

Electrolux Home Products, Inc.

RF TEST REPORT

Report Type:

FCC Part 15.225 & ISSED RSS-210 RF report

Model:

EHAW4010AG, EHAW6020AG

REPORT NUMBER:

210900634SHA-002+A1

ISSUE DATE:

September 18, 2022

DOCUMENT CONTROL NUMBER:

TTRFFCCPART15C_V1 © 2018 Intertek



Applicant: Electrolux Home Products, Inc.
10200 David Taylor Drive, Charlotte, NC 28262, United States

Manufacturer: Electrolux Home Products, Inc.
10200 David Taylor Drive, Charlotte, NC 28262, United States

FCC ID: 2A3EWEHAW4

IC: 12012A-EHAW4

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2020): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-210 Issue 10 (December 2019): Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS-Gen Issue 5 (April 2018)+A1(March 2019):General Requirements for Compliance of Radio Apparatus

PREPARED BY:

Project Engineer
Eric Li

REVIEWED BY:

Reviewer
Wakeyou Wang

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TEST REPORT

Content

REVISION HISTORY.....	4
MEASUREMENT RESULT SUMMARY	5
1 GENERAL INFORMATION	6
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	6
1.2 TECHNICAL SPECIFICATION	6
1.3 DESCRIPTION OF TEST FACILITY	7
2 TEST SPECIFICATIONS.....	8
2.1 STANDARDS OR SPECIFICATION	8
2.2 MODE OF OPERATION DURING THE TEST.....	8
2.3 TEST SOFTWARE LIST	8
2.4 TEST PERIPHERALS LIST	8
2.5 TEST ENVIRONMENT CONDITION:.....	8
2.6 INSTRUMENT LIST	9
2.7 MEASUREMENT UNCERTAINTY	10
3 SPURIOUS EMISSION	11
3.1 LIMIT	11
3.2 MEASUREMENT PROCEDURE	11
3.3 TEST CONFIGURATION	12
3.4 TEST RESULTS OF RADIATED EMISSIONS	14
4 CONDUCTED EMISSIONS	17
4.1 LIMIT	17
4.2 TEST CONFIGURATION	17
4.3 MEASUREMENT PROCEDURE	18
4.4 TEST RESULTS OF CONDUCTED EMISSIONS.....	19

Revision History

Report No.	Version	Description	Issued Date
210900634SHA-002+A1	Rev. 01	<p>This report is based on the original report 210900634SHA-002 for amendment, there is no change on the RF wireless part.</p> <p>The changes as below:</p> <p>1, add alternative cost out motor, the spec is the same as before</p> <p>2, add alternative TVOC sensor on the RFID board, the spec is the same as before</p> <p>3, remove TVS on control board and RFID board</p> <p>Construction checked and after review, we test the Radiated Emissions of 9kHz-1GHz and conducted emission for RFID.</p>	September 18, 2022

TEST REPORT

Measurement result summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Fundamental emission	15.225(a) (b) (c)	RSS-210 Annex B.6(a) (i) (ii) (iii)	Pass*
Spurious emission	15.225(d)	RSS-210 Annex B.6(a) (iiii)	Pass
Frequency stability	15.225(e)	RSS-210 Annex B.6(b)	Pass*
Conducted emissions	15.207	RSS-GEN Clause 8.8	Pass
99% and 20dB Bandwidth	15.215(c)	RSS-GEN Clause 6.7	Pass*
Antenna requirement	15.203	-	Pass*

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: "*" means this test is no need and not performed within this report, and the result can refer to the original report(s).

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Air Purifier
Type/Model/PMN/HVIN:	EHAW4010AG, EHAW6020AG
Description of EUT:	<p>This report is based on the original report 210900634SHA-002 for amendment, there is no change on the RF wireless part.</p> <p>The changes as below:</p> <p>1, add alternative cost out motor, the spec is the same as before</p> <p>2, add alternative TVOC sensor on the RFID board, the spec is the same as before</p> <p>3, remove TVS on control board and RFID board</p> <p>Construction checked and after review, we test the Radiated Emissions of 9kHz-1GHz and conducted emission for RFID.</p>
Rating:	120V~, 60Hz
EUT type:	<input type="checkbox"/> Table top <input checked="" type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample Identification No.:	0220817-06-002
Sample received date:	August 17, 2022
Date of test:	August 18, 2022~ August 23, 2022

1.2 Technical Specification

Operation Frequency:	13.56MHz
Type of Modulation:	ASK
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Channel Number:	1
Antenna Designation:	Integral PCB antenna, non-user removable
Gain of Antenna:	0dBi max (Declared by manufacture)

TEST REPORT

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

TEST REPORT

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)

ANSI C63.10 (2013)

RSS-210 Issue 10 (December 2019)

RSS-Gen Issue 5 (April 2018)+A1(March 2019)

2.2 Mode of operation during the test

While testing, the internal modulation and continuously transmission was applied.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No	Description	Band and Model	S/No
1	/	/	/
2	/	/	/

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	25°C	51% RH
Power line conducted emission	25°C	51% RH

TEST REPORT

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2023-07-15
<input checked="" type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2022-11-30
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2022-01-07
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2022-09-15
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2022-09-23
<input checked="" type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2023-03-24
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross	-	EC 3048	2023-07-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2023-01-05
<input checked="" type="checkbox"/>	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2023-01-05

TEST REPORT

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Occupied Channel Bandwidth	$\pm 0.88 \%$
Power line conducted emission	$\pm 3.19\text{dB}$

TEST REPORT

3 Spurious Emission

Test result: Pass

3.1 Limit

Frequencies (MHz)	Field Strength (microvolts/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

3.2 Measurement Procedure

For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, the lowest height of the magnetic antenna was 1 m above the ground.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna 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

TEST REPORT

set to make the measurement.

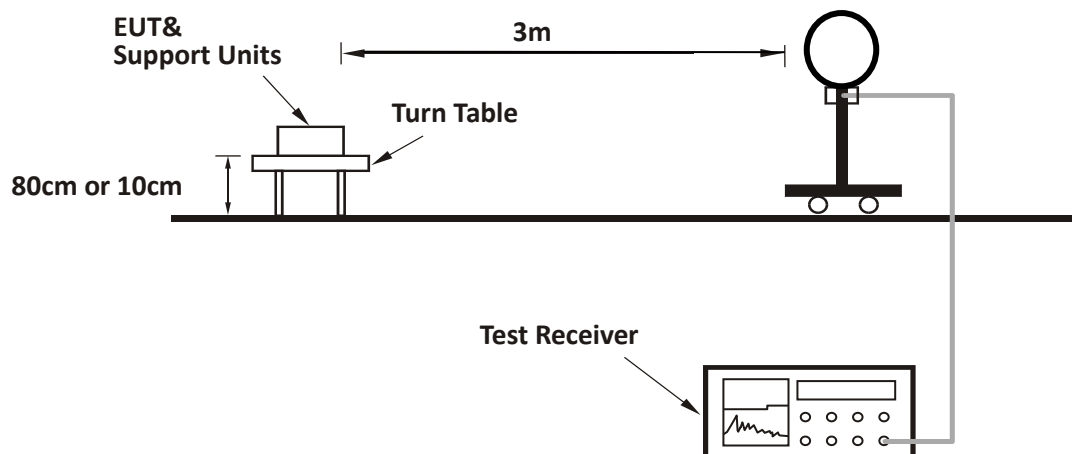
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were evaluated and the worst-case emissions were reported

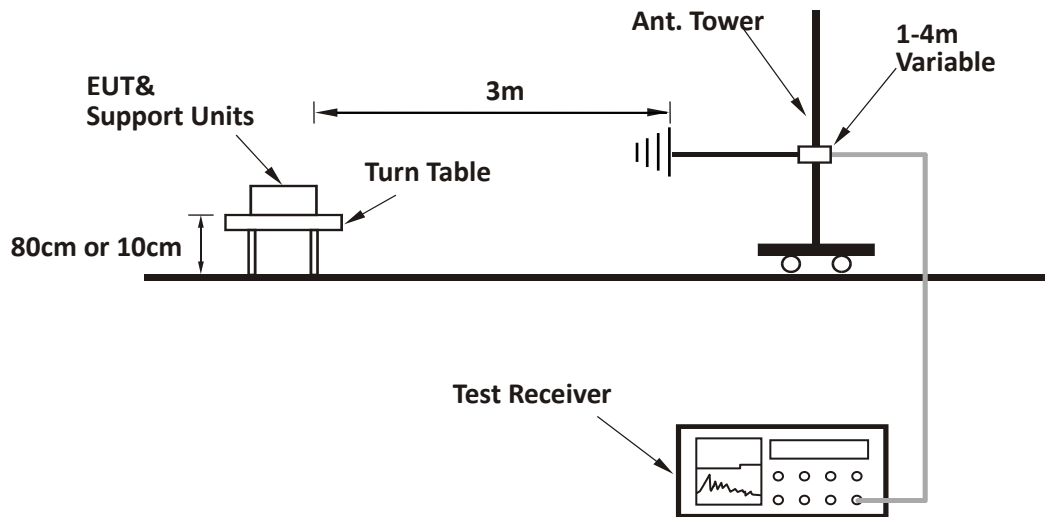
3.3 Test Configuration

For Radiated emission below 30MHz:

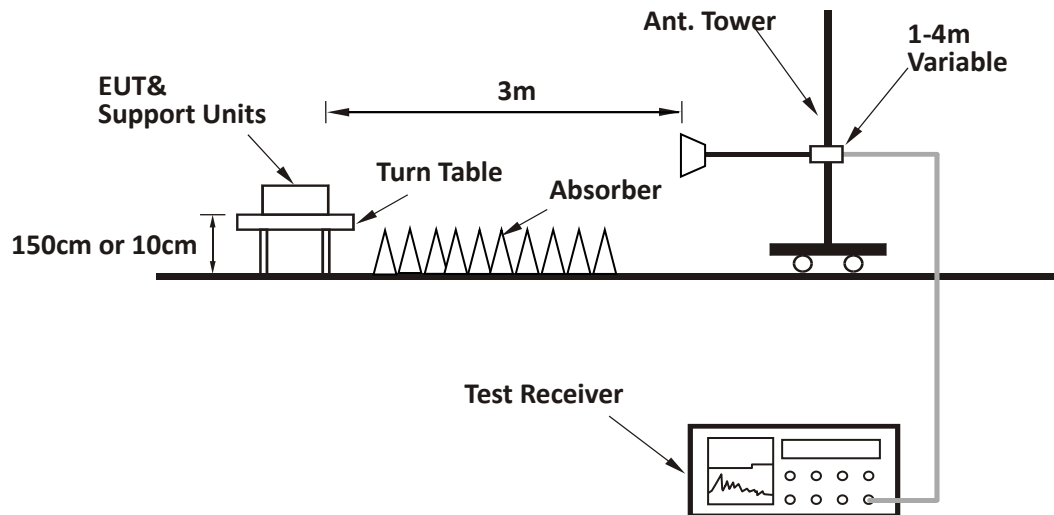


TEST REPORT

For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

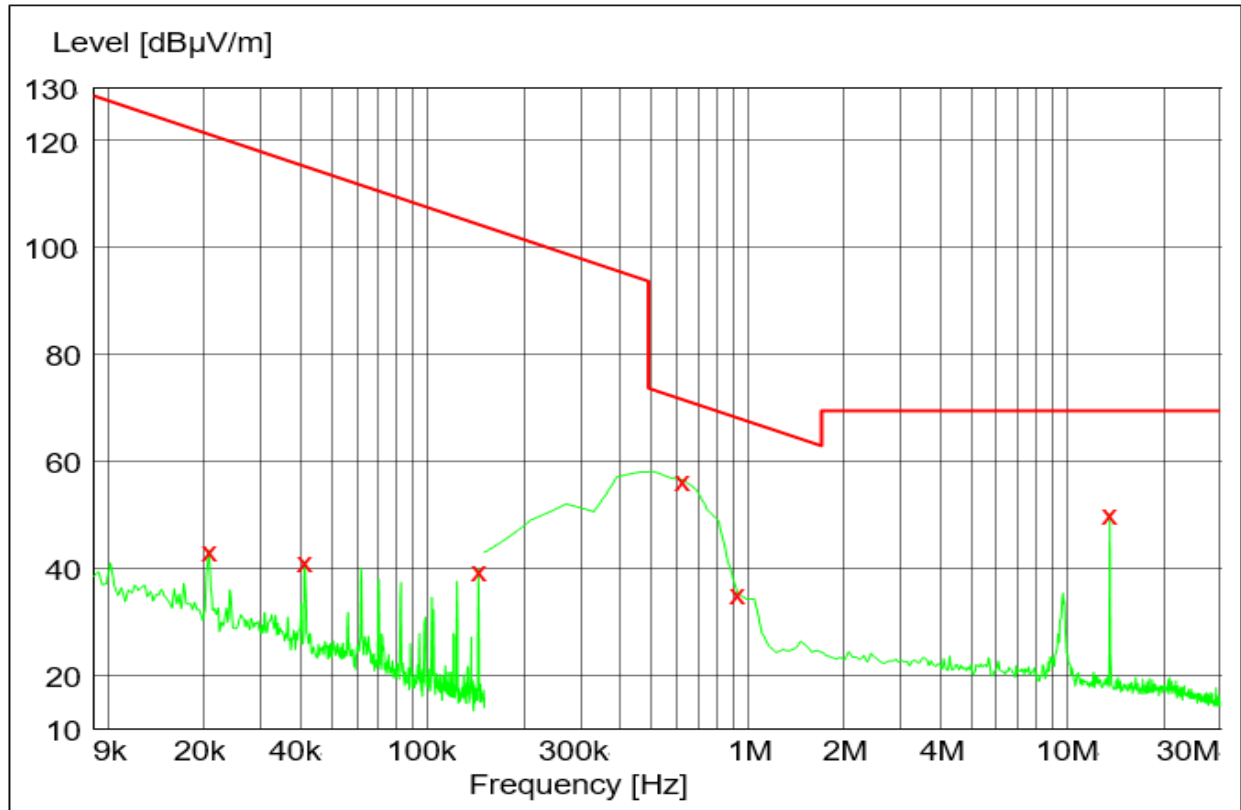


TEST REPORT

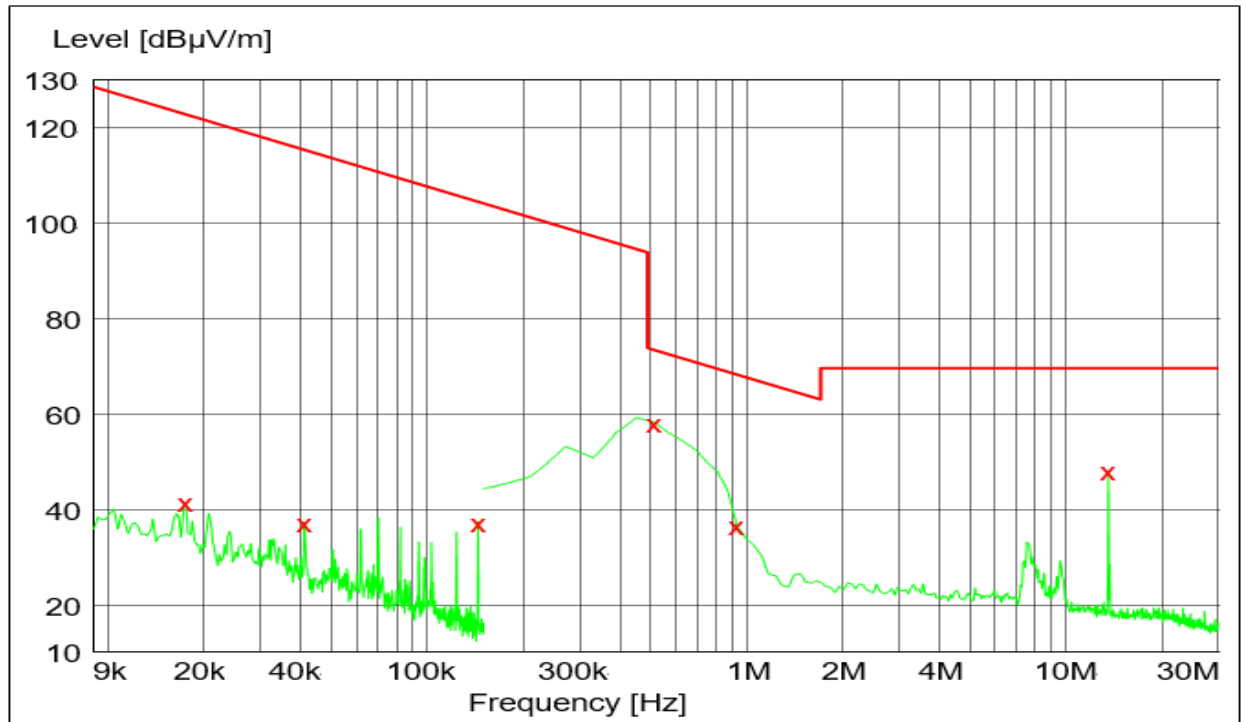
3.4 Test Results of Radiated Emissions

below 30MHz:

X



Y

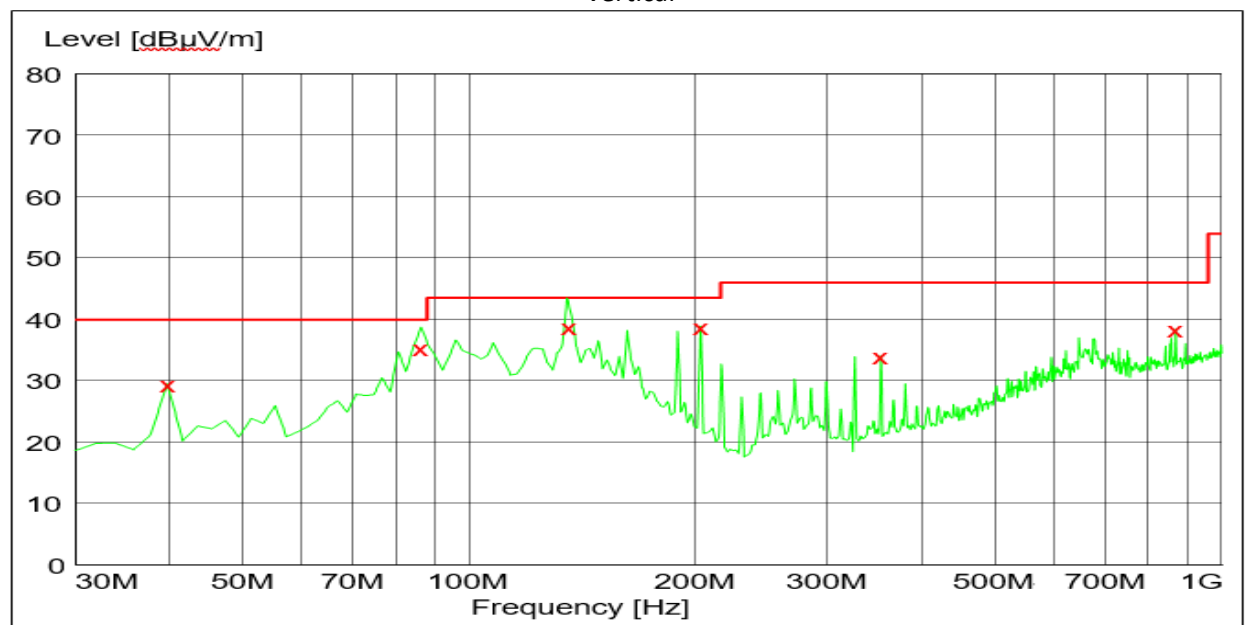
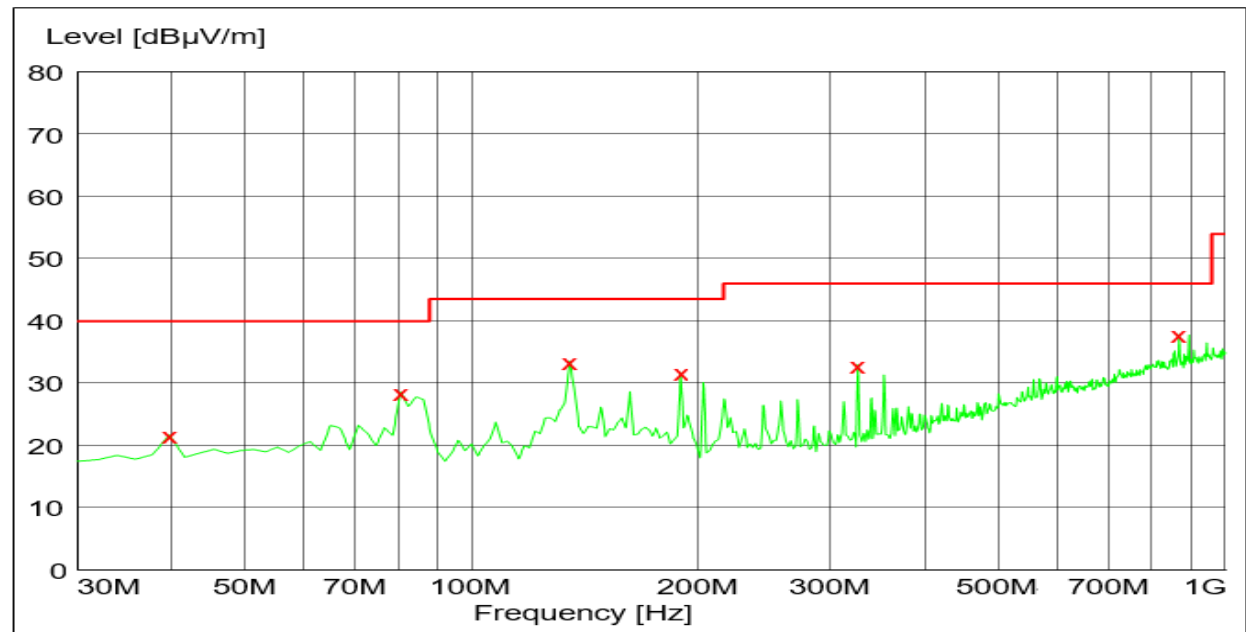


TEST REPORT

Test data

Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector	Remark
X	0.14	39.90	10.60	104.40	64.50	PK	Spurious
X	0.63	56.60	10.60	71.60	15.00	PK	Spurious
X	0.93	35.40	11.30	68.30	32.90	PK	Spurious
Y	0.14	37.40	10.60	104.40	67.00	PK	Spurious
Y	0.51	58.30	10.60	73.50	15.20	PK	Spurious
Y	0.93	36.70	11.30	68.30	31.60	PK	Spurious

30MHz to 1000MHz:



TEST REPORT

Test data

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	39.72	21.70	13.80	40.00	18.30	PK
H	80.54	28.60	9.90	40.00	11.40	PK
H	134.97	33.50	13.50	43.50	10.00	PK
H	189.40	31.70	12.20	43.50	11.80	PK
H	325.47	33.00	15.80	46.00	13.00	PK
H	867.82	37.80	26.00	46.00	8.20	PK
V	39.72	29.60	13.80	40.00	10.40	PK
V	86.37	35.50	9.20	40.00	4.50	QP
V	135.63	39.00	13.50	43.50	4.50	QP
V	203.01	38.90	11.40	43.50	4.60	PK
V	352.69	34.10	16.50	46.00	11.90	PK
V	867.82	38.40	26.00	46.00	7.60	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

TEST REPORT

4 Conducted emissions

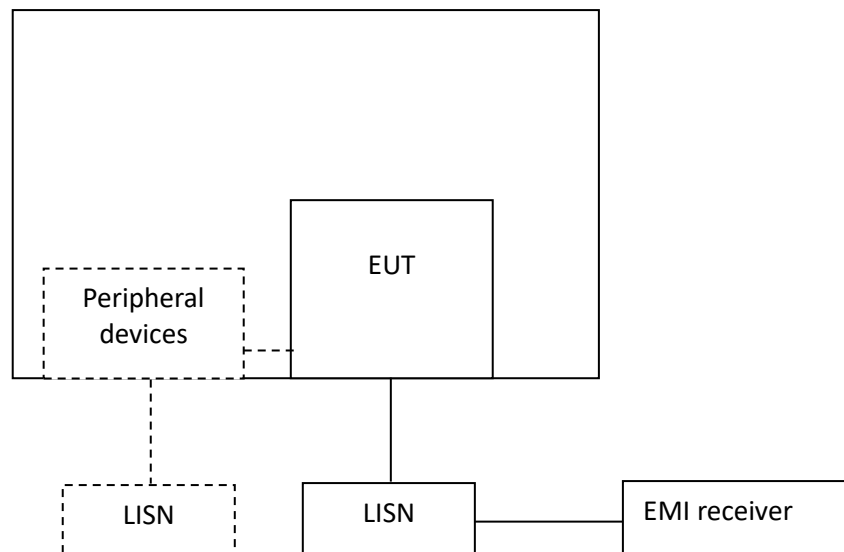
Test result: Pass

4.1 Limit

Frequency of Emission (MHz)	Conducted Emissions Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.2 Test Configuration



TEST REPORT**4.3 Measurement Procedure**

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

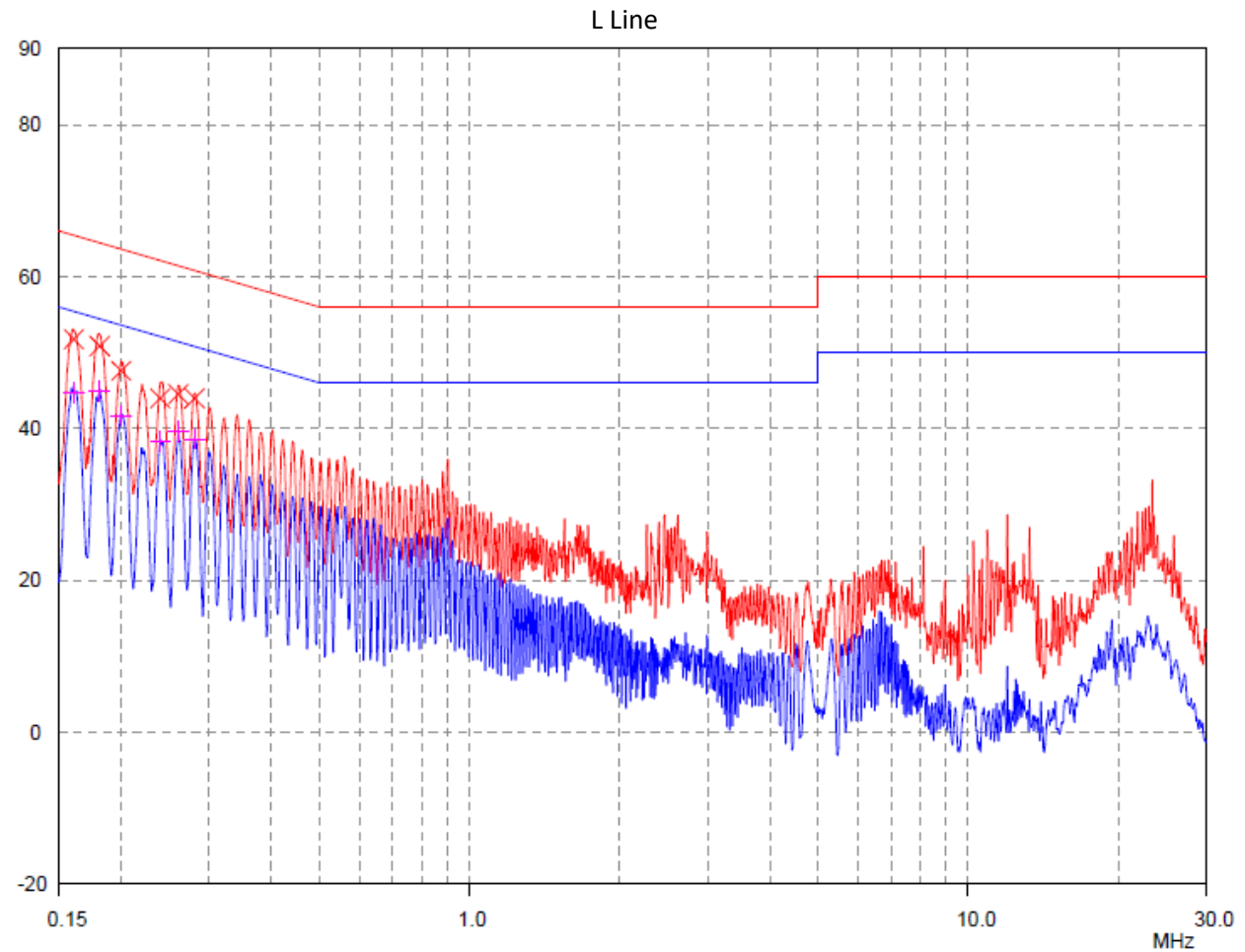
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

TEST REPORT

4.4 Test Results of Conducted Emissions

Test Curve:

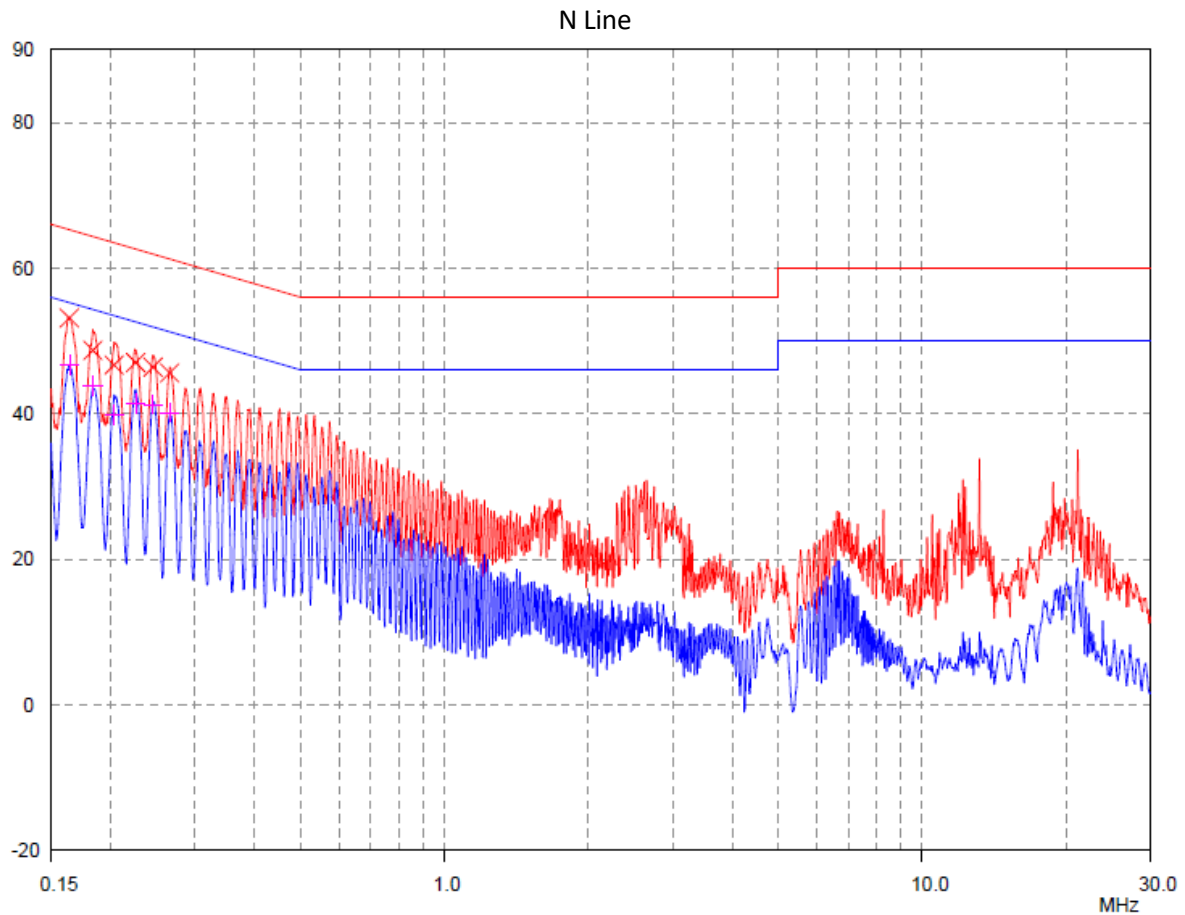


Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.16	51.76	65.44	13.68	44.76	55.44	10.68
0.18	50.87	64.44	13.57	44.93	54.44	9.51
0.20	47.59	63.61	16.02	41.69	53.61	11.92
0.24	43.99	62.12	18.13	38.30	52.12	13.82
0.26	44.54	61.42	16.88	39.61	51.42	11.81
0.28	43.99	60.79	16.80	38.62	50.79	12.17

TEST REPORT

Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.16	53.15	65.27	12.12	46.74	55.27	8.53
0.18	48.71	64.34	15.63	43.86	54.34	10.48
0.20	46.71	63.48	16.77	39.86	53.48	13.62
0.23	47.03	62.62	15.59	41.46	52.62	11.16
0.25	46.41	61.92	15.51	41.22	51.92	10.70
0.27	45.62	61.26	15.64	40.18	51.26	11.08

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

***** END *****