Prüfbericht-Nr.: *Test report no.*:	**CN24LD7J 001**	**Auftrags-Nr.:** *Order no.*:	**326041372**	**Seite 1 von 24** *Page 1 of 24*
Kunden-Referenz-Nr.: *Client reference no.*:	**1288983**	**Auftragsdatum:** *Order date:*	**2024-07-24**	
Auftraggeber: *Client*:	**IKEA of Sweden AB** Box 702, SE-343 81 Älmhult, Sweden			
Prüfgegenstand: *Test item*:	**LED light chain**			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	**J2509**			
Auftrags-Inhalt: *Order content*:	**TÜV Rheinland EMC service**			
Prüfgrundlage: *Test specification*:	**FCC 47 CFR Part 15, Subpart B:2022 Class B** **ICES-005:2018**			
Wareneingangsdatum: *Date of sample receipt*:	**2024-08-30**	Refer to the EUT photos file		
Prüfmuster-Nr.: *Test sample no:*	**A003802473-014**			
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:

Datum:
Date: 2024-11-29

Jessie Xu

Stellung / Position: Project engineer

genehmigt von:
authorized by:

Ausstellungsdatum:
Issue date: 2024-11-29

Jacky Chen

Stellung / Position: Authorizer

Sonstiges / *Other*:

FCC ID: FHO-J2509
Test Firm Name: TUV Rheinland (Shanghai) Co., Ltd.
Designation Number: CN1396
Test Firm Registration Number: 930979

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 specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

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This test report only relates to the above mentioned 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.

Anmerkungen
Remarks

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Revision history of test report:

Report number	Issue date	Contents and reason for change if appropriate
CN24LD7J 001	2024-11-29	Initial release.

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.
Address: Workshop14, North Half of Workshop 10 and Workshop 16, Pingqian (Taicang) Modern Industrial Park, No.525, Yuewang Lingang South Road, Shaxi, Taicang, Jiangsu, 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 lighting chain 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 V, 60 Hz
Rated power : Max 4.0 W
Protection class : II
The equipment is a Class III LED lighting chain, it should be powered by approved SELV LED driver.
LED driver information: ICPSW24-3.6-IL-1, Input: AC 100-240 V, 50/60 Hz, Max. 0.05 A, 2,7 W; Output: DC 24.0 V, Max. 0.15 A, 3.6 W

2.3 Independent Operation Modes

The basic operation modes are: "lighting on", "flashing" and "off".

2.4 Description of interconnecting cables

No.	Interface and name	Shielded or not	Specified length (m)
1	AC power line of LED driver	Unshielded	0.95
2	DC power line of LED driver	Unshielded	5.1

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 24 MHz.

2.7 Submitted Documents

Circuit diagram, user's manual and rating label.

3 Test Set-up and Operation Modes

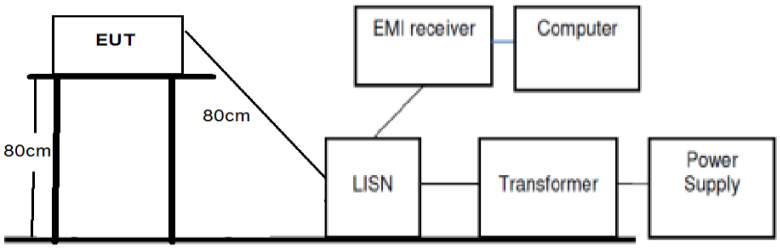
3.1 Principle of Configuration Selection

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.

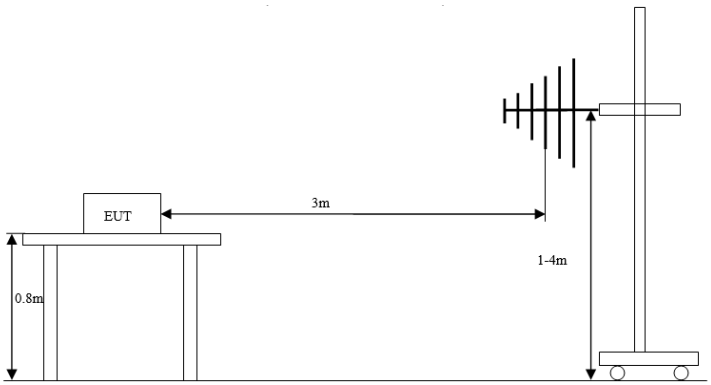
Refer to the related paragraph of this report.
The sequence of testing:
1. Radiated emission tests were performed on 2024-09-03.
2. Conducted emission tests were performed on 2024-09-04.

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)

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

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 E M I S S I O N

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Conducted emission

Result:	**Passed**

Date of testing	:	2024-09-04
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2022, 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 dBµV (decrease with the logarithm of frequency); 0.5 – 5 MHz, 56 dBµV; 5 – 30 MHz, 60 dBµV Average limit: 0.15 – 0.5 MHz, 56 to 46 dBµV (decrease with the logarithm of frequency); 0.5 – 5 MHz, 46 dBµV; 5 – 30 MHz, 50 dBµV
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	:	Mode 1: lighting on Mode 2: flashing
Ambient condition	:	Temperature: 24.1 °C; Relative humidity: 47.2 %
Expanded measurement uncertainty (*k*=2)	:	2.33 dB The minimum margin to the limit is 7.04 dB at 0.152250 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.

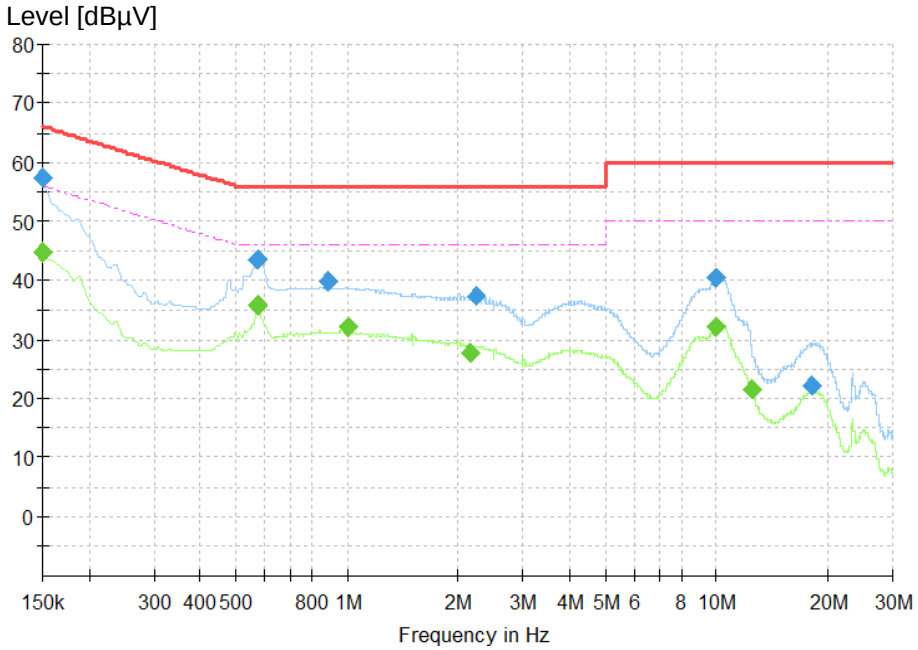
The following figures and tables were those measured by an automatic measuring system. Both quasi-peak and average measurements were performed. In the following spectral diagram, "♦" means Quasi-Peak Value and "♦" means Average Value results.

Notes on following tables of conducted emission results and conversions:

Level (dBµV): 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 (dBµV) - Level (dBµV)

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



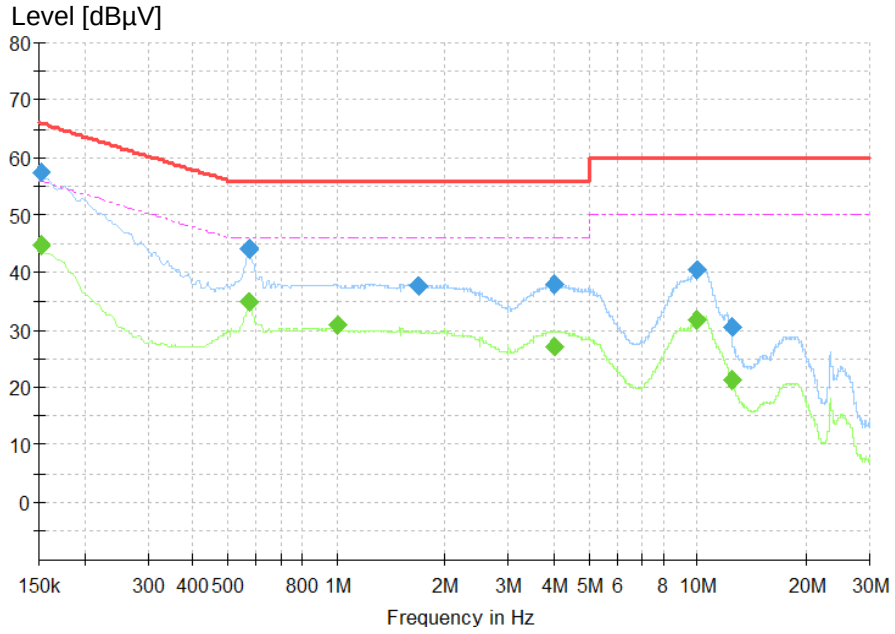
Final quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	57.43	66.00	8.57	1000.0	9.000	L1	10.3
0.575250	43.43	56.00	12.57	1000.0	9.000	L1	10.3
0.883500	39.84	56.00	16.16	1000.0	9.000	L1	10.6
2.242500	37.24	56.00	18.76	1000.0	9.000	L1	10.1
10.002750	40.35	60.00	19.65	1000.0	9.000	L1	10.8
18.111750	22.26	60.00	37.74	1000.0	9.000	L1	11.0

Final average measurement result:

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	44.75	56.00	11.25	1000.0	9.000	L1	10.3
0.570750	35.65	46.00	10.35	1000.0	9.000	L1	10.3
1.005000	32.05	46.00	13.95	1000.0	9.000	L1	10.7
2.150250	27.86	46.00	18.14	1000.0	9.000	L1	10.1
10.005000	32.20	50.00	17.80	1000.0	9.000	L1	10.8
12.405750	21.48	50.00	28.52	1000.0	9.000	L1	10.8

Figure 2: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N on mode 1



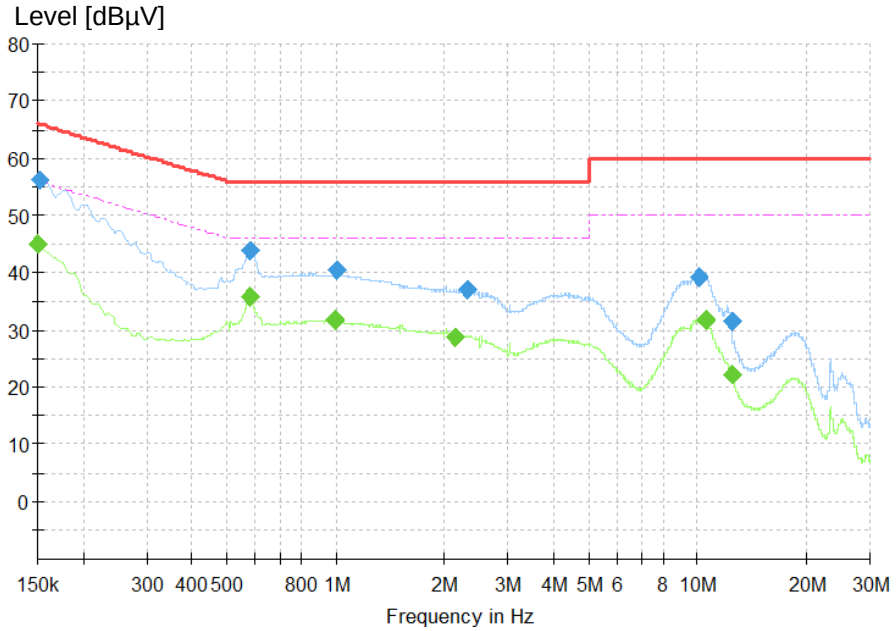
Final quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.152250	57.34	65.88	8.54	1000.0	9.000	N	10.2
0.570750	44.05	56.00	11.95	1000.0	9.000	N	10.3
1.675500	37.48	56.00	18.52	1000.0	9.000	N	10.5
4.011000	37.86	56.00	18.14	1000.0	9.000	N	10.7
9.912750	40.45	60.00	19.55	1000.0	9.000	N	11.1
12.405750	30.42	60.00	29.58	1000.0	9.000	N	11.1

Final average measurement result:

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.152250	44.66	55.88	11.22	1000.0	9.000	N	10.2
0.570750	34.97	46.00	11.03	1000.0	9.000	N	10.3
1.005000	30.79	46.00	15.21	1000.0	9.000	N	10.4
4.008750	27.09	46.00	18.91	1000.0	9.000	N	10.7
10.005000	31.84	50.00	18.16	1000.0	9.000	N	11.1
12.405750	21.36	50.00	28.64	1000.0	9.000	N	11.1

Figure 3: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, L on mode 2



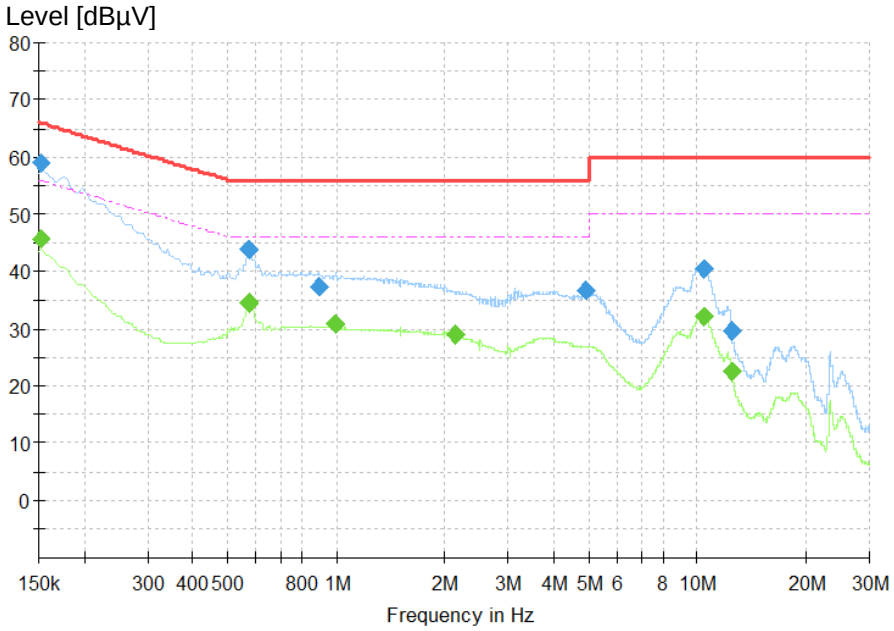
Final quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.152250	56.32	65.88	9.55	1000.0	9.000	L1	10.3
0.577500	43.85	56.00	12.15	1000.0	9.000	L1	10.3
1.002750	40.37	56.00	15.63	1000.0	9.000	L1	10.7
2.296500	37.06	56.00	18.94	1000.0	9.000	L1	10.1
10.034250	39.05	60.00	20.95	1000.0	9.000	L1	10.8
12.405750	31.46	60.00	28.54	1000.0	9.000	L1	10.8

Final average measurement result:

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	45.03	56.00	10.97	1000.0	9.000	L1	10.3
0.577500	35.77	46.00	10.23	1000.0	9.000	L1	10.3
0.993750	31.90	46.00	14.10	1000.0	9.000	L1	10.7
2.134500	28.51	46.00	17.49	1000.0	9.000	L1	10.1
10.482000	31.90	50.00	18.10	1000.0	9.000	L1	10.8
12.405750	22.11	50.00	27.89	1000.0	9.000	L1	10.8

Figure 4: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N on mode 2



Final quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.152250	58.84	65.88	7.04	1000.0	9.000	N	10.2
0.575250	43.84	56.00	12.16	1000.0	9.000	N	10.3
0.894750	37.33	56.00	18.67	1000.0	9.000	N	10.4
4.913250	36.67	56.00	19.33	1000.0	9.000	N	10.7
10.374000	40.46	60.00	19.54	1000.0	9.000	N	11.1
12.410250	29.67	60.00	30.33	1000.0	9.000	N	11.1

Final average measurement result:

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.152250	45.53	55.88	10.35	1000.0	9.000	N	10.2
0.575250	34.58	46.00	11.42	1000.0	9.000	N	10.3
0.996000	30.92	46.00	15.08	1000.0	9.000	N	10.4
2.123250	29.12	46.00	16.88	1000.0	9.000	N	10.5
10.466250	32.09	50.00	17.91	1000.0	9.000	N	11.1
12.423750	22.36	50.00	27.64	1000.0	9.000	N	11.1

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission (30-1000 MHz)

Result:	**Passed**

Date of testing	:	2024-09-03
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2022, 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 dBµV/m; 88 – 216 MHz, 43.5 dBµV/m; 216 – 1000 MHz, 46 dBµV/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	:	Mode 1: lighting on Mode 2: flashing
Ambient condition	:	Temperature: 24.6 °C; Relative humidity: 45.5 %
Expanded measurement uncertainty (*k*=2)	:	5.40 dB The minimum margin to the limit is 9.0 dB at 45.277500 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 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.

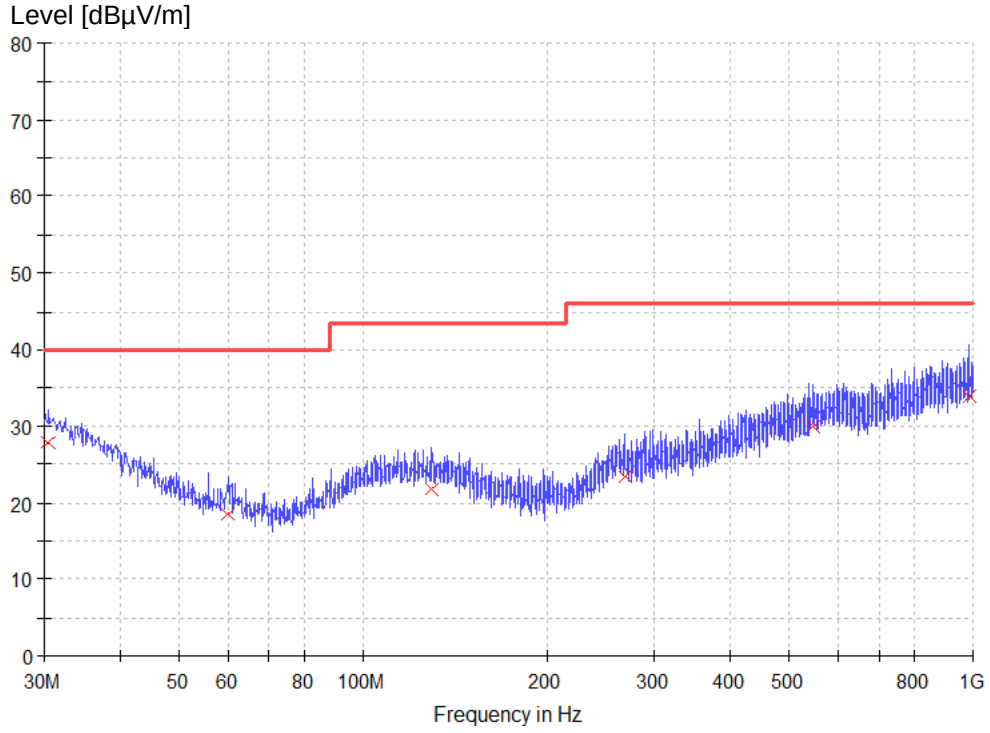
Notes on following tables of radiated emission results and conversions:

QuasiPeak (dBµV/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 (dBµV/m) - QuasiPeak (dBµV/m)

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 47 CFR Part 15, Subpart B:2022 for 3 m test distance. Therefore, the former limits are used in following figures and tables.

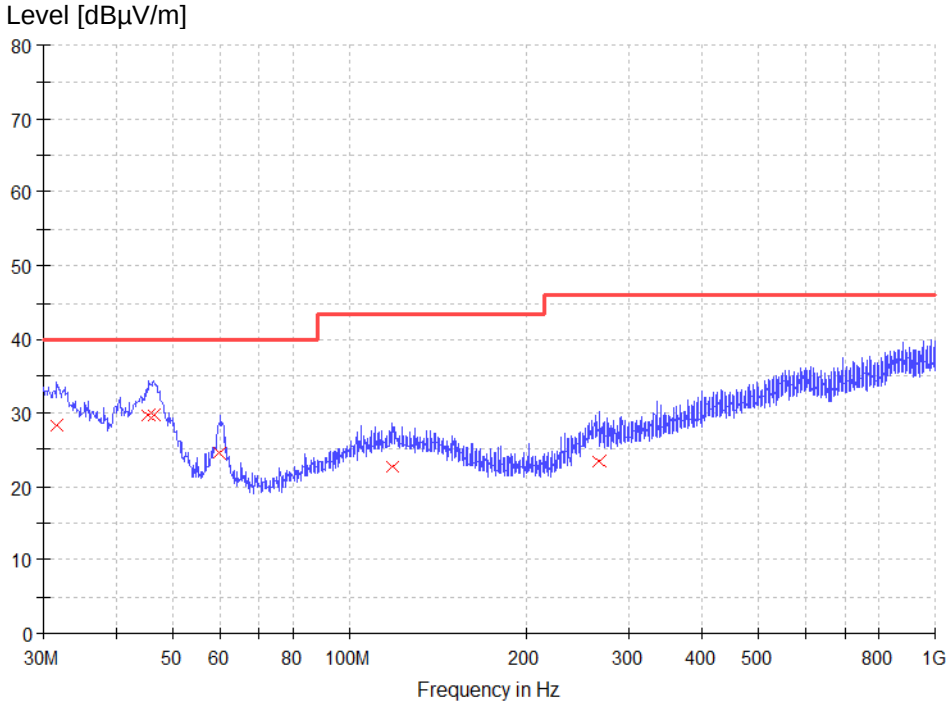
Figure 5: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization on mode 1



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)
30.485000	27.8	120.000	104	H	29	24.6	12.2	40.0
60.191250	18.5	120.000	366	H	-173	12.9	21.5	40.0
129.788750	21.7	120.000	165	H	-85	18.7	21.8	43.5
268.256250	23.4	120.000	170	H	-74	20.3	22.6	46.0
546.525000	30.0	120.000	252	H	155	26.6	16.0	46.0
983.752500	34.0	120.000	143	H	164	29.8	12.0	46.0

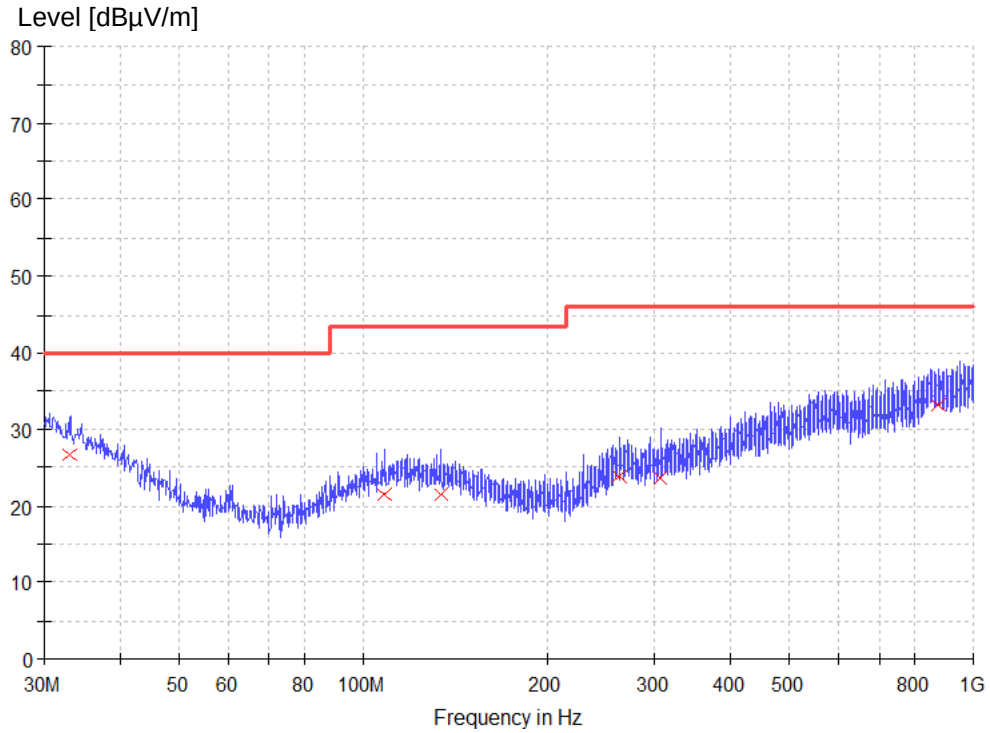
Figure 6: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization on mode 1



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)
31.697500	28.4	120.000	264	V	97.0	24.0	11.6	40.0
45.520000	29.7	120.000	252	V	-158.0	16.9	10.3	40.0
46.490000	29.8	120.000	271	V	160.0	16.5	10.2	40.0
60.191250	24.5	120.000	368	V	-153.0	12.9	15.5	40.0
118.755000	22.6	120.000	164	V	31.0	18.9	20.9	43.5
267.286250	23.5	120.000	298	V	131.0	20.4	22.6	46.0

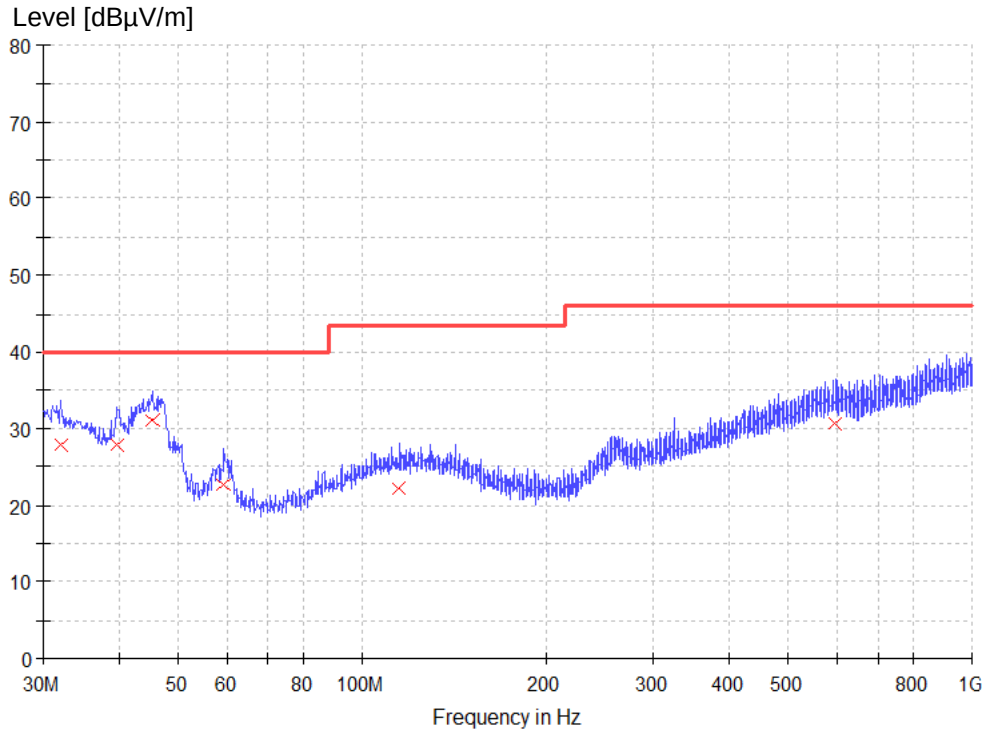
Figure 7: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization on mode 2



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)
32.910000	26.7	120.000	221	H	62	23.5	13.3	40.0
108.327500	21.5	120.000	299	H	11	18.5	22.0	43.5
133.790000	21.4	120.000	280	H	-131	18.5	22.1	43.5
262.436250	23.9	120.000	341	H	-37	20.9	22.1	46.0
306.207500	23.7	120.000	168	H	-152	20.4	22.3	46.0
875.233750	33.2	120.000	184	H	-106	28.6	12.8	46.0

Figure 8: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization on mode 2



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)
32.061250	27.7	120.000	225	V	6	23.8	12.3	40.0
39.700000	27.9	120.000	121	V	4	19.9	12.1	40.0
45.277500	31.0	120.000	127	V	57	17.0	9.0	40.0
59.342500	22.8	120.000	135	V	23	13.0	17.2	40.0
115.117500	22.2	120.000	332	V	-116	18.8	21.3	43.5
597.935000	30.7	120.000	232	V	138	26.9	15.3	46.0

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 DD.MM.YYYY	Due Date DD.MM.YYYY
9061503	Shielded enclosure	10.055x3.605x3.000	Frankonia	08.11.2023	08.11.2028
9023229	EMI test receiver	ESR3	Rohde&Schwarz	03.08.2024	03.08.2025
G1830003	Artificial mains network	ENV432	Rohde&Schwarz	16.10.2023	16.10.2024
G1824248	Dual display multimeter	F45	Fluke	28.06.2024	28.06.2025
9062744	EMI measurement software	EMC32-E+(10.60.20)	Rohde&Schwarz	N/A	N/A
G1811378	3m semi-anechoic chamber	SAC3	Frankonia	03.12.2023	03.12.2026
G1811391	EMI test receiver	ESCI	Rohde&Schwarz	16.10.2023	16.10.2024
G1811425	Bilog antenna	CBL 6112D	Teseq	20.04.2023	20.04.2026
9062745	EMI measurement software	EMC32-MEB (10.60.20)	Rohde&Schwarz	N/A	N/A

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End of test report