ITL Co., Ltd.

No.8, JinQianLing street 5, Huangjiang Town, Dongguan, Guangdong, China.

Telephone: +86-769-39001678
Fax: +86-20-62824387
Email: itl@i-testlab.com

Report Template Version: V02
Report Template Revision Date: 2021-06-01

FCC Test Report

Applicant:	Shenzhen Times Innovation Technology Co., Ltd
Address of Applicant:	5th Floor, Building B, Baseus Intelligence Park, No.2008, Xuegang Rd, Gangtou Community, Bantian Street, Longgang District, Shenzhen.
Manufacturer:	Shenzhen Times Innovation Technology Co., Ltd
Address of Manufacturer:	5th Floor, Building B, Baseus Intelligence Park, No.2008, Xuegang Rd, Gangtou Community, Bantian Street, Longgang District, Shenzhen.
Factory:	Dongguan Chengyue Electronic Technology Co., Ltd
Address of Factory:	NO.15, Yinhu Road, Yinhu industrial estate, jiaoyitang, Tangxia Town, Dongguan, Guangdong, China
Equipment Under Test (EUT):	
Product:	Baseus True Wireless Earphones
Model No.:	Baseus Bowie W04+
Brand Name:	Baseus
FCC ID:	2AY37-W04
Standards:	47 CFR Part 15, Subpart C
Date of Test:	2021-09-13 to 2021-10-14
Date of Issue:	2021-10-14
Report No. :	D210911010-1
Test Result :	**PASS***

Tested By: Damon

(Damon Deng)

Reviewed By: Chivas

(Chivas Zeng)

Approved By: Victor

(Victor Meng)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
D210911010-1	Rev.01	Initial report	2021-10-14

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 (2013)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2013)	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10 (2013)	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Carrier Frequencies Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)	ANSI C63.10 (2013)	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2013)	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2013)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS

3 Contents

4 General Information

4.1 Client Information

Applicant:	Shenzhen Times Innovation Technology Co., Ltd
Address of Applicant:	5th Floor, Building B, Baseus Intelligence Park, No.2008, Xuegang Rd, Gangtou Community, Bantian Street, Longgang District, Shenzhen.
Manufacturer:	Shenzhen Times Innovation Technology Co., Ltd
Address of Manufacturer:	5th Floor, Building B, Baseus Intelligence Park, No.2008, Xuegang Rd, Gangtou Community, Bantian Street, Longgang District, Shenzhen.
Factory:	Dongguan Chengyue Electronic Technology Co., Ltd
Address of Factory:	NO.15, Yinhu Road, Yinhu industrial estate, jiaoyitang, Tangxia Town, Dongguan, Guangdong, China

4.2 General Description of EUT

Product Name:	Baseus True Wireless Earphones
Model No.:	Baseus Bowie W04+
Trade Mark:	Baseus
Hardware Version:	V7.13
Software Version:	V12
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V5.3
Modulation Technique:	Frequency Hopping Spread Spectrum (FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	portable production
Sample number:	20210913001
Test Software of EUT:	BT FCC Tool _V2.24 (manufacturer declare)
Antenna Type:	Chip antenna
Antenna Gain:	0.8dBi
Power Supply:	Earphone capacity: 40mAh/0.148Wh Input: 5V⎓ 80mA Charging case capacity:300mAh/1.11Wh Input: 5V⎓ 350mA

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

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The Lowest channel	2402MHz
The Middle channel	2441MHz
The Highest channel	2480MHz

4.3 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	995mbar
Test Mode:	Use test software (RF Test) to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
PC	Lenovo	ThinkPad E450c	/	DOC

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **ITL Co., LTD.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for **ITL** laboratory is reported:

Test	Range	Uncertainty	Notes
Radiated Emission	Below 1GHz	±4.54dB	(1)
Radiated Emission	Above 1GHz	±4.10dB	(1)
Conducted Disturbance	0.15~30MHz	±3.58dB	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.6 Test Location

ITL Co., Ltd
No.8, JinQianLing street 5, Huangjiang Town, Dongguan,
Guangdong, 523757 P.R.C

4.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS(Lab code: L9342)**
- **NVLAP LAB CODE 600199-0**
- **FCC Designation Number: CN5035**
- **FCC Test Firm Registration Number: 239076**

4.8 Abnormalities from Standard Conditions

None.

4.9 Other Information Requested by the Customer

None.

4.10 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Radiated Emission:

Temperature:	25 ° C
Humidity:	48%
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	25° C
Humidity:	42 %
Atmospheric pressure:	950-1050mbar

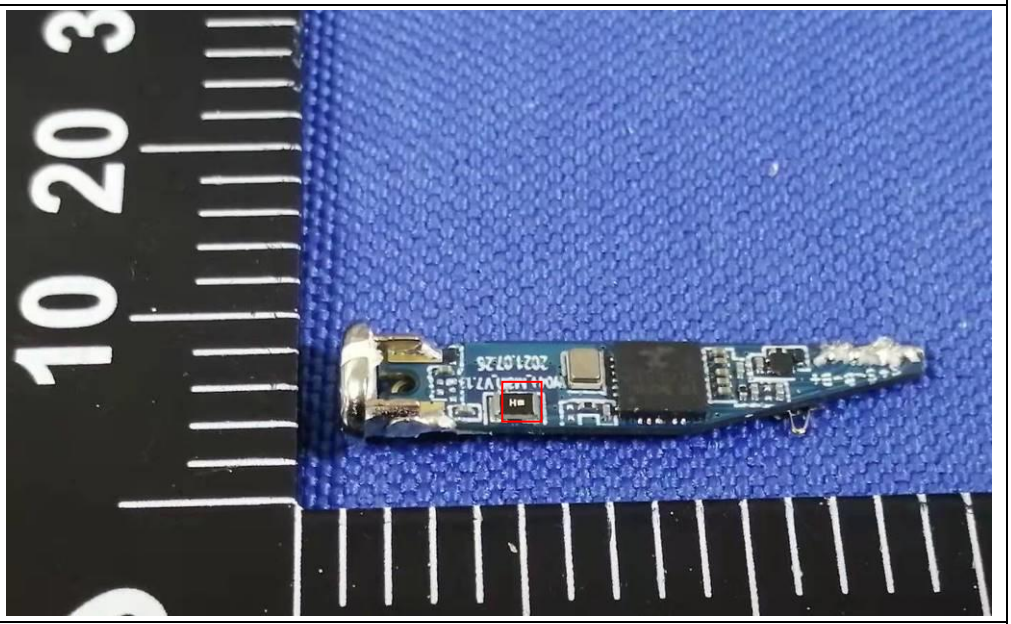
4.11 Equipment List

No.	Test Equipment	Manufacturer	Model	Serial No.	Cal Data	Due Date
DGITL-301	Semi-Anechoic chamber	ETS•Lindgren	9*6*6	CT000874-1181	2021.08.02	2022.08.01
DGITL-307	EMI test receiver	SCHWARZBECK	ESVS10	833616 /003	2021.05.11	2022.05.10
DGITL-376	Wideband Radio Communication Tester	SCHWARZBECK	CMW500	LR114195	2021.05.11	2022.05.10
DGITL-349	MXG Vector Signal Generator	Agilent Technologies	N5182A	MY47071034	2021.05.11	2022.05.10
DGITL-306	Spectrum Analyzer	Agilent Technologies	N9010A	MY54200334	2021.05.11	2022.05.10
DGITL-352	Pre Amplifier	Mlnl-Clrcuits	ZFC-1000HX	SN292801110	2021.05.11	2022.05.10
DGITL-375	Spectrum Analyzer	SCHWARZBECK	FSV40-N	6625-01-588-5515	2021.05.11	2022.05.10
DGITL-309	Horn Antenna	ETS Lindgren	3117	SN00152265	2021.05.11	2024.05.10
DGITL-308	Bilog Antenna	ETS· Lindgren	3142E	156975	2020.06.20	2023.06.19
DGITL-350	Wideband Amplifier Super Ultra	Mlnl-Clrcuits	ZVA-183X-S+	SN986401426	2021.05.11	2022.05.10
DGITL-365	Broad-band Horn Antenna	SCHWARZBECK	9170	795	2020.07.04	2022.07.04
DGITL-371	Pre Amplifier	teramicrowave	TALA-0040G35	18081001	2021.05.11	2022.05.10
DGITL-363	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	062	2020.07.04	2022.07.03

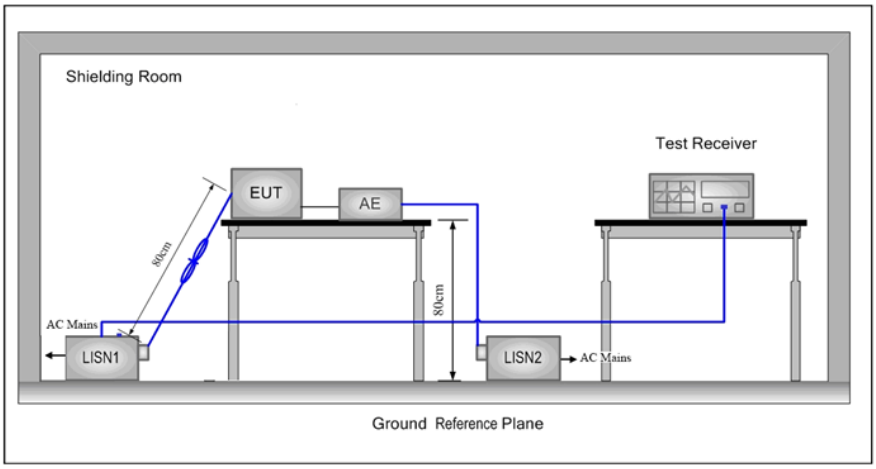
Software list			
Testing software	**Manufacturer**	**Model**	**Version number**
e3	AUDIX	e3.Ink	Version:6.2009-11-3c(itl)
MTS	MWRFTEST	MTS 8310	Version:2.0

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is Chip antenna, The best case gain of the antenna is 0.8 dBi.	

5.2 Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td>47 CFR Part 15C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Test Frequency Range:</td><td>150kHz to 30MHz</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test Procedure:</td><td>1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.</td></tr>
<tr><td>Test Setup:</td><td> 
</td></tr>
<tr><td>Exploratory Test Mode:</td><td>Non-hopping transmitting mode with all kind of modulation and all kind of</td></tr>
</table>

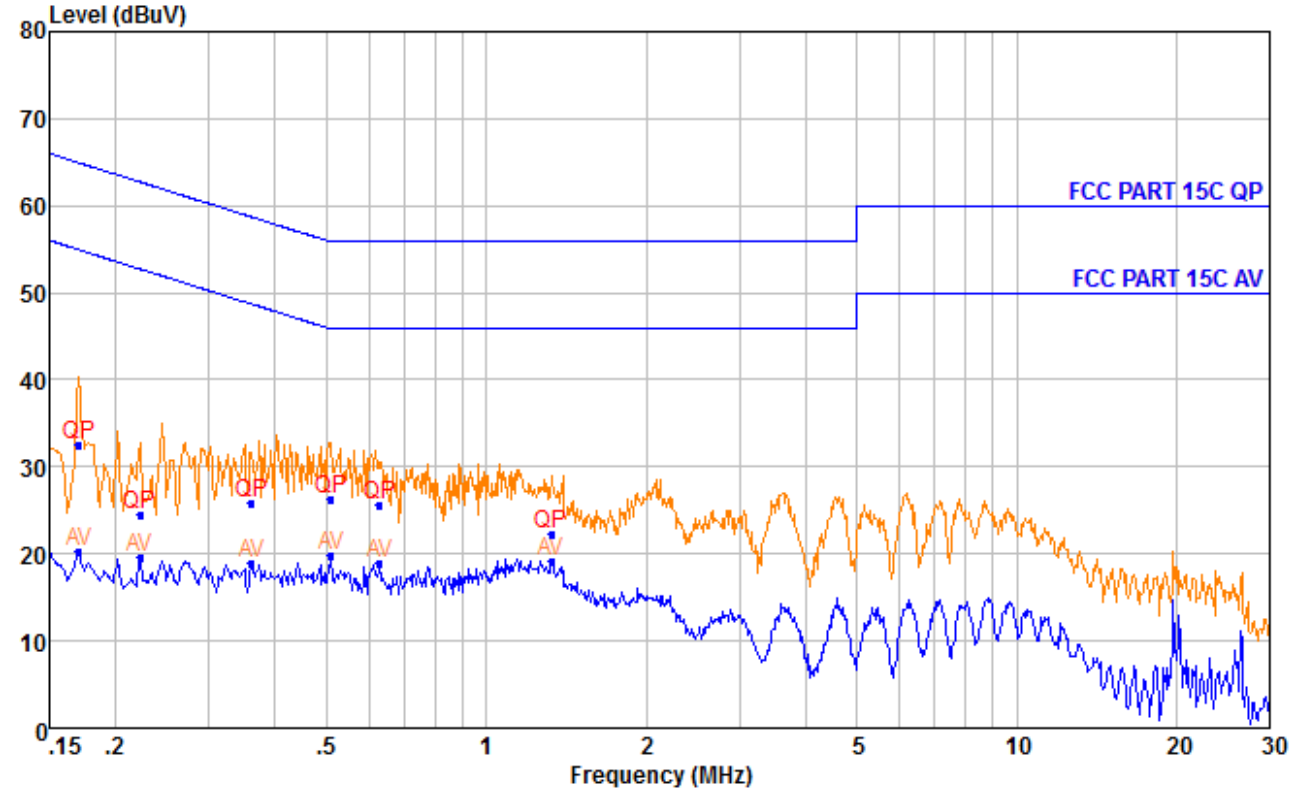
	data type at the lowest, middle, high channel.
Final Test Mode:	Through Pre-scan, find the DH1 of data type and GFSK modulation at the lowest channel is the worst case. Only the worst case is recorded in the report.
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

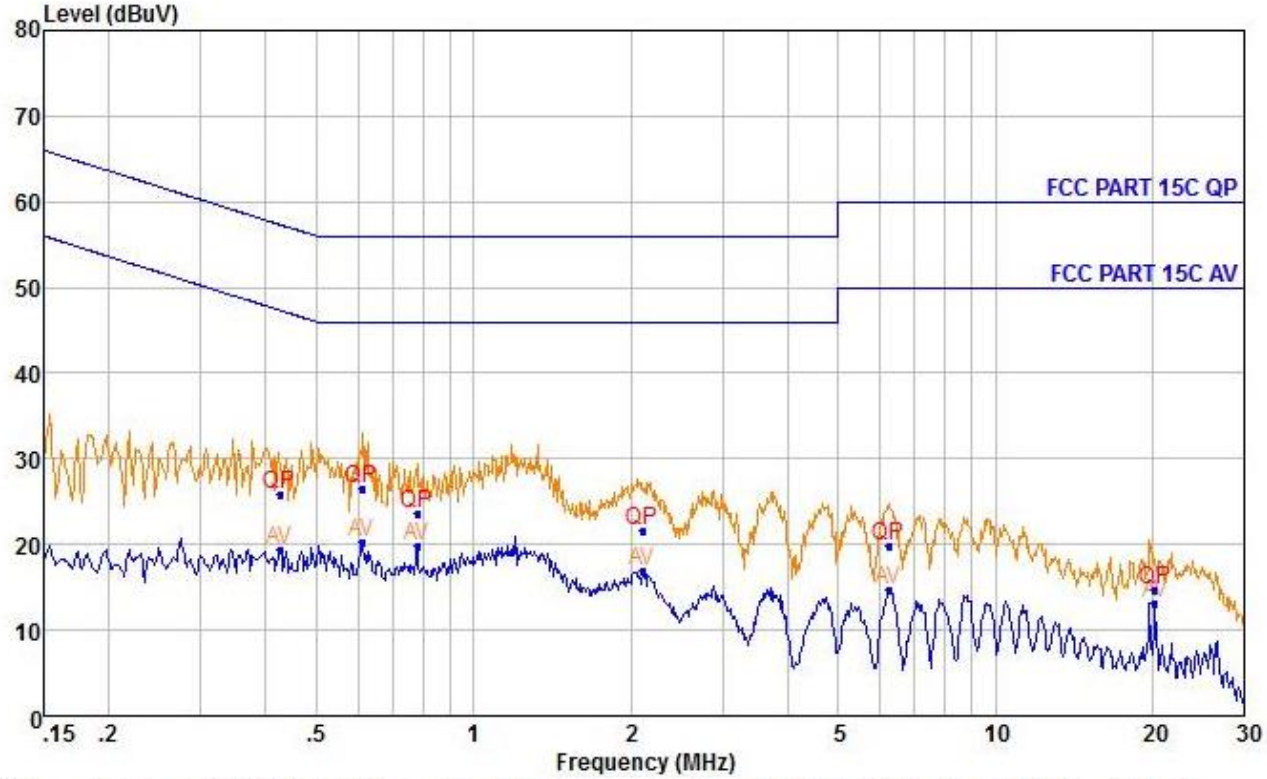
Live line:



NO.	Freq MHz	Reading dBuV	LISN Factor dB	Cable Loss dB	Measured dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.170	9.98	10.28	0.02	20.28	54.94	-34.66	Average
2	0.170	22.20	10.28	0.02	32.50	64.94	-32.44	QP
3	0.222	9.43	10.25	0.02	19.70	52.74	-33.04	Average
4	0.222	14.26	10.25	0.02	24.53	62.74	-38.21	QP
5	0.361	8.61	10.22	0.03	18.86	48.69	-29.83	Average
6	0.361	15.54	10.22	0.03	25.79	58.69	-32.90	QP
7	0.510	9.56	10.20	0.03	19.79	46.00	-26.21	Average
8	0.510	16.10	10.20	0.03	26.33	56.00	-29.67	QP
9	0.630	8.72	10.20	0.04	18.96	46.00	-27.04	Average
10	0.630	15.49	10.20	0.04	25.73	56.00	-30.27	QP
11	1.324	8.98	10.17	0.06	19.21	46.00	-26.79	Average
12	1.324	12.06	10.17	0.06	22.29	56.00	-33.71	QP

1:Measured=Reading + LISN Factor + Cable Loss

Neutral line:



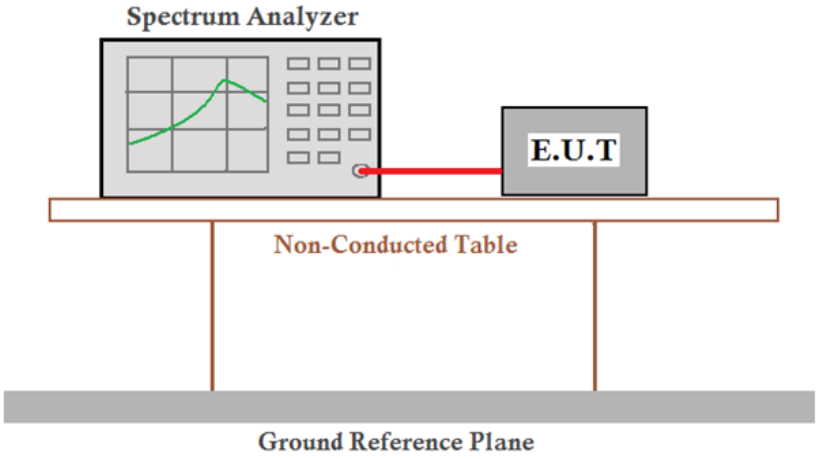
NO.	Freq MHz	Reading dBuV	LISN Factor dB	Cable Loss dB	Measured dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.426	9.17	10.15	0.03	19.35	47.33	-27.98	Average
2	0.426	15.78	10.15	0.03	25.96	57.33	-31.37	QP
3	0.611	10.12	10.15	0.04	20.31	46.00	-25.69	Average
4	0.611	16.42	10.15	0.04	26.61	56.00	-29.39	QP
5	0.779	9.60	10.17	0.04	19.81	46.00	-26.19	Average
6	0.779	13.48	10.17	0.04	23.69	56.00	-32.31	QP
7	2.110	6.68	10.16	0.07	16.91	46.00	-29.09	Average
8	2.110	11.49	10.16	0.07	21.72	56.00	-34.28	QP
9	6.252	4.23	10.33	0.11	14.67	50.00	-35.33	Average
10	6.252	9.44	10.33	0.11	19.88	60.00	-40.12	QP
11	20.270	2.77	10.20	0.19	13.16	50.00	-36.84	Average
12	20.270	4.27	10.20	0.19	14.66	60.00	-45.34	QP

1:Measured=Reading + LISN Factor + Cable Loss

Remark:

The following Quasi-Peak and Average measurements were performed on the EUT:

5.3 Conducted Peak Output Power

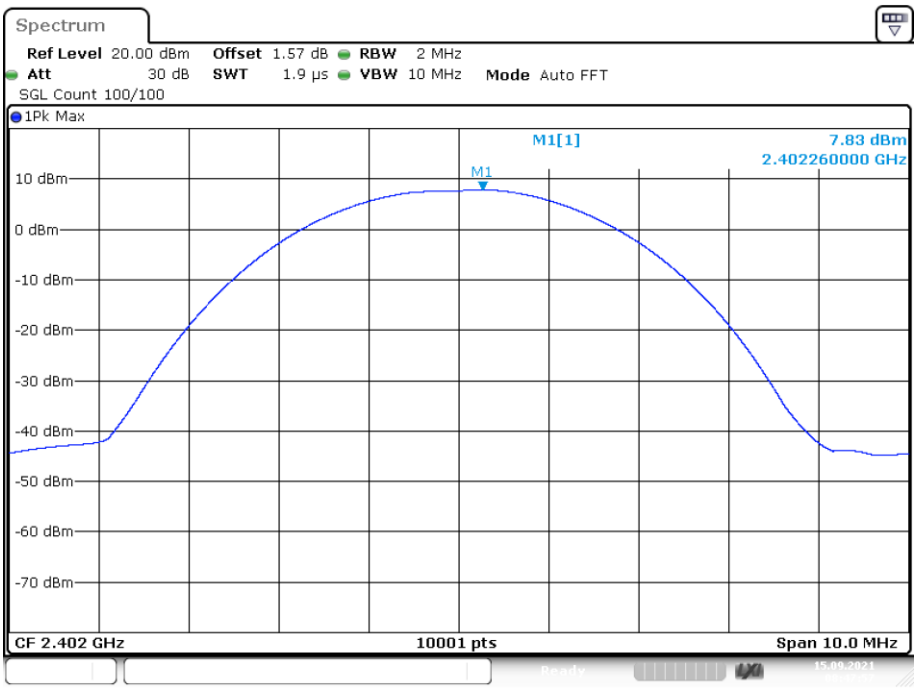
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 *Remark:* *Factor: the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Limit:	21dBm
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

Measurement Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	7.83	30.0	Pass
Middle	6.60	30.0	Pass
Highest	6.98	30.0	Pass
π/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	6.72	21.00	Pass
Middle	5.64	21.00	Pass
Highest	6.64	21.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	7.00	21.00	Pass
Middle	6.18	21.00	Pass
Highest	6.53	21.00	Pass

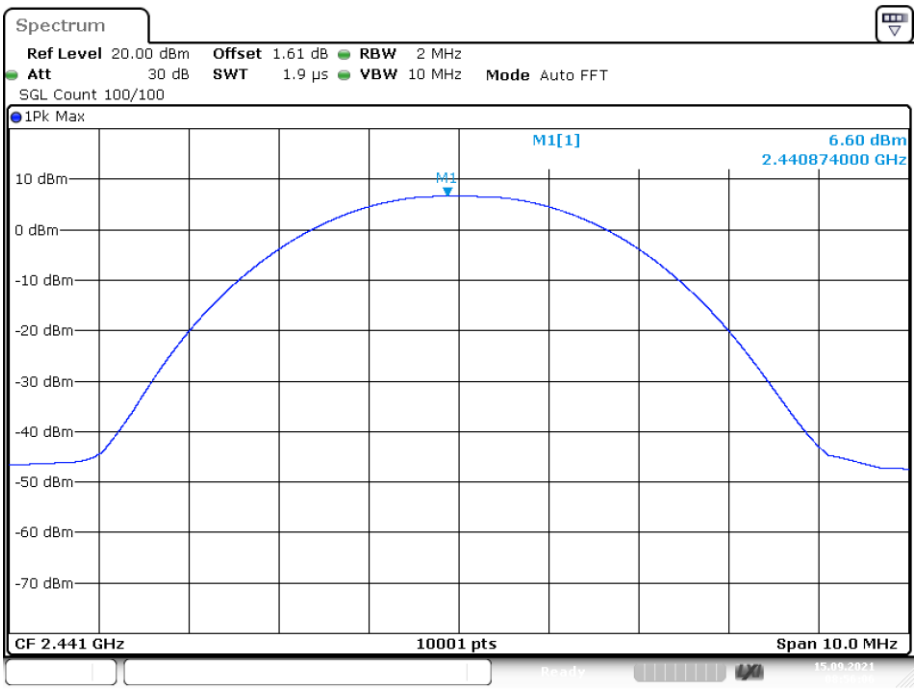
Test plot as follows:

Power NVNT 1-DH5 2402MHz Ant1



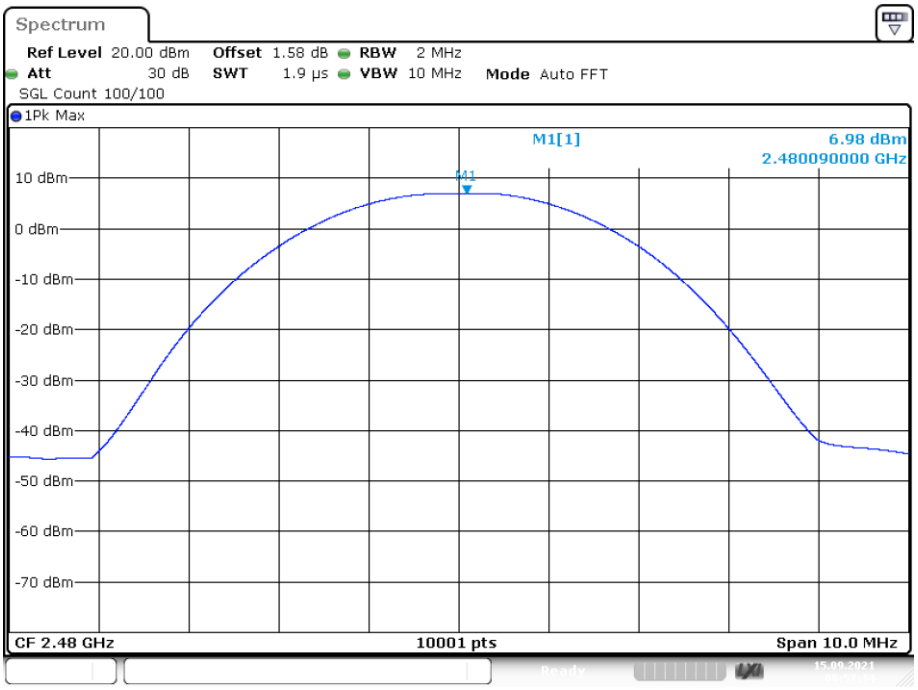
Date: 15.SEP.2021 08:47:57

Power NVNT 1-DH5 2441MHz Ant1



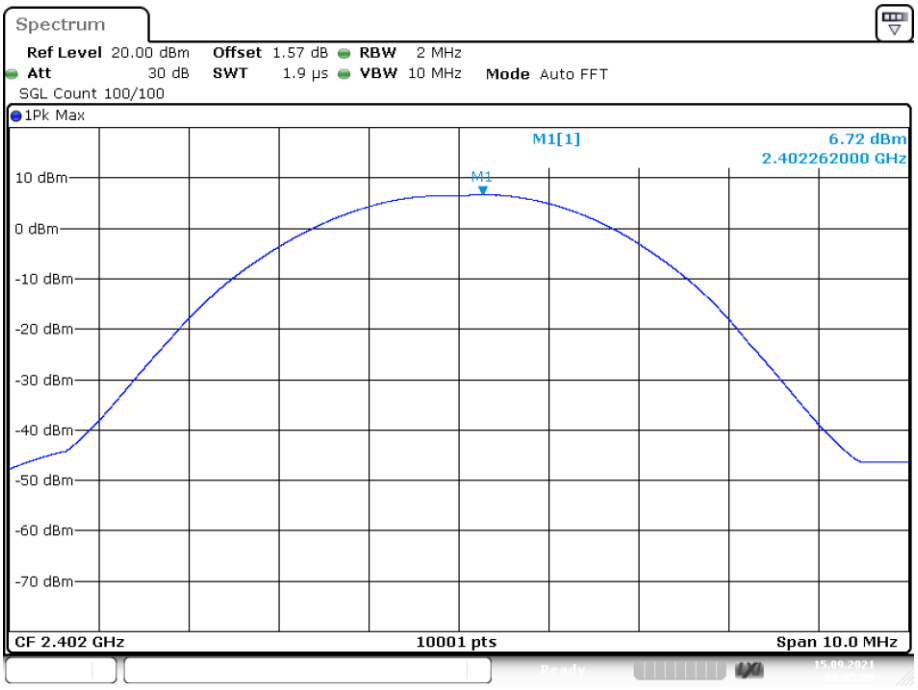
Date: 15.SEP.2021 08:56:06

Power NVNT 1-DH5 2480MHz Ant1



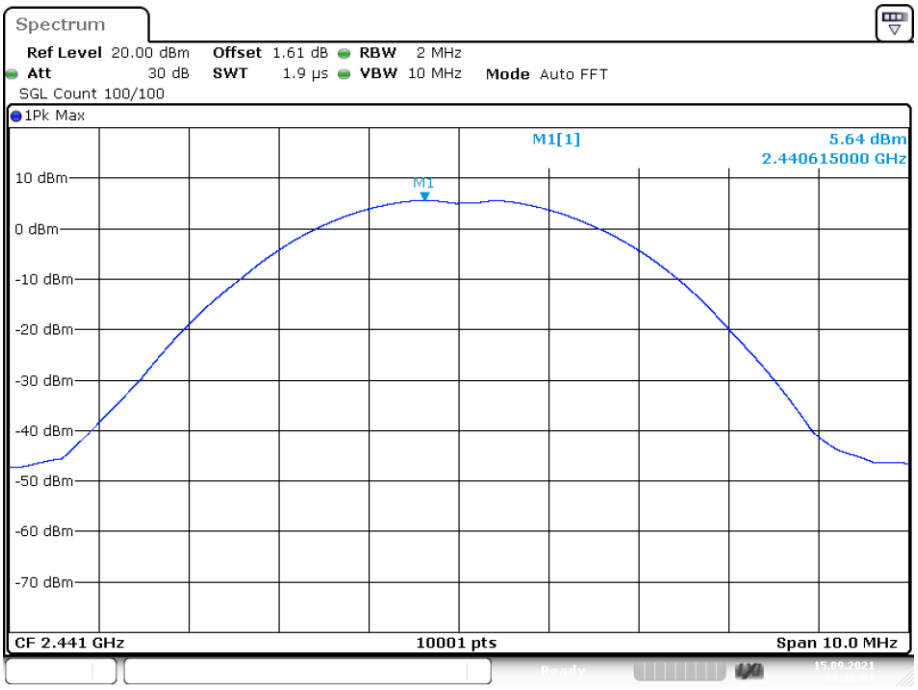
Date: 15.SEP.2021 08:57:34

Power NVNT 2-DH5 2402MHz Ant1



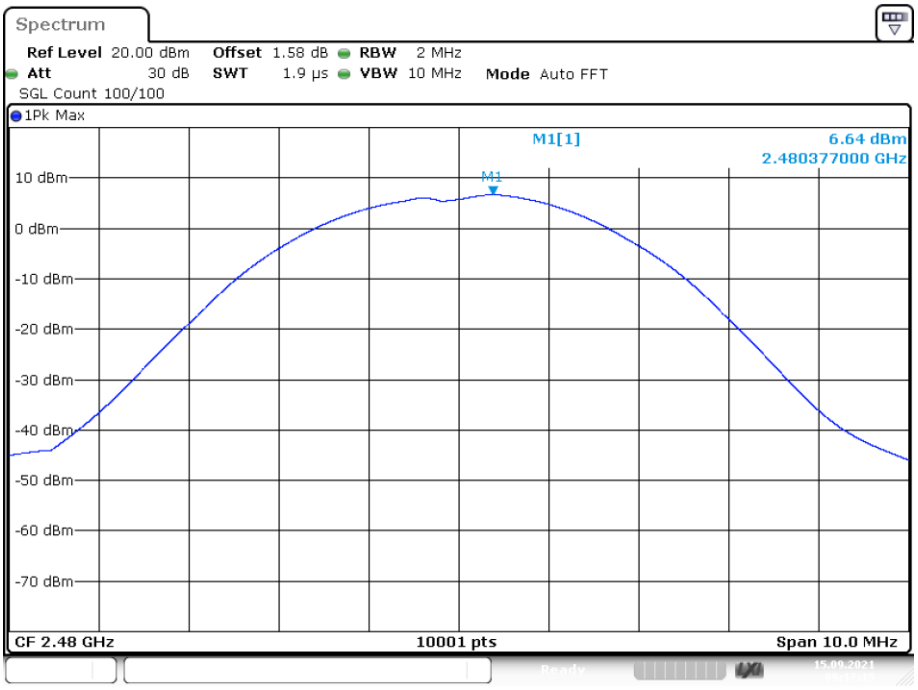
Date: 15.SEP.2021 09:05:58

Power NVNT 2-DH5 2441MHz Ant1



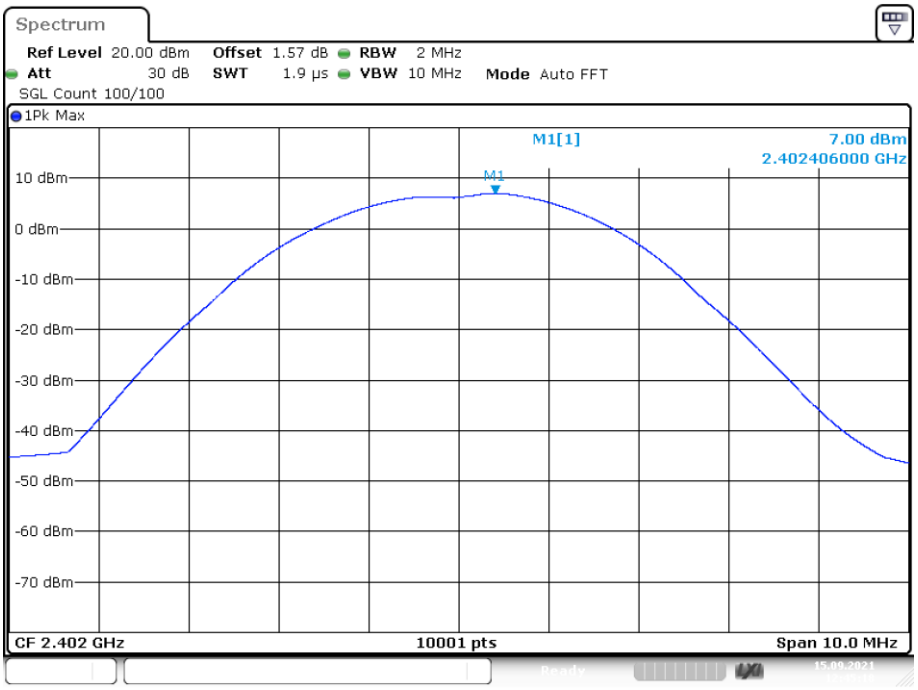
Date: 15.SEP.2021 09:16:01

Power NVNT 2-DH5 2480MHz Ant1



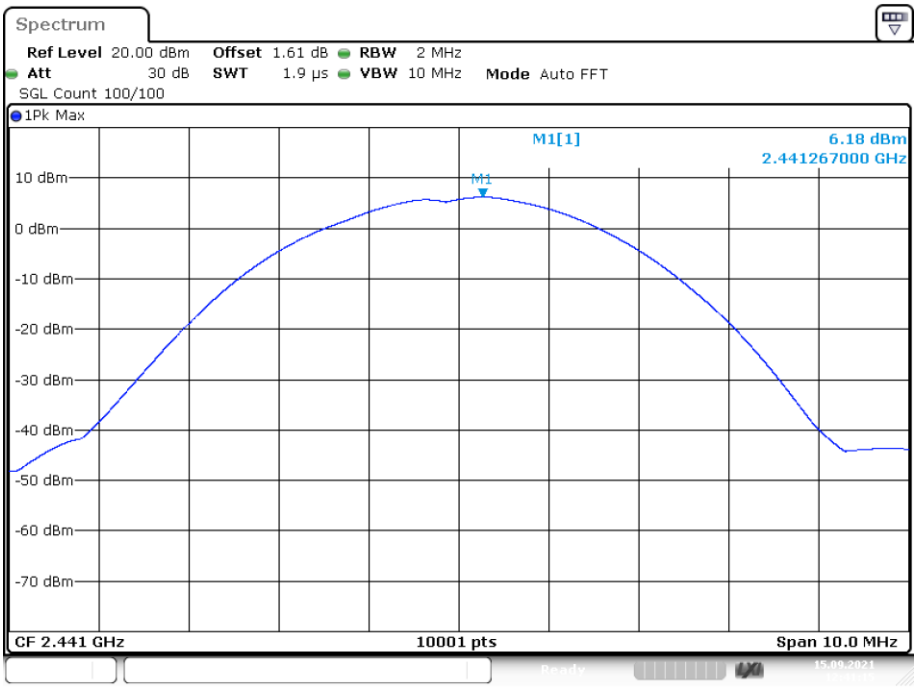
Date: 15.SEP.2021 09:17:15

Power NVNT 3-DH5 2402MHz Ant1



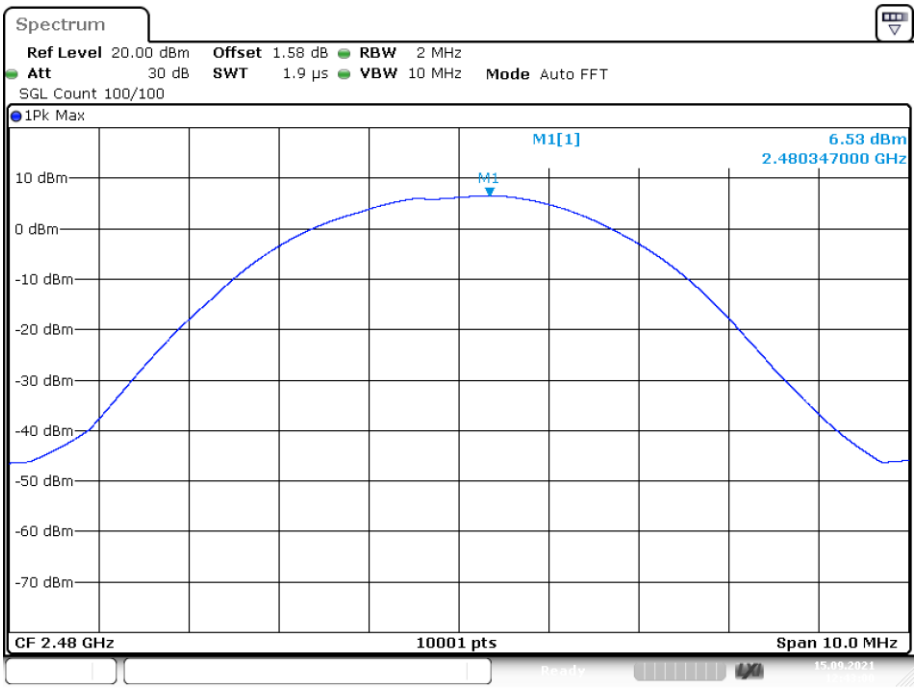
Date: 15.SEP.2021 12:45:18

Power NVNT 3-DH5 2441MHz Ant1

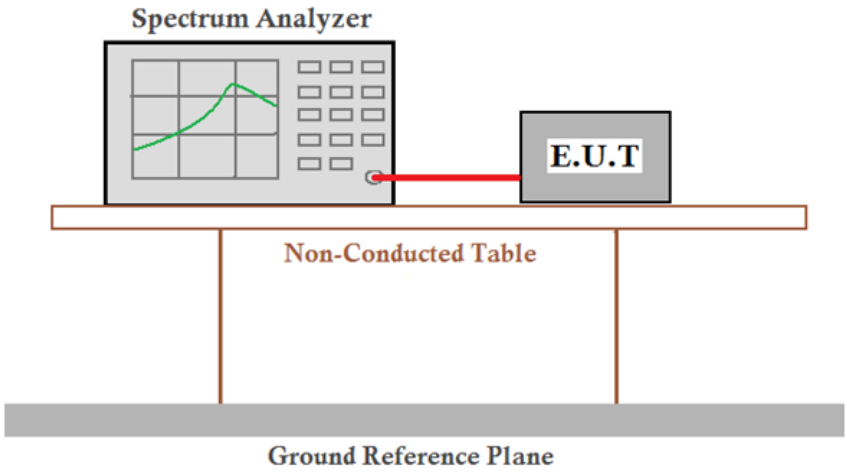


Date: 15.SEP.2021 12:41:14

Power NVNT 3-DH5 2480MHz Ant1



5.4 20dB Occupy Bandwidth

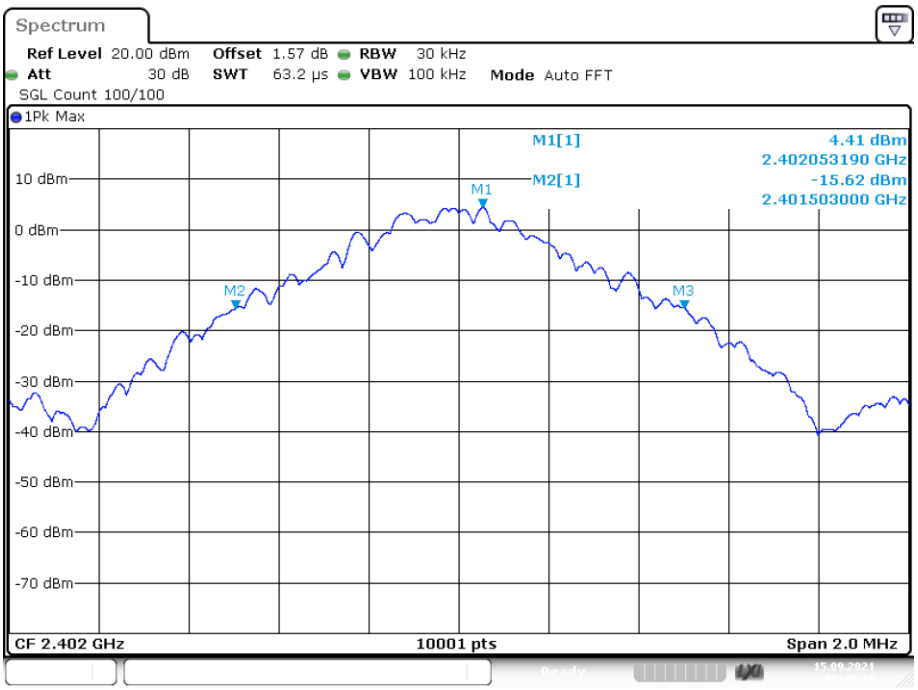
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

Measurement Data

Test channel	20dB Occupy Bandwidth (kHz)		
	GFSK	π/4DQPSK	8DPSK
Lowest	0.998	1.336	1.256
Middle	0.94	1.349	1.234
Highest	0.868	1.279	1.233

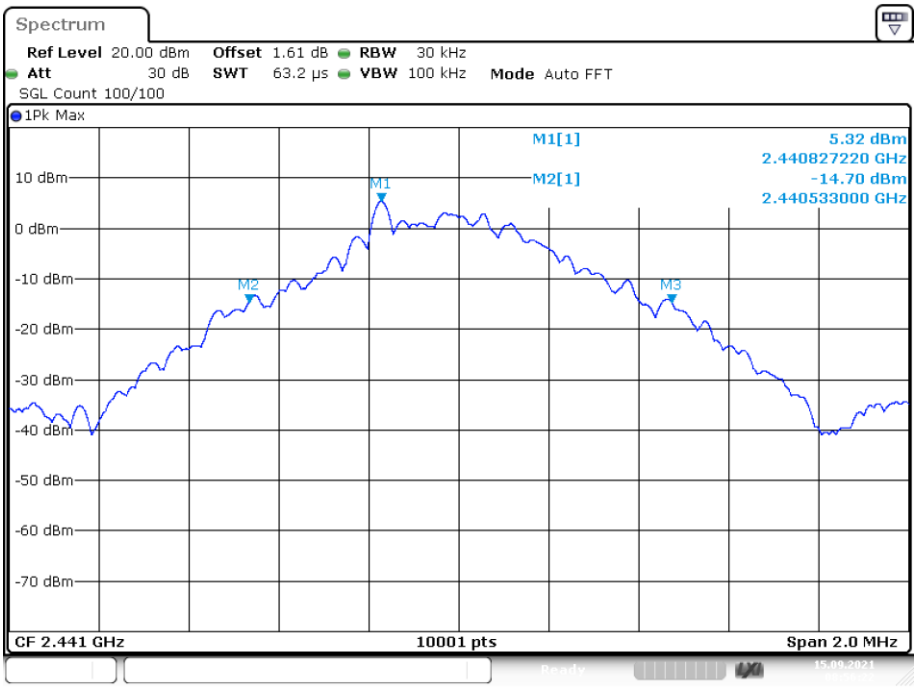
Test plot as follows:-

-20dB Bandwidth NVNT 1-DH5 2402MHz Ant1



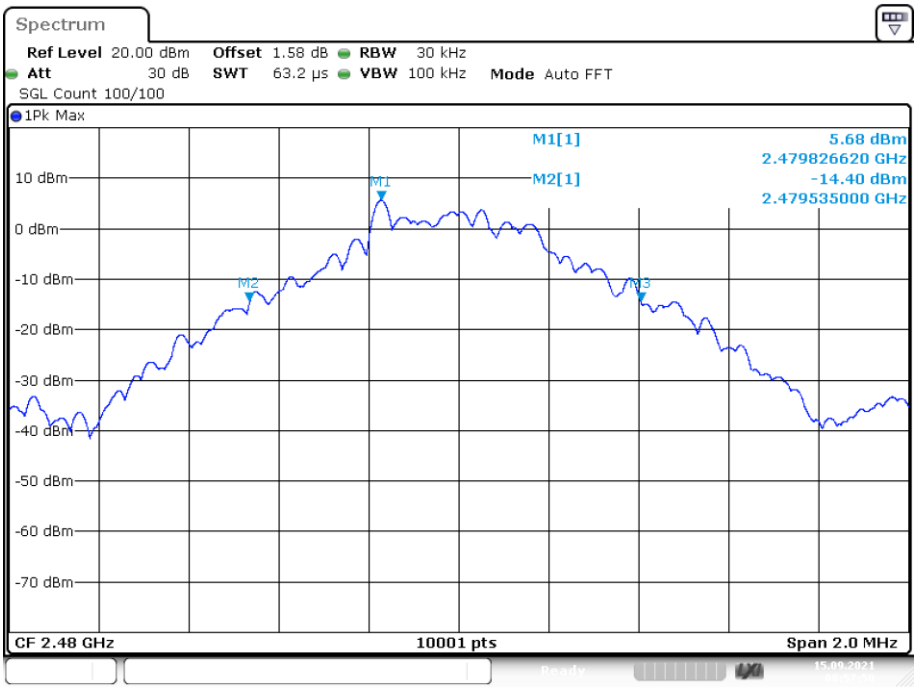
Date: 15.SEP.2021 08:48:18

-20dB Bandwidth NVNT 1-DH5 2441MHz Ant1

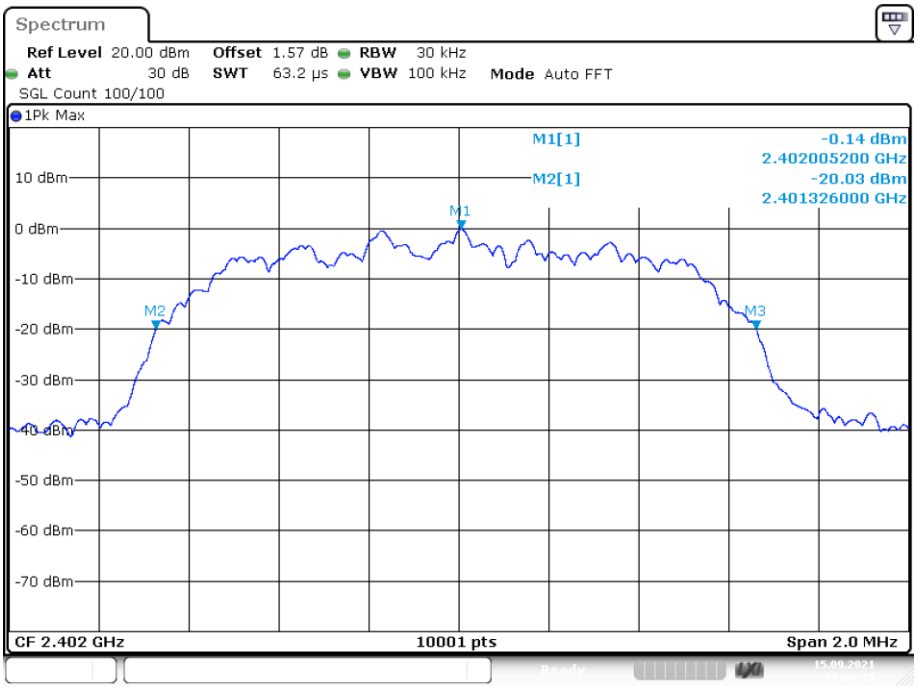


Date: 15.SEP.2021 08:56:22

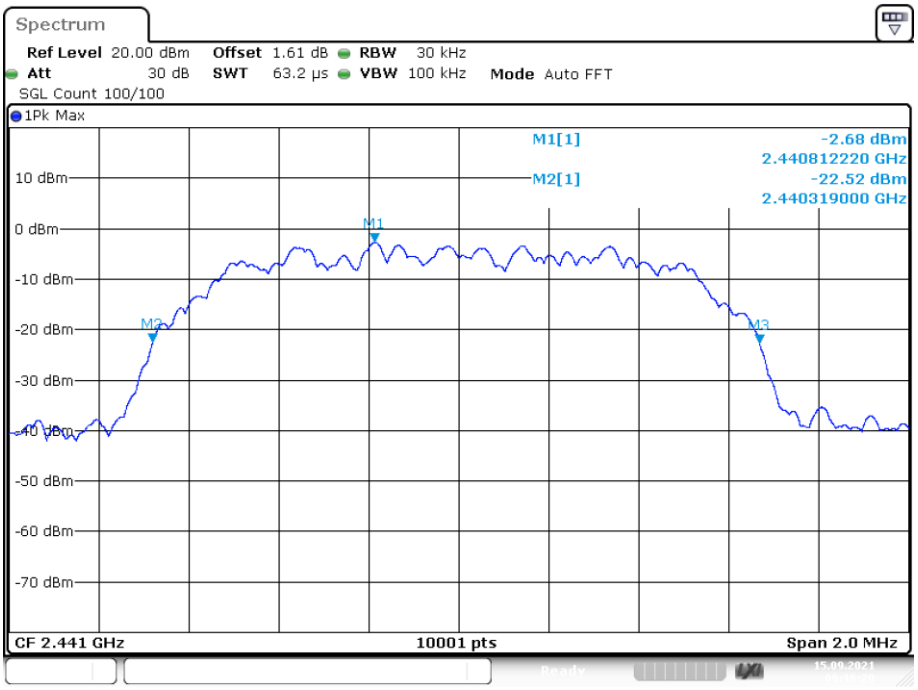
-20dB Bandwidth NVNT 1-DH5 2480MHz Ant1



-20dB Bandwidth NVNT 2-DH5 2402MHz Ant1

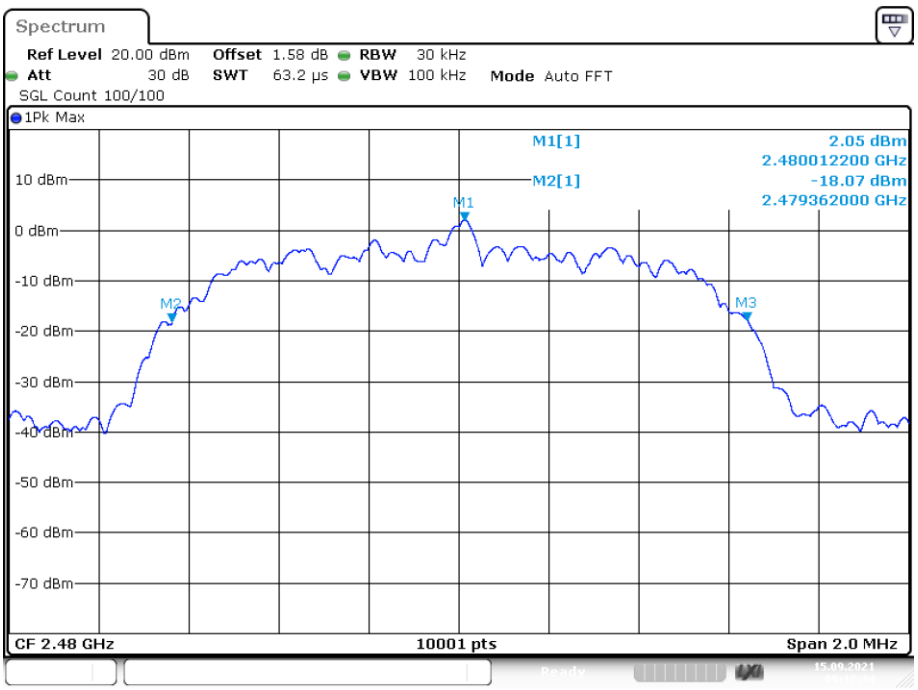


-20dB Bandwidth NVNT 2-DH5 2441MHz Ant1



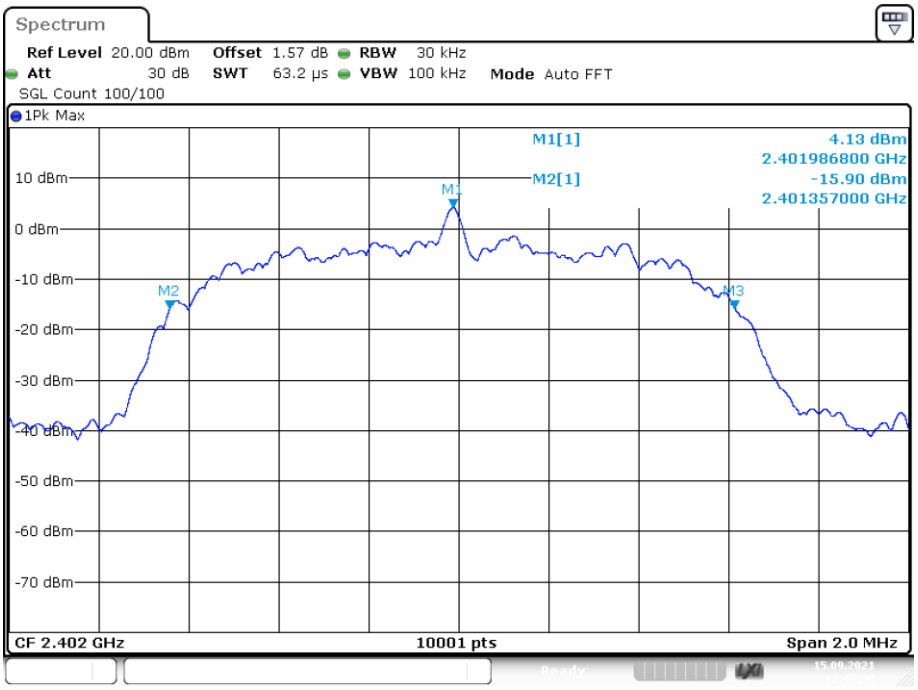
Date: 15.SEP.2021 09:16:19

-20dB Bandwidth NVNT 2-DH5 2480MHz Ant1

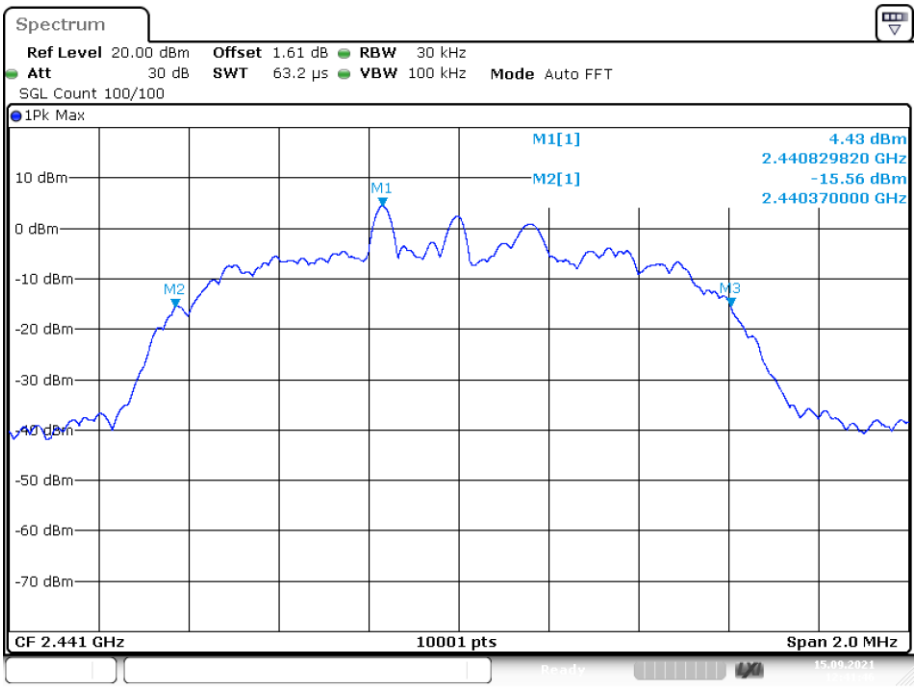


Date: 15.SEP.2021 09:17:34

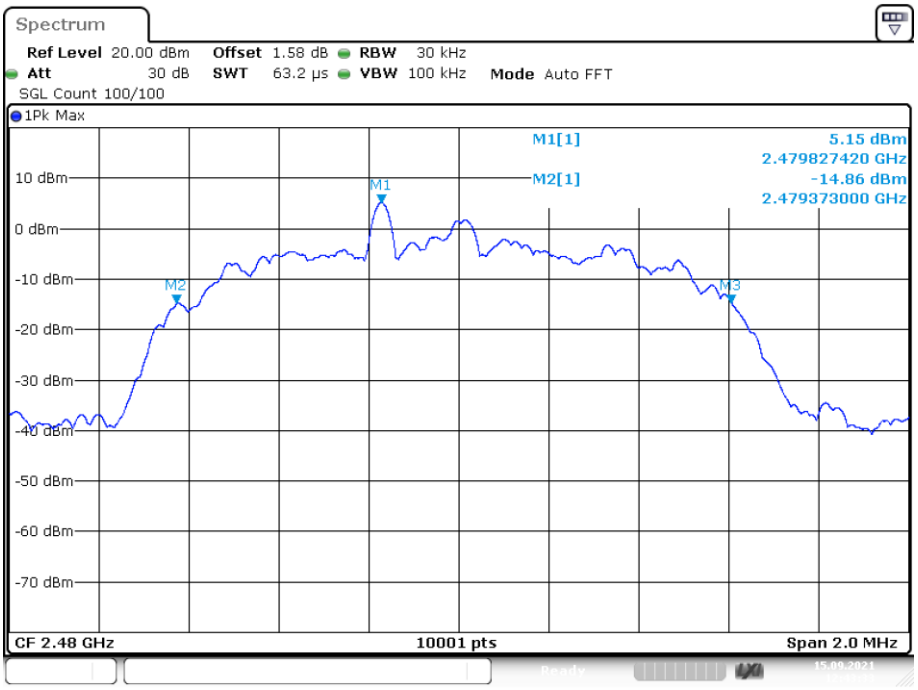
-20dB Bandwidth NVNT 3-DH5 2402MHz Ant1



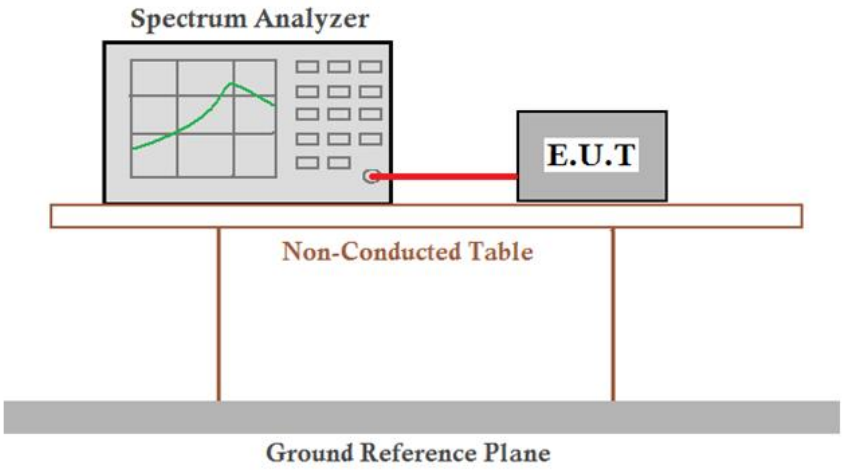
-20dB Bandwidth NVNT 3-DH5 2441MHz Ant1



-20dB Bandwidth NVNT 3-DH5 2480MHz Ant1



5.5 Carrier Frequencies Separation

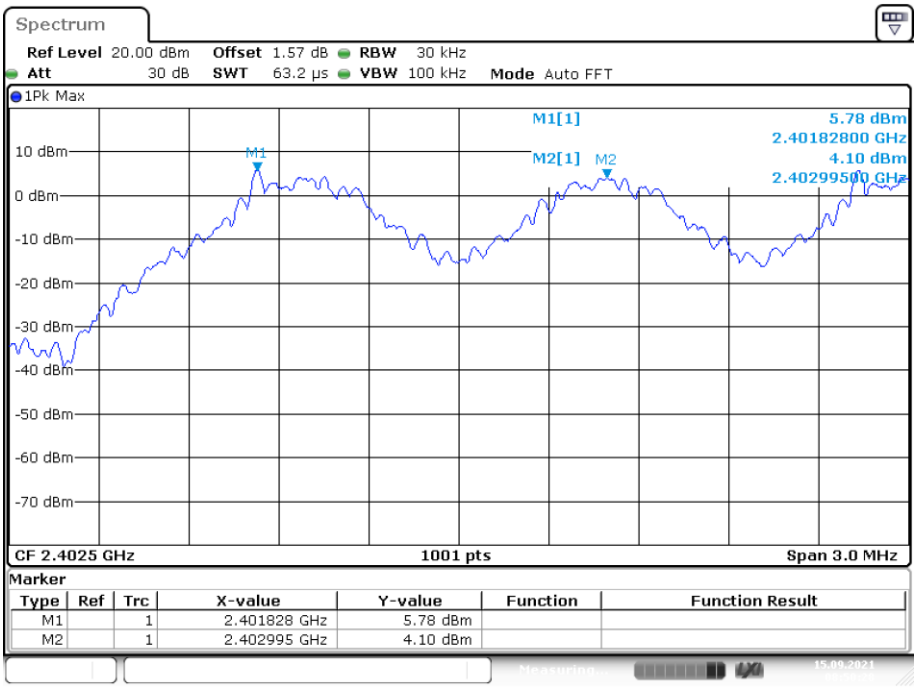
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	
Limit:	2/3 of the 20dB bandwidth
	Remark: the transmission power is less than 0.125W.
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

Measurement Data

GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1.167	≥0.998	Pass
Middle	1.002	≥0.94	Pass
Highest	0.999	≥0.868	Pass
π/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	0.978	≥0.891	Pass
Middle	1.005	≥0.899	Pass
Highest	1.008	≥0.853	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1.002	≥0.837	Pass
Middle	1.002	≥0.823	Pass
Highest	0.996	≥0.822	Pass

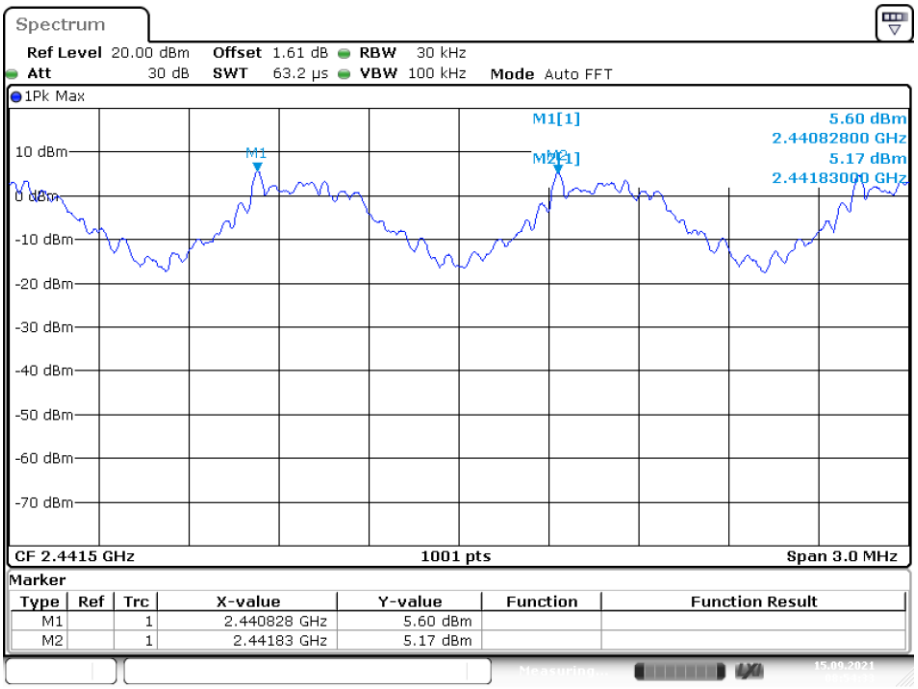
Test plot as follows:

CFS NVNT 1-DH5 2402MHz Ant1



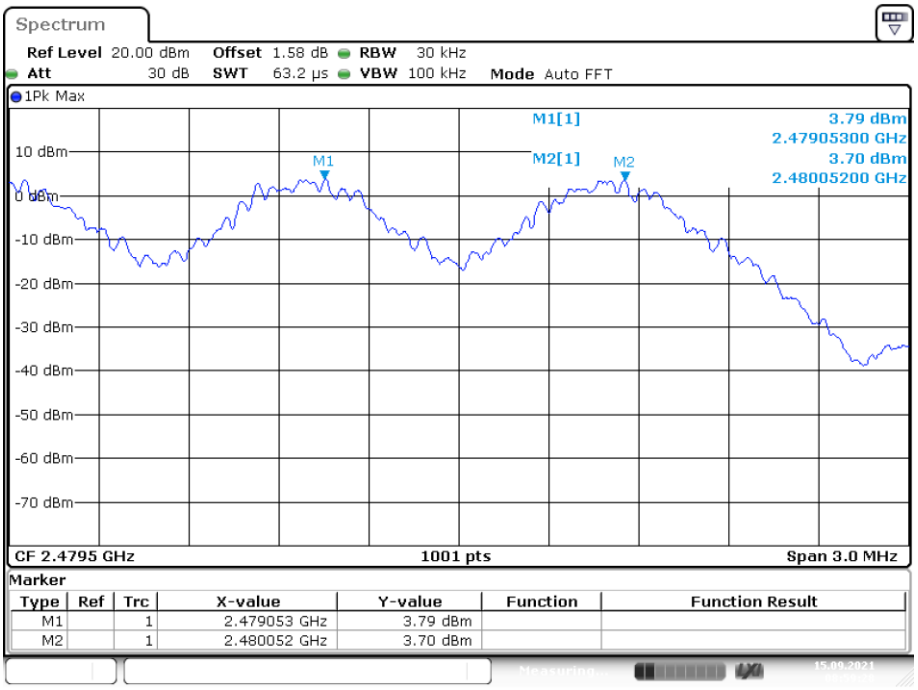
Date: 15.SEP.2021 08:50:28

CFS NVNT 1-DH5 2441MHz Ant1



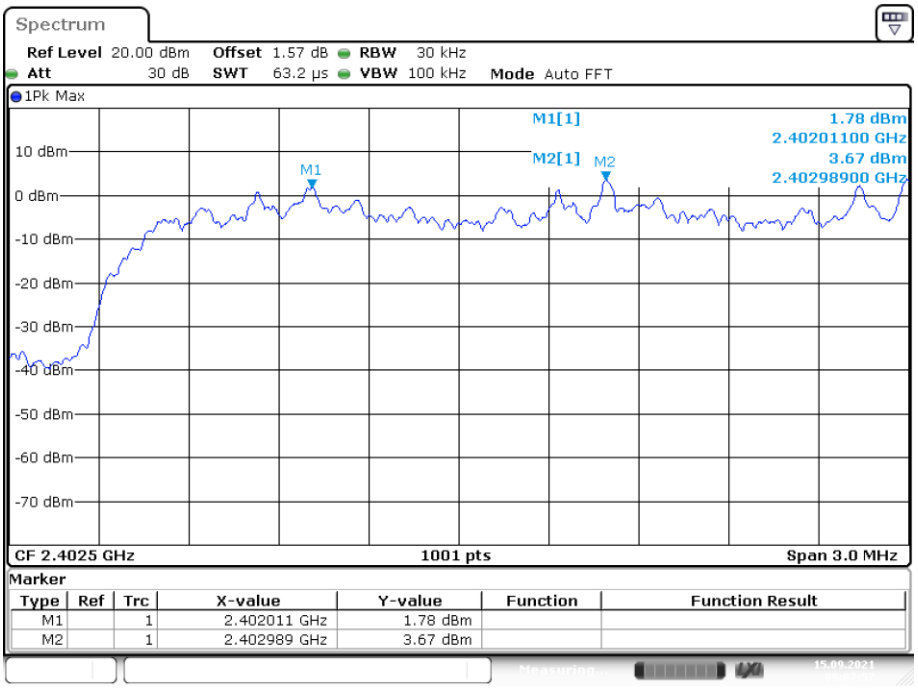
Date: 15.SEP.2021 08:54:33

CFS NVNT 1-DH5 2480MHz Ant1



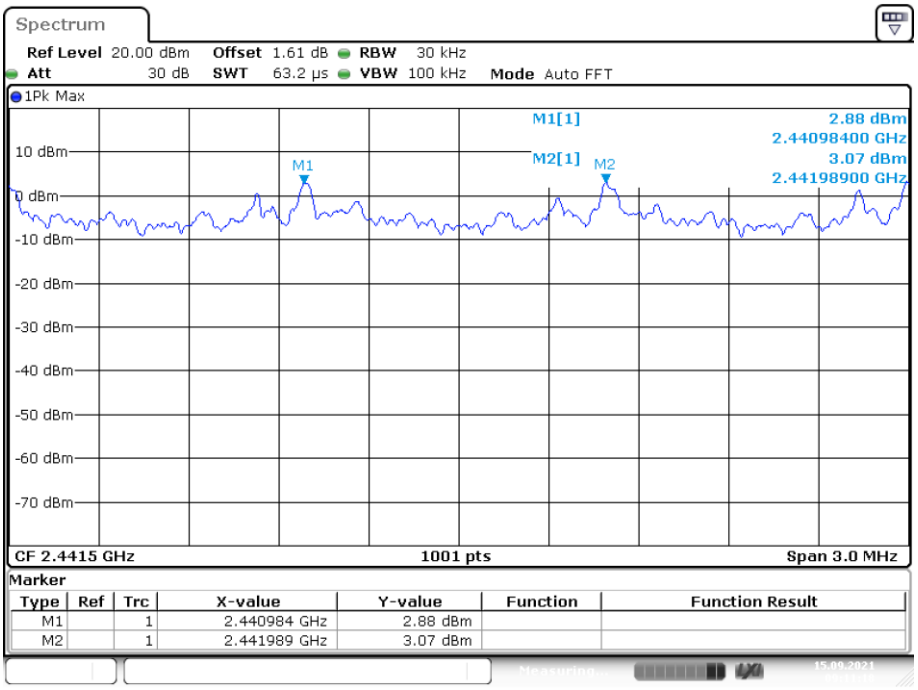
Date: 15.SEP.2021 08:59:28

CFS NVNT 2-DH5 2402MHz Ant1



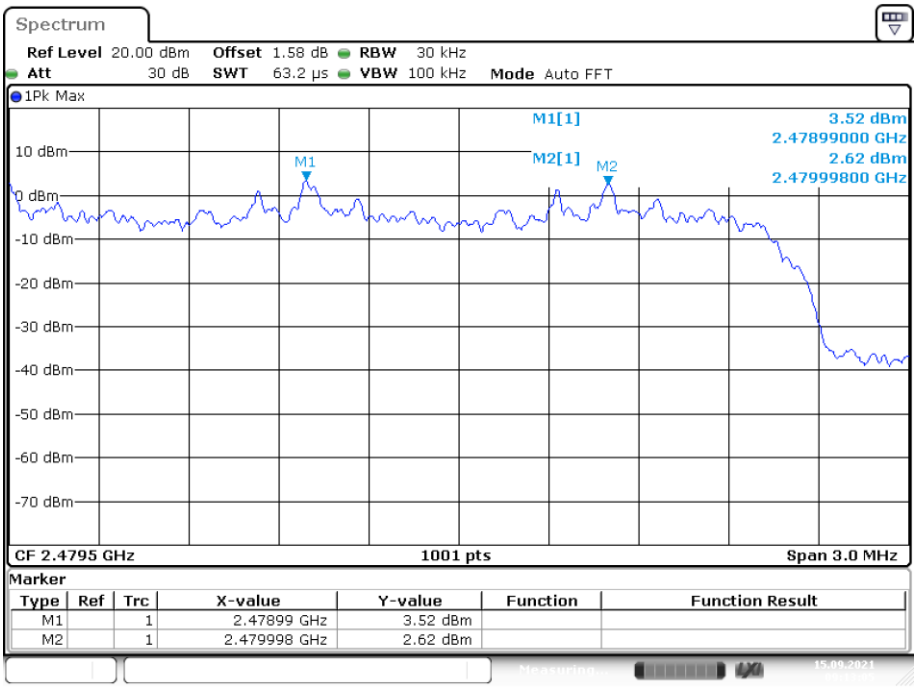
Date: 15.SEP.2021 09:07:57

CFS NVNT 2-DH5 2441MHz Ant1



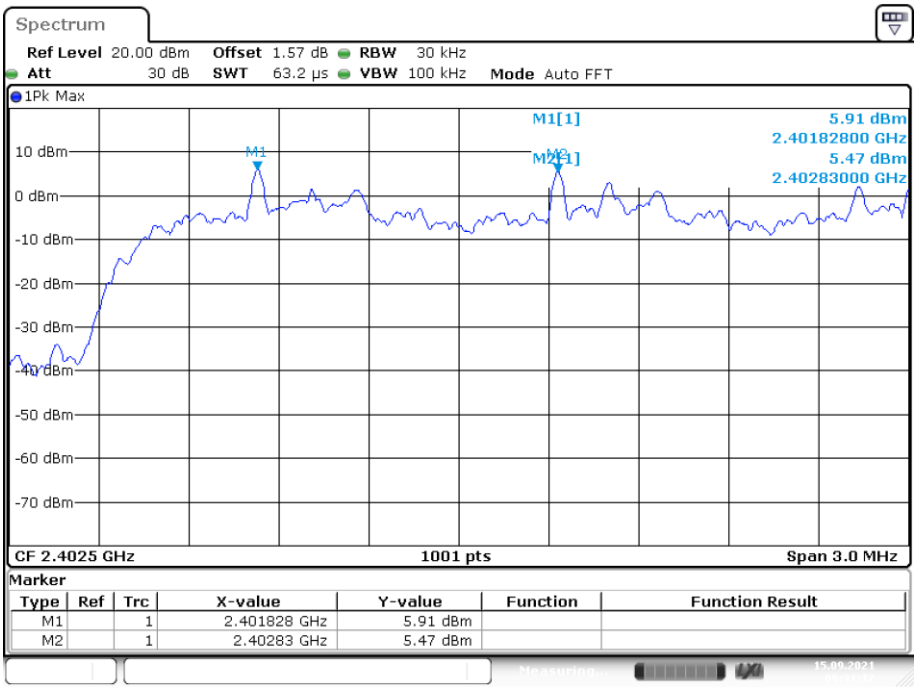
Date: 15.SEP.2021 09:11:18

CFS NVNT 2-DH5 2480MHz Ant1



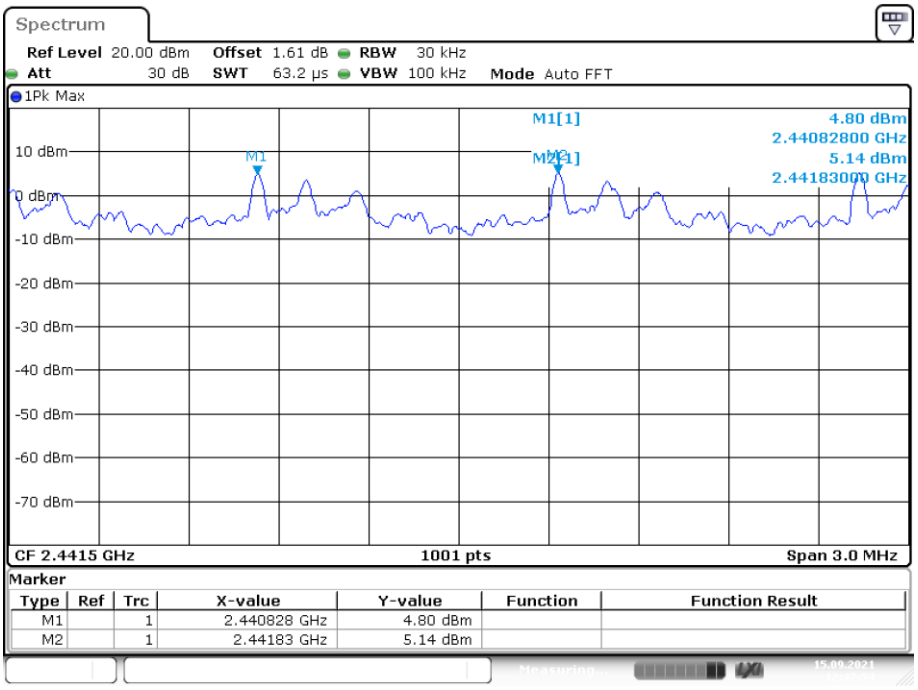
Date: 15.SEP.2021 09:13:05

CFS NVNT 3-DH5 2402MHz Ant1



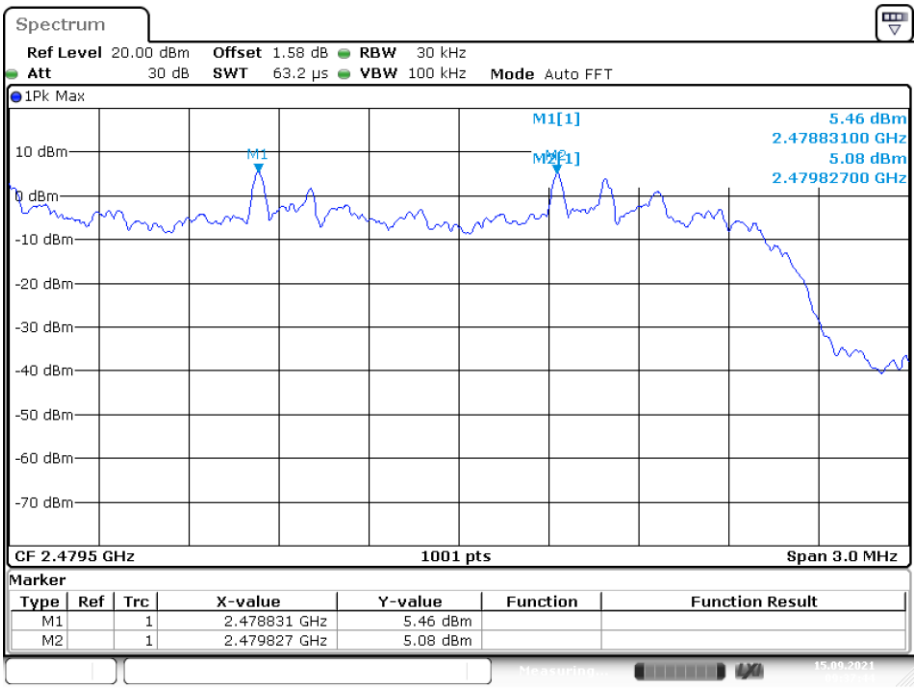
Date: 15.SEP.2021 09:31:12

CFS NVNT 3-DH5 2441MHz Ant1



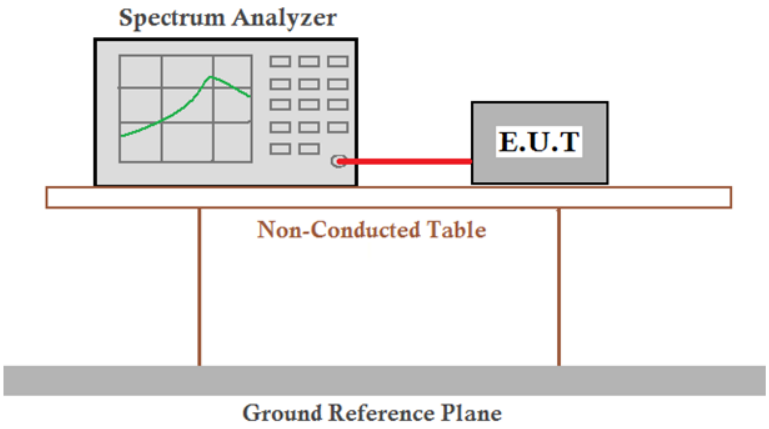
Date: 15.SEP.2021 12:47:55

CFS NVNT 3-DH5 2480MHz Ant1



Date: 15.SEP.2021 09:37:44

5.6 Hopping Channel Number

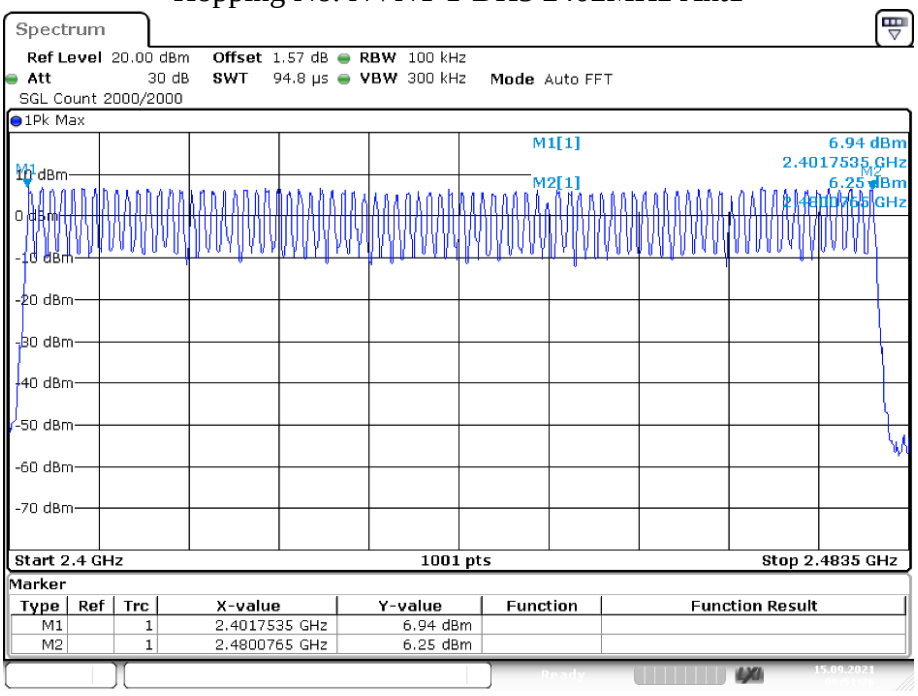
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	
Limit:	At least 15 channels
Test Mode:	Hopping transmitting with all kind of modulation
Test Results:	Pass

Measurement Data

Mode	Hopping channel numbers	Limit
GFSK	79	≥15
π/4DQPSK	79	≥15
8DPSK	79	≥15

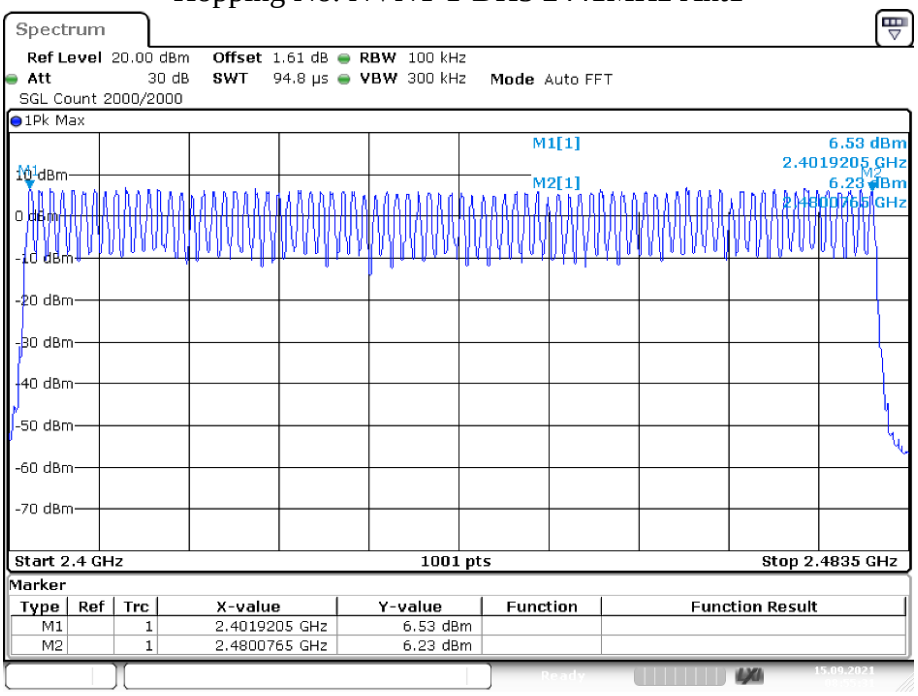
Test plot as follows:

Hopping No. NVNT 1-DH5 2402MHz Ant1



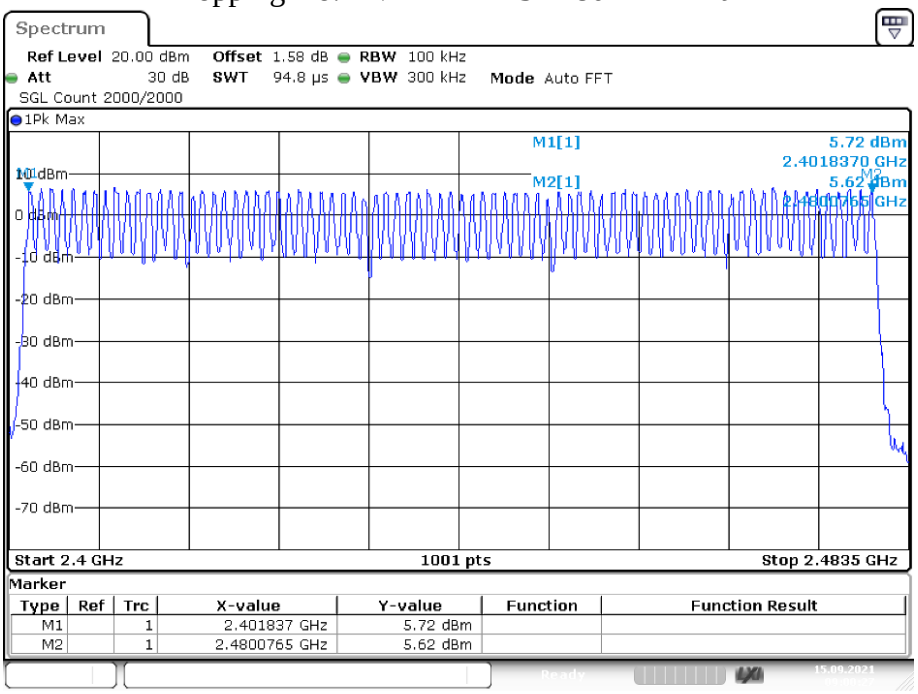
Date: 15.SEP.2021 08:51:26

Hopping No. NVNT 1-DH5 2441MHz Ant1



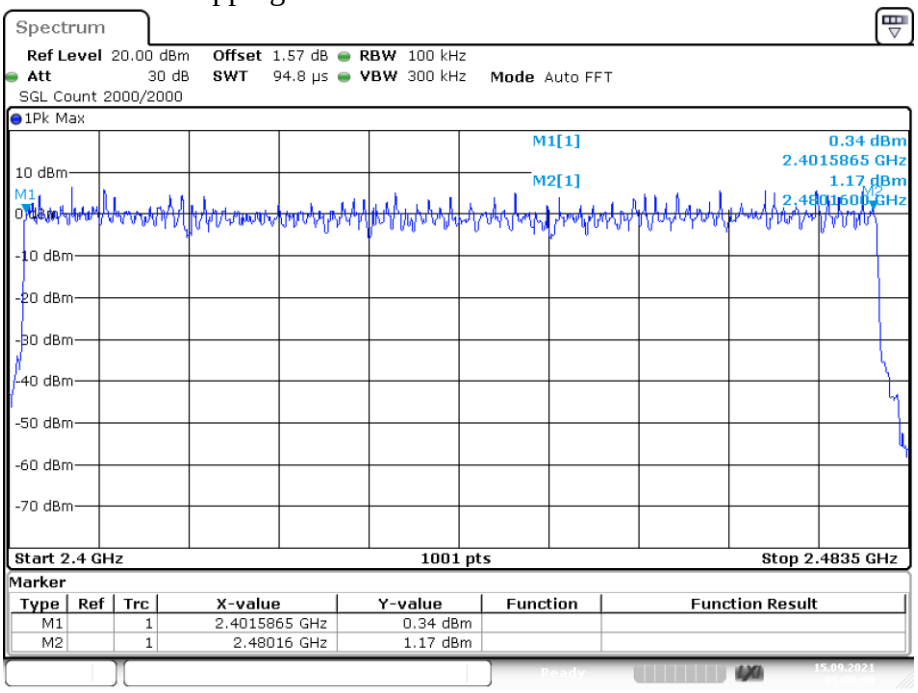
Date: 15.SEP.2021 08:55:30

Hopping No. NVNT 1-DH5 2480MHz Ant1



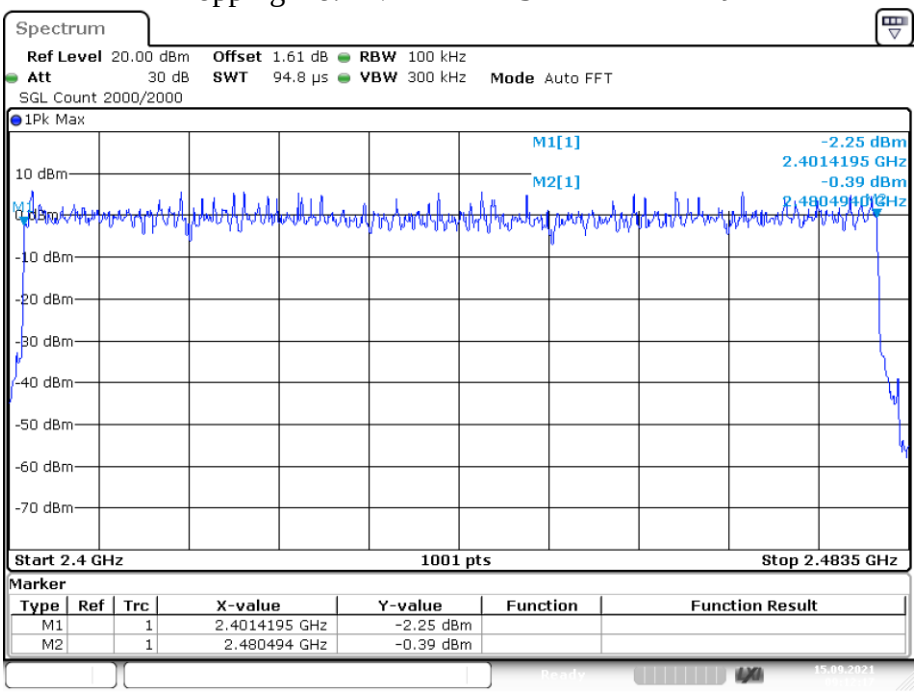
Date: 15.SEP.2021 09:00:27

Hopping No. NVNT 2-DH5 2402MHz Ant1



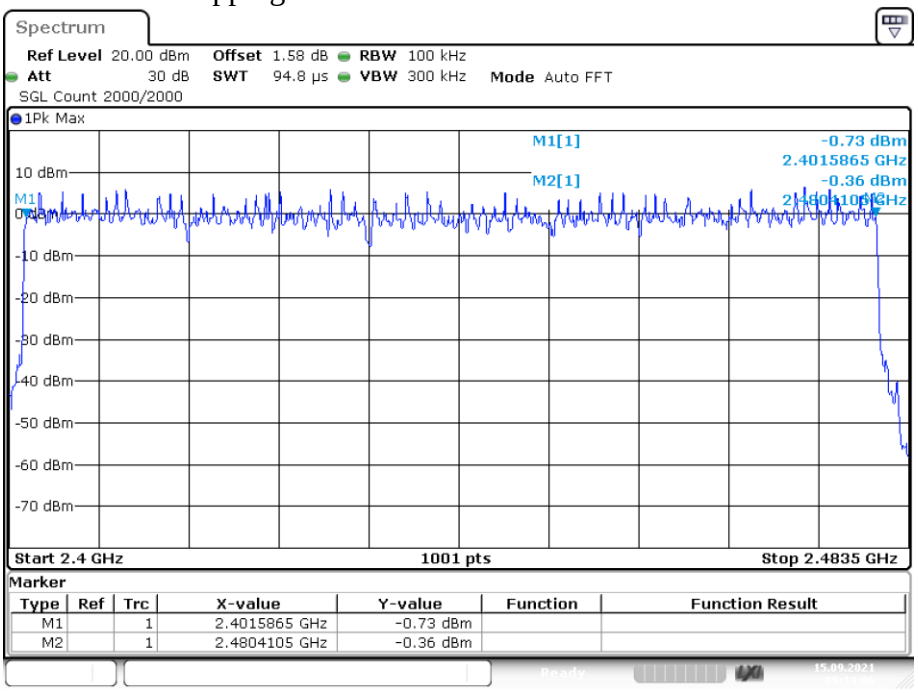
Date: 15.SEP.2021 09:08:59

Hopping No. NVNT 2-DH5 2441MHz Ant1



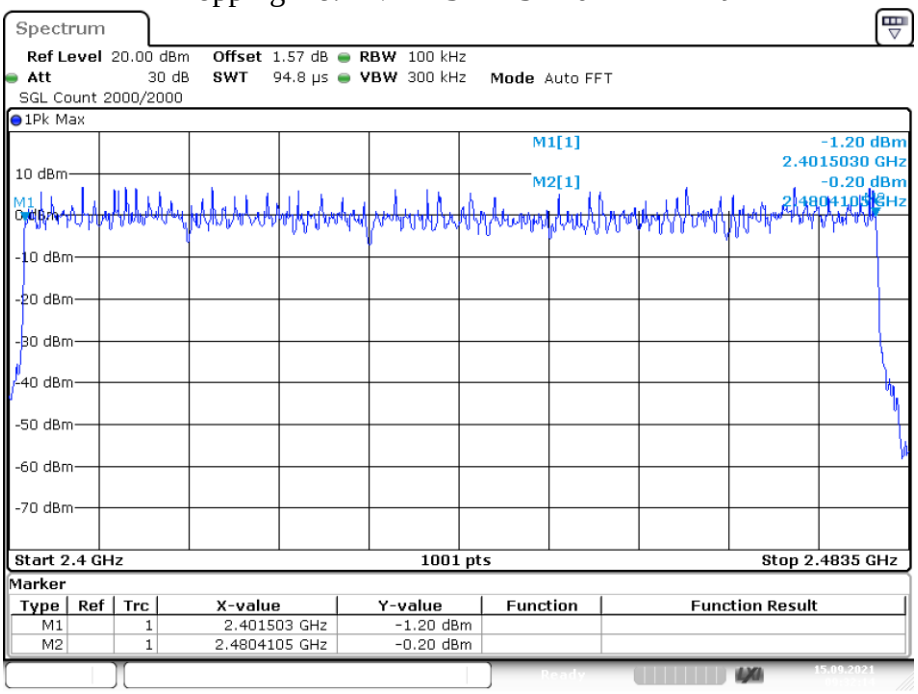
Date: 15.SEP.2021 09:12:17

Hopping No. NVNT 2-DH5 2480MHz Ant1



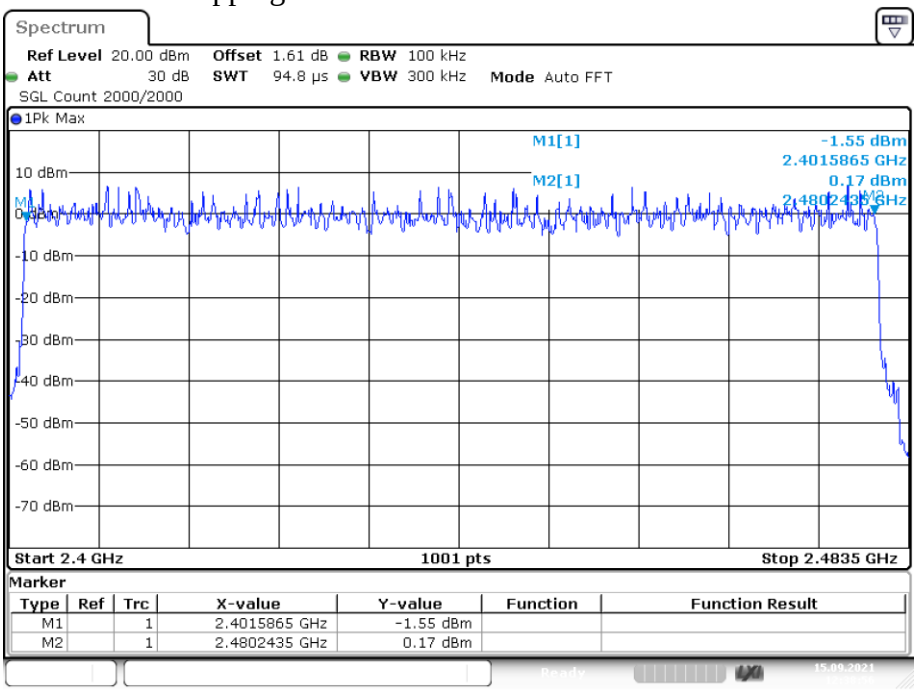
Date: 15.SEP.2021 09:14:05

Hopping No. NVNT 3-DH5 2402MHz Ant1



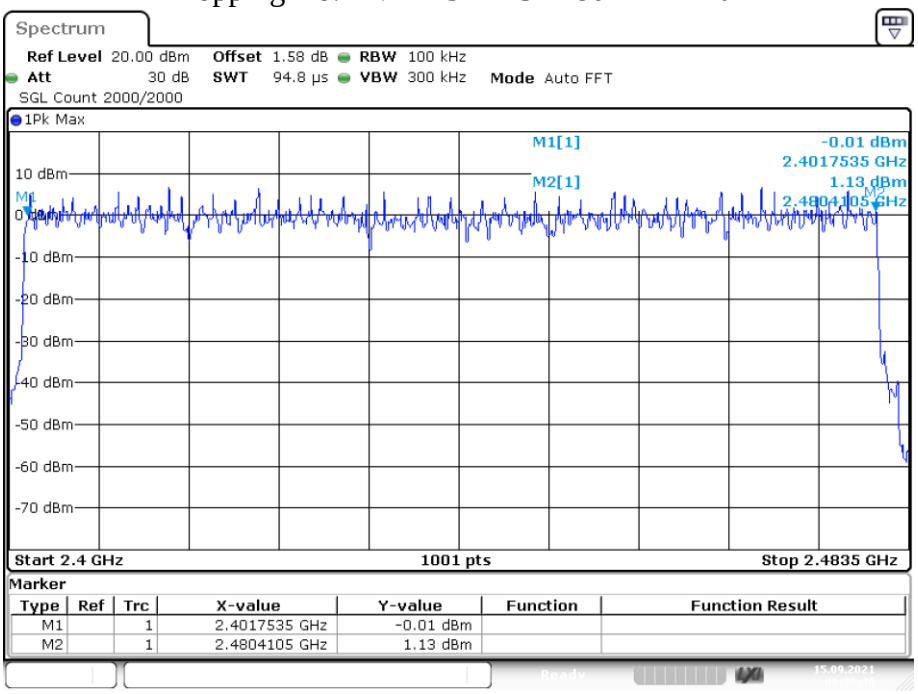
Date: 15.SEP.2021 09:32:14

Hopping No. NVNT 3-DH5 2441MHz Ant1



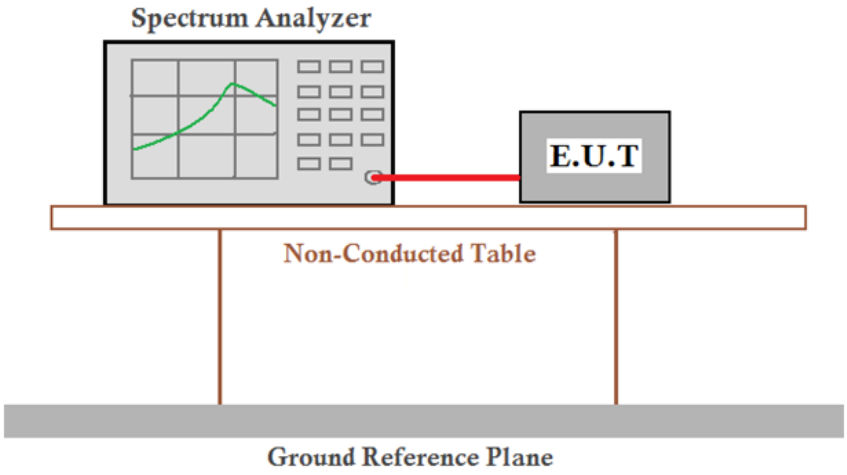
Date: 15.SEP.2021 12:38:55

Hopping No. NVNT 3-DH5 2480MHz Ant1



Date: 15.SEP.2021 09:38:46

5.7 Dwell Time

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Limit:	0.4 Second
Test Results:	Pass

Measurement Data

Mode	Packet	Pulse time (ms)	Dwell time [s]	Limit (second)
GFSK	DH1	0.372	0.119	≤0.4
	DH3	1.621	0.259	≤0.4
	DH5	2.868	0.306	≤0.4
π/4DQPSK	2-DH1	0.380	0.122	≤0.4
	2-DH3	1.630	0.261	≤0.4
	2-DH5	2.877	0.307	≤0.4
8DPSK	3-DH1	0.381	0.122	≤0.4
	3-DH3	1.630	0.261	≤0.4
	3-DH5	2.881	0.307	≤0.4

Test Result:

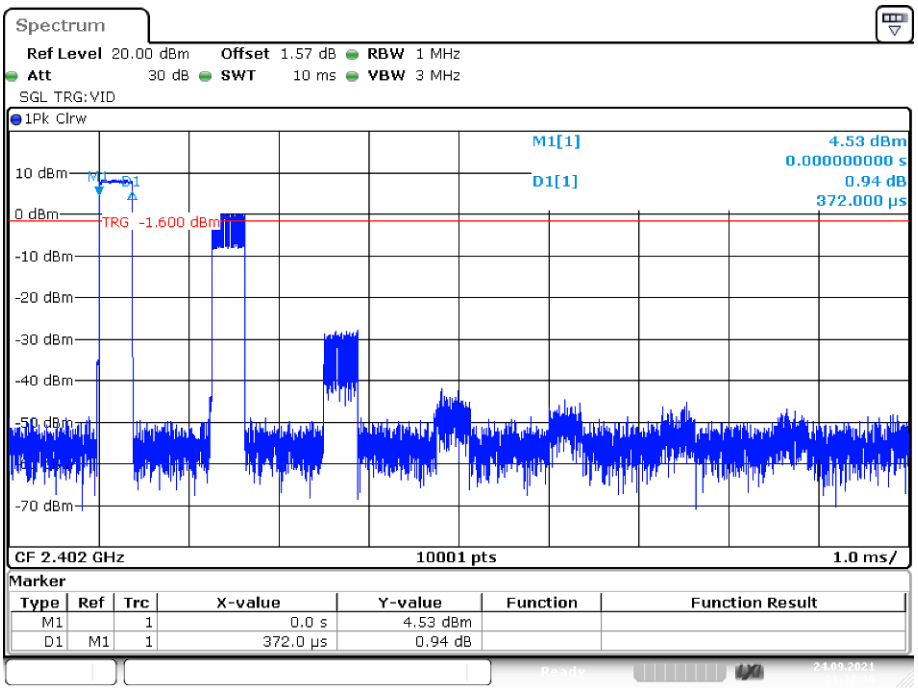
1. We have tested all mode at high,middle and low channel,and recoreded worst case.
2. Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1

   Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3

   Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

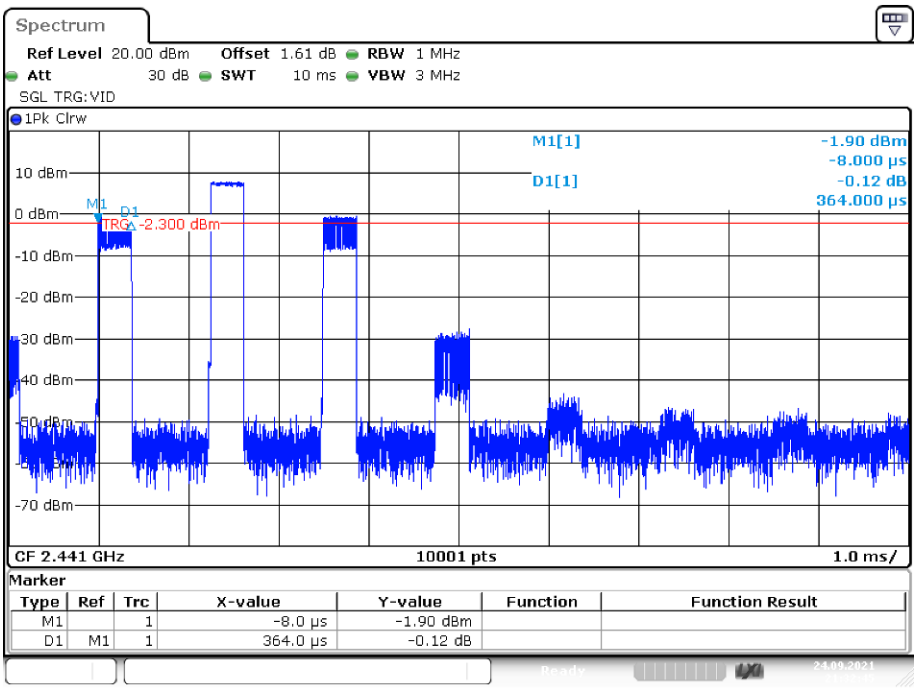
Test plot as follows:

Dwell NVNT 1-DH1 2402MHz Ant1



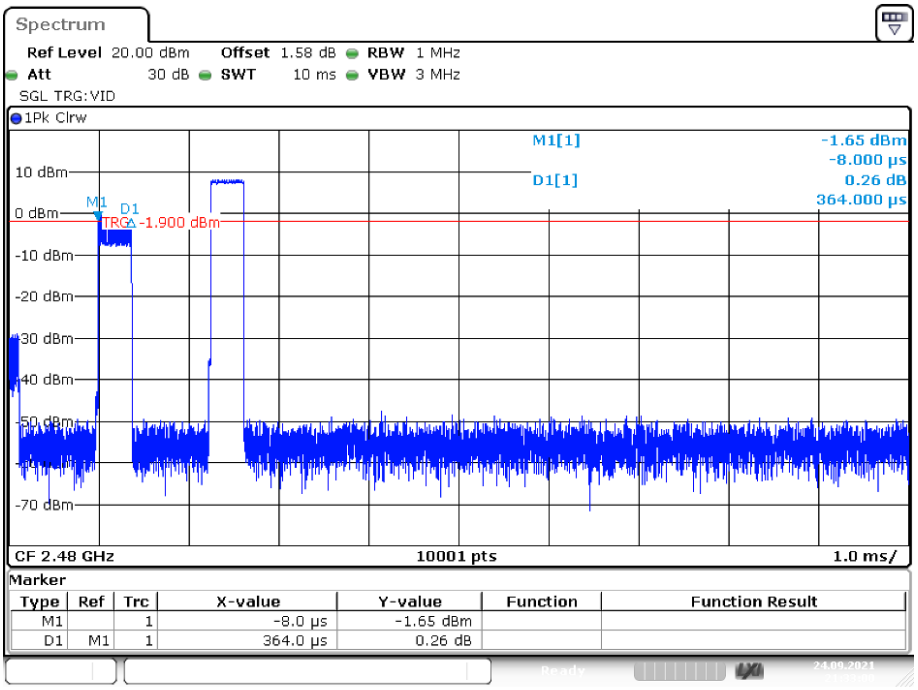
Date: 24.SEP.2021 21:32:35

Dwell NVNT 1-DH1 2441MHz Ant1



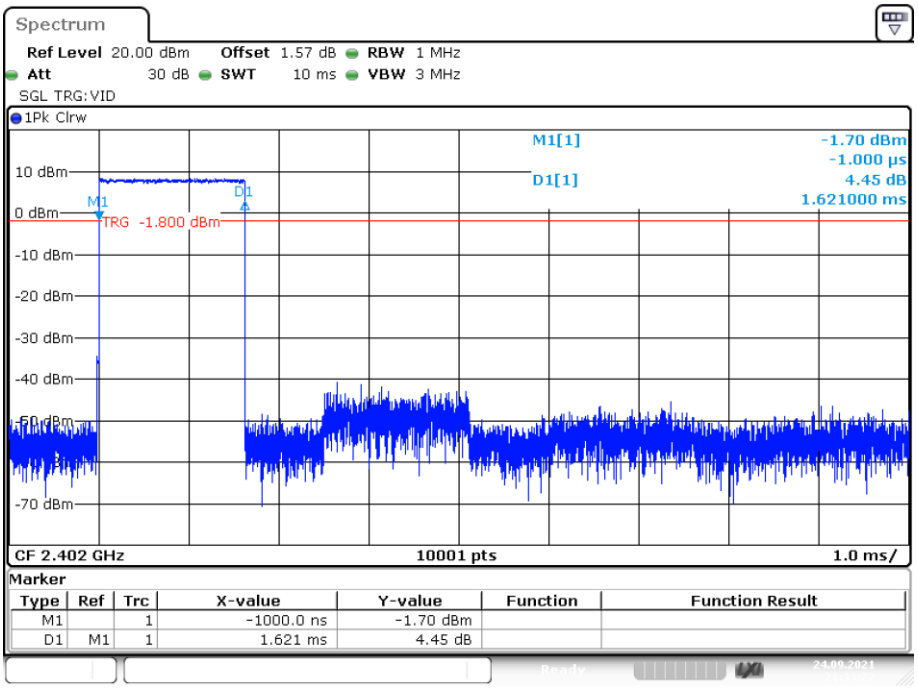
Date: 24.SEP.2021 21:32:44

Dwell NVNT 1-DH1 2480MHz Ant1



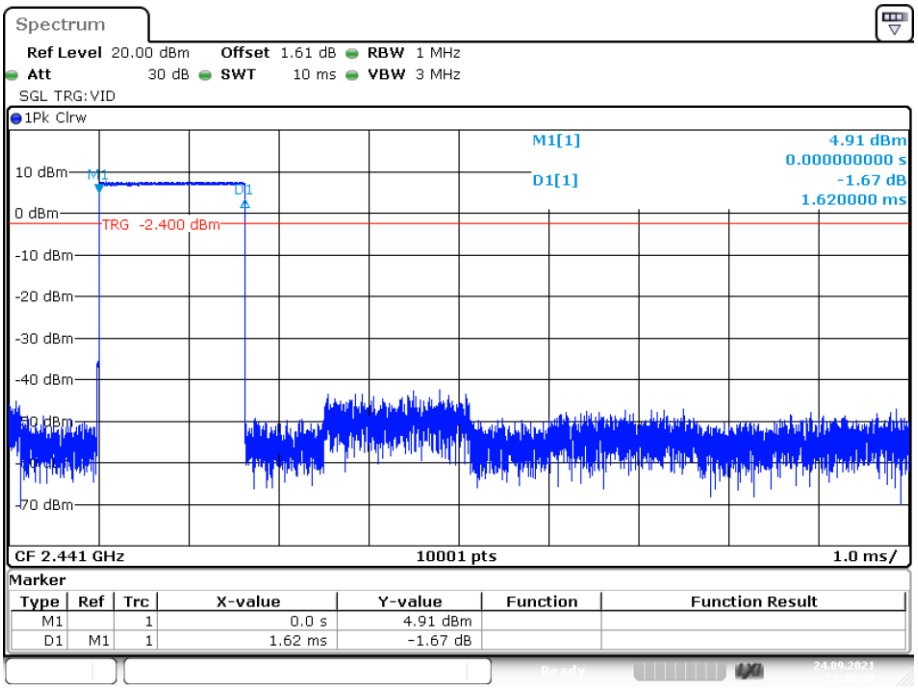
Date: 24.SEP.2021 21:33:00

Dwell NVNT 1-DH3 2402MHz Ant1



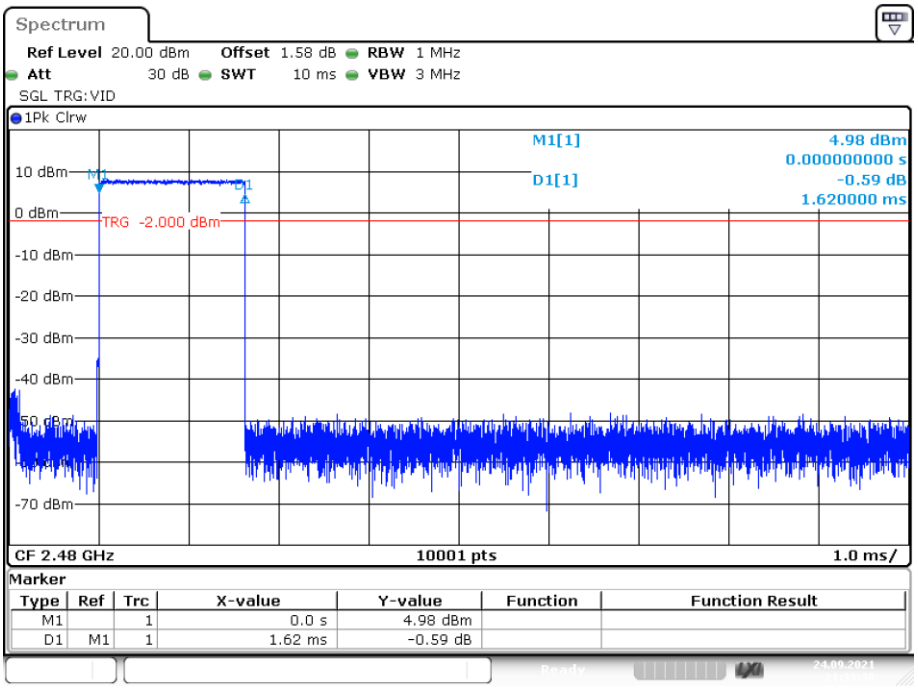
Date: 24.SEP.2021 21:33:22

Dwell NVNT 1-DH3 2441MHz Ant1



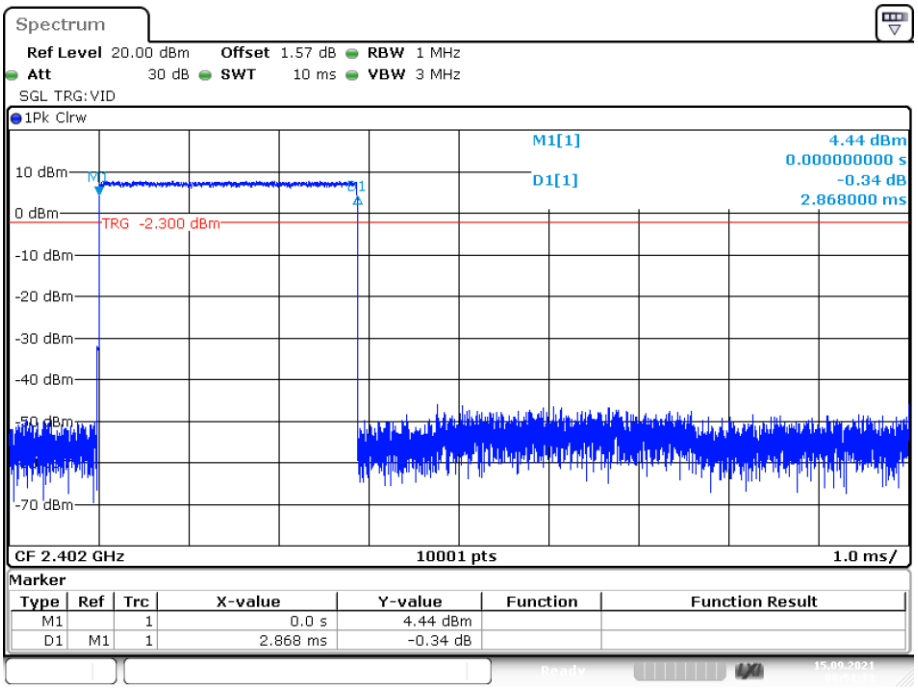
Date: 24.SEP.2021 21:33:30

Dwell NVNT 1-DH3 2480MHz Ant1



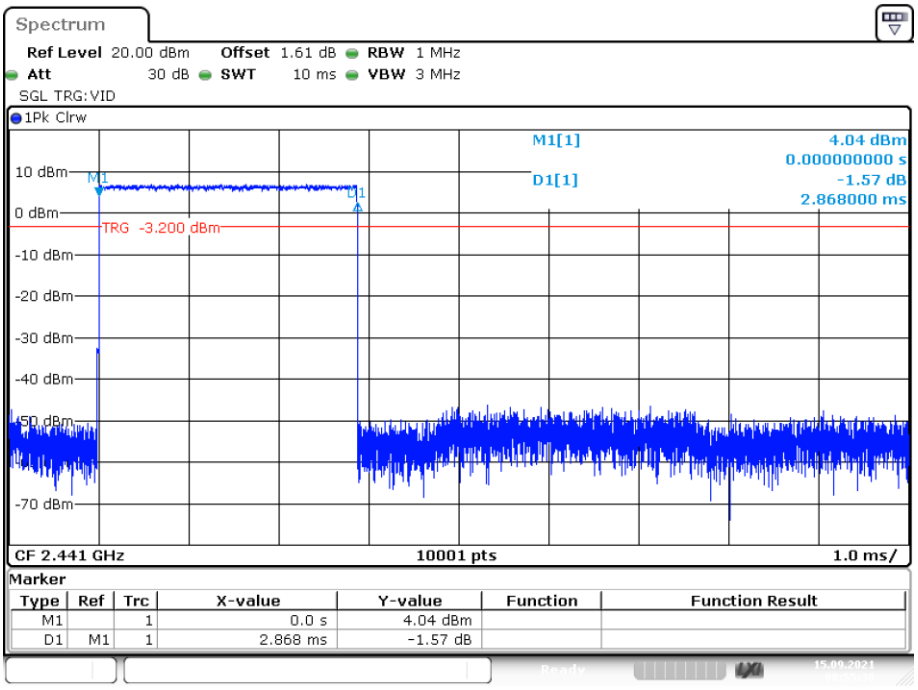
Date: 24.SEP.2021 21:33:38

Dwell NVNT 1-DH5 2402MHz Ant1



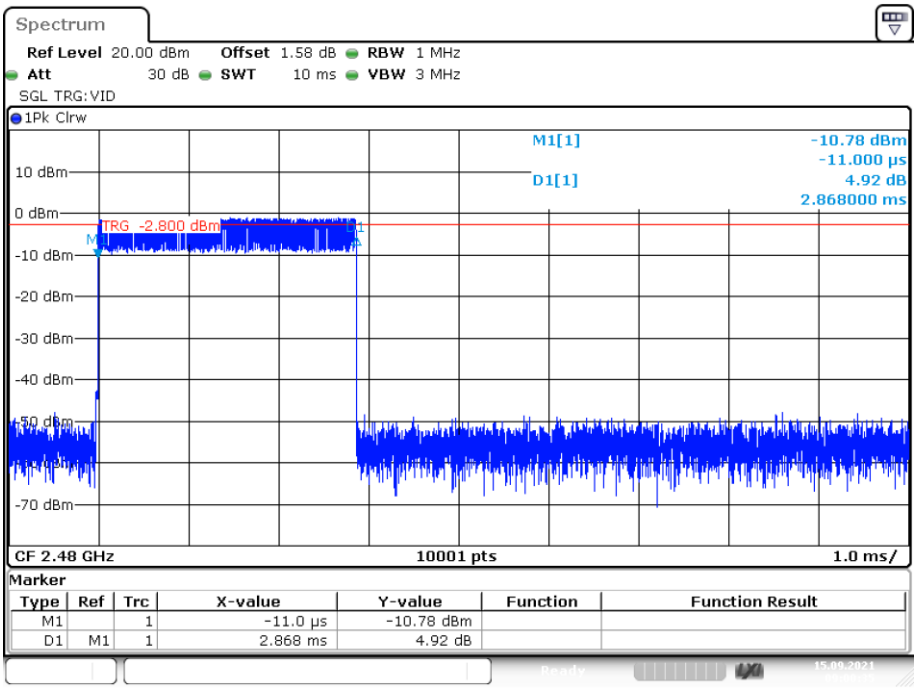
Date: 15.SEP.2021 08:51:33

Dwell NVNT 1-DH5 2441MHz Ant1



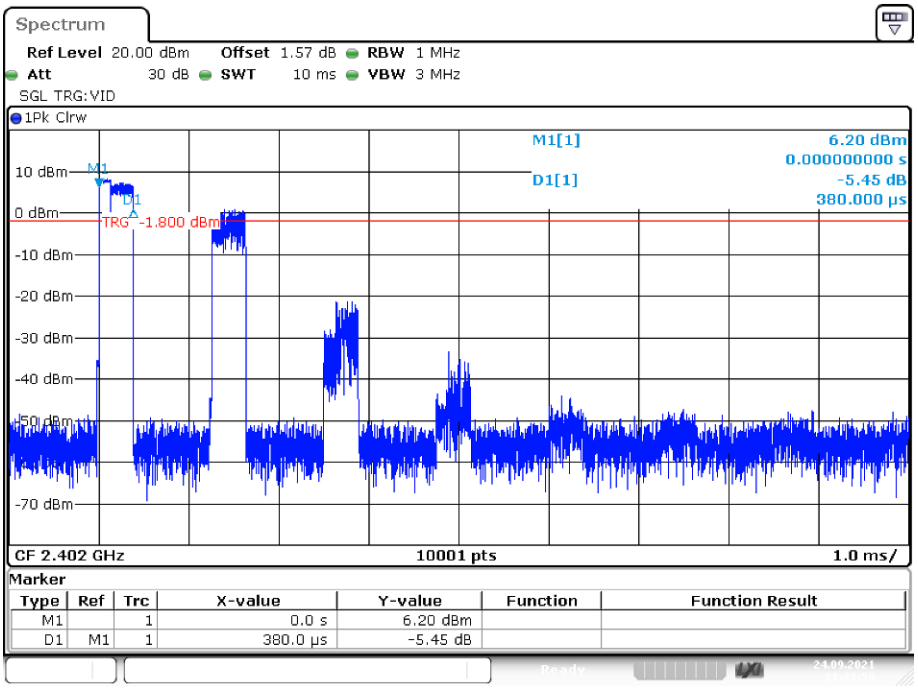
Date: 15.SEP.2021 08:55:37

Dwell NVNT 1-DH5 2480MHz Ant1



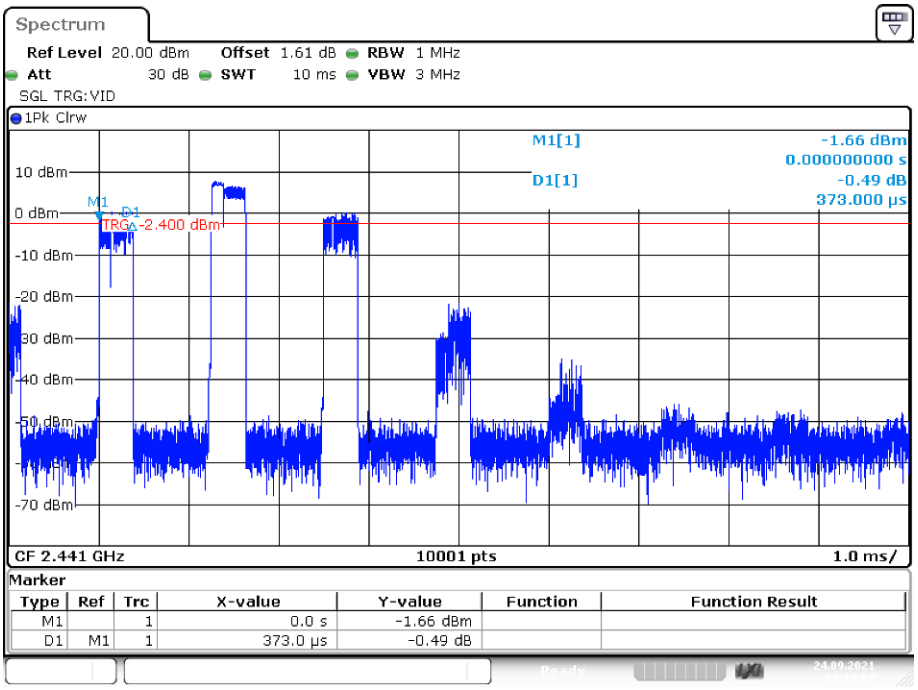
Date: 15.SEP.2021 09:00:35

Dwell NVNT 2-DH1 2402MHz Ant1



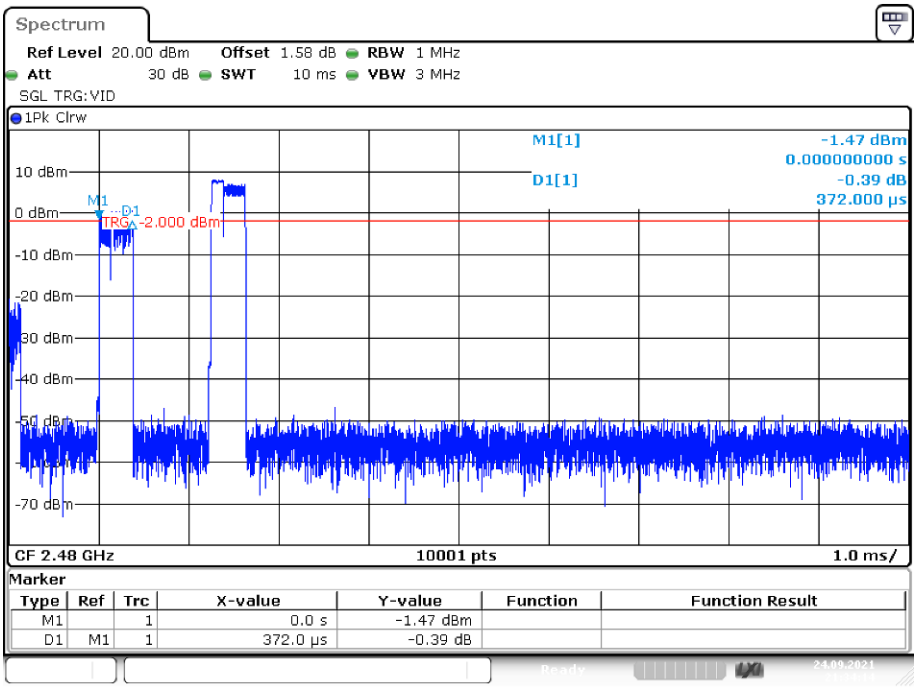
Date: 24.SEP.2021 21:33:59

Dwell NVNT 2-DH1 2441MHz Ant1



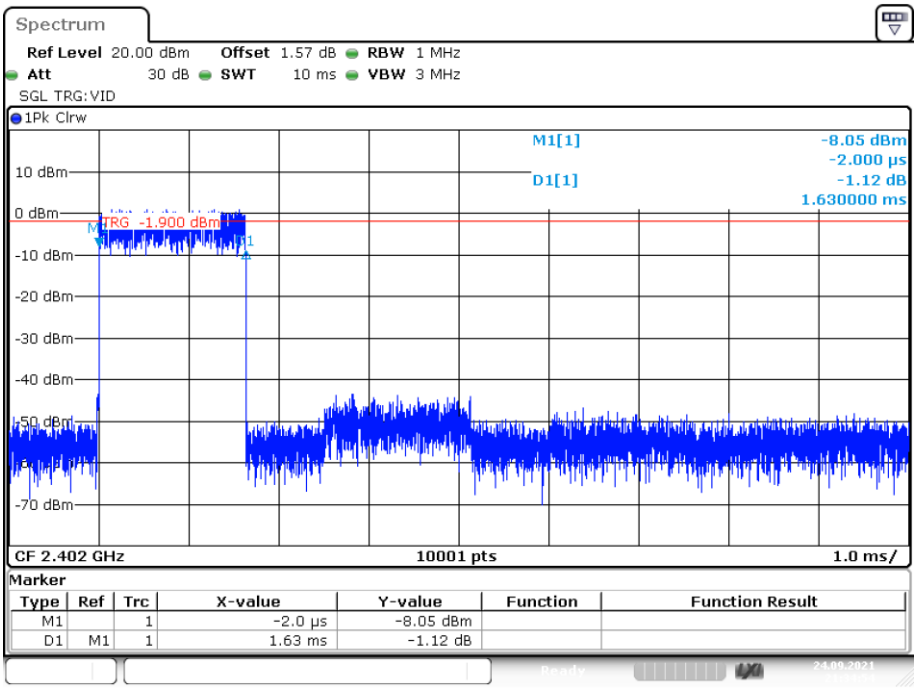
Date: 24.SEP.2021 21:34:06

Dwell NVNT 2-DH1 2480MHz Ant1



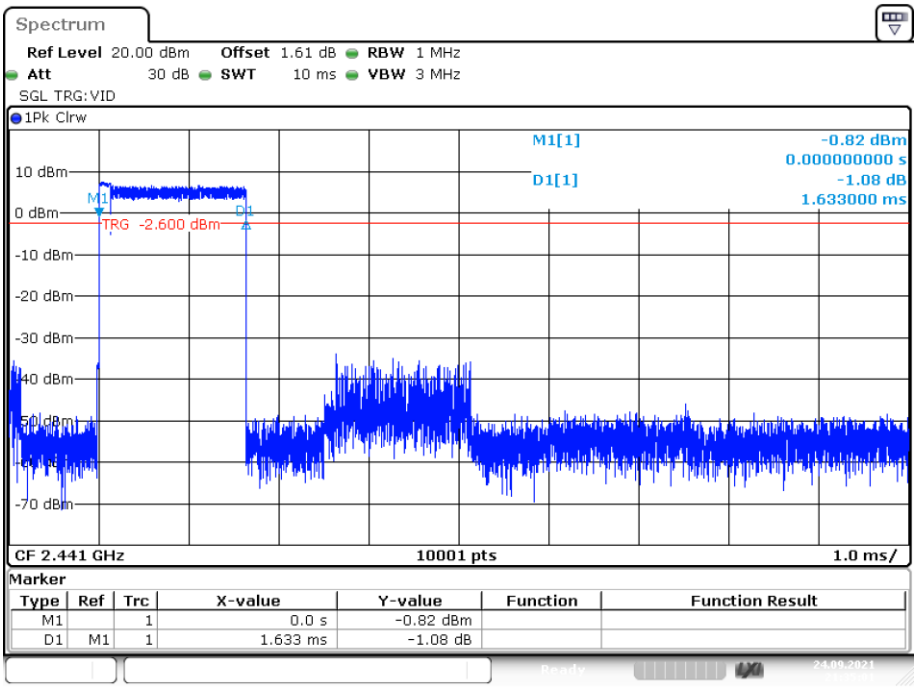
Date: 24.SEP.2021 21:34:14

Dwell NVNT 2-DH3 2402MHz Ant1



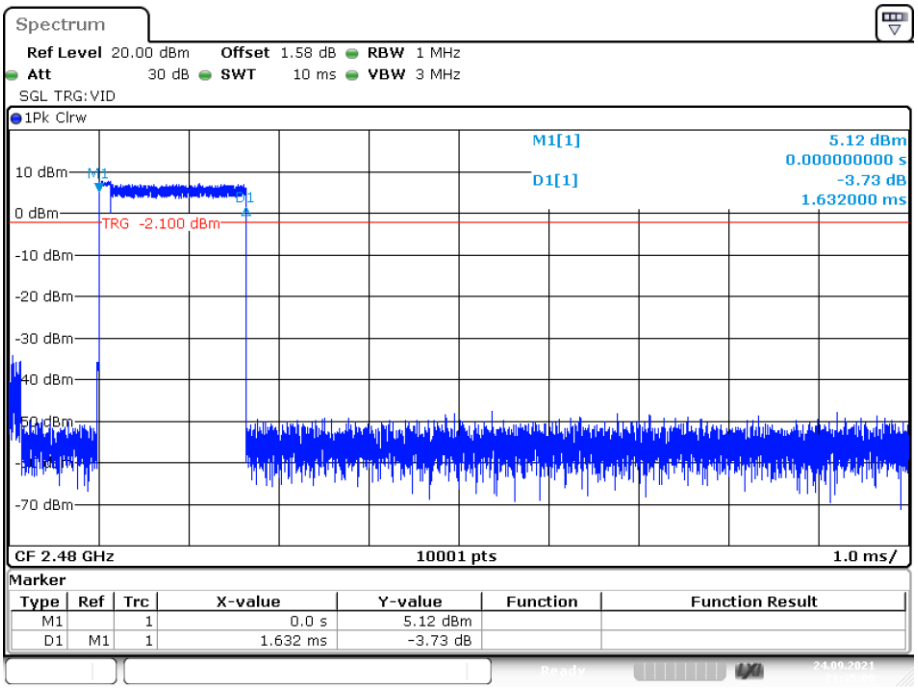
Date: 24.SEP.2021 21:34:54

Dwell NVNT 2-DH3 2441MHz Ant1



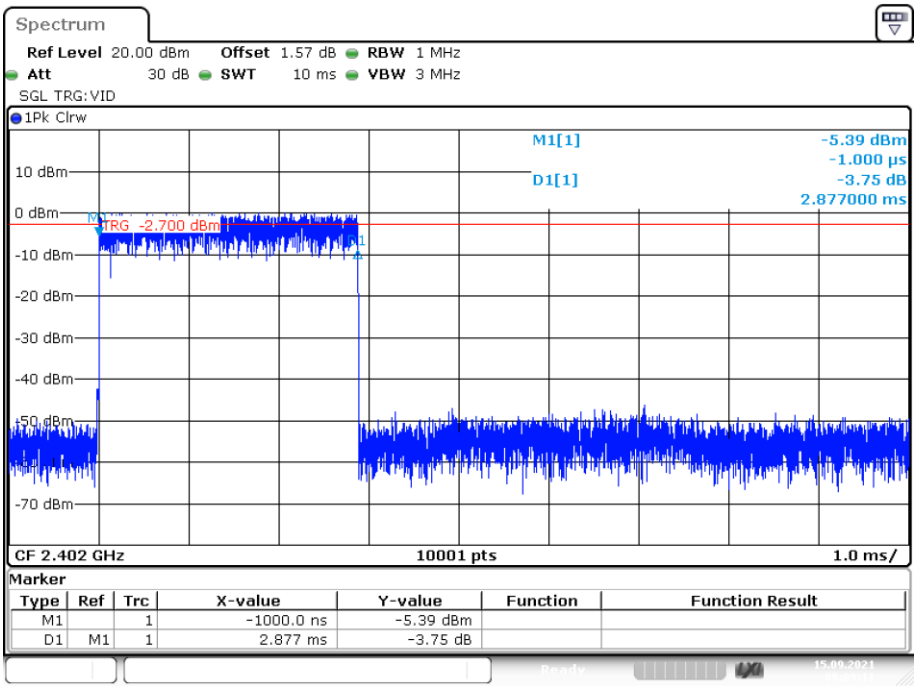
Date: 24.SEP.2021 21:35:01

Dwell NVNT 2-DH3 2480MHz Ant1



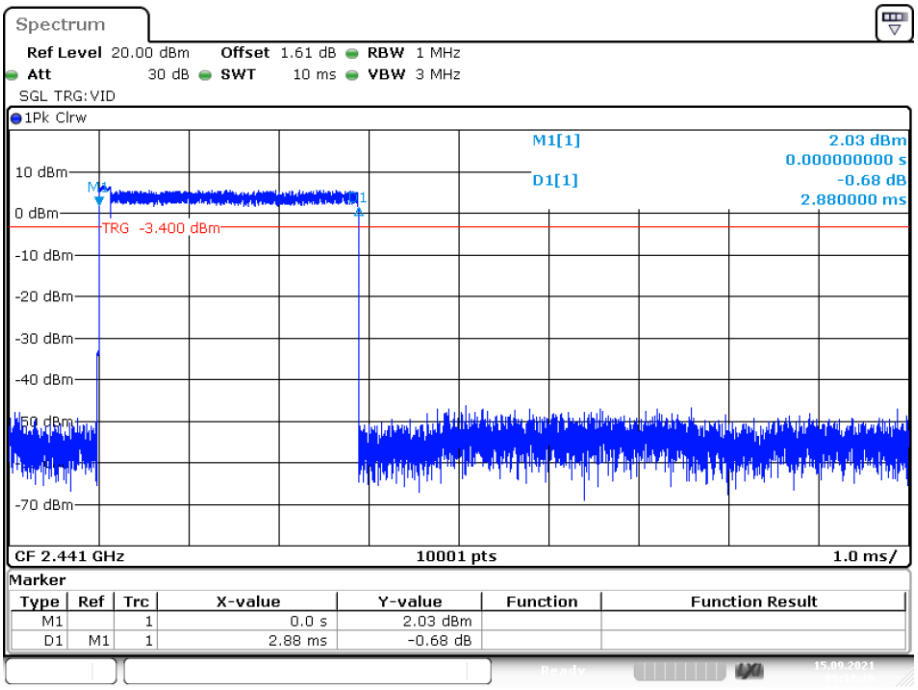
Date: 24.SEP.2021 21:35:08

Dwell NVNT 2-DH5 2402MHz Ant1



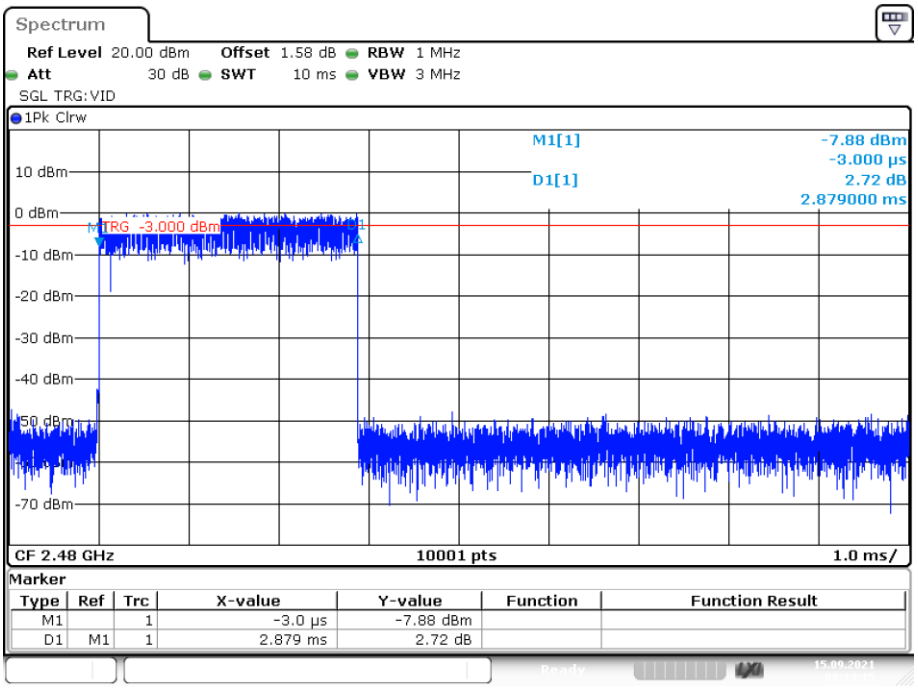
Date: 15.SEP.2021 09:09:11

Dwell NVNT 2-DH5 2441MHz Ant1



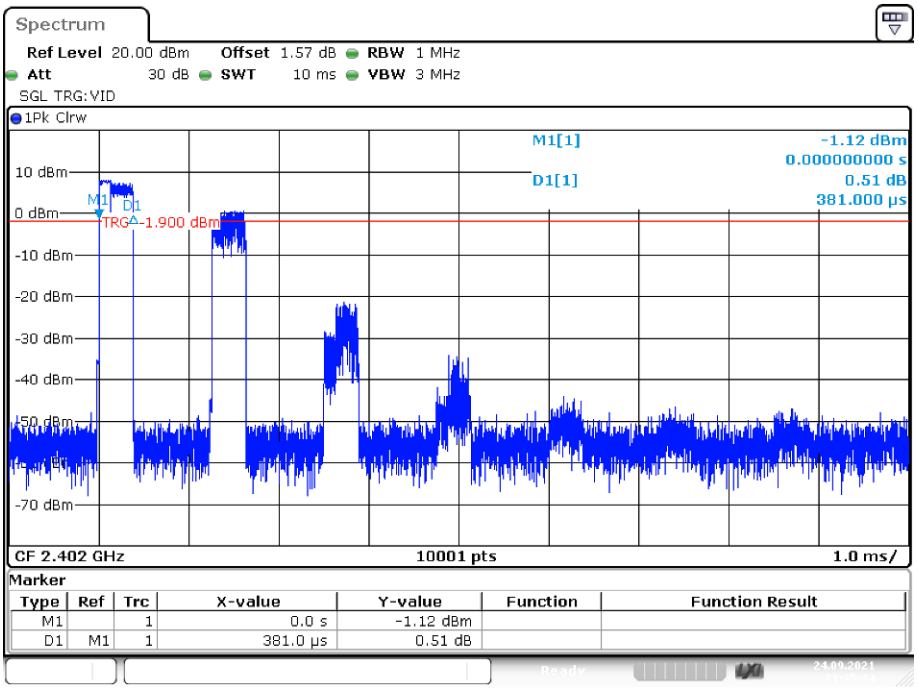
Date: 15.SEP.2021 09:12:26

Dwell NVNT 2-DH5 2480MHz Ant1



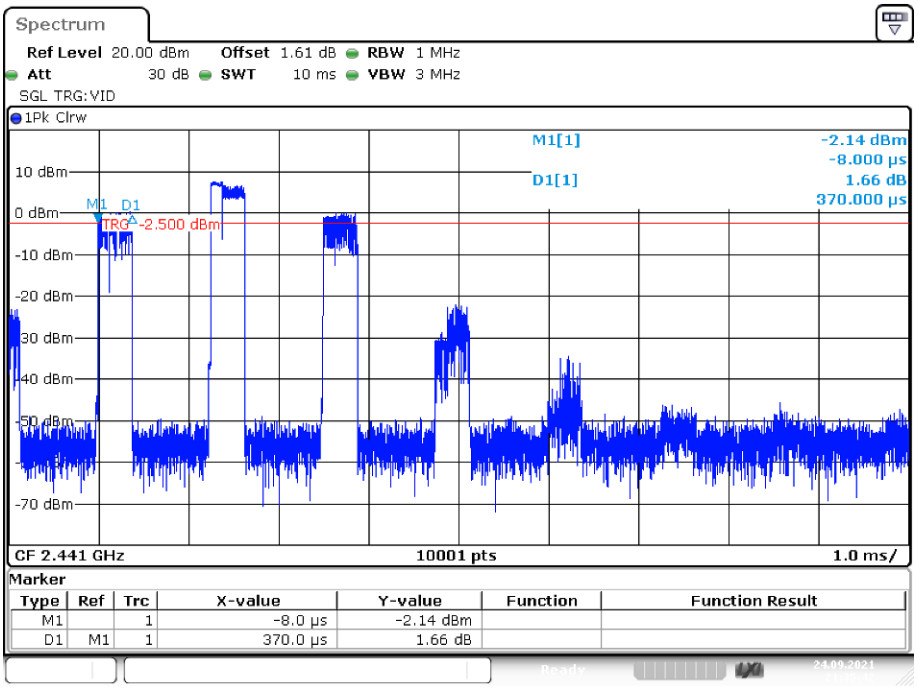
Date: 15.SEP.2021 09:14:15

Dwell NVNT 3-DH1 2402MHz Ant1



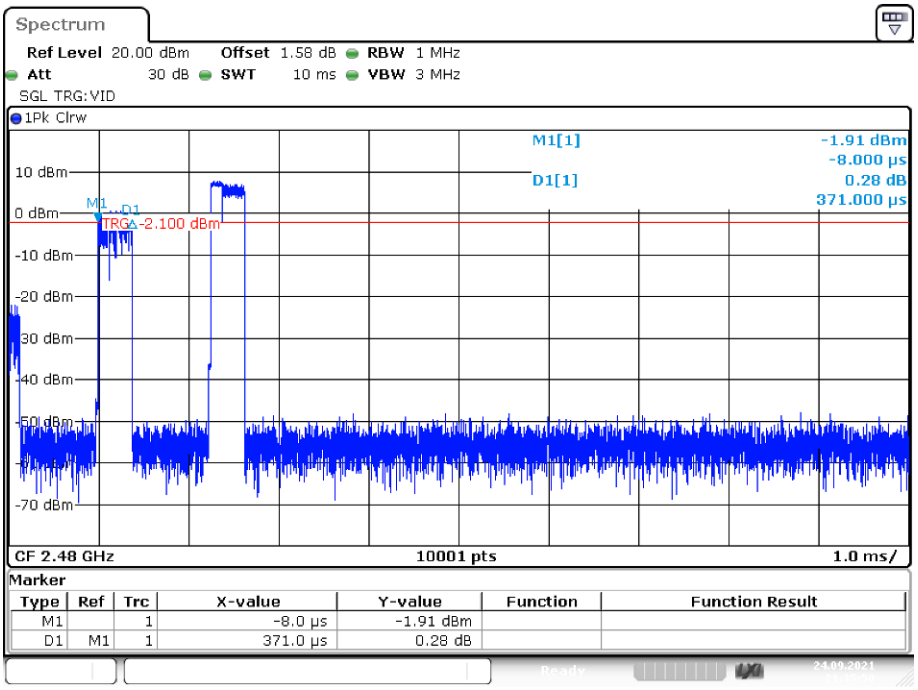
Date: 24.SEP.2021 21:35:34

Dwell NVNT 3-DH1 2441MHz Ant1



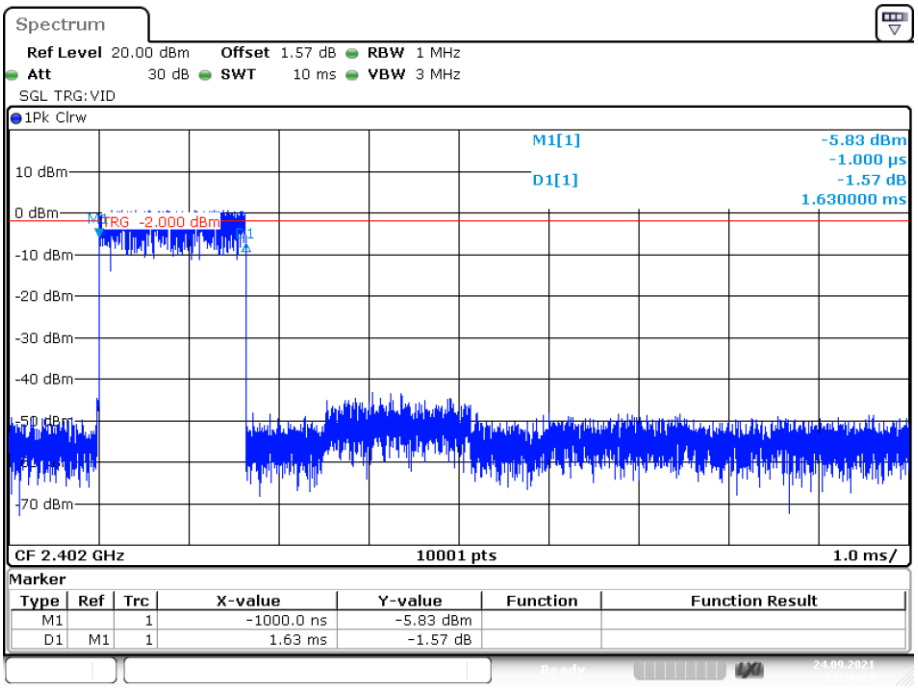
Date: 24.SEP.2021 21:35:42

Dwell NVNT 3-DH1 2480MHz Ant1



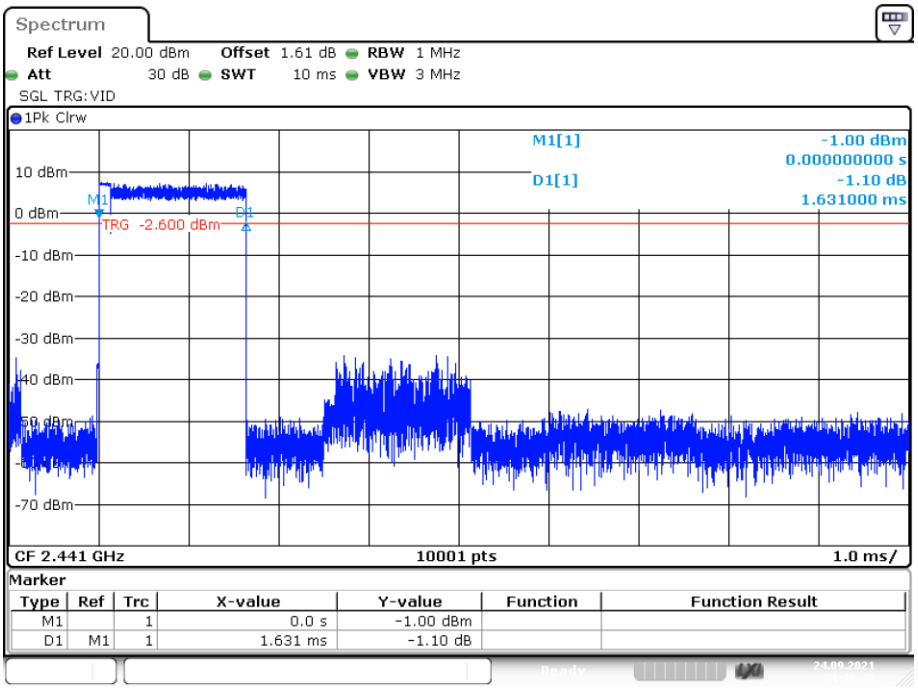
Date: 24.SEP.2021 21:35:50

Dwell NVNT 3-DH3 2402MHz Ant1



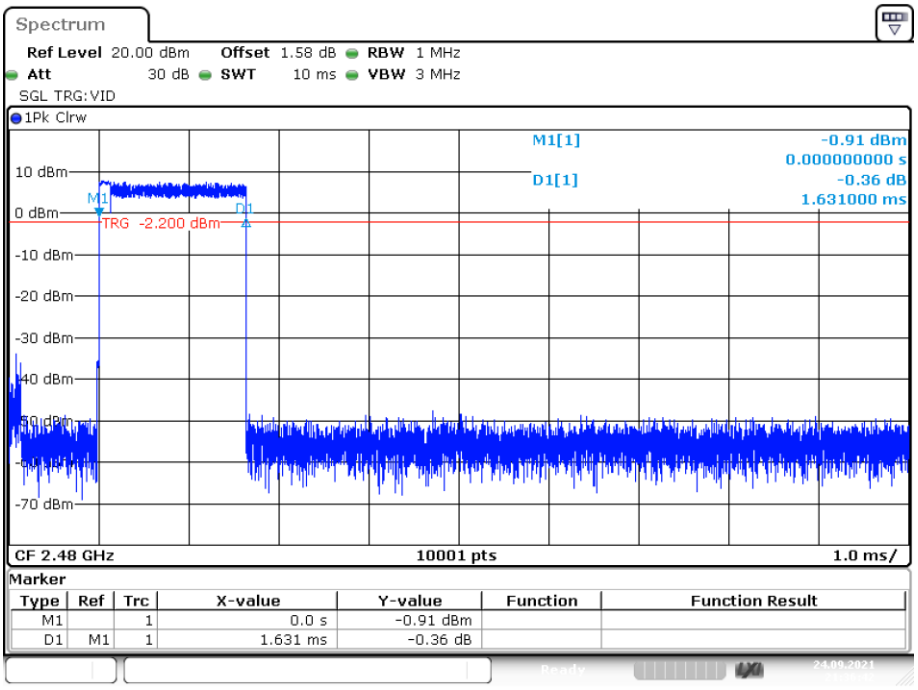
Date: 24.SEP.2021 21:36:27

Dwell NVNT 3-DH3 2441MHz Ant1



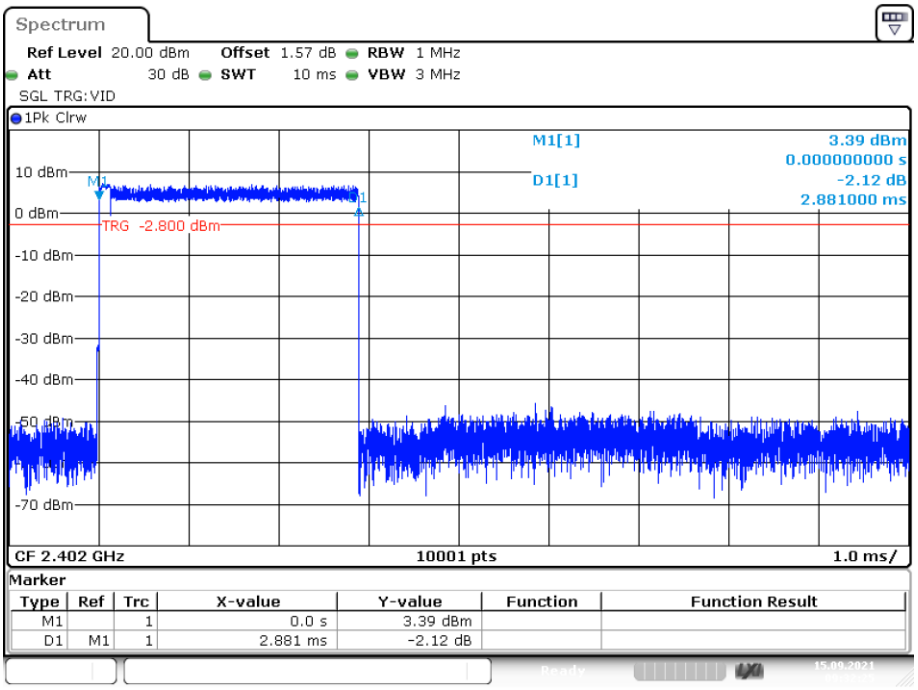
Date: 24.SEP.2021 21:36:35

Dwell NVNT 3-DH3 2480MHz Ant1



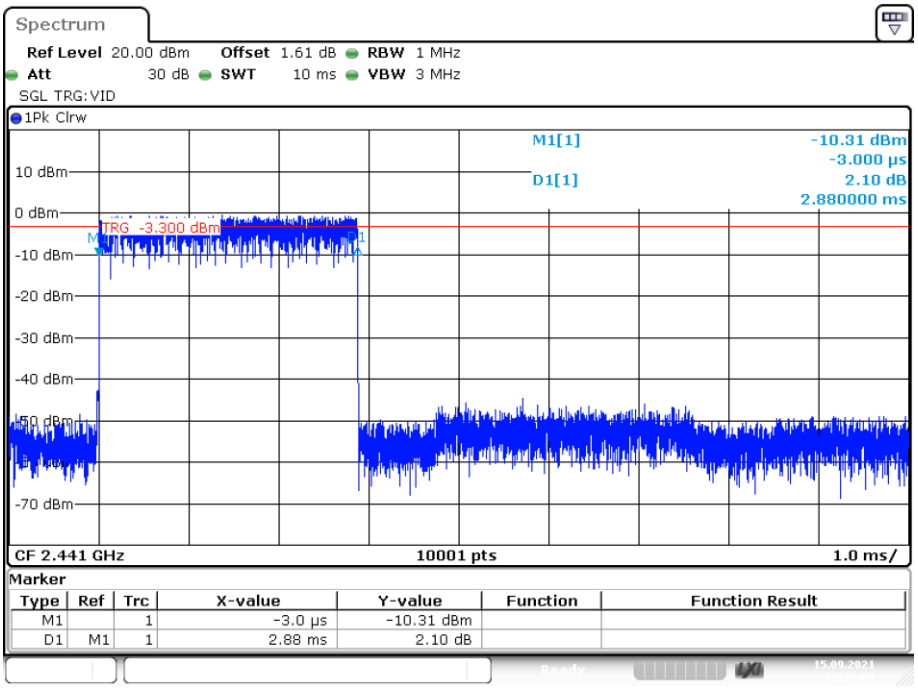
Date: 24.SEP.2021 21:36:43

Dwell NVNT 3-DH5 2402MHz Ant1



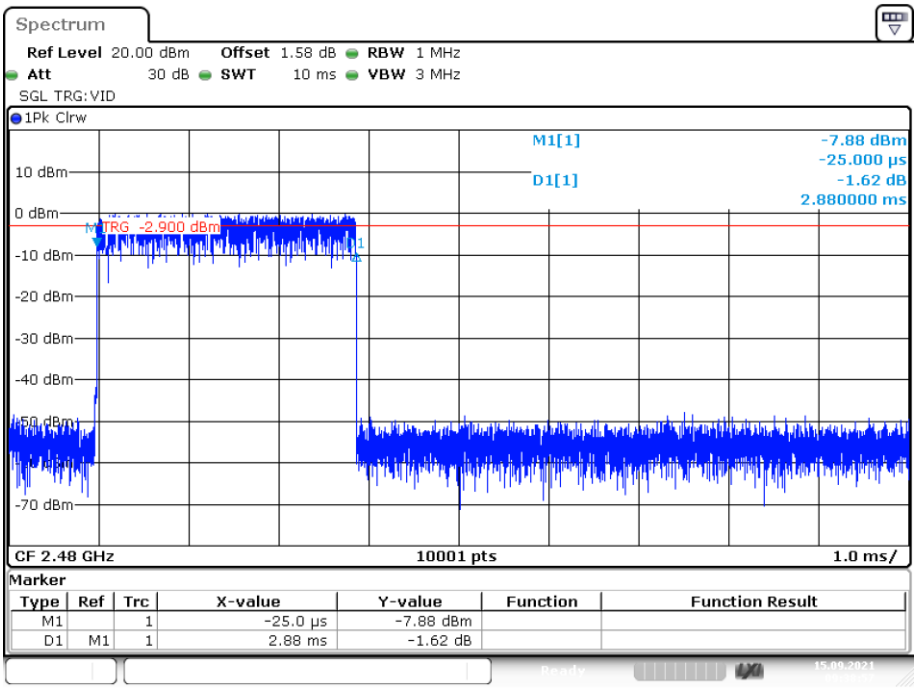
Date: 15.SEP.2021 09:32:25

Dwell NVNT 3-DH5 2441MHz Ant1



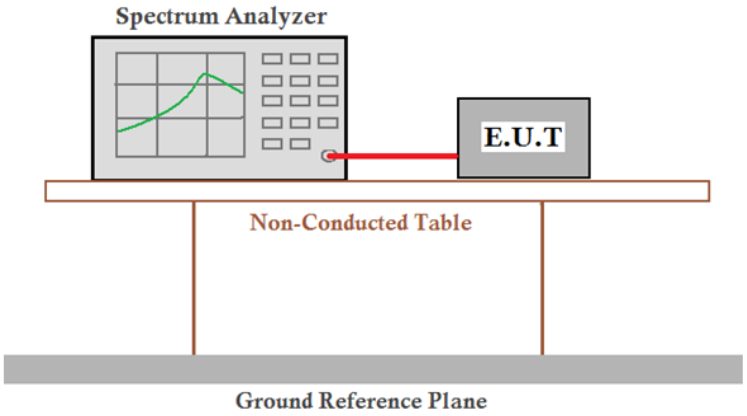
Date: 15.SEP.2021 12:39:07

Dwell NVNT 3-DH5 2480MHz Ant1



Date: 15.SEP.2021 09:38:57

5.8 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Test Setup:	 Remark: Factor: the High-Frequency cable loss 1.5dB in the spectrum analyzer.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Exploratory Test Mode:	Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of π/4DQPSK modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.
Test Results:	Pass

No-hopping mode

GFSK mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass
π/4DQPSK mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass
8DPSK mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass

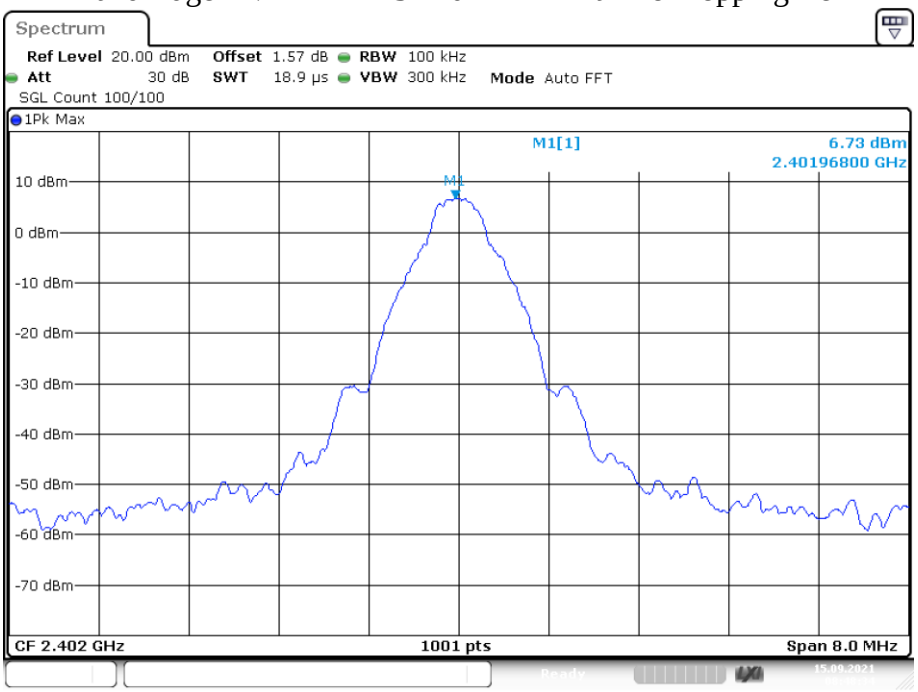
Hopping mode

GFSK mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass
π/4DQPSK mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass
8DPSK mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass

Test plot as follows:

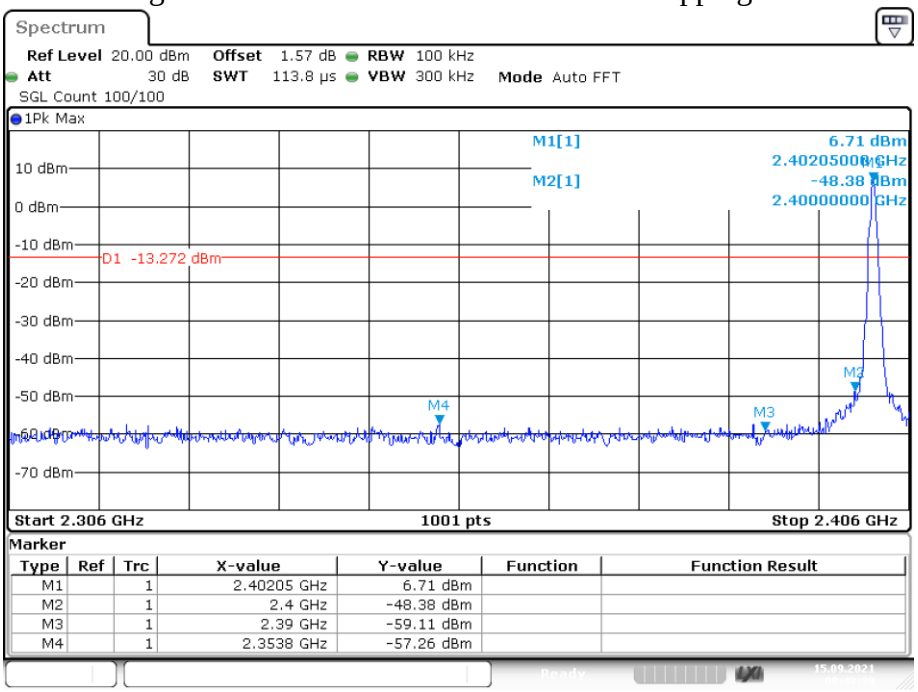
Band Edge

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



Date: 15.SEP.2021 08:48:33

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

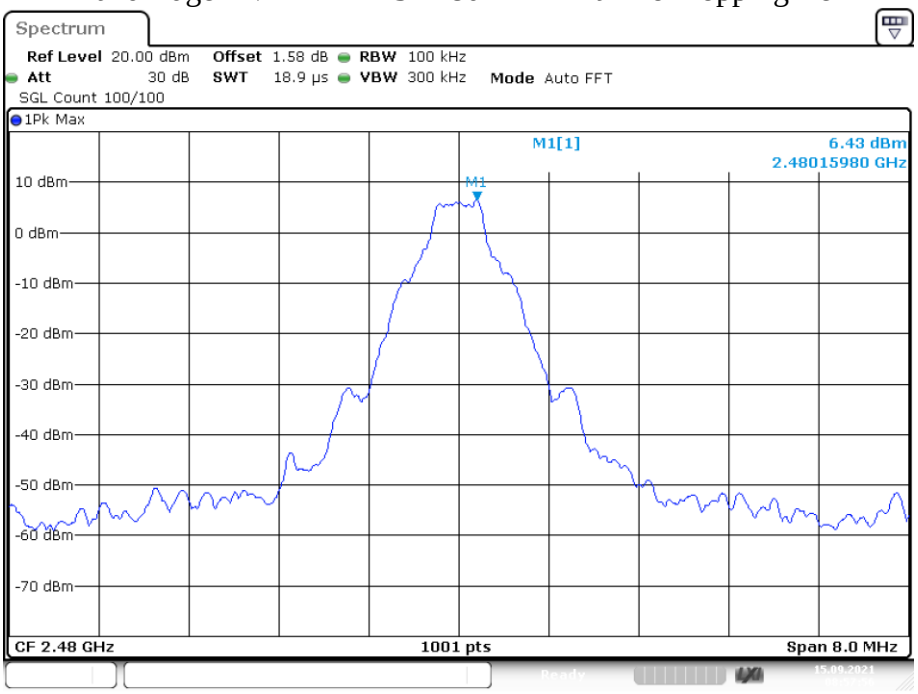


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40205 GHz	6.71 dBm		
M2		1	2.4 GHz	-48.38 dBm		
M3		1	2.39 GHz	-59.11 dBm		
M4		1	2.3538 GHz	-57.26 dBm		

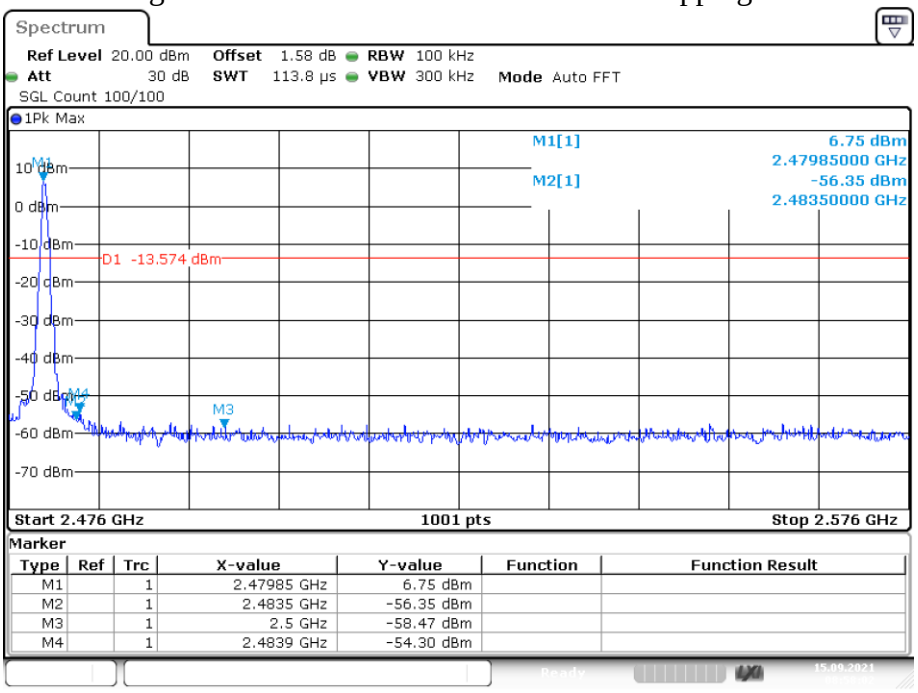
Date: 15.SEP.2021 08:48:38

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



Date: 15.SEP.2021 08:57:56

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

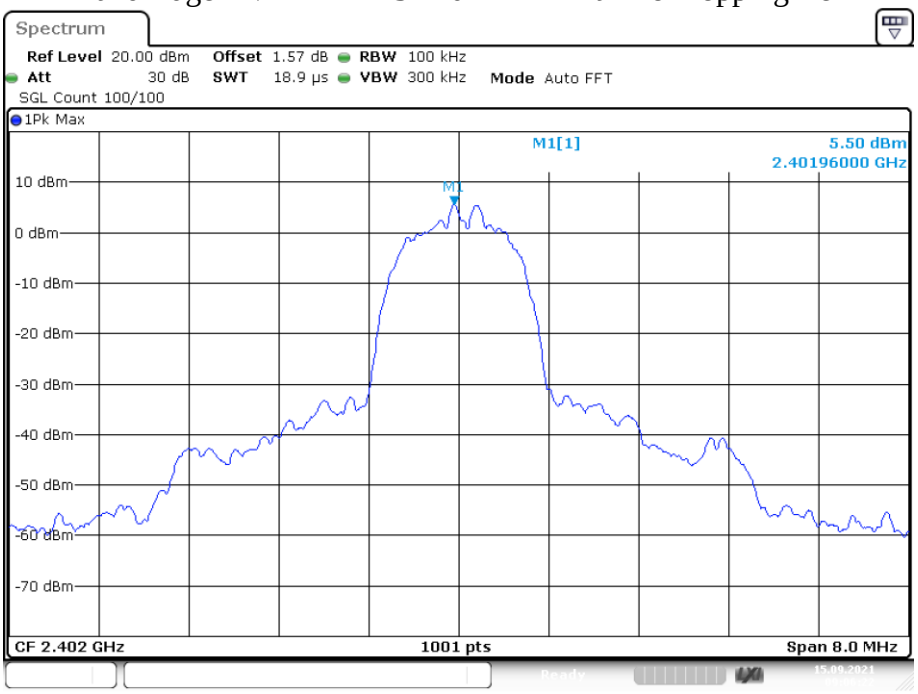


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47985 GHz	6.75 dBm		
M2		1	2.4835 GHz	-56.35 dBm		
M3		1	2.5 GHz	-58.47 dBm		
M4		1	2.4839 GHz	-54.30 dBm		

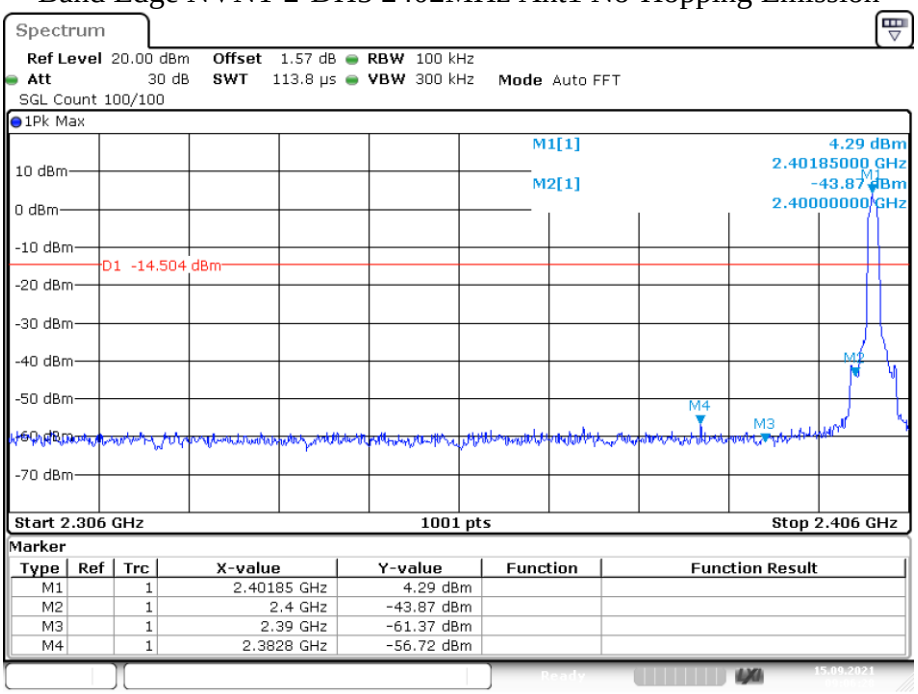
Date: 15.SEP.2021 08:58:01

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



Date: 15.SEP.2021 09:06:22

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

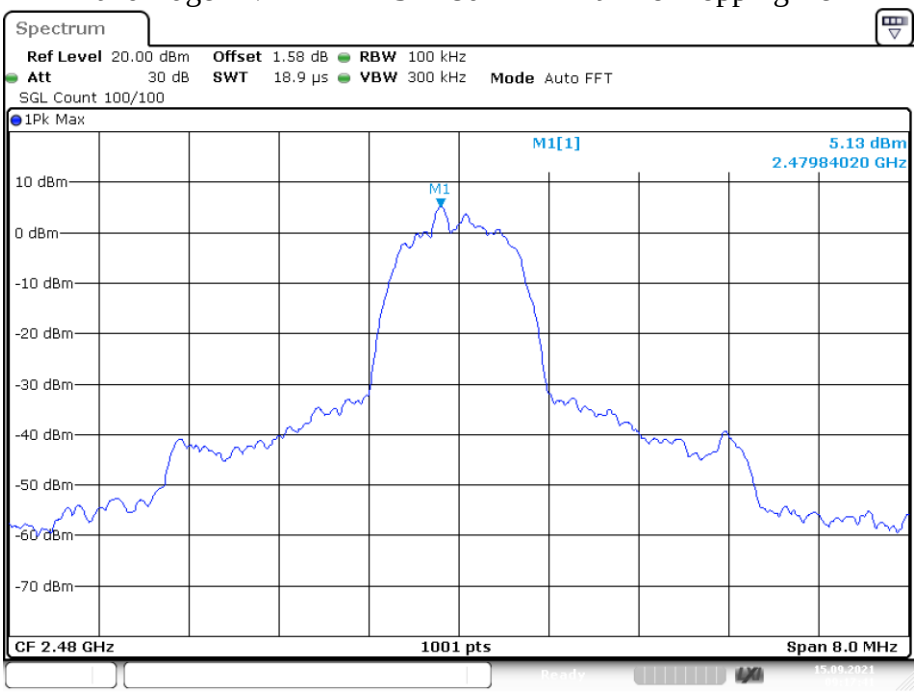


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40185 GHz	4.29 dBm		
M2		1	2.4 GHz	-43.87 dBm		
M3		1	2.39 GHz	-61.37 dBm		
M4		1	2.3828 GHz	-56.72 dBm		

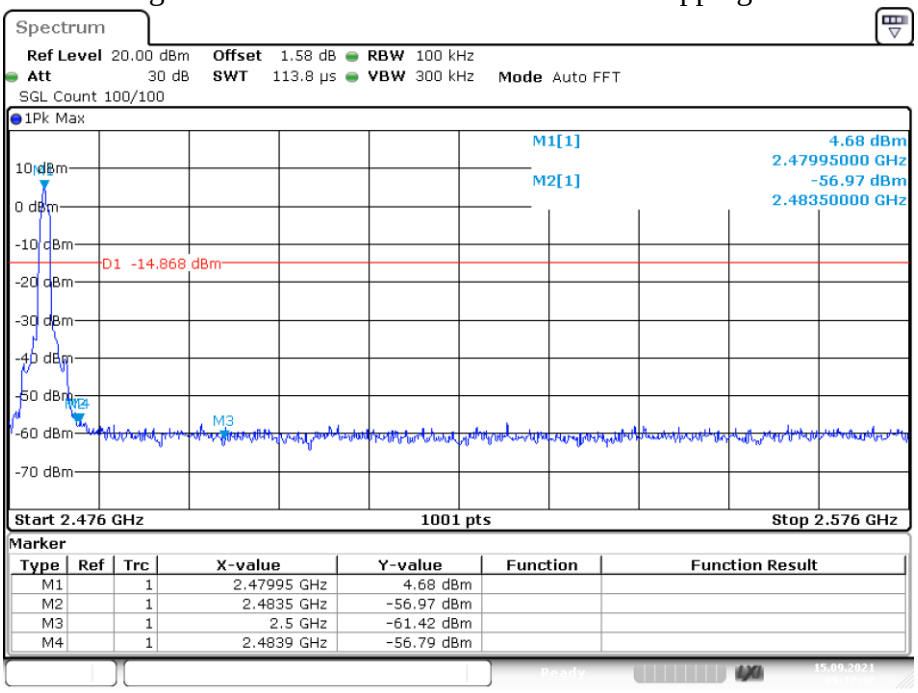
Date: 15.SEP.2021 09:06:27

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



Date: 15.SEP.2021 09:17:42

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



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47995 GHz	4.68 dBm		
M2		1	2.4835 GHz	-56.97 dBm		
M3		1	2.5 GHz	-61.42 dBm		
M4		1	2.4839 GHz	-56.79 dBm		

Date: 15.SEP.2021 09:17:47