

EN IEC 55014-1:2021
EN IEC 55014-2:2021
EN IEC 61000-3-2:2019+A1:2021
EN 61000-3-3:2013+A2:2021

TEST REPORT

For

**Jinjiang Guanghua Electronic Industrial Trade Co.,
Ltd.**

Pujin Industrial Area, Longhu, Jinjiang Quanzhou City, Fujian

Tested Model: GH0712

Report Type: Original Report	Product Name: LED Clock
Project Engineer:	Tim Wang
Report Number:	RXM221025050-01A
Report Date:	2022-10-28
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Manufacturer:	Jinjiang Guanghua Electronic Industrial Trade Co., Ltd.
Tested Model:	GH0712
Product Name:	LED Clock
Rated Voltage:	DC 5V from USB power port or DC 4.5V from 3*AAA battery
★Highest Clock Frequency:	32.768 kHz

Note 1: The highest clock frequency was declared by manufacturer.

All measurement and test data in this report was gathered from production sample serial number: RXM221025050-1. (Assigned by BACL (Kunshan). The EUT supplied by the applicant was received on 2022-10-25)

Objective

The following report is prepared for *Jinjiang Guanghua Electronic Industrial Trade Co.,Ltd.* in accordance with EN IEC 55014-1, Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus Part 1: Emission.

EN IEC 55014-2, Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity- Product family standard.

EN IEC 61000-3-2, Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).

EN 61000-3-3, Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

The objective of the manufacturer is to determine the compliance of the EUT with EN IEC 55014-1, EN IEC 55014-2, EN IEC 61000-3-2 and EN 61000-3-3.

Test Methodology

All measurements contained in this report were conducted with
CISPR 16-1-1:2019: Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus.

CISPR 16-1-4:2019+A1:2020, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements.

CISPR 16-1-2:2014+A1:2017, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements

CISPR 16-2-1:2014+COR1:2020, Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements.

CISPR 16-2-3:2016+A1:2019, Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements.

CISPR 16-2-4:2003, Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-4: Methods of measurement of disturbances and immunity – Immunity measurements.

CISPR 16-4-2:2011+A2:2018+COR1:2019, Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Measurement instrumentation uncertainty.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical mode (as normally used by a typical user).

Test mode 1: Temperature and time display & alarm clock-power supply from Adapter

Test mode 2: Temperature and time display & alarm clock-power supply from Battery

Note: Pre-scan at two nominal voltages of 230V/50Hz and 120 V/60 Hz, only reserve data at 230V/50Hz that is worse than 120V/60Hz.

EUT Exercise Software

No exercise software was used to test.

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

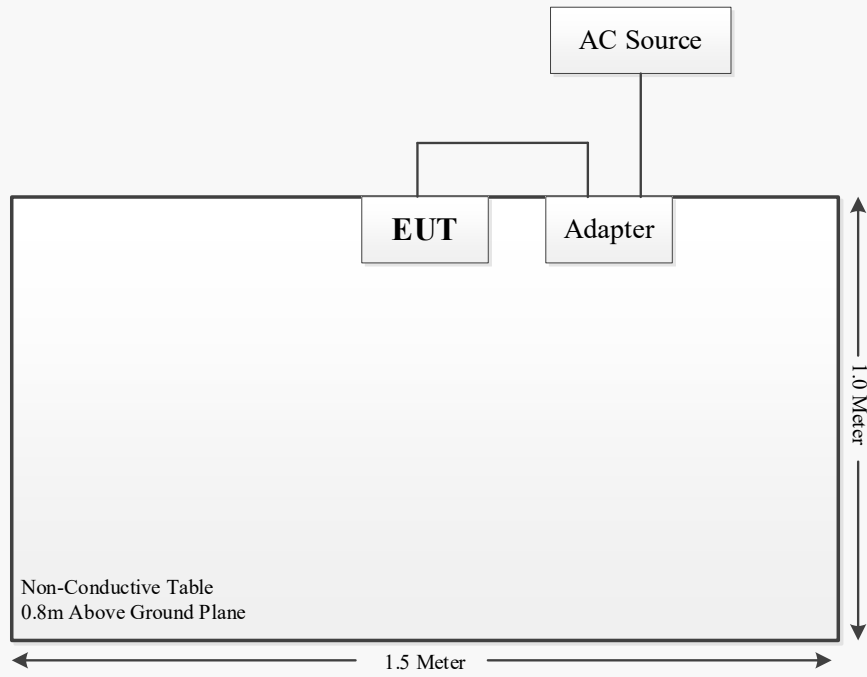
Manufacturer	Description	Model	Serial Number
Power on tools	Adapter	DA-00061000EU001	/
Nanfu	Battery*3	AAA LR03	/

External I/O Cable

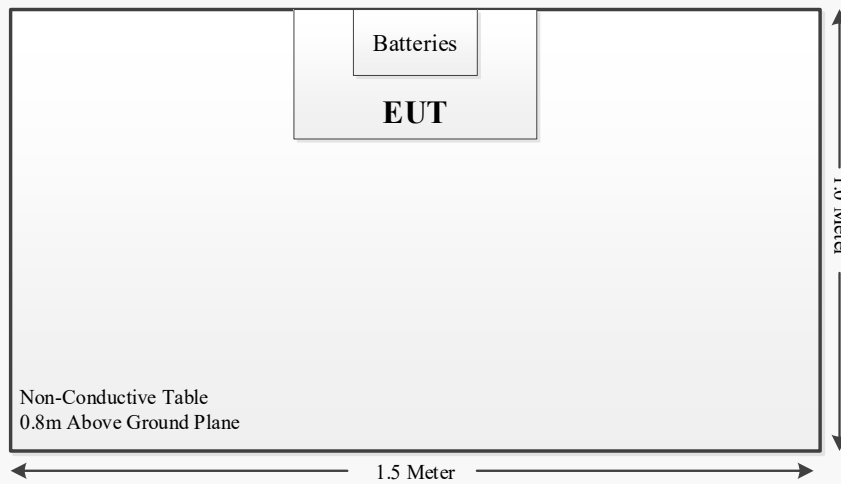
Cable Description	Length (m)	From Port	To Port
Power Cable 1	1.0	AC Source	Adapter
Power Cable 2	1.0	Adapter	EUT

Block Diagram of Radiated Test Setup

Test mode 1:



Test mode 2:



SUMMARY OF TEST REPORT

EN IEC 55014-1

Clause	Description	Results
§4.3.2	Conducted disturbances in frequency range 9 kHz to 30 MHz	Not Applicable (See Note 1)
§4.3.3	Conducted disturbances in frequency range 150 kHz to 30 MHz	Compliant
§4.3.4	Radiated disturbances in frequency range 30 MHz to 1 000 MHz	Compliant
§4.3.5	Radiated disturbances in frequency range 1 GHz to 6 GHz	Not Applicable (See Note 2)

EN IEC 55014-2

Clause	Description	Results
§ 5.1	Electrostatic Discharge (IEC 61000-4-2)	Compliant
§ 5.5	Radio Frequency Electromagnetic Fields (IEC 61000-4-3)	Not Applicable (See Note 3)
§ 5.2	Fast Transients (IEC 61000-4-4)	Compliant
§ 5.6	Surges (IEC 61000-4-5)	Compliant
§ 5.3	Injected Currents (0.15MHz to 230MHz) (IEC 61000-4-6)	Compliant
§ 5.4	Injected Currents (0.15MHz to 80MHz) (IEC 61000-4-6)	Not Applicable (See Note 3)
§ 5.7	Voltage Dips (IEC 61000-4-11)	Compliant

EN IEC 61000-3-2

Clause	Description	Results
§6, §7	Harmonic Current Emissions	Not Applicable (See Note 4)

EN 61000-3-3

Clause	Description	Results
§5, §6	Voltage Fluctuation and Flicker	Compliant

Note :

1. The item applies only to equipment with active IPT functions.
2. The item applies only to equipment with highest clock frequency greater than 108 MHz.
3. The clock frequency is 32.768kHz and the product belongs to Category II.
4. According to EN IEC 61000-3-2 section 7.1: Equipment with a rated power of 75 W or less, other than lighting equipment, are not included in this standard.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions					
Rohde & Schwarz	EMI Test Receiver	ESR	101746	2022-06-23	2023-06-22
Rohde & Schwarz	LISN	ENV216	101115	2021-11-13	2022-11-12
Rohde & Schwarz	Pulse limiter	ESH3-Z2	0357.8810.54	2021-11-13	2022-11-12
MICRO-COAX	Coaxial Cable	Cable-15	015	2022-08-15	2023-08-14
Audix	Test Software	e3	V9	N/A	N/A
Radiated Emissions Chamber 1# (30 MHz to 1 GHz)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2022-06-23	2023-06-22
Sunol Sciences	Hybrid Antenna	JB3	A090314-2	2020-01-07	2023-01-06
Sonoma Instrument	Amplifier	310N	171205	2022-08-15	2023-08-14
MICRO-COAX	Coaxial Cable	Cable-8	008	2022-08-15	2023-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2022-08-15	2023-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2022-08-15	2023-08-14
Rohde & Schwarz	Test software	EMC32	100361	N/A	N/A
Narda	6dB Attenuator	773-6	10690812-2-2	2022-08-15	2023-08-14
Voltage Fluctuation and Flicker					
EM TEST	Harmonic & Flicker Analyzer	DPA 500N	P1402129120	2022-06-23	2023-06-22
EM TEST	AC Power Source	ACS 500N	P1251107475	2022-06-23	2023-06-22
EM TEST	Test Software	net. control	Version 3.0.0	N/A	N/A

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Injected currents					
Agilent	Signal Generator	8648C	3537A01810	2022-07-30	2023-07-29
COM-POWER	CDN	CDN M225E	511098	2021-11-13	2022-11-12
SPANAWAVE	Power Amplifier	PAS-000023-25	AA00535	N/A	N/A
Dressler	Attenuator	ATT 6/75	510020010004	N/A	N/A
BACL	Test Software	VEE-CS	N/A	N/A	N/A
Electrostatic discharge (ESD)					
TESEQ	ESD Simulator	NSG 438	1079	2022-06-23	2023-06-22
Electrical fast transients & Surges & Voltage dips					
HTEC	Transient Integrated Immunity Generator	HV1P16T	214401	2021-11-21	2022-11-20
HTEC	Single Phase AC Fault Power Supply	HCOMPACT 7	214402	2021-11-21	2022-11-20

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

EN IEC 55014-1 §4.3.3- CONDUCTED DISTURBANCE IN FREQUENCY RANGE 150 KHZ TO 30 MHZ

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

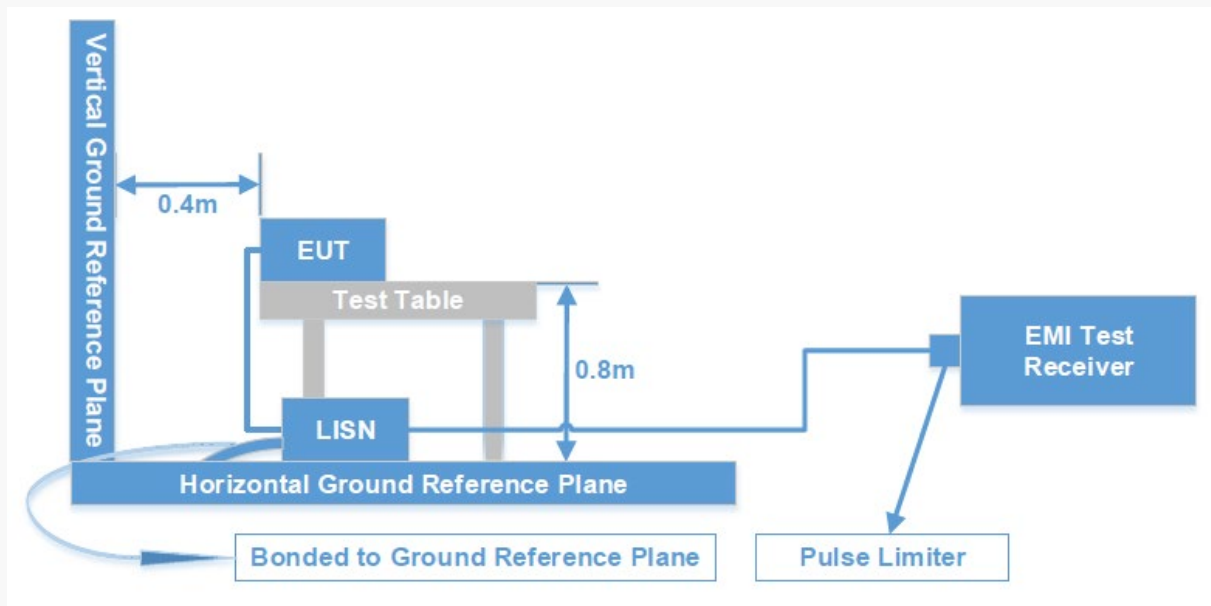
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Item	Frequency Range	Measurement Uncertainty	U_{cispr}
Conducted Disturbance	150 kHz~30 MHz	3.19 dB	3.4 dB

EUT Setup



The setup of EUT is according with per CISPR 16-2-1:2014+COR1:2020 measurement procedures. The specification used was with the EN IEC 55014-1:2021 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz

Frequency Range	RBW	VBW
150 kHz – 30 MHz	9 kHz	30 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

Level & Over Limit Calculation

The Level is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation from the Meter Reading. The basic equation is as follows:

$$\text{Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

$$\text{Level (dB}\mu\text{V)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7 dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Level (dB}\mu\text{V)} - \text{Limit (dB}\mu\text{V)}$$

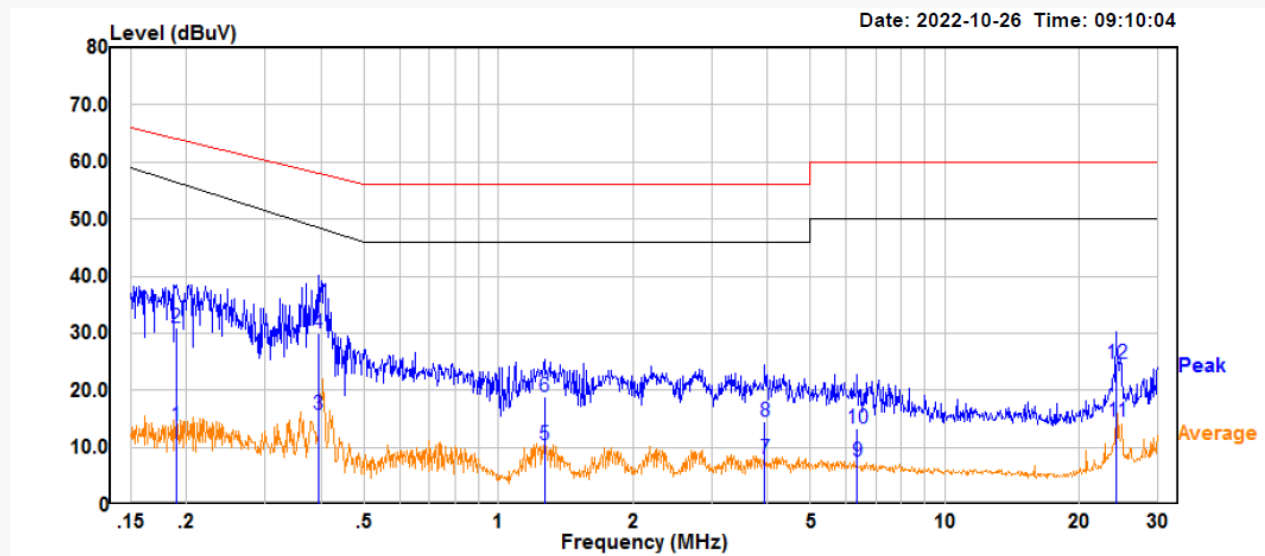
Test Data

Environmental Conditions & Test Information

Temperature:	21.0 °C
Relative Humidity:	52 %
ATM Pressure:	102.5 kPa
Test Date:	2022-10-26
Test Engineer:	Kris Qu

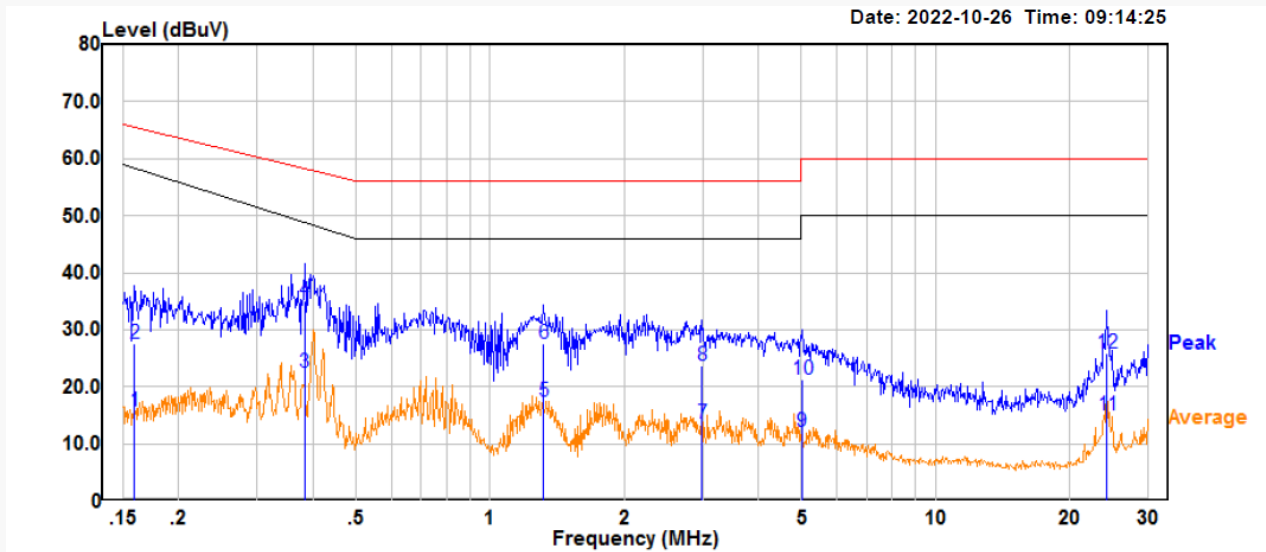
Test mode 1:

Line:



	Read Freq	Read Level	Factor	Limit Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.190	-6.31	20.05	13.74	56.47	-42.73	Average
2	0.190	10.89	20.05	30.94	64.05	-33.11	QP
3	0.394	-4.01	19.63	15.62	48.56	-32.94	Average
4	0.394	10.39	19.63	30.02	57.97	-27.95	QP
5	1.266	-8.90	19.37	10.47	46.00	-35.53	Average
6	1.266	-0.50	19.37	18.87	56.00	-37.13	QP
7	3.946	-11.50	19.51	8.01	46.00	-37.99	Average
8	3.946	-5.10	19.51	14.41	56.00	-41.59	QP
9	6.367	-12.00	19.61	7.61	50.00	-42.39	Average
10	6.367	-6.40	19.61	13.21	60.00	-46.79	QP
11	24.213	-5.30	19.90	14.60	50.00	-35.40	Average
12	24.213	4.80	19.90	24.70	60.00	-35.30	QP

Neutral:



	Read Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.159	-4.29	20.05	15.76	58.35	-42.59	Average
2	0.159	7.61	20.05	27.66	65.50	-37.84	QP
3	0.383	2.81	19.64	22.45	48.88	-26.43	Average
4	0.383	15.31	19.64	34.95	58.22	-23.27	QP
5	1.318	-1.90	19.38	17.48	46.00	-28.52	Average
6	1.318	8.30	19.38	27.68	56.00	-28.32	QP
7	2.985	-5.90	19.46	13.56	46.00	-32.44	Average
8	2.985	4.20	19.46	23.66	56.00	-32.34	QP
9	5.012	-7.40	19.56	12.16	50.00	-37.84	Average
10	5.012	1.80	19.56	21.36	60.00	-38.64	QP
11	24.213	-4.80	19.90	15.10	50.00	-34.90	Average
12	24.213	6.00	19.90	25.90	60.00	-34.10	QP

EN IEC 55014-1 §4.3.4- RADIATED DISTURBANCE IN FREQUENCY RANGE 30 MHZ TO 1000MHZ

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

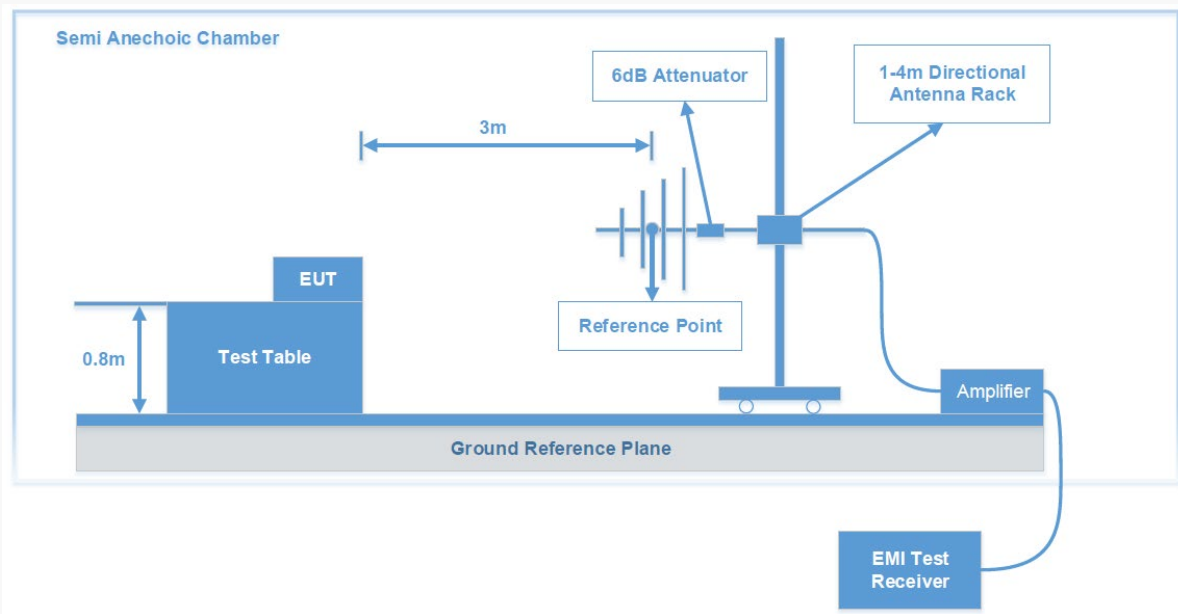
If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Item	Frequency Range	Measurement Uncertainty	U_{cispr}
Radiated Disturbance	30 MHz~1 GHz	6.11 dB	6.3 dB

Test System Setup

30 MHz - 1 GHz:



Radiated Top View:

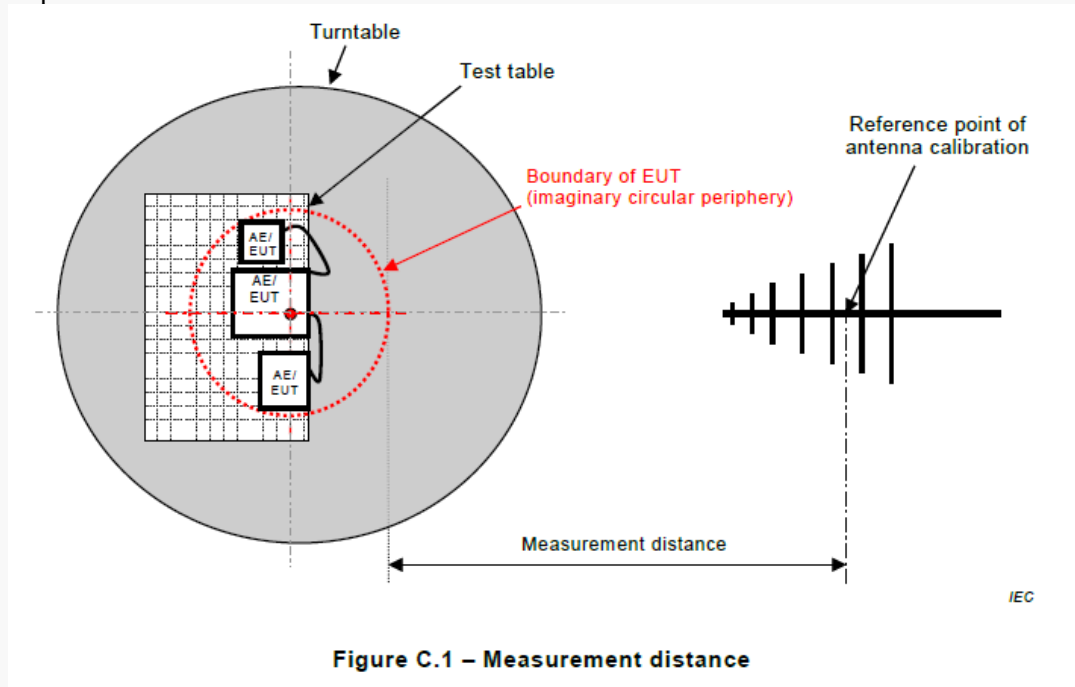


Figure C.1 – Measurement distance

The radiated disturbance tests were performed in the 3 meters, using the setup accordance with the CISPR 16-1-4:2019+A1:2020 and CISPR 16-2-3:2016+A1:2019. The specification used was the EN IEC 55014-1:2021 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 1 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	VBW	Detector Type
30 MHz – 1000 MHz	120 kHz	300 kHz	QP

If the measured peak level of the emissions that the measuring receiver reading level plus corrected factor is at least 10 dB below the QP emission limit, there's no need to record the measured QP level of the emissions in the report.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude (dB}\mu\text{V/m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V/m)}$$

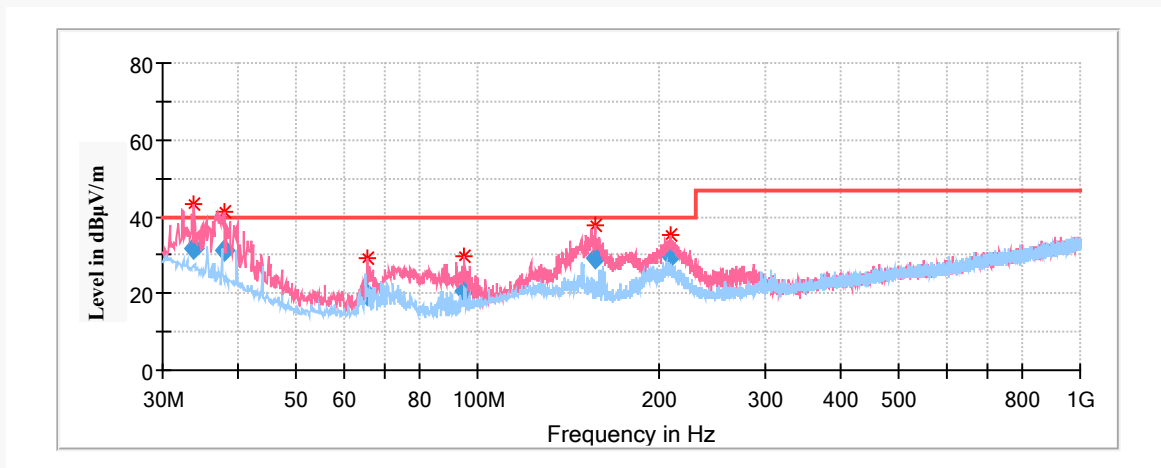
Test Data

Environmental Conditions & Test Information

Frequency Range:	30 MHz - 1 GHz
Temperature:	25.5 °C
Relative Humidity:	49 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Mecal He

Test mode 1:

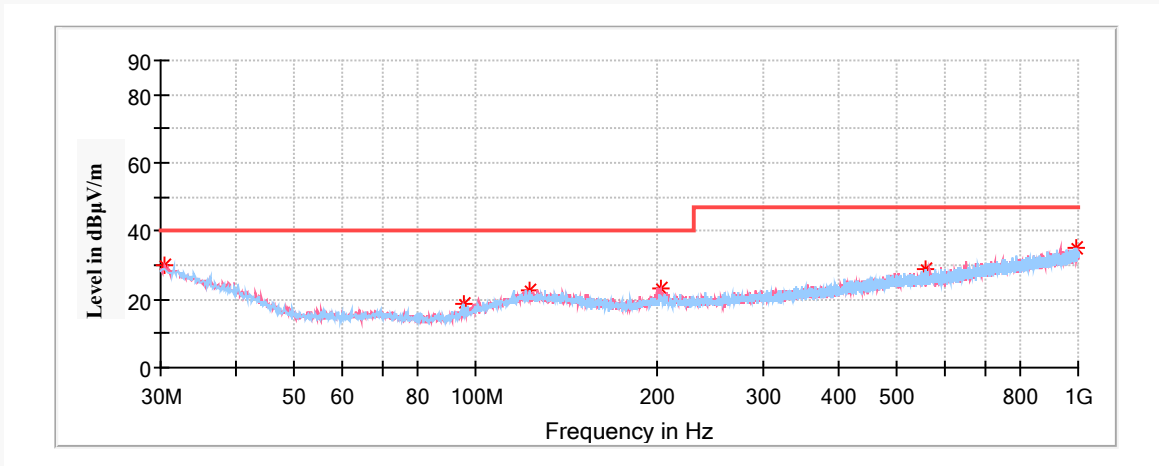
30 MHz - 1 GHz



Frequency (MHz)	Corrected Amplitude	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
	Quasi Peak (dBµV/m)						
33.880000	31.54	40.00	8.46	100.0	V	95.0	-5.3
38.002500	31.05	40.00	8.95	100.0	V	342.0	-8.9
65.647500	19.68	40.00	20.32	100.0	V	227.0	-16.9
95.111250	20.64	40.00	19.36	100.0	V	145.0	-16.4
156.463750	29.27	40.00	10.73	100.0	V	266.0	-12.7
208.843750	29.51	40.00	10.49	100.0	V	255.0	-12.2

Test mode 2:

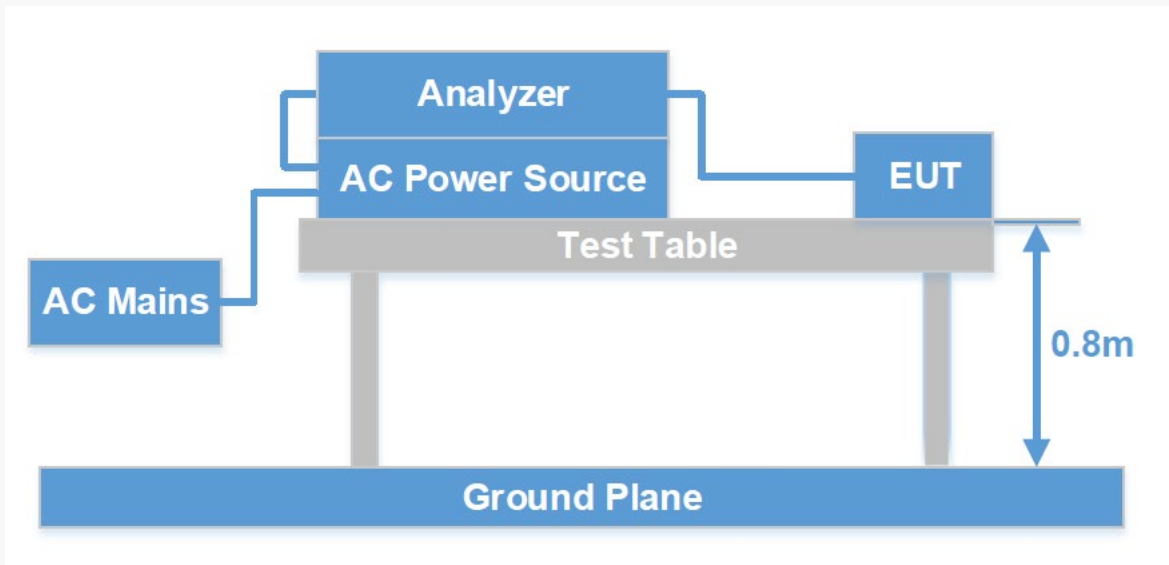
30 MHz - 1 GHz



Frequency (MHz)	Corrected Amplitude	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
	Quasi Peak (dBµV/m)						
30.485000	29.77	40.00	10.23	100.0	V	263.0	-3.7
95.717500	18.47	40.00	21.53	100.0	H	57.0	-16.0
122.877500	22.74	40.00	17.26	100.0	H	124.0	-11.3
203.023750	23.19	40.00	16.81	100.0	V	127.0	-12.3
556.588750	29.09	47.00	17.91	200.0	H	109.0	-5.3
991.512500	35.12	47.00	11.88	200.0	H	203.0	1.9

EN 61000-3-3 VOLTAGE FLUCTUATIONS AND FLICKER

Test System Setup



Test Standard

EN 61000-3-3:2013+A2:2021

Flicker Test Limits

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test, measured or calculated according to clause 4 under test conditions described in clause 6 and annex A. Tests made to prove compliance with the limits are considered to be type tests.

The following limits apply:

- the value of P_{st} shall not be greater than 1,0;
- the value of P_{lt} shall not be greater than 0,65;
- T_{max} , the accumulated time value of $d(t)$ with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms;
- the relative steady-state voltage change, d_c , shall not exceed 3,3 %;
- the maximum relative voltage change d_{max} , shall not exceed
 - a) 4 % without additional conditions;
 - b) 6 % for equipment which is:

Switched manually, or

- switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

Note: The cycling frequency will be further limited by the Pst and Plt limit. For example: a dmax of 6 % producing a rectangular voltage change characteristic twice per hour will give a Plt of about 0,65.

c) 7 % for equipment which is

- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
 – switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

In the case of equipment having several separately controlled circuits in accordance with 6.6, limits b) and c) shall apply only if there is delayed or manual restart after a power supply interruption; for all equipment with automatic switching which is energized immediately on restoration of supply after a power supply interruption, limits a) shall apply; for all equipment with manual switching, limits b) or c) shall apply depending on the rate of switching. Pst and Plt requirements shall not be applied to voltage changes caused by manual switching. The limits shall not be applied to voltage changes associated with emergency switching or emergency interruptions.

Test Data

Environmental Conditions & Test Information

Temperature:	25.5 °C
Relative Humidity:	49 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Jack Liu

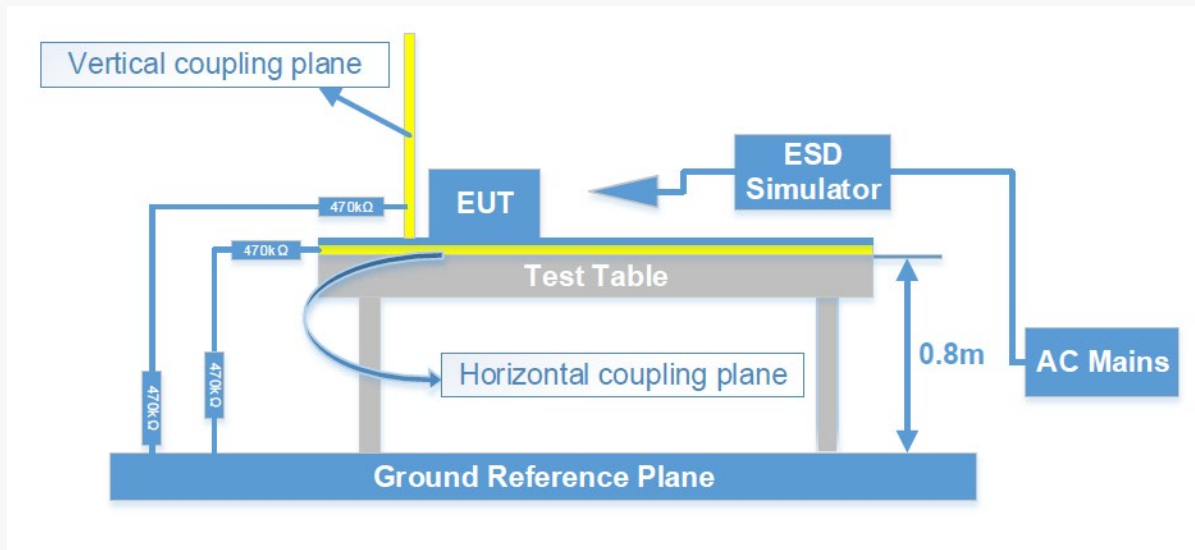
Standard Name:	EN 61000-3-3 (Edition 3.2)
Observation period:	P _{st} : T _p = 10 min
	P _{lt} : T _p = 120 min
EUT operation mode:	Test mode 1

Maximum Flicker results

Parameter	EUT values	Limit	Result
Pst	0.070	1.00	PASS
Plt	0.031	0.65	PASS
Dc	0	3.30	PASS
Dmax	< 0.2	4.00	PASS
Tmax	0.000	0.50	PASS

EN IEC 55014-2 §5.1-ELECTROSTATIC DISCHARGE (IEC 61000-4-2)

Test System Setup



IEC 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

Test Standard

EN IEC 55014-2:2021 / IEC 61000-4-2:2008

Air Discharge at ± 8 kV

Contact Discharge at ± 4 kV

Test Level

Level	Test Voltage Contact Discharge (\pm kV)	Test Voltage Air Discharge (\pm kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

Performance Criterion: B

Test Procedure

Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Contact Discharge:

All the procedure shall be same as Section 8.3.1.of IEC 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane

At least 20 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m * 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

Test Data

Environmental Conditions & Test Information

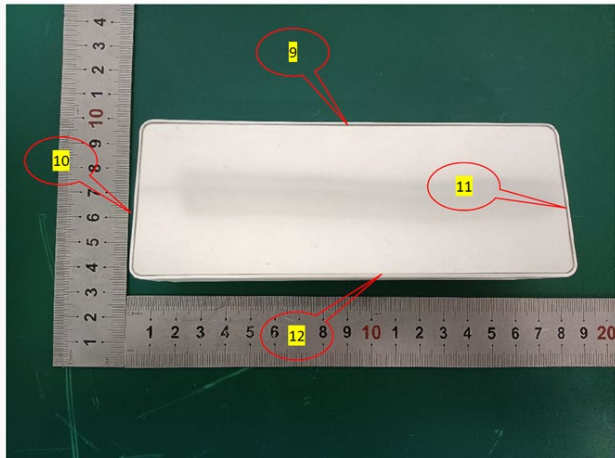
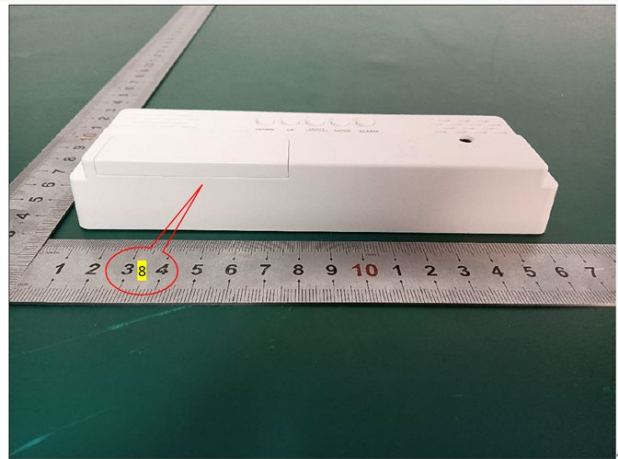
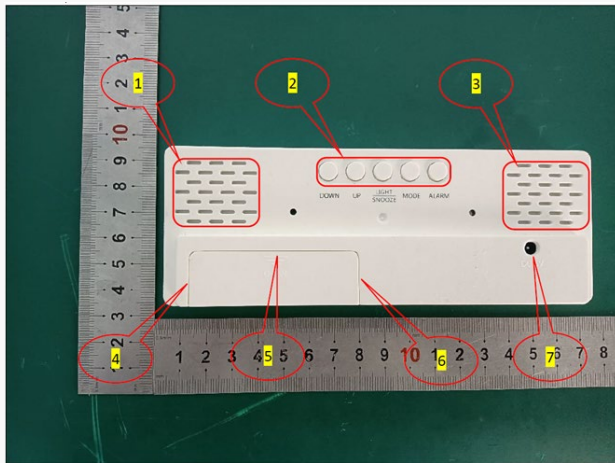
Temperature:	22.0 °C
Relative Humidity:	55 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Jack Liu

Test mode 1&2 :

Electrostatic Discharge Immunity (Air Discharge)									
Test Levels									
Test Points Location	-2 kV	+2 kV	-4 kV	+4 kV	-8 kV	+8 kV	-15 kV	+15 kV	X
1-12	/	/	/	/	A	A	/	/	/
Electrostatic Discharge Immunity (Contact Discharge)									
Test Levels									
Test Points Location	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	X
/	/	/	/	/	/	/	/	/	/
Electrostatic Discharge Immunity (Indirect Contact HCP)									
Test Levels									
Test Points Location	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	X
Front Side	/	/	A	A	/	/	/	/	/
Back Side	/	/	A	A	/	/	/	/	/
Left Side	/	/	A	A	/	/	/	/	/
Right Side	/	/	A	A	/	/	/	/	/
Electrostatic Discharge Immunity (Indirect Contact VCP)									
Test Levels									
Test Points Location	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	X
Front Side	/	/	A	A	/	/	/	/	/
Back Side	/	/	A	A	/	/	/	/	/
Left Side	/	/	A	A	/	/	/	/	/
Right Side	/	/	A	A	/	/	/	/	/

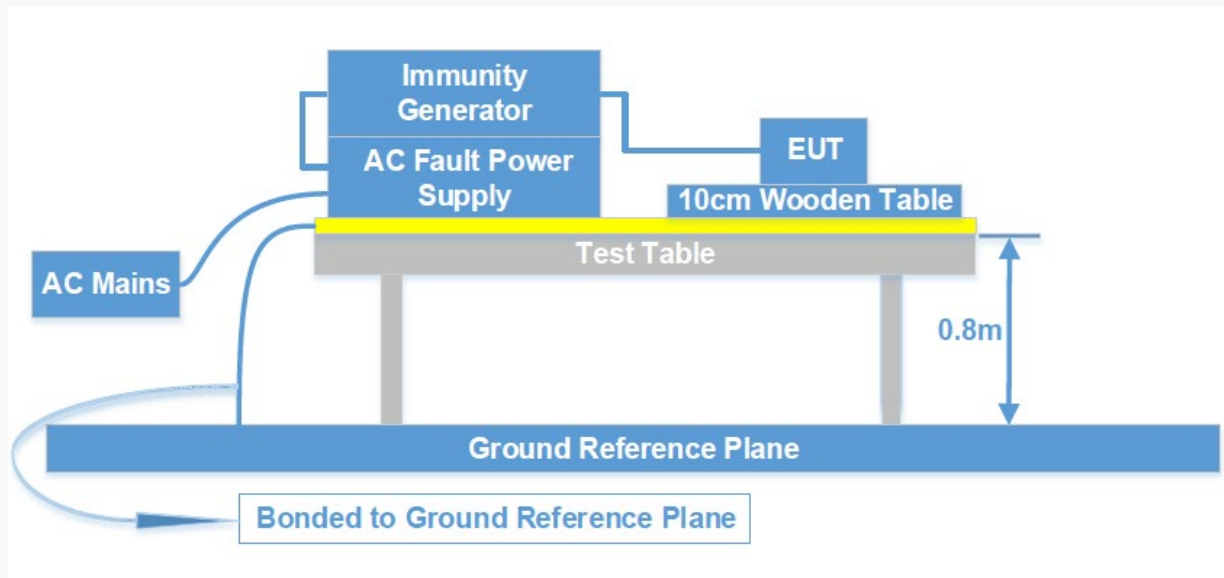
Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

Test point as follows:



EN IEC 55014-2 §5.2-FAST TRANSIENTS (IEC 61000-4-4)

Test System Setup



Test Standard

EN IEC 55014-2:2021/IEC 61000-4-4:2012

Test Level

Open Circuit Output Test Voltage ±10%				
Level	Power ports, earth port(PE)		Signal and control ports	
	Voltage(kV)	Repetition frequency(kHz)	Voltage(kV)	Repetition frequency(kHz)
1	0.5	5 or 100	0.25	5 or 100
2	1		0.5	
3	2		1	
4	4		2	
X	Special	Special	Special	Special

Performance Criterion: B

Test Procedure

The EUT was arranged for Power Line Coupling and for I/O Line Coupling through a capacitive clamp, where applicable. (Note: The I/O coupling test using a capacitive clamp is performed on the I/O interface cables that are longer in length than 3 meters.) A metal ground plane 2.4 meters by 2.0 meter was placed between the floor and the table and is connected to the earth by a 2.0-meter ground rod. The ground rod is connected to the test facility’s electrical earth.

Test Data**Environmental Conditions & Test Information**

Temperature:	22.0 °C
Relative Humidity:	55 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Jack Liu

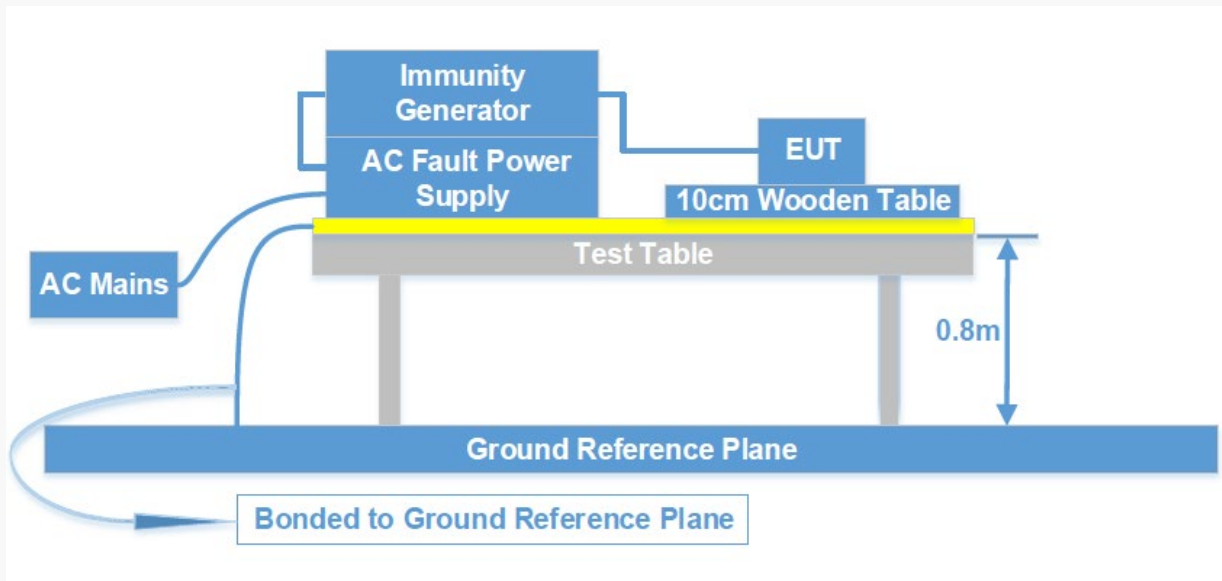
Test mode 1:

Test Ports		Test Levels (kV) Repetition frequency(5kHz)							
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
AC Mains Power Input Ports	L	A	A	A	A	/	/	/	/
	N	A	A	A	A	/	/	/	/
	L+N	A	A	A	A	/	/	/	/
	L+ PE	/	/	/	/	/	/	/	/
	N+ PE	/	/	/	/	/	/	/	/
	L+ N+ PE	/	/	/	/	/	/	/	/
Signal Port	/	/	/	/	/	/	/	/	/

Note: "A" stands for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

EN IEC 55014-2 §5.6 - SURGES (IEC 61000-4-5)

Test System Setup



Test Standard

EN IEC 55014-2:2021 (IEC 61000-4-5:2014+A1:2017)

Test Level

Level	Open Circuit Output Test Voltage ±10%		Performance Criterion	
	Line - Line	Line - Ground	AC Mains	Signal Port
1	---	0.5 kV	---	---
2	0.5 kV	1 kV	---	---
3	1 kV	2 kV	B	---
4	2 kV	4 kV	---	---
X	Special	Special	---	---

Performance Criterion: B

Test Procedure

- 1) Provide disturbance signal described below is injected to EUT.
- 2) 10 positive and 10 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 3) Different phase angles are done individually.
- 4) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

Test Data**Environmental Conditions & Test Information**

Temperature:	22.0 °C
Relative Humidity:	55 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Jack Liu

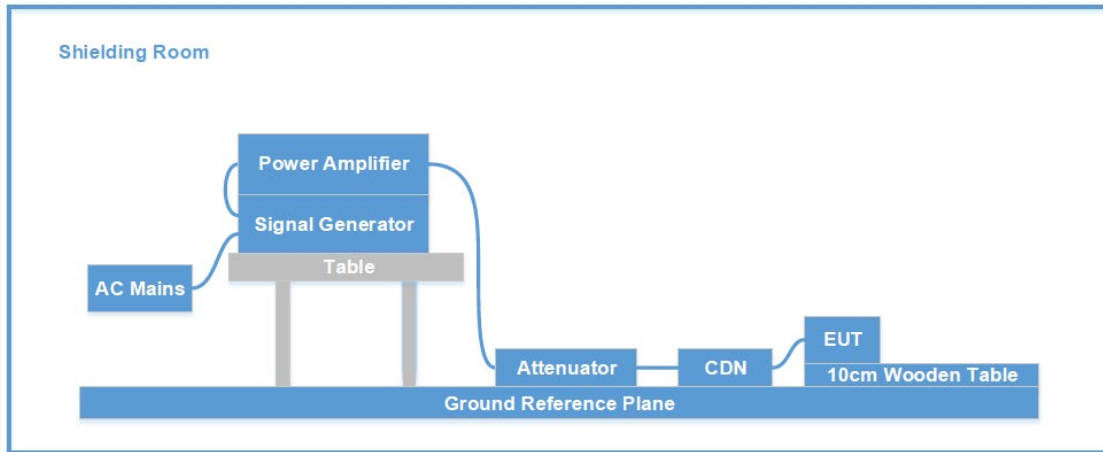
Test mode 1:

Test Ports		Test Levels (kV)							
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
AC Mains power input ports	L-N	/	/	A	A	/	/	/	/
	L- PE	/	/	/	/	/	/	/	/
	N- PE	/	/	/	/	/	/	/	/
Signal port	/	/	/	/	/	/	/	/	/

Note: "A" stands for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

EN IEC 55014-2 §5.3-INJECTED CURRENTS (0.15MHZ TO 230MHZ) (IEC 61000-4-6)

Test Setup



Test Standard

EN IEC 55014-2:2021/IEC 61000-4-6:2013+COR1:2015

Test level 2 at 3V (r.m.s.), 0.15 MHz ~ 230 MHz

Test Level

Level	Voltage Level (V)
1	1
2	3
3	10
X	Special

Performance Criterion: A

Test Procedure

- 1) Let the EUT work in test mode and test it.
- 2) The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 3) The disturbance signal described below is injected to EUT through CDN.
- 4) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 5) The frequency range is swept from 150 kHz to 230 MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave.
- 6) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 7) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

Test Data

Environmental Conditions & Test Information

Temperature:	22.0 °C
Relative Humidity:	55 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Jack Liu

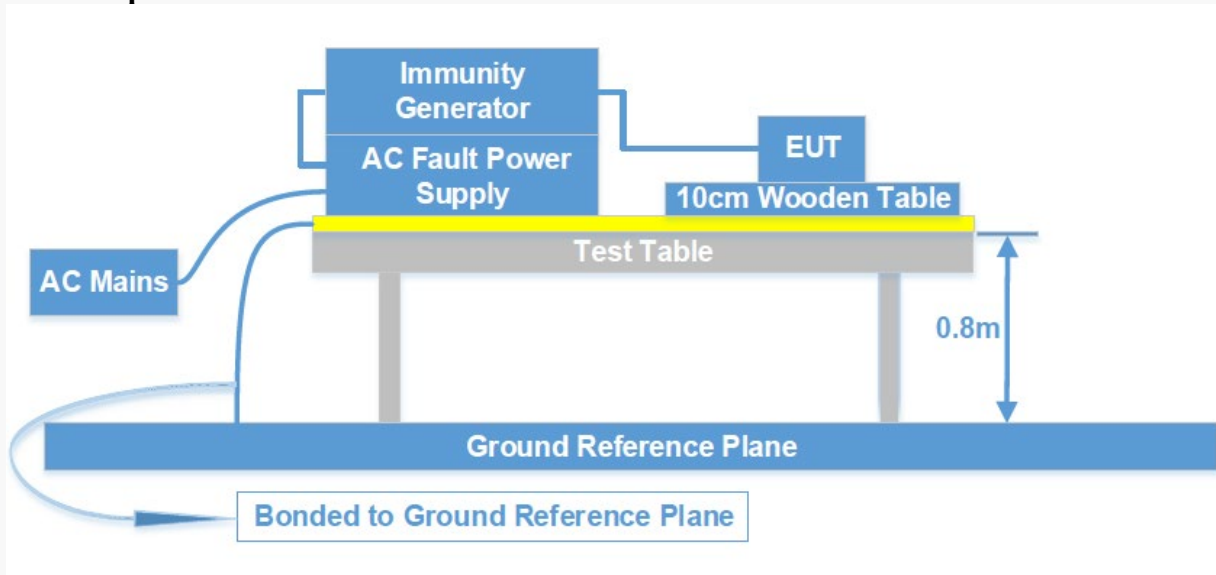
Test mode 1:

Test Ports	Test Equipment	Frequency Range (MHz)	Voltage Level (e.m.f.) U0			
			1V	3V	10V	X
AC mains power input ports	CDN M225E	0.15-230	/	A	/	/
Signal Port	/	/	/	/	/	/

Note: "A" stands for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

EN IEC 55014-2 §5.7-VOLTAGE DIPS (IEC 61000-4-11)

Test setup



Test Standard

EN IEC 55014-2:2021 (IEC 61000-4-11:2020)

Test Levels and Performance Criterion

Test Level	Cycle	Phase Angle	Performance criterion
Voltage dips: 0 % residual voltage	0.5	0°/90°/180°/270°	C
Voltage dips: 40 % residual voltage	10 for 50Hz 12 for 60Hz	0°/90°/180°/270°	C
Voltage dips: 70 % residual voltage	25 for 50Hz 30 for 60Hz	0°/90°/180°/270°	C

Test Procedure

- 1) The interruption is introduced at selected phase angles with specified duration.
- 2) Record any degradation of performance.

Test Data**Environmental Conditions & Test Information**

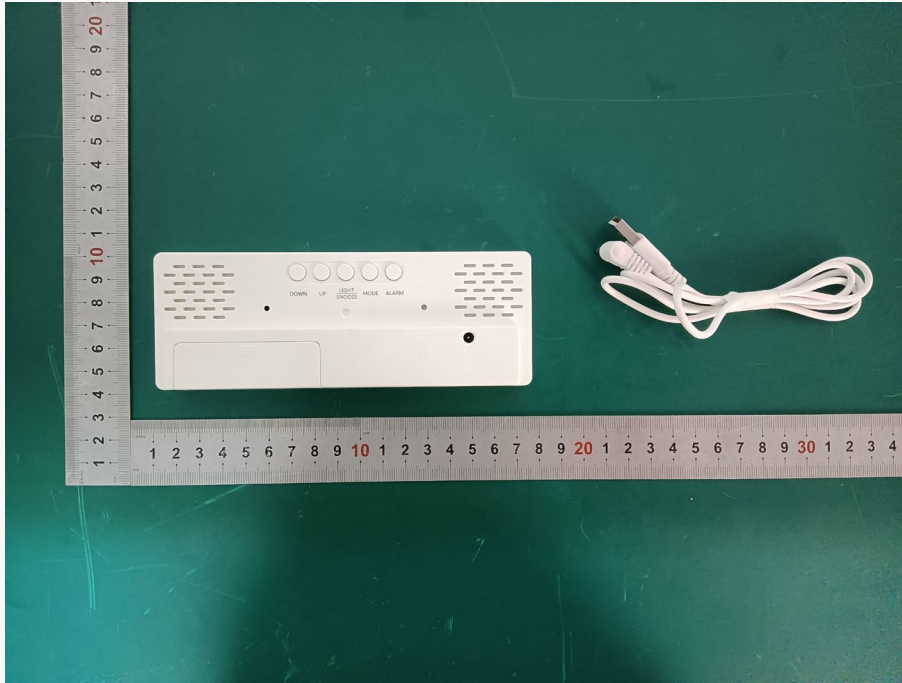
Temperature:	22.0 °C
Relative Humidity:	55 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-27
Test Engineer:	Jack Liu

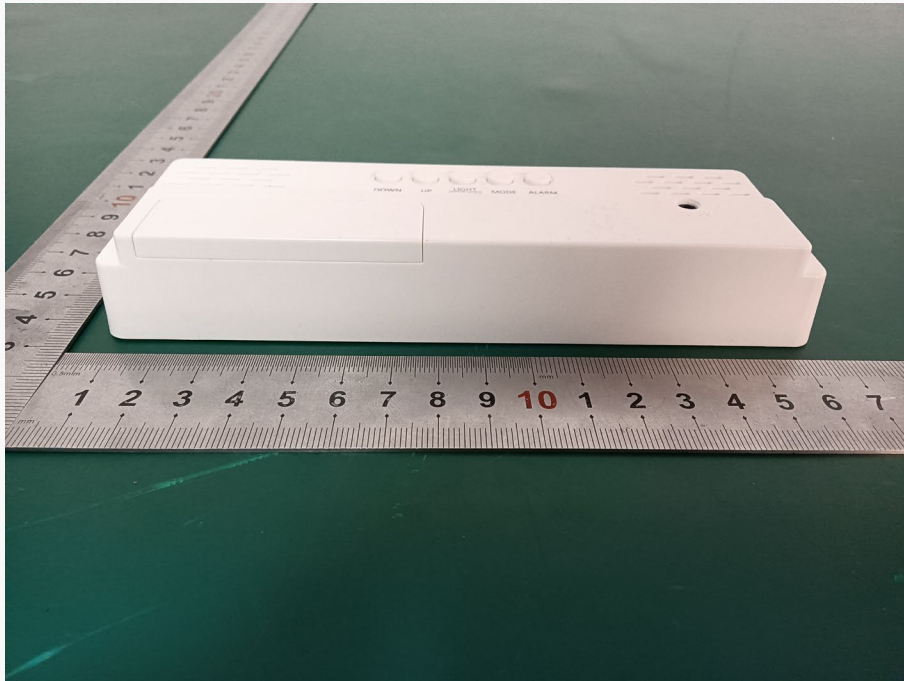
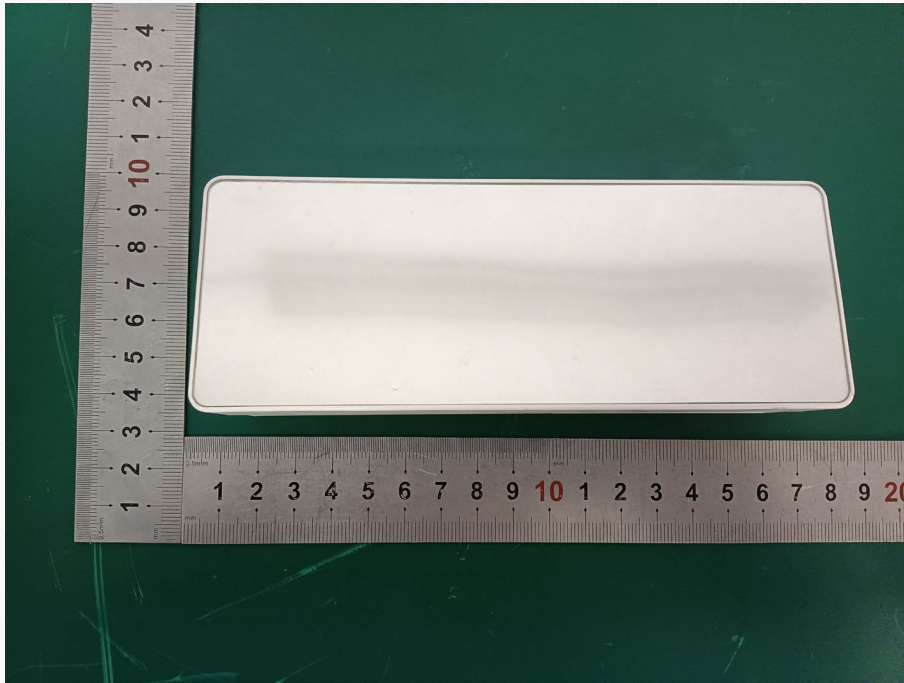
Test mode 1:

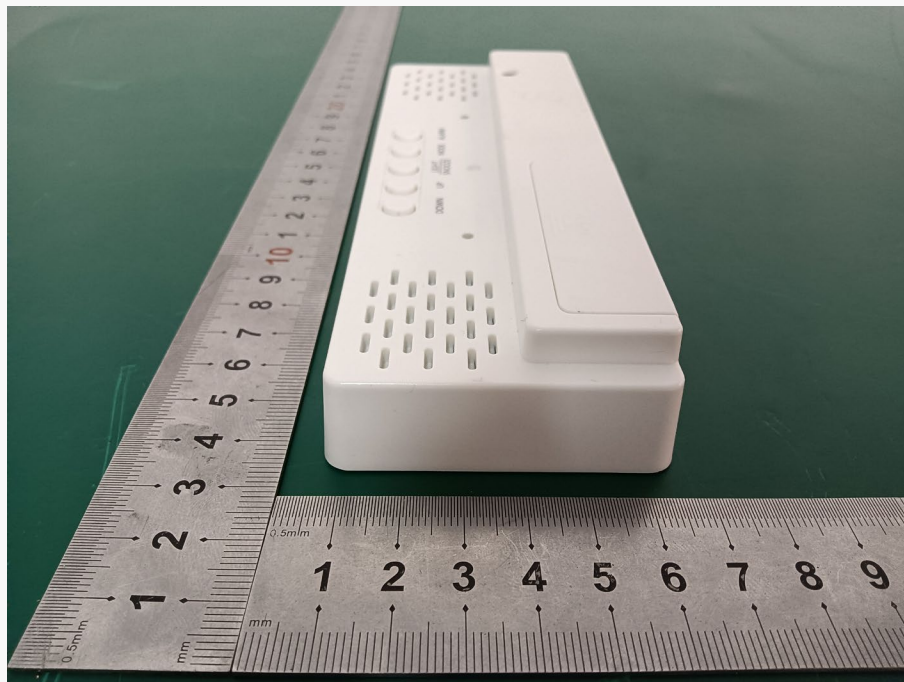
Test Level	Cycle	Phase Angle	Result
Voltage dips: 0 % residual voltage	0.5	0°/90°/180°/270°	A
Voltage dips: 40 % residual voltage	10	0°/90°/180°/270°	A
Voltage dips: 70 % residual voltage	25	0°/90°/180°/270°	A

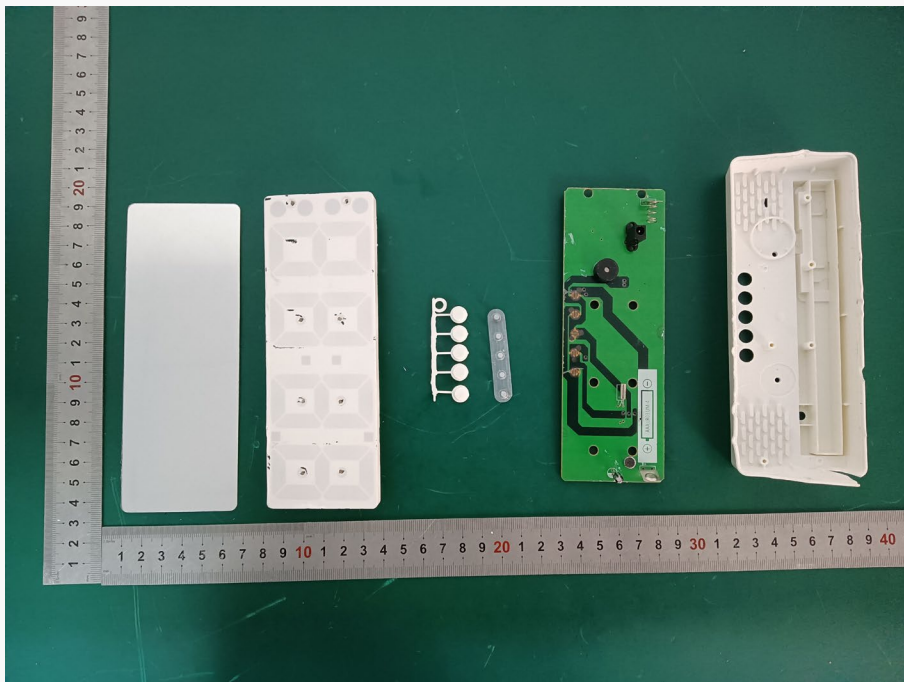
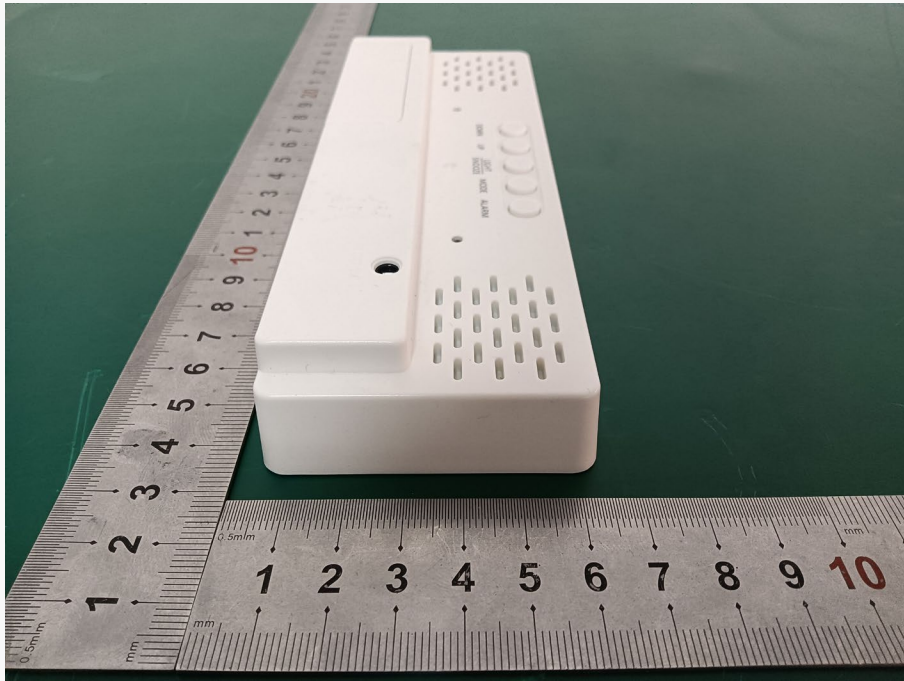
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EXHIBIT A - EUT PHOTOGRAPHS









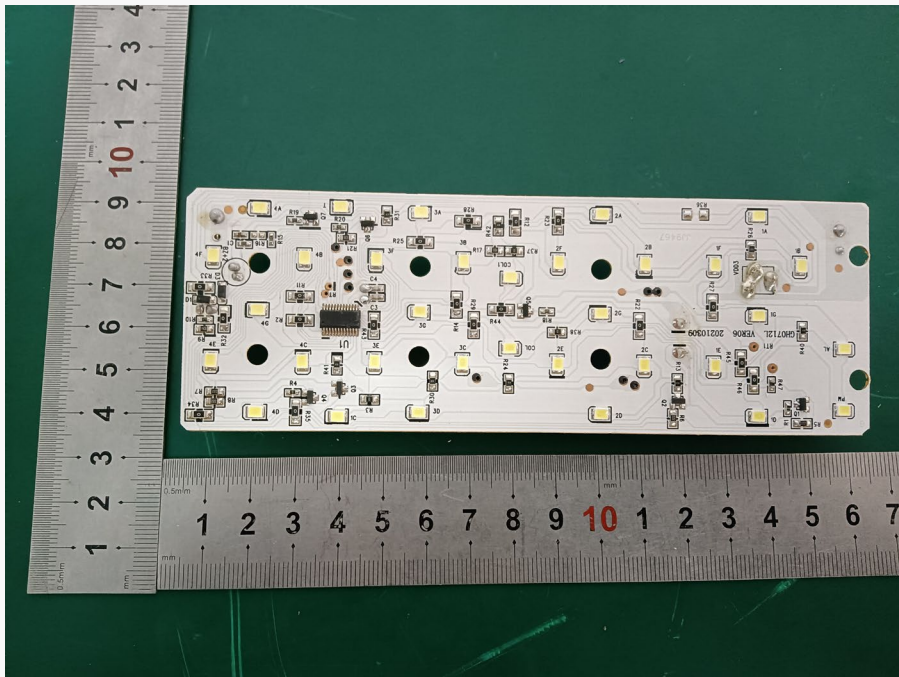
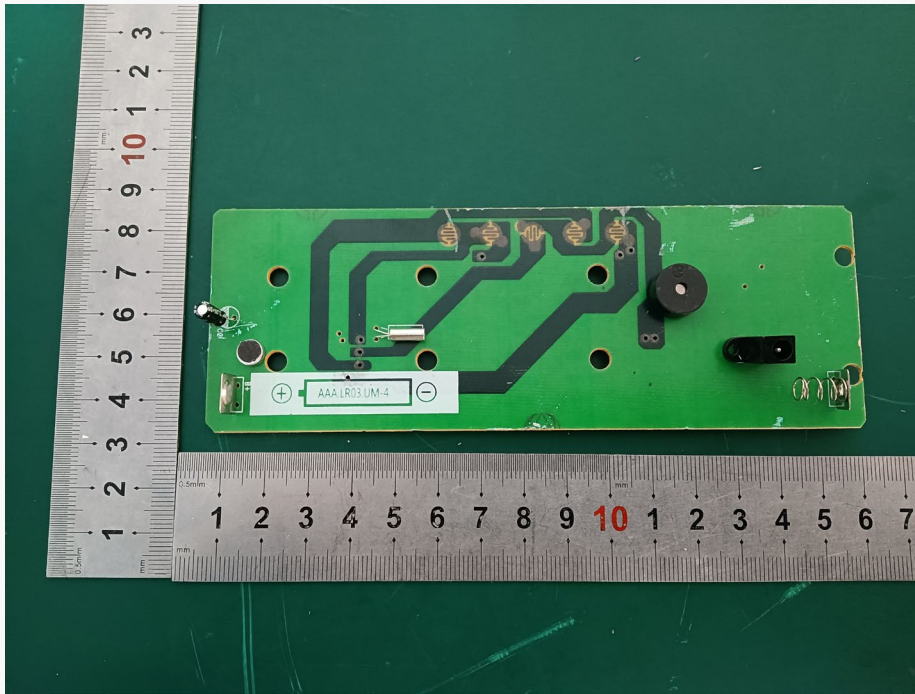


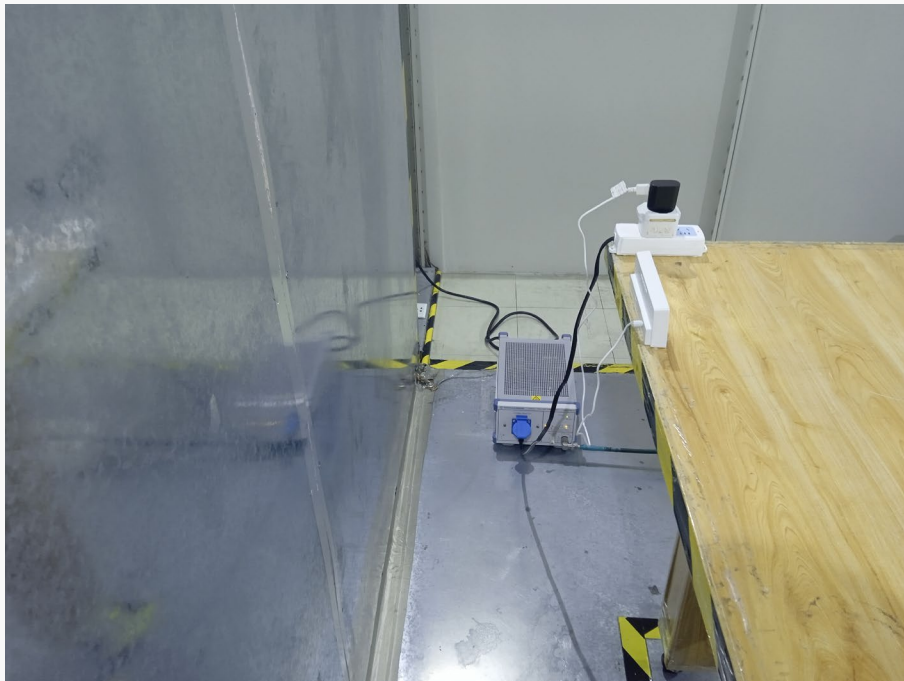
EXHIBIT B - TEST SETUP PHOTOGRAPHS

Test mode 1 :

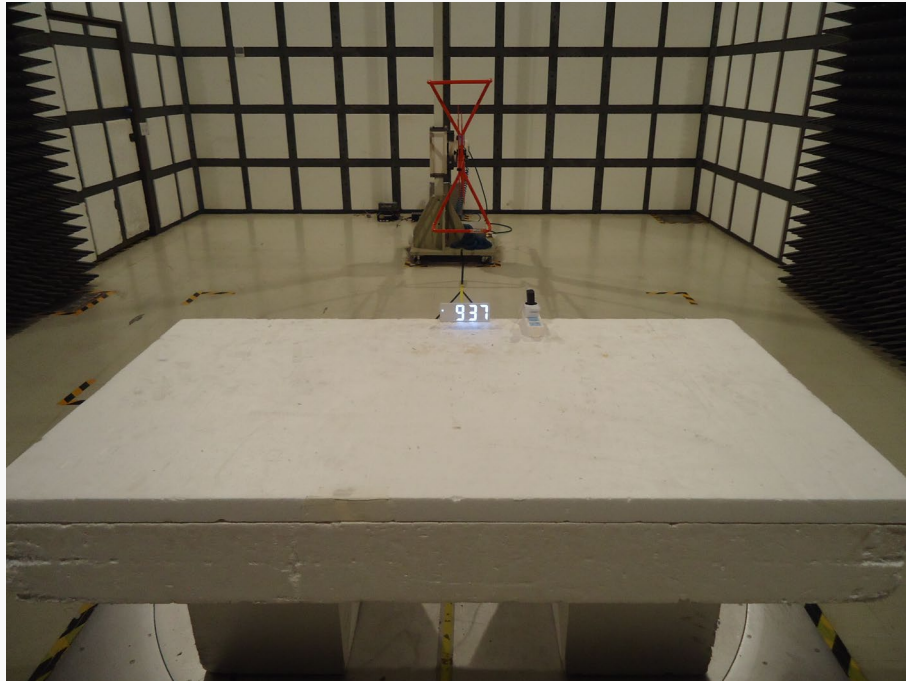
Conducted Disturbance - Front View



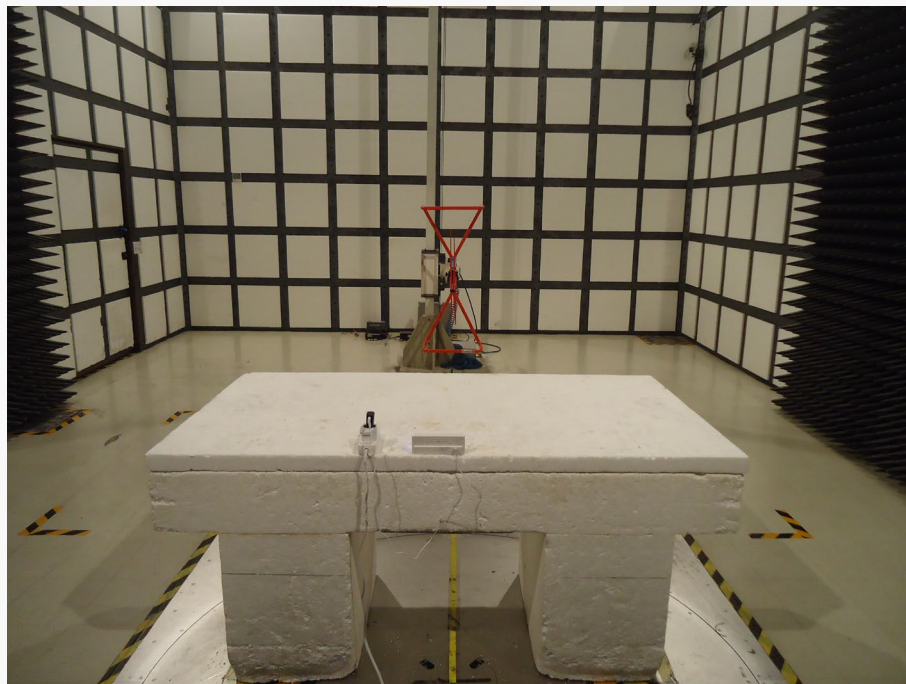
Conducted Disturbance - Side View



Radiated Disturbance - Front View (Below 1GHz)



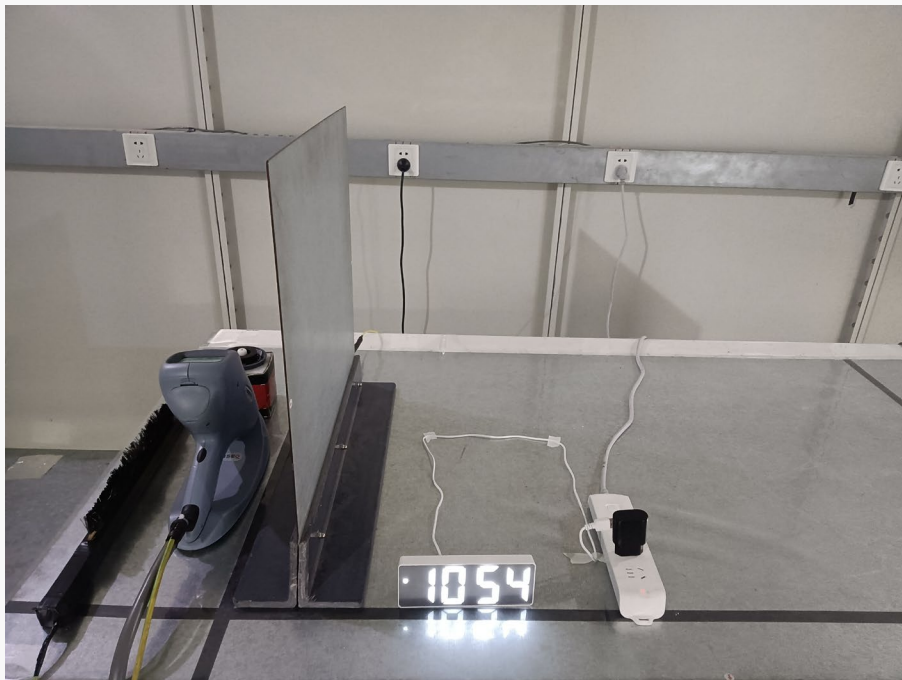
Radiated Disturbance - Rear View (Below 1GHz)



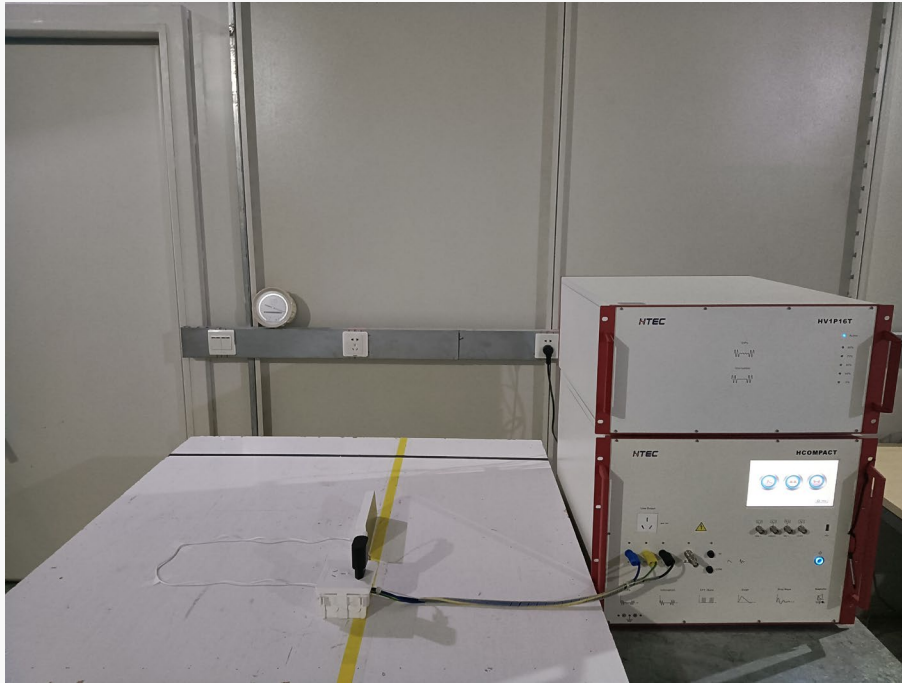
Flicker



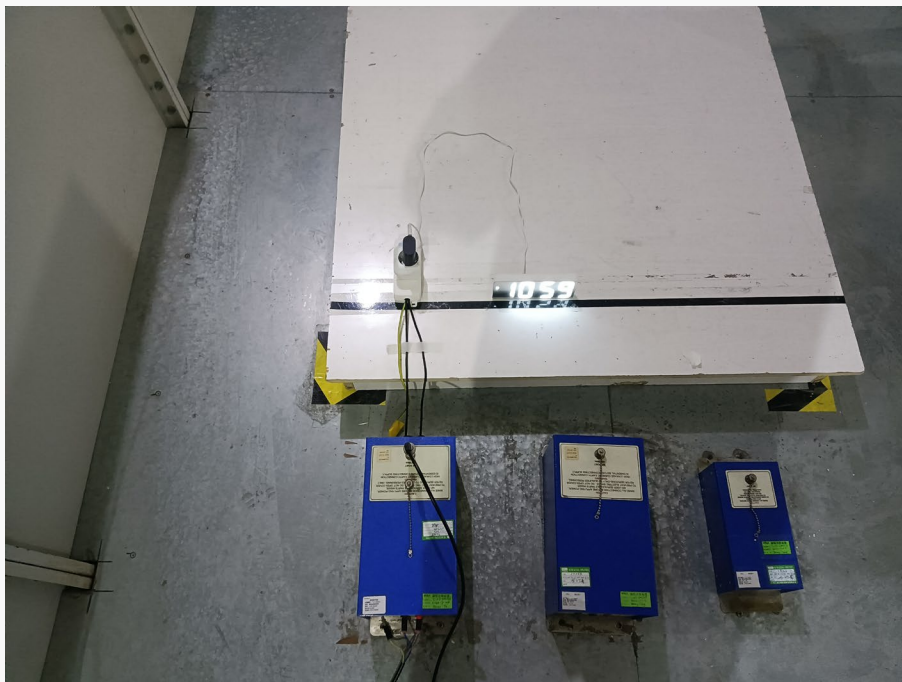
Electrostatic Discharge



Fast Transients & Surges & Dips

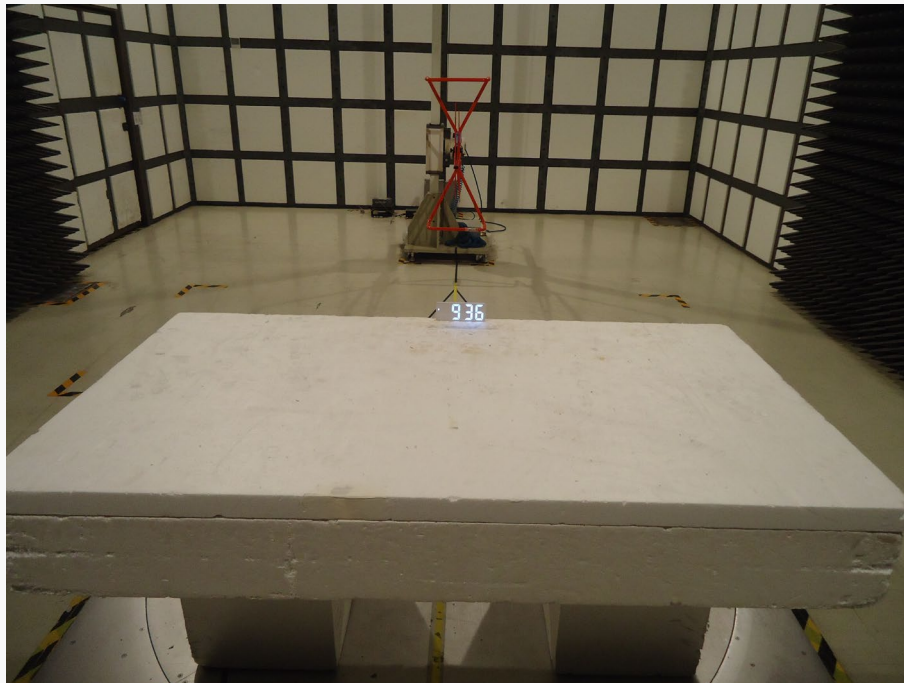


Injected Currents

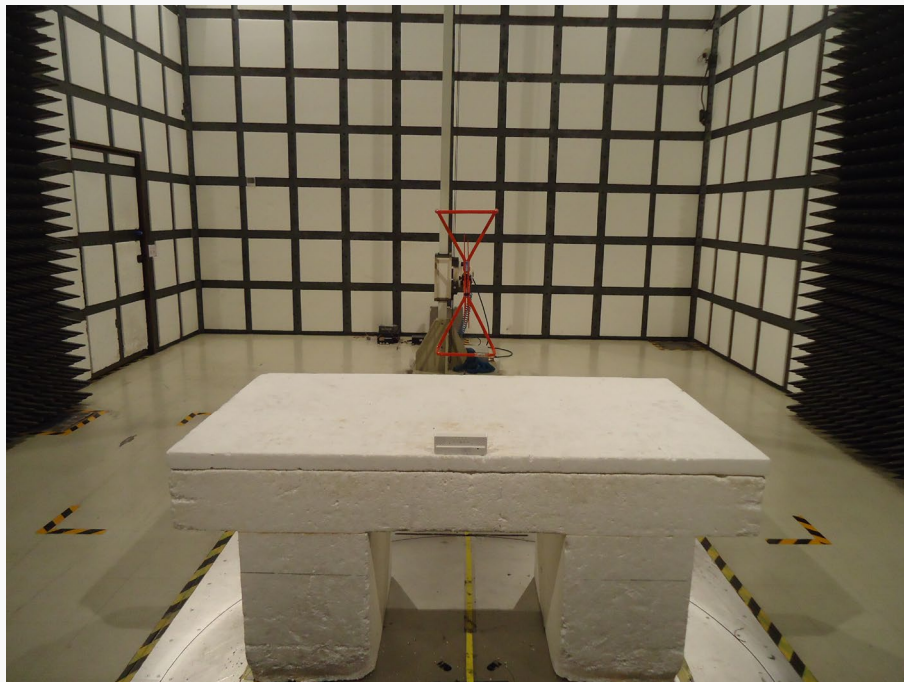


Test mode 2 :

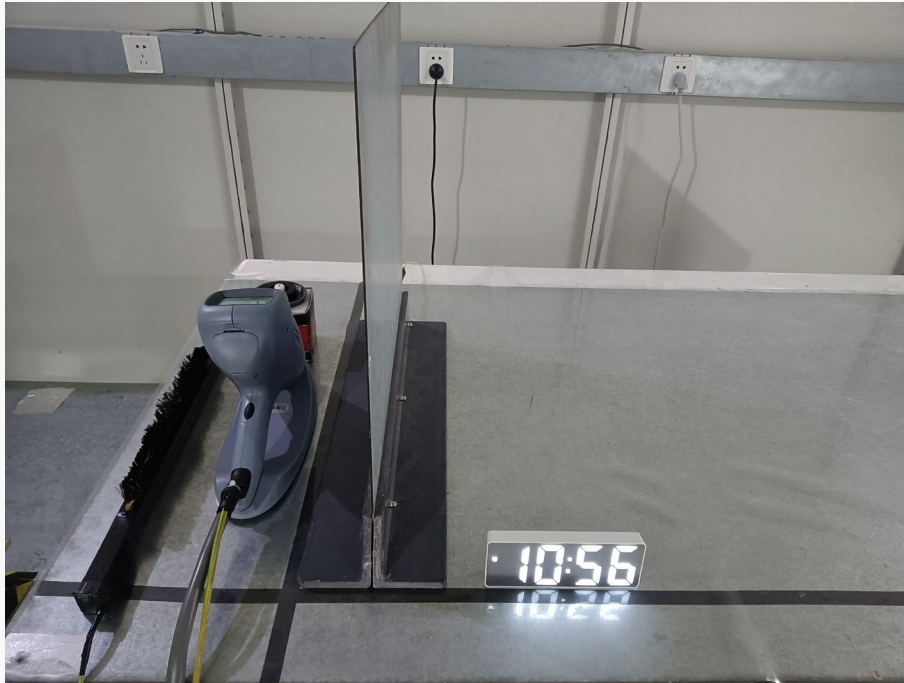
Radiated Disturbance - Front View (Below 1GHz)



Radiated Disturbance - Rear View (Below 1GHz)



Electrostatic Discharge



Declarations

1. Bay Area Compliance Laboratories Corp. (Kunshan) is not responsible for authenticity of any test data provided by the applicant. Test data from the applicant that may affect test results are marked with an asterisk “★”. The model number, product name, address, trademark, etc. from the applicant are not considered as test data.
2. Unless otherwise stated, the results shown in this test report refer only to the sample(s) tested.
3. Unless required by the rule provided by the applicant or product regulations, then decision rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor $k=2$ with the 95.45% confidence interval.
5. This report cannot be reproduced except in full, without prior written approval of Bay Area Compliance Laboratories Corp. (Kunshan).
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*******END OF REPORT*******