Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640
Fax: +86-755-26648637
Website: www.cqa-cert.com

Report Template Version: V03
Report Template Revision Date: Mar. 1st, 2017

Test Report

Report No. :	CQASZ20210400024EX-01
Applicant:	SHENZHEN POWEROAK NEWENER CO.,LTD
Address of Applicant:	Room 701-3, Building B, CADRE Building, Tongsha Road, Nanshan District, Shenzhen City, Guangdong Province, P.R.China
Manufacturer:	SHENZHEN POWEROAK NEWENER CO.,LTD
Address of Manufacturer:	Room 701-3, Building B, CADRE Building, Tongsha Road, Nanshan District, Shenzhen City, Guangdong Province, P.R.China
Equipment Under Test (EUT):	
Product:	ESS(Energy Storage System)
All Models:	EB200, S2000
Test Model No.:	EB200
Brand Name:	/
FCC ID:	2AYT3-EB200
Standards:	47 CFR Part 15, Subpart C
Date of Test:	Apr. 02, 2021 -- Apr. 22, 2021
Date of Issue:	Apr. 22, 2021
Test Result :	**PASS**

Tested By: Jun Li

(Jun Li)

Reviewed By: Ares Liu

(Ares Liu)

Approved By: Sheek.Luo

(Sheek luo)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO., LTD. 华夏准测 APPROVED

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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20210400024EX-01	Rev.01	Initial report	Apr. 22, 2021

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.215 (c)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.209	ANSI C63.10 2013	PASS

3 Contents

4 General Information

4.1 Client Information

Applicant:	SHENZHEN POWEROAK NEWENER CO.,LTD
Address of Applicant:	Room 701-3, Building B, CADRE Building, Tongsha Road, Nanshan District, Shenzhen City, Guangdong Province, P.R.China
Manufacturer:	SHENZHEN POWEROAK NEWENER CO.,LTD
Address of Manufacturer:	Room 701-3, Building B, CADRE Building, Tongsha Road, Nanshan District, Shenzhen City, Guangdong Province, P.R.China

4.2 General Description of EUT

Product Name:	ESS(Energy Storage System)
Test Model No.:	EB200
Trade Mark:	N/A
Hardware Version:	V2.0
Software Version:	V1.0
Operation Frequency:	125kHz -152kHz
Modulation Type:	MSK
Antenna Type:	Loop coil antenna
Antenna Gain:	0 dBi
Information:	Capacity:2000Wh 50VDC, 40Ah Input: DC 12-150VDC , 12A Input adapter: 58.8VDC, 8A **Output:** AC*6: 110-120VAC 50/60Hz, 2000W Total Aviation Sockets*1: 12VDC, 25A USB-A*2: 5-12VDC, 3A, 36W Total USB-A*2: 5VDC ,3A, 15W Total USB-C*1: 5-15VDC, 3A, 20VDC,5A Cigarette lighter*1: 12VDC, 10A DC 5521*2: 12VDC, 10A Wireless Charging*2: 5/7/7.5/10/15W

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4.3 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
Test Mode:	
Mode 1	Charging (DC port)
Mode 2	Charging (adapter)
Mode 3	AC*6(2000W max)
Mode 4	DC 12V *3
Mode 5	USB*5
Mode 6	Wireless charging*2(5W*2)
Mode 7	Wireless charging*2(7.5W*2)
Mode 8	Wireless charging*2(10W*2)
Mode 9	Wireless charging*2(15W*2)
Mode 10	Mode 3+ Mode 4+ Mode 5+ Mode 9
Note: The mode 10 was the worst case and only the data of the worst case record in this report	

4.4 Operation channel list

Channel	Frequency(KHz)
Low	125
Middle	139
High	152

Test channel

Middle	139

4.5 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	emark	FCC certification
Wireless electronic Load	-	-	Provide by laboratory	-
-	-	-	-	-

4.6 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	±5.12dB	(1)
2	Radiated Emission (Above 1GHz)	±4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	±3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.7 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.8 Test Facility

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

• IC Registration No.: 22984-1

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

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

• CNAS (No. CNAS L5785)

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 4742.01)

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• FCC Registration No.: 522263

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.9 Deviation from Standards

None.

4.10 Other Information Requested by the Customer

None.

4.11 Equipment List

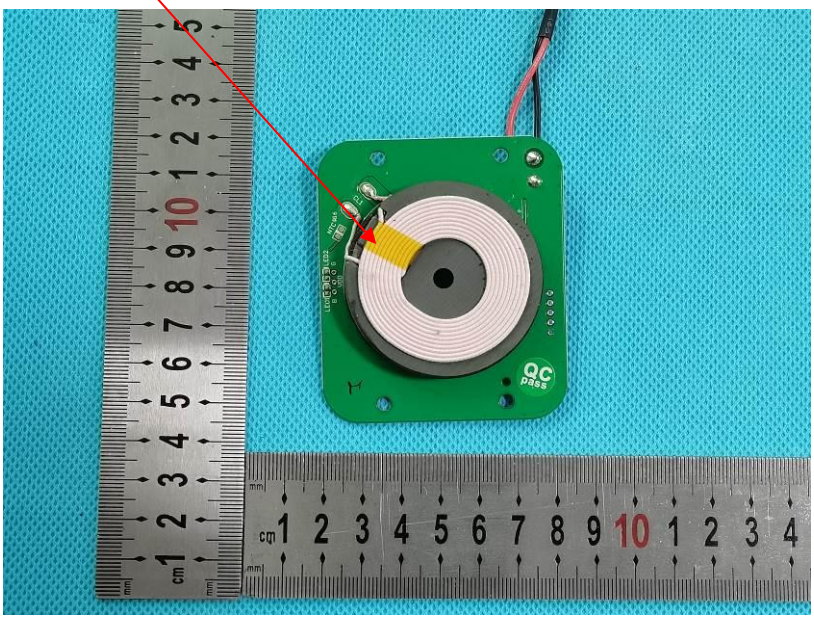
Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2020/09/22	2021/09/21
Spectrum analyzer	R&S	FSU26	CQA-038	2020/10/24	2021/10/23
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2020/09/22	2021/09/21
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2020/10/29	2021/10/28
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2020/10/24	2021/10/23
Bilog Antenna	R&S	HL562	CQA-011	2020/09/22	2021/09/21
Horn Antenna	R&S	HF906	CQA-012	2020/09/22	2021/09/21
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2020/09/22	2021/09/21
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2020/09/22	2021/09/21
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2020/09/22	2021/09/21
Antenna Connector	CQA	RFC-01	CQA-080	2020/09/22	2021/09/21
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2020/09/22	2021/09/21
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2020/09/22	2021/09/21
EMI Test Receiver	R&S	ESPI3	CQA-013	2020/09/22	2021/09/21
LISN	R&S	ENV216	CQA-003	2020/11/01	2021/10/30
Coaxial cable	CQA	N/A	CQA-C009	2020/09/22	2021/09/21

Note:

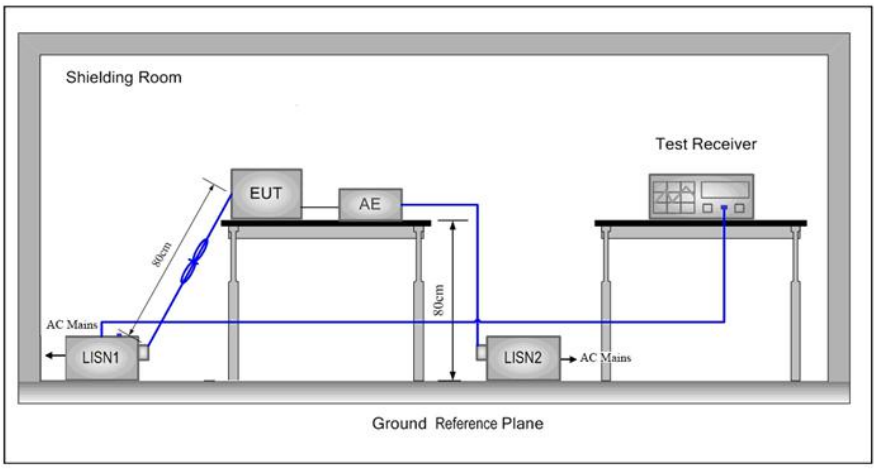
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

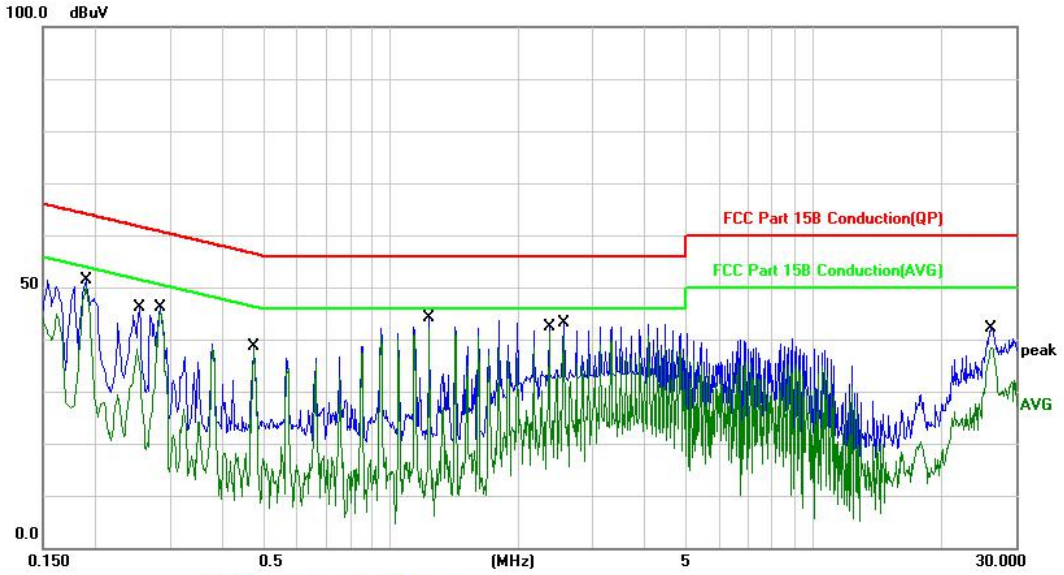
Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	Loop coil antenna 
The antenna is Loop coil Antenna. The best case gain of the antenna is 0 dBi.	

5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Limit:	Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 * Decreases with the logarithm of the frequency.
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane. 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.
Test Setup:	
Test Mode:	Mode 10
Test Results:	Pass

Measurement Data

L line:

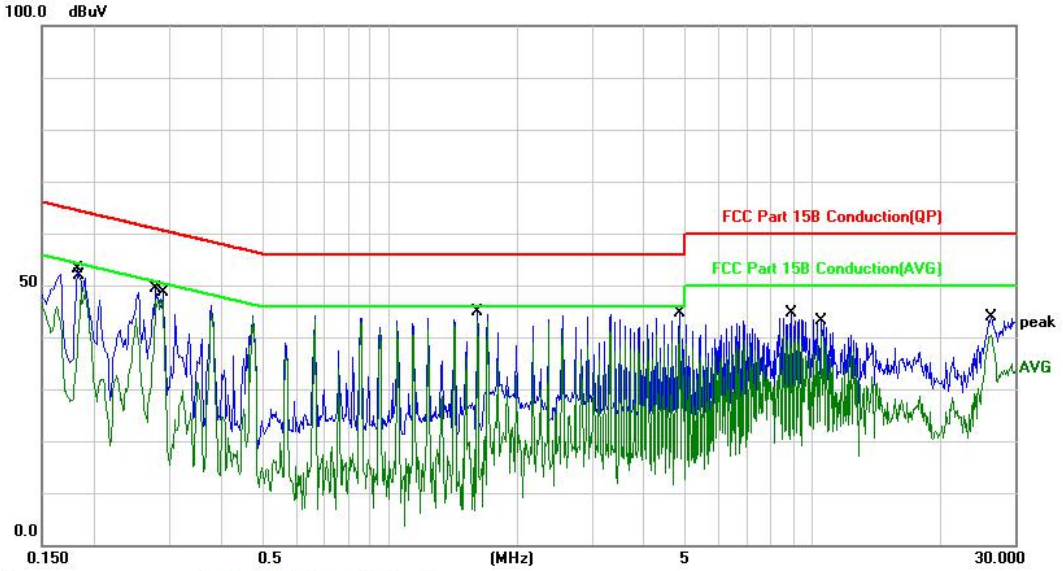


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1900	51.62	-0.13	51.49	64.03	-12.54	QP	
2	*	0.1900	50.41	-0.13	50.28	54.03	-3.75	AVG	
3		0.2540	46.36	-0.11	46.25	61.62	-15.37	QP	
4		0.2819	44.67	-0.01	44.66	50.76	-6.10	AVG	
5		0.4740	38.60	-0.02	38.58	56.44	-17.86	QP	
6		0.4740	38.40	-0.02	38.38	46.44	-8.06	AVG	
7		1.2300	44.17	-0.15	44.02	56.00	-11.98	QP	
8		1.2300	42.24	-0.15	42.09	46.00	-3.91	AVG	
9		2.3660	41.66	-0.25	41.41	46.00	-4.59	AVG	
10		2.5540	43.38	-0.16	43.22	56.00	-12.78	QP	
11		26.2420	42.68	-0.44	42.24	60.00	-17.76	QP	
12		26.4020	38.91	-0.43	38.48	50.00	-11.52	AVG	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

N line:

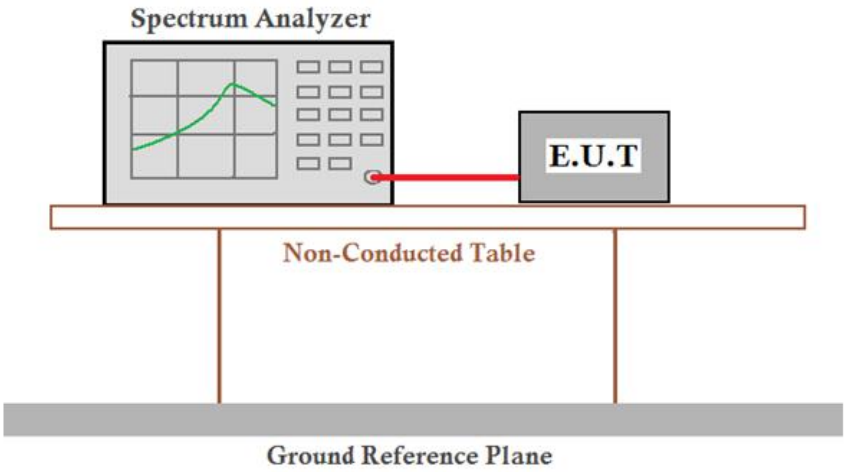


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1819	53.28	-0.13	53.15	64.39	-11.24	QP	
2		0.1860	49.75	-0.13	49.62	54.21	-4.59	AVG	
3		0.2787	49.49	-0.01	49.48	60.85	-11.37	QP	
4		0.2862	47.30	-0.01	47.29	50.63	-3.34	AVG	
5		1.6100	45.03	-0.20	44.83	56.00	-11.17	QP	
6	*	1.6100	43.33	-0.20	43.13	46.00	-2.87	AVG	
7		4.8259	44.93	-0.22	44.71	56.00	-11.29	QP	
8		4.8259	41.76	-0.22	41.54	46.00	-4.46	AVG	
9		8.8939	44.80	-0.19	44.61	60.00	-15.39	QP	
10		10.4098	41.03	-0.11	40.92	50.00	-9.08	AVG	
11		26.2820	44.34	-0.44	43.90	60.00	-16.10	QP	
12		26.2820	40.77	-0.44	40.33	50.00	-9.67	AVG	

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

5.3 20dB Occupy Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.215 (c)
Test Method:	ANSI C63.10 2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Limit:	The 20dB bandwidth shall be less than 80% of the permitted frequency band.
Test Results:	Pass

Test Result:

Frequency (KHz)	20dB emission bandwidth (KHz)	99%occupied bandwidth (KHz)
139	8.702	12.676

5.4 Radiated Spurious Emission

Test Requirement:	47 CFR Part 15C Section 15.209
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:

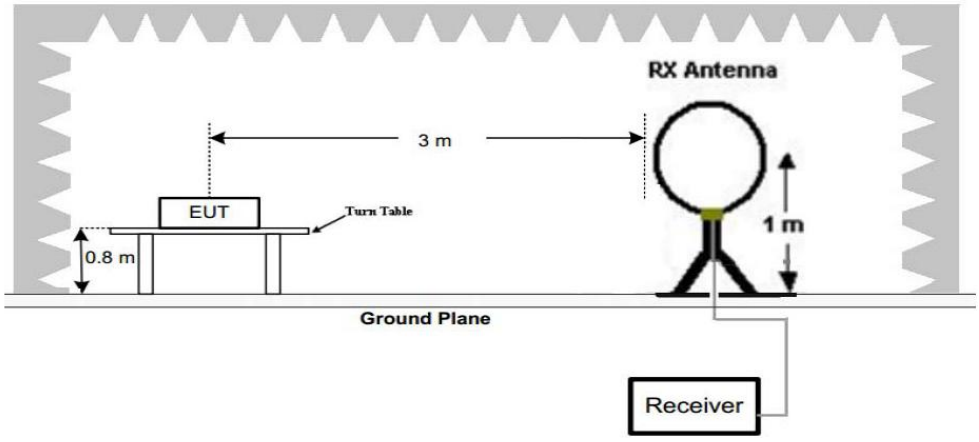


Figure 1. Below 30MHz

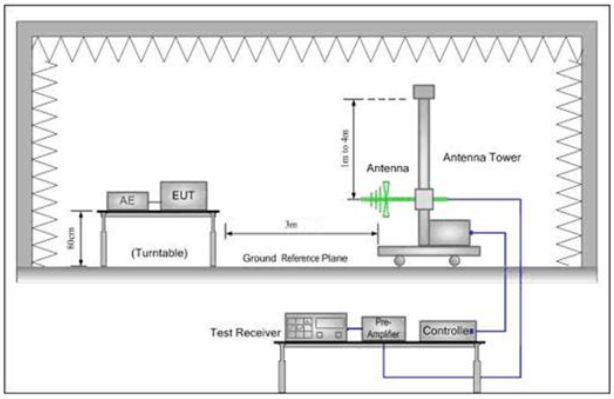


Figure 2. 30MHz to 1GHz

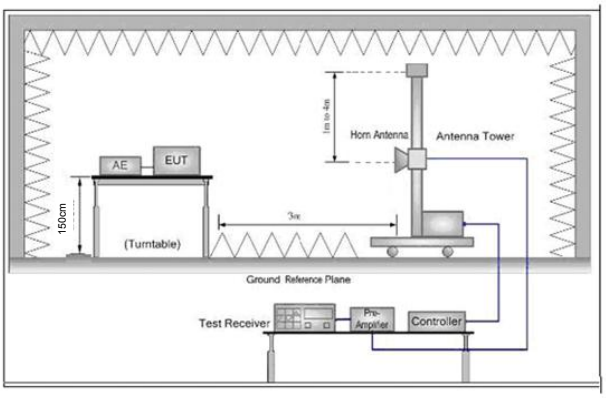


Figure 3. Above 1 GHz

Test Procedure:	1. The EUT was placed on a turn table which is 0.8m above ground plane. 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. 4. Repeat above procedures until all frequency measurements have been completed.
Test Results:	Pass

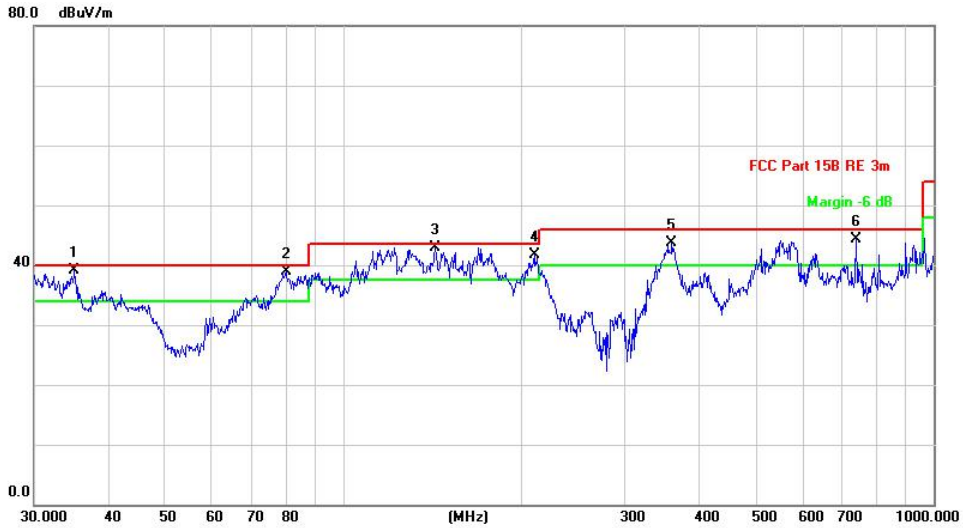
WORST-CASE RADIATED EMISSION BELOW 30 MHz

Frequency	Reading	Polar	Antenna Factor	Cable Loss	Emission Levels	Limits at 3m	Detector Mode
(MHz)	(dBμV/m)	Loop	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	
0.114(F)	48.14	Loop	23.62	0.01	71.77	106.17	PK
0.114(F)	45.25	Loop	23.61	0.01	68.87	86.17	AV
0.110	32.76	Loop	23.44	0.01	56.21	106.78	PK
0.110	31.47	Loop	23.63	0.01	55.11	86.78	AV
0.485	35.41	Loop	25.13	-0.17	60.37	73.71	QP
1.158	35.18	Loop	27.15	-0.25	62.08	66.33	QP
2.178	33.86	Loop	23.72	-0.24	57.34	69.54	QP

Remark:

1. Data of measurement within this frequency range shown " -" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
2. The test limit distance is 3m limit.
3. PK means Peak Value, QP means Quasi Peak Value, AV means Average Value.
4. F means Fundamental Frequency.

Radiated Emission below 1GHz		
30MHz~1GHz, the worst case		
Test mode:	Mode 10	Vertical

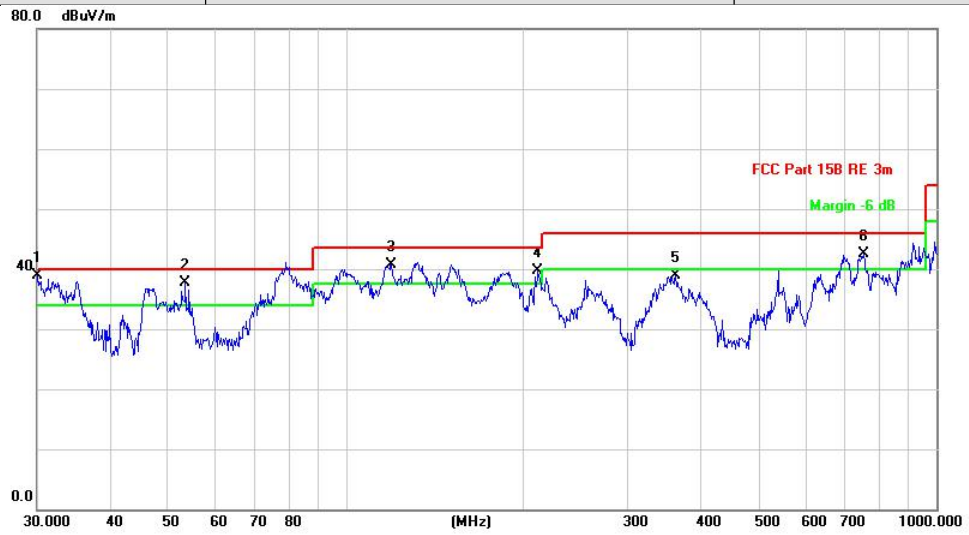


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	35.1278	36.18	2.55	38.73	40.00	-1.27	QP			
2		80.0806	46.44	-8.32	38.12	40.00	-1.88	QP			
3	!	143.3257	42.42	0.59	43.01	43.50	-0.49	QP			
4		210.7860	43.79	-1.99	41.80	43.50	-1.70	QP			
5		360.4476	35.97	7.67	43.64	46.00	-2.36	QP			
6		739.6603	26.03	18.18	44.21	46.00	-1.79	QP			

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

30MHz~1GHz, the worst case		
Test mode:	Mode 10	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	!	30.1051	30.31	8.49	48.80	40.00	-1.20	QP			
2		53.5052	49.88	-12.20	37.68	40.00	-2.32	QP			
3	*	119.4360	45.09	3.80	41.29	43.50	-2.21	QP			
4		211.5262	41.79	-1.99	39.80	43.50	-3.70	QP			
5		361.7139	30.90	7.92	38.82	46.00	-7.18	QP			
6		752.7432	23.99	18.56	42.55	46.00	-3.45	QP			

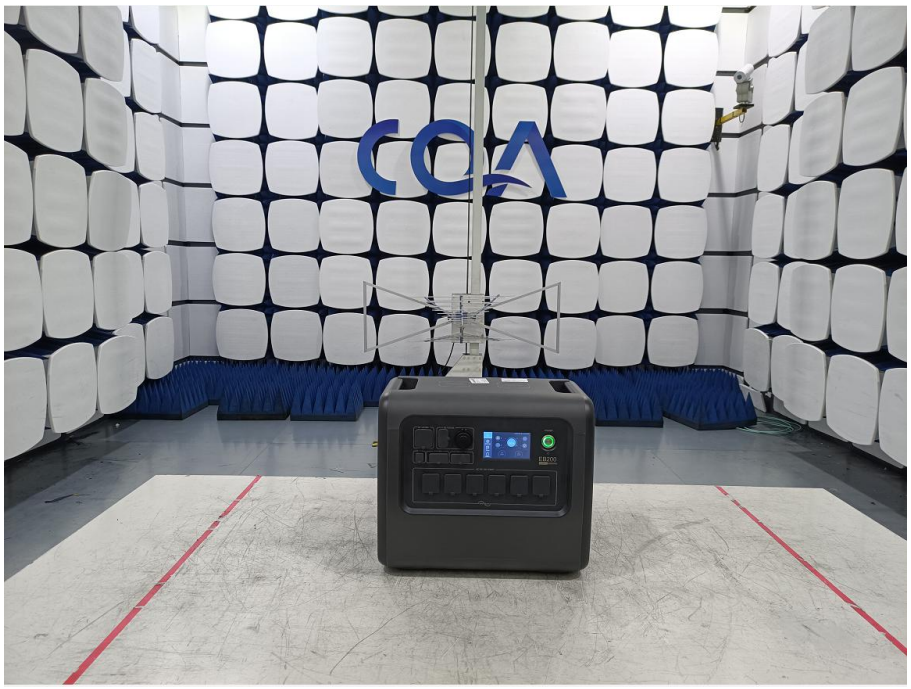
Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

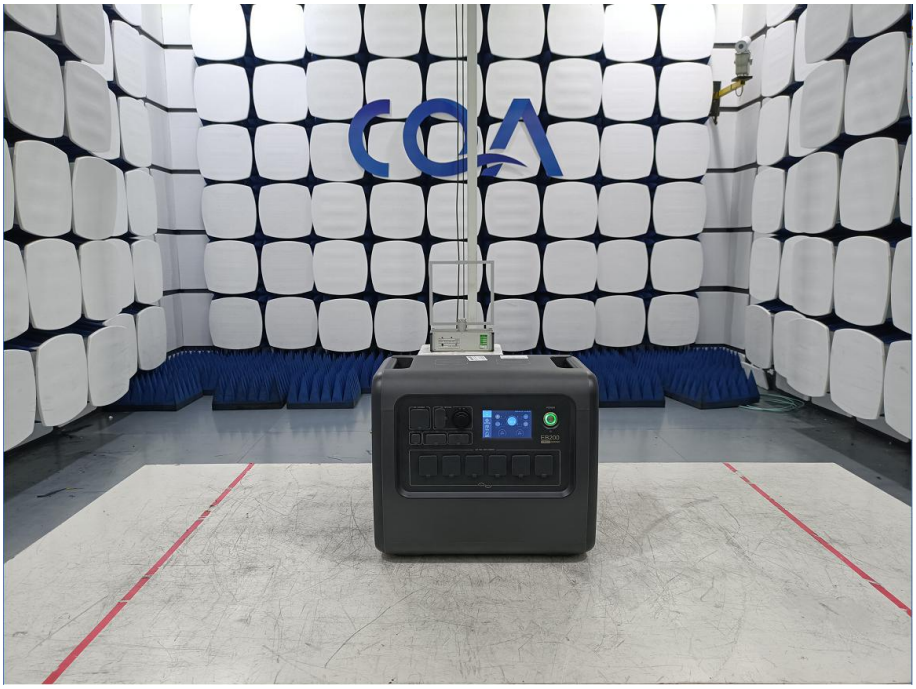
6 Photographs - EUT Test Setup

Conducted Emissions Test Setup

Radiated Emission below 1GHz



Below 30MHz Test Setup



7 Photographs - EUT Constructional Details

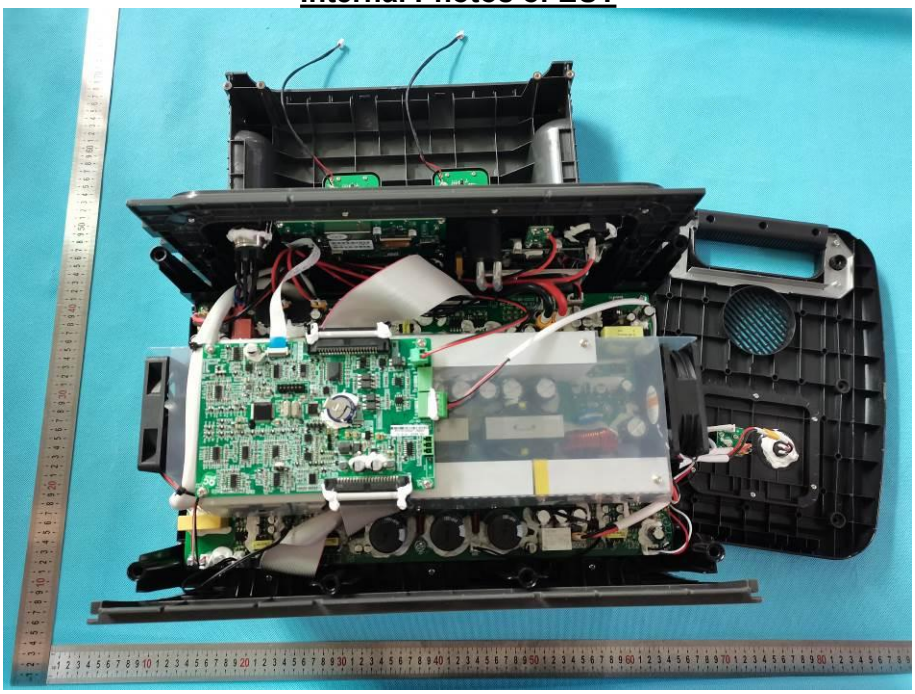
External Photos of EUT

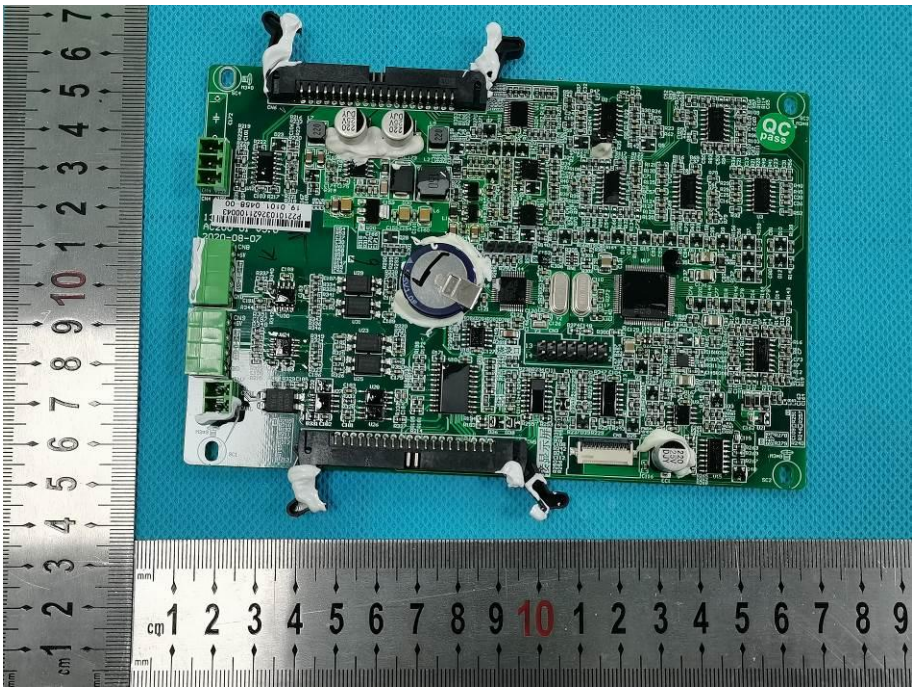

INPUT
INPUT

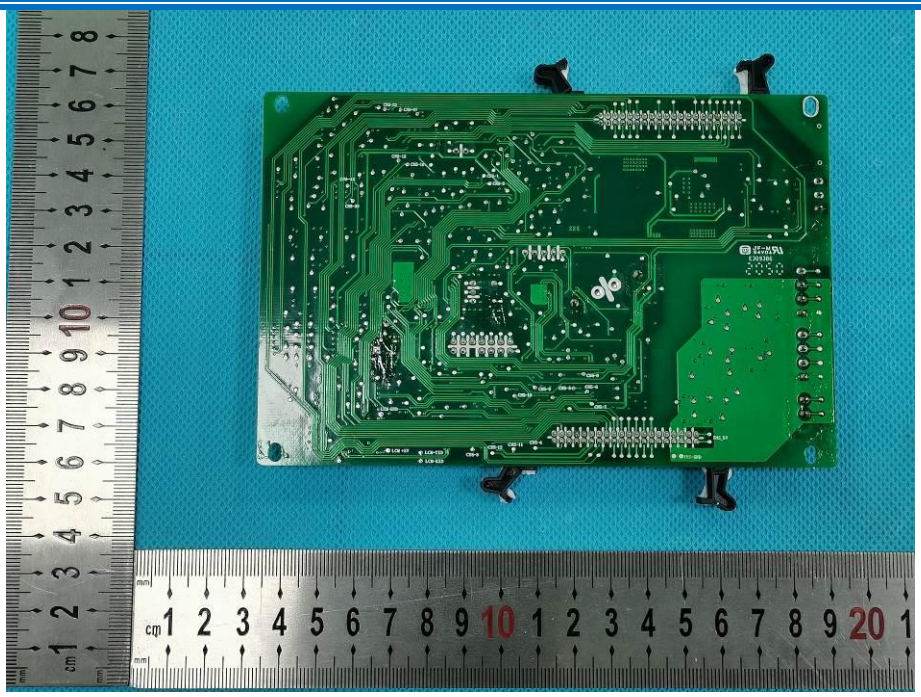

INPUT
50VDC, 12A
INPUT
Adapter: 58.8VDC, 8A

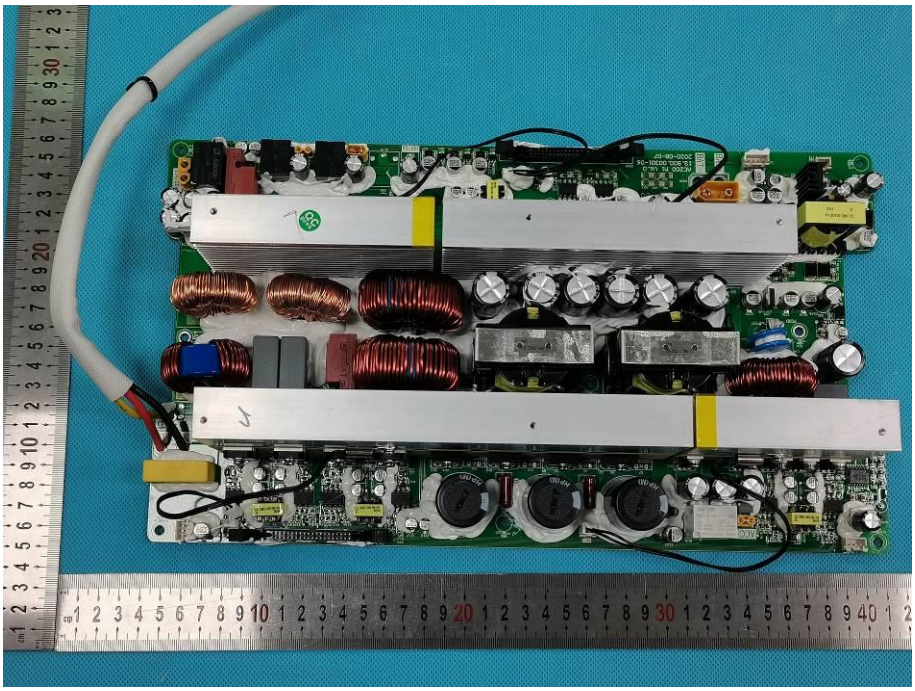

DC 12V/25A
DC 12V/10A
12V
USB-C 100W
USB-A 36W
USB-A 9V/3A
AC 100-120V 2000W
POWER
EB200
2000W 2000Wh

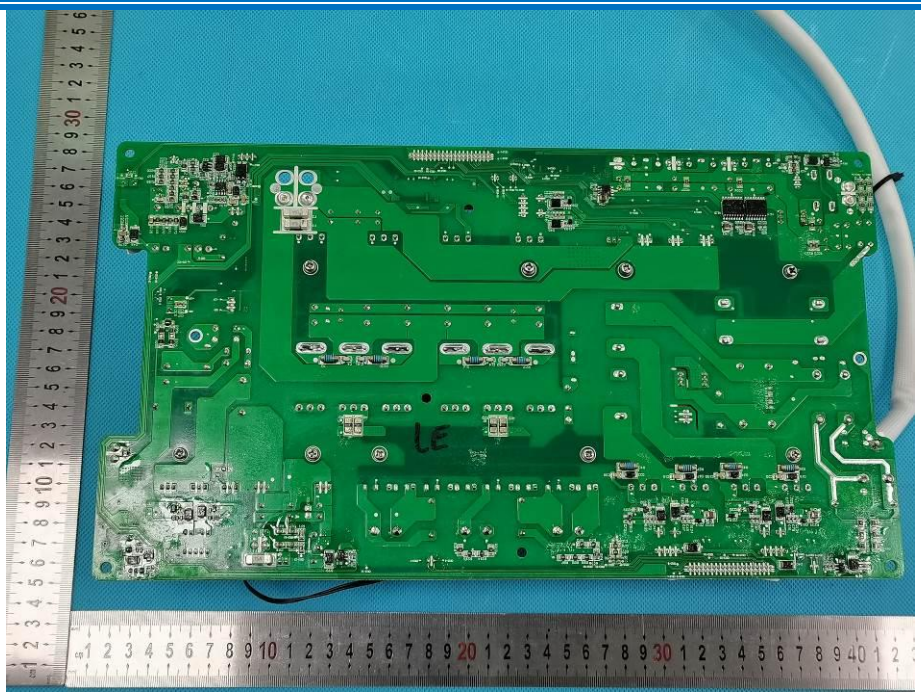
Internal Photos of EUT

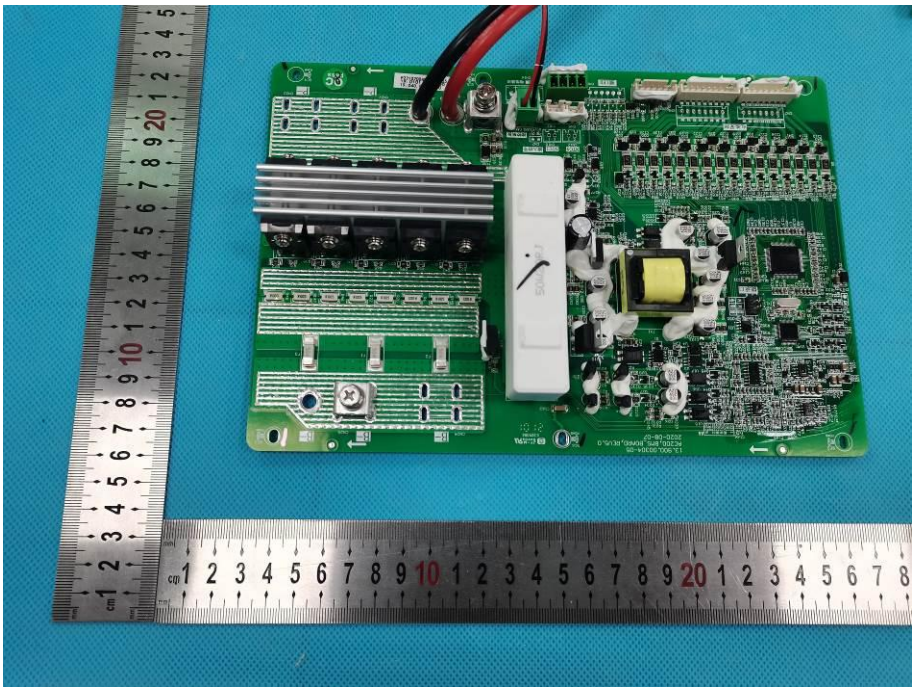


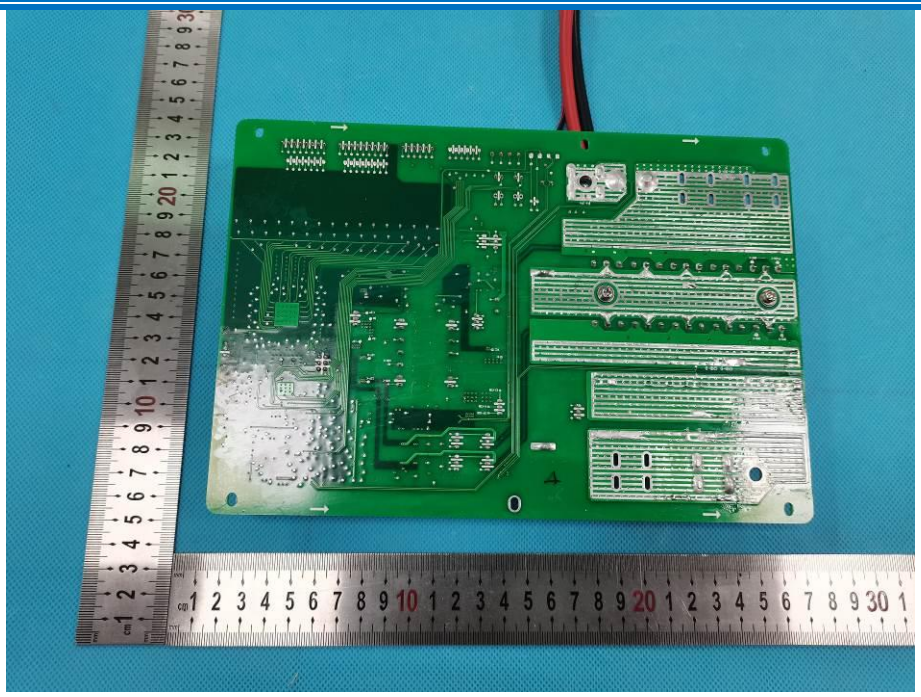


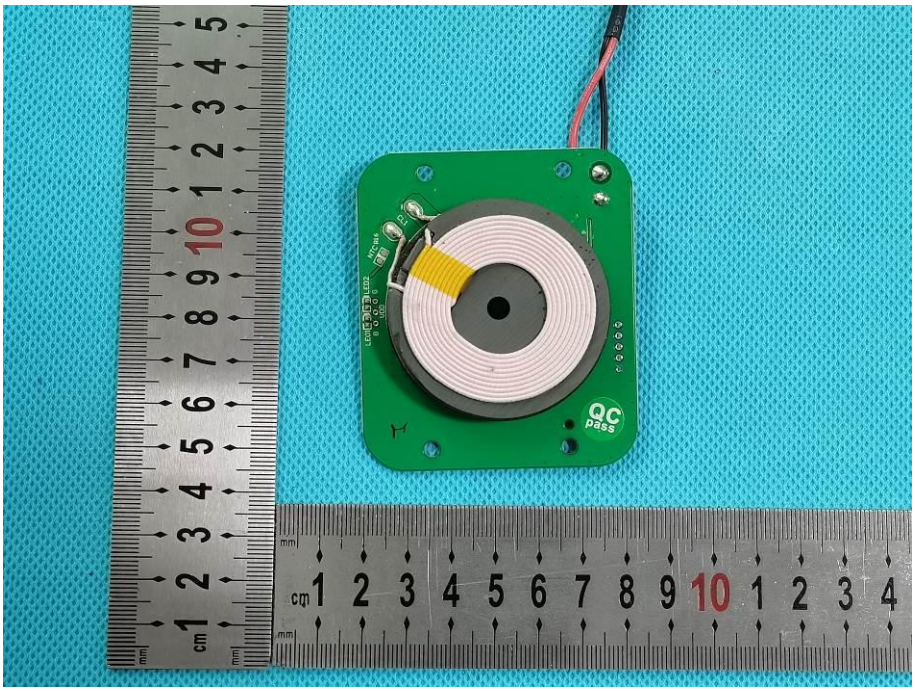


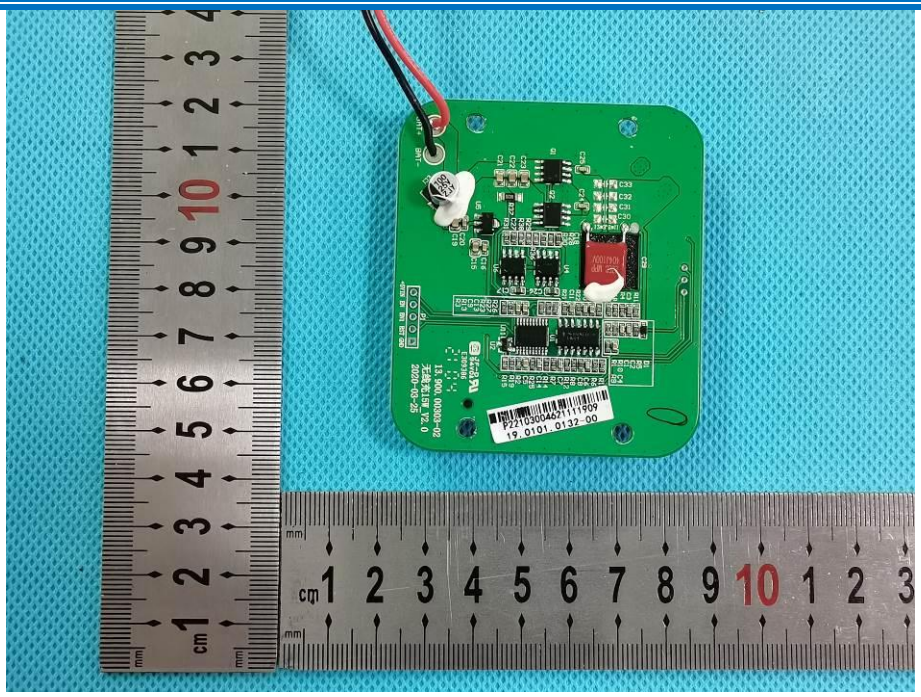


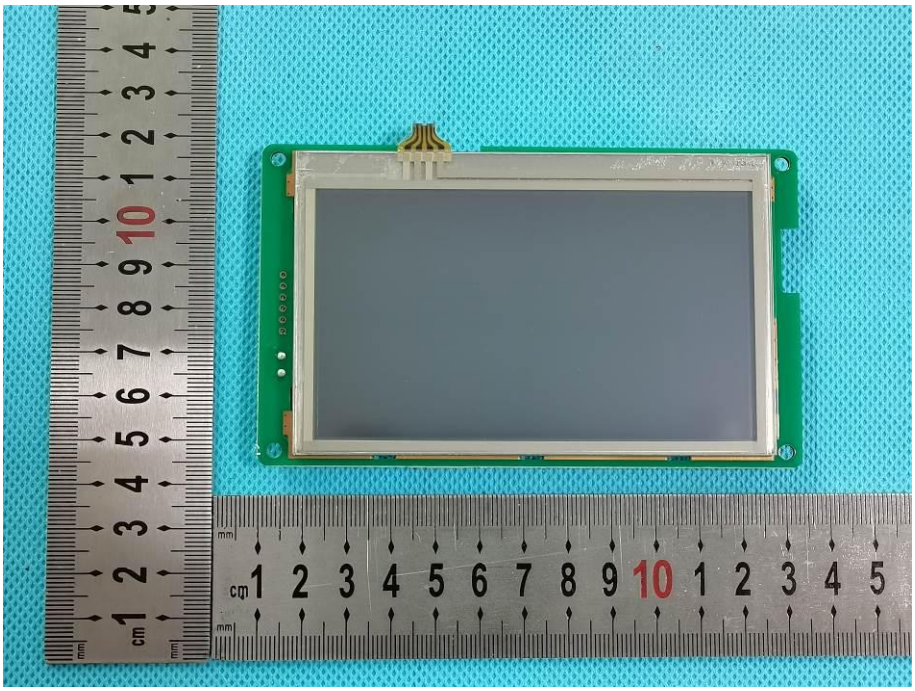


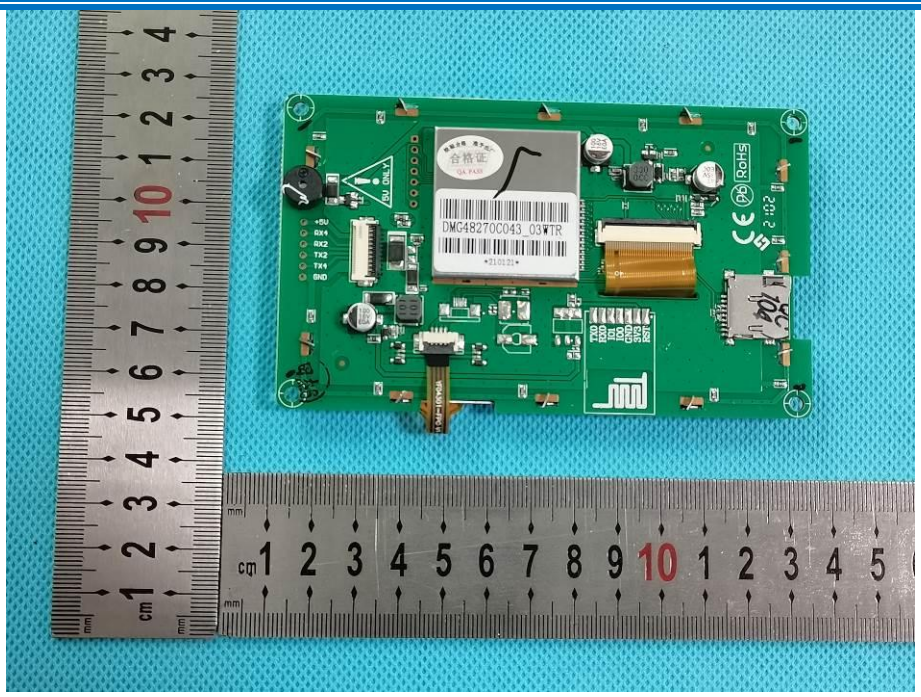


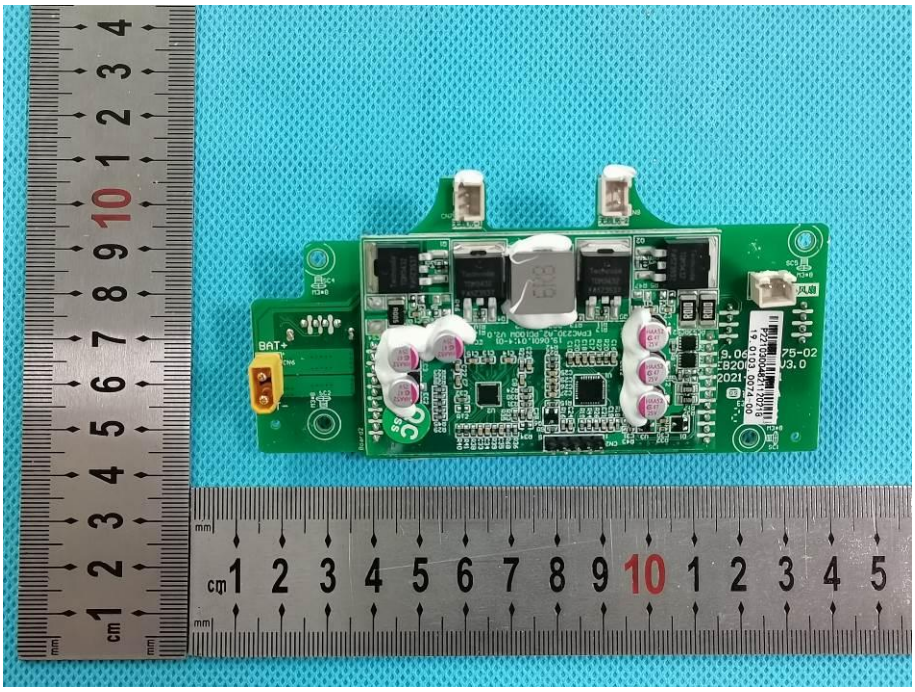


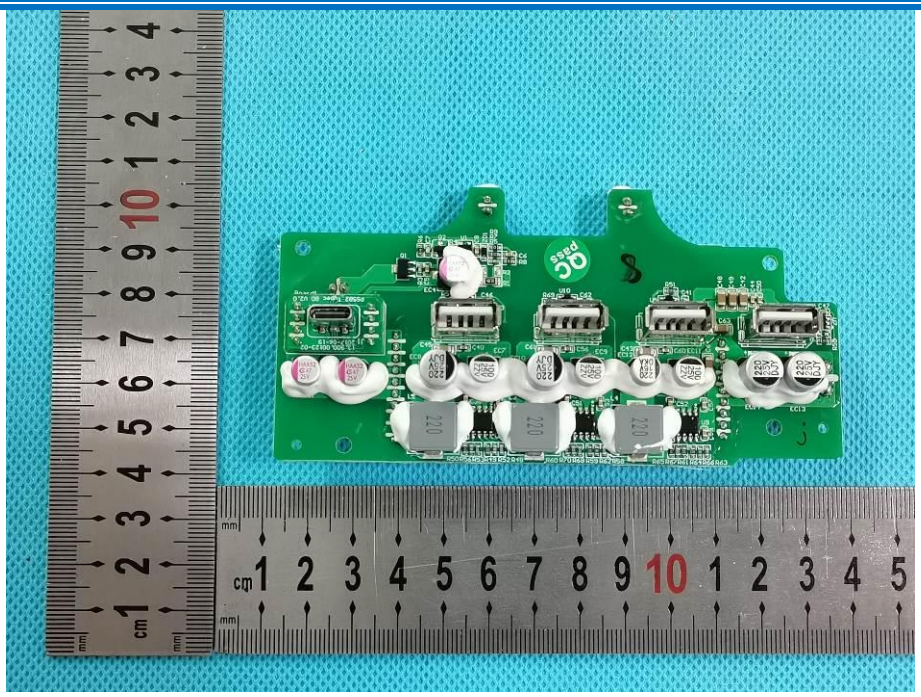







DMG48270C043_03WTR
RoHS


BAT+



The End