



FCC REPORT

Applicant: Coros Wearables Inc.

Address of Applicant: No. 1844 GRAHAM LANE, SANTA CLARA, CA 95050

Equipment Under Test (EUT)

Product Name: Controller

Model No.: HA02-006

Trade Mark: 

FCC ID: 2AEHHHA02-006

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231:2015

Date of sample receipt: June 08, 2016

Date of Test: June 09-10, 2016

Date of report issued: June 15, 2016

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Lo

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of GTS or testing done by GTS in connection with, distribution or use of the product described in this report must be approved by GTS in writing.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

Version No.	Date	Description
00	June 15, 2016	Original

Prepared By:

Edward Pan

Date:

June 15, 2016

Project Engineer

Check By:

Andy Wu

Date:

June 15, 2016

Reviewer

3 Contents

	Page
1 COVER PAGE	1
2 VERSION	2
3 CONTENTS	3
4 TEST SUMMARY	4
5 GENERAL INFORMATION	5
5.1 CLIENT INFORMATION	5
5.2 GENERAL DESCRIPTION OF EUT	5
5.3 TEST MODE	6
5.4 TEST FACILITY.....	6
5.5 TEST LOCATION	6
5.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER.....	6
6 TEST INSTRUMENTS LIST	7
7 TEST RESULTS AND MEASUREMENT DATA.....	8
7.1 ANTENNA REQUIREMENT	8
7.2 RADIATED EMISSION METHOD	9
7.2.1 Field Strength of The Fundamental Signal	11
7.2.2 Spurious emissions.....	13
7.3 20dB OCCUPY BANDWIDTH	14
7.4 RELEASE TIME.....	15
8 TEST SETUP PHOTO	16
9 EUT CONSTRUCTIONAL DETAILS	17

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (b)	Pass
Spurious emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Release time	15.231 (a)(1)	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark: Test according to ANSI C63.10:2013 and ANSI C63.4:2014.

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	$\pm 4.34\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.24\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 4.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.45\text{dB}$	(1)

Note (1): The measurement uncertainty is for coverage factor of $k=2$ and a level of confidence of 95%.

5 General Information

5.1 Client Information

Applicant:	Coros Wearables Inc.
Address of Applicant:	No. 1844 GRAHAM LANE, SANTA CLARA, CA 95050
Manufacturer:	COROS WEARABLES INC.
Address of Manufacturer	No. 1844 GRAHAM LANE, SANTA CLARA, CA 95050

5.2 General Description of EUT

Product Name:	Controller
Model No.:	HA02-006
Operation Frequency:	433.92MHz
Modulation technology:	OOK
Antenna Type:	PCB antenna
Antenna gain:	3.0dBi
Power supply:	DC 3V SR2302

5.3 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
Remark: During the test, the New Battery was used.	

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	77.68	79.05	77.26

Final Test Mode:

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup”:

Y axis (see the test setup photo)

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 28, 2013.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, June 26, 2013.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China

Tel: 0755-27798480

Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

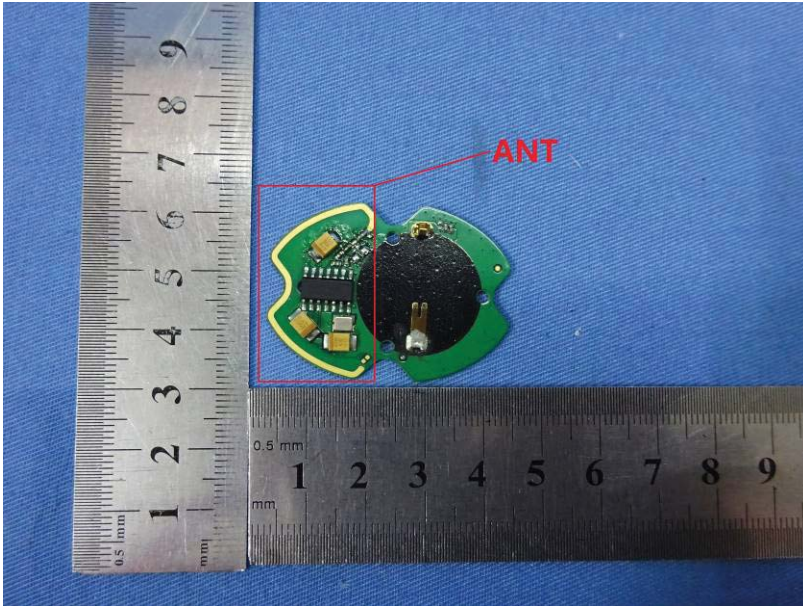
6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 27 2016	Mar. 27 2017
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	Dec. 03 2015	Dec. 02 2016
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jun. 30 2015	Jun. 29 2016
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 21 2016	Feb. 20 2017
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 26 2015	June 25 2016
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 27 2016	Mar. 27 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 27 2016	Mar. 27 2017
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 27 2016	Mar. 27 2017
11	Coaxial cable	GTS	N/A	GTS210	Mar. 27 2016	Mar. 27 2017
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 27 2016	Mar. 27 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jun. 30 2015	Jun. 29 2016
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jun. 30 2015	Jun. 29 2016
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 26 2015	June 25 2016
16	Band filter	Amindeon	82346	GTS219	Mar. 27 2016	Mar. 27 2017
17	D.C. Power Supply	Instek	PS-3030	GTS232	Mar. 27 2016	Mar. 27 2017
18	Thermo meter	KTJ	TA328	GTS256	Dec. 03 2015	Dec. 02 2016

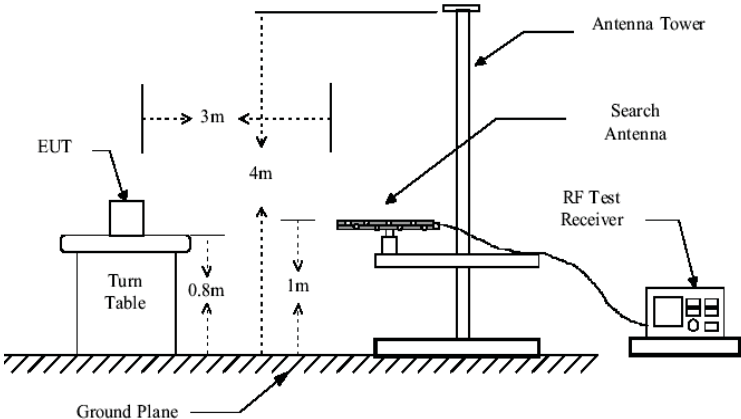
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	Barometer	ChangChun	DYM3	GTS257	July 07 2015	July 06 2016

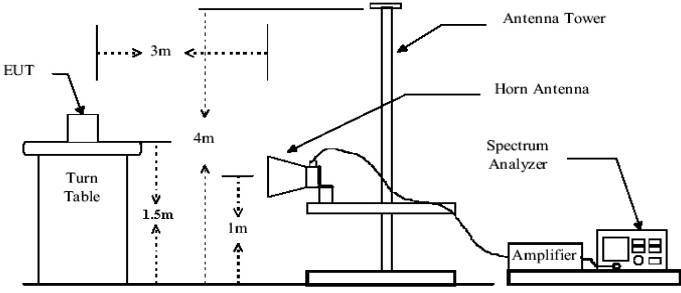
7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 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.	
E.U.T Antenna: The EUT make use of a PCB Antenna, the typical gain of the antenna is 3.0dBi.	
	

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	30MHz to 5000MHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit: (Field strength of the fundamental signal)	Frequency	Limit (dBuV/m @3m)		Remark	
	433.92MHz	80.80		Average Value	
		100.80		Peak Value	
Limit: (Spurious Emissions)	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.00		Quasi-peak Value	
	88MHz-216MHz	43.50		Quasi-peak Value	
	216MHz-960MHz	46.00		Quasi-peak Value	
	960MHz-1GHz	54.00		Quasi-peak Value	
	Above 1GHz	54.00		Average Value	
		74.00		Peak Value	
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.					
Test setup:	Below 1GHz				
					
Above 1GHz					

	 The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a Turn Table. The Turn Table is positioned 3m away from the Antenna Tower. The Antenna Tower has a Horn Antenna mounted on it. The Horn Antenna is positioned 4m above the ground. The EUT is positioned 1.5m above the ground. The Spectrum Analyzer is connected to the Antenna Tower via an Amplifier. The Spectrum Analyzer is positioned 1m above the ground.
Test Procedure:	1. During the test, the New Battery was used. 2. The EUT was placed on the top of a rotating table (0.8 meters below 1G and 1.5 meters above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 3. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 4. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 7. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:(RBW 300KHz, VBW 1MHz, Peak detector)

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.92	84.43	17.53	3.02	31.77	73.21	100.8	-27.59	Horizontal
433.92	90.27	17.53	3.02	31.77	79.05	100.8	-21.75	Vertical

Average value:

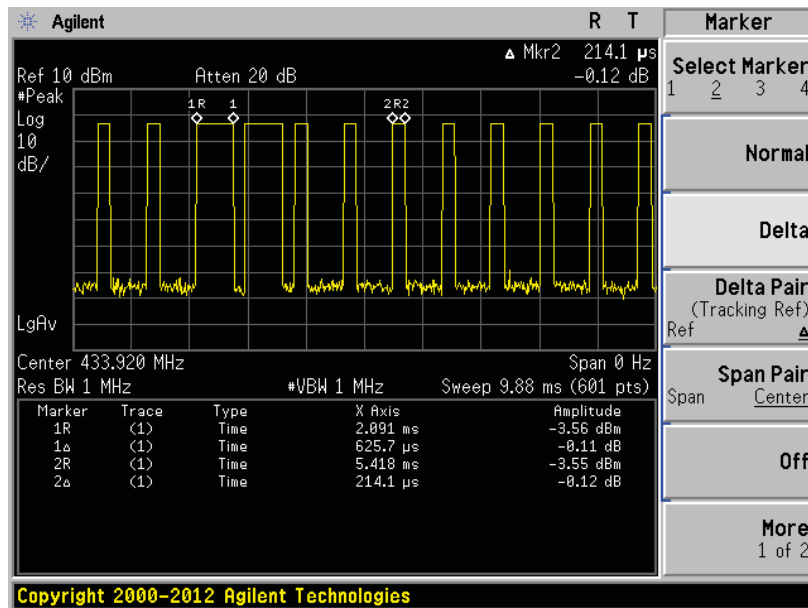
Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	73.21	-12.06	61.15	80.8	-19.65	Horizontal
433.92	79.05	-12.06	66.99	80.8	-13.81	Vertical

Average value:

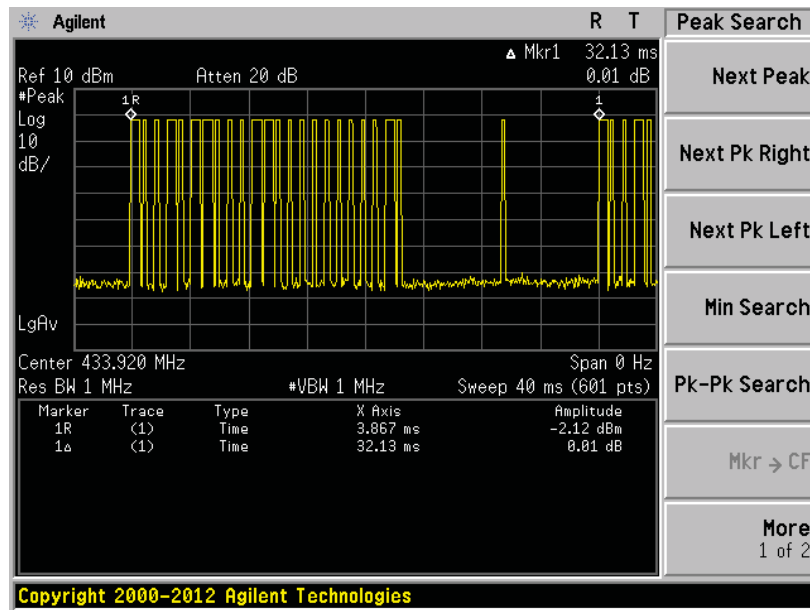
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time = 7*0.6257ms+17*0.2141ms=8.0196ms
	T period =32.13ms
	Duty cycle= 8.0196/32.1300=0.2496
	duty cycle factor=-12.06

Test plot as follows:

Ton time:



T period:



7.2.2 Spurious emissions

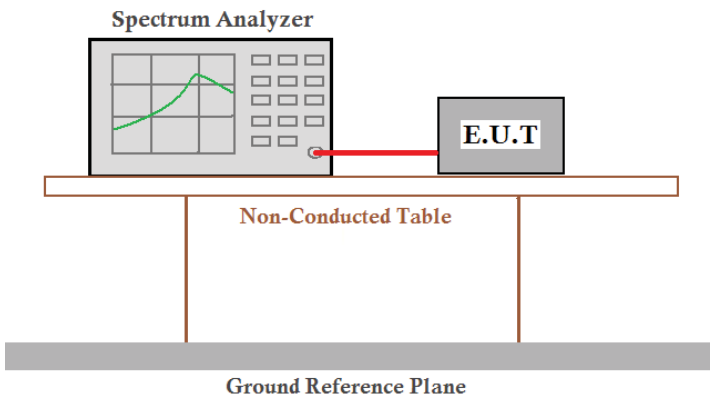
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
735.68	46.54	22.78	4.74	21.22	52.84	80.80	-27.96	Vertical
1456	34.98	25.33	4.65	33.53	31.43	80.80	-48.57	Vertical
1908	34.57	25.77	4.92	34.29	30.97	80.80	-49.03	Vertical
2504	34.84	27.56	5.49	33.9	33.99	80.80	-46.01	Vertical
3080	34.47	28.68	6.1	33.24	36.01	80.80	-47.99	Vertical
3764	31.22	29.32	7.46	32.44	35.56	80.80	-48.44	Vertical
765.36	46.55	22.78	4.74	21.22	52.84	80.80	-27.96	Horizontal
1500	35.72	25.22	4.68	33.59	32.03	80.80	-47.97	Horizontal
1972	36.23	26.01	4.95	34.4	32.79	80.80	-47.21	Horizontal
2552	35.34	27.62	5.54	33.84	34.66	80.80	-45.34	Horizontal
3128	35.23	28.82	6.21	33.18	37.08	80.80	-46.92	Horizontal
3800	30.58	29.37	7.52	32.4	35.07	80.80	-48.93	Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. Average value = Peak value + Duty cycle factor

7.3 20dB Occupy Bandwidth

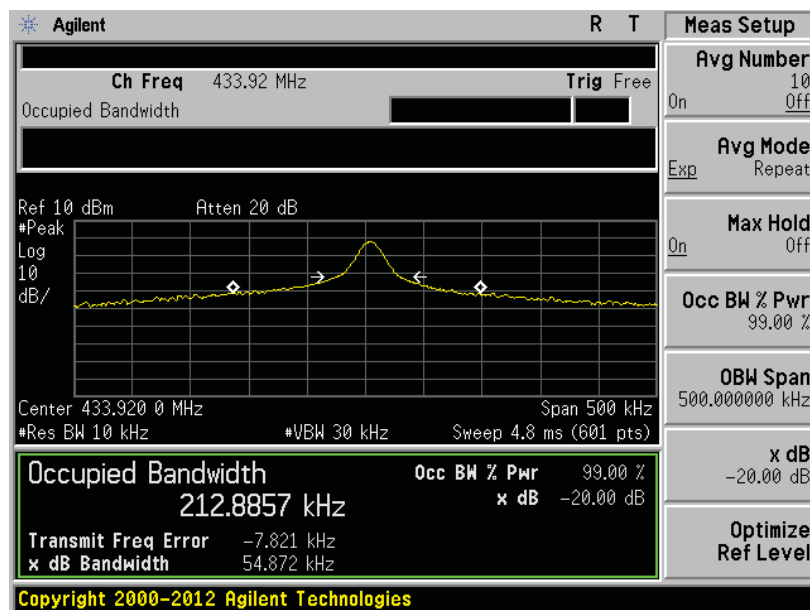
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10 2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

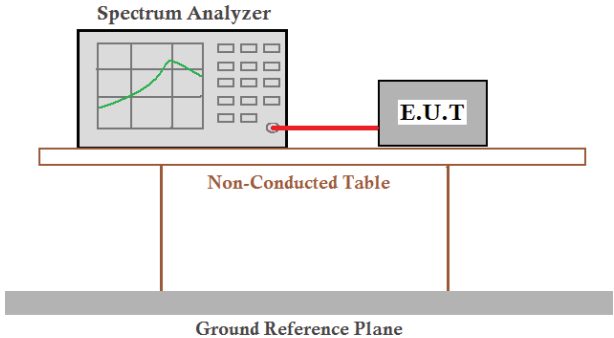
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
433.92	0.0549	1.0848 MHz	Pass

Note: Limit= Fundamental frequency $\times$ 0.25%=433.92 $\times$ 0.25%=1.0848MHz

Test plot as follows:



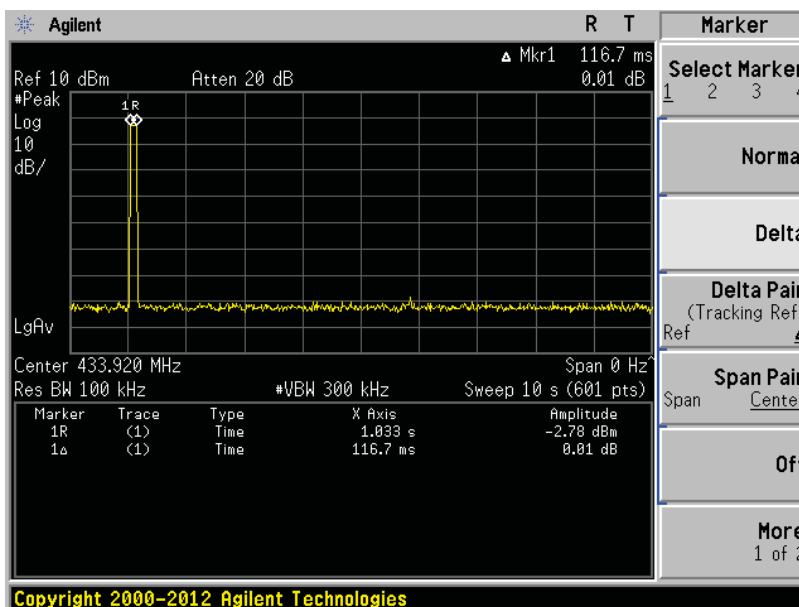
7.4 Release time

Test Requirement:	FCC Part15 C Section 15.231 (a)(1)
Test Method:	ANSI C63.10 2013
Receiver setup:	RBW=100KHz, VBW=300KHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass
Product Description:	It is a manually operated transmitter.

Measurement data:

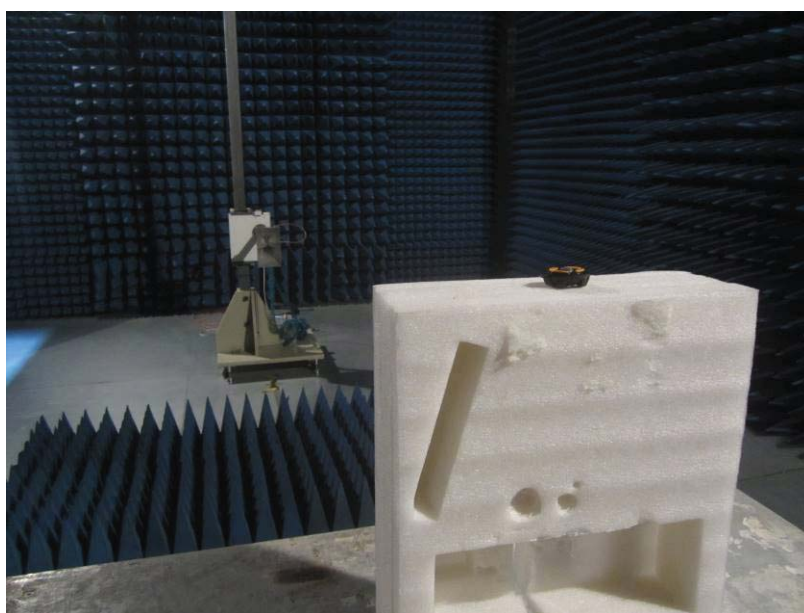
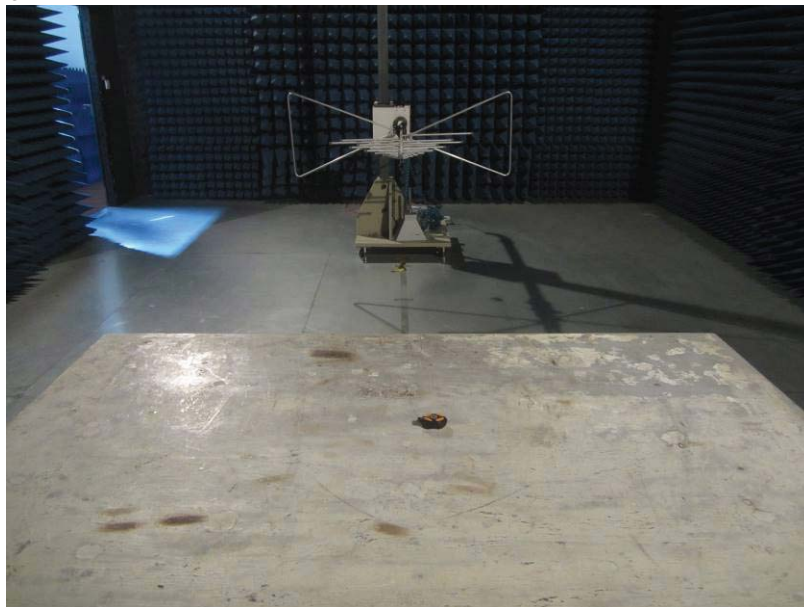
Release time (second)	Limit (second)	Result
0.1167	<5.0	Pass

Test plot as follows:



8 Test Setup Photo

Radiated Emission



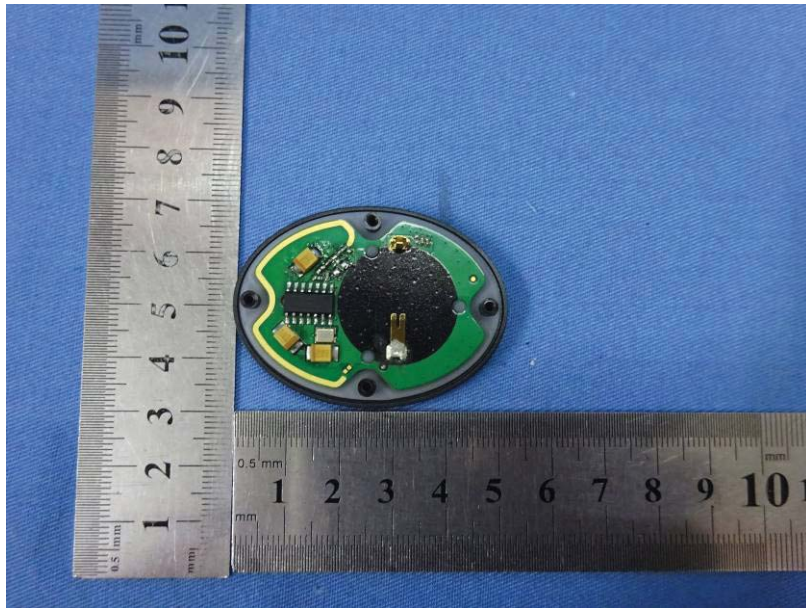
9 EUT Constructional Details

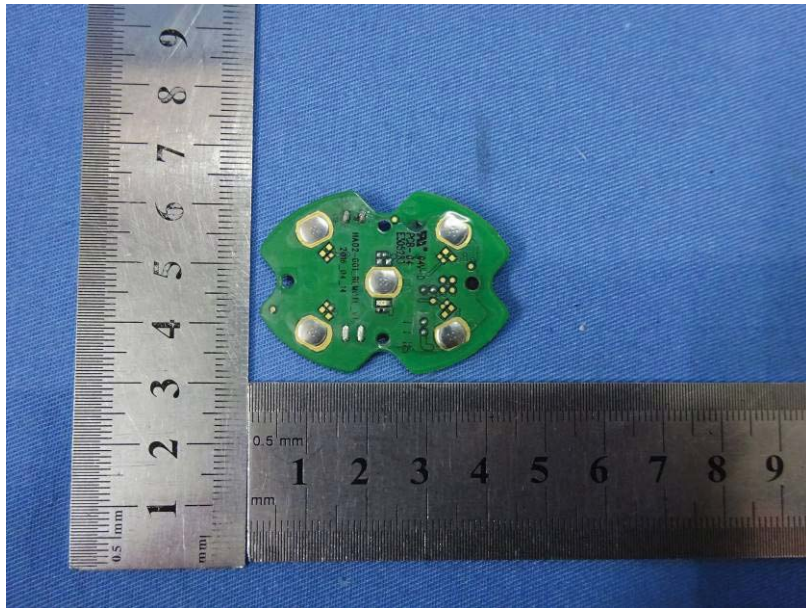
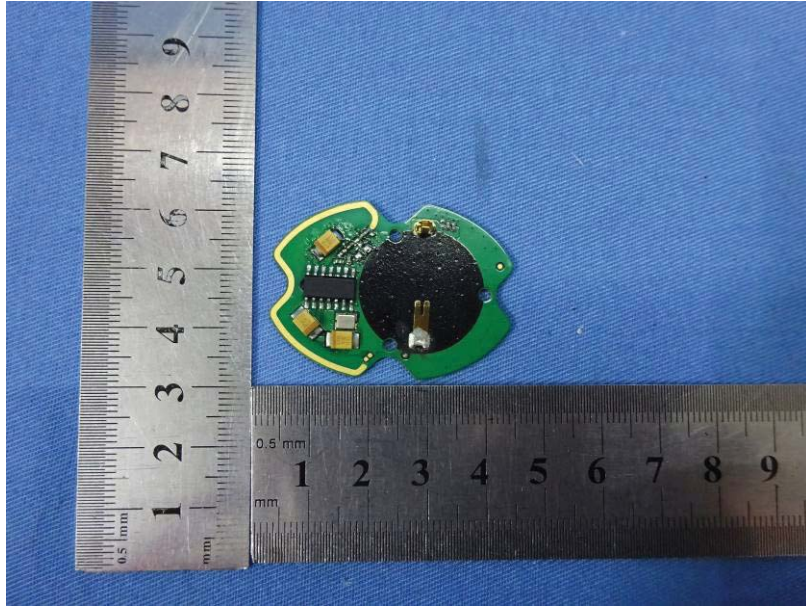












----- end -----