ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT

OF

Game Controller

Model No.: Direwolf 2

Trademark: FLYDIGI

FCC ID: 2AORE-FP2

Report No.: E01A23080889F00401

Issue Date: September 18, 2023

Prepared for

Shanghai Flydigi Electronics Technology Co.,Ltd.

Rm 1108, No.258 Guoxia Rd, Yangpu District, Shanghai, China.

Prepared by

Guangdong Global Testing Technology Co., Ltd.

Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park,

VERIFICATION OF COMPLIANCE

Applicant:	Shanghai Flydigi Electronics Technology Co.,Ltd. Rm 1108, No.258 Guoxia Rd, Yangpu District, Shanghai, China.
Manufacturer:	SHENZHEN KING CHUANG TECH & ELECTRONIC CO.,LTD 58 Guangtian Road, Luotian Neighbour, Yanluo Street, Baoan District, Shenzhen, China (Postal Code 518127)
Product Description:	Game Controller
Trade Mark:	N/A
Model Number:	Direwolf 2
Sample number:	A23080889 004

We hereby certify that:

The above equipment was tested by Guangdong Global Testing Technology Co., Ltd.The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2021).

Date of Test : September 06, 2023 to September 15, 2023

Prepared by : Alan He /Editor

Reviewer & Authorized Signer : Shawn Wen / Supervisor

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	E01A23080889F00401

Table of Contents

1. GENERAL INFORMATION

1.1 Product Description

Characteristics	Description
Product Name	Game Controller
Model number	Direwolf 2
Input rating	5V ⎓ 800mA
Power Supply	DC 5V from adapter or battery 3.7V
Kind of Device	Bluetooth V5.0
Modulation	GFSK, π/4-DQPSK, 8DPSK
Operating Frequency Range	2402-2480MHz
Number of Channels	79
Transmit Power Max(PK)	3.03dBm(0.00201W)
Antenna Type	Internal PCB antenna
Antenna Gain	0dBi
Sample Received Date	September 06, 2023

1.2 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10-2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.3 Test Facility

Site Description

EMC Lab. : **A2LA (Certificate No.: 6947.01)**
Guangdong Global Testing Technology Co., Ltd.
has been assessed and proved to be in compliance with A2LA.
FCC (FCC Designation No.: CN1343)
Guangdong Global Testing Technology Co., Ltd.
has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of EUT was fixed in a particular direction according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Table 2-1 Equipment Used in Tested System

Item	Equipment	Trademark	Manufacturer	Model No.	FCC ID	Note
1.	Game Controller	N/A	Shanghai Flydigi Electronics Technology Co.,Ltd.	Direwolf 2	2AORE-FP2	***EUT***
2.	AC/DC ADAPTER	N/A	Shenzhen Keyu Power Supply Technology Co.,LTD	KA06E-0502000US	N/A	***Support EUT***

Note:

(1) Unless otherwise denoted as EUT in『Remark』column , device(s) used in tested system is a support equipment.

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	AC Power Conducted Emission	Compliant
§15.247(d),§15.209, §15.205	Radiated Emission	Compliant
§15.247(a)(1)	Channel Separation test	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§15.247(a)(1)(iii)	Time of Occupancy(Dwell Time)	Compliant
§15.247(b)	Max Peak output Power test	Compliant
§15.247(d)	Band edge test	Compliant
§15.203	Antenna Requirement	Compliant

4. Description of test modes

The EUT has been tested under its typical operating condition and fully-charged battery for EUT tested alone. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting mode is programmed. EUT is connected by com port, and transimit the control instruction via test software(FCC_assist 1.0.1.1). The test software power value is set to the maximum.

This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes GFSK, π/4-DQPSK, 8DPSK have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Channel	Frequency(MHz)
1	2402
40	2441
79	2480

5. TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test(150KHz-30MHz)	±2.0dB
Radiated Emission Test (30MHz-1000MHz)	±2.0dB
Radiated Emission Test (1GHz-18GHz)	±2.5dB
Radiated Emission Test (18GHz-25GHz)	±3.2dB
Power Density	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5℃
Humidity	±3%

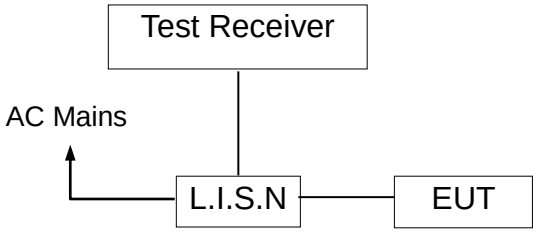
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%

6. Conducted Emissions Test

6.1 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

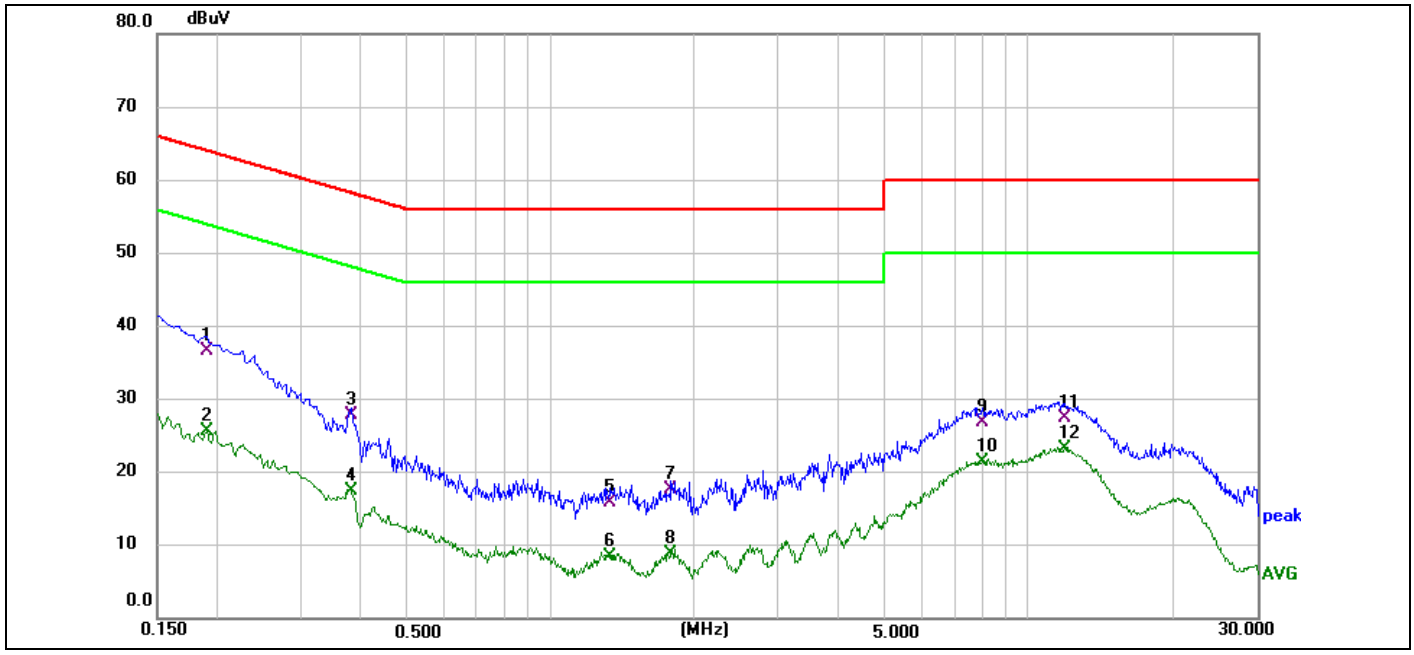
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Shielded Room	CHENG YU	8m*5m*4m	N/A	2022/10/29	2025/10/28
EMI Test Receiver	Rohde & Schwarz	ESR3	102647	2022/12/03	2023/12/02
LISN/AMN	Rohde & Schwarz	ENV216	102843	2022/10/08	2023/10/07
NNLK 8129 RC	Schwarzbeck	NNLK 8129 RC	5046	2023/03/30	2024/03/29
Test Software	Farad	EZ-EMC (Ver. EMC-con-3A1 1+)	N/A	N/A	N/A

6.4 Measurement Result:

Operation Mode:	TX	Test Date :	Sep. 12, 2023
Frequency Range:	0.15MHz~30MHz	Temperature :	23.5℃
Test Result:	PASS	Humidity :	52.6 %
Test By:	Zero		

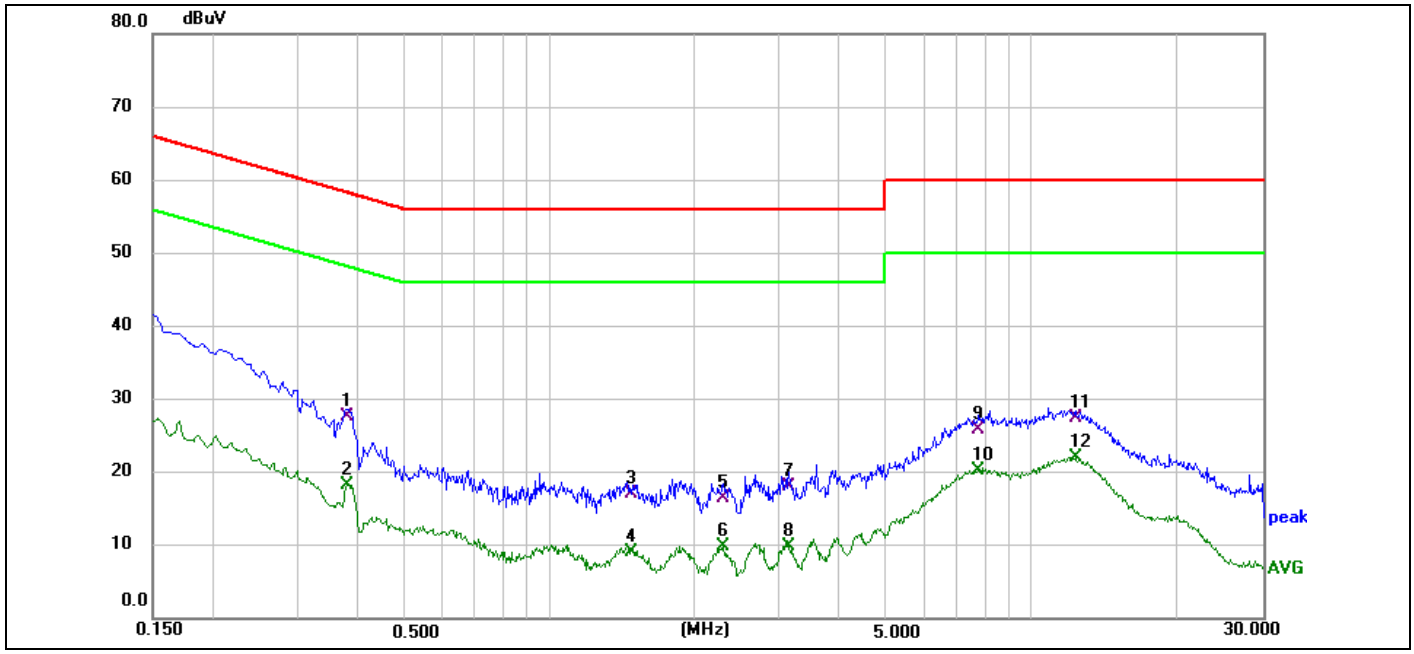
All the modulation modes were tested the data of the worst mode (Pi/4-DQPSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following data.



Site:	**843**	**Phase:L1**	**Temperature(C):23.5(C)**
Limit:	**FCC Part 15 C Conduction(QP)**		**Humidity(%):52.6%**
EUT:	**Game Controller**	**Test Time:**	**2023-09-12**
M/N.:	**Direwolf 2**	**Power Rating:**	**5Vdc from AC/DC adapter**
Mode:	**TX2402**	**Test Engineer:**	**Zero**
Note:			

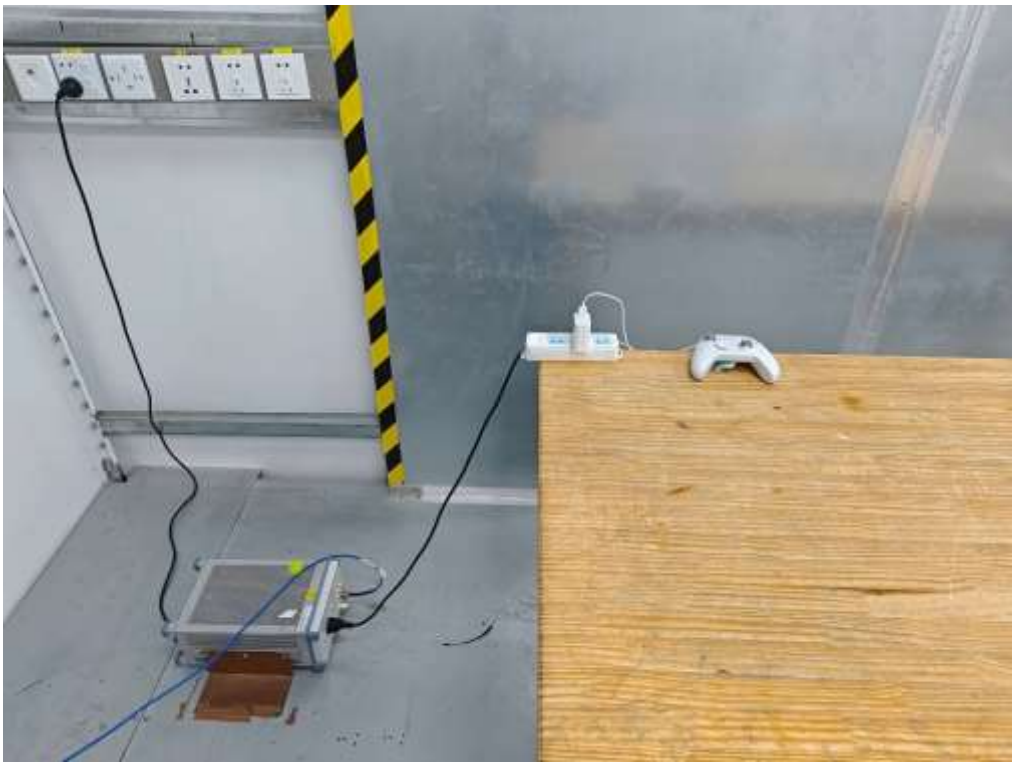
No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1900	25.93	10.71	36.64	64.04	-27.40	QP	
2	0.1900	14.94	10.71	25.65	54.04	-28.39	AVG	
3	0.3820	16.76	11.09	27.85	58.24	-30.39	QP	
4	0.3820	6.43	11.09	17.52	48.24	-30.72	AVG	
5	1.3340	5.60	10.35	15.95	56.00	-40.05	QP	
6	1.3340	-1.89	10.35	8.46	46.00	-37.54	AVG	
7	1.7860	7.39	10.36	17.75	56.00	-38.25	QP	
8	1.7860	-1.55	10.36	8.81	46.00	-37.19	AVG	
9	7.9820	16.37	10.54	26.91	60.00	-33.09	QP	
10	7.9820	10.94	10.54	21.48	50.00	-28.52	AVG	
11	11.9060	16.77	10.69	27.46	60.00	-32.54	QP	
12	11.9060	12.59	10.69	23.28	50.00	-26.72	AVG	



Site:	**843**	**Phase:N**	**Temperature(C):23.5(C)**
Limit:	**FCC Part 15 C Conduction(QP)**		**Humidity(%):52.6%**
EUT:	**Game Controller**	**Test Time:**	**2023-09-12**
M/N.:	**Direwolf 2**	**Power Rating:**	**5Vdc from AC/DC adapter**
Mode:	**TX2402**	**Test Engineer:**	**Zero**
Note:			

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.3780	16.43	11.17	27.60	58.32	-30.72	QP	
2	0.3780	7.17	11.17	18.34	48.32	-29.98	AVG	
3	1.4819	6.67	10.43	17.10	56.00	-38.90	QP	
4	1.4819	-1.32	10.43	9.11	46.00	-36.89	AVG	
5	2.2940	6.01	10.44	16.45	56.00	-39.55	QP	
6	2.2940	-0.62	10.44	9.82	46.00	-36.18	AVG	
7	3.1300	7.51	10.45	17.96	56.00	-38.04	QP	
8	3.1300	-0.60	10.45	9.85	46.00	-36.15	AVG	
9	7.7340	15.21	10.61	25.82	60.00	-34.18	QP	
10	7.7340	9.70	10.61	20.31	50.00	-29.69	AVG	
11	12.3100	16.56	10.79	27.35	60.00	-32.65	QP	
12	12.3100	11.18	10.79	21.97	50.00	-28.03	AVG	

6.5 Conducted Measurement Photos:



7. Radiated Emission Test

7.1 Measurement Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
   1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
   2) Change the antenna polarization and repeat 1) with vertical polarization.
   3) Make a hardcopy of the spectrum.
   4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
   5) Change the analyser mode to Clear/ Write and found the cone of emission.
   6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
   7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
   8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

Use the following spectrum analyzer settings:

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz

and video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	120KHz
VB	300KHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

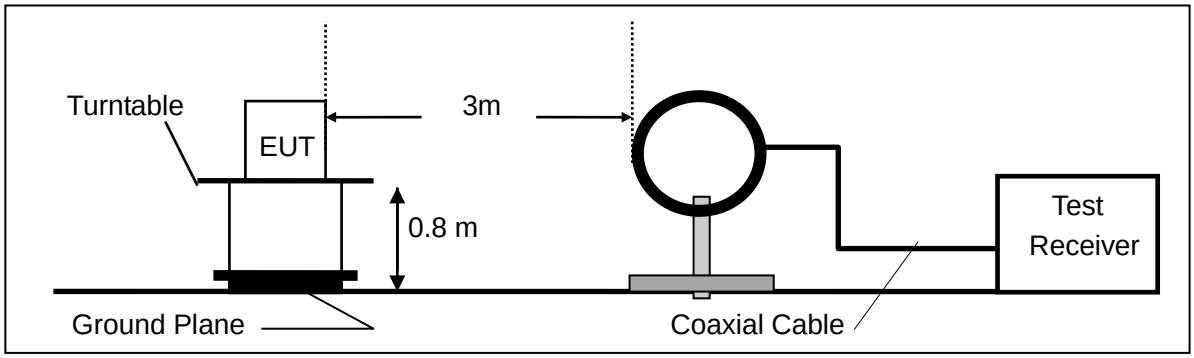
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

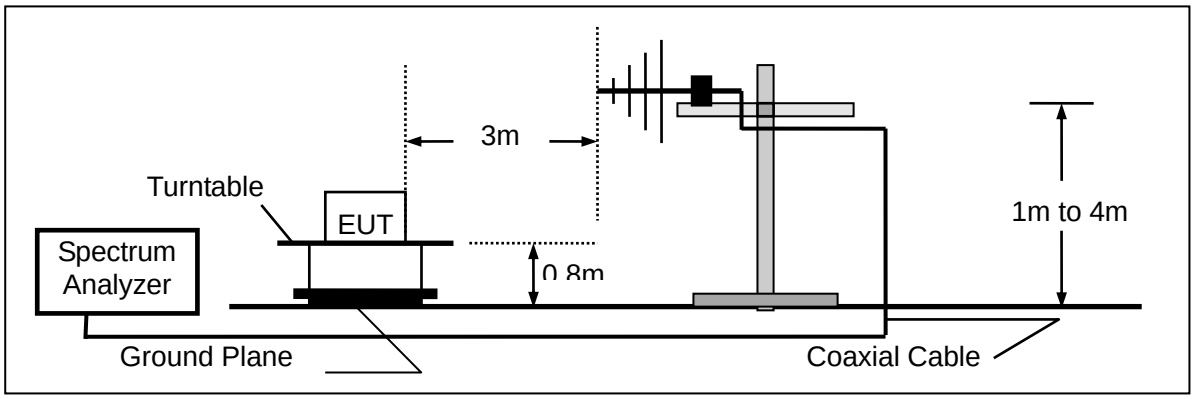
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Average
Trace	Max hold

7.2 Test SET-UP (Block Diagram of Configuration)

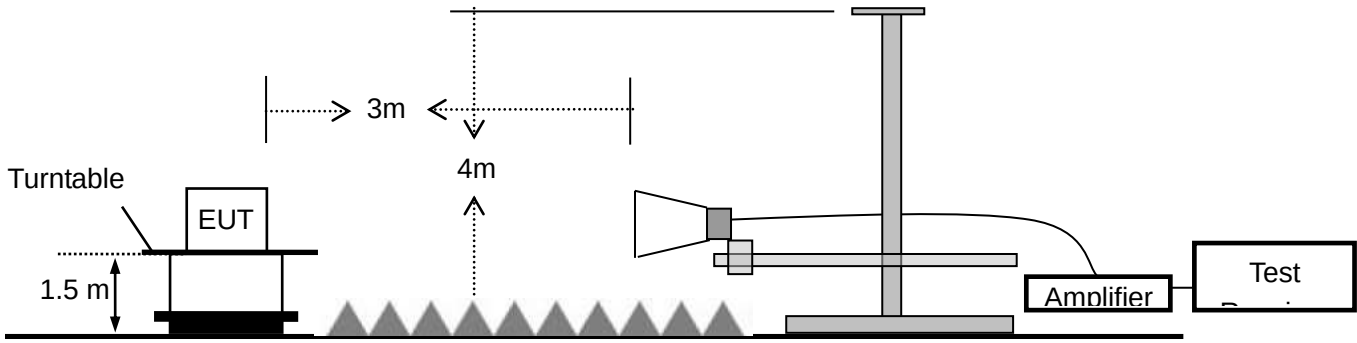
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



7.3 Measurement Equipment Used:

Test Equipment of Radiated emissions below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESCI3	101409	2022/10/08	2023/10/07
Pre-Amplifier	HzEMC	HPA-9K0130	HYPA21001	2022/10/29	2023/10/28
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243646	2022/03/23	2025/03/22
Loop Antenna	ETS	6502	243668	2022/03/30	2025/03/29
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2022/10/08	2023/10/07
Pre-Amplifier	A-INFO	HPA-1G1850	HYPA21003	2022/10/29	2023/10/28
Horn antenna	A-INFO	3117	246069	2022/03/11	2023/03/10
Pre-Amplifier	ZKJC	HPA-184057	HYPA21004	2022/10/29	2023/10/28
Horn antenna	ZKJC	3116C	246265	2022/03/29	2023/03/28
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

7..4 Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

15.205 Restricted bands of operation

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])

Remark : 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

7.5 Measurement Result

Operation Mode:	TX	Test Date :	Sep. 12, 2023
Test By:	Zero	Temperature :	24.8℃
Test Result:	PASS	Humidity :	51.7%
Measured Distance:	3m		

Below 30MHz:

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
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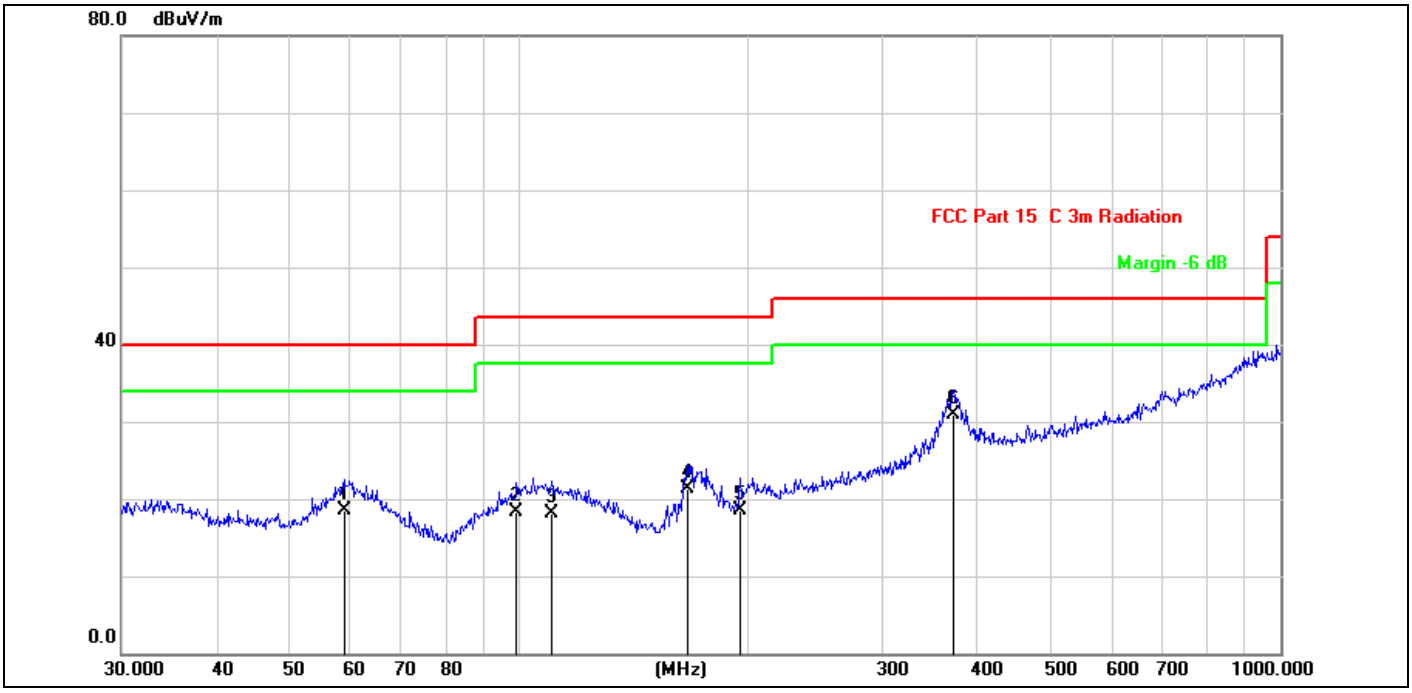
Note: The low frequency, which started from 9KHz-30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Below 1000MHz:

Pass.

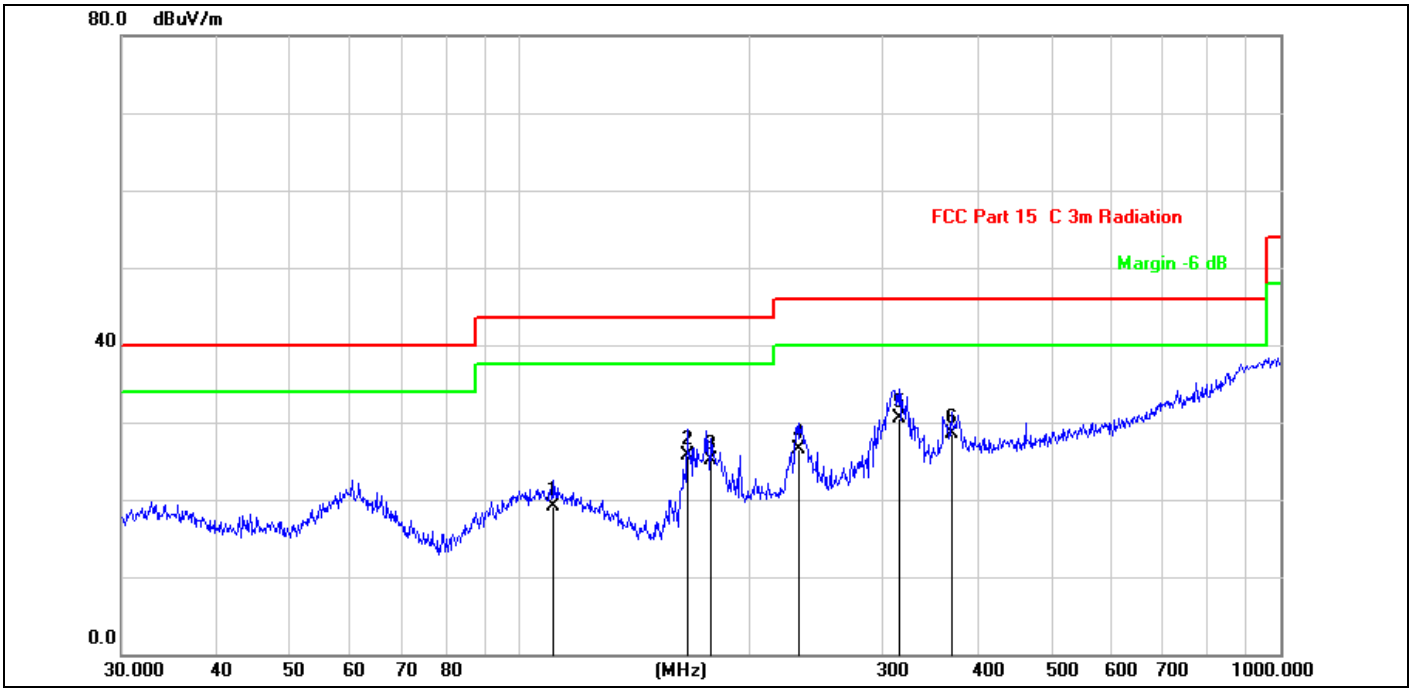
All the modulation modes were tested the data of the worst mode ((Pi/4-DQPSK TX 2402MHz)) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following data.



Site:	**LAB**	**Antenna::Vertical**	**Temperature(C):24.8(C)**
Limit:	**FCC Part 15 C 3m Radiation(QP)**		**Humidity(%):51.7%**
EUT:	**Game Controller**	**Test Time:**	**2023-09-12**
M/N.:	**Direwolf 2**	**Power Rating:**	**Battery DC 3.7V**
Mode:	**TX2402**	**Test Engineer:**	**Zero**
Note:			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Remark
1	58.8185	23.73	-5.31	18.42	40.00	-21.58	QP	
2	99.1796	23.46	-5.13	18.33	43.50	-25.17	QP	
3	110.1816	22.60	-4.51	18.09	43.50	-25.41	QP	
4	166.0680	30.51	-9.11	21.40	43.50	-22.10	QP	
5	195.1365	24.97	-6.38	18.59	43.50	-24.91	QP	
6	372.0045	30.87	-0.04	30.83	46.00	-15.17	QP	



Site:	**LAB**	**Antenna::Horizontal**	**Temperature(C):24.8(C)**
Limit:	**FCC Part 15C 3m Radiation(QP)**		**Humidity(%):51.7%**
EUT:	**Game Controller**	**Test Time:**	**2023-09-12**
M/N.:	**Direwolf 2**	**Power Rating:**	**Battery DC 3.7V**
Mode:	**TX2402**	**Test Engineer:**	**Zero**
Note:			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Remark
1	110.9571	23.79	-4.59	19.20	43.50	-24.30	QP	
2	166.0680	34.73	-9.11	25.62	43.50	-17.88	QP	
3	178.7584	33.65	-8.47	25.18	43.50	-18.32	QP	
4	233.3487	30.84	-4.40	26.44	46.00	-19.56	QP	
5	315.4808	32.21	-1.65	30.56	46.00	-15.44	QP	
6	369.4047	28.69	-0.12	28.57	46.00	-17.43	QP	

Above 1000MHz~10th Harmonics:

Please refer to the following data.

Operation Mode: GFSK (CH1: 2402MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4804	V	94.61	75.32	-32.3	62.31	43.02	74	54	-11.69	-10.98
7206	V	98.44	78.81	-37.25	61.19	41.56	74	54	-12.81	-12.44
9608	V	100.35	80.67	-39.8	60.55	40.87	74	54	-13.45	-13.13
12010	V	97.68	79.11	-40.5	57.18	38.61	74	54	-16.82	-15.39
14412	V	98.06	79.27	-41.7	56.36	37.57	74	54	-17.64	-16.43
16814	V	95.37	76.52	-40	55.37	36.52	74	54	-18.63	-17.48
4804	H	93.46	74.92	-31.4	62.06	43.52	74	54	-11.94	-10.48
7206	H	96.61	77.82	-35.5	61.11	42.32	74	54	-12.89	-11.68
9608	H	98.87	79.51	-38.3	60.57	41.21	74	54	-13.43	-12.79
12010	H	96.58	77.27	-39	57.58	38.27	74	54	-16.42	-15.73
14412	H	98.31	78.45	-42	56.31	36.45	74	54	-17.69	-17.55
16814	H	94.78	75.66	-39.3	55.48	36.36	74	54	-18.52	-17.64

Operation Mode: GFSK (CH40: 2441MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4882	V	94.64	75.56	-32.3	62.34	43.26	74	54	-11.66	-10.74
7323	V	97.54	78.33	-37.2	60.34	41.13	74	54	-13.66	-12.87
9764	V	98.24	79.05	-39.6	58.64	39.45	74	54	-15.36	-14.55
12205	V	97.75	79.14	-40.5	57.25	38.64	74	54	-16.75	-15.36
14646	V	97.31	78.8	-41	56.31	37.8	74	54	-17.69	-16.2
17087	V	96.13	77.21	-41.1	55.03	36.11	74	54	-18.97	-17.89
4882	H	93.74	74.35	-31.6	62.14	42.75	74	54	-11.86	-11.25
7323	H	95.99	76.97	-35.7	60.29	41.27	74	54	-13.71	-12.73
9764	H	96.57	77.93	-38.3	58.27	39.63	74	54	-15.73	-14.37
12205	H	96.31	77.16	-39	57.31	38.16	74	54	-16.69	-15.84
14646	H	98.34	79.82	-42	56.34	37.82	74	54	-17.66	-16.18
17087	H	96.98	77.95	-41.5	55.48	36.45	74	54	-18.52	-17.55

Operation Mode: GFSK (CH79: 2480MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	94.58	75.86	-32.3	62.28	43.56	74	54	-11.72	-10.44
7440	V	97.51	78.77	-37.2	60.31	41.57	74	54	-13.69	-12.43
9920	V	99.24	79.93	-39.6	59.64	40.33	74	54	-14.36	-13.67
12400	V	98.04	79.37	-40.7	57.34	38.67	74	54	-16.66	-15.33
14880	V	97.46	78.84	-41	56.46	37.84	74	54	-17.54	-16.16
17360	V	96.42	77.69	-41.1	55.32	36.59	74	54	-18.68	-17.41
4960	H	92.74	74.28	-31.6	61.14	42.68	74	54	-12.86	-11.32
7440	H	96.01	77.26	-35.7	60.31	41.56	74	54	-13.69	-12.44
9920	H	97.47	78.43	-38.1	59.37	40.33	74	54	-14.63	-13.67
12400	H	96.11	77.68	-39	57.11	38.68	74	54	-16.89	-15.32
14880	H	98.33	79.86	-42	56.33	37.86	74	54	-17.67	-16.14
17360	H	96.95	78.07	-41.5	55.45	36.57	74	54	-18.55	-17.43

Operation Mode: Pi/4-DQPSK (CH1: 2402MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	94.59	75.86	-32.3	62.29	43.56	74	54	-11.71	-10.44
7440	V	97.53	78.77	-37.2	60.33	41.57	74	54	-13.67	-12.43
9920	V	99.24	79.91	-39.6	59.64	40.31	74	54	-14.36	-13.69
12400	V	98.06	79.37	-40.7	57.36	38.67	74	54	-16.64	-15.33
14880	V	97.45	78.84	-41	56.45	37.84	74	54	-17.55	-16.16
17360	V	96.42	77.69	-41.1	55.32	36.59	74	54	-18.68	-17.41
4960	H	92.78	74.28	-31.6	61.18	42.68	74	54	-12.82	-11.32
7440	H	96.04	77.27	-35.7	60.34	41.57	74	54	-13.66	-12.43
9920	H	97.45	78.43	-38.1	59.35	40.33	74	54	-14.65	-13.67
12400	H	96.14	77.67	-39	57.14	38.67	74	54	-16.86	-15.33
14880	H	98.33	79.84	-42	56.33	37.84	74	54	-17.67	-16.16
17360	H	96.98	78.07	-41.5	55.48	36.57	74	54	-18.52	-17.43

Operation Mode: Pi/4-DQPSK (CH40: 2441MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4882	V	95.52	75.52	-32.3	63.22	43.22	74	54	-10.78	-10.78
7323	V	98.32	79.33	-37.2	61.12	42.13	74	54	-12.88	-11.87
9764	V	99.42	80.54	-39.8	59.62	40.74	74	54	-14.38	-13.26
12205	V	98.96	80.07	-40.5	58.46	39.57	74	54	-15.54	-14.43
14646	V	98.54	79.31	-41	57.54	38.31	74	54	-16.46	-15.69
17087	V	96.32	77.58	-41.1	55.22	36.48	74	54	-18.78	-17.52
4882	H	94.69	75.16	-31.6	63.09	43.56	74	54	-10.91	-10.44
7323	H	96.53	77.84	-35.5	61.03	42.34	74	54	-12.97	-11.66
9764	H	97.76	78.64	-38.3	59.46	40.34	74	54	-14.54	-13.66
12205	H	97.61	78.57	-39	58.61	39.57	74	54	-15.39	-14.43
14646	H	98.33	79.54	-42	56.33	37.54	74	54	-17.67	-16.46
17087	H	96.57	77.99	-41.4	55.17	36.59	74	54	-18.83	-17.41

Operation Mode: Pi/4-DQPSK (CH79: 2480MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	94.65	75.94	-32.3	62.35	43.64	74	54	-11.65	-10.36
7440	V	97.54	78.57	-37.2	60.34	41.37	74	54	-13.66	-12.63
9920	V	99.45	80.11	-39.8	59.65	40.31	74	54	-14.35	-13.69
12400	V	98.84	80.15	-40.5	58.34	39.65	74	54	-15.66	-14.35
14880	V	97.27	78.84	-41	56.27	37.84	74	54	-17.73	-16.16
17360	V	96.56	77.99	-41.1	55.46	36.89	74	54	-18.54	-17.11
4960	H	93.99	75.17	-31.6	62.39	43.57	74	54	-11.61	-10.43
7440	H	95.11	76.02	-35.5	59.61	40.52	74	54	-14.39	-13.48
9920	H	96.94	78.11	-38.3	58.64	39.81	74	54	-15.36	-14.19
12400	H	95.34	76.66	-39	56.34	37.66	74	54	-17.66	-16.34
14880	H	97.59	78.46	-42	55.59	36.46	74	54	-18.41	-17.54
17360	H	96.84	78.11	-41.5	55.34	36.61	74	54	-18.66	-17.39

Operation Mode: 8DPSK (CH1: 2402MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4804	V	96.08	76.53	-32.3	63.78	44.23	74	54	-10.22	-9.77
7206	V	98.94	80.09	-37.2	61.74	42.89	74	54	-12.26	-11.1
9608	V	100.12	81.03	-39.8	60.32	41.23	74	54	-13.68	-12.8
12010	V	99.13	80.08	-40.5	58.63	39.58	74	54	-15.37	-14.4
14412	V	99.33	80.3	-41.7	57.63	38.6	74	54	-16.37	-15.4
16814	V	96.02	77.85	-40	56.02	37.85	74	54	-17.98	-16.2
4804	H	93.75	74.82	-31.6	62.15	43.22	74	54	-11.85	-10.8
7206	H	97.63	77.86	-35.5	62.13	42.36	74	54	-11.87	-11.6
9608	H	98.43	79.53	-38.3	60.13	41.23	74	54	-13.87	-12.8
12010	H	97.34	78.62	-39	58.34	39.62	74	54	-15.66	-14.4
14412	H	99.42	80.63	-42	57.42	38.63	74	54	-16.58	-15.4
16814	H	94.66	75.88	-39.3	55.36	36.58	74	54	-18.64	-17.4

Operation Mode: 8DPSK (CH40: 2441MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4882	V	95.45	76.19	-32.3	63.15	43.89	74	54	-10.85	-10.11
7323	V	98.54	79.56	-37.2	61.34	42.36	74	54	-12.66	-11.64
9764	V	99.04	79.86	-39.8	59.24	40.06	74	54	-14.76	-13.94
12205	V	98.06	79.04	-40.5	57.56	38.54	74	54	-16.44	-15.46
14646	V	97.32	78.58	-41	56.32	37.58	74	54	-17.68	-16.42
17087	V	96.55	77.46	-41.1	55.45	36.36	74	54	-18.55	-17.64
4882	H	94.69	76.21	-31.6	63.09	44.61	74	54	-10.91	-9.39
7323	H	96.72	77.85	-35.5	61.22	42.35	74	54	-12.78	-11.65
9764	H	97.65	78.61	-38.3	59.35	40.31	74	54	-14.65	-13.69
12205	H	96.14	77.68	-39	57.14	38.68	74	54	-16.86	-15.32
14646	H	98.31	79.84	-42	56.31	37.84	74	54	-17.69	-16.16
17087	H	96.63	77.74	-41.5	55.13	36.24	74	54	-18.87	-17.76

Operation Mode: 8DPSK (CH79: 2480MHz) Test Date : 2023-09-12

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	94.99	75.99	-32.3	62.69	43.69	74	54	-11.31	-10.31
7440	V	97.45	78.72	-37.2	60.25	41.52	74	54	-13.75	-12.48
9920	V	99.16	79.93	-39.8	59.36	40.13	74	54	-14.64	-13.87
12400	V	98.04	79	-40.5	57.54	38.5	74	54	-16.46	-15.5
14880	V	97.58	78.58	-41	56.58	37.58	74	54	-17.42	-16.42
17360	V	96.42	77.45	-41.1	55.32	36.35	74	54	-18.68	-17.65
4960	H	93.91	74.7	-31.6	62.31	43.1	74	54	-11.69	-10.9
7440	H	95.86	77.19	-35.5	60.36	41.69	74	54	-13.64	-12.31
9920	H	97.47	78.55	-38.3	59.17	40.25	74	54	-14.83	-13.75
12400	H	96.68	77.11	-39	57.68	38.11	74	54	-16.32	-15.89
14880	H	98.58	79.85	-42	56.58	37.85	74	54	-17.42	-16.15
17360	H	96.97	77.97	-41.5	55.47	36.47	74	54	-18.53	-17.53

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.
(4) Measuring frequencies from 1GHz to 25GHz.

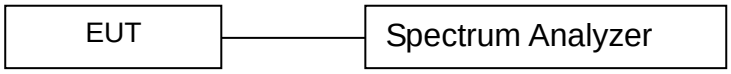
7.5 Radiated Measurement Photos:

8. Channel Separation test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used:

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2022/10/08	2023/10/07
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2022/10/08	2023/10/07
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/03/16	2024/03/15
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2022/10/08	2023/10/07
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/03/16	2024/03/15
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2022/10/08	2023/10/07
temperature humidity chamber	Espec	SH-241	SH-241-2014	2022/10/08	2023/10/07
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

8.4 Measurement Results:

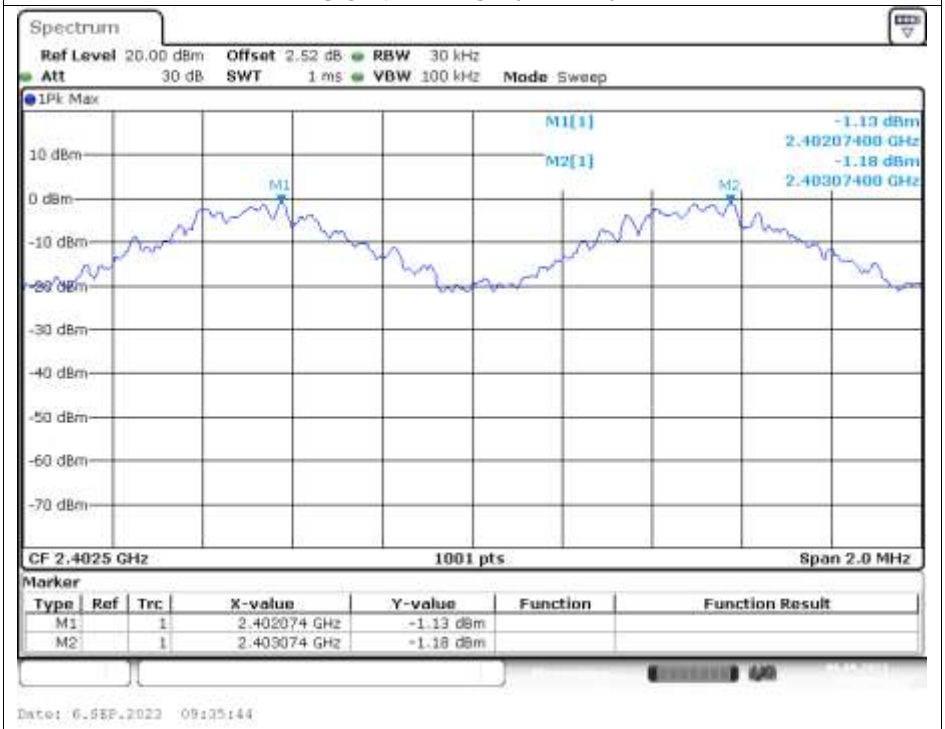
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	Sep. 18, 2023
Test By:	Zero	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	GFSK, π/4-DQPSK, 8DPSK		

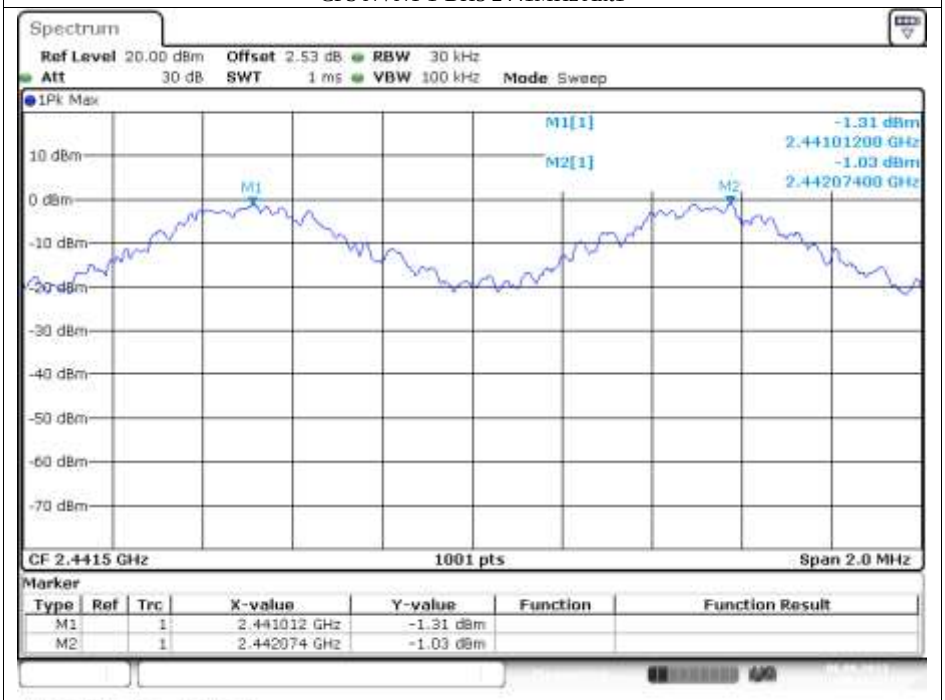
Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
1-DH5	Ant1	2402.074	2403.074	1	0.683	Pass
1-DH5	Ant1	2441.012	2442.074	1.062	0.687	Pass
1-DH5	Ant1	2479.034	2480.03	0.996	0.693	Pass
2-DH5	Ant1	2402.008	2403.018	1.01	0.883	Pass
2-DH5	Ant1	2441.17	2442.162	0.992	0.885	Pass
2-DH5	Ant1	2479.174	2480.168	0.994	0.888	Pass
3-DH5	Ant1	2401.86	2402.856	0.996	0.025	Pass
3-DH5	Ant1	2441.018	2442.006	0.988	0.025	Pass
3-DH5	Ant1	2479.136	2480.148	1.012	0.025	Pass

Test Graphs

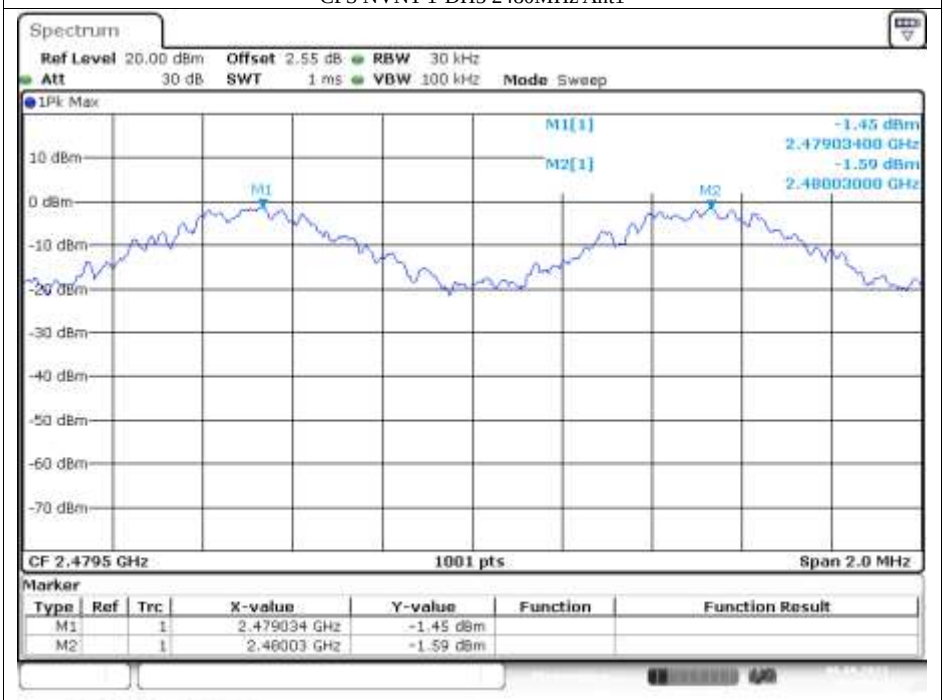
CFS NVNT 1-DH5 2402MHz Ant1



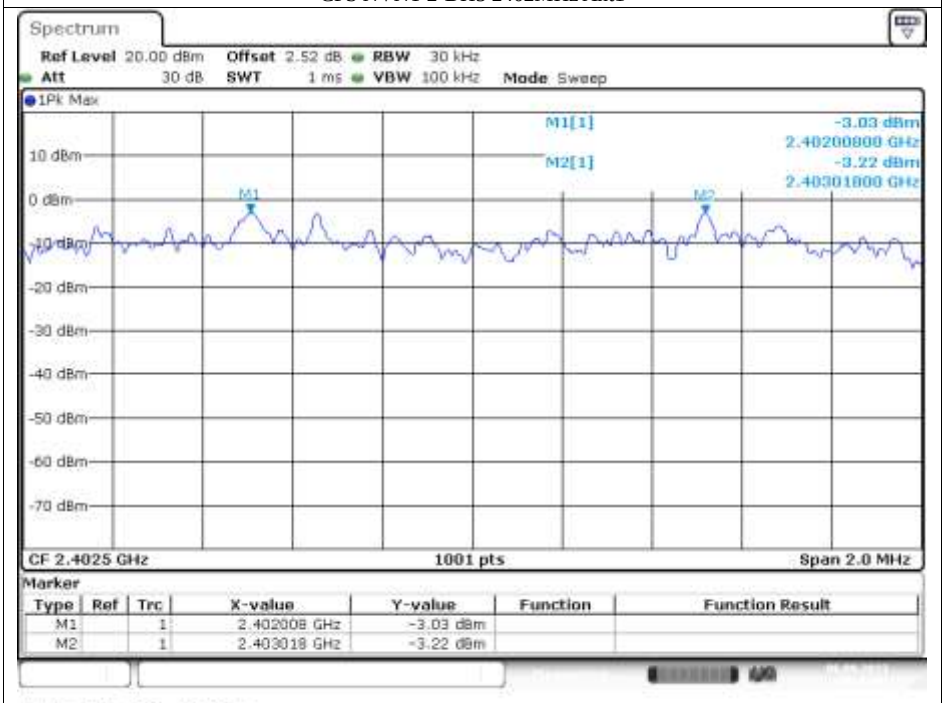
CFS NVNT 1-DH5 2441MHz Ant1



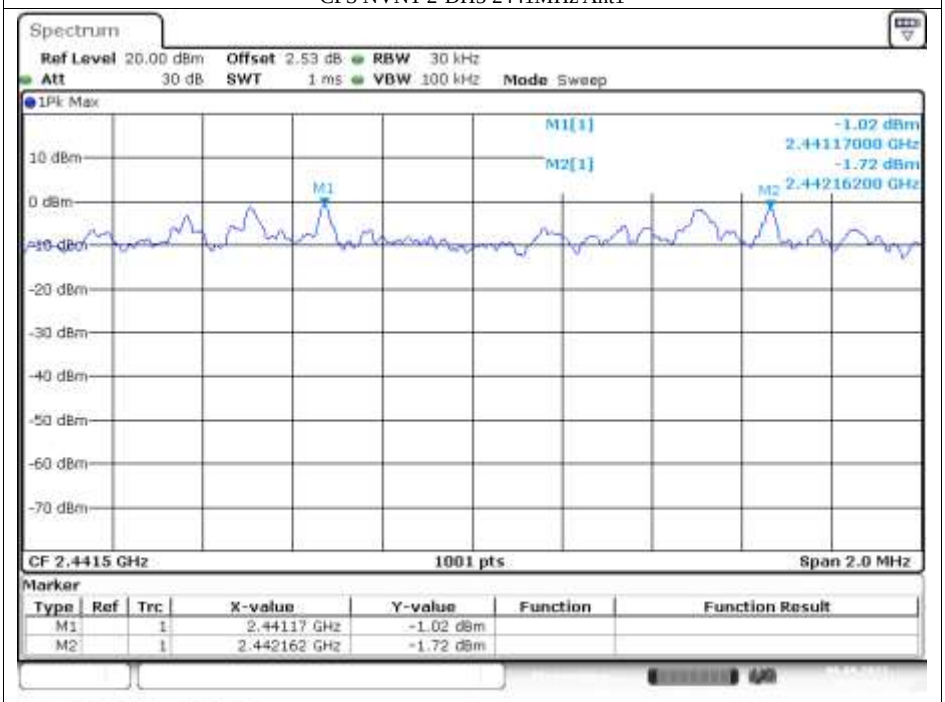
CFS NVNT 1-DH5 2480MHz Ant1



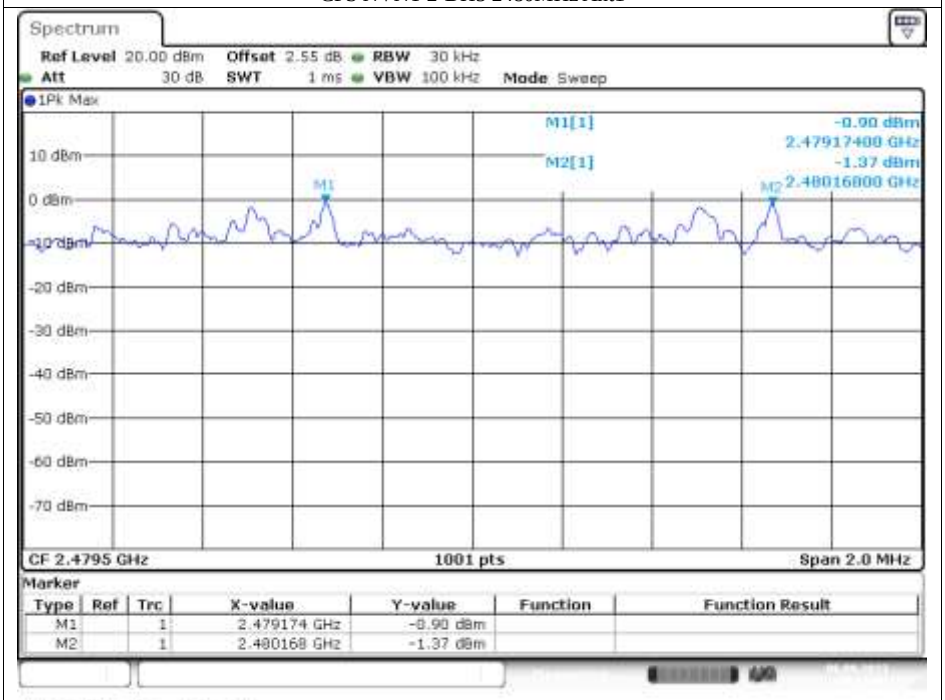
CFS NVNT 2-DH5 2402MHz Ant1



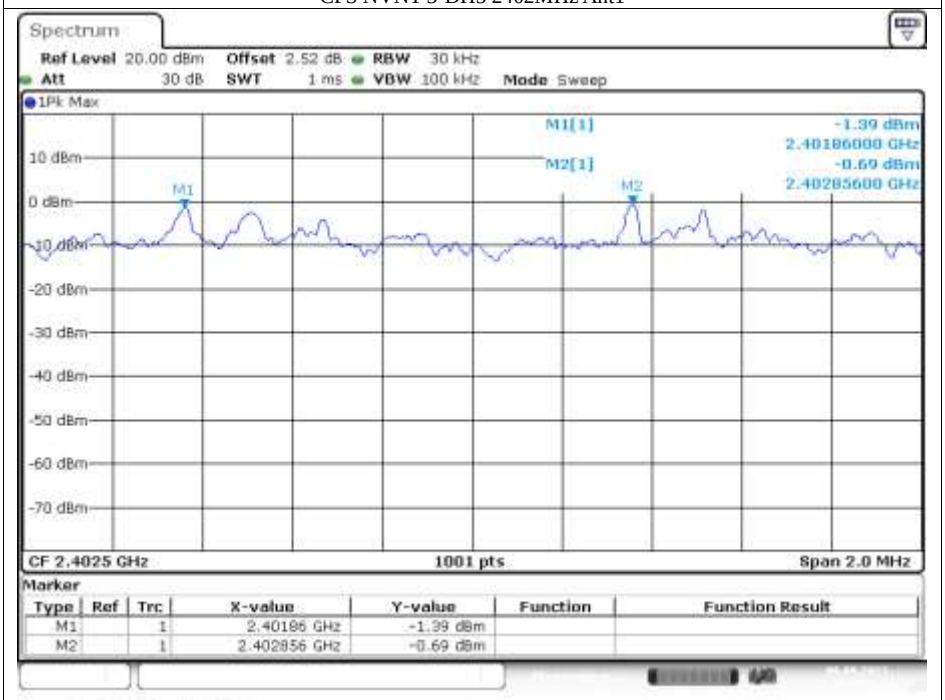
CFS NVNT 2-DH5 2441MHz Ant1



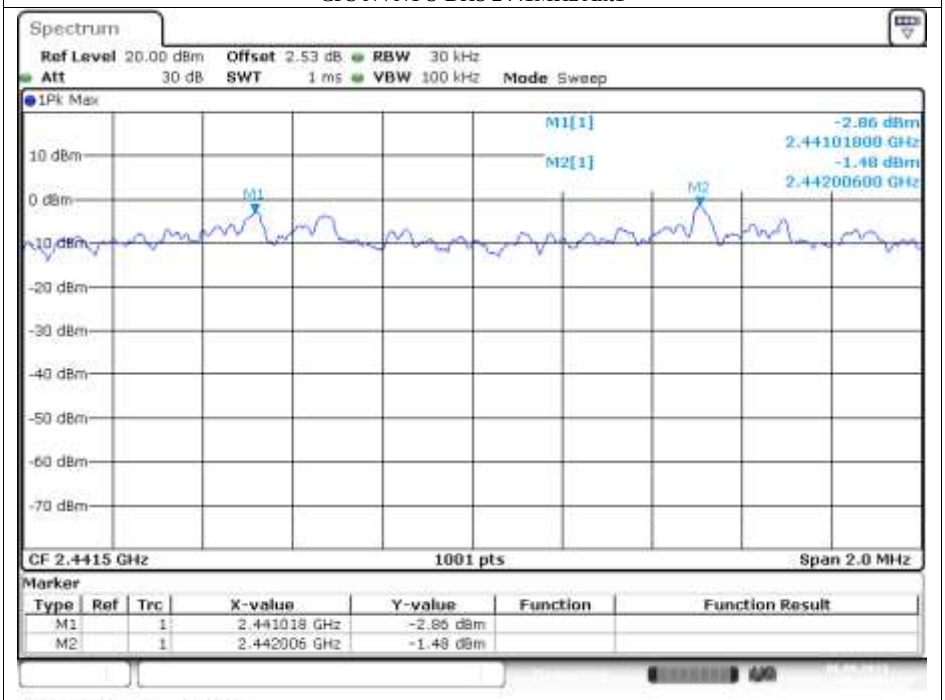
CFS NVNT 2-DH5 2480MHz Ant1



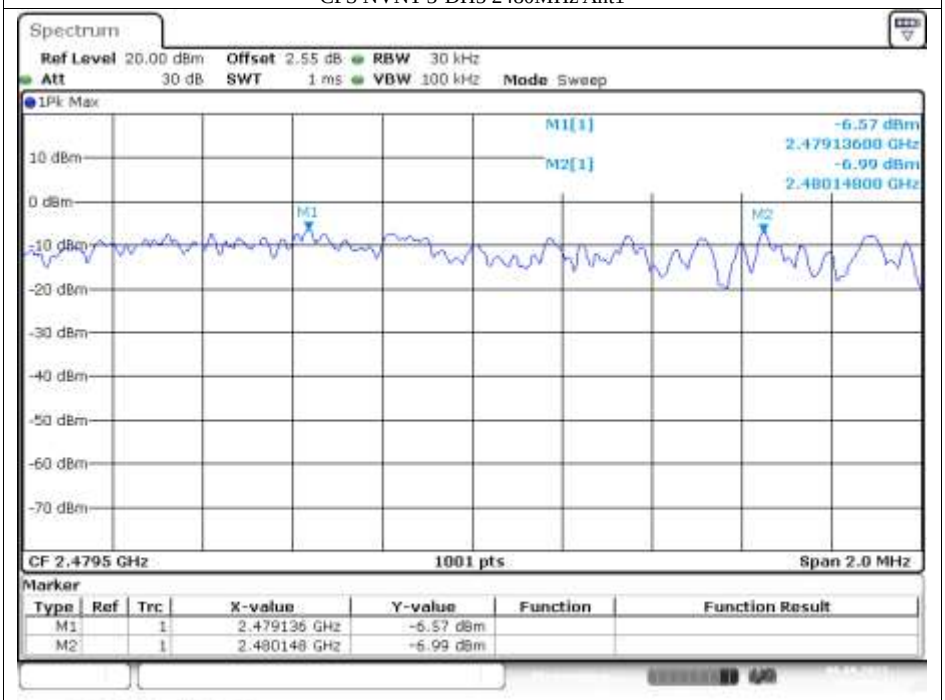
CFS NVNT 3-DH5 2402MHz Ant1



CFS NVNT 3-DH5 2441MHz Ant1



CFS NVNT 3-DH5 2480MHz Ant1

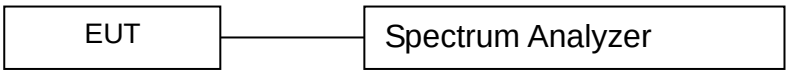


9. 20dB Bandwidth test

9.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2022/10/08	2023/10/07
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2022/10/08	2023/10/07
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/03/16	2024/03/15
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2022/10/08	2023/10/07
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/03/16	2024/03/15
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2022/10/08	2023/10/07
temperature humidity chamber	Espec	SH-241	SH-241-2014	2022/10/08	2023/10/07
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

9.4 Measurement Results:

Refer to attached data chart.

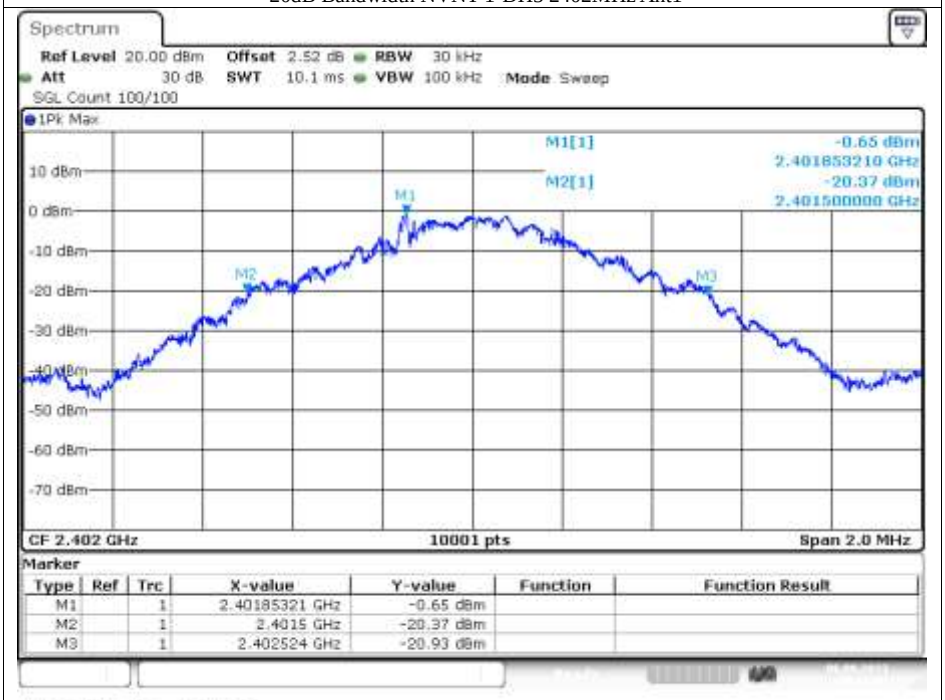
Spectrum Detector:	PK	Test Date :	Sep. 12, 2023
Test By:	Zero	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	GFSK, π/4-DQPSK, 8DPSK		

Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
1-DH5	2402	Ant1	1.024	0	Pass
1-DH5	2441	Ant1	1.031	0	Pass
1-DH5	2480	Ant1	1.039	0	Pass
2-DH5	2402	Ant1	1.325	0	Pass
2-DH5	2441	Ant1	1.328	0	Pass
2-DH5	2480	Ant1	1.332	0	Pass
3-DH5	2402	Ant1	1.286	0	Pass

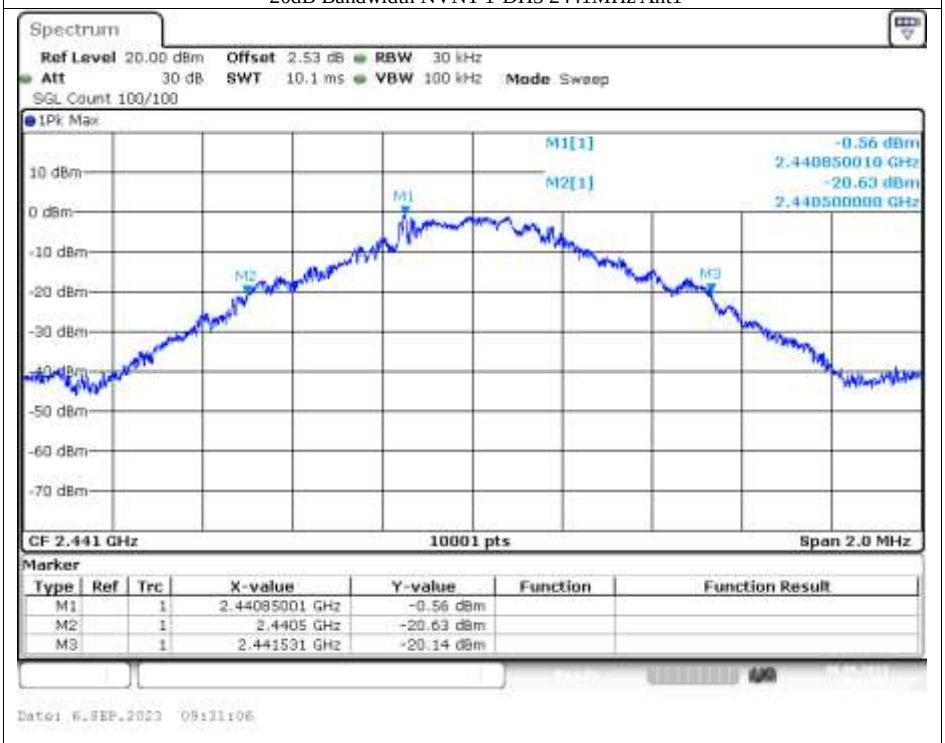
3-DH5	2441	Ant1	1.287	0	Pass
3-DH5	2480	Ant1	1.276	0	Pass

Test Graphs

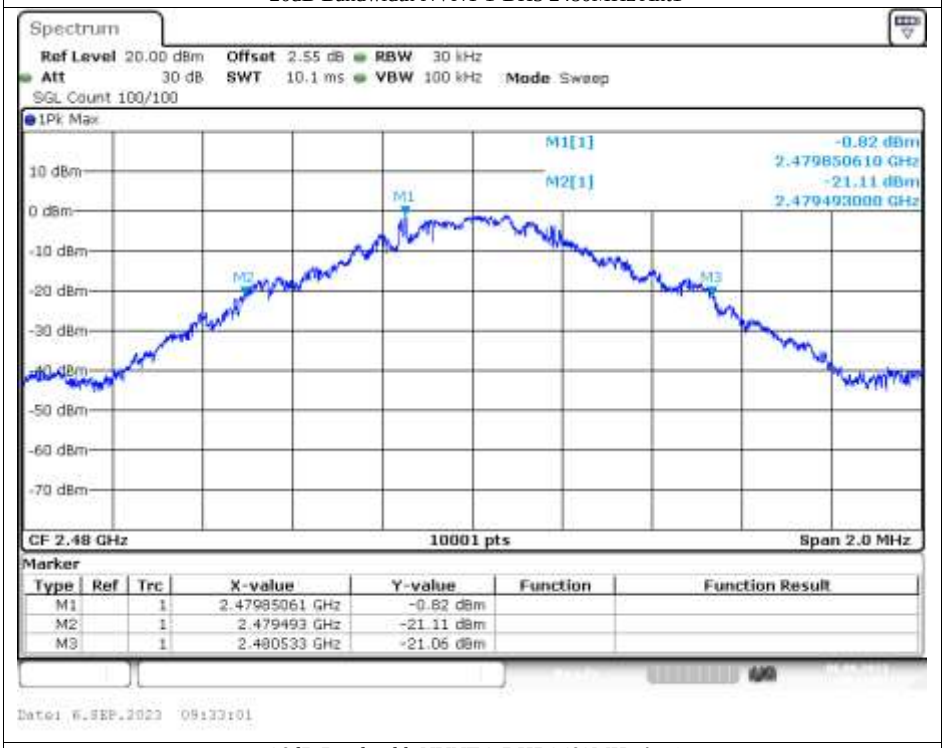
-20dB Bandwidth NVNT 1-DH5 2402MHz Ant1



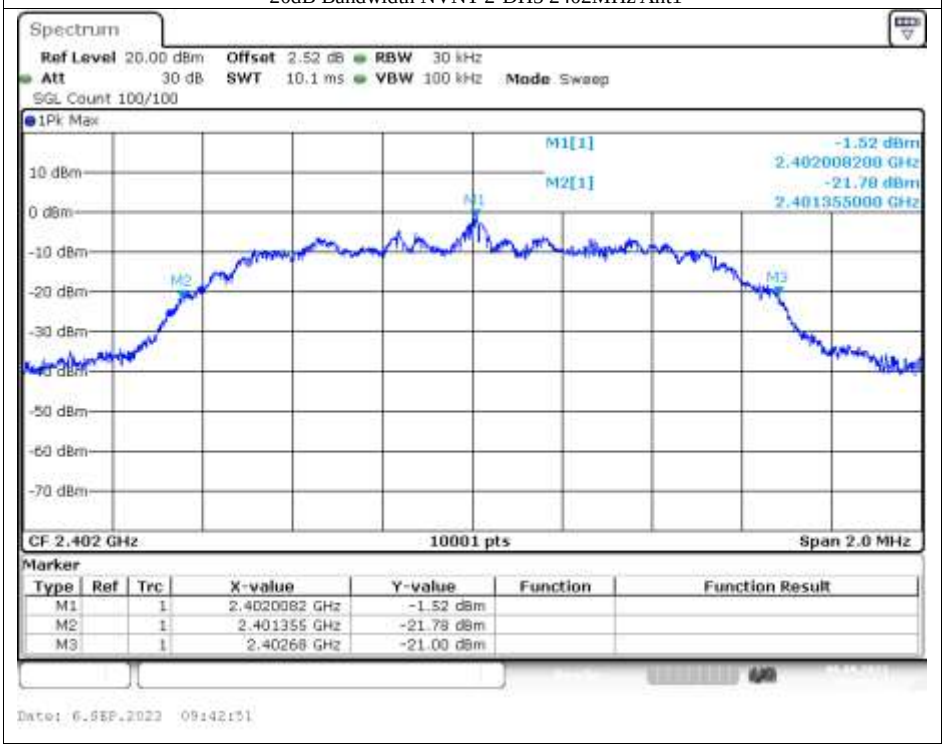
-20dB Bandwidth NVNT 1-DH5 2441MHz Ant1



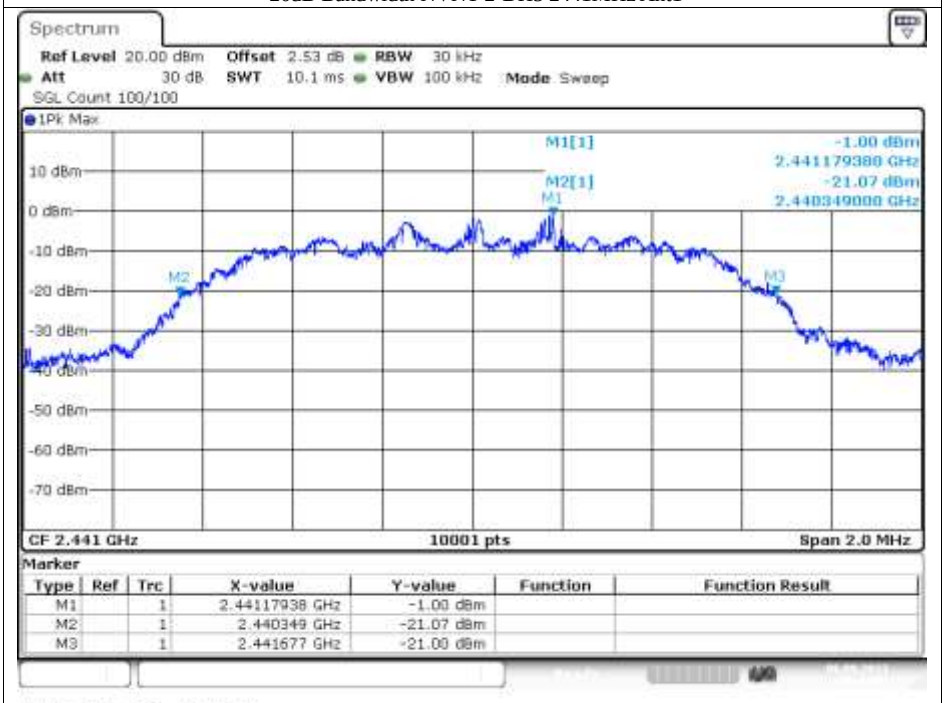
-20dB Bandwidth NVNT 1-DH5 2480MHz Ant1



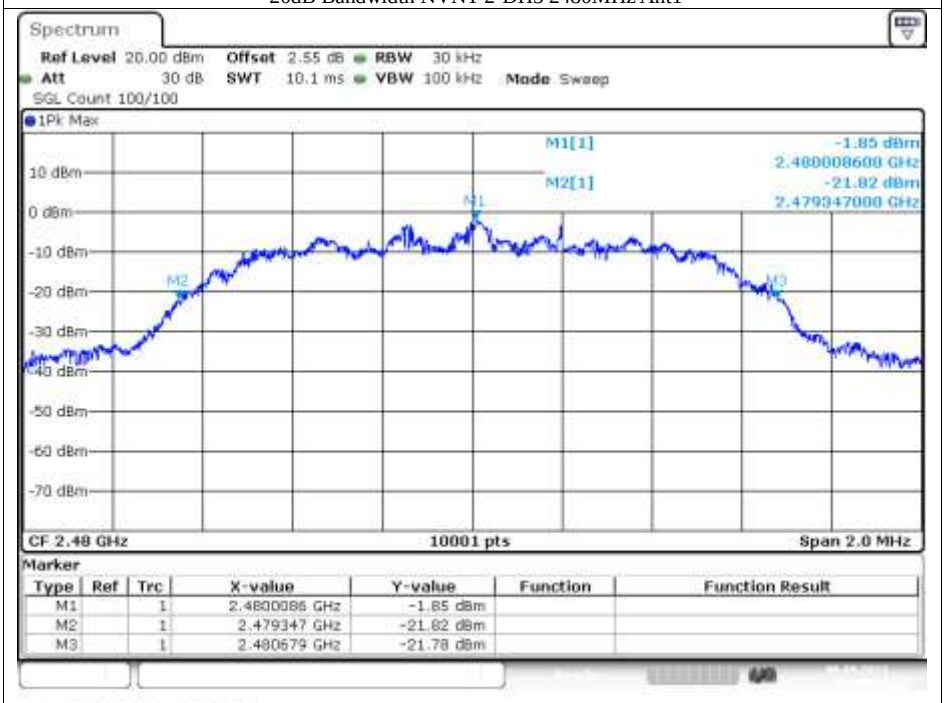
-20dB Bandwidth NVNT 2-DH5 2402MHz Ant1



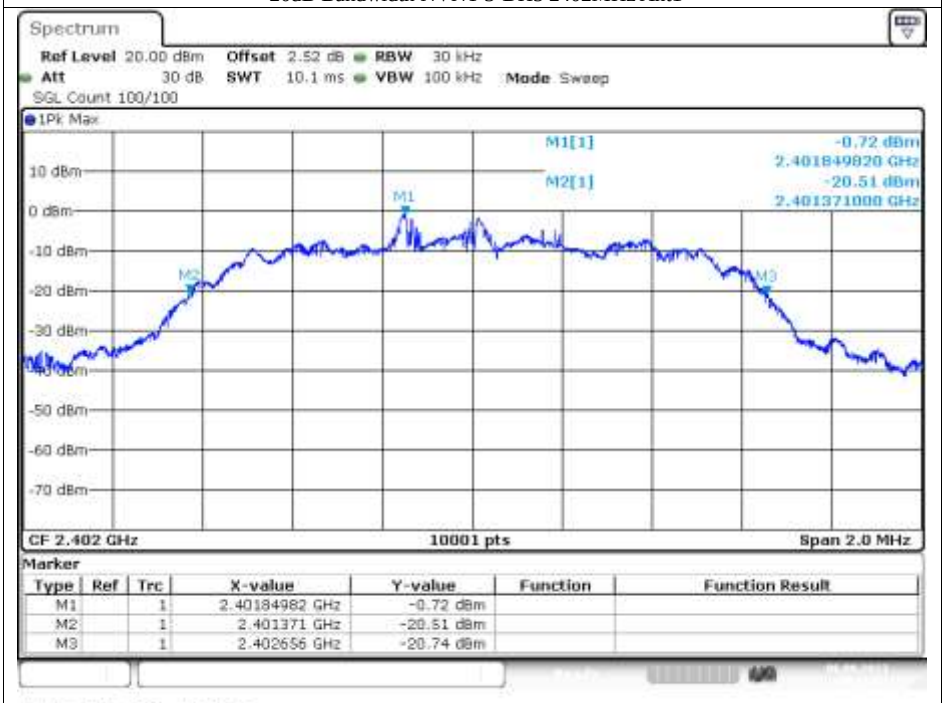
-20dB Bandwidth NVNT 2-DH5 2441MHz Ant1



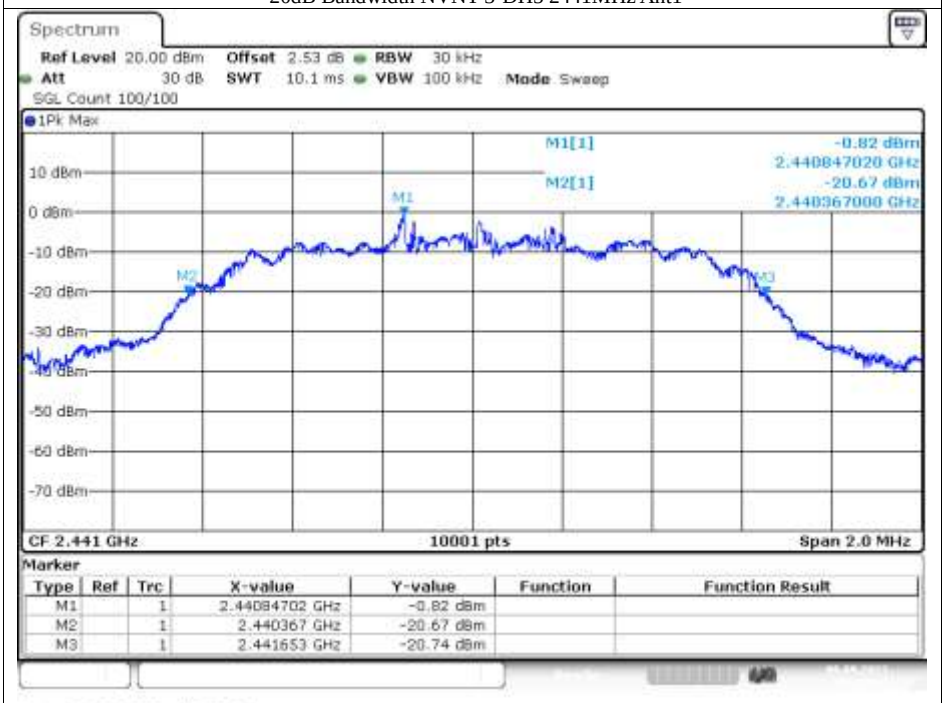
-20dB Bandwidth NVNT 2-DH5 2480MHz Ant1



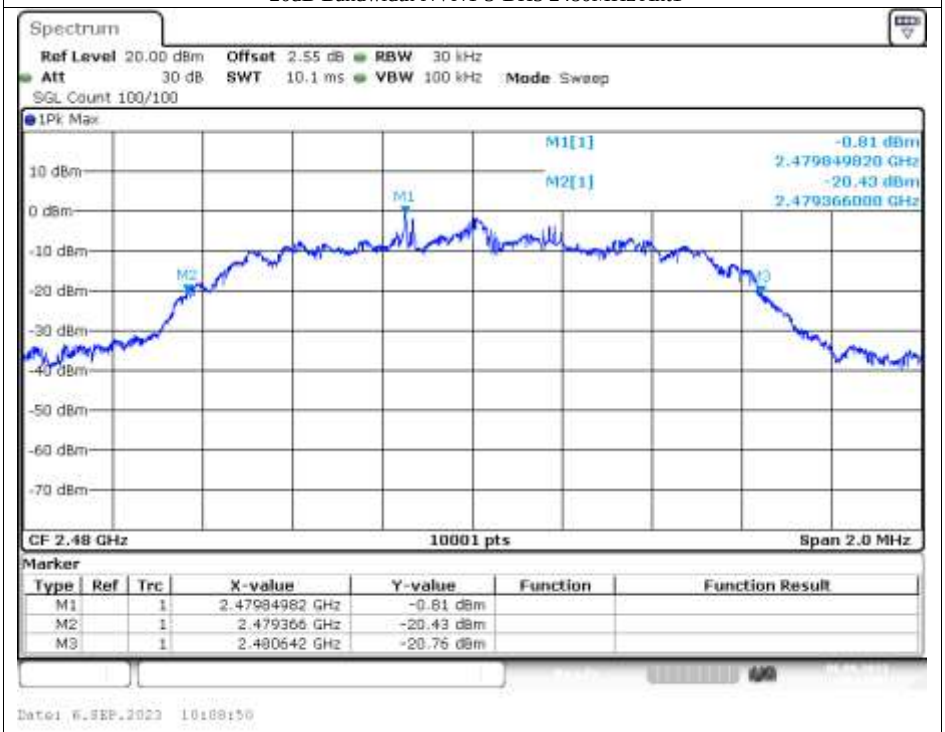
-20dB Bandwidth NVNT 3-DH5 2402MHz Ant1



-20dB Bandwidth NVNT 3-DH5 2441MHz Ant1



-20dB Bandwidth NVNT 3-DH5 2480MHz Ant1

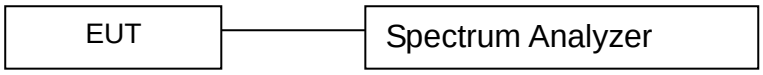


10. Quantity of Hopping Channel Test

10.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used:

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2022/10/08	2023/10/07
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2022/10/08	2023/10/07
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/03/16	2024/03/15
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2022/10/08	2023/10/07
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/03/16	2024/03/15
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2022/10/08	2023/10/07
temperature humidity chamber	Espec	SH-241	SH-241-2014	2022/10/08	2023/10/07
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

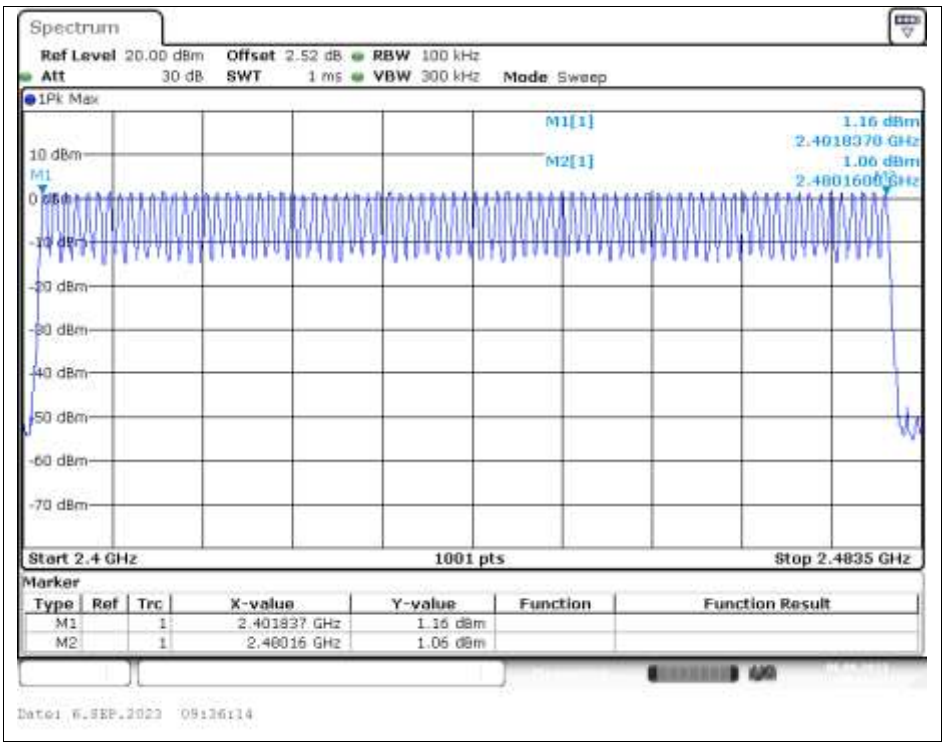
10.4 Measurement Results:

Refer to attached data chart.

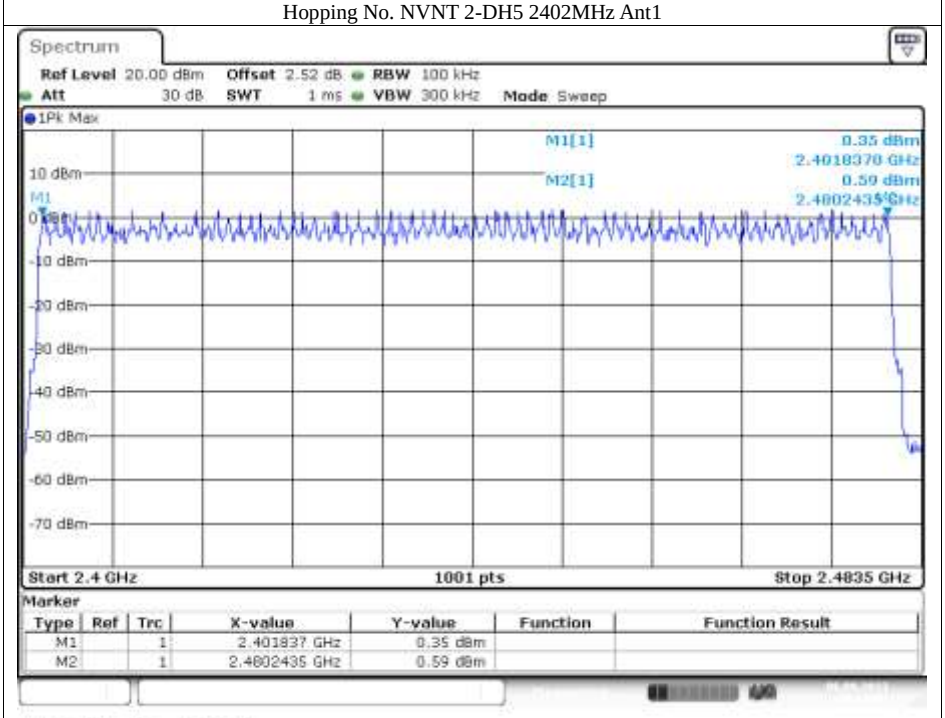
Test Mode	GFSK, π/4-DQPSK, 8DPSK	Test Date :	Sep. 12, 2023
Test By:	Zero	Temperature :	24 ℃
Test Result:	PASS	Humidity :	53 %

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

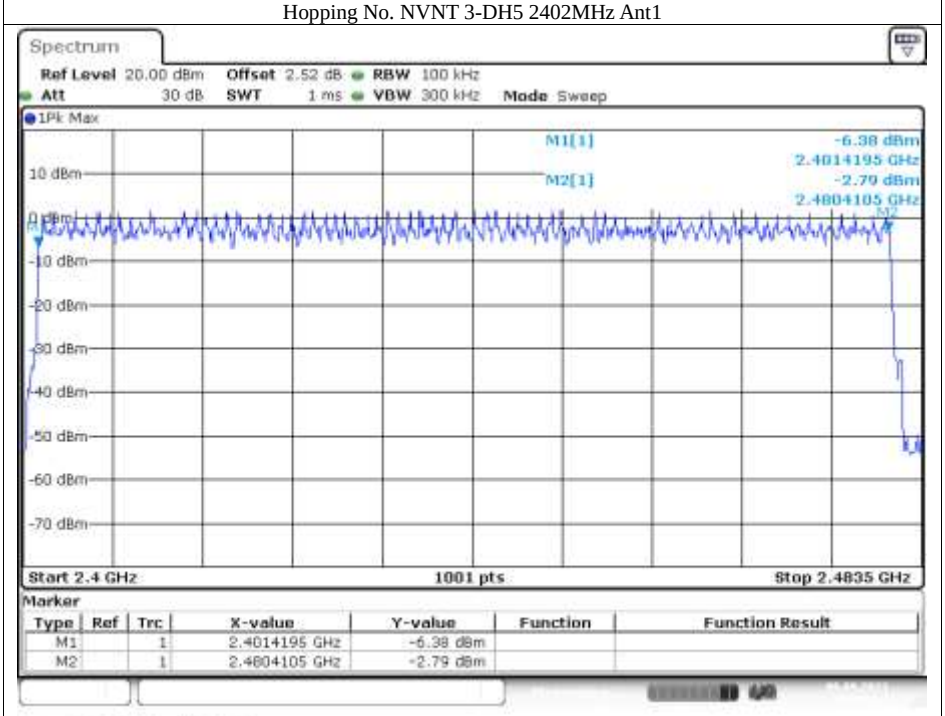
Test Graphs
Hopping No. NVNT 1-DH5 2402MHz Ant1


Spectrum
Ref Level 20.00 dBm Offset 2.52 dB RBW 100 kHz
Att 30 dB SWT 1 ms VBW 300 kHz Mode Sweep
1Pk Max
M1[1] 1.16 dBm
2.4018370 GHz
M2[1] 1.06 dBm
2.4801600 GHz
10 dBm
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
Start 2.4 GHz
1001 pts
Stop 2.4835 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.401837 GHz 1.16 dBm
M2 1 2.48016 GHz 1.06 dBm
Date: 6.SEP.2023 09:36:14

Hopping No. NVNT 2-DH5 2402MHz Ant1



Hopping No. NVNT 3-DH5 2402MHz Ant1



11. Time of Occupancy (Dwell Time) test

11.1 Test Description

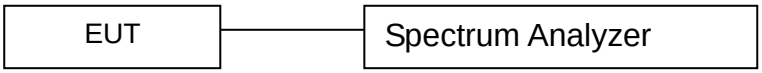
The Equipment Under Test (EUT) was set up to perform the dwell time measurements. The EUT was connected to the spectrum analyzer via a short coax cable. The dwell time is calculated by:

Dwell time = time slot length * hop rate / number of hopping channels * 31.6s

with:
- hop rate = 1600 * 1/s for DH1 packets = 1600 s^{-1}
- hop rate = 1600/3 * 1/s for DH3 packets = 533.33 s^{-1}
- number of hopping channels = 79
- 31.6 s = 0.4 seconds multiplied by the number of hopping channels = 0.4 s * 79

The highest value of the dwell time is reported.

11.2 Test SET-UP (Block Diagram of Configuration)



11.3 Measurement Equipment Used:

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2022/10/08	2023/10/07
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2022/10/08	2023/10/07
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/03/16	2024/03/15
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2022/10/08	2023/10/07
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/03/16	2024/03/15
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2022/10/08	2023/10/07
temperature humidity chamber	Espec	SH-241	SH-241-2014	2022/10/08	2023/10/07
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

11.4 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4

seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6seconds. Refer to attached data chart.

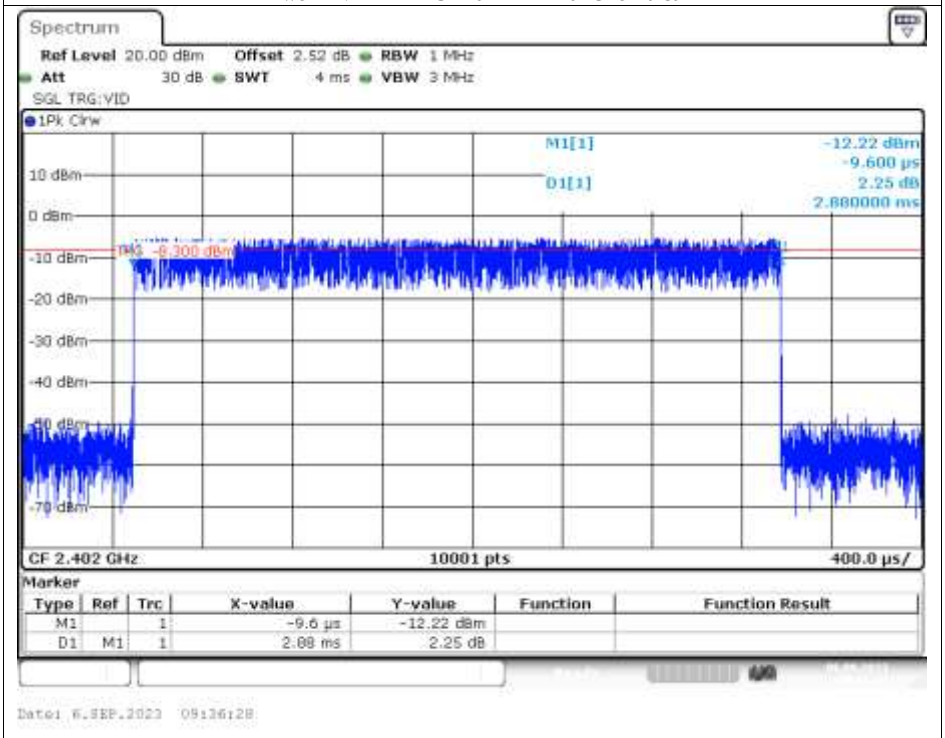
Modulation:	GFSK, π/4-DQPSK, 8DPSK	Test Date :	Sep. 12, 2023
Test By:	Zero	Temperature :	24 ℃
Test Result:	PASS	Humidity :	53 %

11.5 Test result

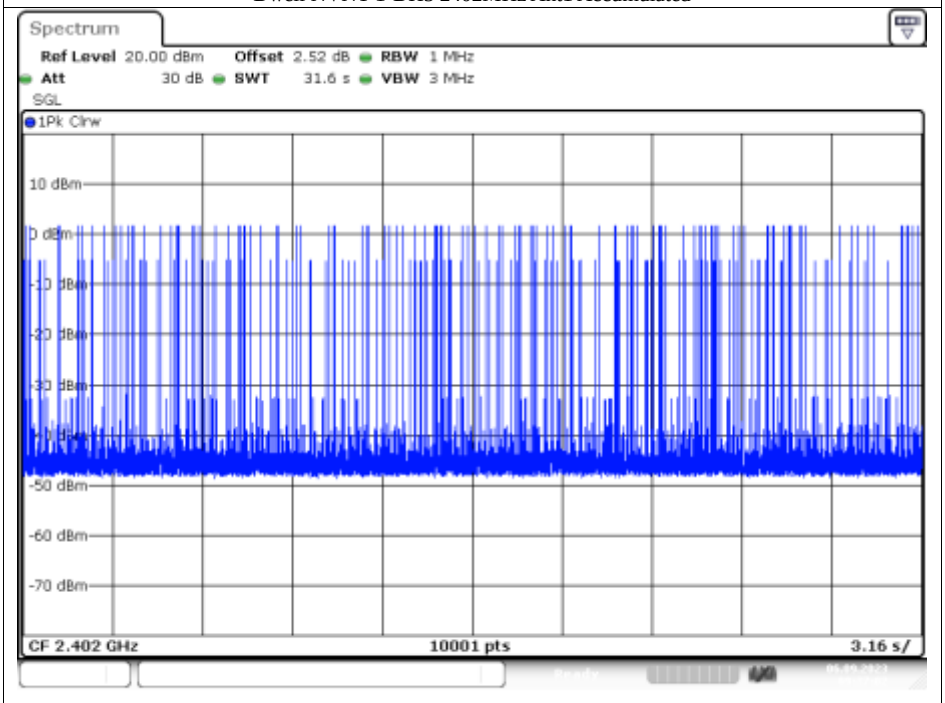
Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
1-DH5	2402	Ant1	2.88	328.32	114	31600	400	Pass
1-DH5	2441	Ant1	2.88	339.84	118	31600	400	Pass
1-DH5	2480	Ant1	2.88	296.64	103	31600	400	Pass
2-DH5	2402	Ant1	2.886	268.398	93	31600	400	Pass
2-DH5	2441	Ant1	2.884	265.328	92	31600	400	Pass
2-DH5	2480	Ant1	2.886	282.828	98	31600	400	Pass
3-DH5	2402	Ant1	2.889	309.123	107	31600	400	Pass
3-DH5	2441	Ant1	2.888	323.456	112	31600	400	Pass
3-DH5	2480	Ant1	2.888	265.696	92	31600	400	Pass

Test Graphs

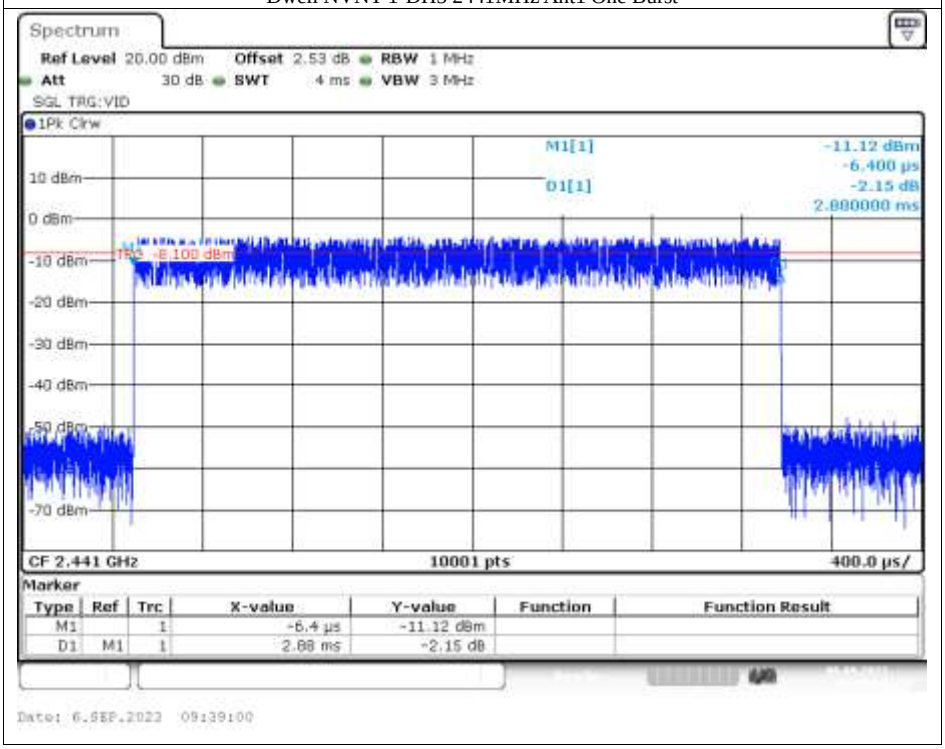
Dwell NVNT 1-DH5 2402MHz Ant1 One Burst



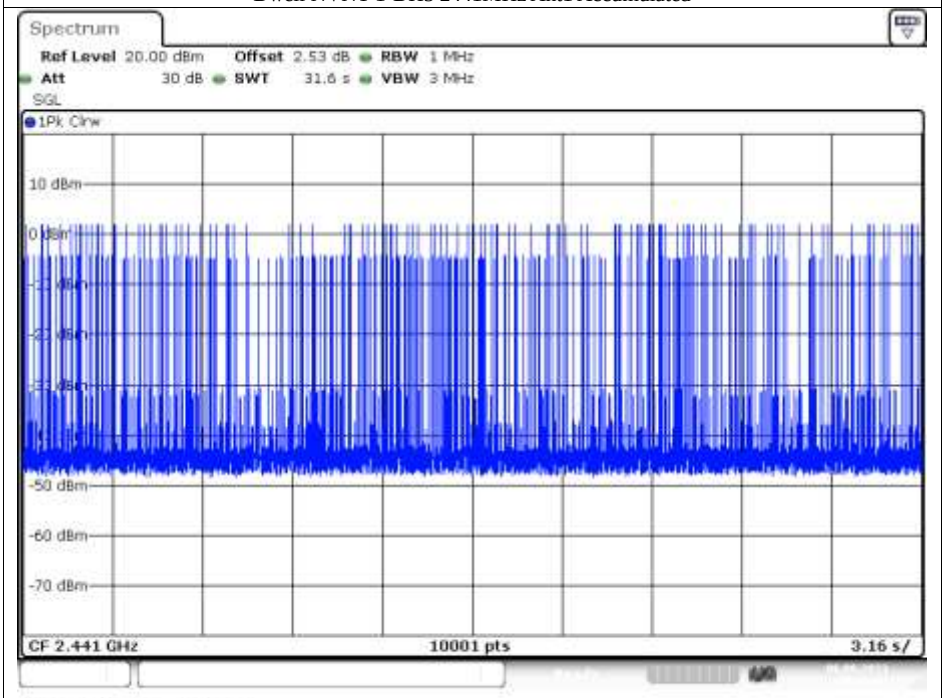
Dwell NVNT 1-DH5 2402MHz Ant1 Accumulated



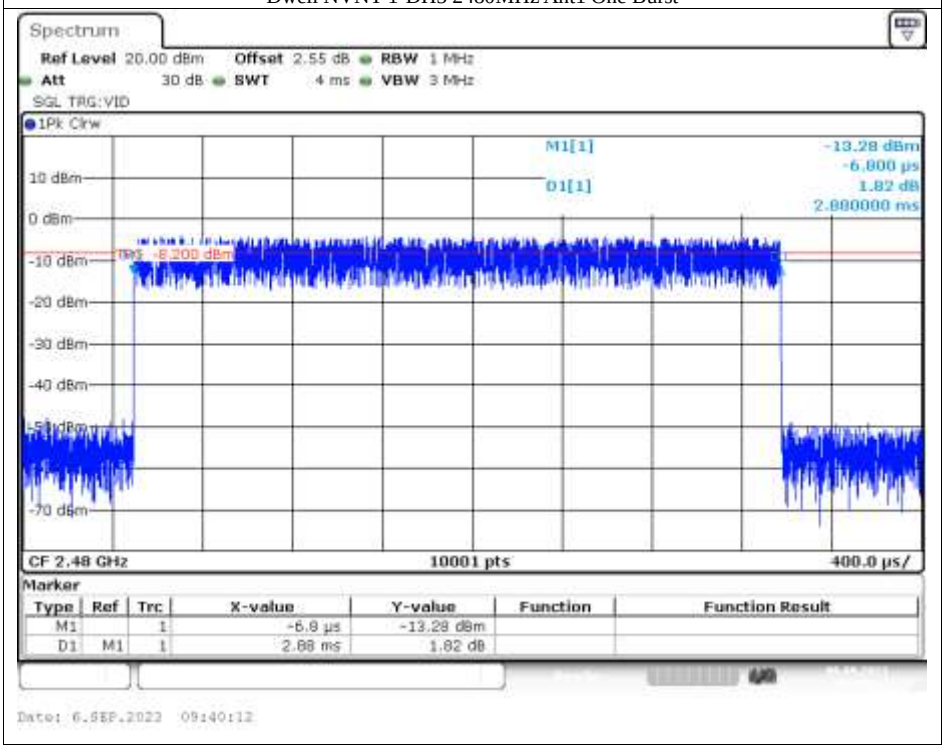
Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



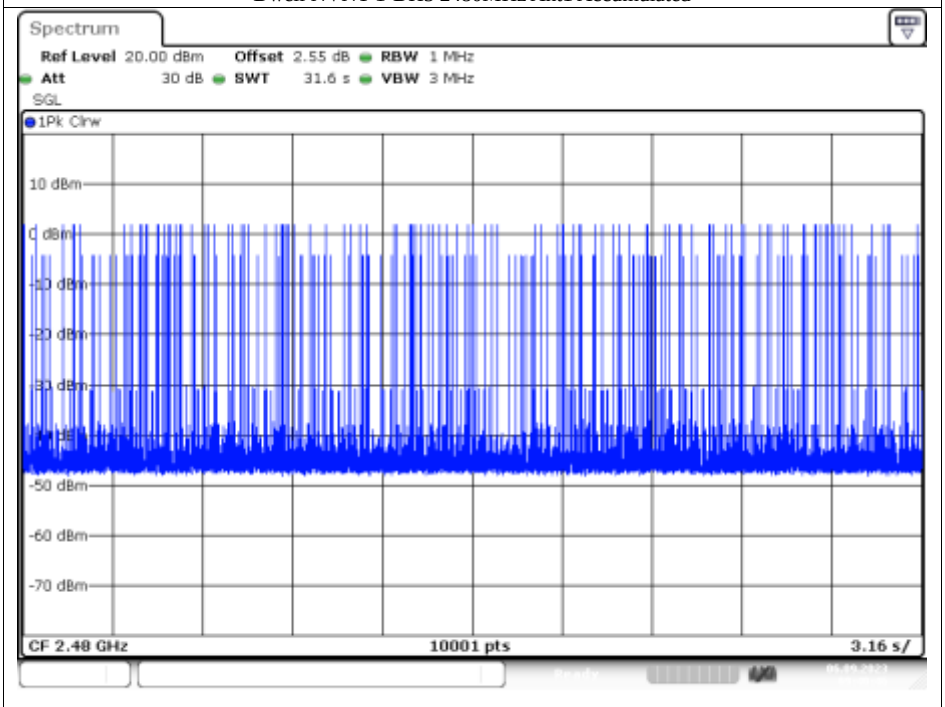
Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated



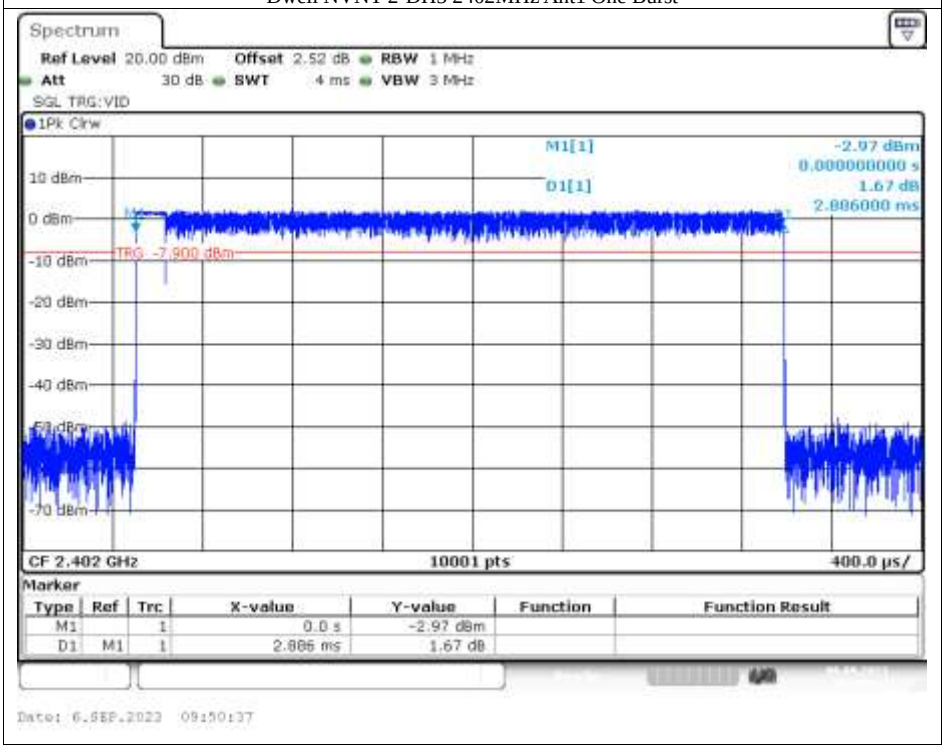
Dwell NVNT 1-DH5 2480MHz Ant1 One Burst



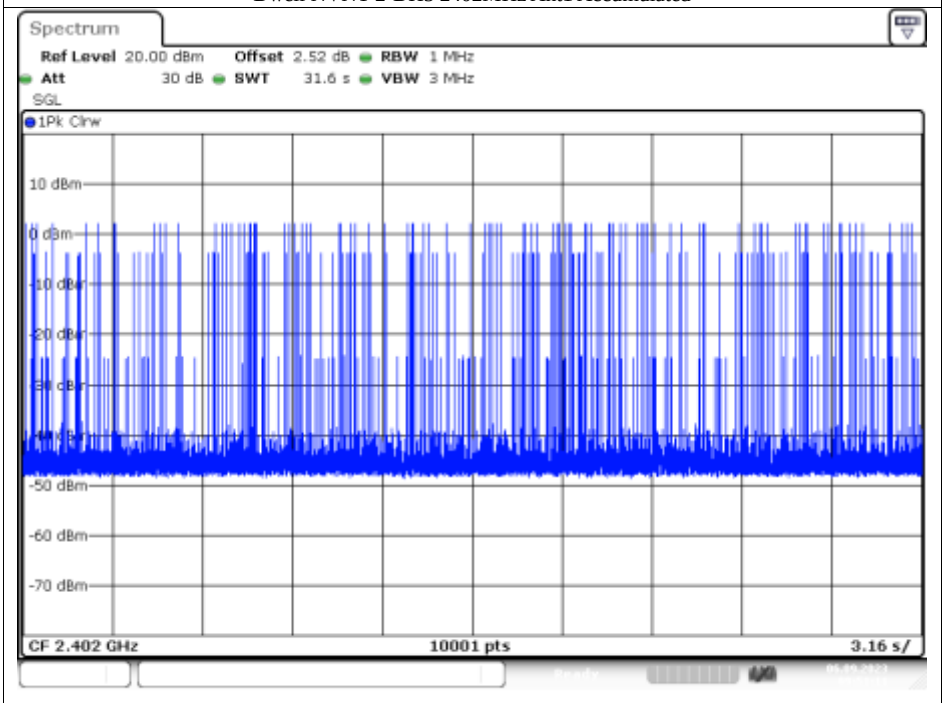
Dwell NVNT 1-DH5 2480MHz Ant1 Accumulated



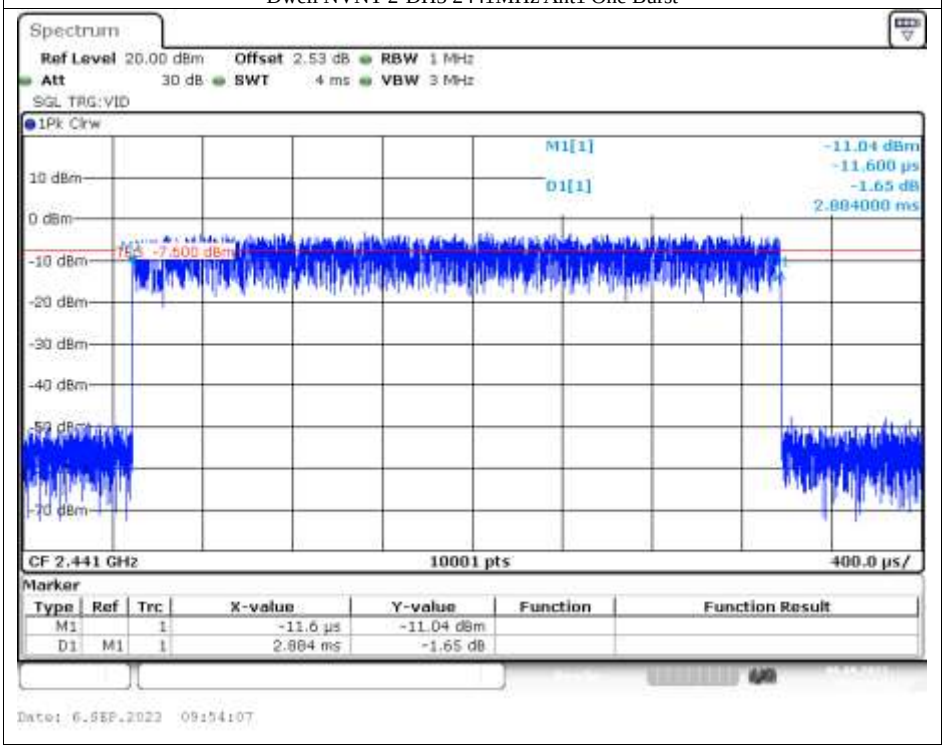
Dwell NVNT 2-DH5 2402MHz Ant1 One Burst



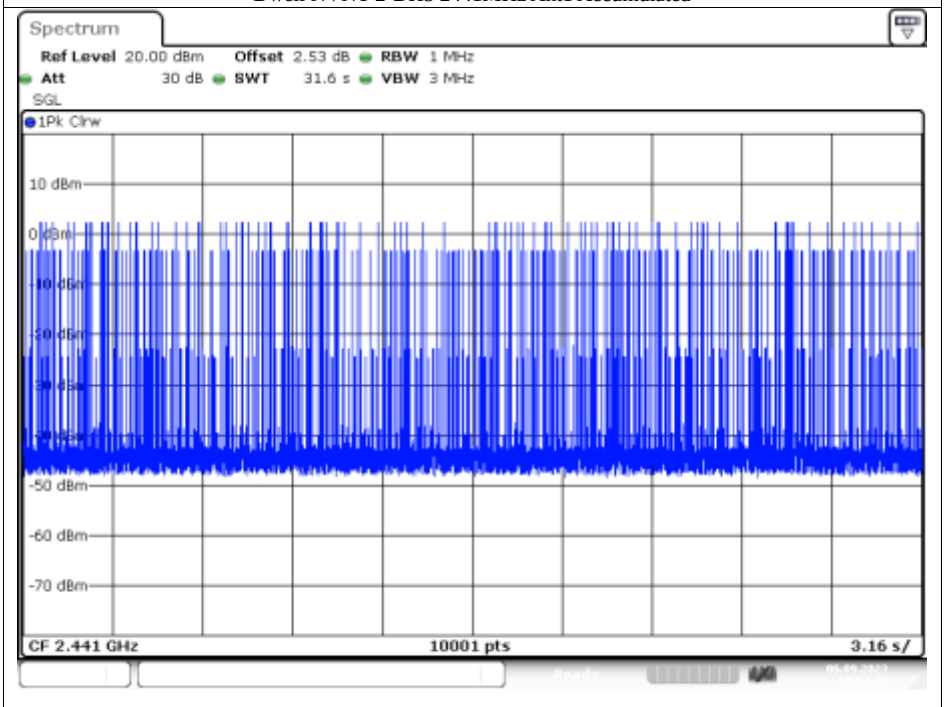
Dwell NVNT 2-DH5 2402MHz Ant1 Accumulated



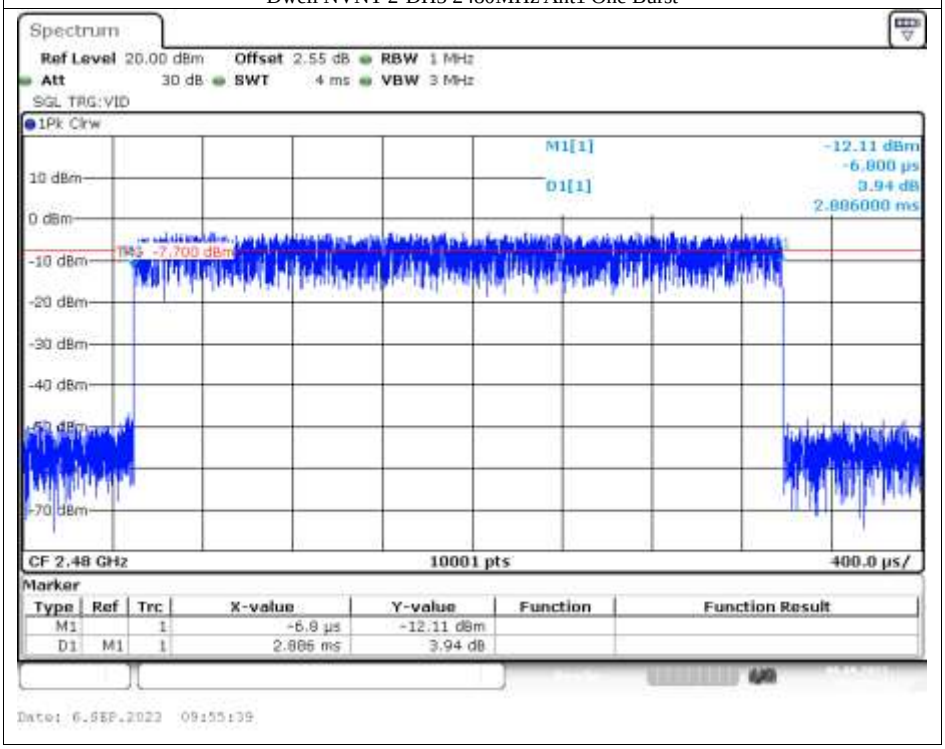
Dwell NVNT 2-DH5 2441MHz Ant1 One Burst



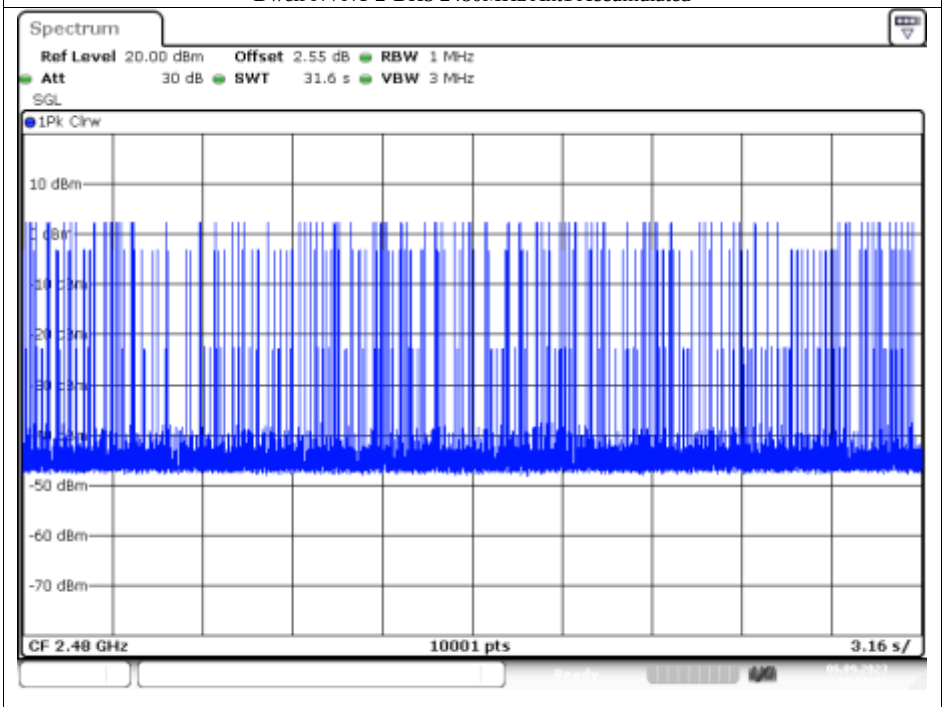
Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated



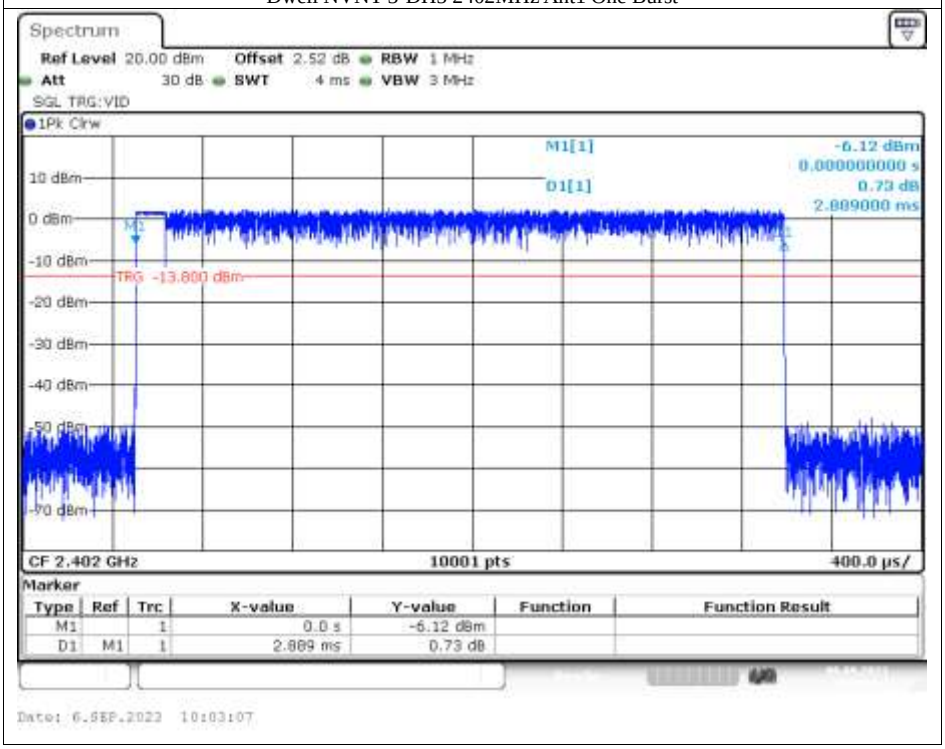
Dwell NVNT 2-DH5 2480MHz Ant1 One Burst



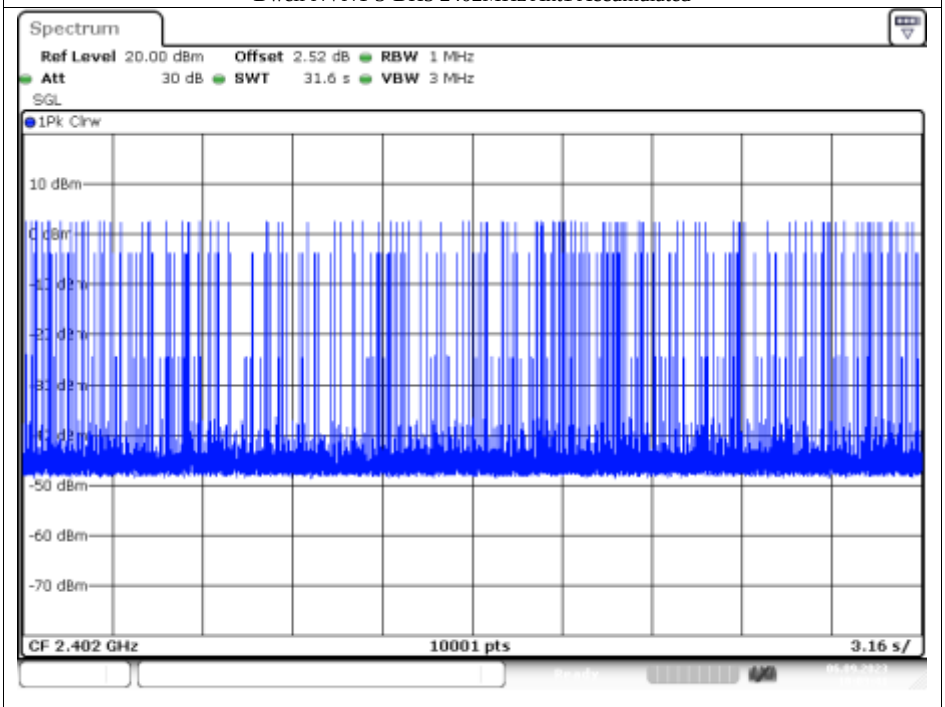
Dwell NVNT 2-DH5 2480MHz Ant1 Accumulated



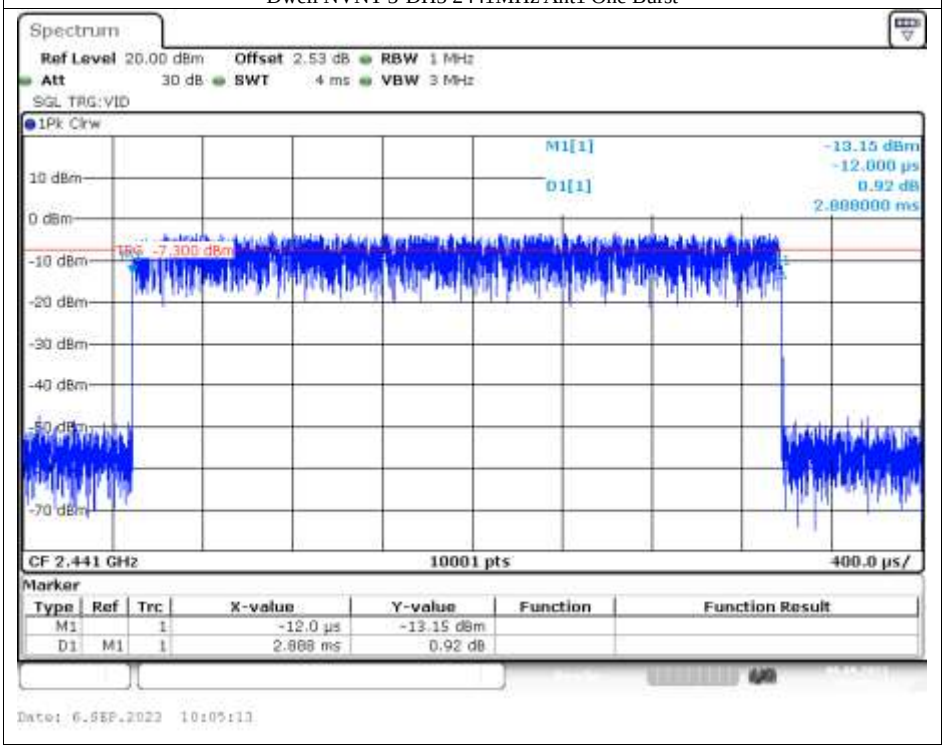
Dwell NVNT 3-DH5 2402MHz Ant1 One Burst



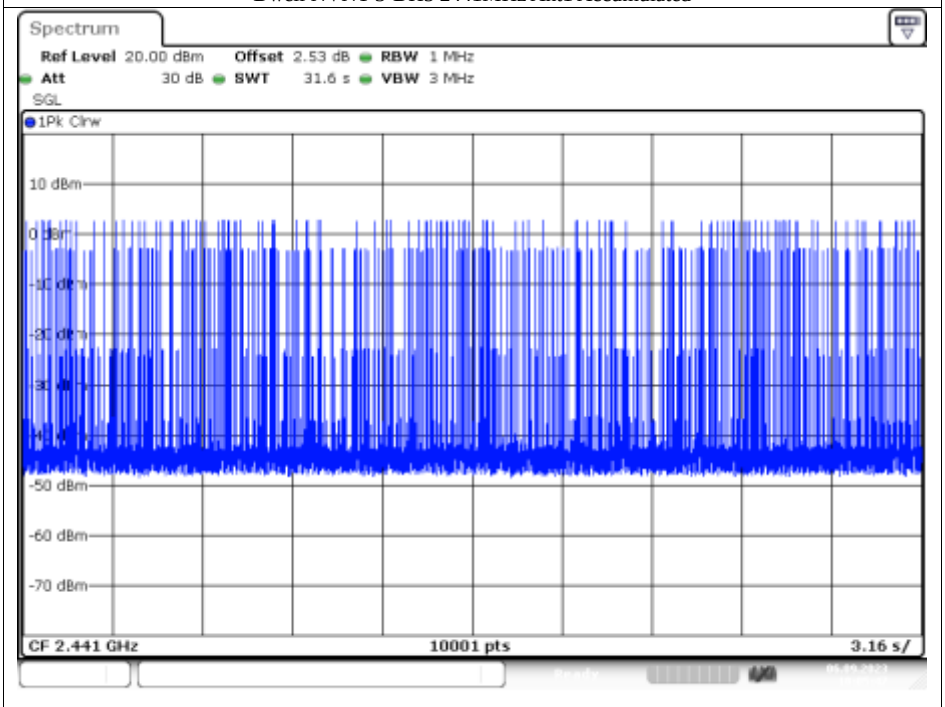
Dwell NVNT 3-DH5 2402MHz Ant1 Accumulated



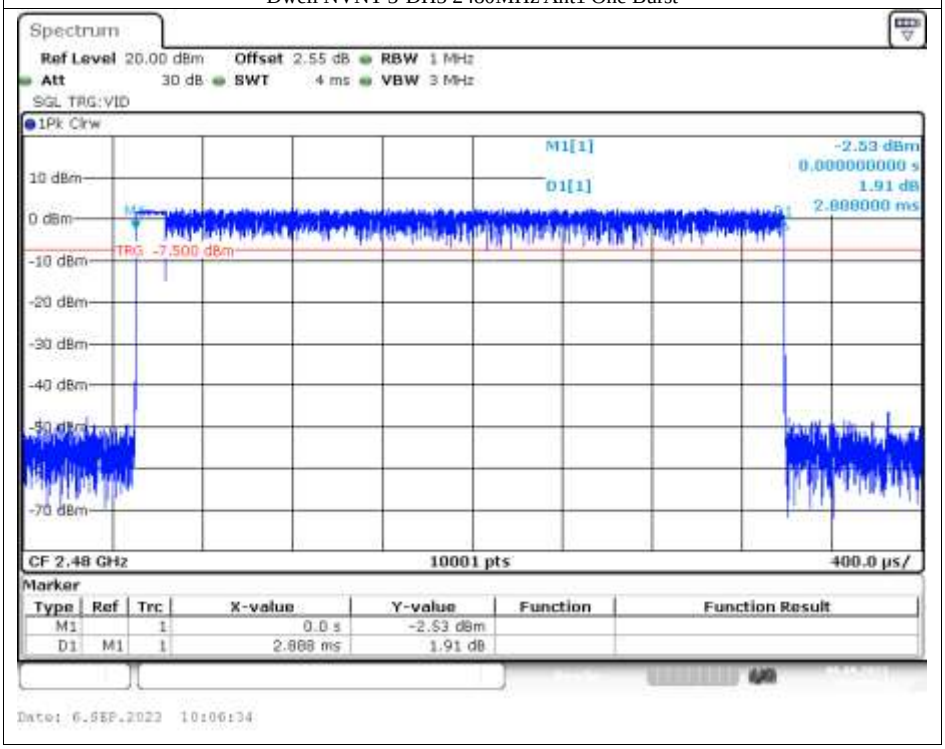
Dwell NVNT 3-DH5 2441MHz Ant1 One Burst



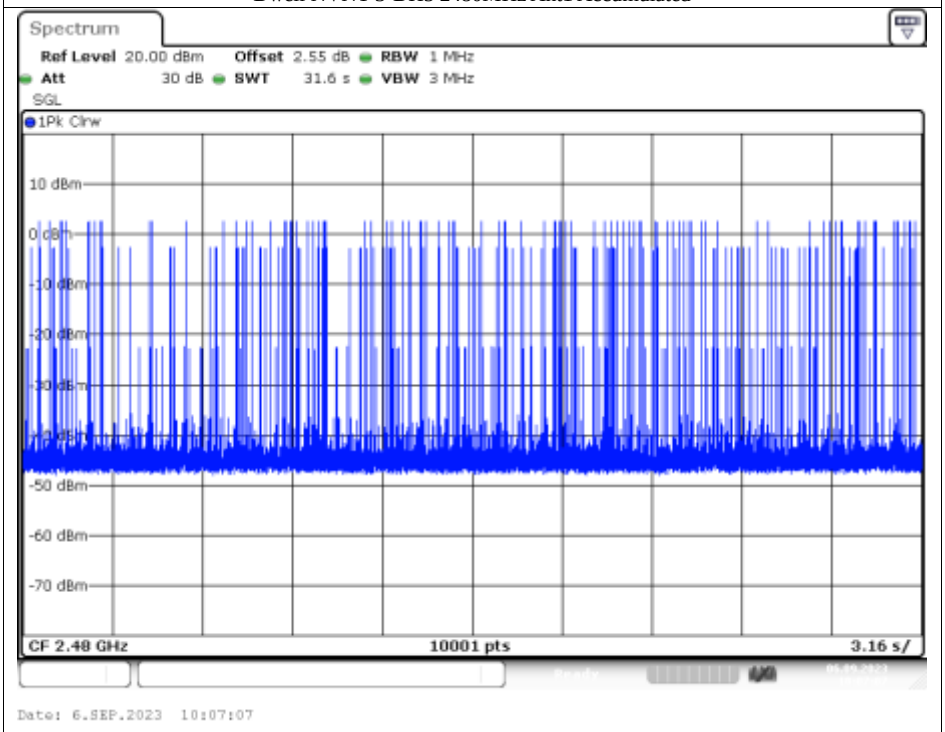
Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated



Dwell NVNT 3-DH5 2480MHz Ant1 One Burst



Dwell NVNT 3-DH5 2480MHz Ant1 Accumulated



12. MAXIMUM PEAK OUTPUT POWER TEST

12.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.

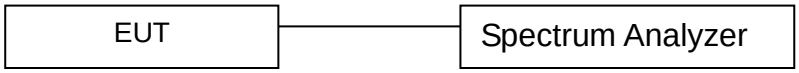
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

12.2 Test SET-UP (Block Diagram of Configuration)



12.3 Measurement Equipment Used:

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2022/10/08	2023/10/07
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2022/10/08	2023/10/07
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/03/16	2024/03/15
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2022/10/08	2023/10/07
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/03/16	2024/03/15
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2022/10/08	2023/10/07
temperature humidity chamber	Espec	SH-241	SH-241-2014	2022/10/08	2023/10/07
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

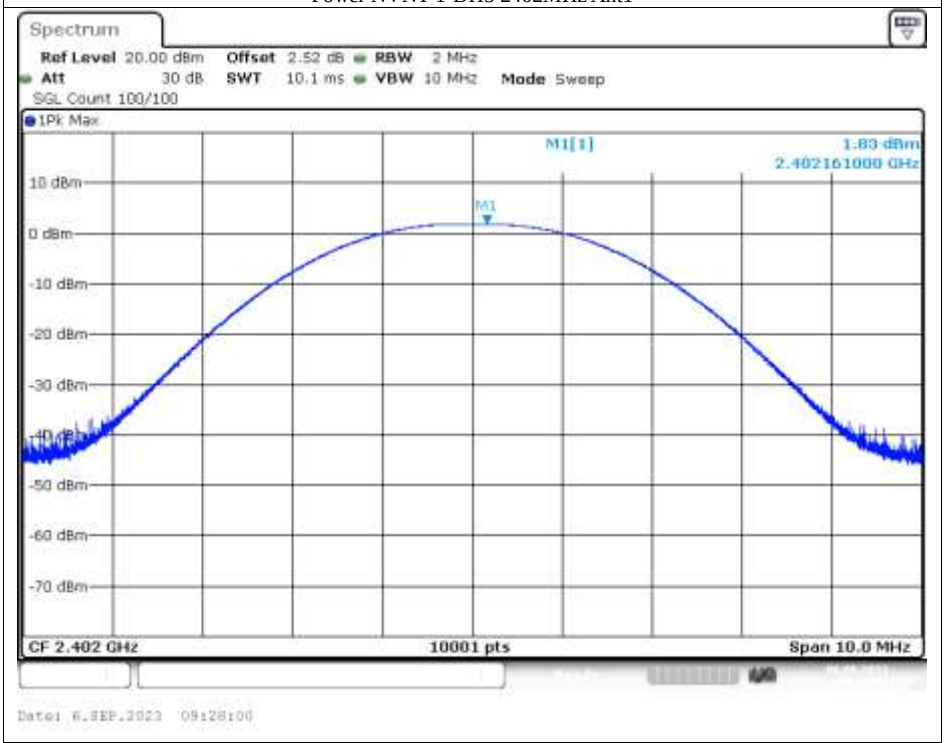
12.4Measurement Results:

Refer to attached data chart.

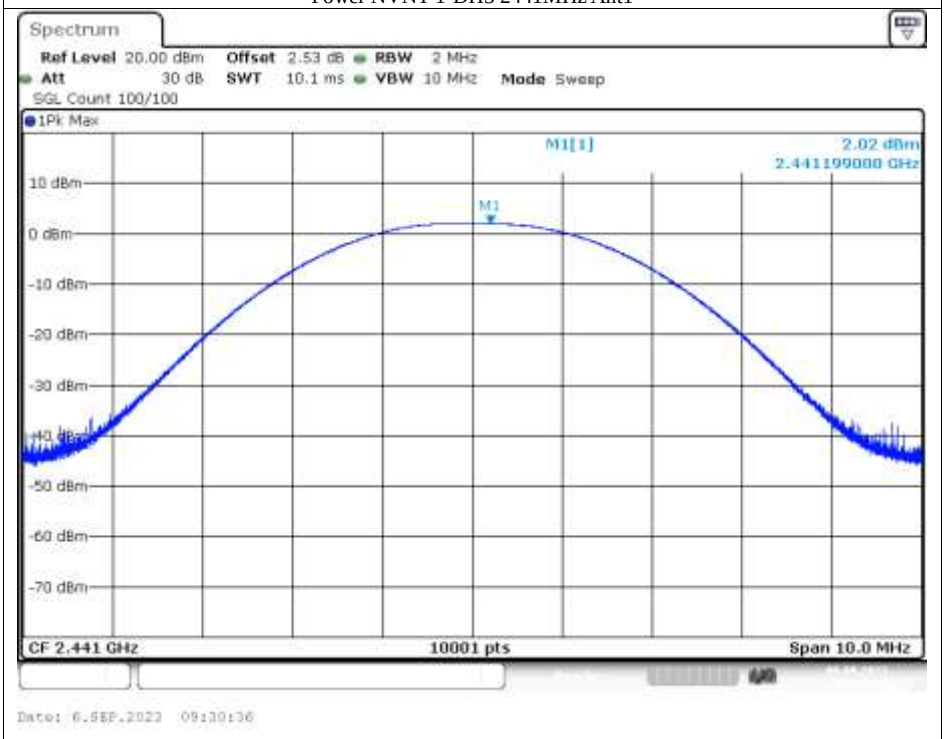
Spectrum Detector:	PK	Test Date :	Sep. 12, 2023
Test By:	Zero	Temperature :	24 ℃
Test Result:	PASS	Humidity :	53 %

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
1-DH5	2402	Ant1	1.83	0	1.83	21	Pass
1-DH5	2441	Ant1	2.02	0	2.02	21	Pass
1-DH5	2480	Ant1	1.91	0	1.91	21	Pass
2-DH5	2402	Ant1	2.52	0	2.52	21	Pass
2-DH5	2441	Ant1	2.73	0	2.73	21	Pass
2-DH5	2480	Ant1	2.64	0	2.64	21	Pass
3-DH5	2402	Ant1	2.82	0	2.82	21	Pass
3-DH5	2441	Ant1	3.03	0	3.03	21	Pass
3-DH5	2480	Ant1	2.9	0	2.9	21	Pass

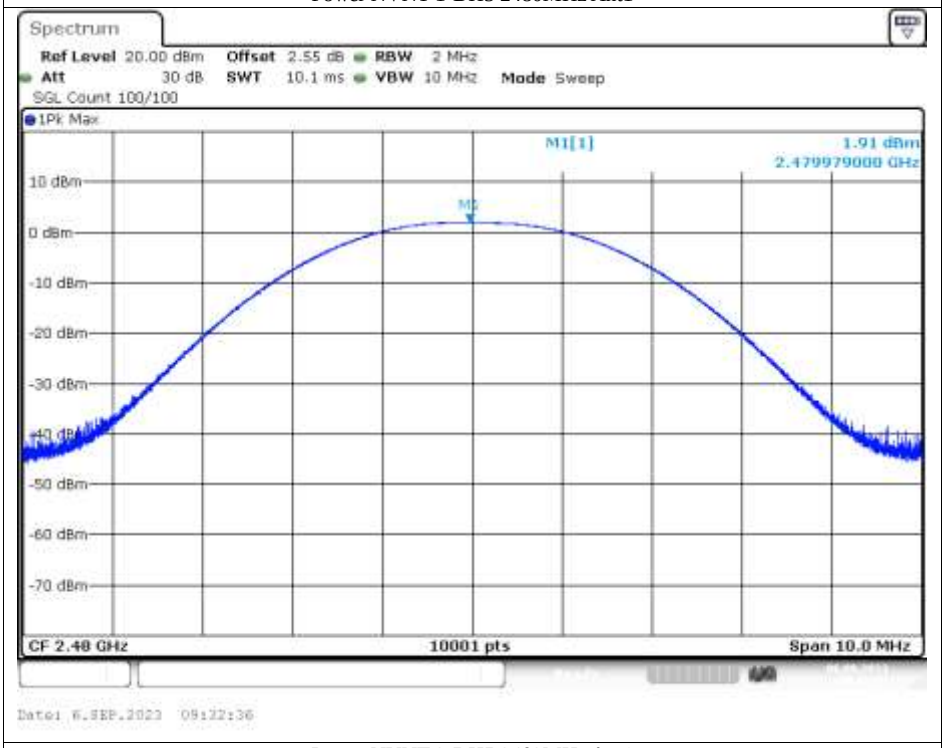
Test Graphs
Power NVNT 1-DH5 2402MHz Ant1



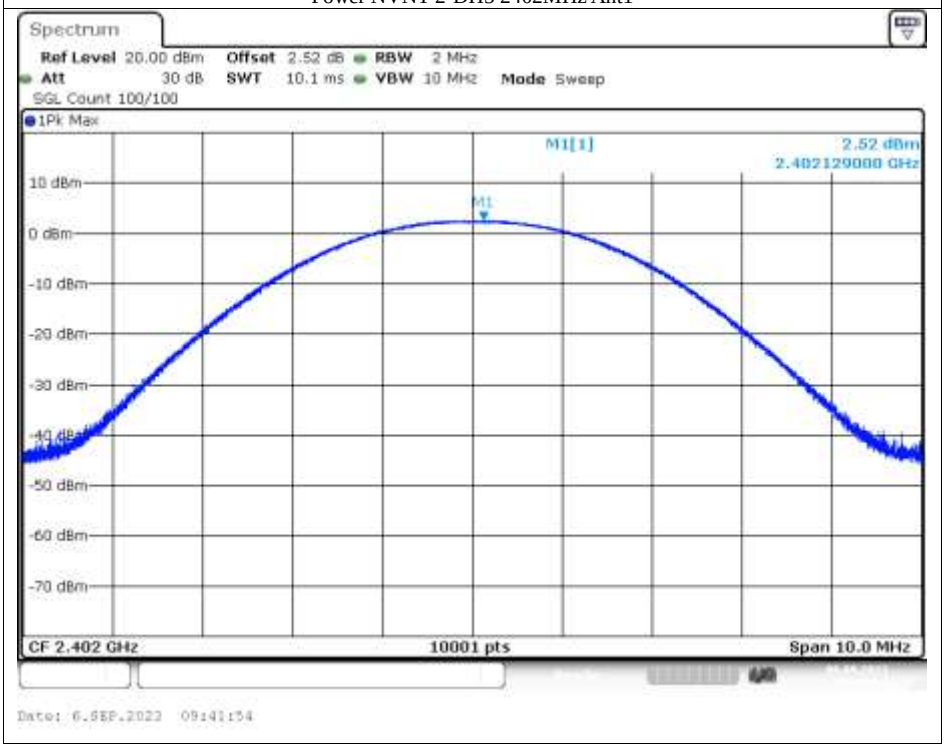
Power NVNT 1-DH5 2441MHz Ant1



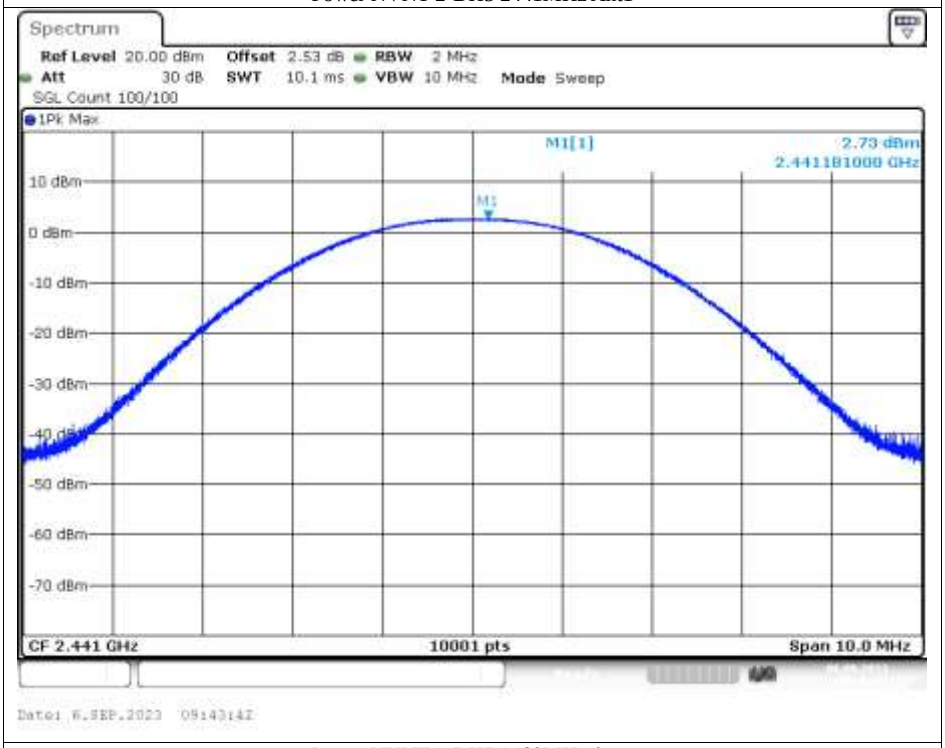
Power NVNT 1-DH5 2480MHz Ant1



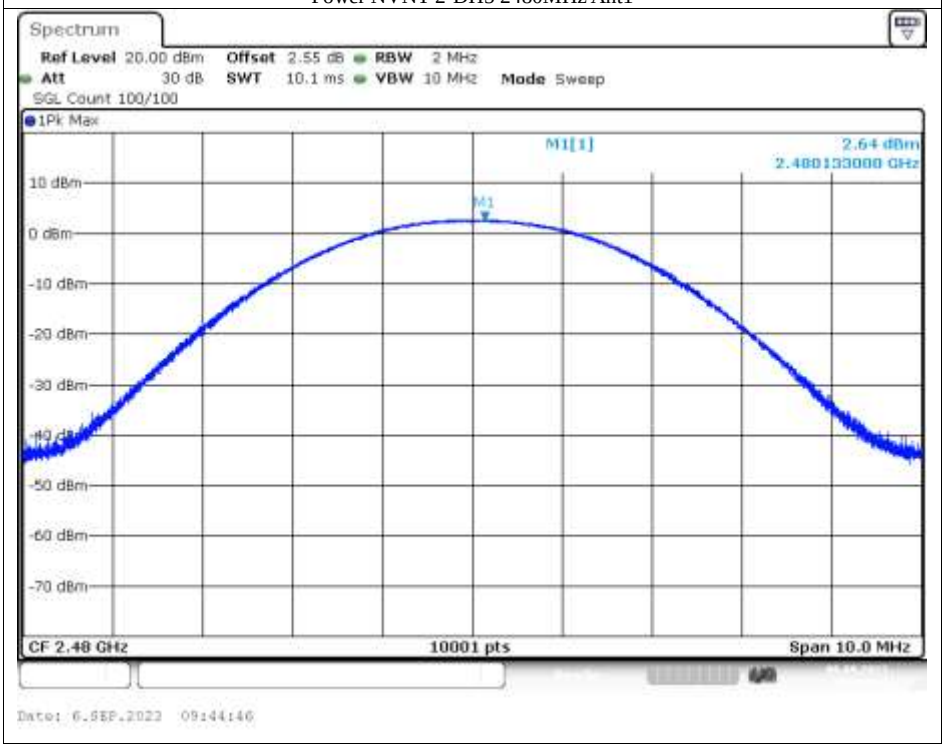
Power NVNT 2-DH5 2402MHz Ant1



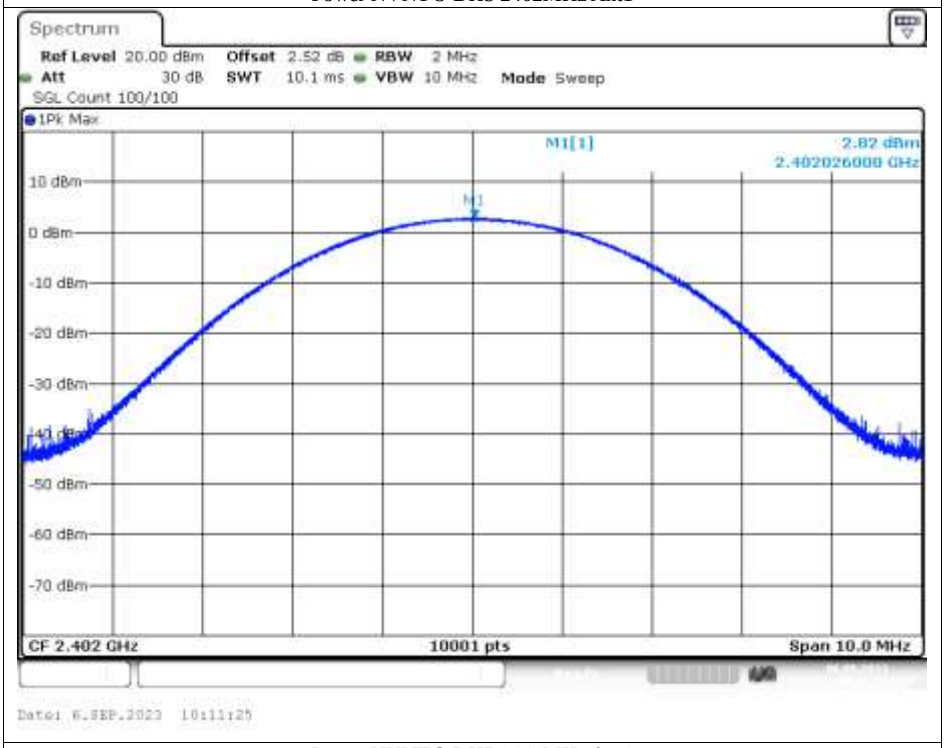
Power NVNT 2-DH5 2441MHz Ant1



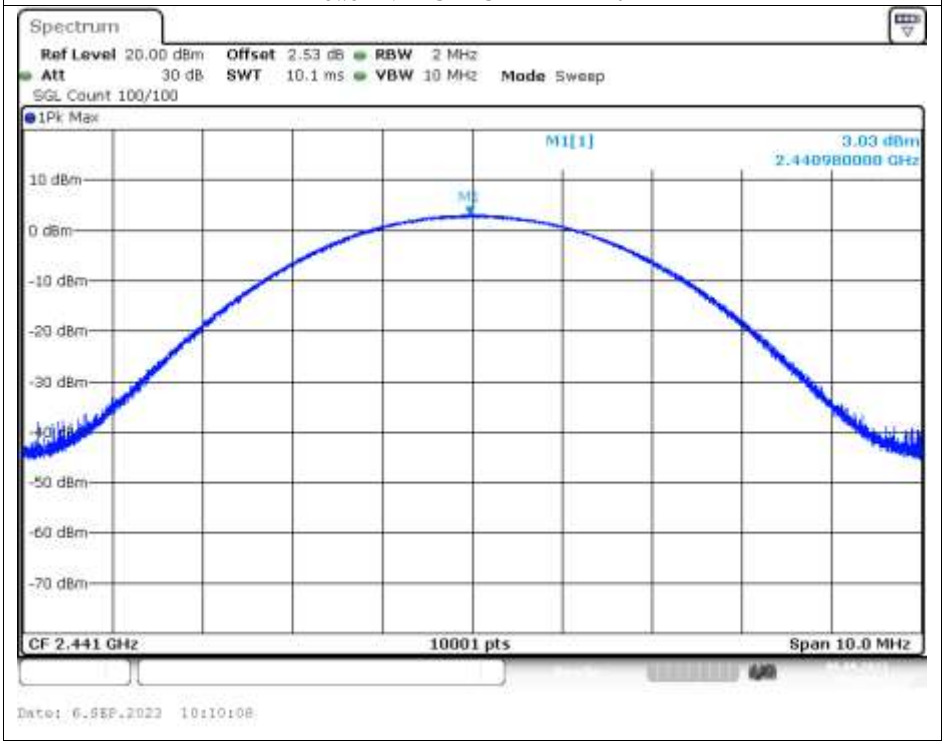
Power NVNT 2-DH5 2480MHz Ant1



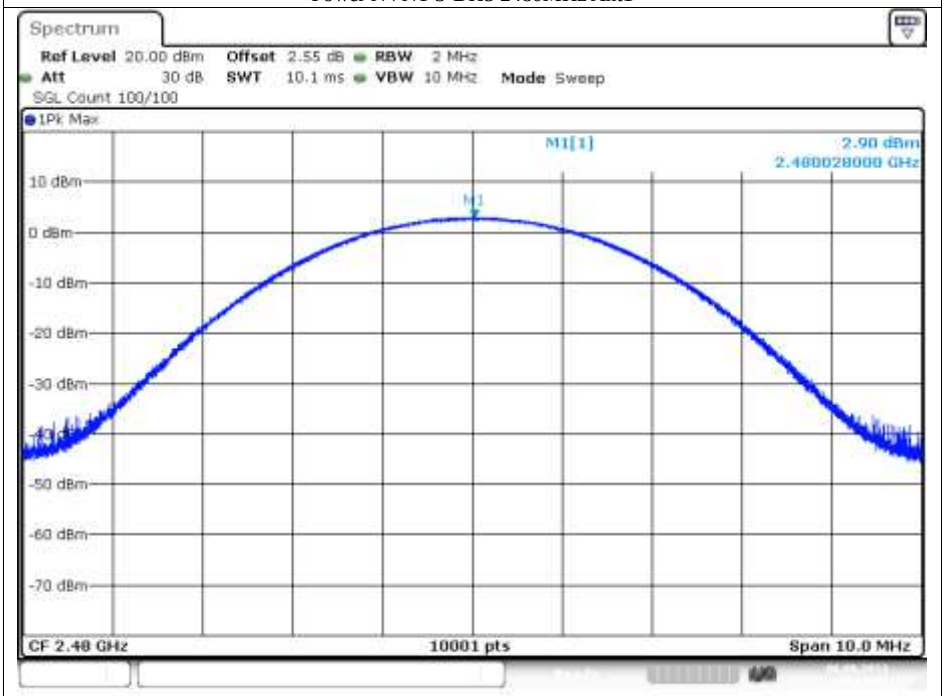
Power NVNT 3-DH5 2402MHz Ant1



Power NVNT 3-DH5 2441MHz Ant1



Power NVNT 3-DH5 2480MHz Ant1



13. Band EDGE test

13.1 Measurement Procedure

For Conducted Test

1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

For Radiated emission Test

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the ban edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were be encompassed by the span. After trace stabilization, the maximum peak was be determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

The measurements were performed at the lower end of the 2.4GHz band.

Use the following spectrum analyzer settings:

For Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

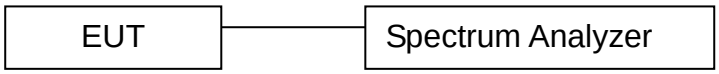
EMI Test Receiver	Setting
Attenuation	Auto
RBW	1MHz
VBW	3MHz
Detector	Peak
Trace	Max hold

For Non-Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 100KHz, video bandwidth 300KHz:

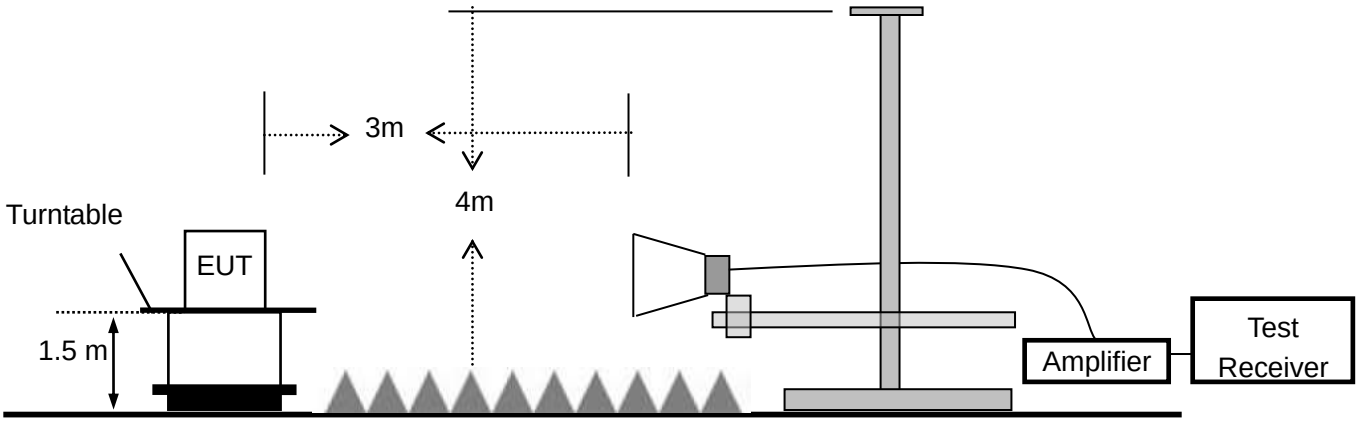
EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

13.2 Test SET-UP (Block Diagram of Configuration)

For Conducted Test



For Radiated emission Test



13.3 Measurement Equipment Used:

For Conducted Test

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL
Spectrum Analyzer	KEYSIGHT	N9020A	MY61250185	2023-10-07
RF Test Software	MWRF-test	MTS 8310	N/A	N/A
Radio Frequency control box	MWRF-test	MW200-RFCB	MW220111ANCI	2024-05-10

For Radiated emission Test

Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2023-10-07
Low noise Amplifiers	A-INFO	LA1018N4009	J10131305240 01	2024-05-10
Horn antenna	A-INFO	LB-10180-SF	J20310906121 23	2024-05-14
RF Cable	N/A	ZT26-NJ-NJ-11M	19060401	2024-05-10
RF Cable	N/A	ZT26-NJ-NJ-2.5M	19060402	2024-05-10
3m Semi-anechoic Chamber	chengyu	9m*6m*6m	N/A	2024-11-12
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A

13.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	Sep. 12, 2023
Test By:	Zero	Temperature :	24 ℃
Test Result:	PASS	Humidity :	53 %

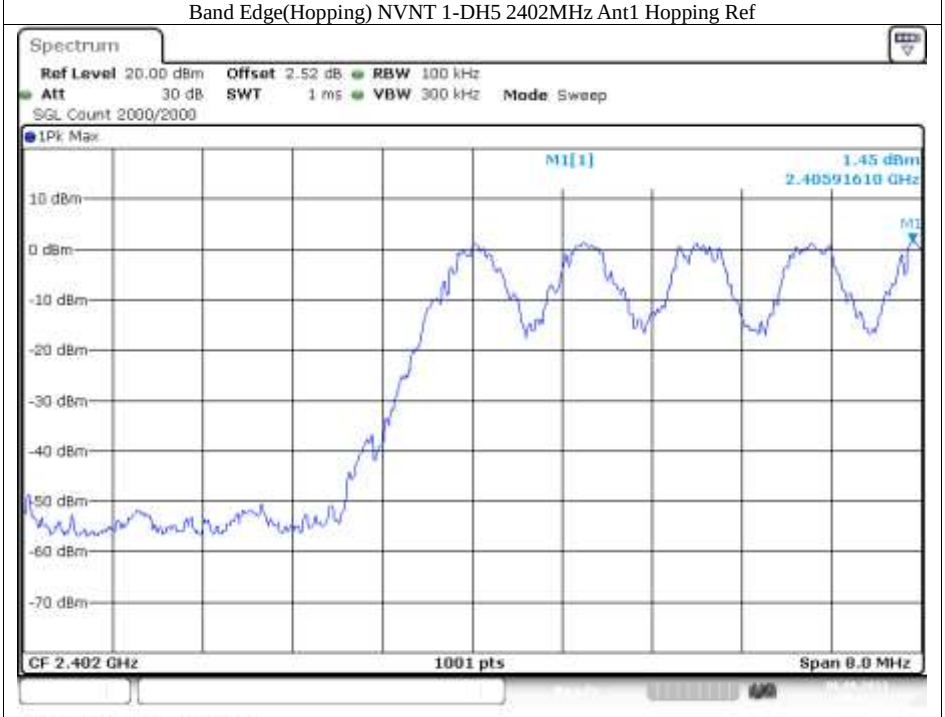
1. Conducted Test

For Hopping Mode:

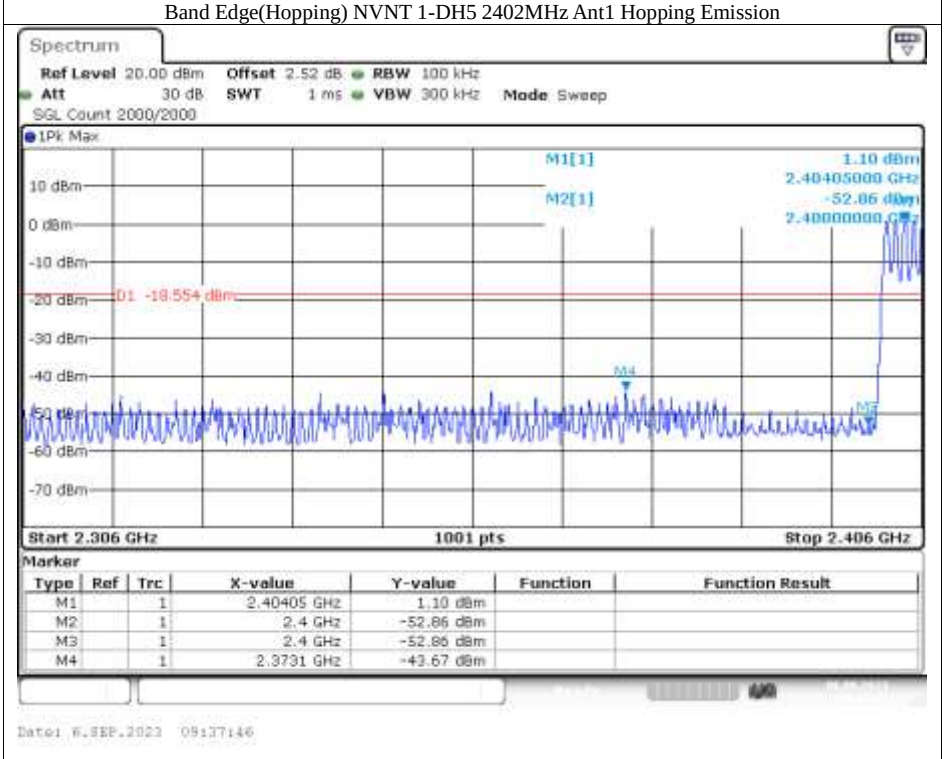
Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
1-DH5	2402	Ant1	Hopping	-45.12	-20	Pass
1-DH5	2480	Ant1	Hopping	-47.03	-20	Pass
2-DH5	2402	Ant1	Hopping	-45.26	-20	Pass
2-DH5	2480	Ant1	Hopping	-46.12	-20	Pass
3-DH5	2402	Ant1	Hopping	-42.45	-20	Pass
3-DH5	2480	Ant1	Hopping	-49.32	-20	Pass

Test Graphs

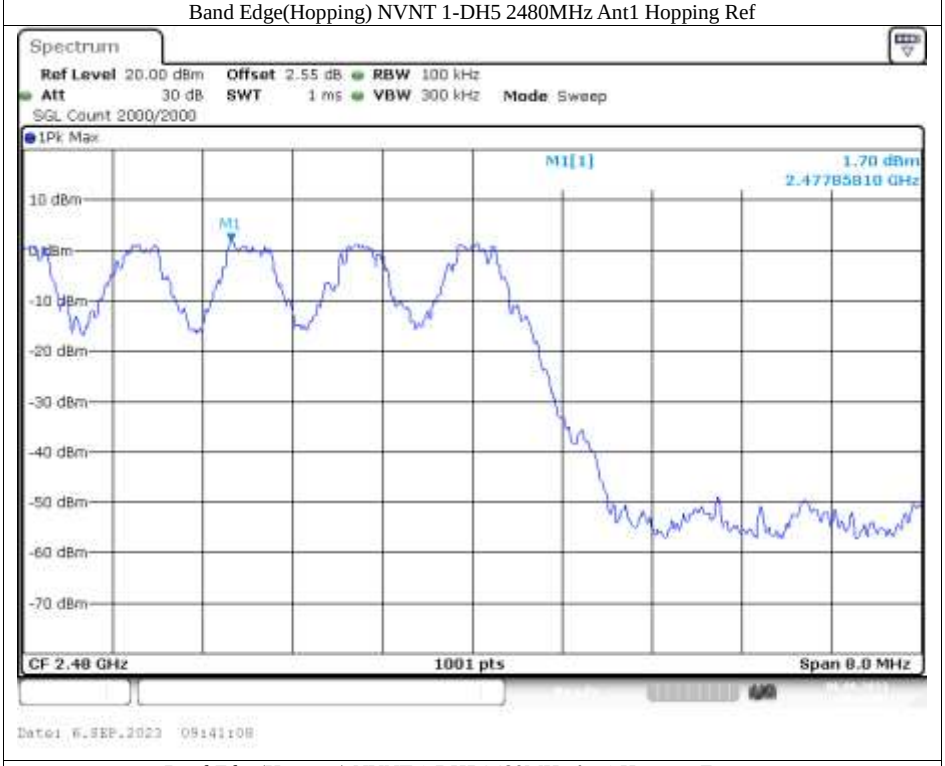
Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Ref



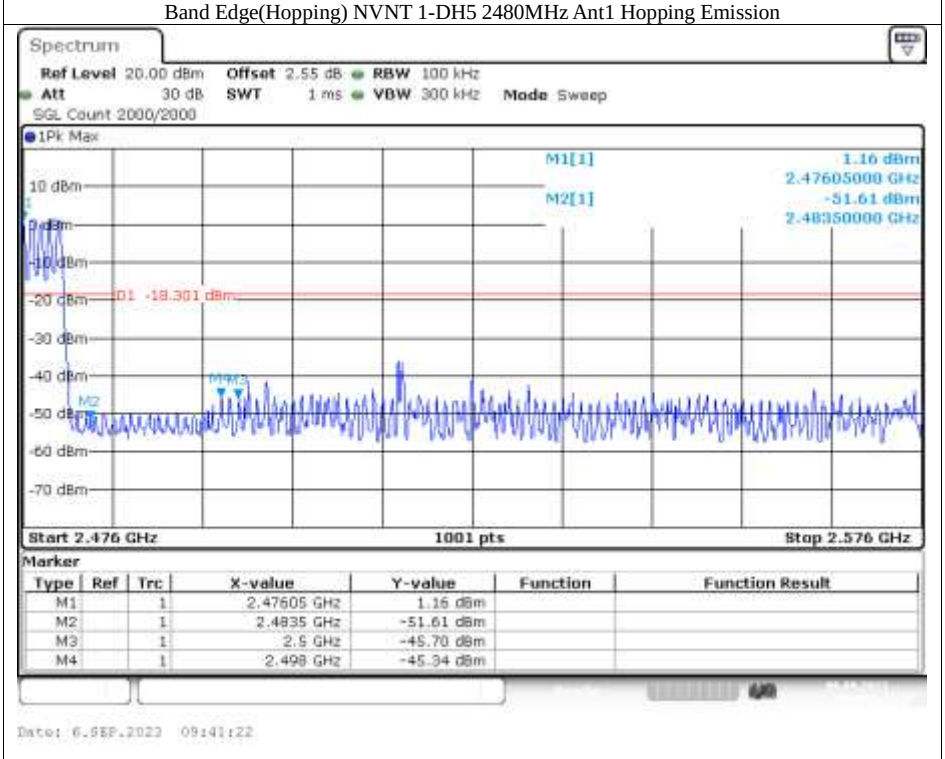
Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant1 Hopping Emission



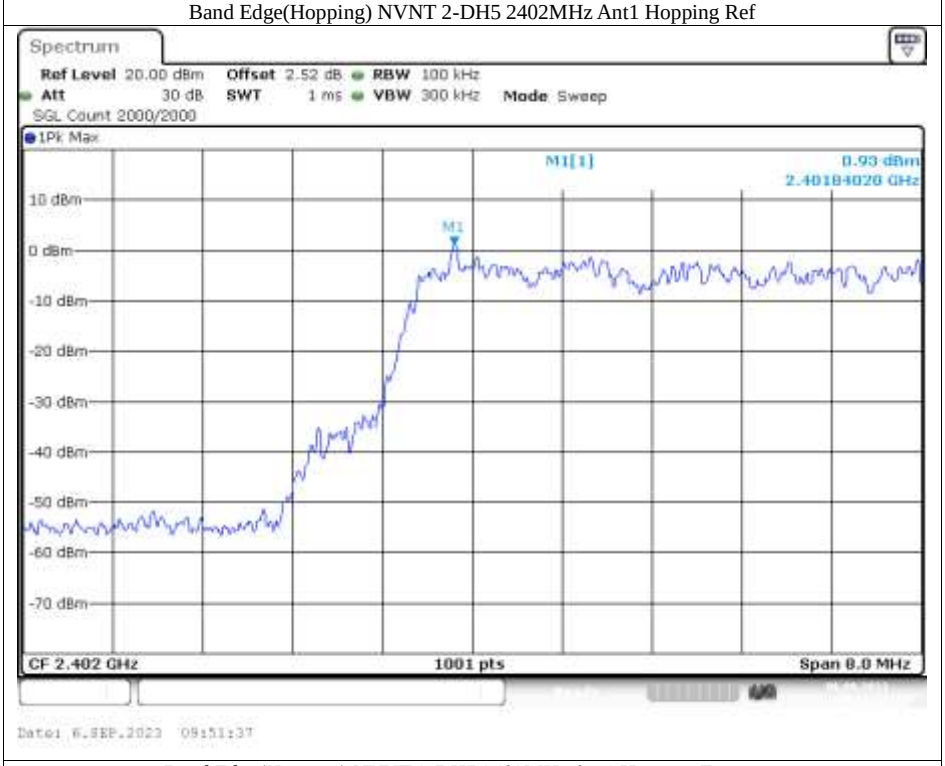
Band Edge(Hopping) NVNT 1-DH5 2480MHz Ant1 Hopping Ref



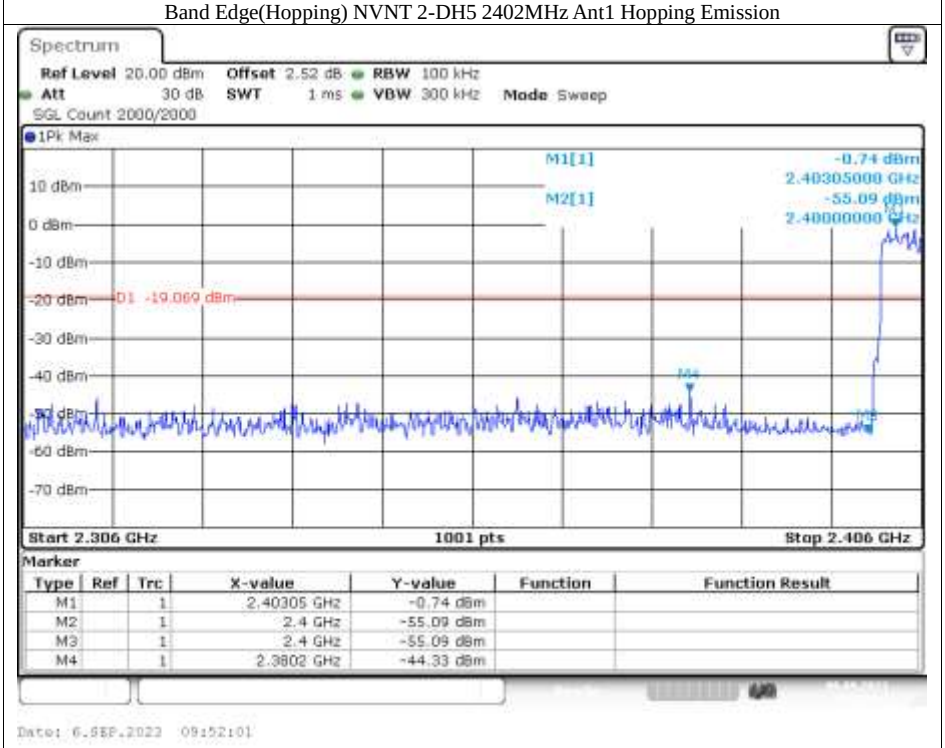
Band Edge(Hopping) NVNT 1-DH5 2480MHz Ant1 Hopping Emission



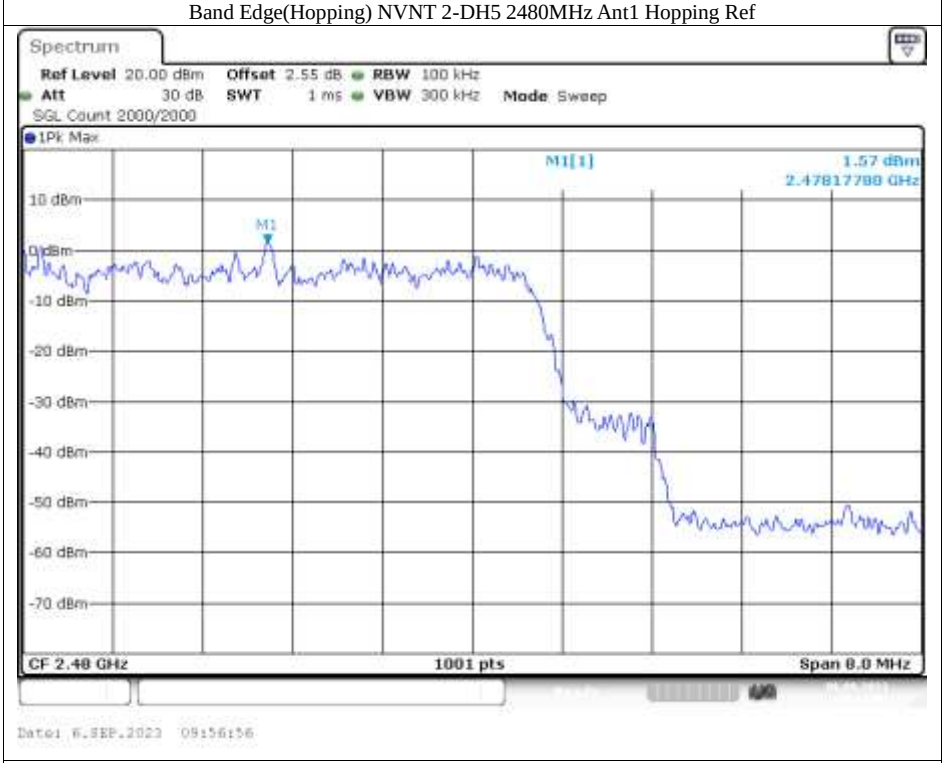
Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Ref



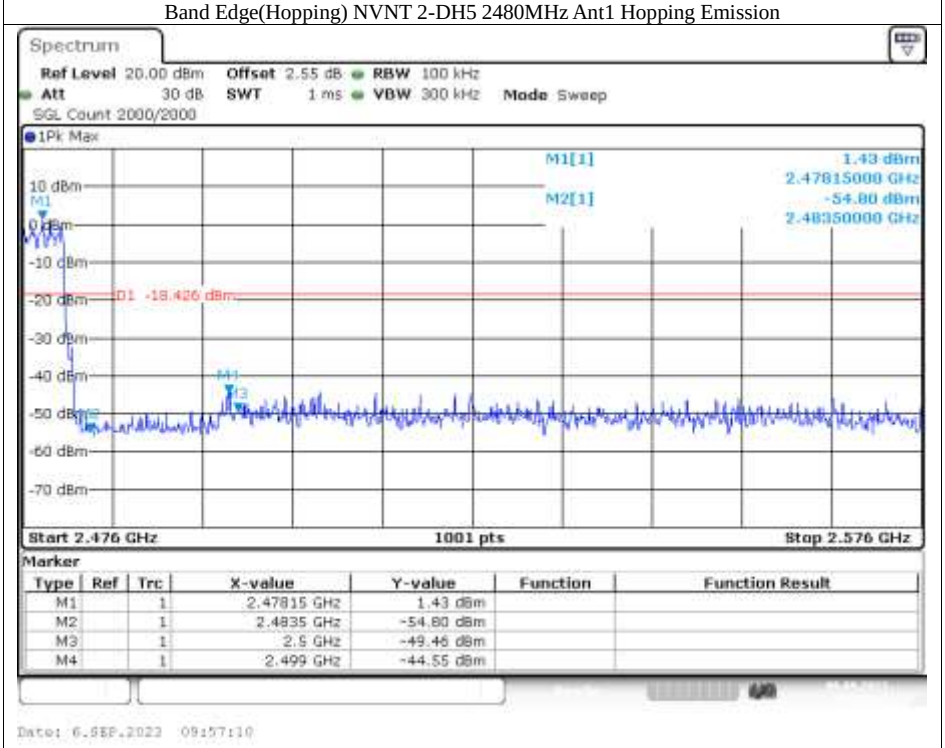
Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Emission



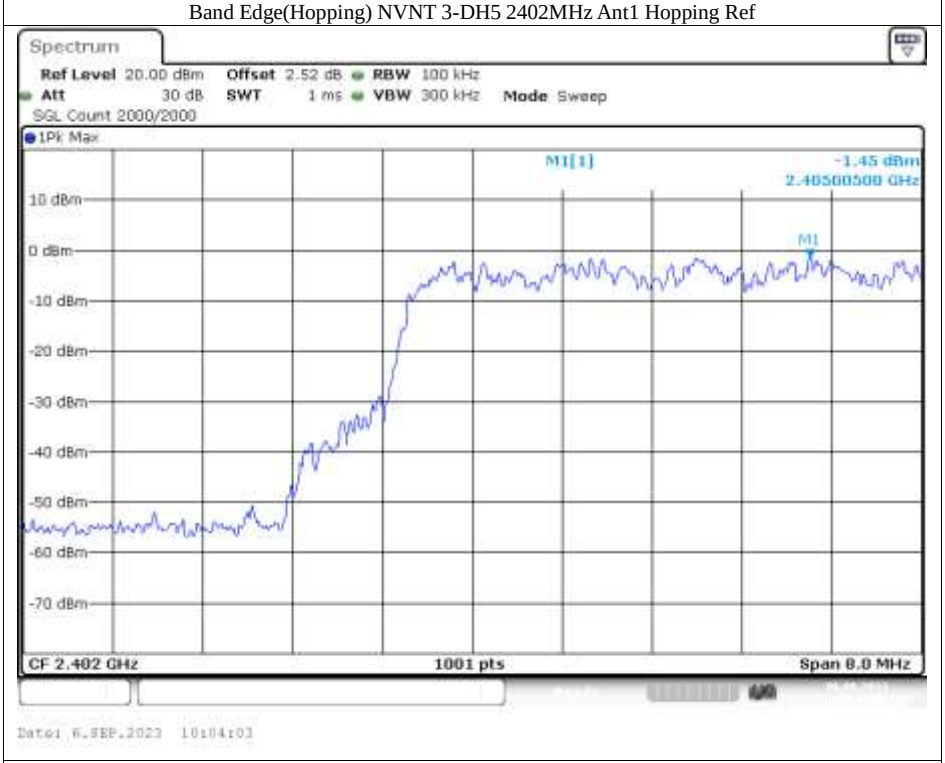
Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Ref



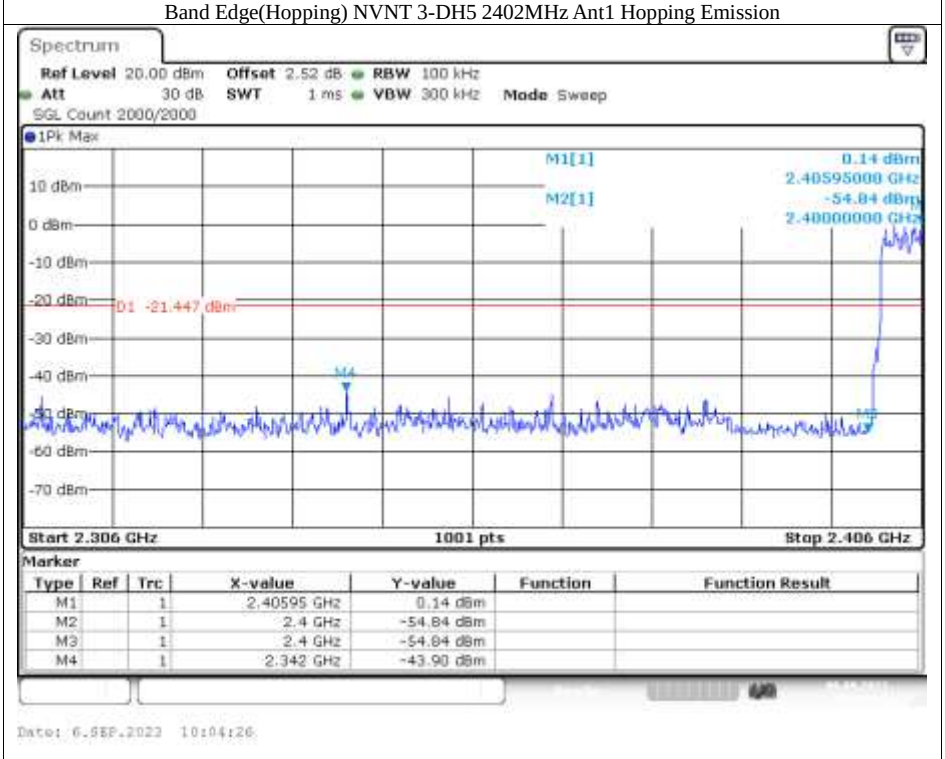
Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Emission



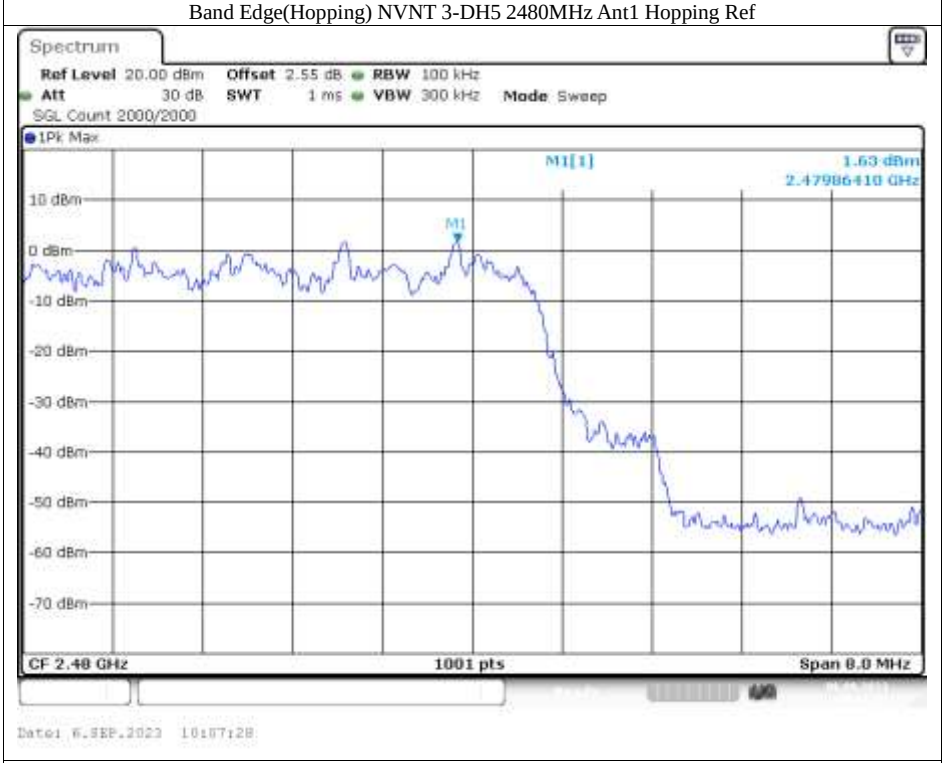
Band Edge(Hopping) NVNT 3-DH5 2402MHz Ant1 Hopping Ref



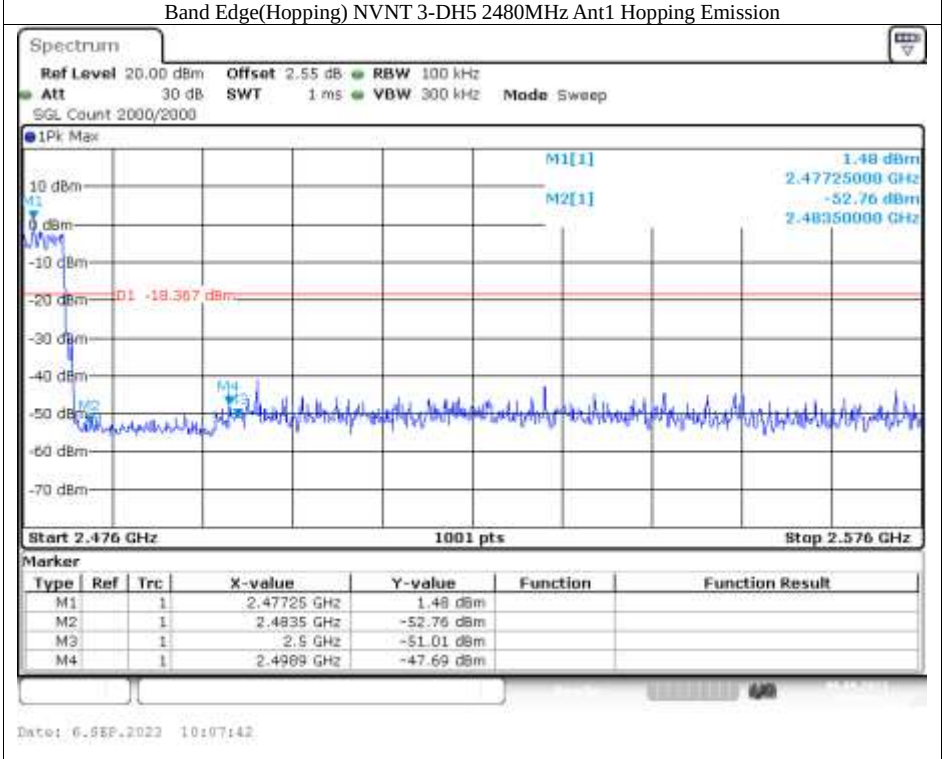
Band Edge(Hopping) NVNT 3-DH5 2402MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 3-DH5 2480MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT 3-DH5 2480MHz Ant1 Hopping Emission

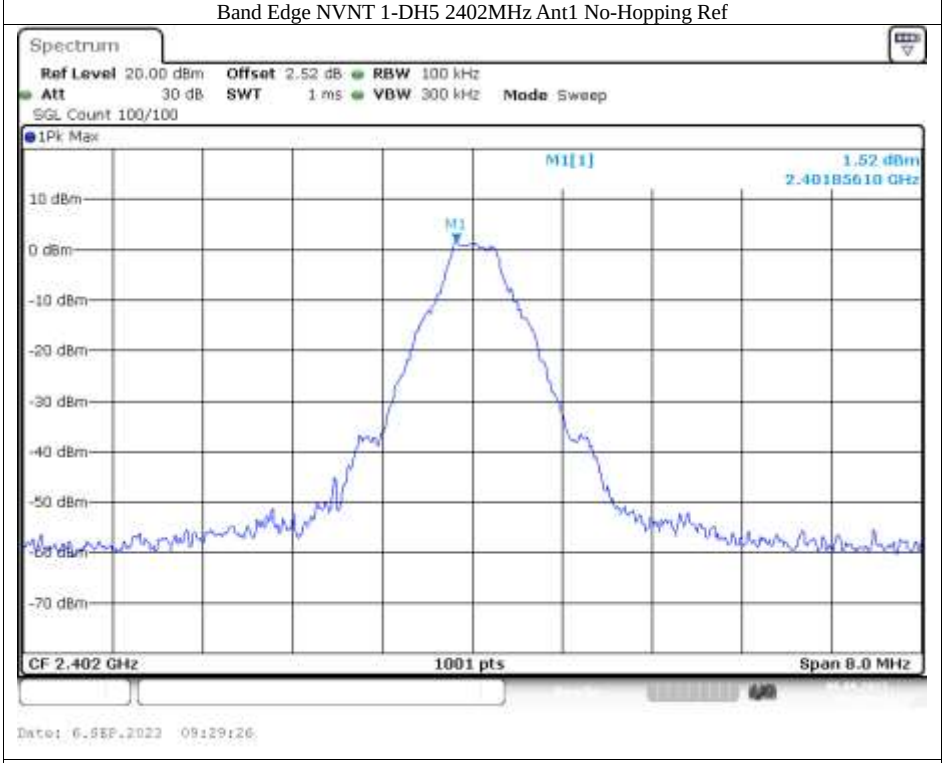


For NO-Hopping Mode:

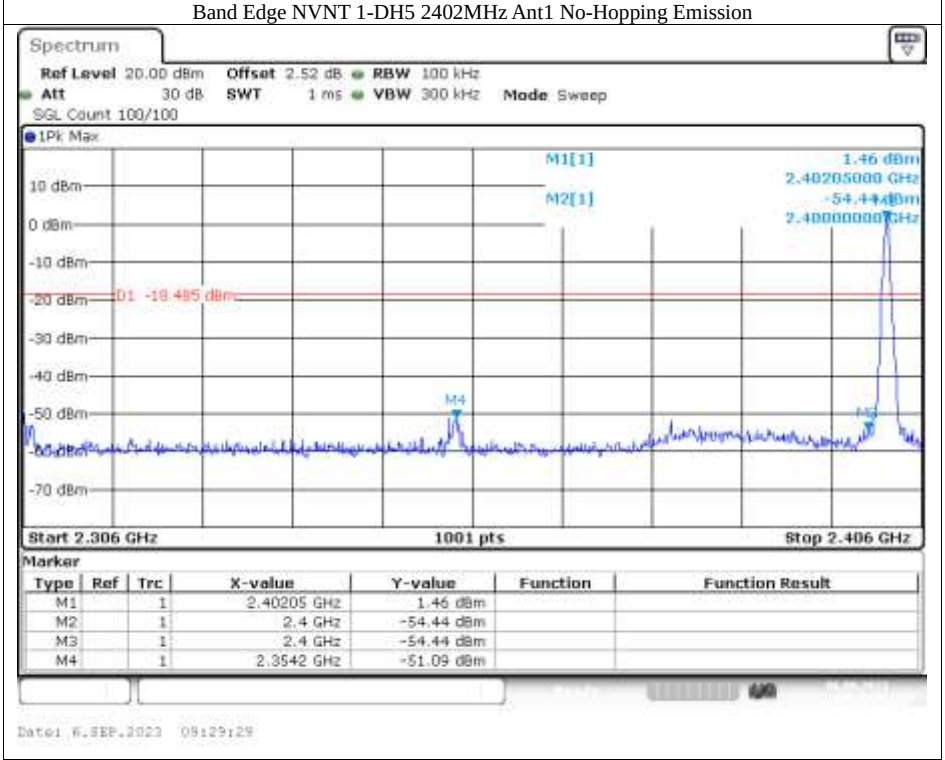
Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
1-DH5	2402	Ant1	No-Hopping	-52.61	-20	Pass
1-DH5	2480	Ant1	No-Hopping	-54.42	-20	Pass
2-DH5	2402	Ant1	No-Hopping	-53.14	-20	Pass
2-DH5	2480	Ant1	No-Hopping	-53.92	-20	Pass
3-DH5	2402	Ant1	No-Hopping	-52.18	-20	Pass
3-DH5	2480	Ant1	No-Hopping	-52.09	-20	Pass

Test Graphs

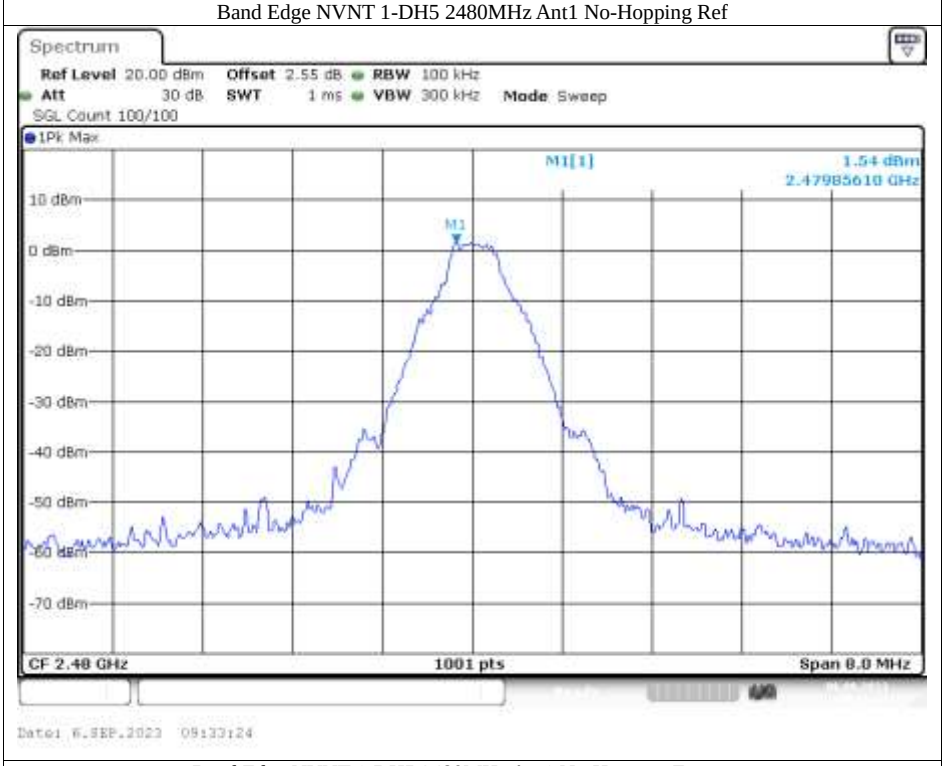
Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Ref



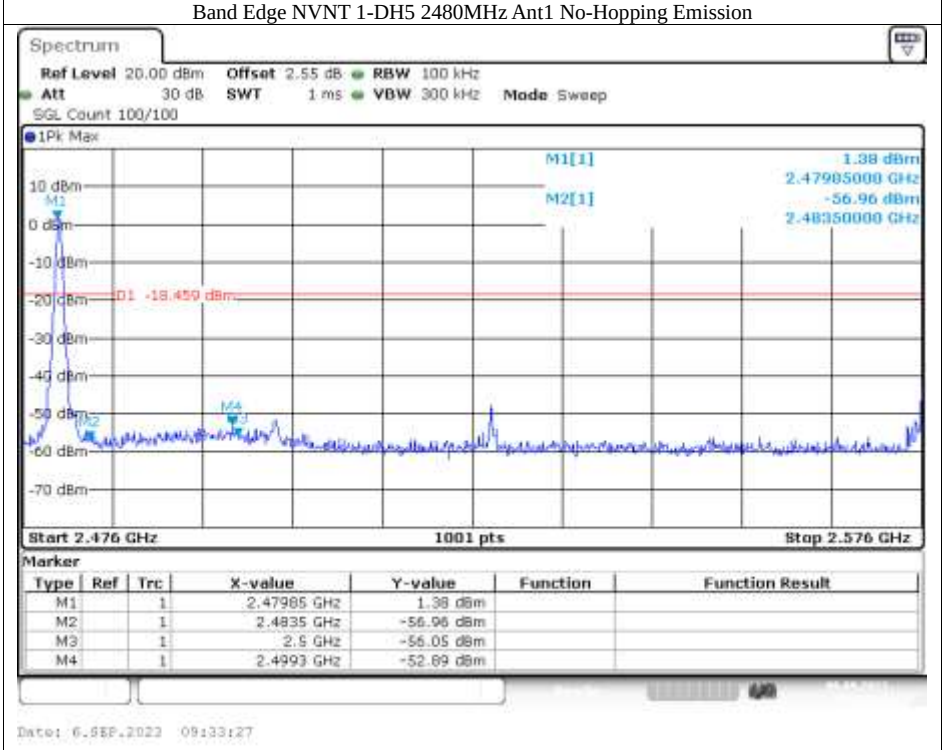
Band Edge NVNT 1-DH5 2402MHz Ant1 No-Hopping Emission



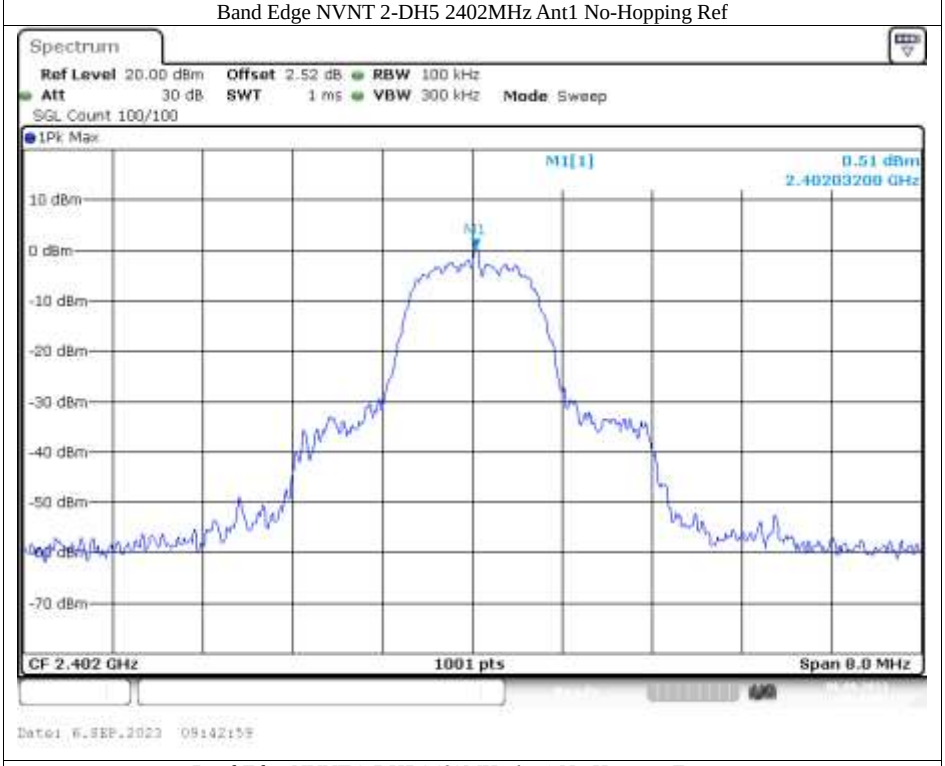
Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Ref



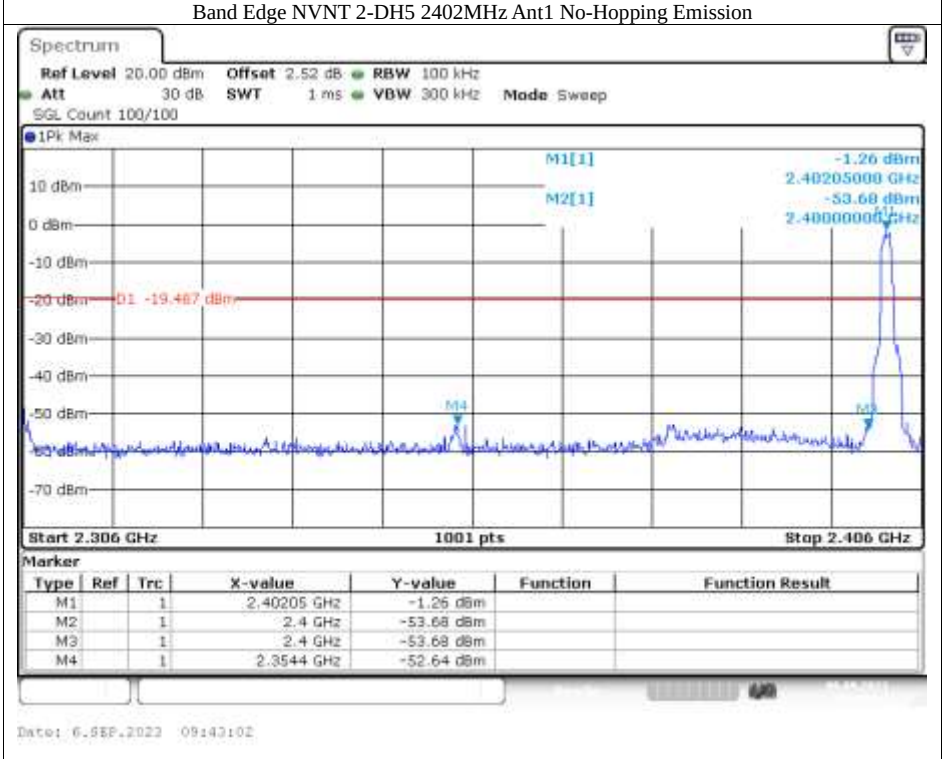
Band Edge NVNT 1-DH5 2480MHz Ant1 No-Hopping Emission



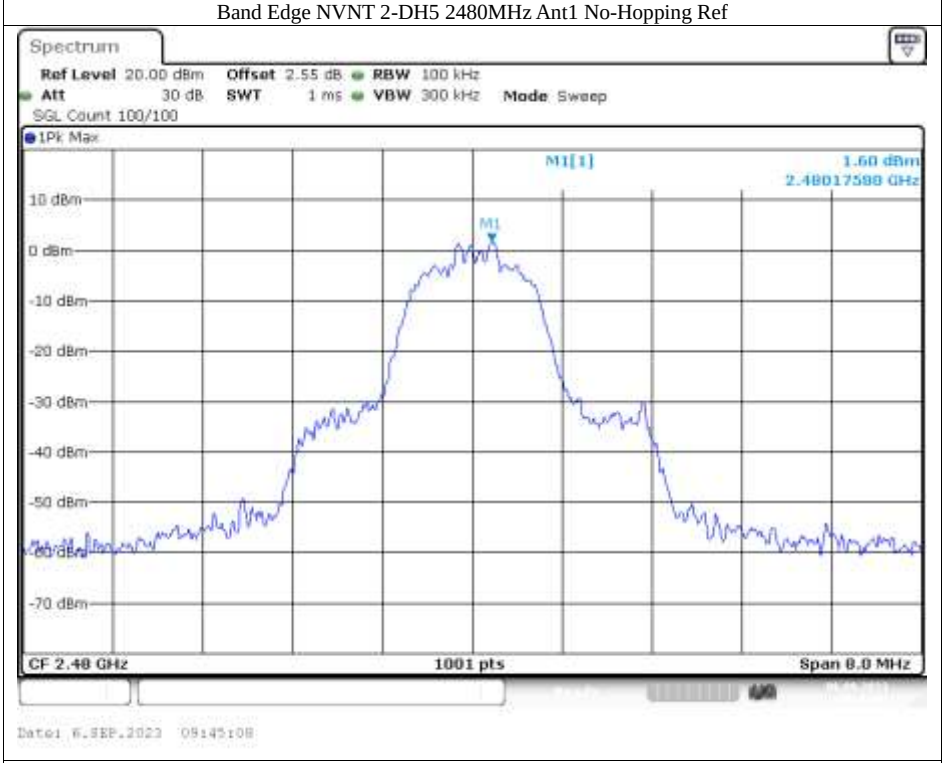
Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Ref



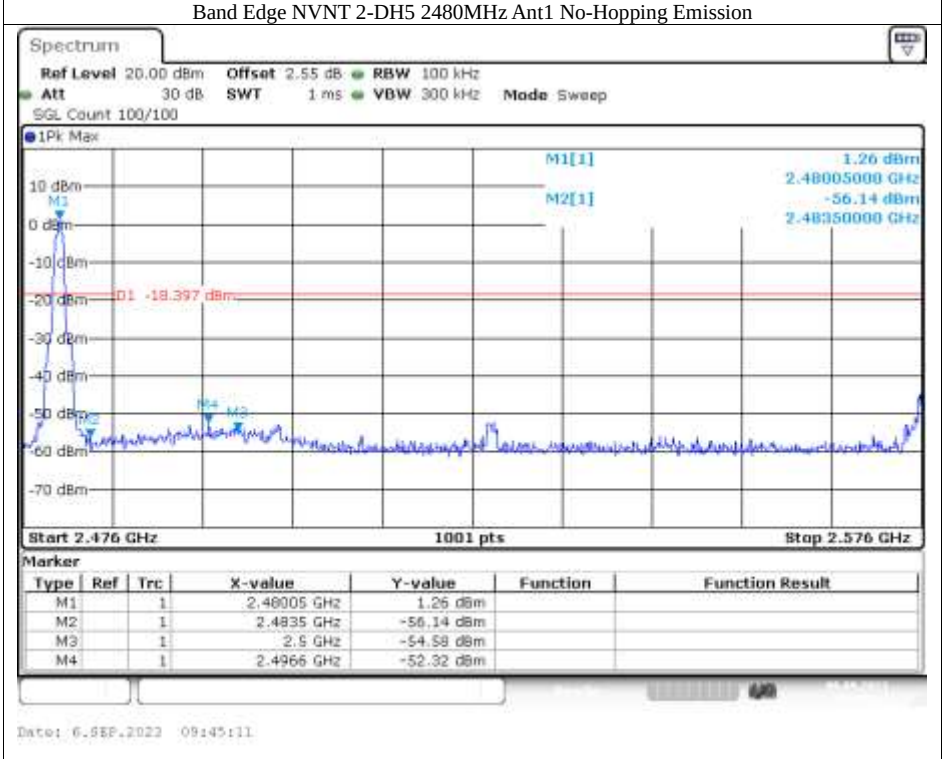
Band Edge NVNT 2-DH5 2402MHz Ant1 No-Hopping Emission



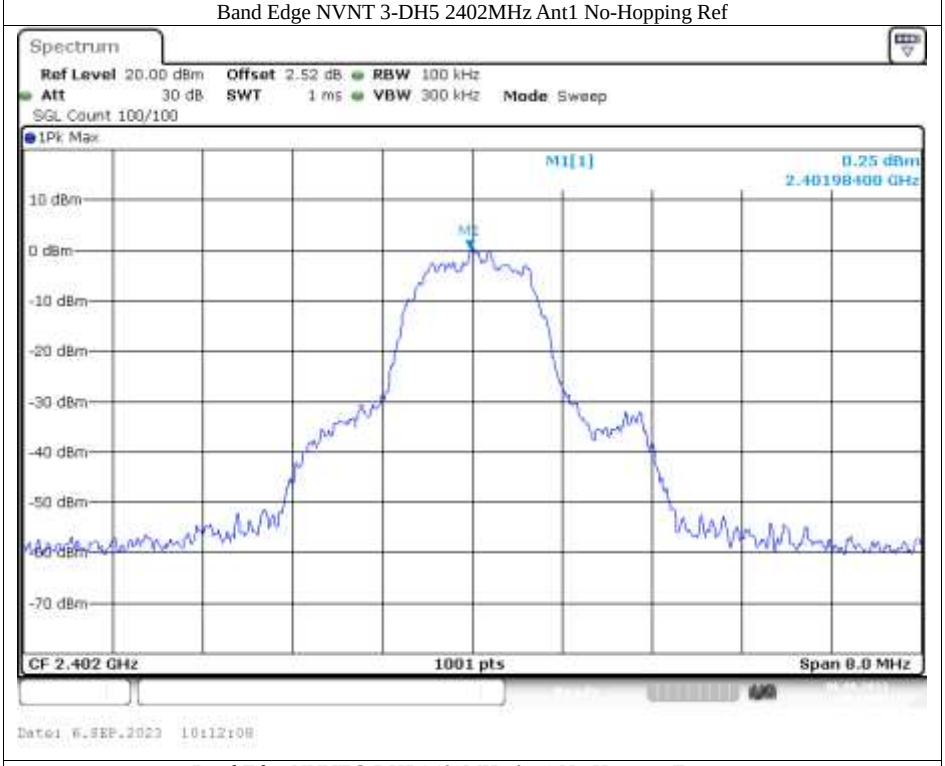
Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Ref



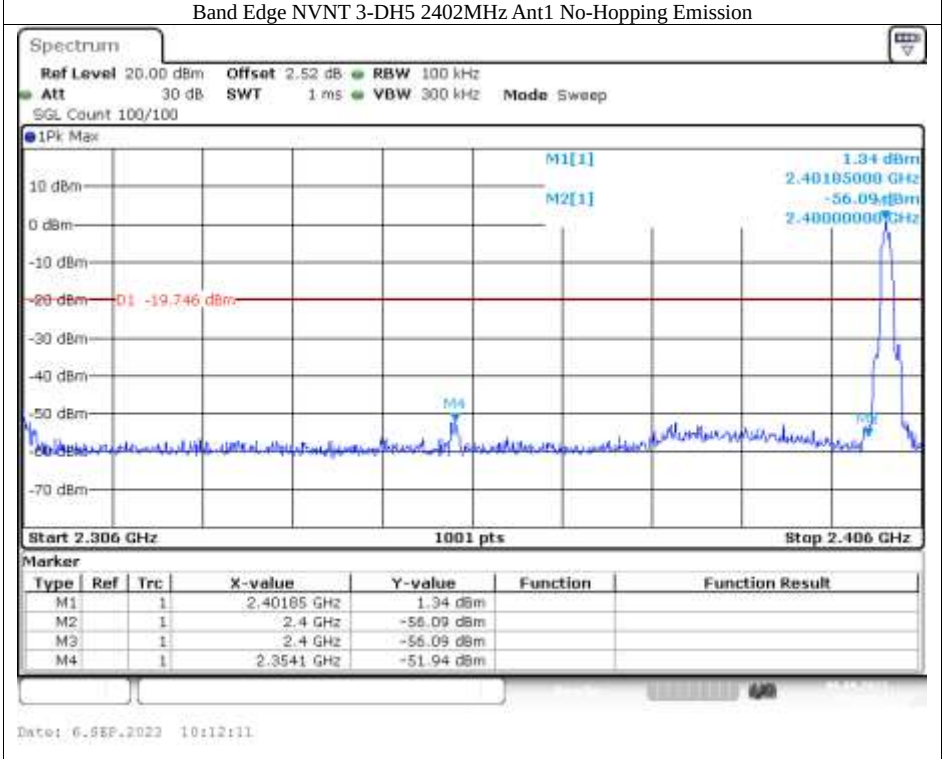
Band Edge NVNT 2-DH5 2480MHz Ant1 No-Hopping Emission



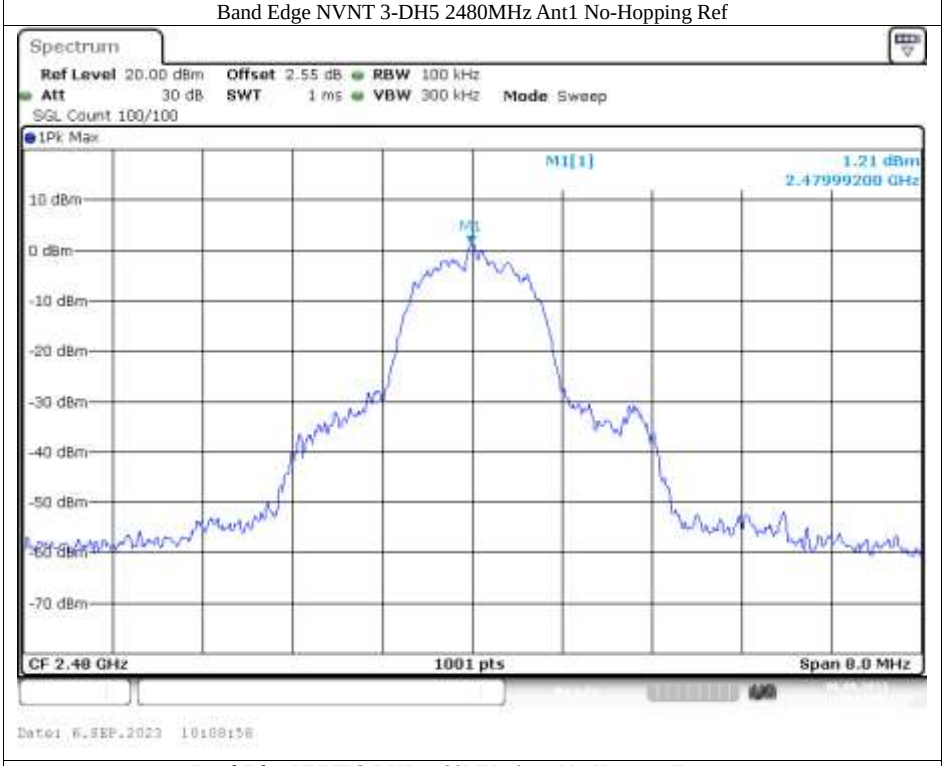
Band Edge NVNT 3-DH5 2402MHz Ant1 No-Hopping Ref



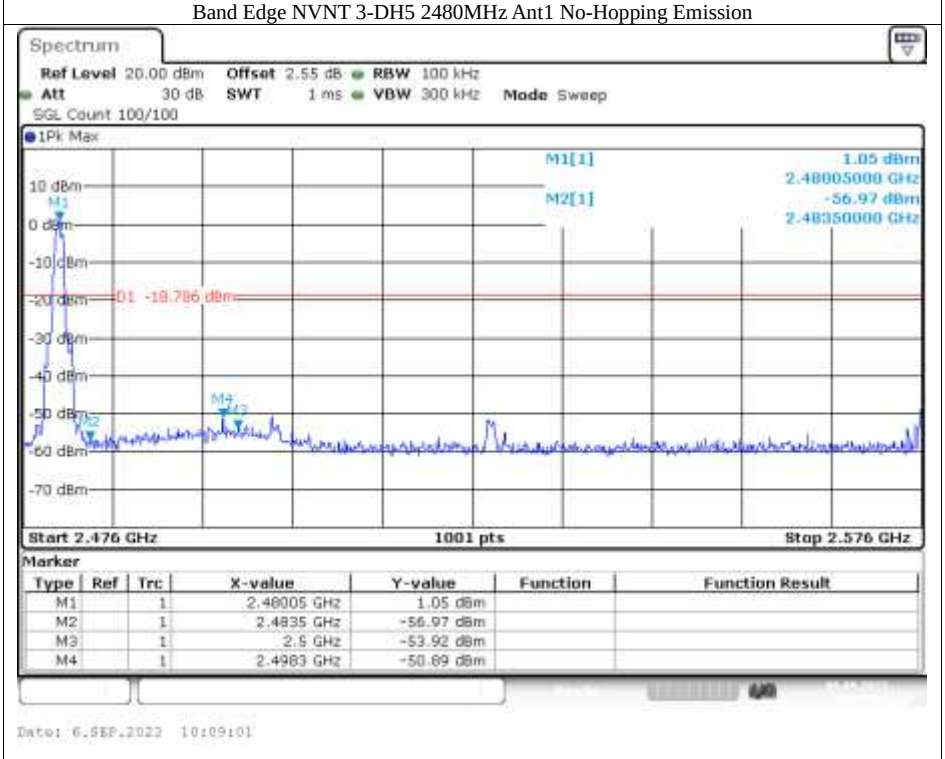
Band Edge NVNT 3-DH5 2402MHz Ant1 No-Hopping Emission



Band Edge NVNT 3-DH5 2480MHz Ant1 No-Hopping Ref

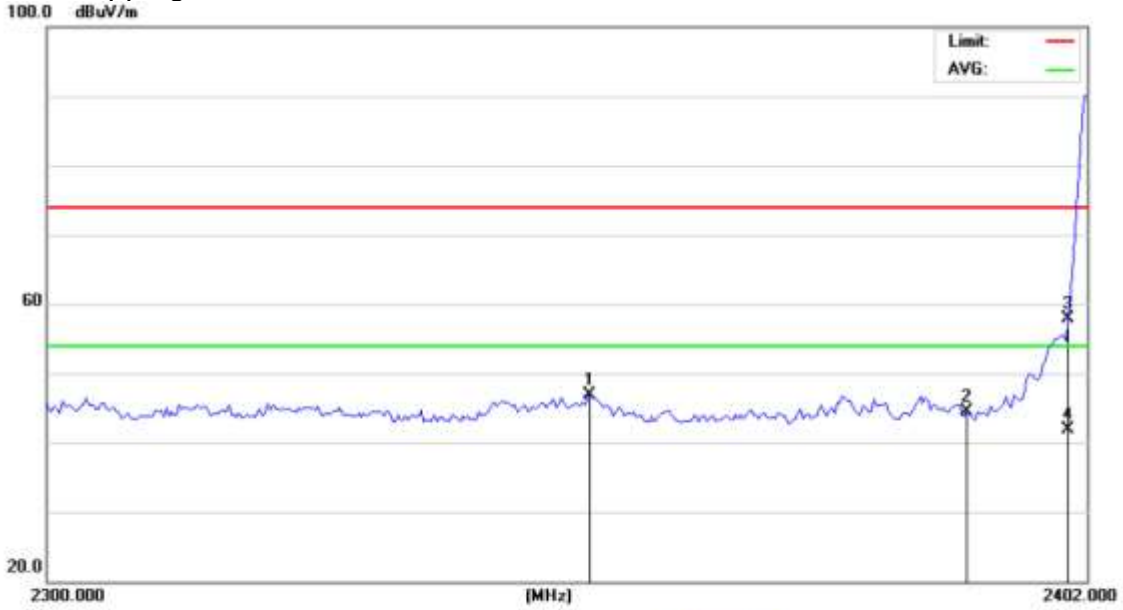


Band Edge NVNT 3-DH5 2480MHz Ant1 No-Hopping Emission



2. Radiated Test

For Non-Hopping Mode:



Site ANCI 843.3 Polarization: *Horizontal* Temperature: 26.5(C)

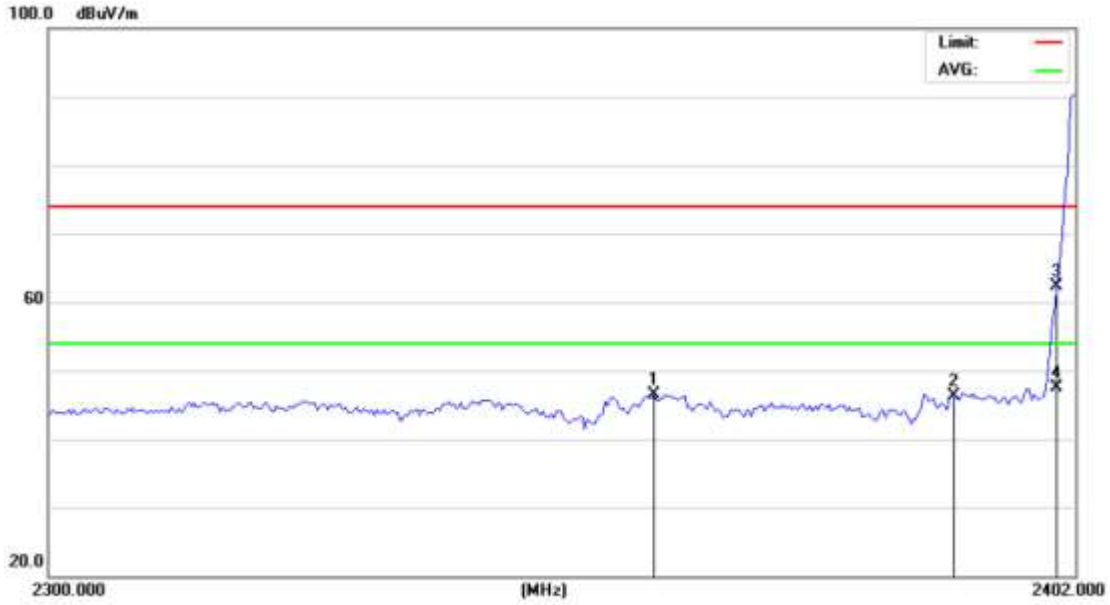
Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: TX2402

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2352.743	52.05	-5.07	46.98	74.00	-27.02	peak			
2		2390.000	49.24	-4.82	44.42	74.00	-29.58	peak			
3		2400.000	62.70	-4.75	57.95	74.00	-16.05	peak			
4	*	2400.000	46.58	-4.75	41.83	54.00	-12.17	AVG			

*:Maximum data x:Over limit !:over margin (Reference Only



Site ANCI 843.3 Polarization: *Vertical* Temperature: 26.5(C)

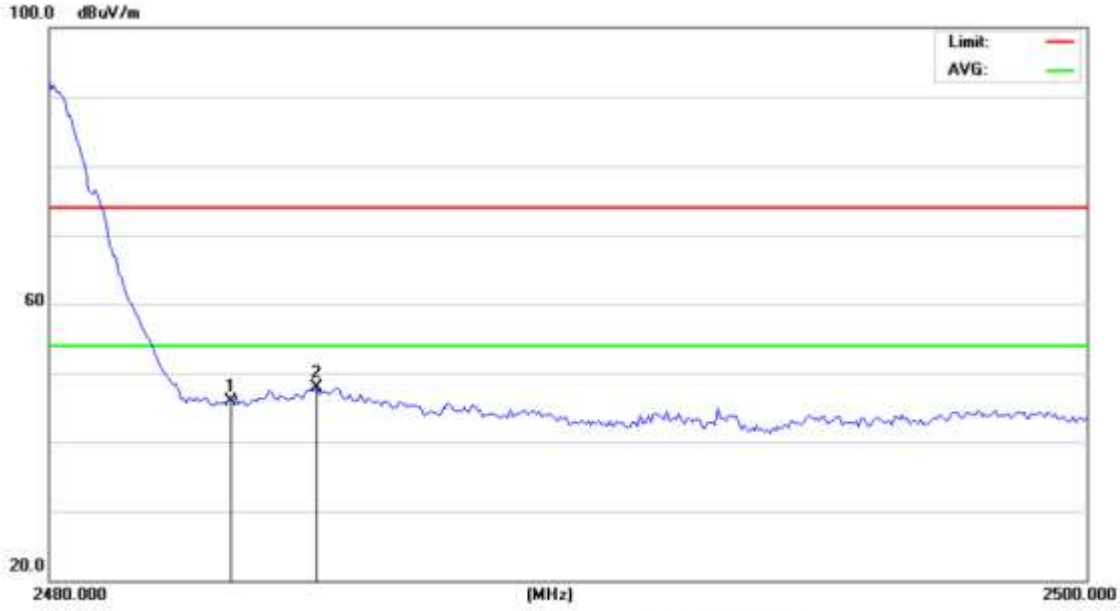
Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: TX2402

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2359.644	51.48	-5.03	46.45	74.00	-27.55	peak			
2		2390.000	51.18	-4.82	46.36	74.00	-27.64	peak			
3		2400.000	67.00	-4.75	62.25	74.00	-11.75	peak			
4	*	2400.000	52.32	-4.75	47.57	54.00	-6.43	AVG			

*:Maximum data x:Over limit !:over margin (Reference Only



Site ANCI 843.3 Polarization: *Horizontal* Temperature: 26.5(C)

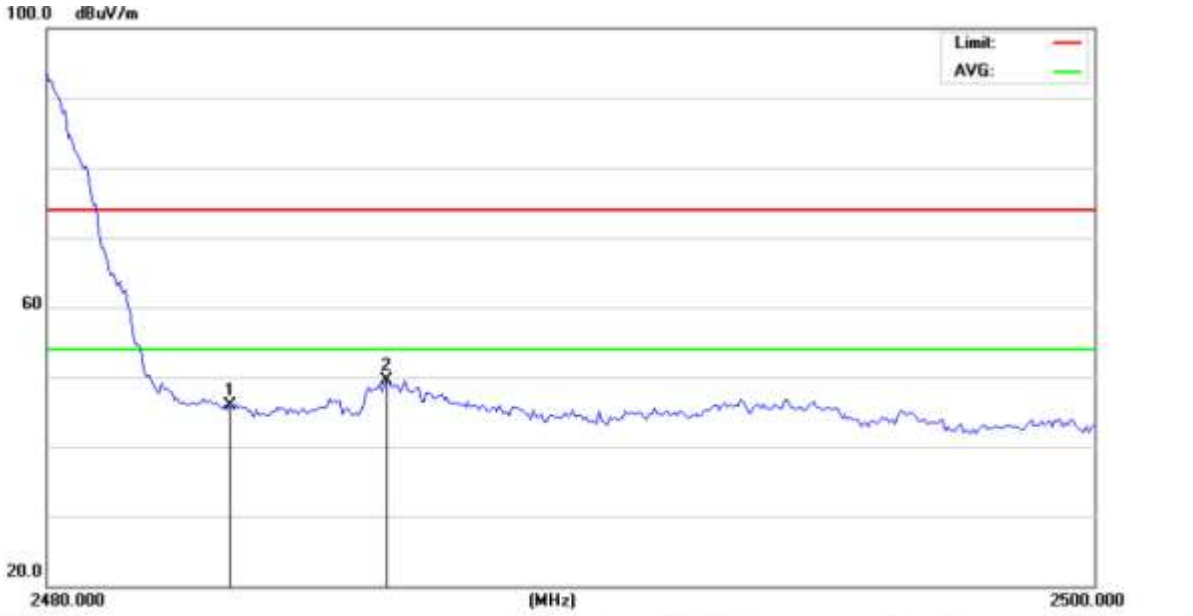
Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: TX2480

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2483.500	50.05	-4.19	45.86	74.00	-28.14	peak			
2	*	2485.135	52.01	-4.18	47.83	74.00	-26.17	peak			

*:Maximum data x:Over limit l:over margin (Reference Only



Site ANCI 843.3 Polarization: *Vertical* Temperature: 26.5(C)

Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

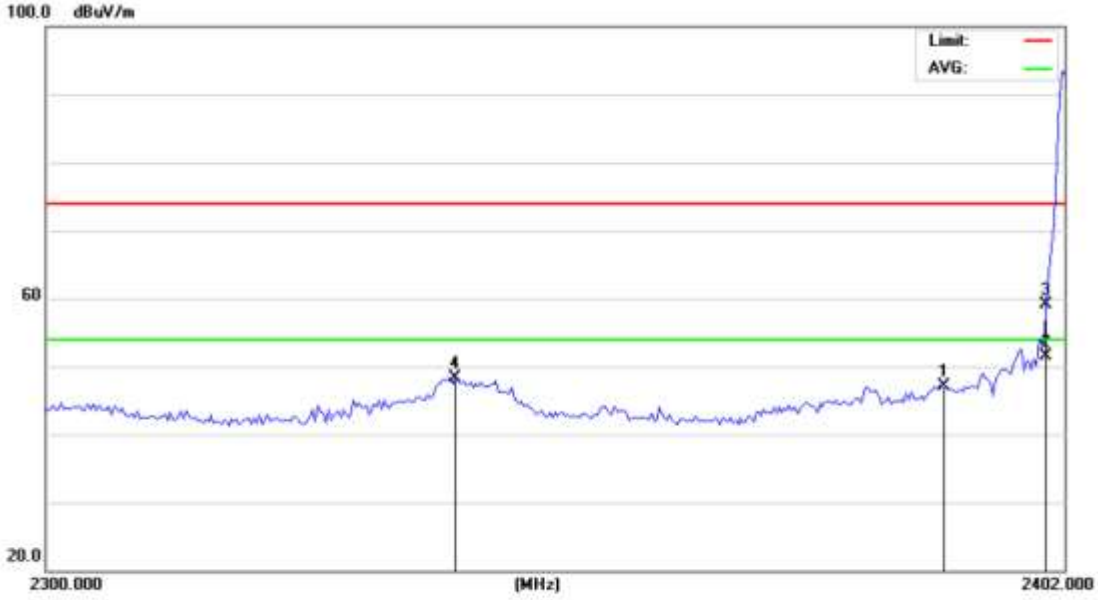
Mode: TX2480

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2483.500	50.14	-4.19	45.95	74.00	-28.05	peak			
2	*	2486.482	53.64	-4.18	49.46	74.00	-24.54	peak			

*:Maximum data x:Over limit l:over margin (Reference Only

For Hopping Mode:



Site ANCI 843.3 Polarization: *Horizontal* Temperature: 26.5(C)

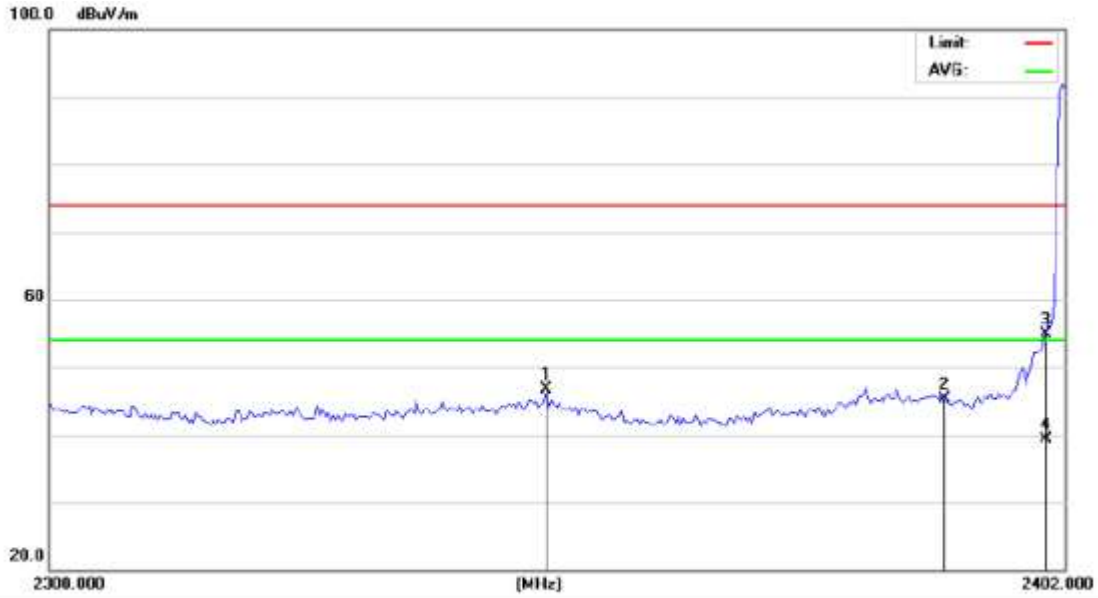
Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: Hopping

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2390.000	52.01	-4.82	47.19	74.00	-26.81	peak			
2		2400.000	56.25	-4.75	51.50	74.00	-22.50	QP			
3	*	2400.000	63.94	-4.75	59.19	74.00	-14.81	peak			
4		2340.523	53.55	-5.15	48.40	74.00	-25.60	peak			

*:Maximum data x:Over limit !:over margin (Reference Only



Site ANCI 843.3 Polarization: *Vertical* Temperature: 26.5(C)

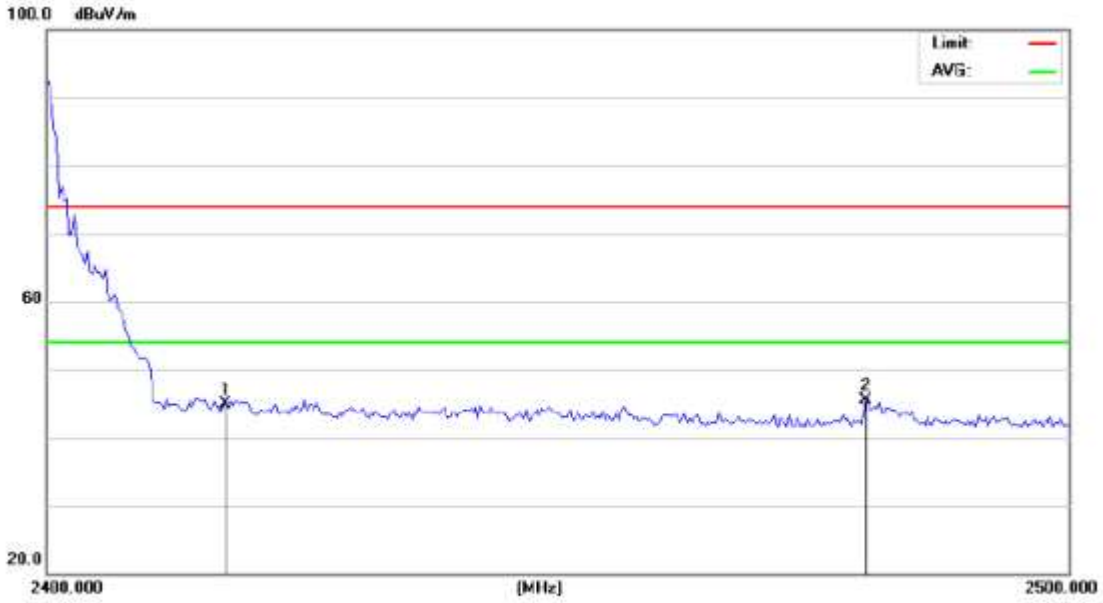
Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: Hopping

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2349.427	51.74	-5.09	46.65	74.00	-27.35	peak			
2		2390.000	50.07	-4.82	45.25	74.00	-28.75	peak			
3		2400.000	59.75	-4.75	55.00	74.00	-19.00	peak			
4	*	2400.000	44.05	-4.75	39.30	54.00	-14.70	AVG			

*:Maximum data x:Over limit !:over margin 〈Reference Only



Site ANCI 843.3 Polarization: *Horizontal* Temperature: 26.5(C)

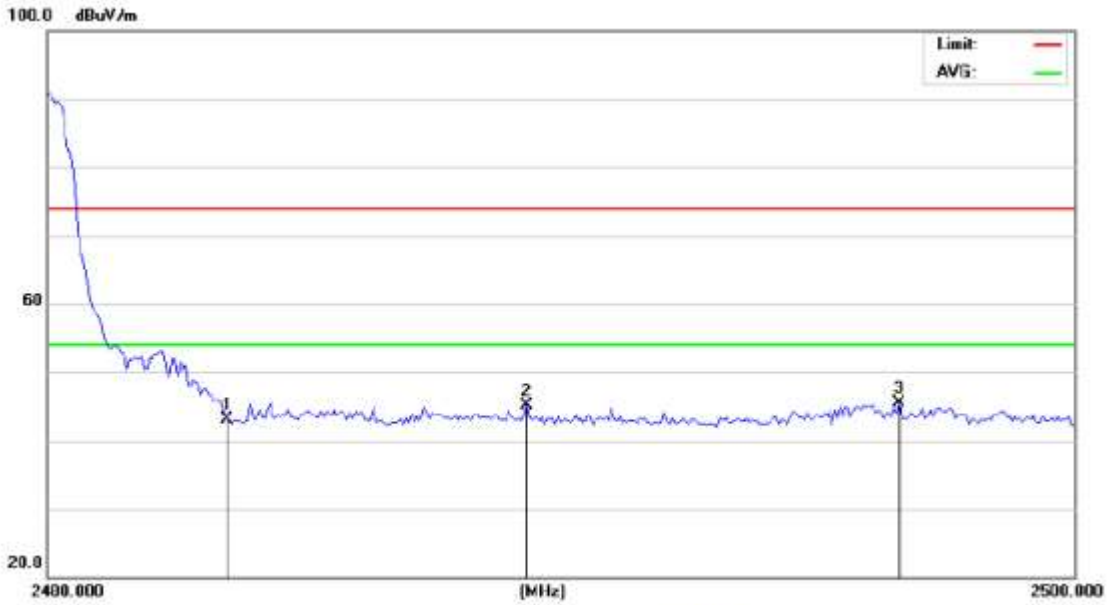
Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: Hopping

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2483.500	49.12	-4.19	44.93	74.00	-29.07	peak			
2	*	2496.037	49.54	-4.11	45.43	74.00	-28.57	peak			

*:Maximum data x:Over limit !:over margin (Reference Only



Site ANCI 843.3 Polarization: *Vertical* Temperature: 26.5(C)

Limit: RE)FCC PART 15 C 3m_PEAK Humidity: 60.6 %

Mode: Hopping

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2483.500	47.22	-4.19	43.03	74.00	-30.97	peak			
2		2489.330	49.32	-4.16	45.16	74.00	-28.84	peak			
3	*	2496.589	49.68	-4.11	45.57	74.00	-28.43	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

14. Antenna Application

14.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247.

FCC part 15C section 15.247 requirements:
Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

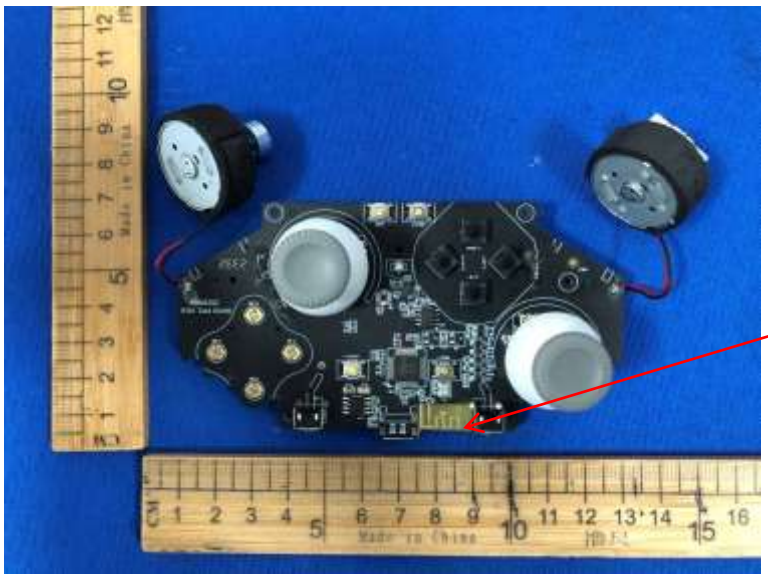
14.2 Result

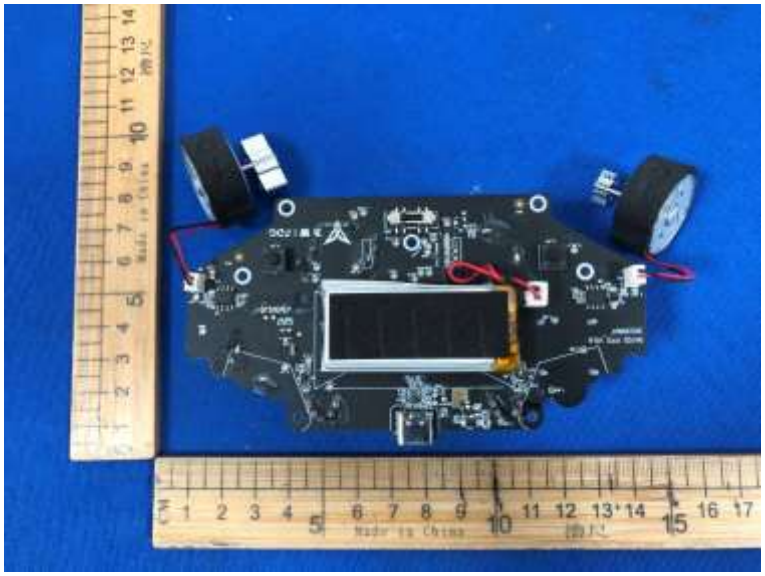
The EUT's antenna, permanent attached antenna, used a Internal PCB antenna and integrated on PCB, The antenna's gain is 0dBi and meets the requirement.

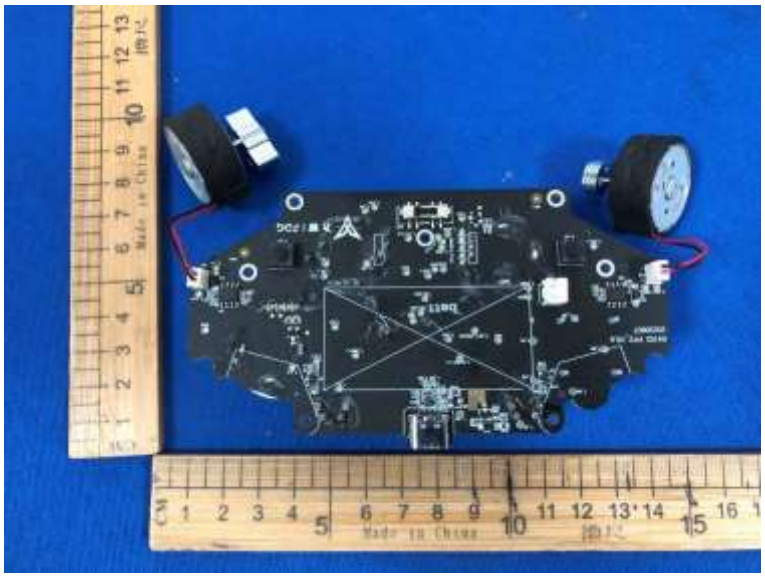
APPENDIX
(Photos of EUT)

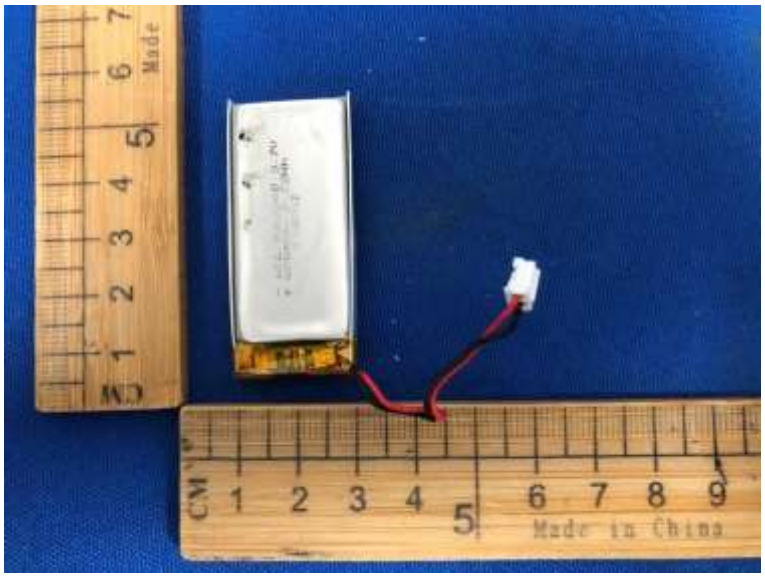
External Photos

Internal Photos









--- End of Report ---