EMC TEST REPORT

No. 2012522STO-106

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	Luminaire for furniture with LED
Type/Model:	L1926 Mittled
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)

For details, see clause 2 – 4.

Date of issue: May 8, 2020

Tested by: Anders Lindström

Approved by: Anna Pogosian

Revision History

Test report number	Date	Description	Changes
2012522STO-106	May 8, 2020	First release	

CONTENTS

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	Elias Molin

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment	Luminaire for furniture with LED
Type/Model	L1926 Mittled
Brand name	**IKEA**
Serial Number	-
Manufacturer	IKEA of Sweden
Rating	24 V DC, 2.2 W
Class	III
Highest clock frequency	< 108 MHz
FCC ID	FHO-L1926

EUT rating plate

2.2 Test setup and EUT photos

Test setup and EUT photos are enclosed in Annex 1, No. 2012522STO-108.

2.3 Additional information about the EUT

The EUT was tested in a tabletop configuration.
The EUT consists of the following units:

Units	Type	Serial number
Luminaire	L1926 Mittled	
LED driver	ICPSLC24-10NA-IL-1	LED driver
LED driver	ICPSLC24-30NA-IL-1	LED driver

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 tested with 120 V, 60 Hz.

The EUT was measured with the dimmer regulation set to max luminous intensity and min luminous intensity and in stand by mode with two alternative LED drivers IKEA, types ICPSLC24-10NA-IL-1 and ICPSLC24-30NA-IL-1.

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 [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-005, section 5.5.3

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	33.0	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 (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 – 1000	46.0	35.6	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 **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 5.3 dB at 0.618 MHz See clause 5.4 – 5.9.	**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 FCC limit was at least 11.8 dB at 30.000 MHz. See clause 6.5 – 6.10.	**PASS**
FCC Part 15 subpart B **ICES-005**	**Radiated emission of electromagnetic fields in the frequency range 1 – 40 GHz** Not applicable, clock frequency < 108 MHz.	**N/A**

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

5.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
April 24, 2020	23 [°C]	24 [%]

5.2 Test setup 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.

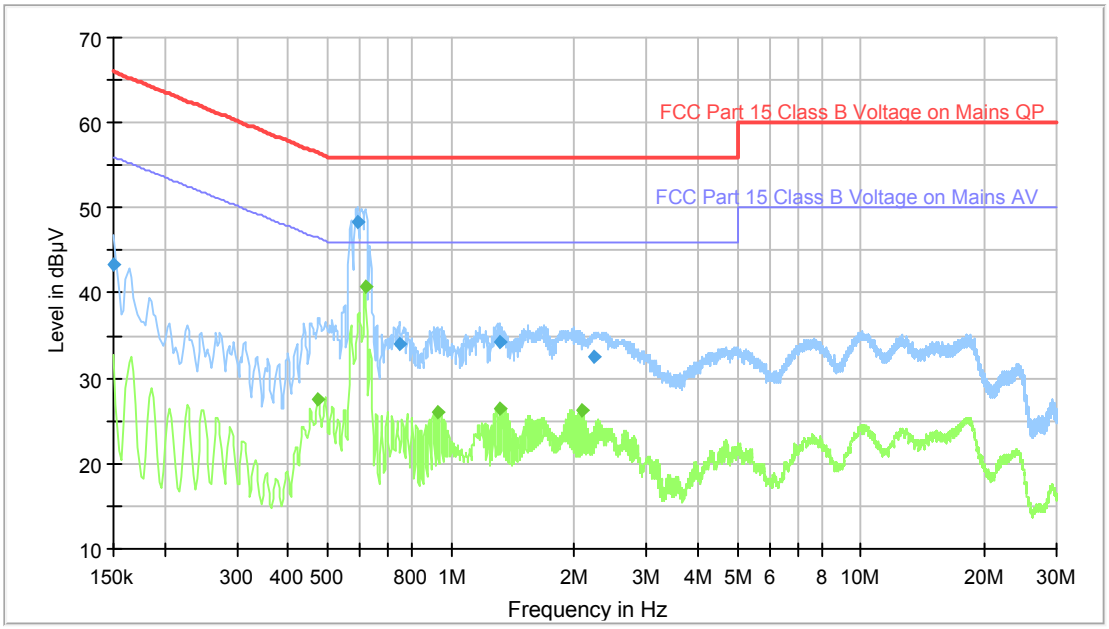
Overview sweeps were performed for each lead.
During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

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, with driver ICPSLC24-10NA-IL-1

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.591	48.3	56.0	L	7.7
0.749	34.0	56.0	L	22.0
1.313	34.4	56.0	L	21.6

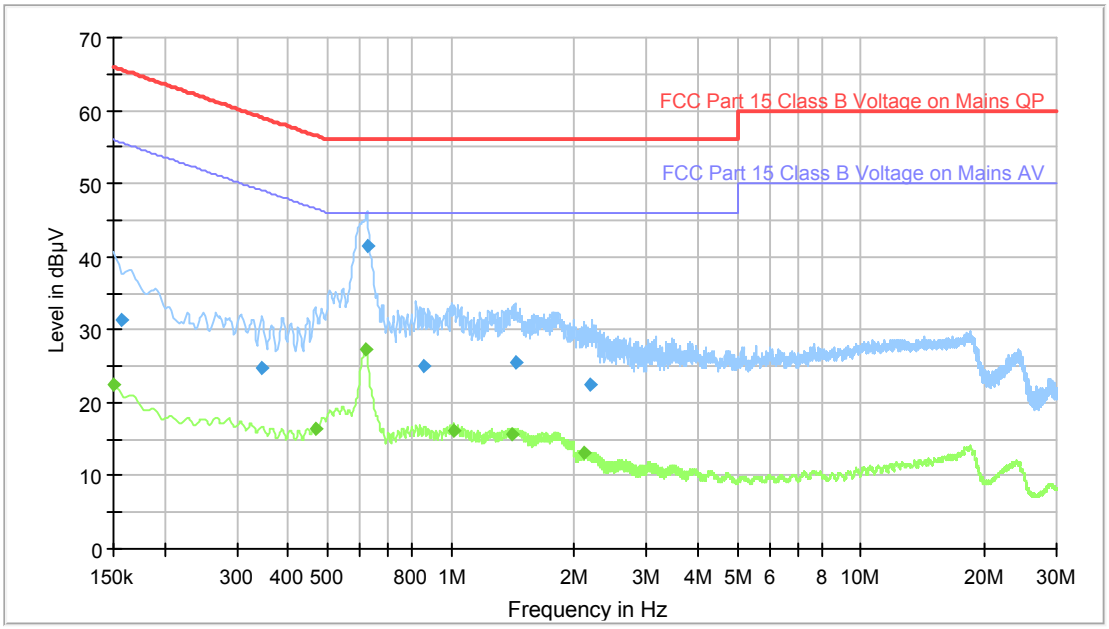
All other measured disturbances have a margin of more than 20 dB to the limits.

Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.474	27.6	46.4	L	18.8
0.618	40.7	46.0	L	5.3
0.926	26.0	46.0	L	20.0
1.315	26.5	46.0	L	19.5
2.076	26.3	46.0	L	19.7

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

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



Diagram, Peak and Average overview sweep, with driver ICPSLC24-10NA-IL-1

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.625	41.3	56.0	L	14.7

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

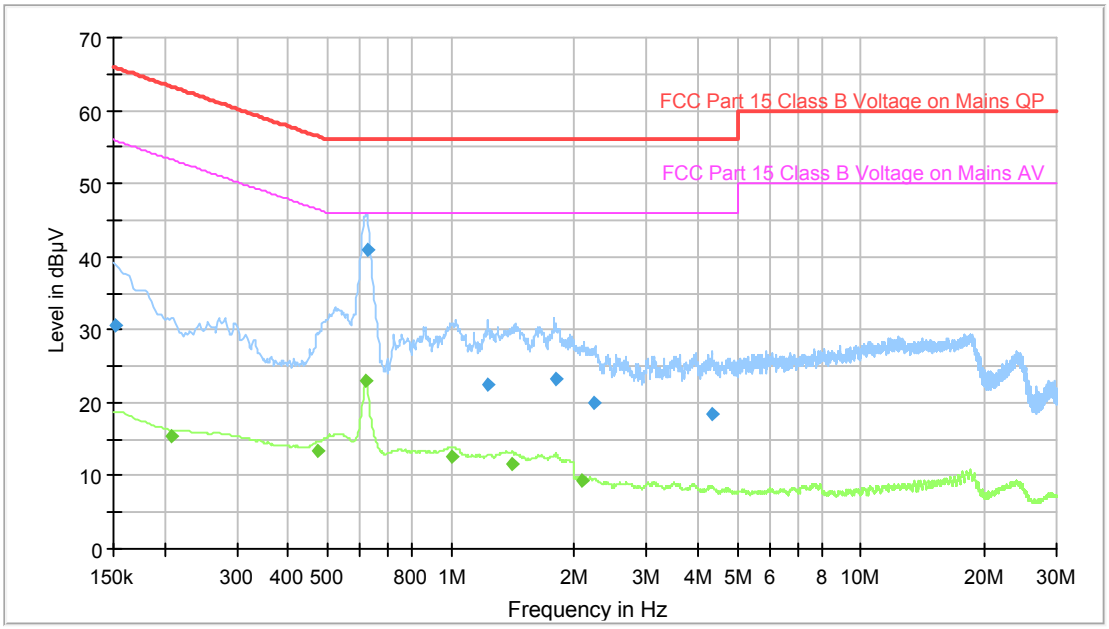
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.620	27.4	46.0	L	18.6

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

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

5.6 Test results, AC Power input port, Class B, stand by



Diagram, Peak and Average overview sweep, with driver ICPSLC24-10NA-IL-1

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.625	40.9	56.0	L	15.1

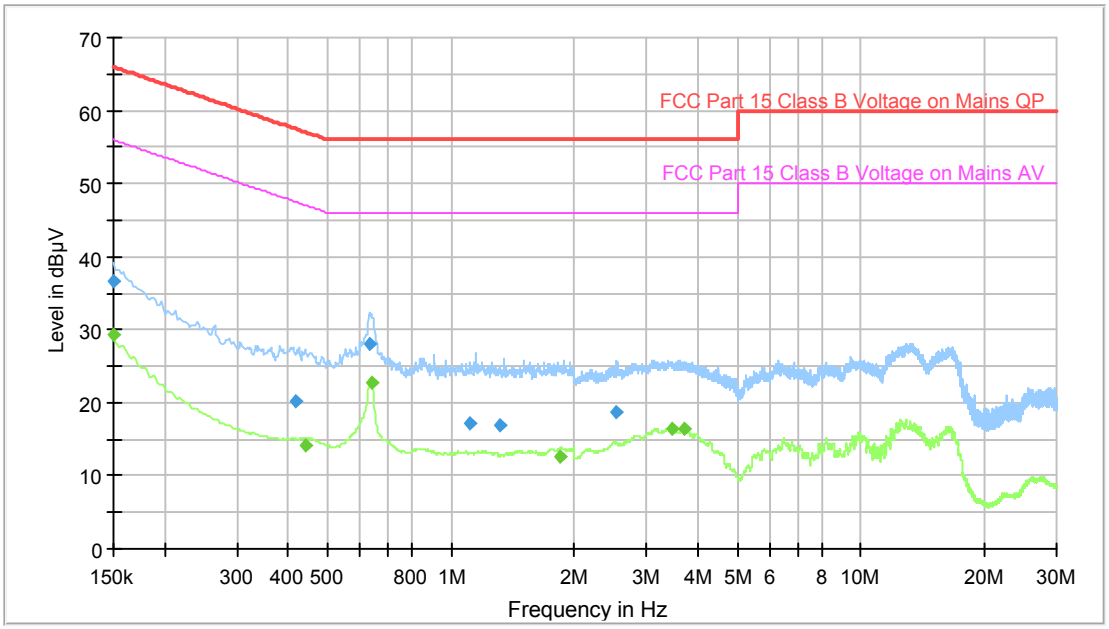
All other measured disturbances have a margin of more than 20 dB to the limits.

Measurement results, Average, Class B

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

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

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



Diagram, Peak and Average overview sweep, with driver ICPSLC24-30NA-IL-1

Measurement results, Quasi-peak, Class B

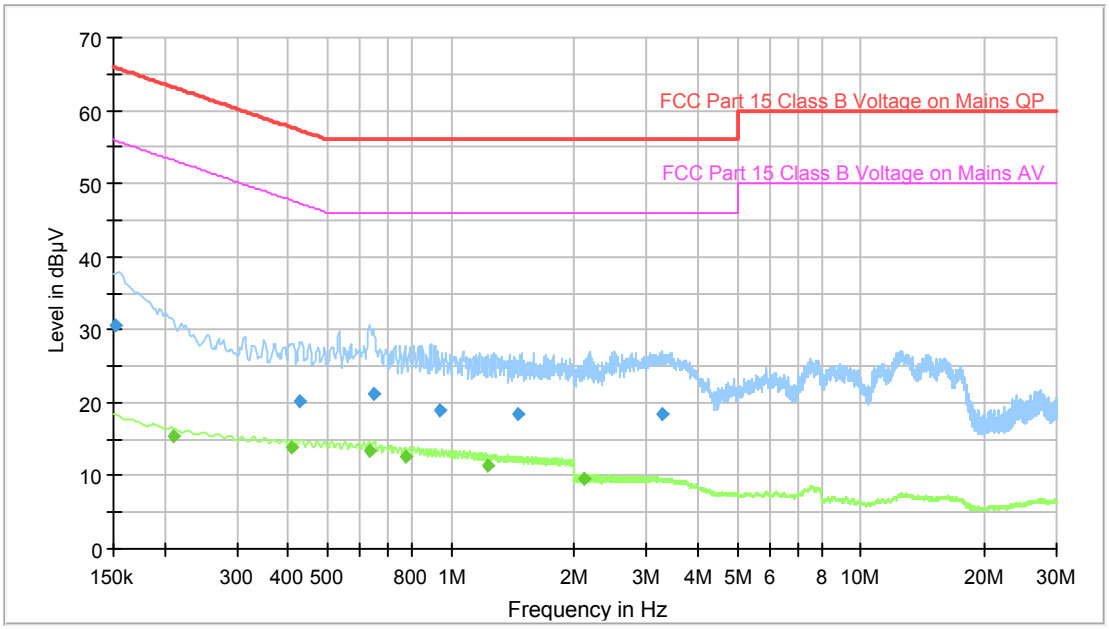
All measured disturbances have a margin of more than 20 dB to the limits.

Measurement results, Average, Class B

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

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

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



Diagram, Peak and Average overview sweep, with driver ICPSLC24-30NA-IL-1

Measurement results, Quasi-peak, Class B

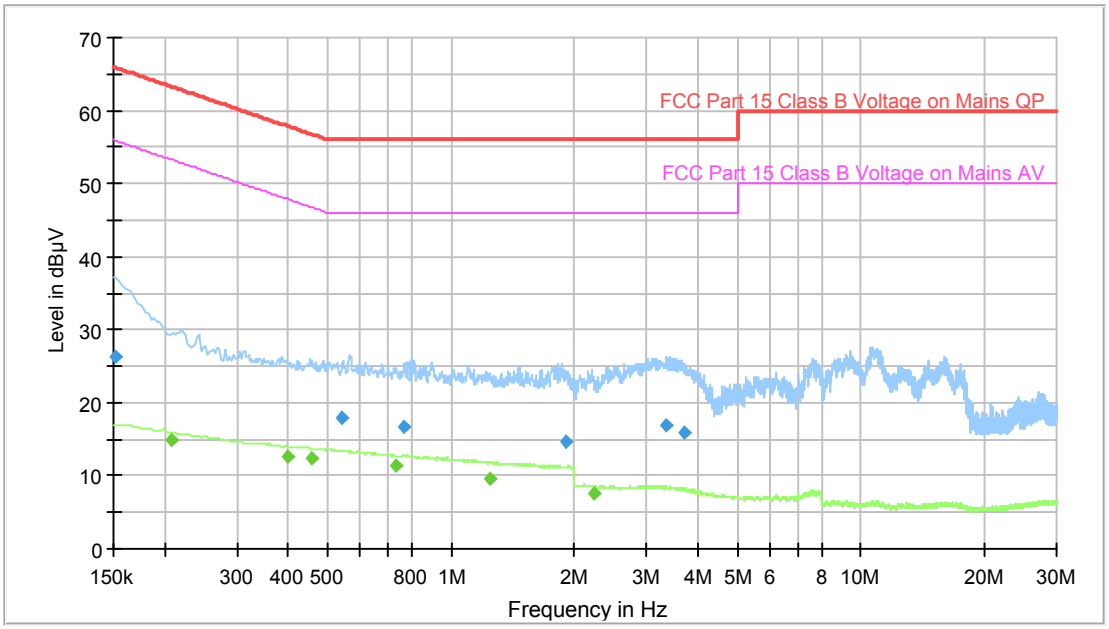
All measured disturbances have a margin of more than 20 dB to the limits.

Measurement results, Average, Class B

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

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

5.9 Test results, AC Power input port, Class B, stand by



Diagram, Peak and Average overview sweep, with driver ICPSLC24-30NA-IL-1

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.

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

5.10 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - v10.50.00	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	06-2019	1 year
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2728	06-2019	1 year
Pulse limiter	Rohde & Schwarz	ESH3-Z2	4623	05-2019	1 year
Coaxial cable	Huber+Suhner	RG 213/U	9815	06-2019	1 year
Coaxial cable	Suhner	G03232 D-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:
April 23, 2020	19 [°C]	28 [%]

6.2 Test setup 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

6.3 Test conditions

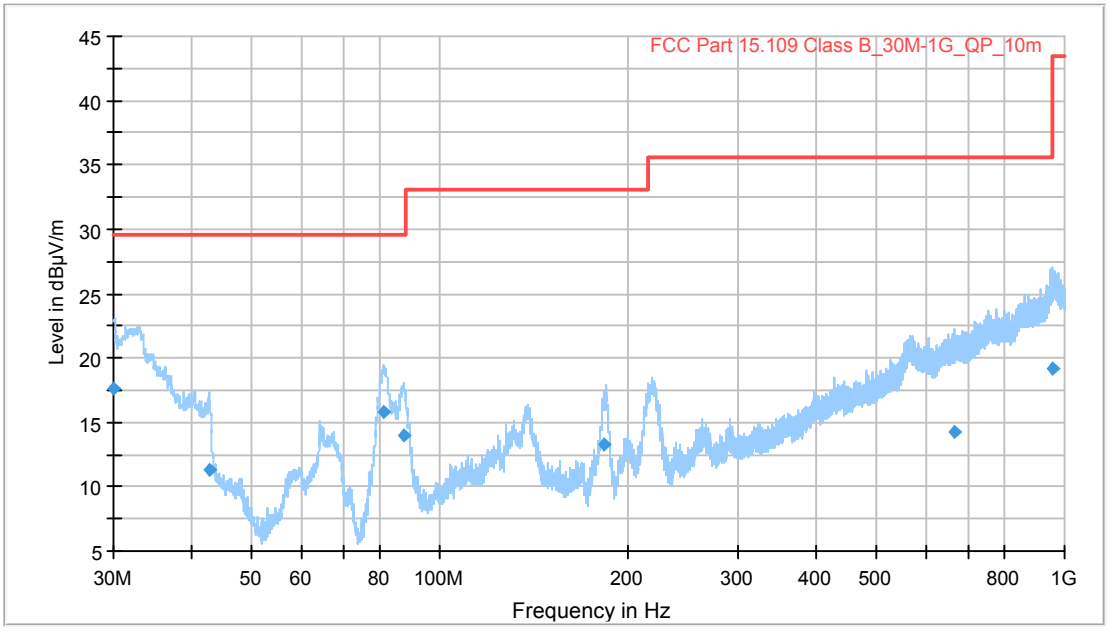
Test setup:	**30 – 1000 MHz**		
Test receiver set-up:			
Preview test:	Peak,	RBW 120 kHz	VBW 1 MHz
Final test:	Quasi-Peak,	RBW 120 kHz	
Measuring distance:	10 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Bilog		

6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance
Uncertainty for the frequency range 30 to 1000 MHz at 10 m ± 5.1 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, max luminous intensity



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m, with driver ICPSLC24-10NA-IL-1.

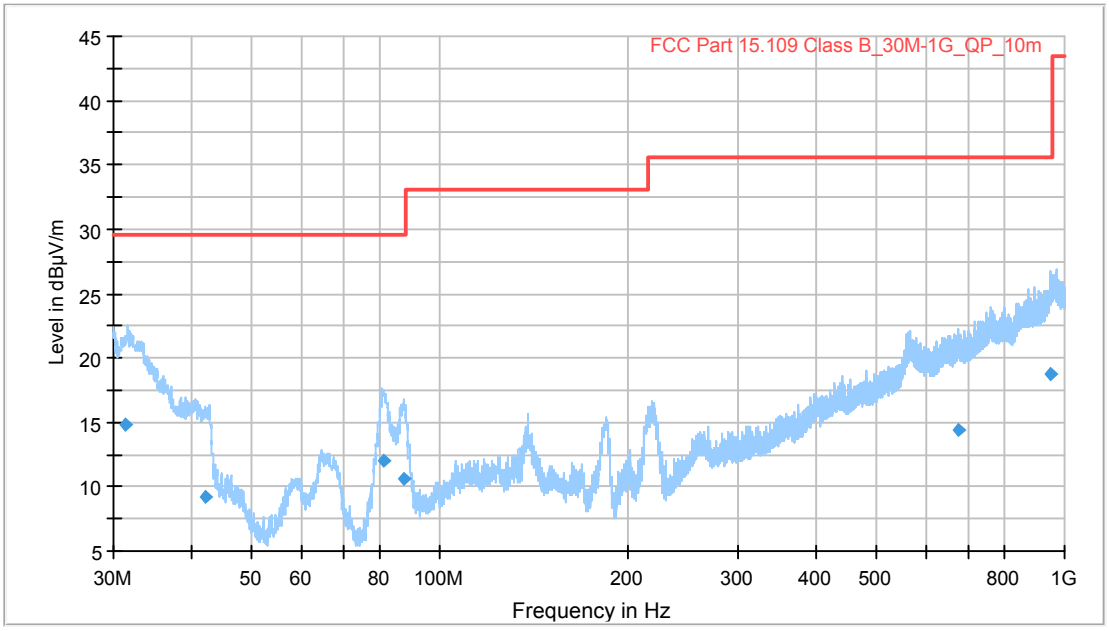
Measurement results, Quasi Peak, FCC Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.000	17.7	29.5	V	11.8
42.690	11.3	29.5	V	18.2
81.540	15.8	29.5	V	13.7
87.180	14.1	29.5	V	15.4
183.600	13.3	33.0	V	19.7
665.550	14.2	35.5	V	21.3
958.410	19.2	35.5	V	16.3

The EUT also fulfil the limit for ICES-005, see limit table clause 3.5 in this test report.

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, min luminous intensity



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m, with driver ICPSLC24-10NA-IL-1.

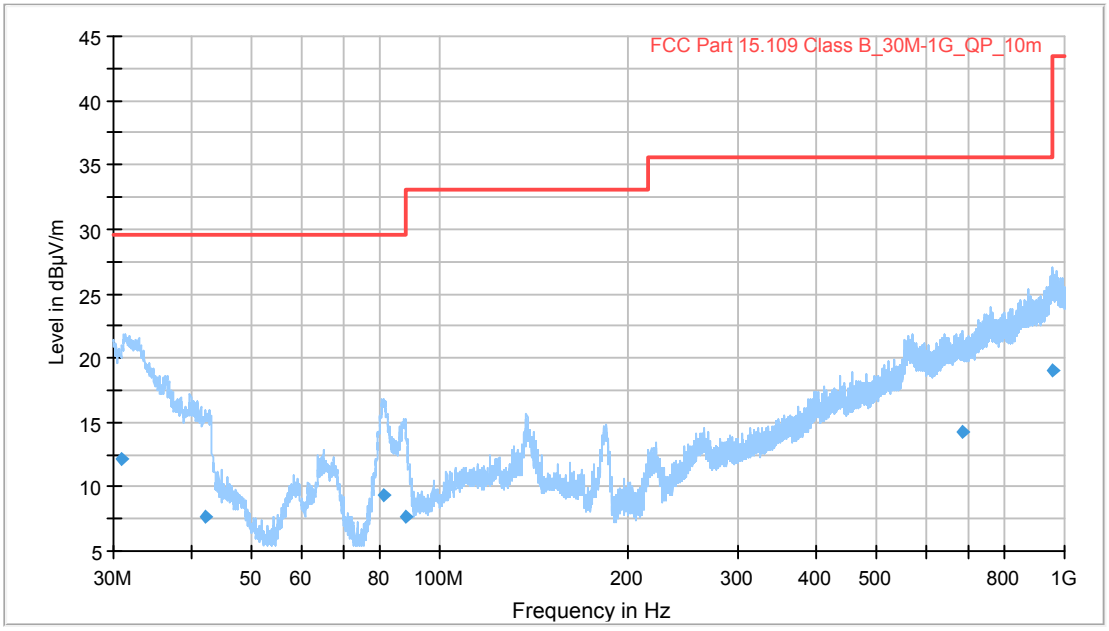
Measurement results, Quasi Peak, FCC Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
31.290	14.8	29.5	V	14.7
42.270	9.3	29.5	V	20.2
81.120	12.1	29.5	V	17.4
87.630	10.6	29.5	V	18.9
677.640	14.4	35.5	V	21.1
949.080	18.8	35.5	H	16.7

The EUT also fulfil the limit for ICES-005, see limit table clause 3.5 in this test report.

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

6.7 Test results, 30 – 1000 MHz, FCC Class B, stand by



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m, with driver ICPSLC24-10NA-IL-1.

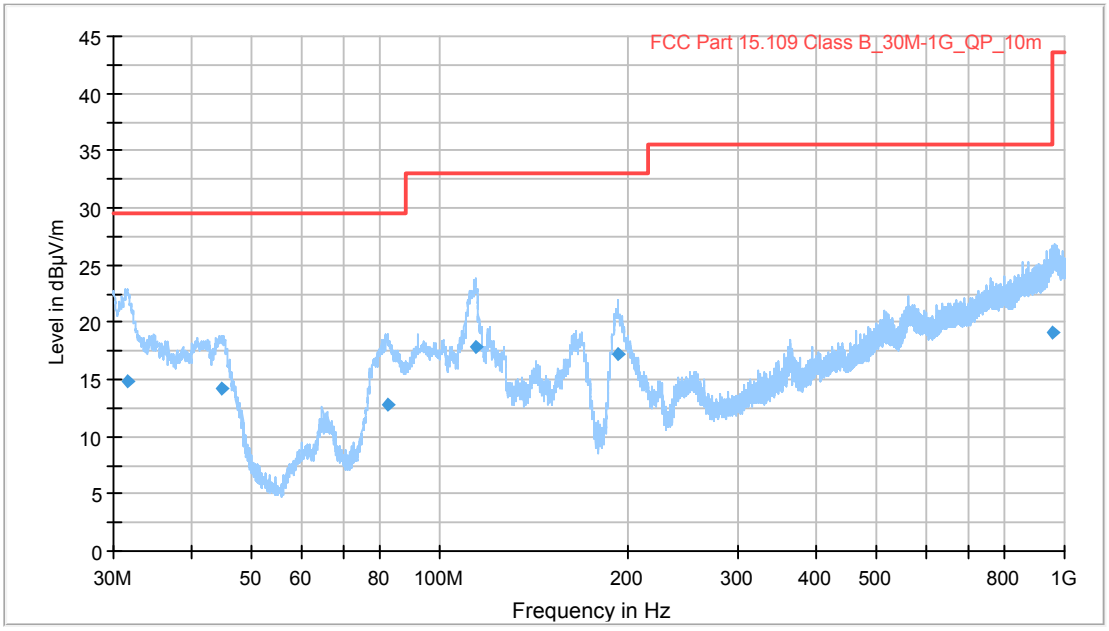
Measurement results, Quasi Peak, FCC Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.930	12.2	29.5	V	17.3
42.090	7.7	29.5	V	21.8
81.510	9.3	29.5	V	20.2
87.960	7.7	29.5	V	21.8
683.850	14.3	35.5	V	21.2
956.310	19.1	35.5	V	16.4

The EUT also fulfil the limit for ICES-005, see limit table clause 3.5 in this test report.

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

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



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m, with driver ICPSLC24-30NA-IL-1.

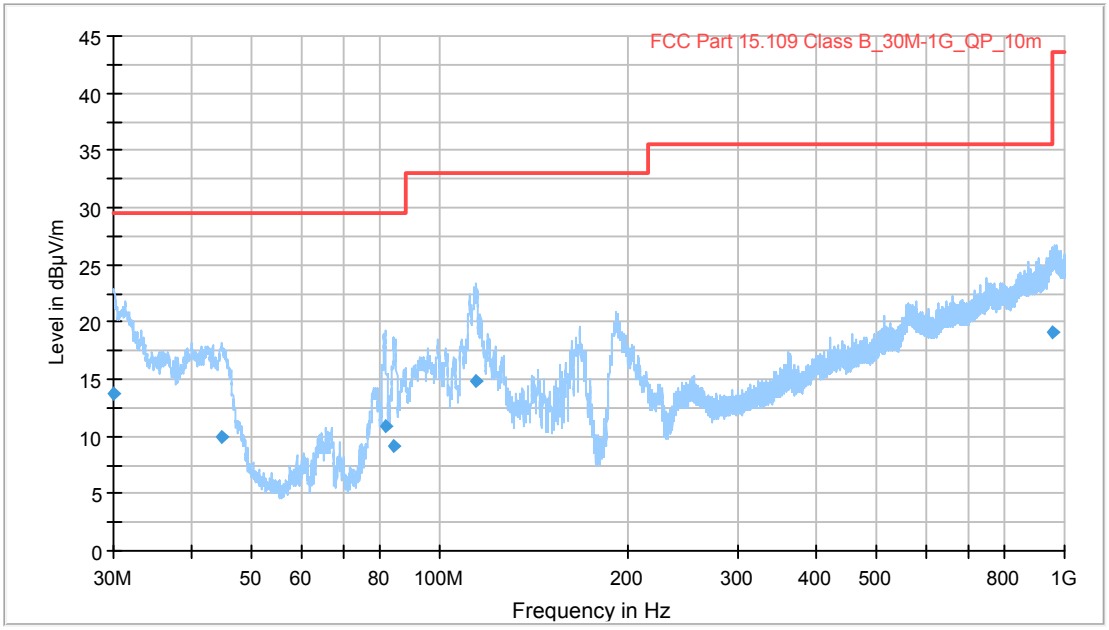
Measurement results, Quasi Peak, FCC Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
31.650	14.8	29.5	V	14.7
44.580	14.1	29.5	V	15.4
82.230	12.8	29.5	V	16.7
114.030	17.8	33.0	V	15.2
192.450	17.2	33.0	V	15.8
956.730	19.1	35.5	H	16.4

The EUT also fulfil the limit for ICES-005, see limit table clause 3.5 in this test report.

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

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



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m, with driver ICPSLC24-30NA-IL-1.

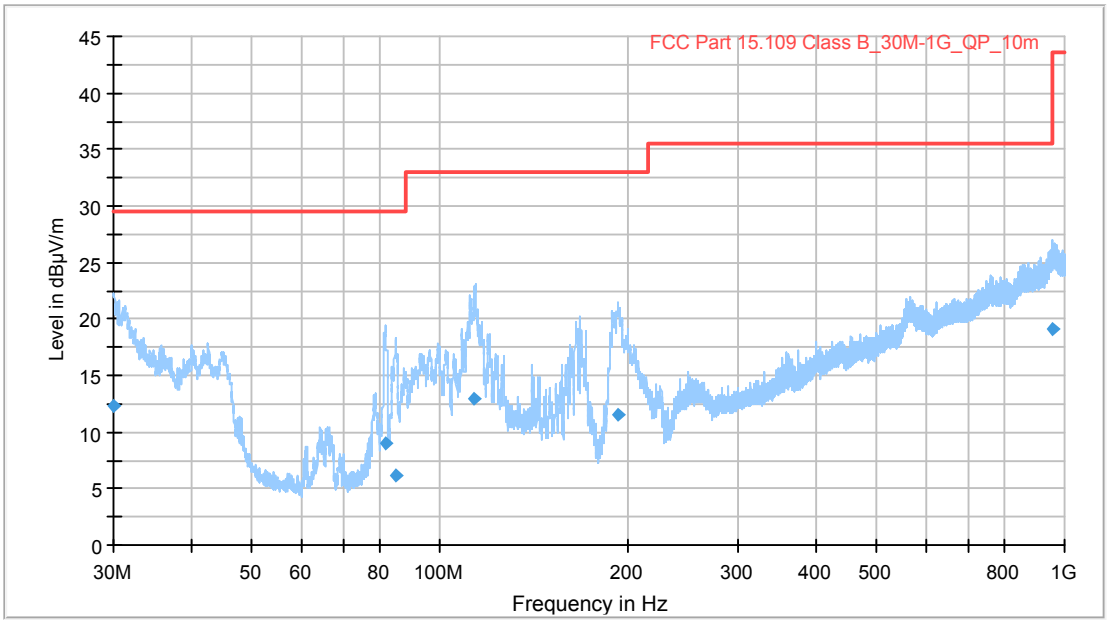
Measurement results, Quasi Peak, FCC Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.000	13.7	29.5	V	15.8
44.700	10.0	29.5	V	19.5
81.720	11.0	29.5	V	18.5
84.600	9.1	29.5	V	20.4
113.910	14.9	33.0	V	18.1
956.940	19.1	35.5	V	16.4

The EUT also fulfil the limit for ICES-005, see limit table clause 3.5 in this test report.

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

6.10 Test results, 30 – 1000 MHz, FCC Class B, stand by



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m, with driver ICPSLC24-30NA-IL-1.

Measurement results, Quasi Peak, FCC Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.000	12.3	29.5	V	17.2
81.840	9.0	29.5	V	20.5
84.990	6.1	29.5	V	23.4
113.640	13.0	33.0	V	20.0
192.360	11.5	33.0	V	21.5
957.780	19.2	35.5	V	16.3

The EUT also fulfil the limit for ICES-005, see limit table clause 3.5 in this test report.

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

6.11 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde&Schwarz	EMC32 - 10.15.00	--	--	--
Measurement Receiver	Rohde&Schwarz	ESW 44	33890	06-2019	1 year
Preamplifier	-	AM1331	S7992	24-04-2019	1 year
Antenna	Teseq	CBL6111D	34200	03-2020	3 year
Measurement cable	Huber&Suhner	Sucoflex106	39122	03-2020	1 year
Measurement cable	Rosenberger	LA5-S003-7000	39164	01-2020	1 year