EN 55032:2015+A1:2020
EN 55035:2017+A11:2020
EN IEC 61000-3-2:2019+A1:2021
EN 61000-3-3:2013+A2:2021

TEST REPORT

For

M5Stack Technology Co., Ltd

5F, Tangwei Stock Commercial Building, Youli Road, Bao'an District, Shenzhen, China

Tested Model: ATOMS3, ATOMS3-LITE

Report Type:	**Product Name:**
Original Report	M5ATOMS3

Project Engineer:	Denny Yang
Report Number:	RSHE220928001-01D
Report Date:	2022-11-07
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	M5Stack Technology Co., Ltd
Tested Model:	ATOMS3, ATOMS3-LITE
Product Name:	M5ATOMS3
Rated Voltage:	DC 5V from type-C USB port
★Highest Operation Frequency	2480 MHz

Note:
1. The highest operating frequency was provided by the applicant.
2. The difference between the two models were explained in the attached declaration letter.

All measurement and test data in this report was gathered from production sample serial number: RSHE220928001-1. (Assigned by BACL (Kunshan). The EUT supplied by the applicant was received on 2022-09-28)

Objective

This test report is prepared for *M5Stack Technology Co., Ltd* in accordance with

EN 55032: Electromagnetic compatibility of multimedia equipment - Emission requirements.

EN 55035: Electromagnetic compatibility of multimedia equipment - Immunity requirements.

EN IEC 61000-3-2, Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase), and also in accordance with EN 61000-3-3, 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 compliance with EN 55032, EN 55035, EN IEC 61000-3-2 and EN 61000-3-3.

Test Methodology

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 16-1-2:2014+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 16-1-4:2019+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 16-2-1:2014+COR1:2020 Specification for radio disturbance and immunity measuring apparatus and methods–Part 2-1: Methods of measurement of disturbance 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

Description of Test Configuration

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

Test mode 1: Active mode

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.

Equipment Software

No software was used to test.

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

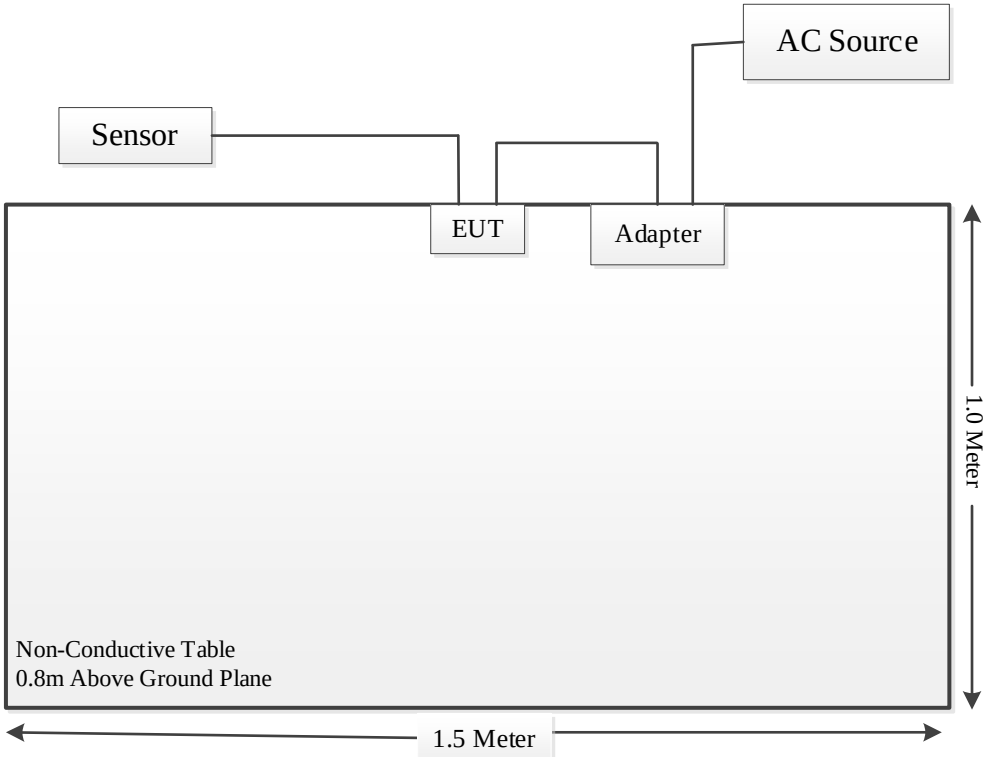
Manufacturer	Description	Model	Serial Number
Unknown	Sensor	N/A	N/A
DELL	Adapter	DA180PM111	N/A

External I/O Cable

Cable Description	Length (m)	From Port	To Port
Power Cable 1	1.5	Adapter	AC Source
Power Cable 2	1.0	Adapter	EUT
Signal Cable	1.5	EUT	Sensor

Configuration of Radiation Test Setup

Test mode 1:



SUMMARY OF TEST RESULTS

EN 55032		
Clause	**Description**	**Results**
§ 5	Requirements Refer to Annex A A.3 Requirements for conducted emissions	Compliant
§ 5	Requirements Refer to Annex A A.2 Requirements for radiated emissions	Compliant
EN 55035		
Clause	**Description**	**Results**
§4.2.1	Electrostatic discharges (IEC 61000-4-2)	Compliant
§4.2.2.2	Continuous RF electromagnetic field disturbances (IEC 61000-4-3)	Compliant
§4.2.4	Electrical fast transients/burst (IEC 61000-4-4)	Compliant
§4.2.5	Surges (IEC 61000-4-5)	Compliant
§4.2.2.3	Continuous induced RF disturbances (IEC 61000-4-6)	Compliant
§4.2.3	Power frequency magnetic field (IEC 61000-4-8)	Compliant
§4.2.6	Voltage dips and interruptions (IEC 61000-4-11)	Compliant
EN IEC 61000-3-2		
Clause	**Description**	**Results**
§6, §7	Harmonic Current Emissions	Not Applicable (See Note)
EN 61000-3-3		
Clause	**Description**	**Results**
§5, §6	Voltage Fluctuations and Flicker	Compliant

Note: The 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	2022-06-24	2023-06-23
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
Narda	6dB Attenuator	773-6	10690812-2-2	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
Radiated Emissions Chamber 2#（Above 1 GHz）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207/040	2022-06-23	2023-06-22
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2020-07-15	2023-07-14
A.H.Systems,inc	Amplifier	PAM-0118P	512	2022-08-15	2023-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2022-08-15	2023-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2022-08-15	2023-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2022-08-15	2023-08-14
Rohde & Schwarz	Test Software	EMC32	100361	N/A	N/A
Voltage Fluctuations 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
Continuous induced RF disturbances or Injected currents					
Agilent	Signal Generator	8648C	3537A01810	2022-06-24	2023-06-23
COM-POWER	CDN	CDN M225E	511098	2022-07-25	2023-07-24
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
Continuous RF electromagnetic field disturbances					
Agilent	Signal Generator	E4428C	MY49070179	2022-06-23	2023-06-22
Agilent	Power Meter	E4419B	MY41291878	2022-06-23	2023-06-22
Agilent	Power Sensor	E9301A	US39211480	2022-06-23	2023-06-22
AR	Trapezoidal Log Periodic Antenna	ATT700M12G	0350307	N/A	N/A
AR	Power Amplifier	200W1000M3A	18062	N/A	N/A
AR	Log-Periodic Antenna	ATL80M1G	0350122	N/A	N/A
AR	Power Amplifier	60S1G6	0369442	N/A	N/A
BACL	Test Software	VEE-RS	N/A	N/A	N/A
Electrostatic discharge (ESD)					
TESEQ	ESD Simulator	NSG 438	1079	2022-06-23	2023-06-22
Electrical fast transients/burst & Surge & Voltage dips and interruptions					
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
Power frequency magnetic field					
EM TEST	Loop Antenna	MS100N	P1334123835	2021-11-13	2022-11-12
EM TEST	Current Transformer	MC2630	P1303109259	2021-11-13	2022-11-12
EM TEST	AC Power Supply	ACS 500N	P1251107475	2022-06-23	2023-06-22

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 55032 §5 REQUIREMENTS, REFER TO ANNEX A A.3 REQUIREMENTS FOR CONDUCTED EMISSIONS

Measurement Uncertainty

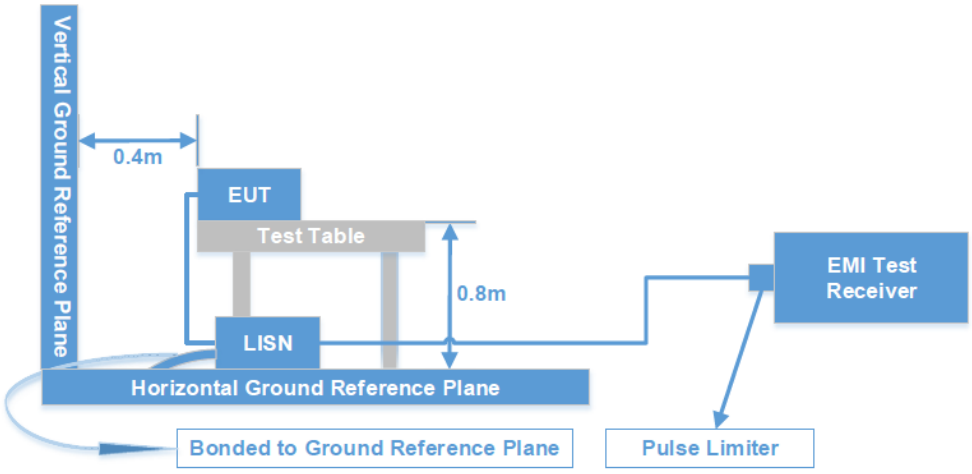
Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

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.

Table 1 - Values of U_{cispr}

Item	Frequency Range	Terminal	Measurement Uncertainty	U_{cispr}
Conducted Emissions	150 kHz~30 MHz	AC Mains	3.19 dB	3.4 dB

EUT Setup



The setup of EUT is according with CISPR 16-2-1:2014+COR1:2020 measurement procedures. The specification used was with the EN 55032 Class B 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.

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

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

If the maximum peak measurement complies with the QP limit and is below the average limit, the QP value and average value measurement need not be performed, only record the maximum peak measured value.

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:

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
Level (dBμV) = Read level (dBμV) + 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:

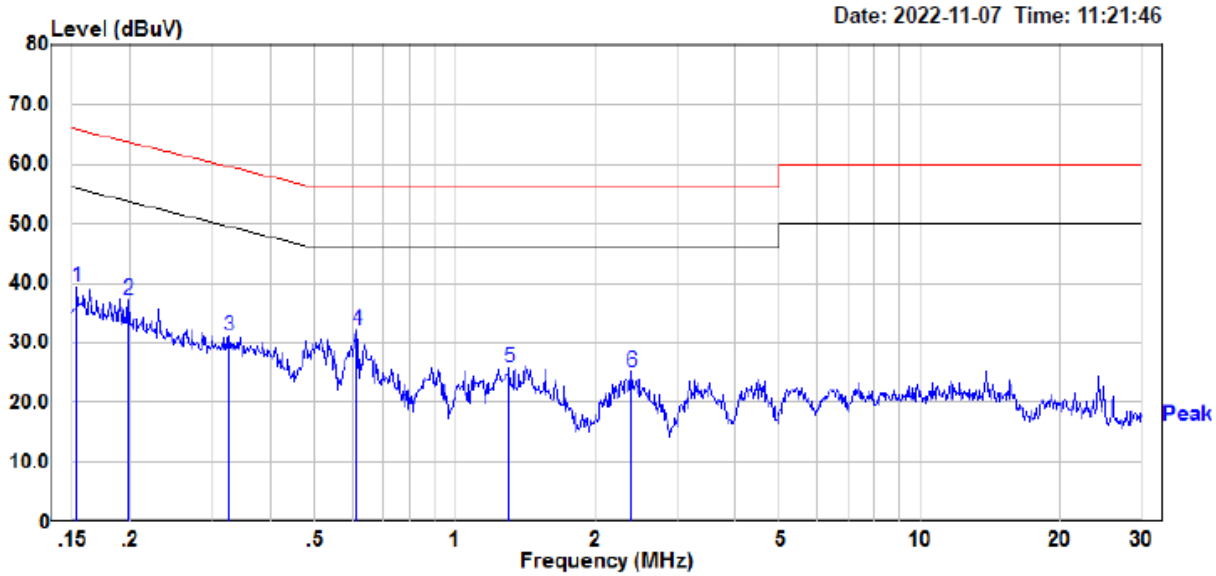
Over Limit (dB) = Level (dBμV) - Limit (dBμV)

Test Data

Environmental Conditions & Test Information

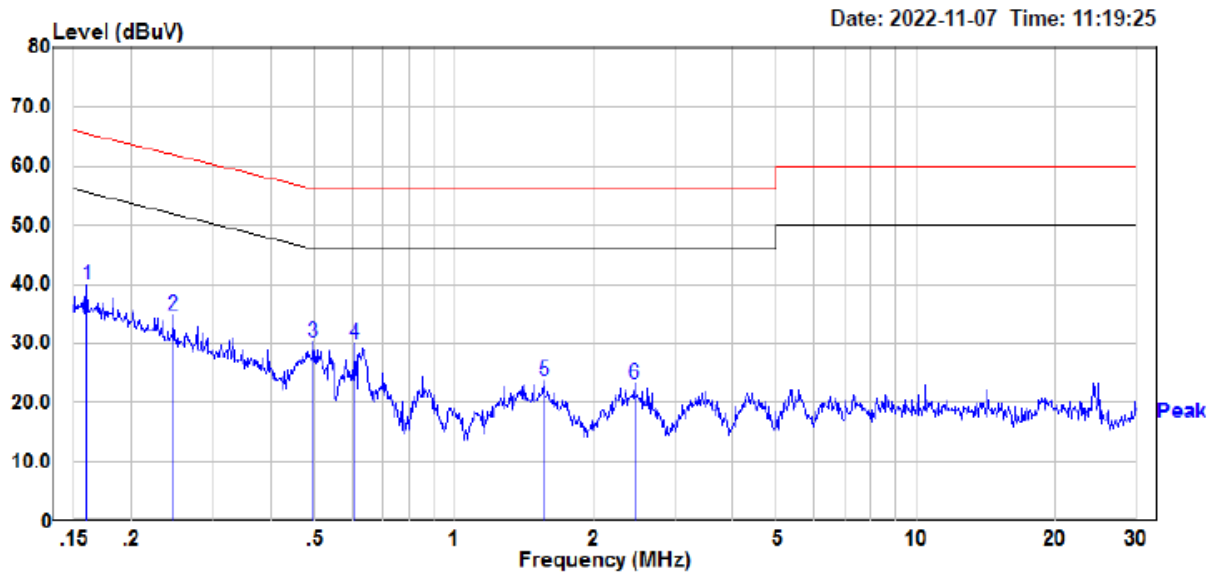
Temperature:	23.7 ℃
Relative Humidity:	37 %
ATM Pressure:	102.3 kPa
Test Date:	2022-11-07
Test Engineer:	Kris Qu

Test mode 1
Model: ATOMS3
Line:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.154	19.24	20.06	39.30	65.79	-26.49	Peak
2	0.198	17.24	20.04	37.28	63.68	-26.40	Peak
3	0.326	11.53	19.77	31.30	59.54	-28.24	Peak
4	0.615	12.65	19.38	32.03	56.00	-23.97	Peak
5	1.311	6.54	19.38	25.92	56.00	-30.08	Peak
6	2.397	5.63	19.43	25.06	56.00	-30.94	Peak

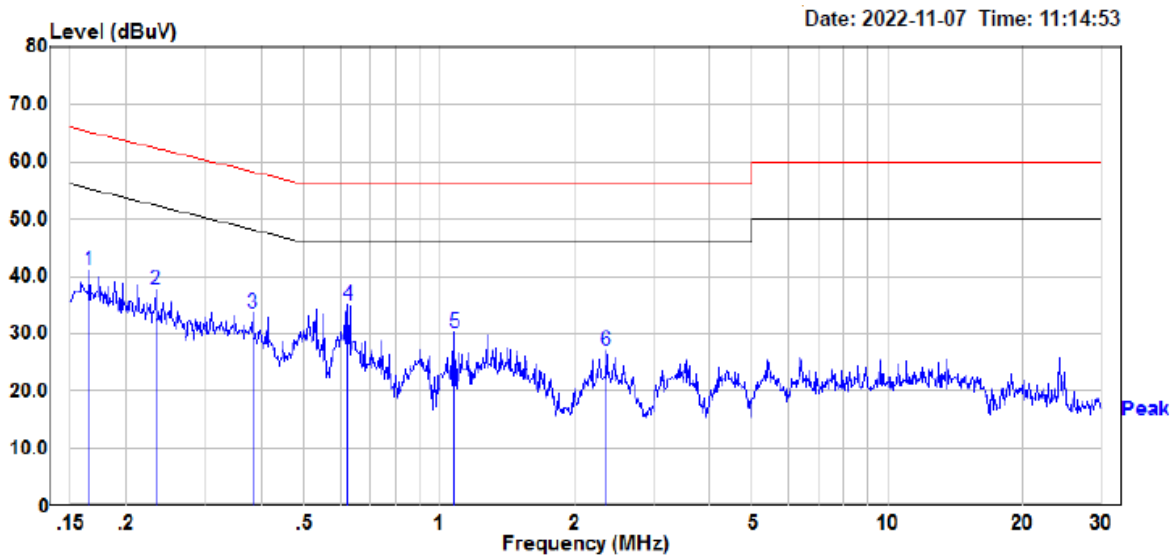
Neutral:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.160	19.85	20.05	39.90	65.46	-25.56	Peak
2	0.247	14.92	19.94	34.86	61.86	-27.00	Peak
3	0.496	10.77	19.40	30.17	56.06	-25.89	Peak
4	0.609	10.60	19.38	29.98	56.00	-26.02	Peak
5	1.569	4.36	19.39	23.75	56.00	-32.25	Peak
6	2.457	3.86	19.43	23.29	56.00	-32.71	Peak

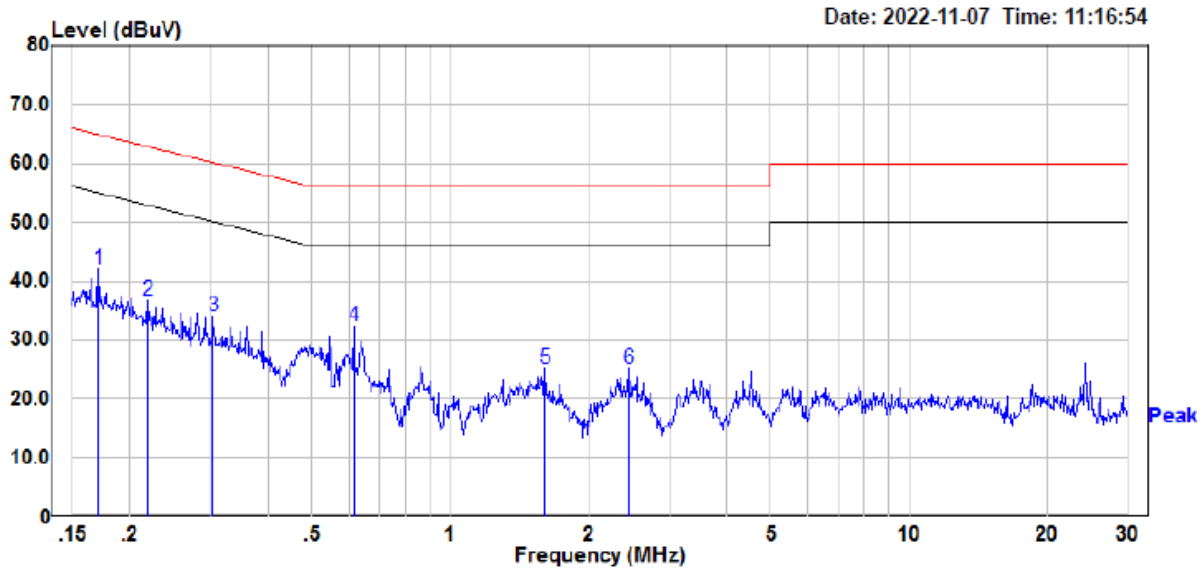
Model: ATOMS3-LITE

Line:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.166	20.93	20.05	40.98	65.17	-24.19	Peak
2	0.233	17.69	19.97	37.66	62.36	-24.70	Peak
3	0.383	14.07	19.64	33.71	58.22	-24.51	Peak
4	0.624	15.62	19.38	35.00	56.00	-21.00	Peak
5	1.080	10.97	19.36	30.33	56.00	-25.67	Peak
6	2.350	7.60	19.43	27.03	56.00	-28.97	Peak

Neutral:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.171	21.92	20.05	41.97	64.92	-22.95	Peak
2	0.219	16.72	20.00	36.72	62.85	-26.13	Peak
3	0.304	14.24	19.82	34.06	60.12	-26.06	Peak
4	0.618	13.03	19.38	32.41	56.00	-23.59	Peak
5	1.609	5.77	19.39	25.16	56.00	-30.84	Peak
6	2.445	5.74	19.43	25.17	56.00	-30.83	Peak

EN 55032 §5 REQUIREMENTS, REFER TO ANNEX A A.2 REQUIREMENTS FOR RADIATED EMISSIONS

Measurement Uncertainty

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

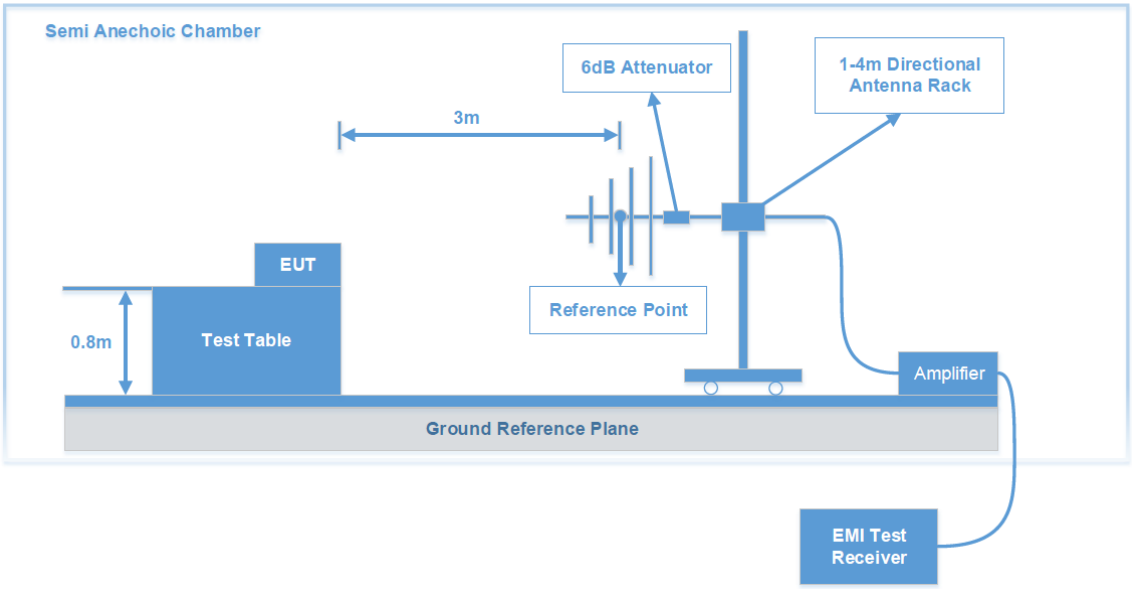
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–Non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of 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.

Table 1 - Values of U_{cispr}

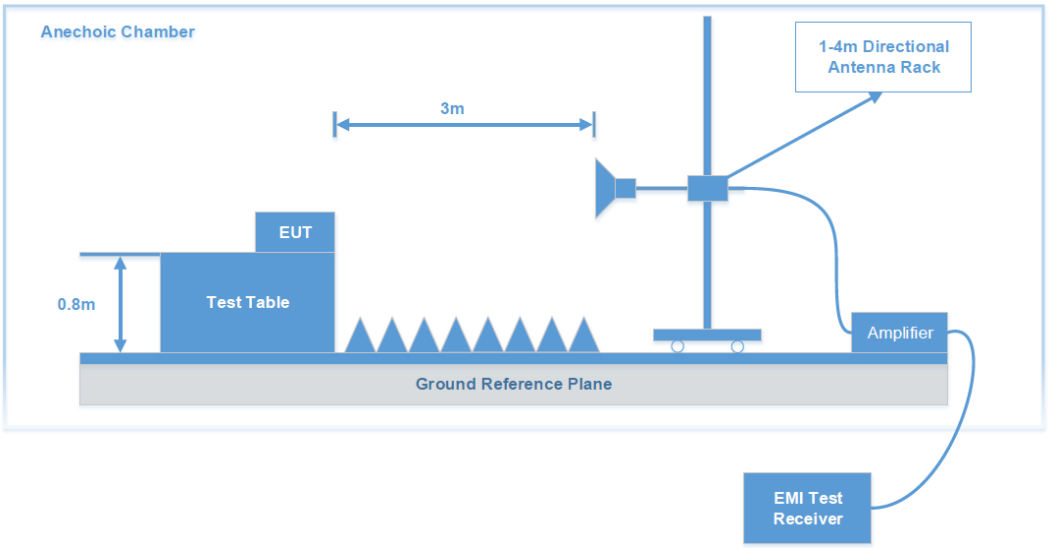
Item	Frequency Range	Measurement Uncertainty	U_{cispr}
Radiated Emissions	30 MHz~1 GHz	6.11dB	6.3 dB
	1 GHz~6 GHz	4.45dB	5.2 dB

Test System Setup

Below 1 GHz:



Above 1 GHz:



Radiated Top View:

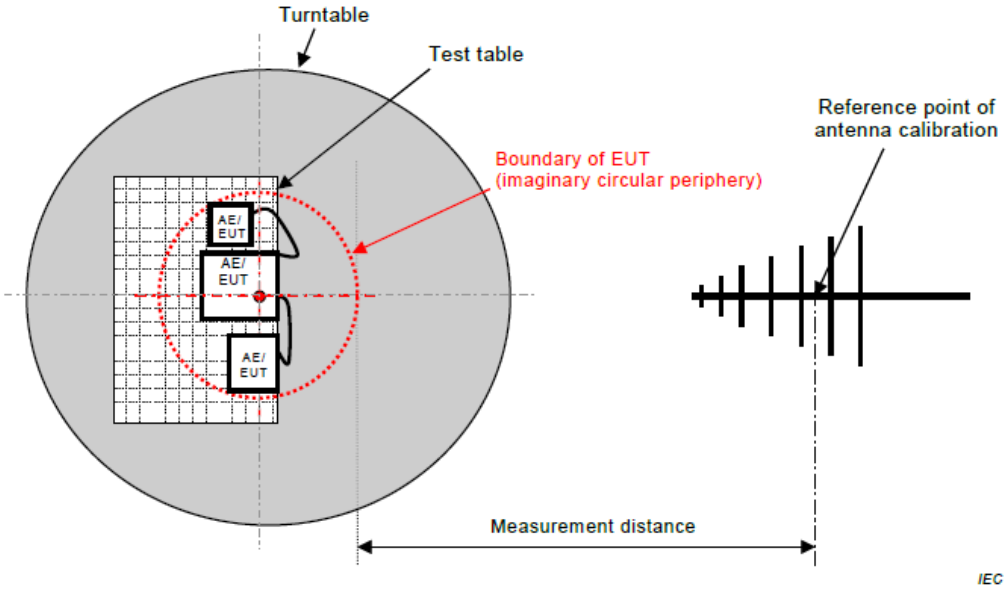


Figure C.1 – Measurement distance

The radiated emission tests below 1GHz were performed in the 3 meters chamber test site, above 1GHz were performed in the 3 meters chamber test site, using the setup accordance with CISPR 16-1-4:2019+A1:2020, CISPR 16-2-3:2016+A1:2019. The specification used was EN 55032 Class B 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 of the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

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

Frequency Range	RBW	VBW	Detector
30MHz – 1000 MHz	120 kHz	300 kHz	QP
Above 1 GHz	1 MHz	3 MHz	Peak
	1 MHz	3 MHz	AV

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:

Corrected Amplitude (dBμV/m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - 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:

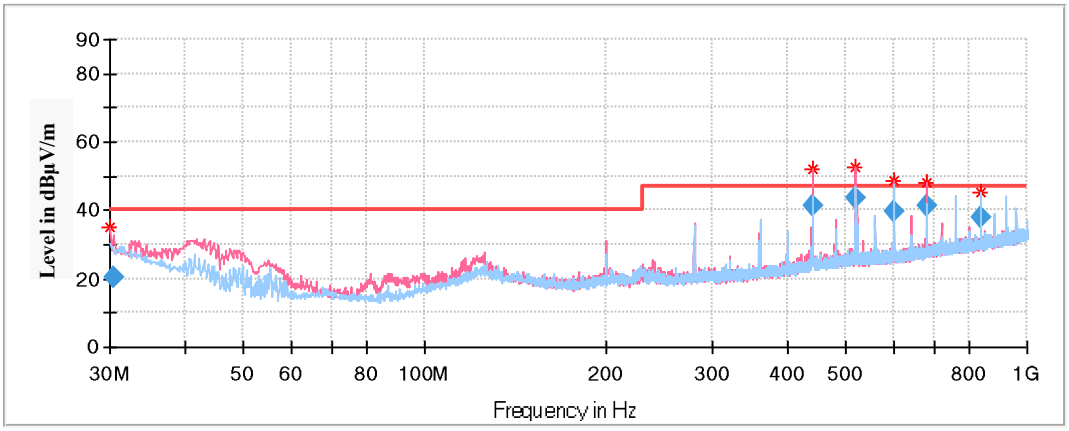
Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV/m)

Test Data

Environmental Conditions & Test Information

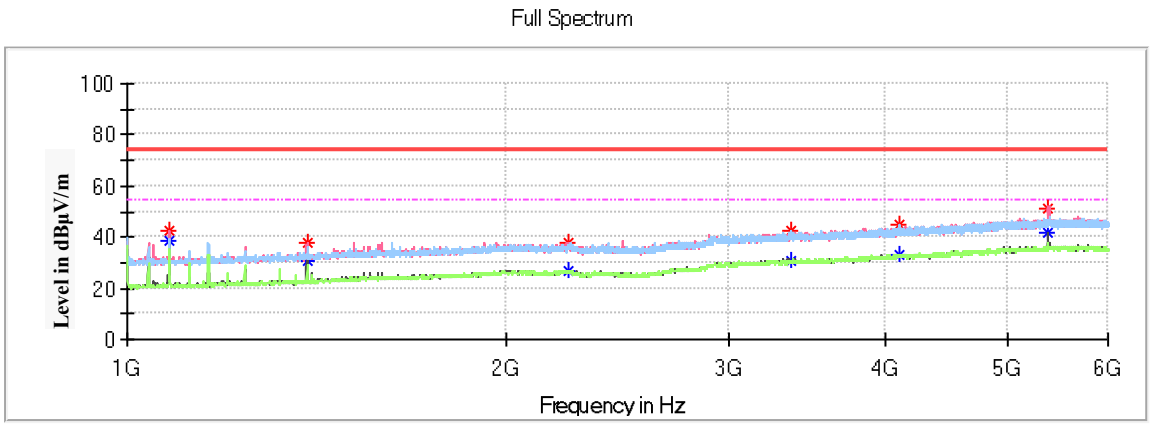
Test Frequency Range:	Below 1 GHz	Above 1 GHz
Temperature:	25.1 ℃	22.3 ℃
Relative Humidity:	52 %	48 %
ATM Pressure:	102.1 kPa	102.1 kPa
Test Date:	2022-10-18	2022-10-14
Test Engineer:	Mecal He	Rick Dai

Test mode 1:
Model: ATOMS3
30 MHz-1 GHz



Frequency (MHz)	Corrected Amplitude Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.436500	20.11	40.00	19.89	100.0	V	248.0	-3.7
440.159250	41.44	47.00	5.56	200.0	V	14.0	-7.3
520.098750	43.67	47.00	3.33	200.0	V	19.0	-5.5
599.880150	39.48	47.00	7.52	100.0	V	326.0	-4.9
680.083350	41.21	47.00	5.79	100.0	V	176.0	-3.1
840.193950	37.72	47.00	9.28	100.0	H	263.0	-0.7
30.436500	20.11	40.00	19.89	100.0	V	248.0	-3.7
440.159250	41.44	47.00	5.56	200.0	V	14.0	-7.3
520.098750	43.67	47.00	3.33	200.0	V	19.0	-5.5

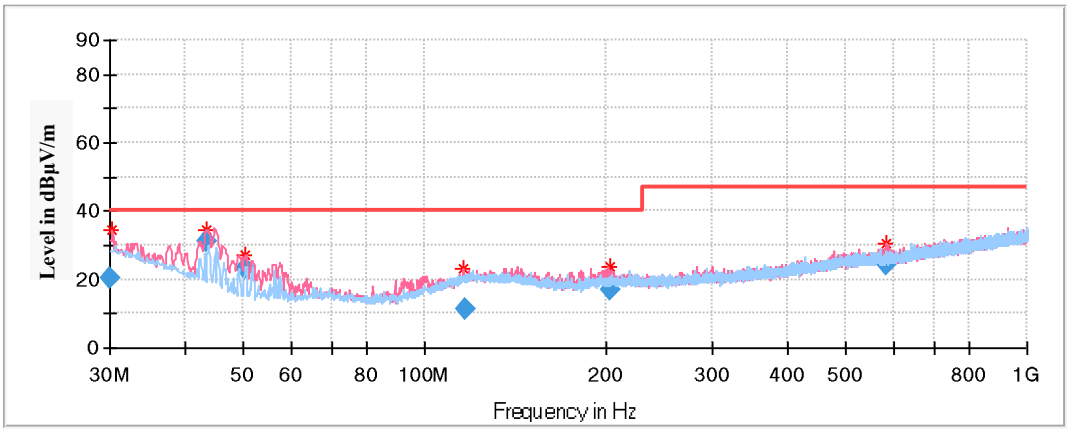
Above 1 GHz:



Frequency (MHz)	Corrected Amplitude		Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
	Max Peak (dBµV/m)	Average (dBµV/m)						
1079.500000	42.68	---	74.00	31.32	200.0	V	39.0	-15.4
1079.500000	---	38.49	54.00	15.51	200.0	V	39.0	-15.4
1389.500000	38.00	---	74.00	36.00	200.0	V	359.0	-13.4
1389.500000	---	30.78	54.00	23.22	200.0	V	359.0	-13.4
2242.000000	---	26.40	54.00	27.60	100.0	H	0.0	-9.8
2242.000000	37.48	---	74.00	36.52	100.0	H	0.0	-9.8
3360.500000	---	30.41	54.00	23.59	200.0	V	335.0	-5.5
3360.500000	42.25	---	74.00	31.75	200.0	V	335.0	-5.5
4105.500000	---	32.74	54.00	21.26	100.0	V	68.0	-3.0
4105.500000	44.83	---	74.00	29.17	100.0	V	68.0	-3.0
5383.500000	51.07	---	74.00	22.93	100.0	V	0.0	0.8
5383.500000	---	41.54	54.00	12.46	100.0	V	0.0	0.8

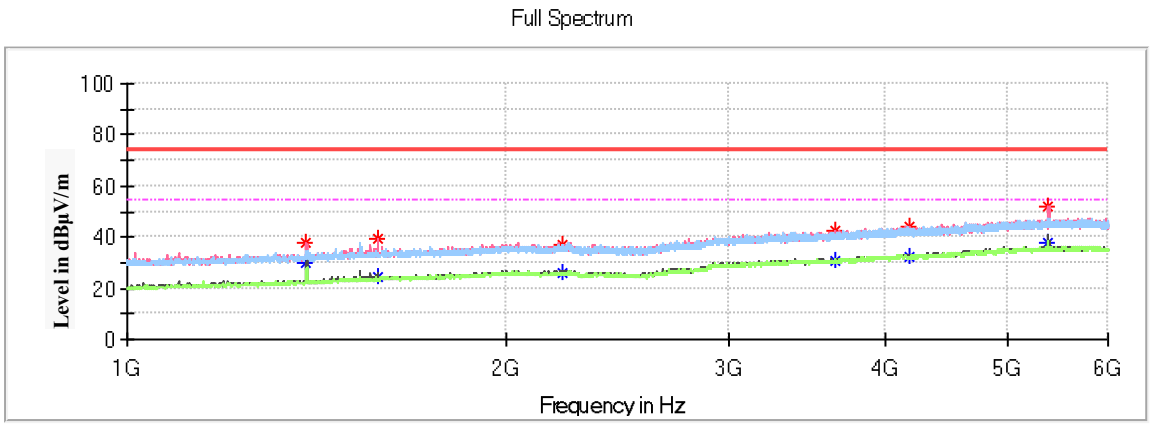
Model: ATOMS3-LITE

30 MHz-1 GHz



Frequency (MHz)	Corrected Amplitude Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.075912	20.49	40.00	19.51	100.0	V	248.0	-3.5
43.499350	30.95	40.00	9.05	100.0	V	127.0	-12.6
50.362200	23.35	40.00	16.65	100.0	V	291.0	-17.1
116.525700	11.11	40.00	28.89	100.0	V	17.0	-11.9
202.375500	17.01	40.00	22.99	100.0	V	221.0	-12.3
585.380950	24.33	47.00	22.67	100.0	V	352.0	-5.0

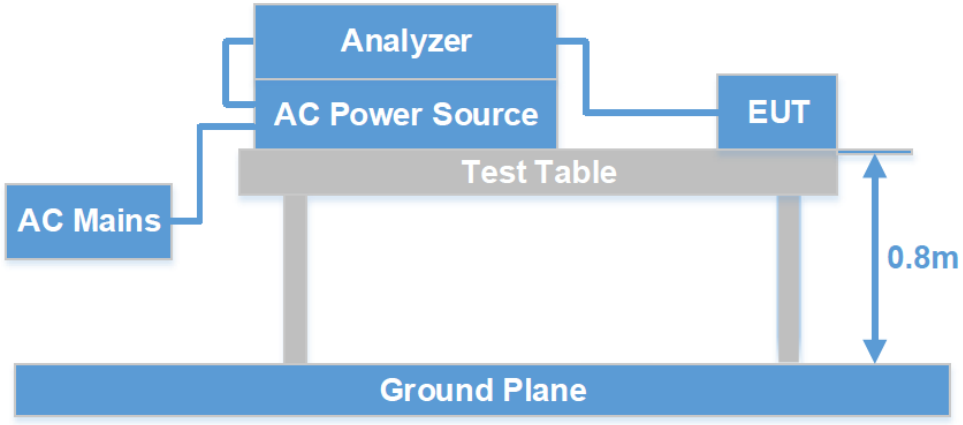
Above 1 GHz:



Frequency (MHz)	Corrected Amplitude		Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
	Max Peak (dBµV/m)	Average (dBµV/m)						
1388.000000	37.96	---	74.00	36.04	100.0	V	9.0	-13.4
1388.000000	---	29.95	54.00	24.05	100.0	V	9.0	-13.4
1581.500000	---	24.53	54.00	29.47	200.0	V	319.0	-12.2
1581.500000	39.44	---	74.00	34.56	200.0	V	319.0	-12.2
2215.000000	---	26.09	54.00	27.91	100.0	V	286.0	-9.9
2215.000000	37.29	---	74.00	36.71	100.0	V	286.0	-9.9
3642.000000	---	30.66	54.00	23.34	100.0	V	197.0	-4.6
3642.000000	42.90	---	74.00	31.10	100.0	V	197.0	-4.6
4167.500000	---	32.17	54.00	21.83	100.0	H	225.0	-2.8
4167.500000	44.28	---	74.00	29.72	100.0	H	225.0	-2.8
5383.500000	---	37.85	54.00	16.15	100.0	V	224.0	0.8
5383.500000	52.28	---	74.00	21.72	100.0	V	224.0	0.8

EN 61000-3-3 VOLTAGE FLUCTUATION 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 Pst shall not be greater than 1,0;
– the value of Plt shall not be greater than 0,65;
–the Tmax, 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, dc, shall not exceed 3,3 %;
– the maximum relative voltage change dmax, shall not exceed
a) 4 % without additional conditions;
b) 6 % for equipment which is:
– switched manually;
– 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:	22.4 ℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-25
Test Engineer:	Max Min

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
Model:	ATOMS3

Maximum Flicker Results

Parameter	EUT values	Limit	Result
Pst	0.076	1.00	PASS
Plt	0.033	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.318	4.00	PASS
Tmax [s]	0.000	0.50	PASS

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
Model:	ATOMS3-LITE

Maximum Flicker Results

Parameter	EUT values	Limit	Result
Pst	0.070	1.00	PASS
Plt	0.031	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.200	4.00	PASS
Tmax [s]	0.000	0.50	PASS

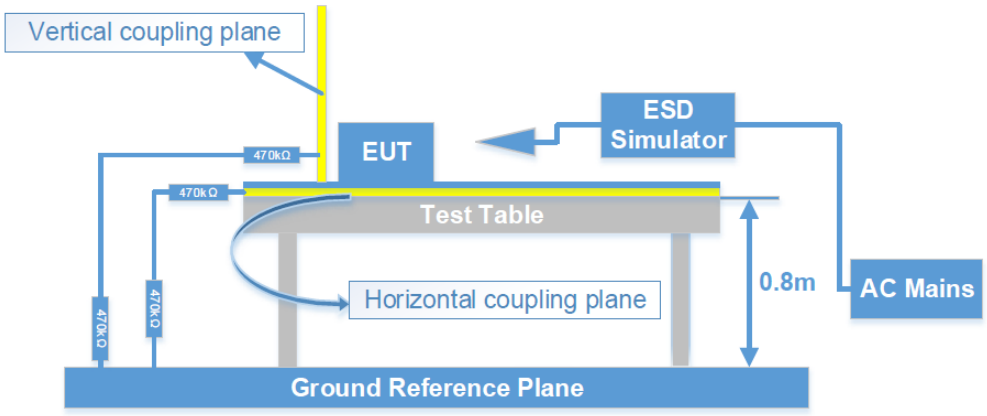
EN 55035 §4.2.1 ELECTROSTATIC DISCHARGE (ESD)

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-2) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	≤ 15%	15%
Peak current I_p	≤ 7%	6.30%
Current at 30 ns	≤ 7%	6.30%
Current at 60 ns	≤ 7%	6.30%

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 an 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 55035:2017+A11:2020 (IEC 61000-4-2:2008)

Test Level

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

Performance criteria: 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 50 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 0.1 m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane:

At least 50 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:	26.5 ℃
Relative Humidity:	48 %
ATM Pressure:	101.5 kPa
Test Date:	2022-09-28
Test Engineer:	Jack Liu

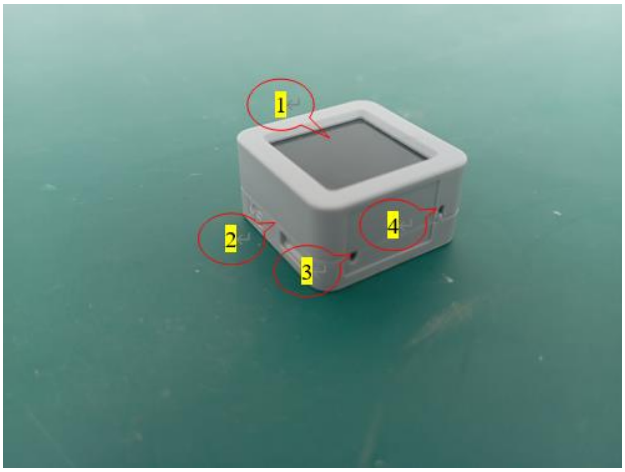
Test mode 1:

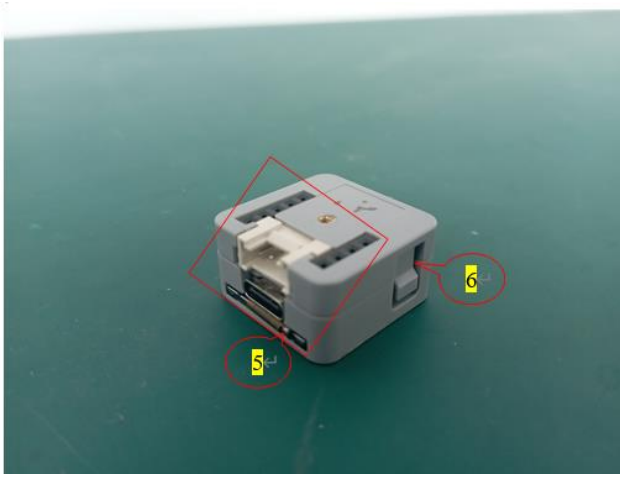
Model: ATOMS3

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**
1~6	A	A	A	A	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	A	A	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/
Right Side	A	A	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	A	A	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/

Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.

Test point as follows:



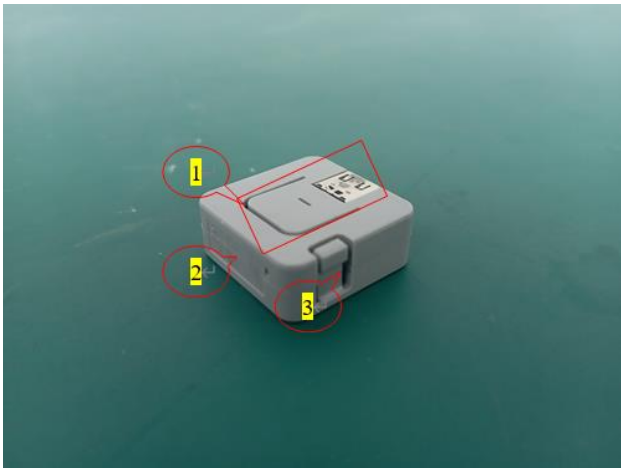


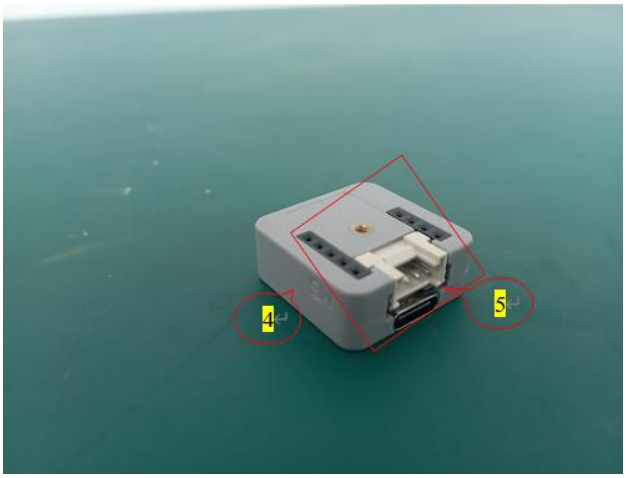
Model: ATOMS3-LITE

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**
1~5	A	A	A	A	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	A	A	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/
Right Side	A	A	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	A	A	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/

Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.

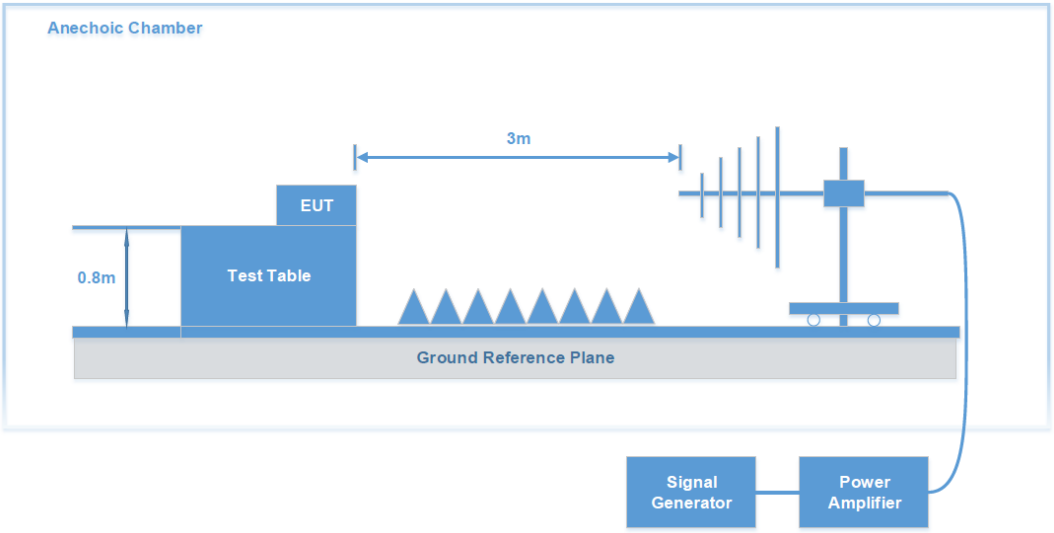
Test point as follows:





EN 55035 §4.2.2.2 CONTINUOUS RF ELECTROMAGNETIC FIELD DISTURBANCES

Test System Setup



Test Standard

EN 55035:2017+A11:2020 (IEC 61000-4-3:2020)

Test Level

Level	Field Strength (V/m)
1.	1
2.	3
3.	10
X.	Special

Performance criteria: A

Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor the EUT.

All the scanning conditions are as follows:

Condition of Test	**Remarks**
Field Strength	3 V/m
Radiated Signal	AM 80%, 1kHz sin wave
Scanning Frequency	80 - 1000 MHz
Spotting Frequency	1800MHz, 2600MHz, 3500MHz, 5000MHz
Dwell Time	3 Sec.
Test step	1%

Test Data

Environmental Conditions & Test Information

Temperature:	22.4 ℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-25
Test Engineer:	Jay Liu

Test mode 1:

3V/m:

Frequency Range (MHz)	**Front Side**		**Rear Side**		**Left Side**		**Right Side**	
	VERT	**HORI**	**VERT**	**HORI**	**VERT**	**HORI**	**VERT**	**HORI**
80-1000	A	A	A	A	A	A	A	A
1800	A	A	A	A	A	A	A	A
2600	A	A	A	A	A	A	A	A
3500	A	A	A	A	A	A	A	A
5000	A	A	A	A	A	A	A	A

Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.

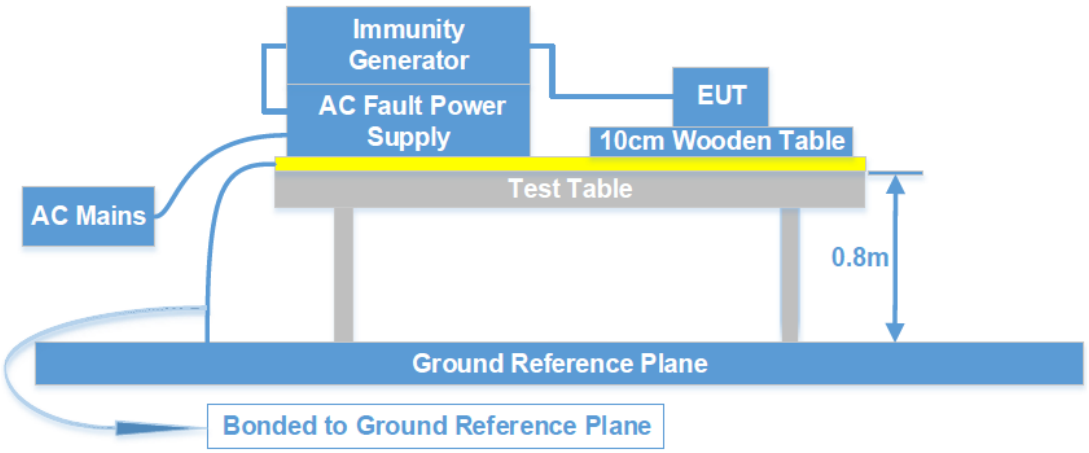
EN 55035 §4.2.4 ELECTRICAL FAST TRANSIENT/BUSRST (EFT/B)

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-4) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	6.20%	6.20%
Peak voltage value V_p	8.60%	8.60%
Voltage pulse width t_w	5.90%	5.90%

Test System Setup



Test Standard

EN 55035:2017+A11:2020 (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 meter 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:	22.4 ℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-25
Test Engineer:	Jack Liu

Test mode 1:

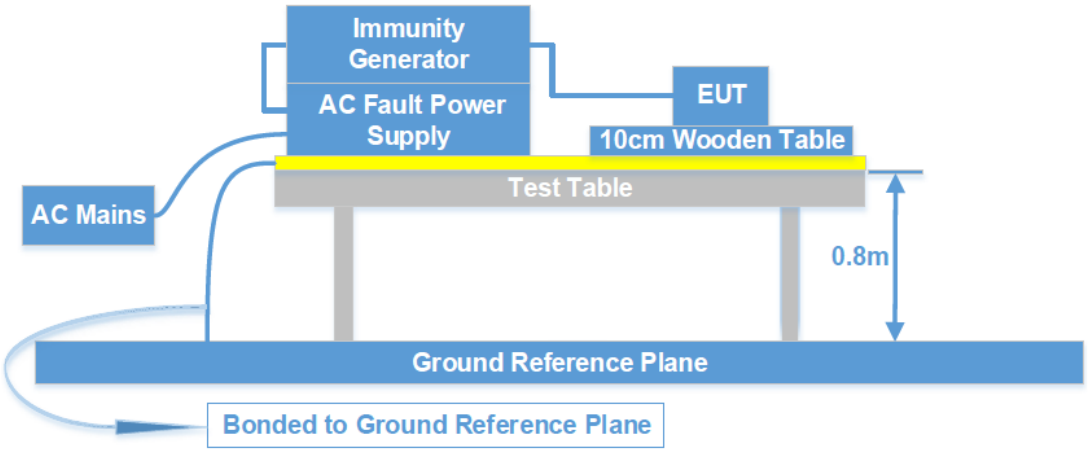
Model: ATOMS3&ATOMS3-LITE

Test Ports		**Test Levels (kV) Repetition frequency(5kHz)**							
		+0.5	**-0.5**	**+1.0**	**-1.0**	**+2.0**	**-2.0**	**+3.0**	**-3.0**
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, and after test, no degradation of performance, no loss of function.

EN 55035 §4.2.5 SURGES

Test System Setup



Test Standard

EN 55035:2017+A11:2020 (IEC 61000-4-5:2014+A1:2017)

Test Level

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

Test Procedure

1) For line to line coupling mode, provide a 1 kV 1.2/50us voltage surge (at open-circuit condition).
2) At least 5 positive and 5 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:	22.4 ℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-25
Test Engineer:	Jack Liu

Test mode 1:

Model: ATOMS3&ATOMS3-LITE

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	A	A	/	/	/	/
	L - PE	/	/	/	/	/	/	/	/
	N - PE	/	/	/	/	/	/	/	/
Signal port	/	/	/	/	/	/	/	/	/

Note:
1. “A” stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.

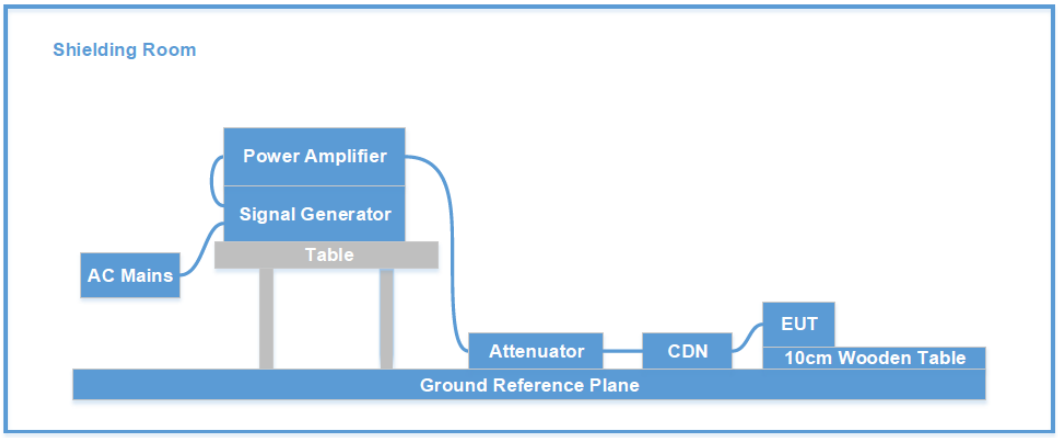
EN 55035 §4.2.2.3 CONTINUOUS INDUCED RF DISTURBANCES

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-6) please refer to the following:

Parameter	U_{EN}	U_{lab}
CDN calibration process	1.27 dB	1.27 dB
CDN test process	1.36 dB	1.36 dB

Test Setup



Test Standard

EN 55035:2017+A11:2020 (IEC 61000-4-6:2013+COR1:2015)

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 80 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*10-3decades/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:	22.4℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	Jack Liu
Test Engineer:	2022-10-25

Test mode 1:

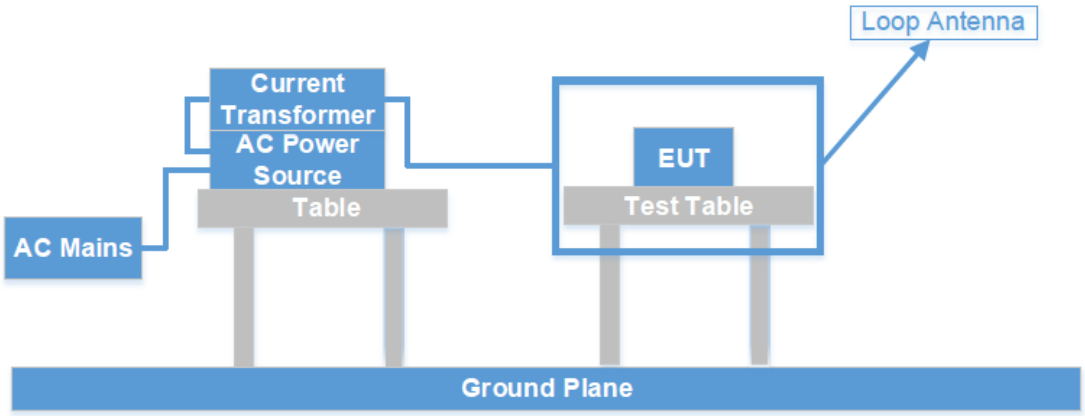
Model: ATOMS3&ATOMS3-LITE

Test Ports	Test equipment	Frequency Range (MHz)	Voltage Level (e.m.f.) U0			
			1V	3V	10V	3V~1V
AC Mains power input ports	CDN M225E	0.15-10	/	A	/	/
		10-30	/	/	/	A
		30-80	A	/	/	/

Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.

EN 55035 §4.2.3 POWER FREQUENCY MAGNETIC FIELD

Test Setup



Test Standard

EN 55035:2017+A11:2020 (IEC 61000-4-8:2009)

Test Level

Level	Magnetic Field Strength (A/m)
1	1
2	3
3	10
4	30
5	100
X.	Special

Performance Criteria: A

Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1 m*1 m). The induction coil shall then be rotated by 90º in order to expose the EUT to the test field with different orientations.

Test Data

Environmental Conditions & Test Information

Temperature:	22.4 ℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-25
Test Engineer:	Jay Liu

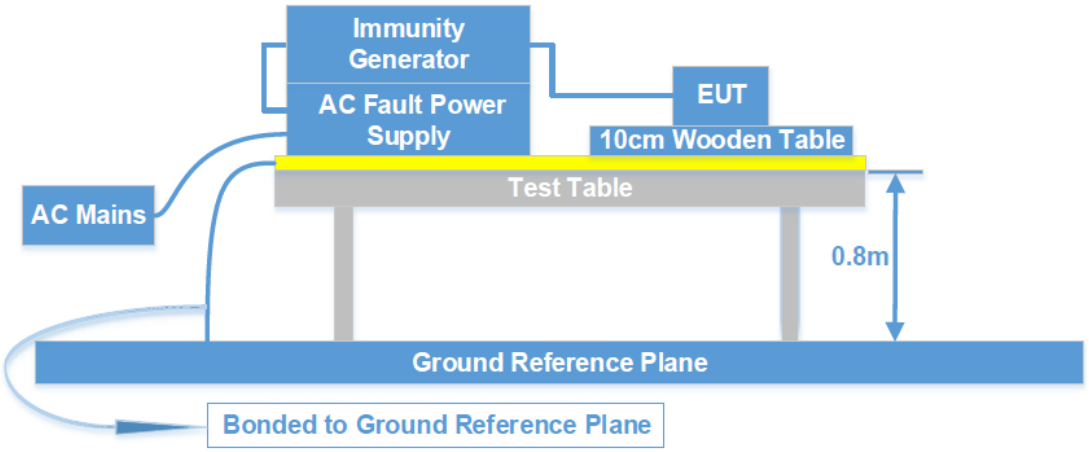
Test mode 1:

Level	Magnetic Field Strength (A/m)	X (Horizontal)	Y (Vertical)	Z (Special)
1	1	A	A	A
2	3	/	/	/
3	10	/	/	/
4	30	/	/	/
5	100	/	/	/
X	Special	/	/	/

Note: “A” stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.

EN 55035 §4.2.6 VOLTAGE DIPS AND INTERRUPTIONS

Test Setup



Test Standard

EN 55035:2017+A11:2020 (IEC 61000-4-11:2020+COR1:2020)

Test levels and Performance Criterion

No.	Test Level	Cycle	Performance criterion
1	Voltage dips: <5 % residual voltage	0.5	B
2	Voltage dips: 70 % residual voltage	25 for 50 Hz 30 for 60 Hz	C
3	Voltage interruptions: <5 % residual voltage	250 for 50 Hz 300 for 60 Hz	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:	22.4 ℃
Relative Humidity:	37 %
ATM Pressure:	102.4 kPa
Test Date:	2022-10-25
Test Engineer:	Jack Liu

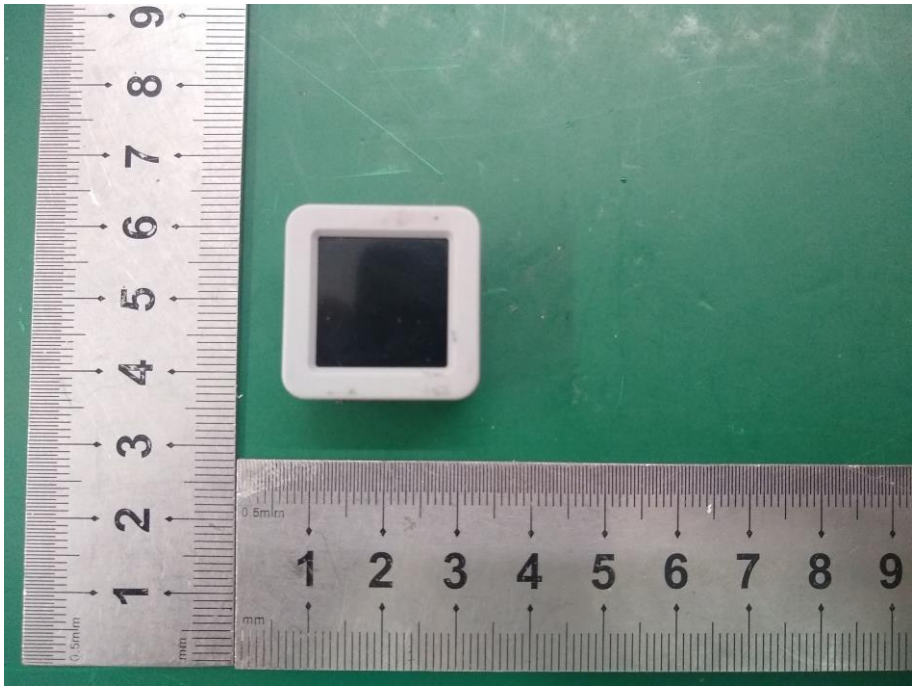
Test mode 1:

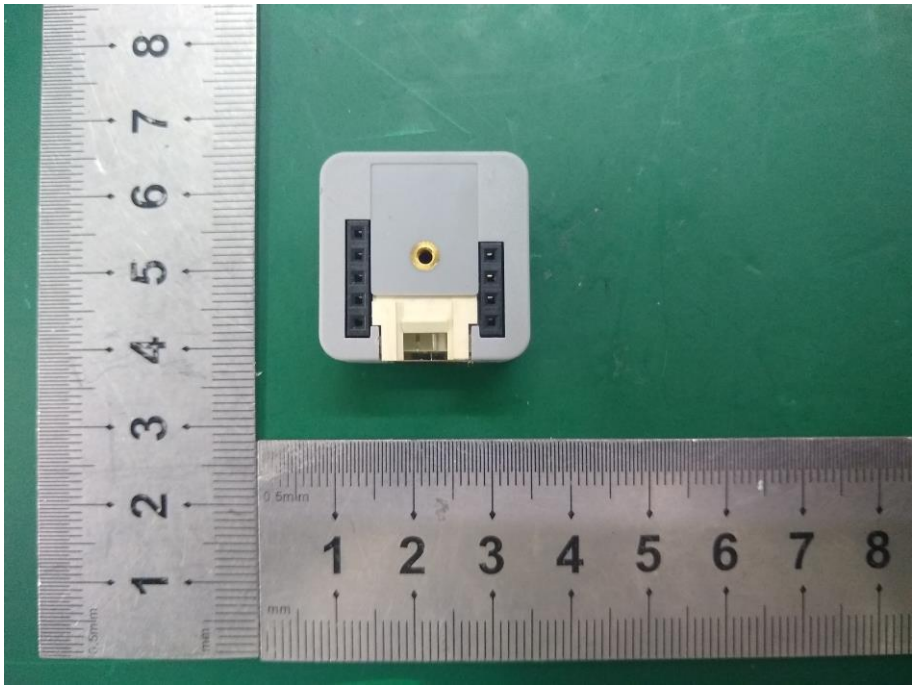
Test Level	Cycle	Phase Angle	Result
Voltage dips: <5 % residual voltage	0.5	0º/90º/180º/270º	A
Voltage dips: 70 % residual voltage	25	0º/90º/180º/270º	A
Voltage interruptions: <5 % residual voltage	250	0º/90º/180º/270º	C

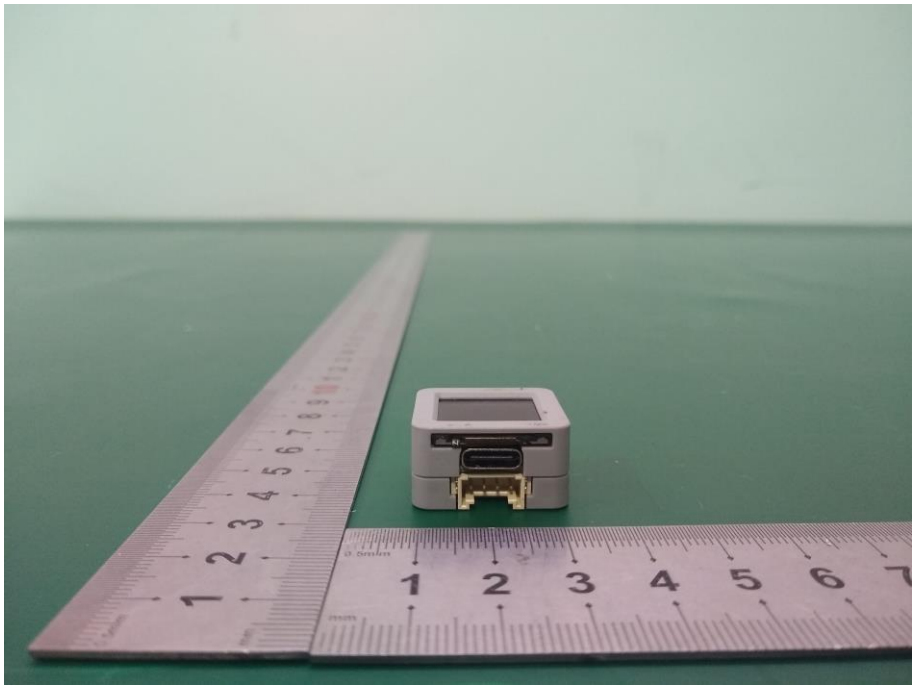
Note:
"A" stands for, during test, operate as intended no loss of function, no degradation of performance, and after test, no degradation of performance, no loss of function.
"C" stands for, the EUT stops working during the test. Manually restore the working status after the test.

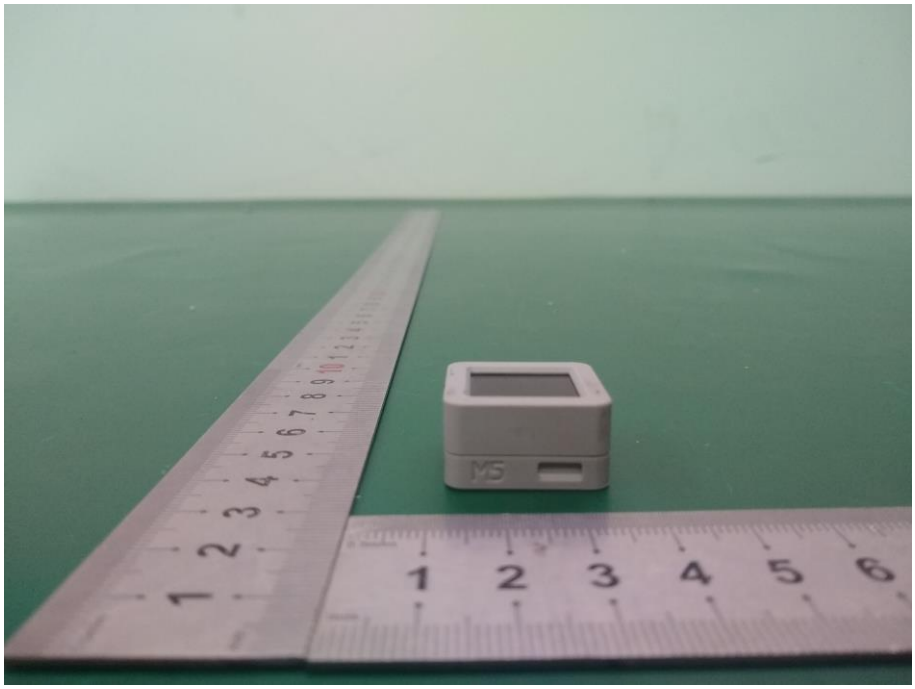
EXHIBIT A - EUT PHOTOGRAPHS

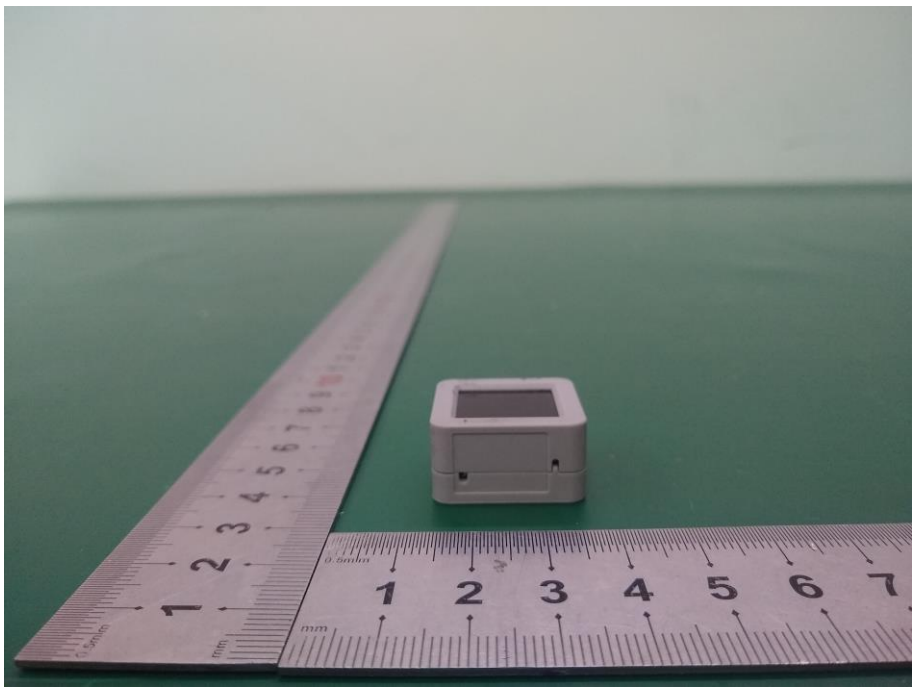
Model: ATOMS3

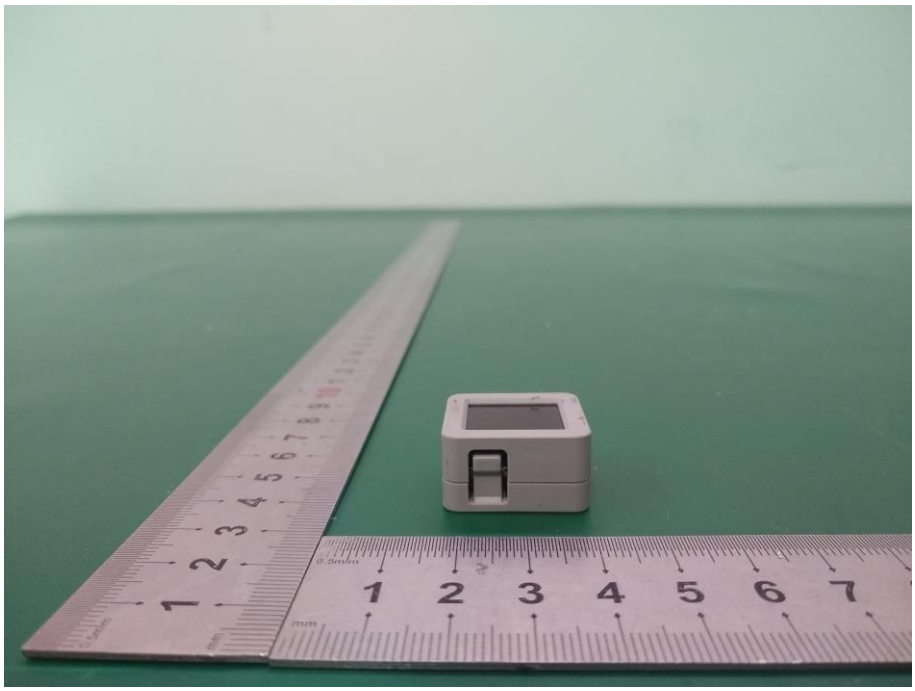


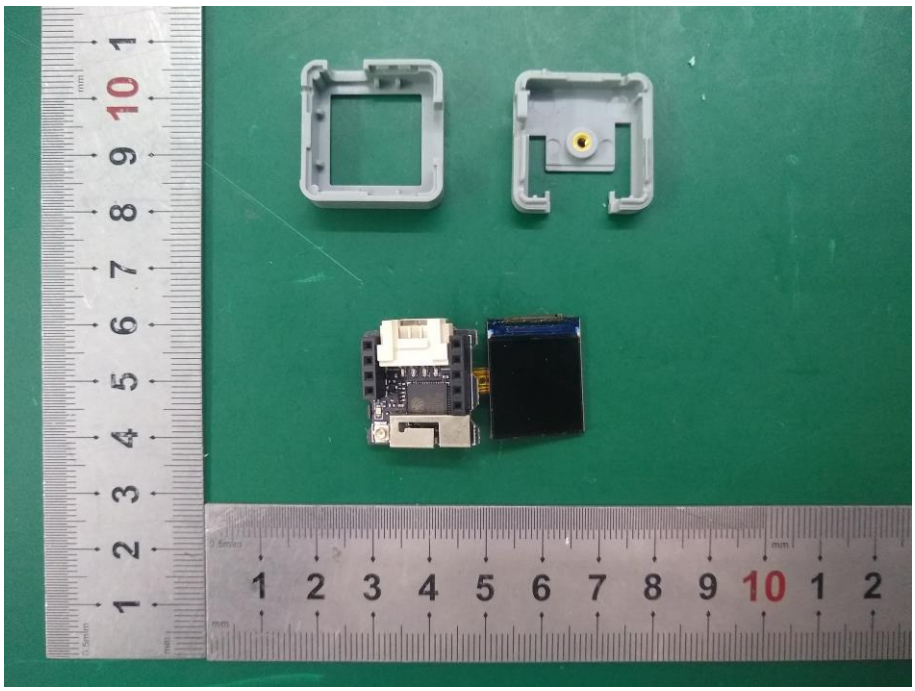


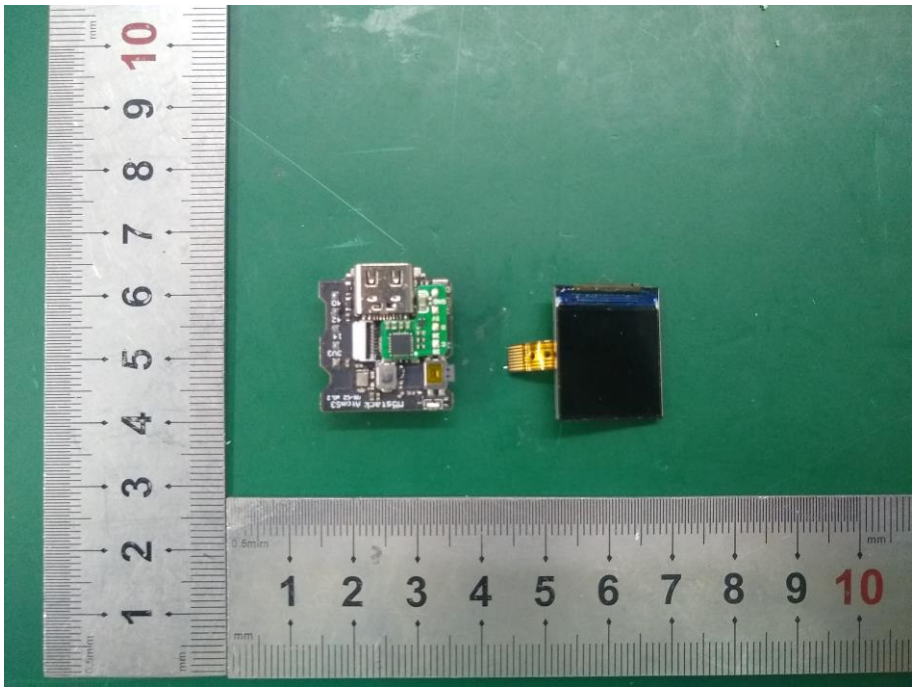


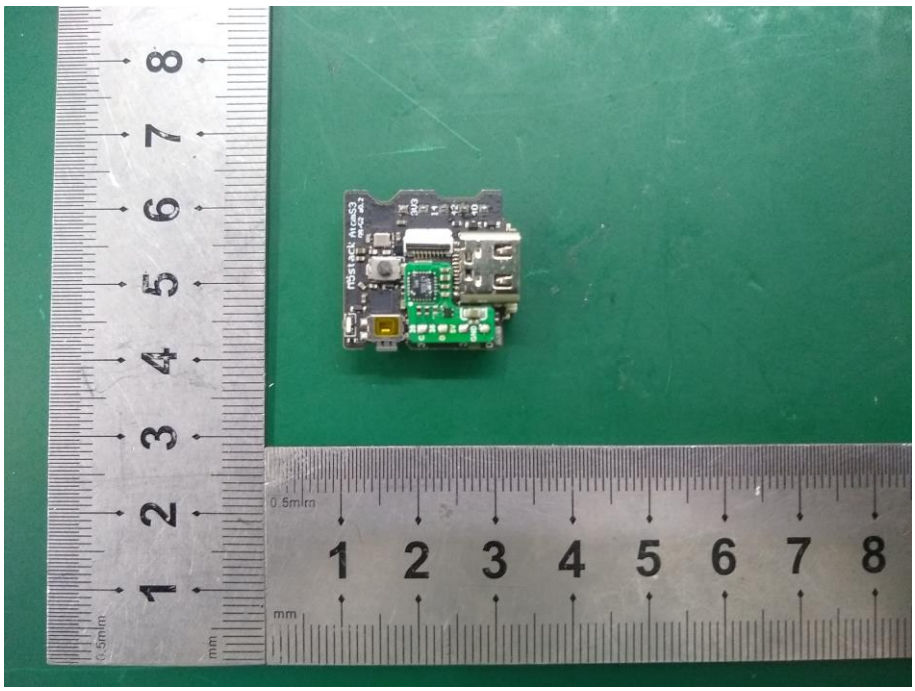


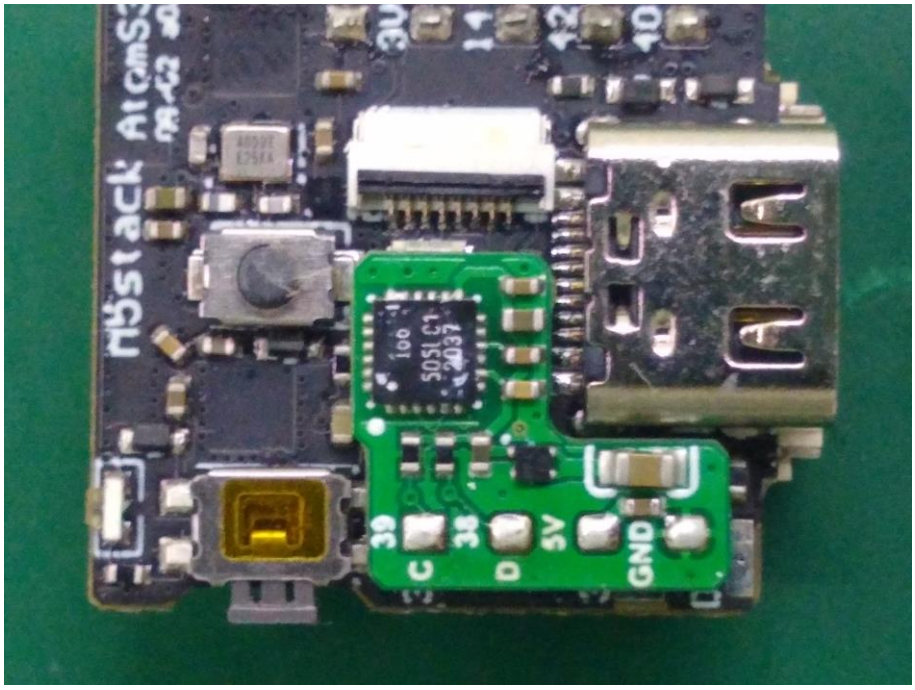


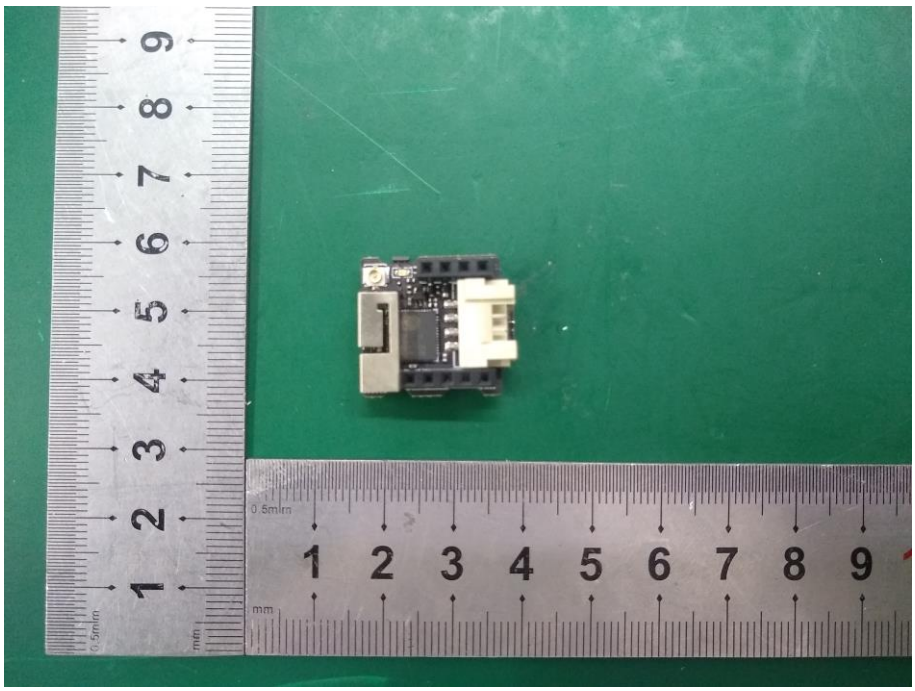


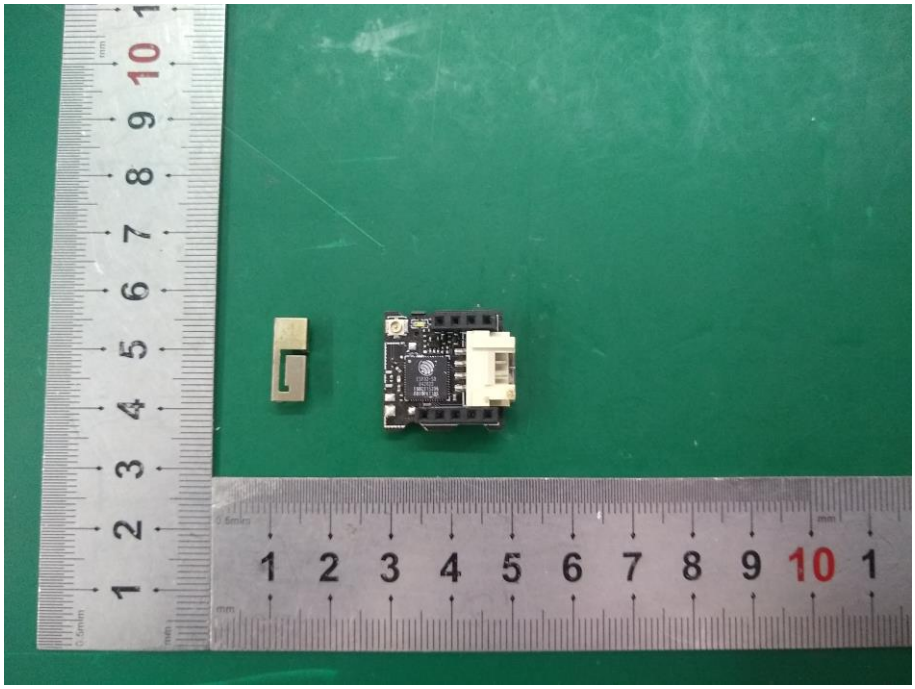


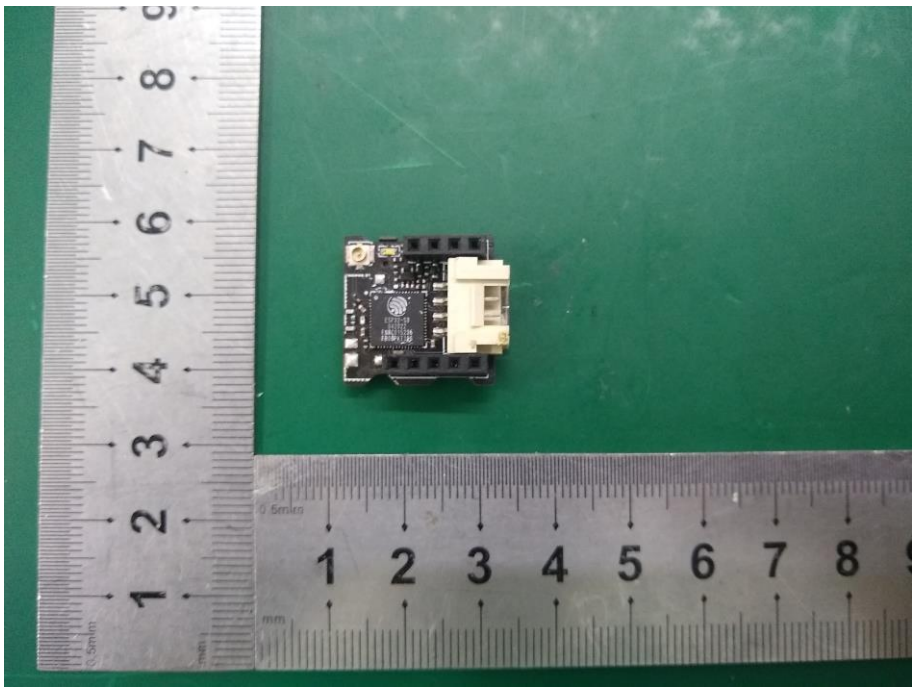


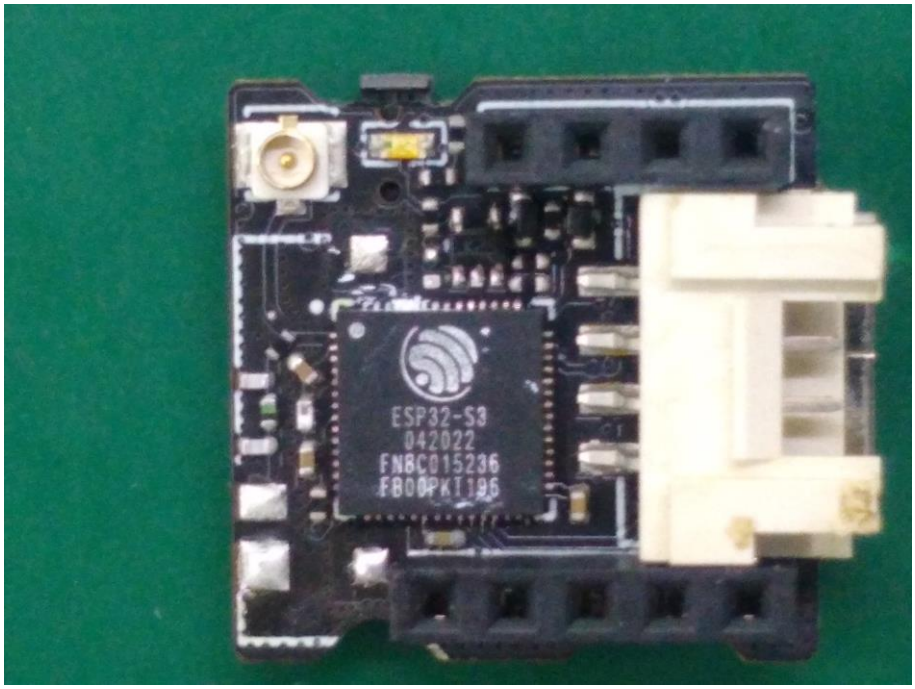

1 2 3 4 5 6 7 8
mm


G39
D38
5V
GND

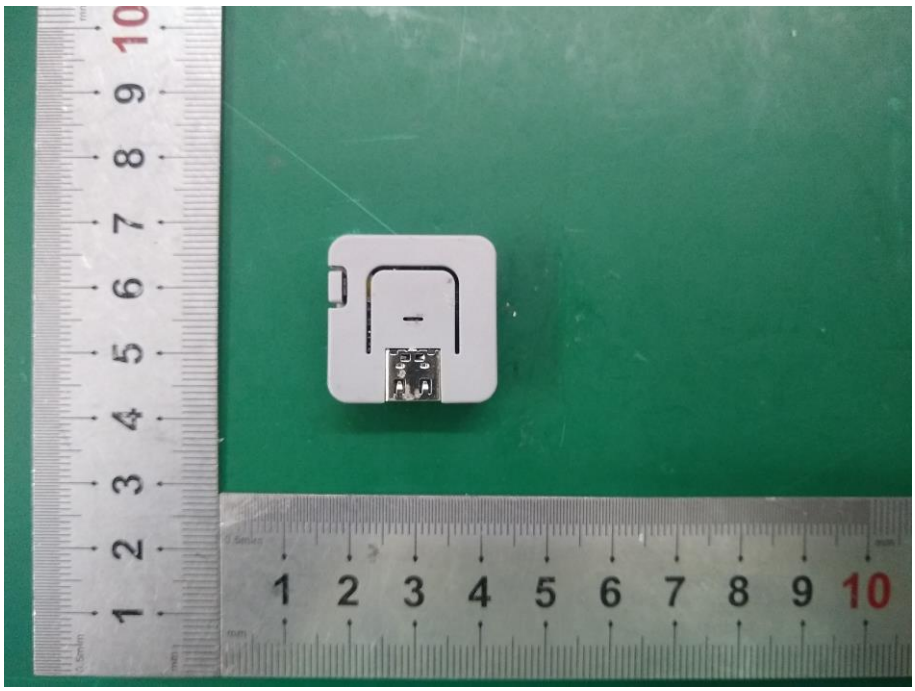


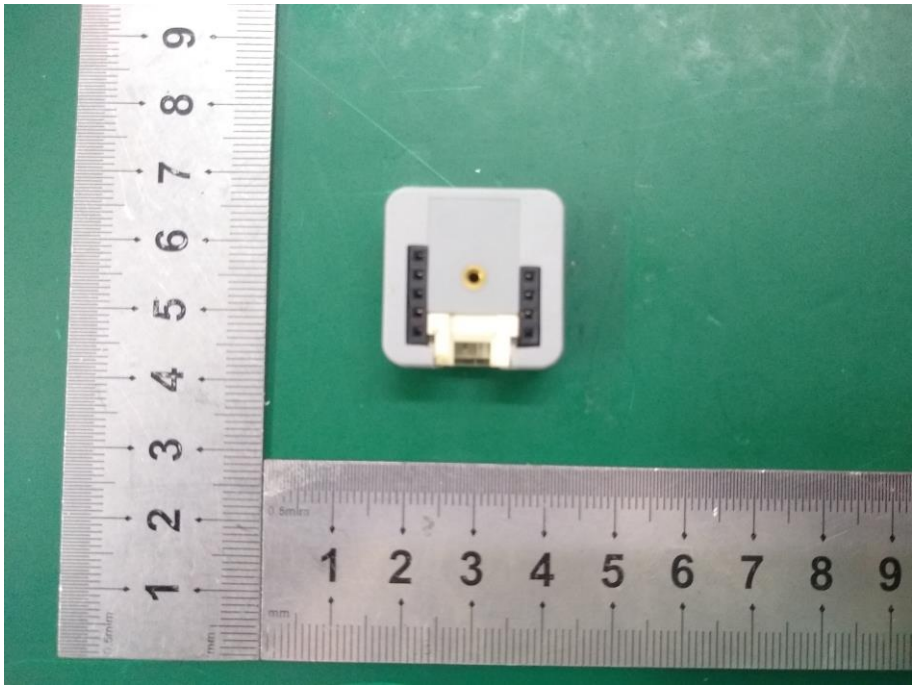


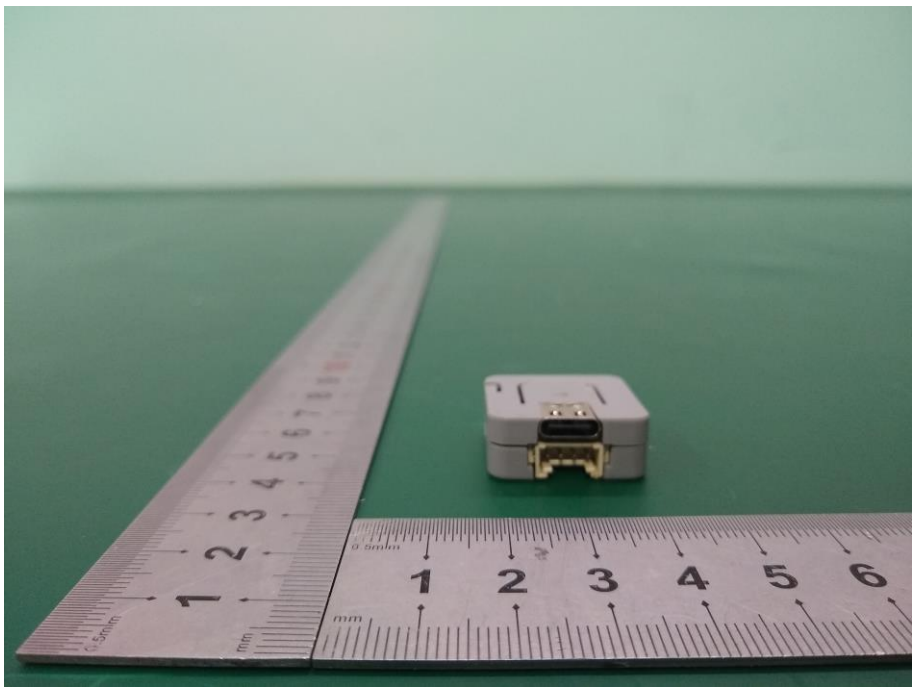


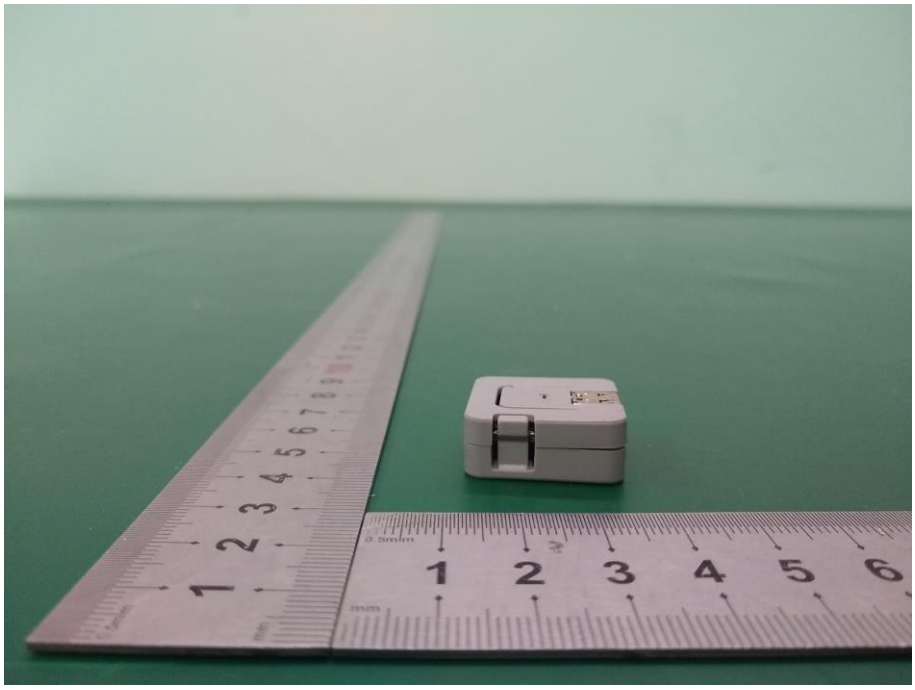

ESP32-S3
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FN8C015236

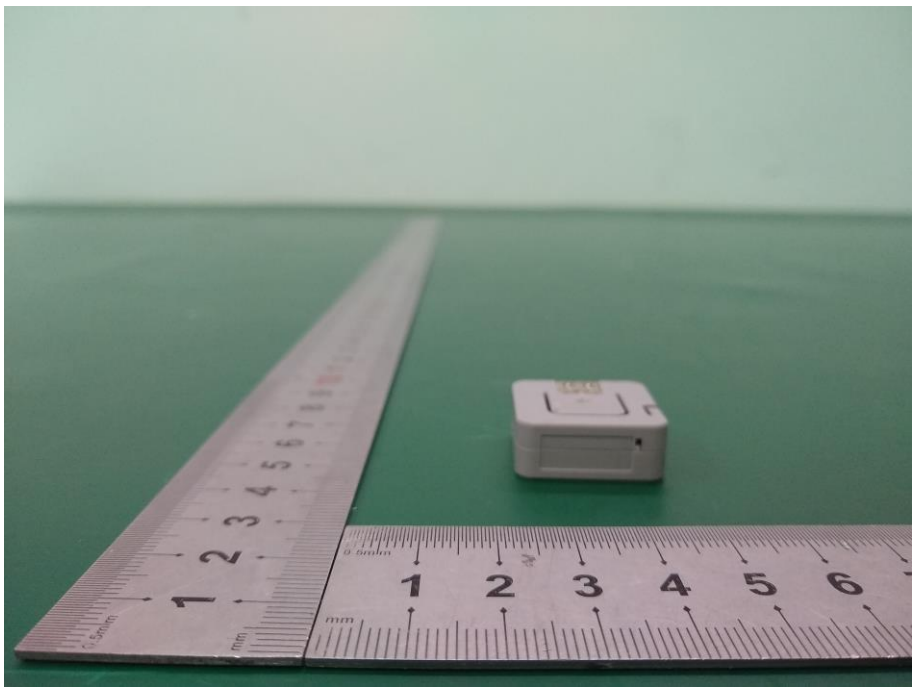
Model: ATOMS3-LITE

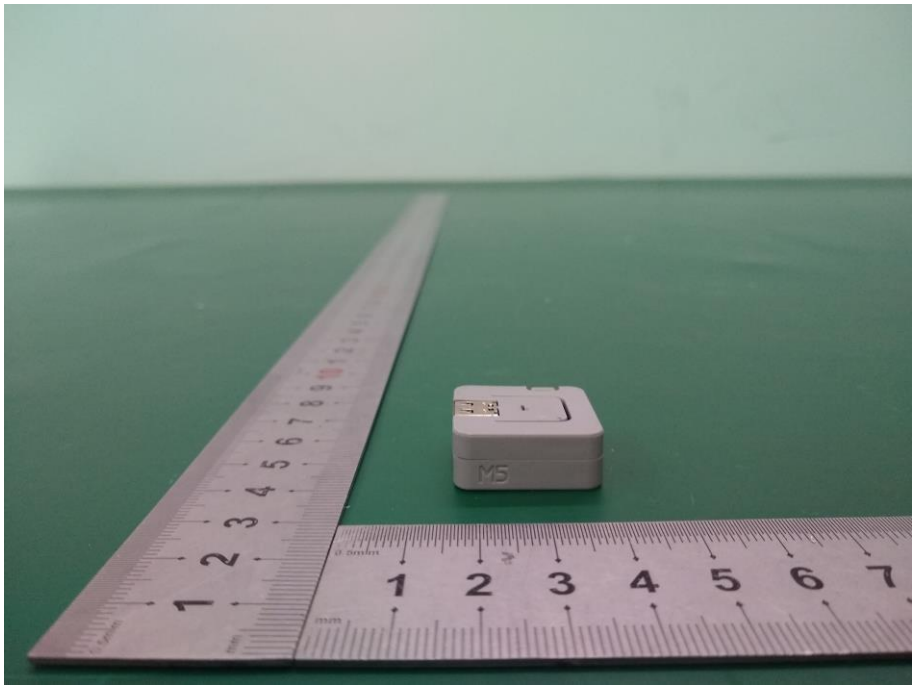


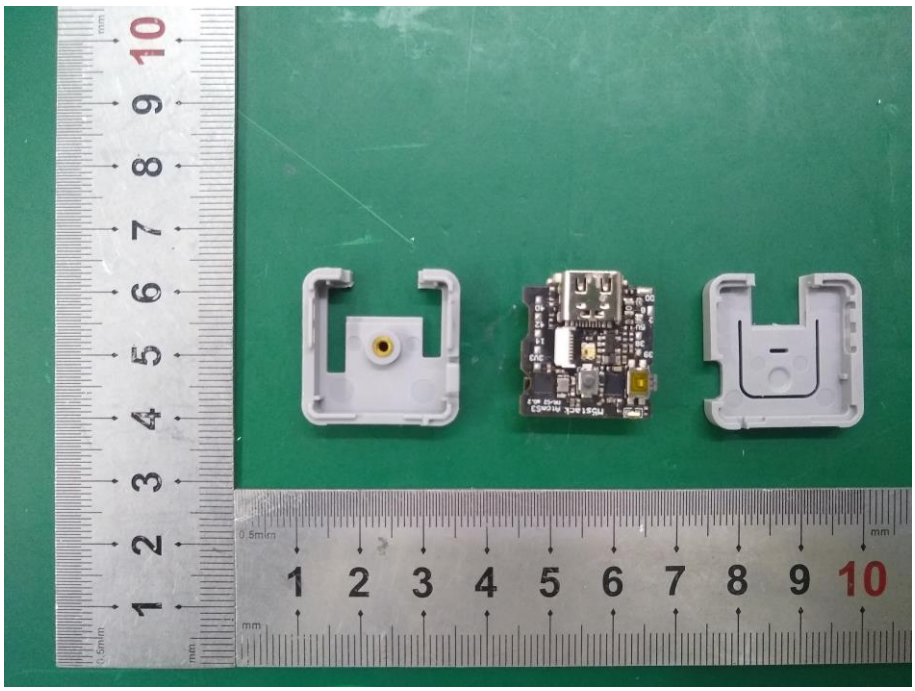


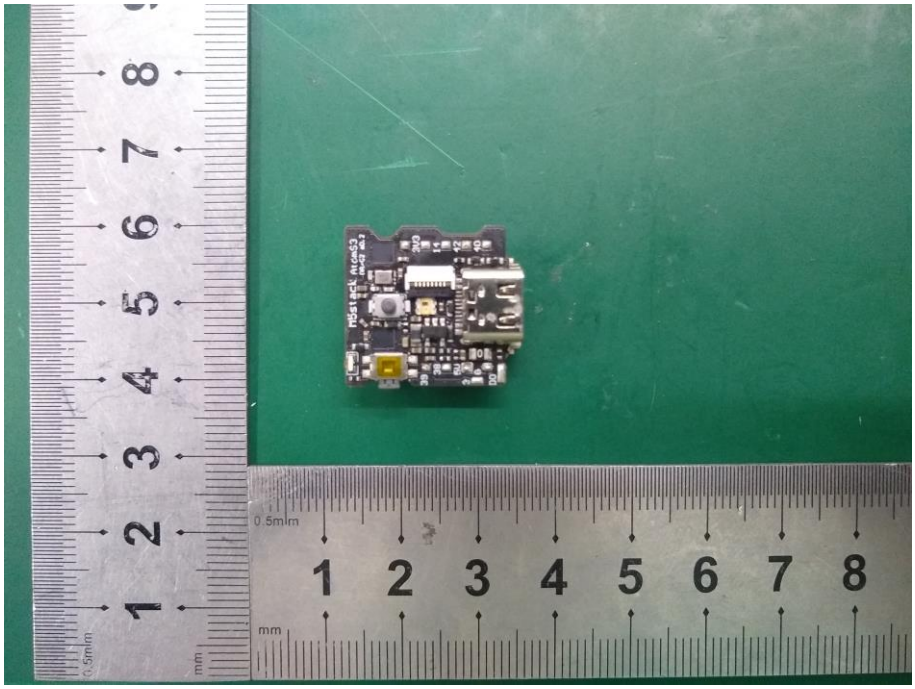


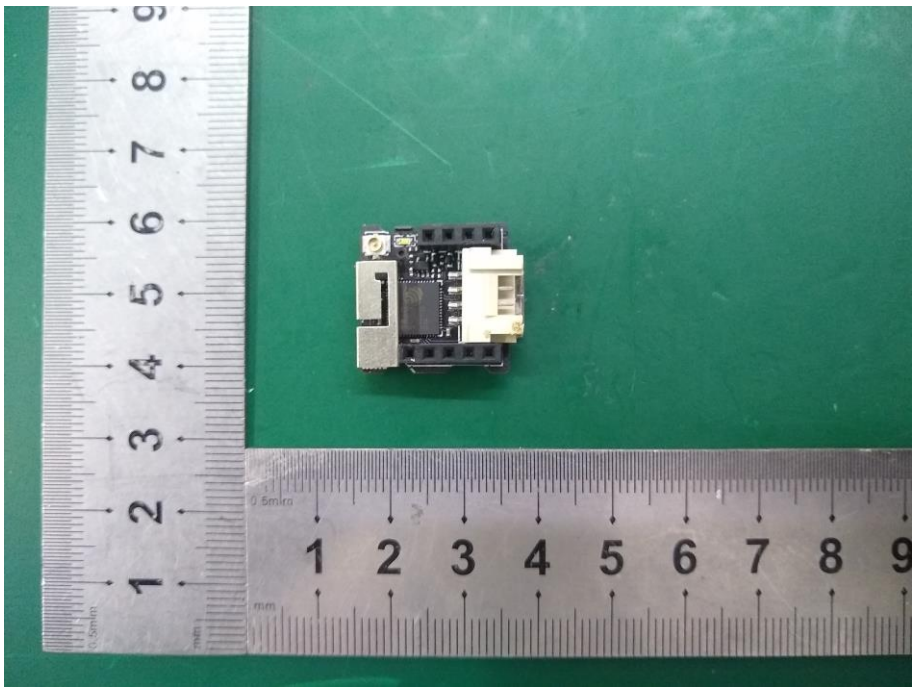


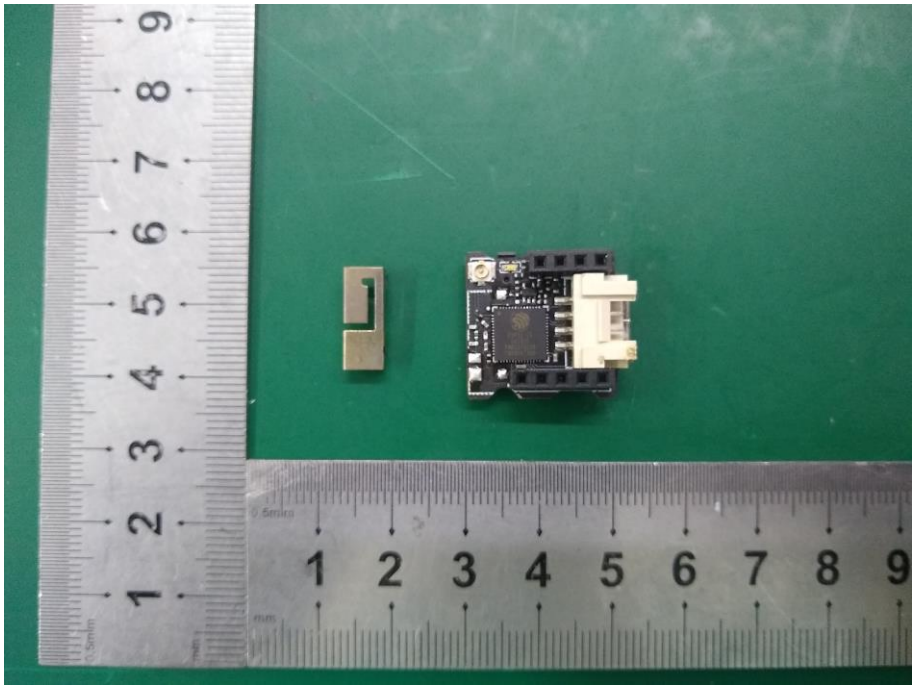


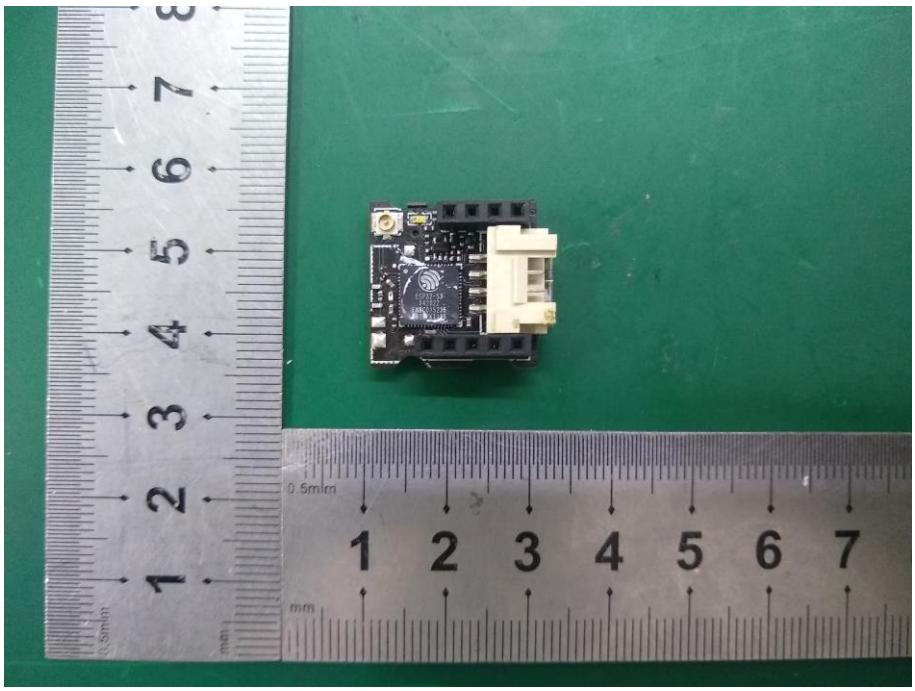












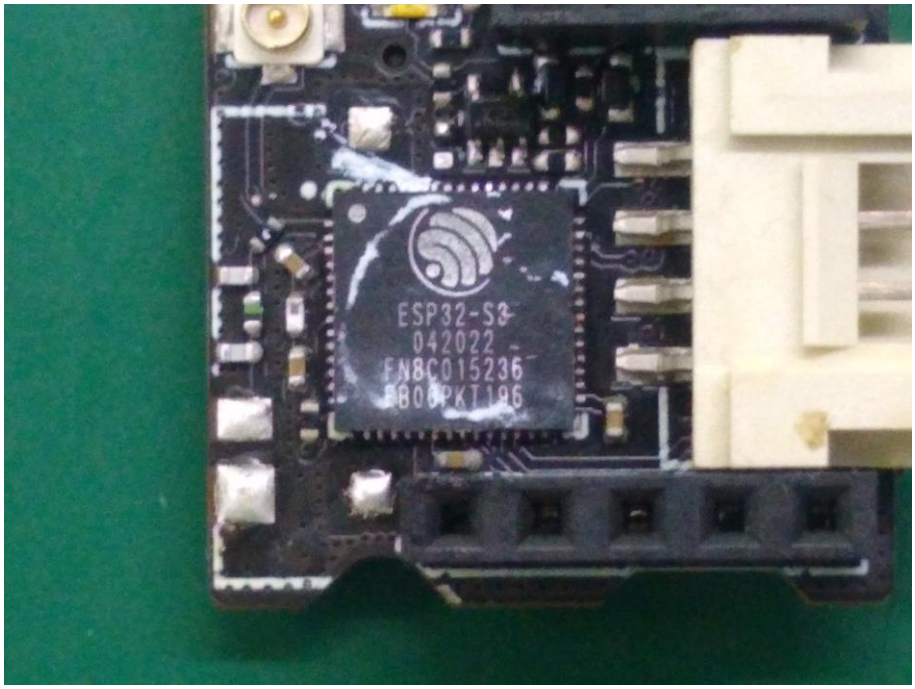

ESP32-S3
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FN8C015236

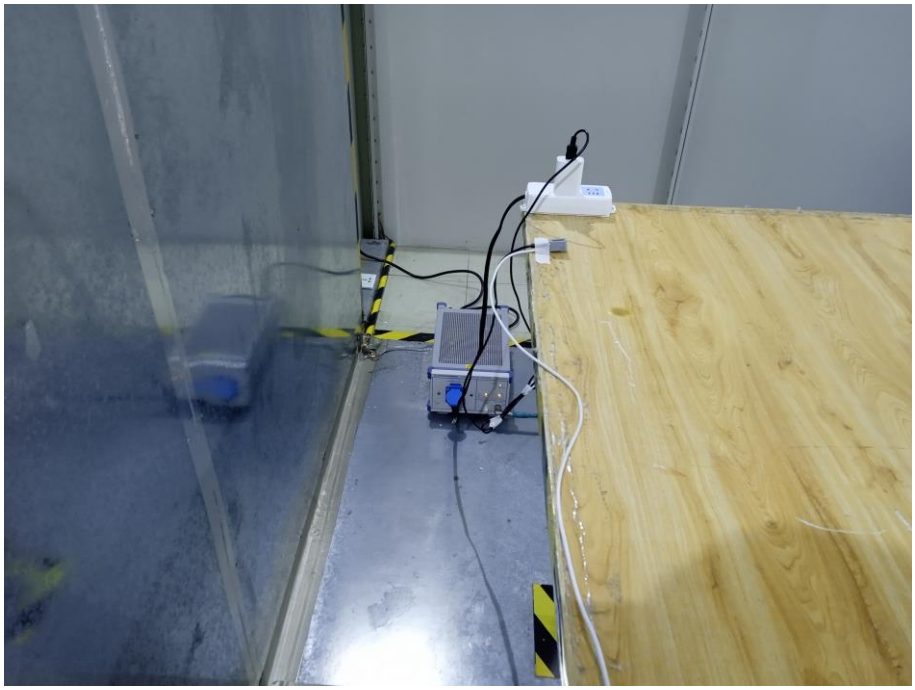
EXHIBIT B – TEST SETUP PHOTOGRAPHS

Model: ATOMS3

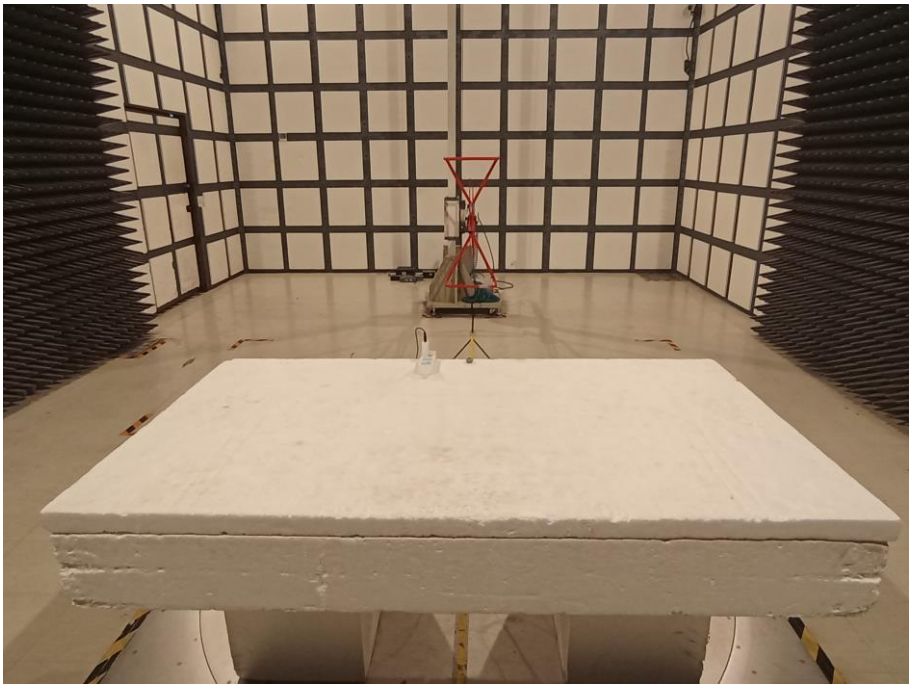
Conducted Emissions - Front View



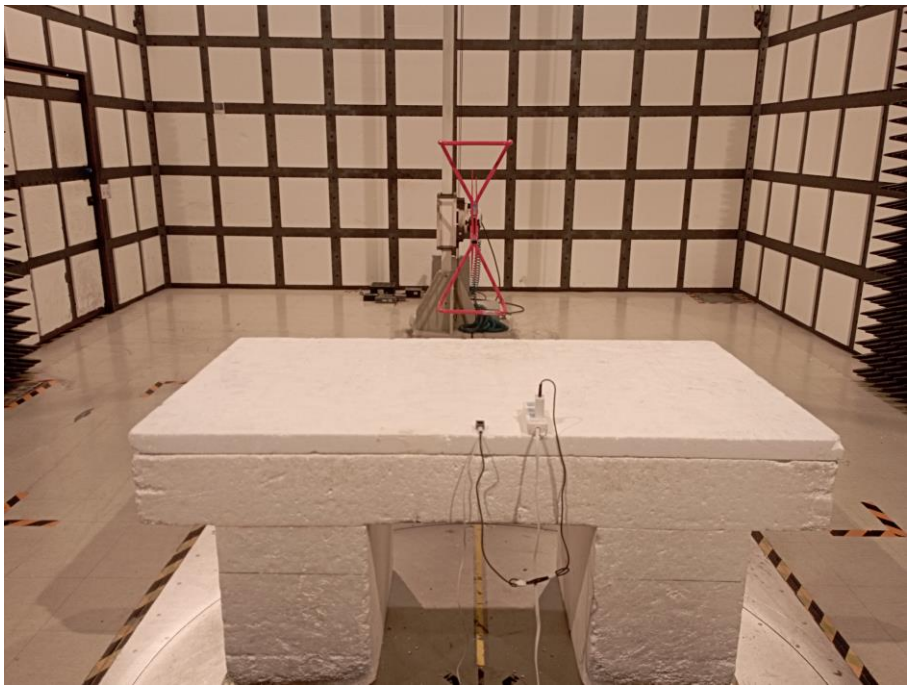
Conducted Emissions - Side View



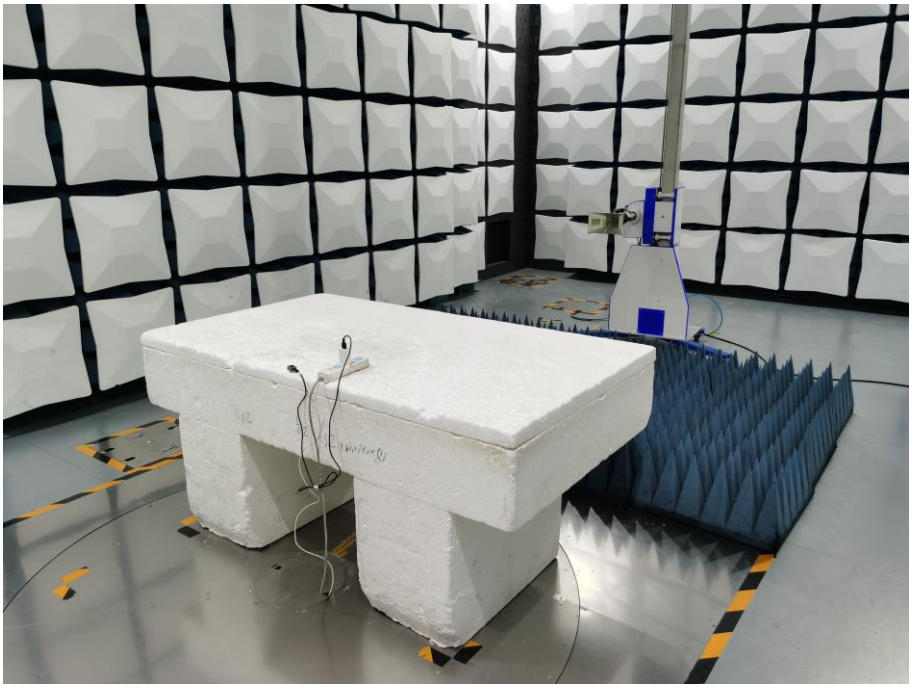
Radiated Emissions - Front View (Below 1GHz)



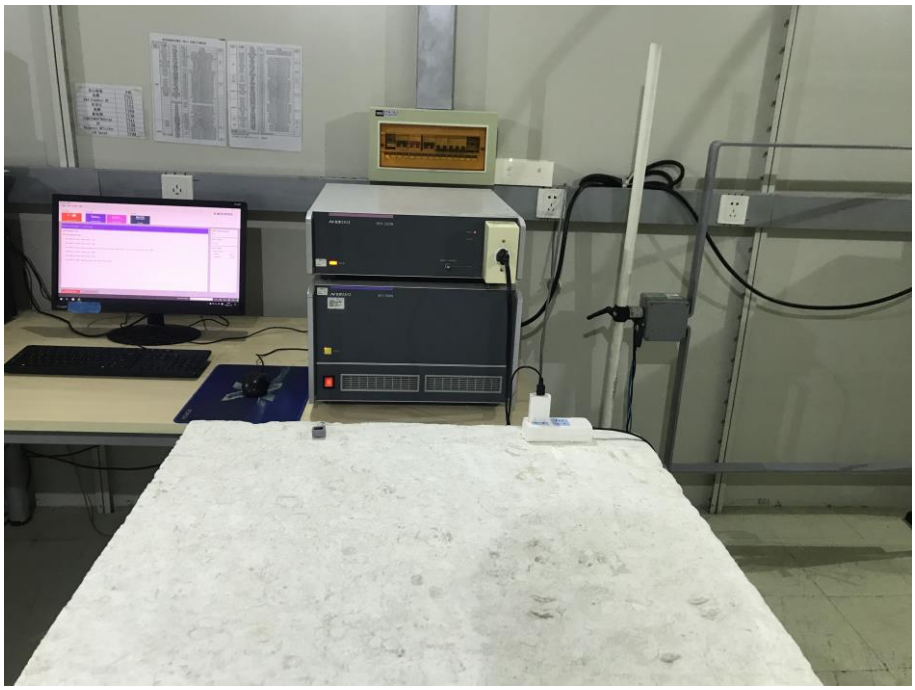
Radiated Emissions - Rear View (Below 1GHz)



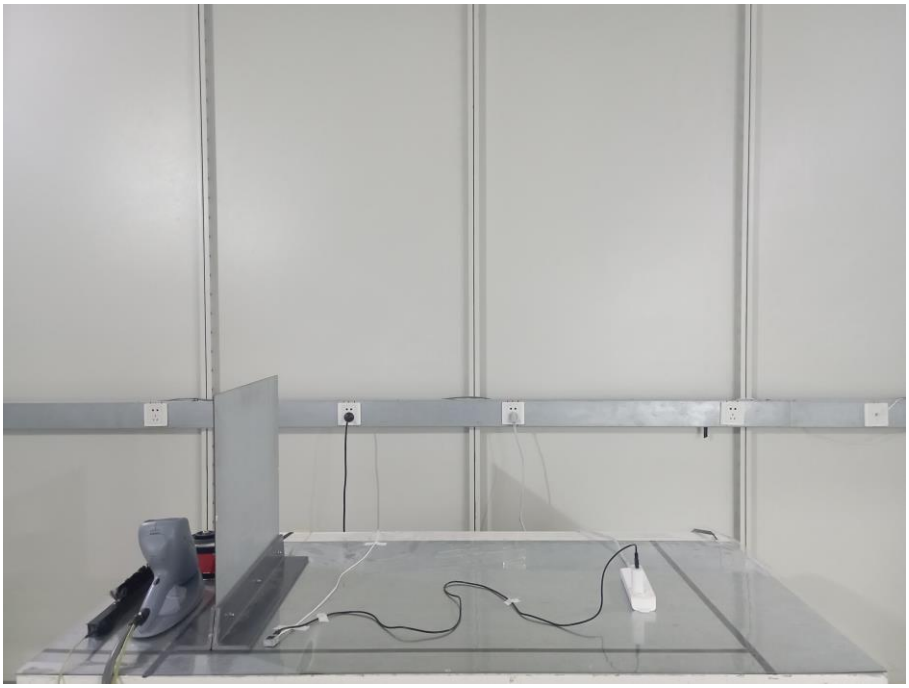
Radiated Emissions - Side View (Above 1GHz)



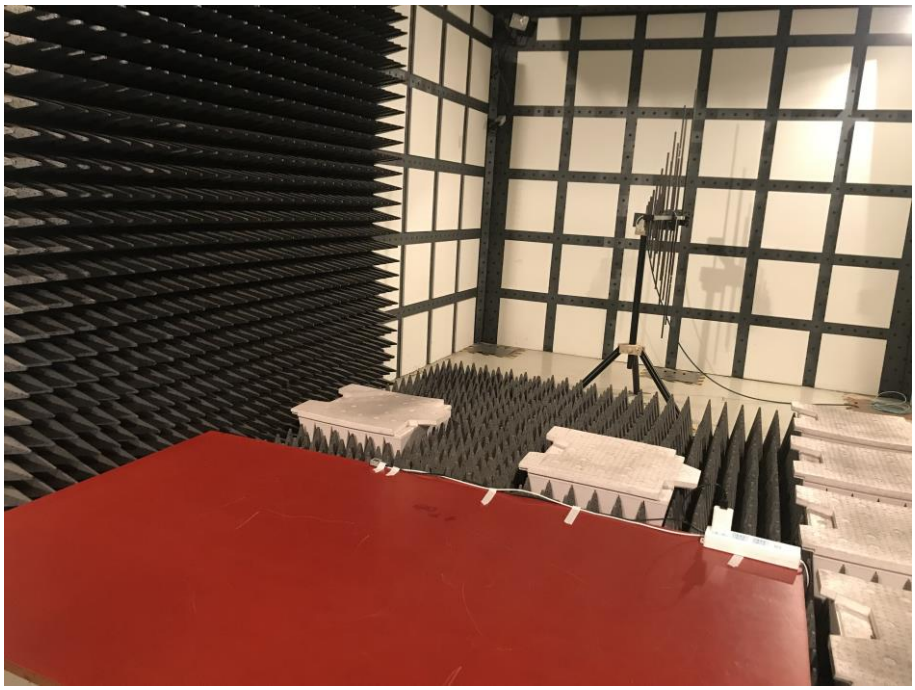
Voltage Fluctuations and Flicker



Electrostatic discharge



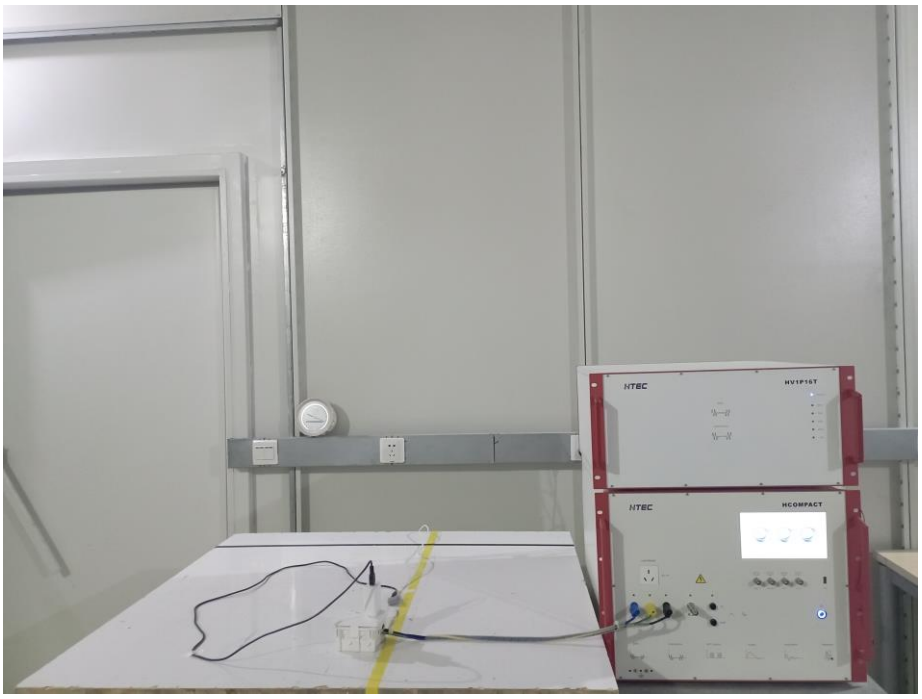
Continuous RF electromagnetic field disturbances (Below 1GHz)



Continuous RF electromagnetic field disturbances (Above 1GHz)



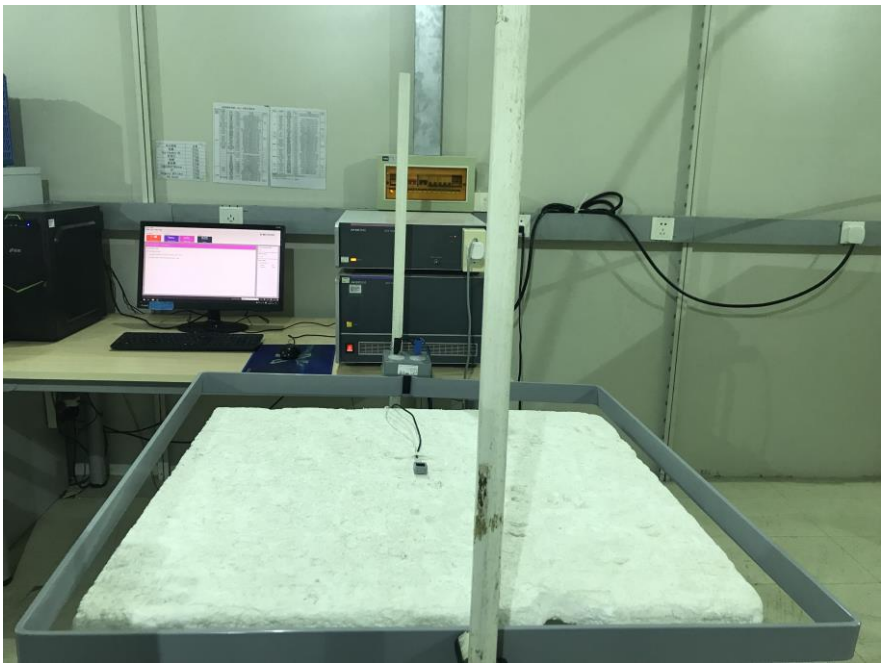
Electrical fast transients burst & Surge & Voltage dips and interruptions



Continuous induced RF disturbances



Power frequency magnetic field

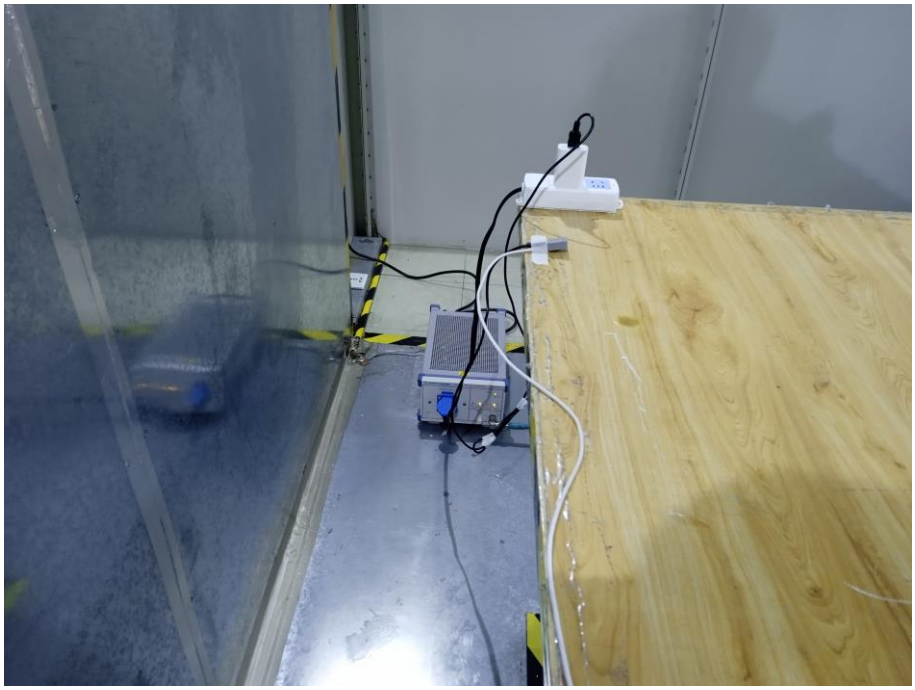


Model: ATOMS3-LITE

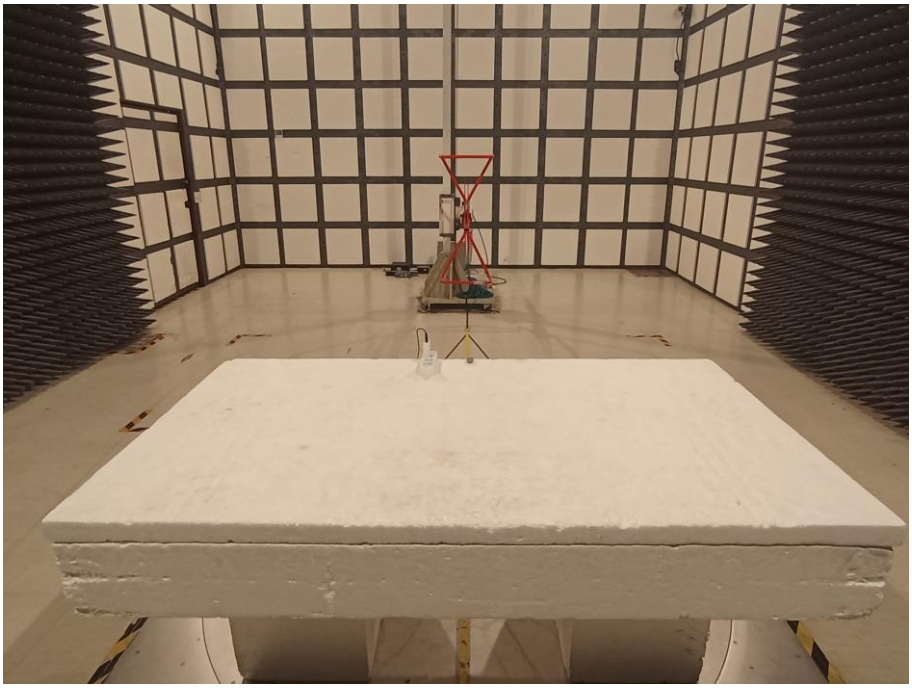
Conducted Emissions - Front View



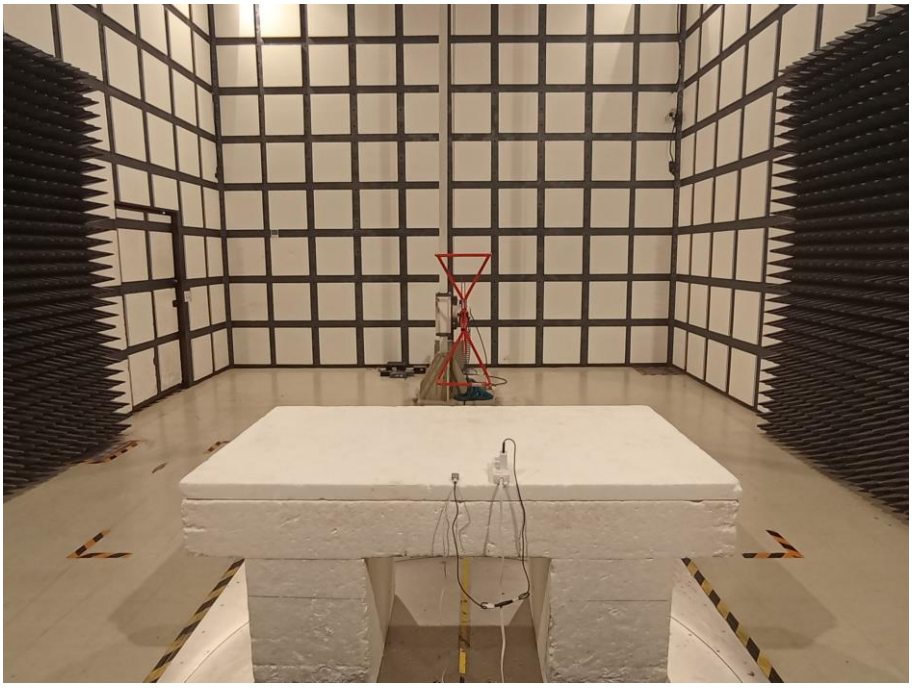
Conducted Emissions - Side View



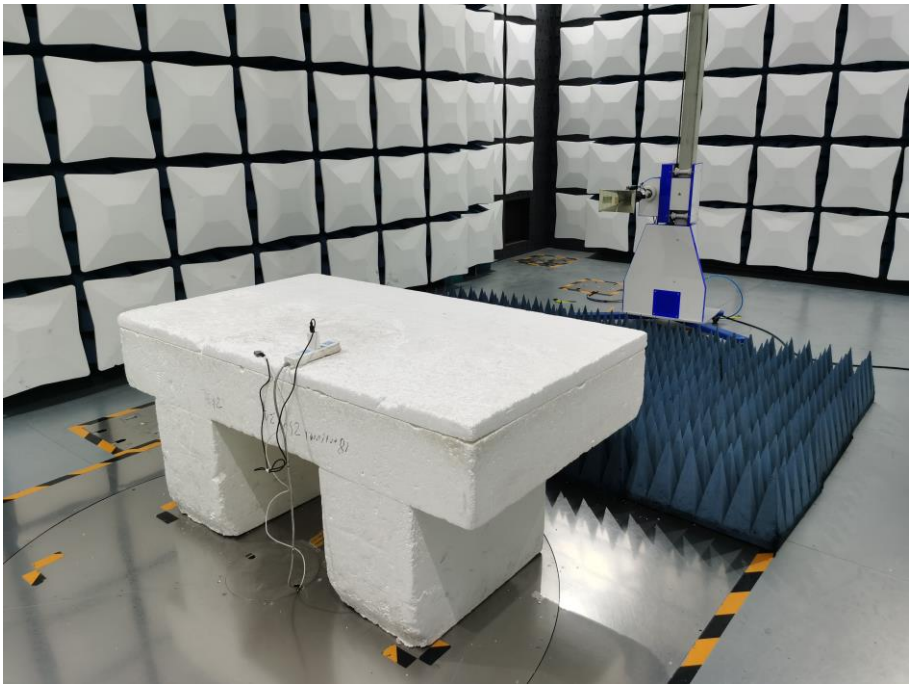
Radiated Emissions - Front View (Below 1GHz)



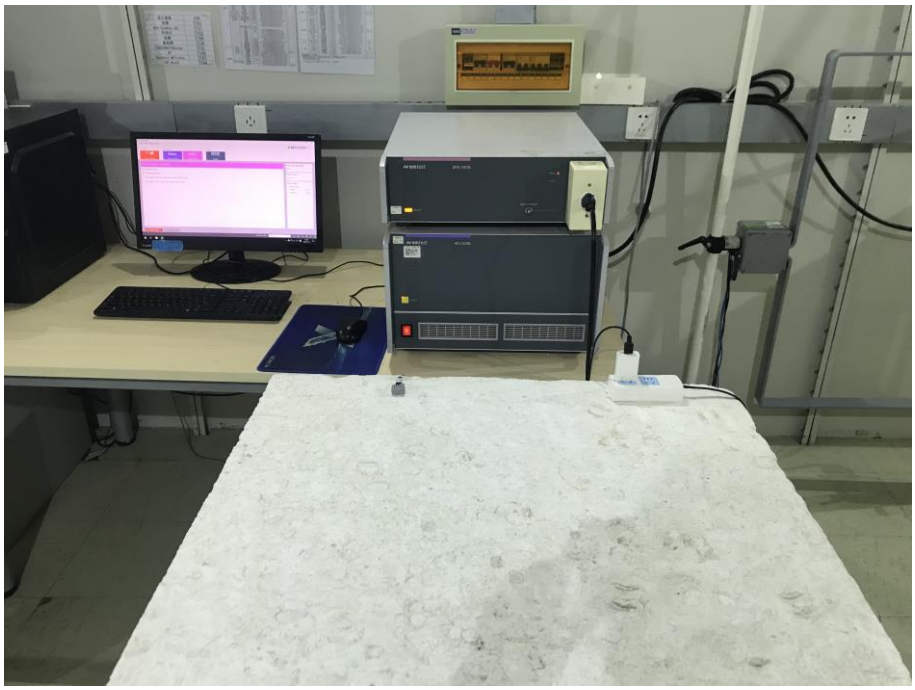
Radiated Emissions - Rear View (Below 1GHz)



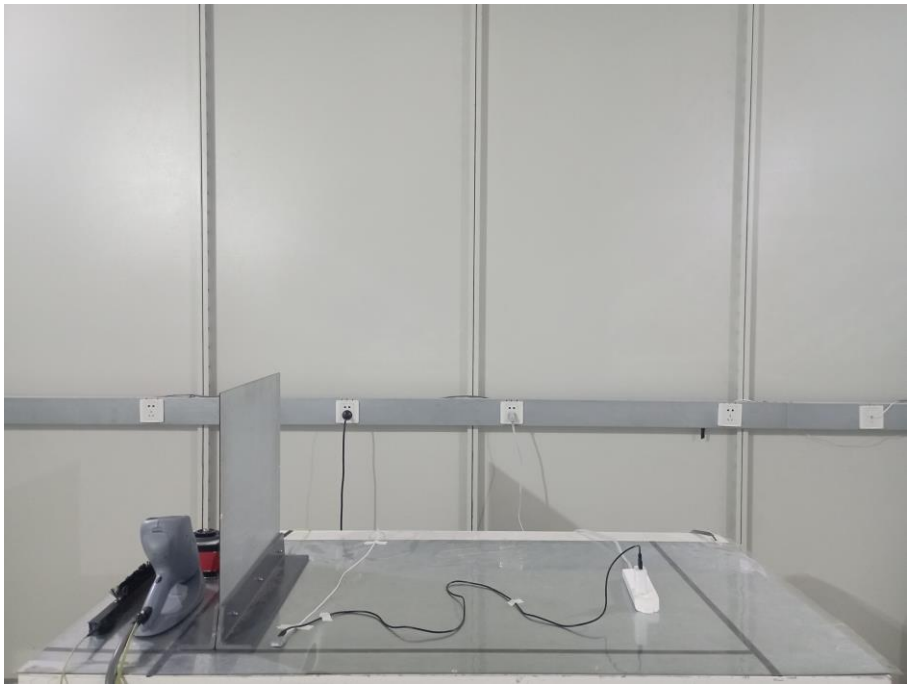
Radiated Emissions - Side View (Above 1GHz)



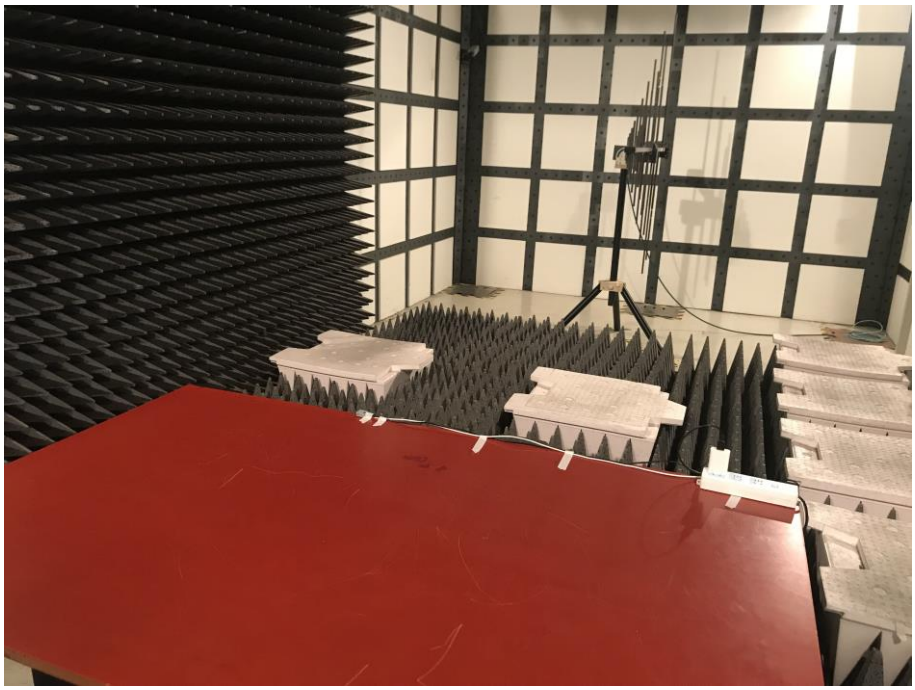
Voltage Fluctuations and Flicker



Electrostatic discharge



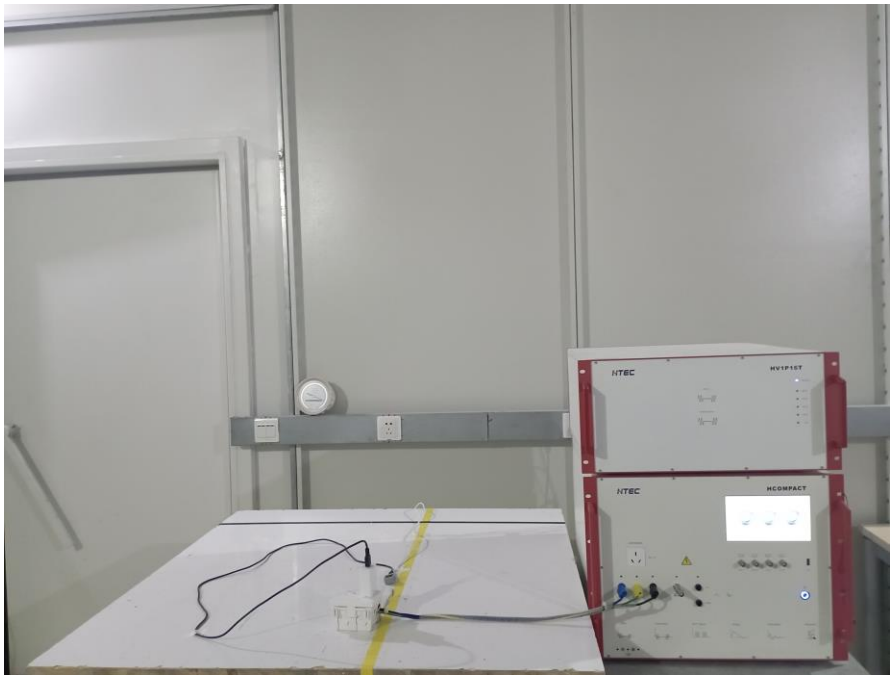
Continuous RF electromagnetic field disturbances (Below 1GHz)



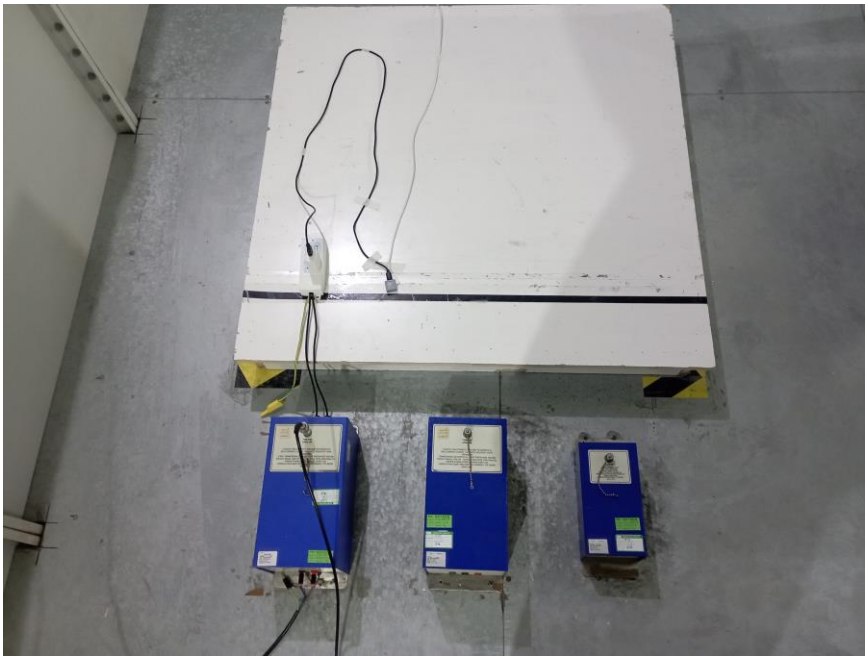
Continuous RF electromagnetic field disturbances (Above 1GHz)



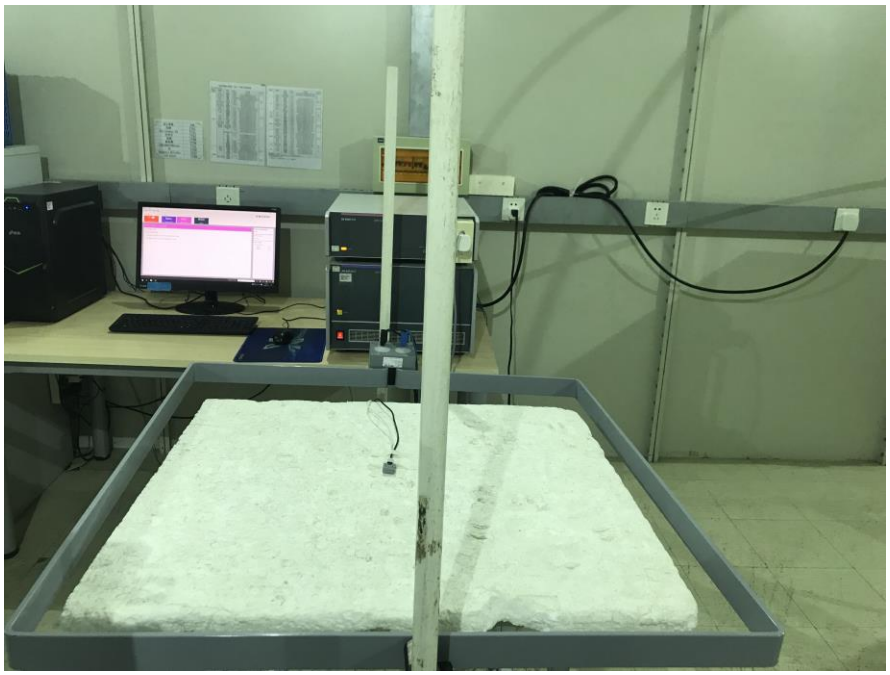
Electrical fast transients burst & Surge & Voltage dips and interruptions



Continuous induced RF disturbances



Power frequency magnetic field



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).

6. This report is valid only with a valid digital signature. The digital signature may be available only under the adobe software above version 7.0.

PRODUCT SIMILARITY DECLARATION LETTER

Company name: M5Stack Technology Co., Ltd
Address: 5F, Tangwei Stock Commercial Building, Youli Road, Bao'an District, Shenzhen, China
Tel: 13509230623
Fax: N/A
Email: jimmylai@m5stack.com

DECLARATION

Date: 2022-09-28

Dear Sir or Madam:

We, M5Stack Technology Co., Ltd, hereby declare that product: M5ATOMS3 (Model name: ATOMS3, ATOMS3-LITE), they are electrically identical with the PCB design, components and electromagnetic compatibility characteristics. ATOM53 and ATOM53-LITE have been tested by BACL(Kunshan).

The differences of them are as follows:
1. ATOMS3 Connect an external LCD, there is a gyroscope unit
2. ATOMS3-LITE No lcd connected

Please contact me if there is need for any additional clarification or information.

Best Regards,

Signature: Jimmy Lai

Printed name: Jimmy Lai
Title: CEO

******* END OF REPORT *******