EMC TEST REPORT

No. 1910087STO-001, Ed. 1

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	Surface mounted luminaire with LED
Tested Type/Model:	T1905 Tybble
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: June 27, 2019

Tested by: Per Granberg

Approved by: Andreas Isaksson

Revision History

Edition	Date	Description	Changes
1	June 27, 2019	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	Surface mounted luminaire with LED
Type/Model	T1905 Tybble
Brand name	IKEA
Serial Number	-
Manufacturer	IKEA of Sweden AB
Rating	120 V, 60 Hz, 5 x 4 W
Class	II
Highest clock frequency	< 108 MHz
FCC ID	FHO-T1905

Rating plate (draft)

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 ceiling mounted luminaire; tested in a Table-top standing configuration.

The EUT has the following noted components:
Built in LED driver: IKEA, type ICPSW24-19-1

The EUT was equipped with the following cables:

Port	Type	Length [m]	Specifications
AC Mains	Fixed connection, L, N	-	-

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.
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 [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:

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 4.3 dB at 0.605 MHz See clause 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 11.4 dB at 40.230 MHz See clause 6.5 – 6.6.	**PASS**

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

5.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
June 14, 2019	22 [°C]	53 [%]

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.

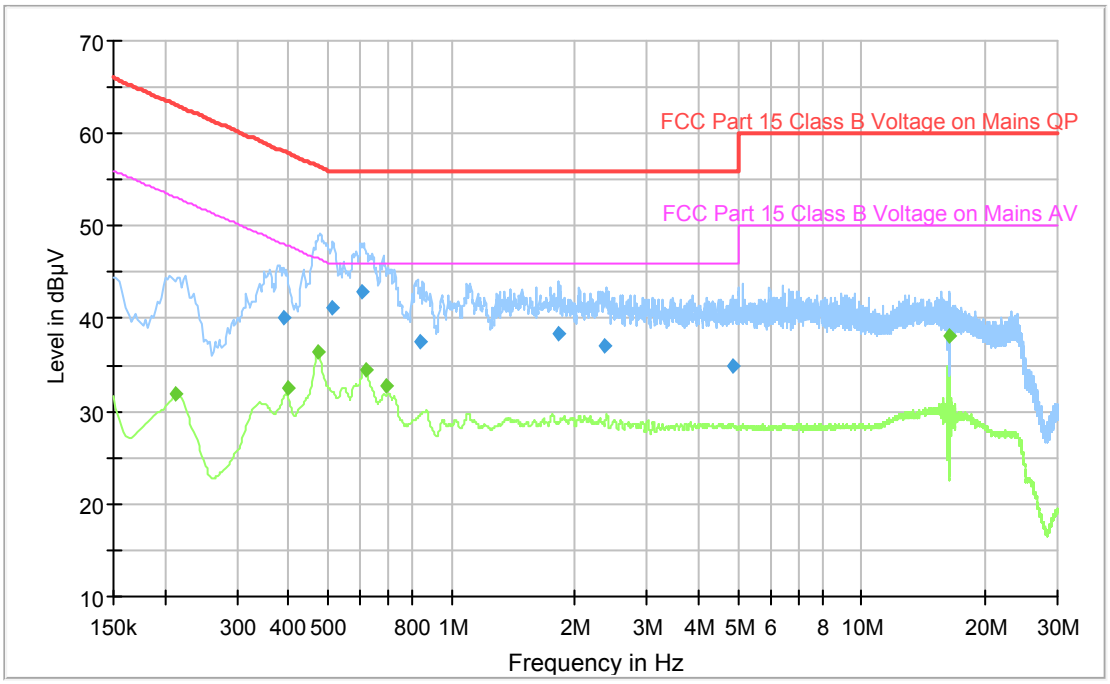
Overview sweeps were performed for each lead.
During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

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

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.389	40.0	58.1	L	18.1
0.510	41.1	56.0	L	14.9
0.605	42.9	56.0	L	13.1
0.839	37.6	56.0	L	18.4
1.820	38.4	56.0	L	17.6
2.369	37.1	56.0	L	18.9

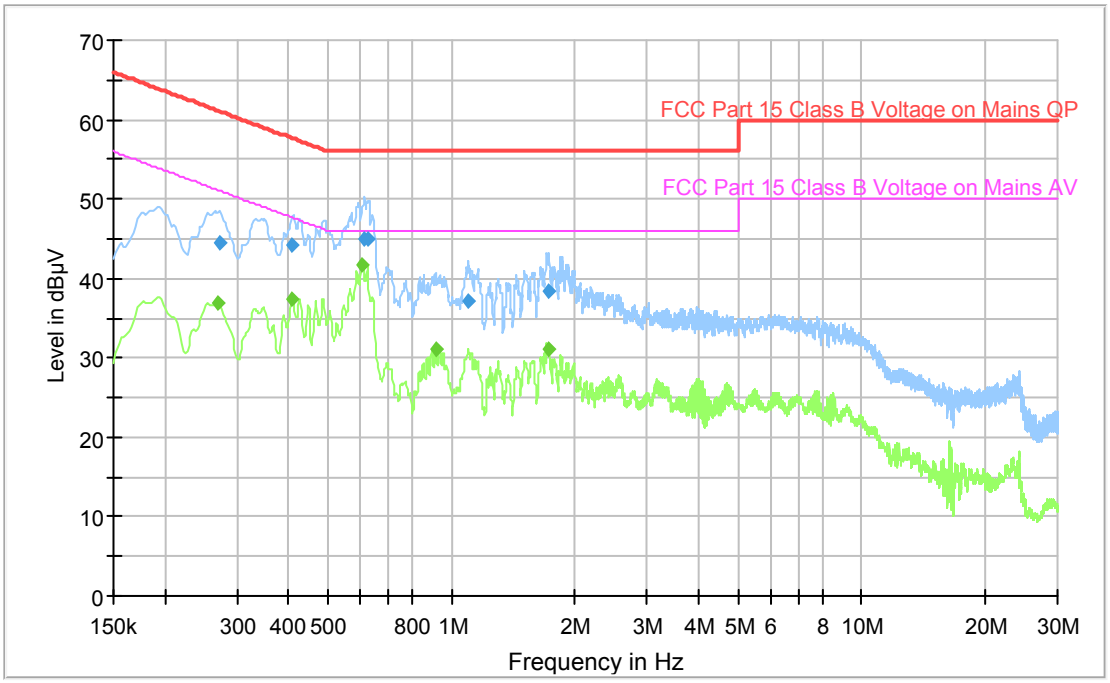
Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.398	32.5	47.9	L	15.4
0.474	36.4	46.4	L	10.0
0.618	34.5	46.0	L	11.5
0.692	32.7	46.0	L	13.3
16.296	38.2	50.0	L	11.8

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]

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



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.272	44.4	61.1	L	16.7
0.409	44.3	57.7	L	13.4
0.611	45.1	56.0	L	10.9
0.629	45.1	56.0	L	10.9
1.102	37.1	56.0	L	18.9
1.721	38.3	56.0	L	17.7

Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0.269	36.9	51.1	L	14.2
0.409	37.3	47.7	L	10.4
0.605	41.7	46.0	L	4.3
0.915	31.0	46.0	L	15.0
1.723	31.2	46.0	L	14.8

Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + 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 223/U	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 – 1 GHZ

6.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
June 11, 2019	23 [°C]	46 [%]

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.

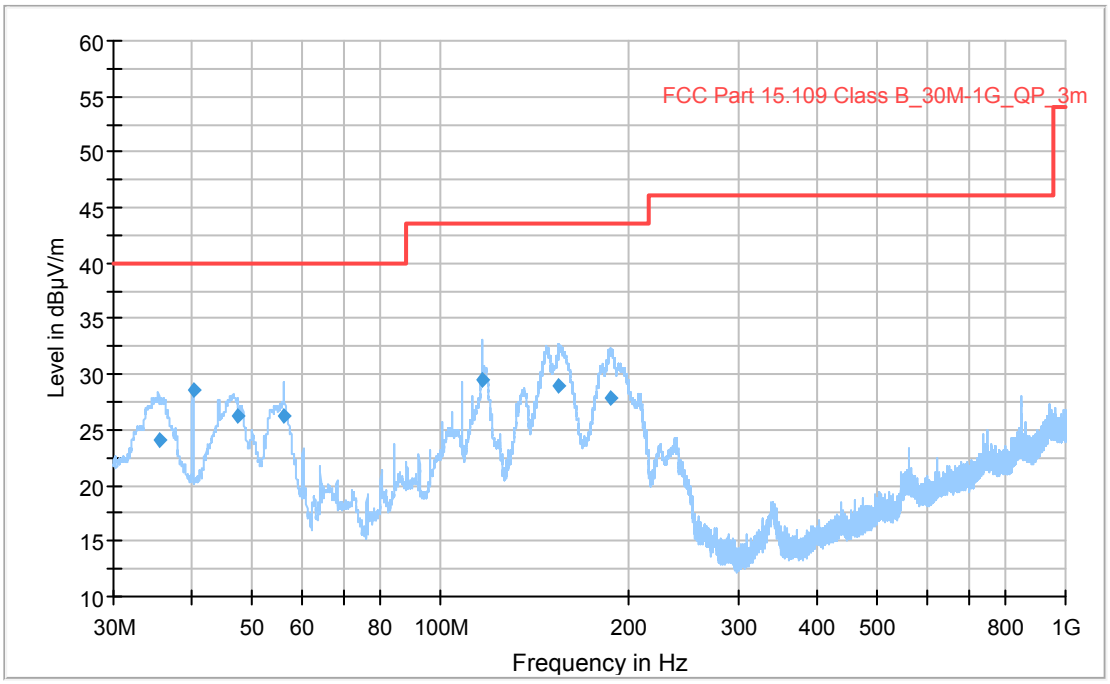
6.3 Test conditions

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, max luminous intensity



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

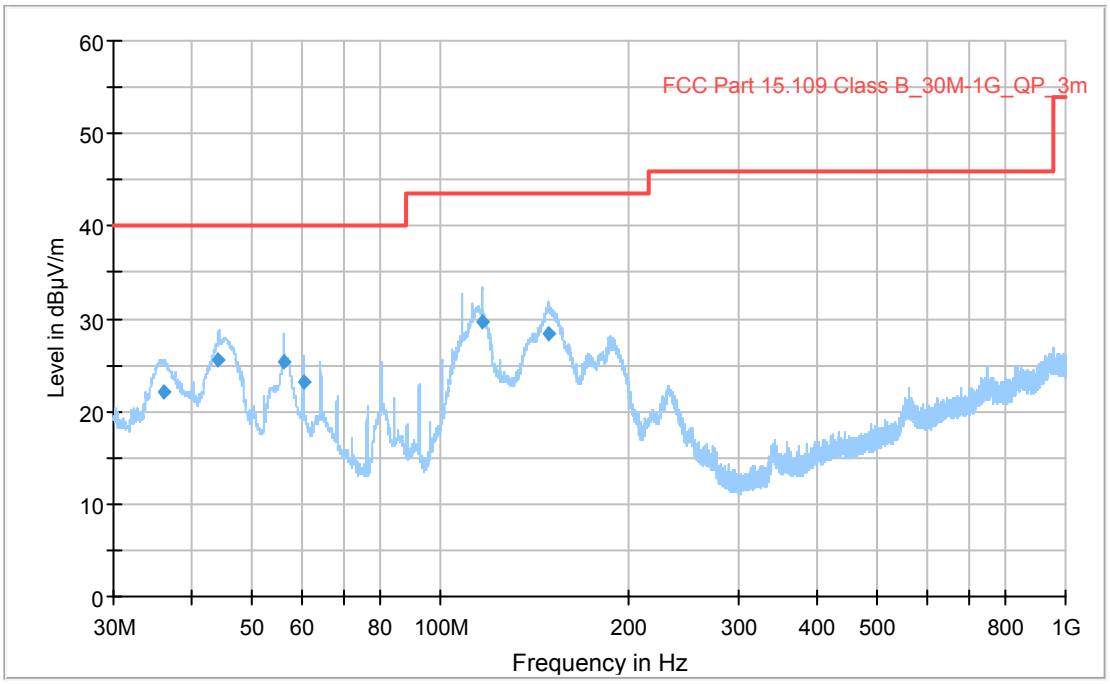
Measurement results, Quasi Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
35.490	24.2	40.0	V	15.8
40.230	28.6	40.0	V	11.4
47.310	26.3	40.0	V	13.7
56.280	26.3	40.0	V	13.7
116.670	29.6	43.5	H	13.9
154.890	28.9	43.5	H	14.6
187.110	27.9	43.5	H	15.6

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, min luminous intensity



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	22.1	40.0	V	17.9
44.190	25.5	40.0	V	14.5
56.280	25.4	40.0	V	14.6
60.270	23.1	40.0	V	16.9
116.430	29.7	43.5	H	13.8
148.590	28.5	43.5	H	15.0

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 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