

Prüfbericht-Nr.: <i>Test Report No.:</i>	CN2180AQ 001	Auftrags-Nr.: <i>Order No.:</i>	244355795	Seite 1 von 23 <i>Page 1 of 23</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	1774198	Auftragsdatum: <i>Order date.:</i>	2021-08-24	
Auftraggeber: <i>Client:</i>	IKEA of Sweden AB BOX 702, SE-343 81 Älmhult, Sweden			
Prüfgegenstand: <i>Test item:</i>	LED fixed lighting			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	L2101 ROLFSTORP			
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland EMC service			
Prüfgrundlage: <i>Test specification:</i>	FCC 47 CFR Part 15, Subpart B:2020 Class B ICES-005:2018			
Wareneingangsdatum: <i>Date of receipt:</i>	2021-08-26	Refer to the EUT photos file		
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003117536-001			
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 (Shanghai) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: / tested by: Jessie Xu		genehmigt von: / authorized by: Jiayi Zhou		
Datum: / Date: 2021-10-14		Datum: / Date: 2021-10-14		
Stellung: / Position: Project manager		Stellung: / Position: Senior manager		
Sonstiges / Other:	FCC ID: FHO-L2101 Test Firm Registration Number: 958801			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* 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 LED fixed lighting for lighting and similar use. For the further information, refer to the user's manual.

2.2 Ratings and System Details

System input : 5 VDC
3 x 1.2 VDC supplied by rechargeable AA battery
Rated power : 3.8 W
Protection class : III

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 (mm)
1	Power supply line	Unshielded	1500

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.

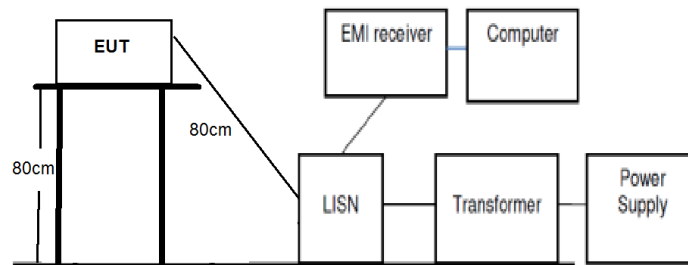
Refer to the related paragraph of this report.

The sequence of testing:

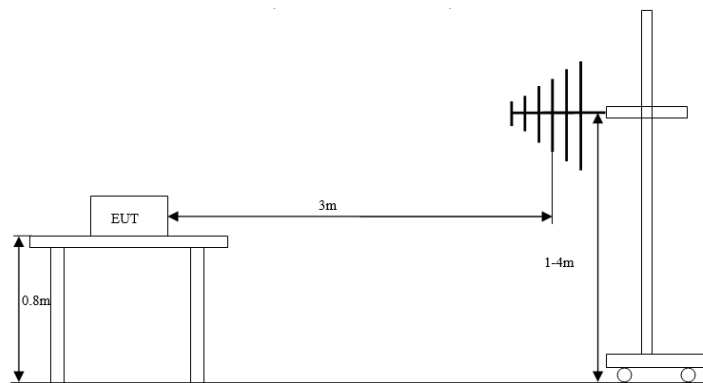
1. Radiated emission tests were performed on 2021-09-27.
2. Conducted emission tests were performed on 2021-09-02.

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

During the tests, the power supply (model: ICPSW5-17NA-1, brand:IKEA) was used.

Model name	Rating
ICPSW5-17NA-1	Input: 100-240 V~, 50/60 Hz, Max. 0.5 A; Output: 5 VDC, Max. 2.4 A per USB-outlet, ta: 45°C

3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

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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	: 2021-09-02
Test procedure	: FCC 47 CFR Part 15, Subpart B:2020, ICES-005:2018, ANSI C63.4-2014 and CISPR 16-1 series standards
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	: Mode 1: Charging and lighting on by adapter Mode 2: Charging and lighting on by computer
Ambient condition	: Temperature: 24.5 °C; Relative humidity: 54.2 %
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.

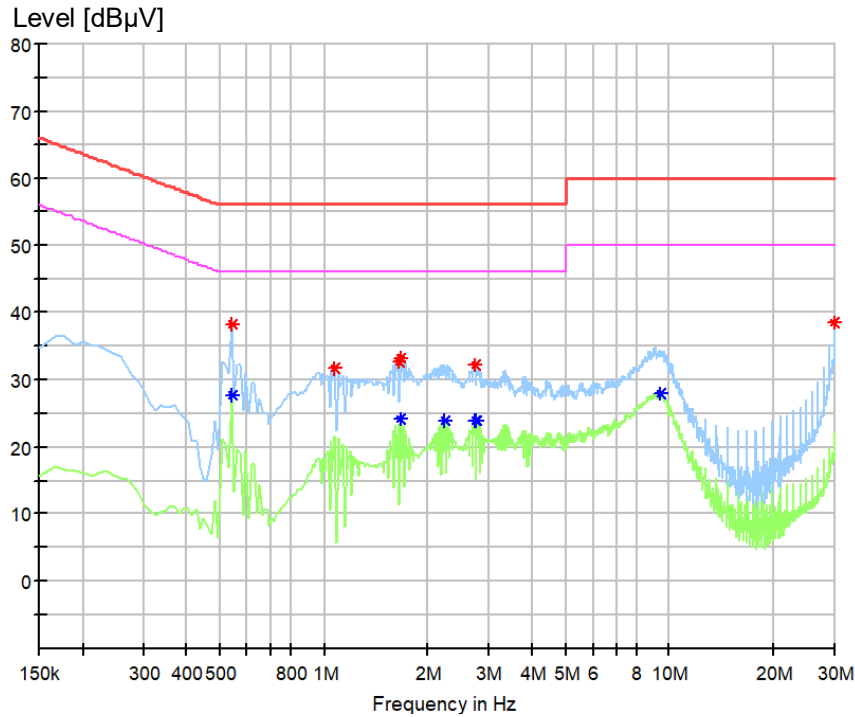
Notes on following tables of conducted emission results and conversions:

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 for mode 1



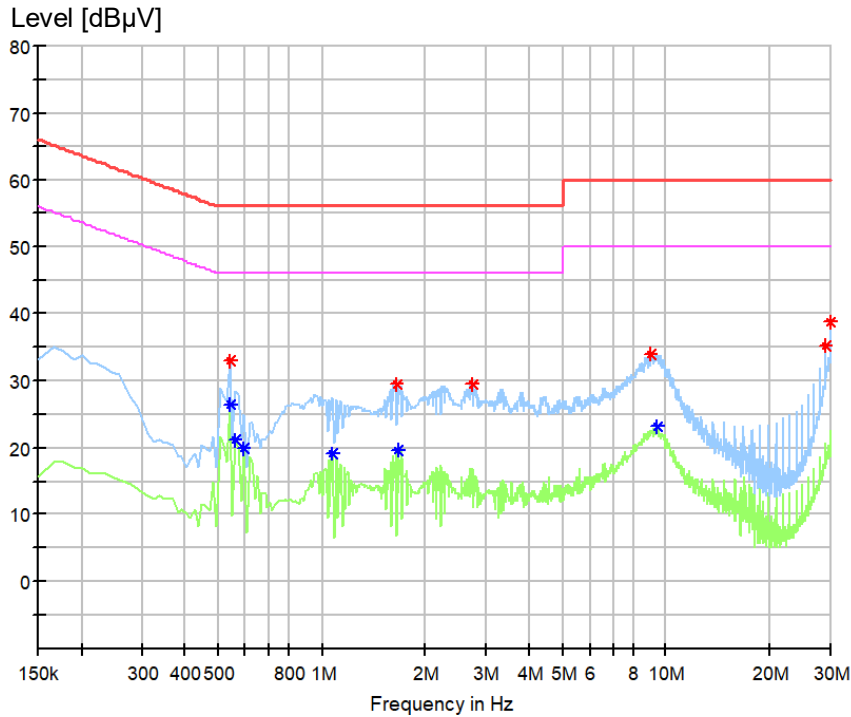
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line
1.078125	31.82	56.00	24.18	L1
2.720625	32.25	56.00	23.75	L1
1.640625	32.80	56.00	23.20	L1
1.674375	33.16	56.00	22.84	L1
0.538125	38.23	56.00	17.77	L1
29.968125	38.46	60.00	21.54	L1

Final Average measurement result:

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line
2.765625	23.84	46.00	22.16	L1
9.391875	28.09	50.00	21.91	L1
2.743125	23.96	46.00	22.04	L1
0.538125	27.67	46.00	18.33	L1
2.236875	23.84	46.00	22.16	L1
1.663125	24.21	46.00	21.79	L1

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



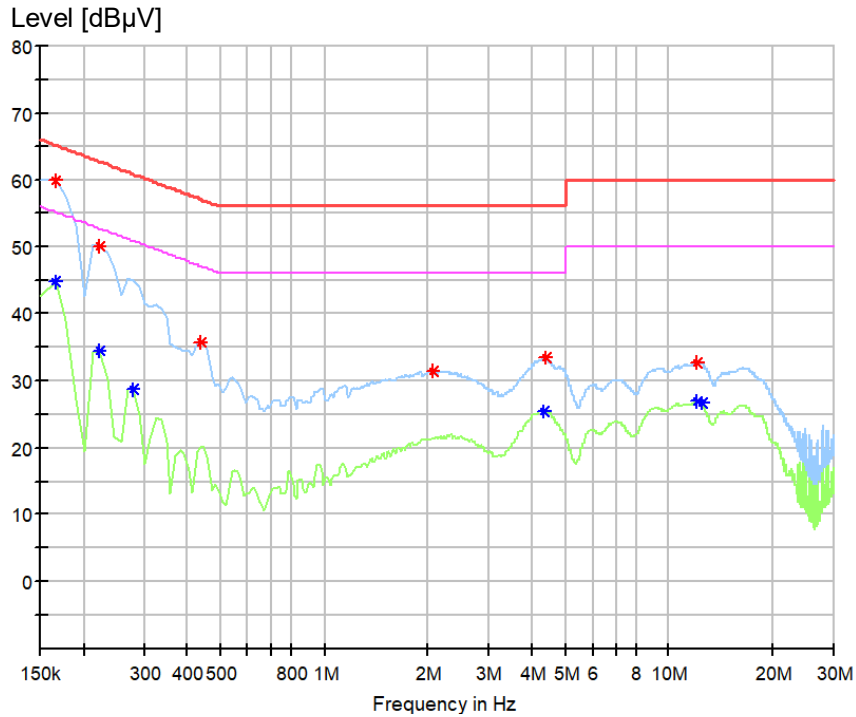
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line
2.743125	29.53	56.00	26.47	N
1.640625	29.57	56.00	26.43	N
0.538125	33.02	56.00	22.98	N
9.020625	33.96	60.00	26.04	N
28.955625	35.20	60.00	24.80	N
29.968125	38.81	60.00	21.19	N

Final Average measurement result:

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line
9.380625	23.19	50.00	26.81	N
0.594375	19.94	46.00	26.06	N
0.560625	21.24	46.00	24.76	N
1.078125	19.07	46.00	26.93	N
1.663125	19.70	46.00	26.30	N
0.538125	26.42	46.00	19.58	N

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



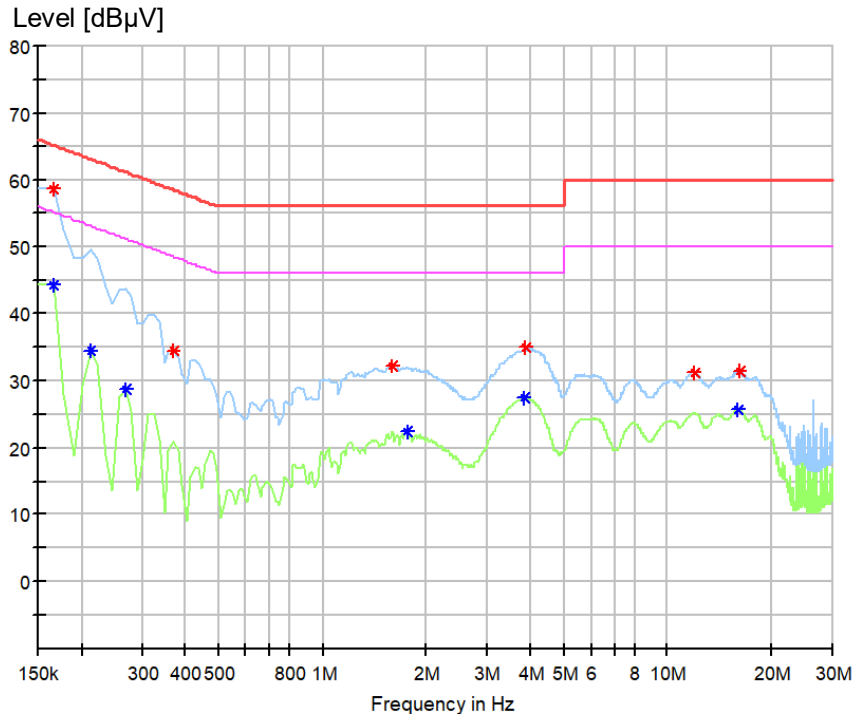
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line
2.056875	31.38	56.00	24.62	L1
12.114375	32.81	60.00	27.19	L1
4.396875	33.41	56.00	22.59	L1
0.436875	35.83	57.12	21.29	L1
0.223125	50.19	62.70	12.52	L1
0.166875	60.01	65.12	5.10	L1

Final Average measurement result:

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line
12.406875	26.73	50.00	23.27	L1
12.114375	26.94	50.00	23.06	L1
0.166875	44.87	55.12	10.24	L1
0.279375	28.74	50.83	22.09	L1
0.223125	34.57	52.70	18.13	L1
4.318125	25.51	46.00	20.49	L1

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



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line
11.990625	31.31	60.00	28.69	N
16.130625	31.42	60.00	28.58	N
1.584375	32.18	56.00	23.82	N
0.369375	34.56	58.52	23.95	N
3.879375	34.91	56.00	21.09	N
0.166875	58.58	65.12	6.54	N

Final Average measurement result:

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line
0.166875	44.23	55.12	10.88	N
16.040625	25.81	50.00	24.19	N
0.211875	34.56	53.13	18.58	N
0.268125	28.60	51.18	22.58	N
3.845625	27.34	46.00	18.66	N
1.753125	22.53	46.00	23.47	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	: 2021-09-27
Test procedure	: FCC 47 CFR Part 15, Subpart B:2020, ICES-005:2018, ANSI C63.4-2014 and CISPR 16-1 series standards
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	: Mode 1: Charging and lighting on by adapter Mode 2: Lighting on by internal battery powered
Ambient condition	: Temperature: 24.7 °C; Relative humidity: 53.3 %
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 a 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 47 CFR Part 15, Subpart B:2020 for 3 m test distance. Therefore, the former limits are used in following figures and tables.

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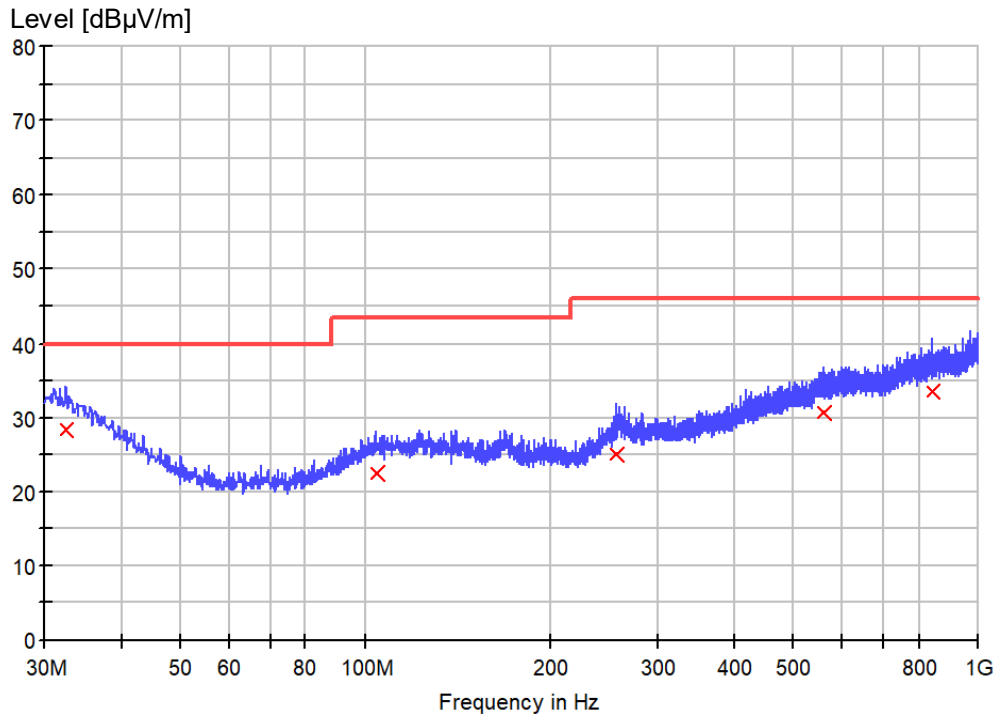
Notes on following tables of radiated emission results and conversions:

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)

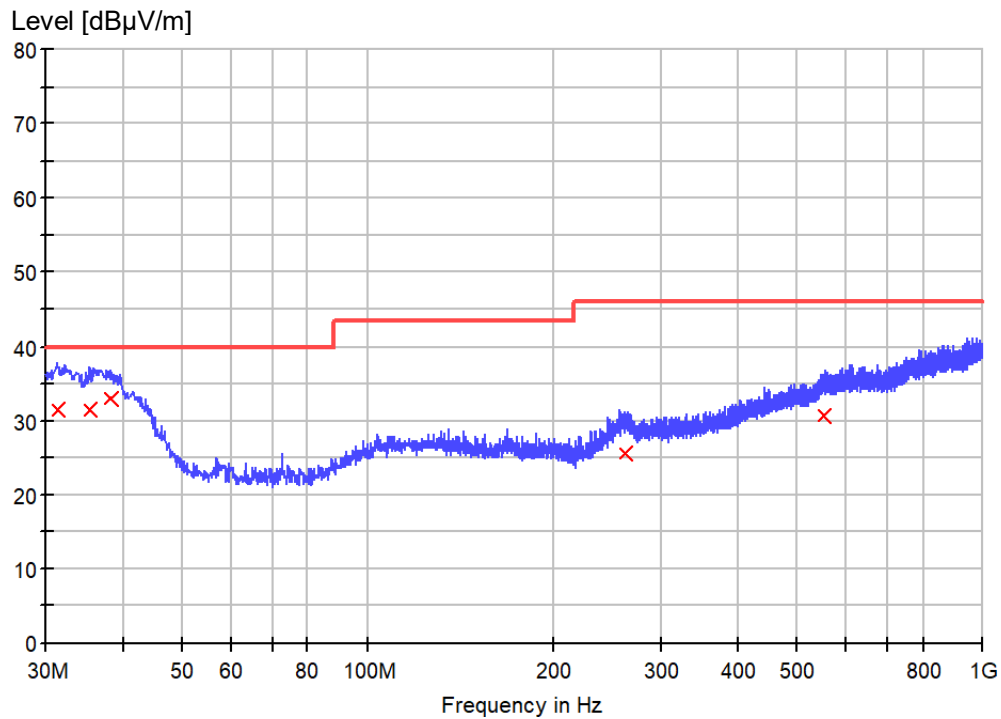
Figure 5: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization for mode 1



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
32.546250	28.4	1000.0	120.000	102.0	H	-162.0	24.1	11.6	40.0
104.205000	22.4	1000.0	120.000	155.0	H	26.0	18.2	21.1	43.5
256.616250	25.0	1000.0	120.000	162.0	H	100.0	20.2	21.0	46.0
560.953750	30.6	1000.0	120.000	112.0	H	180.0	26.3	15.4	46.0
845.891250	33.5	1000.0	120.000	131.0	H	-180.0	27.8	12.5	46.0

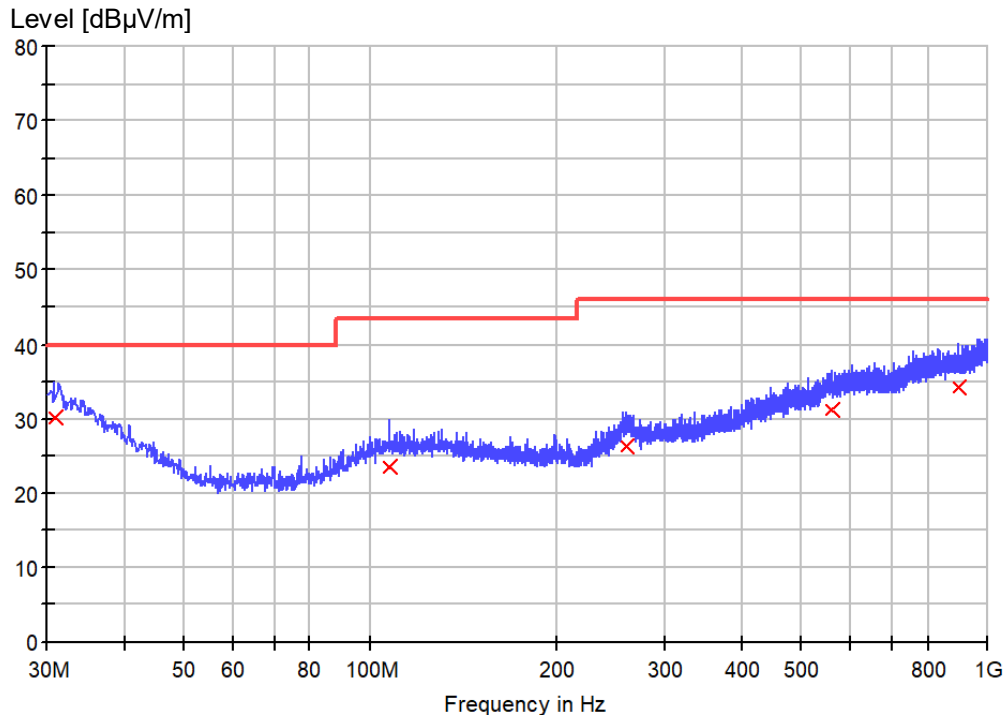
Figure 6: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization for mode 1



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
31.212500	31.4	1000.0	120.000	120.0	V	180.0	24.8	8.6	40.0
35.335000	31.6	1000.0	120.000	120.0	V	-165.0	22.6	8.5	40.0
38.123750	33.0	1000.0	120.000	100.0	V	100.0	21.0	7.0	40.0
261.830000	25.6	1000.0	120.000	135.0	V	10.0	20.7	20.4	46.0
551.860000	30.7	1000.0	120.000	132.0	V	135.0	26.4	15.3	46.0

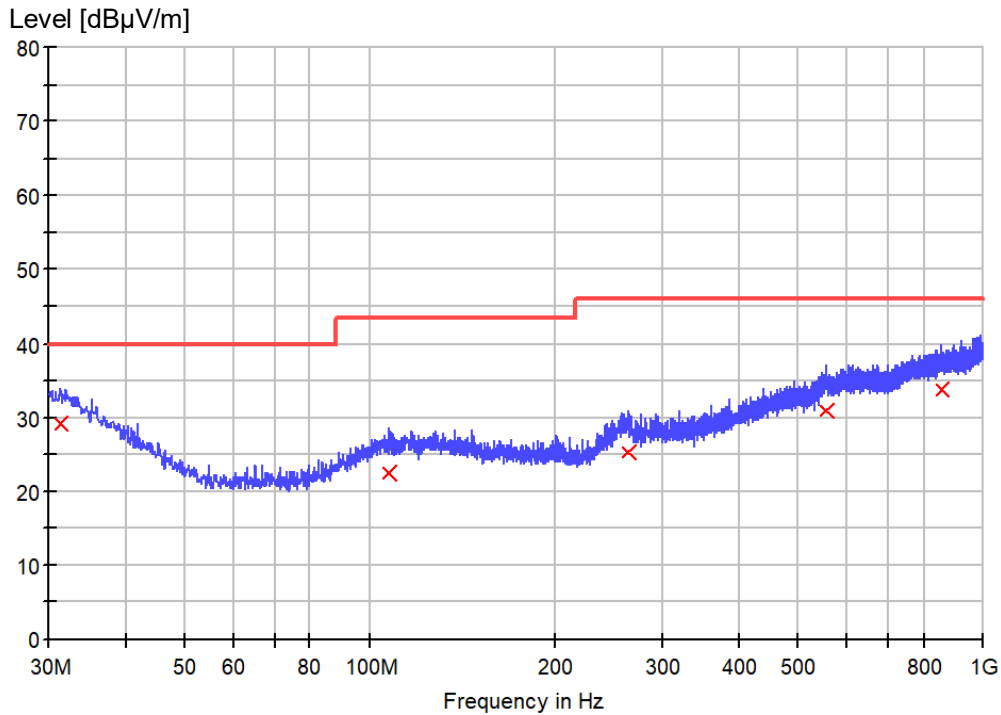
Figure 7: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization for mode 2



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.848750	30.1	1000.0	120.000	165.0	H	165.0	25.0	9.9	40.0
107.115000	23.5	1000.0	120.000	132.0	H	23.0	18.4	20.0	43.5
260.375000	26.4	1000.0	120.000	102.0	H	100.0	20.7	19.6	46.0
557.801250	31.2	1000.0	120.000	155.0	H	-150.0	26.4	14.8	46.0
900.211250	34.3	1000.0	120.000	120.0	H	-15.0	28.2	11.7	46.0

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



Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
31.333750	29.1	1000.0	120.000	102.0	V	-178.0	24.8	10.9	40.0
106.993750	22.5	1000.0	120.000	135.0	V	80.0	18.4	21.0	43.5
263.770000	25.3	1000.0	120.000	125.0	V	16.0	20.7	20.7	46.0
555.861250	30.8	1000.0	120.000	156.0	V	120.0	26.5	15.2	46.0
855.227500	33.6	1000.0	120.000	112.0	V	-66.0	27.9	12.4	46.0

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 DD.MM.YYYY	Due Date DD.MM.YYYY
9023229	EMI test receiver	ESR3	Rohde&Schwarz	22.03.2021	22.03.2022
G1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	N/A	N/A
G1824248	Dual display multimeter	F45	Fluke	18.09.2020	18.09.2022
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	27.06.2019	27.06.2022
G1811402	EMI test receiver	ESCI	Rohde&Schwarz	01.09.2021	01.09.2022
G1811425	Bilog antenna	CBL 6112D	Teseq	10.03.2020	10.03.2023
G1811403	Artificial mains network	ENV216	Rohde&Schwarz	23.11.2020	23.11.2021

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End of test report