FCC TEST REPORT

for

SEAL INNOVATION INC.

SEAL SwimSafe Hub

Model Number: SH002

Serial Model:N/A

FCC ID: 2AFCI-SH002

Prepared for : SEAL INNOVATION INC.
Address : 410 North Boylan Avenue, Ste 87, Raleigh, NC 27608, USA

Prepared by : Keyway Testing Technology Co., Ltd.
Address : Building 1, Baishun Industrial Zone, Zhangmutou Town, Dongguan, Guangdong, China

Tel: 86-769-8718 2258
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Report No. : 15KWE072754F
Date of Test : Jun. 26~Jul.03, 2015
Date of Report : Jul. 04, 2015

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Keyway Testing Technology Co., Ltd.

Applicant: **Address:**	SEAL INNOVATION INC. 410 North Boylan Avenue, Ste 87, Raleigh, NC 27608, USA		
Manufacturer: **Address:**	CAROLINA ELECTRONIC ASSEMBLERS INC. 132 Citation Ln, Smithfield, NC27577 USA		
E.U.T:	SEAL SwimSafe Hub		
Model Number:	SH002		
Trade Name:	SEAL SwimSafe	**Serial No.:**	------
Date of Receipt:	Jun. 26, 2015	**Date of Test:**	Jun. 26~Jul. 03, 2015
Test Specification:	FCC Part 15, Subpart C Section 15.231: 2014 ANSI C63.10-2013		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		

Issue Date: Jul.04, 2015

Tested by:	Reviewed by:	Approved by:
Daisy Chen / Engineer	Andy Gao / Supervisor	Jade Yang/ Supervisor

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

1. TEST SUMMARY

FCC Part15, Subpart C (15.231)		
Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.231(e)	PASS
Occupied Bandwidth	15.231(c)	PASS
Transmitter Timeout	15.231(e)	PASS
Antenna Requirement	15.203	PASS

2. GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	SEAL SwimSafe Hub
Model No.:	SH002
Serial Model :	N/A
Model Difference	N/A
Operation Frequency:	914MHz
Modulation technology:	BPSK
Number Of Channel	1CH
Antenna Type:	PCB
Antenna gain:	1.0dBi
Power supply:	DC 3.7V from battery DC 5V from adapter
Adapter	M/N: WSU050-1500 I/P:AC 100~240V 50/60Hz 0.2A MAX O/P:DC 5V 1.5A

2.3. Independent Operation Modes

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(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX

For Conducted Emission	
Final Test Mode	Description
Mode 1	TX

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX

2.4. TEST SITES

Lab Qualifications : Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

Certificated by FCC, USA
Registration No.: 370994
Date of registration: February 21, 2012

Certificated by CNAS China
Registration No.: CNAS L5783
Date of registration: August 8, 2012

2.5. List of Test and Measurement Instruments

2.5.1. For conducted emission at the mains terminals test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,15	Apr. 27,16
Artificial Mains Network	Rohde&Schwarz	ENV216	101315	Apr. 27,15	Apr. 27,16
Artificial Mains Network (AUX)	Rohde&Schwarz	ENV216	101314	Apr. 27,15	Apr. 27,16
RF Cable	FUJIKURA	3D-2W	944 Cable	Apr. 27,15	Apr. 27,16

2.5.2. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,15	Apr. 27,16
System Simulator	Agilent	E5515C	GB43130245	Apr. 27,15	Apr. 27,16
Power Splitter	Weinschel	1506A	NW425	Apr. 27,15	Apr. 27,16
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 27,15	Apr. 27,16
Spectrum Analyzer	Agilent	E4411B	MY4511304	Apr. 27,15	Apr. 27,16
Spectrum Analyzer	R&S	FSV40	132.1.3008K39 -100967	Apr. 27,15	Apr. 27,16
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 27,15	Apr. 27,16
Signal Amplifier	SONOMA	310	187016	Apr. 27,15	Apr. 27,16
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 27,15	Apr. 27,16
RF Cable	IMRO	IMRO-400	966 Cable 1#	N/A	N/A
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	DAZE	ZN30701	11003	Apr. 27,15	Apr. 27,16
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 27,15	Apr. 27,16
Spectrum Analyzer	Agilent	8593E	3911A04271	Apr. 27,15	Apr. 27,16
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 27,15	Apr. 27,16
Signal Amplifier	DAZE	ZN3380C	11001	Apr. 27,15	Apr. 27,16
High Pass filter	Micro	HPM50111	324216	Apr. 27,15	Apr. 27,16
Filter	COM-MW	ZBSF-C836.5-25-X	KW032	Apr. 27,15	Apr. 27,16
Filter	COM-MW	ZBSF-C1747.5-75-X2	KW035	Apr. 27,15	Apr. 27,16
Filter	COM-MW	ZBSF-C1880-60-X2	KW037	Apr. 27,15	Apr. 27,16
DC Power Supply	LongWei	PS-305D	010964729	Apr. 27,15	Apr. 27,16
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 27,15	Apr. 27,16
Universal radio communication tester	Rohde&Schwarz	CMU200	3215420	Apr. 27,15	Apr. 27,16
Splitter	Agilent	11636B	0025164	Apr. 27,15	Apr. 27,16

3. TEST SET-UP AND OPERATION MODES

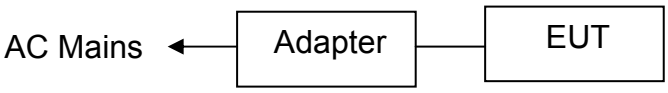
3.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

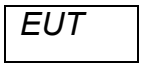
3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators

Conducted Emission



Radiated Emission



3.3. Test Operation Mode and Test Software

None.

3.4. Special Accessories and Auxiliary Equipment

None.

3.5. Countermeasures to Achieve EMC Compliance

None.

4. EMISSION TEST RESULTS

4.1. Conducted Emission at the Mains Terminals Test According to FCC 15.231(e)

4.1.1. Limit 15.207 limits

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5 0.5-5 5-30	66 to 56 56 60	56 to 46 46 50

4.1.2. Test Setup

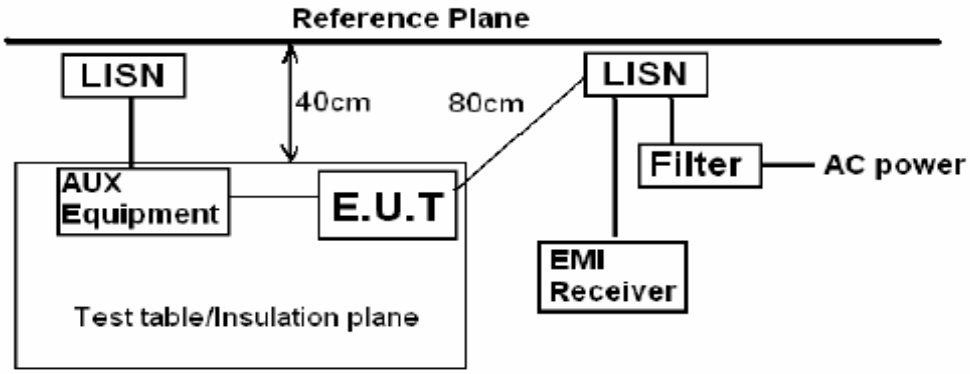
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

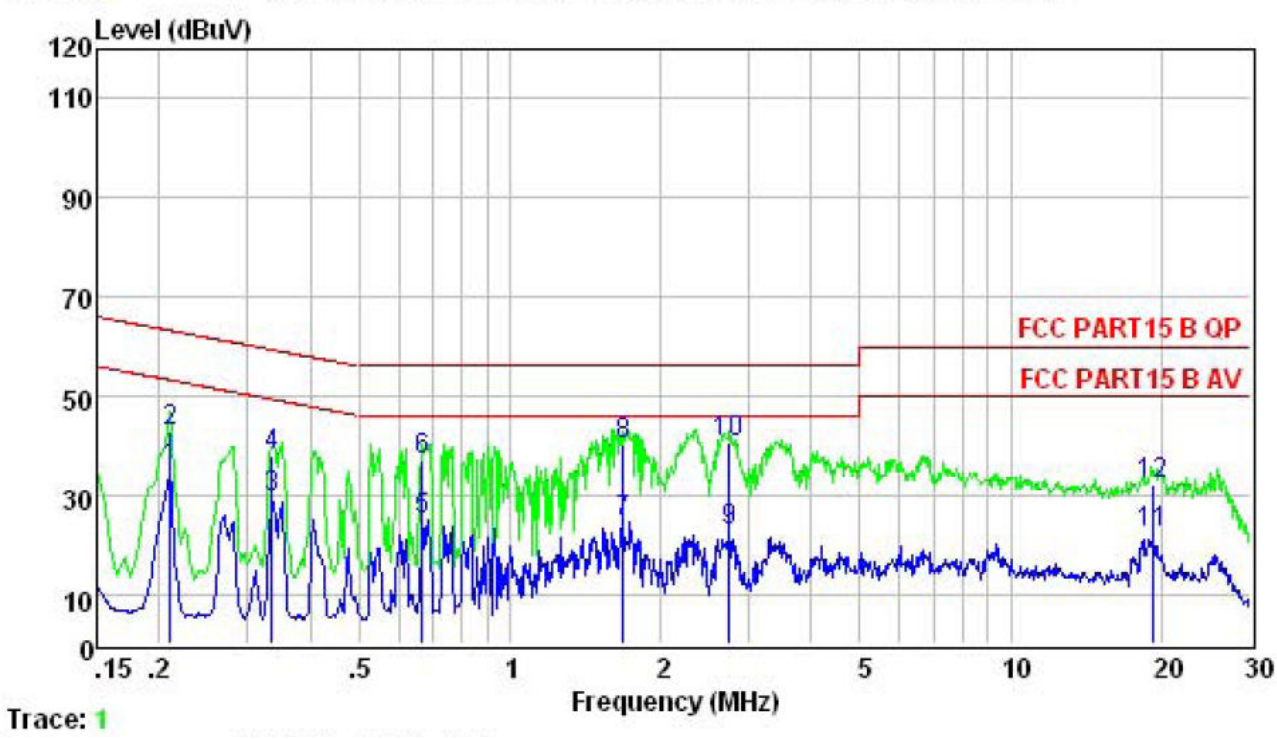
The bandwidth of the test receiver was set at 9 kHz.

Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.



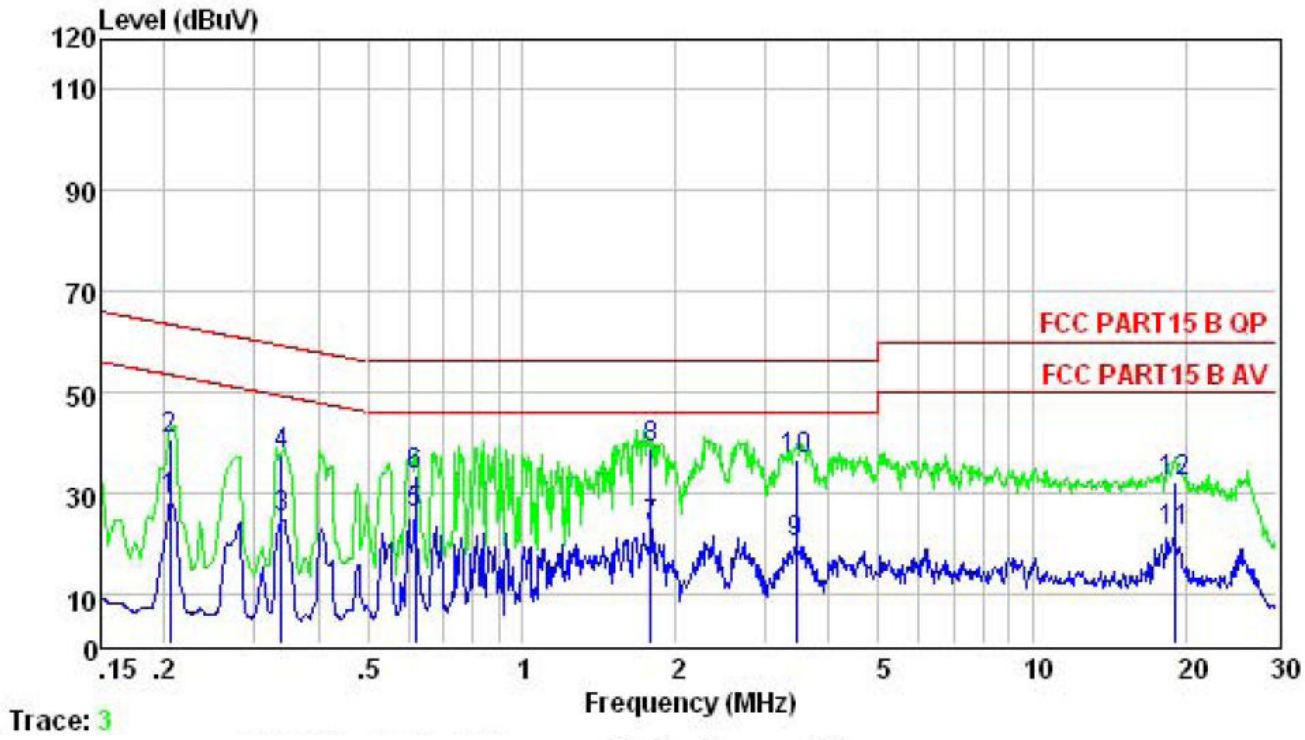
Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

120V/60Hz
L



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.211	35.14	53.18	-18.04	Average
2	0.211	43.00	63.18	-20.18	QP
3	0.336	29.61	49.31	-19.70	Average
4	0.336	38.10	59.31	-21.21	QP
5	0.668	25.06	46.00	-20.94	Average
6	0.668	37.20	56.00	-18.80	QP
7	1.680	24.72	46.00	-21.28	Average
8	1.680	40.30	56.00	-15.70	QP
9	2.736	22.83	46.00	-23.17	Average
10	2.736	40.60	56.00	-15.40	QP
11	19.224	22.22	50.00	-27.78	Average
12	19.224	32.20	60.00	-27.80	QP

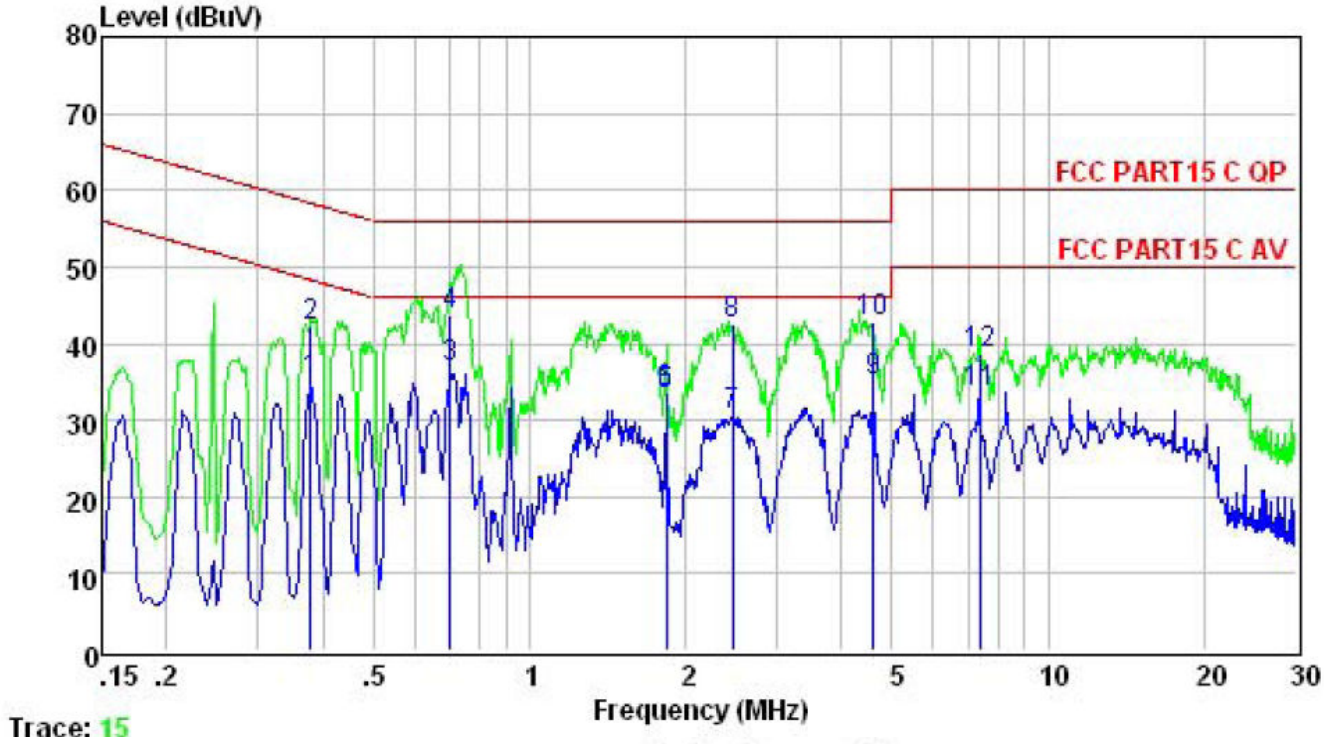
N



Trace: 3

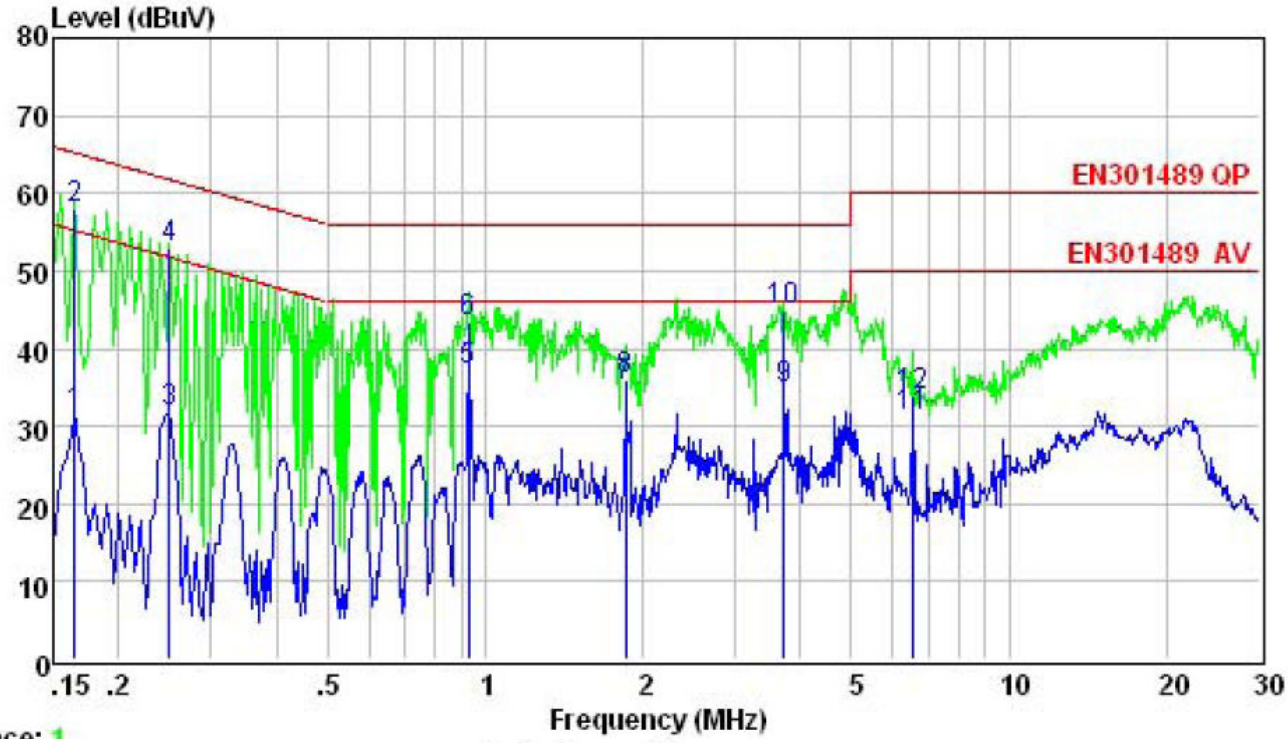
	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.205	28.63	53.40	-24.77	Average
2	0.205	40.60	63.40	-22.80	QP
3	0.339	24.77	49.22	-24.45	Average
4	0.339	37.30	59.22	-21.92	QP
5	0.621	26.00	46.00	-20.00	Average
6	0.621	33.60	56.00	-22.40	QP
7	1.790	23.37	46.00	-22.63	Average
8	1.790	38.70	56.00	-17.30	QP
9	3.436	20.05	46.00	-25.95	Average
10	3.436	36.50	56.00	-19.50	QP
11	18.920	22.23	50.00	-27.77	Average
12	18.920	32.10	60.00	-27.90	QP

240V/60Hz
L



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.379	35.04	58.30	-23.26	Average
2	0.379	42.36	58.30	-15.94	QP
3	0.705	36.90	56.00	-19.10	Average
4	0.705	43.69	56.00	-12.31	QP
5	1.839	33.44	56.00	-22.56	Average
6	1.839	33.69	56.00	-22.31	QP
7	2.461	30.59	56.00	-25.41	Average
8	2.461	42.38	56.00	-13.62	QP
9	4.598	35.02	56.00	-20.98	Average
10	4.598	42.78	56.00	-13.22	QP
11	7.368	33.74	60.00	-26.26	Average
12	7.368	38.76	60.00	-21.24	QP

N



	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.165	31.62	65.21	-33.59	Average
2	0.165	58.10	65.21	-7.11	QP
3	0.249	31.73	61.78	-30.05	Average
4	0.249	53.04	61.78	-8.74	QP
5	0.928	37.12	56.00	-18.88	Average
6	0.928	43.28	56.00	-12.72	QP
7	1.858	35.11	56.00	-20.89	Average
8	1.858	36.12	56.00	-19.88	QP
9	3.720	34.71	56.00	-21.29	Average
10	3.720	44.89	56.00	-11.11	QP
11	6.523	31.16	60.00	-28.84	Average
12	6.523	33.98	60.00	-26.02	QP

4.2. Radiated Emission Test

4.2.1. Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
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	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.231(e))

Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66 - 40.70	1000	100
70 - 130	500	50
130 - 174	500 to 1500 **	50 to 150 **
174 - 260	1500	150
260 - 470	1500 to 5000 **	150 to 500**
Above 470	5000	500

Notes:

(1) ** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,uV/m at 3 meters = 22.72727(F) - 2454.545; for the band 260-470 MHz, uV/m at 3 meters = 16.6667(F) - 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in 93 Section 15.209, whichever limit permits a higher field strength.

4.2.2. Test setup

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz.For frequencies above 1GHz, any suitable measuring distance may be used.

b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m.

d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

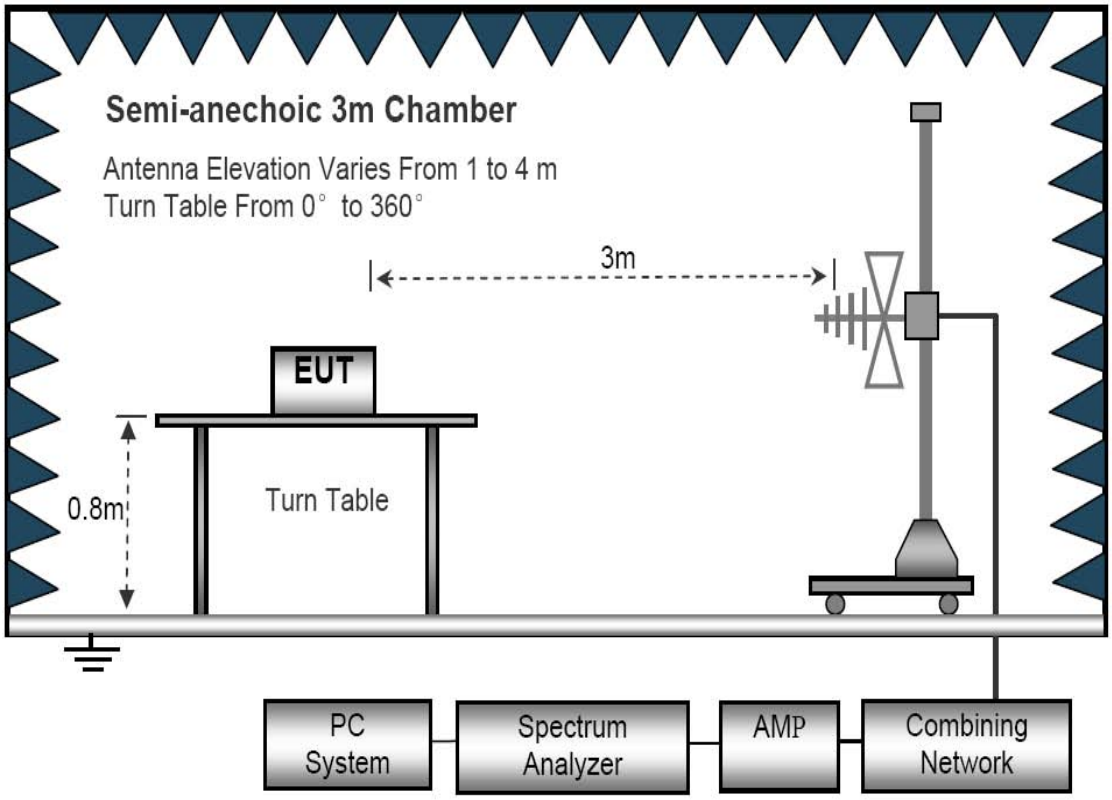
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

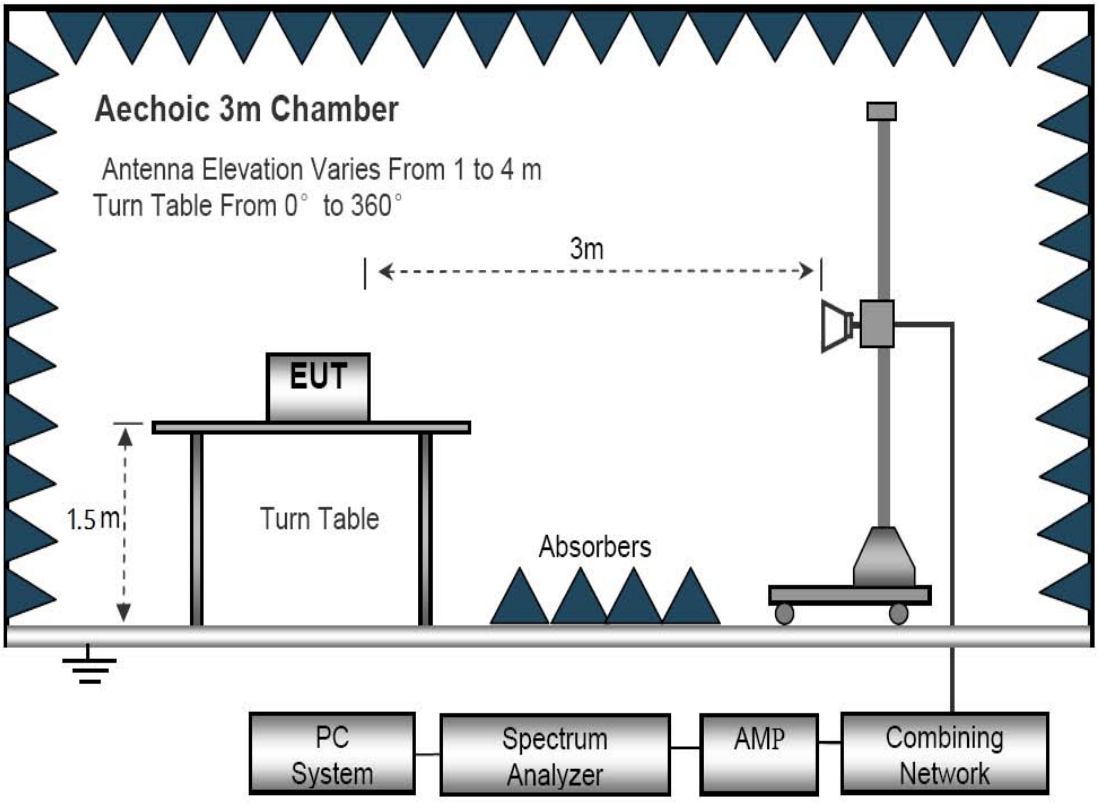
Both horizontal and vertical antenna polarities were tested

and performed pretest to three orthogonal axis. The worst case emissions were reported

Below 1GHz

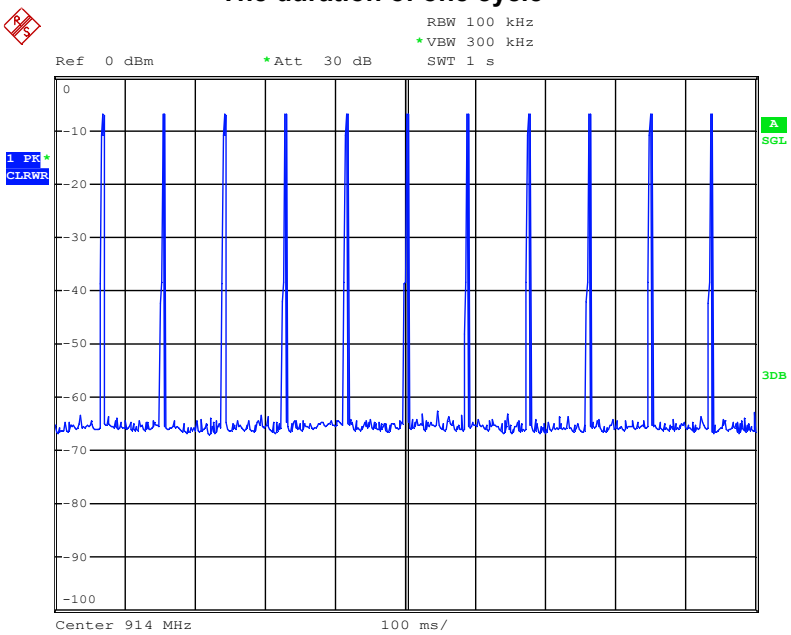


Above 1GHz



TEST RESULTS

The duration of one cycle



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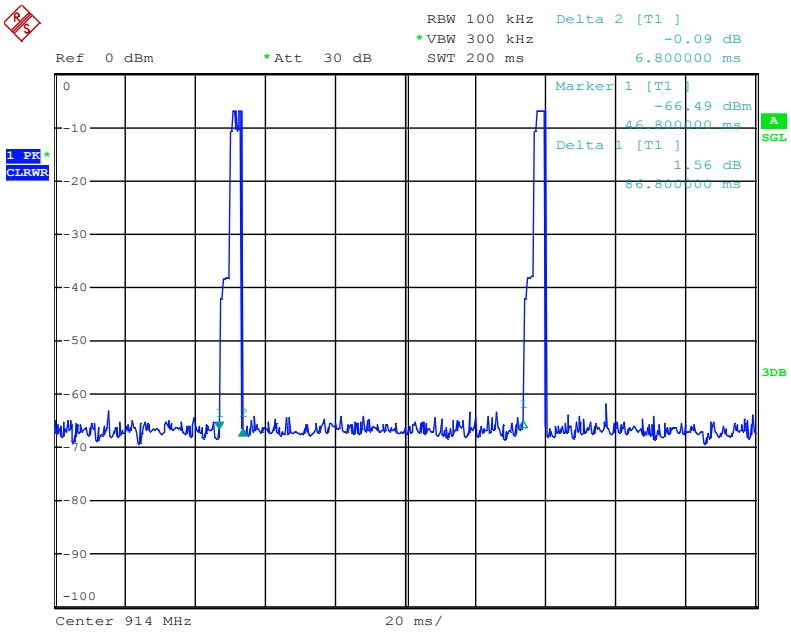

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Frequency	Average Factor	Field Strength	Field Strength	Limit(PK)	Limit(AV)	State	Polarization
MHz	dB	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m		
914	-22.05	83.14	61.09	93.98	73.98	pass	Horizontal
1828	-22.05	50.45	--	74	54	pass	
2742	-22.05	48.52	--	74	54	pass	
3656	-22.05	46.92	--	74	54	pass	
914	-22.05	86.45	64.40	93.98	73.98	pass	Vertical
1828	-22.05	51.03	--	74	54	pass	
2742	-22.05	49.14	--	74	54	pass	
3656	-22.05	47.45	--	74	54	pass	

NoTE:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. Average value= PK value + Average Factor(duty factor)
   The duty cycle is simply the on time divided by the period:
   The duration of one cycle = 86ms
   Effective period of the cycle = 6.8ms
   DC = 6.8ms/86ms = 0.079
   Therefore, the average factor is found by 20log0.079 = -22.05dB
3. If the peak-detected amplitude can be shown to comply with the average limit, thenit is not necessary to Perform a separate average measurement.
4. Pulse Desensitization Correction Factor
   Pulse Width (PW) = 6.8ms
   2/PW = 2/6.8ms = 0.294kHz
   RBW (100 kHz) > 2/PW (0.294kHz)
   Therefore PDCF is not needed

5. BANDWIDTH TEST

5.1. Limit According to FCC 15.231(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier. Limit: 914MHz*0.5%=4.57MHz

5.2. TEST PROCEDURE

1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW= 300 kHz, Span = 3 MHz.
2. Set SPA Max hold, Mark peak, -20 dB

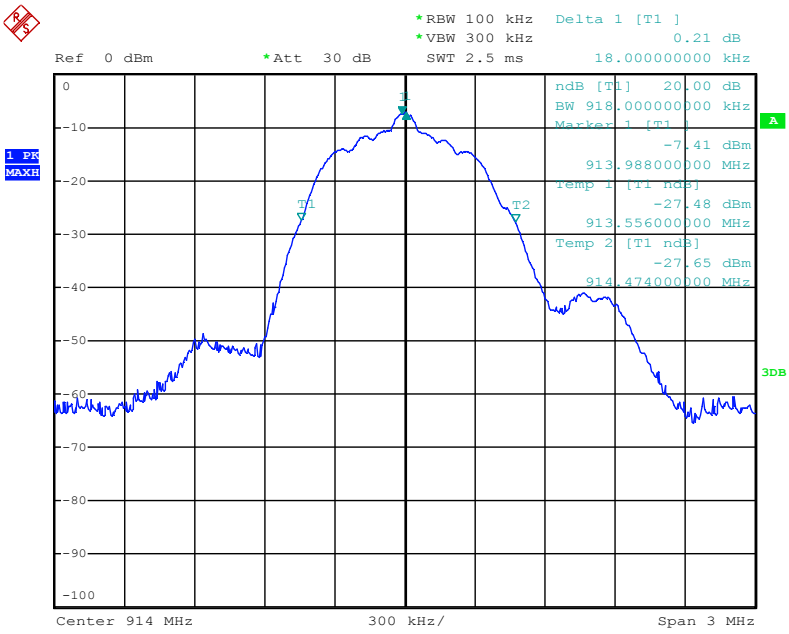
5.3 TEST SETUP

Test data:

Channel Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Result
914	0.918	4.57	Pass

Test plot as follows:

914MHz



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6. TRANSMITTER TIMEOUT

6.1. REQUIREMENTS According to FCC 15.231(e)

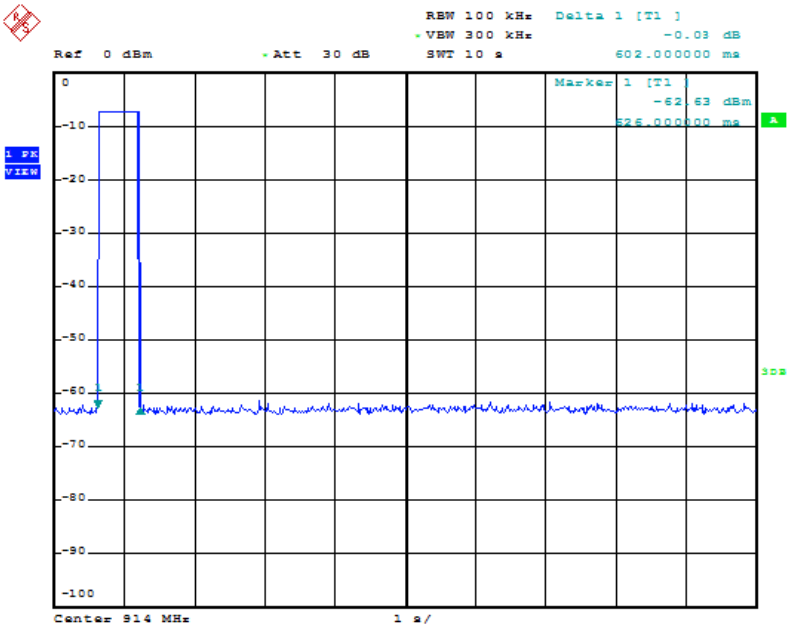
In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds

6.2. TEST PROCEDURE

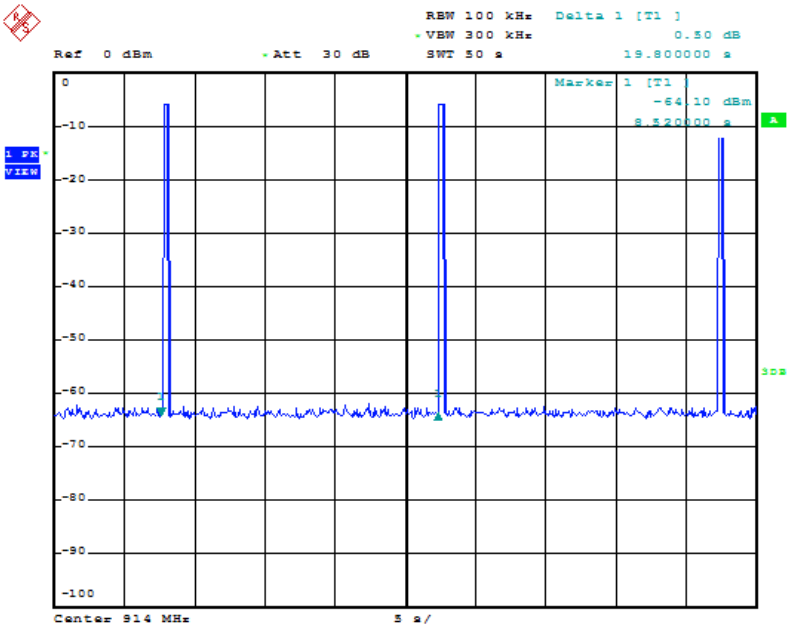
1. Put the EUT on the support in its standard position with associated equipment and switched on.
2. Set center frequency of spectrum analyzer =operating frequency.
3. Set spectrum analyzer as RBW = 100 kHz, VBW= 300 kHz, Span = 0 Hz.
4. record the duration time.

6.3 TEST SETUP

6.4 TEST RESULTS



THE DURATION OF EACH TRANSMISSION	LIMIT	RESULT
602ms	<1s	pass



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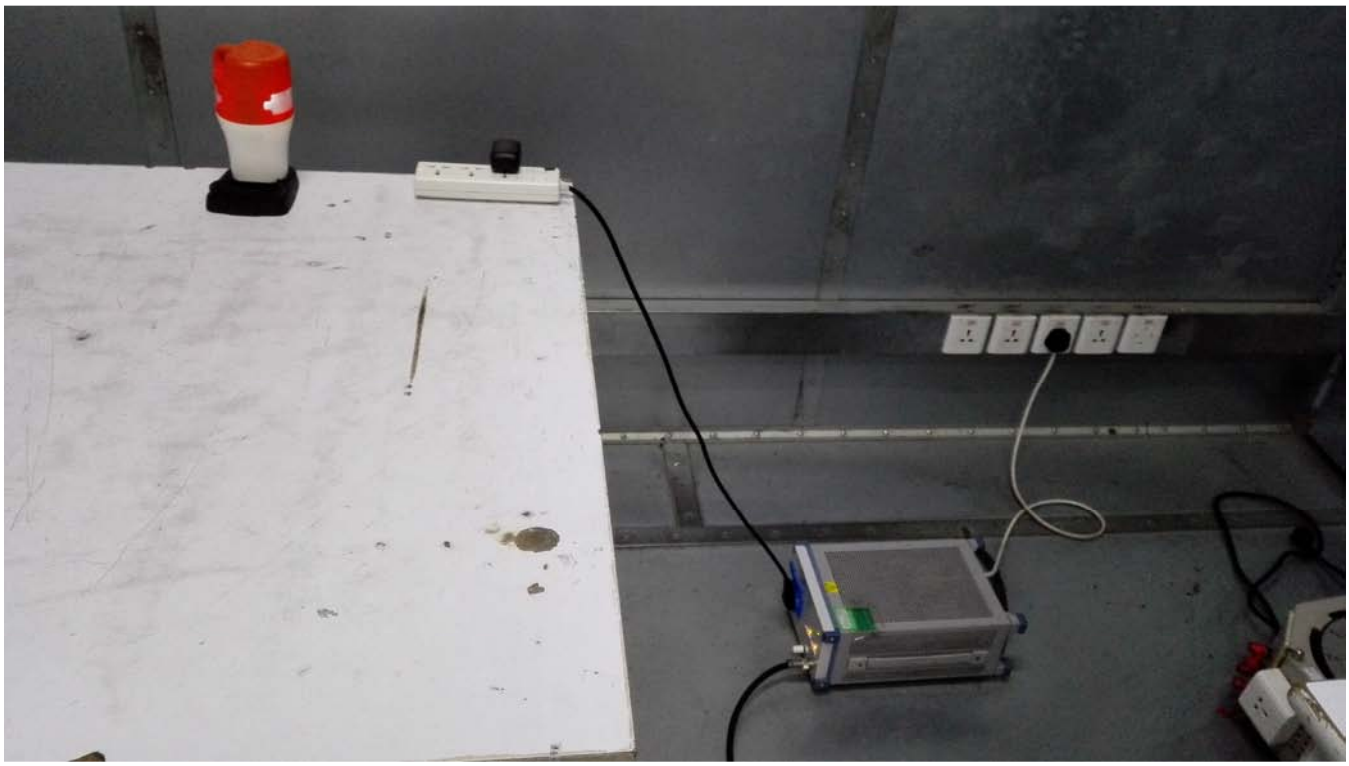
THE DURATION OF EACH TRANSMISSION	LIMIT	RESULT
19.8s	>10s	pass

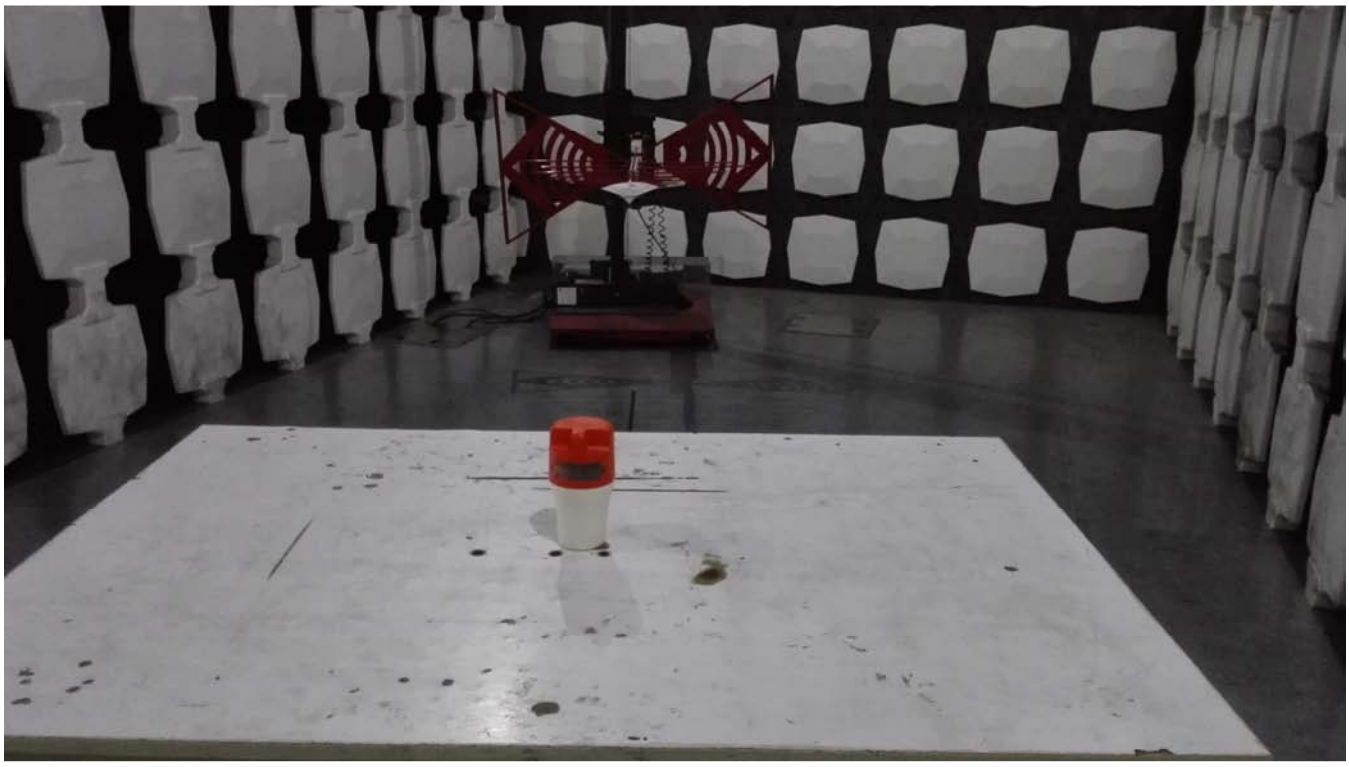
Note： The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.
The duration time is 602ms×30=18060ms=18.06s＜19.8S

7. PHOTOGRAPHS OF TEST SET-UP

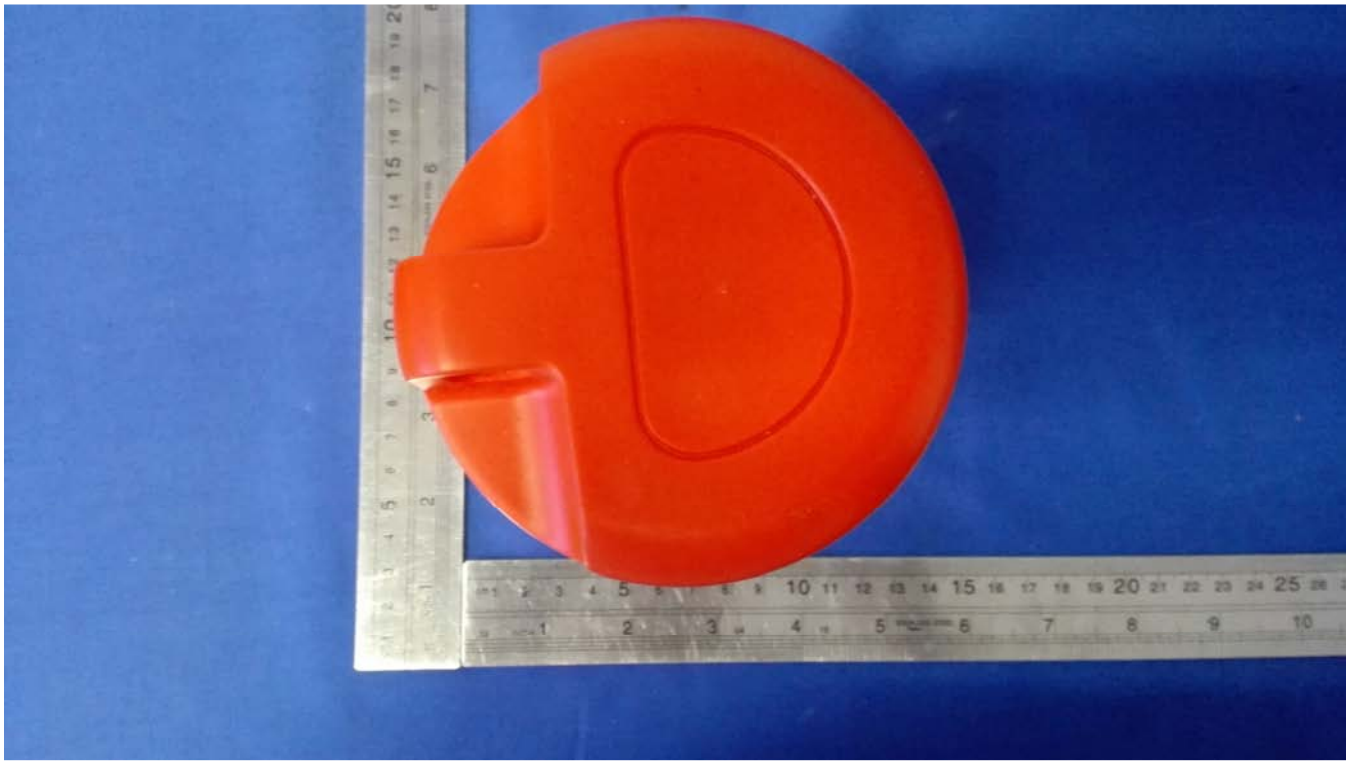
Conducted Emission

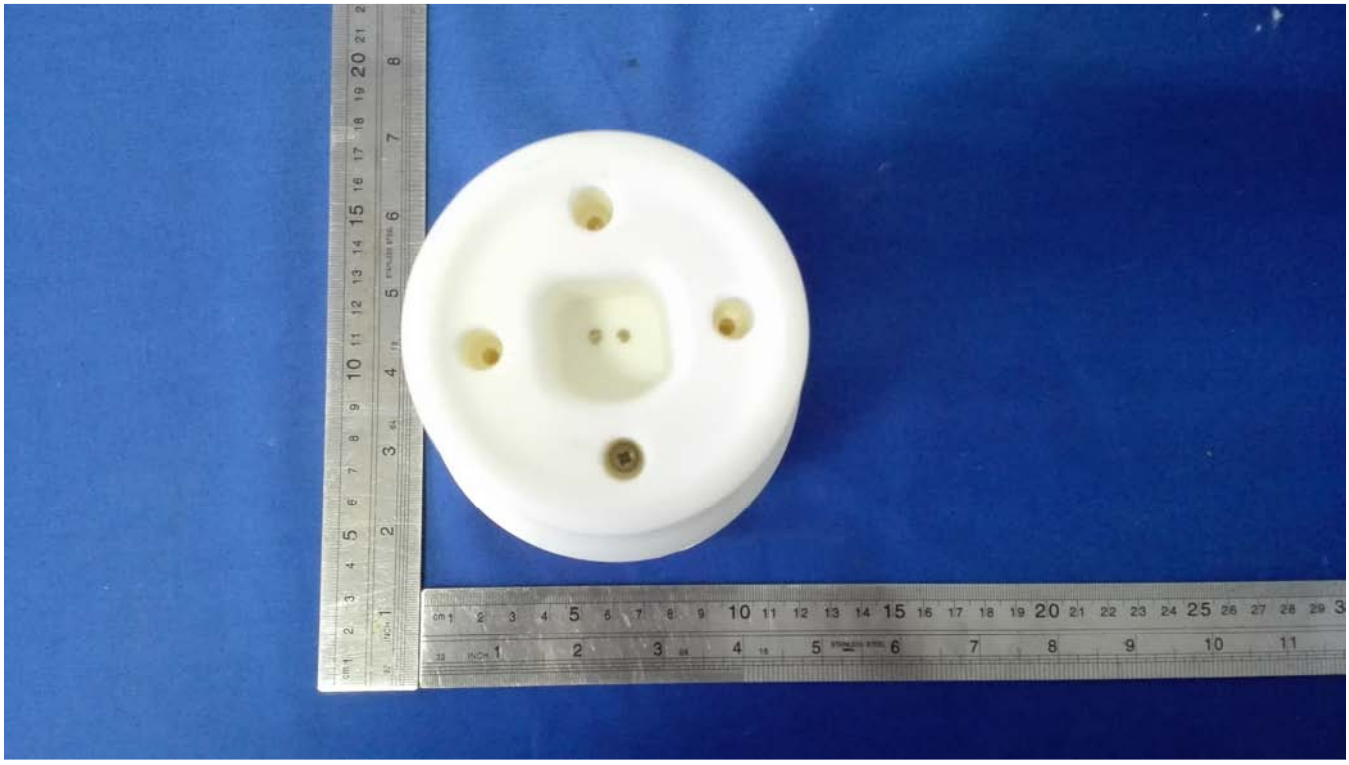


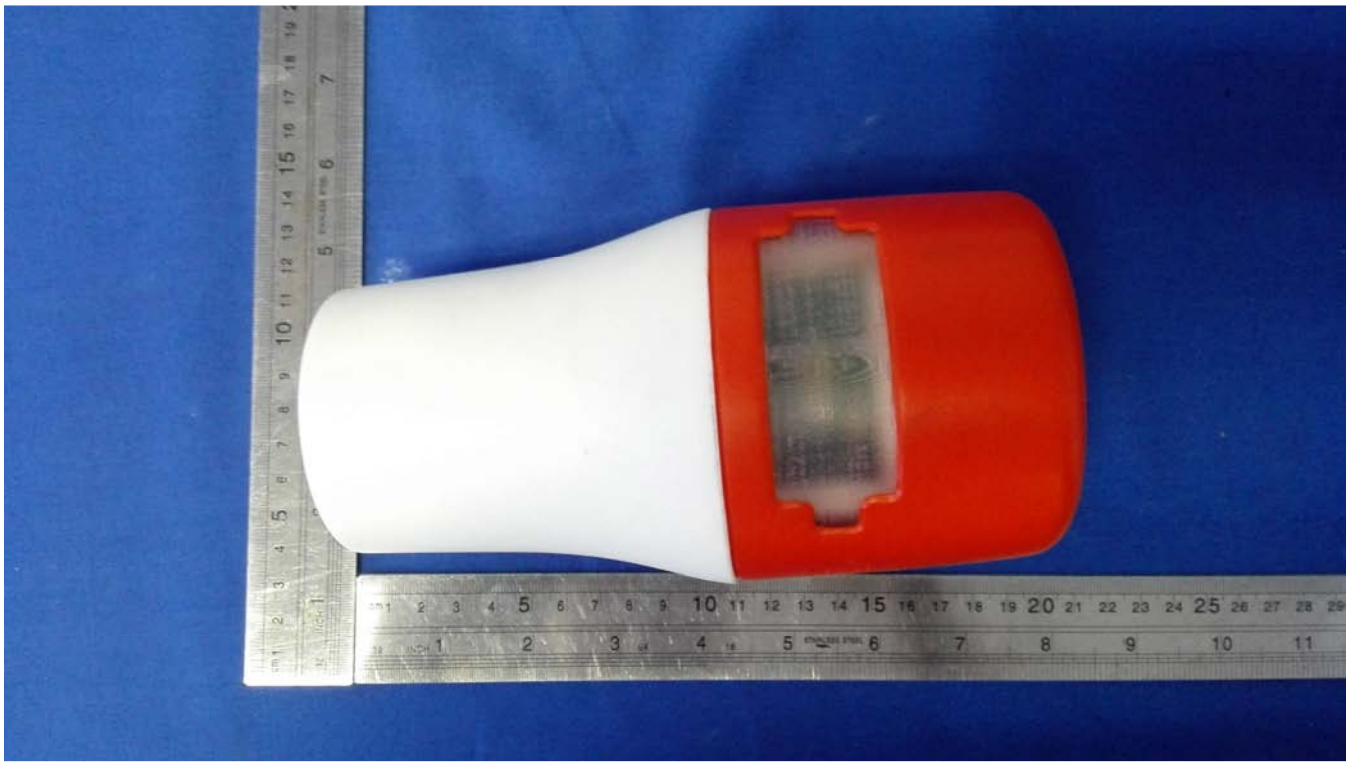
Radiated Emission Test

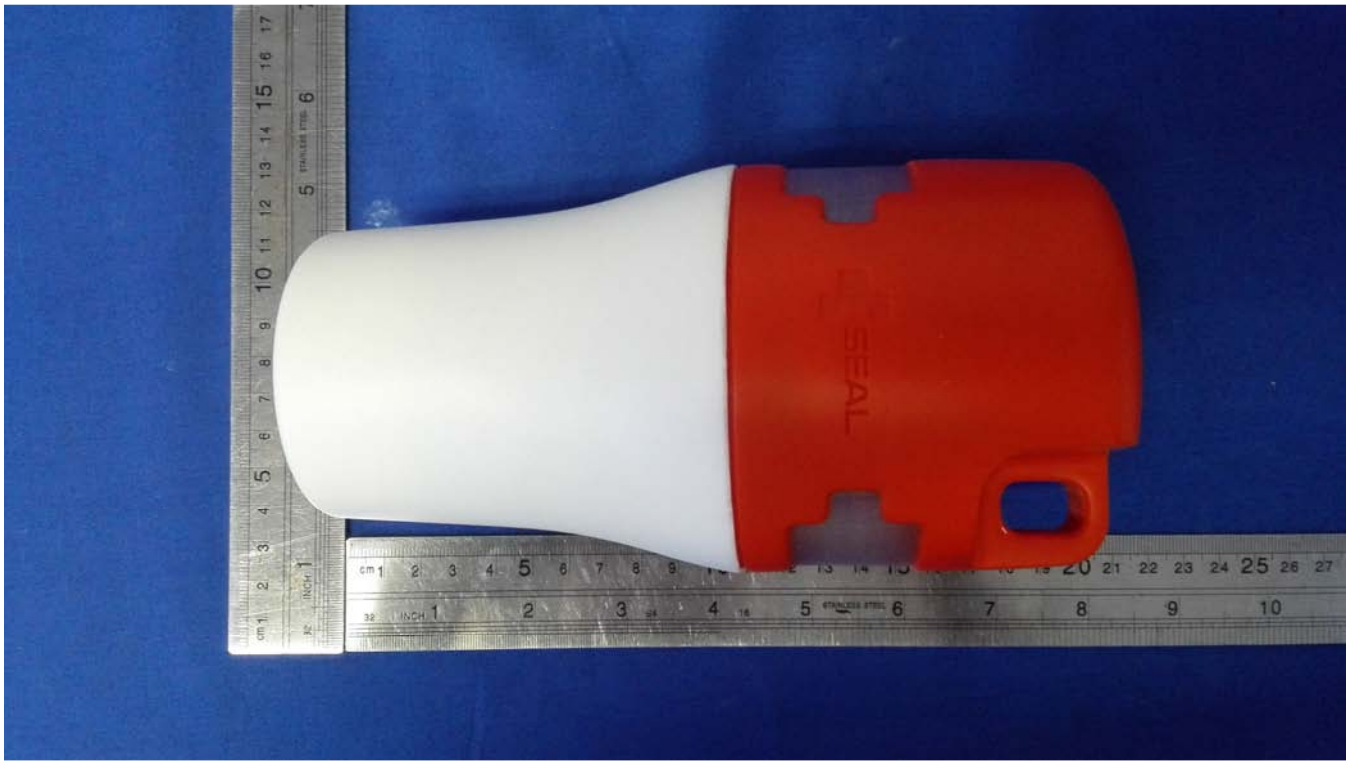


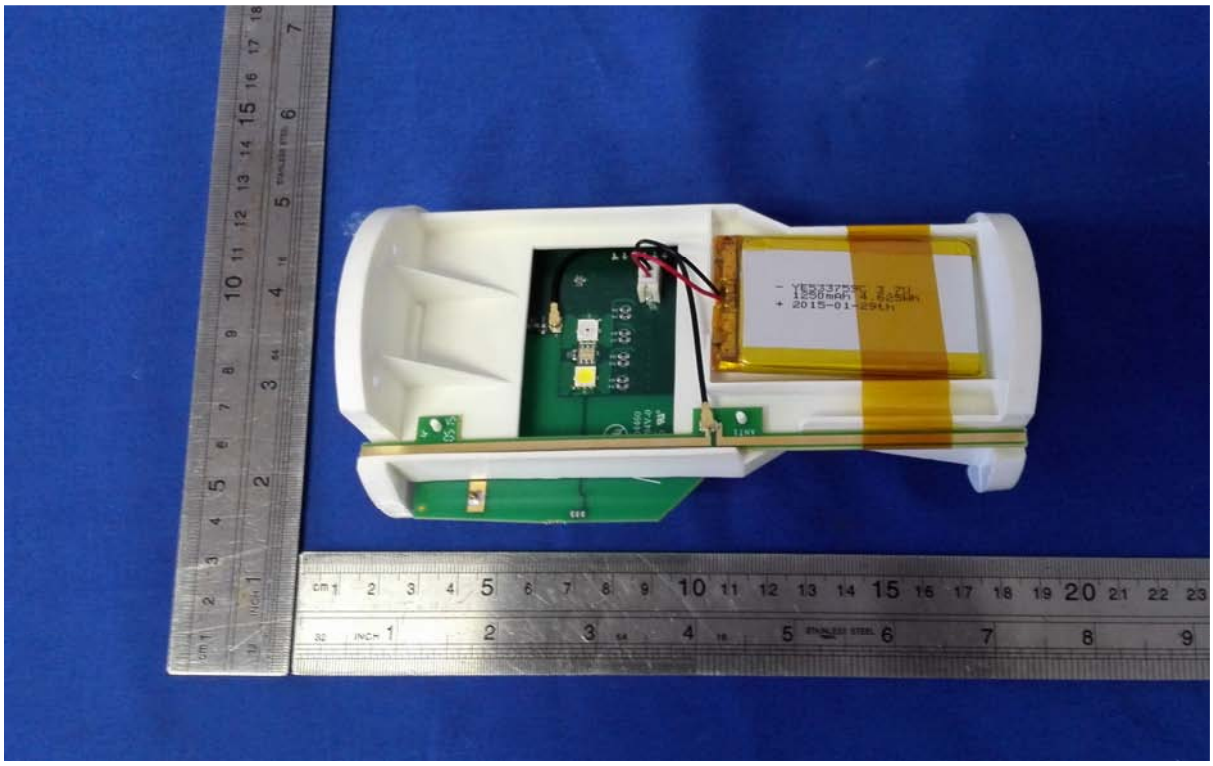
8. PHOTOGRAPHS OF THE EUT

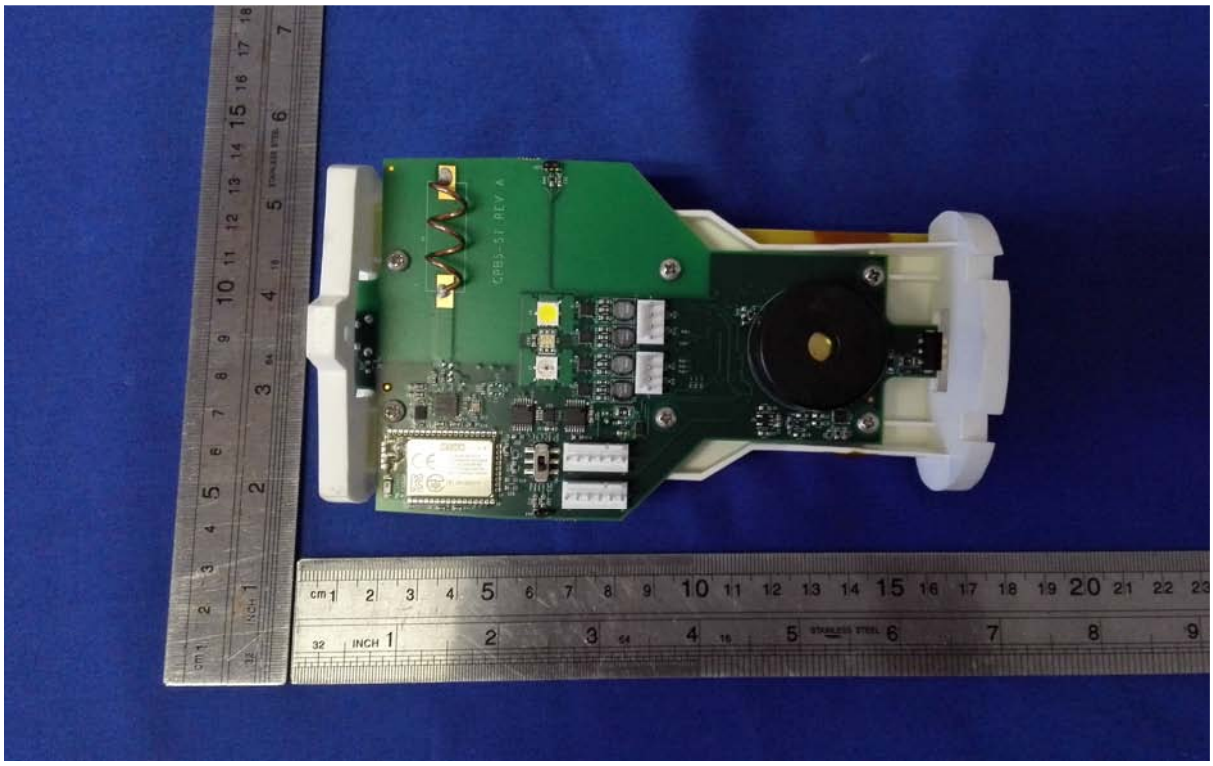


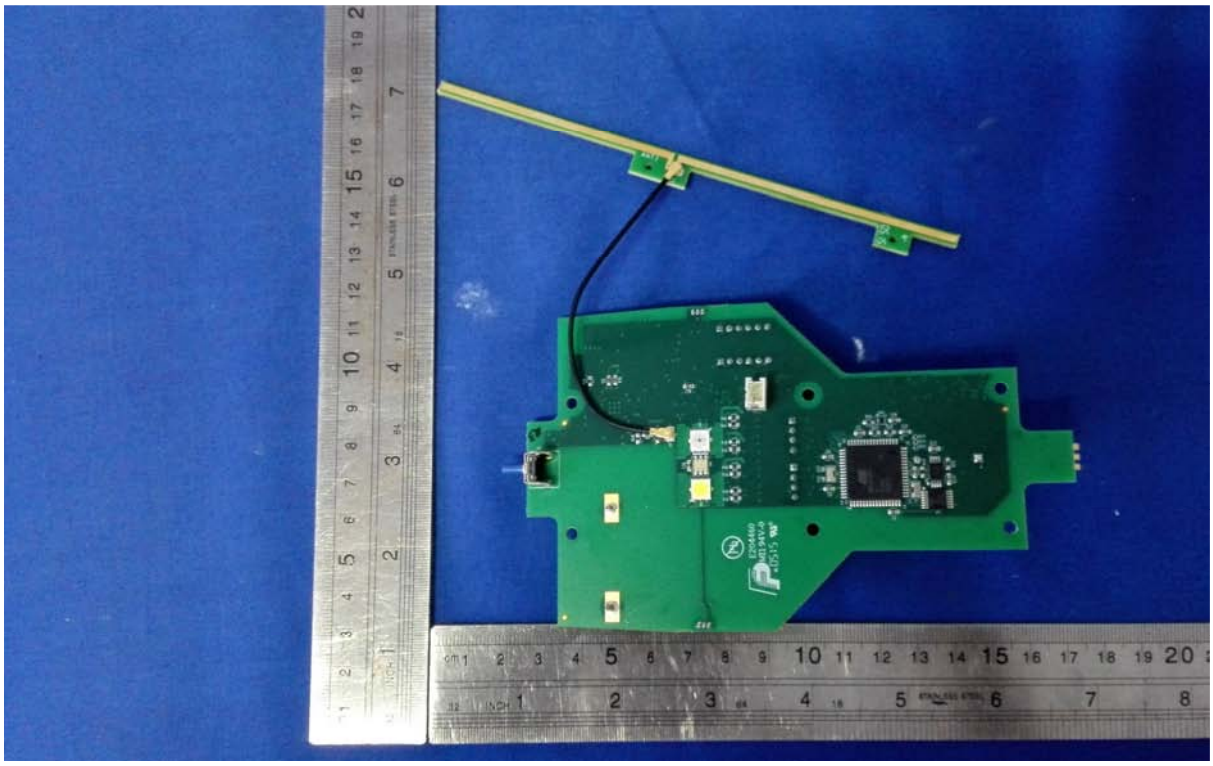


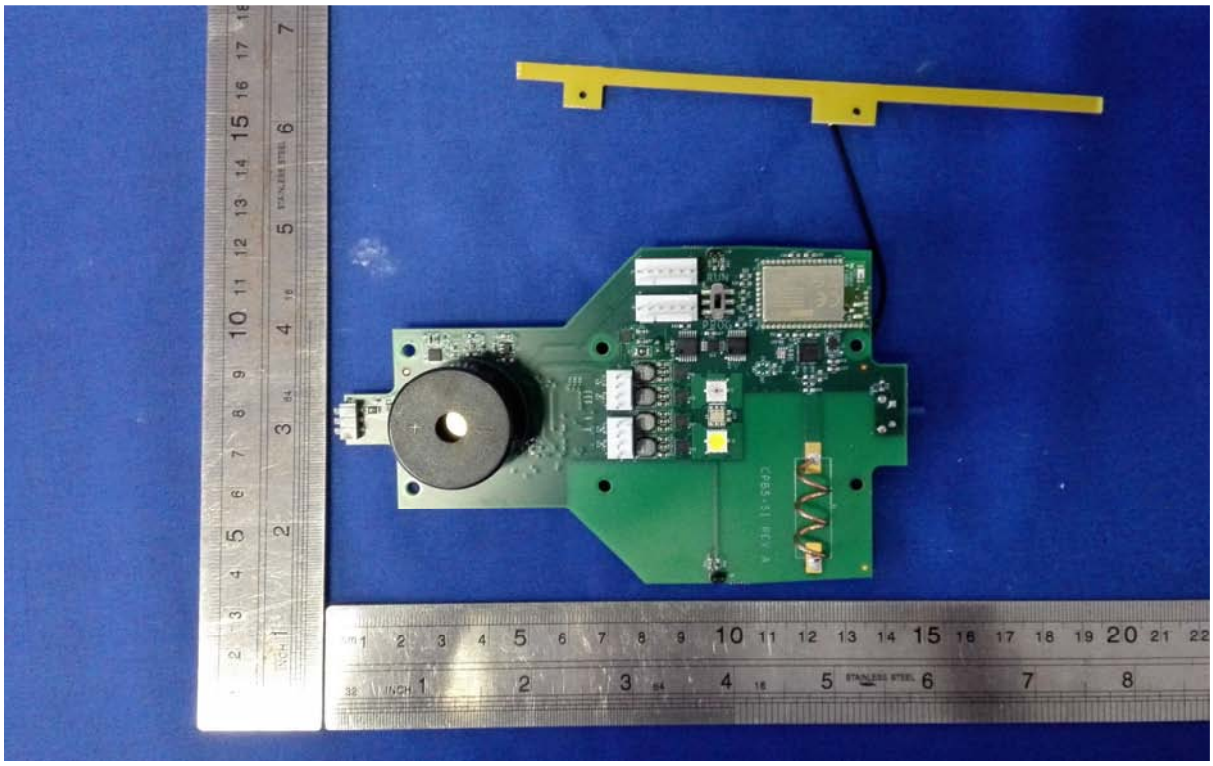



SEAL










- YE533759C 3.7V
1250mAh 4.625Wh
+ 2015-01-29th


TRIAD
P/N:WSU050-1500
MODEL:WSU050-1500
INPUT:100-240V~50/60Hz
0.2A MAX
OUTPUT:5.0V⎓1.5A
3KSG
E345519
LISTED
I.T.E. POWER SUPPLY
MADE IN CHINA
1425

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