

Certificate Number: 4902.01

Prüfbericht-Nr.: <i>Test report no.:</i>	CN23DXW2 001	Auftrags-Nr.: <i>Order no.:</i>	180271185	Seite 1 von 17 Page 1 of 17
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>	LED2316G5 LED2316G5K5			
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>	A003549056-003			
Prüfzeitraum: <i>Testing period:</i>	2023.09.12-2023.09.15			
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	Ausstelldatum: <i>Issue date:</i> 2023.10.07			
Stellung / Position:	Carrie Lei/PE	Stellung / Position:	Feng Liang/Authorizer	
Sonstiges / Other:	FCC ID: FHO-LED2316G5 FCC ID: FHO-LED2316G5K5 Refer to clause 2.2 for further information.			
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
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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Anmerkungen Remarks

1	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.
	<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> <i>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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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

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 : 5 W

Identities and differences: the models LED2316G5 and LED2316G5K5 are identical except color temperature, which have no influence on EMC performance. Therefore, the EMC tests were performed on model LED2316G5.

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 and label.

3 Test Set-up and Operation Modes

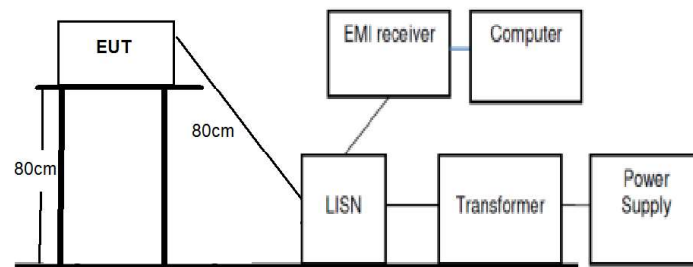
3.1 Principle of Configuration Selection

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

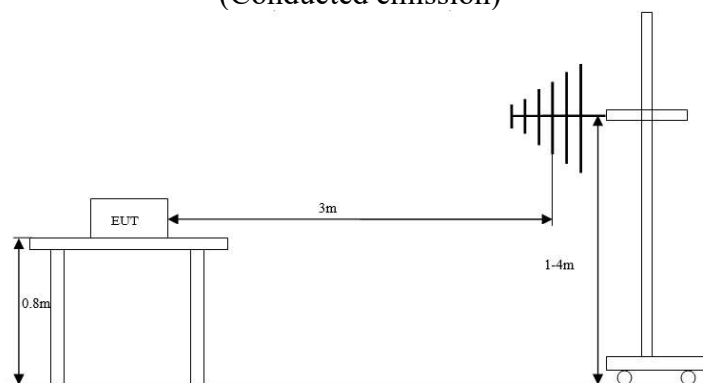
Refer to the related paragraph of this report.

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.

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.

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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 : 2023.09.15
 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 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
 Ambient Condition : Temperature: 22 °C; Relative Humidity: 55%

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)

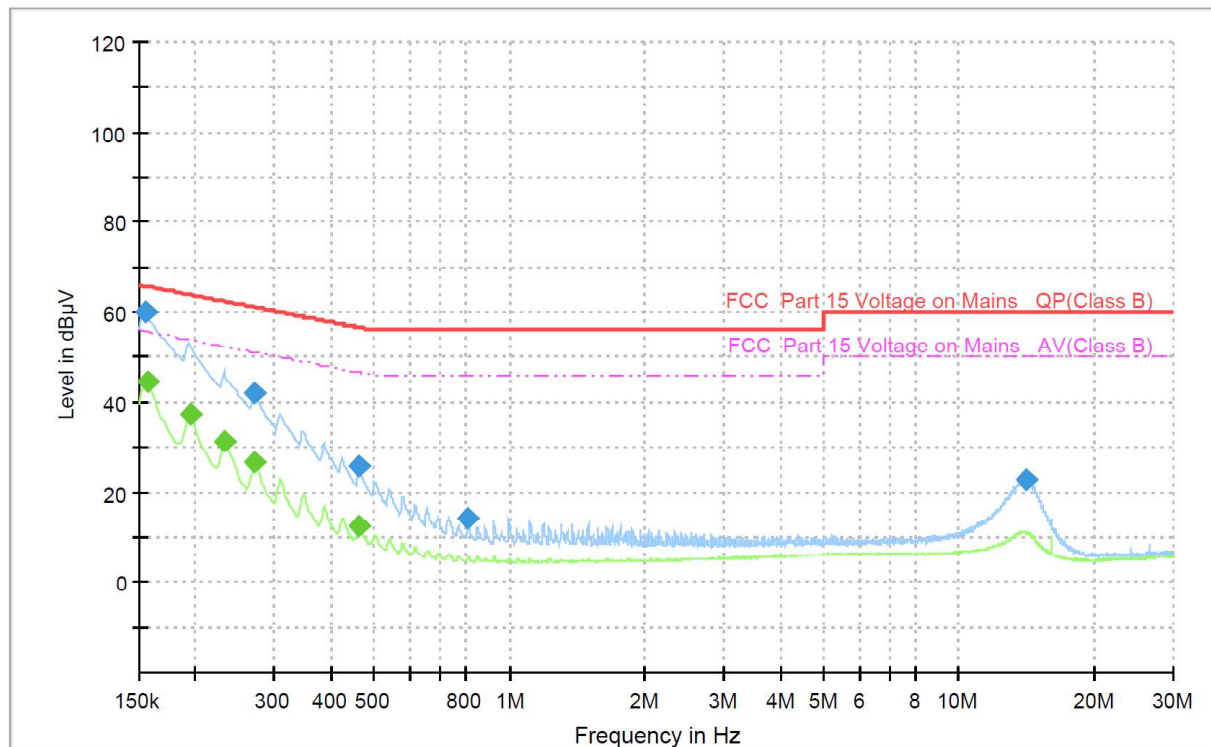
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Figure 1: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	59.95	---	65.75	5.80	1000.0	9.000	L1	ON	9.6
0.156750	---	44.47	55.63	11.16	1000.0	9.000	L1	ON	9.6
0.195000	---	37.33	53.82	16.49	1000.0	9.000	L1	ON	9.6
0.233250	---	31.50	52.33	20.84	1000.0	9.000	L1	ON	9.6
0.269250	41.93	---	61.14	19.21	1000.0	9.000	L1	ON	9.6
0.271500	---	26.59	51.07	24.48	1000.0	9.000	L1	ON	9.6
0.462750	25.96	---	56.64	30.68	1000.0	9.000	L1	ON	9.6
0.462750	---	12.53	46.64	34.11	1000.0	9.000	L1	ON	9.6
0.807000	14.25	---	56.00	41.75	1000.0	9.000	L1	ON	9.6
14.064000	22.95	---	60.00	37.05	1000.0	9.000	L1	ON	10.0

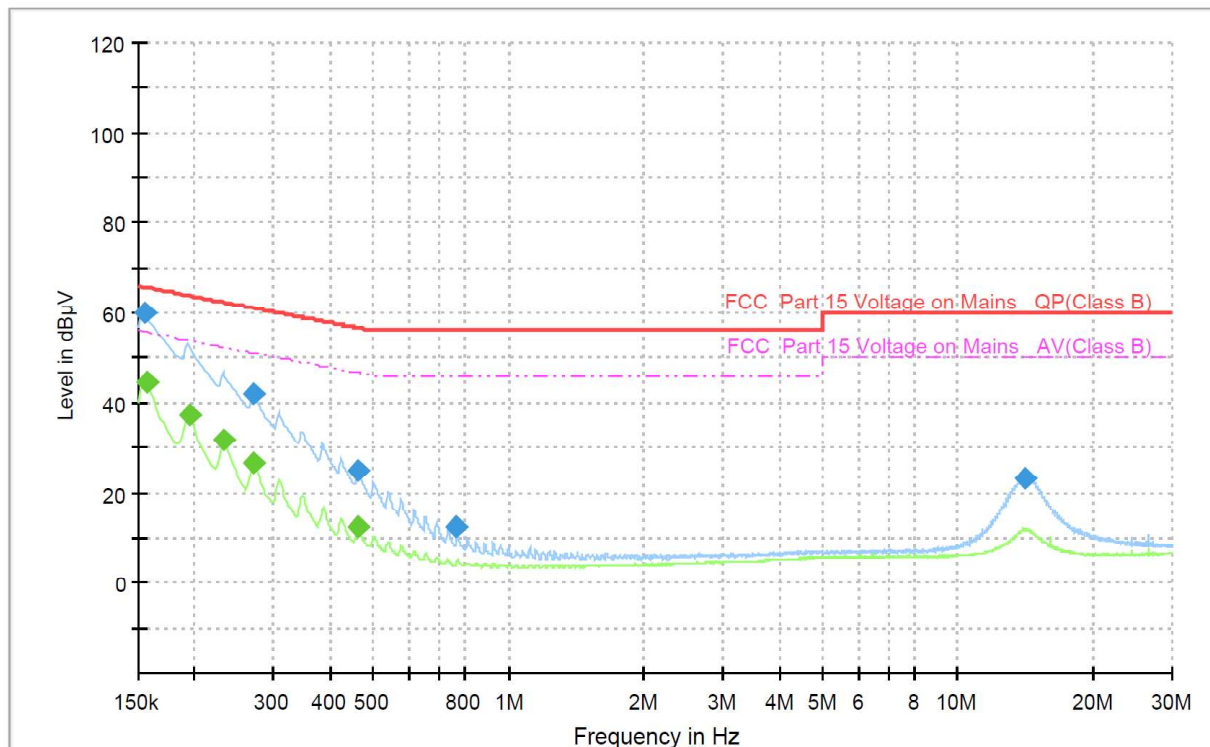
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Figure 2: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	60.09	---	65.75	5.66	1000.0	9.000	N	ON	9.6
0.156750	---	44.61	55.63	11.03	1000.0	9.000	N	ON	9.6
0.195000	---	37.44	53.82	16.38	1000.0	9.000	N	ON	9.6
0.233250	---	31.62	52.33	20.72	1000.0	9.000	N	ON	9.6
0.269250	42.01	---	61.14	19.13	1000.0	9.000	N	ON	9.6
0.271500	---	26.70	51.07	24.37	1000.0	9.000	N	ON	9.6
0.460500	25.12	---	56.68	31.56	1000.0	9.000	N	ON	9.6
0.462750	---	12.37	46.64	34.27	1000.0	9.000	N	ON	9.6
0.766500	12.46	---	56.00	43.54	1000.0	9.000	N	ON	9.6
14.190000	23.33	---	60.00	36.67	1000.0	9.000	N	ON	10.0

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, 40dB μ V/m; 88-216MHz, 43.5dB μ V/m;
 216-960MHz, 46dB μ V/m; Above 960MHz, 54dB μ V/m.
 ICES-005:2018, Class B
 Quasi-peak limits (3m test distance):
 30-88MHz, 40dB μ V/m; 88-216MHz, 43.5dB μ V/m;
 216-1000MHz, 46dB μ V/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)

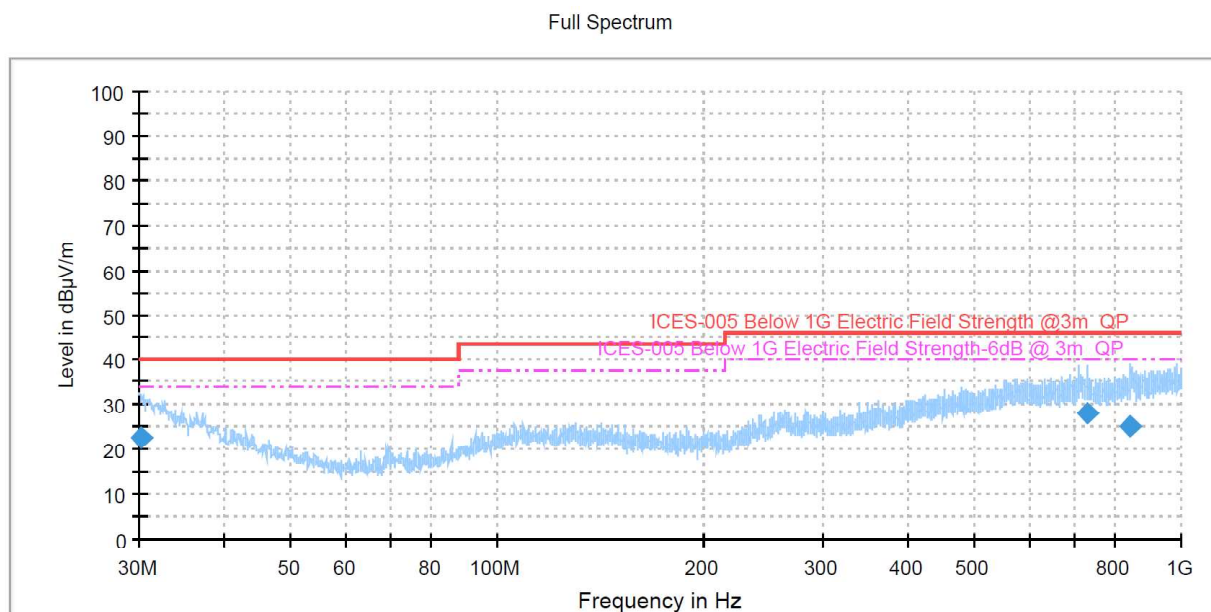
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Figure 3: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Horizontal polarization



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.300000	22.57	40.00	17.43	1000.0	120.000	130.0	H	221.0	25.8
729.955000	27.84	46.00	18.16	1000.0	120.000	121.0	H	27.0	28.1
844.540000	25.27	46.00	20.73	1000.0	120.000	117.0	H	170.0	29.4

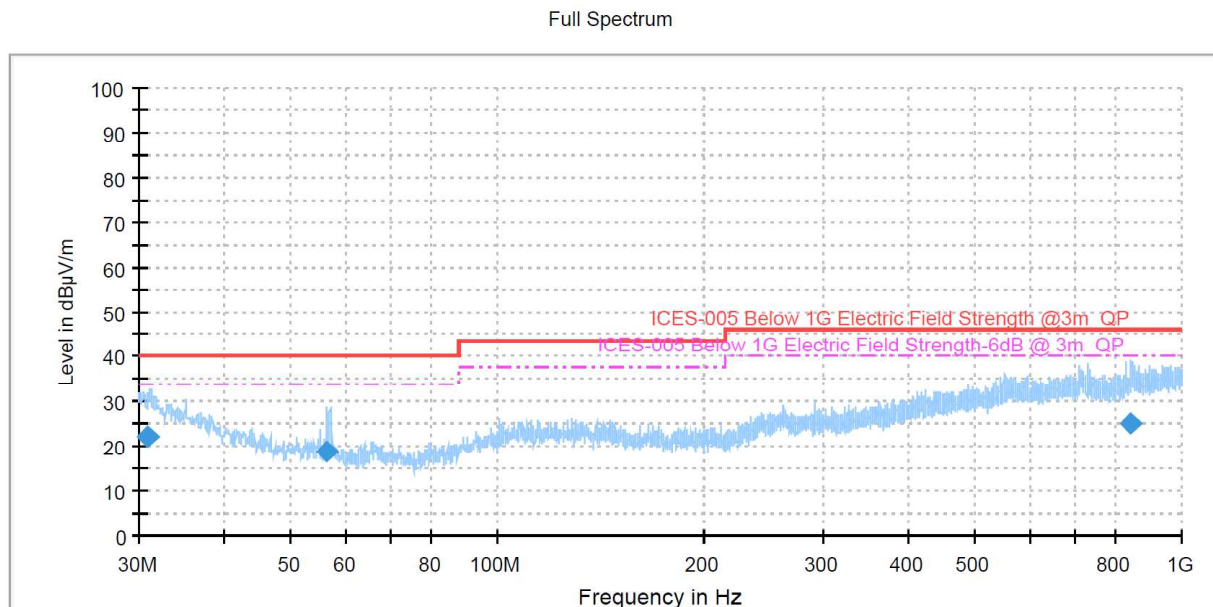
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Figure 4: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Vertical polarization



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.885556	22.17	40.00	17.83	1000.0	120.000	143.0	V	326.0	25.4
56.585556	18.63	40.00	21.37	1000.0	120.000	124.0	V	27.0	13.5
844.873889	25.27	46.00	20.73	1000.0	120.000	124.0	V	87.0	29.4

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6 Photographs of the Test Set-Up

Refer to the test setup file.

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-- The END --