Duracell U.S. Operations, Inc.

RF TEST REPORT

Report Type:
FCC Part 15C RF report

Model:
MAA150W-91Wh

REPORT NUMBER:
231000635SHA-001

ISSUE DATE:
October 21, 2023

DOCUMENT CONTROL NUMBER:
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Intertek Testing Services Shanghai
Building No.86, 1198 Qinzhou Road (North)
Caohejing Development Zone
Shanghai 200233, China

Telephone: 86 21 6127 8200
www.intertek.com

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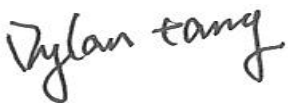
TEST REPORT

Report no.: 231000635SHA-001

Applicant	:	Duracell U.S. Operations, Inc. Berkshire Corporate Park, 14 Research Drive, BETHEL CT 06801
Manufacturer	:	Duracell U.S. Operations, Inc. Berkshire Corporate Park, 14 Research Drive, BETHEL CT 06801
Manufacturer Site	:	NanChang Innotech International Co., Ltd Building No.6, Guowei Industrial Park, No.669 Huangtang E Rd, Linkong Economic Zone, NANCHANG, Jiangxi
Type/Model:	:	MAA150W-91Wh
FCC ID	:	2AMUD-M150

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2021): Radio Frequency Devices (Subpart C) **ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
	
Project Engineer Dylan Tang	Reviewer Wakeyou Wang

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Content

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Revision History

Report No.	Version	Description	Issued Date
231000635SHA-001	Rev. 01	Initial issue of report	October 21, 2023

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Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Radiated emissions	15.209	Pass
Conducted emissions	15.207	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: Additions, Deviations and Exclusions from Standards: None.

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Portable Power Station
Type/Model:	MAA150W-91Wh
Description of EUT:	The EUT is Portable Power Station which supports Wireless Charger function, it has only one model.
Rating:	91.25Wh, 18.25V, 5Ah Dock Input: 24VDC 2.5A (60W Max.) USB-C Input/Output: 5VDC 3A, 9VDC 3A, 15VDC 3A, 20VDC 3A, 20VDC 5A (Input: 60W Max. / Output: 100W Max.) USB-C Output: 5VDC 3A, 9VDC 3A, 15VDC 3A, 20VDC 3A (60W Max.) USB-Ax2 Output: 5VDC 3A, 9VDC 3A, 12VDC 3A, 20VDC 3A (60W Max.) Wireless charger output: 15W Max. DC total output: 148W Max. Ring Light: 2W Max.
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Software Version:	0
Hardware Version:	V2
Sample received date:	October 17, 2023
Date of test:	October 17, 2023 ~ October 21, 2023

1.2 Technical Specification

Frequency Range:	111kHz – 145kHz
Modulation:	ASK
Antenna:	Inductive loop coil antenna

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.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency are specified if used.

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.	Name	Brand and Model	Description
1	Wireless load	Iphone X	100% power level
2	Wireless load	Iphone X	50% power level
3	Wireless load	Iphone X	0% power level

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	25°C	54% RH
Power line conducted emission	24°C	54% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☑	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☐	A.M.N.	R&S	ENV4200	EC 3558	2024-06-04
☑	Attenuator	Huaxiang	Ts5-10db-6g	EC 6194-1	2023-12-07
☑	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
☑	Test Receiver	R&S	ESR	EC6501	2024-09-05
☑	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-08-23
☐	Horn antenna	Tonscend	bha9120d	EC 6432-2	2024-02-15
☐	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-07
☐	Horn antenna	ETS	3117	EC 4792-1	2024-08-28
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2024-07-29
☑	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☑	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

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.

Measurement	Frequency	Expanded Uncertainty (k=2)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB

TEST REPORT

3 Radiated emissions

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:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
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) Both X and Y axes of the antenna are set to make the measurement.
d) 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.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz:

a) 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 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

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 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

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.

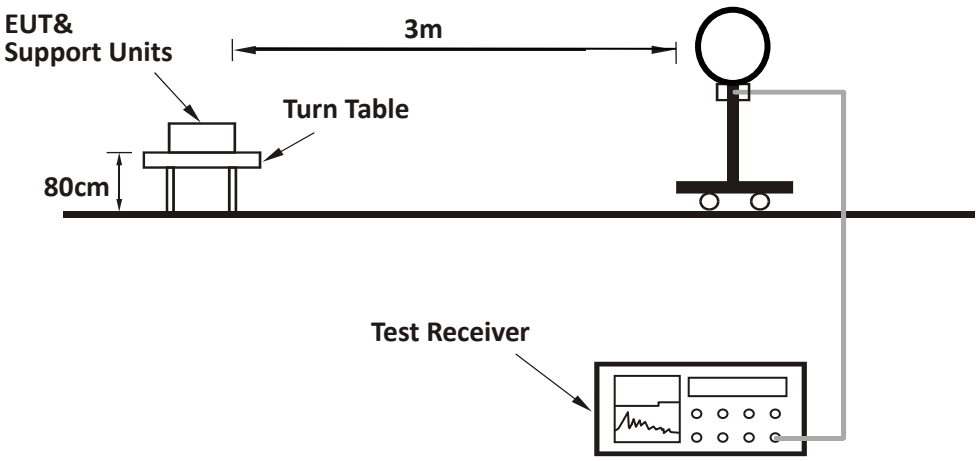
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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:



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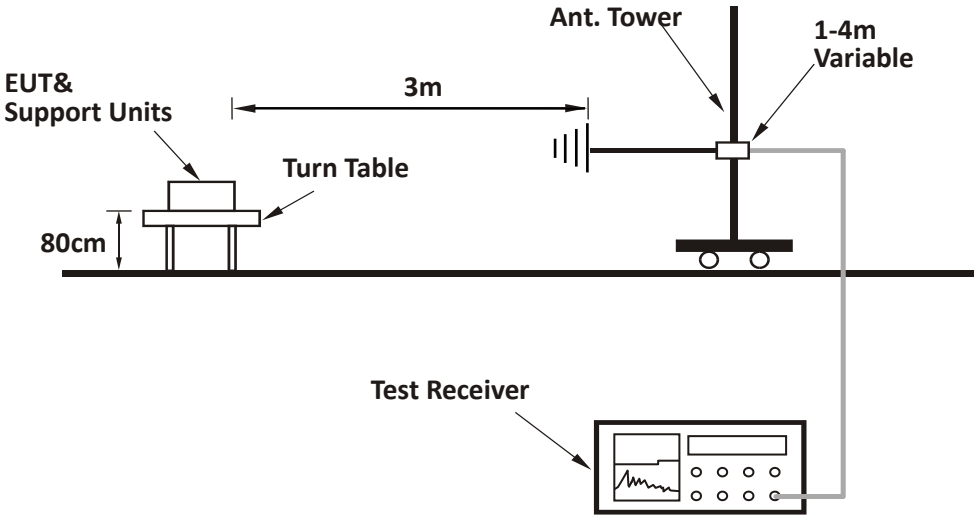
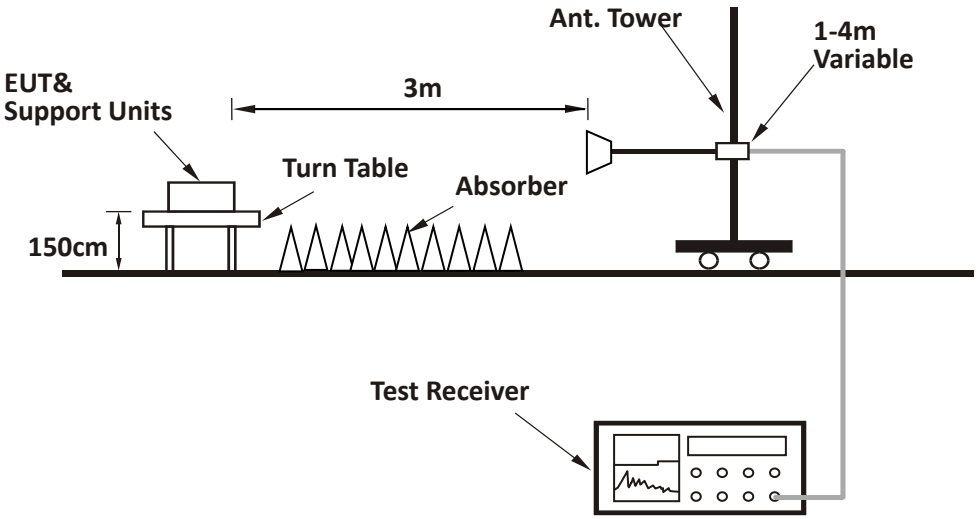
For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



3.4 Test Results of Radiated Emissions

EUT was tested with empty load, half load and full load, the full load is the worst case and we listed the results in the report.

Test data below 30MHz:

Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector	Remark
X	0.1284	75.1	20.1	105.4	30.3	PK	Fundamental
X	0.0099	57.8	20.1	127.7	69.9	PK	Spurious
X	0.5190	66.2	20.2	73.3	7.1	PK	Spurious
X	0.6090	63.5	20.2	71.9	8.4	PK	Spurious
X	0.7080	61.5	20.2	70.6	9.1	PK	Spurious
X	0.8160	51.4	20.1	69.4	18	PK	Spurious
X	7.521	42.3	20.4	69.5	27.2	PK	Spurious
Y	0.1285	74.5	20.1	105.4	30.9	PK	Fundamental
Y	0.1010	70.0	20.1	127.5	57.5	PK	Spurious
Y	0.5010	67.8	20.2	73.6	5.8	PK	Spurious
Y	0.5865	66.7	20.2	72.2	5.5	PK	Spurious
Y	0.7215	60.2	20.1	70.4	10.2	PK	Spurious
Y	7.521	53.4	20.4	69.5	16.1	PK	Spurious
Y	10.455	48.1	20.4	69.5	21.4	PK	Spurious
Z	0.1285	74.1	20.1	105.4	31.3	PK	Fundamental
Z	0.0239	51.7	20.1	120.0	68.3	PK	Spurious
Z	0.4740	66.1	20.2	94.1	28.0	PK	Spurious
Z	0.5370	65.8	20.2	73.0	7.2	PK	Spurious
Z	0.6270	63.9	20.2	71.7	7.8	PK	Spurious
Z	0.7260	62.0	20.1	70.4	8.4	PK	Spurious
Z	7.323	39.5	20.4	69.5	30.0	PK	Spurious

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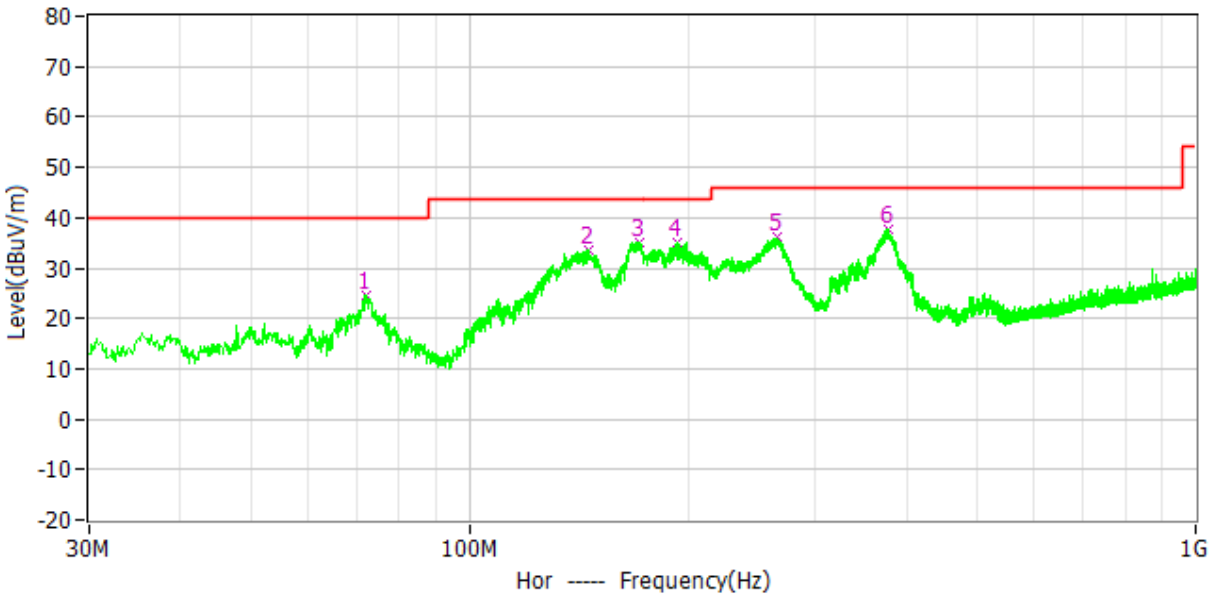
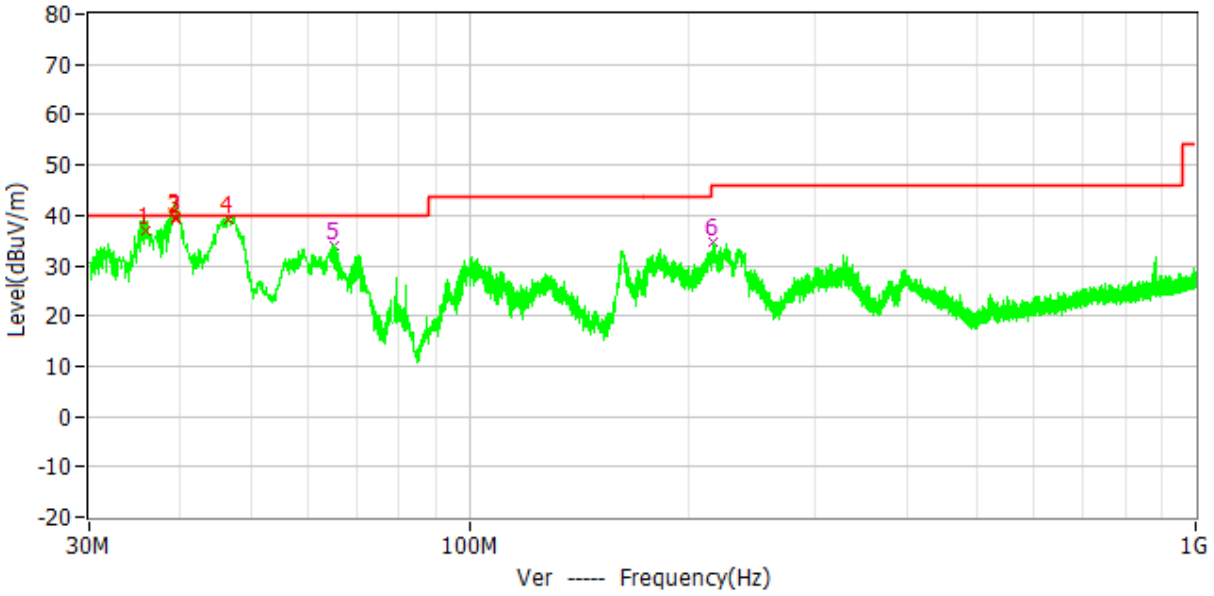
Horizontal



Vertical



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Test data from 30MHz to 1000MHz:

Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector
H	72.292	24.7	12.0	40.0	15.3	QP
H	146.109	33.7	14.2	43.5	9.8	QP
H	171.426	35.2	13.7	43.5	8.3	QP
H	192.960	35.2	12.0	43.5	8.3	QP
H	265.710	36.0	13.9	46.0	10.0	QP
H	376.872	37.7	17.0	46.0	8.3	QP
V	38.730	31.9	13.6	40.0	8.1	QP
V	47.945	36.2	14.3	40.0	3.8	QP
V	71.613	35.1	12.1	40.0	4.9	QP
V	150.280	38.9	14.3	43.5	4.6	QP
V	171.135	36.9	13.7	43.5	6.6	QP
V	261.151	33.6	13.7	46.0	12.4	QP

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.

TEST REPORT

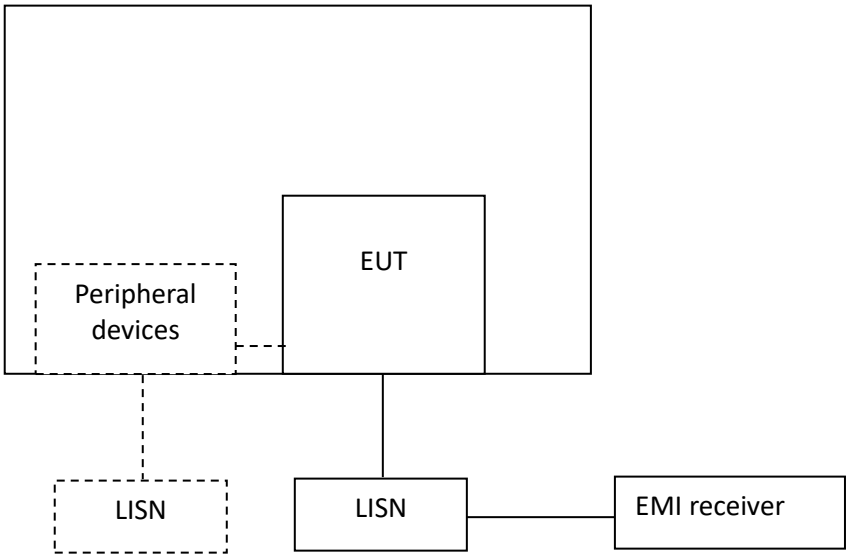
4 Conducted emissions

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



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.

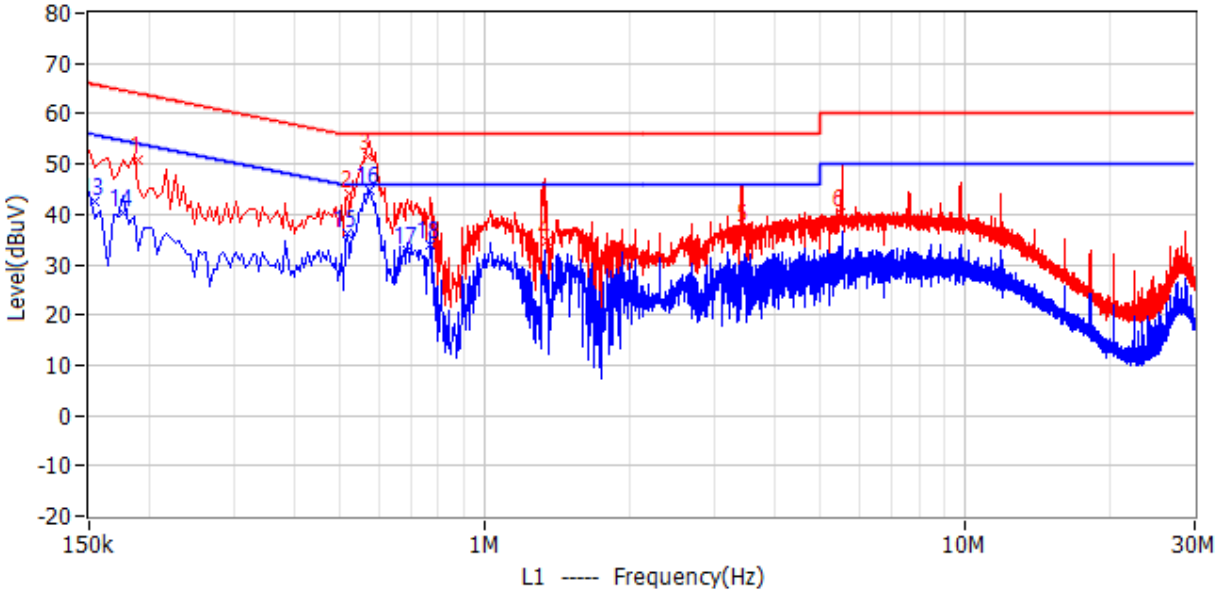
The bandwidth of the test receiver is set at 9 kHz.

4.4 Test Results of Conducted Emissions

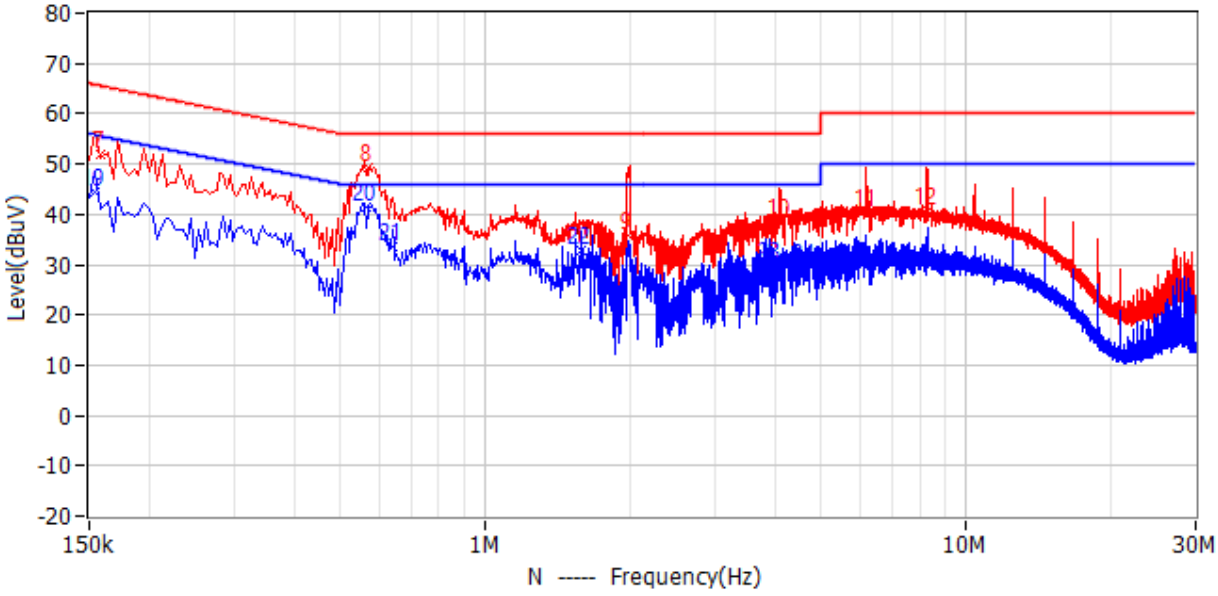
EUT was tested with empty load, half load and full load, the full load is the worst case and we listed the results in the report.

Test Curve:

L Line



N Line



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Test Data:

No.	Frequency	Limit dBuV	Level dBuV	Margin dB	Reading dBuV	Factor dB	Detector	Phase
1	190.500kHz	64.0	50.8	13.3	44.5	6.3	QP	L1
2	519.000kHz	56.0	44.0	12.0	37.7	6.3	QP	L1
3	568.500kHz	56.0	51.5	4.5	45.2	6.3	QP	L1
4	1.343MHz	56.0	34.6	21.4	28.3	6.3	QP	L1
5	3.467MHz	56.0	37.3	18.7	31.0	6.3	QP	L1
6	5.519MHz	60.0	40.2	19.8	33.8	6.4	QP	L1
7	159.000kHz	65.5	51.9	13.6	45.6	6.3	QP	N
8	568.500kHz	56.0	49.4	6.6	43.2	6.2	QP	N
9	1.982MHz	56.0	35.7	20.3	29.4	6.3	QP	N
10	4.101MHz	56.0	38.6	17.4	32.2	6.4	QP	N
11	6.243MHz	60.0	40.4	19.6	34.0	6.4	QP	N
12	8.349MHz	60.0	40.7	19.3	34.3	6.4	QP	N
13	154.500kHz	55.8	42.7	13.0	36.5	6.2	AV	L1
14	177.000kHz	54.6	40.4	14.3	34.2	6.2	AV	L1
15	514.500kHz	46.0	36.1	9.9	29.9	6.2	AV	L1
16	577.500kHz	46.0	44.7	1.3	38.4	6.3	AV	L1
17	690.000kHz	46.0	32.8	13.2	26.5	6.3	AV	L1
18	771.000kHz	46.0	34.1	11.9	27.8	6.3	AV	L1
19	154.500kHz	55.8	44.3	11.5	38.0	6.3	AV	N
20	564.000kHz	46.0	41.3	4.7	35.1	6.2	AV	N
21	640.500kHz	46.0	33.5	12.5	27.2	6.3	AV	N
22	1.581MHz	46.0	32.9	13.1	26.6	6.3	AV	N
23	3.930MHz	46.0	29.7	16.3	23.3	6.4	AV	N
24	4.650MHz	46.0	29.6	16.4	23.2	6.4	AV	N

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

2. Reading = Original Receiver Reading + Factor

3. Margin = Limit - Level

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

5 Antenna requirement

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.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

********** END **********