

Test Report

MOVON MOVON CORPORATION 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea TEL. +82-31-338-8837 FAX. +82-31-338-8847	Report No. : MOV-17-EMC-I033 Page (1)/(23)Pages	
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1. Customer

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- Address : 52, Samjak-ro 107beon-gil, Ojeong-gu, Bucheon-si, Gyeonggi-do, Korea
- Date of receipt : 2017-04-10
- Contact Person : Keun Sik Jang
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- Telephone / Fax : +82-32-722-3550 / +82-32-678-5868

2. Use of report : Evaluation of EMC test

3. Equipment Under Test

- Product name: BLUETOOTH WIRELESS
- Model number : HA-FX9BT

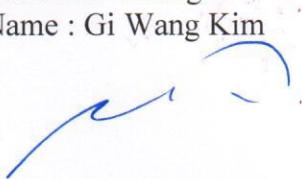
4. Date of test : 2017-05-01

5. Applied Standards : FCC 47 CFR Part 15 Subpart B (Class B) ANSI C63.4-2014 & ICES-003

6. Test results

Test Items	Test Results
Conducted Emission	Complied
Radiated Emission (BELOW 1 GHz)	Complied
Radiated Emission (ABOVE 1 GHz)	Complied

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Affirmation	Tested by Name : Jae Rak Choi 	Techincal manager Name : Gi Wang Kim 
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2017-05-02

MOVON Corporation

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Test Report No. : MOV-17-EMC-I033

Report History

Revision	Date	Description
-	2017-05-02	Initial release



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1 General Information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 2.2. The MOVON CORP. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the MOVON CORP.

1.2 Testing Laboratory

Test Location :

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♦Yongin Laboratory

P. O. box 17030

Address : 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
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2 Applicant Information

2.1 EUT Details

Product name	BLUETOOTH WIRELESS
Model number	HA-FX9BT
Variant model name	HA-FX9BT-A-J, HA-FX9BT-B-J, HA-FX9BT-P-J, HA-FX9BT-W-J, HA-FX9BT-G-J, HA-FX9BT-V-J, HA-FX9BT-A-E, HA-FX9BT-B-E, HA-FX9BT-P-E, HA-FX9BT-W-E, HA-FX9BT-G-E, HA-FX9BT-V-E
Serial number	N/A
Power supply	AC 120 V, 60 Hz
Frequency range	2 402 ~ 2 480 MHz
Manufacture	Dongguan Sambon Electronics CO.,LTD. 2-52,Xihu Industry area, Lincun village, Tangxia town, Dongguan city, Guangdong province, China

2.2 Test mode and Condition

Test mode	Normal Operation Mode(Charge Mode)
Test voltage	AC 120 V, 60 Hz

2.3 Peripheral Equipment

Test set-up of EUT

Description	Model	Serial No.	Manufacturer
BLUETOOTH WIRELESS	HA-FX9BT	None	Dongguan Sambon Electronics CO., LTD.
AC Adapter	A1205	W005B050	Fugang Electronic Co., Ltd

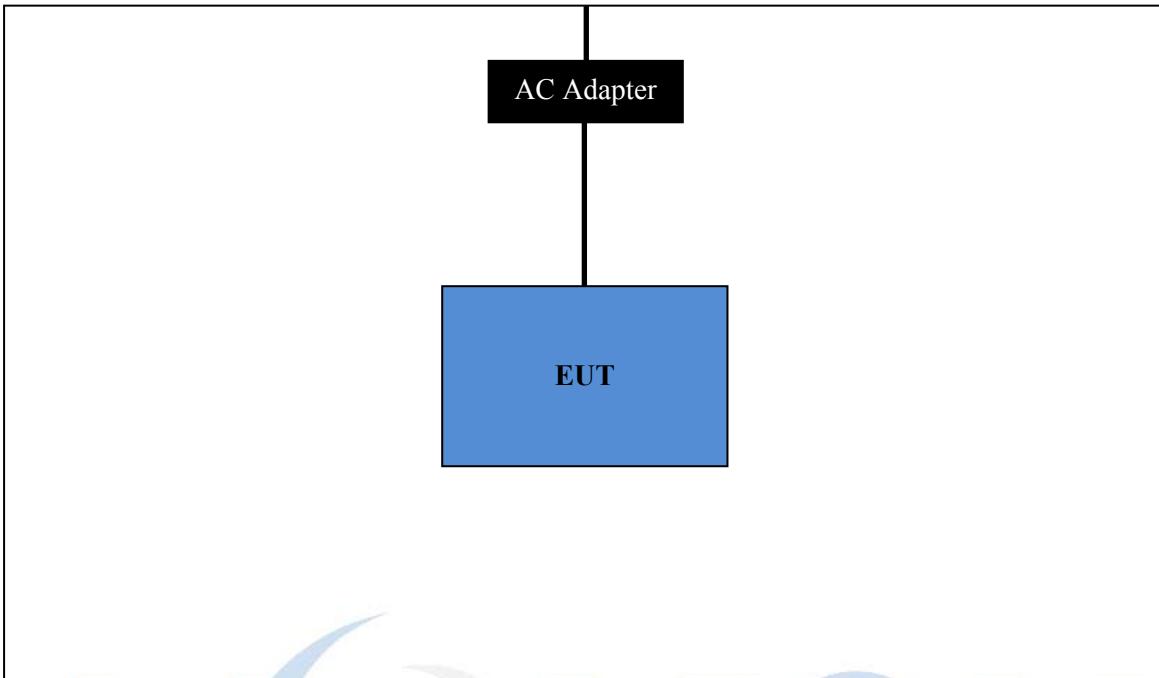
Component parts of EUT

Description	Model	Serial No.	Manufacturer
Main Board	HA-FX9BT V7	None	None
Battery(3.7 V)	SUNOA400926	1703	Shenzhen Sunda Battery Co., ltd

2.4 Cable list

Start		END		Cable Spec.		
Name	I/O Port	Name	I/O Port	Length(m)	Shield	Core
EUT	Micro USB	AC Adapter	USB	0.25	Shielded	N
	AC IN	AC OUTLET	Line	Direct	-	-

2.5 Test System Layout



3 Description of Tests

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2014. The measurement was performed over the frequency range of 0.15MHz to 30MHz using a $50\Omega/50\mu\text{H}$ LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10 kHz or for "quasi-peak" within a bandwidth of 9 KHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table which is placed 40cm away from the vertical wall and 1.5m away from the side wall of the chamber room. Two LISNs are bonded to bottom plane of the shielded room. The EUT is powered from the Com-power LISN and the support equipment is powered from the another Com-power LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the Com-power LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the Signal Analyzer Spectrum Analyzer to determine the frequency producing the max. Emission from the EUT. The frequencies are producing the max. Level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

3.2 Radiated Emission Measurement

Preliminary measurements were made at indoors 3 meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using bilog antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. Above 1GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies which were selected as bottom, middle and top frequency in the operating band. Emission levels from the EUT with various configurations were examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 10-meter test range using bilog antenna. The output from the antenna was connected, via a pre-selector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer(for above 1GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission. The EUT, support equipment and interconnecting cables were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Each emission was maximized by varying the mode of operating frequencies of the EUT. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20dB/decade) as per section 15.31(f).

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Photographs of the worst-case emission test setup can be seen in Appendix 1.

4 Test Condition

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

Radiated Emission Test

Preliminary radiated emission tests were conducted using the procedure in ANSI C63.4/2014 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were conducted at 3 meter open field test site.

5 Test summary and results

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule Parts	Measurement Required	Result
15.107(a)	Conducted Emission	Passed by – 19.46 dB
15.109(a)	Radiated Emissions	Passed by – 9.0 dB

The data collected shows that the iMK Co., Ltd. 3D ACTIVE GLASSES models : iAG-401(X) and family models comply with technical requirements of the Part 15.107 and 15.109 of the FCC Rules.

5.2 Conducted Emission

5.2.1 Test Results : Complied

5.2.2 Measurement equipment

Kind of Equipment	Manufacture / Model	S/N	Calibrated until
TWO LINE-V- NETWORK	Rohde & Schwarz / ESH3-Z5	100296	2017.12.09
EMI TEST RECEIVER	Rohde & Schwarz / ESR3	101873	2017.06.29
PULSE LIMITER	Rohde & Schwarz / ESH3-Z2	100288	2017.06.29
Software	Rohde & Schwarz / EMC32	Version 9.26.01	N/A

5.2.3 Testing Environment

Test Date: 2017-05-01

Temperature: 22.6 °C

Humidity: 34.0 % R.H.

Atmospheric Pressure: 100.3 kPa

5.2.4 Measurement Uncertainty = $U(C_o(y)) = k \times u_c(C_o(y)) = 2 \times 0.627 = 1.3 \text{ dB}$ (The coverage factor $k = 2$ yields approximately a 95 % level of confidence.)



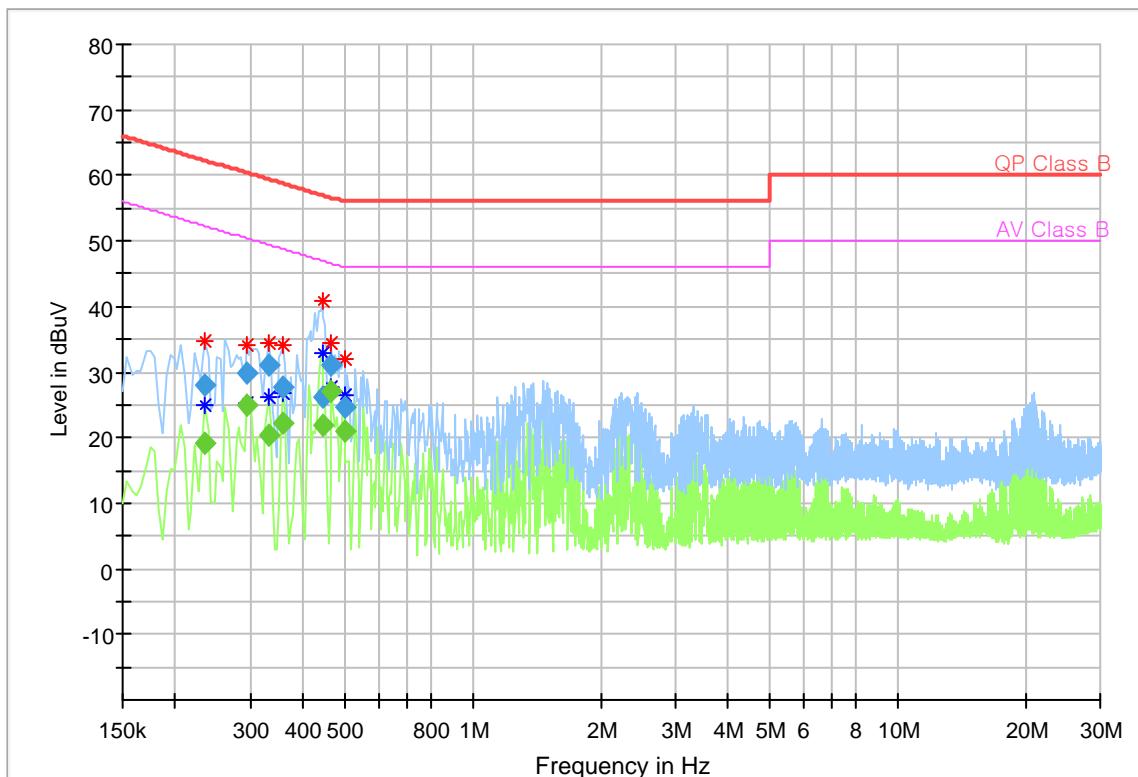
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5.2.5 Test Data

Common Information

Test Description: Conducted Emission
Test Site: Shield Room
Project No.: 0185-01-02/17
Model Name: HA-FX9BT
Test Mode: Charge Mode



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.23	---	19.21	52.31	33.09	7000.0	9.000	N	GND	10.08
0.23	27.96	---	62.31	34.34	7000.0	9.000	L1	GND	10.03
0.29	---	25.00	50.41	24.41	7000.0	9.000	N	GND	10.07
0.29	30.00	---	60.41	30.41	7000.0	9.000	N	GND	10.07
0.33	---	20.45	49.45	29.00	7000.0	9.000	N	GND	10.07
0.33	31.00	---	59.45	28.45	7000.0	9.000	N	GND	10.07
0.36	---	22.07	48.78	26.71	7000.0	9.000	N	GND	10.07
0.36	27.86	---	58.78	30.92	7000.0	9.000	N	GND	10.07
0.44	26.15	---	57.02	30.88	7000.0	9.000	N	GND	10.08
0.44	---	22.03	47.02	24.99	7000.0	9.000	N	GND	10.08
0.47	31.07	---	56.59	25.51	7000.0	9.000	N	GND	10.08
0.47	---	27.12	46.59	19.46	7000.0	9.000	N	GND	10.08
0.50	---	20.91	46.03	25.13	7000.0	9.000	N	GND	10.08
0.50	24.62	---	56.03	31.41	7000.0	9.000	N	GND	10.08

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5.3 Radiated Emissions (BELOW 1 GHz)

5.3.1 Test Results : Complied

5.3.2 Measurement equipment

Kind of Equipment	Manufacture / Model	S/N	Calibrated until
EMI TEST RECEIVER	Rohde & Schwarz / ESVS30	829673/015	2017.12.09
Antenna Mast	INNCO / MA4000-EP	MA4000/285/23880210/L	N/A
Controller	INNCO / CO2000	CO2000/561/23880210/L	N/A
TRILOG Supper Broadband test Antenna	SCHWARZBECK / VULB9161 SE	4159	2018.06.14

5.3.3 Testing Environment

Test Date: 2017-05-01

Temperature: (24.8 ~ 24.9) °C

Humidity: 36.0 % R.H.

Atmospheric Pressure: 100.3 kPa

5.3.4 Measurement Uncertainty = $U(C_o(y)) = k \times u_c(R_o(y)) = 2 \times 2.18 = 4.4$ dB

(The coverage factor $k=2$ yields approximately a 95 % level of confidence.)



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5.3.4 Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical

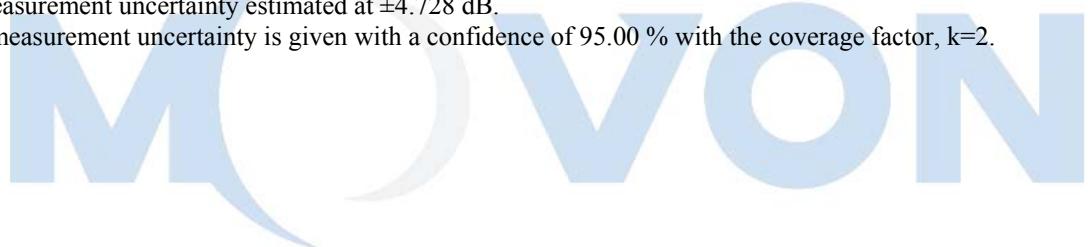
Measurement Distance : 3 meters

Frequency (MHz)	Reading[dB μ V]		H(cm)	Antenna Factor (dB/m)	Cable loss (dB)	Limit (dB μ V/m)	Results (dB μ V/m)	Margin (dB)
	H	V						
42.50	-	17.69	100	11.96	1.36	40.00	31.0	9.0
55.27	-	17.91	100	11.44	1.54	40.00	30.9	9.1
112.70	-	19.49	100	10.69	2.22	43.52	32.4	11.12
143.36	11.04	-	200	18.85	2.51	43.52	32.4	11.12
168.14	-	11.00	100	18.27	2.73	43.52	32.0	11.52
366.29	-	13.38	170	14.95	4.07	46.02	32.4	13.62

NOTES :

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss + AMP Gain
3. Margin value = Emission Level - Limit
4. All other emissions not reported were more than 25dB below the permitted limit.
5. Measurement uncertainty estimated at ± 4.728 dB.

The measurement uncertainty is given with a confidence of 95.00 % with the coverage factor, k=2.



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5.4 Radiated Emissions (ABOVE 1 GHz)

5.4.1 Test Results : Complied

5.4.2 Measurement equipment

Kind of Equipment	Manufacture / Model	S/N	Calibrated until
EMI TEST RECEIVER	Rohde & Schwarz / ESIB26	100196	2017.12.08
Antenna Master	INNCO / MA4640-XP-ET	None	N/A
Controller	INNCO / CO3000	CO3000/812/34240914/L	N/A
Double-ridged horn antenna	ETS Lindgren / 3115	00066157	2017.09.23
Pre amplifier	TESTEK / TK-PA6S	140009	2017.12.08
Software	ROHDE & SCHWARZ / EMC32	Version 9.26.01	N/A

5.4.3 Testing Environment

Test Date: 2017-05-01

Temperature: (22.4 ~ 22.7) °C

Humidity: 34.0 % R.H.

Atmospheric Pressure: 100.3 kPa

5.4.4 Test Data for above 1 GHz

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical

Measurement Distance : 3 meters

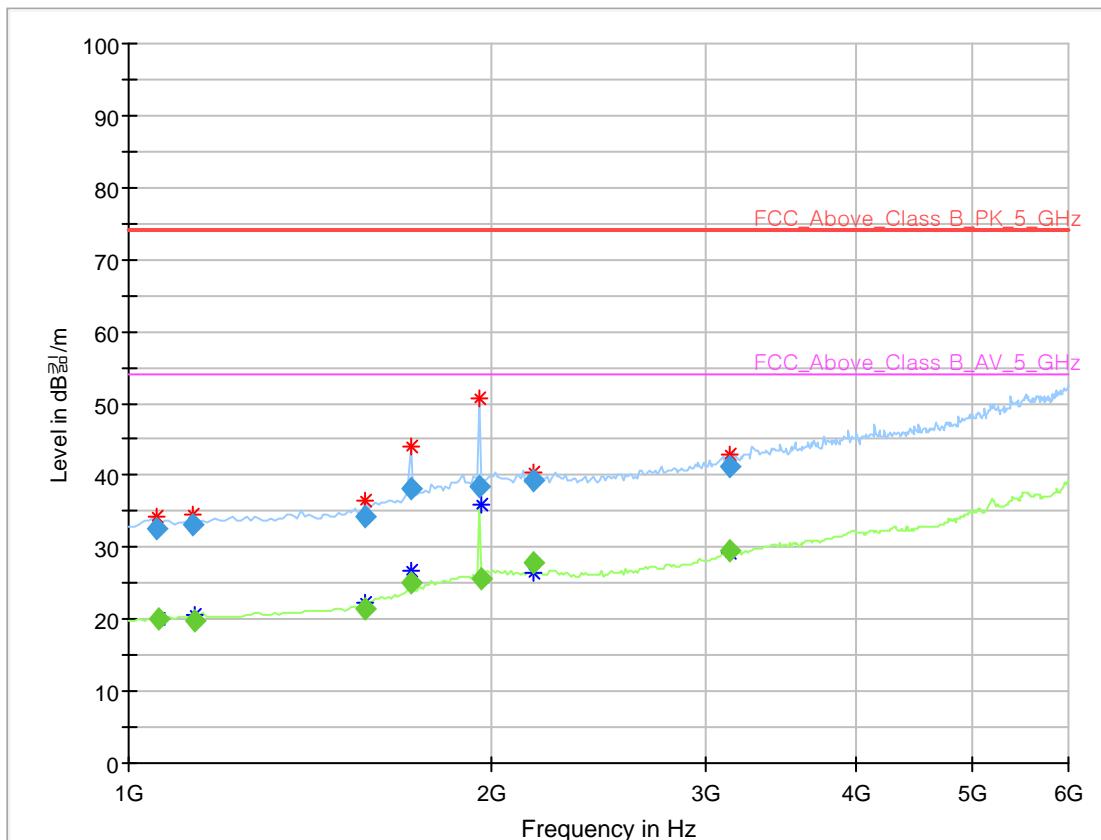
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Common Information

Test Description: Radiated Emission Above 1GHz
Project No.: 0185-01-02/17
Test Site: 3 m Semi Anechoic Chamber
Model Name: HA-FX9BT
Test Mode: Charge Mode

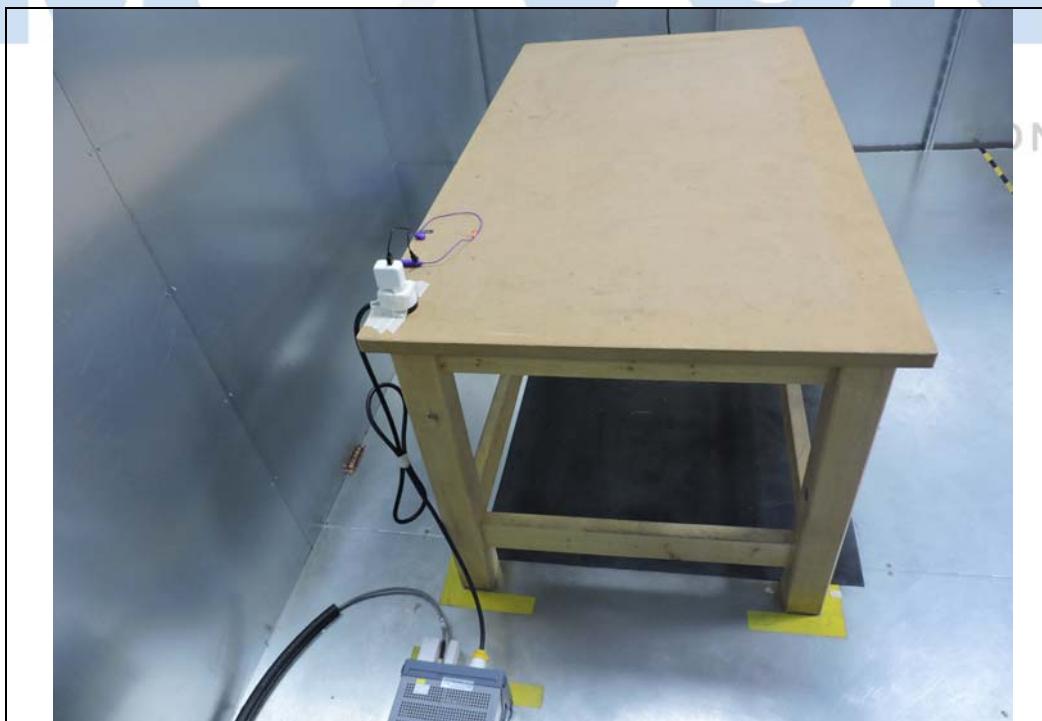


Final Result

Frequency (MHz)	MaxPeak (dB μ V/m)	CAverage (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Corr. (dB)
1055.450901	32.58	---	74.00	41.42	3000.0	1000.000	125.1	H	-14.1
1059.458917	---	20.09	54.00	33.91	3000.0	1000.000	225.3	H	-14.1
1129.519038	33.06	---	74.00	40.94	3000.0	1000.000	175.2	V	-13.7
1133.126252	---	19.70	54.00	34.30	3000.0	1000.000	175.0	H	-13.5
1568.076153	---	21.54	54.00	32.46	3000.0	1000.000	225.0	H	-12.9
1568.837676	34.24	---	74.00	39.76	3000.0	1000.000	106.7	V	-13.1
1715.170341	38.14	---	74.00	35.86	3000.0	1000.000	225.1	H	-11.6
1715.931864	---	24.93	54.00	29.07	3000.0	1000.000	180.0	H	-11.6
1954.128257	38.55	---	74.00	35.45	3000.0	1000.000	103.4	V	-9.2
1961.262525	---	25.50	54.00	28.50	3000.0	1000.000	100.0	V	-9.1
2167.114228	---	27.75	54.00	26.25	3000.0	1000.000	183.5	H	-8.2
2167.274549	39.16	---	74.00	34.84	3000.0	1000.000	154.7	H	-8.2
3142.625250	41.16	---	74.00	32.84	3000.0	1000.000	175.1	V	-4.7
3146.513026	---	29.54	54.00	24.46	3000.0	1000.000	115.1	V	-4.7

Appendix 1. Test Setup Photographs

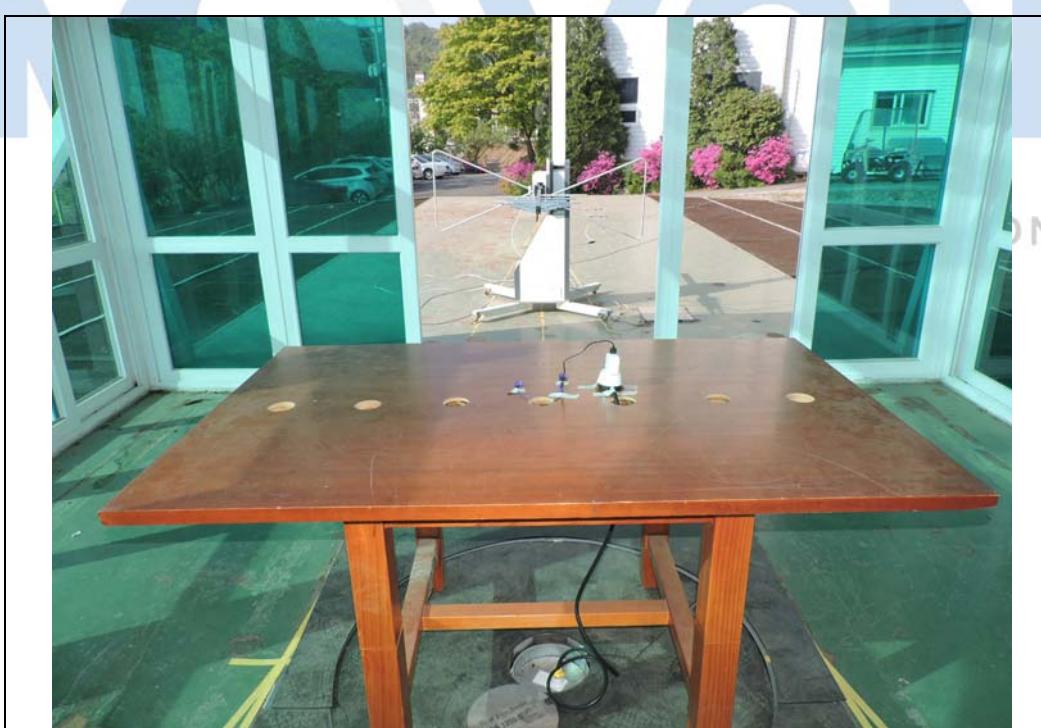
Conducted Emission Test Setup



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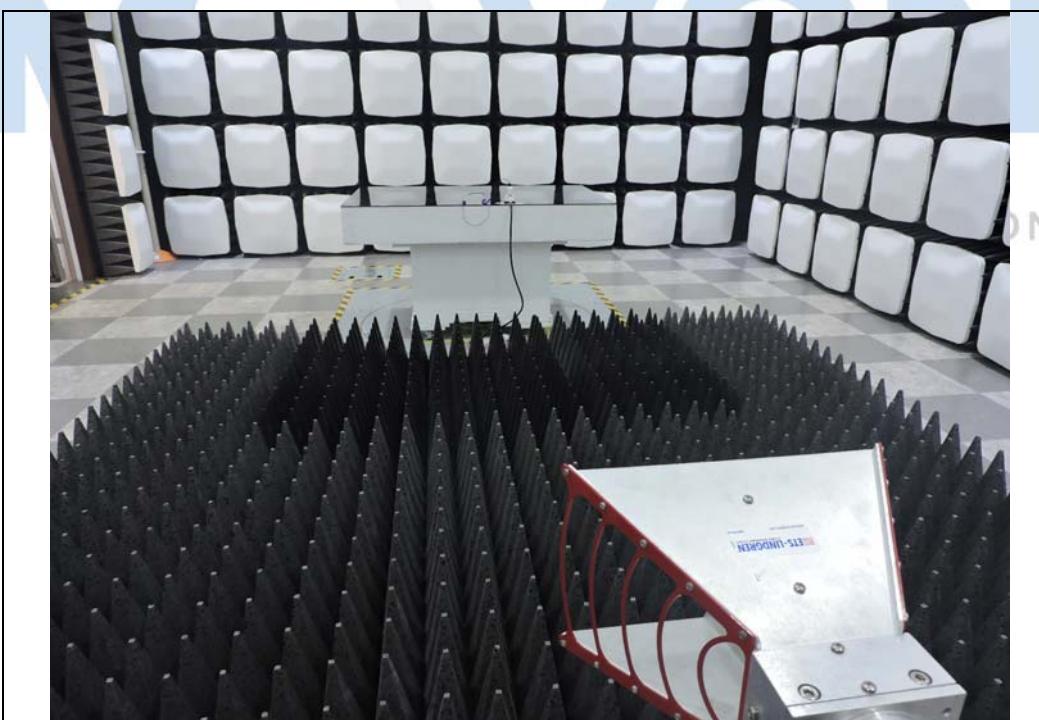
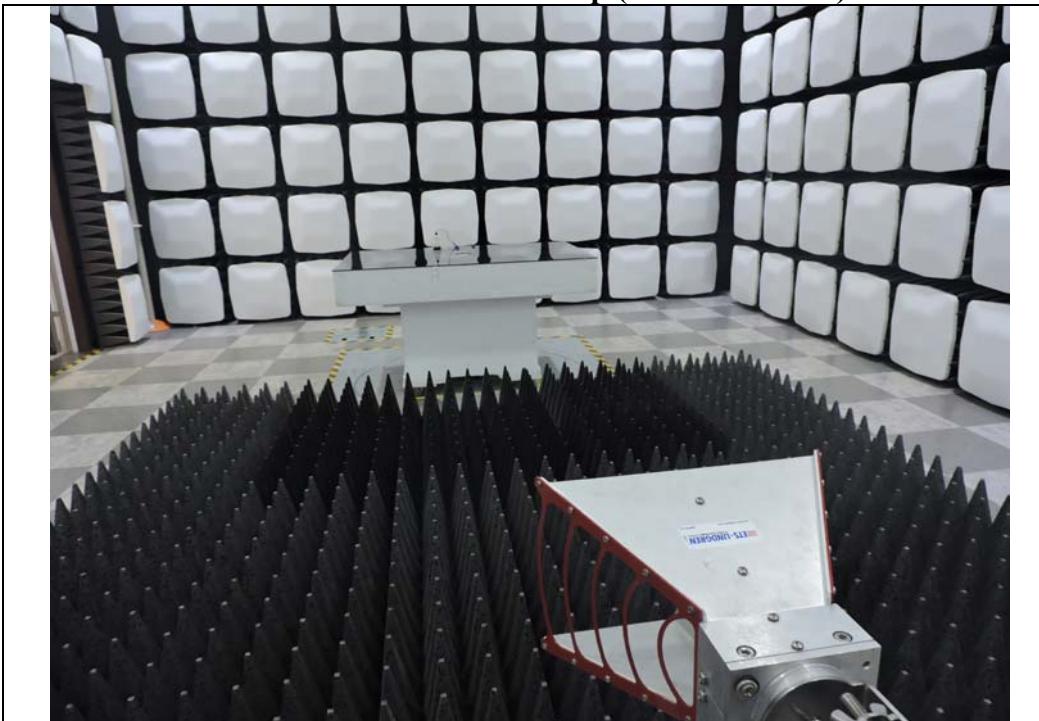
Radiated Emission Test Setup (BELOW 1 GHz)



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Radiated Emission Test Setup (ABOVE 1 GHz)



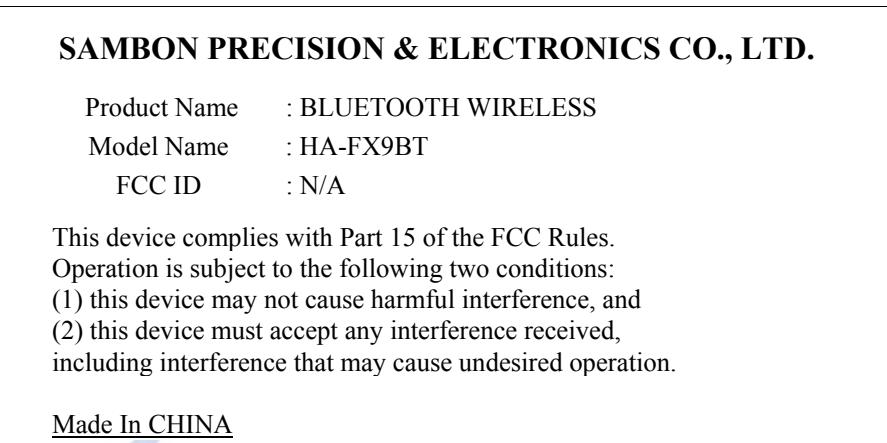
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Appendix 2. FCC ID Label and location

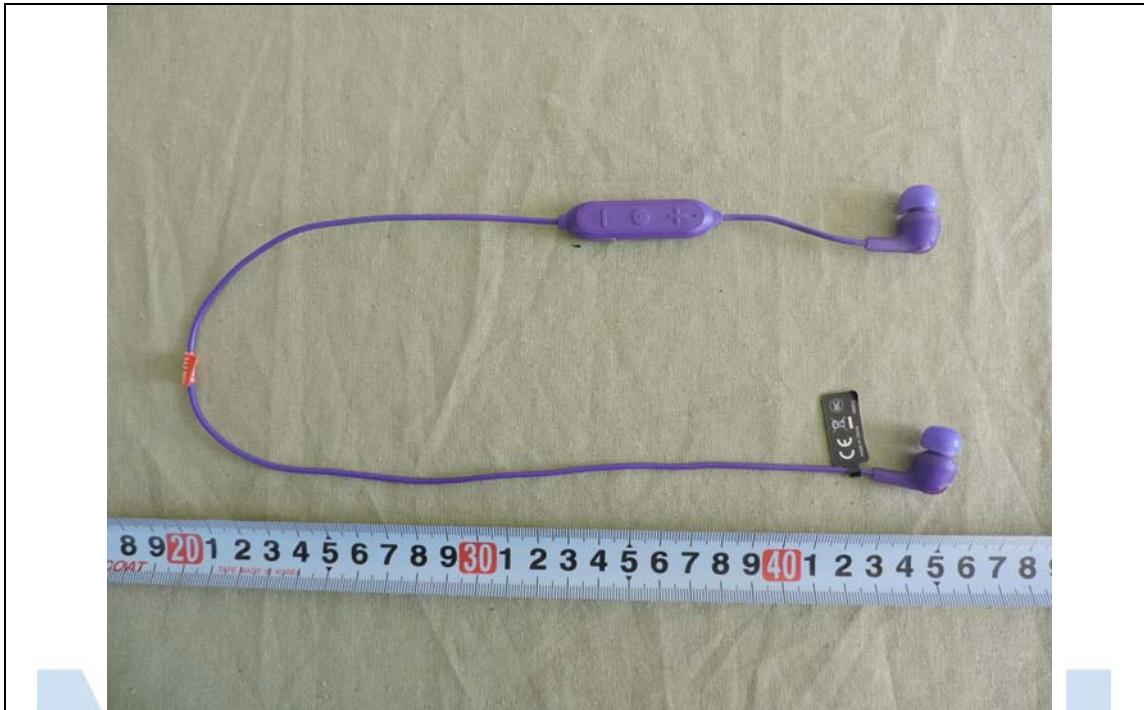
Product Label Sample with FCC ID Label information

Following is a sample copy of the label that will be placed on the rear cabinet of the product. The FCC identifier is marked in the product label. The warning statement and Information to the User are described in the user manual.

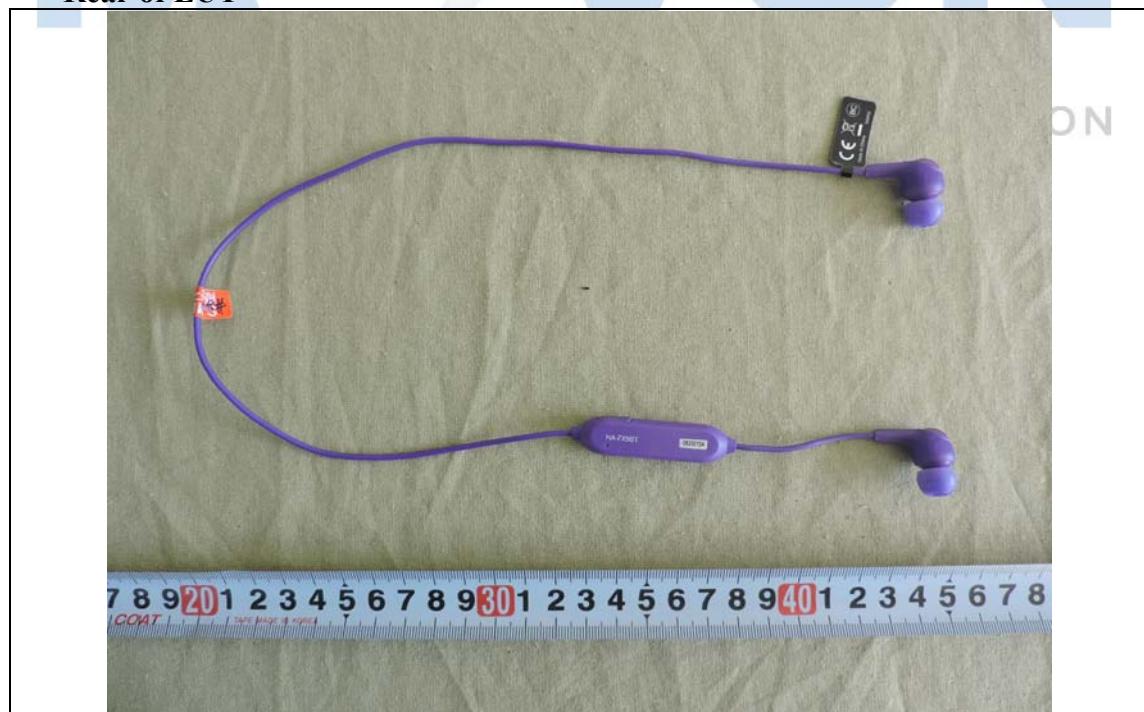


Appendix 3 Photos of EUT

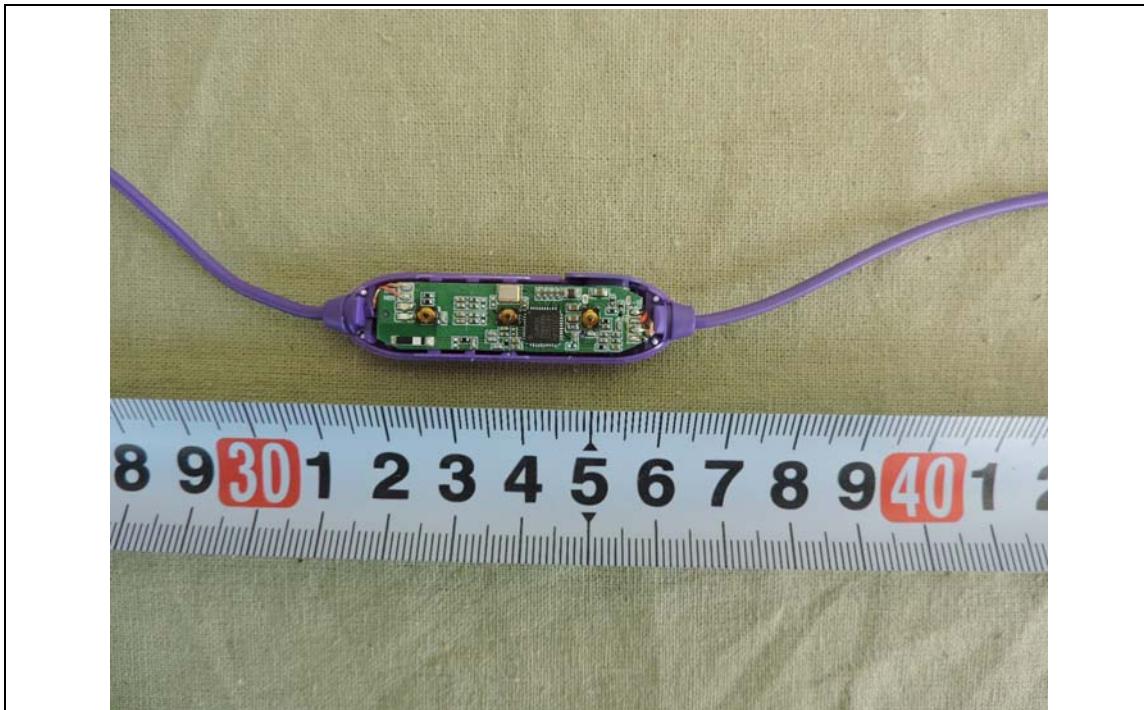
Front of EUT



Rear of EUT

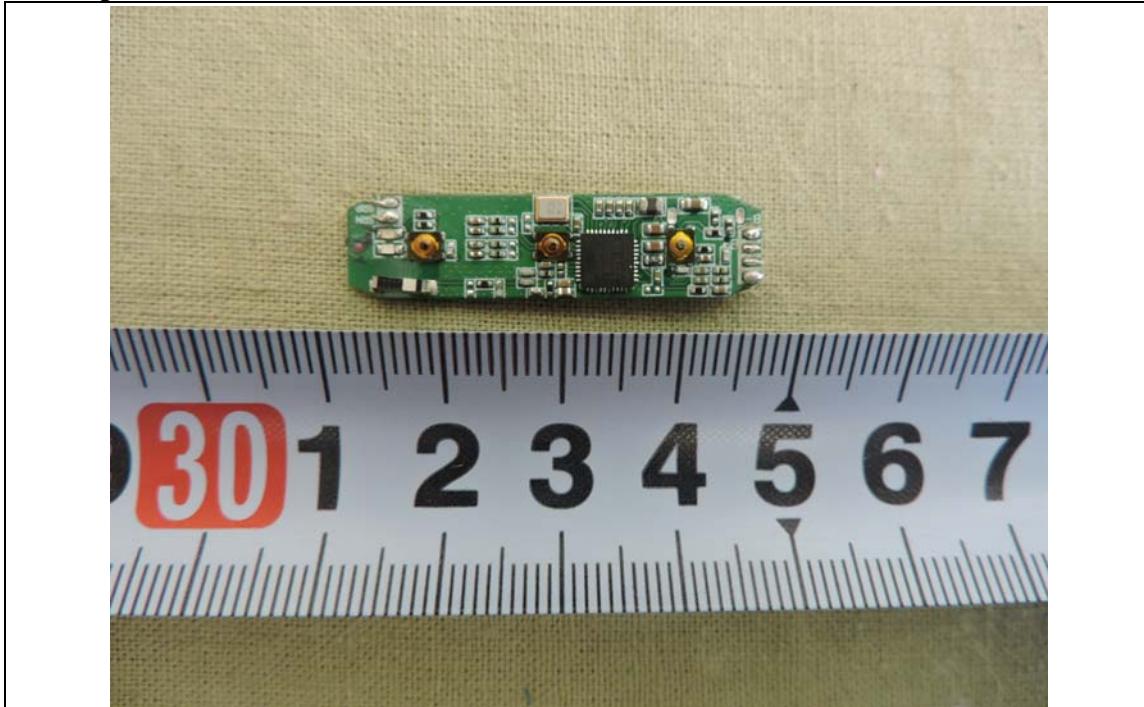


Internal of EUT

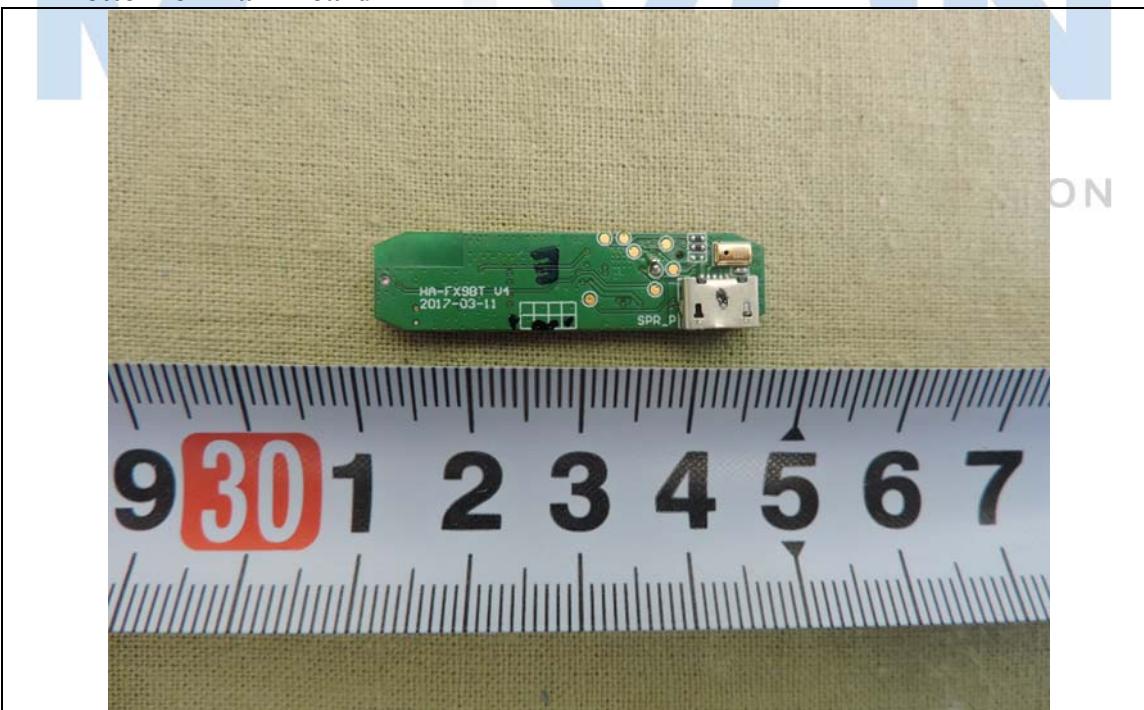


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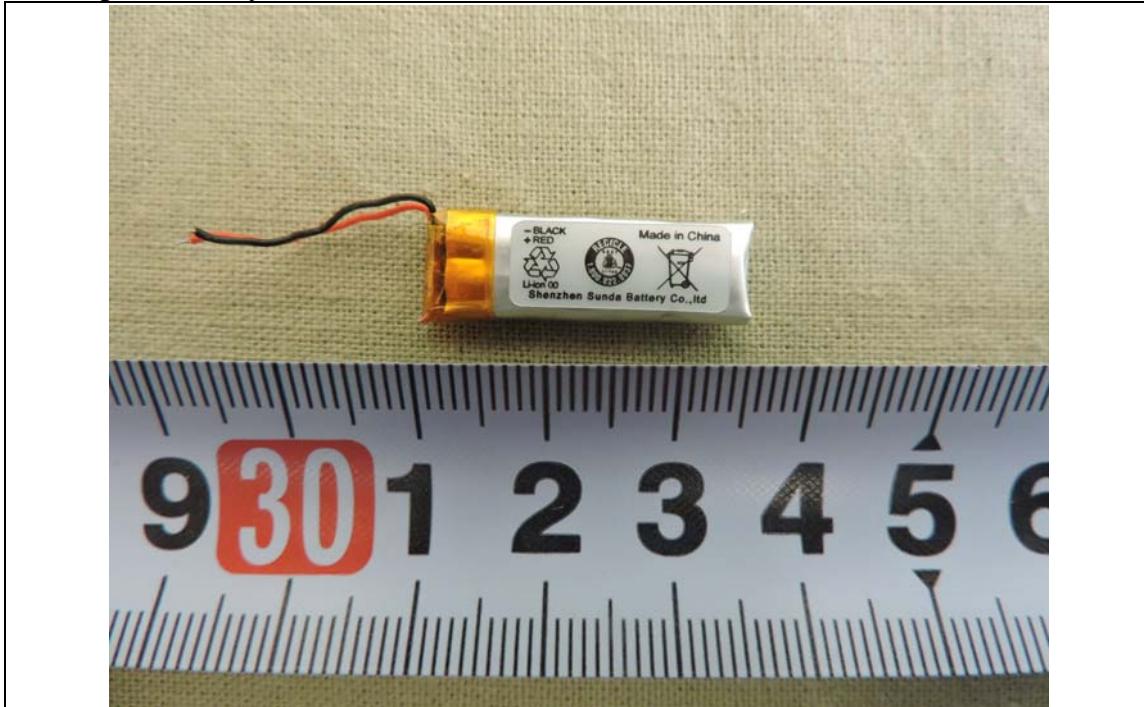
Top of Main Board



Bottom of Main Board



Top of Battery



Bottom of Battery

