



FCC&IC TEST REPORT

FCC ID: 2AIN7DC-15S

On Behalf of

JOYO TECHNOLOGY CO., LTD

DIGITAL GUITAR AMPLIFIER

Model No.: DC-15S

Prepared for : JOYO TECHNOLOGY CO., LTD
Address : 2/F, Lushi Industry Building, 28th District, Baoan, Shenzhen, 518101
China.

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

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Date of Report : October 11, 2021
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TEST REPORT DECLARATION

Applicant : JOYO TECHNOLOGY CO., LTD
Address : 2/F, Lushi Industry Building, 28th District, Baoan, Shenzhen, 518101 China.
Manufacturer : JOYO TECHNOLOGY CO., LTD
Address : 2/F, Lushi Industry Building, 28th District, Baoan, Shenzhen, 518101 China.
EUT Description : DIGITAL GUITAR AMPLIFIER
(A) Model No. : DC-15S
(B) Trademark : JOYO

Measurement Standard Used:

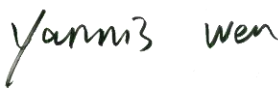
**FCC Rules and Regulations Part 15 Subpart C Section 15.247,
RSS-247 Issue 2, RSS-Gen Issue 5, ANSI C63.10:2013, CISPR 16-1-4:2010**

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

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

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Yannis Wen
Project Engineer


.....

Approved by (name + signature).....: Simple Guan
Project Manager


.....

Date of issue.....: October 11, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	October 11, 2021	Initial released Issue	Yannis Wen

1. Summary Of Standards And Results

1.1.Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) RSS-247(5.4 b) ANSI C63.10 :2013	P
Bandwidth	FCC Part 15: 15.215 RSS-247(5.1 a) ANSI C63.10 :2013	P
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) RSS-247(5.1 b) ANSI C63.10 :2013	P
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1) RSS-247(5.1 d) ANSI C63.10 :2013	P
Dwell Time	FCC Part 15: 15.247(a)(1) RSS-247(5.1 d) ANSI C63.10 :2013	P
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) RSS-Gen(8.9), RSS-247(5.5) ANSI C63.10 :2013	P
Band Edge Compliance	FCC Part 15: 15.247(d) RSS-Gen(8.9), RSS-247(5.5) ANSI C63.10 :2013	P
Power Line Conducted Emissions	FCC Part 15: 15.207 RSS-GEN(8.8) ANSI C63.10 :2013	P
Frequency stability	RSS-GEN(6.11)	P
Antenna requirement	FCC Part 15: 15.203 RSS-GEN(6.8)	P
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.		

2. General Information

2.1. Description of Device (EUT)

Description/PMN	: DIGITAL GUITAR AMPLIFIER
Model	: DC-15S
Number/FVIN(s)	: DC-15S
Diff.	: N/A
Trademark	: JOYO
Test Voltage	: DC 15V from adapter, DC 11.1V from battery
Radio Technology	: Bluetooth (BR+ EDR)
Operation frequency	: 2402-2480MHz
Channel No.	: 79 Channels
Modulation type	: GFSK, $\pi/4$ DQPSK, 8- DPSK
Antenna Type	: Internal antenna, Maximum Gain is -0.58dBi.
Software version	: V1.0
Hardware Version/FVIN	: V1.0R

Remark: The worst-case simultaneous transmission configuration was evaluated with no non-compliance found.
Results in this report are only for Bluetooth (BR+ EDR) function, and there is no other transmitter involved.

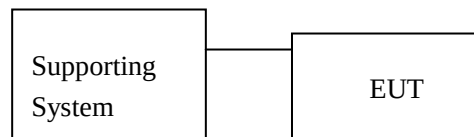
2.2. Accessories of Device (EUT)

Accessories1 : SWITCHING ADAPTER
 Manufacturer : SHENZHEN FUJIA APPLIANCE CO., LTD.
 Model : FJ-SW20171504000
 INPUT : 100-240V~50/60Hz 1.5A Max
 OUTPUT : 15.0V $\overline{=}$ 4.0A 60.0W

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	Notebook PC	Lenovo	ThinkPad E14	N/A	SDOC

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
GFSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
π /4 DQPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480
8- DPSK	Low :CH1	2402
	Middle: CH40	2441
	High: CH79	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	25℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

Designation Number: CN1236

July 15, 2019 Certificated by IC

Registration Number: 12135A

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal. Due day
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2020.04.12	2022.04.11
Test Receiver	ROHDE&SCHWARZ	ESCI	101165	2021.08.25	2022.08.24
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2021.08.25	2022.08.24
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2106	2021.08.30	2023.08.29
Filter	KANGMAI	ZLPF-LDC-1000- 1959	1209002075	2021.08.25	2022.08.24
Filter	WAINWRIGHT	WHKX2.80 /18G- 12SS	SN1	2021.08.25	2022.08.24
RF Cable	Resenberger	Cable 4	PE1	2021.08.25	2022.08.24
CMU200	ROHDE&SCHWARZ	CMU200	116785	2021.08.25	2022.08.24
Signal Analyzer	Agilent	N9020A	MY499100060	2021.08.25	2022.08.24
vector Signal	Agilent	N5182A	MY49060042	2021.08.25	2022.08.24
vector Signal	Agilent	E4438C	US44271917	2021.08.25	2022.08.24
Amplifier	HP	HP8347A	2834A00455	2021.08.25	2022.08.24
Amplifier	Agilent	8449B	3008A02664	2021.08.25	2022.08.24
Filter	SKET	HPF_1-18G-55dB	N/A	2021.08.25	2022.08.24
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2021.08.25	2022.08.24
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-627	2021.08.30	2023.08.29
9*6*6 anechoic	CHENYU	9*6*6	N/A	2020.09.02	2022.09.01
RF Cable	Resenberger	Cable 1	RE1	2021.08.25	2022.08.24
RF Cable	Resenberger	Cable 2	RE2	2021.08.25	2022.08.24
RF Cable	Resenberger	Cable 3	CE1	2021.08.25	2022.08.24
Power Sensor	DARE	RPR3006W	15100041SNO91	2021.08.25	2022.08.24
Power Sensor	DARE	RPR3006W	15100041SNO92	2021.08.25	2022.08.24
CMW500	ROHDE&SCHWARZ	CMW500	1201.0002K50-117239-sM	2021.08.25	2022.08.24
Loop Antenna	SCHWARZBECK	FMZB 1519B	00128	2021.08.30	2023.08.29
Temp. & Humid. Chamber	Weihuang	WHTH-1000-40-880	100631	2021.04.21	2022.04.20
Adjustable attenuator	MWRfTest	N/A	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	N/A	N/A	N/A

3. Maximum Peak Output Power

3.1.Limit

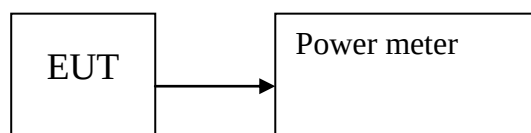
Please refer FCC part 15.247 & RSS-247..

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts, the e.i.r.p shall not exceed 4W

3.2.Test Procedure

The transmitter output is connected to the RF Power meter. The Power meter is set to the peak power detection.

3.3.Test Setup



3.4.Test Result

Mode	Freq (MHz)	PK Output Power (dBm)	Limit (dBm)	Result
GFSK	2402	6.199	30	Pass
	2441	6.462	30	Pass
	2480	3.763	30	Pass
π /4 DQPSK	2402	6.732	21	Pass
	2441	7.122	21	Pass
	2480	3.828	21	Pass
8- DPSK	2402	6.592	21	Pass
	2441	6.748	21	Pass
	2480	3.803	21	Pass
Conclusion: PASS				

4. Bandwidth

4.1.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in RSS-GEN, FCC Section 15.247(a)(1), must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

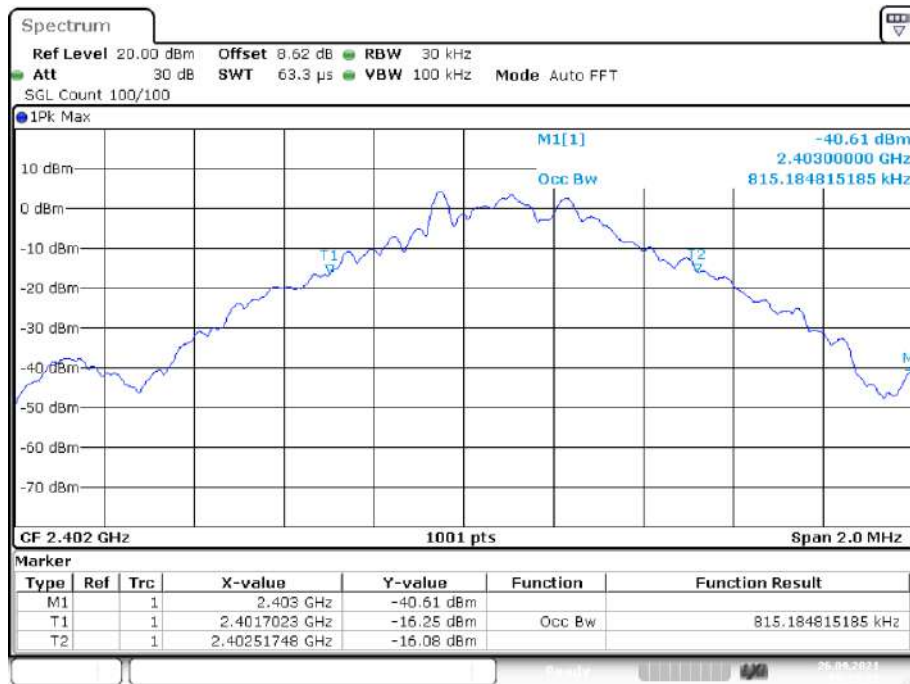
4.2.Test Procedure

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

4.3.Test Result

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant 1	0.815	0.778	/	Pass
NVNT	1-DH1	2441	Ant 1	0.817	0.828	/	Pass
NVNT	1-DH1	2480	Ant 1	0.817	0.866	/	Pass
NVNT	2-DH1	2402	Ant 1	1.163	1.212	/	Pass
NVNT	2-DH1	2441	Ant 1	1.157	1.222	/	Pass
NVNT	2-DH1	2480	Ant 1	1.141	1.226	/	Pass
NVNT	3-DH1	2402	Ant 1	1.171	1.24	/	Pass
NVNT	3-DH1	2441	Ant 1	1.155	1.21	/	Pass
NVNT	3-DH1	2480	Ant 1	1.153	1.238	/	Pass

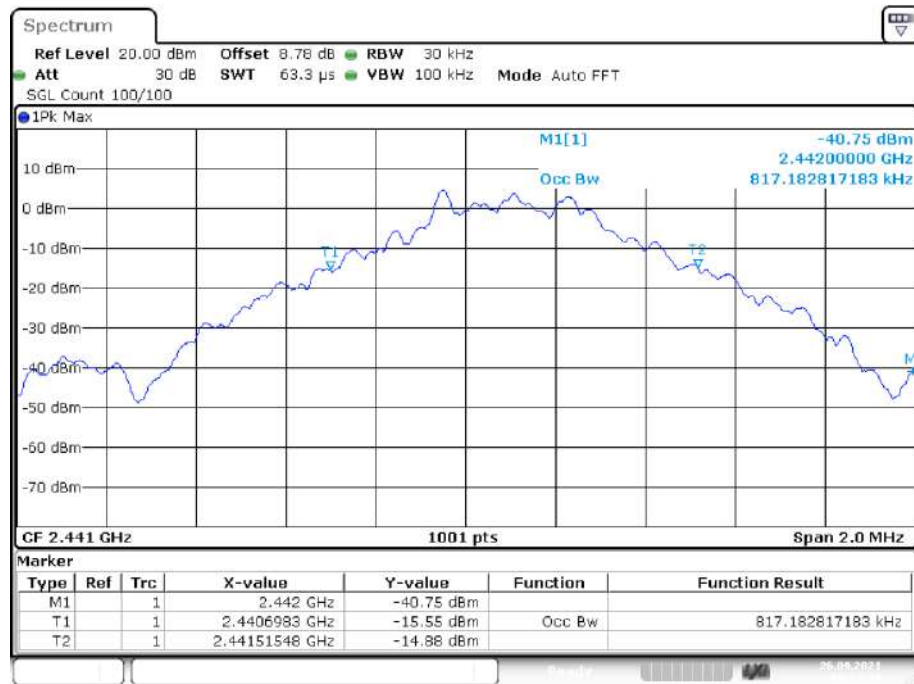
OBW NVNT 1-DH1 2402MHz Ant1



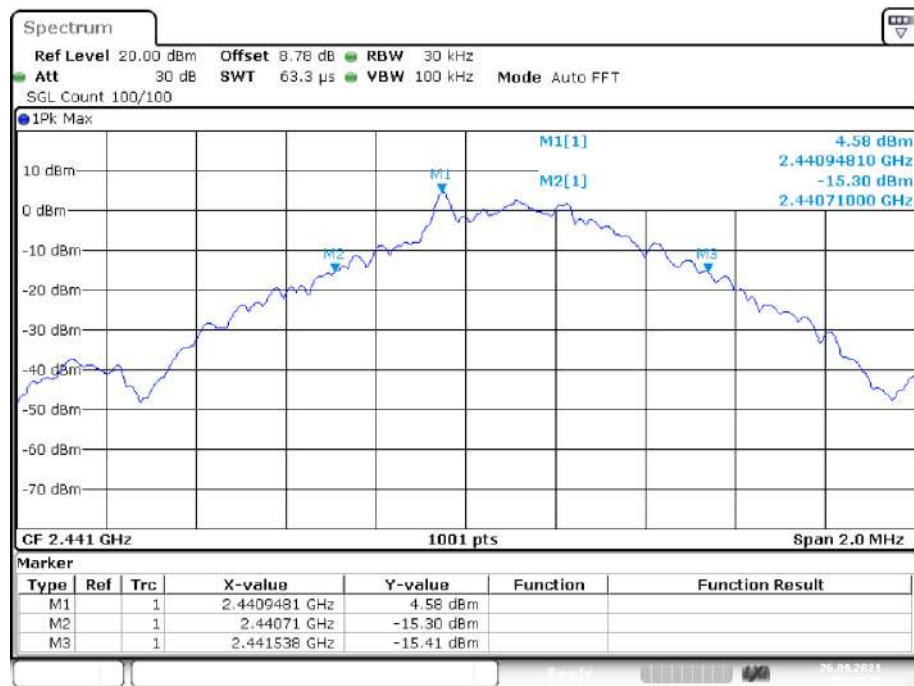
-20 dB BW NVNT 1-DH1 2402MHz Ant1



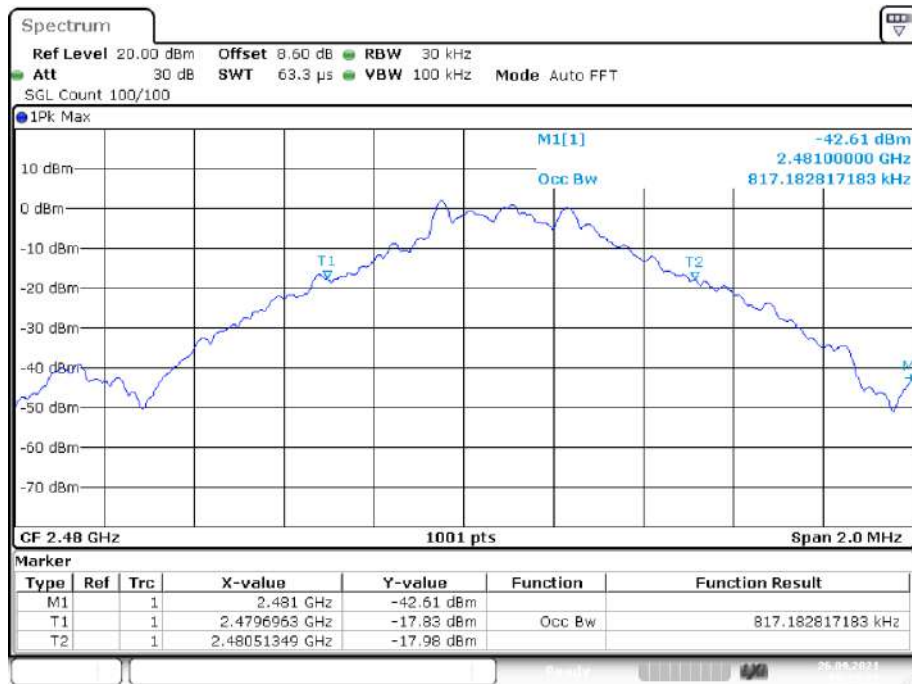
OBW NVNT 1-DH1 2441MHz Ant1



-20 dB BW NVNT 1-DH1 2441MHz Ant1



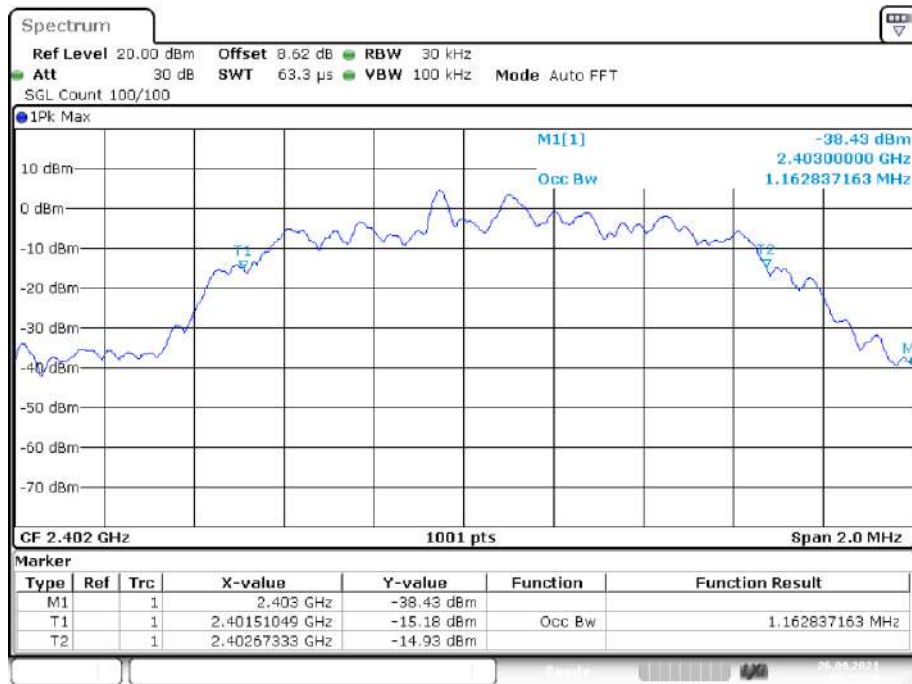
OBW NVNT 1-DH1 2480MHz Ant1



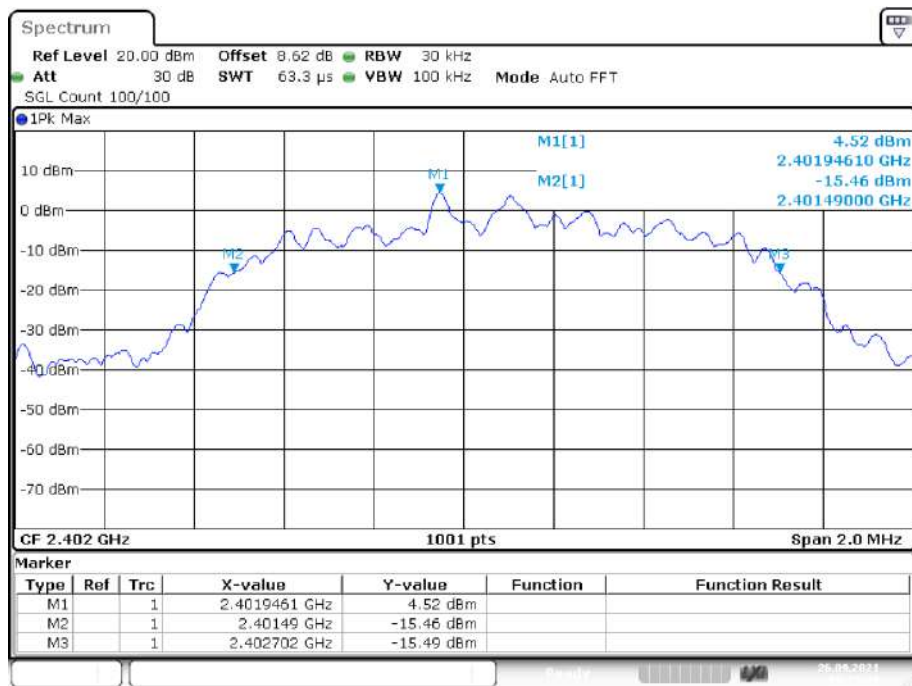
-20 dB BW NVNT 1-DH1 2480MHz Ant1



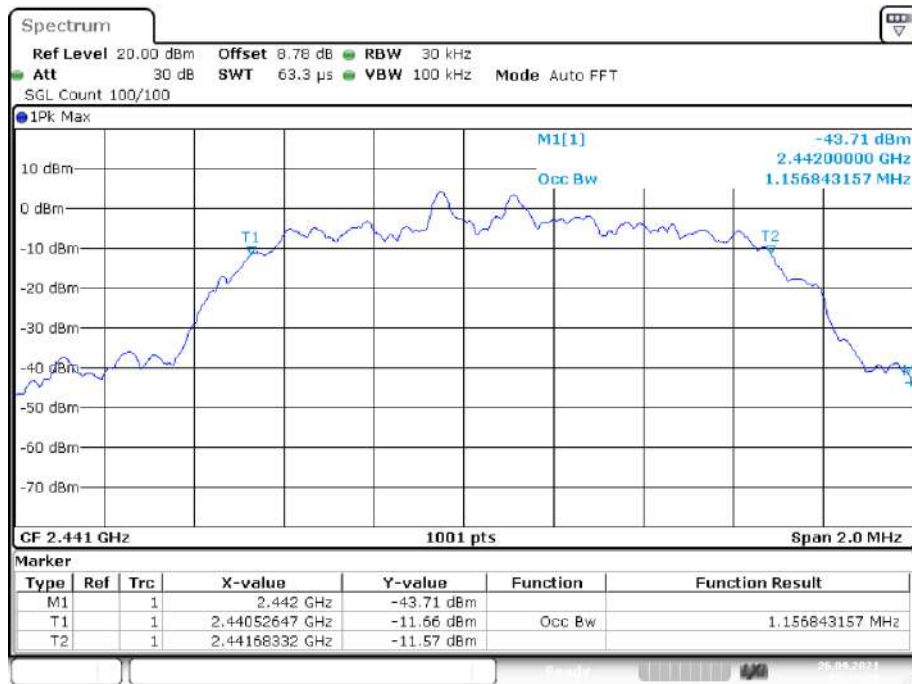
OBW NVNT 2-DH1 2402MHz Ant1



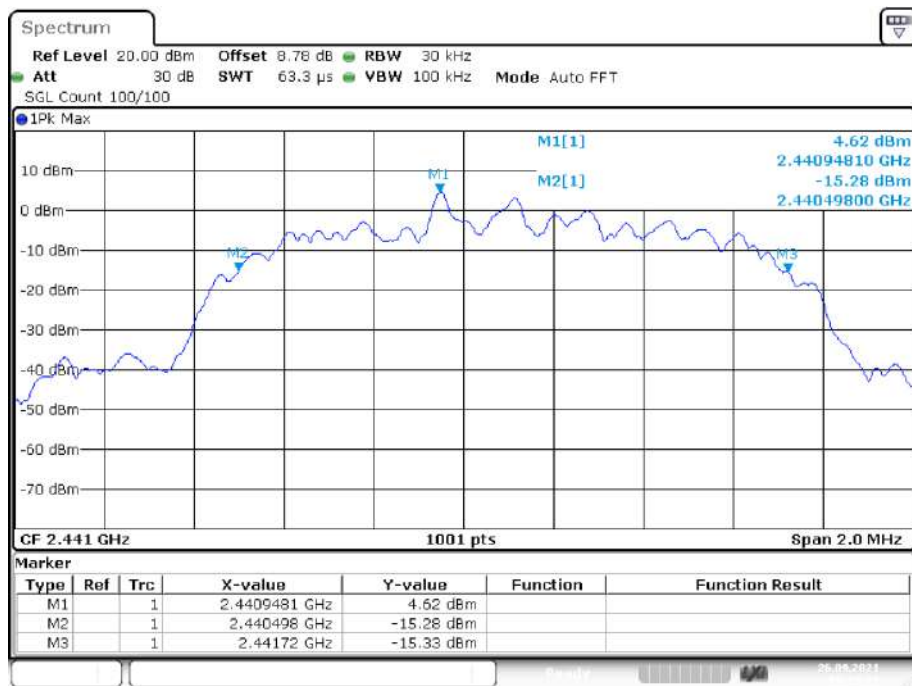
-20 dB BW NVNT 2-DH1 2402MHz Ant1



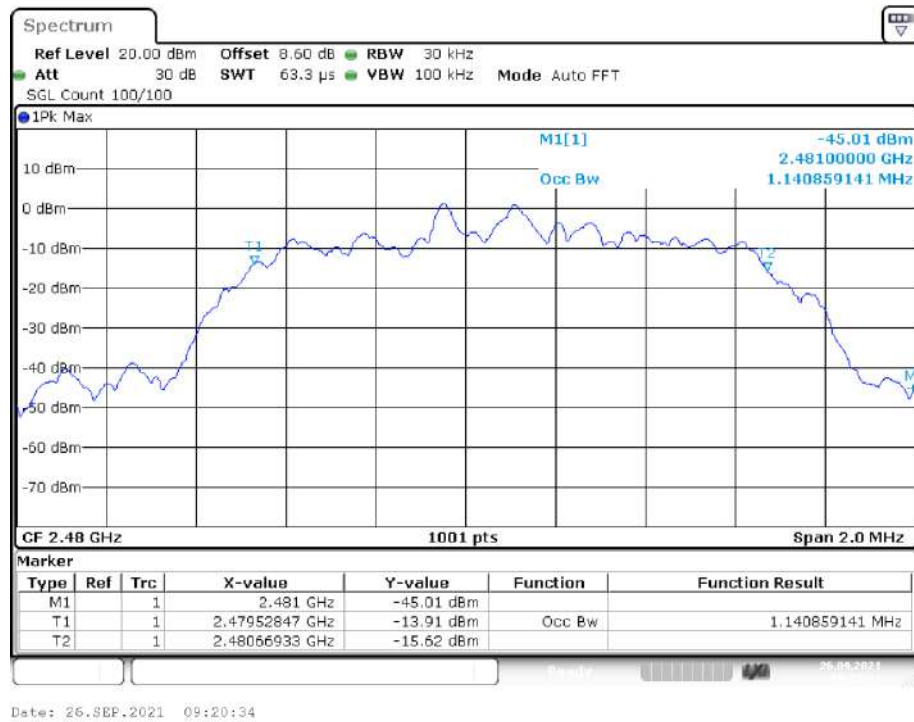
OBW NVNT 2-DH1 2441MHz Ant1



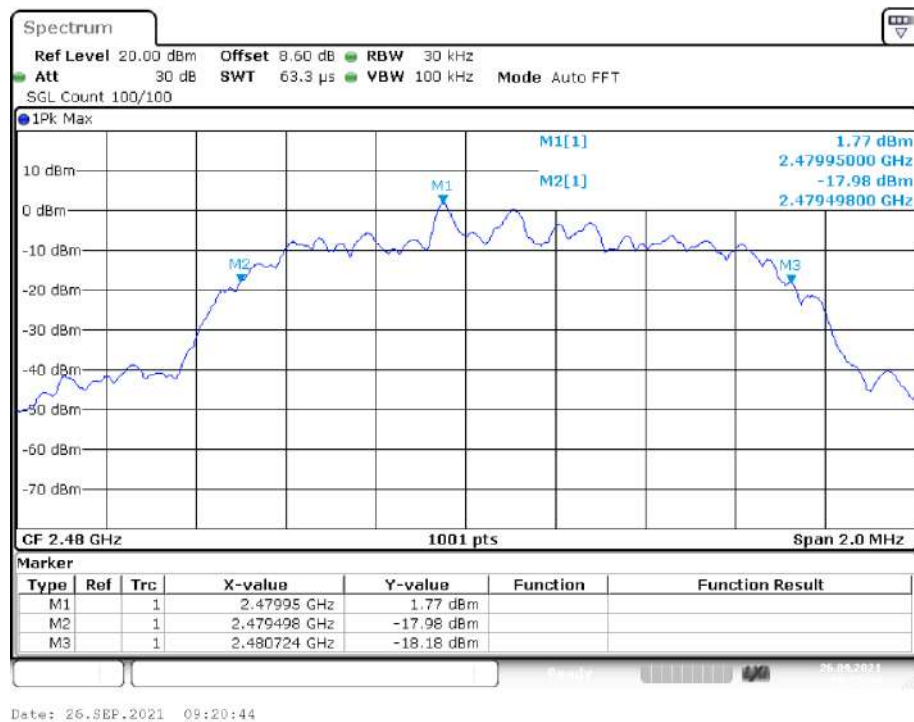
-20 dB BW NVNT 2-DH1 2441MHz Ant1



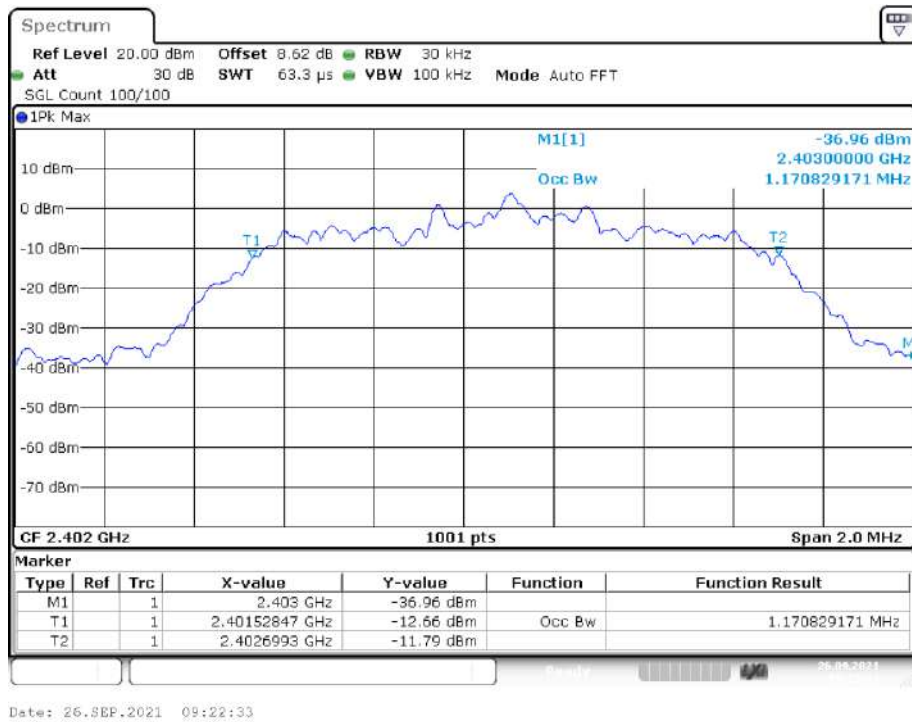
OBW NVNT 2-DH1 2480MHz Ant1



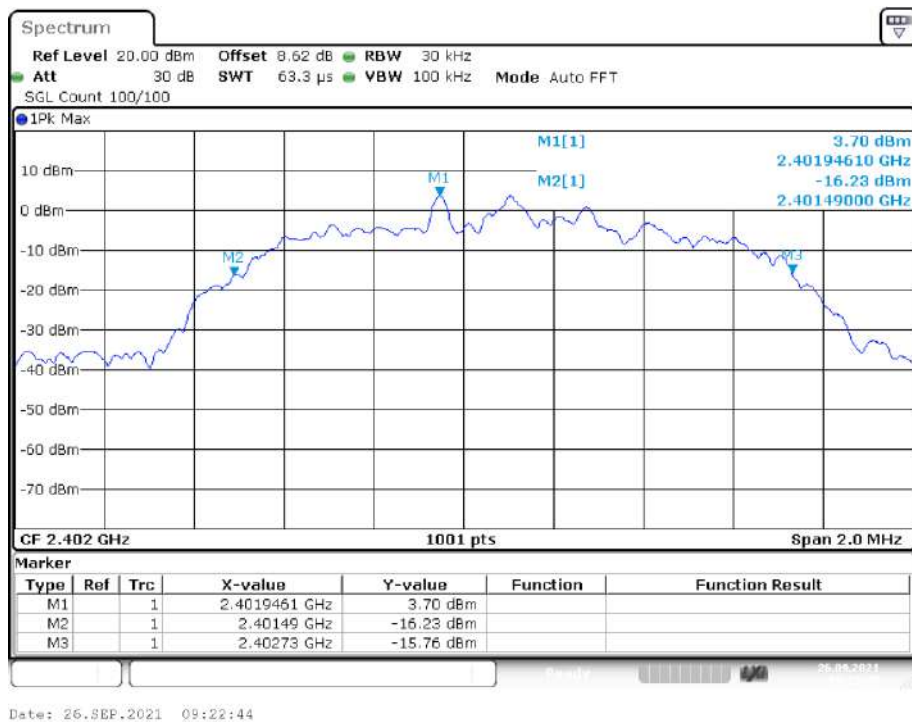
-20 dB BW NVNT 2-DH1 2480MHz Ant1



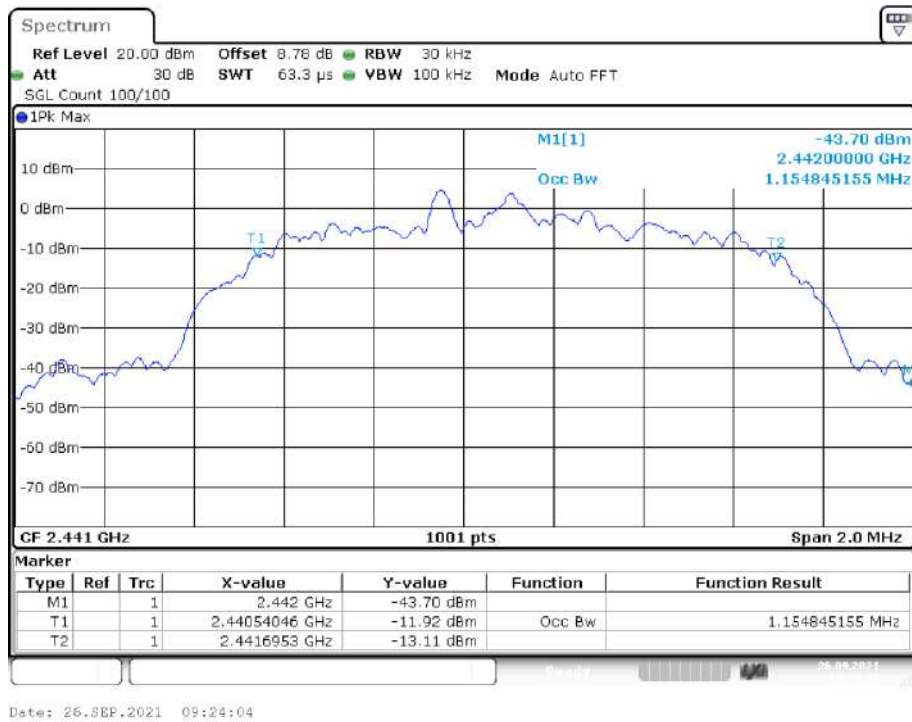
OBW NVNT 3-DH1 2402MHz Ant1



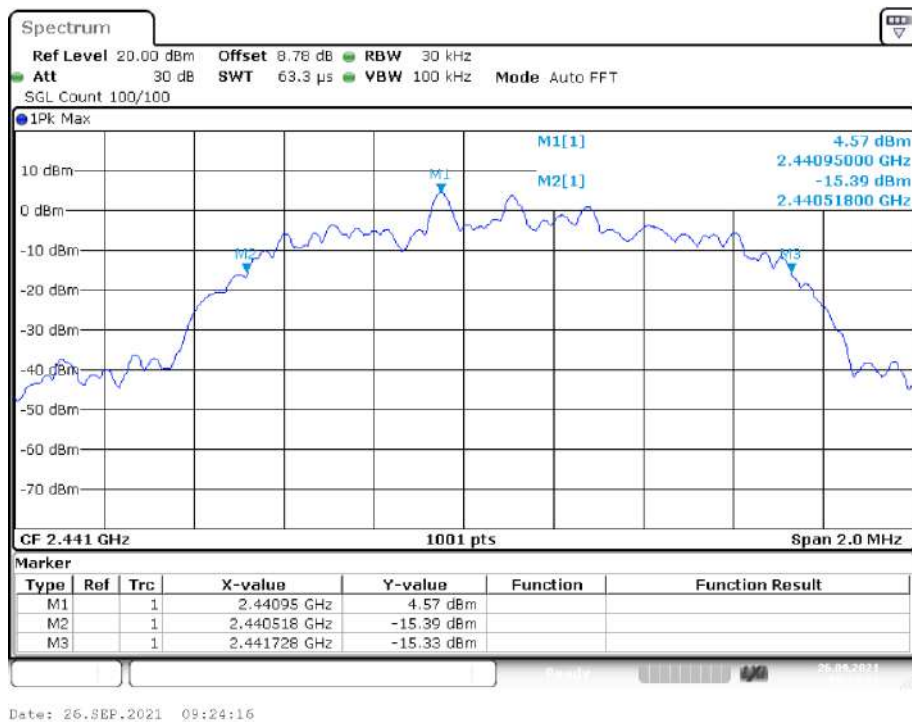
-20 dB BW NVNT 3-DH1 2402MHz Ant1



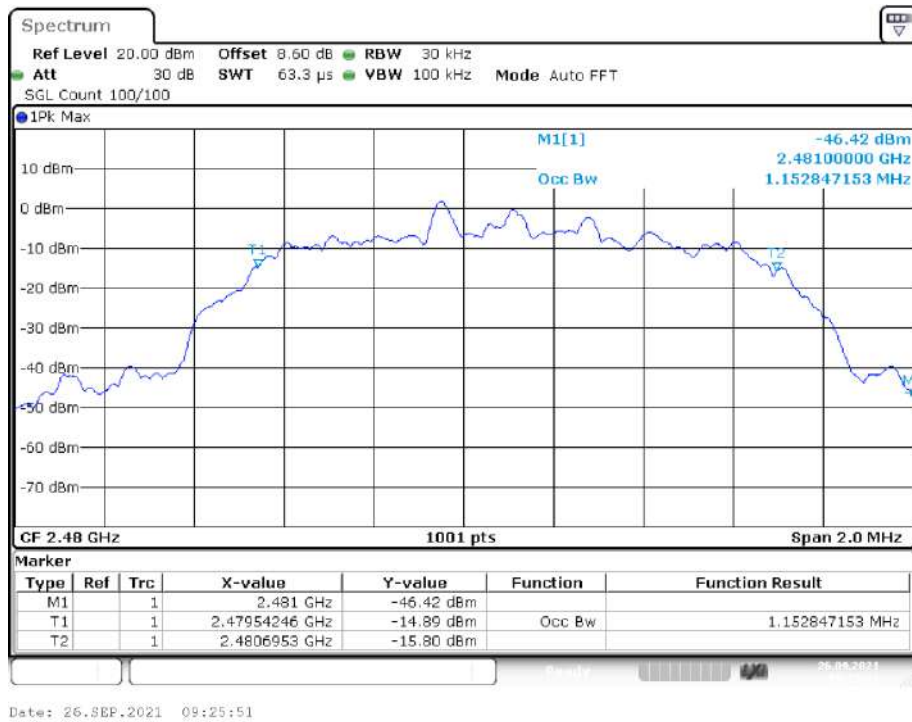
OBW NVNT 3-DH1 2441MHz Ant1



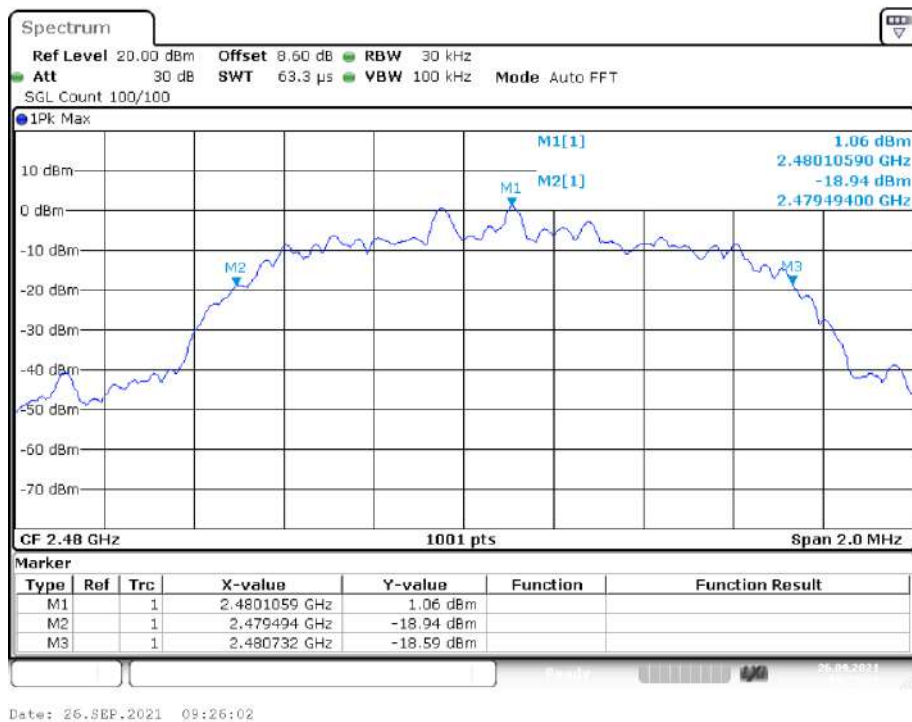
-20 dB BW NVNT 3-DH1 2441MHz Ant1



OBW NVNT 3-DH1 2480MHz Ant1



-20 dB BW NVNT 3-DH1 2480MHz Ant1



5. Carrier Frequency Separation

5.1.Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

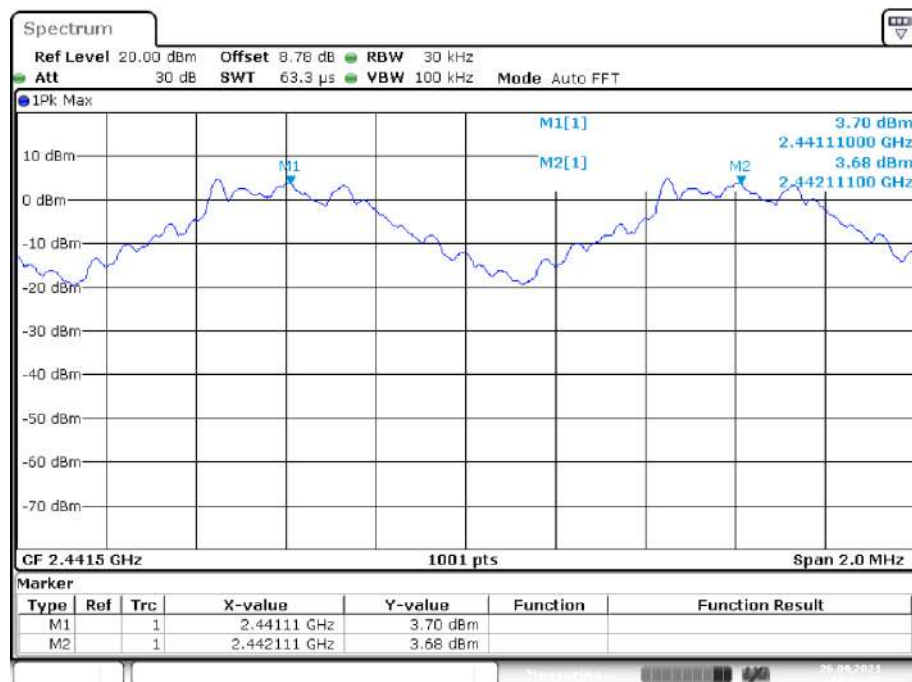
5.2.Test Procedure

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

5.3.Test Result

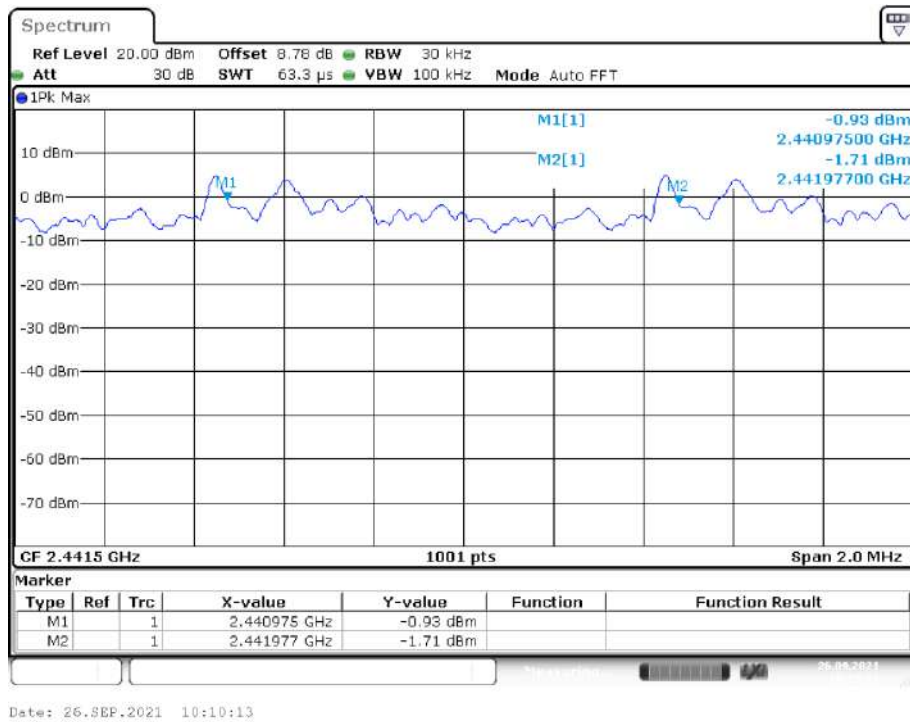
Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	Ant1	2441.11	2442.111	1.001	0.828	Pass
NVNT	2-DH1	Ant1	2440.975	2441.977	1.002	0.815	Pass
NVNT	3-DH1	Ant1	2441.117	2442.13	1.013	0.807	Pass

CFS NVNT 1-DH1 2441MHz Ant1

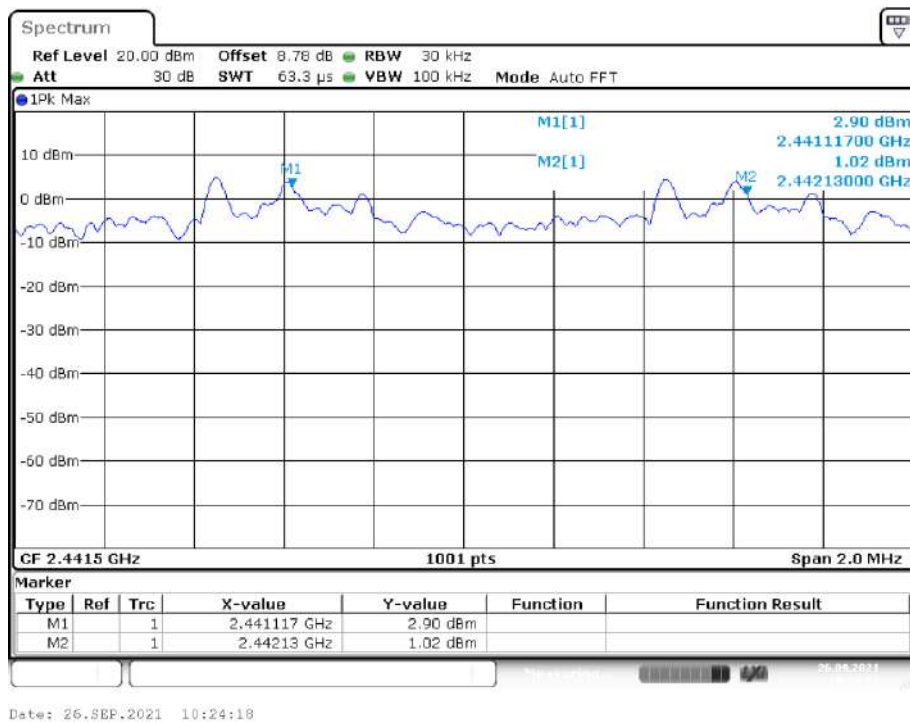


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CFS NVNT 2-DH1 2441MHz Ant1



CFS NVNT 3-DH1 2441MHz Ant1



6. Number Of Hopping Channel

6.1.Limit

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

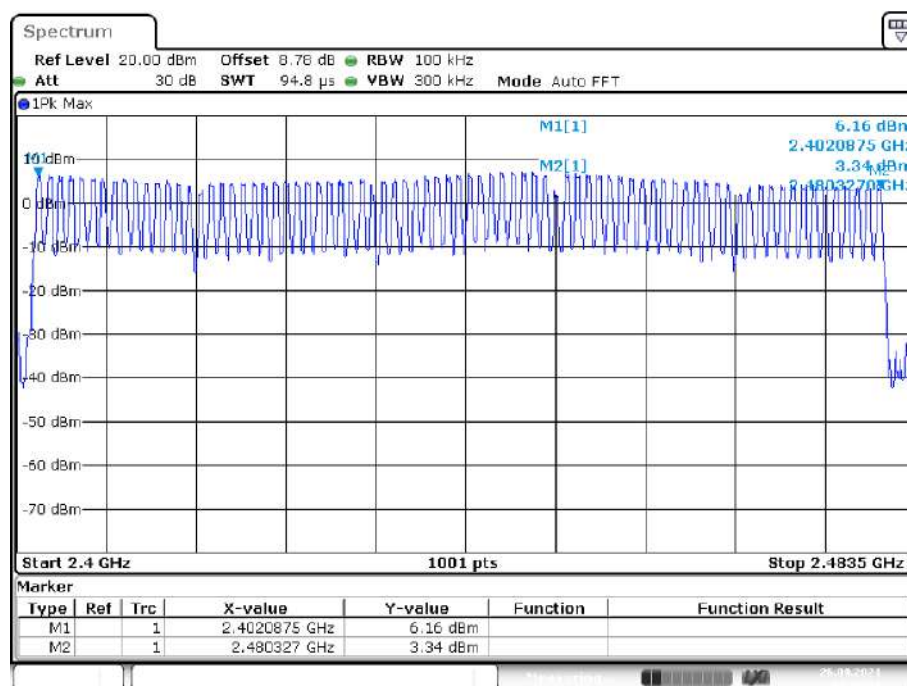
6.2.Test Procedure

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

6.3.Test Result

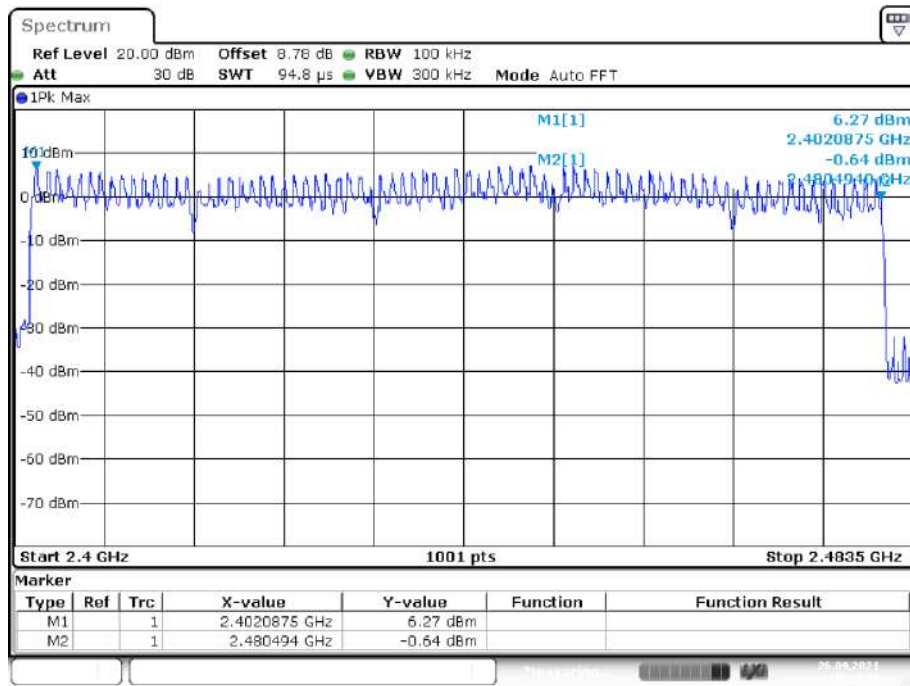
Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass

Hopping No. NVNT 1-DH1 2441MHz Ant1

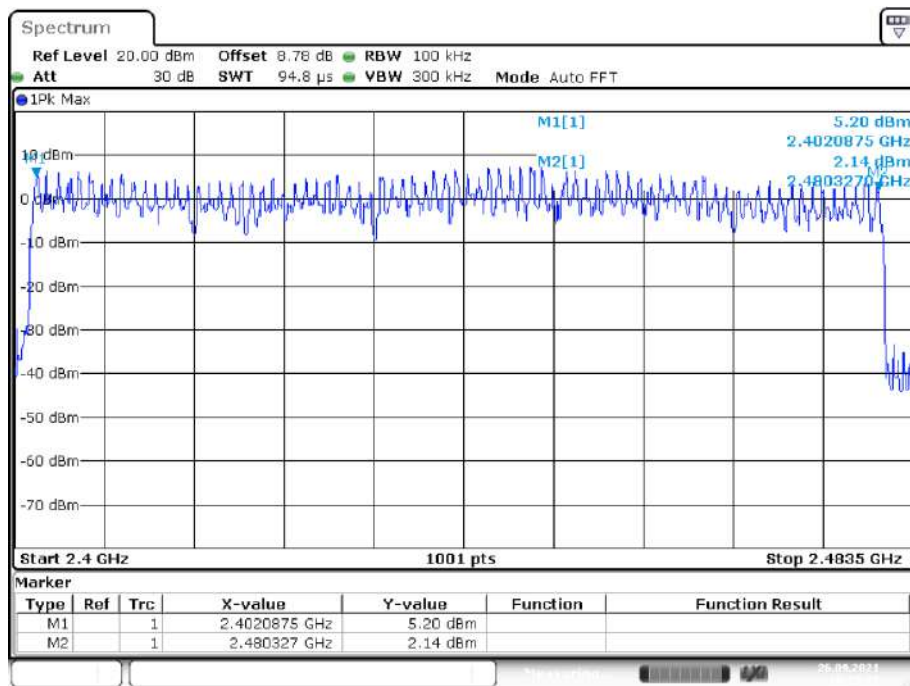


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Hopping No. NVNT 2-DH1 2441MHz Ant1



Hopping No. NVNT 3-DH1 2441MHz Ant1



7. Dwell Time

7.1. Test limit

Please refer FCC part 15.247 & RSS-247.

Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

7.2. Test Procedure

7.2.1. Place the EUT on the table and set it in transmitting mode.

7.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

7.2.3. Set center frequency of spectrum analyzer = operating frequency.

7.2.4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.

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

7.3. Test Result

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	Ant1	0.376	120.320	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.632	261.120	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.879	307.093	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.386	123.520	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.63	260.800	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.886	307.840	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.387	123.840	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.636	261.760	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.888	308.053	31600	400	Pass

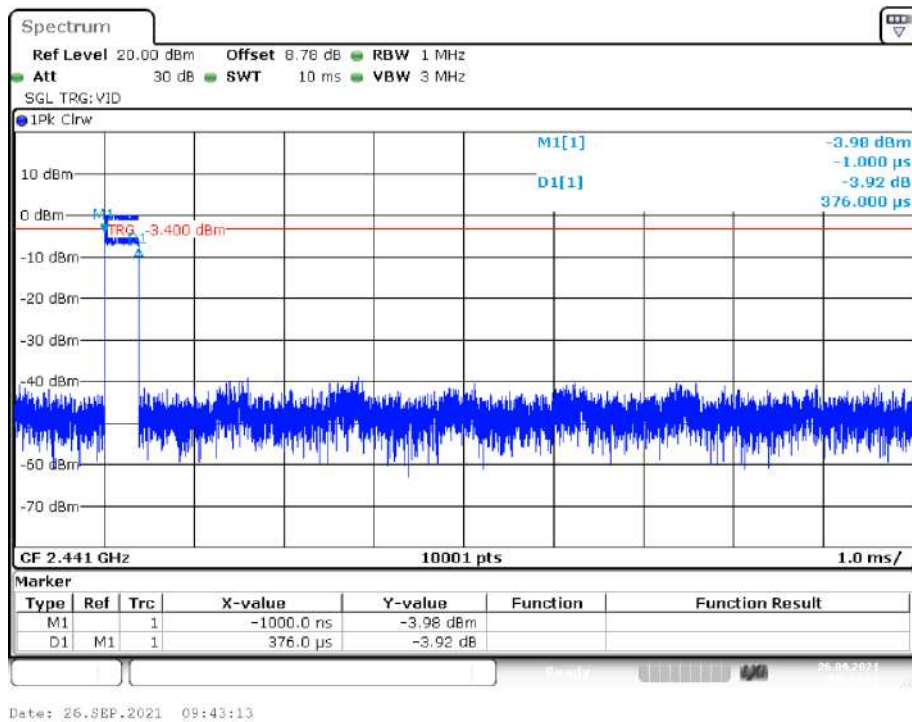
Note: 1 A period time = $0.4 \text{ (s)} * 79 = 31.6 \text{ (s)}$

2 DH1 time slot = Pulse Duration * $(1600 / (2 * 79)) * \text{A period time}$

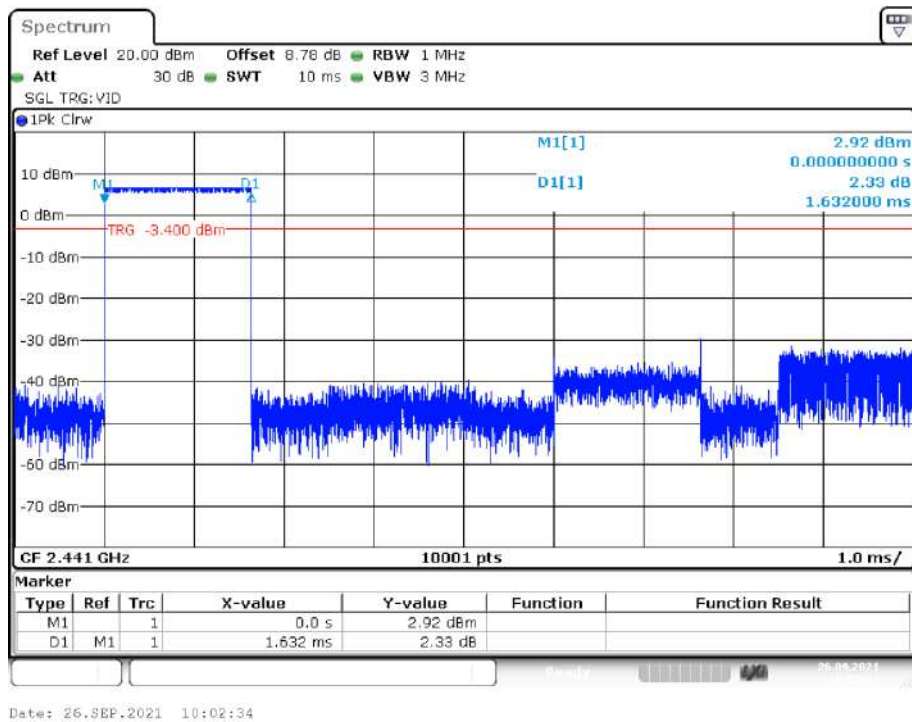
DH3 time slot = Pulse Duration * $(1600 / (4 * 79)) * \text{A period time}$

DH5 time slot = Pulse Duration * $(1600 / (6 * 79)) * \text{A period time}$

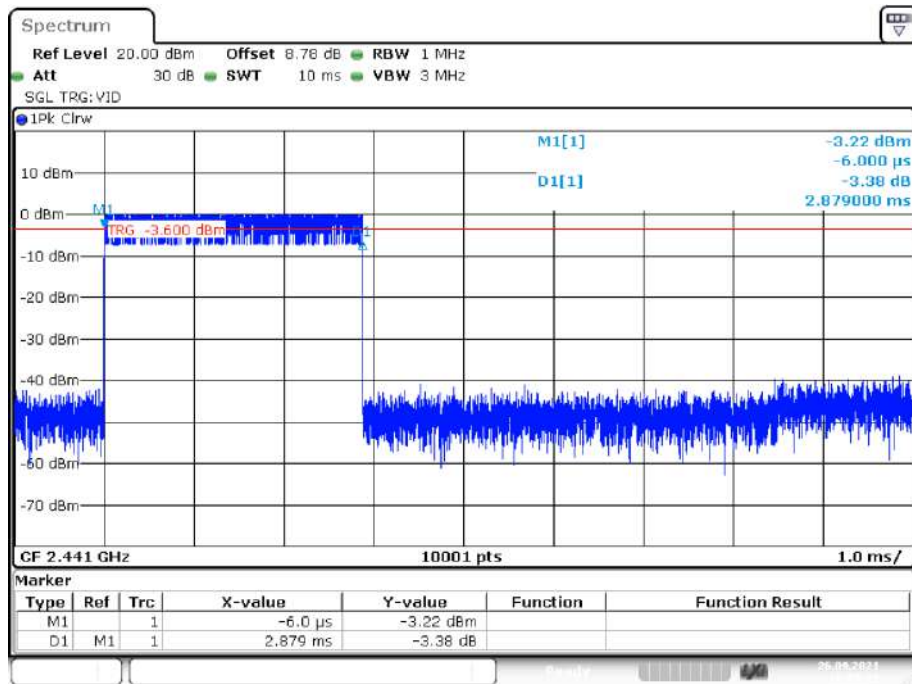
Dwell NVNT 1-DH1 2441MHz Ant1 One Burst



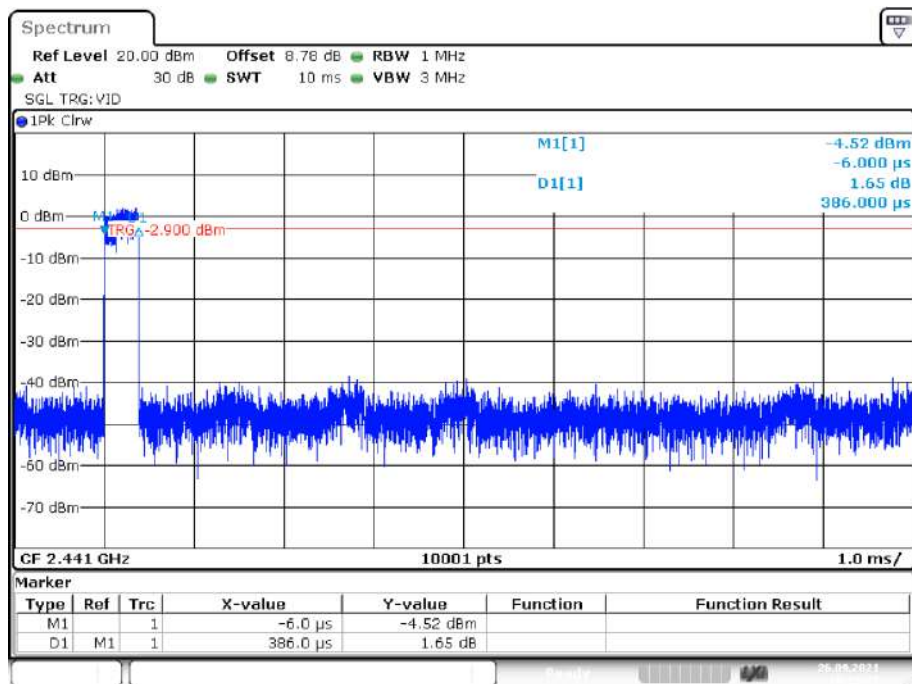
Dwell NVNT 1-DH3 2441MHz Ant1 One Burst



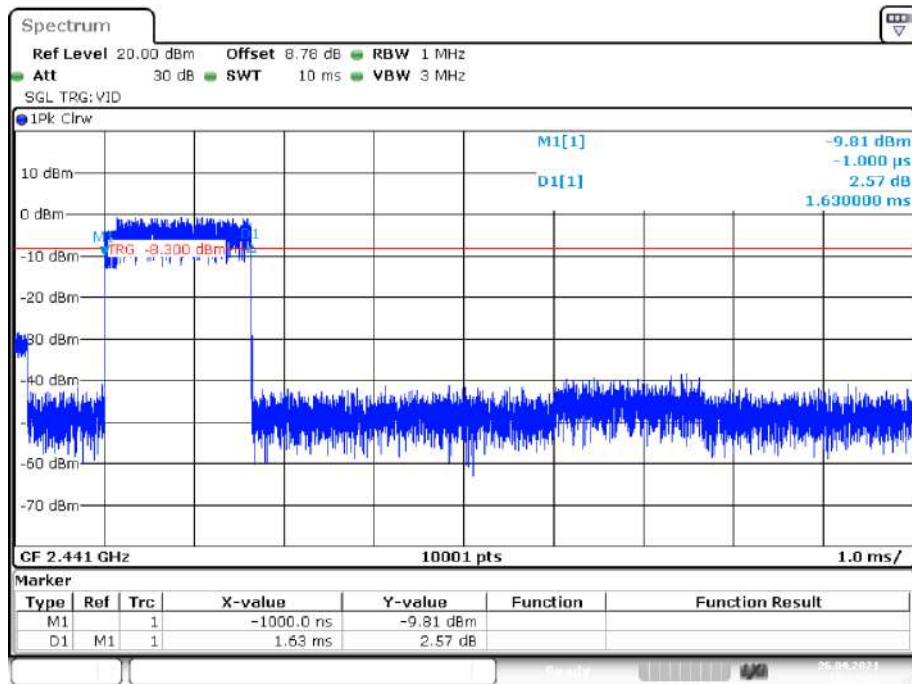
Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



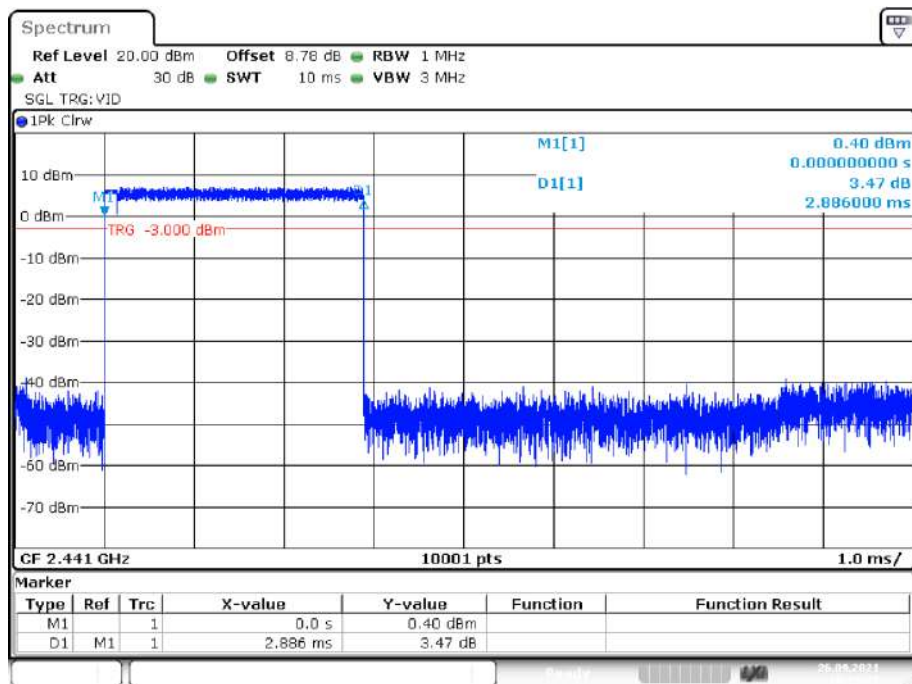
Dwell NVNT 2-DH1 2441MHz Ant1 One Burst



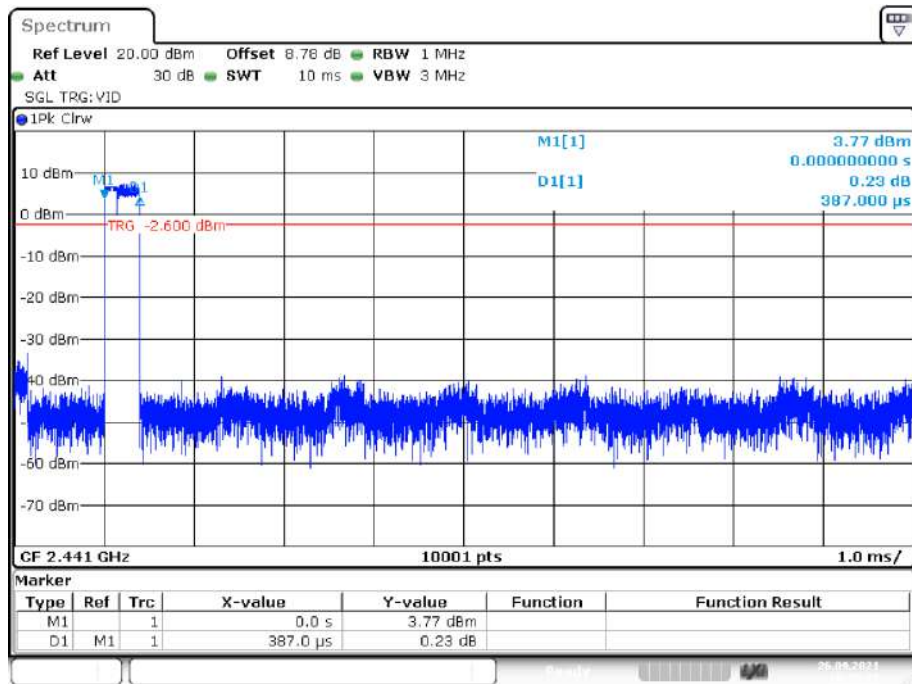
Dwell NVNT 2-DH3 2441MHz Ant1 One Burst



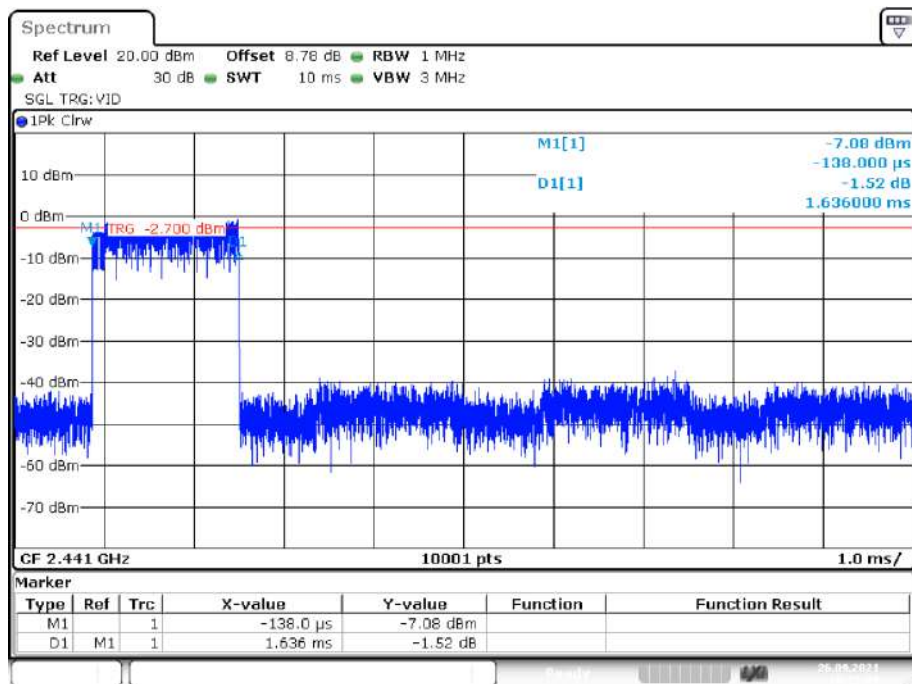
Dwell NVNT 2-DH5 2441MHz Ant1 One Burst



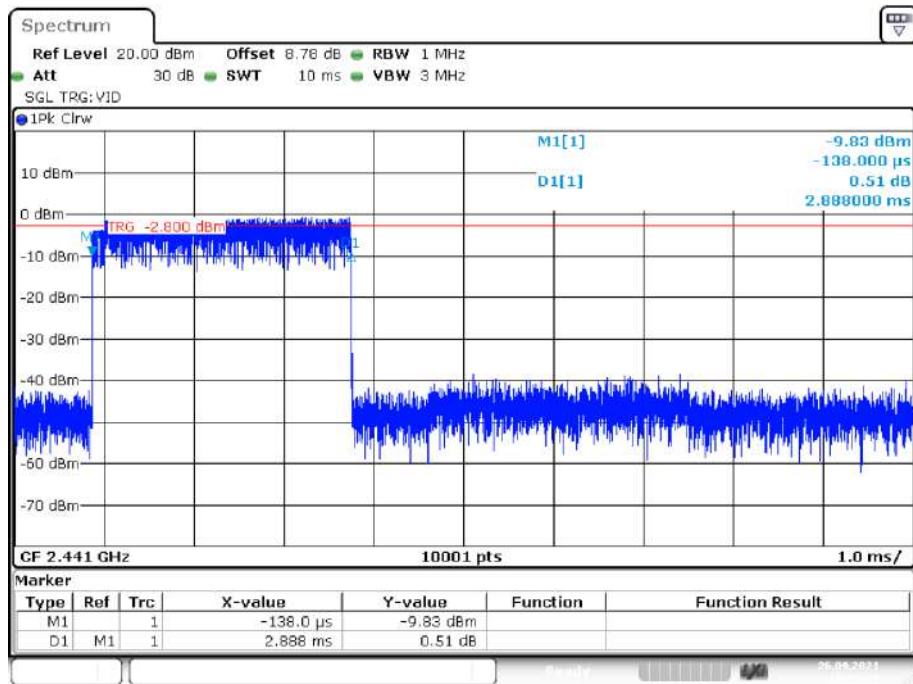
Dwell NVNT 3-DH1 2441MHz Ant1 One Burst



Dwell NVNT 3-DH3 2441MHz Ant1 One Burst



Dwell NVNT 3-DH5 2441MHz Ant1 One Burst



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8. Radiated Emissions

8.1.Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

RSS-GEN Restricted frequency band

Table 7 – Restricted frequency bands ^{Note 1}

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12

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

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

15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009-0.490	300	$2400/\text{F}(\text{KHz})$	/
0.490-1.705	30	$24000/\text{F}(\text{KHz})$	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

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

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

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$ at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

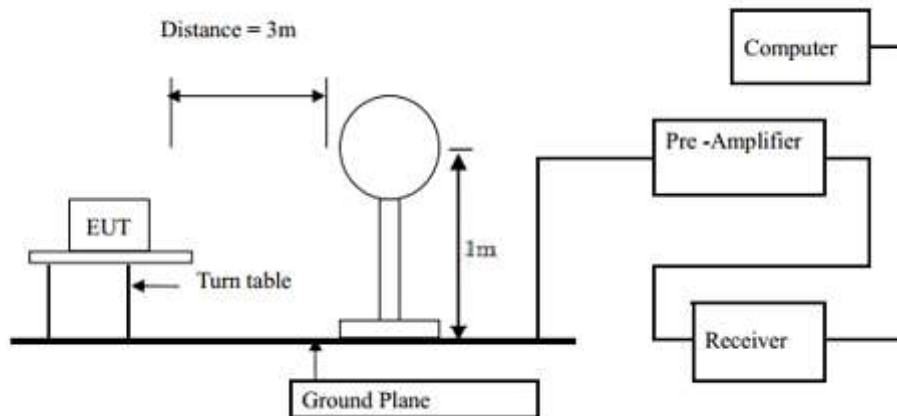
Table 6 – General field strength limits at frequencies below 30 MHz

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

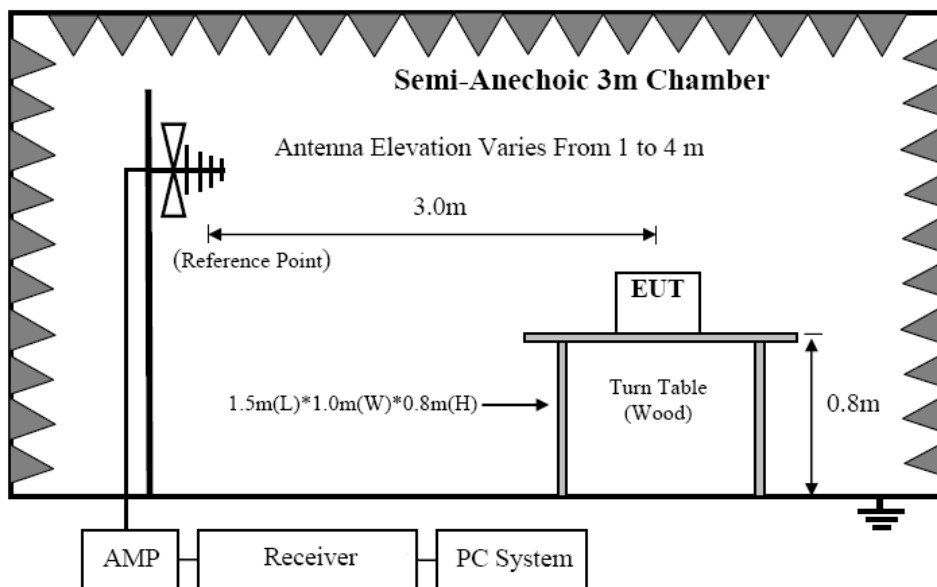
Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

8.2. Block Diagram of Test setup

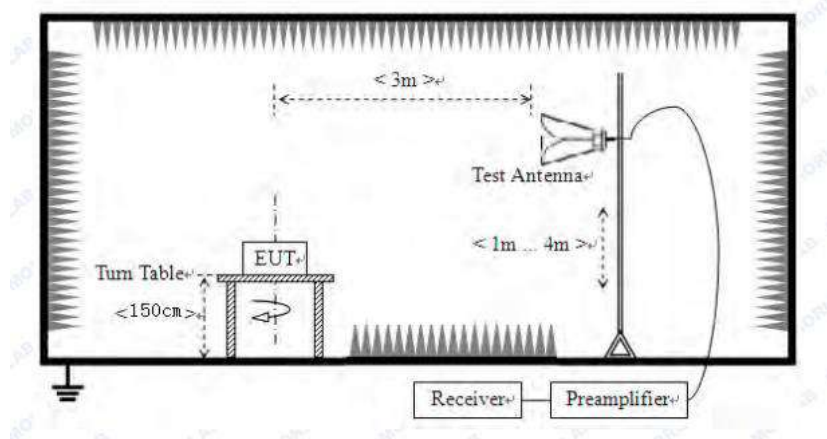
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



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



8.2.2 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3.Test Procedure

- (1) EUT was placed on a non-metallic table, 0.8 m high above ground for below 1GHz testing and 1.5m high for above1GHz testing inside a semi-anechoic chamber.
- (2) Setup EUT and simulator
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
- (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on Radiated Emission test.
- (6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

8.4.Test Result

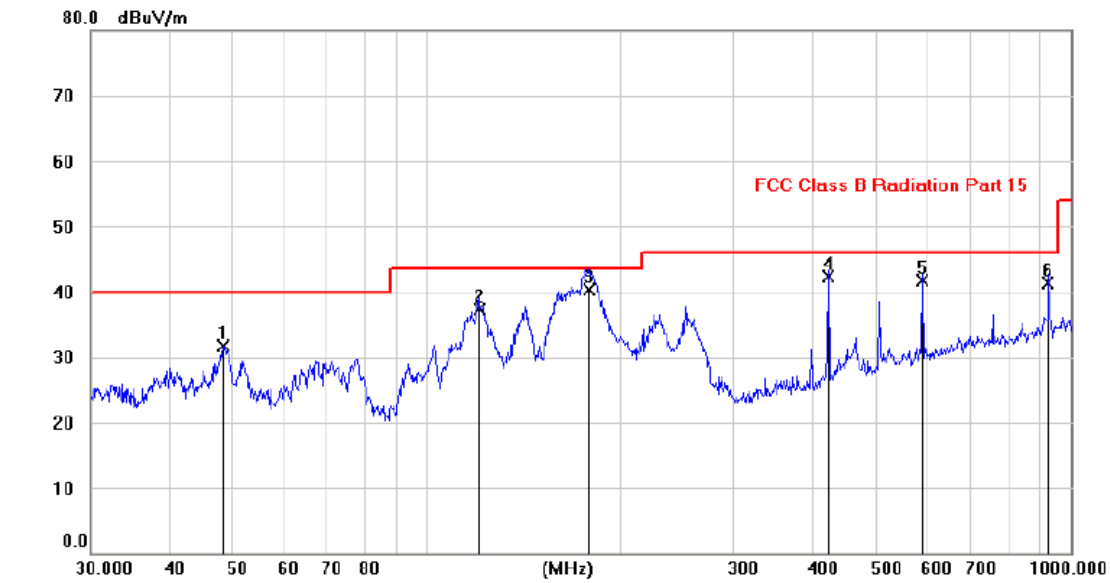
We have scanned from 9kHz to the 10th harmonic of the EUT's highest frequency. Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

From 30MHz to 1000MHz: Conclusion: PASS

Vertical:

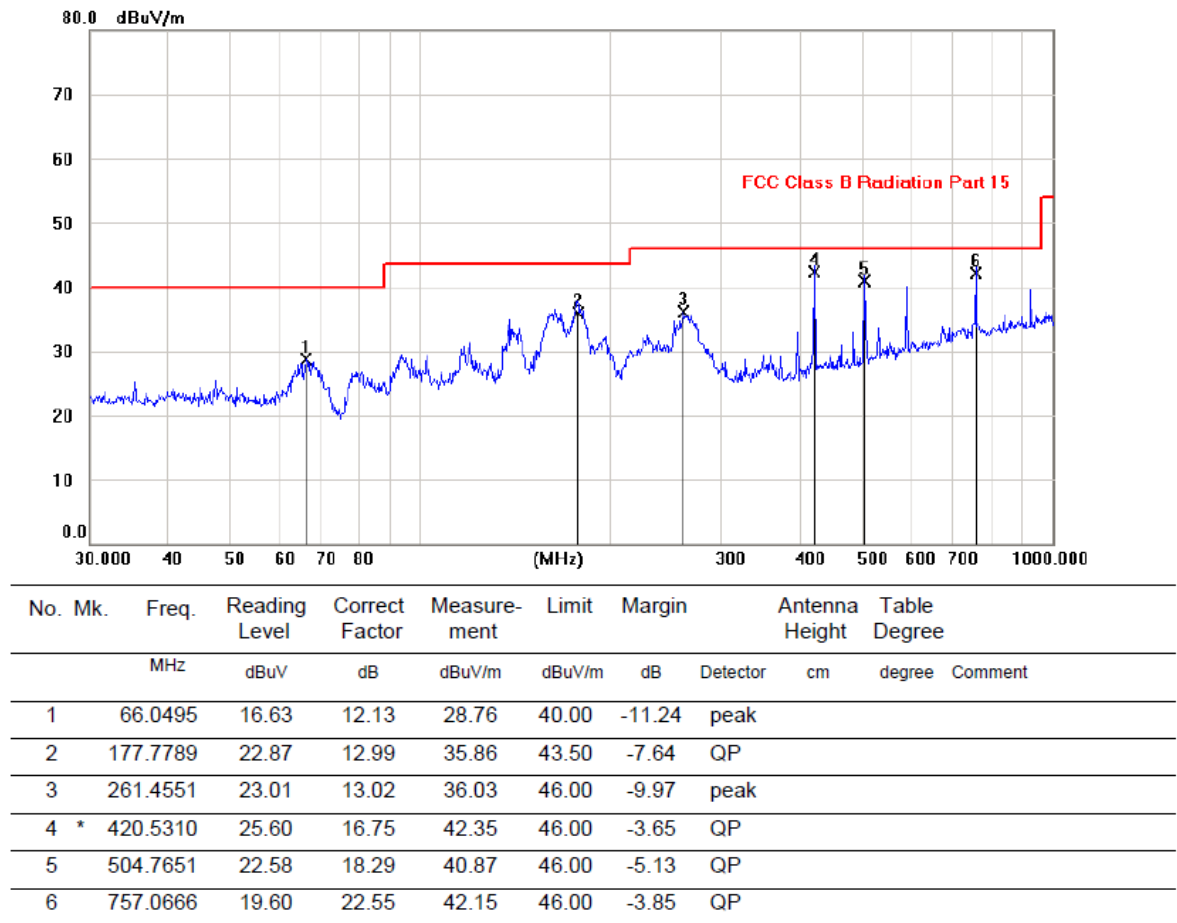


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree	
							Detector		degree	Comment
1		48.2413	17.66	14.07	31.73	40.00	-8.27	peak		
2		120.2905	24.24	13.06	37.30	43.50	-6.20	QP		
3	*	179.0510	27.54	12.81	40.35	43.50	-3.15	QP		
4		420.5310	25.61	16.75	42.36	46.00	-3.64	QP		
5		588.8361	21.64	20.00	41.64	46.00	-4.36	QP		
6		925.2154	16.98	24.37	41.35	46.00	-4.65	QP		

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

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

Horizontal:



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

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

Remark: All modes have been tested, and only worst data of 8-DPSK mode, Channel 2480MHz (AC 120V/60Hz) was listed in this report.

Test Mode: GFSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	48.05	V	33.95	10.18	34.26	57.92	74	-16.08	PK
4804	34.92	V	33.95	10.18	34.26	44.79	54	-9.21	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	45.75	H	33.95	10.18	34.26	55.62	74	-18.38	PK
4804	35.66	H	33.95	10.18	34.26	45.53	54	-8.47	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX Mid									
4882	43.31	V	33.93	10.2	34.29	53.15	74	-20.85	PK
4882	35.77	V	33.93	10.2	34.29	45.61	54	-8.39	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	42.95	H	33.93	10.2	34.29	52.79	74	-21.21	PK
4882	36.15	H	33.93	10.2	34.29	45.99	54	-8.01	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX High									
4960	45.21	V	33.98	10.22	34.25	55.16	74	-18.84	PK
4960	35.43	V	33.98	10.22	34.25	45.38	54	-8.62	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	43.89	H	33.98	10.22	34.25	53.84	74	-20.16	PK
4960	35.32	H	33.98	10.22	34.25	45.27	54	-8.73	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:

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

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

Test Mode: $\pi/4$ DQPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	47.51	V	33.95	10.18	34.26	57.38	74	-16.62	PK
4804	35.81	V	33.95	10.18	34.26	45.68	54	-8.32	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.29	H	33.95	10.18	34.26	56.16	74	-17.84	PK
4804	36.27	H	33.95	10.18	34.26	46.14	54	-7.86	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX Mid									
4882	44.78	V	33.93	10.2	34.29	54.62	74	-19.38	PK
4882	33.06	V	33.93	10.2	34.29	42.90	54	-11.10	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	46.29	H	33.93	10.2	34.29	56.13	74	-17.87	PK
4882	33.47	H	33.93	10.2	34.29	43.31	54	-10.69	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: $\pi/4$ DQPSK TX High									
4960	43.52	V	33.98	10.22	34.25	53.47	74	-20.53	PK
4960	36.48	V	33.98	10.22	34.25	46.43	54	-7.57	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.94	H	33.98	10.22	34.25	54.89	74	-19.11	PK
4960	32.19	H	33.98	10.22	34.25	42.14	54	-11.86	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:

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

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

Test Mode: 8- DQPSK TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	47.84	V	33.95	10.18	34.26	57.71	74	-16.29	PK
4804	35.22	V	33.95	10.18	34.26	45.09	54	-8.91	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.72	H	33.95	10.18	34.26	56.59	74	-17.41	PK
4804	36.62	H	33.95	10.18	34.26	46.49	54	-7.51	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: 8- DQPSK TX Mid									
4882	43.46	V	33.93	10.2	34.29	53.30	74	-20.70	PK
4882	36.20	V	33.93	10.2	34.29	46.04	54	-7.96	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	43.55	H	33.93	10.2	34.29	53.39	74	-20.61	PK
4882	33.90	H	33.93	10.2	34.29	43.74	54	-10.26	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: 8- DQPSK TX High									
4960	43.12	V	33.98	10.22	34.25	53.07	74	-20.93	PK
4960	33.75	V	33.98	10.22	34.25	43.70	54	-10.30	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	45.07	H	33.98	10.22	34.25	55.02	74	-18.98	PK
4960	34.48	H	33.98	10.22	34.25	44.43	54	-9.57	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

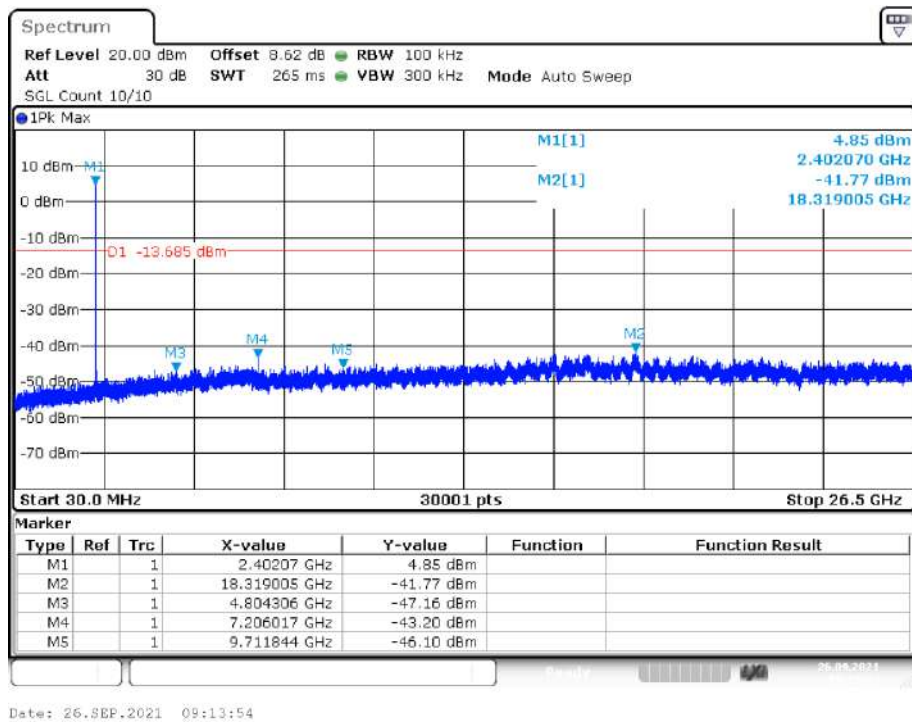
Note:

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

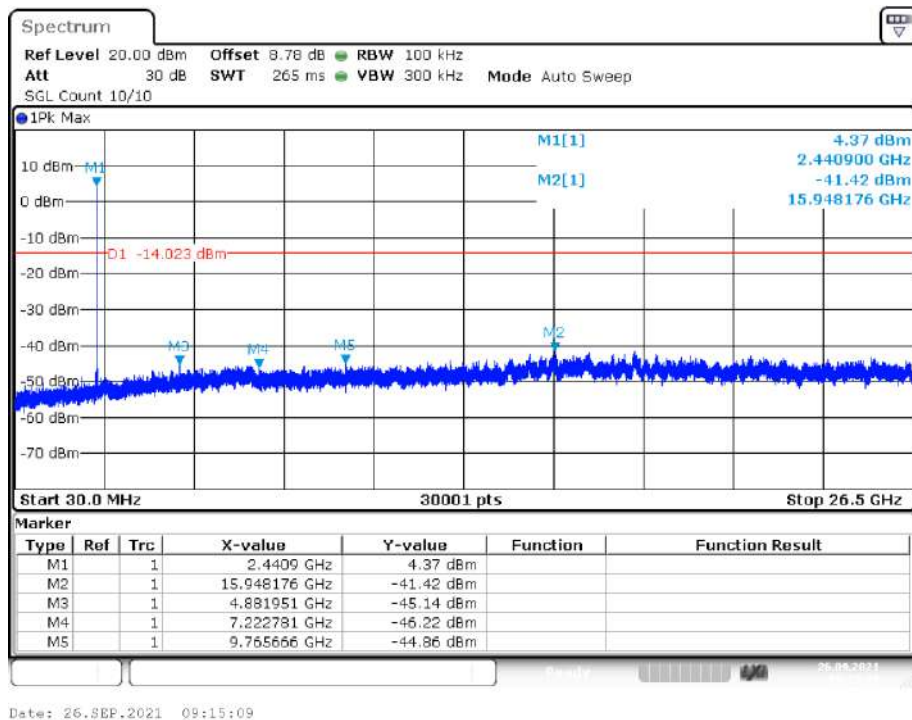
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Conducted method:

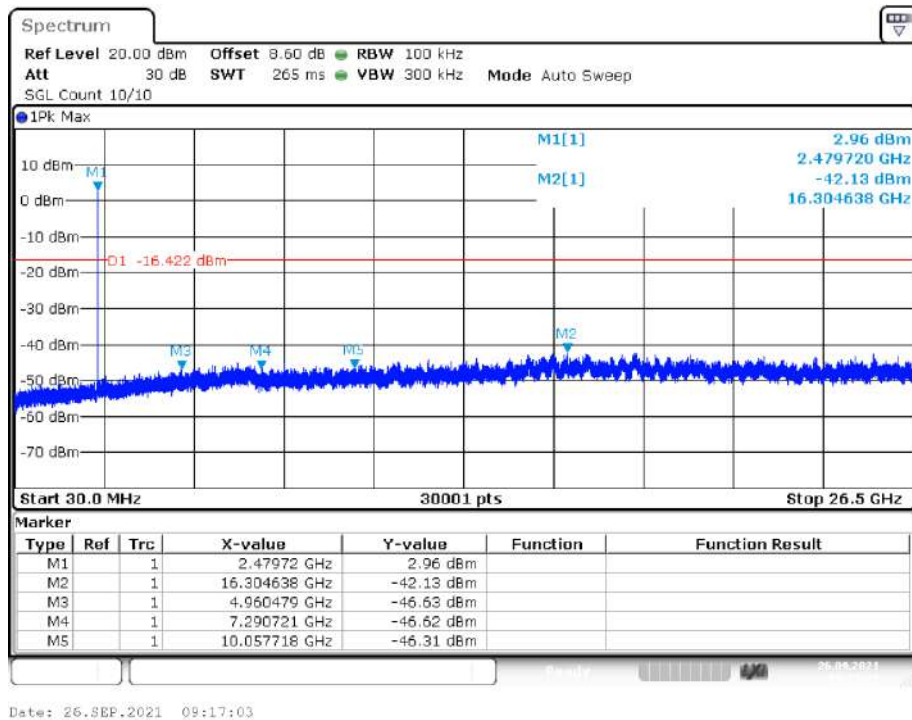
Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission



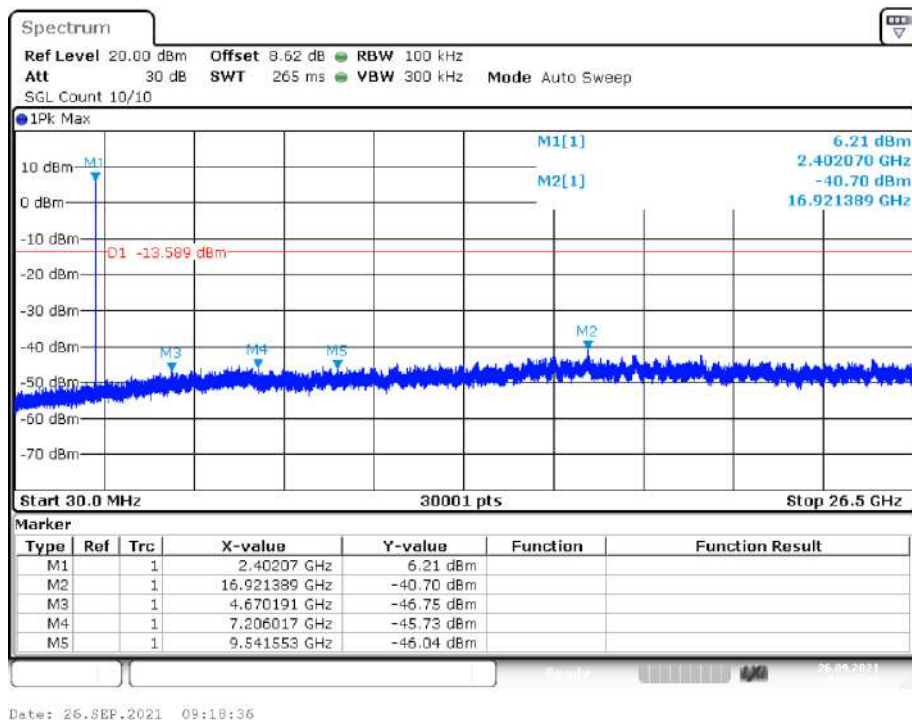
Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission



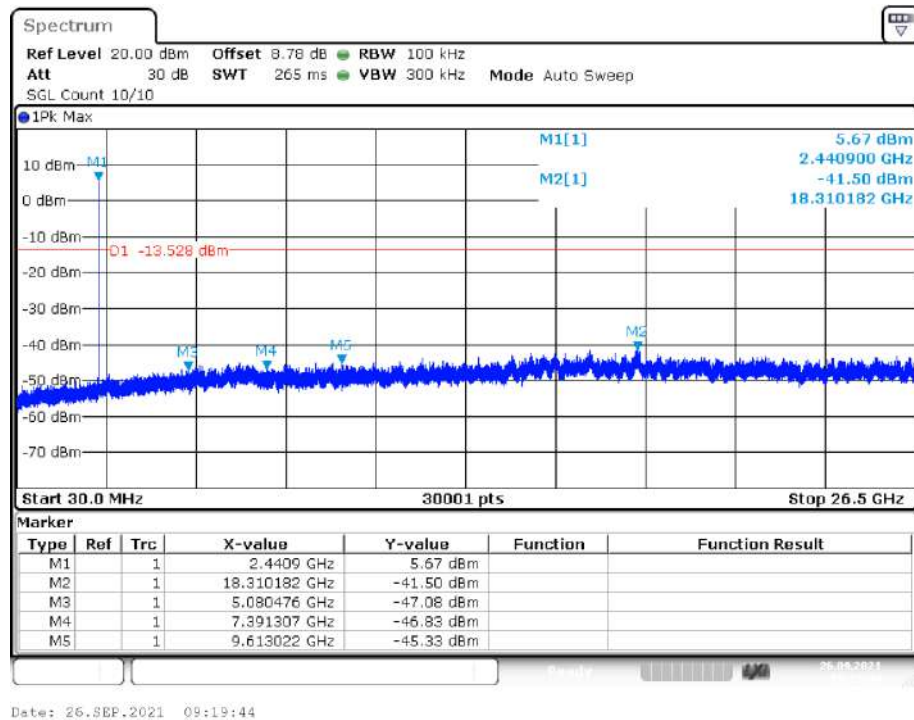
Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission



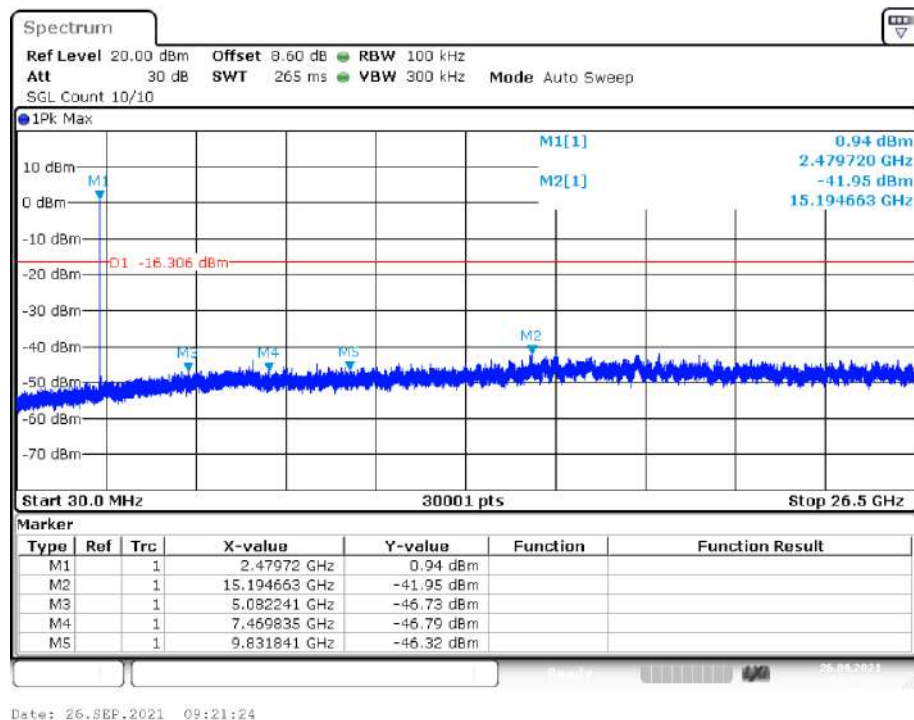
Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission



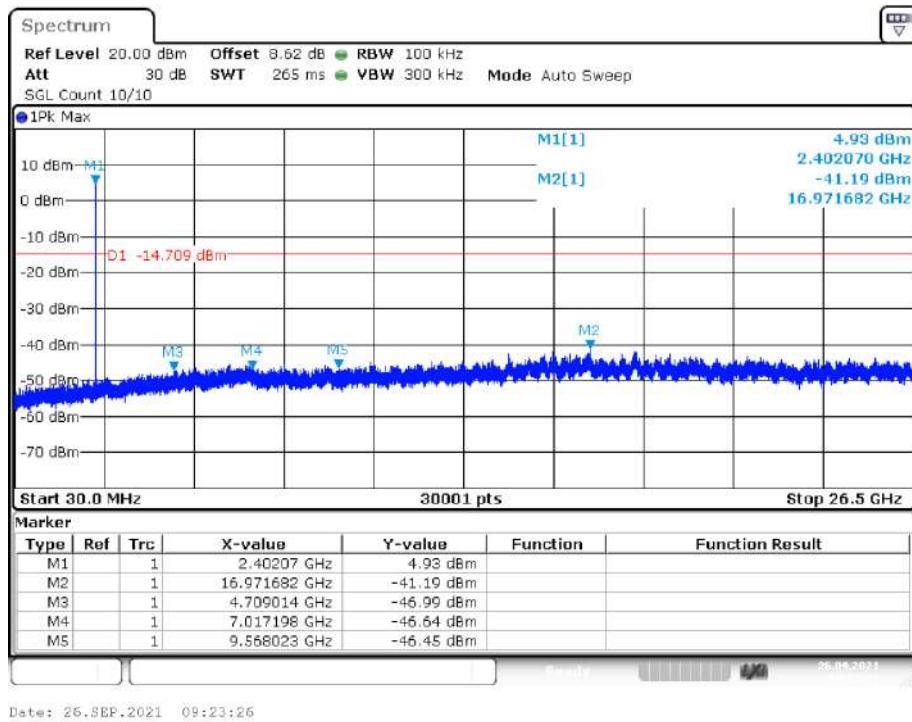
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission



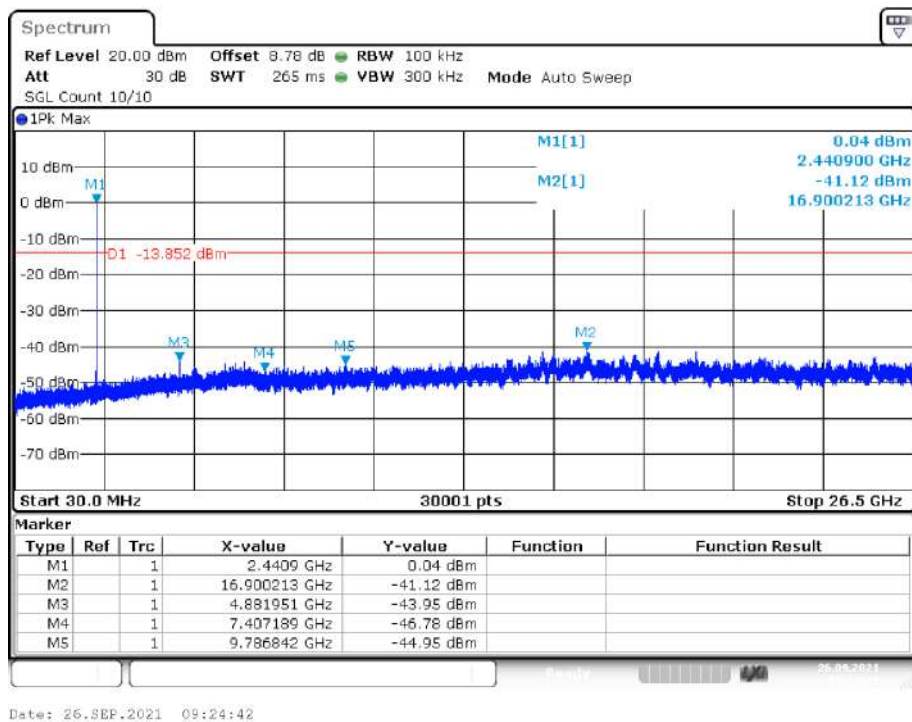
Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission



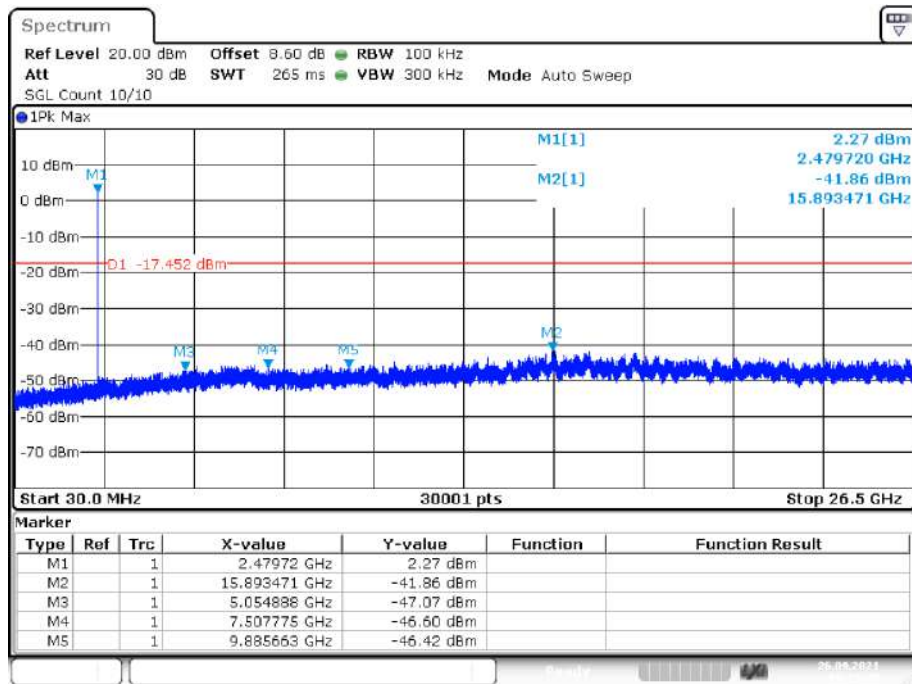
Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission



Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission



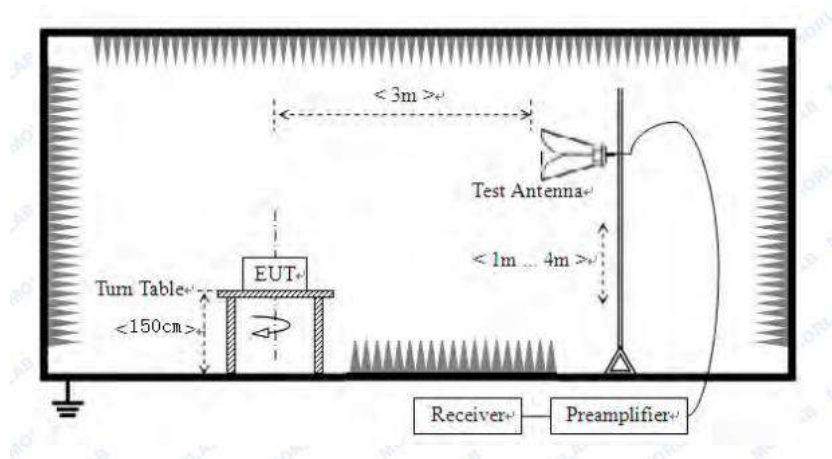
Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



Date: 26.SEP.2021 09:26:46

9. Band Edge Compliance

9.1. Block Diagram of Test Setup



9.2. Limit

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

9.3. Test Procedure

Refer to ANSI C 63.10, Clause 6.10.

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

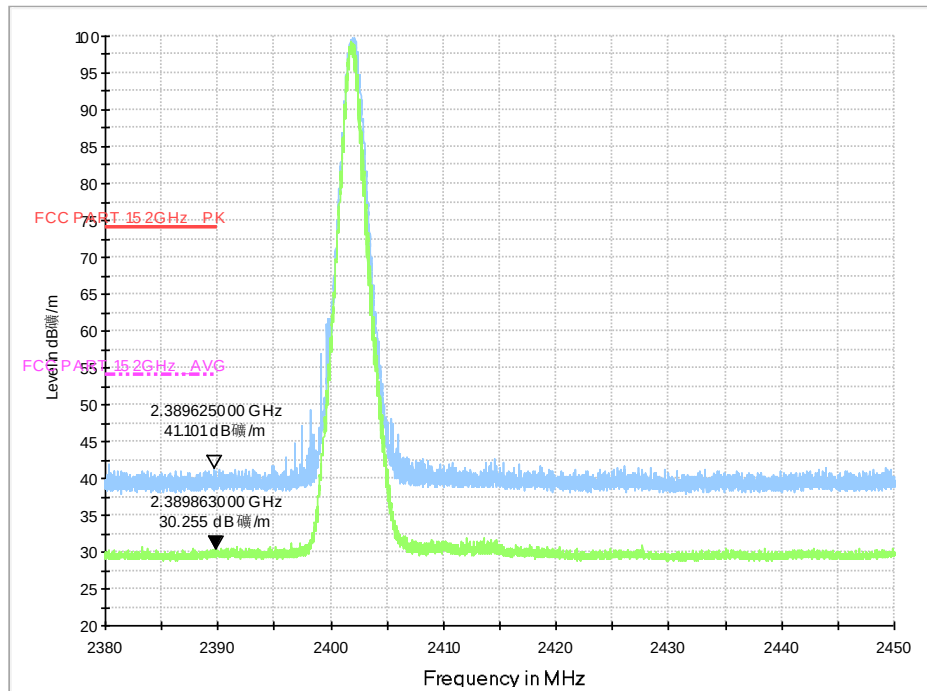
9.4. Test Result

PASS. (See below detailed test data)

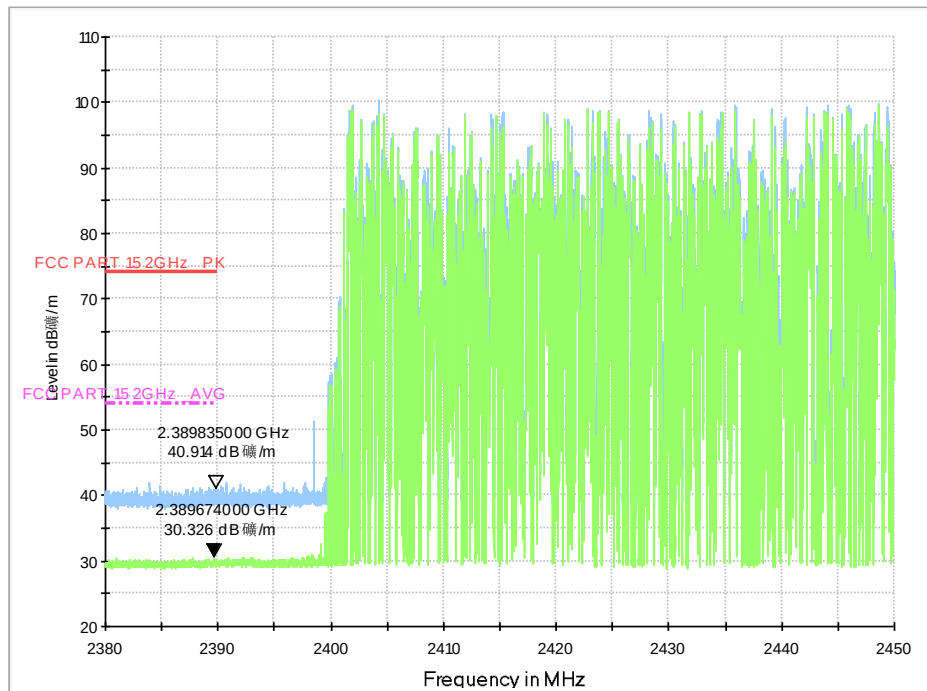
Radiated Method:

Test Mode:

GFSK-Low

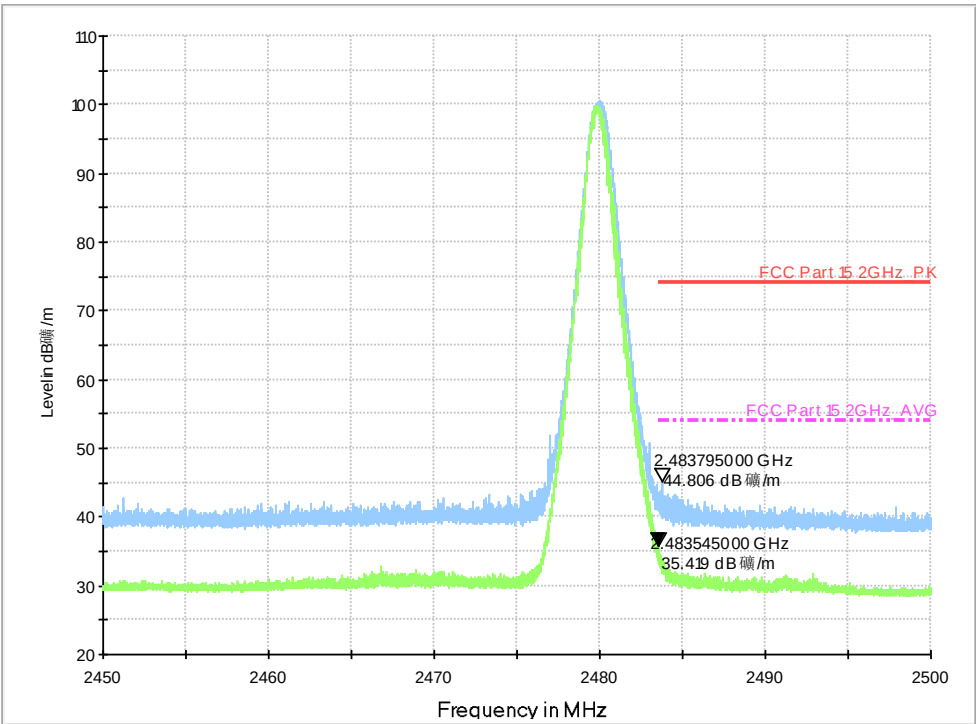


hopping-off

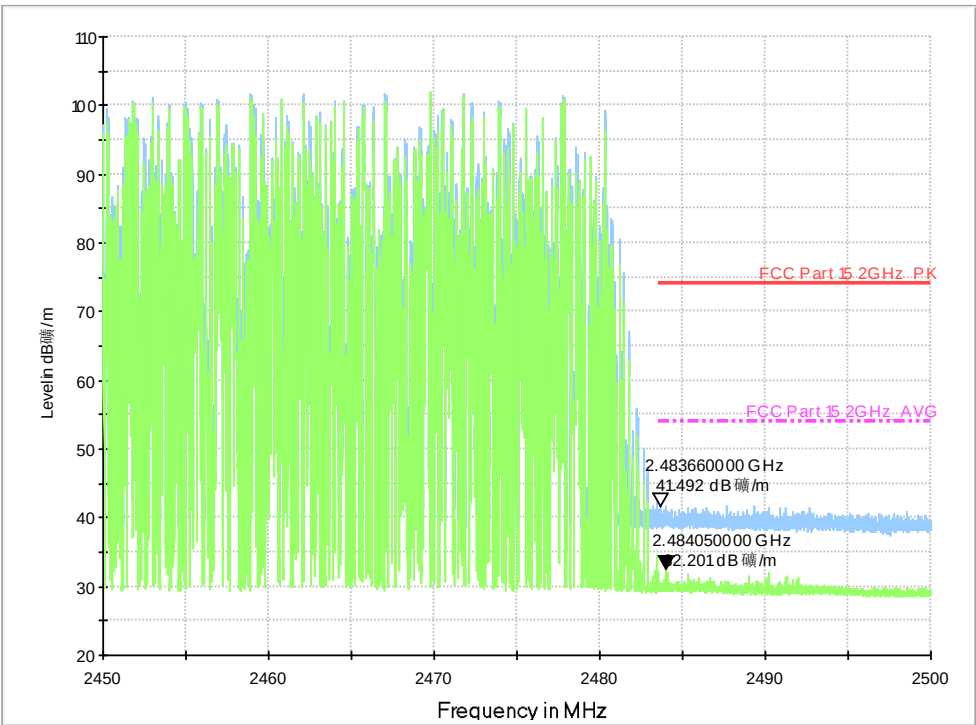


hopping-on

GFSK-High

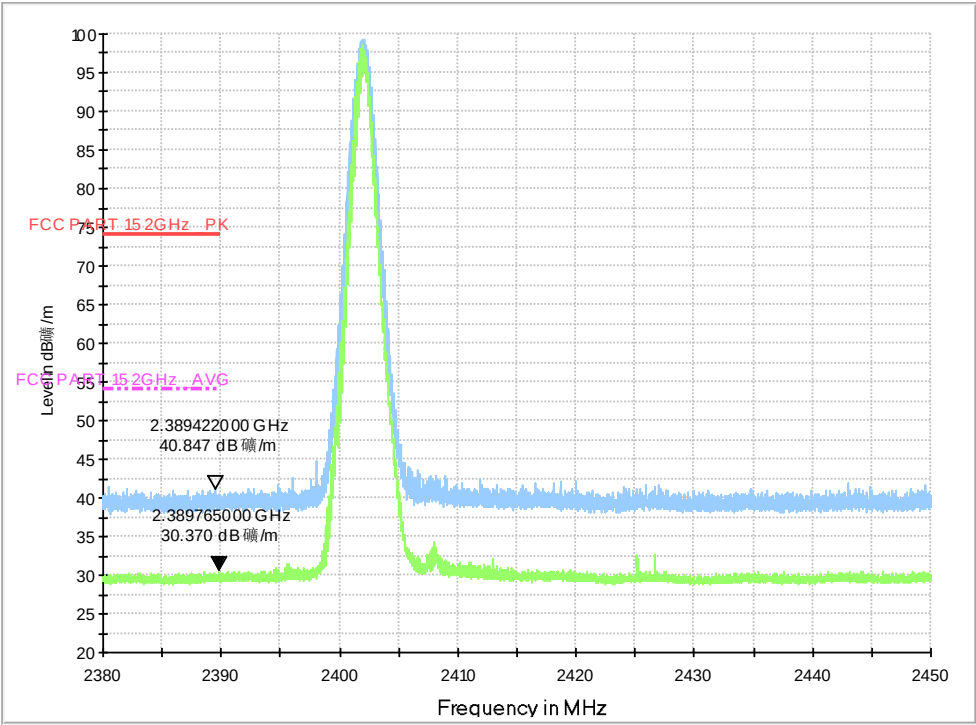


hopping-off

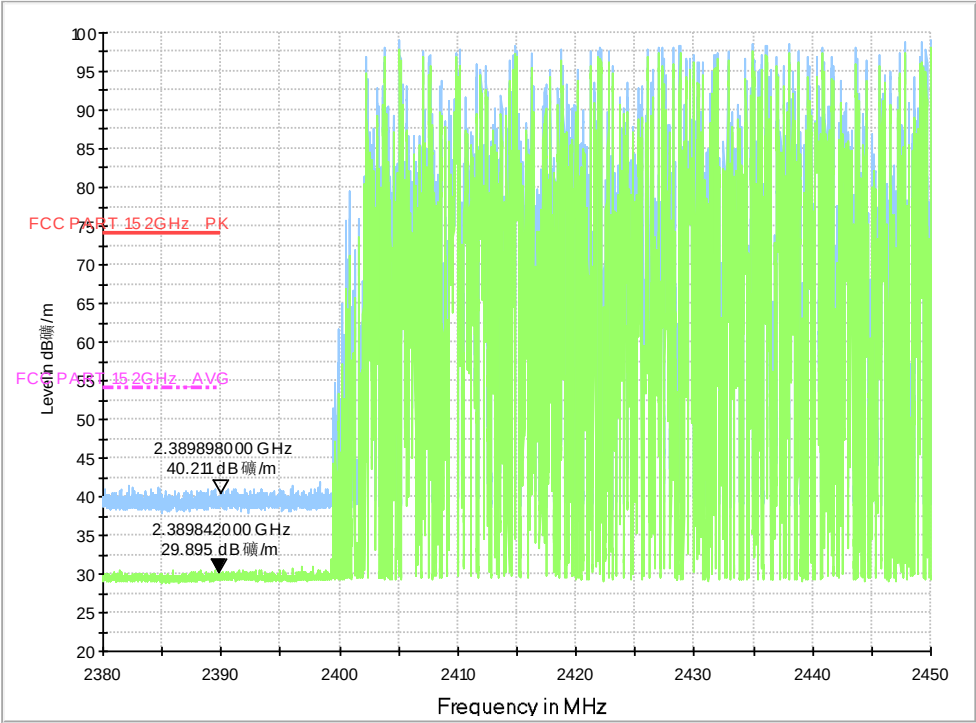


hopping-on

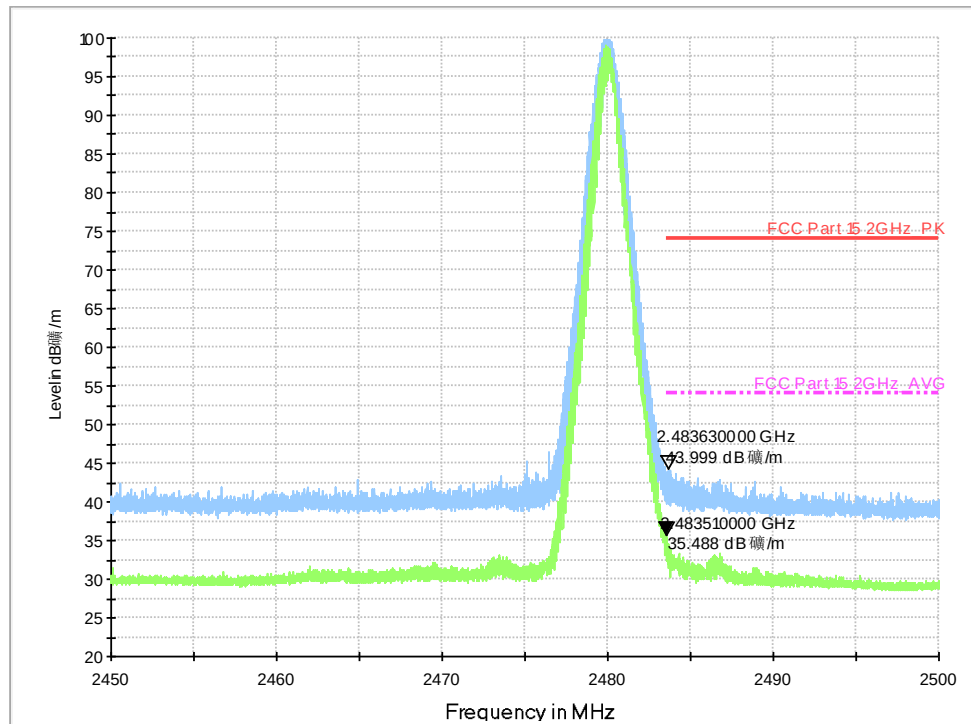
Test Mode: $\pi/4$ DQPSK-Low



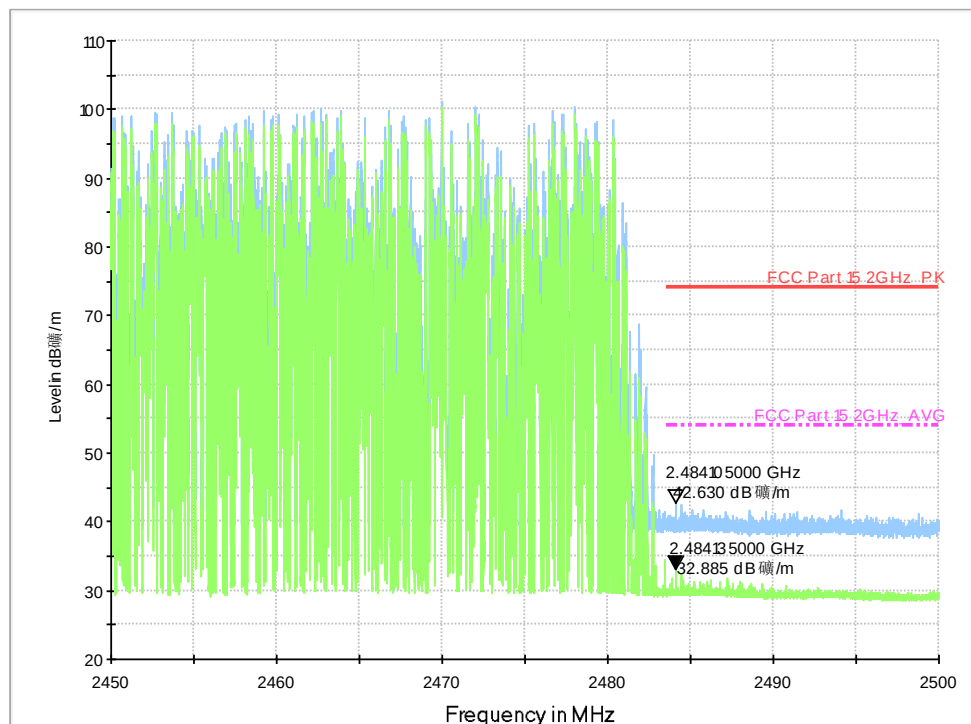
hopping-off



hopping-on

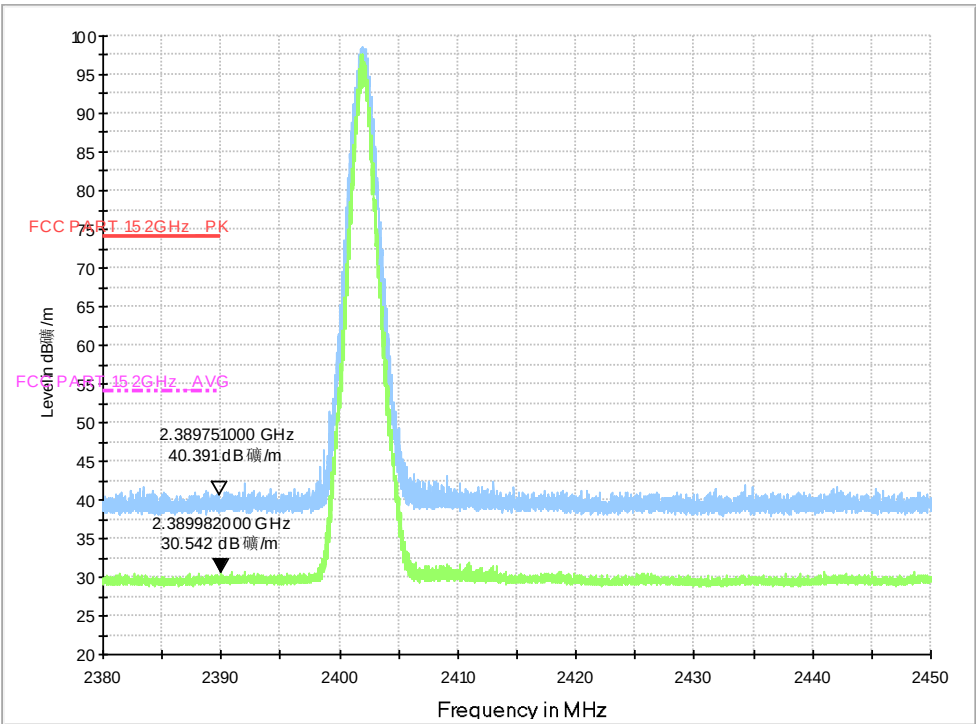
$\pi/4$ DQPSK-High

hopping-off

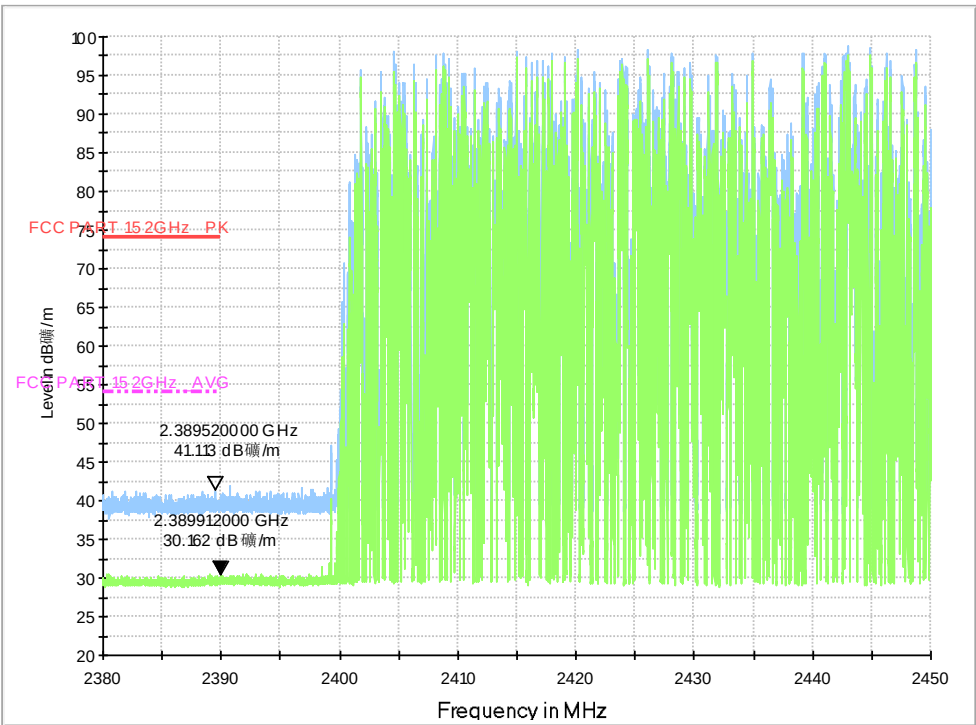


hopping-on

Test Mode: 8DPSK-Low

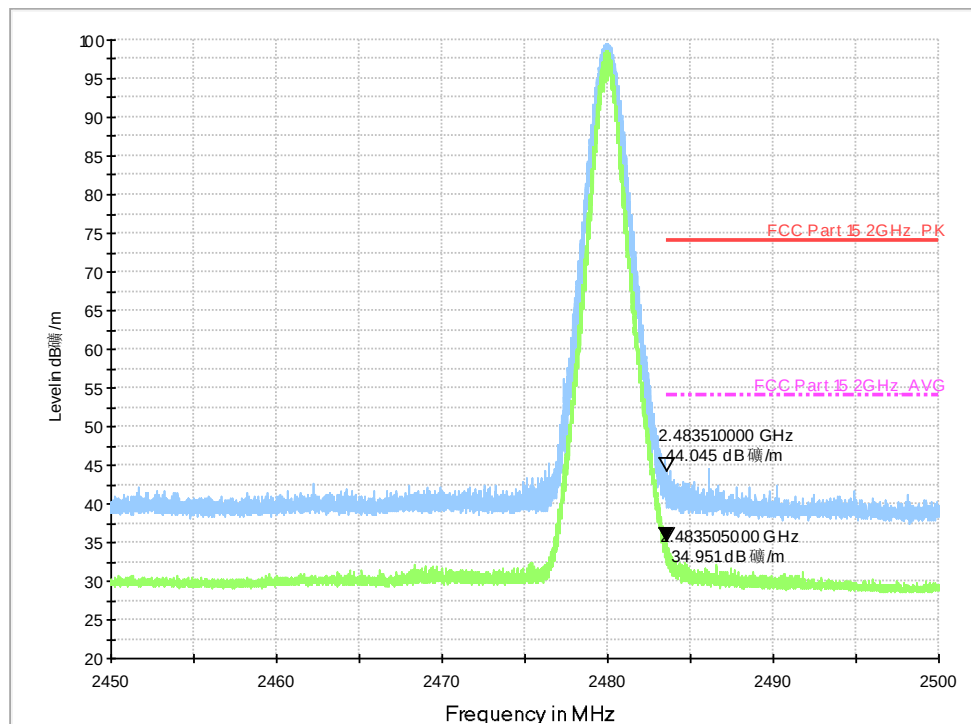


hopping-off

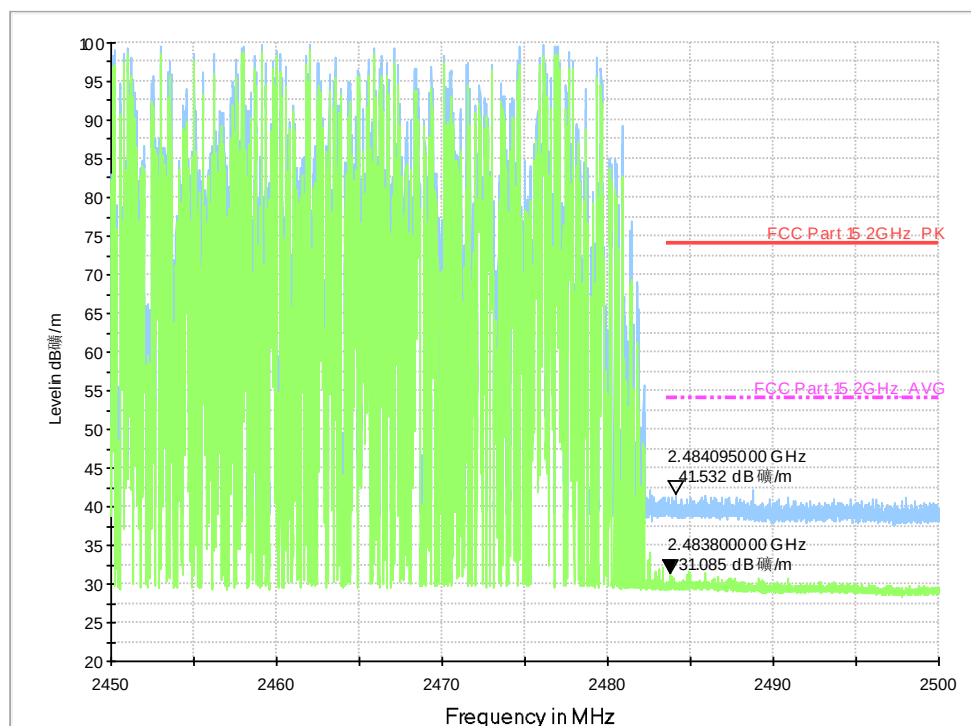


hopping-on

8DPSK-High



hopping-off



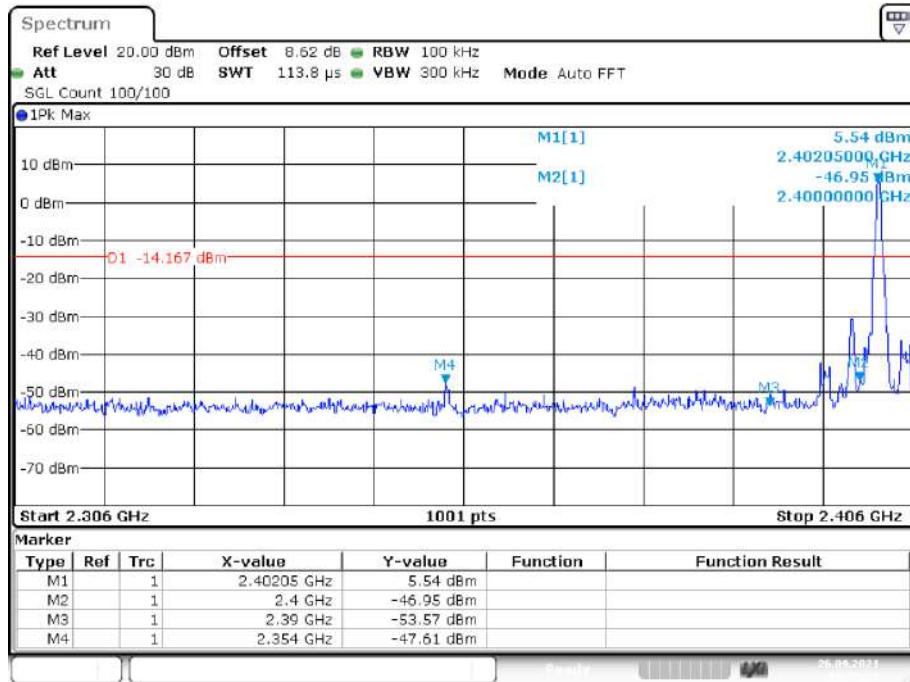
hopping-on

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

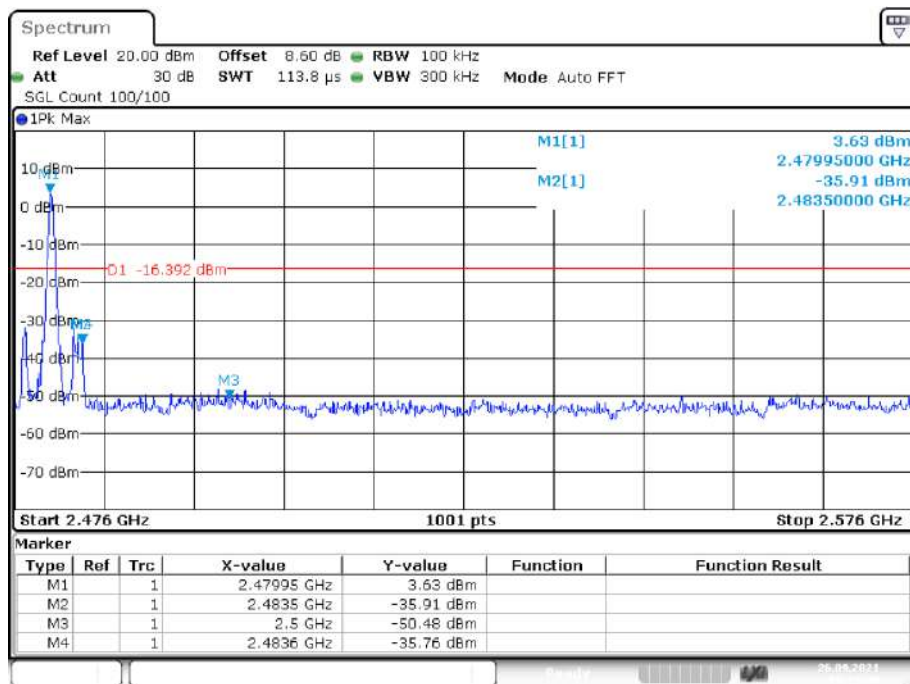
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Conducted Method

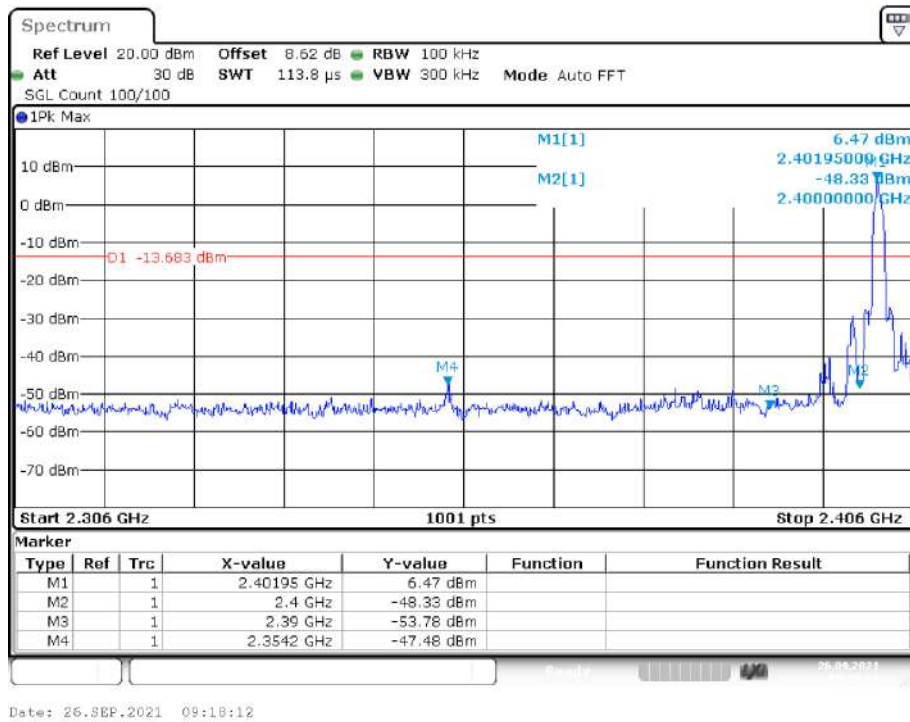
Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Emission



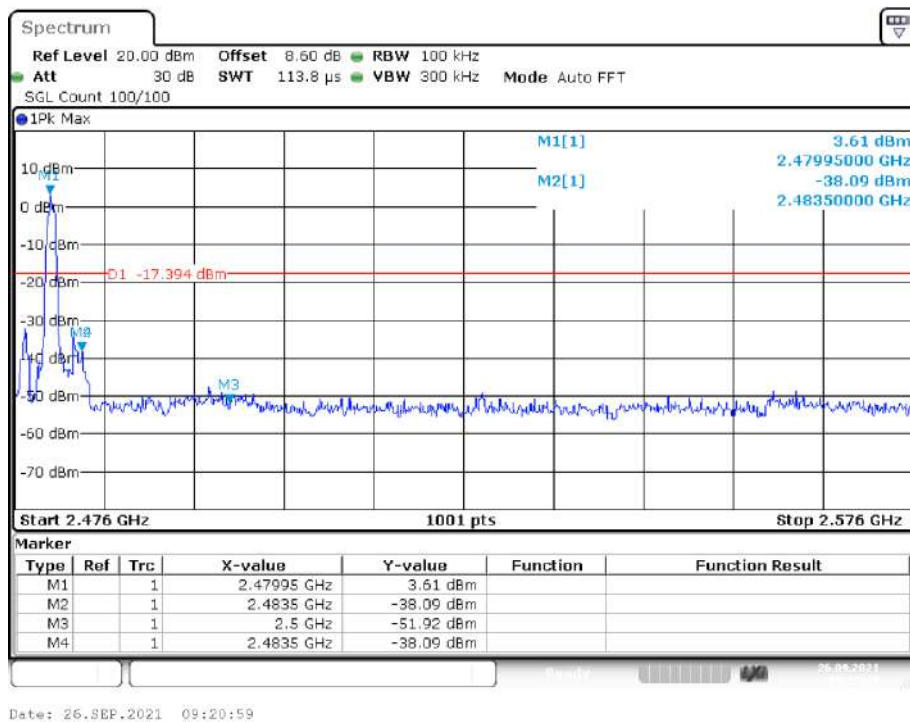
Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Emission



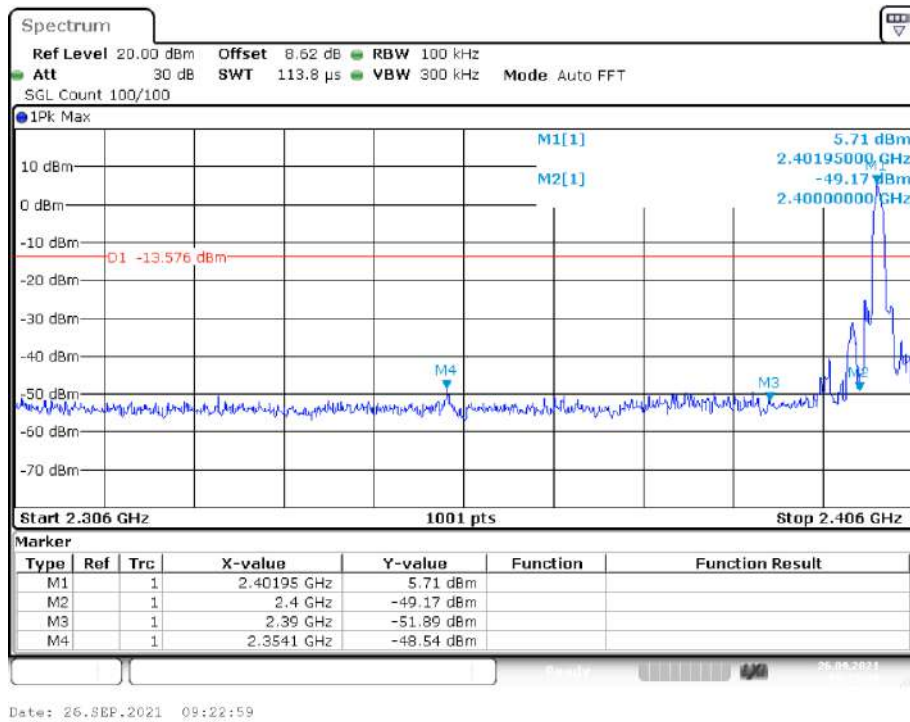
Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Emission



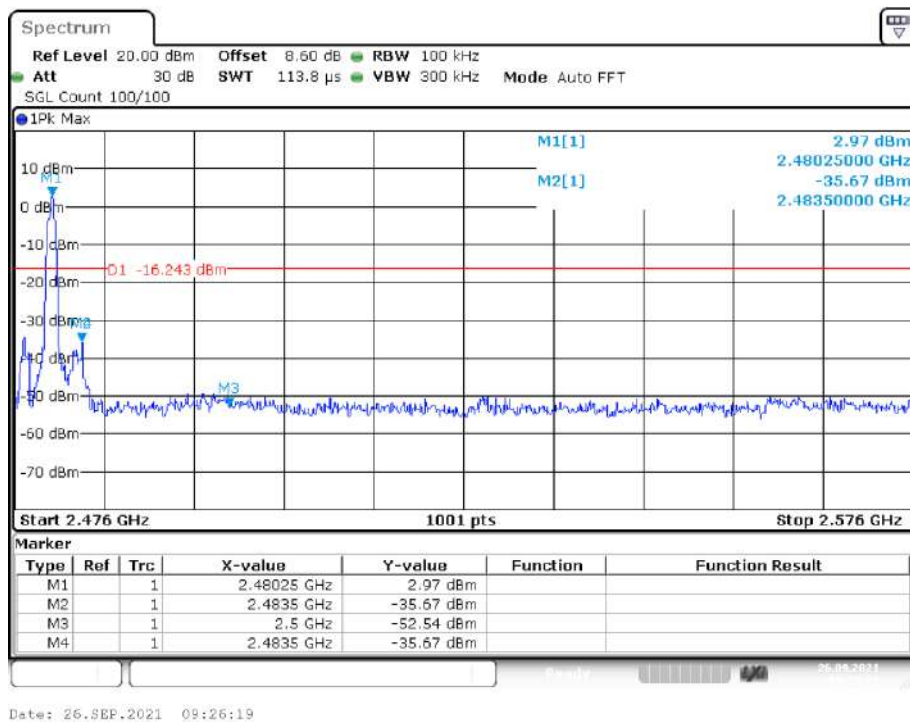
Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Emission



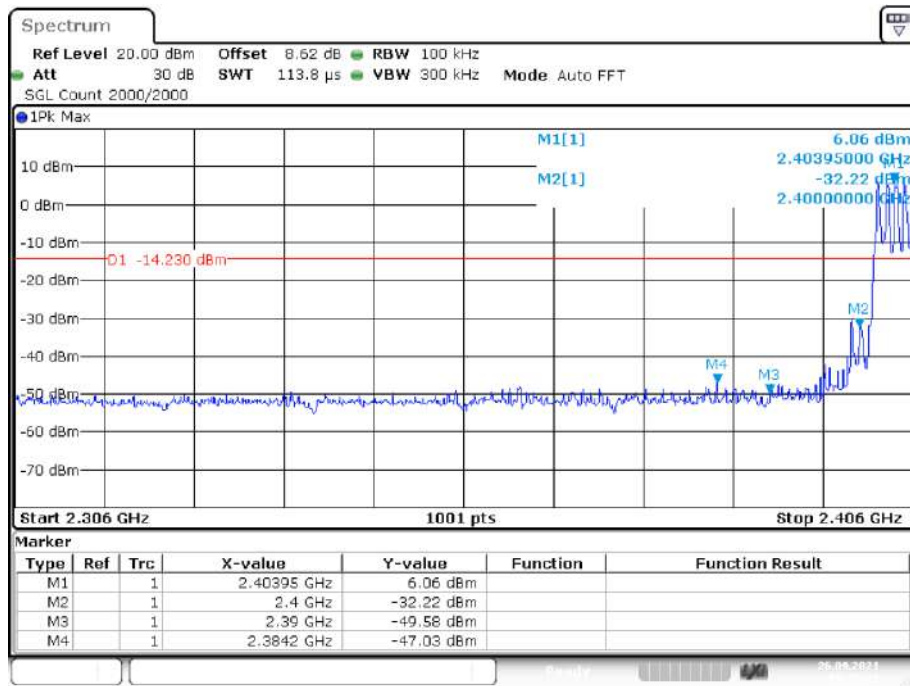
Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Emission



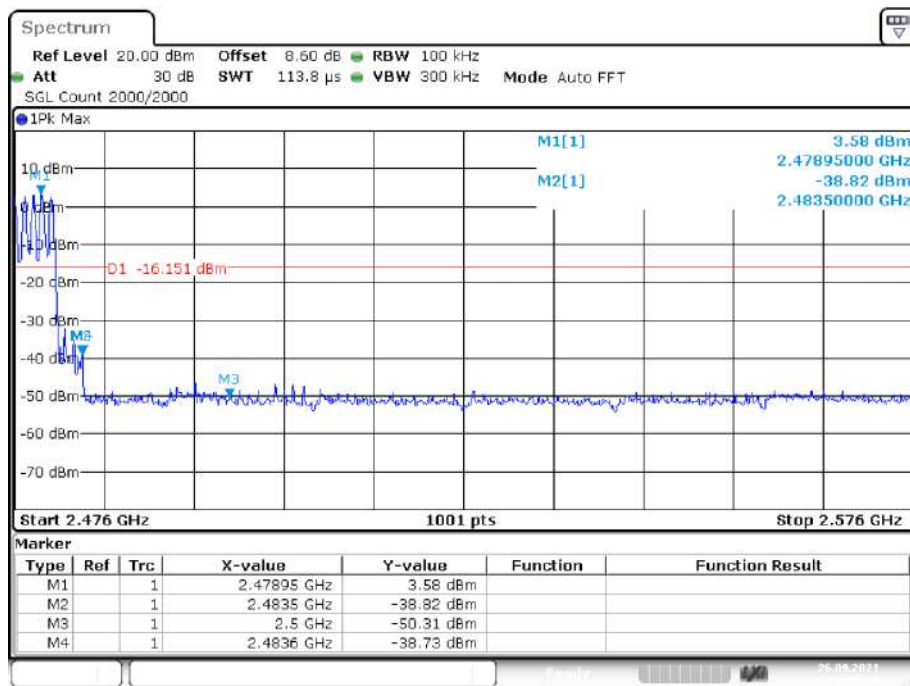
Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Emission



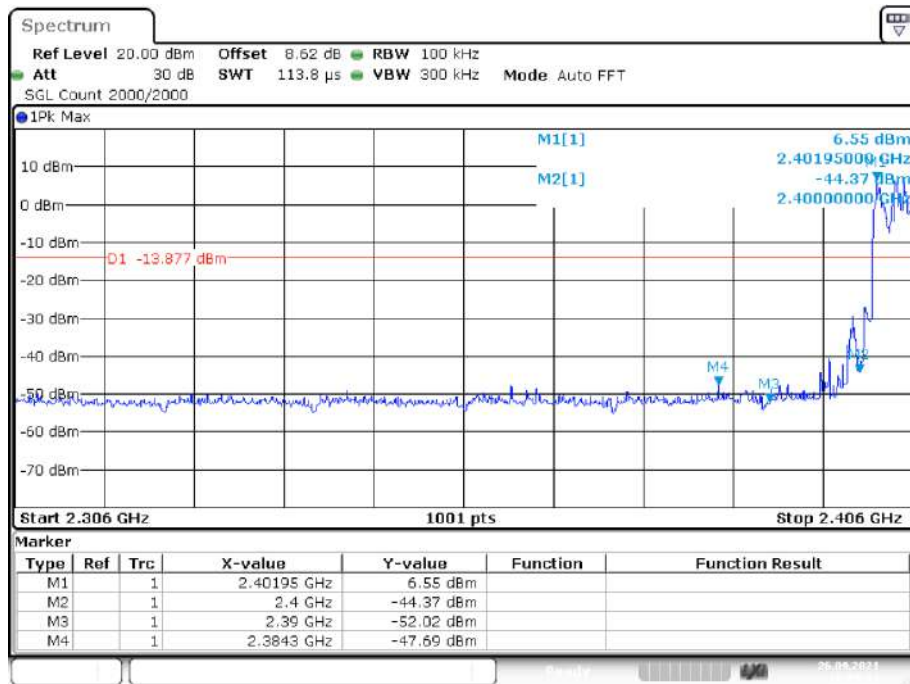
Band Edge(Hopping) NVNT 1-DH1 2402MHz Ant1 Hopping Emission



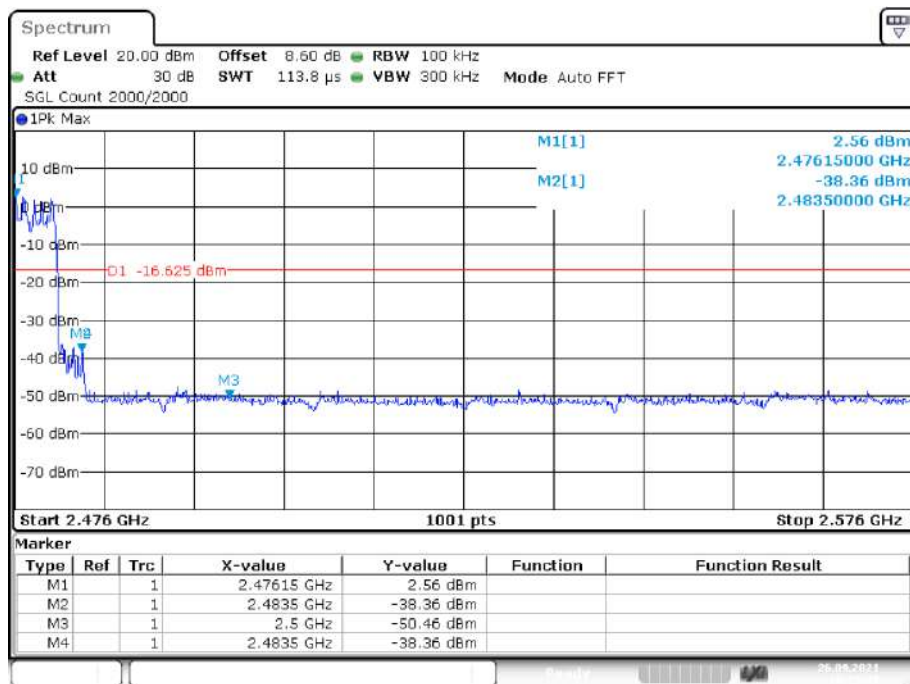
Band Edge(Hopping) NVNT 1-DH1 2480MHz Ant1 Hopping Emission



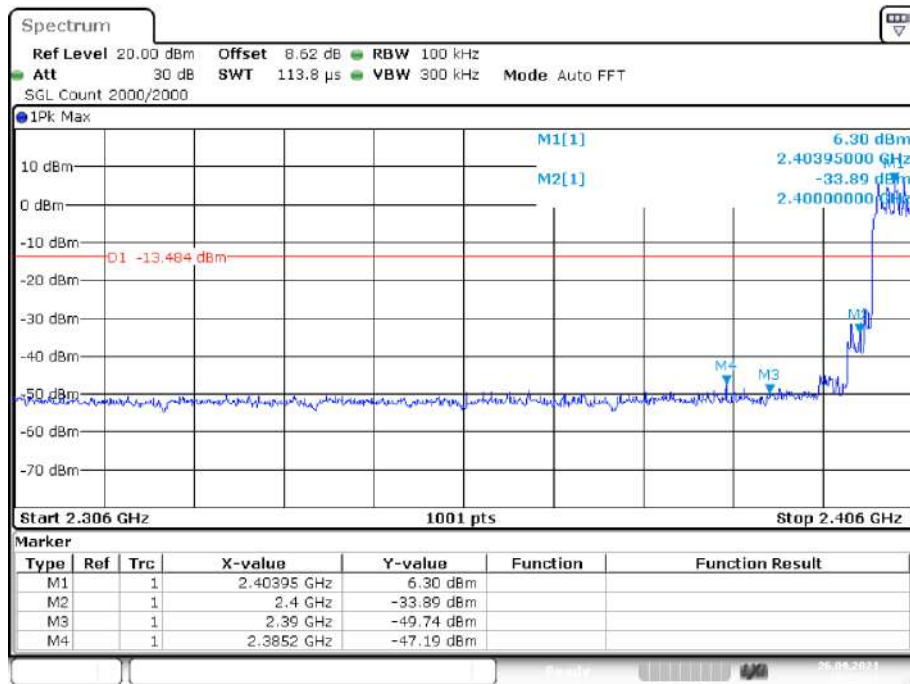
Band Edge(Hopping) NVNT 2-DH1 2402MHz Ant1 Hopping Emission



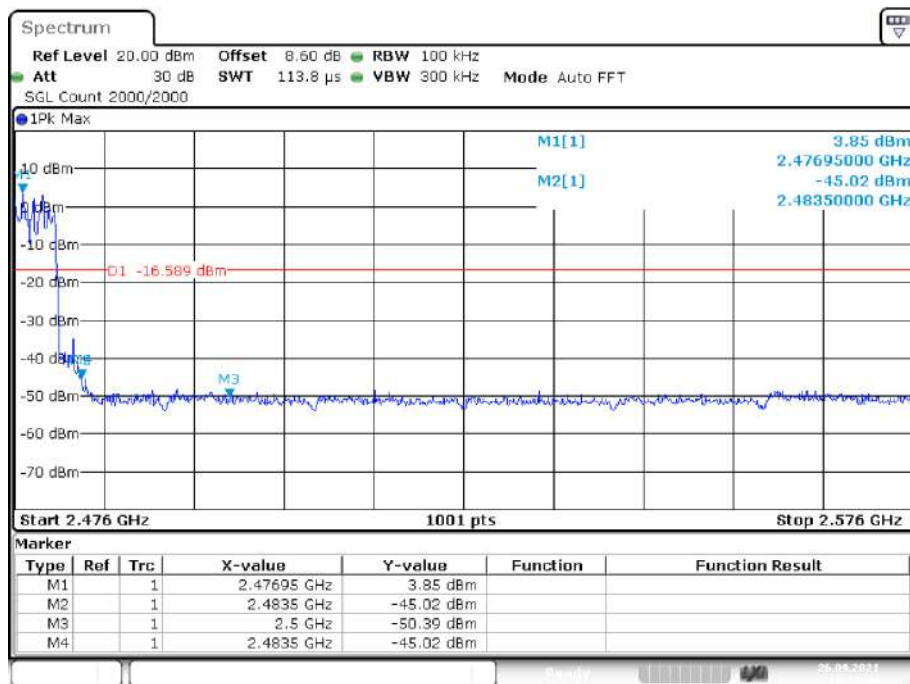
Band Edge(Hopping) NVNT 2-DH1 2480MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 3-DH1 2402MHz Ant1 Hopping Emission

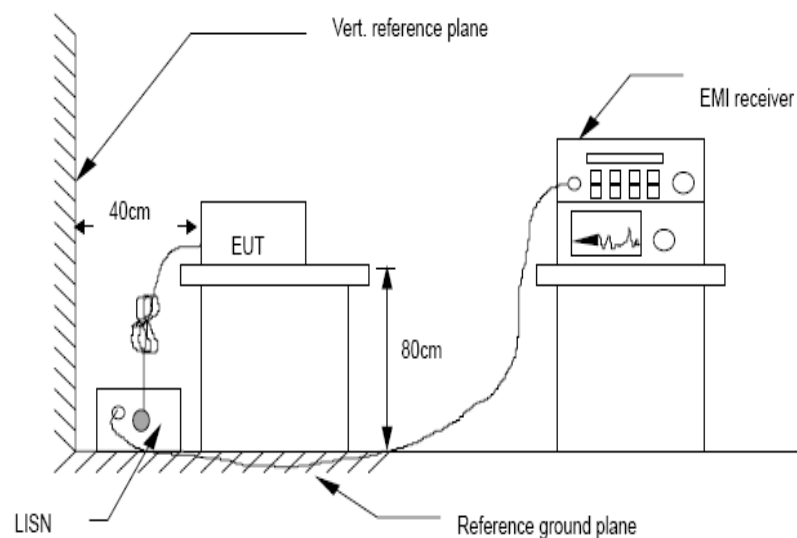


Band Edge(Hopping) NVNT 3-DH1 2480MHz Ant1 Hopping Emission



10. Power Line Conducted Emissions

10.1. Block Diagram of Test Setup



10.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μ V)	Average Level dB(μ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

10.3. Test Procedure

- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013on conducted Emission test.
- (4) The bandwidth of test receiver is set at 10KHz.

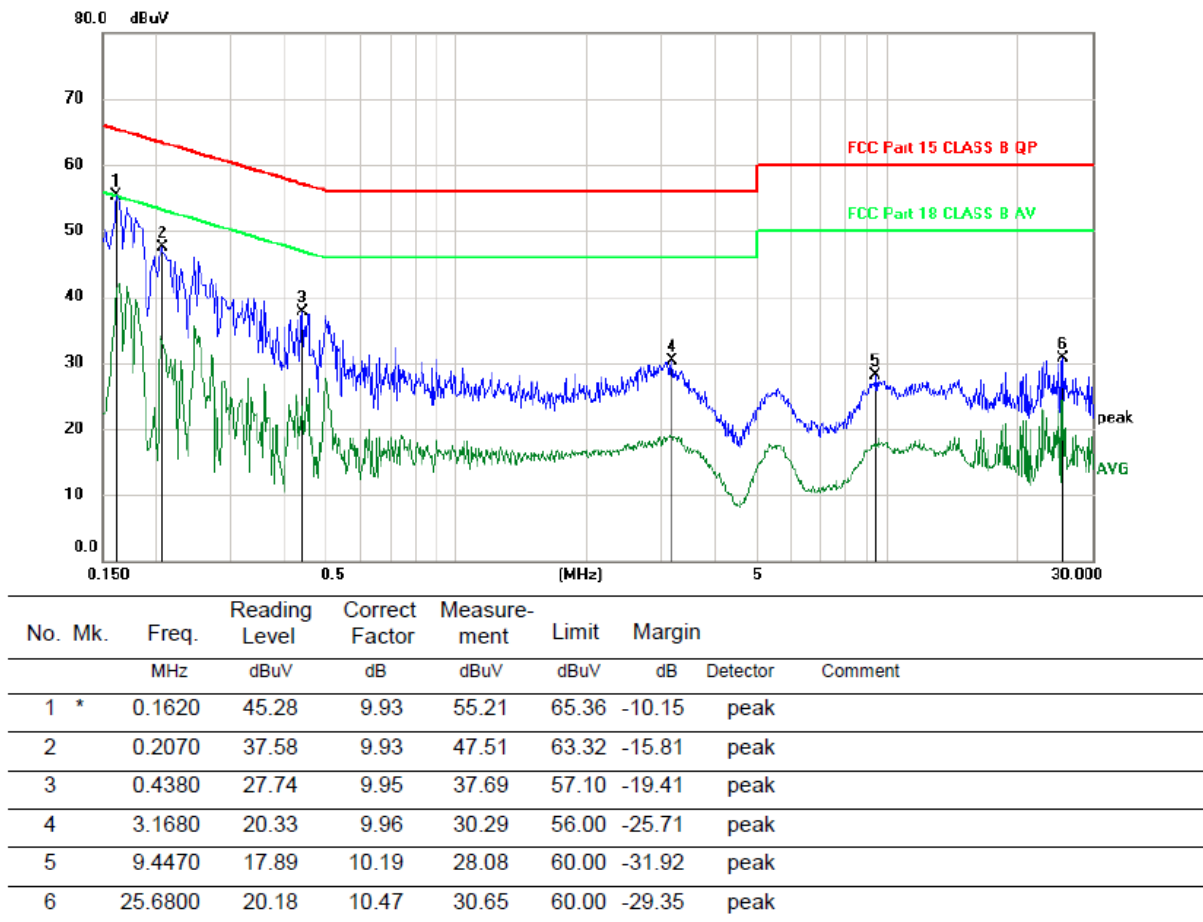
(5) The frequency range from 150 KHz to 30MHz is checked.

10.4.Test Result

PASS. (See below detailed test data)

Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:

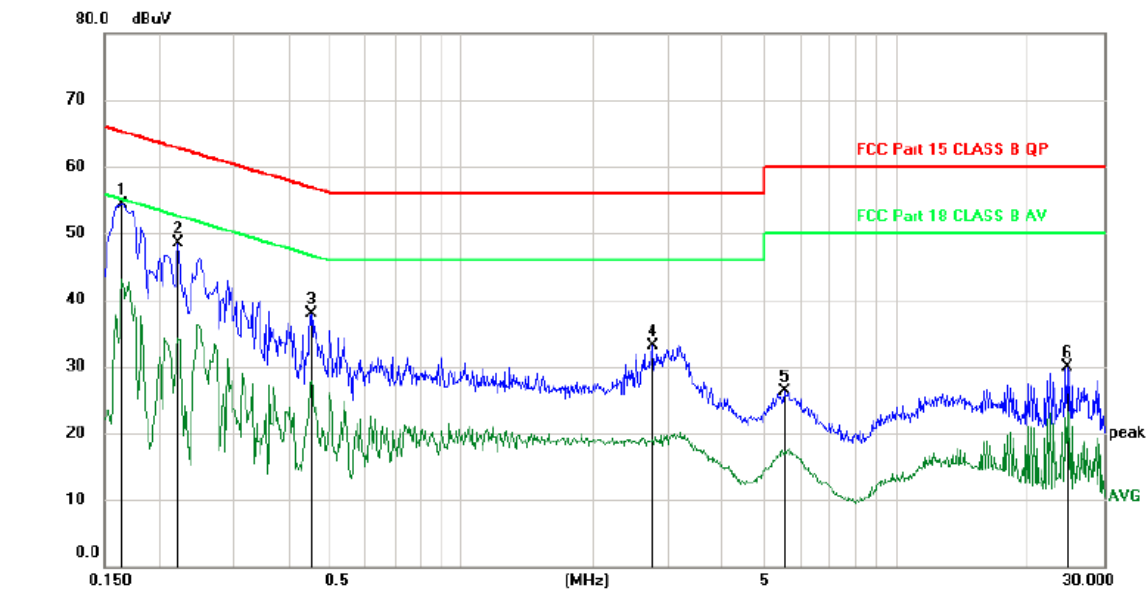


*:Maximum data x:Over limit !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV	dB	dBuV	dBuV	dB		
1	*	0.1650	44.37	9.93	54.30	65.21	-10.91	peak	
2		0.2220	38.58	9.94	48.52	62.74	-14.22	peak	
3		0.4500	27.94	9.95	37.89	56.88	-18.99	peak	
4		2.7510	23.16	9.93	33.09	56.00	-22.91	peak	
5		5.5230	16.28	10.06	26.34	60.00	-33.66	peak	
6		24.7260	19.52	10.45	29.97	60.00	-30.03	peak	

*:Maximum data x:Over limit !:over margin

(Reference Only)

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Remark: All modes have been tested, and only worst data of 8-DPSK mode, Channel 2480MHz (AC 120V/60Hz) was listed in this report.

11. Antenna Requirements

11.1. Limit

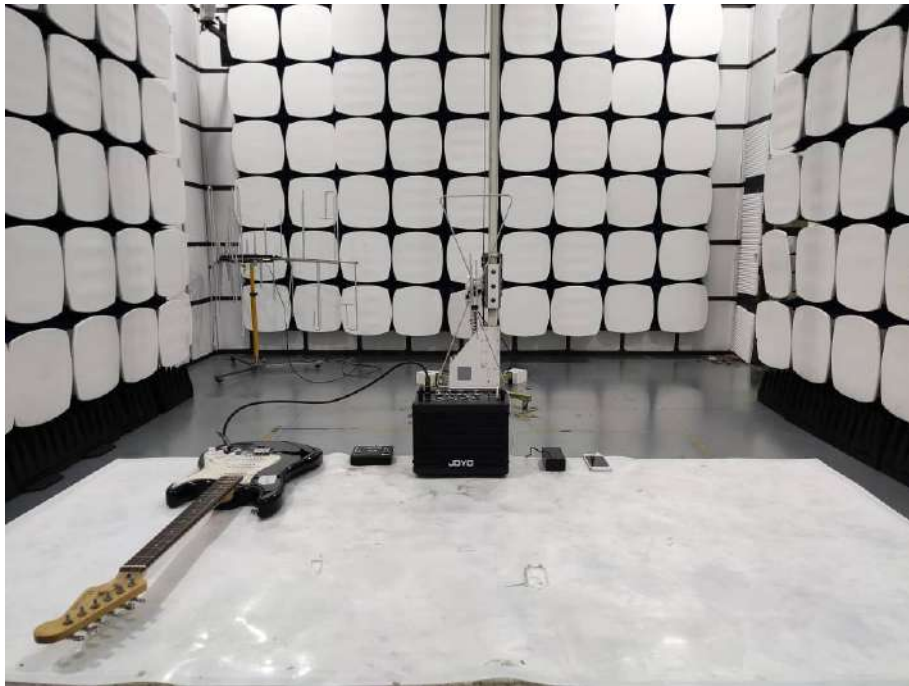
For intentional device, according to FCC 47 CFR Section 15.203 and RSS-GEN, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2. Result

The EUT antenna is internal antenna. It complies with the standard requirement.

12.Photos Of Test Setup

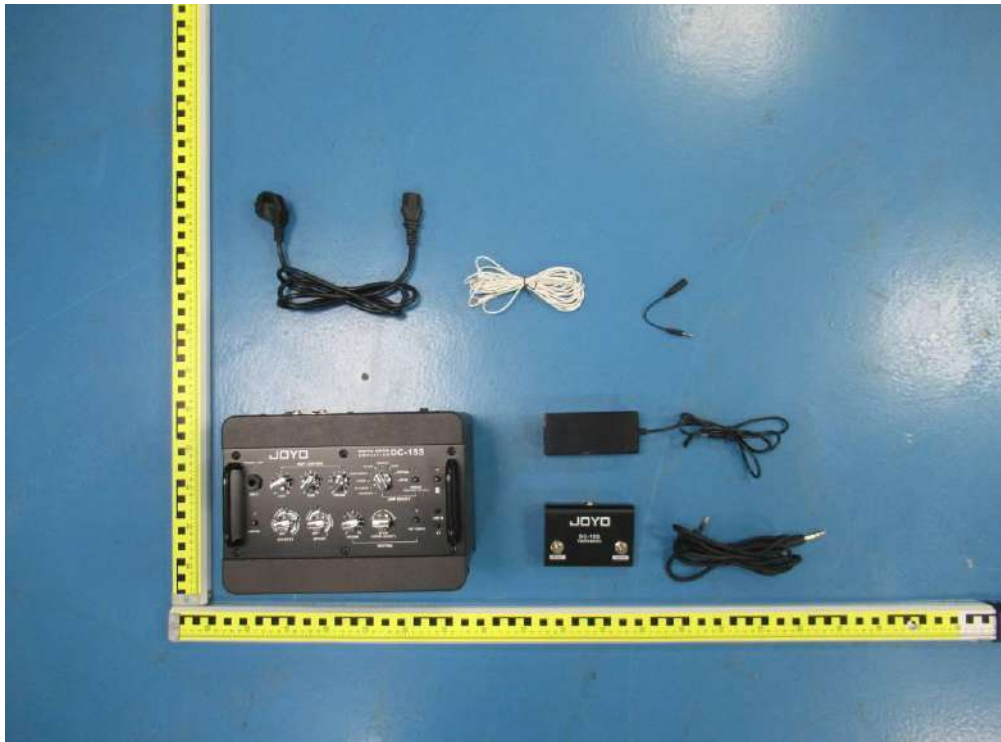
12.1.Photos of Radiated emission



12.2.Photos of Power Line Conducted Emission Test



13. Photos Of Eut

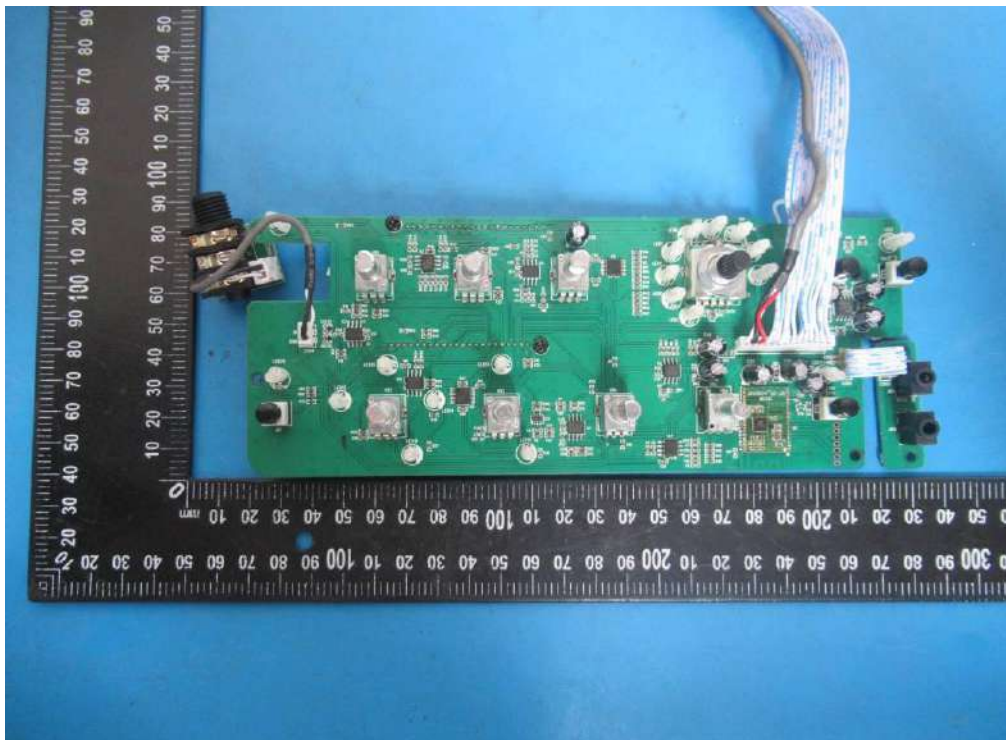
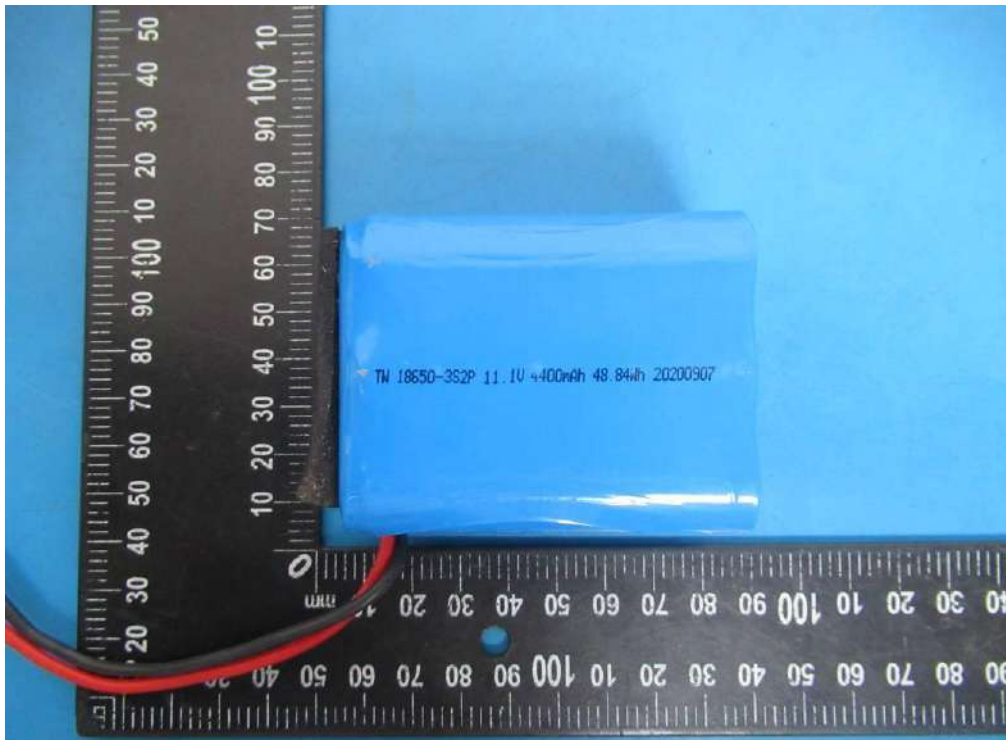


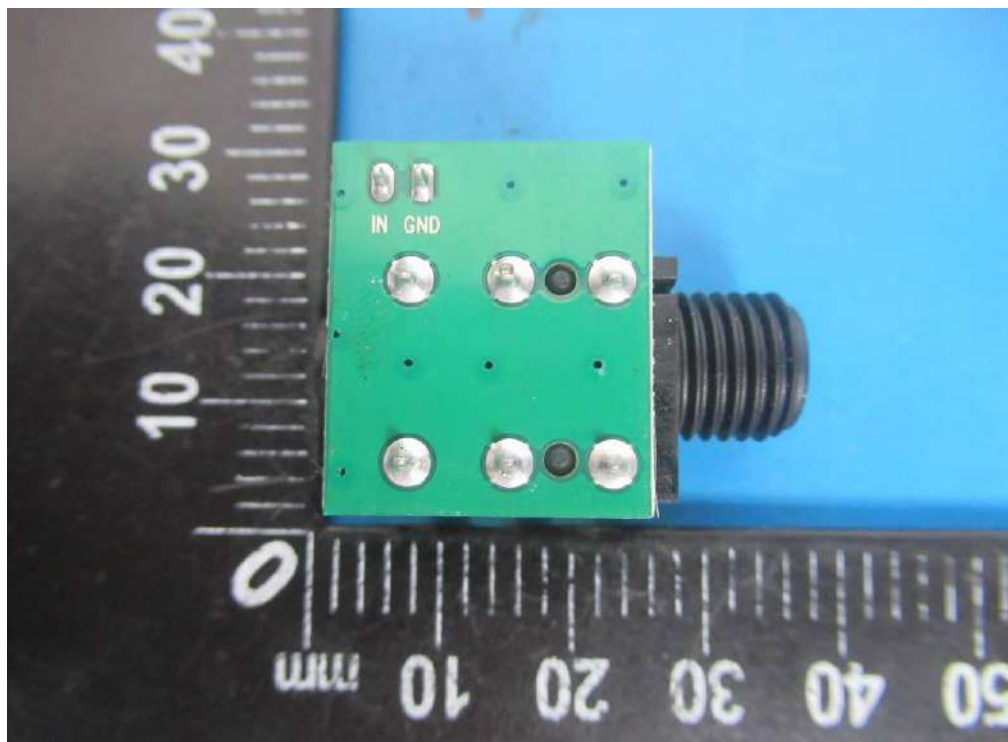
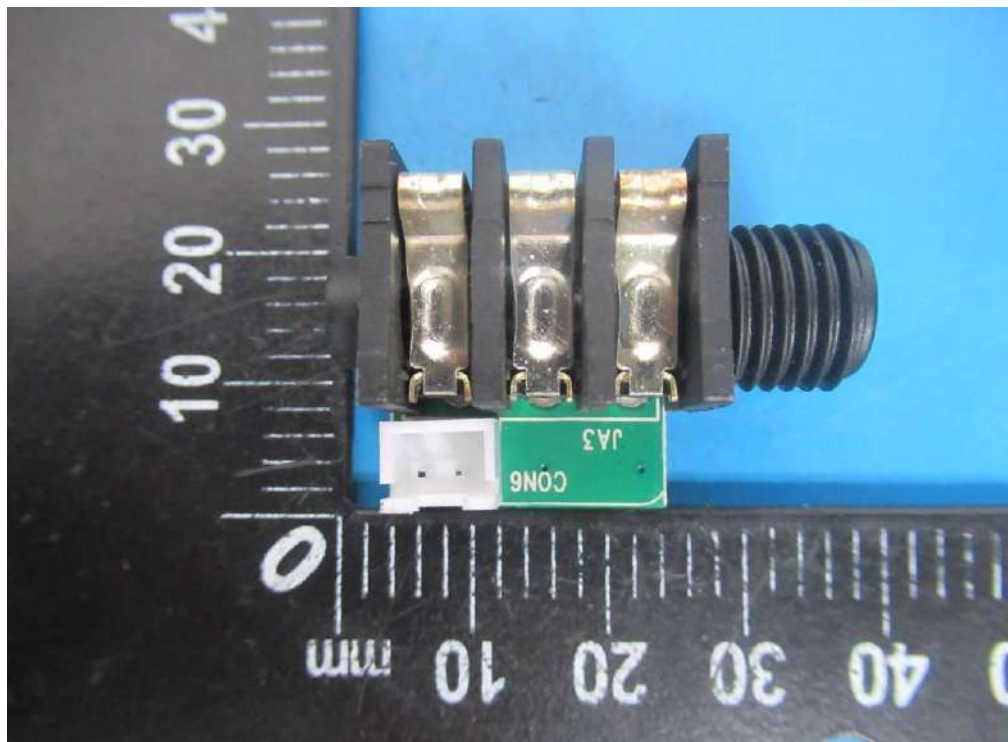


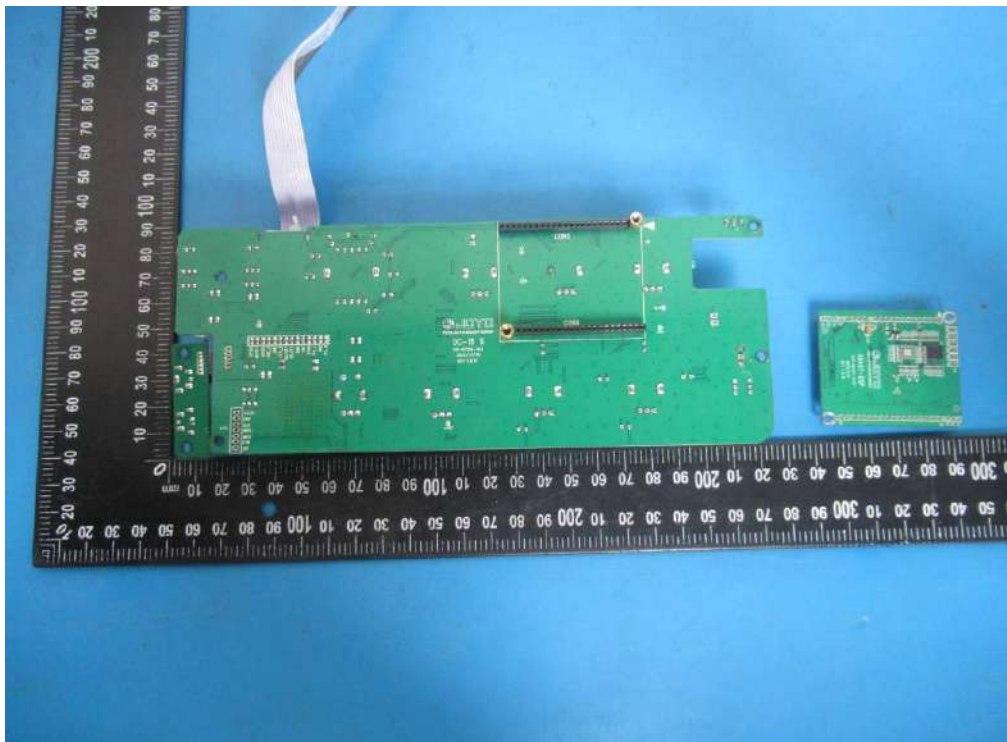


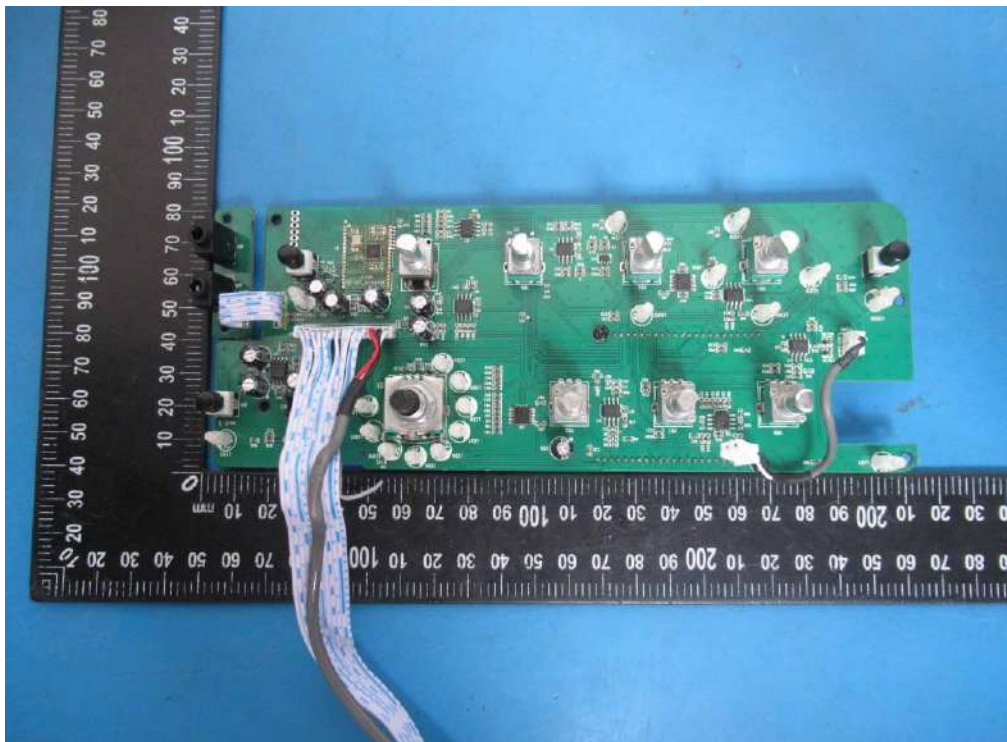
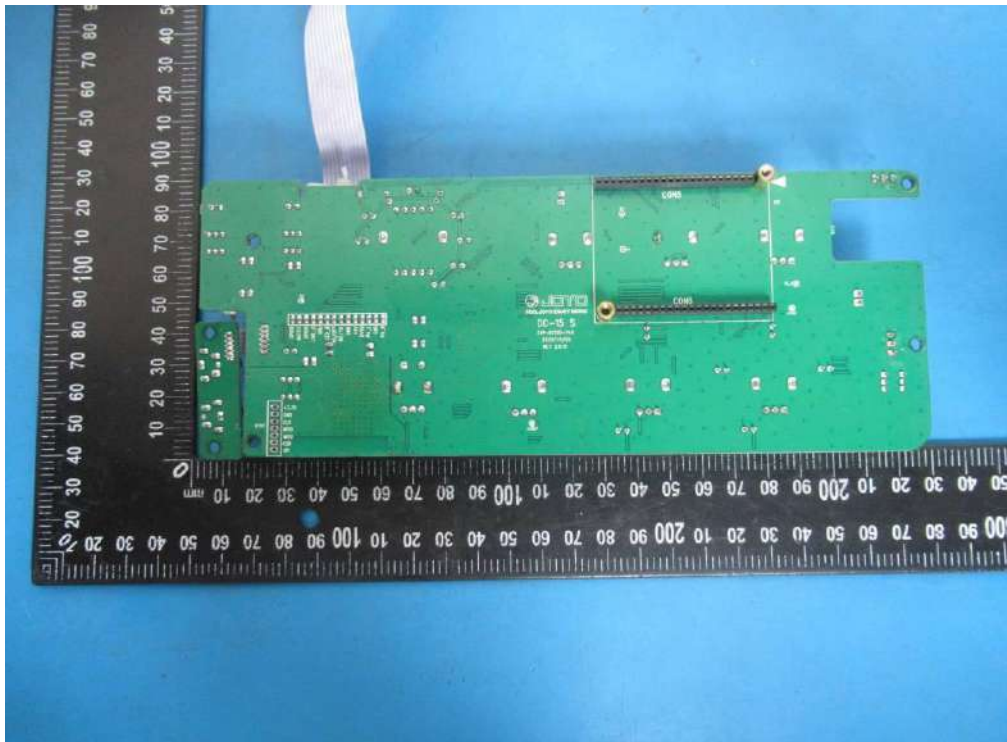


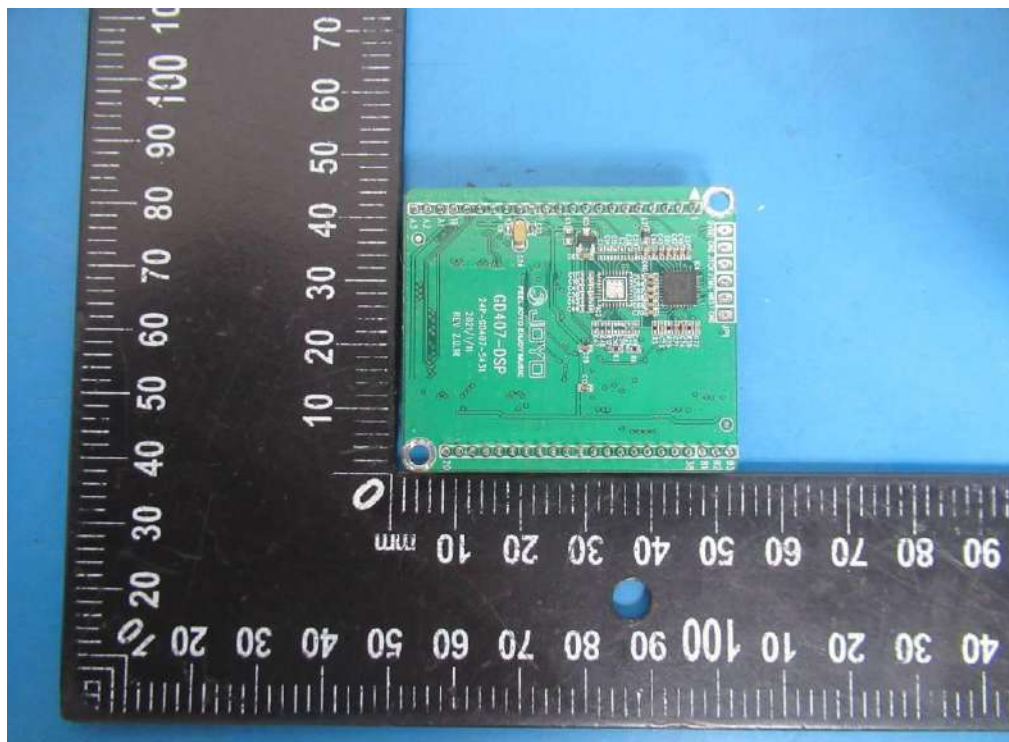
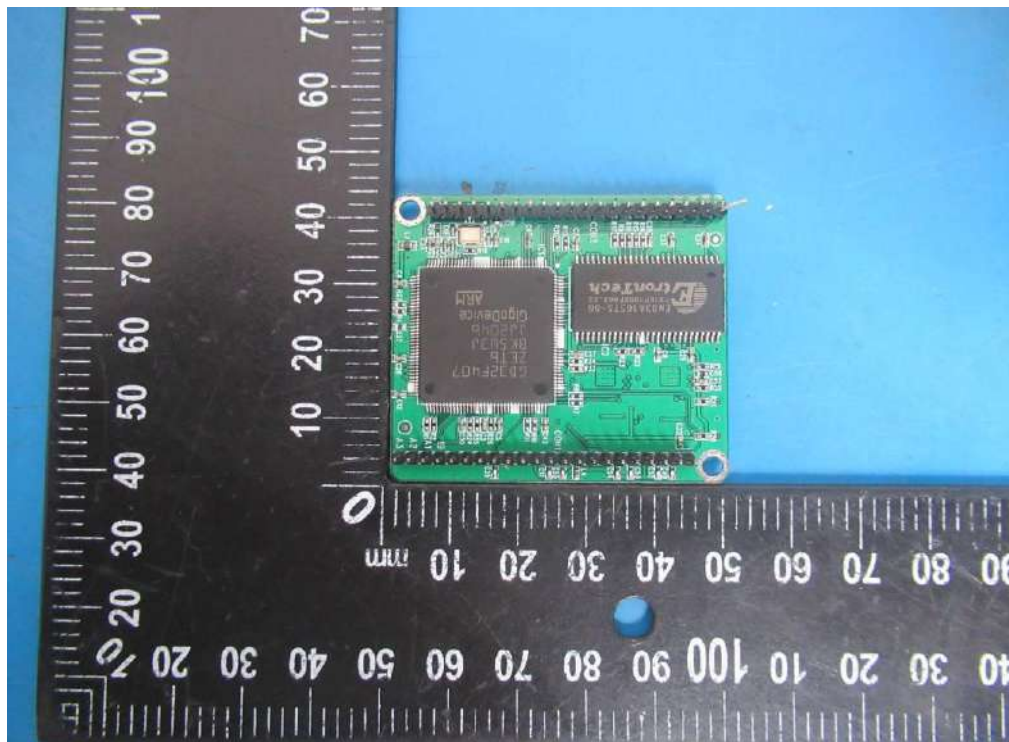


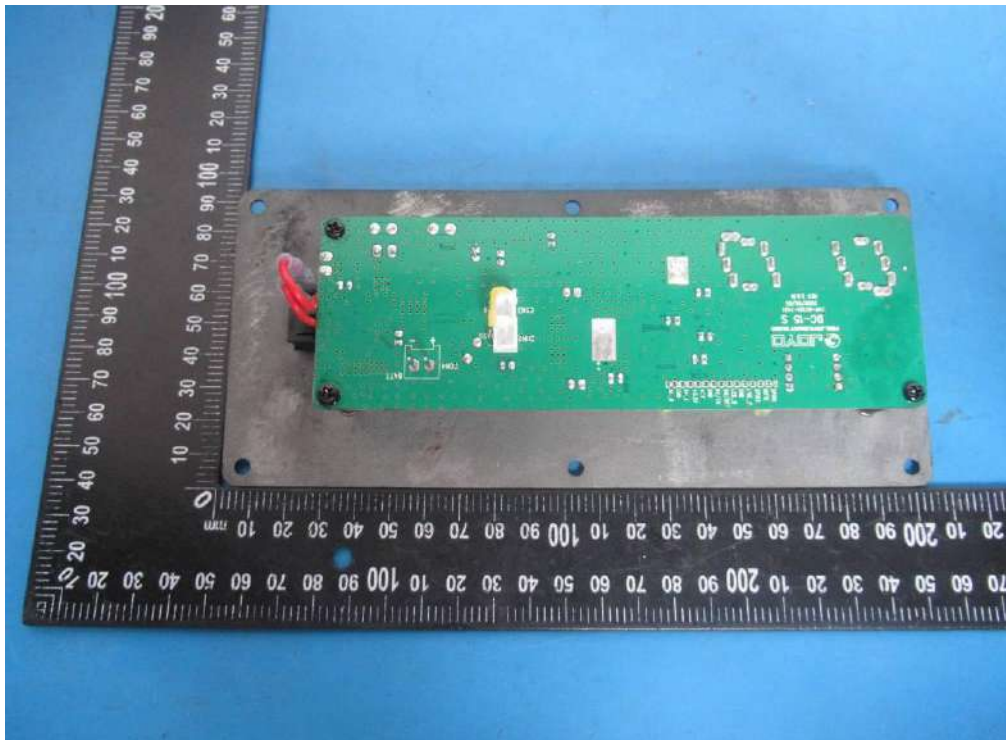


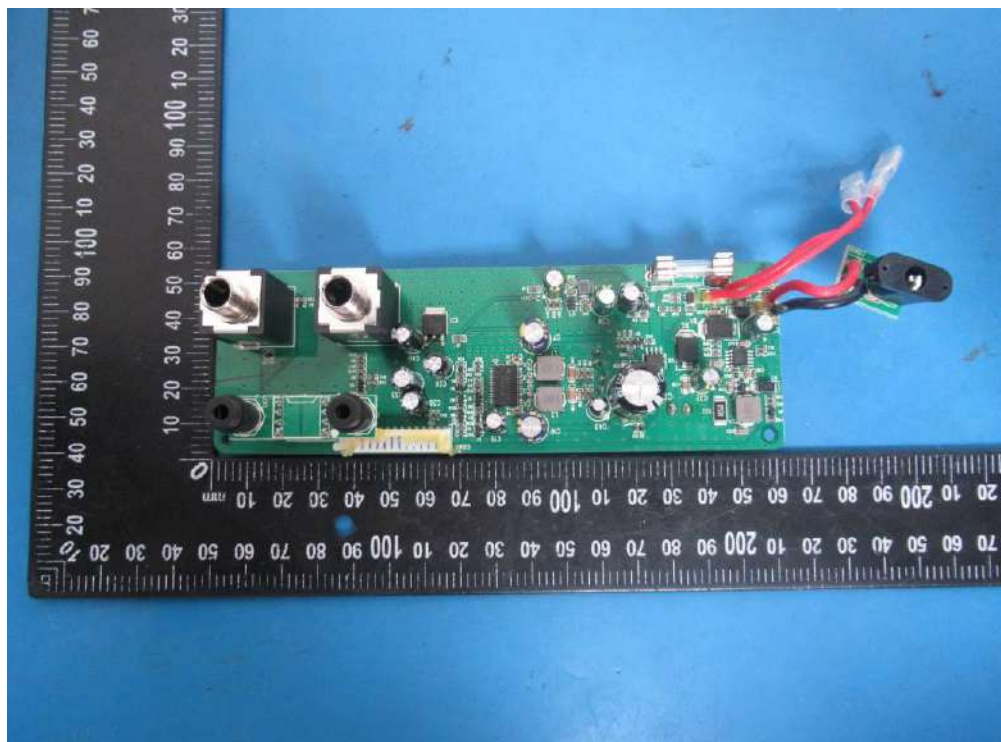


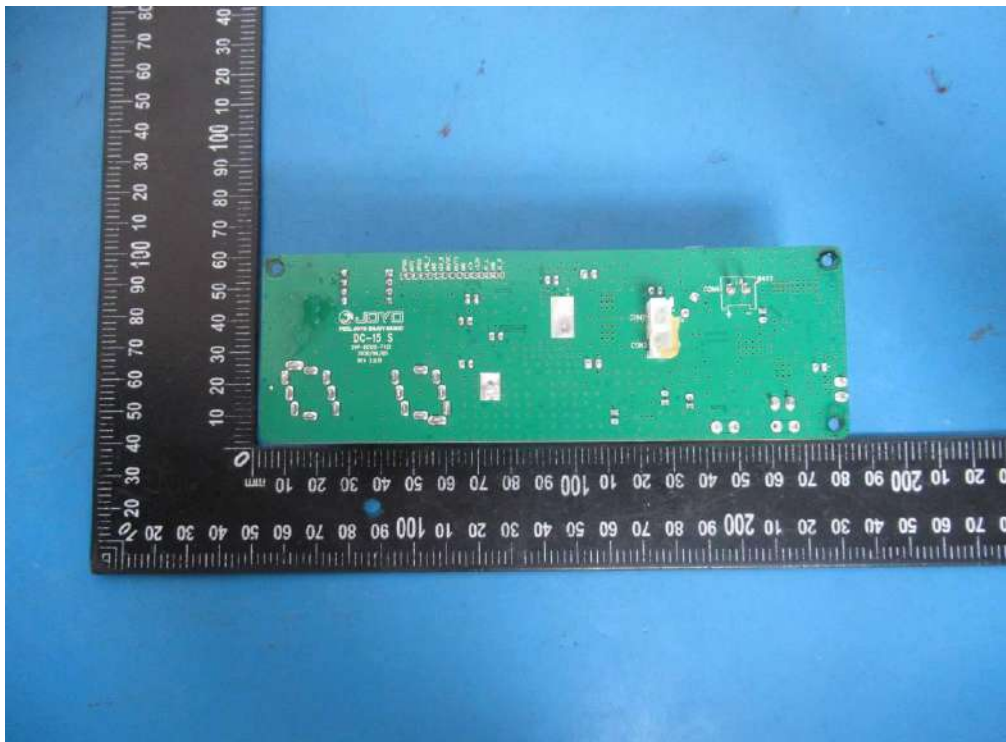
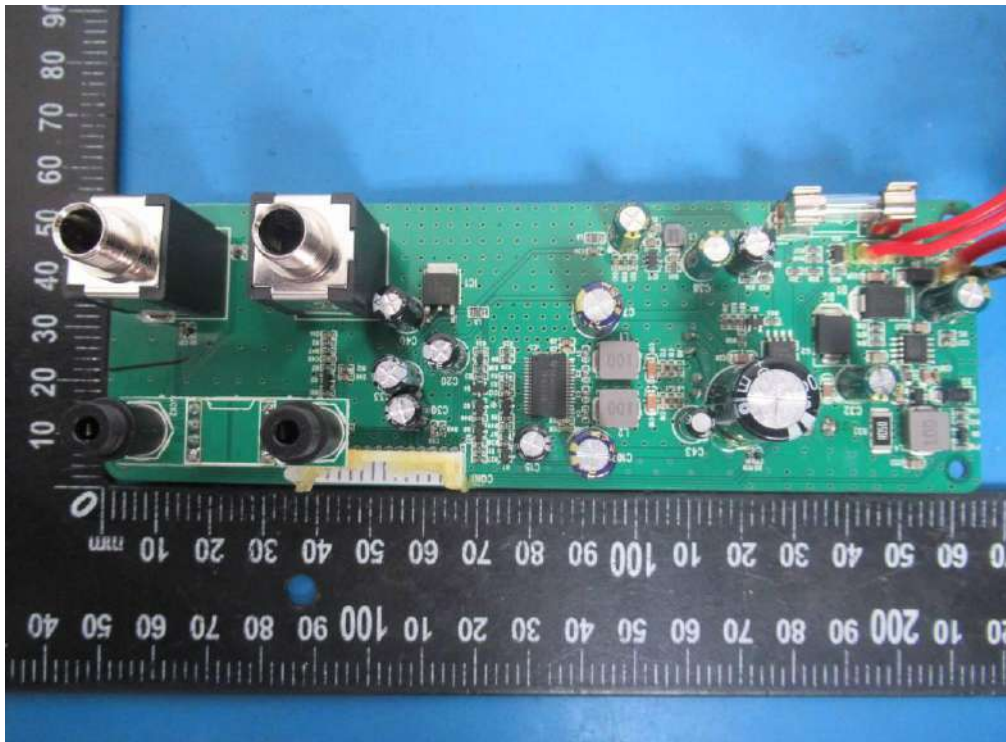


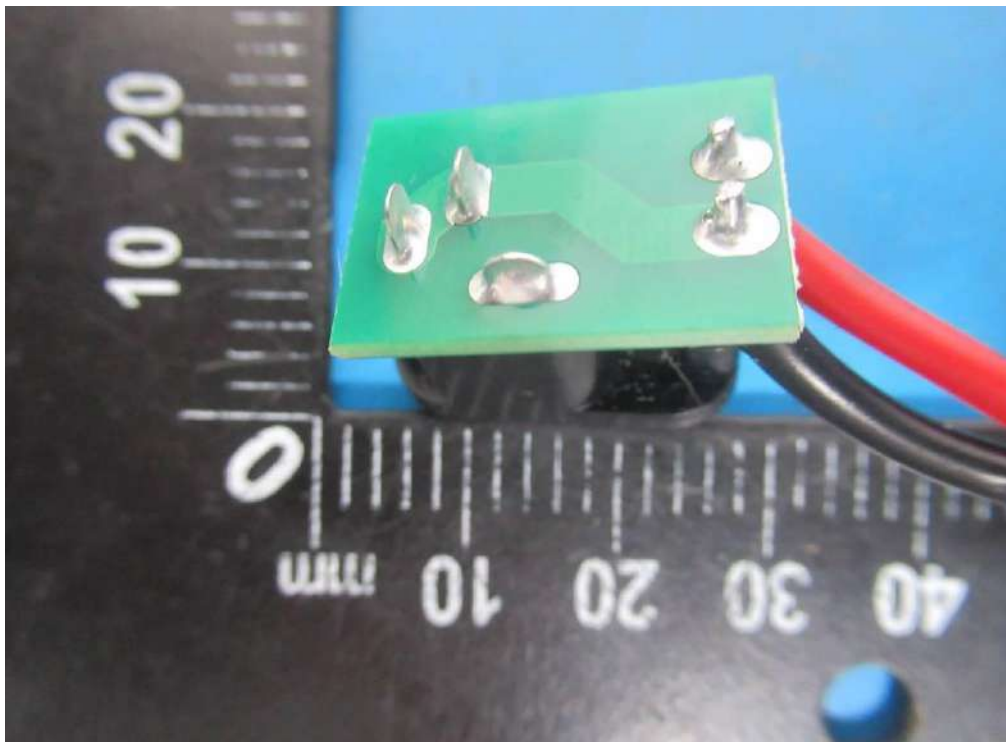
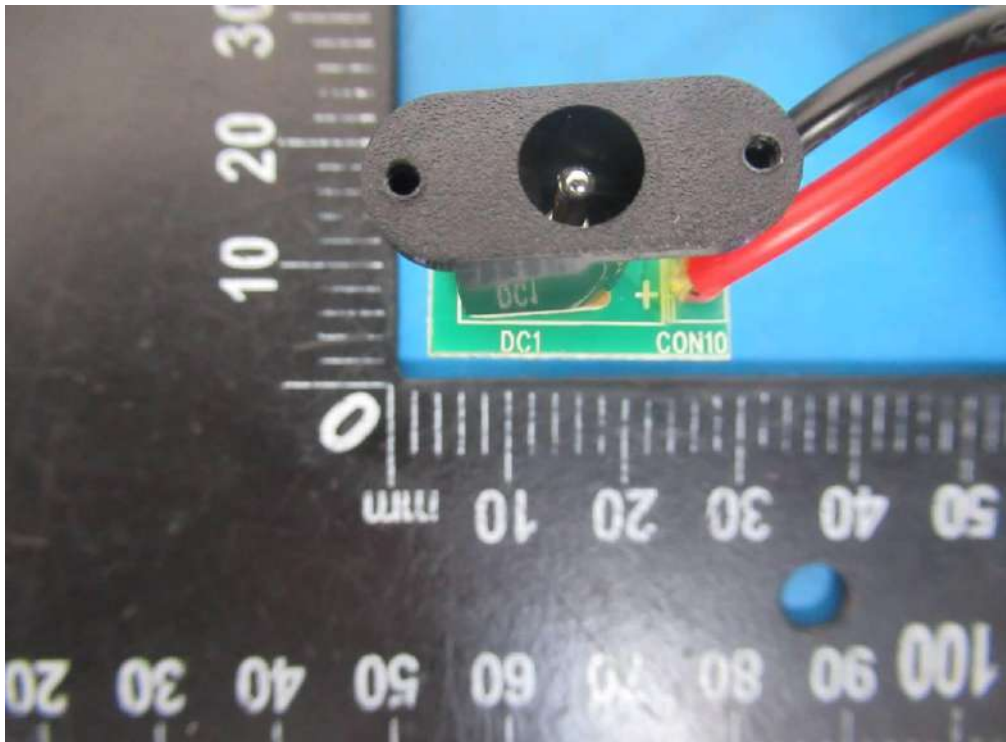


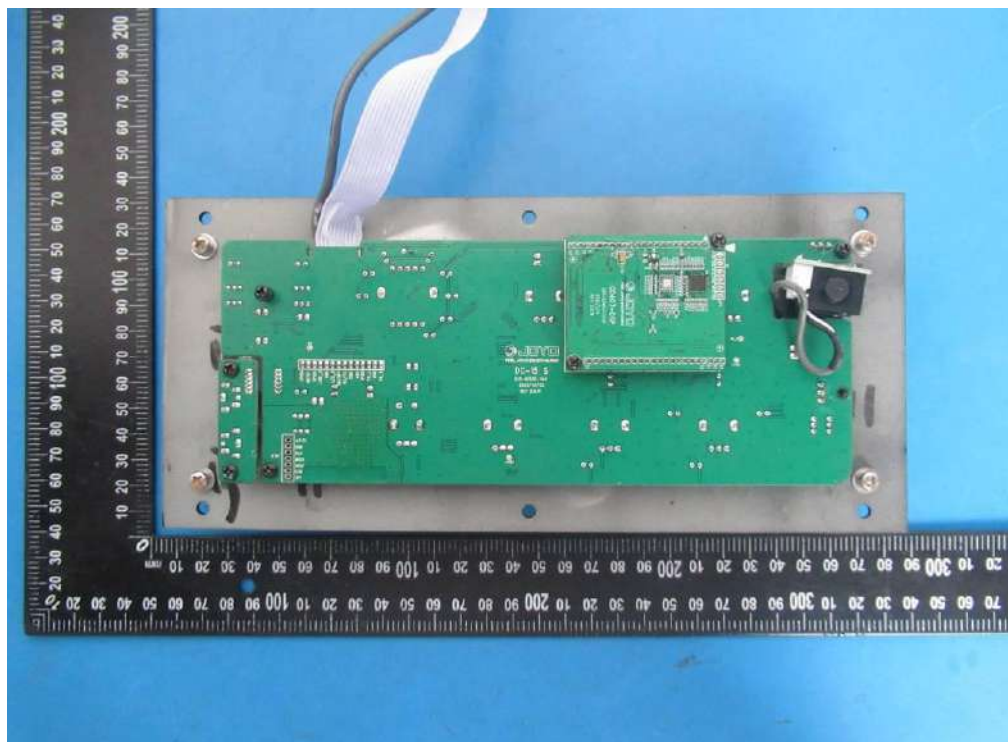


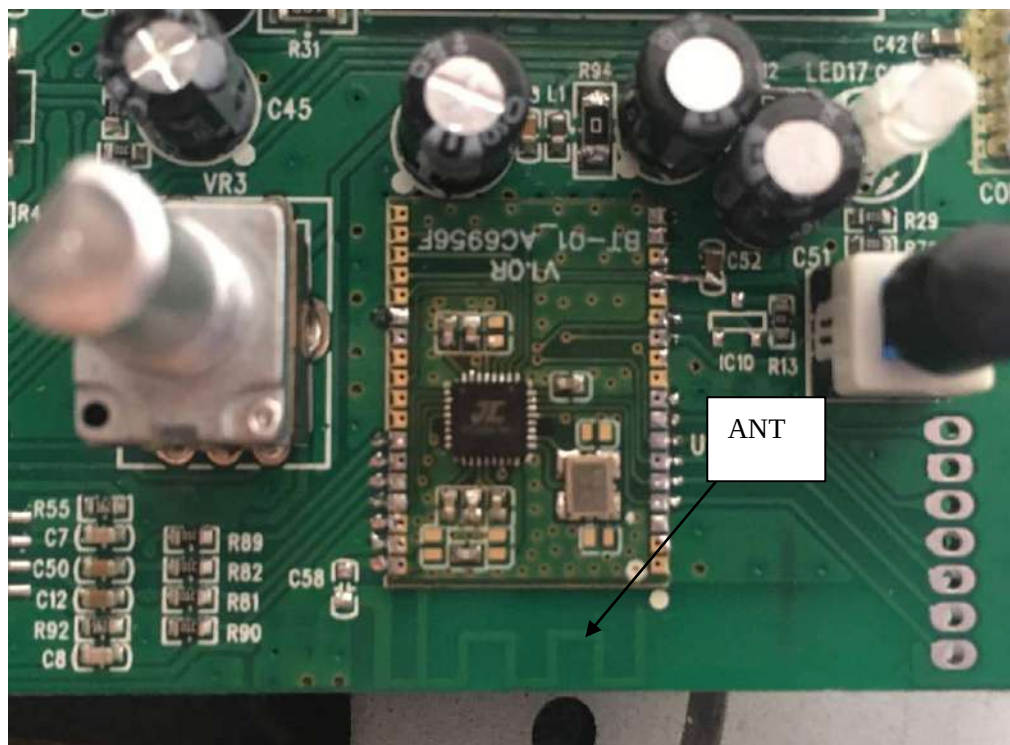












----- END OF REPORT-----