

TEST REPORT

Report No...... : 2021-90021
FCC ID..... : 2A21B-PPS500
Applicant..... : PULSAR PRODUCTS, INC.
Address..... : 5721 E. SANTA ANA ST. ONTARIO, CA 91761, USA.
Manufacturer..... : Guangdong Boltpower Energy Co.,Ltd
Address..... : No.22 Xinfu Road, Lincun, Tangxia Town, Dongguan City,
Guangdong Province, China. 523710
Product Name..... : Portable Power Station
Trade Mark..... : N/A
Model/Type reference..... : PPS500
Listed Model(s)..... : N/A
Standard..... : **FCC CFR Title 47 Part 15 Subpart C**
Section 15.207, 15.209, 15.203
ANSI C63.10:2020
Date of Receipt..... : October 22, 2021
Date of Test Date..... : October 22, 2021 - October 30, 2021
Date of issue..... : December 28, 2021
Test result..... : **Pass**

Compiled by:

(Printed name + Signature)

Chen Zhijun

chen zhijun

Supervised by:

(Printed name + Signature)

Liu Canhui

Liu Canhui

Approved by:

(Printed name + Signature)

Wang Weixiong

Wang Weixiong

Testing Laboratory Name..... : **KSIGN Testing Co., Ltd.**

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15 Subpart C: Operation within the bands 110.1~205 kHz .

ANSI C63.10-2020: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Date of issue	Description
01	December 28, 2021	Original

1.3. Test Description

EMC Emission			
Test Item	FCC Rules	Result	Test Engineer
Conducted Emission	§15.207	Pass	Chen Zhijun
Radiated Emission	§15.209	Pass	Chen Zhijun
ANTENNA APPLICATION	§15.203	Pass	Chen Zhijun

Note: The measurement uncertainty is not included in the test result.

1.4. 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 TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the KSIGN Testing Co., Ltd. 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. Below is the best measurement capability for KSIGN Testing Co., Ltd.

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth	2.80 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

1.5. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	PULSAR PRODUCTS, INC.
Address:	5721 E. SANTA ANA ST. ONTARIO, CA 91761, USA.
Manufacturer:	Guangdong Boltpower Energy Co.,Ltd
Address:	No.22 Xinfu Road, Lincun, Tangxia Town, Dongguan City, Guangdong Province, China. 523710

2.2. General Description of EUT

Test Sample Number:	1-1-1(Normal Sample),1-1-2(Engineering Sample)
Product Name:	Portable Power Station
Trade Mark:	N/A
Model/Type reference:	PPS500
Listed Model(s):	N/A
Model Different:	N/A
Power supply(Adapter) :	Input: AC 100-240V~50/60Hz 1.2A Output: DC 24V= 2000mA 60W
Power supply(Battery) :	Capacity: 518Wh, 25.9V 20Ah DC Charging Input: 24V= 2.5A Inverter: 500W (Pure Sine Wave) AC Output 1/2: 110V/60Hz/500W(Max) DC Output 1/2/3:12V= 10A(Max) USB Output 1: PD45W USB Output 2: 5V= 3A(Max), 9V= 2A, 12V= 1.5A USB Output 3/5: 5V= 2.4A(Max) Wireless Charging Output 1: 10W(Max) LED Light: 2W
Hardware version:	V1.0
Software version:	V1.0.0
Specification	
Frequency range	110.1KHz~205KHz
Modulation:	FSK
Modulation:	Induction
Test frequency:	127.1kHz
Antenna type:	Coil Antenna
Antenna gain:	0dBi

2.3. Description of Test Modes

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Operation Frequency range: 110.1KHz~205KHz

Test mode

MODE	TEST MODE DESCRIPTION
1	Wireless charging mode(Full load)
2	Wireless charging mode(Half load)
3	Wireless charging mode(Null load)
Note: 1. The Mode 1 was the worst case and only the data of the worst case record in this report.	

2.4. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2022
2	Wideband Radio Communication Tester	R&S	CMW500	157282	04/07/2022
3	Climate Chamber	Angul	AGNH80L	1903042120	04/07/2022
4	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	04/07/2022

Transmitter spurious emissions & Receiver spurious emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	04/07/2022
2	Spectrum Analyzer	HP	8593E	3831U02087	04/07/2022
3	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	03/29/2023
4	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/25/2022
5	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2022
7	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	04/07/2022
8	Pre-Amplifier	EMCI	EMC051835SE	980662	04/07/2022

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	LISN	R&S	ENV432	1326.6105.02	03/27/2022
2	EMI Test Receiver	R&S	ESR	102524	04/07/2022
3	Manual RF Switch	JS TOYO	/	MSW-01/002	04/07/2022

Note:

1)The Cal. Interval was one year.

2)The cable loss has calculated in test result which connection between each test instruments.

Auxiliary test equipment					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	PHONE 1	HUAWEI	P40	/	/
2	PHONE 2	HUAWEI	MATE40	/	/

2.5. Test Software

Software name	Model	Version
Conducted emission Measurement Software	EZ-EMC	EMC-Con 3A1.1
Radiated emission Measurement Software	EZ-EMC	FA-03A.2.RE

3. TEST ITEM AND RESULTS

3.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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.

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

(i) Systems operating in the 110KHz~205KHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.

Note: The antenna is permanently fixed to the EUT

3.2. Conducted Emission

Limit

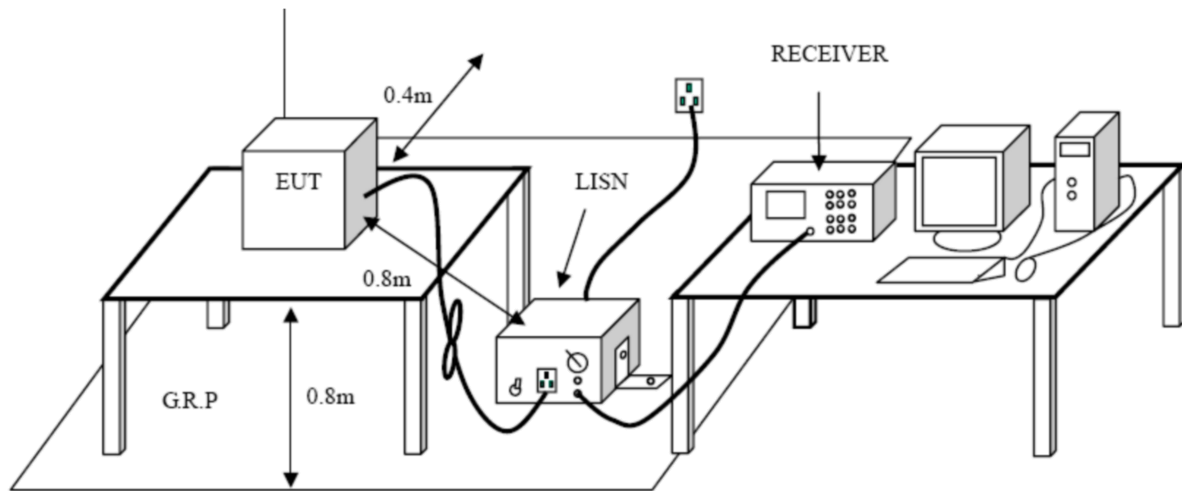
Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dB μ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

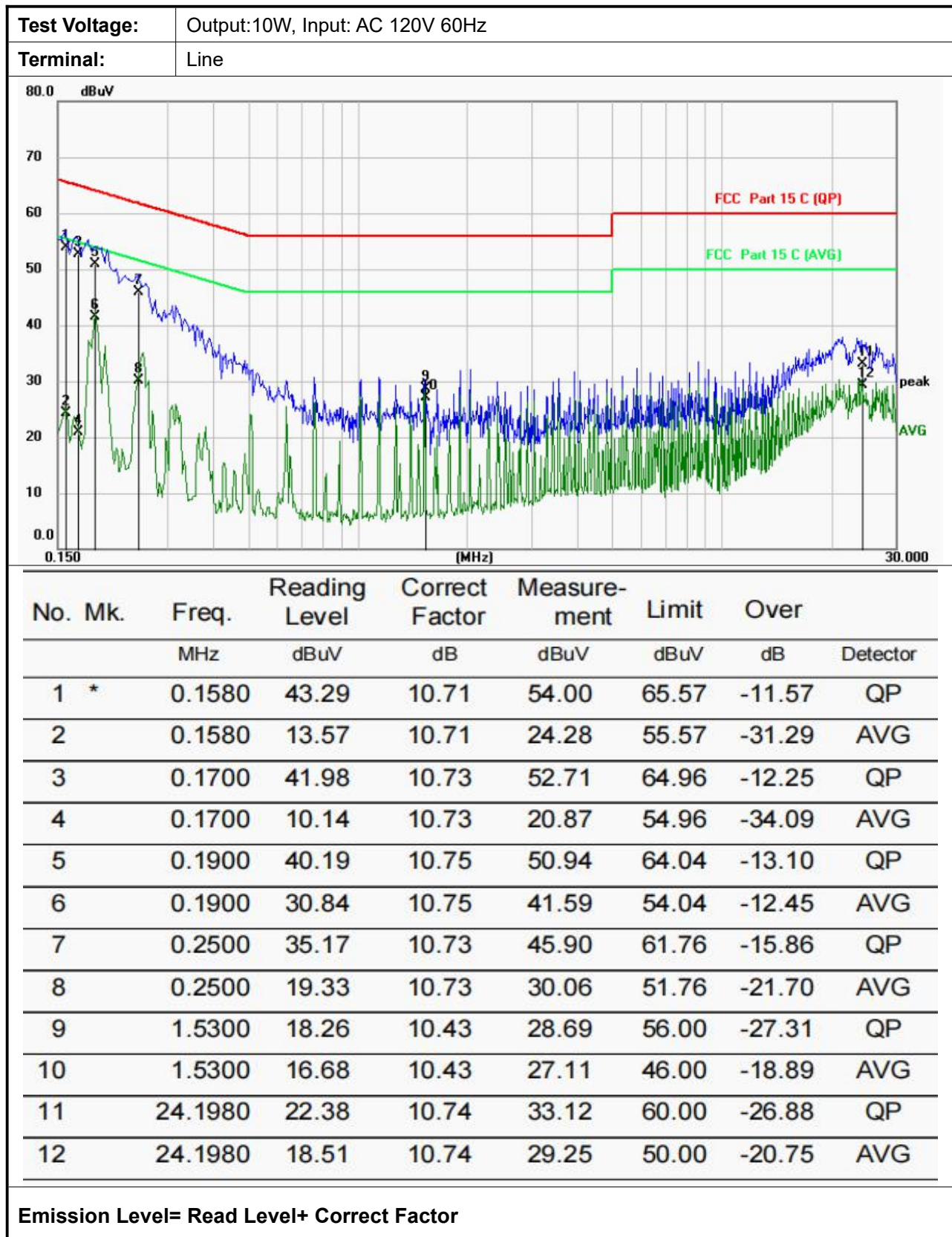
1. The EUT was setup according to ANSI C63.10:2020 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

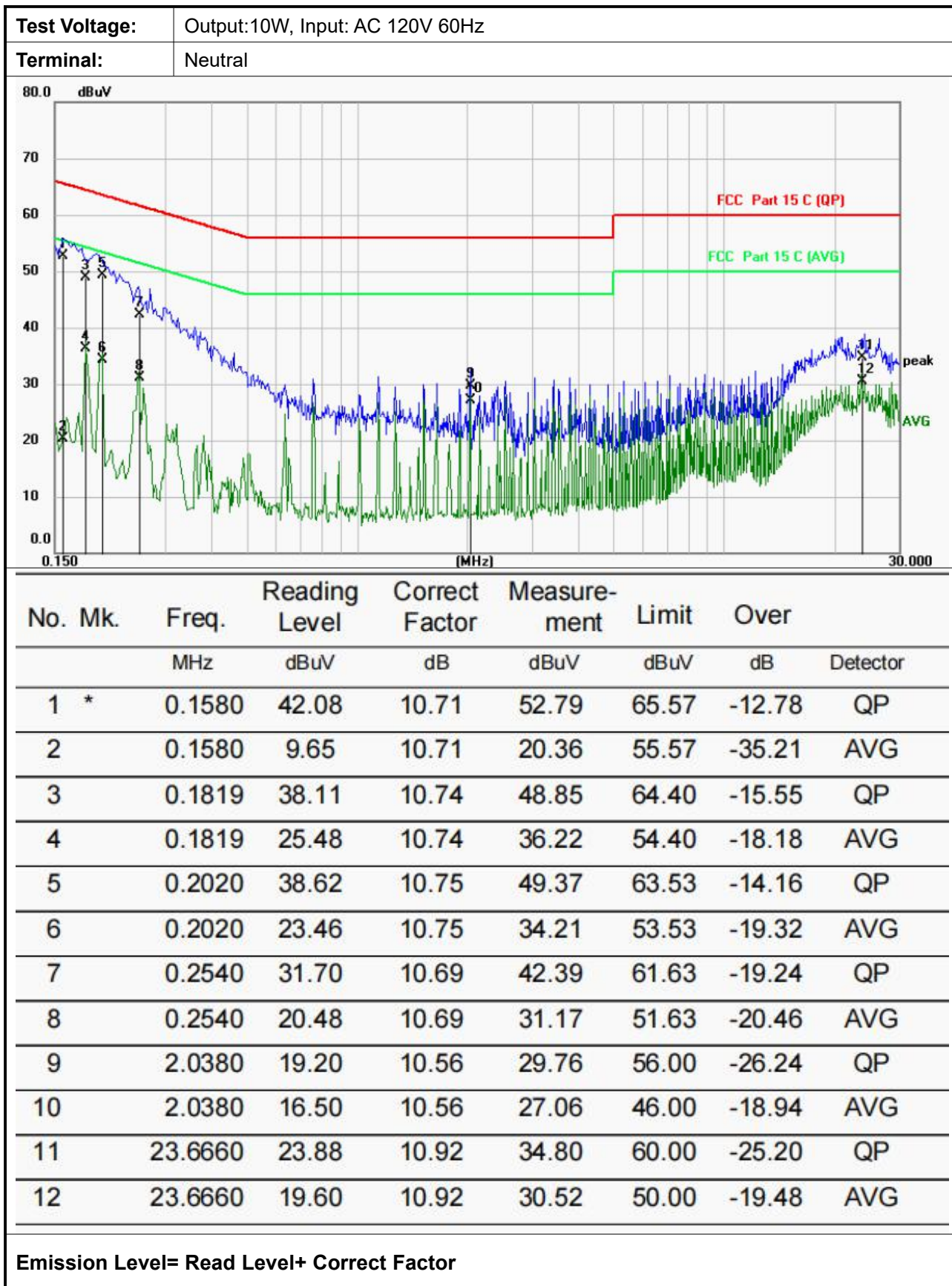
Test Mode:

Please refer to the clause 2.3.

Test Results

Pre-scan Full load, Half load, Null load, and found Full load which it is worse case, so only show the test data for worse case (Mode 1) .





3.3. Radiated Spurious Emissions

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209(a) and 15.205(a)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

15.209(a)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

15.205 Restricted bands of operation:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Notes:

(1).Measurement was performed at an antenna to the closed point of EUT distance of meters.

(2).Emission level (dBuV/m)=20log Emission level (uV/m).

(3).Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

(4) .The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

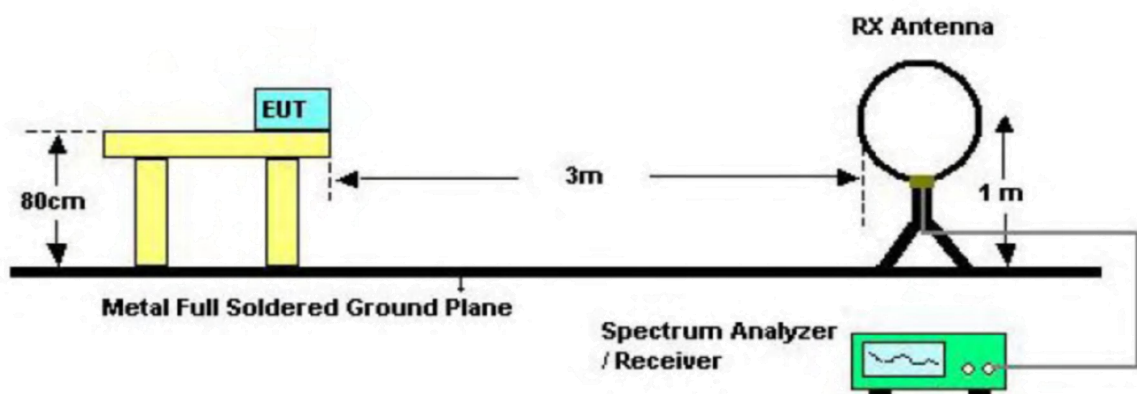
FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

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

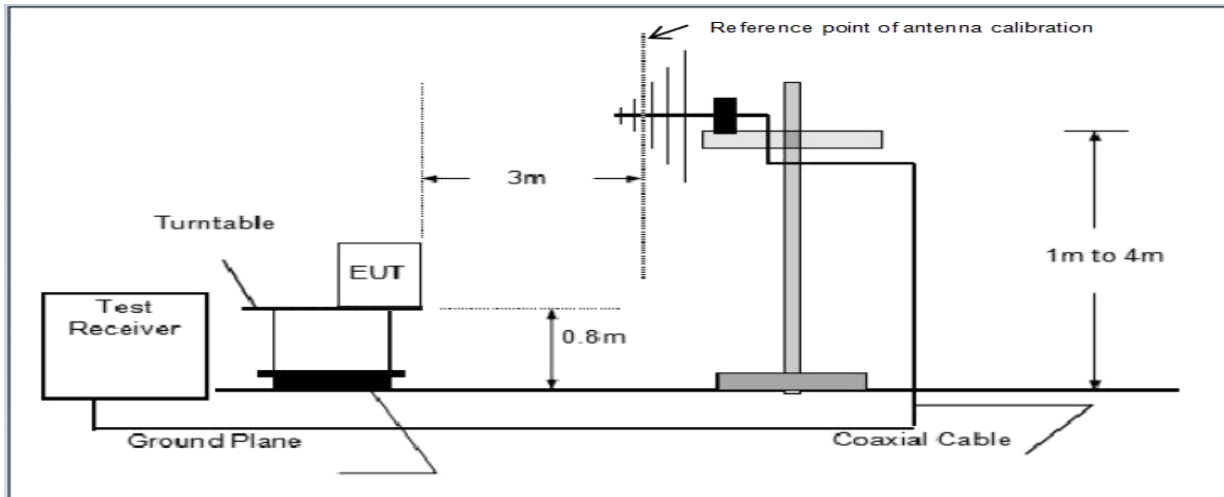
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

Test Configuration



Below 30MHz Test Setup



Below 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2020
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW=10Hz Peak detector for Average value.

TEST MODE:

Please refer to the clause 2.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

9 KHz~30 MHz and 30MHz~1GHz

From 9 KHz~30 MHz and 30MHz~1GHz: Conclusion: PASS

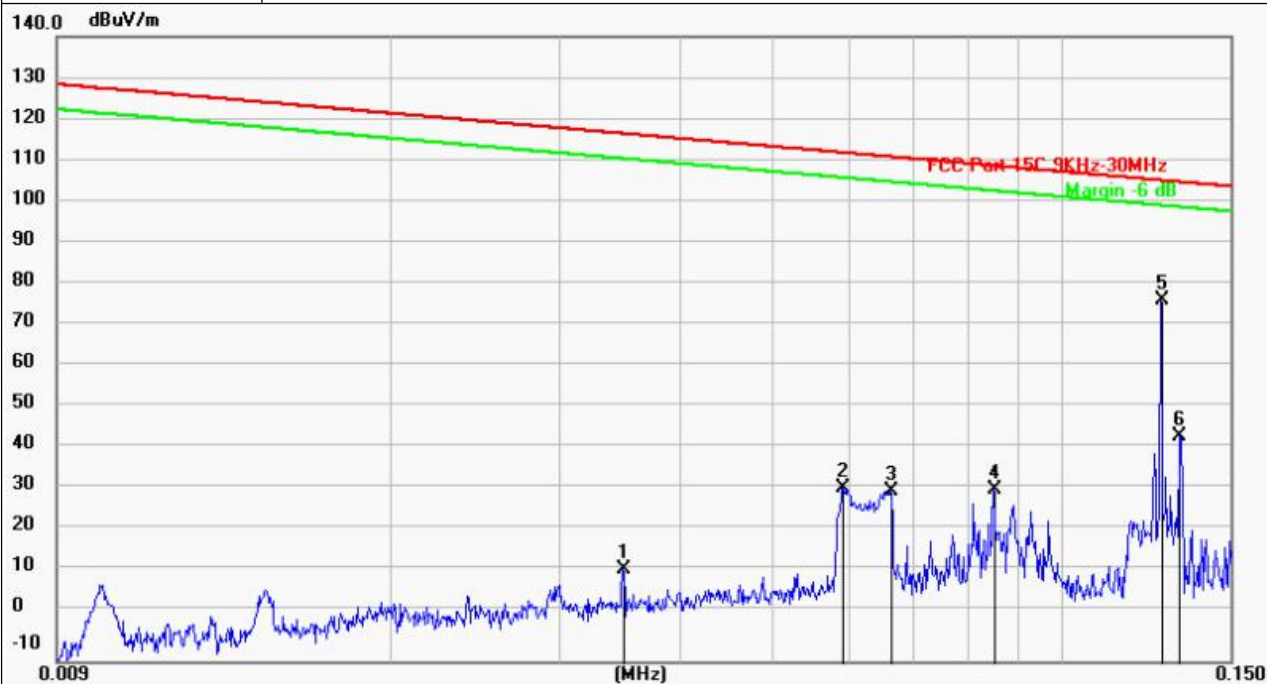
Note:

- 1) Final level = Reading level + Correct Factor

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

9KHz~30MHz

EUT :	Portable Power Station	Model Name. :	PPS500
Test Mode :	Mode 1 (Full load)	Polarization :	X
Test Power :	Output: 10W, Input: AC 120V 60Hz		

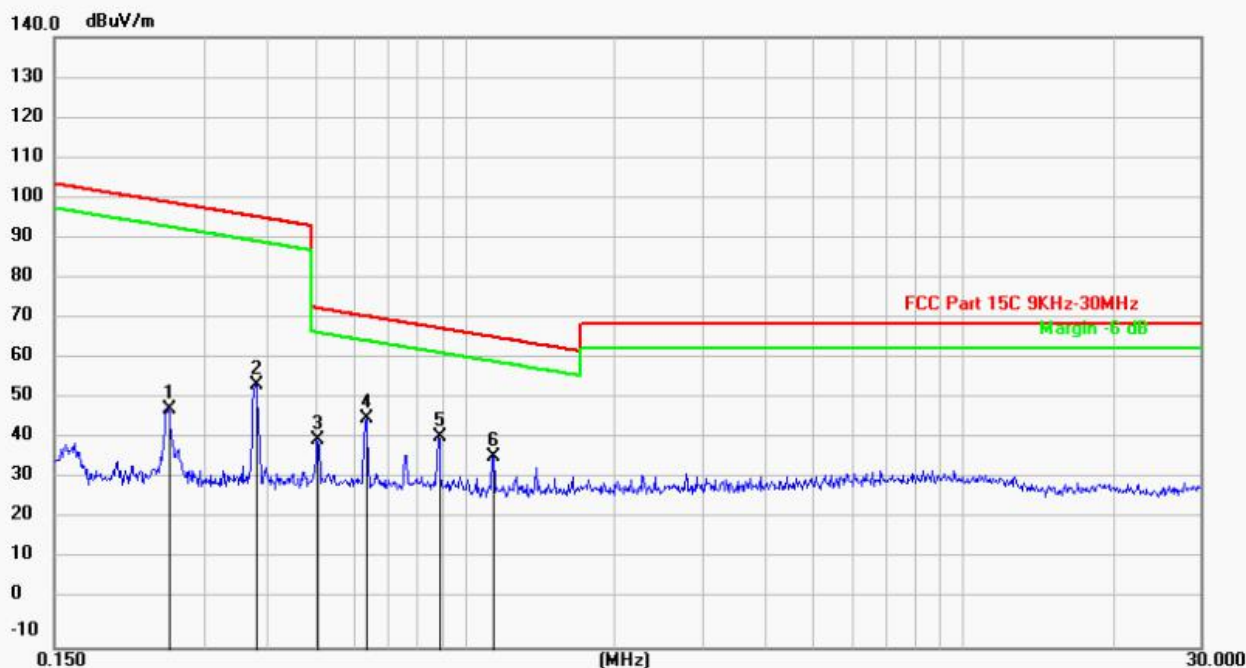


No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		0.0350	21.36	-8.95	12.41	116.72	-104.31	peak
2		0.0592	40.92	-9.08	31.84	112.16	-80.32	peak
3		0.0665	40.21	-9.30	30.91	111.15	-80.24	peak
4		0.0851	40.35	-9.02	31.33	109.01	-77.68	peak
5	*	0.1271	86.34	-9.59	76.75	105.52	-28.77	peak
6		0.1329	53.83	-9.66	44.17	105.13	-60.96	peak

Remark:

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

EUT :	Portable Power Station	Model Name. :	PPS500
Test Mode :	Mode 1 (Full load)	Polarization :	X
Test Power :	Output: 10W, Input: AC 120V 60Hz		

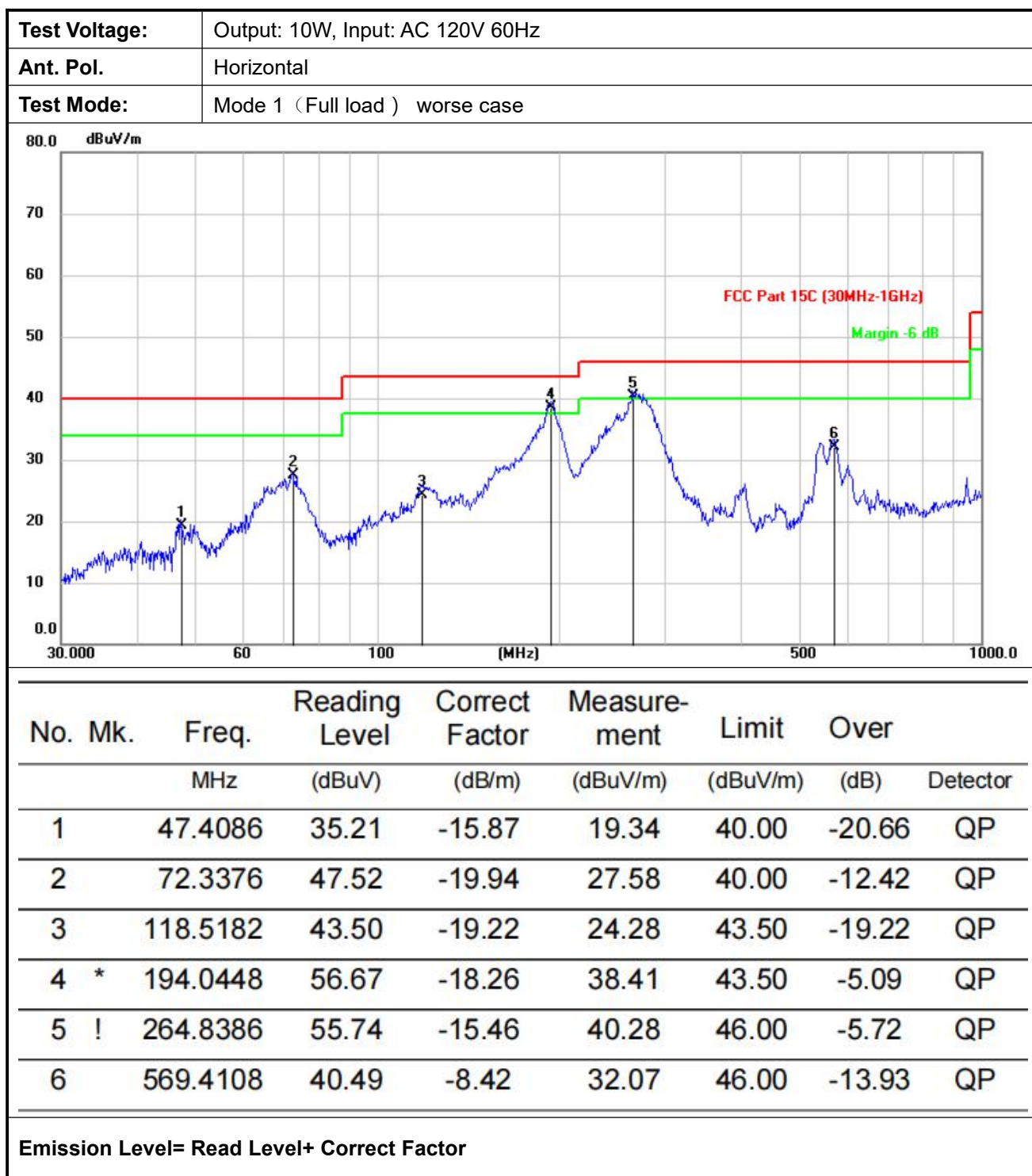


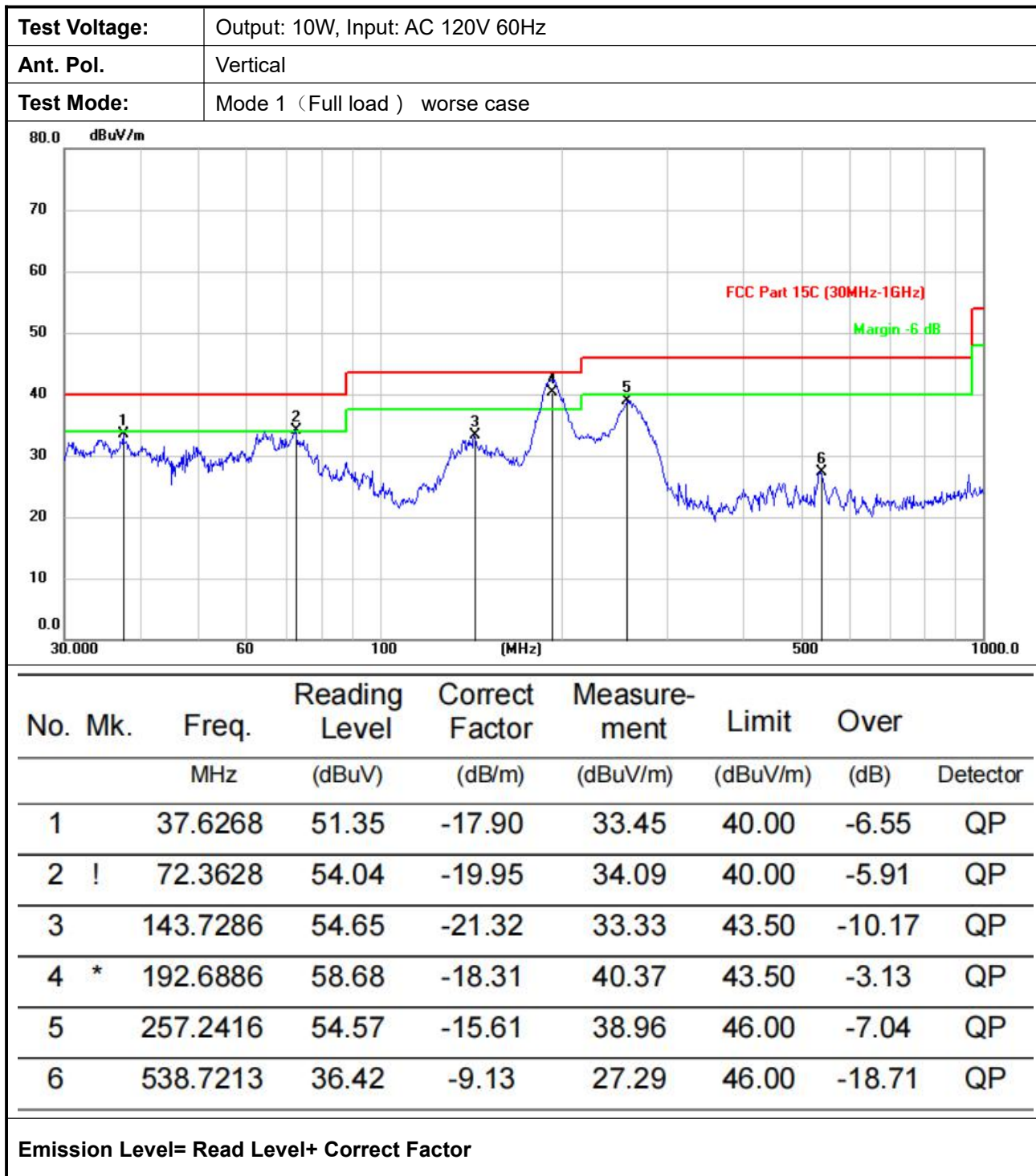
No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		0.2540	57.84	-9.30	48.54	99.51	-50.97	peak
2		0.3811	63.86	-9.26	54.60	95.98	-41.38	peak
3		0.5070	50.38	-9.23	41.15	73.50	-32.35	peak
4	*	0.6345	55.50	-9.19	46.31	71.56	-25.25	peak
5		0.8873	51.04	-9.13	41.91	68.64	-26.73	peak
6		1.1407	46.22	-9.13	37.09	66.46	-29.37	peak

Remark:

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

30MHz-1GHz





Note:

1. 30MHz-1GHz, Pre-test the X, Y, Z axis to find X axis is worst case, so only record X axis test data.
2. Pre-scan Full load, Half load, Null load, and found Full load which it is worse case, so only show the test data for worse case (Mode 1)

4. PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP(9kHz-30MHz)



RADIATED EMISSION TEST SETUP(30MHz-1GHz)



CONDUCTED EMISSION TEST SETUP



5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

External Photographs

Photo 1



Photo 2



Photo 3



Photo 4

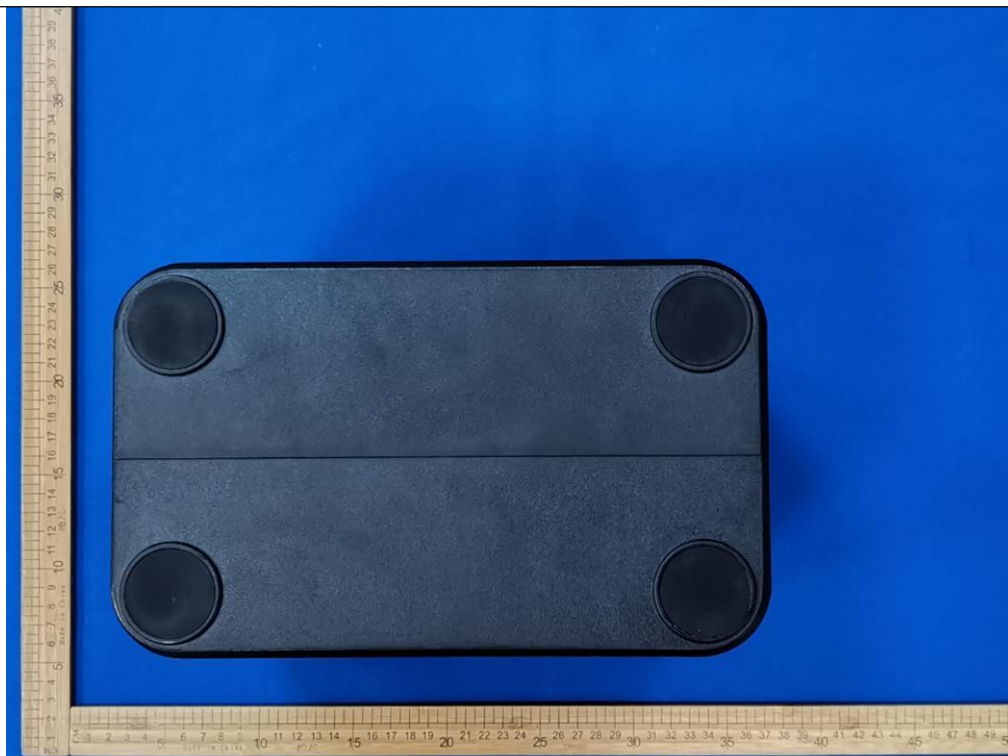


Photo 5



Photo 6



Photo 7



Internal Photographs

Photo 1

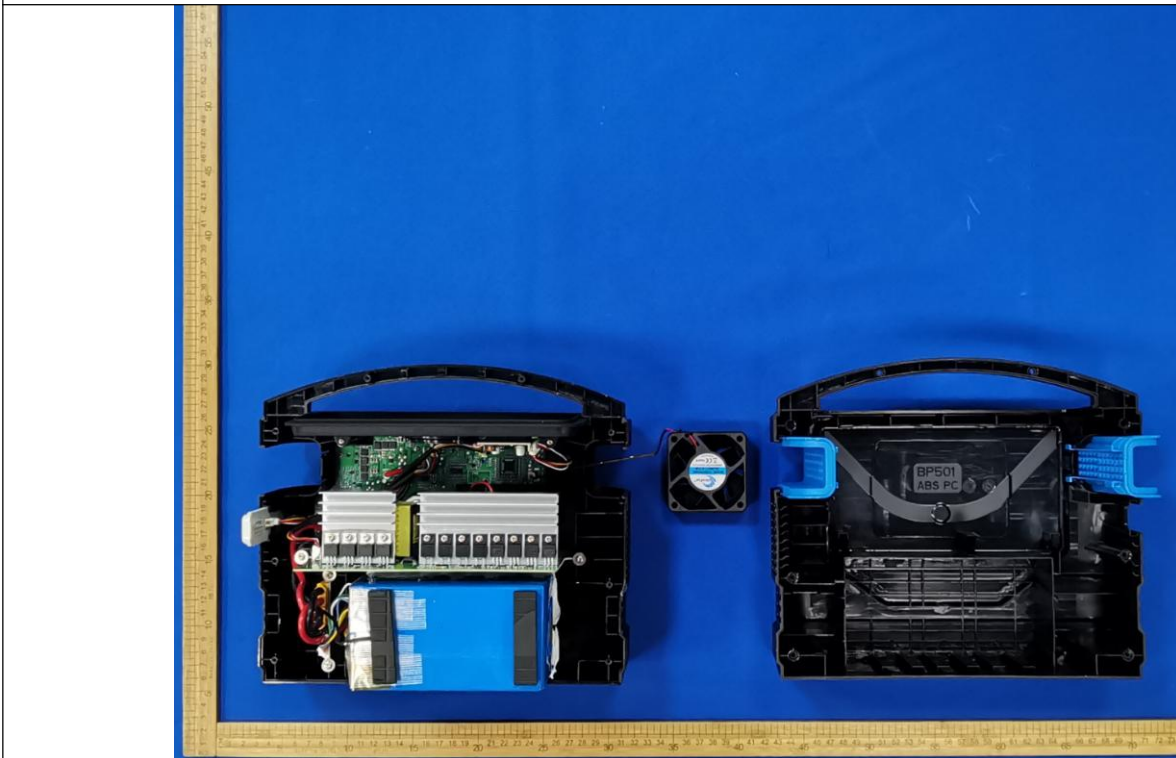


Photo 2

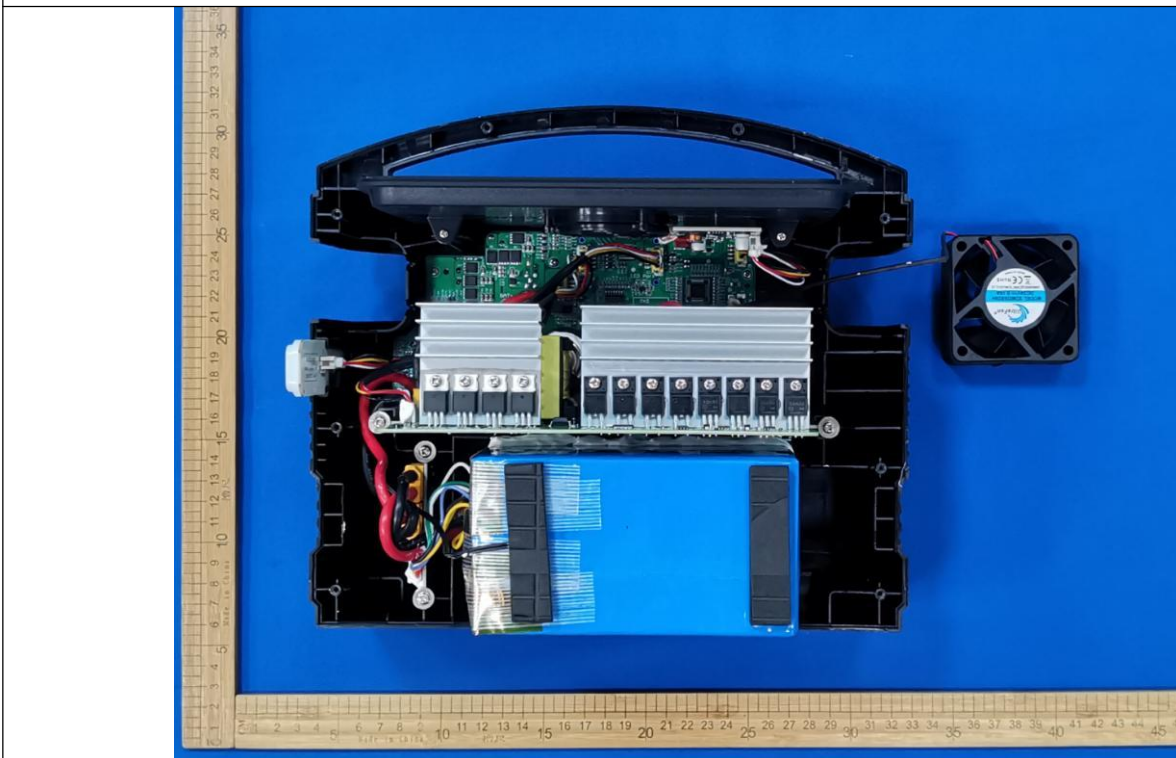


Photo 3

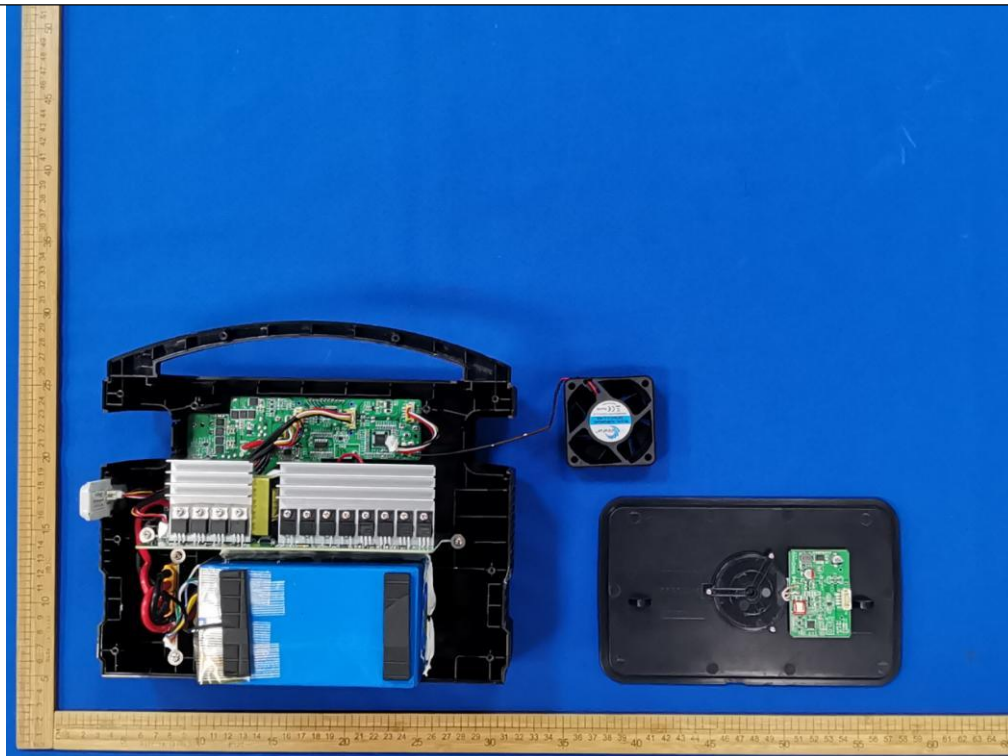


Photo 4



Photo 5

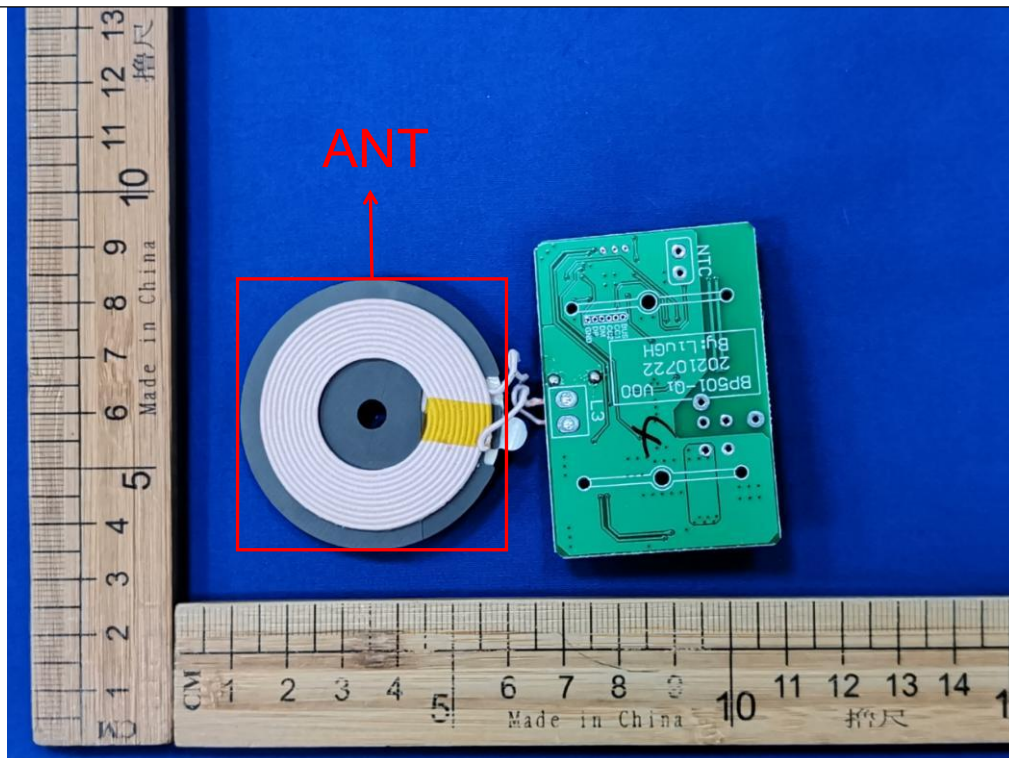


Photo 6

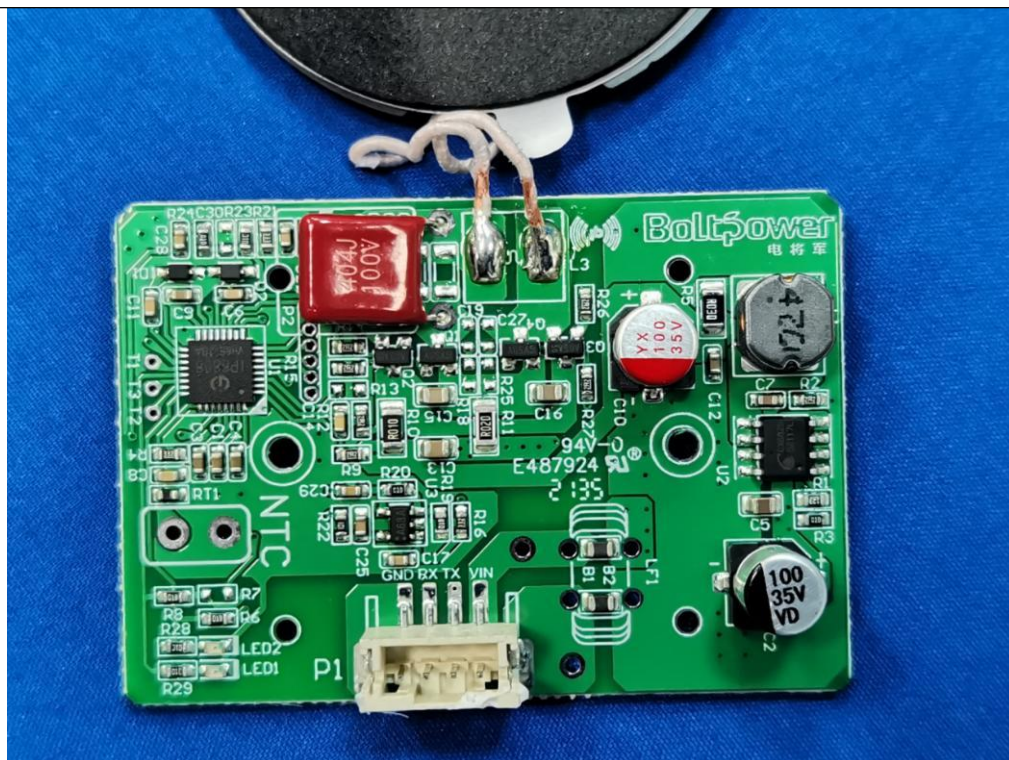


Photo 7

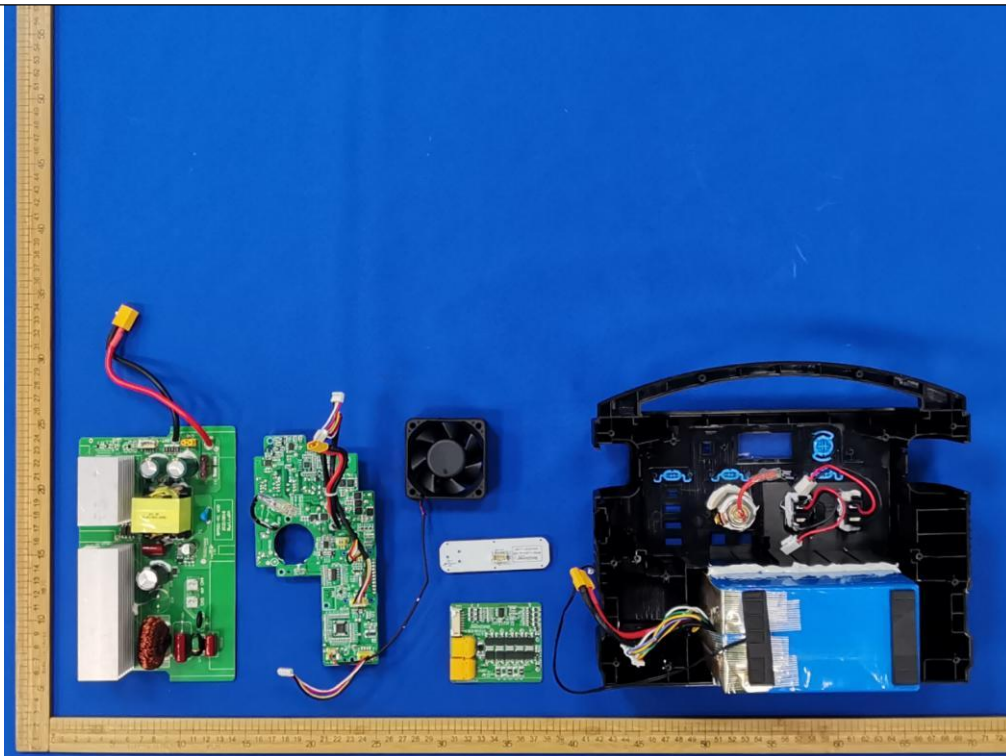


Photo 8

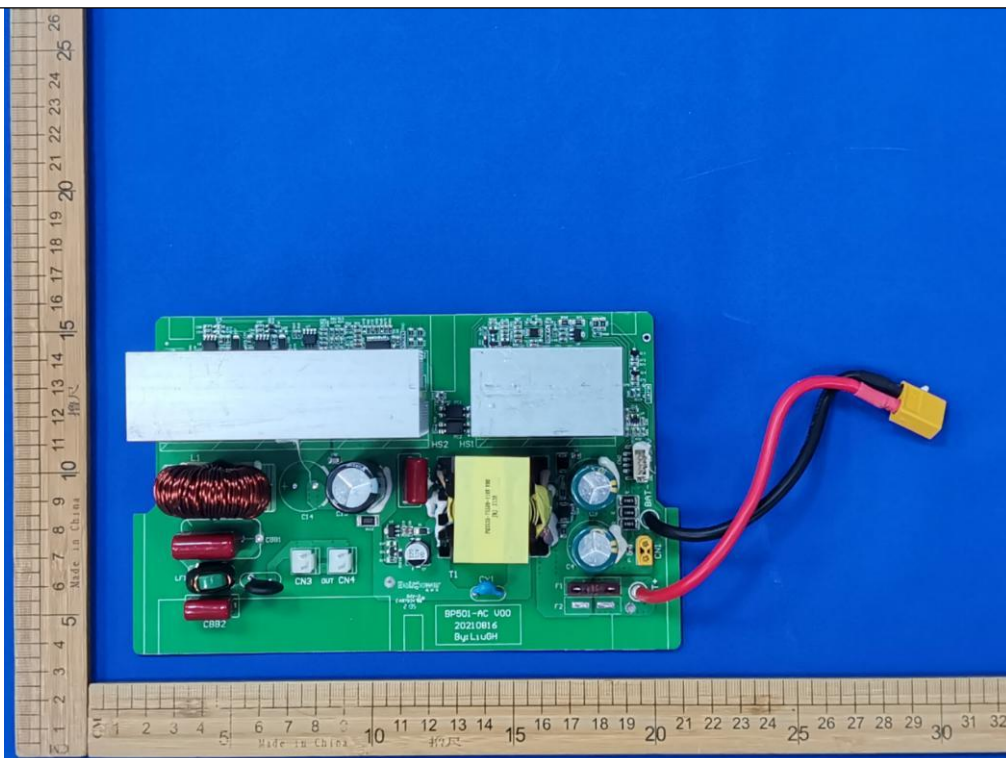


Photo 9

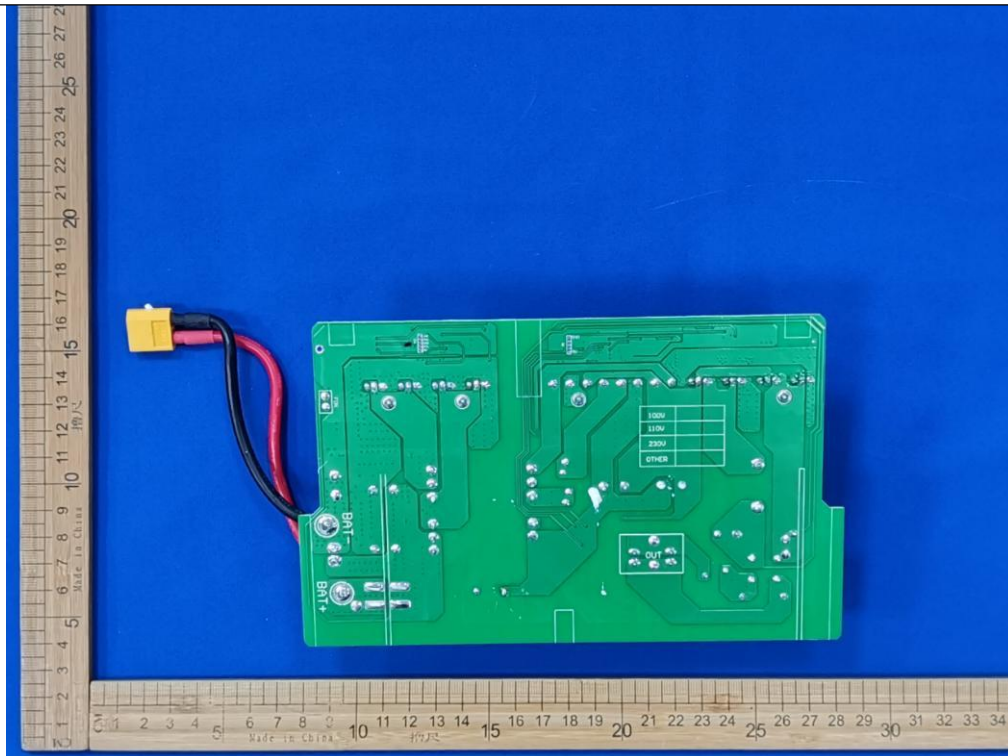


Photo 10

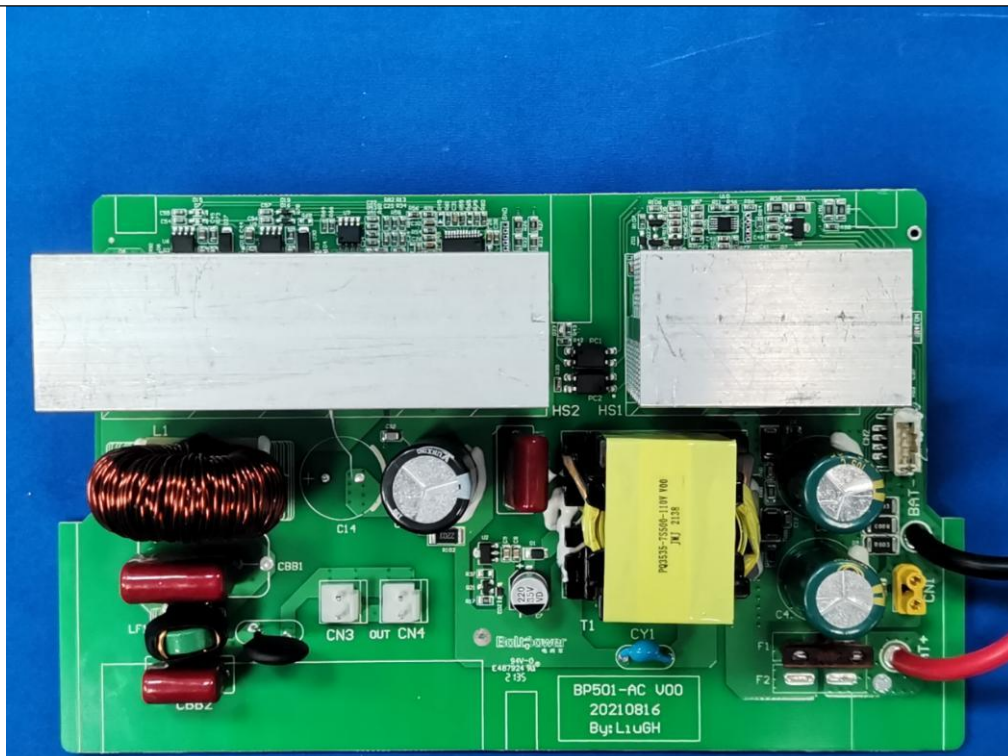


Photo 11

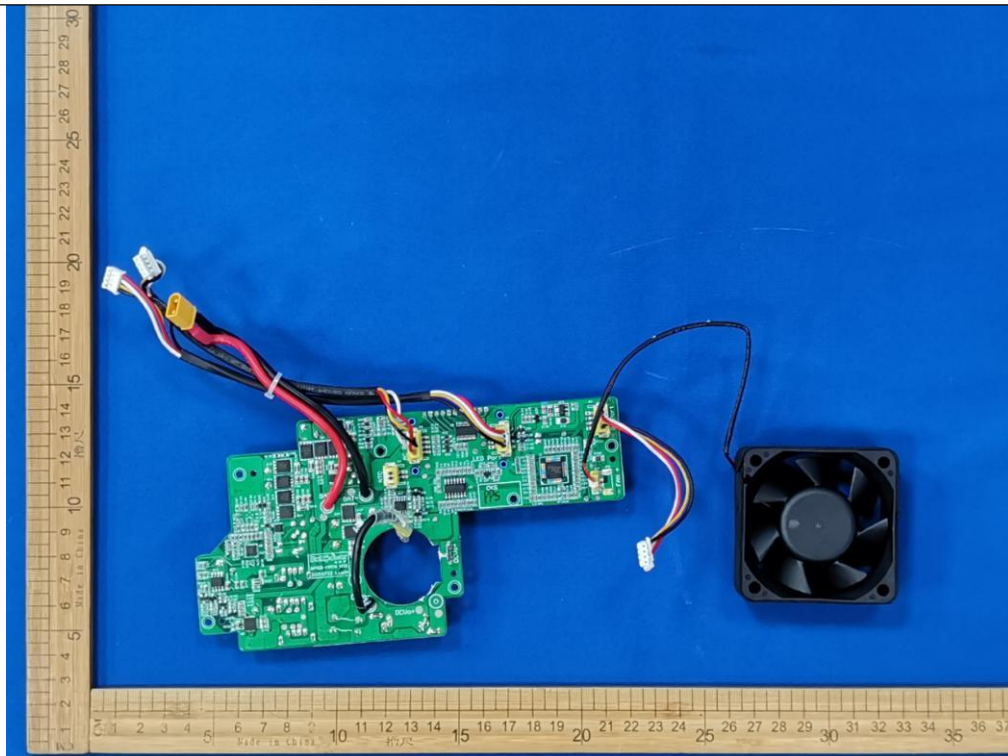


Photo 12

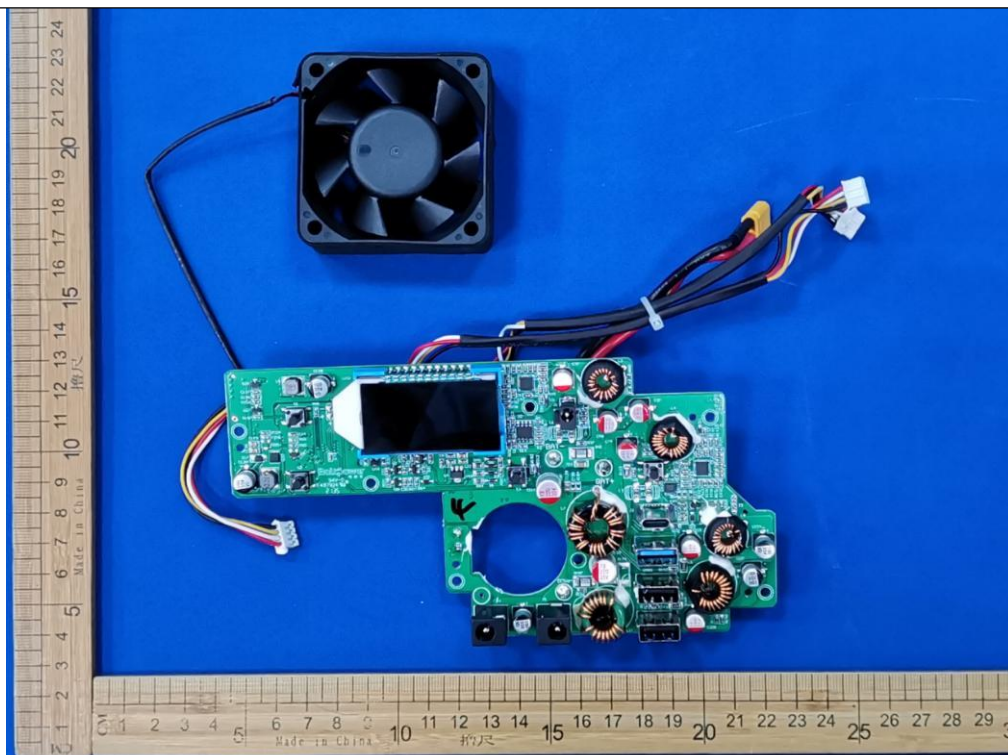


Photo 13

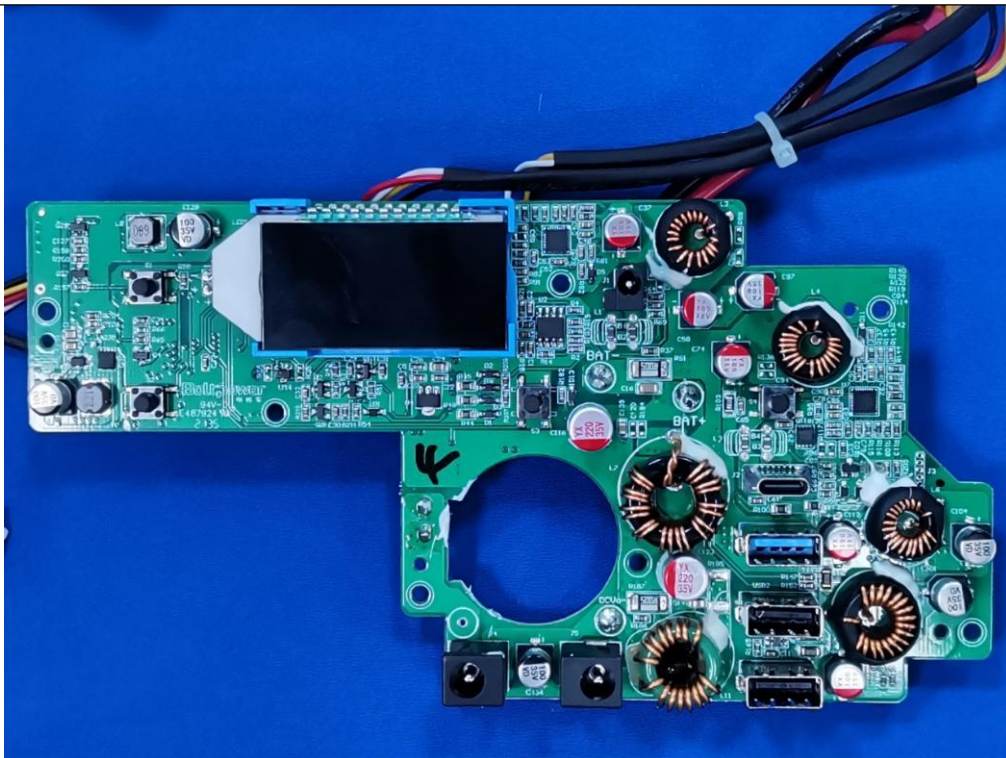


Photo 14

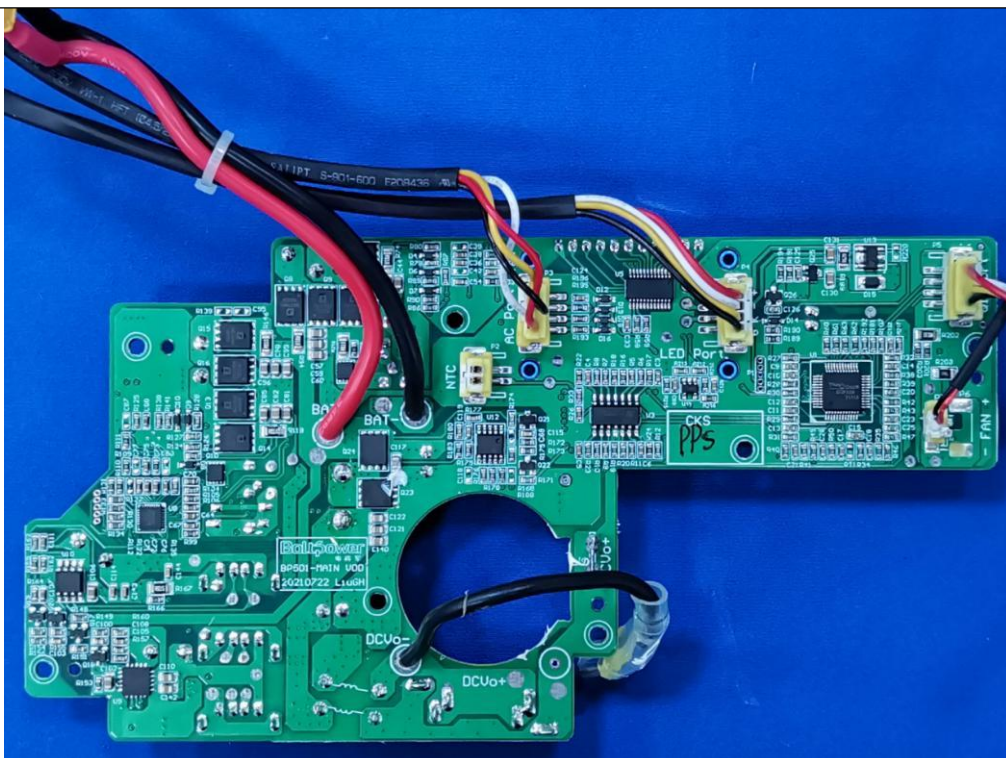


Photo 15

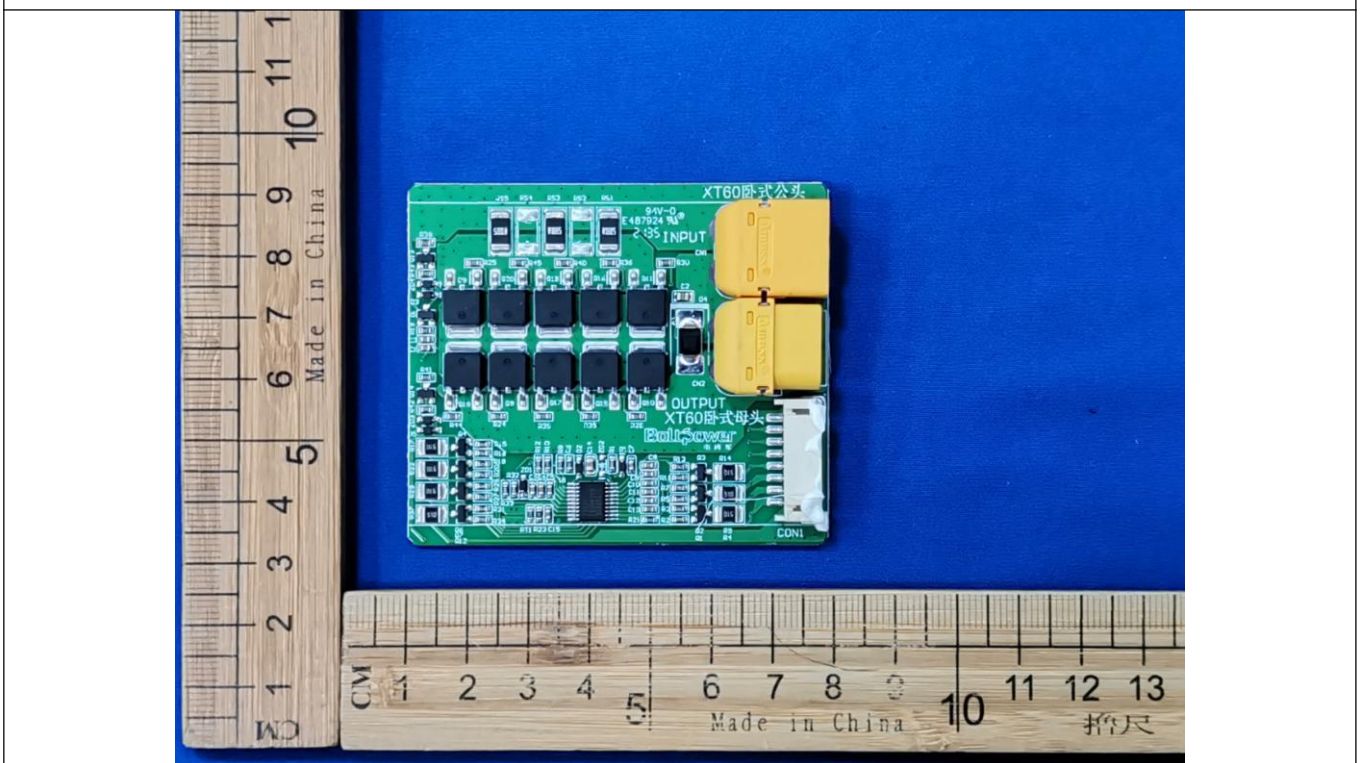


Photo 16

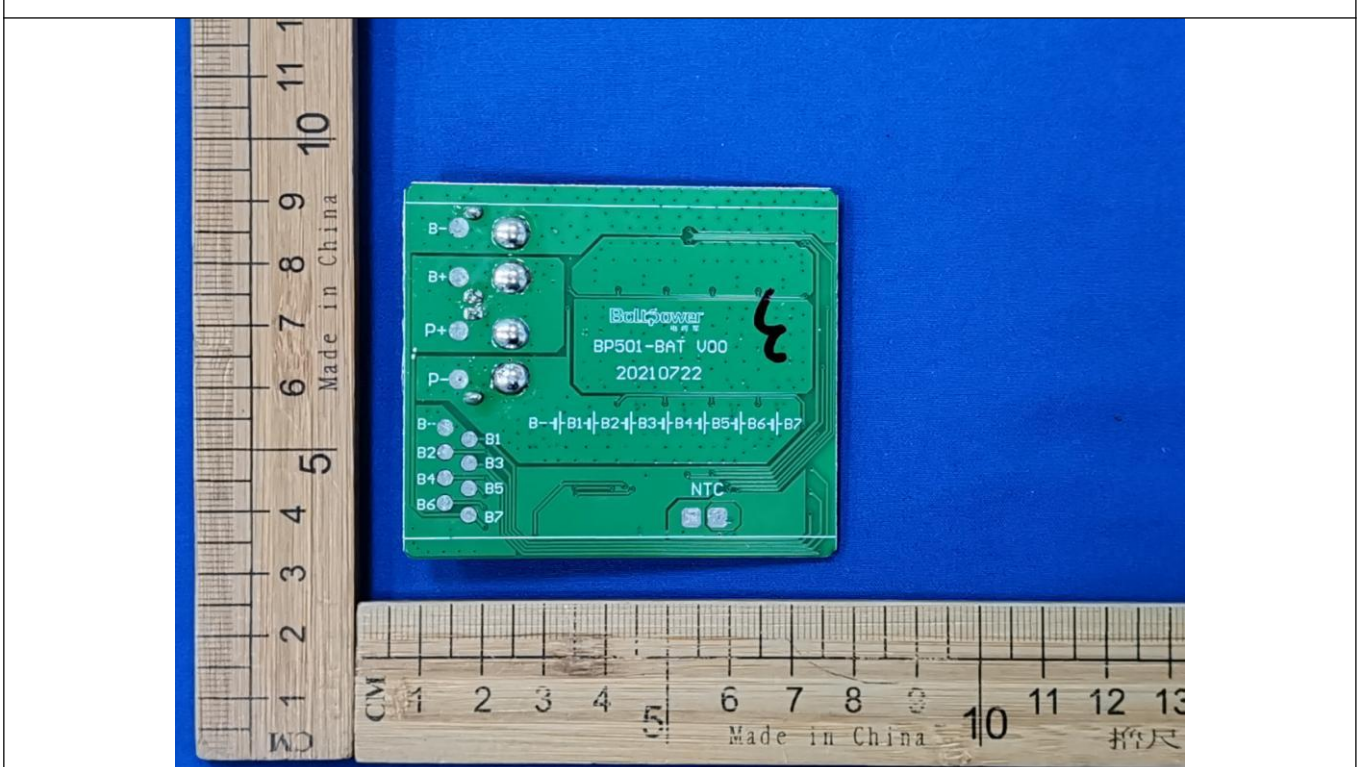


Photo 17

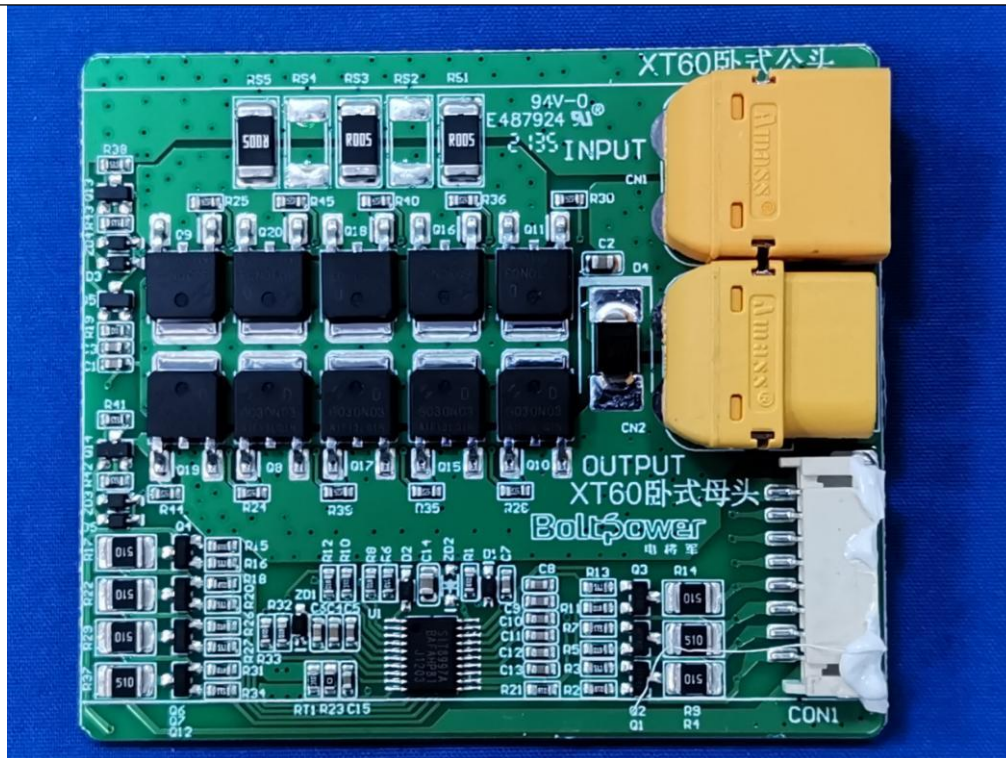


Photo 18

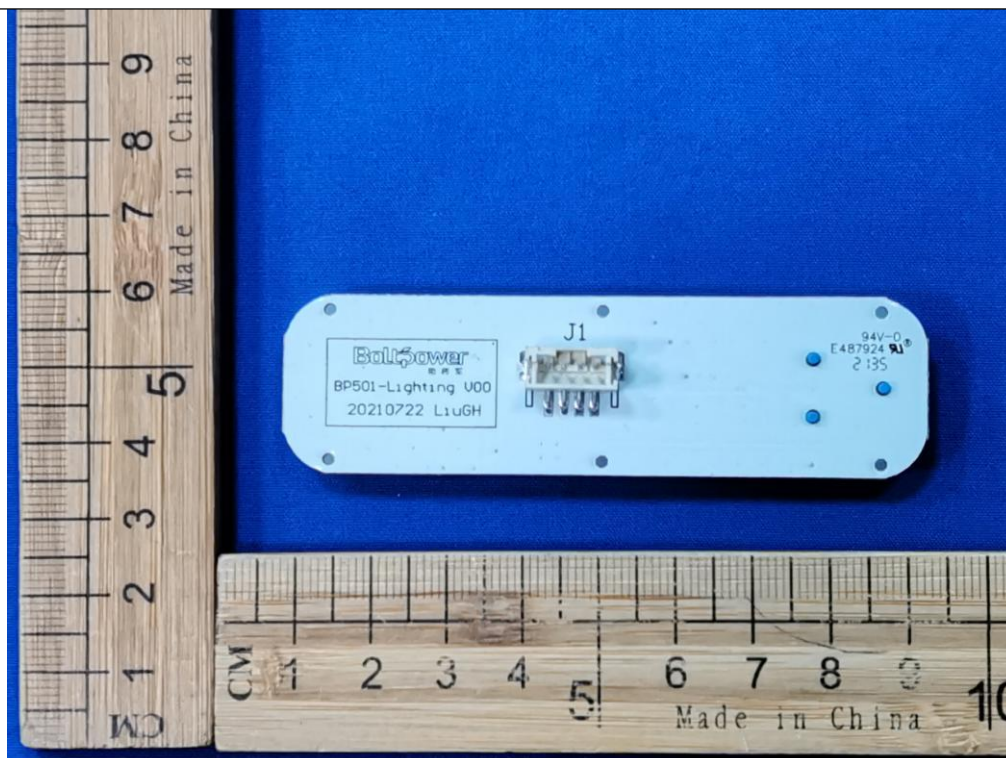


Photo 19



--THE END--