

## TEST REPORT

**Product** : SensePeanut  
**Trade mark** : N/A  
**Model/Type reference** : PEA001  
**Serial Number** : N/A  
**Report Number** : EED32I00158101  
**FCC ID** : 2ABGNPEA001  
**Date of Issue** : Jun. 15, 2016  
**Test Standards** : 47 CFR Part 15 Subpart C (2015)  
**Test result** : PASS

Prepared for:

**Sen.se**

**34 avenue des Champs Elysees 75008 Paris-France**

Prepared by:

**Centre Testing International (Shenzhen) Corporation**

**Hongwei Industrial Zone, Bao'an 70 District,**

**Shenzhen, Guangdong, China**

**TEL: +86-755-3368 3668**

**FAX: +86-755-3368 3385**

Compiled by:

*Kevin Lan*

Reviewed by:

*Emen - Li*

Approved by:

*Sheek, Luo*

Date:

Jun. 15, 2016

Sheek Luo

Lab supervisor

Check No.: 2402652349



## 2 Version

Version No.	Date	Description
00	Jun. 15, 2016	Original

<b>Tested By:</b>	<i>Tom - chen</i> Tom chen (Test Project)	<b>Data:</b>	May 26, 2016
<b>Prepared By:</b>	<i>Kevin Yan</i> Kevin Ian (Project Engineer)	<b>Data:</b>	Jun. 15, 2016
<b>Checked By:</b>	<i>Emen - Li</i> Emen Li (Reviewer)	<b>Data:</b>	Jun. 15, 2016

### 3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10-2013	N/A
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013/ KDB 558074 D01v03r05	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013/ KDB 558074 D01v03r05	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01v03r05	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v03r05	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v03r05	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013 & KDB 558074 D01v03r05.

The tested samples and the sample information are provided by the client.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radiated Frequency.

CH: In this whole report CH means channel.

Volt: In this whole report Volt means Voltage.

Temp: In this whole report Temp means Temperature.

Humid: In this whole report Humid means humidity.

Press: In this whole report Press means Pressure.

N/A: In this whole report not application.

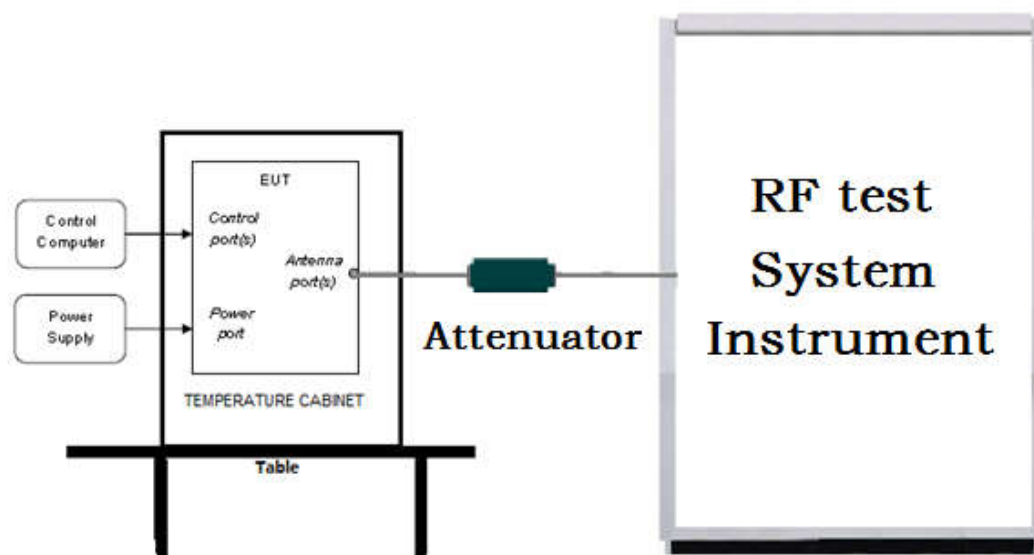
## 4 Content

<b>1 COVER PAGE</b>	<b>1</b>
<b>2 VERSION</b>	<b>2</b>
<b>3 TEST SUMMARY</b>	<b>3</b>
<b>4 CONTENT</b>	<b>4</b>
<b>5 TEST REQUIREMENT</b>	<b>5</b>
5.1 TEST SETUP	5
5.1.1 For Conducted test setup	5
5.1.2 For Radiated Emissions test setup	5
5.1.3 For Conducted Emissions test setup	6
5.2 TEST ENVIRONMENT	6
5.3 TEST CONDITION	6
<b>6 GENERAL INFORMATION</b>	<b>7</b>
6.1 CLIENT INFORMATION	7
6.2 GENERAL DESCRIPTION OF EUT	7
6.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	7
6.4 DESCRIPTION OF SUPPORT UNITS	8
6.5 TEST LOCATION	8
6.6 TEST FACILITY	8
6.7 DEVIATION FROM STANDARDS	9
6.8 ABNORMALITIES FROM STANDARD CONDITIONS	9
6.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER	9
6.10 MEASUREMENT UNCERTAINTY(95% CONFIDENCE LEVELS, $k=2$ )	9
<b>7 EQUIPMENT LIST</b>	<b>10</b>
<b>8 RADIO TECHNICAL REQUIREMENTS SPECIFICATION</b>	<b>12</b>
Appendix A): 6dB Occupied Bandwidth	13
Appendix B): Conducted Peak Output Power	15
Appendix C): Band-edge for RF Conducted Emissions	17
Appendix D): RF Conducted Spurious Emissions	18
Appendix E): Power Spectral Density	21
Appendix F): Antenna Requirement	23
Appendix G): Restricted bands around fundamental frequency (Radiated)	24
Appendix H): Radiated Spurious Emissions	26
<b>PHOTOGRAPHS OF TEST SETUP</b>	<b>31</b>
<b>PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS</b>	<b>32</b>

## 5 Test Requirement

### 5.1 Test setup

#### 5.1.1 For Conducted test setup



#### 5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

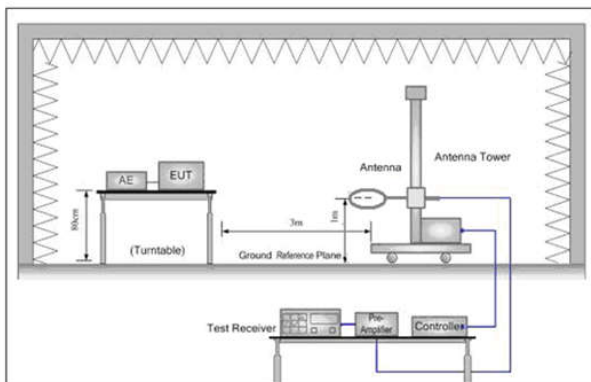


Figure 1. Below 30MHz

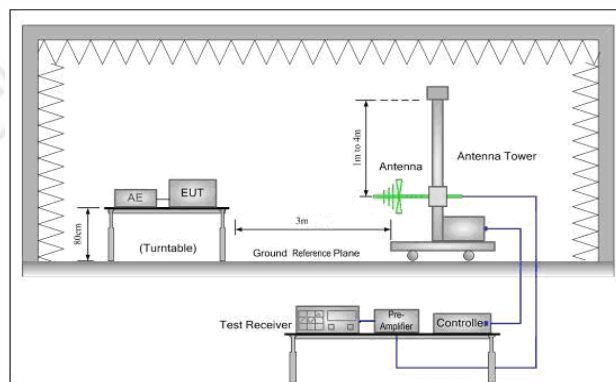


Figure 2. 30MHz to 1GHz

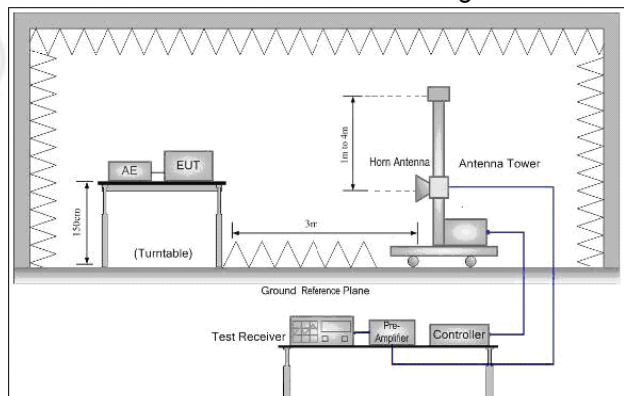
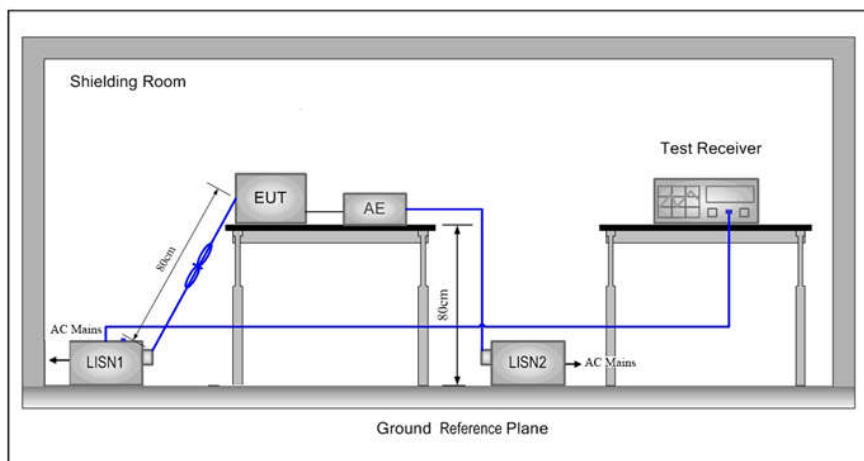


Figure 3. Above 1GHz



### 5.1.3 For Conducted Emissions test setup

#### Conducted Emissions setup



## 5.2 Test Environment

Operating Environment:	
Temperature:	25 °C
Humidity:	48% RH
Atmospheric Pressure:	1010mbar

## 5.3 Test Condition

Test channel:

Test Mode	Tx	RF Channel		
		Low(L)	Middle(M)	High(H)
GFSK	2402MHz ~2480 MHz	Channel 1	Channel 20	Channel40
		2402MHz	2440MHz	2480MHz
Transmitting mode:	Keep the EUT transmitted the continuous modulation test signal at the specific channel(s).			

## 6 General Information

### 6.1 Client Information

Applicant:	Sen.se
Address of Applicant:	34 avenue des Champs Elysees 75008 Paris-France
Manufacturer:	ABO Electronics
Address of Manufacturer:	Unit 201-202, Wang Rong Ind Park, 99 ind Zone Minzhu, Shajing, Baoan, Shenzhen
Factory:	ARTech
Address of Factory:	Room2011, Gongle Business Center, Gonghe Ind Road Xixiang, Baoan, Shenzhen

### 6.2 General Description of EUT

Product Name:	SensePeanut
Model No.(EUT):	PEA001
Trade mark:	N/A
EUT Supports Radios application:	2402MHz ~2480MHz
Power Supply:	LITHIUM BATTERY:1x3V(CR2032H)=3V
Sample Received Date:	May 26, 2016
Sample tested Date:	May 26, 2016 to Jun. 15, 2016

### 6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz						
Bluetooth Version:	4.1						
Modulation Type:	GFSK						
Number of Channel:	40						
Sample Type:	Portable production						
Test Power Grade:	N/A(manufacturer declare)						
Test Software of EUT:	N/A(manufacturer declare)						
Hardware Version:	1.0(manufacturer declare)						
Software Version:	1.0(manufacturer declare)						
Antenna Type and Gain::	Type: Monopole PCB antenna Gain: 1.6dBi						
Test Voltage:	LITHIUM BATTERY:1x3V(CR2032H)=3V						
Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	11	2422MHz	21	2442MHz	31	2462MHz
2	2404MHz	12	2424MHz	22	2444MHz	32	2464MHz
3	2406MHz	13	2426MHz	23	2446MHz	33	2466MHz
4	2408MHz	14	2428MHz	24	2448MHz	34	2468MHz
5	2410MHz	15	2430MHz	25	2450MHz	35	2470MHz

6	2412MHz	16	2432MHz	26	2452MHz	36	2472MHz
7	2414MHz	17	2434MHz	27	2454MHz	37	2474MHz
8	2416MHz	18	2436MHz	28	2456MHz	38	2476MHz
9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

## 6.4 Description of Support Units

The EUT has been tested independently.

## 6.5 Test Location

All tests were performed at:

Centre Testing International (Shenzhen) Corporation

Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

## 6.6 Test Facility

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

### FCC-Registration No.: 886427

Centre Testing International (Shenzhen) Corporation. 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 our files. Registration 886427.

### IC-Registration No.: 7408A-2

The 3m Alternate Test Site of Centre Testing International (Shenzhen) Corporation. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408A-2 .

### IC-Registration No.: 7408B-1

The 10m Alternate Test Site of Centre Testing International (Shenzhen) Corporation., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408B-1.

### NEMKO-Aut. No.: ELA503

Centre Testing International Group Co., Ltd. has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10.

### VCCI

The Radiation 3 & 10 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-4096.



Main Ports Conducted Interference Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-4563. Telecommunication Ports Conducted Disturbance Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-2146.

The Radiation 3 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-758

## 6.7 Deviation from Standards

None.

## 6.8 Abnormalities from Standard Conditions

None.

## 6.9 Other Information Requested by the Customer

None.

## 6.10 Measurement Uncertainty(95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	$7.9 \times 10^{-8}$
2	RF power, conducted	0.31dB (30MHz-1GHz)
		0.57dB(1GHz-18GHz)
3	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB(1GHz-12.75GHz)
4	Conduction emission	3.6dB (9kHz to 150kHz)
		3.2dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	2.8%
7	DC power voltages	0.025%

## 7 Equipment List

RF test system					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. Date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Signal Generator	Keysight	E8257D	MY53401106	04-01-2016	03-31-2017
Communication test set test set	Agilent	N4010A	MY51400230	04-01-2016	03-31-2017
Spectrum Analyzer	Keysight	N9010A	MY54510339	04-01-2016	03-31-2017
Signal Generator	Keysight	N5182B	MY53051549	04-01-2016	03-31-2017
High-pass filter(3-18GHz)	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-12-2016	01-11-2017
High-pass filter(6-18GHz)	MICRO-TRONICS	SPA-F-63029-4	---	01-12-2016	01-11-2017
band rejection filter (GSM900)	Sinoscite	FL5CX01CA09C L12-0395-001	---	01-12-2016	01-11-2017
band rejection filter (GSM850)	Sinoscite	FL5CX01CA08C L12-0393-001	---	01-12-2016	01-11-2017
band rejection filter (GSM1800)	Sinoscite	FL5CX02CA04C L12-0396-002	---	01-12-2016	01-11-2017
band rejection filter (GSM1900)	Sinoscite	FL5CX02CA03C L12-0394-001	---	01-12-2016	01-11-2017
DC Power	Keysight	E3642A	MY54436035	04-01-2016	03-31-2017
PC-1	Lenovo	R4960d	---	04-01-2016	03-31-2017
BT&WI-FI Automatic control	R&S	OSP120	101374	04-01-2016	03-31-2017
RF control unit	JS Tonscend	JS0806-2	158060006	04-01-2016	03-31-2017
BT&WI-FI Automatic test software	JS Tonscend	JS1120-2	---	04-01-2016	03-31-2017

3M Semi/full-anechoic Chamber					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-02-2013	06-01-2016
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-01-2016	05-31-2019
TRILOG Broadband Antenna	SCHWARZBEC K	VULB9163	9163-484	05-23-2016	05-22-2017
Microwave Preamplifier	Agilent	8449B	3008A02425	02-04-2016	02-03-2017
Horn Antenna	ETS-LINDGREN	3117	00057410	06-30-2015	06-28-2018
Horn Antenna	A.H.SYSTEMS	SAS-574	374	06-30-2015	06-29-2016
Loop Antenna	ETS	6502	00071730	07-30-2015	07-28-2017
Spectrum Analyzer	R&S	FSP40	100416	06-30-2015	06-28-2016
Receiver	R&S	ESCI	100435	06-30-2015	06-28-2016
Multi device Controller	maturo	NCD/070/10711 112	---	01-12-2016	01-11-2017
LISN	schwarzbeck	NNBM8125	81251547	06-30-2015	06-28-2016
LISN	schwarzbeck	NNBM8125	81251548	06-30-2015	06-28-2016
Signal Generator	Agilent	E4438C	MY45095744	04-01-2016	03-31-2017
Signal Generator	Keysight	E8257D	MY53401106	04-01-2016	03-31-2017
Temperature/ Humidity Indicator	TAYLOR	1451	1905	07- 08-2015	07-06-2016
Communication test set	Agilent	E5515C	GB47050534	04-01-2016	03-31-2017
Cable line	Fulai(7M)	SF106	5219/6A	01-12-2016	01-11-2017
Cable line	Fulai(6M)	SF106	5220/6A	01-12-2016	01-11-2017
Cable line	Fulai(3M)	SF106	5216/6A	01-12-2016	01-11-2017
Cable line	Fulai(3M)	SF106	5217/6A	01-12-2016	01-11-2017
Communication test set	R&S	CMW500	152394	04-01-2016	03-31-2017
High-pass filter(3-18GHz)	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-12-2016	01-11-2017
High-pass filter(6-18GHz)	MICRO-TRONICS	SPA-F-63029-4	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX01CA09 CL12-0395-001	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX01CA08 CL12-0393-001	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX02CA04 CL12-0396-002	---	01-12-2016	01-11-2017
band rejection filter	Sinoscite	FL5CX02CA03 CL12-0394-001	---	01-12-2016	01-11-2017

## 8 Radio Technical Requirements Specification

### Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C (2015)	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

### Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10/ KDB 558074	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10/ KDB 558074	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10/ KDB 558074	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10/ KDB 558074	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10/ KDB 558074	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	N/A	N/A
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix H)

## Appendix A): 6dB Occupied Bandwidth

### Test Result

Mode	Channel	6dB Bandwidth [MHz]	99% OBW[MHz]	Verdict	Remark
BLE	LCH	0.7062	1.0947	PASS	Peak detector
BLE	MCH	0.7149	1.0920	PASS	
BLE	HCH	0.7093	1.0938	PASS	



## Test Graphs

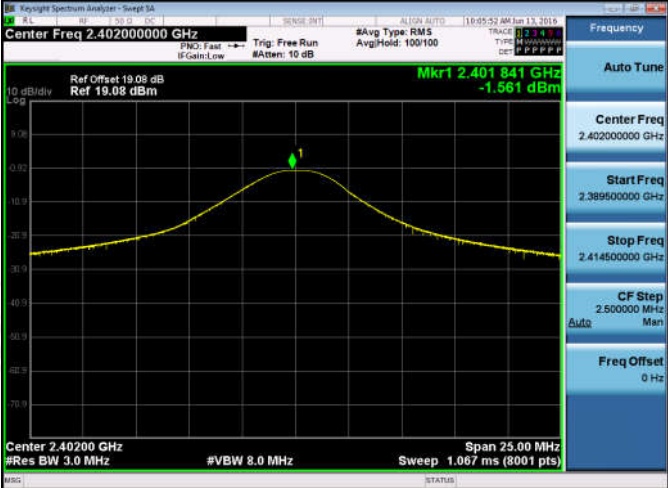
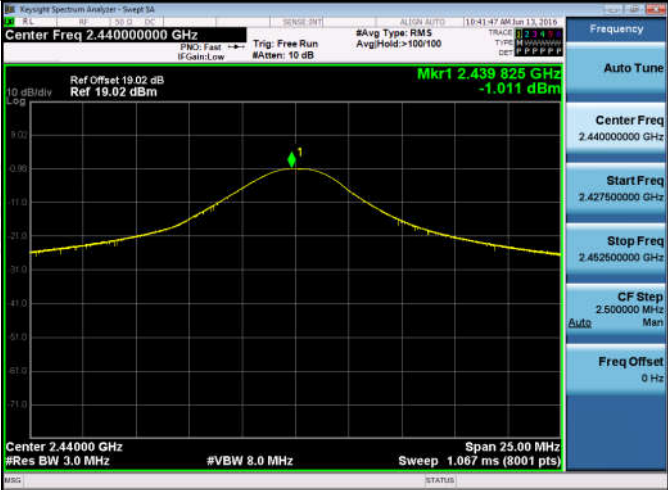

Graphs	
LCH	 <p>Keygraph Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.402000000 GHz</p> <p>Ref Offset 19.08 dB Ref 10.00 dBm</p> <p>Center 2.402 GHz #Res BW 100 kHz</p> <p>Occupied Bandwidth: 1.0947 MHz</p> <p>Total Power: 4.91 dBm</p> <p>Transmit Freq Error: 16.498 kHz</p> <p>x dB Bandwidth: 706.2 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB: -6.00 dB</p>
MCH	 <p>Keygraph Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.440000000 GHz</p> <p>Ref Offset 19.02 dB Ref 10.00 dBm</p> <p>Center 2.44 GHz #Res BW 100 kHz</p> <p>Occupied Bandwidth: 1.0920 MHz</p> <p>Total Power: 5.41 dBm</p> <p>Transmit Freq Error: 9.978 kHz</p> <p>x dB Bandwidth: 714.9 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB: -6.00 dB</p>
HCH	 <p>Keygraph Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.480000000 GHz</p> <p>Ref Offset 19.05 dB Ref 10.00 dBm</p> <p>Center 2.48 GHz #Res BW 100 kHz</p> <p>Occupied Bandwidth: 1.0938 MHz</p> <p>Total Power: 1.28 dBm</p> <p>Transmit Freq Error: 12.951 kHz</p> <p>x dB Bandwidth: 709.3 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB: -6.00 dB</p>

## Appendix B): Conducted Peak Output Power

### Test Result

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	-1.561	PASS
BLE	MCH	-1.011	PASS
BLE	HCH	-5.125	PASS

## Test Graphs

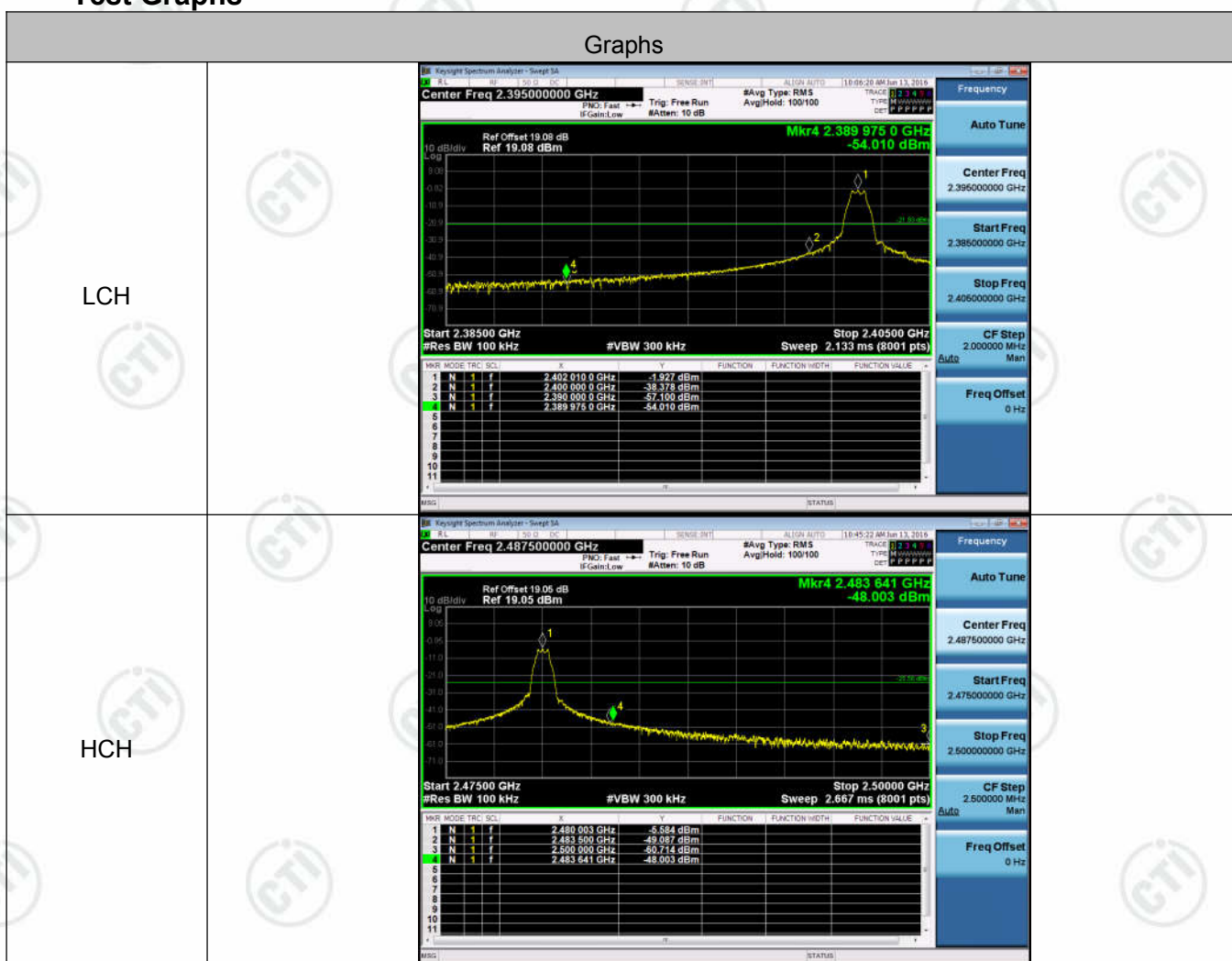
Graphs	
LCH	 <p>Keygraph Spectrum Analyzer - Sweep SA Center Freq 2.402000000 GHz Ref Offset 19.08 dB Ref 19.08 dBm Mkr1 2.401841 GHz -1.561 dBm Center 2.40200 GHz #Res BW 3.0 MHz #VBW 8.0 MHz Sweep 1.067 ms (8001 pts) Span 25.00 MHz</p>
MCH	 <p>Keygraph Spectrum Analyzer - Sweep SA Center Freq 2.440000000 GHz Ref Offset 19.02 dB Ref 19.02 dBm Mkr1 2.439825 GHz -1.011 dBm Center 2.44000 GHz #Res BW 3.0 MHz #VBW 8.0 MHz Sweep 1.067 ms (8001 pts) Span 25.00 MHz</p>
HCH	 <p>Keygraph Spectrum Analyzer - Sweep SA Center Freq 2.480000000 GHz Ref Offset 19.05 dB Ref 19.05 dBm Mkr1 2.479838 GHz -5.125 dBm Center 2.48000 GHz #Res BW 3.0 MHz #VBW 8.0 MHz Sweep 1.067 ms (8001 pts) Span 25.00 MHz</p>

## Appendix C): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	-1.927	-54.010	-21.93	PASS
BLE	HCH	-5.584	-48.003	-25.58	PASS

Test Graphs



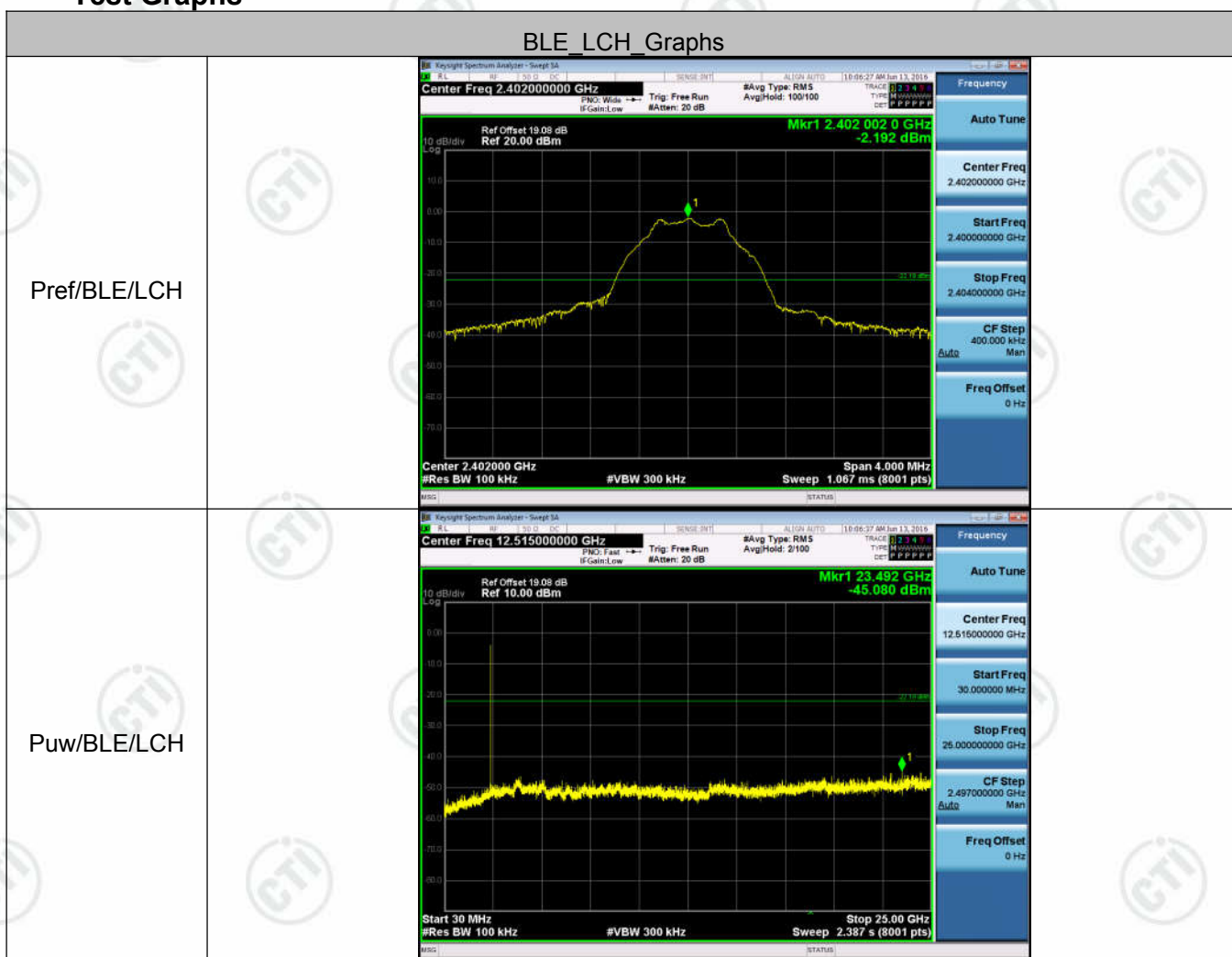


## Appendix D): RF Conducted Spurious Emissions

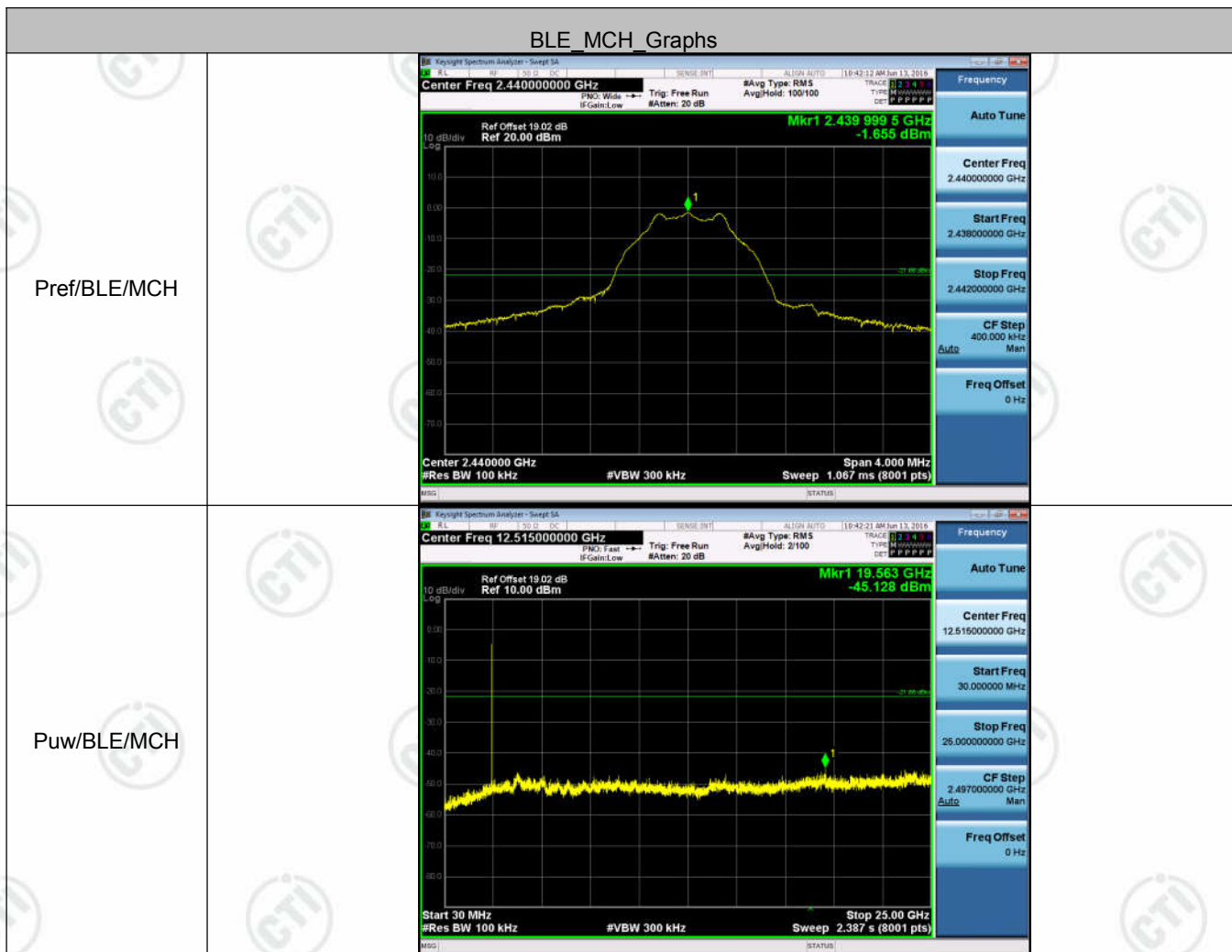
Result Table

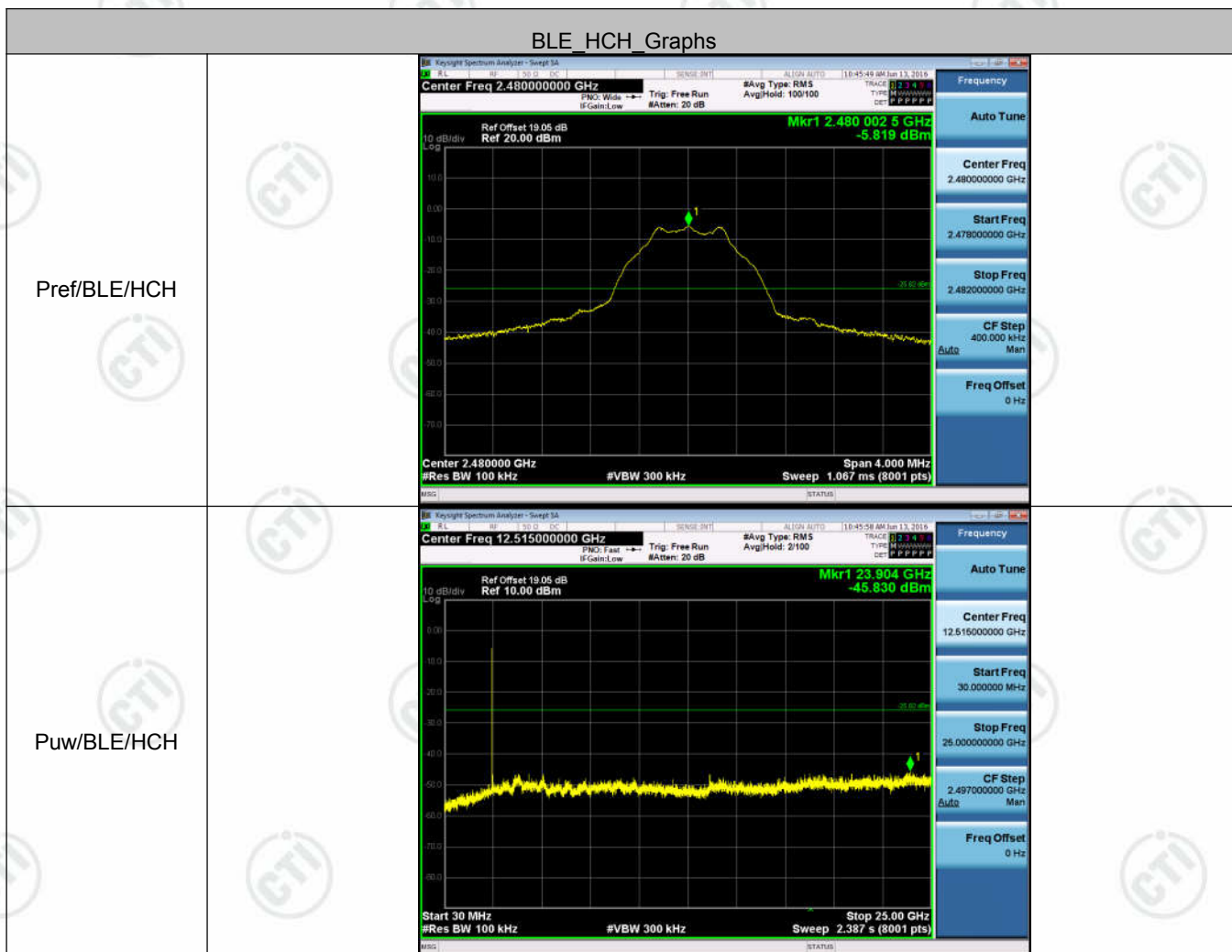
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	-2.192	<Limit	PASS
BLE	MCH	-1.655	<Limit	PASS
BLE	HCH	-5.819	<Limit	PASS

Test Graphs












## Appendix E): Power Spectral Density

Result Table

Mode	Channel	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE	LCH	-16.004	8	PASS
BLE	MCH	-15.550	8	PASS
BLE	HCH	-19.637	8	PASS

## Test Graphs

Graphs	
LCH	 <p>Keygraph Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.402000000 GHz</p> <p>Ref Offset 19.08 dB Ref 10.00 dBm</p> <p>Mkr1 2.40199588 GHz -16.004 dBm</p> <p>Center 2.4020000 GHz #Res BW 3.0 kHz #VBW 10 kHz Sweep 158.4 ms (8001 pts)</p>
MCH	 <p>Keygraph Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.440000000 GHz</p> <p>Ref Offset 19.02 dB Ref 10.00 dBm</p> <p>Mkr1 2.43998875 GHz -15.550 dBm</p> <p>Center 2.4400000 GHz #Res BW 3.0 kHz #VBW 10 kHz Sweep 158.4 ms (8001 pts)</p>
HCH	 <p>Keygraph Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.480000000 GHz</p> <p>Ref Offset 19.05 dB Ref 10.00 dBm</p> <p>Mkr1 2.47999006 GHz -19.637 dBm</p> <p>Center 2.4800000 GHz #Res BW 3.0 kHz #VBW 10 kHz Sweep 158.4 ms (8001 pts)</p>



## Appendix F): Antenna Requirement

15.203 requirement:

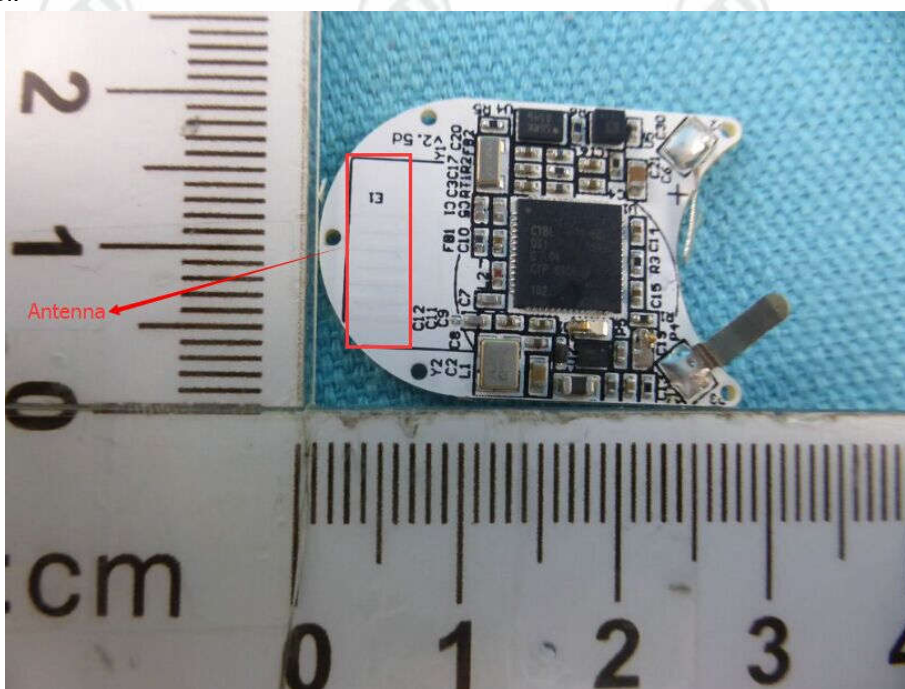
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### EUT Antenna:

The antenna is Monopole PCB antenna and no consideration of replacement. The best case gain of the antenna is 1.6dBi.





## Appendix G): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Test Procedure:	<p><b>Below 1GHz test procedure as below:</b></p> <ol style="list-style-type: none"> <li>The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>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.</li> <li>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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel</li> </ol> <p><b>Above 1GHz test procedure as below:</b></p> <ol style="list-style-type: none"> <li>Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).</li> <li>. Test the EUT in the lowest channel , the Highest channel</li> <li>The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.</li> <li>Repeat above procedures until all frequencies measured was complete.</li> </ol>				
Limit:	Frequency	Limit (dBuV/m @3m)	Remark		
	30MHz-88MHz	40.0	Quasi-peak Value		
	88MHz-216MHz	43.5	Quasi-peak Value		
	216MHz-960MHz	46.0	Quasi-peak Value		
	960MHz-1GHz	54.0	Quasi-peak Value		
	Above 1GHz	54.0	Average Value		
		74.0	Peak Value		

**Test plot as follows:**

Worse case mode:		GFSK								
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Antenna Polaxis	Remark	Test channel
2390.00	32.53	3.15	34.39	48.04	49.33	74	-24.67	H	PK	Lowest
2390.00	32.53	3.15	34.39	61.06	62.35	74	-11.65	V	PK	Lowest
2390.00	32.53	3.15	34.39	43.21	44.50	54	-9.50	V	AV	Lowest
2483.50	32.71	3.22	34.41	57.27	58.79	74	-15.21	H	PK	Highest
2483.50	32.71	3.22	34.41	47.71	49.23	54	-4.77	H	AV	Highest
2483.50	32.71	3.22	34.41	68.78	70.30	74	-3.70	V	PK	Highest
2483.50	32.71	3.22	34.41	49.21	50.73	54	-3.27	V	AV	Highest

**Note:**

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

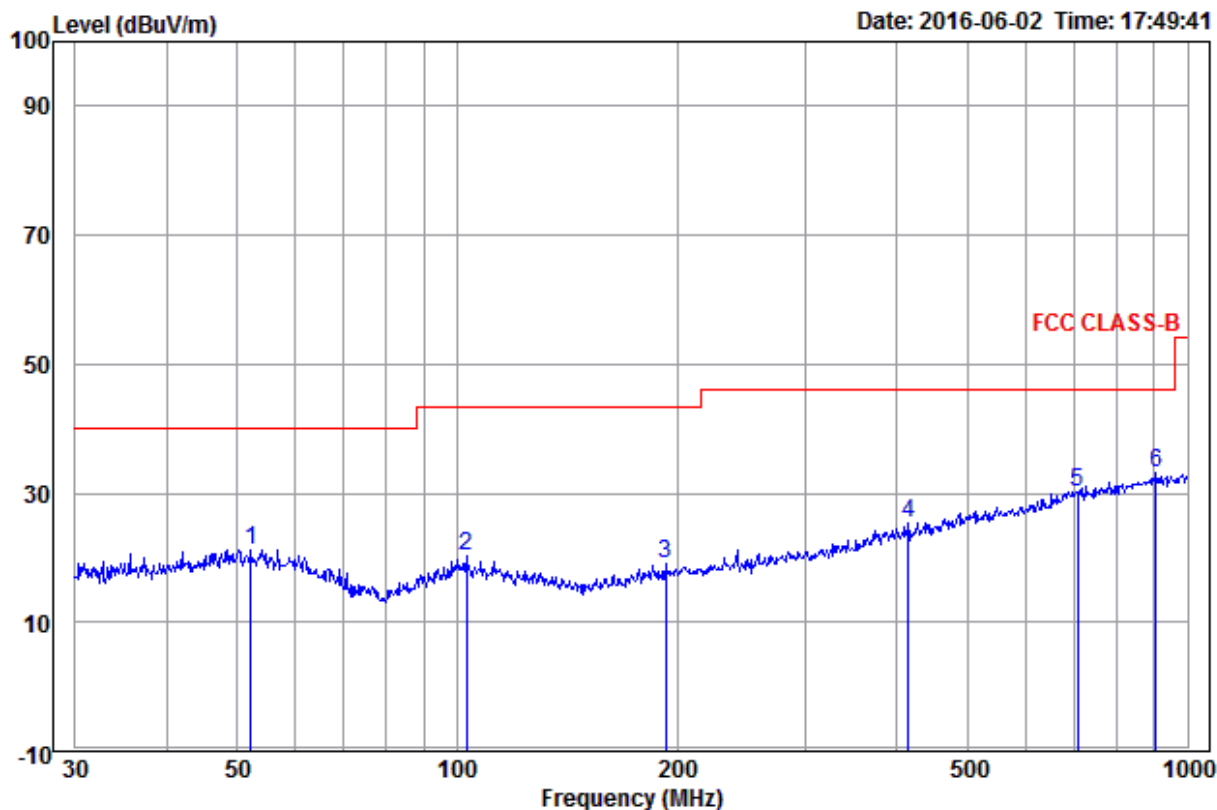
Final Test Level = Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

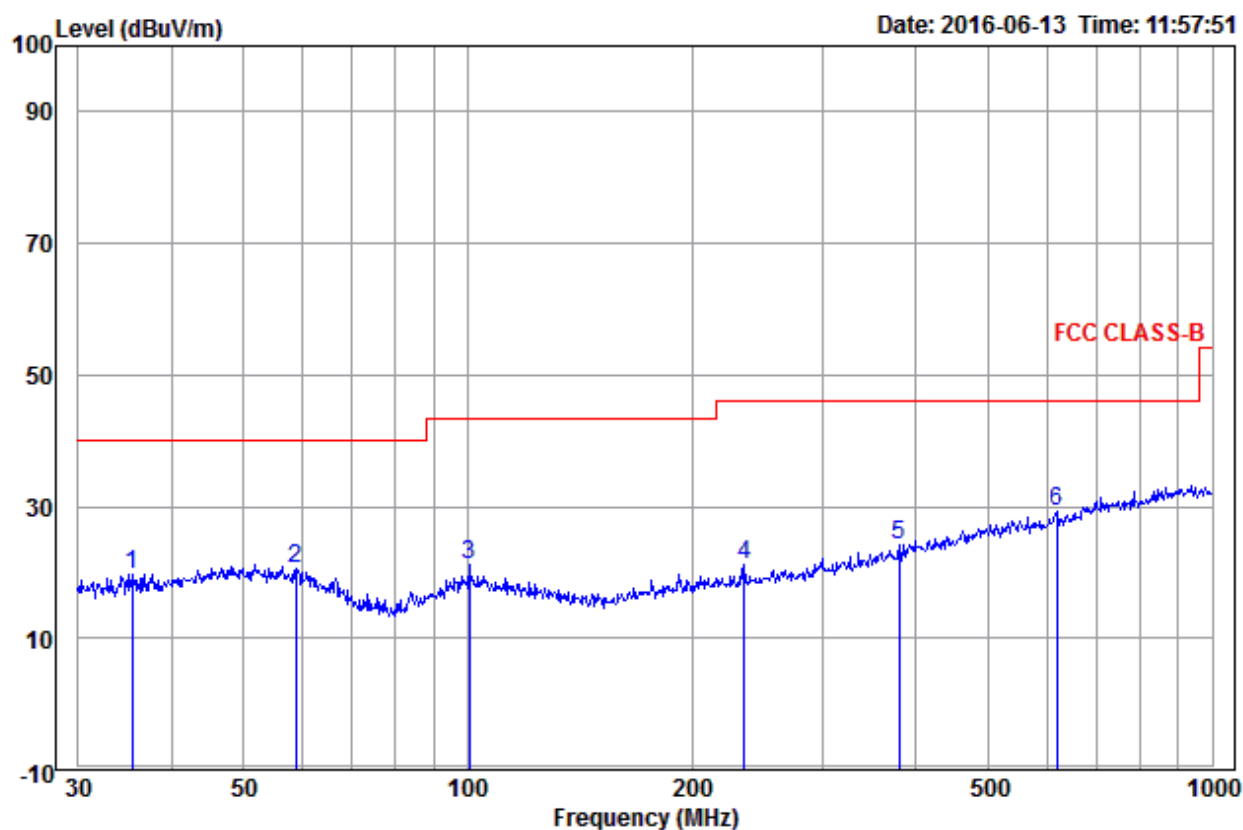
## Appendix H): Radiated Spurious Emissions

Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Test Procedure:					
Below 1GHz test procedure as below:					
<p>a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <p>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</p> <p>c. 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.</p> <p>d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. 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.</p>					
Above 1GHz test procedure as below:					
<p>g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).</p> <p>h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel</p> <p>i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.</p> <p>j. Repeat above procedures until all frequencies measured was complete.</p>					
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

# **Radiated Spurious Emissions test Data:** **Radiated Emission 30MHz~1GHz**



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	52.208	14.79	1.41	5.03	21.23	40.00	-18.77	Horizontal	
2	103.080	12.94	1.57	5.70	20.21	43.50	-23.29	Horizontal	
3	193.095	11.37	2.13	5.51	19.01	43.50	-24.49	Horizontal	
4	414.722	16.55	2.86	6.03	25.44	46.00	-20.56	Horizontal	
5	706.700	20.74	3.91	5.63	30.28	46.00	-15.72	Horizontal	
6 pp	906.482	22.40	4.34	6.29	33.03	46.00	-12.97	Horizontal	



	Ant Freq	Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	35.375	13.47	0.81	5.45	19.73	40.00	-20.27	Vertical	
2	58.819	13.94	1.43	5.15	20.52	40.00	-19.48	Vertical	
3	100.581	13.15	1.57	6.37	21.09	43.50	-22.41	Vertical	
4	234.991	12.18	2.31	6.59	21.08	46.00	-24.92	Vertical	
5	379.914	15.72	2.77	5.79	24.28	46.00	-21.72	Vertical	
6 pp	618.537	19.10	3.53	6.55	29.18	46.00	-16.82	Vertical	



**Transmitter Emission above 1GHz**

Worse case mode:		GFSK		Test channel:		Lowest			
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1254.268	30.35	2.58	34.91	46.74	44.76	74	-29.24	Pass	H
1719.783	31.26	3.02	34.50	46.65	46.43	74	-27.57	Pass	H
3516.592	33.16	5.52	34.56	45.38	49.50	74	-24.50	Pass	H
4804.000	34.69	5.11	34.35	42.78	48.23	74	-25.77	Pass	H
7206.000	36.42	6.66	34.90	40.07	48.25	74	-25.75	Pass	H
9608.000	37.88	7.73	35.08	38.18	48.71	74	-25.29	Pass	H
1204.210	30.24	2.52	34.96	47.79	45.59	74	-28.41	Pass	V
1663.803	31.17	2.97	34.54	47.54	47.14	74	-26.86	Pass	V
3747.656	32.98	5.48	34.58	45.42	49.30	74	-24.70	Pass	V
4804.000	34.69	5.11	34.35	44.20	49.65	74	-24.35	Pass	V
7206.000	36.42	6.66	34.90	39.10	47.28	74	-26.72	Pass	V
9608.000	37.88	7.73	35.08	35.54	46.07	74	-27.93	Pass	V

Worse case mode:		GFSK		Test channel:		Middle			
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1185.958	30.19	2.50	34.98	48.16	45.87	74	-28.13	Pass	H
1724.166	31.27	3.02	34.49	46.30	46.10	74	-27.90	Pass	H
3863.9000	32.90	5.46	34.59	44.72	48.49	74	-25.51	Pass	H
4880.000	34.85	5.08	34.33	44.45	50.05	74	-23.95	Pass	H
7320.000	36.43	6.77	34.90	38.64	46.94	74	-27.06	Pass	H
9760.000	38.05	7.60	35.05	35.84	46.44	74	-27.56	Pass	H
1129.964	30.05	2.43	35.04	47.85	45.29	74	-28.71	Pass	V
1521.981	30.91	2.85	34.65	46.27	45.38	74	-28.62	Pass	V
3844.279	32.91	5.46	34.59	45.35	49.13	74	-24.87	Pass	V
4880.000	34.85	5.08	34.33	45.24	50.84	74	-23.16	Pass	V
7320.000	36.43	6.77	34.90	40.46	48.76	74	-25.24	Pass	V
9760.000	38.05	7.60	35.05	38.50	49.10	74	-24.90	Pass	V

Worse case mode:		GFSK		Test channel:		Highest			
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1346.929	30.56	2.68	34.81	46.81	45.24	74	-28.76	Pass	H
1755.164	31.32	3.05	34.47	46.23	46.13	74	-27.87	Pass	H
3747.656	32.98	5.48	34.58	44.46	48.34	74	-25.66	Pass	H
4960.000	35.02	5.05	34.31	41.87	47.63	74	-26.37	Pass	H
7440.000	36.45	6.88	34.90	39.56	47.99	74	-26.01	Pass	H
9920.000	38.22	7.47	35.02	36.67	47.34	74	-26.66	Pass	H
1198.095	30.22	2.51	34.97	46.91	44.67	74	-29.33	Pass	V
1668.044	31.18	2.98	34.54	46.23	45.85	74	-28.15	Pass	V
3738.129	32.99	5.48	34.58	45.28	49.17	74	-24.83	Pass	V
4960.000	35.02	5.05	34.31	41.69	47.45	74	-26.55	Pass	V
7440.000	36.45	6.88	34.90	39.54	47.97	74	-26.03	Pass	V
9920.000	38.22	7.47	35.02	37.53	48.20	74	-25.80	Pass	V

**Note:**

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

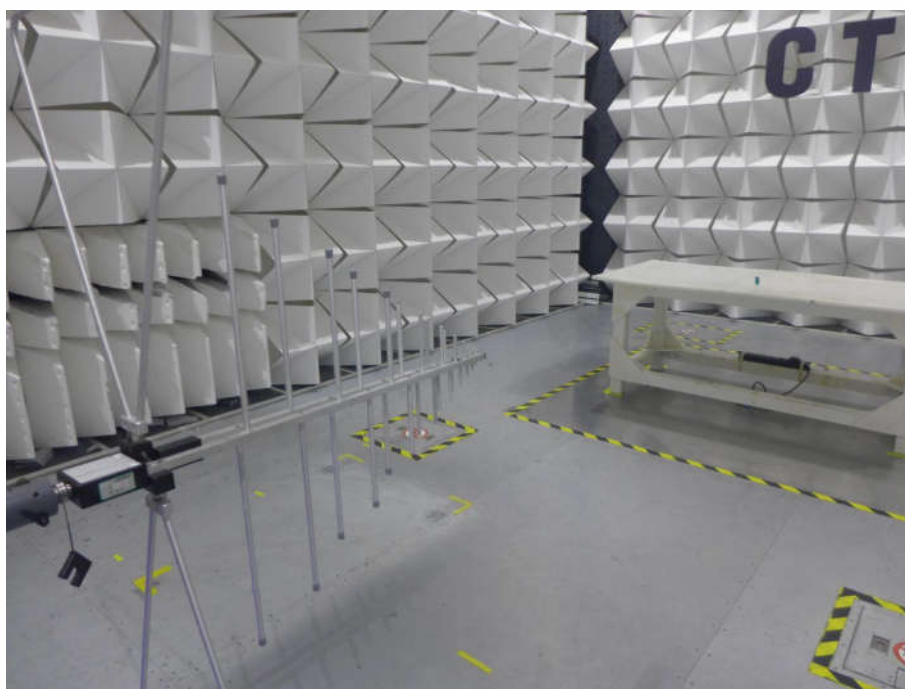
Final Test Level = Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

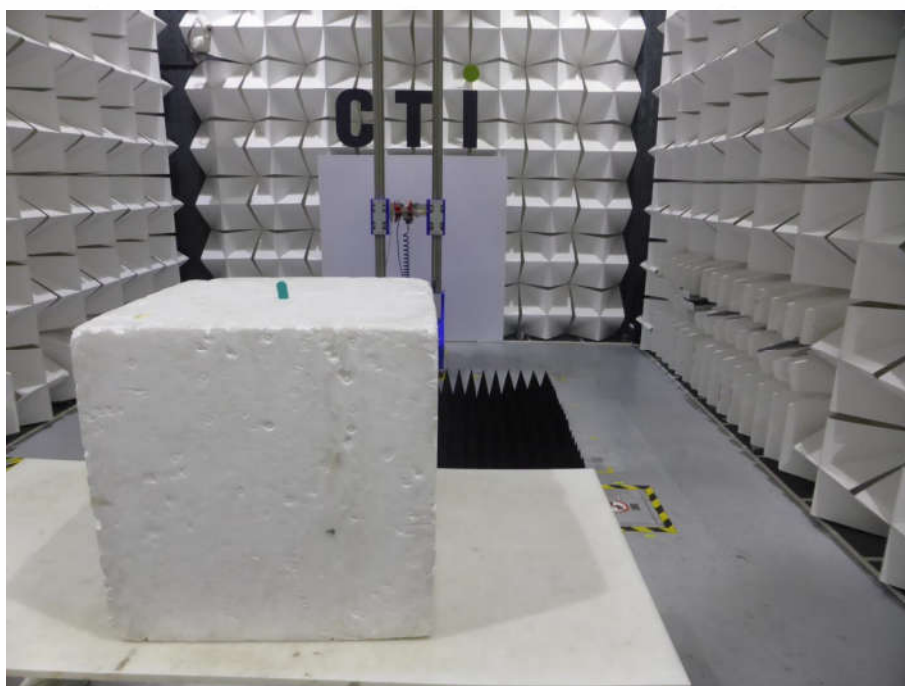
2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

## PHOTOGRAPHS OF TEST SETUP

Test mode No.: PEA001



**Radiated spurious emission Test Setup-1(Below 1GHz)**



**Radiated spurious emission Test Setup-2(Above 1GHz)**

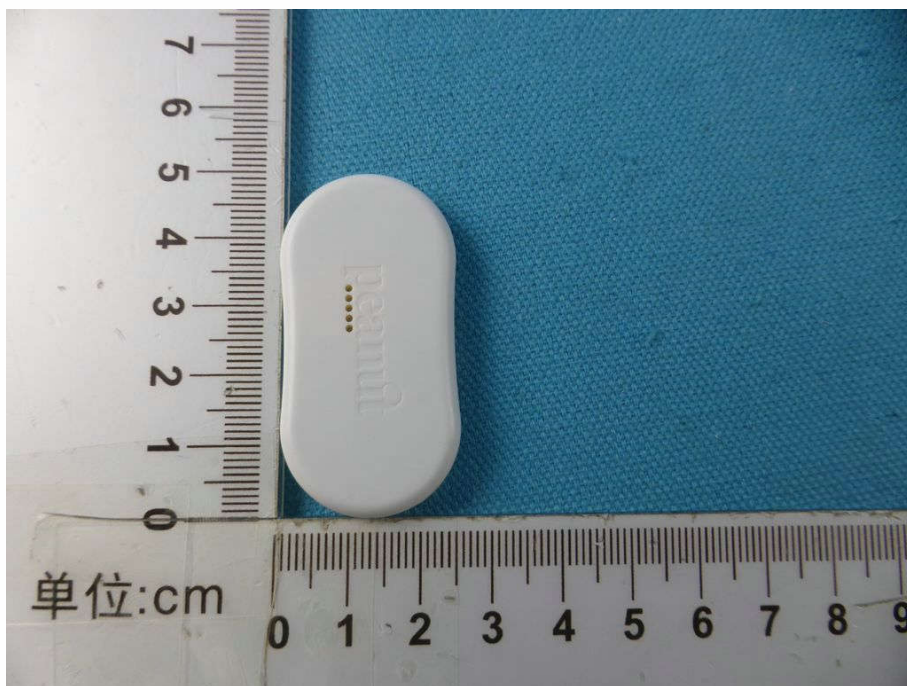


## PHOTOGRAPHS OF EUT Constructional Details

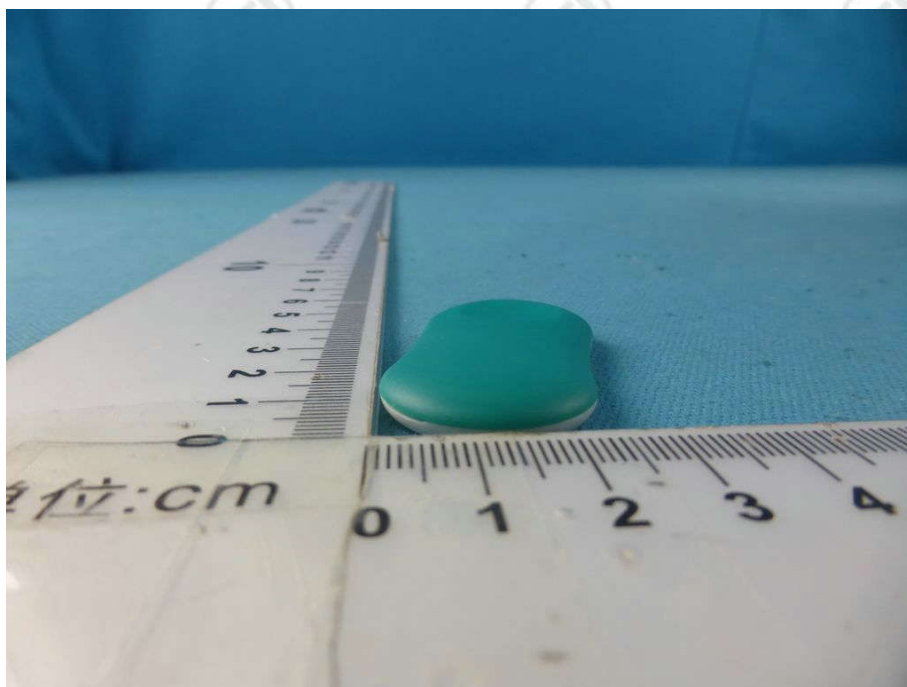
Test mode No.: PEA001



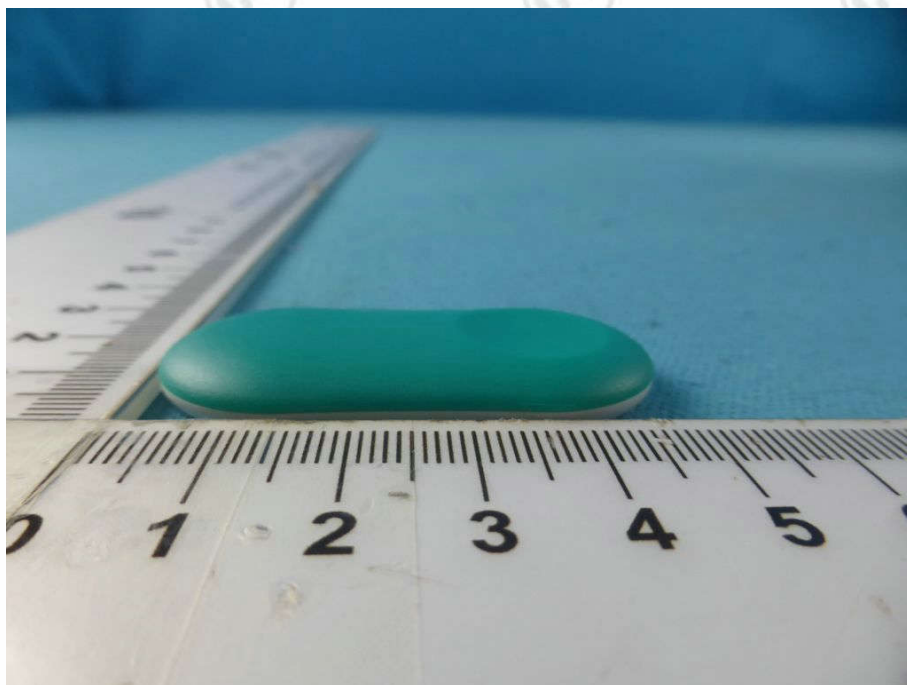
View of Product-1



View of Product-2

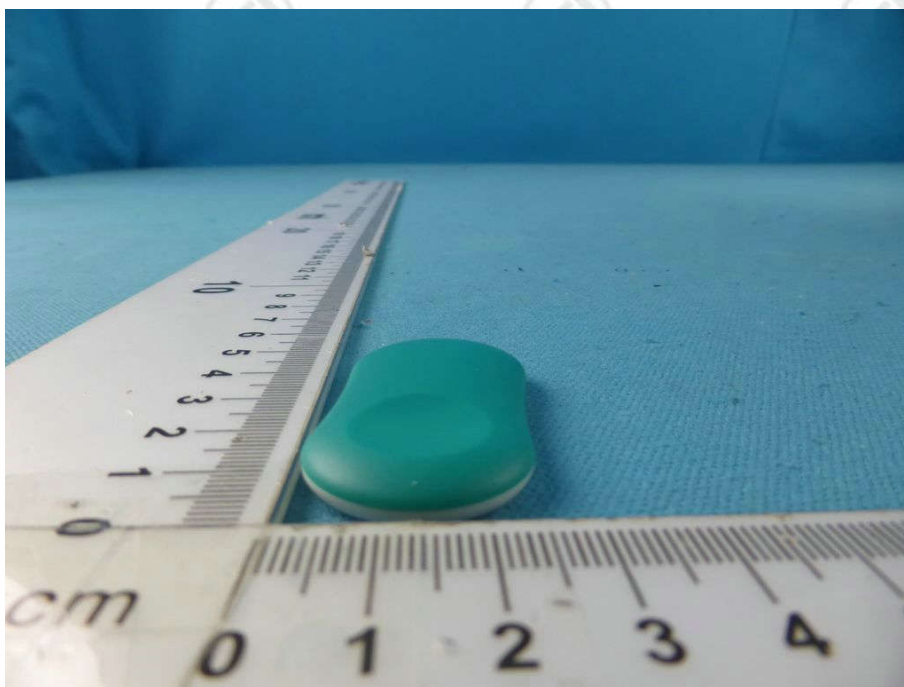


View of Product-3

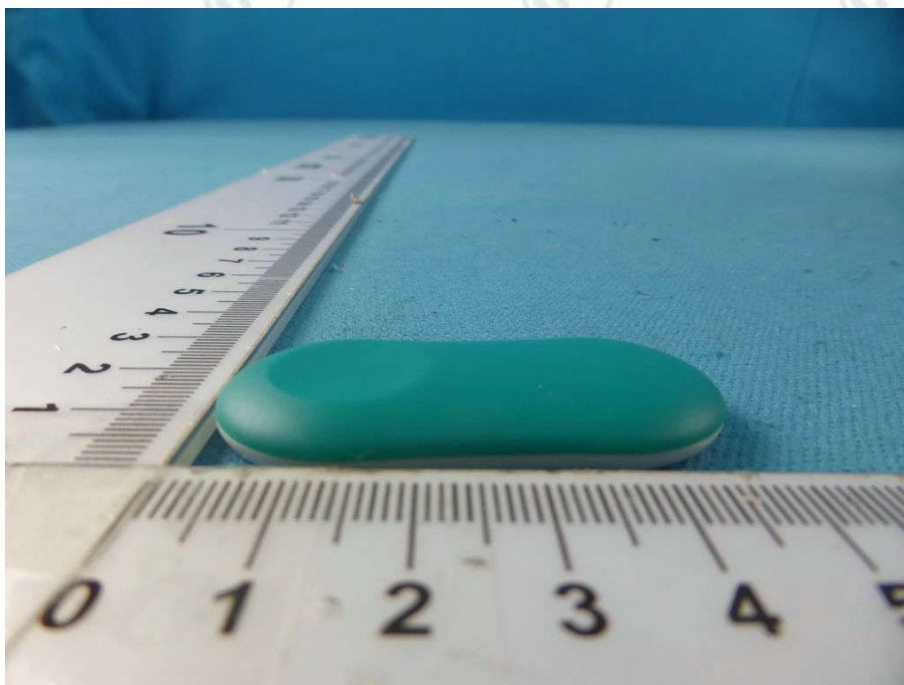


View of Product-4





View of Product-5



View of Product-6

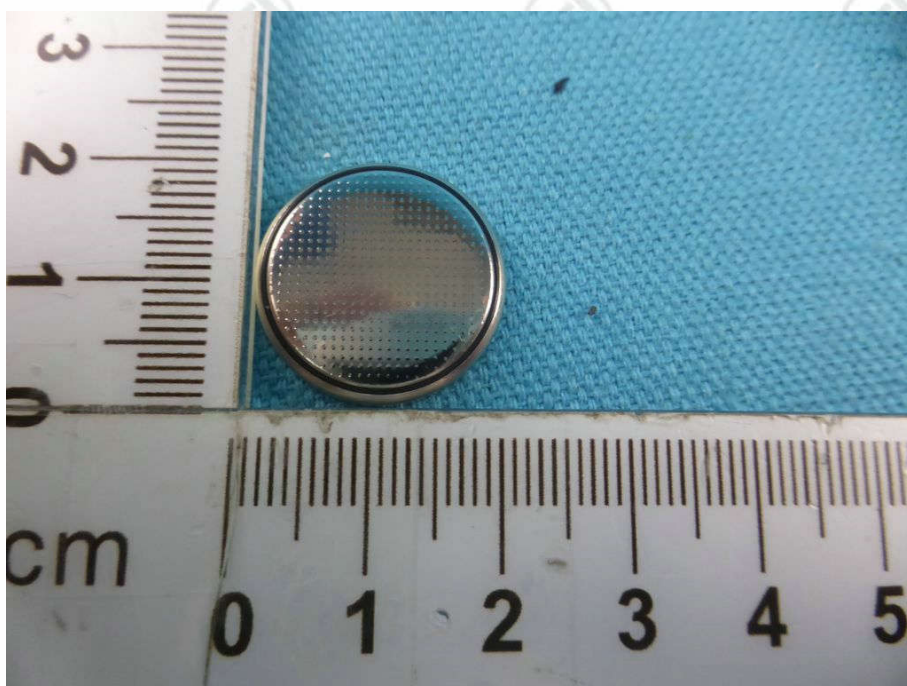


View of Product-7



View of Product-8

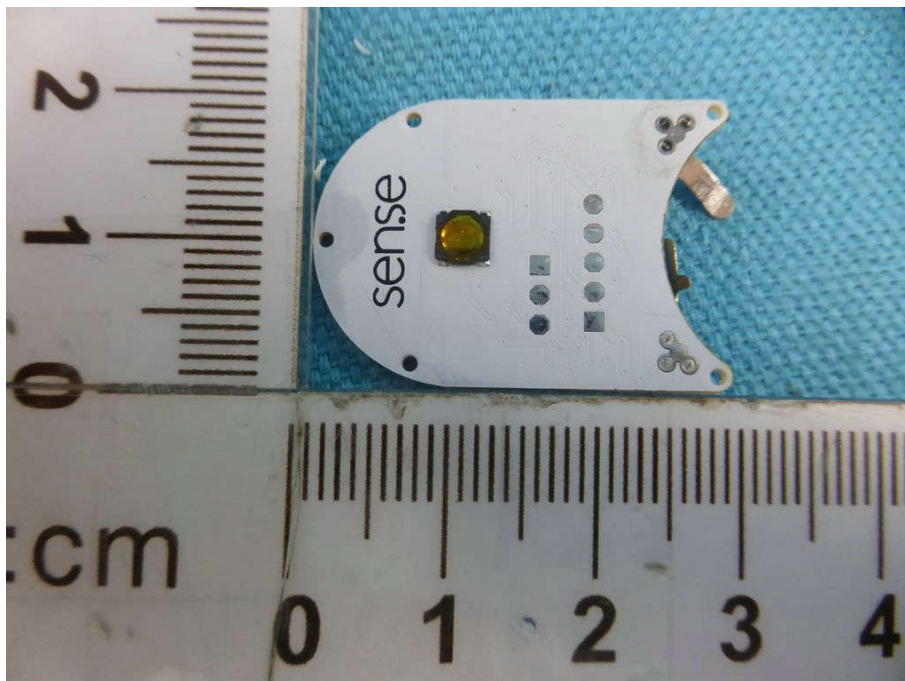




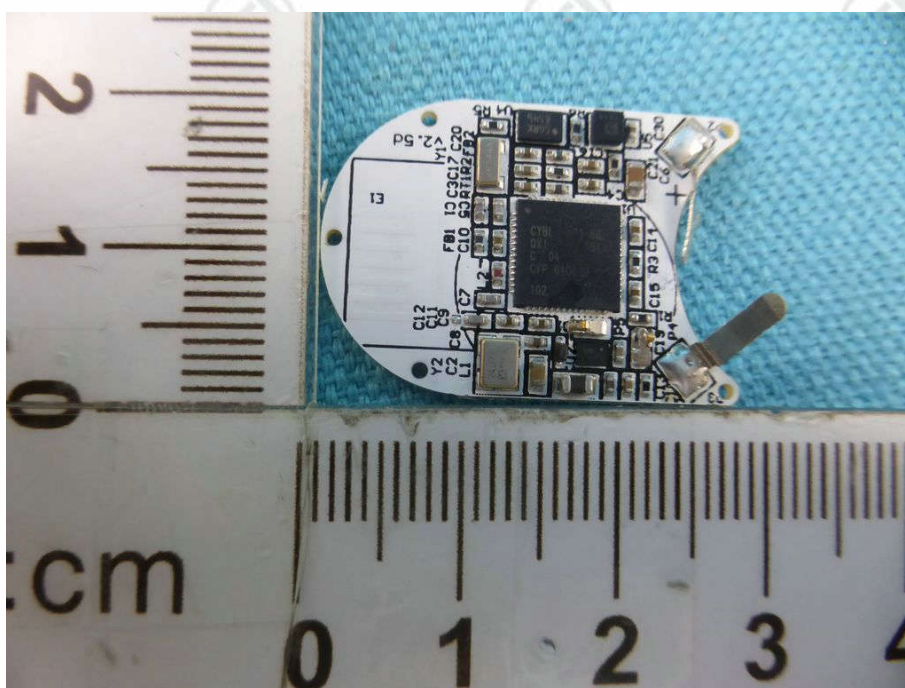
View of Product-9



View of Product-10



View of Product-11



View of Product-12

\*\*\* End of Report \*\*\*

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.