

# TEST REPORT

Applicant Name: Seeed Technology Co., Ltd.  
Address: 9F, G3 Building, TCL International E City, Zhongshanyuan Road,  
Nanshan District, Shenzhen, Guangdong Province, P.R.C  
Report Number: RA230825-50054E-EM-00

## Test Standards:

FCC Rules and Regulations Part 15 Subpart B Class A

## Sample Description

Product: reServer Industrial  
Model No.: J4012, J4011  
Trademark: Seeed Studio  
Date Received: 2023-08-25  
Date of Test: 2023-08-29  
Report Date: 2023-09-06

Test Result:	Pass*
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\* In the configuration tested, the EUT complied with the standards above.

## Prepared and Checked By:

Dave Liang

Dave Liang  
EMC Engineer

## Approved By:

Martin Lü  
EMC Engineer

**Note:** This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
Rev.00	RA230825-50054E-EM-00	Original Report	2023-09-06

## Test Report Declaration

Applicant : Seeed Technology Co., Ltd.  
Manufacturer : Seeed Technology Co., Ltd.  
Product : reServer Industrial  
Model No. : J4012, J4011

Measurement Procedure Used:

### FCC Rules and Regulations Part 15 Subpart B Class A

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart B Class A limits radiated and conducted emissions. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.



1. TEST RESULTS SUMMARY

Test Items	Test Standard	Test Results
Conducted Emission (9kHz-30MHz)	FCC Part 15 Subpart B Class A	Pass
Radiated Emission (30-1000MHz)	FCC Part 15 Subpart B Class A	Pass
Radiated Emission (1- 10GHz)	FCC Part 15 Subpart B Class A	Pass

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

Product	: reServer Industrial
Model No.	: J4012
Multiple Model	: J4011
Model Difference	: J4012 and J4011 are the same except for different DDR(Double Data Rate) size, we choose J4012 for testing.
Voltage Range	: AC 100-240V, 50/60Hz with ground (Note:The product comes with 2-pin terminal block power connector line. The line length is 0.2m.)
Remark(s)	: The EUT's highest operating frequency is 2GHz more than 1GHz, the radiated emission measurement shall be made up to 10GHz.
Applicant	: Seeed Technology Co., Ltd.
Address	: 9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Manufacturer	: Seeed Technology Co., Ltd.
Address	: 9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C
Sample Number	: 2AH7-1
Adapter Information	: Model No.: PA-1121-24 Input: 100-240V $\equiv$ 2.0A ~ 50/60Hz 0.3A Output: 24V $\equiv$ 5A 120.0W The adapter DC cable length is 1.5 meters with a ferrite core.

### 2.2. Test Mode

Test Mode 1: Working(Data communication)

### 2.3. Accessory and Auxiliary Equipment

1 touch panel	: Manufacturer &model:unknown
2 Router	: Manufacturer :TP-LINK Model :TL-R476G
3 USB disk*2	: SanDisk 32GB
4 Phone	: Model: Xiaomi 12
5 Displayer	: Manufacturer :Xiaomi

	Model :L43M5-ES
6 Mouse	Manufacturer :A4TECH
	: Model :OP-550NU
7 Keyboard	Manufacturer :A4TECH
	: Model :KB-US9813
8 SIM card	: Manufacturer :China Telecom
9 External Antenna*2	Manufacturer &model:unknown

Note:

1. The touch panel, router and USB disk are provided by the applicant.
2. The two external antennas are used to connect to the two reserved antenna ports of the EUT for testing. The product is shipped without antenna, which is declared by applicant.

### 2.3.1 External I/O Cable

Cable Description	Length (m)	From Port(EUT)	To
2-pin terminal block power connector line	0.2	DCIN12-36V	Adapter
AC cable	1.5	Adapter	LISN
Network cable*4	0.85	LAN1/2/3/4(OUT)	Router
Network cable*1	0.85	LAN0(IN)	LAN Network
CAN lightning line	1	CAN(CL,CH,CG)	touch panel
RS485 lightning line	1	485	touch panel
Equipment geodetic line	1.2	EUT shell	ground
HDMI cable	1.5	HDMI	Displayer
USB cable	2	USB	Mouse
USB cable	2	USB	Keyboard
USB Type-C cable	1.5	USB device	Phone

Note:

1. 2-pin terminal block power connector line, CAN lightning line, RS485 lightning line and equipment geodetic line are provided by the applicant.
2. The product comes with two Type-C ports, one is for device use, and the other is for set-up use.

## 2.4. Description of Test Facility

Name of Firm : Shenzhen Accurate Technology Co., Ltd.  
Site Location : Floor 1, KuMaKe Building, Dongzhou Community,  
Guangming Street, Guangming District, Shenzhen,  
Guangdong, China

## 2.5. Measurement Uncertainty

Conduction Emission Expanded Uncertainty : U=2.74dB, k=2  
(9kHz-30MHz)

Radiated emission expanded uncertainty : U=5.08dB, k=2  
(30MHz-1000MHz)

Radiated emission expanded uncertainty : U=4.96dB, k=2  
(1GHz-18GHz)

### 3. MEASURING DEVICE AND TEST EQUIPMENT

#### 3.1. For Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1.	EMI Test Receiver	Rohde& Schwarz	ESCI	100784	2022/11/25	2023/11/24
2.	L.I.S.N.	Rohde& Schwarz	ENV216	101314	2022/11/25	2023/11/24
3.	50 Coaxial Switch	Anritsu Corp	MP59B	6100237248	2022/12/07	2023/12/06
4.	RF Coaxial Cable	Unknown	No.17	N0350	2022/11/25	2023/11/24
5.	Conducted Emission Test Software: e3 191218 (V9)					

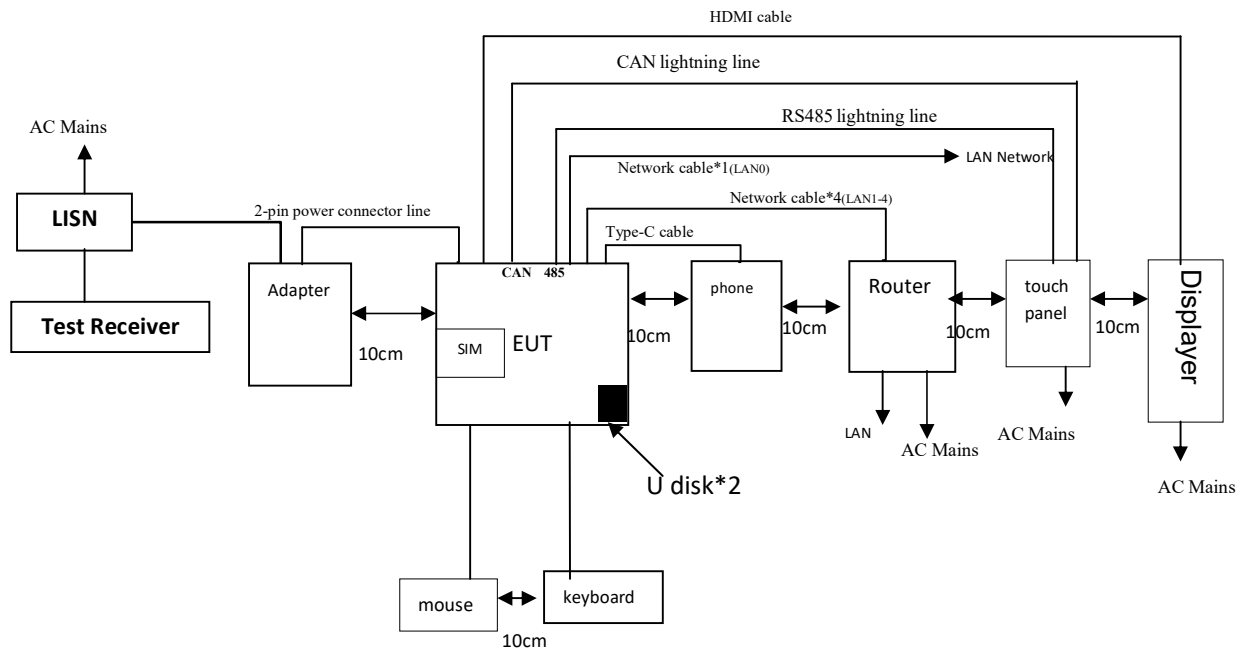
#### 3.2. For Radiated Emission Measurement

Item	Manufacturer	Equipment	Model No.	Serial No.	Calibration Date	Calibration Due Date
1.	Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
2.	Rohde& Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
3.	SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
4.	A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
5	Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/7/6	2024/7/5
6	Schwarzbeck	Horn Antenna	BBHA9120D	837	2023/02/22	2026/02/21
7	Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
8	Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
9	Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
10	Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
11	Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
12	Radiated Emission Test Software: e3 191218 (V9)					

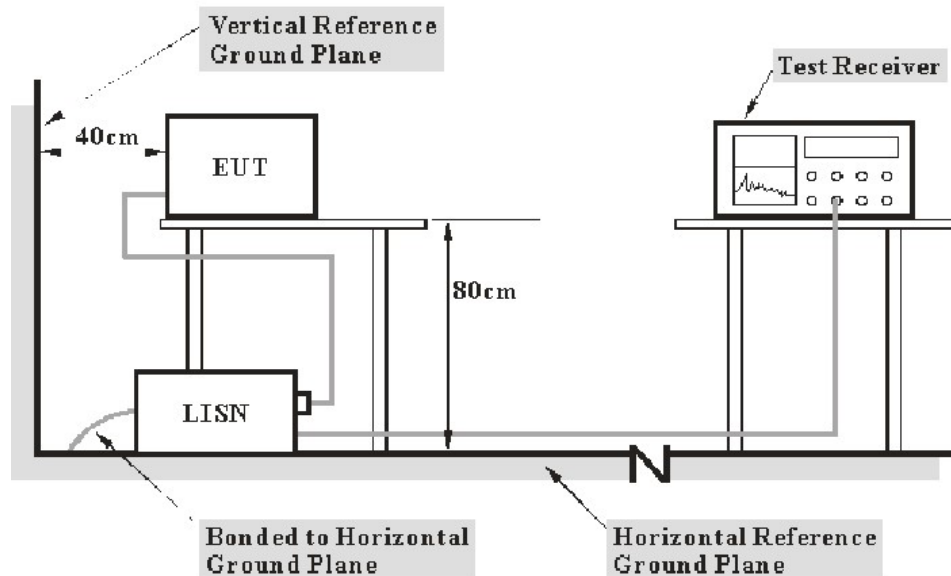
## 4. CONDUCTED EMISSION MEASUREMENT

### 4.1. Block Diagram of Test Setup

#### 4.1.1. Block diagram of connection between the EUT and simulators



#### 4.1.2. Test System Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

## 4.2. Conducted Emission Measurement Limits (Class A)

Frequency (MHz)	Limit dB( $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 - 0.50	79.0	66.0
0.50 - 30.00	73.0	60.0
NOTE1: The lower limit shall apply at the transition frequencies.		

## 4.3. Manufacturer

The following equipments are installed on Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

## 4.4. Operating Condition of EUT

4.4.1. Setup the EUT and simulator as shown as Section 4.1.

4.4.2. Turn on the power of all equipments.

4.4.3. Let the EUT work in test mode1 and measure it.

## 4.5. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4-2014 on Conducted Emission Measurement.

The bandwidth of test receiver is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

## 4.6. Data Explain

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

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 below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit  
Level = Read Level + Factor

#### 4.7. Conducted Emission Measurement Results

##### Environmental Conditions

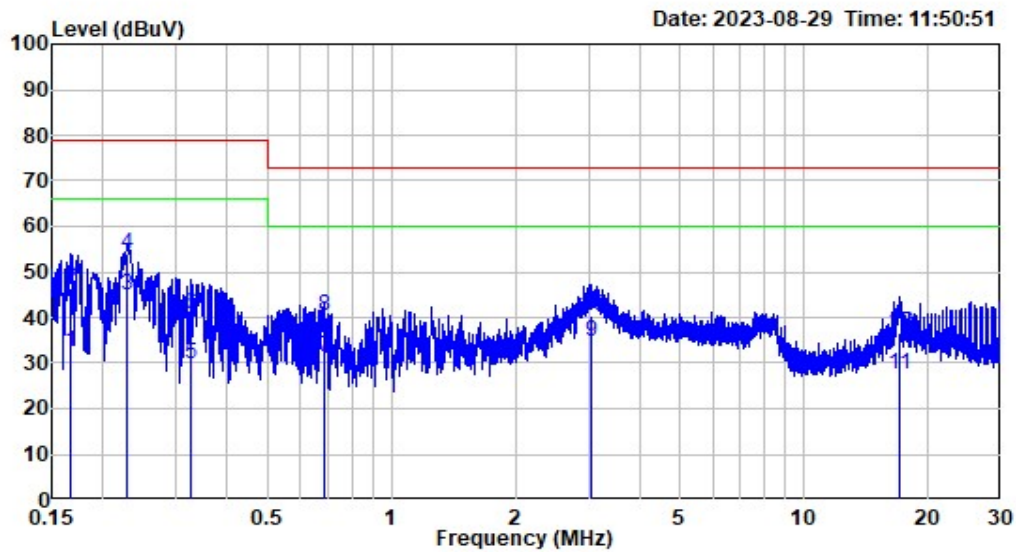
<b>Temperature:</b>	24 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	99.55kPa

*The testing was performed by Jeef Huang from 2023-08-29.*

Test Result: Pass. The spectral diagrams are shown in the following pages.



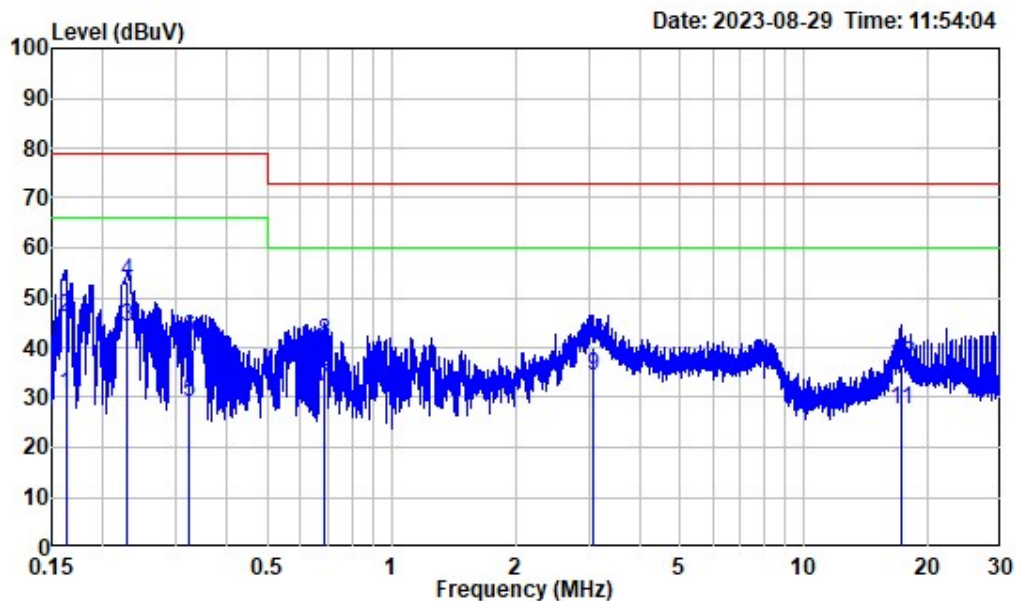
AC 120V/60Hz, Line:



Site : Shielding Room  
 Condition: Line  
 Job No. : RA230825-50054E-EM  
 Test Mode: Test Mode 1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.167	9.98	22.54	32.52	66.00	-33.48	Average
2	0.167	9.98	36.26	46.24	79.00	-32.76	QP
3	0.229	10.00	34.78	44.78	66.00	-21.22	Average
4	0.229	10.00	43.84	53.84	79.00	-25.16	QP
5	0.326	10.02	19.97	29.99	66.00	-36.01	Average
6	0.326	10.02	30.86	40.88	79.00	-38.12	QP
7	0.688	10.16	21.22	31.38	60.00	-28.62	Average
8	0.688	10.16	30.26	40.42	73.00	-32.58	QP
9	3.054	10.45	24.20	34.65	60.00	-25.35	Average
10	3.054	10.45	29.98	40.43	73.00	-32.57	QP
11	17.007	14.84	12.77	27.61	60.00	-32.39	Average
12	17.007	14.84	21.60	36.44	73.00	-36.56	QP

## AC 120V/60Hz, Neutral:



Site : Shielding Room  
Condition: Neutral  
Job No. : RA230825-50054E-EM  
Test Mode: Test Mode 1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.162	10.18	20.46	30.64	66.00	-35.36	Average
2	0.162	10.18	35.86	46.04	79.00	-32.96	QP
3	0.229	10.21	34.07	44.28	66.00	-21.72	Average
4	0.229	10.21	43.08	53.29	79.00	-25.71	QP
5	0.323	10.27	18.85	29.12	66.00	-36.88	Average
6	0.323	10.27	31.48	41.75	79.00	-37.25	QP
7	0.687	9.90	22.19	32.09	60.00	-27.91	Average
8	0.687	9.90	31.34	41.24	73.00	-31.76	QP
9	3.086	10.22	24.17	34.39	60.00	-25.61	Average
10	3.086	10.22	29.77	39.99	73.00	-33.01	QP
11	17.199	14.88	12.54	27.42	60.00	-32.58	Average
12	17.199	14.88	21.75	36.63	73.00	-36.37	QP

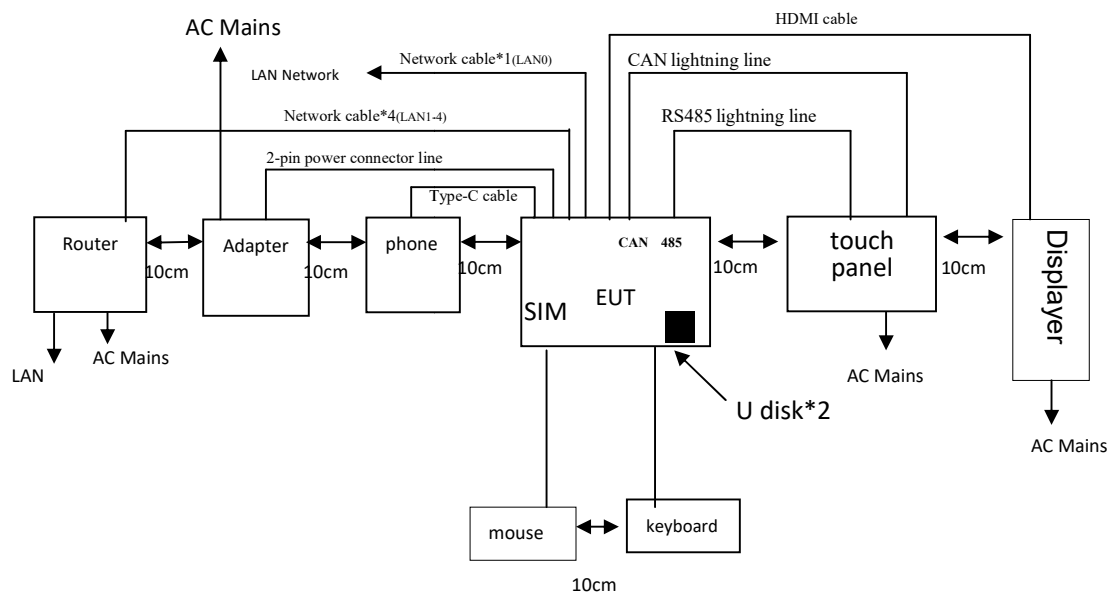
## Note:

1. The frequency range from 150 kHz to 30MHz is investigated
2. Emissions attenuated more than 20 dB below the permissible value are not reported.

## 5. RADIATED EMISSION MEASUREMENT

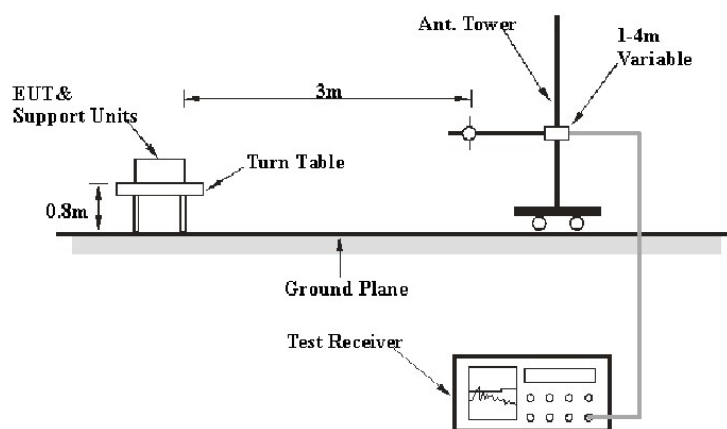
### 5.1. Block Diagram of Test Setup

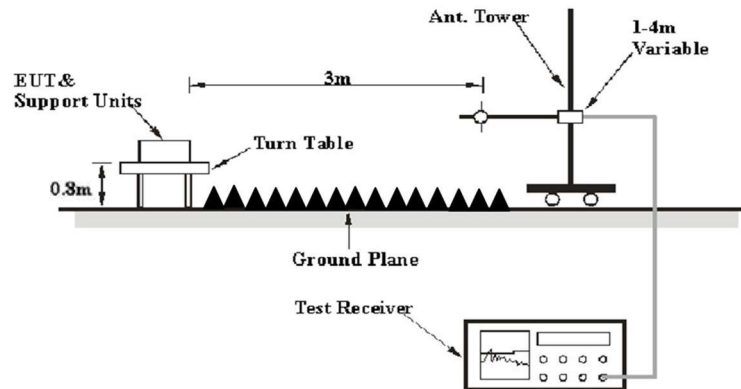
### 5.1.1. Block diagram of connection between the EUT and simulators



### 5.1.2. Test System Setup

### Below 1GHz:



**Above 1GHz:**

Boundary of the EUT, local AE and associated cabling and measurement distance for radiated emissions measurements:

The central point of the arrangement shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and the calibration point of the antenna. See as below Figure C.1 and C.2.

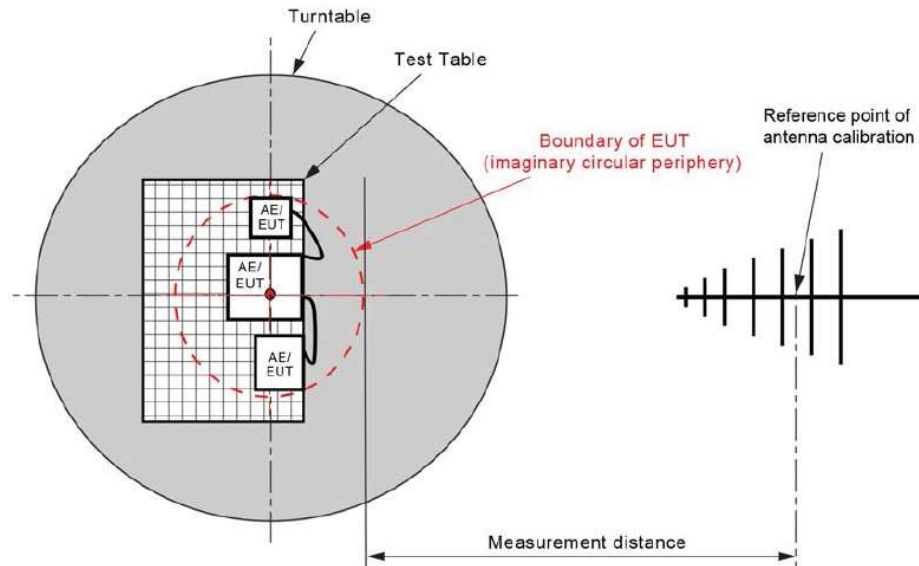


Figure C.1 – Measurement distance

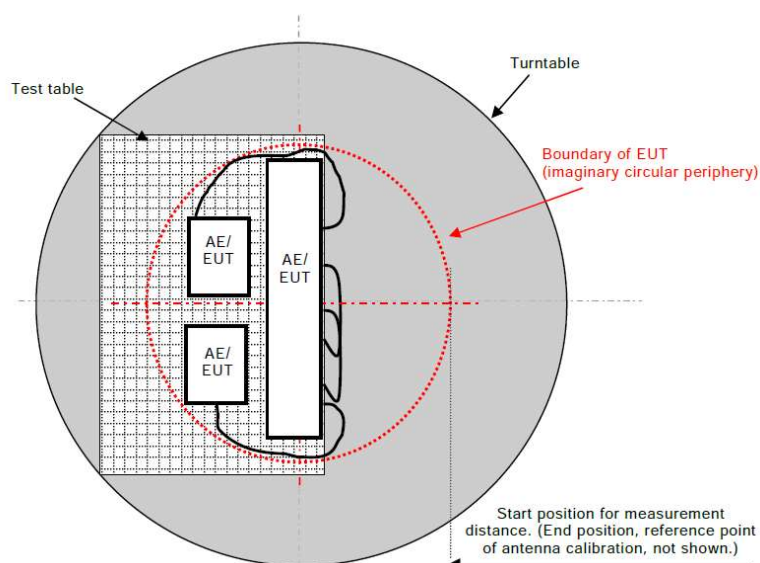


Figure C.2 – Boundary of EUT, Local AE and associated cabling

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.

## 5.2. Radiated Emission Limit (Class A)

All emanations from a class A device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

Frequency MHz	Distance Meters	Field Strengths QP Limit
		dB( $\mu$ V/m)
30-88	3	49.54
88-216	3	53.98
216-960	3	56.9
960-1000	3	60.0

Remark:

(1) Emission level  $\text{dB}(\mu\text{V/m}) = 20 \log \text{Emission level } \mu\text{V/m}$ .

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument antenna and the closest point of any part of the device or system.

Frequency MHz	Distance Meters	Field Strengths Limit	
		Peak dB( $\mu$ V/m)	AVG dB( $\mu$ V/m)
1000-10000	3	80.0	60.0

### 5.3.Manufacturer

The following equipment are installed on Radiated Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

### 5.4.Operating Condition of EUT

5.4.1.Setup the EUT and simulator as shown as Section 5.1.

5.4.2.Turn on the power of all equipment.

5.4.3.Let the EUT work in test mode1 and measure it.

### 5.5.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated blog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2014 on radiated emission measurement.

The bandwidth of the Receiver (ESR) is set at 9 kHz in 150kHz-30MHz, 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 30MHz to 10000MHz is investigated.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705 .....	30.
1.705–108 .....	1000.
108–500 .....	2000.
500–1000 .....	5000.
Above 1000 .....	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

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

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Over Limit” 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.

Over Limit= Level – Limit

Level = Read Level + Factor

## 5.6.Radiated Emission Measurement Result

### Environmental Conditions

<b>Temperature:</b>	23-24 °C
<b>Relative Humidity:</b>	50-56 %
<b>ATM Pressure:</b>	99.55 kPa

*The Below 1GHz testing was performed by Jason Liu on 2023-08-29.*

*The Above 1GHz testing was performed by Jimi Zheng on 2023-08-29*

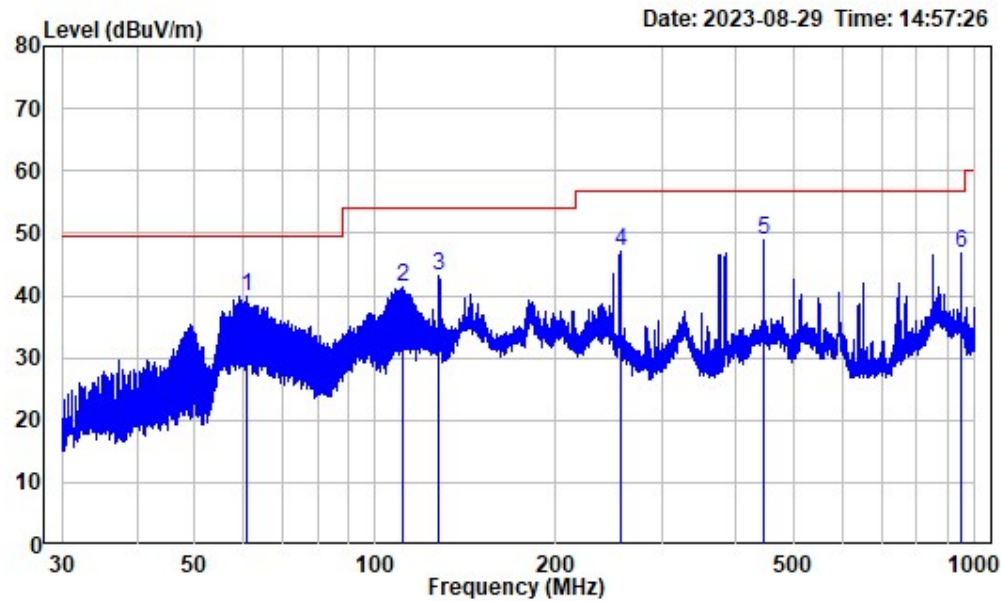
*Input power: AC120V 60Hz*

*The frequency range from 30MHz to 10000 MHz is investigated.*

Test Result: Pass. The spectral diagrams are shown in the following pages.

Below 1GHz

Horizontal

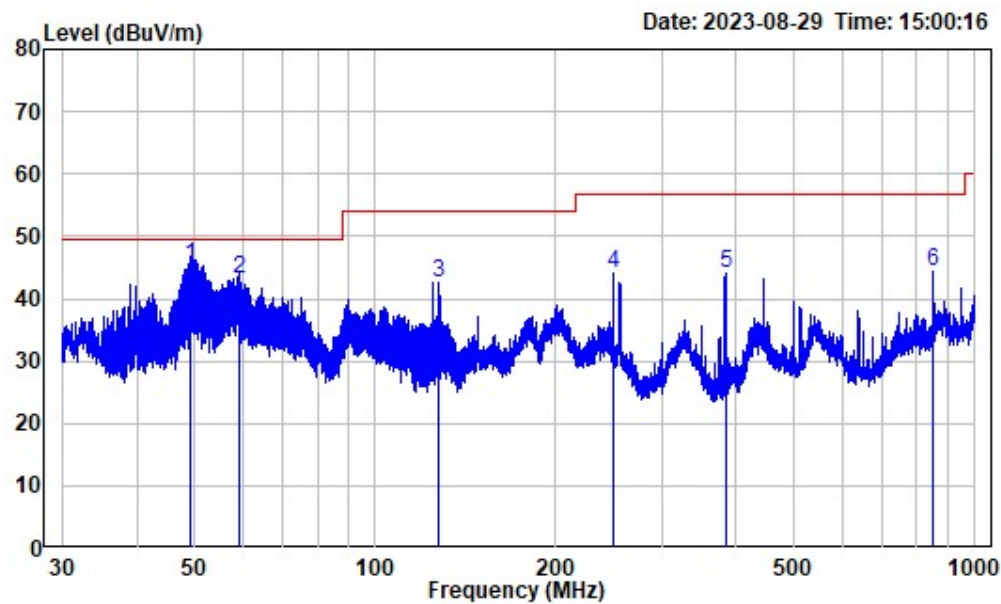


Site : chamber  
Condition: 3m HORIZONTAL  
Job No. : RA230825-50054E-EM  
Test Mode: Test Mode 1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	61.105	-11.07	50.99	39.92	49.54	-9.62	Peak
2	111.006	-12.10	53.36	41.26	53.98	-12.72	Peak
3	127.833	-14.67	57.71	43.04	53.98	-10.94	Peak
4	256.072	-10.61	57.85	47.24	56.90	-9.66	Peak
5	445.632	-5.63	54.59	48.96	56.90	-7.94	Peak
6	950.009	2.05	44.68	46.73	56.90	-10.17	Peak



Vertical

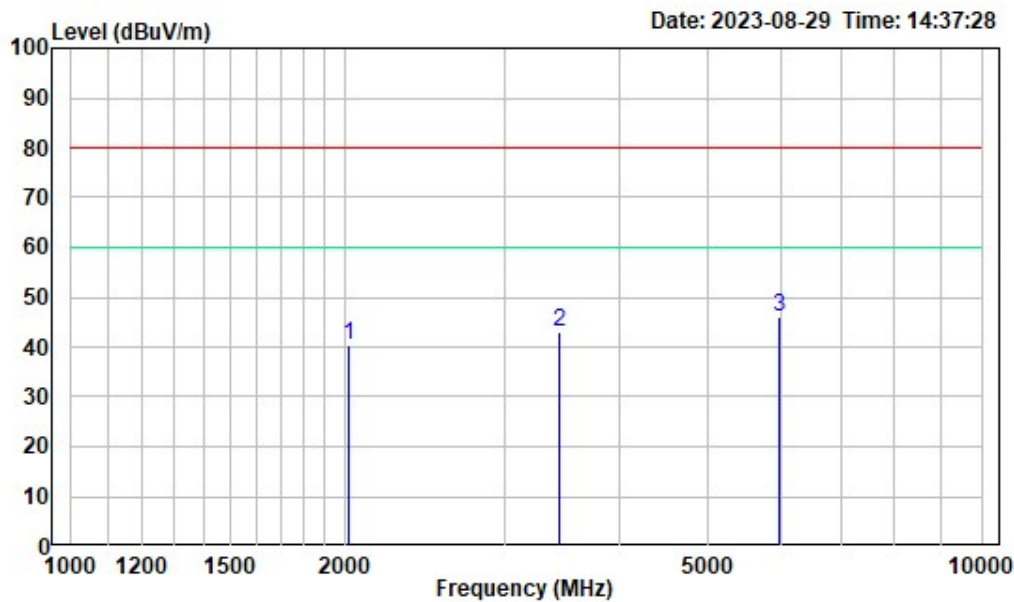


Site : chamber  
Condition: 3m VERTICAL  
Job No. : RA230825-50054E-EM  
Test Mode: Test Mode 1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	49.036	-9.96	55.11	45.15	49.54	-4.39	QP
2	59.467	-10.43	53.45	43.02	49.54	-6.52	QP
3	127.777	-14.67	57.34	42.67	53.98	-11.31	Peak
4	249.972	-10.74	54.89	44.15	56.90	-12.75	Peak
5	383.764	-7.08	51.19	44.11	56.90	-12.79	Peak
6	850.290	0.36	44.12	44.48	56.90	-12.42	Peak

Above 1GHz (1-10 GHz)

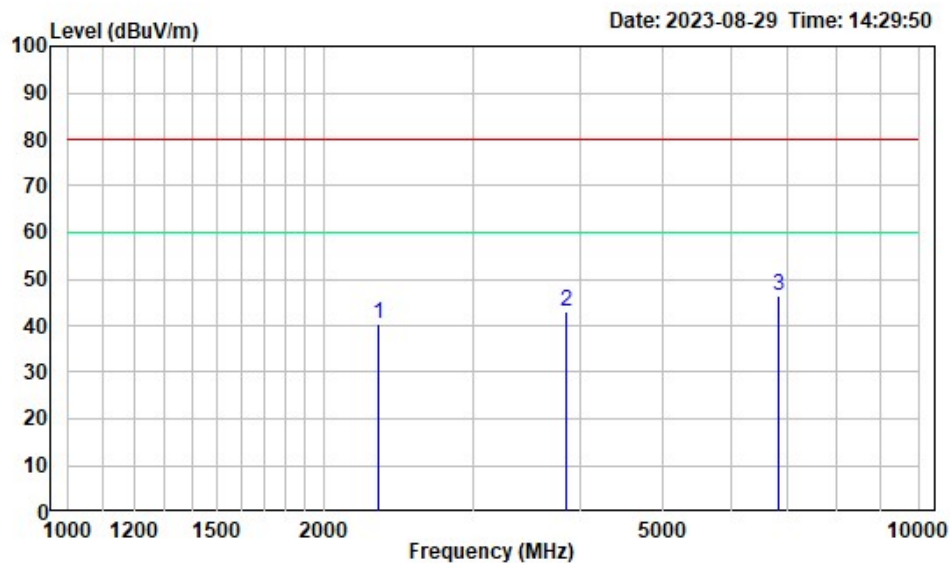
Horizontal



Site : chamber  
Condition: 3m HORIZONTAL  
Job No. : RA230825-50054E-EM  
Test Mode: Test Mode 1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2019.000	-12.23	52.54	40.31	80.00	-39.69	Peak
2	3435.000	-9.82	52.77	42.95	80.00	-37.05	Peak
3	5974.000	-0.50	46.53	46.03	80.00	-33.97	Peak

Vertical



Site : chamber  
Condition: 3m VERTICAL  
Job No. : RA230825-50054E-EM  
Test Mode: Test Mode 1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2316.000	-10.39	50.66	40.27	80.00	-39.73	Peak
2	3859.000	-8.71	51.85	43.14	80.00	-36.86	Peak
3	6844.000	0.19	46.18	46.37	80.00	-33.63	Peak

Note:  
1) Level= Reading + Factor  
2) Margin = Level-Limit  
3) For below 1GHz testing, if the maximized peak measured value complies with the limit, then it is unnecessary to perform QP measurement.  
4) For above 1GHz testing, the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

## 6. PHOTOGRAPHS

### 6.1.Photo of Conducted Emission Measurement

#### Conducted Emissions

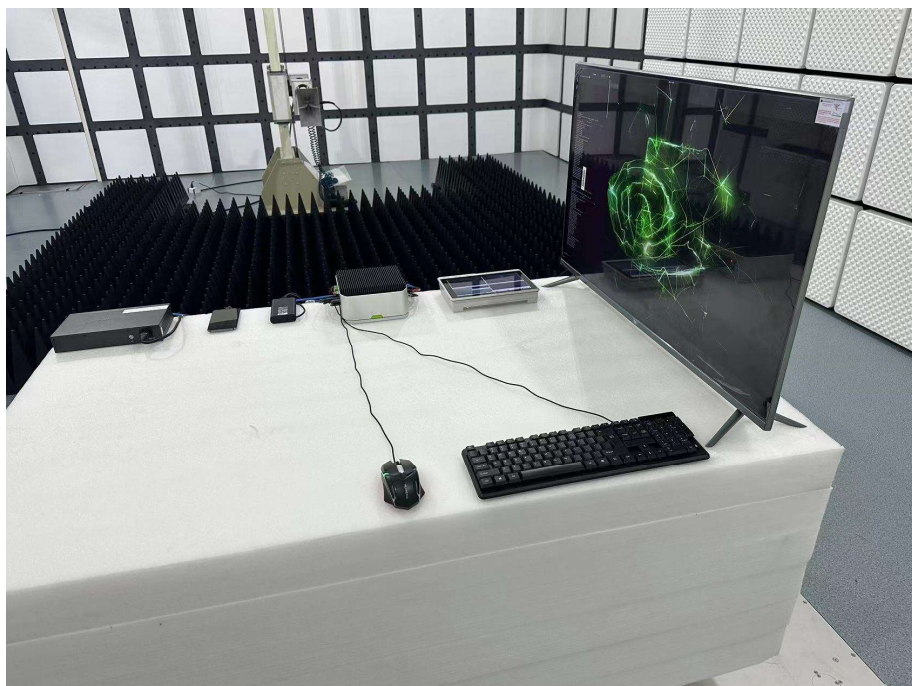


## 6.2.Photo of Radiation Emission Measurement

**Radiated Emissions-Below 1G**

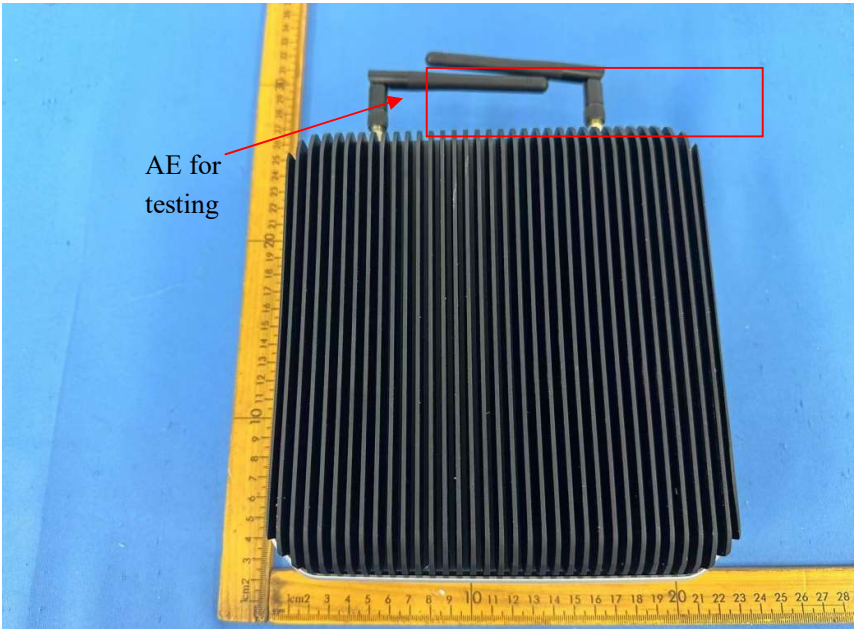
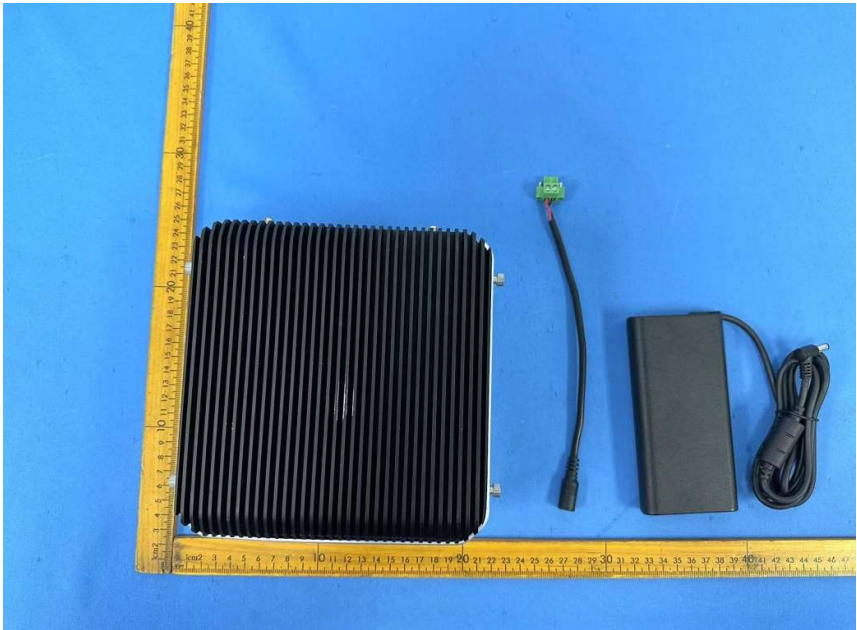


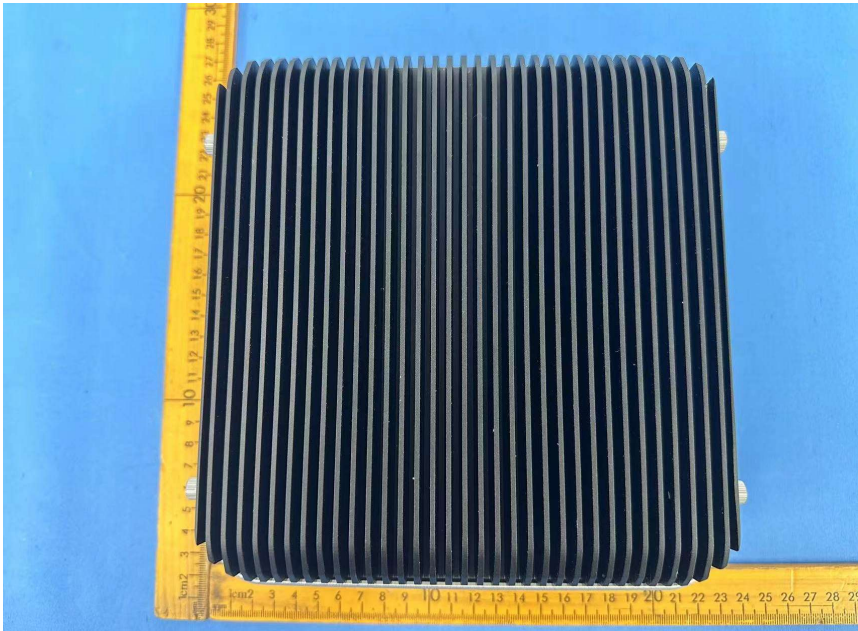
**Radiated Emissions-Above 1G**





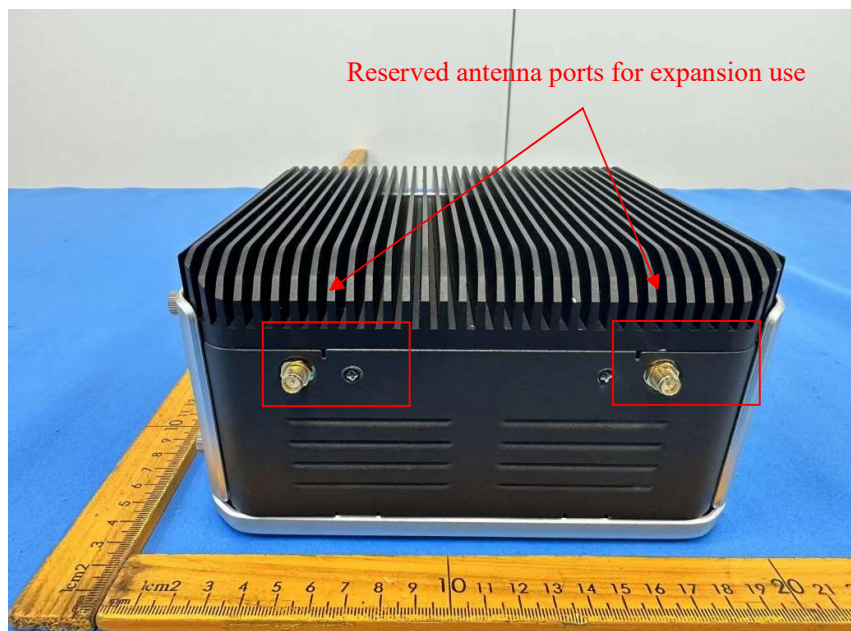
6.3.Photo of EUT

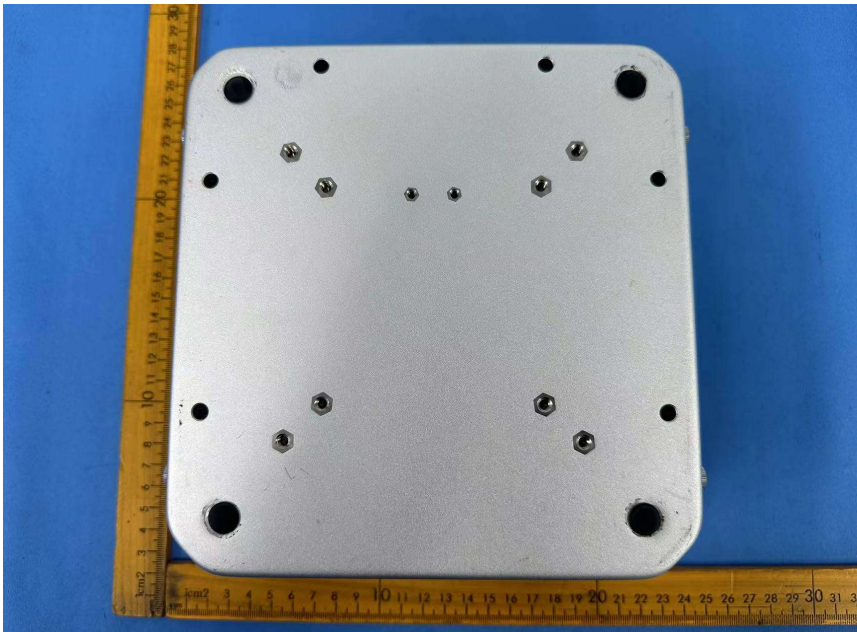






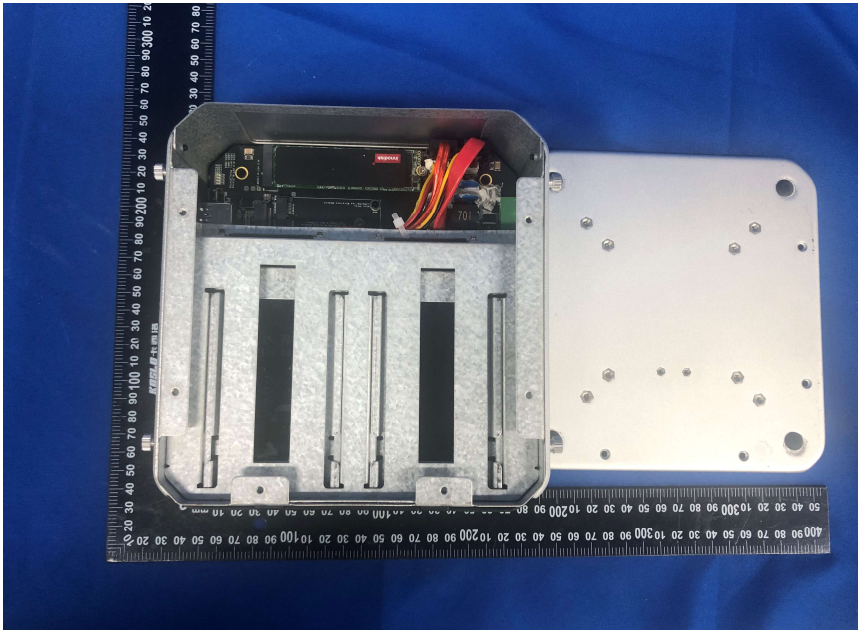




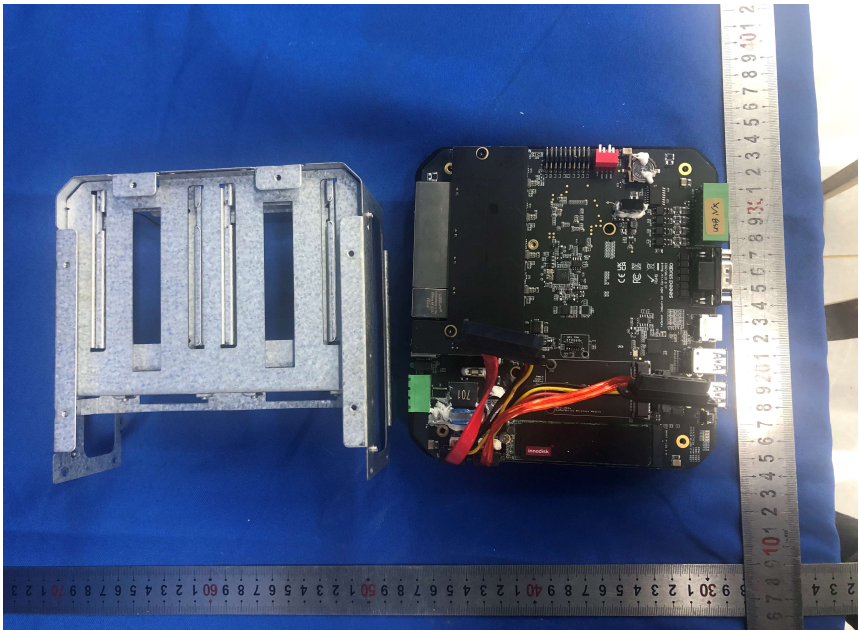
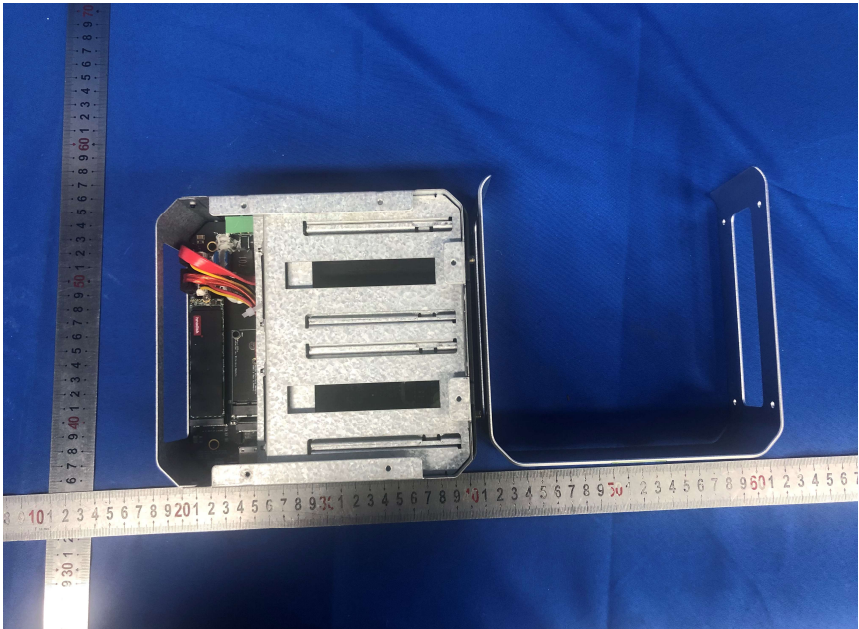


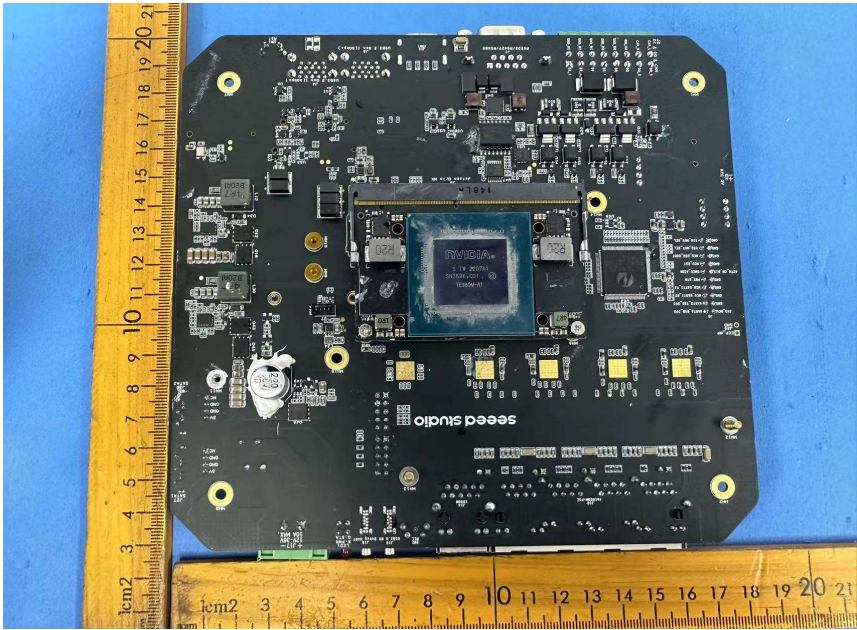
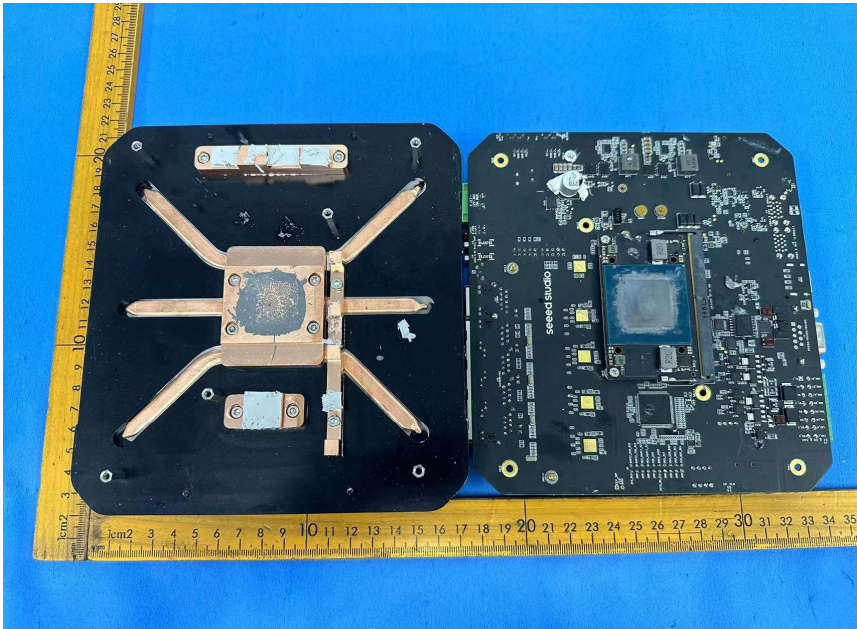




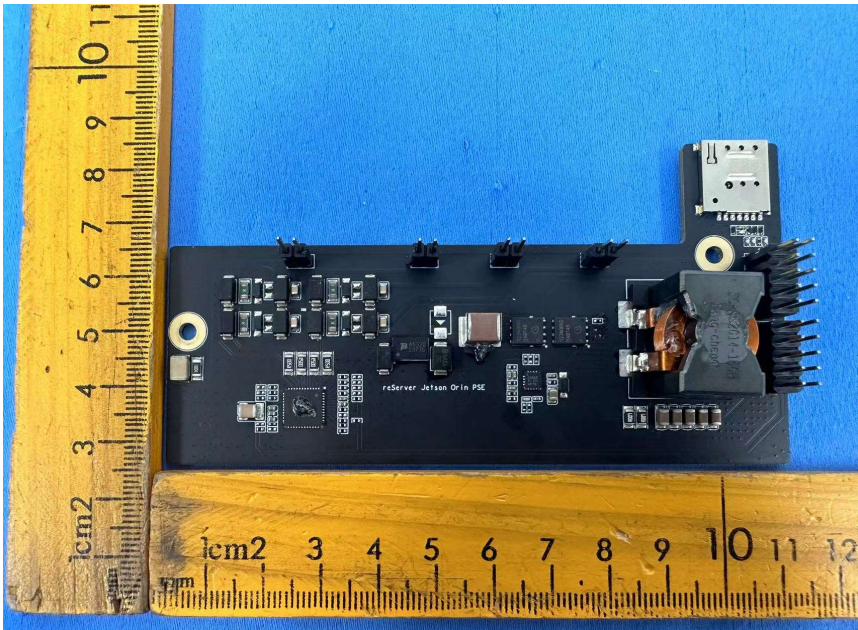
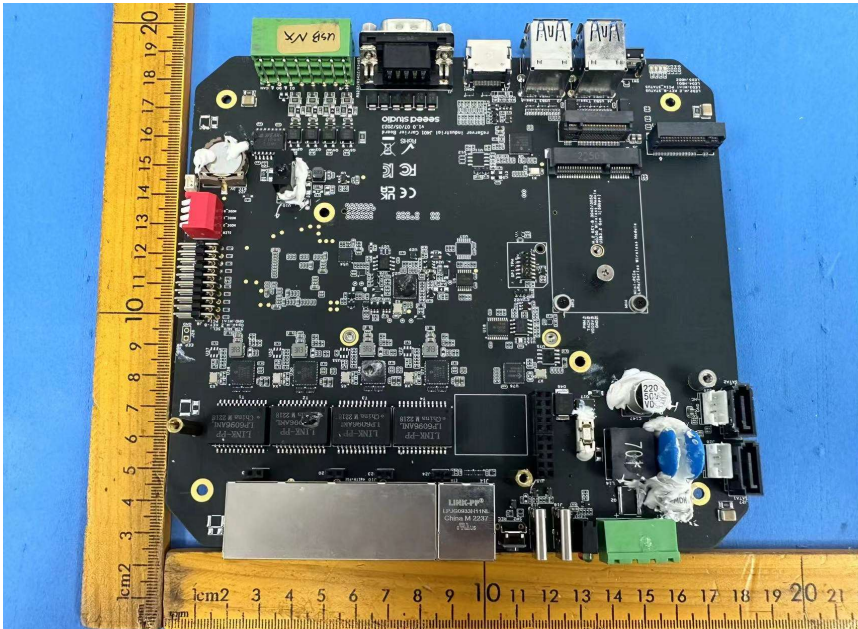


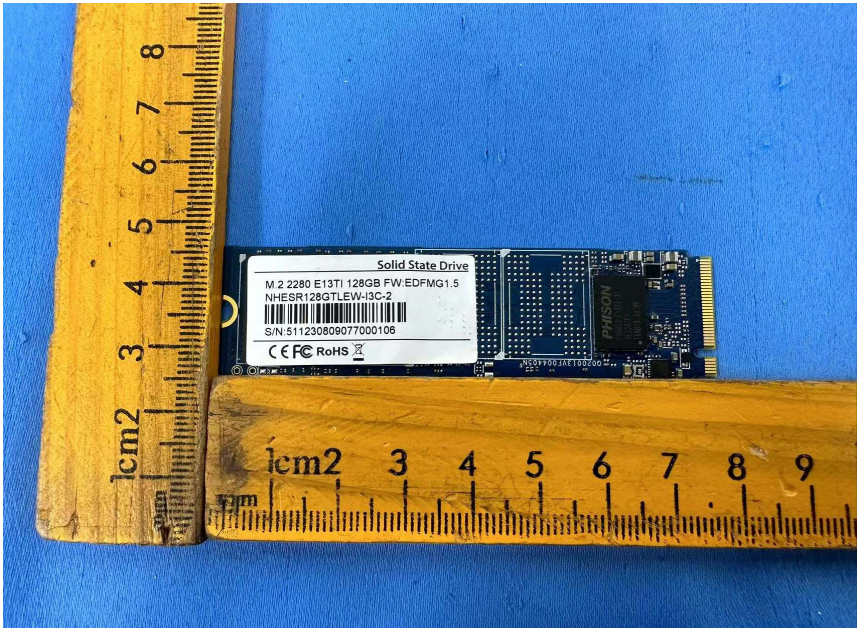
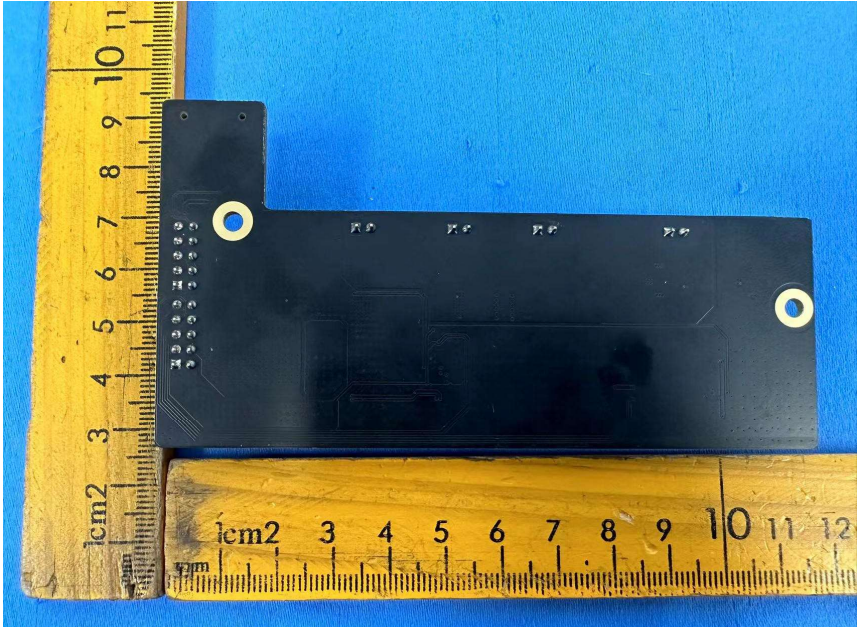




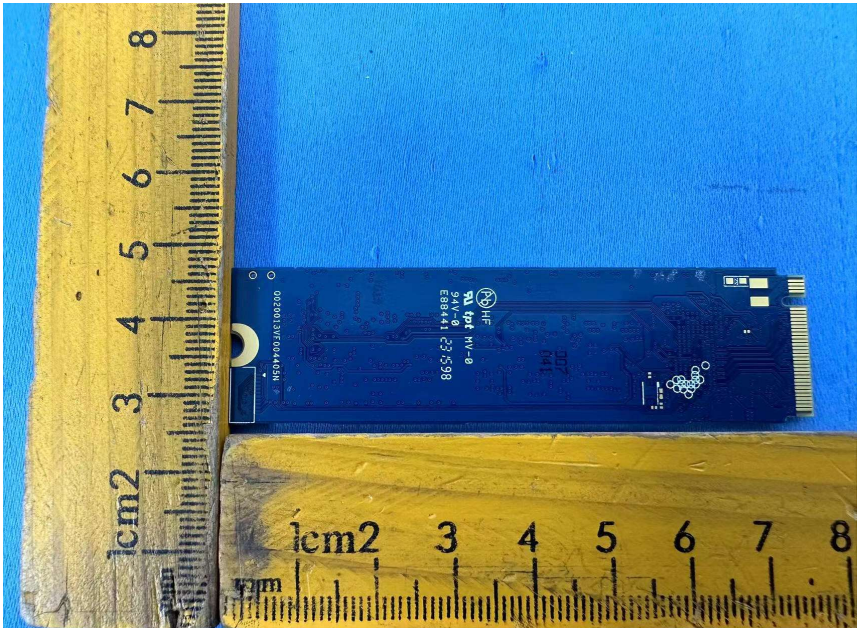
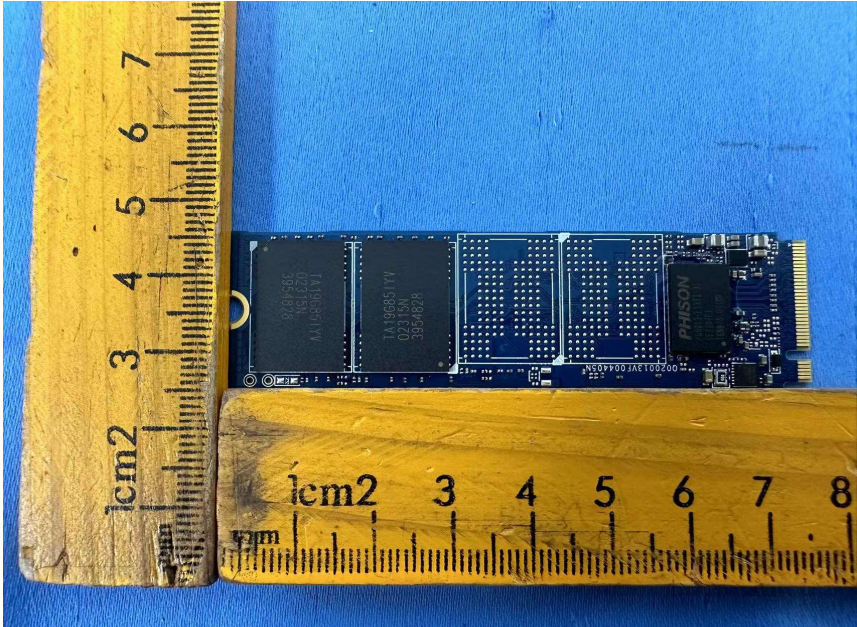


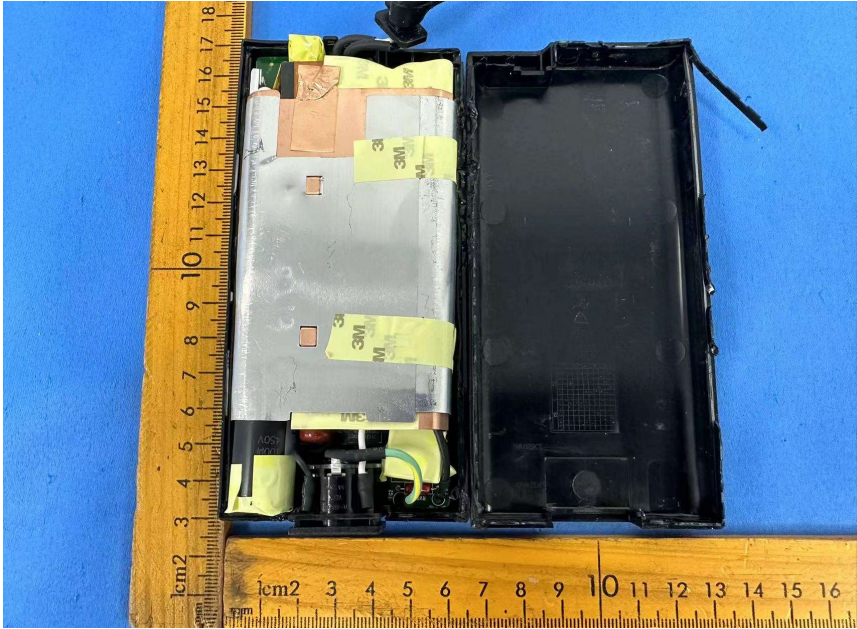




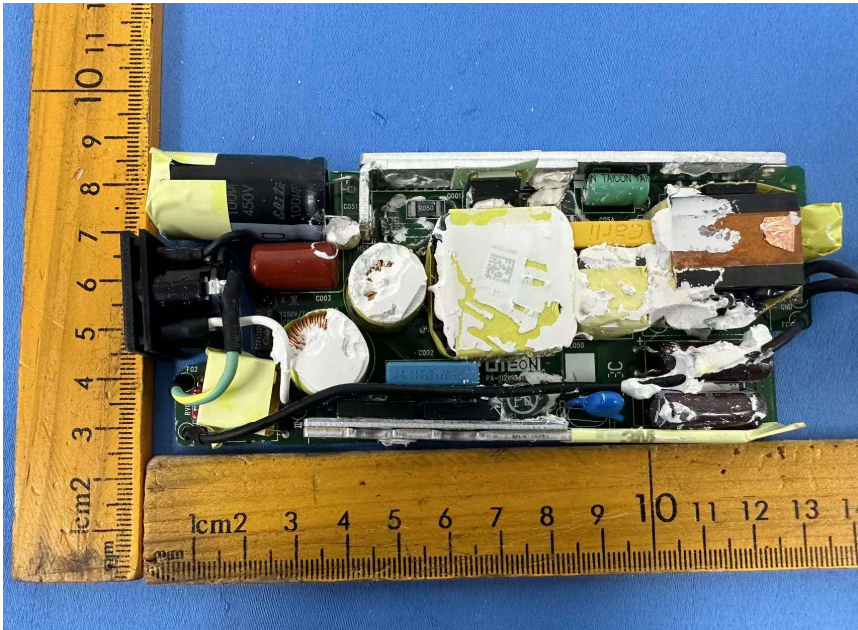


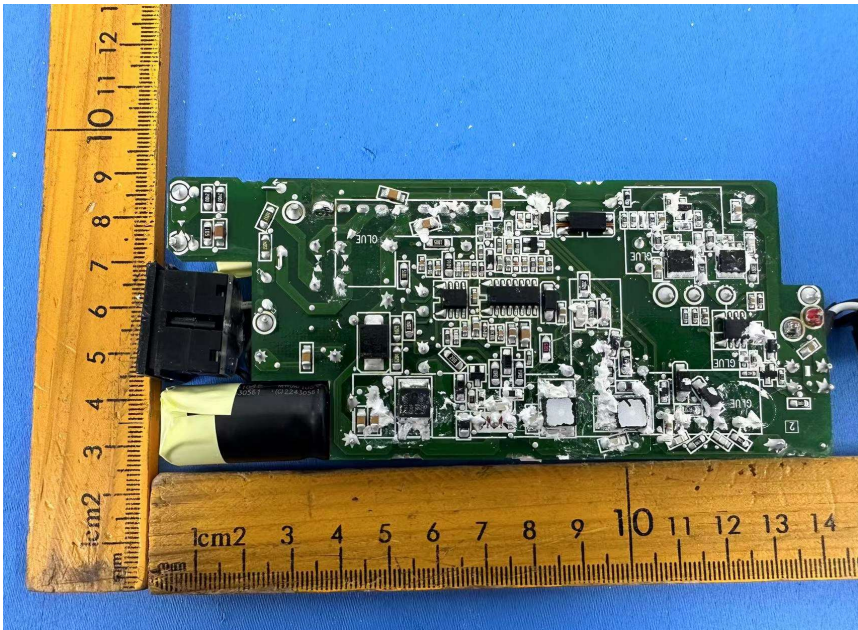
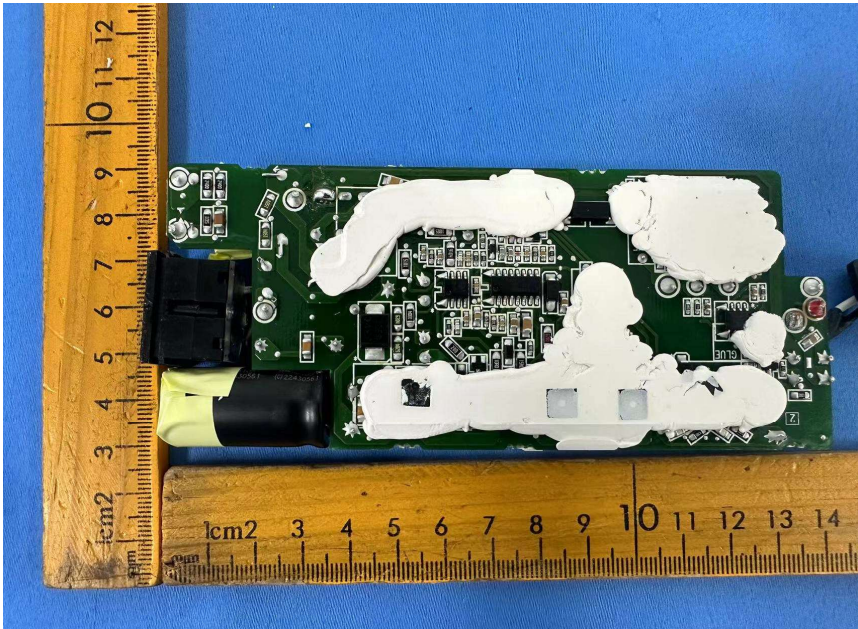












----- THE END OF TEST REPORT -----