

Prüfbericht-Nr.: Test Report No.:	CN2299UM 001	Auftrags-Nr.: Order No.:	244453410	Seite 1 von 19 Page 1 of 19
Kunden-Referenz-Nr.: Client Reference No.:	1288983	Auftragsdatum: Order date.:	2022-10-12	
Auftraggeber: Client:	IKEA of Sweden AB Box 702, SE-343 81 Älmhult, Sweden			
Prüfgegenstand: Test item:	Self-Ballasted LED Lamp			
Bezeichnung / Typ-Nr.: Identification / Type No.:	LED2221R35K5			
Auftrags-Inhalt: Order content:	TÜV Rheinland EMC service			
Prüfgrundlage: Test specification:	FCC Part 15, Subpart B:2021 Class B ICES-005:2018			
Wareneingangsdatum: Date of receipt:	2022-11-06	Refer to the EUT photos file		
Prüfmuster-Nr.: Test sample No.:	A003366537-002			
Prüfzeitraum: Testing period:	Refer to test report			
Ort der Prüfung: Place of testing:	Refer to clause 1.1			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: / tested by: Jessie Xu		genehmigt von: / authorized by: Jiayi Zhou		
Datum: / Date: 2022-11-26		Datum: / Date: 2022-11-26		
Stellung: / Position: Project manager		Stellung: / Position: Senior manager		
Sonstiges / Other:	FCC ID: FHO-LED2221R35K5 Test Firm Registration Number: 958801			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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TEST SUMMARY

5.1.1 CONDUCTED EMISSION

Result:

Passed

5.2.1 RADIATED EMISSION

Result:

Passed

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.

Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 7 for test and measurement instruments.

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2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is the ordinary self-ballasted LED lamp for lighting and similar use. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated input	:	AC 120-277 V, 60 Hz
Rated power	:	35 W
Protection class	:	II

2.3 Independent Operation Modes

The basic operation modes are: "ON" and "OFF".

2.4 Description of interconnecting cables

N/A

2.5 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.6 Highest frequency generated or used in the device or on which the device operates or tunes

The highest frequency used in the EUT is less than 108 MHz.

2.7 Submitted Documents

Circuit diagram, user's manual and rating label.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

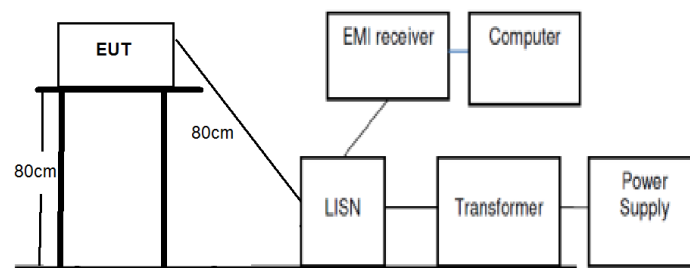
Refer to the related paragraph of this report.

The sequence of testing:

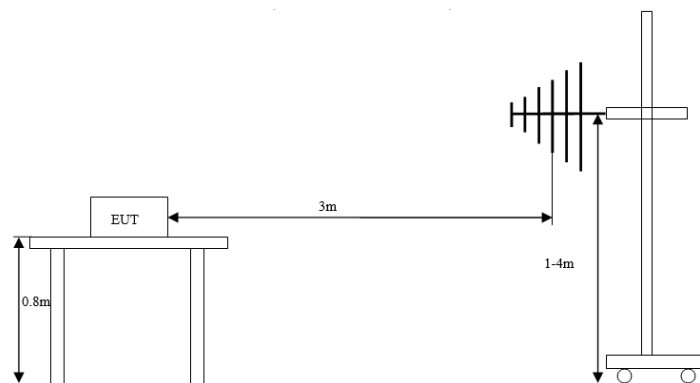
1. Radiated emission tests were performed on 2022-11-22.
2. Conducted emission tests were performed on 2022-11-22.

3.2 Equipment and cable arrangement

Block diagram for both conducted emission and radiated emission tests is as follows:



(Conducted emission)



(Radiated emission)

Also refer to photographs on clause 6 for test setups for both conducted emission test and radiated emission test.

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3.3 Test Software

No special test software was used during the tests.

3.4 Special Accessories and Auxiliary Equipment

None.

3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

4 Conformity Decision Rule

For all EMI tests included in this report, as measurement uncertainties are less than the values U_{CISPR} given in CISPR 16-4-2, compliance with the limits is determined by comparing measurement results directly with corresponding limits without taking into consideration of measurement uncertainties.

5 Test Results EMISSION

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Conducted emission

Result:		Passed
Date of testing	: 2022-11-22	
Test procedure	: FCC Part 15, Subpart B:2021, ICES-005:2018, ANSI C63.4-2014 and CISPR 16-2-1	
Frequency range	: 0.15 – 30 MHz	
Limits	: Quasi-peak limit: 0.15 – 0.5 MHz, 66 to 56 dB μ V (decrease with the logarithm of frequency); 0.5 – 5 MHz, 56 dB μ V; 5 – 30 MHz, 60 dB μ V Average limit: 0.15 – 0.5 MHz, 56 to 46 dB μ V (decrease with the logarithm of frequency); 0.5 – 5 MHz, 46 dB μ V; 5 – 30 MHz, 50 dB μ V	
Bandwidth of EMI receiver for final measurement	: 9 kHz	
Measurement time for final measurement	: 1 s	
Kind of test site	: Shielded room	
Input voltage	: AC 120 V, 60 Hz	
Operational mode	: Power on	
Ambient condition	: Temperature: 25.5 °C; Relative humidity: 39.2 %	
Expanded measurement uncertainty ($k=2$)	: 3.39 dB	

The measurement setup was made according to ANSI C63.4-2014 in a shielded room.

The measurement equipment like test receivers, quasi-peak detector and artificial mains network (AMN) are in compliance with CISPR 16-1 series standards.

The tested object was set-up on a wooden support. The EUT was set 0.8 m away from the AMN. The cord longer than necessary to be connected to the AMN was folded forth and back parallel so as to form a bundle with a length between 0.3 m and 0.4 m.

The disturbance voltage test was performed on the neutral line and phase line of the power supply of the EUT respectively.

The following figures and tables were those measured by an automatic measuring system. Both quasi-peak and average measurements were performed. In the following spectral diagram, “*”

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means Quasi-Peak Value and “*” means Average Value results.

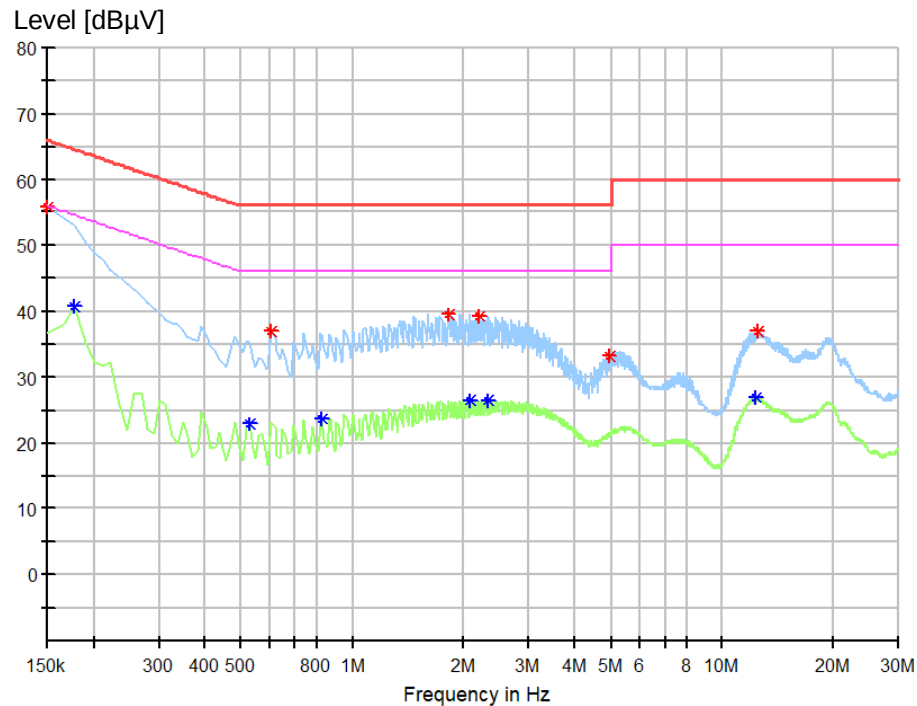
Notes on following tables of conducted emission results and conversions:

Level (dB μ V): final measurement results by using quasi-peak detector and average detector

Transd (dB): transducer factor including cable loss, insertion loss of artificial mains network and gain of pre-amplifier (if used)

Margin: Limit (dB μ V) - Level (dB μ V)

Figure 1: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, L



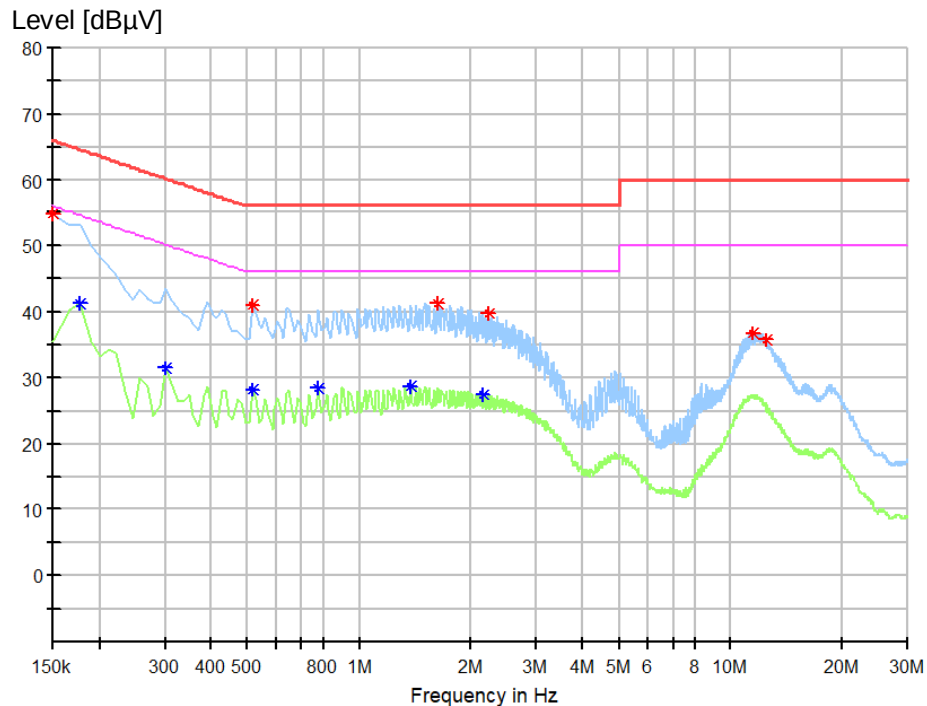
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Line
4.936875	33.26	56.00	22.74	L1
12.429375	36.95	60.00	23.05	L1
0.605625	36.97	56.00	19.03	L1
2.214375	39.38	56.00	16.62	L1
1.820625	39.47	56.00	16.53	L1
0.150000	55.85	66.00	10.15	L1

Final Average measurement result:

Frequency (MHz)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.178125	40.77	54.57	13.81	L1
12.350625	26.91	50.00	23.09	L1
2.338125	26.43	46.00	19.57	L1
0.830625	23.76	46.00	22.24	L1
2.079375	26.41	46.00	19.59	L1
0.526875	22.94	46.00	23.06	L1

Figure 2: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Line
12.463125	35.87	60.00	24.13	N
11.484375	36.88	60.00	23.12	N
2.225625	39.78	56.00	16.22	N
0.515625	40.96	56.00	15.04	N
1.629375	41.27	56.00	14.73	N
0.150000	54.92	66.00	11.08	N

Final Average measurement result:

Frequency (MHz)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line
2.146875	27.54	46.00	18.46	N
0.301875	31.57	50.19	18.62	N
0.178125	41.30	54.57	13.27	N
0.515625	28.31	46.00	17.69	N
1.370625	28.72	46.00	17.28	N
0.774375	28.39	46.00	17.61	N

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission

Result:	Passed
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Date of testing	: 2022-11-22
Test procedure	: FCC Part 15, Subpart B:2021, ICES-005:2018, ANSI C63.4-2014 and CISPR 16-2-3
Product classification	: Class B
Frequency range	: 30 – 1000 MHz (see Note 1)
Limits	: Quasi-peak limits (3 m distance): 30 – 88 MHz, 40 dB μ V/m; 88 – 216 MHz, 43.5 dB μ V/m; 216 – 1000 MHz, 46 dB μ V/m (see Note 2)
Bandwidth of EMI receiver for final measurement	: 120 kHz
Measurement time for final measurement	: 1 s
Kind of test site	: Semi-anechoic chamber
Input voltage	: AC 120 V, 60 Hz
Operational mode	: Power on
Ambient condition	: Temperature: 25.7 °C; Relative humidity: 39.6 %
Expanded measurement uncertainty (k=2)	: 5.49 dB

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on an 80 cm wooden support above the reference ground plane. The wooden support was rotated 360° around and the height of the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following spectral diagram, “×” means quasi-peak test results.

Note 1: The highest frequency in the EUT is less than 108 MHz. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is 1000 MHz.

Note 2: The class B limits of ICES-005:2018 is stricter than those FCC Part 15, Subpart B:2021 for 3 m test distance. Therefore, the former limits are used in following figures and tables.

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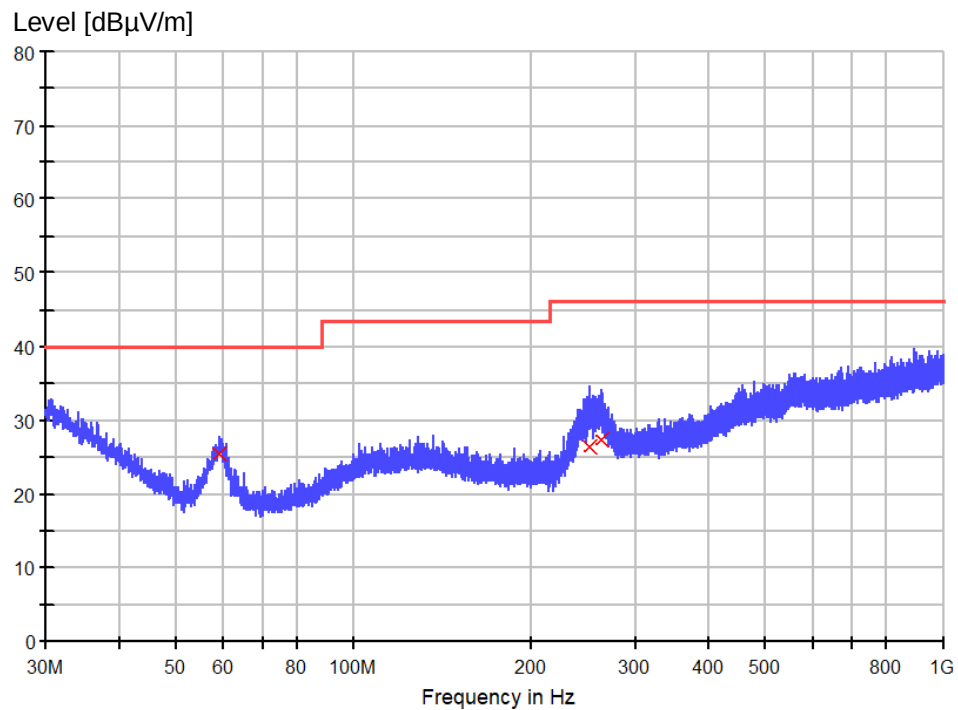
Notes on following tables of radiated emission results and conversions:

QuasiPeak (dB μ V/m): final measurement results by using quasi-peak detector

Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)

Margin: Limit (dB μ V/m) - QuasiPeak (dB μ V/m)

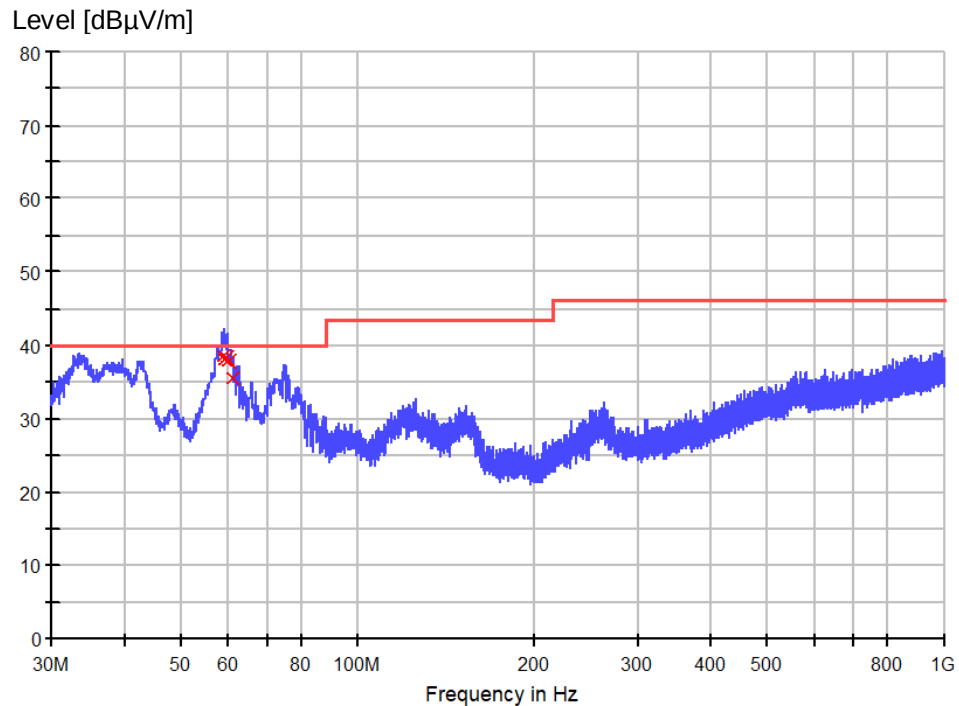
Figure 3: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
59.294000	25.4	120.000	100.0	H	120.0	12.7	14.6	40.0
251.548000	26.5	120.000	100.0	H	110.0	19.5	19.5	46.0
262.024000	27.4	120.000	100.0	H	-50.0	20.7	18.6	46.0

Figure 4: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
58.744333	38.6	120.000	100.0	V	180.0	12.7	1.4	40.0
59.261667	38.1	120.000	100.0	V	-180.0	12.7	1.9	40.0
59.488000	38.3	120.000	100.0	V	180.0	12.7	1.7	40.0
59.908333	38.0	120.000	100.0	V	-180.0	12.7	2.1	40.0
60.943000	35.6	120.000	100.0	V	180.0	12.8	4.4	40.0

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6 Photographs of the Test Set-Up

Refer to the test setup file.

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7 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date	Due Date
				DD.MM.YYYY	DD.MM.YYYY
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	10.06.2021	10.06.2024
9042162	EMI test receiver	ESR7	Rohde&Schwarz	02.03.2022	02.03.2023
G1811425	Bilog antenna	CBL 6112D	Teseq	10.03.2020	10.03.2023
9023229	EMI test receiver	ESR3	Rohde&Schwarz	11.08.2022	11.08.2023
G1811403	Artificial mains network	ENV216	Rohde&Schwarz	19.10.2022	19.10.2023
G1824248	Dual display multimeter	F45	Fluke	08.10.2022	08.10.2024

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End of test report