

Certificate Number: 4902.01

Prüfbericht-Nr.: <i>Test report no.:</i>	CN23C3KJ 001	Auftrags-Nr.: <i>Order no.:</i>	180271236	Seite 1 von 17 <i>Page 1 of 17</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	1288983	Auftragsdatum: <i>Order date:</i>	2023.09.08	
Auftraggeber: <i>Client:</i>	IKEA of Sweden AB Box 702, SE-343 81 Älmhult, Sweden			
Prüfgegenstand: <i>Test item:</i>	Self-Ballasted LED Lamp			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	LED2328T2			
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>	2023.09.11	Refer to the EUT photos file		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003541763-005			
Prüfzeitraum: <i>Testing period:</i>	2023.09.12-2023.09.14			
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 1.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland / CCIC (Ningbo) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2023.10.07	<i>Carrie Lei</i>	Ausstelldatum: <i>Issue date:</i> 2023.10.07	<i>Feng Liang</i>	
Stellung / Position:	Carrie Lei/PE	Stellung / Position:	Feng Liang/Authorizer	
Sonstiges / Other:	FCC ID: FHO-LED2328T2			
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:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient 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.</p> <p>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.</i></p> <p><i>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>

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Test Summary

5.1.1 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE

Result:

Pass

5.2.1 RADIATED DISTURBANCE

Result:

Pass

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland / CCIC(Ningbo) Co., Ltd.

1st Floor, Building 11, Scholar Innovation Park, No.1188 Zhongguan Road, Zhenhai District, Ningbo 315200 P.R. China.

FCC Designation Number: CN1237

FCC Test Firm Registration Number: 647754

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

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment of Laboratory

No.	Equipment	Model	Serial no.	Last Cal. date	Cal. due date
1.	EMI test receiver	ESR3	102331	2022.10.31	2023.10.30
2.	Bilog Antenna	CBL6112D	49033	2021.03.15	2024.03.14
3.	EMI test receiver	ESR 7	101929	2022.10.31	2023.10.30
4.	LISN	ENV216	102250	2022.10.31	2023.10.30

1.3 Measurement Uncertainty

Table 2: Measurement Uncertainty of Laboratory

Test Item	Expanded Measurement Uncertainty (k=2)
Conducted Emission (150k-30MHz)	3.30dB
Radiated Emission (30-1000MHz)	4.39dB

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2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an 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 V, 60 Hz
Rated power : 1.8 W

2.3 Independent Operation Modes

The basic operation modes are: "On" or "Off".
Refer to the user's manual for further information.

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram for more information.

2.5 Submitted Documents

Circuit diagram, PCB layout, user's manual etc.

3 Test Set-up and Operation Modes

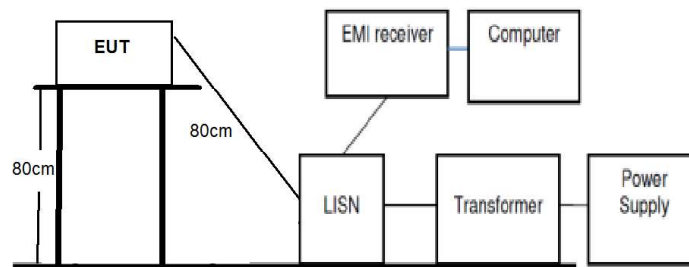
3.1 Principle of Configuration Selection

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

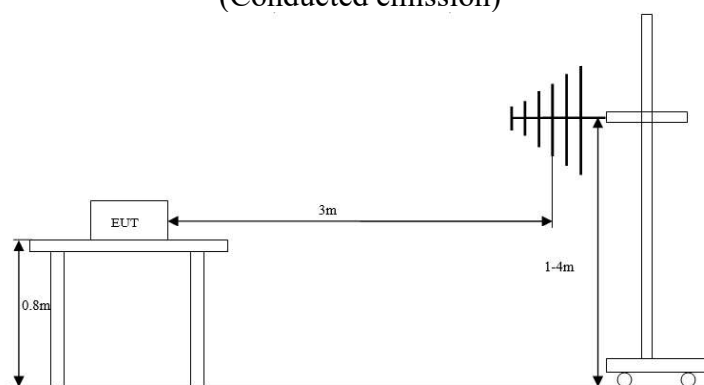
Refer to the related paragraph of this report.

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 Operation and 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

The tested sample contained noise suppression components 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 Mains Terminal Continuous Disturbance Voltage

Result:	Pass
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Date of testing	: 2023.09.14
Kind of test site	: Shielding Room
Port	: Mains
Basic Standard	: ANSI C63.4:2014 and CISPR 16-1 series standards
Frequency Range	: 0.15 – 30MHz
Limit	: FCC 47 CFR Part 15 Subpart B:2021& ICES-005:2018, Class B 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
Ambient Condition	: Temperature: 21 °C; Relative Humidity: 63%

Test Setup

Input Voltage	: AC 120V, 60Hz
Operational mode	: ON
Test Setup	: ANSI C63.4:2014 and CISPR 16-1 series standards

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 ANSI C63.4:2014 and CISPR 16-1 series standards.

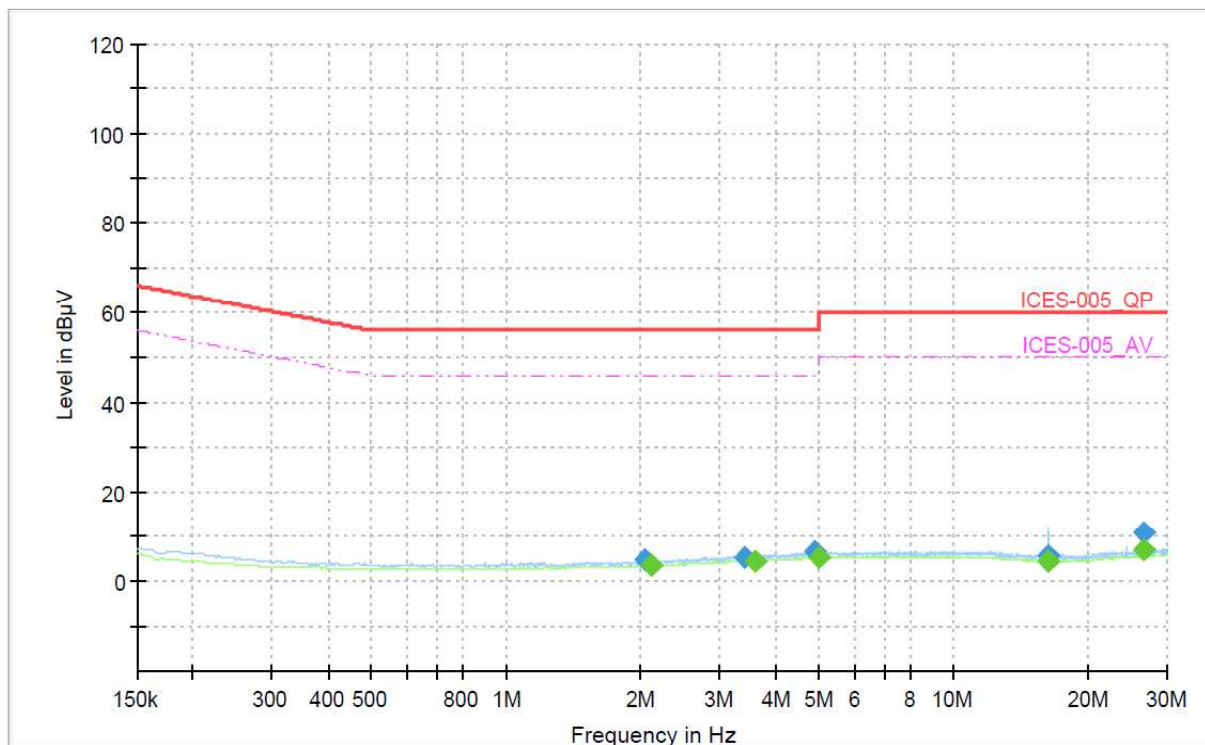
The tested object was set-up on a wooden table. The EUT was set 0.8m away from the AMN.

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

In the figures, the symbol “◆” in blue color means Quasi-Peak Value and the symbol “◆” in green color means Average Value which was measured in final measurement.

The measurement result is calculated based on the following formula by the test software:
 Emission Level = Reading level + Correction (LISN factor + cable loss)

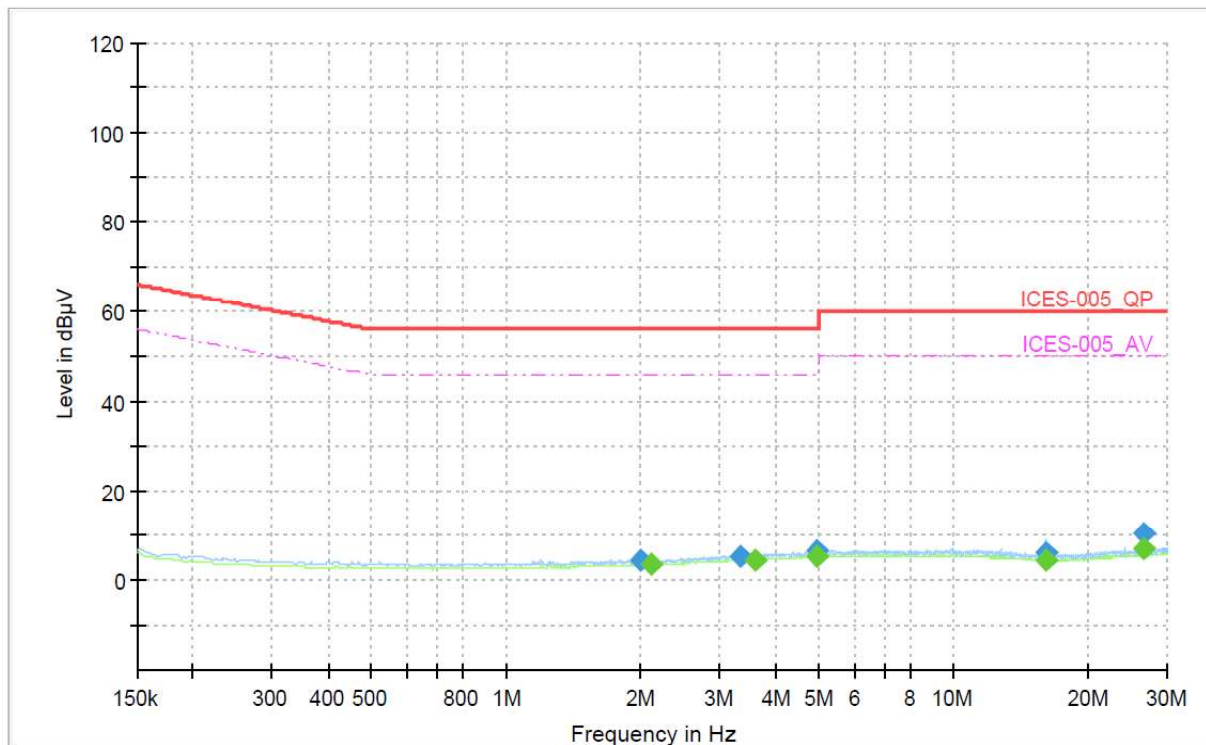
Figure 1: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
2.037750	4.64	---	56.00	51.36	1000.0	9.000	L1	ON	9.7
2.121000	---	3.44	46.00	42.56	1000.0	9.000	L1	ON	9.7
3.396750	5.43	---	56.00	50.57	1000.0	9.000	L1	ON	9.8
3.601500	---	4.48	46.00	41.52	1000.0	9.000	L1	ON	9.8
4.895250	6.43	---	56.00	49.57	1000.0	9.000	L1	ON	9.8
4.983000	---	5.16	46.00	40.84	1000.0	9.000	L1	ON	9.8
16.197000	---	4.48	50.00	45.52	1000.0	9.000	L1	ON	10.1
16.197000	5.84	---	60.00	54.16	1000.0	9.000	L1	ON	10.1
26.610000	10.65	---	60.00	49.35	1000.0	9.000	L1	ON	10.2
26.610000	---	6.84	50.00	43.16	1000.0	9.000	L1	ON	10.2

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



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
1.992750	4.47	---	56.00	51.53	1000.0	9.000	N	ON	9.7
2.098500	---	3.37	46.00	42.63	1000.0	9.000	N	ON	9.7
3.347250	5.44	---	56.00	50.56	1000.0	9.000	N	ON	9.8
3.601500	---	4.53	46.00	41.47	1000.0	9.000	N	ON	9.8
4.951500	---	5.20	46.00	40.80	1000.0	9.000	N	ON	9.8
4.958250	6.36	---	56.00	49.64	1000.0	9.000	N	ON	9.8
16.098000	---	4.58	50.00	45.42	1000.0	9.000	N	ON	10.1
16.098000	6.00	---	60.00	54.00	1000.0	9.000	N	ON	10.1
26.610000	10.26	---	60.00	49.74	1000.0	9.000	N	ON	10.2
26.610000	---	6.76	50.00	43.24	1000.0	9.000	N	ON	10.2

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated disturbance

Result:	Pass
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- Date of testing : 2023.09.12
- Test procedure : ANSI C63.4:2014 and CISPR 16-1 series standards
- Frequency range : 30 – 1000MHz
- Limits : FCC 47 CFR Part 15 Subpart B:2021
 Quasi-peak limits (3m test distance):
 30-88MHz, 40dBµV/m; 88-216MHz, 43.5dBµV/m;
 216-960MHz, 46dBµV/m; Above 960MHz, 54dBµV/m.
 ICES-005:2018, Class B
 Quasi-peak limits (3m test distance):
 30-88MHz, 40dBµV/m; 88-216MHz, 43.5dBµV/m;
 216-1000MHz, 46dBµV/m
 (Note: The class B limits of ICES-005:2018 is stricter than those
 FCC 47 CFR Part 15, Subpart B:2021 for 3 m test distance.
 Therefore, the ICES-005:2018 limits are used in following
 figures and tables.)
- Kind of test site : Semi-anechoic chamber
- Operation modes : ON
- Input voltage : AC 120 V; 60 Hz
- Ambient Condition : Temperature: 21 °C ; Relative Humidity: 63 %

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3m. 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 wooden table, which is 0.8m high. The wooden table was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

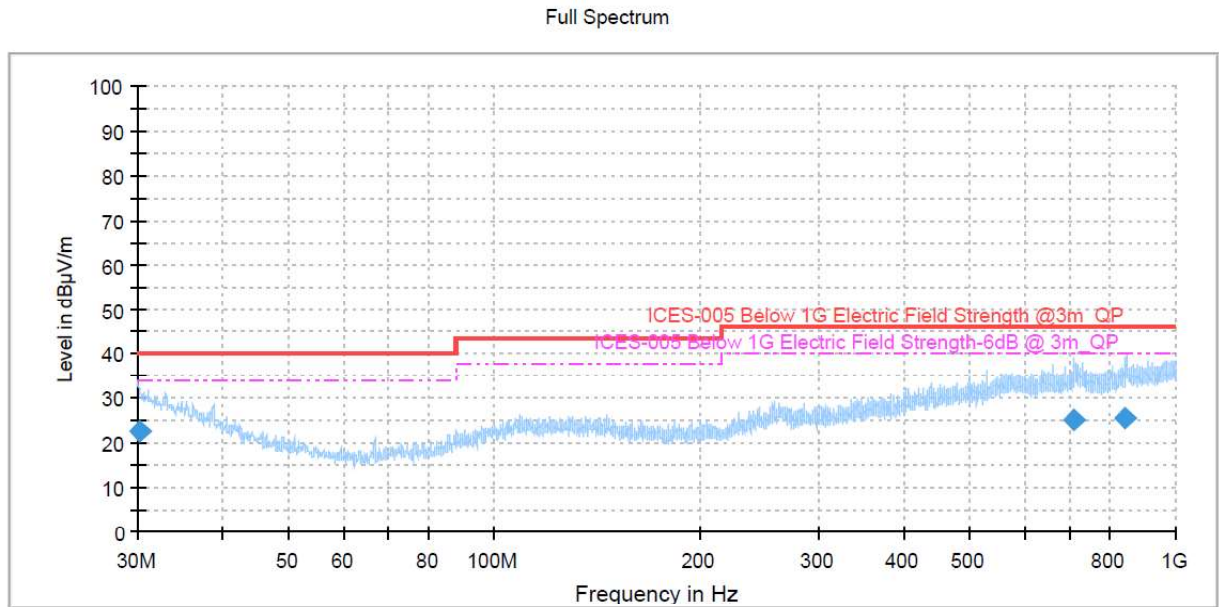
According to the clause 15.33 “Frequency range of radiated measurements” of FCC 47 CFR Part 15 Subpart B:2021 and clause 3.2.2 “Radiated Emissions Limits” of ICES-005:2018 Class B, the highest frequency in the EUT is below 108 MHz, therefore the EUT’s upper frequency of measurement range is 1000MHz.

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 figures, “◆” mean final measurement results with quasi-peak detector.

Before measurement, a survey was made to determine in which state the maximum disturbance was obtained. And the measurement was made in the state the maximum disturbance was obtained.

The measurement result is calculated based on the following formula by the test software:
 Emission Level = Reading level + Correction (Antenna factor + Cable loss)

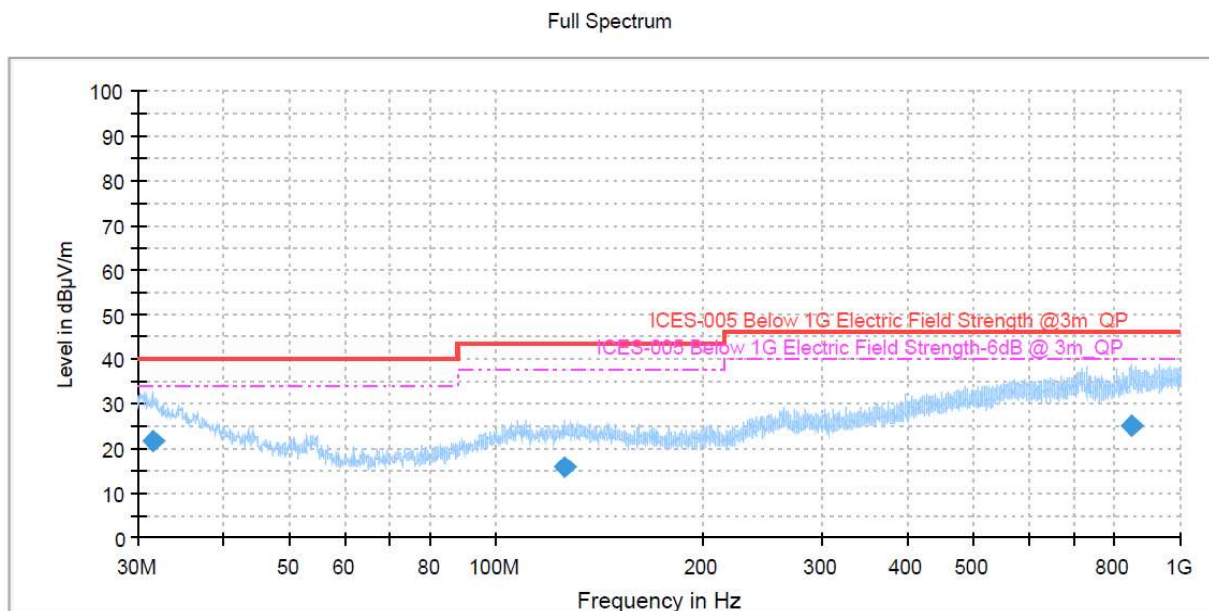
Figure 3: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Horizontal polarization



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.160000	22.78	40.00	17.22	1000.0	120.000	211.0	H	347.0	25.9
708.807778	24.99	46.00	21.01	1000.0	120.000	236.0	H	18.0	27.8
844.580000	25.40	46.00	20.60	1000.0	120.000	100.0	H	23.0	29.4

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



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.475000	21.72	40.00	18.28	1000.0	120.000	120.0	V	11.0	24.9
126.211667	16.04	43.50	27.46	1000.0	120.000	250.0	V	278.0	19.0
845.720556	25.29	46.00	20.71	1000.0	120.000	201.0	V	106.0	29.3

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6 Photographs of the Test Set-Up

Refer to the test setup file.

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-- The END --