Prüfbericht-Nr.: *Test report no.*:	**CN24ZNRW 001**	**Auftrags-Nr.:** *Order no.*:	**326031877**	**Seite 1 von 21** *Page 1 of 21*
Kunden-Referenz-Nr.: *Client reference no.*:	**1288983**	**Auftragsdatum:** *Order date:*	**2024-06-18**	
Auftraggeber: *Client*:	**IKEA of Sweden AB** Box 702, SE-343 81, Älmhult, Sweden			
Prüfgegenstand: *Test item*:	**Ceiling fan with light**			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	**T2416**			
Auftrags-Inhalt: *Order content*:	**TÜV Rheinland EMC service**			
Prüfgrundlage: *Test specification*:	**FCC 47 CFR Part 15, Subpart B:2022 Class B** **ICES-003:2020** **ICES-005:2018**			
Wareneingangsdatum: *Date of sample receipt*:	**2024-06-18**	**Please refer to Photo Document**		
Prüfmuster-Nr.: *Test sample no:*	**A003775294-001**			
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:*	Xuelan Zhong	**genehmigt von:** *authorized by*:	Jiayi Zhou
Datum: *Date:* 2024-10-10		**Ausstellungsdatum:** *Issue date:* 2024-10-10	
Stellung / Position:	Project engineer	**Stellung** / Position:	Reviewer

Sonstiges / *Other*:
FCC ID: FHO-T2416
Test Firm Name: TUV Rheinland (Shanghai) Co., Ltd.
Designation Number: CN1396
Test Firm Registration Number: 930979

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *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*

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. *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.*
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3	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. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted 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.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen 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 bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *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.*

Revision history of test report:

Report number	Issue date	Contents and reason for change if appropriate
CN24ZNRW 001	2024-10-10	Initial release.

Contents

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 6 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a ceiling fan with light. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated input	:	120 V ~ 60 Hz 49 W 0.5 A FAN: 27 W 0.25 A LIGHT KIT: 22 W 0.25 A
Protection class	:	I

2.3 Independent Operation Modess

The basic operation mode is continuously operated with different airflow and lighting on with different light output level by wireless connection (433.92 MHz).

2.4 Description of interconnecting cables

None.

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 433.92 MHz.

2.7 Submitted Documents

Circuit diagram, user's manual and rating label.

3 Test Set-up and Operation Modes

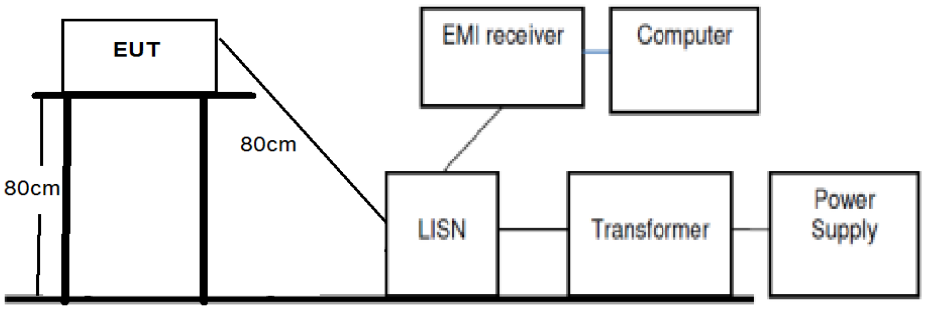
3.1 Principle of Configuration Selection

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.

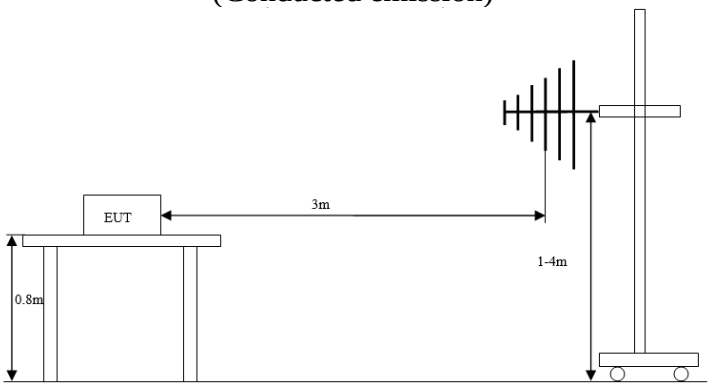
Refer to the related paragraph of this report.
The sequence of testing:
1. Radiated emission tests were performed on 2024-07-08~2024-08-13;
2. Conducted emission tests were performed on 2024-07-08~2024-08-13.

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.

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 Mains Terminal Continuous Disturbance Voltage

Result:	**Passed**

Date of testing	:	2024-07-08~2024-08-13
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2022, ICES-003:2020, 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 as defined in clause 2.3
Ambient condition	:	Temperature: 22.5 °C; Relative humidity: 48 %
Expanded measurement uncertainty (k=2)	:	2.33 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.

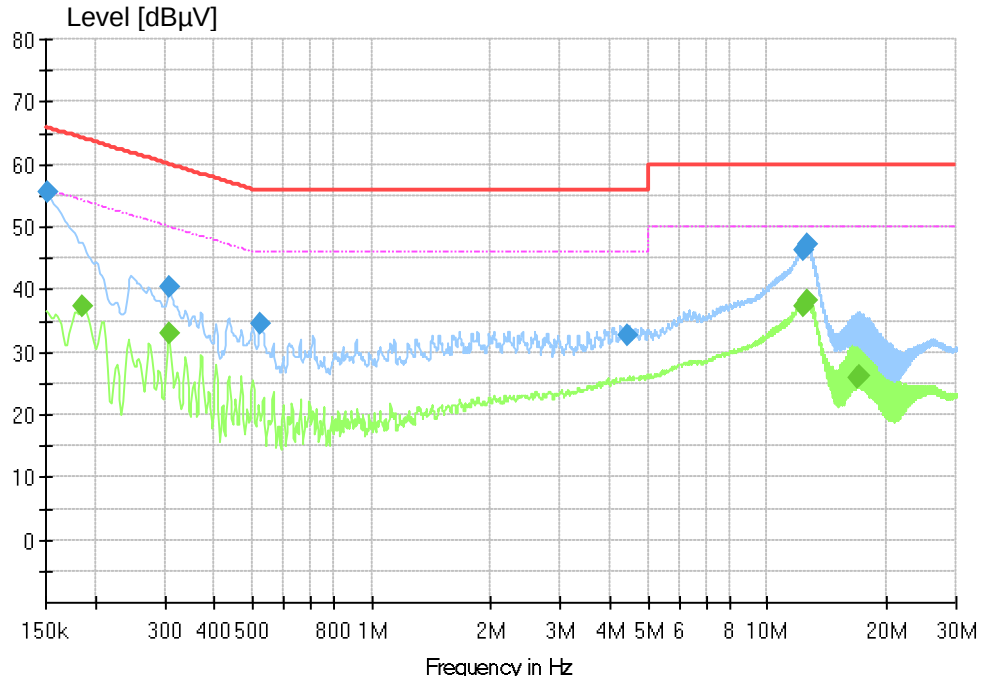
The disturbance voltage test was performed on the neutral line and phase line of the power supply of the EUT respectively.

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, "◆" 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



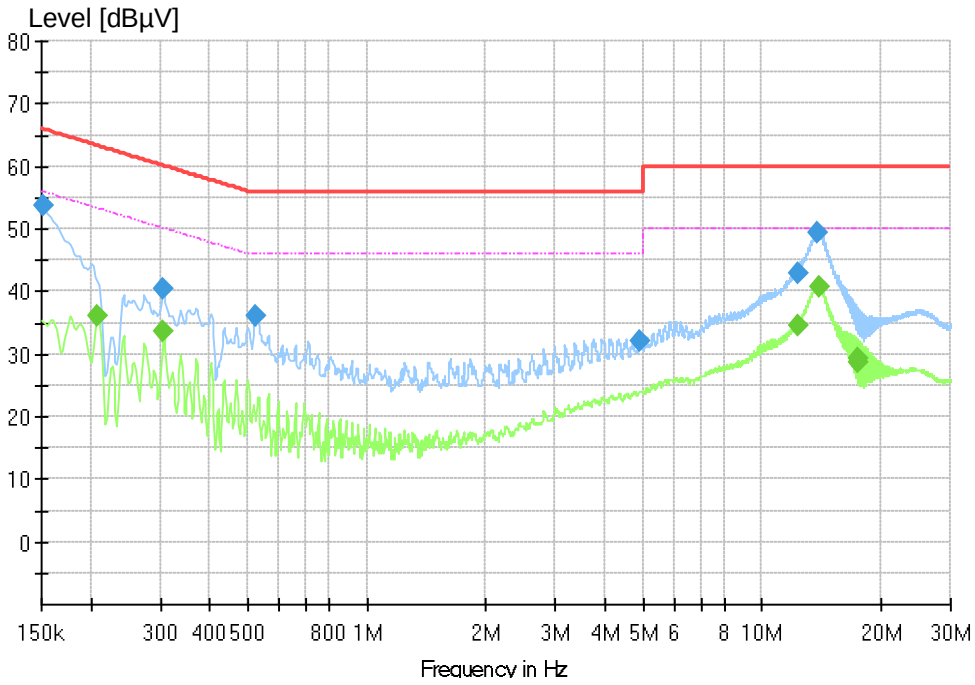
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth	Line	Corr. (dB)
0.152250	55.47	65.88	10.41	1000.0	9.000	L1	10.3
0.307500	40.42	60.04	19.62	1000.0	9.000	L1	10.3
0.525750	34.53	56.00	21.47	1000.0	9.000	L1	10.3
4.434000	32.62	56.00	23.38	1000.0	9.000	L1	10.3
12.376500	46.15	60.00	13.85	1000.0	9.000	L1	10.8
12.624000	47.07	60.00	12.93	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)
0.186000	37.33	54.21	16.88	1000.0	9.000	L1	10.3
0.307500	32.96	50.04	17.08	1000.0	9.000	L1	10.3
12.304500	37.36	50.00	12.64	1000.0	9.000	L1	10.8
12.583500	38.16	50.00	11.84	1000.0	9.000	L1	10.8
16.876500	25.80	50.00	24.20	1000.0	9.000	L1	10.9
17.155500	26.11	50.00	23.89	1000.0	9.000	L1	10.9

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



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.152250	53.74	65.88	12.13	1000.0	9.000	N	10.2
0.305250	40.54	60.10	19.56	1000.0	9.000	N	10.5
0.525750	36.17	56.00	19.83	1000.0	9.000	N	10.2
4.906500	32.10	56.00	23.90	1000.0	9.000	N	10.7
12.365250	42.83	60.00	17.17	1000.0	9.000	N	11.1
13.861500	49.26	60.00	10.74	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)
0.208500	36.15	53.27	17.12	1000.0	9.000	N	10.8
0.305250	33.71	50.10	16.39	1000.0	9.000	N	10.5
12.387750	34.52	50.00	15.48	1000.0	9.000	N	11.1
13.906500	40.70	50.00	9.30	1000.0	9.000	N	11.1
17.412000	29.28	50.00	20.73	1000.0	9.000	N	11.2
17.551500	28.73	50.00	21.27	1000.0	9.000	N	11.2

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission (30 MHz - 1 GHz)

Result:	**Passed**

Date of testing	:	2024-07-08~2024-08-13
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2022, ICES-003:2020, ICES-005:2018, ANSI C63.4-2014 and CISPR 16-2-3
Frequency range	:	30 – 1000 MHz
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 1)
Bandwidth of EMI receiver for final measurement	:	120 kHz
Measurement time for final measurement	:	1 s
Kind of test site	:	Semi-anechoic chamber
Operational mode	:	Mode as defined in clause 2.3
Input voltage	:	AC 120 V, 60 Hz
Ambient condition	:	Temperature: 20.5 °C; Relative humidity: 45 %
Expanded measurement uncertainty (k=2)	:	5.40 dB

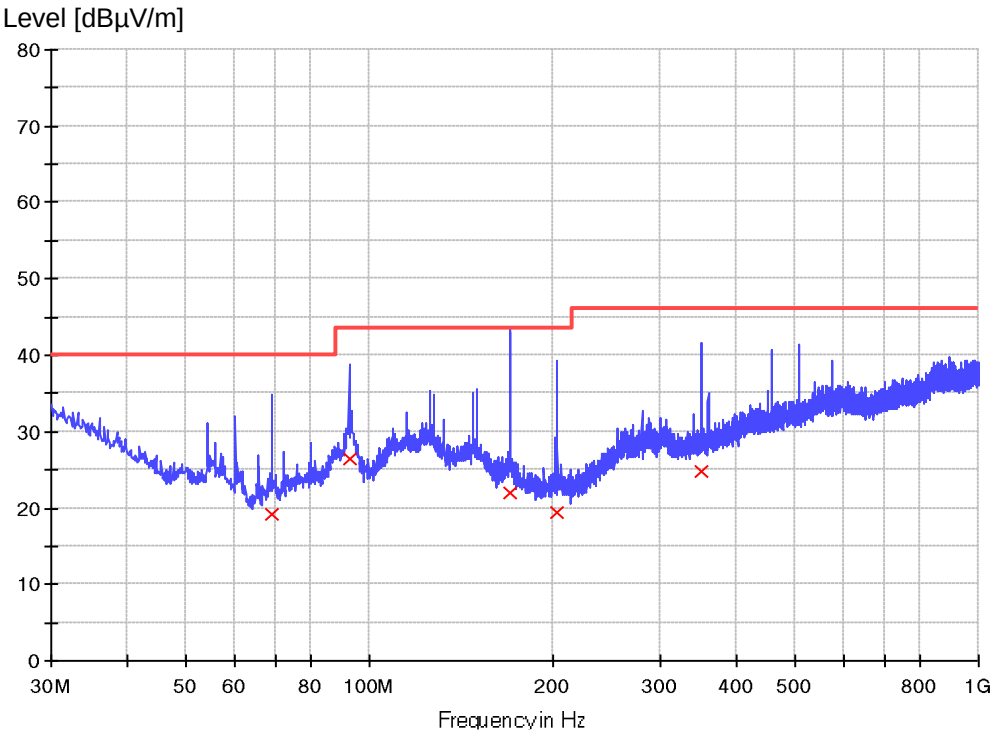
The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 0.8 m high wooden table above the reference ground plane. The wooden table 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 Class B limits in ICES-005:2018 Table 4 are more stringent than those in FCC Part 15 subpart B §15.109 (a) and Class B limits in ICES-003:2020 Table 2. Therefore, the former are used in following figures and tables.

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)

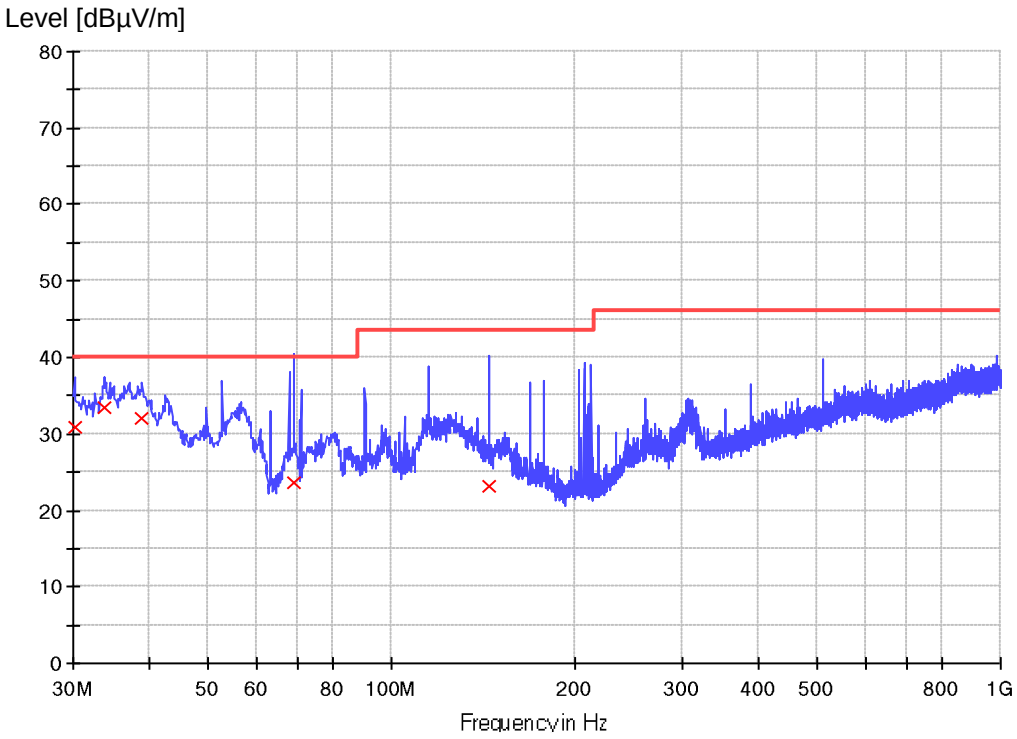
Figure 3: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz)



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
69.042500	19.2	120.000	150.0	H	-180.0	12.6	20.9	40.0
92.565000	26.4	120.000	150.0	H	150.0	16.3	17.1	43.5
169.680000	22.0	120.000	150.0	H	74.0	16.5	21.5	43.5
202.538750	19.5	120.000	150.0	H	-118.0	16.2	24.0	43.5
351.312500	24.9	120.000	150.0	H	-180.0	21.6	21.1	46.0

Figure 4: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz)



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.121250	30.8	120.000	100.0	V	178.0	24.7	9.2	40.0
33.758750	33.4	120.000	100.0	V	-180.0	23.1	6.6	40.0
38.851250	32.1	120.000	100.0	V	180.0	20.4	7.9	40.0
69.163750	23.6	120.000	100.0	V	-180.0	12.6	16.4	40.0
144.600000	23.3	120.000	100.0	V	-17.0	17.9	20.2	43.5

5.2.2 Radiated emission (Above 1 GHz)

Result:	**Passed**

Date of testing	:	2024-07-08~2024-08-13
Port	:	Enclosure
Test procedure	:	FCC 47 CFR Part 15, Subpart B:2022, ANSI C63.4-2014 and CISPR 16-2-3, ICES-003:2020
Limit	:	1-12 GHz, Peak limit: 74 dBµV/m; Average limit: 54 dBµV/m
Frequency range	:	1-12 GHz (see Note)
Bandwidth of EMI receiver for final measurement	:	1000 kHz
Measurement time for final measurement	:	1 s
Test distance	:	3 m
Kind of test site	:	Semi-anechoic chamber
Operational mode	:	Mode as defined in clause 2.3
Input voltage	:	AC 120 V; 60 Hz
Earthing	:	No earthing
Ambient condition	:	Temperature: 20.5 °C; Relative humidity: 45 %
Expanded measurement uncertainty (*k*=2)	:	5.08 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 wooden table, which is 0.8 m high. The wooden table was rotated 360° around and 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.

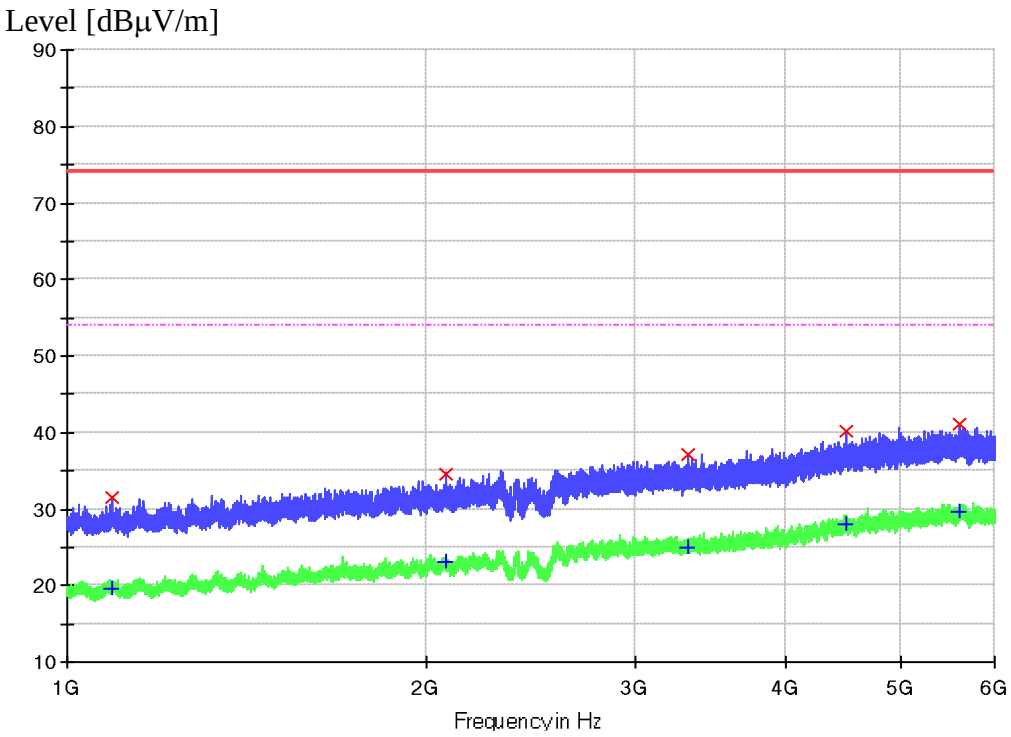
The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, "× (red)" means measurement results with peak detector and "+ (blue)" means measurement results with average detector.

Note: The highest frequency in the EUT is 433.92 MHz. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is to 2 GHz. The actual measurement frequency is to 6 GHz.

Notes on following tables of radiated emission results and conversions:
Peak (dBµV/m): final measurement results by using peak detector
Average (dBµV/m): final measurement results by using average detector
Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)

Margin: Limit PK (dBµV/m) - Peak (dBµV/m)
Limit CAV (dBµV/m) – Average (dBµV/m)

Figure 5: Spectral Diagrams and measurement results, 1-6 GHz, horizontal polarization



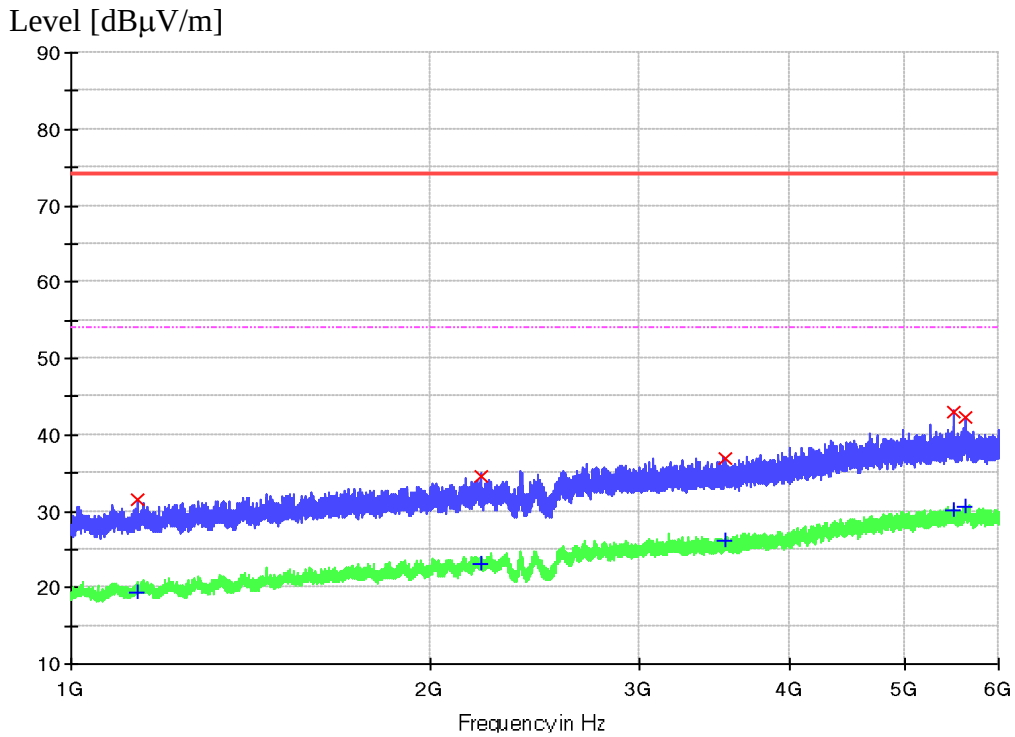
Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1090.625000	31.4	1000.000	120.0	H	36.0	-20.6	42.6	74.0
2079.531250	34.6	1000.000	150.0	H	124.0	-16.9	39.4	74.0
3315.781250	37.1	1000.000	115.0	H	180.0	-13.7	36.9	74.0
4511.875000	40.1	1000.000	100.0	H	-180.0	-10.7	33.9	74.0
5599.687500	41.0	1000.000	213.0	H	15.0	-9.1	33.0	74.0

Final Average measurement results:

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1090.625000	19.6	1000.000	120.0	H	36.0	-20.6	34.4	54.0
2079.531250	23.1	1000.000	150.0	H	124.0	-16.9	30.9	54.0
3315.781250	25.0	1000.000	115.0	H	180.0	-13.7	29.0	54.0
4511.875000	27.9	1000.000	100.0	H	-180.0	-10.7	26.1	54.0
5599.687500	29.7	1000.000	213.0	H	15.0	-9.1	24.3	54.0

Figure 6: Spectral Diagrams and measurement results, 1-6 GHz, vertical polarization



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1137.031250	31.5	1000.000	100.0	V	180.0	-20.4	42.5	74.0
2204.062500	34.6	1000.000	115.0	V	-180.0	-16.4	39.4	74.0
3541.093750	36.8	1000.000	190.0	V	124.0	-13.4	37.2	74.0
5504.687500	43.0	1000.000	130.0	V	-100.0	-9.2	31.0	74.0
5622.187500	42.3	1000.000	100.0	V	180.0	-9.1	31.7	74.0

Final Average measurement results:

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1137.031250	19.4	1000.000	100.0	V	180.0	-20.4	34.6	54.0
2204.062500	23.1	1000.000	115.0	V	-180.0	-16.4	30.9	54.0
3541.093750	26.1	1000.000	190.0	V	124.0	-13.4	27.9	54.0
5504.687500	30.2	1000.000	130.0	V	-100.0	-9.2	23.8	54.0
5622.187500	30.5	1000.000	100.0	V	180.0	-9.1	23.5	54.0

6 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
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
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	15.07.2024	15.07.2025
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	24.07.2024	24.07.2025
G1825372	Preamplifier	EMC184045SE	Taiwan EMCI	24.07.2024	24.07.2025
9059157	Double ridged broadband horn antenna	BBHA 9120 D	Schwarzbeck	16.03.2024	16.03.2029
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

7 List of Figures

End of test report