



# FCC TEST REPORT

## FCC ID:2AQTM-22060

Product Name	:	Sherpa 100PD
Model Name	:	22060
Brand Name	:	GOAL ZERO
Report No.	:	PTC19022504302E-FC01
<b>Prepared for</b>		
Power System Electronic Technology Co., Ltd.		
No.1 Shangbian Road, Puxin Industrial District, Shipai Town, Dongguan City, Guangdong, China		
<b>Prepared by</b>		
Dongguan Precise Testing & Certification Corp., Ltd.		
Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, 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 100PD  
Model name : 22060  
Standards : FCC CFR47 Part 15C  
Test procedure : ANSI C63.10:2013  
Test Date : April 01.2019 to April 18.2019  
Date of Issue : April 18.2019  
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:

A handwritten signature in black ink that reads "Leo Yang" with a stylized flourish at the end.

Leo Yang / Engineer

Technical Manager:

A handwritten signature in black ink that appears to read "Chris Du" with a stylized flourish at the end.

Chris Du / Manager



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## 2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.209	PASS



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### **3 TEST FACILITY**

Dongguan Precise Testing & Certification Corp., Ltd.

Address: Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1



## 4 General Information

### 4.1 General Description of E.U.T.

Product Name	:	Sherpa 100PD
Model Name	:	22060
Operating frequency	:	110-205kHz
Numbers of Channel	:	20 Channels
Antenna Type	:	Inductive Loop Coil Antenna
Antenna Gain	:	0dBi
Type of Modulation	:	ASK
Power supply	:	AC 120V, 60Hz for Adapter



## 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.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH10
Mode 3	CH20
Mode 4	Keeping TX+Charging mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Keeping TX+Charging mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH10
Mode 3	CH20

### Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	0.110	6	0.135	11	0.160	16	0.185
2	0.115	7	0.140	12	0.165	17	0.190
3	0.120	8	0.145	13	0.170	18	0.195
4	0.125	9	0.150	14	0.175	19	0.200
5	0.130	10	0.155	15	0.180	20	0.205



## 5 Equipment During Test

### 5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-30GHz	Sep. 19, 2019
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Sep. 19, 2019
Antenna Connector	Florida RF Labs	N/A	RF01#	N/A	Sep. 19, 2019

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.	Characteristics	Calibration Due
Spectrum Analyzer	Agilent	E4407B	MY45109572	9kHz-26.5GHz	Sep.19, 2019
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 kHz -30MHz	Sep.19, 2019
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Sep.19, 2019
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep.19, 2019
Cable	Schwarzbeck	PLF-100	549489	9kHz-3GHz	Sep.19, 2019
Spectrum Analyzer	Agilent	E4407B	MY45109572	9kHz-40GHz	Sep.19, 2019
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Sep.19, 2019
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Sep.25, 2019
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Sep.19, 2019
RF Cable	R&S	R204	R21X	1GHz-40GHz	Sep.19, 2019





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Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9kHz-3GHz	Sep. 19, 2019
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9kHz-300MHz	Sep. 19, 2019
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9kHz-300MHz	Sep. 19, 2019



## 5.2 Measurement Uncertainty

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



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### 5.3 Description of Support Units

Equipment	Model No.	Series No.
Adapter	Model: PS65B150Y3000S Input: AC120V, 60Hz, 1.5A Output: DC 5V, 3000mA	N/A
Mobile Phone	Samsung S9	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)

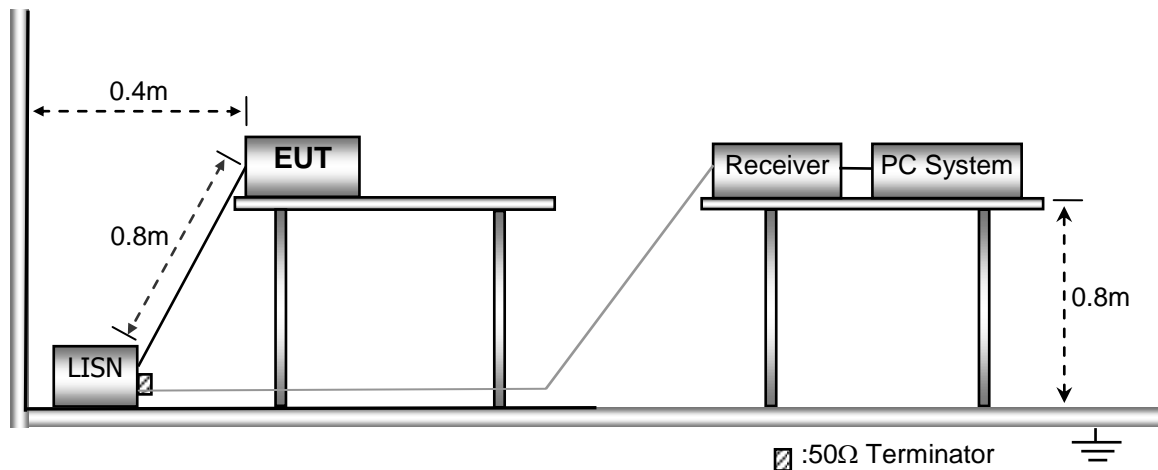
### 6.1 E.U.T. Operation

Operating Environment :

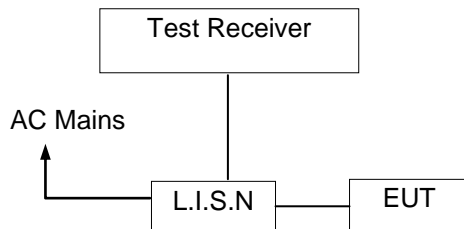
Temperature:	: 25.5 °C
Humidity:	: 51 % RH
Atmospheric Pressure:	: 101.2kPa
Test Voltage	: AC 120V/60Hz

### 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

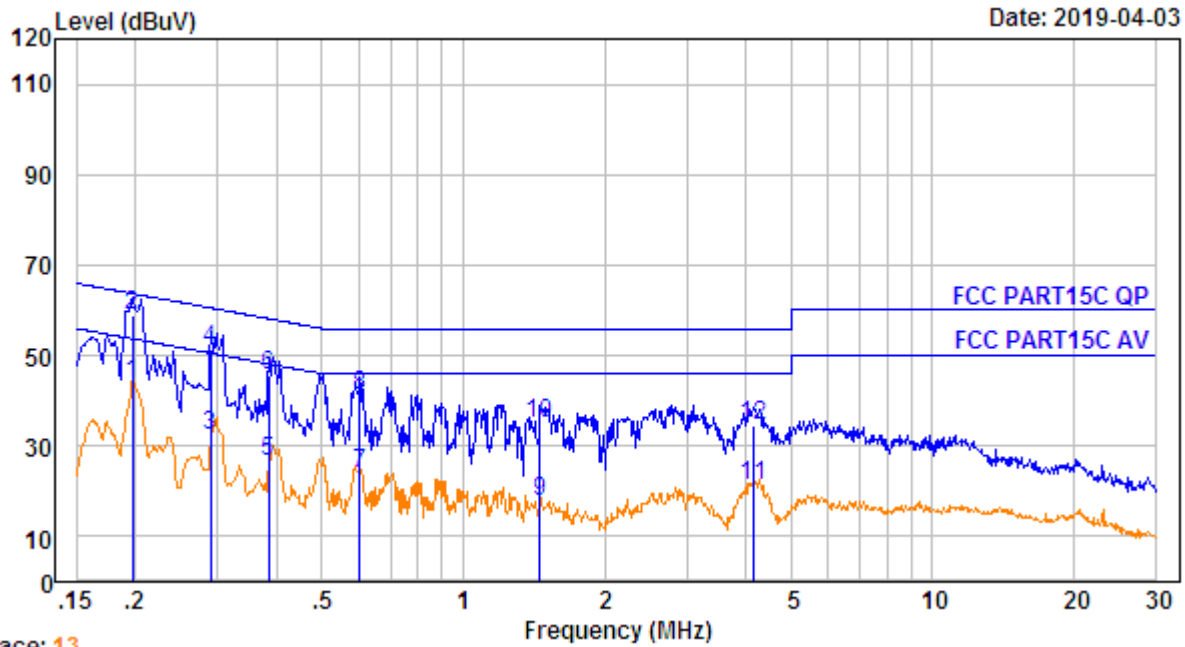
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

### 6.7 Conducted Emission Test Result

Pass.



Line -120V/60Hz:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.198	0.28	9.59	33.94	43.81	53.71	-9.90	Average
2.	0.198	0.28	9.59	48.98	58.85	63.71	-4.86	QP
3.	0.289	0.36	9.67	22.25	32.28	50.54	-18.26	Average
4.	0.289	0.36	9.67	41.28	51.31	60.54	-9.23	QP
5.	0.385	0.40	9.73	16.56	26.69	48.17	-21.48	Average
6.	0.385	0.40	9.73	35.59	45.72	58.17	-12.45	QP
7.	0.601	0.44	9.79	13.89	24.12	46.00	-21.88	Average
8.	0.601	0.44	9.79	30.87	41.10	56.00	-14.90	QP
9.	1.456	0.47	9.84	7.51	17.82	46.00	-28.18	Average
10.	1.456	0.47	9.84	24.56	34.87	56.00	-21.13	QP
11.	4.158	0.48	9.90	10.98	21.36	46.00	-24.64	Average
12.	4.158	0.48	9.90	23.95	34.33	56.00	-21.67	QP

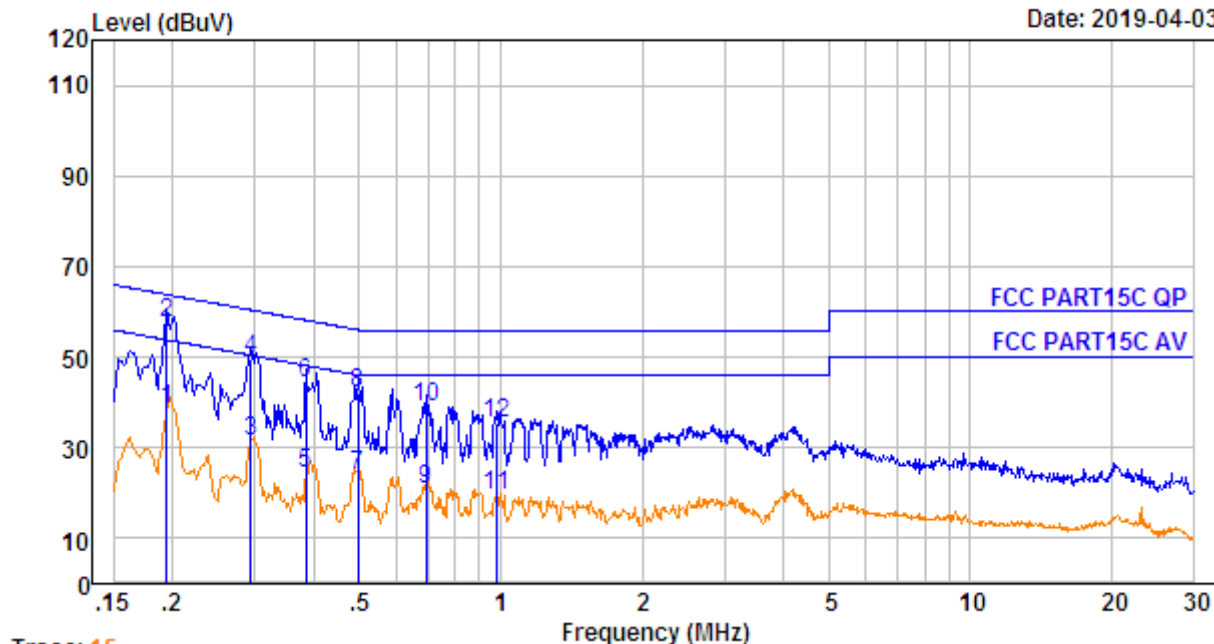


Neutral -120V/60Hz:

Data: 16

File: E:\Test Data 843\Conduction Data\2019\Y源心电子.EM6 (16)

Date: 2019-04-03



Trace: 15

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.194	0.27	9.61	28.82	38.70	53.84	-15.14	Average
2.	0.194	0.27	9.61	47.86	57.74	63.84	-6.10	QP
3.	0.294	0.37	9.70	21.34	31.41	50.41	-19.00	Average
4.	0.294	0.37	9.70	39.38	49.45	60.41	-10.96	QP
5.	0.385	0.40	9.76	14.23	24.39	48.17	-23.78	Average
6.	0.385	0.40	9.76	34.27	44.43	58.17	-13.74	QP
7.	0.497	0.43	9.81	13.87	24.11	46.05	-21.94	Average
8.	0.497	0.43	9.81	31.84	42.08	56.05	-13.97	QP
9.	0.694	0.44	9.83	10.52	20.79	46.00	-25.21	Average
10.	0.694	0.44	9.83	28.57	38.84	56.00	-17.16	QP
11.	0.979	0.46	9.85	8.96	19.27	46.00	-26.73	Average
12.	0.979	0.46	9.85	24.98	35.29	56.00	-20.71	QP



## 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	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
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 :

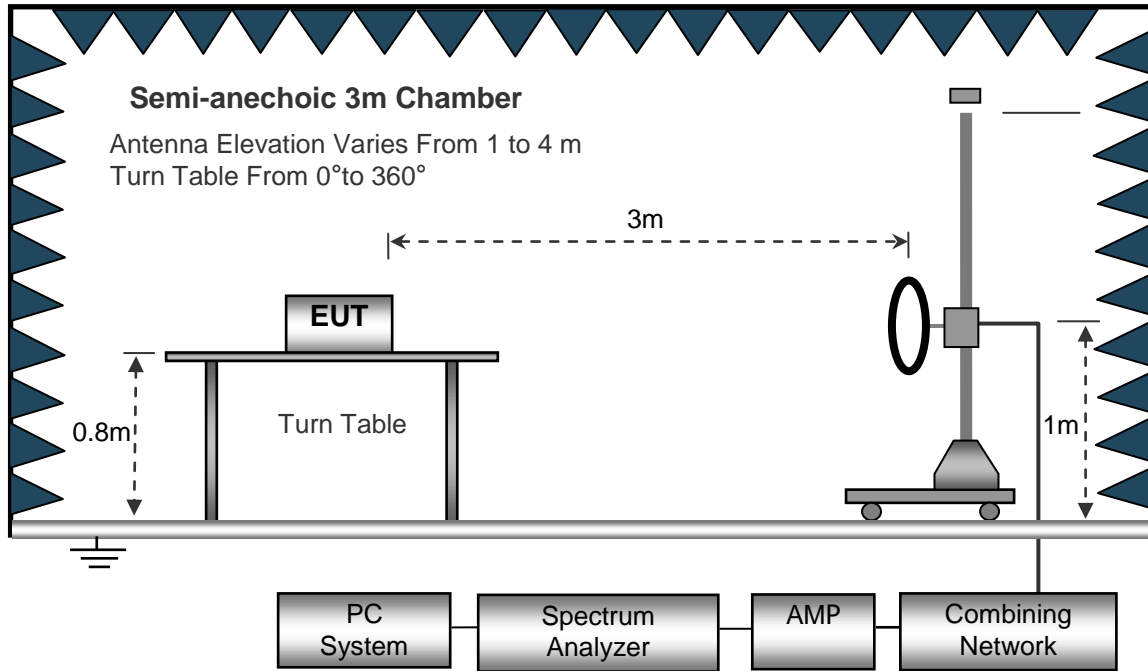
Temperature : 23.5 °C  
 Humidity : 51.1 % RH  
 Atmospheric Pressure : 101.2kPa



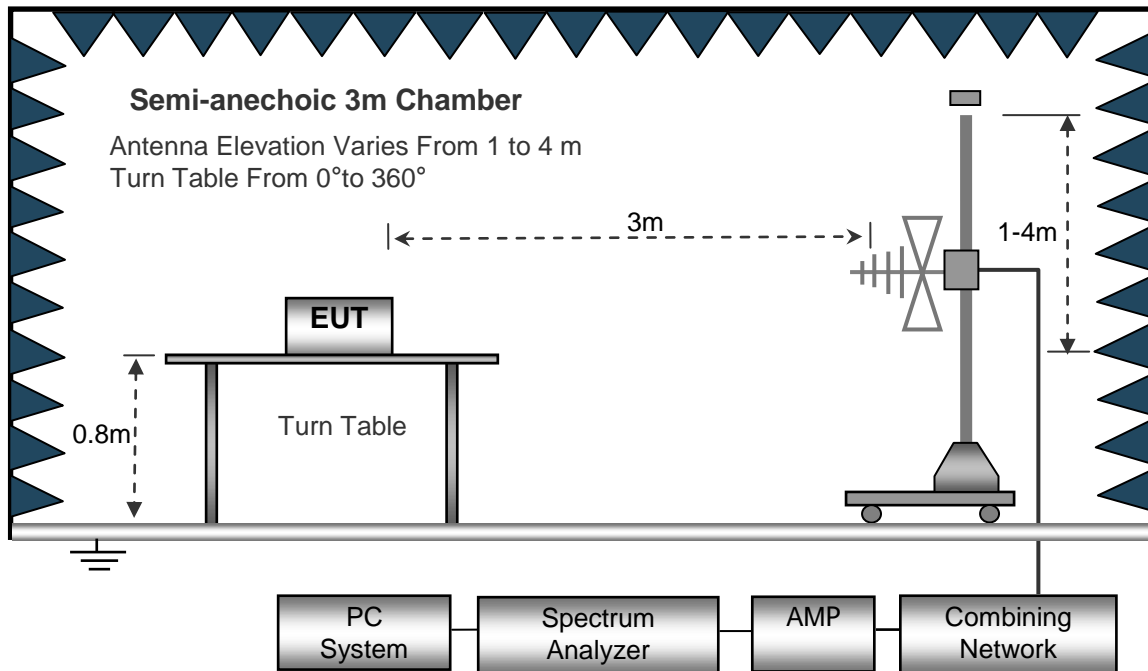
## 7.2 Test Setup

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

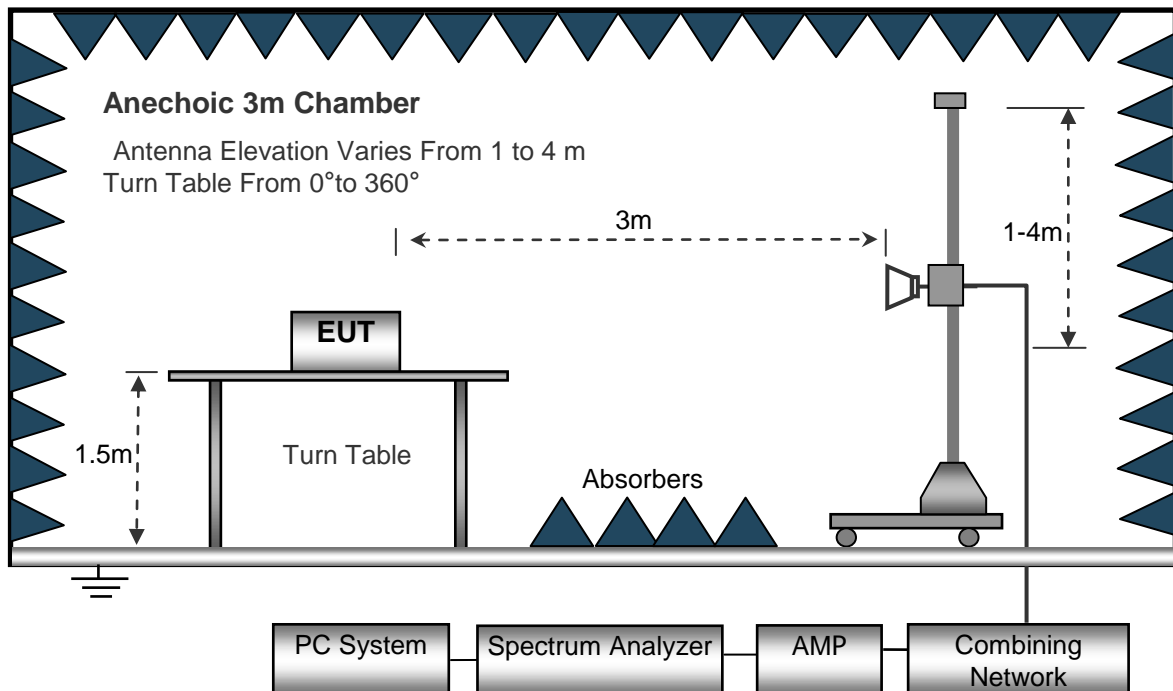
The test setup for emission measurement below 30MHz.



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



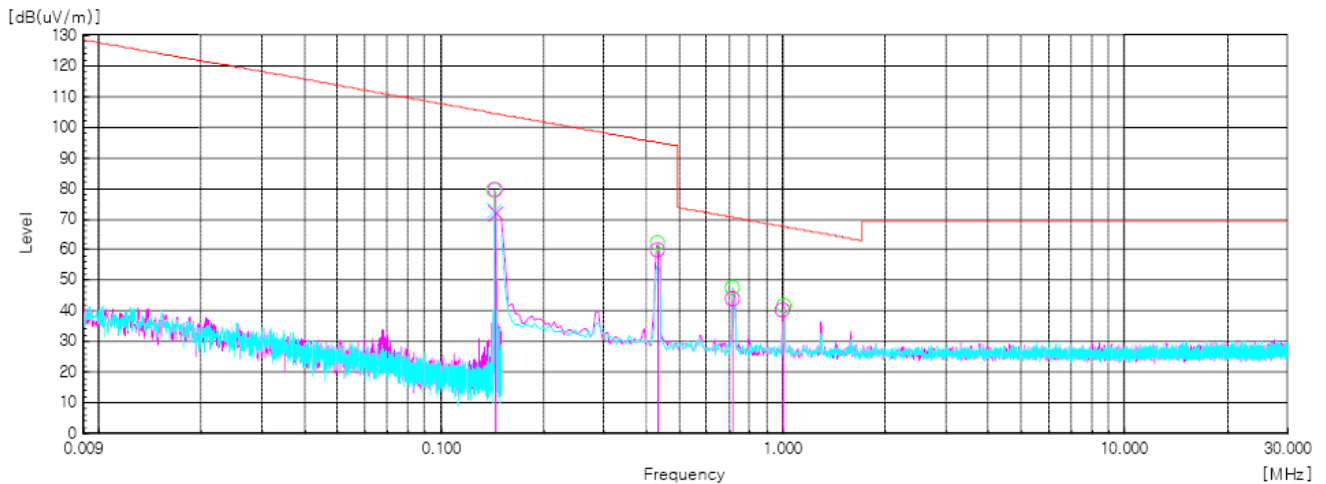
## 7.4 Test Procedure

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



Fre (MHz)	Reading [dB(uV)]	Pol V/H	Cable Loss (dB)	Amp Gain (dB)	Antenna Factor (dB)	Factor (dB)	3m Field Strength [dB(uV/m)]	Limit At 3m [dB(uV/m)]	Margin (dB)
0.125	97.20	H	0.55	-32.76	19.91	-12.30	84.90	105.67	20.77
0.430	72.30	H	0.58	-32.73	19.76	-12.40	59.80	94.93	35.13
0.717	56.20	H	0.70	-32.73	19.73	-12.30	43.90	60.49	16.59
1.004	52.40	H	0.82	-32.72	19.70	-12.20	40.20	77.57	27.37

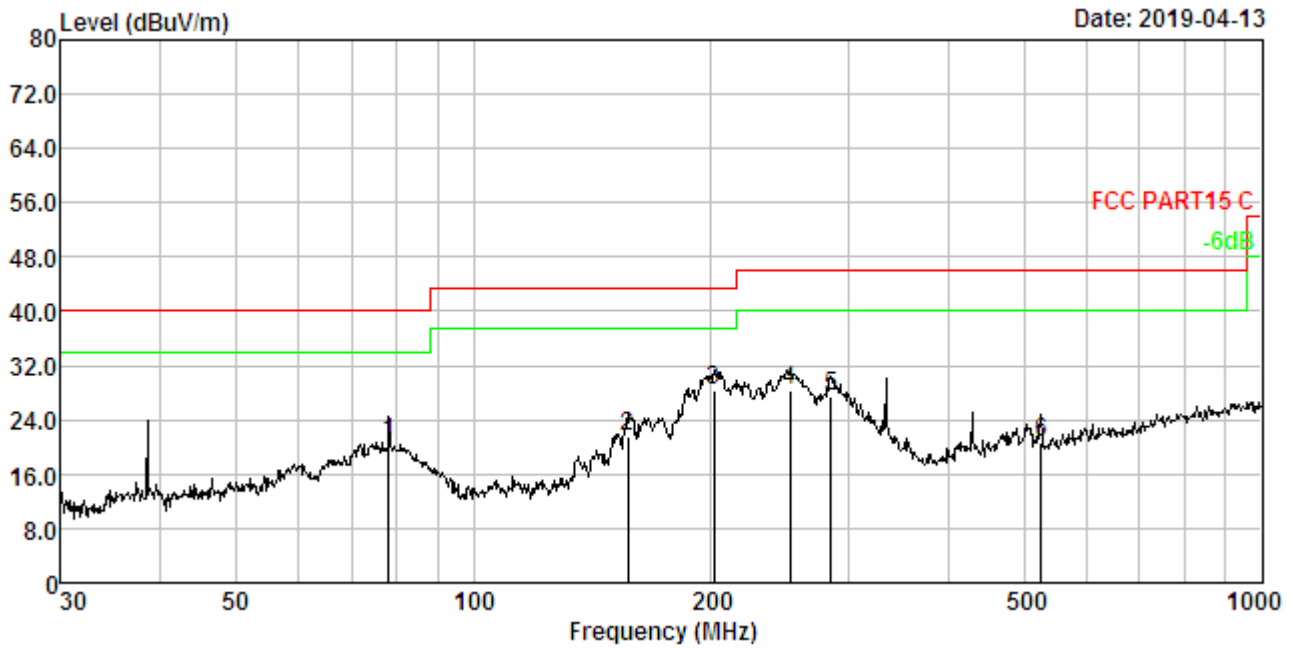
Note: Factor=Cable loss+ Amp gain+ Antenna factor

Remark: 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.



Test Frequency: 30MHz ~ 1GHz

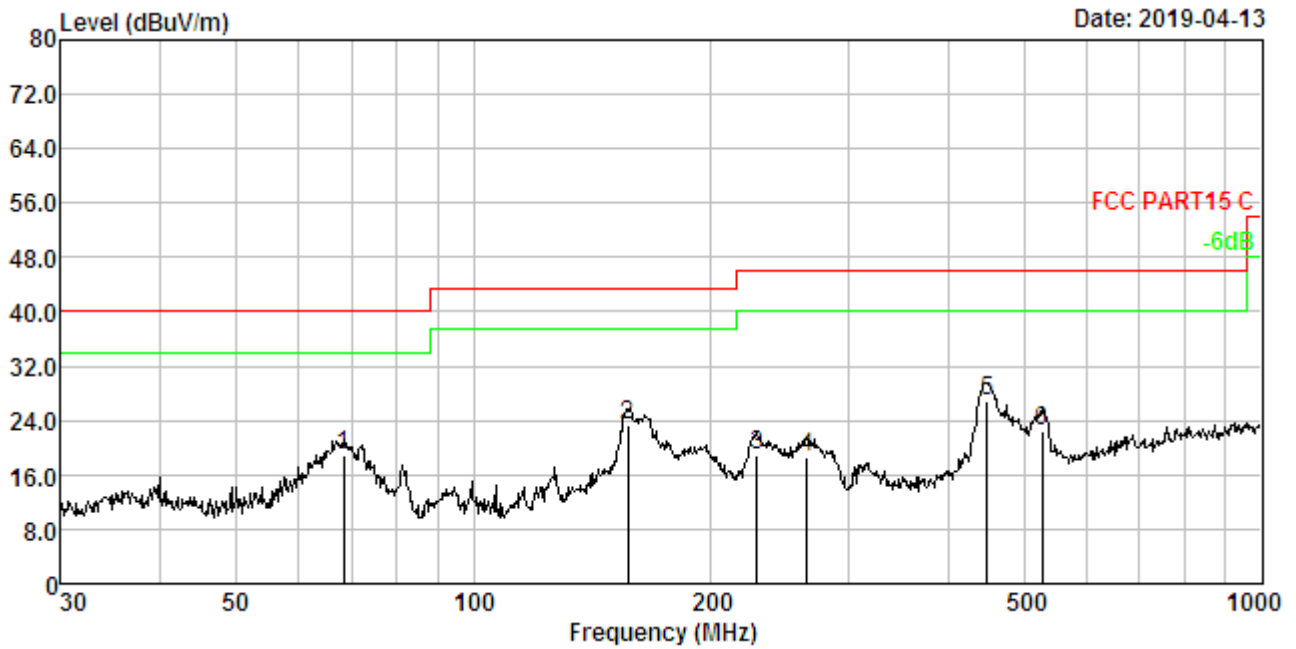
Horizontal:



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	78.139	2.85	9.17	38.86	30.30	20.58	40.00	-19.42	QP
2.	157.007	4.05	13.89	34.28	30.55	21.67	43.50	-21.83	QP
3.	202.100	4.48	10.42	44.15	30.63	28.42	43.50	-15.08	QP
4.	252.063	4.86	11.97	42.27	30.71	28.39	46.00	-17.61	QP
5.	283.979	5.07	12.89	40.33	30.75	27.54	46.00	-18.46	QP
6.	524.554	6.12	17.41	28.25	30.97	20.81	46.00	-25.19	QP



**Vertical:**



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamplifier Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	68.391	2.62	10.57	36.10	30.26	19.03	40.00	-20.97	QP
2.	157.007	4.05	13.89	35.82	30.55	23.21	43.50	-20.29	QP
3.	229.293	4.70	11.21	33.77	30.68	19.00	46.00	-27.00	QP
4.	264.746	4.95	12.30	31.95	30.73	18.47	46.00	-27.53	QP
5.	447.982	5.85	16.33	35.66	30.91	26.93	46.00	-19.07	QP
6.	526.397	6.13	17.44	29.96	30.97	22.56	46.00	-23.44	QP



## **8 Antenna Requirement**

### **8.1 Antenna 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.

### **8.2 Result**

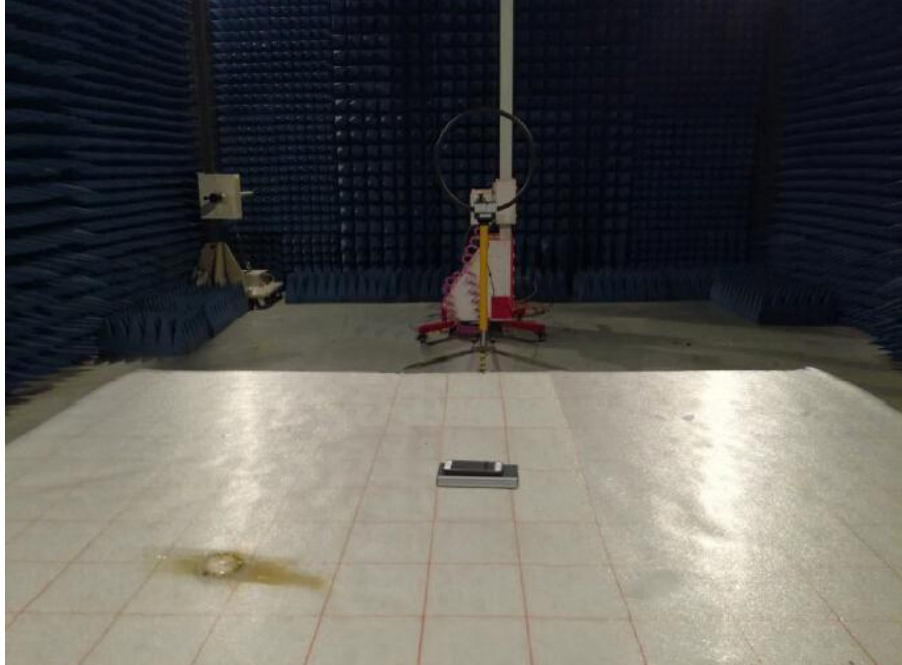
The antenna is inductive loop coil antenna which permanently attached, and the best case gain of the antenna is 0dBi and meets the requirement.

## 9 TEST PHOTOS

Conducted Emissions



Radiated Spurious Emissions  
Test Frequency From 9kHz-30MHz

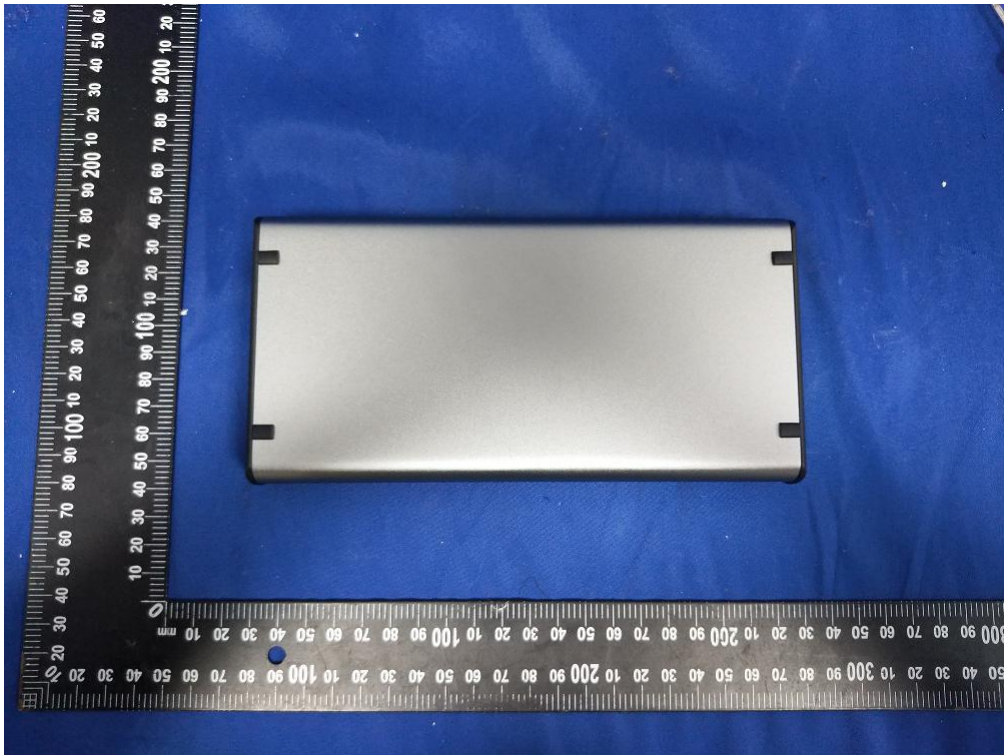
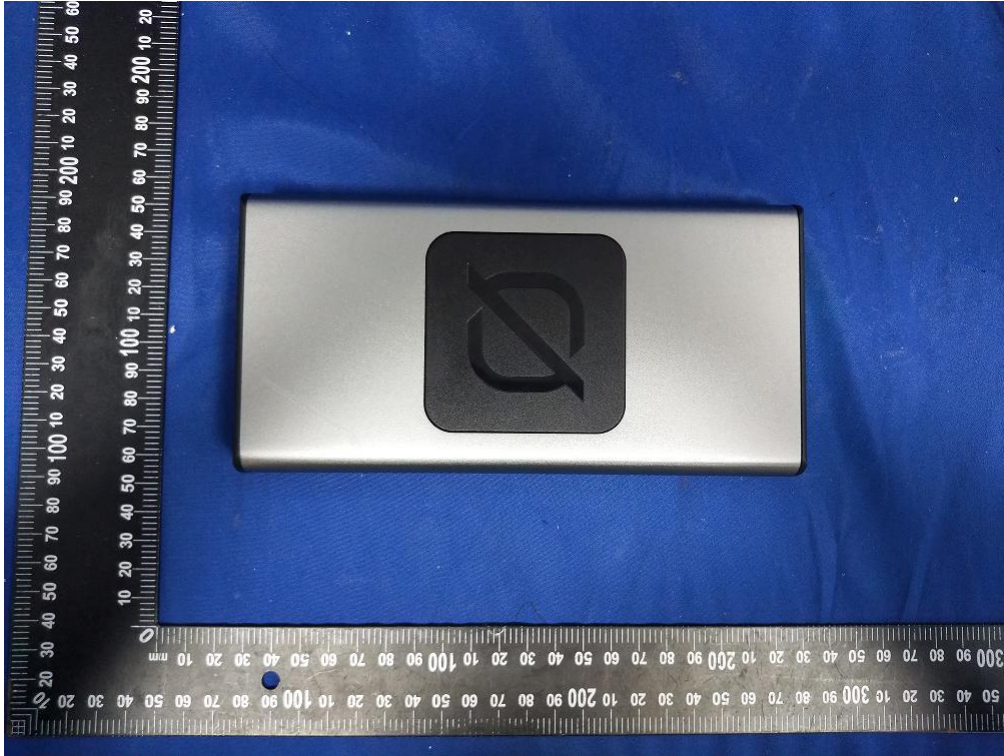




Test frequency from 30MHz-1000MHz

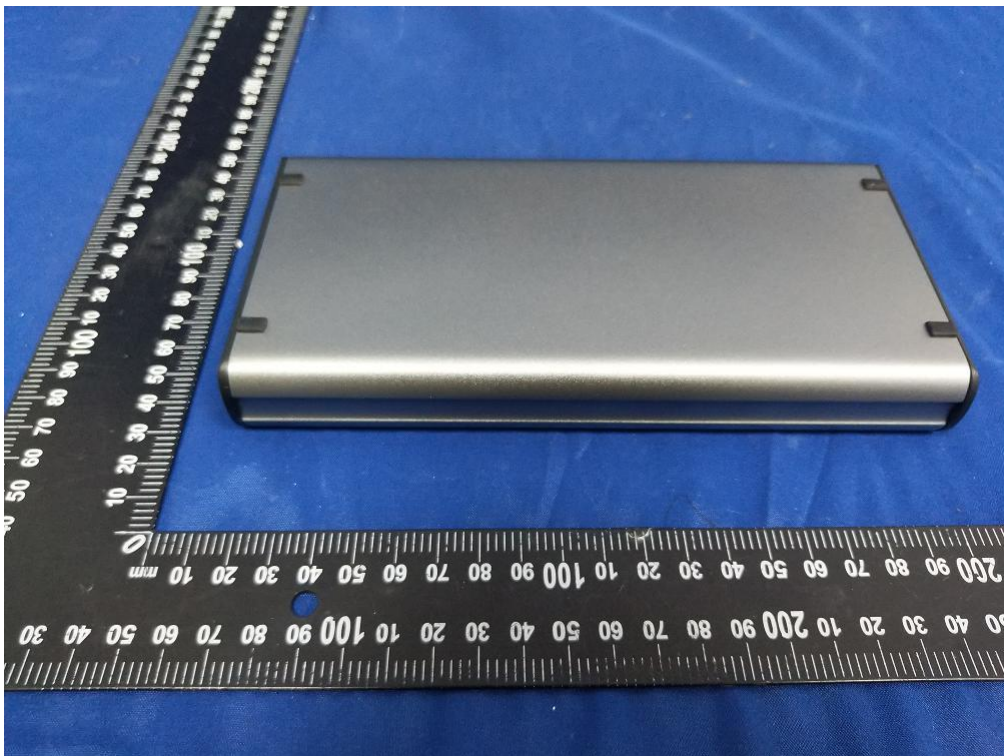
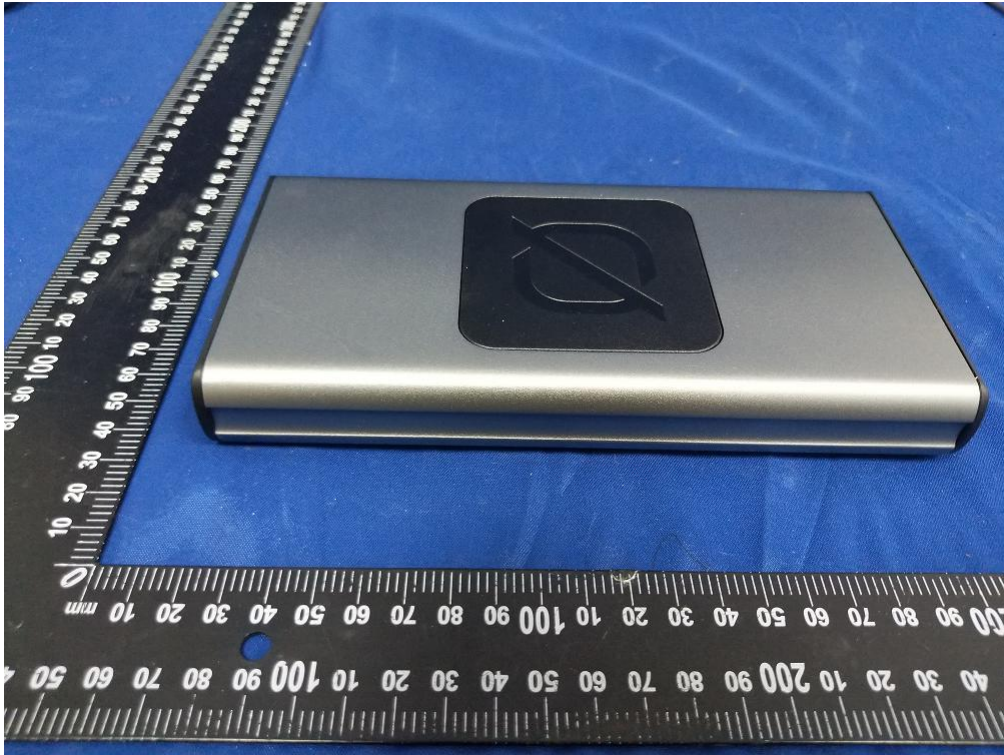


## 10 EUT PHOTOS



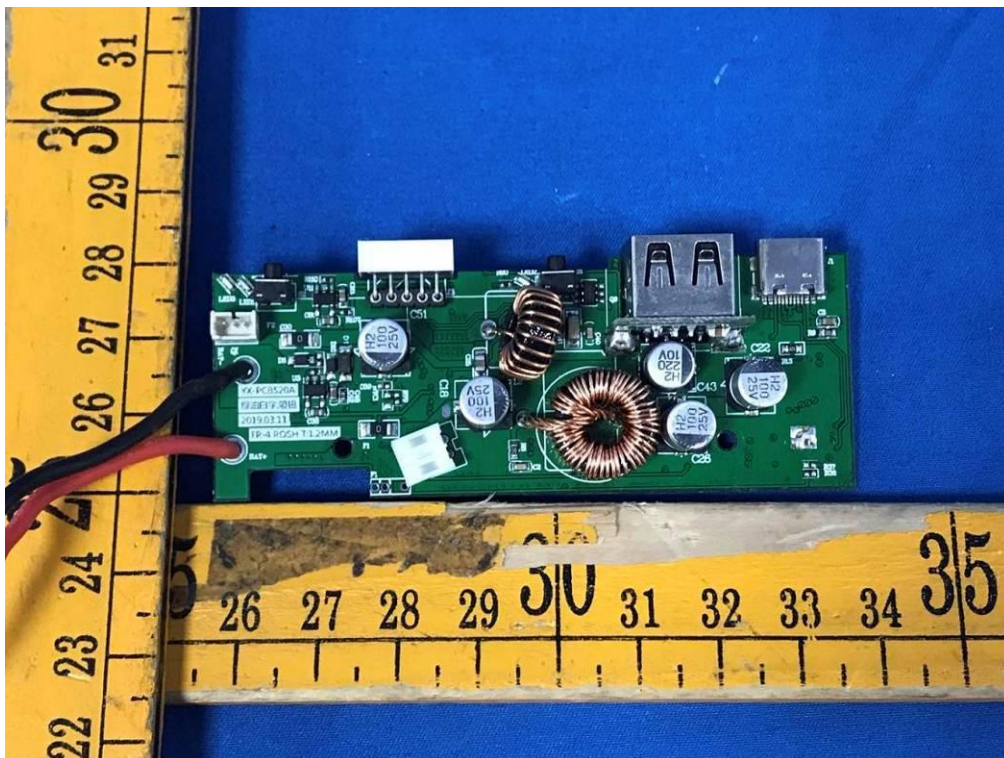




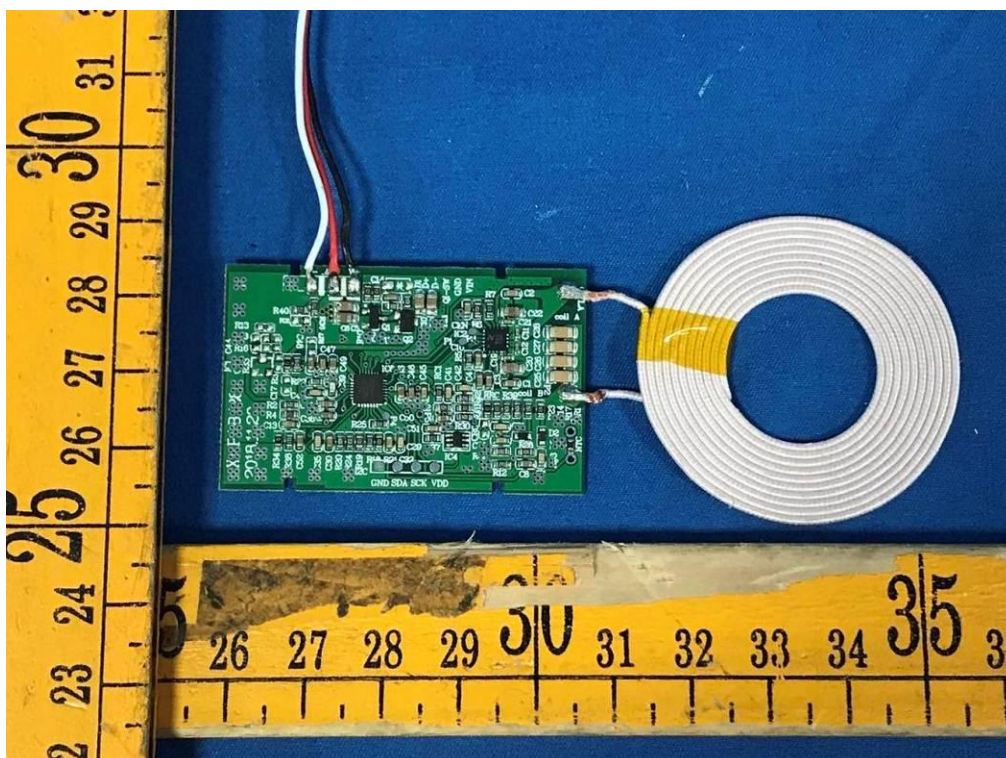
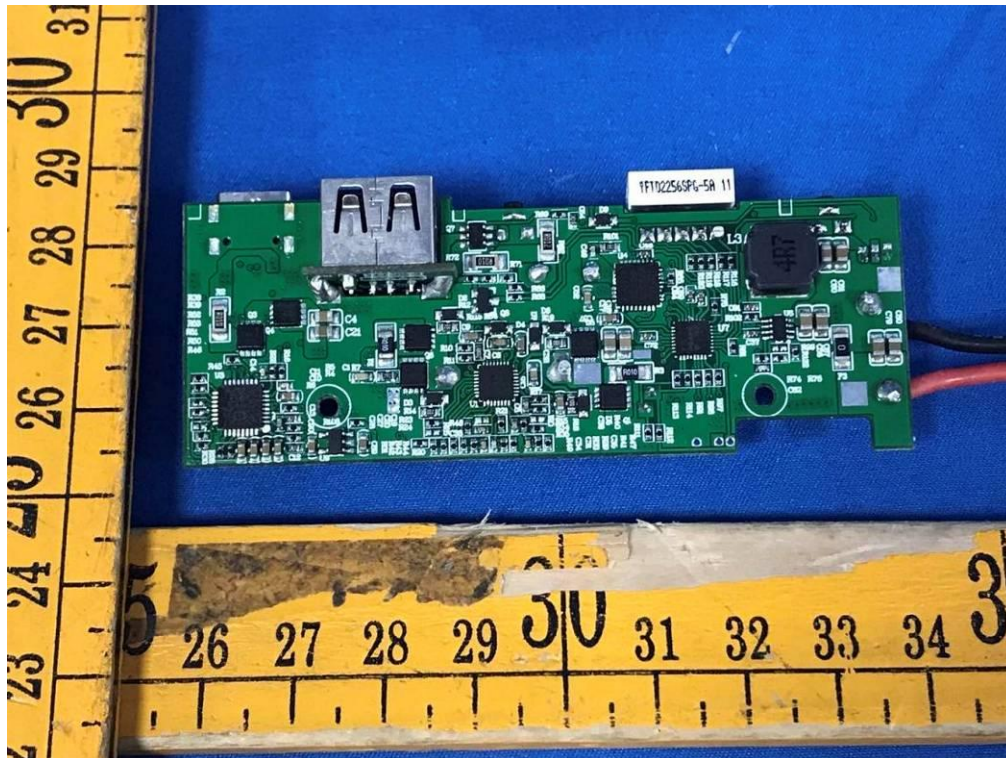


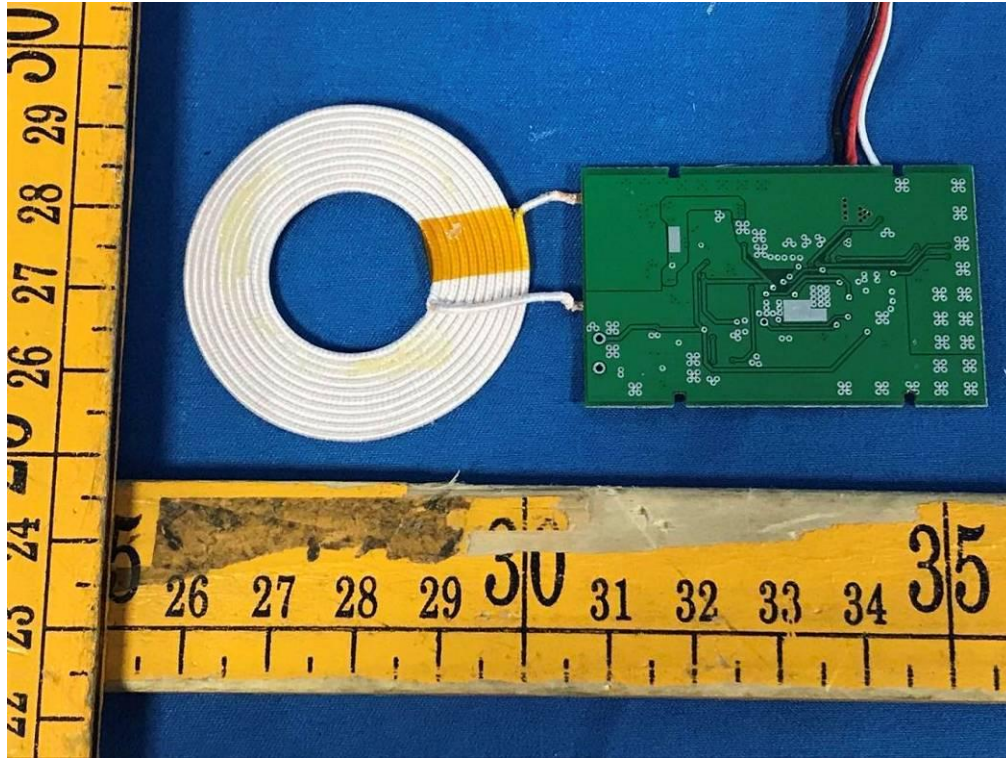












\*\*\*\*\*THE END REPORT\*\*\*\*\*