



FCC TEST REPORT

FCC ID: RFD-FLX100PLUS

On Behalf of

Leica Geosystems AG

Smart Antenna

Model No.: Zeno FLX100 plus

Prepared for : Leica Geosystems AG
Address : Heinrich-Wild-Strasse, 9435 Heerbrugg, Switzerland

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 : A2203204-C02-R05
Date of Receipt : March 23, 2022
Date of Test : March 24, 2022-April 6, 2022
Date of Report : April 6, 2022
Version Number : V0

TABLE OF CONTENTS

Description	Page
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.....	24
5.1. Limit	24
5.2. Test Procedure	24
5.3. Test Result	24
6. Number Of Hopping Channel.....	26
6.1. Limit	26
6.2. Test Procedure	26
6.3. Test Result	26
7. Dwell Time.....	28
7.1. Test limit	28
7.2. Test Procedure	28
7.3. Test Result	28
8. Radiated emissions.....	45
8.1. Limit	45
8.2. Block Diagram of Test setup	48
8.3. Test Procedure	49
8.4. Test Result	49
9. Band Edge Compliance	64

9.1. Block Diagram of Test Setup.....	64
9.2. Limit	64
9.3. Test Procedure	64
9.4. Test Result	64
10. Power Line Conducted Emissions	71
10.1. Block Diagram of Test Setup.....	71
10.2. Limit	71
10.3. Test Procedure	71
10.4. Test Result	72
11. Frequency stability.....	75
11.1. Test limit	75
11.2. Test Procedure	75
11.3. Test Setup.....	75
11.4. Test Results	75
12. Antenna Requirements	76
12.1. Limit	76
12.2. Result	76
13. Test Setup Photo	77
13.1. Photos of Radiated emission.....	77
13.2. Photos of Conducted Emission test	78
14. EUT photo	79

TEST REPORT DECLARATION

Applicant : Leica Geosystems AG
Address : Heinrich-Wild-Strasse, 9435 Heerbrugg, Switzerland
Manufacturer : Leica Geosystems AG
Address : Heinrich-Wild-Strasse, 9435 Heerbrugg, Switzerland
EUT Description : Smart Antenna
(A) Model No. : Zeno FLX100 plus
(B) Trademark : Leica

Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247,
RSS-247 Issue 2, RSS-Gen Issue 5, ANSI C63.10:2013, CISPR 16-1-4:2010**

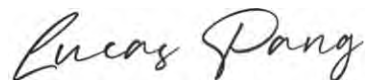
The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness 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).....:

Lucas Pang
Project Engineer



Approved by (name + signature).....:

Simple Guan
Project Manager



Date of issue.....:

April 6, 2022

Revision History

Revision	Issue Date	Revisions	Revised By
V0	April 6, 2022	Initial released Issue	Lucas Pang

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), RSS-247(5.4 b), ANSI C63.10 :2013	P
Bandwidth	FCC Part 15: 15.215, RSS-247(5.1 a), ANSI C63.10 :2013	P
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1), RSS-247(5.1 b), ANSI C63.10 :2013	P
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1), RSS-247(5.1 d), ANSI C63.10 :2013	P
Dwell Time	FCC Part 15: 15.247(a)(1), RSS-247(5.1 d), ANSI C63.10 :2013	P
Radiated Emission	FCC Part 15: 15.209, FCC Part 15: 15.247(d), RSS-Gen(8.9), RSS-247(5.5), ANSI C63.10 :2013	P
Band Edge Compliance	FCC Part 15: 15.247(d), RSS-Gen(8.9), RSS-247(5.5), ANSI C63.10 :2013	P
Power Line Conducted Emissions	FCC Part 15: 15.207, RSS-GEN(8.8), ANSI C63.10 :2013	P
Frequency stability	RSS-GEN(6.11)	N/A
Antenna requirement	FCC Part 15: 15.203, RSS-GEN(6.8)	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/PMN : Smart Antenna

Model : Zeno FLX100 plus

Number/HVIN(s) :

Diff. : N/A

Trademark : Leica

Test Voltage : DC 5V from adapter, DC 3.85V from battery

Radio Technology : Bluetooth V5.0 EDR

Operation frequency : 2402MHz-2480MHz

Modulation : GFSK, $\pi/4$ -DQPSK, 8-DPSK

Channel No. : 79 Channels

Channel Separation : 1MHz

Antenna Type : Internal Antenna, max gain 2.0dBi.
Antenna information is provided by applicant.

Software version : V1.0.2022-03-18-01

Hardware : M5II_A7_MB_V2.0

version/FVIN

Remark:

1. The worst-case simultaneous transmission configuration was evaluated with no non-compliance found. Results in this report are only for Bluetooth EDR function, and there is no other transmitter involved.
2. In this report, the main test model is Zeno FLX100 plus, and the main test model serial number is ZF10P662200014.

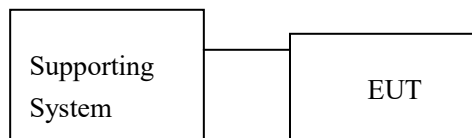
2.2. Accessories of Device (EUT)

Accessories	:	Switching Adapter
Manufacturer	:	DEE VAN ENTERPRISE CO., LTD.
Model	:	DSA-45PDH
		Input: 100-240Vac~50/60Hz 1.5A
Ratings	:	Output: 5V=3A, 9V=3A, 12V=3A, 15V=3A, 20V=2.25A

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	Notebook	Thinkpad	E490	N/A	N/A

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

The test software “sscom.exe” was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
Carrier Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
GFSK / Pi/4-DQPSK /8-DPSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
GFSK / Pi/4-DQPSK/8-DPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	25°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

Designation Number: CN1236

July 15, 2019 Certificated by IC

Registration Number: CN0085

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
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.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2020.09.02	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2021.08.25	1 Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2021.08.25	1 Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-10208 2-Wa	2021.08.25	1 Year
Receiver	R&S	ESCI	101165	2021.08.25	1 Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB 9168#627	2021.08.30	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2106	2021.08.30	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	RE1	2021.08.25	1 Year
RF Cable	Resenberger	Cable 2	RE2	2021.08.25	1 Year
RF Cable	Resenberger	Cable 3	CE1	2021.08.25	1 Year
Pre-amplifier	HP	HP8347A	2834A00455	2021.08.25	1 Year
Pre-amplifier	Agilent	8449B	3008A02664	2021.08.25	1 Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126-466	2021.08.25	1 Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2021.08.25	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840 -50	SK2018101801	2021.08.25	1 Year
Power Meter	Agilent	E9300A	MY41496628	2021.08.25	1 Year
Power Sensor	DARE	RPR3006W	15100041SNO91	2021.08.25	1 Year
Temp. & Humid. Chamber	Wei Huang	WHTH-1000 -40-880	100631	2022.04.22	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2021.08.25	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	2.0.0.0

3. MAXIMUM PEAK OUTPUT POWER

3.1.Limit

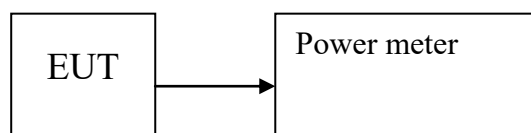
Please refer FCC part 15.247 & RSS-247.

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 Power meter is set to the peak power detection.

3.3.Test Setup



3.4.Test Result

Mode	Freq (MHz)	PK Output Power (dBm)	Limit (dBm)	Result
GFSK	2402	-5.524	21	Pass
	2441	-4.515	21	Pass
	2480	-3.997	21	Pass
$\pi/4$ DQPSK	2402	-8.951	21	Pass
	2441	-7.408	21	Pass
	2480	-7.303	21	Pass
8-DPSK	2402	-9.088	21	Pass
	2441	-7.507	21	Pass
	2480	-7.097	21	Pass
Conclusion: Pass				

4. BANDWIDTH

4.1.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in RSS-GEN, 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

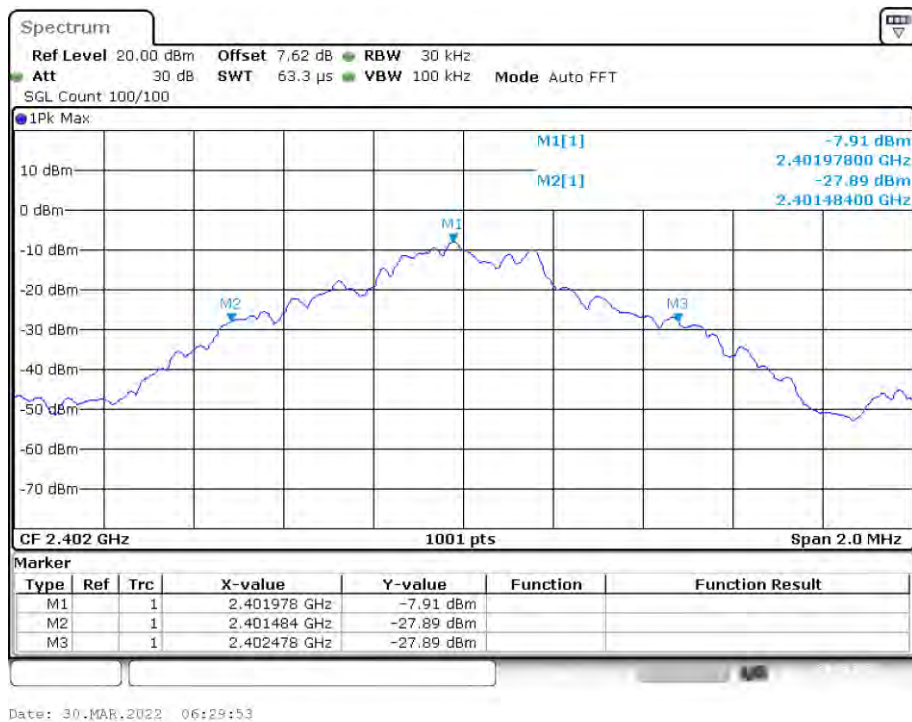
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3.Test Result

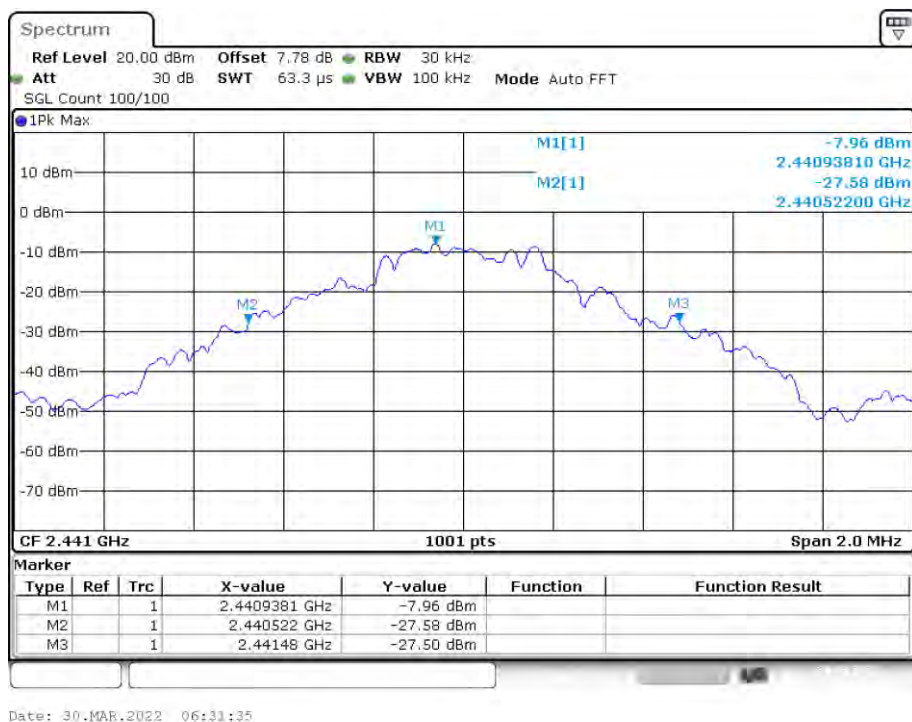
-20dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant1	0.994	0	Pass
NVNT	1-DH1	2441	Ant1	0.958	0	Pass
NVNT	1-DH1	2480	Ant1	1.02	0	Pass
NVNT	2-DH1	2402	Ant1	1.308	0	Pass
NVNT	2-DH1	2441	Ant1	1.35	0	Pass
NVNT	2-DH1	2480	Ant1	1.31	0	Pass
NVNT	3-DH1	2402	Ant1	1.276	0	Pass
NVNT	3-DH1	2441	Ant1	1.282	0	Pass
NVNT	3-DH1	2480	Ant1	1.286	0	Pass

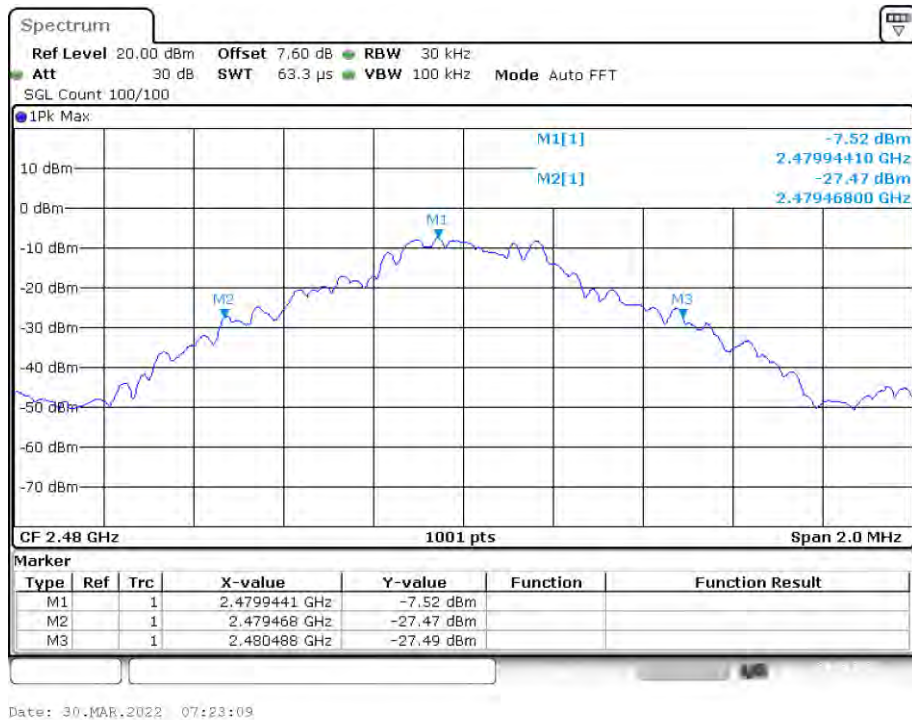
-20dB Bandwidth NVNT 1-DH1 2402MHz Ant1



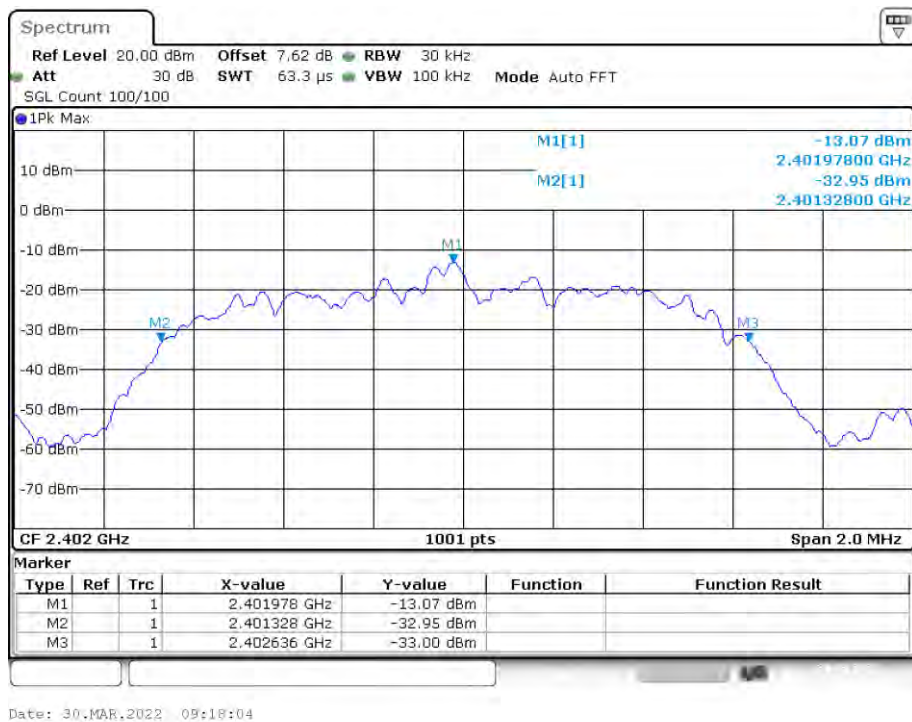
-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1



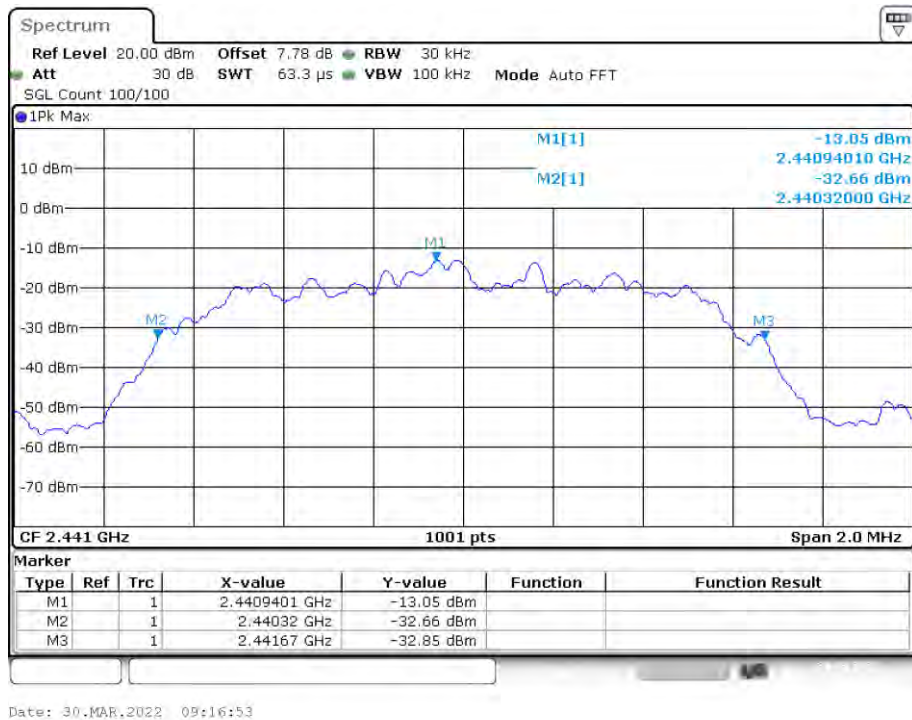
-20dB Bandwidth NVNT 1-DH1 2480MHz Ant1



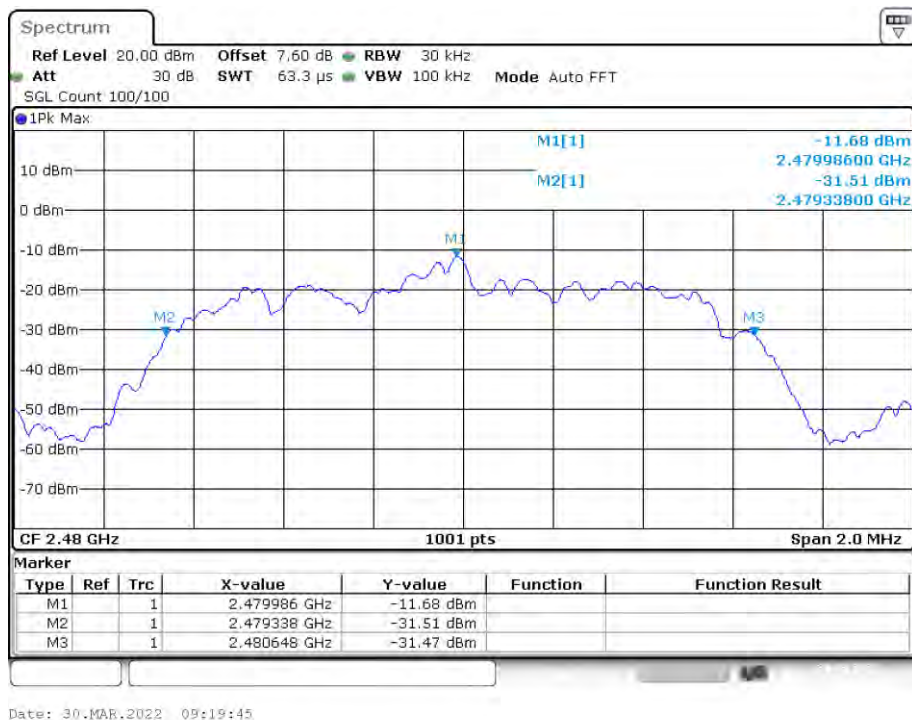
-20dB Bandwidth NVNT 2-DH1 2402MHz Ant1



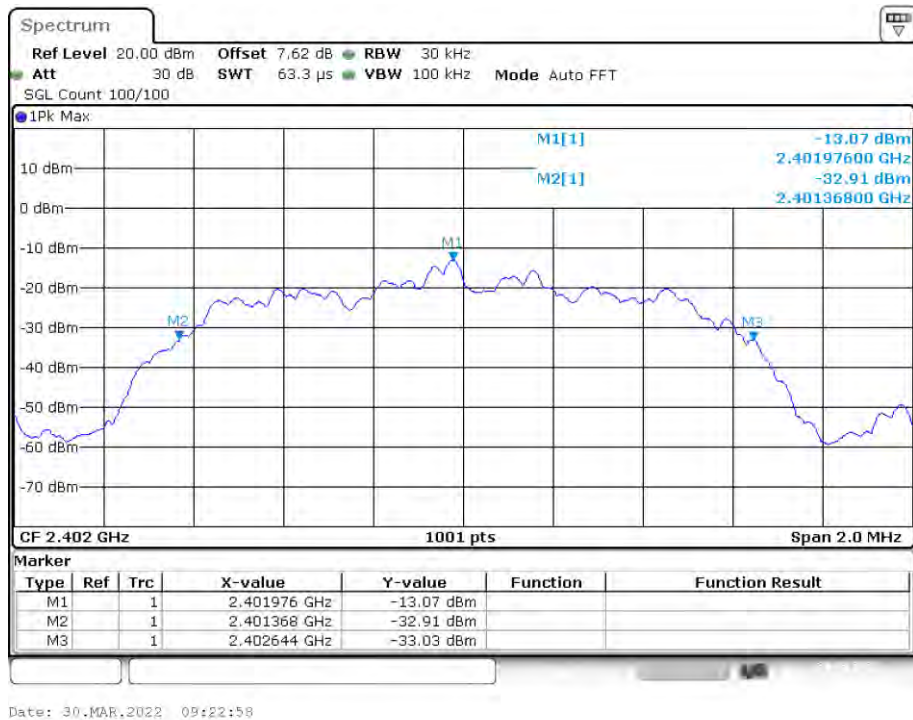
-20dB Bandwidth NVNT 2-DH1 2441MHz Ant1



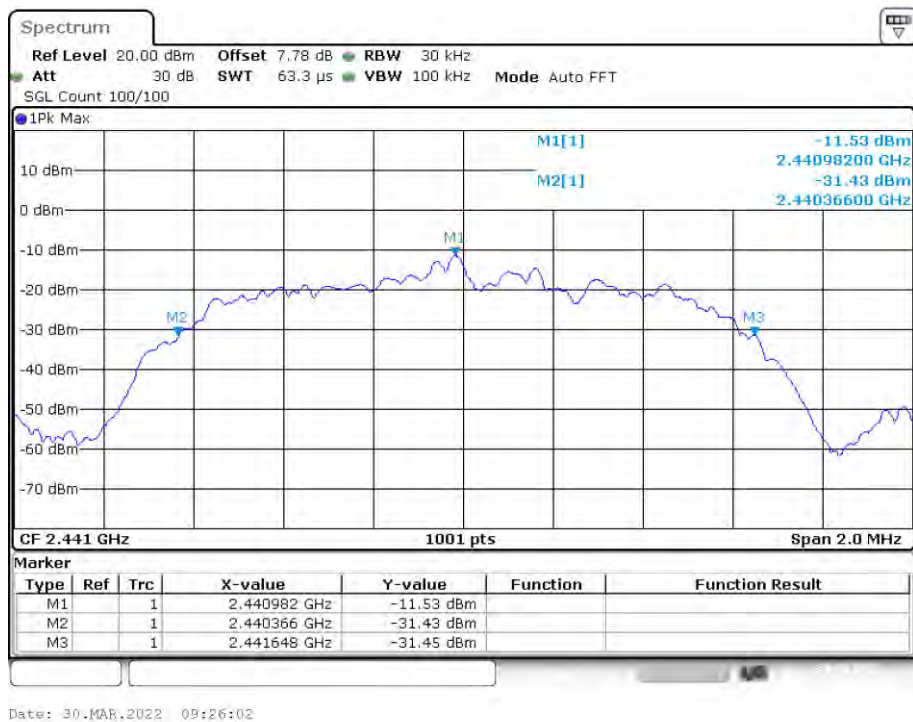
-20dB Bandwidth NVNT 2-DH1 2480MHz Ant1



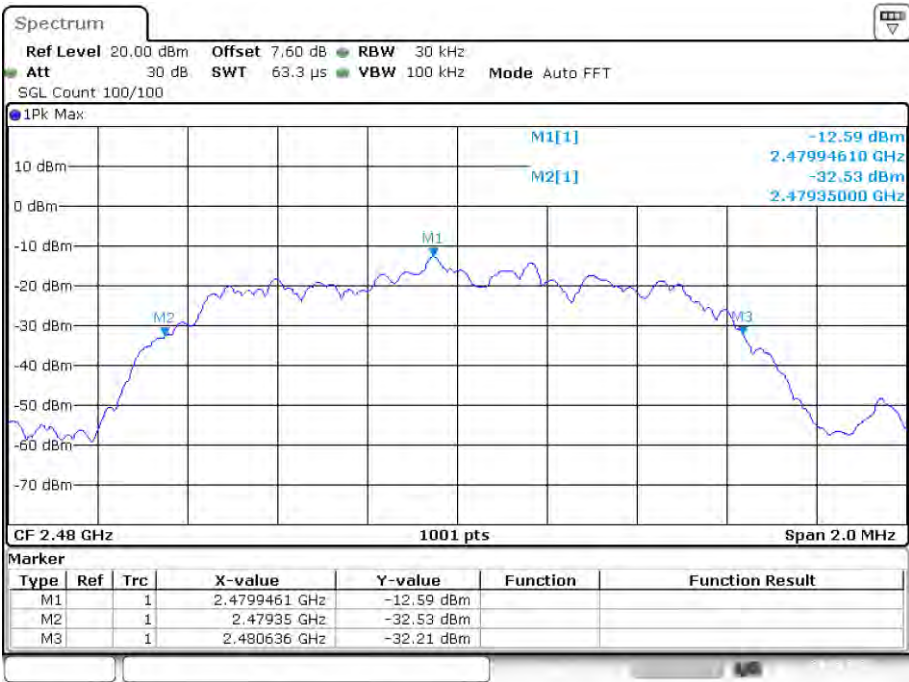
-20dB Bandwidth NVNT 3-DH1 2402MHz Ant1



-20dB Bandwidth NVNT 3-DH1 2441MHz Ant1



-20dB Bandwidth NVNT 3-DH1 2480MHz Ant1

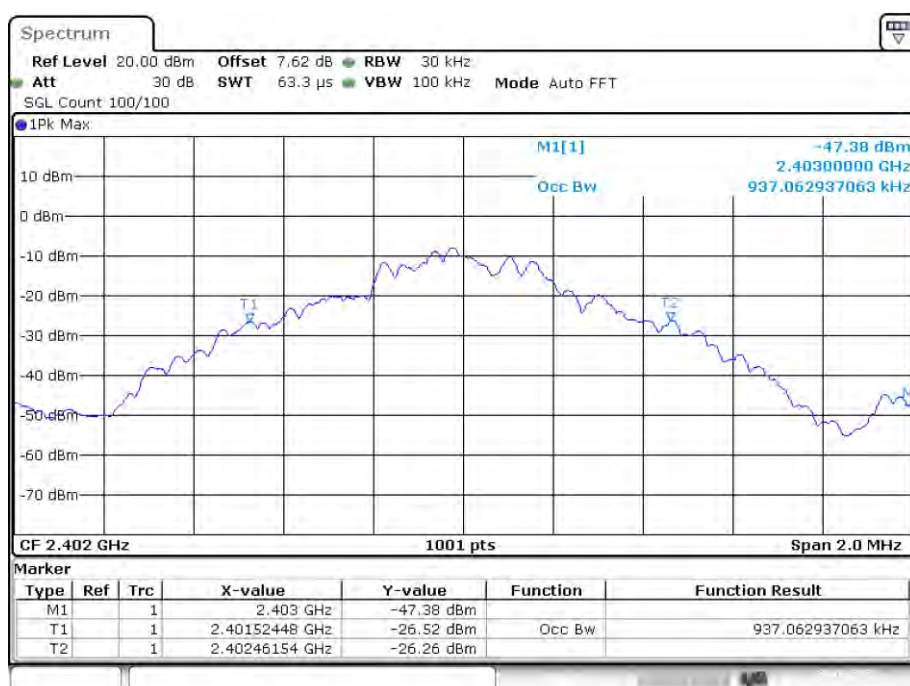


Date: 30.MAR.2022 09:27:20

Occupied Channel Bandwidth

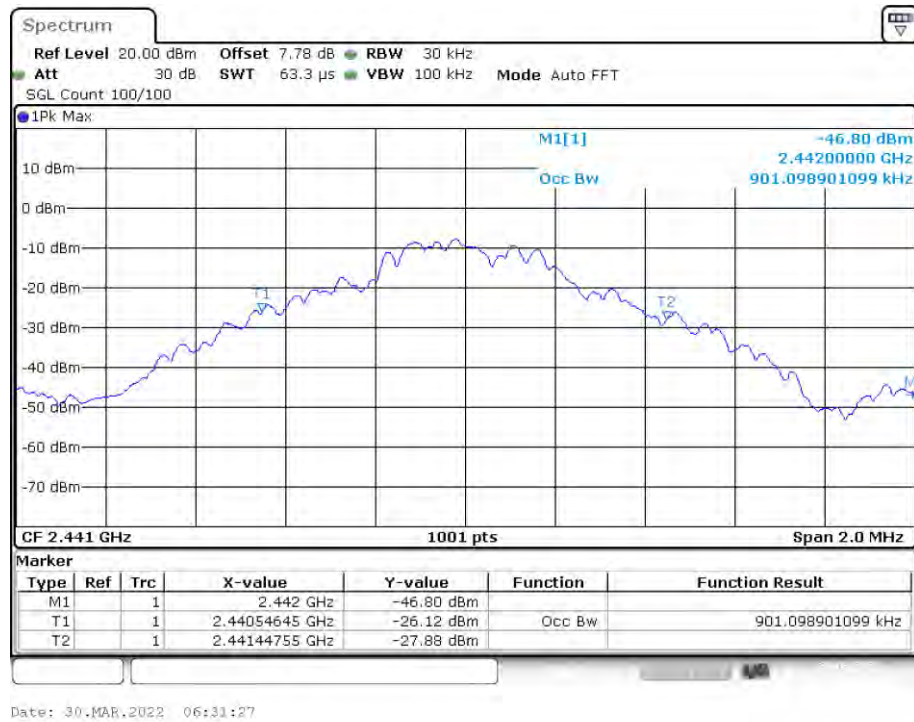
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH1	2402	Ant1	0.937
NVNT	1-DH1	2441	Ant1	0.901
NVNT	1-DH1	2480	Ant1	0.921
NVNT	2-DH1	2402	Ant1	1.199
NVNT	2-DH1	2441	Ant1	1.205
NVNT	2-DH1	2480	Ant1	1.181
NVNT	3-DH1	2402	Ant1	1.173
NVNT	3-DH1	2441	Ant1	1.185
NVNT	3-DH1	2480	Ant1	1.183

OBW NVNT 1-DH1 2402MHz Ant1

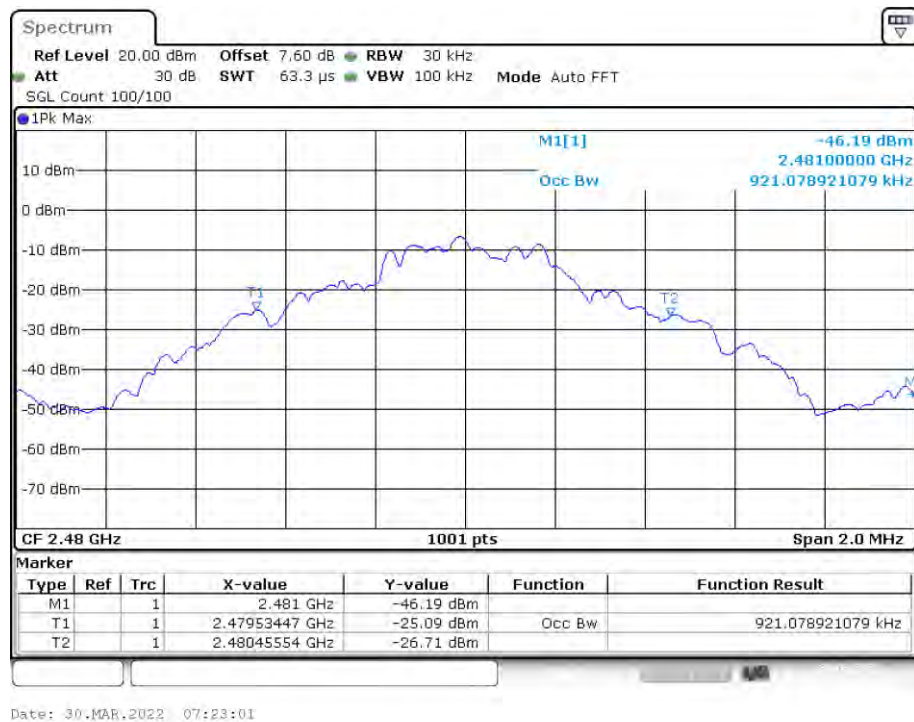


Date: 30.MAR.2022 06:29:45

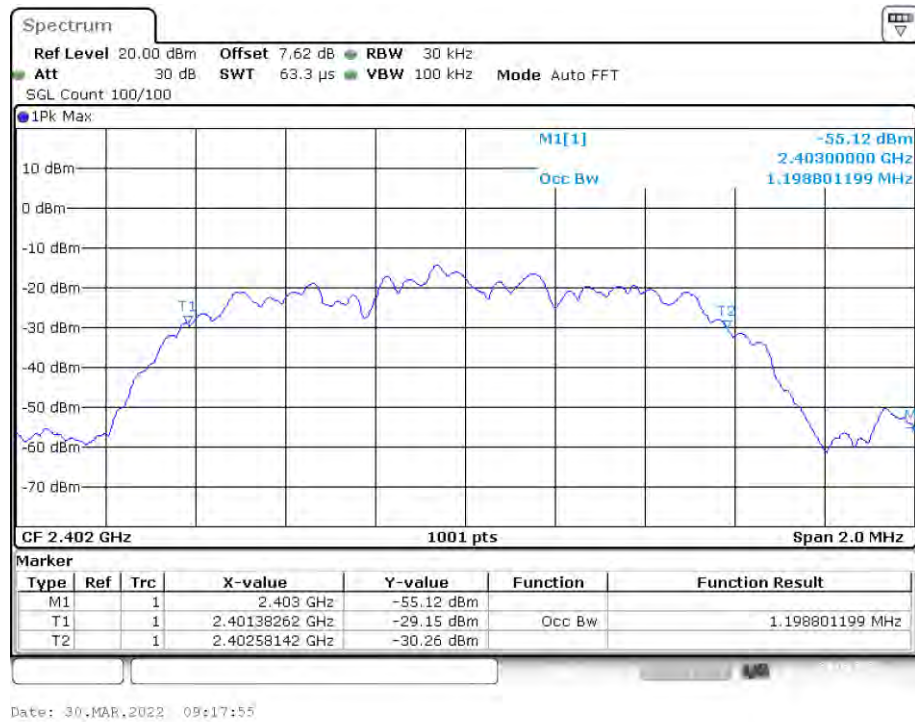
OBW NVNT 1-DH1 2441MHz Ant1



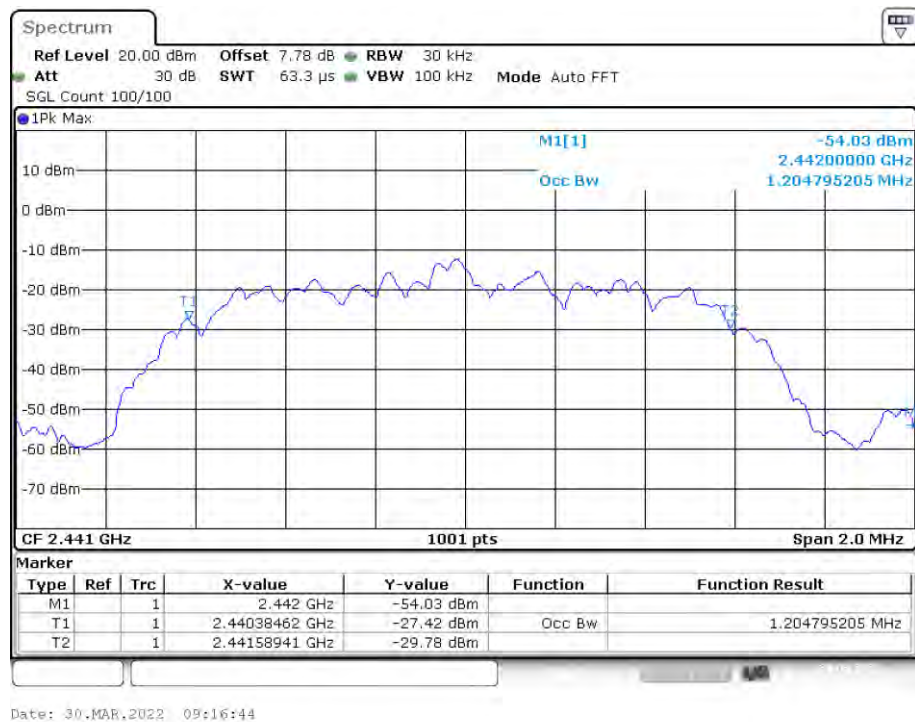
OBW NVNT 1-DH1 2480MHz Ant1



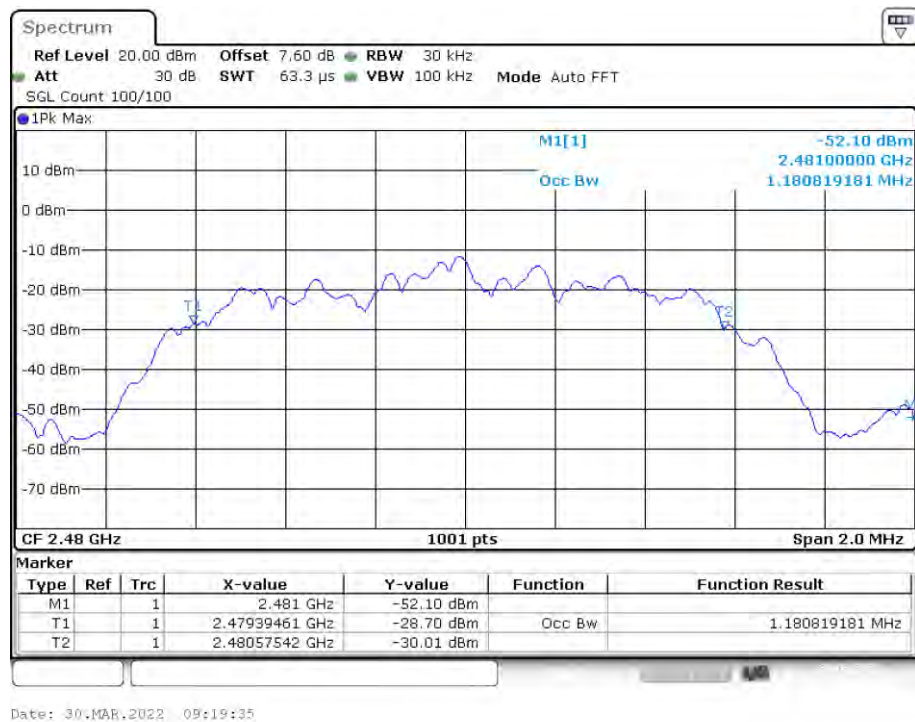
OBW NVNT 2-DH1 2402MHz Ant1



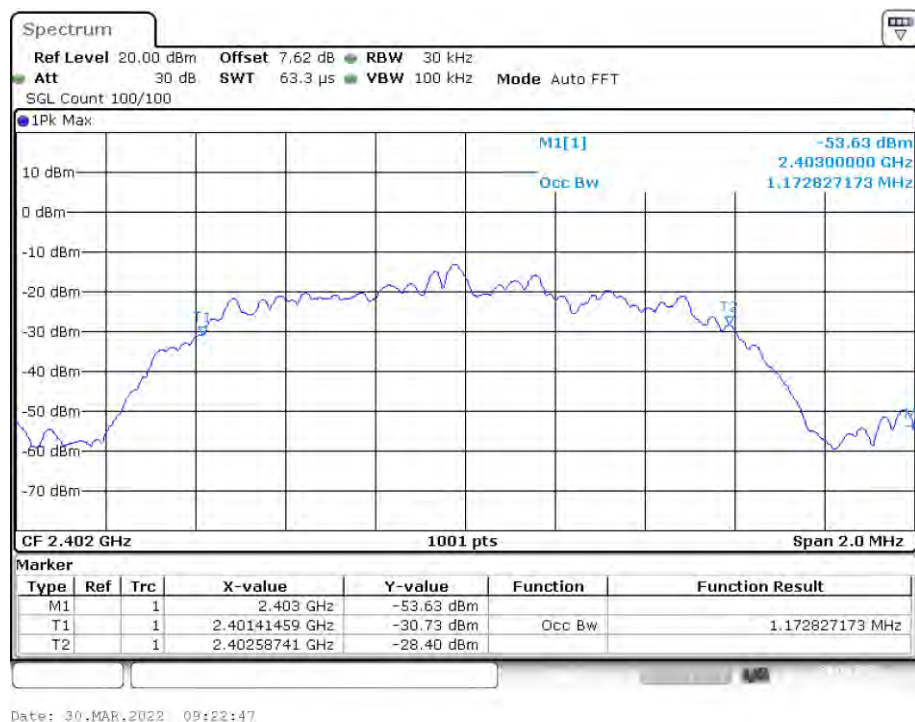
OBW NVNT 2-DH1 2441MHz Ant1



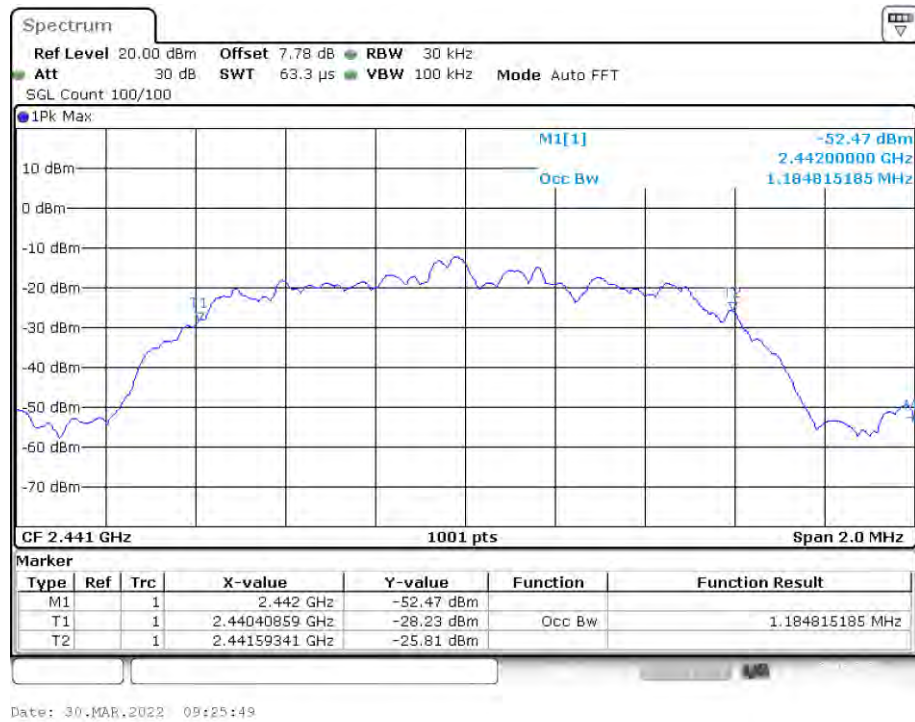
OBW NVNT 2-DH1 2480MHz Ant1



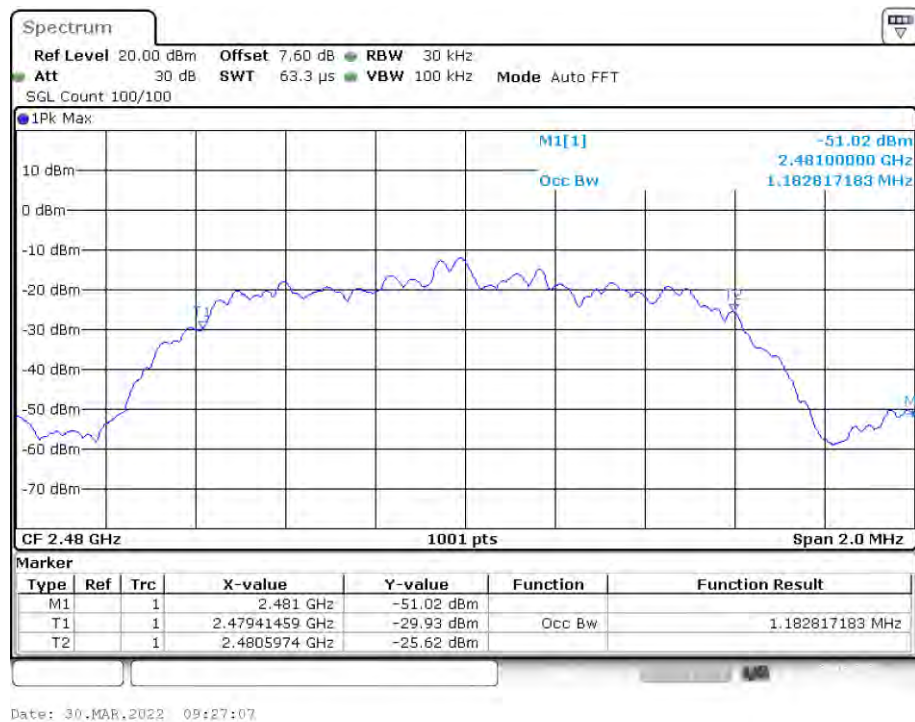
OBW NVNT 3-DH1 2402MHz Ant1



OBW NVNT 3-DH1 2441MHz Ant1



OBW NVNT 3-DH1 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

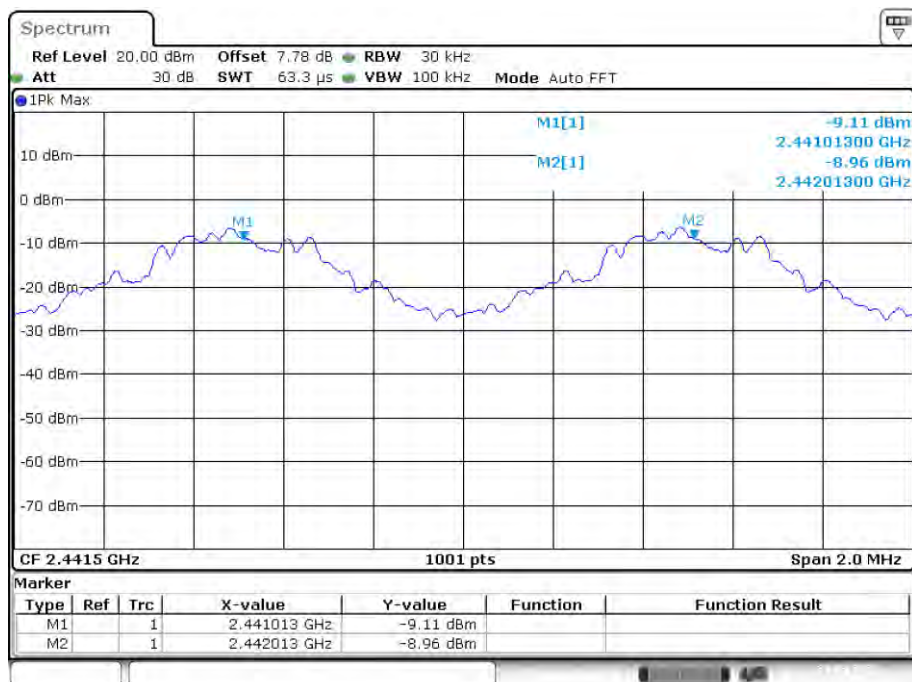
5.2.Test Procedure

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

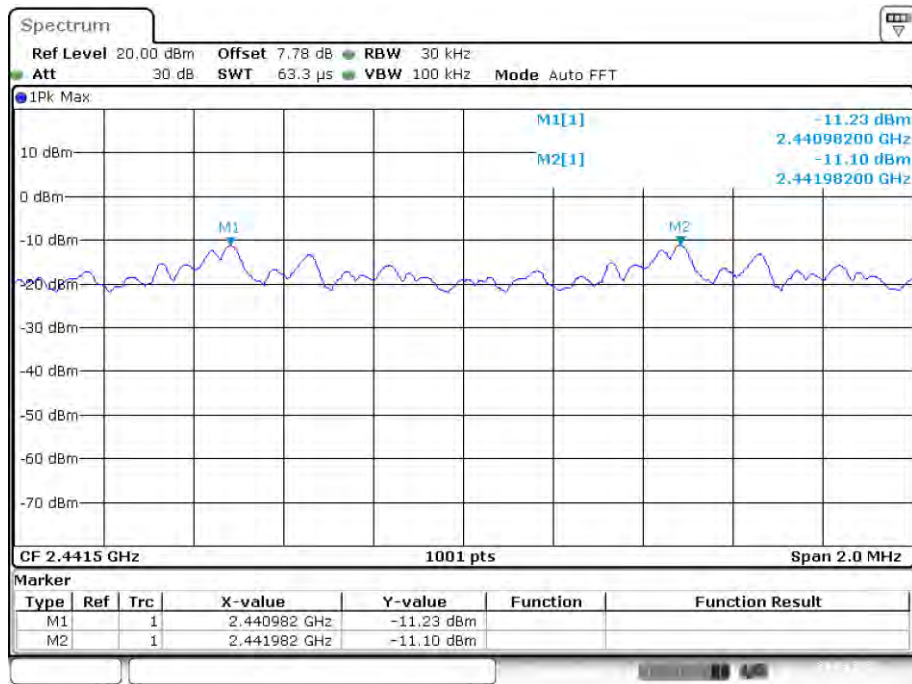
Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	Ant1	2441.013	2442.013	1	0.958	Pass
NVNT	2-DH1	Ant1	2440.982	2441.982	1	0.9	Pass
NVNT	3-DH1	Ant1	2440.98	2441.98	1	0.855	Pass

CFS NVNT 1-DH1 2441MHz Ant1



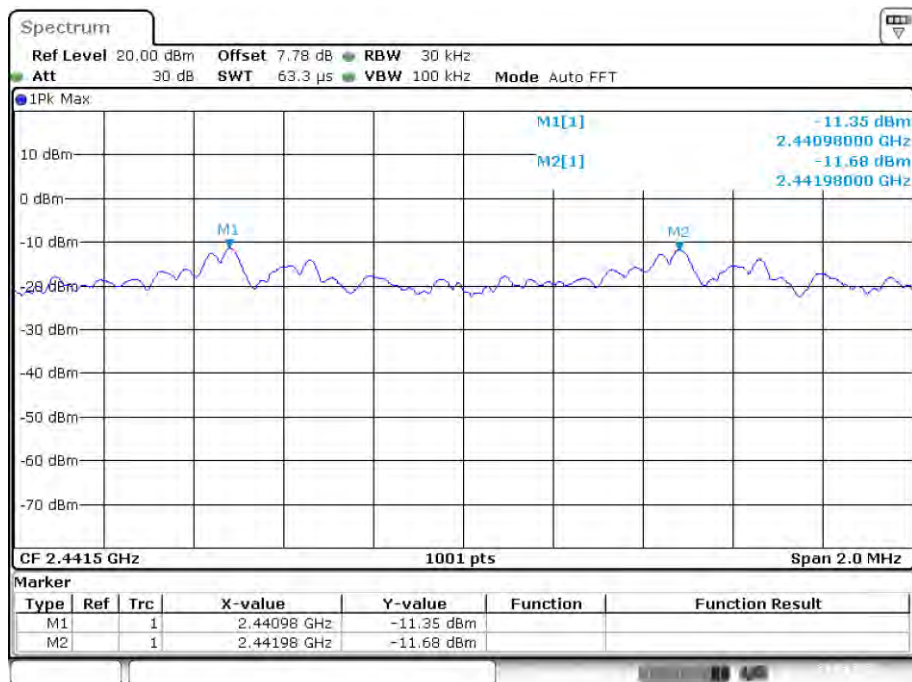
Date: 30.MAR.2022 09:35:52

CFS NVNT 2-DH1 2441MHz Ant1



Date: 30.MAR.2022 10:03:39

CFS NVNT 3-DH1 2441MHz Ant1



Date: 30.MAR.2022 10:17:12

6. NUMBER OF HOPPING CHANNEL

6.1.Limit

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

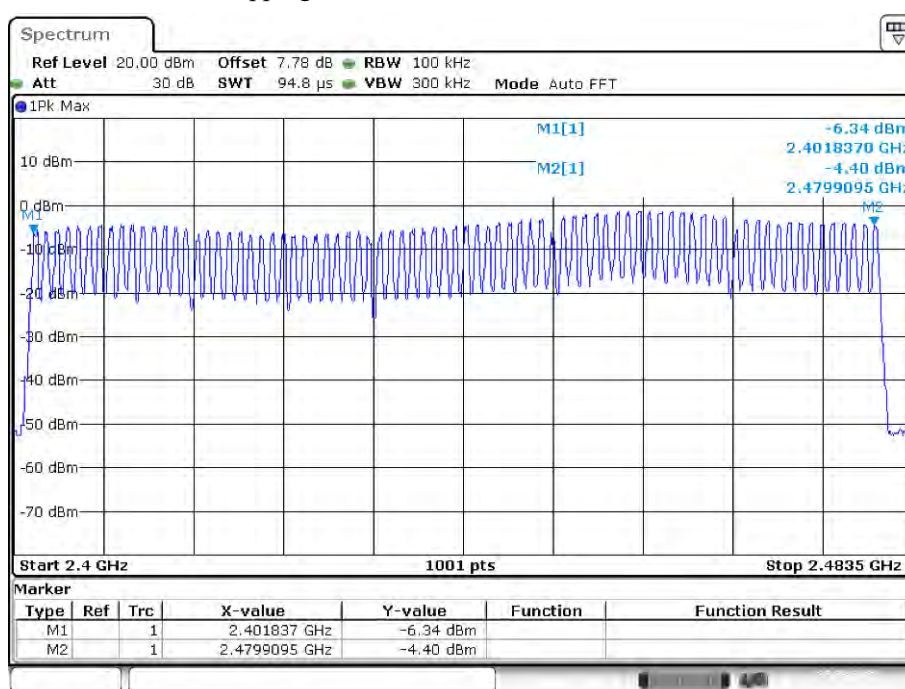
6.2.Test Procedure

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

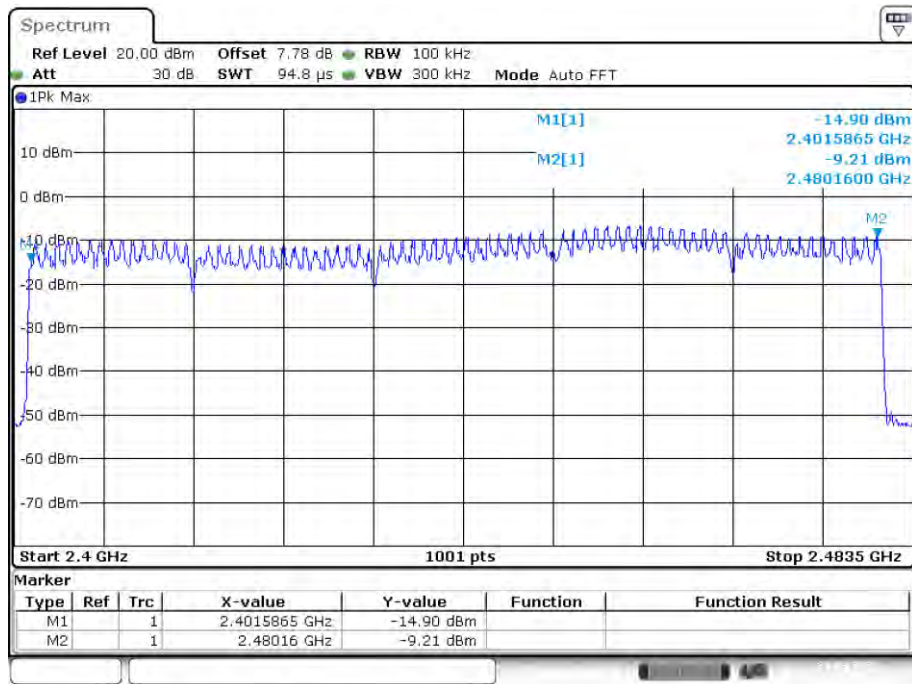
Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass

Hopping No. NVNT 1-DH1 2441MHz Ant1

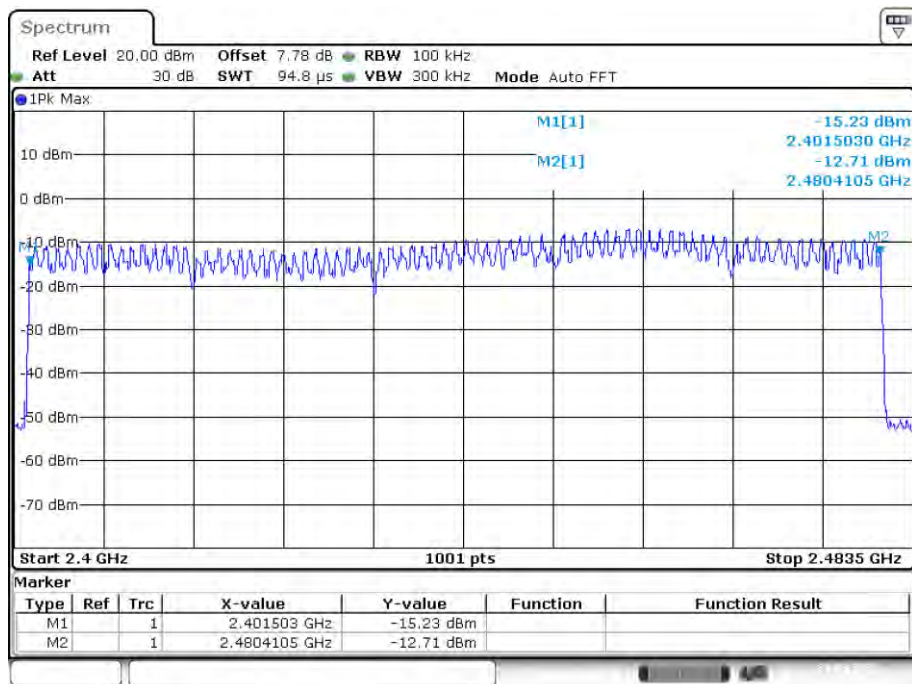


Date: 30.MAR.2022 09:59:05

Hopping No. NVNT 2-DH1 2441MHz Ant1



Hopping No. NVNT 3-DH1 2441MHz Ant1



7. DWELL TIME

7.1. Test limit

Please refer FCC part 15.247 & RSS-247.

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, VBW=1MHz, Span = 0Hz, Sweep = auto.

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

7.3. Test Result

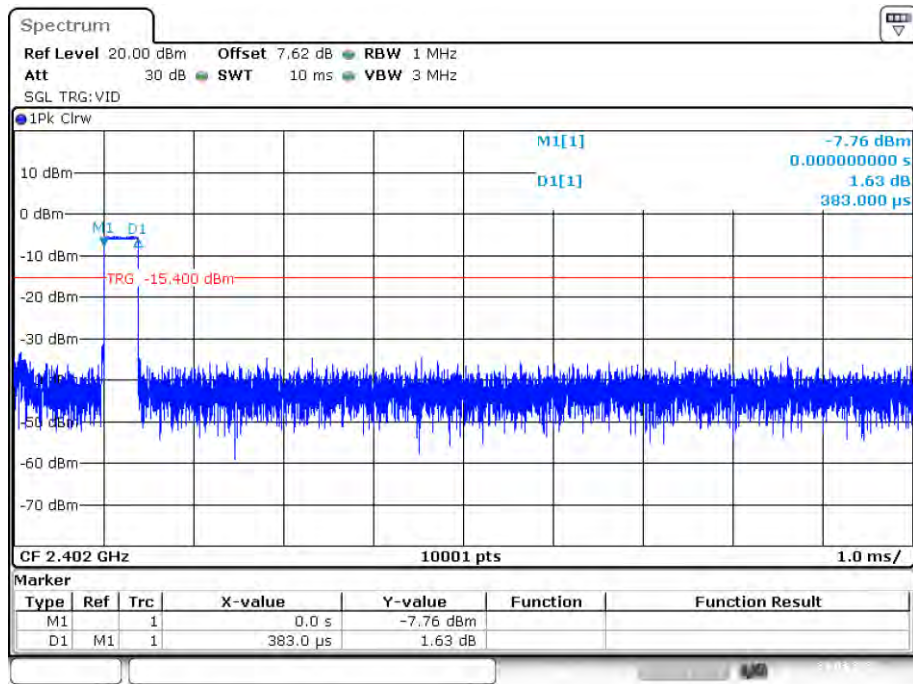
Pass.

Detailed information please see the following page.

Dwell Time

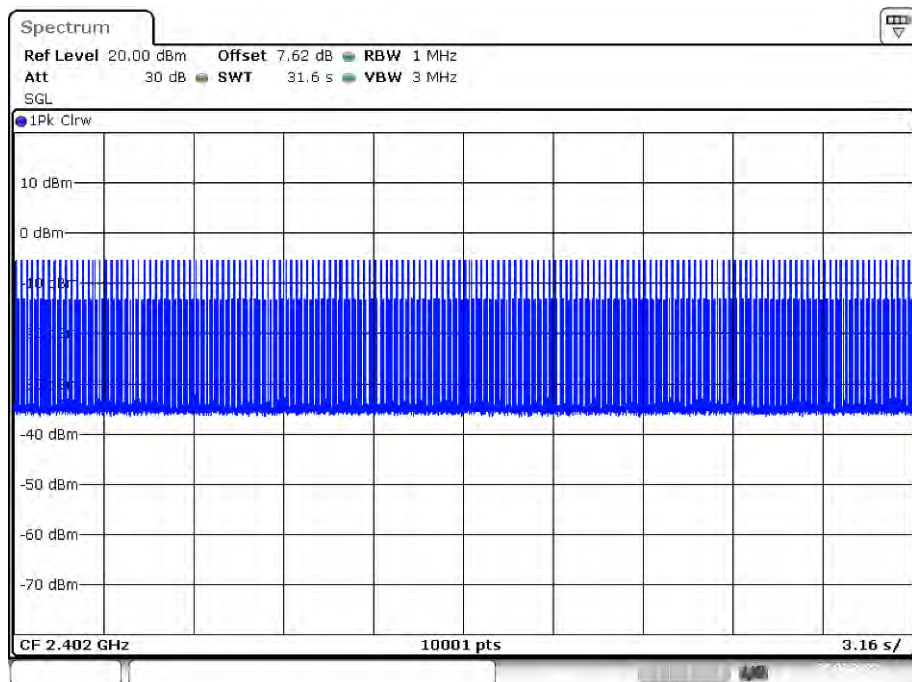
Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2402	Ant1	0.383	121.794	318	31600	400	Pass
NVNT	1-DH1	2441	Ant1	0.384	122.112	318	31600	400	Pass
NVNT	1-DH1	2480	Ant1	0.383	121.794	318	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.639	242.572	148	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.887	340.666	118	31600	400	Pass
NVNT	2-DH1	2402	Ant1	0.389	124.091	319	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.389	123.702	318	31600	400	Pass
NVNT	2-DH1	2480	Ant1	0.389	123.702	318	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.642	272.572	166	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.888	274.36	95	31600	400	Pass
NVNT	3-DH1	2402	Ant1	0.389	123.313	317	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.389	123.702	318	31600	400	Pass
NVNT	3-DH1	2480	Ant1	0.389	123.313	317	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.64	241.08	147	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.891	294.882	102	31600	400	Pass

Dwell NVNT 1-DH1 2402MHz Ant1 One Burst



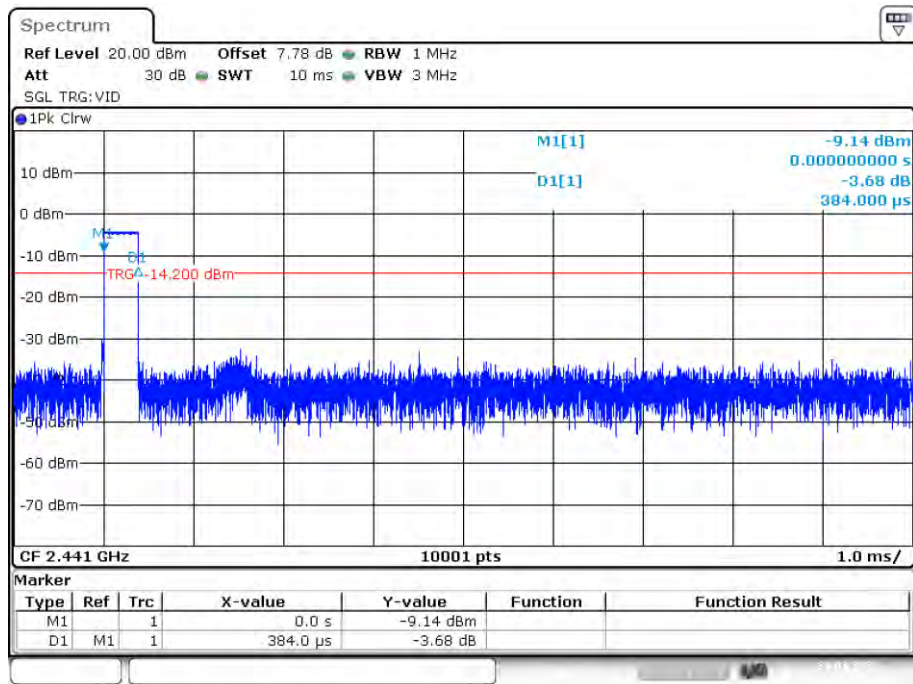
Date: 30.MAR.2022 09:29:39

Dwell NVNT 1-DH1 2402MHz Ant1 Accumulated

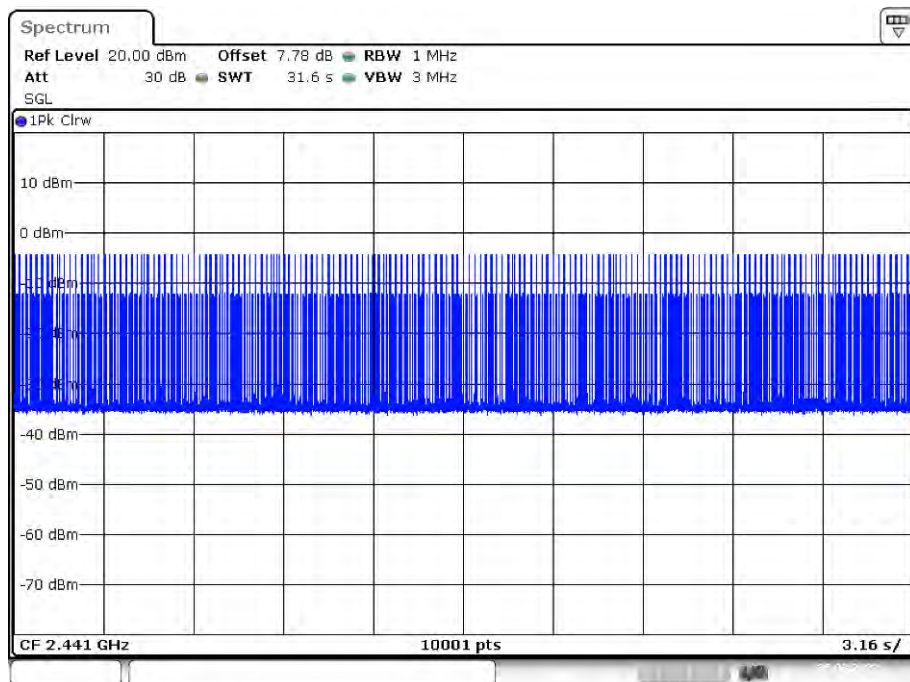


Date: 30.MAR.2022 09:30:13

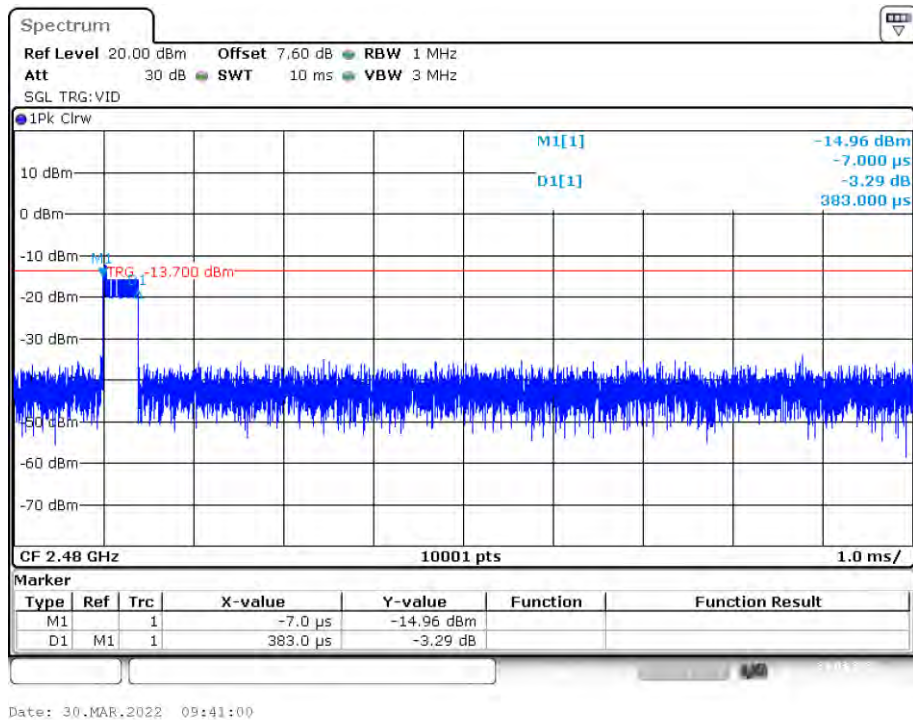
Dwell NVNT 1-DH1 2441MHz Ant1 One Burst



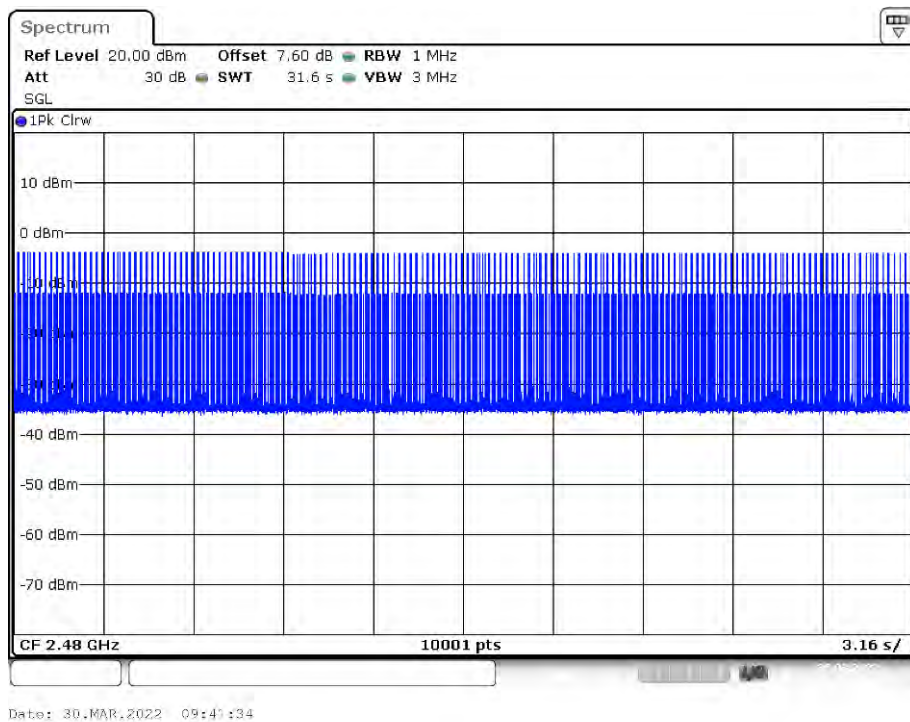
Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated



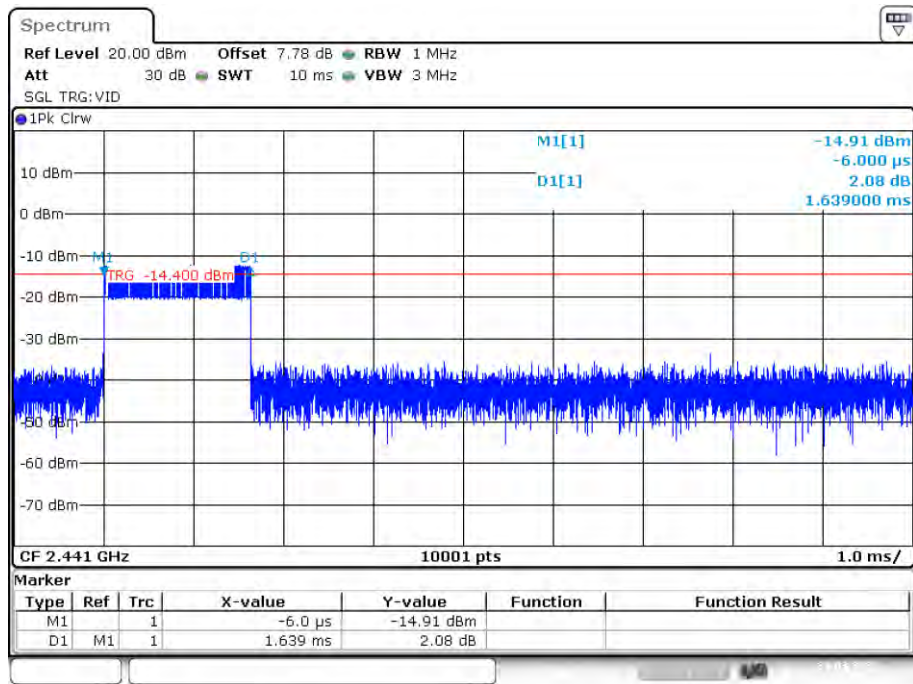
Dwell NVNT 1-DH1 2480MHz Ant1 One Burst



Dwell NVNT 1-DH1 2480MHz Ant1 Accumulated

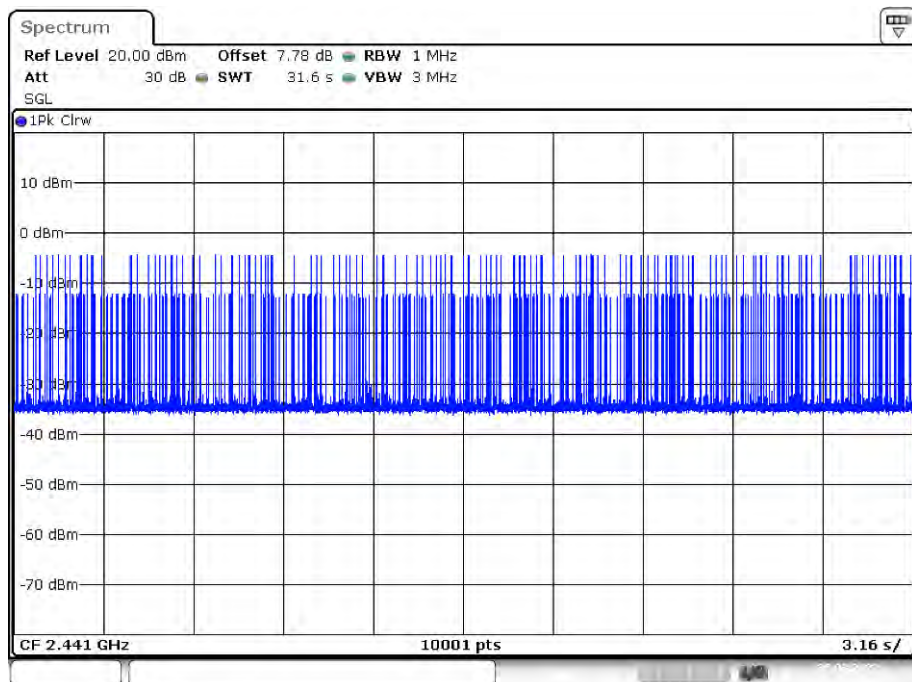


Dwell NVNT 1-DH3 2441MHz Ant1 One Burst



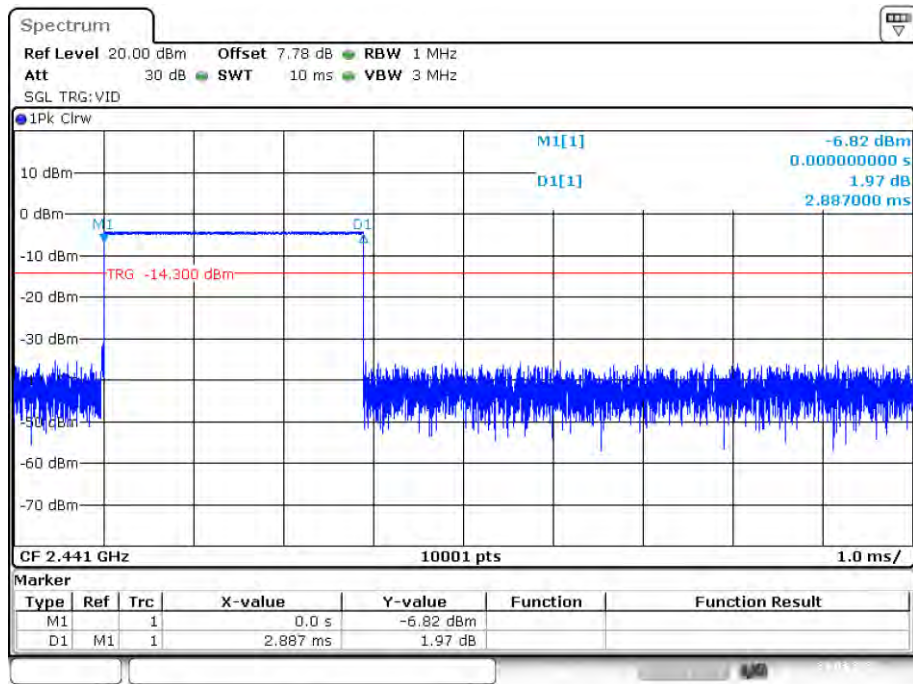
Date: 30.MAR.2022 09:50:30

Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated



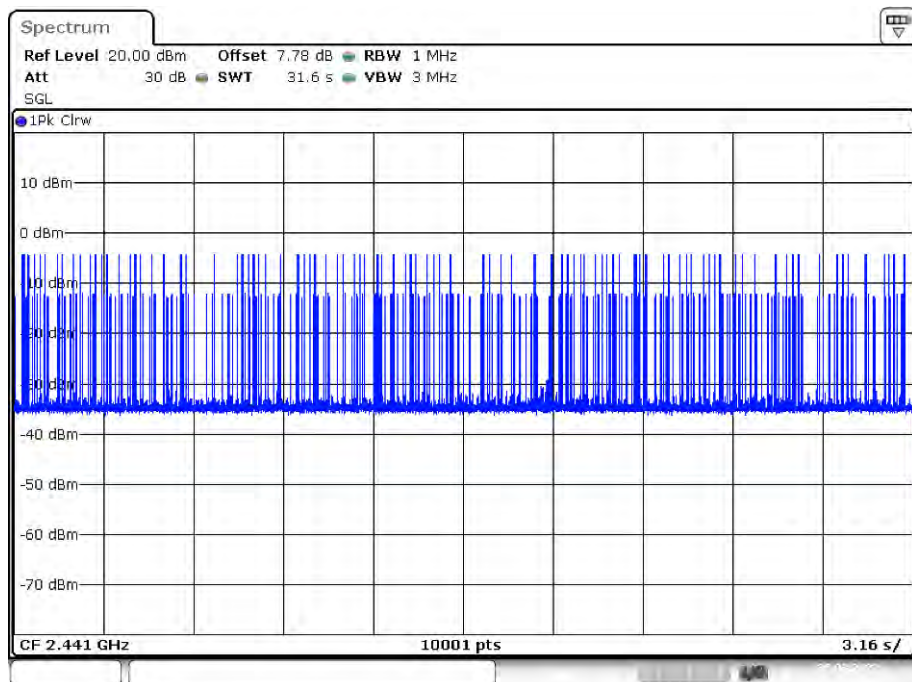
Date: 30.MAR.2022 09:51:05

Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



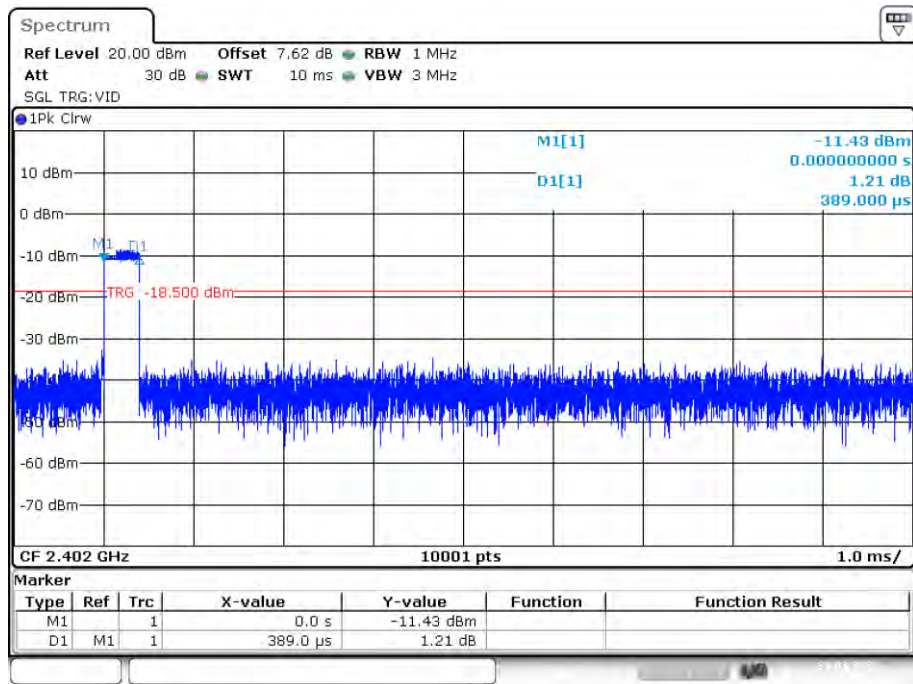
Date: 30.MAR.2022 09:52:24

Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated



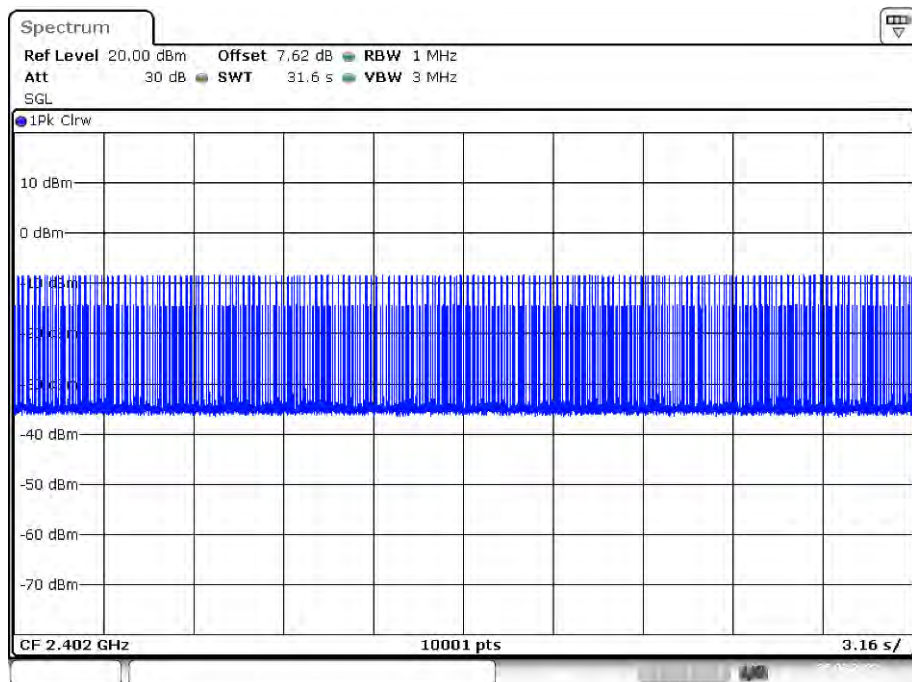
Date: 30.MAR.2022 09:52:58

Dwell NVNT 2-DH1 2402MHz Ant1 One Burst



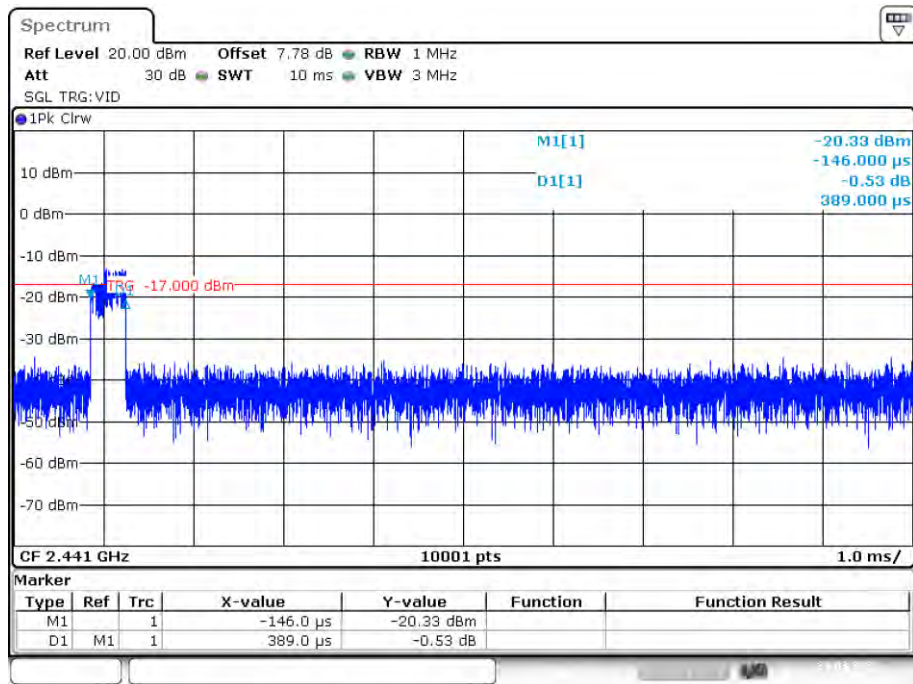
Date: 30.MAR.2022 09:58:57

Dwell NVNT 2-DH1 2402MHz Ant1 Accumulated



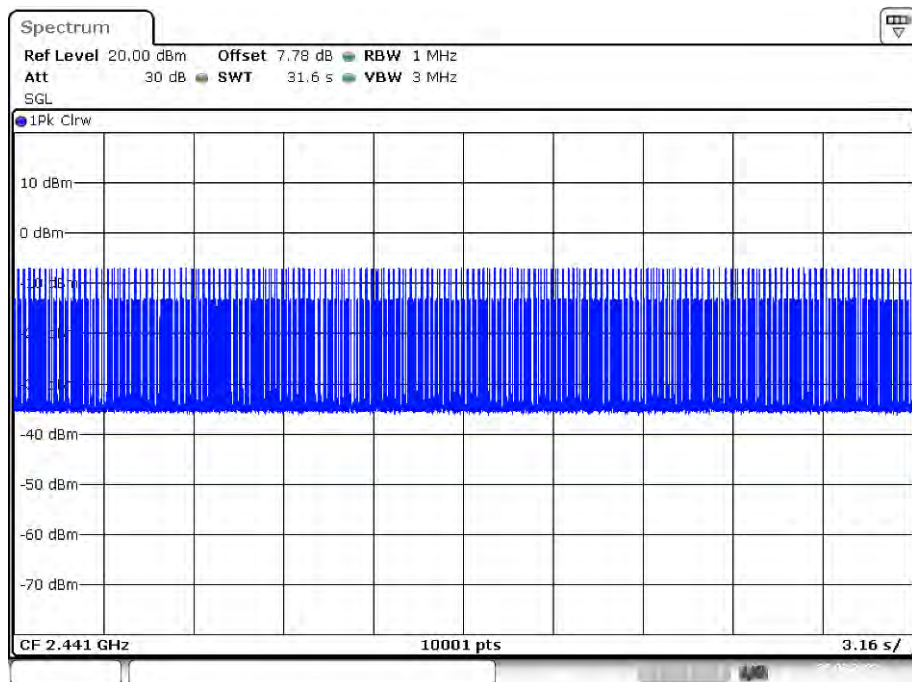
Date: 30.MAR.2022 09:59:31

Dwell NVNT 2-DH1 2441MHz Ant1 One Burst



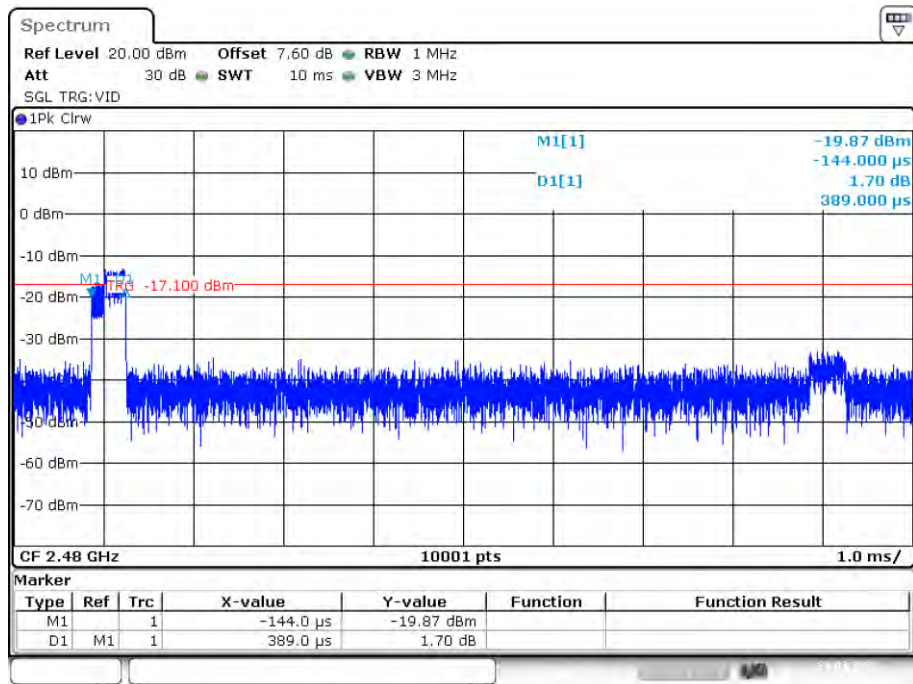
Date: 30.MAR.2022 10:07:30

Dwell NVNT 2-DH1 2441MHz Ant1 Accumulated



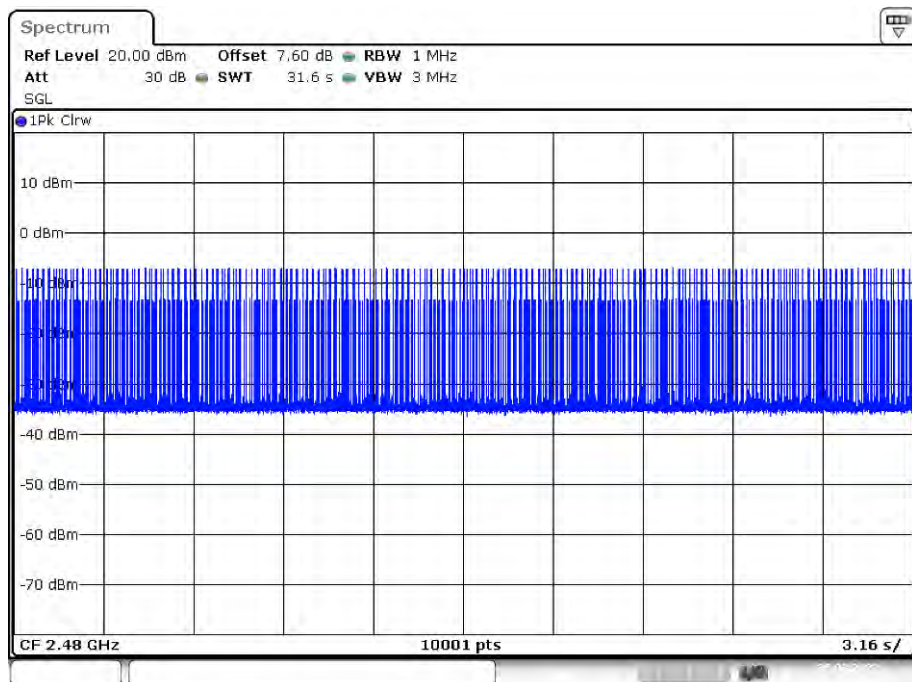
Date: 30.MAR.2022 10:08:04

Dwell NVNT 2-DH1 2480MHz Ant1 One Burst



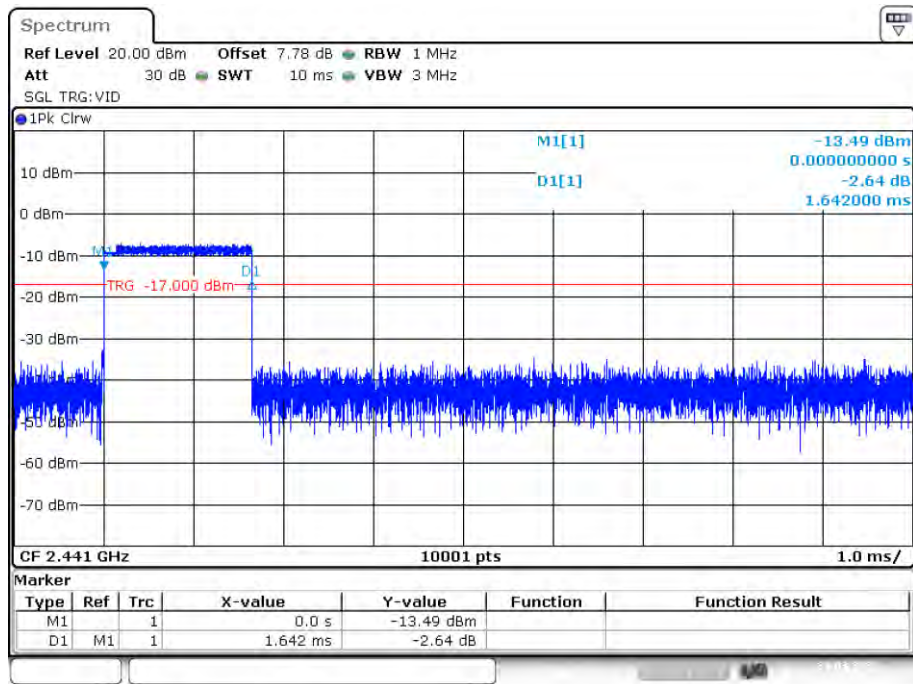
Date: 30.MAR.2022 10:08:29

Dwell NVNT 2-DH1 2480MHz Ant1 Accumulated



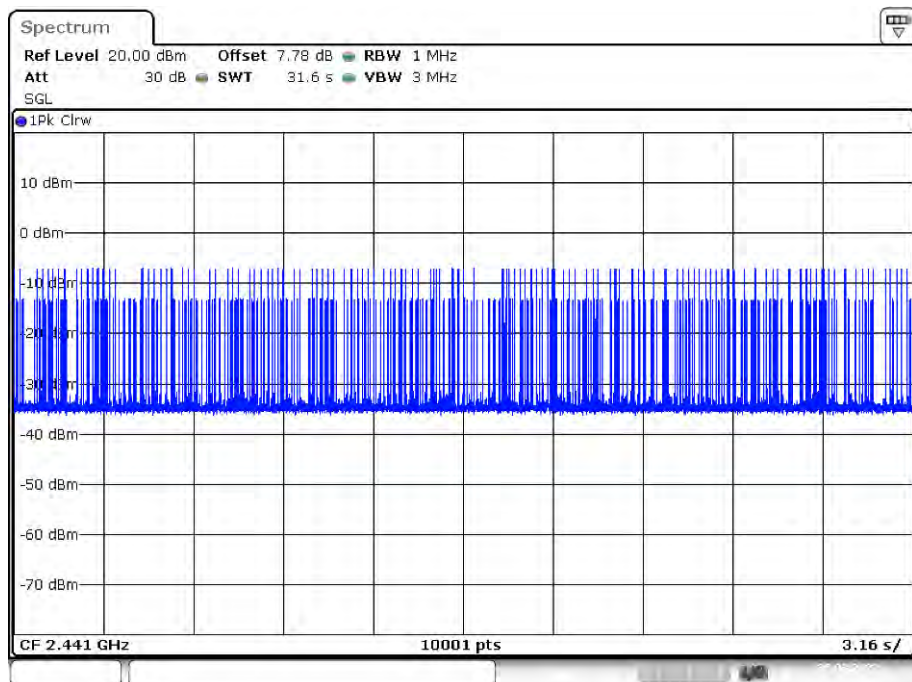
Date: 30.MAR.2022 10:09:03

Dwell NVNT 2-DH3 2441MHz Ant1 One Burst



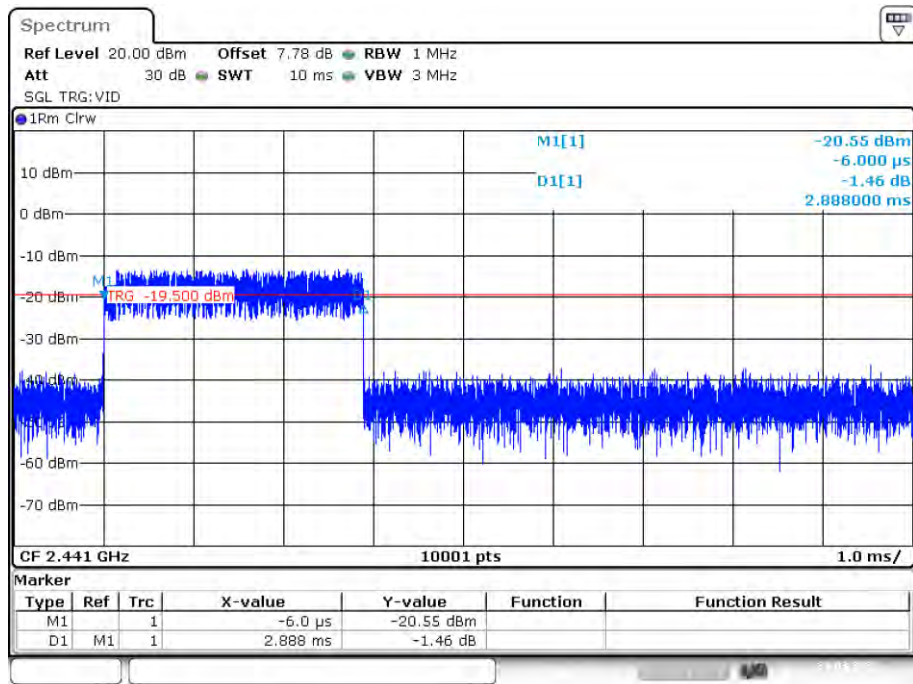
Date: 30.MAR.2022 10:10:56

Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated



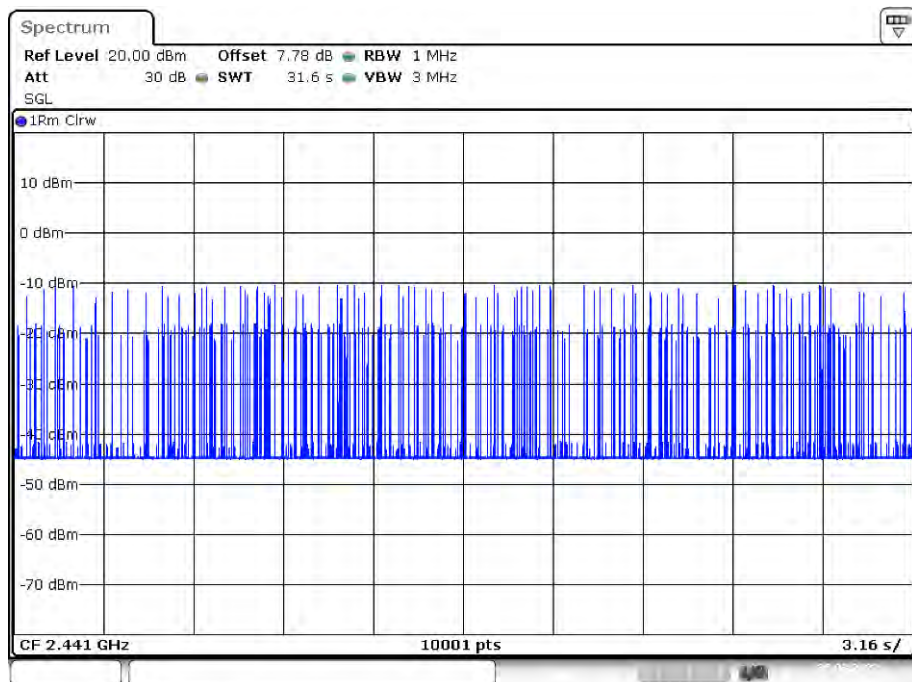
Date: 30.MAR.2022 10:11:30

Dwell NVNT 2-DH5 2441MHz Ant1 One Burst



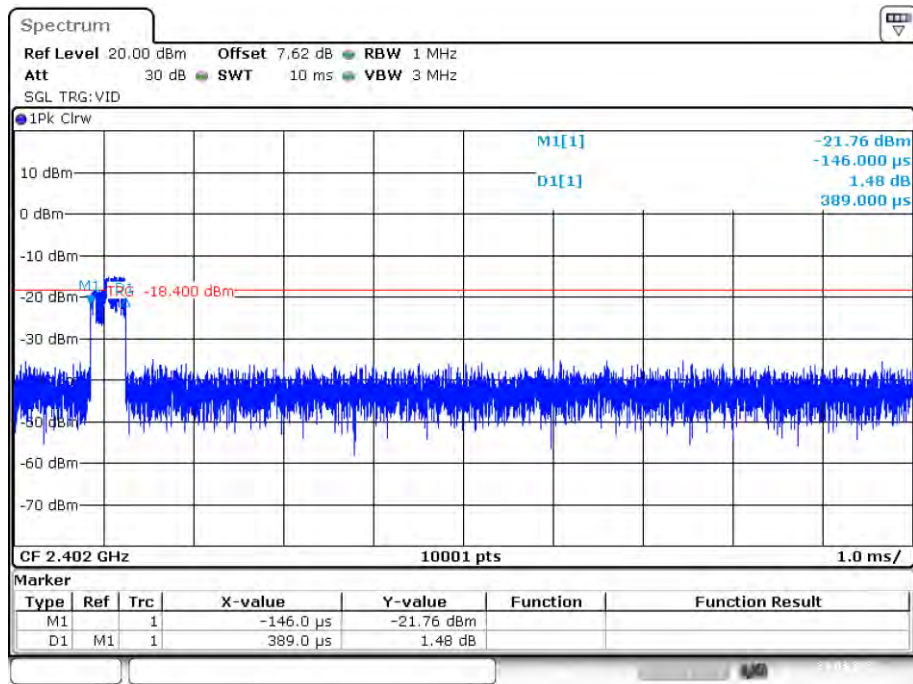
Date: 30.MAR.2022 10:12:15

Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated



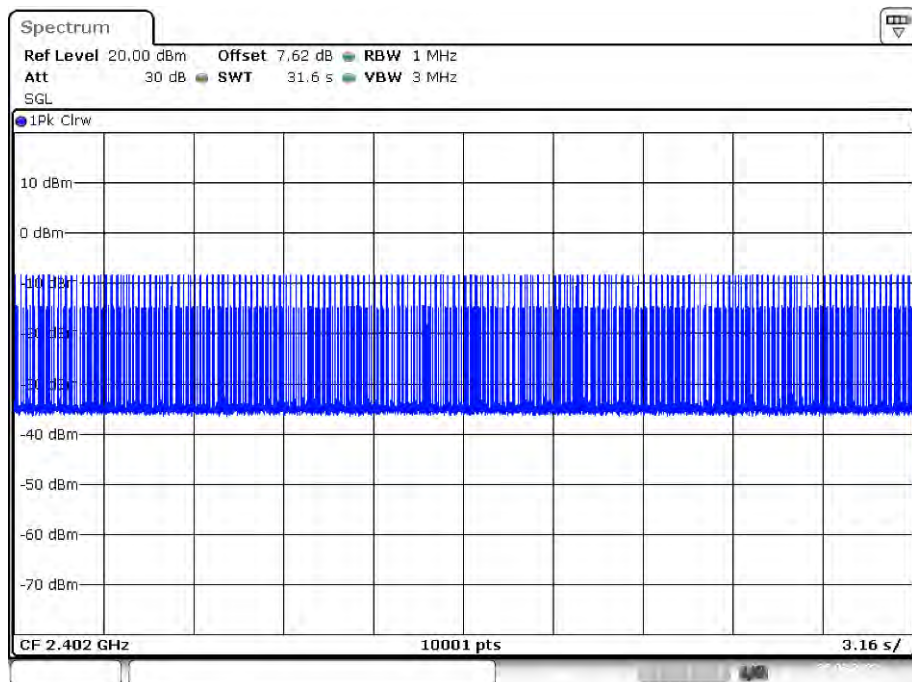
Date: 30.MAR.2022 10:12:49

Dwell NVNT 3-DH1 2402MHz Ant1 One Burst



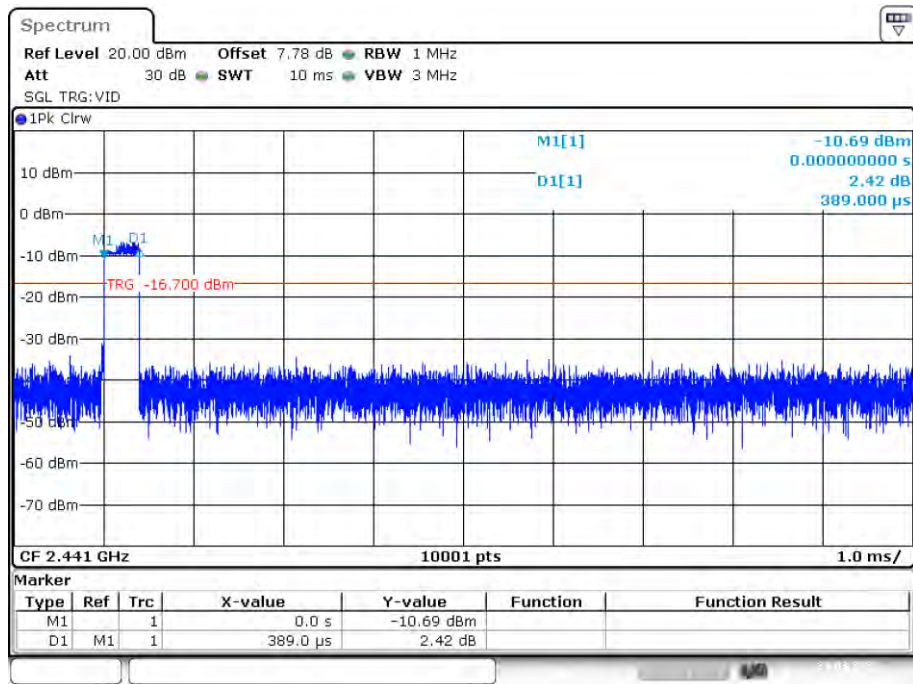
Date: 30.MAR.2022 10:14:09

Dwell NVNT 3-DH1 2402MHz Ant1 Accumulated

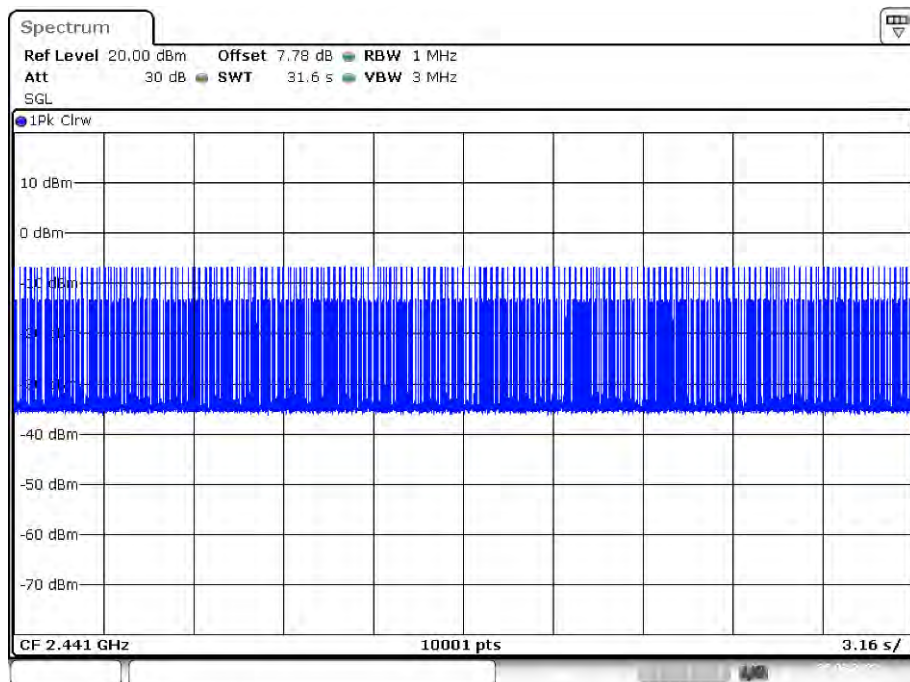


Date: 30.MAR.2022 10:14:43

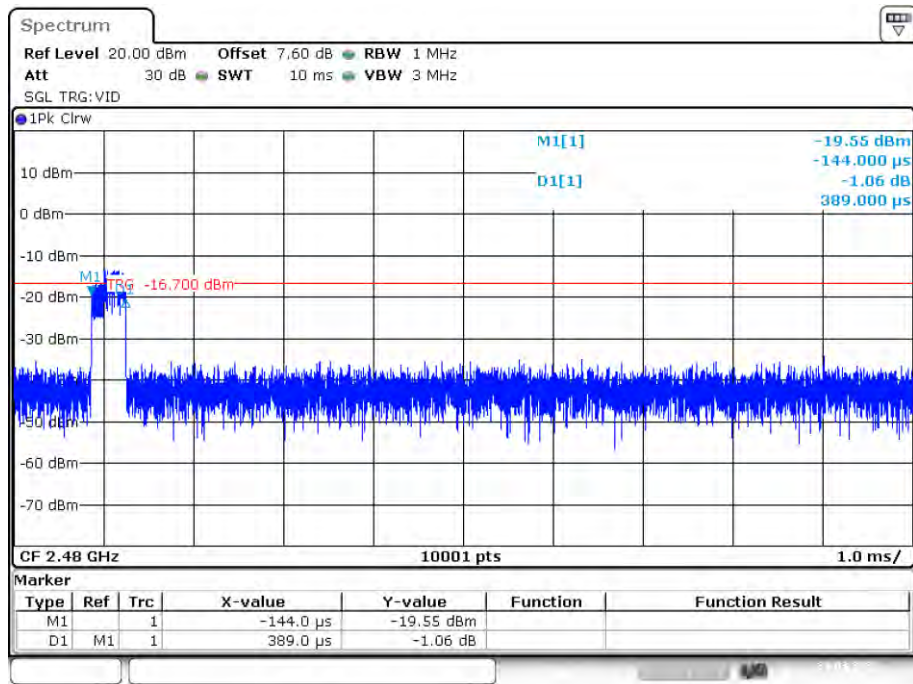
Dwell NVNT 3-DH1 2441MHz Ant1 One Burst



Dwell NVNT 3-DH1 2441MHz Ant1 Accumulated

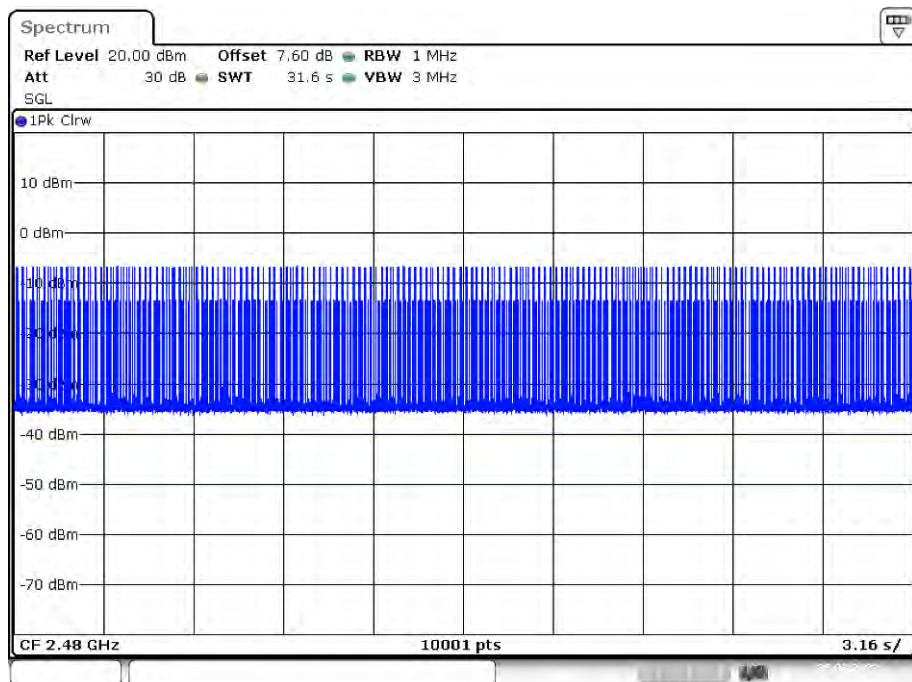


Dwell NVNT 3-DH1 2480MHz Ant1 One Burst



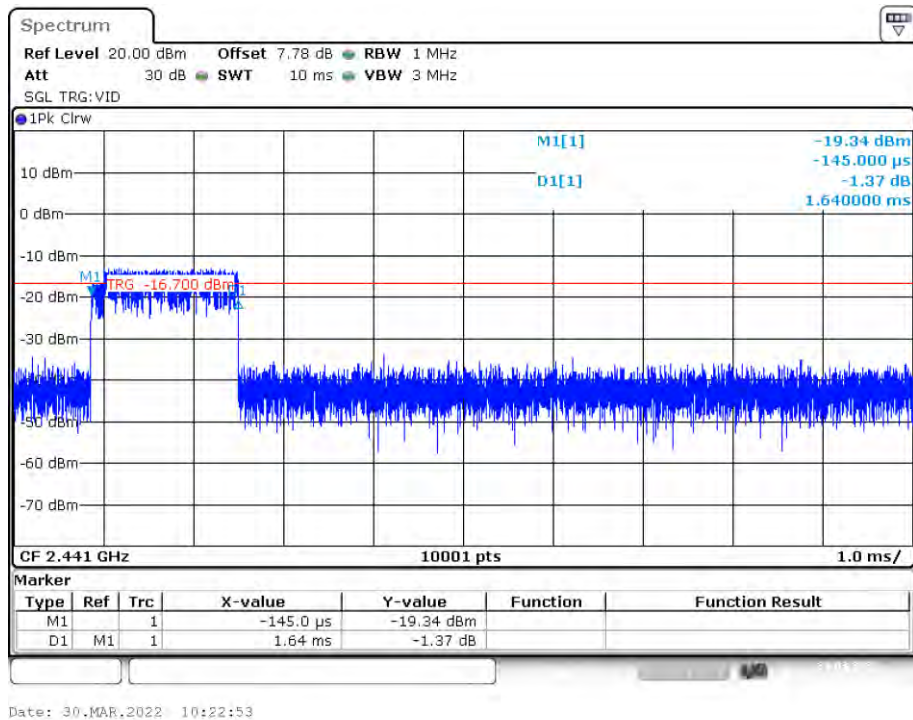
Date: 30.MAR.2022 10:20:36

Dwell NVNT 3-DH1 2480MHz Ant1 Accumulated

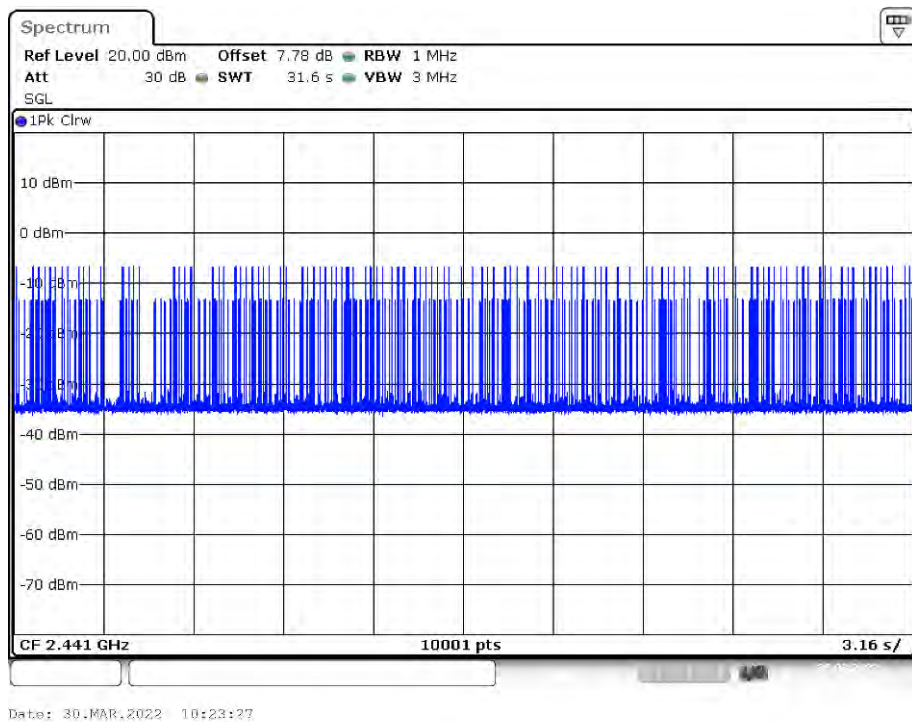


Date: 30.MAR.2022 10:20:11

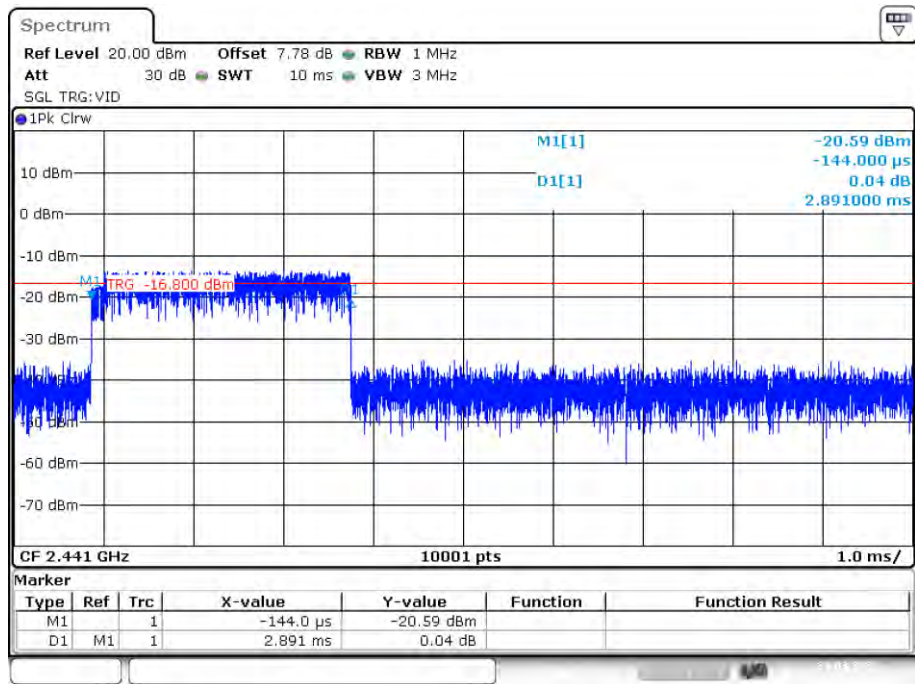
Dwell NVNT 3-DH3 2441MHz Ant1 One Burst



Dwell NVNT 3-DH3 2441MHz Ant1 Accumulated

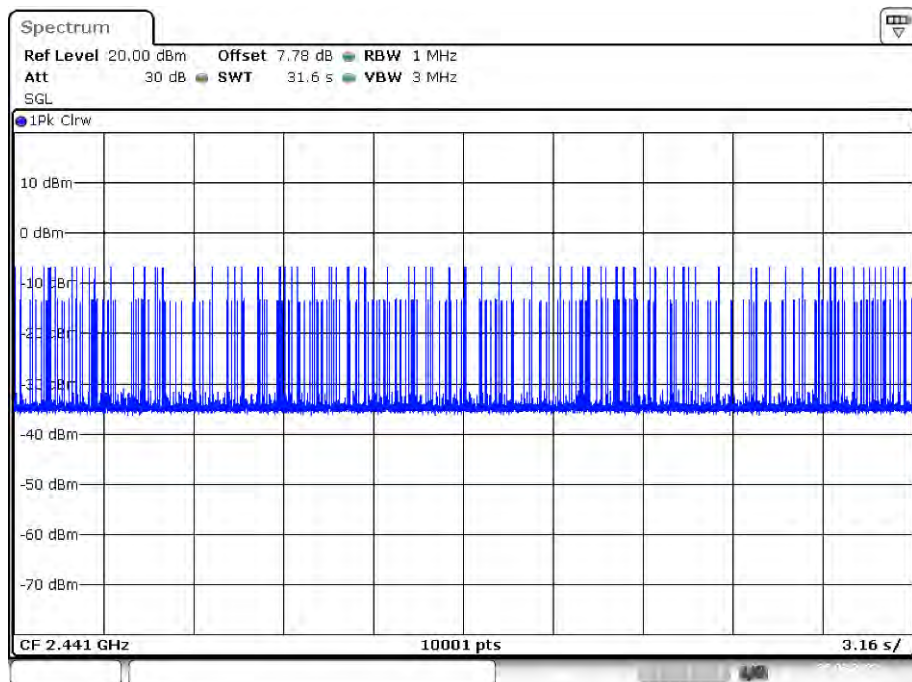


Dwell NVNT 3-DH5 2441MHz Ant1 One Burst



Date: 30.MAR.2022 10:24:09

Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated



Date: 30.MAR.2022 10:24:44

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)

RSS-GEN Restricted frequency band

Table 7 – Restricted frequency bands ^{Note 1}

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4

5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009-0.490	300	$2400/\text{F}(\text{KHz})$	/
0.490-1.705	30	$24000/\text{F}(\text{KHz})$	/
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 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (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 ($\mu\text{V}/\text{m}$ at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

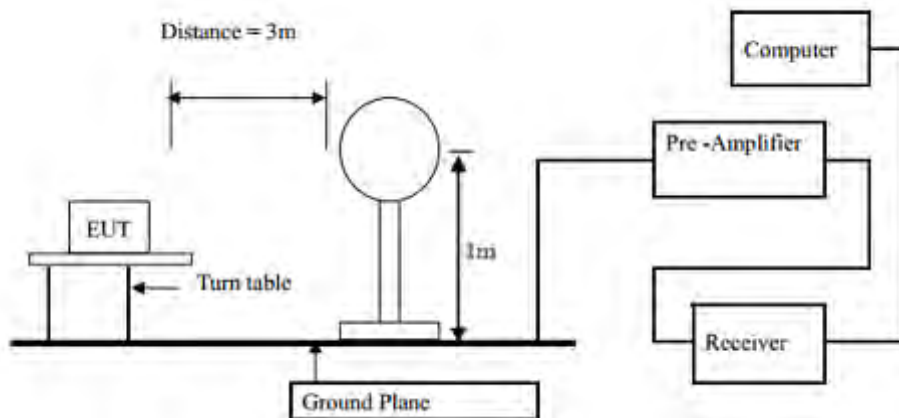
Table 6 – General field strength limits at frequencies below 30 MHz

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

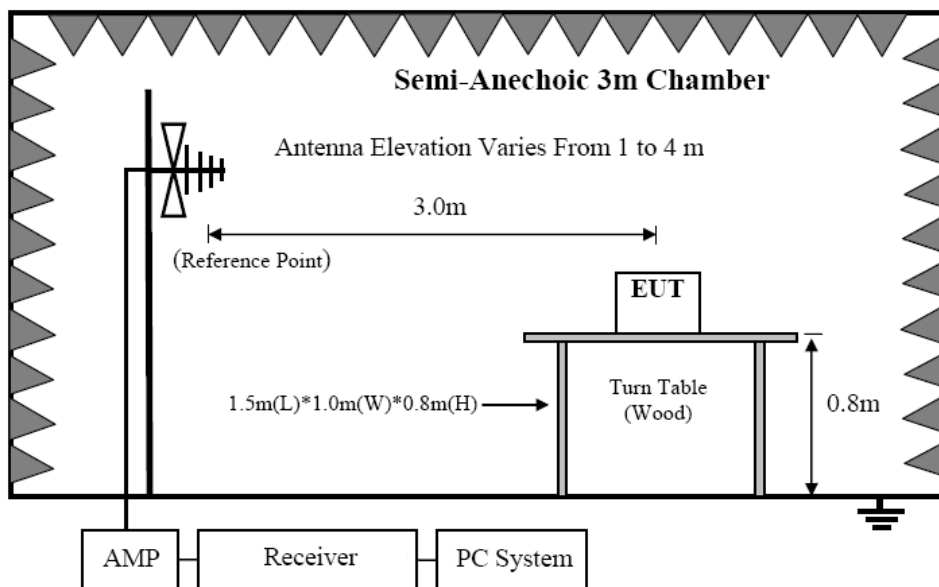
Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

8.2. Block Diagram of Test setup

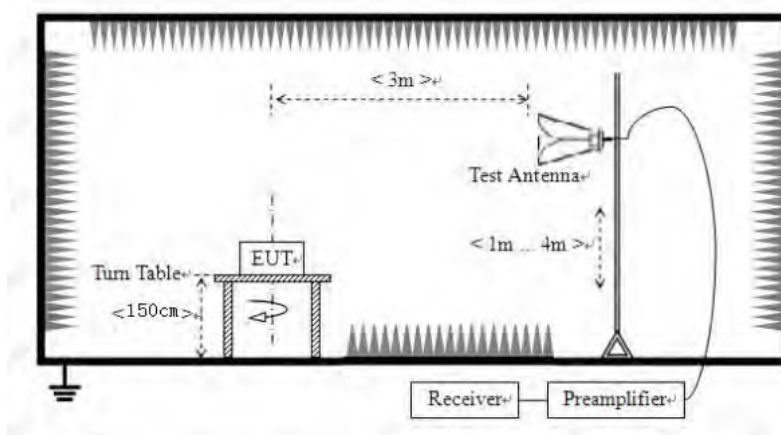
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



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
- (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

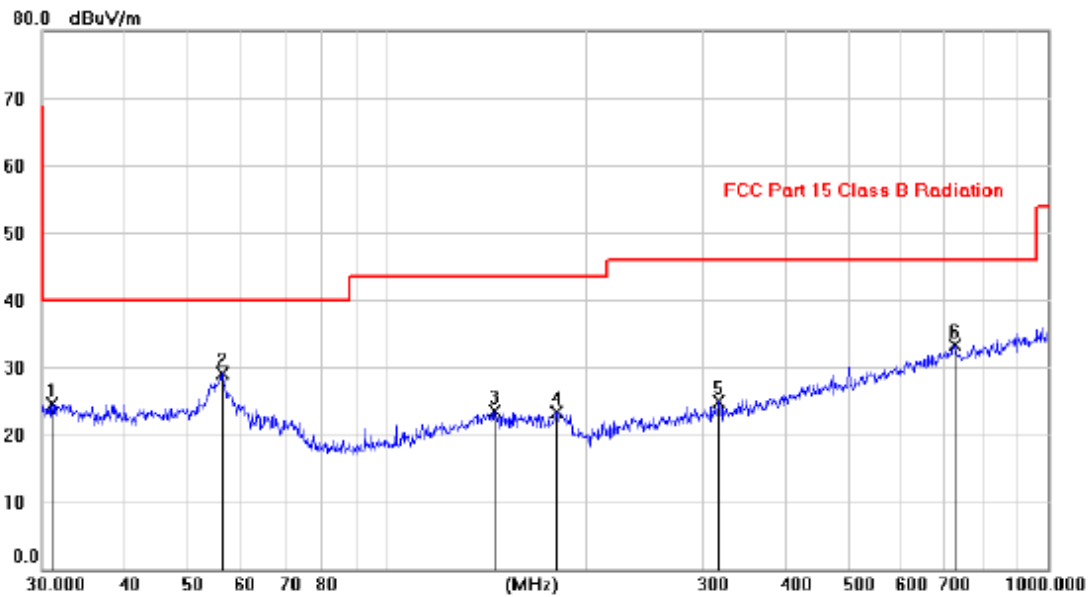
We have scanned from 9kHz to the 10th harmonic of the EUT's highest frequency. Detailed information please see the following page.

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

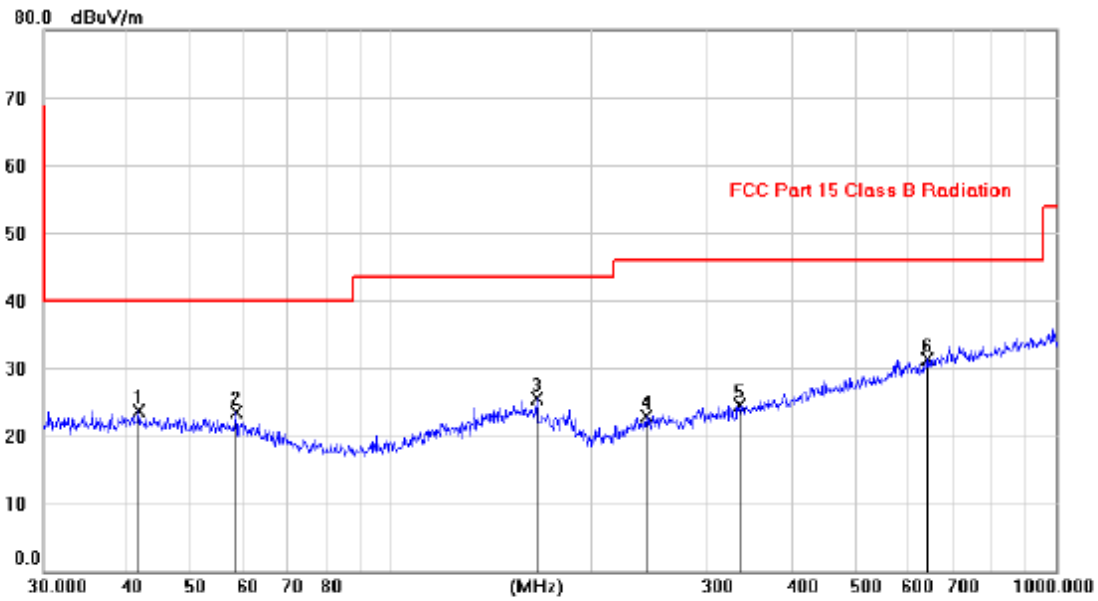
Vertical:



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		31.1797	11.00	13.59	24.59	40.00	-15.41	peak		
2	*	56.3487	15.53	13.51	29.04	40.00	-10.96	peak		
3		145.5545	8.73	14.73	23.46	43.50	-20.04	peak		
4		180.3745	10.72	12.63	23.35	43.50	-20.15	peak		
5		318.2585	10.32	14.58	24.90	46.00	-21.10	peak		
6		724.0071	11.30	22.07	33.37	46.00	-12.63	peak		

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		41.7228	9.36	14.35	23.71	40.00	-16.29	peak		
2		58.4689	10.13	13.33	23.46	40.00	-16.54	peak		
3		165.6222	10.98	14.50	25.48	43.50	-18.02	peak		
4		242.1853	10.29	12.60	22.89	46.00	-23.11	peak		
5		333.9208	9.53	14.92	24.45	46.00	-21.55	peak		
6	*	638.8911	10.26	20.96	31.22	46.00	-14.78	peak		

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 mode, Channel 2480MHz (AC 120V/ 60Hz) was listed in this report.

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	46.59	V	33.95	10.18	34.26	56.46	74	-17.54	PK
4804	34.49	V	33.95	10.18	34.26	44.36	54	-9.64	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	47.87	H	33.95	10.18	34.26	57.74	74	-16.26	PK
4804	34.40	H	33.95	10.18	34.26	44.27	54	-9.73	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX Mid									
4882	46.19	V	33.93	10.20	34.29	56.03	74	-17.97	PK
4882	35.95	V	33.93	10.20	34.29	45.79	54	-8.21	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	47.14	H	33.93	10.20	34.29	56.98	74	-17.02	PK
4882	34.28	H	33.93	10.20	34.29	44.12	54	-9.88	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX High									
4960	48.91	V	33.98	10.22	34.25	58.86	74	-15.14	PK
4960	35.53	V	33.98	10.22	34.25	45.48	54	-8.52	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	46.02	H	33.98	10.22	34.25	55.97	74	-18.03	PK
4960	34.99	H	33.98	10.22	34.25	44.94	54	-9.06	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.

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	46.78	V	33.95	10.18	34.26	56.65	74	-17.35	PK
4804	34.51	V	33.95	10.18	34.26	44.38	54	-9.62	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	48.12	H	33.95	10.18	34.26	57.99	74	-16.01	PK
4804	34.94	H	33.95	10.18	34.26	44.81	54	-9.19	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX Mid									
4882	45.89	V	33.93	10.20	34.29	55.73	74	-18.27	PK
4882	36.16	V	33.93	10.20	34.29	46.00	54	-8.00	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	47.55	H	33.93	10.20	34.29	57.39	74	-16.61	PK
4882	34.91	H	33.93	10.20	34.29	44.75	54	-9.25	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX High									
4960	48.47	V	33.98	10.22	34.25	58.42	74	-15.58	PK
4960	35.22	V	33.98	10.22	34.25	45.17	54	-8.83	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	46.68	H	33.98	10.22	34.25	56.63	74	-17.37	PK
4960	34.30	H	33.98	10.22	34.25	44.25	54	-9.75	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.

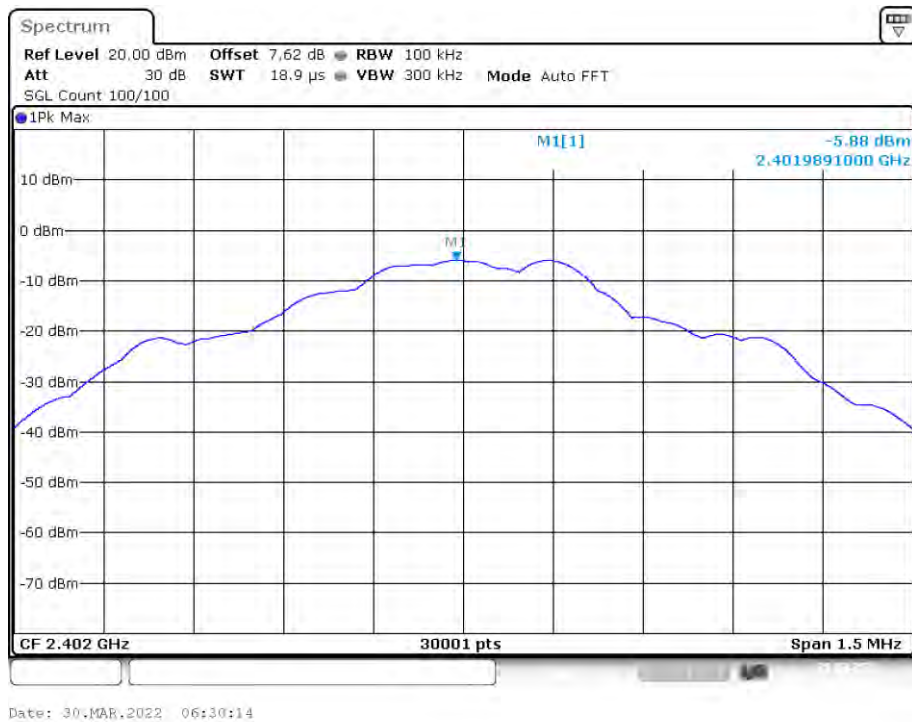
Note:

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

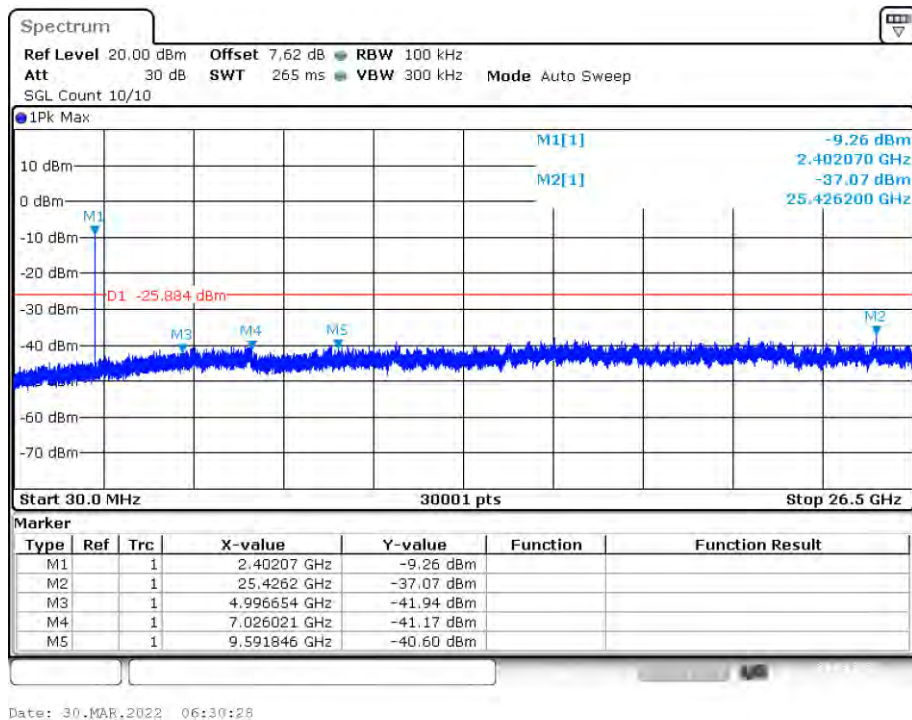
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Conducted RF Spurious Emission

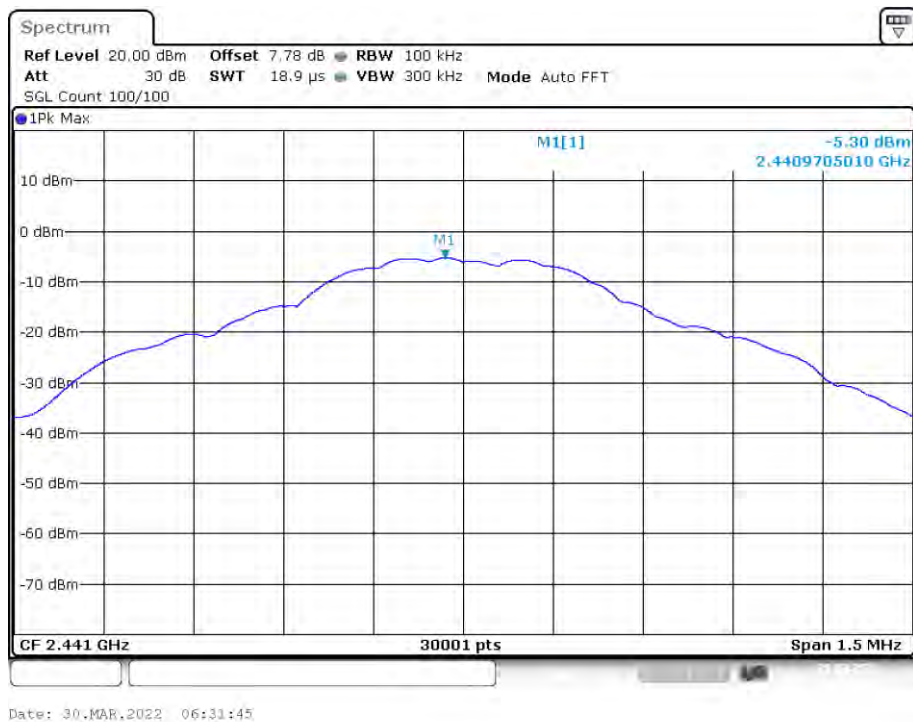
Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Ref



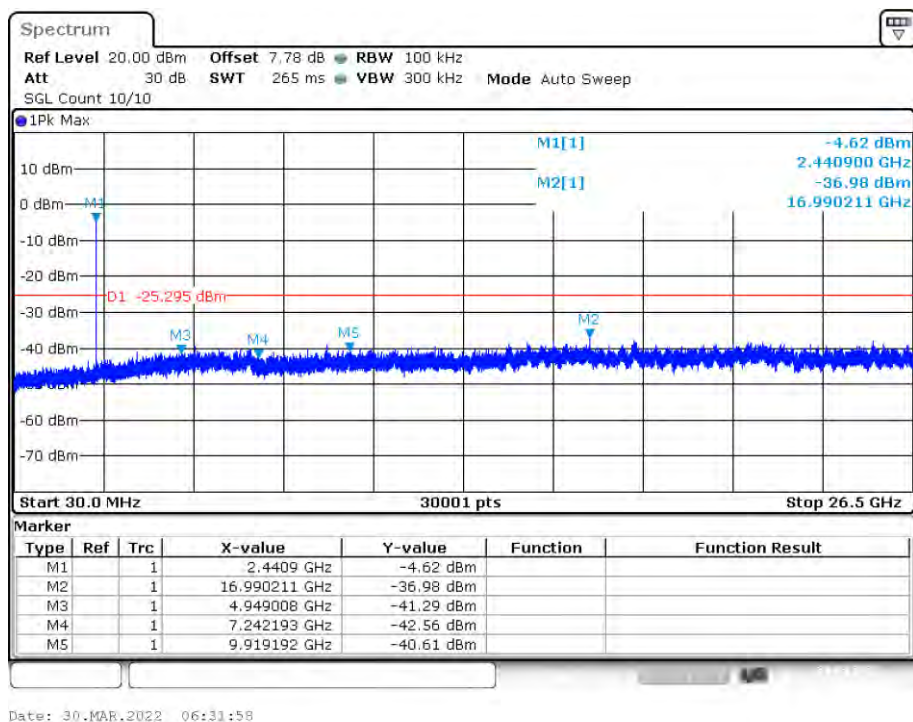
Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission



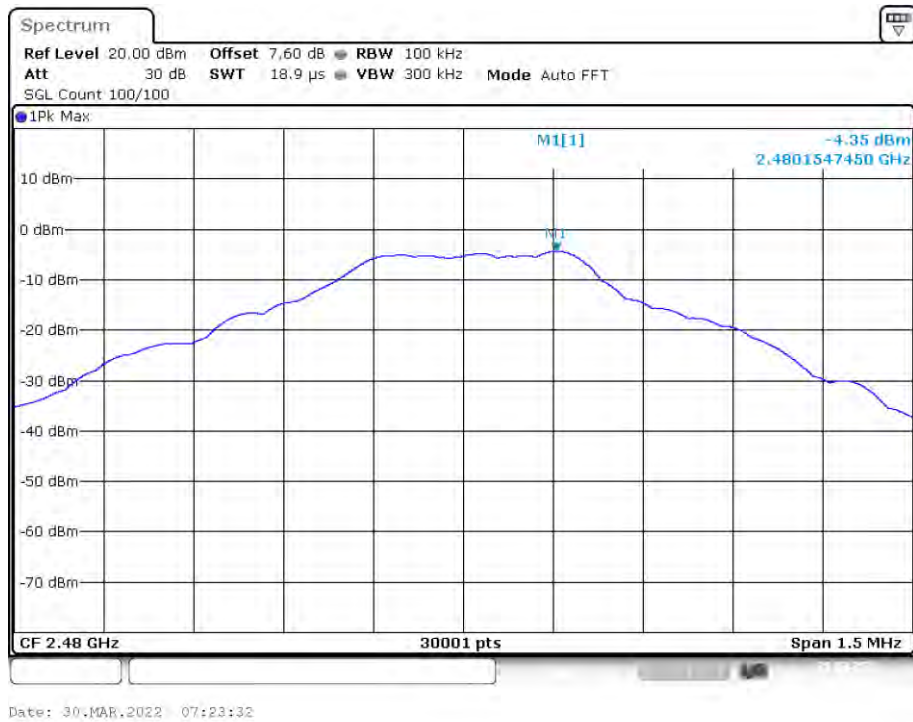
Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Ref



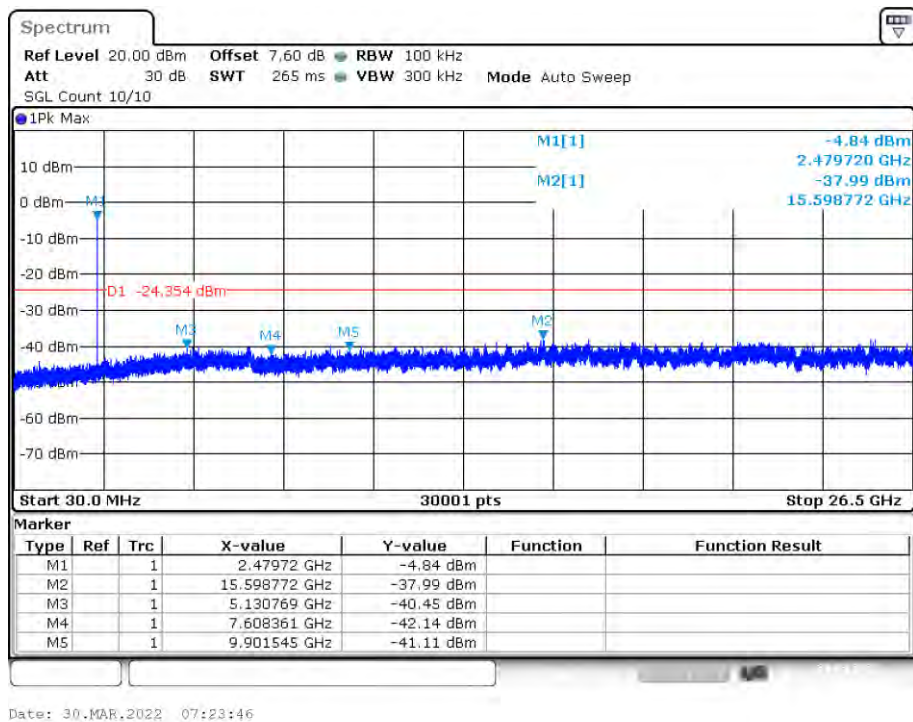
Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission



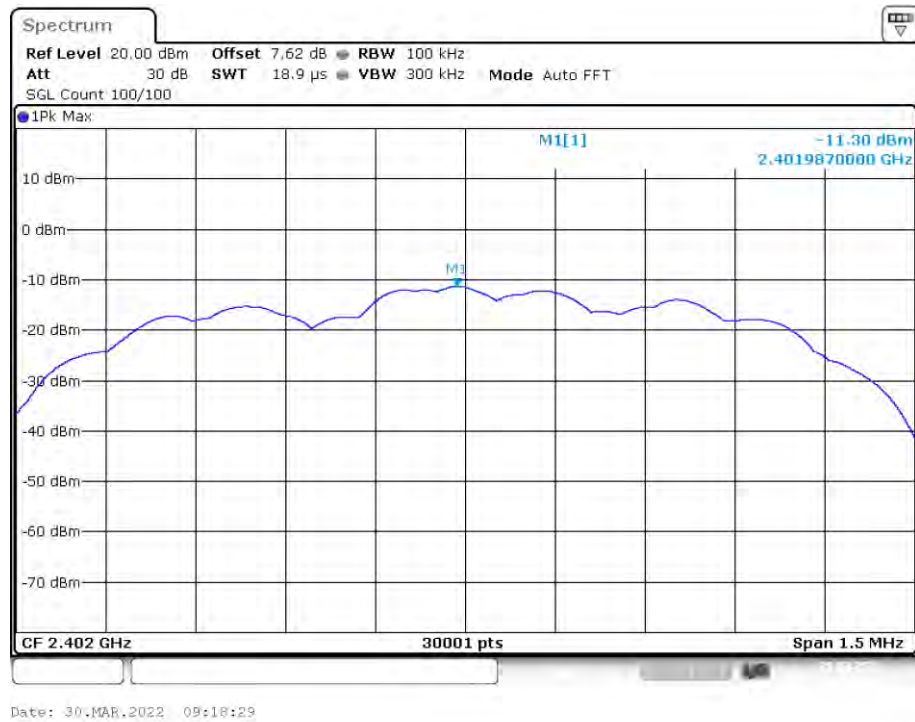
Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Ref



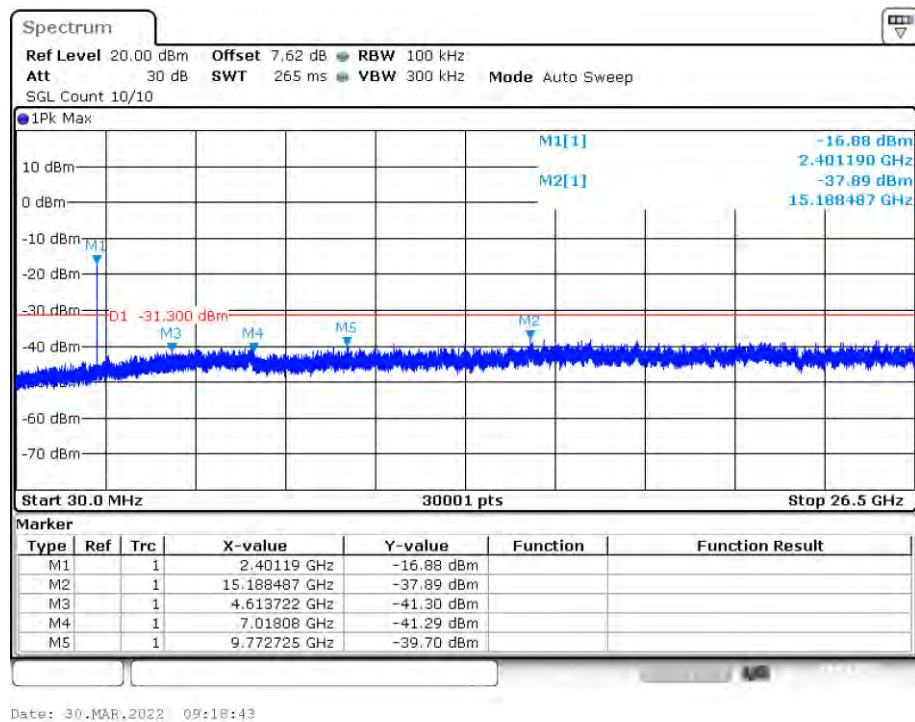
Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission



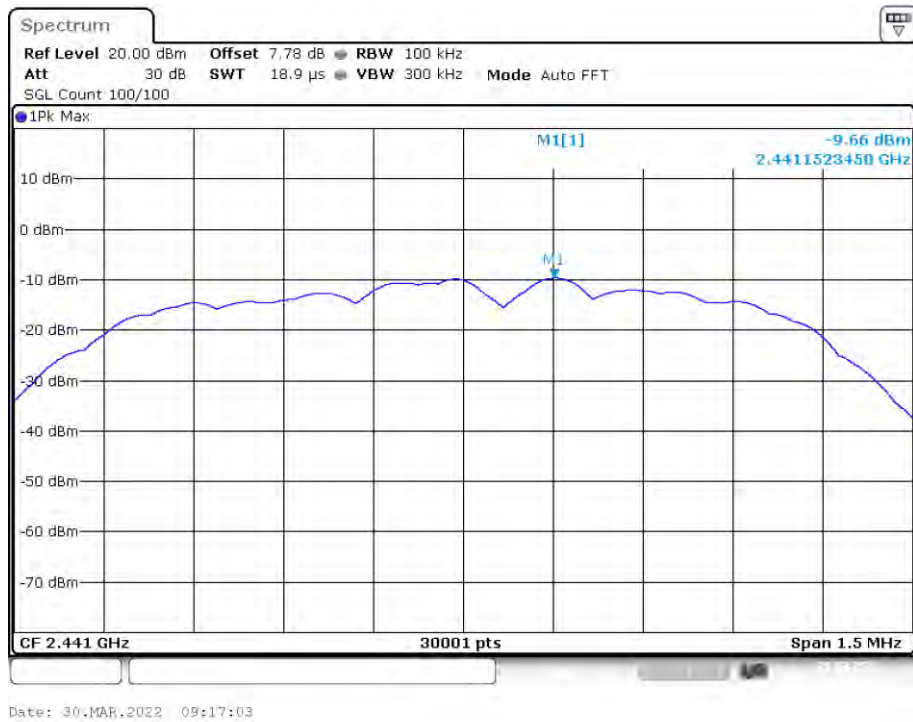
Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Ref



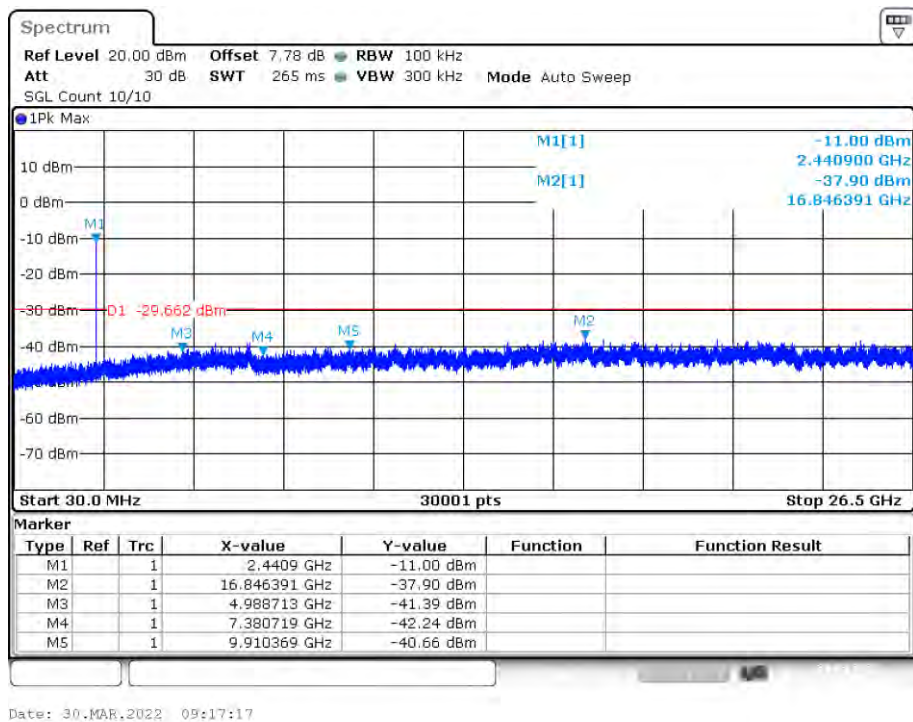
Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission



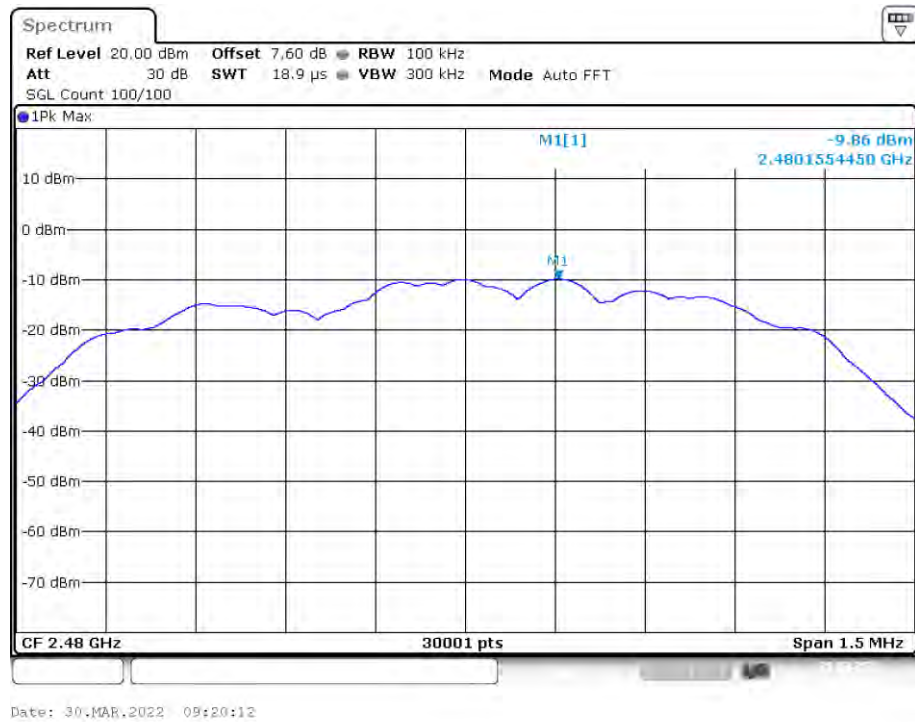
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Ref



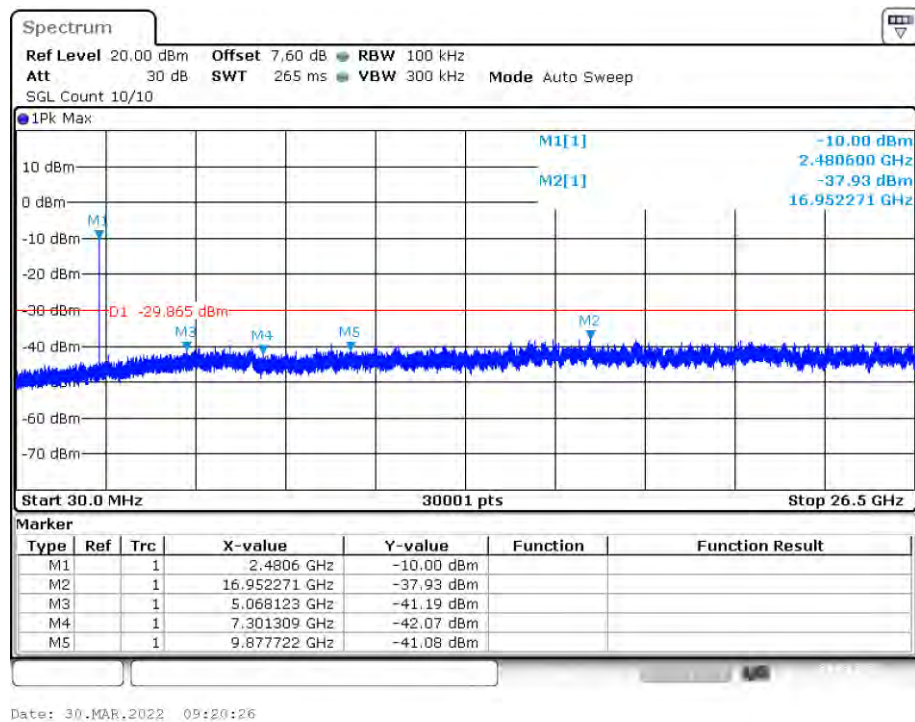
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission



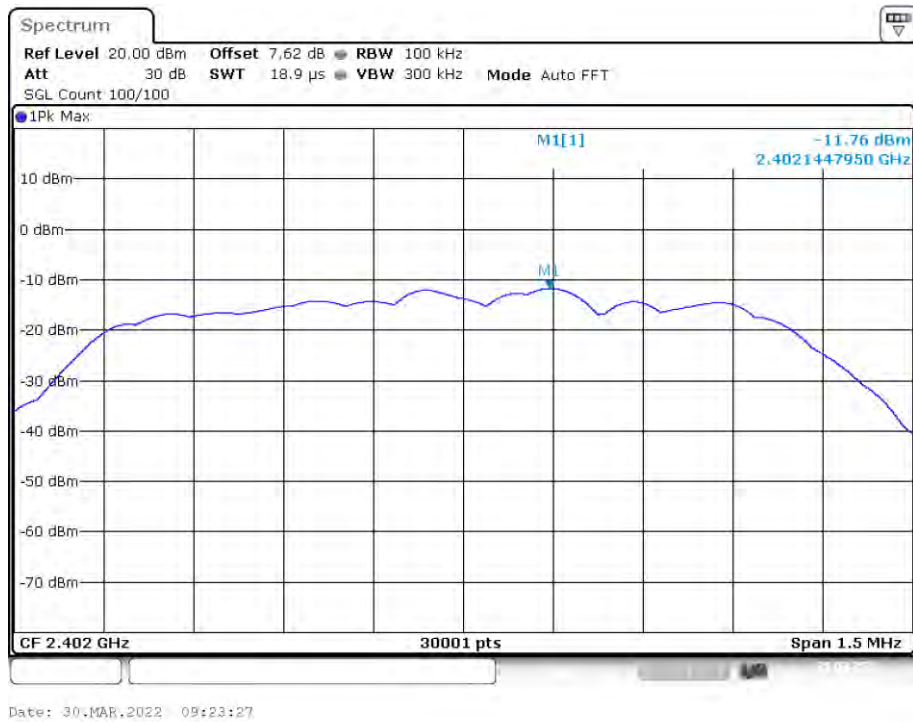
Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Ref



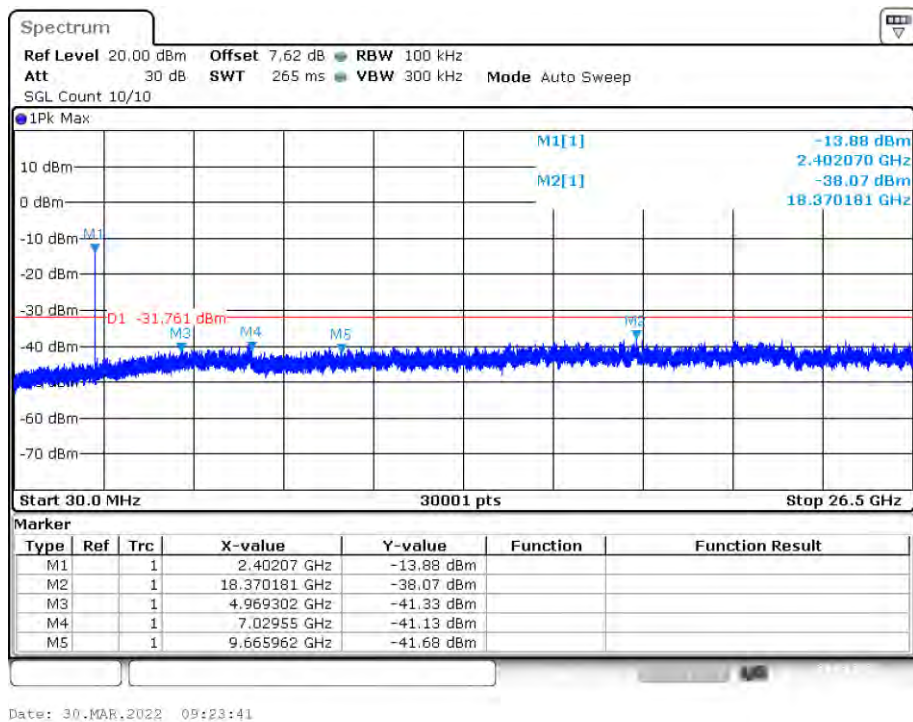
Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission



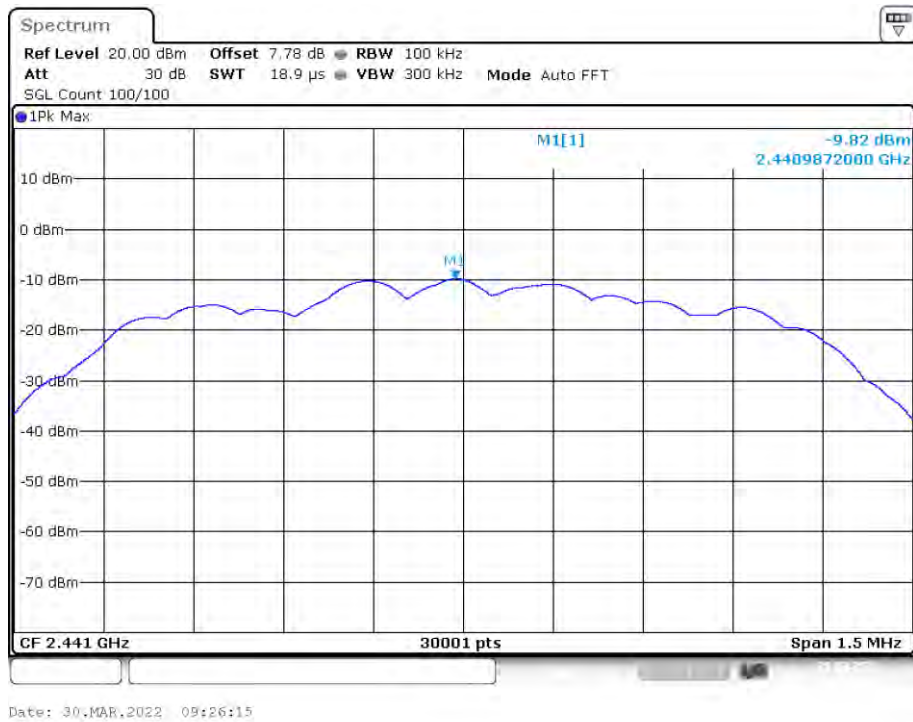
Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Ref



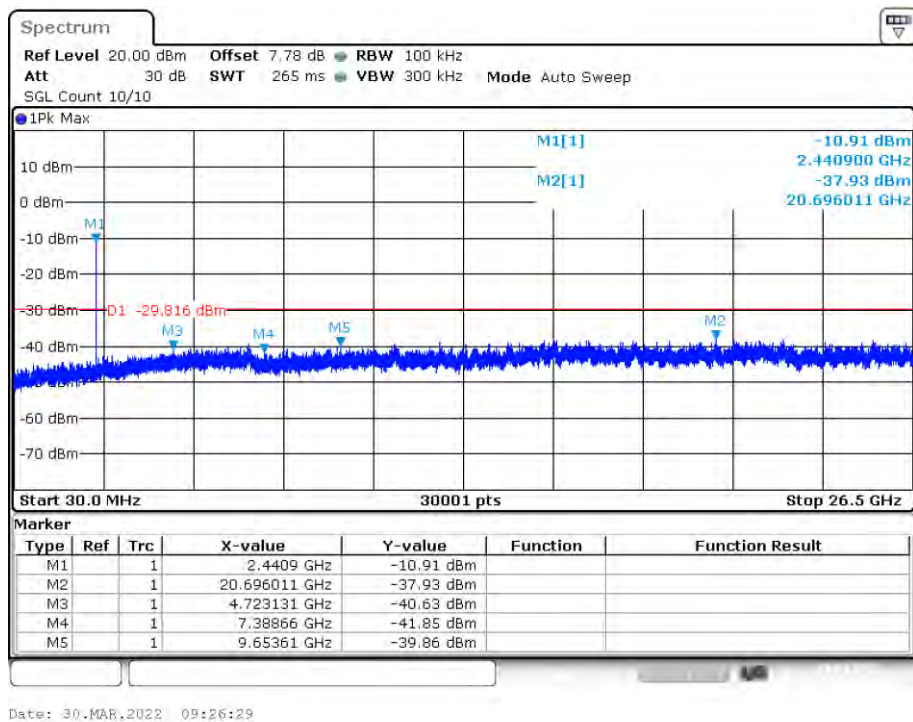
Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission



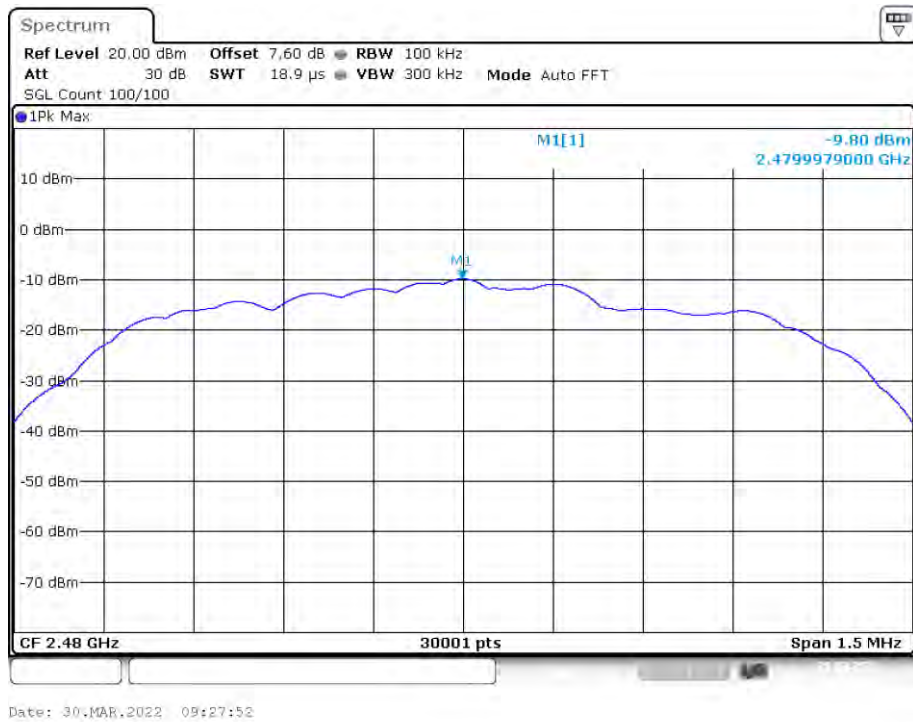
Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Ref



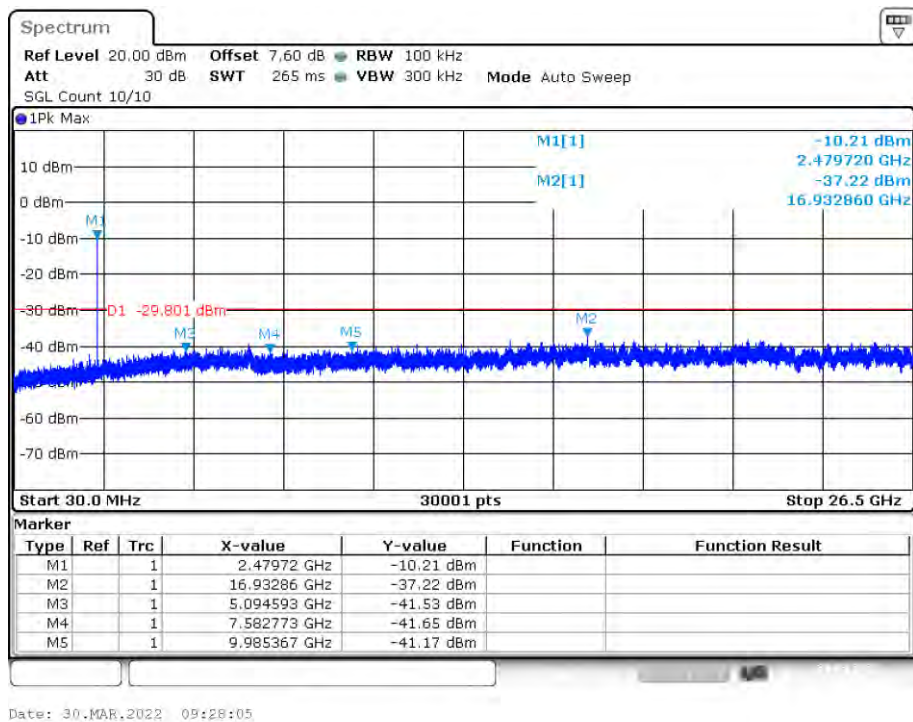
Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission



Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Ref



Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



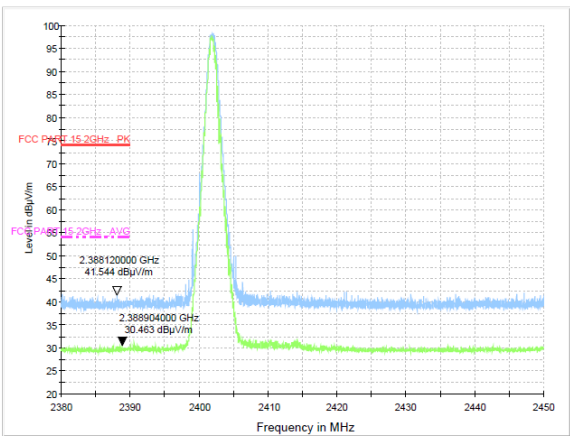
Pass. (See below detailed test data)

Radiated Method:

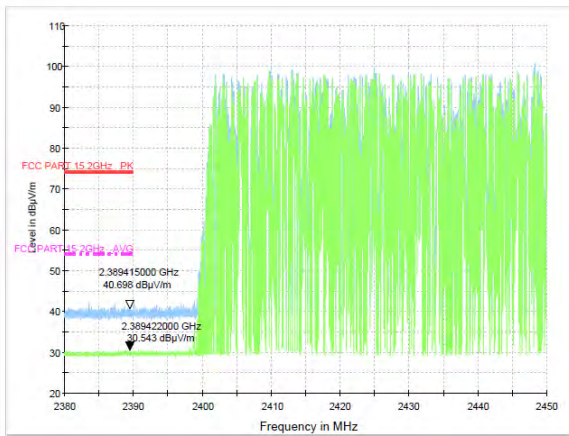
GFSK Mode:

Test channel:

Lowest channel



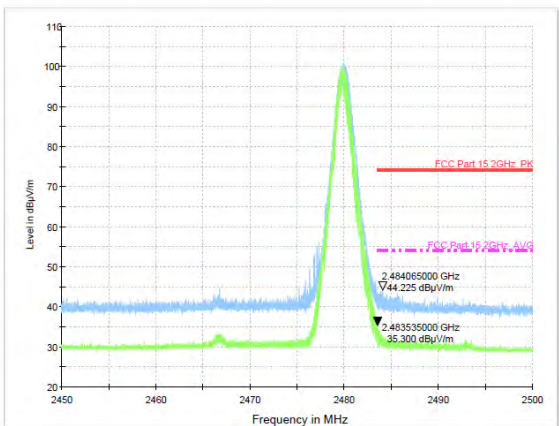
No-hopping mode



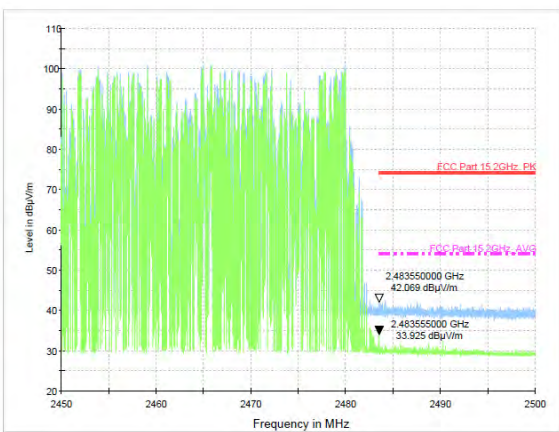
Hopping mode

Test channel:

Highest channel



No-hopping mode

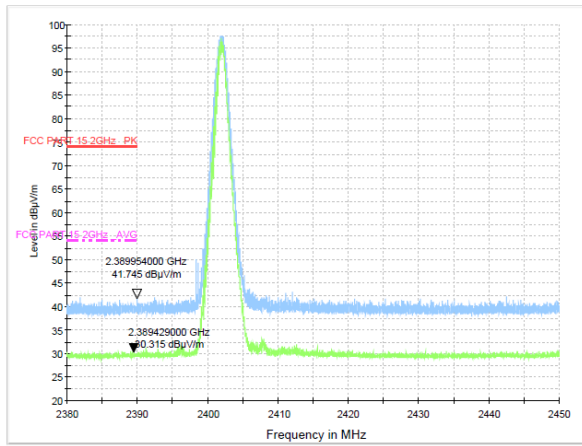


Hopping mode

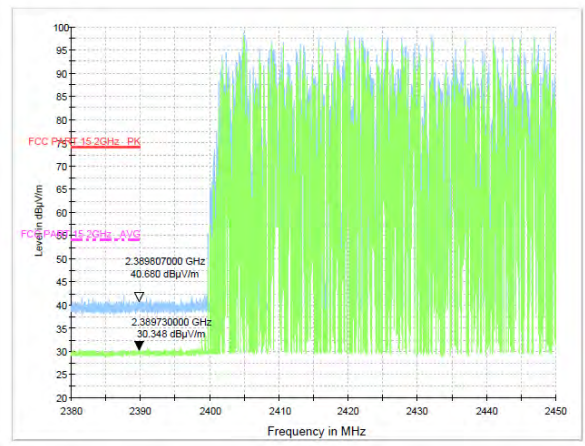
$\pi/4$ DQPSK Mode:

Test channel:

Lowest channel



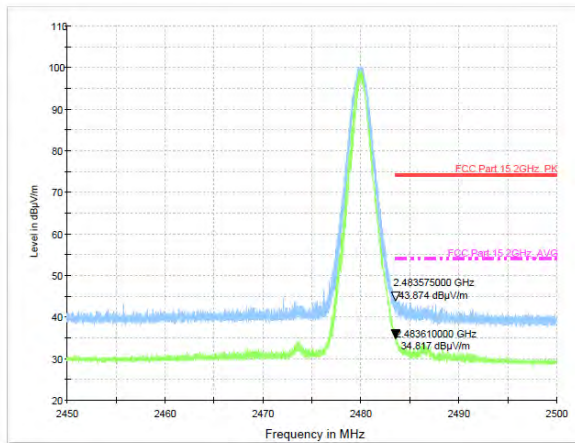
No-hopping mode



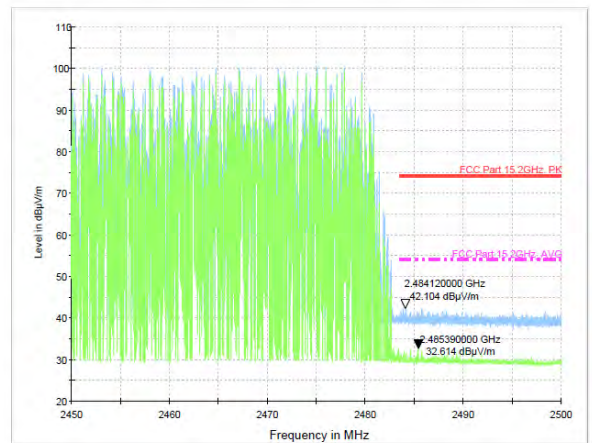
Hopping mode

Test channel:

Highest channel



No-hopping mode



Hopping mode