EMC TEST REPORT

No. 1918301STO-001, Ed. 1

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	LED driver/Power supply
Tested Type/Model:	ICPSW24-3-3
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 devices, Subpart B: Unintentional radiators. Class B equipment.

ICES-001 Issue 4: Industrial, Scientific and Medical (ISM) Radio Frequency Generators with emission limits for class B Group 1 equipment

For details, see clause 2 – 4.

Date of issue: January 9, 2020

Tested by: Per Granberg

Approved by: Thomas Nordlund

Revision History

Edition	Date	Description	Changes
1	January 9, 2020	First release	

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company	IKEA of Sweden AB Box 702 SE-343 81 Älmhult Sweden
Name of contact	Vivian Xu

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment	LED driver/Power supply
Type/Model	ICPSW24-3-3
Brand name	IKEA
Serial Number	-
Manufacturer	IKEA of Sweden AB
Rating	Input: 100 – 240 V AC/~, 50/60 Hz, 0.08 A, 4 W Output: 24 V DC/⎓, Max 3 W
Class	II
Highest clock frequency	< 108 MHz
Software/Firmware version	-

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 Additional information about the EUT

The EUT is a stand-alone plug-in LED driver for luminaires, which also can be used as power supply for other apparatus.

The EUT is tested in a table-top standing configuration.

The EUT was equipped with the following cable:

Port	Type	Length [m]	Specifications
AC Mains	Plug-in type (L/N)	-	-
DC output	Two-core	5 m	-

3. TEST SPECIFICATIONS

3.1 Standards

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

ICES-001 Issue 4: Industrial, Scientific and Medical (ISM) Radio Frequency Generators

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

CISPR 11:2009 + A1:2010: Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement

3.2 Additions, deviations and exclusions from standards and accreditation

The following editions of basic standards were applied instead of the standards referenced in ICES-001 Issue 4.

Referenced ICES-001 Issue 4	Applied
CISPR 11:2003 + A1:2004	CISPR 11:2009 + A1:2010

No other 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.
Tests were performed with max load condition and in standby. The EUT was provided with a resistive load for max output power, and in addition during conducted emission also with a LED lamp load of 3 W.

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-001, section 5 / CISPR 11: 2009, section 6.2.1.3

Limits for conducted emission according to FCC and ICES-001

Class B

Frequency range [MHz]	Limits [dBµV]	
	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-001, section 5 / CISPR 11: 2009, section 6.2.2.3

Limits for radiated emission according to FCC

Class B

Frequency range [MHz]	Field strength at 3 m (dBµV/m)	Field strength at 10 m (dBµV/m)	Detector
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.1	Quasi Peak
216 – 960	46.0	35.6	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-001

Class B, Group 1

Frequency range [MHz]	Field strength at 3 m (dBµV/m)	Field strength at 10 m (dBµV/m)	Detector
30 – 230	40.0	30.0	Quasi Peak
230 – 1000	47.0	37.0	Quasi Peak

4. TEST SUMMARY

The results in this report apply only to sample tested:
Result: Pass – Fail – N/A= Not applicable

Standard	Description	Result
	Emission	
FCC Part 15 subpart B	**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 7.6 dB at 16.294 MHz See clause 5.4 – 5.6.	**PASS**
ICES-001	**Conducted continuous emission in the frequency range 0.150 – 30 MHz, AC Power input port** The EUT complies with the Class B, Group 1 limits. The margin to the limit was at least 7.6 dB at 16.294 MHz See clause 5.4 – 5.6.	**PASS**
FCC Part 15 subpart B	**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 11.4 dB at 118.110 MHz See clause 6.5 – 6.6.	**PASS**
ICES-001	**Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz** The EUT complies with the Class B, Group 1 limits. The margin to the limit was at least 8.3 dB at 118.110 MHz See clause 6.7 – 6.8.	**PASS**

5. CONDUCTED CONTINUOUS DISTURBANCES in the frequency-range 0.15 – 30 MHz

5.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
November 28, 2019	23 [°C]	35 [%]

5.2 Test setup and test procedure

The test method is in accordance with ANSI C63.4 & CISPR 11.

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.

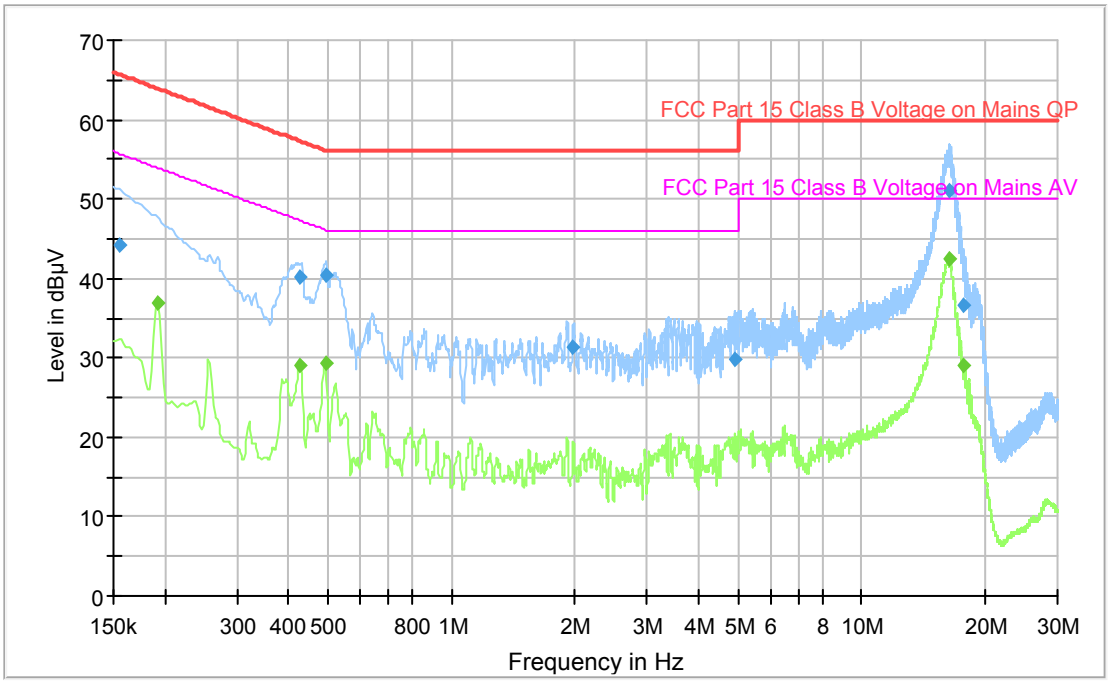
Overview sweeps were performed for each lead.
During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

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, resistive load, max rated 3 W



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.155	44.1	65.8	N	21.7
0.427	40.1	57.3	N	17.2
0.497	40.3	56.1	L	15.8
1.982	31.4	56.0	N	24.6
4.911	29.8	56.0	N	26.2
16.348	51.2	60.0	N	8.8
17.714	36.7	60.0	N	23.3

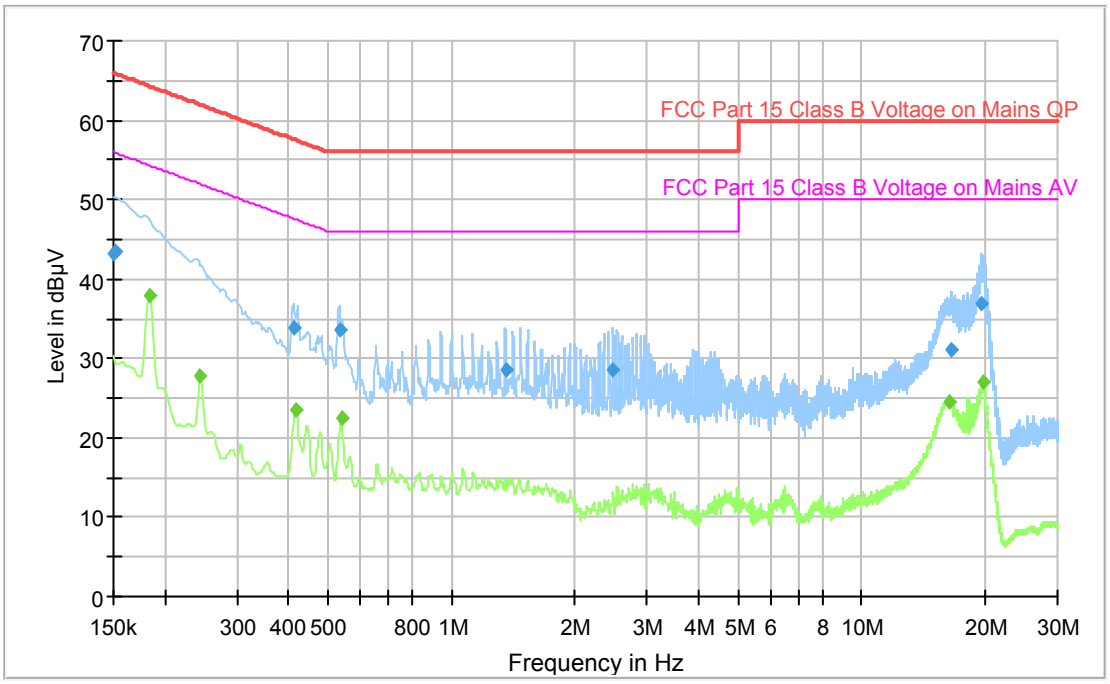
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.193	36.9	53.9	L	17.0
0.427	29.1	47.3	N	18.2
0.492	29.2	46.1	L	16.9
16.294	42.4	50.0	N	7.6
17.651	29.1	50.0	N	20.9

The EUT also fulfil the limit for ICES-001, see limit table, clause 3.5 Compliance in this test report.

Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + LISN insertion loss [dB]

5.5 Test results, AC Power input port, Class B, mode: LED load of 3 W



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.150	43.2	66.0	L	22.8
0.411	33.9	57.6	L	23.7
0.533	33.7	56.0	L	22.3
1.354	28.5	56.0	N	27.5
2.481	28.6	56.0	N	27.4
16.607	31.1	60.0	L	28.9
19.660	36.9	60.0	L	23.1

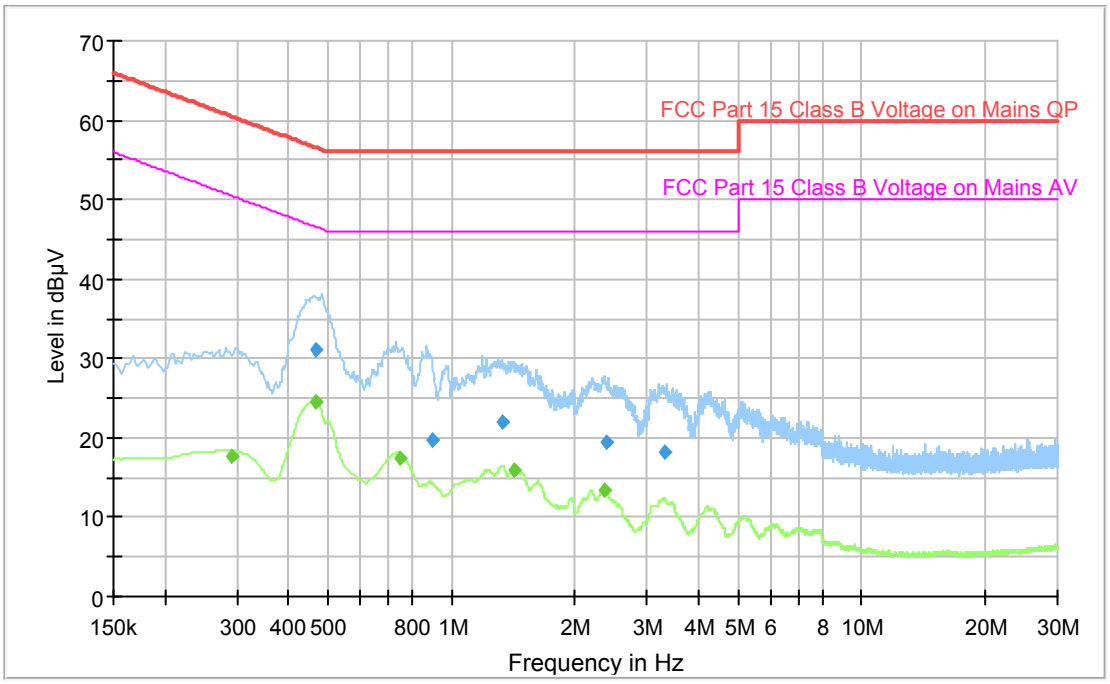
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.184	37.8	54.3	N	16.5
0.245	27.8	51.9	L	24.1
0.418	23.5	47.5	L	24.0
0.539	22.5	46.0	L	23.5
16.307	24.5	50.0	N	25.5
19.727	27.1	50.0	N	22.9

The EUT also fulfil the limit for ICES-001, see limit table, clause 3.5 Compliance in this test report.

Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + LISN insertion loss [dB]

5.6 Test results, AC Power input port, Class B, Standby



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.467	31.1	56.6	N	25.5
0.902	19.8	56.0	N	36.2
1.329	22.1	56.0	N	33.9
2.378	19.5	56.0	N	36.5
3.318	18.2	56.0	N	37.8

Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.292	17.8	50.5	N	32.7
0.467	24.5	46.6	N	22.1
0.470	24.4	46.5	N	22.1
0.746	17.4	46.0	N	28.6
1.428	15.9	46.0	N	30.1
2.357	13.4	46.0	N	32.6

The EUT also fulfil the limit for ICES-001, see limit table, clause 3.5 Compliance in this test report.

Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + LISN insertion loss [dB]

5.7 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	06-2019	1 year
Pulse limiter	Rohde & Schwarz	ESH3-Z2	4623	03-2019	1 year
Artificial mains network	Rohde & Schwarz	ESH3-Z5	2728	06-2019	1 year
Measurement cable	Suhner	RG 223/U	9815	06-2019	1 year
Measurement cable	Suhner	G03232D-01	9701	06-2019	1 year

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 1 GHZ

6.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
November 29, 2019	21 [°C]	27 [%]

6.2 Test setup and test procedure

The test method is in accordance with ANSI C63.4 and CISPR 11.

The EUT was set up according to the standards.

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.

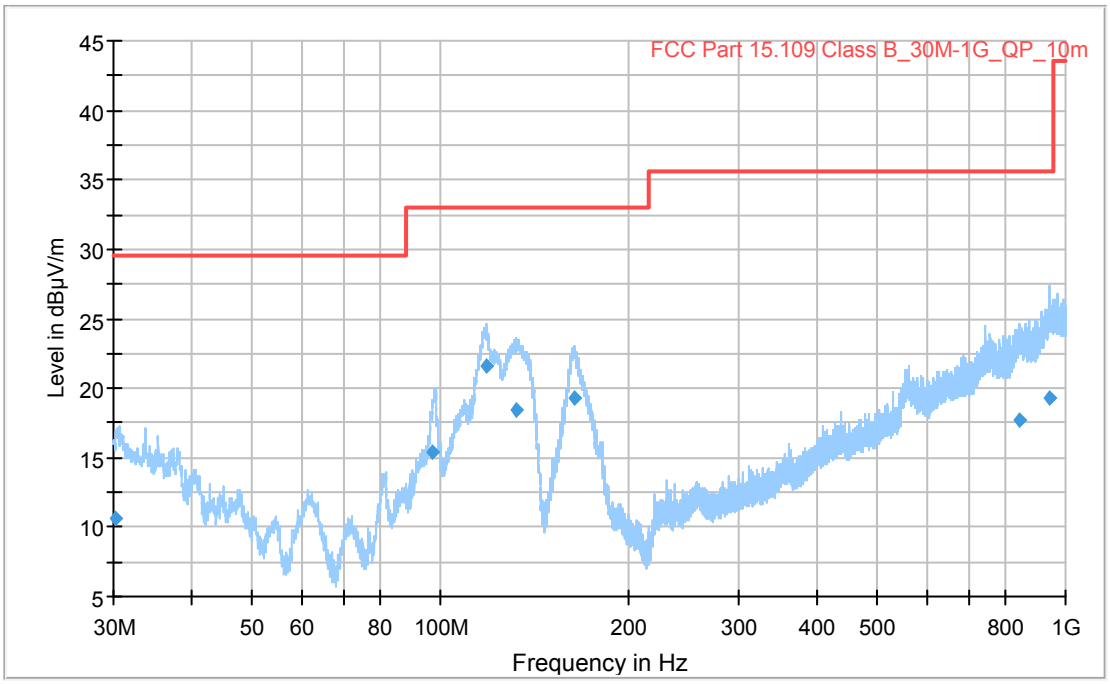
6.3 Test conditions

Test setup:	**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:	10 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Bilog		

6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance
Uncertainty for the frequency range 30 to 1000 MHz at 10 m ± 5.0 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, FCC, Class B, resistive load, max rated 3 W



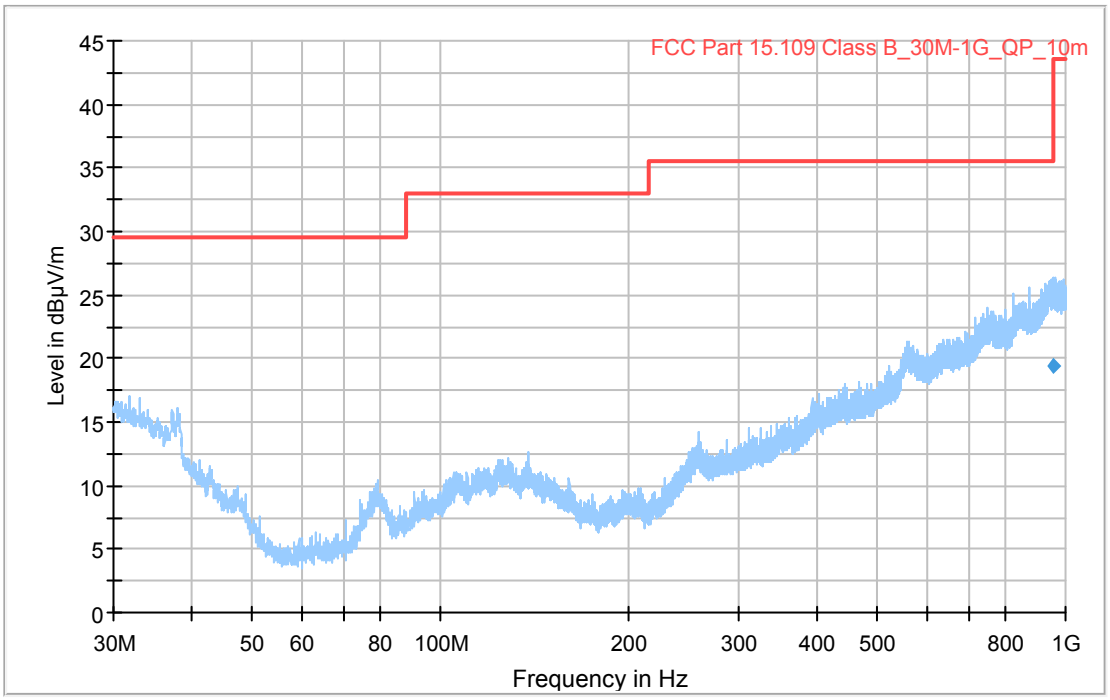
Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m distance.

Measurement results, Quasi Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.210	10.6	29.5	V	18.9
97.290	15.4	33.1	V	17.7
118.110	21.7	33.1	V	11.4
132.390	18.4	33.1	V	14.7
163.740	19.3	33.1	V	13.8
846.330	17.7	35.6	H	17.9
941.220	19.3	35.6	V	16.3

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

6.6 Test results, 30 – 1000 MHz, FCC, Class B, standby



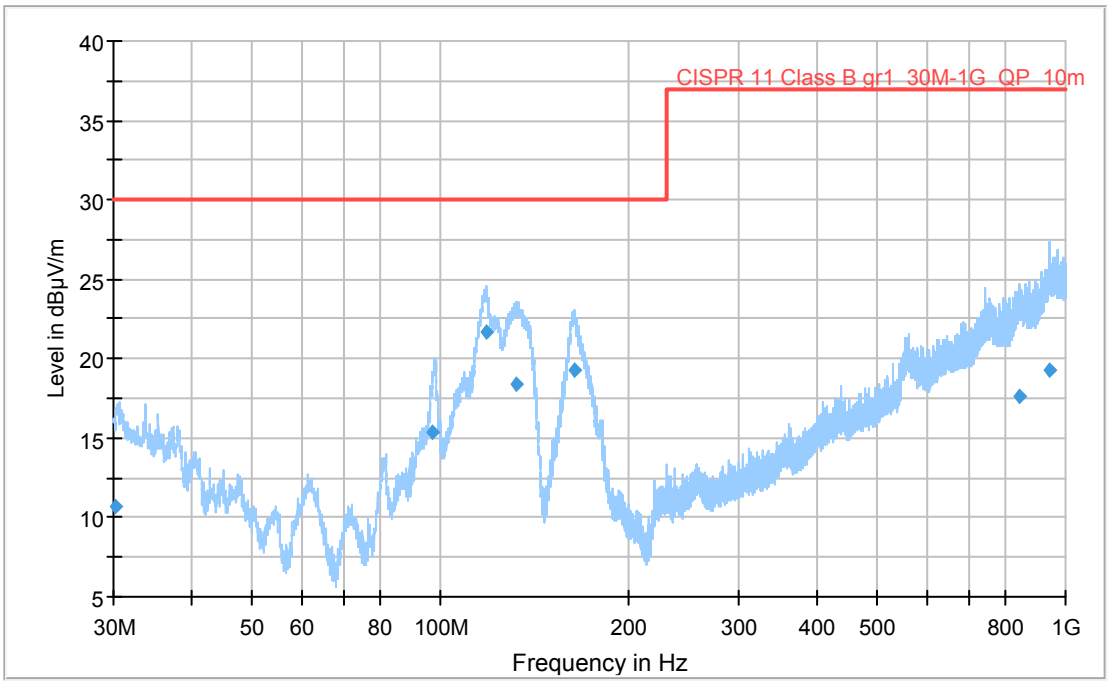
Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m distance.

Measurement results, Quasi Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
956.460	19.5	35.6	H	16.1

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

6.7 Test results, 30 – 1000 MHz, ICES-001, Group 1, Class B, resistive load, rated 3 W



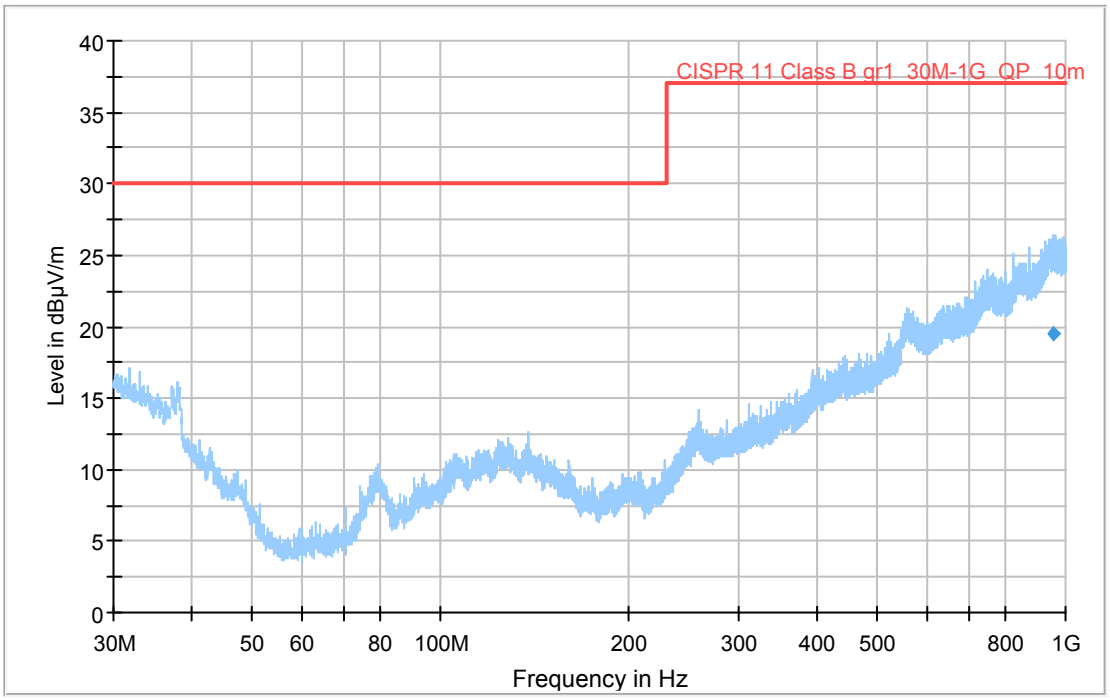
Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m distance.

Measurement results, Quasi Peak, Group 1, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.210	10.6	30.0	V	19.4
97.290	15.4	30.0	V	14.6
118.110	21.7	30.0	V	8.3
132.390	18.4	30.0	V	11.6
163.740	19.3	30.0	V	10.7
846.330	17.7	37.0	H	19.3
941.220	19.3	37.0	V	17.7

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

6.8 Test results, 30 – 1000 MHz, ICES-001, Group 1, Class B, Standby



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m distance.

Measurement results, Quasi Peak, Group 1, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
956.460	19.5	37.0	H	17.5

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

6.9 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	06-2019	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