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|--|--|--|------------------------------|--|
| Prüfbericht-Nr.: <i>Test report no.:</i> | CN235MLN 001 | Auftrags-Nr.: <i>Order no.:</i> | 244555497 | Seite 1 von 28 <i>Page 1 of 28</i> |
| Kunden-Referenz-Nr.: <i>Client reference no.:</i> | 1288983 | Auftragsdatum: <i>Order date:</i> | 2023-11-01 | |
| Auftraggeber: <i>Client:</i> | IKEA of Sweden AB Box 702, SE-343 81 Älmhult, Sweden | | | |
| Prüfgegenstand: <i>Test item:</i> | Light Chain | | | |
| Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i> | J2325 | | | |
| 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> | 2023-12-19 | Refer to the EUT photos file | | |
| Prüfmuster-Nr.: <i>Test sample no.:</i> | A003627301-001 | | | |
| 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 (Suzhou) Co., Ltd. | | | |
| Prüfergebnis*: <i>Test result*:</i> | Pass | | | |
| geprüft von: <i>tested by:</i> | <i>Jessie Xu</i> | genehmigt von: <i>authorized by:</i> | <i>Jiayi Zhou</i> | |
| Datum: <i>Date:</i> | 2024-02-06 | Ausstellungsdatum: <i>Issue date:</i> | 2024-02-06 | |
| Stellung / Position: | Project engineer | Stellung / Position: | Reviewer | |
| Sonstiges / <i>Other:</i> | FCC ID: FHO-J2325 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 <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 specification(s) | F(ail) = failed a.m. test specification(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 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.</i> | | | | |

v05

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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> |
| 2 | <p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i></p> |
| 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

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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 light chain 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 : 4 W

LED driver information: ICPSW-24-3.6-IL-1, Input: AC 100-240 V, 50/60 Hz, Max. 0,05 A;
Output: DC 24.0 V, Max.0.15 mA, 3.6W.

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 | AC power line | Unshielded | 950 |
| 2 | DC Power supply line | Unshielded | 4800 |

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.

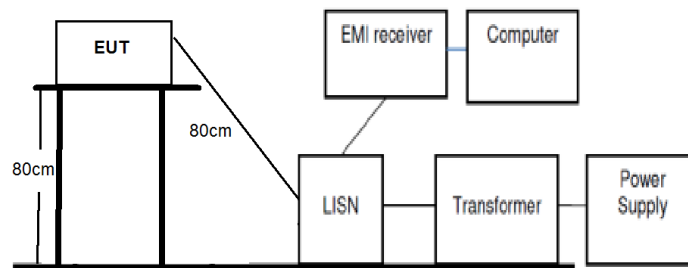
Refer to the related paragraph of this report.

The sequence of testing:

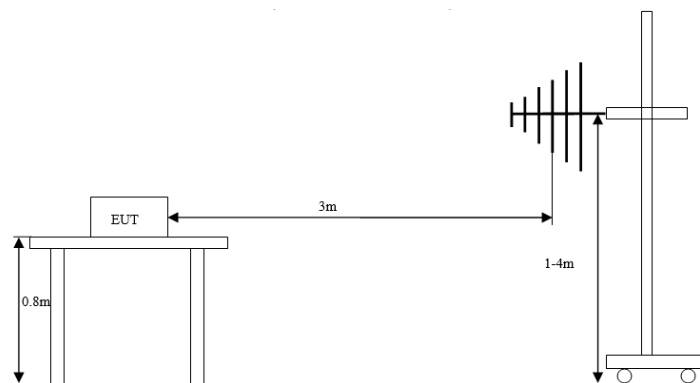
1. Radiated emission tests were performed on 2023-12-28.
2. Conducted emission tests were performed on 2023-12-28.

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 EMISSION

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Conducted emission

| Result: | Passed |
|---|---|
| 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 16-2-1 |
| 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 with LED driver |
| Operational mode | : Mode 1: lighting on mode Mode 2: flashing mode Mode 3: sensor mode |
| Ambient condition | : Temperature: 21.1 °C; Relative humidity: 45.7 % |
| Expanded measurement uncertainty ($k=2$) | : 2.33 dB The minimum margin to the limit is 5.38 dB at 0.166875 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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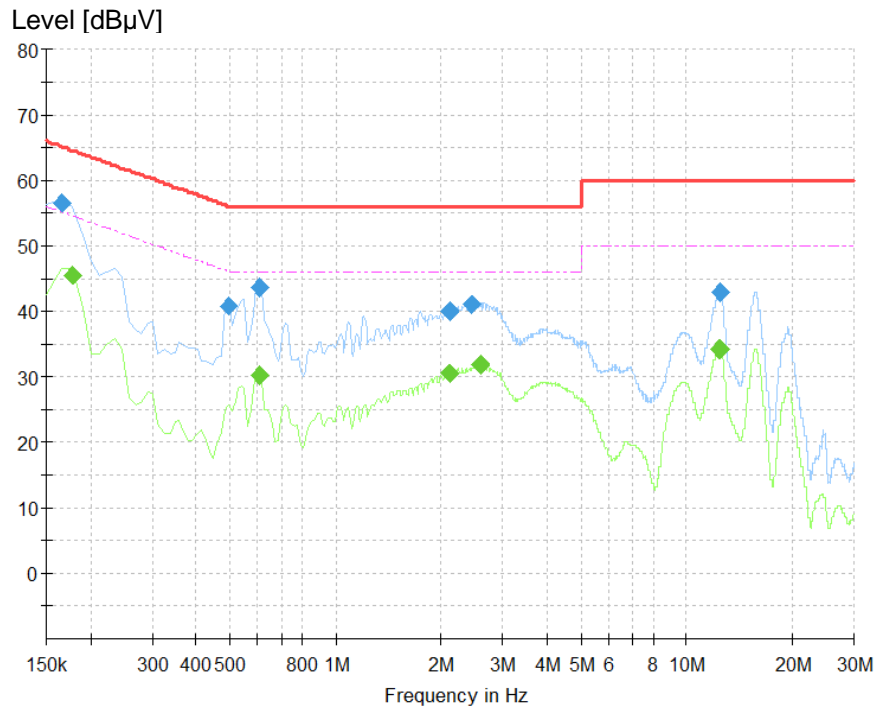
The following figures and tables were those measured by an automatic measuring system. Both quasi-peak and average measurements were performed. In the following spectral diagram, “♦” means Quasi-Peak Value and “◆” means Average Value results.

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)

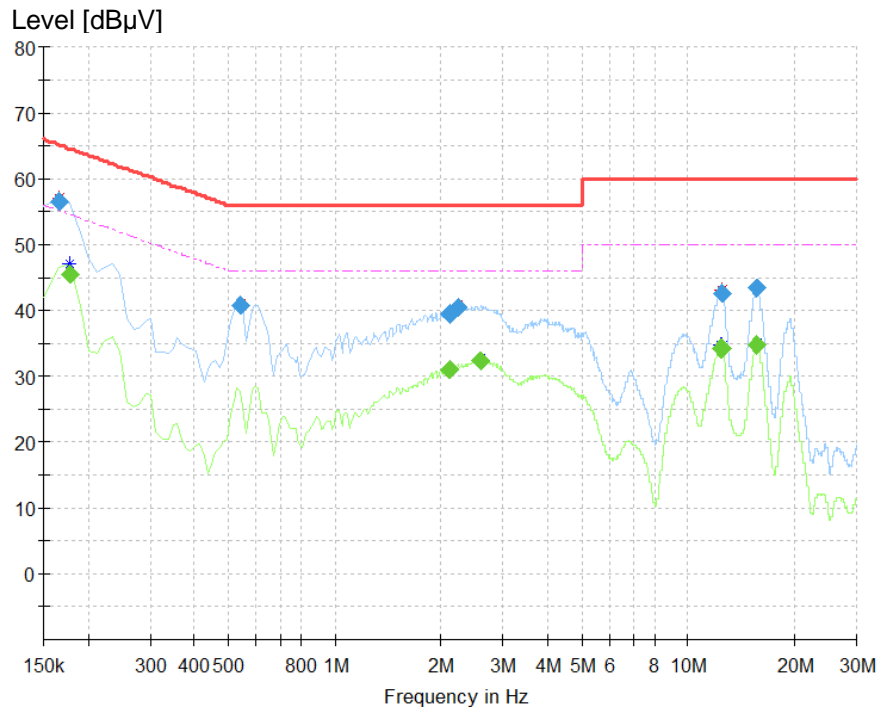
Margin: Limit (dB μ V) - Level (dB μ V)

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

Final Quasi-peak measurement result:

| Frequency (MHz) | QuasiPeak (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.166875 | 56.54 | 65.12 | 8.57 | 1000.0 | 9.000 | L1 | 10.4 |
| 0.493125 | 40.72 | 56.12 | 15.40 | 1000.0 | 9.000 | L1 | 10.5 |
| 0.605625 | 43.74 | 56.00 | 12.26 | 1000.0 | 9.000 | L1 | 10.5 |
| 2.113125 | 39.87 | 56.00 | 16.13 | 1000.0 | 9.000 | L1 | 10.3 |
| 2.450625 | 41.06 | 56.00 | 14.94 | 1000.0 | 9.000 | L1 | 10.3 |
| 12.440625 | 42.80 | 60.00 | 17.20 | 1000.0 | 9.000 | L1 | 11.0 |

Final Average measurement result:

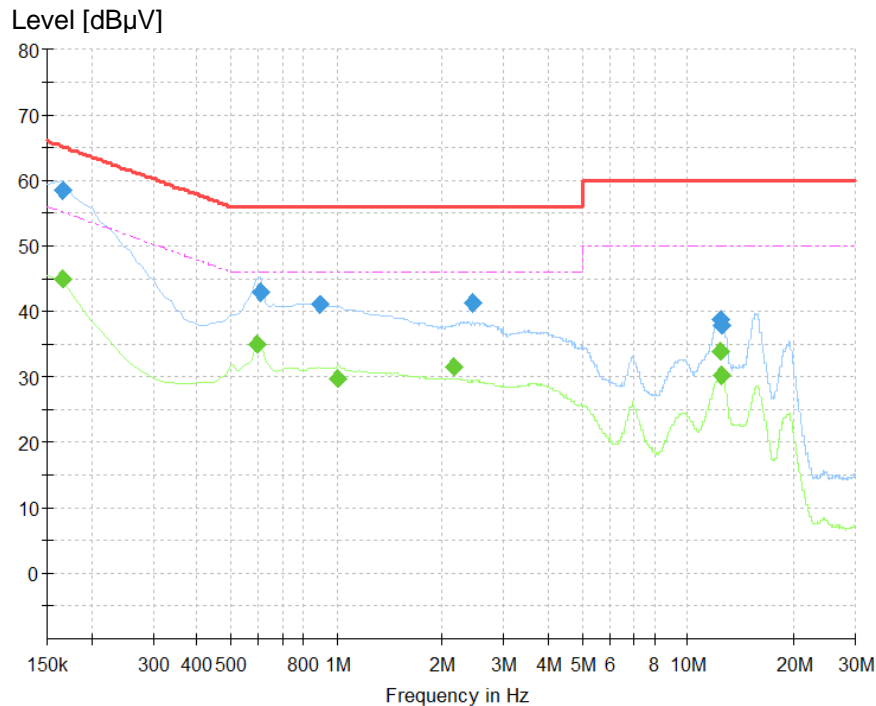
| Frequency (MHz) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.178125 | 45.49 | 54.57 | 9.08 | 1000.0 | 9.000 | L1 | 10.4 |
| 0.605625 | 30.15 | 46.00 | 15.85 | 1000.0 | 9.000 | L1 | 10.5 |
| 2.113125 | 30.45 | 46.00 | 15.55 | 1000.0 | 9.000 | L1 | 10.3 |
| 2.585625 | 31.72 | 46.00 | 14.28 | 1000.0 | 9.000 | L1 | 10.3 |
| 12.395625 | 34.25 | 50.00 | 15.75 | 1000.0 | 9.000 | L1 | 11.0 |
| 12.451875 | 34.29 | 50.00 | 15.71 | 1000.0 | 9.000 | L1 | 11.0 |

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) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.166875 | 56.55 | 65.12 | 8.57 | 1000.0 | 9.000 | N | 10.6 |
| 0.538125 | 40.91 | 56.00 | 15.09 | 1000.0 | 9.000 | N | 10.4 |
| 2.113125 | 39.35 | 56.00 | 16.65 | 1000.0 | 9.000 | N | 10.7 |
| 2.225625 | 40.46 | 56.00 | 15.54 | 1000.0 | 9.000 | N | 10.7 |
| 12.440625 | 42.69 | 60.00 | 17.31 | 1000.0 | 9.000 | N | 11.3 |
| 15.658125 | 43.38 | 60.00 | 16.62 | 1000.0 | 9.000 | N | 11.4 |

Final Average measurement result:

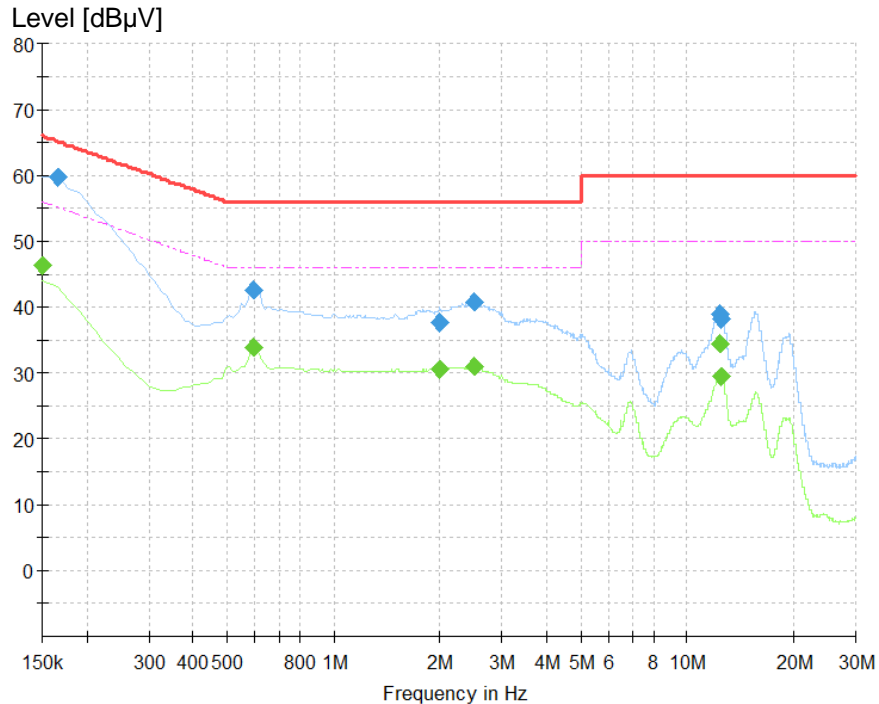
| Frequency (MHz) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.178125 | 45.64 | 54.57 | 8.93 | 1000.0 | 9.000 | N | 10.7 |
| 2.113125 | 31.07 | 46.00 | 14.93 | 1000.0 | 9.000 | N | 10.7 |
| 2.585625 | 32.40 | 46.00 | 13.60 | 1000.0 | 9.000 | N | 10.8 |
| 12.373125 | 34.30 | 50.00 | 15.70 | 1000.0 | 9.000 | N | 11.3 |
| 12.429375 | 34.30 | 50.00 | 15.70 | 1000.0 | 9.000 | N | 11.3 |
| 15.669375 | 34.79 | 50.00 | 15.21 | 1000.0 | 9.000 | N | 11.4 |

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) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.166875 | 58.48 | 65.12 | 6.64 | 1000.0 | 9.000 | L1 | 10.4 |
| 0.605625 | 42.91 | 56.00 | 13.09 | 1000.0 | 9.000 | L1 | 10.5 |
| 0.898125 | 40.97 | 56.00 | 15.03 | 1000.0 | 9.000 | L1 | 10.8 |
| 2.439375 | 41.25 | 56.00 | 14.75 | 1000.0 | 9.000 | L1 | 10.3 |
| 12.395625 | 38.56 | 60.00 | 21.44 | 1000.0 | 9.000 | L1 | 11.0 |
| 12.429375 | 37.78 | 60.00 | 22.22 | 1000.0 | 9.000 | L1 | 11.0 |

Final Average measurement result:

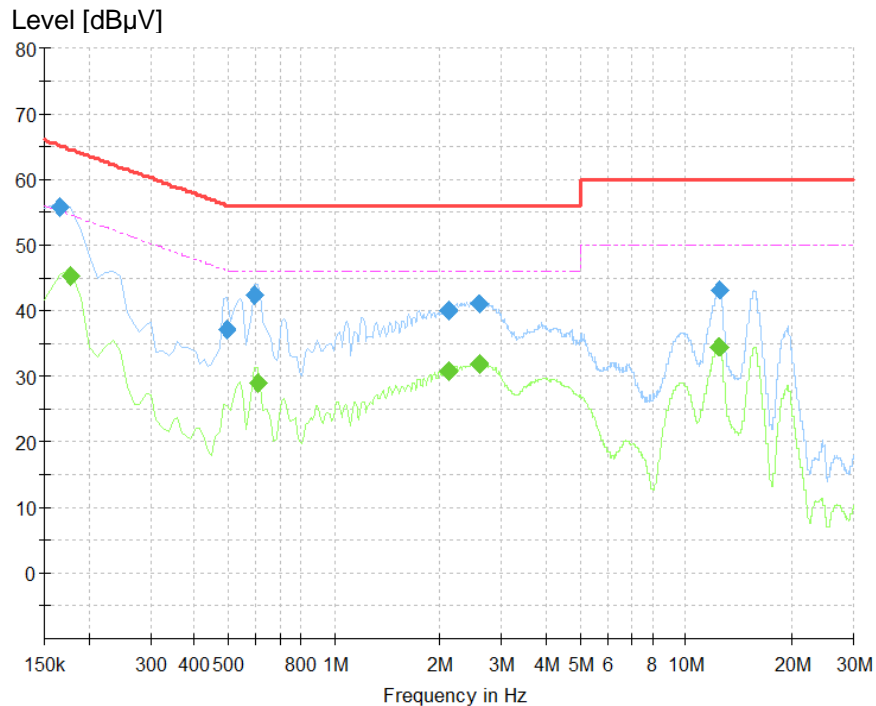
| Frequency (MHz) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.166875 | 44.90 | 55.12 | 10.21 | 1000.0 | 9.000 | L1 | 10.4 |
| 0.594375 | 34.91 | 46.00 | 11.09 | 1000.0 | 9.000 | L1 | 10.5 |
| 0.999375 | 29.62 | 46.00 | 16.38 | 1000.0 | 9.000 | L1 | 10.9 |
| 2.169375 | 31.45 | 46.00 | 14.55 | 1000.0 | 9.000 | L1 | 10.3 |
| 12.395625 | 34.07 | 50.00 | 15.93 | 1000.0 | 9.000 | L1 | 11.0 |
| 12.463125 | 30.38 | 50.00 | 19.62 | 1000.0 | 9.000 | L1 | 11.0 |

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) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.166875 | 59.73 | 65.12 | 5.38 | 1000.0 | 9.000 | N | 10.6 |
| 0.594375 | 42.61 | 56.00 | 13.39 | 1000.0 | 9.000 | N | 10.5 |
| 2.000625 | 37.72 | 56.00 | 18.28 | 1000.0 | 9.000 | N | 10.7 |
| 2.484375 | 40.87 | 56.00 | 15.13 | 1000.0 | 9.000 | N | 10.8 |
| 12.395625 | 38.84 | 60.00 | 21.16 | 1000.0 | 9.000 | N | 11.3 |
| 12.429375 | 38.10 | 60.00 | 21.90 | 1000.0 | 9.000 | N | 11.3 |

Final Average measurement result:

| Frequency (MHz) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.150000 | 46.21 | 56.00 | 9.79 | 1000.0 | 9.000 | N | 10.4 |
| 0.594375 | 33.97 | 46.00 | 12.03 | 1000.0 | 9.000 | N | 10.5 |
| 1.989375 | 30.44 | 46.00 | 15.56 | 1000.0 | 9.000 | N | 10.7 |
| 2.495625 | 31.07 | 46.00 | 14.93 | 1000.0 | 9.000 | N | 10.8 |
| 12.395625 | 34.40 | 50.00 | 15.60 | 1000.0 | 9.000 | N | 11.3 |
| 12.451875 | 29.50 | 50.00 | 20.50 | 1000.0 | 9.000 | N | 11.3 |

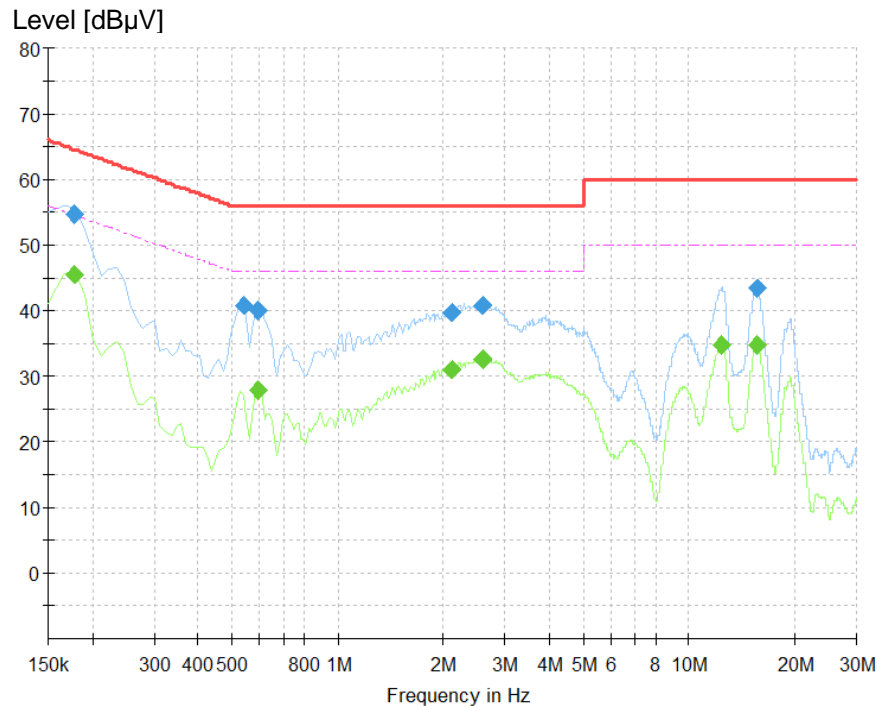
Figure 5: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, L on mode 3


Final Quasi-peak measurement result:

| Frequency (MHz) | QuasiPeak (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.166875 | 55.78 | 65.12 | 9.34 | 1000.0 | 9.000 | L1 | 10.4 |
| 0.493125 | 37.14 | 56.12 | 18.97 | 1000.0 | 9.000 | L1 | 10.5 |
| 0.594375 | 42.37 | 56.00 | 13.63 | 1000.0 | 9.000 | L1 | 10.5 |
| 2.101875 | 40.07 | 56.00 | 15.93 | 1000.0 | 9.000 | L1 | 10.3 |
| 2.574375 | 41.07 | 56.00 | 14.93 | 1000.0 | 9.000 | L1 | 10.3 |
| 12.429375 | 43.14 | 60.00 | 16.86 | 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) |
|-----------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.178125 | 45.36 | 54.57 | 9.21 | 1000.0 | 9.000 | L1 | 10.4 |
| 0.605625 | 28.88 | 46.00 | 17.12 | 1000.0 | 9.000 | L1 | 10.5 |
| 2.101875 | 30.68 | 46.00 | 15.32 | 1000.0 | 9.000 | L1 | 10.3 |
| 2.574375 | 31.95 | 46.00 | 14.05 | 1000.0 | 9.000 | L1 | 10.3 |
| 12.373125 | 34.55 | 50.00 | 15.45 | 1000.0 | 9.000 | L1 | 11.0 |
| 12.429375 | 34.47 | 50.00 | 15.53 | 1000.0 | 9.000 | L1 | 11.0 |

Figure 6: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, N on mode 3


Final Quasi-peak measurement result:

| Frequency (MHz) | QuasiPeak (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.178125 | 54.61 | 64.57 | 9.96 | 1000.0 | 9.000 | N | 10.7 |
| 0.538125 | 40.87 | 56.00 | 15.13 | 1000.0 | 9.000 | N | 10.4 |
| 0.594375 | 40.12 | 56.00 | 15.88 | 1000.0 | 9.000 | N | 10.5 |
| 2.101875 | 39.67 | 56.00 | 16.33 | 1000.0 | 9.000 | N | 10.7 |
| 2.574375 | 40.78 | 56.00 | 15.22 | 1000.0 | 9.000 | N | 10.8 |
| 15.556875 | 43.39 | 60.00 | 16.61 | 1000.0 | 9.000 | N | 11.4 |

Final Average measurement result:

| Frequency (MHz) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.178125 | 45.47 | 54.57 | 9.10 | 1000.0 | 9.000 | N | 10.7 |
| 0.594375 | 27.77 | 46.00 | 18.23 | 1000.0 | 9.000 | N | 10.5 |
| 2.101875 | 31.15 | 46.00 | 14.85 | 1000.0 | 9.000 | N | 10.7 |
| 2.574375 | 32.54 | 46.00 | 13.46 | 1000.0 | 9.000 | N | 10.8 |
| 12.361875 | 34.65 | 50.00 | 15.35 | 1000.0 | 9.000 | N | 11.3 |
| 15.556875 | 34.84 | 50.00 | 15.16 | 1000.0 | 9.000 | N | 11.4 |

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission (30-1000 MHz)

| | |
|----------------|---------------|
| Result: | Passed |
|----------------|---------------|

| | |
|---|---|
| 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 (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 with LED driver |
| Operational mode | : Mode 1: lighting on mode Mode 2: flashing mode Mode 3: sensor mode |
| Ambient condition | : Temperature: 19.7 °C; Relative humidity: 50.2 % |
| Expanded measurement uncertainty ($k=2$) | : 5.49 dB |

The minimum margin to the limit is 10.9 dB at 32.788750 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:

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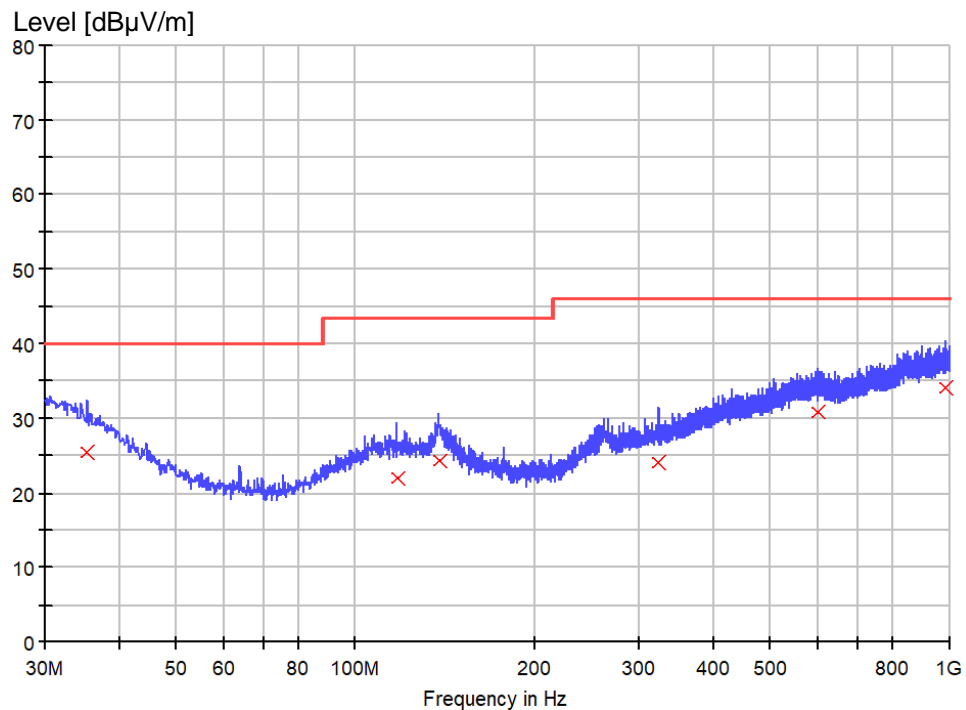
QuasiPeak (dB μ V/m): final measurement results by using quasi-peak detector

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)

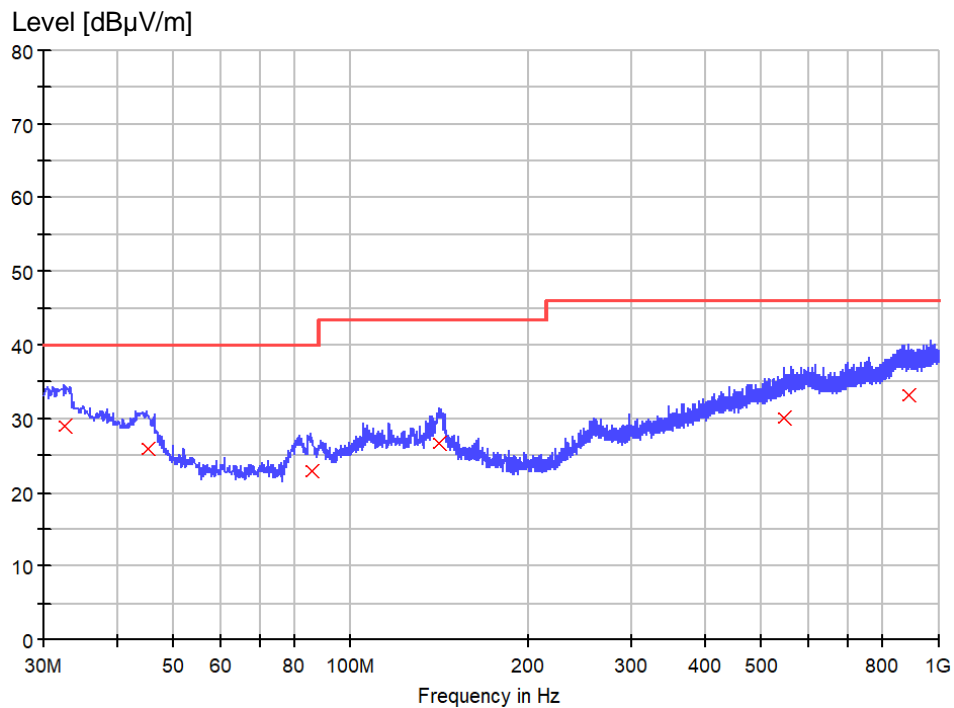
Note 1: The highest frequency in the EUT is 24 MHz. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is 1000 MHz.

Note 2: The class B limits of ICES-005:2018 is stricter than those FCC 47 CFR Part 15, Subpart B:2021 for 3 m test distance. Therefore, the former limits are used in following figures and tables.

Figure 7: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization on mode 1


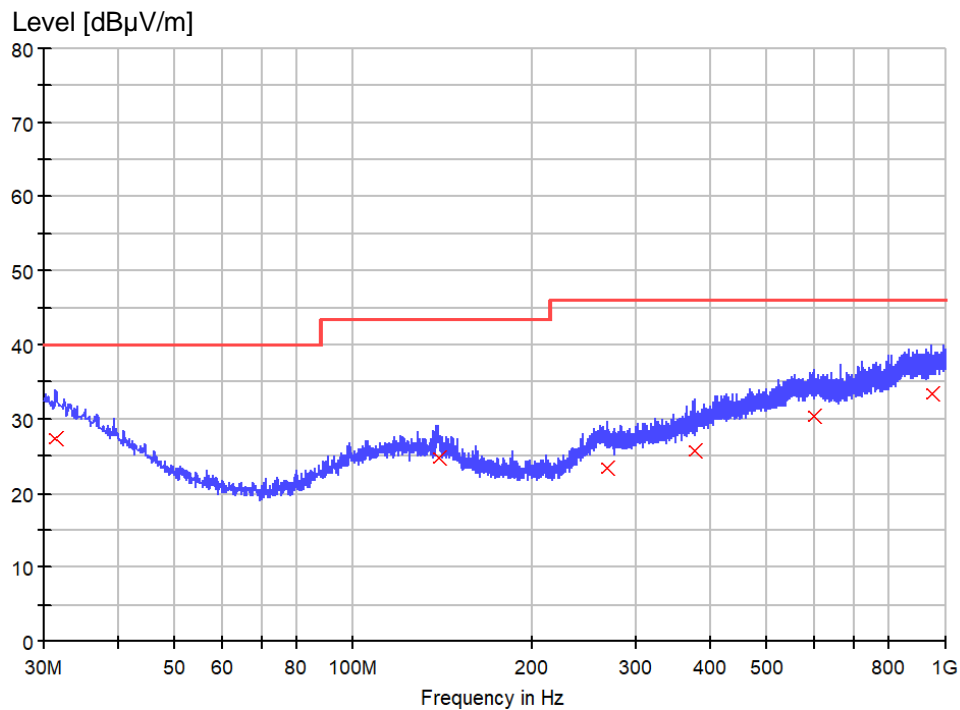
Final quasi-peak measurement results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Margin - QPK (dB) | Limit - QPK (dBµV/m) |
|-----------------|--------------------|-----------------|-------------|-----|---------------|--------------|-------------------|----------------------|
| 35.335000 | 25.5 | 120.000 | 100.0 | H | 69.0 | 22.3 | 14.5 | 40.0 |
| 117.785000 | 21.9 | 120.000 | 100.0 | H | -44.0 | 18.9 | 21.6 | 43.5 |
| 138.518750 | 24.3 | 120.000 | 100.0 | H | 100.0 | 18.3 | 19.2 | 43.5 |
| 324.395000 | 24.1 | 120.000 | 100.0 | H | 162.0 | 20.9 | 21.9 | 46.0 |
| 598.783750 | 30.8 | 120.000 | 100.0 | H | -9.0 | 26.9 | 15.2 | 46.0 |
| 981.812500 | 34.1 | 120.000 | 100.0 | H | -73.0 | 29.8 | 11.9 | 46.0 |

Figure 8: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization on mode 1


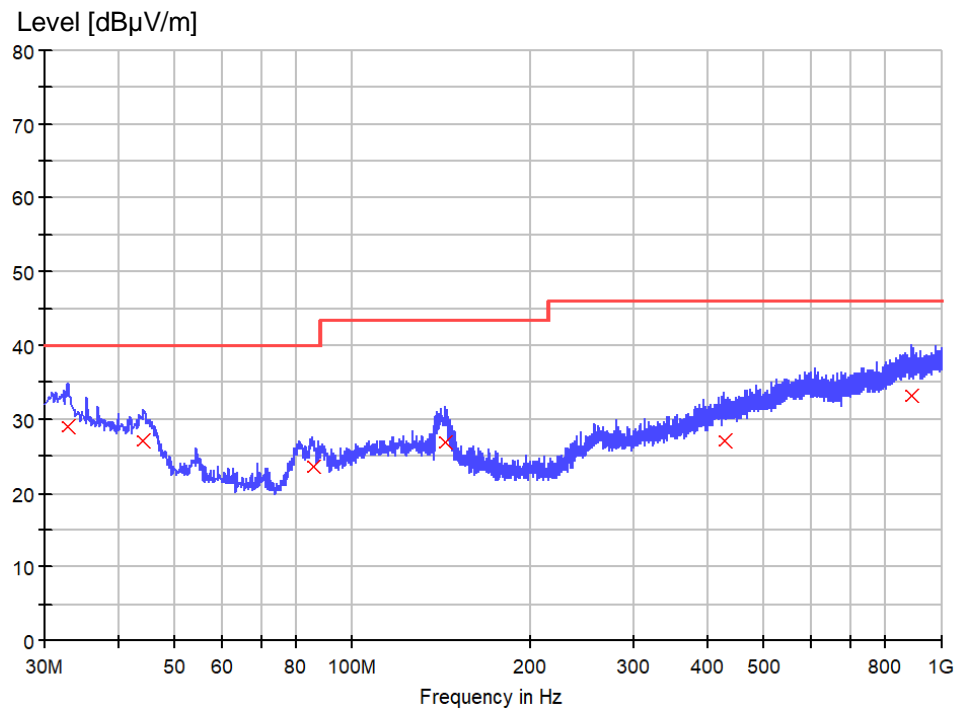
Final quasi-peak measurement results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Margin - QPK (dB) | Limit - QPK (dBµV/m) |
|-----------------|--------------------|-----------------|-------------|-----|---------------|--------------|-------------------|----------------------|
| 32.546250 | 29.0 | 120.000 | 100.0 | V | -27.0 | 23.6 | 11.0 | 40.0 |
| 45.035000 | 25.9 | 120.000 | 100.0 | V | 65.0 | 17.1 | 14.1 | 40.0 |
| 85.411250 | 22.9 | 120.000 | 100.0 | V | 180.0 | 14.7 | 17.1 | 40.0 |
| 141.307500 | 26.7 | 120.000 | 100.0 | V | 37.0 | 18.1 | 16.8 | 43.5 |
| 547.252500 | 30.1 | 120.000 | 200.0 | V | -180.0 | 26.6 | 15.9 | 46.0 |
| 889.420000 | 33.2 | 120.000 | 200.0 | V | -180.0 | 28.7 | 12.8 | 46.0 |

Figure 9: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization on mode 2


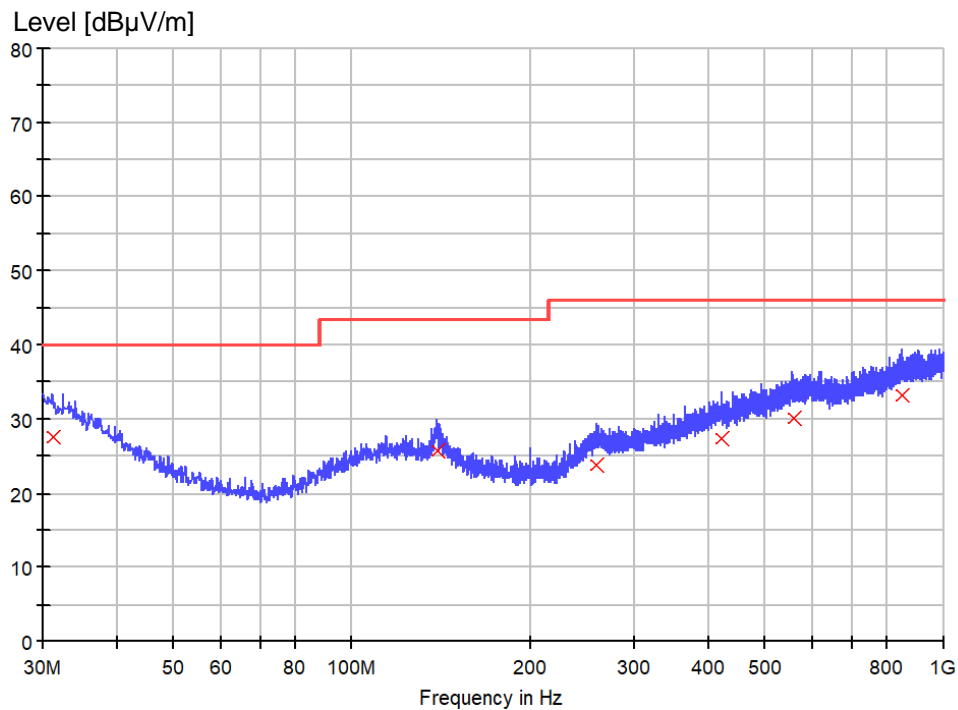
Final quasi-peak measurement results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Margin - QPK (dB) | Limit - QPK (dBµV/m) |
|-----------------|--------------------|-----------------|-------------|-----|---------------|--------------|-------------------|----------------------|
| 31.455000 | 27.4 | 120.000 | 100.0 | H | 99.0 | 24.1 | 12.6 | 40.0 |
| 138.882500 | 24.8 | 120.000 | 100.0 | H | -47.0 | 18.3 | 18.7 | 43.5 |
| 268.256250 | 23.4 | 120.000 | 100.0 | H | -132.0 | 20.3 | 22.6 | 46.0 |
| 378.472500 | 25.7 | 120.000 | 100.0 | H | -175.0 | 22.4 | 20.3 | 46.0 |
| 602.785000 | 30.4 | 120.000 | 100.0 | H | 155.0 | 27.0 | 15.6 | 46.0 |
| 952.470000 | 33.6 | 120.000 | 100.0 | H | 9.0 | 29.3 | 12.4 | 46.0 |

Figure 10: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization on mode 2


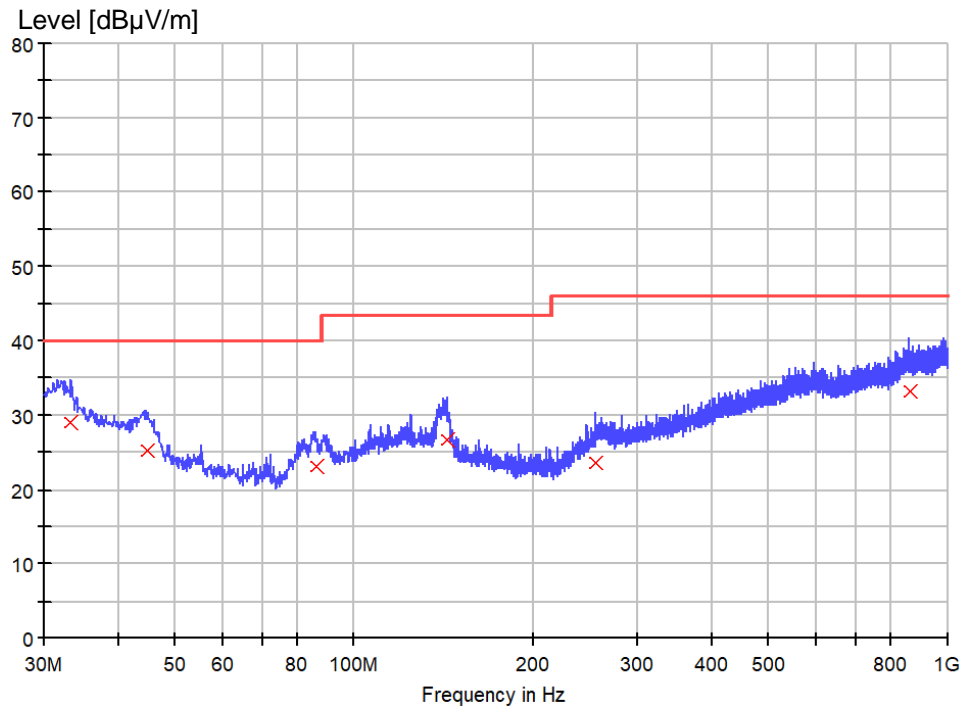
Final quasi-peak measurement results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Margin - QPK (dB) | Limit - QPK (dBµV/m) |
|-----------------|--------------------|-----------------|-------------|-----|---------------|--------------|-------------------|----------------------|
| 32.788750 | 29.1 | 120.000 | 100.0 | V | 3.0 | 23.5 | 10.9 | 40.0 |
| 44.186250 | 27.2 | 120.000 | 100.0 | V | -66.0 | 17.6 | 12.8 | 40.0 |
| 85.775000 | 23.7 | 120.000 | 100.0 | V | 19.0 | 14.8 | 16.3 | 40.0 |
| 143.126250 | 26.8 | 120.000 | 100.0 | V | -91.0 | 18.0 | 16.7 | 43.5 |
| 427.457500 | 27.2 | 120.000 | 100.0 | V | -180.0 | 24.0 | 18.8 | 46.0 |
| 885.661250 | 33.3 | 120.000 | 100.0 | V | 74.0 | 28.7 | 12.7 | 46.0 |

Figure 11: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Horizontal polarization on mode 3


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) |
|-----------------|--------------------|-----------------|-------------|-----|---------------|--------------|-------------------|----------------------|
| 31.212500 | 27.6 | 120.000 | 100.0 | H | 36.0 | 24.3 | 12.4 | 40.0 |
| 138.882500 | 25.8 | 120.000 | 100.0 | H | -11.0 | 18.3 | 17.7 | 43.5 |
| 259.405000 | 23.8 | 120.000 | 100.0 | H | 95.0 | 20.7 | 22.2 | 46.0 |
| 420.667500 | 27.3 | 120.000 | 100.0 | H | -65.0 | 23.9 | 18.7 | 46.0 |
| 558.043750 | 30.1 | 120.000 | 100.0 | H | 174.0 | 26.6 | 15.9 | 46.0 |
| 851.953750 | 33.3 | 120.000 | 100.0 | H | 99.0 | 29.0 | 12.7 | 46.0 |

Figure 12: Spectral Diagrams, Radiated Emission, 30 MHz – 1000 MHz, Vertical polarization on mode 3


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) |
|-----------------|--------------------|-----------------|-------------|-----|---------------|--------------|-------------------|----------------------|
| 33.273750 | 28.9 | 120.000 | 100.0 | V | 180.0 | 23.3 | 11.1 | 40.0 |
| 44.671250 | 25.3 | 120.000 | 100.0 | V | 95.0 | 17.3 | 14.7 | 40.0 |
| 86.138750 | 23.1 | 120.000 | 100.0 | V | -11.0 | 14.9 | 16.9 | 40.0 |
| 143.247500 | 26.7 | 120.000 | 100.0 | V | -143.0 | 18.0 | 16.8 | 43.5 |
| 256.010000 | 23.5 | 120.000 | 100.0 | V | -6.0 | 20.3 | 22.5 | 46.0 |
| 860.320000 | 33.3 | 120.000 | 100.0 | V | 107.0 | 28.9 | 12.7 | 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 | Due Date |
|----------|--------------------------|----------------------|---------------|------------|------------|
| | | | | DD.MM.YYYY | DD.MM.YYYY |
| 9053584 | Shielded enclosure | FRSR | Frankonia | 02.12.2022 | 02.12.2027 |
| 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 |
| G1824248 | Dual display multimeter | F45 | Fluke | 08.10.2022 | 08.10.2024 |
| G1811378 | 3m semi-anechoic chamber | SAC3 | Frankonia | 10.06.2021 | 10.06.2024 |
| G1811391 | EMI test receiver | ESCI | Rohde&Schwarz | 29.09.2023 | 29.09.2024 |
| G1811425 | Bilog antenna | CBL 6112D | Teseq | 20.04.2023 | 20.04.2026 |
| G1824845 | EMC measurement software | EMC32 (Ver 10.20.01) | Rohde&Schwarz | N/A | N/A |

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End of test report