FCC TEST REPORT

Test report

On Behalf of

Shenzhen Ruijing Industrial Co., Ltd

For

MODULAR

Model No.: MODULAR

FCC ID: 2AQXM-MODULAR

Prepared for :	**Shenzhen Ruijing Industrial Co., Ltd** **C1 Building,Hengli Industrial Park, Xiakeng 1st Road No.168,Longgang Street, Longgang District, Shenzhen, Guangdong, China**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China**

Date of Test:	**Oct, 29, 2018 to Nov. 03, 2018**
Date of Report:	**Nov. 03, 2018**
Report Number:	**HK1811051457E**

TEST RESULT CERTIFICATION

Applicant's name ..... : Shenzhen Ruijing Industrial Co., Ltd

Address ..... : C1 Building,Hengli Industrial Park, Xiakeng 1st Road No.168,Longgang Street, Longgang District, Shenzhen, Guangdong, China

Manufacture's Name ..... : Shenzhen Ruijing Industrial Co., Ltd

Address ..... : C1 Building,Hengli Industrial Park, Xiakeng 1st Road No.168,Longgang Street, Longgang District, Shenzhen, Guangdong, China

Product description

Trade Mark: MINI/BATT

Product name..... : MODULAR

Model and/or type reference : MODULAR

Standards ..... : FCC Rules and Regulations Part 15 Subpart C Section 15.207, 15.209, 15.203
ANSI C63.10: 2013

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen HUAK Testing Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen HUAK Testing Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Date of Test ..... :

Date (s) of performance of tests..... : Oct, 29, 2018 to Nov. 03, 2018

Date of Issue..... : Nov. 03, 2018

Test Result..... : **Pass**

Testing Engineer : Gary Qian

(Gary Qian)

Technical Manager : Eden Hu

(Eden Hu)

Authorized Signatory : Jason Zhou

(Jason Zhou)

Table of Contents **Page**

1 . TEST SUMMARY 4

2 . GENERAL INFORMATION 5

2.1 GENERAL DESCRIPTION OF EUT 5

2.2 OPERATION OF EUT DURING TESTING 6

2.3 DESCRIPTION OF TEST SETUP 6

2.4 MEASUREMENT INSTRUMENTS LIST 7

3. RADIATED EMISSION 8

3.1TEST LIMIT 8

3.2. MEASUREMENT PROCEDURE 9

3.3. TEST SETUP 10

3.4. TEST RESULT 11

4. 20DB BANDWIDTH 14

4.1. MEASUREMENT PROCEDURE 14

4.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 14

4.3. MEASUREMENT RESULTS 15

5. FCC LINE CONDUCTED EMISSION TEST 16

5.1. LIMITS OF LINE CONDUCTED EMISSION TEST 16

5.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST 16

5.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST 17

5.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST 17

5.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST 18

6. PHOTOGRAPH OF TEST 20

7. PHOTOGRAPH OF EUT 22

1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.209	Radiated Emission	Compliant
§15.215	20dB bandwidth	Compliant
§15.207	Conducted Emission	Compliant

1.2 TEST FACILITY

Test Firm : Shenzhen HUAK Testing Technology Co., Ltd.

Address : 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

Designation Number: : CN1229

Test Firm Registration Number : 616276

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty(9kHz-30MHz) = 3.08dB, k=2

Radiated emission expanded uncertainty(30MHz-1000MHz) = 4.42dB, k=2

Radiated emission expanded uncertainty(Above 1GHz) = 4.06dB, k=2

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Operation Frequency	127.71KHz
Maximum field strength	56.92dBuV/m(Peak)@3m
Number of channels	1
Antenna Designation	Integrated Antenna (Met 15.203 Antenna requirement)
Hardware Version	WXC-105-B-V1.1
Software Version	V1.0
Power Supply	DC 12V by adapter

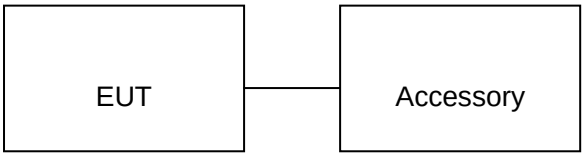
2.2 OPERATION OF EUT DURING TESTING

NO.	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.

2.3 DESCRIPTION OF TEST SETUP

Configure :



Item	Equipment	Model No.	ID or Specification	Remark
1	Wireless electronic Load	--	Maximum power 5W	Support
2	Adapter	RJT-AS120300E999	DC 12V/3A	AE

2.4 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2017	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
3.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
4.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2017	1 Year
5.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
6.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2017	1 Year
7.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2017	1 Year
8.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2017	N/A
9.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2017	3 Year

3. RADIATED EMISSION

3.1TEST LIMIT

Standard FCC 15.209

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark: (1) Emission level dBμV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

3.2. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

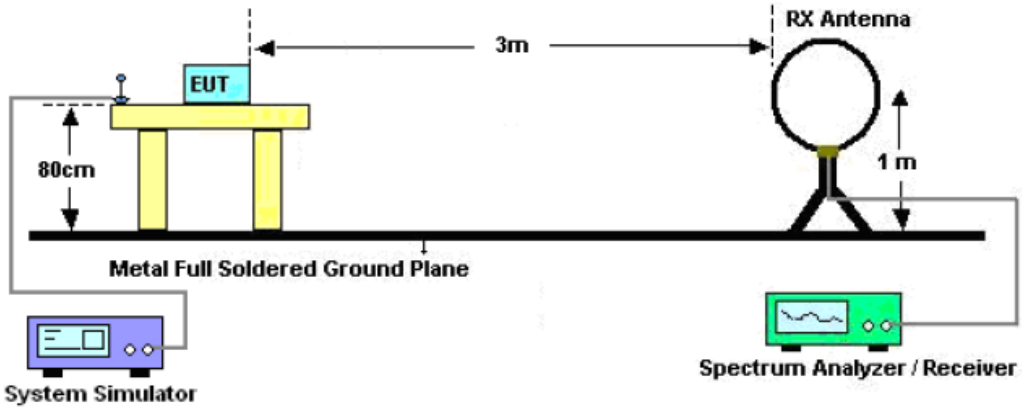
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
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

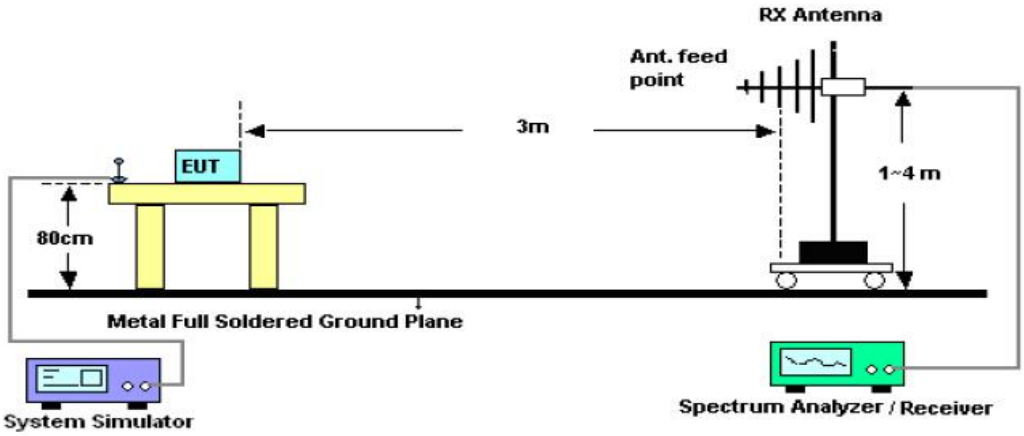
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

3.3. TEST SETUP

Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



3.4. TEST RESULT

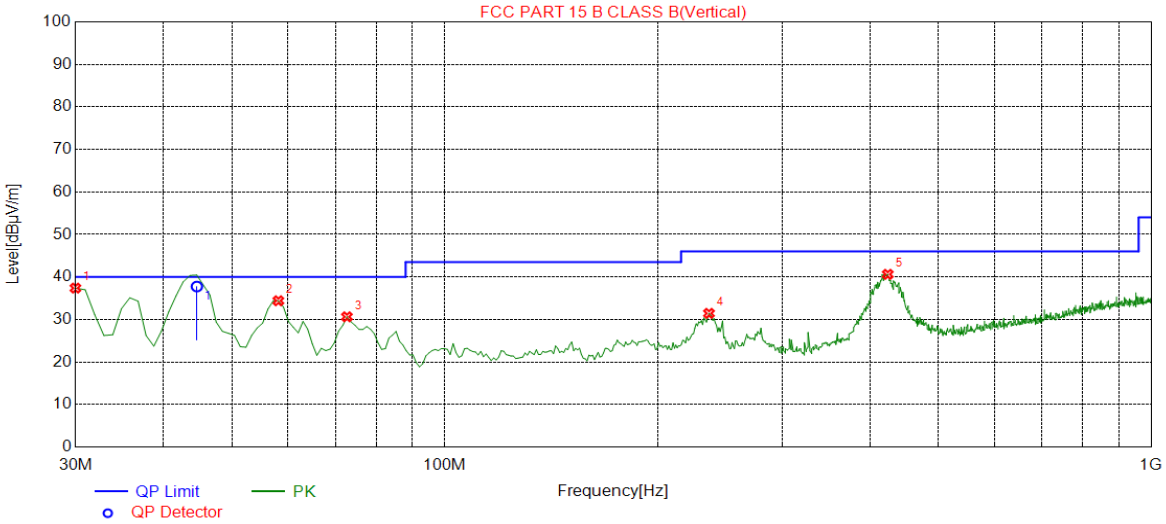
RADIATED EMISSION BELOW 30MHZ

Frequency MHz	Polarization	Reading dB(uV)	Factor dB (1/m)	Level dB(uV/m) Peak	Limit dB(uV/m) Average	Margin dB	Pass/Fail
0.12771	Face	46.52	10.4	56.92	105.48	48.56	Pass
0.12771	Side	39.81	10.4	50.21	105.48	55.27	Pass

Note: No other emissions found between lowest internal used/generated frequencies to 30MHz. The peak level of the emission is less than the average limit, so the average level shall be less than the limit without test.

RADIATED EMISSION 30MHz- 1GHZ

EUT：	MODULAR	Model Name. ：	MODULAR
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	Normal
Test Mode ：	Mode 1	Polarization :	Horizontal

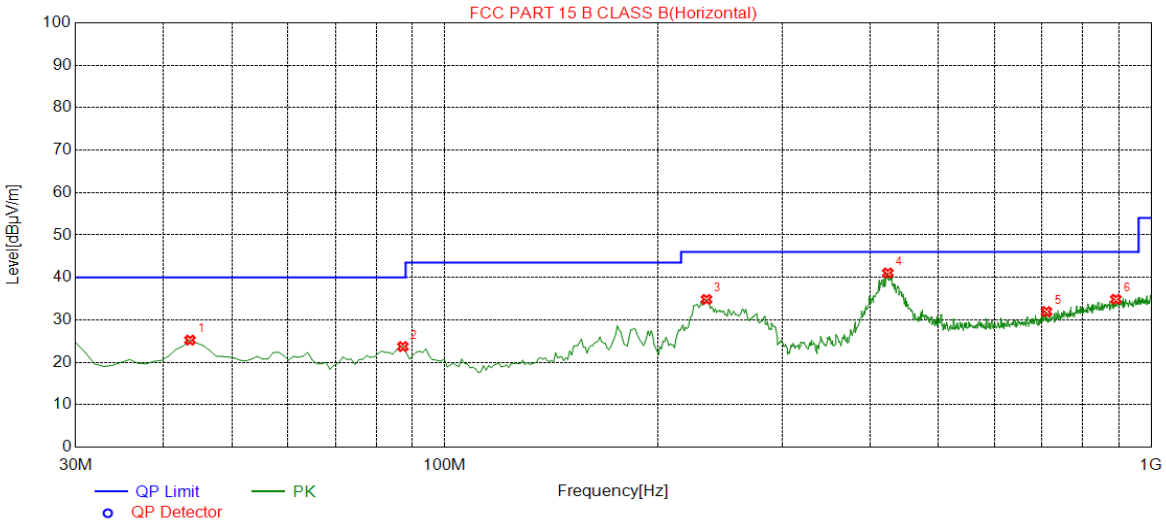


Suspected Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.0000	37.38	12.59	40.00	2.62	100	336	Vertical
2	58.1300	34.40	13.69	40.00	5.60	100	219	Vertical
3	72.6800	30.63	11.27	40.00	9.37	100	166	Vertical
4	236.6100	31.44	13.75	46.00	14.56	100	213	Vertical
5	423.8200	40.62	19.20	46.00	5.38	150	344	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	44.5643	14.51	37.75	40.00	2.25	105.4	313.8	Vertical

RESULT: PASS

EUT：	MODULAR	Model Name. ：	MODULAR
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	Normal
Test Mode ：	Mode 1	Polarization :	Vertical



Suspected Data List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	43.5800	25.23	14.53	40.00	14.77	100	232	Horizontal
2	87.2300	23.71	9.76	40.00	16.29	200	344	Horizontal
3	234.6700	34.82	13.61	46.00	11.18	100	276	Horizontal
4	423.8200	41.05	19.20	46.00	4.95	100	286	Horizontal
5	710.9400	31.95	24.69	46.00	14.05	200	230	Horizontal
6	891.3600	34.86	28.13	46.00	11.14	100	252	Horizontal

RESULT: PASS

Note:

Factor=Antenna Factor + Cable loss, Margin=Result-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

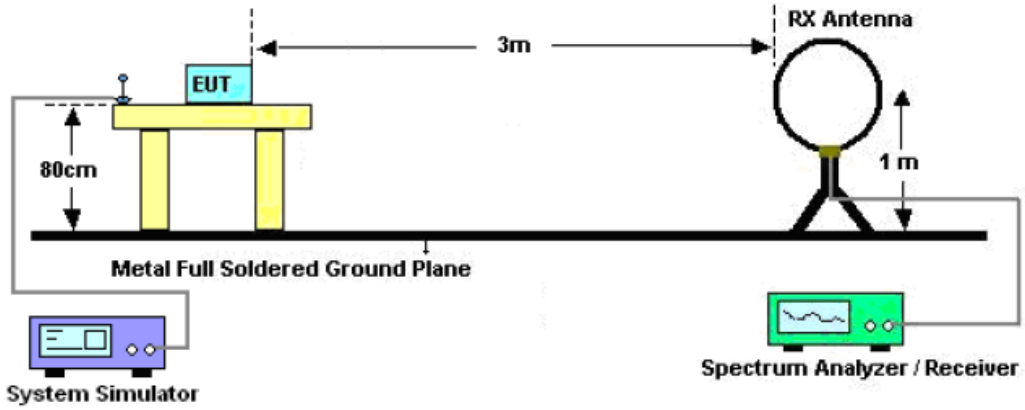
The mode 1 which operate with maximum output power was the worst case and only the data of the worst case record in this report.

4. 20DB BANDWIDTH

4.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2, Set the EUT Work on operation frequency.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

4.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



4.3. MEASUREMENT RESULTS

TEST ITEM	20DB BANDWIDTH
TEST MODULATION	FSK

Frequency (KHz)	Test Data (Hz)	Criteria
127.71	813	PASS

TEST PLOT OF BANDWIDTH

5. FCC LINE CONDUCTED EMISSION TEST

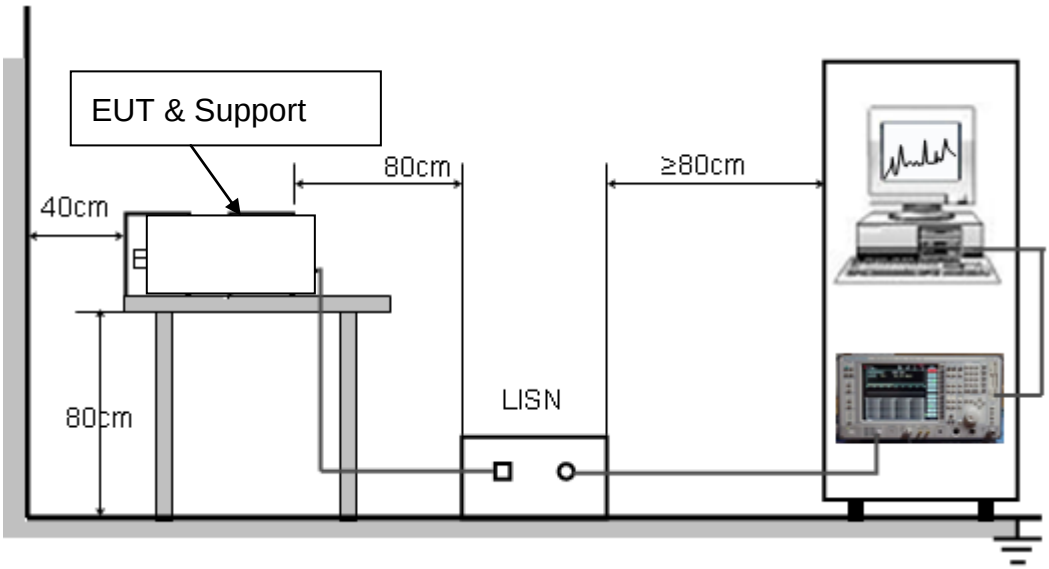
5.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

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

5.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



5.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received charging voltage by adapter which received 120V/60Hzpower by a LISN..
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

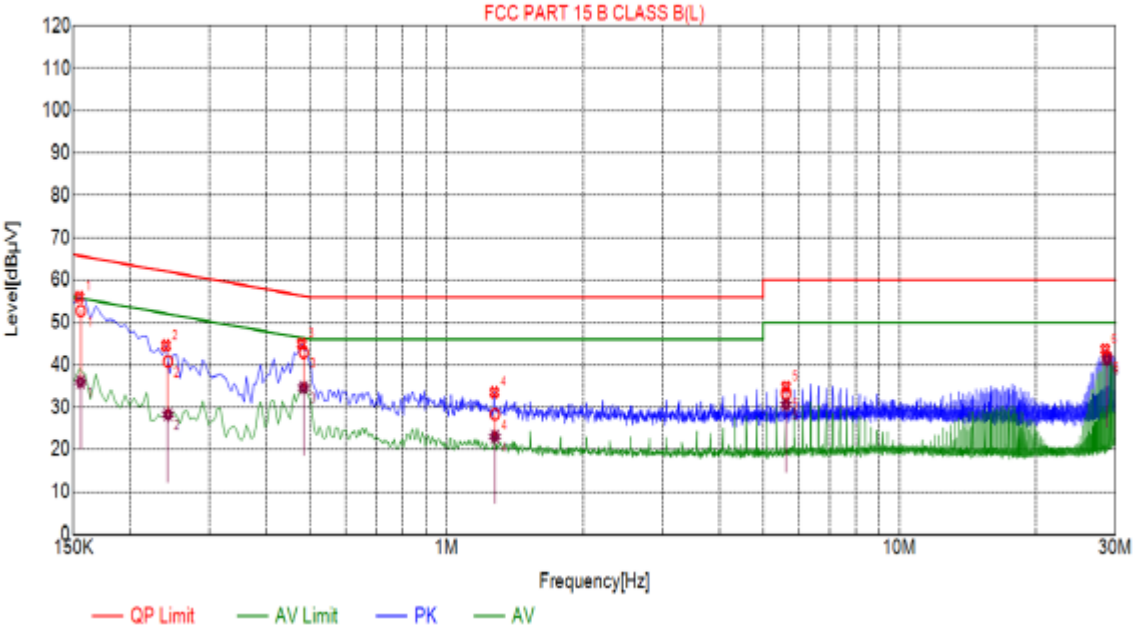
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

5.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

5.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

LINE CONDUCTED EMISSION TEST-L

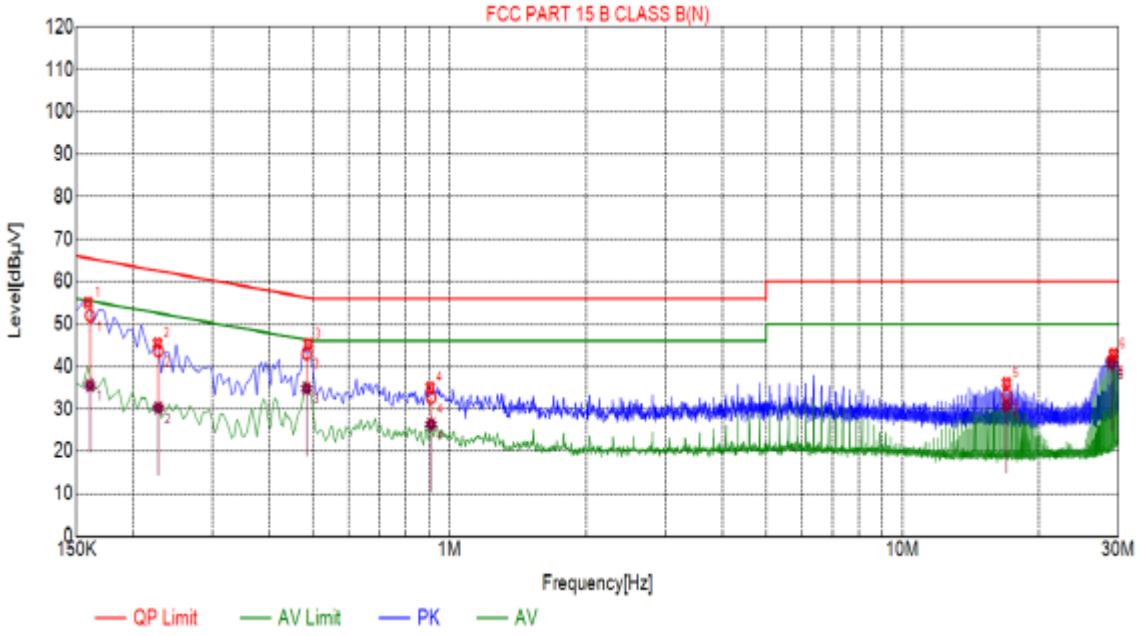


Suspected List						
NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Detector
1	0.1545	56.00	10.03	65.75	9.75	PK
2	0.2400	44.55	10.03	62.10	17.55	PK
3	0.4785	44.91	10.04	56.37	11.46	PK
4	1.2750	33.53	10.09	56.00	22.47	PK
5	5.6175	34.82	10.25	60.00	25.18	PK
6	28.4685	43.66	10.26	60.00	16.34	PK

Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.1556	10.03	52.77	65.70	12.93	36.00	55.70	19.70
2	0.2424	10.03	40.78	62.01	21.23	28.29	52.01	23.72
3	0.4833	10.04	42.92	56.28	13.36	34.62	46.28	11.66
4	1.2783	10.09	28.34	56.00	27.66	23.07	46.00	22.93
5	5.6168	10.25	33.21	60.00	26.79	30.64	50.00	19.36
6	28.7239	10.26	42.04	60.00	17.96	41.29	50.00	8.71

RESULT: PASS

LINE CONDUCTED EMISSION TEST-N



Suspected List						
NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Detector
1	0.1590	55.06	10.01	65.52	10.46	PK
2	0.2265	45.42	10.03	62.58	17.16	PK
3	0.4875	45.25	10.04	56.21	10.96	PK
4	0.9060	35.11	10.06	56.00	20.89	PK
5	16.9600	36.09	10.00	60.00	23.91	PK
6	29.2335	42.92	10.26	60.00	17.08	PK

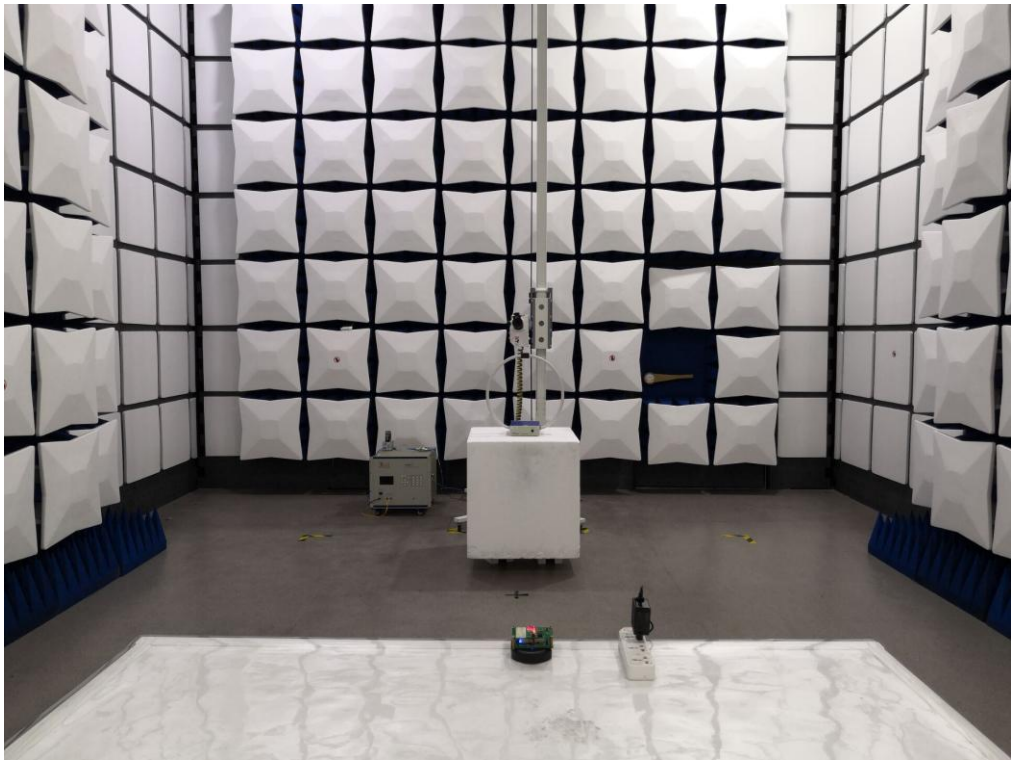
Final Data List								
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.1606	10.00	51.94	65.43	13.49	35.59	55.43	19.84
2	0.2274	10.03	43.60	62.54	18.94	30.25	52.54	22.29
3	0.4833	10.04	42.99	56.28	13.29	34.81	46.28	11.47
4	0.9100	10.06	32.60	56.00	23.40	26.41	46.00	19.59
5	16.9785	10.00	33.34	60.00	26.66	30.77	50.00	19.23
6	28.9788	10.26	41.45	60.00	18.55	40.65	50.00	9.35

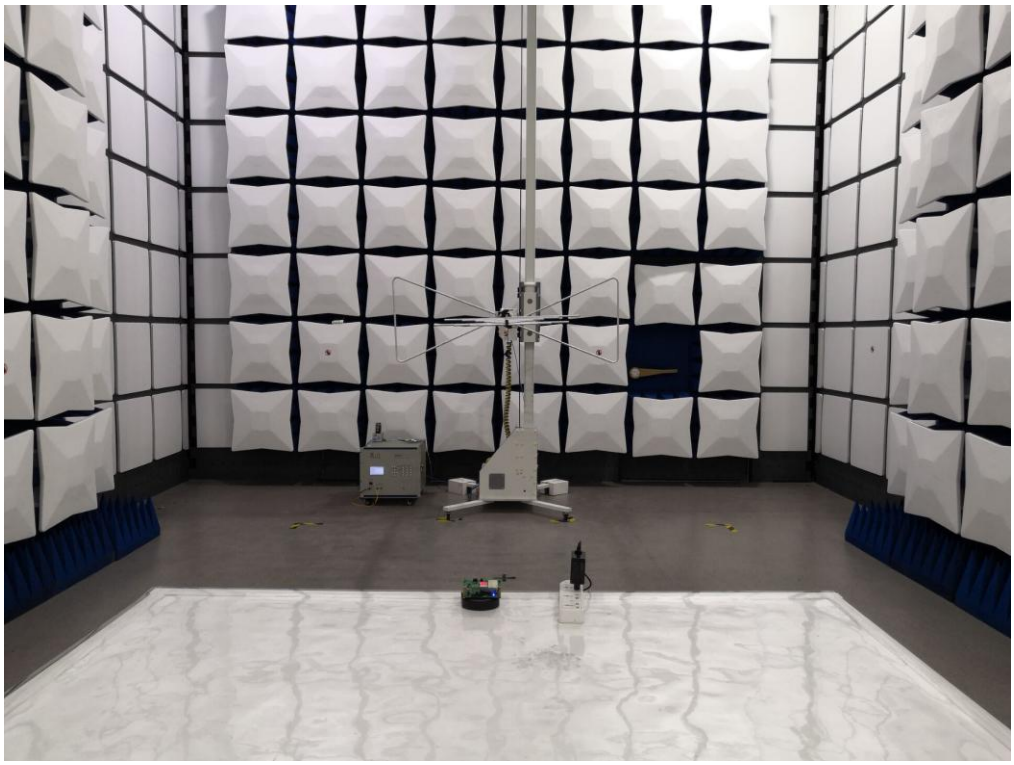
RESULT: PASS

Note: The mode 1 which operate with maximum output power was the worst case and only the data of the worst case record in this report.

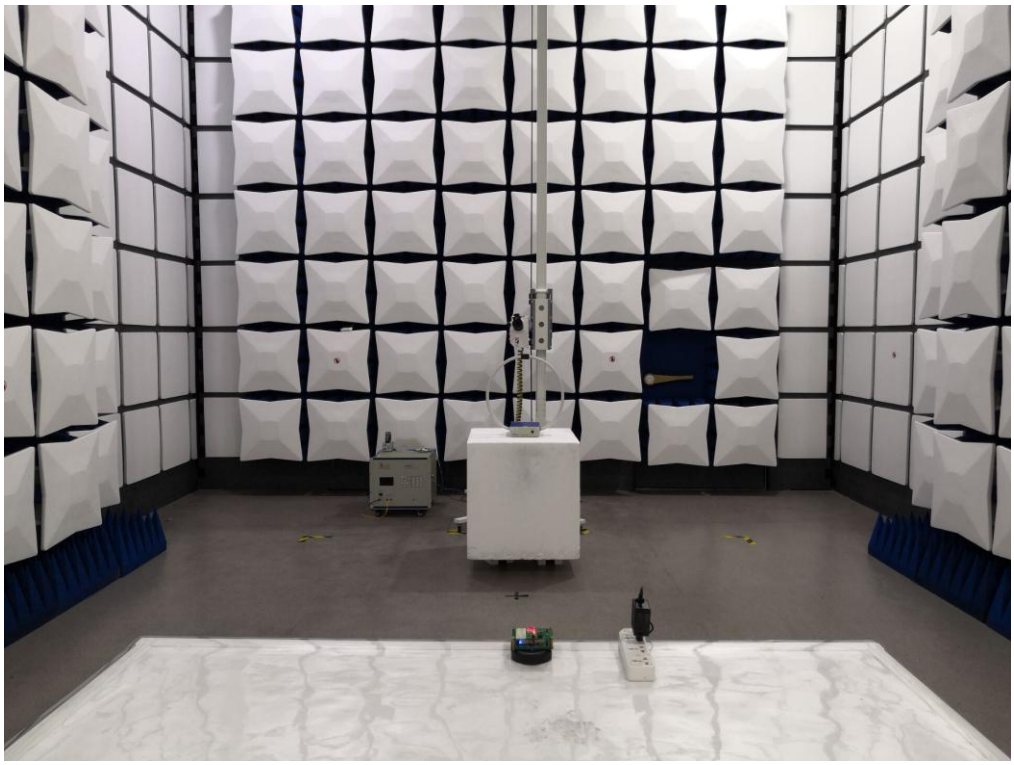
6. PHOTOGRAPH OF TEST

Radiated Emission





Conducted Emission

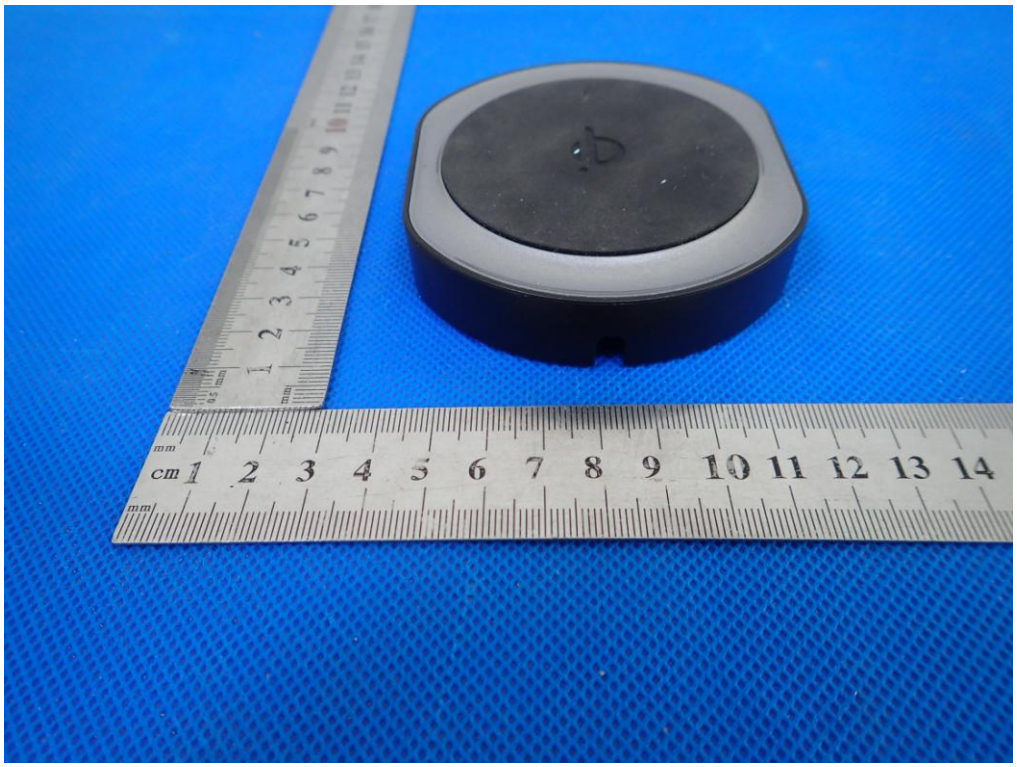


7. PHOTOGRAPH OF EUT

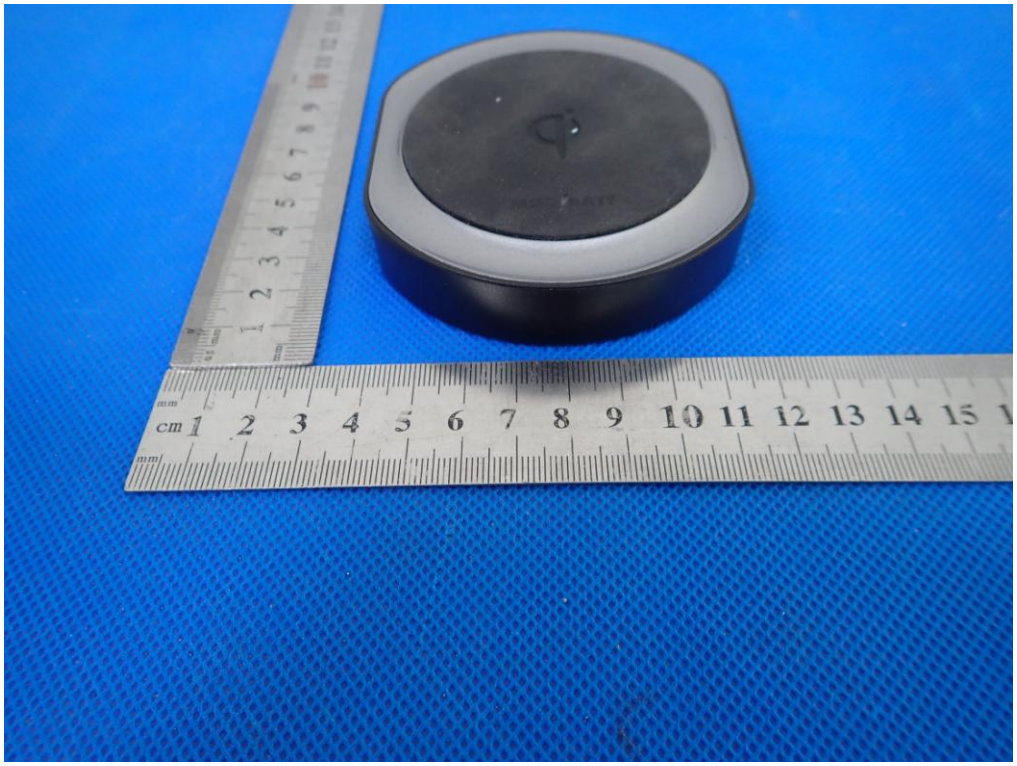
TOP VIEW OF EUT

BOTTOM VIEW OF EUT

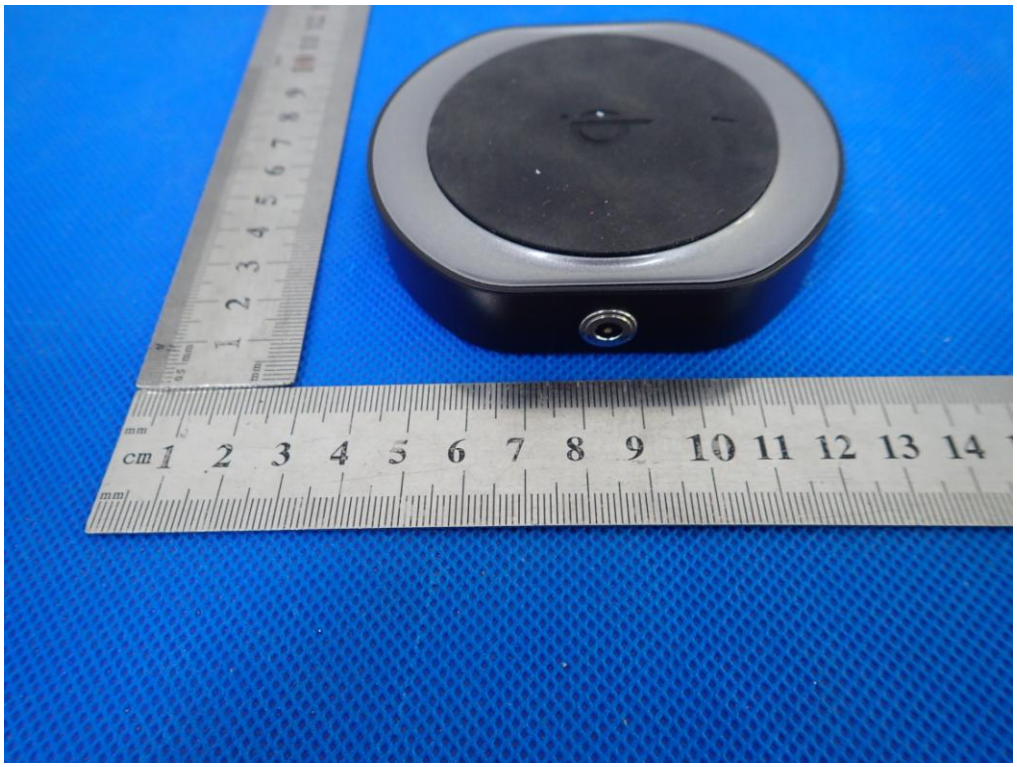
FRONT VIEW OF EUT



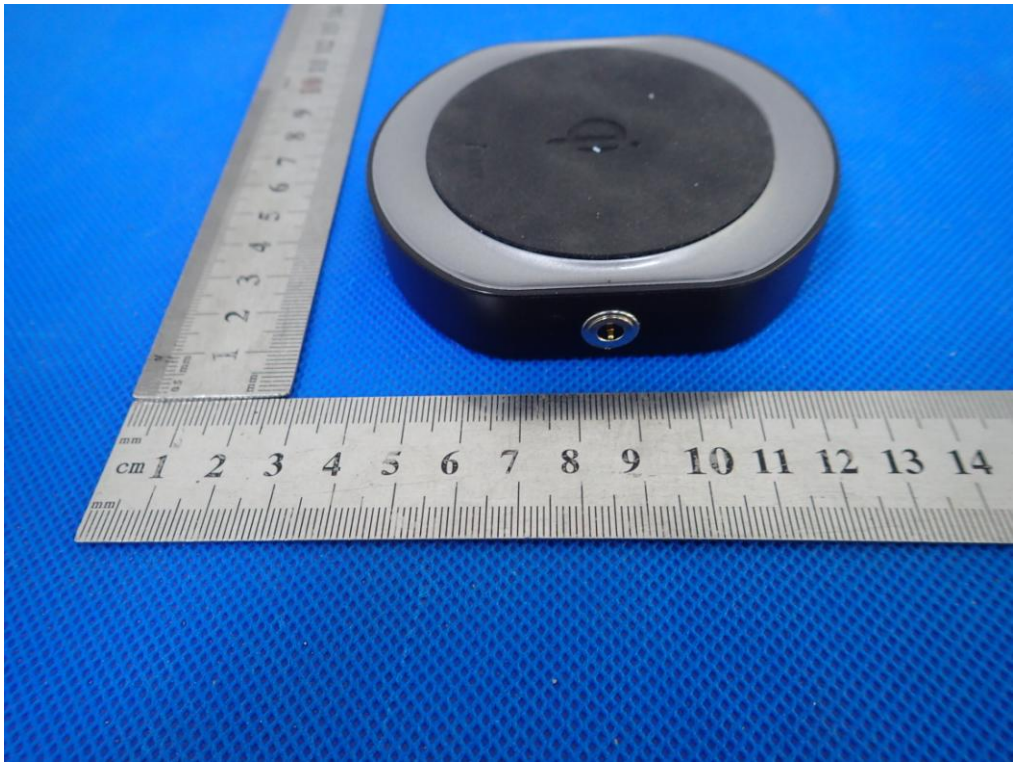
BACK VIEW OF EUT



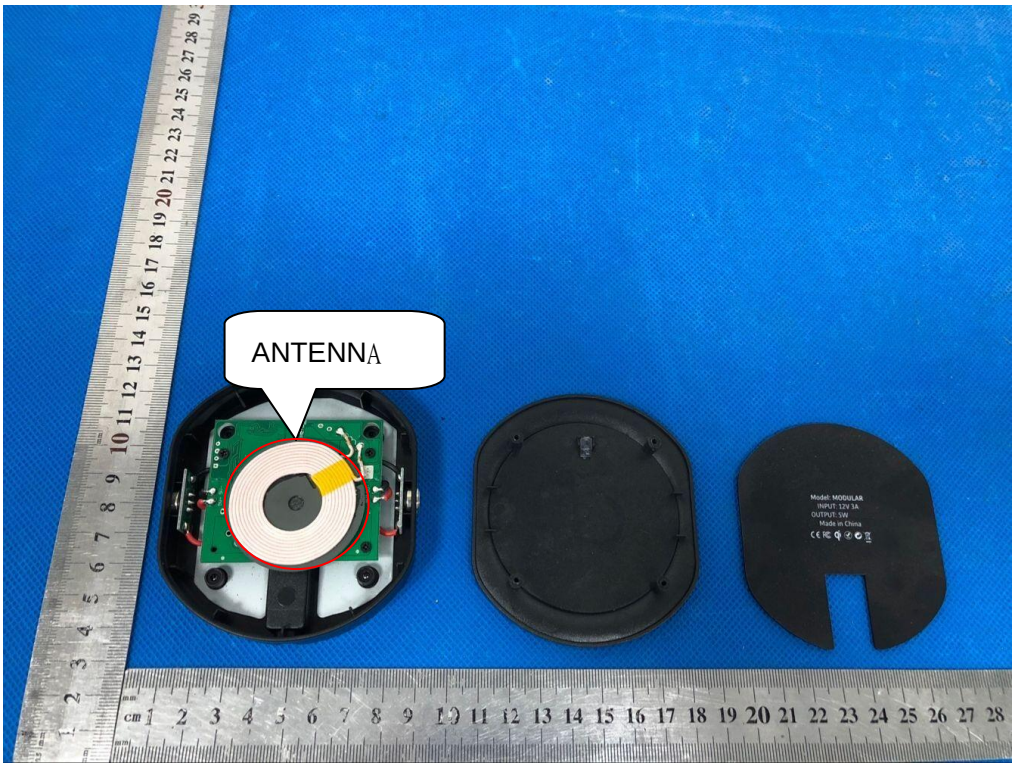
LEFT VIEW OF EUT



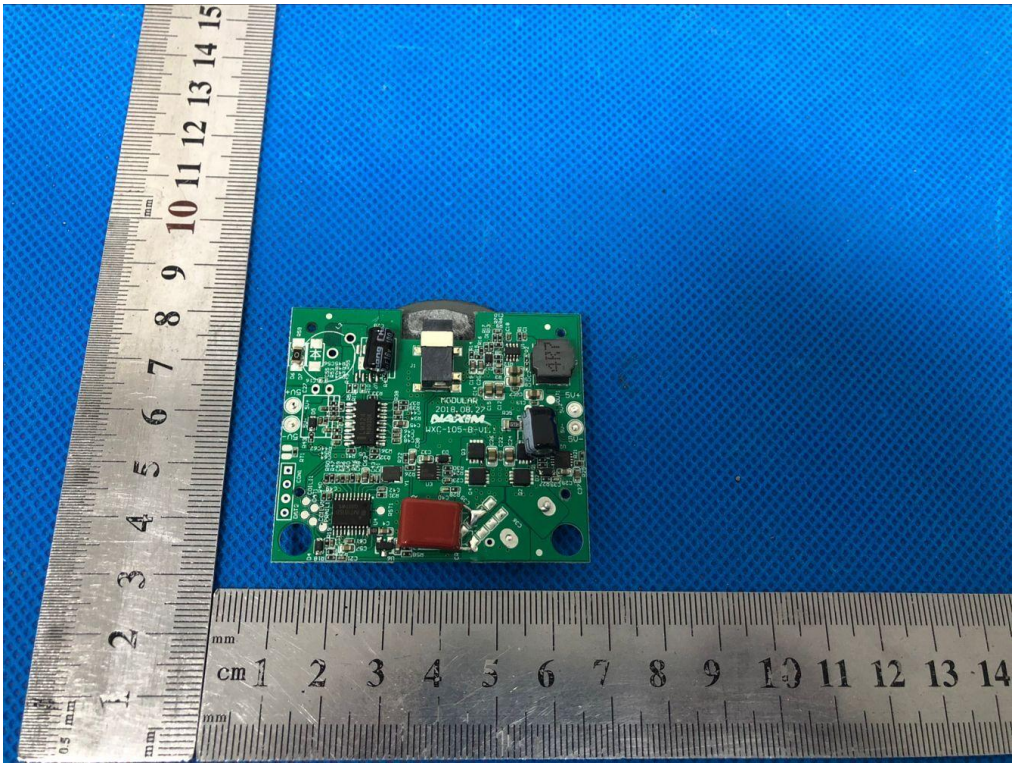
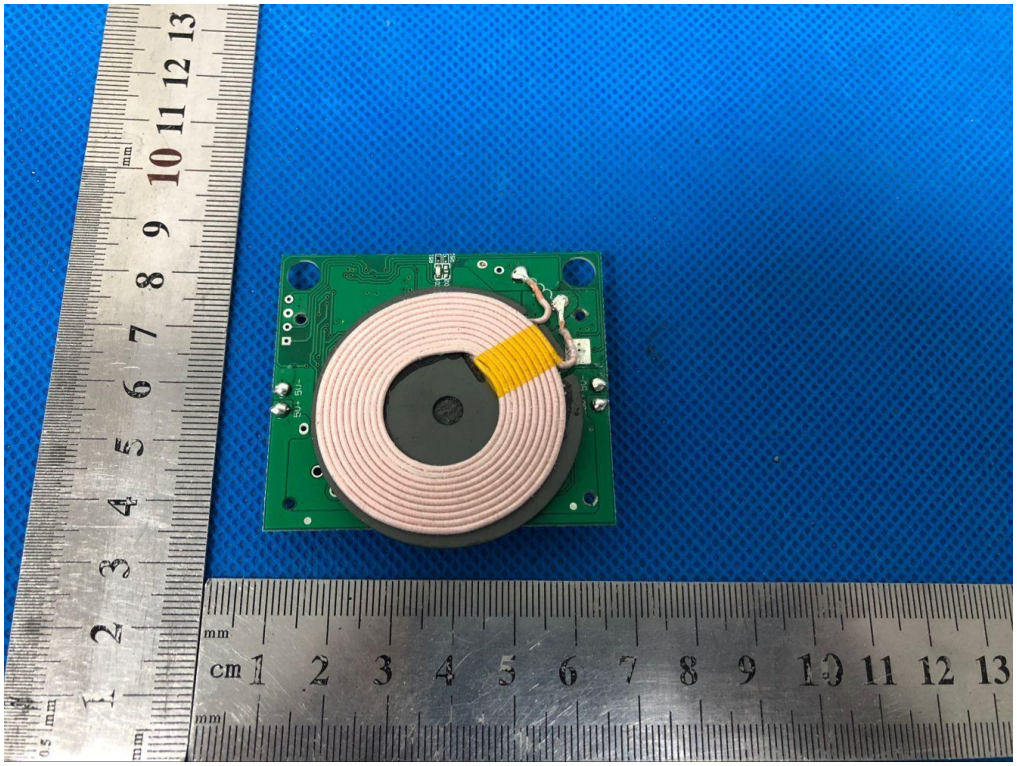
RIGHT VIEW OF EUT



OPEN VIEW- OF EUT



INTERNAL VIEW-1 OF EUT



INTERNAL VIEW-2 OF EUT