Shenzhen Huaxia Testing Technology Co., Ltd

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Report Template Version: V04
Report Template Revision Date: 2018-07-06

Test Report

Report No.: CQASZ20201201466E-01
Applicant: TECH-AUDIO CO., LTD
Address of Applicant: NO.3, TungShih li, Ping Cheng Tao Yuan, Taiwan.
Equipment Under Test (EUT):
Product: Weather Speakers
Model No.: AW-WS100, AW-WS200, AW-WS300
Test Model No.: AW-WS100, AW-WS200, AW-WS300
Brand Name: N/A
FCC ID: 2AABM-AWWS
Standards: 47 CFR Part 15, Subpart C
Date of Receipt: 2020-12-09
Date of Test: 2020-12-09 to 2020-12-28
Date of Issue: 2020-12-28
Test Result: **PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: Martin Lee
(Martin Lee)

Reviewed By: Ares Liu
(Ares Liu)

Approved By: Sheek. Luo
(Sheek Luo)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20201201466E-01	Rev.01	Initial report	2020-12-28

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 (2013)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2013)	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10 (2013)	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Carrier Frequencies Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10 (2013)	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2013)	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2013)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS

3 Contents

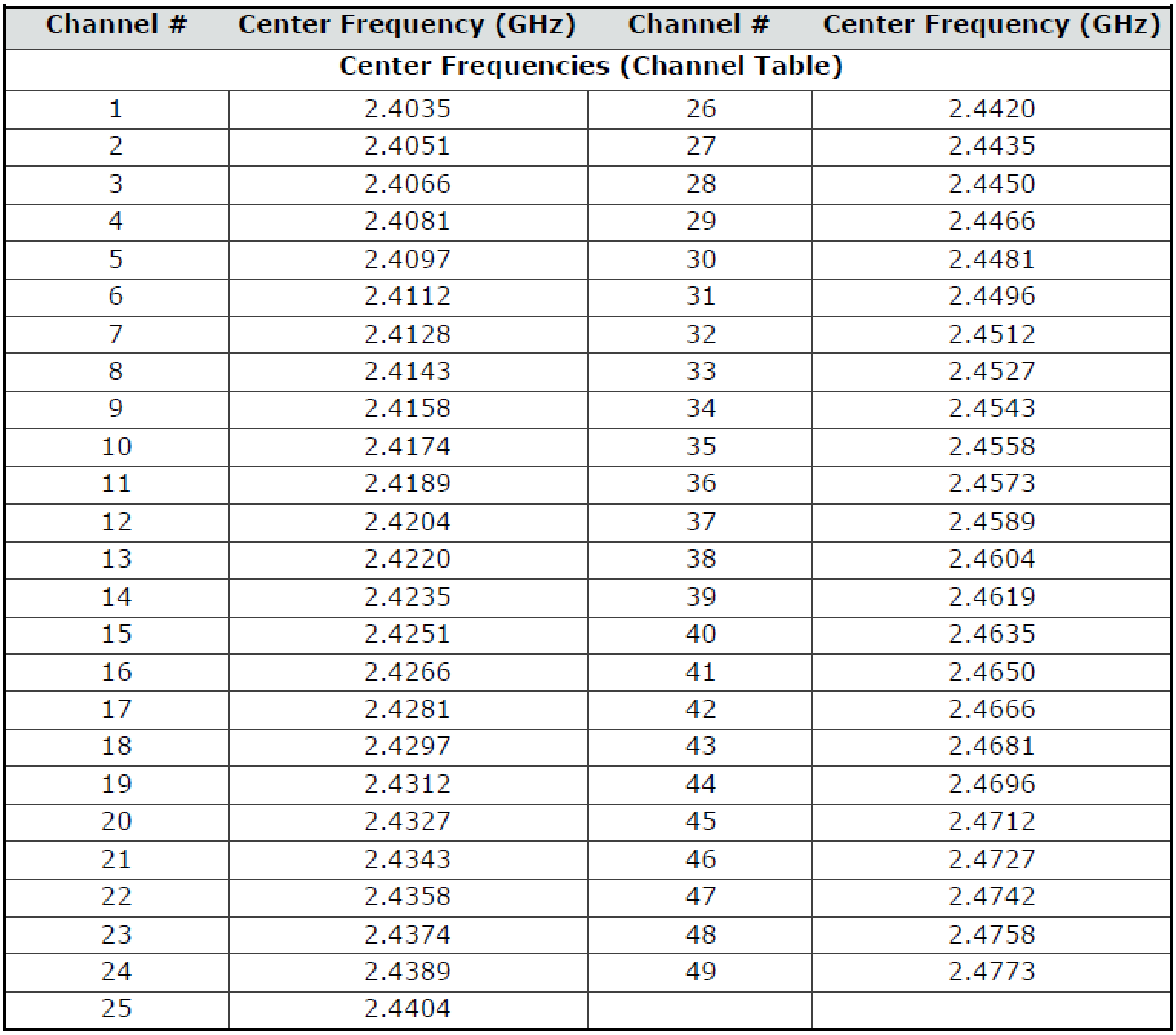
4 General Information

4.1 Client Information

Applicant:	TECH-AUDIO CO., LTD
Address of Applicant:	NO.3, TungShih li, Ping Cheng Tao Yuan, Taiwan.
Manufacturer:	Atlantic Technology
Address of Manufacturer:	343 Vanderbilt Avenue, Norwood, MA 02062-5060
Factory:	Xiamen Tech-Sound CO.,Ltd
Address of Factory:	NO.170,Ji Yin Road, Tong An District , Xiamen , China.

4.2 General Description of EUT

Product Name:	Weather Speakers
Model No.:	AW-WS100, AW-WS200, AW-WS300
Test Model No.:	AW-WS100, AW-WS200, AW-WS300
Trade Mark:	N/A
Hardware Version:	REV1.0
Software Version:	skaa-rx-Tech_Audio_JE0685/JE0686/JE0687-develop-v2.5.0-74-gb9c45343-untested.tcf
Test sample No:	CQASZ20201201466E#1, CQASZ20201201466E#2, CQASZ20201201466E#3
Operation Frequency:	2403.5MHz~2477.3MHz
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	FSK
Transfer Rate:	1Mbps
BW:	2.5MHz
Number of Channel:	49
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	SKAA (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	3.3dBi
Power Supply:	Adapter: 15VDC For AW-WS100, 19VDC For AW-WS200, 24VDC For AW-WS300.



Channel #	Center Frequency (GHz)	Channel #	Center Frequency (GHz)
Center Frequencies (Channel Table)			
1	2.4035	26	2.4420
2	2.4051	27	2.4435
3	2.4066	28	2.4450
4	2.4081	29	2.4466
5	2.4097	30	2.4481
6	2.4112	31	2.4496
7	2.4128	32	2.4512
8	2.4143	33	2.4527
9	2.4158	34	2.4543
10	2.4174	35	2.4558
11	2.4189	36	2.4573
12	2.4204	37	2.4589
13	2.4220	38	2.4604
14	2.4235	39	2.4619
15	2.4251	40	2.4635
16	2.4266	41	2.4650
17	2.4281	42	2.4666
18	2.4297	43	2.4681
19	2.4312	44	2.4696
20	2.4327	45	2.4712
21	2.4343	46	2.4727
22	2.4358	47	2.4742
23	2.4374	48	2.4758
24	2.4389	49	2.4773
25	2.4404		

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

Channel	Frequency
The Lowest channel	2403.5MHz
The Middle channel	2440.4MHz
The Highest channel	2477.3MHz

4.3 Additional Instructions

EUT Test Software Settings:	
Mode:	☒Special software is used. ☐Through engineering command into the engineering mode. engineering command: *#*#3646633#*#*
EUT Power level:	Class2 (Power level is built-in set parameters and cannot be changed and selected)

Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

Run Software:

Press this key to switch high, middle and low channels

4.4 Test Environment

Operating Environment:	
Radiated Emissions:	
Temperature:	25.3 °C
Humidity:	55 % RH
Atmospheric Pressure:	1009mbar
Conducted Emissions:	
Temperature:	23.2 °C
Humidity:	51 % RH
Atmospheric Pressure:	1009mbar
Radio conducted item test (RF Conducted test room):	
Temperature:	25.4 °C
Humidity:	52 % RH
Atmospheric Pressure:	1009mbar
Test mode:	
Test Mode:	Use test software (SKAA) to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

4.5 Description of Support Units

The EUT has been tested with associated equipment below.

1）Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
PC	Lenovo	ThinkPad E450c	FCC ID	CQA

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.6 Statement of the measurement uncertainty

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

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

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

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

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequency Error	5.5 Hz	(1)

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

4.7 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd,
1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.8 Test Facility

- **A2LA (Certificate No. 4742.01)**
  Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.
- **FCC Registration No.: 522263**
  Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.9 Abnormalities from Standard Conditions

None.

4.10 Other Information Requested by the Customer

None.

4.11 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2019/10/25	2020/10/24
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2019/10/25	2020/10/24
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2019/10/25	2020/10/24
Preamplifier	EMCI	EMC184055SE	CQA-089	2020/9/25	2021/9/24
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2019/10/21 2020/10/21	2020/10/20 2021/10/20
Bilog Antenna	R&S	HL562	CQA-011	2020/9/26	2021/9/25
Horn Antenna	R&S	HF906	CQA-012	2020/9/26	2021/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2020/9/25	2021/9/24
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2020/9/26	2021/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2020/9/26	2021/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2020/9/26	2021/9/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2020/9/26	2021/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2020/9/26	2021/9/25
EMI Test Receiver	R&S	ESR7	CQA-005	2019/10/25	2020/10/24
LISN	R&S	ENV216	CQA-003	2019/10/23 2020/10/23	2020/10/22 2021/10/22
Coaxial cable	CQA	N/A	CQA-C009	2020/9/26	2021/9/25
DC power	KEYSIGHT	E3631A	CQA-028	2020/9/26	2021/9/25

Test software:

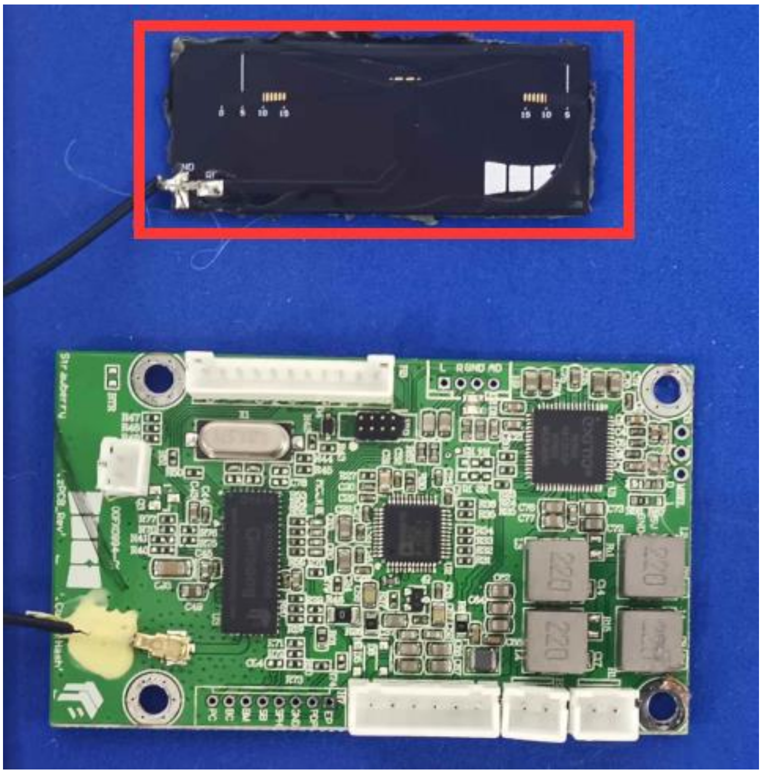
	Manufacturer	Software brand
Radiated Emissions test software	Tonscend	JS1120-3
Conducted Emissions test software	Audix	e3
RF Conducted test software	Audix	e3

Note:

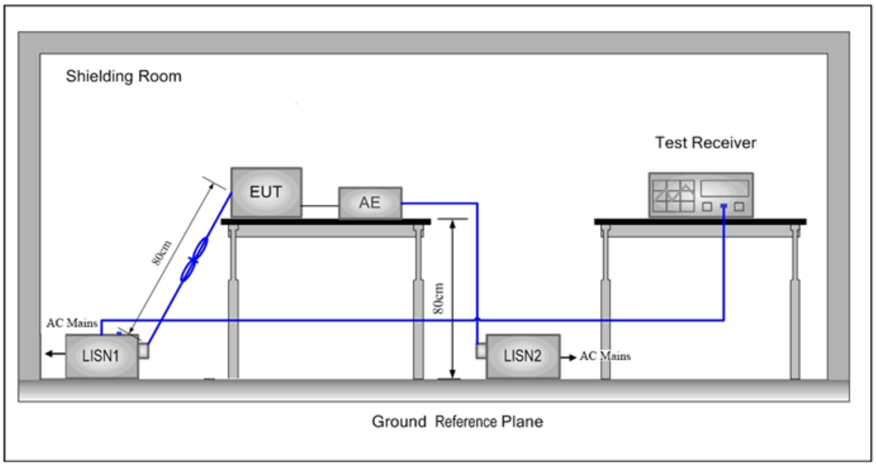
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is PCB antenna. The best case gain of the antenna is 3.3dBi.	

5.2 Conducted Emissions

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


</td></tr>
</table>

Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel.
Final Test Mode:	Through Pre-scan, find FSK modulation at the highest channel is the worst case. Only the worst case is recorded in the report.
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

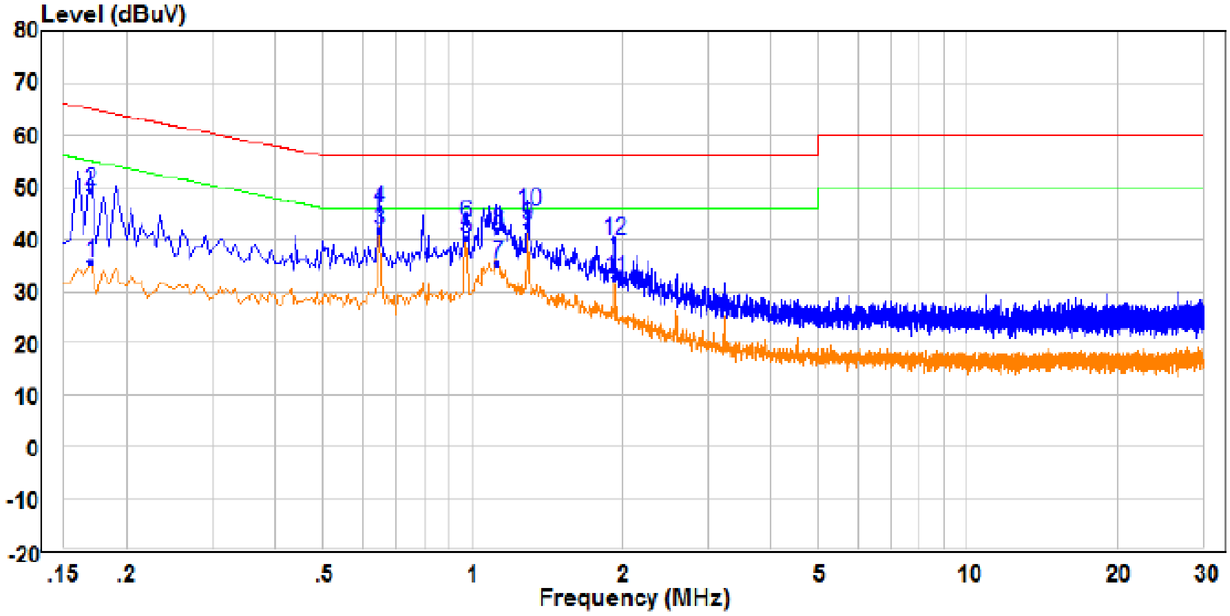
Measurement Data

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

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

Model No.: AW-WS100

Live line:

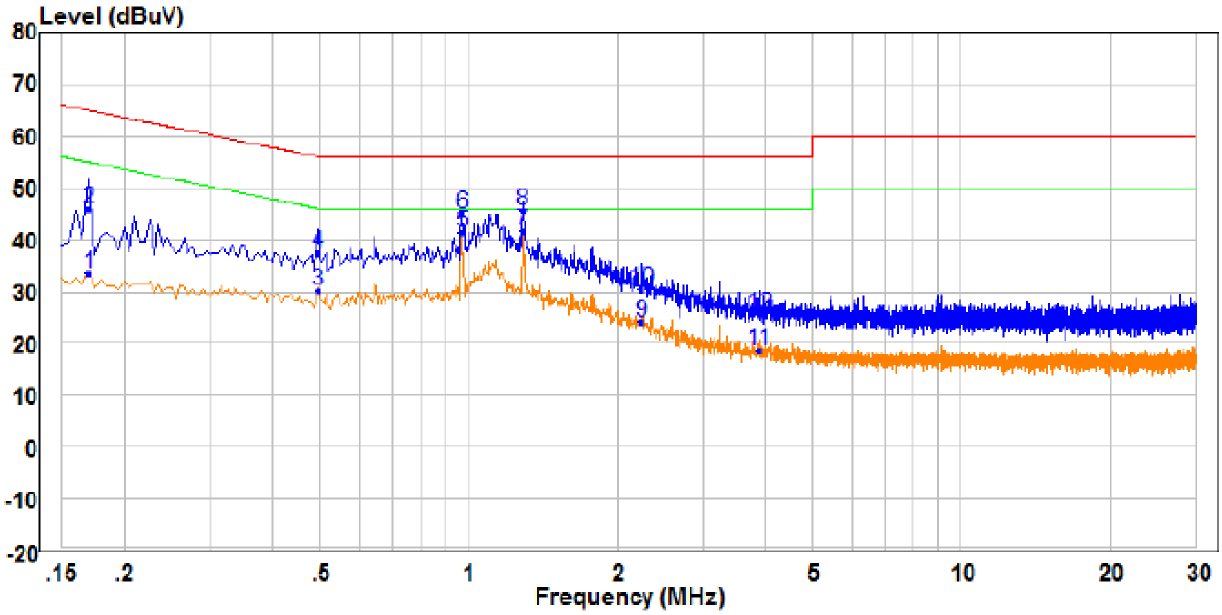


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.170	26.00	9.49	35.49	54.96	-19.47	Average	Line
2	0.170	39.68	9.49	49.17	64.96	-15.79	QP	Line
3	0.650	32.02	9.79	41.81	46.00	-4.19	Average	Line
4 QP	0.650	36.25	9.79	46.04	56.00	-9.96	QP	Line
5	0.975	30.64	9.56	40.20	46.00	-5.80	Average	Line
6	0.975	33.64	9.56	43.20	56.00	-12.80	QP	Line
7	1.125	25.69	9.53	35.22	46.00	-10.78	Average	Line
8	1.125	32.19	9.53	41.72	56.00	-14.28	QP	Line
9 PP	1.295	33.24	9.52	42.76	46.00	-3.24	Average	Line
10	1.295	35.97	9.52	45.49	56.00	-10.51	QP	Line
11	1.940	23.16	9.53	32.69	46.00	-13.31	Average	Line
12	1.940	30.31	9.53	39.84	56.00	-16.16	QP	Line

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:



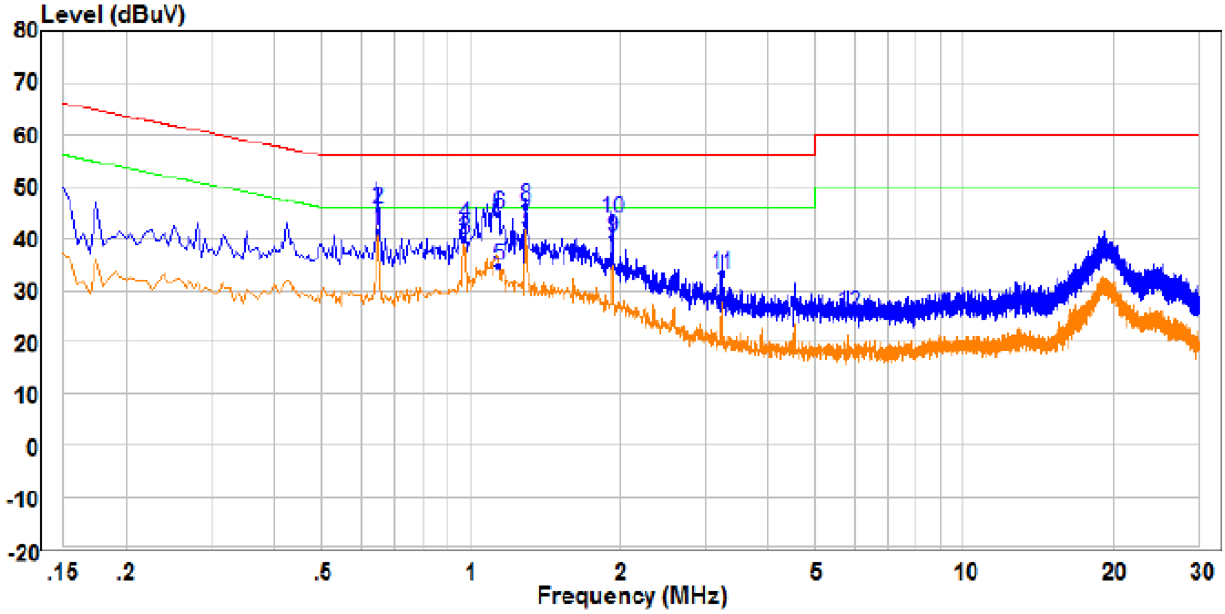
		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.170	24.15	9.48	33.63	54.96	-21.33	Average	Neutral
2		0.170	36.51	9.48	45.99	64.96	-18.97	QP	Neutral
3		0.495	20.54	9.59	30.13	46.08	-15.95	Average	Neutral
4		0.495	27.87	9.59	37.46	56.08	-18.62	QP	Neutral
5		0.970	31.65	9.73	41.38	46.00	-4.62	Average	Neutral
6		0.970	35.31	9.73	45.04	56.00	-10.96	QP	Neutral
7	PP	1.290	31.97	9.71	41.68	46.00	-4.32	Average	Neutral
8	QP	1.290	36.06	9.71	45.77	56.00	-10.23	QP	Neutral
9		2.245	14.37	9.72	24.09	46.00	-21.91	Average	Neutral
10		2.245	20.63	9.72	30.35	56.00	-25.65	QP	Neutral
11		3.880	8.71	9.77	18.48	46.00	-27.52	Average	Neutral
12		3.880	15.70	9.77	25.47	56.00	-30.53	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Model No.: AW-WS200

Live line:

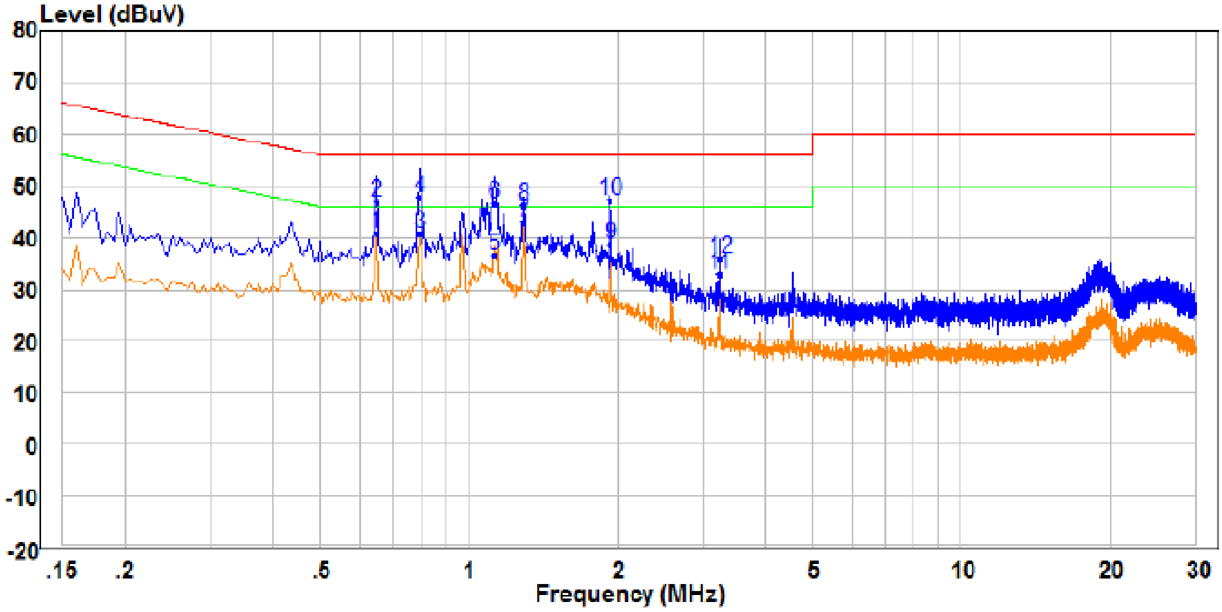


		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.650	31.56	9.79	41.35	46.00	-4.65	Average	Line
2		0.650	35.86	9.79	45.65	56.00	-10.35	QP	Line
3		0.970	30.19	9.56	39.75	46.00	-6.25	Average	Line
4		0.970	33.19	9.56	42.75	56.00	-13.25	QP	Line
5		1.140	25.22	9.53	34.75	46.00	-11.25	Average	Line
6		1.140	35.16	9.53	44.69	56.00	-11.31	QP	Line
7	PP	1.295	33.26	9.52	42.78	46.00	-3.22	Average	Line
8	QP	1.295	36.63	9.52	46.15	56.00	-9.85	QP	Line
9		1.940	30.61	9.53	40.14	46.00	-5.86	Average	Line
10		1.940	34.26	9.53	43.79	56.00	-12.21	QP	Line
11		3.235	23.70	9.62	33.32	46.00	-12.68	Average	Line
12		5.820	15.82	9.73	25.55	60.00	-34.45	QP	Line

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:



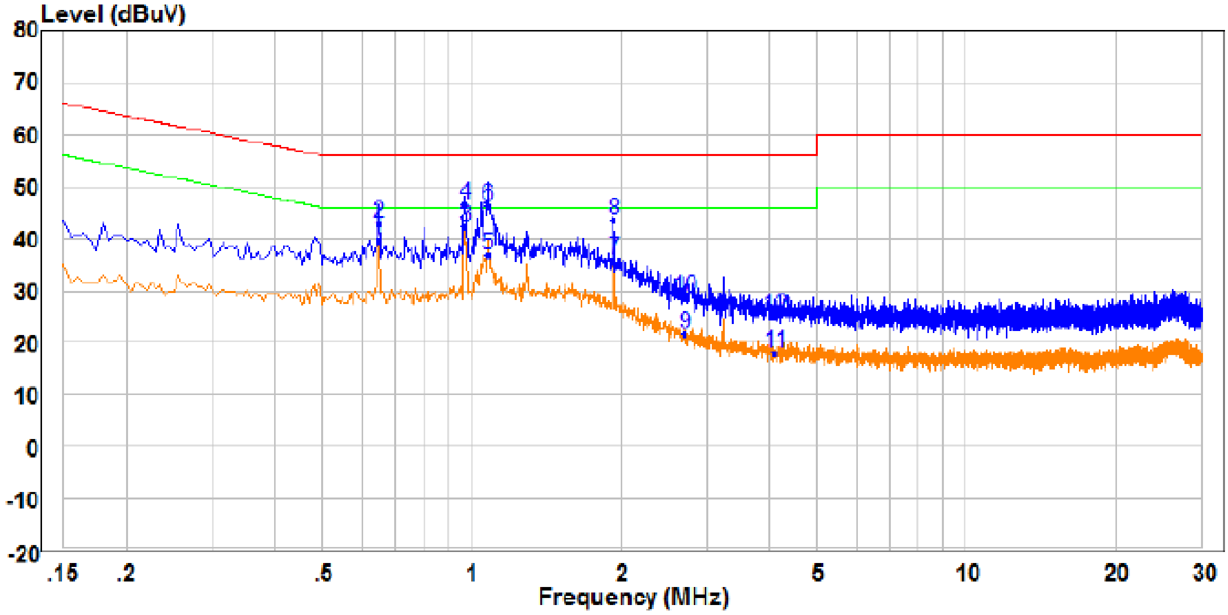
		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.650	30.91	9.77	40.68	46.00	-5.32	Average	Neutral
2		0.650	37.07	9.77	46.84	56.00	-9.16	QP	Neutral
3		0.795	30.90	9.80	40.70	46.00	-5.30	Average	Neutral
4	QP	0.795	37.85	9.80	47.65	56.00	-8.35	QP	Neutral
5		1.130	26.89	9.72	36.61	46.00	-9.39	Average	Neutral
6		1.130	36.90	9.72	46.62	56.00	-9.38	QP	Neutral
7	PP	1.295	33.34	9.71	43.05	46.00	-2.95	Average	Neutral
8		1.295	36.66	9.71	46.37	56.00	-9.63	QP	Neutral
9		1.940	28.97	9.72	38.69	46.00	-7.31	Average	Neutral
10		1.940	37.33	9.72	47.05	56.00	-8.95	QP	Neutral
11		3.235	23.06	9.75	32.81	46.00	-13.19	Average	Neutral
12		3.235	26.25	9.75	36.00	56.00	-20.00	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Model No.: AW-WS300

Live line:

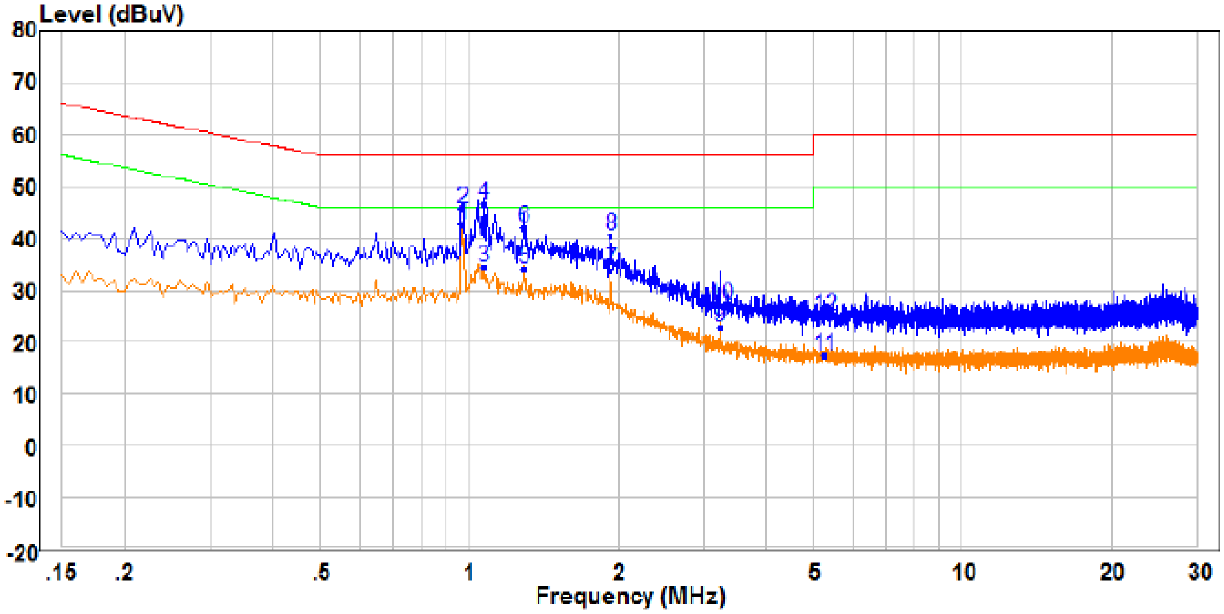


		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.650	29.65	9.79	39.44	46.00	-6.56	Average	Line
2		0.650	33.22	9.79	43.01	56.00	-12.99	QP	Line
3	PP	0.970	32.66	9.56	42.22	46.00	-3.78	Average	Line
4	QP	0.970	36.91	9.56	46.47	56.00	-9.53	QP	Line
5		1.080	27.39	9.52	36.91	46.00	-9.09	Average	Line
6		1.080	36.76	9.52	46.28	56.00	-9.72	QP	Line
7		1.940	26.54	9.53	36.07	46.00	-9.93	Average	Line
8		1.940	33.86	9.53	43.39	56.00	-12.61	QP	Line
9		2.695	12.06	9.58	21.64	46.00	-24.36	Average	Line
10		2.695	19.04	9.58	28.62	56.00	-27.38	QP	Line
11		4.110	8.41	9.69	18.10	46.00	-27.90	Average	Line
12		4.110	15.19	9.69	24.88	56.00	-31.12	QP	Line

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:

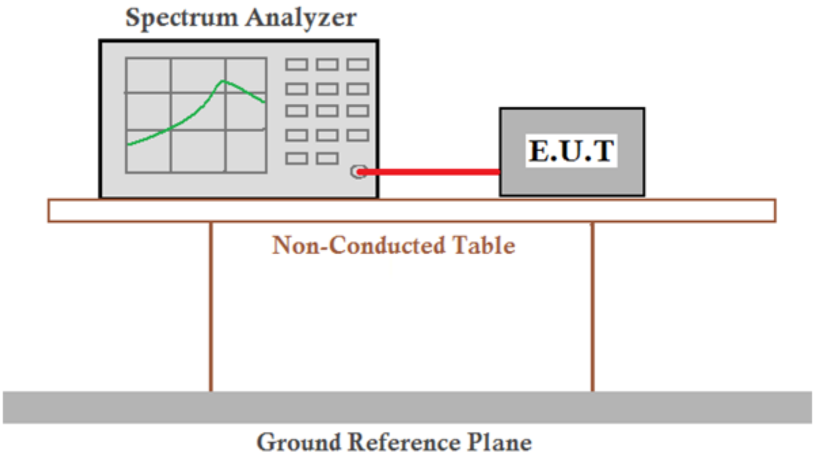


			Read			Limit	Over		
		Freq	Level	Factor	Level	Line	Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	PP	0.970	32.86	9.73	42.59	46.00	-3.41	Average	Neutral
2		0.970	36.08	9.73	45.81	56.00	-10.19	QP	Neutral
3		1.070	24.61	9.72	34.33	46.00	-11.67	Average	Neutral
4	QP	1.070	36.80	9.72	46.52	56.00	-9.48	QP	Neutral
5		1.295	24.41	9.71	34.12	46.00	-11.88	Average	Neutral
6		1.295	32.29	9.71	42.00	56.00	-14.00	QP	Neutral
7		1.940	24.08	9.72	33.80	46.00	-12.20	Average	Neutral
8		1.940	30.73	9.72	40.45	56.00	-15.55	QP	Neutral
9		3.230	13.19	9.75	22.94	46.00	-23.06	Average	Neutral
10		3.230	17.48	9.75	27.23	56.00	-28.77	QP	Neutral
11		5.250	7.58	9.82	17.40	50.00	-32.60	Average	Neutral
12		5.250	15.33	9.82	25.15	60.00	-34.85	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

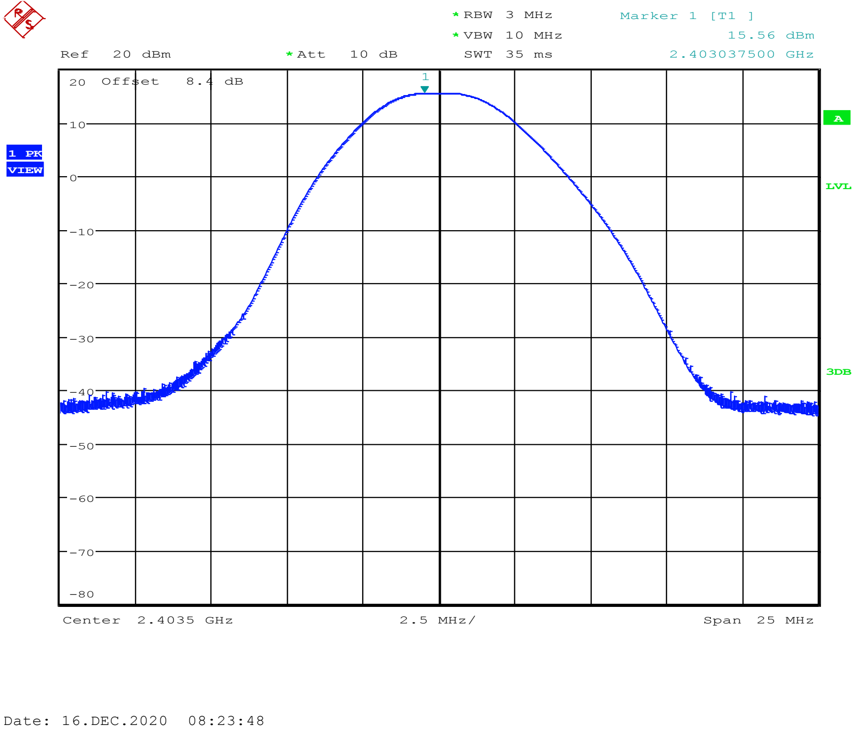
5.3 Conducted Peak Output Power

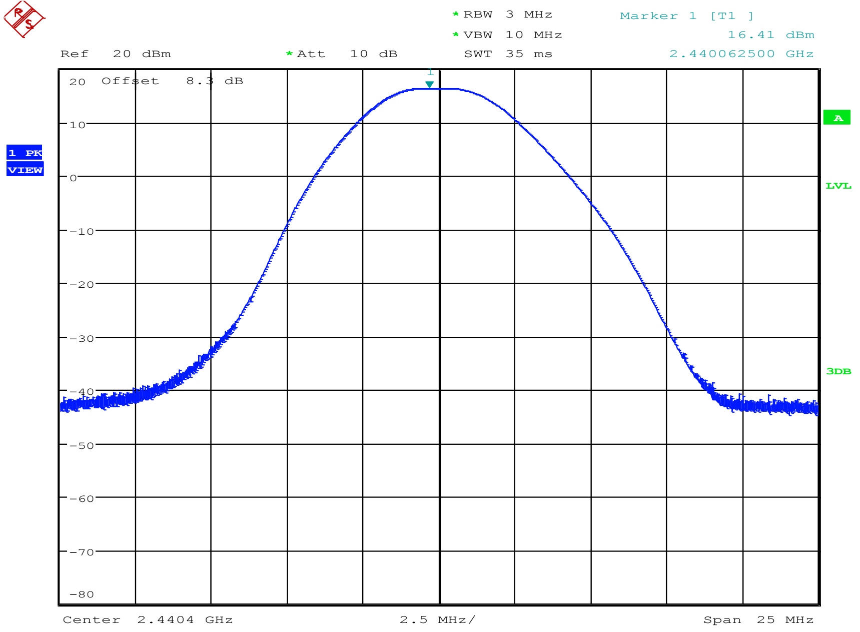
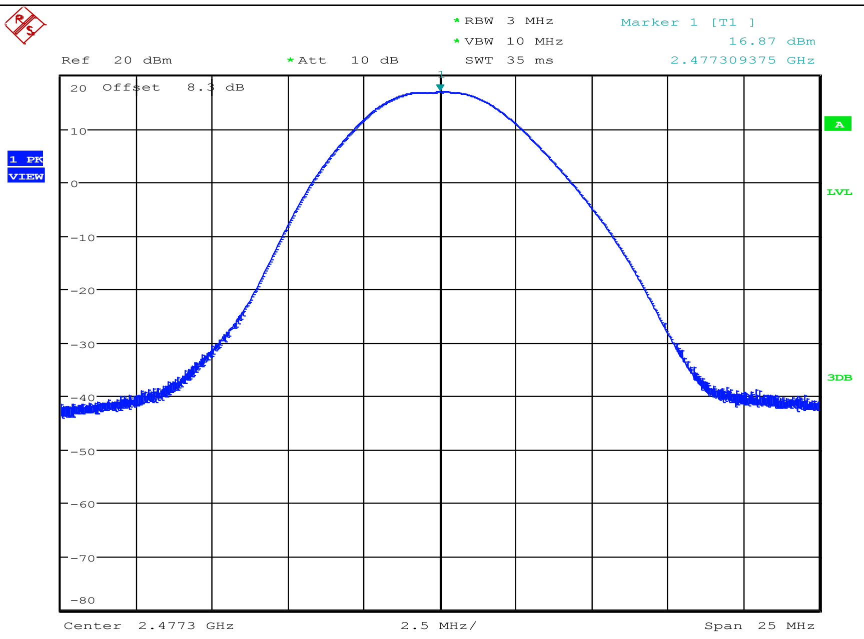
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	21dBm
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Non-hopping transmitting mode with FSK modulation at the lowest, middle, highest channel.
Test Results:	Pass

Measurement Data

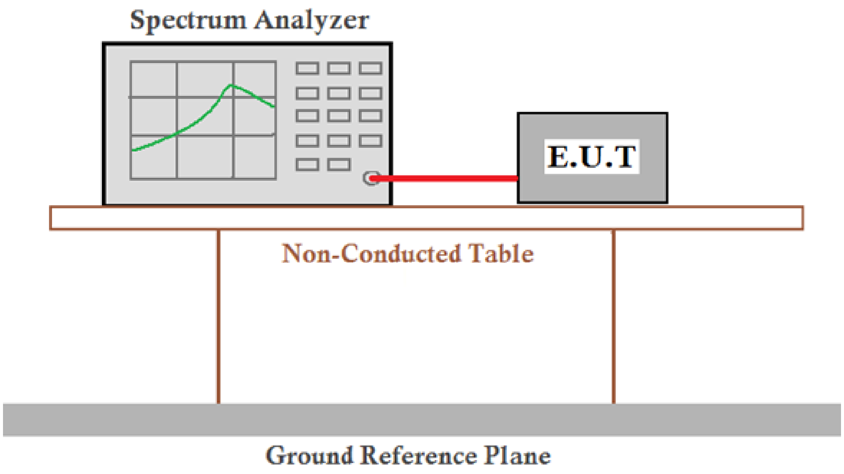
Test Model No.: AW-WS300			
FSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	15.560	21.00	Pass
Middle	16.410	21.00	Pass
Highest	16.870	21.00	Pass

Test plot as follows:

Graphs	
FSK/LCH	 *RBW 3 MHz *VBW 10 MHz Ref 20 dBm *Att 10 dB SWT 35 ms Marker 1 [T1] 15.56 dBm 2.403037500 GHz Offset 8.4 dB Center 2.4035 GHz 2.5 MHz/ Span 25 MHz Date: 16.DEC.2020 08:23:48

FSK/MCH	 *RBW 3 MHz *VBW 10 MHz Ref 20 dBm *Att 10 dB SWT 35 ms Marker 1 [T1] 16.41 dBm 2.440062500 GHz Offset 8.3 dB Center 2.4404 GHz 2.5 MHz/ Span 25 MHz Date: 16.DEC.2020 08:39:00
FSK/HCH	 *RBW 3 MHz *VBW 10 MHz Ref 20 dBm *Att 10 dB SWT 35 ms Marker 1 [T1] 16.87 dBm 2.477309375 GHz Offset 8.3 dB Center 2.4773 GHz 2.5 MHz/ Span 25 MHz Date: 16.DEC.2020 08:42:46

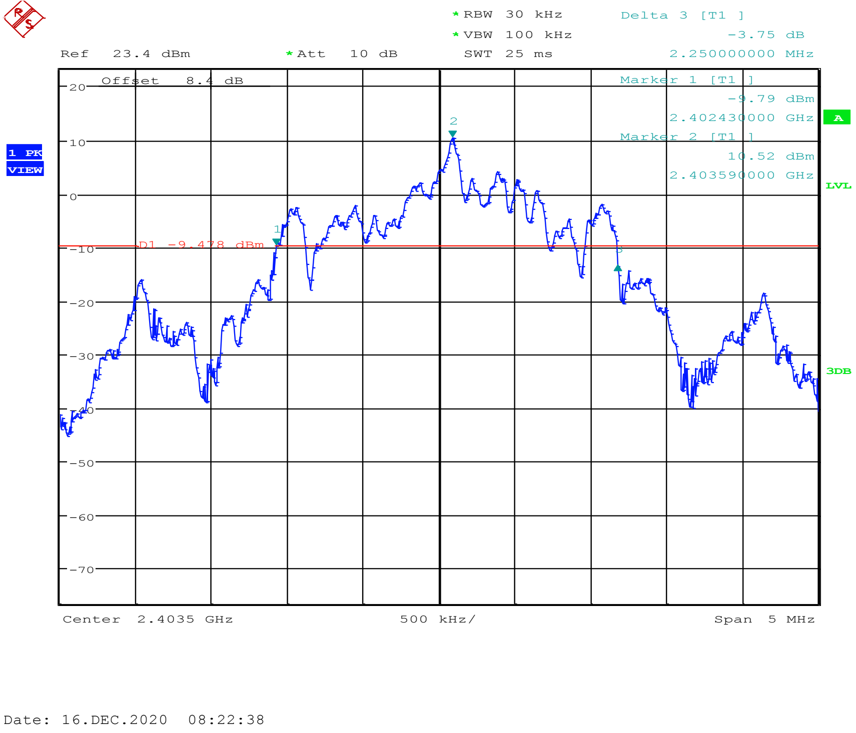
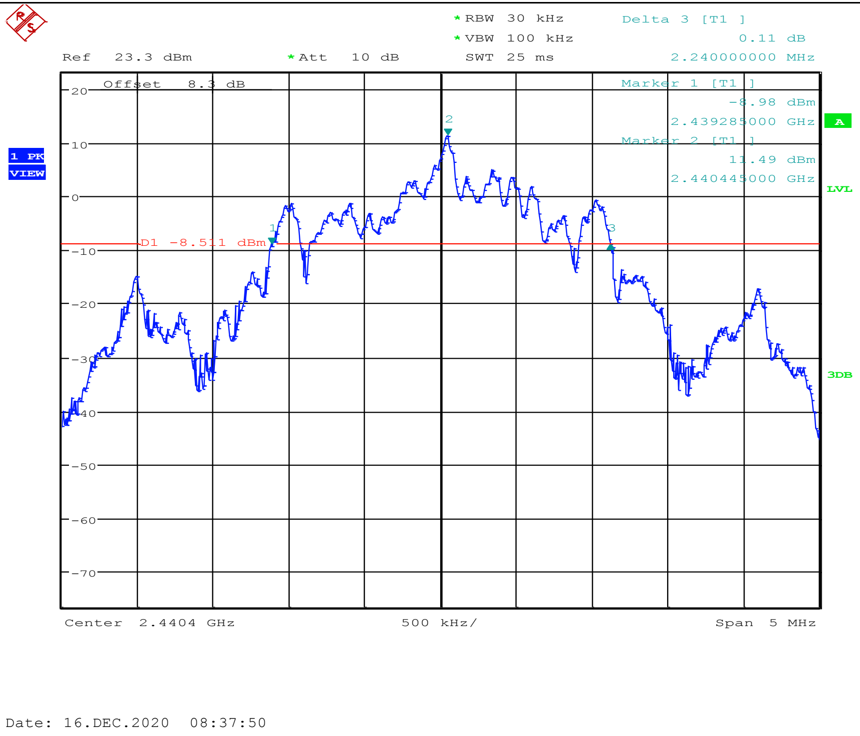
5.4 20dB Occupy Bandwidth

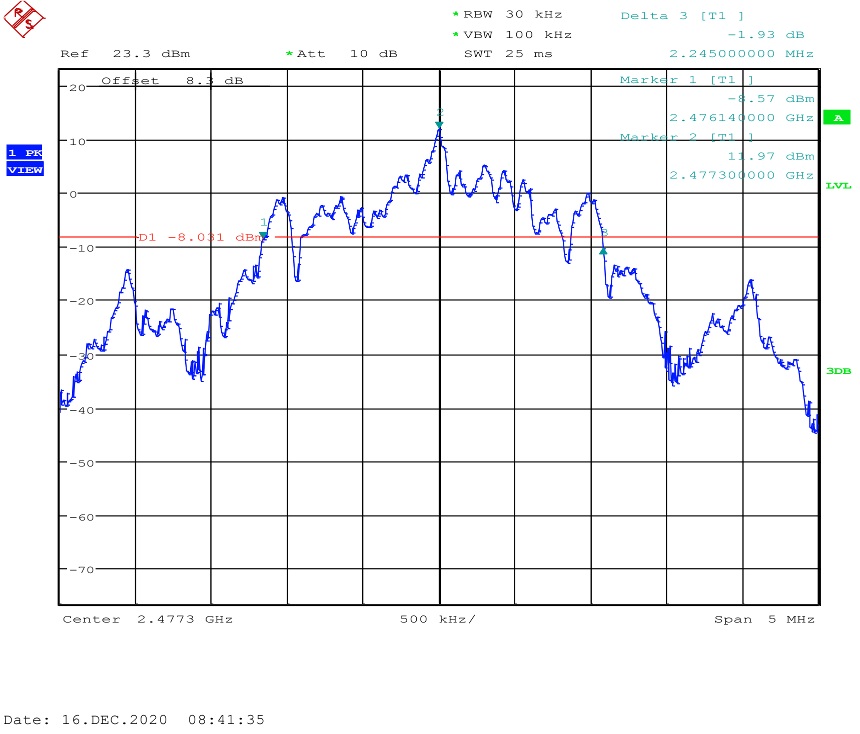
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Non-hopping transmitting mode with FSK modulation at the lowest, middle, highest channel.
Test Results:	Pass

Measurement Data

Test Model No.: AW-WS300	
Test channel	20dB Occupy Bandwidth (MHz)
	FSK
Lowest	2.250
Middle	2.240
Highest	2.245

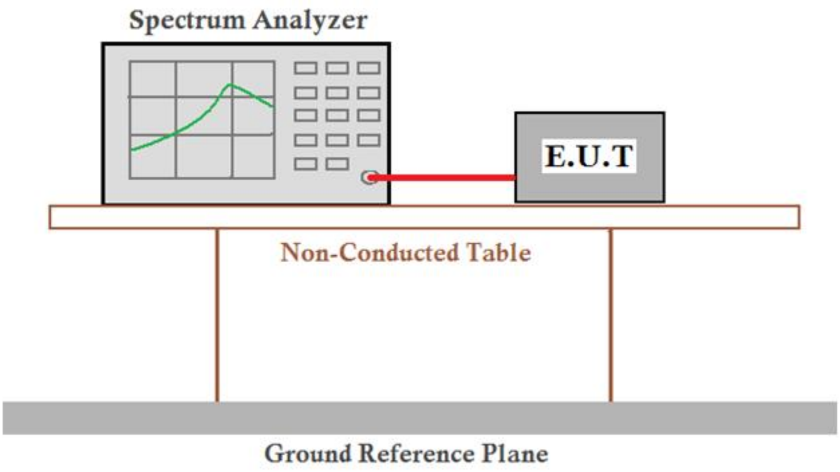
Test plot as follows:

<table>
<tr><th colspan="2">Graphs</th></tr>
<tr><td>FSK/LCH</td><td>
</td></tr>
<tr><td>FSK/MCH</td><td>
</td></tr>
</table>

FSK/HCH	

RBW 30 kHz
VBW 100 kHz
Ref 23.3 dBm
Att 10 dB
SWT 25 ms
Delta 3 [T1]
-1.93 dB
2.245000000 MHz
Offset 8.3 dB
Marker 1 [T1]
-8.57 dBm
2.476140000 GHz
Marker 2 [T1]
11.97 dBm
2.477300000 GHz
1 PK
VIEW
A
LVL
3DB
D1 -8.031 dBm
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.4773 GHz
500 kHz/
Span 5 MHz
Date: 16.DEC.2020 08:41:35

5.5 Carrier Frequencies Separation

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Limit:	2/3 of the 20dB bandwidth
	Remark: the transmission power is less than 0.125W.
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Hopping transmitting mode with FSK modulation at the lowest, middle, highest channel.
Test Results:	Pass

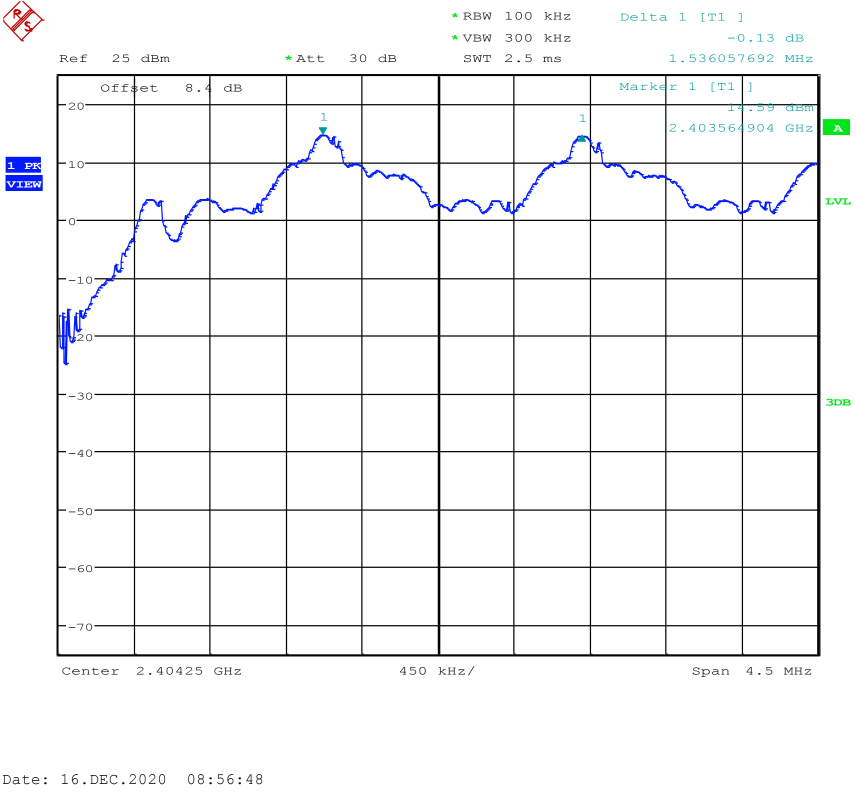
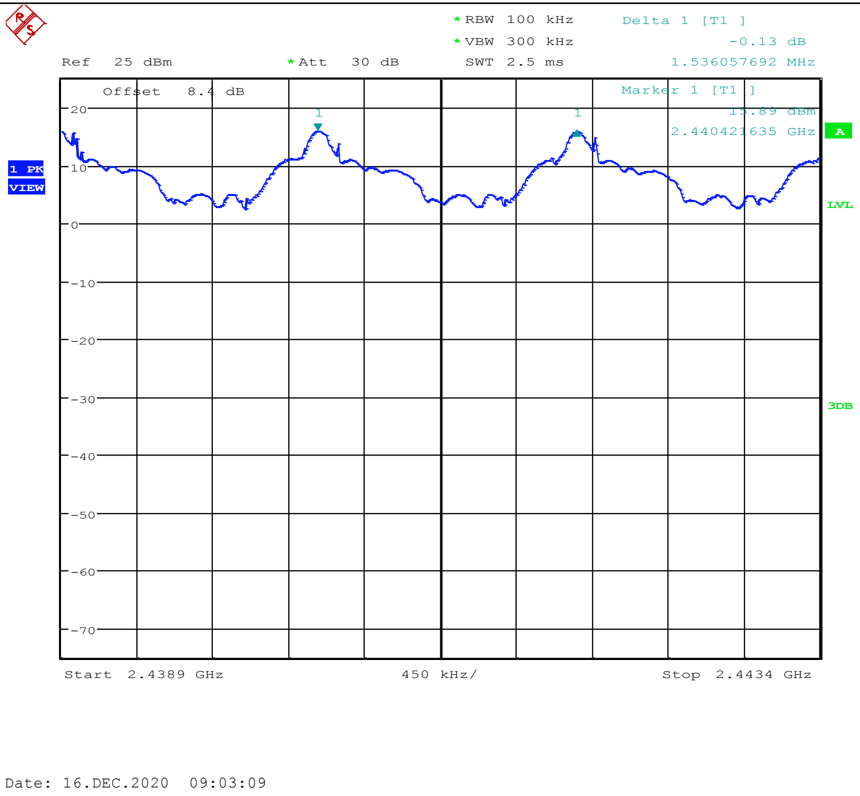
Measurement Data

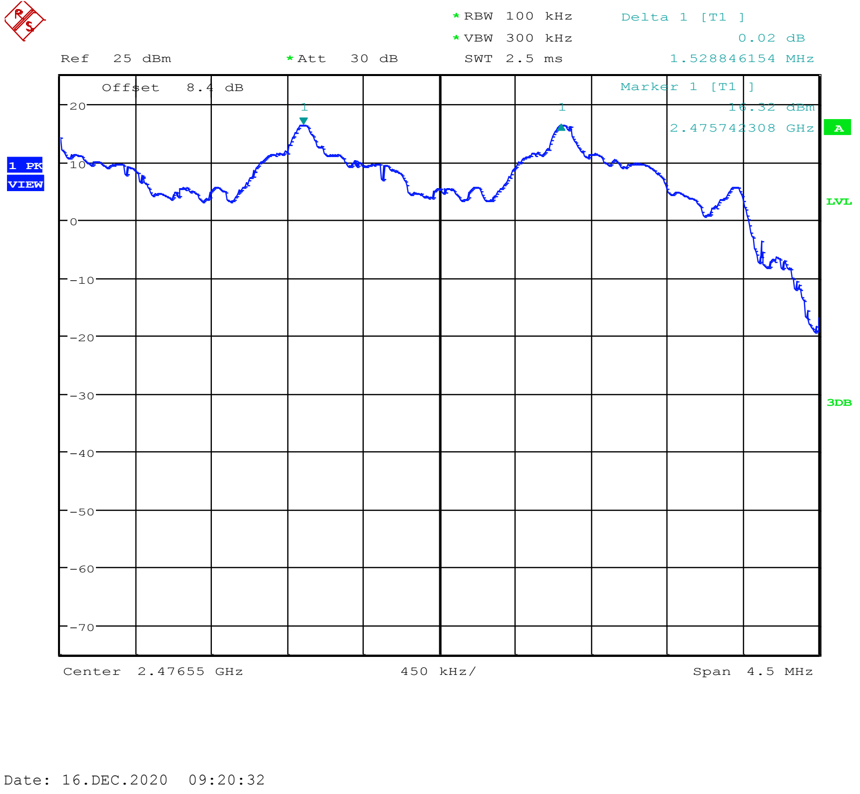
Test Model No.: AW-WS300			
FSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	1.536	≥1.500	Pass
Middle	1.536	≥1.500	Pass
Highest	1.529	≥1.500	Pass

Note: According to section 5.4,

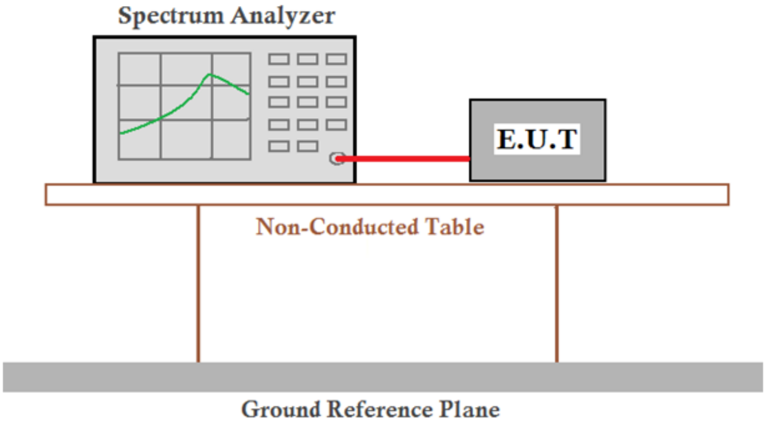
Mode	20dB bandwidth (MHz) (worse case)	Limit (MHz) (Carrier Frequencies Separation)
FSK	2.250	1.500

Test plot as follows:

Graphs	
FSK/LCH	 *RBW 100 kHz *VBW 300 kHz Ref 25 dBm *Att 30 dB SWT 2.5 ms Offset 8.4 dB Delta 1 [T1] -0.13 dB 1.536057692 MHz Marker 1 [T1] 14.59 dBm 2.403564904 GHz Center 2.40425 GHz 450 kHz/ Span 4.5 MHz Date: 16.DEC.2020 08:56:48
FSK/MCH	 *RBW 100 kHz *VBW 300 kHz Ref 25 dBm *Att 30 dB SWT 2.5 ms Offset 8.4 dB Delta 1 [T1] -0.13 dB 1.536057692 MHz Marker 1 [T1] 15.89 dBm 2.440421635 GHz Start 2.4389 GHz 450 kHz/ Stop 2.4434 GHz Date: 16.DEC.2020 09:03:09

FSK/HCH	 *RBW 100 kHz *VBW 300 kHz Ref 25 dBm *Att 30 dB SWT 2.5 ms Delta 1 [T1] 0.02 dB 1.528846154 MHz Offset 8.4 dB Marker 1 [T1] 16.32 dBm 2.475742308 GHz Center 2.47655 GHz 450 kHz/ Span 4.5 MHz Date: 16.DEC.2020 09:20:32

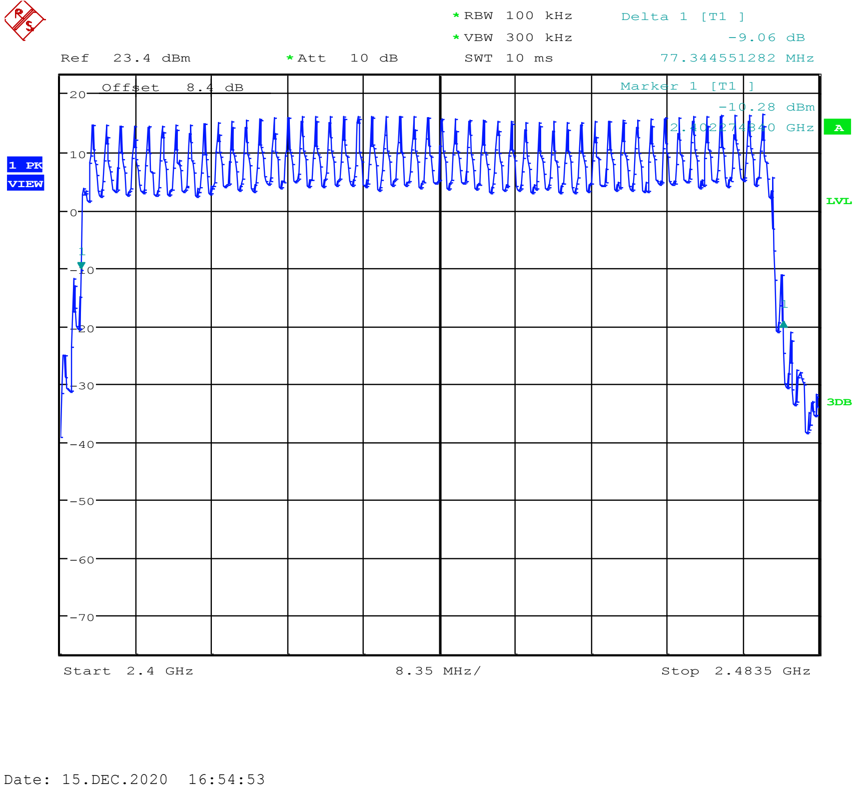
5.6 Hopping Channel Number

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	At least 15 channels
Exploratory Test Mode:	hopping transmitting with all kind of modulation and all kind of data type.
Test Results:	Pass

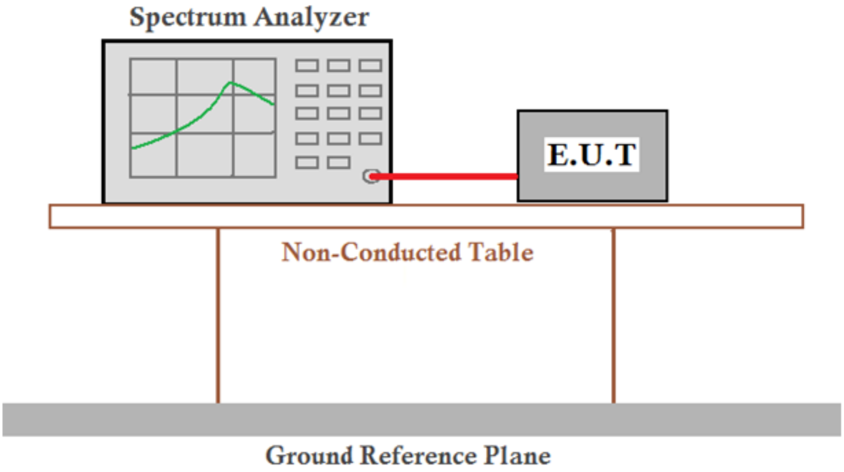
Measurement Data

Test Model No.: AW-WS300		
Mode	Hopping channel numbers	Limit
FSK	49	≥15

Test plot as follows:

Graphs	
FSK/Hop	

5.7 Dwell Time

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

Measurement Data

Test Model No.: AW-WS300			
Mode	channel	Dwell time (second)	Limit (second)
FSK	Lowest	0.30924	0.4
	Middle	0.30924	0.4
	Highest	0.311544	0.4

Remark:

The test period: T= 0.4 Second/Channel x 49 Channel = 19.6s

On (ms)*total number=dwell time (ms)

The lowest channel, as below:

dwell time (ms)=4.295 (ms)*72 =309.24 (ms)

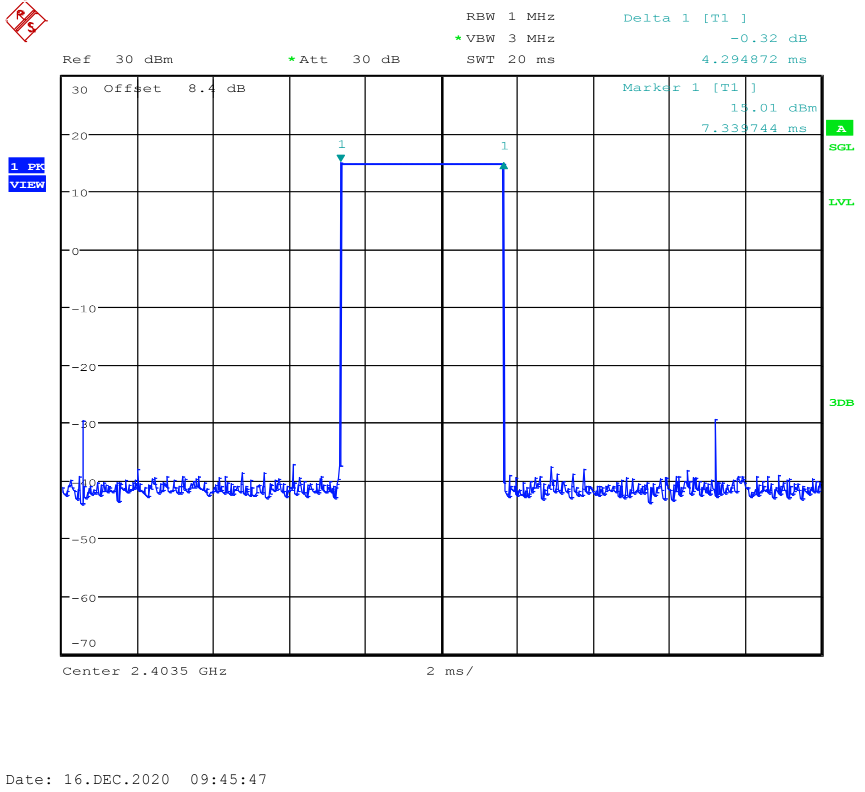
The middle channel, as below:

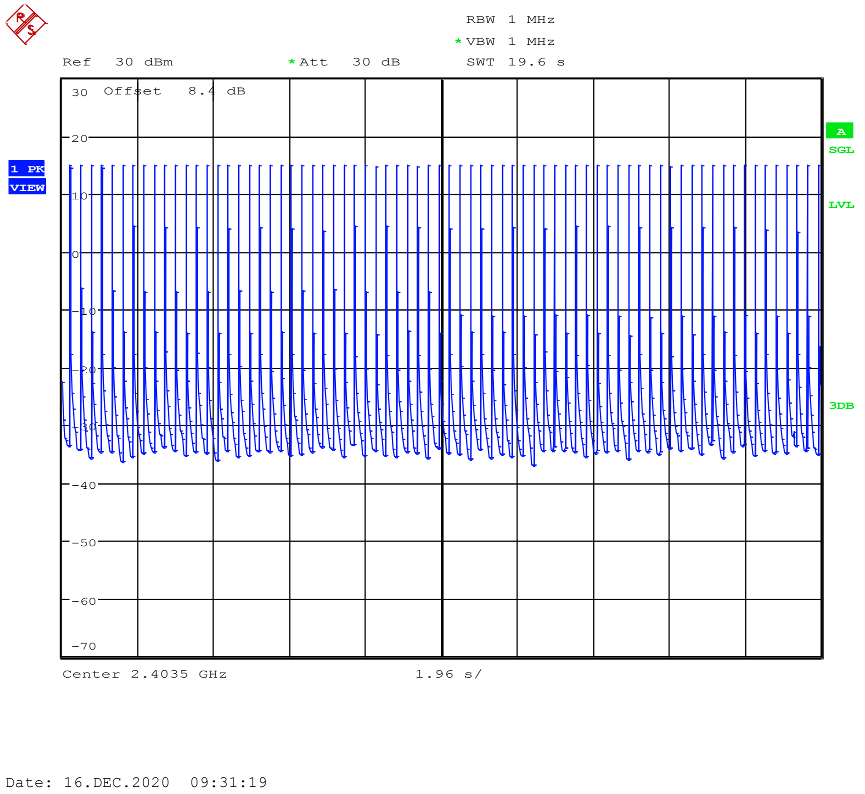
dwell time (ms)=4.295 (ms)*72=309.24 (ms)

The highest channel, as below:

dwell time (ms)=4.327 (ms)*72=311.544 (ms)

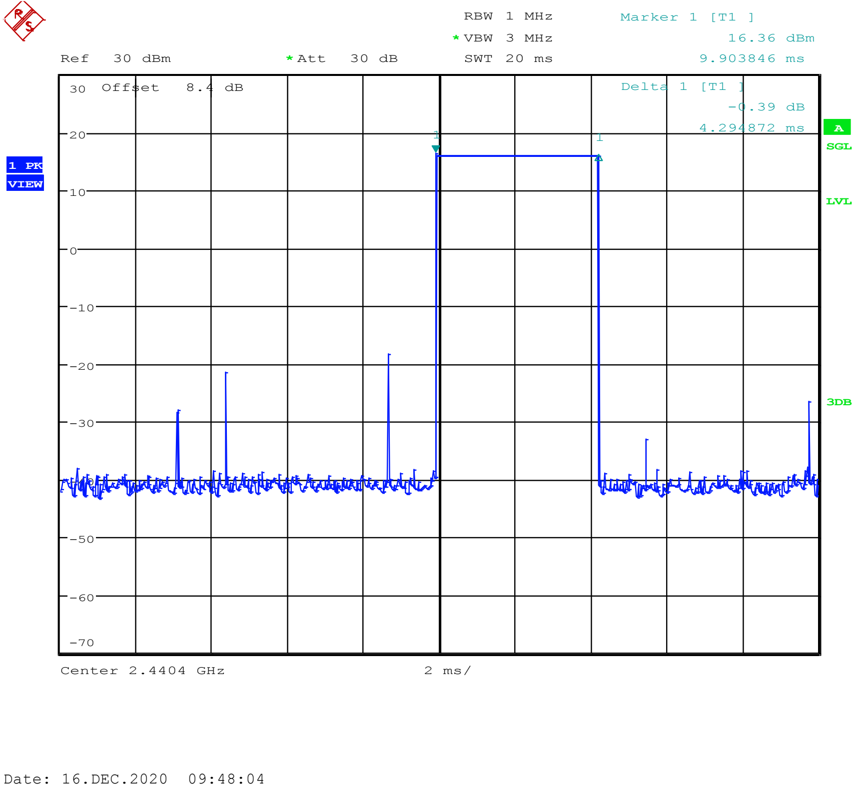
Test plot as follows:

<table>
<tr><th colspan="2">Graphs</th></tr>
<tr><td>FSK/LCH</td><td>




</td></tr>
</table>

FSK/MCH



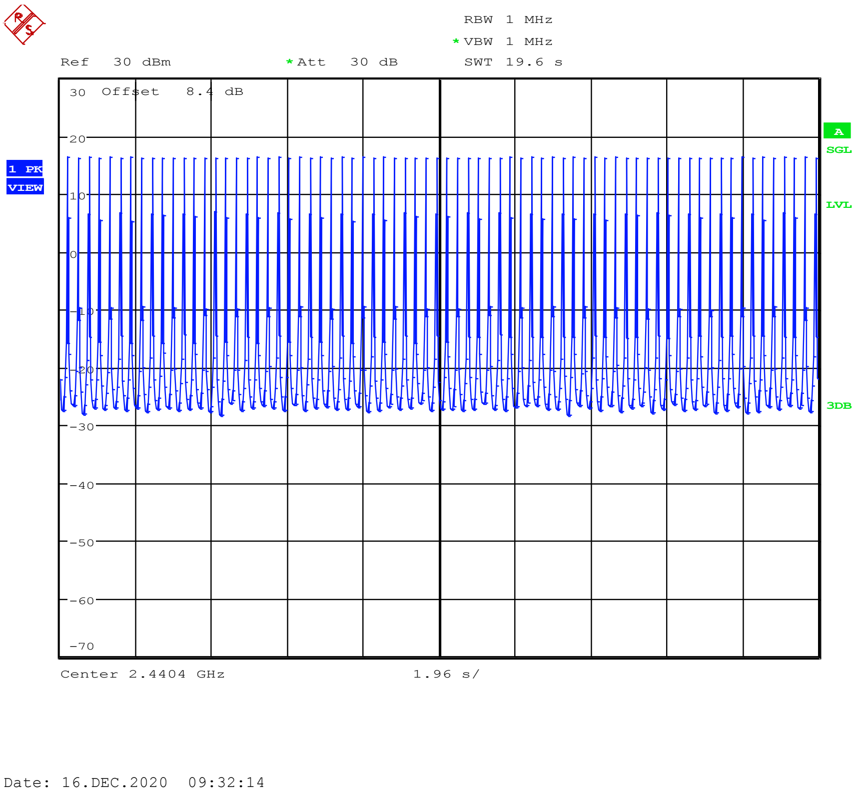
RBW 1 MHz
*VBW 3 MHz
SWT 20 ms
Ref 30 dBm
*Att 30 dB
Offset 8.4 dB

Marker 1 [T1]
16.36 dBm
9.903846 ms

Delta 1 [T1]
-0.39 dB
4.294872 ms

Center 2.4404 GHz
2 ms/

Date: 16.DEC.2020 09:48:04

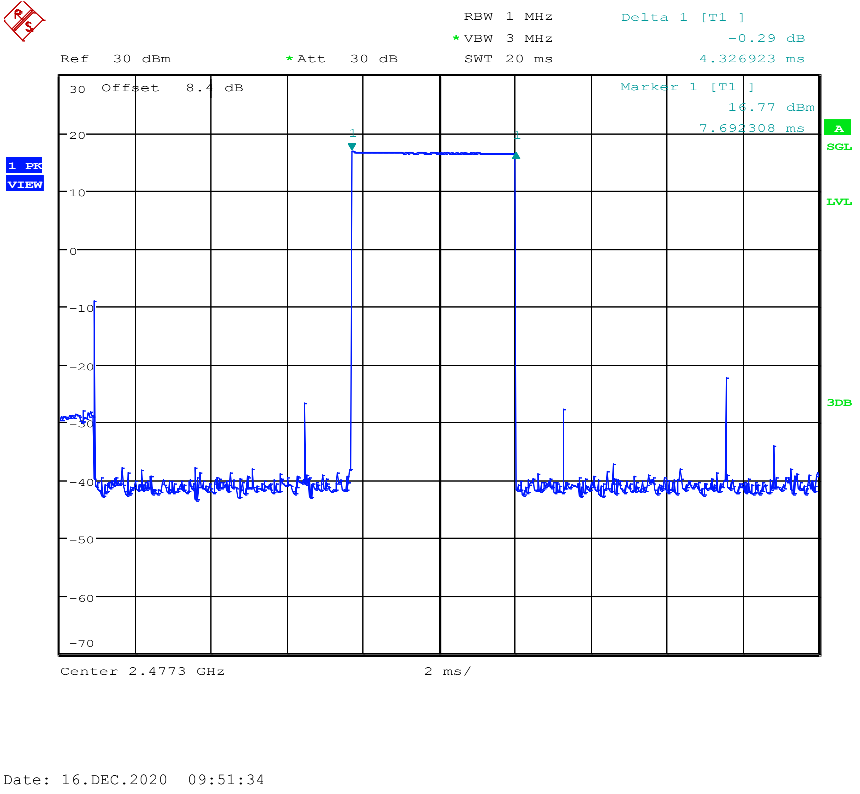


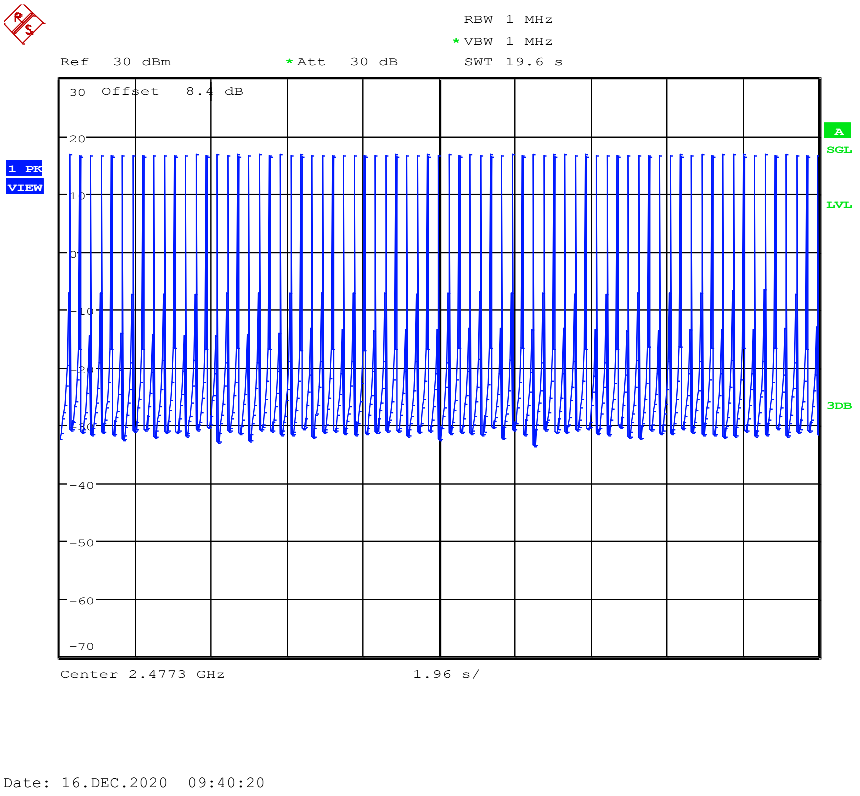
RBW 1 MHz
*VBW 1 MHz
SWT 19.6 s
Ref 30 dBm
*Att 30 dB
Offset 8.4 dB

Center 2.4404 GHz
1.96 s/

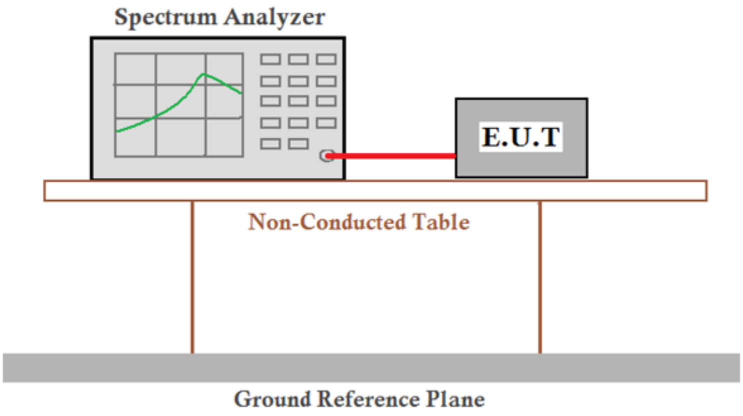
Date: 16.DEC.2020 09:32:14

FSK/HCH


RBW 1 MHz
Delta 1 [T1]
VBW 3 MHz
-0.29 dB
Ref 30 dBm
Att 30 dB
SWT 20 ms
4.326923 ms
30 Offset 8.4 dB
Marker 1 [T1]
16.77 dBm
7.692308 ms
1 PK VIEW
A
SGL
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.4773 GHz
2 ms/
Date: 16.DEC.2020 09:51:34

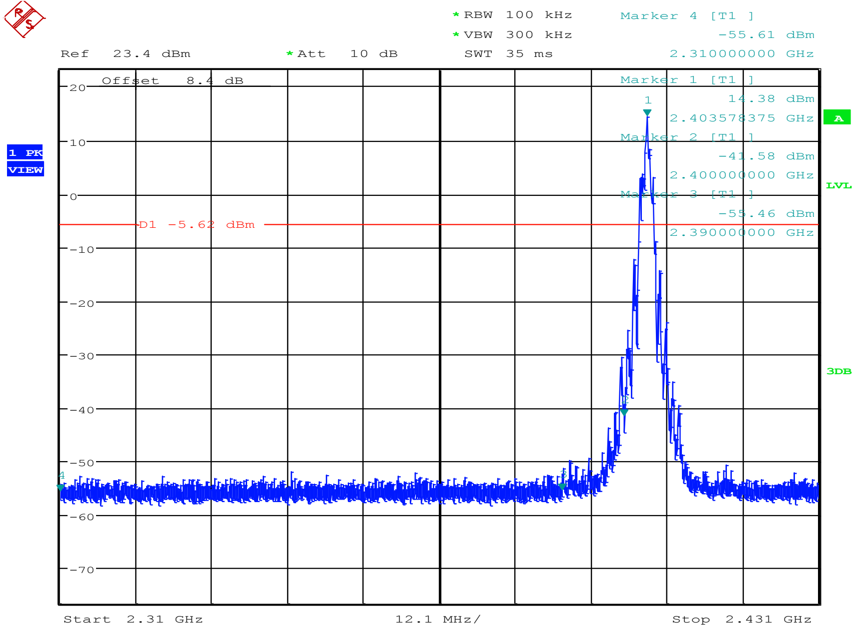
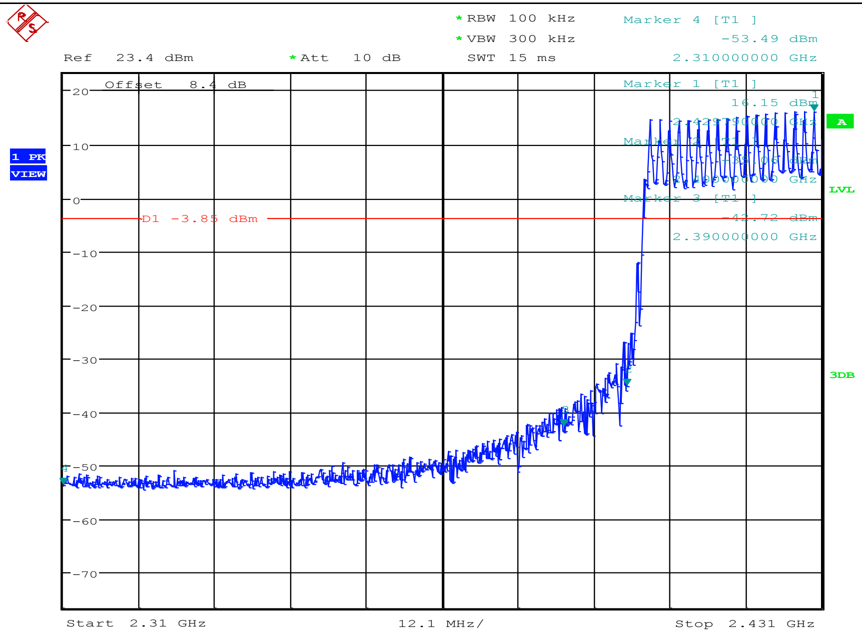

RBW 1 MHz
VBW 1 MHz
Ref 30 dBm
Att 30 dB
SWT 19.6 s
30 Offset 8.4 dB
1 PK VIEW
A
SGL
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.4773 GHz
1.96 s/
Date: 16.DEC.2020 09:40:20

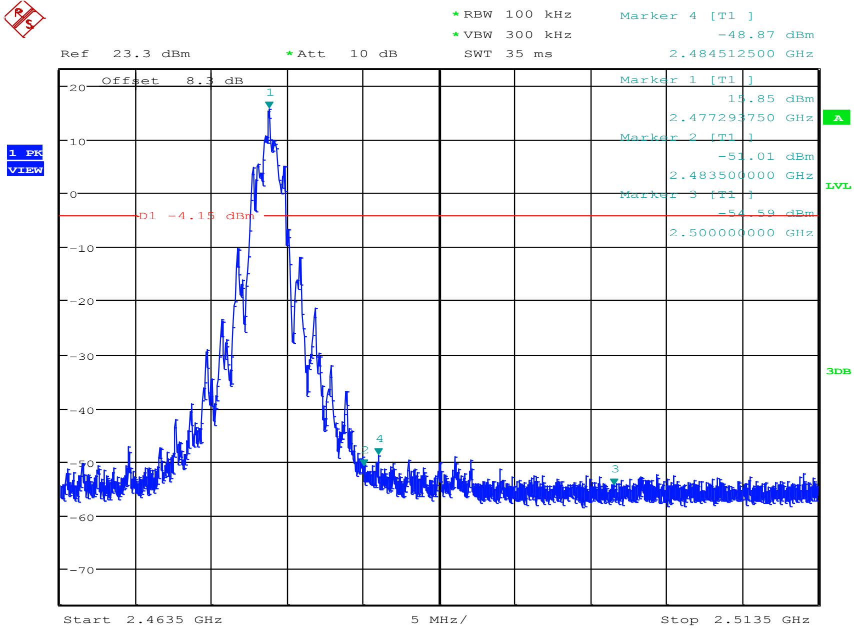
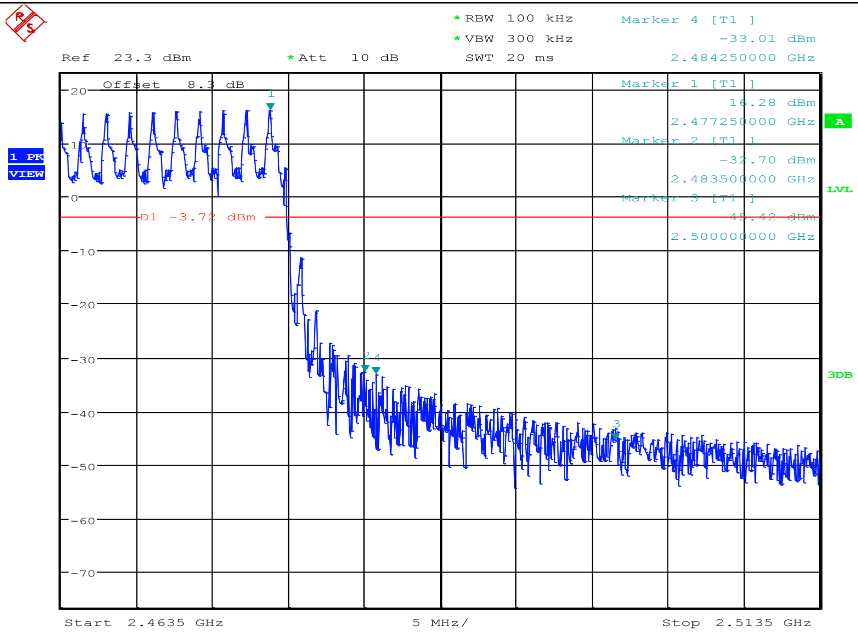
5.8 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Test Setup:	 *Remark: Offset=cable loss+ attenuation factor.*
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Exploratory Test Mode:	Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type.
Test Results:	Pass

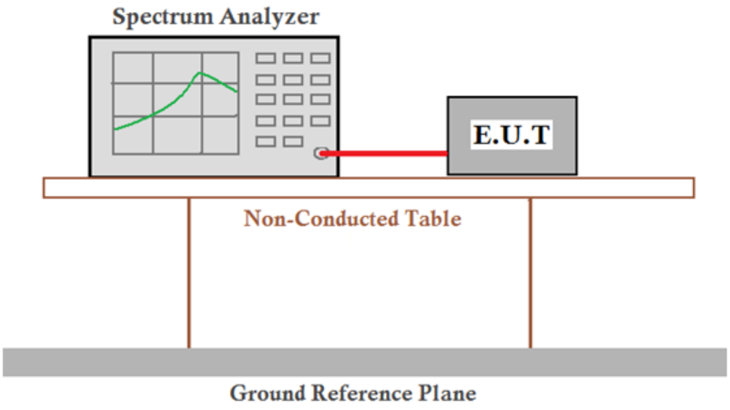
Test Model No.: AW-WS300						
Mode	**Test Channel**	**Frequency [MHz]**	**Frequency Hopping**	**Emission Level [dBm]**	**Limit [dBm]**	**Result**
FSK	LCH	2400	Off	-41.580	-5.62	PASS
			On	-35.060	-3.85	PASS
FSK	HCH	2483.5	Off	-51.010	-4.15	PASS
			On	-32.700	-3.72	PASS

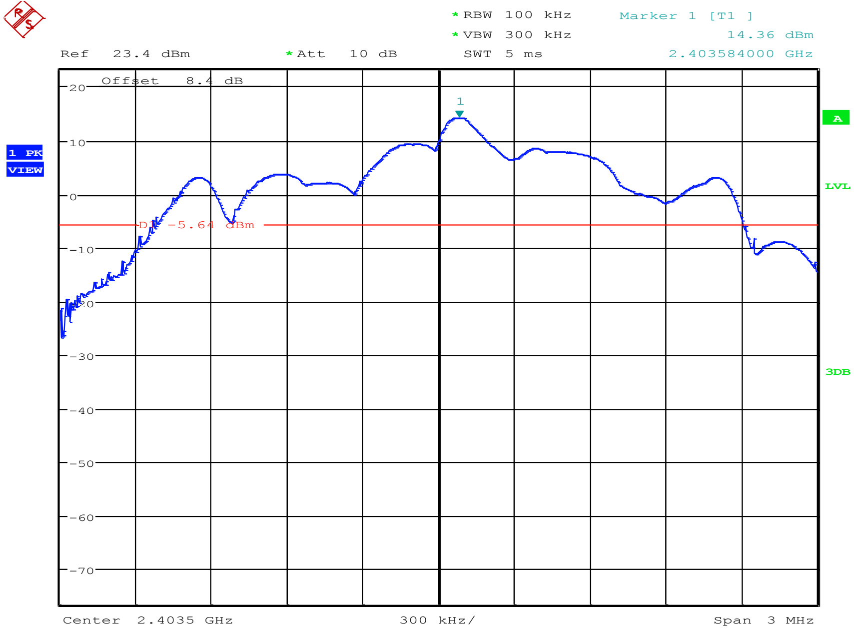
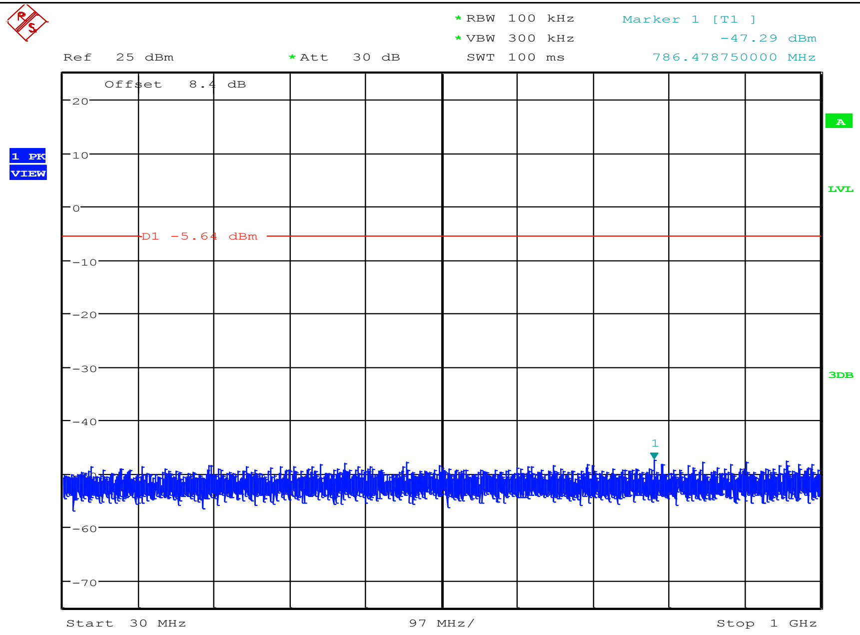
Test plot as follows:

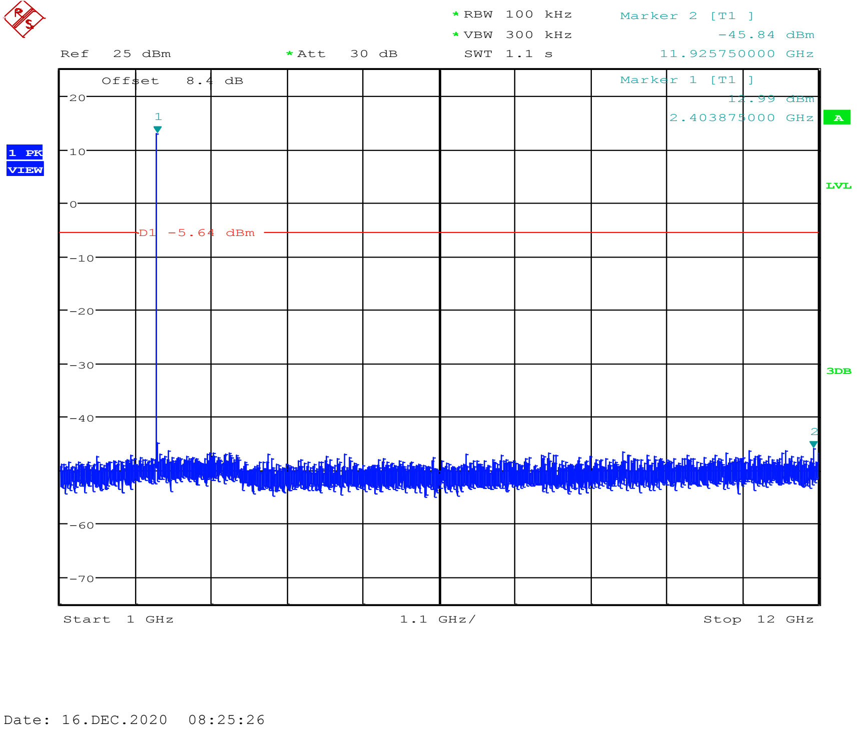
<table>
<tr><th colspan="2">Graphs</th></tr>
<tr><td>FSK/LCH/No Hop</td><td>
RBW 100 kHz
VBW 300 kHz
Ref 23.4 dBm
Att 10 dB
SWT 35 ms
Offset 8.4 dB
Marker 4 [T1] -55.61 dBm 2.310000000 GHz
Marker 1 [T1] 14.38 dBm 2.403578375 GHz
Marker 2 [T1] -41.58 dBm 2.400000000 GHz
Marker 3 [T1] -55.46 dBm 2.390000000 GHz
D1 -5.62 dBm
Start 2.31 GHz
12.1 MHz/
Stop 2.431 GHz
Date: 16.DEC.2020 08:24:28</td></tr>
<tr><td>FSK/LCH/Hop</td><td>
RBW 100 kHz
VBW 300 kHz
Ref 23.4 dBm
Att 10 dB
SWT 15 ms
Offset 8.4 dB
Marker 4 [T1] -53.49 dBm 2.310000000 GHz
Marker 1 [T1] 16.15 dBm 2.429790000 GHz
Marker 2 [T1] -35.06 dBm 2.400000000 GHz
Marker 3 [T1] -42.72 dBm 2.390000000 GHz
D1 -3.85 dBm
Start 2.31 GHz
12.1 MHz/
Stop 2.431 GHz
Date: 15.DEC.2020 16:57:45</td></tr>
</table>

FSK/HCH/No Hop	 *RBW 100 kHz *VBW 300 kHz Ref 23.3 dBm *Att 10 dB SWT 35 ms Offset 8.3 dB Marker 4 [T1] -48.87 dBm 2.484512500 GHz Marker 1 [T1] 15.85 dBm 2.477293750 GHz Marker 2 [T1] -51.01 dBm 2.483500000 GHz Marker 3 [T1] -54.59 dBm 2.500000000 GHz D1 -4.15 dBm Start 2.4635 GHz 5 MHz/ Stop 2.5135 GHz Date: 16.DEC.2020 08:43:21
FSK/HCH/Hop	 *RBW 100 kHz *VBW 300 kHz Ref 23.3 dBm *Att 10 dB SWT 20 ms Offset 8.3 dB Marker 4 [T1] -33.01 dBm 2.484250000 GHz Marker 1 [T1] 16.28 dBm 2.477250000 GHz Marker 2 [T1] -32.70 dBm 2.483500000 GHz Marker 3 [T1] -45.42 dBm 2.500000000 GHz D1 -3.72 dBm Start 2.4635 GHz 5 MHz/ Stop 2.5135 GHz Date: 15.DEC.2020 16:59:51

5.9 Spurious RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Test Setup:	 *Remark: Offset=cable loss+ attenuation factor.*
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type.
Test Results:	Pass

Test Model No.: AW-WS300	
FSK_LCH_Graphs	
Pref	 Date: 16.DEC.2020 08:25:03
Puw	 Date: 16.DEC.2020 08:25:15



Ref 25 dBm *Att 30 dB

*RBW 100 kHz

*VBW 300 kHz

SWT 1.1 s

Offset 8.4 dB

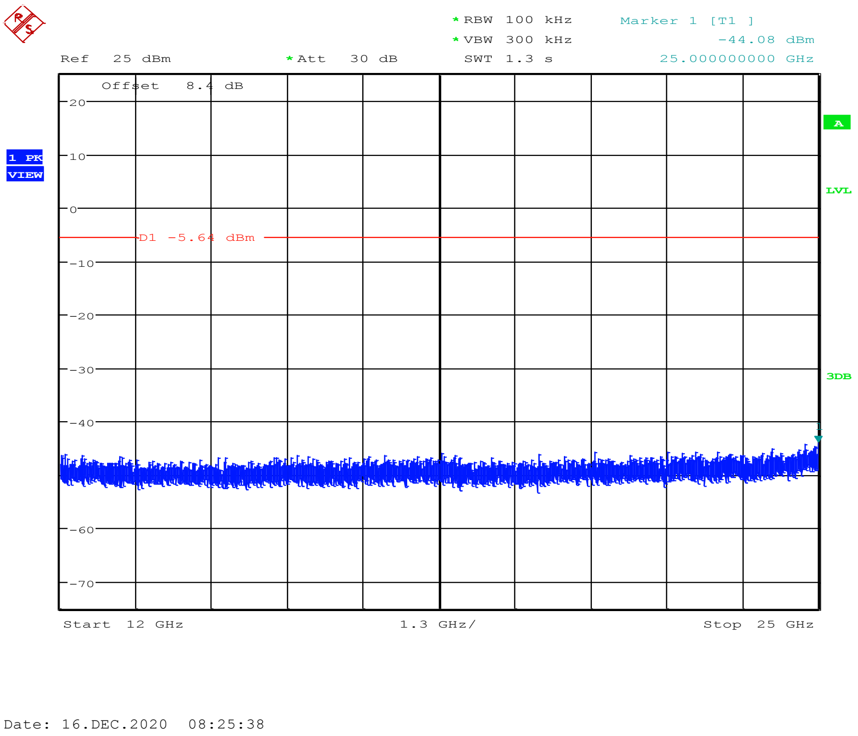
Marker 2 [T1]
-45.84 dBm
11.925750000 GHz

Marker 1 [T1]
12.99 dBm
2.403875000 GHz

D1 -5.64 dBm

Start 1 GHz 1.1 GHz/ Stop 12 GHz

Date: 16.DEC.2020 08:25:26



Ref 25 dBm *Att 30 dB

*RBW 100 kHz

*VBW 300 kHz

SWT 1.3 s

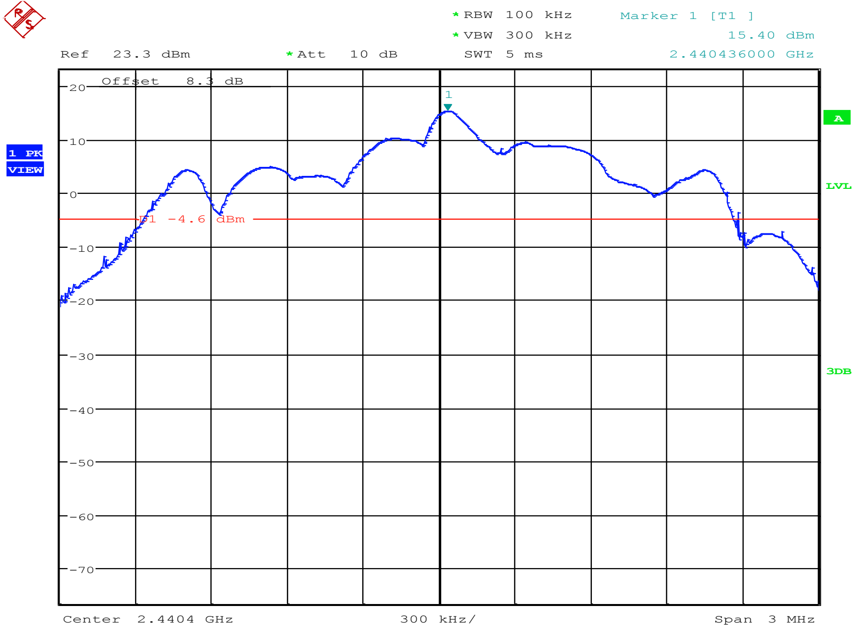
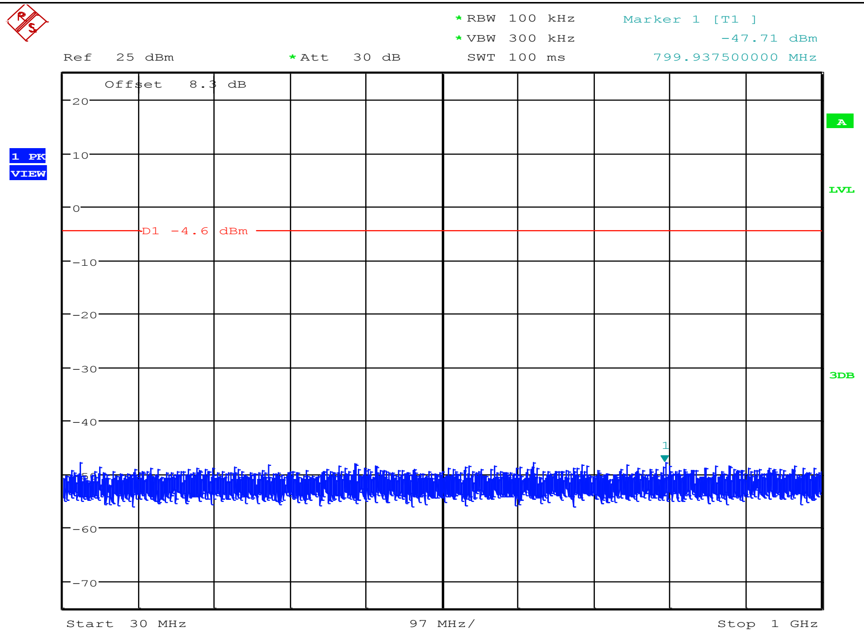
Offset 8.4 dB

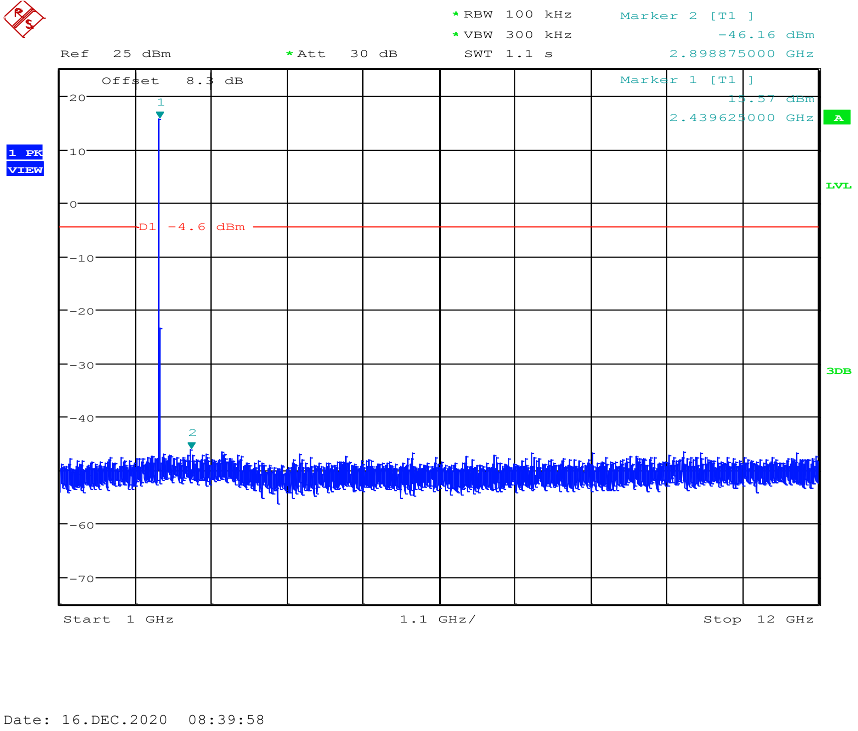
Marker 1 [T1]
-44.08 dBm
25.000000000 GHz

D1 -5.64 dBm

Start 12 GHz 1.3 GHz/ Stop 25 GHz

Date: 16.DEC.2020 08:25:38

FSK_MCH_Graphs	
Pref	 *RBW 100 kHz *VBW 300 kHz Marker 1 [T1] 15.40 dBm 2.440436000 GHz Ref 23.3 dBm *Att 10 dB SWT 5 ms Offset 8.3 dB D1 -4.6 dBm Center 2.4404 GHz 300 kHz/ Span 3 MHz Date: 16.DEC.2020 08:39:35
Puw	 *RBW 100 kHz *VBW 300 kHz Marker 1 [T1] -47.71 dBm 799.937500000 MHz Ref 25 dBm *Att 30 dB SWT 100 ms Offset 8.3 dB D1 -4.6 dBm Start 30 MHz 97 MHz/ Stop 1 GHz Date: 16.DEC.2020 08:39:47



RBW 100 kHz
VBW 300 kHz
SWT 1.1 s
Ref 25 dBm
Att 30 dB
Offset 8.3 dB

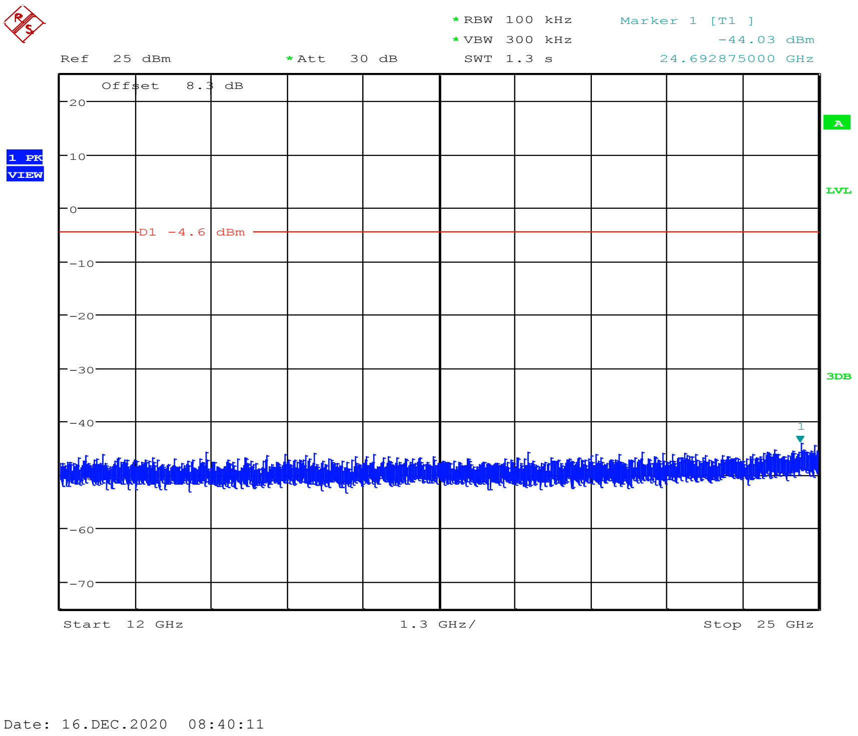
Marker 2 [T1]
-46.16 dBm
2.898875000 GHz

Marker 1 [T1]
13.57 dBm
2.439625000 GHz

D1 -4.6 dBm

Start 1 GHz 1.1 GHz/ Stop 12 GHz

Date: 16.DEC.2020 08:39:58



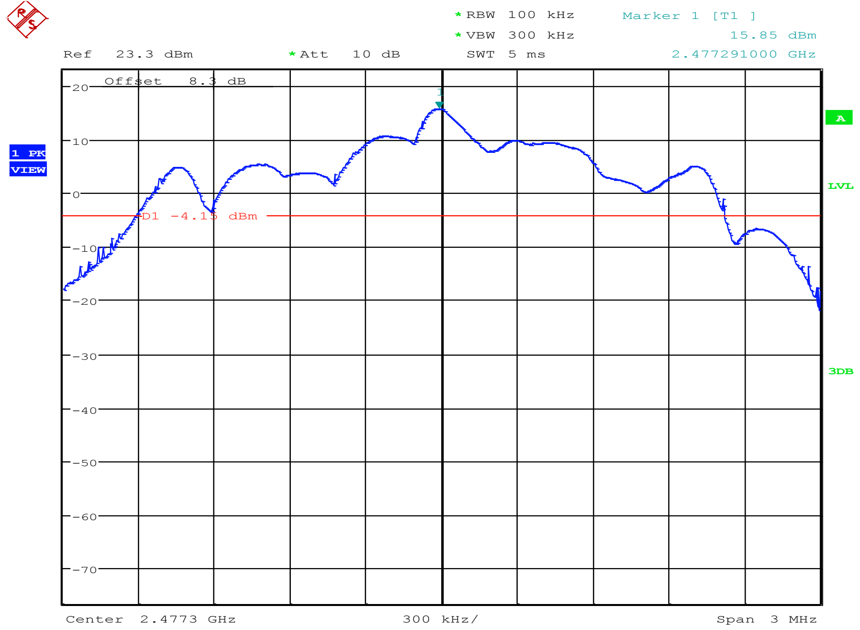
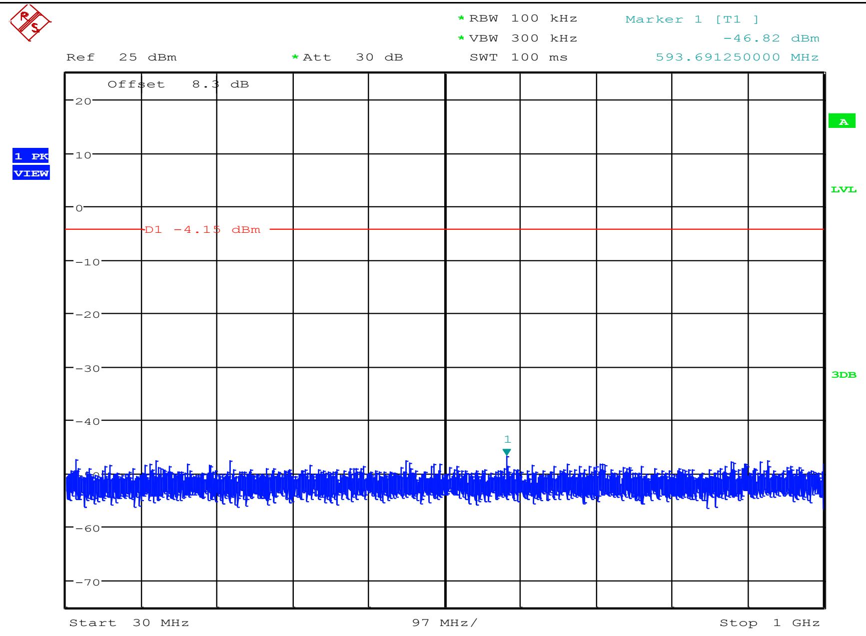
RBW 100 kHz
VBW 300 kHz
SWT 1.3 s
Ref 25 dBm
Att 30 dB
Offset 8.3 dB

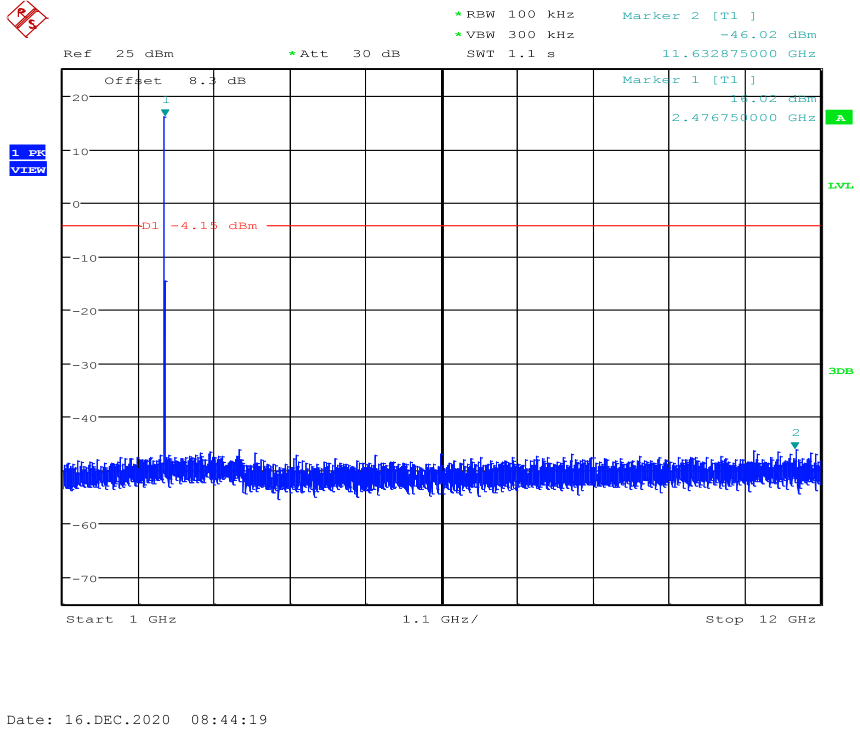
Marker 1 [T1]
-44.03 dBm
24.692875000 GHz

D1 -4.6 dBm

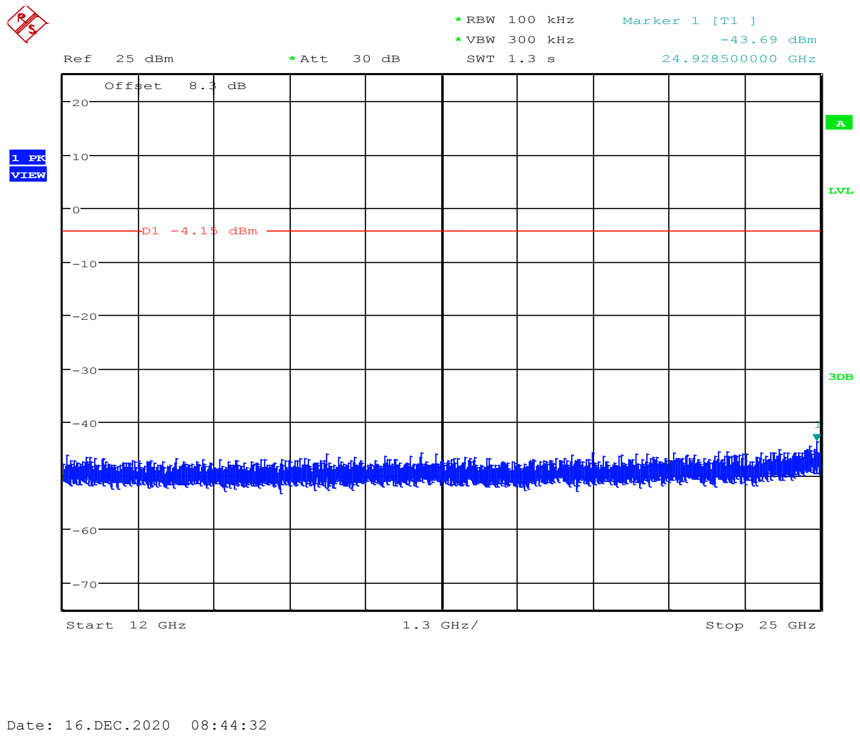
Start 12 GHz 1.3 GHz/ Stop 25 GHz

Date: 16.DEC.2020 08:40:11

FSK_HCH_Graphs	
Pref	 *RBW 100 kHz *VBW 300 kHz Marker 1 [T1] 15.85 dBm 2.477291000 GHz Ref 23.3 dBm *Att 10 dB SWT 5 ms Offset 8.3 dB D1 -4.15 dBm Center 2.4773 GHz 300 kHz/ Span 3 MHz Date: 16.DEC.2020 08:43:56
Puw	 *RBW 100 kHz *VBW 300 kHz Marker 1 [T1] -46.82 dBm 593.691250000 MHz Ref 25 dBm *Att 30 dB SWT 100 ms Offset 8.3 dB D1 -4.15 dBm Start 30 MHz 97 MHz/ Stop 1 GHz Date: 16.DEC.2020 08:44:08



Date: 16.DEC.2020 08:44:19



Date: 16.DEC.2020 08:44:32

Remark:

Pre test 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

5.10 Other requirements Frequency Hopping Spread Spectrum System

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1), (h) requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

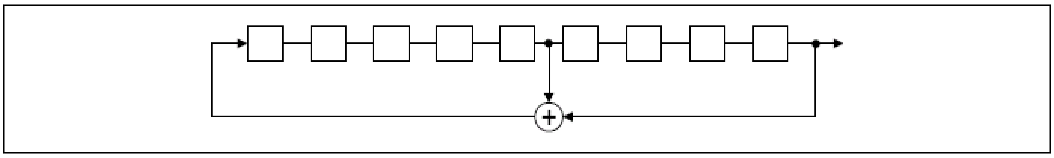
Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1)

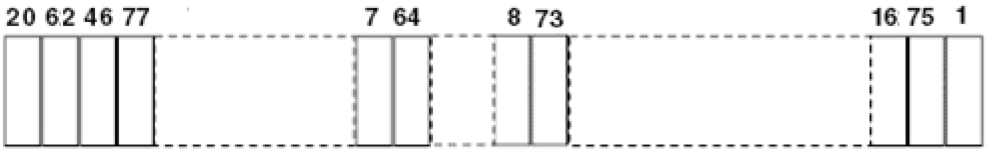
According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: 2^9 -1 = 511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h)
According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels. According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

5.11 Radiated Spurious Emission & Restricted bands

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Peak	100 kHz	300kHz	Peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz$^{1)}$	Average

1): VBW = 10 Hz or 1/T for average levels,

Mode	On Time (msec)	1/ T Minimum VBW (kHz)
FSK	4.327	0.23

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:	

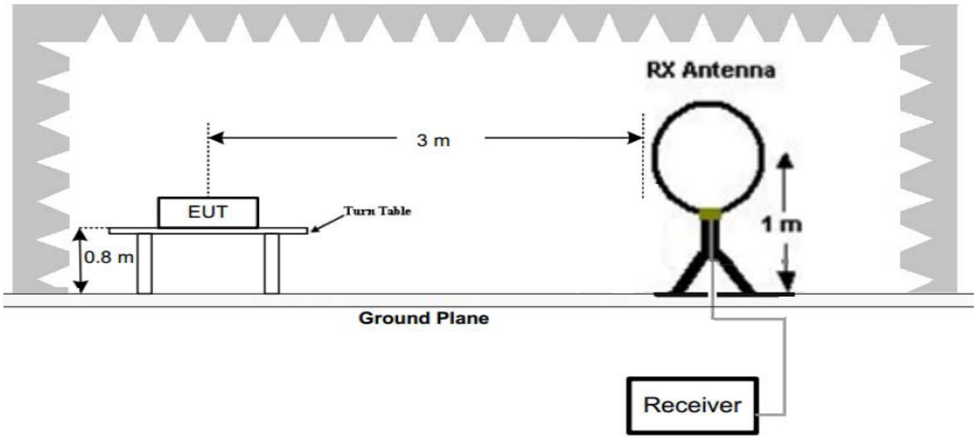


Figure 1. Below 30MHz

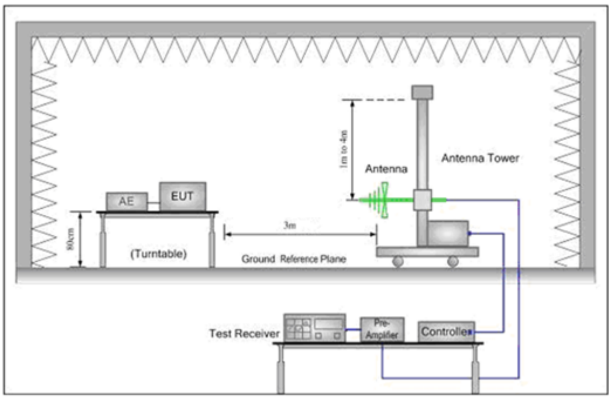


Figure 2. 30MHz to 1GHz

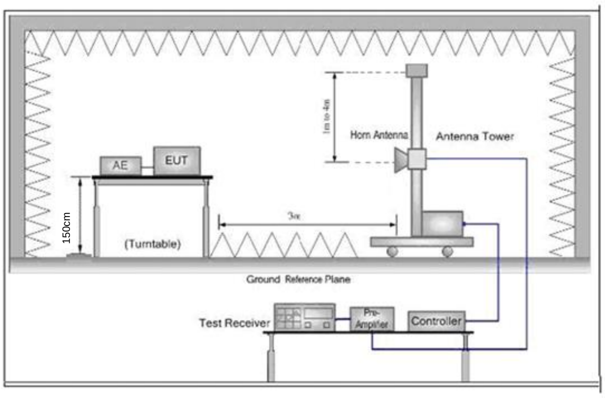


Figure 3. Above 1 GHz

Test Procedure:	a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

	d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz) h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the FSK modulation is the worst case. Pretest the EUT at Transmitting mode, For below 1GHz part, through pre-scan, the worst case is the lowest channel. Only the worst case is recorded in the report.
Test Results:	Pass

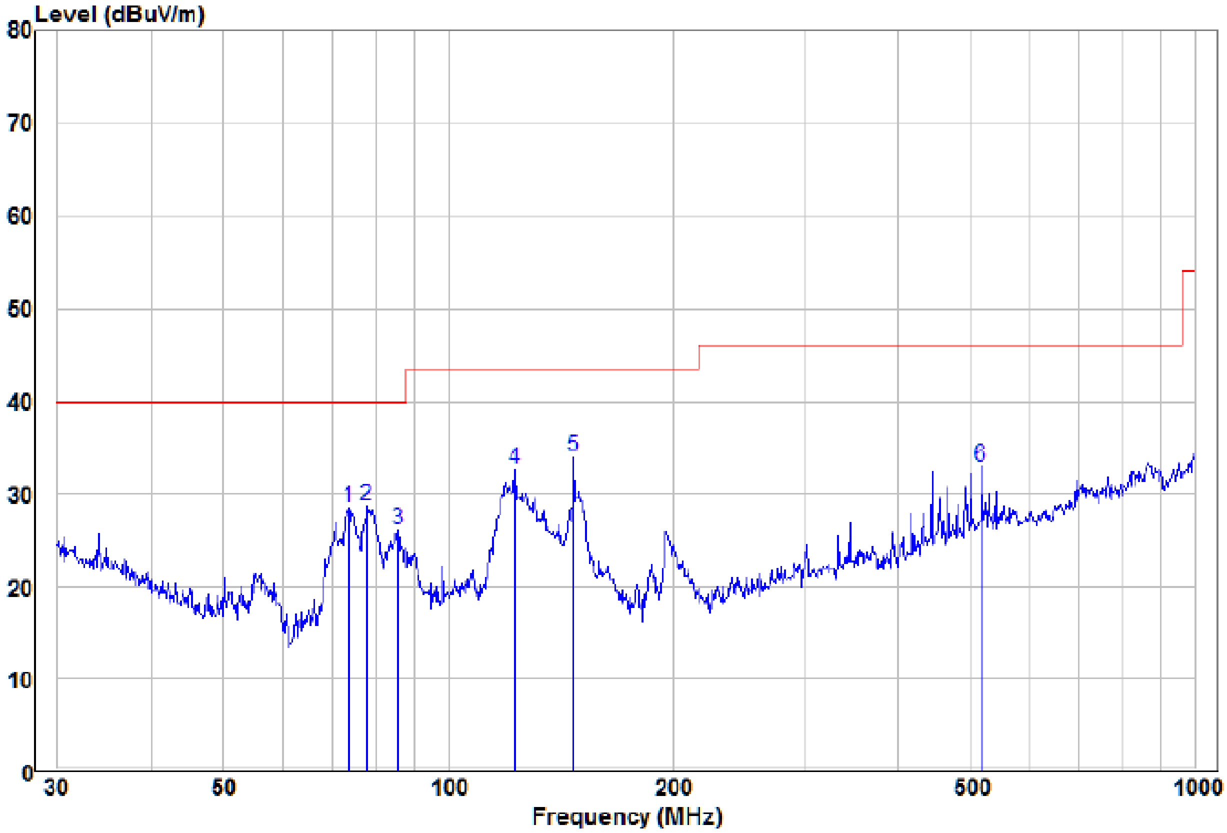
5.11.1 Radiated Emission below 1GHz

9KHz~30MHz

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement.

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30MHz~1GHz		
Model No.: AW-WS100		
Test mode:	Transmitting	Vertical



```
                  Read                  Limit   Over
          Freq   Level  Factor  Level    Line   Limit  Remark      Pol/Phase

       ------- -------  ------ ------  ------  ------  ----------  ----------
           MHz    dBuV    dB/m dBuV/m  dBuV/m      dB

  1      73.62   19.80    8.75  28.55   40.00  -11.45  QP          VERTICAL
  2      77.87   19.16    9.44  28.60   40.00  -11.40  QP          VERTICAL
  3      85.60   16.14    9.91  26.05   40.00  -13.95  QP          VERTICAL
  4     122.83   21.92   10.59  32.51   43.50  -10.99  QP          VERTICAL
  5 pp  147.40   25.56    8.36  33.92   43.50   -9.58  QP          VERTICAL
  6     517.25   14.49   18.46  32.95   46.00  -13.05  QP          VERTICAL
```

Remark:

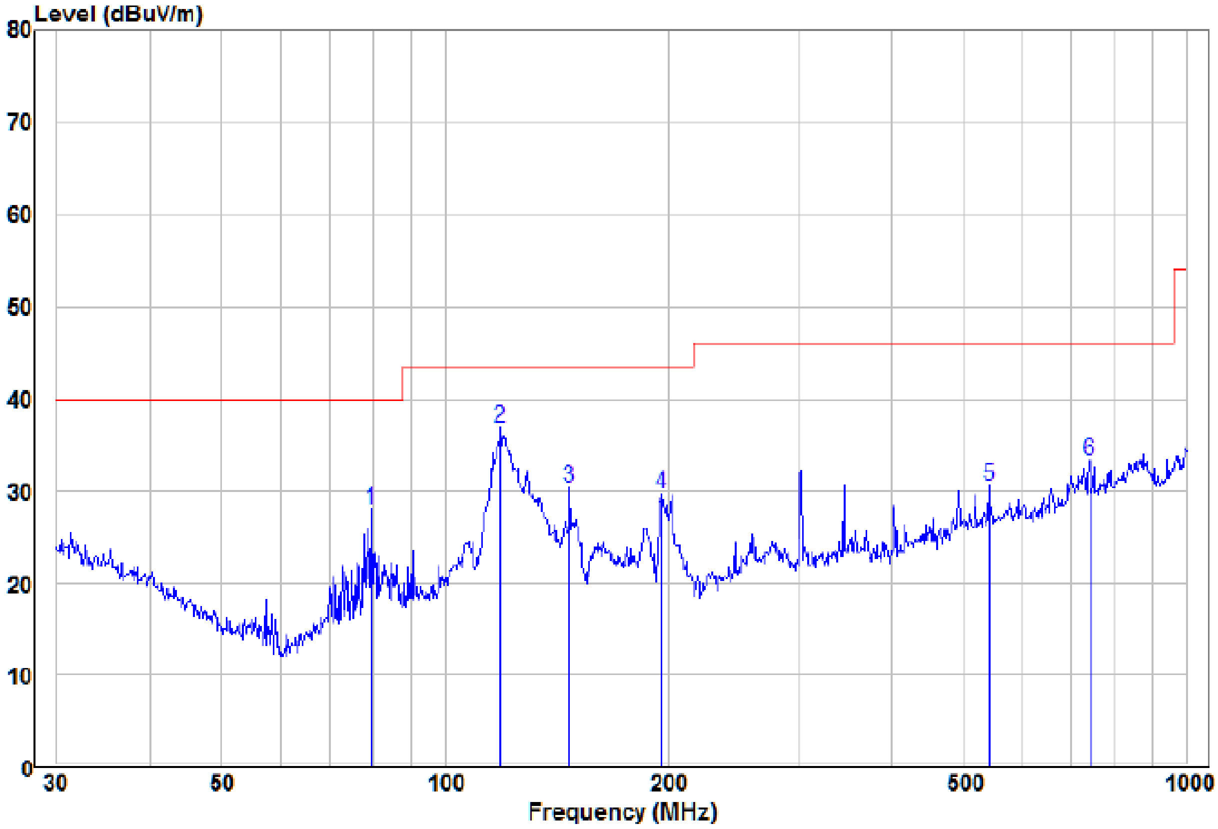
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Test mode:	Transmitting	Horizontal



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	79.52	18.21	9.70	27.91	40.00	-12.09	QP	HORIZONTAL
2 pp	119.02	26.12	10.65	36.77	43.50	-6.73	QP	HORIZONTAL
3	147.40	22.02	8.36	30.38	43.50	-13.12	QP	HORIZONTAL
4	196.51	21.32	8.31	29.63	43.50	-13.87	QP	HORIZONTAL
5	541.37	11.75	18.71	30.46	46.00	-15.54	QP	HORIZONTAL
6	739.66	11.91	21.35	33.26	46.00	-12.74	QP	HORIZONTAL

Remark:

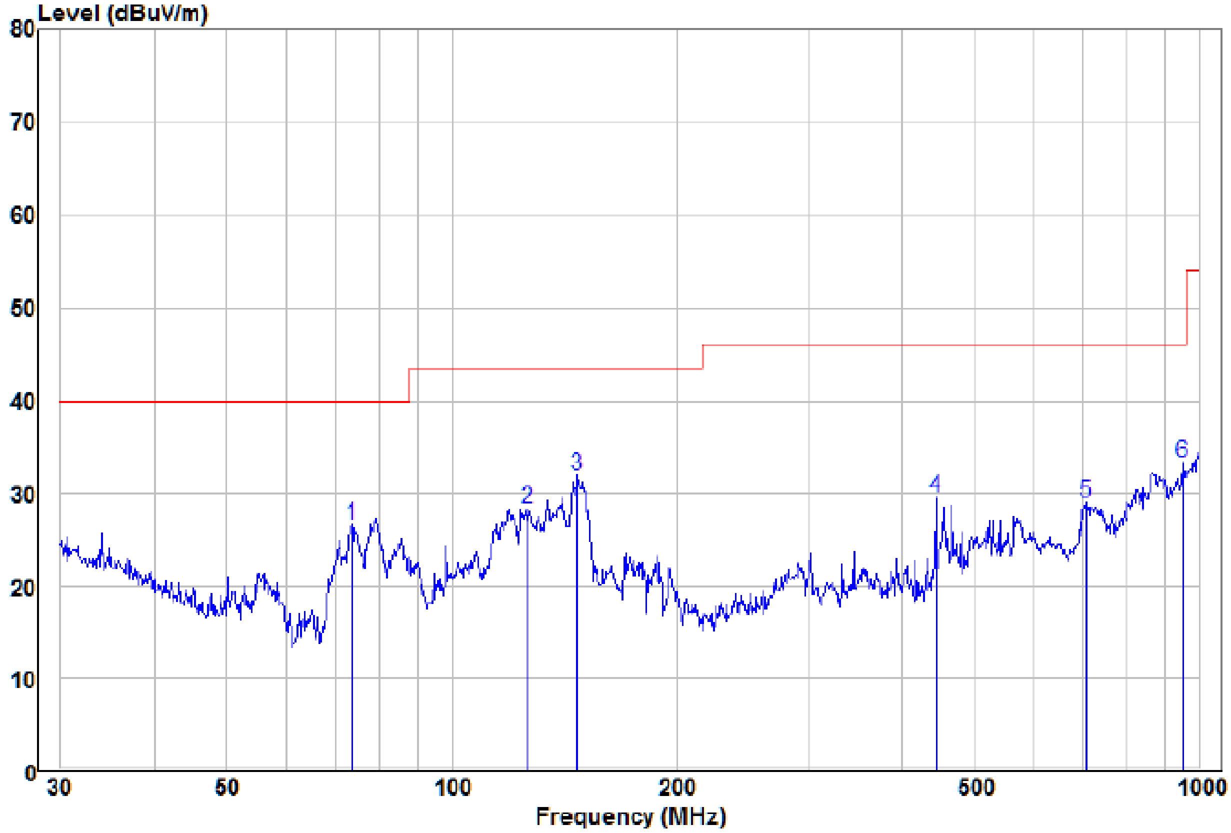
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Model No.: AW-WS200		
Test mode:	Transmitting	Vertical



```
                 Read                   Limit   Over
           Freq  Level Factor  Level     Line  Limit Remark      Pol/Phase

       ───────── ──────── ──────── ──────── ──────── ──────── ──────────── ────────────
            MHz    dBuV    dB/m  dBuV/m  dBuV/m     dB

 1        73.62  17.80    8.75   26.55   40.00 -13.45 QP          VERTICAL
 2       126.33  17.89   10.46   28.35   43.50 -15.15 QP          VERTICAL
 3 pp    147.40  23.56    8.36   31.92   43.50 -11.58 QP          VERTICAL
 4       443.29  12.93   16.52   29.45   46.00 -16.55 QP          VERTICAL
 5       704.23   7.91   21.12   29.03   46.00 -16.97 QP          VERTICAL
 6       948.76   9.61   23.71   33.32   46.00 -12.68 QP          VERTICAL
```

Remark:

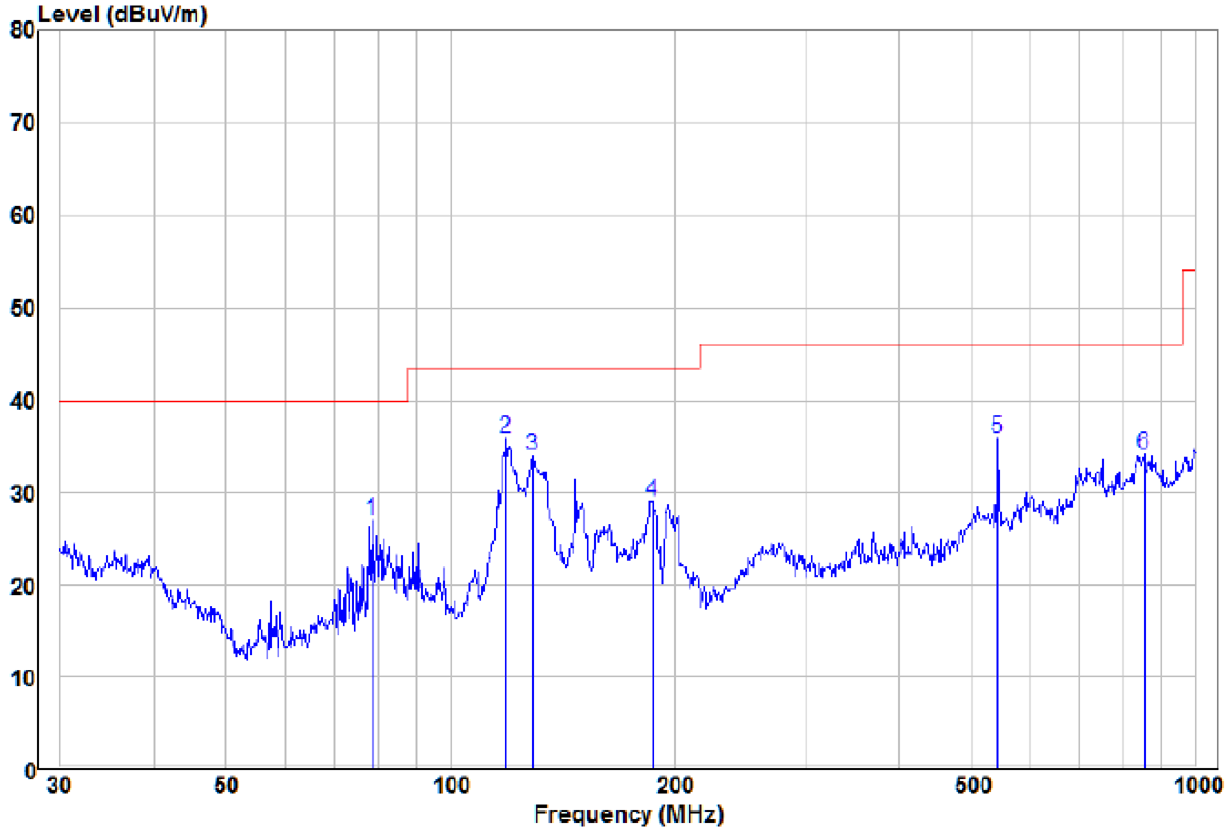
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

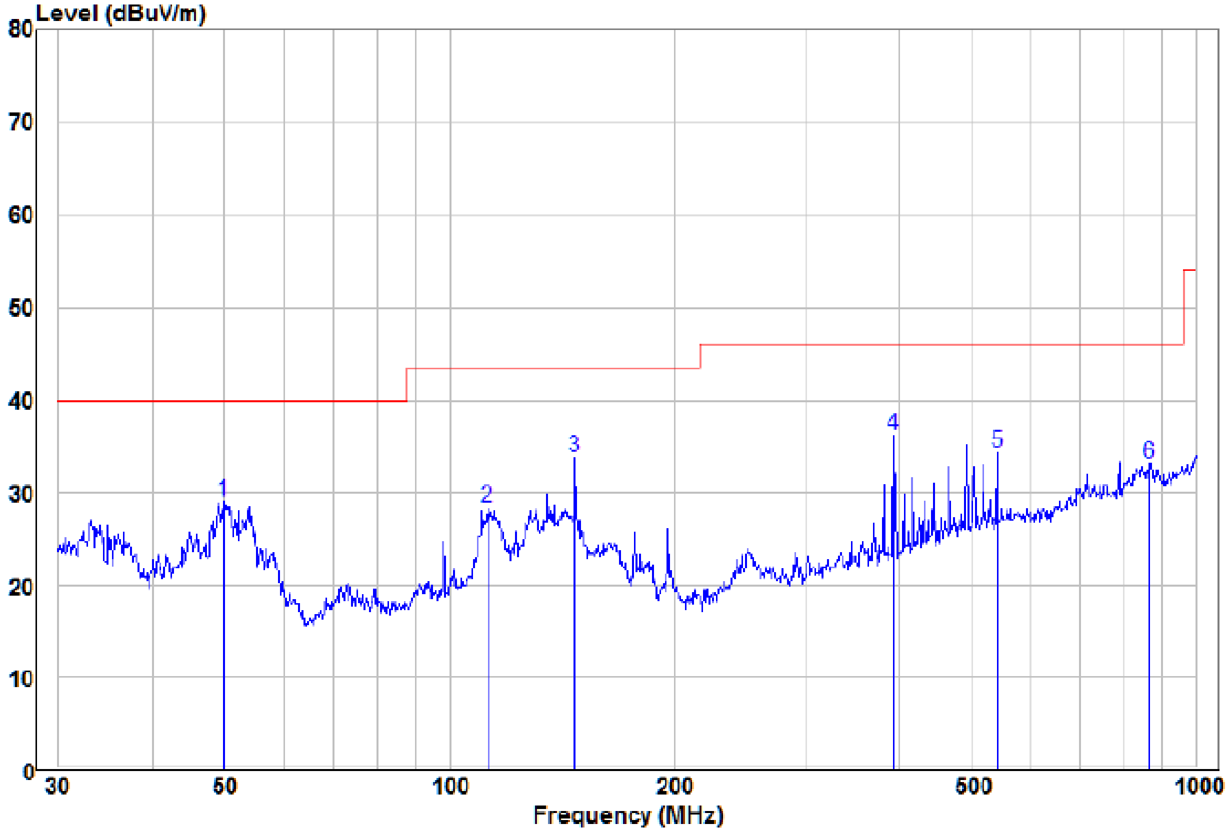
Test mode:	Transmitting	Horizontal



		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1		78.41	17.48	9.53	27.01	40.00	-12.99	QP	HORIZONTAL
2	pp	119.02	25.12	10.65	35.77	43.50	-7.73	QP	HORIZONTAL
3		129.01	23.65	10.36	34.01	43.50	-9.49	QP	HORIZONTAL
4		186.44	20.88	8.10	28.98	43.50	-14.52	QP	HORIZONTAL
5		543.27	17.10	18.73	35.83	46.00	-10.17	QP	HORIZONTAL
6		851.04	10.07	24.04	34.11	46.00	-11.89	QP	HORIZONTAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

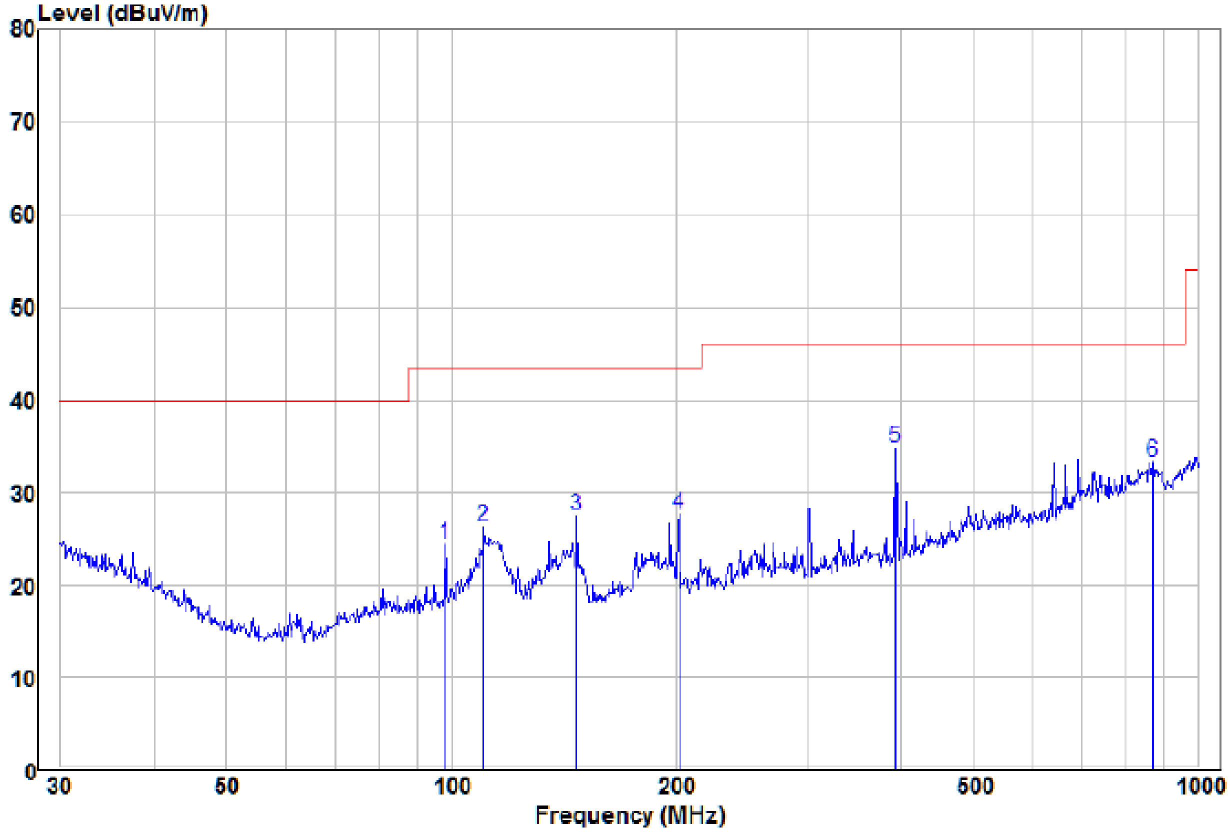
Model No.: AW-WS300		
Test mode:	Transmitting	Vertical



		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1		49.88	20.89	8.15	29.04	40.00	-10.96	QP	VERTICAL
2		112.52	18.00	10.31	28.31	43.50	-15.19	QP	VERTICAL
3	pp	147.40	25.34	8.36	33.70	43.50	-9.80	QP	VERTICAL
4		393.47	21.15	14.99	36.14	46.00	-9.86	QP	VERTICAL
5		541.37	15.59	18.71	34.30	46.00	-11.70	QP	VERTICAL
6		866.09	9.05	23.98	33.03	46.00	-12.97	QP	VERTICAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

Test mode:	Transmitting	Horizontal



		Read			Limit	Over		
	Freq	Level	Factor	Level	Line	Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	98.14	13.92	10.53	24.45	43.50	-19.05	QP	HORIZONTAL
2	110.57	16.05	10.21	26.26	43.50	-17.24	QP	HORIZONTAL
3	147.40	19.11	8.36	27.47	43.50	-16.03	QP	HORIZONTAL
4	201.39	19.14	8.53	27.67	43.50	-15.83	QP	HORIZONTAL
5 pp	393.47	19.76	14.99	34.75	46.00	-11.25	QP	HORIZONTAL
6	869.13	9.34	23.97	33.31	46.00	-12.69	QP	HORIZONTAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

5.11.2 Transmitter Emission above 1GHz

Model No.: AW-WS100							
Worse case mode:		FSK		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390	**55.55**	**-9.2**	**46.35**	**74**	**-27.65**	**Peak**	**H**
2400	54.53	-9.39	45.14	74	-28.86	Peak	H
4807	52.71	-4.32	48.39	74	-25.61	Peak	H
7210.5	48.78	1.02	49.80	74	-24.20	Peak	H
2390	**54.52**	**-9.2**	**45.32**	**74**	**-28.68**	**Peak**	**V**
2400	56.04	-9.39	46.65	74	-27.35	Peak	V
4807	53.78	-4.32	49.46	74	-24.54	Peak	V
7210.5	48.89	1.02	49.91	74	-24.09	Peak	V

Worse case mode:		FSK		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4880.8	50.81	-4.1	46.71	74	-27.29	peak	H
7321.2	49.09	1.52	50.61	74	-23.39	peak	H
4880.8	51.43	-4.1	47.33	74	-26.67	peak	V
7321.2	49.11	1.52	50.63	74	-23.37	peak	V

Worse case mode:		FSK		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.5	**55.18**	**-9.29**	**45.89**	**74**	**-28.11**	**Peak**	**H**
4954.6	51.21	-4.03	47.18	74	-26.82	Peak	H
7431.9	48.77	1.58	50.35	74	-23.65	Peak	H
2483.5	**53.89**	**-9.29**	**44.60**	**74**	**-29.40**	**Peak**	**V**
4954.6	50.41	-4.03	46.38	74	-27.62	Peak	V
7431.9	49.68	1.58	51.26	74	-22.74	Peak	V

Model No.: AW-WS200							
Worse case mode:		FSK		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2390	**53.28**	**-9.2**	**44.08**	**74**	**-29.92**	**Peak**	**H**
2400	54.99	-9.39	45.60	74	-28.40	Peak	H
4807	51.50	-4.32	47.18	74	-26.82	Peak	H
7210.5	49.38	1.02	50.40	74	-23.60	Peak	H
2390	**56.11**	**-9.2**	**46.91**	**74**	**-27.09**	**Peak**	**V**
2400	55.74	-9.39	46.35	74	-27.65	Peak	V
4807	53.97	-4.32	49.65	74	-24.35	Peak	V
7210.5	49.59	1.02	50.61	74	-23.39	Peak	V

Worse case mode:		FSK		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4880.8	50.93	-4.1	46.83	74	-27.17	peak	H
7321.2	51.11	1.52	52.63	74	-21.37	peak	H
4880.8	53.89	-4.1	49.79	74	-24.21	peak	V
7321.2	49.26	1.52	50.78	74	-23.22	peak	V

Worse case mode:		FSK		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
2483.5	**57.21**	**-9.29**	**47.92**	**74**	**-26.08**	**Peak**	**H**
4954.6	52.82	-4.03	48.79	74	-25.21	Peak	H
7431.9	51.15	1.58	52.73	74	-21.27	Peak	H
2483.5	**54.56**	**-9.29**	**45.27**	**74**	**-28.73**	**Peak**	**V**
4954.6	49.11	-4.03	45.08	74	-28.92	Peak	V
7431.9	51.12	1.58	52.70	74	-21.30	Peak	V

Model No.: AW-WS300							
Worse case mode:		FSK		Test channel:		Lowest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
2390	**55.56**	**-9.2**	**46.36**	**74**	**-27.64**	**Peak**	**H**
2400	56.01	-9.39	46.62	74	-27.38	Peak	H
4807	52.31	-4.32	47.99	74	-26.01	Peak	H
7210.5	49.19	1.02	50.21	74	-23.79	Peak	H
2390	**54.71**	**-9.2**	**45.51**	**74**	**-28.49**	**Peak**	**V**
2400	55.17	-9.39	45.78	74	-28.22	Peak	V
4807	53.43	-4.32	49.11	74	-24.89	Peak	V
7210.5	50.74	1.02	51.76	74	-22.24	Peak	V

Worse case mode:		FSK		Test channel:		Middle	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
4880.8	50.70	-4.1	46.60	74	-27.40	peak	H
7321.2	49.10	1.52	50.62	74	-23.38	peak	H
4880.8	53.28	-4.1	49.18	74	-24.82	peak	V
7321.2	50.42	1.52	51.94	74	-22.06	peak	V

Worse case mode:		FSK		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)		H/V
2483.5	**56.10**	**-9.29**	**46.81**	**74**	**-27.19**	**Peak**	**H**
4954.6	50.31	-4.03	46.28	74	-27.72	Peak	H
7431.9	49.05	1.58	50.63	74	-23.37	Peak	H
2483.5	**54.70**	**-9.29**	**45.41**	**74**	**-28.59**	**Peak**	**V**
4954.6	51.19	-4.03	47.16	74	-26.84	Peak	V
7431.9	48.56	1.58	50.14	74	-23.86	Peak	V

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

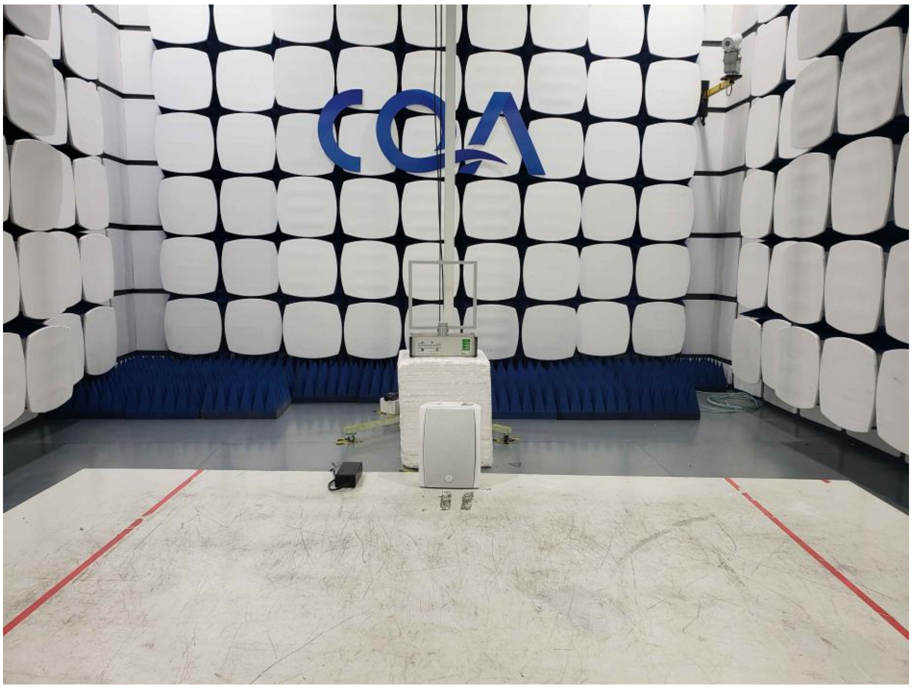
2) Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

6 Photographs - EUT Test Setup

6.1 Radiated Emission

9kHz~30MHz:

Model No.: AW-WS100

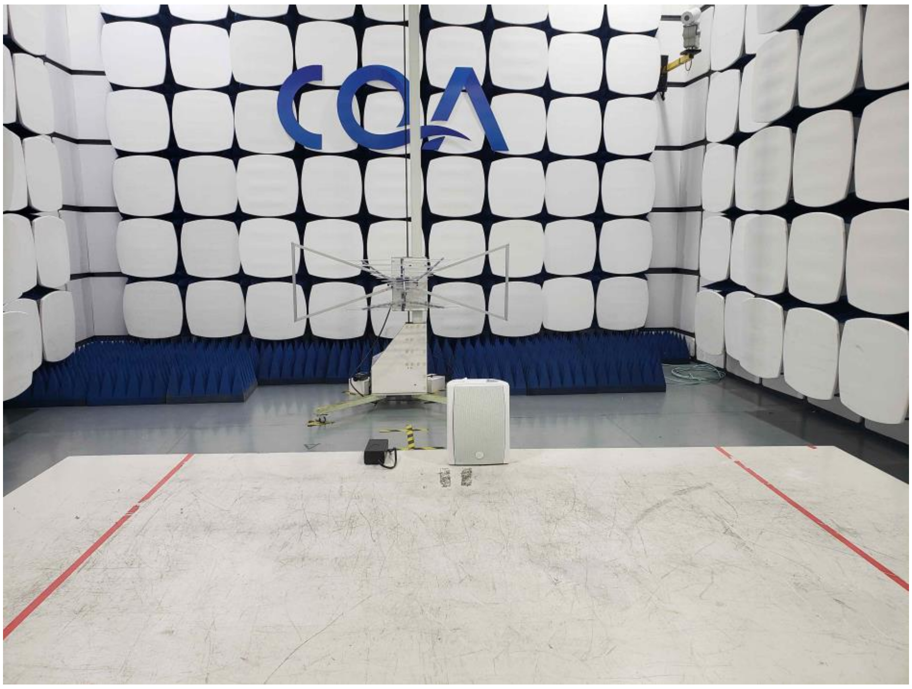


Model No.: AW-WS200

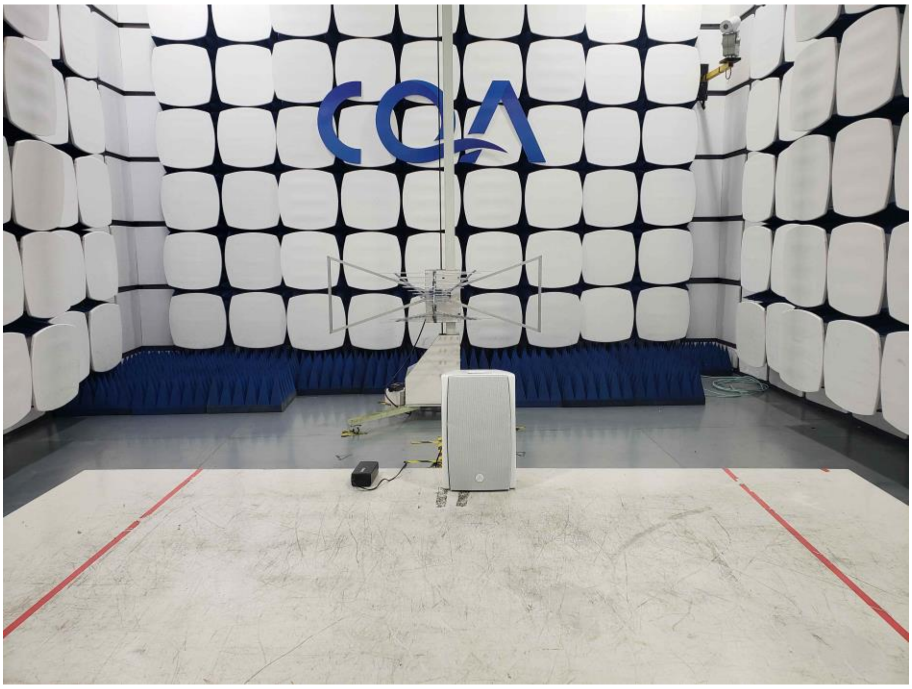
Model No.: AW-WS300

30MHz~1GHz:

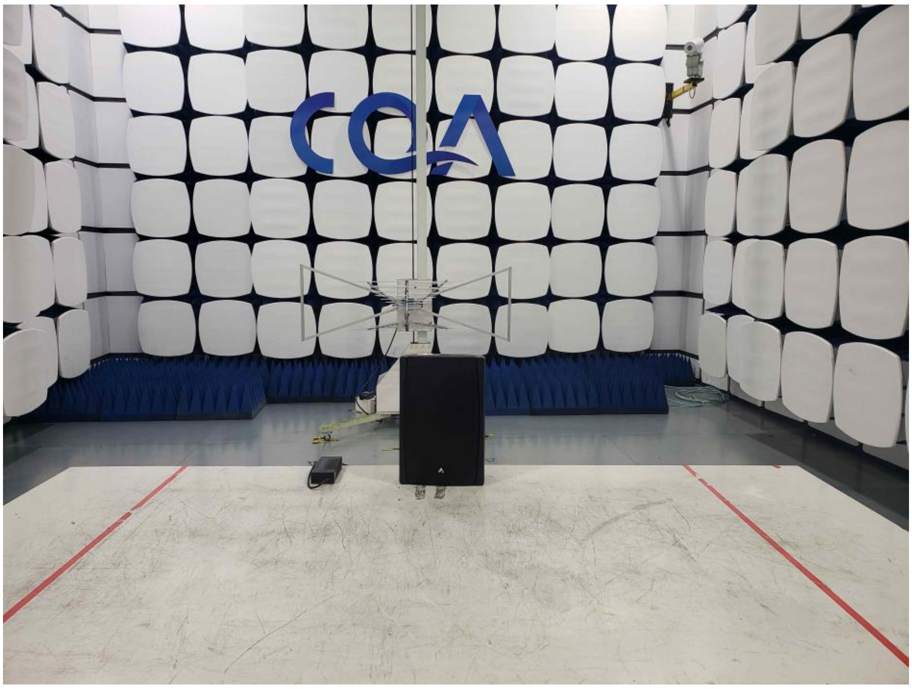
Model No.: AW-WS100



Model No.: AW-WS200



Model No.: AW-WS300

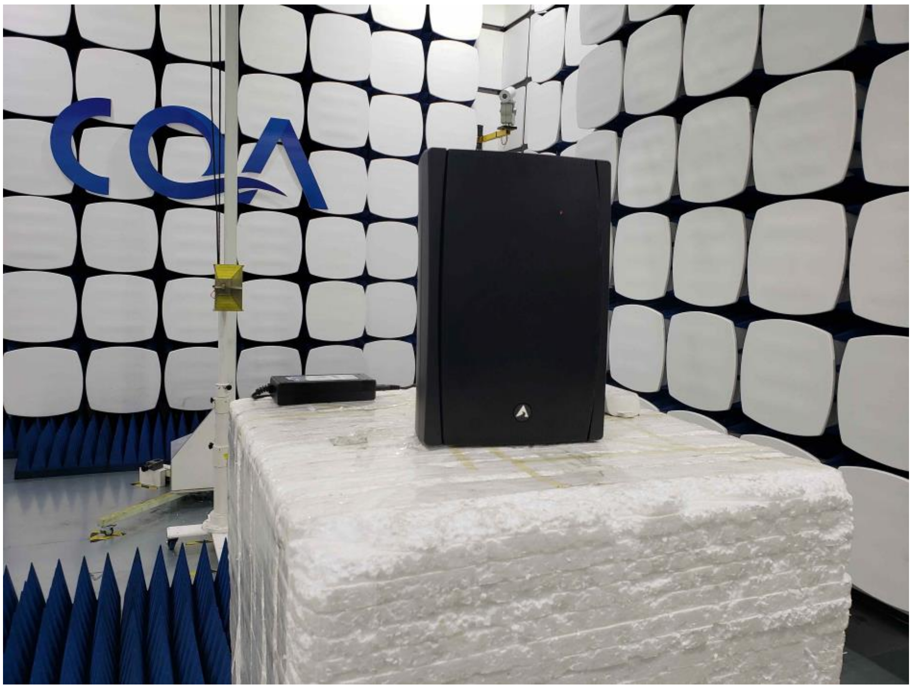


Above 1GHz:

Model No.: AW-WS100

Model No.: AW-WS200

Model No.: AW-WS300



6.2 Conducted Emission

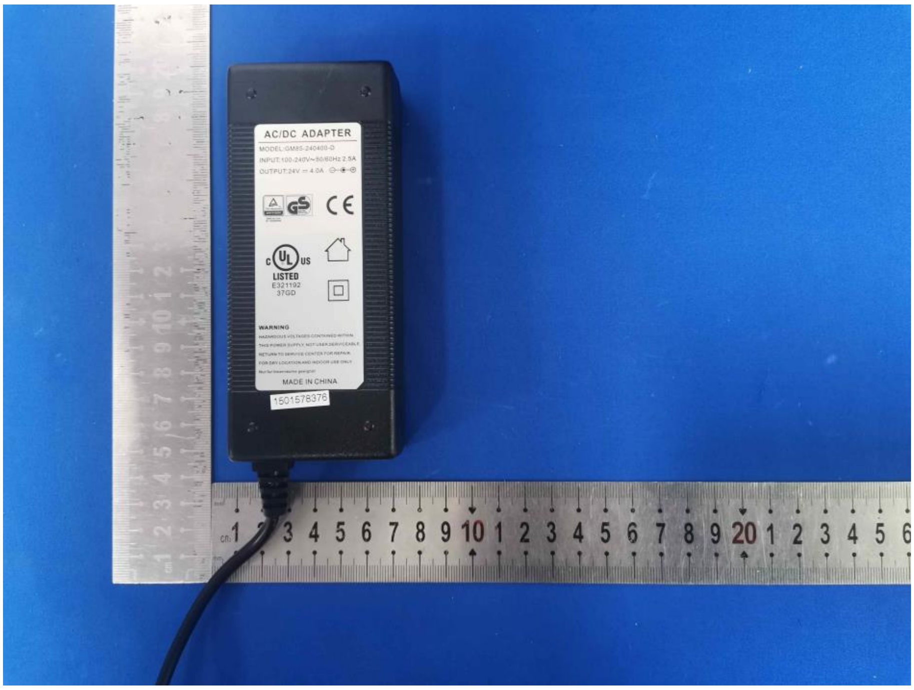
Model No.: AW-WS100

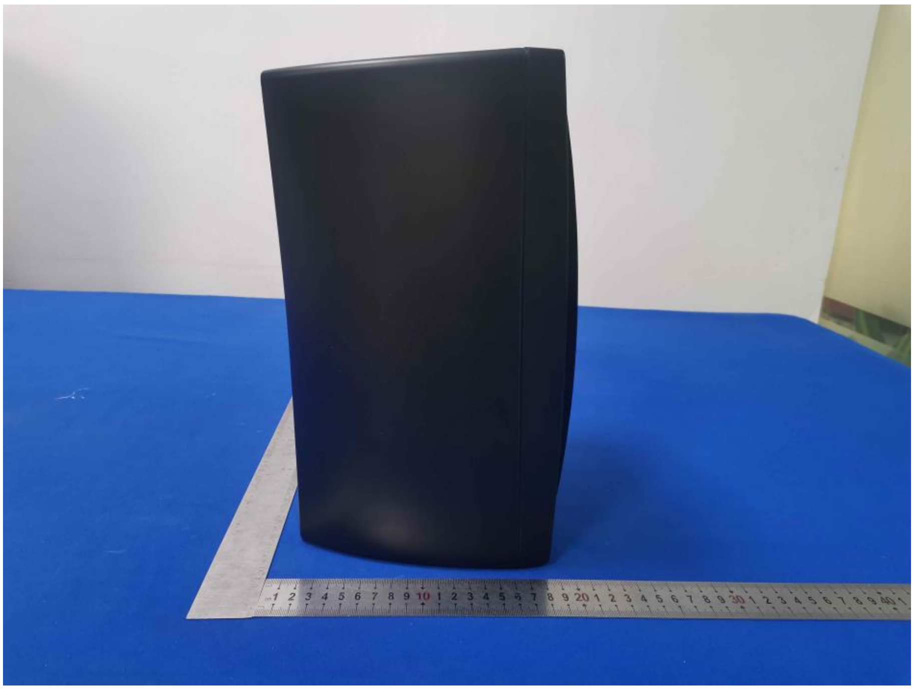
Model No.: AW-WS200

Model No.: AW-WS300

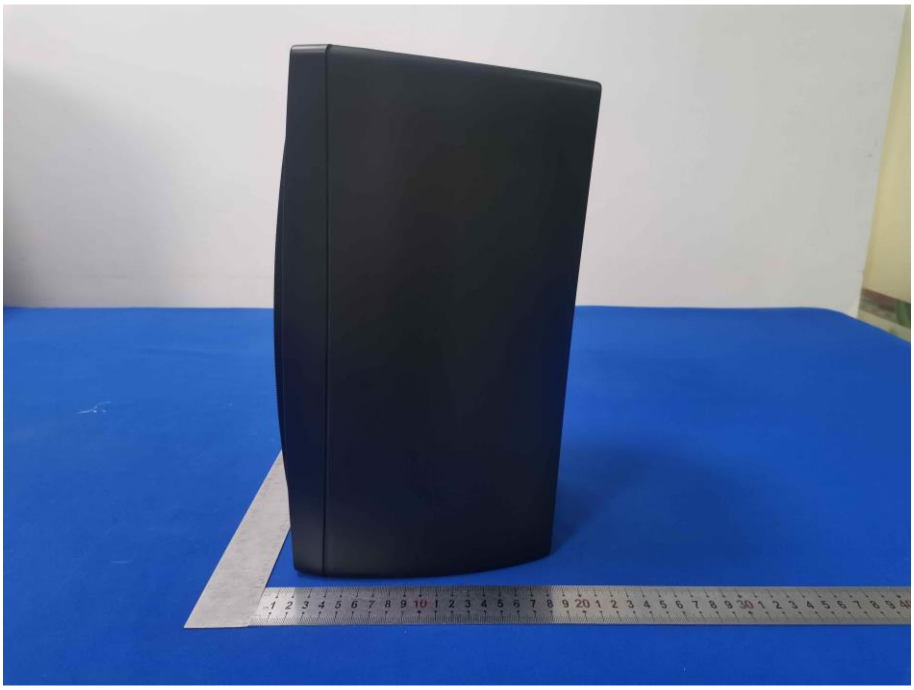
7 Photographs - EUT Constructional Details

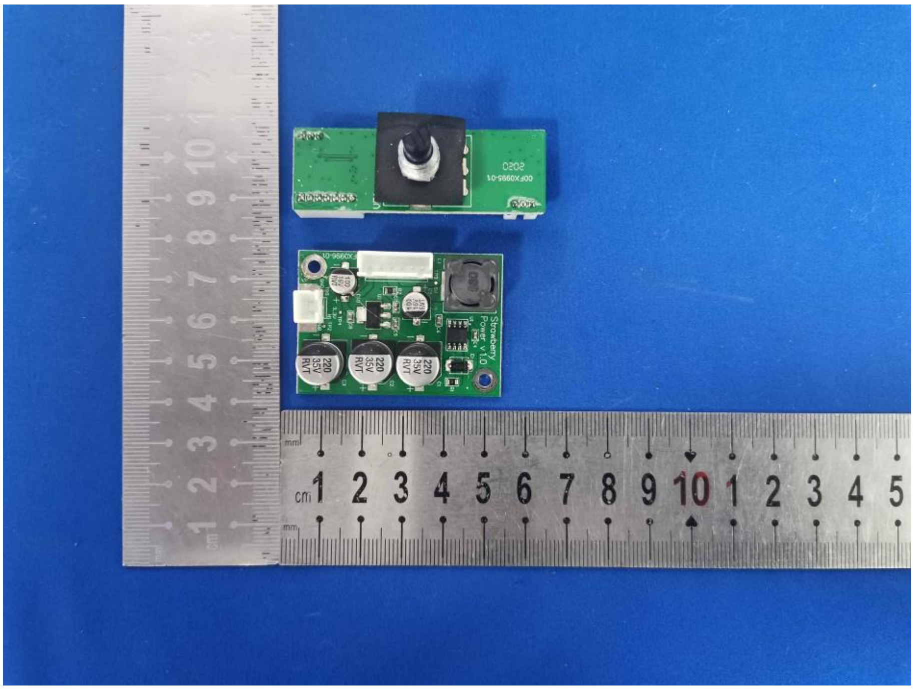
Model No.: AW-WS300

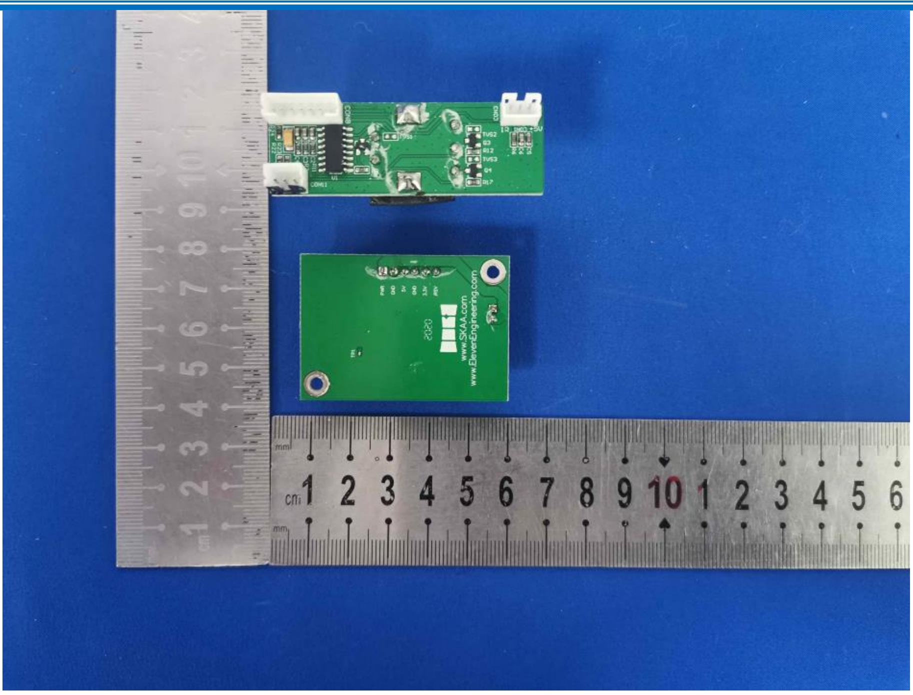


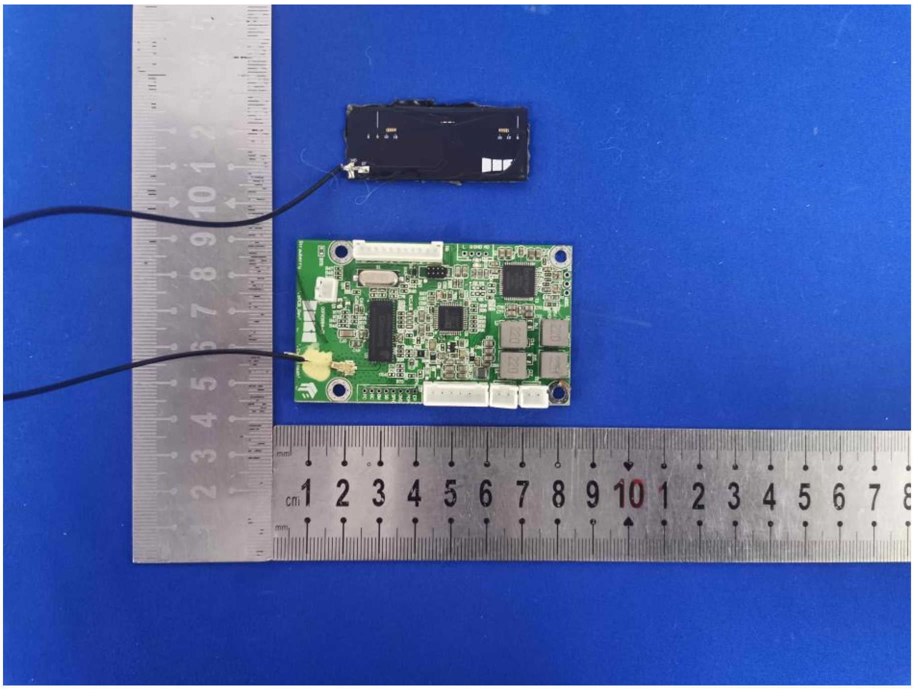


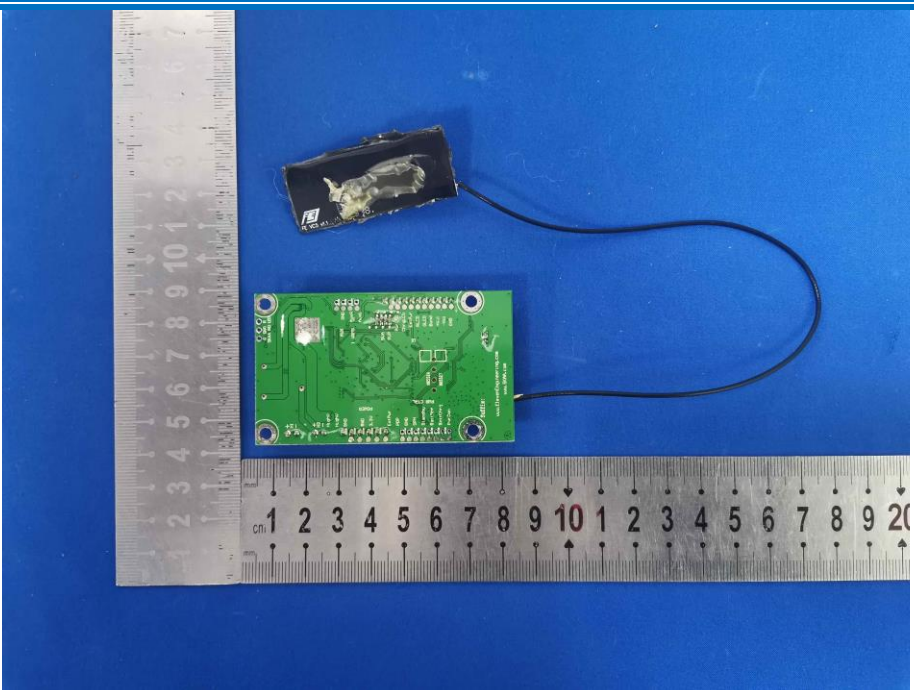

MODEL:AW-WS300
POWER
SPEAKER

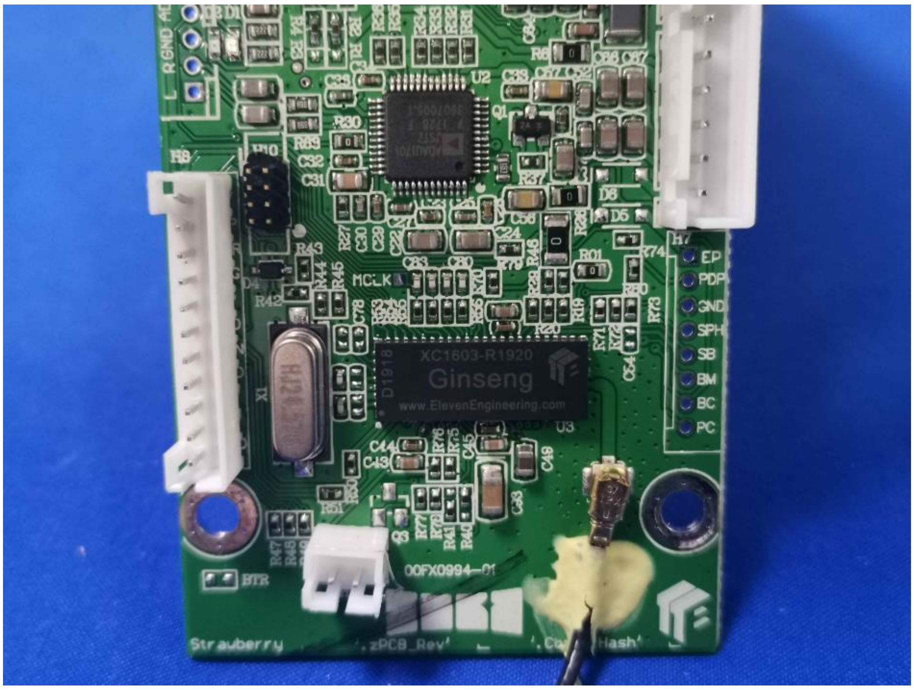




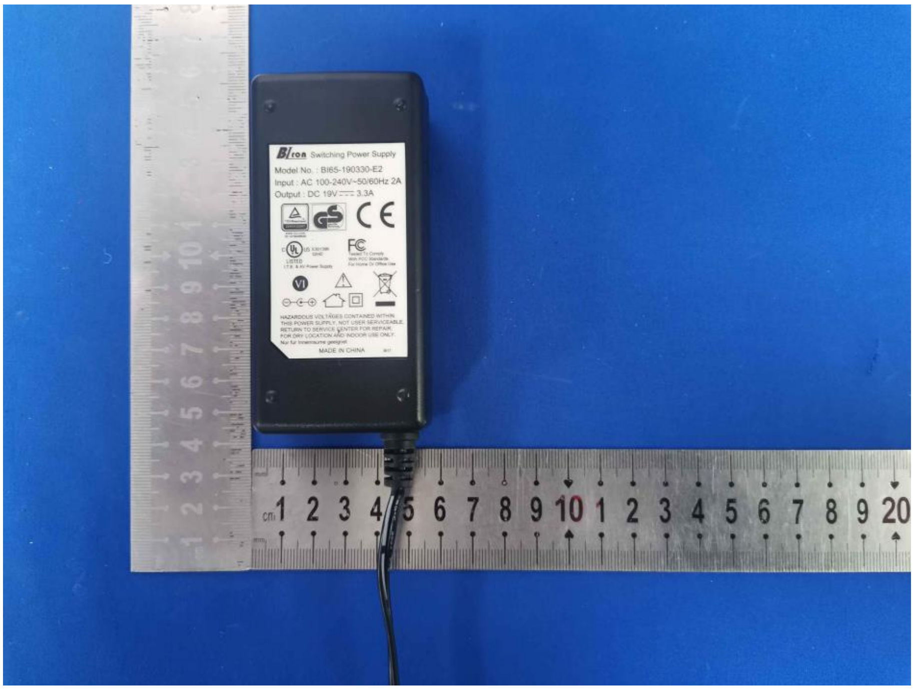


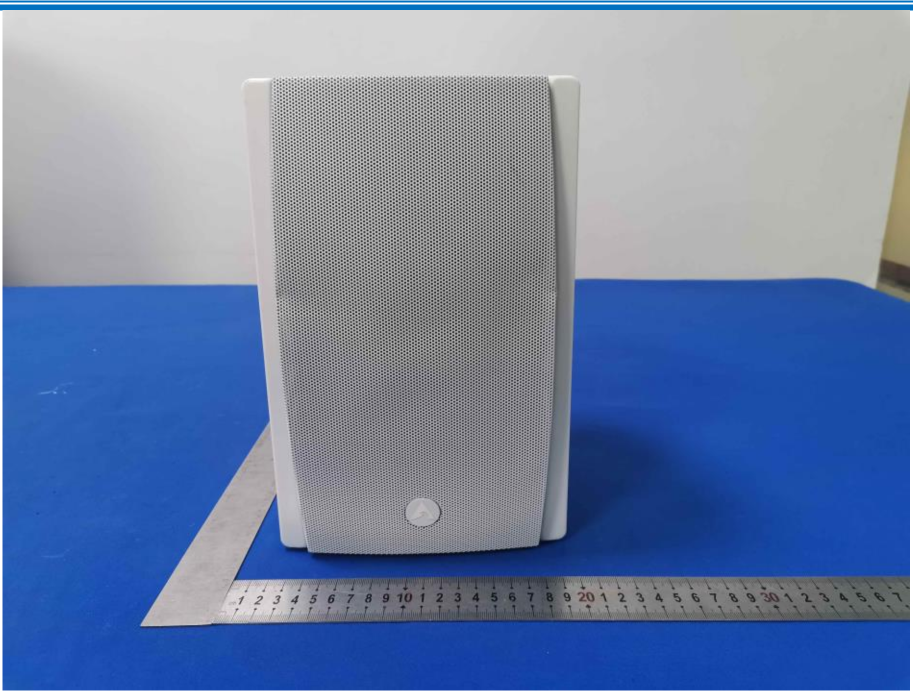






Model No.: AW-WS200

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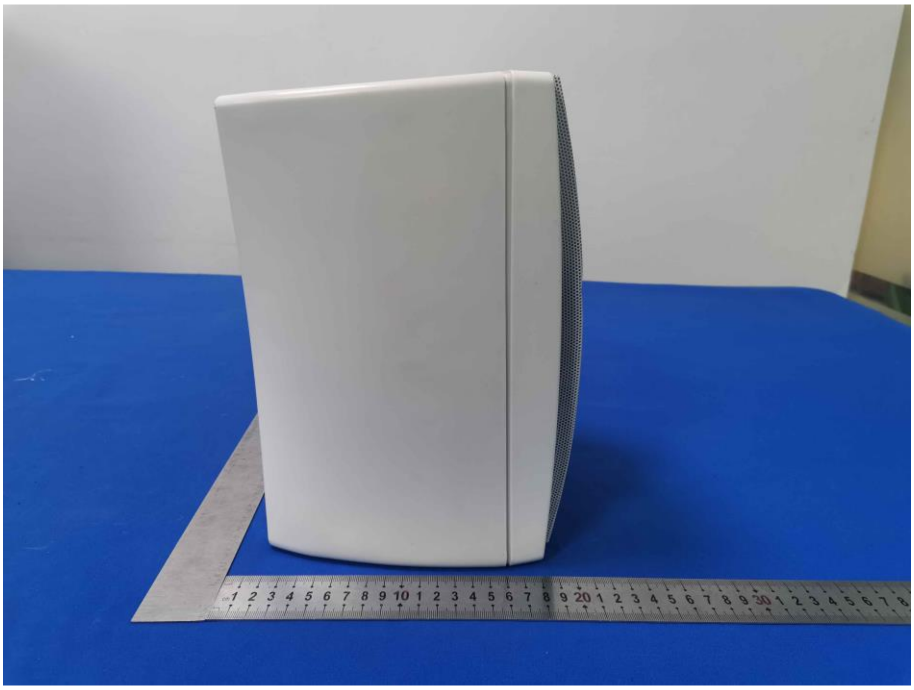
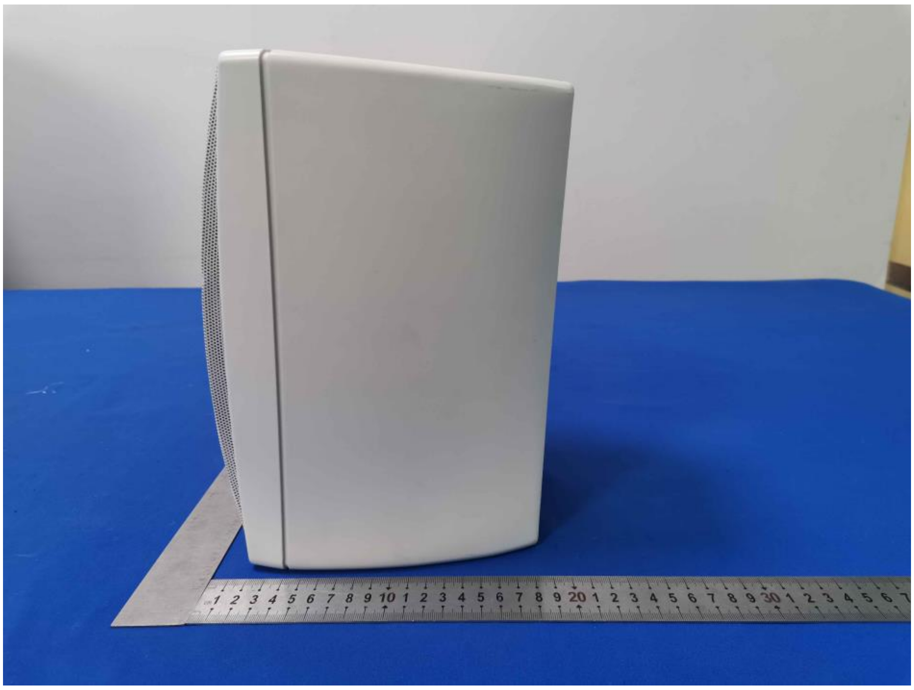
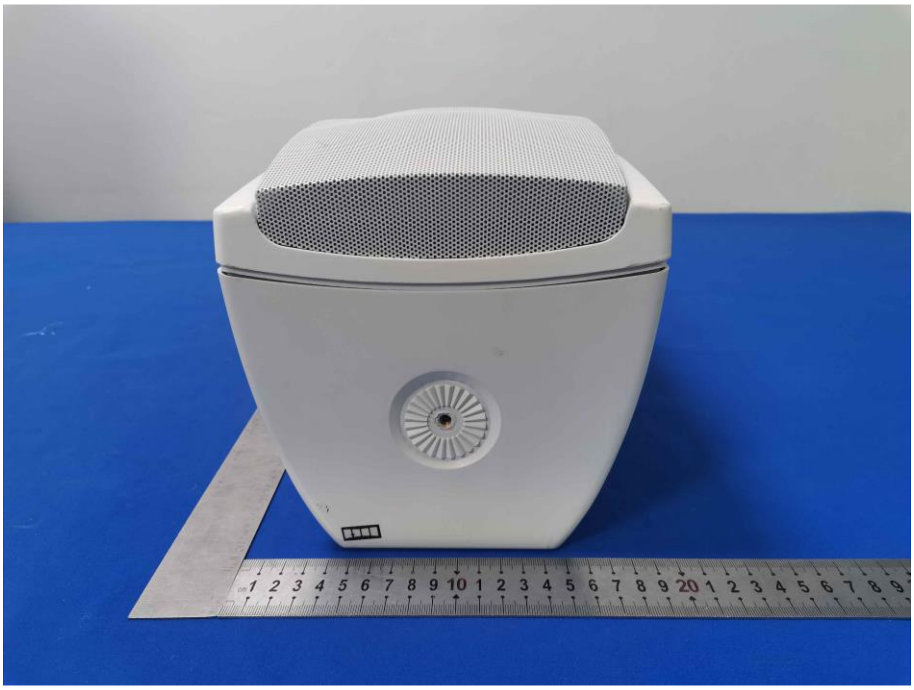
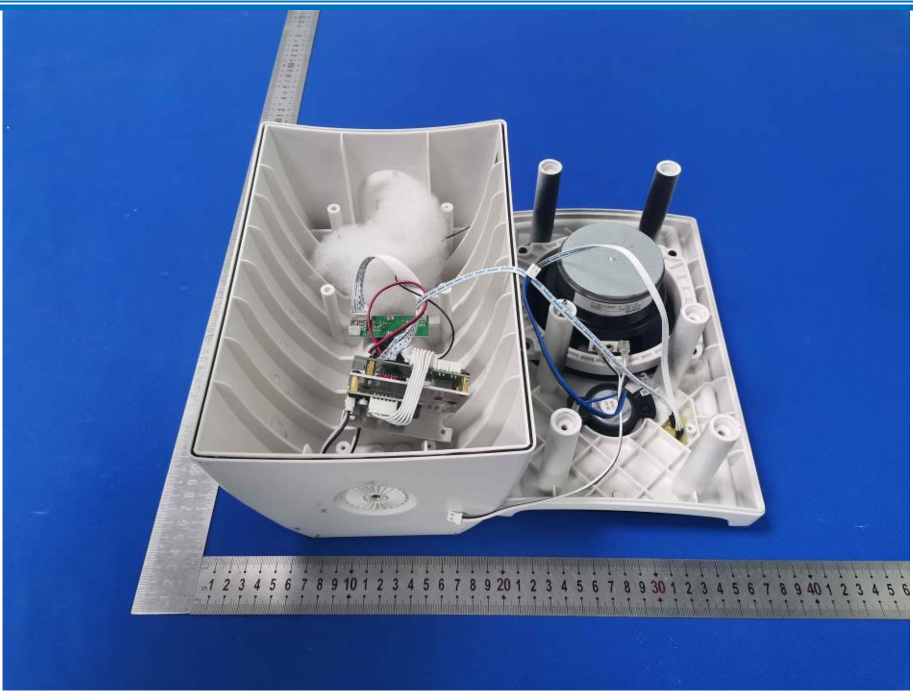
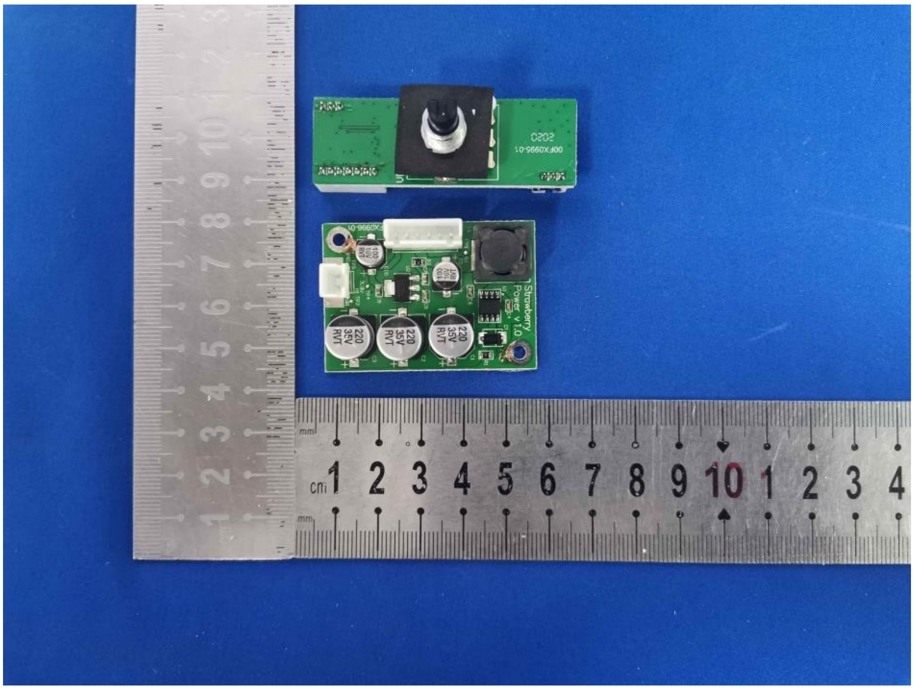

1 2 3 4 5 6 7 8 9 10 1 2 3 4 5 6 7 8 9 20 1 2 3 4 5 6 7 8 9 30 1 2 3 4 5 6 7 8

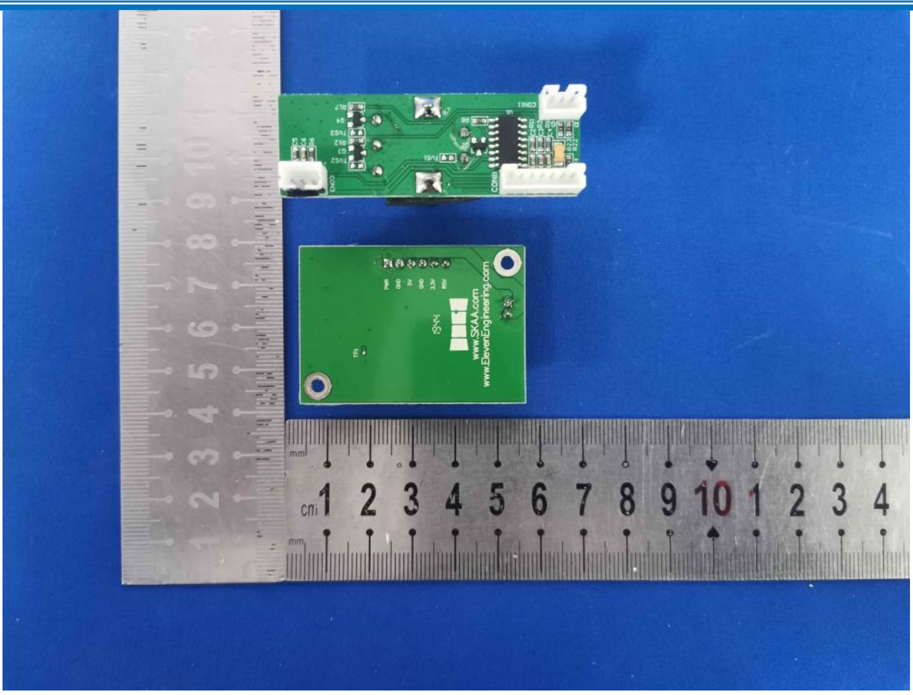

MODEL:AW-WS200
POWER
SPEAKER
Atlantic

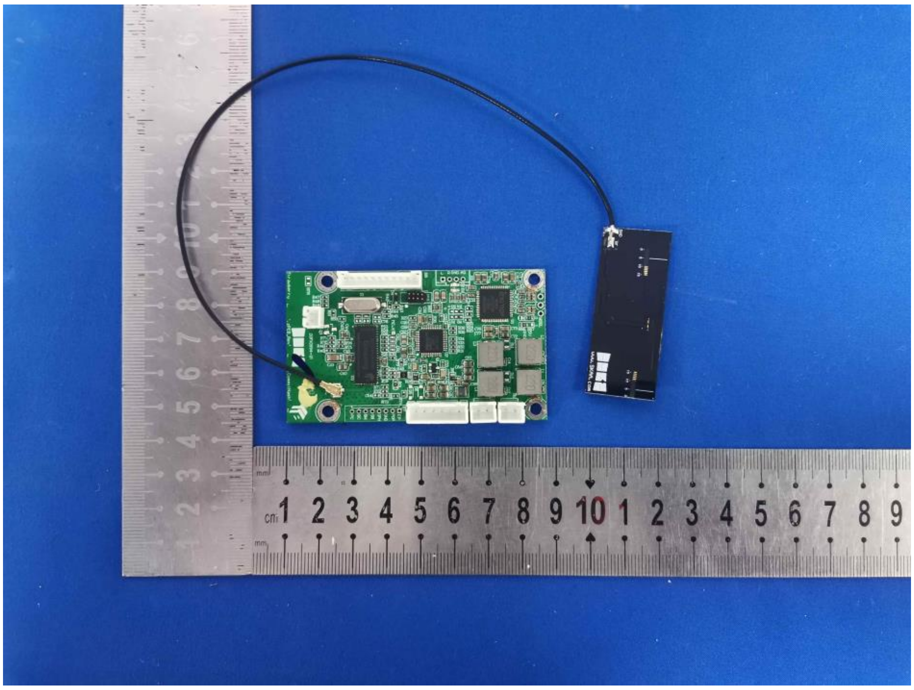


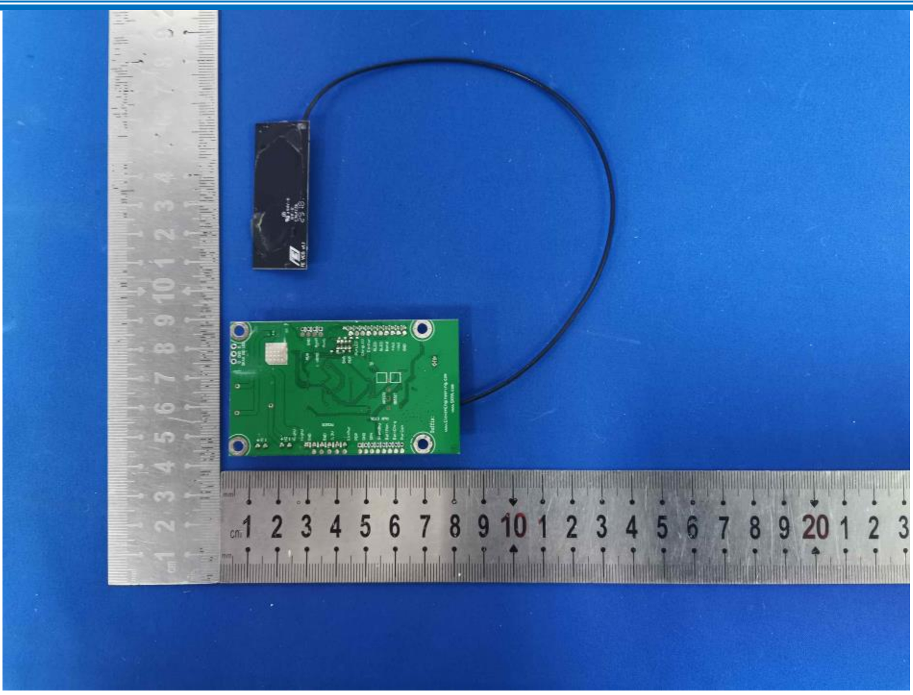






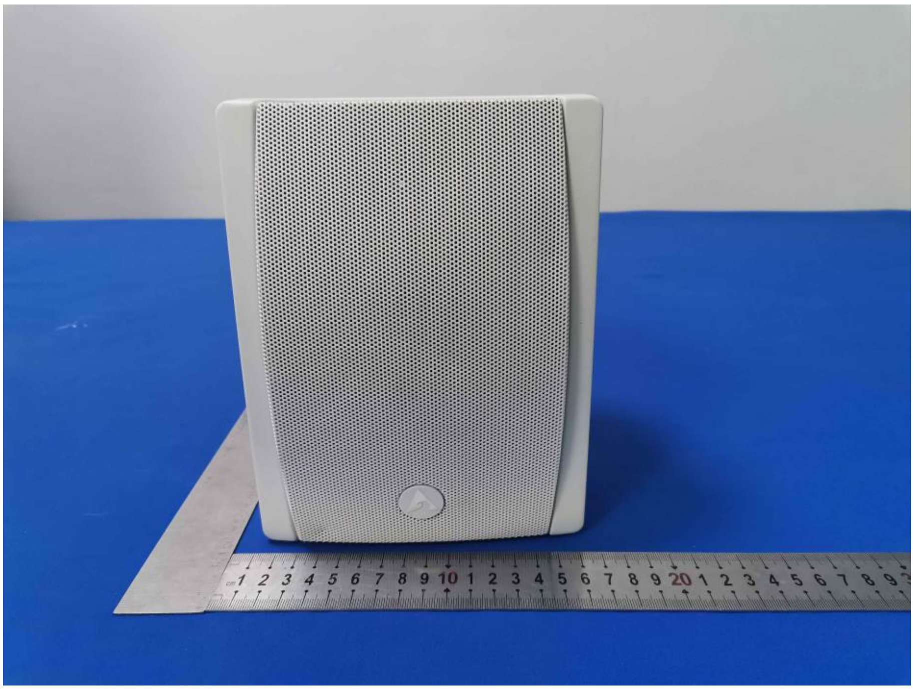


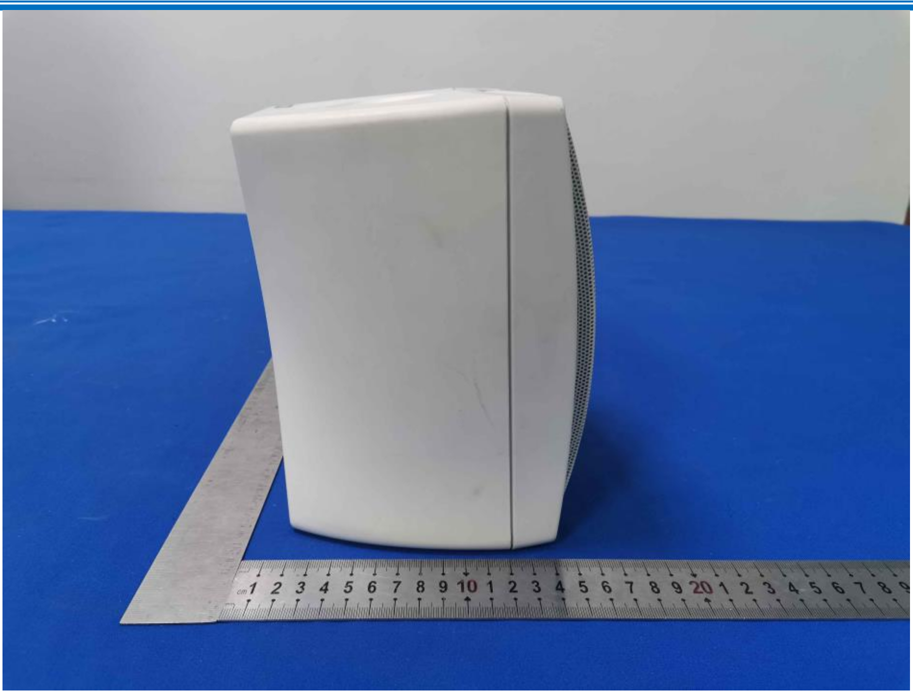




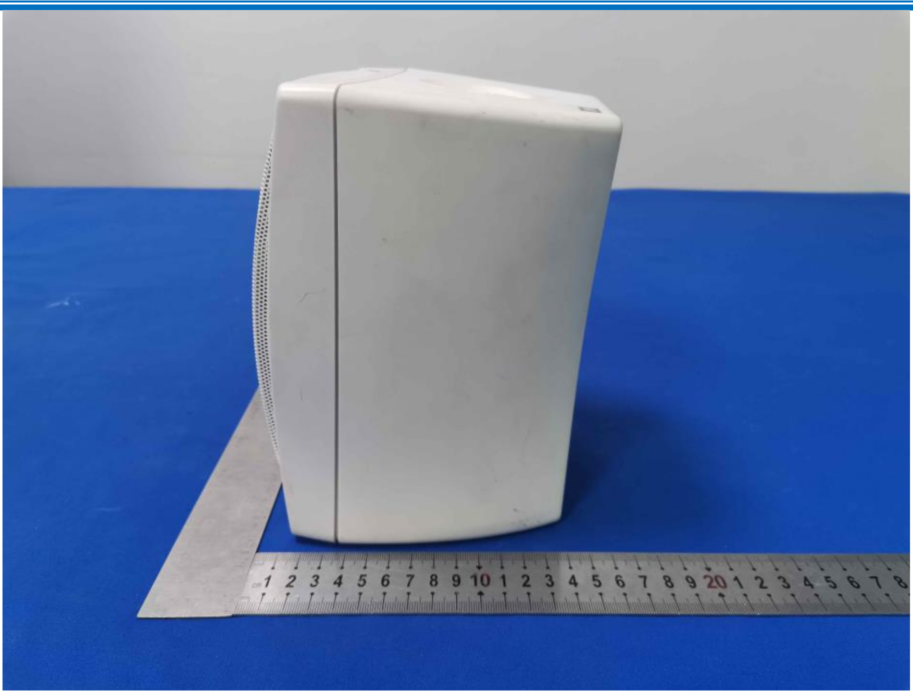
Model No.: AW-WS100

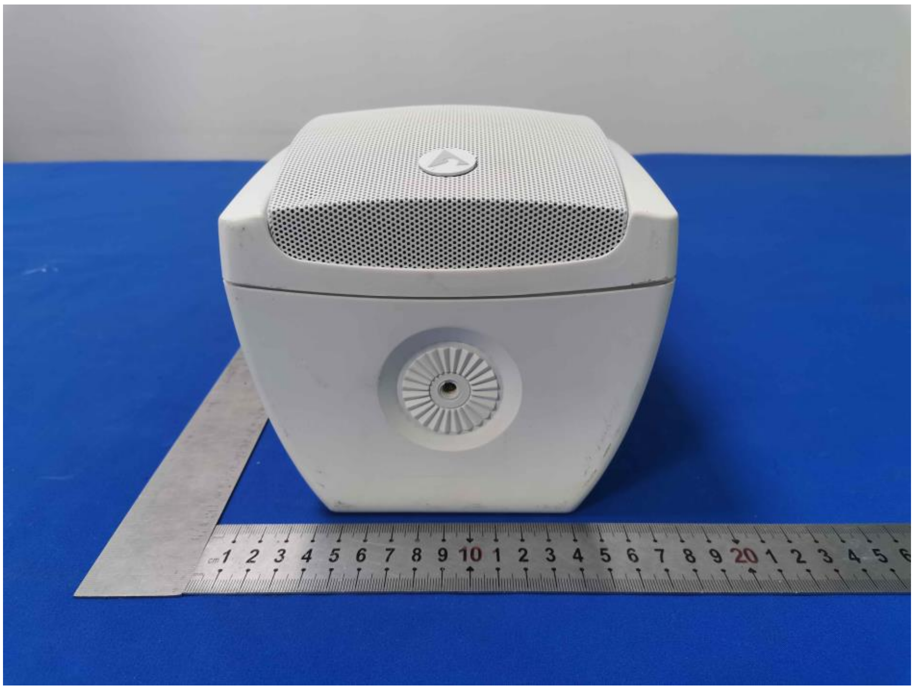

BI Switching Power Supply
Model No. : BI60-150400-E2
Input : AC 100-240V~50/60Hz 2A
Output : DC 15V ⎓ 4A
GS
CE
c UL us E301399
32HD
LISTED
I.T.E. POWER SUPPLY
FC
Tested To Comply
With FCC Standards
For Home Or Office Use
WARNING
HAZARDOUS VOLTAGES CONTAINED WITHIN.
THIS POWER SUPPLY. NOT USER SERVICEABLE.
RETURN TO SERVICE CENTER FOR REPAIR.
FOR DRY LOCATION AND INDOOR USE ONLY.
Nur fur Innenraume geeignet
MADE IN CHINA

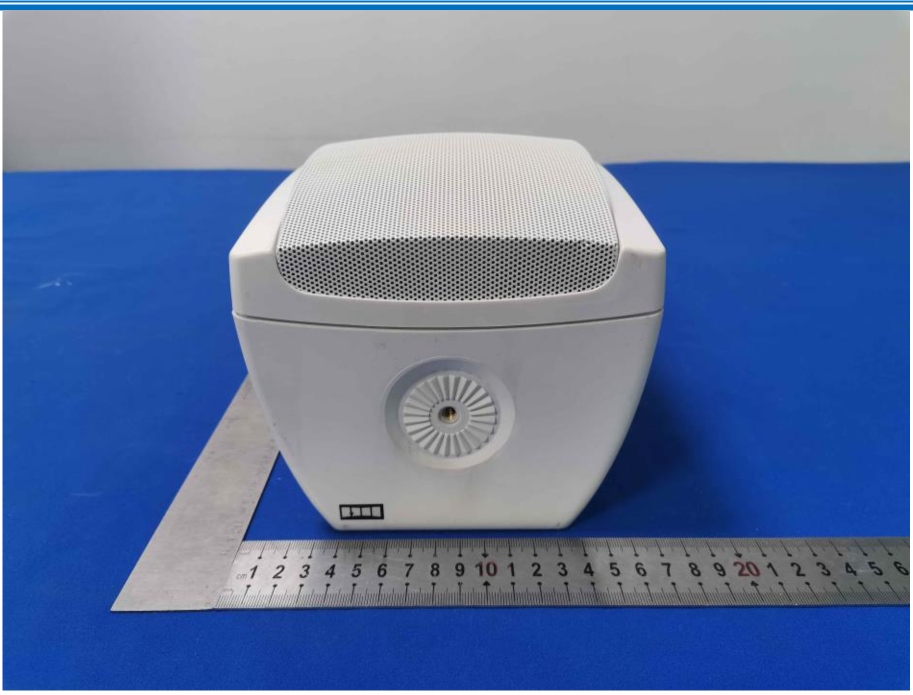


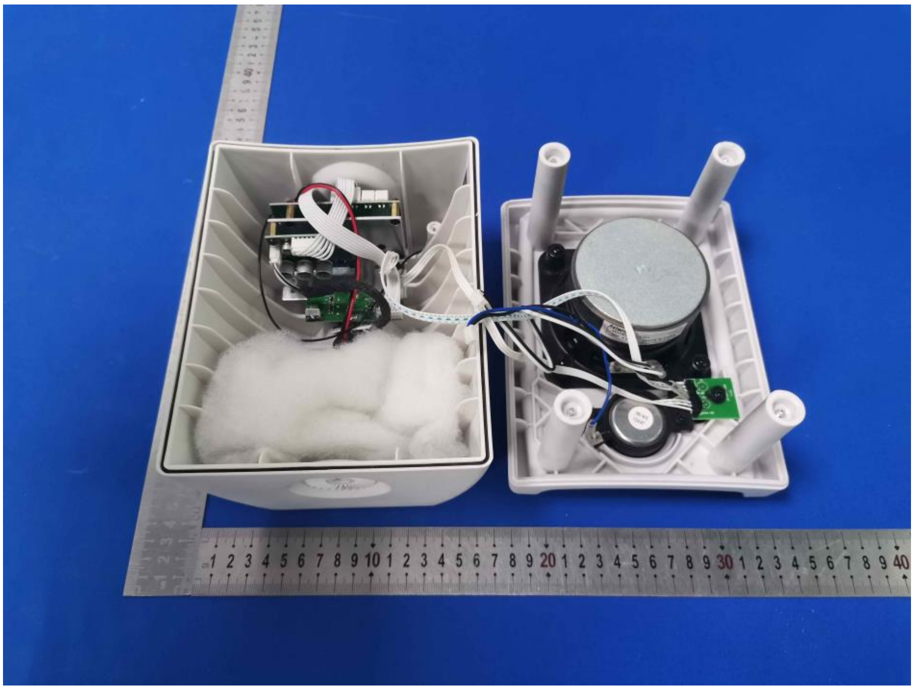


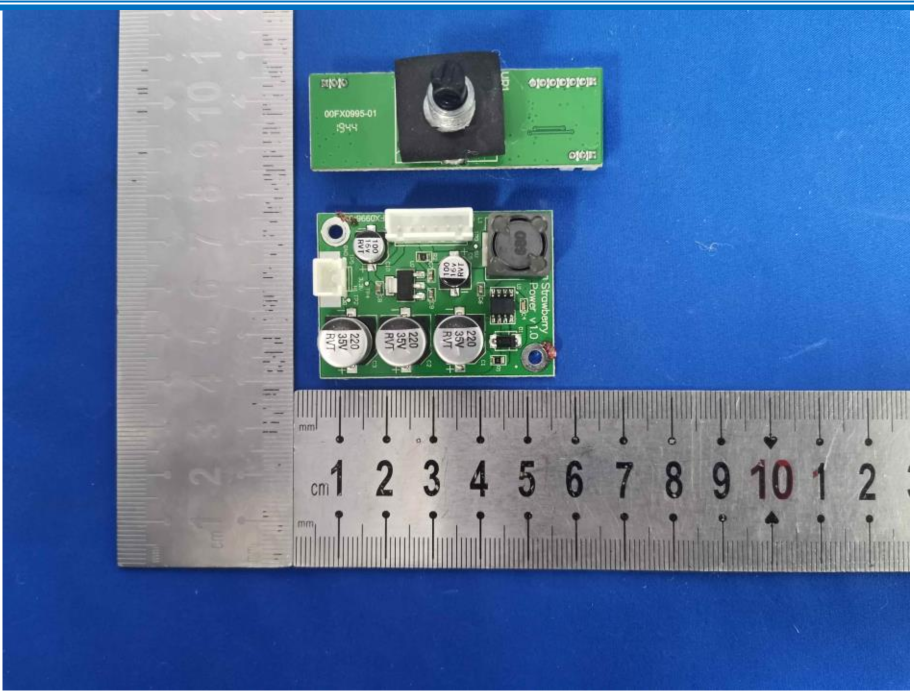

MODEL:AW-WS100
POWER
SPEAKER
L
R

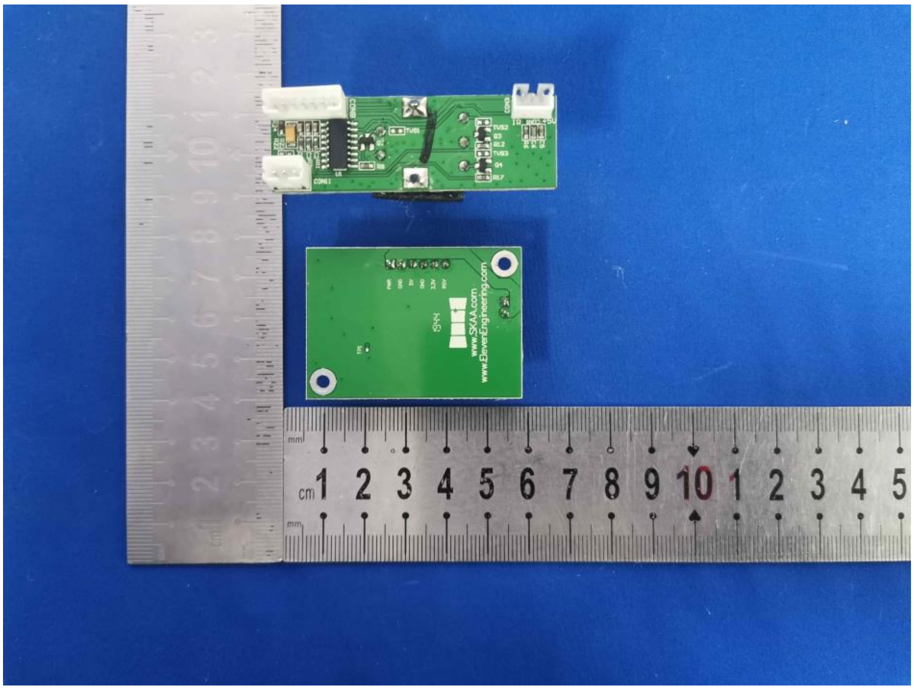


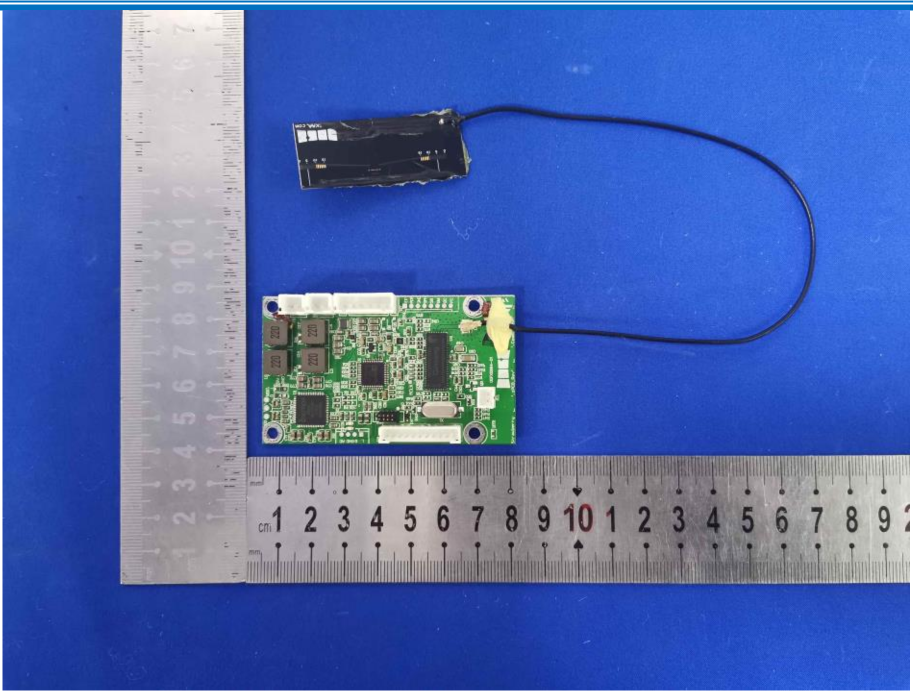


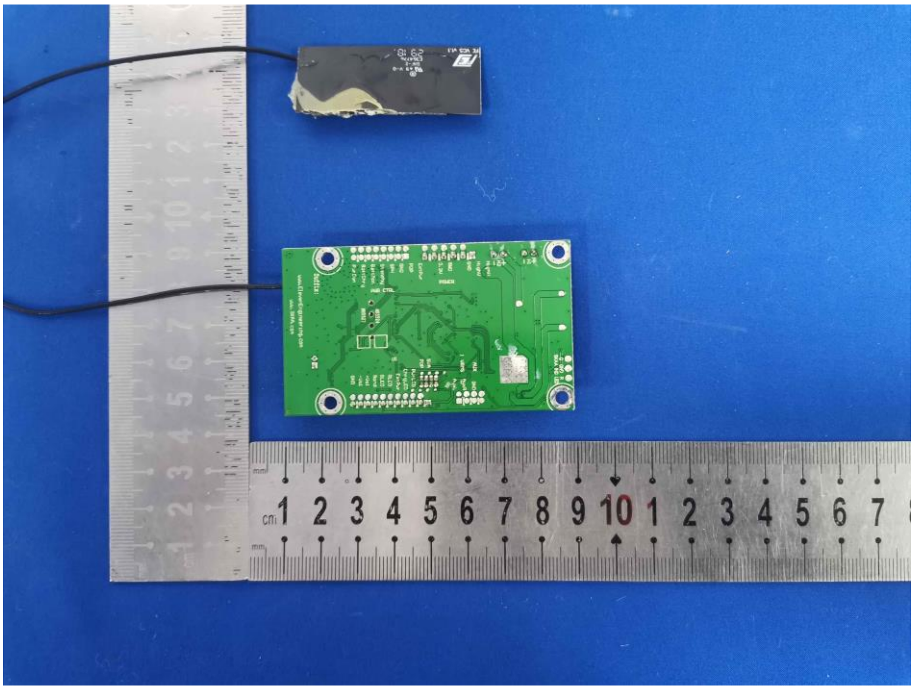












The End