

# **FCC REPORT**

## **(BLE)**

**Applicant:** BITWAVE PTE LTD

**Address of Applicant:** Ascendas Building, 53 Serangoon North Ave 4, #05-06

**Equipment Under Test (EUT)**

Product Name: Bluetooth Helmet Communicator

Model No.: MOTION HDX-V

Trade mark: UCLEAR DIGITAL

**FCC ID:** NMC-MHDX

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247

**Date of sample receipt:** 17 Nov., 2021

**Date of Test:** 18 Nov., 2021 to 18 Jan., 2022

**Date of report issued:** 20 Dec., 2022

**Test Result:** PASS \*

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

Authorized Signature:



Bruce Zhang  
Laboratory Manager

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

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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

## 2 Version

Version No.	Date	Description
00	19 Jan., 2022	Original
01	20 Dec., 2022	Update Page 5, 10.

Tested by:

*Mike.ou*

Test Engineer

Date:

20 Dec., 2022

Reviewed by:

*Winner Zhang*

Project Engineer

Date:

20 Dec., 2022

### 3 Contents

Page

<b>1</b>	<b>COVER PAGE.....</b>	<b>1</b>
<b>2</b>	<b>VERSION .....</b>	<b>2</b>
<b>3</b>	<b>CONTENTS .....</b>	<b>3</b>
<b>4</b>	<b>TEST SUMMARY.....</b>	<b>4</b>
<b>5</b>	<b>GENERAL INFORMATION.....</b>	<b>5</b>
5.1	CLIENT INFORMATION.....	5
5.2	GENERAL DESCRIPTION OF E.U.T.....	5
5.3	TEST ENVIRONMENT AND MODE .....	6
5.4	DESCRIPTION OF SUPPORT UNITS.....	6
5.5	MEASUREMENT UNCERTAINTY.....	6
5.6	ADDITIONS TO, DEVIATIONS, OR EXCLUSIONS FROM THE METHOD.....	6
5.7	LABORATORY FACILITY.....	7
5.8	LABORATORY LOCATION .....	7
5.9	TEST INSTRUMENTS LIST.....	8
<b>6</b>	<b>TEST RESULTS AND MEASUREMENT DATA .....</b>	<b>10</b>
6.1	ANTENNA REQUIREMENT:.....	10
6.2	CONDUCTED EMISSION .....	11
6.3	CONDUCTED OUTPUT POWER .....	14
6.4	OCCUPY BANDWIDTH .....	15
6.5	POWER SPECTRAL DENSITY .....	16
6.6	BAND EDGE .....	17
6.6.1	Conducted Emission Method.....	17
6.6.2	Radiated Emission Method.....	18
6.7	SPURIOUS EMISSION .....	23
6.7.1	Conducted Emission Method.....	23
6.7.2	Radiated Emission Method.....	24
<b>7</b>	<b>TEST SETUP PHOTO .....</b>	<b>28</b>
<b>8</b>	<b>EUT CONSTRUCTIONAL DETAILS .....</b>	<b>30</b>

## 4 Test Summary

Test Items	Section in CFR 47	Test Data	Result
Antenna requirement	15.203 & 15.247 (b)	See Section 6.1	Pass
AC Power Line Conducted Emission	15.207	See Section 6.2	Pass
Conducted Peak Output Power	15.247 (b)(3)	Appendix A – BLE-1M PHY	Pass
6dB Emission Bandwidth 99% Occupied Bandwidth	15.247 (a)(2)	Appendix A – BLE-1M PHY	Pass
Power Spectral Density	15.247 (e)	Appendix A – BLE-1M PHY	Pass
Conducted Band Edge	15.247 (d)	Appendix A – BLE-1M PHY	Pass
Radiated Band Edge		See Section 6.6.2	Pass
Conducted Spurious Emission	15.205 & 15.209	Appendix A – BLE-1M PHY	Pass
Radiated Spurious Emission		See Section 6.7.2	Pass
<b>Remark:</b> 1. Pass: The EUT complies with the essential requirements in the standard. 2. The cable insertion loss used by “RF Output Power” and other conduction measurement items is 0.5dB (provided by the customer).			
<b>Test Method:</b>	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02		

## 5 General Information

### 5.1 Client Information

Applicant:	BITWAVE PTE LTD
Address:	Ascendas Building, 53 Serangoon North Ave 4, #05-06
Manufacturer:	Bitwave Pte Ltd
Address:	Ascendas Building, 53 Serangoon North Ave 4, #05-06 Singapore 555852

### 5.2 General Description of E.U.T.

Product Name:	Bluetooth Helmet Communicator
Model No.:	MOTION HDX-V
Operation Frequency:	2402-2480 MHz
Channel numbers:	40
Channel separation:	2 MHz
Modulation technology:	GFSK
Data speed :	1Mbps
Antenna Type:	Internal Antenna
Antenna gain:	1.5 dBi
Power supply:	Rechargeable Li-ion Battery DC3.7V, 650mAh
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
2	2406MHz	12	2426MHz	22	2446MHz	32	2466MHz
3	2408MHz	13	2428MHz	23	2448MHz	33	2468MHz
4	2410MHz	14	2430MHz	24	2450MHz	34	2470MHz
5	2412MHz	15	2432MHz	25	2452MHz	35	2472MHz
6	2414MHz	16	2434MHz	26	2454MHz	36	2474MHz
7	2416MHz	17	2436MHz	27	2456MHz	37	2476MHz
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz

Note:  
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test. Channel No. 0, 20 & 39 were selected as Lowest, Middle and Highest channel.

### 5.3 Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
Radiated Emission: The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

### 5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
Lenovo	Laptop	ThinkPad T14 Gen 1	SL10Z47277	DoC
HUAWEI	Adapter	HW-050200C02	HS952E2KBS103C1	/

### 5.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%)
Conducted Emission (9kHz ~ 150KHz) for V-AMN	3.11 dB
Conducted Emission (150kHz ~ 30MHz) for V-AMN	2.62 dB
Radiated Emission (9kHz ~ 30MHz electric field) for 3m SAC	3.13 dB
Radiated Emission (9kHz ~ 30MHz magnetic field) for 3m SAC	3.13 dB
Radiated Emission (30MHz ~ 1GHz) for 3m SAC	4.45 dB
Radiated Emission (1GHz ~ 18GHz) for 3m SAC	5.34 dB
Radiated Emission (18GHz ~ 40GHz) for 3m SAC	5.34 dB
Radiated Emission (30MHz ~ 1GHz) for 10m SAC	4.32 dB

### 5.6 Additions to, deviations, or exclusions from the method

No
----

## 5.7 Laboratory Facility

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

● **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

● **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **CNAS - Registration No.: CNAS L15527**

JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527.

● **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

## 5.8 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info-JYTee@lets.com, Website: <http://jyt.lets.com>

## 5.9 Test Instruments list

Radiated Emission(above 1GHz):					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
3m SAC	ETS	RFD-100	Q1984	04-14-2021	04-13-2024
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-044	03-07-2021	03-06-2022
BiConiLog Antenna	SCHWARZBECK	VULB9163	9163-1246	03-07-2021	03-06-2022
Biconical Antenna	SCHWARZBECK	VUBA 9117	9117#359	06-17-2021	06-17-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	912D-916	03-07-2021	03-06-2022
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	1067	04-02-2021	04-01-2022
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	1068	04-02-2021	04-01-2022
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Keysight	N9010B	MY60240202	10-27-2021	10-26-2022
Simulated Station	Anritsu	MT8820C	6201026545	03-03-2021	03-02-2022
Low Pre-amplifier	SCHWARZBECK	BBV9743B	00305	03-07-2021	03-06-2022
High Pre-amplifier	SKET	LNPA_0118G-50	MF280208233	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-1G-NN-8M	JYT3M-1	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-18G-NN-8M	JYT3M-2	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-1G-BB-5M	JYT3M-3	03-07-2021	03-06-2022
Cable	Bost	JYT3M-40G-SS-8M	JYT3M-4	04-02-2021	04-01-2022
EMI Test Software	Tonscend	TS+	Version:3.0.0.1		

Radiated Emission(below 1GHz):					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
10m SAC	ETS	RFSD-100-F/A	Q2005	04-28-2021	04-27-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	1249	04-02-2021	04-01-2022
BiConiLog Antenna	SCHWARZBECK	VULB 9168	1250	04-02-2021	04-01-2022
EMI Test Receiver	R&S	ESR 3	102800	04-08-2021	04-07-2022
EMI Test Receiver	R&S	ESR 3	102802	04-08-2021	04-07-2022
Low Pre-amplifier	Bost	LNA 0920N	2016	04-06-2021	04-05-2022
Low Pre-amplifier	Bost	LNA 0920N	2019	04-06-2021	04-05-2022
Cable	Bost	JYT10M-1G-NN-10M	JYT10M-1	04-02-2021	04-01-2022
Cable	Bost	JYT10M-1G-NN-10M	JYT10M-2	04-02-2021	04-01-2022
Test Software	R&S	EMC32	Version: 10.50.40		

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI 3	101189	03-03-2021	03-02-2022
LISN	Schwarzbeck	NSLK 8127	QCJ001-13	03-18-2021	03-17-2022
LISN	Rohde & Schwarz	ESH3-Z5	843862/010	06-18-2020	06-17-2022
RF Switch	TOP PRECISION	RSU0301	N/A	03-03-2021	03-02-2022
Cable	Bost	JYTCE-1G-NN-2M	JYTCE-1	03-03-2021	03-02-2022
Cable	Bost	JYTCE-1G-BN-3M	JYTCE-2	03-03-2021	03-02-2022
EMI Test Software	AUDIX	E3	Version: 6.110919b		



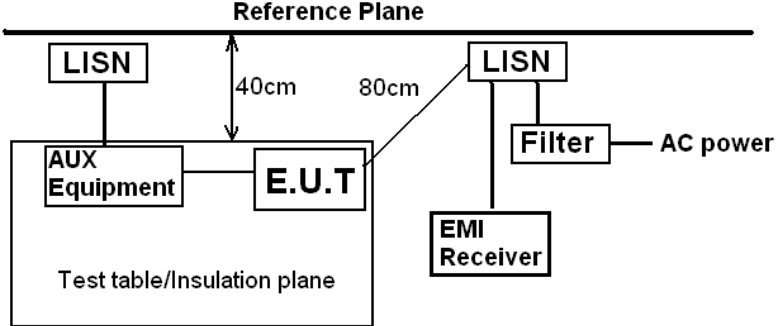
Conducted method:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Keysight	N9010B	MY60240202	10-27-2021	10-26-2022
Vector Signal Generator	Keysight	N5182B	MY59101009	10-27-2021	10-26-2022
Analog Signal Generator	Keysight	N5173B	MY59100765	10-27-2021	10-26-2022
Power Detector Box	MWRF-test	MW100-PSB	MW201020JYT	11-19-2021	11-18-2022
Simulated Station	Rohde & Schwarz	CMW270	102335	10-27-2021	10-26-2022
RF Control Box	MWRF-test	MW100-RFCB	MW200927JYT	N/A	N/A
PDU	MWRF-test	XY-G10	N/A	N/A	N/A
DC Power Supply	Keysight	E3642A	MY60296194	11-27-2020	11-26-2023
Temperature Humidity Chamber	Deli	8840	N/A	03-08-2021	03-07-2022
Test Software	MWRF-tes	MTS 8310	Version: 2.0.0.0		

## 6 Test results and Measurement Data

### 6.1 Antenna requirement:

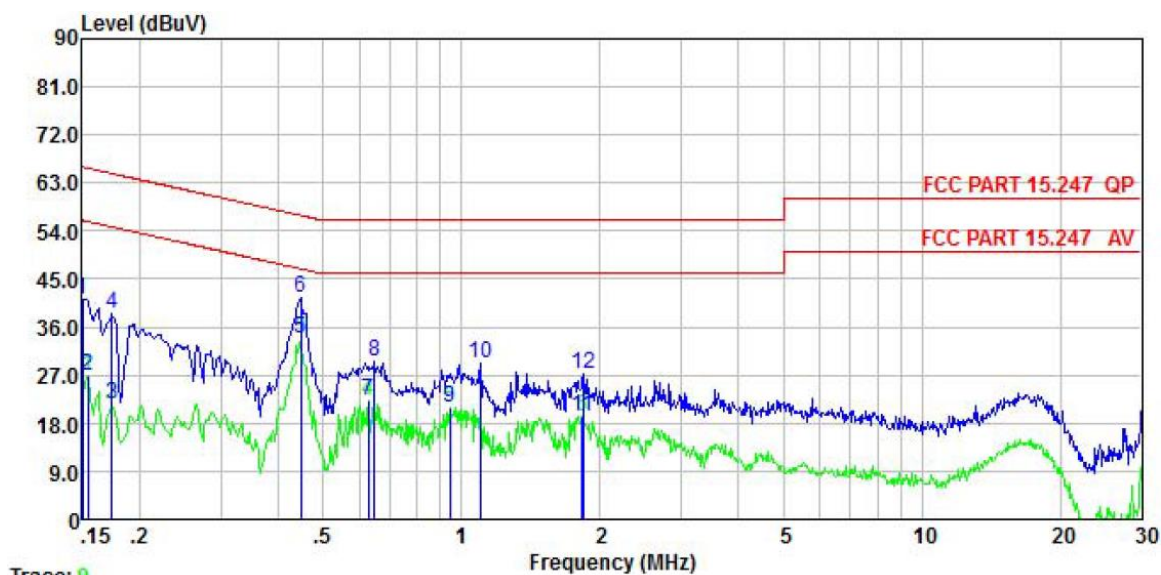
<b>Standard requirement:</b>	FCC Part 15 C Section 15.203 /247(b)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that 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.</p> <p>15.247(b) (4) requirement: (4) 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.</p>	
<b>E.U.T Antenna:</b>	
<p>The BLE antenna is an Internal antenna which cannot replace by end-user, the best-case gain of the antenna is 1.5 dBi.</p>	

## 6.2 Conducted Emission

Test Requirement:	FCC Part 15 C Section 15.207		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test procedure:	<ol style="list-style-type: none"> <li>The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.), which provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>Both sides of A.C. line are checked for maximum conducted interference. 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(latest version) on conducted measurement.</li> </ol>		
Test setup:	 <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>		
Test Instruments:	Refer to section 5.9 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Passed		

## Measurement Data:

Product name:	Bluetooth Helmet Communicator	Product model:	MOTION HDX-V
Test by:	Mike	Test mode:	BLE Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 23.2℃ Humi: 40%

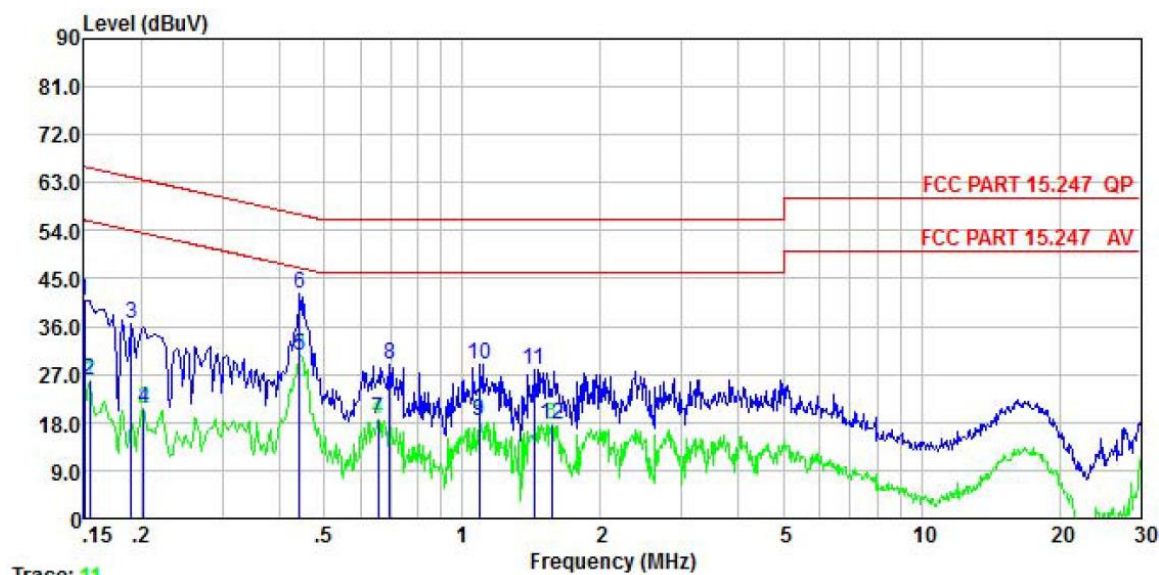


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.150	31.06	10.22	-0.05	0.01	41.24	66.00	-24.76	QP
2	0.154	16.69	10.22	-0.06	0.01	26.86	55.78	-28.92	Average
3	0.174	11.31	10.23	-0.11	0.01	21.44	54.77	-33.33	Average
4	0.174	28.28	10.23	-0.11	0.01	38.41	64.77	-26.36	QP
5	0.447	23.64	10.28	0.05	0.03	34.00	46.93	-12.93	Average
6	0.447	31.01	10.28	0.05	0.03	41.37	56.93	-15.56	QP
7	0.627	12.23	10.30	-0.38	0.02	22.17	46.00	-23.83	Average
8	0.647	19.63	10.30	-0.39	0.02	29.56	56.00	-26.44	QP
9	0.943	10.41	10.32	0.30	0.04	21.07	46.00	-24.93	Average
10	1.100	18.31	10.32	0.36	0.07	29.06	56.00	-26.94	QP
11	1.829	9.11	10.33	-0.22	0.19	19.41	46.00	-26.59	Average
12	1.848	16.98	10.33	-0.23	0.19	27.27	56.00	-28.73	QP

## Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.

Product name:	Bluetooth Helmet Communicator	Product model:	MOTION HDX-V
Test by:	Mike	Test mode:	BLE Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 23.2°C Humi: 40%

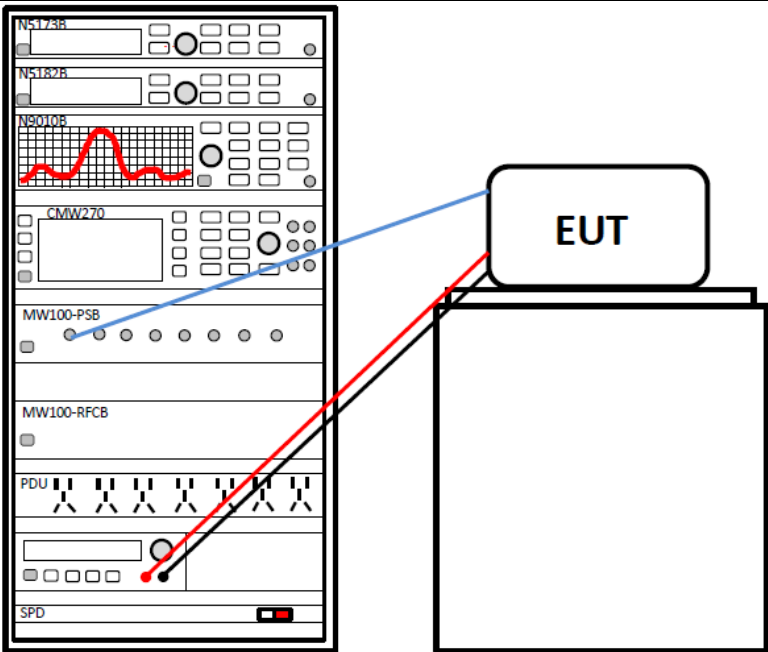


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.150	30.68	10.19	0.01	0.01	40.89	66.00	-25.11	QP
2	0.154	15.70	10.19	0.01	0.01	25.91	55.78	-29.87	Average
3	0.190	26.38	10.21	0.00	0.03	36.62	64.02	-27.40	QP
4	0.202	10.21	10.22	0.00	0.04	20.47	53.54	-33.07	Average
5	0.442	20.44	10.27	-0.02	0.03	30.72	47.02	-16.30	Average
6	0.442	31.84	10.27	-0.02	0.03	42.12	57.02	-14.90	QP
7	0.654	8.21	10.30	0.04	0.03	18.58	46.00	-27.42	Average
8	0.694	18.51	10.30	0.04	0.03	28.88	56.00	-27.12	QP
9	1.088	7.72	10.31	0.09	0.07	18.19	46.00	-27.81	Average
10	1.094	18.53	10.31	0.09	0.07	29.00	56.00	-27.00	QP
11	1.433	17.48	10.32	0.13	0.13	28.06	56.00	-27.94	QP
12	1.568	7.07	10.32	0.14	0.15	17.68	46.00	-28.32	Average

#### Notes:

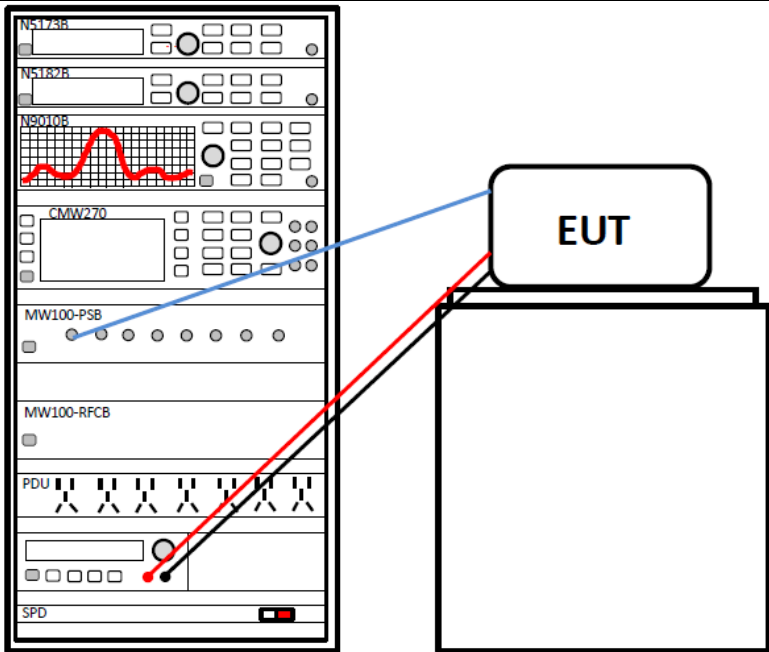
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.

### 6.3 Conducted Output Power

Test Requirement:	FCC Part 15 C Section 15.247 (b)(3)
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

**Measurement Data:** Refer to Appendix A – BLE-1M PHY

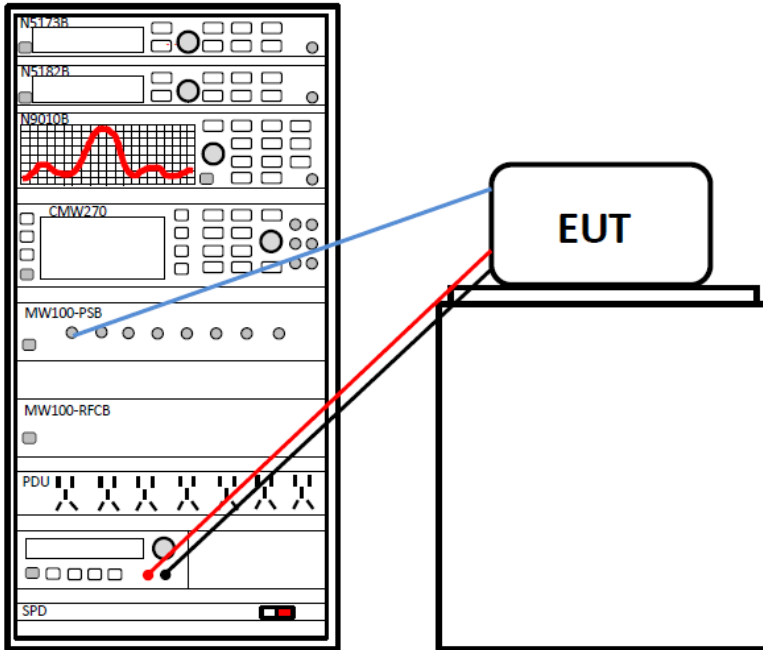
## 6.4 Occupy Bandwidth

Test Requirement:	FCC Part 15 C Section 15.247 (a)(2)
Limit:	>500kHz
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

**Measurement Data:** Refer to Appendix A – BLE-1M PHY



## 6.5 Power Spectral Density

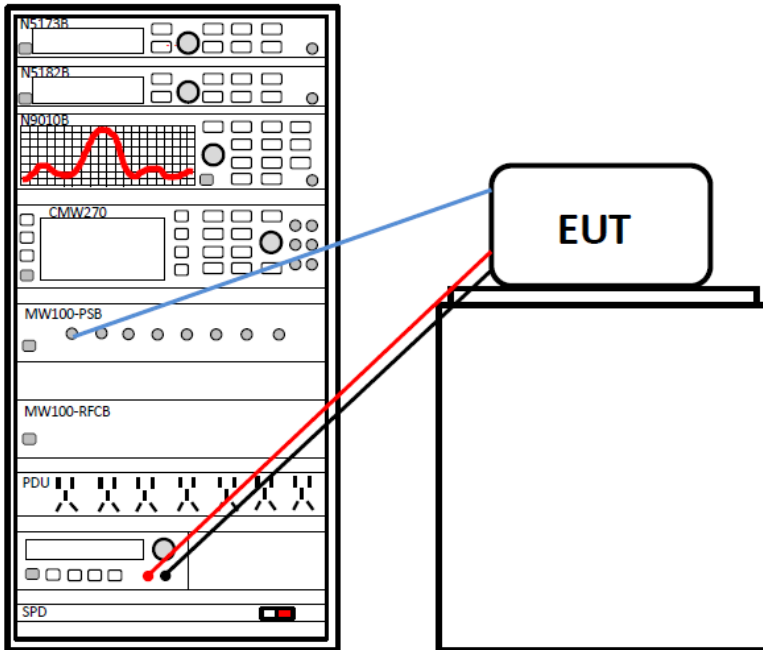
Test Requirement:	FCC Part 15 C Section 15.247 (e)
Limit:	8 dBm/3kHz
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

**Measurement Data:** Refer to Appendix A – BLE-1M PHY



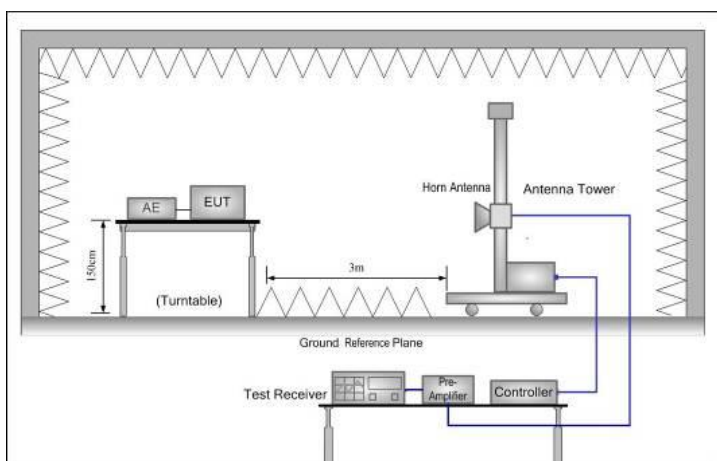
## 6.6 Band Edge

### 6.6.1 Conducted Emission Method

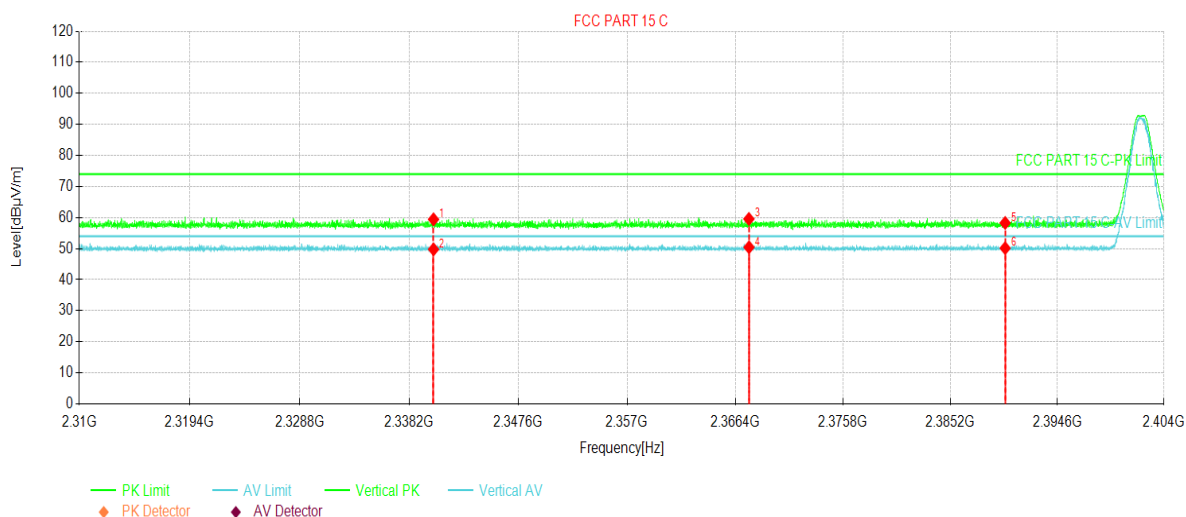
Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

**Measurement Data:** Refer to Appendix A – BLE-1M PHY

## 6.6.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.205 and 15.209				
Test Frequency Range:	2310 MHz to 2390 MHz and 2483.5MHz to 2500 MHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak RMS	1MHz 1MHz	3MHz 3MHz	Peak Value Average Value
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	54.00 74.00		Average Value Peak Value	
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. 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.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div>				
Test setup:	<div></div>				
Test Instruments:	Refer to section 5.9 for details				
Test mode:	Refer to section 5.3 for details				
Test results:	Passed				

Product name:	Bluetooth Helmet Communicator	Product model:	MOTION HDX-V
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Lowest channel	Polarization:	Vertical
Test Voltage:	AC 120 V/60 Hz	Environment:	Temp:22.2℃ Humi: 55%



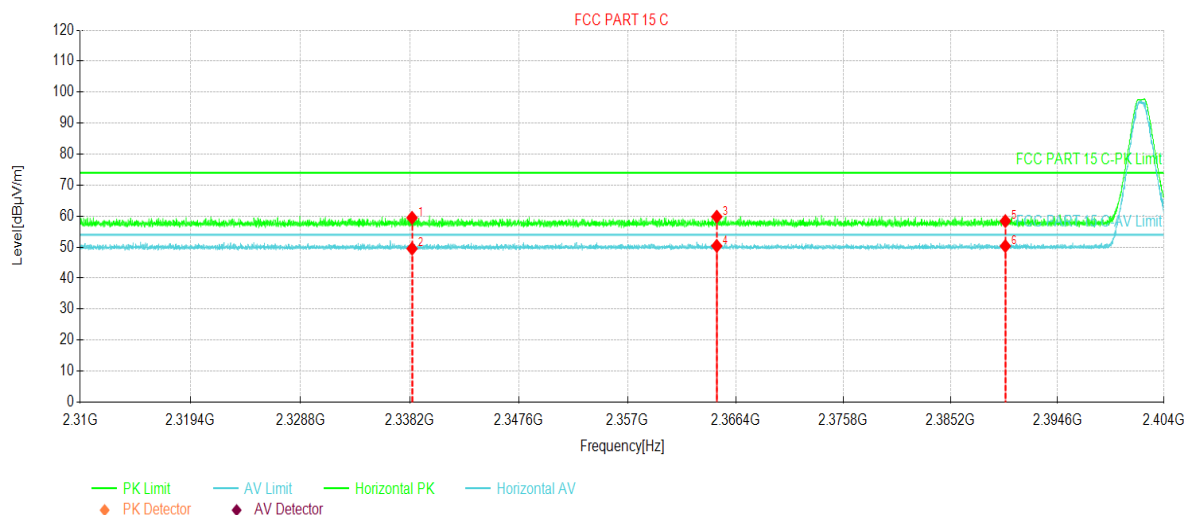
#### Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2340.29	23.93	35.49	59.42	74.00	14.58	PK	Vertical
2	2340.29	14.28	35.49	49.77	54.00	4.23	AV	Vertical
3	2367.58	23.87	35.68	59.55	74.00	14.45	PK	Vertical
4	2367.59	14.76	35.68	50.44	54.00	3.56	AV	Vertical
5	2390.00	22.43	35.84	58.27	74.00	15.73	PK	Vertical
6	2390.00	14.32	35.84	50.16	54.00	3.84	AV	Vertical

#### Remark:

- Final Level = Receiver Read level + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

Product name:	Bluetooth Helmet Communicator	Product model:	MOTION HDX-V
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Lowest channel	Polarization:	Horizontal
Test Voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.2℃ Humi: 55%



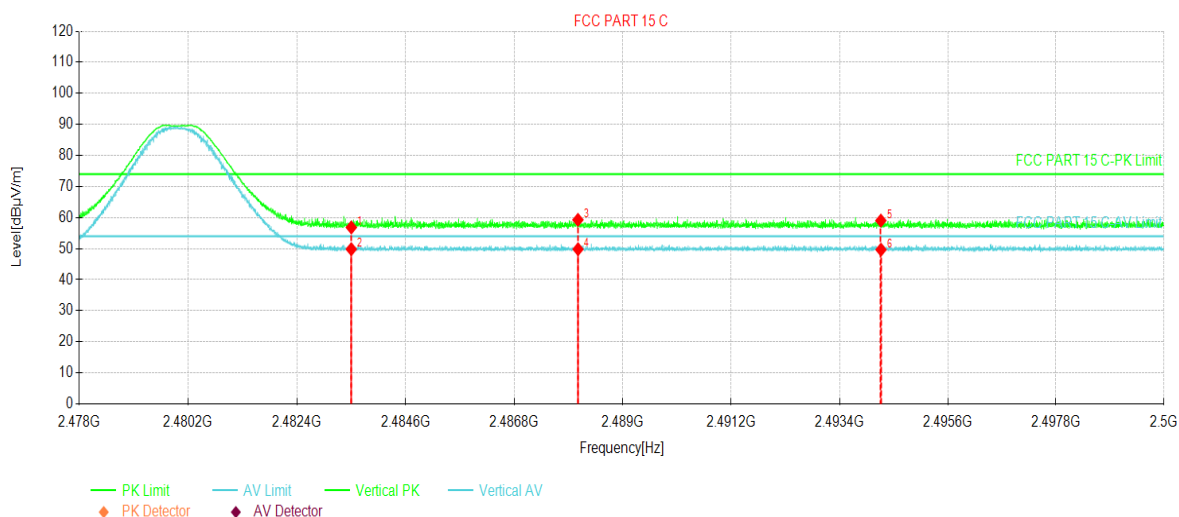
#### Suspected Data List

NO.	Freq. [MHz]	Reading [dBuV/m]	Factor [dB]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	2338.38	24.00	35.47	59.47	74.00	14.53	PK	Horizontal
2	2338.38	14.04	35.47	49.51	54.00	4.49	AV	Horizontal
3	2364.75	24.16	35.66	59.82	74.00	14.18	PK	Horizontal
4	2364.75	14.74	35.66	50.40	54.00	3.60	AV	Horizontal
5	2390.00	22.56	35.84	58.40	74.00	15.60	PK	Horizontal
6	2390.00	14.50	35.84	50.34	54.00	3.66	AV	Horizontal

#### Remark:

- Final Level = Receiver Read level + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

Product name:	Bluetooth Helmet Communicator	Product model:	MOTION HDX-V
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	AC 120 V/60 Hz	Environment:	Temp:22.2℃ Huni: 55%



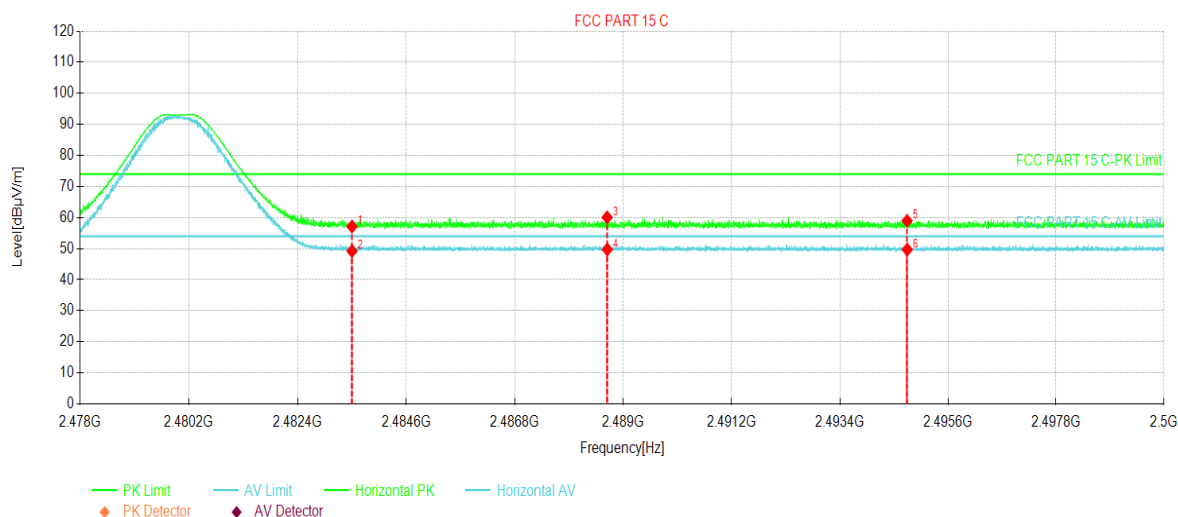
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2483.50	21.10	35.72	56.82	74.00	17.18	PK	Vertical
2	2483.50	14.10	35.72	49.82	54.00	4.18	AV	Vertical
3	2488.08	23.55	35.71	59.26	74.00	14.74	PK	Vertical
4	2488.09	14.11	35.71	49.82	54.00	4.18	AV	Vertical
5	2494.23	23.33	35.69	59.02	74.00	14.98	PK	Vertical
6	2494.24	13.97	35.69	49.66	54.00	4.34	AV	Vertical

Remark:

- Final Level = Receiver Read level + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

Product name:	Bluetooth Helmet Communicator	Product model:	MOTION HDX-V
Test By:	Mike	Test mode:	BLE Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.2℃ Huni: 55%



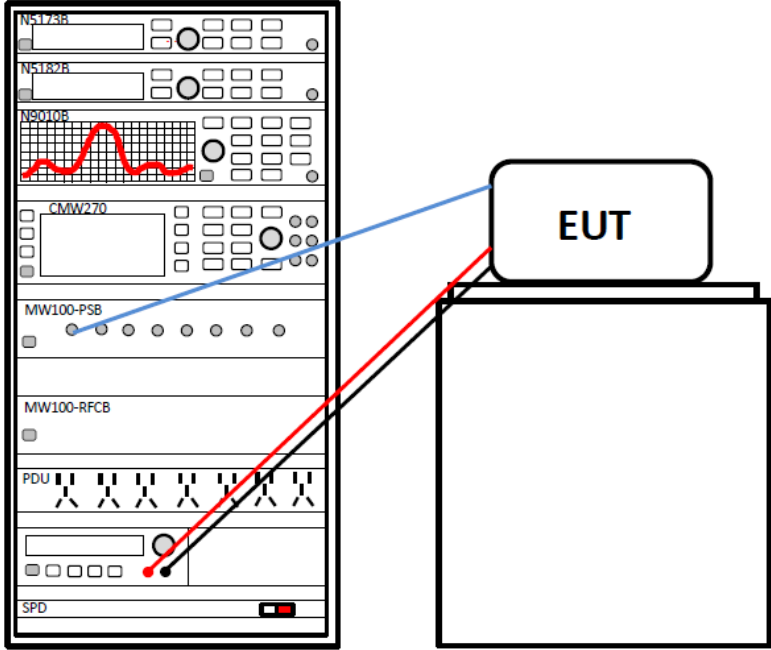
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBuV/m]	Factor [dB]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	2483.50	21.38	35.72	57.10	74.00	16.90	PK	Horizontal
2	2483.50	13.50	35.72	49.22	54.00	4.78	AV	Horizontal
3	2488.67	24.36	35.71	60.07	74.00	13.93	PK	Horizontal
4	2488.67	14.02	35.71	49.73	54.00	4.27	AV	Horizontal
5	2494.76	23.26	35.69	58.95	74.00	15.05	PK	Horizontal
6	2494.76	14.01	35.69	49.70	54.00	4.30	AV	Horizontal

#### Remark:

- Final Level = Receiver Read level + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).
- The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

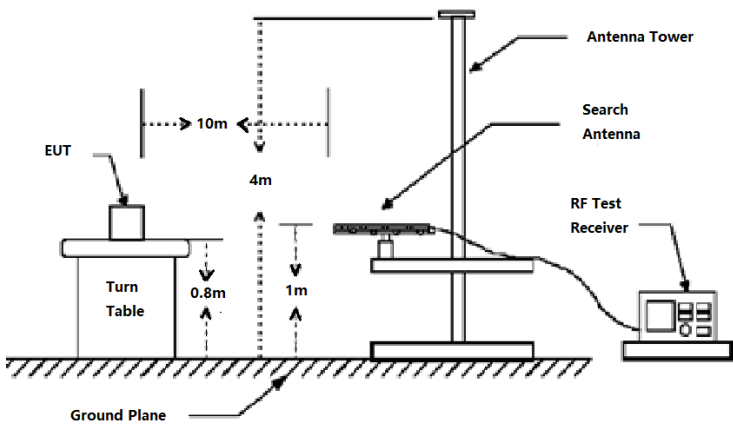
## 6.7 Spurious Emission

### 6.7.1 Conducted Emission Method

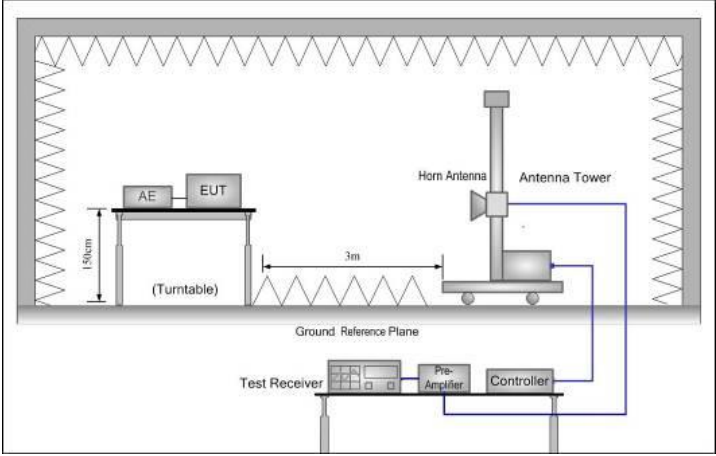
Test Requirement:	FCC Part 15 C Section 15.247 (d)
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

**Measurement Data:** Refer to Appendix A – BLE-1M PHY

## 6.7.2 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.205 and 15.209				
Test Frequency Range:	9kHz to 25GHz				
Test Distance:	3m or 10m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak RMS	1MHz 1MHz	3MHz 3MHz	Peak Value Average Value
Limit:	Frequency		Limit (dBuV/m @10m)		Remark
	30MHz-88MHz		30.0		Quasi-peak Value
	88MHz-216MHz		33.5		Quasi-peak Value
	216MHz-960MHz		36.0		Quasi-peak Value
	960MHz-1GHz		44.0		Quasi-peak Value
	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.0 74.0		Average Value Peak Value
Test Procedure:	<div>1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 10 meter chamber (below 1GHz) or 3 meter chamber(above 1GHz). The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 10 meters(below 1GHz) or 3 meters(above 1GHz) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. 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.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div>				
Test setup:	<div>Below 1GHz</div> <div></div>				

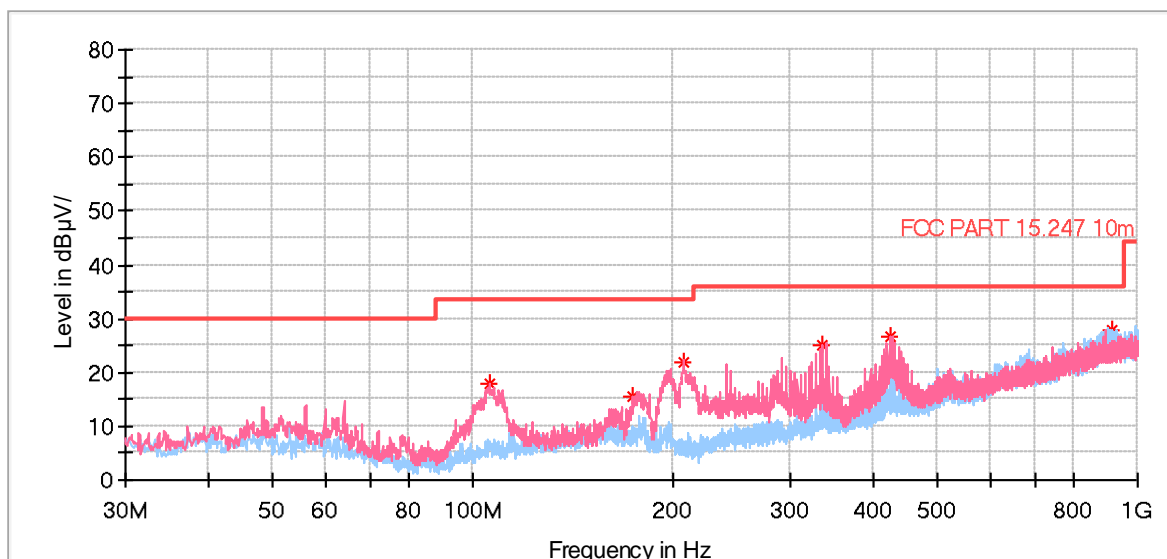


	<p>Above 1GHz</p> 
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	<ol style="list-style-type: none"> <li>1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.</li> <li>2. 9 kHz to 30MHz is lower than the limit 20dB, so only shows the data of above 30MHz in this report.</li> </ol>

**Measurement Data (worst case):**
**Below 1GHz:**

<b>Product name:</b>	Bluetooth Helmet Communicator	<b>Product model:</b>	MOTION HDX-V
<b>Test By:</b>	Mike	<b>Test mode:</b>	BLE Tx mode
<b>Test Frequency:</b>	30 MHz ~ 1 GHz	<b>Polarization:</b>	Vertical & Horizontal
<b>Test Voltage:</b>	AC 120 V/60 Hz	<b>Environment:</b>	Temp: 21.8°C Humi: 52%

Full Spectrum



Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
105.757000	17.83	33.50	15.67	100.0	V	20.0	-18.3
173.754000	15.53	33.50	17.97	100.0	V	20.0	-16.8
207.898000	22.00	33.50	11.50	100.0	V	61.0	-17.8
336.035000	25.27	36.00	10.73	100.0	V	90.0	-13.3
424.014000	26.73	36.00	9.27	100.0	V	28.0	-10.5
917.647000	28.00	36.00	8.00	100.0	H	0.0	-1.0

**Remark:**

1. Final Level = Receiver Read level + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).
2. The emission levels of other frequencies are lower than the limit 20dB and not show in test report.

### Above 1GHz

Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4804.00	60.78	-9.60	51.18	74.00	22.82	Vertical
4804.00	59.54	-9.60	49.94	74.00	24.06	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4804.00	56.52	-9.60	46.92	54.00	7.08	Vertical
4804.00	56.63	-9.60	47.03	54.00	6.97	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4884.00	61.03	-9.04	51.99	74.00	22.01	Vertical
4884.00	59.10	-9.04	50.06	74.00	23.94	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4884.00	56.51	-9.04	47.47	54.00	6.53	Vertical
4884.00	56.43	-9.04	47.39	54.00	6.61	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4960.00	61.27	-8.45	52.82	74.00	21.18	Vertical
4960.00	59.80	-8.45	51.35	74.00	22.65	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
4960.00	56.38	-8.45	47.93	54.00	6.07	Vertical
4960.00	56.17	-8.45	47.72	54.00	6.28	Horizontal
Remark: 1. Final Level =Receiver Read level + Factor. 2. The emission levels of other frequencies are lower than the limit 20dB and not show in test report.						