

Prüfbericht-Nr.: <i>Test report no.:</i>	CN23Z1FC 001	Auftrags-Nr.: <i>Order no.:</i>	244553426	Seite 1 von 24 <i>Page 1 of 24</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	1288983	Auftragsdatum: <i>Order date:</i>	2023-10-31	
Auftraggeber: <i>Client:</i>	IKEA of Sweden AB Box 702, SE-343 81 Älmhult, Sweden			
Prüfgegenstand: <i>Test item:</i>	LED Wall Lamp			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	L2205 JETSTRÖM			
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland EMC service			
Prüfgrundlage: <i>Test specification:</i>	FCC 47 CFR Part 15, Subpart B:2021 Class B ICES-005:2018			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-11-16	Refer to the EUT photos file		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003611738-002			
Prüfzeitraum: <i>Testing period:</i>	Refer to test report			
Ort der Prüfung: <i>Place of testing:</i>	Refer to clause 1.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Suzhou) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	2024-01-04		2024-01-04	
Stellung / Position:	Project engineer		Reviewer	
Sonstiges / <i>Other:</i>	FCC ID: FHO-L2205 Test Firm Name: TÜV Rheinland (Suzhou) Co., Ltd. Test Firm Registration Number: 251781 Designation Number: CN1370			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	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 specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
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Anmerkungen
Remarks

1	<p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p>
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3	<p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p>
4	<p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p>

TEST SUMMARY

5.1.1 CONDUCTED EMISSION

Result:

Passed

5.2.1 RADIATED EMISSION (30-1000 MHz)

Result:

Passed

5.2.2 RADIATED EMISSION (1-18 GHz)

Result:

Passed

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1 Test Sites

1.1 Test Facilities

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

Address: No.14 building and north half of No.10 workshop building, No.525, Yuewang Lingang South Road, Pingqian (Taicang) Modern Industrial Park, Shaxi Town, Taicang City, Jiangsu Province, 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.

2 General Product Information

2.1 Product Function and Intended Use

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

2.2 Ratings and System Details

System input : AC 120 V, 60 Hz
Rated power : 9.5 W
Operating frequency : 2400~2483.5MHz

2.3 Independent Operation Modes

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

2.4 Description of interconnecting cables

No.	Interface and name	Shielded or not	Specified length (m)
1	AC power line	Unshielded	3.5

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 2483.5 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.

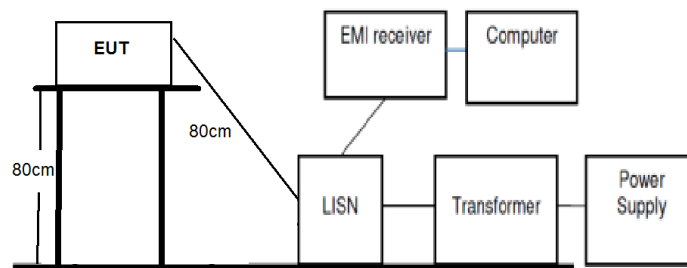
Refer to the related paragraph of this report.

The sequence of testing:

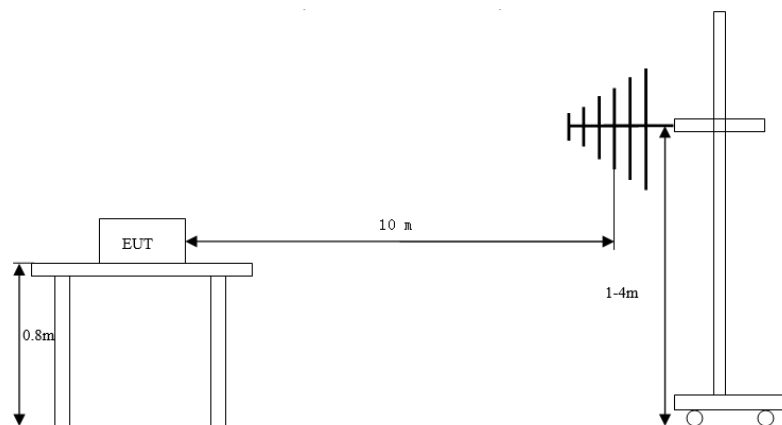
1. Radiated emission tests were performed on 2023-12-18~2023-12-28.
2. Conducted emission tests were performed on 2023-12-21.

3.2 Equipment and cable arrangement

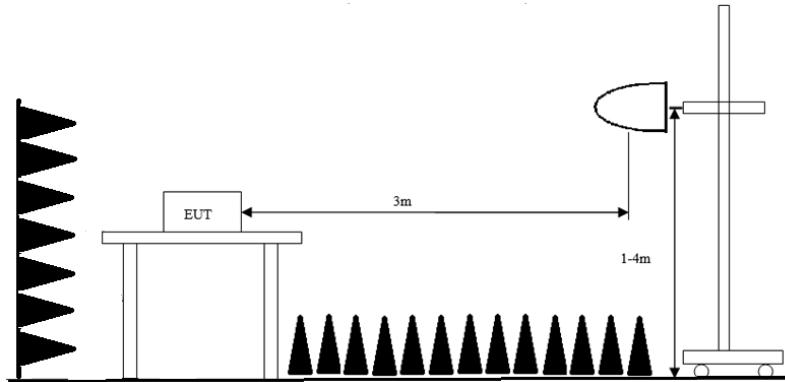
Block diagram for both conducted emission and radiated emission tests is as follows:



(Conducted emission)



(Radiated emission 30-1000 MHz)



(Radiated emission 1-18 GHz)

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

3.3 Test Software

No special test software was used during the tests.

3.4 Special Accessories and Auxiliary Equipment

During the tests, the STYRBAR ZigBee remote control (Model: E2002, manufacturer: IKEA) was used.

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	: 2023-12-21
Test procedure	: FCC 47 CFR 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 with dimming
Ambient condition	: Temperature: 20.1 °C; Relative humidity: 45.1 %
Expanded measurement uncertainty ($k=2$)	: 2.33 dB The minimum margin to the limit is 15.88 dB at 1.246875 MHz. The margin is higher than expanded measurement uncertainty.

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.

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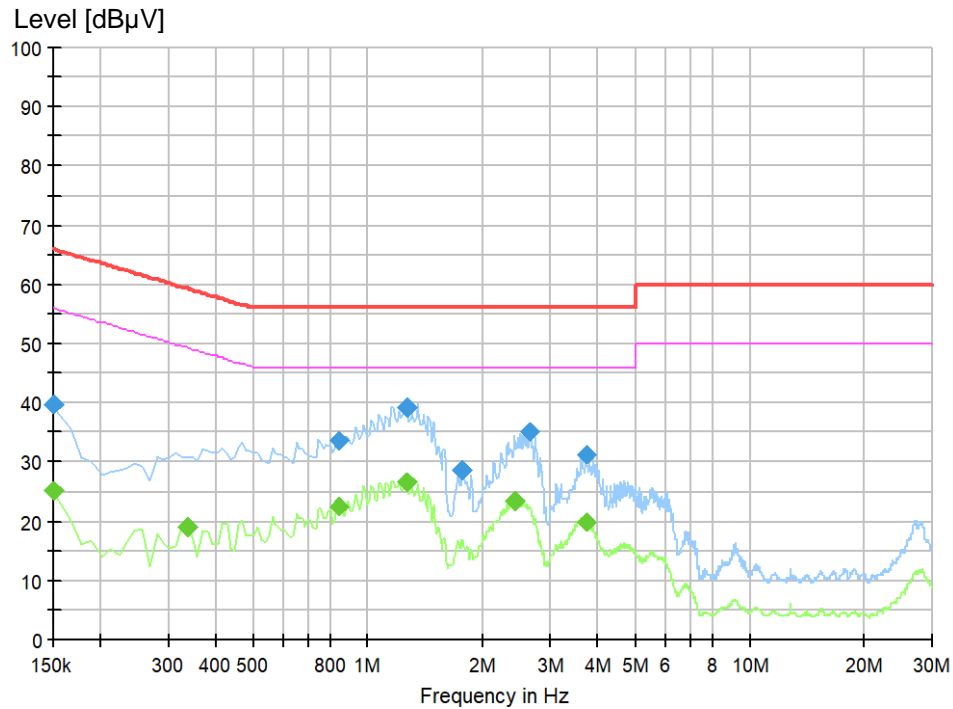
The following figures and tables were those measured by an automatic measuring system. Both quasi-peak and average measurements were performed. In the following spectral diagram, “♦” means Quasi-Peak Value and “◆” means Average Value results.

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)

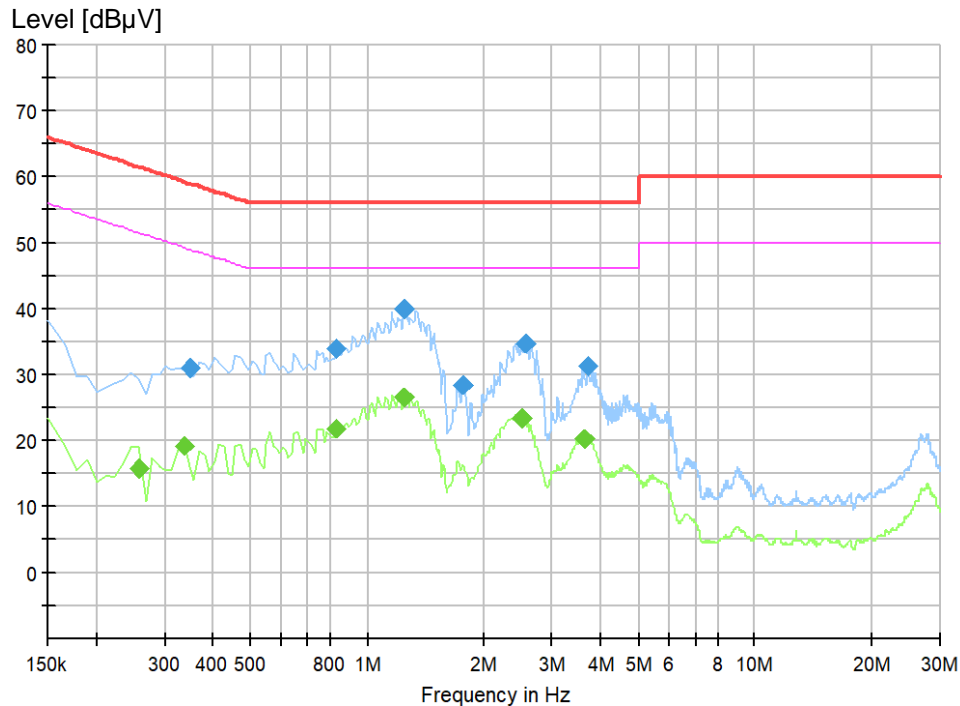
Margin: Limit (dB μ V) - Level (dB μ V)

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

Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line
0.150000	39.80	66.00	26.20	1000.0	9.000	L1
0.841875	33.72	56.00	22.28	1000.0	9.000	L1
1.258125	39.21	56.00	16.79	1000.0	9.000	L1
1.764375	28.71	56.00	27.29	1000.0	9.000	L1
2.641875	35.21	56.00	20.79	1000.0	9.000	L1
3.710625	31.32	56.00	24.68	1000.0	9.000	L1

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line
0.150000	25.19	56.00	30.81	1000.0	9.000	L1
0.335625	19.11	49.31	30.20	1000.0	9.000	L1
0.841875	22.62	46.00	23.38	1000.0	9.000	L1
1.258125	26.57	46.00	19.43	1000.0	9.000	L1
2.416875	23.50	46.00	22.50	1000.0	9.000	L1
3.721875	19.78	46.00	26.22	1000.0	9.000	L1

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

Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line
0.346875	31.17	59.04	27.87	1000.0	9.000	N
0.830625	33.91	56.00	22.09	1000.0	9.000	N
1.246875	40.12	56.00	15.88	1000.0	9.000	N
1.753125	28.32	56.00	27.68	1000.0	9.000	N
2.540625	34.87	56.00	21.13	1000.0	9.000	N
3.699375	31.42	56.00	24.58	1000.0	9.000	N

Final Average measurement result:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line
0.256875	15.72	51.53	35.81	1000.0	9.000	N
0.335625	19.22	49.31	30.09	1000.0	9.000	N
0.830625	21.93	46.00	24.07	1000.0	9.000	N
1.246875	26.57	46.00	19.43	1000.0	9.000	N
2.495625	23.49	46.00	22.51	1000.0	9.000	N
3.609375	20.37	46.00	25.63	1000.0	9.000	N

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission (30-1000 MHz)

Result:	Passed
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Date of testing	: 2023-12-28
Test procedure	: FCC 47 CFR 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 (10 m distance): 30 – 88 MHz, 29.5 dB μ V/m; 88 – 216 MHz, 33.1 dB μ V/m; 216 – 1000 MHz, 35.6 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 with dimming
Ambient condition	: Temperature: 21.2 °C; Relative humidity: 46.3 %
Expanded measurement uncertainty ($k=2$)	: 5.49 dB The minimum margin to the limit is 10.22 dB at 375.051 MHz. The margin is higher than expanded measurement uncertainty.

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 10 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, “ \diamond ” means quasi-peak test results.

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)

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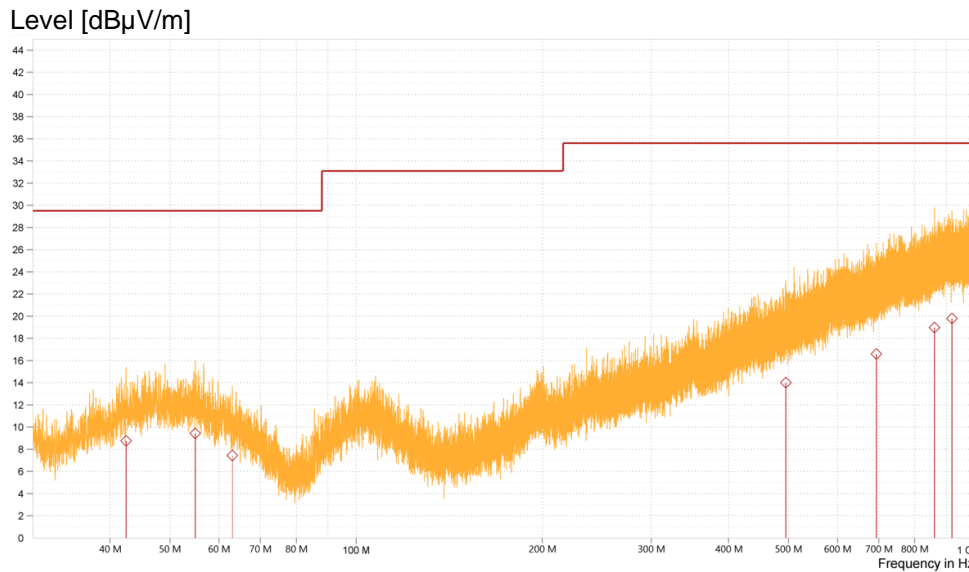
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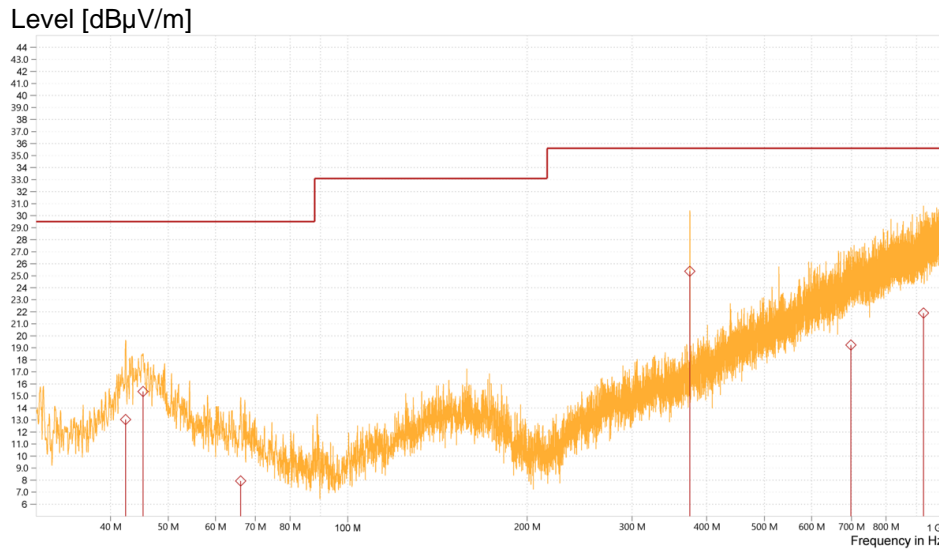
Margin: Limit (dB μ V/m) - QuasiPeak (dB μ V/m)

Note 2: The class B limits of ICES-005:2018 is stricter than those FCC 47 CFR Part 15, Subpart B:2021 for 10 m test distance. Therefore, the former limits are used in following figures and tables.

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


Final quasi-peak measurement results:

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Meas. Time [ms]
42.448	8.76	29.50	20.74	-8.14	H	-176	4	120.000	1,000.000
54.929	9.43	29.50	20.07	-7.48	H	28	2.25	120.000	1,000.000
63.045	7.44	29.50	22.06	-9.15	H	-48	2.25	120.000	1,000.000
495.271	14.01	35.60	21.59	0.81	H	-154	2.75	120.000	1,000.000
693.615	16.59	35.60	19.01	3.61	H	98	3.25	120.000	1,000.000
861.096	18.98	35.60	16.62	5.92	H	180	1.15	120.000	1,000.000
918.924	19.79	35.60	15.81	6.63	H	150	1.154	120.000	1,000.000

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


Final quasi-peak measurement results:

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Meas. Time [ms]
42.394	13.03	29.50	16.47	-7.80	V	-180	1	120.000	1,000.000
45.358	15.38	29.50	14.12	-7.70	V	128	2.25	120.000	1,000.000
66.106	7.92	29.50	21.58	-8.86	V	78	1.99	120.000	1,000.000
375.051	25.38	35.60	10.22	-2.85	V	125	1	120.000	1,000.000
698.384	19.24	35.60	16.36	4.35	V	47	3.25	120.000	1,000.000
924.663	21.90	35.60	13.70	6.76	V	-78	3.25	120.000	1,000.000

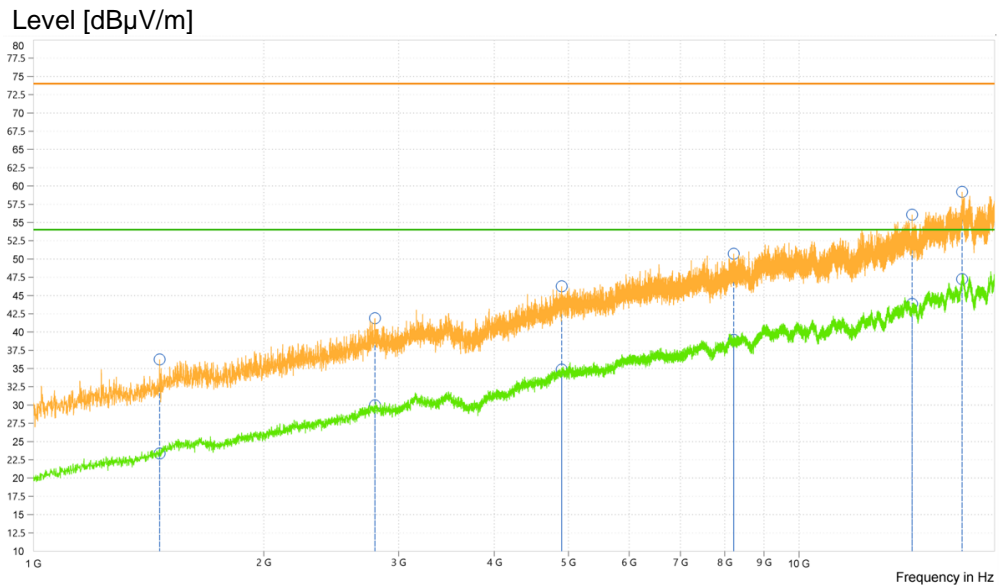
5.2.2 Radiated Emission (1-18 GHz)

Result:
Passed

Date of testing	: 2023-12-28
Port	: Enclosure
Test procedure	: FCC 47 CFR Part 15, Subpart B:2021, ANSI C63.4-2014 and CISPR 16-2-3
Product classification	: Class B
Limit	: MaxPeak limits (3 m distance): 1-18 GHz, 74 dB μ V/m Average limits (3 m distance): 1-18 GHz, 54 dB μ V/m
Frequency range	: 1 GHz – 18 GHz (Note: The highest frequency in the EUT is 2483.5 MHz. According to FCC Part 15 subpart B §15.33 (b) (1) the upper frequency for radiated emission measurement is 18 GHz.
Kind of test site	: Semi-anechoic chamber with RF absorber material on the ground plane.
Test distance	: 3 m
Test voltage	: AC 120 V, 60 Hz
Operational mode	: Power on with dimming
Ambient condition	: Temperature: 21.2 °C; Relative humidity: 46.3 %
Expanded measurement uncertainty ($k=2$)	: 5.13 dB (1 GHz~6 GHz) 5.18 dB (6 GHz~18 GHz) The minimum margin to the limit is 6.49 dB at 16,351.000 MHz. The margin is higher than expanded measurement uncertainty.

The radiated disturbance test was carried out in an anechoic room. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber with RF absorber material on the ground plane is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden support, which is 80 cm high. And the wooden support was rotated 360° around. The test was performed with the antenna both in its horizontal and vertical polarizations.

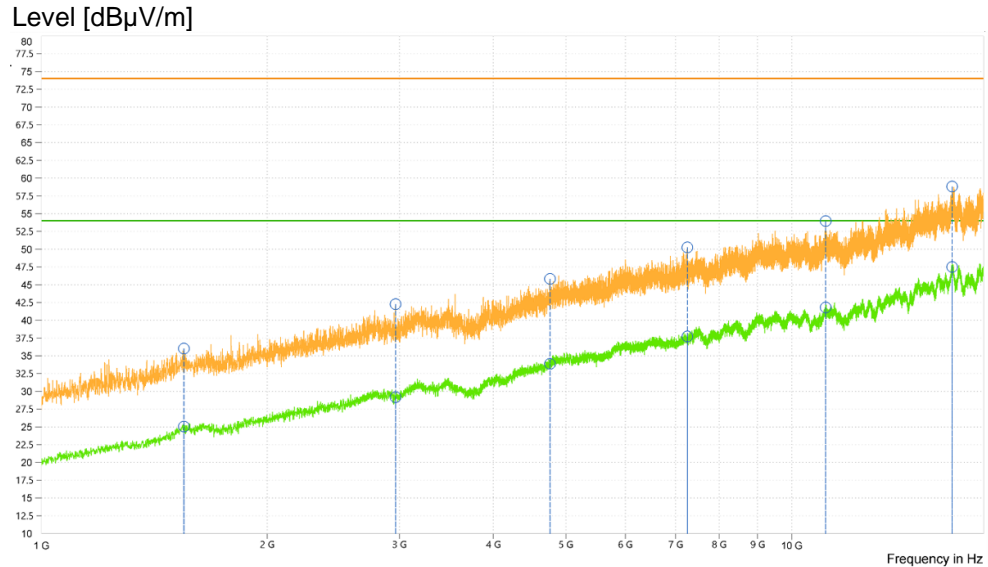
The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, “○” means measurement results with peak detector and average detector.

Figure 5: Spectral Diagrams and measurement results, 1 GHz – 18 GHz, horizontal polarization

Final maxpeak measurement result:

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1,461.833	36.25	74.00	37.75	-17.08	H	-173	1
2,792.556	41.88	74.00	32.12	-9.19	H	-173	1
4,898.667	46.26	74.00	27.74	-2.25	H	-173	1
8,220.278	50.70	74.00	23.30	2.82	H	-173	1
14,049.389	56.07	74.00	17.93	12.01	H	-173	1
16,331.167	59.19	74.00	14.81	15.95	H	-173	1

Final average measurement result:

Frequency [MHz]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1,461.833	23.38	54.00	30.62	-17.08	H	-173	1
2,792.556	29.96	54.00	24.04	-9.19	H	-173	1
4,898.667	34.87	54.00	19.13	-2.25	H	-173	1
8,220.278	38.92	54.00	15.08	2.82	H	-173	1
14,049.389	43.84	54.00	10.16	12.01	H	-173	1
16,331.167	47.23	54.00	6.77	15.95	H	-173	1

Figure 6: Spectral Diagrams and measurement results, 1 GHz – 18 GHz, vertical polarization

Final maxpeak measurement result:

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1,548.722	36.02	74.00	37.98	-15.64	V	148.9	1
2,963.500	42.27	74.00	31.73	-9.03	V	118.4	2
4,759.833	45.81	74.00	28.19	-2.87	V	-97.8	3
7,254.111	50.25	74.00	23.75	1.39	V	94.3	1
11,091.389	53.95	74.00	20.05	7.91	V	-150.1	2
16,351.000	58.83	74.00	15.18	15.88	V	-84.9	1

Final average measurement result:

Frequency [MHz]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]
1,548.722	25.06	54.00	28.94	-15.64	V	148.9	1
2,963.500	29.18	54.00	24.82	-9.03	V	118.4	2
4,759.833	33.88	54.00	20.12	-2.87	V	-97.8	3
7,254.111	37.73	54.00	16.27	1.39	V	94.3	1
11,091.389	41.79	54.00	12.21	7.91	V	-150.1	2
16,351.000	47.51	54.00	6.49	15.88	V	-84.9	1

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6 Photographs of the Test Set-Up

Refer to the test setup file.

7 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date	Due Date
				DD.MM.YYYY	DD.MM.YYYY
9023229	EMI test receiver	ESR3	Rohde&Schwarz	23.08.2023	23.08.2024
G1830003	Artificial mains network	ENV432	Rohde&Schwarz	16.10.2023	16.10.2024
G1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	N/A	N/A
9042162	EMI test receiver	ESR7	Rohde&Schwarz	15.02.2023	15.02.2024
9053514	EMI test receiver	ESR3	Rohde & Schwarz	25.10.2023	25.10.2024
9058428	Trilog broadband antenna	VULB 9163	Schwarzbeck	16.08.2022	16.08.2025
9053687	Trilog broadband antenna	VULB 9168	Schwarzbeck	09.01.2023	09.01.2026
9059155	EMC measurement software	ELEKTRA 4.61.0	Rohde & Schwarz	N/A	N/A
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	31.08.2023	31.08.2025
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	20.06.2023	20.06.2025
G1811417	Log periodic antenna	HL050	Rohde&Schwarz	19.04.2023	19.04.2026

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End of test report