IKEA of Sweden AB

TEST REPORT

SCOPE OF WORK
EMC TESTING–LED2124T4

REPORT NUMBER
211112269GZU-001

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TEST REPORT

Applicant Name & Address	:	IKEA of Sweden AB Box 702, SE-343 81 Älmhult, Sweden
Manufacturing Site	:	Dongguan Kee Tat Lighting Limited Kai Shek Cheng, DONGGUAN Guangdong Province 523000, China
Manufacturing Site 2		KEE TAT INNOVATIVE TECHNOLOGY HOLDINGS LTD No.2, Mowujiweigongye Road, Qishi Town, DONGGUAN CITY, Guangdong Province 523000, China
Intertek Report No	:	211112269GZU-001

Test standards

CFR 47, FCC Part 15, Subpart B: 2019

Sample Description

Product	:	Self-ballasted LED lamp
Model No.	:	LED2124T4
Electrical Rating	:	120V, 60Hz, 4W, 60mA, E26 base, 10pcs LEDs.
Serial No.		Not Labeled
Date Received	:	12 November 2021
Date Test Conducted	:	12 November 2021-27 January 2022

Prepared and Checked By

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Engineer

Approved By:

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Jackson Zhang

Sr. Project Engineer

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1. TEST RESULTS SUMMARY

Classification of EUT: Class B

Test Item	Standard	Result
Conducted disturbance voltage at mains ports	**CFR 47, FCC Part 15, Subpart B**	**Pass**
Radiated emission (30 MHz–1 GHz)	**CFR 47, FCC Part 15, Subpart B**	**Pass**
Radiated emission (Above 1 GHz)	**CFR 47, FCC Part 15, Subpart B**	**N/A**
Remark: Reference publication is used for methods of measurement: ANSI C63.4:2014		

Remark:

1. The symbol “N/A” in above table means Not Applicable.
2. When determining the test results, measurement uncertainty of tests has been considered.

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2. EMC RESULTS CONCLUSION

RE: EMC Testing Pursuant to FCC part 15 performed on the Self-ballasted LED lamp, Models: LED2124T4.

We tested the Self-ballasted LED lamp, Model: LED2124T4 to determine if it was in compliance with the relevant standards as marked on the Test Results Summary. We found that the unit met the requirement of FCC part 15 standard when tested as received. The worst case's test data was presented in this test report.

The production units are required to conform to the initial sample as received when the units are placed on the market.

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3. LABORATORY MEASUREMENTS

Configuration Information

Support Equipment: N/A

Notes:

Rated Voltage and frequency under test: 120 V~; 60 Hz

Condition of Environment: Temperature: 22~28°C
Relative Humidity:35~60%
Atmosphere Pressure:86~106kPa

1. The EMI measurements had been made in the operating mode produced the largest emission in the frequency band being investigated consistent with normal applications. An attempt had been made to maximize the emission by varying the configuration of the EUT.

2. Test Facility accreditation:
A2LA Certificate Number 0078.10
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch is accredited by A2LA and Listed in FCC website. FCC accredited test labs may perform both Certification testing under Parts 15 and 18 and Declaration of Conformity testing.

3. Test Location:
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch
All tests were performed at:
Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Except Radiated Emissions was performed at:
Room 102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China

4. Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conducted Emission (9 kHz-150 kHz)	2.79 dB
2	Conducted Emission (150 kHz-30 MHz)	2.55 dB
3	Disturbance Power (30 MHz-300 MHz)	3.04 dB
4	Radiated Emission (30 MHz-1 GHz)	4.80 dB
5	Radiated Emission (1 GHz-6 GHz)	4.97 dB
6	Radiated Emission (6 GHz-18 GHz)	4.89 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty is calculated in accordance with CISPR16-4-2:2011+A1:2014 +A2:2018.
The measurement uncertainty is given with a confidence of 95%, k=2.
Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

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4. EQUIPMENT USED DURING TEST

Conducted Disturbance-Mains Terminal (2)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM080-04	EMI receiver	ESCS30	R&S	1Y
EM031-04	EMI receiver	ESR3	R&S	1Y
EM006-06	LISN	ENV216	R&S	1Y
SA047-111	Digital Temperature-Humidity Recorder	RS210	YIJIE	1Y
EM004-03	EMC shield Room	8m×4m×3m	Zhongyu	1Y
EM031-04-01	EMC32 software (CE)	V10.01.00	R&S	N/A

Radiated Disturbance（30 MHz-1 GHz）

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM030-04	3m Semi-Anechoic Chamber	9×6×6 m3	ETS-LINDGREN	1Y
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	1Y
EM033-01	TRILOG Super Broadband test Antenna（30 MHz-3 GHz）	VULB 9163	SCHWARZBECK	1Y
EM031-02-01	Coaxial cable	/	R&S	1Y
EM036-01	Common-mode absorbing clamp	CMAD 20B	TESEQ	1Y
SA047-118	Digital Temperature-Humidity Recorder	RS210	YIJIE	1Y
EM045-01-01	EMC32 software (RE/RS)	V10.01.00	R&S	N/A

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Detail of the equipment calibration due date:

Equipment No.	Cal. Due date (DD-MM-YYYY)
Conducted Disturbance-Mains Terminal (1)	
EM080-05	15/07/2022
EM006-05	06/06/2022
SA047-112	22/11/2022
EM004-04	06/01/2023
Conducted Disturbance-Mains Terminal (2)	
EM031-04	06/01/2023
EM006-06	03/09/2022
SA047-111	22/11/2022
EM004-03	06/01/2023
EM031-04-01	N/A
Conducted Disturbance-Load and Control Terminal (1)	
EM080-05	15/07/2022
EM080-05-01	02/09/2022
SA047-112	22/11/2022
EM004-04	06/01/2023
Conducted Disturbance-Load and Control Terminal (2)	
EM080-05	15/07/2022
EM005-06-01	02/09/2022
SA047-112	22/11/2022
EM004-04	06/01/2023
Conducted Disturbance-Telecom Terminal	
EM080-05	15/07/2022
EM011-05	05/04/2022
EM011-06	05/04/2022
EM006-06	03/09/2022
SA047-112	22/11/2022
EM004-04	6/01/2023
Conducted Disturbance-Antenna Terminal	
EM031-04	06/01/2023
EM084-02	19/07/2022
EM041-01	05/01/2022
EM041-02	05/01/2022
SA047-111	22/11/2022
EM004-03	06/01/2023
Click (1)	

Equipment No.	Cal. Due date (DD-MM-YYYY)
Radiated Disturbance (CDN Method)	
EM080-05	15/07/2022
EM003-02	16/11/2022
EM003-03	16/11/2022
EM003-01-05	02/09/2022
EM032-02-01	15/07/2022
EM032-02-02	15/07/2022
SA047-112	22/11/2022
EM004-04	06/01/2023
Radiated electromagnetic disturbances (9 kHz-30 MHz)	
EM031-04	06/01/2023
EM061-04	07/03/2022
SA047-111	22/11/2022
EM004-03	06/01/2023
Radiated Disturbance (9 kHz-30 MHz)	
EM030-04	06/04/2022
EM031-02	16/11/2022
EM011-04	25/06/2022
EM031-02-01	05/04/2022
SA047-118	21/07/2022
EM045-01-01	N/A
Radiated Disturbance (30 MHz-1 GHz)	
EM030-04	06/04/2022
EM031-02	16/11/2022
EM033-01	18/10/2022
EM031-02-01	05/04/2022
EM036-01	18/07/2022
SA047-118	21/07/2022
EM045-01-01	N/A
Radiated Disturbance (1-18 GHz)	
EM030-04	06/04/2022
EM031-02	16/11/2022
EM031-03	23/12/2022
EM033-02	18/06/2022
EM033-02-02	05/04/2022
EM022-03	11/05/2022
SA047-118	21/07/2022
EM045-01-01	N/A

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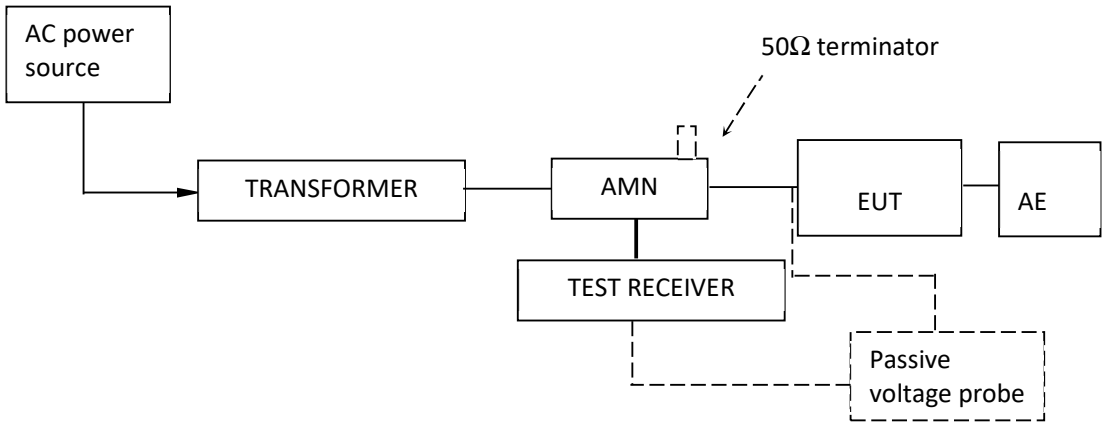
5. EMI TEST

5.1 Conducted Disturbance Voltage at mains ports

Test Result: Pass

5.1.1 Block Diagram of Test Setup



5.1.2 Test Setup and Procedure

The EUT was set to achieve the maximum emission level. The mains terminal disturbance voltage was measured with the EUT in a shielded room. The EUT was connected to AC power source through an Artificial Mains Network which provides a 50Ω linear impedance Artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.
The table-top EUT was placed on a 0.8m high non-metallic table above earthed ground plane(Ground Reference Plane).And for floor standing EUT, was placed on a 0.1m high non-metallic supported on GRP. The EUT keeps a distance of at least 0.8m from any other of the metallic surface. The Artificial Mains Network is situated at a distance of 0.8m from the EUT. During the test, mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m.
The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30MHz was checked.

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5.1.3 Limit

Frequency range MHz	**AC mains terminals** dB (uV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50
Note 1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. Note 2: The lower limit is applicable at the transition frequency.		

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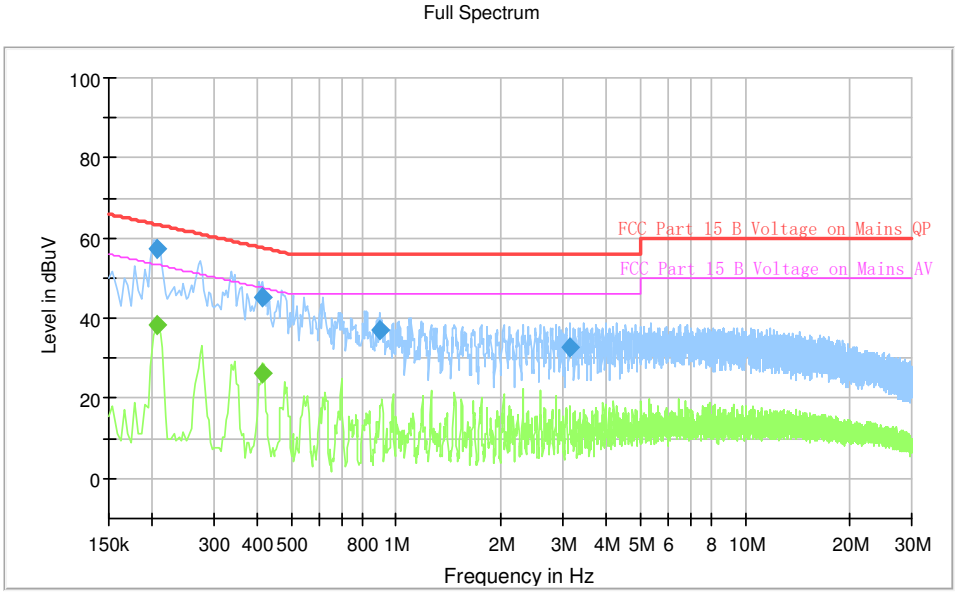
5.1.4 Test Data and curve

At mains terminal:
Tested Wire: Live Operation **Mode: LED lighting mode**



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.206000	---	38.35	53.37	15.01	1000.0	9.000	L1	ON	9.8
0.206000	57.09	---	63.37	6.28	1000.0	9.000	L1	ON	9.8
0.414000	---	26.10	47.57	21.46	1000.0	9.000	L1	ON	9.8
0.414000	45.26	---	57.57	12.31	1000.0	9.000	L1	ON	9.8
0.898000	37.17	---	56.00	18.83	1000.0	9.000	L1	ON	9.8
3.154000	32.88	---	56.00	23.12	1000.0	9.000	L1	ON	9.8

Remark:
1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBµV) = Corr. (dB) + Read Level (dBµV)
3. Delta Limit (dB) = Level (dBµV)-Limit (dBµV)

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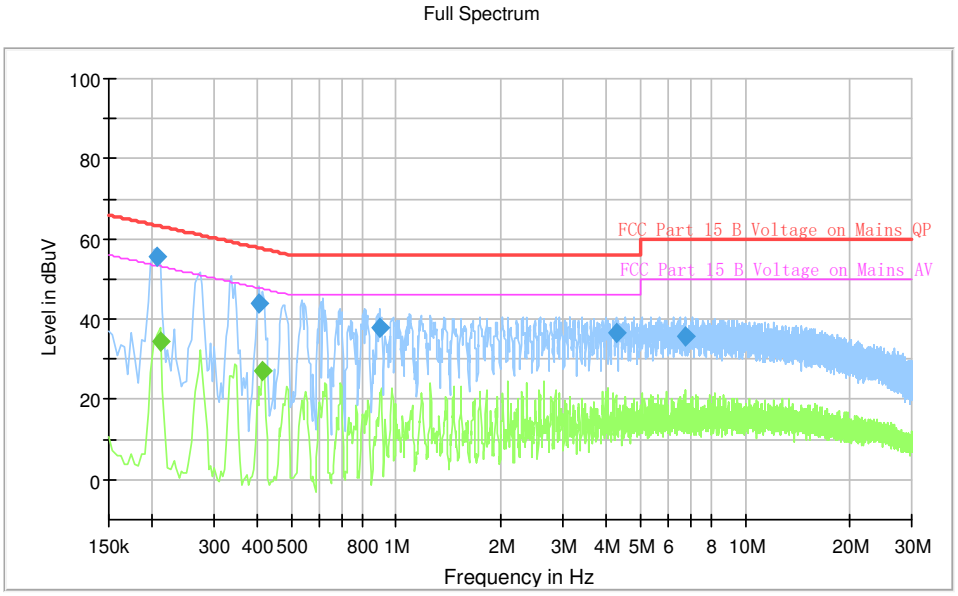
Tested Wire: Neutral **Operation Mode: LED lighting mode**



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.206000	55.43	---	63.37	7.94	1000.0	9.000	N	ON	9.8
0.210000	---	34.24	53.21	18.96	1000.0	9.000	N	ON	9.8
0.406000	43.79	---	57.73	13.94	1000.0	9.000	N	ON	9.8
0.414000	---	27.26	47.57	20.31	1000.0	9.000	N	ON	9.8
0.894000	38.03	---	56.00	17.97	1000.0	9.000	N	ON	9.8
4.254000	36.71	---	56.00	19.29	1000.0	9.000	N	ON	9.9
6.766000	35.64	---	60.00	24.36	1000.0	9.000	N	ON	10.0

Remark:

1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBµV) = Corr. (dB) + Read Level (dBµV)
3. Delta Limit (dB) = Level (dBµV)-Limit (dBµV)

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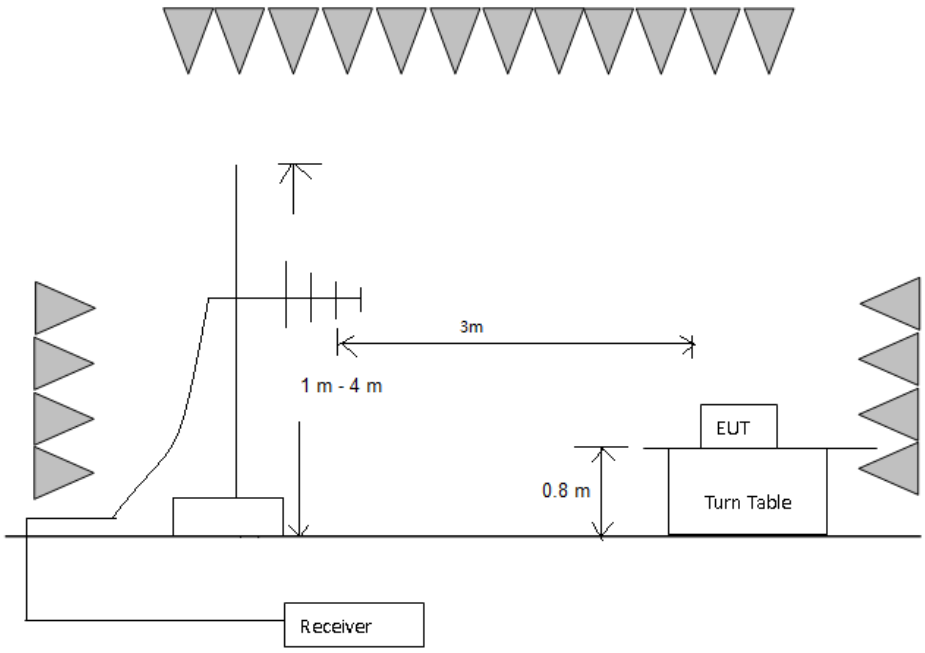
5.2 Radiated Emission 30 MHz -1000 MHz

Test Result: Pass

5.2.1 Block Diagram of Test Setup



5.2.2 Test Setup and Procedure

The measurement was applied in a semi-anechoic chamber. The EUT and simulators were placed on a 0.8 m high foamed table above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mask. The antenna moved up and down between from 1 meter to 4 meters to find out the maximum emission level.

Broadband antenna was used as receiving antenna. Both horizontal and vertical polarization of the antenna was set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4 requirement during radiated test.
The bandwidth setting on R&S Test Receiver was 120 kHz.

For an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

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Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper Frequency of Radiated Measurement
Below 1.705 MHz	30MHz
1.705 MHz – 108 MHz	1 GHz
108 MHz – 500 MHz	2 GHz
500 MHz – 1 GHz	5 GHz
Above 1 GHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower.
At transitional frequencies the lower limit applies.	

Remark: Radiated Emission was performed from 30 MHz to 1 GHz.

5.2.3 Limit

Class B limit at 3m test distance:

Frequency range MHz	Quasi-peak limits dB (μV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
960 to 1000	54
At transitional frequencies the lower limit applies.	

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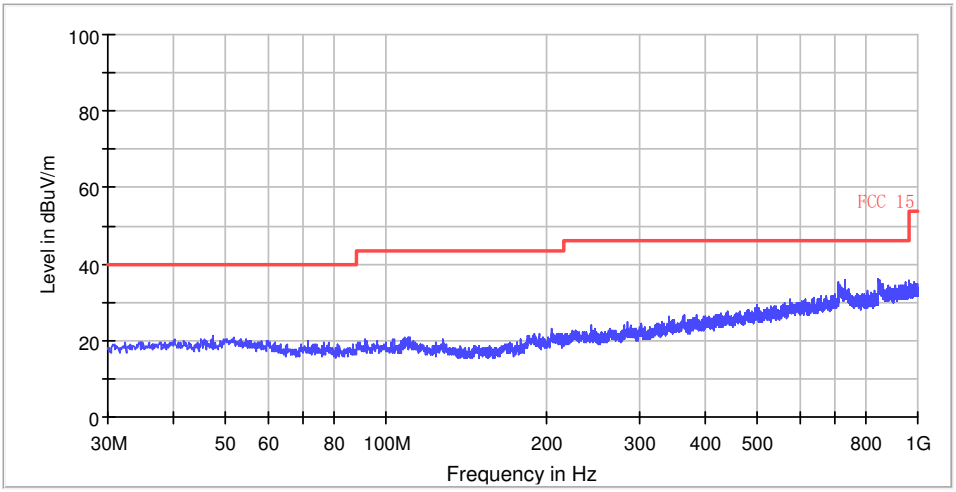
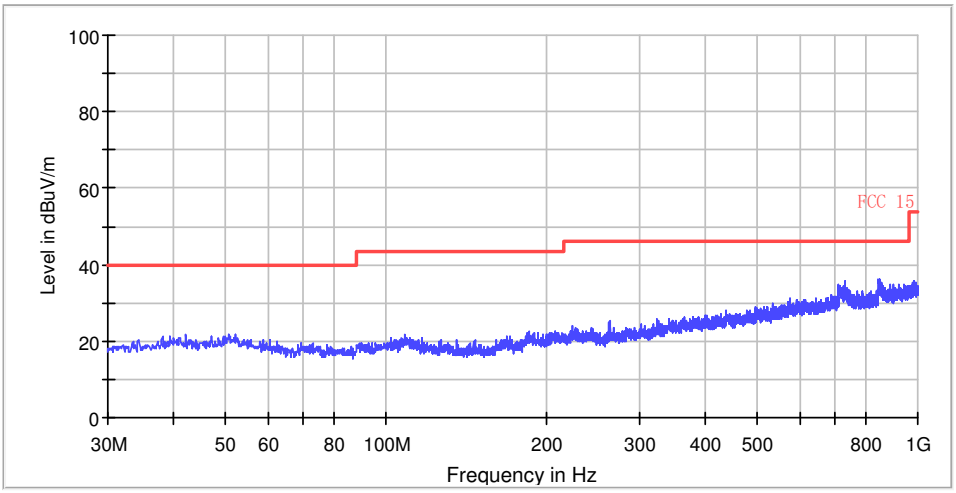
5.2.4 Test Data and Curve

Operation Mode: LED lighting mode
Horizontal



All emission levels are more than 6 dB below the limit.

Vertical



All emission levels are more than 6 dB below the limit.

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5.3 Radiated Emission above 1 GHz

Test Result: Not Applicable
Remark:
The highest internal source of the EUT is not more than 108 MHz, so the measurement above 1000 MHz is not applicable.

**********End of Report**********