

IKEA of Sweden AB

TEST REPORT

SCOPE OF WORK

EMC TESTING- LED2030G4

REPORT NUMBER

210623111GZU-001

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TEST REPORT

Applicant Name & : IKEA of Sweden AB
Address : Box 702, SE-343 81 Älmhult, SWEDEN
Manufacturing Site : Dongguan Kee Tat Lighting Limited
Kai Shek Cheng DONGGUAN Guangdong Province 523000, China
Intertek Report No: 210623111GZU-001
FCC ID: FHO-LED2030G4

Test standards

CFR 47, FCC Part 15, Subpart B:2019

Sample Description

Product : Self-ballasted LED lamp
Model No. : LED2030G4
Electrical Rating : 120V, 60Hz, 4W, 60mA, 10pcs LEDs.
Serial No. : Not Labeled
Date Received : 04 December 2020
Date Test : 04 December 2020 to 25 February 2021
Conducted

Prepared and Checked By



Oscar Gao
Project Engineer

Approved By:



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Manager

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Guangzhou, Guangdong, China

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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, Model: LED2030G4.

We tested the Self-ballasted LED lamp, Model: LED2030G4 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

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

Notes:

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 |
|---------------|---------------------------------------|-----------|--------------|----------------------|
| 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 |

Detail of the equipment calibration due date:

| Equipment No. | Cal. Due date (DD-MM-YYYY) |
|-------------------------------------------------|-------------------------------|
| Conducted Disturbance-Mains Terminal (2) | |
| EM031-04 | 07/01/2022 |
| EM006-06 | 06/09/2021 |
| SA047-111 | 16/11/2021 |
| EM004-03 | 21/01/2023 |
| EM031-04-01 | N/A |

| Equipment No. | Cal. Due date (DD-MM-YYYY) |
|--------------------------------------------|-------------------------------|
| Radiated Disturbance (30 MHz-1 GHz) | |
| EM030-04 | 10/04/2021 |
| EM031-02 | 16/10/2021 |
| EM033-01 | 18/09/2021 |
| EM031-02-01 | 12/04/2021 |
| EM036-01 | 21/07/2021 |
| SA047-118 | 21/07/2021 |
| EM045-01-01 | N/A |

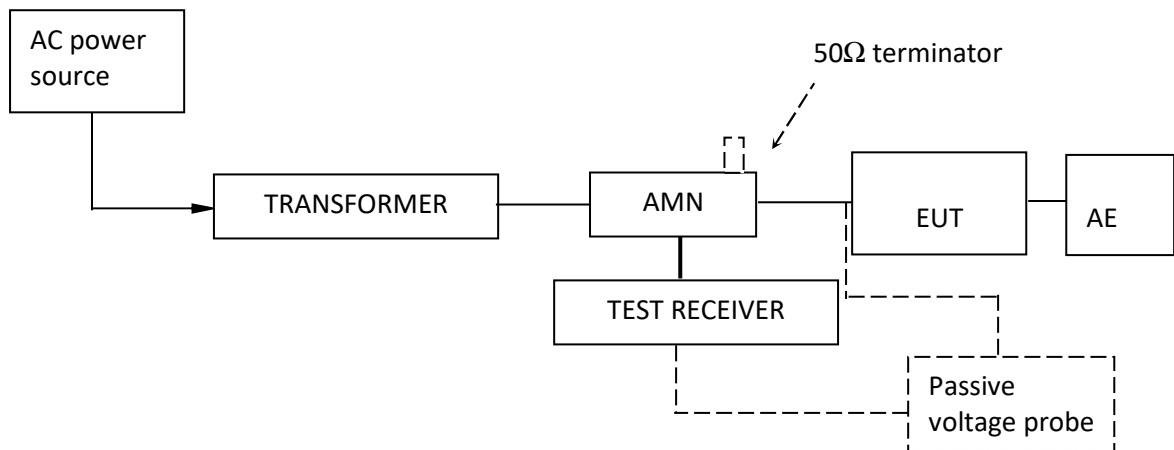
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5. EMI TEST

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.

TEST REPORT

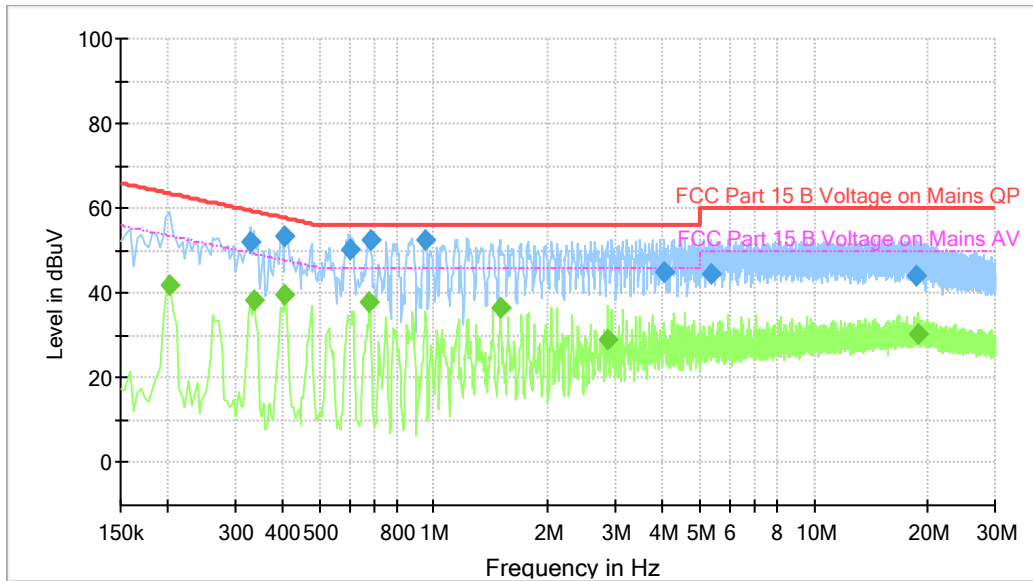
5.1.4 Test Data and curve

At mains terminal:

Tested Wire: Live

Operation Mode: lighting

Full Spectrum



| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.202000 | --- | 41.95 | 53.53 | 11.58 | 1000.0 | 9.000 | L1 | ON | 9.6 |
| 0.330000 | 52.30 | --- | 59.45 | 7.15 | 1000.0 | 9.000 | L1 | ON | 9.6 |
| 0.338000 | --- | 38.44 | 49.25 | 10.81 | 1000.0 | 9.000 | L1 | ON | 9.6 |
| 0.406000 | --- | 39.68 | 47.73 | 8.05 | 1000.0 | 9.000 | L1 | ON | 9.6 |
| 0.406000 | 53.33 | --- | 57.73 | 4.40 | 1000.0 | 9.000 | L1 | ON | 9.6 |
| 0.602000 | 50.25 | --- | 56.00 | 5.75 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 0.678000 | --- | 37.99 | 46.00 | 8.01 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 0.682000 | 52.73 | --- | 56.00 | 3.27 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 0.954000 | 52.72 | --- | 56.00 | 3.28 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 1.498000 | --- | 36.53 | 46.00 | 9.47 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 2.866000 | --- | 28.81 | 46.00 | 17.19 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 4.026000 | 45.07 | --- | 56.00 | 10.93 | 1000.0 | 9.000 | L1 | ON | 9.7 |
| 5.386000 | 44.52 | --- | 60.00 | 15.48 | 1000.0 | 9.000 | L1 | ON | 9.8 |
| 18.578000 | 44.29 | --- | 60.00 | 15.71 | 1000.0 | 9.000 | L1 | ON | 10.2 |
| 18.850000 | --- | 30.34 | 50.00 | 19.66 | 1000.0 | 9.000 | L1 | ON | 10.2 |

Remark:

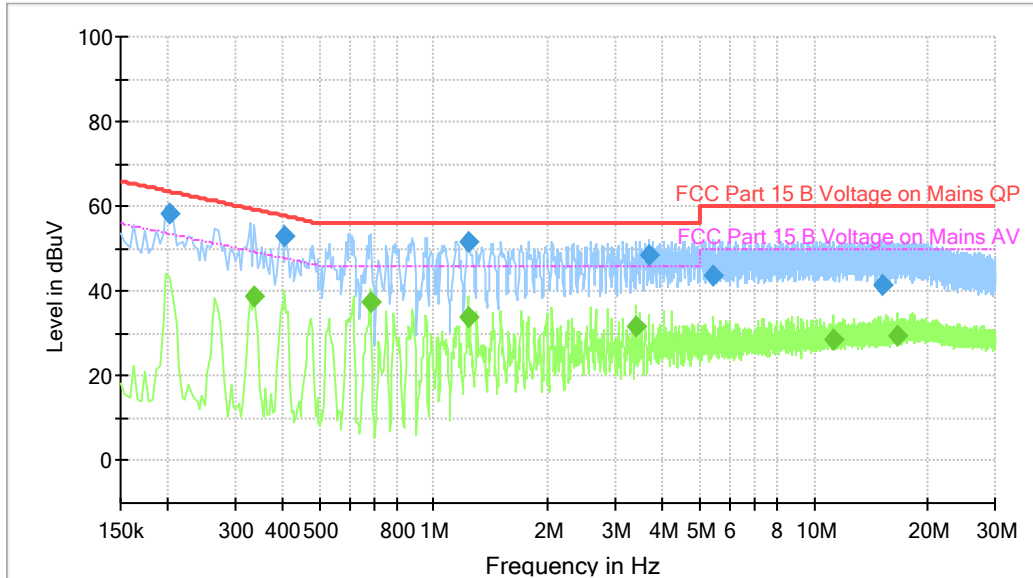
1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. QuasiPeak (dBμV) = Corr. (dB) + Read Level (dBμV)
3. Margin (dB) = Limit (dBμV) - QuasiPeak (dBμV)

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Tested Wire: Neutral

Operation Mode: lighting

Full Spectrum



| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.202000 | 58.31 | --- | 63.53 | 5.22 | 1000.0 | 9.000 | N | ON | 9.6 |
| 0.338000 | --- | 38.82 | 49.25 | 10.43 | 1000.0 | 9.000 | N | ON | 9.6 |
| 0.406000 | 52.86 | --- | 57.73 | 4.87 | 1000.0 | 9.000 | N | ON | 9.6 |
| 0.682000 | --- | 37.25 | 46.00 | 8.75 | 1000.0 | 9.000 | N | ON | 9.7 |
| 1.230000 | 51.51 | --- | 56.00 | 4.49 | 1000.0 | 9.000 | N | ON | 9.7 |
| 1.230000 | --- | 33.97 | 46.00 | 12.03 | 1000.0 | 9.000 | N | ON | 9.7 |
| 3.418000 | --- | 31.71 | 46.00 | 14.29 | 1000.0 | 9.000 | N | ON | 9.7 |
| 3.686000 | 48.72 | --- | 56.00 | 7.28 | 1000.0 | 9.000 | N | ON | 9.7 |
| 5.406000 | 43.87 | --- | 60.00 | 16.13 | 1000.0 | 9.000 | N | ON | 9.8 |
| 11.302000 | --- | 28.50 | 50.00 | 21.50 | 1000.0 | 9.000 | N | ON | 10.1 |
| 15.202000 | 41.61 | --- | 60.00 | 18.39 | 1000.0 | 9.000 | N | ON | 10.3 |
| 16.554000 | --- | 29.32 | 50.00 | 20.68 | 1000.0 | 9.000 | N | ON | 10.3 |

Remark:

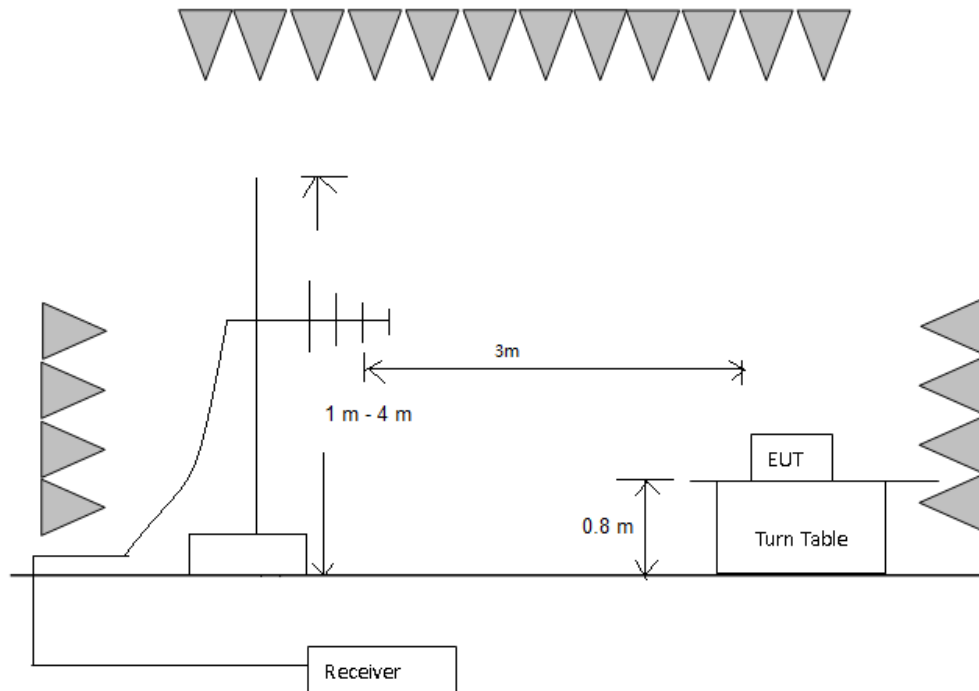
1. Corr. (dB) = LISN Factor (dB) + Cable Loss (dB)
2. QuasiPeak (dBμV) = Corr. (dB) + Read Level (dBμV)
3. Margin (dB) = Limit (dBμV) - QuasiPeak (dBμV)

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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

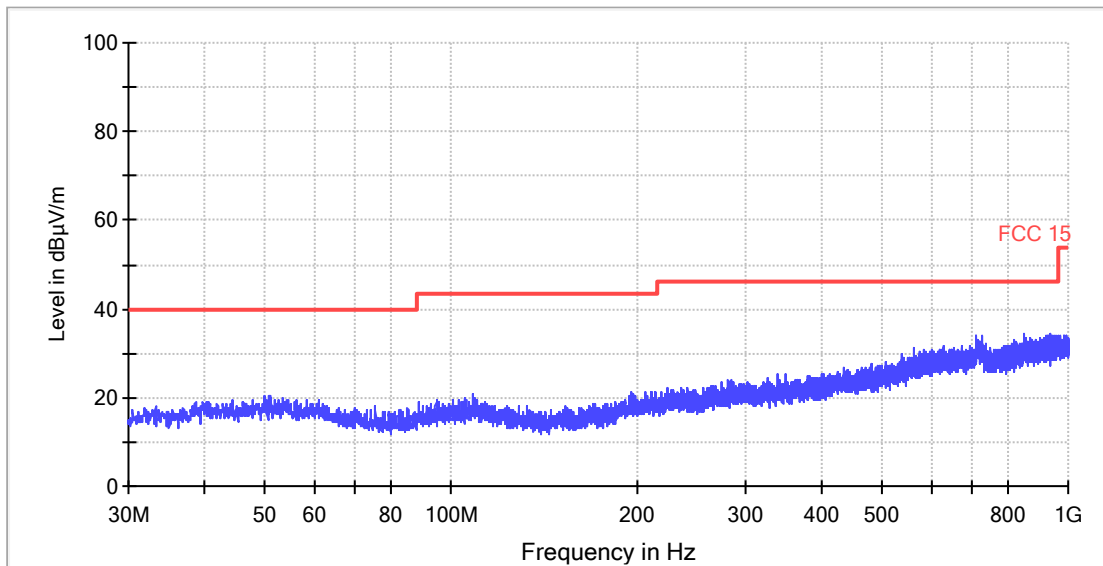
Class B limit at 3m test distance:

| 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

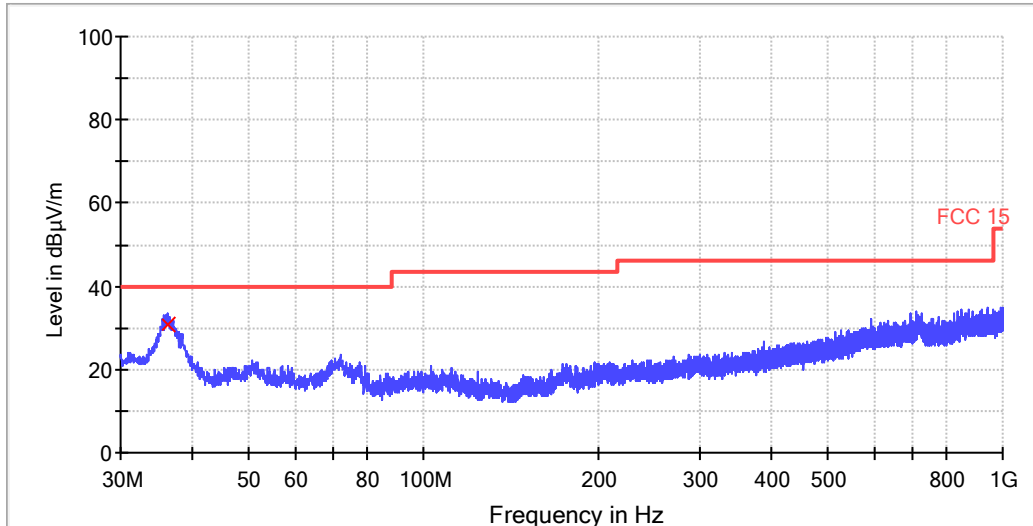
Operation Mode: EUT on lighting
Horizontal



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

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Vertical



| Frequency (MHz) | Quasi Peak (dBµV/m) | Bandwidth (kHz) | Pol | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBµV/m) |
|-----------------|---------------------|-----------------|-----|------------|-------------------|----------------------|
| 36.160000 | 30.7 | 120.000 | V | 11.9 | 9.3 | 40.0 |

Remark:

1. Corr. (dB) = Antenna Factor (dB) + Cable Loss (dB)
2. Quasi Peak (dBµV/m) = Corr. (dB) + Read Level (dBµV)
3. Margin (dB) = Limit QPK (dBµV/m) – Quasi Peak (dBµV/m)

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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.

6. PHOTO OF TEST SETUP AND EUT

Test set up and EUT photos are put in 210623111GZU-001 Annex 1 separately as part of this test report.

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