



FCC TEST REPORT

FCC ID: SY4-A02051

On Behalf of

Shanghai Huace Navigation Technology Ltd.

Geodetic GNSS Receiver

Model No.: i76

Prepared for : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, 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 : A2404066-C01-R02
Date of Receipt : April 15, 2024
Date of Test : April 15, 2024 - May 15, 2024
Date of Report : May 15, 2024
Version Number : V0
Test Result : Pass

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TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China
Manufacturer : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China
EUT Description : Geodetic GNSS Receiver
(A) Model No. : i76
(B) Trademark : 

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

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.

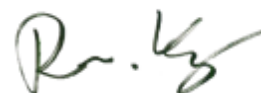
After the test, our opinion is that EUT compliance with the requirement of the above standards.

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).....: Reak Yang
Project Manager



Date of issue.....: May 15, 2024

Revision History

Revision	Issue Date	Revisions	Revised By
V0	May 15, 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	: i76
Diff	: N/A
Power supply	: DC 7.2V by battery, DC 5V from adapter
Radio Technology	: Bluetooth V4.2 EDR
Operation frequency	: 2402-2480MHz
Channel No.	: 79 Channels
Channel spacing	: 1MHz
Modulation type	: GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna Type	: Internal antenna, Maximum Gain is 0dBi. Antenna information is provided by applicant.
Software version	: V1.0
Hardware version	: V1.0
Connector cable loss	: N/A
Intend use environment	: Residential, commercial and light industrial environment

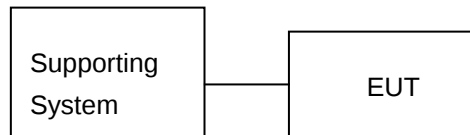
2.2. Accessories of Device (EUT)

Accessories : AC Adapter
 Manufacturer : EDACPOWER ELEC.
 Model : EA1012AVRU-050
 INPUT : 100-240Vac, 1.0A 50-60Hz
 OUTPUT : 5.0V = 2.4A, 12.0W

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1.	--	--	--	--	--

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 :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
$\pi/4$ DQPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
8DPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	24°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

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	2022.05.17	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2023.08.16	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2023.08.16	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-10 2082-Wa	2023.08.16	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2023.08.16	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	1Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	1Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	1Year
RF Cable	Resenberger	Cable 1	/	RE1	2023.08.16	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2023.08.16	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2023.08.16	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2023.08.16	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2023.08.16	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2023.08.16	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2023.08.16	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	1Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2023.08.16	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2023.08.16	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2023.08.16	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205-01	2023.07.25	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2023.08.16	1 Year
Adjustable attenuator	MWRFTtest	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

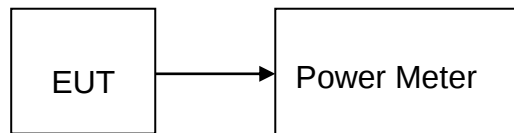
Please refer section 15.247 & RSS-247

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 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)	EIRP (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	Ant1	6.054	6.054	21	Pass
NVNT	1-DH1	2441	Ant1	5.801	5.801	21	Pass
NVNT	1-DH1	2480	Ant1	4.745	4.745	21	Pass
NVNT	1-DH3	2441	Ant1	3.898	3.898	21	Pass
NVNT	1-DH5	2441	Ant1	4.19	4.19	21	Pass
NVNT	2-DH1	2402	Ant1	4.576	4.576	21	Pass
NVNT	2-DH1	2441	Ant1	3.702	3.702	21	Pass
NVNT	2-DH1	2480	Ant1	3.149	3.149	21	Pass
NVNT	2-DH3	2441	Ant1	3.937	3.937	21	Pass
NVNT	2-DH5	2441	Ant1	4.233	4.233	21	Pass
NVNT	3-DH1	2402	Ant1	5.763	5.763	21	Pass
NVNT	3-DH1	2441	Ant1	4.562	4.562	21	Pass
NVNT	3-DH1	2480	Ant1	3.856	3.856	21	Pass
NVNT	3-DH3	2441	Ant1	4.706	4.706	21	Pass
NVNT	3-DH5	2441	Ant1	4.76	4.76	21	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..

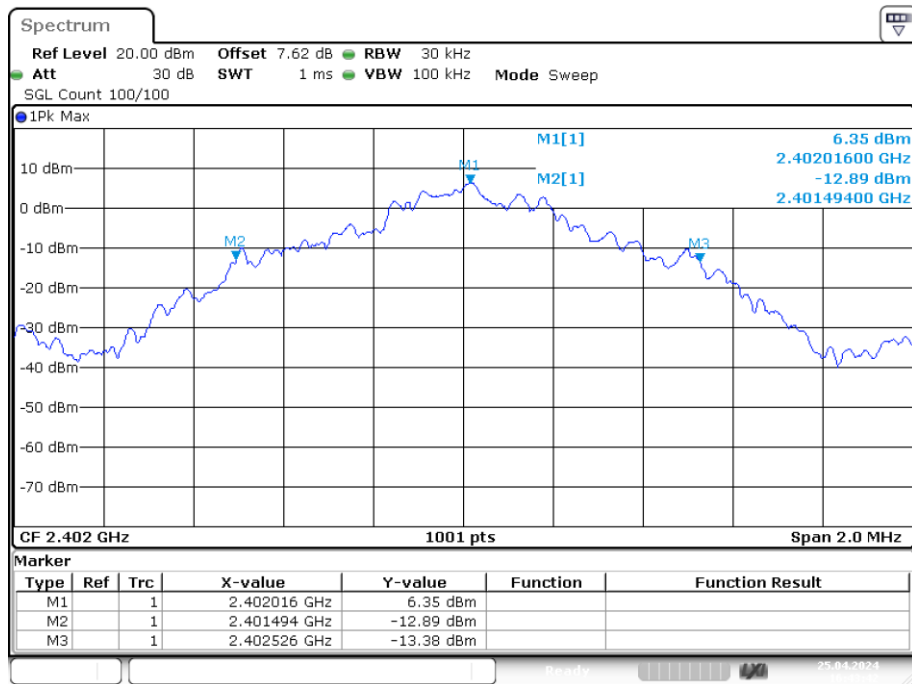
4.2. Test Procedure

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.

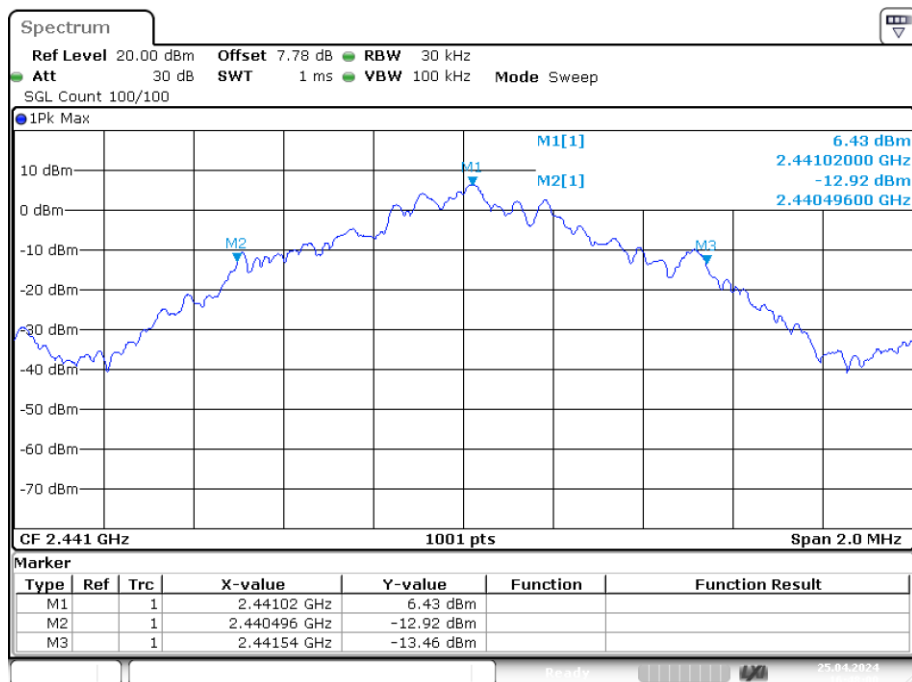
4.3. Test Result

-20dB Bandwidth

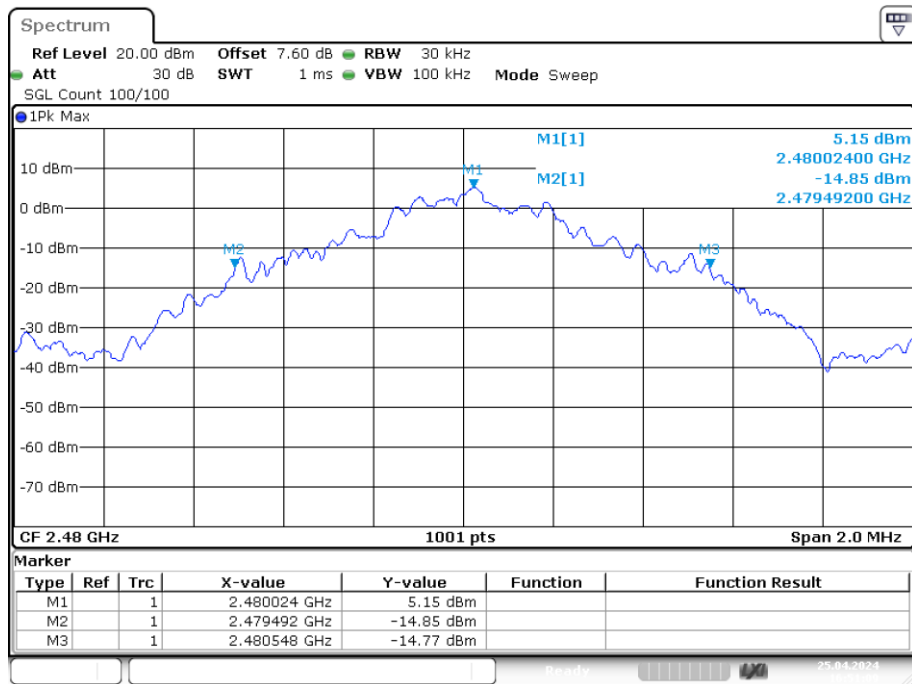
Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant1	1.032	0	Pass
NVNT	1-DH1	2441	Ant1	1.044	0	Pass
NVNT	1-DH1	2480	Ant1	1.056	0	Pass
NVNT	2-DH1	2402	Ant1	1.332	0	Pass
NVNT	2-DH1	2441	Ant1	1.322	0	Pass
NVNT	2-DH1	2480	Ant1	1.302	0	Pass
NVNT	3-DH1	2402	Ant1	1.262	0	Pass
NVNT	3-DH1	2441	Ant1	1.262	0	Pass
NVNT	3-DH1	2480	Ant1	1.284	0	Pass

-20dB Bandwidth NVNT 1-DH1 2402MHz Ant1

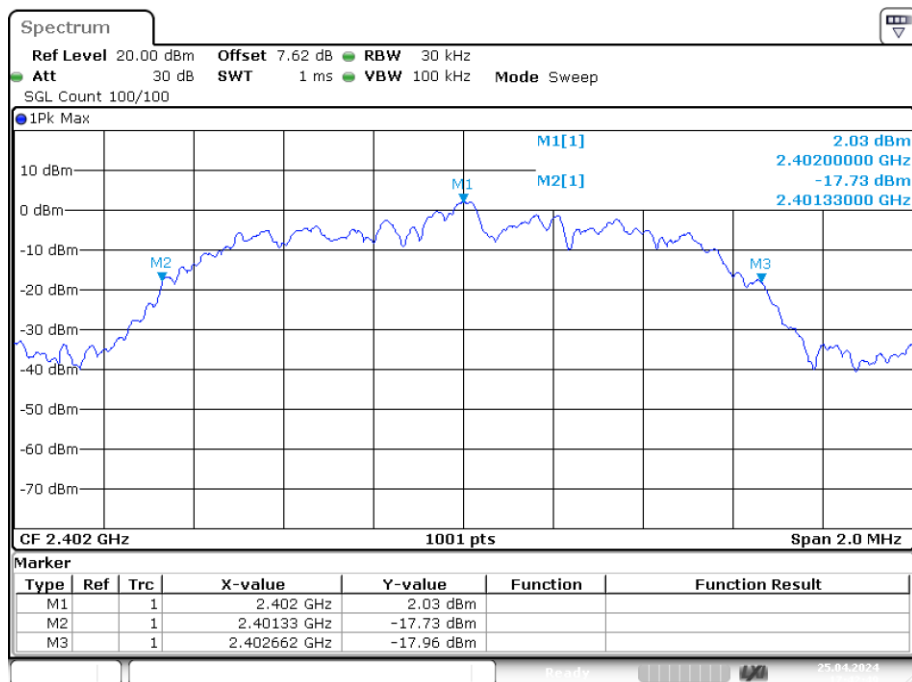
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-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1

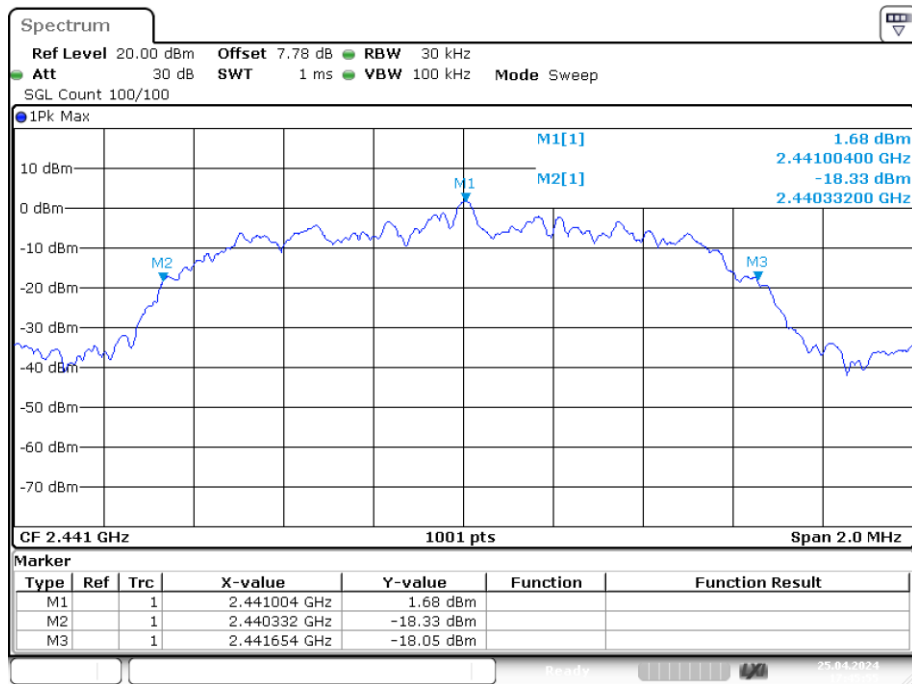
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-20dB Bandwidth NVNT 1-DH1 2480MHz Ant1

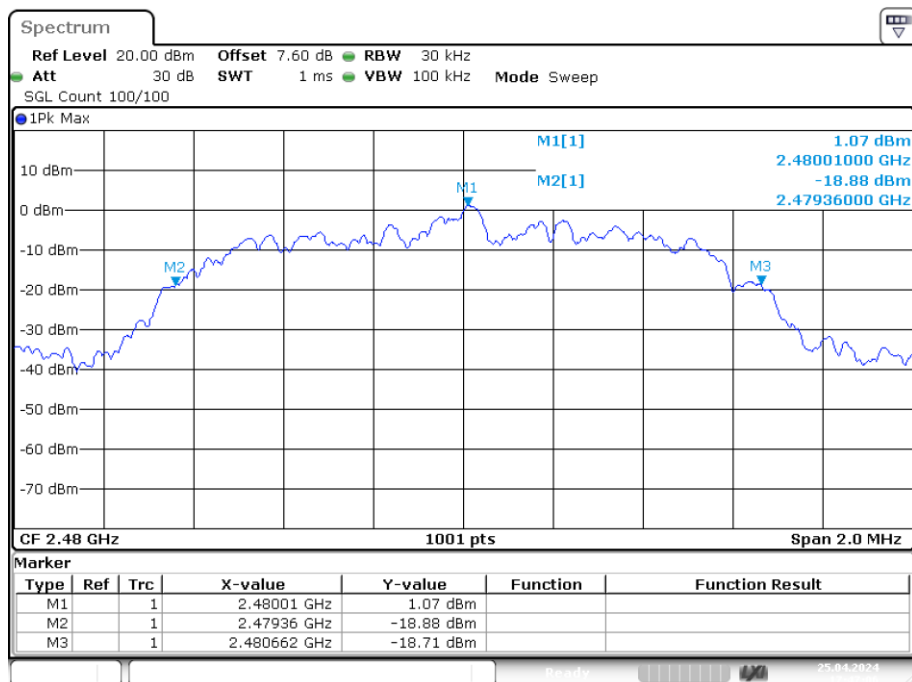
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-20dB Bandwidth NVNT 2-DH1 2402MHz Ant1

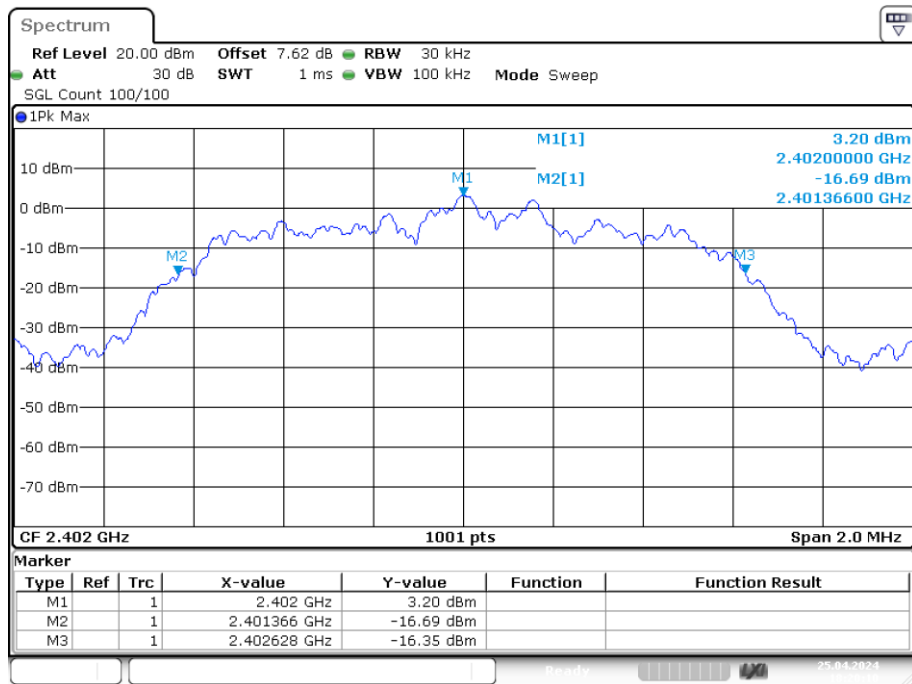
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-20dB Bandwidth NVNT 2-DH1 2441MHz Ant1

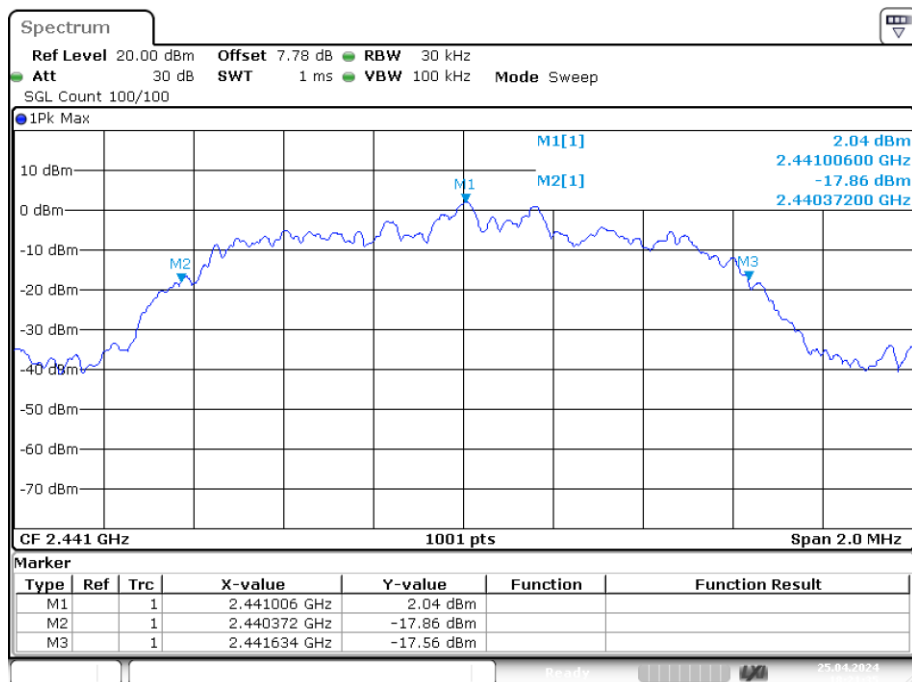
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-20dB Bandwidth NVNT 2-DH1 2480MHz Ant1

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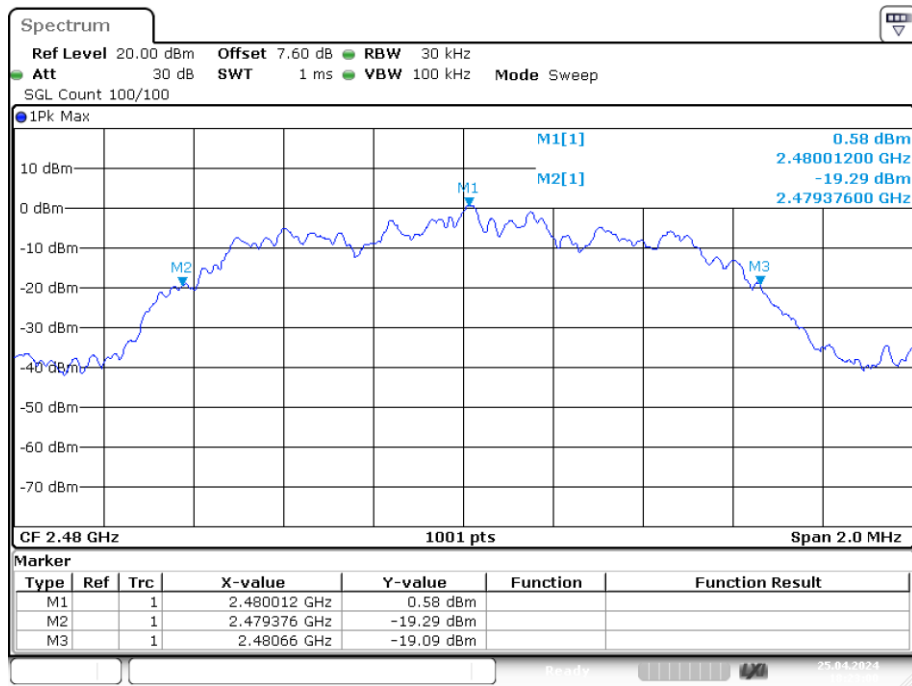
-20dB Bandwidth NVNT 3-DH1 2402MHz Ant1

Date: 25.APR.2024 18:20:10

-20dB Bandwidth NVNT 3-DH1 2441MHz Ant1

Date: 25.APR.2024 18:21:35

-20dB Bandwidth NVNT 3-DH1 2480MHz Ant1

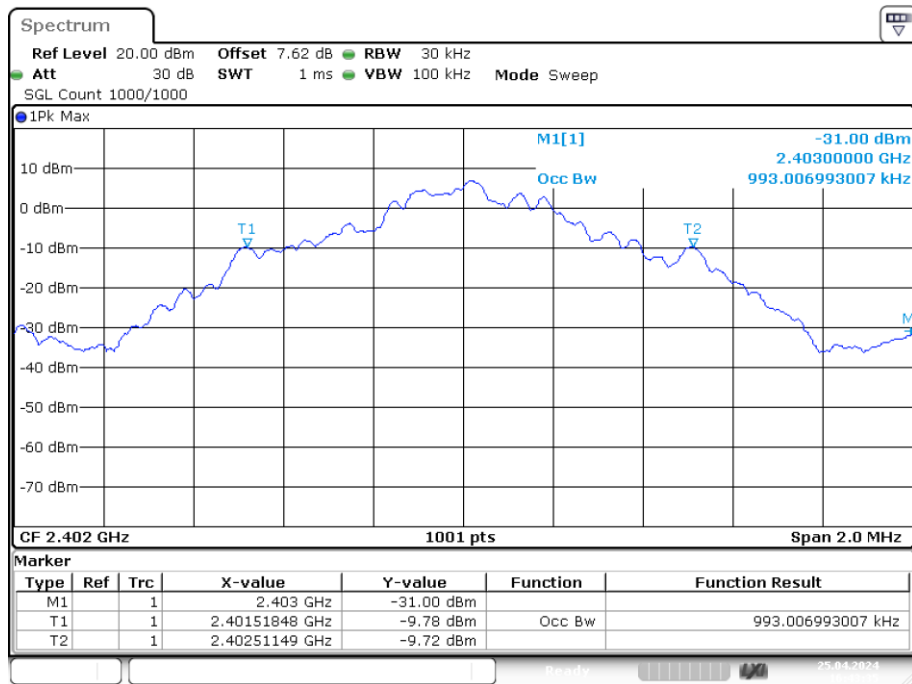


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Occupied Channel Bandwidth

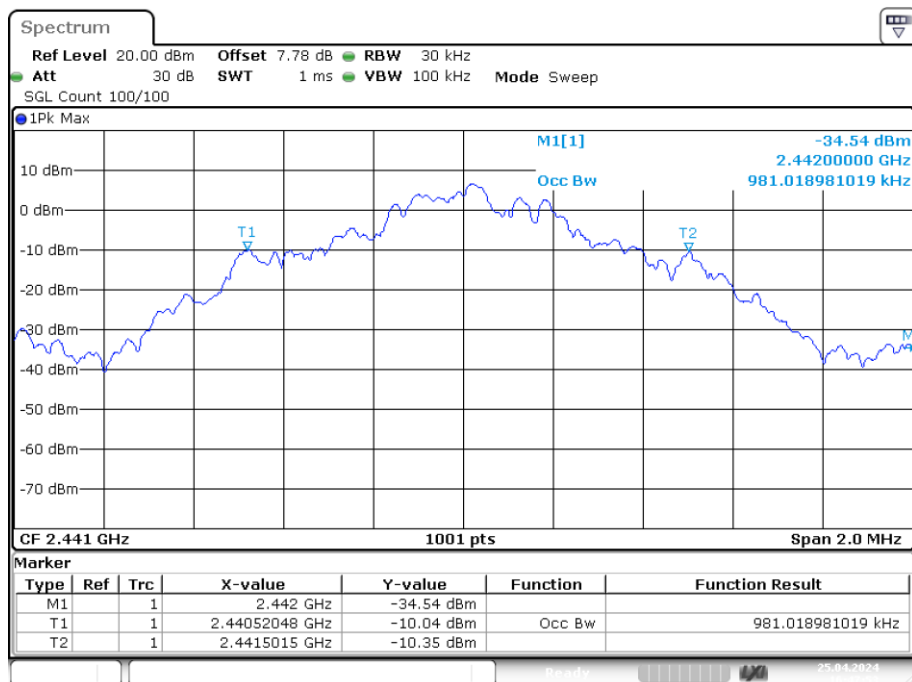
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH1	2402	Ant1	0.993
NVNT	1-DH1	2441	Ant1	0.981
NVNT	1-DH1	2480	Ant1	0.981
NVNT	2-DH1	2402	Ant1	1.193
NVNT	2-DH1	2441	Ant1	1.187
NVNT	2-DH1	2480	Ant1	1.199
NVNT	3-DH1	2402	Ant1	1.177
NVNT	3-DH1	2441	Ant1	1.179
NVNT	3-DH1	2480	Ant1	1.187

OBW NVNT 1-DH1 2402MHz Ant1



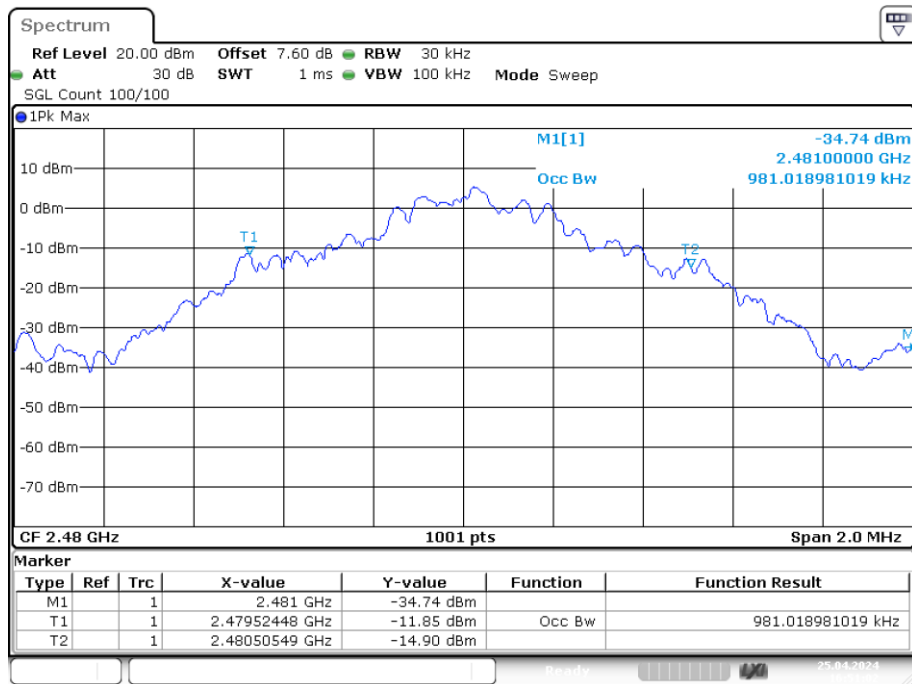
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OBW NVNT 1-DH1 2441MHz Ant1



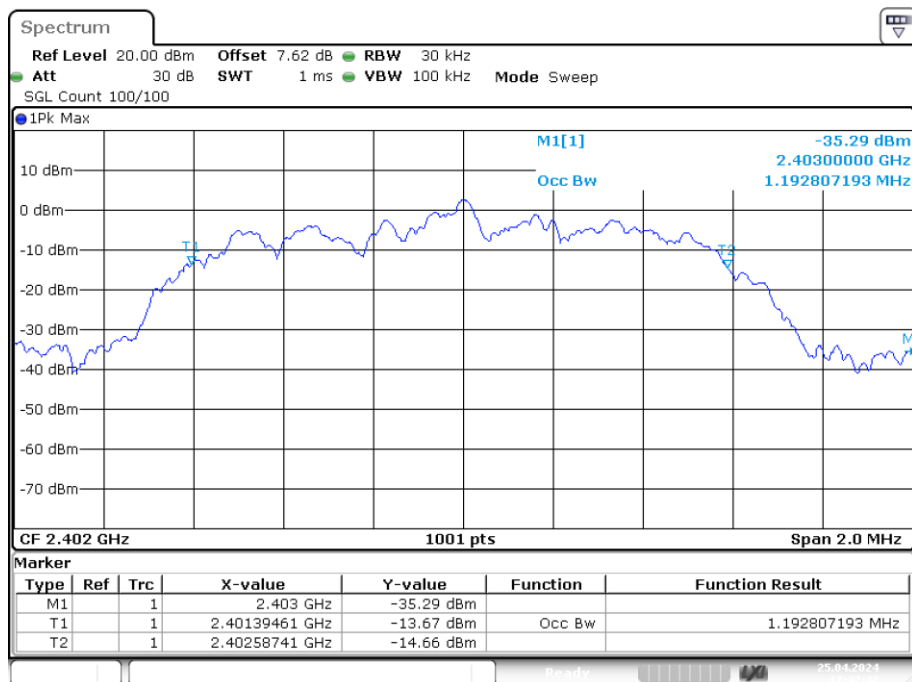
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OBW NVNT 1-DH1 2480MHz Ant1



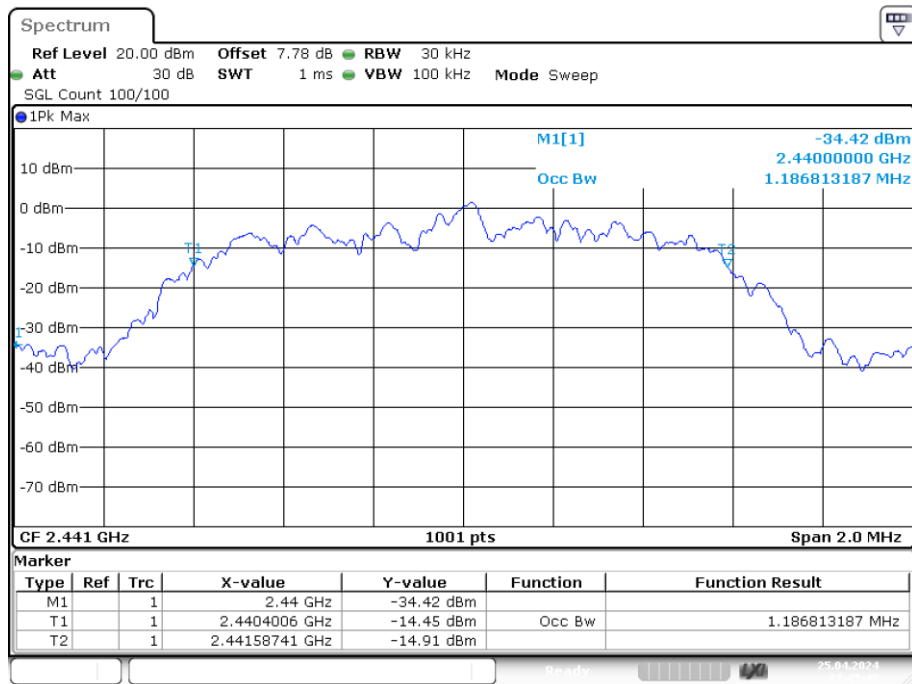
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OBW NVNT 2-DH1 2402MHz Ant1



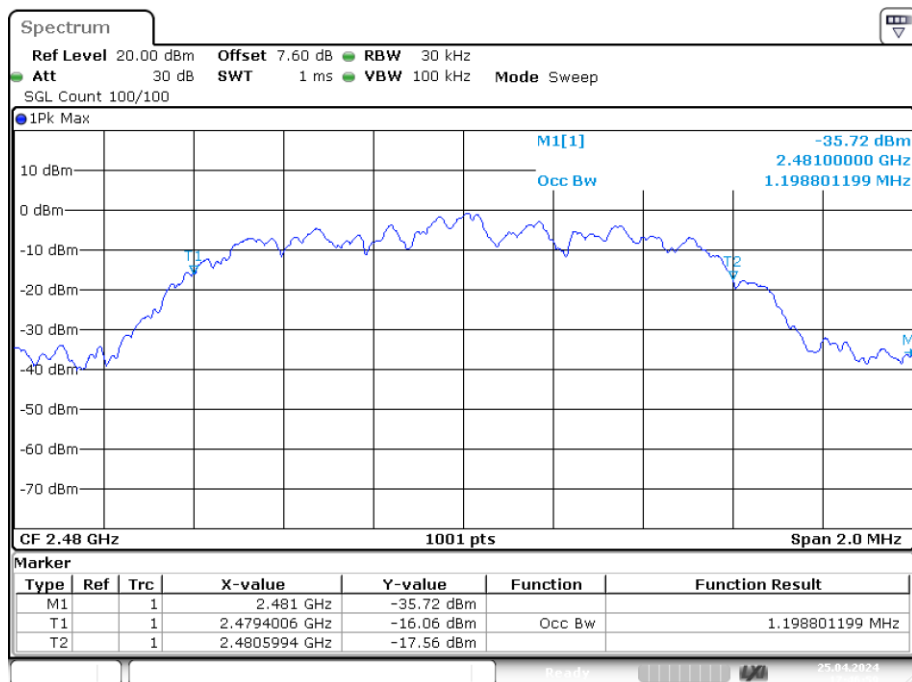
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OBW NVNT 2-DH1 2441MHz Ant1



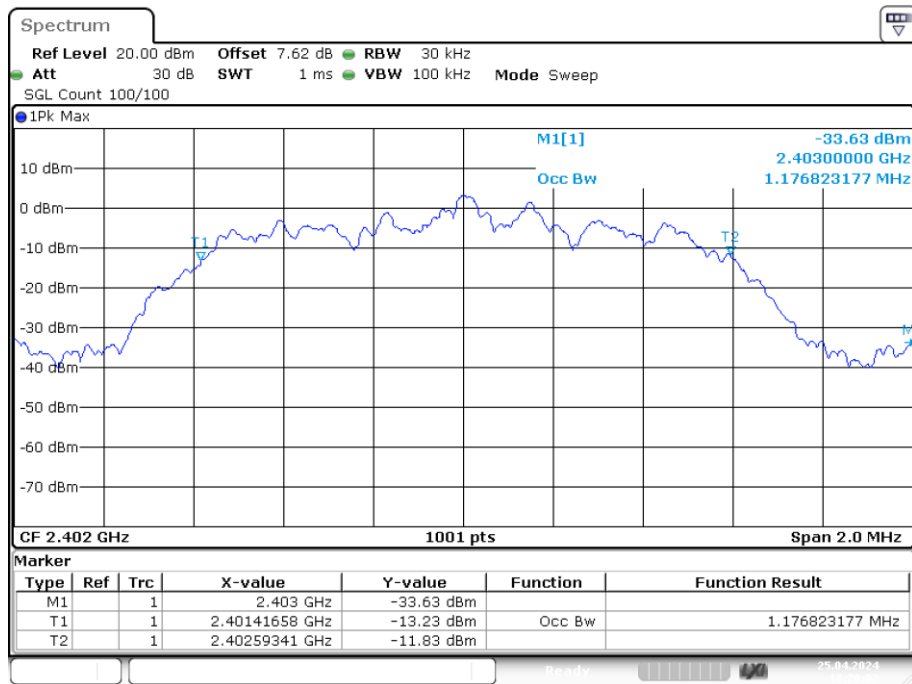
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OBW NVNT 2-DH1 2480MHz Ant1



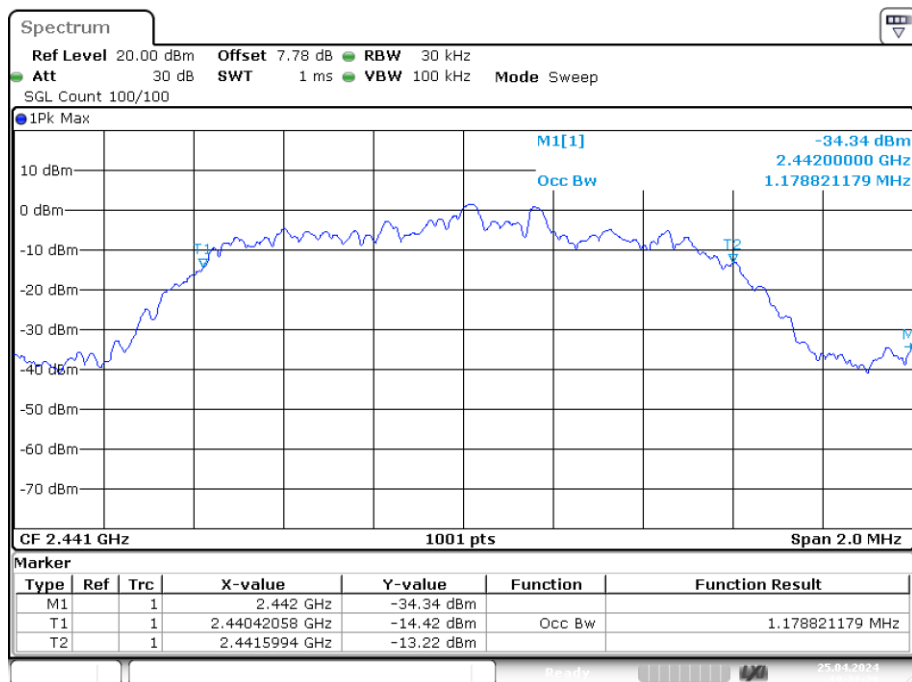
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OBW NVNT 3-DH1 2402MHz Ant1



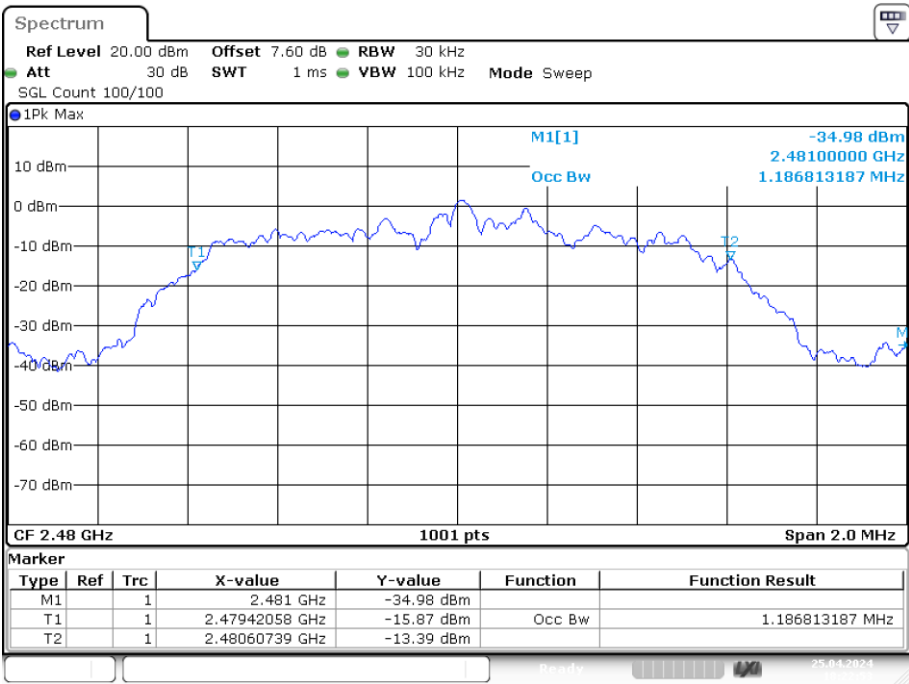
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OBW NVNT 3-DH1 2441MHz Ant1



Date: 25.APR.2024 18:21:28

OBW NVNT 3-DH1 2480MHz Ant1



Date: 25.APR.2024 18:22:52

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

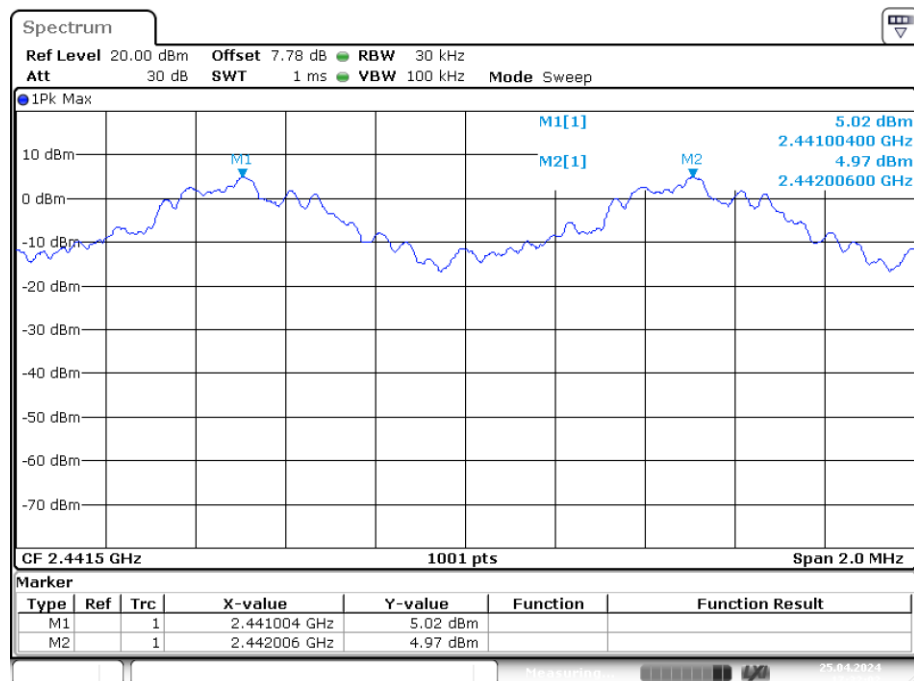
5.2. Test Procedure

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

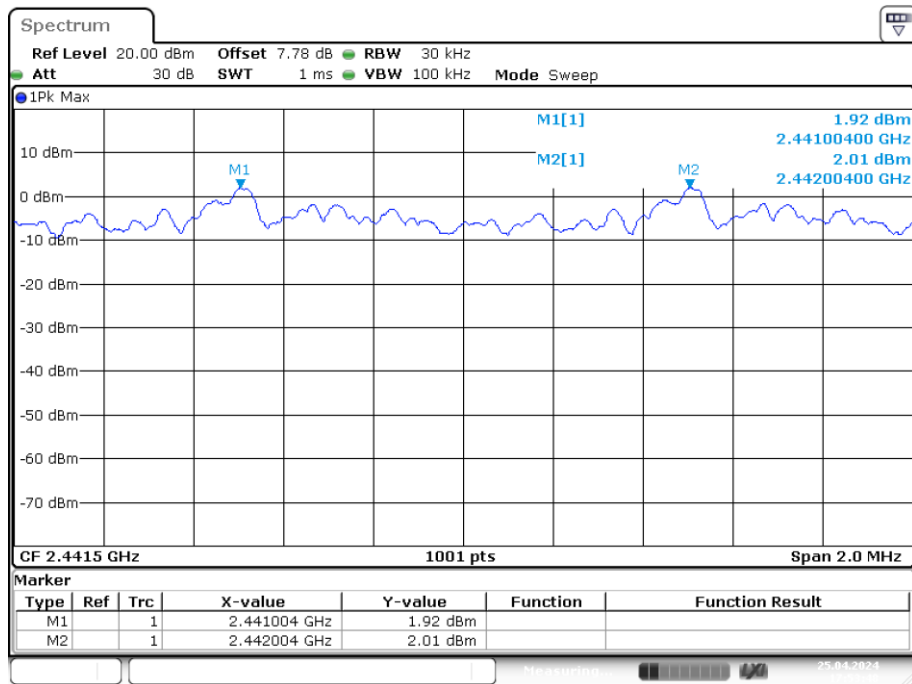
Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	Ant1	2441.004	2442.006	1.002	0.327	Pass
NVNT	2-DH1	Ant1	2441.004	2442.004	1	0.881	Pass
NVNT	3-DH1	Ant1	2441.004	2442.004	1	0.841	Pass

CFS NVNT 1-DH1 2441MHz Ant1



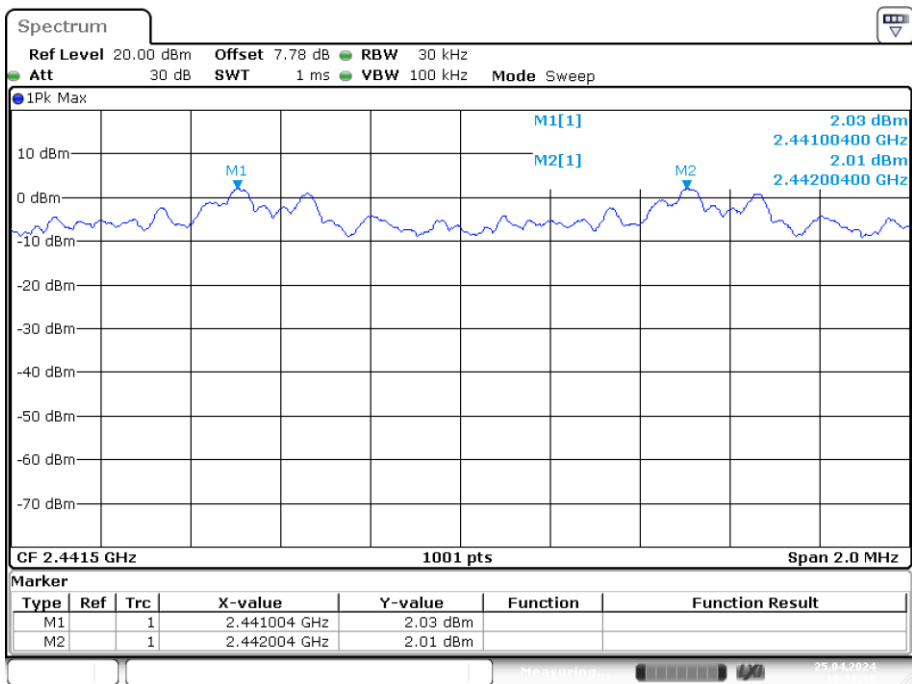
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CFS NVNT 2-DH1 2441MHz Ant1



Date: 25.APR.2024 17:53:48

CFS NVNT 3-DH1 2441MHz Ant1



Date: 25.APR.2024 18:28:19

6. NUMBER OF HOPPING CHANNEL

6.1. Limit

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

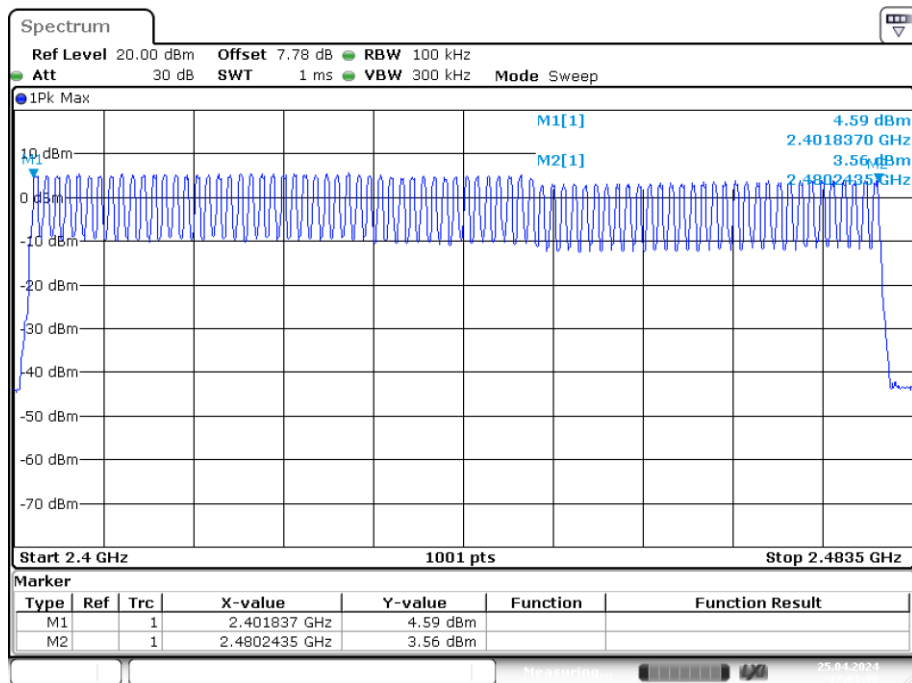
6.2. Test Procedure

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

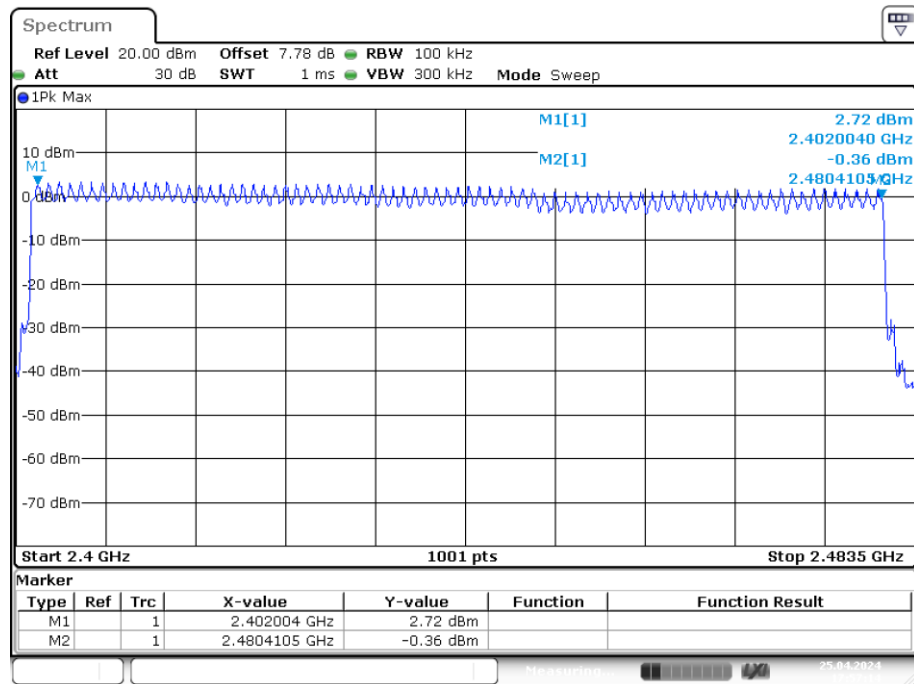
Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass

Hopping No. NVNT 1-DH1 2441MHz Ant1



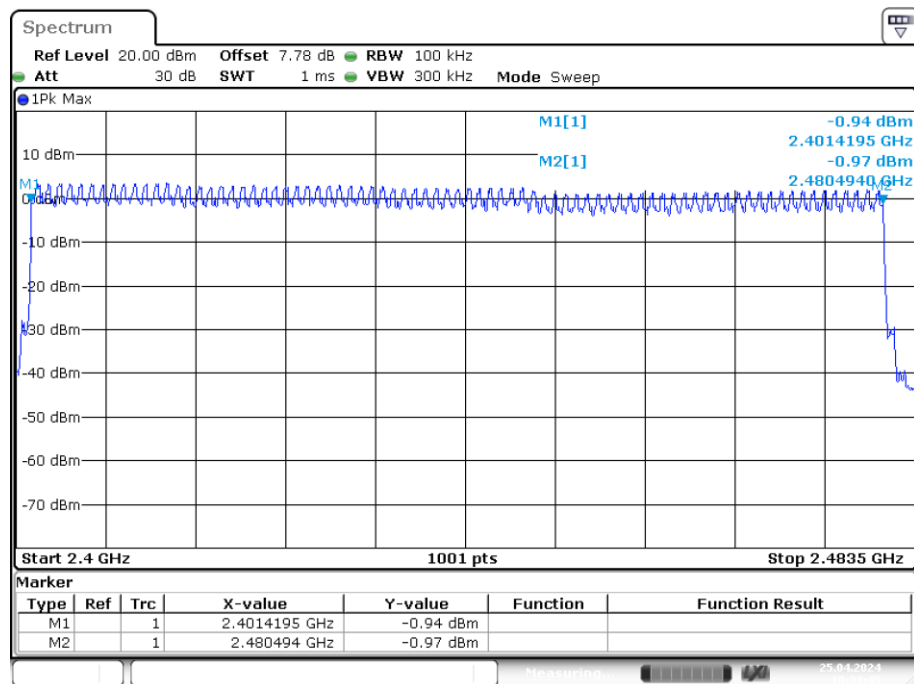
Date: 25.APR.2024 17:01:36

Hopping No. NVNT 2-DH1 2441MHz Ant1



Date: 25.APR.2024 17:57:14

Hopping No. NVNT 3-DH1 2441MHz Ant1



Date: 25.APR.2024 18:31:45

7. DWELL TIME

7.1. Test limit

Please refer section 15.247 & RSS-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.

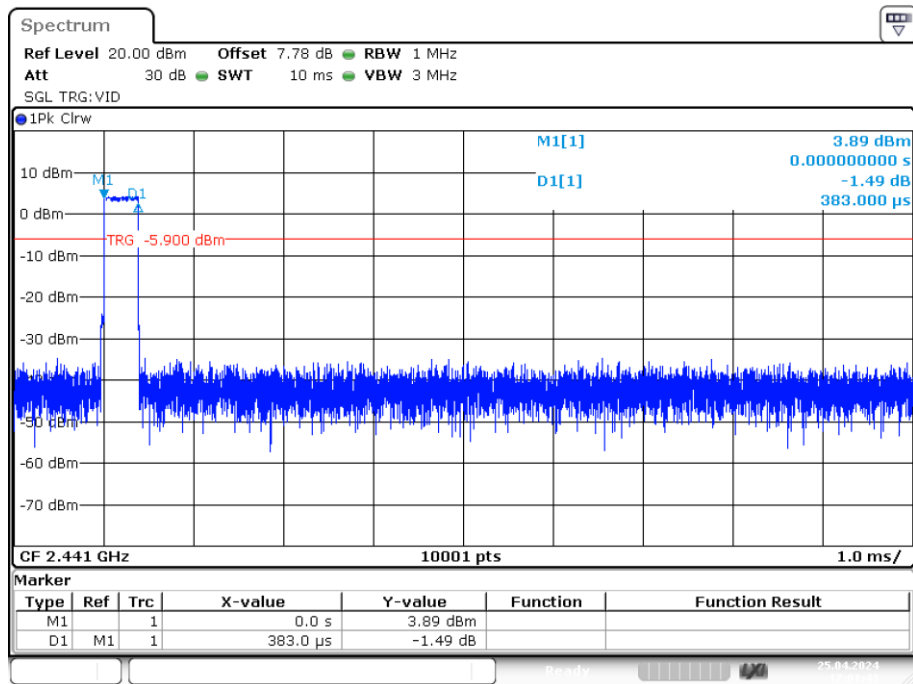
7.2.5. Repeat above procedures until all frequency measured were complete.

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	122.560	319	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.639	262.240	154	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.887	307.947	109	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.39	124.800	319	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.64	262.400	154	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.889	308.160	119	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.389	124.480	316	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.64	262.400	157	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.891	308.373	121	31600	400	Pass

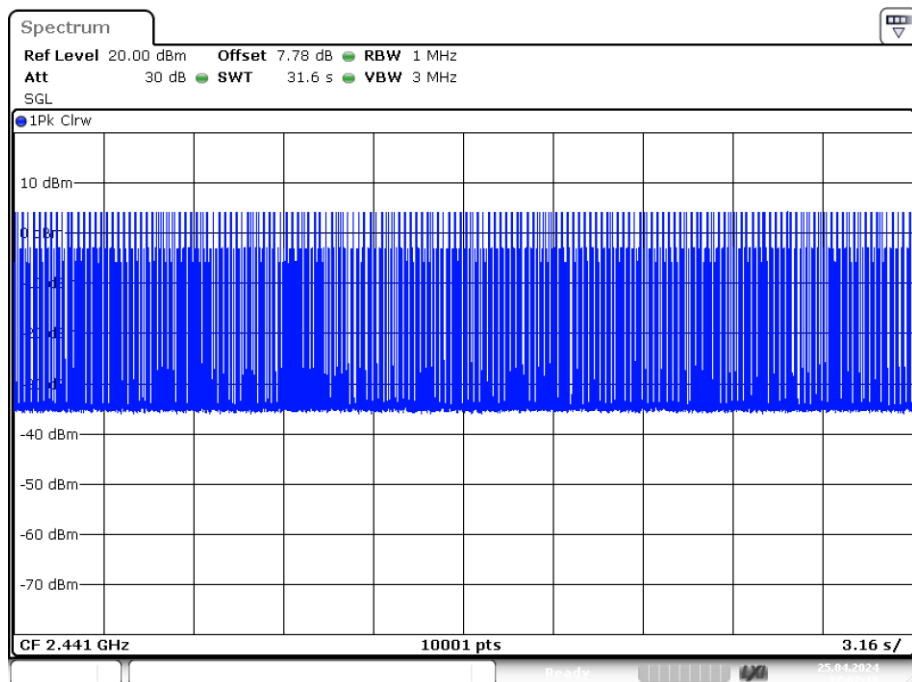
Note: Total Dwell Time= Pulse Time* Burst Count

Dwell NVNT 1-DH1 2441MHz Ant1 One Burst



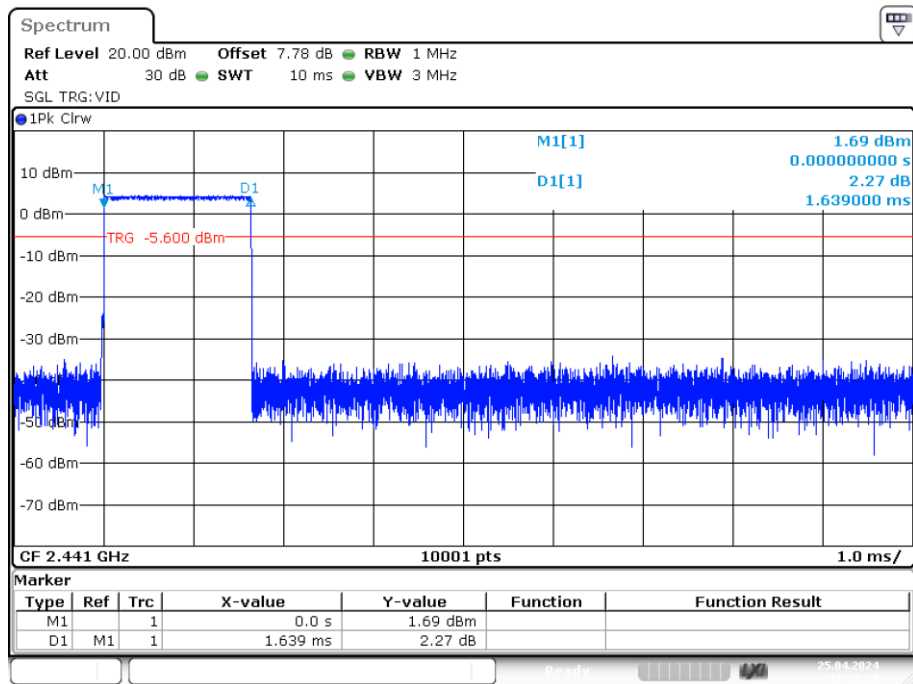
Date: 25.APR.2024 17:01:43

Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated

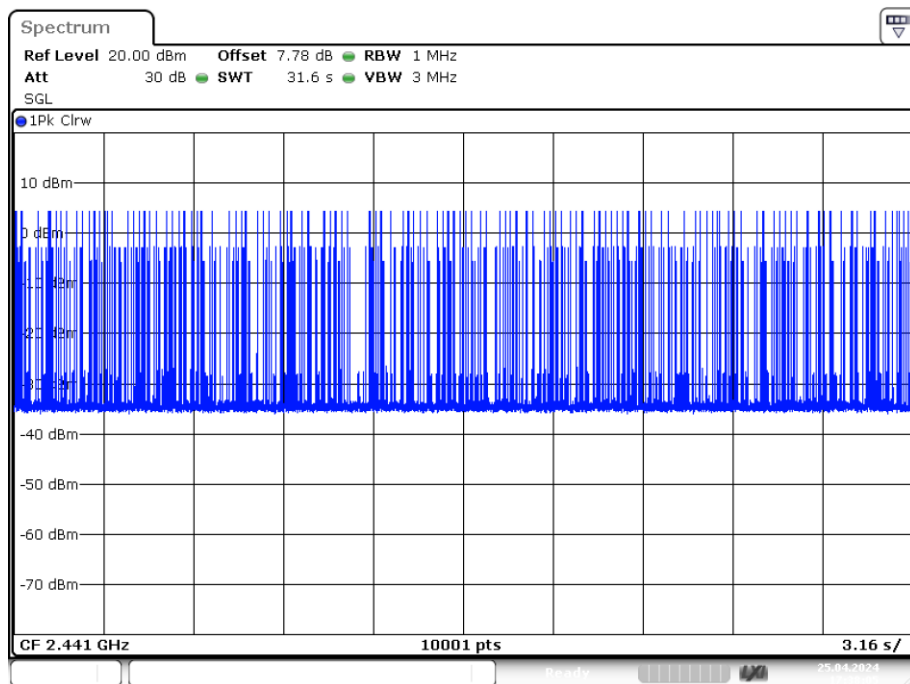


Date: 25.APR.2024 17:02:18

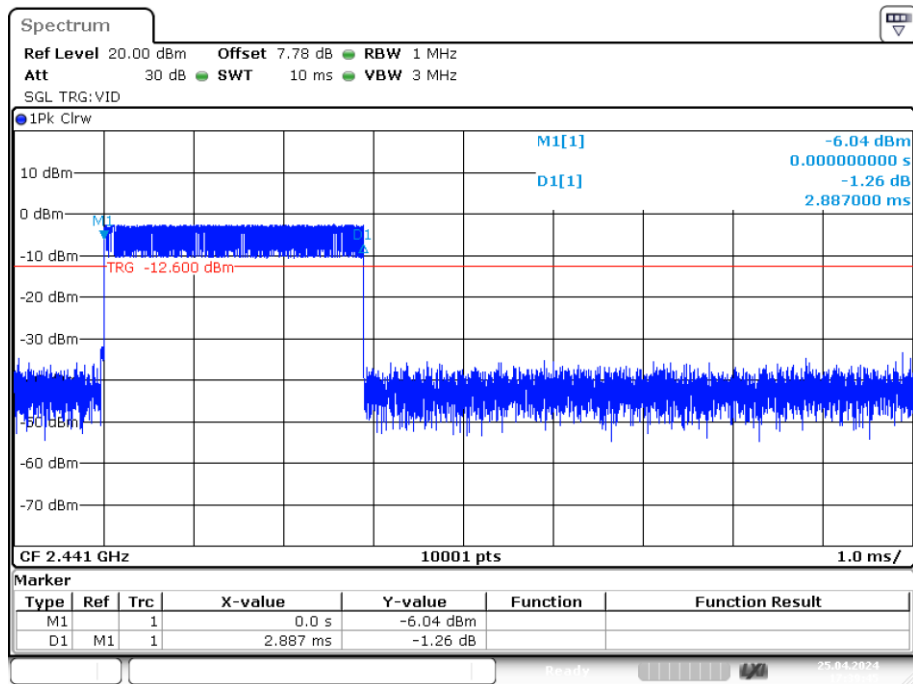
Dwell NVNT 1-DH3 2441MHz Ant1 One Burst



Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated

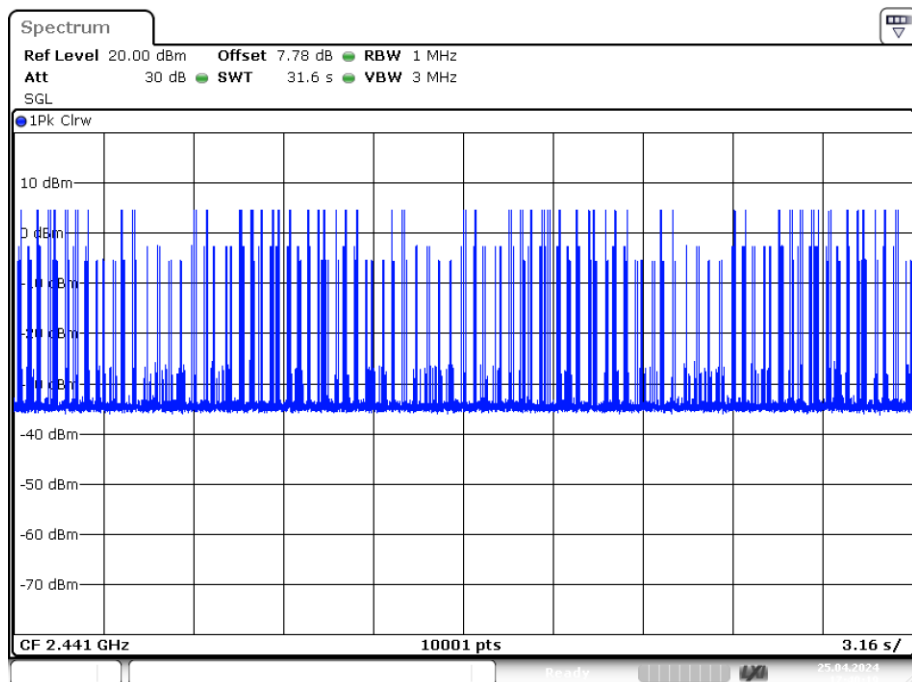


Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



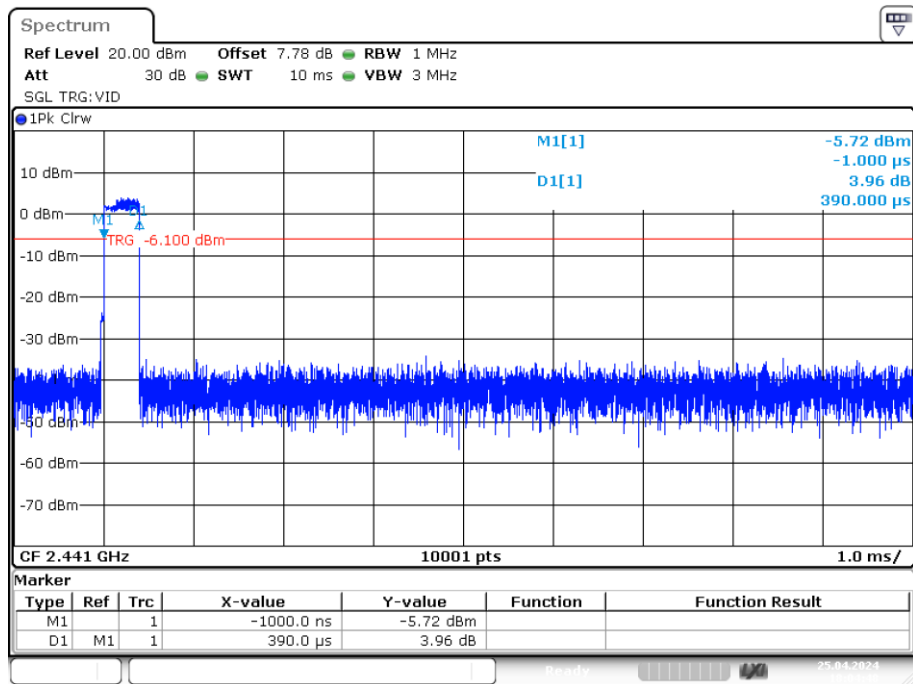
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Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated



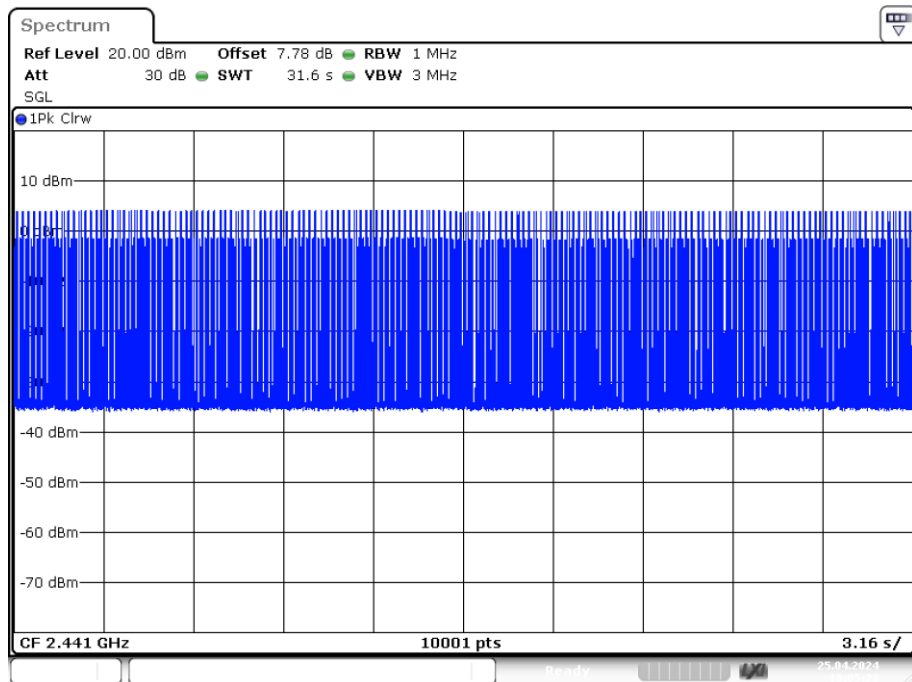
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Dwell NVNT 2-DH1 2441MHz Ant1 One Burst



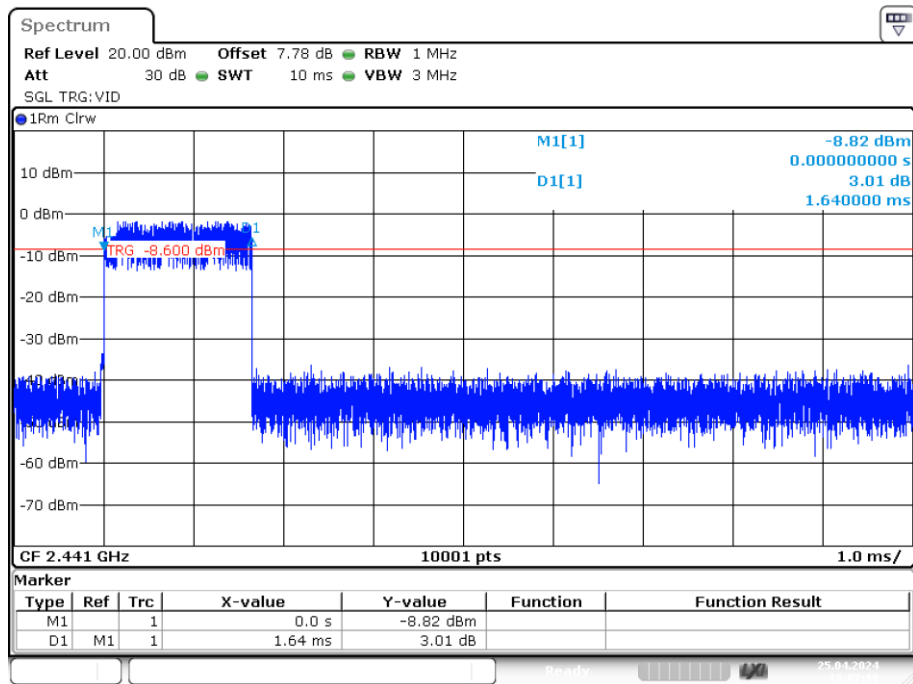
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Dwell NVNT 2-DH1 2441MHz Ant1 Accumulated



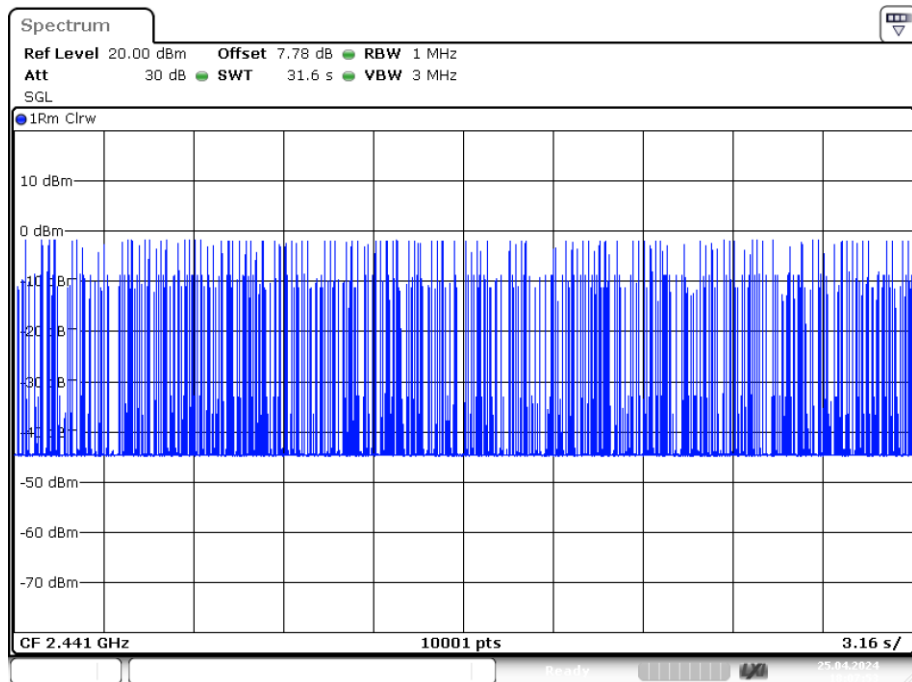
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Dwell NVNT 2-DH3 2441MHz Ant1 One Burst



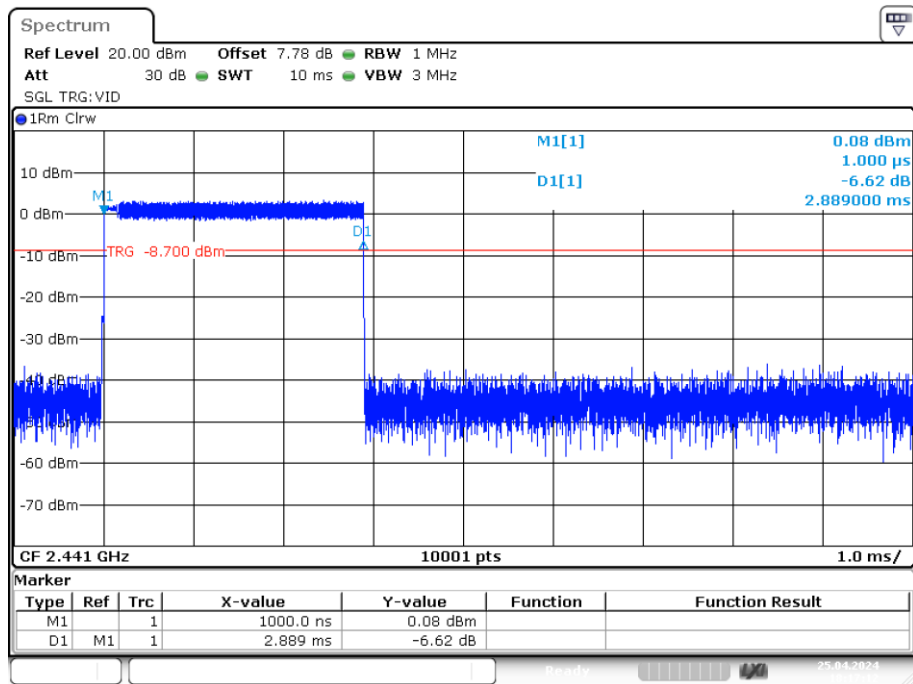
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Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated



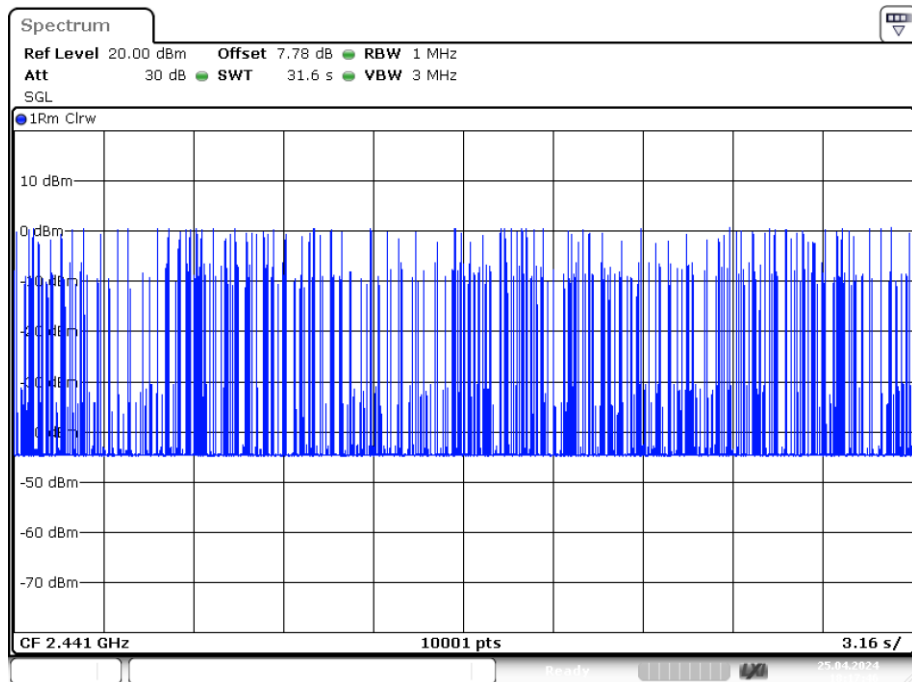
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Dwell NVNT 2-DH5 2441MHz Ant1 One Burst



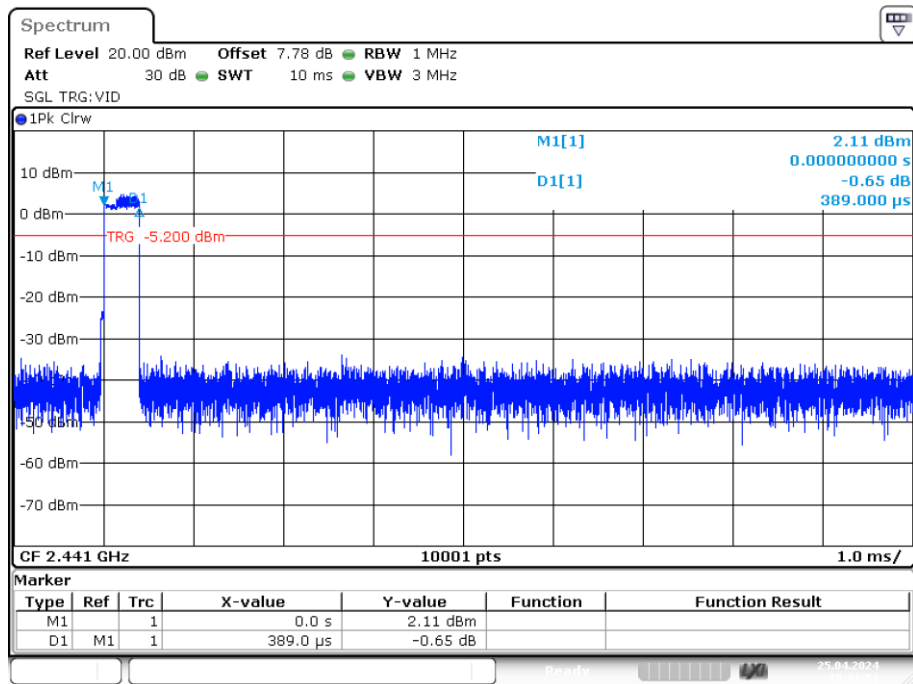
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Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated



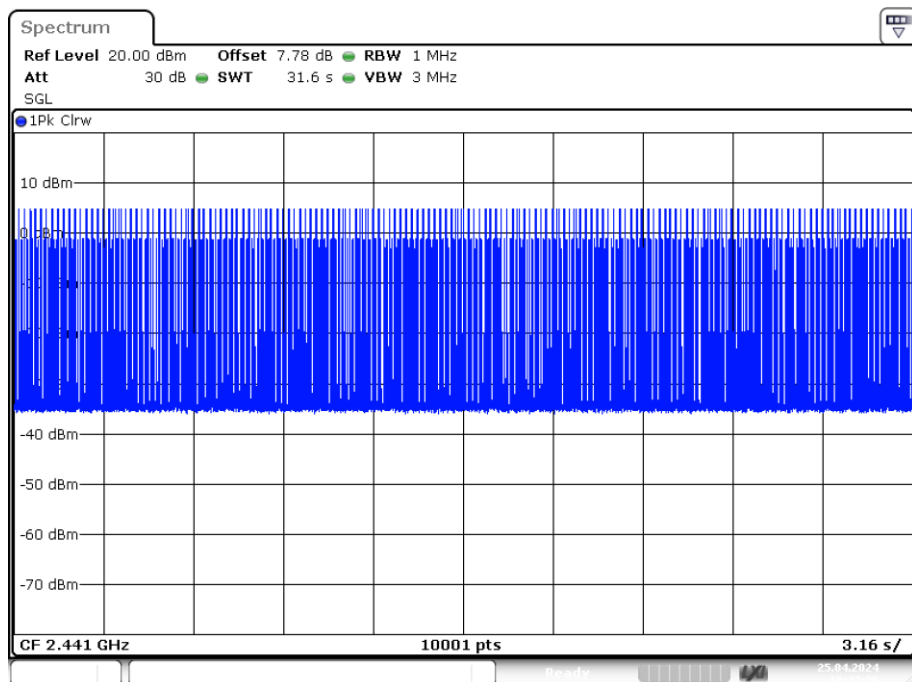
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Dwell NVNT 3-DH1 2441MHz Ant1 One Burst



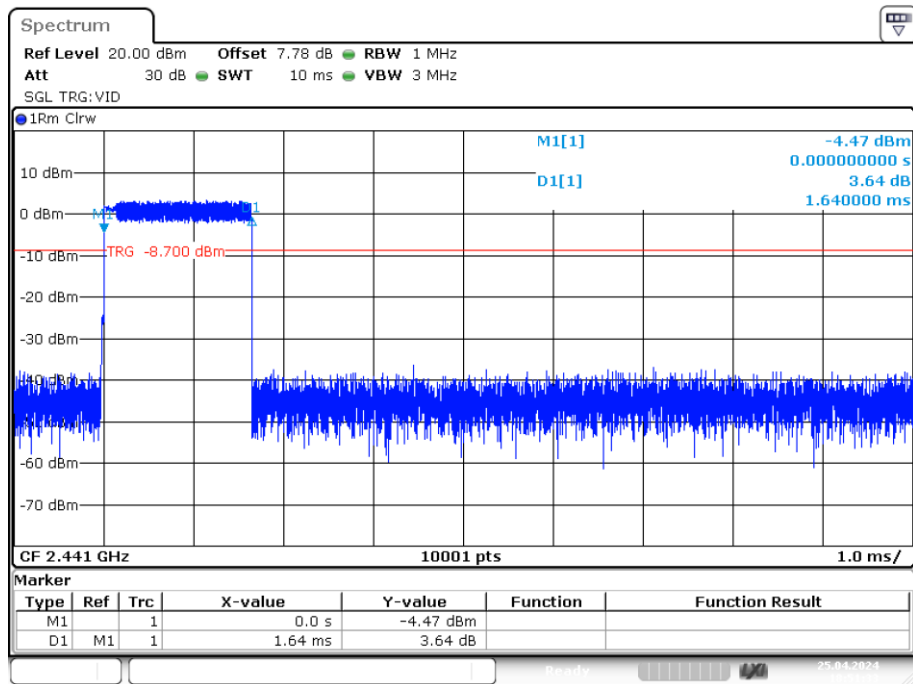
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Dwell NVNT 3-DH1 2441MHz Ant1 Accumulated



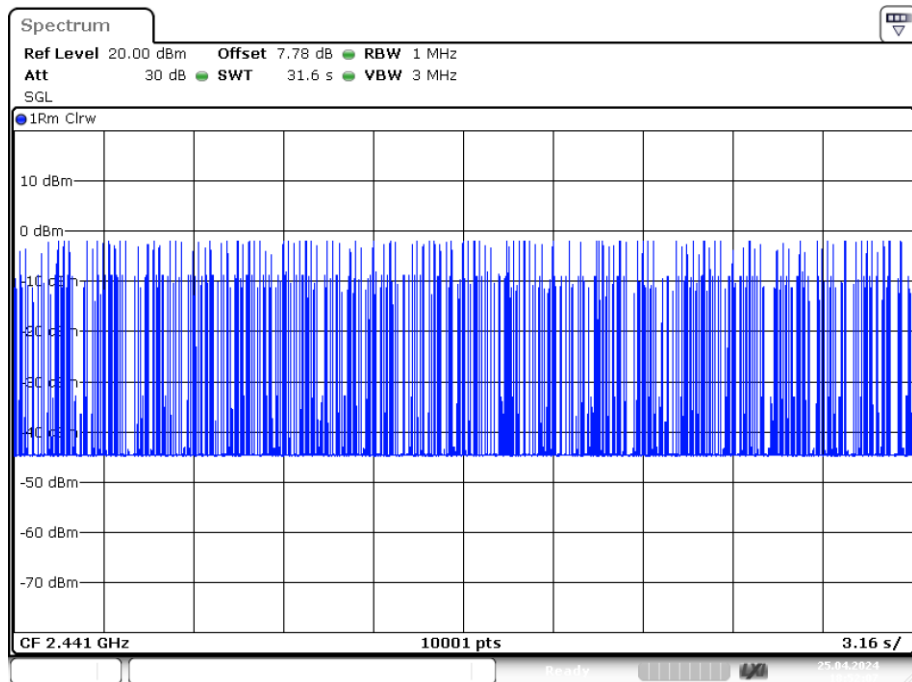
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Dwell NVNT 3-DH3 2441MHz Ant1 One Burst



Date: 25.APR.2024 18:51:32

Dwell NVNT 3-DH3 2441MHz Ant1 Accumulated



Date: 25.APR.2024 18:52:07