



FCC TEST REPORT

FCC ID: 2A7ZC-SG20A

On Behalf of

GEOMATE POSITIONING PTE. LTD.

Geodetic GNSS Receiver

Model No.: SG20AR

Prepared for : GEOMATE POSITIONING PTE. LTD.
Address : 13 Tampines Lane #09-53 Singapore 528479

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 : A2407246-C01-R12
Date of Receipt : August 2, 2024
Date of Test : August 2, 2024- August 28, 2024
Date of Report : August 31, 2024
Version Number : V0
Test Result : Pass

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TEST REPORT DECLARATION

Applicant : GEOMATE POSITIONING PTE. LTD.
Address : 13 Tampines Lane #09-53 Singapore 528479
Manufacturer : GEOMATE POSITIONING PTE. LTD.
Address : 13 Tampines Lane #09-53 Singapore 528479
EUT Description : Geodetic GNSS Receiver
(A) Model No. : SG20AR
(B) Trademark : 

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	
Approved by (name + signature).....:	Jack Xu Project Manager	
Date of issue.....:	August 31, 2024	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	August 31, 2024	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)	P
Bandwidth	FCC Part 15: 15.215	P
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1)	P
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)	P
Dwell Time	FCC Part 15: 15.247(a)(1)	P
Radiated Emission	FCC Part 15: 15.209, FCC Part 15: 15.247(d)	P
Band Edge Compliance	FCC Part 15: 15.247(d)	P
Power Line Conducted Emissions	FCC Part 15: 15.207	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.		

1. Pass: The EUT complies with the essential requirements in the standard.
2. Frequency Stability: The manufacturer stated in the user's manual.
3. 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	: Geodetic GNSS Receiver
Model Number	: SG20AR
Diff	: N/A
Power supply	: DC 5V from AC Adapter, DC 7.2V from battery.
Radio Technology	: Bluetooth EDR
Operation frequency	: 2402-2480MHz
Channel No.	: 79 channels
Channel Separation	: 1MHz
Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna Type	: PCB Antenna, max gain 0dBi (Antenna information is provided by applicant.)
Software version	: V1.0
Hardware version	: V1.0.1
Intend use environment	Residential, commercial and light industrial environment

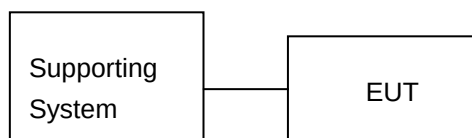
2.2. Accessories of Device (EUT)

Accessories : AC Adapter
 Manufacturer : Yisheng Electronics Co., LTD
 Model : EA1012AVRU-050
 INPUT : 100-240Vac, 1.0A, 50-60Hz
 OUTPUT : 5.0V=2.4A 12.0W
 Accessories Type-C charging cable
 Manufacturer /
 Model /
 Accessories UHF Receiving Antenna
 Manufacturer /
 Model /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1.	Notebook PC	Lenovo	ThinkPad E14	--	--

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel information		
Mode	Channel	Frequency (MHz)
GFSK	Low :CH0	2402
	Middle: CH39	2441
	High: CH78	2480
$\pi/4$ DQPSK	Low :CH0	2402
	Middle: CH39	2441
	High: CH78	2480
8DPSK	Low :CH0	2402
	Middle: CH39	2441
	High: CH78	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	24°C
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

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 15, 2019 Certificated by IC

Registration Number: 12135A

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°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.18	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2024.08.08	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2024.08.08	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-10 2082-Wa	2024.08.08	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2024.08.08	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	2Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2024.08.08	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2024.08.08	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2024.08.08	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2024.08.08	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2024.08.08	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2024.08.08	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2024.08.08	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	2Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2024.08.08	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2024.08.08	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2024.08.08	1 Year
Electronic Thermo-Hygrometer	S.H.Qixiang	HTC-1	/	N/A	2024.08.11	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2024.08.08	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	EZ	Alpha-3A1
CE	EZ-EMC	EZ	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

3. MAXIMUM PEAK OUTPUT POWER

3.1. Limit

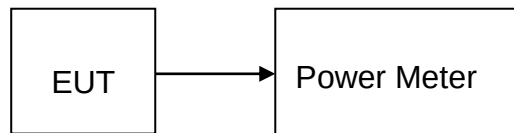
Please refer section 15.247

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-DH1	2402	Ant1	1.949	21	Pass
NVNT	1-DH1	2441	Ant1	2.132	21	Pass
NVNT	1-DH1	2480	Ant1	1.675	21	Pass
NVNT	1-DH3	2441	Ant1	2.495	21	Pass
NVNT	1-DH5	2441	Ant1	2.355	21	Pass
NVNT	2-DH1	2402	Ant1	2.107	21	Pass
NVNT	2-DH1	2441	Ant1	2.559	21	Pass
NVNT	2-DH1	2480	Ant1	2.34	21	Pass
NVNT	2-DH3	2441	Ant1	1.538	21	Pass
NVNT	2-DH5	2441	Ant1	1.661	21	Pass
NVNT	3-DH1	2402	Ant1	1.8	21	Pass
NVNT	3-DH1	2441	Ant1	2.099	21	Pass
NVNT	3-DH1	2480	Ant1	2.238	21	Pass
NVNT	3-DH3	2441	Ant1	2.289	21	Pass
NVNT	3-DH5	2441	Ant1	2.279	21	Pass

4. BANDWIDTH

4.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in FCC Section 15.247(a)(1), 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

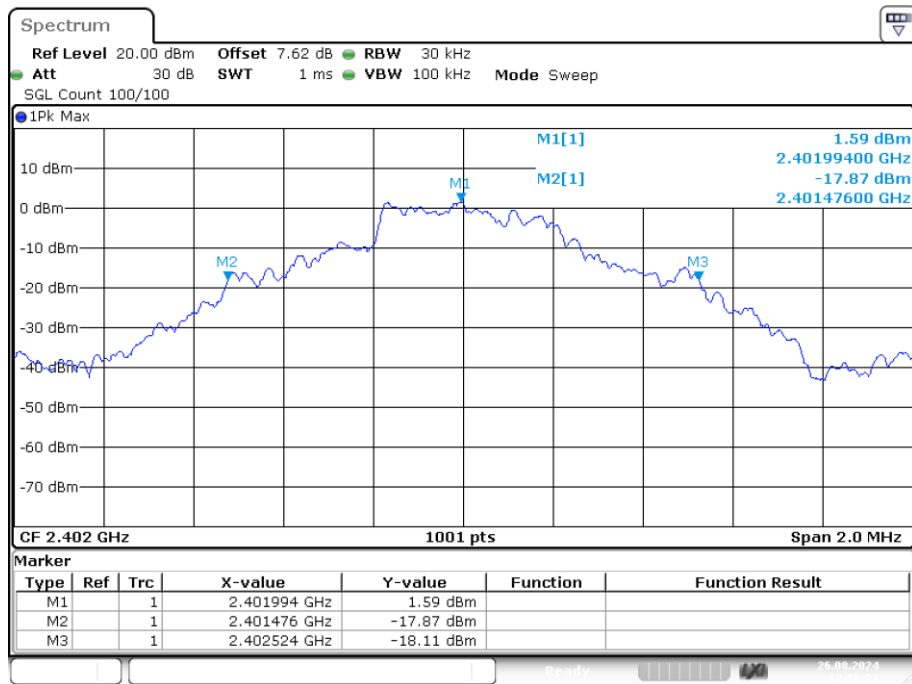
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3. Test Result

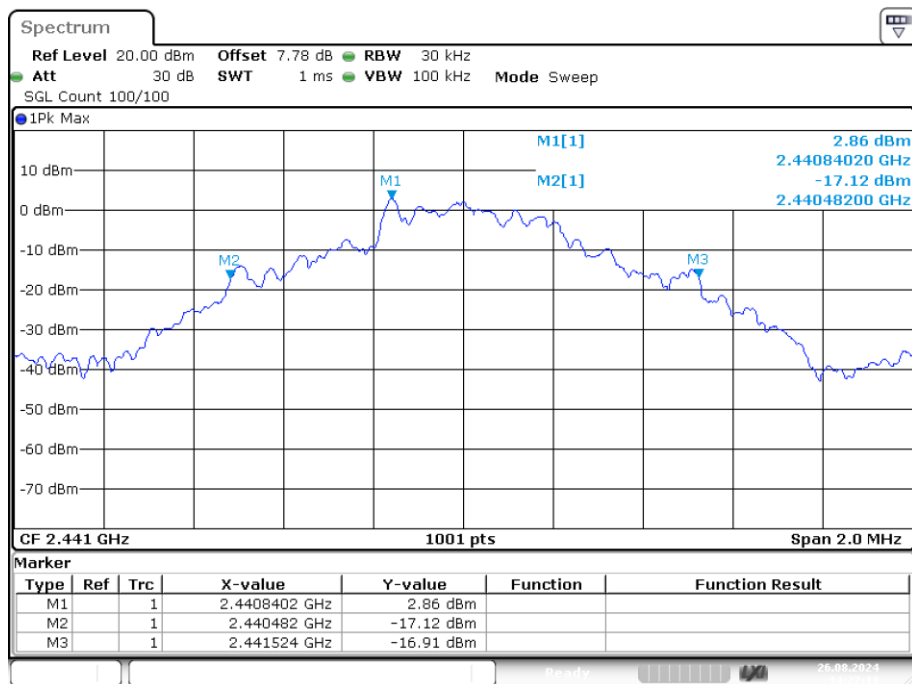
-20dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant1	1.048	/	Pass
NVNT	1-DH1	2441	Ant1	1.042	/	Pass
NVNT	1-DH1	2480	Ant1	1.026	/	Pass
NVNT	2-DH1	2402	Ant1	1.35	/	Pass
NVNT	2-DH1	2441	Ant1	1.32	/	Pass
NVNT	2-DH1	2480	Ant1	1.348	/	Pass
NVNT	3-DH1	2402	Ant1	1.33	/	Pass
NVNT	3-DH1	2441	Ant1	1.348	/	Pass
NVNT	3-DH1	2480	Ant1	1.268	/	Pass

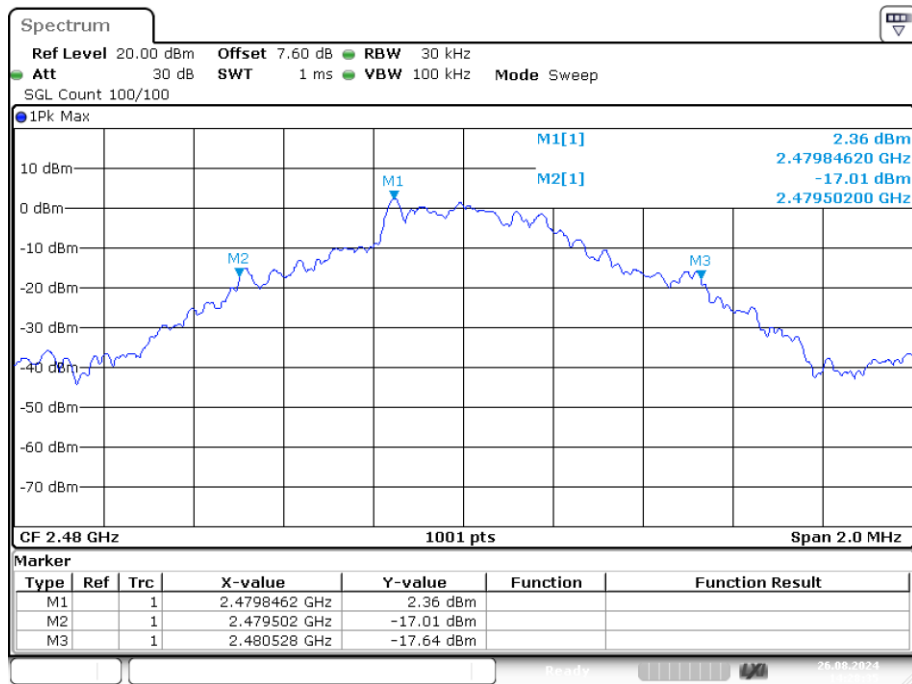
Note: All mode were tested, this Report only show the test plots of the worst case.

-20dB Bandwidth NVNT 1-DH1 2402MHz Ant1

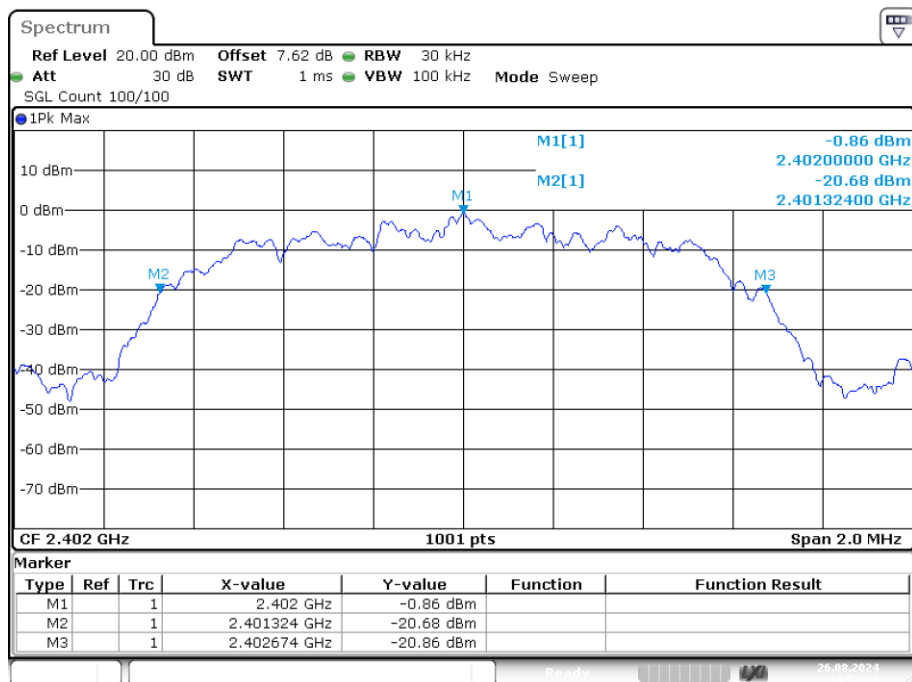
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-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1

Date: 26.AUG.2024 14:27:11

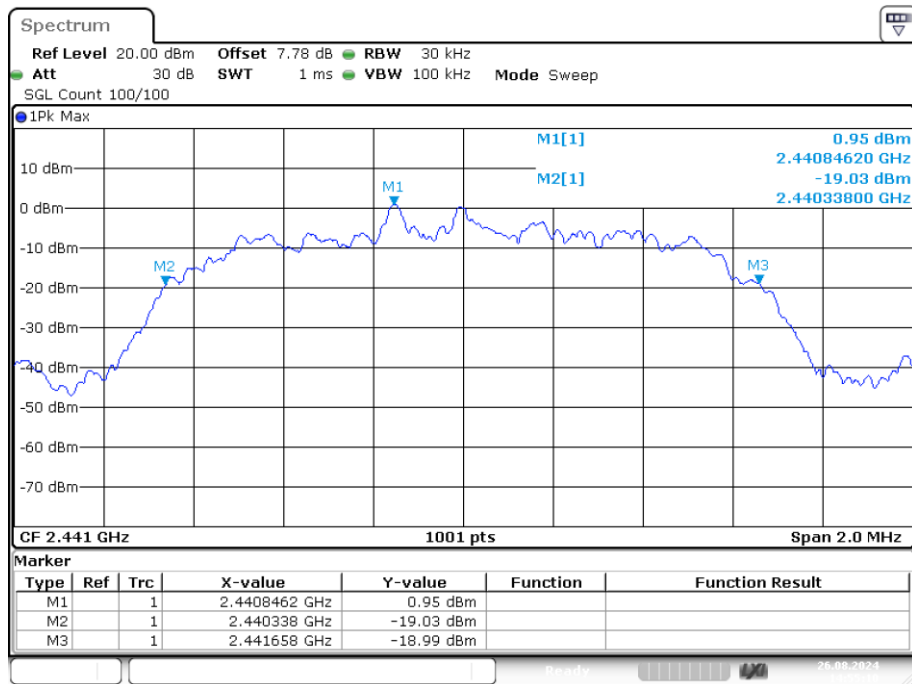
-20dB Bandwidth NVNT 1-DH1 2480MHz Ant1

Date: 26.AUG.2024 14:28:35

-20dB Bandwidth NVNT 2-DH1 2402MHz Ant1

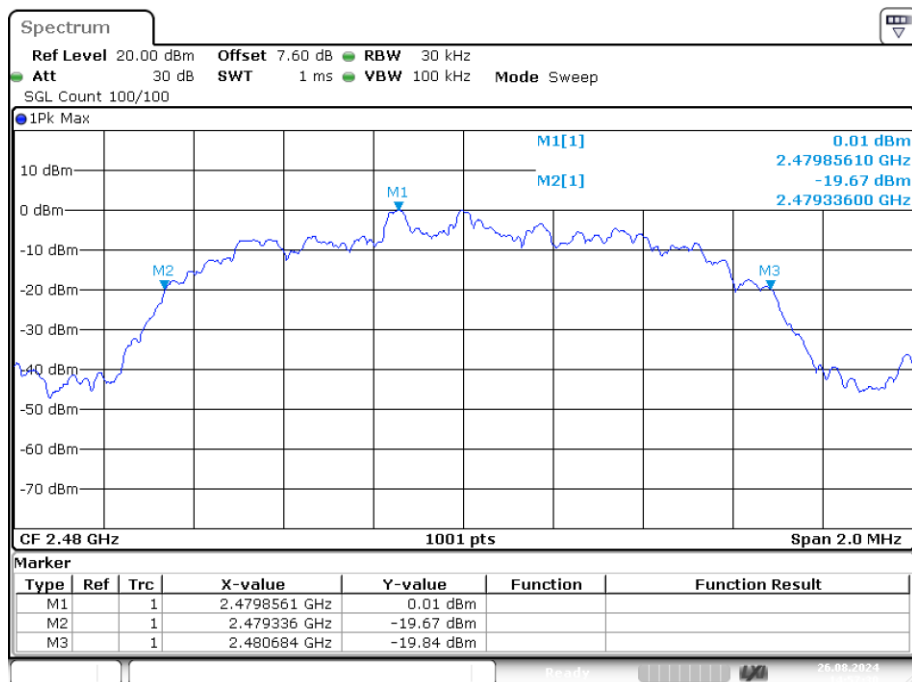
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-20dB Bandwidth NVNT 2-DH1 2441MHz Ant1



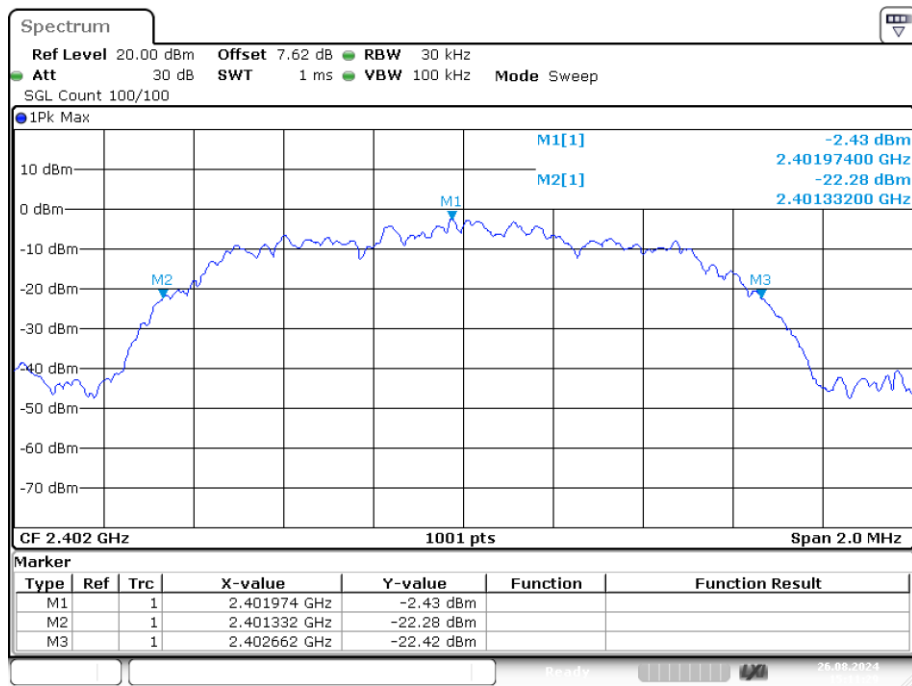
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-20dB Bandwidth NVNT 2-DH1 2480MHz Ant1



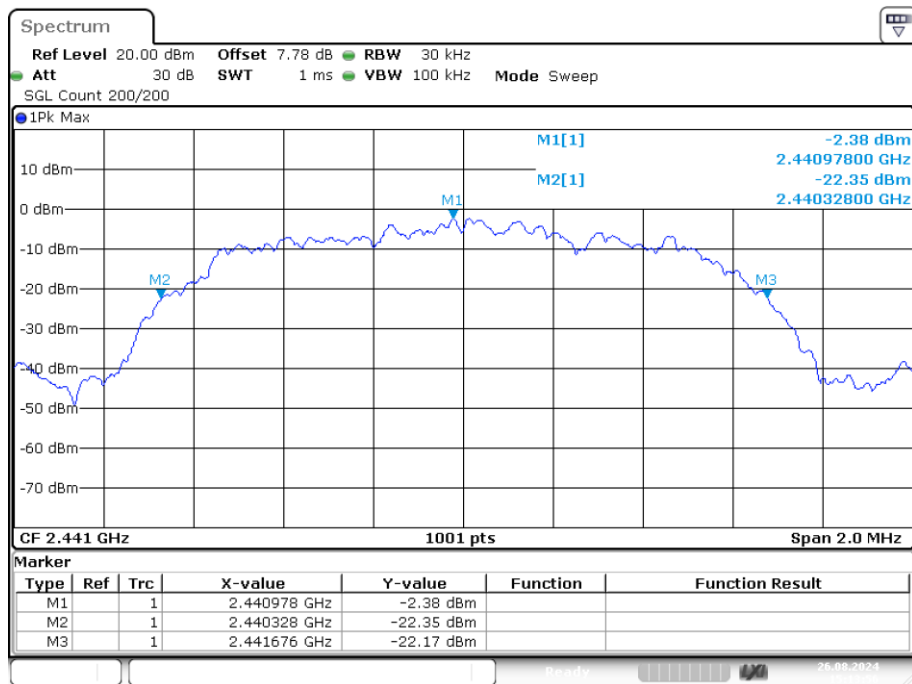
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-20dB Bandwidth NVNT 3-DH1 2402MHz Ant1



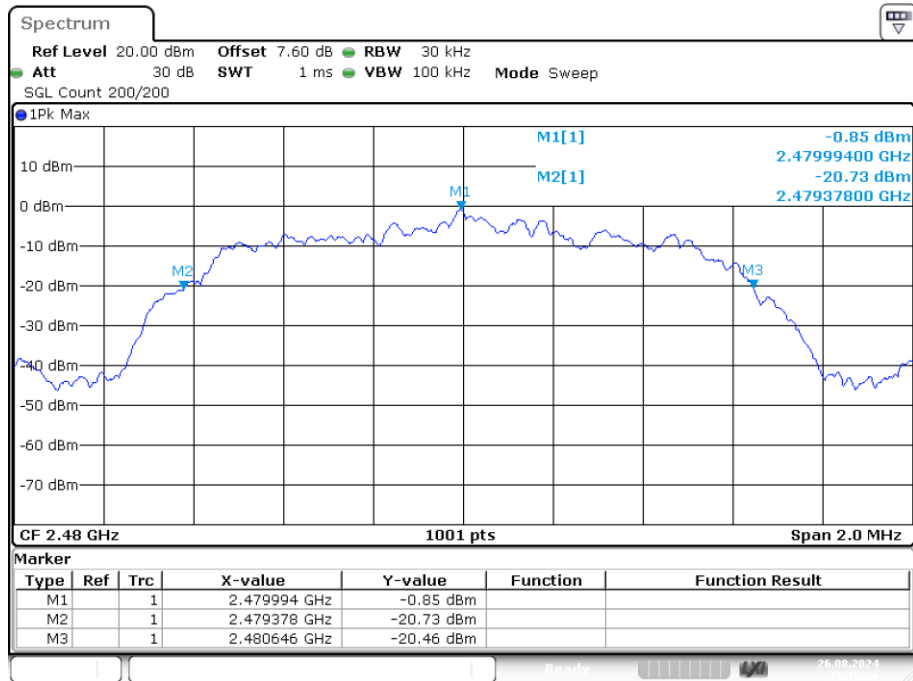
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-20dB Bandwidth NVNT 3-DH1 2441MHz Ant1



Date: 26.AUG.2024 15:13:56

-20dB Bandwidth NVNT 3-DH1 2480MHz Ant1

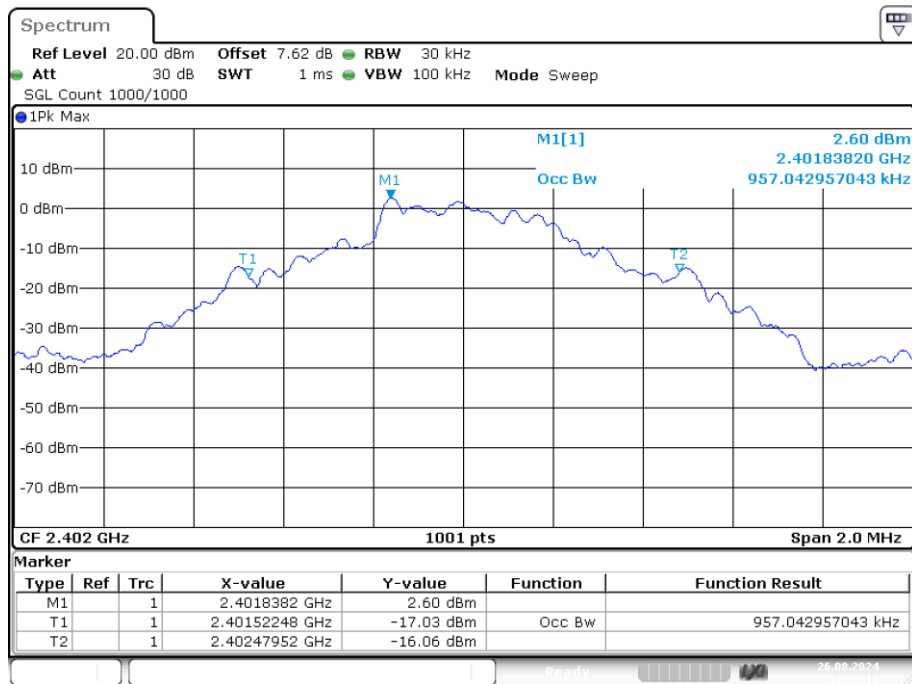


Date: 26.AUG.2024 15:15:35

Occupied Channel Bandwidth

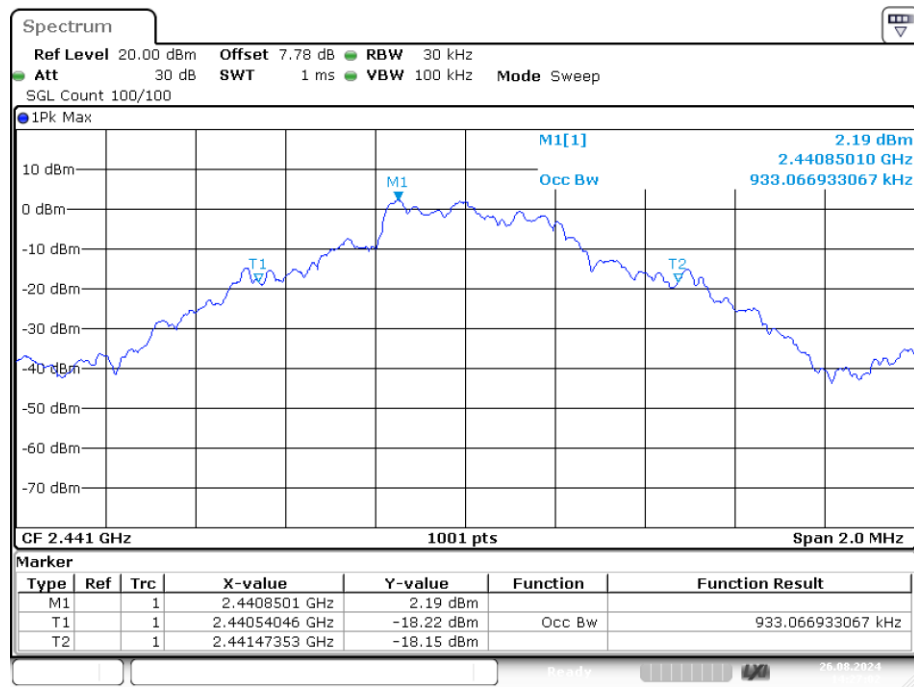
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH1	2402	Ant1	0.957
NVNT	1-DH1	2441	Ant1	0.933
NVNT	1-DH1	2480	Ant1	0.961
NVNT	2-DH1	2402	Ant1	1.197
NVNT	2-DH1	2441	Ant1	1.177
NVNT	2-DH1	2480	Ant1	1.193
NVNT	3-DH1	2402	Ant1	1.179
NVNT	3-DH1	2441	Ant1	1.181
NVNT	3-DH1	2480	Ant1	1.179

Note: All mode were tested, this Report only show the test plots of the worst case.

OBW NVNT 1-DH1 2402MHz Ant1

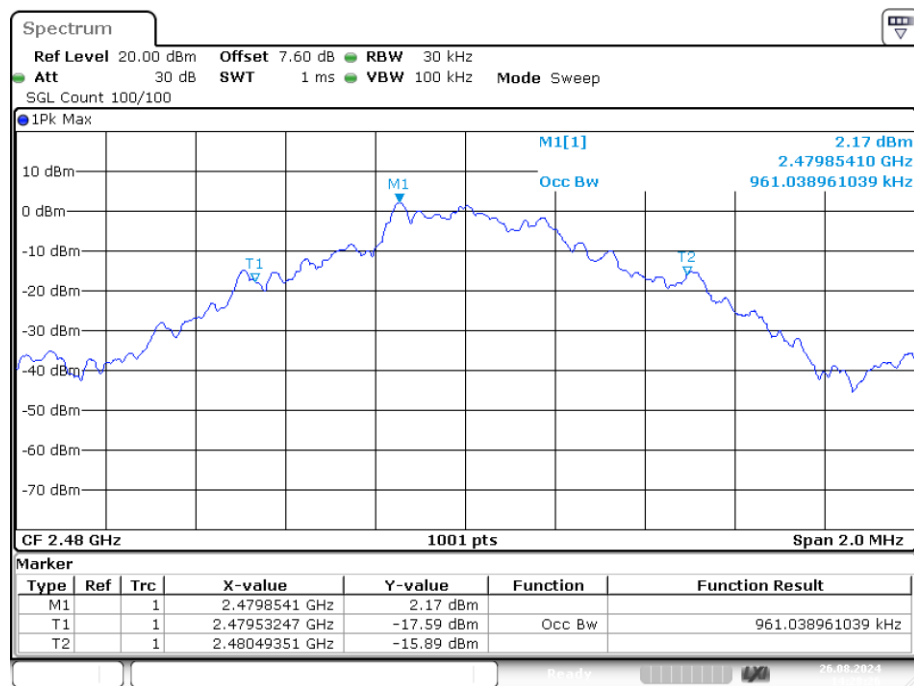
Date: 26.AUG.2024 12:50:13

OBW NVNT 1-DH1 2441MHz Ant1



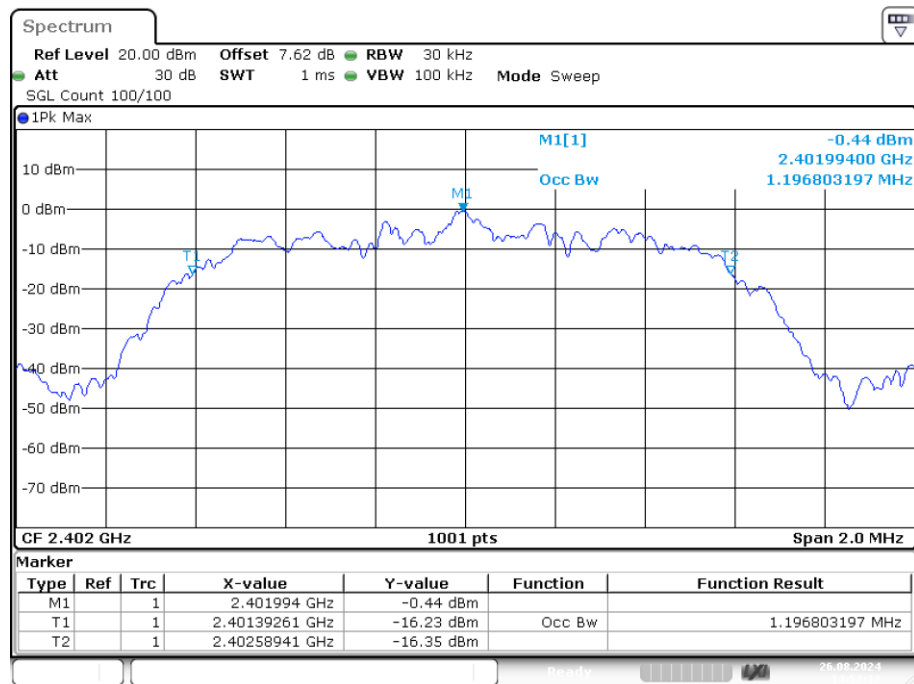
Date: 26.AUG.2024 14:27:02

OBW NVNT 1-DH1 2480MHz Ant1



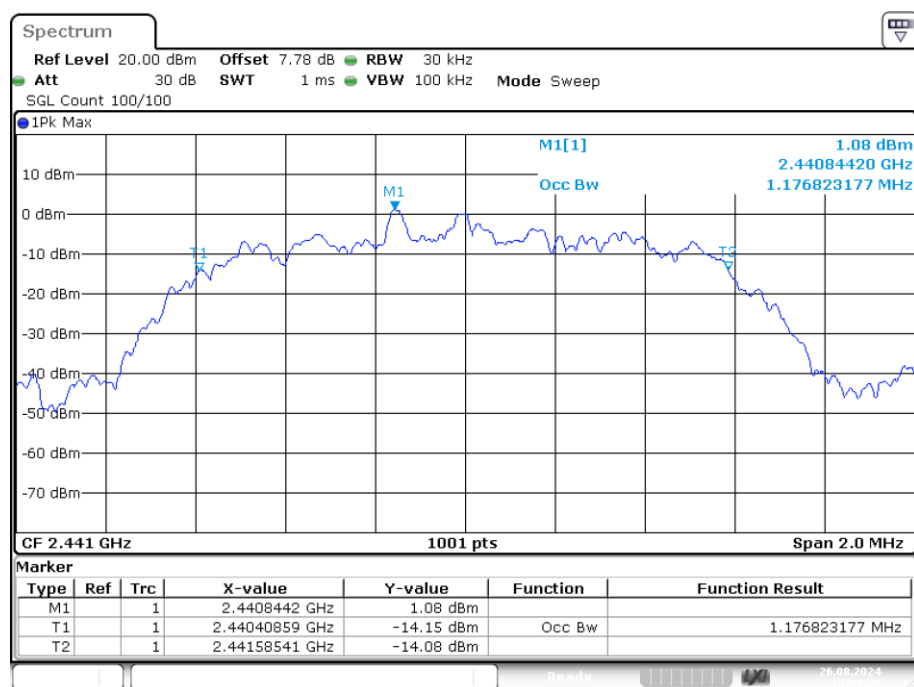
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OBW NVNT 2-DH1 2402MHz Ant1



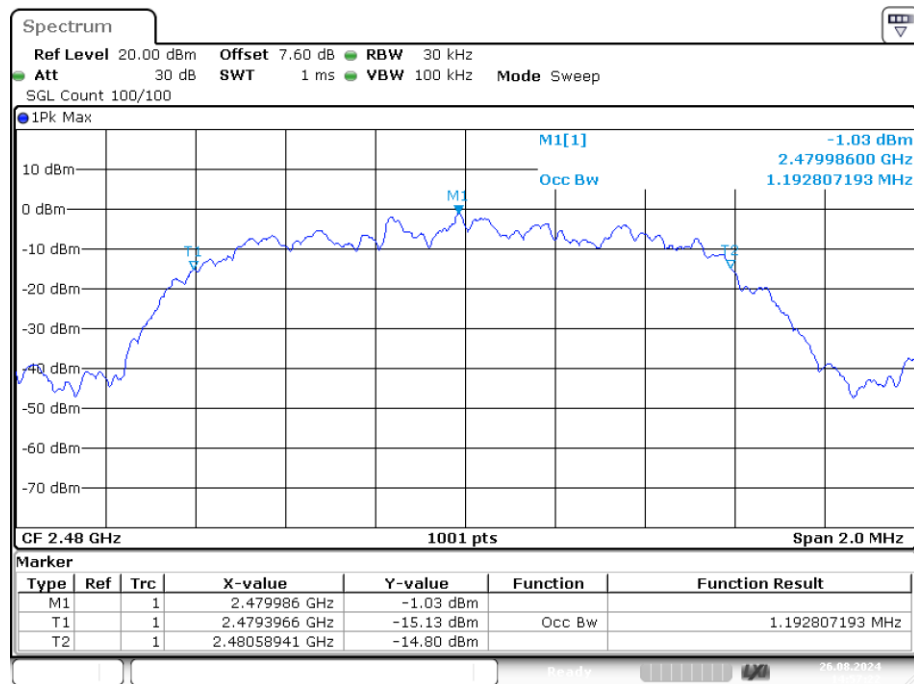
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OBW NVNT 2-DH1 2441MHz Ant1



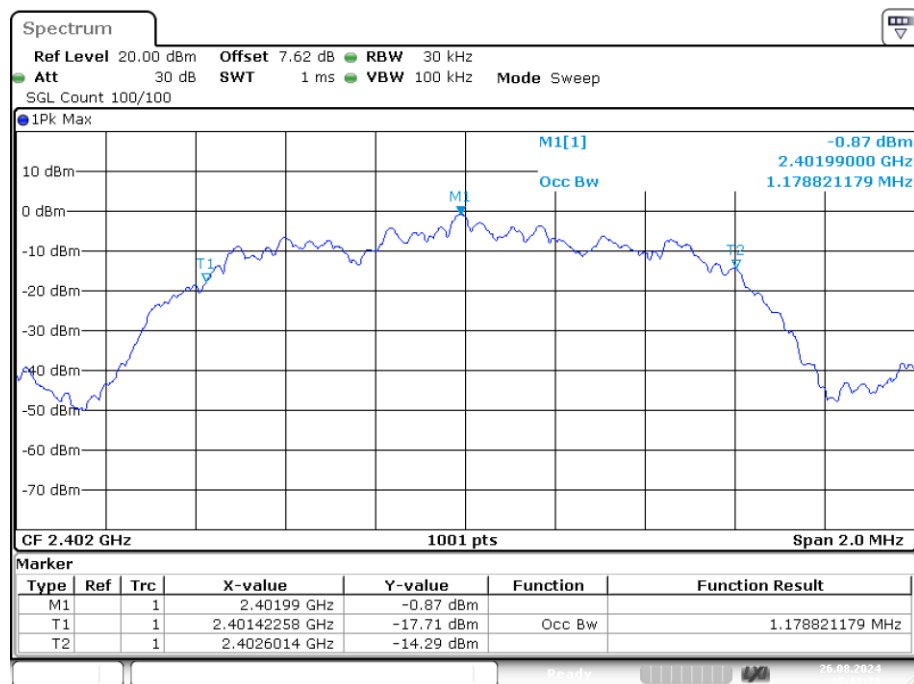
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OBW NVNT 2-DH1 2480MHz Ant1



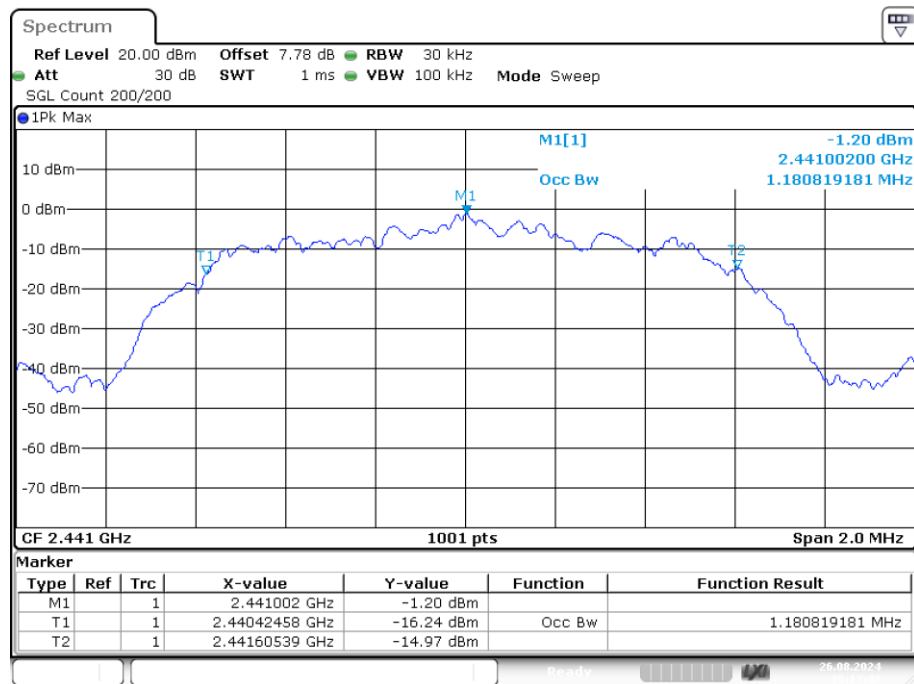
Date: 26.AUG.2024 14:57:23

OBW NVNT 3-DH1 2402MHz Ant1



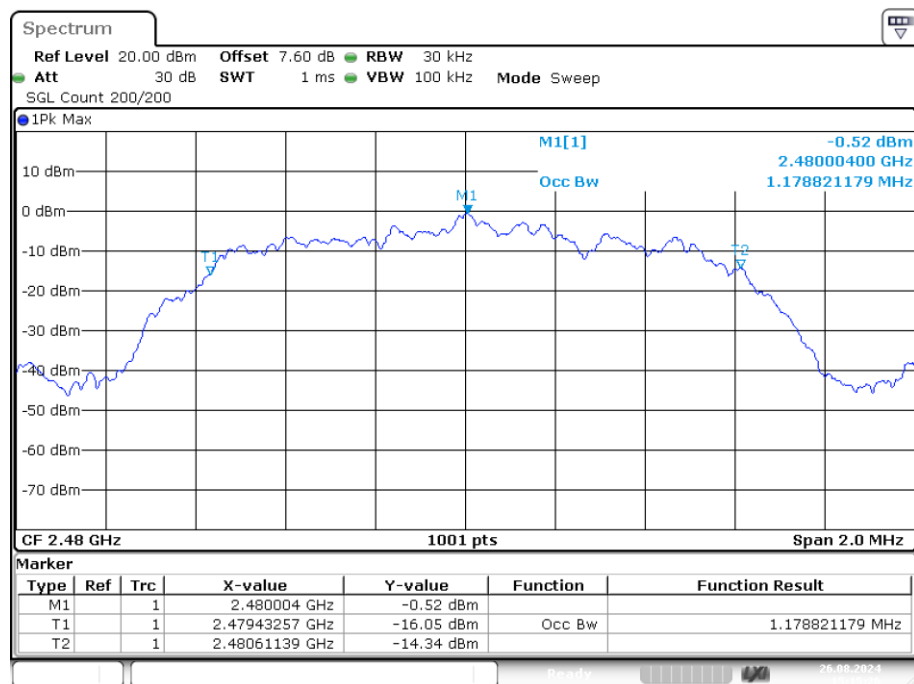
Date: 26.AUG.2024 15:11:20

OBW NVNT 3-DH1 2441MHz Ant1



Date: 26.AUG.2024 15:13:47

OBW NVNT 3-DH1 2480MHz Ant1



Date: 26.AUG.2024 15:15:26

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

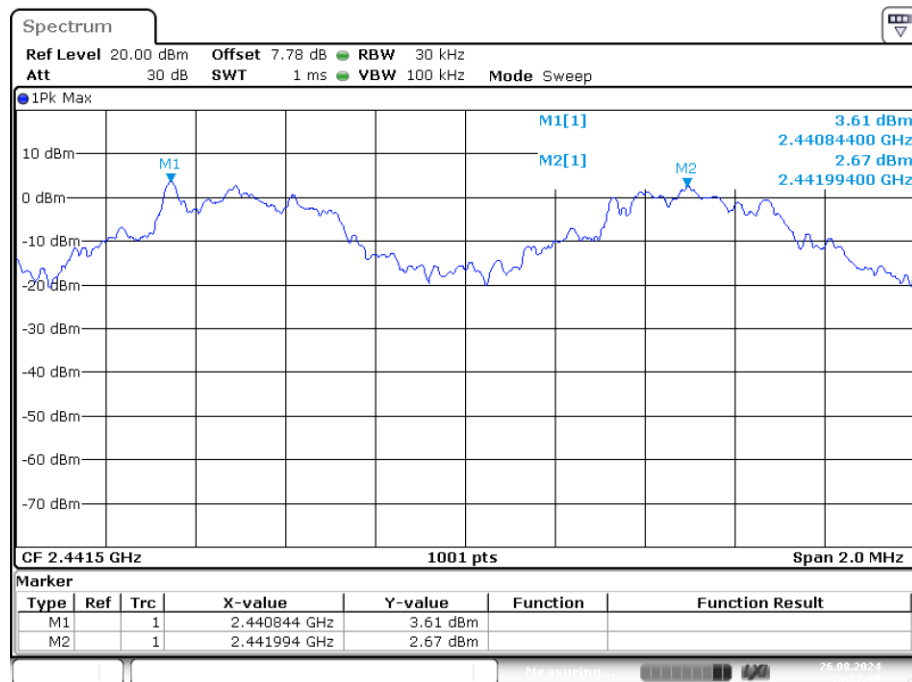
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The carrier frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW.

5.3. Test Result

Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	Ant1	2440.844	2441.994	1.15	1.042	Pass
NVNT	2-DH1	Ant1	2440.838	2441.842	1.004	0.88	Pass
NVNT	3-DH1	Ant1	2440.992	2441.978	0.986	0.899	Pass

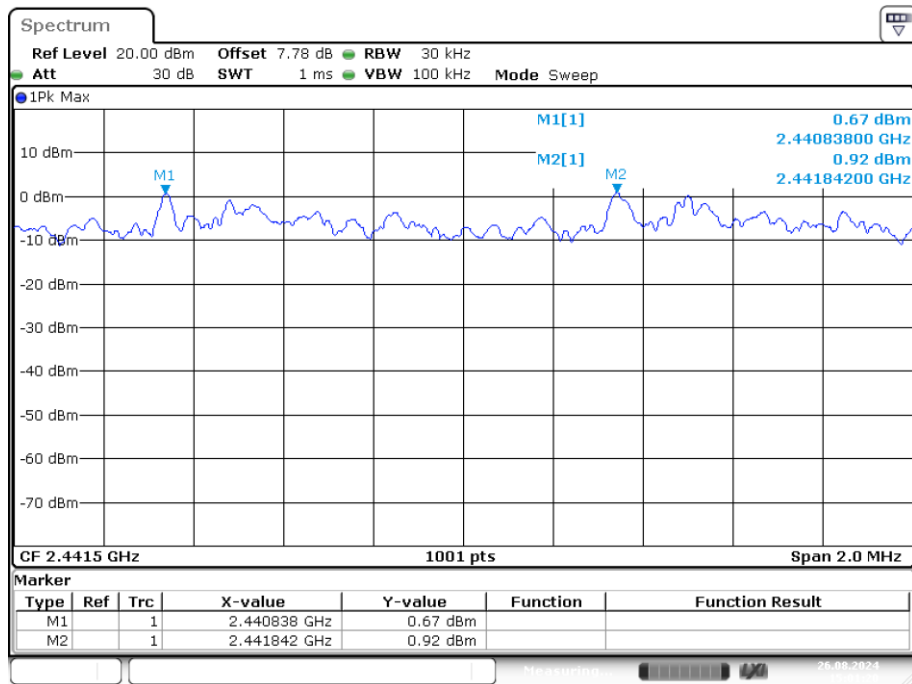
Note: All mode were tested, this Report only show the test plots of the worst case.

CFS NVNT 1-DH1 2441MHz Ant1



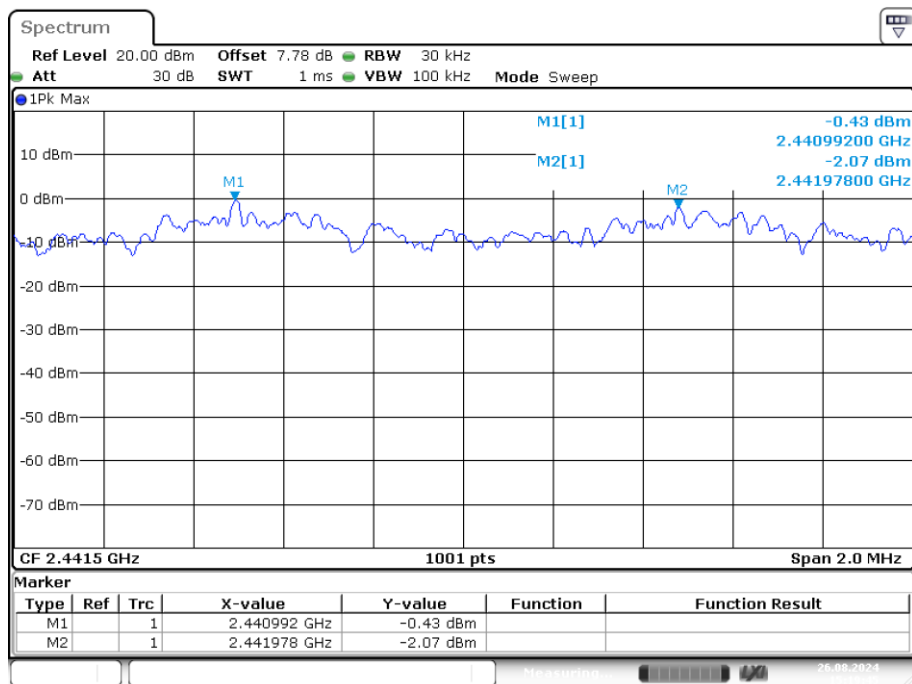
Date: 26.AUG.2024 14:37:11

CFS NVNT 2-DH1 2441MHz Ant1



Date: 26.AUG.2024 15:01:20

CFS NVNT 3-DH1 2441MHz Ant1



Date: 26.AUG.2024 15:19:45

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

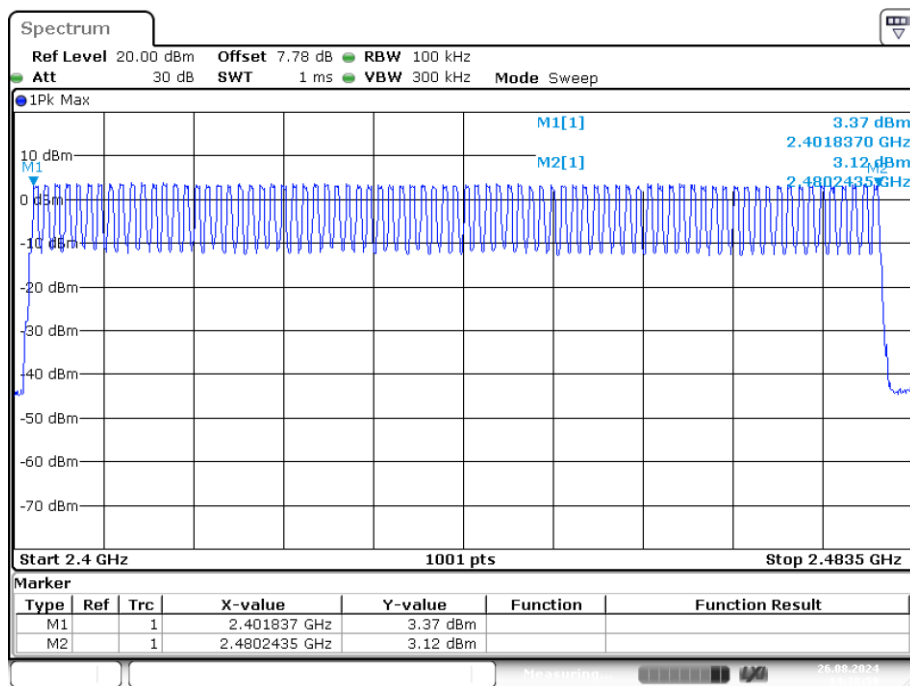
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.

6.3. Test Result

Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass

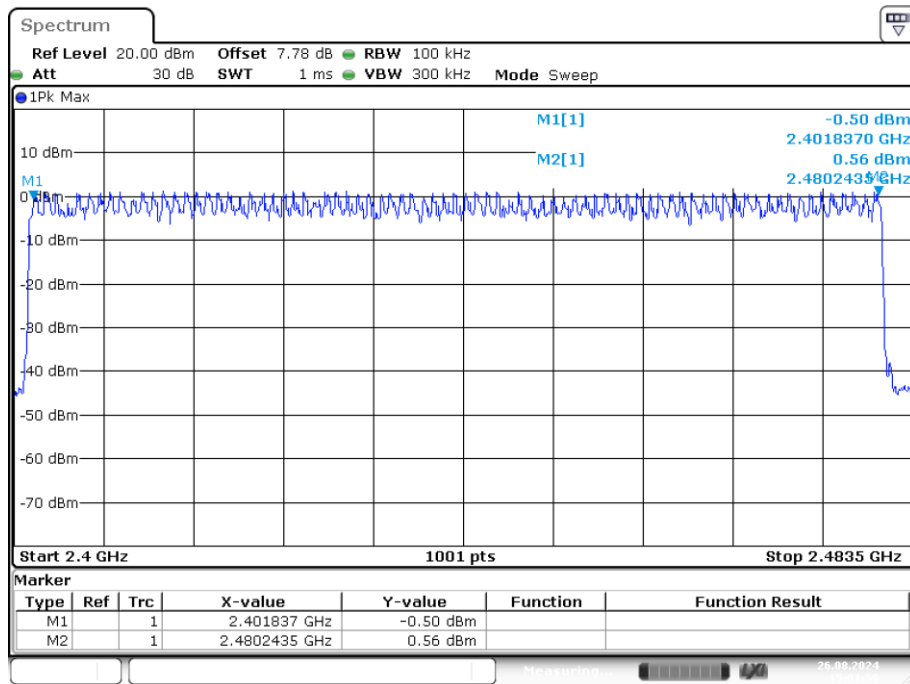
Note: All mode were tested, this Report only show the test plots of the worst case.

Hopping No. NVNT 1-DH1 2441MHz Ant1



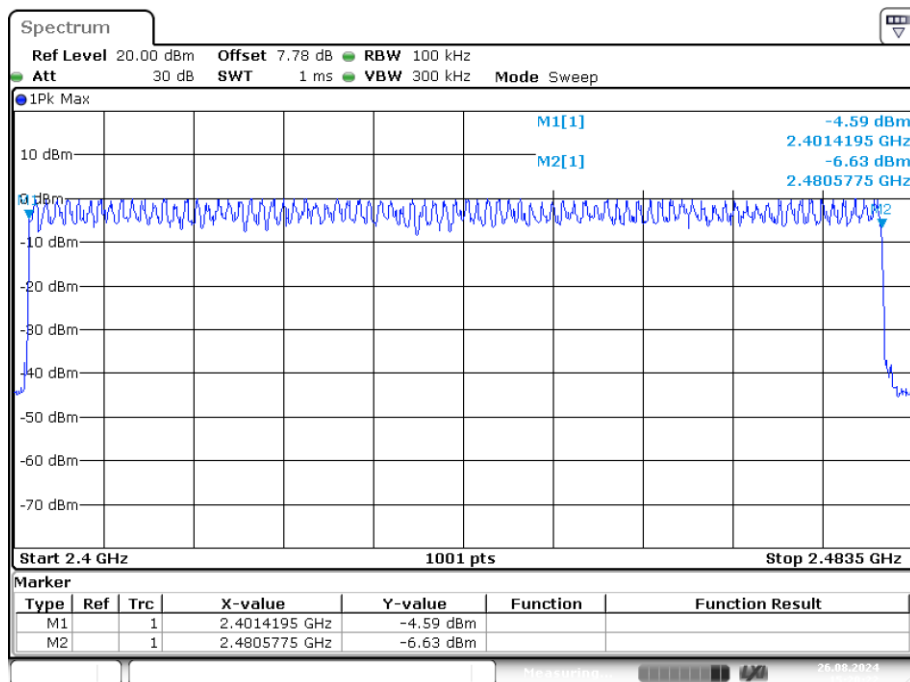
Date: 26.AUG.2024 14:38:59

Hopping No. NVNT 2-DH1 2441MHz Ant1



Date: 26.AUG.2024 15:01:59

Hopping No. NVNT 3-DH1 2441MHz Ant1



Date: 26.AUG.2024 15:20:23

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.

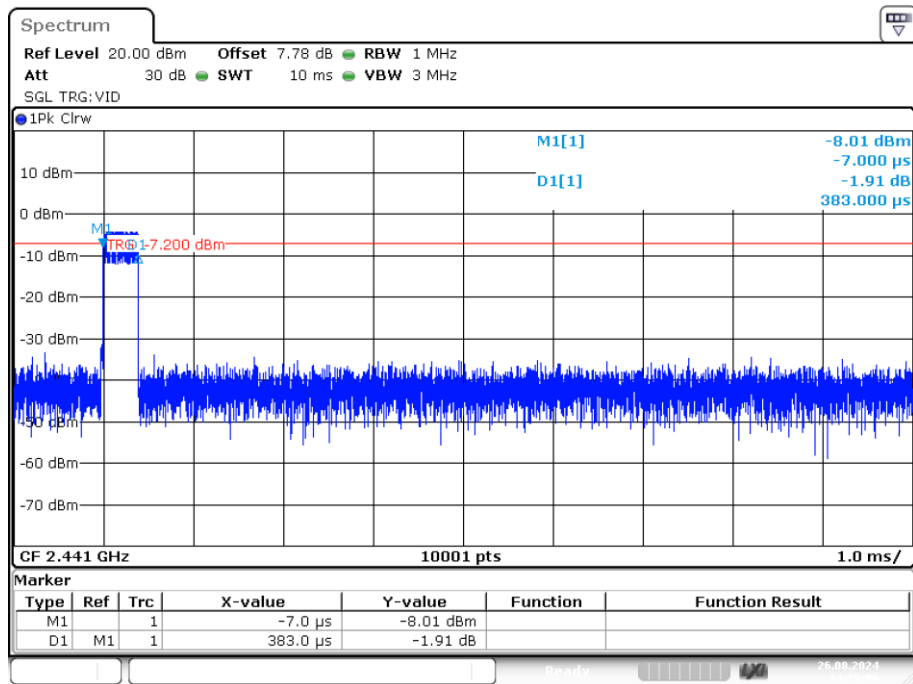
7.2.5. Repeat above procedures until all frequency measured were complete.

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	0.383	121.794	318	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.639	263.879	161	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.887	357.988	124	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.389	124.091	319	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.64	270.6	165	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.888	268.584	93	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.389	123.702	318	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.639	263.879	161	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.891	291.991	101	31600	400	Pass

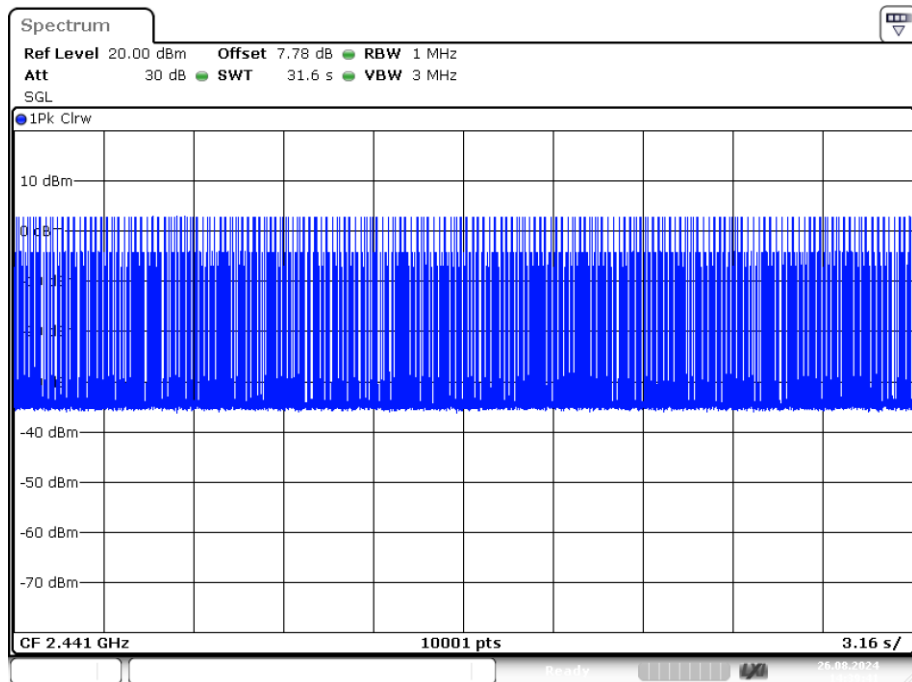
Note: Total Dwell Time= Pulse Time* Burst Count

Dwell NVNT 1-DH1 2441MHz Ant1 One Burst



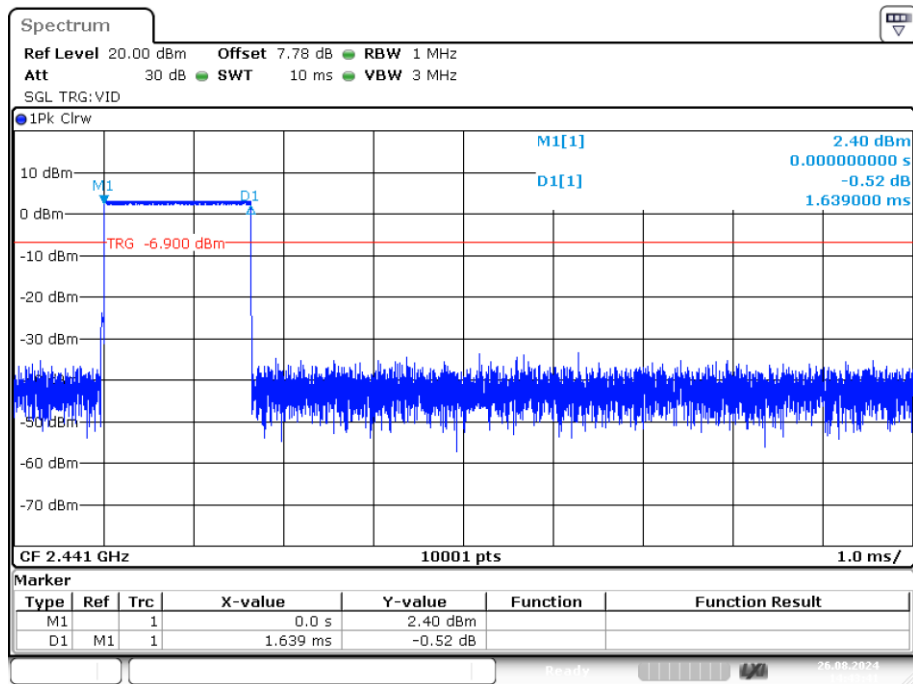
Date: 26.AUG.2024 14:39:06

Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated



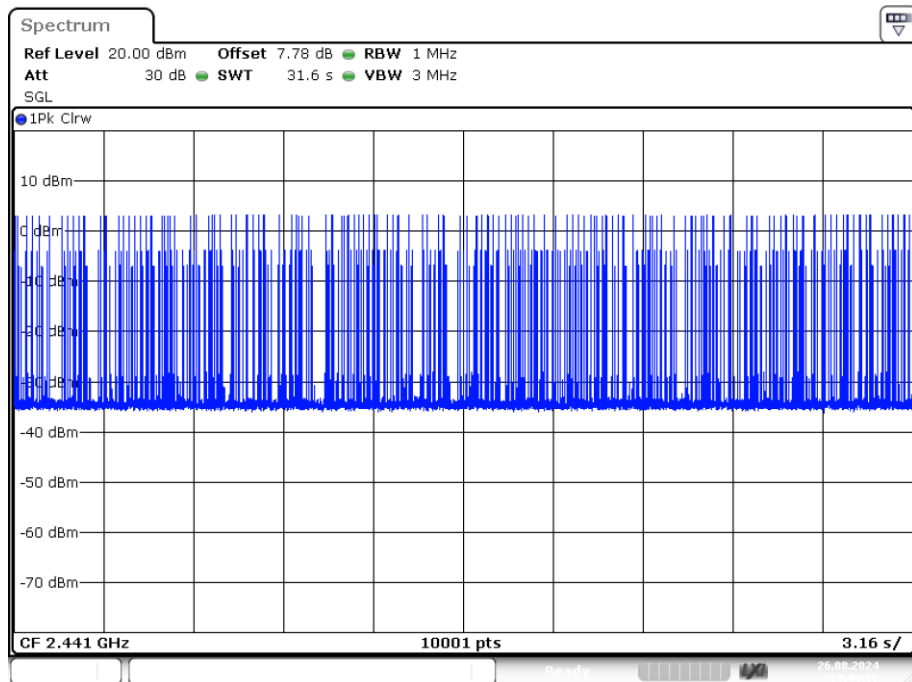
Date: 26.AUG.2024 14:39:41

Dwell NVNT 1-DH3 2441MHz Ant1 One Burst



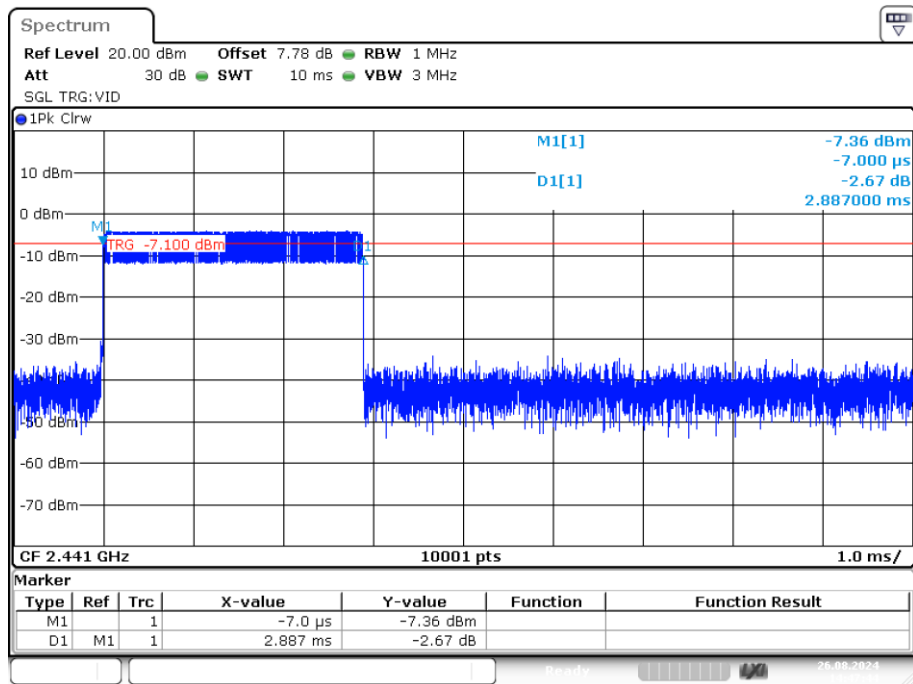
Date: 26.AUG.2024 14:43:41

Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated



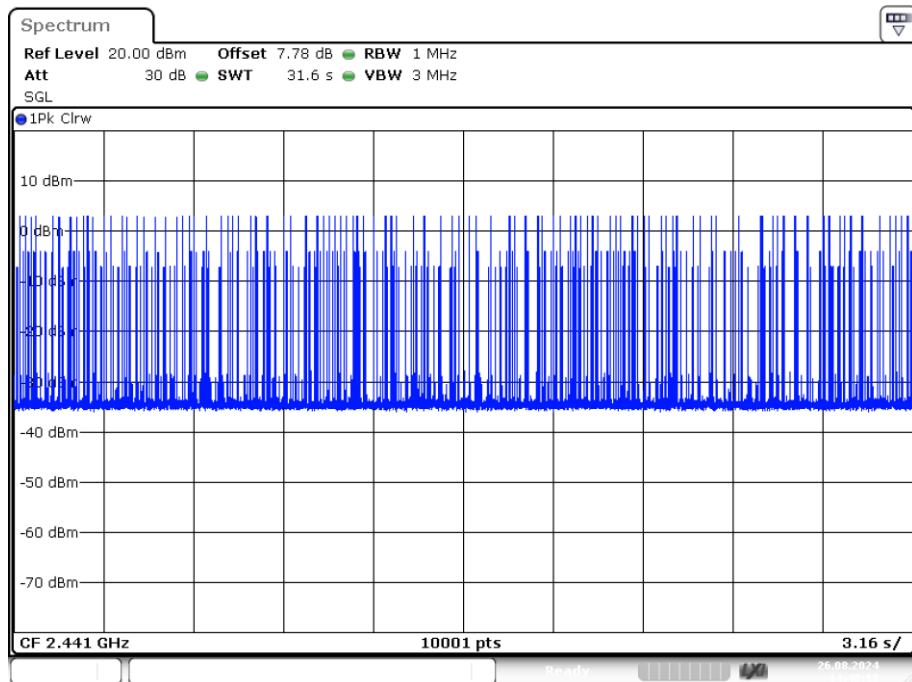
Date: 26.AUG.2024 14:44:16

Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



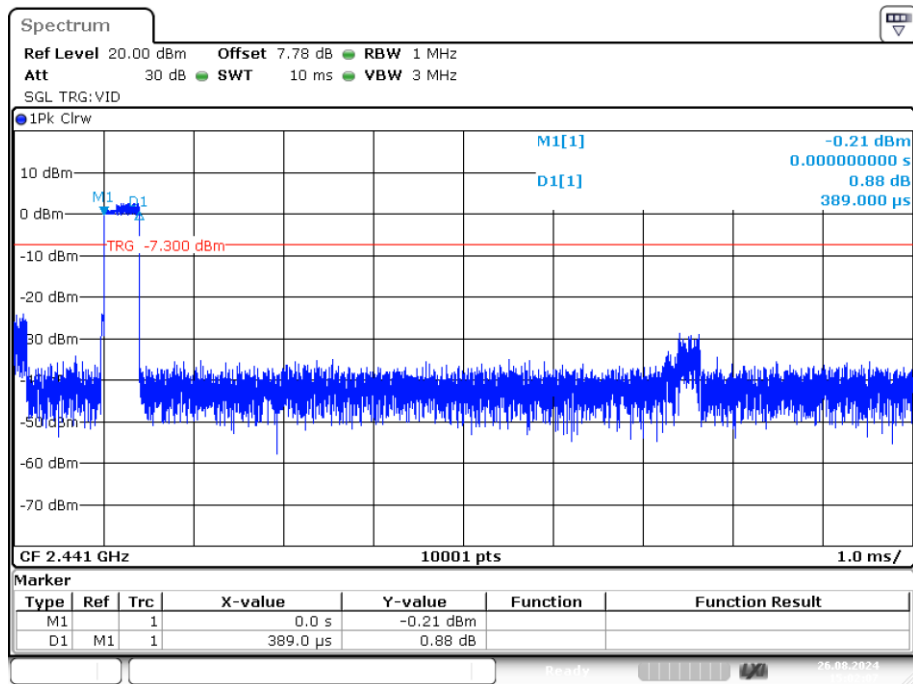
Date: 26.AUG.2024 14:47:43

Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated



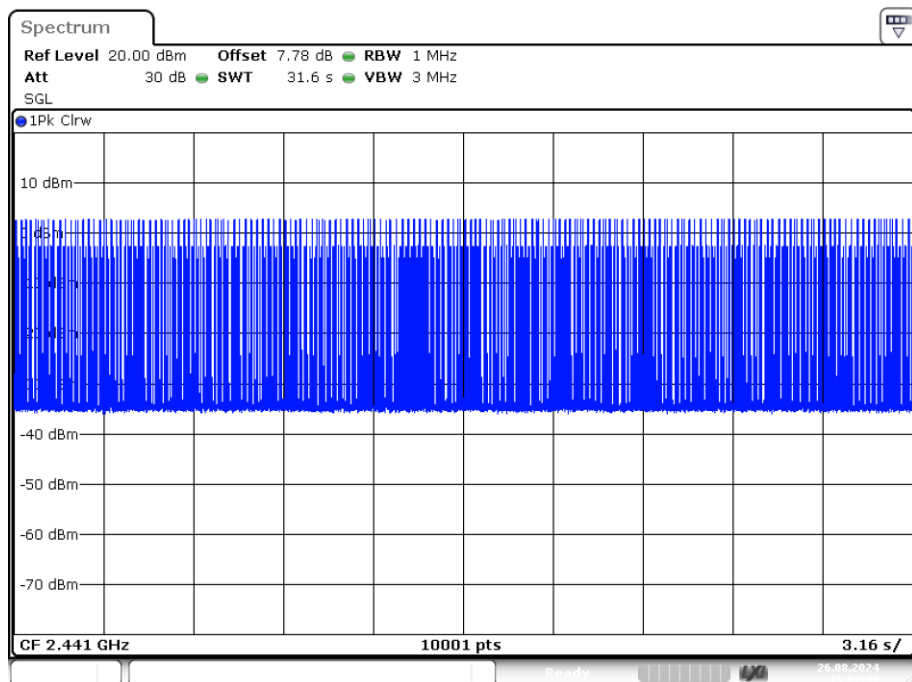
Date: 26.AUG.2024 14:48:18

Dwell NVNT 2-DH1 2441MHz Ant1 One Burst



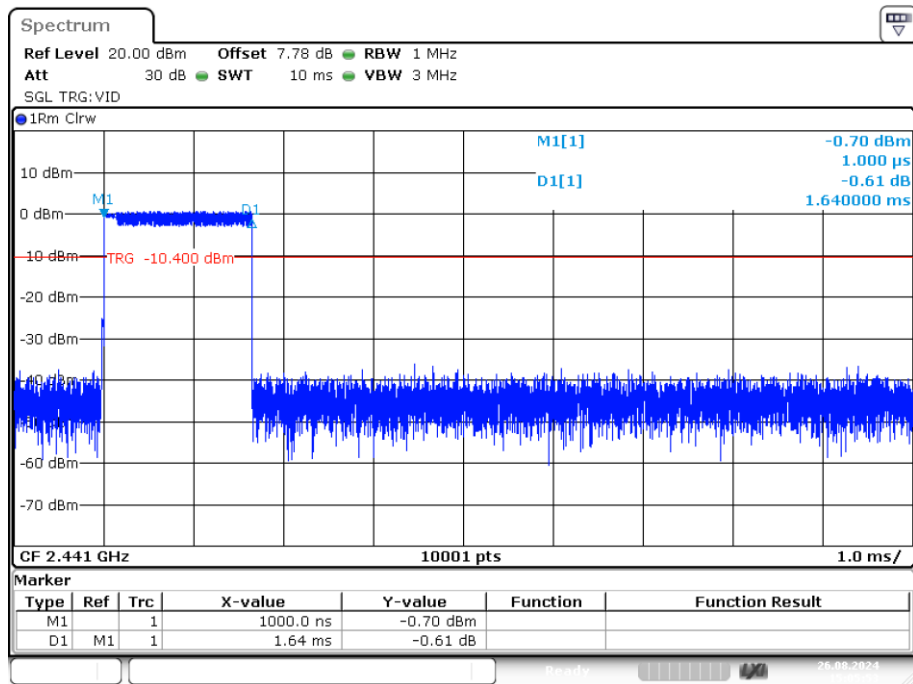
Date: 26.AUG.2024 15:02:06

Dwell NVNT 2-DH1 2441MHz Ant1 Accumulated



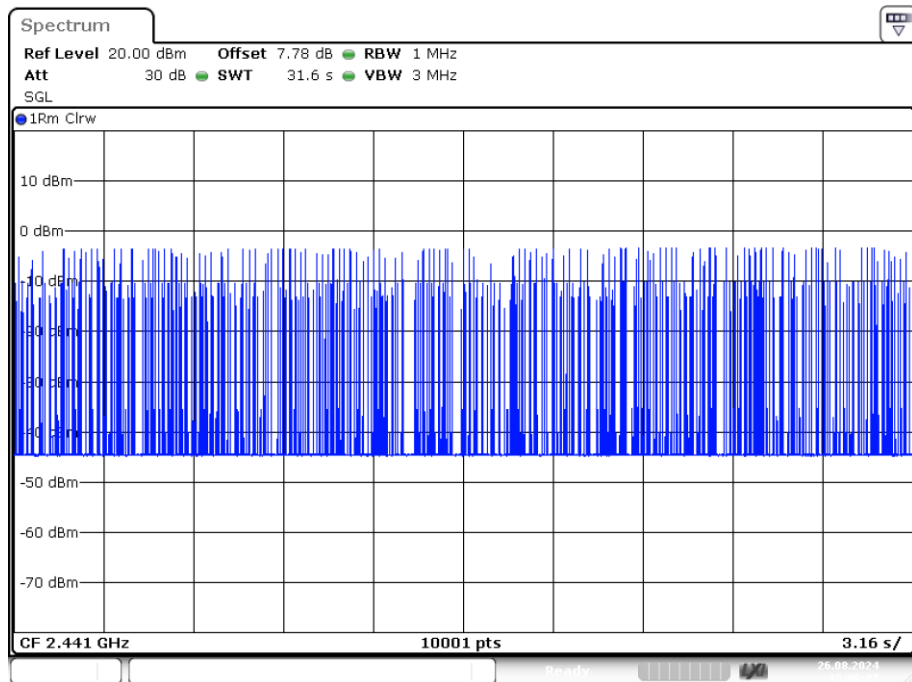
Date: 26.AUG.2024 15:02:41

Dwell NVNT 2-DH3 2441MHz Ant1 One Burst



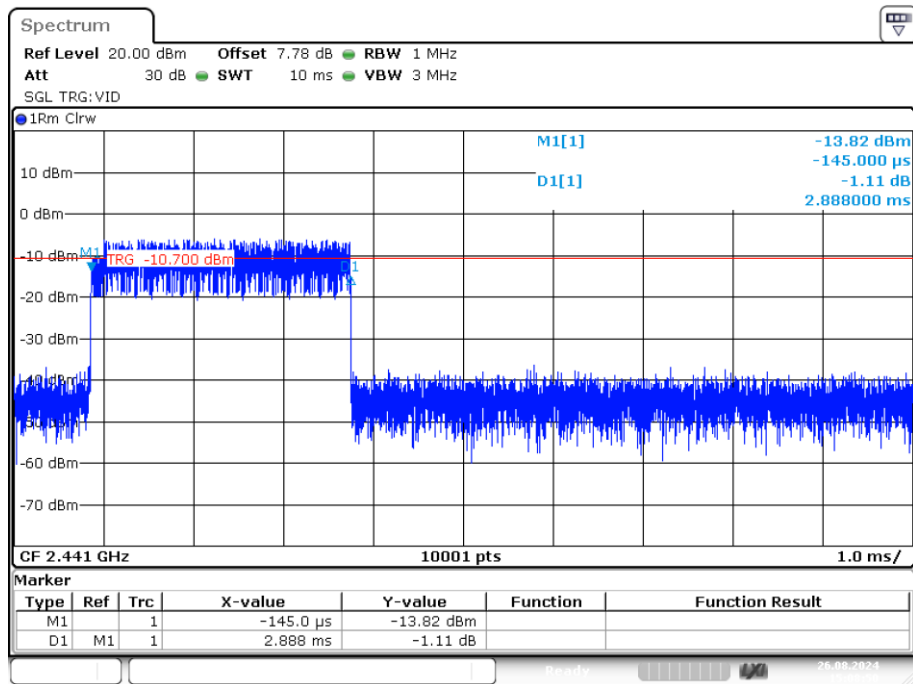
Date: 26.AUG.2024 15:05:53

Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated



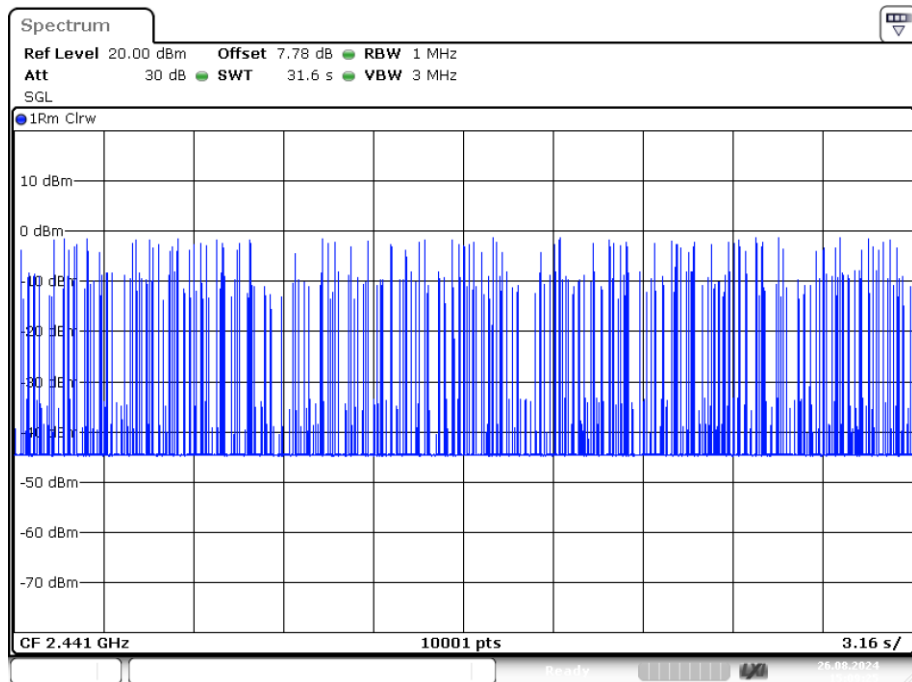
Date: 26.AUG.2024 15:06:27

Dwell NVNT 2-DH5 2441MHz Ant1 One Burst



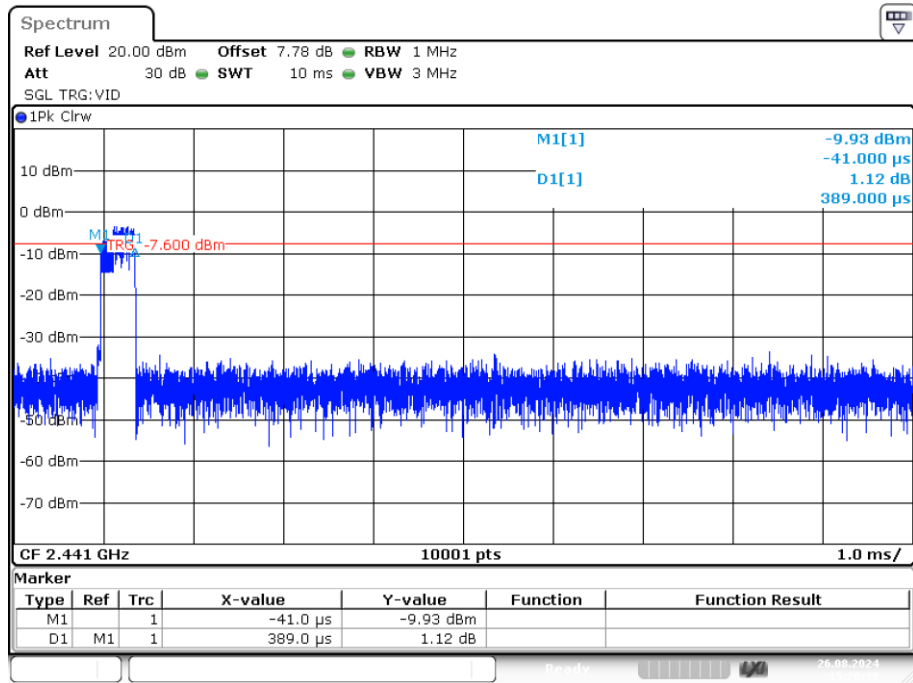
Date: 26.AUG.2024 15:08:50

Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated



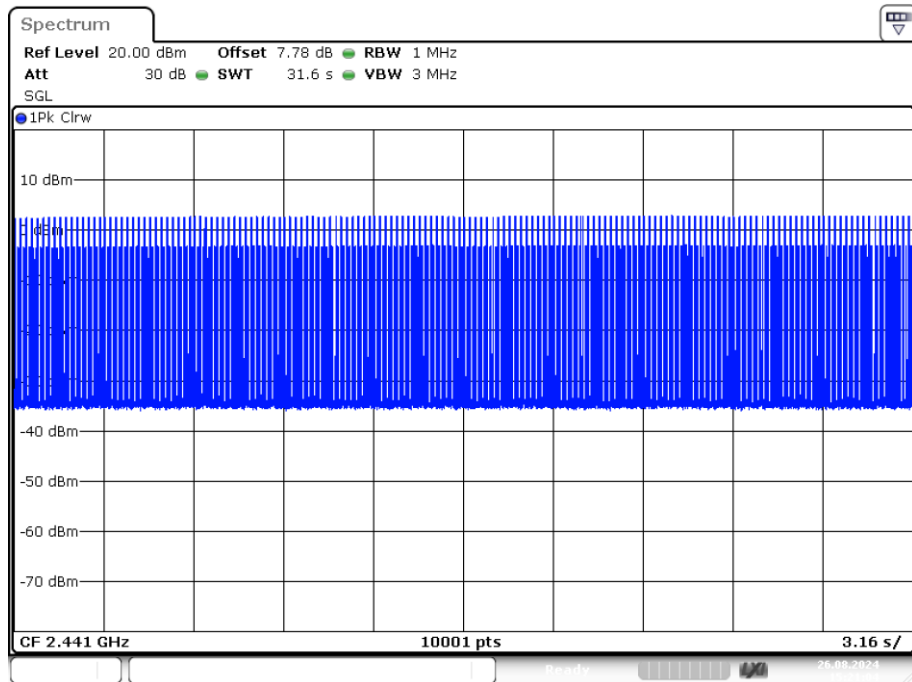
Date: 26.AUG.2024 15:09:25

Dwell NVNT 3-DH1 2441MHz Ant1 One Burst



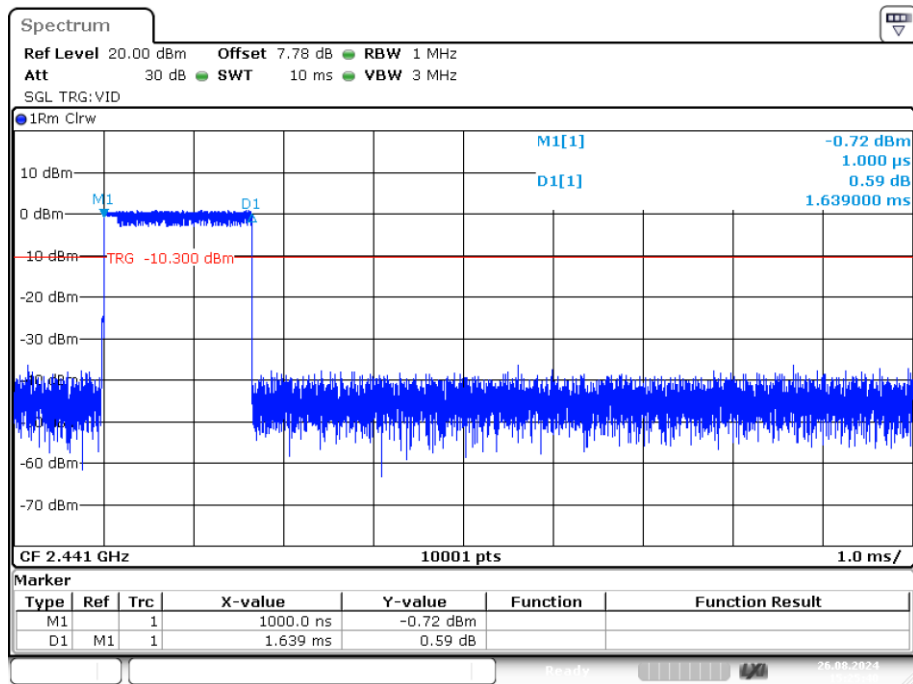
Date: 26.AUG.2024 15:20:30

Dwell NVNT 3-DH1 2441MHz Ant1 Accumulated



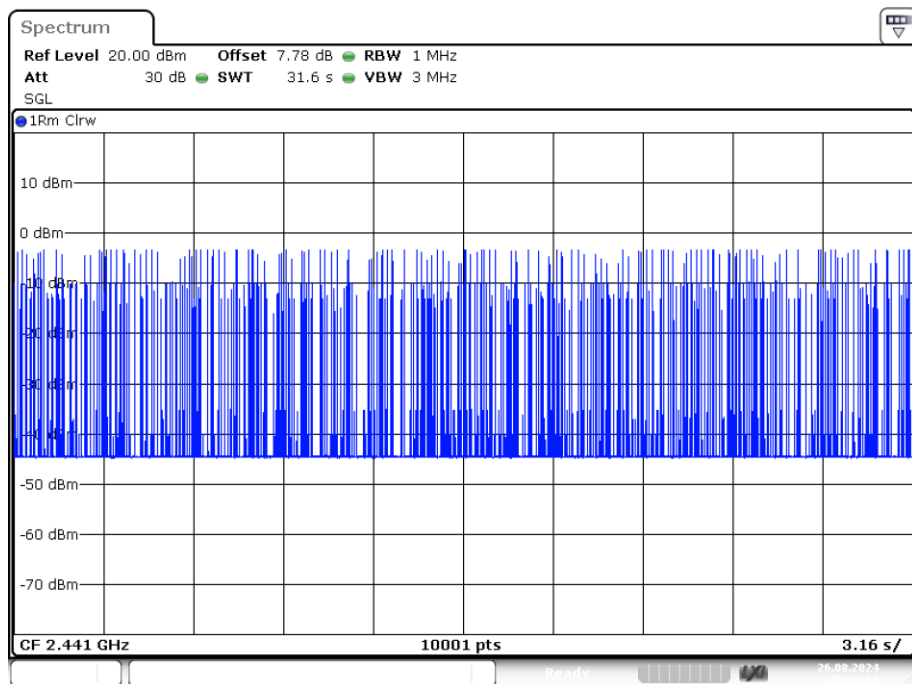
Date: 26.AUG.2024 15:21:04

Dwell NVNT 3-DH3 2441MHz Ant1 One Burst



Date: 26.AUG.2024 15:25:40

Dwell NVNT 3-DH3 2441MHz Ant1 Accumulated

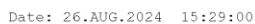


Date: 26.AUG.2024 15:26:14

Dwell NVNT 3-DH5 2441MHz Ant1 One Burst



Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated



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)	

Note: The peak limit is 20 dB higher than the average limit

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (µV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

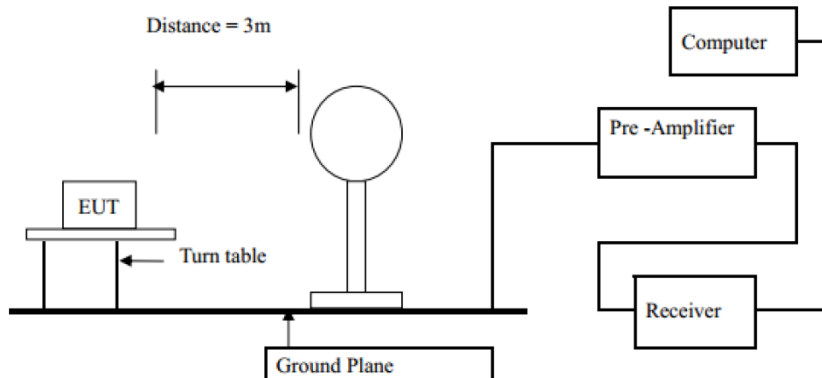
Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)
9 - 490 kHz ^{Note 1}	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

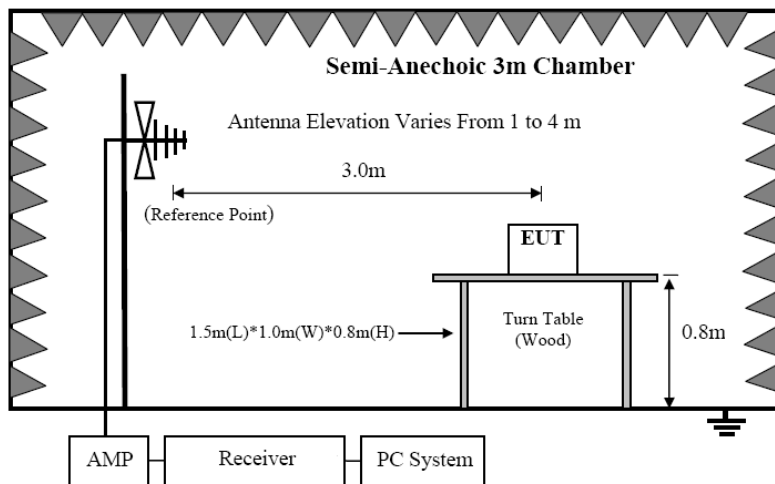
Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

8.2. Block Diagram of Test setup

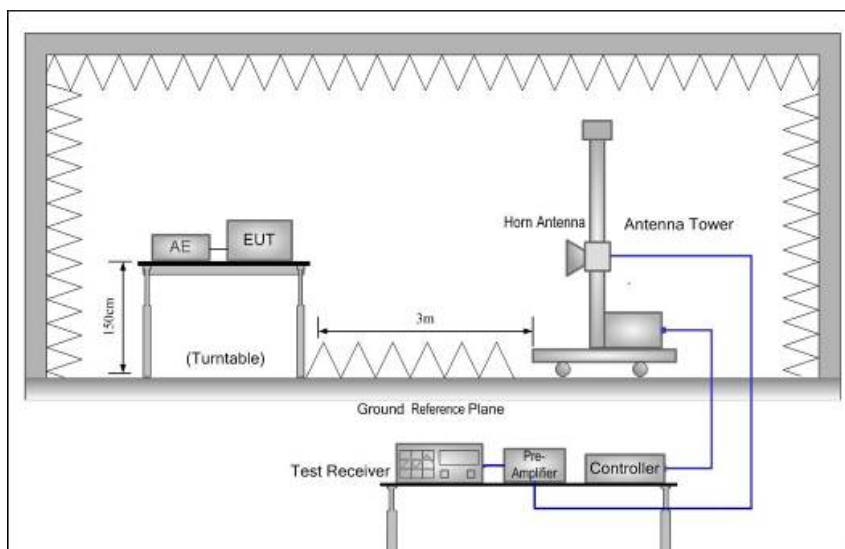
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



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



8.2.2 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

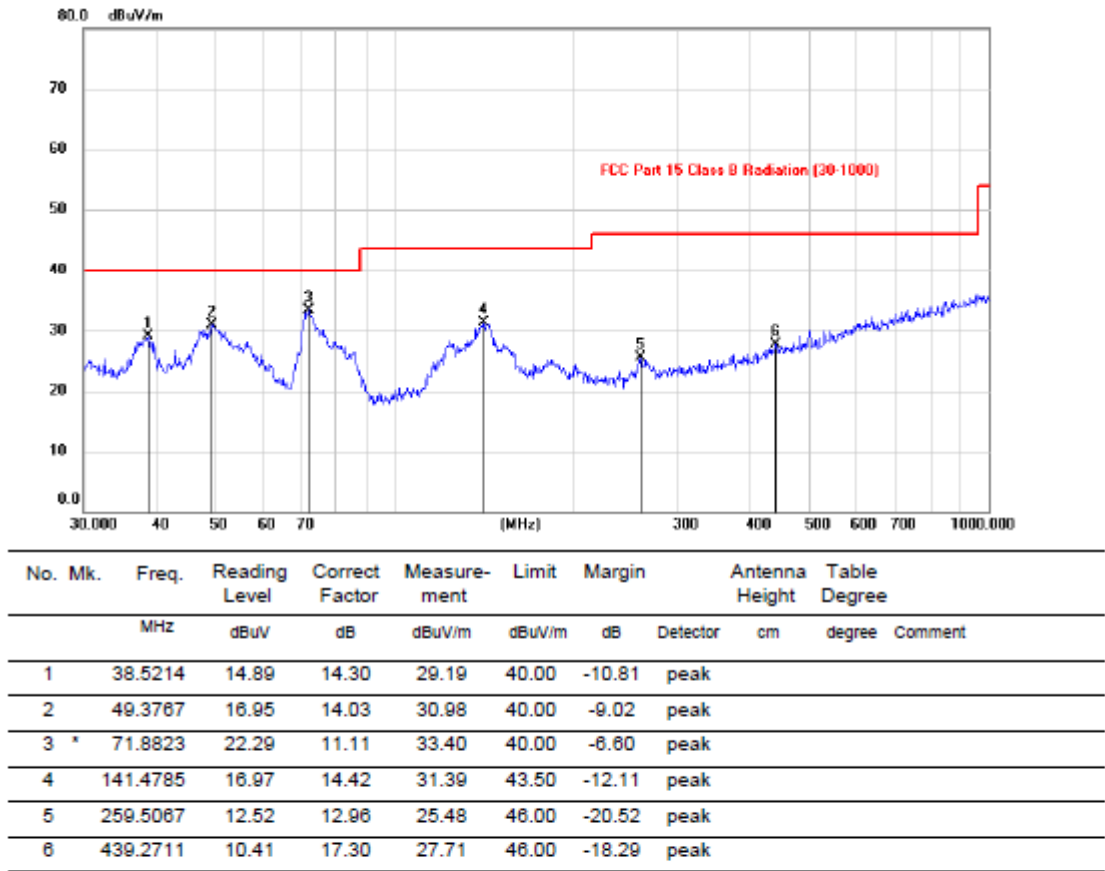
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency.
Detailed information please see the following page.

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.

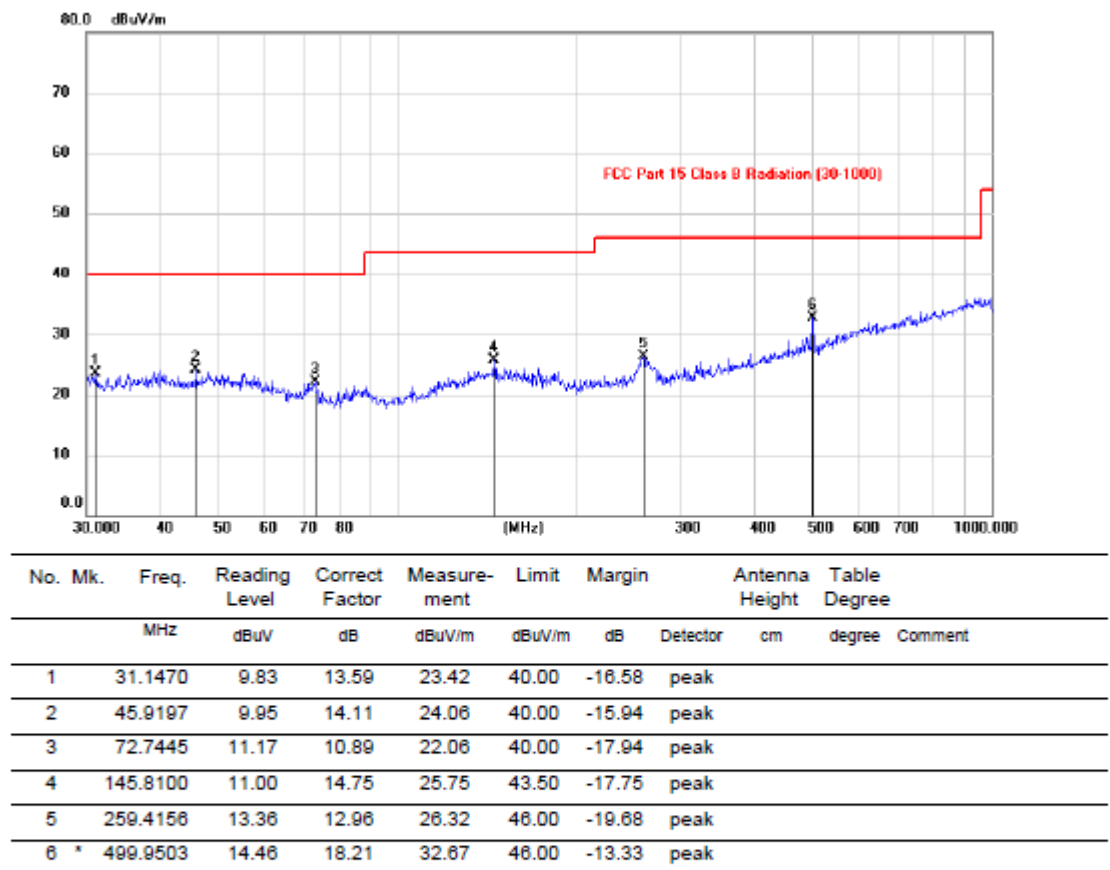
From 30MHz to 1000MHz: Conclusion: PASS

Vertical:



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

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

Horizontal:

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	46.86	V	33.95	10.18	34.26	56.73	74	-17.27	PK
4804	37.11	V	33.95	10.18	34.26	46.98	54	-7.02	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	48.22	H	33.95	10.18	34.26	58.09	74	-15.91	PK
4804	37.66	H	33.95	10.18	34.26	47.53	54	-6.47	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX Mid									
4882	44.69	V	33.93	10.2	34.29	54.53	74	-19.47	PK
4882	33.12	V	33.93	10.2	34.29	42.96	54	-11.04	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	46.00	H	33.93	10.2	34.29	55.84	74	-18.16	PK
4882	34.54	H	33.93	10.2	34.29	44.38	54	-9.62	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX High									
4960	44.35	V	33.93	10.2	34.29	54.19	74	-19.81	PK
4960	36.23	V	33.93	10.2	34.29	46.07	54	-7.93	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.34	H	33.93	10.2	34.29	54.18	74	-19.82	PK
4960	33.10	H	33.93	10.2	34.29	42.94	54	-11.06	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.
3. "/" means the test data is too lower than the limit.

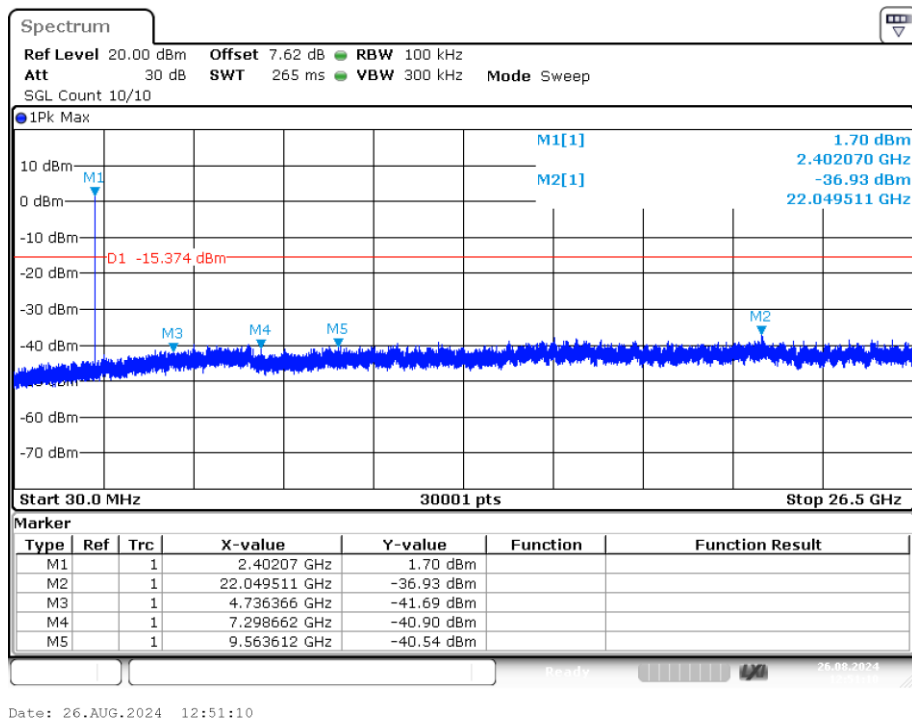
Test Mode: $\pi/4$ DQPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	45.02	V	33.95	10.18	34.26	54.89	74	-19.11	PK
4804	36.76	V	33.95	10.18	34.26	46.63	54	-7.37	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	48.09	H	33.95	10.18	34.26	57.96	74	-16.04	PK
4804	34.98	H	33.95	10.18	34.26	44.85	54	-9.15	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX Mid									
4882	42.51	V	33.93	10.2	34.29	52.35	74	-21.65	PK
4882	33.48	V	33.93	10.2	34.29	43.32	54	-10.68	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	44.73	H	33.93	10.2	34.29	54.57	74	-19.43	PK
4882	36.20	H	33.93	10.2	34.29	46.04	54	-7.96	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX High									
4960	45.26	V	33.93	10.2	34.29	55.10	74	-18.90	PK
4960	34.78	V	33.93	10.2	34.29	44.62	54	-9.38	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	45.23	H	33.93	10.2	34.29	55.07	74	-18.93	PK
4960	34.33	H	33.93	10.2	34.29	44.17	54	-9.83	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:

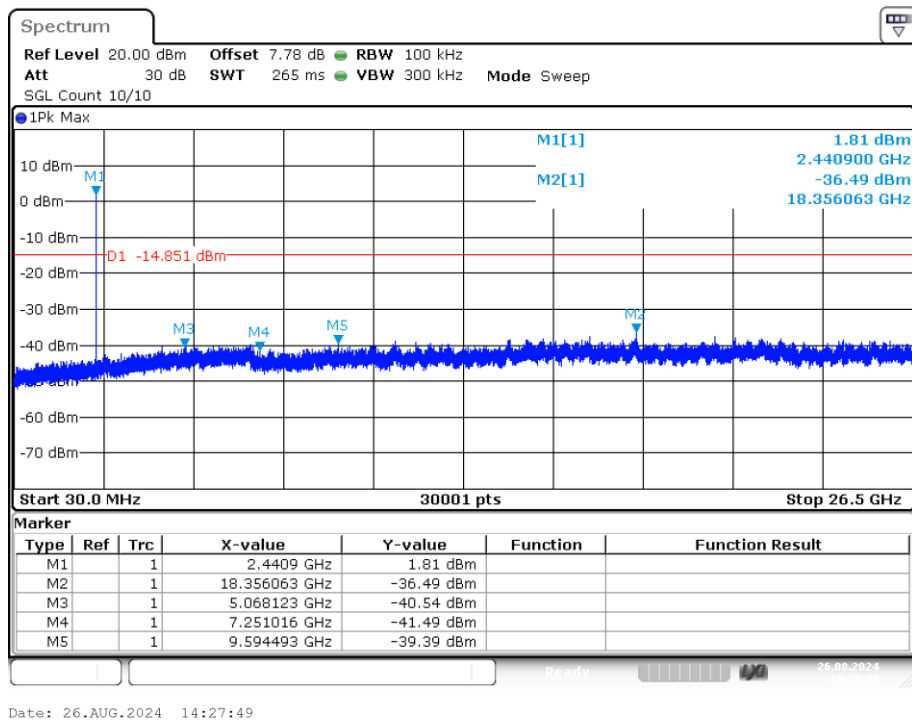
- 1, Result = Read level + Antenna factor + cable loss-Amp factor
- 2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.
3. “/” means the test data is too lower than the limit.

Conducted RF Spurious Emission

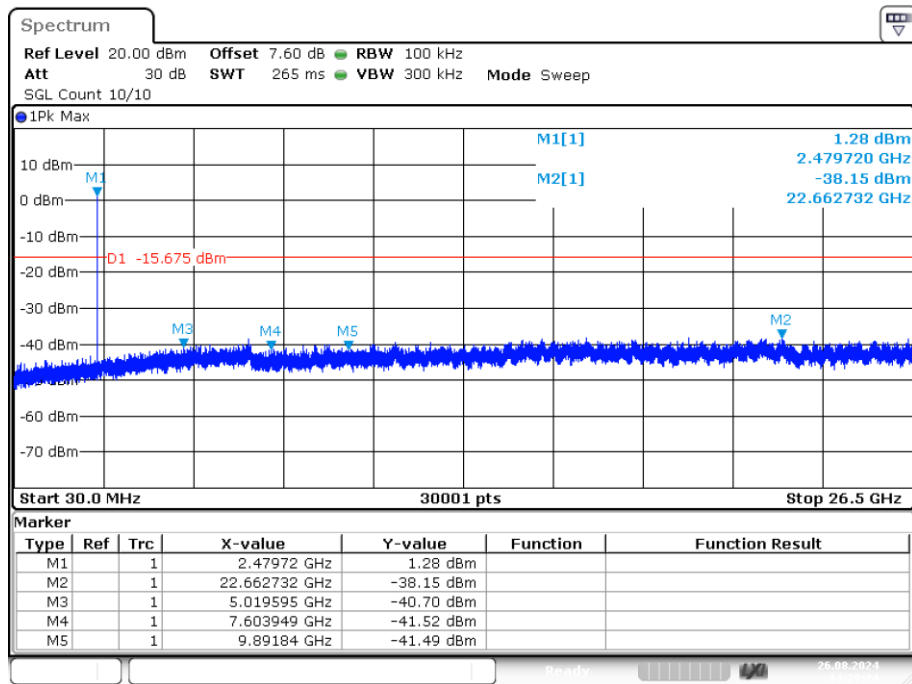
Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission



Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission

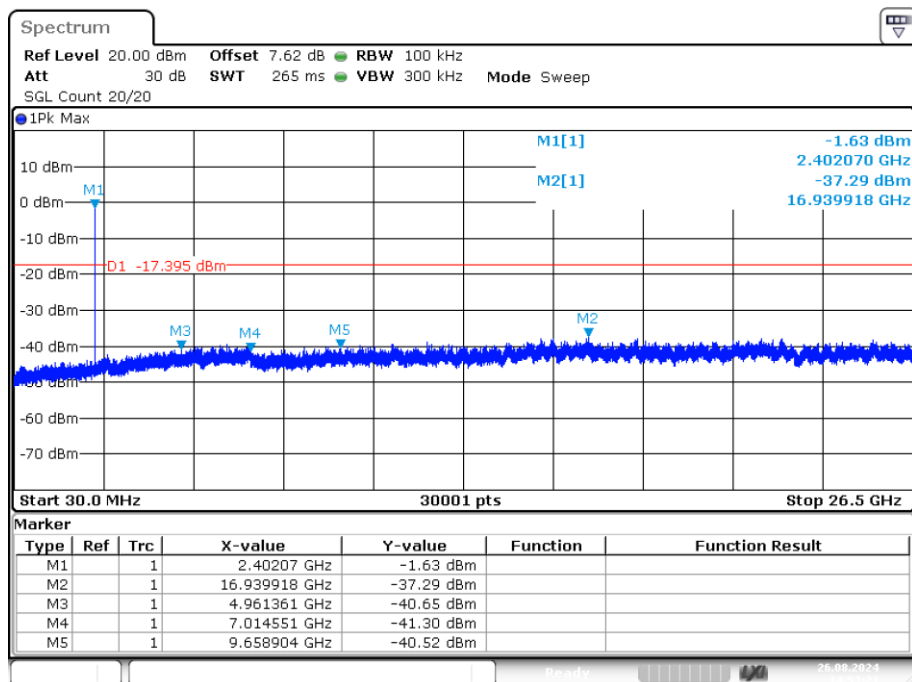


Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission



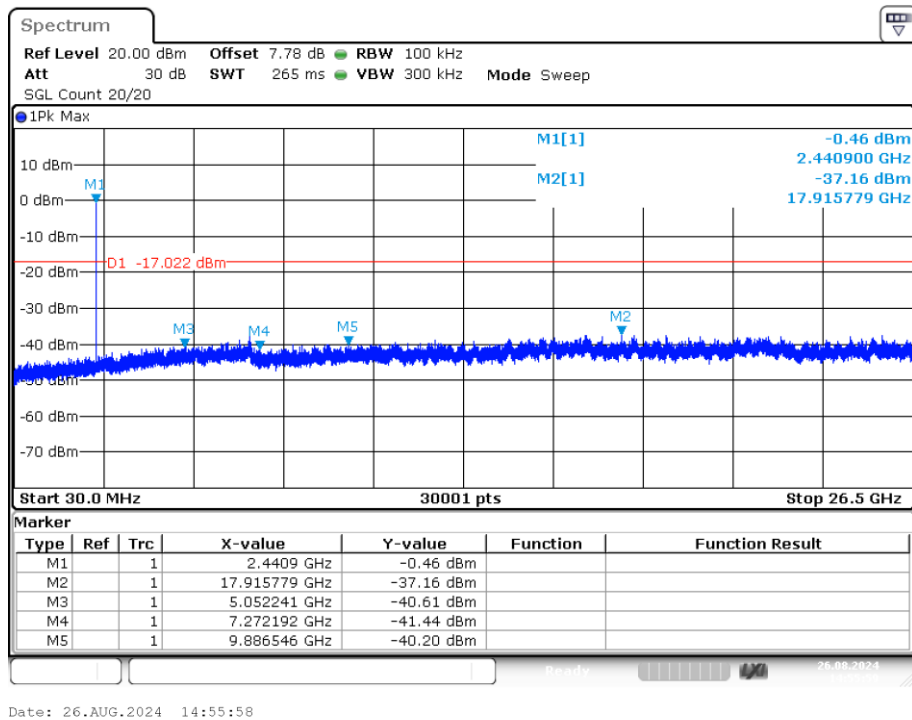
Date: 26.AUG.2024 14:29:24

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission

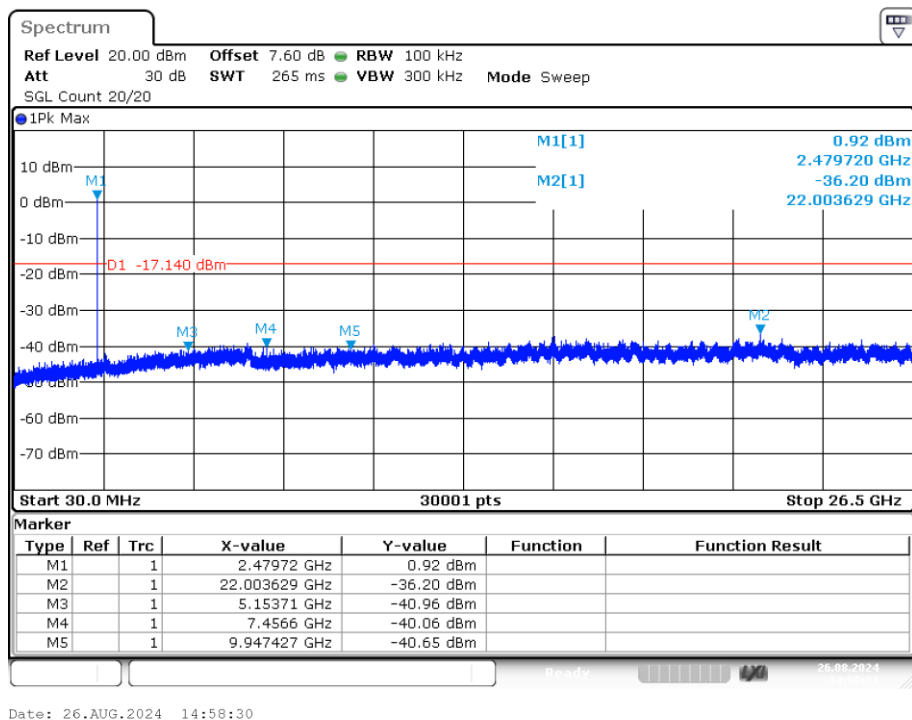


Date: 26.AUG.2024 14:53:21

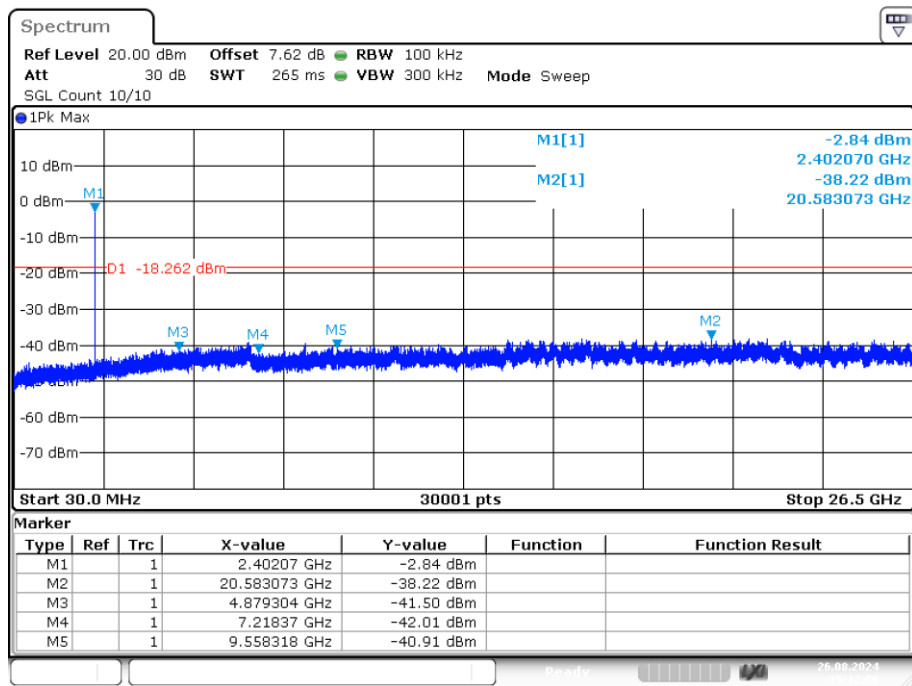
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission



Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission

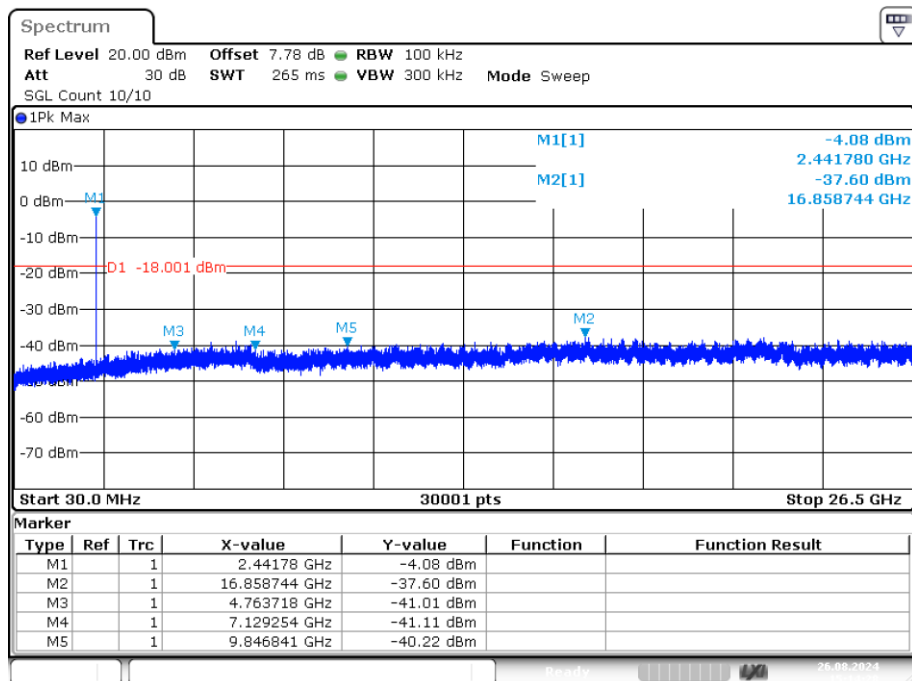


Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission



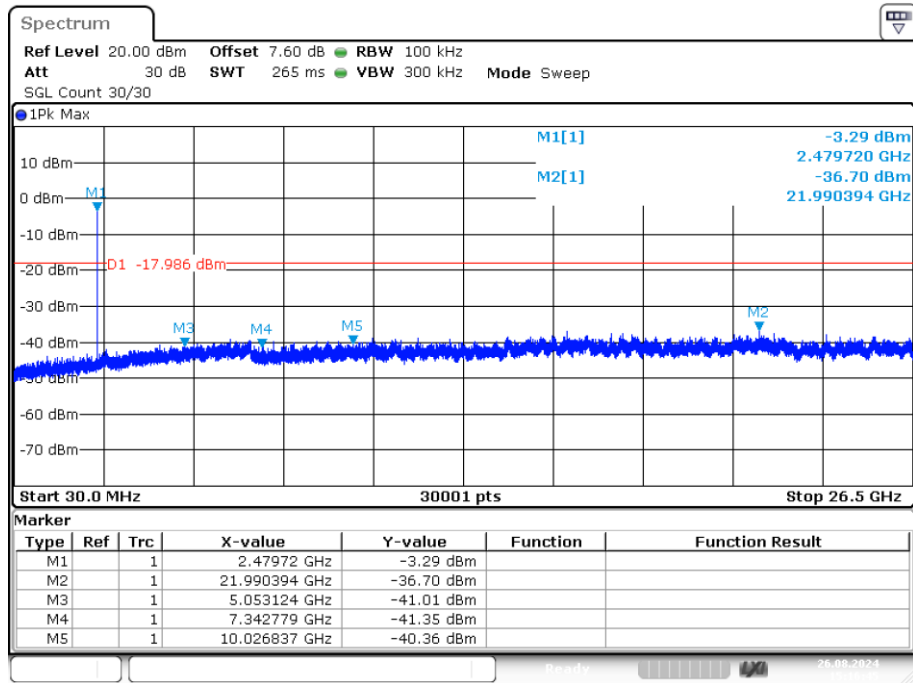
Date: 26.AUG.2024 15:12:06

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission



Date: 26.AUG.2024 15:14:28

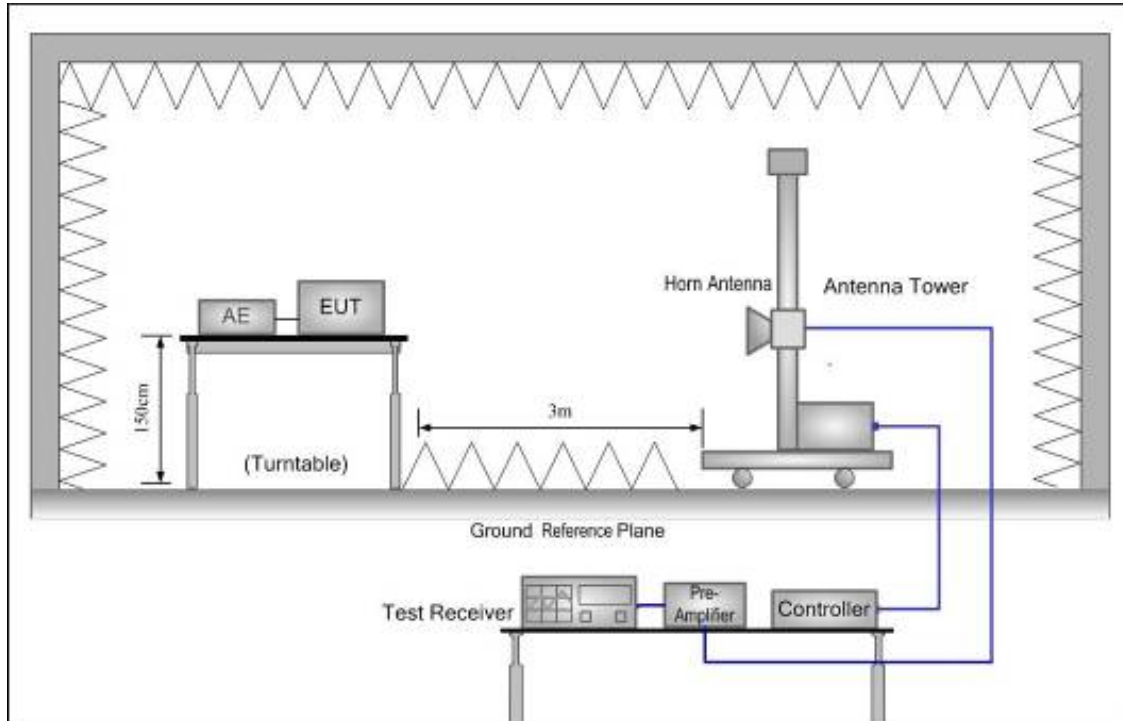
Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



Date: 26.AUG.2024 15:16:45

9. BAND EDGE COMPLIANCE

9.1. Block Diagram of Test Setup



9.2. Limit

All the lower and upper band-edges emissions appearing within restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

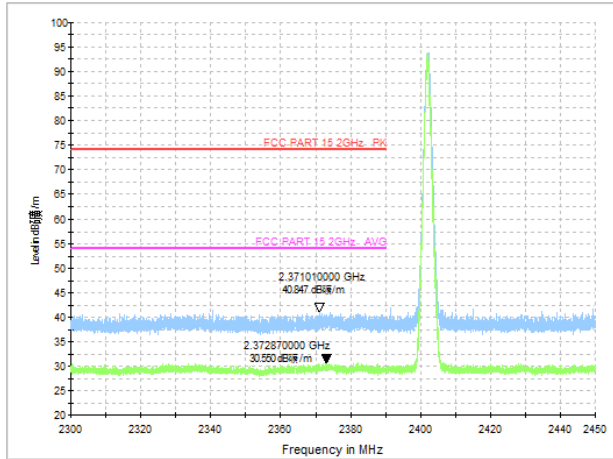
9.3. Test Procedure

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

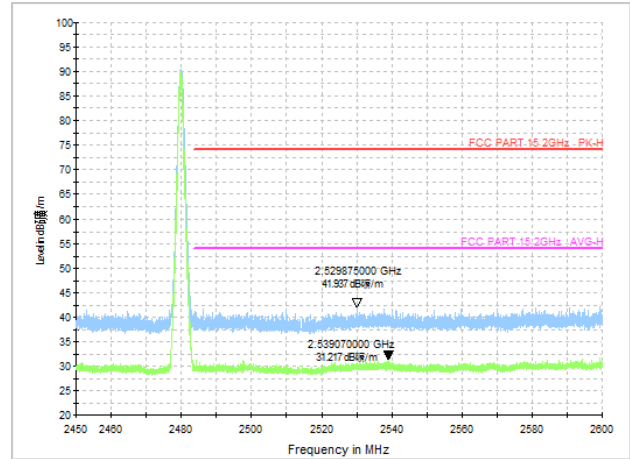
9.4. Test Result

PASS. (See below detailed test data)

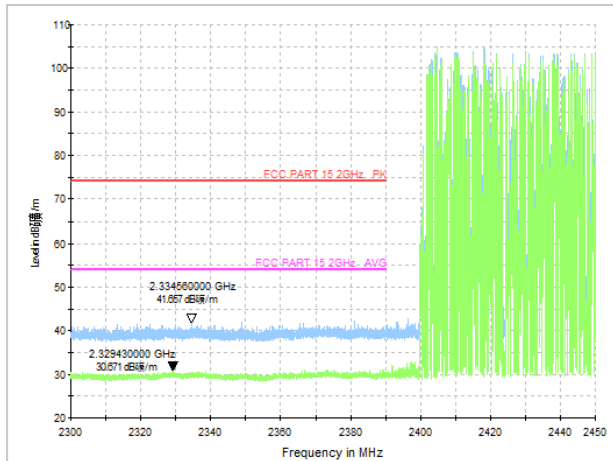
Test Mode: GFSK-Low Hopping-off



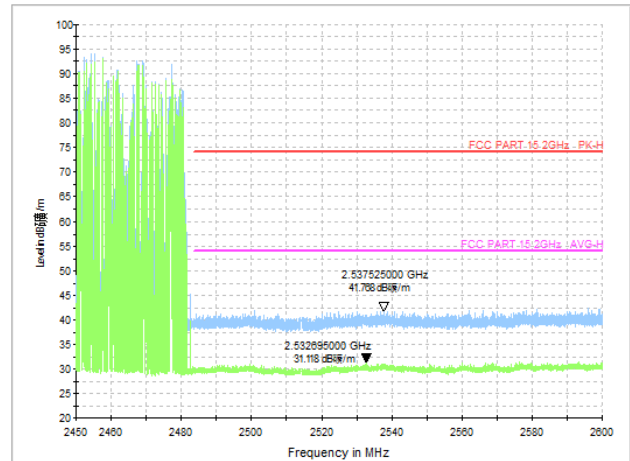
Test Mode: GFSK-High Hopping-off



Test Mode: GFSK-Low Hopping-on

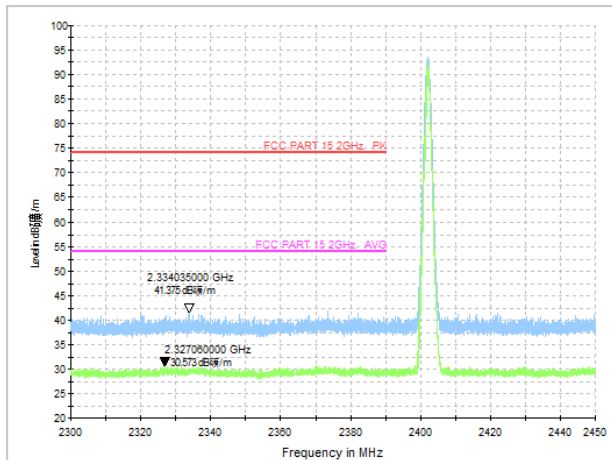
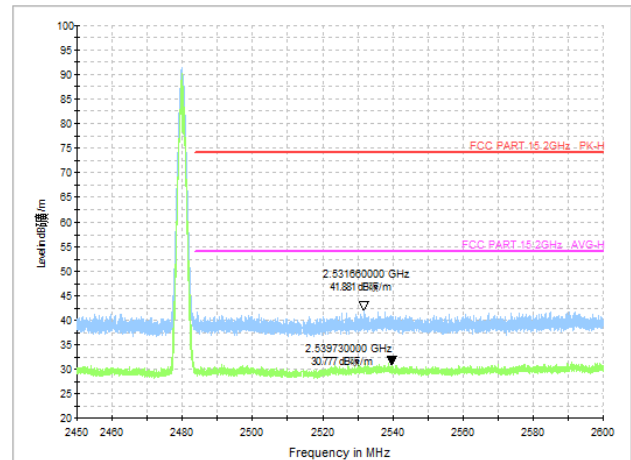
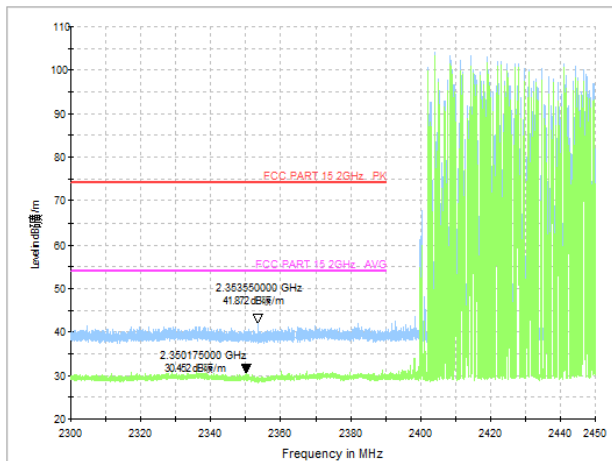
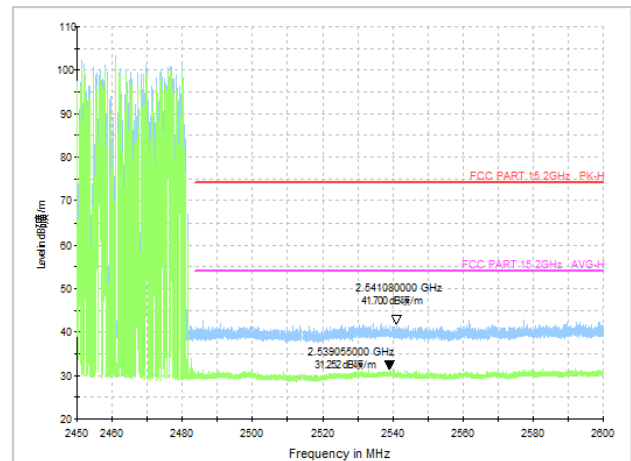


Test Mode: GFSK-High Hopping-on



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

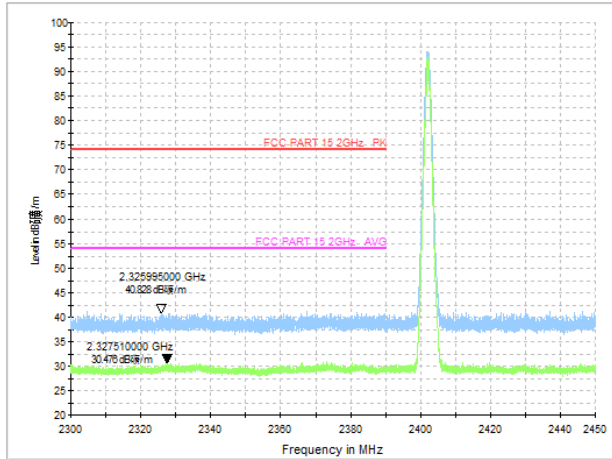
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

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

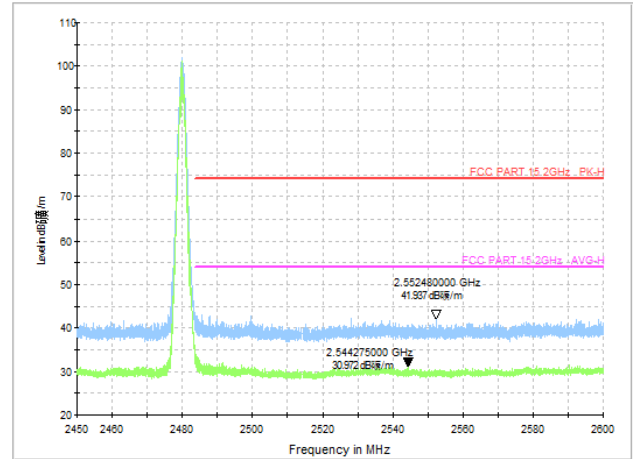
Note: 1. *:Maximum data; x:Over limit; !:over margin.

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

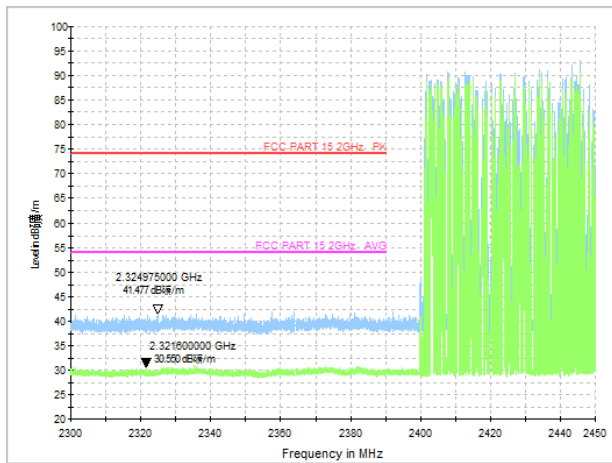
Test Mode: 8DPSK-Low Hopping-off



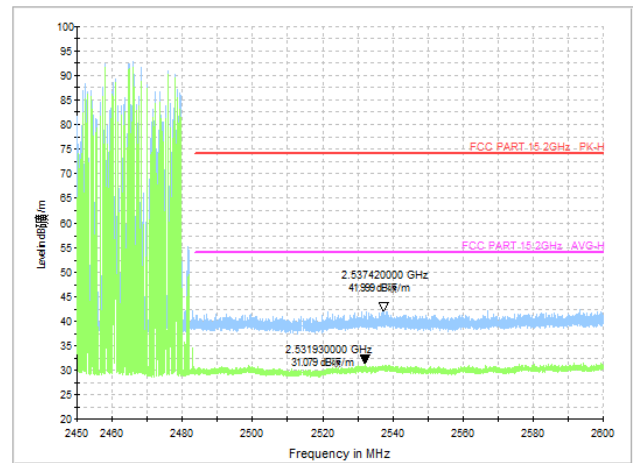
Test Mode: 8DPSK-High Hopping-off



Test Mode: 8DPSK-Low Hopping-on

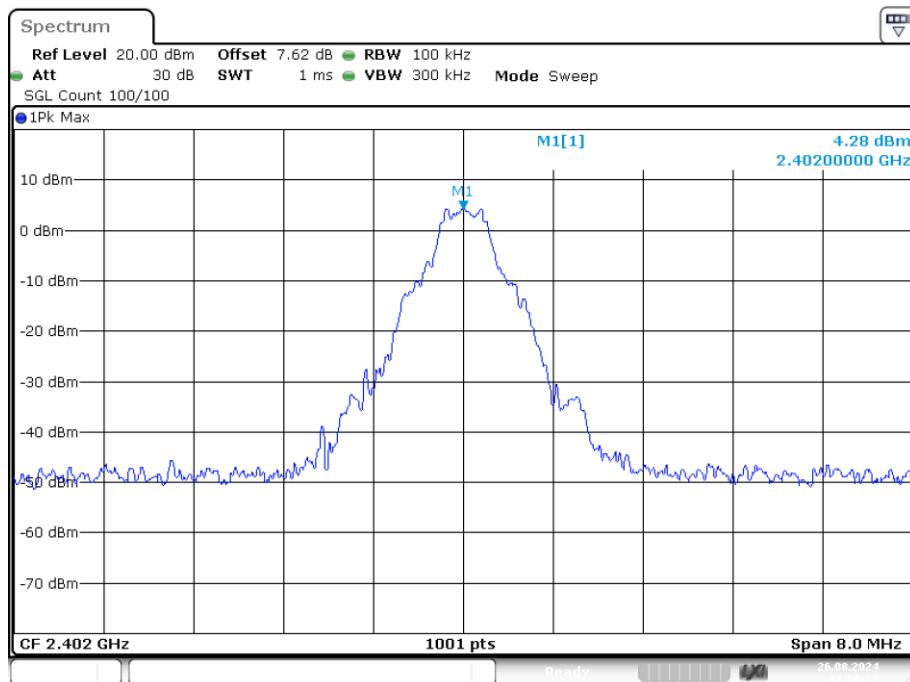
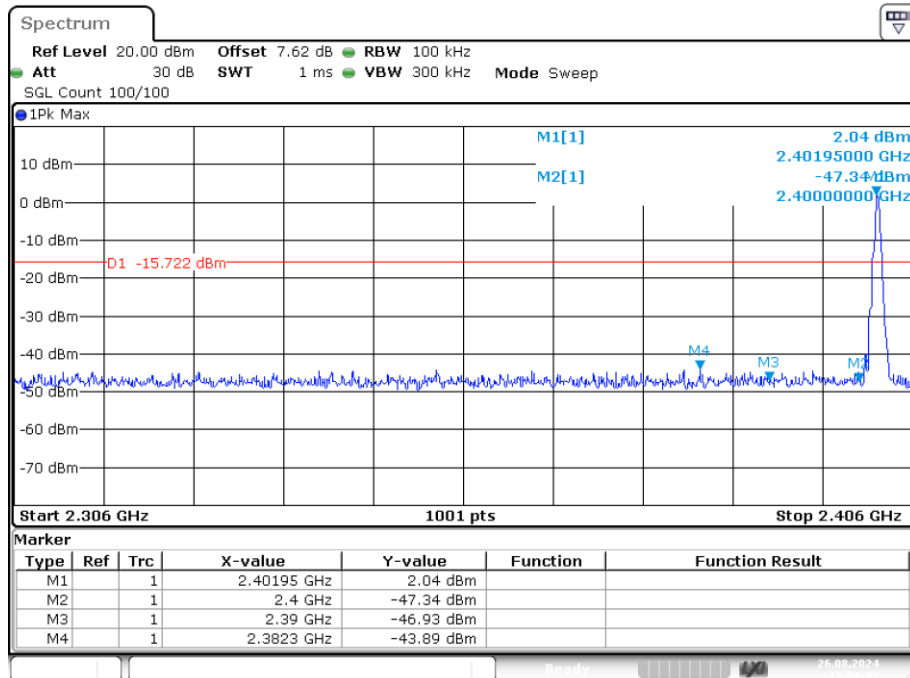


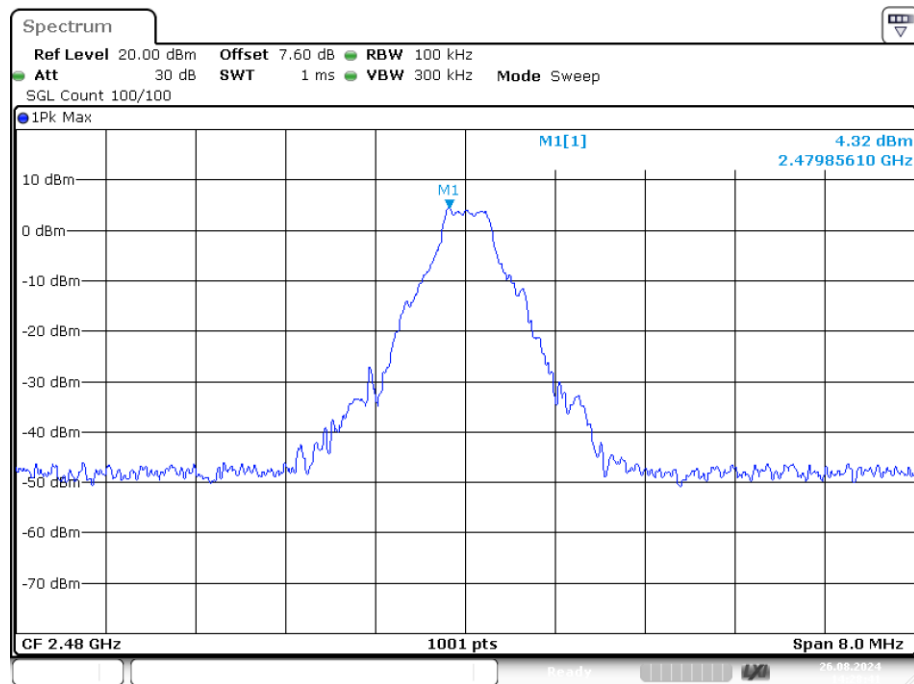
Test Mode: 8DPSK-High Hopping-on



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

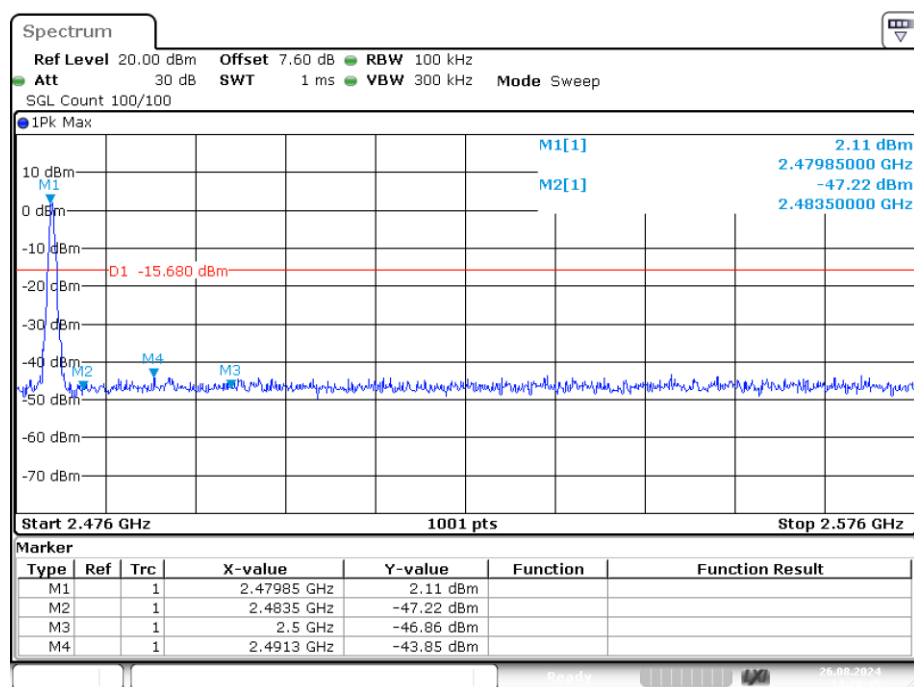
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Conducted Method**GFSK Mode:****Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Ref****Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Emission****Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Ref**



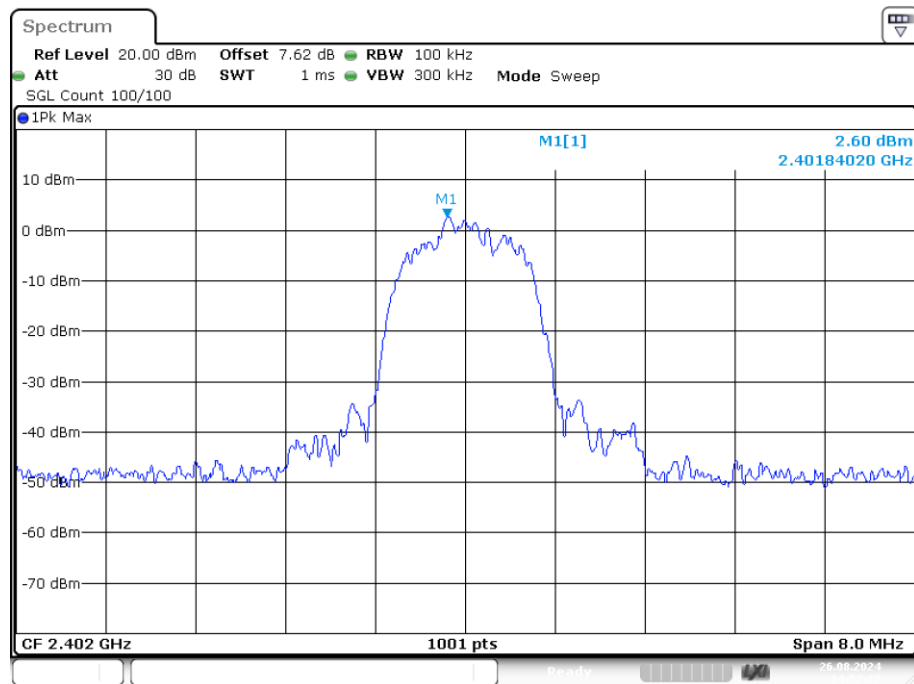
Date: 26.AUG.2024 14:28:41

Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Emission



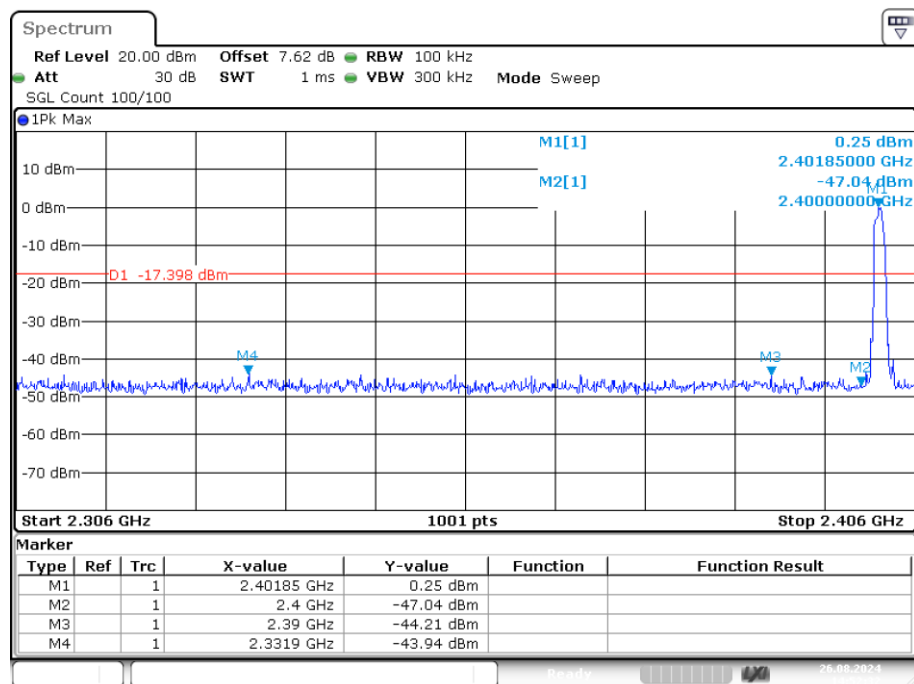
Date: 26.AUG.2024 14:28:45

Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Ref



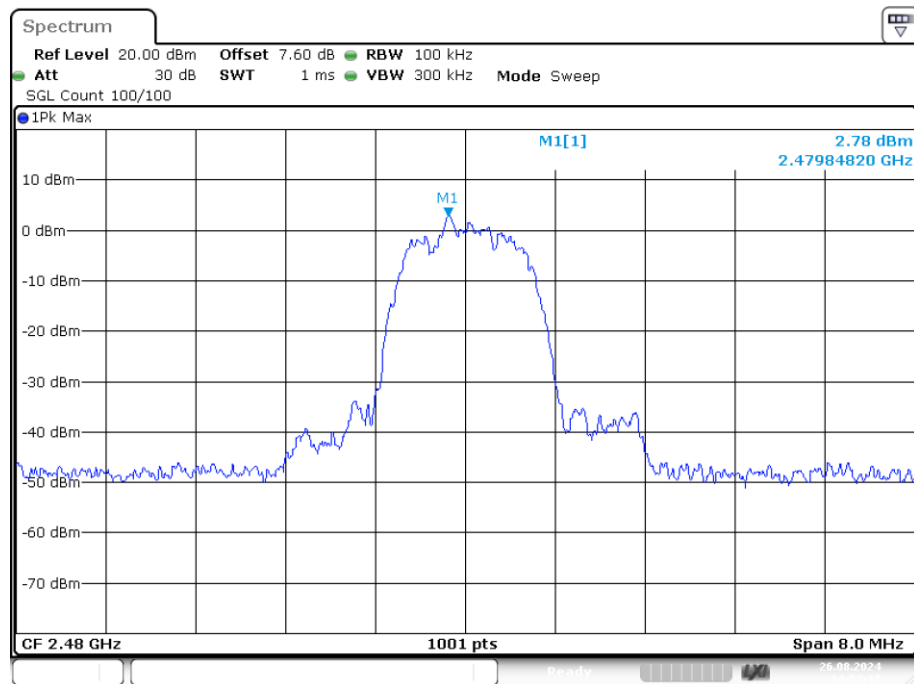
Date: 26.AUG.2024 14:52:28

Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Emission



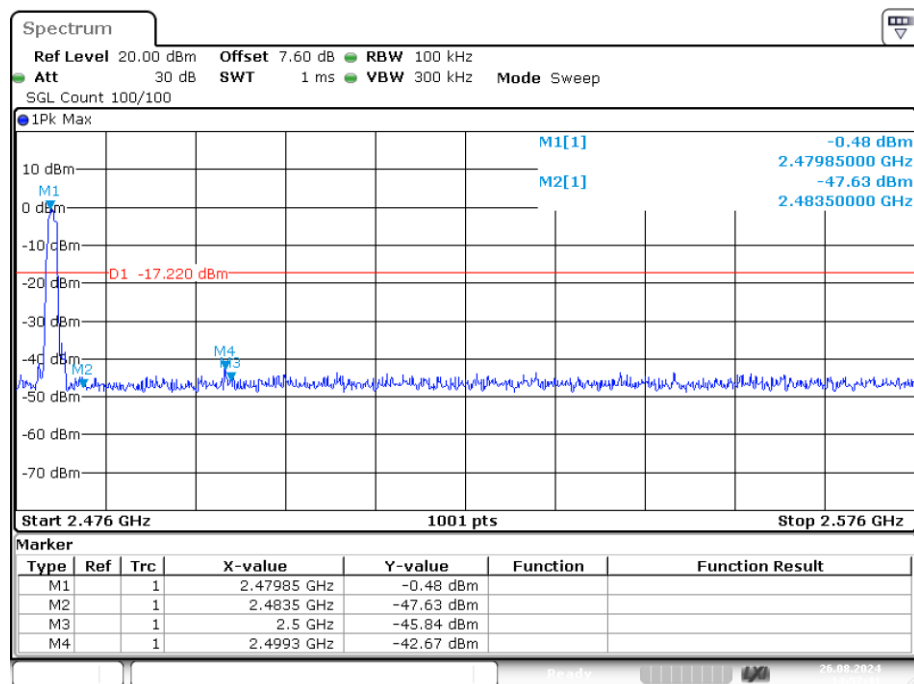
Date: 26.AUG.2024 14:52:32

Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Ref



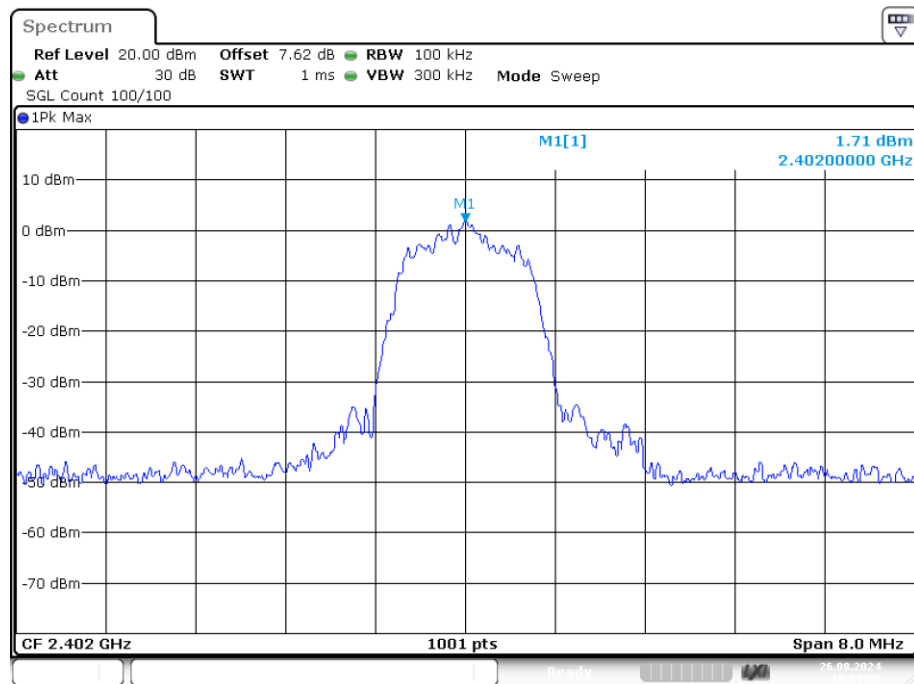
Date: 26.AUG.2024 14:57:37

Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Emission



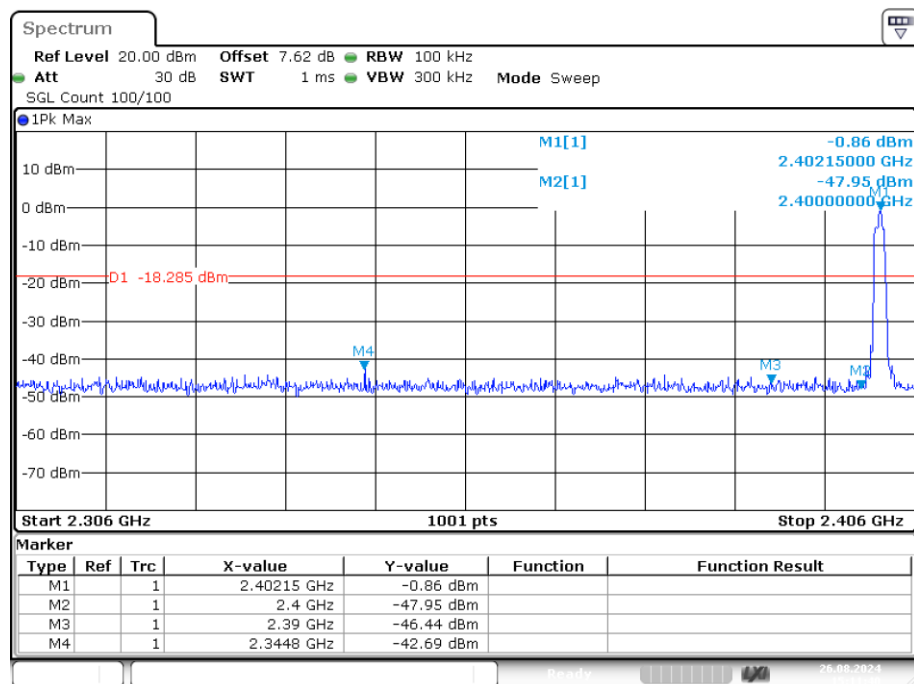
Date: 26.AUG.2024 14:57:41

Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Ref



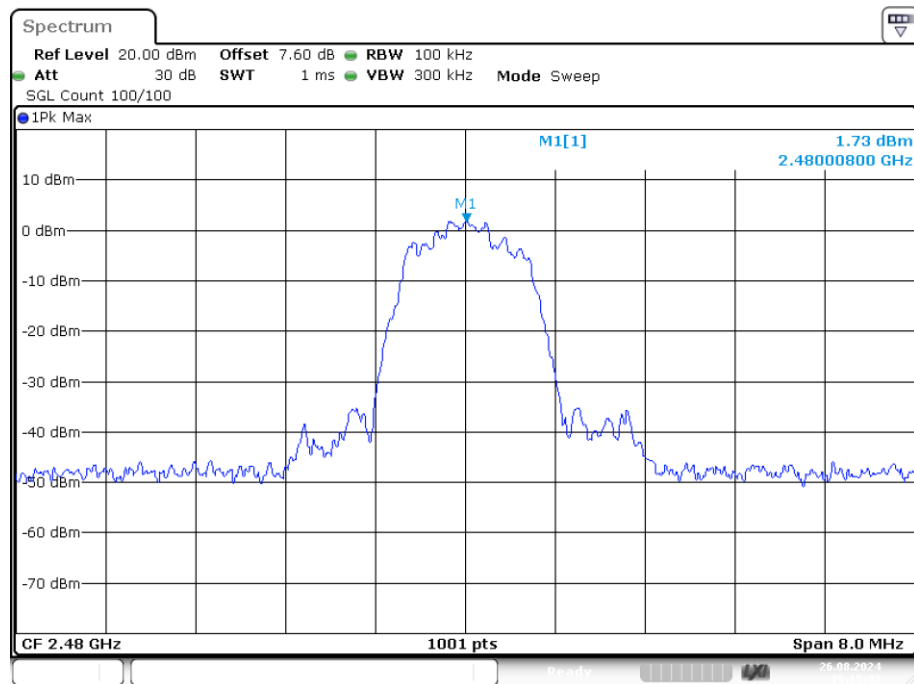
Date: 26.AUG.2024 15:11:35

Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Emission



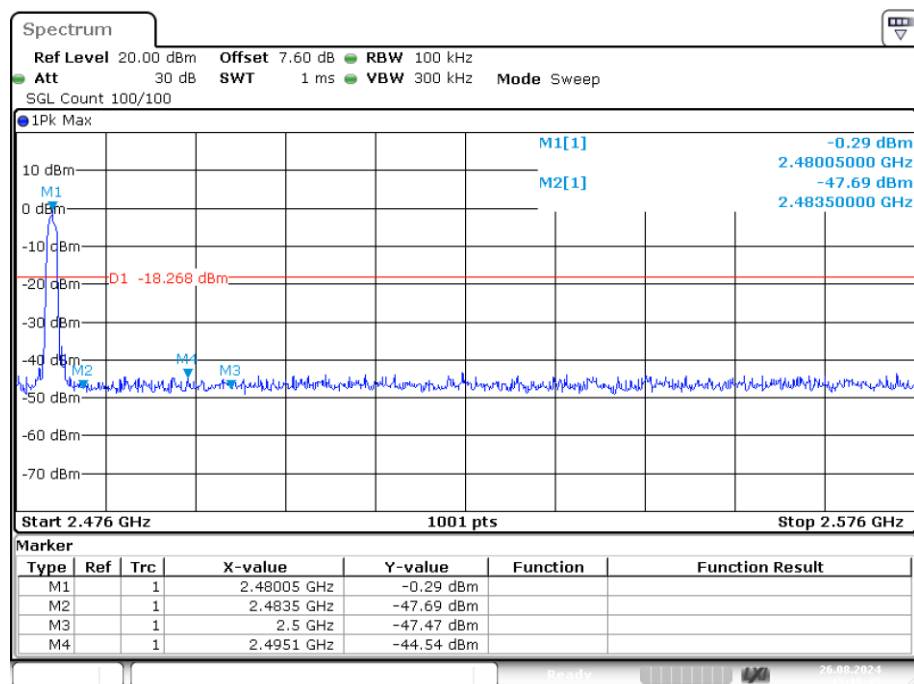
Date: 26.AUG.2024 15:11:39

Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Ref



Date: 26.AUG.2024 15:15:42

Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Emission



Date: 26.AUG.2024 15:15:45