FCC TEST REPORT

FCC ID: 2AQTM-22200

Product Name	:	SHERPA 100 AC 110V
Model Name	:	22200
Additional Model	:	N/A
Brand Name	:	GOAL ZERO
Report No.	:	PTC22041106301E-FC01

Prepared for

Power System Electronic Technology Co., Ltd.

No.1 Shangbian Road, Puxin Industrial District, Shipai Town, Dongguan City, Guangdong, China

Prepared by

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

1TEST RESULT CERTIFICATION

Applicant's name	:	Power System Electronic Technology Co., Ltd.
Address	:	No.1 Shangbian Road, Puxin Industrial District, Shipai Town, Dongguan City, Guangdong, China
Manufacture's name	:	Power System Electronic Technology Co., Ltd.
Address	:	No.1 Shangbian Road, Puxin Industrial District, Shipai Town, Dongguan City, Guangdong, China
Product name	:	SHERPA 100 AC 110V
Model name	:	22200
Standards	:	FCC CFR47 Part 15C
Test procedure	:	ANSI C63.10:2013
Test Date	:	May.18 , 2022 to Jun. 22, 2022
Date of Issue	:	Aug. 22, 2022
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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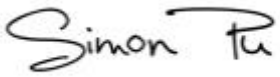
Test Engineer:



Simon Pu / Engineer

Technical Manager:

Ronnie Liu / Manager

Contents

2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.209	PASS
20dB Bandwidth	Part 15.215(c)	PASS
Antenna requirement	15.203	PASS

3 TEST FACILITY

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

A2LA Certificate No.: 4408.01

FCC Registration Number: 790290

FCC Designation Number：CN1219

IC Registration Number: 12191A

CAB identifier: CN0080

4 General Information

4.1 General Description of E.U.T.

Product Name	:	SHERPA 100 AC 110V
Model Name	:	22200
Operating frequency	:	110～205kHz
Antenna Type	:	Coil Antenna
Power supply	:	15-22VDC, 75W
Wireless Charging output Power	:	15W
Antenna Gain	:	0 dBi
Hardware Version	:	N/A
Software Version	:	N/A

4.2 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode or test configuration mode mentioned above was evaluated respectively.
This EUT is tested with a adapter, the adapter are checked and only worst case is record with the adaptor GaN Mini I.
Wireless charging:

Pretest Mode	Description
Mode 1	Stand charging mode(15W,no load, half load, full load)

Description of Support Units

Equipment	Model No.	Series No.
Load	Redmi K50 Pro	N/A

5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Last calibration	Calibration Due	Calibration period
MXA Signal Analyzer	Agilent	N9020A	MY56070279	Aug. 21, 2021	Aug. 22, 2022	1 year
Coaxial Cable	CDS	79254	46107086	Aug. 21, 2021	Aug. 22, 2022	1 year
Power Meter	Anritsu	ML2495A	0949003	Aug. 21, 2021	Aug. 22, 2022	1 year
Power Sensor	Anritsu	MA2411B	0917017	Aug. 21, 2021	Aug. 22, 2022	1 year
Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	Aug. 21, 2021	Aug. 22, 2022	1 year

Remark: 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.
Radiated Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Last calibration	Calibration Due	Calibration period
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 21, 2021	Aug. 22, 2022	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	Aug. 21, 2021	Aug. 22, 2022	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	Aug. 21, 2021	Aug. 22, 2022	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	Aug. 21, 2021	Aug. 22, 2022	1 year
Cable	Schwarzbeck	PLF-100	549489	Aug. 21, 2021	Aug. 22, 2022	1 year
Spectrum Analyzer	Agilent	E4407B	MY45109572	Aug. 21, 2021	Aug. 22, 2022	1 year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	Aug. 21, 2021	Aug. 22, 2022	1 year
Power Amplifier	LUNAR EM	LNA1G18-40	J101000000081	Aug. 21, 2021	Aug. 22, 2022	1 year
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	Aug. 21, 2021	Aug. 22, 2022	1 year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	Aug. 21, 2021	Aug. 22, 2022	1 year

Cable	H+S	CBL-26	N/A	Aug. 21, 2021	Aug. 22, 2022	1 year
RF Cable	R&S	R204	R21X	Aug. 21, 2021	Aug. 22, 2022	1 year

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Last calibration	Calibration Due	Calibration period
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 21, 2021	Aug. 22, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	Aug. 21, 2021	Aug. 22, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	Aug. 21, 2021	Aug. 22, 2022	1 year

5.2 Measurement Uncertainty

Parameter	**Uncertainty**
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9KHz~30MHz)	±2.54dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	

5.3 Description of Support Units

Equipment	Model No.	Series No.
Adapter	XY18U30-QC1	N/A

6 Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method:	:	ANSI C63.10:2013
Test Result:	:	PASS
Frequency Range:	:	150kHz to 30MHz
Class/Severity:	:	Class B
Detector:	:	Peak for pre-scan (9kHz Resolution Bandwidth)

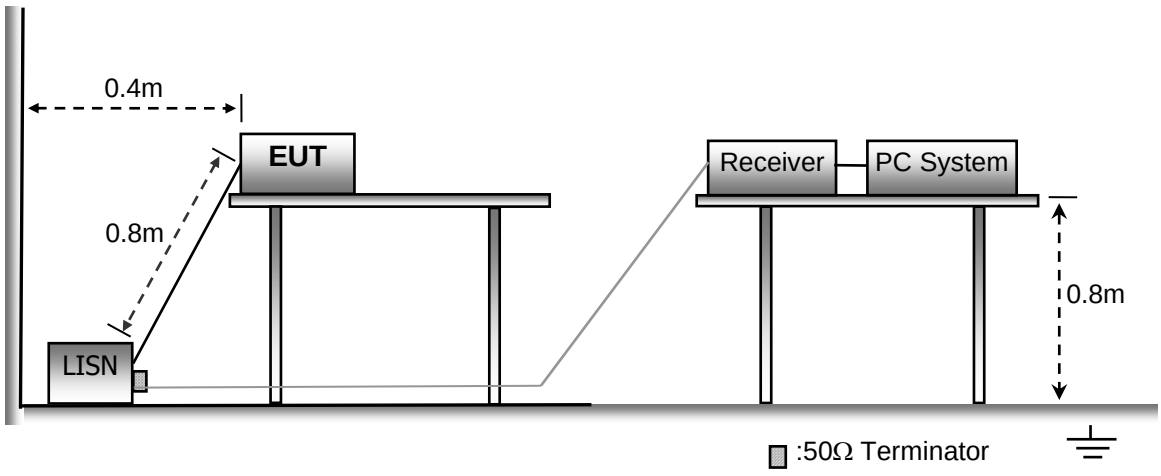
6.1 E.U.T. Operation

Operating Environment **:**

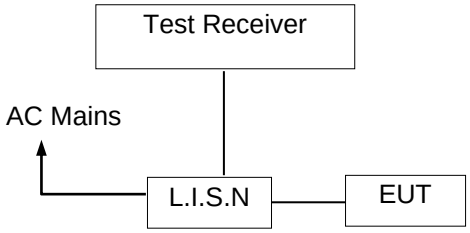
Temperature:	:	25.5 °C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.2kPa
Test Voltage	:	AC 120V/60Hz

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.

2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:
1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6 Measurement Description

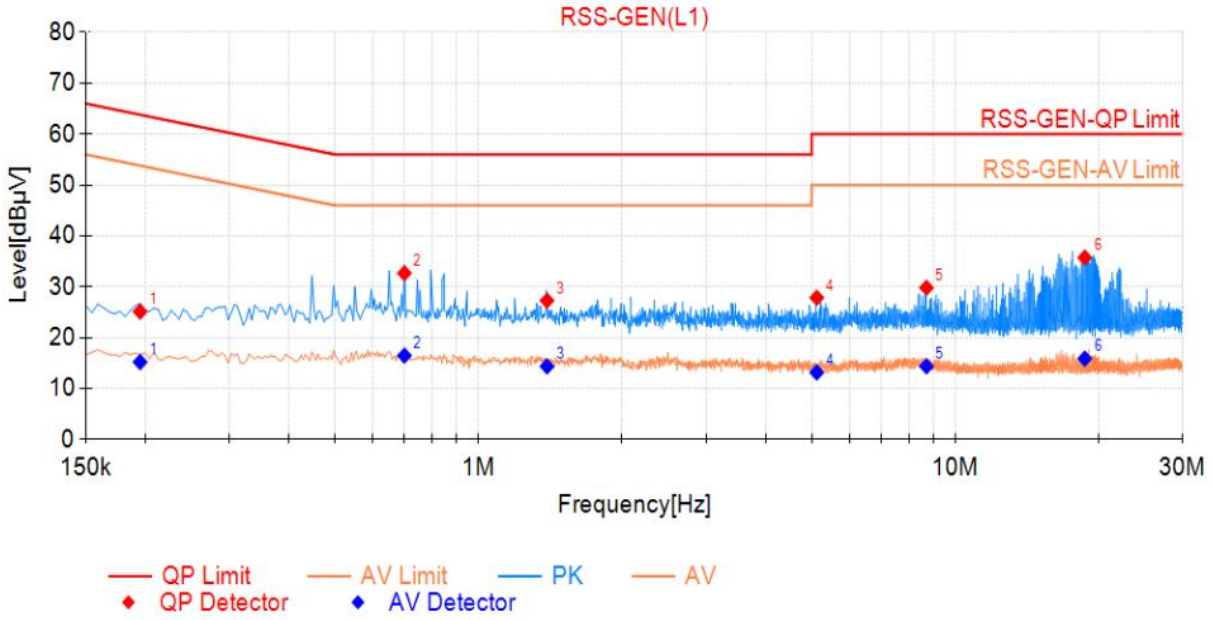
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass.

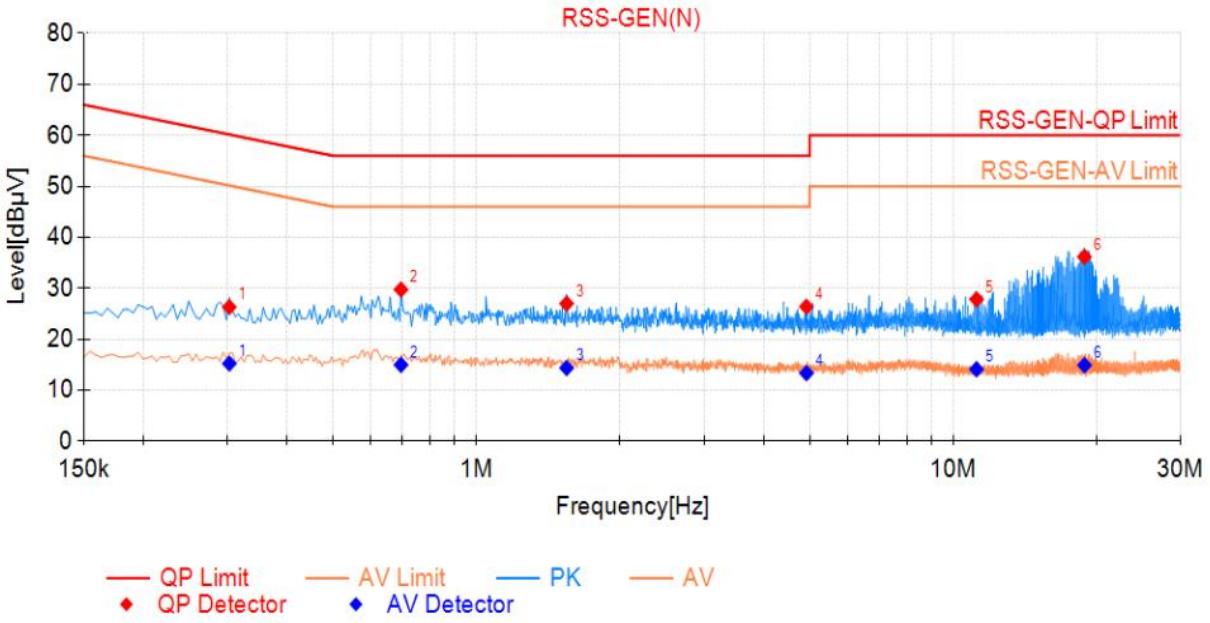
EUT is Keeping TX+Charging mode.All the modulation modes were tested with AC120V 60Hz, the data of the worst mode (AC 120V/60Hz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Line -120V/60Hz:



Final Data List								
NO.	Freq. [MHz]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.195	25.13	63.82	38.69	15.23	53.82	38.59	PASS
2	0.699	32.68	56.00	23.32	16.49	46.00	29.51	PASS
3	1.392	27.29	56.00	28.71	14.37	46.00	31.63	PASS
4	5.123	27.87	60.00	32.13	13.19	50.00	36.81	PASS
5	8.700	29.84	60.00	30.16	14.39	50.00	35.61	PASS
6	18.695	35.75	60.00	24.25	15.91	50.00	34.09	PASS

Neutral -120V/60Hz:



Final Data List								
NO.	Freq. [MHz]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.303	26.33	60.16	33.83	15.25	50.16	34.91	PASS
2	0.695	29.76	56.00	26.24	15.00	46.00	31.00	PASS
3	1.545	27.00	56.00	29.00	14.37	46.00	31.63	PASS
4	4.920	26.40	56.00	29.60	13.37	46.00	32.63	PASS
5	11.189	27.85	60.00	32.15	14.12	50.00	35.88	PASS
6	18.843	36.18	60.00	23.82	14.92	50.00	35.08	PASS

7 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature : 23.5 °C

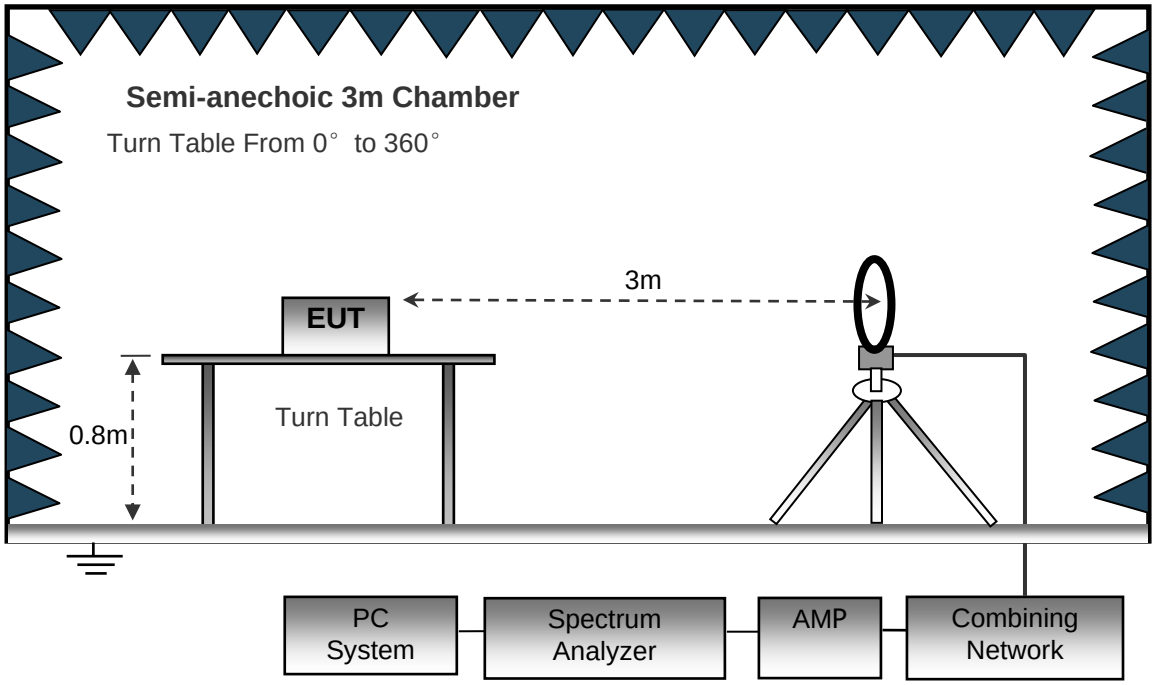
Humidity : 51.1 % RH

Atmospheric Pressure : 101.2kPa

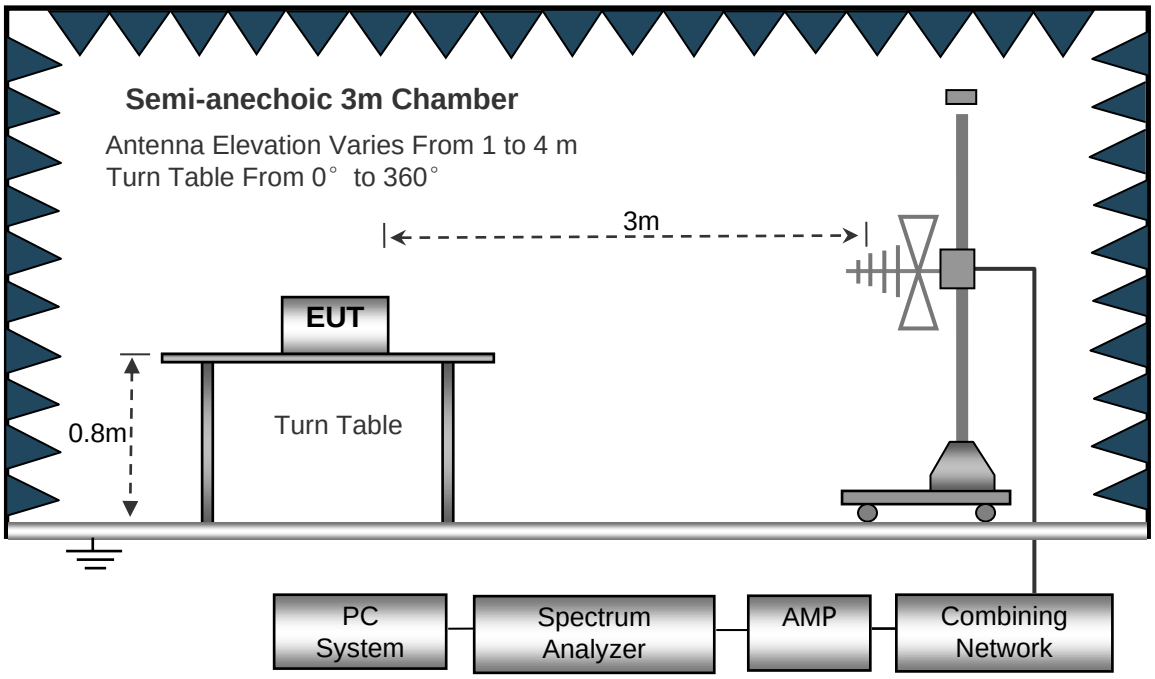
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

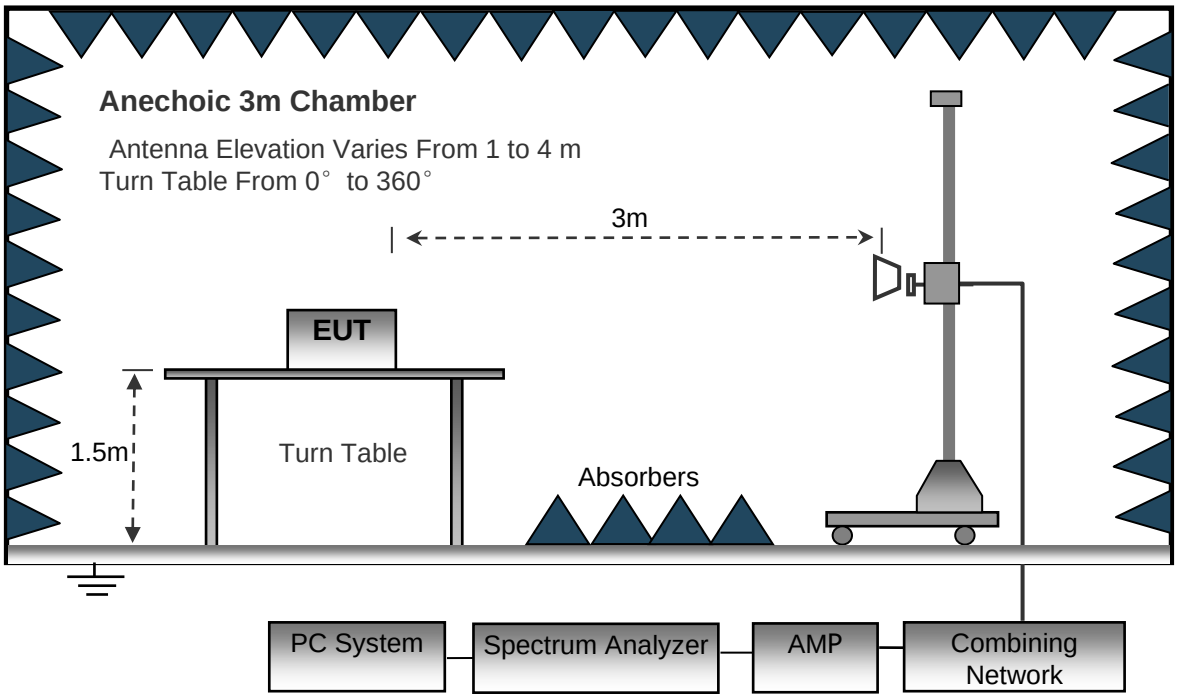
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

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

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference 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 1m to 4m) and turntable (from 0 degree to 360 degree) 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. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Frequency(122KHz):

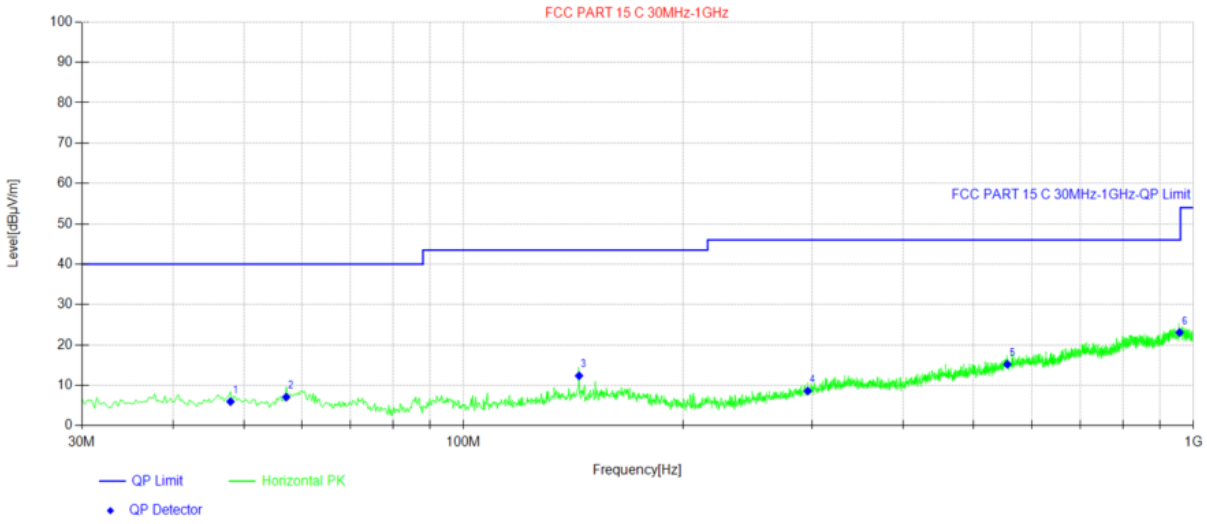
Frequency (MHz)	Read Level (dBuV)	Polar	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector
0.110	12.68	Loop	19.3	2.53	0	34.51	126.78	-92.27	Peak
0.110	3.39	Loop	19.3	2.53	0	25.22	106.78	-81.56	AV
0.122	47.47	Loop	19.28	2.53	0	69.28	125.88	-56.60	Peak
0.122	36.82	Loop	19.28	2.53	0	58.63	105.88	-47.25	AV
0.2459	15.65	Loop	19.3	2.54	0	37.49	119.79	-82.30	Peak
0.2459	5.28	Loop	19.3	2.54	0	27.12	99.79	-72.67	AV
0.506	6.36	Loop	19.53	2.59	0	28.48	73.52	-45.04	QP
0.9495	2.83	Loop	19.53	2.59	0	24.95	68.05	-43.10	QP
3.5659	1.68	Loop	19.53	2.59	0	23.80	69.54	-45.74	QP

Remark: Final Level=Receiver level+Factor.

According to FCC Part 15.209(d), the emission limits for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz. Radiated emission limits in these three bans are based on measurements employing an average detector. The value : Peak>QP>AV. So the result is passed.

Test Frequency: 30MHz ~ 1GHz

Horizontal:

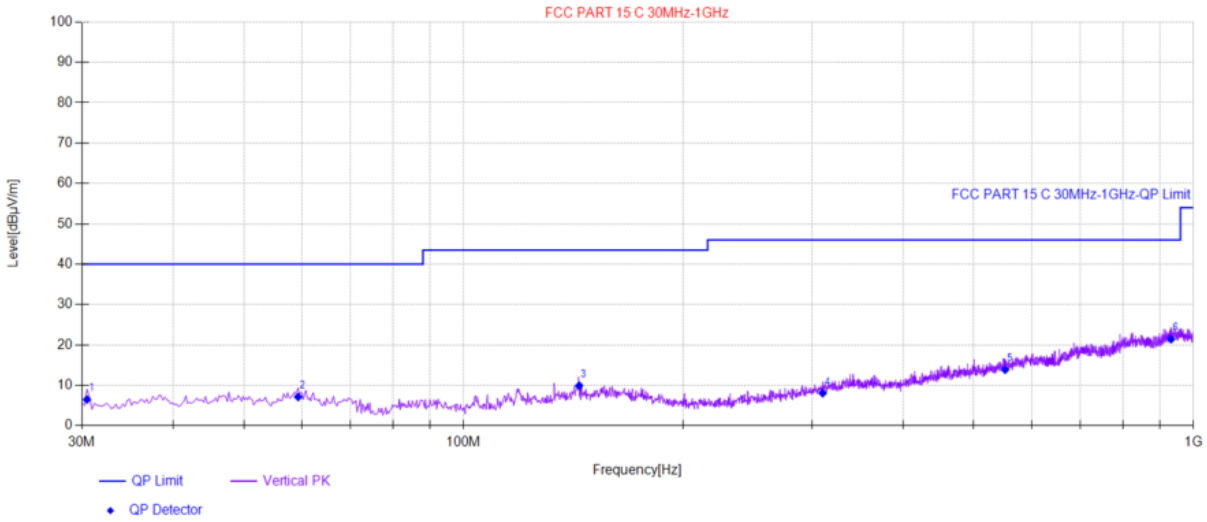


Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	47.95	-17.69	5.97	40.00	34.03	100	152	Horizonta
2	57.16	-17.92	7.08	40.00	32.92	100	42	Horizonta
3	143.98	-16.46	12.36	43.50	31.14	100	292	Horizonta
4	296.27	-15.61	8.60	46.00	37.40	100	251	Horizonta
5	555.98	-9.31	15.21	46.00	30.79	100	42	Horizonta
6	957.08	-2.09	23.10	46.00	22.90	100	257	Horizonta

Remark: Emission Level=Receiver level+Cable Loss +Ant factor-Amp Factor

Over Limit=Emission Level-Limited

Vertical:



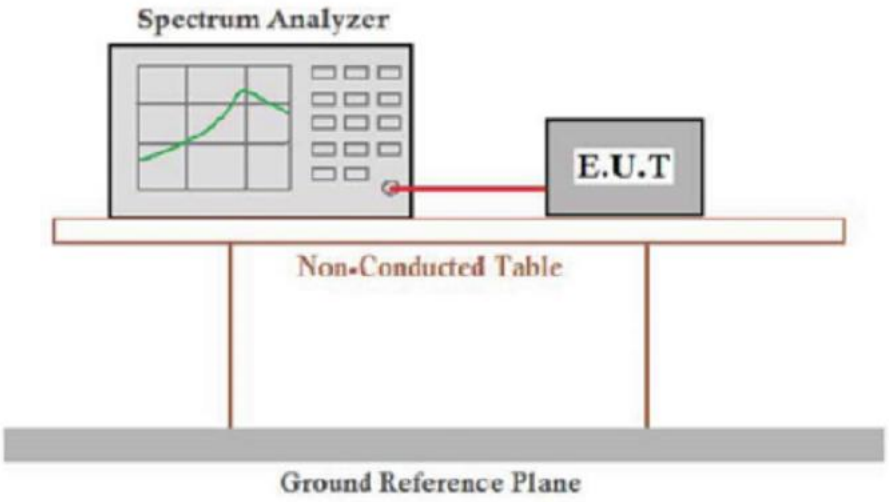
Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.49	-18.32	6.50	40.00	33.50	100	120	Vertical
2	59.34	-17.84	7.12	40.00	32.88	100	10	Vertical
3	143.98	-16.46	9.91	43.50	33.59	100	206	Vertical
4	310.57	-15.14	8.05	46.00	37.95	100	327	Vertical
5	552.10	-9.35	13.87	46.00	32.13	100	332	Vertical
6	931.86	-2.46	21.43	46.00	24.57	100	117	Vertical

Remark: Emission Level=Receiver level+Cable Loss +Ant factor-Amp Factor

Over Limit=Emission Level-Limited

8 20dB Bandwidth

8.1 Block Diagram of Test Setup



8.2 Rules and specifications

DFR 47 Part 15.215(c)

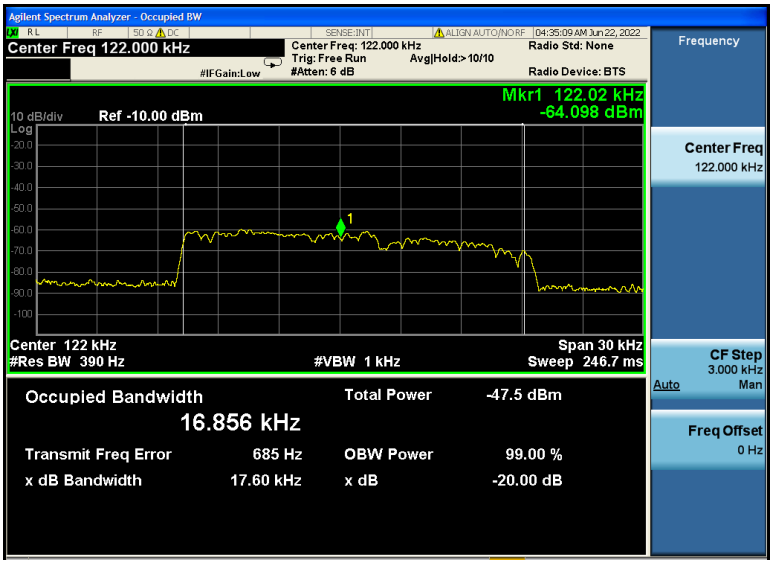
ANSI C63.10-2013

8.3 Test Procedure

Intentional radiator operating under the altemative provisions to the general emission limits,as contained in 15.217 and in subpart E of this part,must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be deomonstrated by measuring the radiated emissions.

8.4 Result

Pass.


Agilent Spectrum Analyzer - Occupied BW
Center Freq 122.000 kHz
Center Freq: 122.000 kHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 6 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Mkr1 122.02 kHz
-64.098 dBm
10 dB/div
Ref -10.00 dBm
Log
Center 122 kHz
#Res BW 390 Hz
#VBW 1 kHz
Span 30 kHz
Sweep 246.7 ms
Occupied Bandwidth
16.856 kHz
Total Power
-47.5 dBm
Transmit Freq Error
685 Hz
OBW Power
99.00 %
x dB Bandwidth
17.60 kHz
x dB
-20.00 dB
Frequency
Center Freq
122.000 kHz
CF Step
3.000 kHz
Auto
Man
Freq Offset
0 Hz

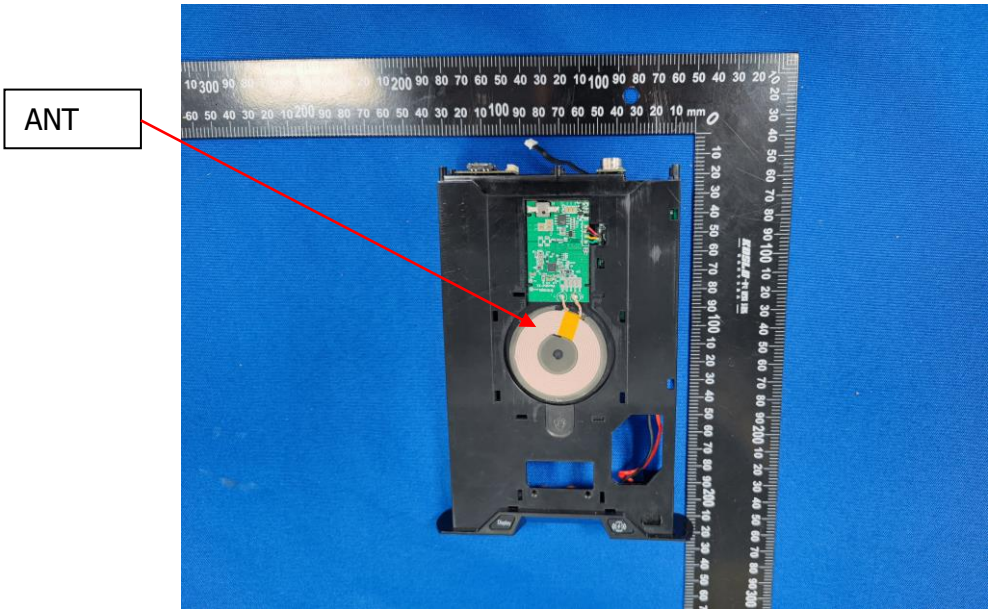
9 Antenna Application

9.1 Antenna Requirement

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

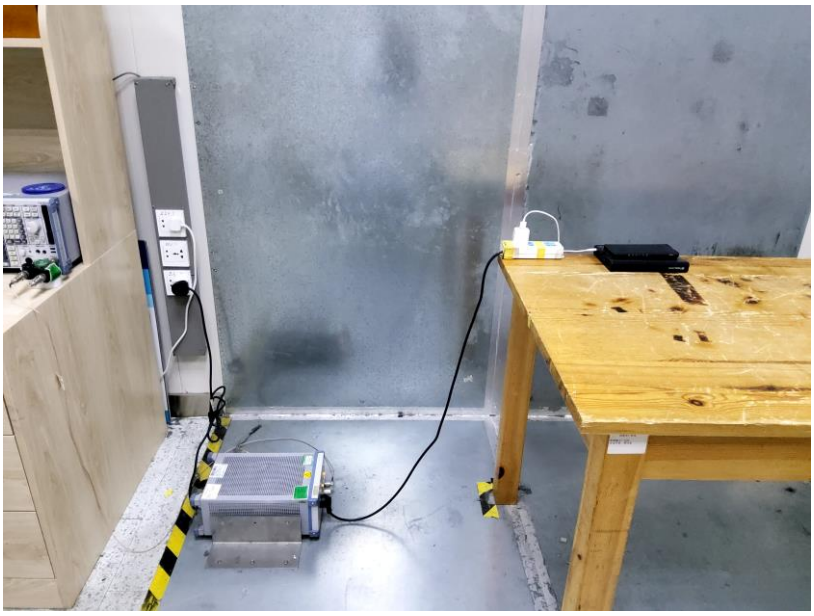
9.2 Result

The EUT'S antenna, permanent attached antenna,is coil Antenna. The antenna's gain is 0 dBi and meets the requirement.



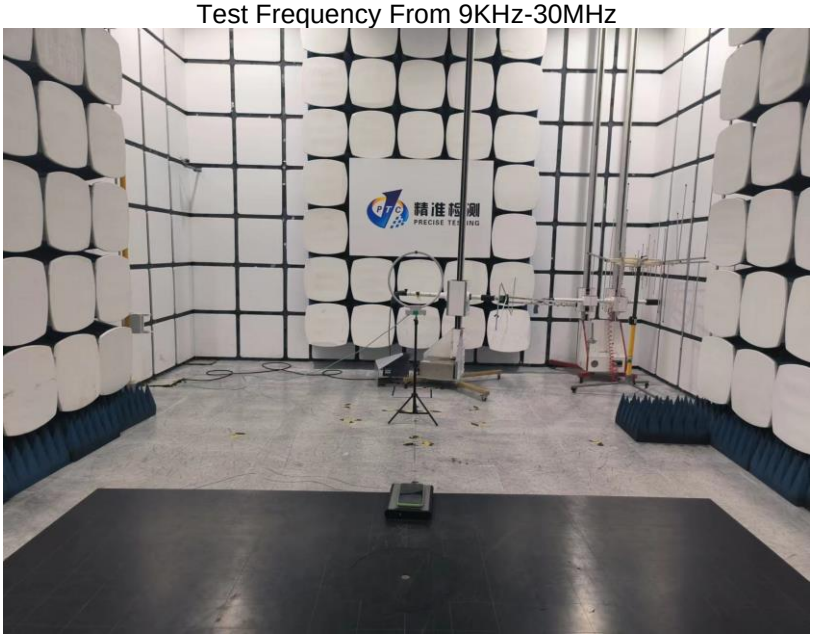
9 TEST PHOTOS

Conducted Emissions

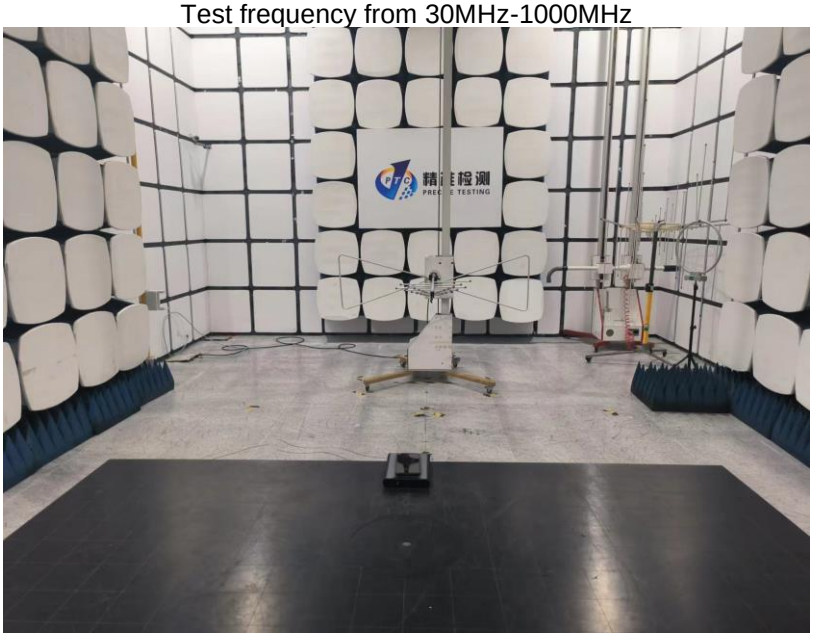


Radiated Spurious Emissions

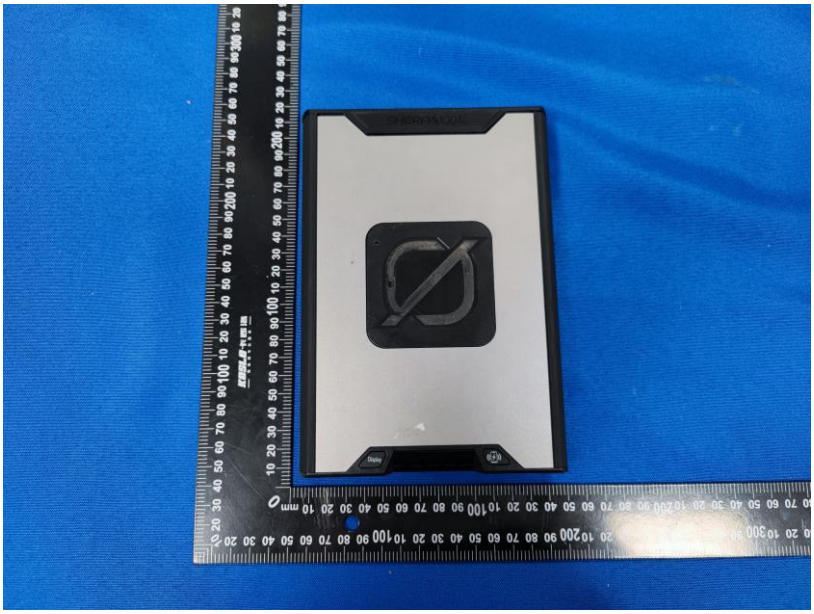
Test Frequency From 9KHz-30MHz

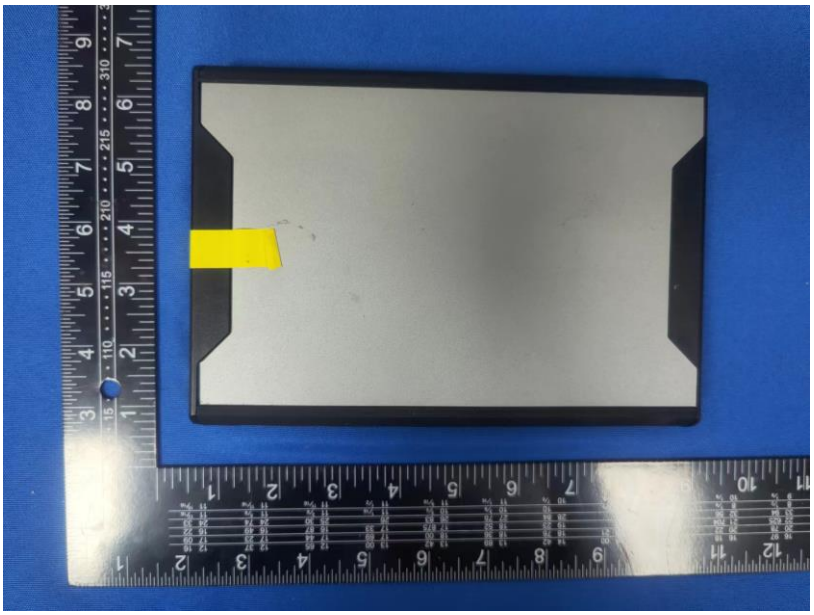


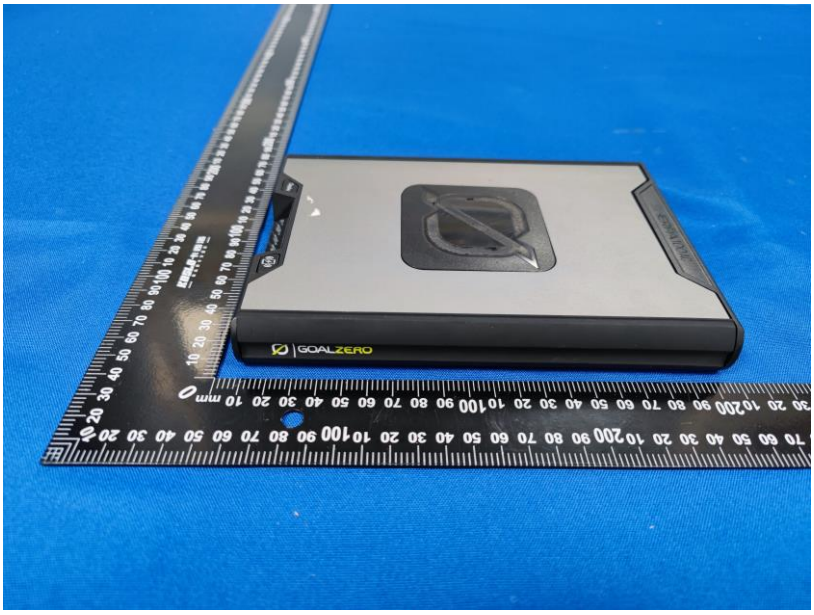
Test frequency from 30MHz-1000MHz



10 EUT PHOTOS



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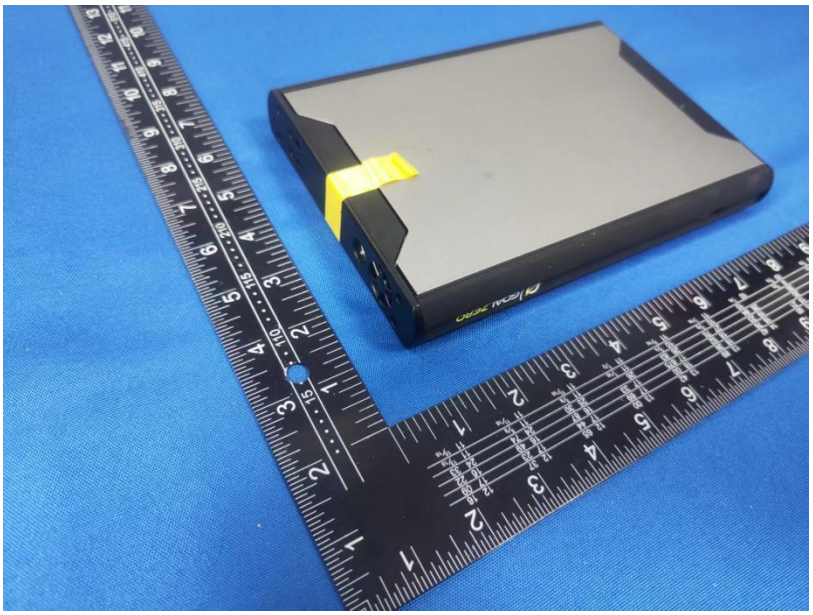

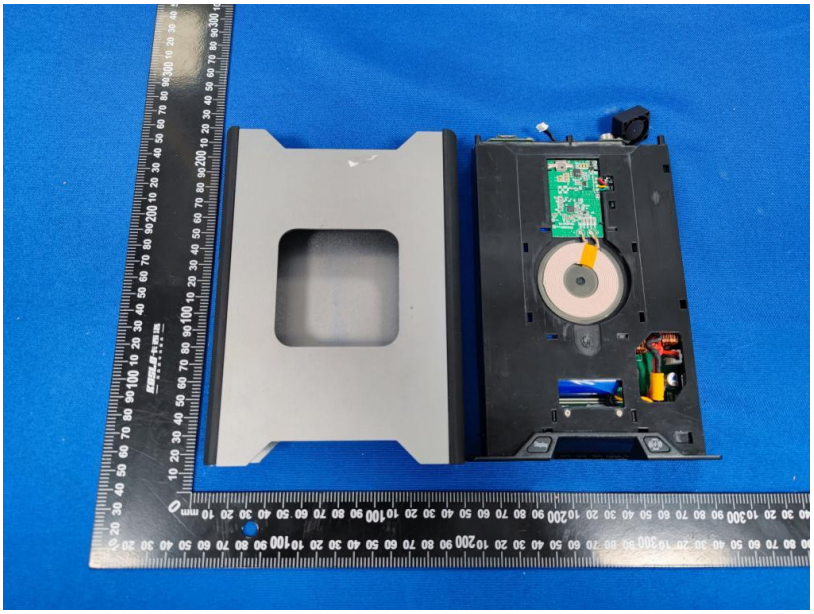

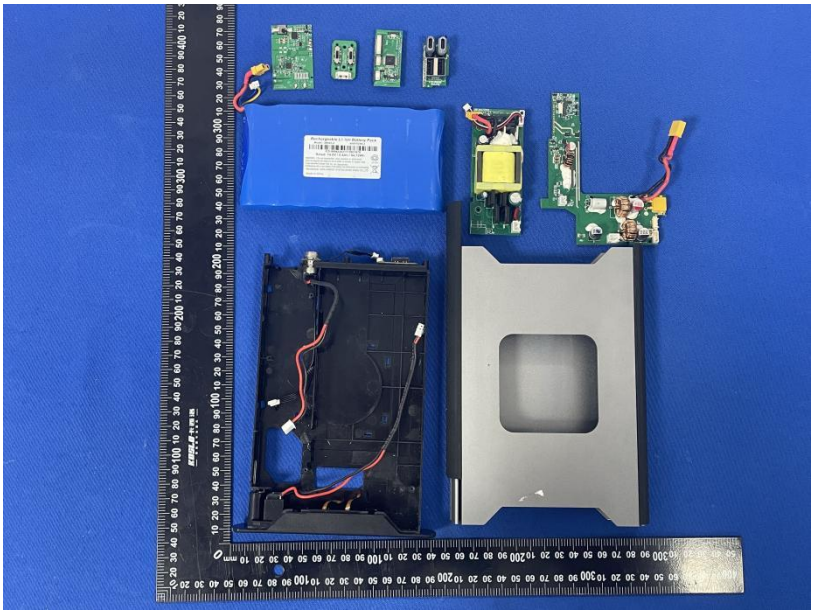

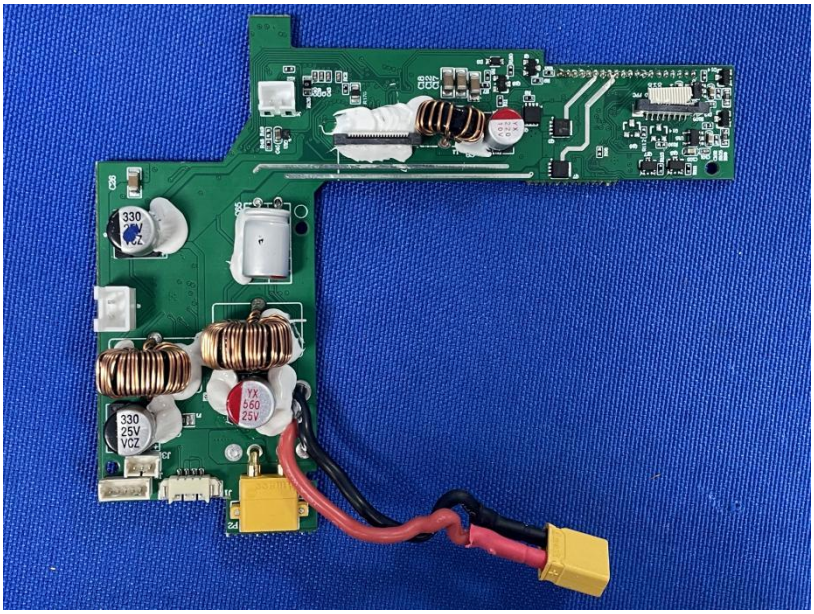
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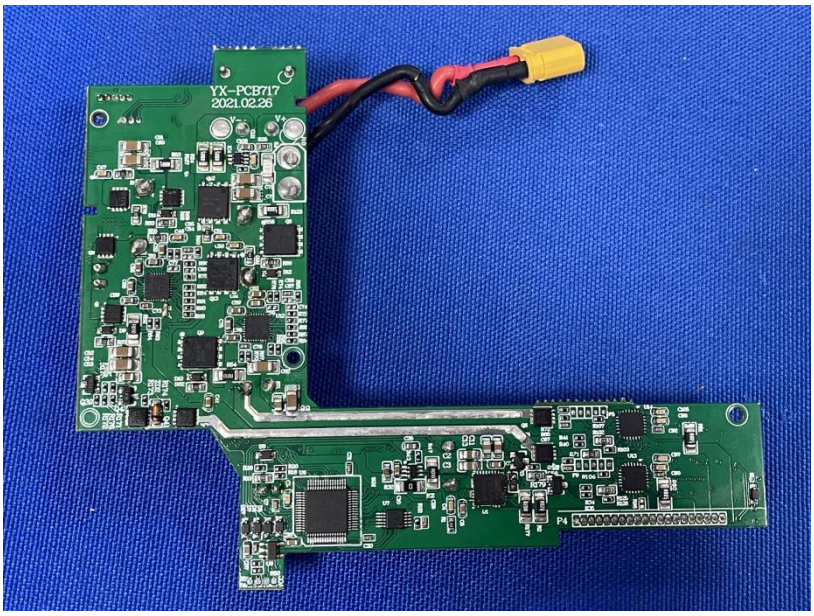
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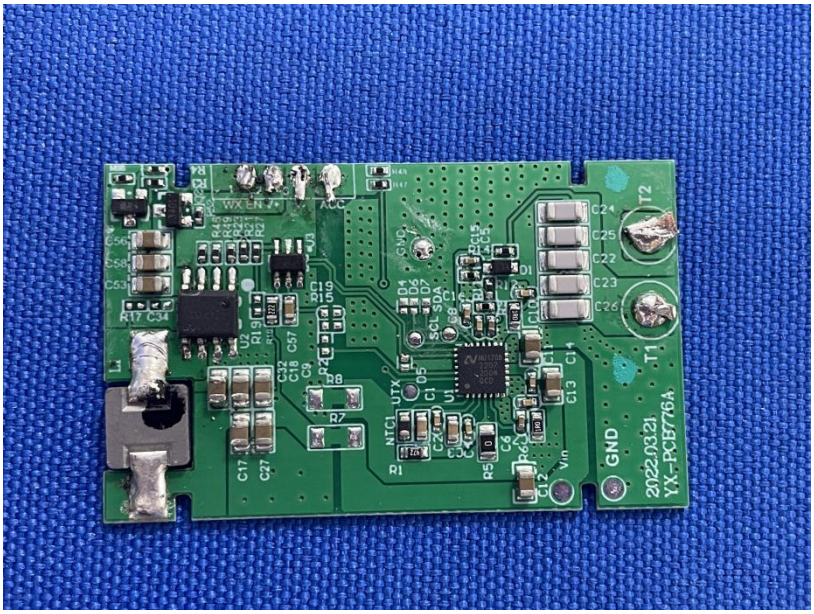
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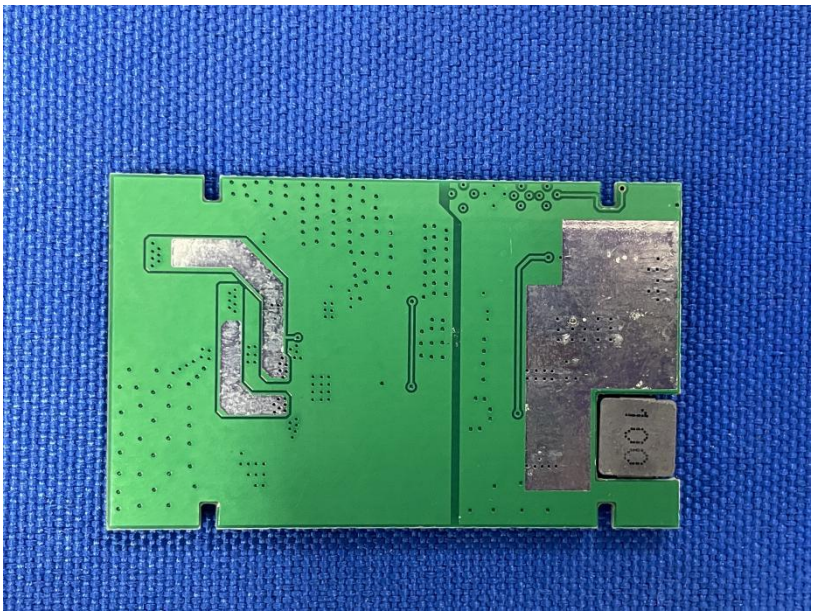
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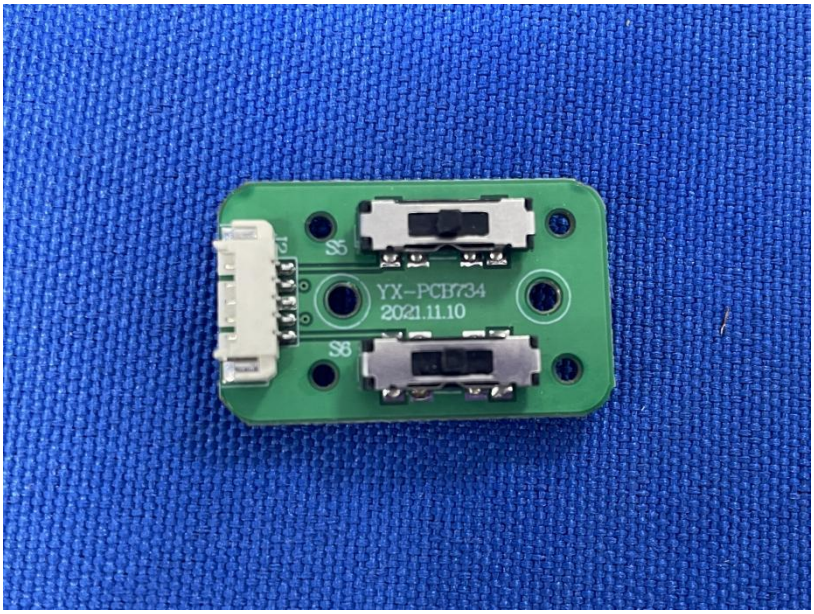
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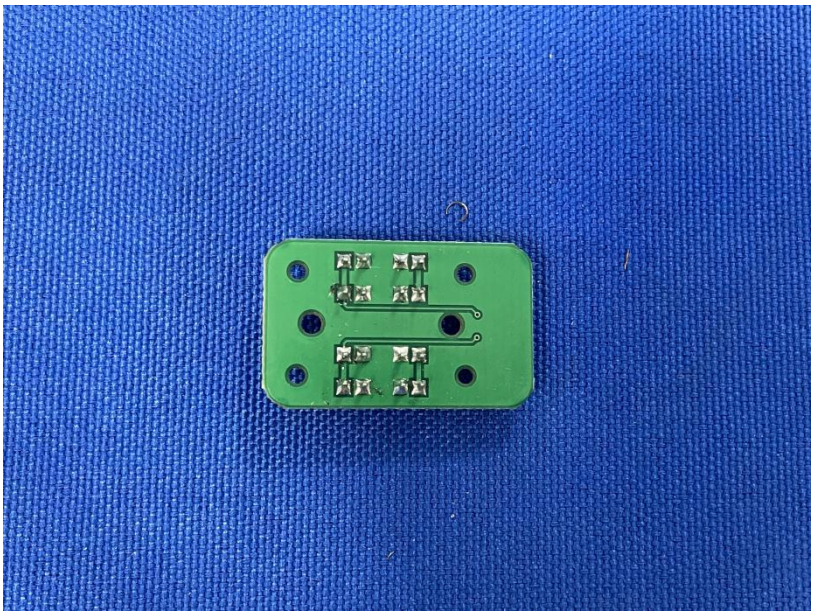


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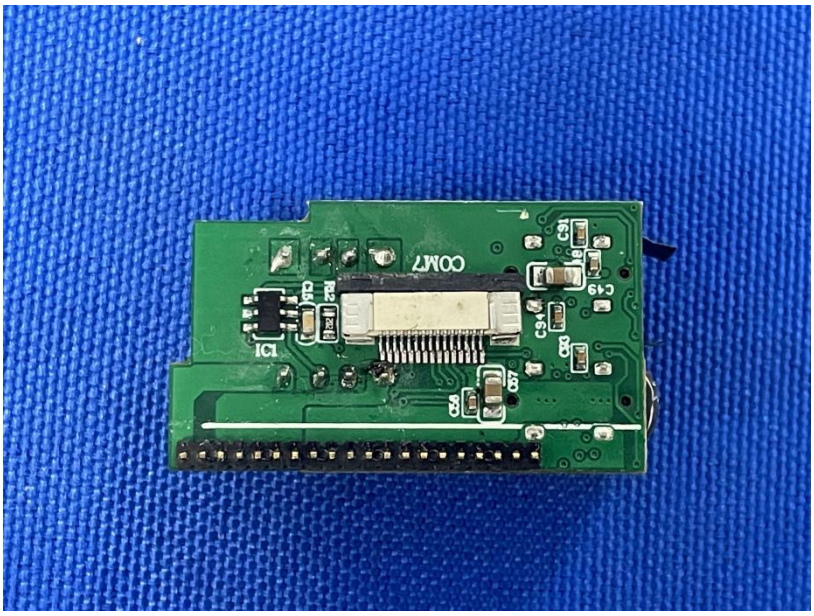
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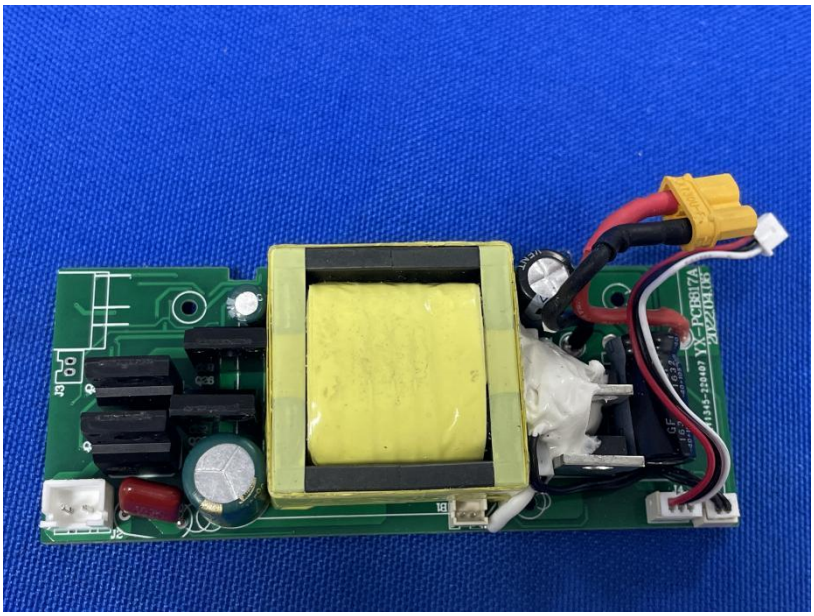

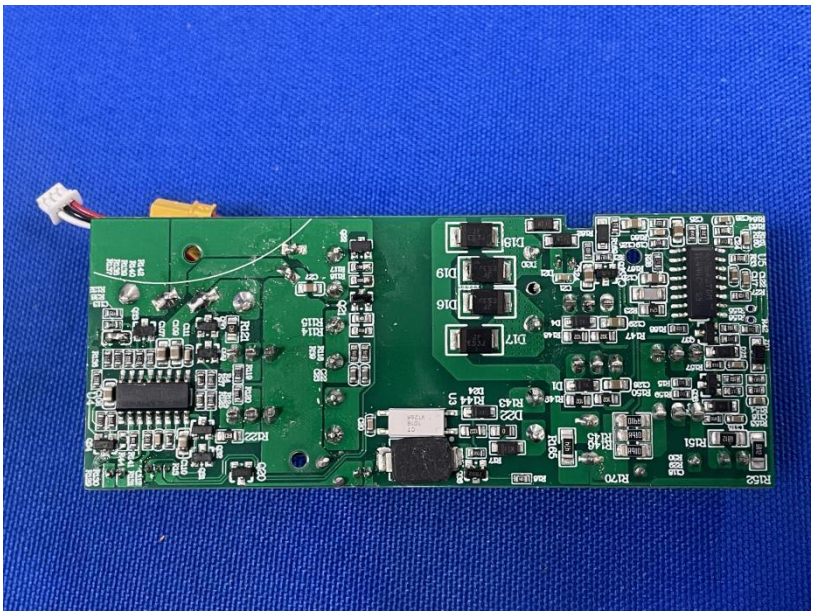

********THE END REPORT********