



FCC TEST REPORT

FCC ID: SLFEF-W280

On Behalf of

Shenzhen Wanfengda Electronics Co., Ltd

Powered Bookshelf Bluetooth and Wifi Speakers

Model No.: EF-W280

Prepared for : Shenzhen Wanfengda Electronics Co., Ltd
Address : 2F, Building 1, Hezhou Yuye Industrial Zone, Xixiang, Bao'an,
Shenzhen, Guangdong, China, 518128.

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
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Shenzhen, Guangdong, China

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Date of Receipt : March 17, 2021
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TEST REPORT DECLARATION

Applicant : Shenzhen Wanfengda Electronics Co., Ltd
Address : 2F, Building 1, Hezhou Yuye Industrial Zone, Xixiang, Bao'an, Shenzhen,
Guangdong, China, 518128.
Manufacturer : Shenzhen Wanfengda Electronics Co., Ltd
Address : 2F, Building 1, Hezhou Yuye Industrial Zone, Xixiang, Bao'an, Shenzhen,
Guangdong, China, 518128.
EUT Description : Powered Bookshelf Bluetooth and Wifi Speakers
(A) Model No. : EF-W280
(B) Trademark : **Pohopa**

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

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

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

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

Lucas Pang
Project Engineer



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

Simple Guan
Project Manager



Date of issue.....

April 23, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	April 23, 2021	Initial released Issue	Lucas Pang

1. Summary Of Standards And Results

1.1. Description of Standards and Results

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

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

2. General Information

2.1. Description of Device (EUT)

Description : Powered Bookshelf Bluetooth and Wifi Speakers

Trademark : ***Pohopa***

Model Number : EF-W280

DIFF. : N/A

Test Voltage : AC 120V/60Hz

Radio Technology : Bluetooth (EDR)

Operation frequency : 2402-2480MHz

Channel No. : 79 Channels

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

Antenna Type : External antenna, Maximum Gain is 2dBi(This value is supplied by applicant)

Software version : V1.0

Hardware version : V4

Connector cable loss : 0.5dB (This value is supplied by applicant).

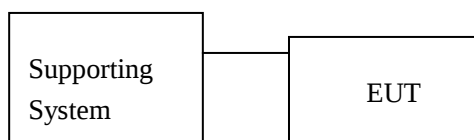
2.2. Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 Ratings : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification
1.	N/A	N/A	N/A	N/A	N/A

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℃	24℃
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

July 15, 2019 Certificated by IC

Registration Number: CN0085

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

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

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2020.09.02	1Year
Spectrum analyzer	ROHDE&SCHWARZ	FSU	1166.1660.26	2020.09.02	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2020.09.02	1Year
Receiver	R&S	ESCI	101165	2020.09.02	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2019.09.07	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2020.09.02	1Year
Cable	SCHWARZBECK	N/A	No.2	2020.09.02	1Year
Cable	SCHWARZBECK	N/A	No.3	2020.09.02	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2020.09.02	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2020.09.02	1Year
Temperature controller	Terchy	MHQ	120	2020.09.02	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126-466	2020.09.02	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2020.09.02	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2020.09.02	1 Year
Power meter	Agilent	E4419B	GB40202122	2020.09.02	1 Year

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	EZ	Alpha-3A1
CE	EZ-EMC	EZ	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

3. Maximum Peak Output Power

3.1.Limit

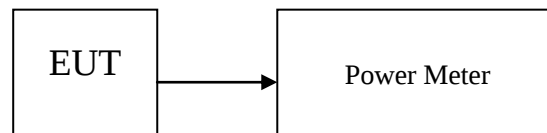
Please refer section15.247.

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

3.2.Test Procedure

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the average power detection.

3.3.Test Setup



3.4.Test Result

Mode	Freq (MHz)	Average Output Power (dBm)	Limit (dBm)	Result
GFSK	2402	-1.79	21	Pass
	2441	0.097	21	Pass
	2480	-1.896	21	Pass
$\pi/4$ DQPSK	2402	-2.393	21	Pass
	2441	-1.179	21	Pass
	2480	-2.543	21	Pass
8- DPSK	2402	-2.363	21	Pass
	2441	-0.906	21	Pass
	2480	-2.568	21	Pass

Conclusion: PASS

4. Bandwidth

4.1.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, 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.

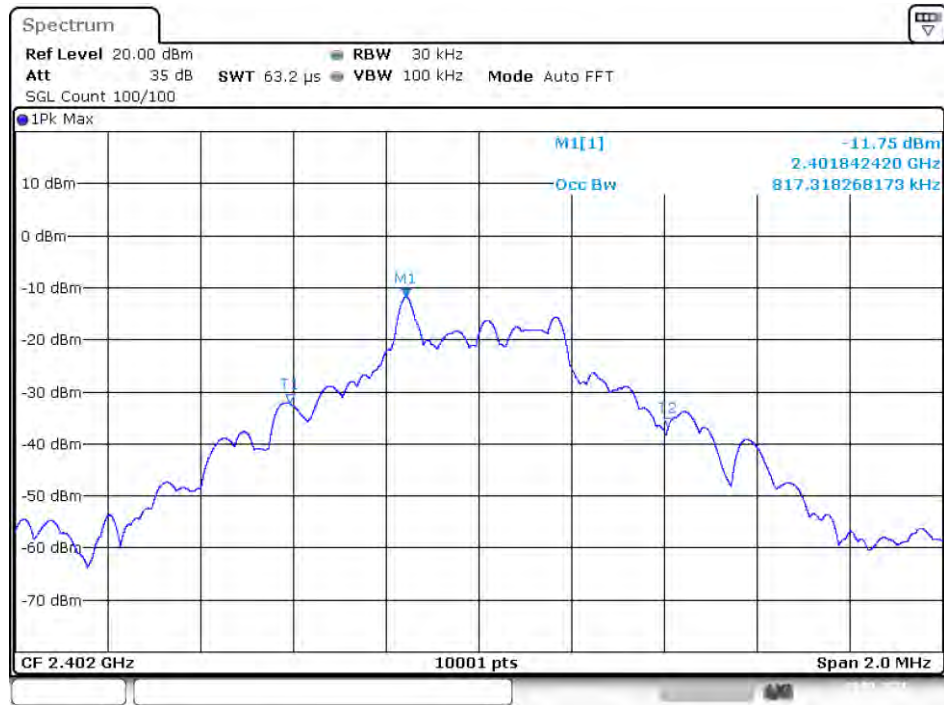
4.2.Test Procedure

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	0.8173	0.7322	N/A	Pass
NVNT	1-DH1	2441	Ant 1	0.8193	0.7308	N/A	Pass
NVNT	1-DH1	2480	Ant 1	0.7903	0.7764	N/A	Pass
NVNT	2-DH1	2402	Ant 1	1.0565	1.1058	N/A	Pass
NVNT	2-DH1	2441	Ant 1	1.0305	1.0926	N/A	Pass
NVNT	2-DH1	2480	Ant 1	0.8573	0.8398	N/A	Pass
NVNT	3-DH1	2402	Ant 1	1.0771	1.1482	N/A	Pass
NVNT	3-DH1	2441	Ant 1	0.9085	1.0572	N/A	Pass
NVNT	3-DH1	2480	Ant 1	0.8859	1.1548	N/A	Pass

OBW NVNT 1-DH1 2402MHz Ant1



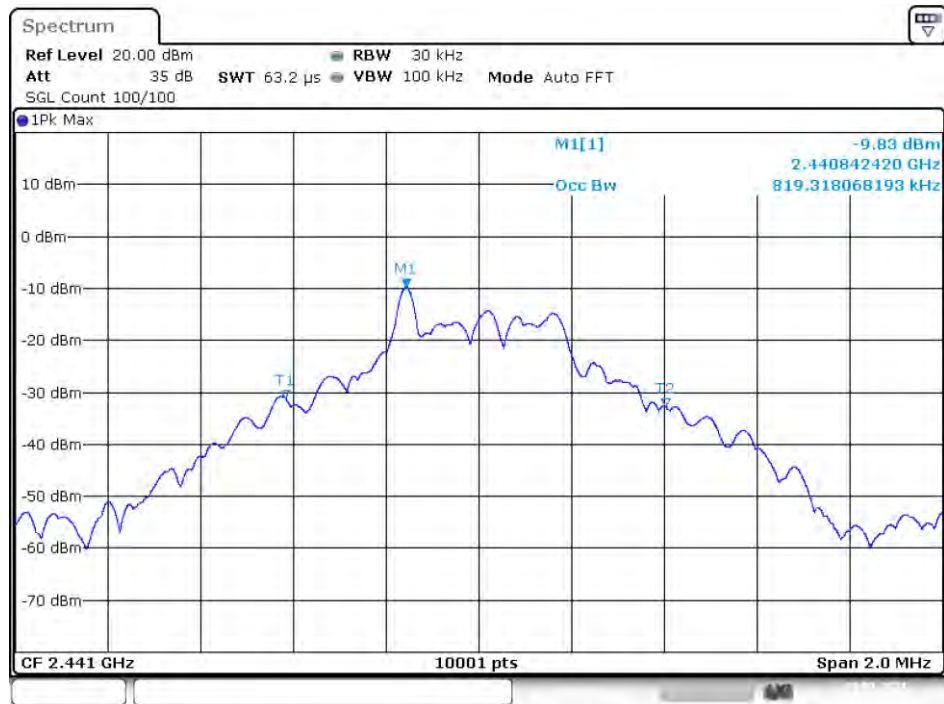
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-20 dB BW NVNT 1-DH1 2402MHz Ant1



Date: 29,MAR,2021 04:46:42

OBW NVNT 1-DH1 2441MHz Ant1



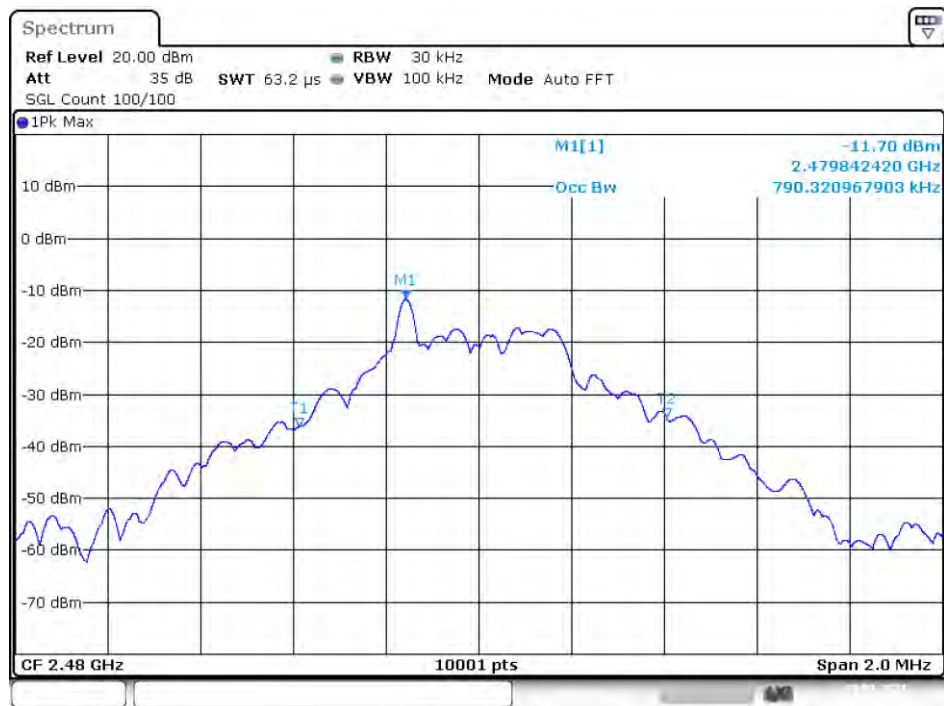
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-20 dB BW NVNT 1-DH1 2441MHz Ant1



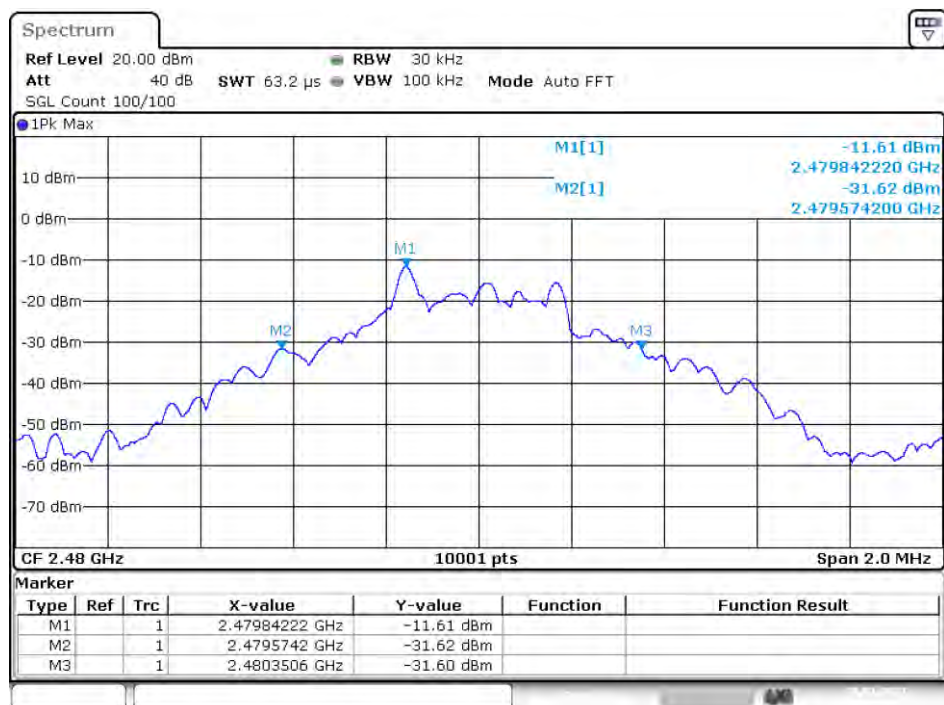
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OBW NVNT 1-DH1 2480MHz Ant1



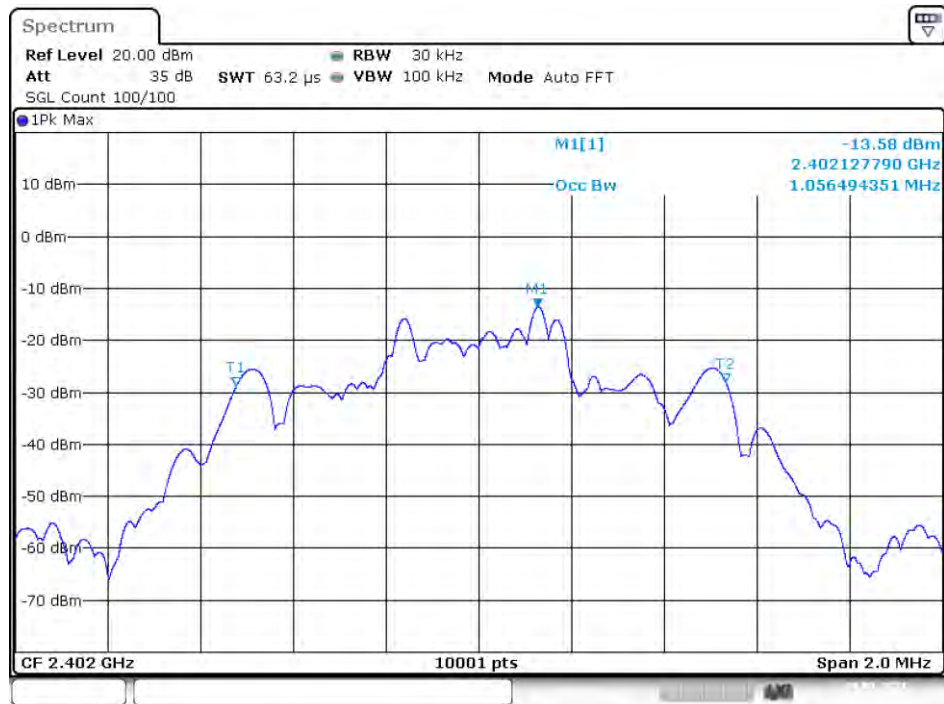
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-20 dB BW NVNT 1-DH1 2480MHz Ant1



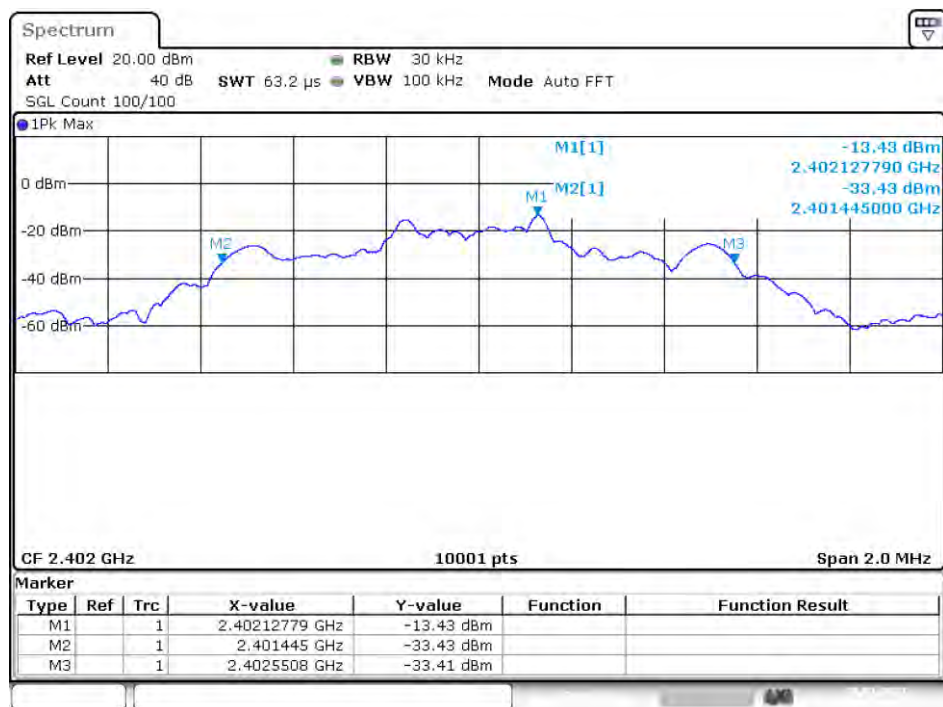
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OBW NVNT 2-DH1 2402MHz Ant1



Date: 29.MAR.2021 06:45:02

-20 dB BW NVNT 2-DH1 2402MHz Ant1

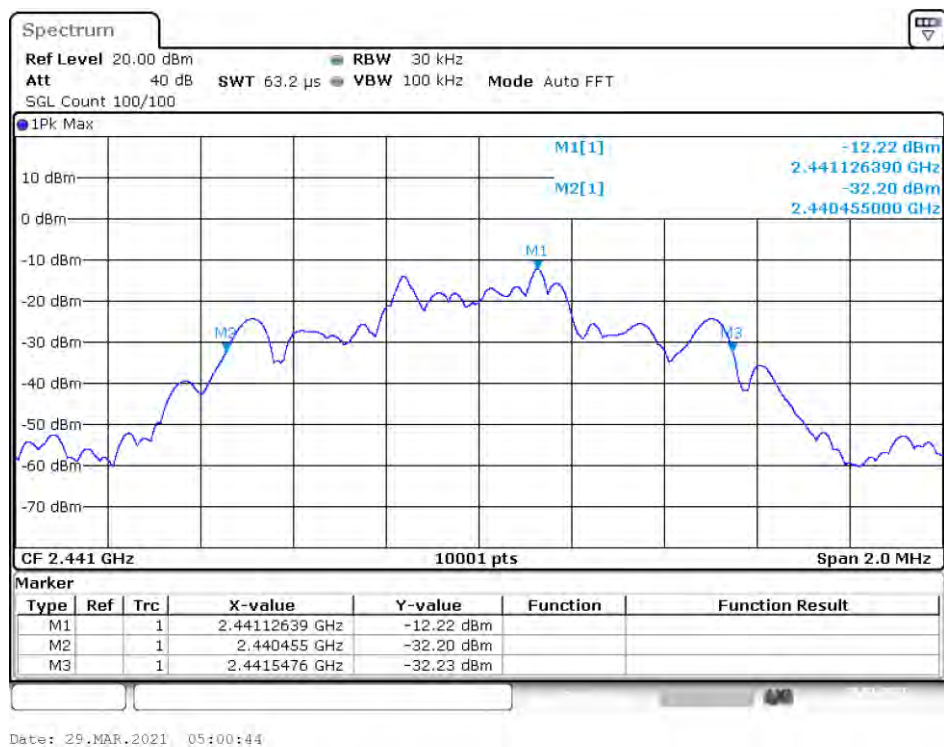


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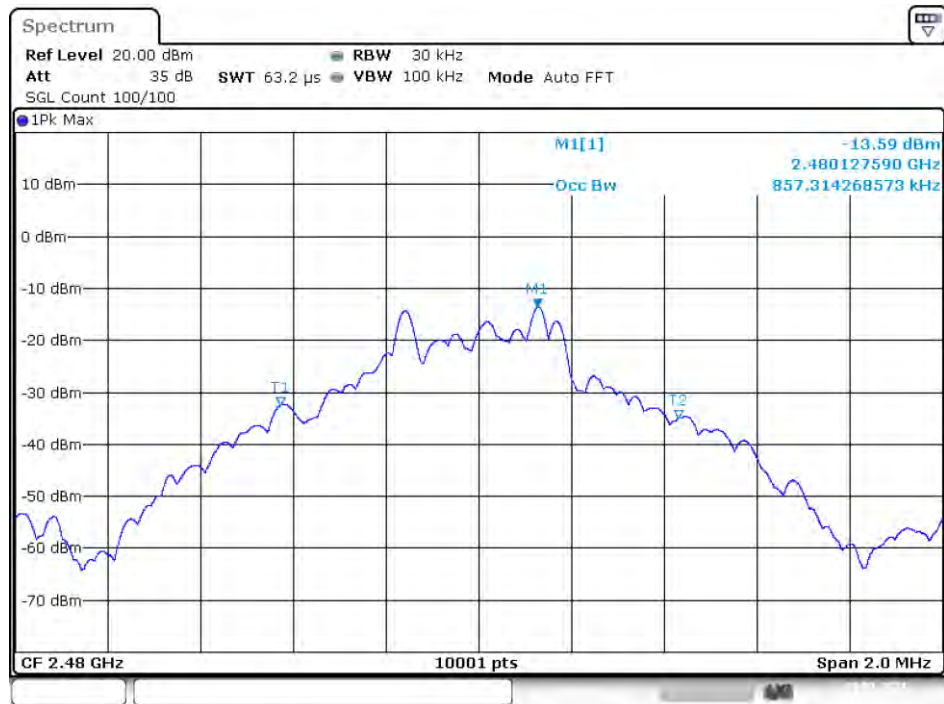
OBW NVNT 2-DH1 2441MHz Ant1



-20 dB BW NVNT 2-DH1 2441MHz Ant1



OBW NVNT 2-DH1 2480MHz Ant1



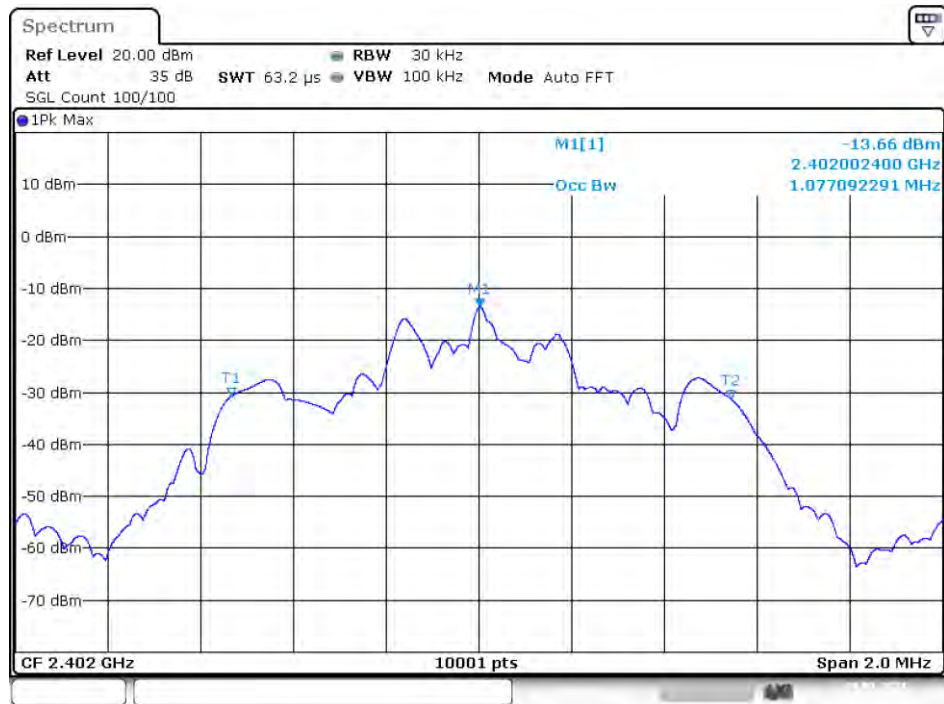
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-20 dB BW NVNT 2-DH1 2480MHz Ant1



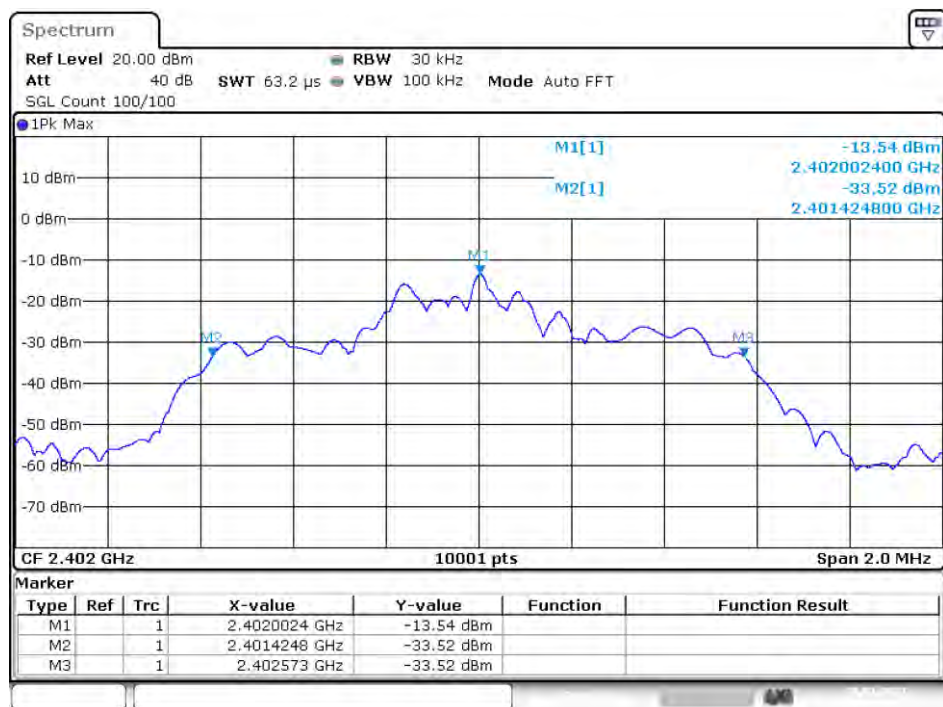
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OBW NVNT 3-DH1 2402MHz Ant1



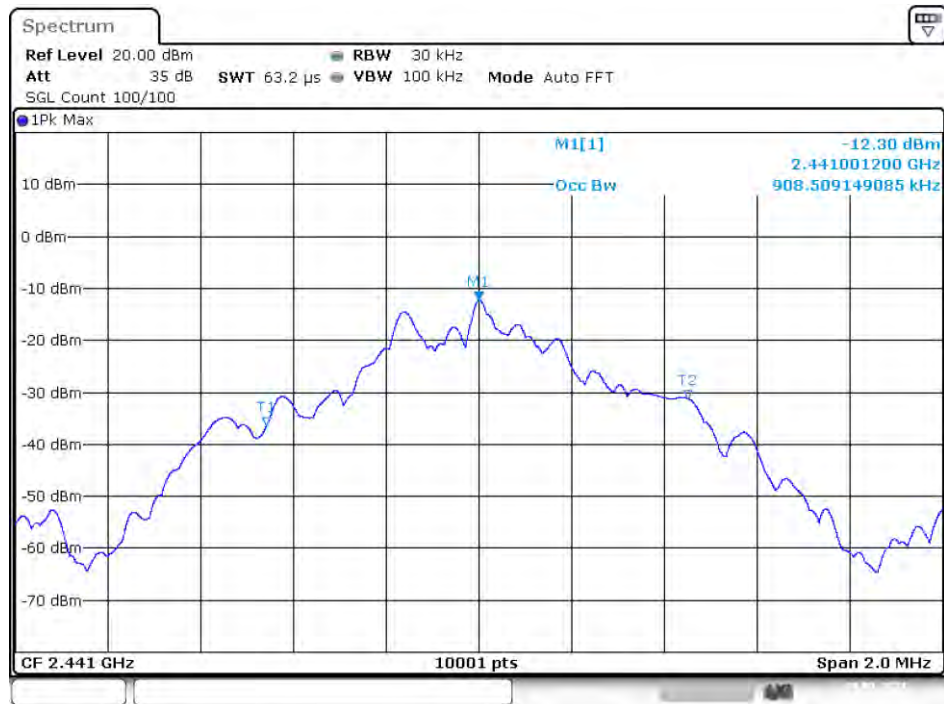
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-20 dB BW NVNT 3-DH1 2402MHz Ant1



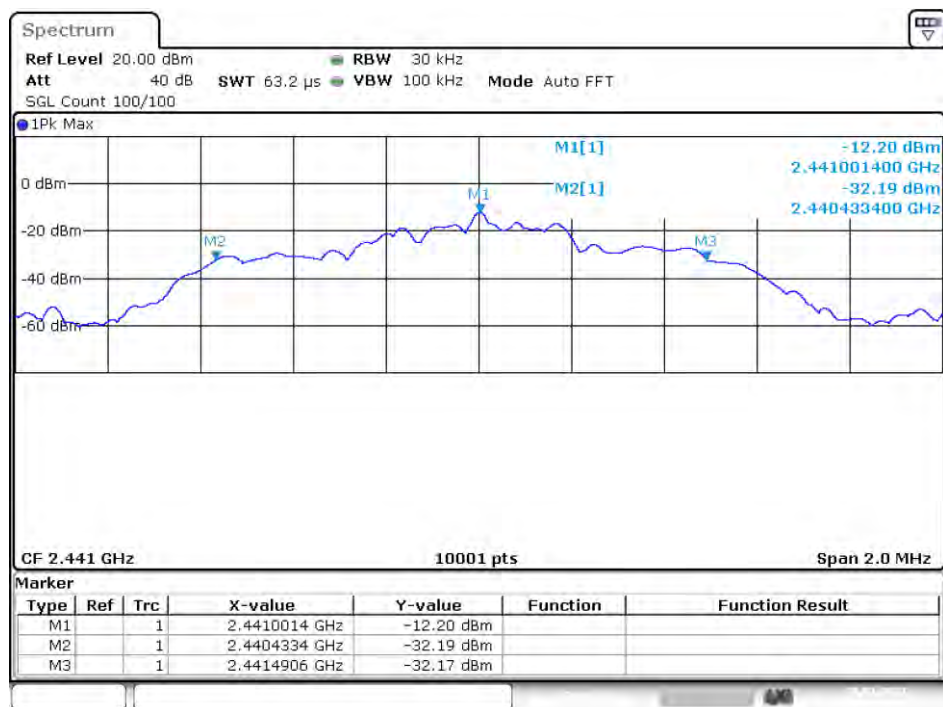
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OBW NVNT 3-DH1 2441MHz Ant1



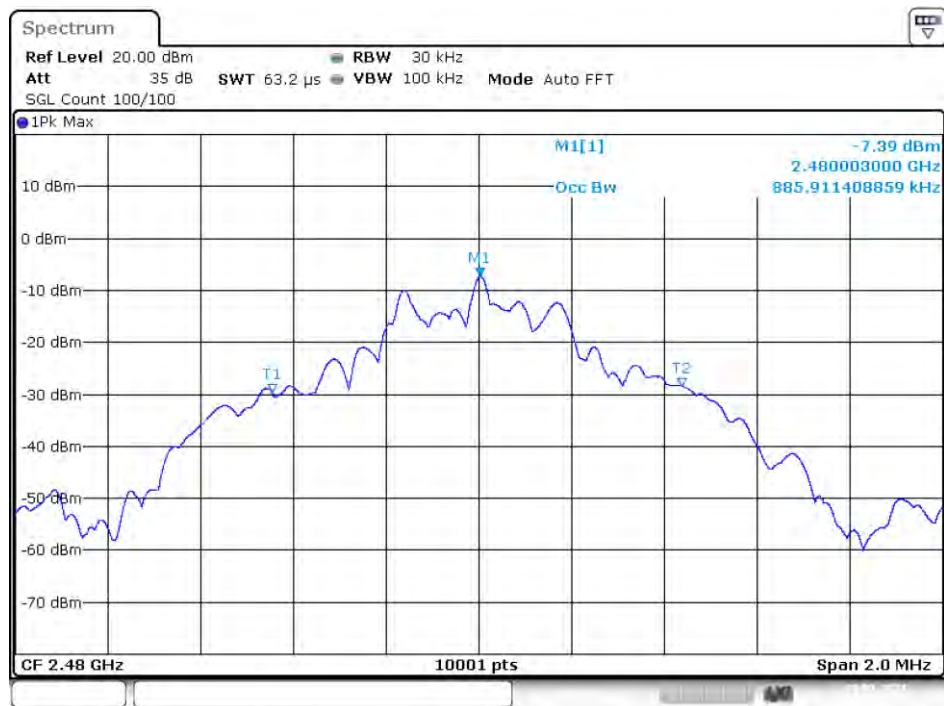
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-20 dB BW NVNT 3-DH1 2441MHz Ant1



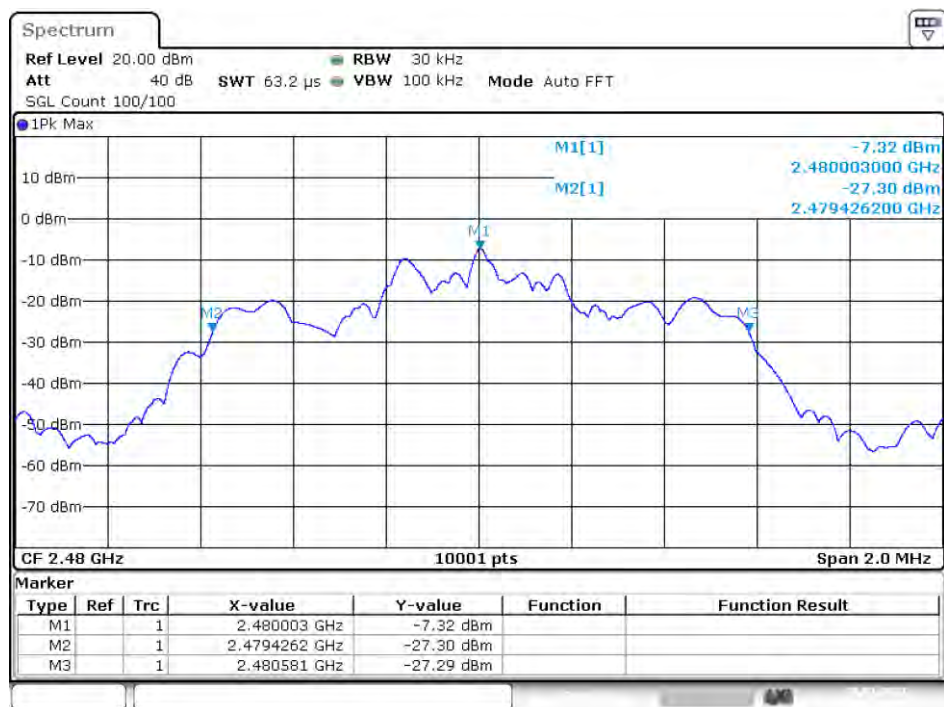
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OBW NVNT 3-DH1 2480MHz Ant1



Date: 29.MAR.2021 16:11:57

-20 dB BW NVNT 3-DH1 2480MHz Ant1



Date: 29.MAR.2021 16:12:00

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

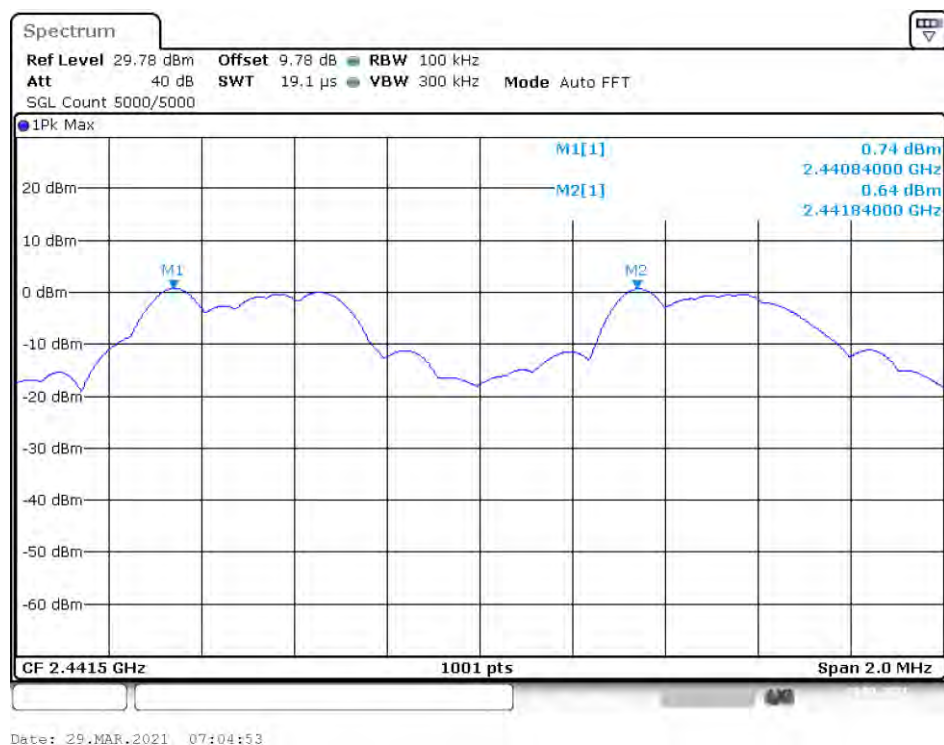
5.2.Test Procedure

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 20kHz RBW and 62kHz VBW.

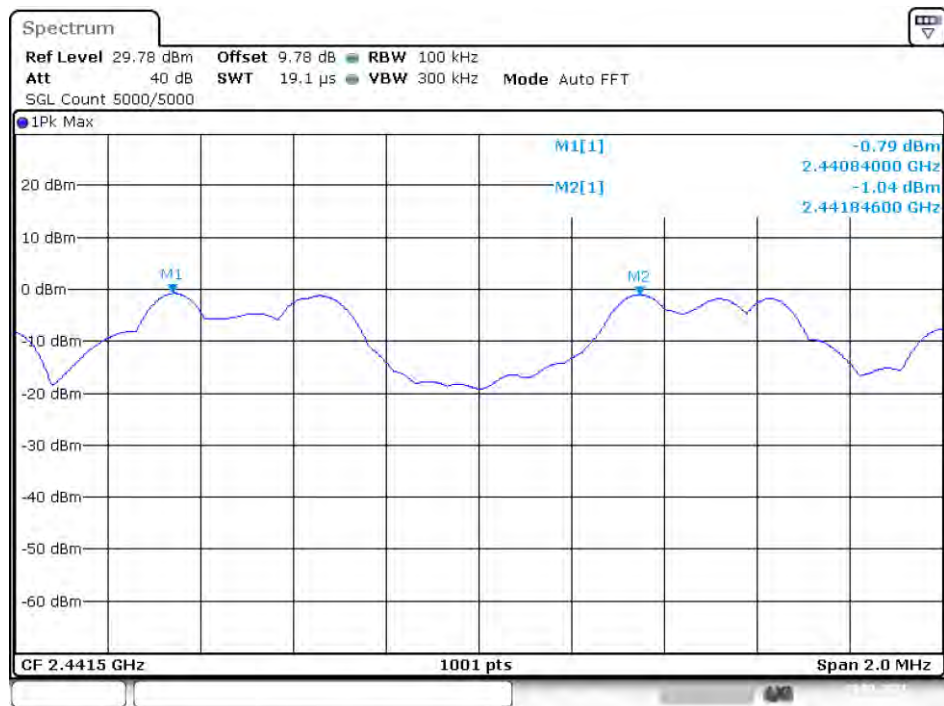
5.3.Test Result

Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2440.84	2441.84	1	0.769	Pass
NVNT	2-DH1	2440.84	2441.846	1.006	0.769	Pass
NVNT	3-DH1	2440.992	2442.004	1.012	0.667	Pass

CFS NVNT 1-DH1 2441MHz

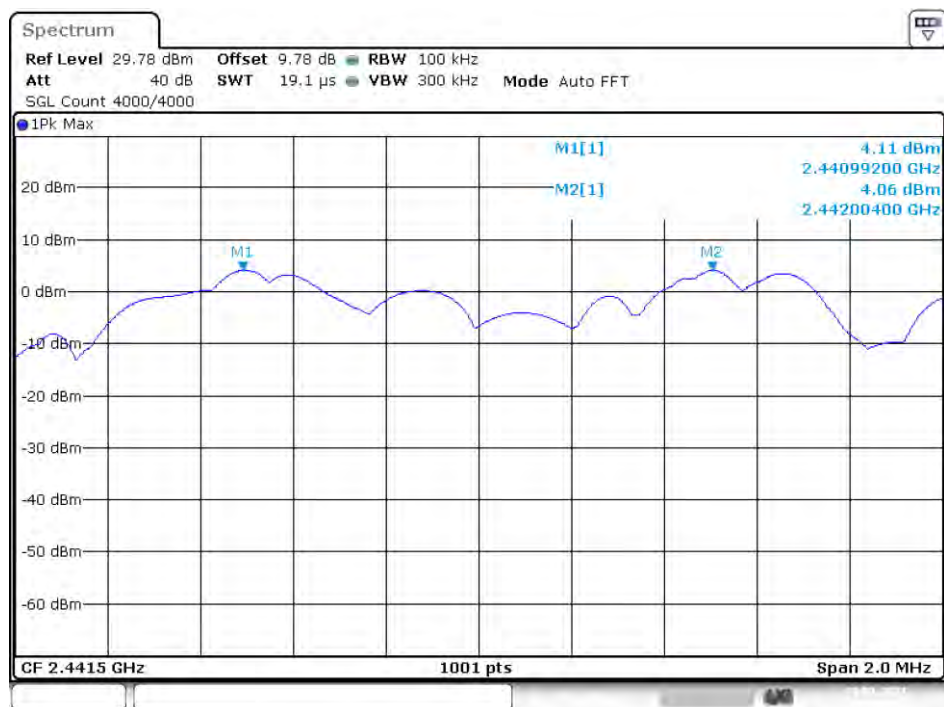


CFS NVNT 2-DH1 2441MHz



Date: 29,MAR,2021 07:17:03

CFS NVNT 3-DH1 2441MHz



Date: 29,MAR,2021 16:07:53

6. Number Of Hopping Channel

6.1.Limit

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

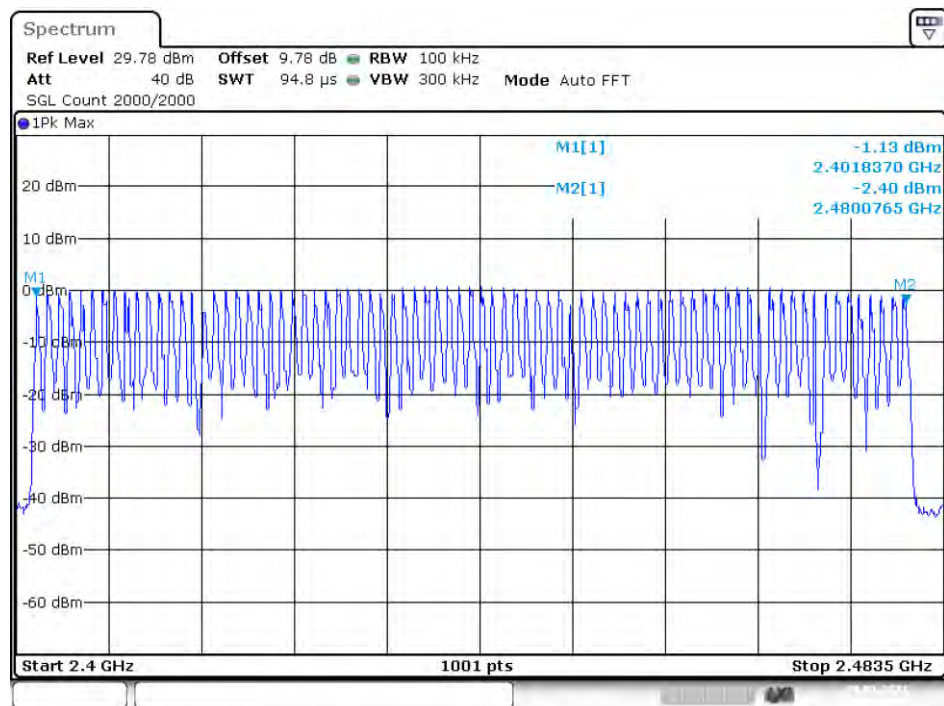
6.2.Test Procedure

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

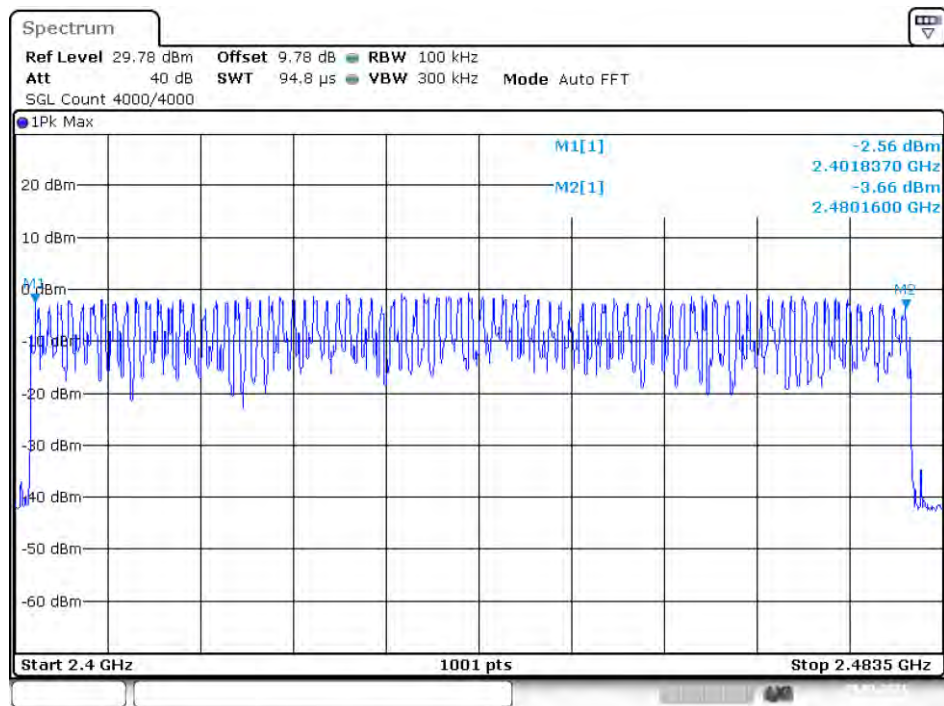
Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass

Hopping No. NVNT 1-DH1 2441MHz



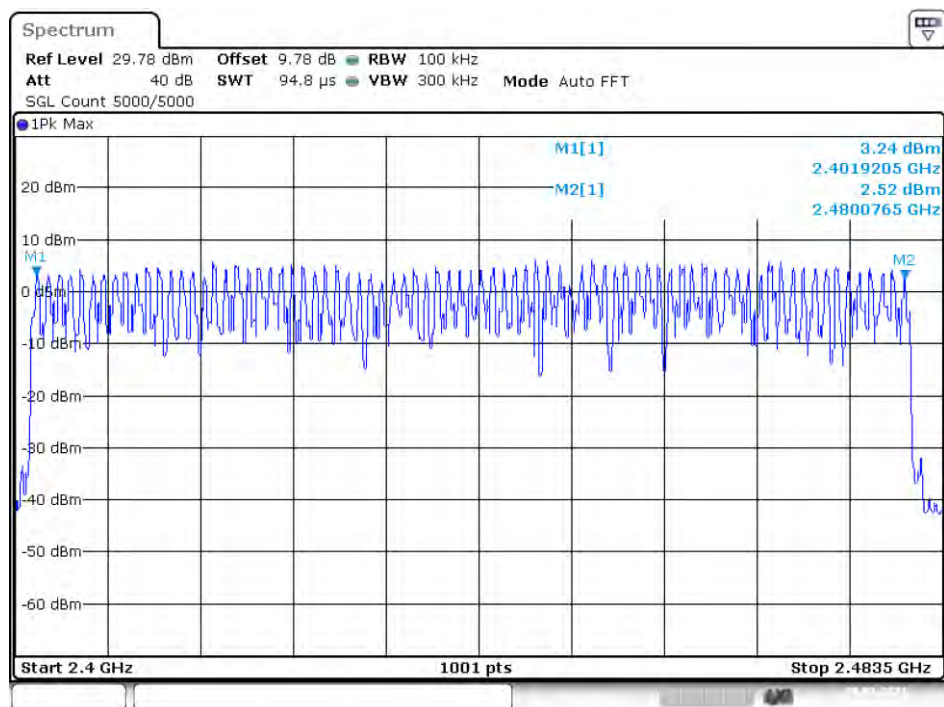
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Hopping No. NVNT 2-DH1 2441MHz



Date: 29.MAR.2021 07:19:41

Hopping No. NVNT 3-DH1 2441MHz



Date: 29.MAR.2021 16:05:33

7. Dwell Time

7.1. Test limit

Please refer section 15.247

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 s within period of 0.4 sec- onds multiplied by the number of hopping channel employed.

7.2. Test Procedure

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

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

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

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

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

7.3. Test Result

PASS.

Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	0.365	116.800	31600	400	Pass
NVNT	1-DH3	2441	1.622	259.520	31600	400	Pass
NVNT	1-DH5	2441	2.874	306.560	31600	400	Pass
NVNT	2-DH1	2441	0.374	119.680	31600	400	Pass
NVNT	2-DH3	2441	1.626	260.160	31600	400	Pass
NVNT	2-DH5	2441	2.877	306.880	31600	400	Pass
NVNT	3-DH1	2441	0.375	120.000	31600	400	Pass
NVNT	3-DH3	2441	1.625	260.000	31600	400	Pass
NVNT	3-DH5	2441	2.874	306.560	31600	400	Pass

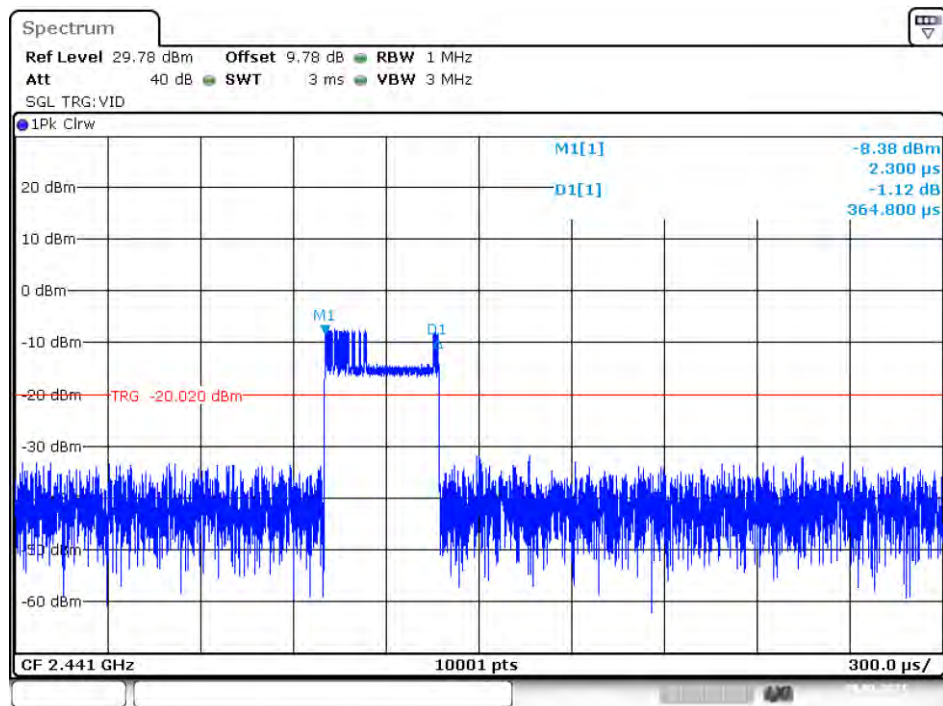
Note: 1 A period time = 0.4 (s) * 79 = 31.6(s)

DH1 Dwell Time = Pulse Time * (1600/(2*79)) * A period time

DH3 Dwell Time = Pulse Time * (1600/(4*79)) * A period time

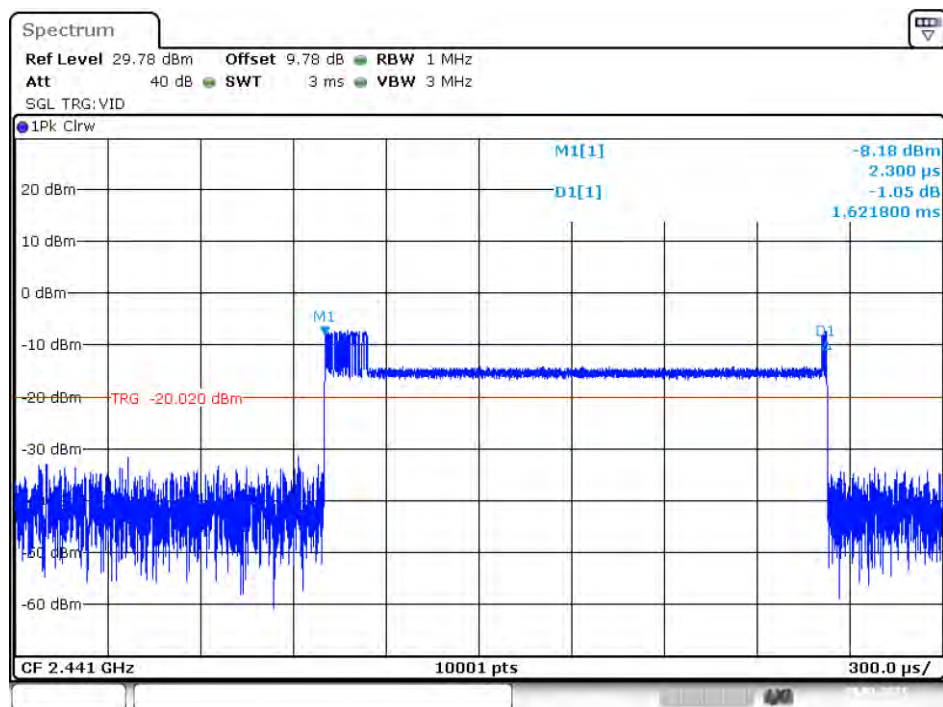
DH5 Dwell Time = Pulse Time * (1600/(6*79)) * A period time

Dwell NVNT 1-DH1 2441MHz



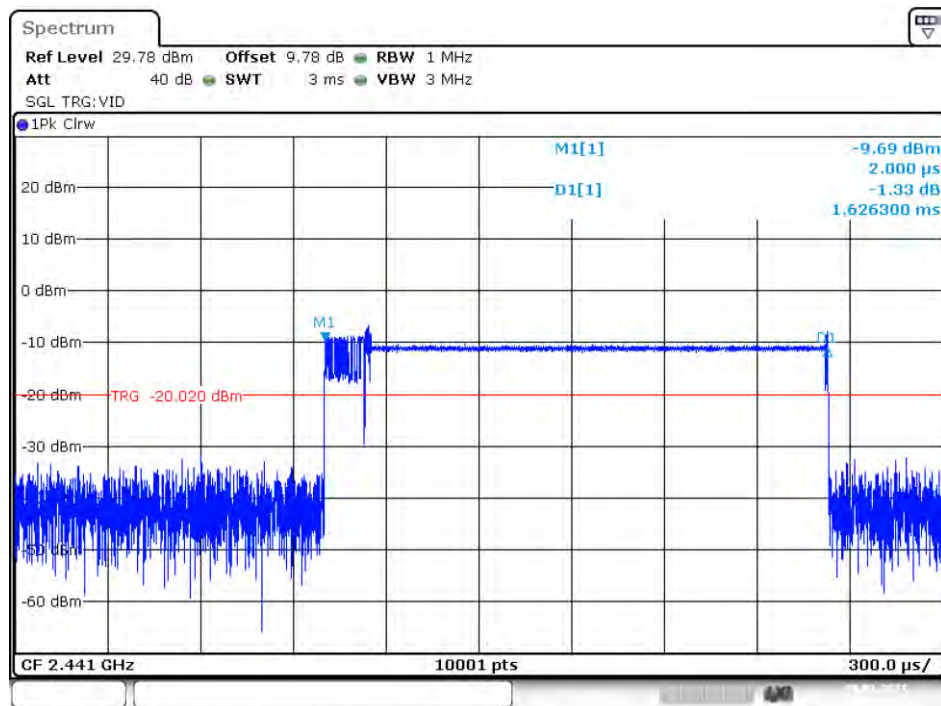
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Dwell NVNT 1-DH3 2441MHz

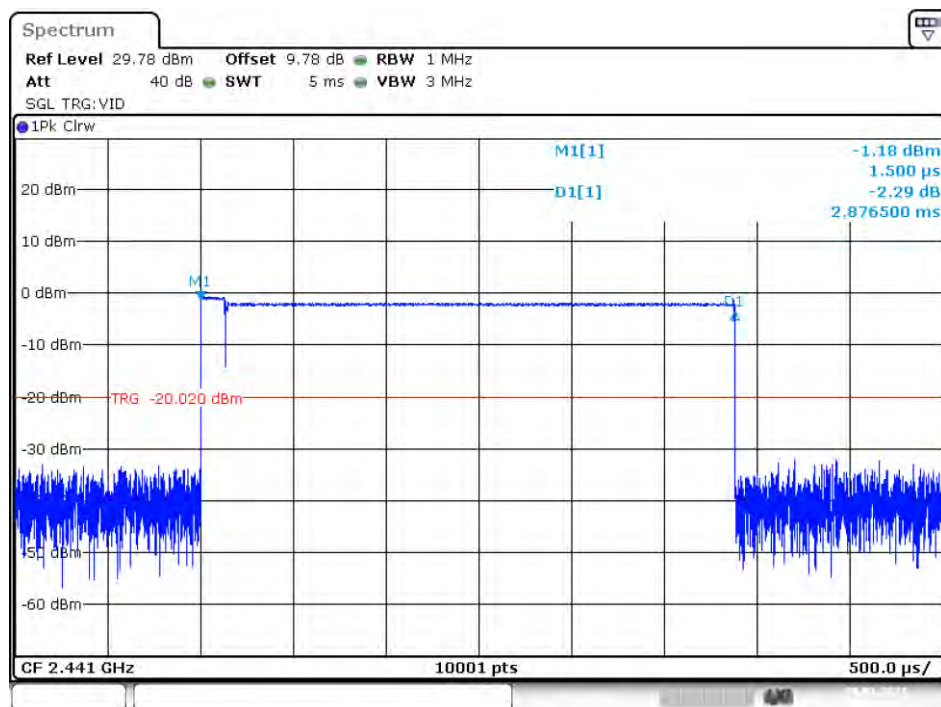


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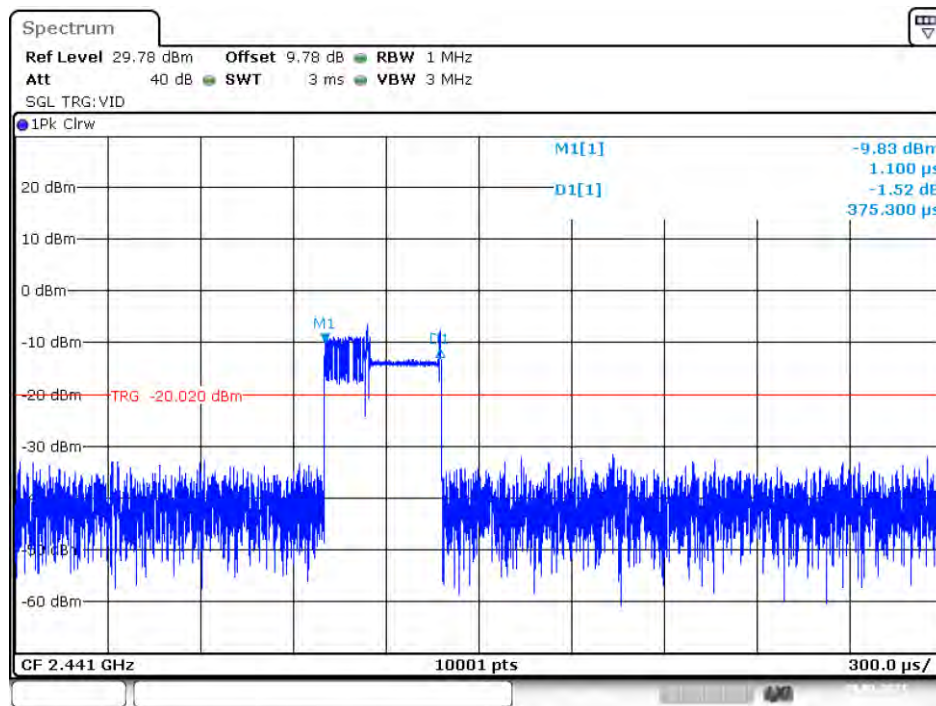
Dwell NVNT 2-DH3 2441MHz



Dwell NVNT 2-DH5 2441MHz

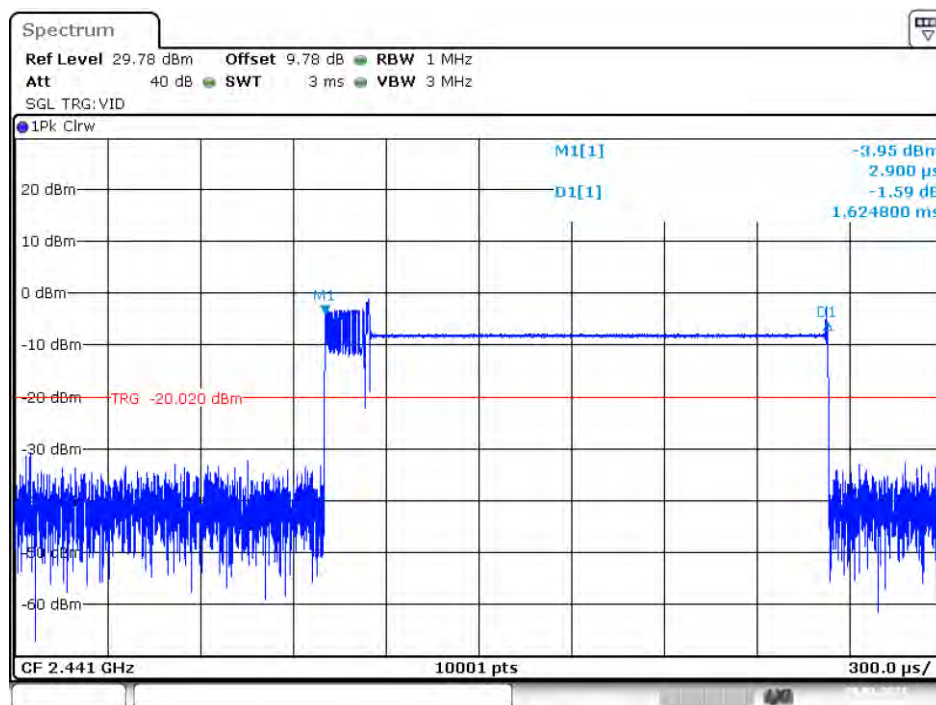


Dwell NVNT 3-DH1 2441MHz



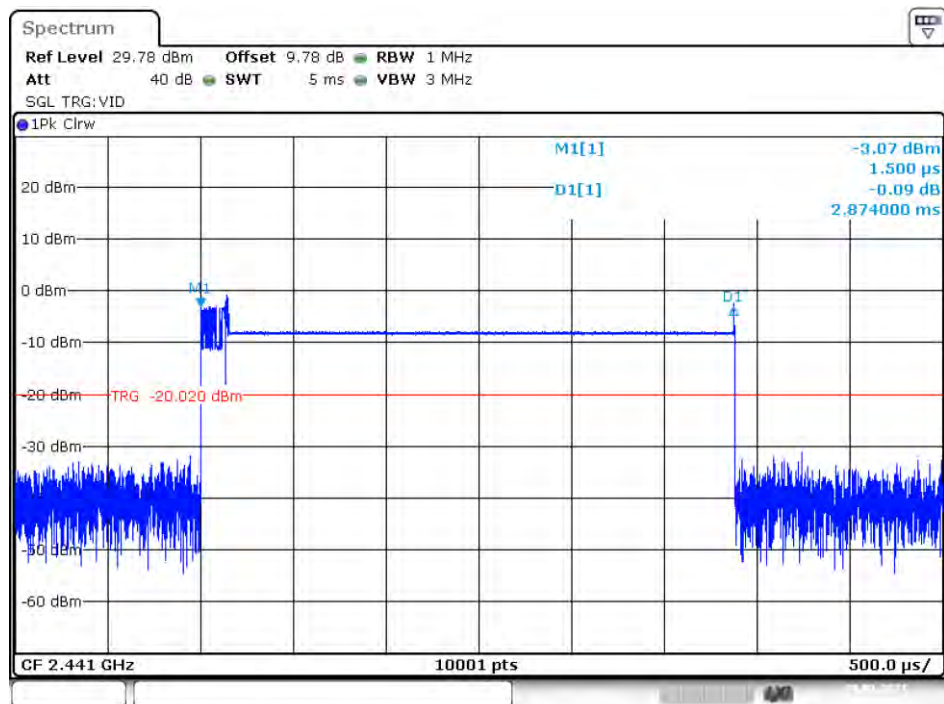
Date: 29.MAR.2021 07:25:01

Dwell NVNT 3-DH3 2441MHz



Date: 29.MAR.2021 16:13:25

Dwell NVNT 3-DH5 2441MHz



Date: 29.MAR.2021 16:13:51

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

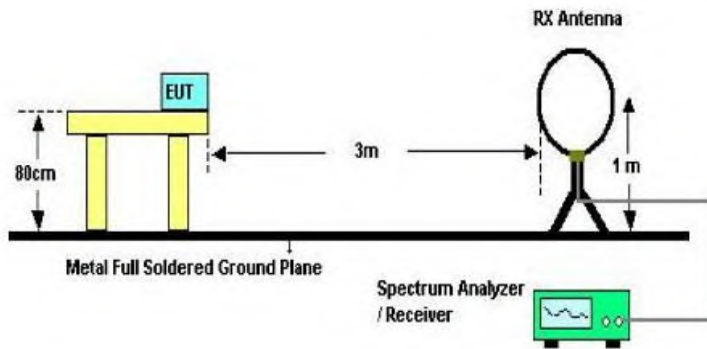
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 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)

15.209 Limit

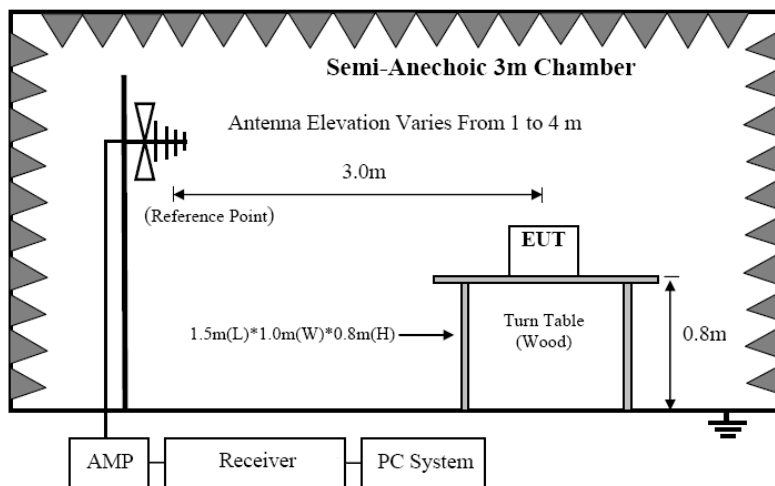
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

8.2. Block Diagram of Test setup

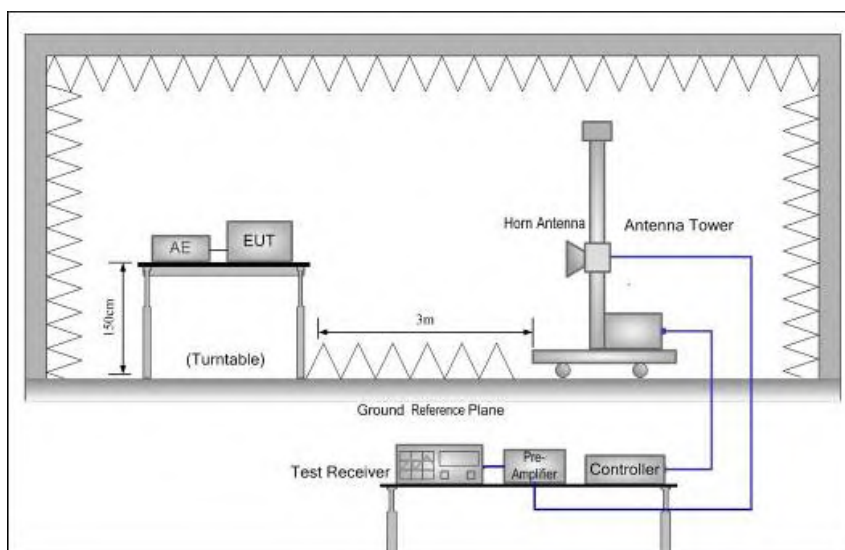
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



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



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



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

8.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and simulator as shown in section 1.4 and 6.1
- (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 through 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 :2013 on 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

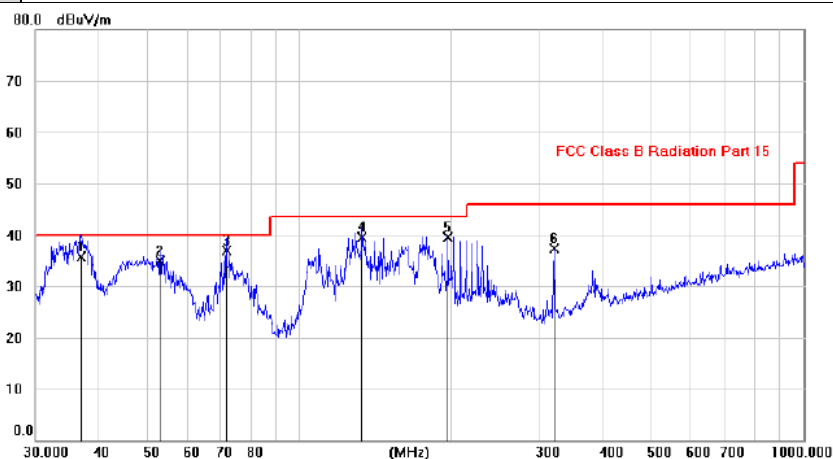
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency..
Detailed information please see the following page.

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.

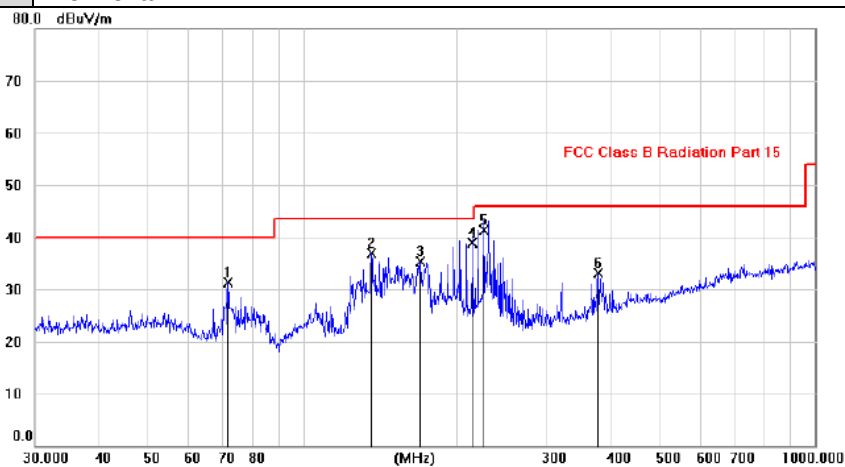
From 30MHz to 1000MHz: Conclusion: PASS

Pol Vertical



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table
		MHz	Level	Factor	ment			Height	Degree
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
							Detector		Comment
1		36.9514	21.61	14.08	35.69	40.00	-4.31	QP	
2		52.9949	21.24	13.72	34.96	40.00	-5.04	QP	
3	*	71.7565	25.78	11.11	36.89	40.00	-3.11	QP	
4		133.5564	25.61	13.85	39.46	43.50	-4.04	QP	
5		197.6385	28.39	11.03	39.42	43.50	-4.08	QP	
6		320.0118	22.60	14.63	37.23	46.00	-8.77	peak	

Pol Horizontal



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table
		MHz	Level	Factor	ment			Height	Degree
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
							Detector		Comment
1		71.3884	20.16	11.11	31.27	40.00	-8.73	peak	
2		136.3164	22.85	14.04	36.89	43.50	-6.61	peak	
3		170.0158	21.29	14.08	35.37	43.50	-8.13	peak	
4	*	214.6146	27.60	11.38	38.98	43.50	-4.52	QP	
5		225.9145	29.28	12.08	41.36	46.00	-4.64	QP	
6		378.3631	17.33	15.87	33.20	46.00	-12.80	peak	

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

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

Remark: All modes have been tested, and only worst data of (GFSK) was listed in this report.

From 1G-25GHz

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	44.96	V	33.95	10.18	34.26	54.83	74	19.17	PK
4804	40.02	V	33.95	10.18	34.26	49.89	54	4.11	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4824	43.70	H	33.95	10.18	34.26	53.57	74	20.43	PK
4824	35.91	H	33.95	10.18	34.26	45.78	54	8.22	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX Mid									
4882	43.47	V	33.93	10.2	34.29	53.31	74	20.69	PK
4882	35.39	V	33.93	10.2	34.29	45.23	54	8.77	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
4882	44.79	H	33.93	10.2	34.29	54.63	74	19.37	PK
4882	35.65	H	33.93	10.2	34.29	45.49	54	8.51	AV
7323	/	/	/	/	/	/	/	/	/
9764	/	/	/	/	/	/	/	/	/
Test Mode: GFSK TX High									
4960	45.67	V	33.98	10.22	34.25	55.62	74	18.38	PK
4960	36.53	V	33.98	10.22	34.25	46.48	54	7.52	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	45.51	H	33.98	10.22	34.25	55.46	74	18.54	PK
4960	32.03	H	33.98	10.22	34.25	41.98	54	12.02	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.									

Remark: All modes have been tested, and only worst data of (GFSK) was listed in this report.

Conducted method

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280
Temperature	24°C	Humidity	56%
Test mode	GFSK(2402MHz)	Test mode	GFSK(2441MHz)

Spectrum

Ref Level 19.62 dBm Offset 9.62 dB RBW 100 kHz
Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep
SGL Count 10/10

1Pk Max

M1[1]

-2.23 dBm

2.401650 GHz

M2[1]

-42.33 dBm

18.912314 GHz

D1

-21.931 dBm

M3

M4

M5

M2

Start 30.0 MHz 30001 pts Stop 25.0 GHz

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.40165 GHz	-2.23 dBm		
M2	1		18.912314 GHz	-42.33 dBm		
M3	1		4.708546 GHz	-47.47 dBm		
M4	1		7.049067 GHz	-46.97 dBm		
M5	1		9.57936 GHz	-46.81 dBm		

Date: 29.MAR.2021 04:47:16

Spectrum

Ref Level 19.78 dBm Offset 9.78 dB RBW 100 kHz
Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep
SGL Count 10/10

1Pk Max

M1[1]

-0.27 dBm

2.440770 GHz

M2[1]

-42.52 dBm

19.63091 GHz

D1

-19.925 dBm

M3

M4

M5

M2

Start 30.0 MHz 30001 pts Stop 25.0 GHz

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.44077 GHz	-0.27 dBm		
M2	1		19.63091 GHz	-42.52 dBm		
M3	1		4.964904 GHz	-47.97 dBm		
M4	1		7.139791 GHz	-46.77 dBm		
M5	1		9.933102 GHz	-46.83 dBm		

Date: 29.MAR.2021 04:48:03

Test mode	GFSK(2480MHz)
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Spectrum

Ref Level 19.60 dBm Offset 9.60 dB RBW 100 kHz
Att 30 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep
SGL Count 10/10

1Pk Max

M1[1]

-2.18 dBm

2.479890 GHz

M2[1]

-42.77 dBm

17.913514 GHz

D1

-22.003 dBm

M3

M4

M5

M2

Start 30.0 MHz 30001 pts Stop 25.0 GHz

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.47989 GHz	-2.18 dBm		
M2	1		17.913514 GHz	-42.77 dBm		
M3	1		5.130539 GHz	-48.55 dBm		
M4	1		7.469395 GHz	-47.49 dBm		
M5	1		9.872342 GHz	-46.76 dBm		

Date: 29.MAR.2021 04:48:55

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280
Temperature	24°C	Humidity	56%
Test mode	π /4 DQPSK (2402MHz)	Test mode	π /4 DQPSK (2441MHz)

Spectrum

Ref Level 19.62 dBm Offset 9.62 dB RBW 100 kHz

Att 20 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep

SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-2.96 dBm

2.401650 GHz

-52.39 dBm

18.261429 GHz

D1 -22.744 dBm

Start 30.0 MHz

30001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.40165 GHz	-2.96 dBm		
M2	1		18.261429 GHz	-52.39 dBm		
M3	1		4.830899 GHz	-57.89 dBm		
M4	1		7.034085 GHz	-56.68 dBm		
M5	1		9.622642 GHz	-57.36 dBm		

Date: 29.MAR.2021 06:45:45

Spectrum

Ref Level 19.78 dBm Offset 9.78 dB RBW 100 kHz

Att 20 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep

SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-2.74 dBm

2.440777 GHz

-52.17 dBm

16.929696 GHz

D1 -21.393 dBm

Start 30.0 MHz

30001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.440777 GHz	-2.74 dBm		
M2	1		16.929696 GHz	-52.17 dBm		
M3	1		4.711043 GHz	-57.86 dBm		
M4	1		7.133133 GHz	-57.32 dBm		
M5	1		9.827396 GHz	-56.56 dBm		

Date: 29.MAR.2021 05:01:07

Test mode	π /4 DQPSK (2480MHz)
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Spectrum

Ref Level 19.60 dBm Offset 9.60 dB RBW 100 kHz

Att 20 dB SWT 250 ms VBW 300 kHz Mode Auto Sweep

SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1[1]

M2[1]

M3

M4

M5

M2

-4.17 dBm

2.479889 GHz

-52.00 dBm

18.293058 GHz

D1 -23.004 dBm

Start 30.0 MHz

30001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.47989 GHz	-4.17 dBm		
M2	1		18.293058 GHz	-52.00 dBm		
M3	1		4.885 GHz	-58.31 dBm		
M4	1		7.39615 GHz	-57.69 dBm		
M5	1		9.933934 GHz	-56.07 dBm		

Date: 29.MAR.2021 06:48:25

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280
Temperature	24°C	Humidity	56%
Test mode	8- DPSK (2402MHz)	Test mode	8- DPSK (2441MHz)

Spectrum

Ref Level 19.62 dBm

Offset 9.62 dB

RBW 100 kHz

Att 20 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1

M2

M3

M4

M5

M1[1] -4.31 dBm

M2[1] 2.401650 GHz

-51.83 dBm

18.897332 GHz

D1 -22.777 dBm

Start 30.0 MHz

30001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.40165 GHz	-4.31 dBm		
M2	1		18.897332 GHz	-51.83 dBm		
M3	1		4.957413 GHz	-58.20 dBm		
M4	1		7.03242 GHz	-57.68 dBm		
M5	1		9.759144 GHz	-57.48 dBm		

Date: 29.MAR.2021 06:50:48

Spectrum

Ref Level 19.78 dBm

Offset 9.78 dB

RBW 100 kHz

Att 20 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1

M2

M3

M4

M5

M1[1] -2.82 dBm

M2[1] 2.440770 GHz

-52.41 dBm

15.871800 GHz

D1 -21.994 dBm

Start 30.0 MHz

30001 pts

Stop 25.0 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.44077 GHz	-2.82 dBm		
M2	1		15.8718 GHz	-52.41 dBm		
M3	1		4.801767 GHz	-57.63 dBm		
M4	1		7.250492 GHz	-57.23 dBm		
M5	1		9.695887 GHz	-56.67 dBm		

Date: 29.MAR.2021 05:04:54

Test mode	8- DPSK (2480MHz)
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Spectrum

Ref Level 19.60 dBm

Offset 9.60 dB

RBW 100 kHz

Att 20 dB

SWT 250 ms

VBW 300 kHz

Mode Auto Sweep

SGL Count 10/10

1Pk Max

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

-50 dBm

-60 dBm

-70 dBm

M1

M2

M3

M4

M5

M1[1] -4.05 dBm

M2[1] 2.479890 GHz

-51.63 dBm

16.945510 GHz

D1 -23.633 dBm

Start 30.0 MHz

30001 pts

Stop 25.0 GHz

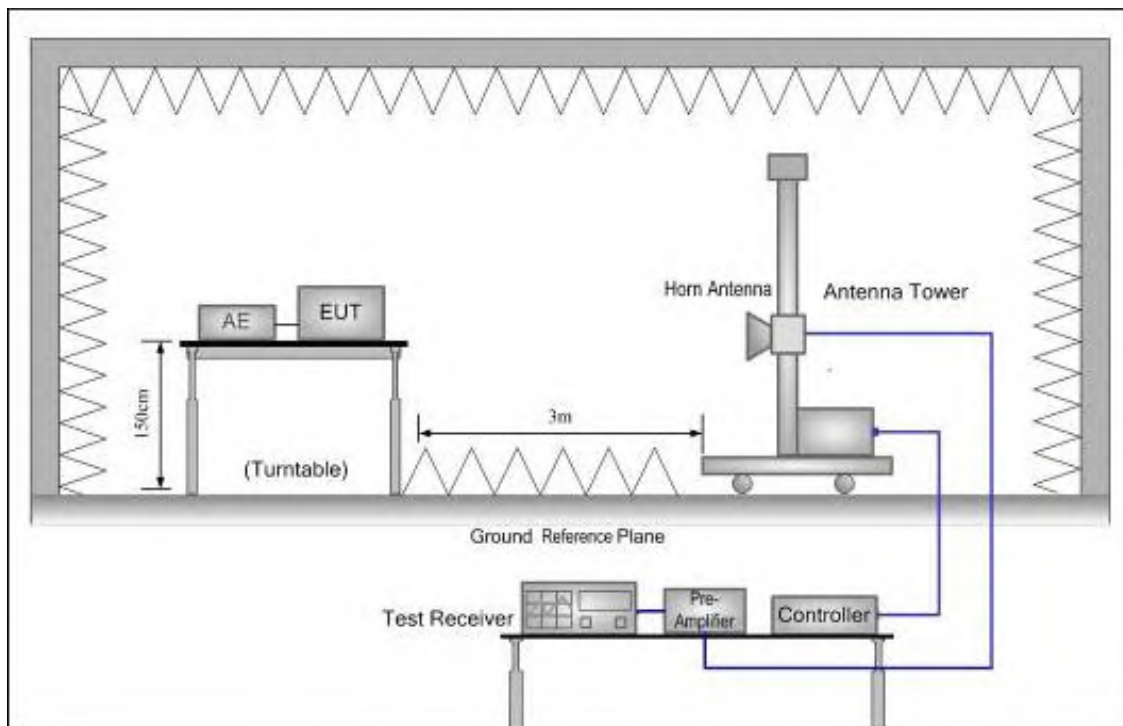
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.47989 GHz	-4.05 dBm		
M2	1		16.94551 GHz	-51.63 dBm		
M3	1		5.060623 GHz	-58.07 dBm		
M4	1		7.600904 GHz	-57.13 dBm		
M5	1		9.903138 GHz	-56.64 dBm		

Date: 29.MAR.2021 06:54:26

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 15.209, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

9.3. Test Procedure

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

9.4. Test Result

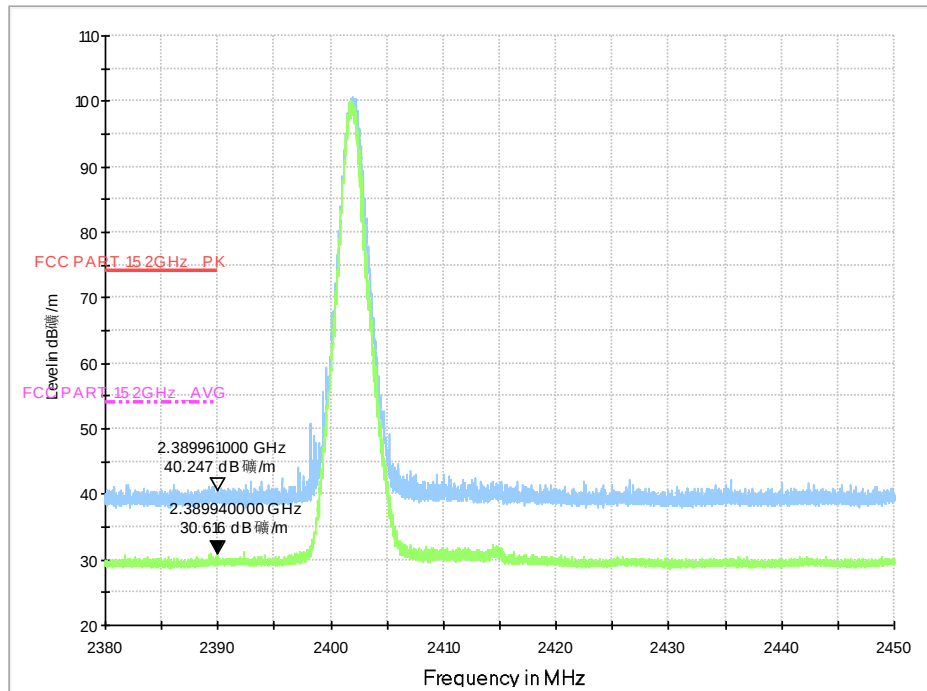
PASS. (See below detailed test data)

Radiated Method:

Hopping-off

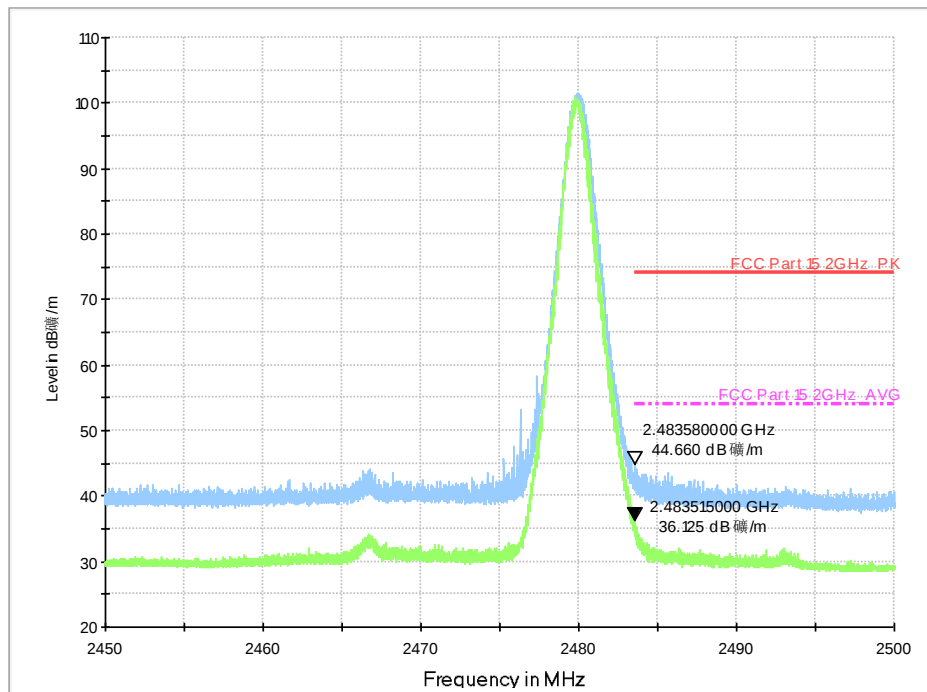
Test Mode:

GFSK-Low



Test Mode:

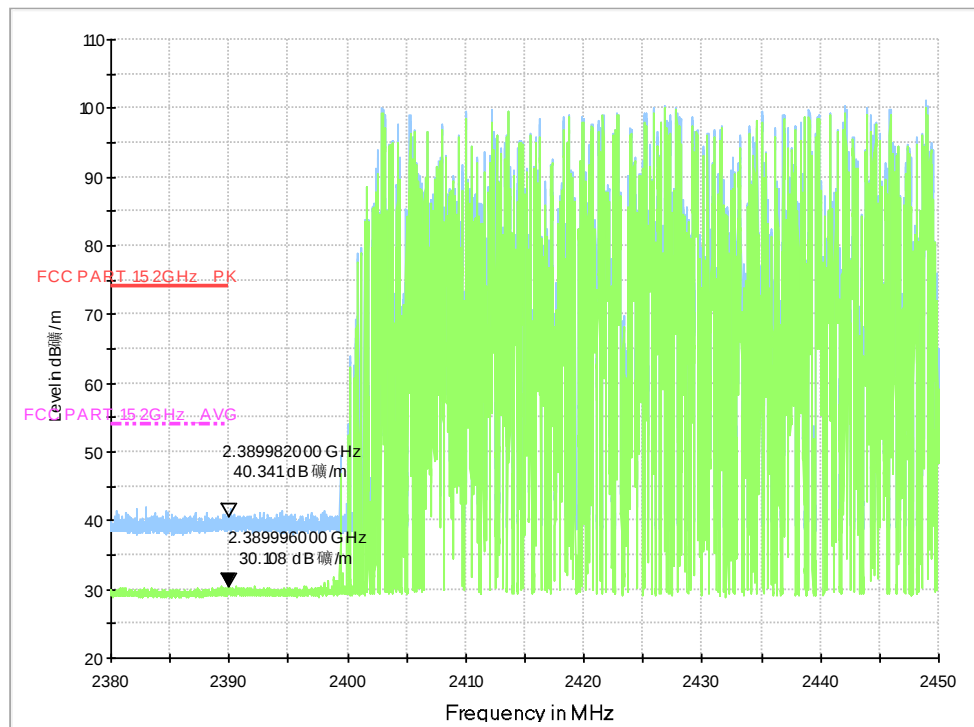
GFSK-High



Hopping-on

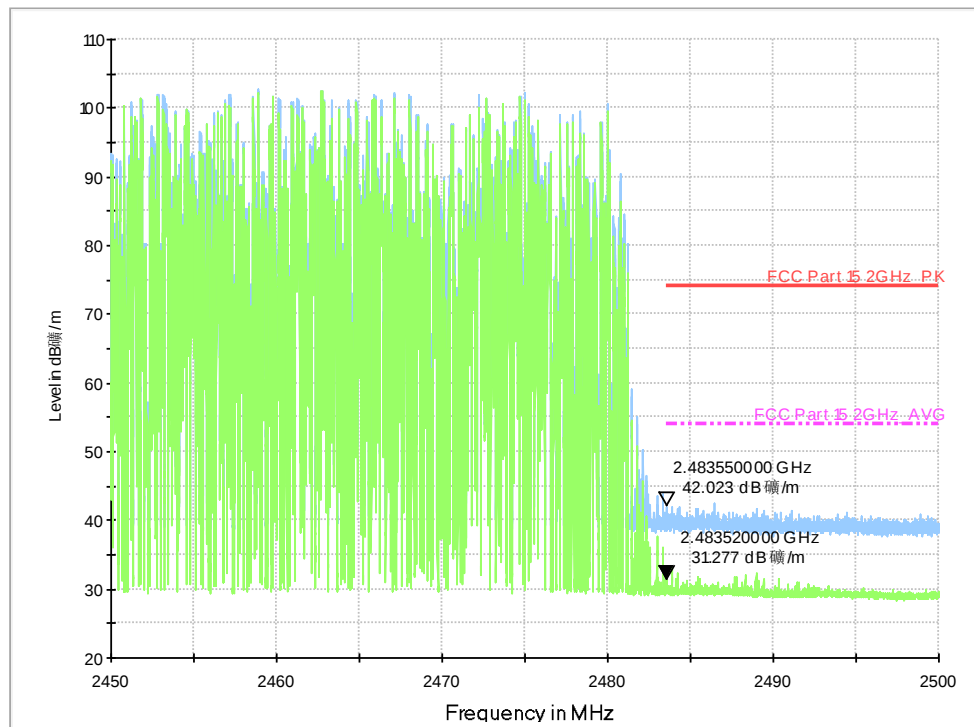
Test Mode:

GFSK-Low



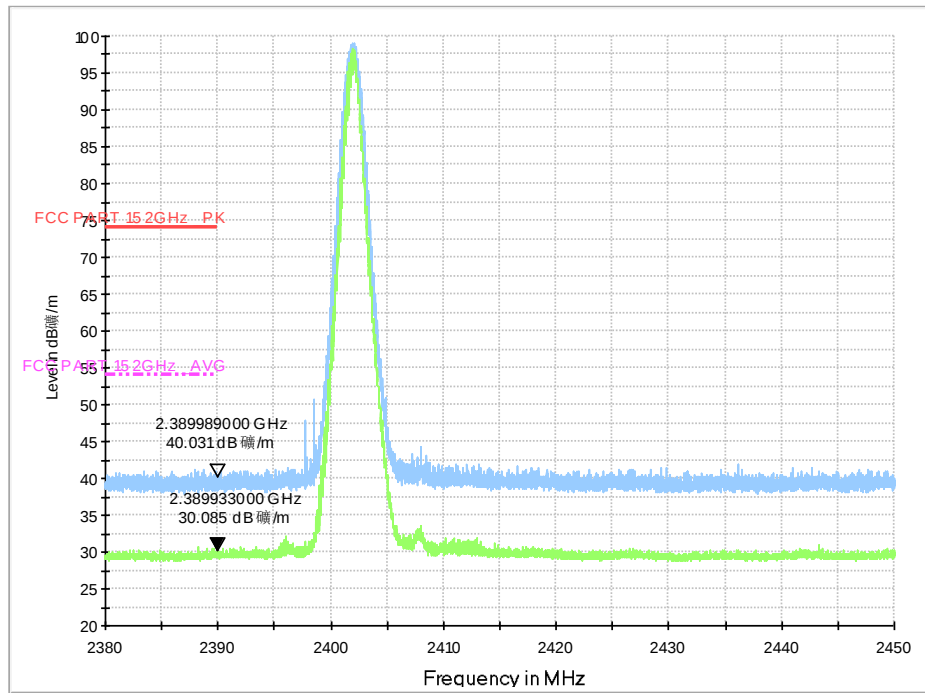
Test Mode:

GFSK-High

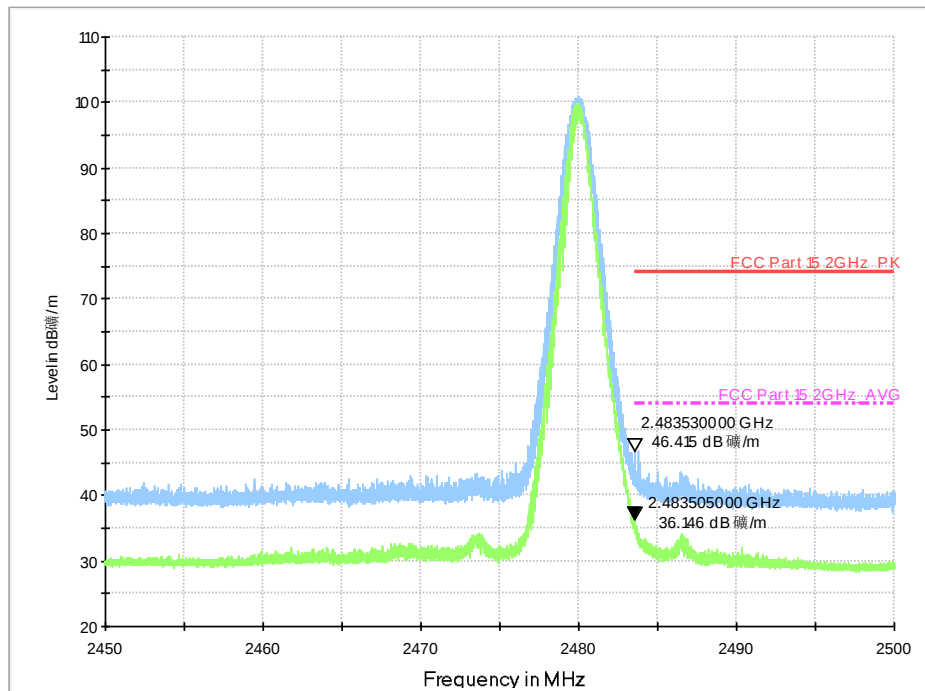


Hopping-off

Test Mode:

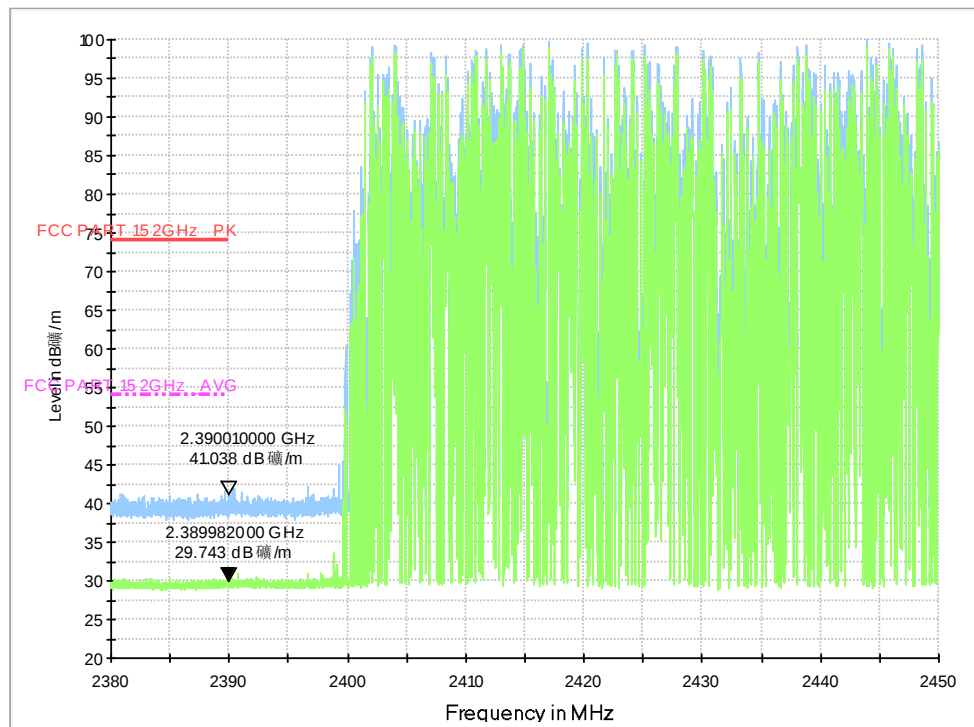
 π /4-DQPSK-Low

Test Mode:

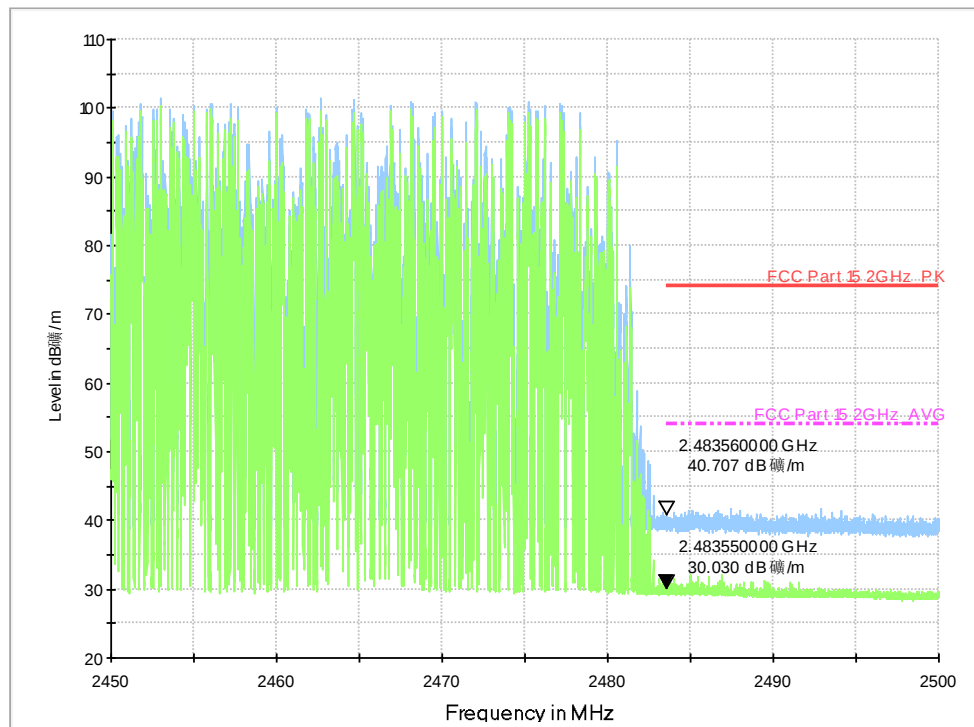
 π /4-DQPSK-High

Hopping-on

Test Mode:

 π /4-DQPSK-Low

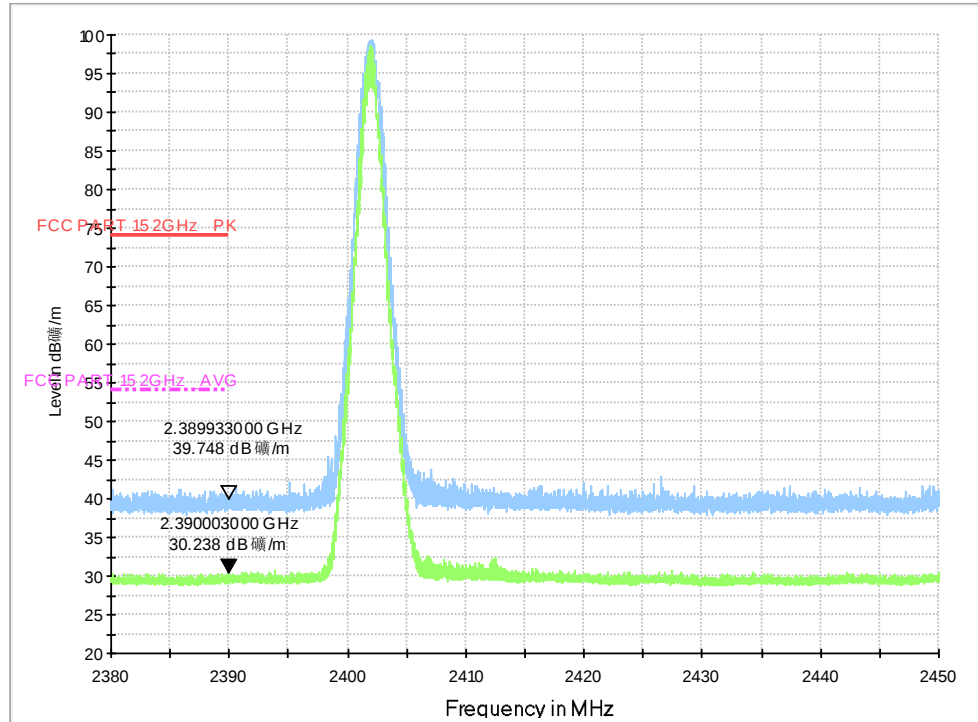
Test Mode:

 π /4-DQPSK-High

Hopping-off

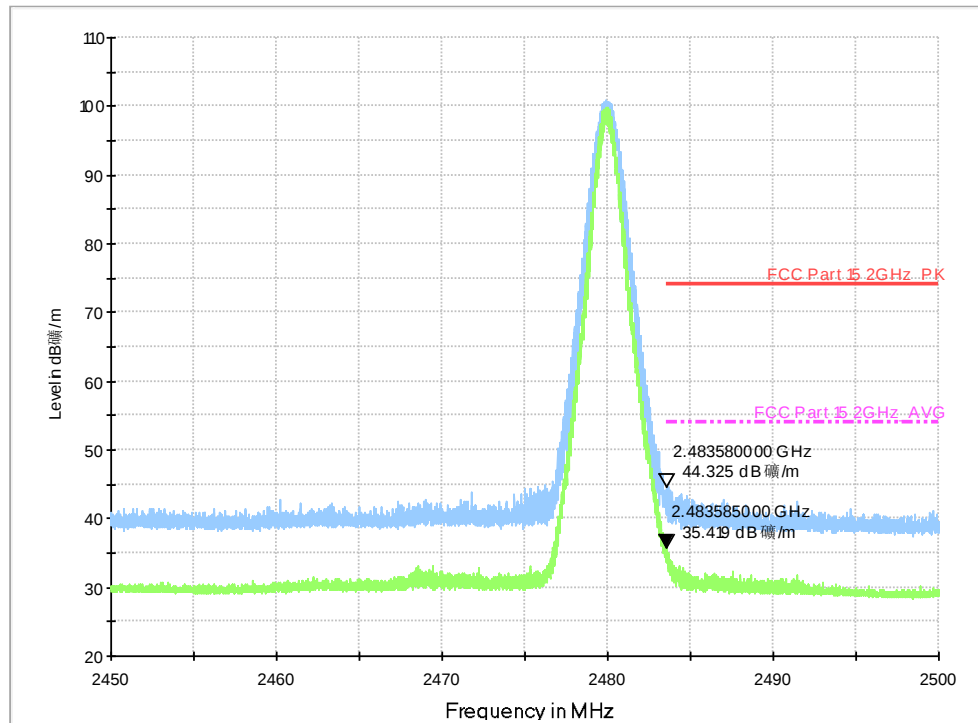
Test Mode:

8-DPSK-Low



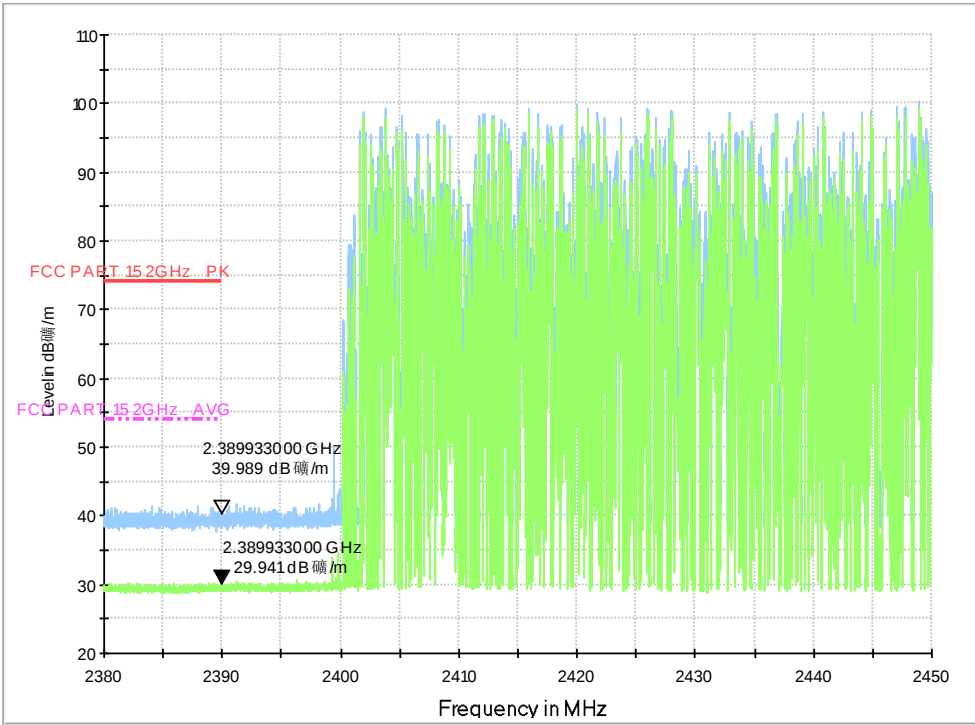
Test Mode:

8-DPSK-Low

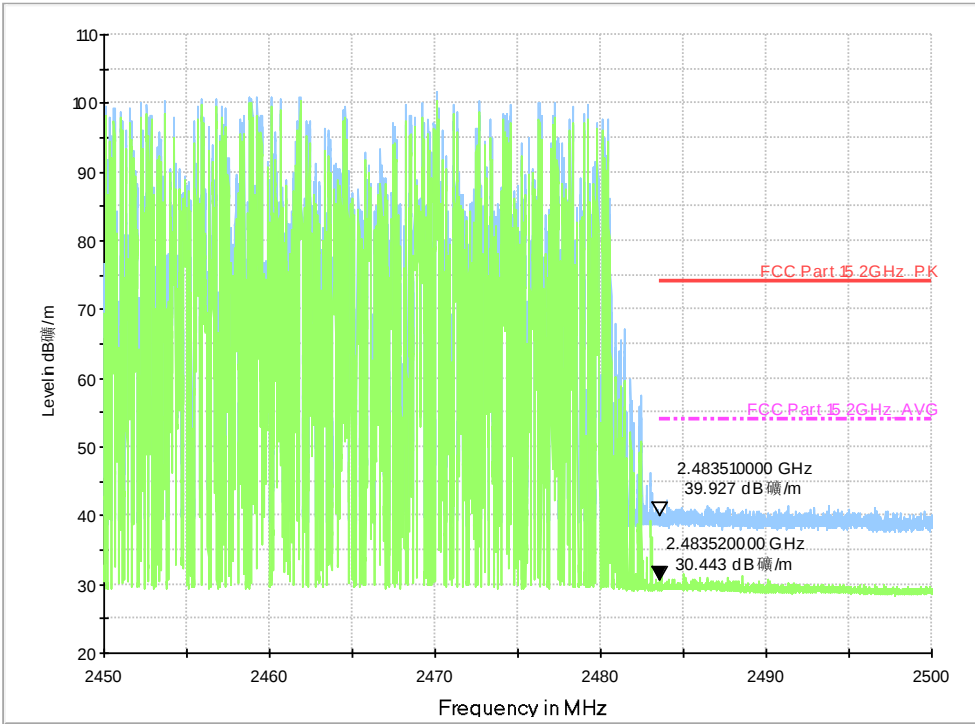


Hopping-on

Test Mode: 8-DPSK -Low



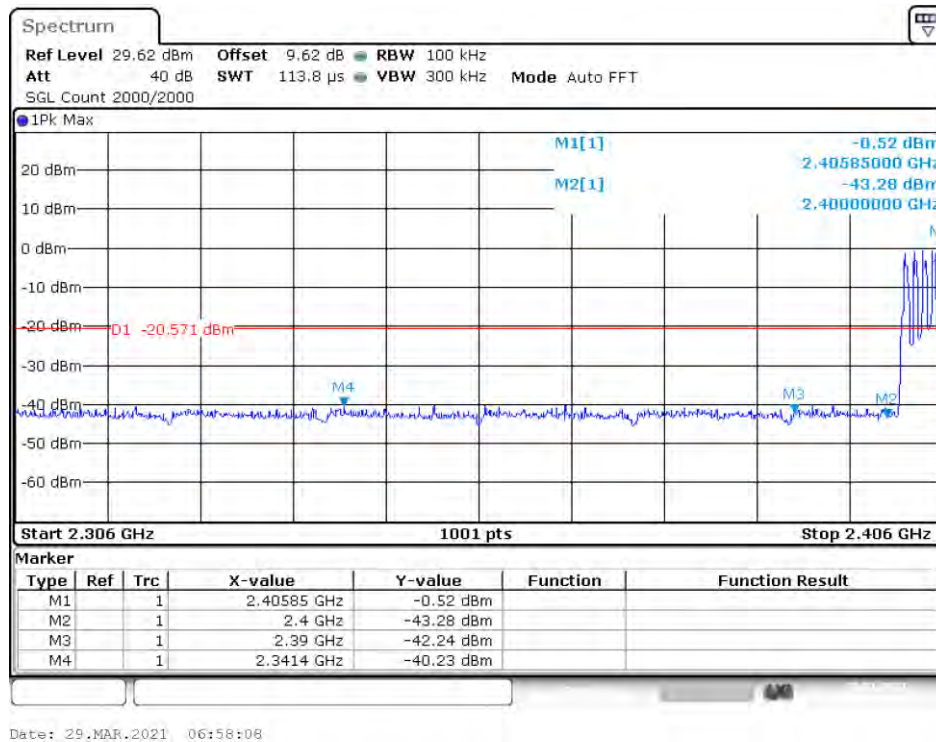
Test Mode: 8-DPSK -High



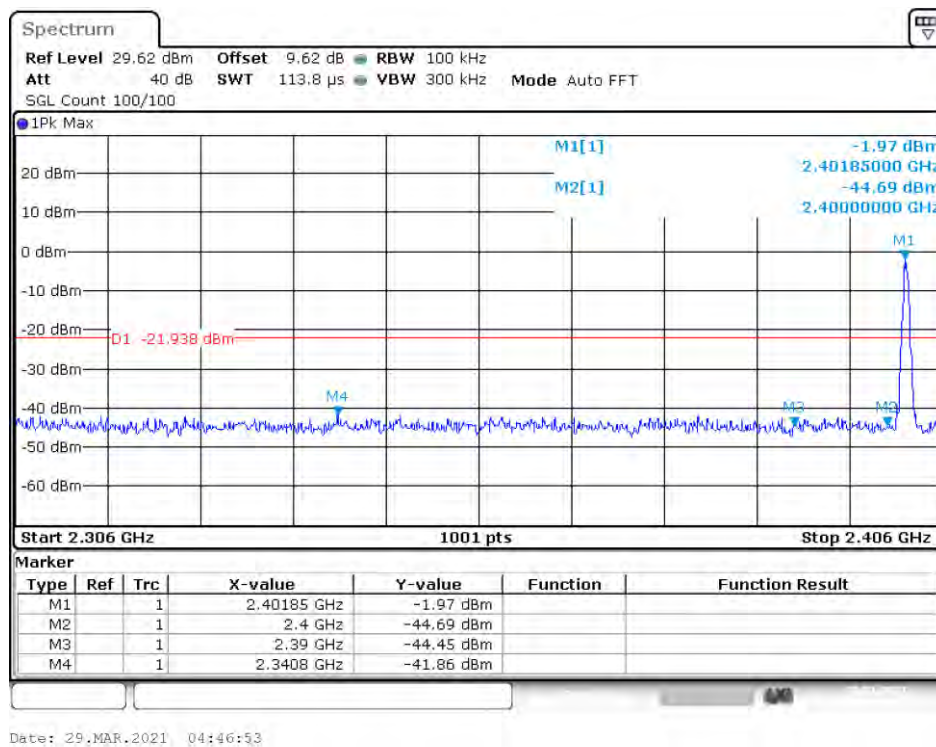
hopping-on

Conducted Method

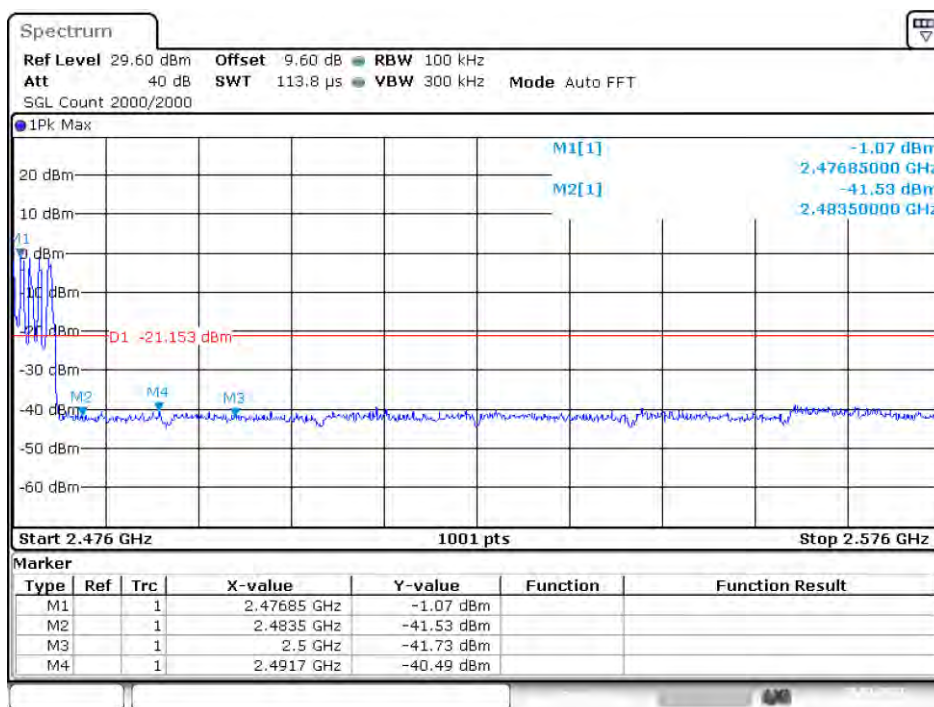
Band Edge NVNT 1-DH1 2402MHz Ant1 Hopping Emission



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

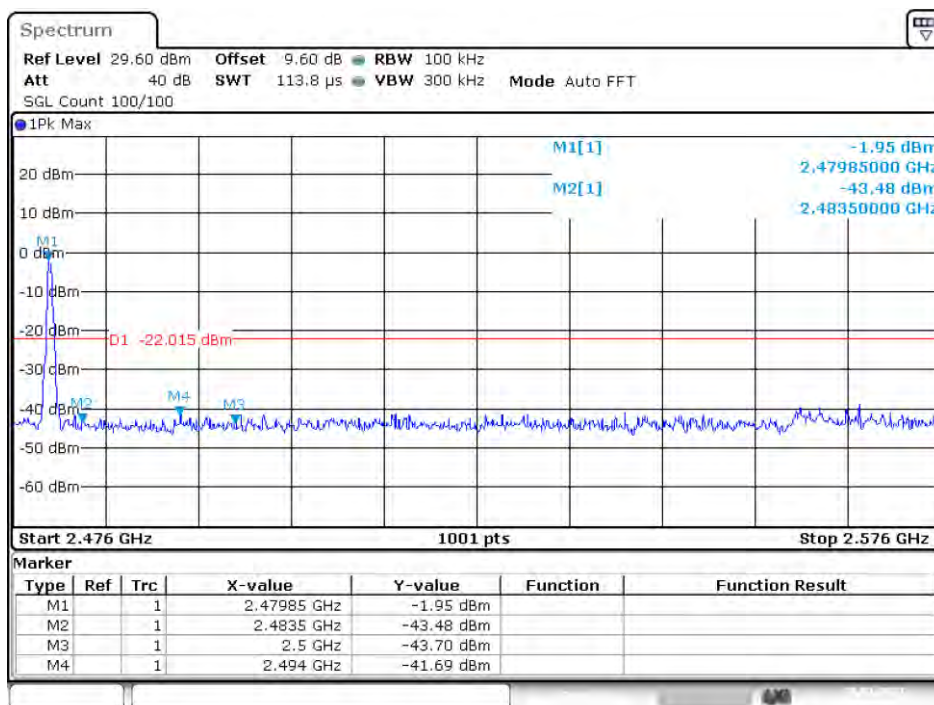


Band Edge NVNT 1-DH1 2480MHz Ant1 Hopping Emission



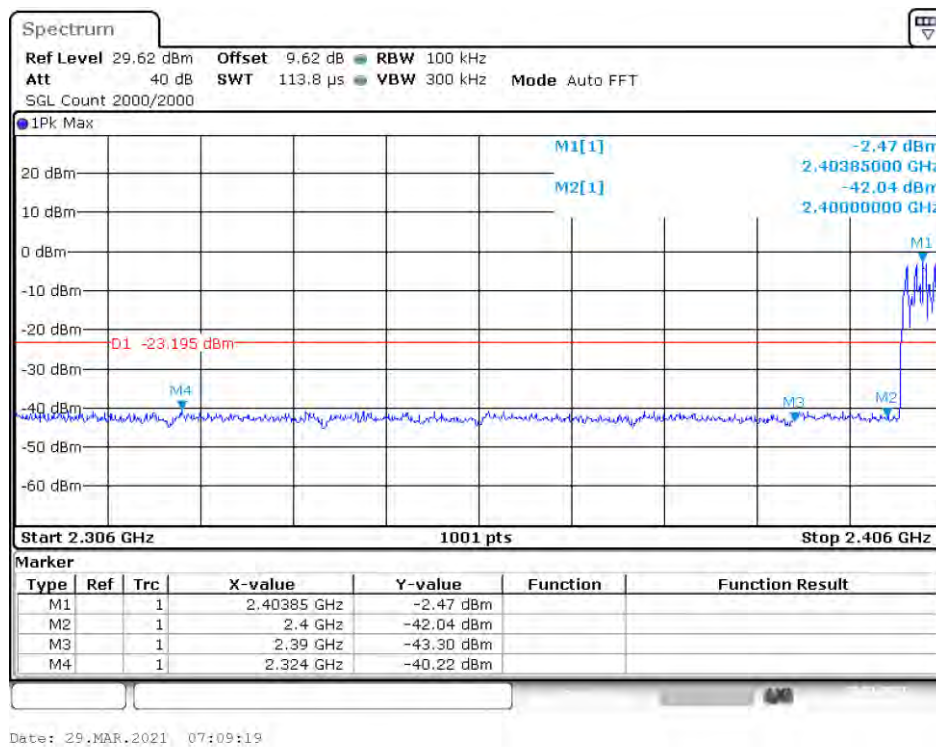
Date: 29.MAR.2021 07:03:27

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

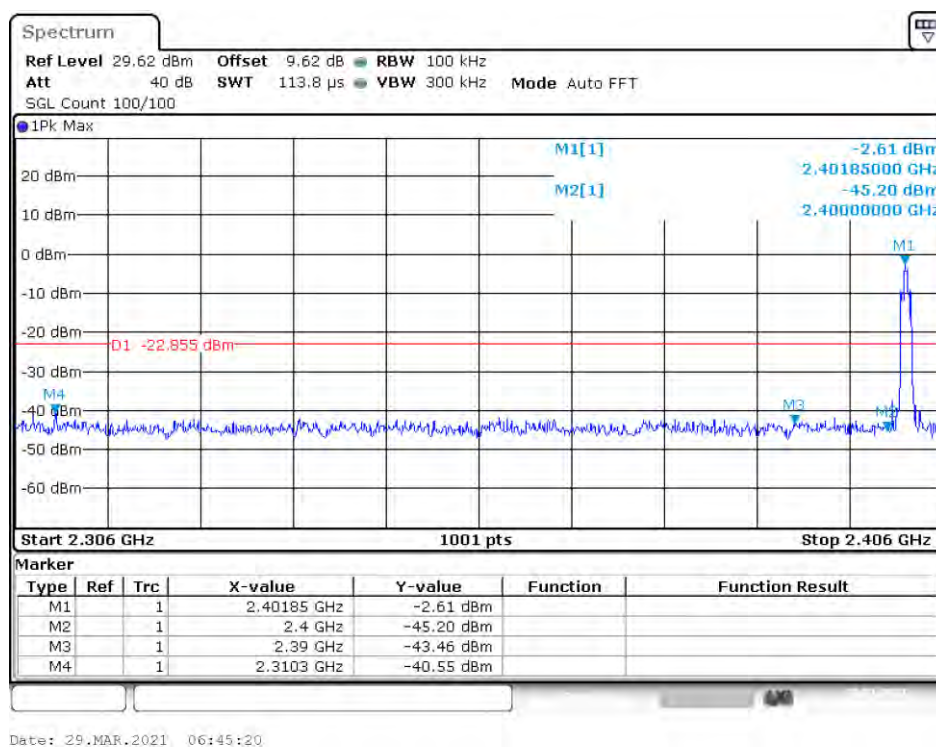


Date: 29.MAR.2021 04:49:31

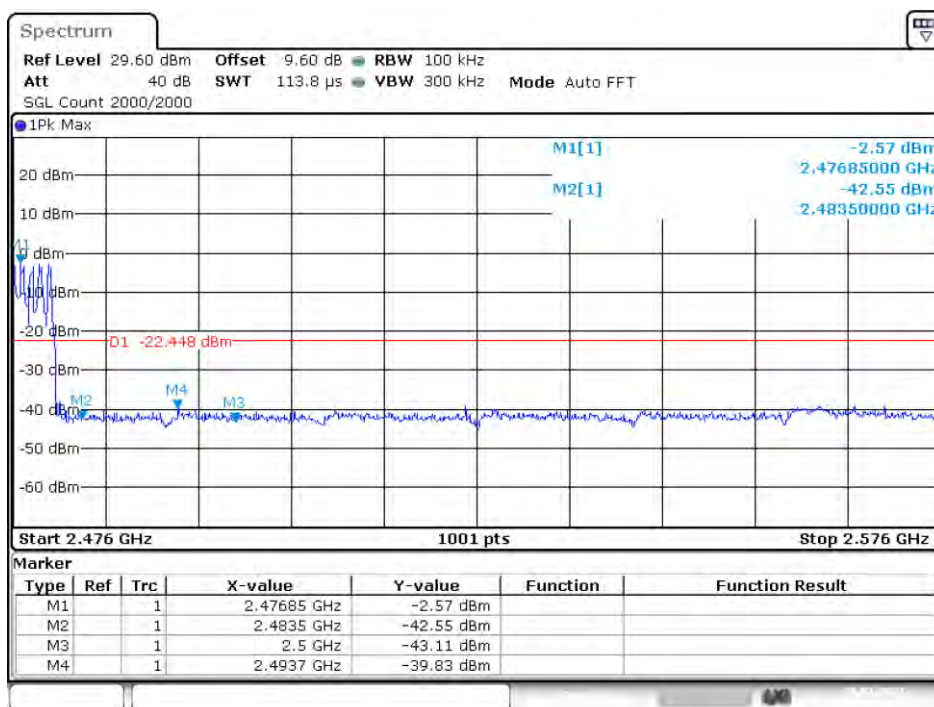
Band Edge NVNT 2-DH1 2402MHz Ant1 Hopping Emission



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

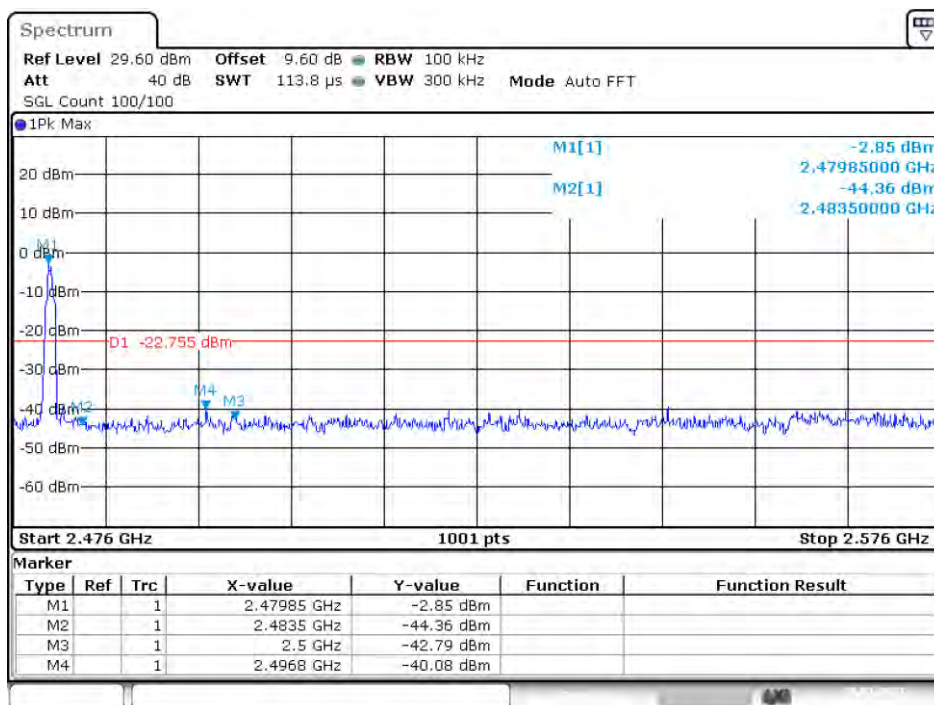


Band Edge NVNT 2-DH1 2480MHz Ant1 Hopping Emission



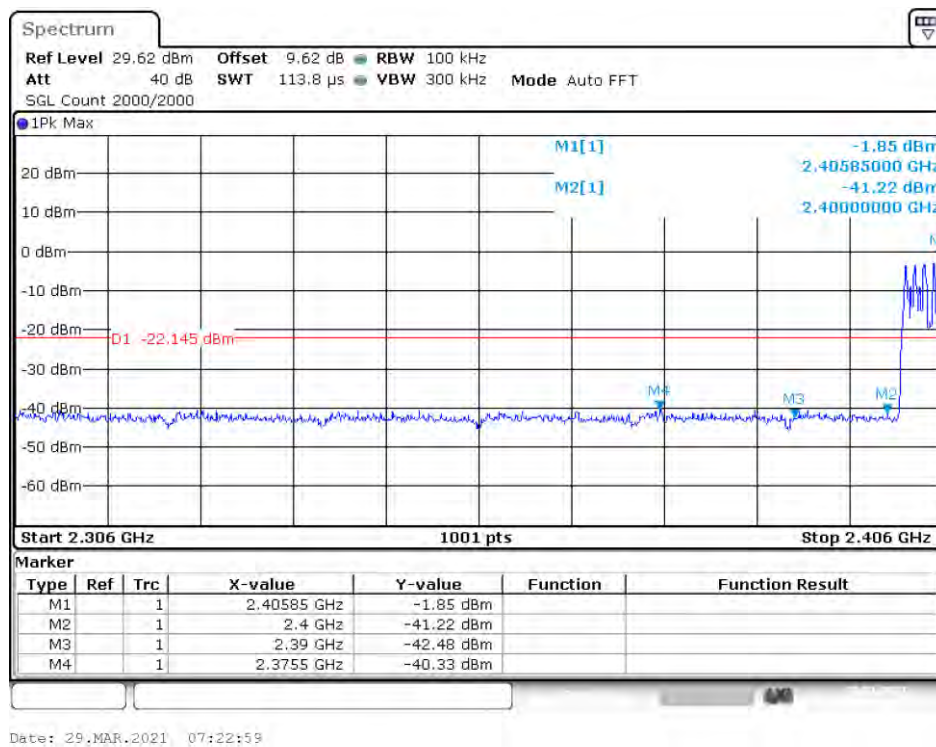
Date: 29.MAR.2021 07:13:17

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

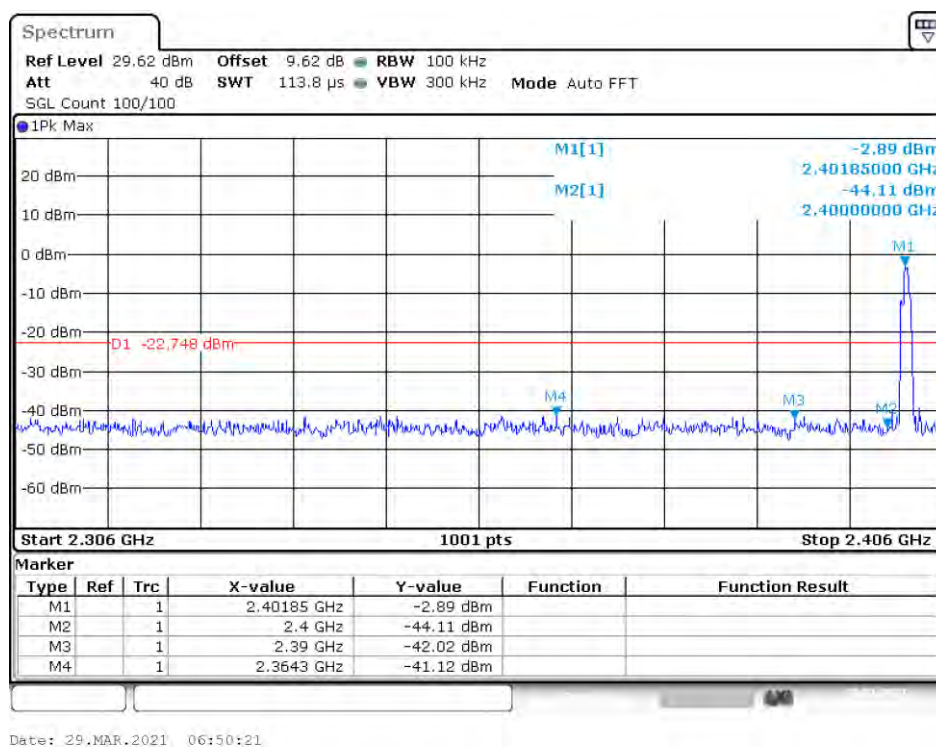


Date: 29.MAR.2021 06:47:59

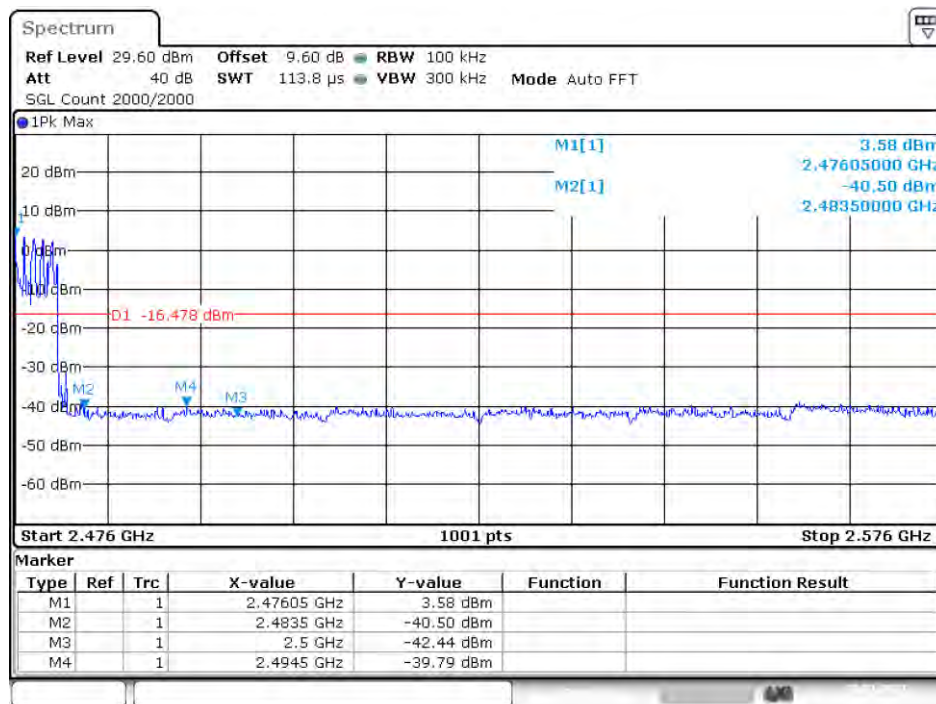
Band Edge NVNT 3-DH1 2402MHz Ant1 Hopping Emission



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

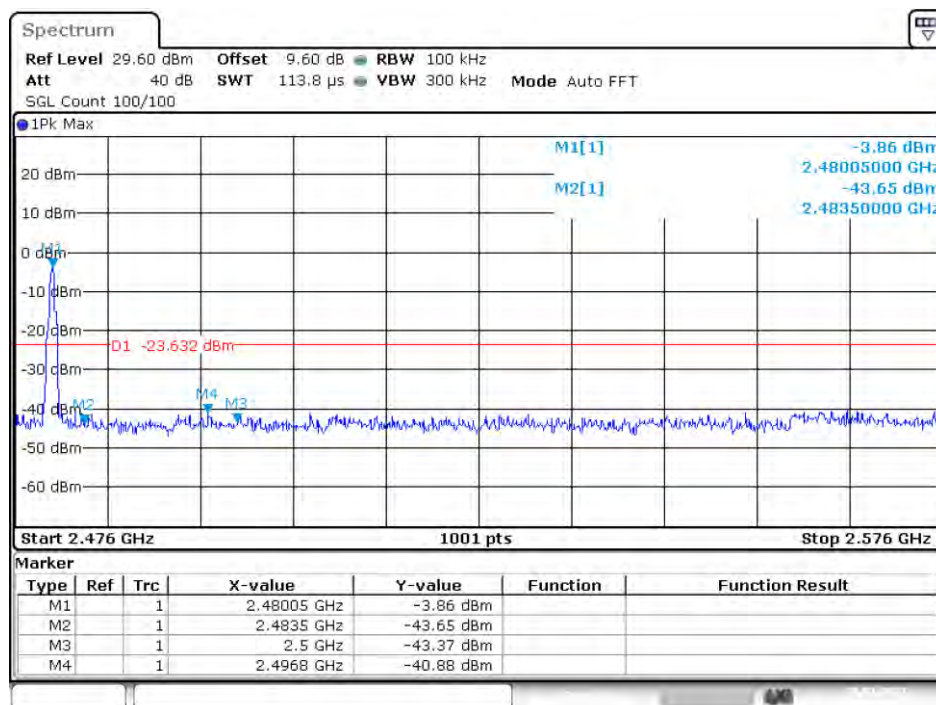


Band Edge NVNT 3-DH1 2480MHz Ant1 Hopping Emission



Date: 29.MAR.2021 16:11:31

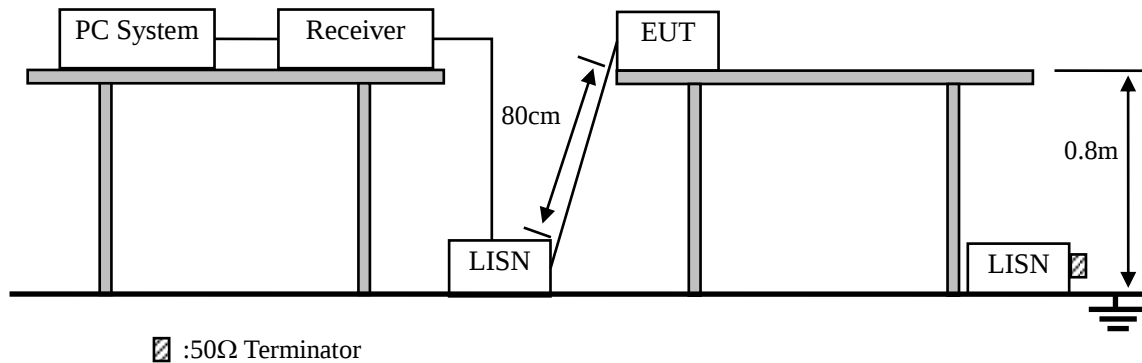
Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Emission



Date: 29.MAR.2021 06:53:59

10. Power Line Conducted Emissions

10.1. Block Diagram of Test Setup



10.2. Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
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

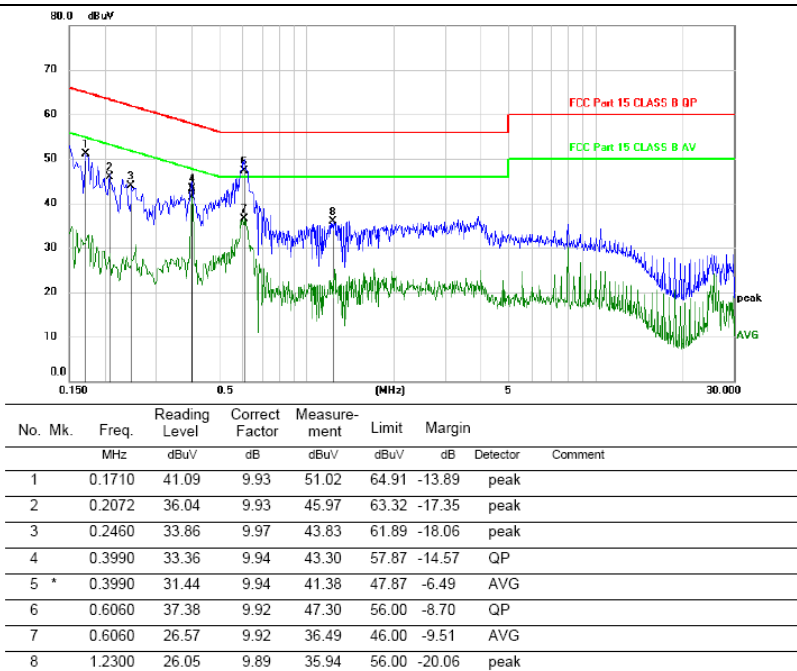
- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected 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

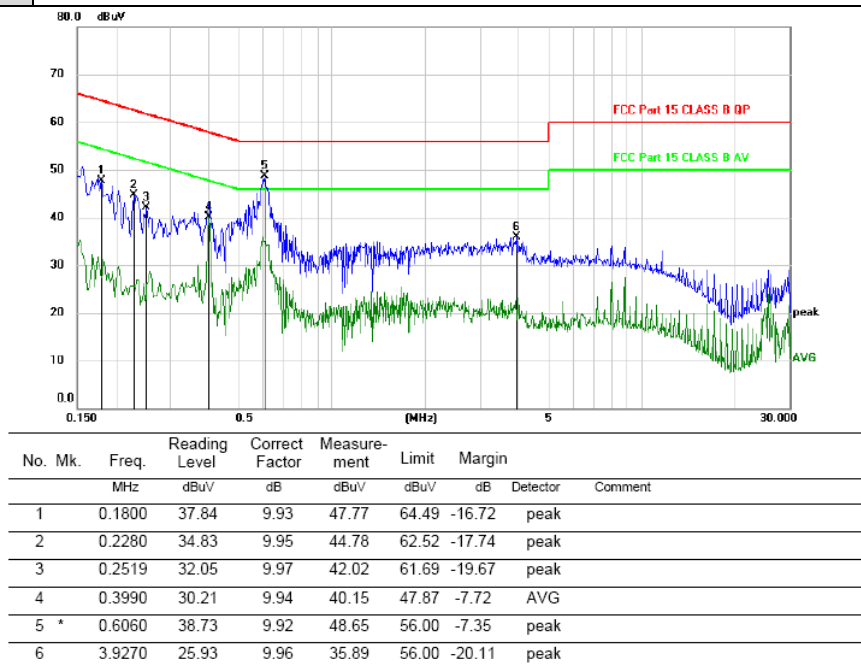
PASS. (See below detailed test data)

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

Pol	Line
-----	------



Pol	Neutral
-----	---------



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

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 GFSK was listed in this report.

11. Antenna Requirements

11.1. Limit

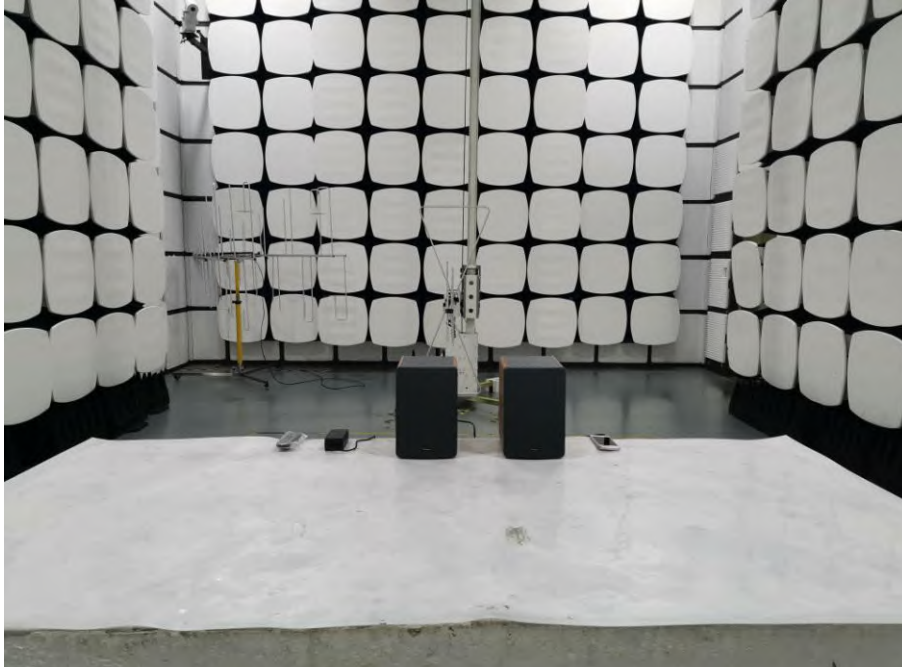
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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 external antenna and the interface is RP-SMA. It complies with the standard requirement.

12. Test Setup Photo

12.1. Photos of Radiated emission



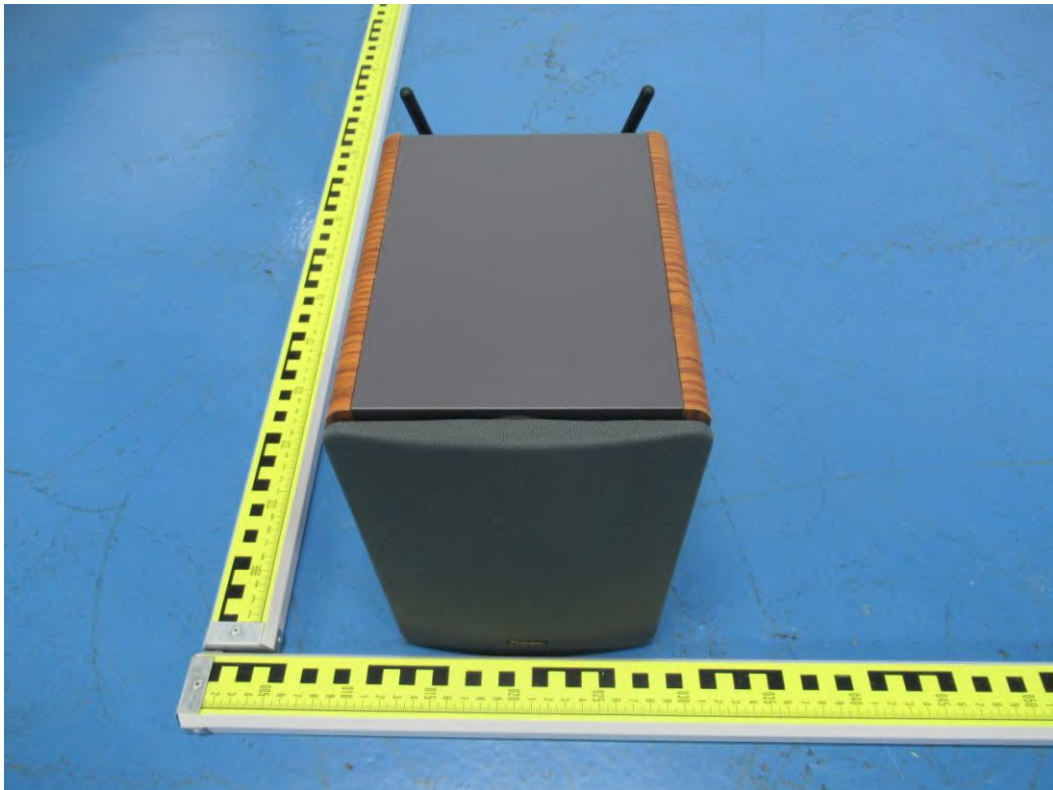
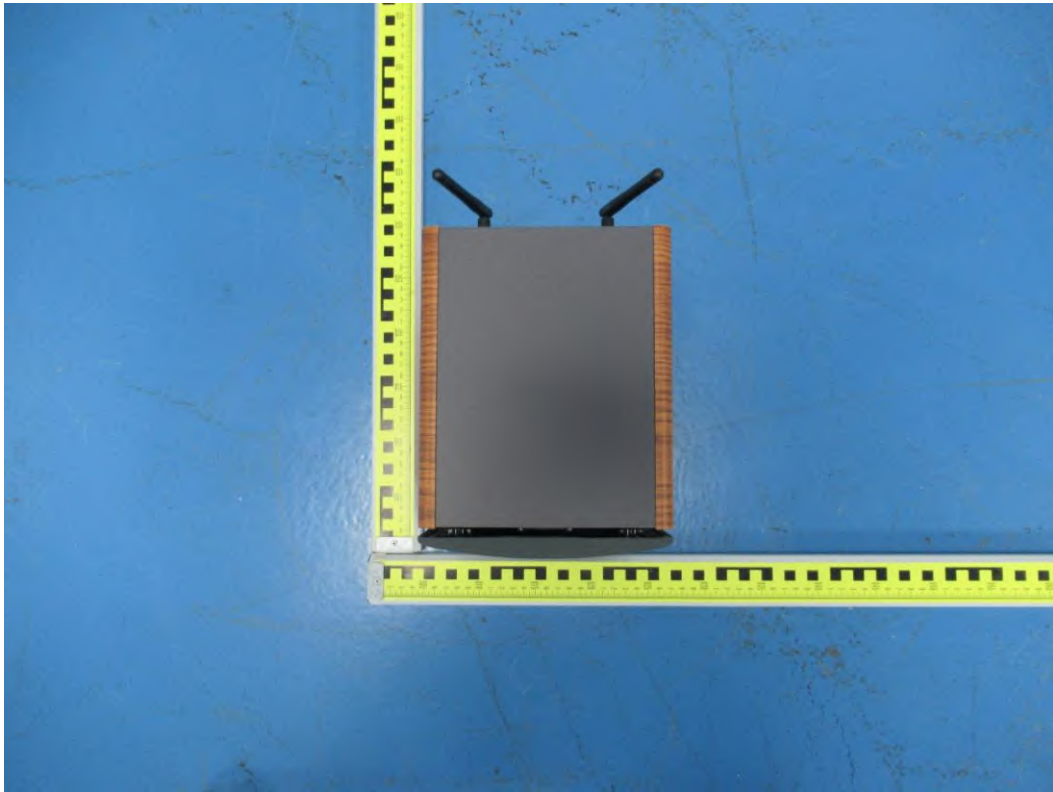


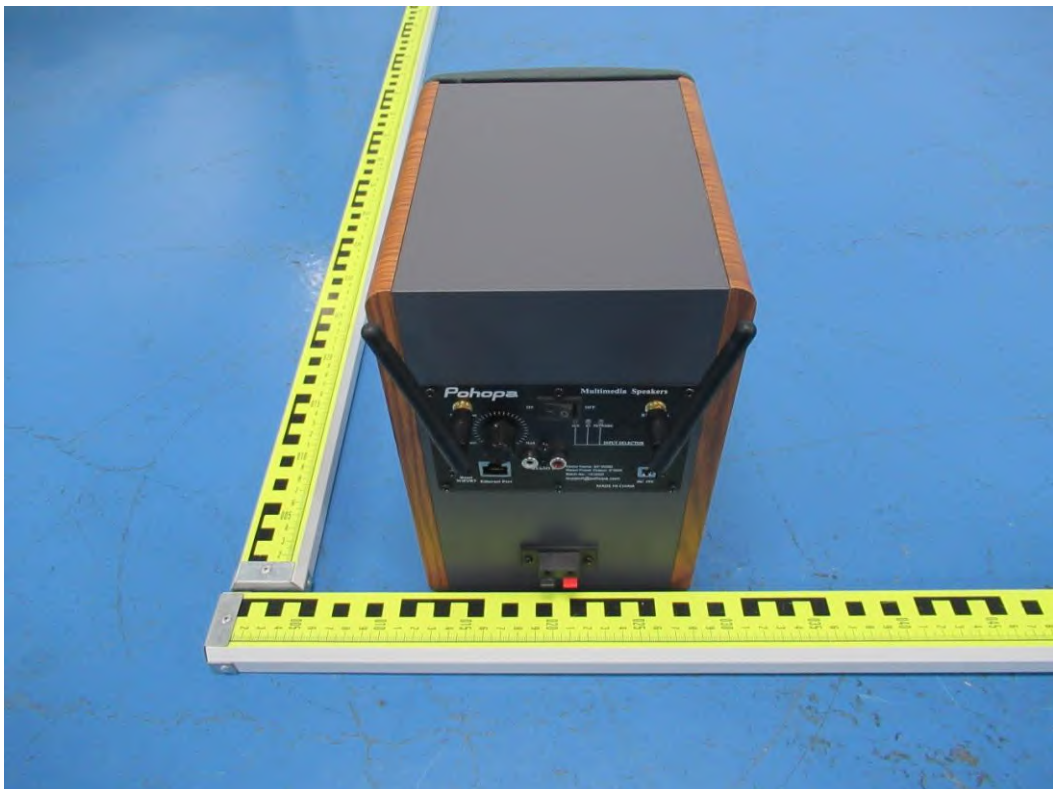
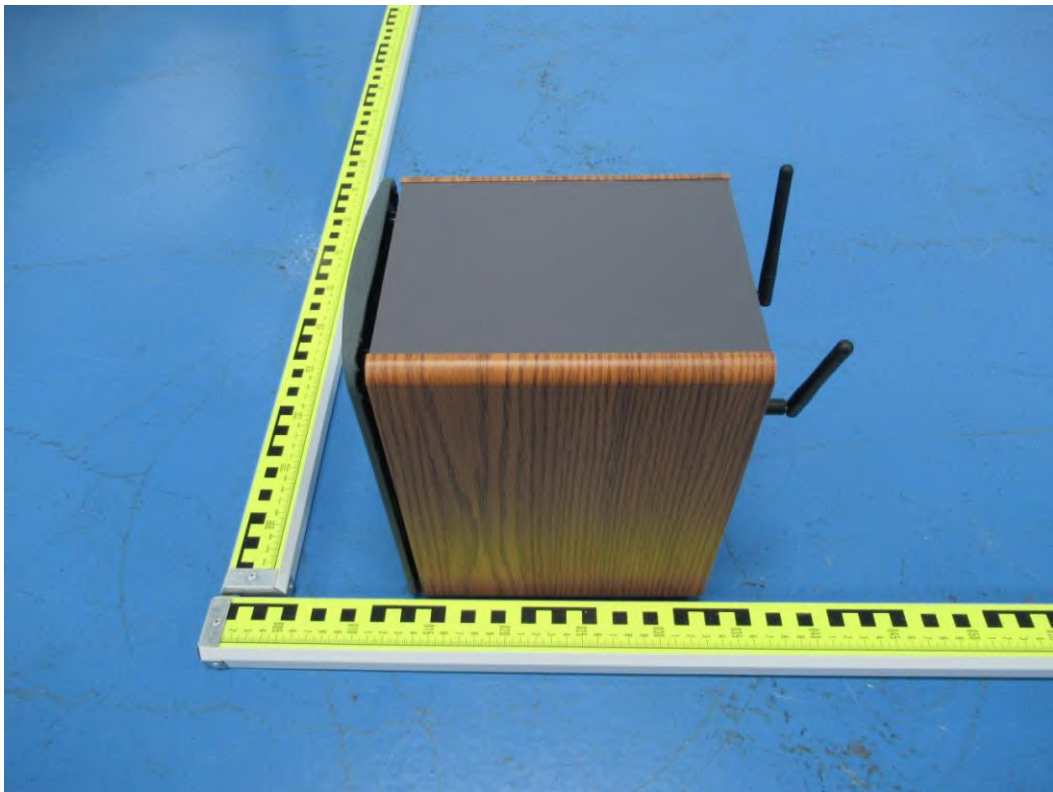
12.2.Photos of Conducted Emission test

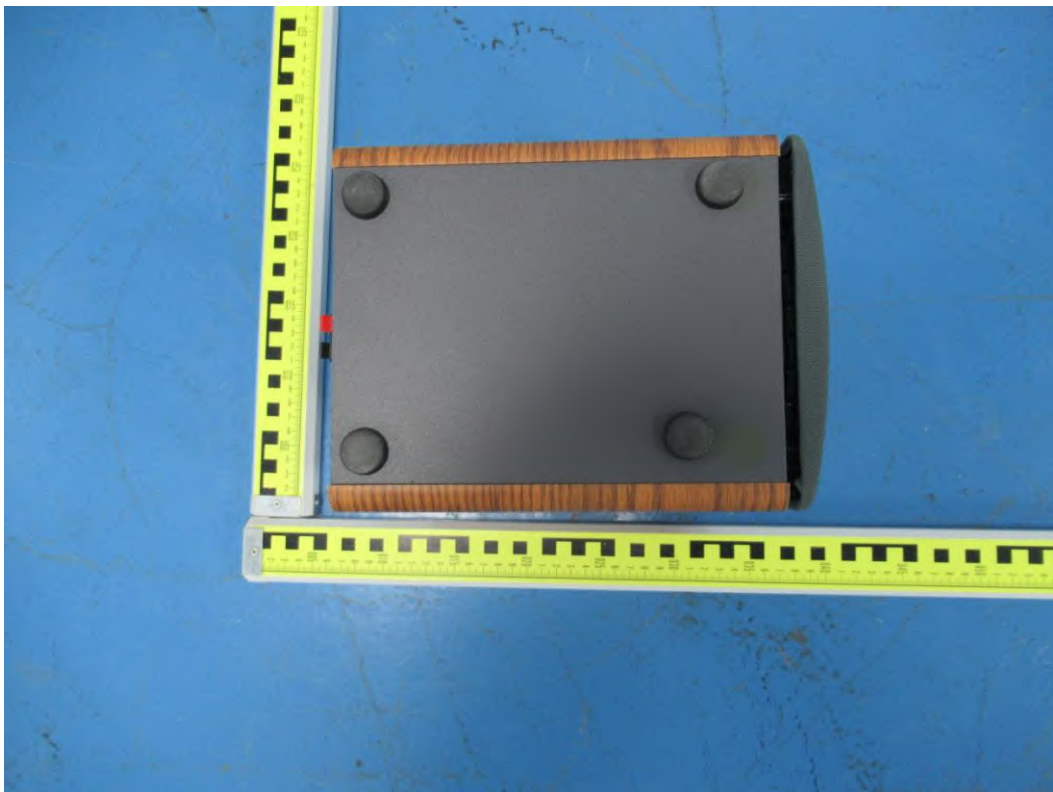
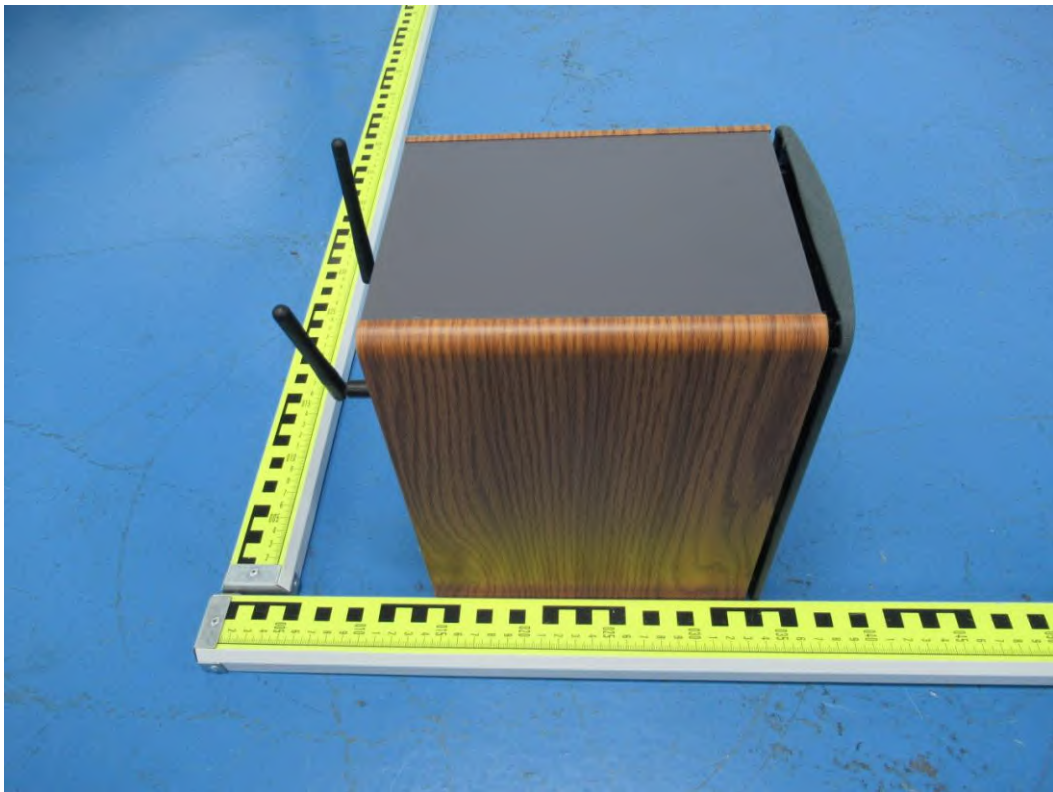


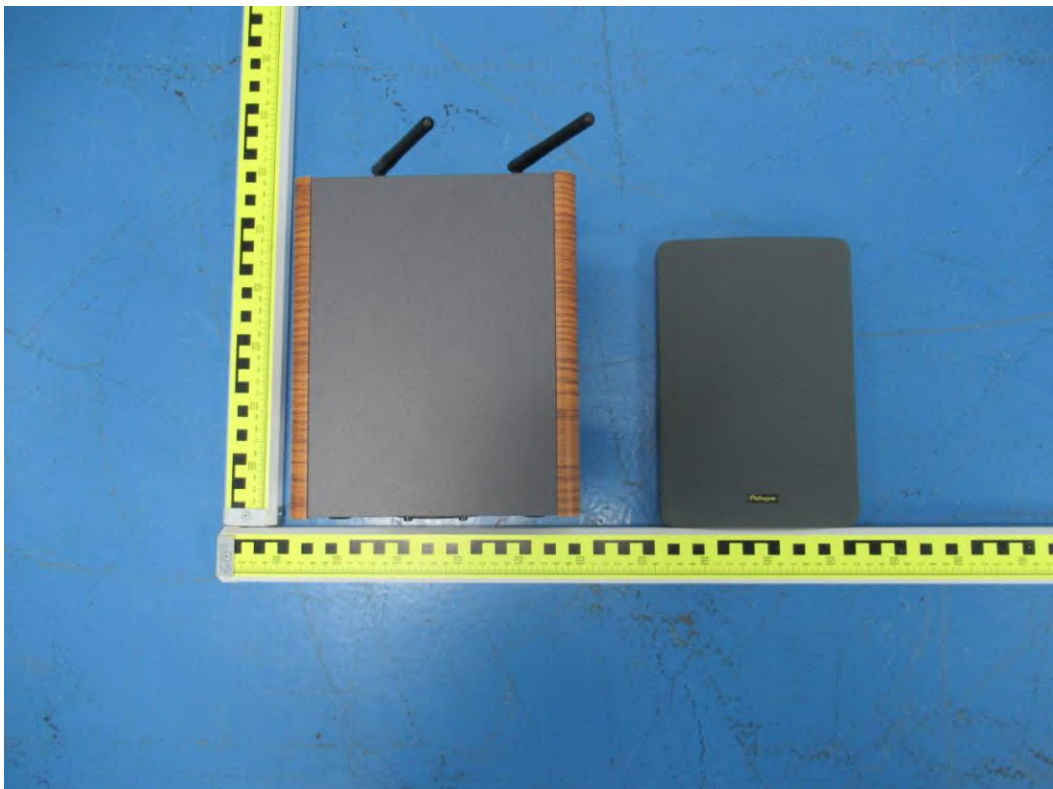
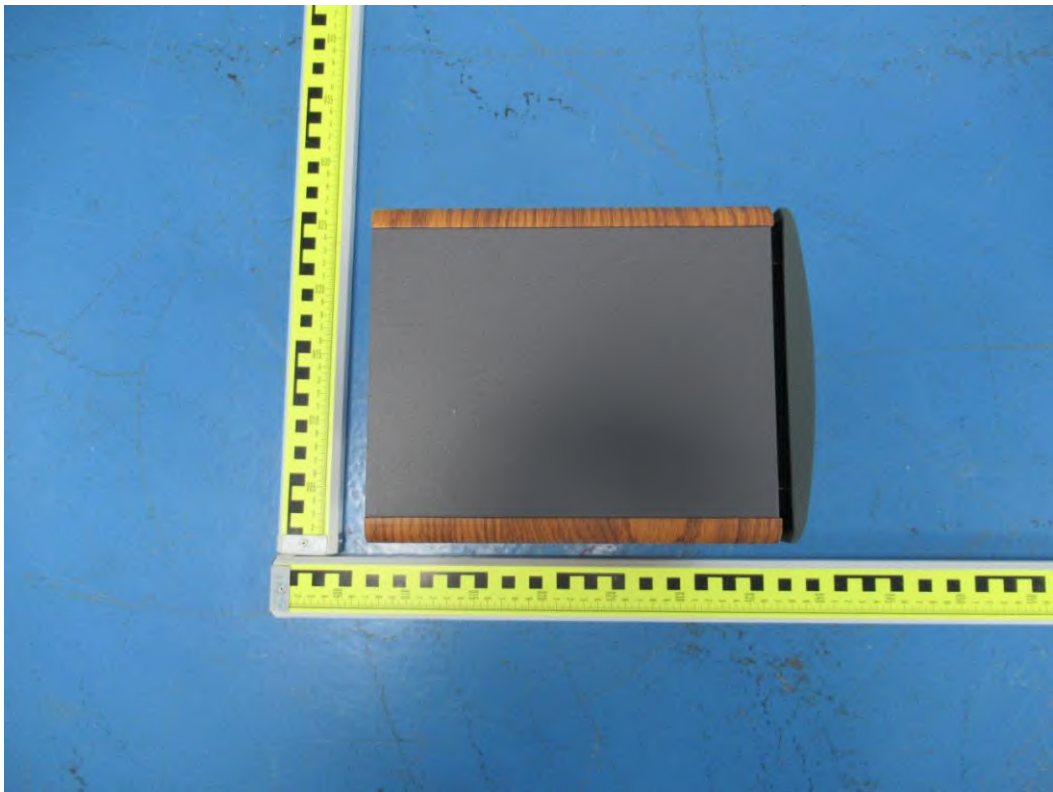
13.Photos Of EUT

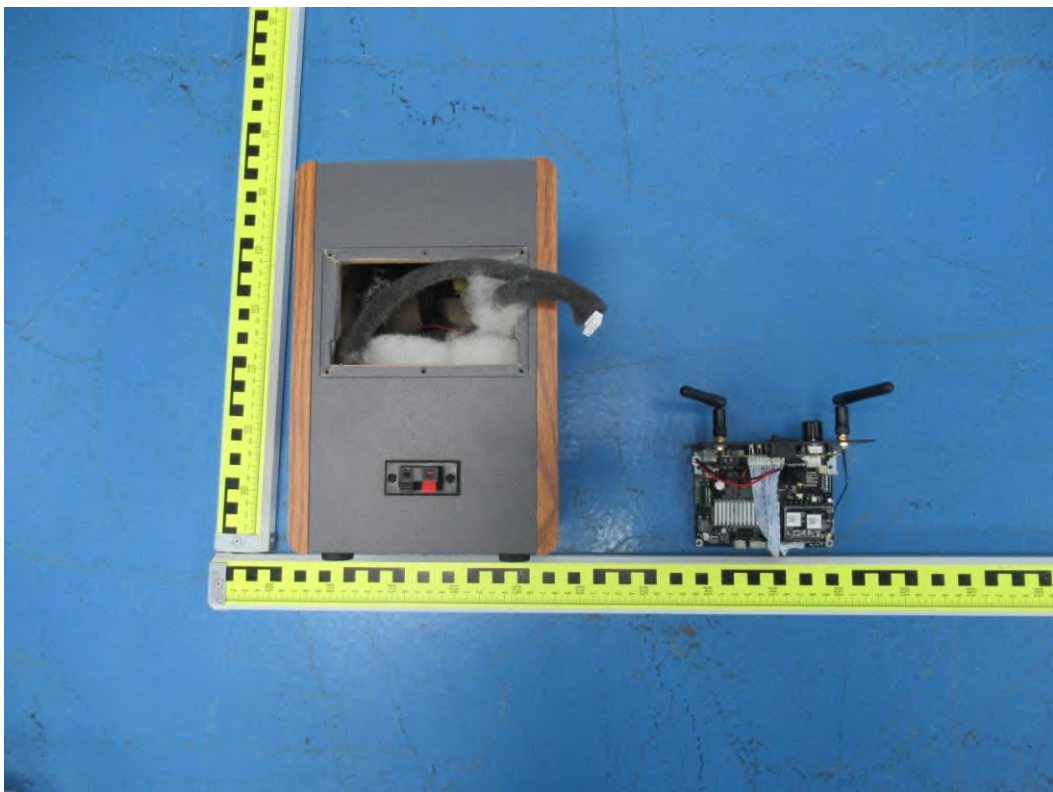
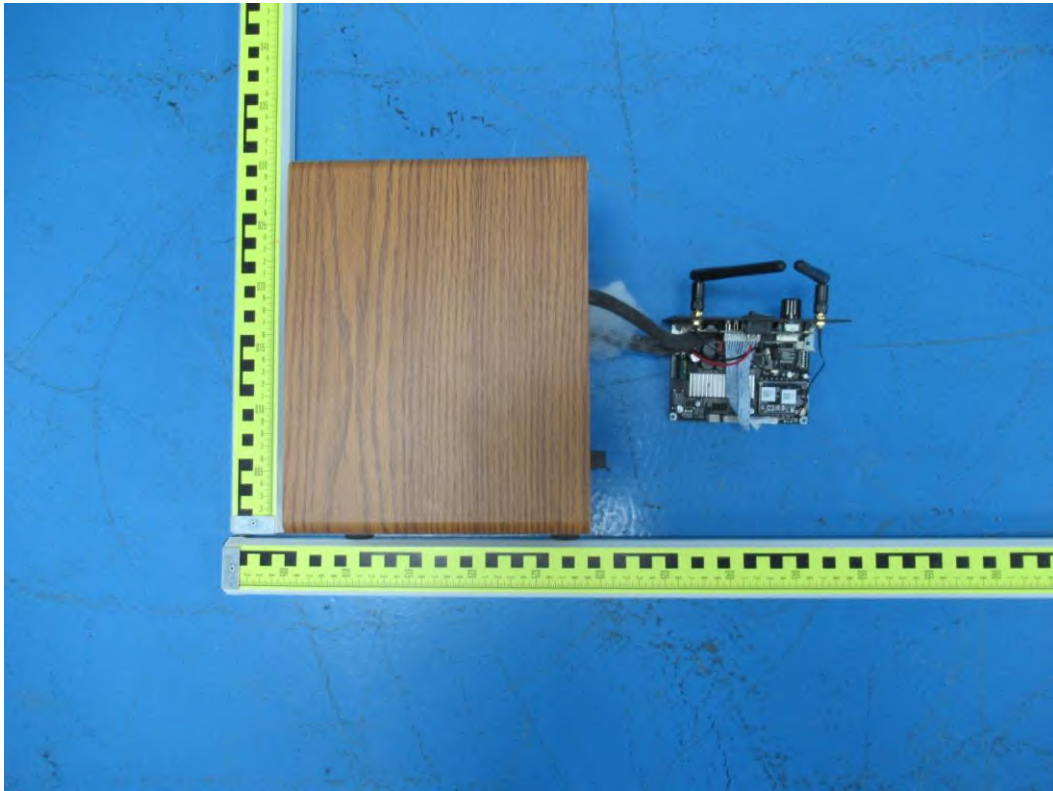


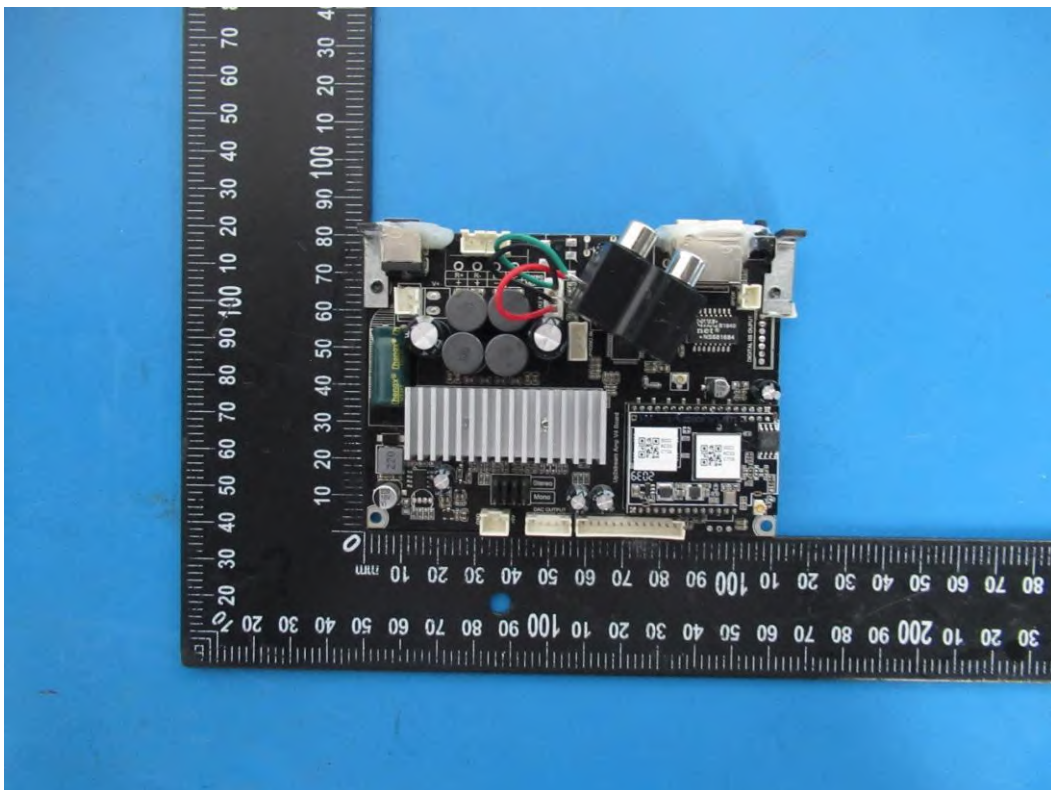
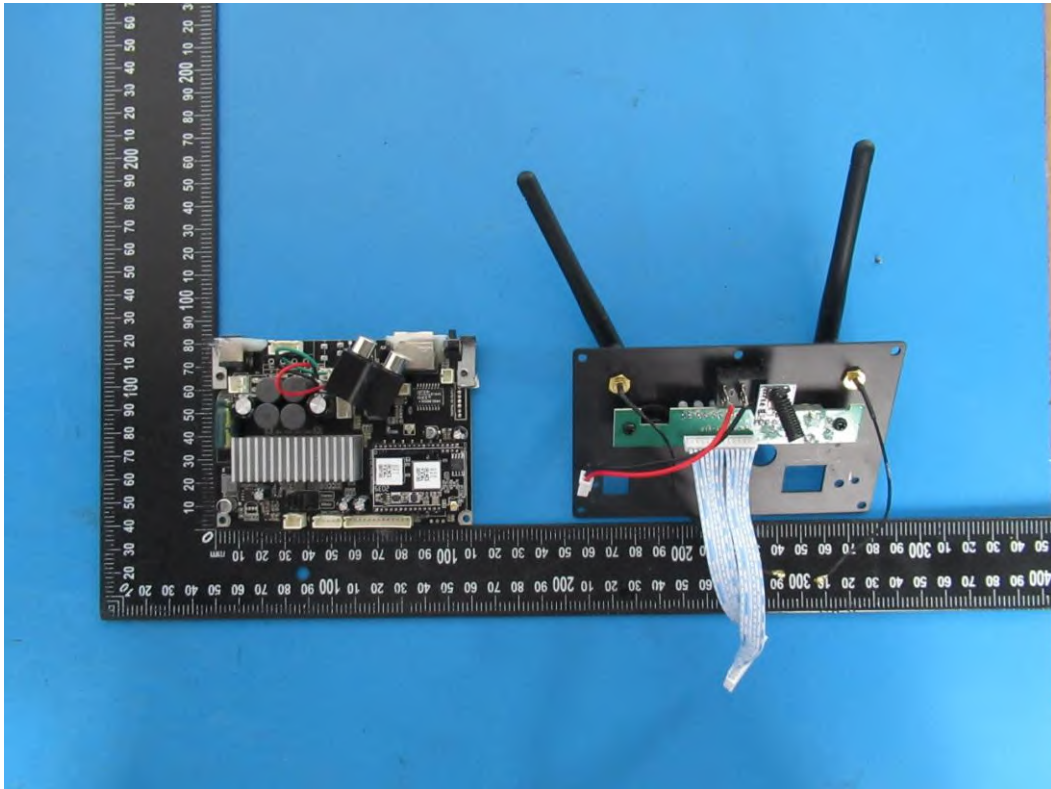


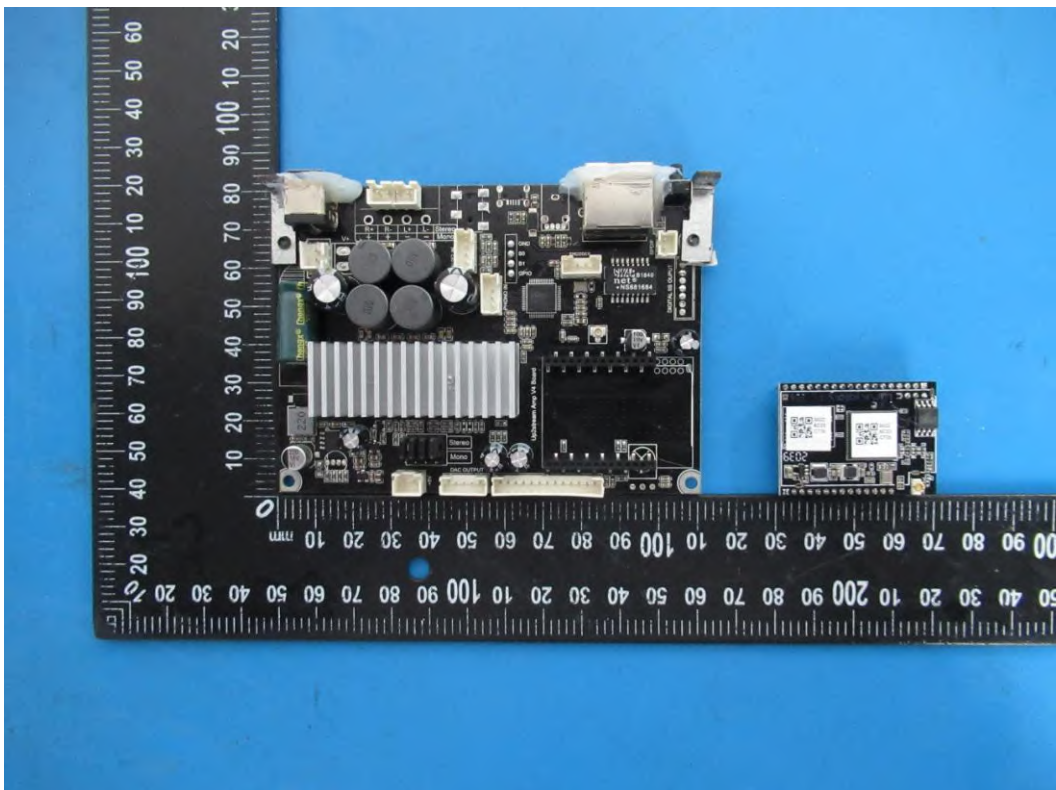
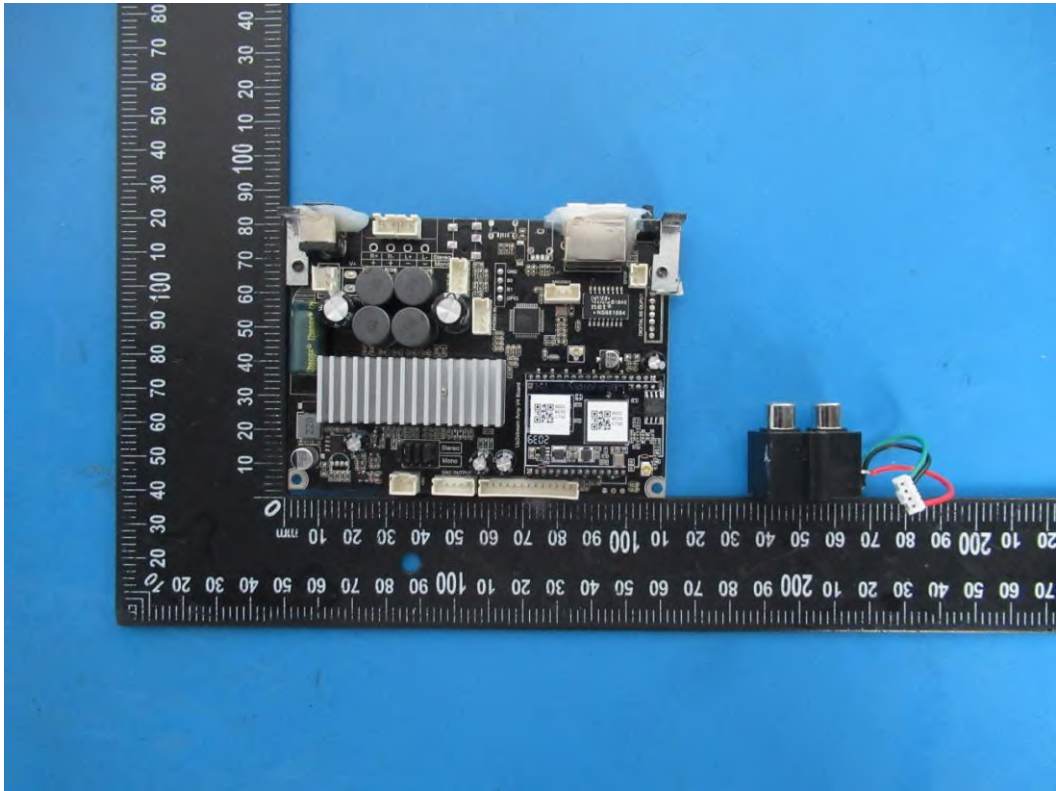


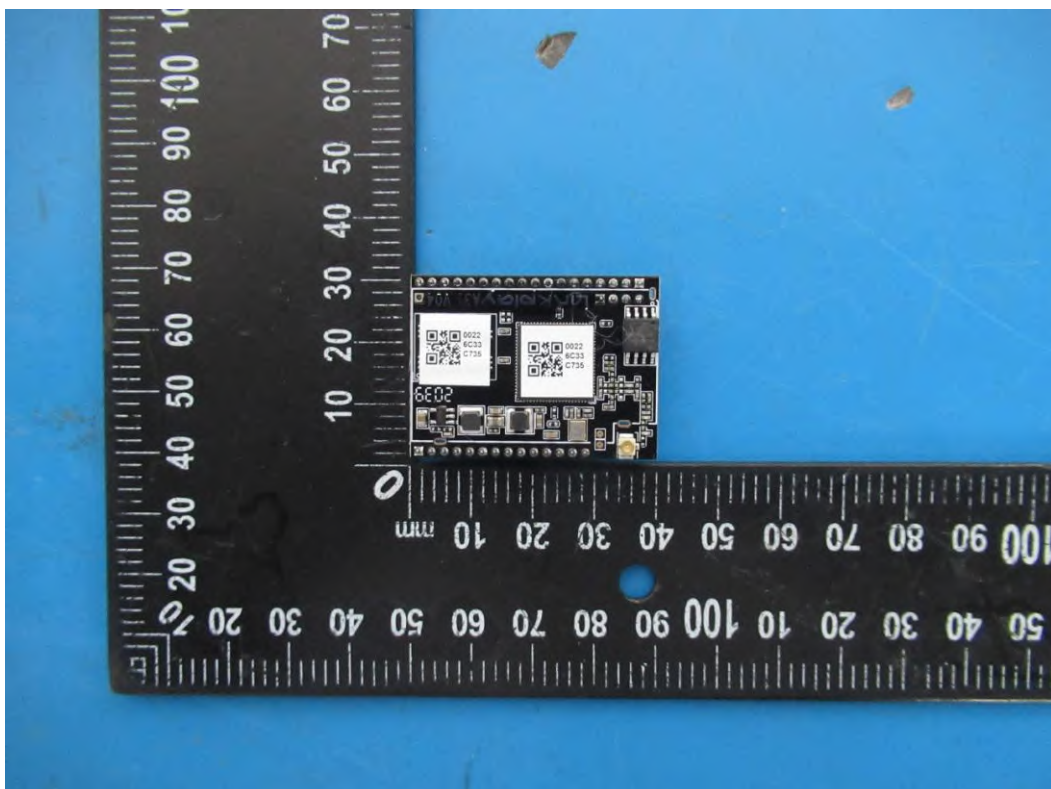
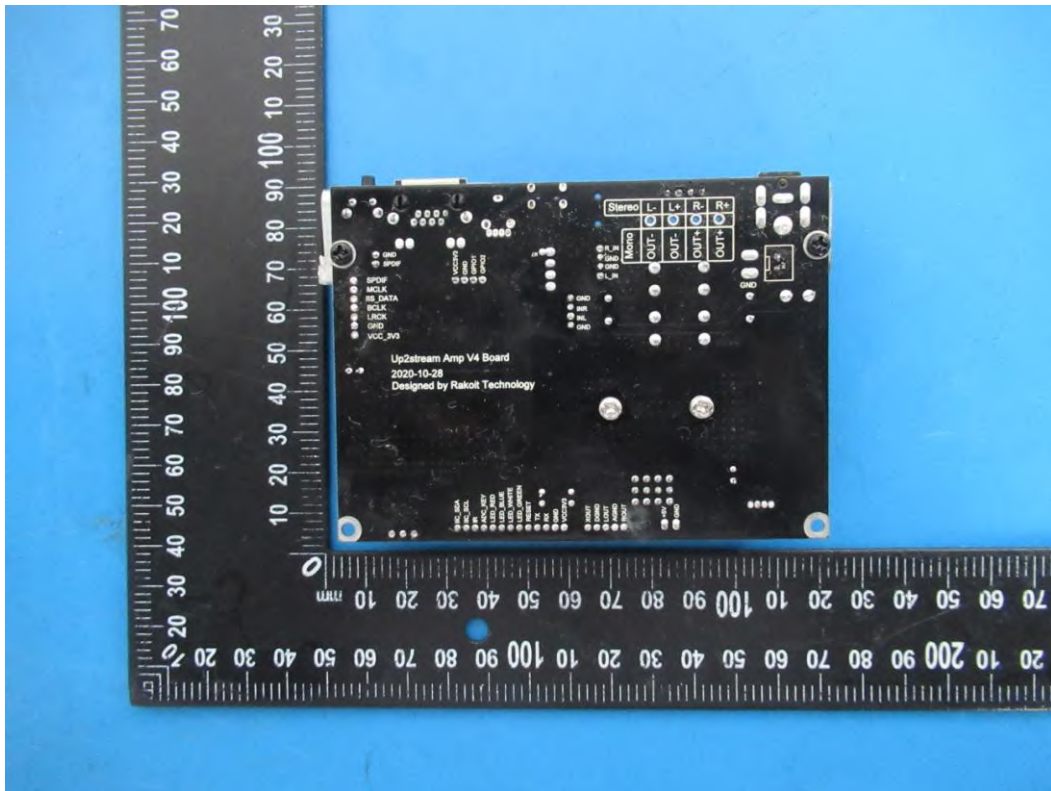


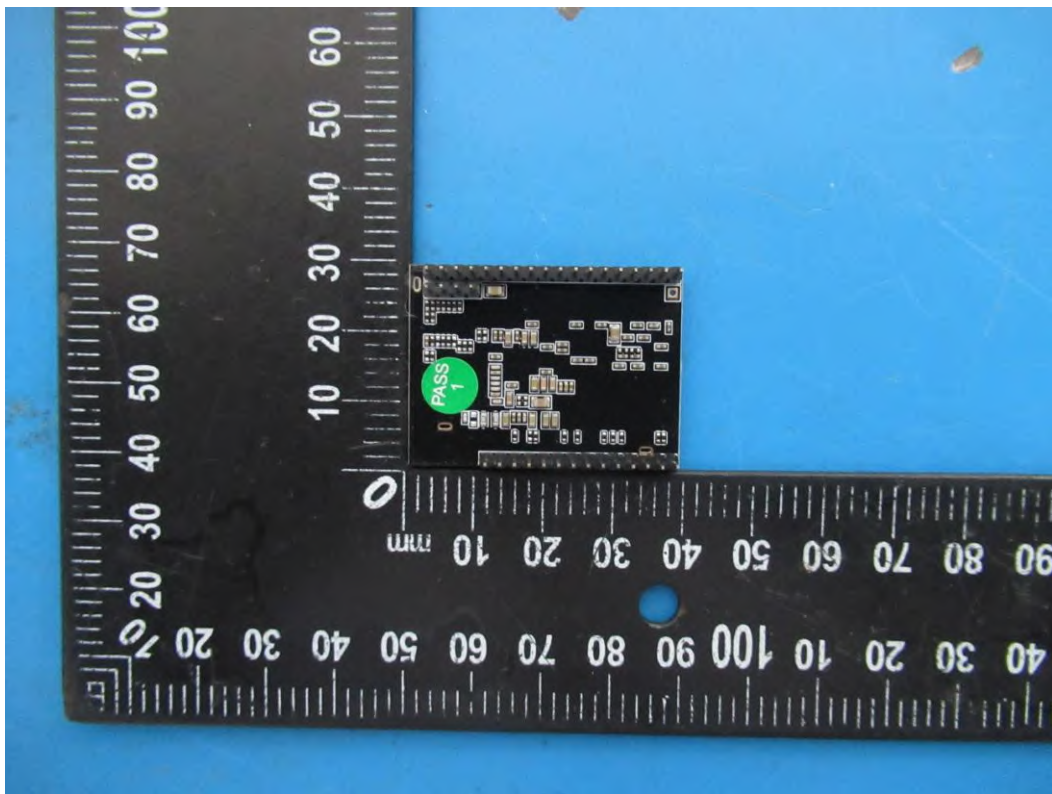


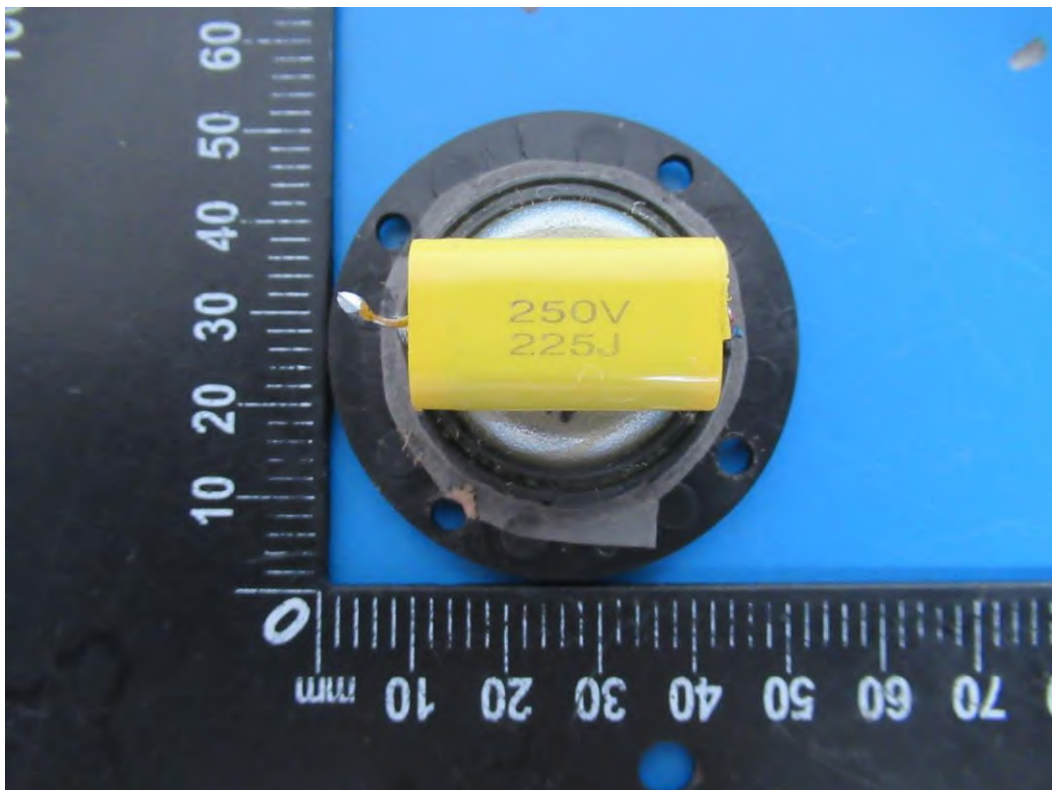
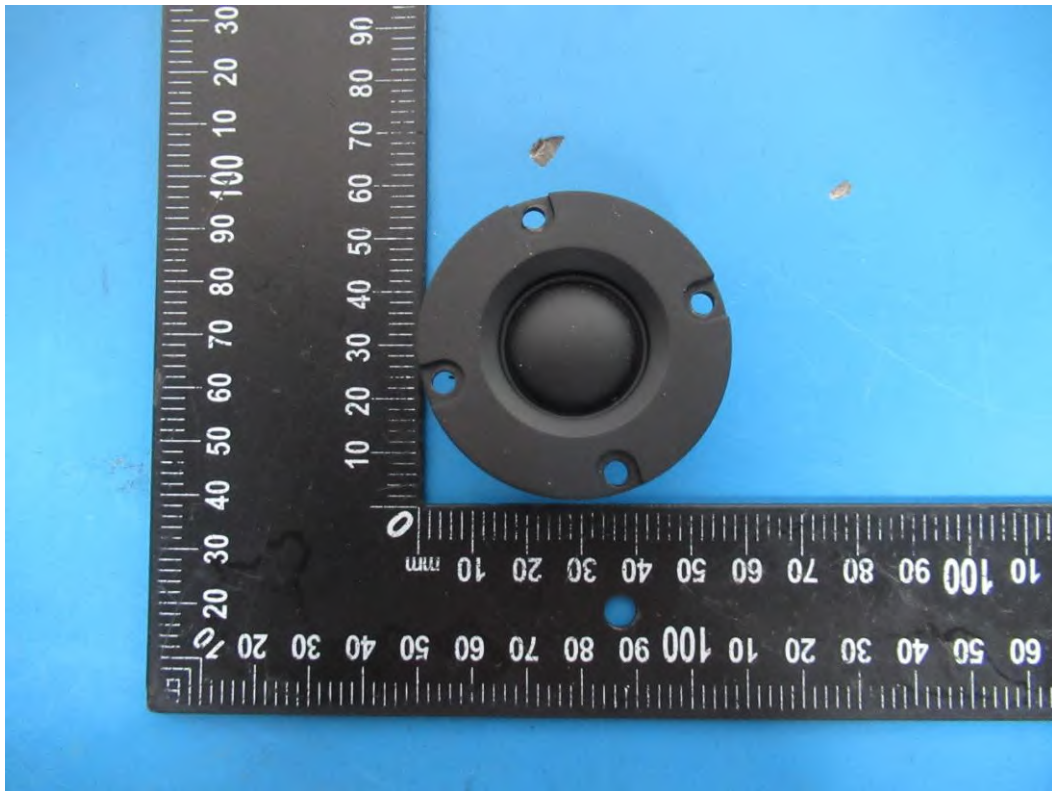


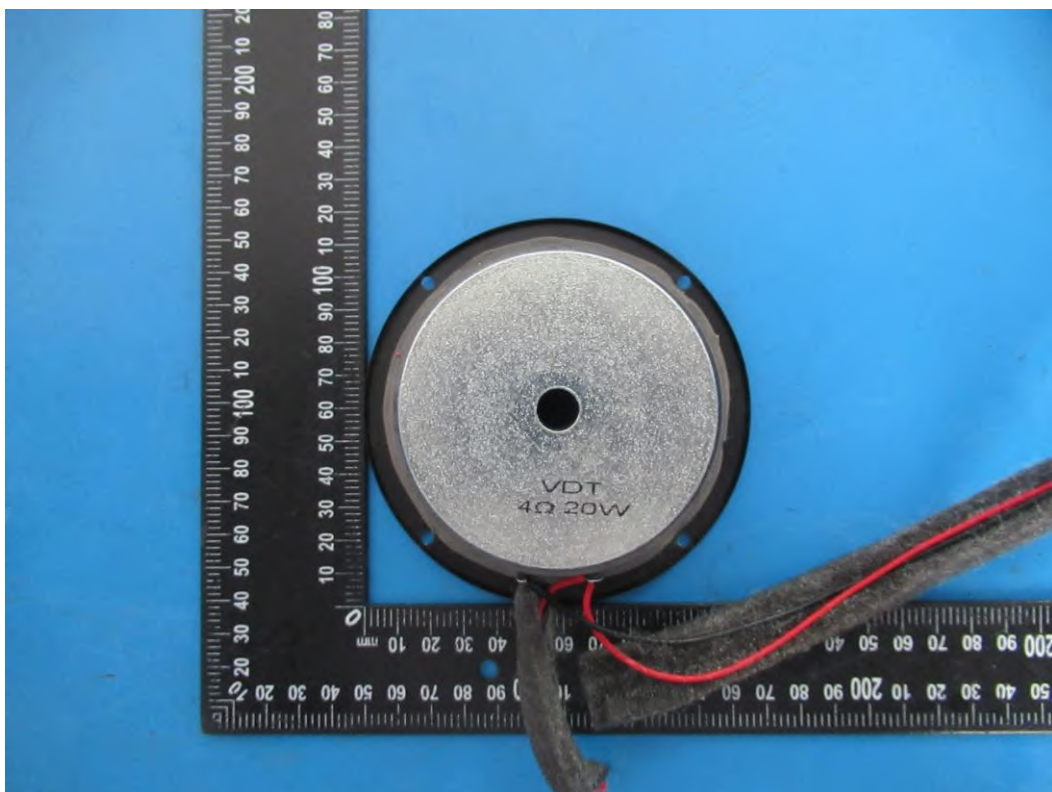


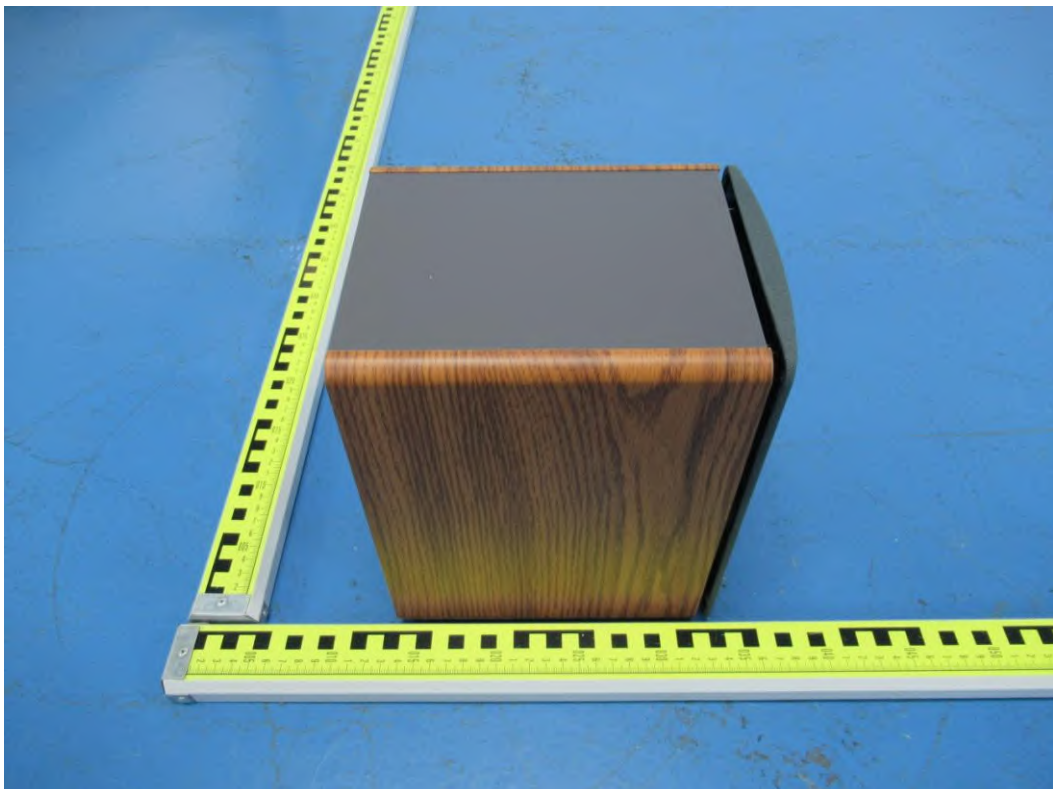
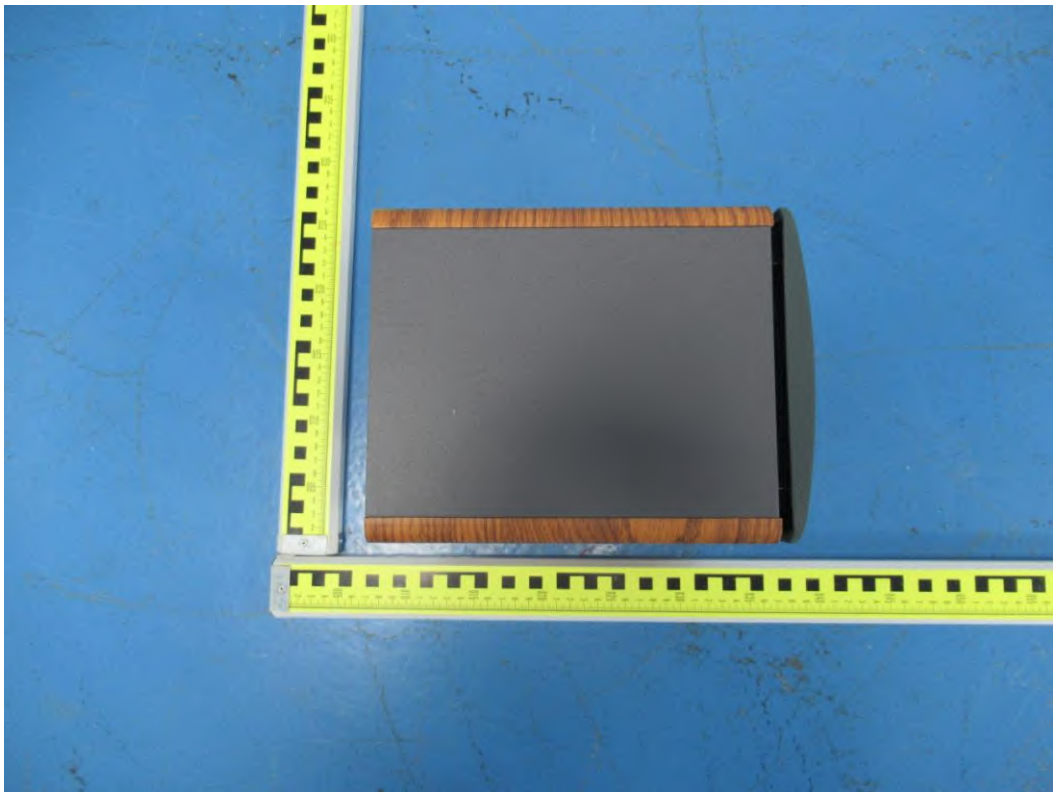


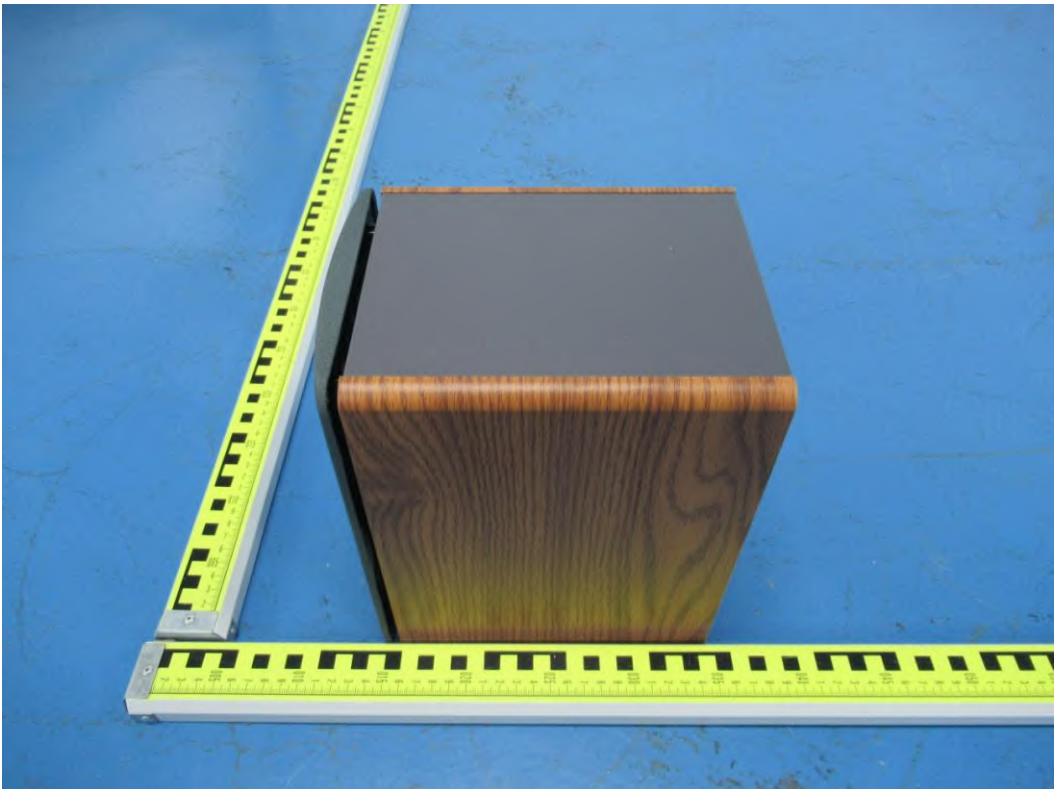
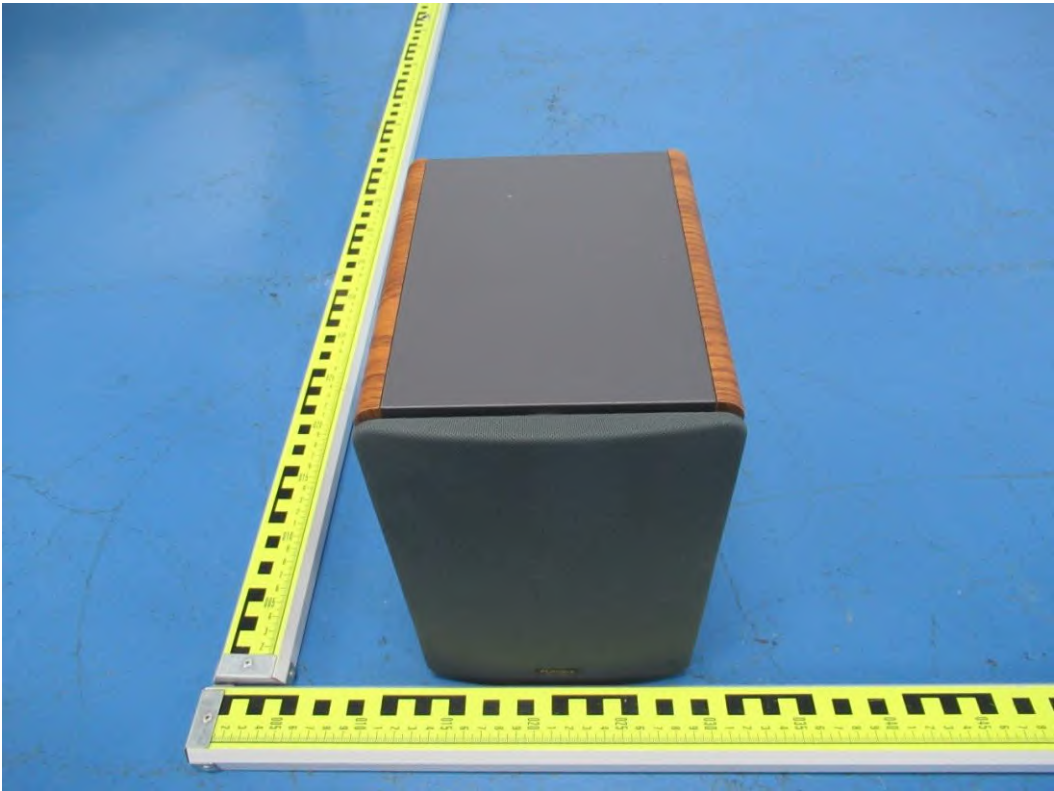


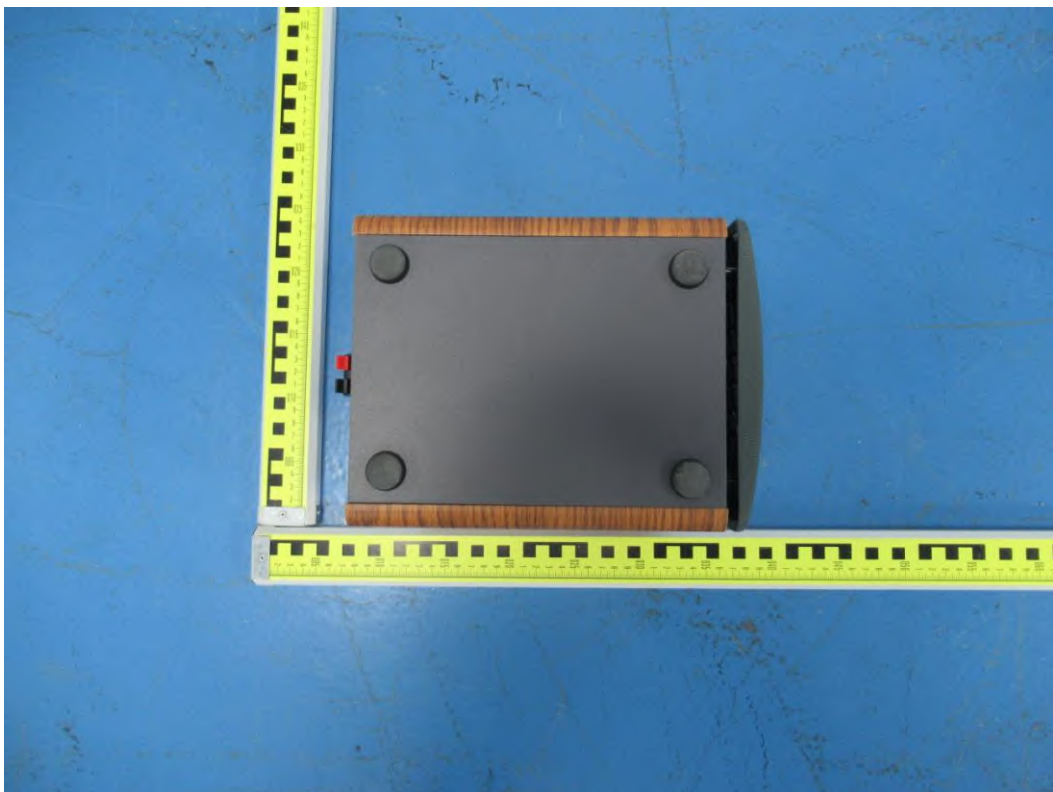
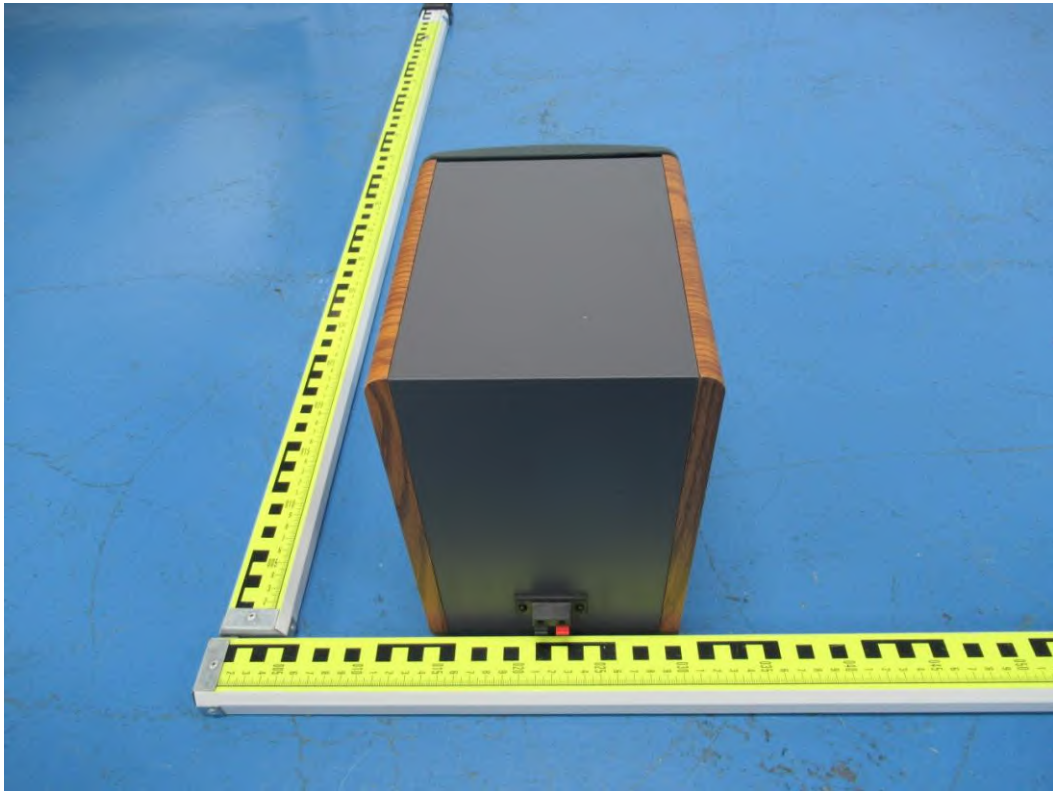


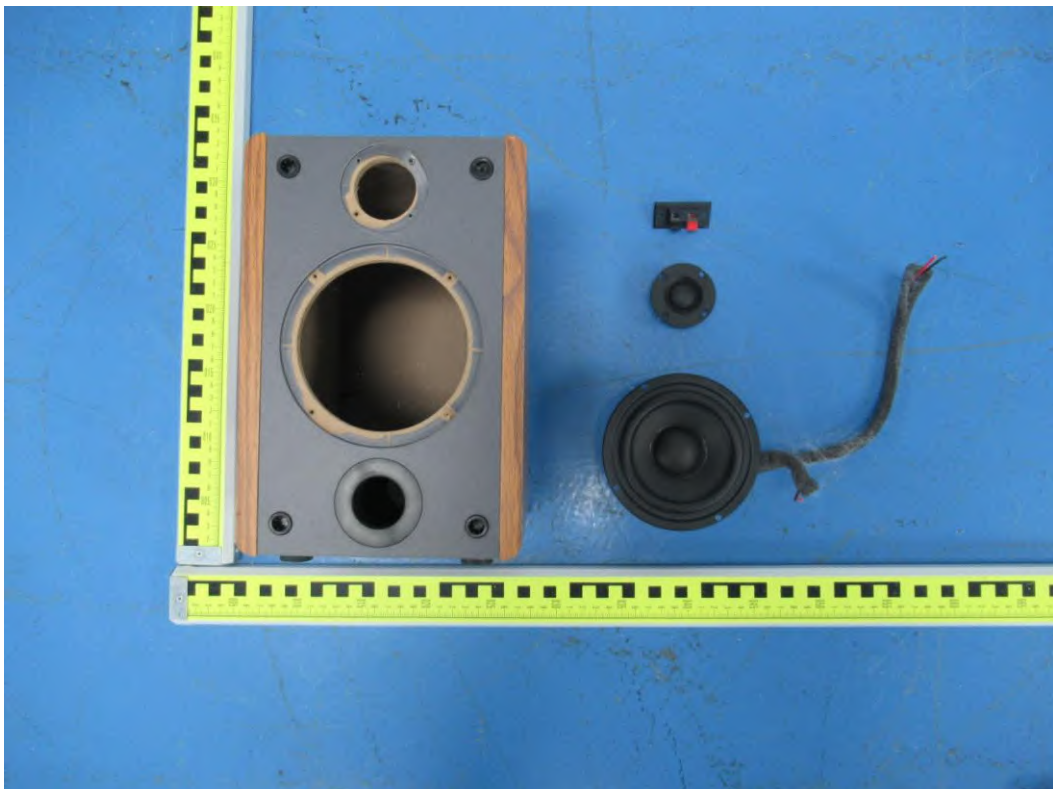
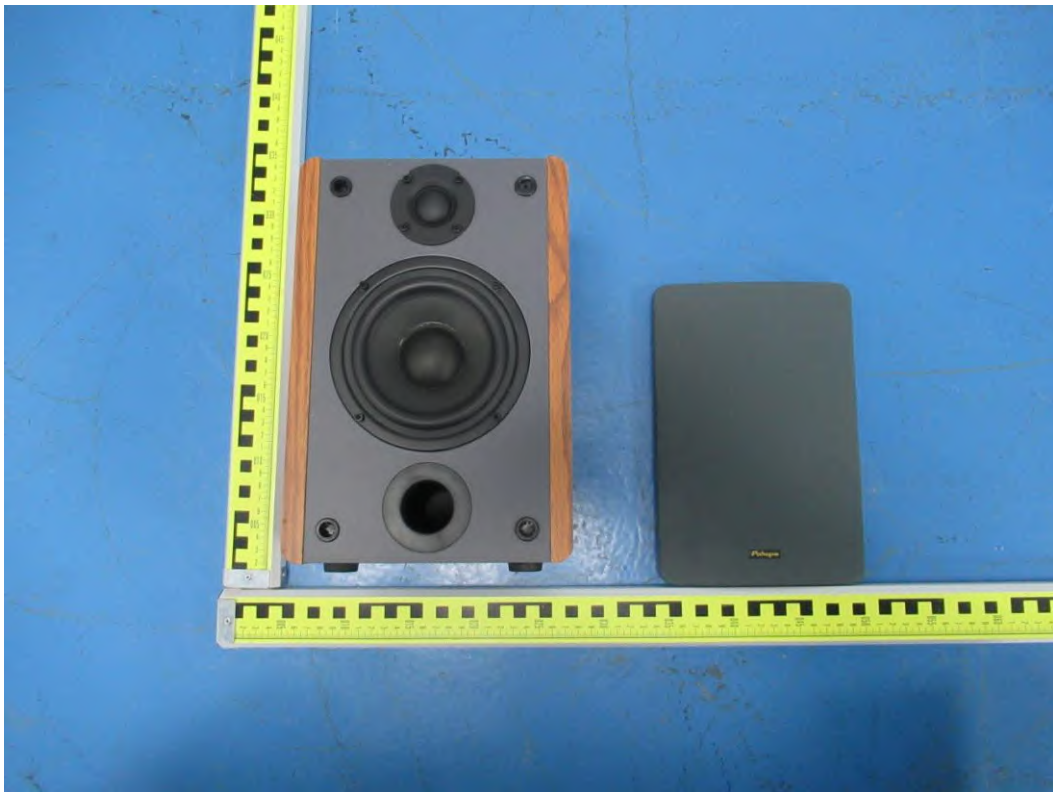


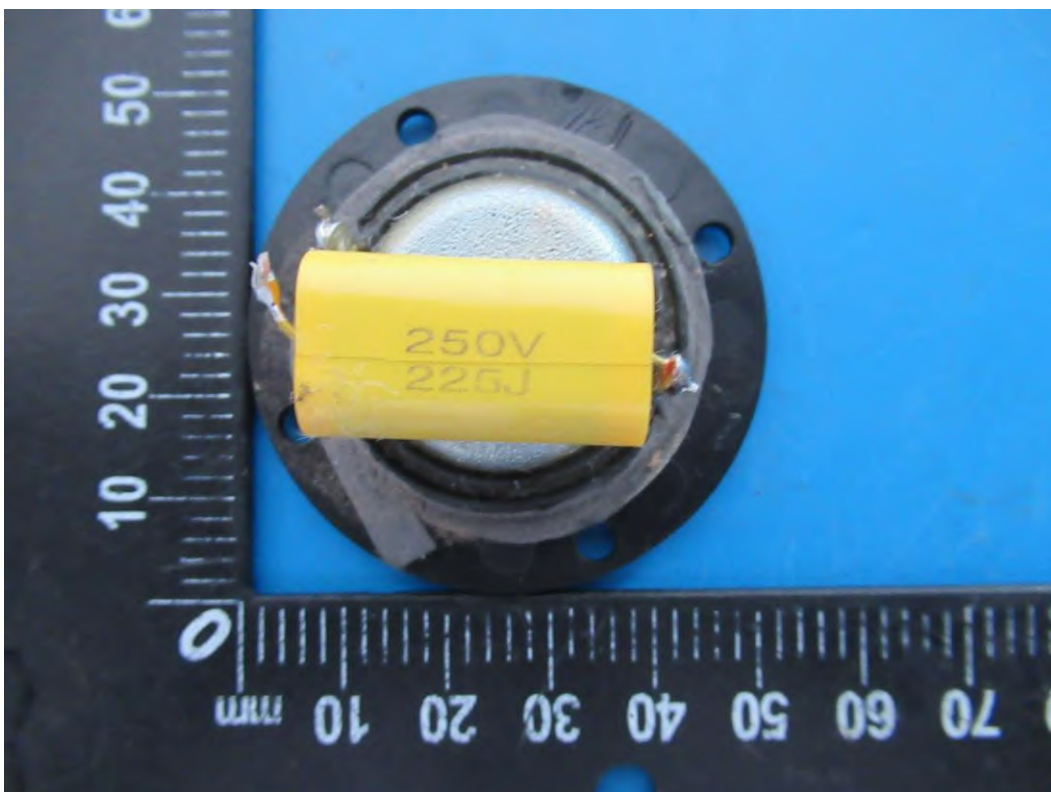


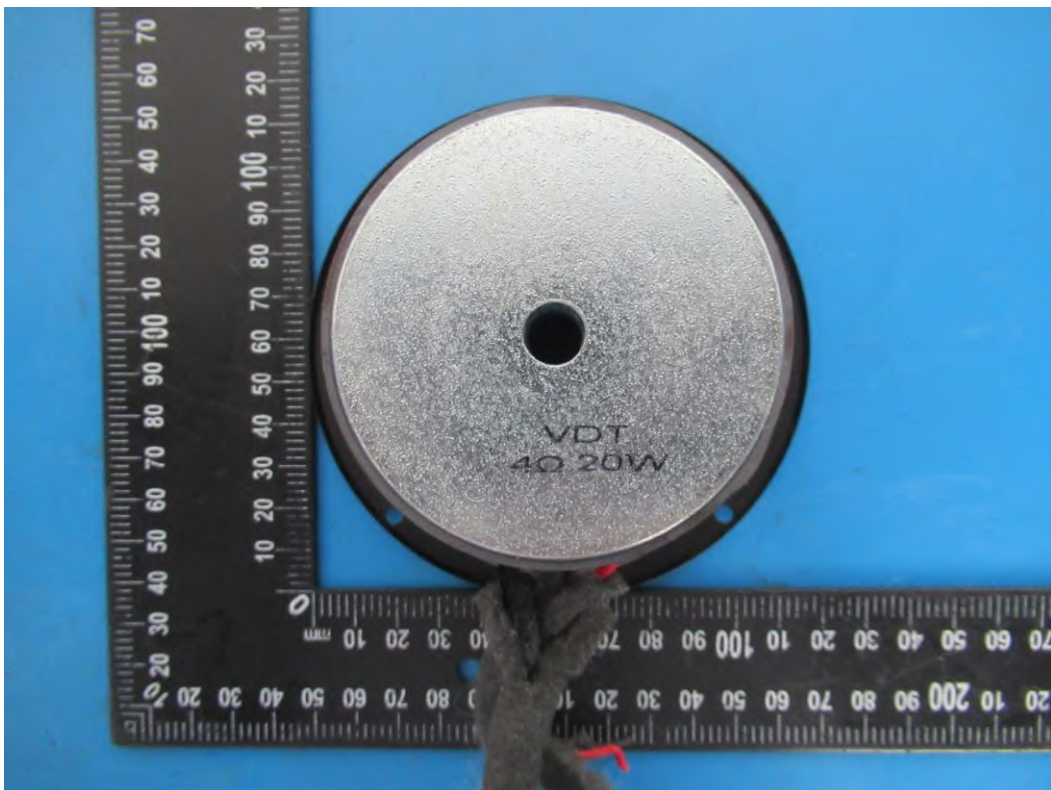
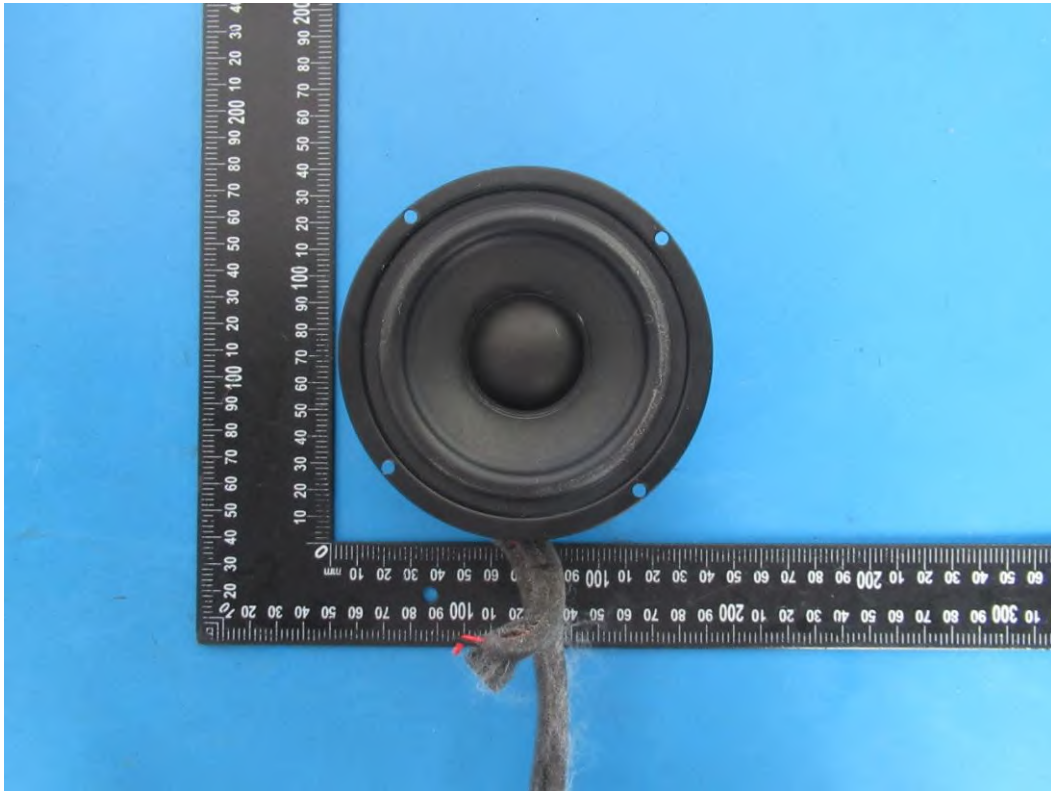












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