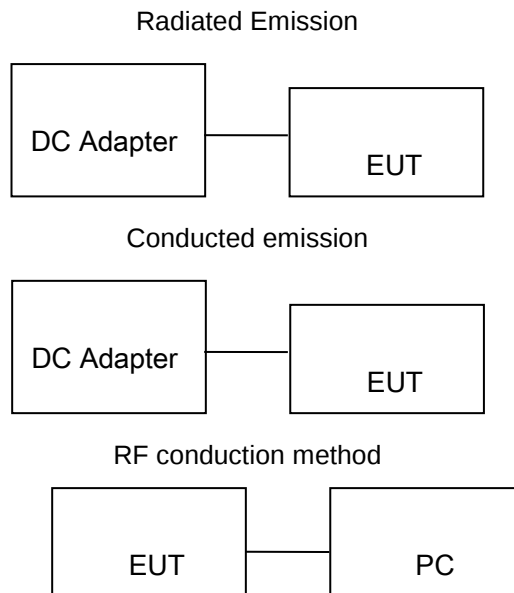
2.2. Accessories of Device (EUT)

Accessories : N/A
 Manufacturer : N/A
 Model : N/A
 Ratings : N/A

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1.	Notebook PC	Lenovo	ThinkPad L14	N/A	N/A

2.4. Block Diagram of Test



2.5. Test Mode Description

Tested mode, channel information		
Mode	Channel	Frequency (MHz)
GFSK, $\pi/4$ DQPSK Hopping-off mode	Low :CH0	2402
	Middle: CH39	2441
	High: CH78	2480
GFSK, $\pi/4$ DQPSK Hopping-on mode	Hopping	2402-2480

Using FCC_assist_1.0.2.2 testing software to control EUT work in Continuous TX mode, and select test channel, wireless mode, the power level of the test is set to default.

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (18GHz to 40GHz)	4.31 dB(Polarize: V)
	4.30 dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8} GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacturer	Model No.	Firmware version	Serial No.	Last Cal.	Cal. Due day
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2025.03.09	4Year
4*4*3 Shielded room	CHENYU	4*4*3	/	N/A	2025.03.09	4Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2025.08.04	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2025.08.04	1Year
Test Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03 -102082-Wa	2025.08.04	1Year
Test Receiver	ROHDE&SCHWARZ	ESCI	4.42 SP1	101165	2025.08.04	1Year
Bilog Antenna	SCHWARZBECK	VULB 9168	/	VULB 9168#627	2025.08.11	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2025.08.11	2Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2025.08.11	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2025.08.04	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2025.08.04	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2025.08.04	1Year
Amplifier	HP	HP8347A	/	2834A00455	2025.08.04	1Year
Amplifier	Agilent	8449B	/	3008A02664	2025.08.04	1Year
L.I.S.N.#1	SCHWARZBECK	NSLK8126	/	8126-466	2025.08.04	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2025.08.04	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2025.08.11	2Year
Preamplifier	SKET	LNPA_1840-5 0	/	SK201810180 1	2025.08.04	1 Year
Power Meter	Agilent	E4419B	/	GB40202122	2025.08.04	1 Year
Power Sensor	Agilent	E9300A	/	MY41496628	2025.08.04	1 Year
Power Sensor	Agilent	E9304A	/	MY41496815	2025.08.04	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205- 01	2025.07.14	1 Year
Electronic Thermo-Hygrometer	S.H.Qixiang	HTC-1	/	N/A	2025.08.04	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2025.08.04	1 Year
Adjustable attenuator	MWRFtest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	Farad	Alpha-3A1
CE	EZ-EMC	Farad	Alpha-3A1
RF-CE	MTS 8310	MWRFtest	V2.0.0.0

3. MAXIMUM PEAK OUTPUT POWER

3.1. Limit

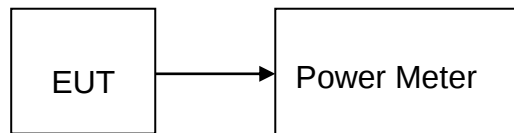
Please refer section 15.247.

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, the e.i.r.p shall not exceed 4W

3.2. Test Procedure

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.

3.3. Test Setup



3.4. Test Result

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH5	2402	Ant1	-2.79	21	Pass
NVNT	1-DH5	2441	Ant1	-2.662	21	Pass
NVNT	1-DH5	2480	Ant1	-3.22	21	Pass
NVNT	2-DH5	2402	Ant1	-1.663	21	Pass
NVNT	2-DH5	2441	Ant1	-1.667	21	Pass
NVNT	2-DH5	2480	Ant1	-2.511	21	Pass

4. BANDWIDTH

4.1. Limit

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.

4.2. Test Procedure

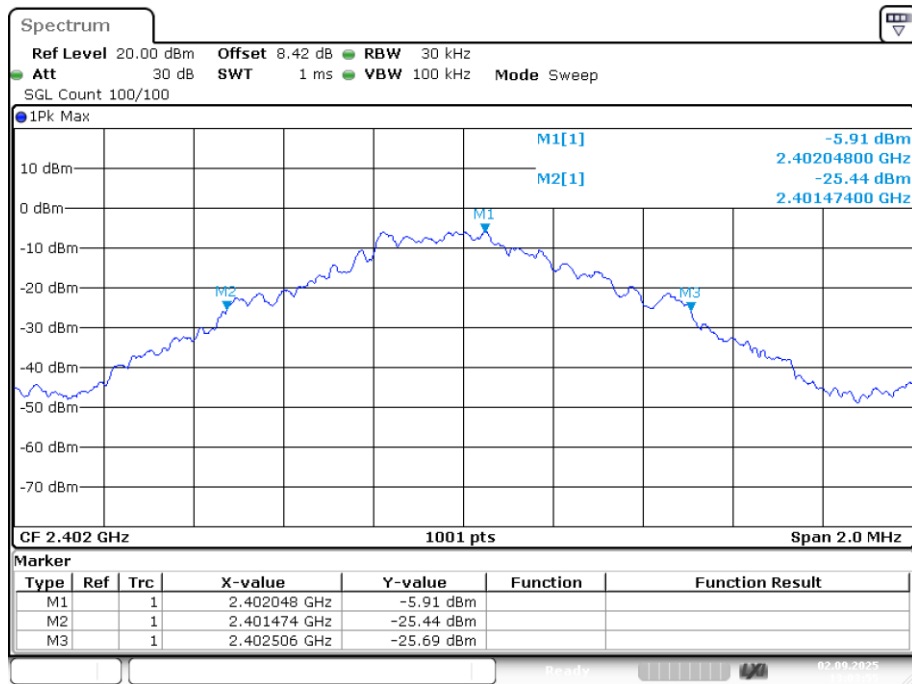
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3. Test Result

-20dB Bandwidth

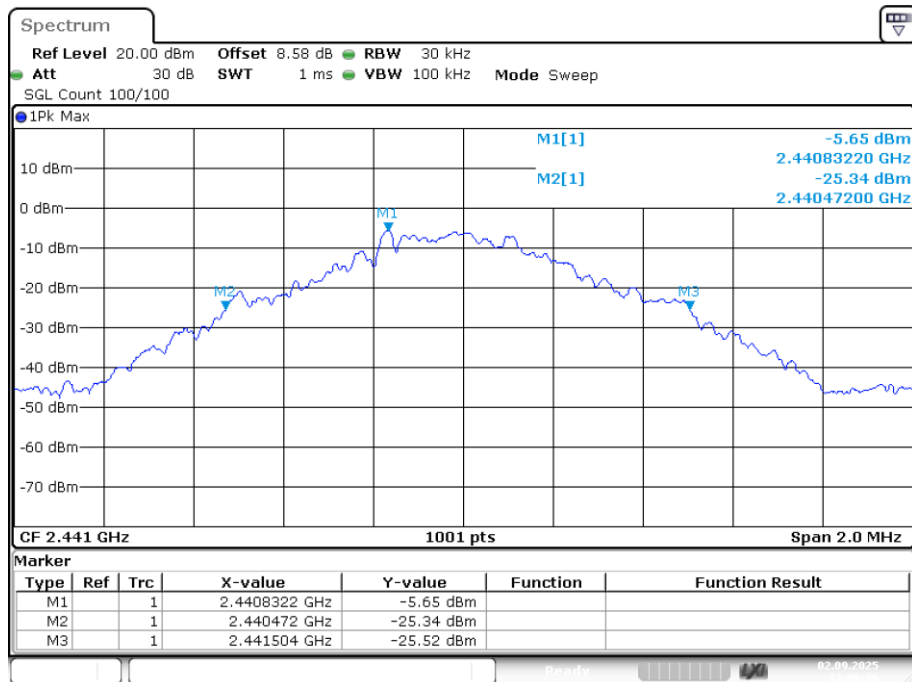
Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH5	2402	Ant1	1.032	/	Pass
NVNT	1-DH5	2441	Ant1	1.032	/	Pass
NVNT	1-DH5	2480	Ant1	1.072	/	Pass
NVNT	2-DH5	2402	Ant1	1.302	/	Pass
NVNT	2-DH5	2441	Ant1	1.334	/	Pass
NVNT	2-DH5	2480	Ant1	1.352	/	Pass

-20dB Bandwidth NVNT 1-DH5 2402MHz Ant1



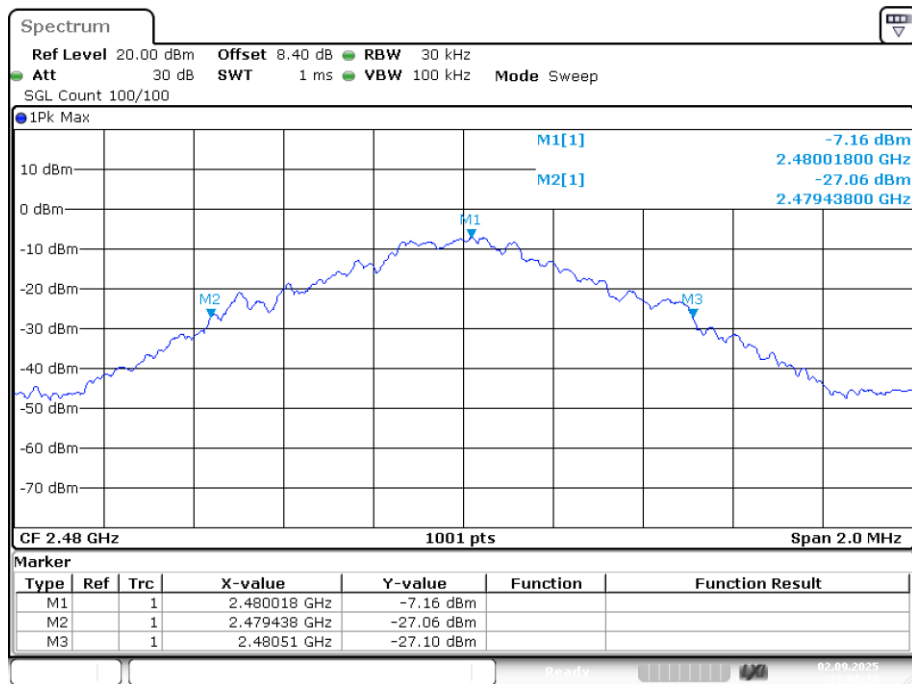
Date: 2.SEP.2025 13:03:55

-20dB Bandwidth NVNT 1-DH5 2441MHz Ant1

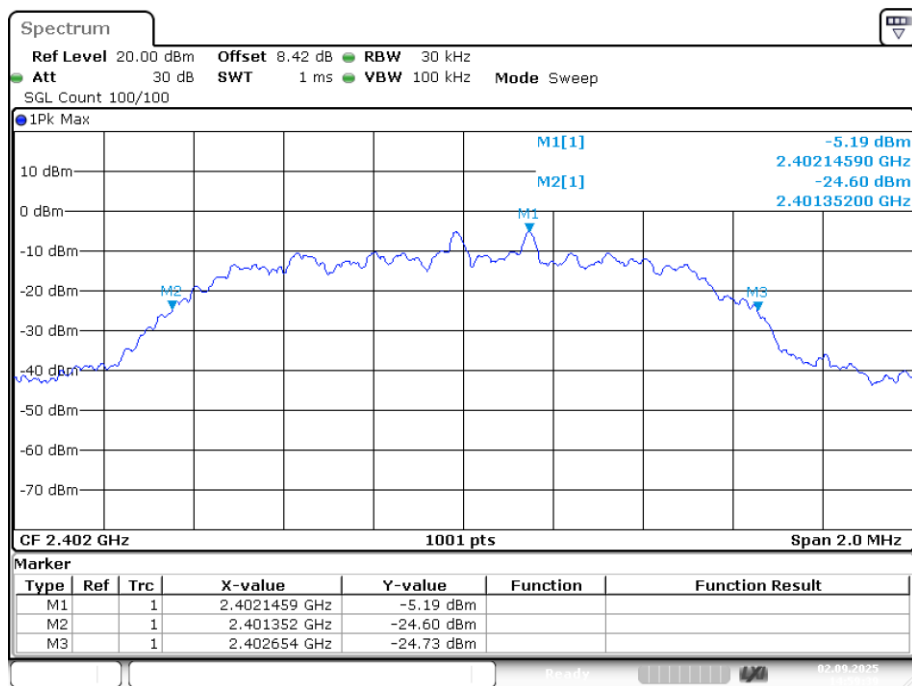


Date: 2.SEP.2025 13:06:35

-20dB Bandwidth NVNT 1-DH5 2480MHz Ant1

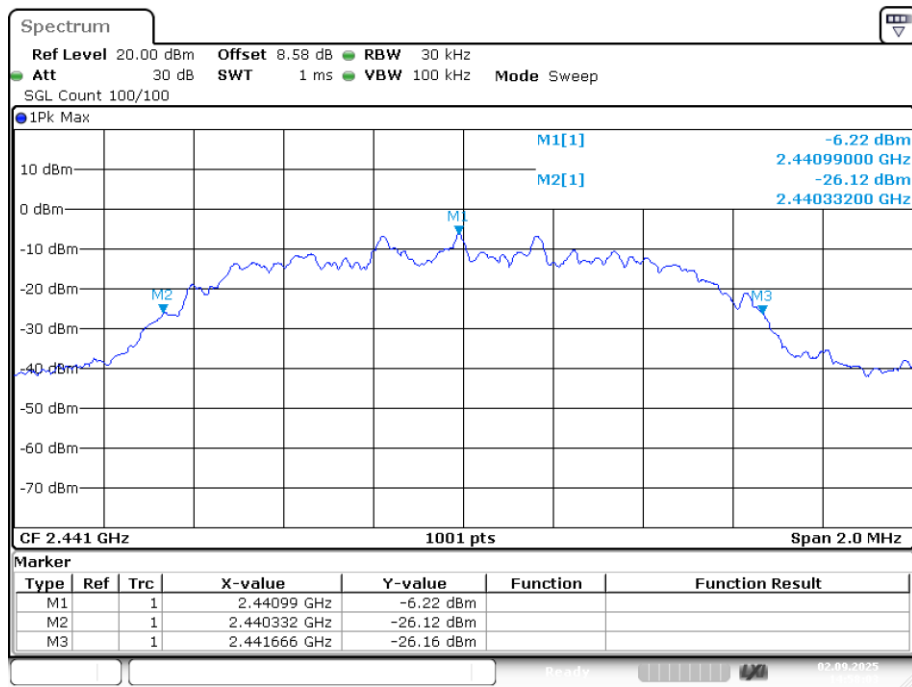


Date: 2.SEP.2025 13:08:14

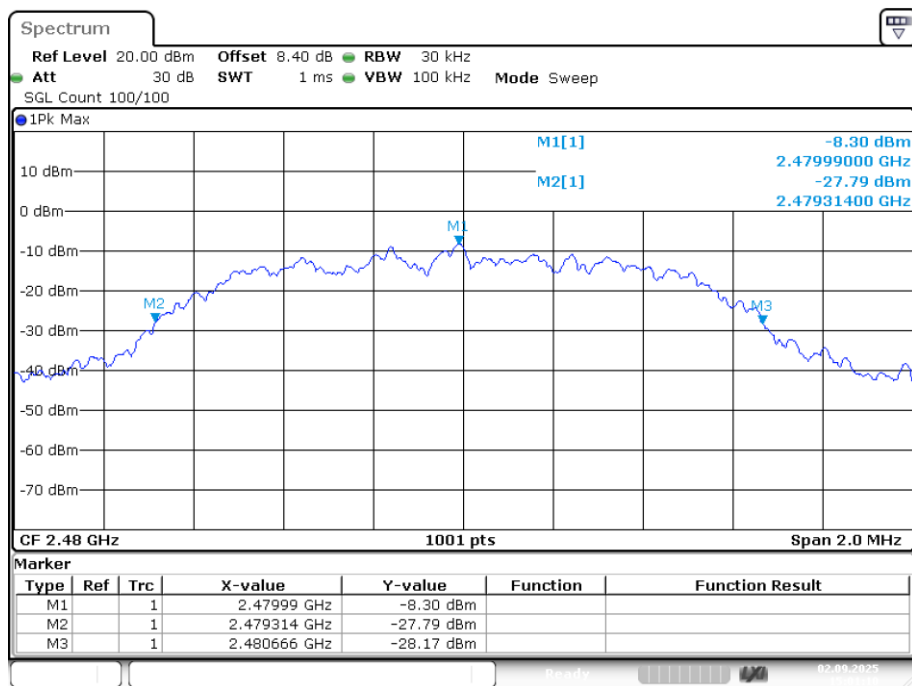
-20dB Bandwidth NVNT 2-DH5 2402MHz Ant1

Date: 2.SEP.2025 14:59:39

-20dB Bandwidth NVNT 2-DH5 2441MHz Ant1



Date: 2.SEP.2025 14:58:02

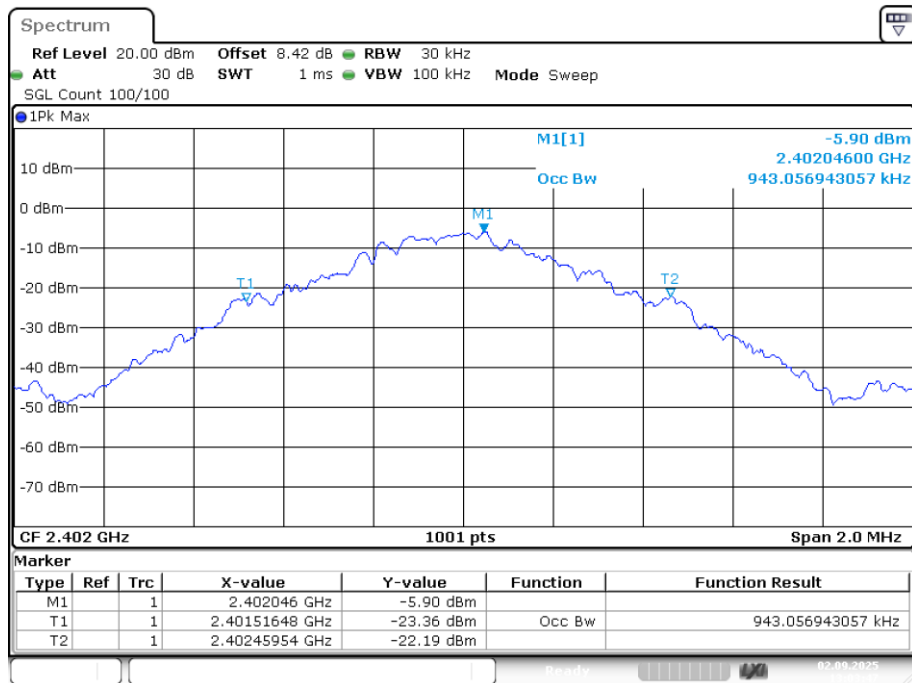
-20dB Bandwidth NVNT 2-DH5 2480MHz Ant1

Date: 2.SEP.2025 15:01:10

Occupied Channel Bandwidth

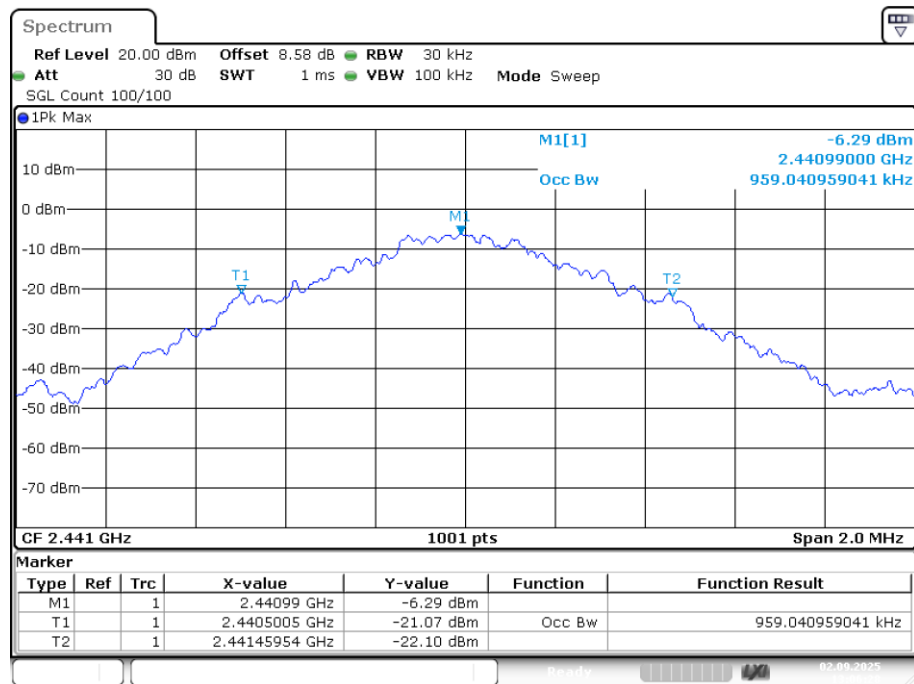
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH5	2402	Ant1	0.943
NVNT	1-DH5	2441	Ant1	0.959
NVNT	1-DH5	2480	Ant1	0.967
NVNT	2-DH5	2402	Ant1	1.219
NVNT	2-DH5	2441	Ant1	1.225
NVNT	2-DH5	2480	Ant1	1.235

OBW NVNT 1-DH5 2402MHz Ant1



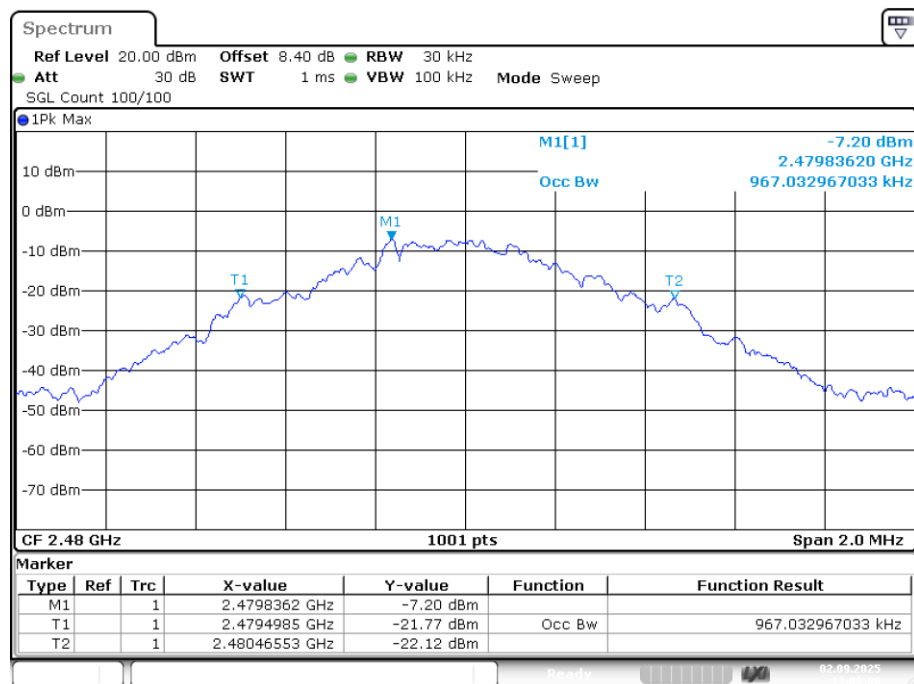
Date: 2.SEP.2025 13:03:47

OBW NVNT 1-DH5 2441MHz Ant1



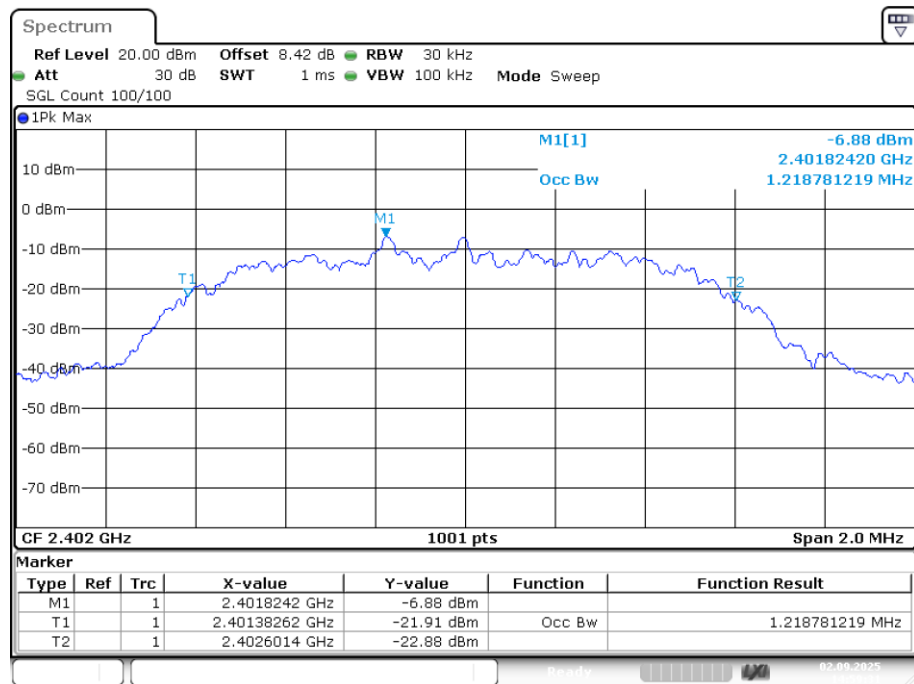
Date: 2.SEP.2025 13:06:27

OBW NVNT 1-DH5 2480MHz Ant1



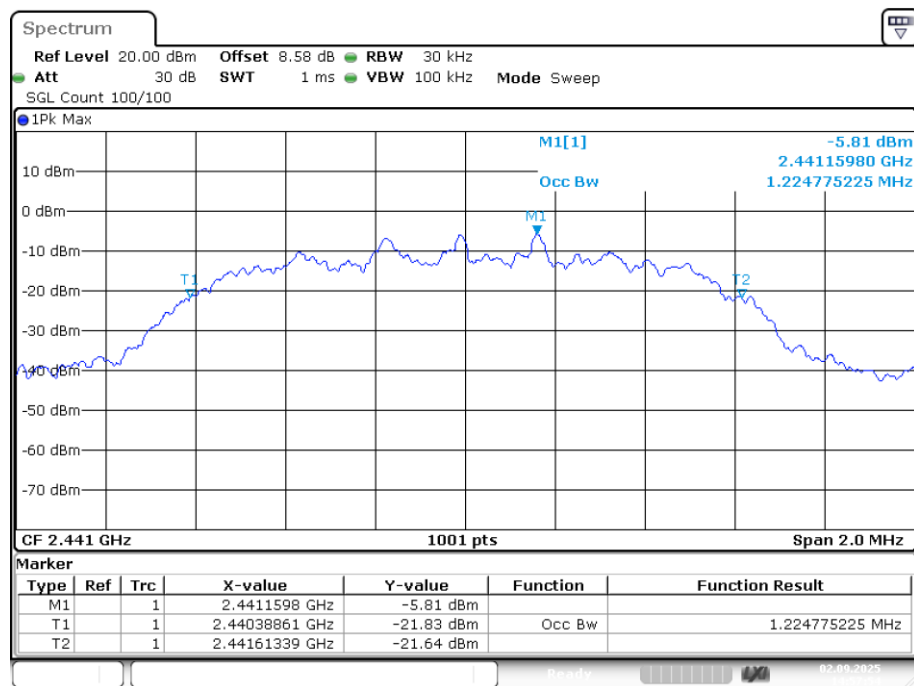
Date: 2.SEP.2025 13:08:06

OBW NVNT 2-DH5 2402MHz Ant1



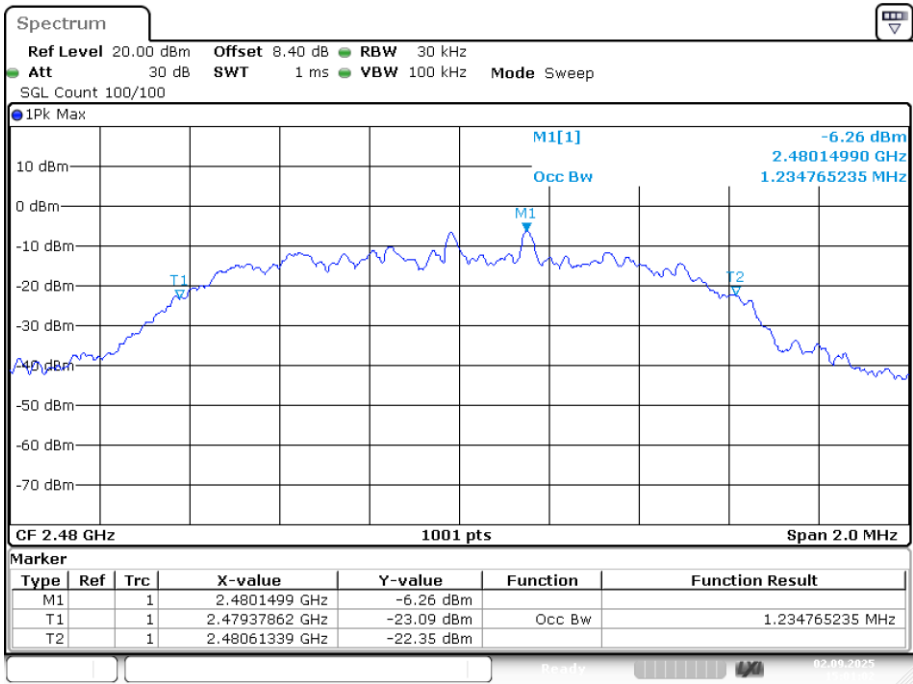
Date: 2.SEP.2025 14:59:31

OBW NVNT 2-DH5 2441MHz Ant1



Date: 2.SEP.2025 14:57:55

OBW NVNT 2-DH5 2480MHz Ant1



5. CARRIER FREQUENCY SEPARATION

5.1. Limit

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

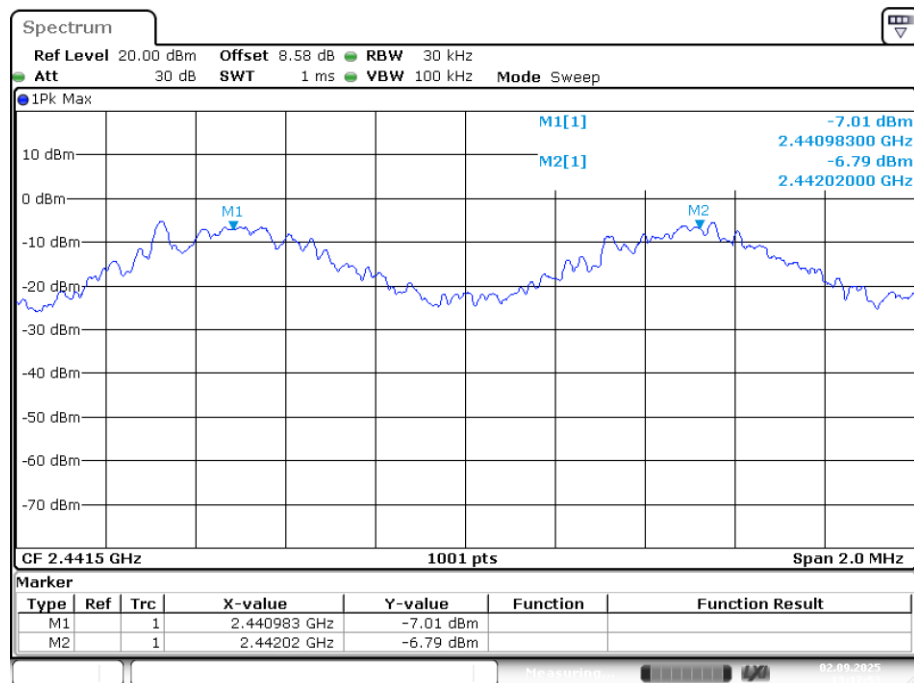
5.2. Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The carrier frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW.

5.3. Test Result

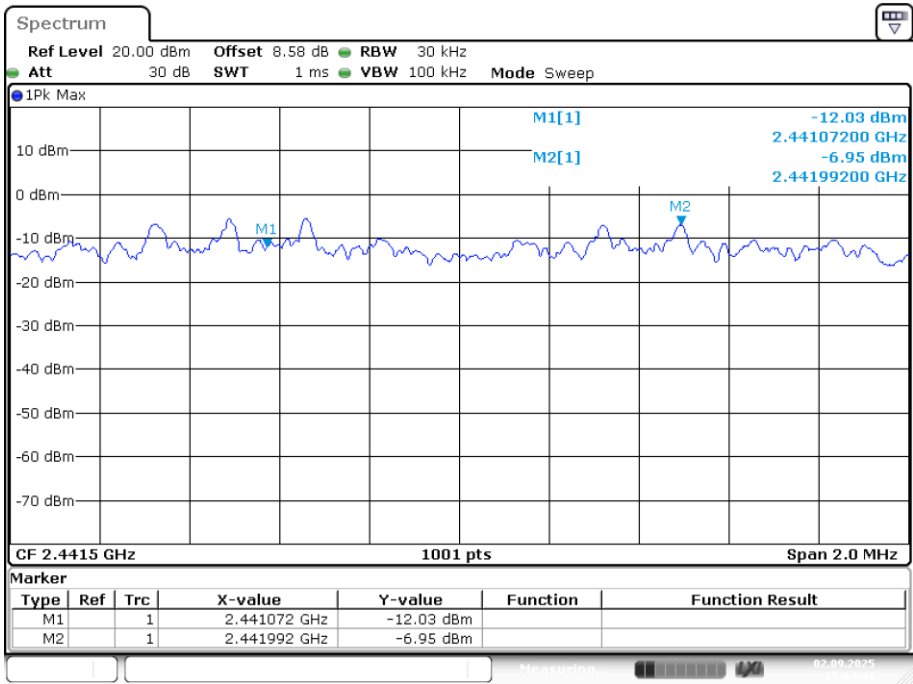
Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH5	Ant1	2440.983	2442.02	1.037	1.032	Pass
NVNT	2-DH5	Ant1	2441.072	2441.992	0.92	0.889	Pass

CFS NVNT 1-DH5 2441MHz Ant1



Date: 2.SEP.2025 13:17:53

CFS NVNT 2-DH5 2441MHz Ant1



Date: 2.SEP.2025 15:04:41

6. NUMBER OF HOPPING CHANNEL

6.1. Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

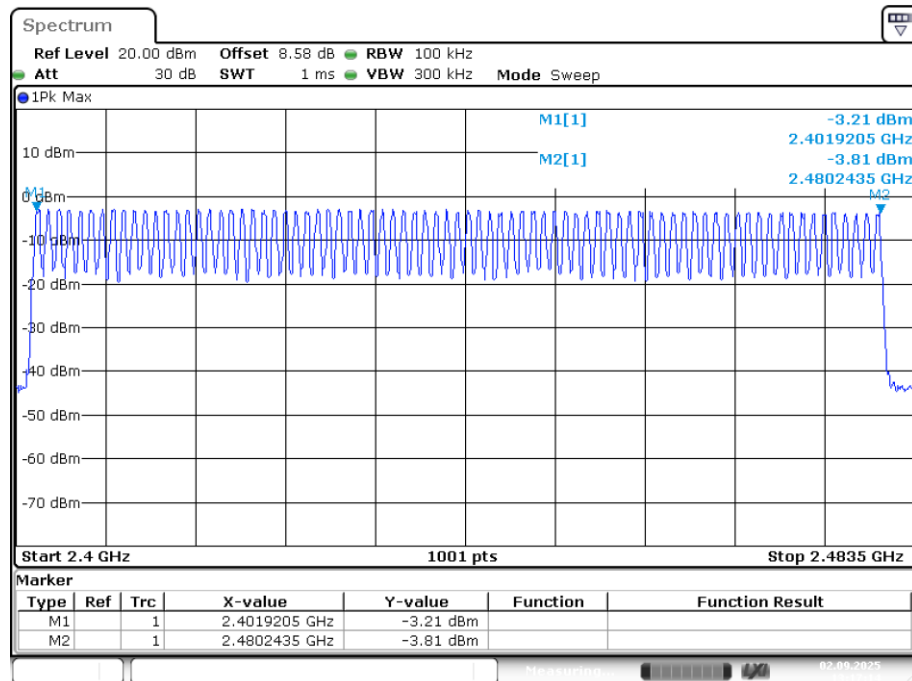
6.2. Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.

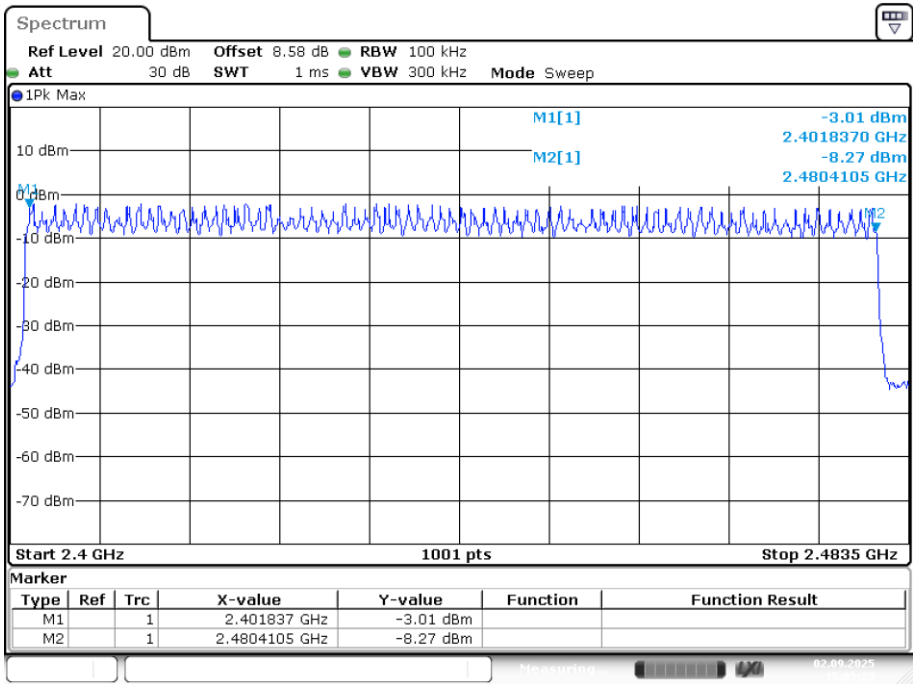
6.3. Test Result

Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	1-DH5	Ant1	79	15	Pass
NVNT	2-DH5	Ant1	79	15	Pass

Hopping No. NVNT 1-DH5 2441MHz Ant1



Hopping No. NVNT 2-DH5 2441MHz Ant1



7. DWELL TIME

7.1. Test Limit

Please refer section 15.247

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5

MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

7.2. Test Procedure

7.2.1. Place the EUT on the table and set it in transmitting mode.

7.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

7.2.3. Set center frequency of spectrum analyzer = operating frequency.

7.2.4. Set the spectrum analyzer as RBW=1MHz, VBW=1MHz, Span = 0Hz, Sweep = auto.

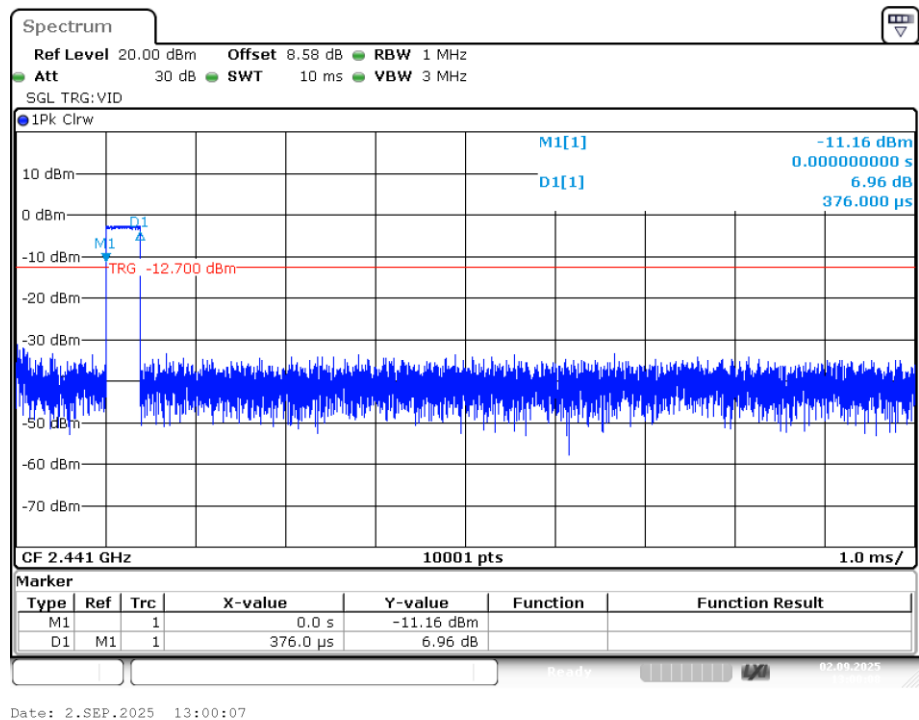
7.2.5. Repeat above procedures until all frequency measured were complete.

7.3. Test Result

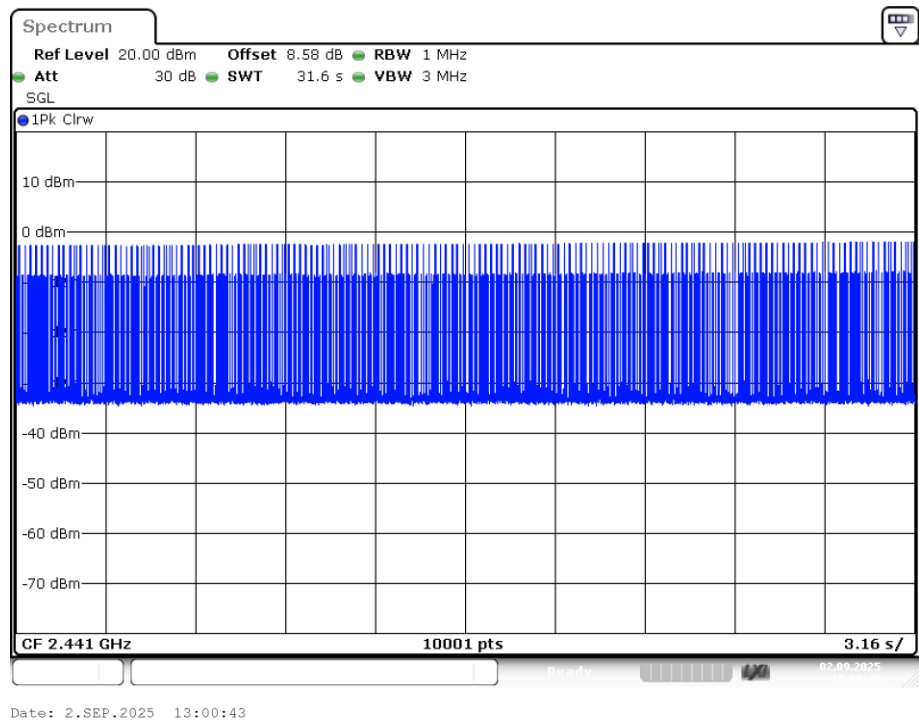
Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	Ant1	0.376	119.944	319	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.632	252.96	155	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.88	299.52	104	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.384	122.112	318	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.638	266.994	163	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.885	320.235	111	31600	400	Pass

Note: Total Dwell Time= Pulse Time* Burst Count

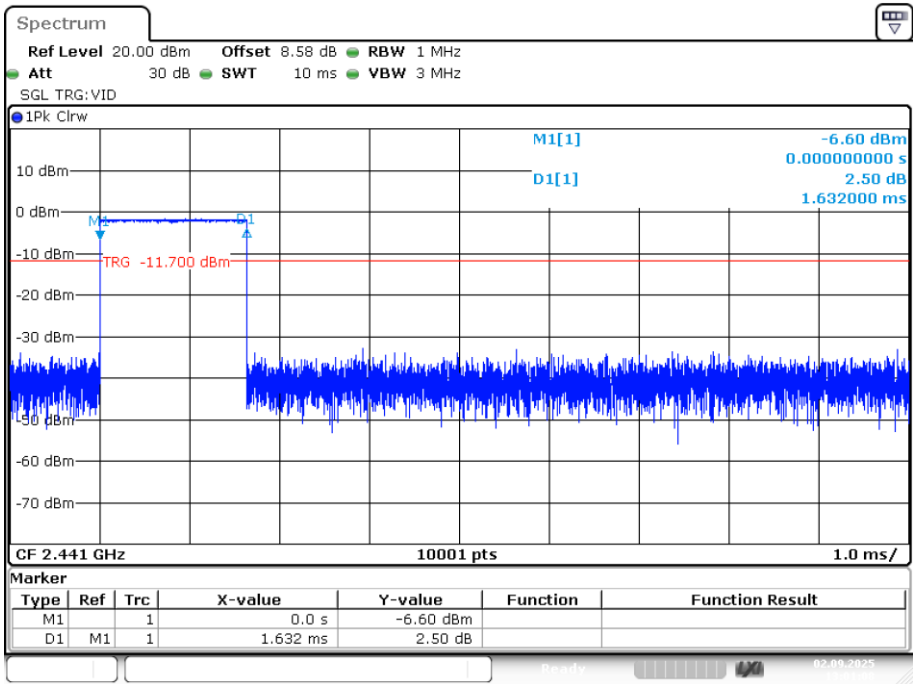
Dwell NVNT 1-DH1 2441MHz Ant1 One Burst



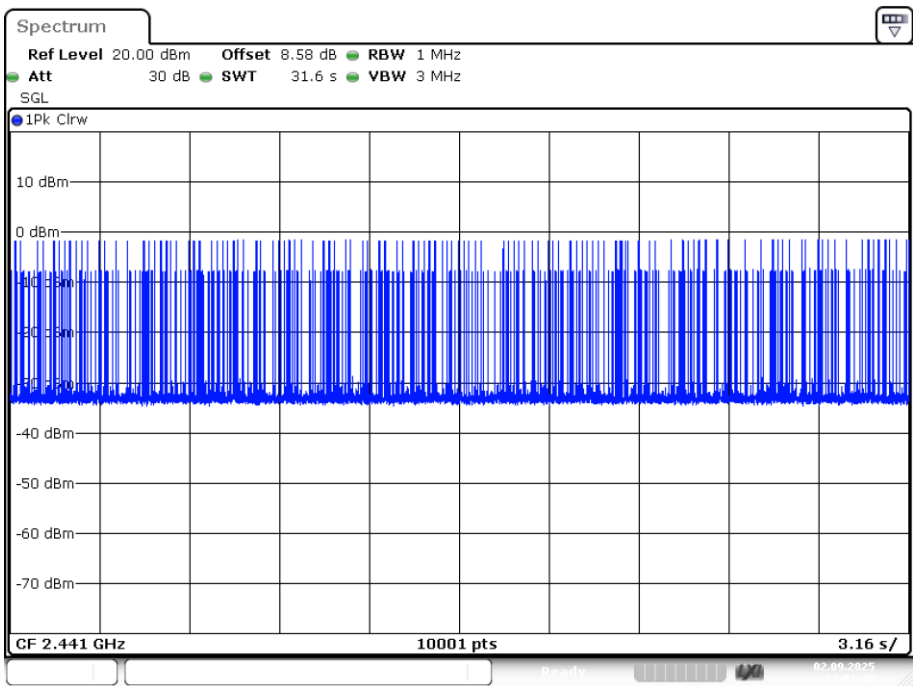
Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated



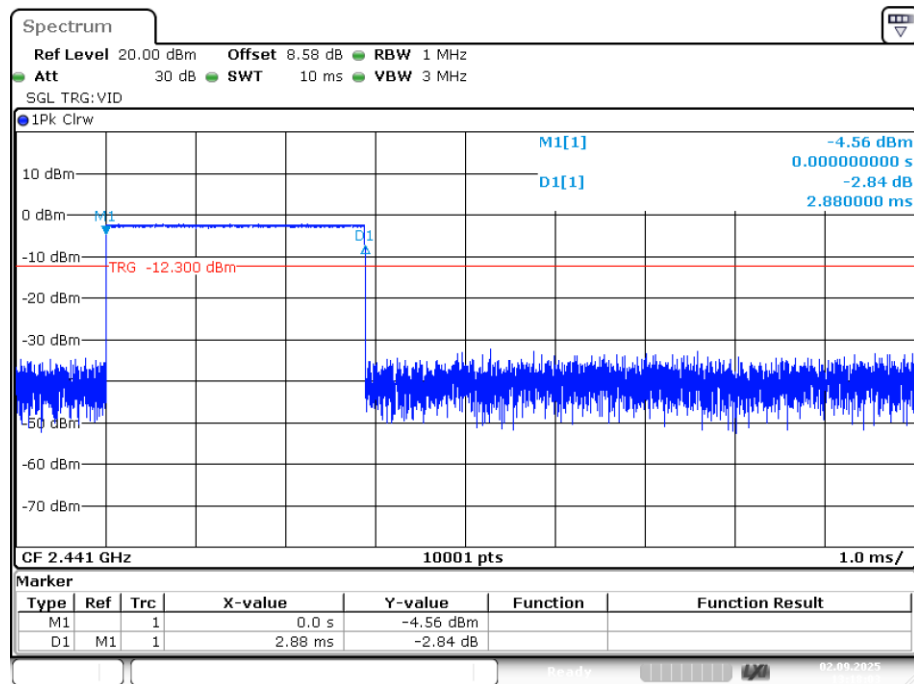
Dwell NVNT 1-DH3 2441MHz Ant1 One Burst



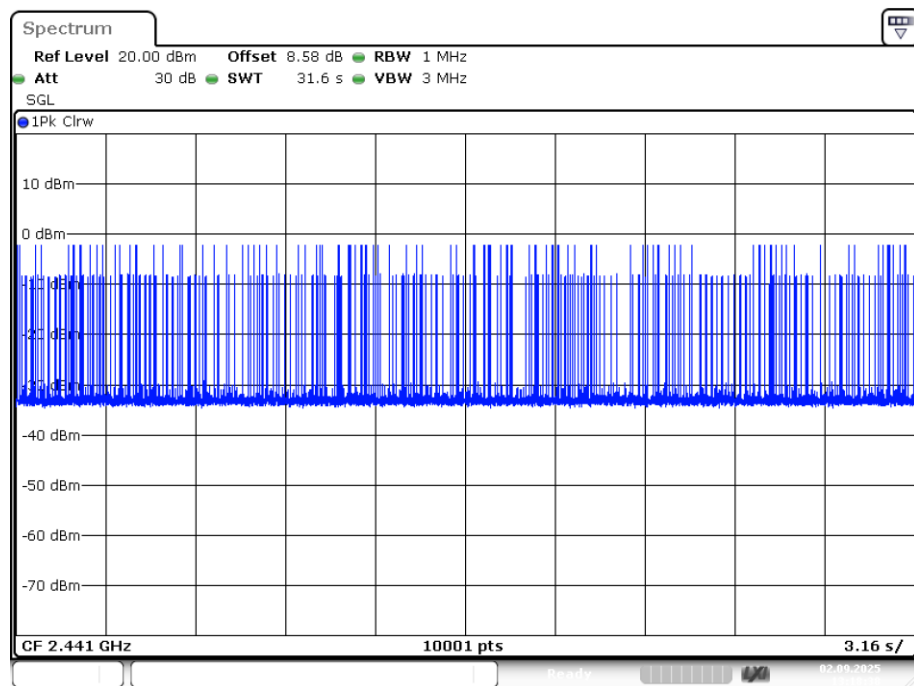
Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated



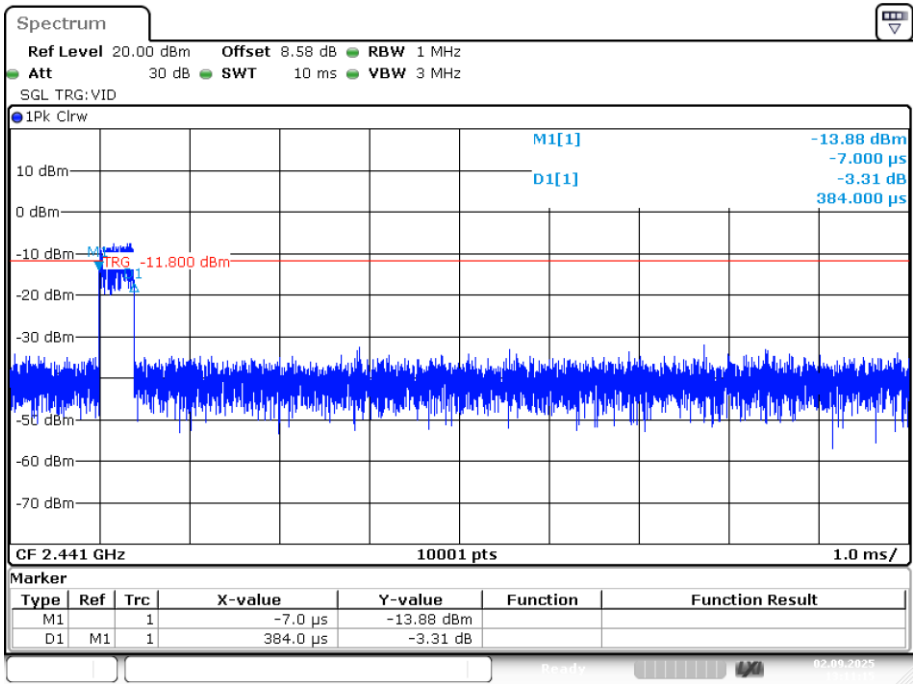
Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated

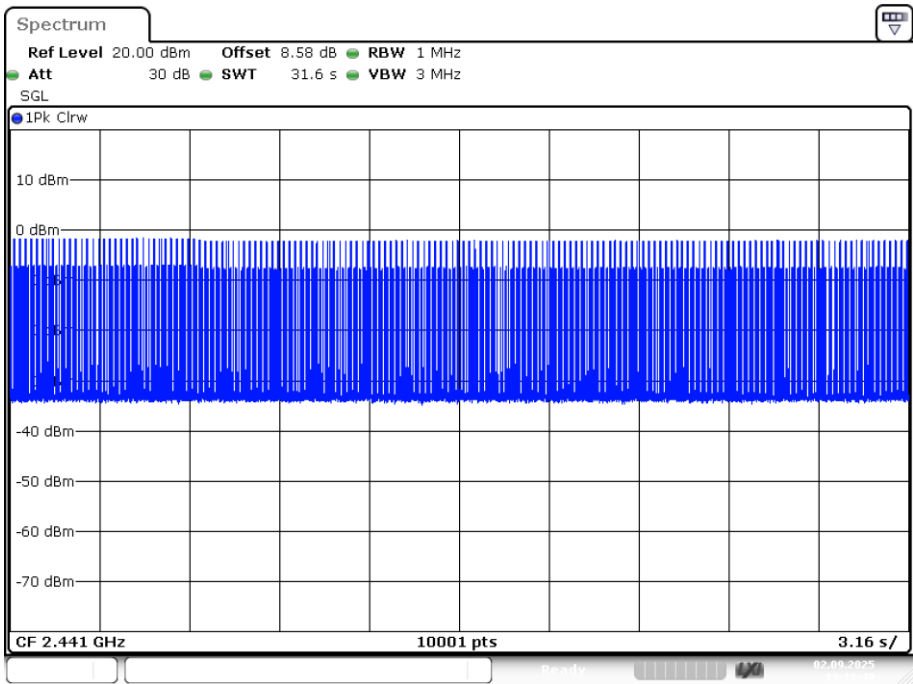


Dwell NVNT 2-DH1 2441MHz Ant1 One Burst



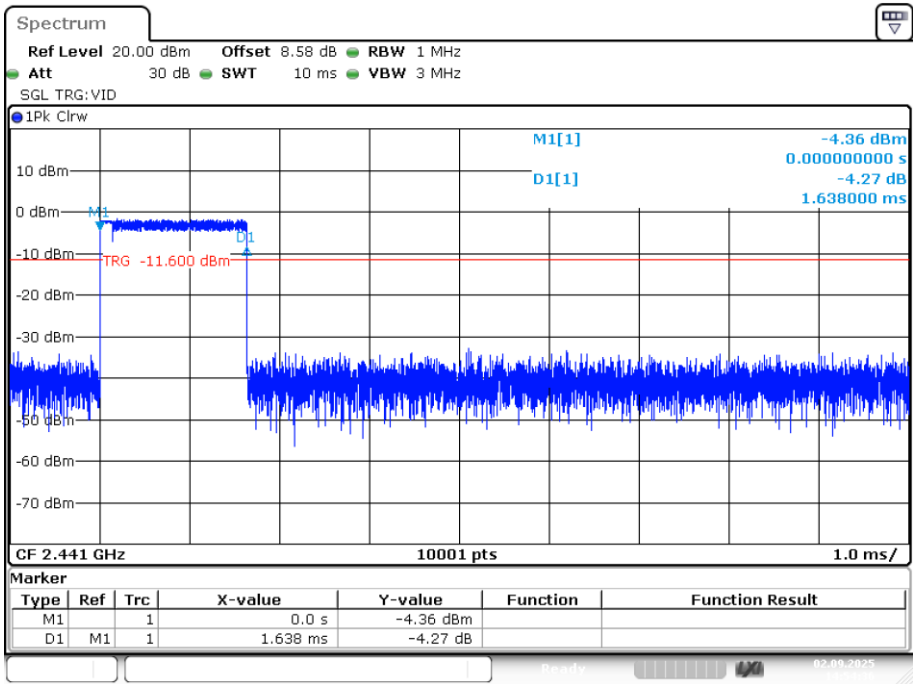
Date: 2.SEP.2025 13:11:15

Dwell NVNT 2-DH1 2441MHz Ant1 Accumulated



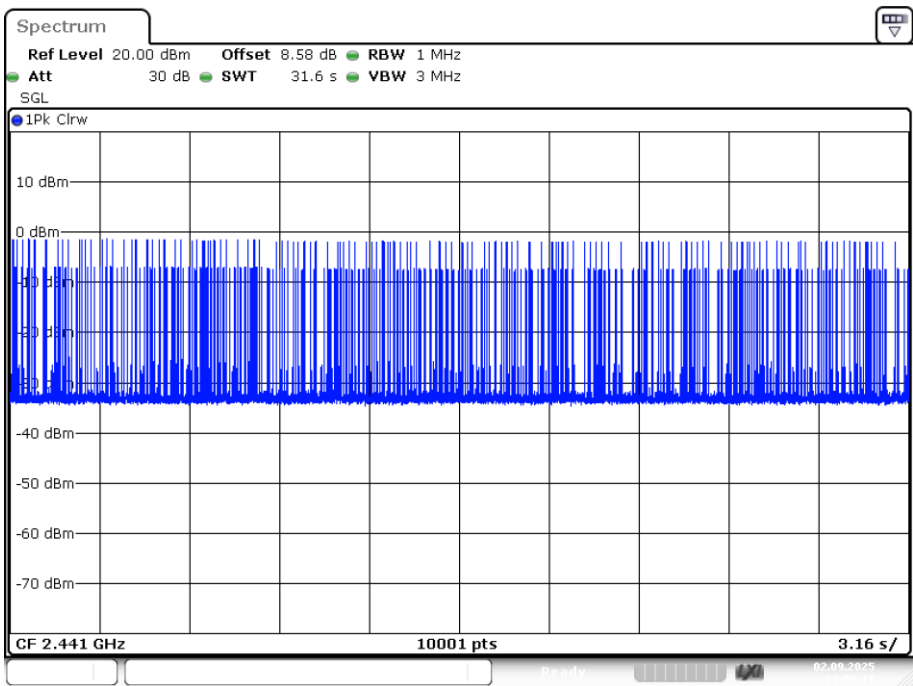
Date: 2.SEP.2025 13:11:49

Dwell NVNT 2-DH3 2441MHz Ant1 One Burst



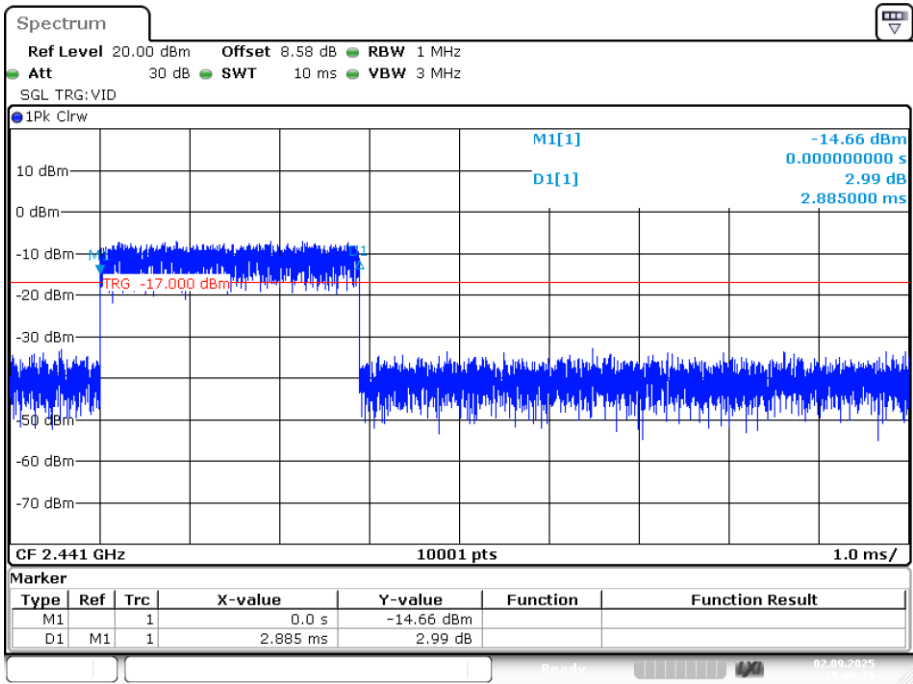
Date: 2.SEP.2025 14:54:36

Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated



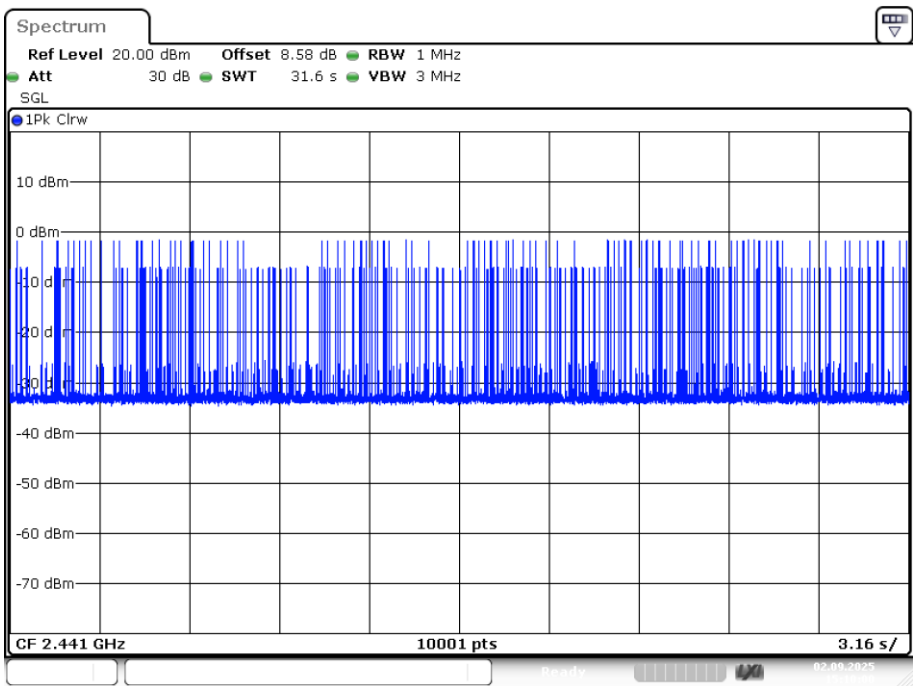
Date: 2.SEP.2025 14:55:11

Dwell NVNT 2-DH5 2441MHz Ant1 One Burst



Date: 2.SEP.2025 15:09:25

Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated



Date: 2.SEP.2025 15:10:00

8. RADIATED EMISSIONS

8.1. Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

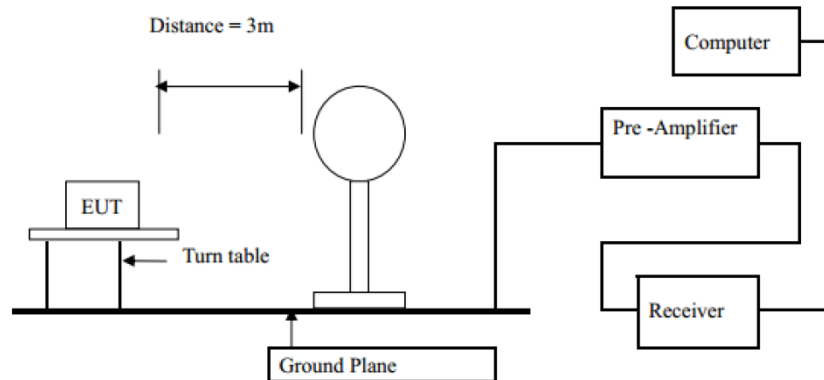
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

15.209 Limit

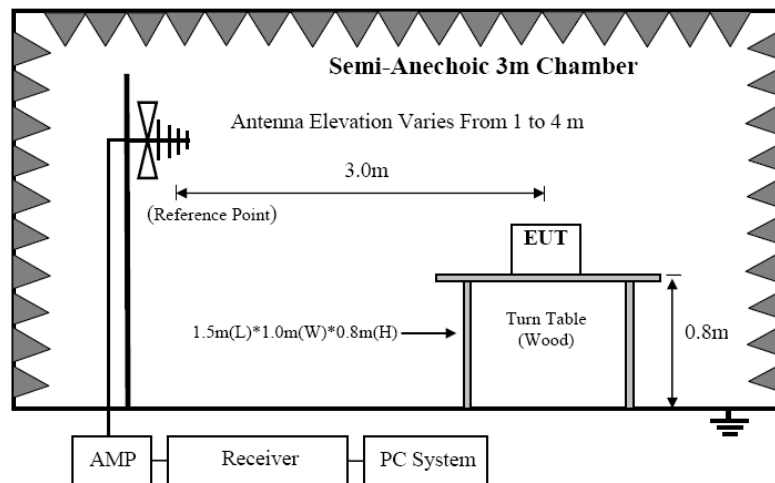
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

8.2. Block Diagram of Test Setup

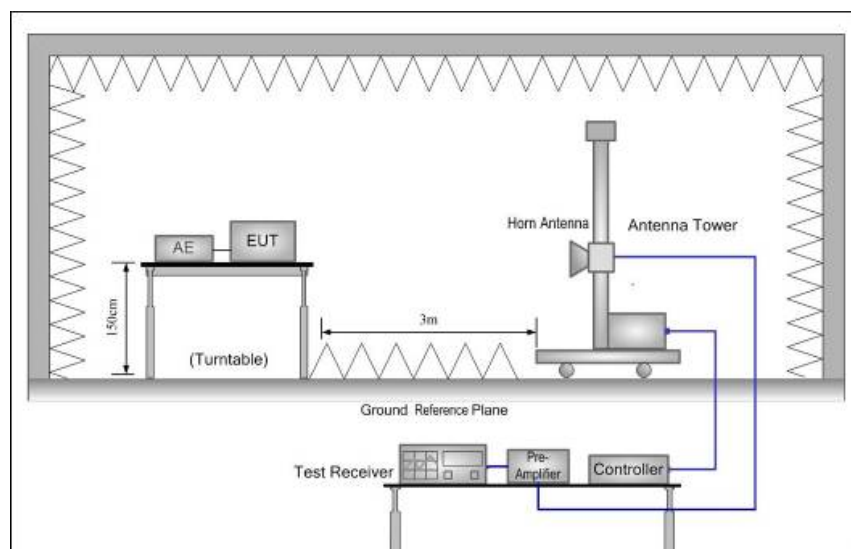
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



8.2.2 In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



8.2.3 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and simulator as shown in section 1.4 and 6.1
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013on Radiated Emission test.
- (6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

8.4. Test Result

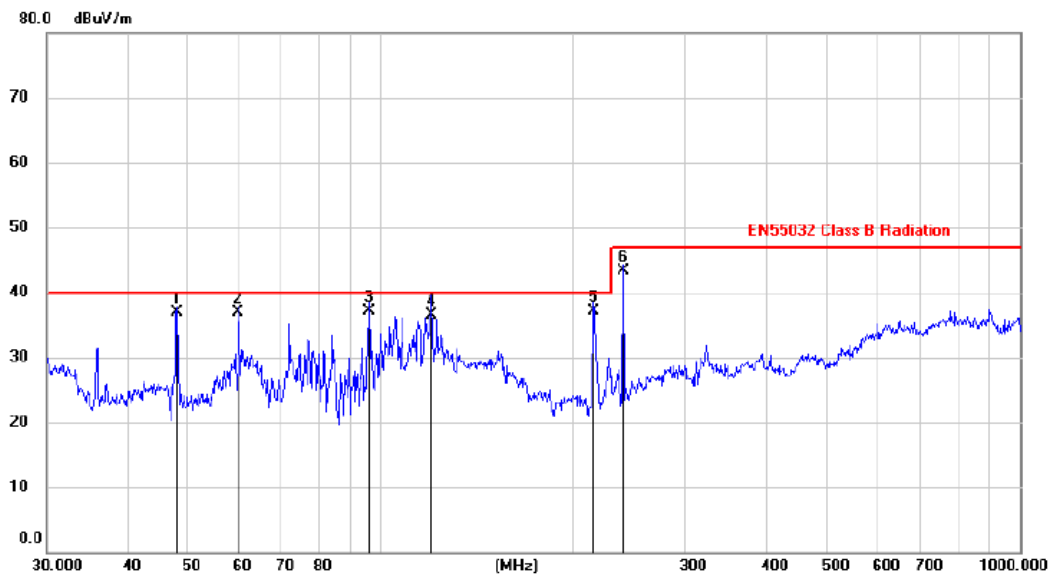
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency.
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

From 30MHz to 1000MHz: Conclusion: PASS

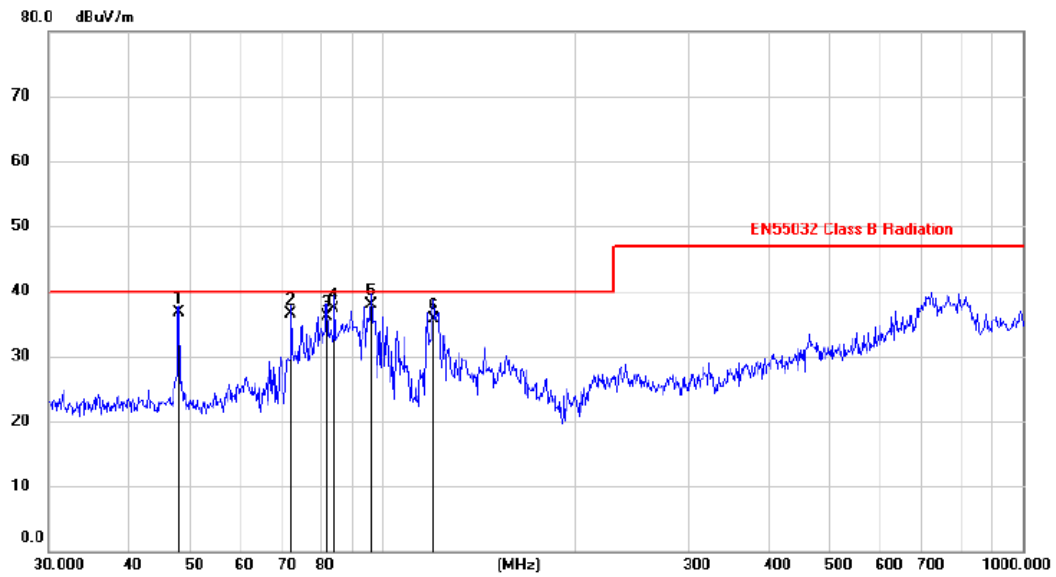
Vertical:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		48.0108	22.92	14.08	37.00	40.00	-3.00	QP		
2		60.0059	23.73	13.25	36.98	40.00	-3.02	QP		
3	*	96.0087	26.57	10.53	37.10	40.00	-2.90	QP		
4		120.0098	23.48	13.04	36.52	40.00	-3.48	QP		
5		216.0239	25.55	11.47	37.02	40.00	-2.98	QP		
6		240.0154	30.69	12.55	43.24	47.00	-3.76	QP		

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Horizontal:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		47.9996	22.54	14.08	36.62	40.00	-3.38	QP		
2		72.0001	25.46	11.11	36.57	40.00	-3.43	QP		
3		81.7927	26.26	9.92	36.18	40.00	-3.82	QP		
4		84.0019	27.34	9.95	37.29	40.00	-2.71	QP		
5	*	96.0087	27.37	10.53	37.90	40.00	-2.10	QP		
6		120.0097	22.69	13.04	35.73	40.00	-4.27	QP		

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Remark: All modes have been tested, and only worst data of GFSK (2402MHz) was listed in this report.

From 1G-25GHz

Test Mode: GFSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	46.96	V	33.95	10.18	34.26	56.83	74	-17.17	PK
4804	37.97	V	33.95	10.18	34.26	47.84	54	-6.16	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	48.23	H	33.95	10.18	34.26	58.10	74	-15.90	PK
4804	37.55	H	33.95	10.18	34.26	47.42	54	-6.58	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX Mid									
4882	43.35	V	33.93	10.2	34.29	53.19	74	-20.81	PK
4882	35.29	V	33.93	10.2	34.29	45.13	54	-8.87	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	46.05	H	33.93	10.2	34.29	55.89	74	-18.11	PK
4882	33.44	H	33.93	10.2	34.29	43.28	54	-10.72	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX High									
4960	46.78	V	33.93	10.2	34.29	56.62	74	-17.38	PK
4960	35.57	V	33.93	10.2	34.29	45.41	54	-8.59	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.88	H	33.93	10.2	34.29	54.72	74	-19.28	PK
4960	34.33	H	33.93	10.2	34.29	44.17	54	-9.83	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

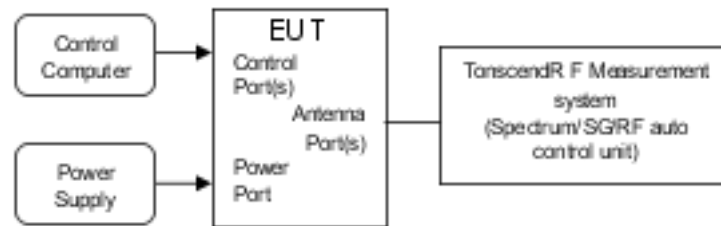
Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

9. RF CONDUCTED SPURIOUS EMISSIONS

9.1. Block Diagram of Test Setup



9.2. Limits

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 20dB.

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)).

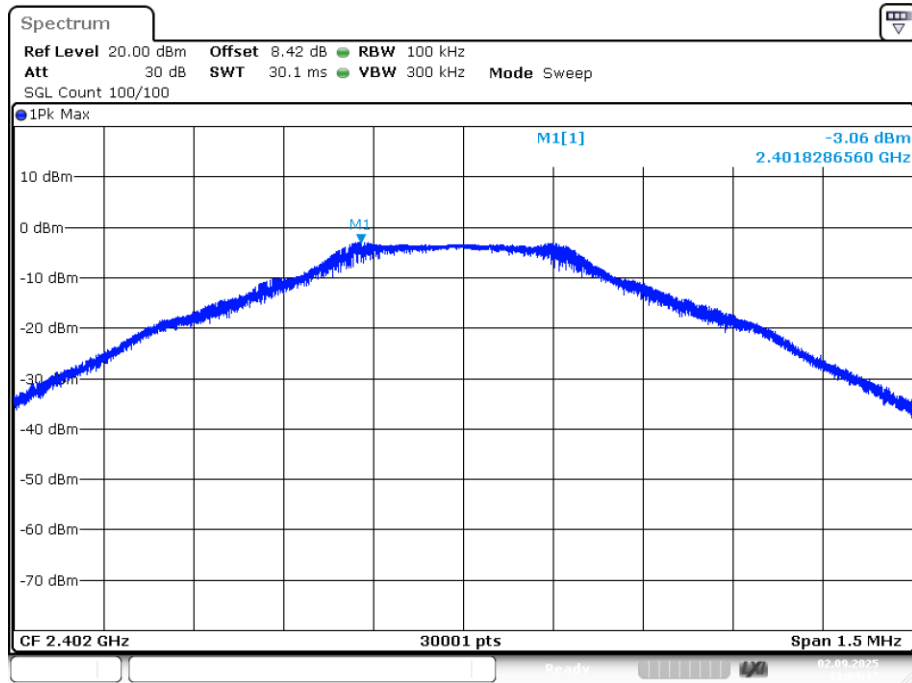
9.3. Test Procedure

The test receiver set RBW = 100kHz, VBW $\geq$ 3*RBW =300kHz, sweep time set auto

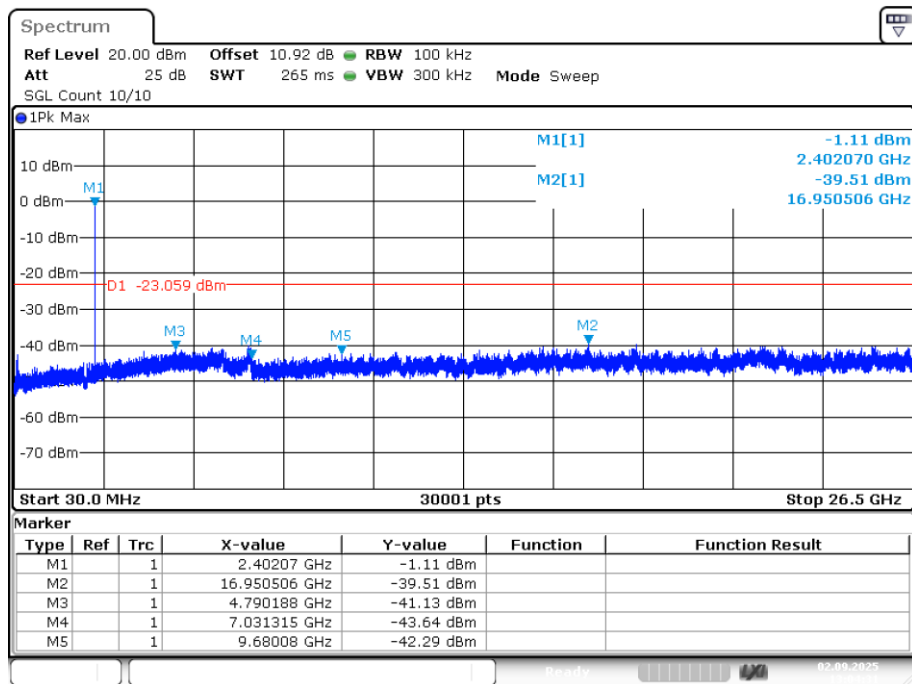
9.4. Test Result

PASS

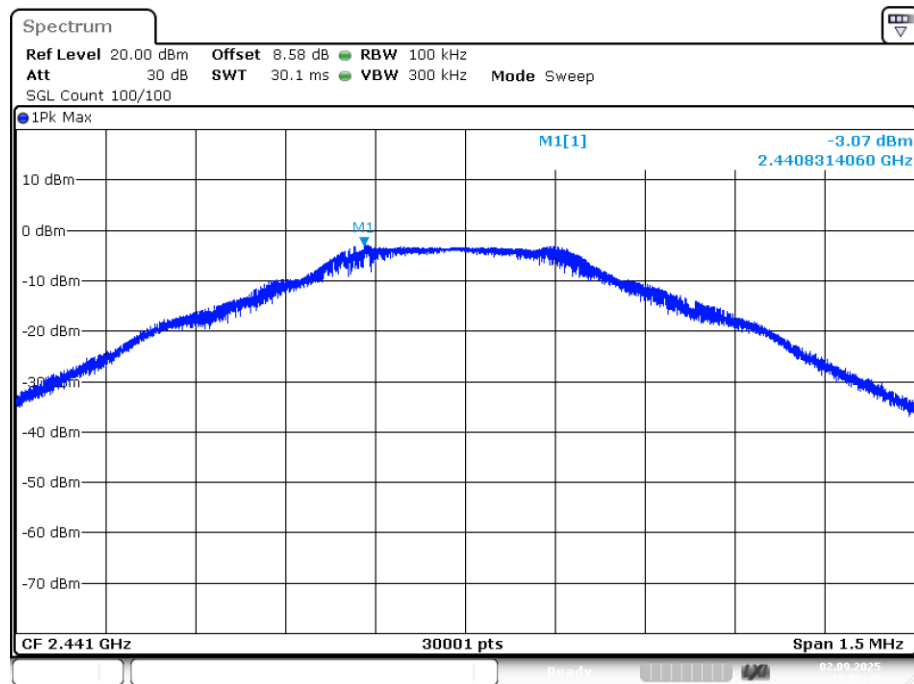
Tx. Spurious NVNT 1-DH5 2402MHz Ant1 Ref



Tx. Spurious NVNT 1-DH5 2402MHz Ant1 Emission

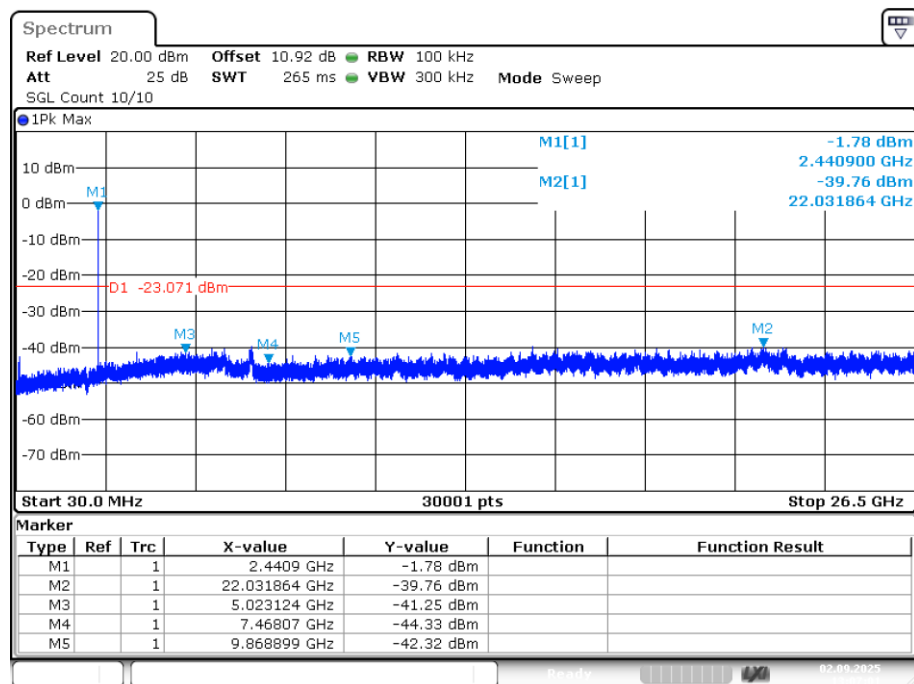


Tx. Spurious NVNT 1-DH5 2441MHz Ant1 Ref



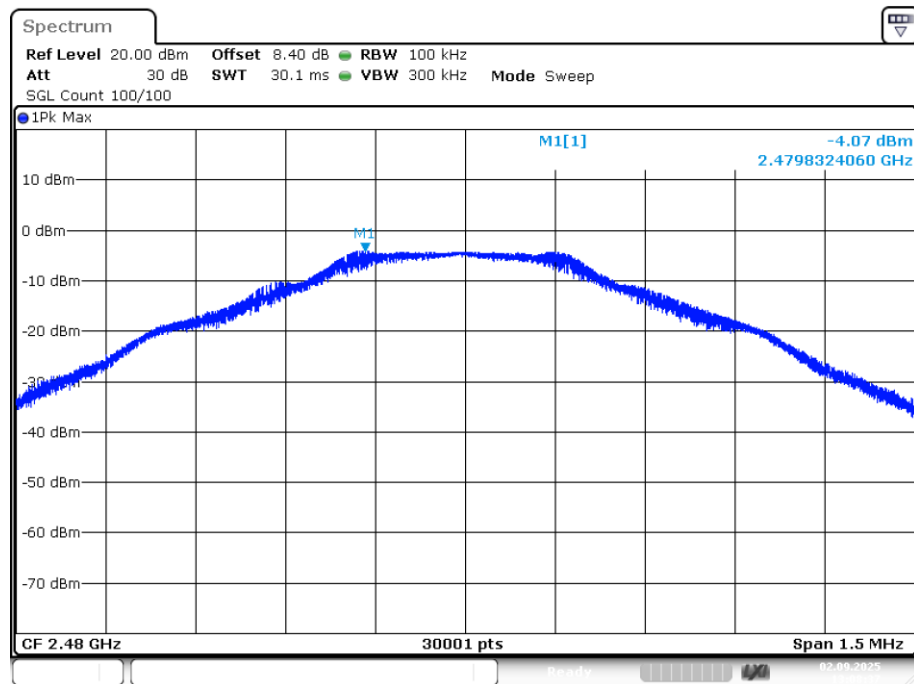
Date: 2.SEP.2025 13:06:47

Tx. Spurious NVNT 1-DH5 2441MHz Ant1 Emission



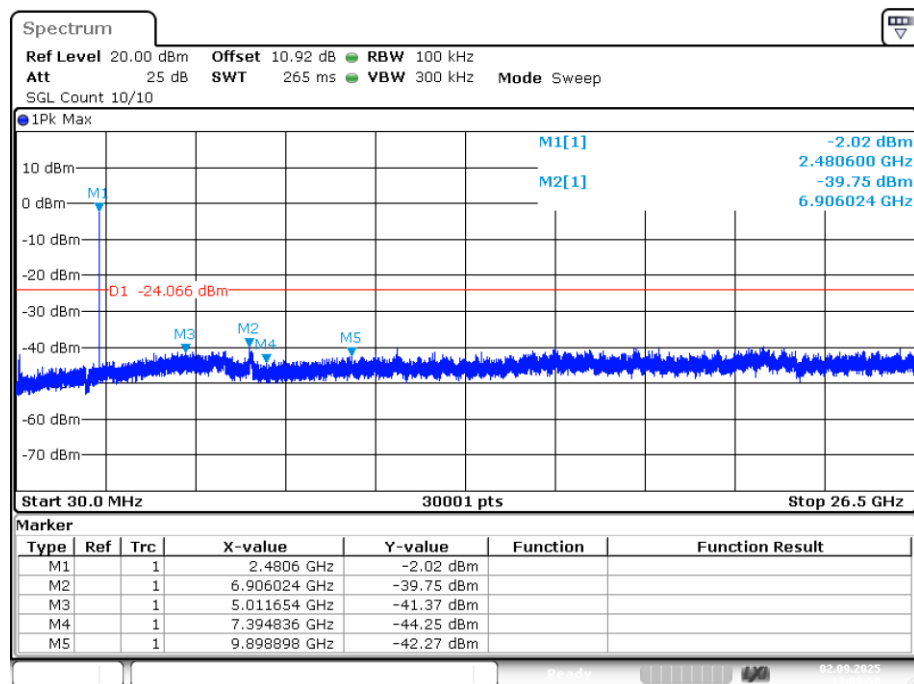
Date: 2.SEP.2025 13:07:01

Tx. Spurious NVNT 1-DH5 2480MHz Ant1 Ref



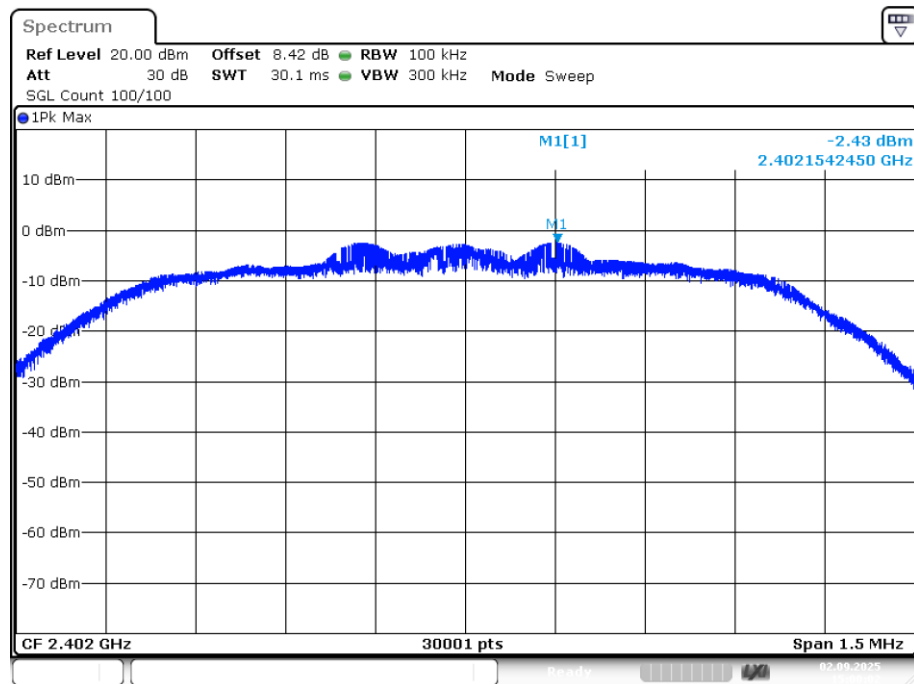
Date: 2.SEP.2025 13:08:36

Tx. Spurious NVNT 1-DH5 2480MHz Ant1 Emission



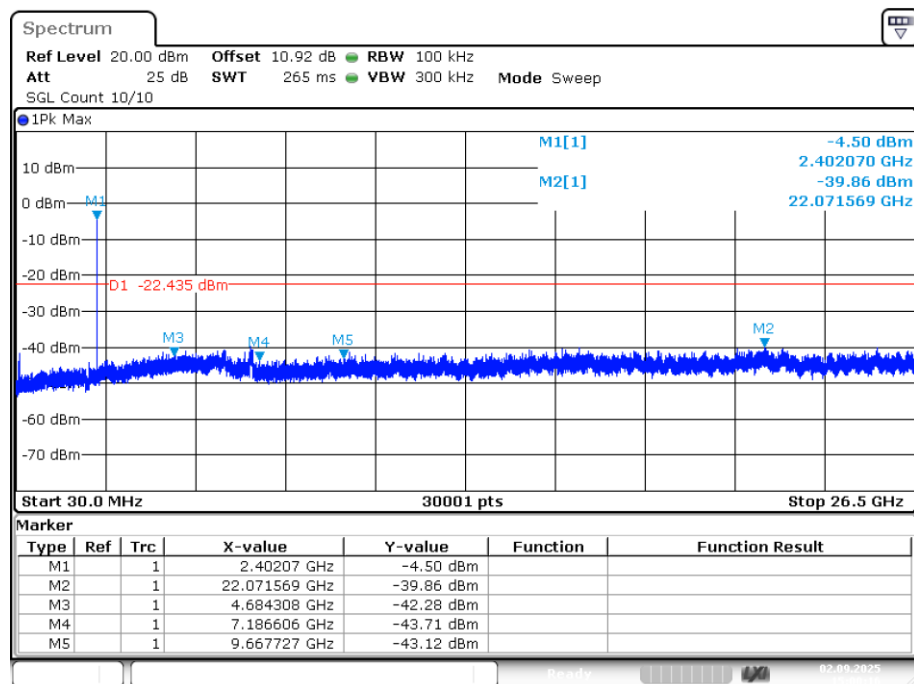
Date: 2.SEP.2025 13:08:50

Tx. Spurious NVNT 2-DH5 2402MHz Ant1 Ref



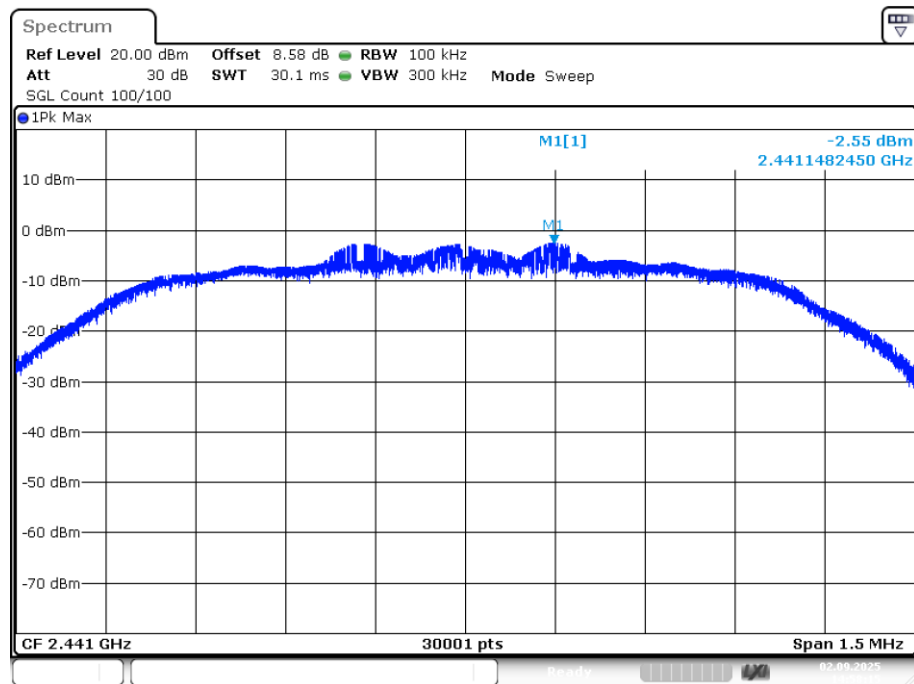
Date: 2.SEP.2025 15:00:01

Tx. Spurious NVNT 2-DH5 2402MHz Ant1 Emission



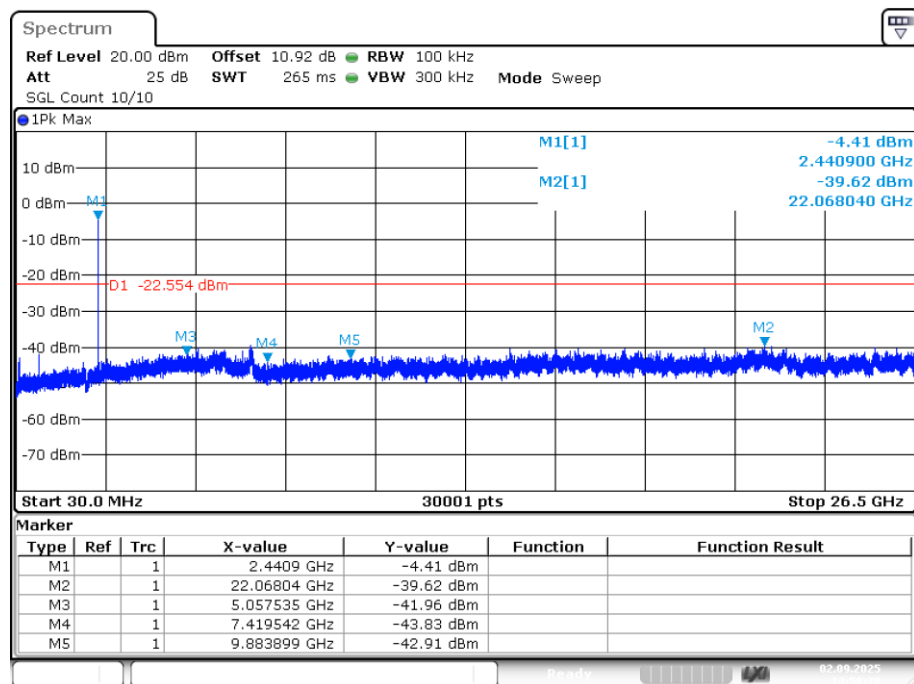
Date: 2.SEP.2025 15:00:15

Tx. Spurious NVNT 2-DH5 2441MHz Ant1 Ref



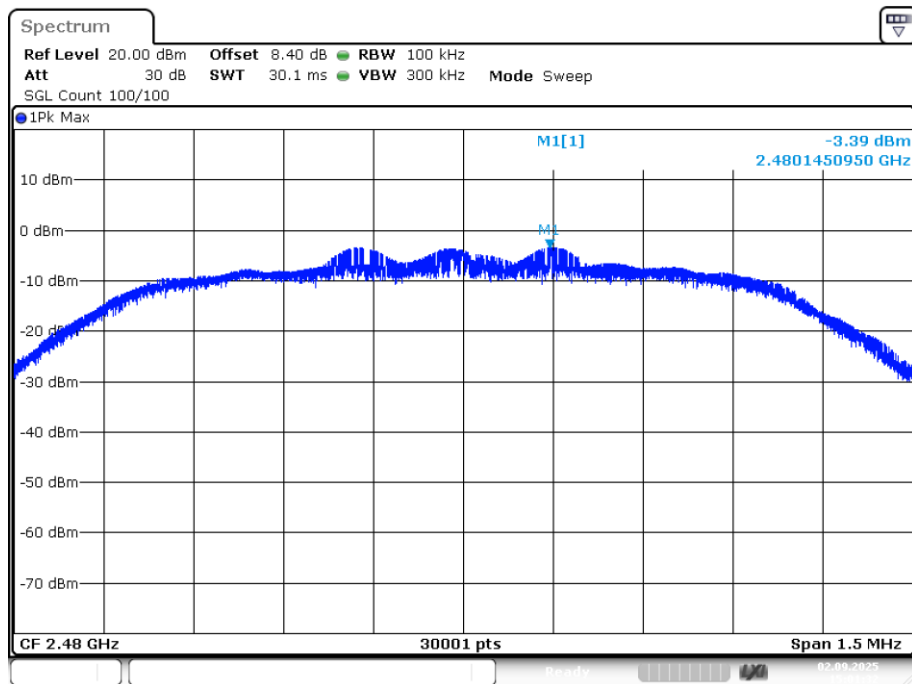
Date: 2.SEP.2025 14:58:14

Tx. Spurious NVNT 2-DH5 2441MHz Ant1 Emission



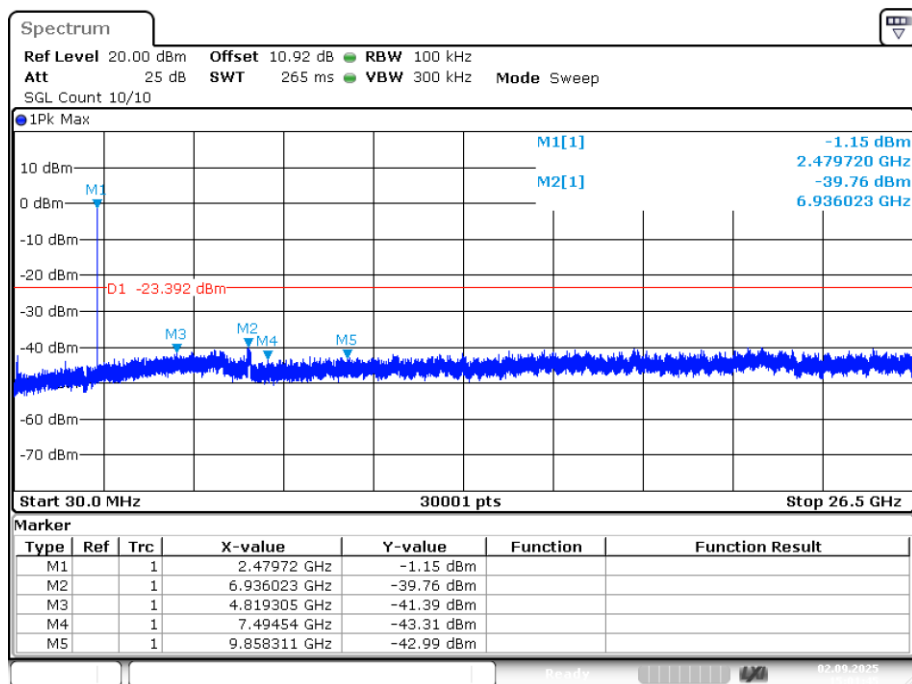
Date: 2.SEP.2025 14:58:28

Tx. Spurious NVNT 2-DH5 2480MHz Ant1 Ref



Date: 2.SEP.2025 15:01:32

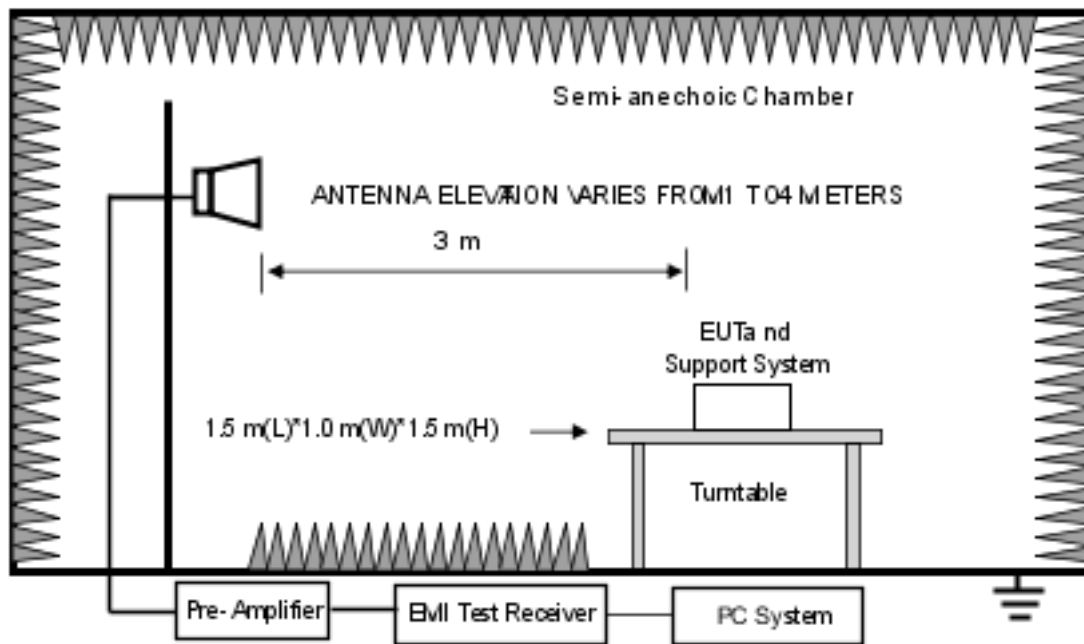
Tx. Spurious NVNT 2-DH5 2480MHz Ant1 Emission



Date: 2.SEP.2025 15:01:46

10. BAND EDGE COMPLIANCE

10.1. Block Diagram of Test Setup



10.2. Limit

Please refer section 15.247.

10.3. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

10.3.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

10.3.2 Check the spurious emissions out of band.

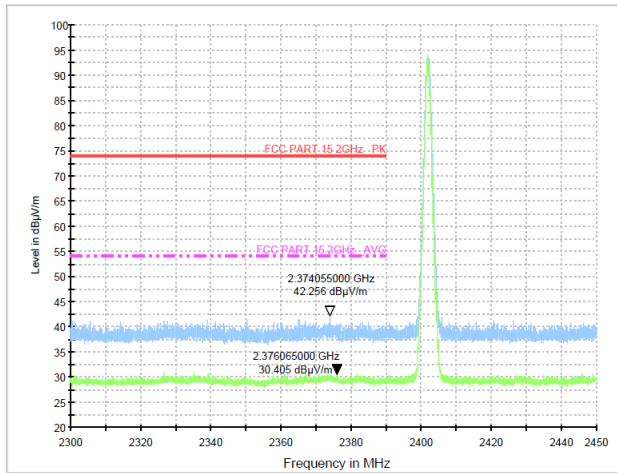
10.3.3 RBW 1MHz, VBW 3MHz, peak detector for peak value, RBW 1MHz, VBW 3MHz, RMS detector for AV value.

All restriction band and non- restriction band have been tested, only worse case is reported.

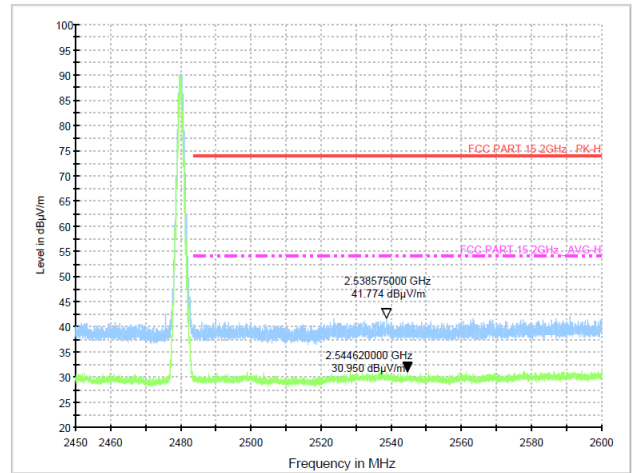
10.4. Test Result

PASS. (See below detailed test data)

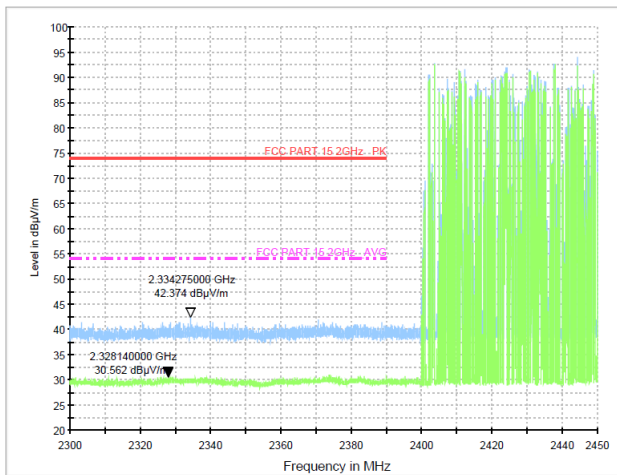
Test Mode: GFSK-Low Hopping-off



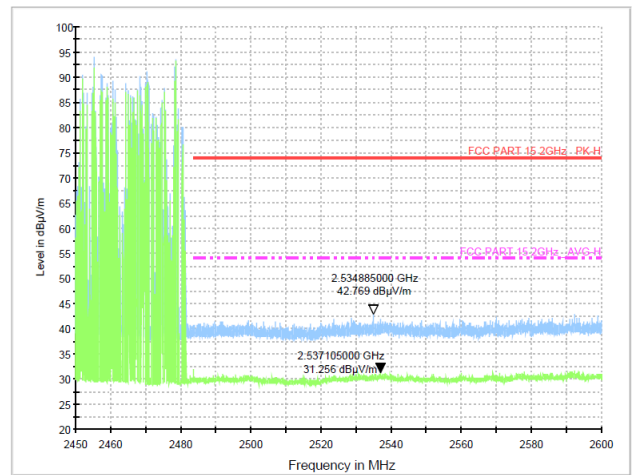
Test Mode: GFSK-High Hopping-off



Test Mode: GFSK-Low Hopping-on

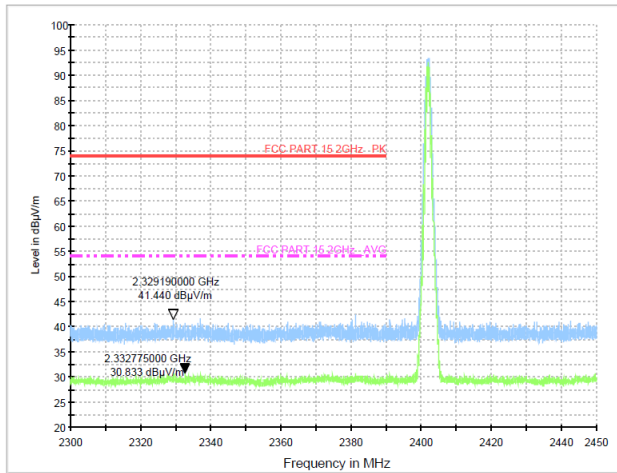
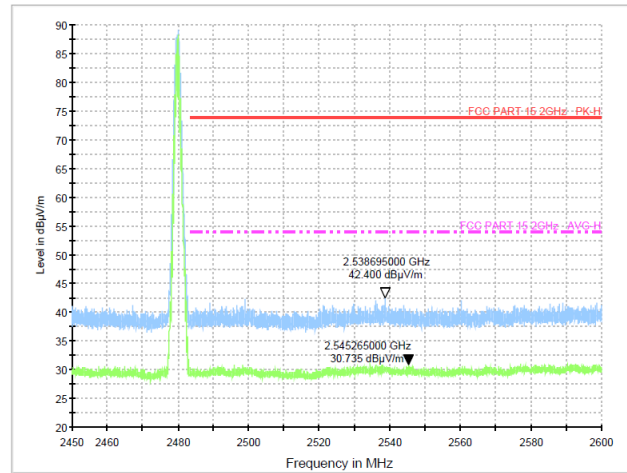
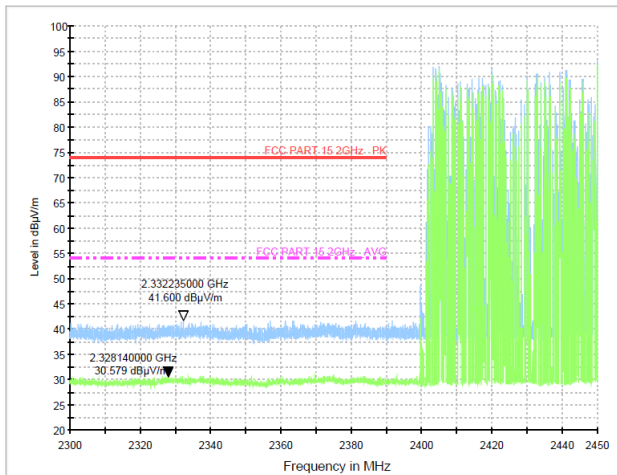
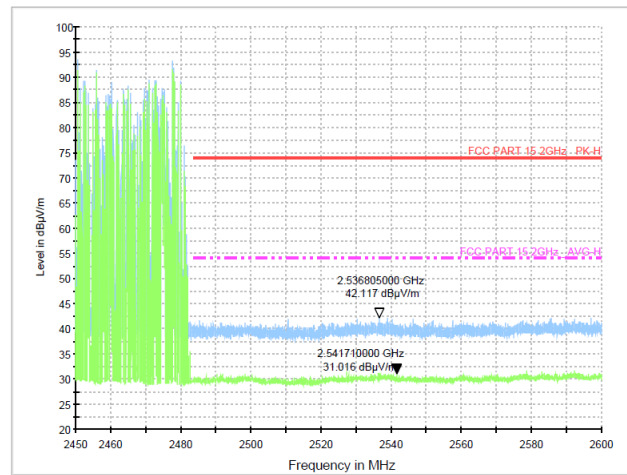


Test Mode: GFSK-High Hopping-on



Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

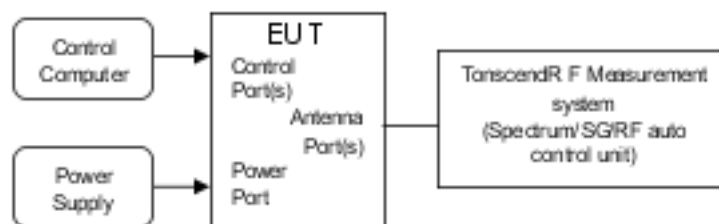
Test Mode: $\pi/4$ DQPSK-Low Hopping-offTest Mode: $\pi/4$ DQPSK-High Hopping-offTest Mode: $\pi/4$ DQPSK-Low Hopping-onTest Mode: $\pi/4$ DQPSK-High Hopping-on

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

11. BAND EDGE (CONDUCTED)

11.1. Block Diagram of Test Setup



11.2. Test Limits

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.

11.3. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

Place the EUT on the table and set it in transmitting mode.

11.3.1. Place the EUT on the table and set it in transmitting mode.

11.3.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

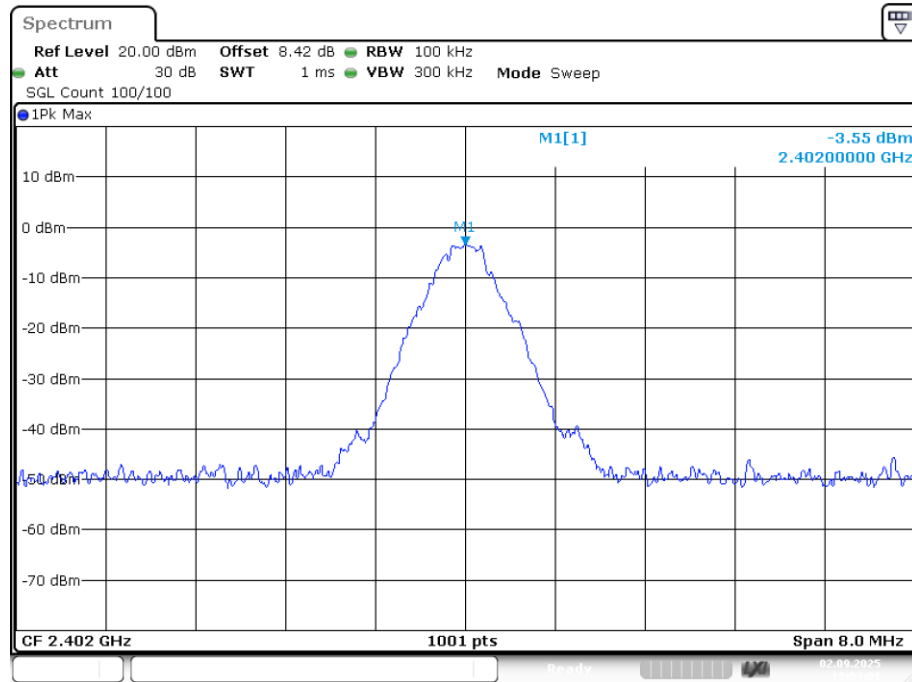
11.3.3. Set the spectrum analyzer as RBW=100KHz, VBW=300KHz, Sweep = auto.

11.3.4. Repeat above procedures until all frequency measured were complete..

11.4. Test Results

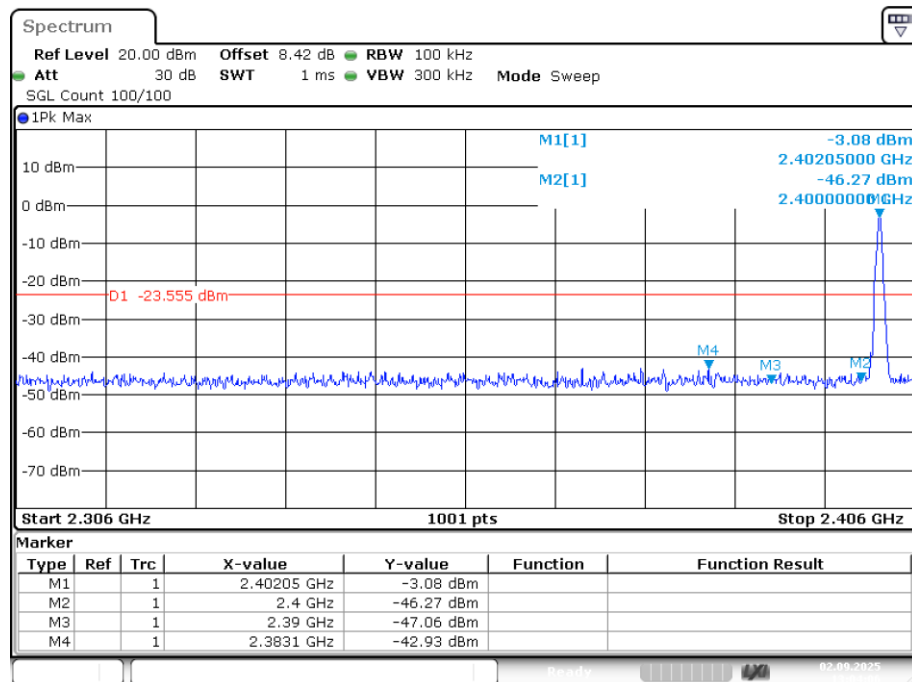
Pass

Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Ref



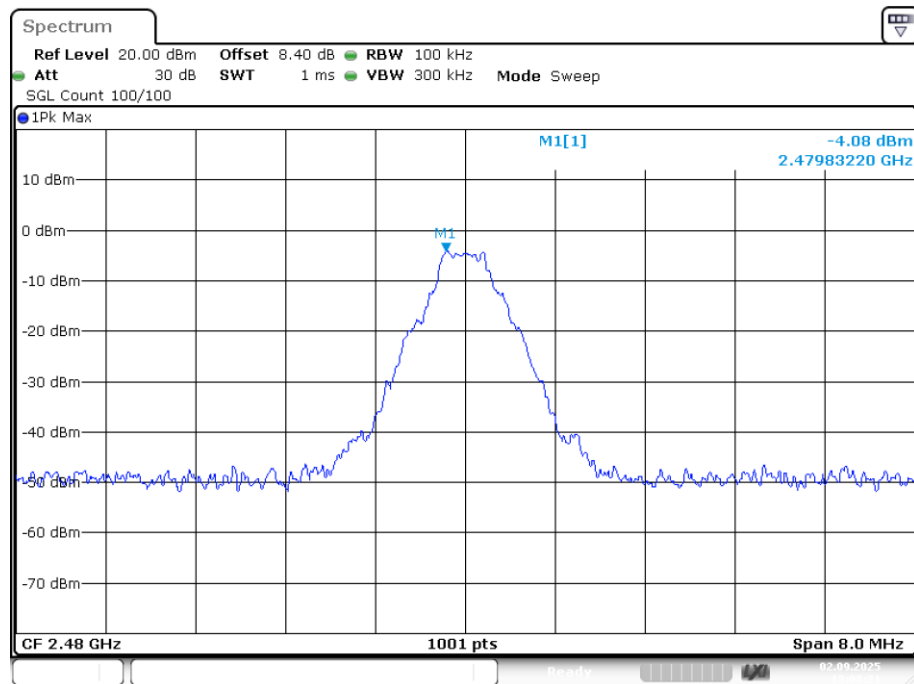
Date: 2.SEP.2025 13:04:01

Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Emission



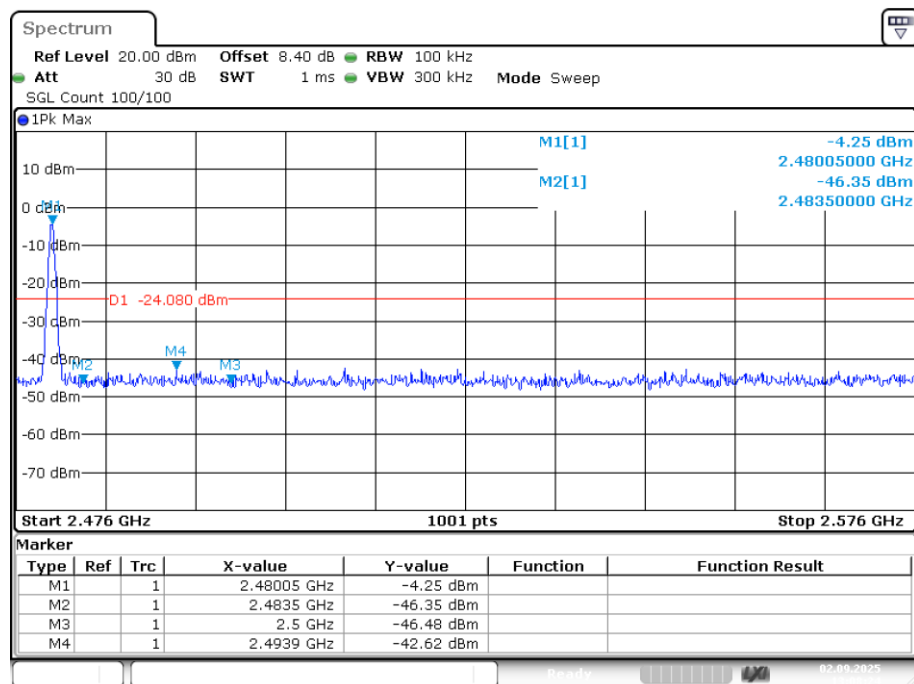
Date: 2.SEP.2025 13:04:05

Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Ref



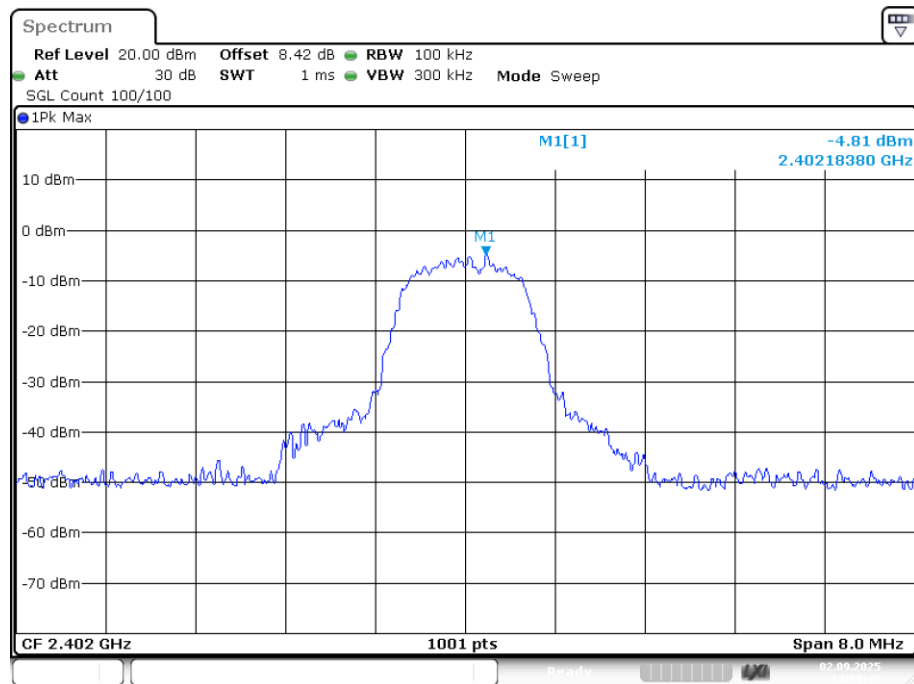
Date: 2.SEP.2025 13:08:21

Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Emission



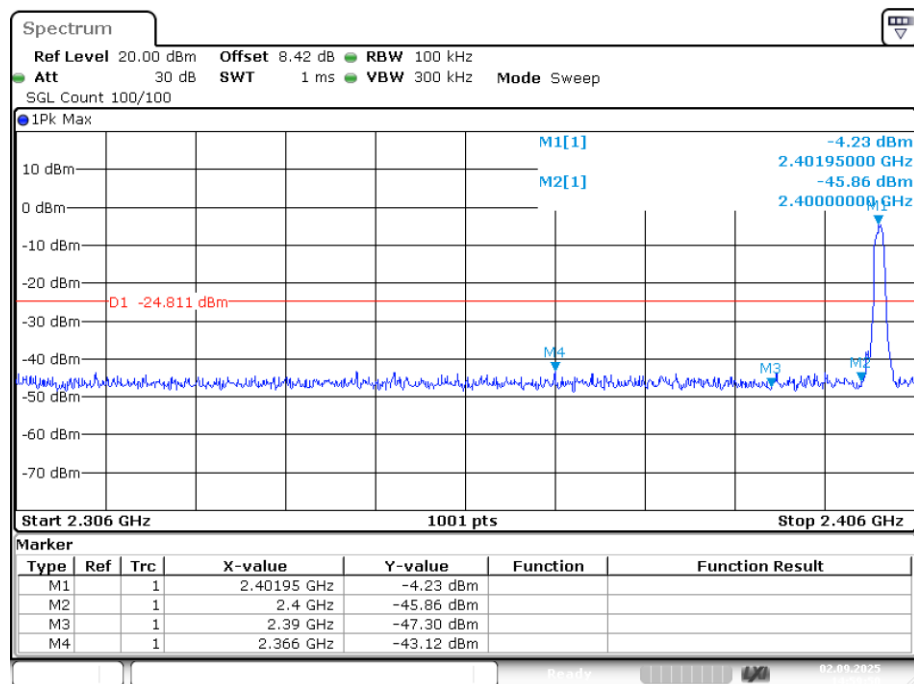
Date: 2.SEP.2025 13:08:24

Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Ref



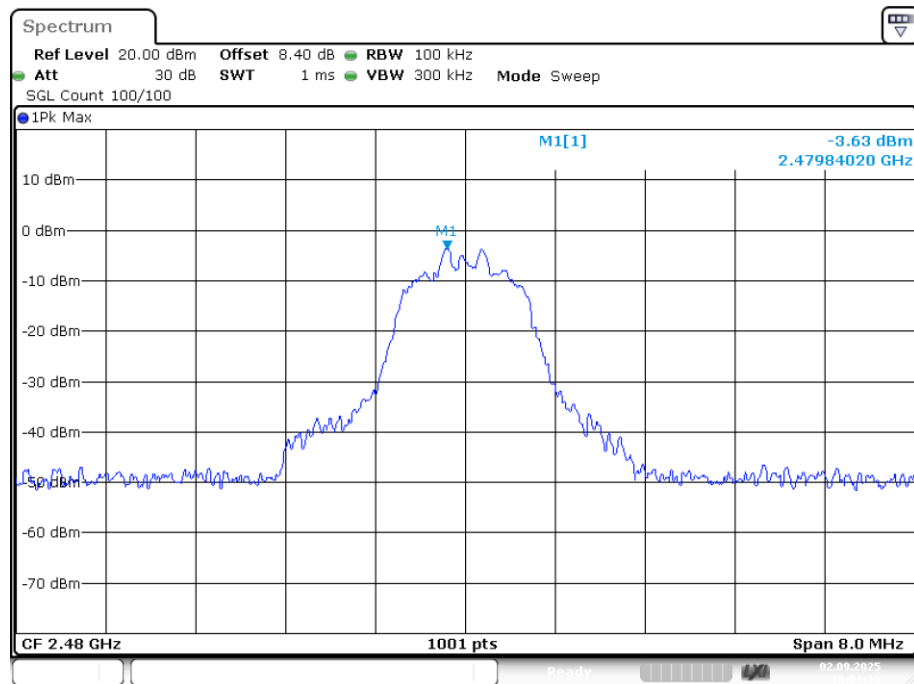
Date: 2.SEP.2025 14:59:45

Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Emission



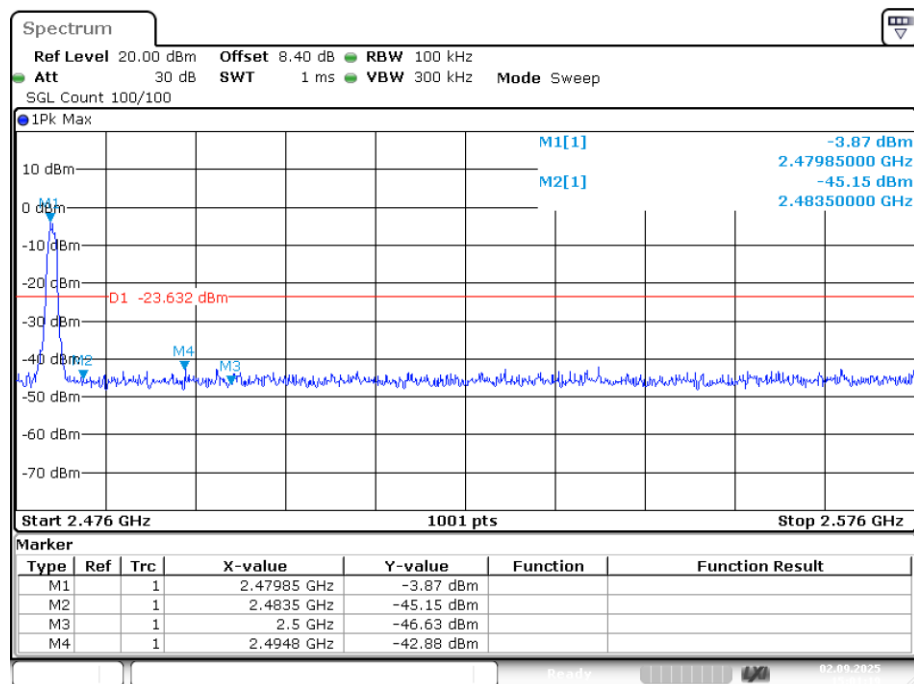
Date: 2.SEP.2025 14:59:49

Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Ref



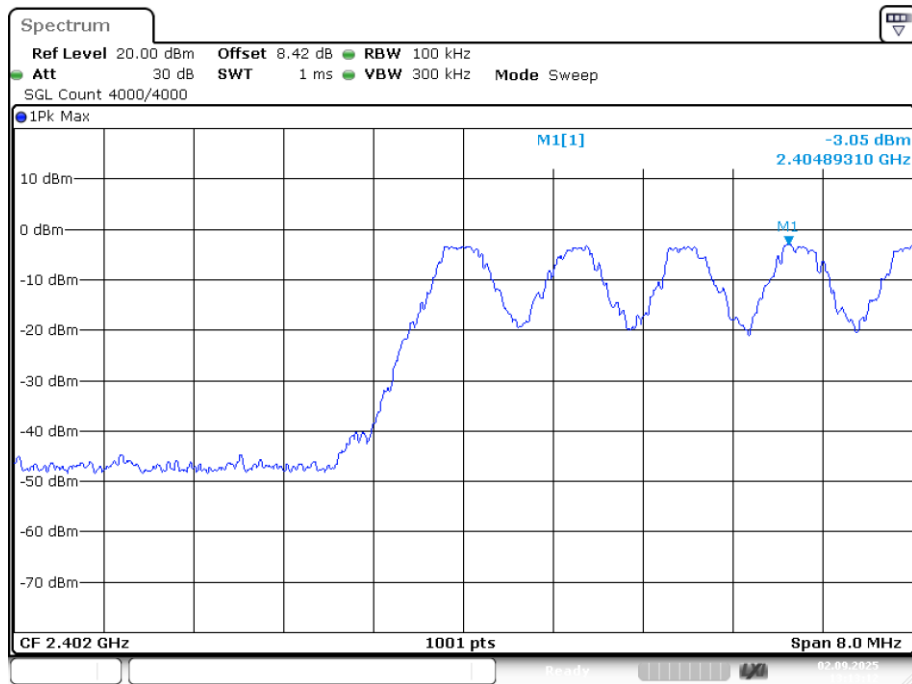
Date: 2.SEP.2025 15:01:16

Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Emission



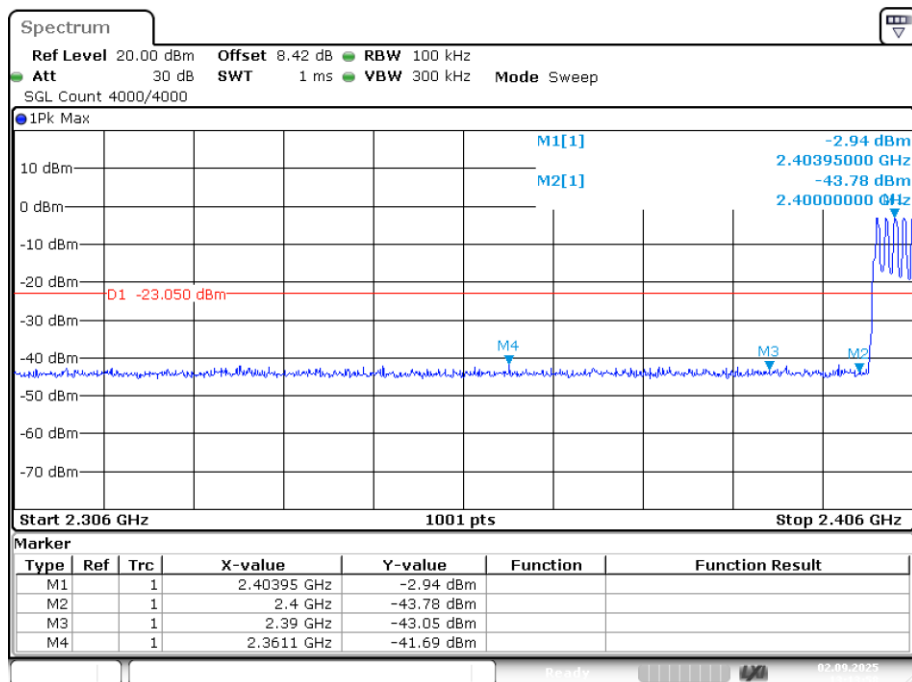
Date: 2.SEP.2025 15:01:20

Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Ref



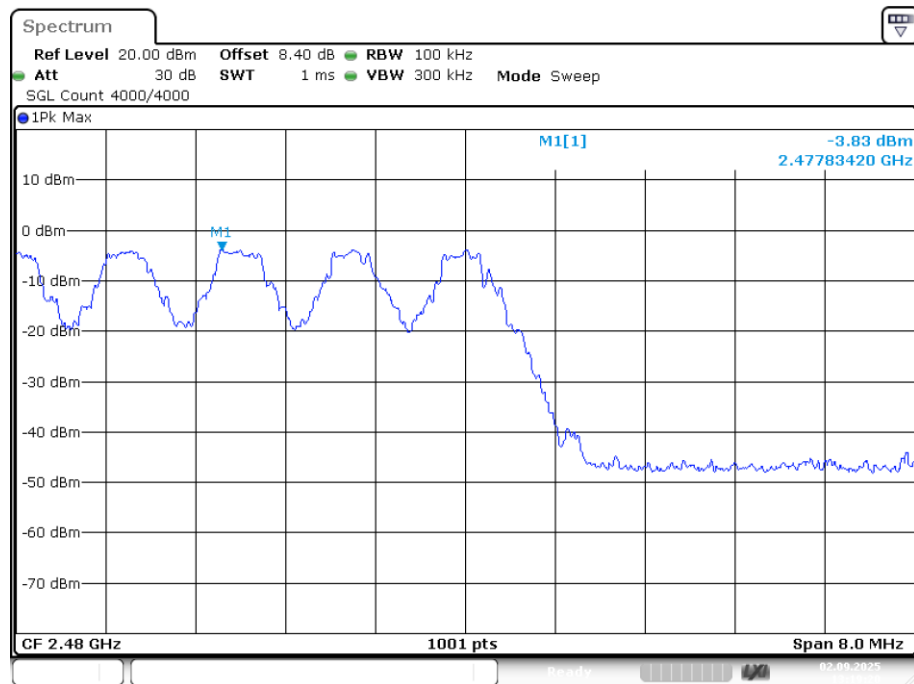
Date: 2.SEP.2025 13:13:12

Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Emission



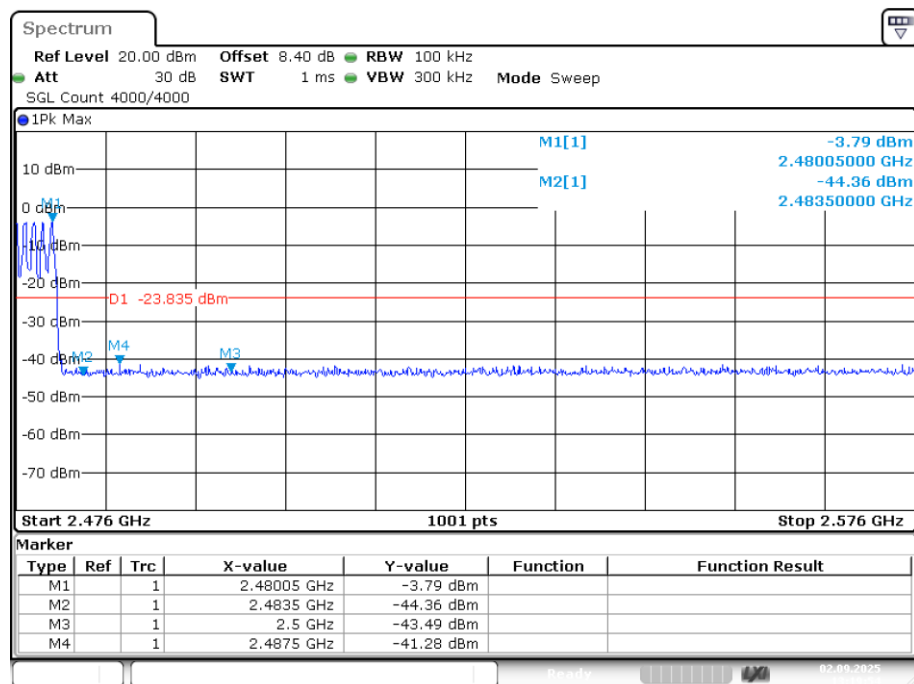
Date: 2.SEP.2025 13:13:58

Band Edge(Hopping) NVNT 1-DH5 2480MHz Ant1 Hopping Ref



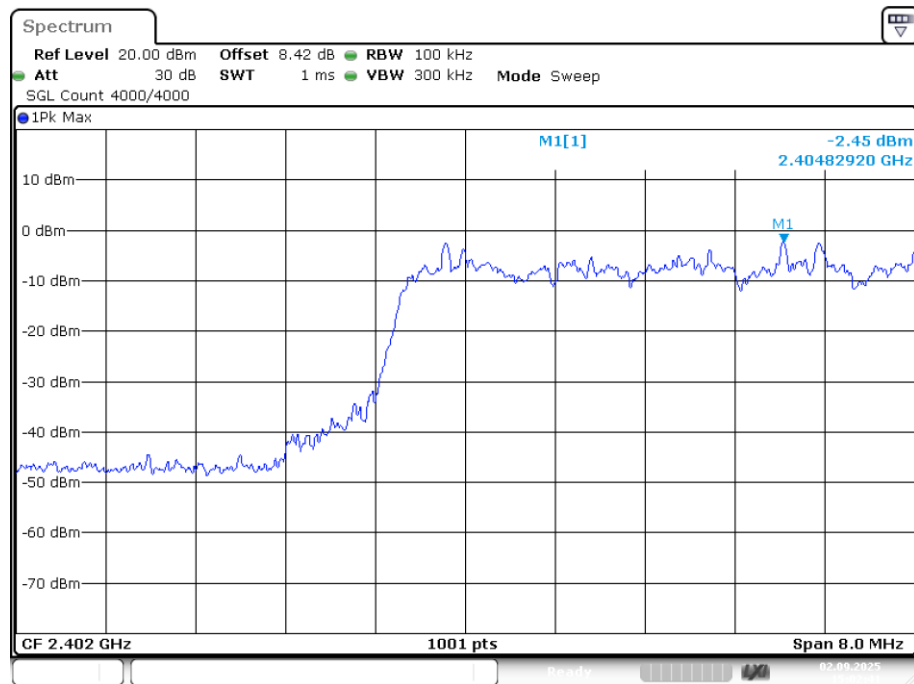
Date: 2.SEP.2025 13:19:20

Band Edge(Hopping) NVNT 1-DH5 2480MHz Ant1 Hopping Emission



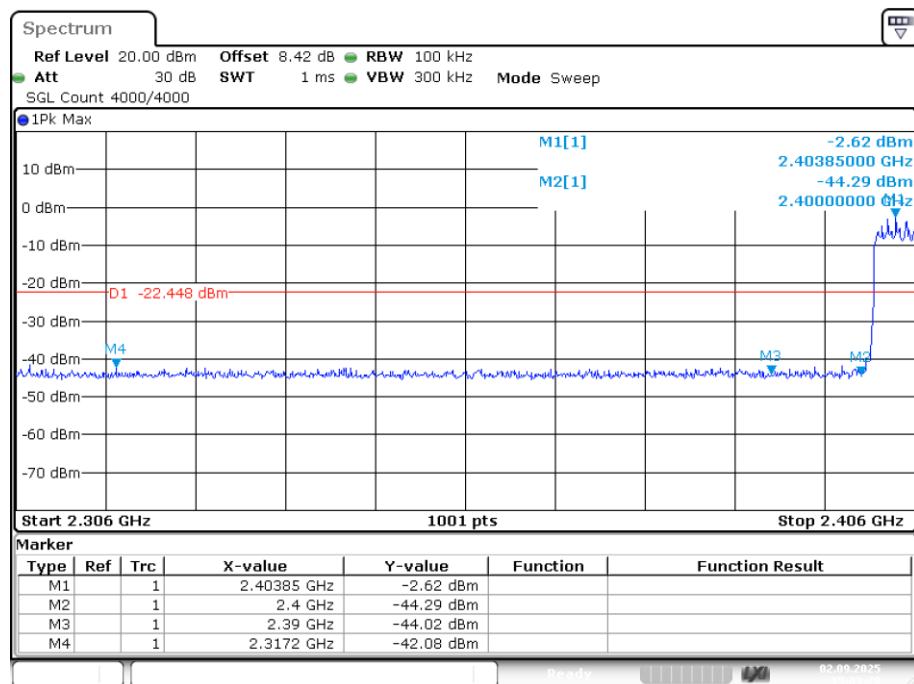
Date: 2.SEP.2025 13:19:54

Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Ref



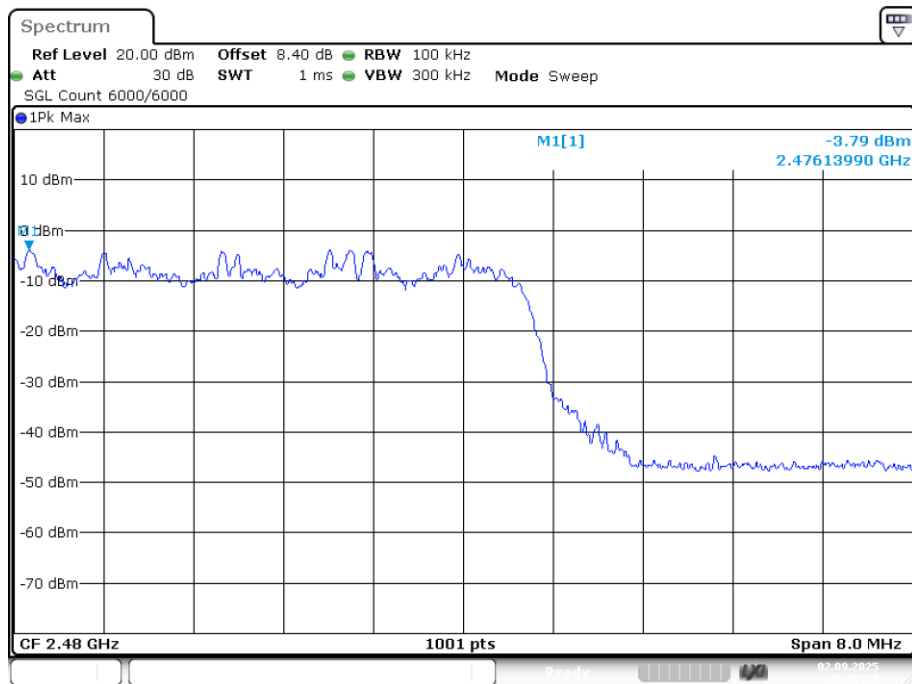
Date: 2.SEP.2025 15:02:42

Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Emission



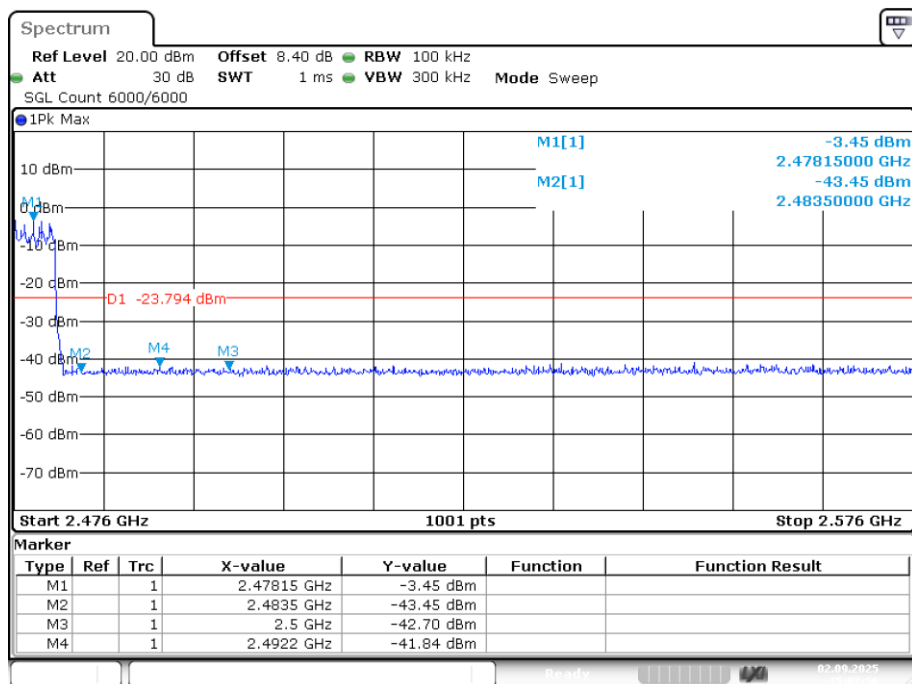
Date: 2.SEP.2025 15:03:28

Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Ref



Date: 2.SEP.2025 15:07:20

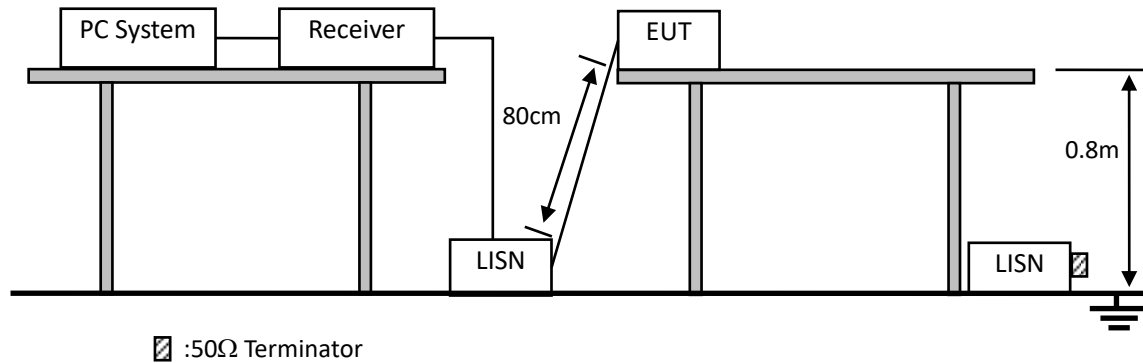
Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Emission



Date: 2.SEP.2025 15:07:56

12. POWER LINE CONDUCTED EMISSIONS

12.1. Block Diagram of Test Setup



□ :50Ω Terminator

12.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

12.3. Test Procedure

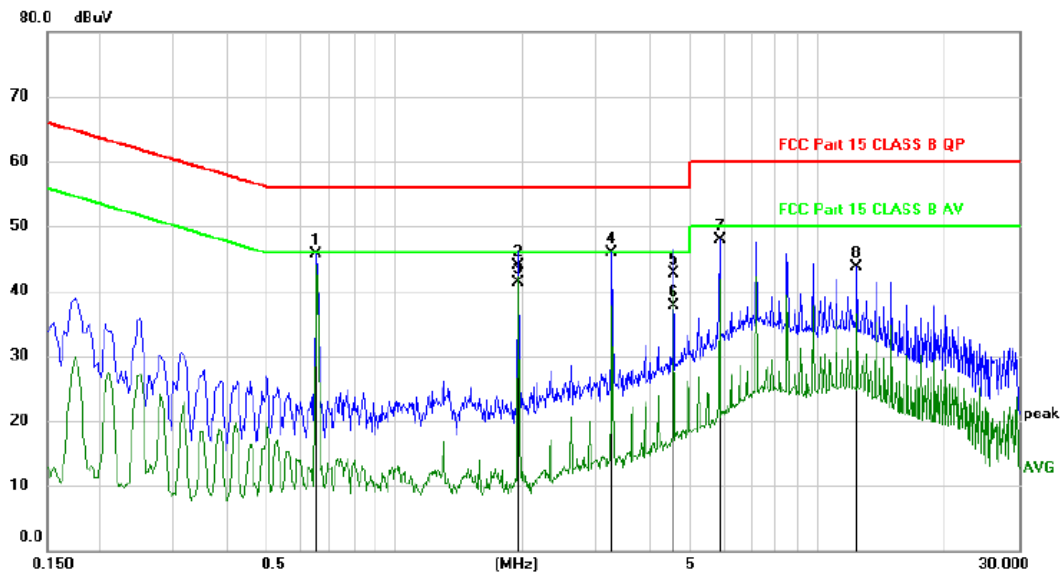
- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on conducted Emission test.
- (4) The bandwidth of test receiver is set at 10KHz.
- (5) The frequency range from 150 KHz to 30MHz is checked.

12.4. Test Result

PASS. (See below detailed test data)

Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:



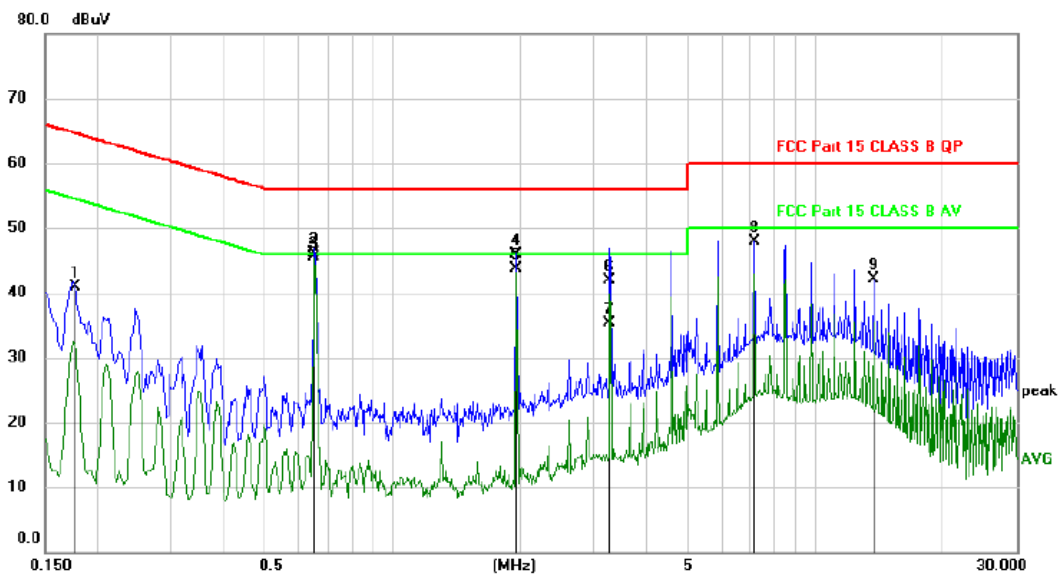
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.6540	35.80	9.93	45.73	56.00	-10.27	peak	
2	1.9620	34.08	9.88	43.96	56.00	-12.04	QP	
3 *	1.9620	31.48	9.88	41.36	46.00	-4.64	AVG	
4	3.2670	36.00	9.95	45.95	56.00	-10.05	peak	
5	4.5720	32.75	10.01	42.76	56.00	-13.24	QP	
6	4.5720	27.67	10.01	37.68	46.00	-8.32	AVG	
7	5.8770	37.73	10.08	47.81	60.00	-12.19	peak	
8	12.4110	33.42	10.27	43.69	60.00	-16.31	peak	

*:Maximum data x:Over limit !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1770	31.02	9.93	40.95	64.63	-23.68	peak	
2		0.6540	36.11	9.93	46.04	56.00	-9.96	QP	
3	*	0.6540	35.48	9.93	45.41	46.00	-0.59	AVG	
4		1.9620	36.10	9.88	45.98	56.00	-10.02	QP	
5		1.9620	33.76	9.88	43.64	46.00	-2.36	AVG	
6		3.2730	32.04	9.95	41.99	56.00	-14.01	QP	
7		3.2730	25.39	9.95	35.34	46.00	-10.66	AVG	
8		7.1940	37.83	10.13	47.96	60.00	-12.04	peak	
9		13.7340	31.86	10.30	42.16	60.00	-17.84	peak	

*:Maximum data x:Over limit !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Note: All modes and channels have been tested and only the GFSK 2402MHz mode with the worst data is listed.

13. ANTENNA REQUIREMENTS

13.1.Limit

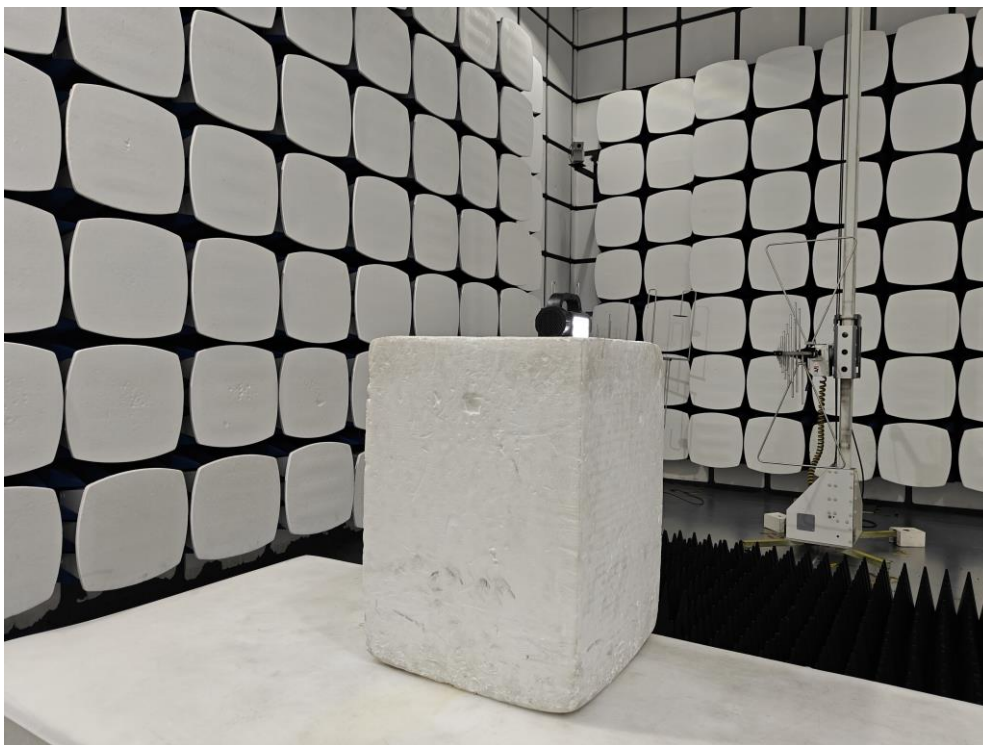
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

13.2.Result

The EUT antenna is PCB Antenna. It complies with the standard requirement.

14. TEST SETUP PHOTO

14.1. Photo of Radiated Emission Test



14.2.Photo of Conducted Emission Test

