TEST REPORT

Product	:	TouchLock BT XS
Trade mark	:	BIO-key
Model/Type reference	:	BL0509
Serial Number	:	N/A
Report Number	:	EED32J00175901
FCC ID	:	2AIKJ-BL
Date of Issue	:	Oct. 16, 2017
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

BIO-key Hong Kong Limited
1806, 18/F, Tower Two, Lippo Centre, 89 Queensway Hong Kong

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
Shenzhen, Guangdong, China
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Tested By:	Tom chen (Test Project)	Compiled by:	Mill chen (Project Engineer)
Reviewed by:	Kevin yang (Reviewer)	Approved by:	Sheek Luo (Lab supervisor)
Date:	Oct. 16, 2017		Check No.: 1022565636

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. CTI Report Seal

2 Version

Version No.	Date	Description
00	Oct. 16, 2017	Original

3 Test Summary

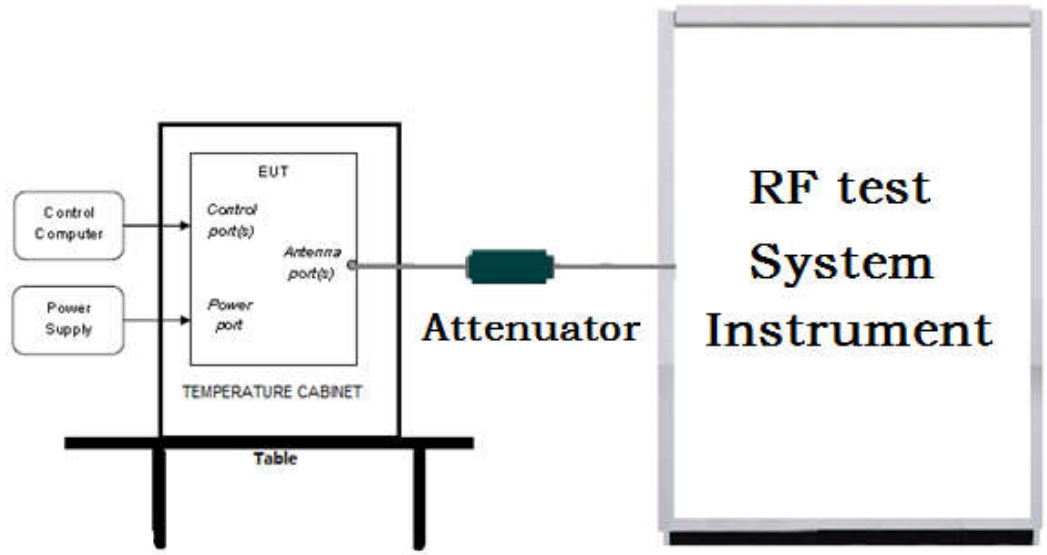
Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
6dB Occupied Bandwidth	47 CFR Part 15Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
RF Conducted Spurious Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Radiated Spurious Emissions	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Remark: Test according to ANSI C63.4-2014 & ANSI C63.10-2013. The tested sample and the sample information are provided by the client.			

4 Content

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:

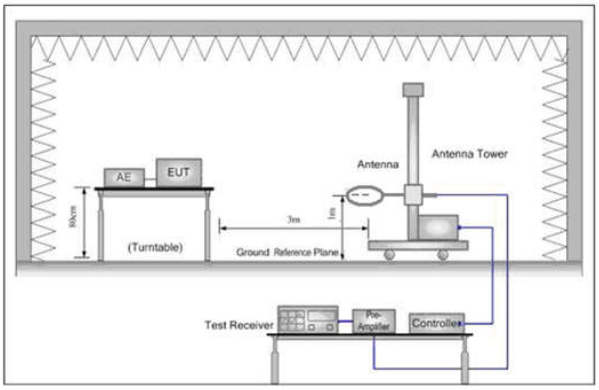


Figure 1. Below 30MHz

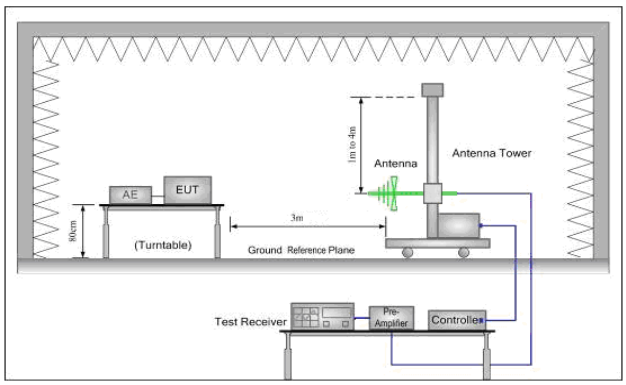


Figure 2. 30MHz to 1GHz

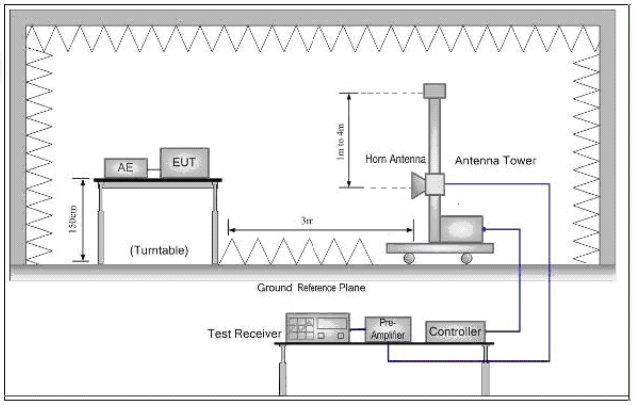
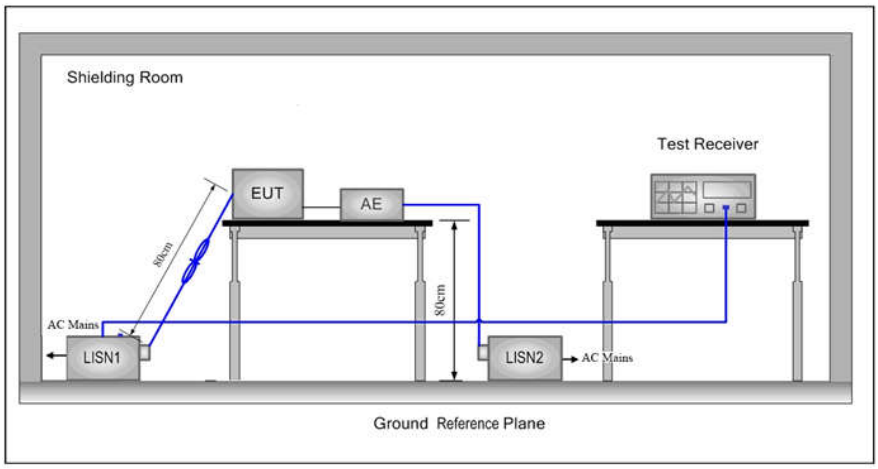


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	24°C
Humidity:	56% 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	Channel 40
		2402MHz	2440MHz	2480MHz
Transmitting mode:	The EUT transmitted the continuous modulation test signal at the specific channel(s).			

6 General Information

6.1 Client Information

Applicant:	BIO-key Hong Kong Limited
Address of Applicant:	1806, 18/F, Tower Two, Lippo Centre, 89 Queensway, Hong Kong
Manufacturer:	TOP LEADER ELECTRONIC (SHEN ZHEN) CO., LTD.
Address of Manufacturer:	No.9 NanXin Road, NanLing Village Community, NanWan Street Office, LongGang District, ShenZhen, Guangdong, China
Factory:	TOP LEADER ELECTRONIC (SHEN ZHEN) CO., LTD.
Address of Factory:	No.9 NanXin Road, NanLing Village Community, NanWan Street Office, LongGang District, ShenZhen, Guangdong, China

6.2 General Description of EUT

Product Name:	TouchLock BT XS
Model No.(EUT):	BL0509
Trade mark:	BIO-key
EUT Supports Radios application:	BT 4.1 Signal mode
Power Supply:	DC 5V by USB port DC 3.7V by battery
Sample Received Date:	Aug. 14, 2017
Sample tested Date:	Aug. 14, 2017 to Oct. 16, 2017

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.1
Modulation Type:	GFSK
Hardware Version:	5.0 (manufacturer declare)
Software Version:	29 (manufacturer declare)
Test Power Grade:	6
Test Software of EUT:	BLUENRG_GUI.exe
Antenna Type:	Integral
Antenna Gain:	0.49dBi
Test Voltage:	DC 3.7V

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 with associated equipment below.

Associated equipment name		Manufacture	model	FCC ID	Supplied by
AE1	AC/DC adapter	Apple	A1385	N/A	CTI

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.
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

Test location

The test site a is located on *Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China.* Test site at Centre Testing International Group Co., Ltd has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

FCC Designation No.: CN1164

FCC-Registration No.: 886427

Centre Testing International Group Co., Ltd. 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.

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	7.9×10^{-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**	**Model No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Signal Generator	Keysight	E8257D	MY53401106	03-14-2017	03-13-2018
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-14-2017	03-13-2018
Signal Generator	Keysight	N5182B	MY53051549	03-14-2017	03-13-2018
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	TTF20120439	01-11-2017	01-10-2018
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	003	01-11-2017	01-10-2018
DC Power	Keysight	E3642A	MY54436035	03-14-2017	03-13-2018
BT&WI-FI Automatic control	R&S	OSP120	101374	03-14-2017	03-13-2018
RF control unit	JS Tonscend	JS0806-2	158060006	03-14-2017	03-13-2018

Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100009	06-14-2017	06-13-2018
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-08-2017	05-07-2018
LISN	R&S	ENV216	100098	06-13-2017	06-12-2018
LISN	schwarzbeck	NNLK8121	8121-529	06-13-2017	06-12-2018
Voltage Probe	R&S	ESH2-Z3	--	06-13-2017	06-12-2018
Current Probe	R&S	EZ17	100106	06-13-2017	06-12-2018
ISN	TESEQ GmbH	ISN T800	30297	02-23-2017	02-22-2018

Radiated Emission					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-05-2016	06-05-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-484	05-23-2017	05-22-2018
Microwave Preamplifier	Agilent	8449B	3008A02425	02-16-2017	02-15-2018
Horn Antenna	ETS-LINDGREN	3117	00057407	07-20-2015	07-18-2018
Loop Antenna	ETS	6502	00071730	07-30-2016	07-28-2018
Spectrum Analyzer	R&S	FSP40	100416	06-13-2017	06-12-2018
Receiver	R&S	ESCI	100435	06-14-2017	06-13-2018
Multi device Controller	maturo	NCD/070/10711112	---	01-11-2017	01-10-2018
LISN	schwarzbeck	NNBM8125	81251547	06-13-2017	06-12-2018
LISN	schwarzbeck	NNBM8125	81251548	06-13-2017	06-12-2018
Signal Generator	Agilent	E4438C	MY45095744	03-14-2017	03-13-2018
Signal Generator	Keysight	E8257D	MY53401106	03-14-2017	03-13-2018
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-08-2017	05-07-2018
Cable line	Fulai(7M)	SF106	5219/6A	01-11-2017	01-10-2018
Cable line	Fulai(6M)	SF106	5220/6A	01-11-2017	01-10-2018
Cable line	Fulai(3M)	SF106	5216/6A	01-11-2017	01-10-2018
Cable line	Fulai(3M)	SF106	5217/6A	01-11-2017	01-10-2018
High-pass filter	Sinoscite	FL3CX03WG18NM1 2-0398-002	---	01-11-2017	01-10-2018
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX01CA09CL12 -0395-001	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX01CA08CL12 -0393-001	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX02CA04CL12 -0396-002	---	01-11-2017	01-10-2018
band rejection filter	Sinoscite	FL5CX02CA03CL12 -0394-001	---	01-11-2017	01-10-2018

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 Unlicesed Wireless Devices

Test Results List:

Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10	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	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix H)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix I)

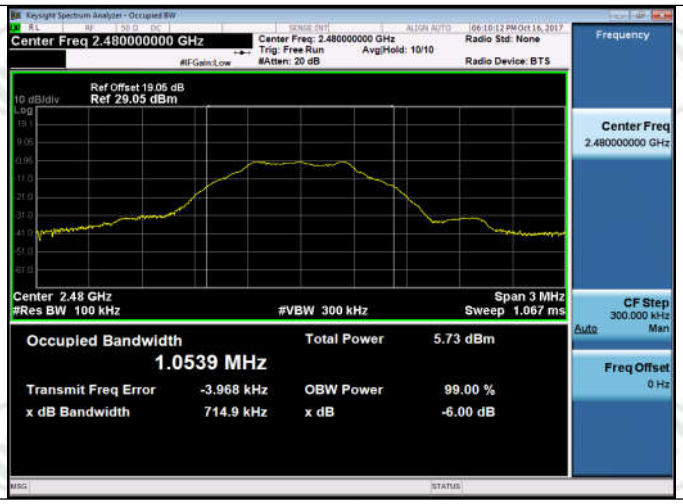
Appendix A): 6dB Occupied Bandwidth

Test Result

Mode	Channel	6dB Bandwidth [MHz]	99% OBW[MHz]	Verdict
BLE	LCH	0.6930	1.1136	PASS
BLE	MCH	0.6961	1.0742	PASS
BLE	HCH	0.7149	1.0539	PASS

Test Graphs

Graphs		
LCH		
MCH		

HCH	

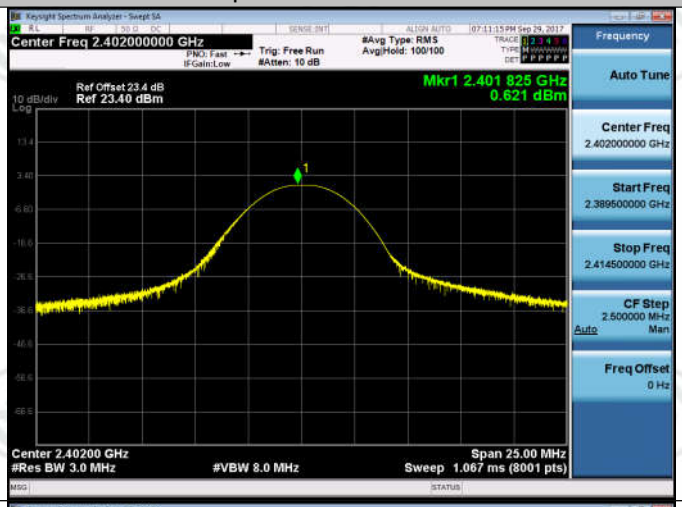
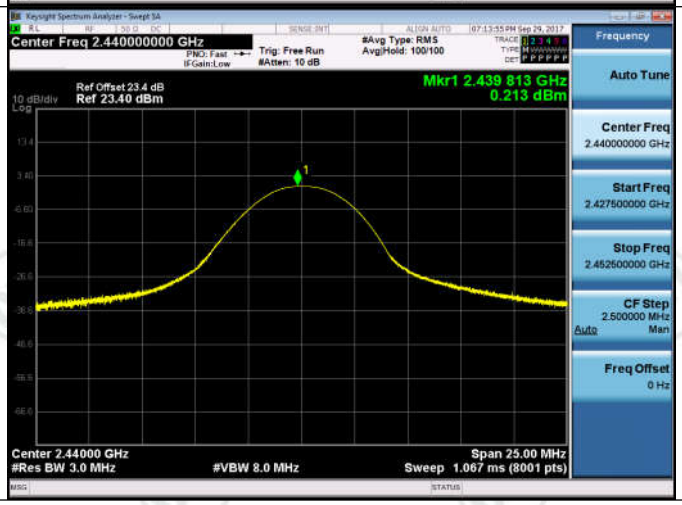
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 10/10
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 19.05 dB
10 dB/div
Ref 29.05 dBm
Log
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1.067 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.0539 MHz
Total Power 5.73 dBm
Freq Offset
0 Hz
Transmit Freq Error -3.968 kHz
OBW Power 99.00 %
x dB Bandwidth 714.9 kHz
x dB -6.00 dB
MSG
STATUS

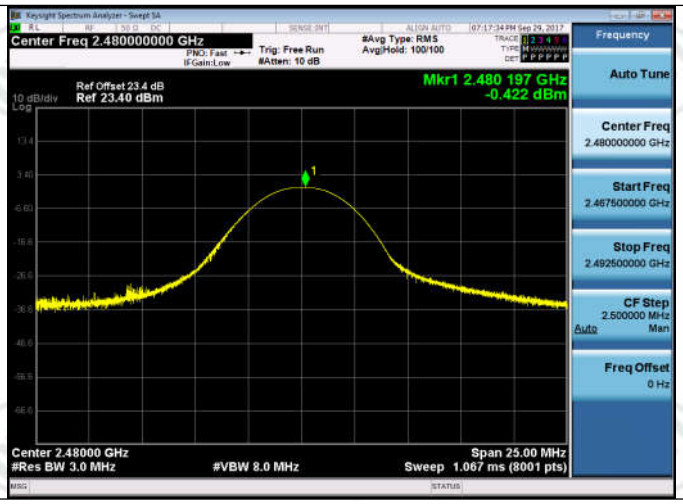
Appendix B): Conducted Peak Output Power

Test Result

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	0.621	PASS
BLE	MCH	0.213	PASS
BLE	HCH	-0.422	PASS

Test Graphs

Graphs		
LCH		
MCH		

HCH	

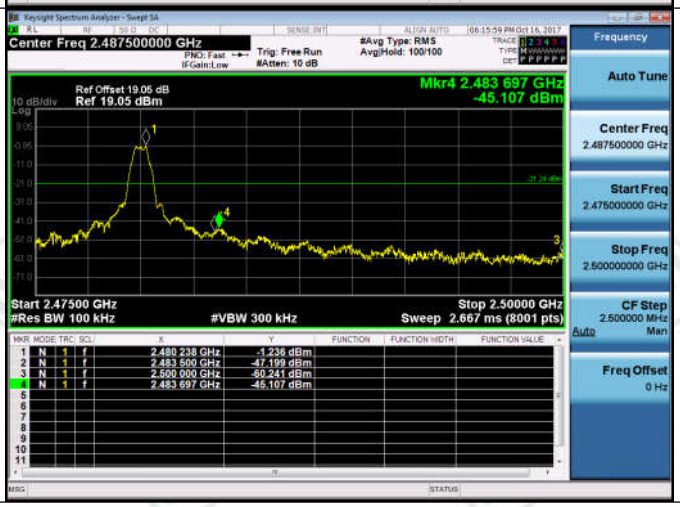
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ref Offset 23.4 dB
10 dB/div
Log
Ref 23.40 dBm
Mkr1 2.480 197 GHz
-0.422 dBm
Center 2.48000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 25.00 MHz
Sweep 1.067 ms (8001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.467500000 GHz
Stop Freq
2.492500000 GHz
CF Step
2.500000 MHz
Auto
Man
Freq Offset
0 Hz

Appendix C): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	-1.643	-53.481	-21.64	PASS
BLE	HCH	-1.236	-45.107	-21.24	PASS

Test Graphs

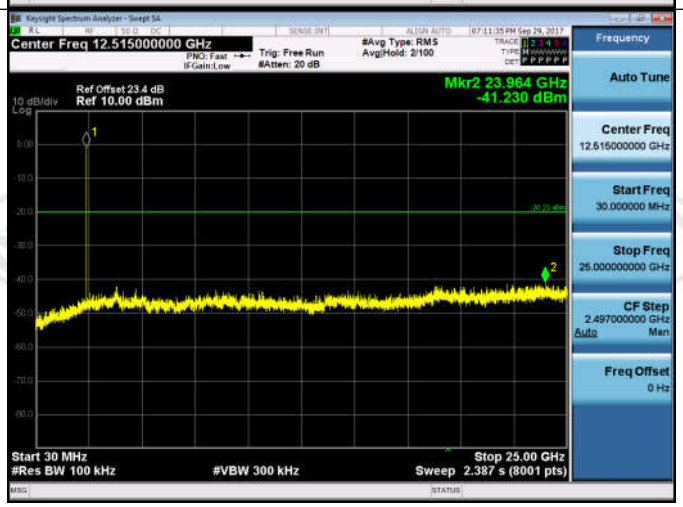
Graphs	
LCH	
HCH	

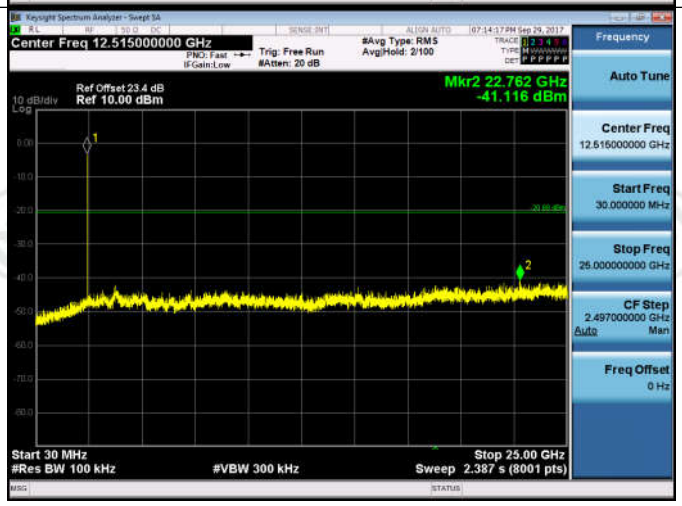
Appendix D): RF Conducted Spurious Emissions

Result Table

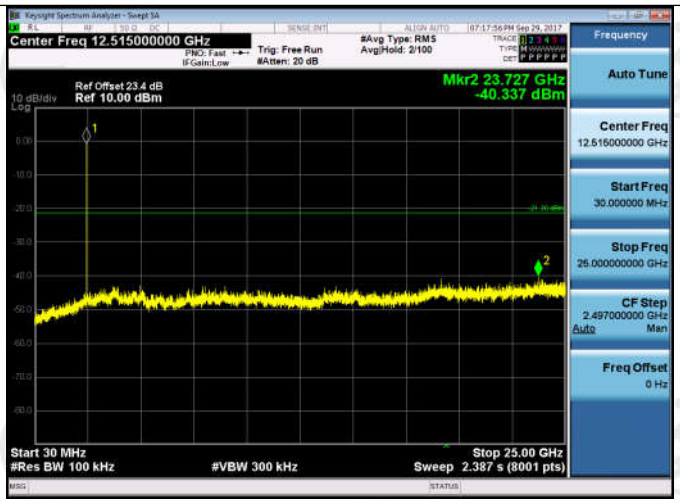
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	-0.233	<Limit	PASS
BLE	MCH	-0.68	<Limit	PASS
BLE	HCH	-1.295	<Limit	PASS

Test Graphs

BLE_LCH_Graphs	
Pref/BLE/LCH	
Puw/BLE/LCH	

BLE_MCH_Graphs		
Pref/BLE/MCH		
Puw/BLE/MCH		

BLE_HCH_Graphs		
Pref/BLE/HCH		

Puw/BLE/H CH	

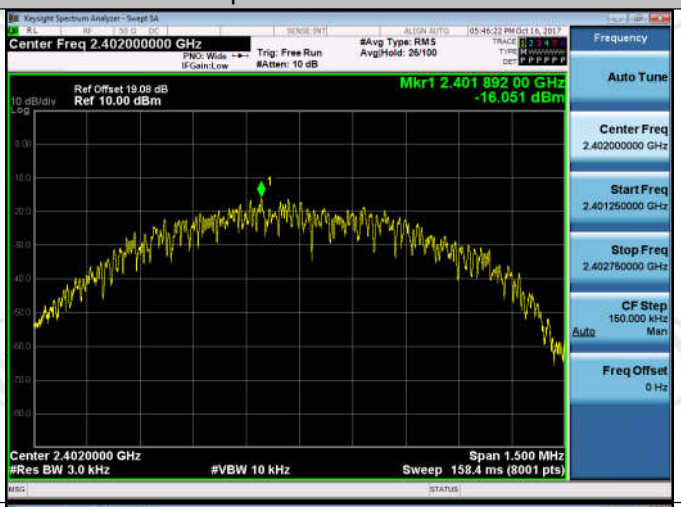
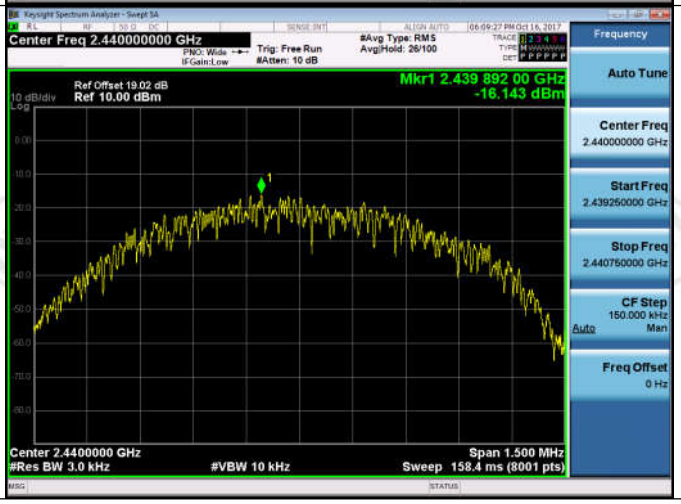
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 2/100
Ref Offset 23.4 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr2 23.727 GHz
-40.337 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (8001 pts)
Frequency
Auto Tune
Center Freq
12.515000000 GHz
Start Freq
30.000000 MHz
Stop Freq
25.000000000 GHz
CF Step
2.497000000 GHz
Auto
Man
Freq Offset
0 Hz

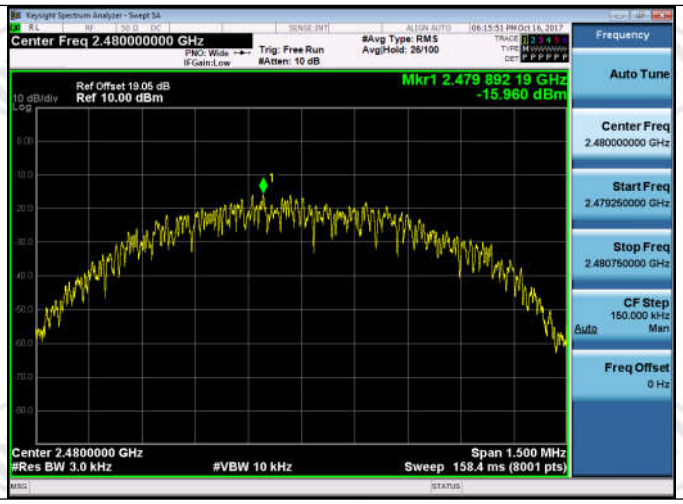
Appendix E): Power Spectral Density

Result Table

Mode	Channel	PSD [dBm]	Verdict
BLE	LCH	-16.051	PASS
BLE	MCH	-16.143	PASS
BLE	HCH	-15.960	PASS

Test Graphs

Graphs			
LCH			
MCH			

HCH	

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 10 dB
#Avg Type: RMS
Avg|Hold: 26/100
Ref Offset 19.05 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 892 19 GHz
-15.960 dBm
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.500 MHz
Sweep 158.4 ms (8001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.479250000 GHz
Stop Freq
2.480750000 GHz
CF Step
150.000 kHz
Auto
Man
Freq Offset
0 Hz

Appendix F): Antenna Requirement

15.203 requirement:

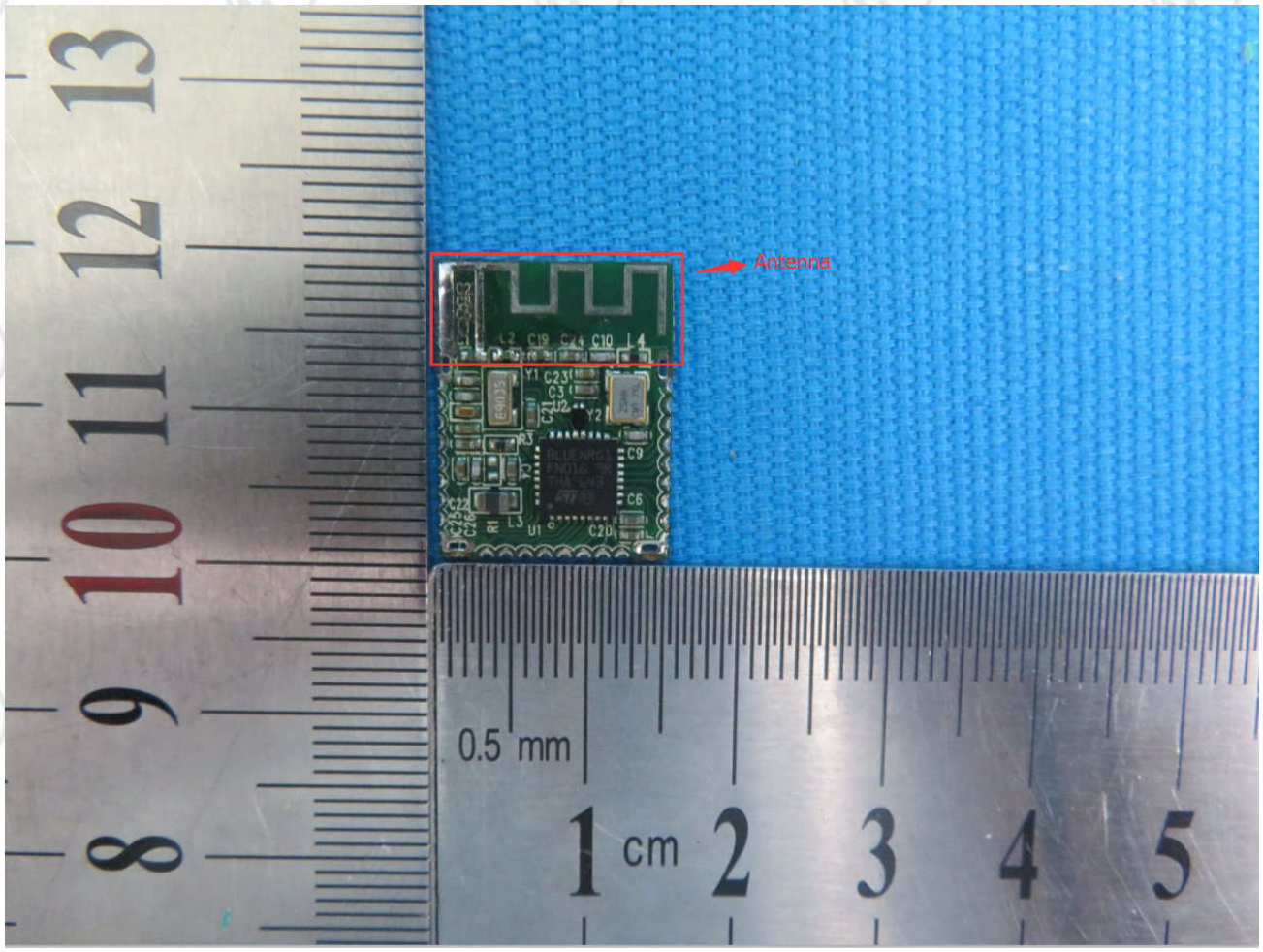
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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 Integral Antenna and no consideration of replacement. The best case gain of the antenna is 0.49dBi.



Appendix G): AC Power Line Conducted Emission

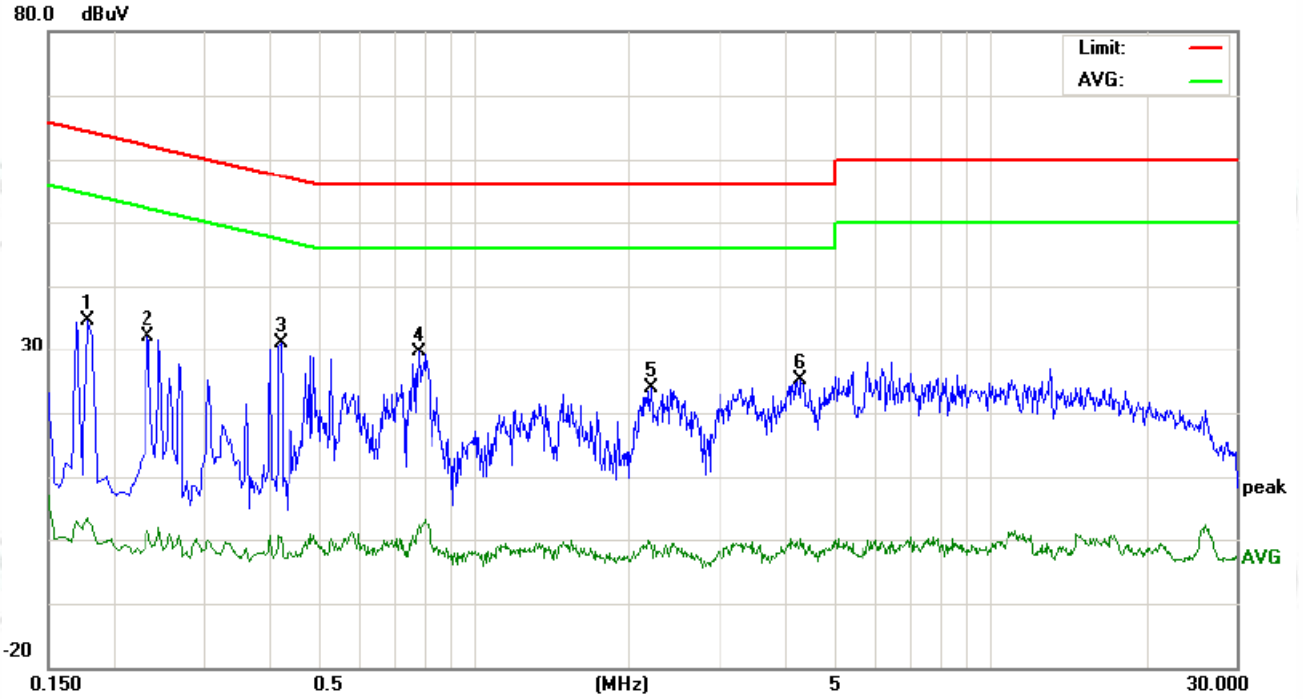
<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz
1)The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.
NOTE : The lower limit is applicable at the transition frequency</td></tr>
</table>

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

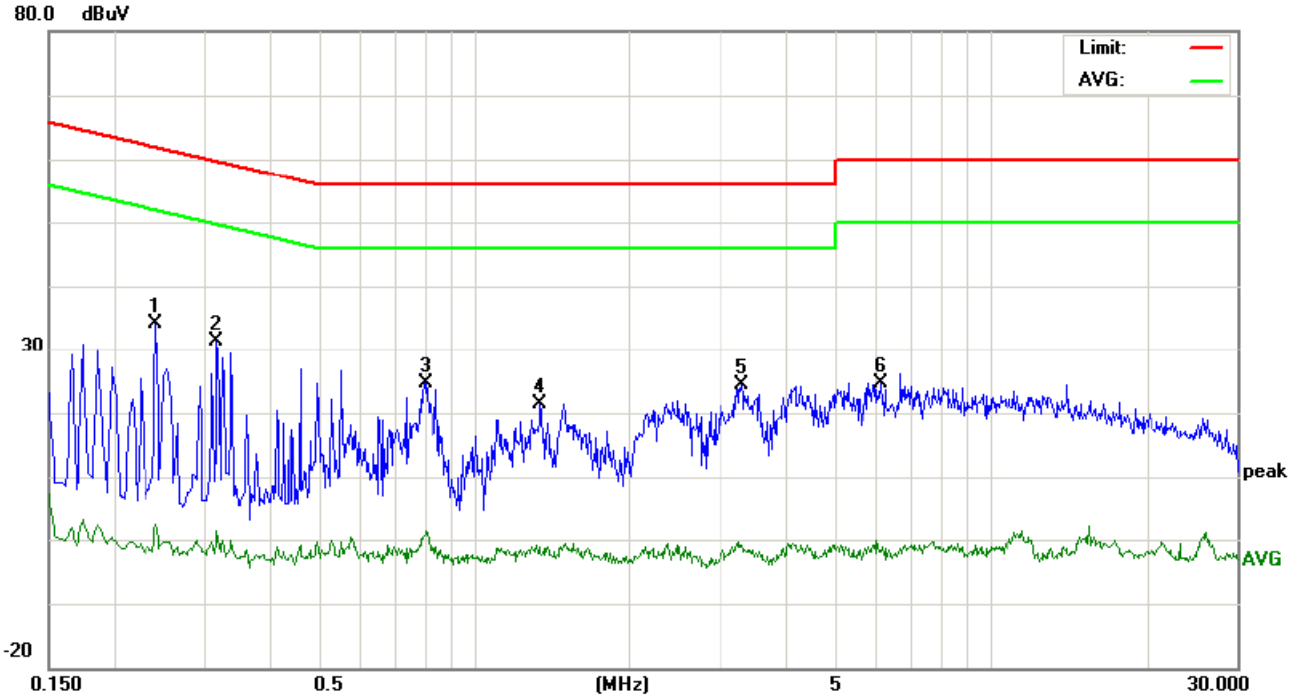
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1780	25.01	9.72	-10.4	9.73	34.74	19.45	-0.71	64.57	54.57	-45.12	-55.28	P	
2	0.2340	22.29	9.90	-10.6	9.73	32.02	19.63	-0.90	62.30	52.30	-42.67	-53.20	P	
3	0.4220	21.27	6.91	-12.3	9.74	31.01	16.65	-2.62	57.41	47.41	-40.76	-50.03	P	
4	0.7820	19.76	8.79	-9.46	9.74	29.50	18.53	0.28	56.00	46.00	-37.47	-45.72	P	
5	2.2020	14.20	5.20	-11.7	9.71	23.91	14.91	-2.01	56.00	46.00	-41.09	-48.01	P	
6	4.2980	15.37	6.47	-11.8	9.64	25.01	16.11	-2.25	56.00	46.00	-39.89	-48.25	P	

Neutral Line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.2420	24.29	10.86	-10.7	9.74	34.03	20.60	-0.97	62.02	52.02	-41.42	-52.99	P	
2	0.3180	21.67	7.53	-11.6	9.77	31.44	17.30	-1.91	59.76	49.76	-42.46	-51.67	P	
3	0.8059	14.99	10.70	-8.66	9.74	24.73	20.44	1.08	56.00	46.00	-35.56	-44.92	P	
4	1.3380	11.65	1.86	-12.2	9.72	21.37	11.58	-2.52	56.00	46.00	-44.42	-48.52	P	
5	3.3020	14.62	5.29	-11.8	9.68	24.30	14.97	-2.21	56.00	46.00	-41.03	-48.21	P	
6	6.1300	15.13	6.72	-11.7	9.62	24.75	16.34	-2.15	60.00	50.00	-43.66	-52.15	P	

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

Appendix H): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
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.
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.
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 and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. 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

Above 1GHz test procedure as below:

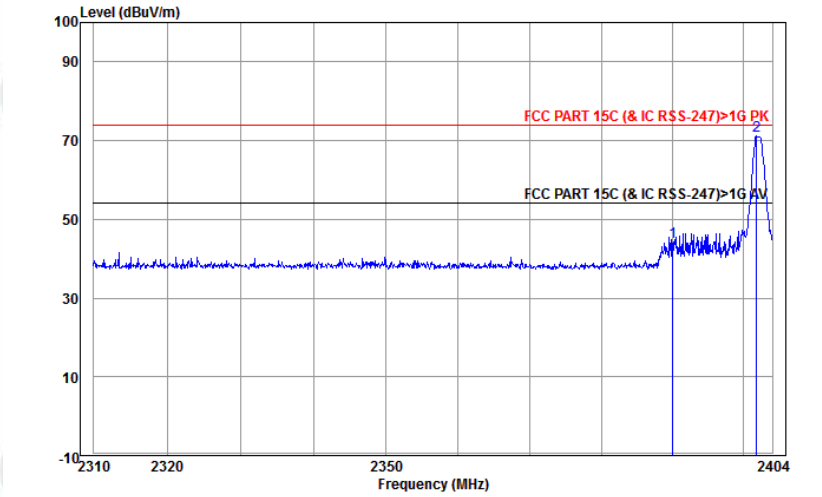
g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency	Limit (dBμV/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

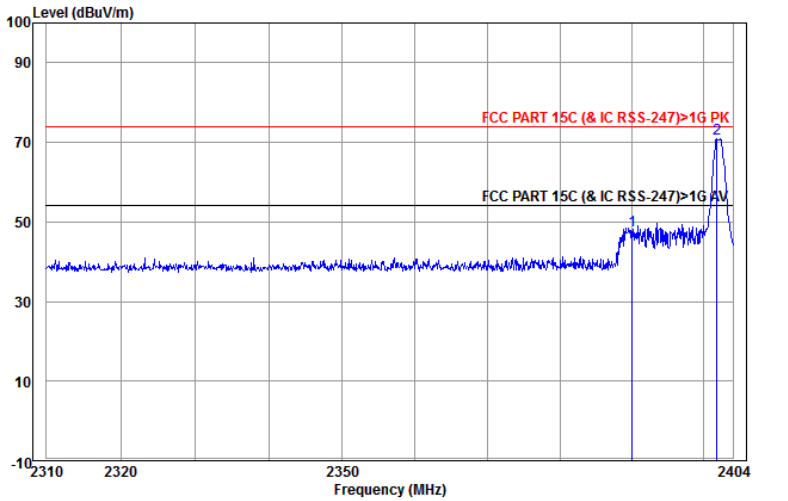
Test plot as follows:

Worse case mode:	GFSK		
Frequency: 2390.0MHz	Test channel: Lowest	Polarization: Horizontal	Remark: Peak



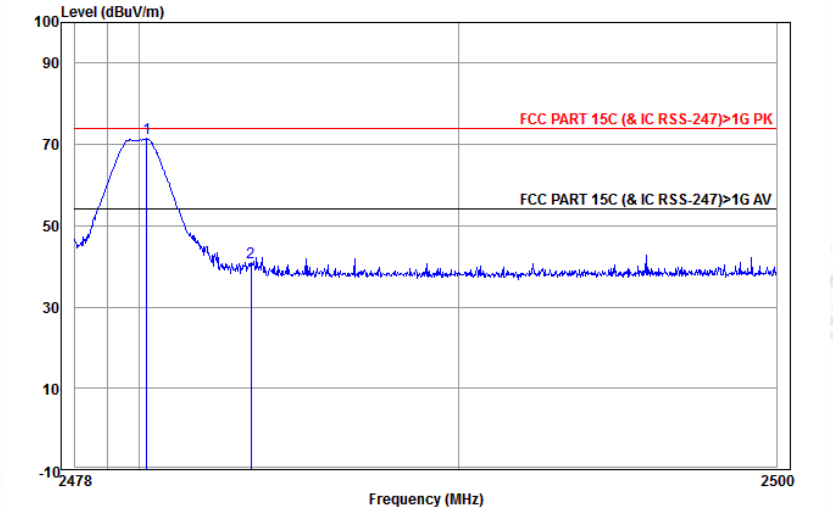
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	3.07	44.03	52.56	44.13	74.00	-29.87	Horizontal	Peak
2 pp	2401.796	32.56	3.07	44.04	79.50	71.09	74.00	-2.91	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2390.0MHz	Test channel: Lowest	Polarization: Vertical	Remark: Peak



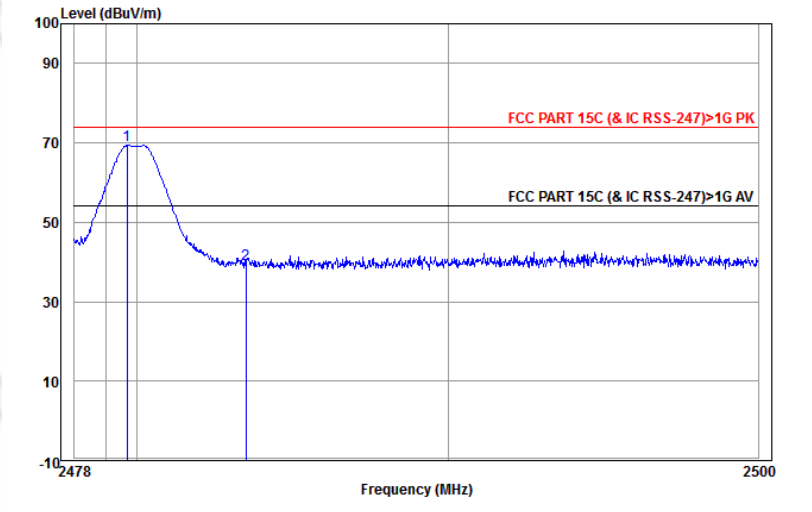
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	3.07	44.03	56.14	47.71	74.00	-26.29	Vertical	Peak
2 pp	2401.796	32.56	3.07	44.04	79.23	70.82	74.00	-3.18	Vertical	Peak

Worse case mode:	GFSK		
Frequency: 2483.5MHz	Test channel: Highest	Polarization: Horizontal	Remark: Peak



	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.235	32.71	3.12	44.14	79.71	71.40	74.00	-2.60	Horizontal	Peak
2	2483.500	32.71	3.12	44.14	49.28	40.97	74.00	-33.03	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2483.5MHz	Test channel: Highest	Polarization: Vertical	Remark: Peak



	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2479.687	32.71	3.12	44.14	77.78	69.47	74.00	-4.53	Vertical	Peak
2	2483.500	32.71	3.12	44.14	47.76	39.45	74.00	-34.55	Vertical	Peak

Note:
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 I): 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	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower.
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.
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 was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
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.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
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.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

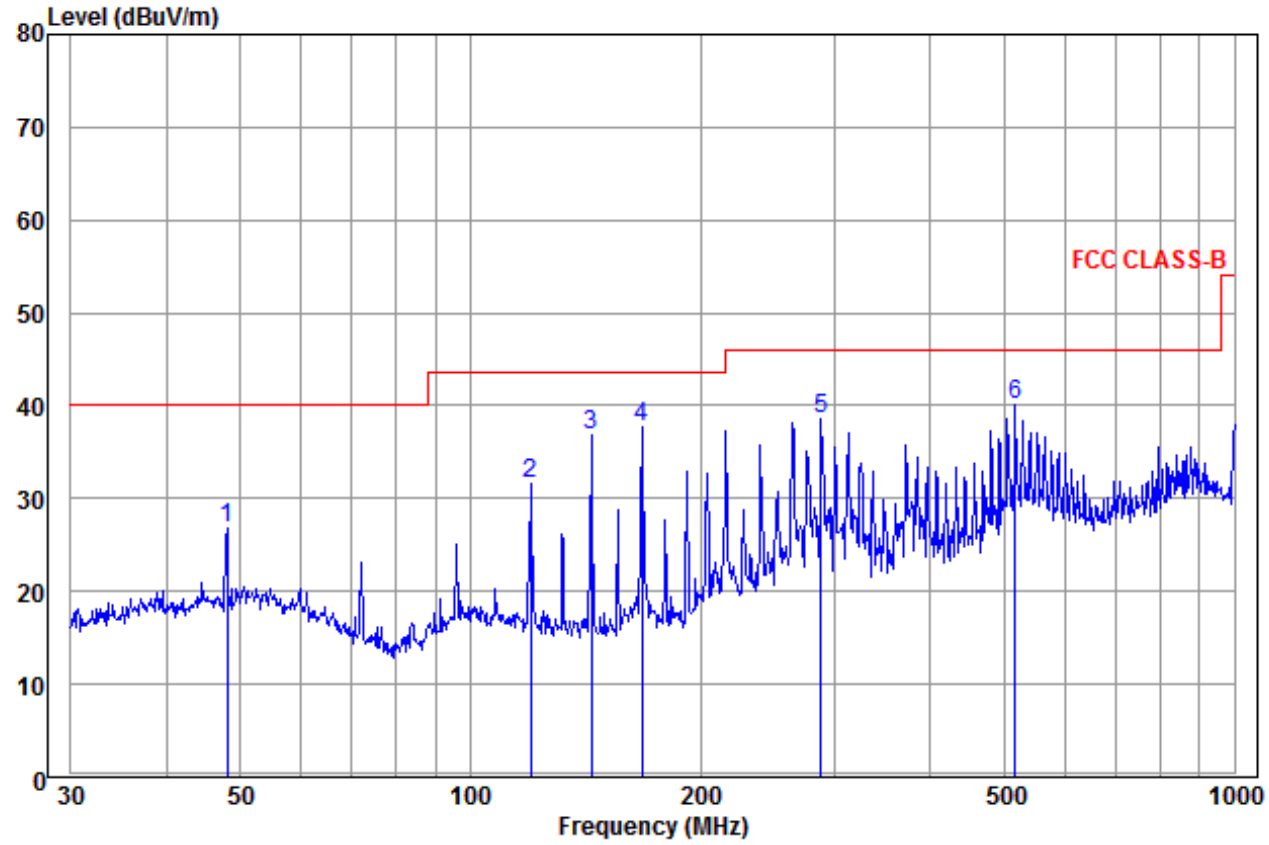
Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	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:

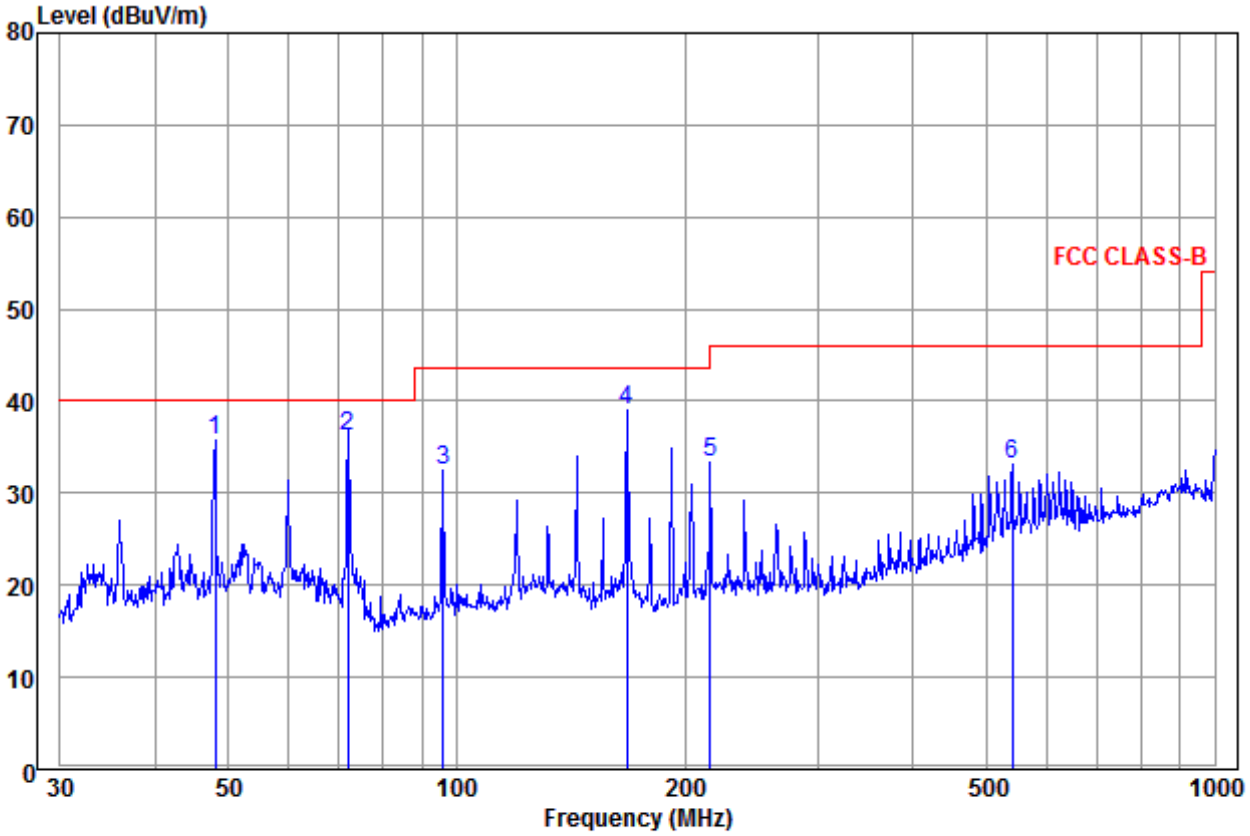
Radiated Emission below 1GHz

30MHz~1GHz (QP)		
Test mode:	Transmitting	Horizontal



	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	47.994	14.45	0.10	12.37	26.92	40.00	-13.08	Horizontal	QP
2	119.856	10.85	0.60	20.19	31.64	43.50	-11.86	Horizontal	QP
3	143.830	9.18	0.61	27.03	36.82	43.50	-6.68	Horizontal	QP
4 pp	167.824	9.85	0.80	27.08	37.73	43.50	-5.77	Horizontal	QP
5	287.990	13.22	1.13	24.33	38.68	46.00	-7.32	Horizontal	QP
6	517.248	17.22	1.53	21.25	40.00	46.00	-6.00	Horizontal	QP

Test mode:	Transmitting	Vertical



	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	47.994	14.45	0.10	21.28	35.83	40.00	-4.17	Vertical	QP
2 pp	71.832	10.05	0.28	25.83	36.16	40.00	-3.84	Vertical	QP
3	96.099	11.90	0.52	20.06	32.48	43.50	-11.02	Vertical	QP
4	167.824	9.85	0.80	28.45	39.10	43.50	-4.40	Vertical	QP
5	216.024	11.88	1.18	20.37	33.43	46.00	-12.57	Vertical	QP
6	541.373	17.65	1.54	14.05	33.24	46.00	-12.76	Vertical	QP

Transmitter Emission above 1GHz

Worse case mode:		GFSK		Test channel:		Lowest	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1316.422	30.49	2.04	44.22	45.88	34.19	74.00	-39.81	Pass	H
1791.273	31.38	2.63	43.69	46.29	36.61	74.00	-37.39	Pass	H
4804.000	34.69	5.98	44.60	43.05	39.12	74.00	-34.88	Pass	H
5806.408	35.76	7.25	44.52	45.81	44.30	74.00	-29.70	Pass	H
7206.000	36.42	6.97	44.77	42.44	41.06	74.00	-32.94	Pass	H
9608.000	37.88	6.98	45.58	41.44	40.72	74.00	-33.28	Pass	H
1210.356	30.25	1.88	44.37	46.93	34.69	74.00	-39.31	Pass	V
1837.456	31.46	2.68	43.65	46.90	37.39	74.00	-36.61	Pass	V
4804.000	34.69	5.98	44.60	43.01	39.08	74.00	-34.92	Pass	V
6611.326	36.21	7.28	44.56	45.12	44.05	74.00	-29.95	Pass	V
7206.000	36.42	6.97	44.77	43.15	41.77	74.00	-32.23	Pass	V
9608.000	37.88	6.98	45.58	42.38	41.66	74.00	-32.34	Pass	V

Worse case mode:		GFSK		Test channel:		Middle	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1340.089	30.54	2.07	44.19	46.99	35.41	74.00	-38.59	Pass	H
1786.719	31.37	2.62	43.70	47.03	37.32	74.00	-36.68	Pass	H
4880.000	34.85	6.13	44.60	42.44	38.82	74.00	-35.18	Pass	H
6396.125	36.11	7.34	44.54	45.67	44.58	74.00	-29.42	Pass	H
7320.000	36.43	6.85	44.87	43.46	41.87	74.00	-32.13	Pass	H
9760.000	38.05	7.12	45.55	40.80	40.42	74.00	-33.58	Pass	H
1192.011	30.21	1.85	44.40	46.42	34.08	74.00	-39.92	Pass	V
1605.554	31.07	2.42	43.88	47.76	37.37	74.00	-36.63	Pass	V
4880.000	34.85	6.13	44.60	42.04	38.42	74.00	-35.58	Pass	V
5836.044	35.78	7.28	44.52	44.88	43.42	74.00	-30.58	Pass	V
7320.000	36.43	6.85	44.87	43.07	41.48	74.00	-32.52	Pass	V
9760.000	38.05	7.12	45.55	41.09	40.71	74.00	-33.29	Pass	V

Worse case mode:		GFSK		Test channel:		Highest	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1289.885	30.43	2.00	44.26	45.33	33.50	74.00	-40.50	Pass	H
1746.251	31.31	2.58	43.73	45.23	35.39	74.00	-38.61	Pass	H
4960.000	35.02	6.29	44.60	40.81	37.52	74.00	-36.48	Pass	H
5836.044	35.78	7.28	44.52	44.11	42.65	74.00	-31.35	Pass	H
7440.000	36.45	6.73	44.97	40.65	38.86	74.00	-35.14	Pass	H
9920.000	38.22	7.26	45.52	40.75	40.71	74.00	-33.29	Pass	H
1251.079	30.35	1.94	44.31	47.24	35.22	74.00	-38.78	Pass	V
1617.862	31.09	2.43	43.87	46.17	35.82	74.00	-38.18	Pass	V
4960.000	35.02	6.29	44.60	41.87	38.58	74.00	-35.42	Pass	V
5791.646	35.74	7.23	44.52	45.58	44.03	74.00	-29.97	Pass	V
7440.000	36.45	6.73	44.97	42.13	40.34	74.00	-33.66	Pass	V
9920.000	38.22	7.26	45.52	43.09	43.05	74.00	-30.95	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:

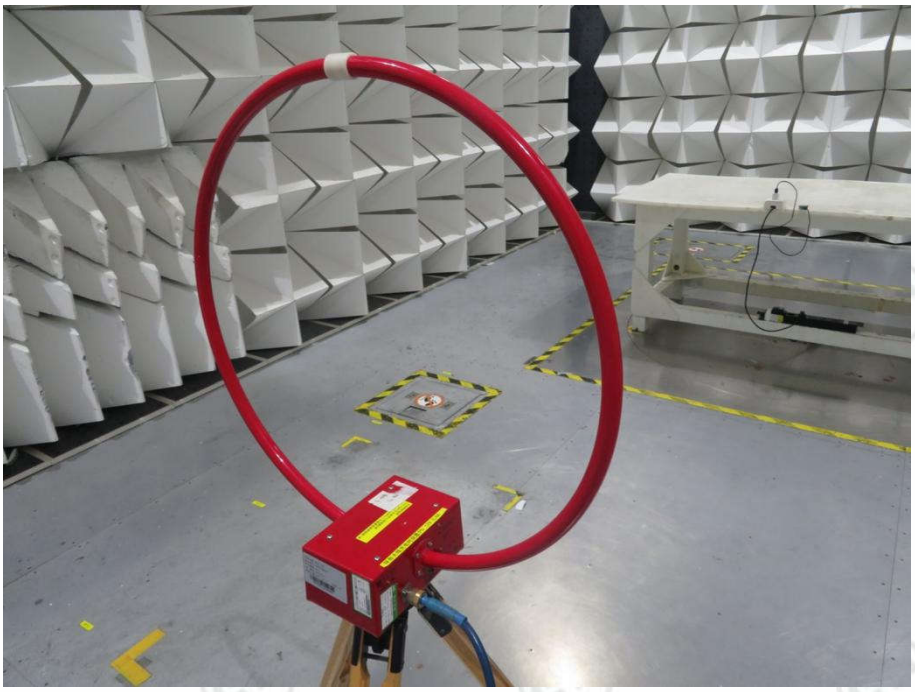
Final Test Level =Receiver Reading -Correct Factor

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.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Test Model No.: BL0509



Radiated emission Test Setup-1(9kHz～30MHz)

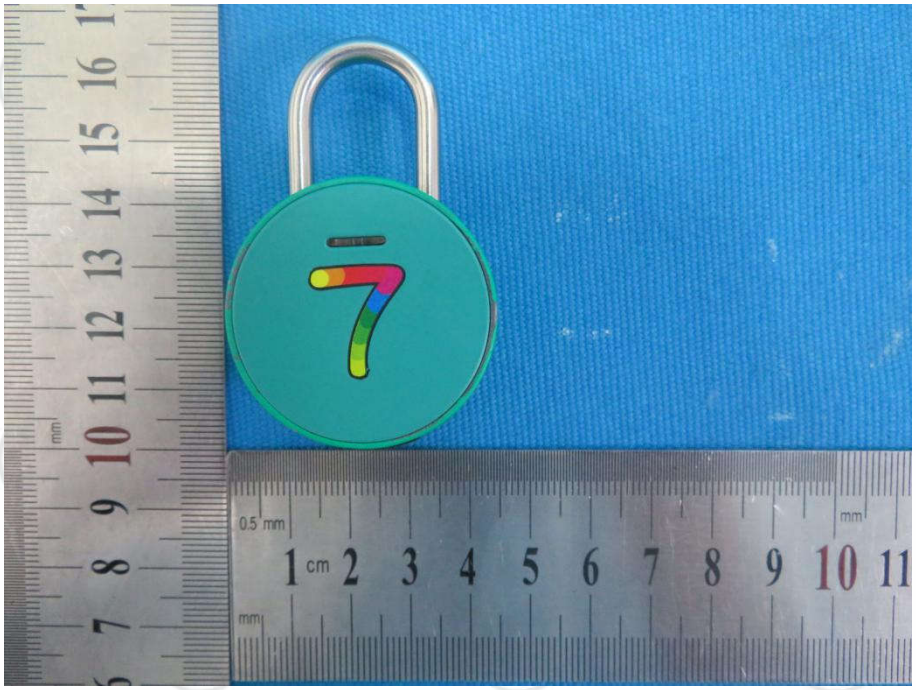
Radiated spurious emission Test Setup-2 (30MHz～1GHz)

Radiated spurious emission Test Setup-3(Above 1GHz)

Conducted Emissions

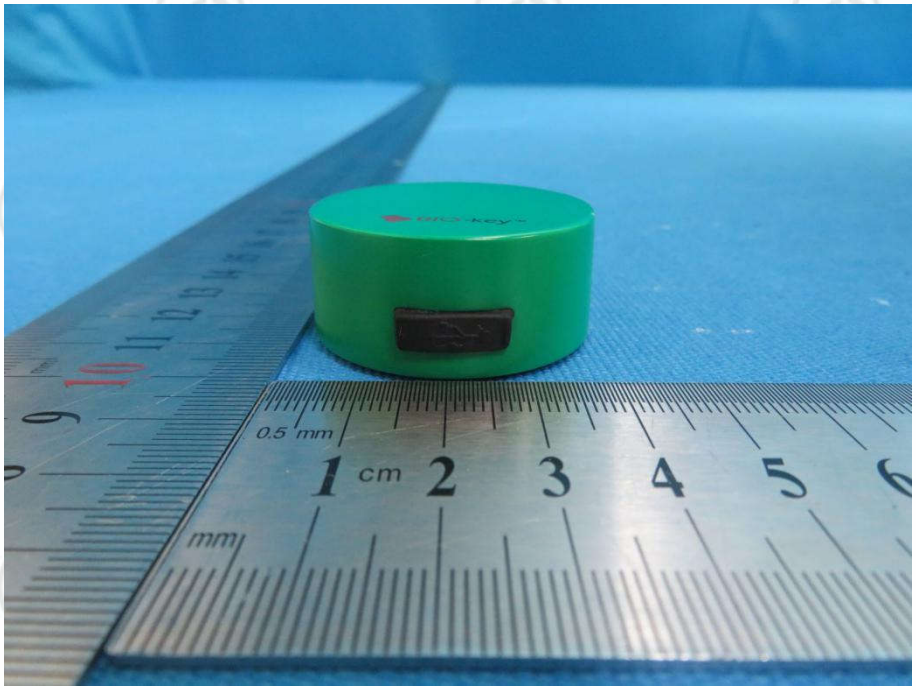
APPENDIX 2 PHOTOGRAPHS OF EUT

Test model No.: BL0509

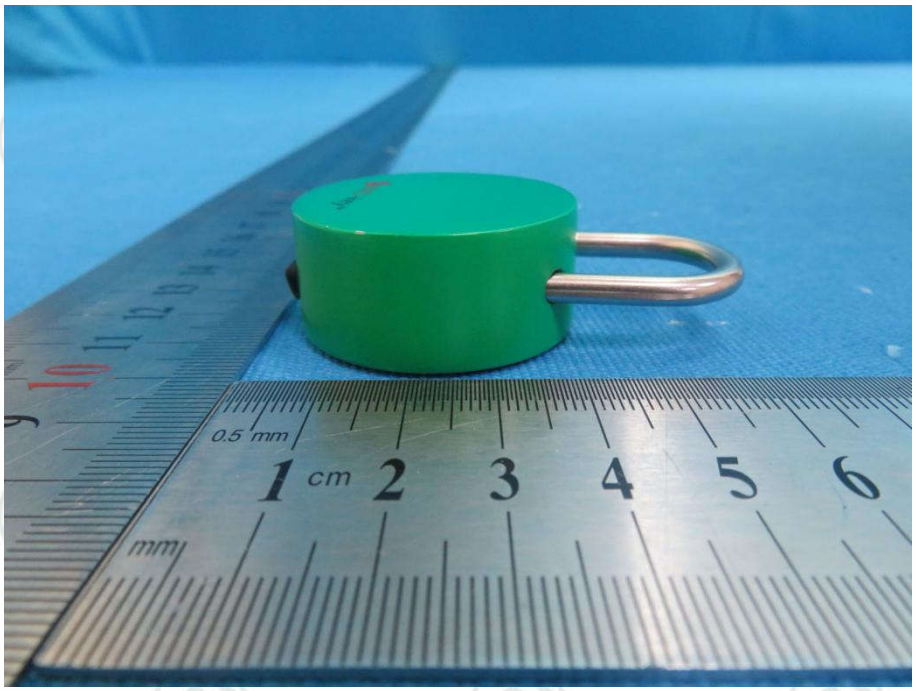


View of Product-1

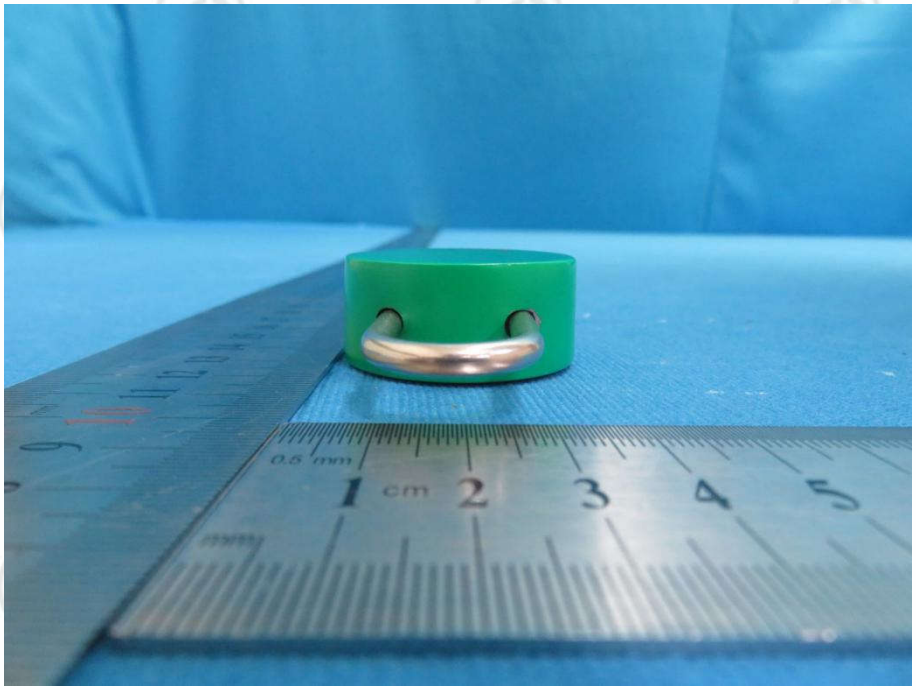
View of Product-2



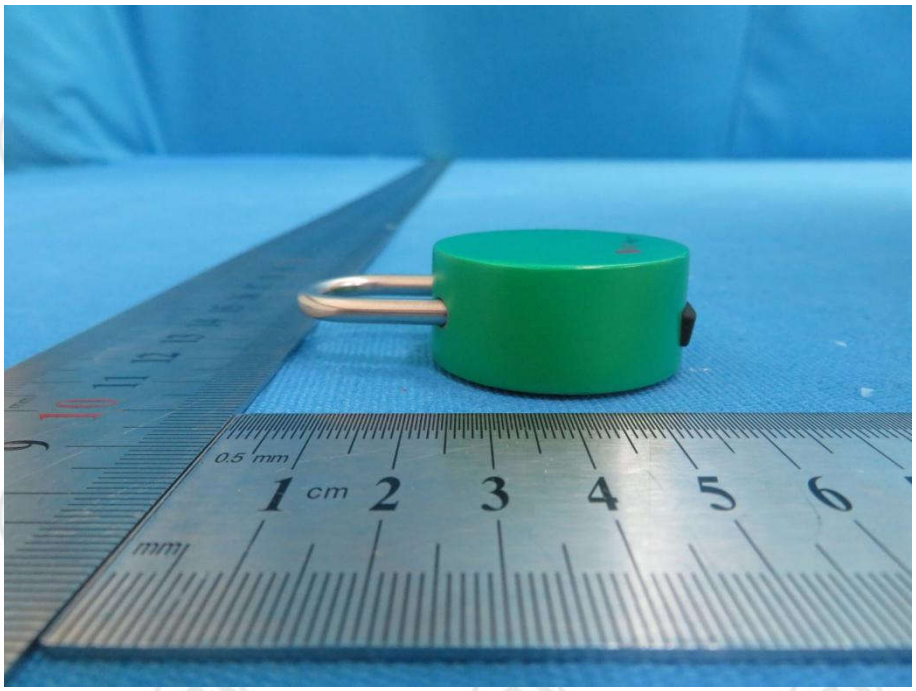
View of Product-3



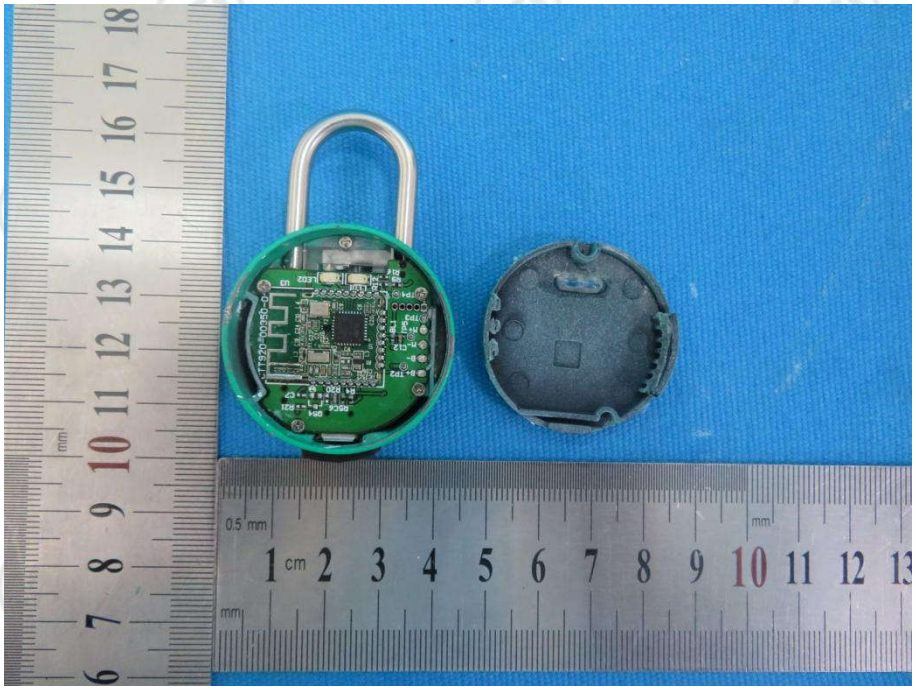
View of Product-4



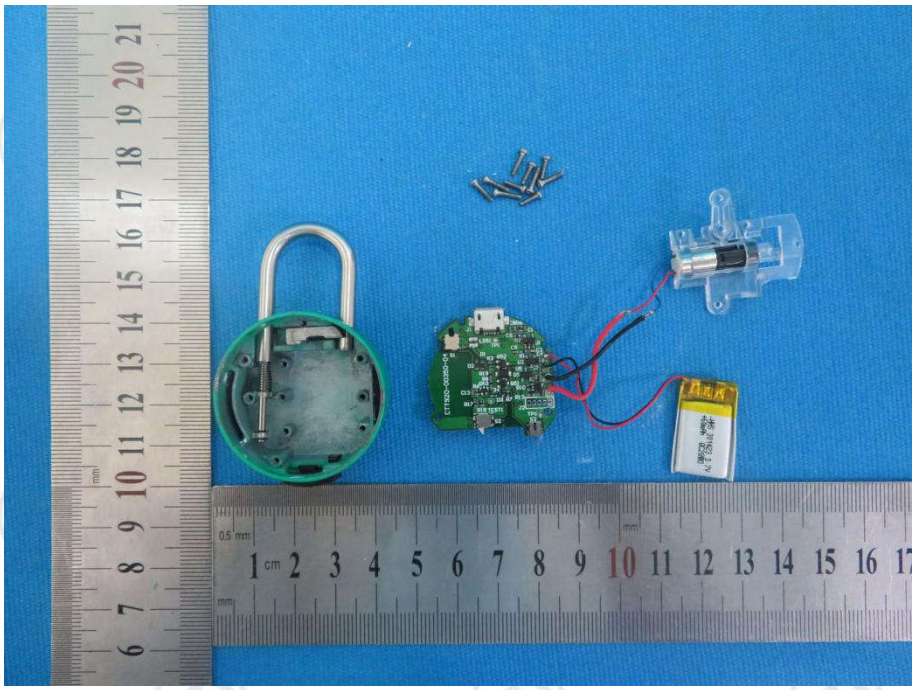
View of Product-5



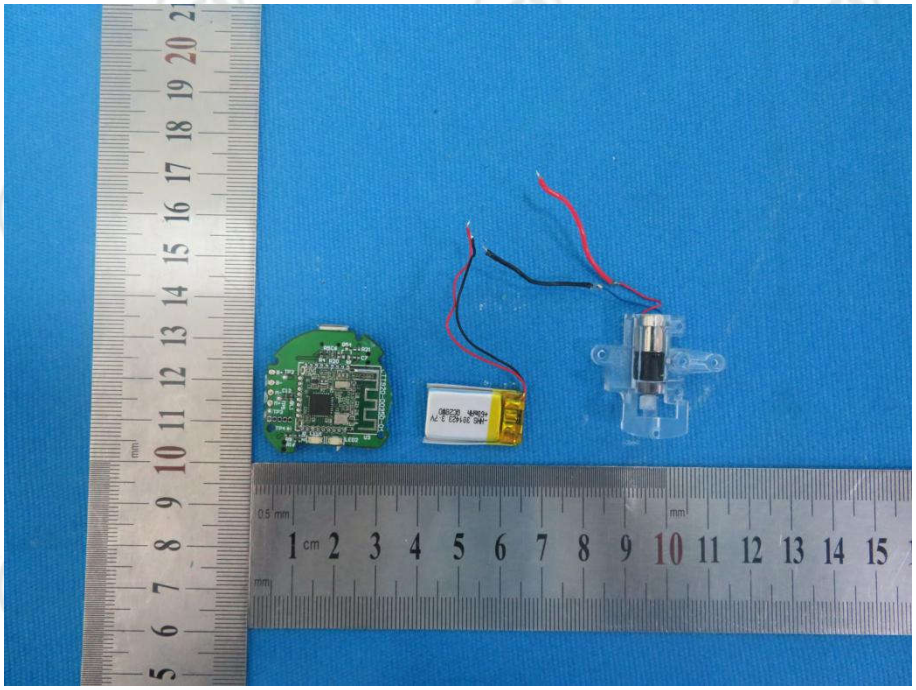
View of Product-6



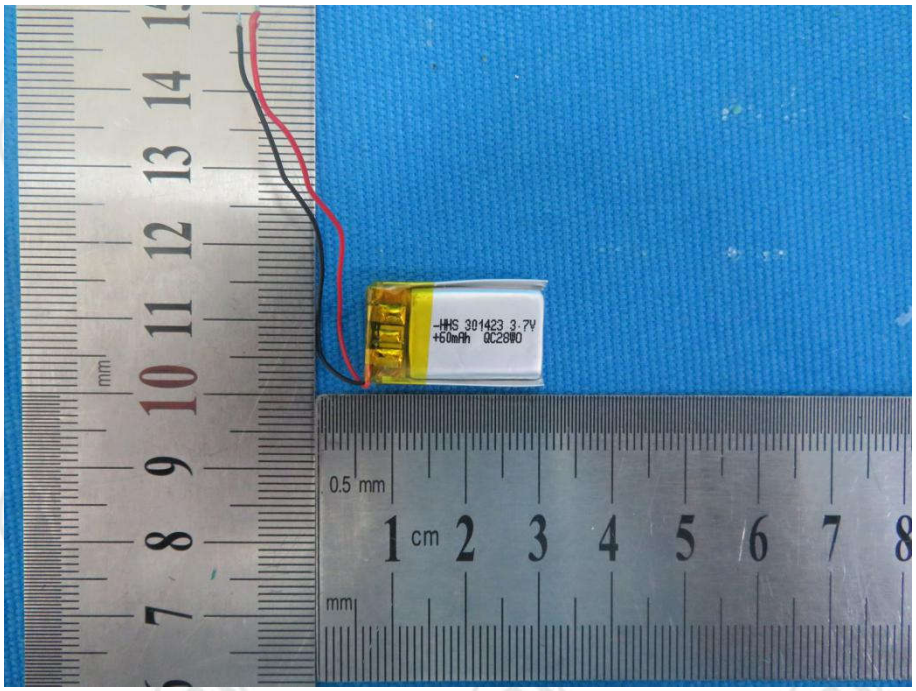
View of Product-7



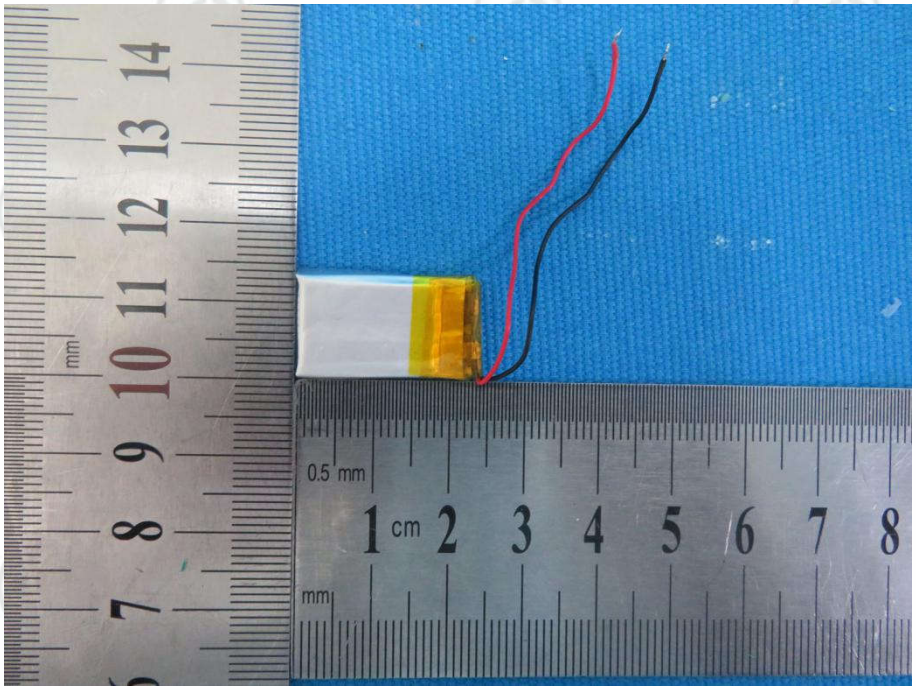
View of Product-8



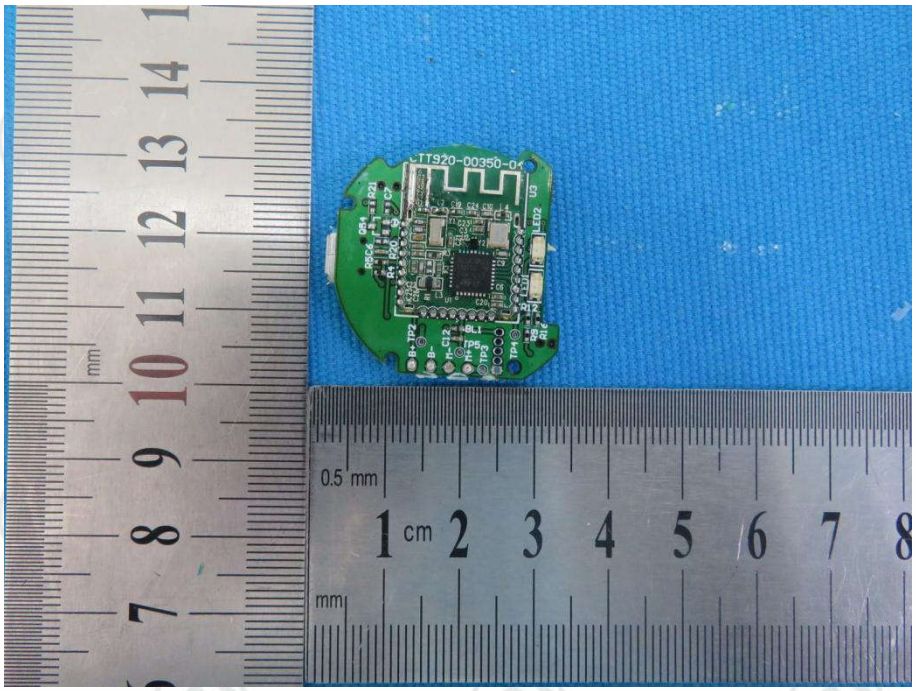
View of Product-9



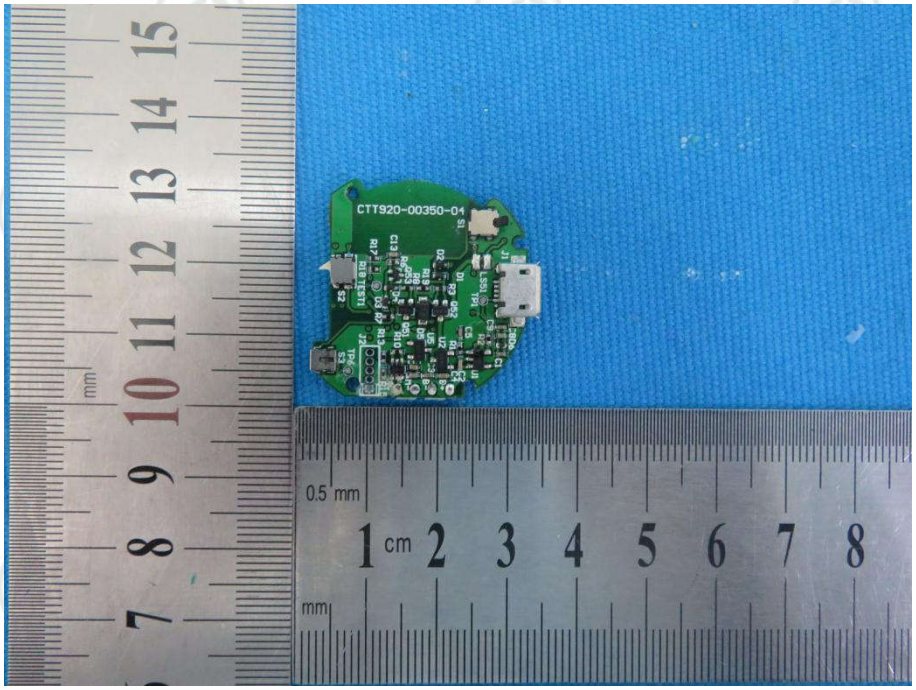
View of Product-10



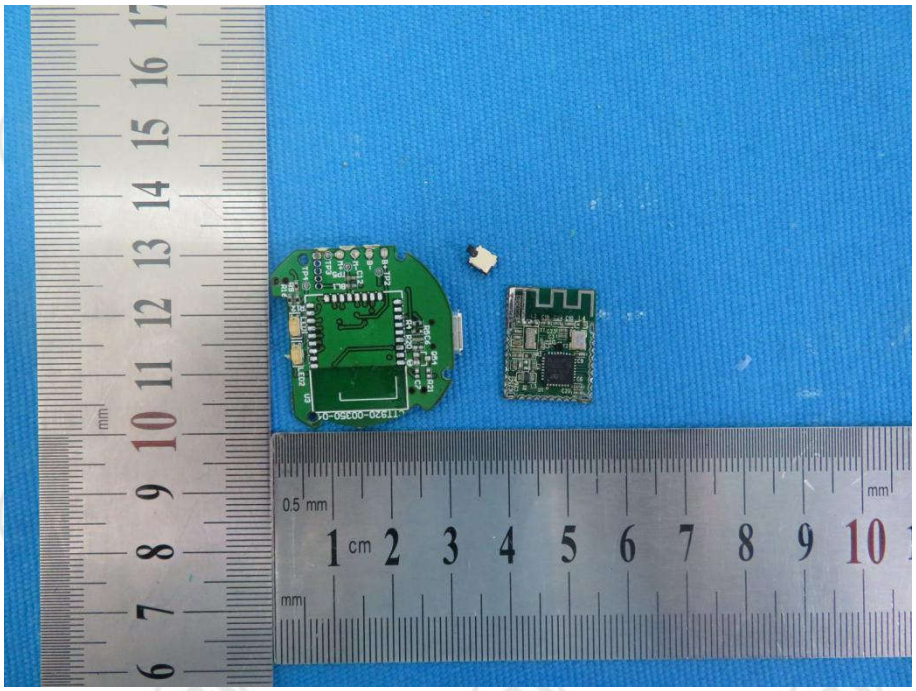
View of Product-11



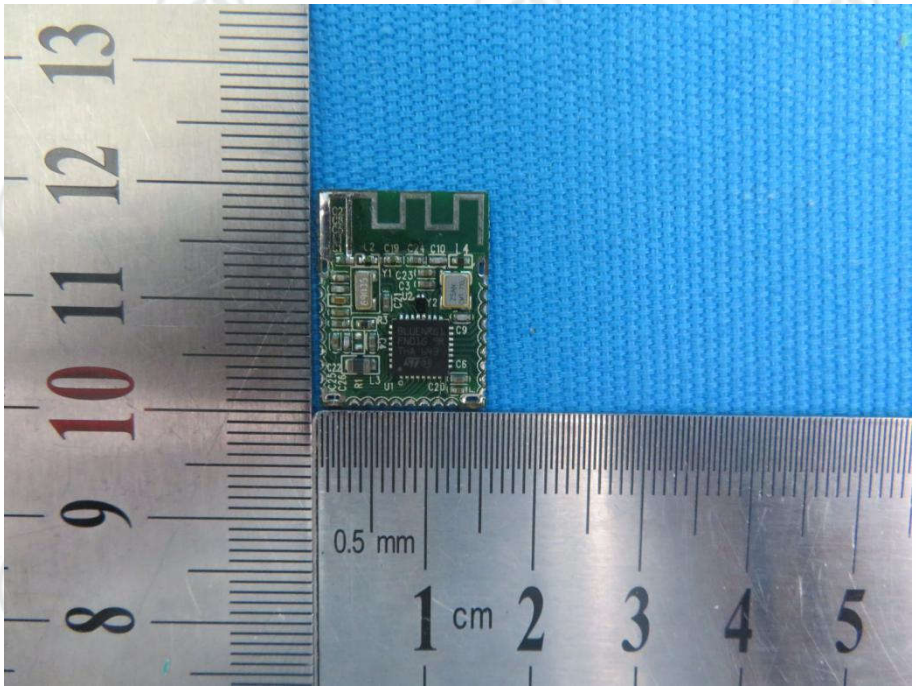
View of Product-12



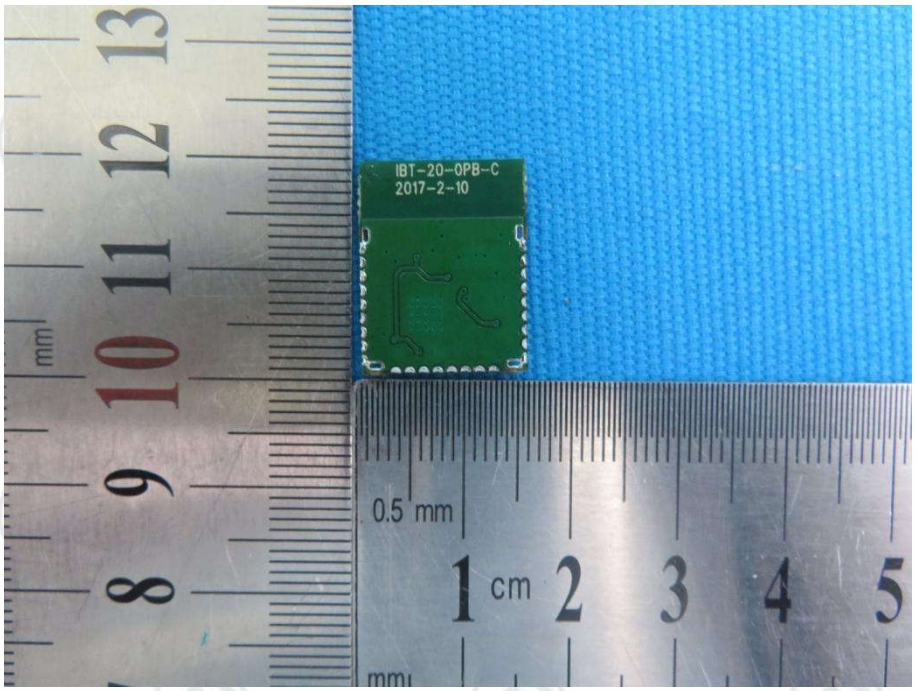
View of Product-13



View of Product-14



View of Product-15



View of Product-16

*** End of Report ***