EMC TEST REPORT

No. 2019873STO-101

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	Surface mounted luminaire with LED
Type/Model:	L1924 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 devices, 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: June 23, 2020

Tested by: Per Granberg

Approved by: Matti Virkki

Revision History

Test report number	Date	Description	Changes
2019873STO-101	June 23, 2020	First release	

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	IKEA of Sweden AB Box 702 SE-343 81 Älmhult Sweden
Client observer	Markus Mauritzon

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment	Surface mounted luminaire with LED
Type/Model	L1924 Mittled
Brand name	IKEA
Serial Number	_
Manufacturer	IKEA of Sweden AB
Rating	24 V DC, 5 W
Class	III
Highest clock frequency	< 108 MHz
Software/Firmware version	-
FCC ID	FHO-L1924

Rating plate (draft)

2.2 Test set up and EUT photos

Test set up and EUT photos are enclosed in 2019873STO-102 Annex 1.

2.3 Additional information about the EUT

The EUT is a surface mounted luminaire supplied with 24 V DC via external LED-drivers connected to 120 V, 60 Hz. The EUT is tested in a table-top standing configuration.

The EUT was equipped with the following cables:

Port	Type	Length [m]	Specifications
DC	Two wire	3,5	-

2.4 Peripheral equipment

Peripheral equipment is equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

Equipment	Type / Model	Manufacturer	Serial no.
LED-driver	ICPSLC24-10NA-IL-1	IKEA	-
LED-driver	ICPSLC24-30NA-IL-1	IKEA	-

3. TEST SPECIFICATIONS

3.1 Standards

Requirements:
FCC 47 CFR Part 15: Radio frequency devices, 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 supplied with 24 V DC via a LED-driver connected to 120 V, 60 Hz.

Operating mode No.1: dimmer set to max luminous intensity, supplied by ICPSLC24-30NA-IL-1
Operating mode No.2: dimmer set to min luminous intensity, supplied by ICPSLC24-30NA-IL-1
Operating mode No.3: dimmer set to max luminous intensity, supplied by ICPSLC24-10NA-IL-1
Operating mode No.4: dimmer set to min luminous intensity, supplied by ICPSLC24-10NA-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	33.1	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-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 8.7 dB at 0.596 MHz See clause 5.4 – 5.7.	**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 4.3 dB at 47.400 MHz The measured value is within the measurement uncertainty interval to the limit. See clause 6.5 – 6.8.	**PASS**
FCC Part 15 subpart B **ICES-005**	**Radiated emission of electromagnetic fields in the frequency range 1.0 – 40.0 GHz** The EUT has no clock frequency above 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:
May 26, 2020	23 [°C]	32/30 [%]

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.

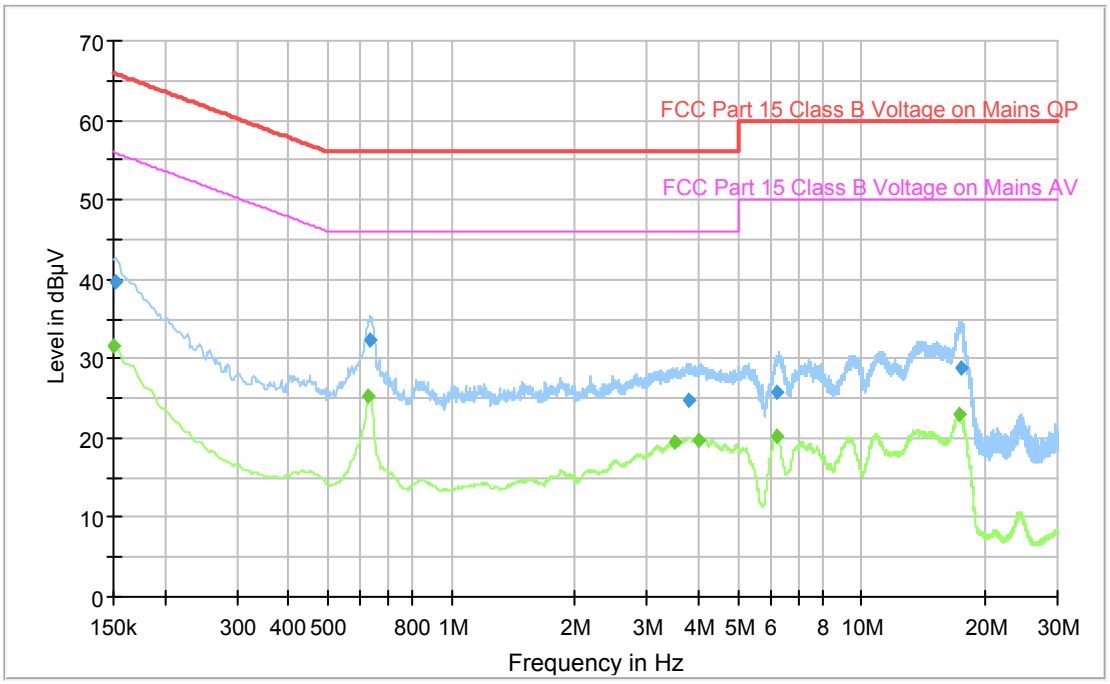
During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

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, Operating Mode No.1



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
-	*	-	-	-

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

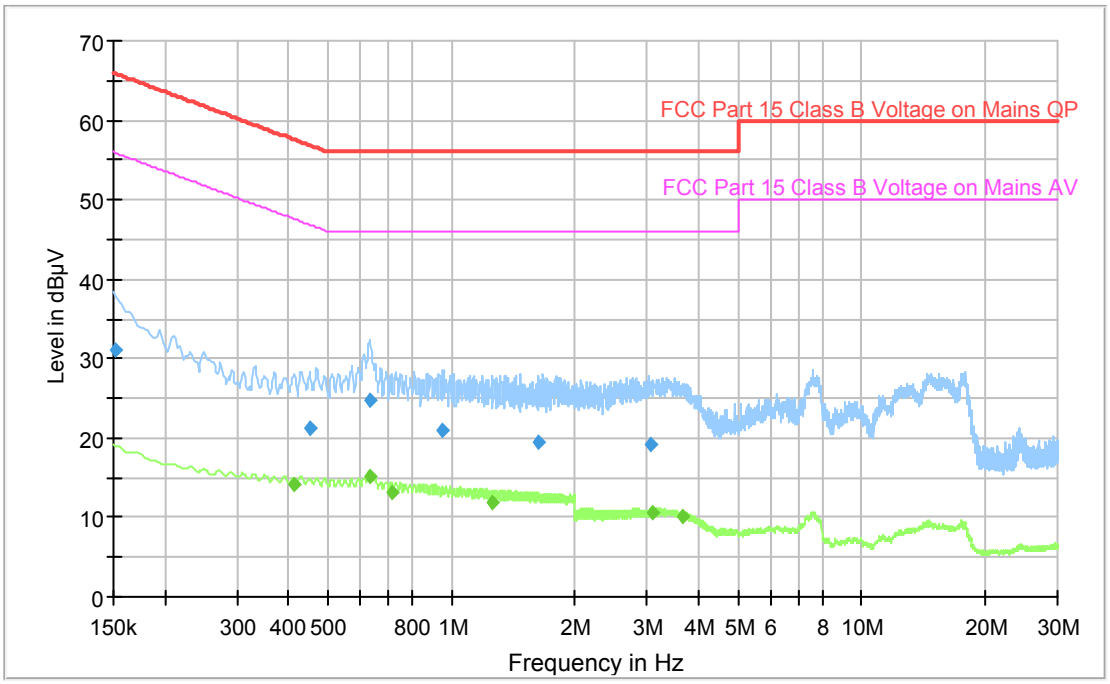
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
-	*	-	-	-

***** 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]

5.5 Test results, AC Power input port, Class B, Operating Mode No.2



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
-	*	-	-	-

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

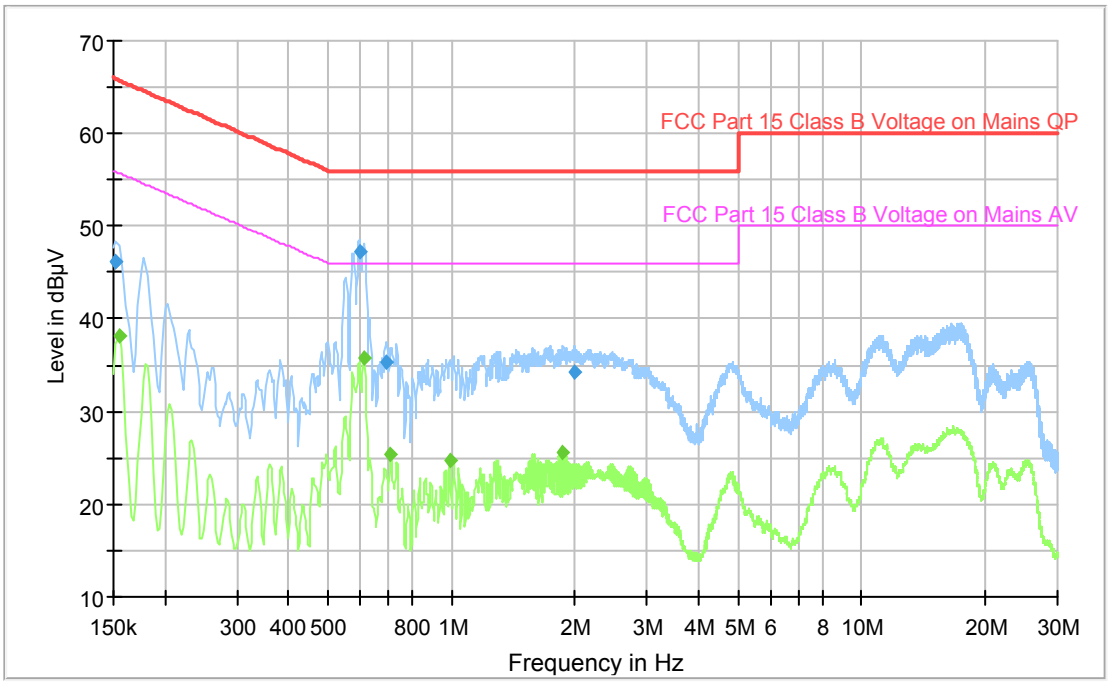
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
-	*	-	-	-

***** 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]

5.6 Test results, AC Power input port, Class B, Operating Mode No.3



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.152	46.2	65.9	L1	19.7
0.152	46.2	65.9	L1	19.7
0.596	47.3	56.0	L1	8.7

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

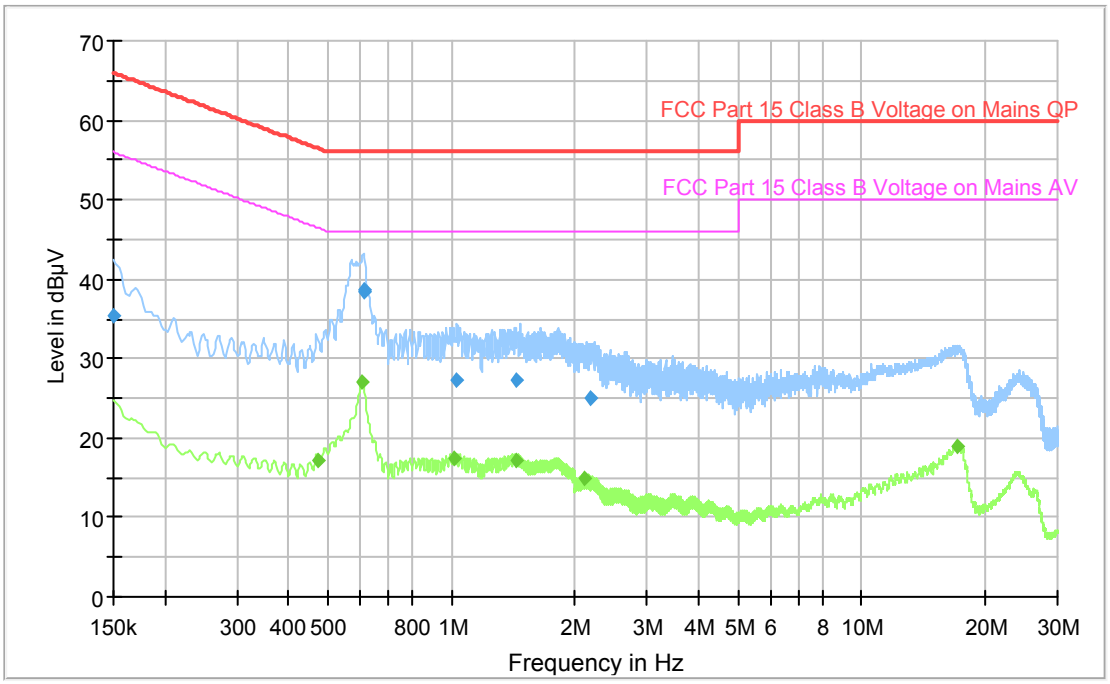
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.155	38.1	55.8	L1	17.7
0.611	35.8	46.0	L1	10.2

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]

5.7 Test results, AC Power input port, Class B, Operating Mode No.4



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.609	38.7	56.0	L1	17.3
0.611	38.4	56.0	L1	17.6

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]
0.607	27.1	46.0	L1	18.9

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]

5.8 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	26-06-2019	1 year
Pulse limiter	Rohde & Schwarz	ESH3-Z2	4623	13-05-2020	1 year
Artificial mains network	Rohde & Schwarz	ESH3-Z5	2728	26-06-2019	1 year
Measurement cable	Bedea	RG 223	39212	11-11-2019	1 year
Measurement cable	Suhner	G03232D-01	9763	04-11-2019	1 year

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

6.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
June 1, 2020	20 [°C]	41 [%]
June 3, 2020	20 [°C]	43 [%]

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

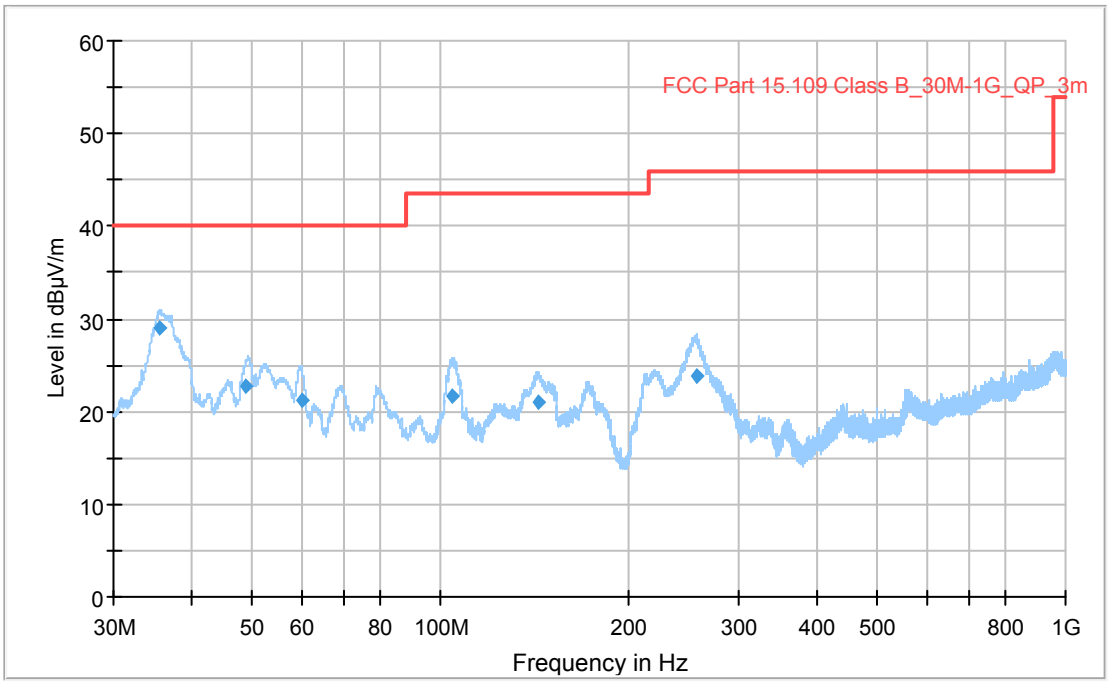
Test setup:	**30 – 1000 MHz**		
Test receiver set-up:			
Preview test:	Peak,	RBW 120 kHz	VBW 1 MHz
Final test:	Quasi-Peak,	RBW 120 kHz	
Measuring distance:	3 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Bilog		

6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance
Uncertainty for the frequency range 30 to 1000 MHz at 3 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, Operating Mode No.1



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

Measurement results, Quasi Peak, Class B

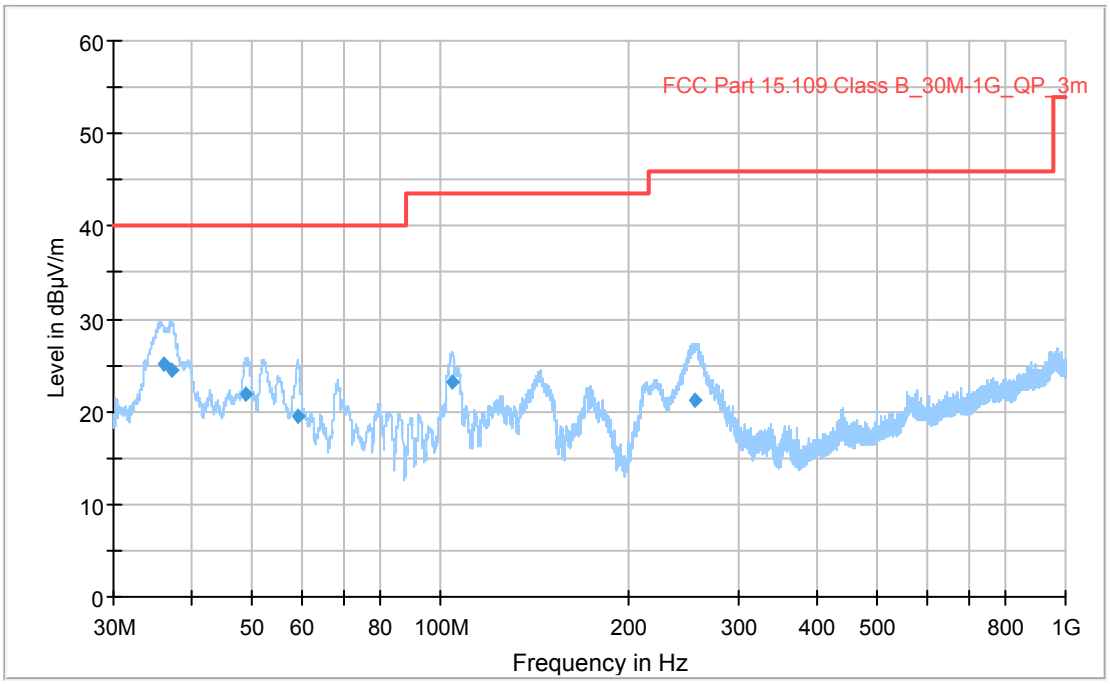
Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
35.670	28.9	40.0	V	11.1
48.990	22.8	40.0	V	17.2
59.940	21.2	40.0	V	18.8

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

The EUT also fulfil the limit for ICES-005, see limit table, clause 3.5 Compliance 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, Operating Mode No.2



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

Measurement results, Quasi Peak, Class B

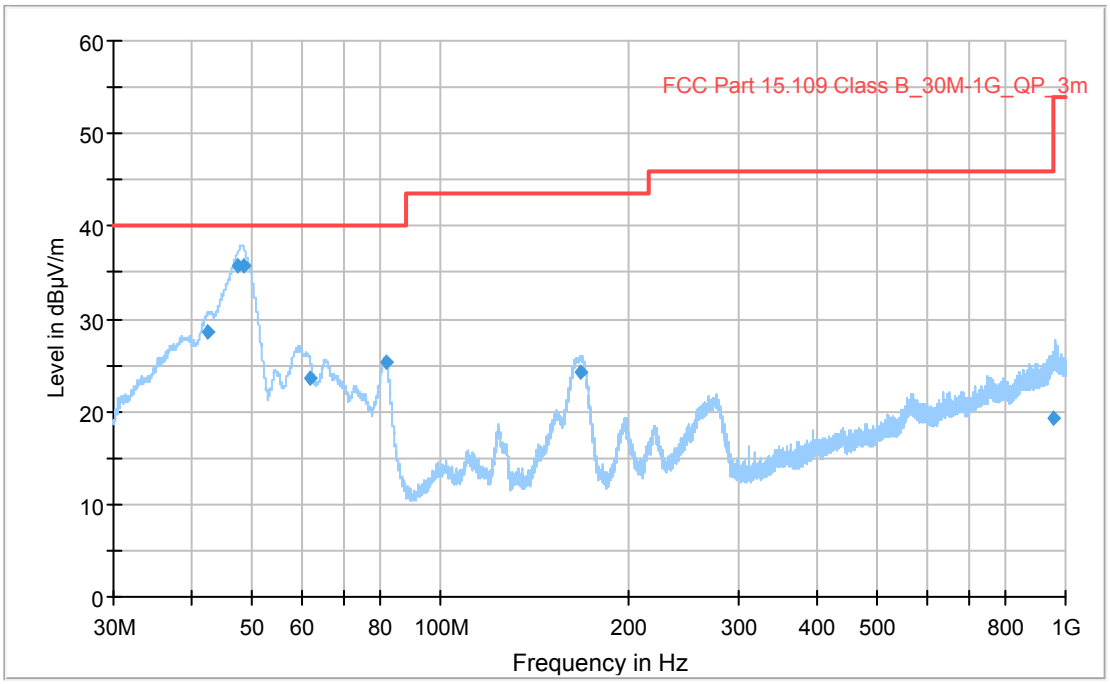
Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
36.150	25.0	40.0	V	15.0
37.050	24.5	40.0	V	15.5
48.930	21.8	40.0	V	18.2

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

The EUT also fulfil the limit for ICES-005, see limit table, clause 3.5 Compliance 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, Operating Mode No.3



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

Measurement results, Quasi Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
42.420	28.6	40.0	V	11.4
47.400	35.7	40.0	V	4.3*
48.300	35.7	40.0	V	4.3*
61.620	23.5	40.0	V	16.5
81.810	25.4	40.0	H	14.6
167.880	24.3	43.5	V	19.2

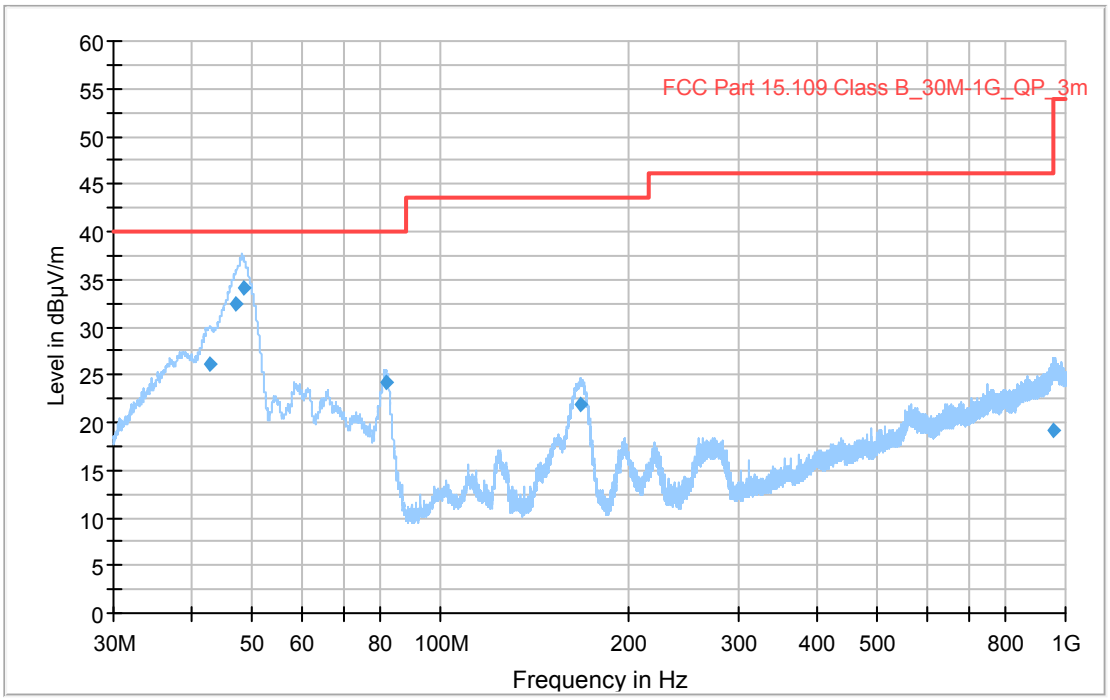
*The measured result is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

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

The EUT also fulfil the limit for ICES-005, see limit table, clause 3.5 Compliance 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, Operating Mode No.4



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

Measurement results, Quasi Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
42.690	26.2	40.0	V	13.8
47.130	32.4	40.0	V	7.6
48.300	34.2	40.0	V	5.8
81.690	24.3	40.0	H	15.7

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

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

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	28-06-2019	1.5 years
Antenna	Chase	CBL 6111A	34200	18-03-2020	3 years
Pre-amplifier	SEMKO	AM1331	7992	15-06-2020*	1 year
Measurement cable	Huber & Suhner	Sucoflex 106	39122	16-04-2020	1 year
Measurement cable	Rosenberger	LA5-S003-7000	39148	01-04-2020	1 year
Measurement cable	Rosenberger	LA5-S003-7000	39163	02-06-2020*	1 year

*The previous calibration interval was extended with 1.5 month; the new calibration shows correct data for the equipment.