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. China
Report Number:	SZNS1220824-38524E-EM

Test Standard (s)

FCC Rules and Regulations Part 15 Subpart B Class B

Sample Description

Product:	reTerminal E10-1
Trademark:	Seeed Studio
Model:	E10-1
Date Received:	2022-08-24
Date of Test:	2022-08-31 to 2022-09-02
Report Date:	2022-09-05

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Zeki Ma

Zeki Ma
EMC Engineer

Approved By:

Martin Lu

Martin Lü
EMC Engineer

ACCURATE TECHNOLOGY CO. LTD
ATC
APPROVED

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

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Test Report Declaration

Applicant	:	Seeed Technology Co., Ltd
Manufacturer	:	Seeed Technology Co., Ltd
Product	:	reTerminal E10-1
Model	:	E10-1

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart B Class B
ANSI C63.4: 2014

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 B limits both 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
Radiated Emission (30-1000MHz)	FCC Part 15 Subpart B Class B	Pass
Power Line Conducted Emission (0.15-30MHz)	FCC Part 15 Subpart B Class B	Pass

2. GENERAL INFORMATION

2.1.Description of Device (EUT)

Product	:	reTerminal E10-1
Model	:	E10-1
Rating	:	100-240V,50/60Hz
Remark(s)	:	The EUT's highest operating frequency is 40MHz less than 108MHz, the radiated emission measurement shall be made up to 1GHz.
Applicant	:	Seeed Technology Co., Ltd
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.China
Manufacturer	:	Seeed Technology Co., Ltd
Address	:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.China
Sample Number	:	SZNS1220824-38524E-EM-S1

2.2.Test Mode

Test Mode 1: Powered by AC/DC adapter

Test Mode 2: Powered by AC/DC adapter (POE)

2.3.Accessory and Auxiliary Equipment

1. AC/DC Adapter	:	Model: KA2401A-1202000EU Input: 100~240V - 50/60Hz 0.65A Max Output: 12.0V=2.0A 24.0W (The DC line length is 147cm)
2. AC/DC Adapter(POE)	:	Model: UE-PoE-35 Input: 100~240V - 50/60Hz 1.0A MAX Output: 54V=0.65A (The DC line length is 93cm)
3. Laptop	:	Manufacturer: DELL Model: E7450

2.4.Description of Test Facility

Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

2.5.Measurement Uncertainty

Radiated emission expanded uncertainty (30MHz-1000MHz)	:	*U=4.28dB, k=2*
Conduction Emission Expanded Uncertainty (0.15kHz-30MHz)	:	U=2.72dB, k=2

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.	Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12
2.	Rohde & Schwarz	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12
3.	Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
4.	Rohde & Schwarz	ISN-8	CAT5 8158	8158-0035	2021/12/13	2022/12/12
5.	Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
6.	Conducted Emission Test Software: e3 19821b (V9)					

3.2.For Radiated Emission Measurement

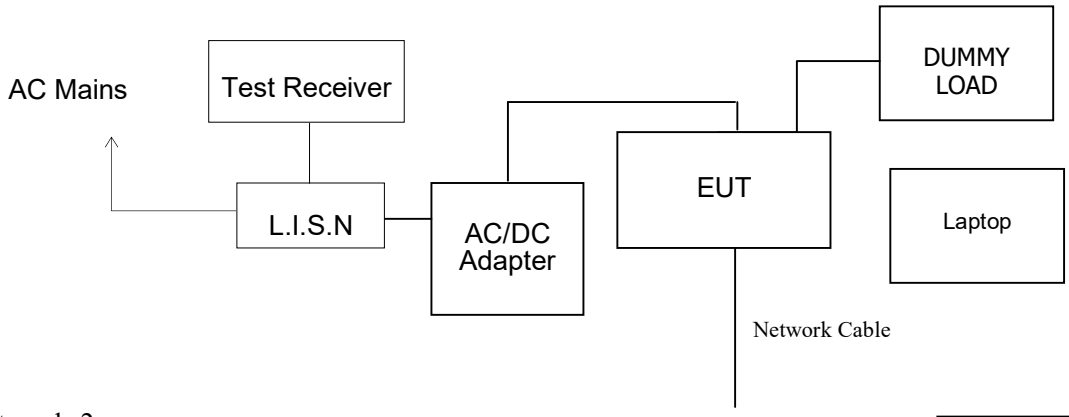
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1.	Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
2.	SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
3.	Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
4.	Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
5.	Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
6.	Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
7.	Radiated Emission Test Software: e3 19821b (V9)					

4. POWER LINE CONDUCTED MEASUREMENT

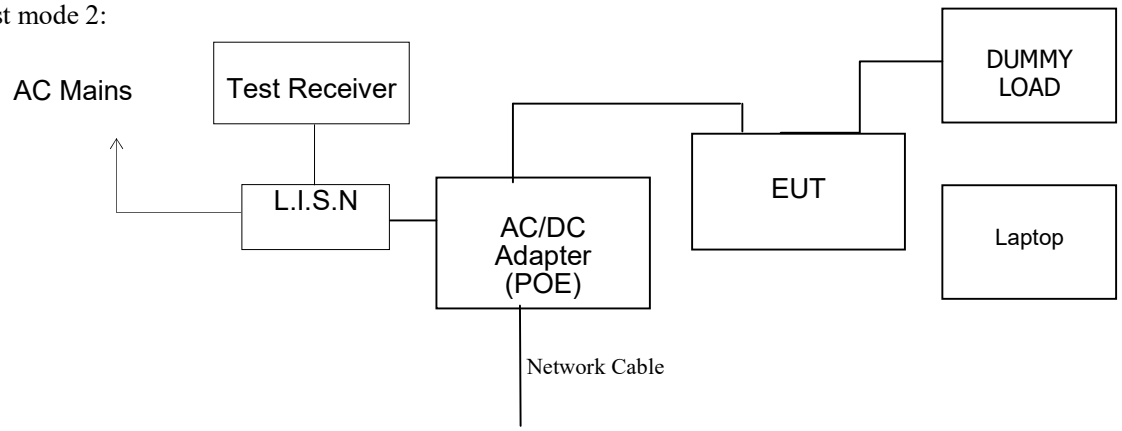
4.1.Block Diagram of Test Setup

4.1.1.Block diagram of connection between the EUT and simulators

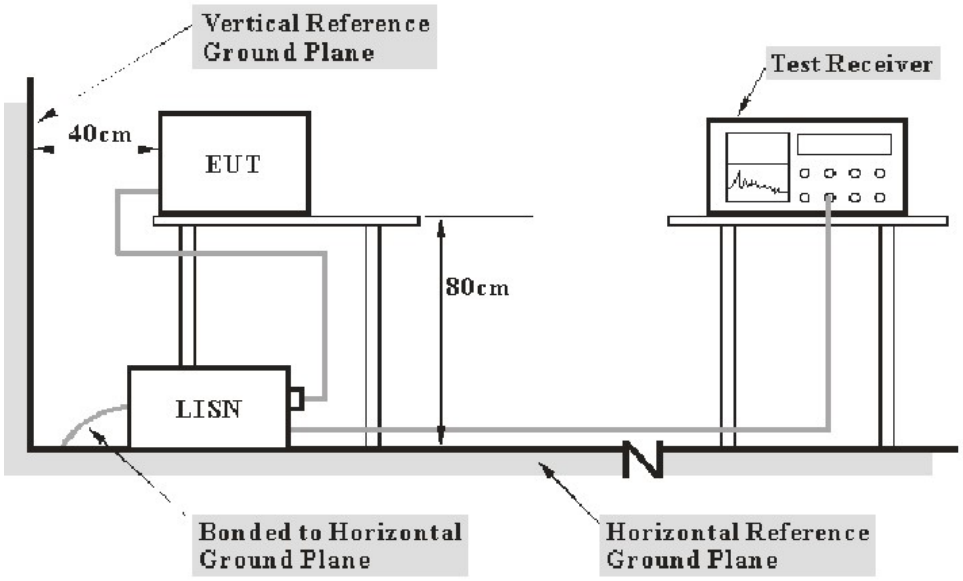
Test mode 1:



Test mode 2:



4.1.2.Test System Setup



4.2.Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies. NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

4.3.Manufacturer

The equipment are installed on Power Line 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 equipment.

4.4.3.Let the EUT work in test mode 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.

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

4.6.Power Line Conducted Emission Measurement Results

PASS.

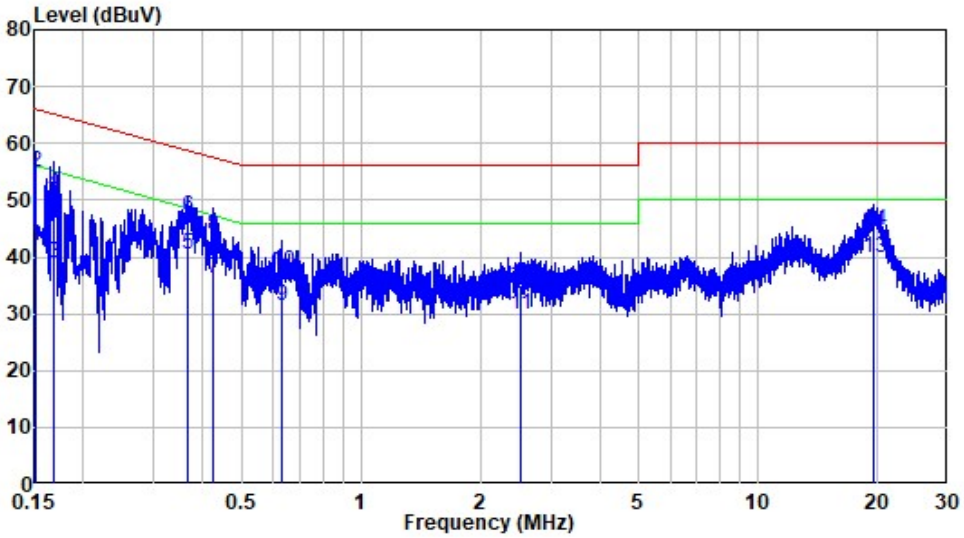
The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT. Emissions attenuated more than 20 dB below the permissible value are not reported.

All data was recorded in the Quasi-peak and average detection mode.

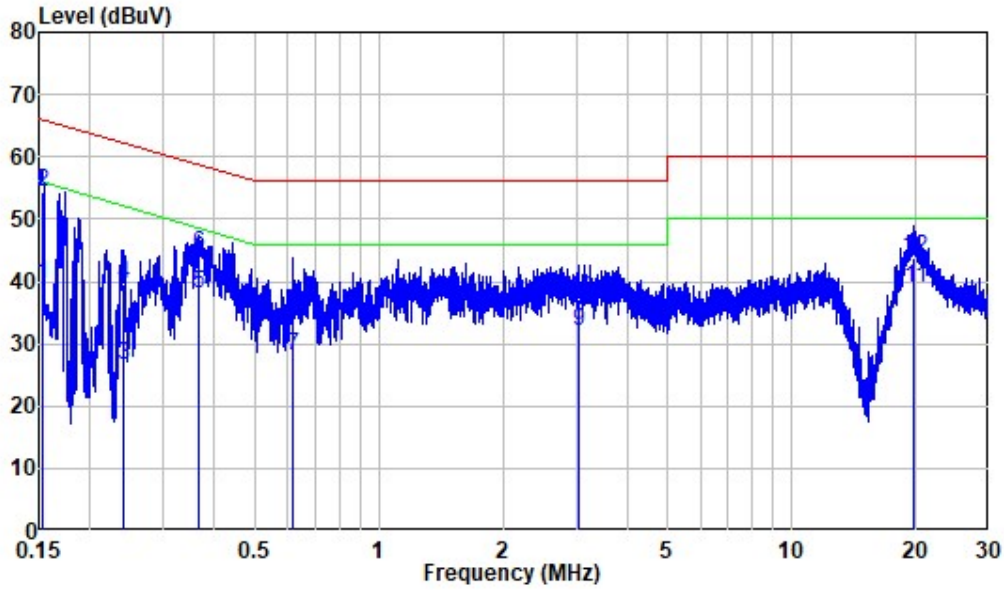
The spectral diagrams are attached as below.

Job No.:	**SZNS1220824-38524E-EM**	**Power:**	**AC 120V 60Hz**
Eut No.:	**SZNS1220824-38524E-EM-S1**	**Test By:**	**Jason Liu**
Eut:	**reTerminal E10-1**	**Test item:**	**Conduction Test**
Model:	**E10-1**	**Test standard:**	**FCC Part 15B**
Climatic:	**23° C 42%RH**	**Date:**	**2022.08.31**



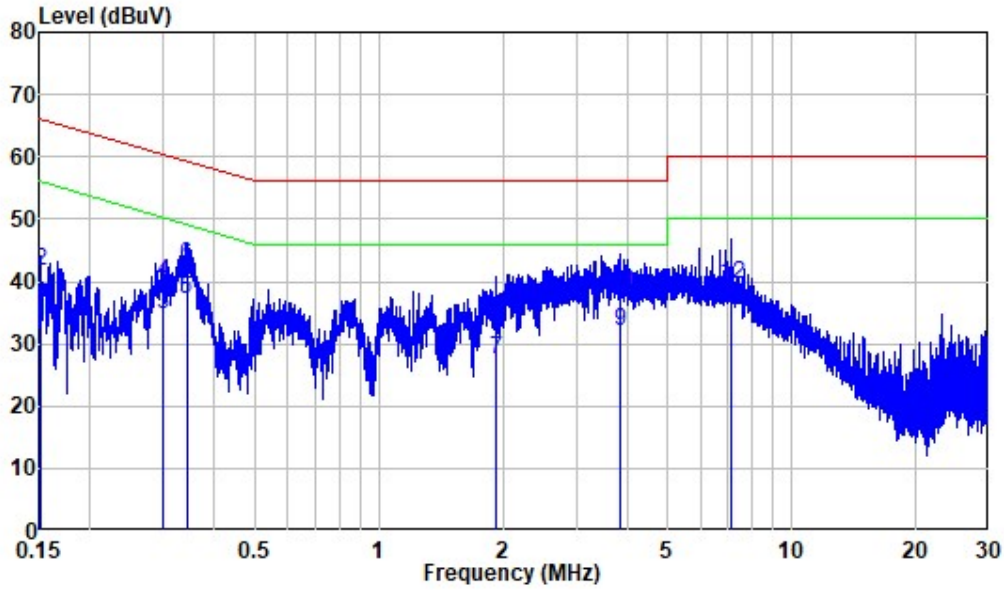
Site : Shielding Room
Condition: Line
Job No. : SZNS1220824-38524E-EM
Mode : Powered by AC/DC adapter
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	9.80	32.15	41.95	55.92	-13.97	Average
2	0.151	9.80	45.08	54.88	65.92	-11.04	QP
3	0.168	9.80	29.25	39.05	55.04	-15.99	Average
4	0.168	9.80	41.64	51.44	65.04	-13.60	QP
5	0.367	9.80	30.73	40.53	48.58	-8.05	Average
6	0.367	9.80	37.19	46.99	58.58	-11.59	QP
7	0.423	9.80	26.42	36.22	47.39	-11.17	Average
8	0.423	9.80	33.99	43.79	57.39	-13.60	QP
9	0.634	9.81	21.55	31.36	46.00	-14.64	Average
10	0.634	9.81	27.47	37.28	56.00	-18.72	QP
11	2.525	9.83	20.11	29.94	46.00	-16.06	Average
12	2.525	9.83	25.28	35.11	56.00	-20.89	QP
13	19.570	10.00	29.93	39.93	50.00	-10.07	Average
14	19.570	10.00	34.62	44.62	60.00	-15.38	QP



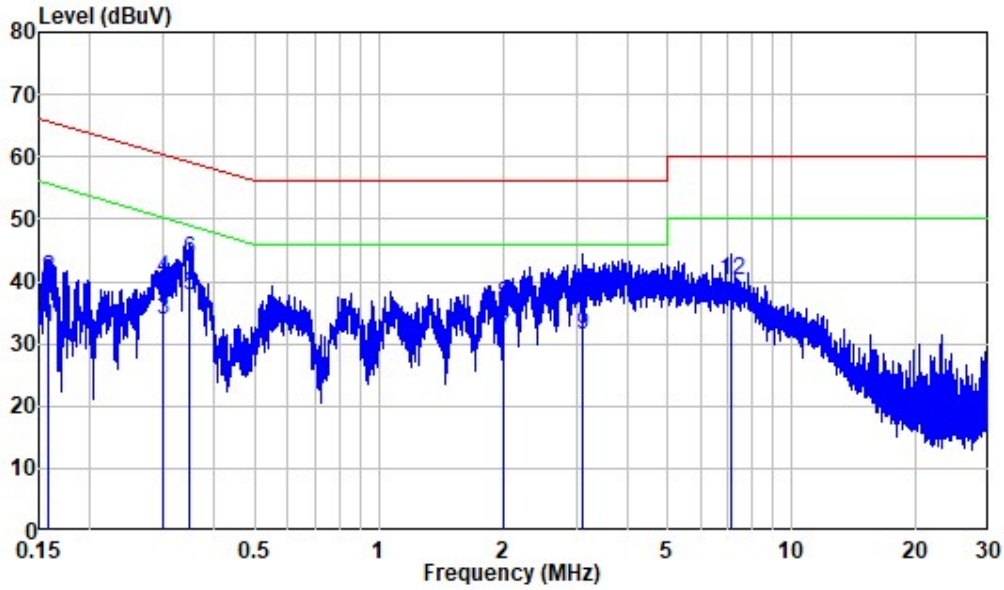
Site : Shielding Room
Condition: Neutral
Job No. : SZNS1220824-38524E-EM
Mode : Powered by AC/DC adapter
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.153	9.80	29.74	39.54	55.85	-16.31	Average
2	0.153	9.80	44.54	54.34	65.85	-11.51	QP
3	0.239	9.80	16.67	26.47	52.12	-25.65	Average
4	0.239	9.80	29.83	39.63	62.12	-22.49	QP
5	0.367	9.80	28.21	38.01	48.58	-10.57	Average
6	0.367	9.80	34.66	44.46	58.58	-14.12	QP
7	0.618	9.81	18.29	28.10	46.00	-17.90	Average
8	0.618	9.81	25.17	34.98	56.00	-21.02	QP
9	3.056	9.83	22.14	31.97	46.00	-14.03	Average
10	3.056	9.83	27.20	37.03	56.00	-18.97	QP
11	19.792	10.10	28.80	38.90	50.00	-11.10	Average
12	19.792	10.10	33.79	43.89	60.00	-16.11	QP



Site : Shielding Room
Condition: Line
Job No. : SZNS1220824-38524E-EM
Mode : Powered by AC/DC adapter(POE)
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	9.80	23.74	33.54	55.94	-22.40	Average
2	0.151	9.80	31.91	41.71	65.94	-24.23	QP
3	0.299	9.80	24.85	34.65	50.26	-15.61	Average
4	0.299	9.80	30.18	39.98	60.26	-20.28	QP
5	0.342	9.80	27.25	37.05	49.16	-12.11	Average
6	0.342	9.80	32.91	42.71	59.16	-16.45	QP
7	1.927	9.82	17.78	27.60	46.00	-18.40	Average
8	1.927	9.82	23.67	33.49	56.00	-22.51	QP
9	3.835	9.84	22.11	31.95	46.00	-14.05	Average
10	3.835	9.84	28.49	38.33	56.00	-17.67	QP
11	7.156	9.87	25.68	35.55	50.00	-14.45	Average
12	7.156	9.87	29.67	39.54	60.00	-20.46	QP



Site : Shielding Room
Condition: Neutral
Job No. : SZNS1220824-38524E-EM
Mode : Powered by AC/DC adapter(POE)
Power : AC 120V 60Hz

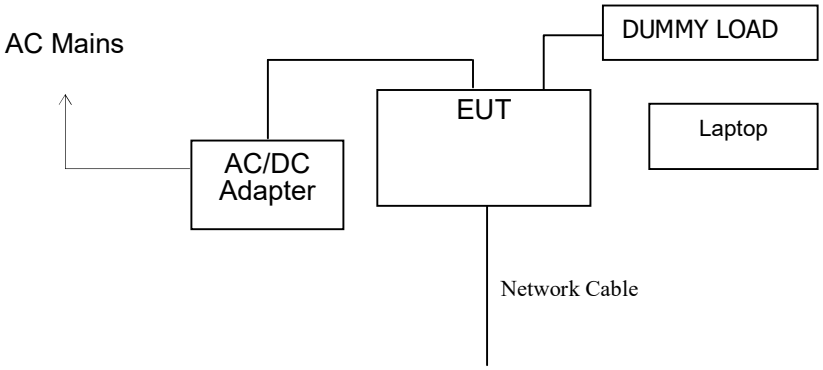
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.159	9.80	22.71	32.51	55.53	-23.02	Average
2	0.159	9.80	30.73	40.53	65.53	-25.00	QP
3	0.299	9.80	24.04	33.84	50.26	-16.42	Average
4	0.299	9.80	30.56	40.36	60.26	-19.90	QP
5	0.348	9.80	28.07	37.87	49.02	-11.15	Average
6	0.348	9.80	33.67	43.47	59.02	-15.55	QP
7	1.997	9.82	21.18	31.00	46.00	-15.00	Average
8	1.997	9.82	26.48	36.30	56.00	-19.70	QP
9	3.107	9.83	21.66	31.49	46.00	-14.51	Average
10	3.107	9.83	27.89	37.72	56.00	-18.28	QP
11	7.156	9.97	26.12	36.09	50.00	-13.91	Average
12	7.156	9.97	30.15	40.12	60.00	-19.88	QP

5. RADIATED EMISSION MEASUREMENT

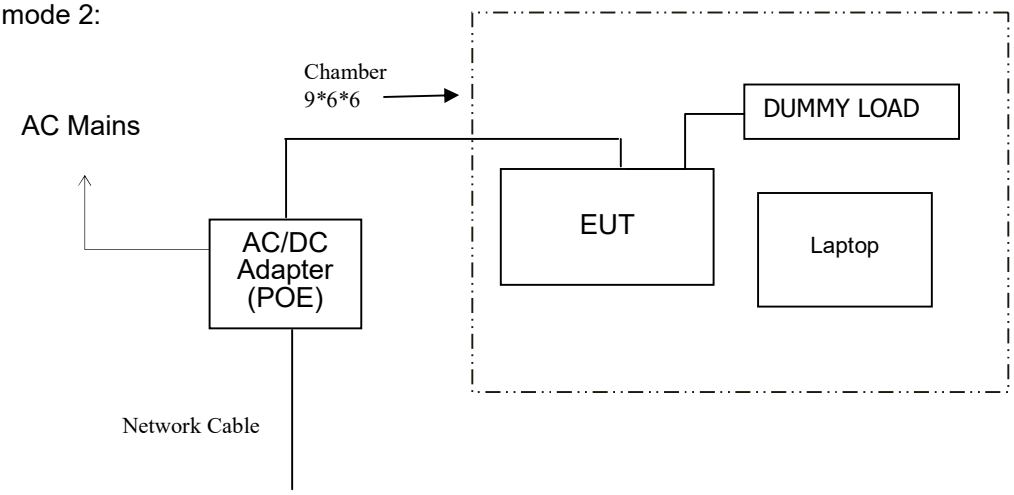
5.1.Block Diagram of Test Setup

5.1.1.Block diagram of connection between the EUT and simulators

Test mode 1:

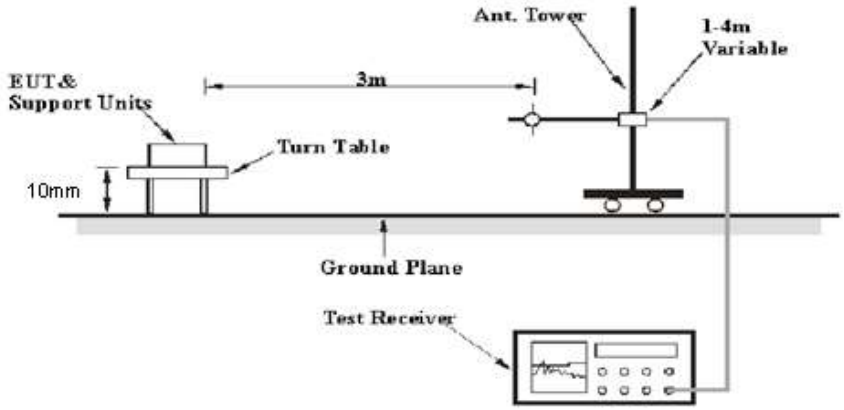


Test mode 2:



5.1.2.Test System Setup

Below 1GHz:



5.2.Radiated Emission Limit

All emanations from 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	
		μV/m	dB(μV/m)
30-88	3	100	40.0
88-216	3	150	43.5
216-960	3	200	46.0
Above 960	3	500	54.0
Remark: (1) Emission level dB(μV) = 20 log Emission level μV/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(μV/m)	AVGdB(μV/m)
1000-18000	3	74	54

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 mode 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 9kHz in 9kHz-30MHz, 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 30MHz to 1000MHz 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.

Over Limit (dB) = Level(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

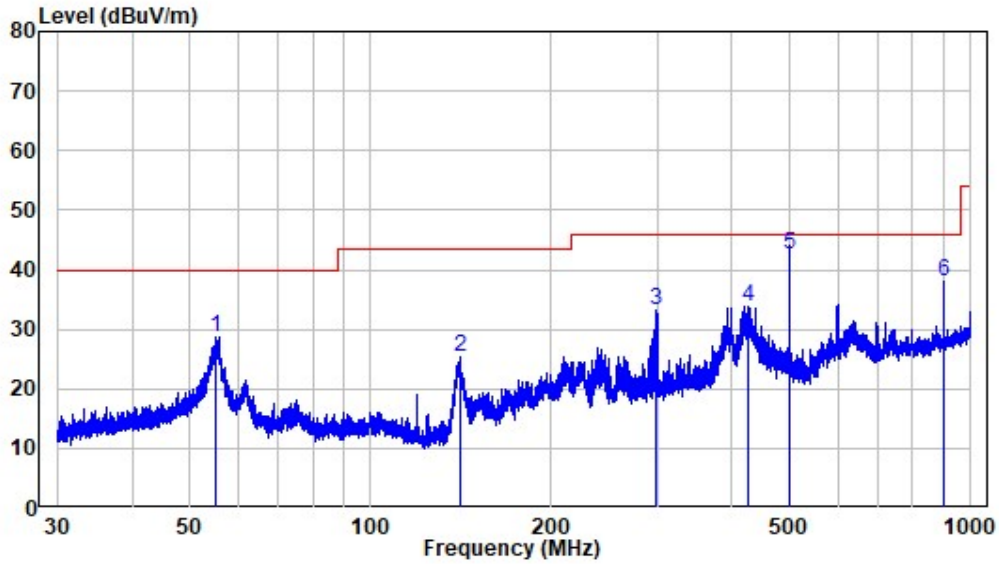
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

5.6.Radiated Emission Measurement Result

PASS.

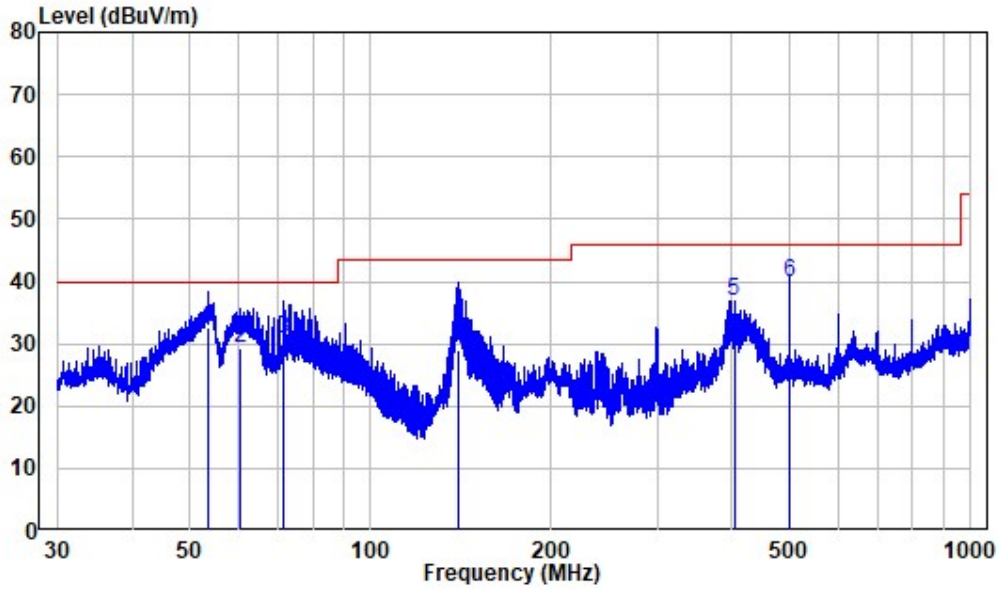
The frequency range from 30MHz to 1.0GHz is investigated.
The spectral diagrams are attached as below.
Over Limit = Level (dBμV) - Limit (dBμV)

Job No.:	**SZNS1220824-38524E-EM**	**Power:**	**120V 60Hz**
EUT No.:	**SZNS1220824-38524E-EM-S1**	**Test By:**	**Level Li**
EUT:	**reTerminal E10-1**	**Test item:**	**Radiation Emission**
Model:	**E10-1**	**Temp.(℃)/Hum.(%)::**	**27° C 61%RH**
Test standard:	**FCC PART 15B**	**Date:**	**2022.09. 01**



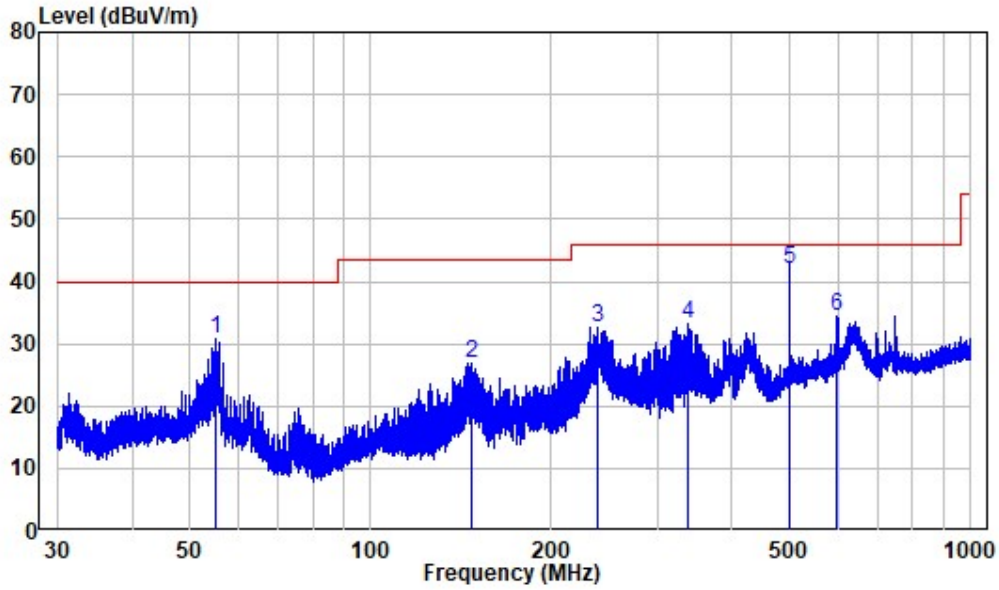
Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS1220824-38524E-EM
Test Mode: Powered by AC/DC adapter

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	55.052	-10.28	38.95	28.67	40.00	-11.33	Peak
2	141.330	-15.51	40.79	25.28	43.50	-18.22	Peak
3	298.661	-9.24	42.52	33.28	46.00	-12.72	Peak
4	424.656	-5.87	39.69	33.82	46.00	-12.18	Peak
5	497.895	-4.34	47.00	42.66	46.00	-3.34	QP
6	900.542	1.38	36.66	38.04	46.00	-7.96	Peak



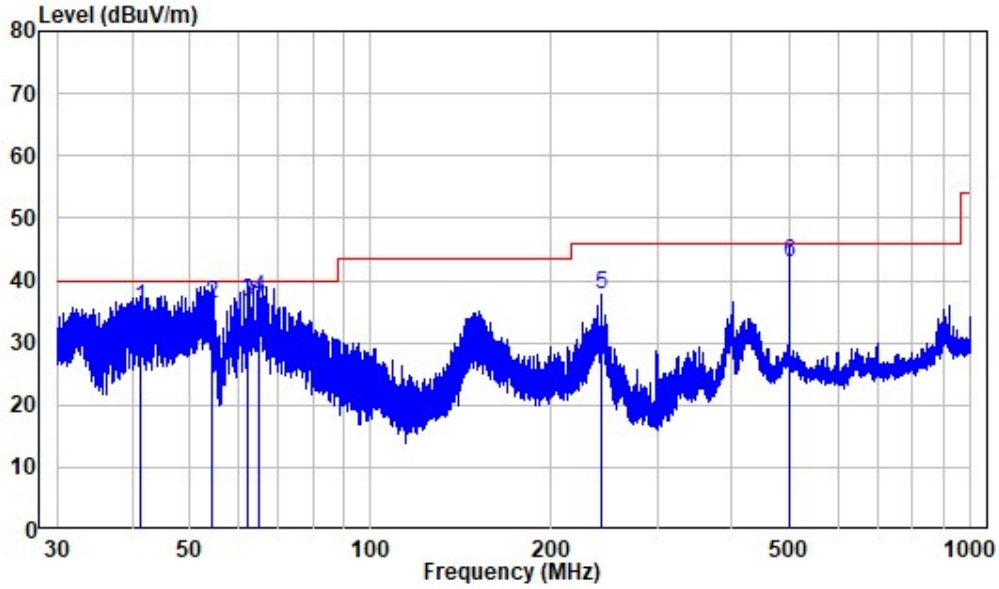
Site : chamber
Condition: 3m VERTICAL
Job No. : SZNS1220824-38524E-EM
Test Mode: Powered by AC/DC adapter

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	53.576	-10.28	42.91	32.63	40.00	-7.37	QP
2	60.704	-10.91	40.10	29.19	40.00	-10.81	QP
3	71.424	-15.37	46.13	30.76	40.00	-9.24	QP
4	139.728	-15.44	44.52	29.08	43.50	-14.42	QP
5	403.250	-6.73	43.64	36.91	46.00	-9.09	Peak
6	499.863	-4.26	44.13	39.87	46.00	-6.13	QP



Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS1220824-38524E-EM
Test Mode: Powered by AC/DC adapter (POE)

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	55.269	-10.26	41.00	30.74	40.00	-9.26	Peak
2	147.468	-15.43	42.19	26.76	43.50	-16.74	Peak
3	239.672	-10.92	43.66	32.74	46.00	-13.26	Peak
4	338.697	-7.48	40.54	33.06	46.00	-12.94	Peak
5	499.863	-4.26	46.30	42.04	46.00	-3.96	QP
6	597.485	-2.55	36.88	34.33	46.00	-11.67	Peak



Site : chamber
Condition: 3m VERTICAL
Job No. : SZNS1220824-38524E-EM
Test Mode: Powered by AC/DC adapter (POE)

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	41.422	-10.12	45.62	35.50	40.00	-4.50	QP
2	54.523	-10.31	46.60	36.29	40.00	-3.71	QP
3	62.186	-11.50	48.10	36.60	40.00	-3.40	QP
4	65.286	-12.62	49.70	37.08	40.00	-2.92	QP
5	242.738	-10.74	48.57	37.83	46.00	-8.17	Peak
6	499.863	-4.26	47.00	42.74	46.00	-3.26	QP

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/Average measurement.

6. PHOTOGRAPHS

6.1.Photo of Conducted Emission Measurement

Conducted Emissions



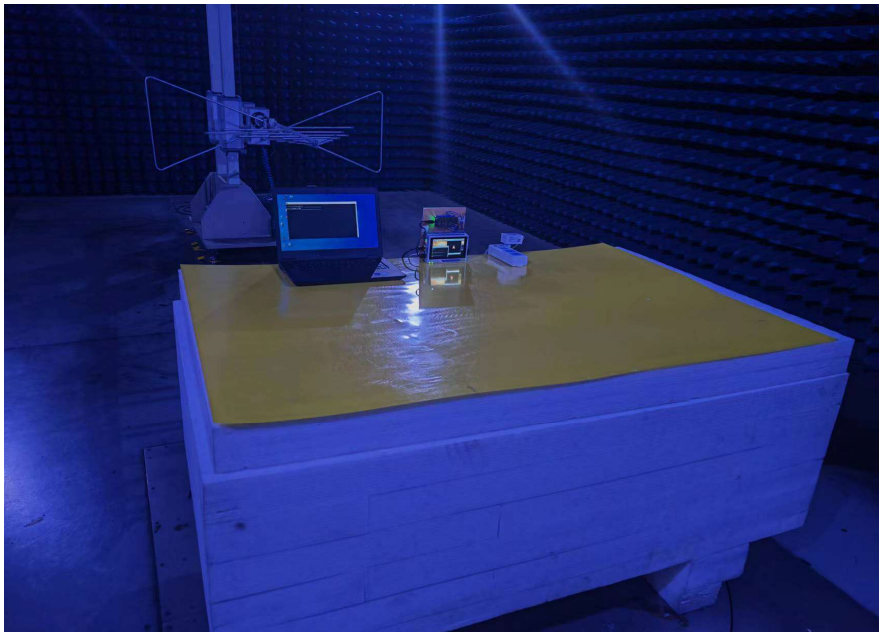


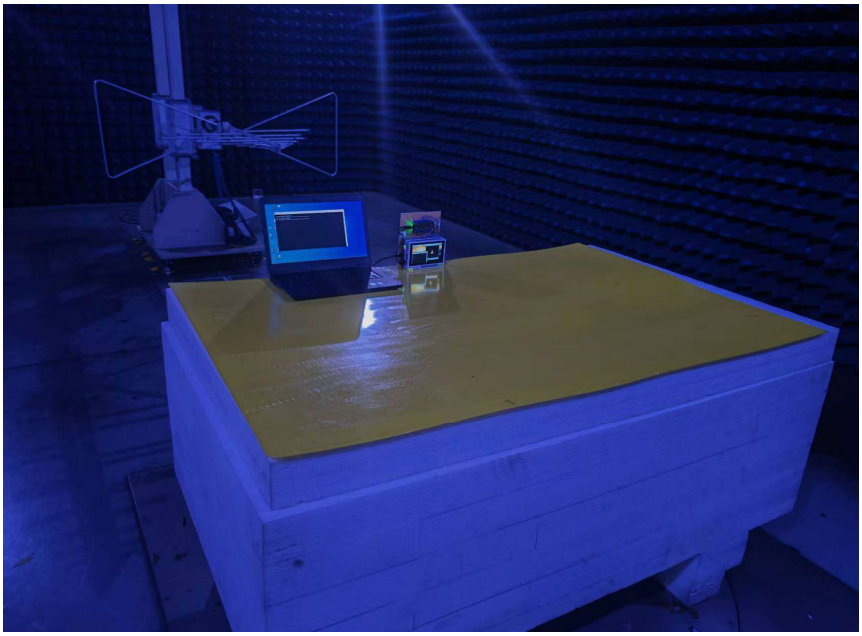




6.2.Photo of Radiation Emission Measurement

Radiated Emissions – Below 1 GHz

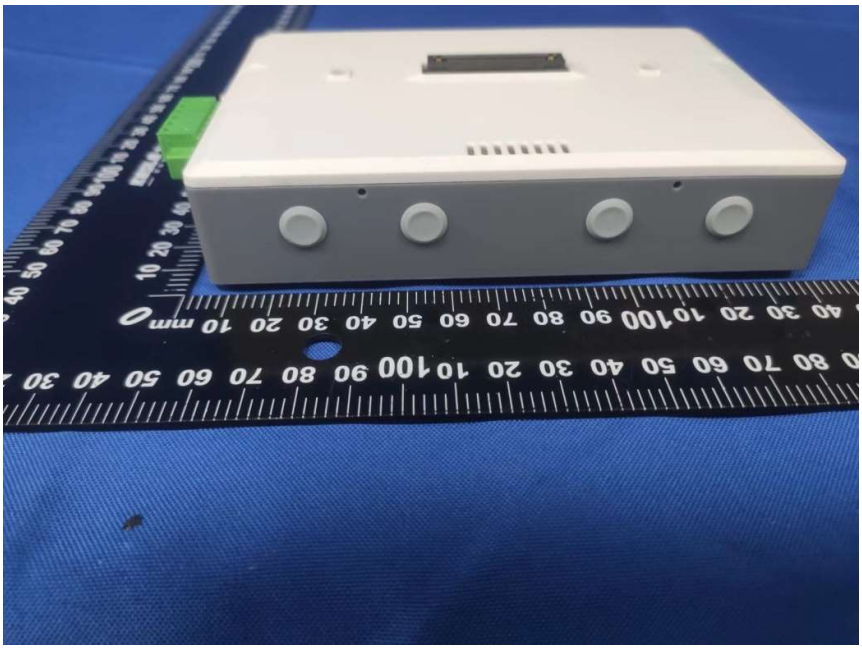


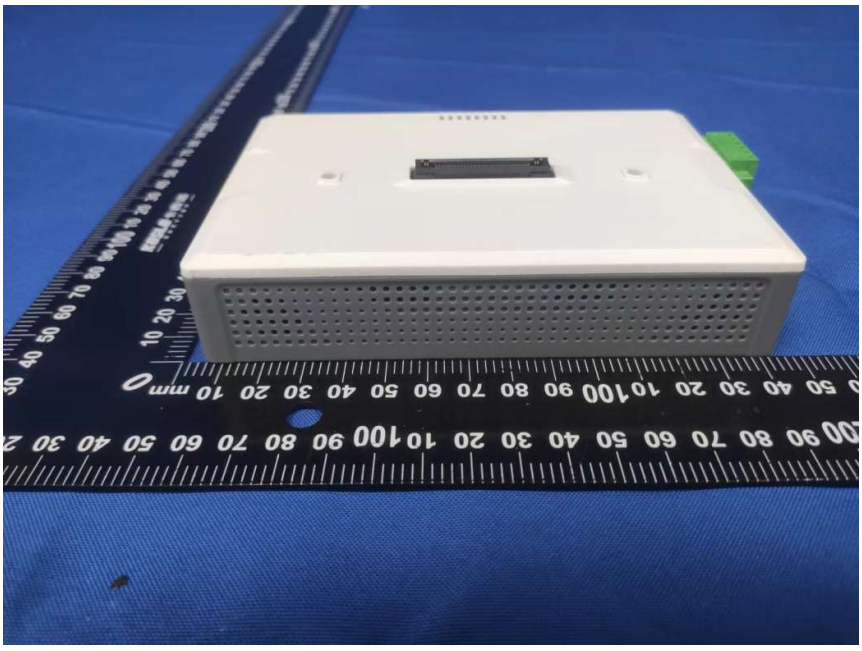


6.3.Photo of EUT

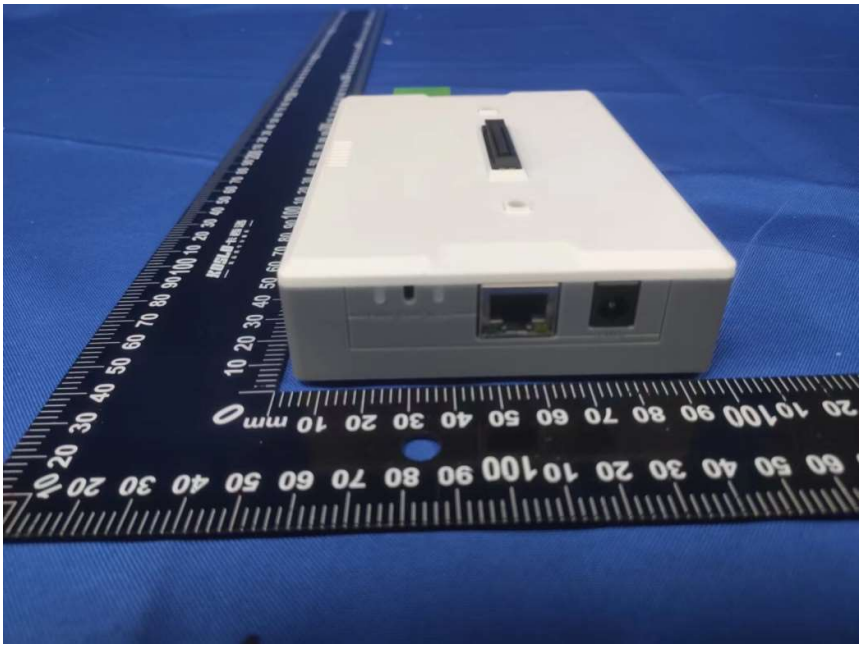


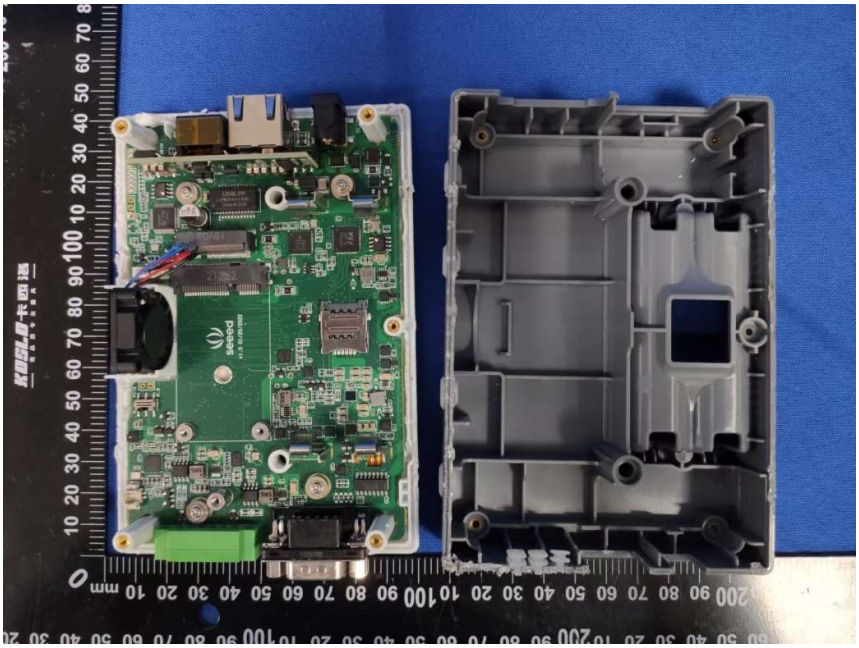


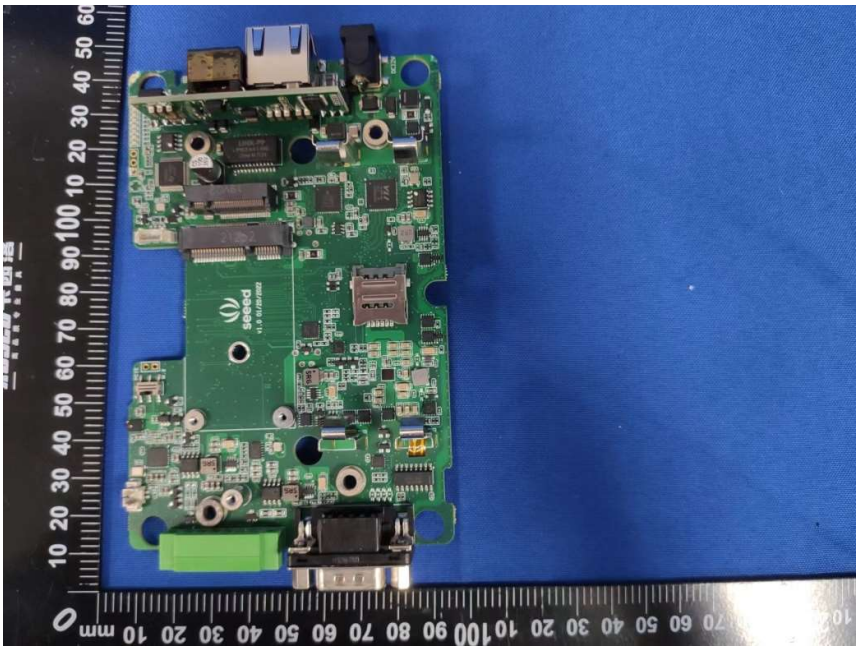


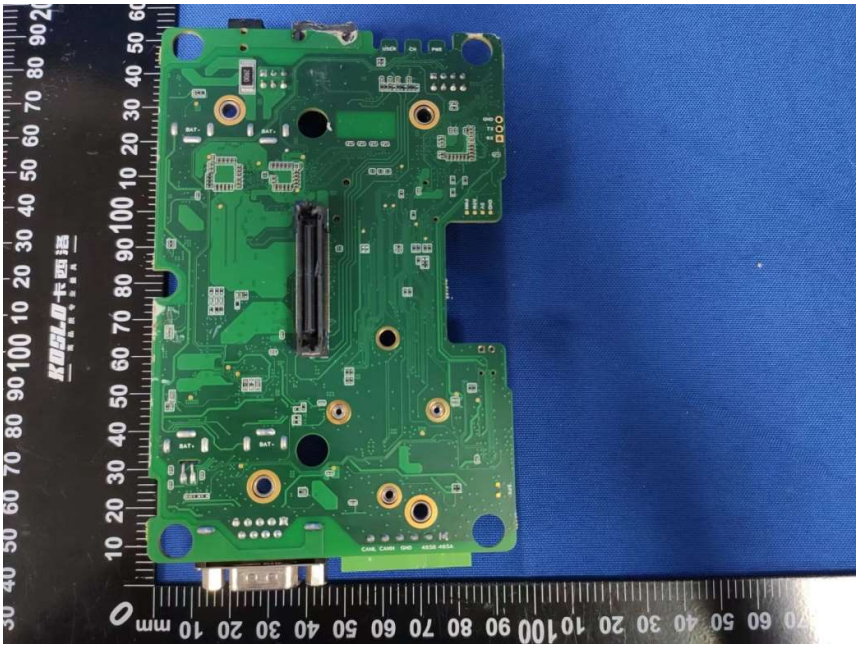


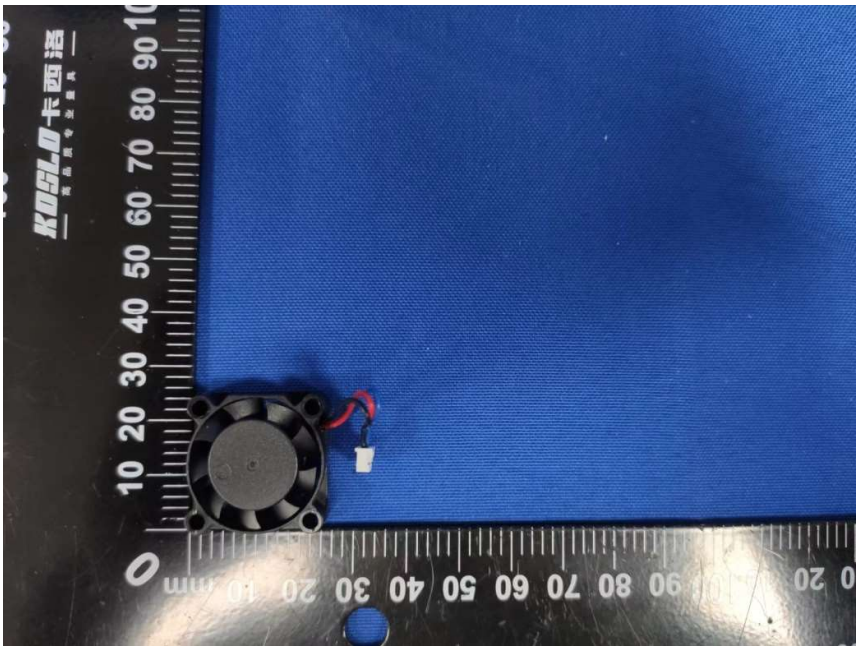












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