

EMC TEST REPORT

No. 1907679STO-001, Ed. 2

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment: Self-ballasted LED-lamp
Tested Type/Model: LED1805E22
Manufacturer: IKEA of Sweden AB
Tested by request of: IKEA of Sweden AB

SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators. Class B equipment.

ICES-005 Issue 5: Lighting Equipment, Class B. (2018)

Date of issue: February 11, 2020

Tested by:


Ann-Christine Norrström

Approved by:


Per Granberg

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Revision History

| Edition | Date | Description | Changes |
|---------|-------------------|----------------|---|
| 1 | May 24, 2019 | First release | |
| 2 | February 11, 2020 | Second release | <p>The report was updated according to order number 2010438STO-101</p> <p>Photos of EUT and test setups in annex 1.</p> |

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company **IKEA of Sweden AB**
 Box 702
 343 81 Älmhult
 Sweden

Name of contact **Jörgen Skoog**

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment **Self-ballasted LED-lamp**
 Type/Model **LED1805E22**
 Brand name 
 Serial Number **-**
 Manufacturer **IKEA of Sweden AB**
 Rating **120 V, 60 Hz, max 25 W**
 Class **-**
 Highest frequency **2405 – 2480 MHz**
 Software version **-**



PRECAUCIÓN:
 RIESGO DE CHOQUE ELÉCTRICO -
 USAR SOLO EN LUGARES SECOS
 NO USAR CON ATENUADORES DE LUZ
 COMUNES, VÉASE LAS INSTRUCCIONES.
 COMPONENTE INTEGRADO

RECOGNIZED COMPONENT

 Intertek
 3067563

120VAC/60Hz PF>0.9 Max 25W 260mA
 LED1805E22 2000lm 90lm/W 54VDC 0.39A
 MADE IN CHINA 21633 YYWW-XXX
 CCT TRÅDFRI WS CANICES005(B)/NMB-005(B)
 CONFORMS TO UL STD.8750
 CERTIFIED TO CSA STD. C22.2 NO.250.13
 CONTAINS FCC ID:FHO-ICC-A-1 AND IC:10912A-ICCA1

ATTENTION: RISQUE DE CHOC ÉLECTRIQUE -
 UTILISER DANS UN EMPLACEMENT SEC UNIQUEMENT.
 NE PAS UTILISER AVEC DES GRADATEURS STANDARD.
 SE REPORTER AUX INSTRUCTIONS. COMPOSANT INTÉGRÉ

 
 IKEA of Sweden AB
 SE-343 81 Älmhult

  • tc 80 °C

CAUTION: RISK OF ELECTRIC SHOCK - USE IN DRY LOCATION ONLY.
 DO NOT USE WITH STANDARD DIMMERS, SEE INSTRUCTIONS.
 BUILT-IN COMPONENT

Rating plate

2.2 Test set up and EUT photos

Test set up and EUT photos are enclosed in Annex 1 to this test report.

2.3 Purpose of the test

The purpose of the tests was to verify that the EUT fulfills the requirements according to FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators Class B and ICES-005 Issue 5: Lighting Equipment, Class B.

2.4 Additional information about the EUT

The EUT is a self-ballasted LED – lamp provided with a radio remote control for on/off, color setting and dimming.

The EUT has the following noted components: radio module, type ICC-A-1

The EUT was tested in a tabletop configuration.

The EUT was tested with the following cables

| Port | Type | Length [m] | Specifications |
|----------|------------------|------------|----------------|
| AC Mains | Fixed connection | - | - |

2.5 Modifications made to improve EMC-characteristics

In order to comply with the requirements regarding radiated emission 30 – 1000 MHz, the electronic is slightly modified by the manufacturer. The modification of the electronic circuit consists of adjusted component values and adding of an inductor, see table below.

| Component/position | Original value | Adjusted value |
|--------------------|----------------|------------------------------|
| C26 | 2.2 nF | 3.3nF |
| R5 | 10 Ω | 47 Ω |
| R1, R4 | 100 Ω | 20 Ω |
| C3, C33 | 100 pF | 220 pF |
| L5 (inductor) | - | 10*6*5-5:5 (added component) |

These modifications may also affect the EMC-characteristics regarding conducted emission, and a re-test of conducted emission is therefore performed. The previous found test result for radiated emission 1-13 GHz is deemed to be the same irrespective of the modifications.

3. TEST SPECIFICATIONS

3.1 Standards

Requirements:

FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators.

ICES-005 Issue 5: Lighting Equipment (2018).

Test methods:

ANSI C63.4: 2014: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913

Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002

Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

| Measurement Chamber | Type of chamber | IC Site filing # |
|---------------------|-------------------------------|------------------|
| STORA HALLEN | Semi-anechoic 10 m and 3 m | 2042G-2 |

3.4 Mode of operation during the test

The EUT was supplied with 120 V, 60 Hz.

Measurements were performed with the dimmer regulation set to max luminous intensity and min luminous intensity.

3.5 Compliance

The EUT shall comply with the emission limits according to the standards as listed below

Conducted emission requirements:

The EUT shall meet the limits for the standards.

Reference: 47 CFR §15.107
ICES-005, section 5.5.2

Limits for conducted emission according to FCC and ICES-005

Class B

| Frequency range [MHz] | Limits [dB μ V] | |
|--------------------------|---------------------|---------|
| | Quasi-Peak | Average |
| 0.15 – 0.50 | 66 – 56 | 56 – 46 |
| 0.50 – 5.00 | 56 | 46 |
| 5.00 – 30.0 | 60 | 50 |

Radiated Emission requirements:

The EUT shall meet the limits for the standards.

Reference: 47 CFR §15.109
ICES-005, section 5.5.3

Limits for radiated emission according to FCC

Class B

| Frequency range [MHz] | Field strength at 3 m (dB μ V/m) | Field strength at 10 m (dB μ V/m) | Detector |
|--------------------------|--|---|----------------|
| 30 – 88 | 40.0 | 29.5 | Quasi Peak |
| 88 – 216 | 43.5 | 33.0 | Quasi Peak |
| 216 – 960 | 46.0 | 35.5 | Quasi Peak |
| 960 – 1000 | 54.0 | 43.5 | Quasi Peak |
| Above 1000 | 54.0 / 74.0 | 43.5 / 63.5 | Average / Peak |

The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit. (i.e. an extrapolation factor of 20 dB/decade according to §15.31(f)(1))

Limits for radiated emission according to ICES-005

Class B

| Frequency range [MHz] | Field strength at 3 m (dB μ V/m) | Field strength at 10 m (dB μ V/m) | Detector |
|--------------------------|--|---|------------|
| 30 – 88 | 40.0 | 29.5 | Quasi Peak |
| 88 – 216 | 43.5 | 33.1 | Quasi Peak |
| 216 – 1000 | 46.0 | 35.6 | Quasi Peak |

4. TEST SUMMARY

The results in this report apply only to sample tested:

| Standard | Description | Result |
|---|---|-------------|
| | Emission | |
| FCC Part 15 subpart B ICES-005 | Conducted continuous emission in the frequency range 0.150 – 30 MHz, AC Power input port The EUT complies with the Class B limits. The margin to the limit was at least 15.5 dB at 0.179 MHz See clauses 5.4 – 5.5. | PASS |
| FCC Part 15 subpart B ICES-005 | Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz The EUT complies with the Class B limits. The margin to the limit was at least 2.5 dB at 63.900 MHz. The measured value is within the measurement uncertainty interval to the limit. See clauses 6.5 – 6.6. | PASS |
| FCC Part 15 subpart B | Radiated emission of electromagnetic fields in the frequency range 1.0 – 13 GHz The EUT complies with the Class B limits. The margin to the limit was at least 18 dB for all frequencies. See clause 6.8 – 6.9 | PASS |

5. CONDUCTED CONTINUOUS DISTURBANCES in the frequency-range 0,009 to 30 MHz

5.1 Operating environment

| Date of test: | Temperature: | Relative Humidity: |
|---------------|--------------|--------------------|
| May 23, 2019 | 23 [°C] | 48 [%] |

5.2 Test set-up and test procedure

The test method is in accordance with ANSI C63.4.

The EUT was connected to the power via Artificial Mains Networks AMN.

The EUT was placed on an insulating support 0.8 m above the floor, 0.4 m from the vertical reference ground plane (RGP) and 0.8 m from the AMN/ISN.

Overview sweeps were performed for each lead.

During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

5.3 Measurement uncertainty

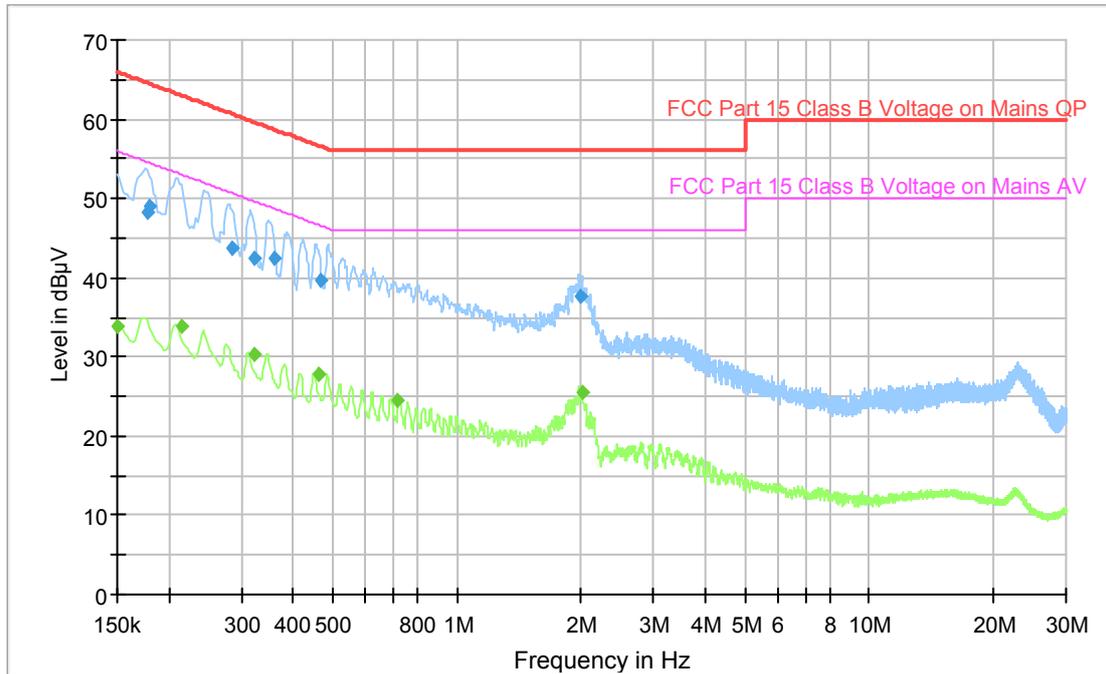
Continuous conducted disturbances with AMN
in the frequency range 150 kHz to 30 MHz

± 3.3 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2011.

The measurement uncertainty is given with a confidence of 95 %.

5.4 Test results, AC Power input port, Class B, max luminous intensity



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

| Frequency [MHz] | Level [dBµV] | Limit [dBµV] | Line L/N | Margin [dB] |
|-----------------|--------------|--------------|----------|-------------|
| 0.177 | 48.2 | 64.6 | N | 16.4 |
| 0.179 | 49.0 | 64.5 | N | 15.5 |
| 0.285 | 43.6 | 60.7 | N | 17.1 |
| 0.321 | 42.4 | 59.7 | N | 17.3 |
| 0.359 | 42.4 | 58.8 | N | 16.4 |
| 0.465 | 39.7 | 56.6 | N | 16.9 |
| 1.997 | 37.6 | 56.0 | L | 18.4 |

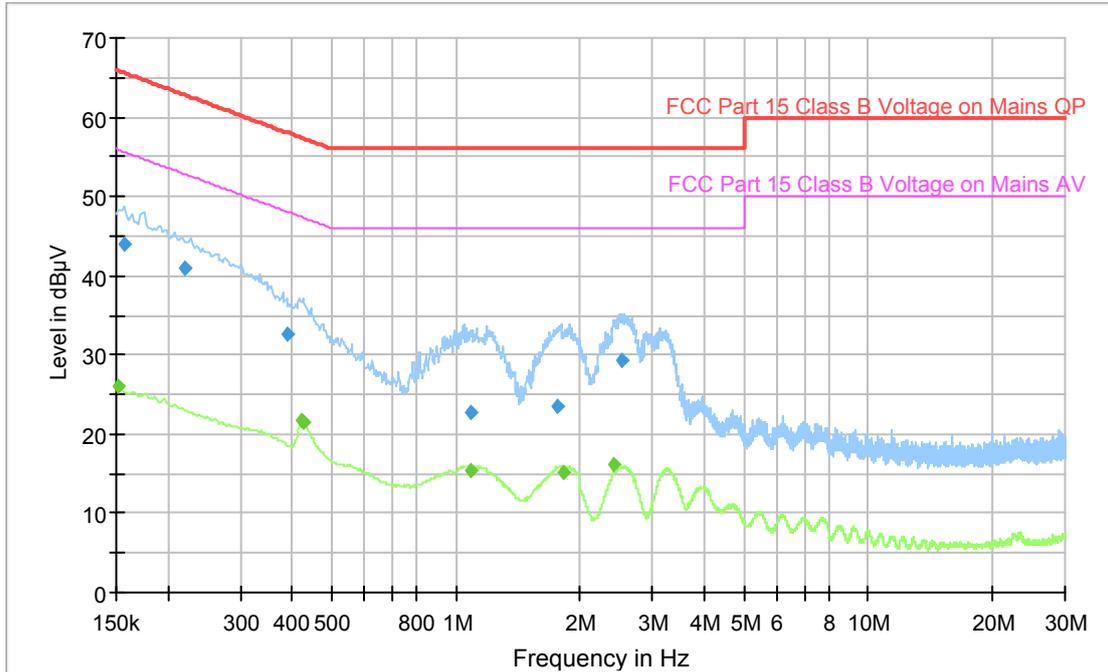
Measurement results, Average, Class B

| Frequency [MHz] | Level [dBµV] | Limit [dBµV] | Line L/N | Margin [dB] |
|-----------------|--------------|--------------|----------|-------------|
| 0.215 | 33.8 | 53.0 | N | 19.2 |
| 0.321 | 30.4 | 49.7 | N | 19.3 |
| 0.463 | 27.9 | 46.6 | N | 18.7 |

All other measured disturbances have a margin of more than 20 dB to the limits.

$$\text{Result [dBµV]} = \text{Analyser reading [dBµV]} + \text{cable loss [dB]} + \text{LISN insertion loss [dB]}$$

5.5 Test results, AC Power input port, Class B, min luminous intensity



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

All measured disturbances have a margin of more than 20 dB to the limits.

Measurement results, Average, Class B

All measured disturbances have a margin of more than 20 dB to the limits.

$$\text{Result [dB}\mu\text{V]} = \text{Analyser reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{LISN insertion loss [dB]}$$

5.6 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Last Cal. date | Cal. interval |
|--------------------------|-----------------|-------------------|----------|----------------|---------------|
| Measurement software | Rohde & Schwarz | EMC32 - V10.50.00 | -- | -- | -- |
| Measurement Receiver | Rohde & Schwarz | ESU 8 | 12866 | 07-2018 | 1 year |
| Pulse limiter | Rohde & Schwarz | ESH3-Z2 | 32455 | 07-2018 | 1 year |
| Artificial mains network | Rohde & Schwarz | ESH3-Z5 | 2728 | 07-2018 | 1 year |
| Measurement cable | Suhner | RG 58 | 9815 | 07-2018 | 1 year |
| Measurement cable | Suhner | G03232D-01 | 9701 | 07-2018 | 1 year |

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 13 GHZ

6.1 Operating environment

| Date of test: | Temperature: | Relative Humidity: |
|----------------|--------------|--------------------|
| May 21, 2019 | 21 [°C] | 52 [%] |
| March 25, 2019 | 21 [°C] | 13 [%] |

6.2 Test set-up and test procedure

The test method is in accordance with ANSI C63.4.

The EUT was set up according to the standard

The EUT was placed on an insulating support 0.8 m above the turntable which is part of the reference ground plane.

Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated in the frequency-range 30 – 1000 MHz

Above 1 GHz additionally the average detector was activated.

During height scan above 1 GHz the EUT was kept in antennas cone of radiation.

6.3 Test conditions

Test set-up:

30 – 1000 MHz

Test receiver set-up:

Preview test:

Peak, RBW 120 kHz VBW 1 MHz

Final test:

Quasi-Peak, RBW 120 kHz

Measuring distance:

3 m

Measuring angle:

0 – 359°

Antenna

Height above ground plane:

1 – 4 m

Polarisation:

Vertical and Horizontal

Type:

Bilog

Test setup:

1 – 13 GHz

Test receiver set-up:

Preview test:

Peak, RBW 1 MHz VBW 3 MHz

Final test:

Average, RBW 1 MHz

Peak, RBW 1 MHz

Measuring distance:

3 m

Measuring angle:

0 – 359°

Antenna

Height above ground plane:

1 – 4 m

Polarisation:

Vertical and Horizontal

Type:

Horn

Antenna tilt:

Activated

6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance

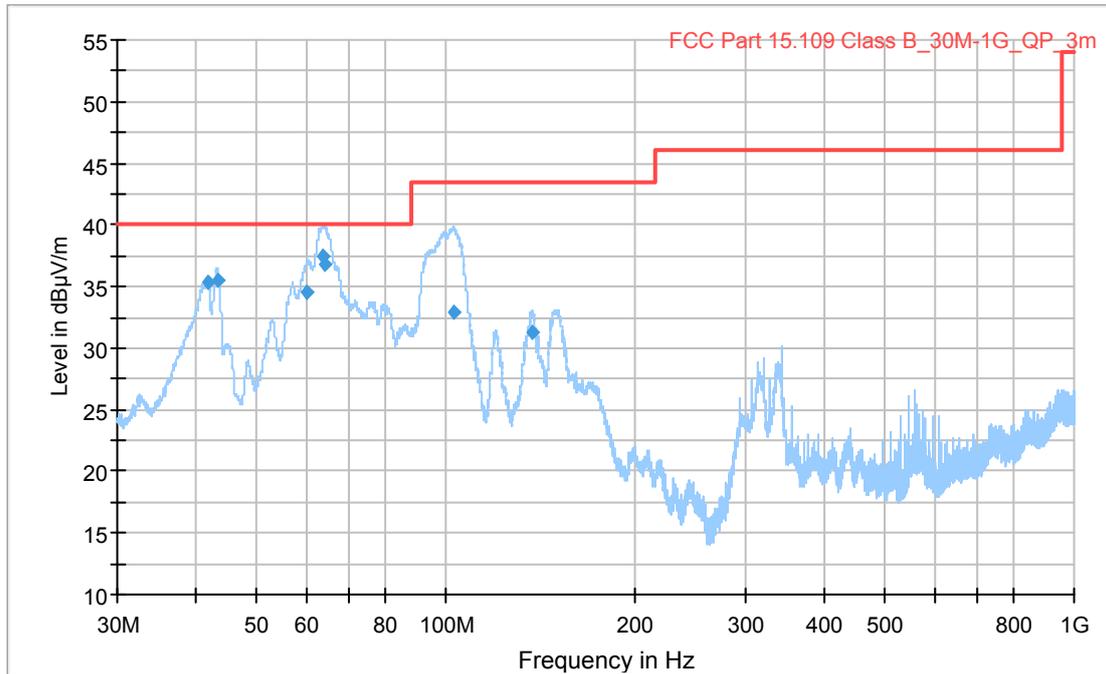
Uncertainty for the frequency range 30 to 1000 MHz at 3 m ± 5.1 dB

Uncertainty for the frequency range 1.0 to 18 GHz at 3 m ± 4.5 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2011.

The measurement uncertainty is given with a confidence of 95 %.

6.5 Test results, 30 – 1000 MHz, Class B, max luminous intensity



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance.

Measurement results, Quasi Peak, Class B

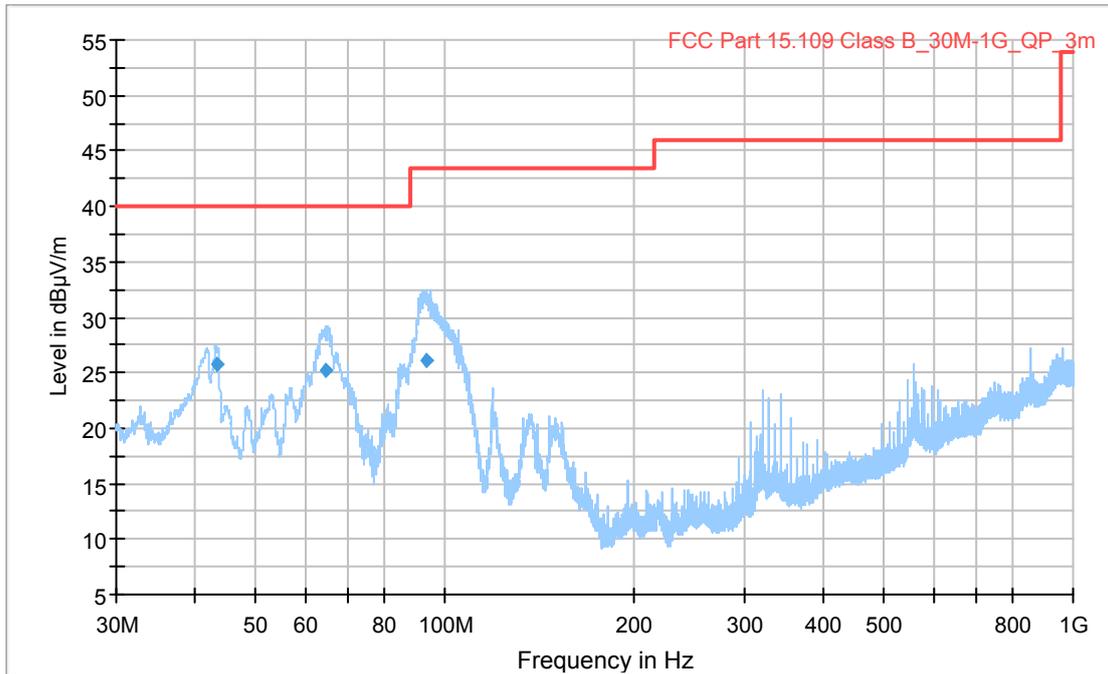
| Frequency [MHz] | Level [dBµV/m] | Limit [dBµV/m] | Polarization H/V | Margin [dB] |
|-----------------|----------------|----------------|------------------|-------------|
| 41.700 | 35.3 | 40.0 | V | 4.7* |
| 43.290 | 35.5 | 40.0 | V | 4.5* |
| 60.030 | 34.6 | 40.0 | V | 5.4* |
| 63.900 | 37.5 | 40.0 | V | 2.5* |
| 64.230 | 36.8 | 40.0 | V | 3.2* |
| 103.050 | 32.9 | 43.5 | V | 10.6 |
| 136.800 | 31.3 | 43.5 | V | 12.2 |

The margin to the limits for the measured values are equal for FCC part 15 B and ICES-005.

*The measured result is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.6 Test results, 30 – 1000 MHz, Class B, min luminous intensity



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance.

Measurement results, Quasi Peak, Class B

| Frequency [MHz] | Level [dBµV/m] | Limit* [dBµV/m] | Polarization H/V | Margin [dB] |
|-----------------|----------------|-----------------|------------------|-------------|
| 43.290 | 25.8 | 40.0 | V | 14.2 |
| 64.500 | 25.2 | 40.0 | V | 14.8 |
| 93.330 | 26.1 | 43.5 | V | 17.4 |

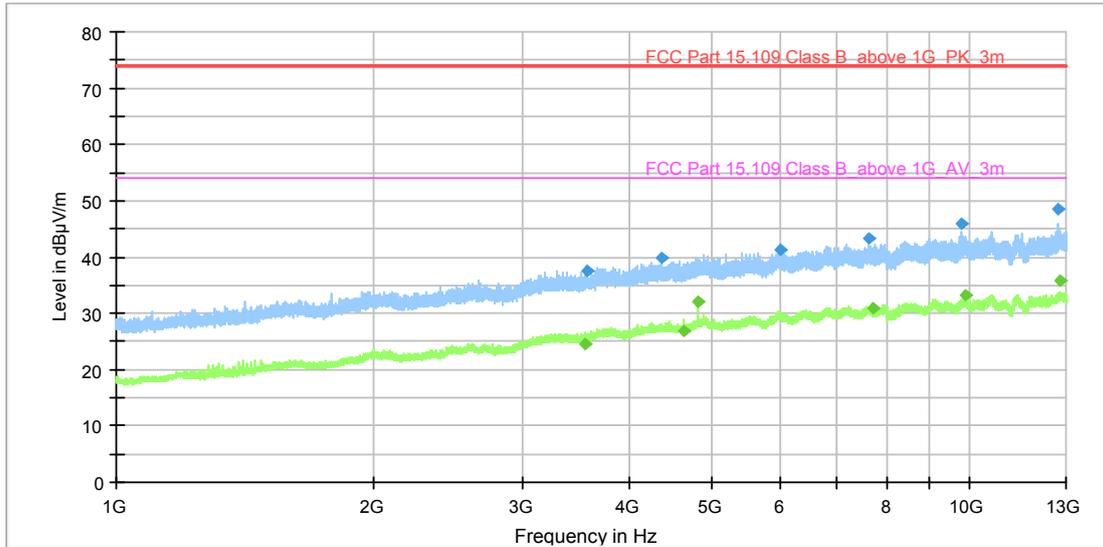
The margin to the limits for the measured values are equal for FCC part 15 B and ICES-005.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.7 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Last Cal. date | Cal. interval |
|----------------------|-----------------|------------------|----------|----------------|---------------|
| Measurement software | Rohde & Schwarz | EMC32 - V10.50.0 | -- | -- | -- |
| Measurement Receiver | Rohde & Schwarz | ESW44 | 33890 | 02-2018 | 1.5 years |
| Antenna | Chase | CBL 6111A | 971 | 09-2017 | 3 years |
| Pre-amplifier | SEMKO | AM1331 | 7992 | 04-2019 | 1 year |
| Measurement cable | Huber & Suhner | Sucoflex 106 | 39122 | 03-2019 | 1 year |
| Measurement cable | Rosenberger | LA5-S003-7000 | 39162 | 04-2019 | 1 year |
| Measurement cable | Rosenberger | LA5-S003-7000 | 39163 | 04-2019 | 1 year |

6.8 Test results, 1 – 13 GHz, Class B, max luminous intensity



Diagram, Peak and average overview sweep, 1 – 13 GHz at 3 m distance.

Measurement results, Peak, Class B

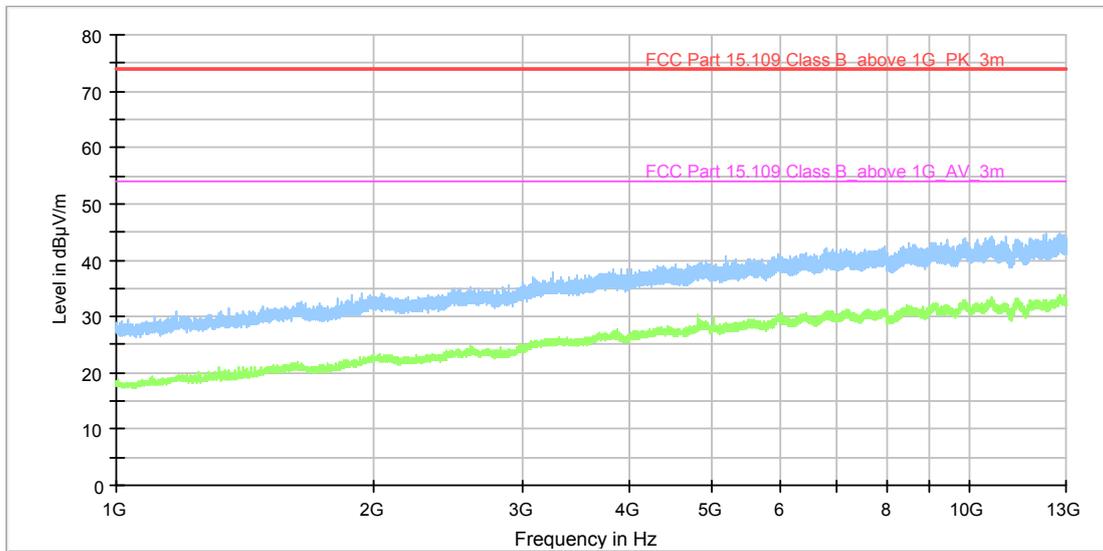
No disturbance above the background noise is found, the closest margin of the background noise to the limit is 18 dB.

Measurement results, Average, Class B

No disturbance above the background noise is found, the closest margin of the background noise to the limit is 18 dB.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.9 Test results, 1 – 13 GHz, Class B, min luminous intensity



Diagram, Peak and average overview sweep, 1 – 13 GHz at 3 m distance.

Measurement results, Peak, Class B

No disturbance above the background noise is found, the closest margin of the background noise to the limit is 18 dB.

Measurement results, Average, Class B

No disturbance above the background noise is found, the closest margin of the background noise to the limit is 18 dB.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.10 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Last Cal. date | Cal. interval |
|----------------------|-----------------|------------------|----------|----------------|---------------|
| Measurement software | Rohde & Schwarz | EMC32 - V10.50.0 | -- | -- | -- |
| Measurement Receiver | Rohde & Schwarz | ESW44 | 33890 | 02-2018 | 1.5 years |
| Antenna | Rohde & Schwarz | HF907 | 31245 | 12-2016 | 3 years |
| Pre-amplifier | Bonn | BLMA 0118M | 312456 | 04-2019 | 1 year |
| Measurement cable | Huber & Suhner | Sucoflex 106 | 39122 | 03-2019 | 1 year |
| Measurement cable | Rosenberger | LA5-S003-7000 | 39162 | 04-2019 | 1 year |
| Measurement cable | Rosenberger | LA5-S003-7000 | 39163 | 04-2019 | 1 year |