TEST REPORT

Product	:	TouchLock TSA PLUS
Trade mark	:	BIO-key
Model/Type reference	:	BFS1709
Serial Number	:	N/A
Report Number	:	EED32K00187701
FCC ID	:	2AIKJ-BFS1709
Date of Issue	:	Aug. 10, 2018
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

BIO-key Hong Kong Limited
Unit 1212, 12/F, Grand City Plaza, 1-17 Sai Lau Kok Road,
Tsuen Wan, New Territories, Hong Kong

Prepared by:

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Tested By:	Tom chen (Test Project)	Compiled by:	Kevin Ian (Project Engineer)
Reviewed by:	Kevin yang (Reviewer)	Approved by:	Sheek Luo (Lab supervisor)
Date:	Aug. 10, 2018		Check No.:1022594255

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. Report Seal

2 Version

Version No.	Date	Description
00	Aug. 10, 2018	Original

3 Test Summary

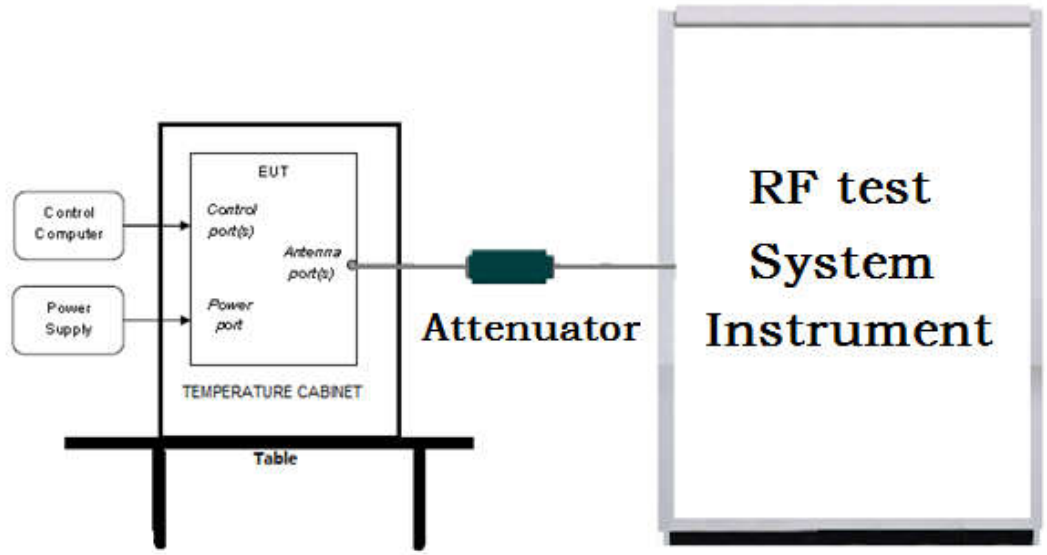
Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15Subpart C Section 15.247 (b)(3)	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(s) 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:

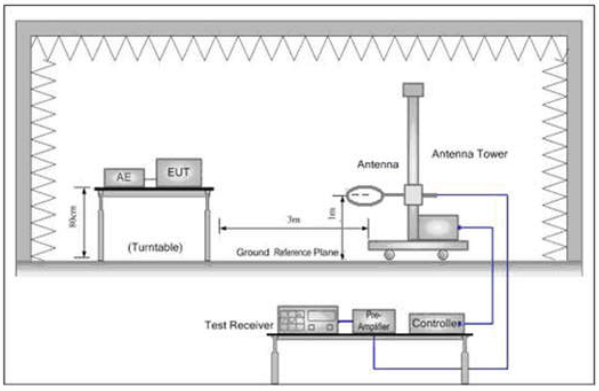


Figure 1. Below 30MHz

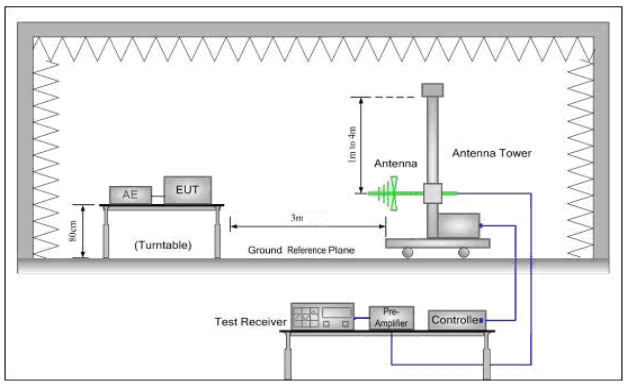


Figure 2. 30MHz to 1GHz

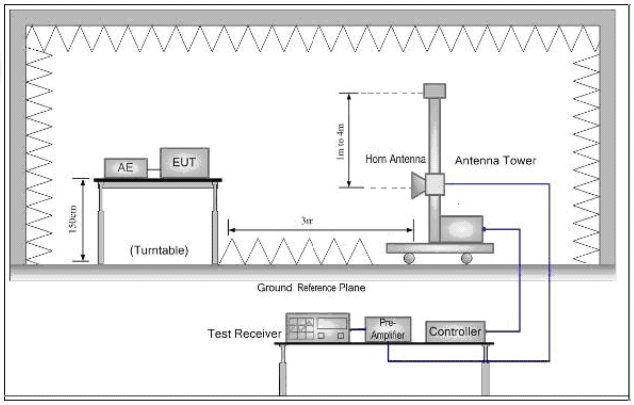
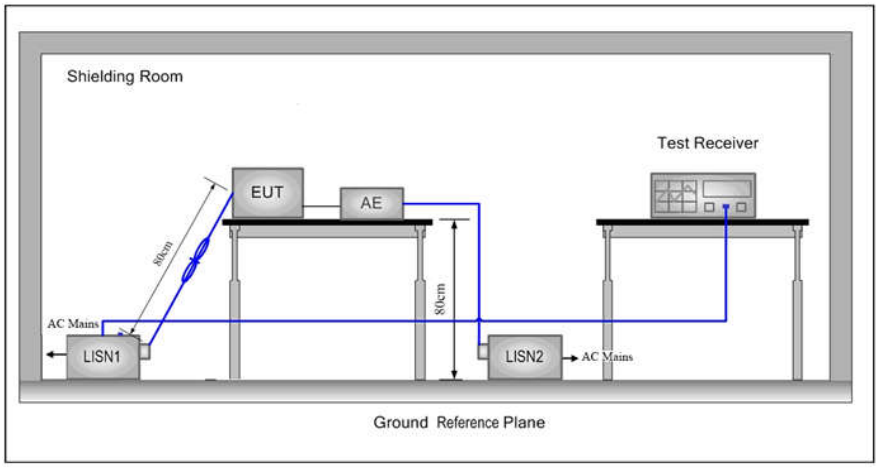


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	25.3°C
Humidity:	59% RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	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 signal at the specific channel(s).			

6 General Information

6.1 Client Information

Applicant:	BIO-key Hong Kong Limited
Address of Applicant:	Unit 1212, 12/F, Grand City Plaza, 1-17 Sai Lau Kok Road, Tsuen Wan, New Territories, Hong Kong
Manufacturer:	ZHUHAI SKYGOOD TECH. INDUSTRIAL CO., LTD.
Address of Manufacturer:	4/F, 3RD, BUILDING 30 NANWAN ROAD(N), NANPING, ZHUHAI, GUANGDONG, P.R. CHINA
Factory:	ZHUHAI SKYGOOD TECH. INDUSTRIAL CO., LTD.
Address of Factory:	4/F, 3RD, BUILDING 30 NANWAN ROAD(N), NANPING, ZHUHAI, GUANGDONG, P.R. CHINA

6.2 General Description of EUT

Product Name:	TouchLock TSA PLUS
Model No.(EUT):	BFS1709
Trade mark:	BIO-key
EUT Supports Radios application:	4.1 BT Single mode, 2402-2480MHz
Power Supply:	Battery: 3.7V, 85mAh
Sample Received Date:	Jul. 17, 2018
Sample tested Date:	Jul. 17, 2018 to Aug. 10, 2018

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	4.1
Modulation Type:	GFSK
Number of Channel:	40
Firmware version of the sample:	29(manufacturer declare)
Hardware version of the sample:	5.0(manufacturer declare)
Test power grade:	N/A
Test software of EUT:	BLUENRG_GUI.exe(manufacturer declare)
Antenna Type:	PCB Antenna
Antenna gain:	0.49dBi
Test Voltage:	Battery: 3.7V, 85mAh

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	Serial number	Supplied by	Certification
AE1	AC Adapter	XIAOMI	MDY-08-EZ	2C418010000013A	CTI	UL

6.5 Test Location

All tests were performed at:
Centre Testing International Group Co., Ltd.
Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, Guangdong, China 518101
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.
FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

6.9 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	03-13-2018	03-12-2019
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-13-2018	03-12-2019
Signal Generator	Keysight	N5182B	MY53051549	03-13-2018	03-12-2019
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-10-2018	01-09-2019
DC Power	Keysight	E3642A	MY54436035	03-13-2018	03-12-2019
power meter & power sensor	R&S	OSP120	101374	04-11-2018	04-10-2019
RF control unit	JS Tonscend	JS0806-2	2015860006	03-13-2018	03-12-2019
BT&WI-FI Automatic test software	JS Tonscend	JSTS1120-2	---	03-29-2018	03-28-2019
Temperature / Humidity Indicator	Defu	TH128	---	07-02-2018	07-01-2019

Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100435	05-25-2018	05-24-2019
Temperature / Humidity Indicator	Defu	TH128	---	07-02-2018	07-01-2019
LISN	R&S	ENV216	100098	05-11-2018	05-10-2019

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-04-2016	06-03-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-618	08-15-2017	08-14-2018
Preamplifier	JS Tonscend	EMC051845SE	980380	01-19-2018	01-18-2019
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1869	04-25-2018	04-23-2021
Loop Antenna	ETS	6502	00071730	06-21-2018	06-20-2019
Spectrum Analyzer	Agilent	E4443A	MY45300910	11-16-2017	11-15-2018
Spectrum Analyzer	R&S	FSP40	100416	05-11-2018	05-10-2019
Receiver	R&S	ESCI	100435	05-25-2018	05-24-2019
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-02-2018	05-01-2019
Double ridge horn antenna	A.H.SYSTEMS	SAS-574	6042	06-05-2018	06-03-2021
Pre-amplifier	A.H.SYSTEMS	PAP-1840-60	6041	06-05-2018	06-03-2021
Cable line	Fulai(7M)	SF106	5219/6A	01-10-2018	01-09-2019
Cable line	Fulai(6M)	SF106	5220/6A	01-10-2018	01-09-2019
Cable line	Fulai(3M)	SF106	5216/6A	01-10-2018	01-09-2019
Cable line	Fulai(3M)	SF106	5217/6A	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX01CA09CL12 -0395-001	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX01CA08CL12 -0393-001	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX02CA04CL12 -0396-002	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX02CA03CL12 -0394-001	---	01-10-2018	01-09-2019

8 Radio Technical Requirements Specification

Reference documents for testing:

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

Test Results List:

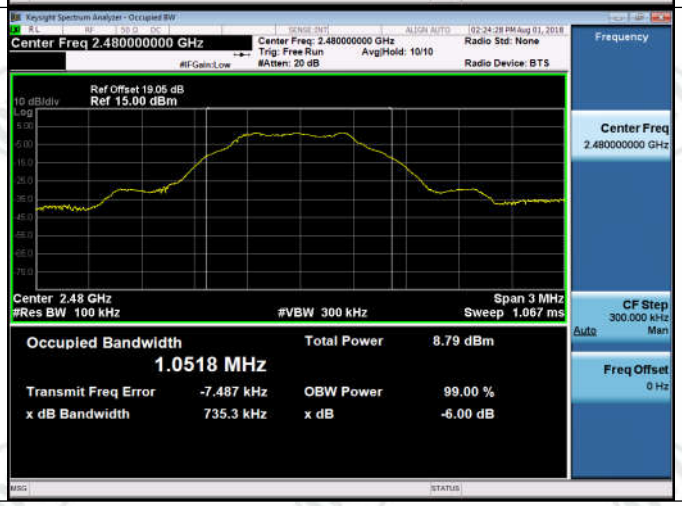
Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	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	Remark
BLE	LCH	0.7048	1.0504	PASS	Peak detector
BLE	MCH	0.7020	1.0505	PASS	
BLE	HCH	0.7353	1.0518	PASS	

Test Graphs

Graphs		
LCH		
MCH		
HCH		

Appendix B): Conducted Peak Output Power

Test Result

Mode	Channel	Conduct Peak Power[dBm]	Verdict
BLE	LCH	2.902	PASS
BLE	MCH	2.381	PASS
BLE	HCH	2.334	PASS

Test Graphs

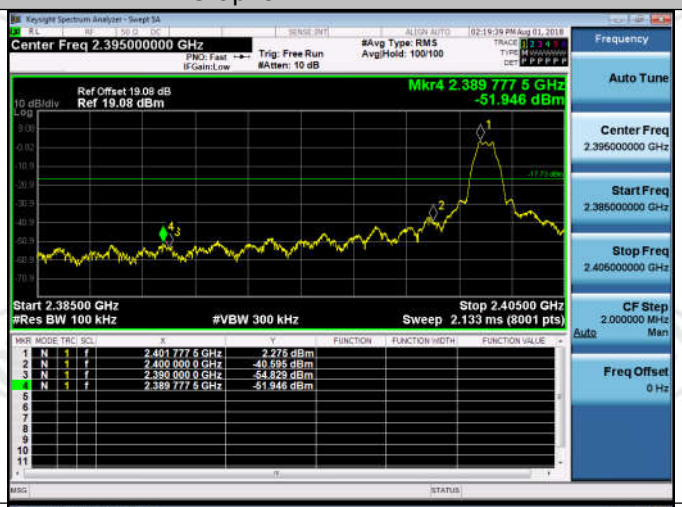
Graphs		
LCH		
MCH		
HCH		

Appendix C): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	2.275	-51.946	-17.73	PASS
BLE	HCH	1.691	-40.811	-18.31	PASS

Test Graphs

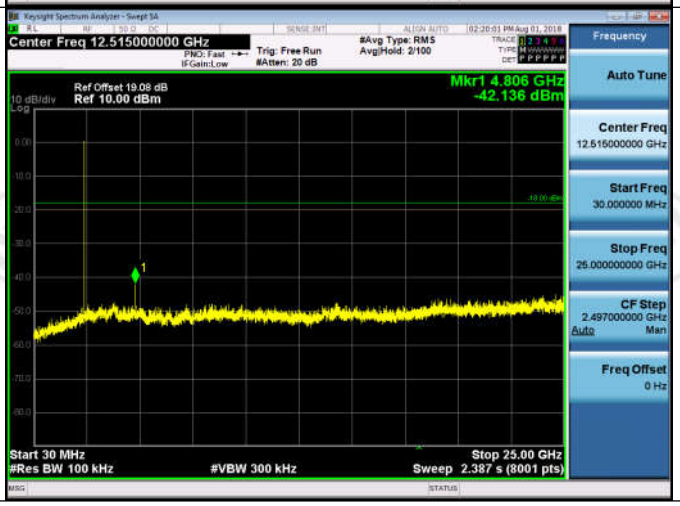
Graphs		
LCH		
HCH		

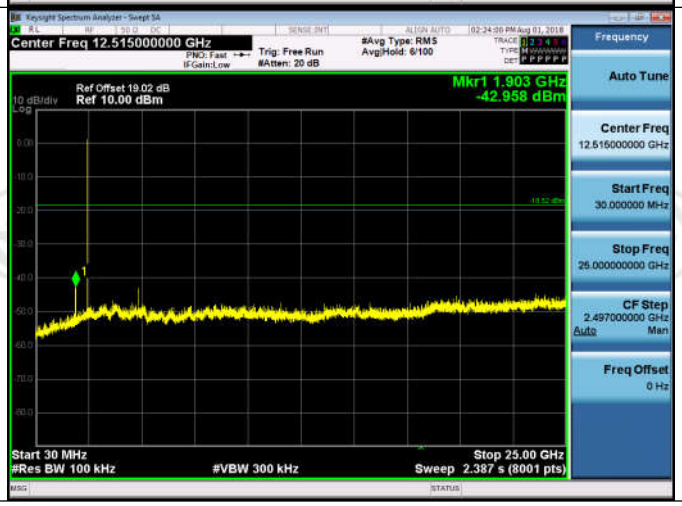
Appendix D): RF Conducted Spurious Emissions

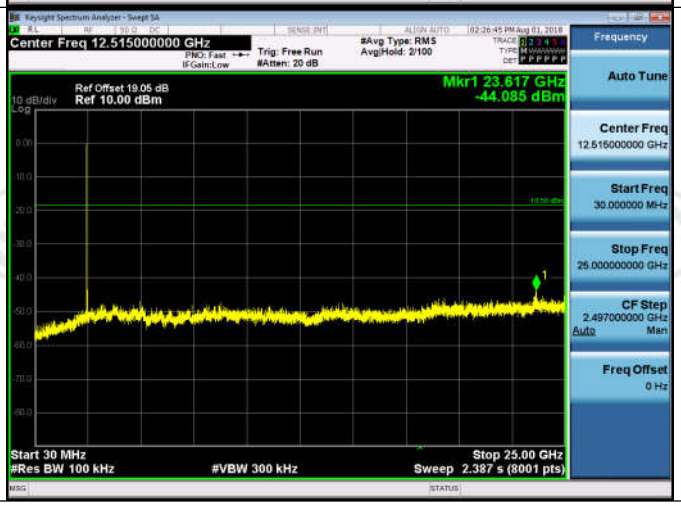
Result Table

Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	2.005	<Limit	PASS
BLE	MCH	1.482	<Limit	PASS
BLE	HCH	1.420	<Limit	PASS

Test Graphs

BLE_LCH_Graphs		
Pref/BLE/LCH		
Puw/BLE/LCH		

BLE_MCH_Graphs			
Pref/BLE/MCH			
Puw/BLE/MCH			

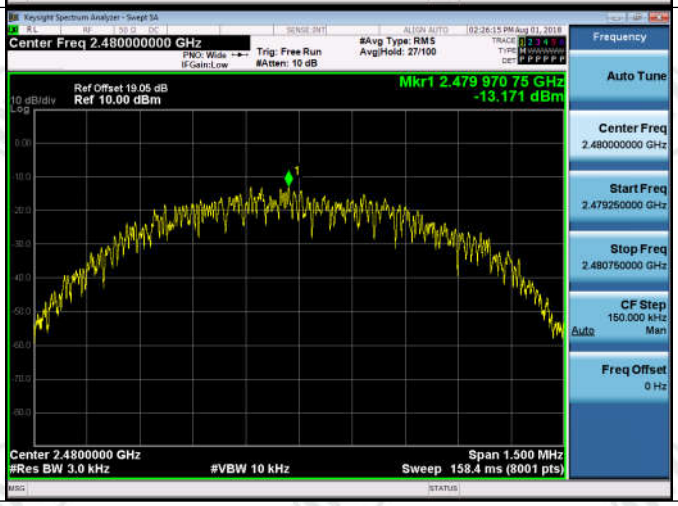
BLE_HCH_Graphs			
Pref/BLE/HCH			
Puw/BLE/HCH			

Appendix E): Power Spectral Density

Result Table

Mode	Channel	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE	LCH	-12.589	8	PASS
BLE	MCH	-12.959	8	PASS
BLE	HCH	-13.171	8	PASS

Test Graphs

Graphs		
LCH		
MCH		
HCH		

Appendix F): Antenna Requirement

15.203 requirement:

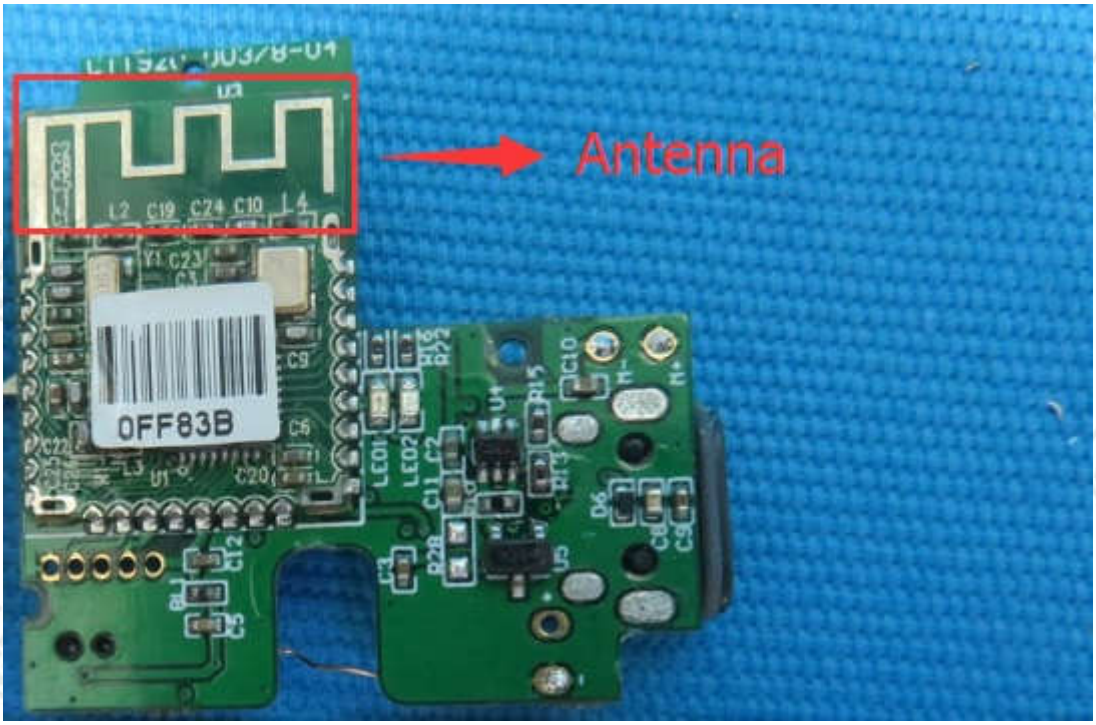
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit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



Appendix G): AC Power Line Conducted Emission

Test Procedure:	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.
Limit:	

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

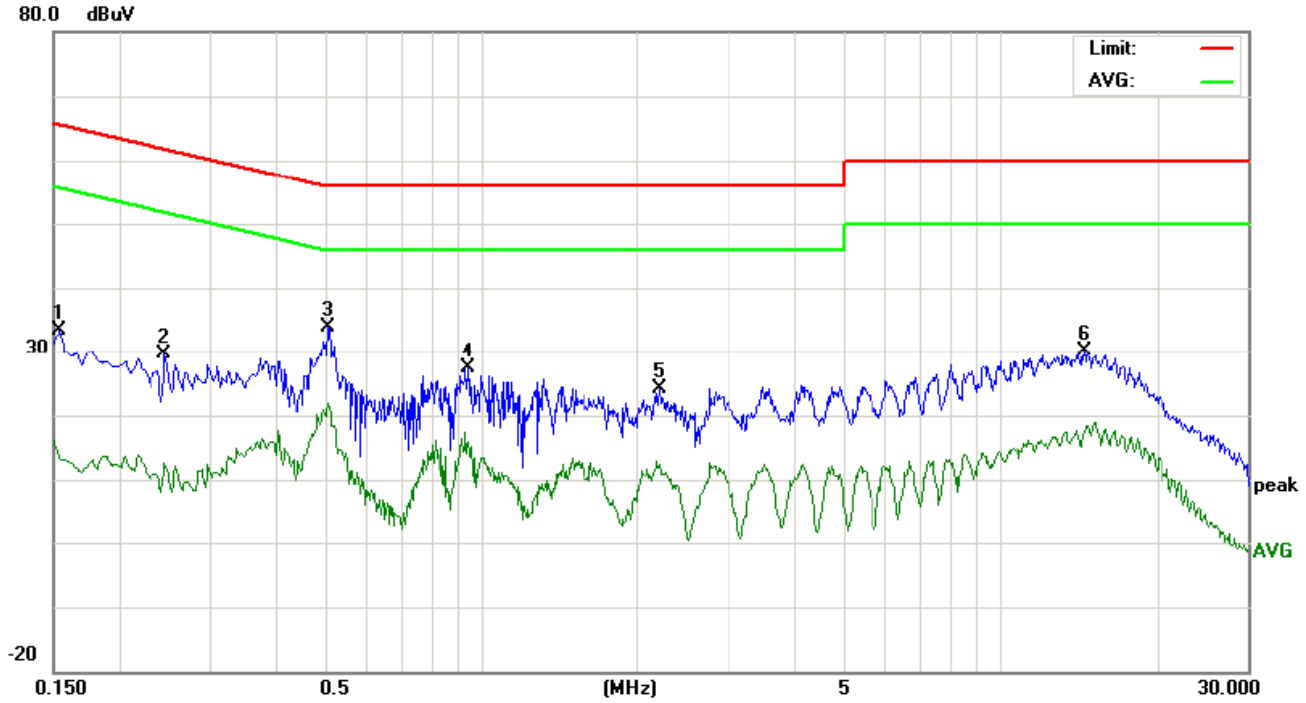
NOTE : The lower limit is applicable at the transition frequency

Measurement Data

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

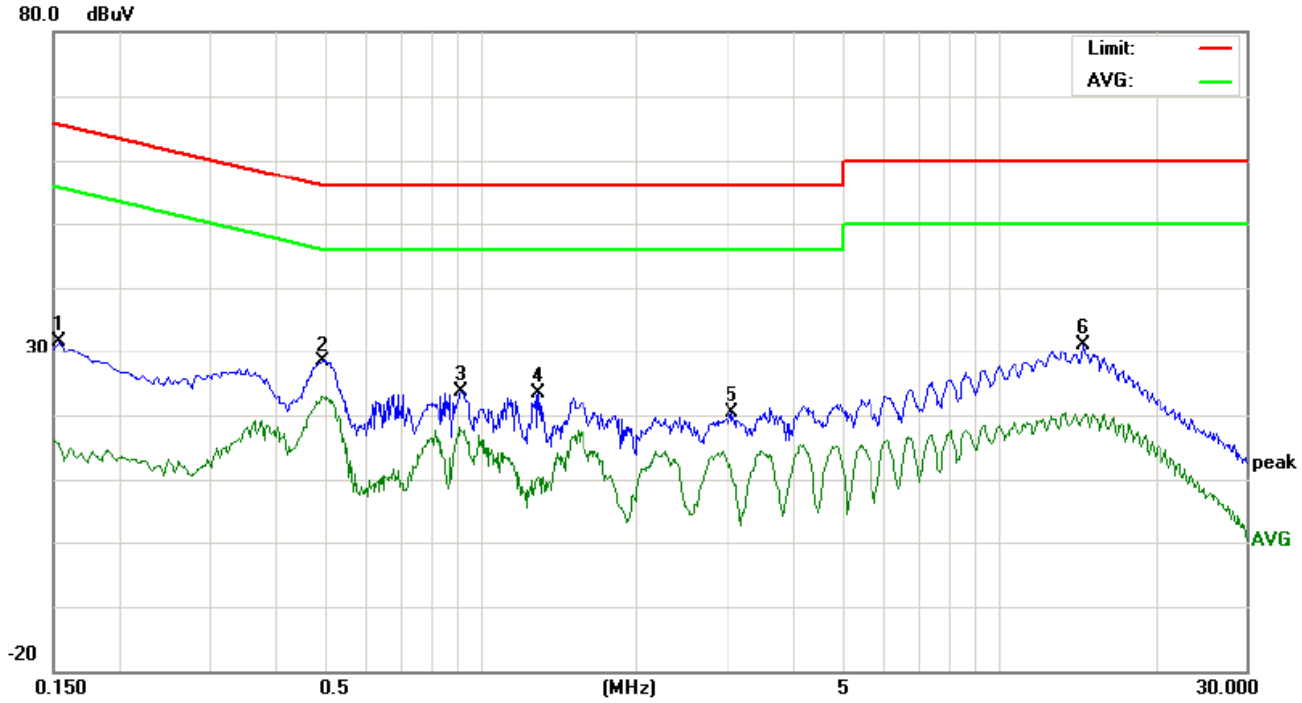
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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	0.1539	23.58	17.68	3.51	9.76	33.34	27.44	13.27	65.78	55.78	-38.34	-42.51	P	
2	0.2460	19.95	13.24	2.81	9.74	29.69	22.98	12.55	61.89	51.89	-38.91	-39.34	P	
3	0.5100	24.25	18.47	12.08	9.71	33.96	28.18	21.79	56.00	46.00	-27.82	-24.21	P	
4	0.9460	17.59	11.41	6.26	9.74	27.33	21.15	16.00	56.00	46.00	-34.85	-30.00	P	
5	2.2060	14.52	8.22	2.71	9.71	24.23	17.93	12.42	56.00	46.00	-38.07	-33.58	P	
6	14.5860	20.20	14.78	7.55	9.99	30.19	24.77	17.54	60.00	50.00	-35.23	-32.46	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	0.1539	21.88	15.57	5.61	9.76	31.64	25.33	15.37	65.78	55.78	-40.45	-40.41	P	
2	0.4980	18.68	12.47	13.28	9.71	28.39	22.18	22.99	56.03	46.03	-33.85	-23.04	P	
3	0.9220	13.84	7.74	7.99	9.74	23.58	17.48	17.73	56.00	46.00	-38.52	-28.27	P	
4	1.2900	13.58	7.82	0.69	9.72	23.30	17.54	10.41	56.00	46.00	-38.46	-35.59	P	
5	3.0620	10.78	4.69	0.63	9.68	20.46	14.37	10.31	56.00	46.00	-41.63	-35.69	P	
6	14.5260	21.26	15.32	9.69	9.99	31.25	25.31	19.68	60.00	50.00	-34.69	-30.32	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:

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.

The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

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.

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.

The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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:

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).

. Test the EUT in the lowest channel , the Highest channel

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.

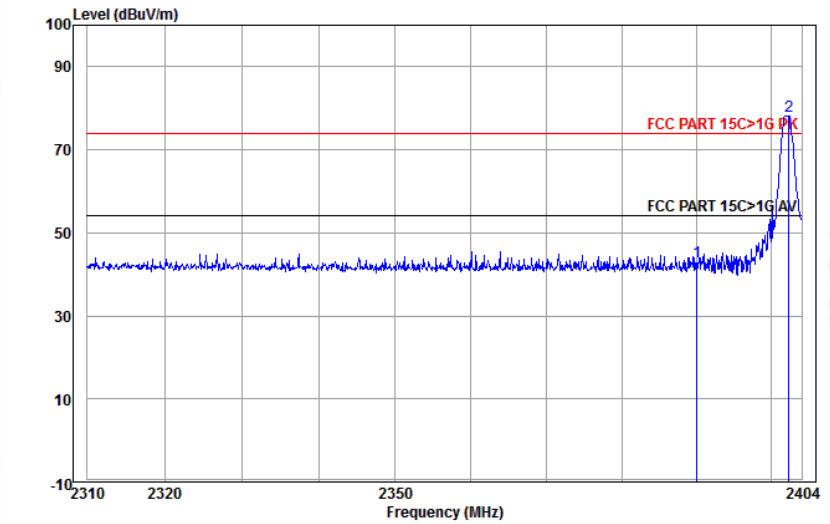
Repeat above procedures until all frequencies measured was complete.

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

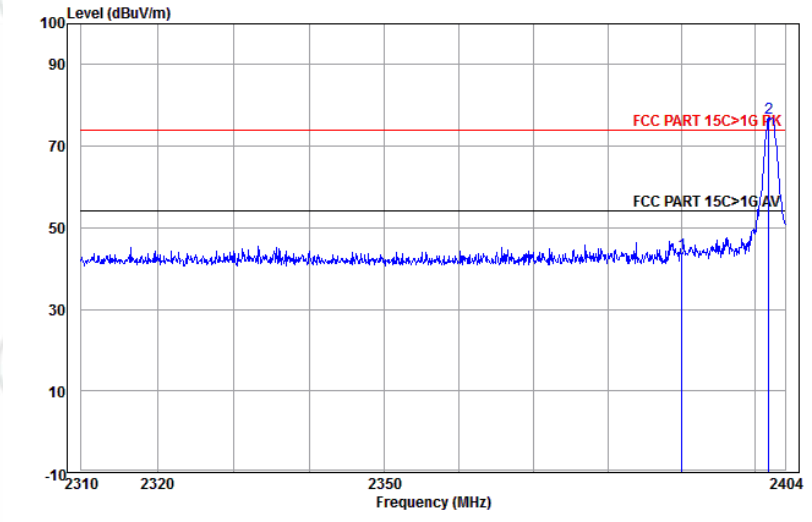
Test plot as follows:

Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Horizontal	Remark: Peak



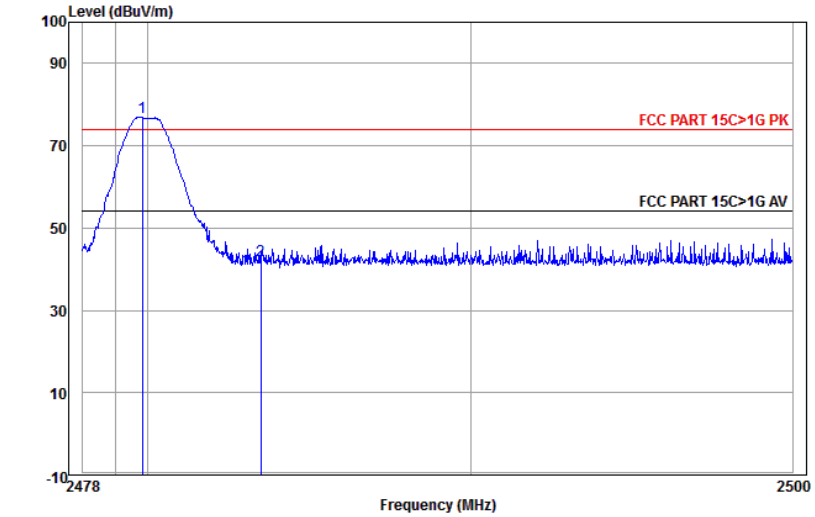
	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	27.64	3.07	12.48	43.19	74.00	-30.81	Horizontal	Peak
2 pp	2402.275	27.62	3.08	47.57	78.27	74.00	4.27	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Vertical	Remark: Peak



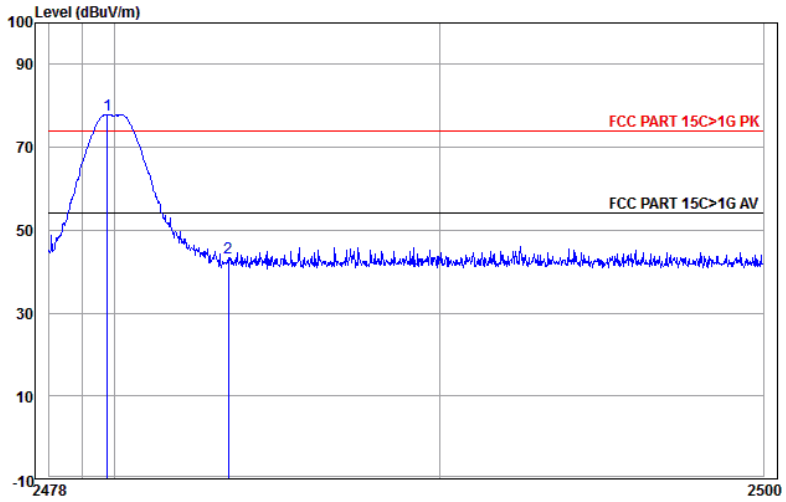
	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	27.64	3.07	12.84	43.55	74.00	-30.45	Vertical	Peak
2 pp	2401.796	27.62	3.07	46.26	76.95	74.00	2.95	Vertical	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Horizontal	Remark: Peak



	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 pp	2479.841	27.59	3.12	46.23	76.94	74.00	2.94	Horizontal	Peak
2	2483.500	27.59	3.12	11.47	42.18	74.00	-31.82	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Vertical	Remark: Peak



	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 pp	2479.775	27.59	3.12	47.21	77.92	74.00	3.92	Vertical	Peak
2	2483.500	27.59	3.12	12.58	43.29	74.00	-30.71	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:

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.

The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower.

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.

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.

The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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:

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).

Test the EUT in the lowest channel ,the middle channel ,the Highest channel

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.

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

Test mode: Transmitting

NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Magin [dB]	Result	Polarity
1	95.9732	10.36	1.13	-32.08	45.73	25.14	43.50	18.36	Pass	Horizontal
2	144.0948	7.34	1.41	-31.99	55.64	32.40	43.50	11.10	Pass	Horizontal
3	192.0224	10.14	1.62	-31.96	55.27	35.07	43.50	8.43	Pass	Horizontal
4	239.9500	11.94	1.84	-31.90	54.84	36.72	46.00	9.28	Pass	Horizontal
5	288.0716	12.96	2.02	-31.89	52.33	35.42	46.00	10.58	Pass	Horizontal
6	742.5105	20.27	3.26	-32.11	37.00	28.42	46.00	17.58	Pass	Horizontal
7	48.6277	13.20	0.79	-32.12	42.61	24.48	40.00	15.52	Pass	Vertical
8	192.0224	10.14	1.62	-31.96	43.25	23.05	43.50	20.45	Pass	Vertical
9	208.9038	11.13	1.71	-31.94	42.69	23.59	43.50	19.91	Pass	Vertical
10	239.9500	11.94	1.84	-31.90	38.75	20.63	46.00	25.37	Pass	Vertical
11	375.0010	14.85	2.31	-31.88	33.42	18.70	46.00	27.30	Pass	Vertical
12	742.5105	20.27	3.26	-32.11	36.45	27.87	46.00	18.13	Pass	Vertical

Transmitter Emission above 1GHz

Worse case mode: GFSK			Test channel: Lowest						
Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Magin [dB]	Polarity	Remark
2707.1414	32.73	4.12	-36.72	46.53	46.66	74.00	27.34	H	Peak
4804.0000	34.50	4.55	-36.15	47.79	50.69	74.00	23.31	H	Peak
7206.0000	36.31	5.81	-36.43	44.54	50.23	74.00	23.77	H	Peak
8424.4674	36.57	6.36	-36.33	42.45	49.05	74.00	24.95	H	Peak
9608.0000	37.64	6.63	-36.79	45.76	53.24	74.00	20.76	H	Peak
9608.0000	37.64	6.63	-36.79	30.95	38.43	54.00	15.57	H	Average
12010.0000	39.31	7.60	-36.04	43.24	54.11	74.00	19.89	H	Peak
12010.0000	39.31	7.60	-36.04	29.61	40.48	54.00	13.52	H	Average
1592.9186	29.01	3.06	-36.99	52.77	47.85	74.00	26.15	V	Peak
4804.0000	34.50	4.55	-36.15	49.71	52.61	74.00	21.39	V	Peak
4804.0000	34.50	4.55	-36.15	35.06	37.96	54.00	16.04	V	Average
7206.0000	36.31	5.81	-36.43	46.38	52.07	74.00	21.93	V	Peak
7206.0000	36.31	5.82	-36.43	34.56	40.26	54.00	13.74	V	Average
7763.3513	36.49	6.20	-36.57	43.79	49.91	74.00	24.09	V	Peak
9608.0000	37.64	6.63	-36.79	47.61	55.09	74.00	18.91	V	Peak
9608.0000	37.64	6.63	-36.79	34.25	41.73	54.00	12.27	V	Average
12010.0000	39.31	7.60	-36.04	44.11	54.98	74.00	19.02	V	Peak
12010.0000	39.31	7.60	-36.04	30.69	41.56	54.00	12.44	V	Average

Worse case mode: GFSK			Test channel: Middle						
Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Magin [dB]	Polarity	Remark
3507.0507	33.41	4.48	-36.57	45.59	46.91	74.00	27.09	H	Peak
4880.0000	34.50	4.80	-36.09	48.71	51.92	74.00	22.08	H	Peak
4880.0000	34.50	4.80	-36.10	38.86	42.06	54.00	11.94	H	Average
7320.0000	36.42	5.85	-36.38	45.22	51.11	74.00	22.89	H	Peak
7320.0000	36.42	5.85	-36.38	29.40	35.29	54.00	18.71	H	Average
8462.4963	36.58	6.42	-36.42	43.86	50.44	74.00	23.56	H	Peak
9760.0000	37.70	6.73	-36.81	45.55	53.17	74.00	20.83	H	Peak
9760.0000	37.70	6.73	-36.82	30.05	37.66	54.00	16.34	H	Average
12200.0000	39.42	7.67	-35.92	42.60	53.77	74.00	20.23	H	Peak
12200.0000	39.42	7.67	-35.92	29.22	40.39	54.00	13.61	H	Average
1593.7187	29.02	3.06	-36.99	51.48	46.57	74.00	27.43	V	Peak
3123.8374	33.25	4.65	-36.88	45.83	46.85	74.00	27.15	V	Peak
4880.0000	34.50	4.80	-36.09	47.69	50.90	74.00	23.10	V	Peak
7320.0000	36.42	5.85	-36.38	45.34	51.23	74.00	22.77	V	Peak
7320.0000	36.42	5.85	-36.38	28.59	34.48	54.00	19.52	V	Average
9760.0000	37.70	6.73	-36.81	46.72	54.34	74.00	19.66	V	Peak
9760.0000	37.70	6.73	-36.82	31.14	38.75	54.00	15.25	V	Average
12200.0000	39.42	7.67	-35.92	40.05	51.22	74.00	22.78	V	Peak
12200.0000	39.42	7.67	-35.92	28.83	40.00	54.00	14.00	V	Average

Worse case mode: GFSK			Test channel: Highest						
Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Magin [dB]	Polarity	Remark
2990.3981	33.18	4.52	-36.72	45.66	46.64	74.00	27.36	H	Peak
4960.0000	34.50	4.82	-36.20	48.65	51.77	74.00	22.23	H	Peak
4960.0000	34.50	4.82	-36.21	39.71	42.82	54.00	11.18	H	Average
5936.0186	35.70	5.25	-36.18	43.08	47.85	74.00	26.15	H	Peak
7440.0000	36.54	5.85	-36.34	46.18	52.23	74.00	21.77	H	Peak
7440.0000	36.54	5.85	-36.34	33.76	39.81	54.00	14.19	H	Average
9920.0000	37.77	6.79	-36.82	41.26	49.00	74.00	25.00	H	Peak
12400.0000	39.54	7.86	-36.18	44.86	56.08	74.00	17.92	H	Peak
12400.0000	39.54	7.86	-36.18	31.30	42.52	54.00	11.48	H	Average
1594.5189	29.02	3.07	-36.99	52.36	47.46	74.00	26.54	V	Peak
3189.1689	33.28	4.63	-36.75	46.91	48.07	74.00	25.93	V	Peak
4960.0000	34.50	4.82	-36.20	48.83	51.95	74.00	22.05	V	Peak
4960.0000	34.50	4.82	-36.21	32.56	35.67	54.00	18.33	V	Average
7440.0000	36.54	5.85	-36.34	45.16	51.21	74.00	22.79	V	Peak
7440.0000	36.54	5.85	-36.34	29.04	35.09	54.00	18.91	V	Average
9920.0000	37.77	6.79	-36.82	45.13	52.87	74.00	21.13	V	Peak
9920.0000	37.77	6.79	-36.82	28.80	36.54	54.00	17.46	V	Average
12400.0000	39.54	7.86	-36.18	42.93	54.15	74.00	19.85	V	Peak
12400.0000	39.54	7.86	-36.18	30.45	41.67	54.00	12.33	V	Average

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

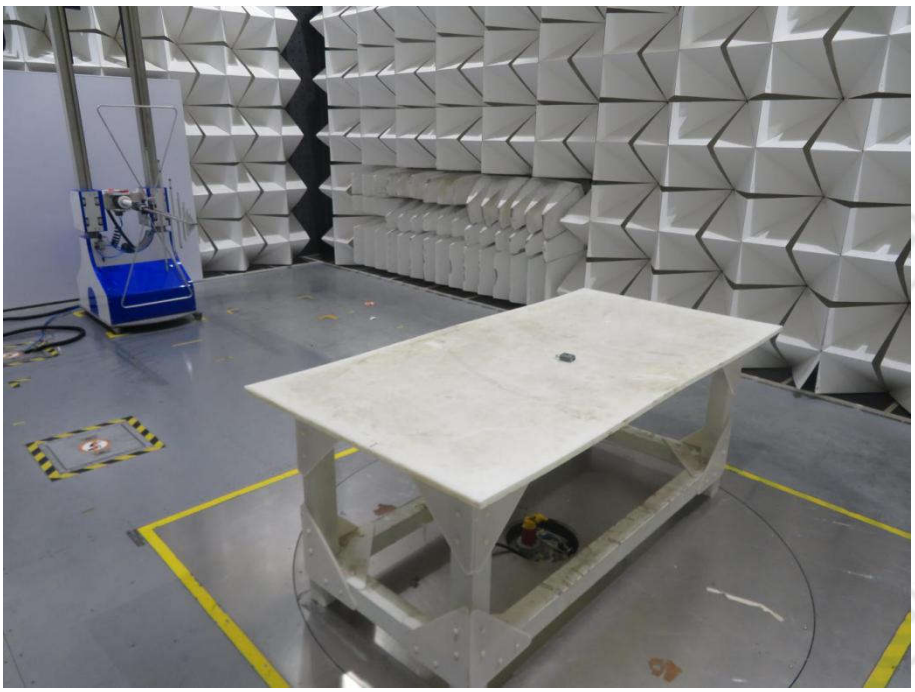
Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

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 model No.: BFS1709

Radiated spurious emission Test Setup-1(9KHz-30MHz)



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

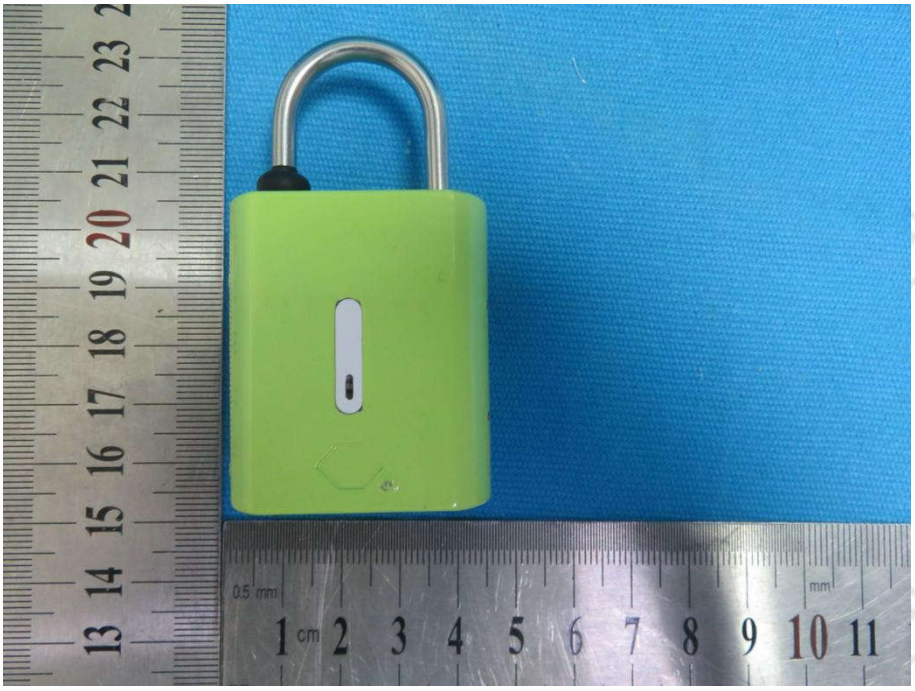
Radiated spurious emission Test Setup-3(Above 1GHz)

Conducted Emissions Test Setup

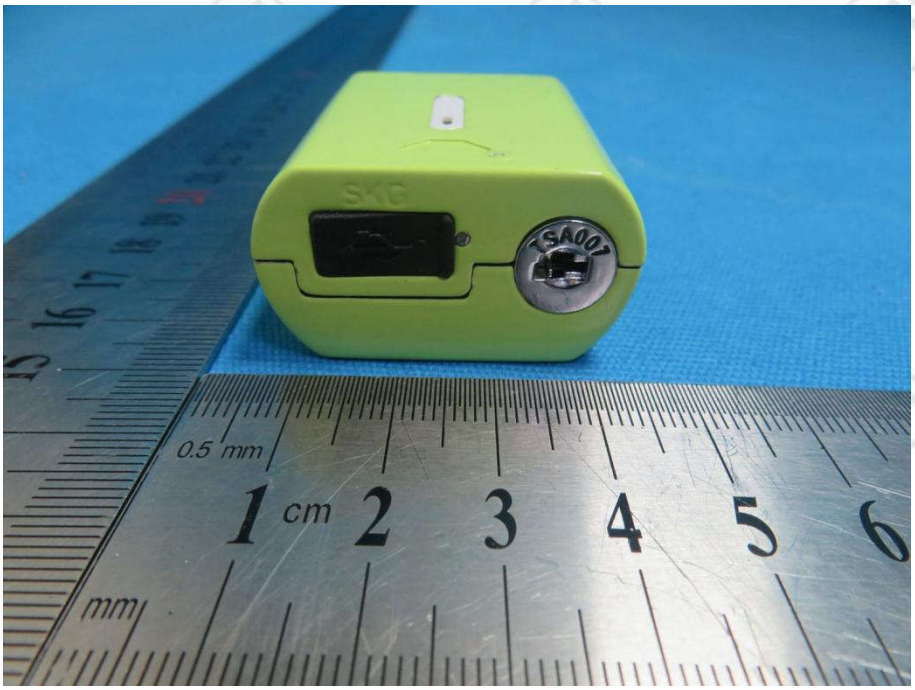
PHOTOGRAPHS OF EUT Constructional Details

Test model No.: BFS1709

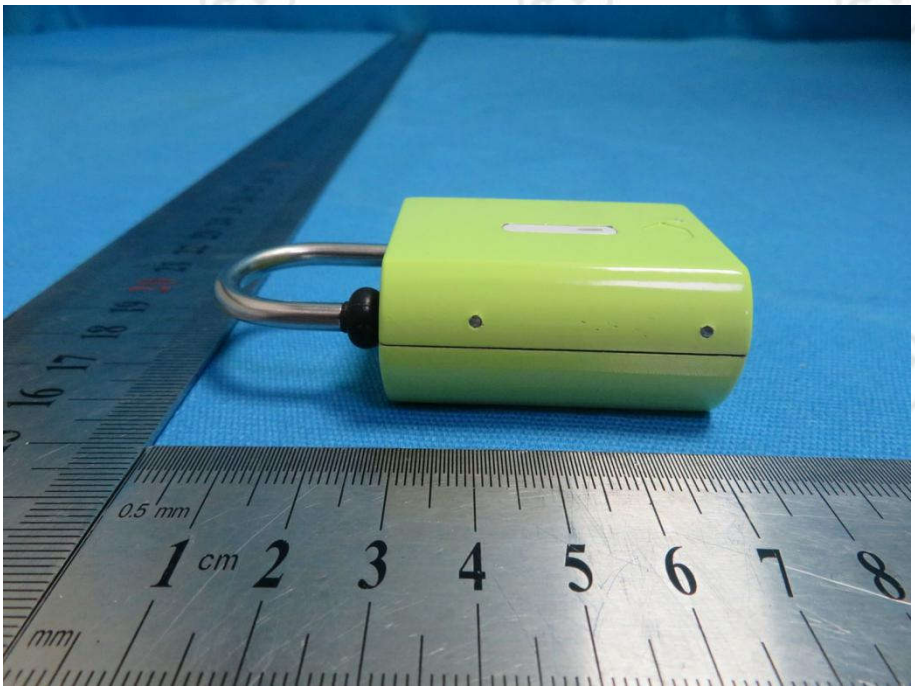
View of Product-1



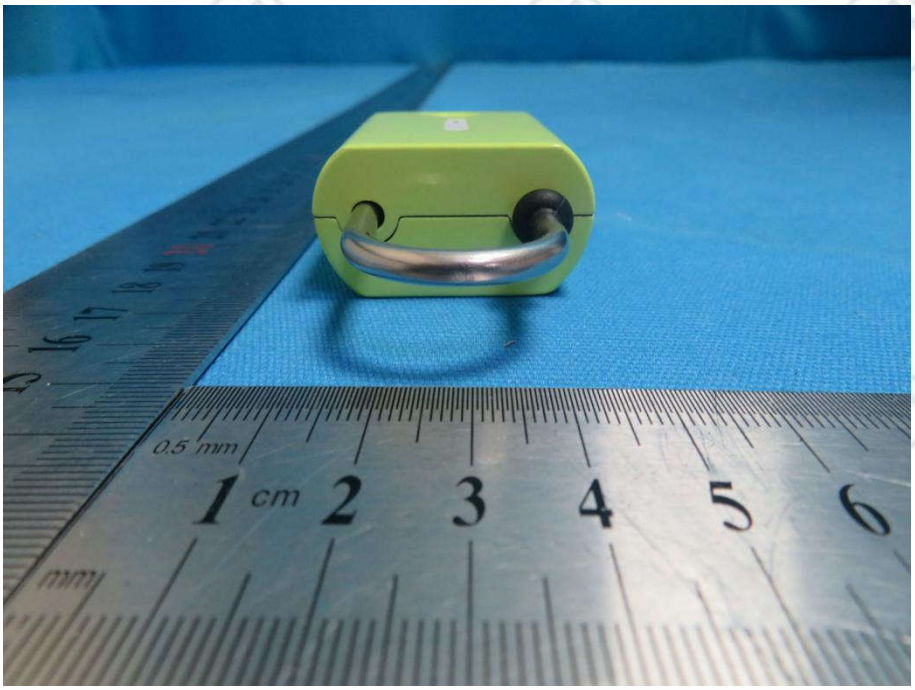
View of Product-2



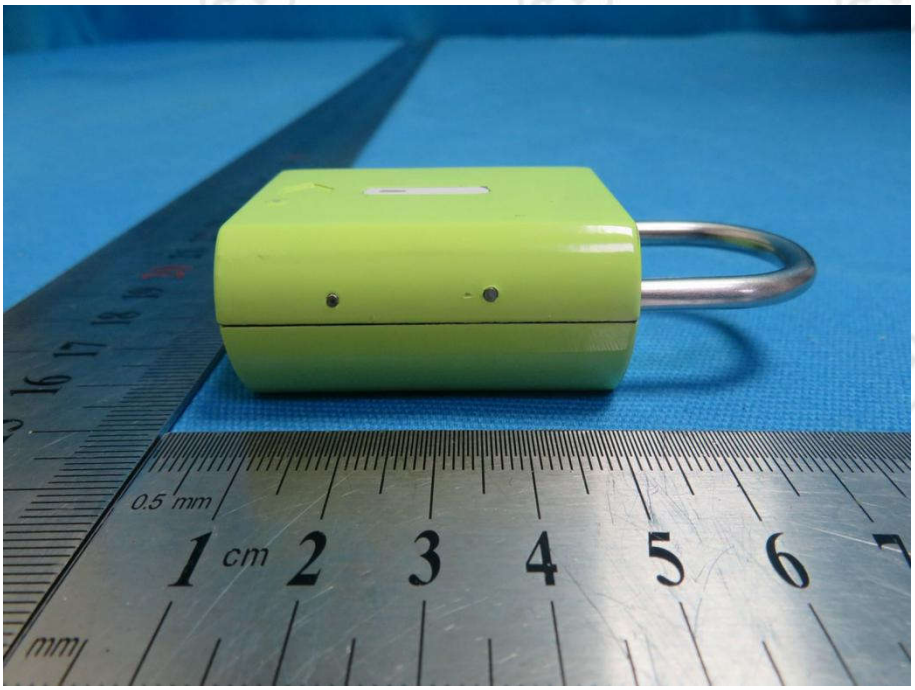
View of Product-3



View of Product-4

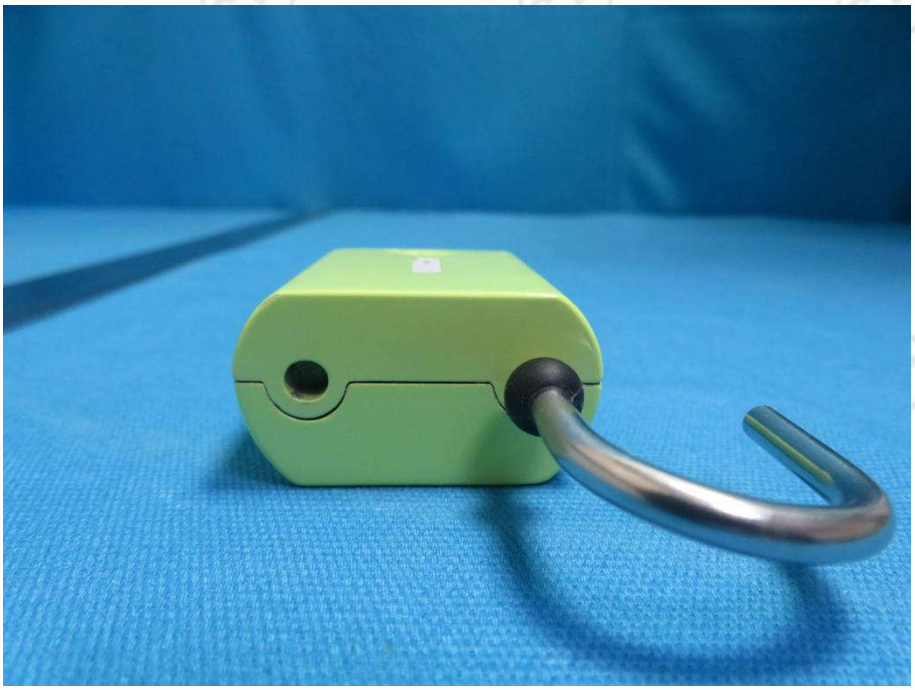


View of Product-5

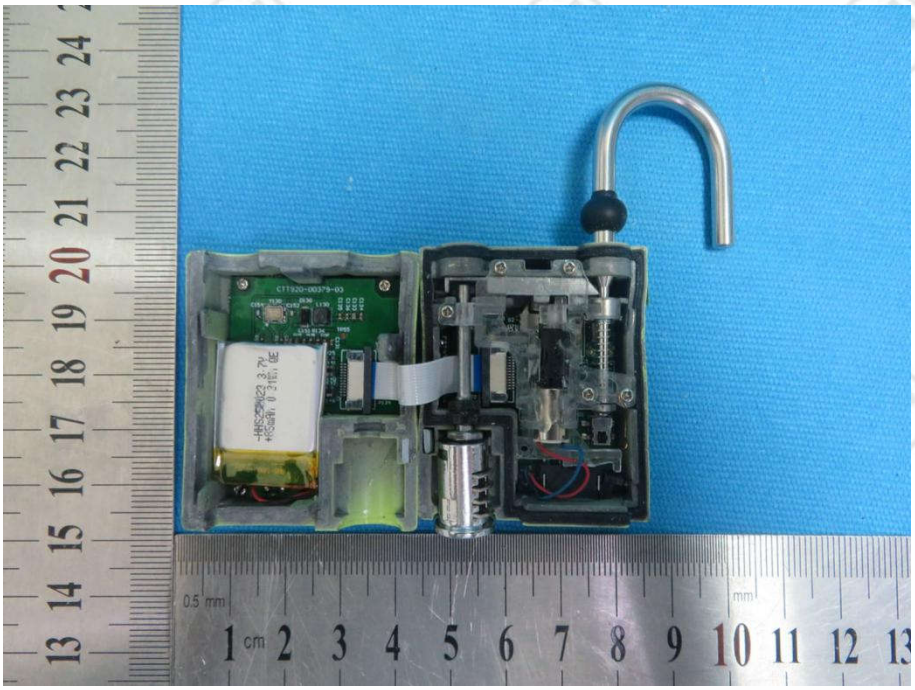


View of Product-6

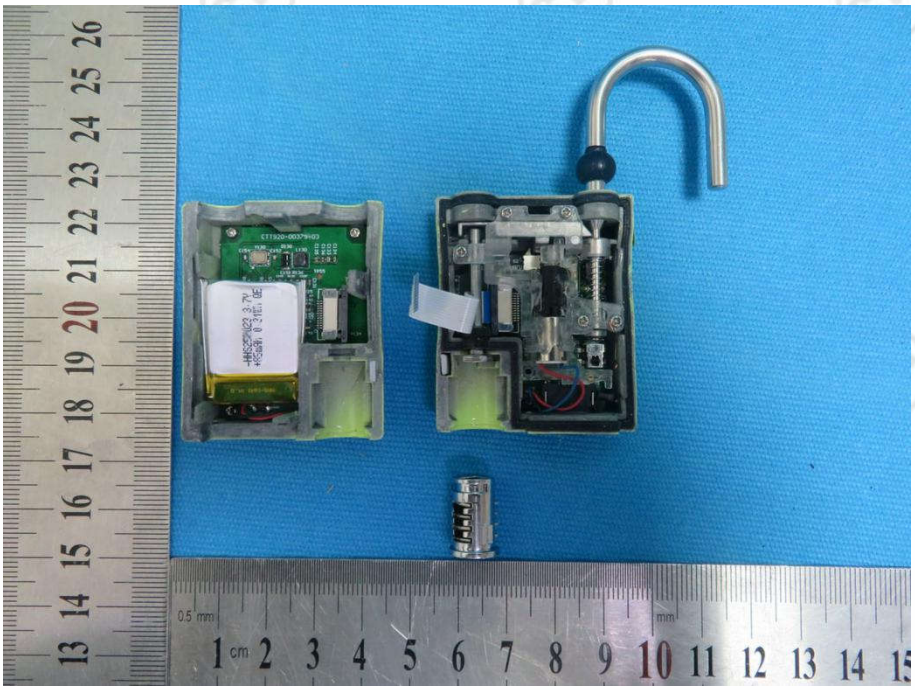
View of Product-7



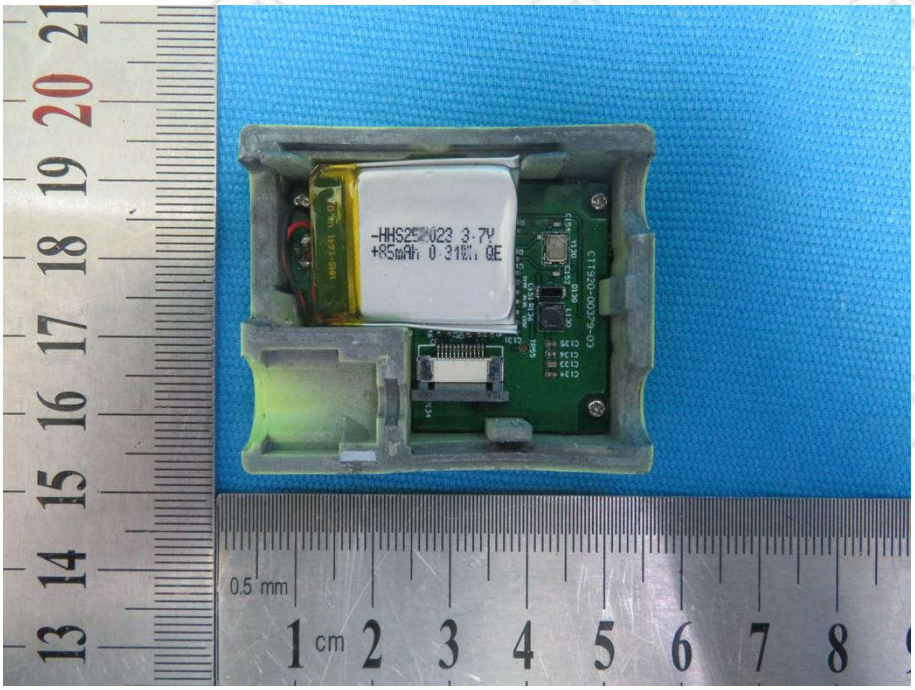
View of Product-8



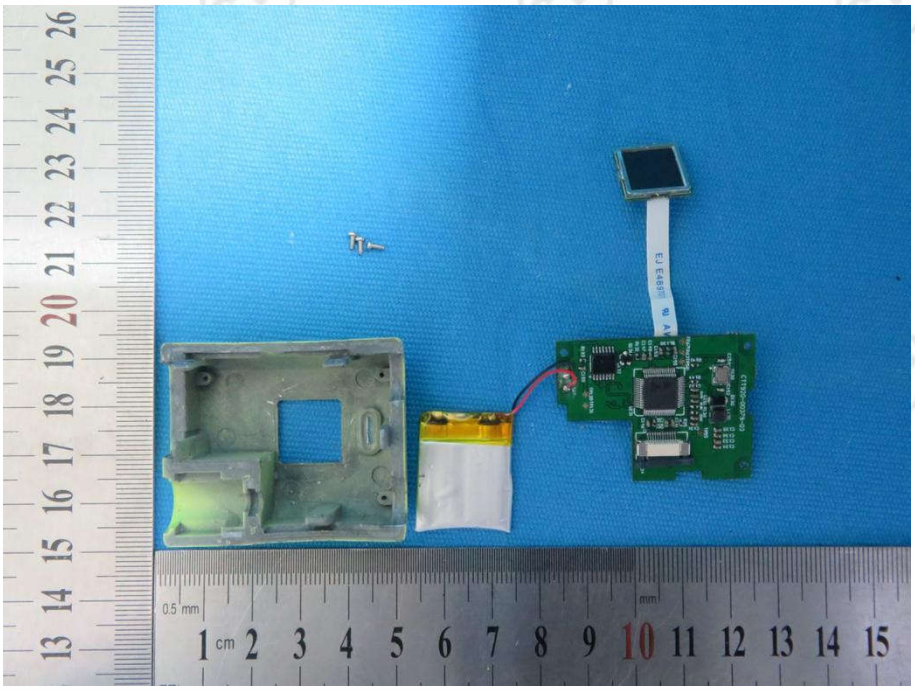
View of Product-9



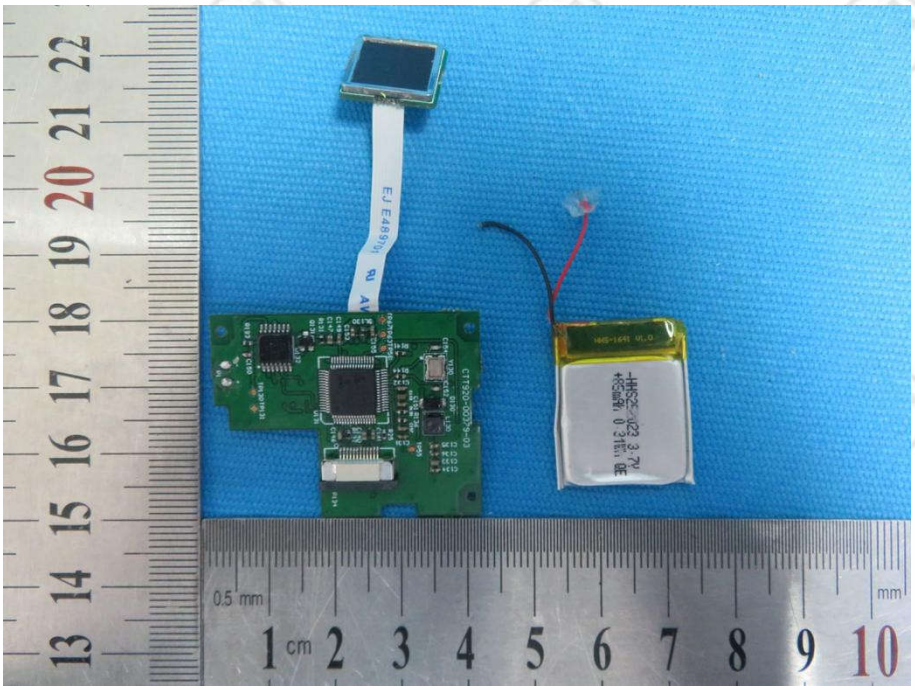
View of Product-10



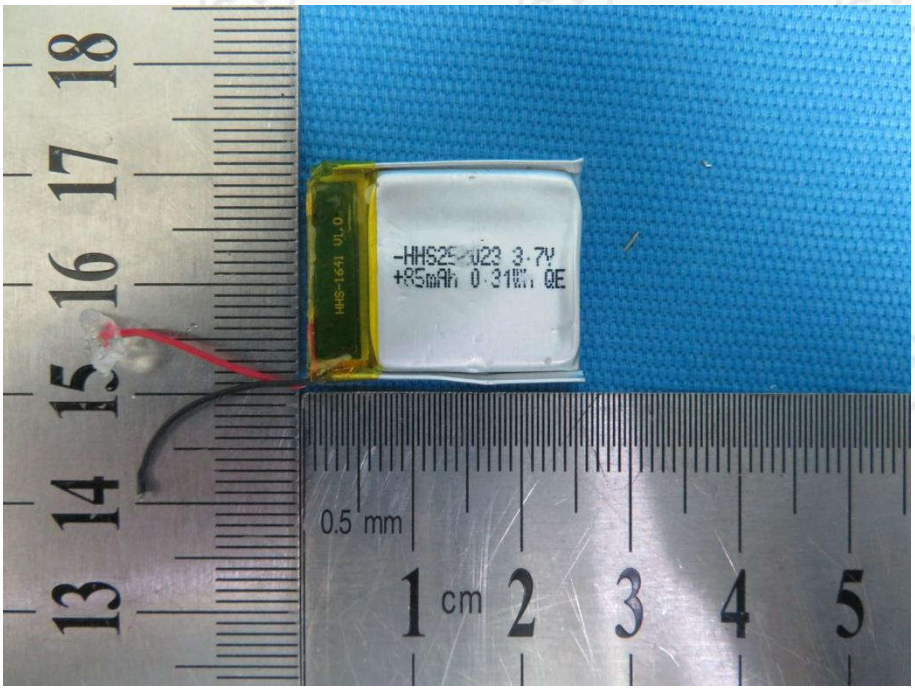
View of Product-11



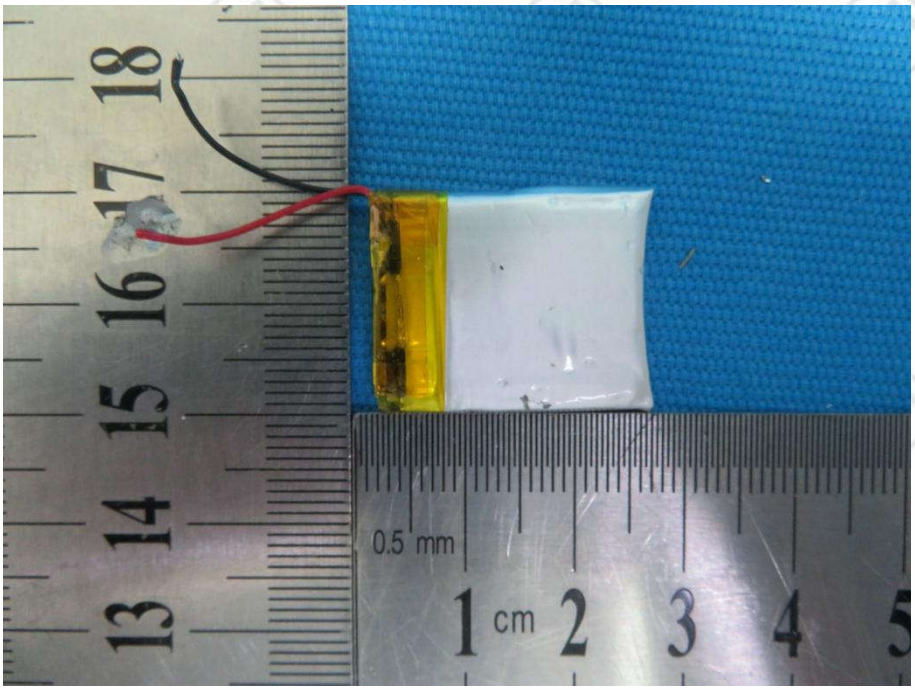
View of Product-12



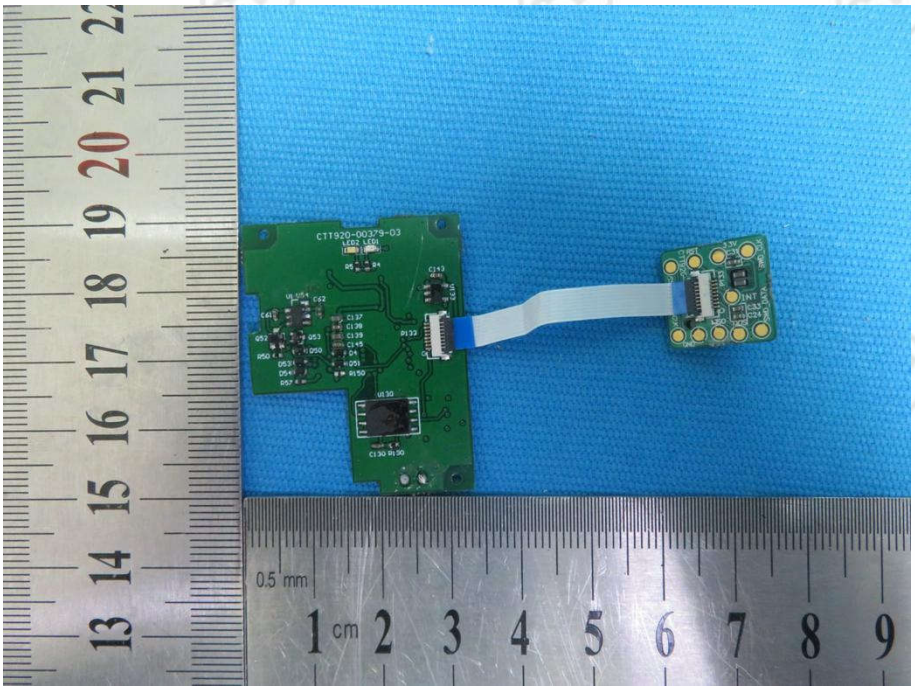
View of Product-13



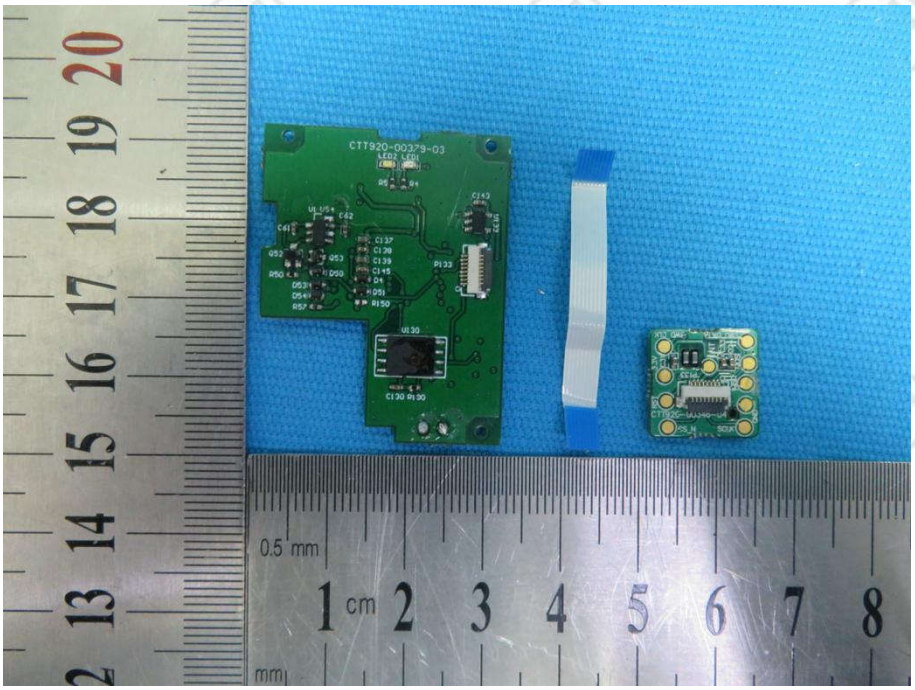
View of Product-14



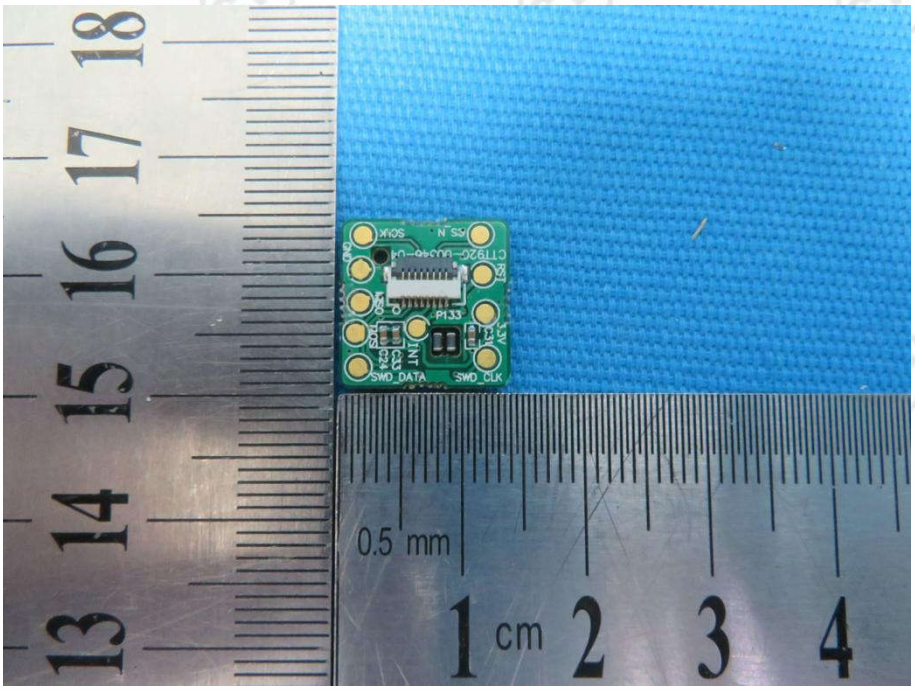
View of Product-15



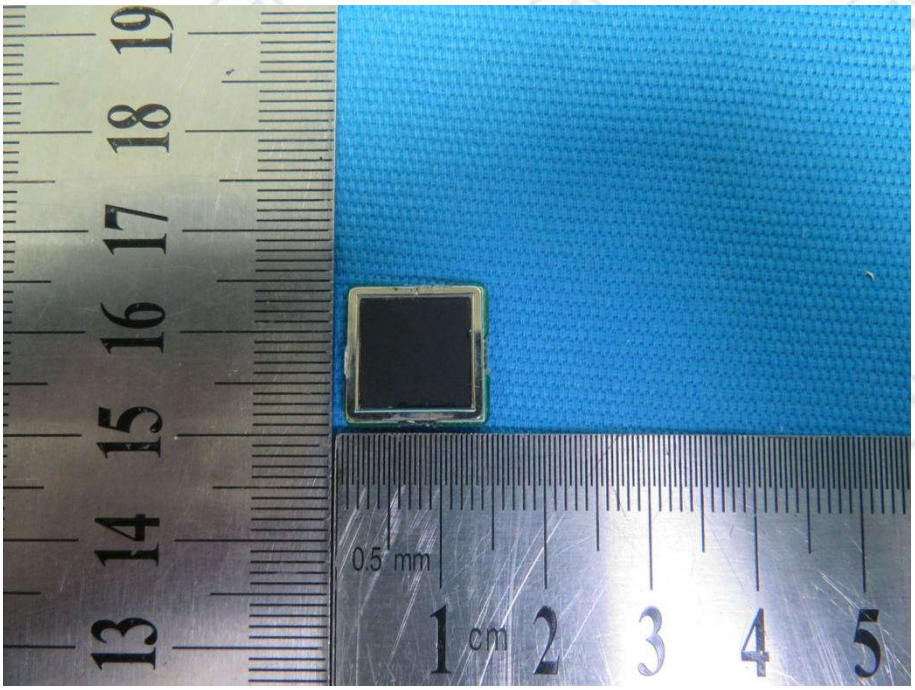
View of Product-16



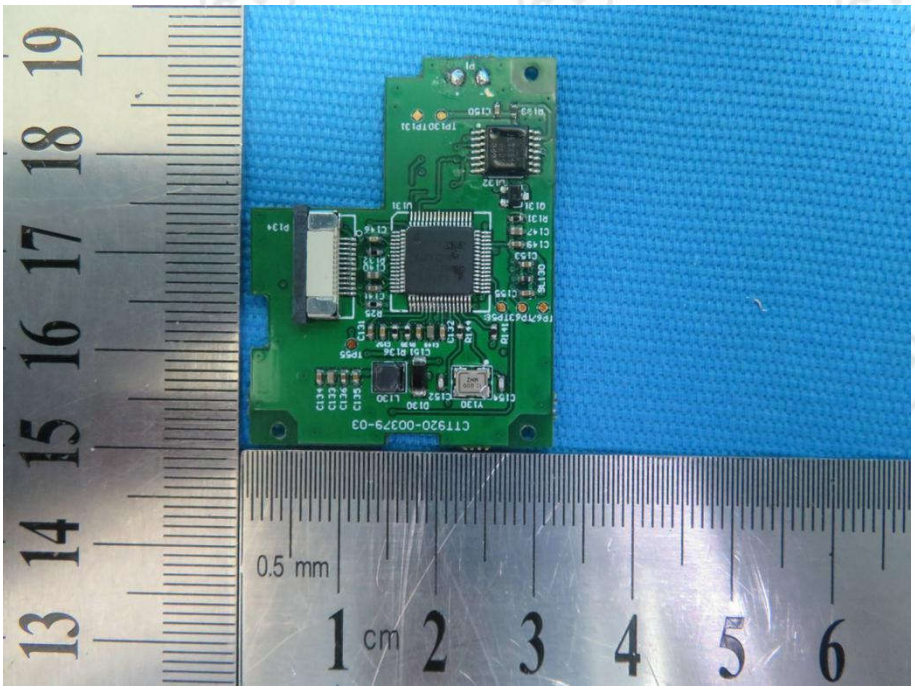
View of Product-17



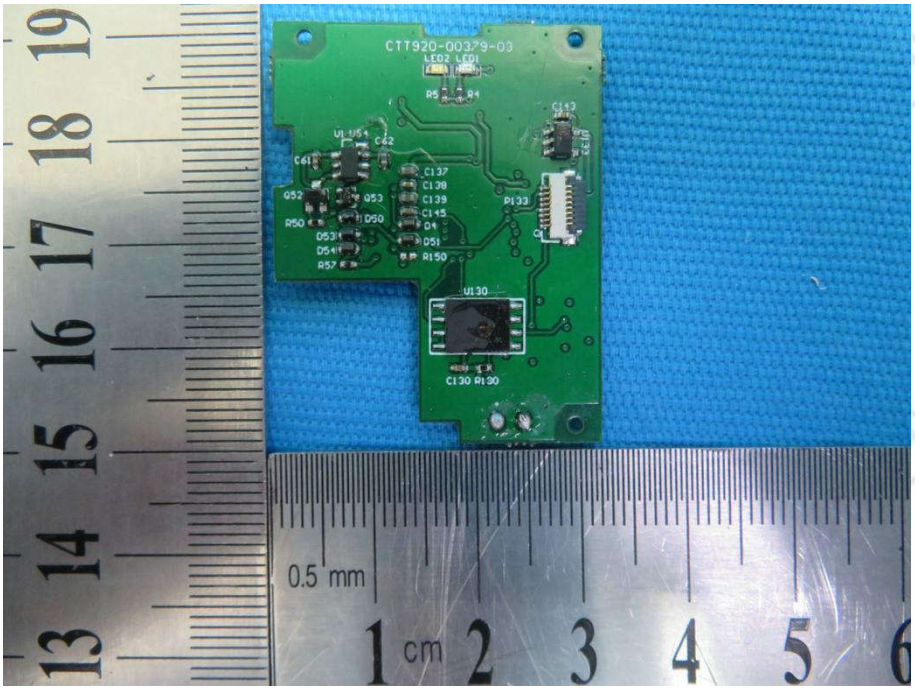
View of Product-18



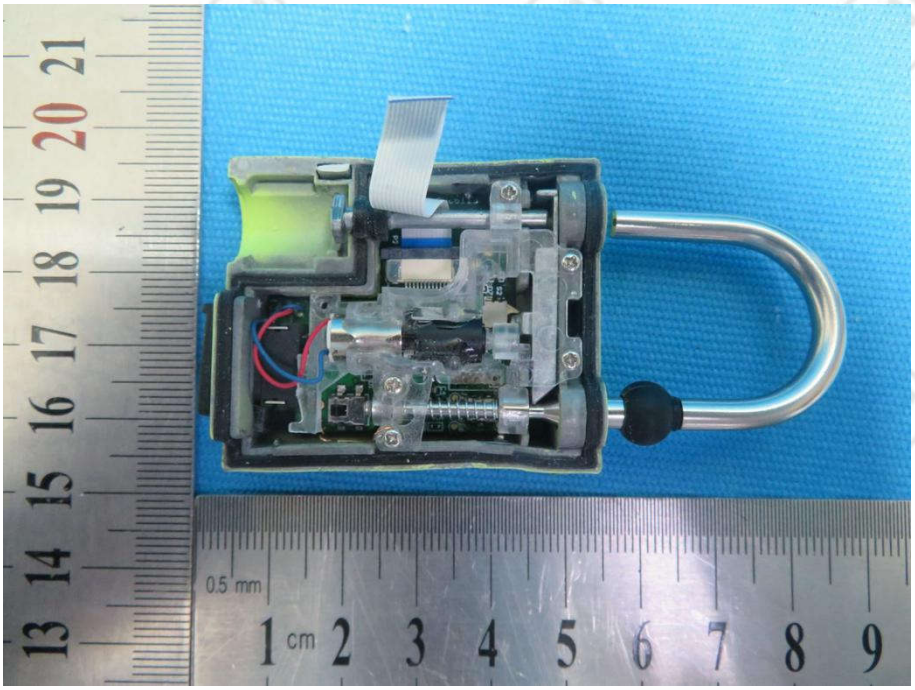
View of Product-19



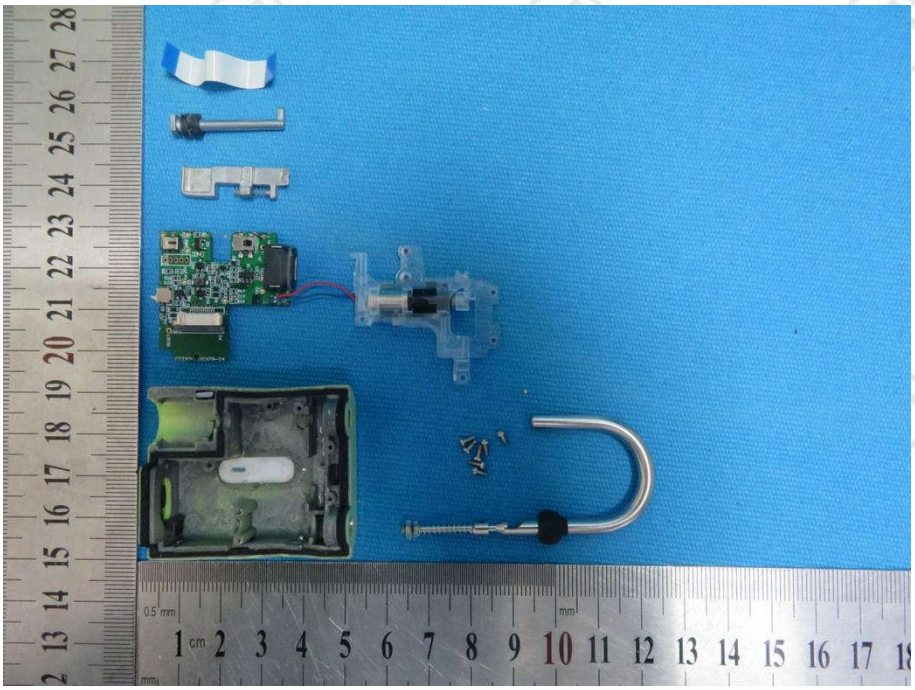
View of Product-20



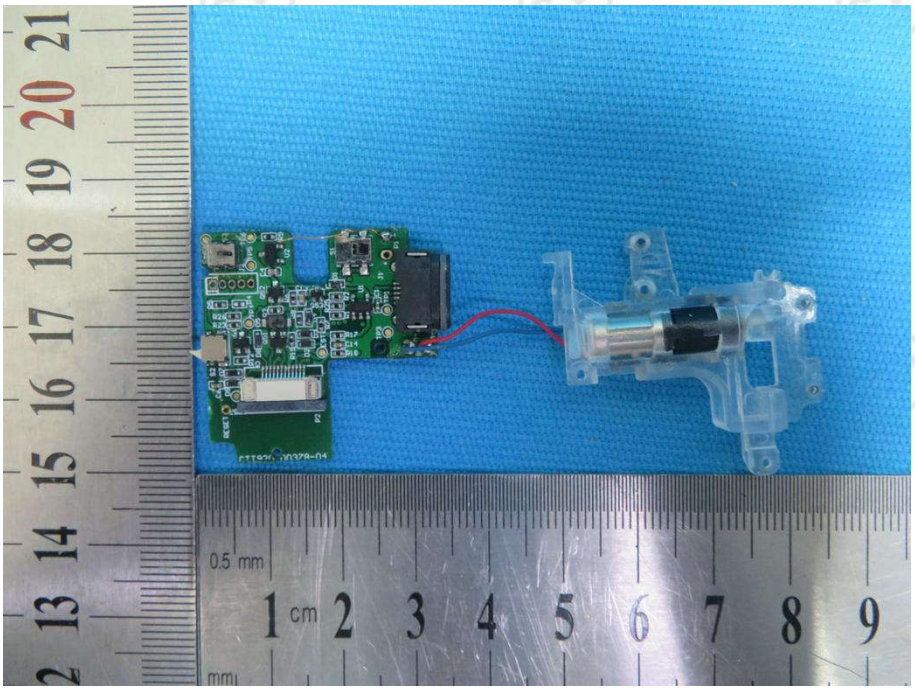
View of Product-21



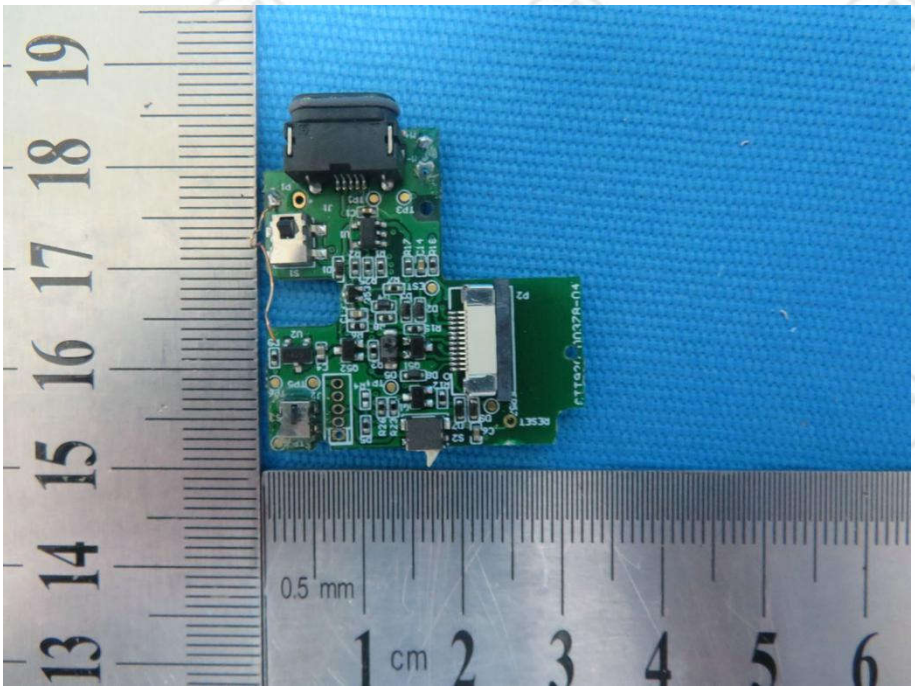
View of Product-22



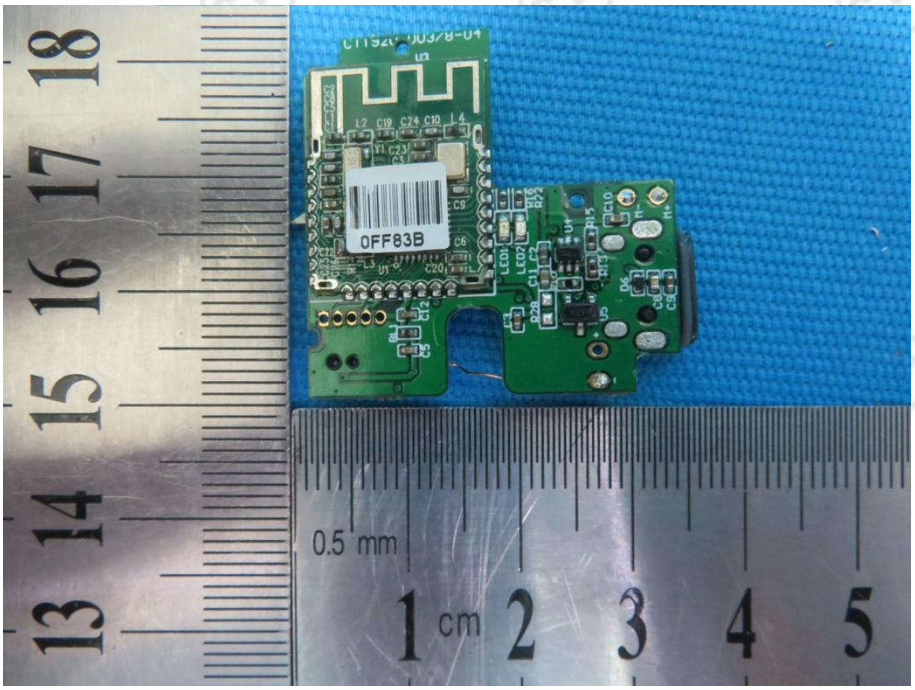
View of Product-23



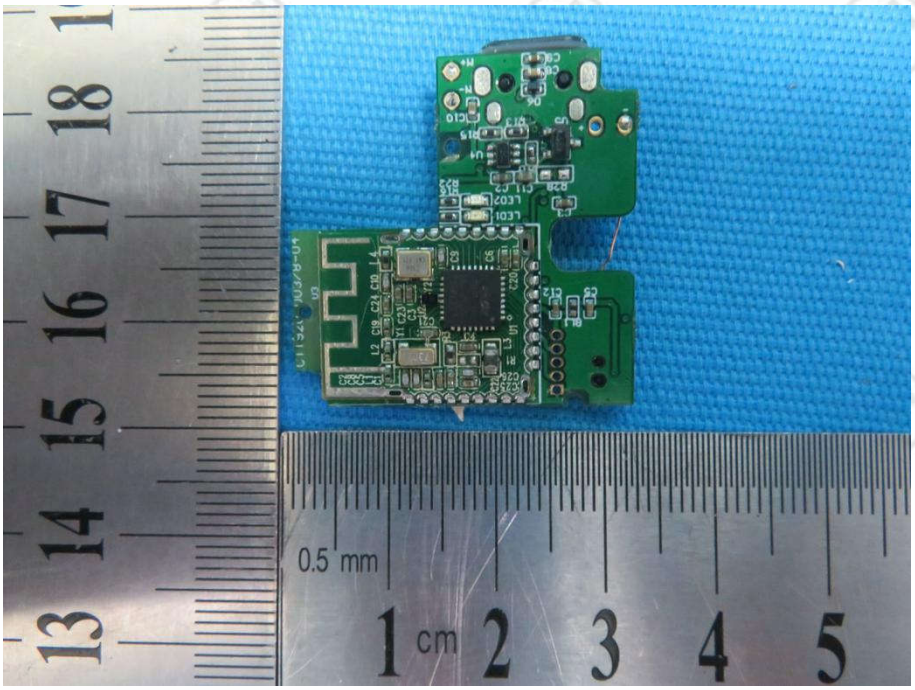
View of Product-24



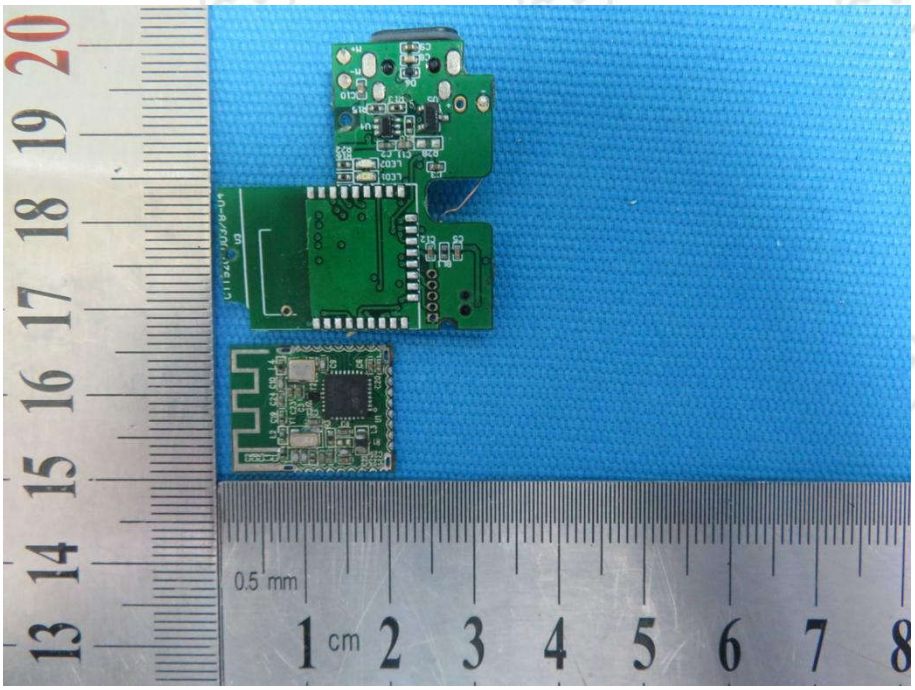
View of Product-25



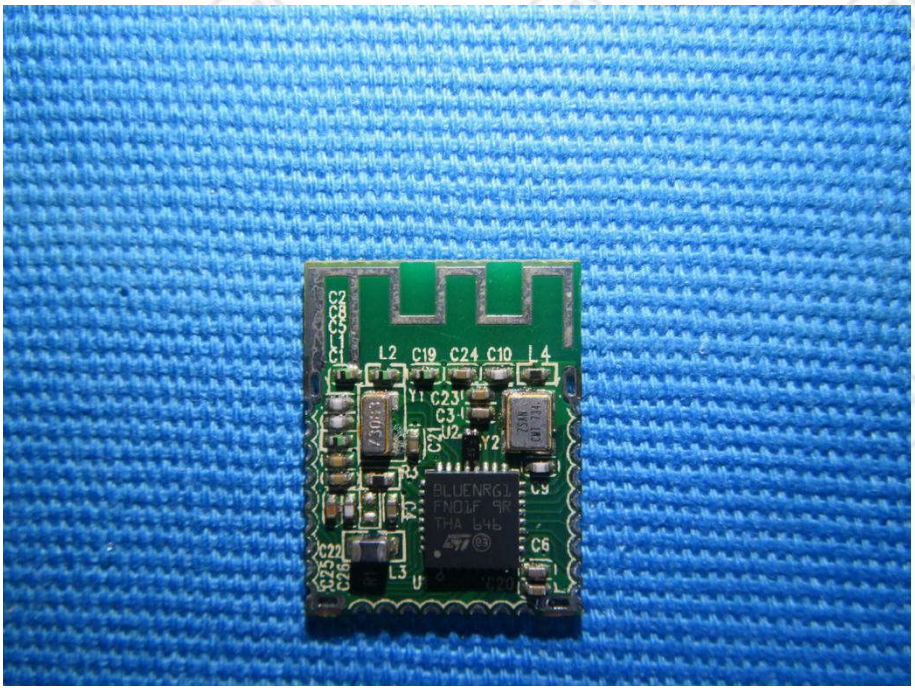
View of Product-26



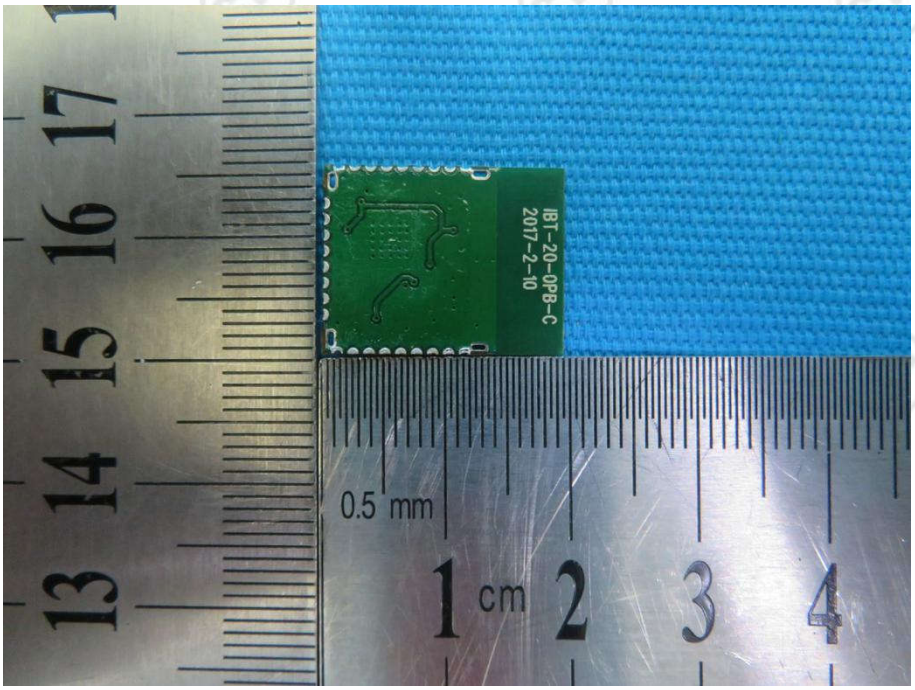
View of Product-27



View of Product-28



View of Product-29



View of Product-30

*** End of Report ***