
EMC Test Report

Report No.: AGC05443231012ER01

PRODUCT DESIGNATION : Wireless charger
BRAND NAME : N/A
MODEL NAME : MO2220
APPLICANT : MID OCEAN BRANDS B.V
DATE OF ISSUE : Nov. 15, 2023
STANDARD(S) : ETSI EN 301 489-1 V2.2.3 (2019-11)
: ETSI EN 301 489-3 V2.3.2 (2023-01)
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Nov. 15, 2023	Valid	Initial release

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1. General information

Applicant	MID OCEAN BRANDS B.V
Address	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer	MID OCEAN BRANDS B.V
Address	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Factory	MID OCEAN BRANDS B.V
Address	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Product Designation	Wireless charger
Brand Name	N/A
Test Model	MO2220
Series Model(s)	N/A
Difference Description	N/A
Deviation from Standard	No any deviation from the test method
Date of Receipt	Oct. 12, 2023
Date of Test	Oct. 12, 2023 to Nov. 15, 2023
Test Result	Pass
Test Report Form No	AGCTR-ER-EMC-GEN-V1.0
Note: The test results of this report relate only to the tested sample identified in this report.	

Prepared By 

 Jack Gui
 (Project Engineer) Nov. 15, 2023

Reviewed By 

 Calvin Liu
 (Reviewer) Nov. 15, 2023

Approved By 

 Max Zhang
 (Authorized Officer) Nov. 15, 2023

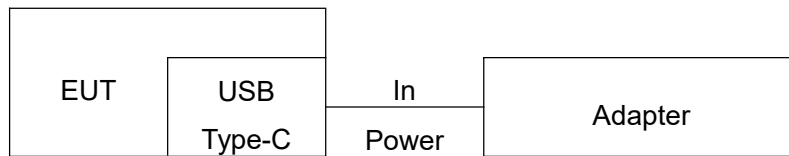
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2. Description of Test Configuration

2.1. Technical Description of Product

Categorization of Equipment	Class B equipment
Test arrangements of EUT	Table-top
Hardware Version	V1.0
Software Version	V1.0
Highest Internal Frequency	Less than 108MHz
EUT Input Rating	DC 9V/2A, DC 5V/2A
Wireless Charging Output Power	5W/7.5W/10W/15W (Max)

Connection Diagram of Host System



I/O Port Information (Applicable Not Applicable)

Port Type	Input/Output	Number	Cable Description
USB Type-C/USB-A	In	1	0.8m unshielded

2.2. Description of Support Equipment

Device Type	Manufacturer	Model Name	Specifications	Data Cable	Power Cable
Wireless Charging Load	--	--	5W,7.5W,10W,15W	--	--
Adapter	Jinbaotong	K-T10E0502000E	AC100-240V, 50-60Hz, 0.35A, DC5V2A	--	--

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2.3. Description of Test Modes

No.	Test Mode Description	Worst
1	AC/DC Adapter + Wireless Full load	--
2	AC/DC Adapter + Wireless Half load	--
3	AC/DC Adapter + Wireless Null load	--

Note: 1. Only worst mode data recorded in the test report.

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3. Summary of Measurement Results and Uncertainty

3.1. Test Specifications

ETSI EN 301 489-1 V2.2.3 (2019-11)	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN 301 489-3 V2.3.2 (2023-01)	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz

3.2. Description of Measurement Results

Test items	Test Standard(s)	Verdict
Conducted emissions from the AC mains power ports	EN 55032	Pass
Radiated emissions at frequencies up to 1 GHz	EN 55032	Pass
Harmonic current emissions	EN IEC 61000-3-2	Pass
Voltage fluctuations and flicker	EN 61000-3-3	Pass
Electrostatic discharge	EN 61000-4-2 ^a	Pass
Radio-frequency electromagnetic field	EN 61000-4-3 ^a	Pass
Fast transients	EN 61000-4-4 ^a	Pass
Surges	EN 61000-4-5 ^a	Pass
Radio-frequency common mode (Injected currents)	EN 61000-4-6 ^a	Pass
Voltage dips and interruptions	EN 61000-4-11 ^a	Pass

Note:

a. The applicable versions of the basic standards are defined in the standard which listed in the test specification.

Performance table

EN 301 489-17 Performance criteria		
Criteria	During Test	After Test (i.e. as a result of the application of the test)
A	Shall operate as intended. (see note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.
<p>The performance criteria A shall apply for continuous phenomena. The performance criteria B shall apply for transient phenomena, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Where the EUT is a transmitter in standby mode or receive mode, unintentional transmission shall not occur during the test.</p>		
<p>Note: Operate as intended during the test allows a level of degradation in accordance with the Minimum performance level.</p>		
Minimum performance level		
<p>For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %. For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.</p>		

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3.3. Description of Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Conducted emissions from the AC mains power ports	$U_c = \pm 2.9$ dB
Radiated emissions at frequencies up to 1 GHz	$U_c = \pm 3.9$ dB
Radiated emissions at frequencies above 1 GHz	$U_c = \pm 4.9$ dB

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4. Test Facility

Laboratory name: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Laboratory Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. is accredited in accordance with the recognized International Standard ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories).

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This laboratory also meets the requirements of any additional program requirements in the Electrical field.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

IC-Registration No.: 24842

CAB identifier: CN0063

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

VCCI Membership No.: 4112

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered in accordance with VCCI Council Rules.

VCCI Registration No. C-20098 for conducted emissions at AC main power ports

VCCI Registration No. T-20102 for conducted emissions at telecommunication ports

VCCI Registration No. R-20136 for radiated emissions below 1GHz

VCCI Registration No. G-20132 for radiated emissions above 1GHz

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5. Measurement of Conducted Emissions from the AC Mains Power Ports

5.1. Requirements

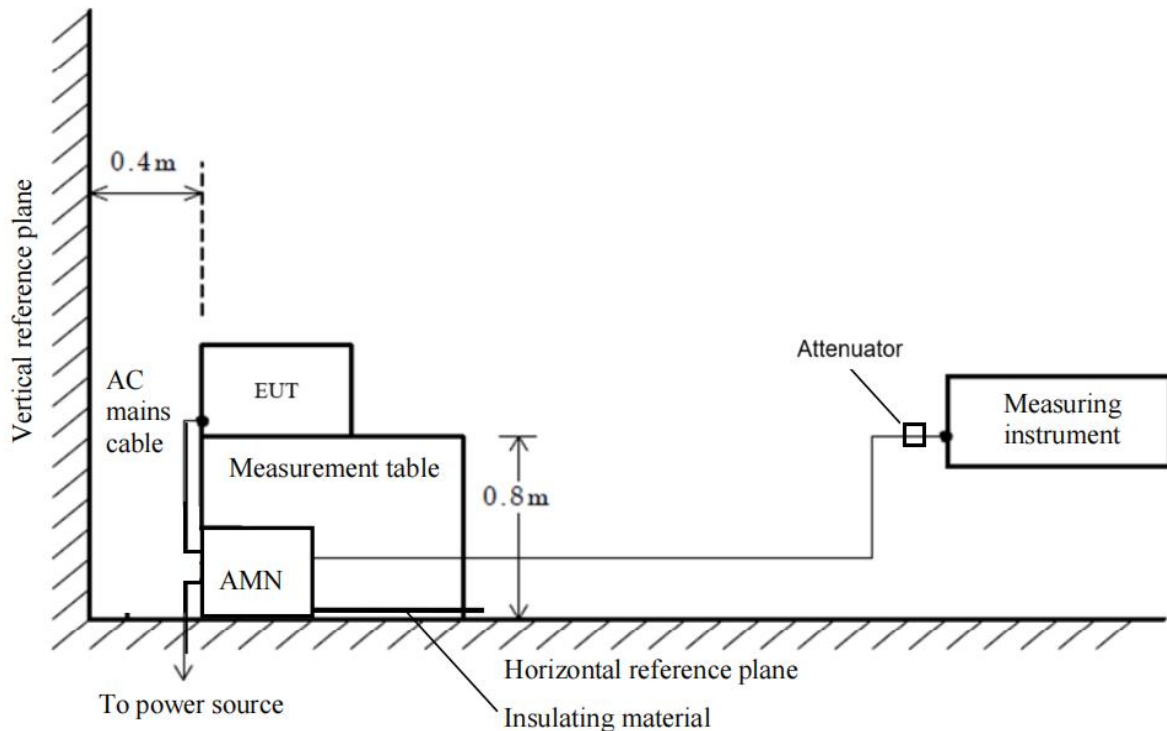
Requirements for conducted emissions, low voltage AC mains port

Network device	Detector type/ bandwidth	Frequency Range (MHz)	Limits dB(μ V)	Measurement specifications
AMN	Quasi-peak/ 9kHz	0.15 to 0.5	66 to 56	Instrumentation: CISPR 16-1-1, Clauses 4, 5 and 7 Networks: CISPR 16-1-2, Clause 4 Method: CISPR 16-2-1, Clause 7 Set-up: CISPR 16-2-1, Clause 7
		0.5 to 5	56	
		5 to 30	60	
	Average/ 9kHz	0.15 to 0.5	56 to 46	
		0.5 to 5	46	
		5 to 30	50	

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.5MHz.

5.2. Block Diagram of Test Setup



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5.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESPI	101206	Jun. 03, 2023	Jun. 02, 2024
Artificial Mains Network	R&S	ESH2-Z5	100086	Jun. 03, 2023	Jun. 02, 2024
Attenuator	East sheep	LM-XX-6-5W	N/A	Jun. 09, 2023	Jun. 08, 2024

Measuring Software

Software Name	Manufacturer	Details
ES-K1	R&S	For EMC Measurement, Version 1.71

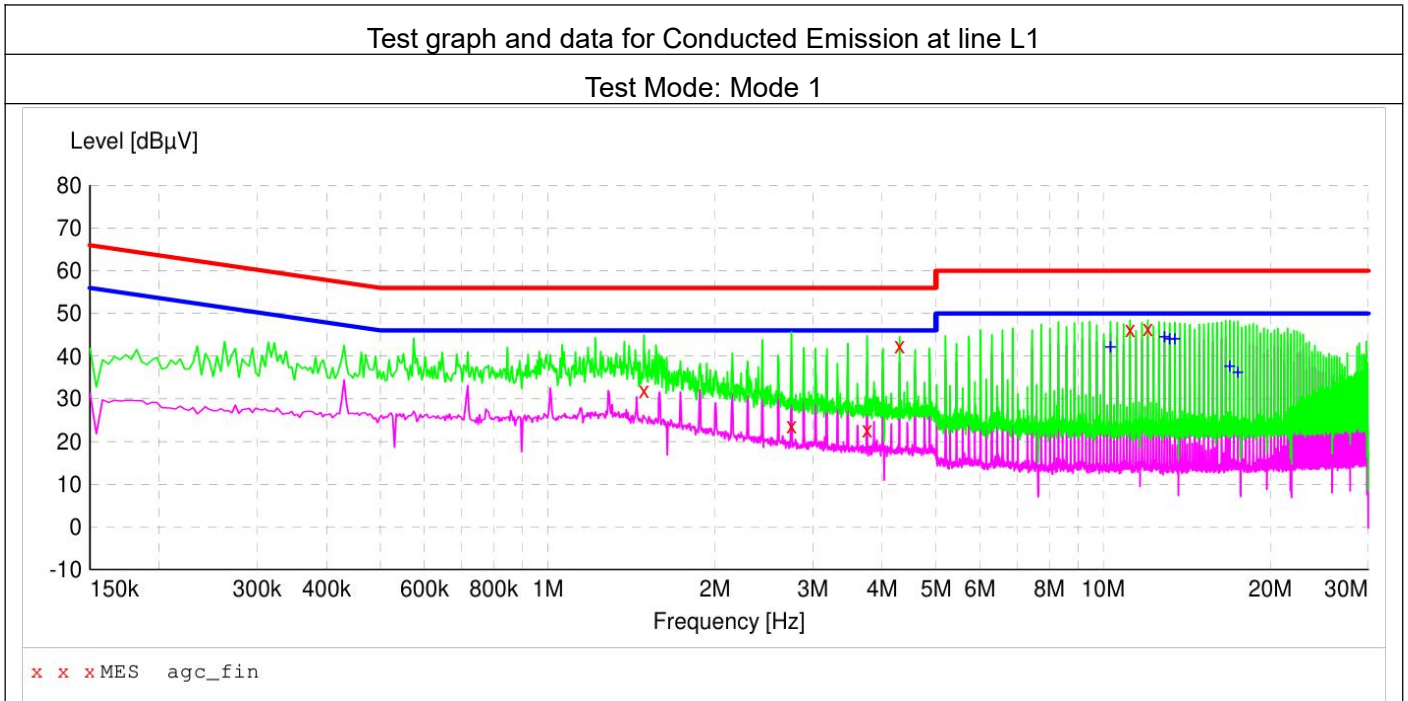
5.4. Configuration of the EUT and method of measurement

- a. The EUT was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, the EUT was placed on the top surface of a measurement table, 0.8 m high from the horizontal reference plane, and was positioned at a distance of 0.4 m away from the vertical reference plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 10 cm non-conductive covering to insulate the EUT from the ground plane.
- b. Support equipment, if needed, was placed as per CISPR 16-2-1.
- c. All I/O cables were positioned to simulate typical actual usage as per CISPR 16-2-1.
- d. The EMI receiver measured the emission levels emanating from the EUT into the AC Mains through an Artificial Mains Network (AMN) and an attenuator used on the front end of the EMI receiver. Testing included measurements on all live and neutral lines.
- e. The more description of the tests, the test methods, and the test set-ups are given in the applicable test standard.
- f. Record at least six highest emissions relative to the limits at each frequency of interest unless the emission is 10 dB or greater below the limit.
- g. A conducted emission is calculated by the following equation:
 - Measurement Level (dB μ V) = Receiver reading (dB μ V) + Tansd (dB)
 - Transd(dB)= AMN Factor(dB)+Cable Loss(dB)+Attenuation(dB)
 - Margin= Limit-Level

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5.5. Test Summary

Test Engineer	Jimu	Temperature	22.4 °C
Test Date	Nov. 07, 2023	Air Pressure	985 Mbar
Worst Mode	Mode 1	Relative Humidity	55.6 %
Verdict	Pass		

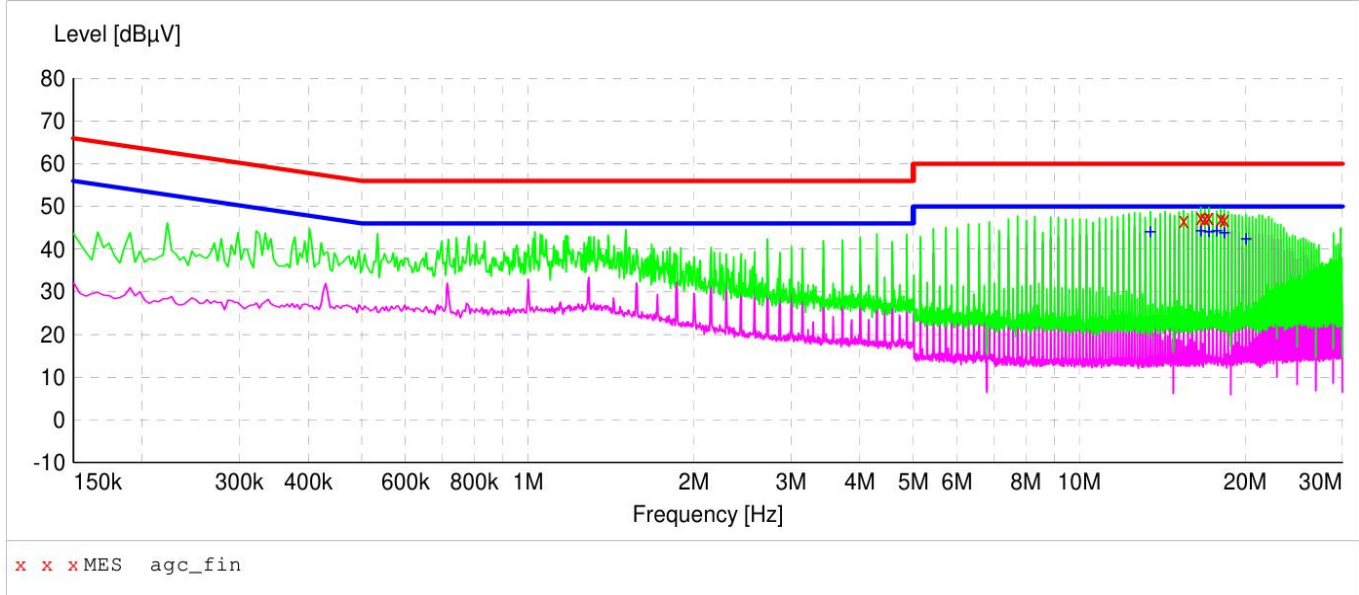


Frequency[MHz]	Level[dBµV]	Factor[dB]	Limit[dBµV]	Margin[dB]	Detector	Line
1.490000	32.0	6.2	56.0	24.0	QP	L1
2.746000	23.7	6.3	56.0	32.3	QP	L1
3.758000	22.8	6.3	56.0	33.2	QP	L1
4.298000	42.4	6.3	56.0	13.6	QP	L1
11.174000	46.3	6.7	60.0	13.7	QP	L1
12.030000	46.6	6.8	60.0	13.4	QP	L1
10.310000	42.7	6.7	50.0	7.3	AV	L1
12.890000	45.0	6.8	50.0	5.0	AV	L1
13.178000	44.5	6.8	50.0	5.5	AV	L1
13.462000	44.7	6.8	50.0	5.3	AV	L1
16.898000	38.1	6.9	50.0	11.9	AV	L1
17.474000	36.7	7.0	50.0	13.3	AV	L1

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Test graph and data for Conducted Emission at line N

Test Mode: Mode 1



Frequency[MHz]	Level[dBµV]	Factor[dB]	Limit[dBµV]	Margin[dB]	Detector	Line
15.458000	46.7	6.9	60.0	13.3	QP	N
16.610000	47.6	6.9	60.0	12.4	QP	N
16.890000	47.1	6.9	60.0	12.9	QP	N
17.182000	47.6	7.0	60.0	12.4	QP	N
18.038000	47.3	7.0	60.0	12.7	QP	N
18.326000	47.0	7.0	60.0	13.0	QP	N
13.458000	44.7	6.8	50.0	5.3	AV	N
16.610000	44.9	6.9	50.0	5.1	AV	N
17.182000	44.5	7.0	50.0	5.5	AV	N
17.754000	44.8	7.0	50.0	5.2	AV	N
18.326000	44.3	7.0	50.0	5.7	AV	N
20.046000	42.9	7.1	50.0	7.1	AV	N

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6. Measurement of Radiated Emissions at Frequencies up to 1 GHz

6.1. Requirements

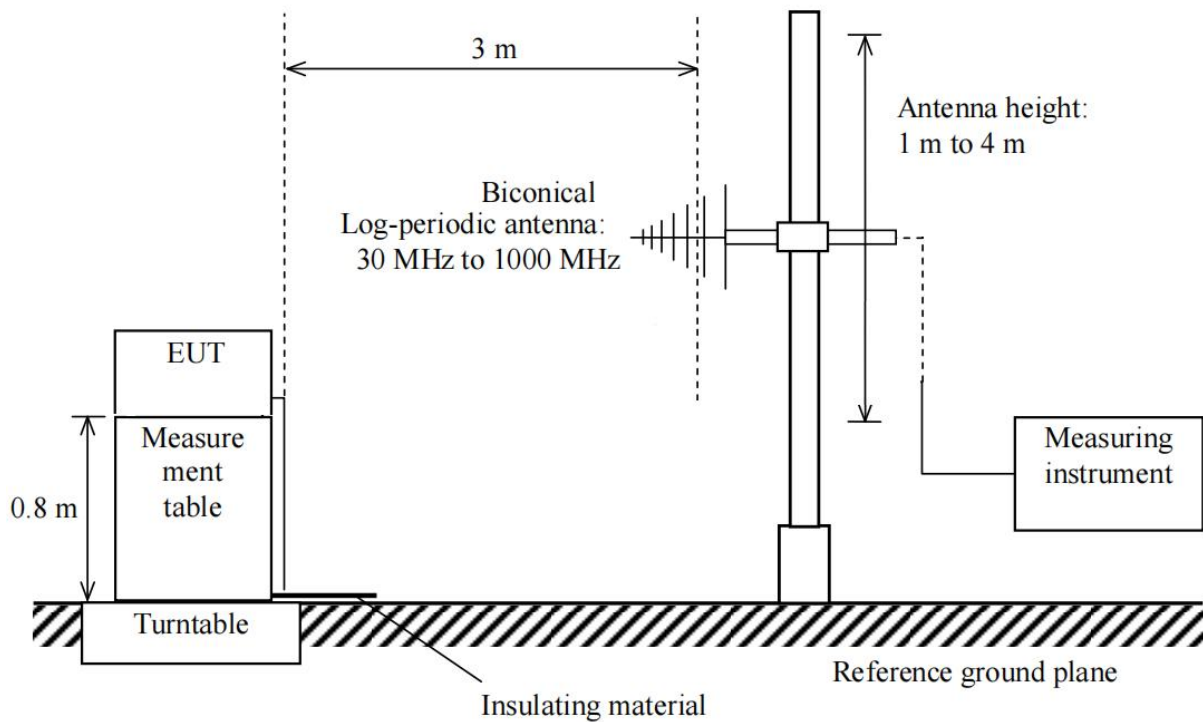
Requirements for radiated emissions at frequencies up to 1 GHz at 3m distance

Test facility	Detector type/ bandwidth	Frequency Range (MHz)	Limits dB(μ V/m)	Measurement specifications
SAC	Quasi-peak/ 120kHz	30 to 230	40	Instrumentation: CISPR 16-1-1, Clauses 4, 5 Antennas: CISPR 16-1-4, Clause 4.5 Test Site: CISPR 16-1-4, Clause 6 Method: CISPR 16-2-3, Clause 7.6
		230 to 1000	47	

Note:

- The lower limit shall apply at the transition frequency.

6.2. Block Diagram of Test Setup



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6.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Test Receiver	R&S	ESCI	10096	Feb. 18, 2023	Feb. 17, 2024
Antenna	SCHWARZBECK	VULB9168	D69250	May 11, 2023	May 10, 2025

Measuring Software

Software Name	Manufacturer	Details
EZ-EMC	FARA	For EMC Measurement, Version RA-03A
TS+[JS32-RE]	Tonscend	For EMC measurement, version 4.0.0.0

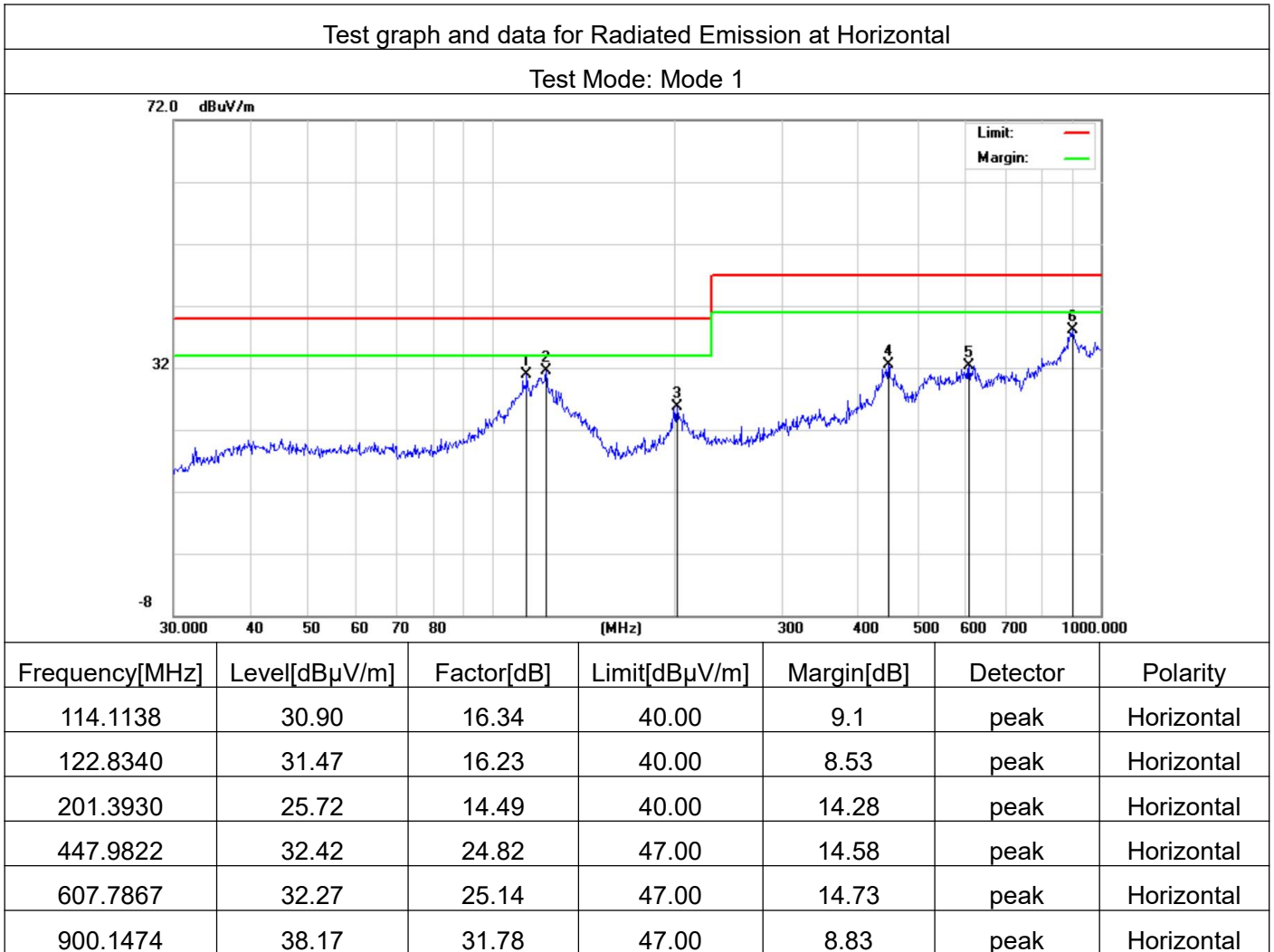
6.4. Configuration of the EUT and method of measurement

- a. The EUT was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, the EUT was placed on the top surface of a measurement table, 0.8 m high from the horizontal reference plane. When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 10 cm non-conductive covering to insulate the EUT from the ground plane.
- b. Support equipment, if needed, was placed as per CISPR 16-2-3.
- c. All I/O cables were positioned to simulate typical actual usage as per CISPR 16-2-3.
- d. The maximum receiving level of radiated emissions from the EUT was measured while the turntable was rotated from 0° to 360° and the antenna height was scanned between 1 m and 4 m. The cables were laid out to attain the maximum level of radiated emissions.
- e. The more description of the tests, the test methods, and the test set-ups are given in the applicable test standard.
- f. Record at least six highest emissions relative to the limits at each frequency of interest unless the emission is 10 dB or greater below the limit.
- g. A radiated emission is calculated by the following equation:
 - Measurement Level dB(μV/m) = Receiver reading dB(μV) + Factor(dB/m)
 - Factor(dB/m) = Antenna Factor(dB/m) + Cable Loss(dB)
 - Margin= Limit-Level

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6.5. Test Summary

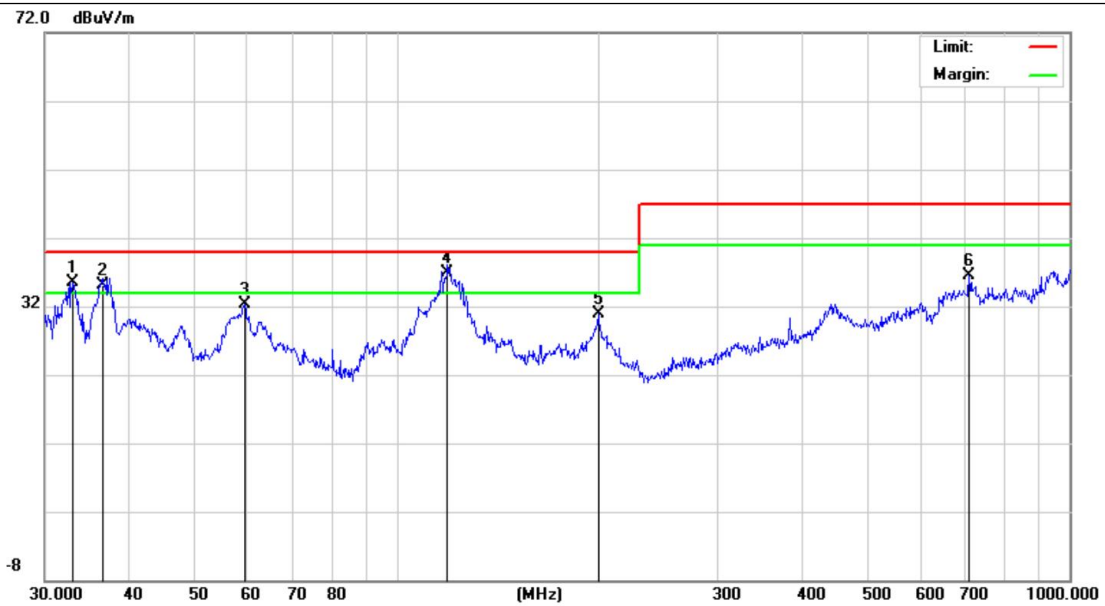
Test Engineer	Alex	Temperature	23.3 °C
Test Date	Nov. 10, 2023	Air Pressure	985 Mbar
Worst Mode	Mode 1	Relative Humidity	61.6 %
Verdict	Pass		



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Test graph and data for Radiated Emission at Vertical

Test Mode: Mode 1



Frequency[MHz]	Level[dBμV/m]	Factor[dB]	Limit[dBμV/m]	Margin[dB]	Detector	Polarity
32.9791	35.54	14.58	40.00	4.46	peak	Vertical
36.6375	35.12	15.79	40.00	4.88	QP	Vertical
59.4405	32.37	17.09	40.00	7.63	peak	Vertical
119.0180	36.87	17.53	40.00	3.13	QP	Vertical
199.2855	30.90	17.92	40.00	9.1	peak	Vertical
709.1823	36.54	28.42	47.00	10.46	peak	Vertical

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7. Measurement of Harmonic Current Emissions

7.1. Requirements

Applicable test standard(s): EN IEC 61000-3-2:2019+A1:2021

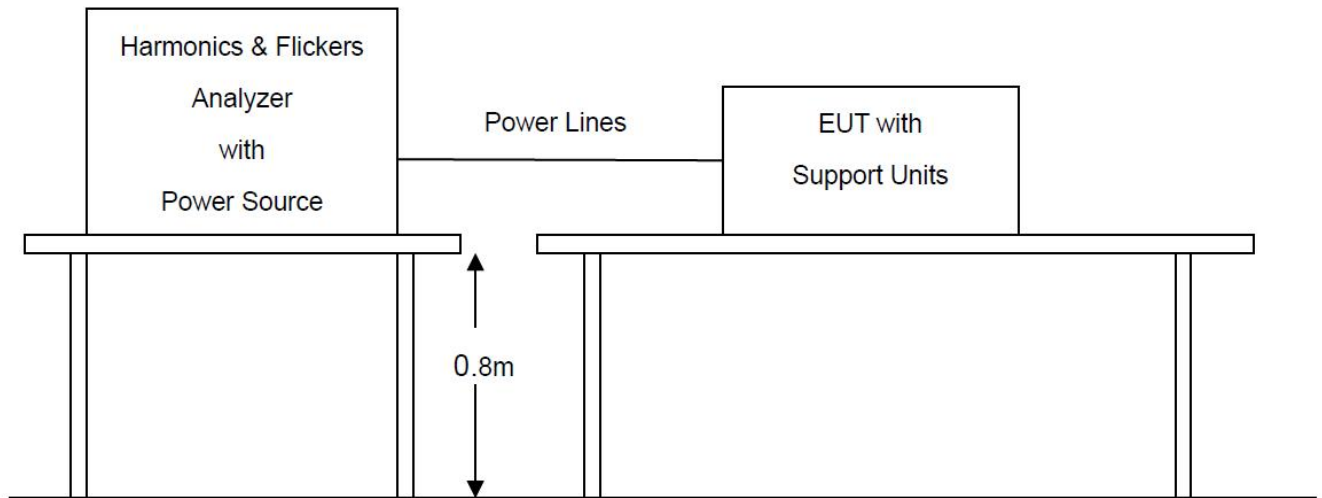
Limits of Harmonic Current Emissions

Harmonic order <i>h</i>	Limits				
	Class A	Class B	Class C ^a	Class D	
	Maximum permissible harmonic current (A)		Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)	Maximum permissible harmonic current per watt (mA/W)	Maximum permissible harmonic current (A)
3	2.30	3.45	27 ^b	3.4	2.30
5	1.14	1.71	10	1.9	1.14
7	0.77	1.155	7	1.0	0.77
9	0.40	0.6	5	0.5	0.40
11	0.33	0.495	3	0.35	0.33
13	0.21	0.315	3	3.85/13	0.21
15 ≤ <i>h</i> ≤ 39 (odd harmonics only)	2.25/ <i>h</i>	3.375/ <i>h</i>	3	3.85/ <i>h</i>	2.25/ <i>h</i>
2	1.08	1.62	2	Not applicable	Not applicable
4	0.43	0.645	Not applicable		
6	0.30	0.45			
8 ≤ <i>h</i> ≤ 40 (even harmonics only)	1.84/ <i>h</i>	2.76/ <i>h</i>			

Note:
 (a) For some Class C products, other emission limits apply.
 (b) The limit is determined based on the assumption of modern lighting technologies having power factors of 0.90 or higher.

The application of limits had been as defined in the applicable test standard.

7.2. Block Diagram of Test Setup



7.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Conditioning Unit	Schaffner	CCN1000-1	72431	Jun. 02, 2023	Jun. 01, 2024
AC Source	Schaffner	NSG 1007	56825	Jun. 02, 2023	Jun. 01, 2024

Measuring Software

Software Name	Manufacturer	Details
CTS 4	AMETEK	For harmonics and flickers measurement, version 4.29.0

7.4. Configuration of the EUT and method of measurement

- a. The test shall be conducted according to the general requirements given in the applicable test standard. The test duration had been as defined in the applicable test standard.
- b. The measurement of harmonic currents shall be performed as follows:
 - for each harmonic order, measure the 1.5 s smoothed RMS harmonic current in each discrete Fourier transform (DFT) time window;
 - calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period.
- c. The value of the active input power to be used for the calculation of limits shall be determined as follows:
 - measure the 1.5 s smoothed active input power in each DFT time window;
 - determine the maximum of the measured values of active power from the DFT time windows over the entire duration of the test.

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- d. The harmonic currents and the active input power shall be measured under the same test conditions but need not be measured simultaneously.

7.5. Test Summary

Equipment with a rated power less than or equal to 75W is deemed to fulfil all relevant requirements of this standard without testing.

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Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: <http://www.agccert.com/>

8. Measurement of Voltage Fluctuations and Flicker

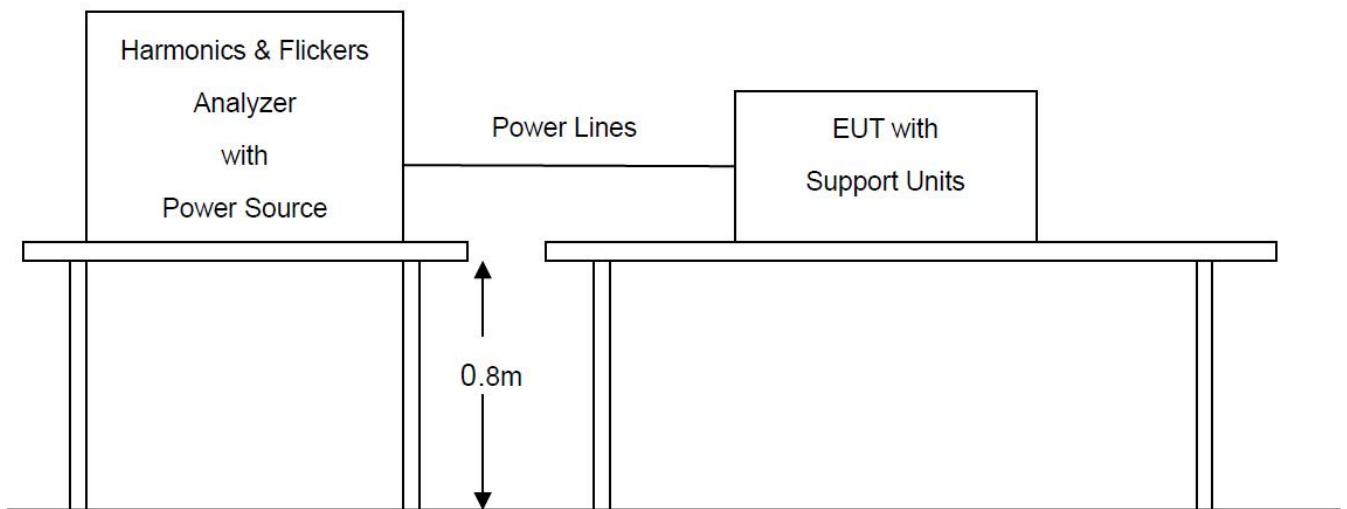
8.1. Requirements

Applicable test standard(s): EN 61000-3-3:2013+A2:2021

Limits of Voltage Fluctuations and Flicker

Parameters	Definitions	Limits
T_{max}	the accumulated time value of $d(t)$ with a deviation exceeding 3.3 % during a single voltage change at the EUT terminals	≤ 500 ms
d_c	the maximum relative steady-state voltage change	$\leq 3.3\%$
d_{max}	the maximum relative voltage change	<input checked="" type="checkbox"/> $\leq 4\%$ <input type="checkbox"/> $\leq 6\%$ <input type="checkbox"/> $\leq 7\%$
<input checked="" type="checkbox"/> P_{st}	short-term flicker severity	≤ 0.65
<input type="checkbox"/> P_{lt}	long-term flicker severity	≤ 1.0

8.2. Block Diagram of Test Setup



8.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Conditioning Unit	Schaffner	CCN1000-1	72431	Jun. 02, 2023	Jun. 01, 2024
AC Source	Schaffner	NSG 1007	56825	Jun. 02, 2023	Jun. 01, 2024

Measuring Software

Software Name	Manufacturer	Details
CTS 4	AMETEK	For harmonics and flickers measurement, version 4.29.0

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8.4. Configuration of the EUT and method of measurement

- a. The test shall be conducted according to the general requirements given in the applicable test standard. The test duration and test condition had been as defined in the applicable test standard.
- b. All types of voltage fluctuations would be assessed by direct measurement using a flicker meter which complies with the specification given in IEC 61000-4-15:2010.

8.5. Test Summary

Test Engineer	Jimu	Temperature	22.4 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Worst Mode	Mode 1	Relative Humidity	52.9 %
Verdict	Pass		

Parameters	Measurement Value	Limits
T_{max}	0	≤ 500 ms
d_c	0.00	$\leq 3.3\%$
d_{max}	0.00	$\leq 4\%$
P_{st}	0.115	≤ 0.65

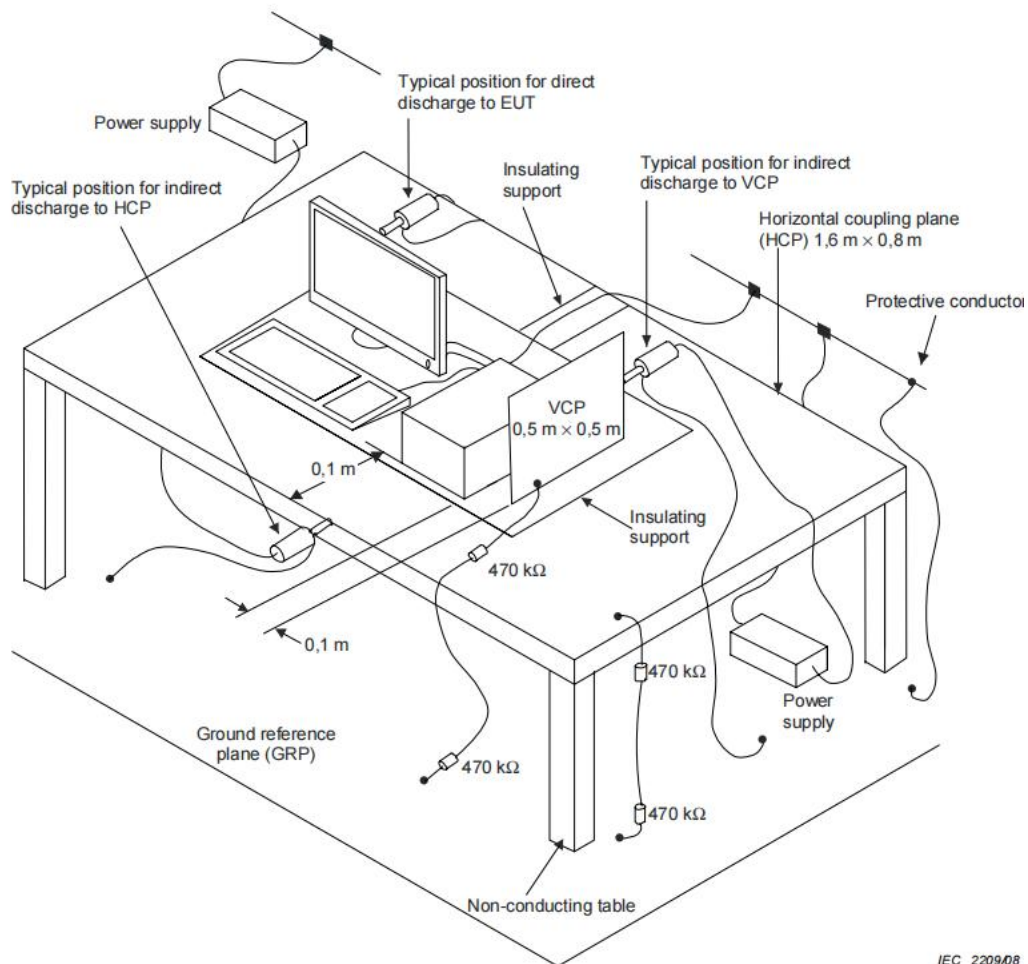
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9. Measurement of Electrostatic discharge

9.1. Requirements

Port	Enclosure
Basic Standard	EN 61000-4-2
Required Performance Criterion	The performance criteria for transient phenomena shall apply.
Test Level	±8.0 kV (Air Discharge) ±4.0 kV (Contact Discharge) ±4.0 kV (Indirect Discharge)
Time Between Each Discharge:	1 second
Number of Discharge for Each Applied Voltage	10

9.2. Block Diagram of Test Setup



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9.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
ESD Simulator	Schaffner	NSG 438	782	Dec. 30, 2022	Dec. 29, 2023

Measuring Software

Software Name	Manufacturer	Details
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9.4. Configuration of the EUT and method of measurement

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were completed.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.
- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m×0.5m) was placed vertically to and 0.1 meters from the EUT.
- i. The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance criterion defined in the report.

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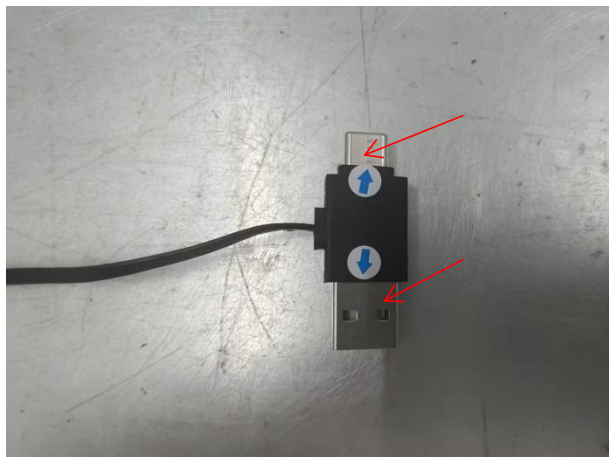
9.5. Test Summary

Test Engineer	Sam	Temperature	23 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Test Mode(s)	Mode 1/2/3	Relative Humidity	51 %
Verdict	Pass		

Voltage	Coupling	Observation	Results
±4kV	Contact Discharge	No degradation of performance	Pass
±2KV, ±4kV, ±8kV	Air Discharge	No degradation of performance	Pass
±4kV	Indirect Discharge HCP	No degradation of performance	Pass
±4kV	Indirect Discharge VCP	No degradation of performance	Pass

Blue line: Air discharge

Red line: Contact discharge



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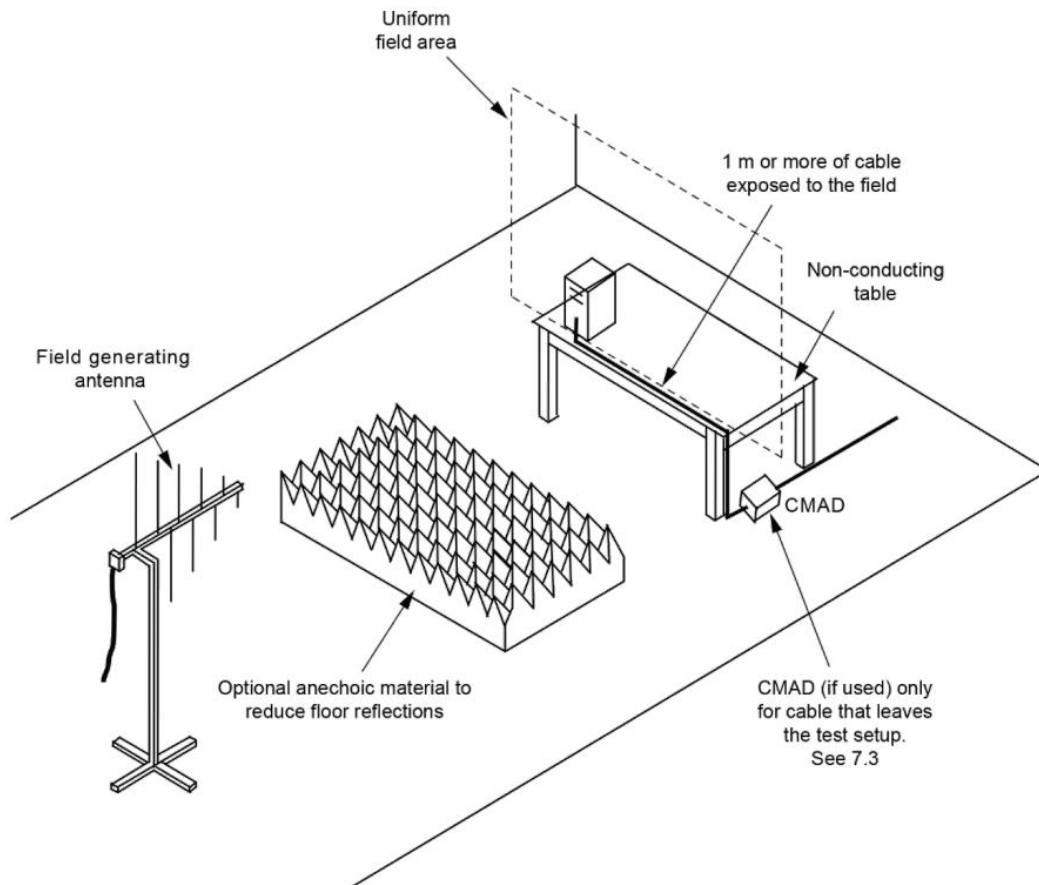
10. Measurement of Radio-Frequency Electromagnetic Field

10.1. Requirements

Port	Enclosure
Basic Standard	IEC 61000-4-3
Required Performance Criterion	A
Test Level	3V/m with 80% AM. 1kHz Modulation at 80 to 1000MHz 3V/m with 80% AM. 1kHz Modulation at 1400 to 6000MHz
Antenna polarization	Vertical and Horizontal
Step size increment ^a	1%
Dwell time ^b	≤5 seconds
Test Distance	3m
EUT position facing antenna	Front side, back side, left side and right side
<p>Notes:</p> <p>a. Recognizing that a 1% step size is preferred, the frequency range can be swept incrementally with a step size not exceeding 4% of the previous frequency with a test level of twice the value of the specified test level in order to reduce the testing time for equipment requiring testing in multiple configurations and/or long cycle times.</p> <p>b. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.</p>	

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10.2. Block Diagram of Test Setup



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10.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Signal Generator	Aglient	N5182A	MY50140530	Feb. 17, 2023	Feb. 16, 2024
Directional coupler	Werlatone	C5571-10	99463	Mar. 10, 2022	Mar. 09, 2024
Power Amplifier	KALMUS	7100LC	04-02/17-06-001	N/A	N/A
Power Meter	R&S	NRVD	8323781027	Mar. 24, 2022	Mar. 23, 2025
Wideband Antenna	ETS	3142C	00060447	N/A	N/A

Measuring Software

Software Name	Manufacturer	Details
TS+[JS35-RS]	Tonscend	For EMC measurement, version 2.0.1.8

10.4. Configuration of the EUT and method of measurement

- a. The Equipment Under Test (EUT) was positioned within the Uniform Field Area (UFA) on a supporting table, ensuring a 3-meter separation from the transmitting antenna. This setup aligns with the calibrated square area, guaranteeing field uniformity during testing. The supporting units were strategically located outside the UFA to avoid any potential interference. Nonetheless, the cables connected to the EUT were intentionally exposed to the precisely calibrated field within the UFA.
- b. Before testing, it will verify the proper operation of the test equipment/system. This verification will involve measuring the field strength at one point within the Uniform Field Area (UFA) at various frequencies.
- c. The test shall be performed according to the above requirements and block diagram which shall specify the test setup.
- d. The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance criterion defined in the report.

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10.5. Test Summary

Test Engineer	Jimu	Temperature	22.4 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Test Mode(s)	Mode 1/2/3	Relative Humidity	52.9 %
Verdict	Pass		

Frequency	Exposed Side	Field Strength (V/m)	Observation	Performance
80MHz to 1GHz	Front	3V/m (rms)	No degradation of performance	A
	Left		No degradation of performance	A
	Rear		No degradation of performance	A
	Right		No degradation of performance	A
1.4GHz to 6GHz	Front	3V/m (rms)	No degradation of performance	A
	Left		No degradation of performance	A
	Rear		No degradation of performance	A
	Right		No degradation of performance	A

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11. Measurement of Radio-frequency common mode

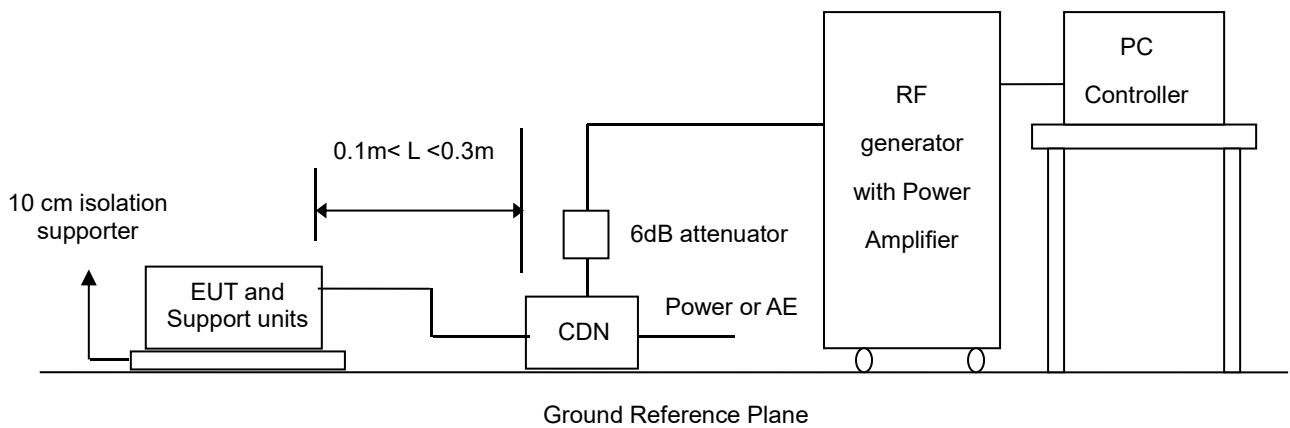
11.1. Requirements

Port	<input checked="" type="checkbox"/> AC mains power ports	<input type="checkbox"/> signal, wired network and control ports ^a	<input type="checkbox"/> DC power ports ^a
Basic Standard	EN 61000-4-6		
Required Performance Criterion	The performance criteria for continuous phenomena shall apply.		
Test Level	0.15 to 80 MHz, 3 V RMS (unmodulated), 80 % AM (1 kHz)		
Step size increment ^b	1%		
Dwell time ^c	≤5 seconds		

Notes:

- Applicable only to ports which, according to the manufacturer's specification, supports cable lengths greater than 3 m.
- Recognizing that a 1% step size is preferred, the frequency range can be swept incrementally with a step size not exceeding 4% of the previous frequency with a test level of twice the value of the specified test level in order to reduce the testing time for equipment requiring testing in multiple configurations and/or long cycle times.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond. However, the dwell time shall not exceed 5 seconds at each of the frequencies during the scan. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.

11.2. Block Diagram of Test Setup



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11.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Amplifier	AR	75A250	18464	N/A	N/A
CDN	ZHINAN	ZN3751	15004	Aug. 03, 2022	Sep. 02, 2024
6dB attenuator	ZHINAN	E-002	N/A	Aug. 04, 2022	Aug. 03, 2024
Power Probe	R&S	URV5-Z4	100124	Mar. 24, 2023	Mar. 23, 2025
Electromagnetic Injection Clamp	Luthi	EM101	35773	Aug. 12, 2022	Aug. 11, 2024
Power Meter	R&S	NRVD	8323781027	Mar. 24, 2023	Mar. 23, 2025
Signal Generator	Keysight	E4421B	MY43351603	Feb. 17, 2023	Feb. 16, 2024

Measuring Software

Software Name	Manufacturer	Details
TS+[JS35-CS]	Tonscend	For EMC measurement, version 2.0.1.7

11.4. Configuration of the EUT and method of measurement

- a. The Equipment Under Test (EUT) shall be tested within its intended operating and climatic conditions.
- b. The test generator and the coupling/decoupling network shall be placed directly on, and bonded to, the ground reference plane. The test shall be performed with the test generator connected to each of the coupling devices (CDN, EM clamp, current clamp) in turn. All other cables not under test shall either be disconnected (when functionally allowed) or provided with decoupling networks or unterminated CDNs only.
- c. The test shall be performed according to the above requirements and block diagram which shall specify the test setup.
- d. The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance criterion defined in the report.

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11.5. Test Summary

Test Engineer	Sam	Temperature	23 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Test Mode(s)	Mode 1/2/3	Relative Humidity	51 %
Verdict	Pass		

Test port	Test Level	Coupling method	Observation	Results
AC Mains Input	3 V	CDN	No degradation of performance	Pass

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12. Measurement of Fast Transients

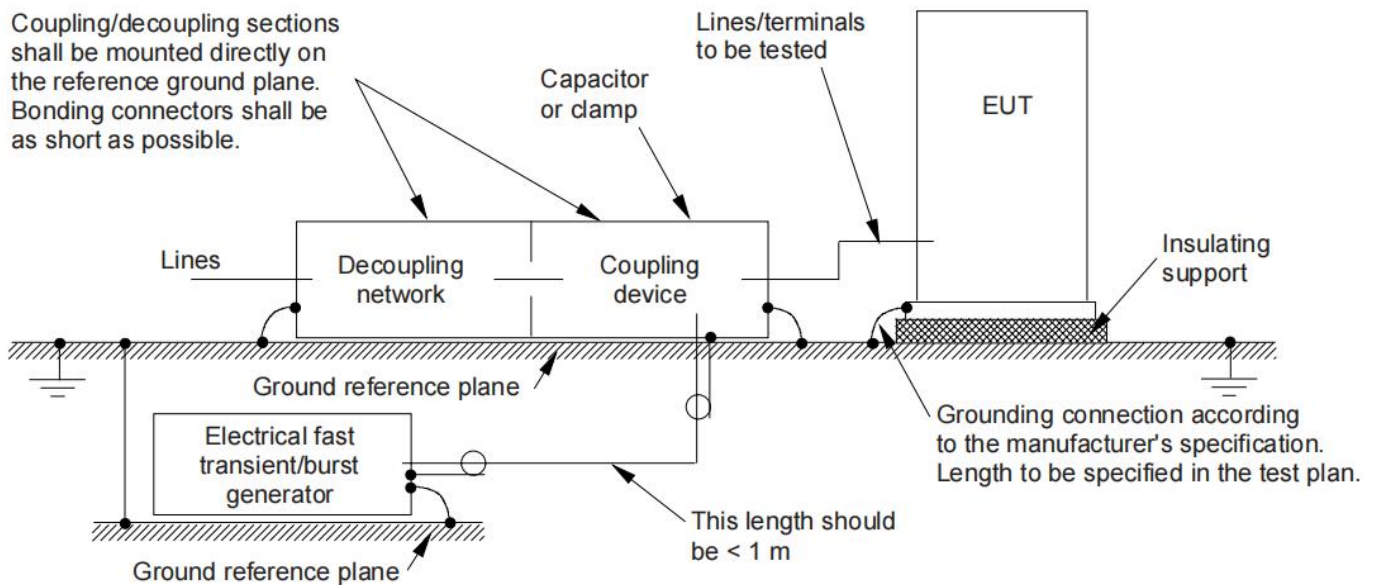
12.1. Requirements

Port	<input checked="" type="checkbox"/> AC mains power ports	<input type="checkbox"/> signal, wired network and control ports ^a	<input type="checkbox"/> DC power ports ^a
Basic Standard	IEC 61000-4-4		
Required Performance Criterion	B		
Test Level	1 kV (peak)	0.5 kV (peak)	0.5 kV (peak)
Polarity	Positive/Negative		
Impulse Frequency	5kHz		
Impulse wave shape	5/50ns		
Burst Duration	15ms		
Burst Period	300ms		

Notes:

- a. Applicable only to ports which, according to the manufacturer's specification, supports cable lengths greater than 3 m.

12.2. Block Diagram of Test Setup



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12.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
EFT/Surge/DIPS Generator	Schaffner	Modula 6150	34437	Jun. 08, 2023	Jun. 07, 2024

Measuring Software

Software Name	Manufacturer	Details
WinModula	Schaffner	For EFT/Surge/Dips measurement, version 2.31 c

12.4. Configuration of the EUT and method of measurement

- a. The Equipment Under Test (EUT), whether stationary floor-mounted or table top, and equipment designed to be mounted in other configurations, shall be placed on a ground reference plane and shall be insulated from it by an insulating support 0,1 m ± 0,01 m thick.
- b. The test generator and the coupling/decoupling network shall be placed directly on, and bonded to, the ground reference plane.
- c. The EUT shall be arranged and connected to satisfy its functional requirements, according to the equipment installation specifications. The minimum distance between the EUT and all other conductive structures (e.g. the walls of a shielded room), except the ground reference plane shall be more than 0,5 m. All cables to the EUT shall be placed on the insulation support 0,1 m above the ground reference plane. Cables not subject to electrical fast transients shall be routed as far as possible from the cable under test to minimize the coupling between the cables.
- d. The test voltages shall be coupled to all of the EUT ports including those between two units of equipment involved in the test, unless the length of the interconnecting cable makes it impossible to test.
- e. Either a direct coupling network or a capacitive clamp shall be used for the application of the test voltages.
- f. The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance criterion defined in the report.

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12.5. Test Summary

Test Engineer	Sam	Temperature	23 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Test Mode(s)	Mode 1/2/3	Relative Humidity	53 %
Verdict	Pass		

Inject Line	Voltage(kV)	Inject Method	Observation	Performance
AC Lines	0.5, 1	Direct	No degradation of performance	A

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13. Measurement of Surges

13.1. Requirements

Port	<input checked="" type="checkbox"/> AC mains power ports ^a	<input type="checkbox"/> signal, wired network and control ports ^b	<input type="checkbox"/> DC network power ports ^b
Basic Standard	IEC 61000-4-5		
Required Performance Criterion	B	B	B
Test Level	Line to line: 1 kV; Line to ground: 2 kV	shield to ground: 0.5 kV	Line to ground: 0.5 kV
Tr/Th	1.2/50 (8/20) μ s		
Number of impulses	Five positive and five negative impulses		
Time between successive impulses	1 min		

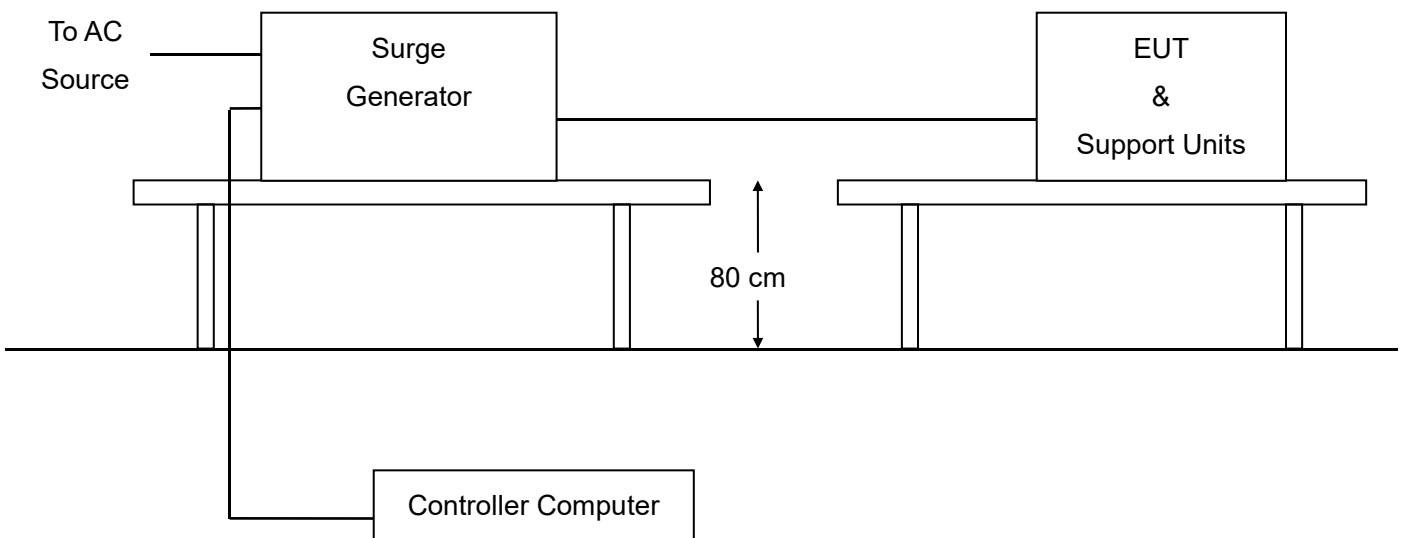
Notes:

- a. The number of pulses applied shall be as follows:
 - Five positive pulses line-to-neutral at 90° phase.
 - Five negative pulses line-to-neutral at 270° phase.

The following additional pulses are required only if the EUT has an earth connection or if the EUT is earthed via any AE:

 - Five positive pulses line-to-earth at 90° phase.
 - Five negative pulses line-to-earth at 270° phase.
 - Five negative pulses neutral-to-earth at 90° phase.
 - Five positive pulses neutral-to-earth at 270° phase.
- b. Applicable only to ports which, according to the manufacturer’s specification, supports cable lengths greater than 3 m.

13.2. Block Diagram of Test Setup



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13.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
EFT/Surge/DIPS Generator	Schaffner	Modula 6150	34437	Jun. 08, 2023	Jun. 07, 2024

Measuring Software

Software Name	Manufacturer	Details
WinModula	Schaffner	For EFT/Surge/Dips measurement, version 2.31 c

13.4. Configuration of the EUT and method of measurement

- a. Verification shall be performed. It is preferable to perform the verification prior to the test.
- b. The test shall be performed according to the above requirements and block diagram which shall specify the test setup.
- c. When testing line-to-ground, the lines are tested individually in sequence, if there is no other specification.
- d. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore, all lower test levels including the selected test level shall be tested.
- e. The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance criterion defined in the report.

13.5. Test Summary

Test Engineer	Sam	Temperature	23 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Test Mode(s)	Mode 1/2/3	Relative Humidity	53 %
Verdict	Pass		

Test port	Coupling	Voltage(kV)	Observation	Performance
AC Mains Input	line-to-neutral	0.5, 1	No degradation of performance	A

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14. Measurement of Voltage dips and interruptions

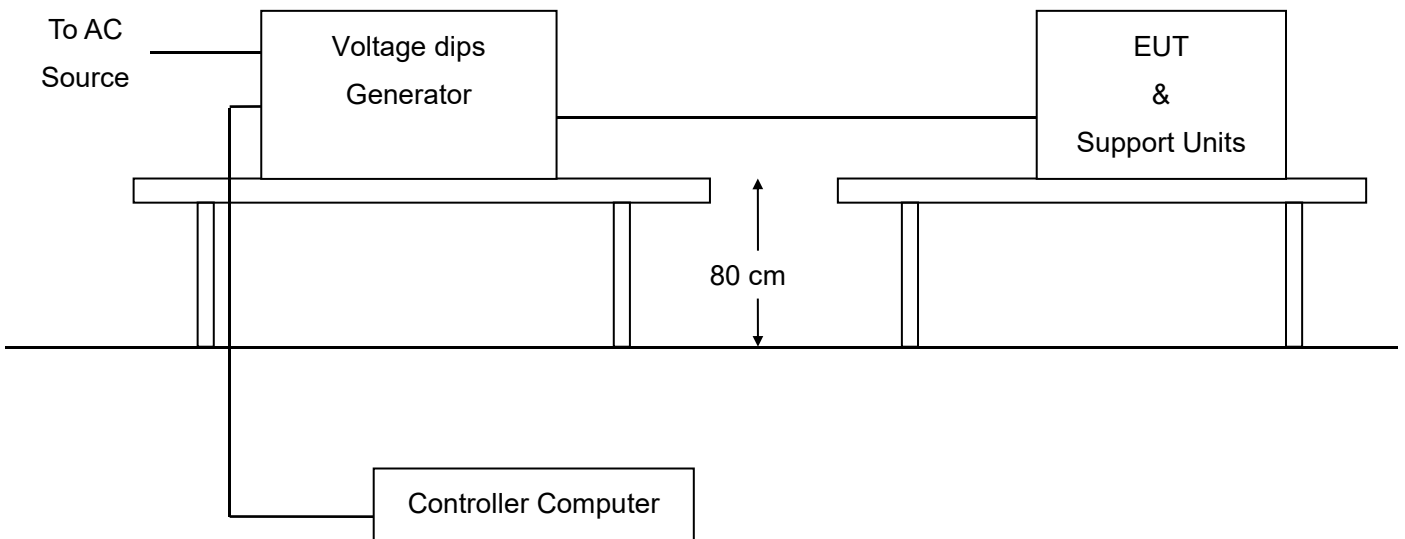
14.1. Requirements

Port	AC mains power ports			
Basic Standard	EN 61000-4-11			
Required Performance Criterion	B	B	C	C
Residual voltage ^a	0 %	0 %	70 %	0 %
Number of cycles ^b	0.5	1	25 for 50 Hz 30 for 60 Hz	250 for 50 Hz 300 for 60 Hz
Variation/dip repetition	Sequence of three dips/interruptions with an interval of 10 seconds between each test			

Notes:

- Changes to occur at 0 degree crossover point of the voltage waveform. If the EUT does not demonstrate compliance when tested with 0 degree switching, the test shall be repeated with the switching occurring at both 90 degrees and 270 degrees. If the EUT satisfies these alternative requirements, then it fulfils the requirements.
- Apply at only one supply frequency of the EUT.

14.2. Block Diagram of Test Setup



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14.3. Equipment Details

Measuring Instruments

Instruments	Manufacturer	Model	S/N	Cal. Date	Cal. Due
EFT/Surge/DIPS Generator	Schaffner	Modula 6150	34437	Jun. 08, 2023	Jun. 07, 2024

Measuring Software

Software Name	Manufacturer	Details
WinModula	Schaffner	For EFT/Surge/Dips measurement, version 2.31 c

Auxiliary Apparatus

Device Type	Manufacturer	Model Name	Serial No.	Data Cable	Power Cable
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14.4. Configuration of the EUT and method of measurement

- a. The test shall be performed according to the above requirements and block diagram which shall specify the test setup.
- b. The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance criterion defined in the report.

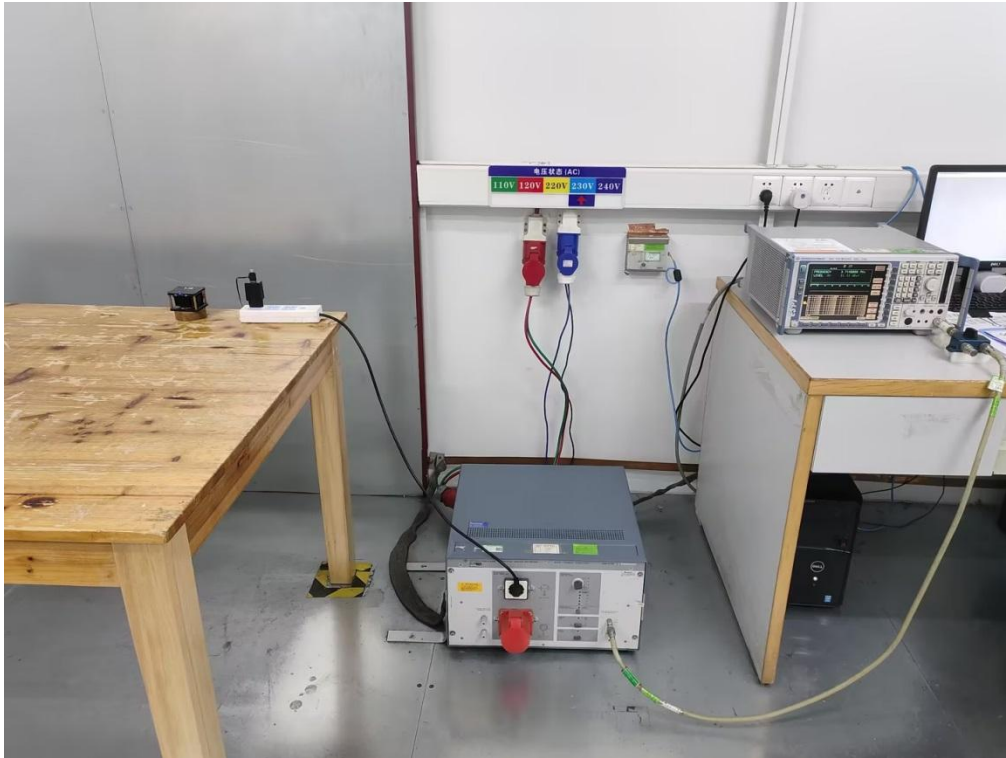
14.5. Test Summary

Test Engineer	Sam	Temperature	23 °C
Test Date	Oct. 17, 2023	Air Pressure	985 Mbar
Test Mode(s)	Mode 1/2/3	Relative Humidity	53 %
Verdict	Pass		

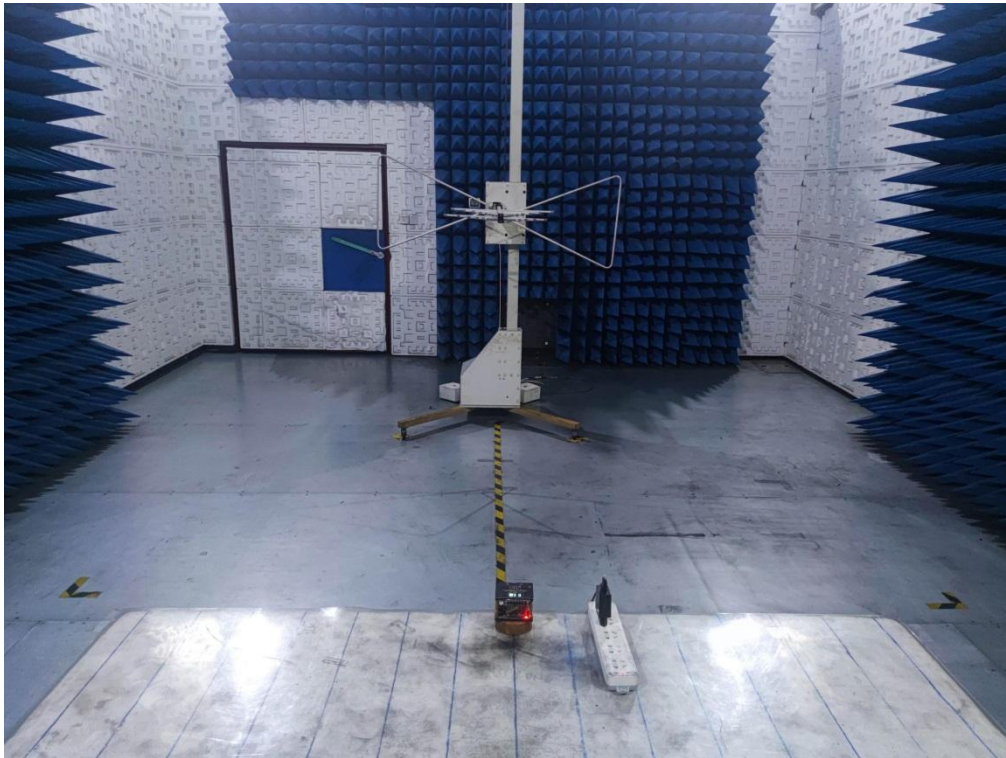
Test port	Residual voltage (%)	Cycles	Observation	Performance
AC Mains Input	0	0.5	No degradation of performance	A
	0	1	No degradation of performance	A
	70	25	No degradation of performance	A
	0	250	EUT power cycled	B

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15. Photographs of Test Setup



Conducted emissions from the AC mains power ports



Radiated emissions at frequencies up to 1 GHz

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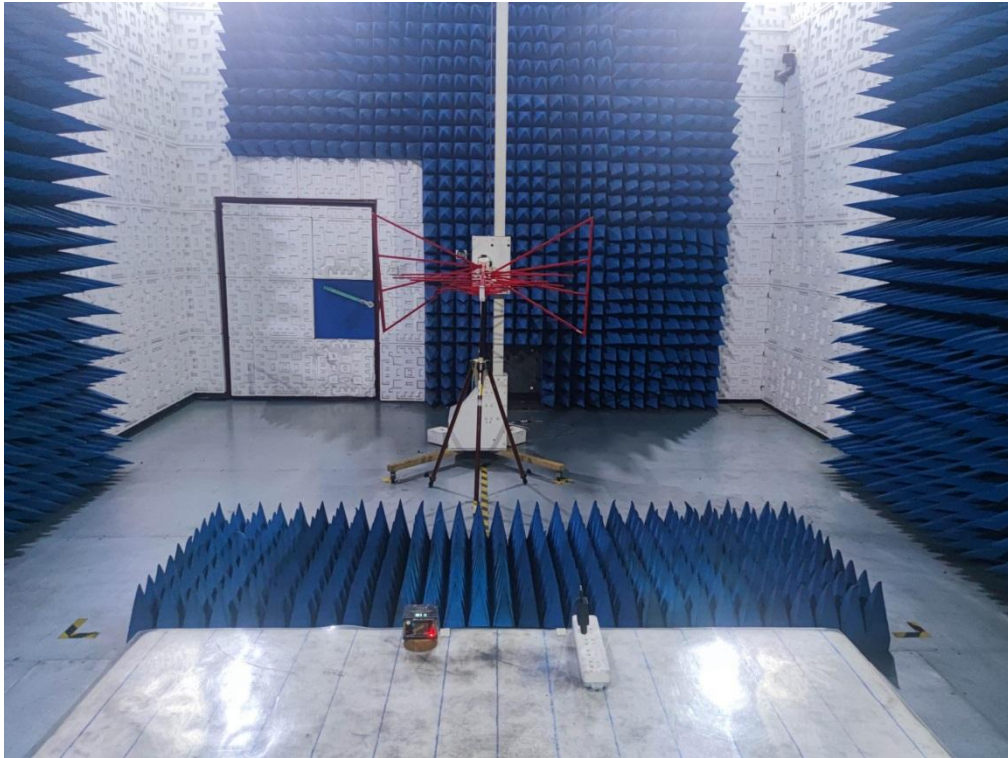
Harmonic current emissions & Voltage fluctuations and flicker



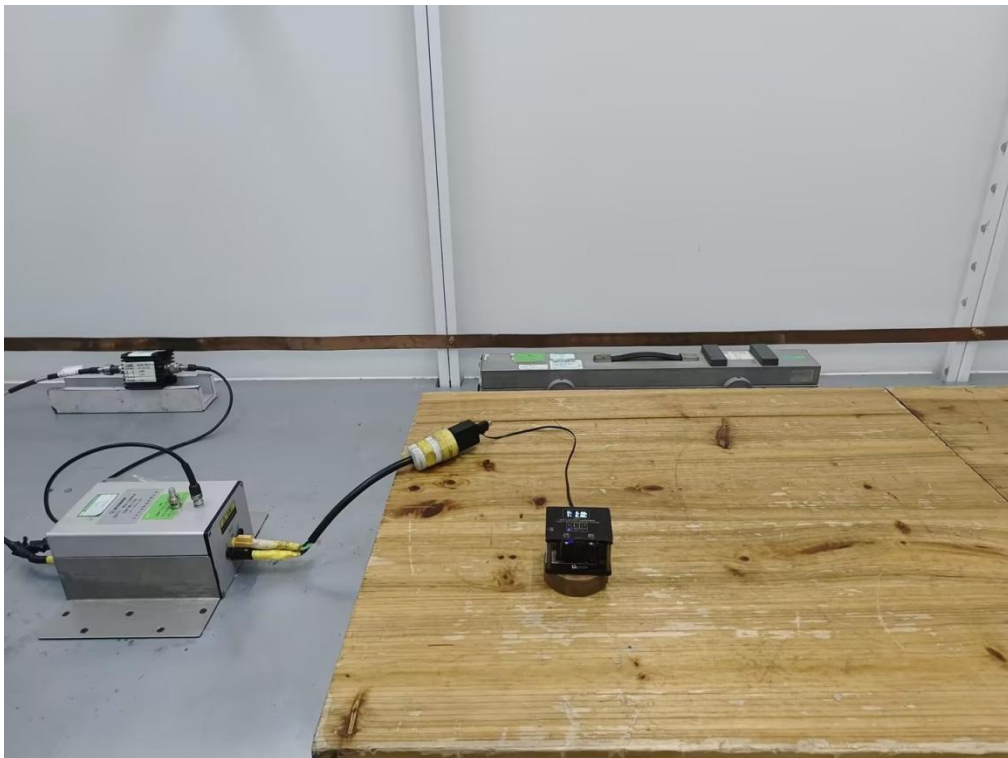
Electrostatic discharge

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Radio-frequency electromagnetic field up to 1 GHz



Radio-frequency common mode at the AC mains power ports

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Fast transients/Surges/ Voltage dips at the AC mains power ports

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16. Photographs of EUT

Refer to the Report No.: AGC05443231012AP01

----End of Report----

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3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
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7. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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