



# **FCC TEST REPORT**

## **FCC ID: 2ACWB-JPACXSM**

On Behalf of

mophie LLC

mophie juice pack™

Model No.: JPAC-IPXSM

Prepared for : mophie LLC  
Address : 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.


Prepared By : Shenzhen Alpha Product Testing Co., Ltd.  
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,  
518103, Shenzhen, Guangdong, China

Report Number : T1890144 05  
Date of Receipt : January 22, 2019  
Date of Test : January 22, 2019-February 26, 2019  
Date of Report : February 26, 2019  
Version Number : REV0

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## TEST REPORT DECLARATION

Applicant : mophie LLC  
Address : 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.  
Manufacturer : mophie LLC  
Address : 6244 Technology Ave. Kalamazoo, MI 49009 U.S.A.  
EUT : mophie juice pack™  
Description :  
(A) Model No. : JPAC-IPXSM  
(B) Trademark :  mophie

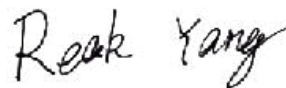
Measurement Standard Used:

**FCC CFR Title 47 Part 15 Subpart C Section 15.209**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the FCC CFR Title 47 Part 15 Subpart C Section 15.209 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang  
Project Engineer



Approved by (name + signature).....: Simple Guan  
Project Manager



Date of issue.....: February 26, 2019

**Revision History**

Revision	Issue Date	Revisions	Revised By
00	February 26, 2019	Initial released Issue	Simple Guan

## 1. Test Result Summary


Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Spurious Emission	§15.209(a)(f)	PASS
Occupied Bandwidth	§15.215 (c)	PASS

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

## 2. General Information

### 2.1. Description of Device (EUT)

EUT Name	:	mophie juice pack™
Model No.	:	JPAC-IPXSM
DIFF.	:	N/A
Trademark	:	
Power supply	:	Input (Qi): 7.5W MAX Input (USB-C): DC 5V/2A Output (Qi): 5W Battery Capacity: DC 3.8V, 2200mAh, 8.36Wh
Operation frequency	:	127KHz
Modulation	:	ASK
Antenna Type	:	ANT1: Coil Antenna (TX&RX) ANT2: FPC Antenna (RX only)
Software version	:	V1.0
Hardware version	:	V1.2

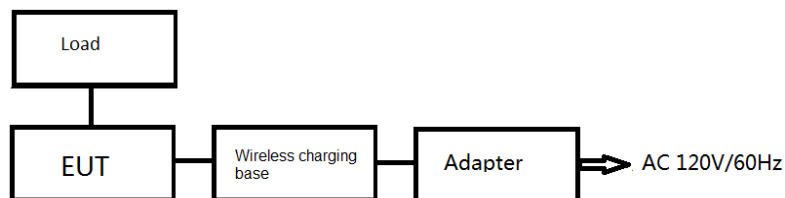
## 2.2. Accessories of Device (EUT)

Accessories1 : /  
 Manufacturer : /  
 Model : /  
 Ratings : /

## 2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1	Wireless charging base 10W	Mophie inc	WRLS-CHGB ASE-10W	--	--
2	Power Adapter	Mophie inc	A138A-12015 0U-US2	--	--
3	Load	--	--	--	--

## 2.4. Block Diagram of connection between EUT and simulators



## 2.5. Description of Test Modes

Channel	Frequency (KHz)
1	127

## 2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	27°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

## 2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 25, 2017 Certificated by IC

Registration Number: 12135A

## 2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Conducted Emission Test	2.74dB	
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB	Polarize: V
	2.57dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB	Polarize: V
	3.80dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB	Polarize: H
	4.13dB	Polarize: V
Uncertainty for radio frequency	$5.4 \times 10^{-8}$	
Uncertainty for conducted RF Power	0.37dB	



## 2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2018.09.21	1Year
Spectrum analyzer	Agilent	E4407B	MY46185649	2018.09.21	2019.09.20
Receiver	R&S	ESCI	1166.5950K03-1011	2018.09.21	1Year
Receiver	R&S	ESCI	101202	2018.09.21	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2018.04.13	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2018.09.26	2Year
Cable	Resenberger	N/A	No.1	2018.09.21	1Year
Cable	SCHWARZBECK	N/A	No.2	2018.09.21	1Year
Cable	SCHWARZBECK	N/A	No.3	2018.09.21	1Year
Pre-amplifier	Schwarzbeck	BBV9743	9743-019	2018.09.21	1Year
Pre-amplifier	R&S	AFS33-18002650-30-8P-44	SEL0080	2018.09.21	1Year
Temperature controller	Terchy	MHQ	120	2018.09.21	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2018.09.21	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2018.09.21	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2018.09.21	1 Year

### 3. Test Results and Measurement Data

#### 3.1. Conducted Emission

##### 3.1.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	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
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													
Test Setup:	<div><p>Reference Plane</p><p>40cm 80cm</p><p>E.U.T Adapter</p><p>Test table/Insulation plane</p><p>LISN Filter AC power</p><p>EMI Receiver</p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>														
Test Mode:	Charging + Transmitting Mode														
Test Procedure:	<div><div>1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</div><div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div><div>3. Both sides of A.C. line are checked for maximum conducted interference. 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.</div></div>														
Test Result:	PASS														

### 3.1.2. Test data

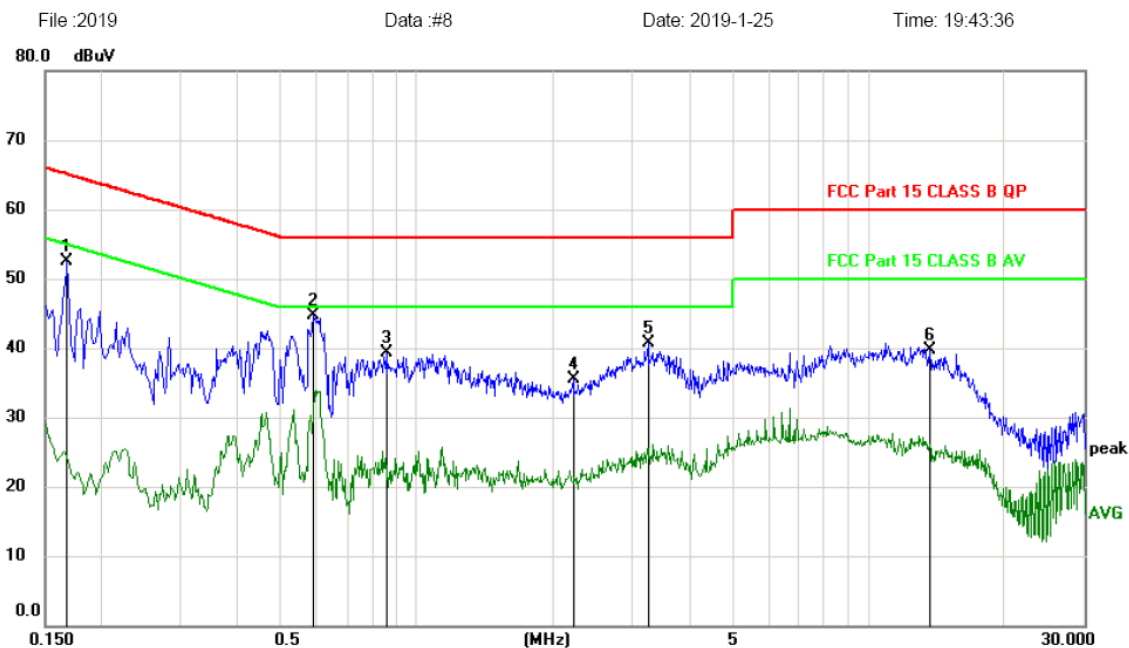
**Please refer to following diagram for individual**

Test Mode	: Full Load
Test Results	: <b>PASS</b>
Note:	<p>The test results are listed in next pages.</p> <p>This mode is worst case mode, so this report only reflected the worst mode.</p> <p>If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector and quasi-peak detector need not be carried out.</p> <p>If the limits for the measurement with the average detector are met when using a receiver with a quasi-peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.</p>

Test result for Channel 127KHz, AC 120V/ 60Hz

Line:

### Conducted Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1680	42.94	9.63	52.57	65.06	-12.49	peak	
2	*	0.5910	35.06	9.69	44.75	56.00	-11.25	peak	
3		0.8550	29.49	9.72	39.21	56.00	-16.79	peak	
4		2.2200	25.63	9.85	35.48	56.00	-20.52	peak	
5		3.2550	30.73	9.94	40.67	56.00	-15.33	peak	
6		13.6440	29.54	10.11	39.65	60.00	-20.35	peak	

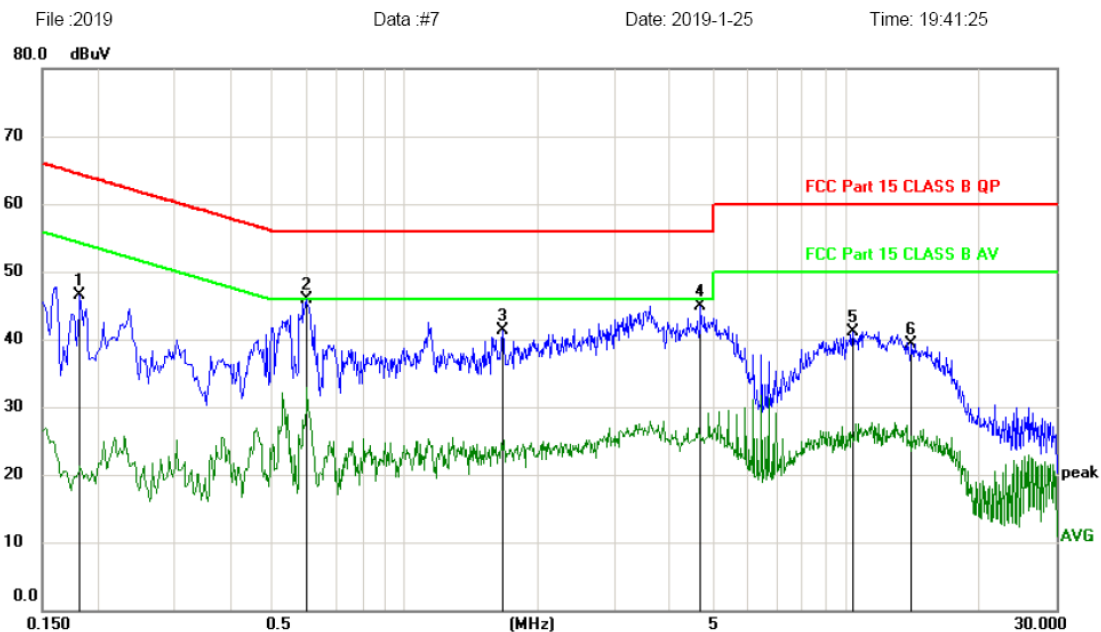
\*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Test result for Channel 127KHz, AC 120V/ 60Hz

Neutral:

### Conducted Emission Measurement



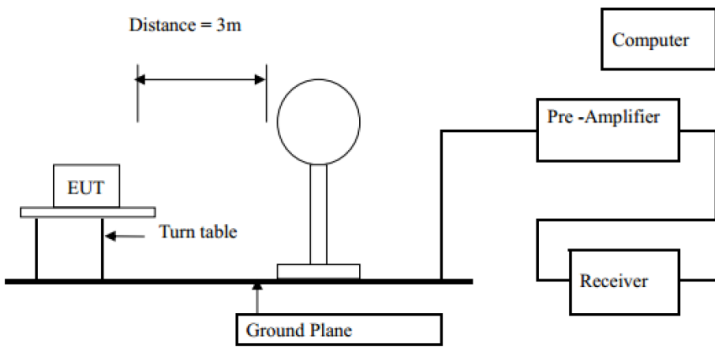
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1830	36.91	9.64	46.55	64.35	-17.80	peak	
2	*	0.5970	36.12	9.69	45.81	56.00	-10.19	peak	
3		1.6710	31.55	9.80	41.35	56.00	-14.65	peak	
4		4.6800	34.78	10.04	44.82	56.00	-11.18	peak	
5		10.3470	30.99	10.13	41.12	60.00	-18.88	peak	
6		14.0730	29.21	10.10	39.31	60.00	-20.69	peak	

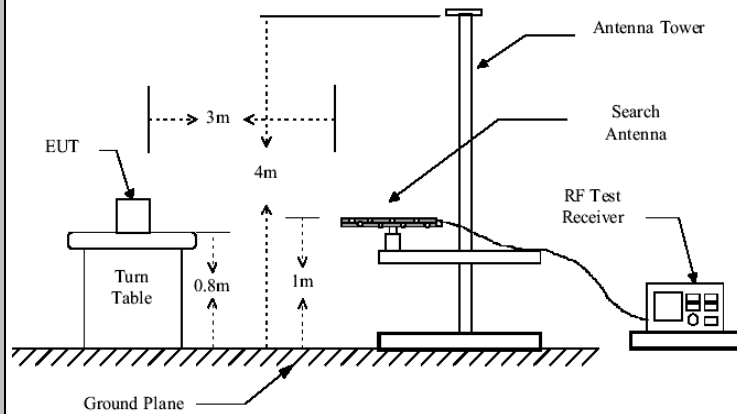
\*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

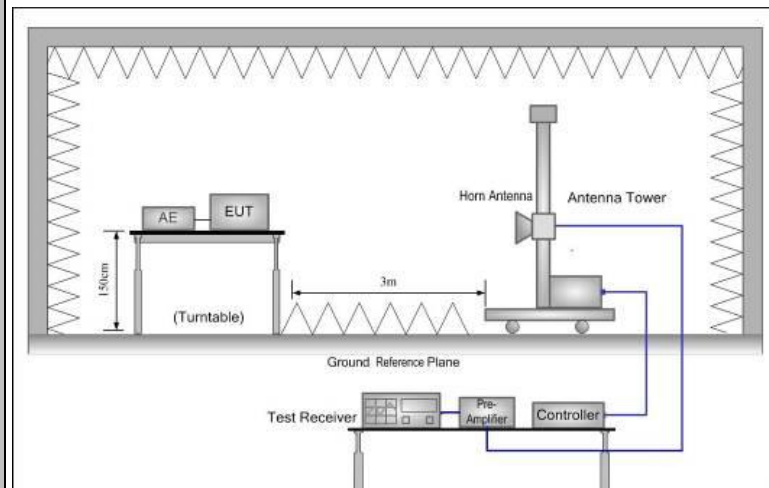
## 3.2. Radiated Spurious Emission Measurement

### 3.2.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.209			
<b>Test Method:</b>	ANSI C63.10: 2013			
<b>Frequency Range:</b>	9 kHz to 25 GHz			
<b>Measurement Distance:</b>	3 m			
<b>Antenna Polarization:</b>	Horizontal & Vertical			
<b>Operation mode:</b>	Refer to item 4.1			
<b>Receiver Setup:</b>	Frequency	Detector	RBW	VBW
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz
	30MHz-1GHz	Quasi-peak	100KHz	300KHz
	Above 1GHz	Peak	1MHz	3MHz
<b>Limit:</b>	Remark			
	Quasi-peak Value			
	Quasi-peak Value			
	Quasi-peak Value			
	Peak Value			
	Average Value			
<b>Test setup:</b>	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	
	0.009-0.490	2400/F(KHz)	300	
	0.490-1.705	24000/F(KHz)	30	
	1.705-30	30	30	
	30-88	100	3	
	88-216	150	3	
	216-960	200	3	
	Above 960	500	3	
	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
	Above 1GHz	500	3	Average
		5000	3	Peak
	For radiated emissions below 30MHz			
				
	30MHz to 1GHz			



Above 1GHz

**Test Procedure:**

1. For the radiated emission test below 1GHz:  
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. 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.  
For the radiated emission test above 1GHz:  
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which

	<p>maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <p>2. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p> <p>3. For measurement below 1GHz, 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.</p> <p>4. Use the following spectrum analyzer settings:</p> <p>(1) Span shall wide enough to fully capture the emission being measured;</p> <p>(2) Set RBW=100 kHz for <math>f &lt; 1</math> GHz; VBW <math>\geq</math> RBW; Sweep = auto; Detector function = peak; Trace = max hold;</p> <p>(3) Set RBW = 1 MHz, VBW= 3MHz for <math>f \geq 1</math> GHz for peak measurement.</p> <p>For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW <math>\geq 1/T</math>, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.</p>
<b>Test mode:</b>	Refer to section 4.1 for details
<b>Test results:</b>	PASS



### 3.2.2. Test Data

Please refer to following diagram for individual

Frequency Range	: 9KHz~30MHz
Test Mode	: TX: 127KHz
Test Results	: <b>PASS</b>
Note: 1. The test results are listed in next pages. 2. This mode is worst case mode, so this report only reflected the worst mode. 3. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the quasi-peak detector need not be carried out.	

Freq.	Reading	Antenna Factor	Cable loss	Amp Factor	Result	Limit	Margin	Detect or	State
(MHz)	(dBuV/m)	dB/m	dB	dB	(dBuV/m)	(dBuV/m) at 3 m	(dB)		P/F
0.127	50.47	48.34	0.16	29.87	69.10	125.53	-56.43	PK	PASS
0.127	45.95	48.34	0.16	29.87	64.58	105.53	-40.95	AV	PASS

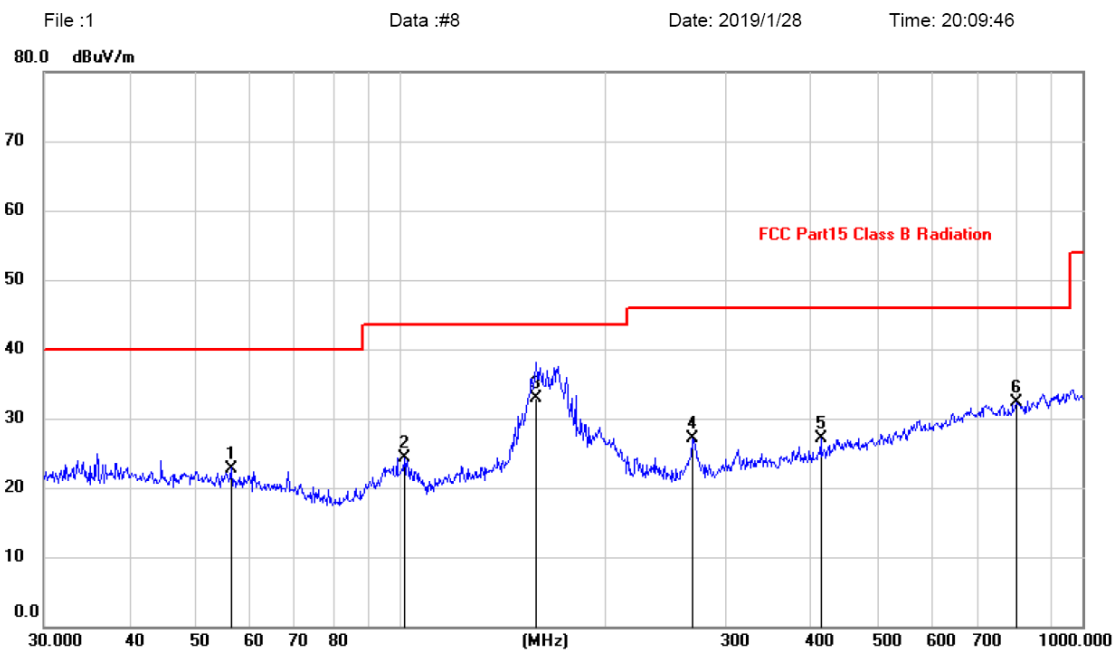
Frequency Range	: 30MHz~1000MHz
Test Mode	: Full Load
Test Results	: <b>PASS</b>
Note: 1. The test results are listed in next pages. 2. This mode is worst case mode, so this report only reflected the worst mode. 3. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the quasi-peak detector need not be carried out.	

Frequency Range	: Above 1GHz	
EUT	: /	Test Date : /
M/N	: /	Temperature : /
Test Engineer	: /	Humidity : /
Test Mode	: /	
Test Results	: N/A	
Note: 1. The highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. So the frequency rang above 1GHz radiation test not applicable.		

Test result for Channel 127KHz, AC 120V/ 60Hz

**30MHz-1GHz**

Horizontal:

**Radiated Emission Measurement**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		56.3948	9.64	13.16	22.80	40.00	-17.20	peak		
2		101.2885	13.66	10.73	24.39	43.50	-19.11	peak		
3	*	158.2610	18.33	14.57	32.90	43.50	-10.60	QP	300	360
4		268.4853	14.34	12.71	27.05	46.00	-18.95	peak		
5		413.2706	11.08	15.96	27.04	46.00	-18.96	peak		
6		801.7863	10.10	22.23	32.33	46.00	-13.67	peak		

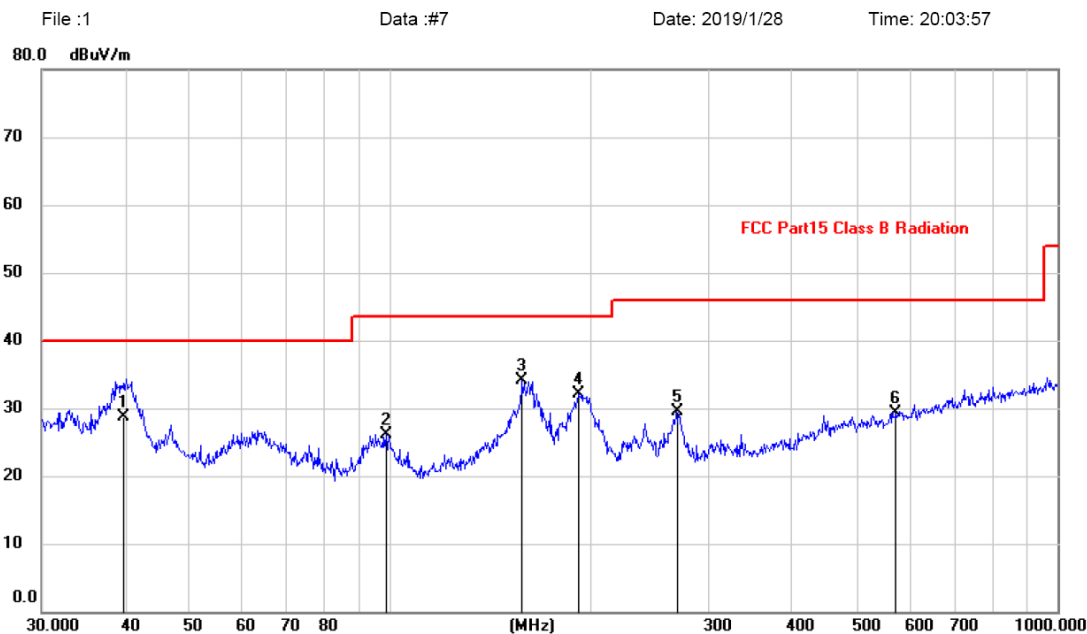
Note:1. \*:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Test result for Channel 127KHz, AC 120V/ 60Hz

Vertical:

### Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		39.9261	14.49	14.24	28.73	40.00	-11.27	QP	100	0
2		98.4866	15.69	10.41	26.10	43.50	-17.40	peak		
3	*	157.5588	19.44	14.57	34.01	43.50	-9.49	peak		
4		191.7450	21.20	10.82	32.02	43.50	-11.48	peak		
5		269.4284	16.85	12.75	29.60	46.00	-16.40	peak		
6		572.6144	10.27	19.09	29.36	46.00	-16.64	peak		

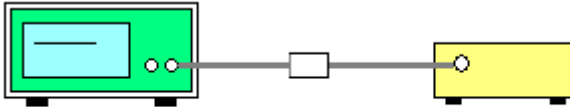
Note:1. \*:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

### Note:

Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

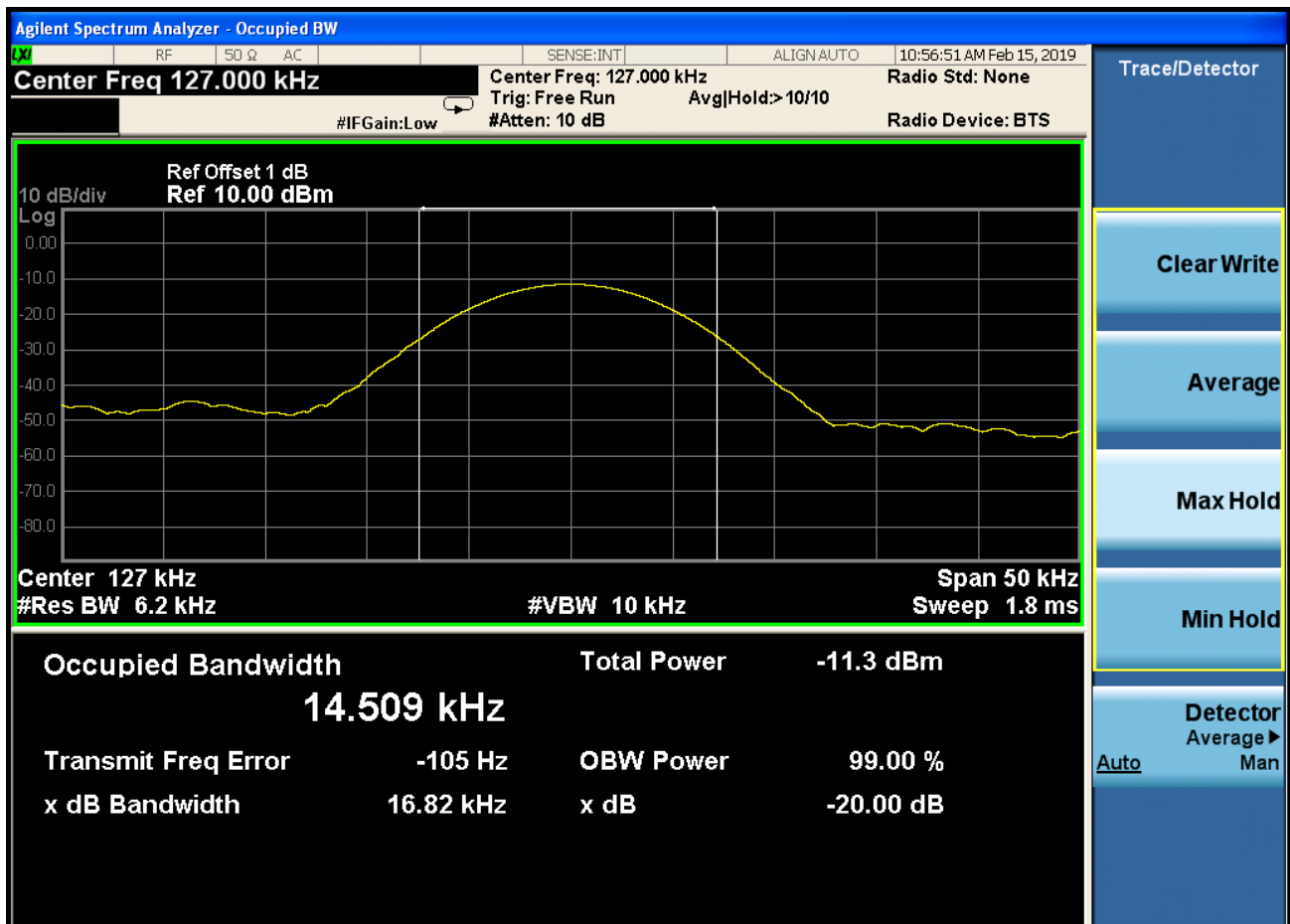
### 3.3. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.215(c)
<b>Test Method:</b>	ANSI C63.10: 2013
<b>Limit:</b>	N/A
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW <math>\geq</math> 1% of the 20 dB bandwidth; VBW <math>\geq</math> RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test setup:</b>	 <p>The diagram illustrates the test setup. On the left is a green Spectrum Analyzer with a blue screen. A black cable connects it to a yellow rectangular box on the right, which is labeled 'EUT'. A small white square is located on the cable between the two devices.</p>
<b>Test Mode:</b>	Refer to section 4.1 for details
<b>Test results:</b>	PASS

### 3.3.1. Test data

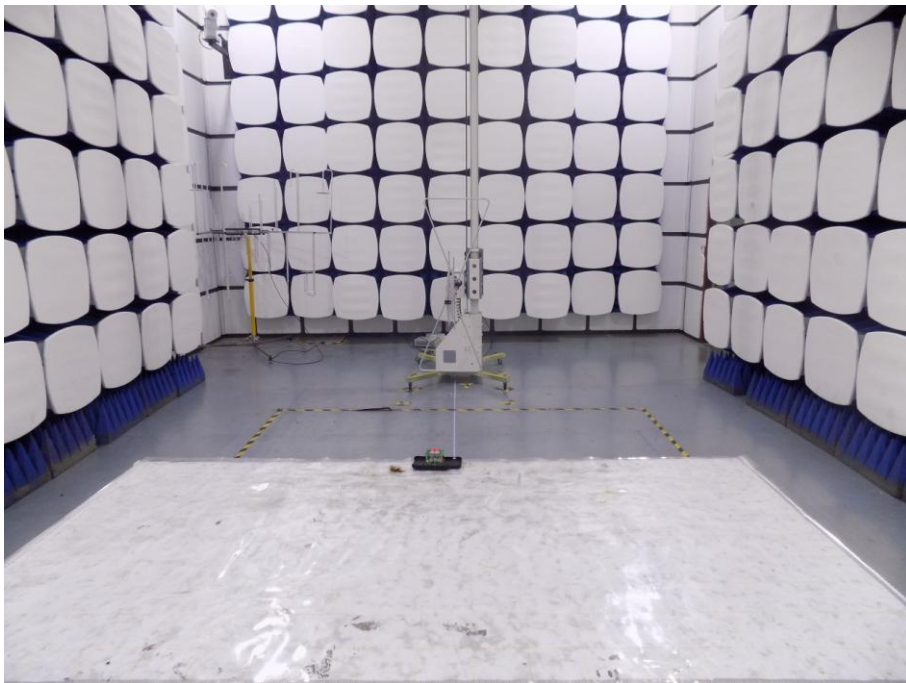
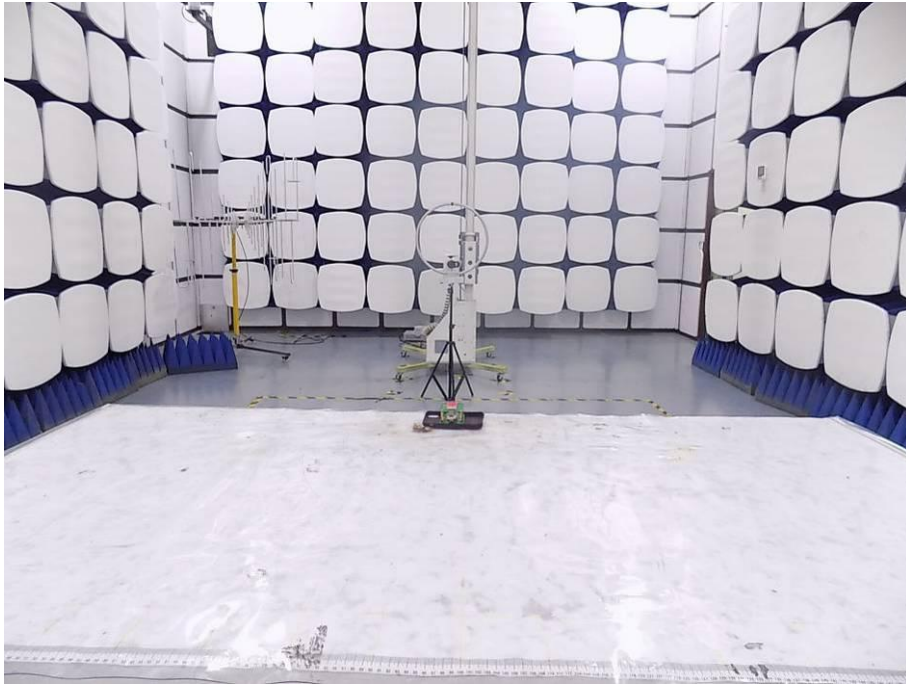
Frequency(KHz)	20dB Occupy Bandwidth (kHz)	Limit (kHz)	Conclusion
127.0	16.82	---	PASS

Test plots as follows:



## 4. Photos of test setup

### Radiated Emission



## Conducted Emission





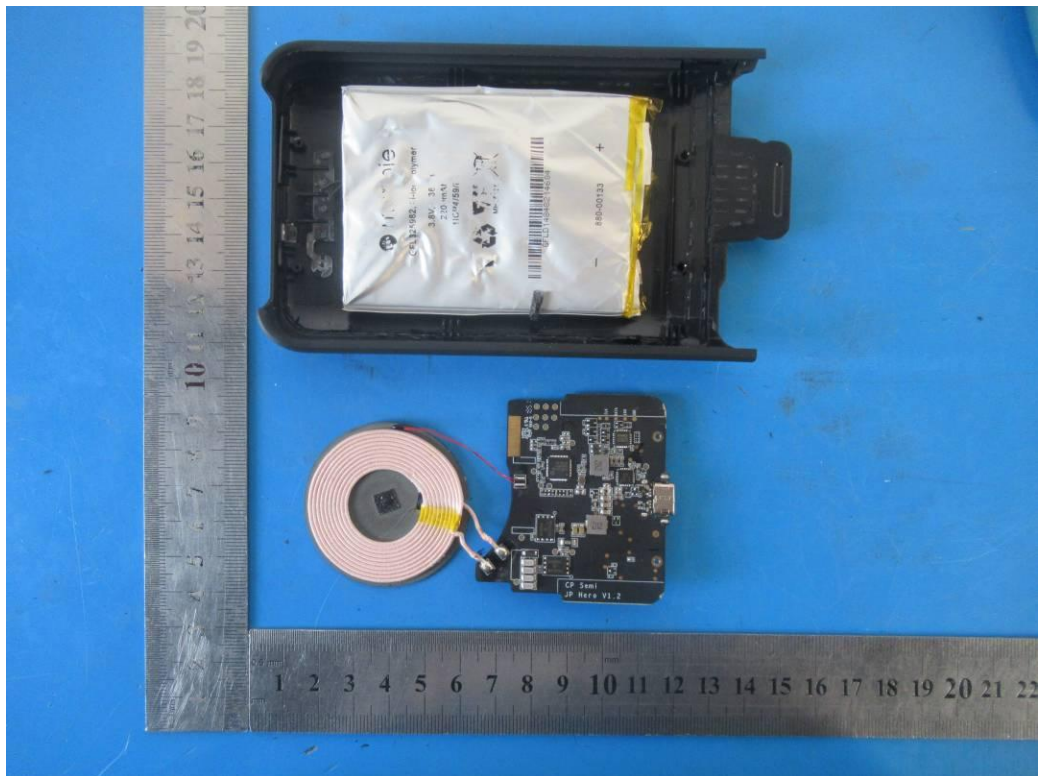
## 5. Photographs of EUT





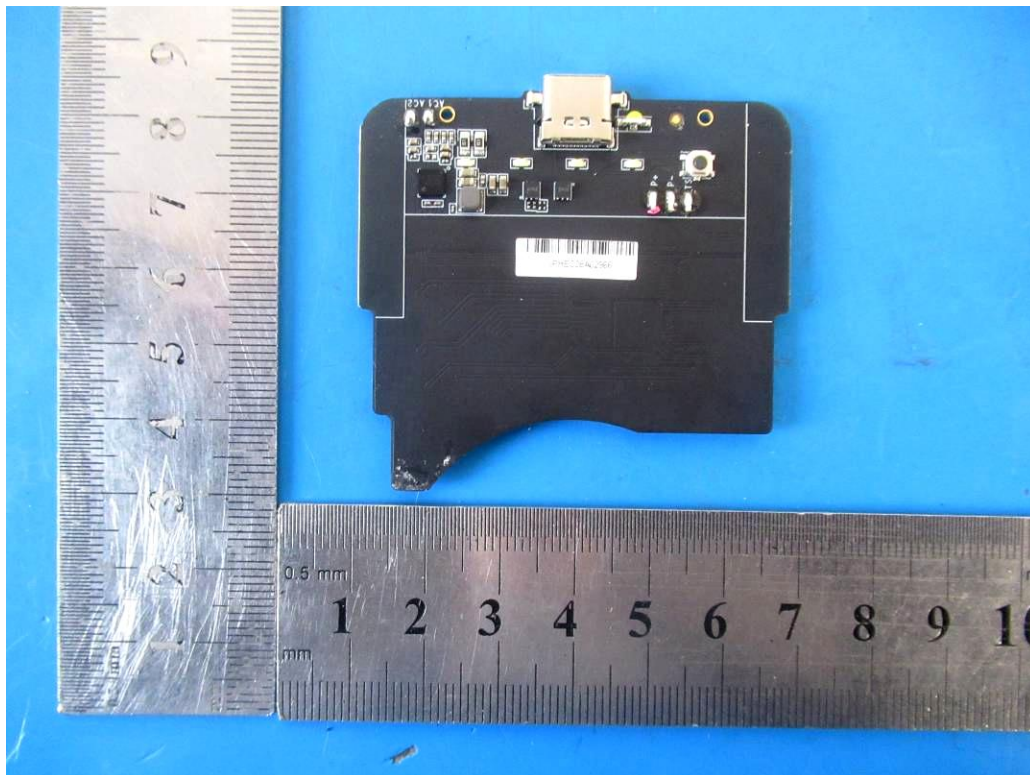
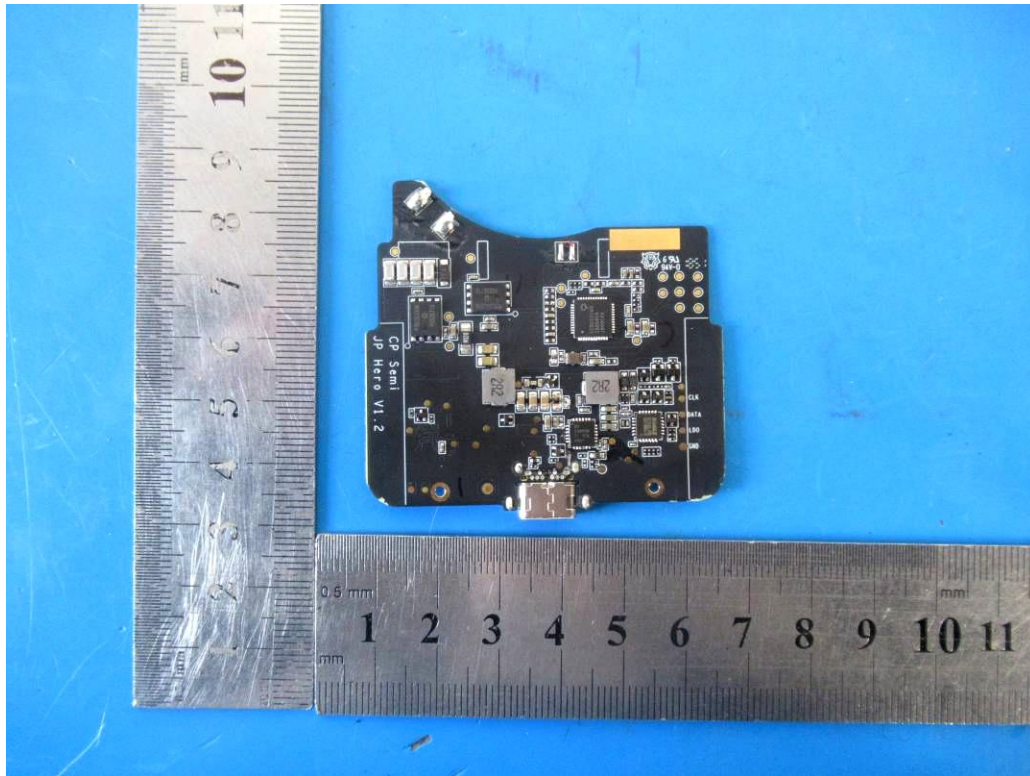


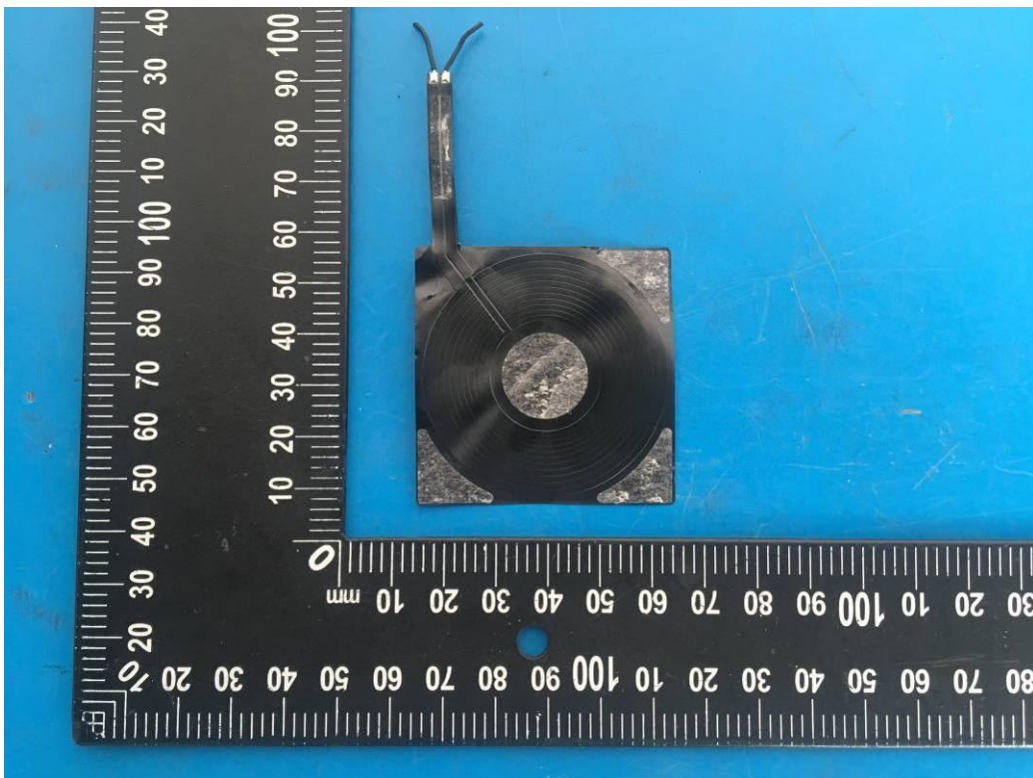
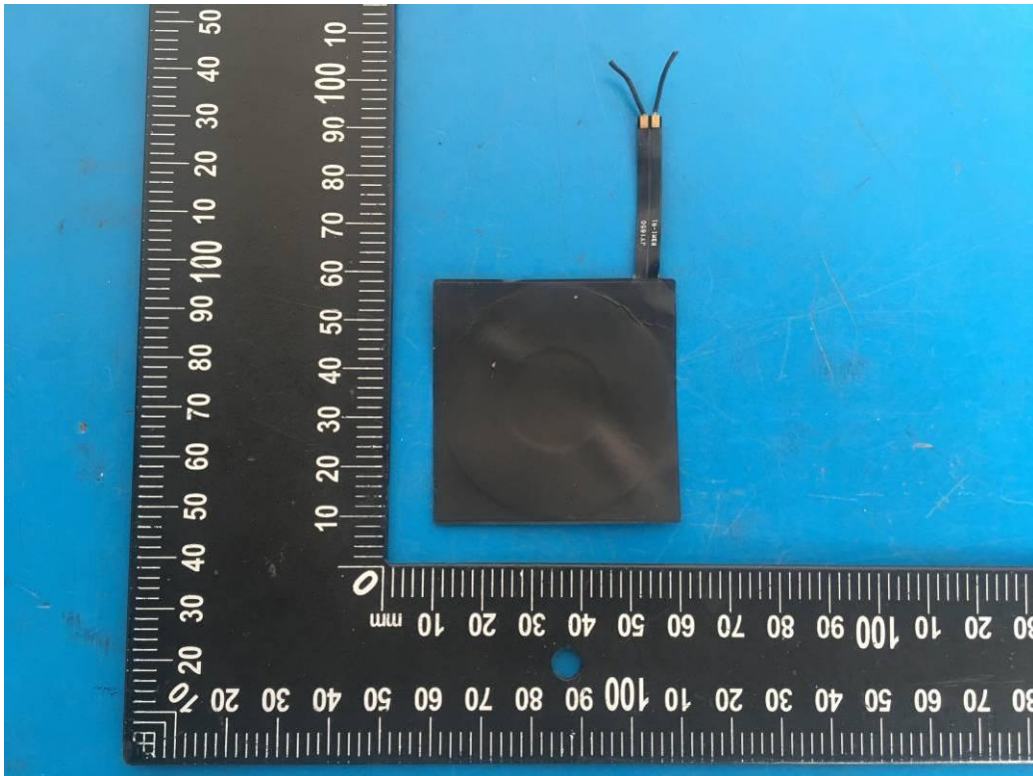




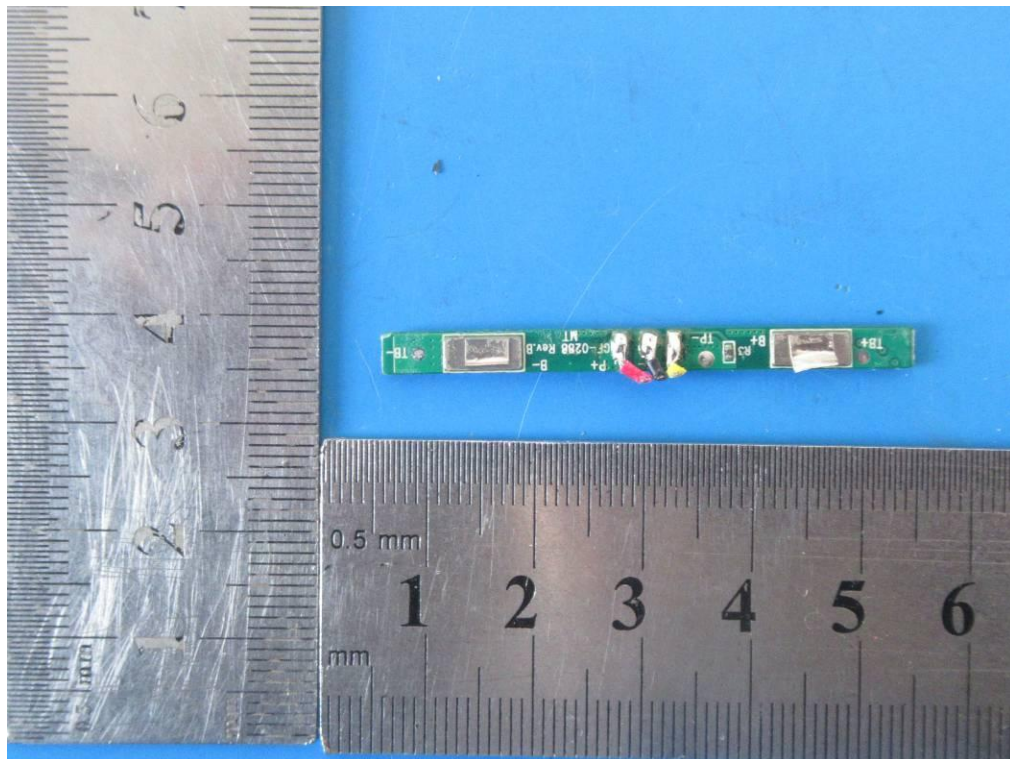
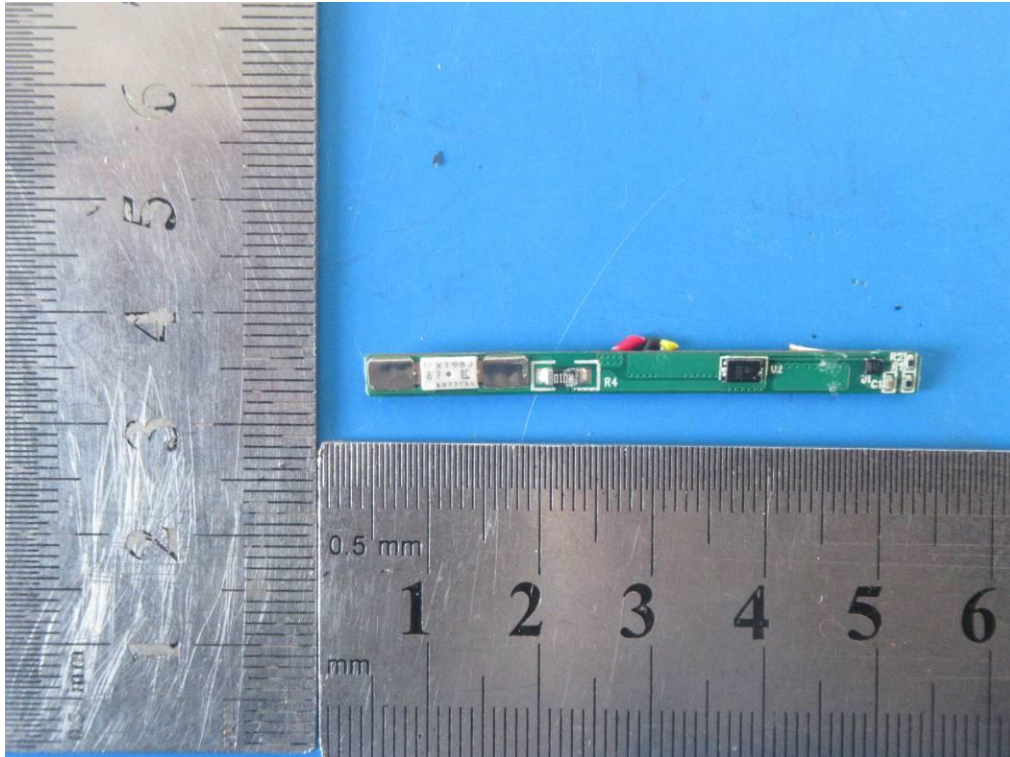












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