



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

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Date of Test : March 17, 2021-April 16, 2021
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Version Number : V0

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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	Test Requirement	Standards Paragraph	Result
Conducted Emission	FCC PART 15	15.207	P
6dB Bandwidth	FCC PART 15	15.247 (a)(2)	P
Output Power	FCC PART 15	15.247 (b)(3)	P
Radiated Spurious Emission	FCC PART 15	15.247 (c)	P
Conducted Spurious & Band Edge Emission	FCC PART 15	15.247 (d)	P
Power Spectral Density	FCC PART 15	15.247 (e)	P
Radiated Band Edge Emission	FCC PART 15	15.205	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

Model Number : EF-W280

Diff : N/A

Trademark : ***Pohopa***

Test Voltage : AC 120V/60Hz

Operation frequency : 2412MHz-2462MHz for IEEE 802.11 b, g, n/HT20
2422MHz-2452MHz for IEEE 802.11 b, g, n/HT40,

Channel No. : 802.11b/802.11g /802.11n(HT20): 11CH
802.11(HT40): 7CH

Modulation type : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)
IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)

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).

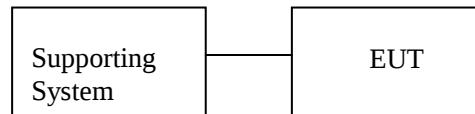
2.2.Accessories of Device (EUT)

Accessories1 : /
Manufacturer : /
Model : /
Input : /
Output : /

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

Duty cycle :100%Keeping TX			
Mode	data rate (Mbps)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20 with 2.4G	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40 with 2.4G	13	Low :CH3	2422
	13	Middle: CH6	2437
	13	High: CH9	2452
Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.			

Channel list:					
For IEEE 802.11b, g, n/HT20 with 2.4G					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		
For IEEE 802.11 n/HT40 with 2.4G					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	/	CH5	2432	CH9	2452
CH2	/	CH6	2437		
CH3	2422	CH7	2442		
CH4	2427	CH8	2447		

Setting output power (Max)			
802.11b	802.11g	802.11n(HT20)	802.11n(HT40)

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&SCHW ARZ	FSU	1166.1660.26	2020.09.02	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1Year
Receiver	ROHDE&SCHW ARZ	ESR	1316.3003K03-10208 2-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	SCHWARZBEC K	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Loop Antenna	SCHWARZBEC K	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2020.09.02	1Year
Cable	SCHWARZBEC K	N/A	No.2	2020.09.02	1Year
Cable	SCHWARZBEC K	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&SCHW ARZ	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

3. Spurious Emission

3.1. Test Limits

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

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

- The tighter limit applies at the band edges.
- Emission Level(dB uV/m)=20log Emission Level(Uv/m)

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency below 1GHz and above 1GHz, The EUT was placed on a rotating 80cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150cm above the ground plane inside a semi-anechoic chamber for above 1GHz, The table was rotated 360 degrees to determine the position of the highest radiation.

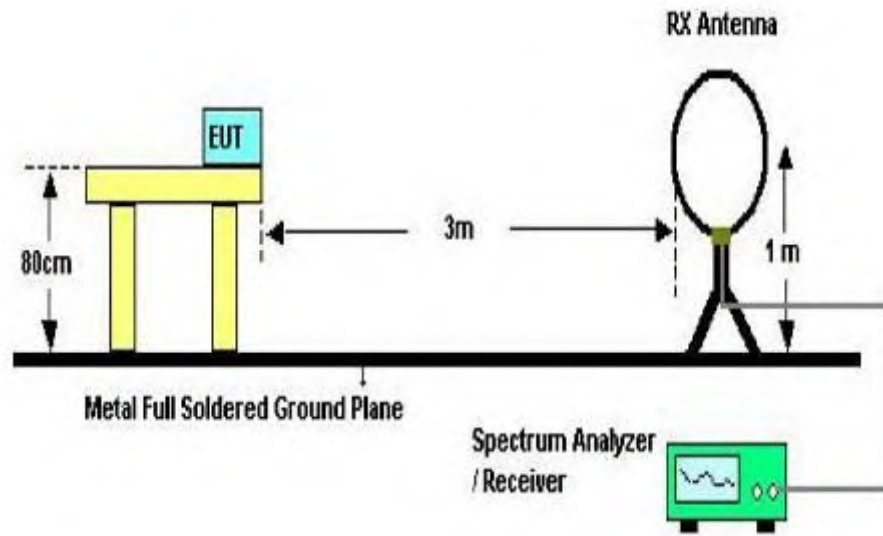
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured.

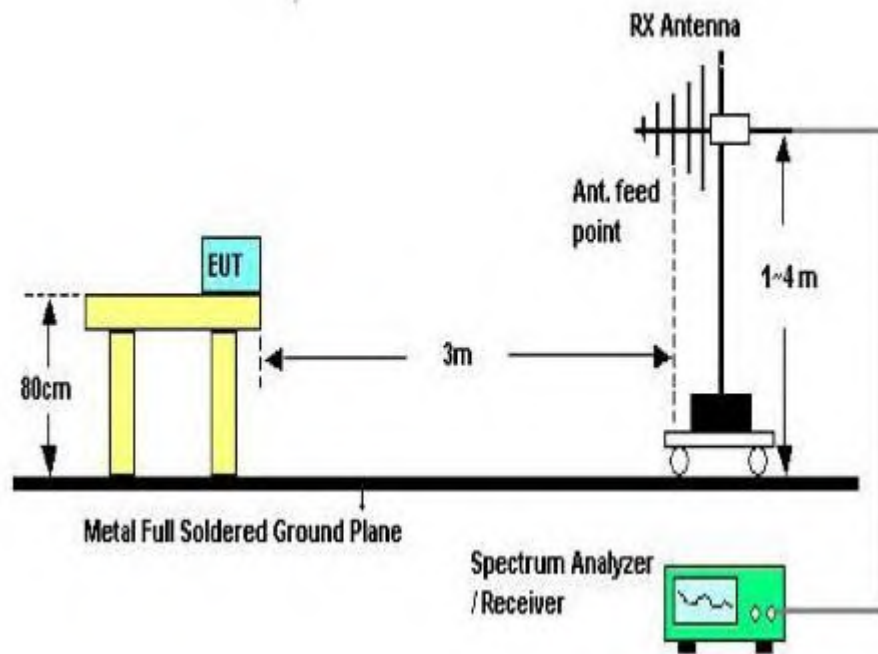
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

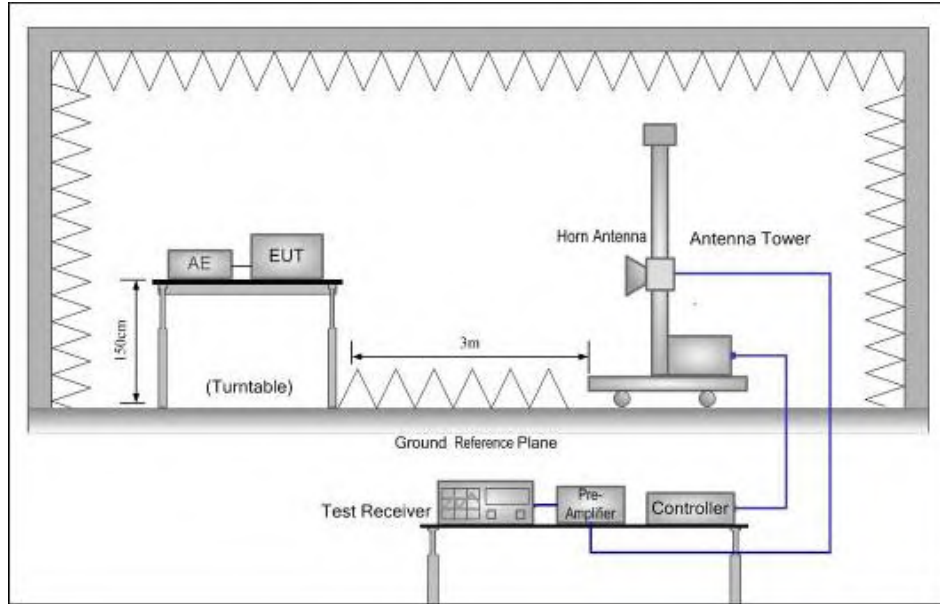
3.3.Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4. Test Results

Test Condition

Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHz~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned the 10th harmonic from 9 kHz to the EUT.

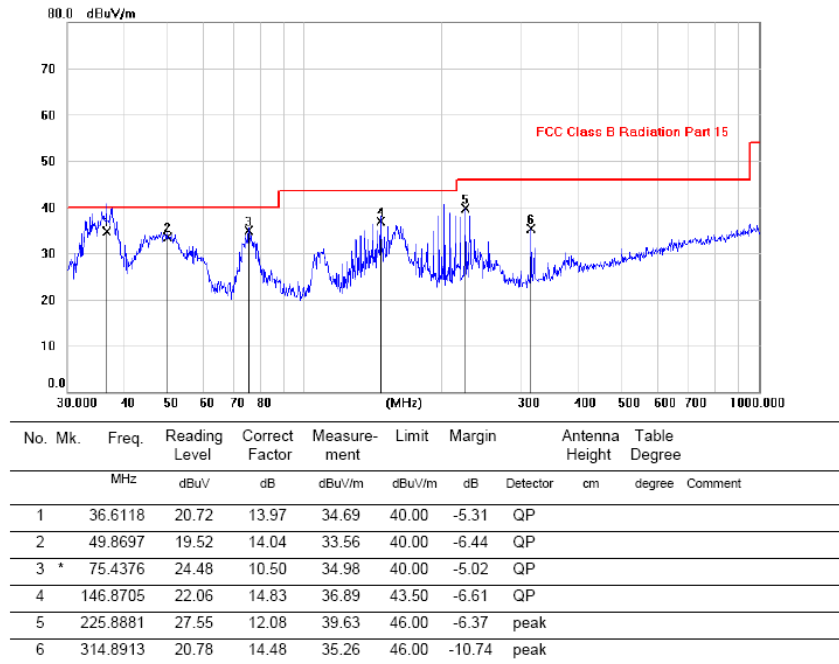
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

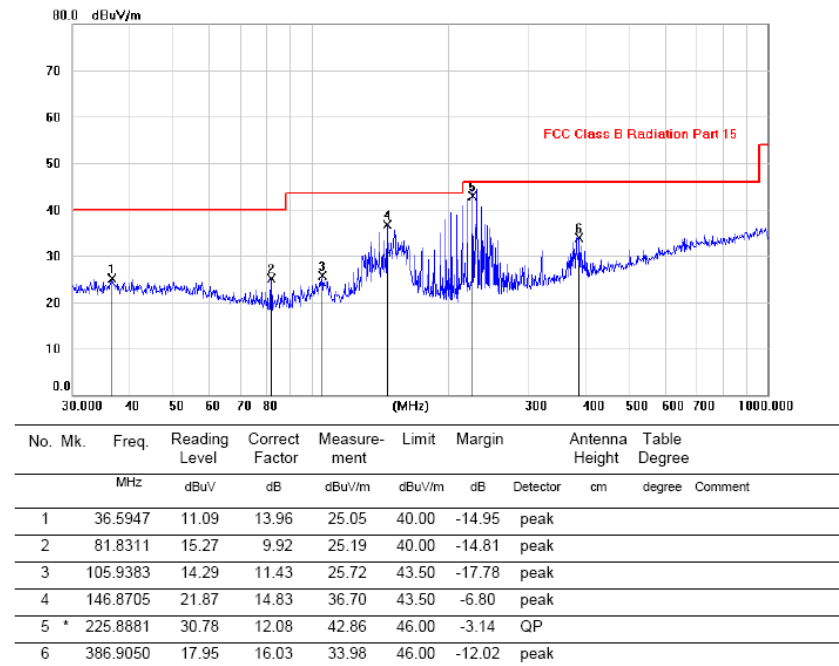
Note:1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

2.Only show the test data of the worst Channel in this report.

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280
Temperature	24°C	Humidity	56%
Pol	Vertical	Test date	2021/3/24
Test Voltage	AC 120V/60Hz	Test mode	802.11b (2412MHz)



Pol	Horizontal
------------	------------



Remark: All modes have been tested, and only worst data of 802.11b (2412MHz) was listed in this report.

Test Mode: IEEE 802.11b 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
4824	45.43	V	33.95	10.18	34.26	55.30	74	18.70	PK
4824	35.64	V	33.95	10.18	34.26	45.51	54	8.49	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	48.77	H	33.95	10.18	34.26	58.64	74	15.36	PK
4824	39.85	H	33.95	10.18	34.26	49.72	54	4.28	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX Mid									
4874	44.88	V	33.93	10.2	34.29	54.72	74	19.28	PK
4874	30.65	V	33.93	10.2	34.29	40.49	54	13.51	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	44.58	H	33.93	10.2	34.29	54.42	74	19.58	PK
4874	33.10	H	33.93	10.2	34.29	42.94	54	11.06	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX High									
4924	47.73	V	33.98	10.22	34.25	57.68	74	16.32	PK
4924	33.95	V	33.98	10.22	34.25	43.90	54	10.10	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	47.73	H	33.98	10.22	34.25	57.68	74	16.32	PK
4924	33.58	H	33.98	10.22	34.25	43.53	54	10.47	AV
7386	/	H	/	/	/	/	74	/	/
9848	/	H	/	/	/	/	74	/	/

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.

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.

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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.

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

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280
Temperature	24°C	Humidity	56%
Test mode	802.11b (2412MHz)	Test mode	802.11b (2437MHz)

Spectrum

Ref Level 20.00 dBm

Offset 7.63 dB

RBW 100 kHz

Att 30 dB

SWT 265 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

9.01 dBm

2.4230 GHz

-43.94 dBm

16.8385 GHz

D1 -26.128 dBm

Start 30.0 MHz

1001 pts

Stop 26.5 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.423 GHz	3.81 dBm		
M2	1		16.8385 GHz	-43.94 dBm		
M3	1		4.8211 GHz	-50.01 dBm		
M4	1		7.0975 GHz	-49.22 dBm		
M5	1		9.6916 GHz	-49.22 dBm		

Date: 27.MAR.2021 08:34:49

Spectrum

Ref Level 20.00 dBm

Offset 7.77 dB

RBW 100 kHz

Att 30 dB

SWT 265 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

5.26 dBm

2.4500 GHz

-44.12 dBm

18.2414 GHz

D1 -23.244 dBm

Start 30.0 MHz

1001 pts

Stop 26.5 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.45 GHz	5.26 dBm		
M2	1		18.2414 GHz	-44.12 dBm		
M3	1		4.9534 GHz	-48.59 dBm		
M4	1		7.3093 GHz	-49.42 dBm		
M5	1		9.8504 GHz	-48.63 dBm		

Date: 27.MAR.2021 08:37:25

Test mode	802.11b (2462MHz)
-----------	-------------------

Spectrum

Ref Level 20.00 dBm

Offset 7.72 dB

RBW 100 kHz

Att 30 dB

SWT 265 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

5.24 dBm

2.4760 GHz

-44.03 dBm

18.2943 GHz

D1 -24.972 dBm

Start 30.0 MHz

1001 pts

Stop 26.5 GHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1	1		2.476 GHz	5.24 dBm		
M2	1		18.2943 GHz	-44.03 dBm		
M3	1		5.0328 GHz	-49.56 dBm		
M4	1		7.3622 GHz	-49.77 dBm		
M5	1		9.7974 GHz	-48.93 dBm		

Date: 27.MAR.2021 08:39:48

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280																																																																																				
Temperature	24°C	Humidity	56%																																																																																				
Test mode	802.11g (2412MHz)	Test mode	802.11g (2437MHz)																																																																																				
Spectrum Ref Level 20.00 dBm Offset 7.63 dB RBW 100 kHz Att 30 dB SWT 265 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 M6 -1.24 dBm 2.4230 GHz -44.82 dBm 15.9649 GHz -29.993 dBm Start 30.0 MHz 1001 pts Stop 26.5 GHz <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.423 GHz</td><td>-1.24 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>15.9649 GHz</td><td>-44.82 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.9534 GHz</td><td>-49.33 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.071 GHz</td><td>-48.99 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.7445 GHz</td><td>-49.22 dBm</td><td></td><td></td></tr></table>		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.423 GHz	-1.24 dBm			M2	1		15.9649 GHz	-44.82 dBm			M3	1		4.9534 GHz	-49.33 dBm			M4	1		7.071 GHz	-48.99 dBm			M5	1		9.7445 GHz	-49.22 dBm			Spectrum Ref Level 20.00 dBm Offset 7.77 dB RBW 100 kHz Att 30 dB SWT 265 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 M6 -1.79 dBm 2.4500 GHz -43.85 dBm 18.2943 GHz -27.809 dBm Start 30.0 MHz 1001 pts Stop 26.5 GHz <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.45 GHz</td><td>-1.79 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>18.2943 GHz</td><td>-43.85 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.8211 GHz</td><td>-50.14 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.124 GHz</td><td>-49.04 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.8239 GHz</td><td>-48.42 dBm</td><td></td><td></td></tr></table>		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.45 GHz	-1.79 dBm			M2	1		18.2943 GHz	-43.85 dBm			M3	1		4.8211 GHz	-50.14 dBm			M4	1		7.124 GHz	-49.04 dBm			M5	1		9.8239 GHz	-48.42 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																																																																																	
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M3	1		4.9534 GHz	-49.33 dBm																																																																																			
M4	1		7.071 GHz	-48.99 dBm																																																																																			
M5	1		9.7445 GHz	-49.22 dBm																																																																																			
Type	Ref	Trc	X-value	Y-value	Function	Function Result																																																																																	
M1	1		2.45 GHz	-1.79 dBm																																																																																			
M2	1		18.2943 GHz	-43.85 dBm																																																																																			
M3	1		4.8211 GHz	-50.14 dBm																																																																																			
M4	1		7.124 GHz	-49.04 dBm																																																																																			
M5	1		9.8239 GHz	-48.42 dBm																																																																																			
Test mode	802.11g(2462MHz)	Spectrum Ref Level 20.00 dBm Offset 7.72 dB RBW 100 kHz Att 30 dB SWT 265 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 M6 -2.39 dBm 2.4760 GHz -44.70 dBm 15.9649 GHz -29.460 dBm Start 30.0 MHz 1001 pts Stop 26.5 GHz <table><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr><tr><td>M1</td><td>1</td><td></td><td>2.476 GHz</td><td>-2.39 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>15.9649 GHz</td><td>-44.70 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.7417 GHz</td><td>-48.34 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.5475 GHz</td><td>-49.65 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.8768 GHz</td><td>-48.62 dBm</td><td></td><td></td></tr></table>		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.476 GHz	-2.39 dBm			M2	1		15.9649 GHz	-44.70 dBm			M3	1		4.7417 GHz	-48.34 dBm			M4	1		7.5475 GHz	-49.65 dBm			M5	1		9.8768 GHz	-48.62 dBm																																												
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EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280																																																																																				
Temperature	24°C	Humidity	56%																																																																																				
Test mode	802.11n20 (2412MHz)	Test mode	802.11n20 (2437MHz)																																																																																				
Spectrum Ref Level 20.00 dBm Offset 7.63 dB RBW 100 kHz Att 30 dB SWT 265 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 M2 M1[1] M2[1] -2.03 dBm 2.4230 GHz -43.94 dBm 18.2943 GHz Start 30.0 MHz 1001 pts Stop 26.5 GHz Marker <table><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.423 GHz</td><td>-2.03 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>18.2943 GHz</td><td>-43.94 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.6623 GHz</td><td>-50.10 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.0975 GHz</td><td>-49.36 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.771 GHz</td><td>-47.25 dBm</td><td></td><td></td></tr></tbody></table> Date: 27.MAR.2021 09:05:43		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.423 GHz	-2.03 dBm			M2	1		18.2943 GHz	-43.94 dBm			M3	1		4.6623 GHz	-50.10 dBm			M4	1		7.0975 GHz	-49.36 dBm			M5	1		9.771 GHz	-47.25 dBm			Spectrum Ref Level 20.00 dBm Offset 7.77 dB RBW 100 kHz Att 30 dB SWT 265 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 M2 M1[1] M2[1] -1.47 dBm 2.4500 GHz -42.68 dBm 16.8914 GHz Start 30.0 MHz 1001 pts Stop 26.5 GHz Marker <table><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.45 GHz</td><td>-1.47 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>16.8914 GHz</td><td>-42.68 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.9269 GHz</td><td>-50.00 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.2828 GHz</td><td>-48.43 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.9033 GHz</td><td>-47.39 dBm</td><td></td><td></td></tr></tbody></table> Date: 27.MAR.2021 09:09:39		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.45 GHz	-1.47 dBm			M2	1		16.8914 GHz	-42.68 dBm			M3	1		4.9269 GHz	-50.00 dBm			M4	1		7.2828 GHz	-48.43 dBm			M5	1		9.9033 GHz	-47.39 dBm		
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Test mode	802.11n20 (2462MHz)	Spectrum Ref Level 20.00 dBm Offset 7.72 dB RBW 100 kHz Att 30 dB SWT 265 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 M2 M1[1] M2[1] -3.05 dBm 2.4760 GHz -43.98 dBm 15.9120 GHz Start 30.0 MHz 1001 pts Stop 26.5 GHz Marker <table><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.476 GHz</td><td>-3.05 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>15.912 GHz</td><td>-43.98 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.7946 GHz</td><td>-49.90 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.5739 GHz</td><td>-49.62 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.9033 GHz</td><td>-48.67 dBm</td><td></td><td></td></tr></tbody></table> Date: 27.MAR.2021 09:13:29		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.476 GHz	-3.05 dBm			M2	1		15.912 GHz	-43.98 dBm			M3	1		4.7946 GHz	-49.90 dBm			M4	1		7.5739 GHz	-49.62 dBm			M5	1		9.9033 GHz	-48.67 dBm																																												
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EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280																																																																																				
Temperature	24°C	Humidity	56%																																																																																				
Test mode	802.11n40 (2422MHz)	Test mode	802.11n40 (2437MHz)																																																																																				
Spectrum Ref Level 20.00 dBm Offset 7.66 dB RBW 100 kHz Att 30 dB SWT 265 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 M6 M1[1] M2[1] -9.06 dBm 2.4230 GHz -44.39 dBm 18.3208 GHz D1 -31.684 dBm Start 30.0 MHz 1001 pts Stop 26.5 GHz Marker <table><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.423 GHz</td><td>-3.06 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>18.3208 GHz</td><td>-44.39 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>5.0328 GHz</td><td>-50.06 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.124 GHz</td><td>-48.76 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.8239 GHz</td><td>-48.67 dBm</td><td></td><td></td></tr></tbody></table> Date: 27.MAR.2021 09:19:04		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.423 GHz	-3.06 dBm			M2	1		18.3208 GHz	-44.39 dBm			M3	1		5.0328 GHz	-50.06 dBm			M4	1		7.124 GHz	-48.76 dBm			M5	1		9.8239 GHz	-48.67 dBm			Spectrum Ref Level 20.00 dBm Offset 7.77 dB RBW 100 kHz Att 30 dB SWT 265 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 M6 M1[1] M2[1] -2.80 dBm 2.4230 GHz -44.47 dBm 16.8649 GHz D1 -30.254 dBm Start 30.0 MHz 1001 pts Stop 26.5 GHz Marker <table><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.423 GHz</td><td>-2.80 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>16.8649 GHz</td><td>-44.47 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>5.0593 GHz</td><td>-50.06 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.2828 GHz</td><td>-48.90 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.6651 GHz</td><td>-48.31 dBm</td><td></td><td></td></tr></tbody></table> Date: 27.MAR.2021 09:22:14		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.423 GHz	-2.80 dBm			M2	1		16.8649 GHz	-44.47 dBm			M3	1		5.0593 GHz	-50.06 dBm			M4	1		7.2828 GHz	-48.90 dBm			M5	1		9.6651 GHz	-48.31 dBm		
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M5	1		9.6651 GHz	-48.31 dBm																																																																																			
Test mode	802.11n40 (2452MHz)	Spectrum Ref Level 20.00 dBm Offset 7.75 dB RBW 100 kHz Att 30 dB SWT 265 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 M6 M1[1] M2[1] -2.58 dBm 2.4500 GHz -44.24 dBm 18.2943 GHz D1 -33.784 dBm Start 30.0 MHz 1001 pts Stop 26.5 GHz Marker <table><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.45 GHz</td><td>-2.58 dBm</td><td></td><td></td></tr><tr><td>M2</td><td>1</td><td></td><td>18.2943 GHz</td><td>-44.24 dBm</td><td></td><td></td></tr><tr><td>M3</td><td>1</td><td></td><td>4.9534 GHz</td><td>-50.16 dBm</td><td></td><td></td></tr><tr><td>M4</td><td>1</td><td></td><td>7.3357 GHz</td><td>-49.72 dBm</td><td></td><td></td></tr><tr><td>M5</td><td>1</td><td></td><td>9.8239 GHz</td><td>-46.61 dBm</td><td></td><td></td></tr></tbody></table> Date: 27.MAR.2021 09:28:09		Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.45 GHz	-2.58 dBm			M2	1		18.2943 GHz	-44.24 dBm			M3	1		4.9534 GHz	-50.16 dBm			M4	1		7.3357 GHz	-49.72 dBm			M5	1		9.8239 GHz	-46.61 dBm																																												
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4. Power Line Conducted Emission

4.1. Test Limits

Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

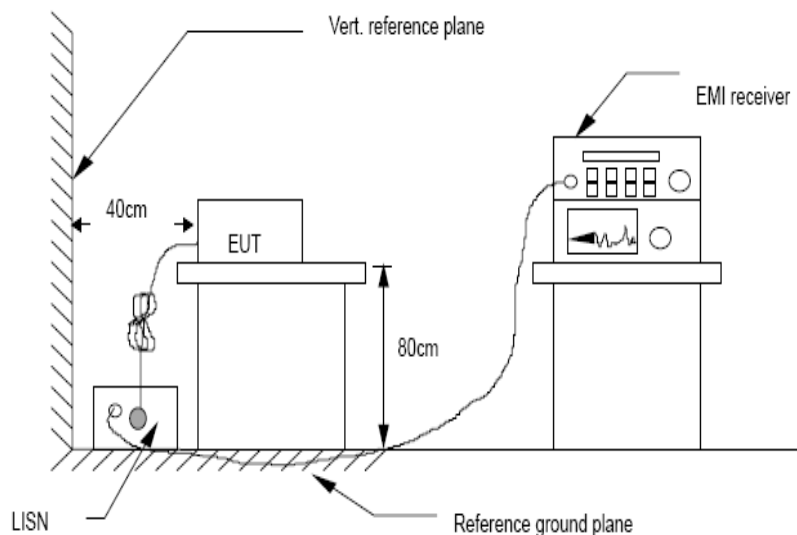
Notes: 1. *Decreasing linearly with logarithm of frequency.
 2. The lower limit shall apply at the transition frequencies.
 3. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.

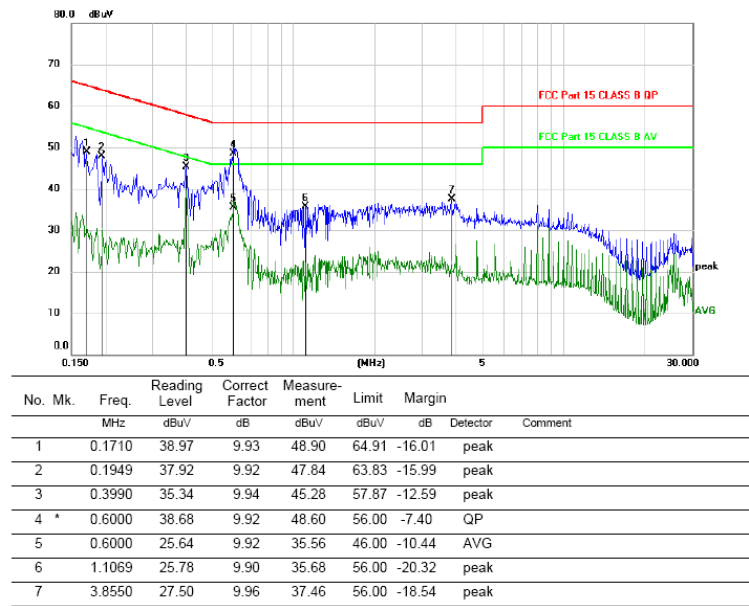
The bandwidth of test receiver is set at 9 kHz.

4.3. Test Setup

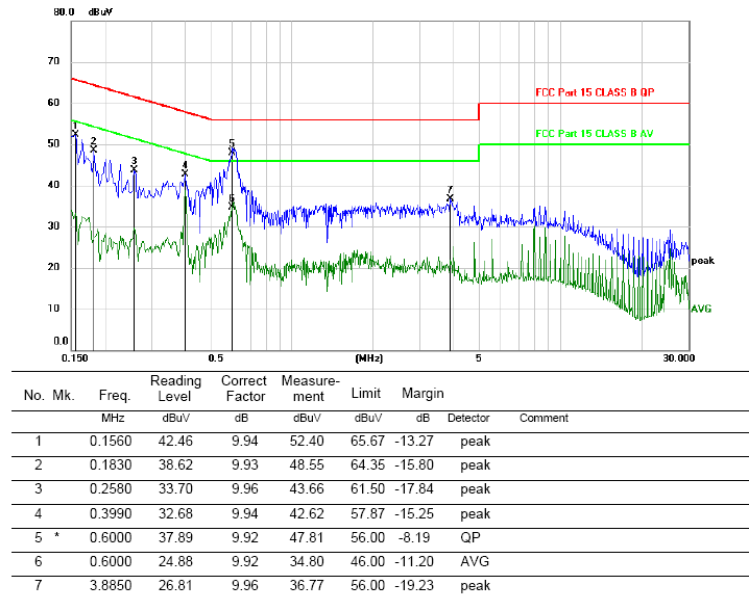


4.4. Test Results

EUT Description	Powered Bookshelf Bluetooth and Wifi Speakers	Model No.	EF-W280
Temperature	24°C	Humidity	56%
Pol	Line	Test date	2020/4/1
Test Voltage	AC 120V/60Hz	Test mode	802.11b (2412MHz)



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



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 802.11b (2412MHz) was listed in this report.

5. Conducted Maximum Output Power

5.1. Test limits

Please refer section 15.247.

Regulation 15.247(b) The limit of Maximum PK Output Power Measurement is 1 W(30dBm)

5.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

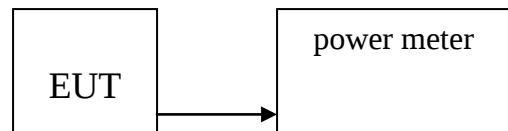
5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Connected the EUT's antenna port to PK power meter by 20dB attenuator.

5.2.3 Measure out each mode and each bands PK output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

PASS

Detailed information please see the following page.

Mode	Frequency (MHz)	PK Output power(dBm)	Limit (dBm)	Result
IEEE 802.11 b	CH1: 2412	9.006	30	PASS
	CH6: 2437	9.395	30	PASS
	CH11: 2462	8.086	30	PASS
IEEE 802.11 g	CH1: 2412	9.039	30	PASS
	CH6: 2437	9.197	30	PASS
	CH11: 2462	8.406	30	PASS
IEEE 802.11 n/HT20	CH1: 2412	8.951	30	PASS
	CH6: 2437	9.444	30	PASS
	CH11: 2462	8.315	30	PASS
IEEE 802.11 n/HT40	CH3: 2422	9.097	30	PASS
	CH6: 2437	9.767	30	PASS
	CH9: 2452	9.313	30	PASS

6. Power Spectral Density

6.1. Test limits

6.1.1 Please refer section 15.247.

6.1.2 For direct sequence systems, the Average power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

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

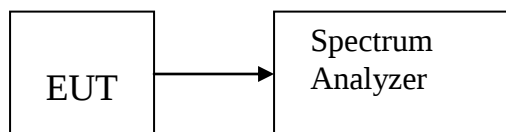
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Detector = RMS. Set the spectrum analyzer as RBW = 3kHz (Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$), VBW = 10kHz (Set the VBW $\geq 3 \times \text{RBW}$), span = $1.5 \times \text{DTS bandwidth}$, detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

6.3. Test Setup



6.4. Test Results

Condition	Mode	Frequency (MHz)	Max PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	802.11b	2412	0.592	8	Pass
NVNT	802.11b	2437	-0.345	8	Pass
NVNT	802.11b	2462	-1.583	8	Pass
NVNT	802.11g	2412	-3.816	8	Pass
NVNT	802.11g	2437	-4.657	8	Pass
NVNT	802.11g	2462	-6.159	8	Pass
NVNT	802.11n(HT20)	2412	-4.748	8	Pass
NVNT	802.11n(HT20)	2437	-4.085	8	Pass
NVNT	802.11n(HT20)	2462	-6.006	8	Pass
NVNT	802.11n(HT40)	2422	-7.358	8	Pass
NVNT	802.11n(HT40)	2437	-5.14	8	Pass
NVNT	802.11n(HT20)	2452	-8.436	8	Pass

PSD NVNT b 2412MHz Ant1



Date: 27.MAR.2021 08:49:38

PSD NVNT b 2437MHz Ant1



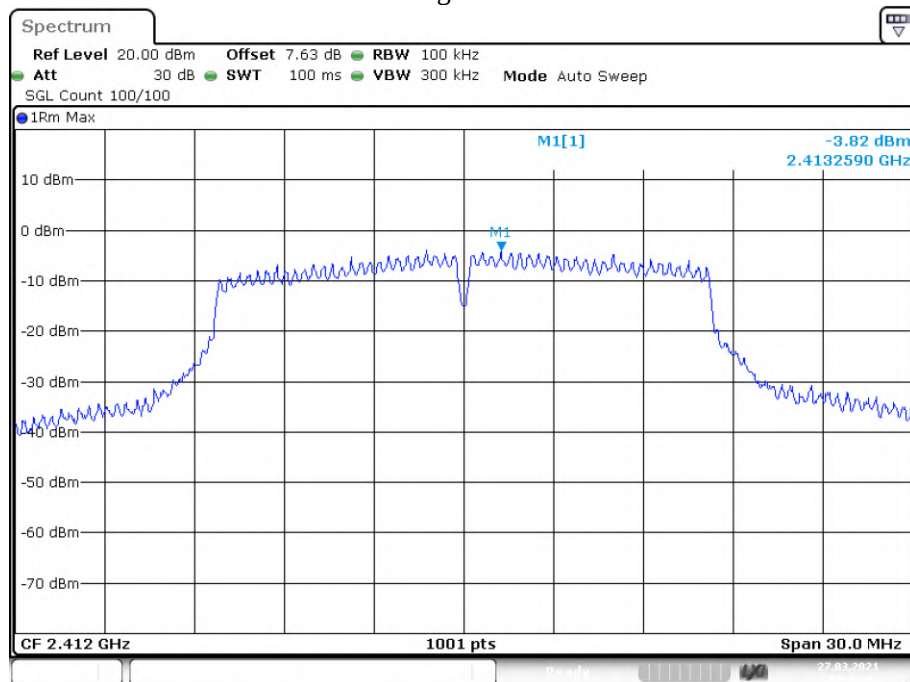
Date: 27.MAR.2021 08:51:54

PSD NVNT b 2462MHz Ant1



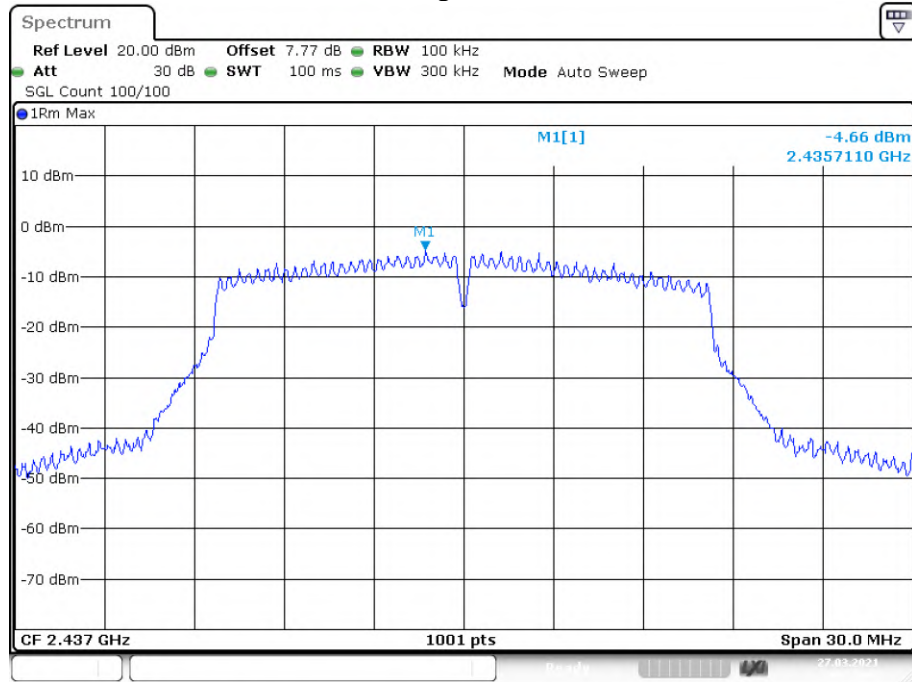
Date: 27.MAR.2021 08:53:12

PSD NVNT g 2412MHz Ant1



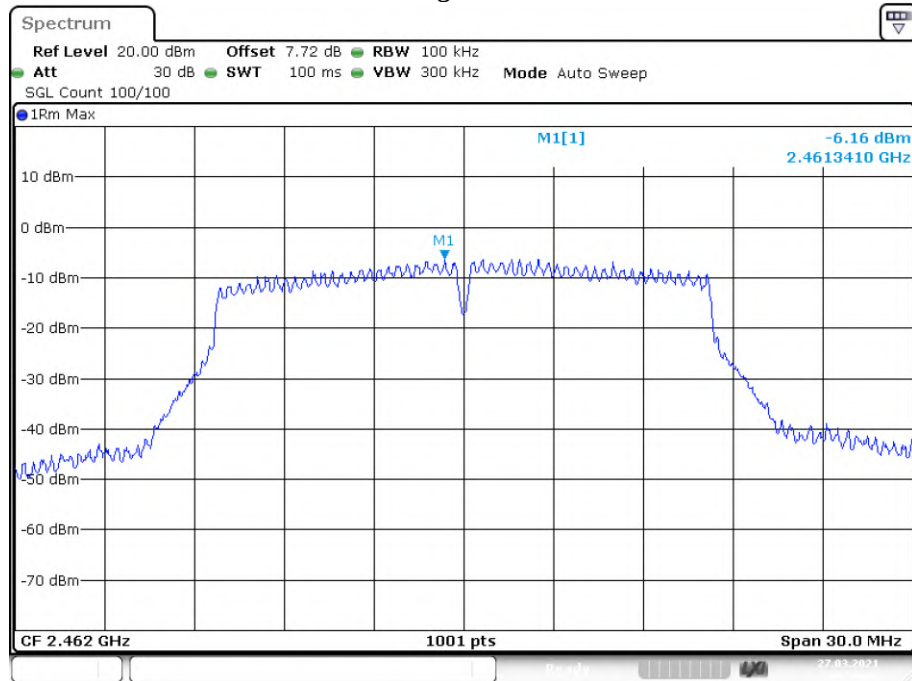
Date: 27.MAR.2021 08:41:46

PSD NVNT g 2437MHz Ant1



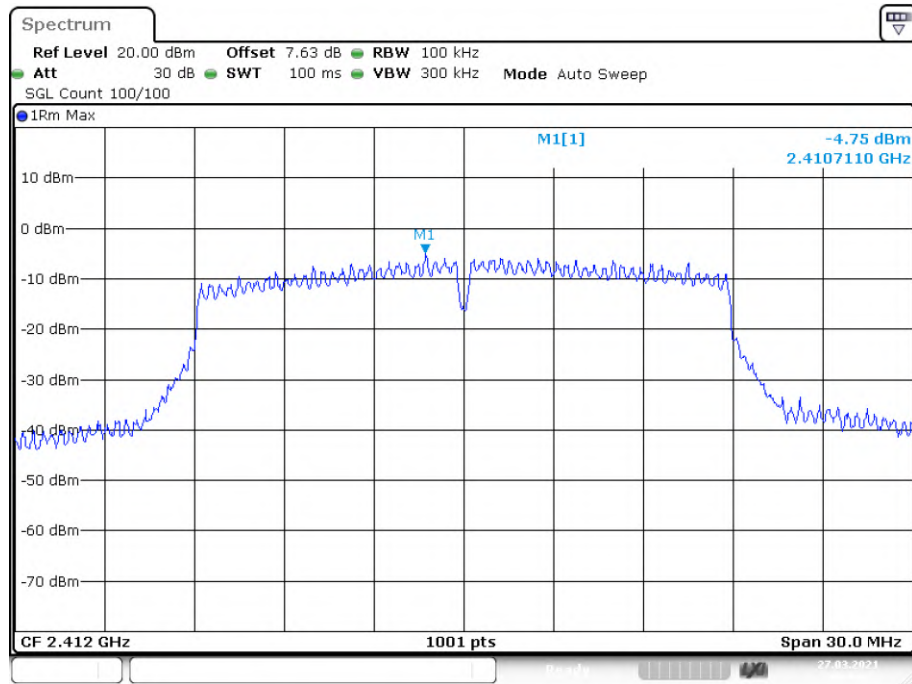
Date: 27.MAR.2021 08:55:05

PSD NVNT g 2462MHz Ant1

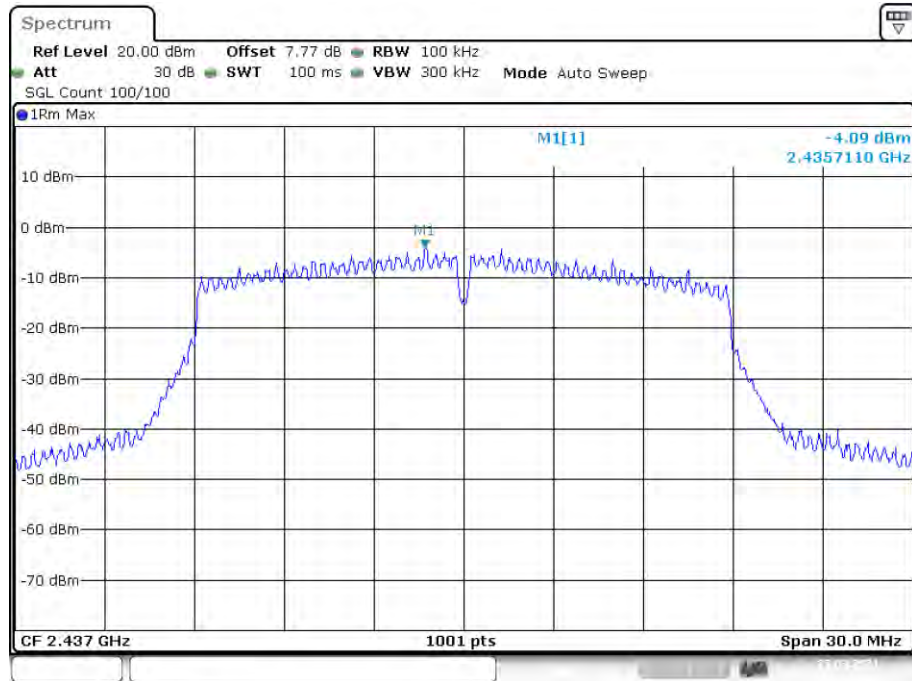


Date: 27.MAR.2021 08:59:00

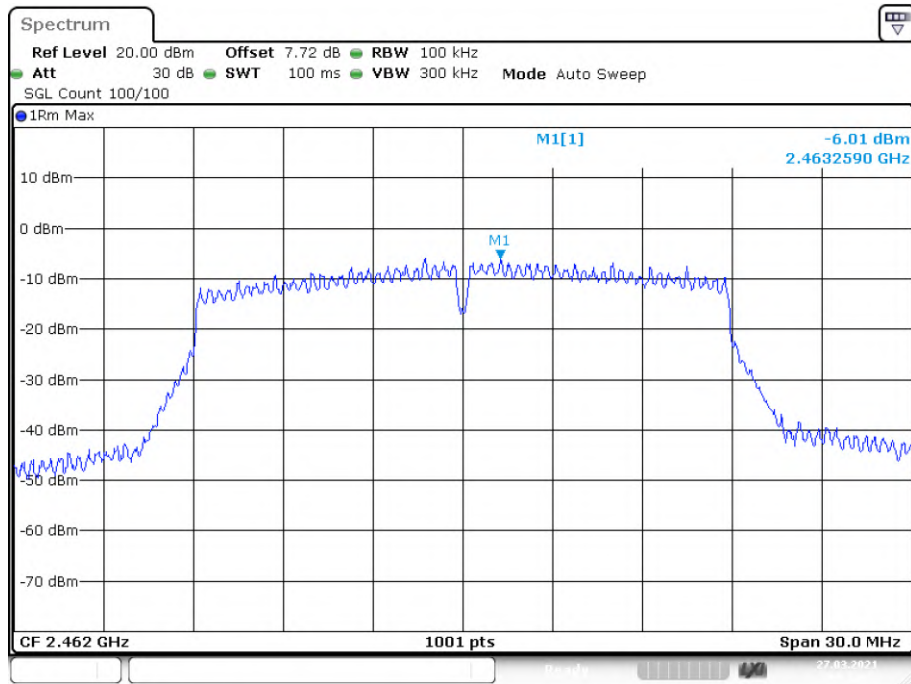
PSD NVNT n20 2412MHz Ant1



PSD NVNT n20 2437MHz Ant1

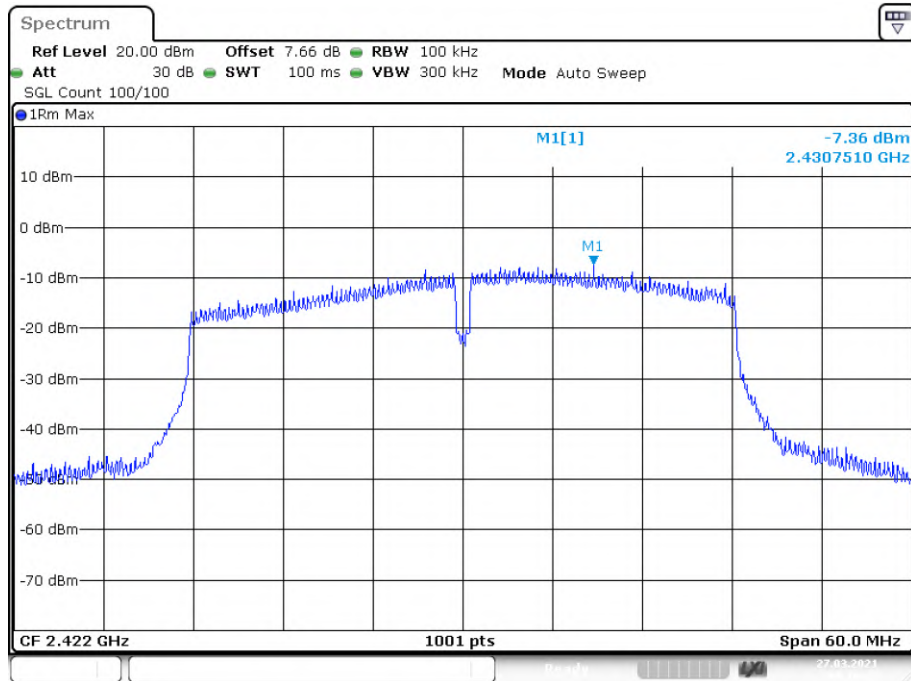


PSD NVNT n20 2462MHz Ant1



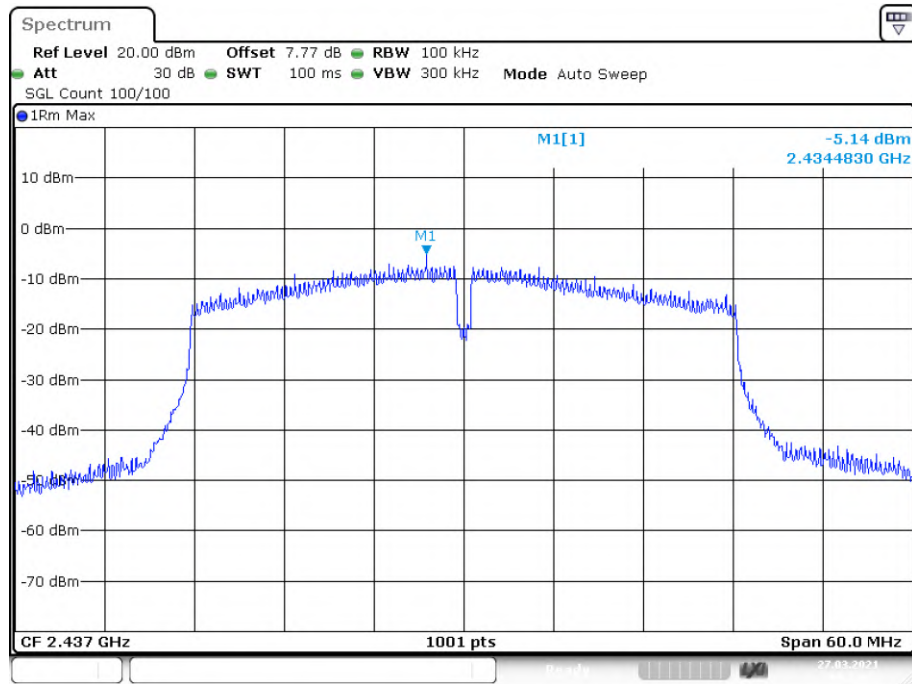
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PSD NVNT n40 2422MHz Ant1



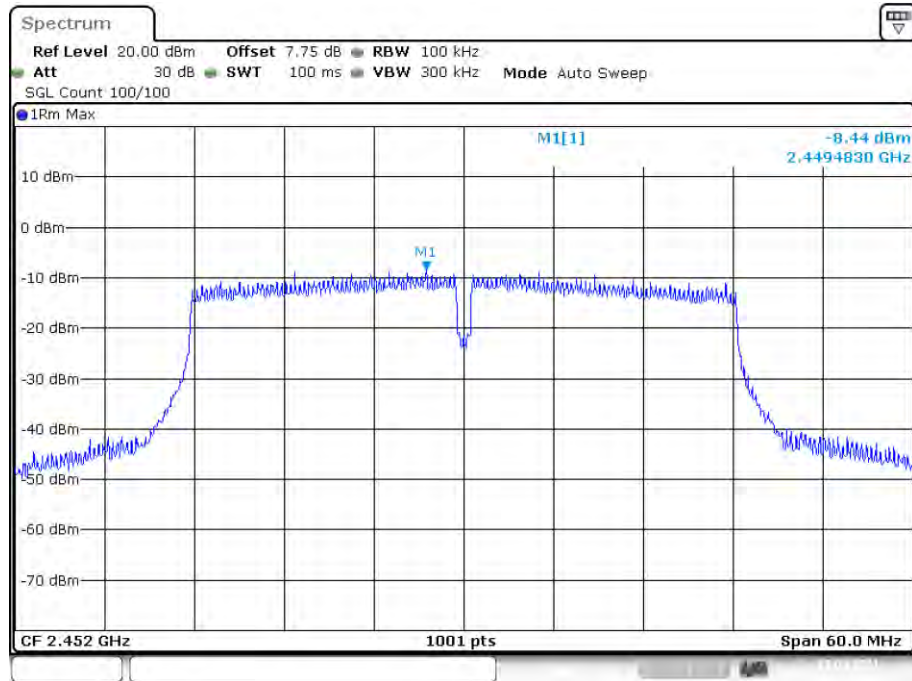
Date: 27.MAR.2021 09:18:09

PSD NVNT n40 2437MHz Ant1



Date: 27.MAR.2021 09:21:40

PSD NVNT n40 2452MHz Ant1



Date: 27.MAR.2021 09:27:11

7. Band Edge Check

7.1. Test limits

Please refer section 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

8.2.1 Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value , RBW 1MHz ,VBW 10Hz , RMS detector for AV value.

7.3. Test Setup

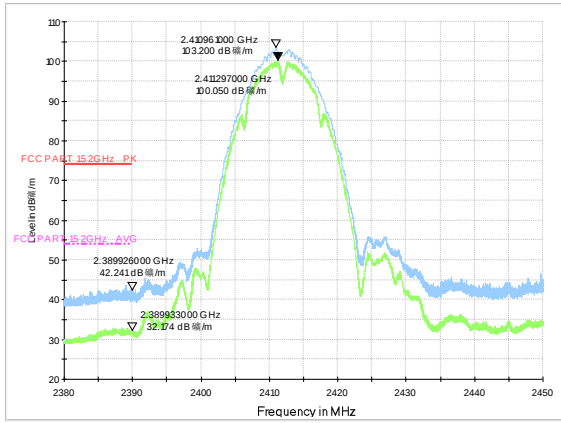
Same as 5.2.2.

7.4. Test Results

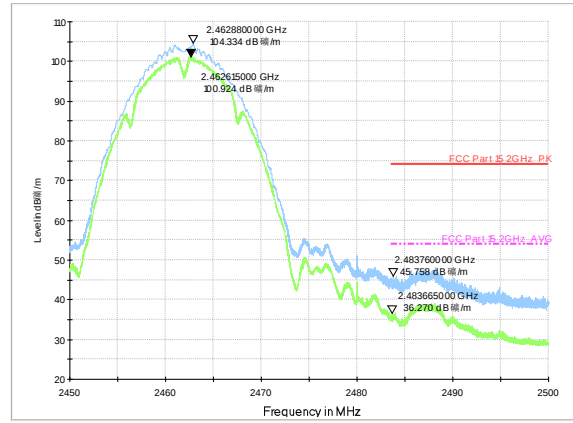
PASS.

Detailed information please see the following page.

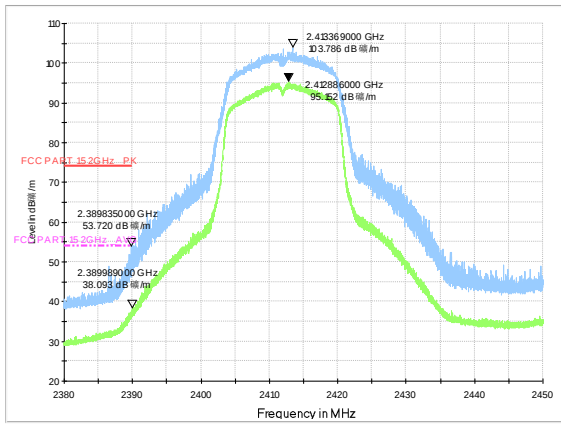
Test Mode: IEEE 802.11b-Low



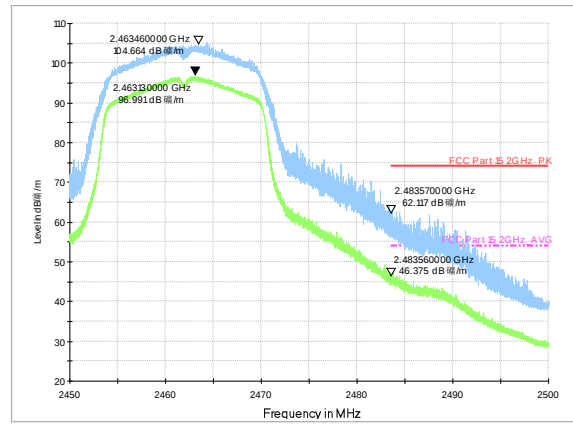
Test Mode: IEEE 802.11b-High



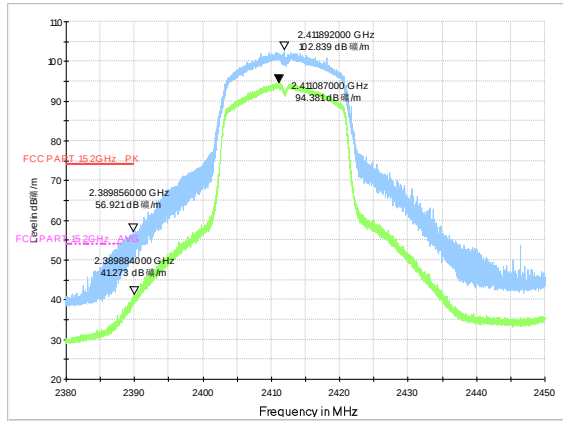
Test Mode: IEEE 802.11g-Low



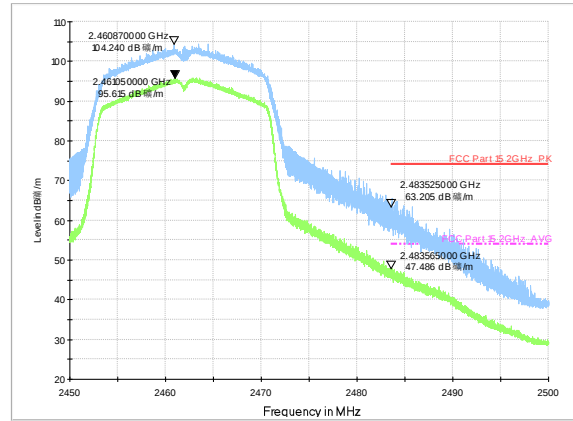
Test Mode: IEEE 802.11g-High



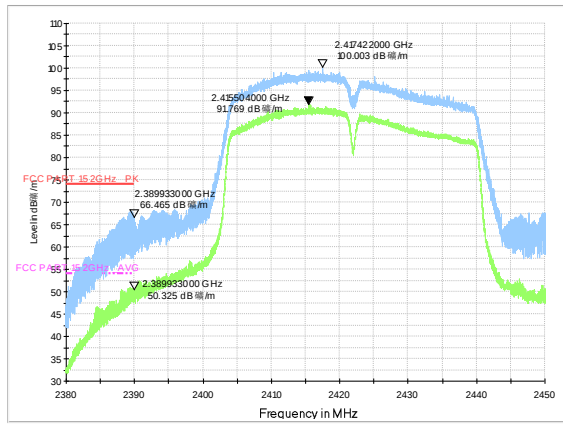
Test Mode: IEEE 802.11n20-Low



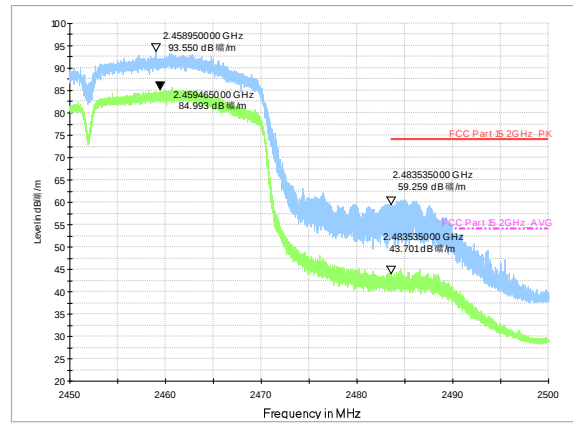
Test Mode: IEEE 802.11n20-High



Test Mode: IEEE 802.11n40-Low

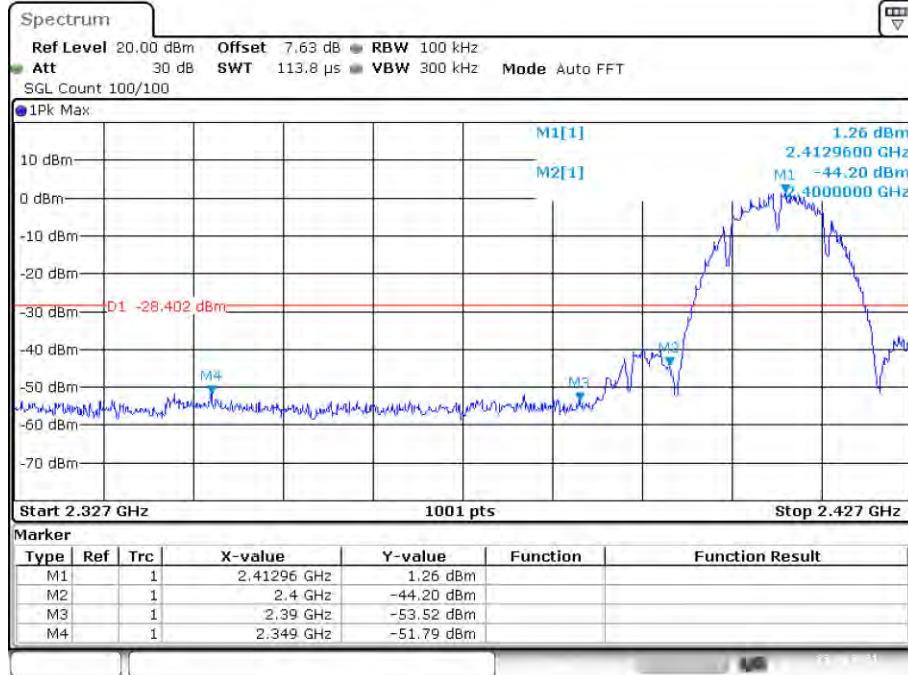


Test Mode: IEEE 802.11n40-High



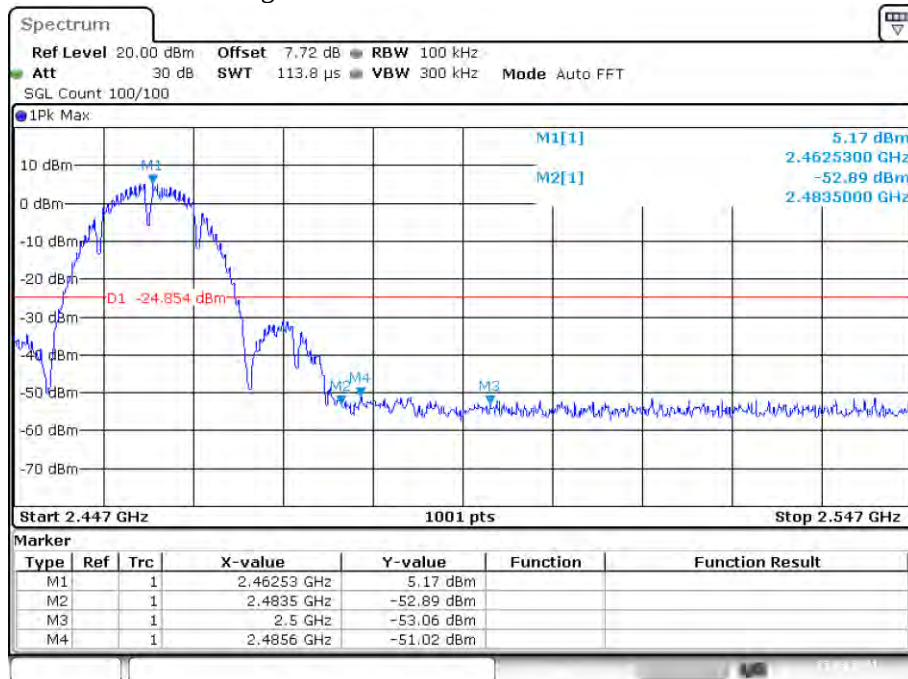
Conduction Band Edge:

Band Edge NVNT 802.11b 2412MHz Ant1 Emission



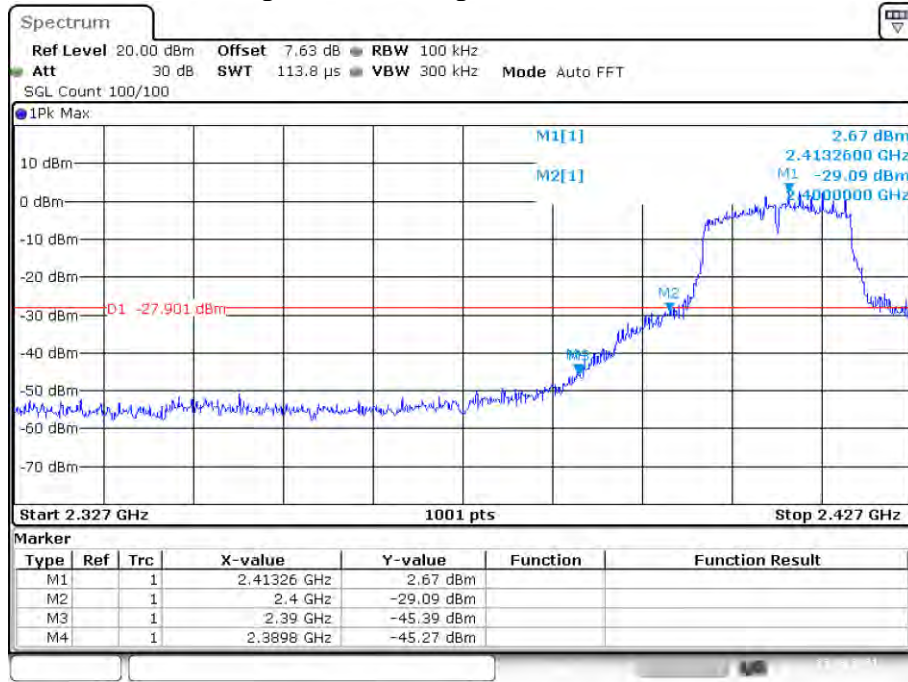
Date: 27.MAR.2021 08:50:16

Band Edge NVNT 802.11b 2462MHz Ant1 Emission



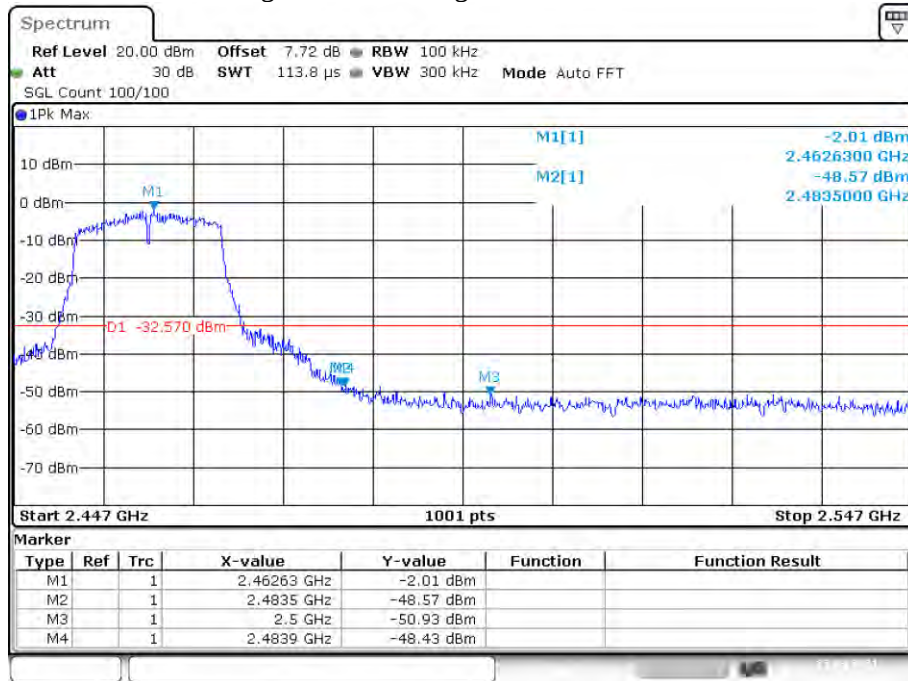
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Band Edge NVNT 802.11g 2412MHz Ant1 Emission



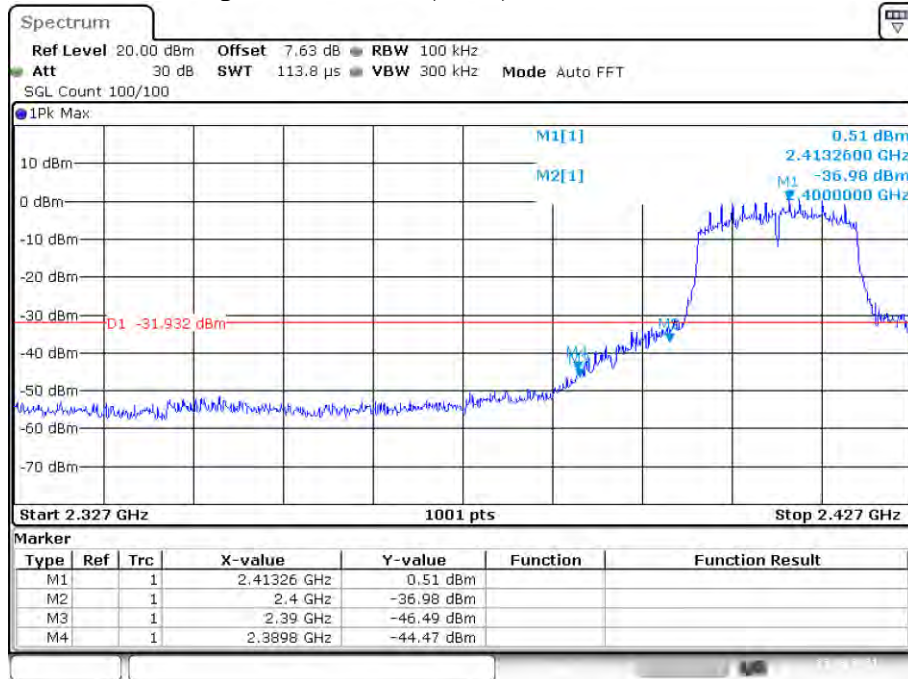
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Band Edge NVNT 802.11g 2462MHz Ant1 Emission



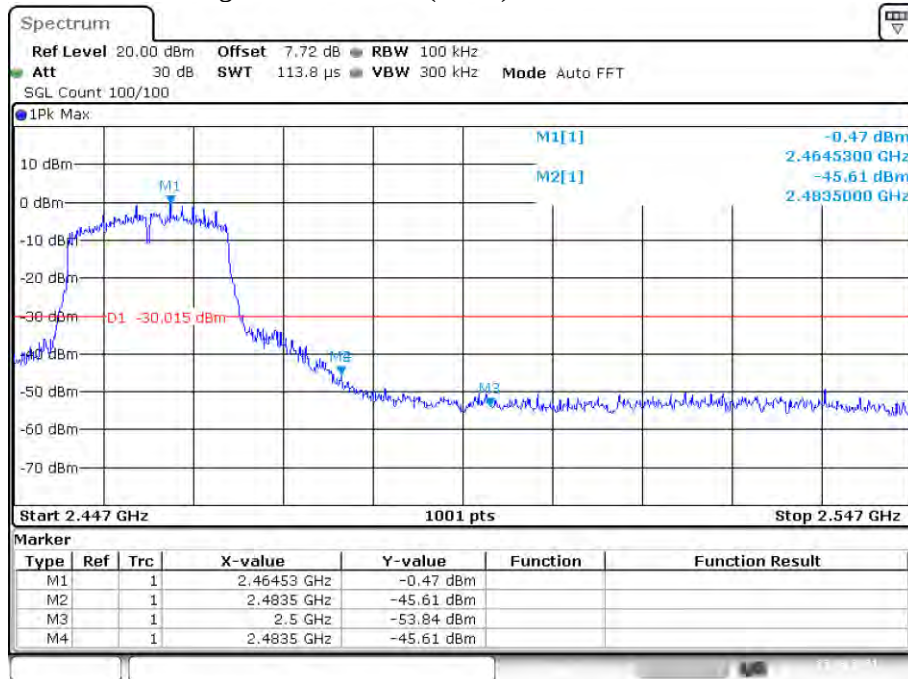
Date: 27.MAR.2021 08:59:17

Band Edge NVNT 802.11n(HT20) 2412MHz Ant1 Emission



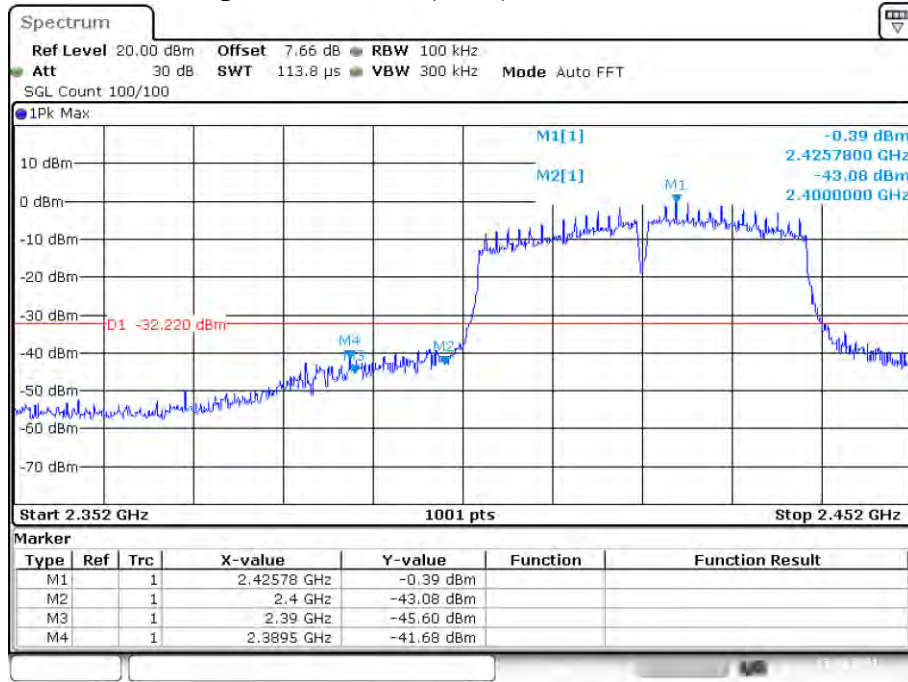
Date: 27.MAR.2021 09:05:12

Band Edge NVNT 802.11n(HT20) 2462MHz Ant1 Emission

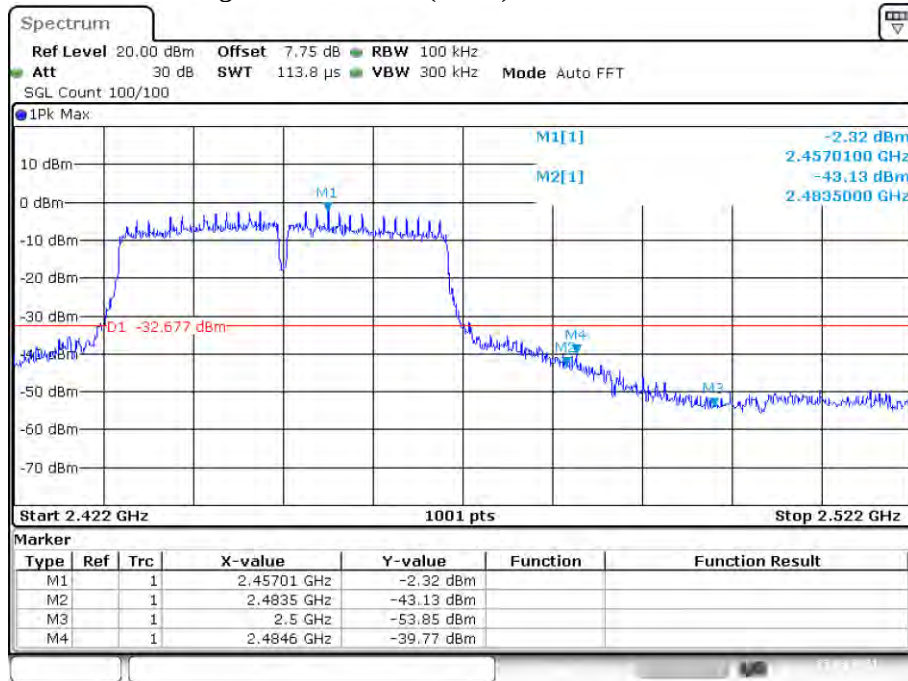


Date: 27.MAR.2021 09:12:57

Band Edge NVNT 802.11n(HT40) 2412MHz Ant1 Emission



Band Edge NVNT 802.11n(HT40) 2462MHz Ant1 Emission



8. Antenna Requirement

8.1. Standard Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

8.2. Antenna Connected Construction

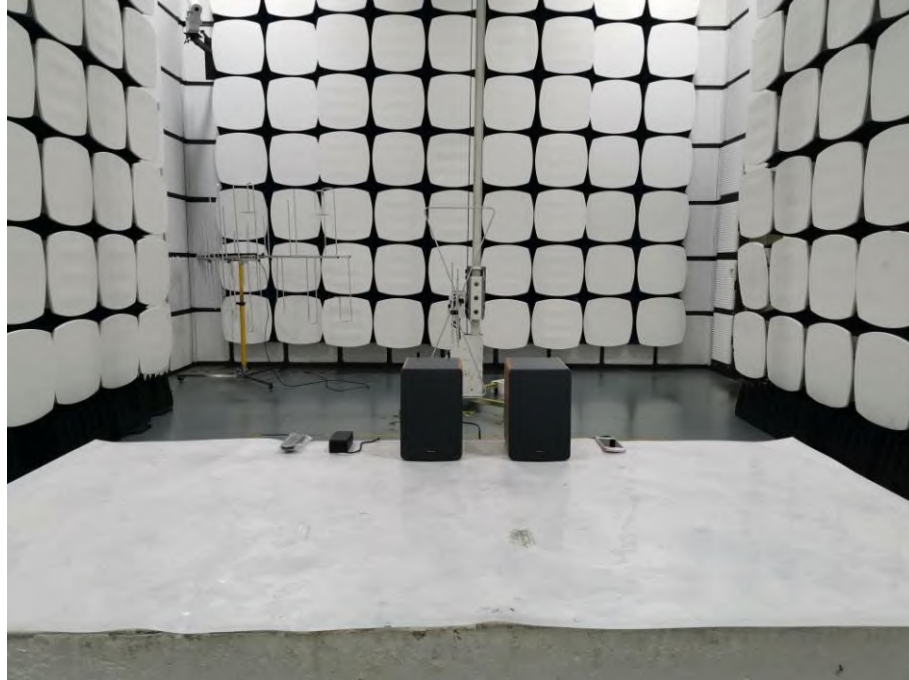
The antenna connector is unique antenna and no consideration of replacement. Please see EUT photo for details.

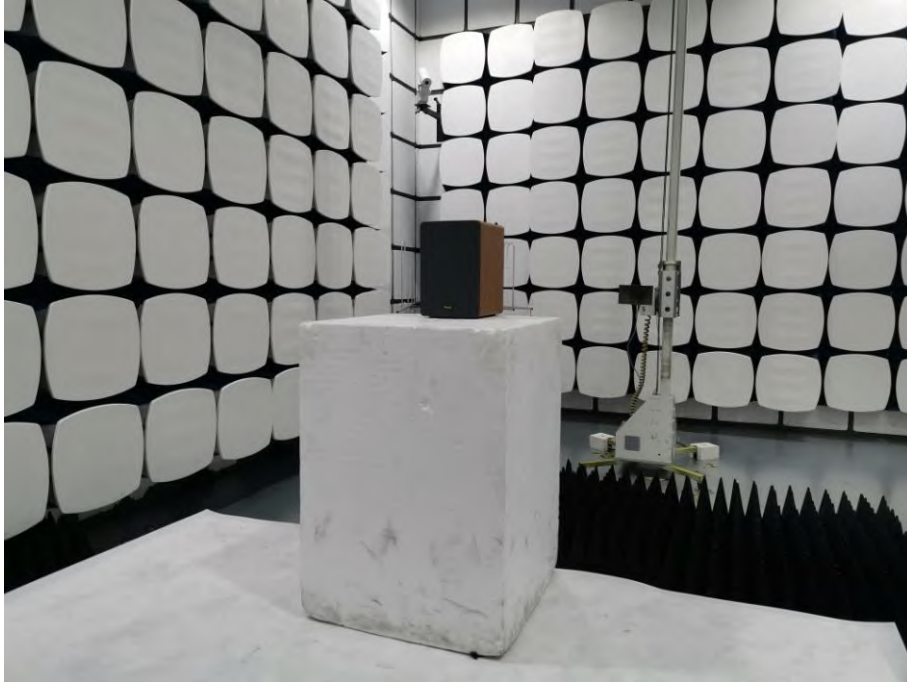
8.3. Results

The EUT antenna is external antenna and the interface is RP-SMA. It complies with the standard requirement.

9. Test Setup Photo

9.1. Photos of Radiated emission



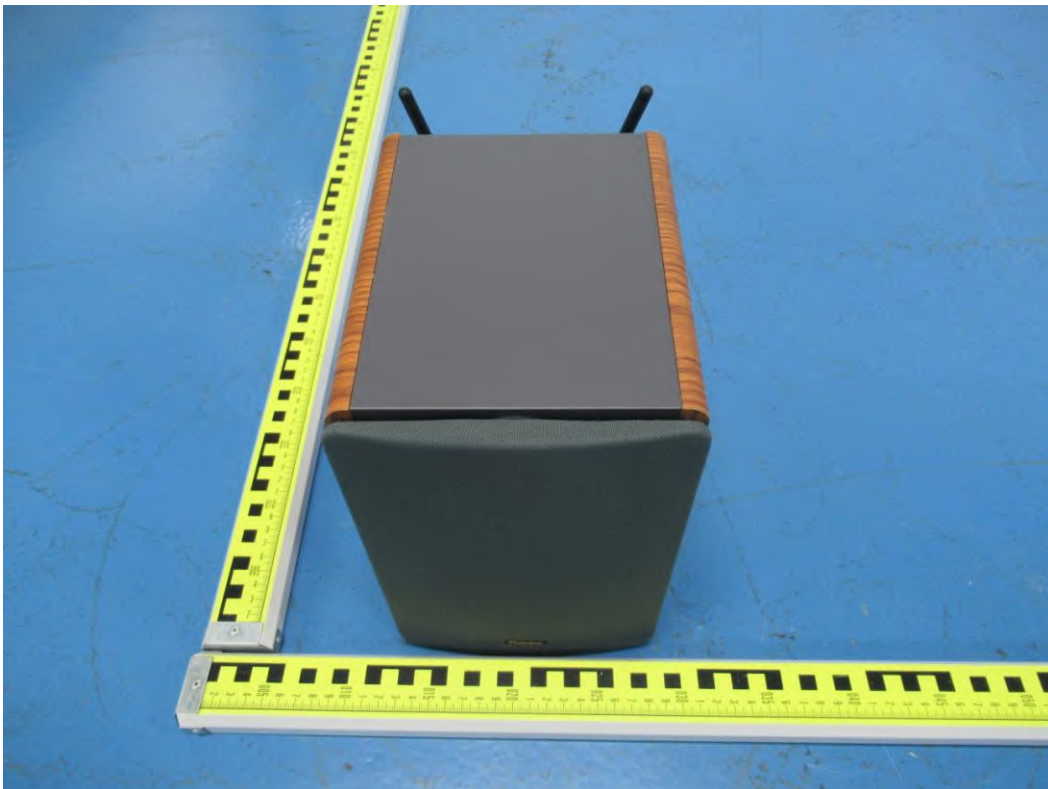
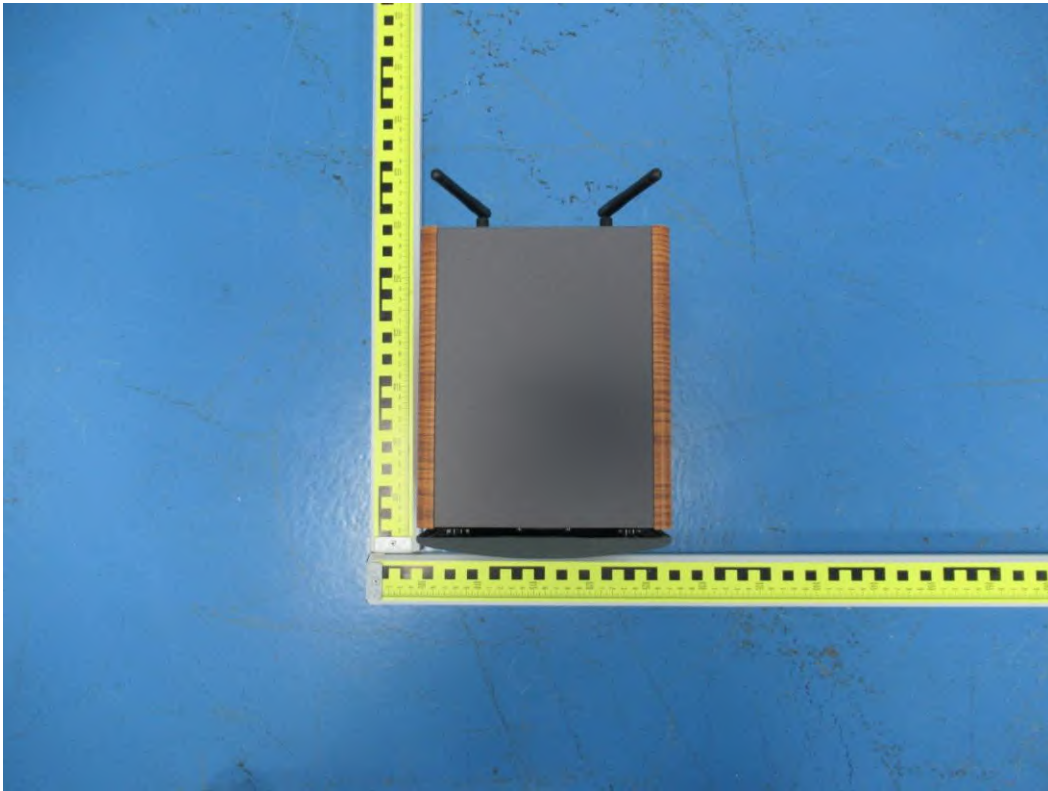


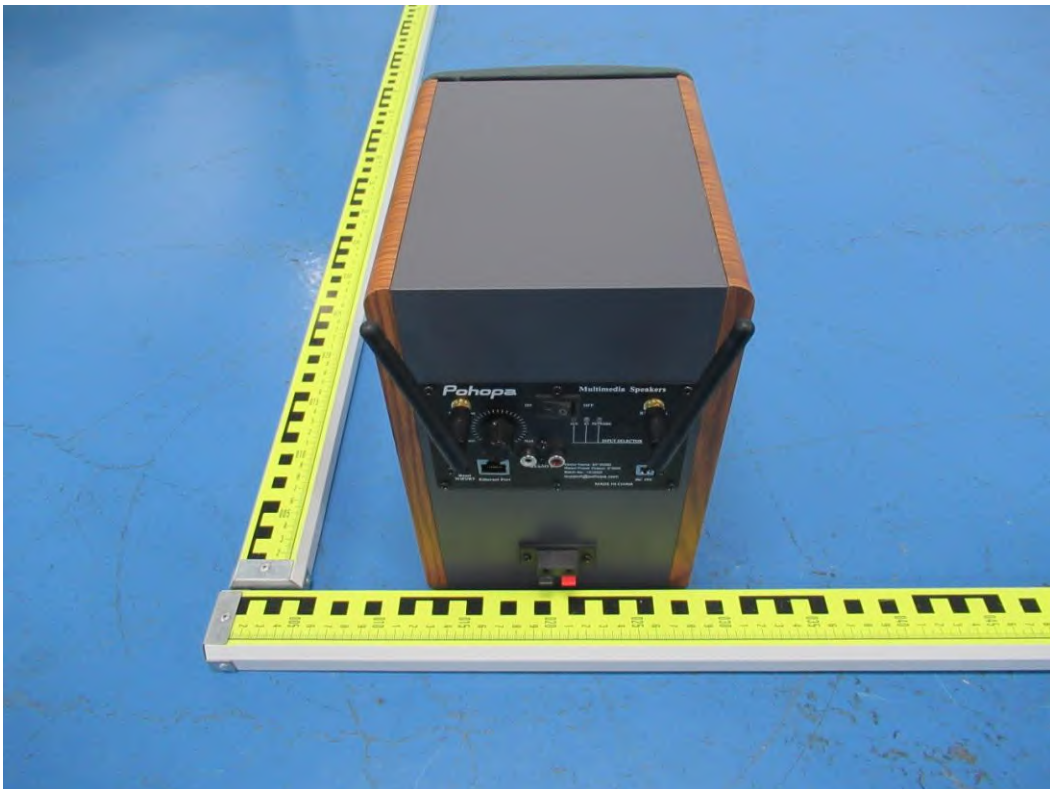
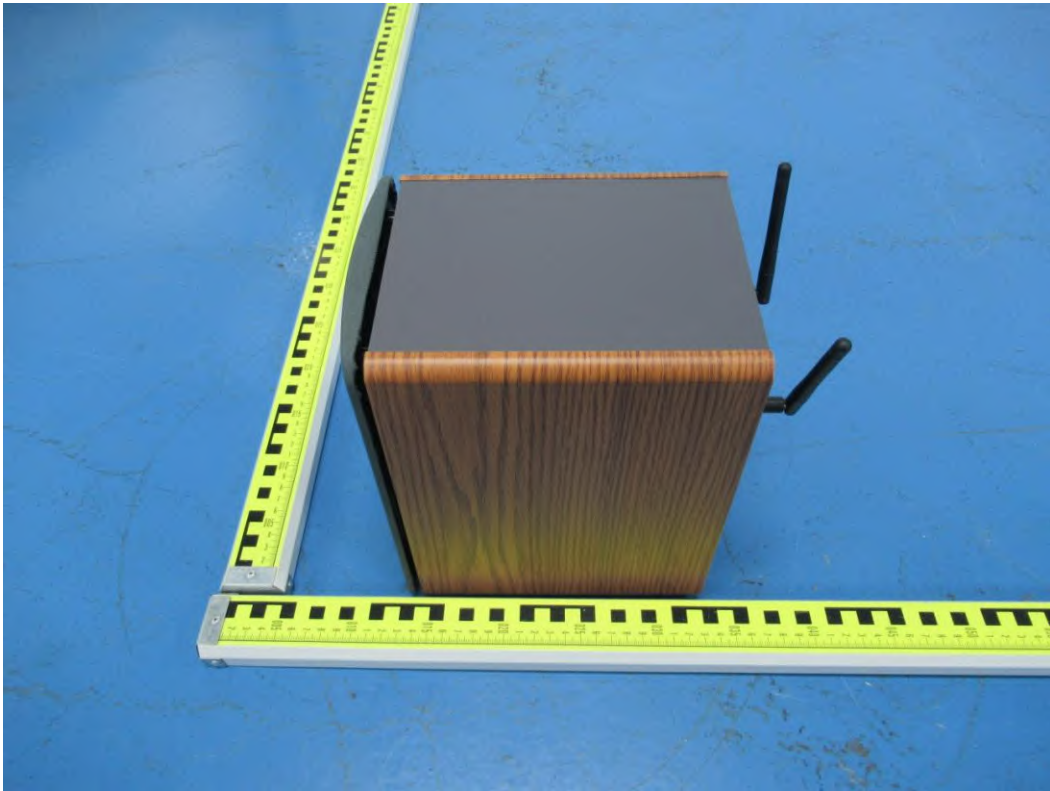
9.2.Photos of Conducted Emission test

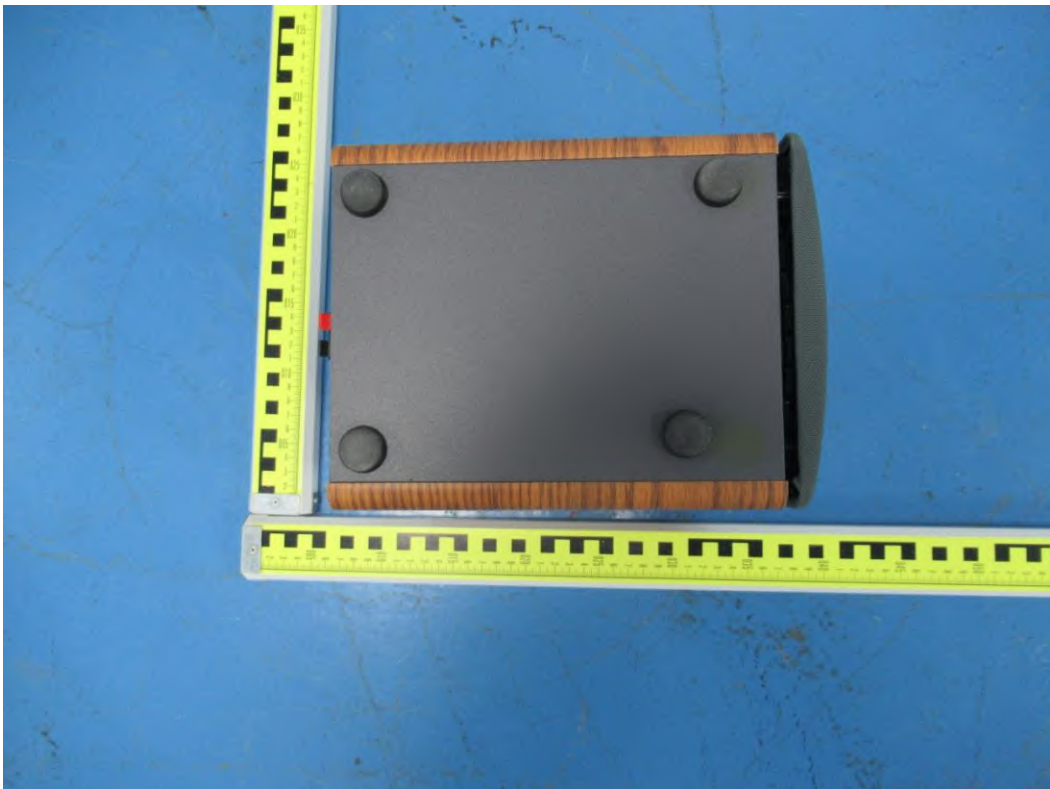
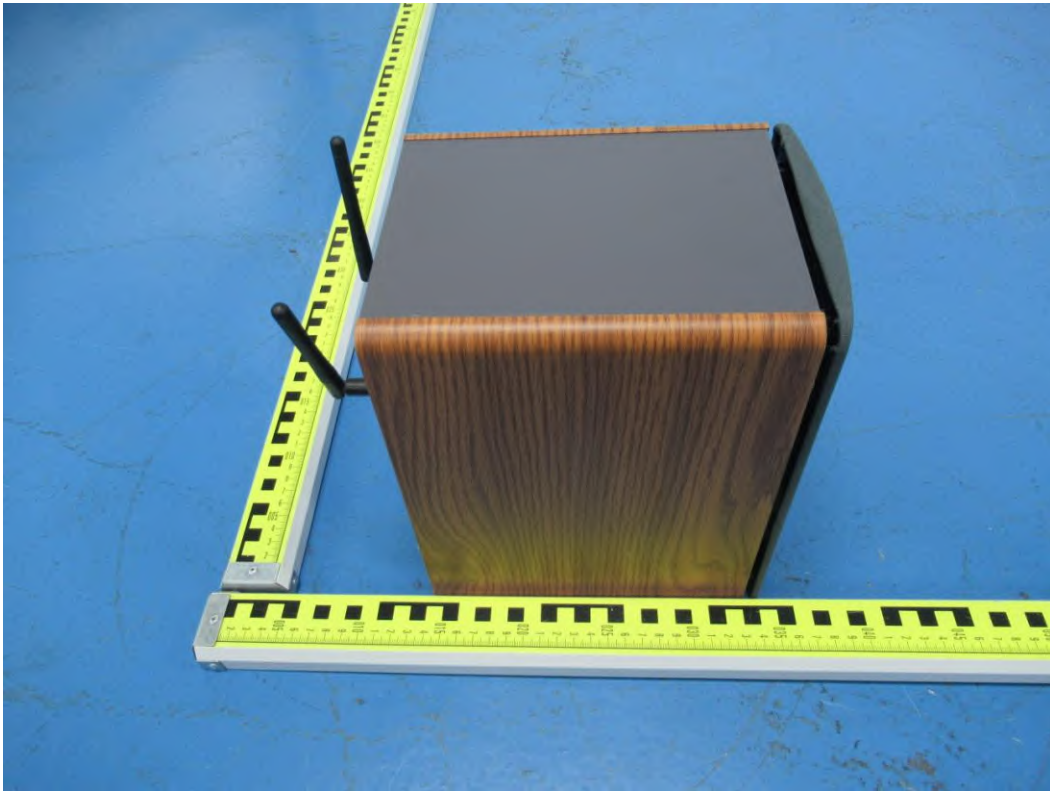


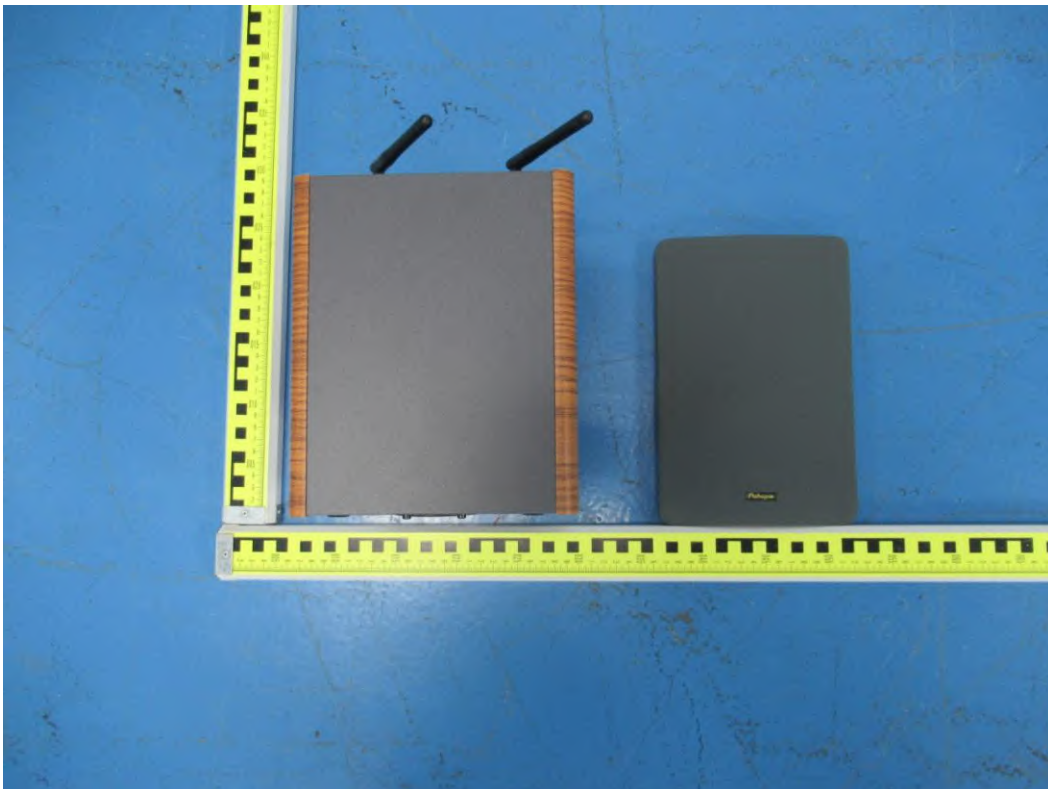
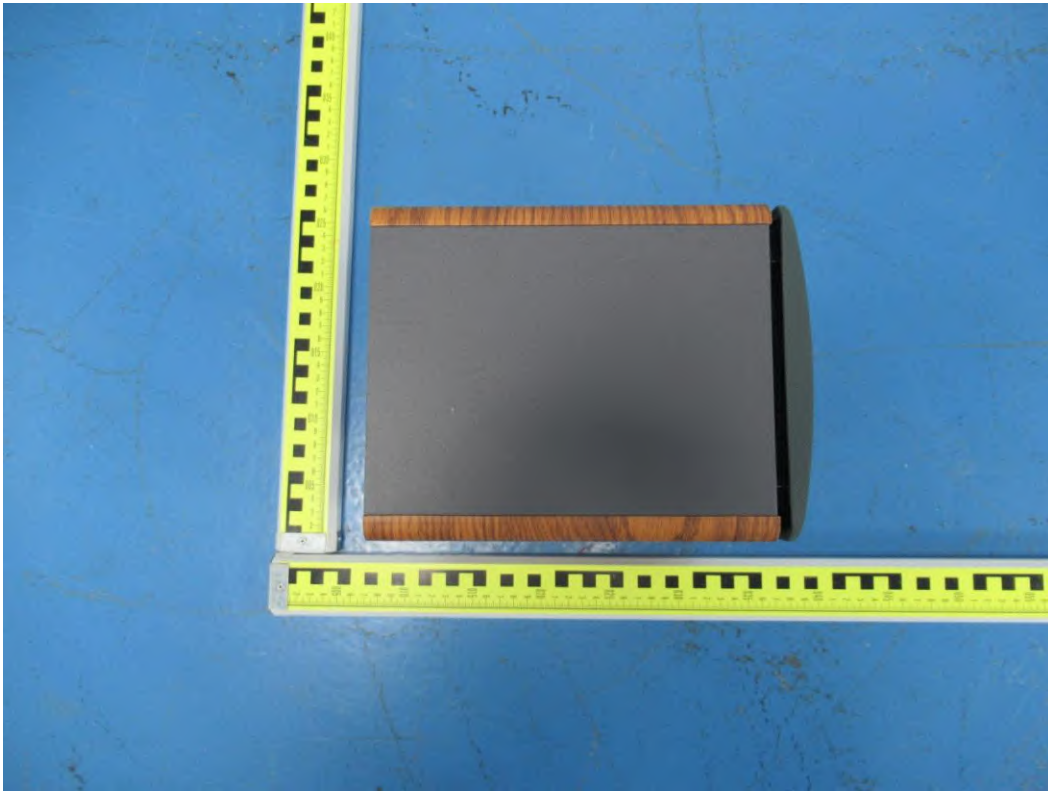
10.Photos Of EUT

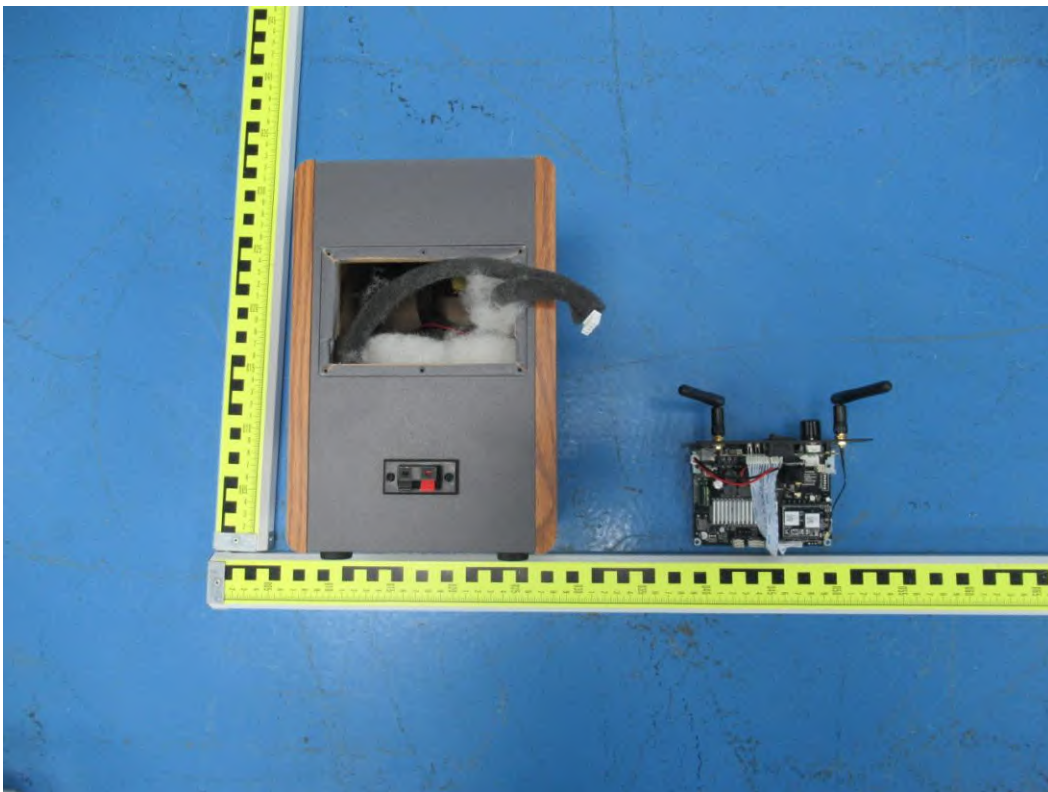
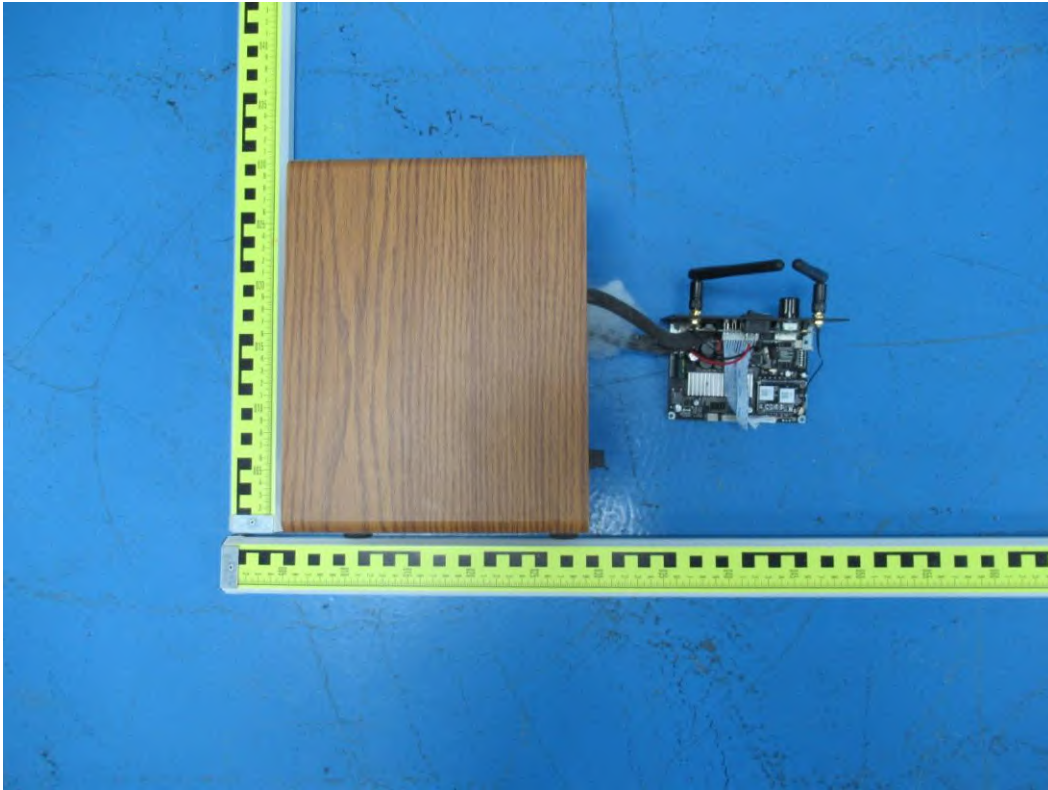


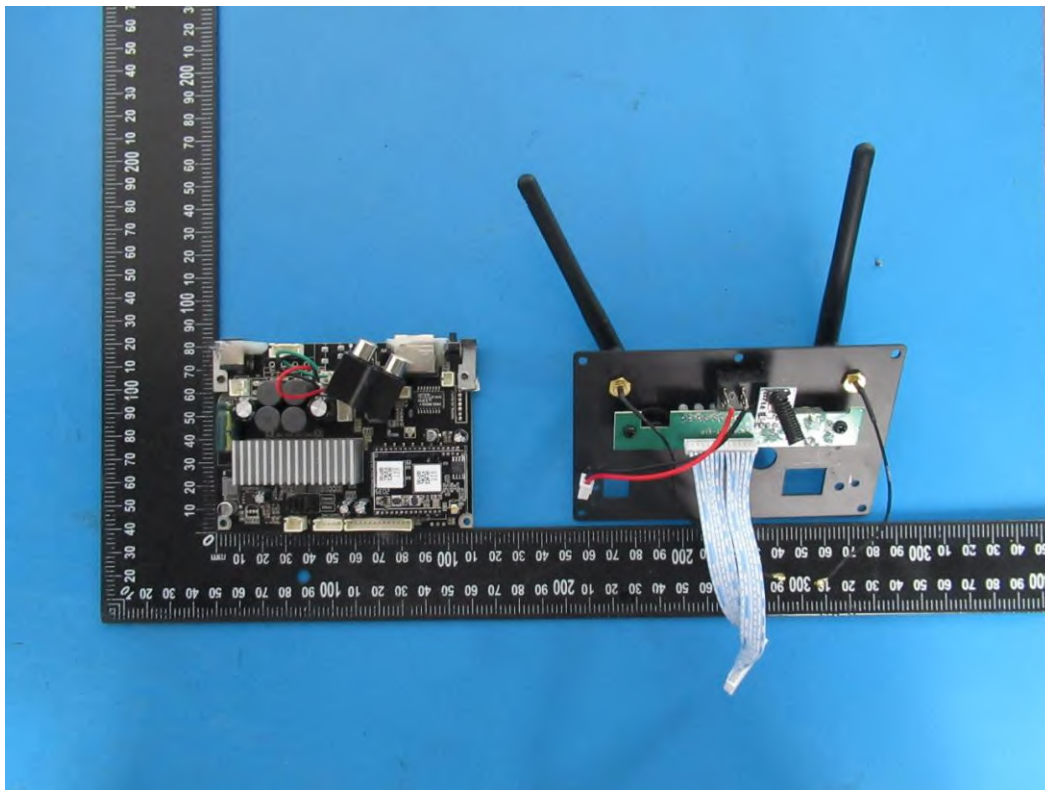


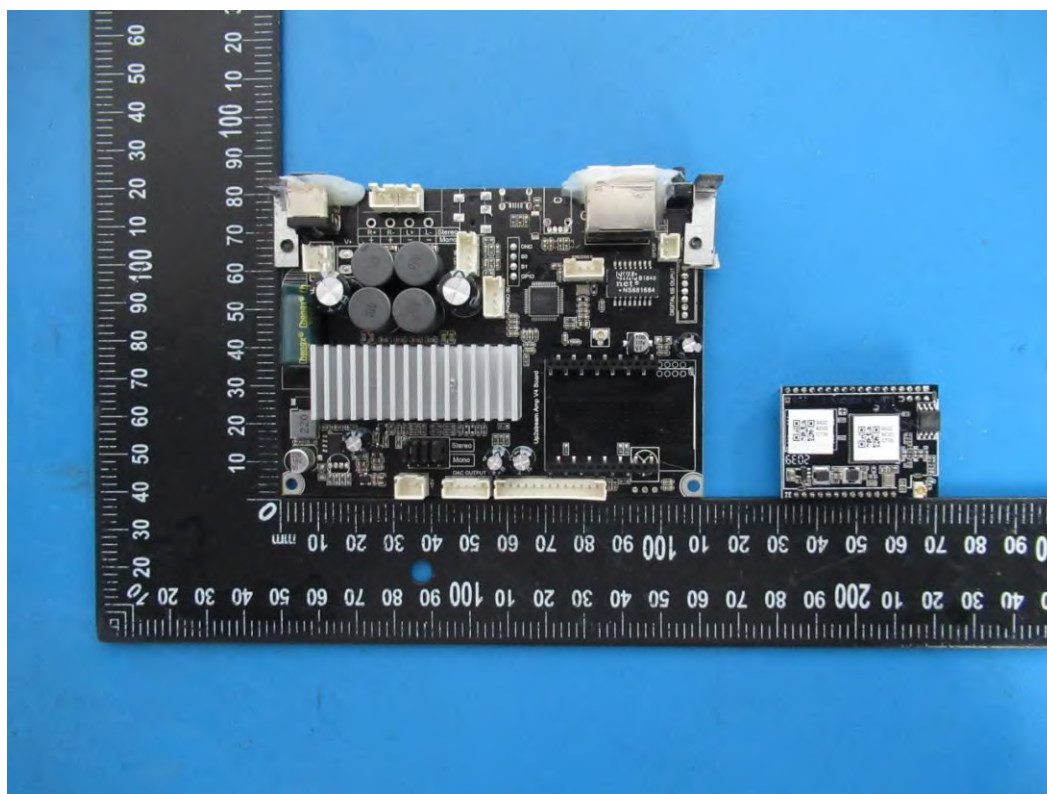
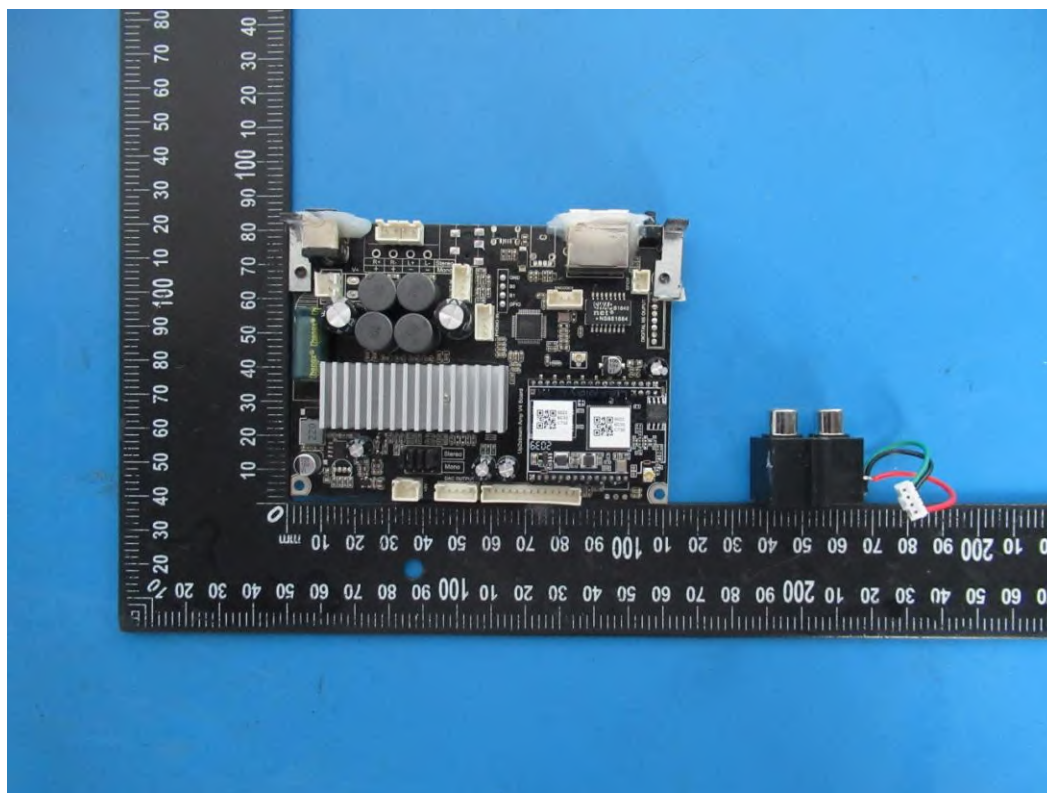


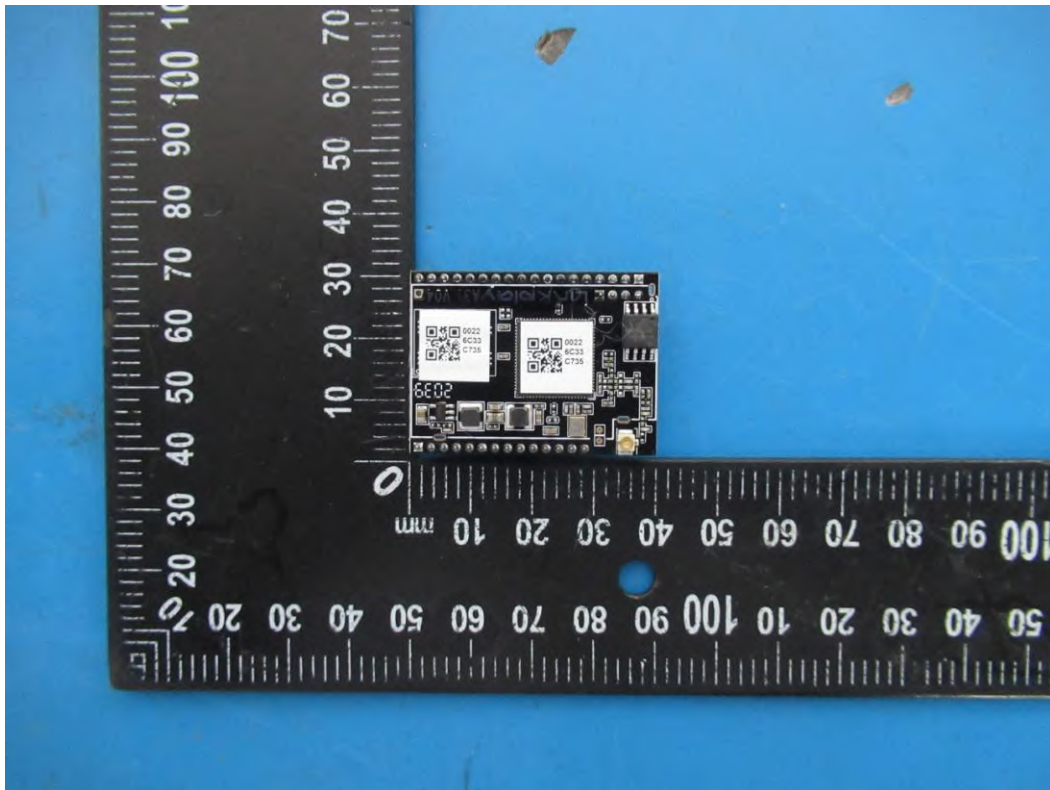
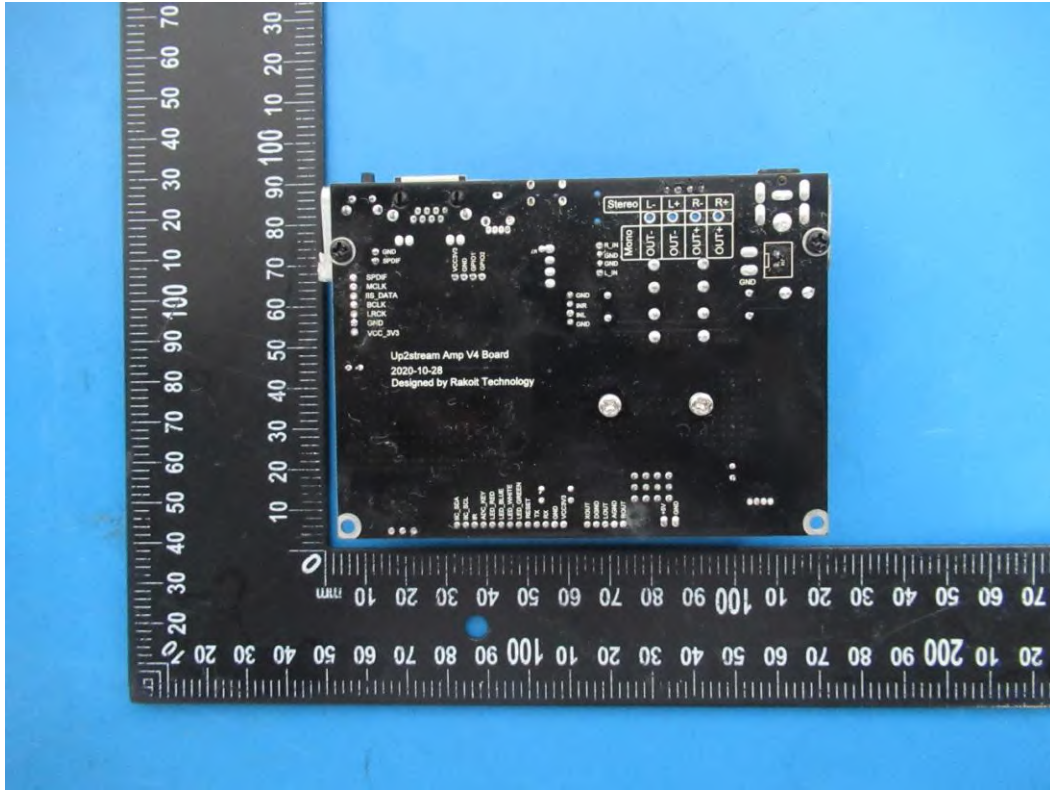


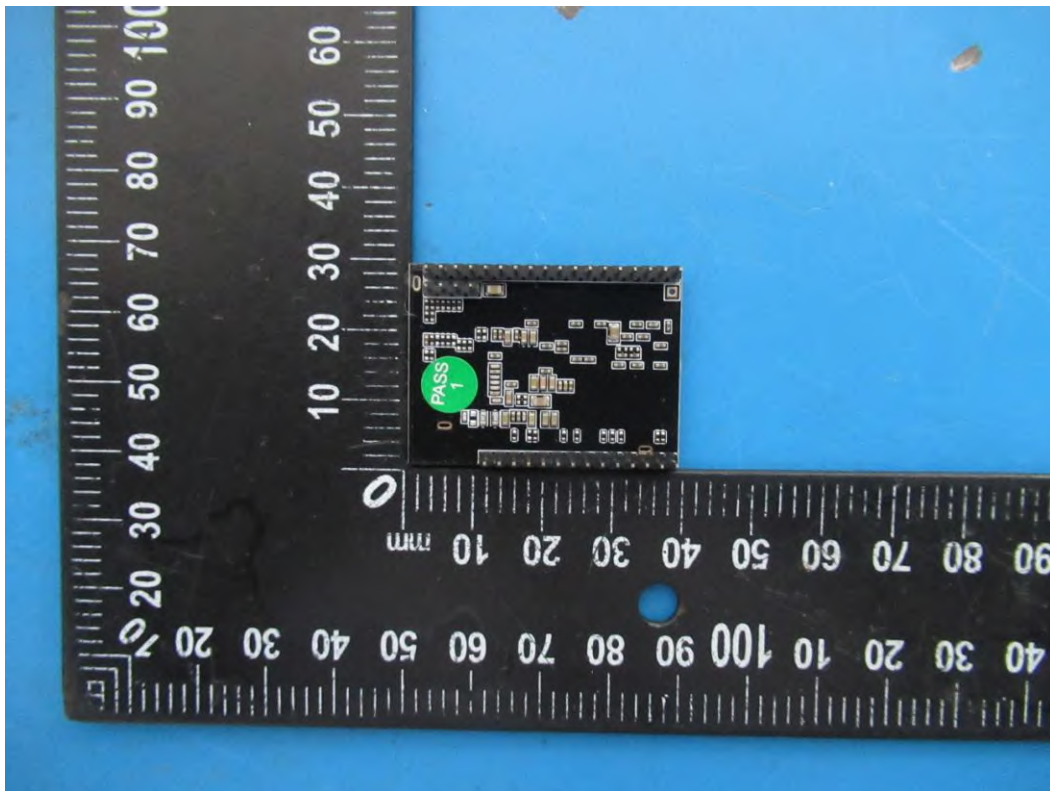


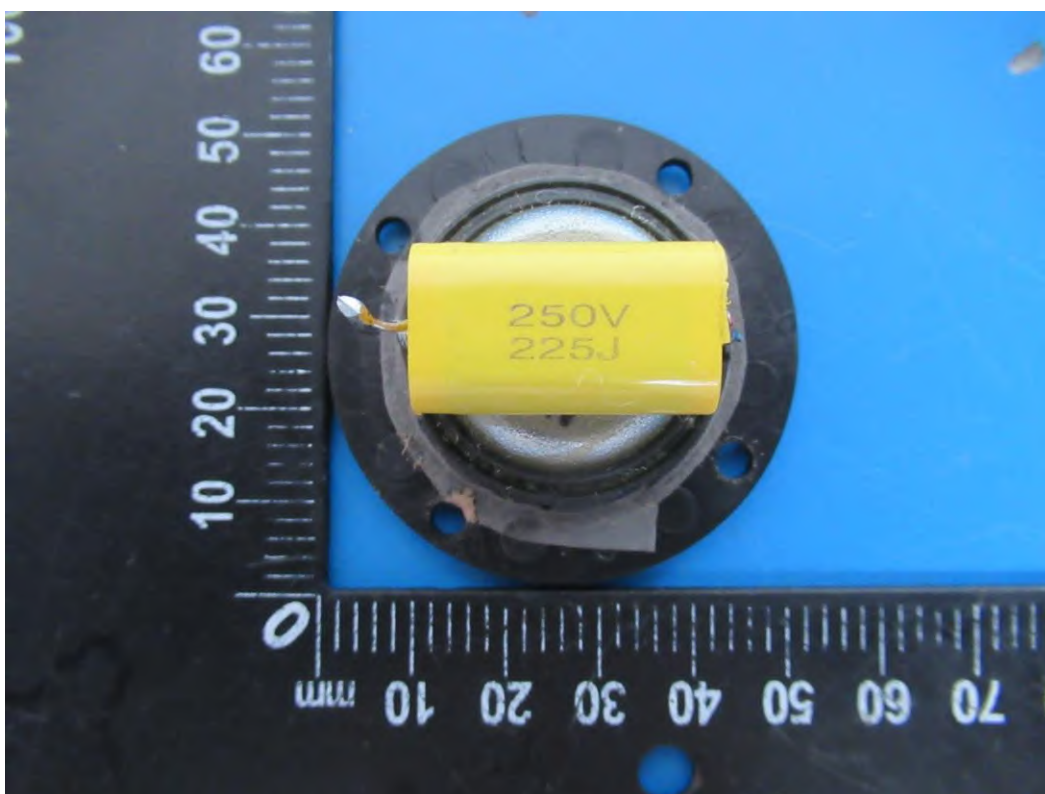
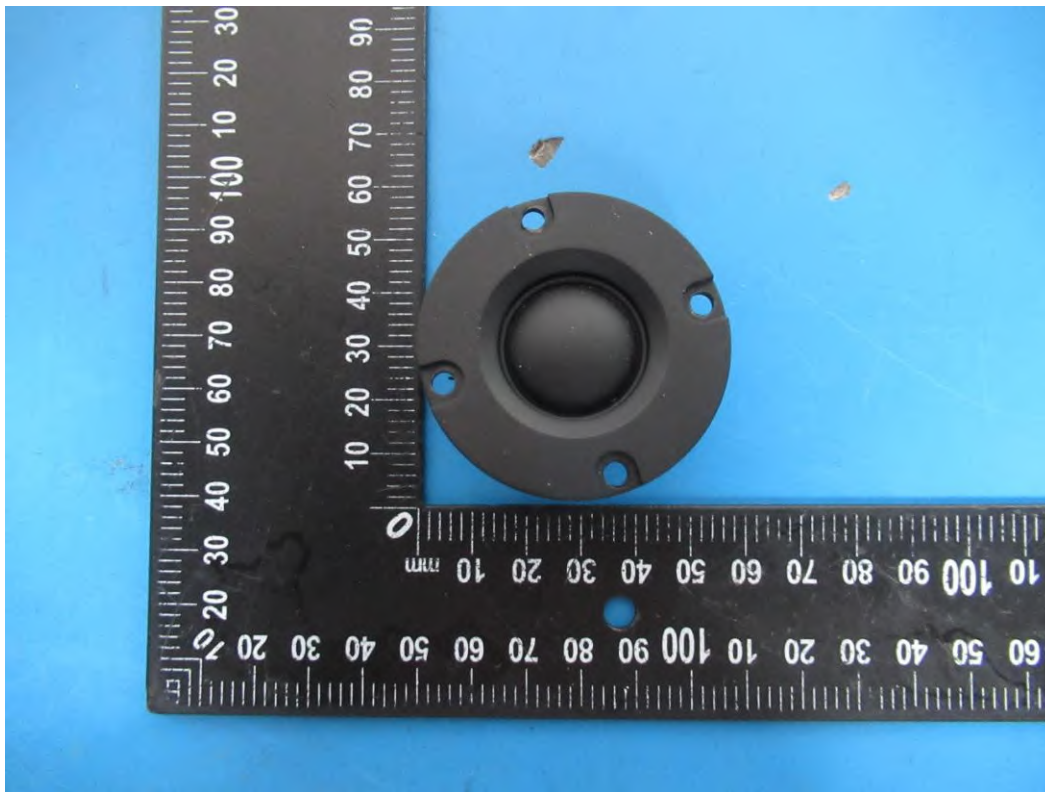


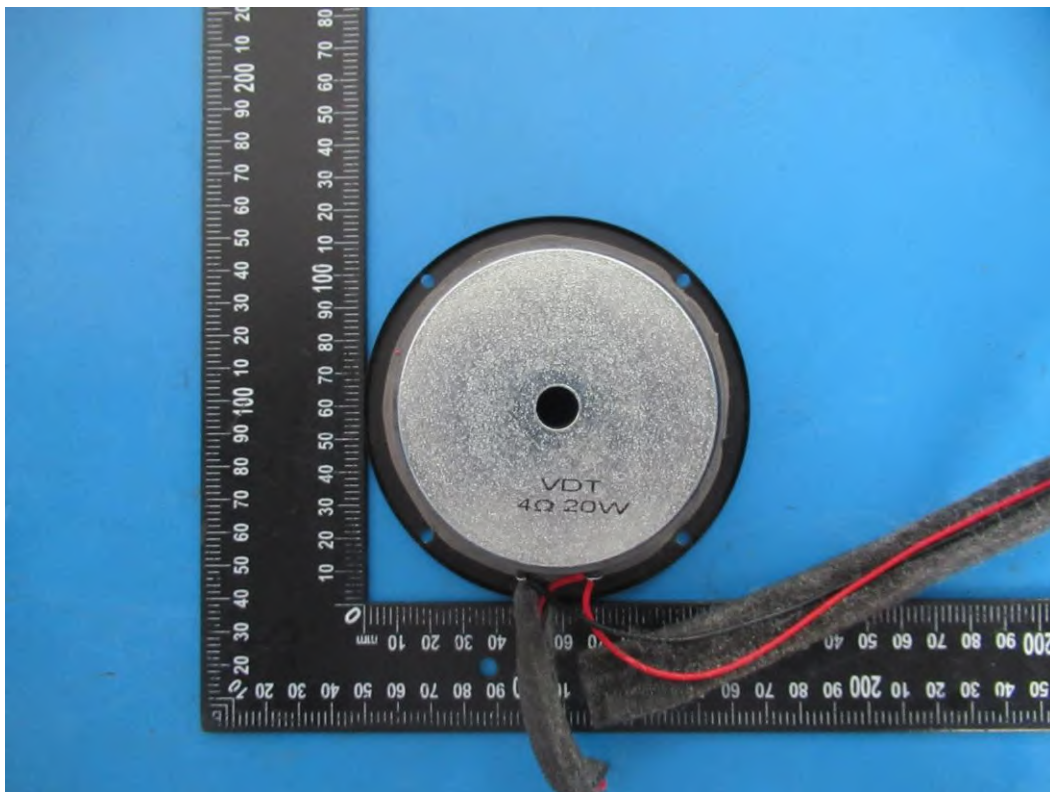


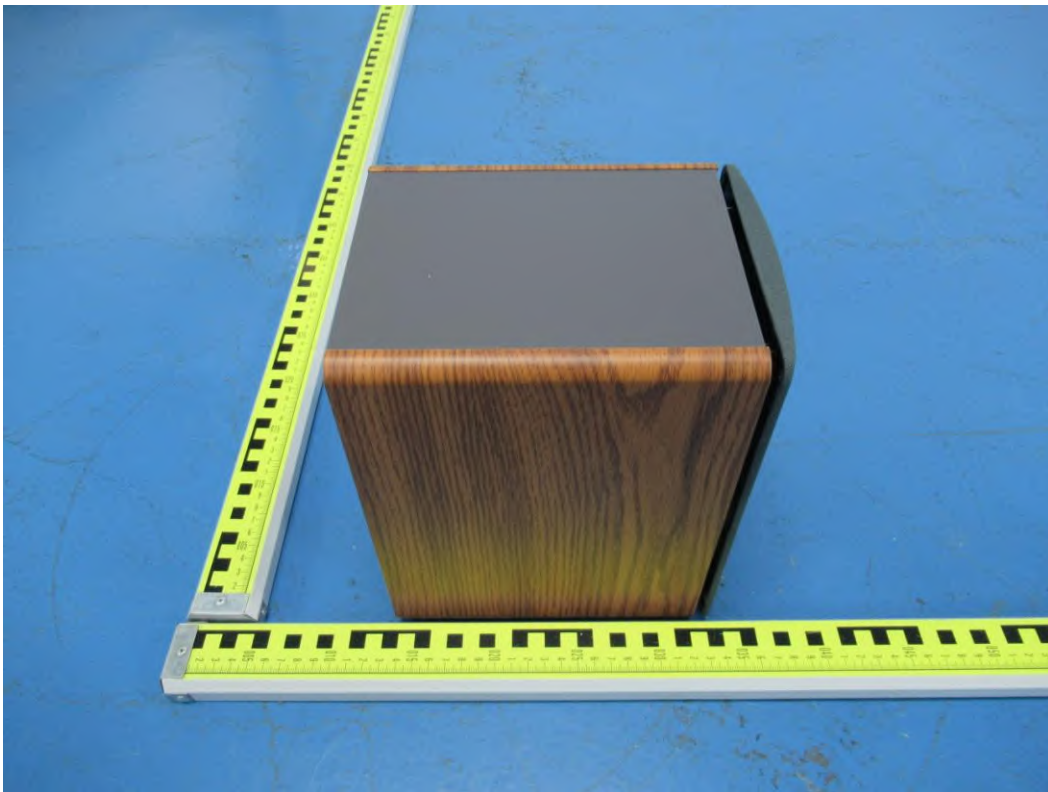
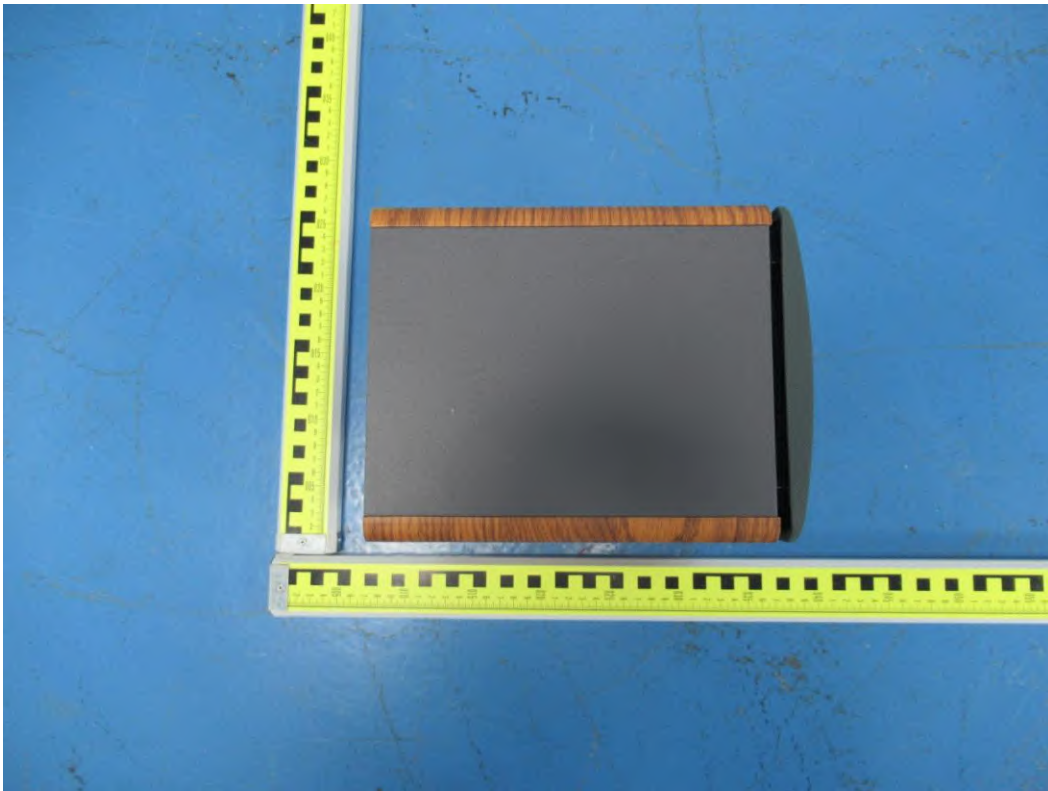


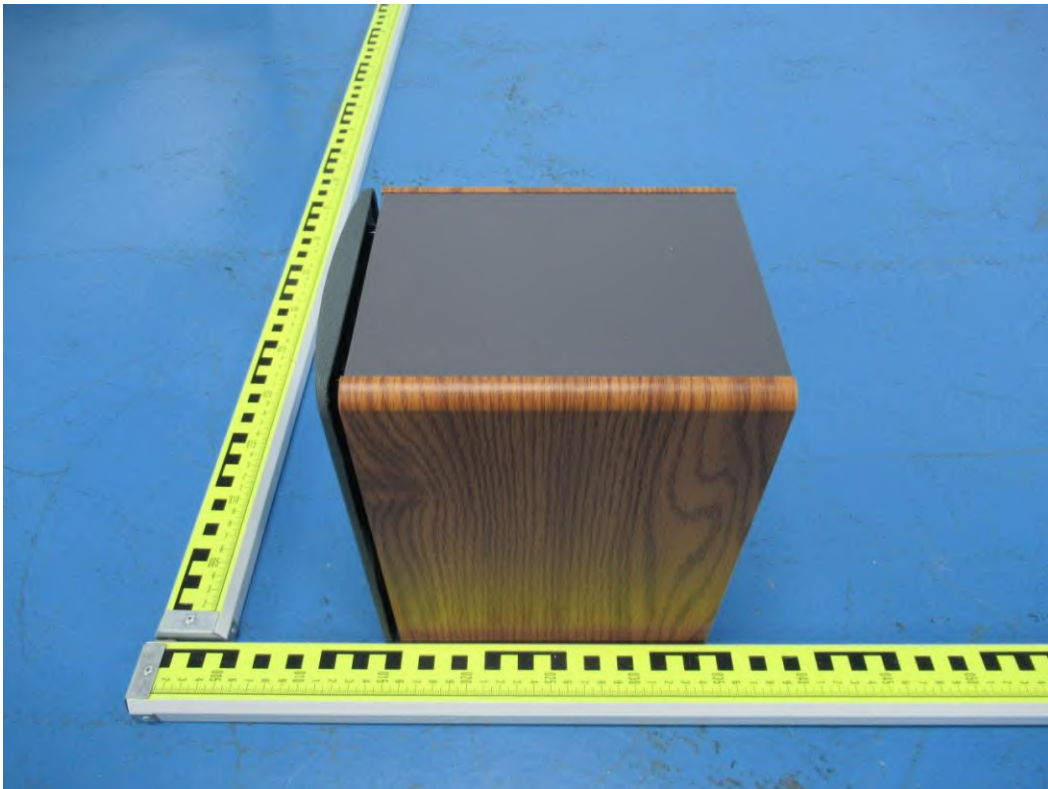
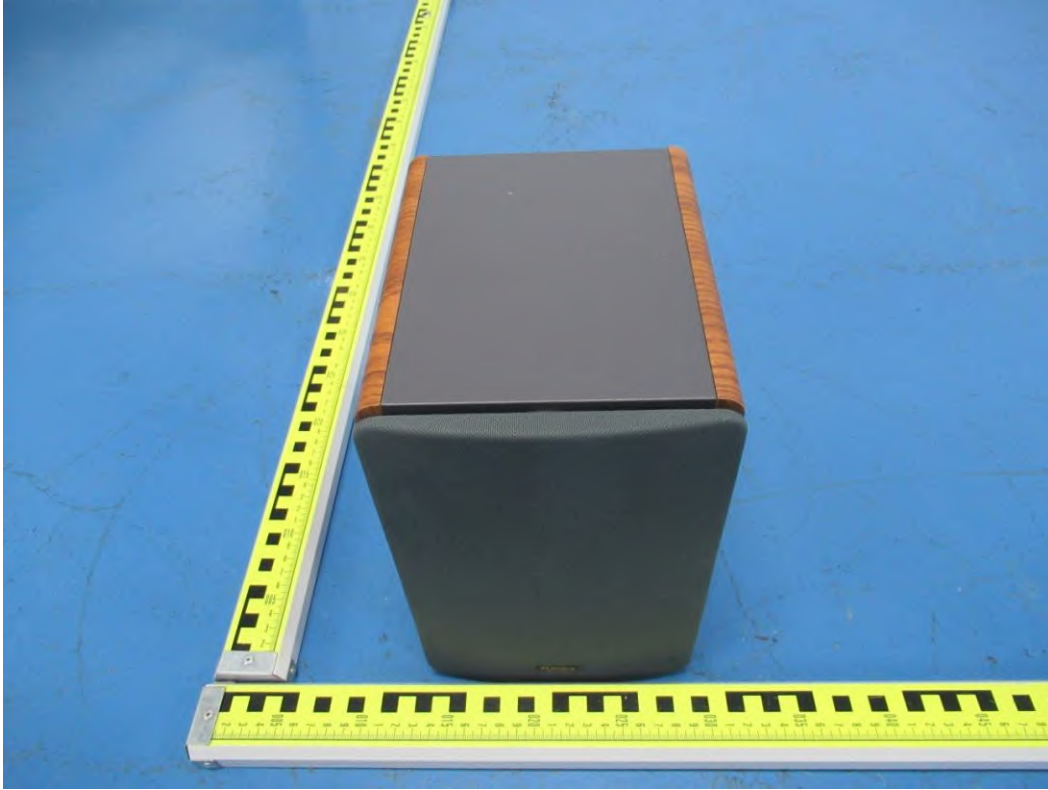


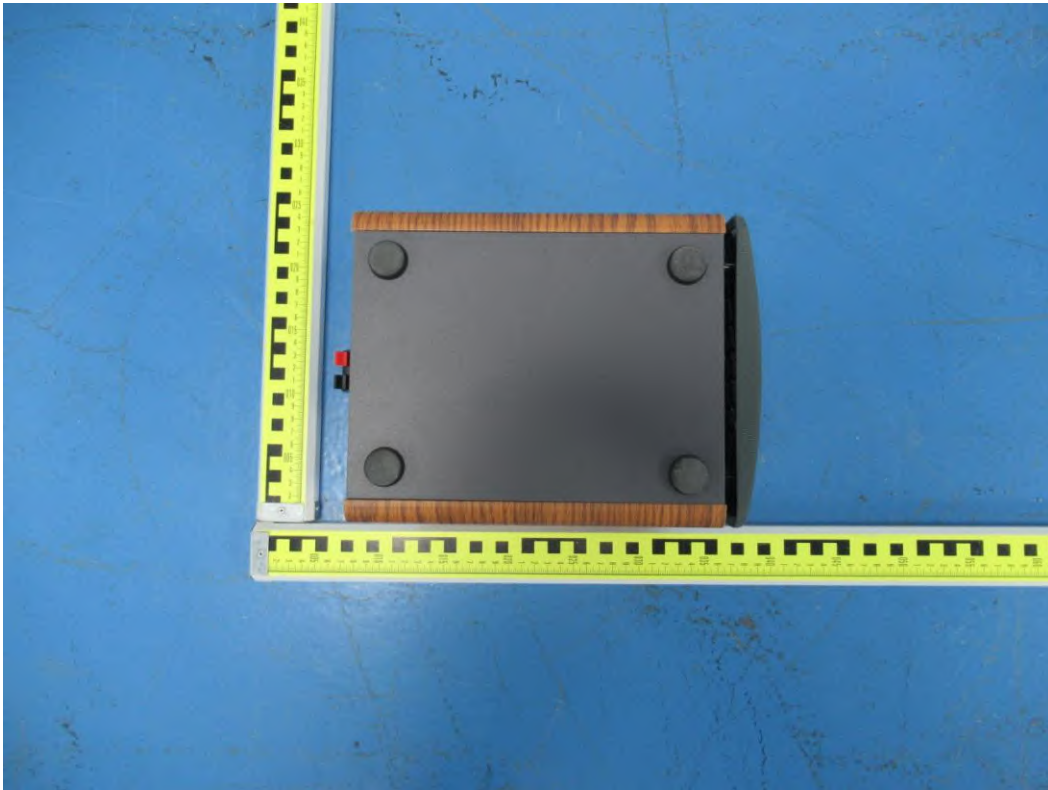
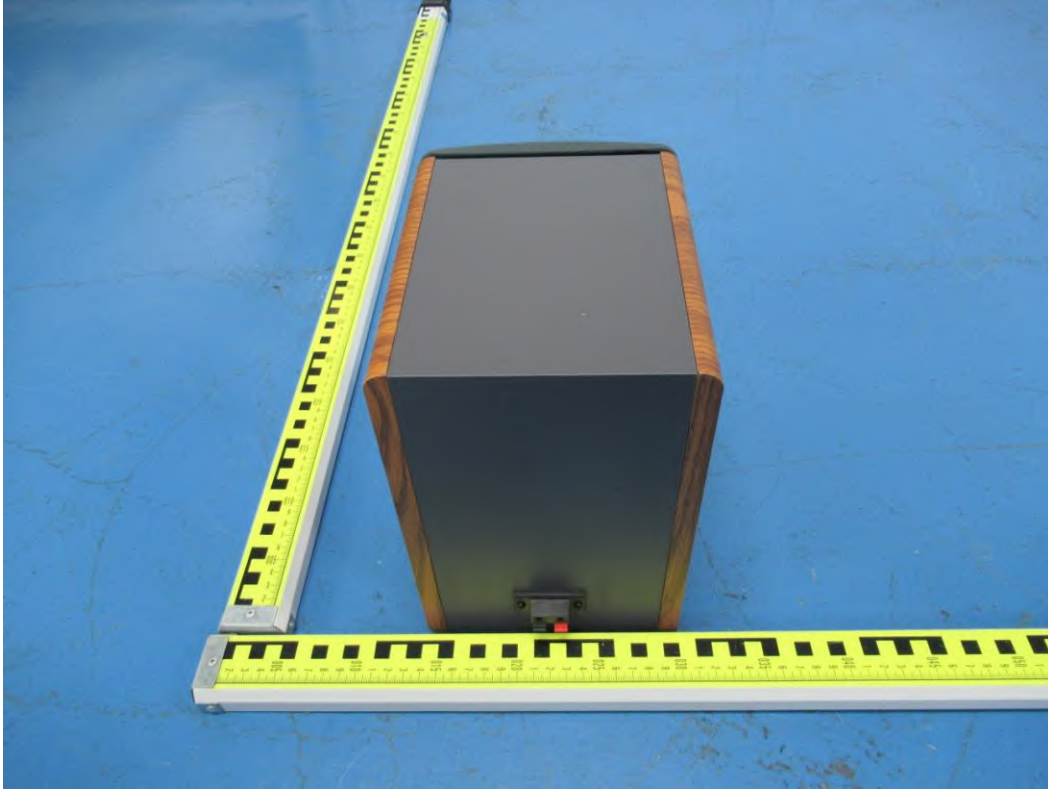


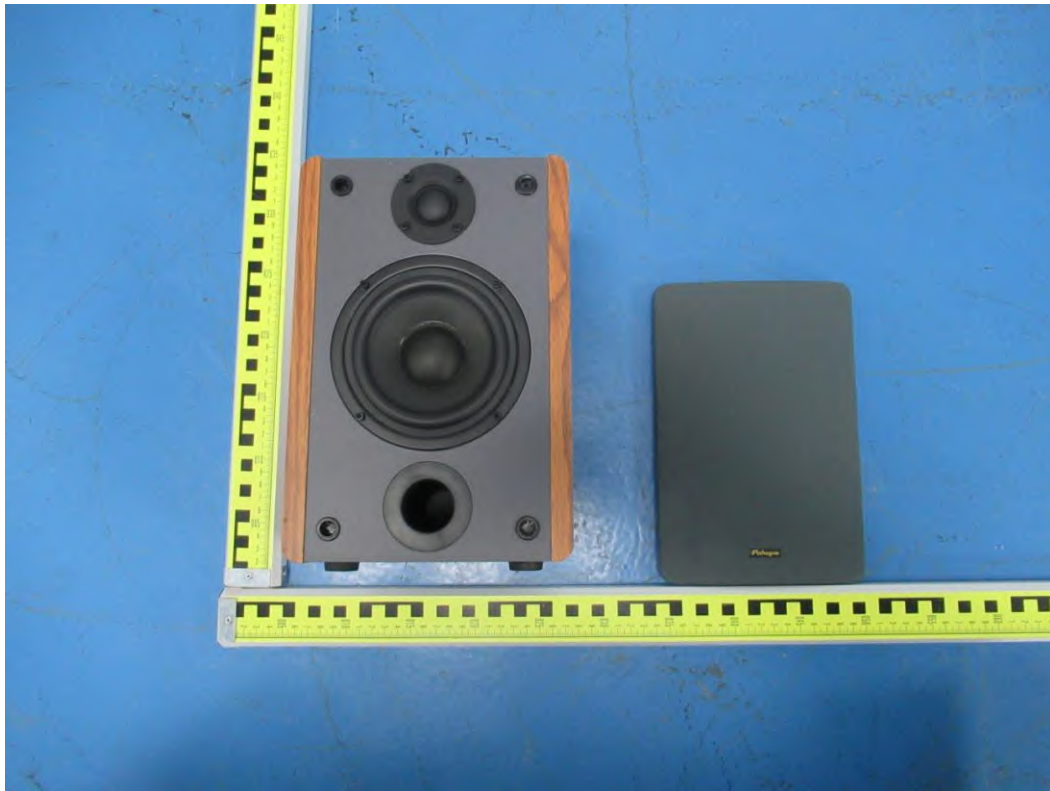


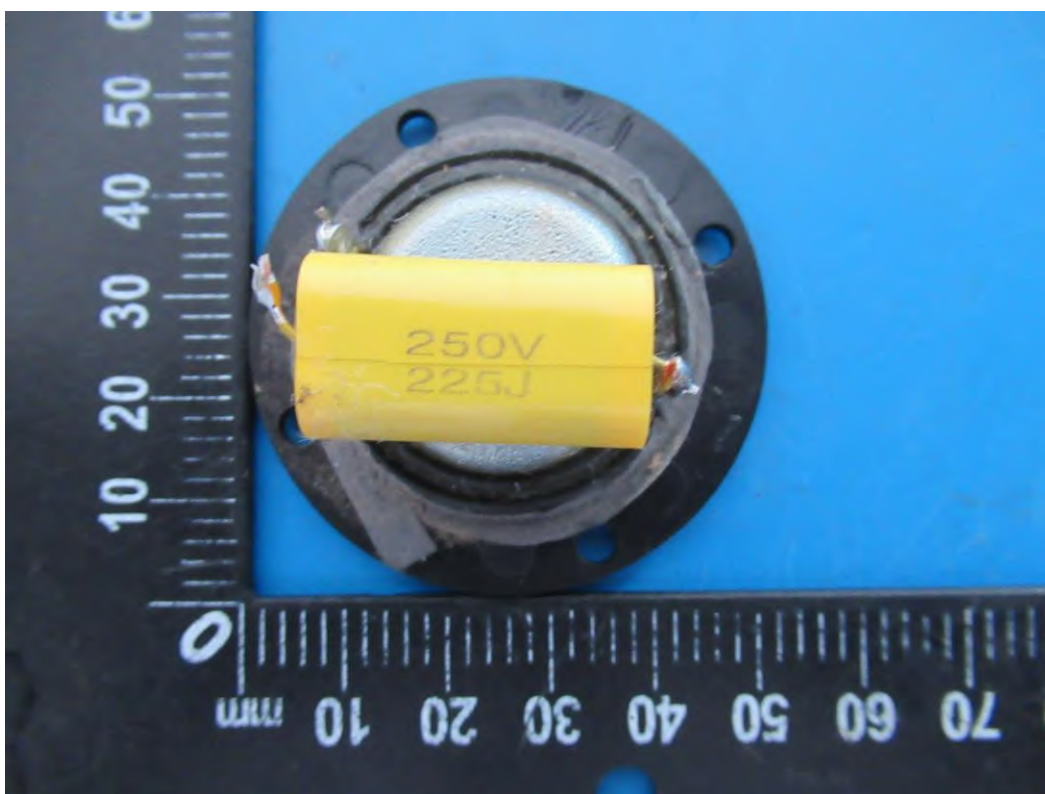
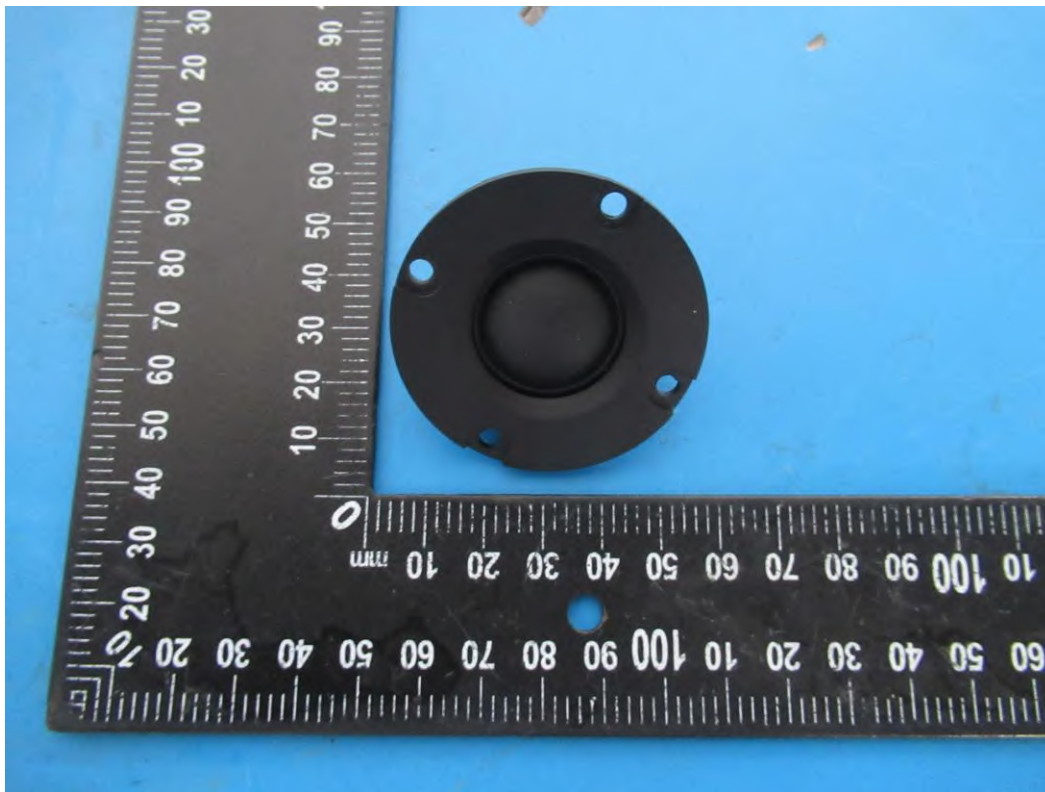














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