

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

**Test Report No.** : OT-199-RWD-011  
**AGR No.** : A197A-116  
**Applicant** : Bitfinder, Inc.  
**Address** : 814 SARATOGA AVE #J205, SAN JOSE, California, 95129, United States  
**Manufacturer** : Bitfinder, Inc.  
**Address** : 13F WeWork, 343 Samilda-Ro, Jung-Gu, Seoul, Republic of Korea  
**Type of Equipment** : AWAIR LITE  
**FCC ID.** : 2AF65AWAIR0HD3  
**Model Name** : AWAIR Rev3  
**Serial number** : N/A  
**Total page of Report** : 8 pages (including this page)  
**Date of Incoming** : August 02, 2019  
**Date of issue** : September 04, 2019

## SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.249, 15.247*

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:

  
 Tae-Ho, Kim / Senior Manager  
 ONETECH Corp.

Approved by:

  
 Ki-Hong, Nam / Chief Engineer  
 ONETECH Corp.

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**Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-199-RWD-011	September 04, 2019	Initial Release	All

## 1. VERIFICATION OF COMPLIANCE

Applicant : Bitfinder, Inc.  
Address : 814 SARATOGA AVE #J205, SAN JOSE, California, 95129, United States  
Contact Person : Kevin, Cho / CTO  
Telephone No. : 408-930-9235  
FCC ID : 2AF65AWAIR0HD3  
Model Name : AWAIR Rev3  
Brand Name : -  
Serial Number : N/A  
Date : September 04, 2019

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	AWAIR LITE
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.225, 15.247 FCC CFR47 Part 15 Subpart C Section 15.249 558074 D01 15.225, 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. GENERAL INFORMATION

### 2.1 Product Description

The Bitfinder, Inc., Model AWAIR Rev3 (referred to as the EUT in this report) is an AWAIR LITE, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	AWAIR LITE	
Temperature Range	-10 °C ~ 50 °C	
OPERATING FREQUENCY	Sub 1 G	915 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
MODULATION TYPE	Sub 1 G	GFSK
	Bluetooth LE	GFSK
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
RF OUTPUT POWER'	Sub 1 G	112.50 dBuV/m
	Bluetooth LE	6.74 dBm
	WLAN 2.4 GHz	6.84 dBm(802.11b) 11.30 dBm(802.11g) 10.16 dBm(802.11n_HT20)
ANTENNA TYPE	Sub 1 G : PCB Antenna WLAN 2.4 GHz / Bluetooth LE : PCB Antenna	
ANTENNA GAIN	Sub 1 G: 2.234 dBi WLAN 2.4 GHz / Bluetooth LE: 5.049 dBi	
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768 kHz, 12.288 MHz, 24 MHz	

### 2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

## 3. EUT MODIFICATIONS

-. None

## 4. MAXIMUM PERMISSIBLE EXPOSURE

### 4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are  $f/1500 \text{ mW/cm}^2$  for the frequency range between 300 MHz and 1 500 MHz and  $1.0 \text{ mW/cm}^2$  for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a  $1 \text{ mW/cm}^2$  exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

$S$  = Power density in  $\text{mW/cm}^2$ ,  $Z$  = Impedance of free space,  $377 \Omega$

$E$  = Electric field strength in  $\text{V/m}$ ,  $G$  = Numeric antenna gain, and  $d$  = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using  $P (\text{mW}) = P (\text{W}) / 1 000$ ,  $d (\text{cm}) = 0.01 * d (\text{m})$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

$d$  = distance in cm,  $P$  = Power in mW,  $G$  = Numeric antenna gain, and  $S$  = Power density in  $\text{mW/cm}^2$

Kind of EUT	AWAIR LITE
Device Category	<input type="checkbox"/> Portable (< 20 cm separation) <input type="checkbox"/> Mobile (> 20 cm separation) <input checked="" type="checkbox"/> Others
Exposure Evaluation Applied	<input checked="" type="checkbox"/> MPE <input type="checkbox"/> SAR <input type="checkbox"/> N/A



Tested by: Hyung-Kwon, Oh / Assistant Manager

## 4.2 Test Result for Bluetooth LE

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm <sup>2</sup> ) @ 20 cm Separation	Limit (mW/cm <sup>2</sup> )
		(dBm)	(dBm)	(mW)	Log	Linear			
2 402 ~ 2 480	Bluetooth LE Low Channel	-1.00 ± 0.5	0.50	1.12	5.049	3.20	0.53	0.000 7	1.00
	Bluetooth LE Middle Channel	6.50 ± 0.5	7.00	5.01			1.13	0.003 2	1.00
	Bluetooth LE High Channel	5.00 ± 0.5	5.50	3.55			0.95	0.002 3	1.00

According to above table, for 2 402 MHz ~ 2 480 MHz Band(Low Channel), safe distance,

$$D = 0.282 * \sqrt{(5.01 * 3.20) / 1.00} = 1.13 \text{ cm}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 5.01 * 3.20 / (4 * 3.14 * 20^2) = 0.003 2$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna



Tested by: Hyung-Kwon, Oh / Assistant Manager

### 4.3 Test Result for WLAN 2.4 GHz

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm <sup>2</sup> ) @ 20 cm Separation	Limit (mW/cm <sup>2</sup> )
		(dBm)	(dBm)	(mW)	Log	Linear			
2 400 ~ 2 483.5	802.11b	6.50 ± 0.5	7.00	5.01	5.049	3.20	1.13	0.003 2	1.00
	802.11g	11.00 ± 0.5	11.50	14.13			1.90	0.009 0	1.00
	802.11n_HT20	10.00 ± 0.5	10.50	11.22			1.69	0.007 1	1.00

According to above table, for 2 400 ~ 2 483.5 MHz Band(802.11g), safe distance,

$$D = 0.282 * \sqrt{(14.13 * 3.20)/1.00} = 1.90 \text{ cm}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 14.13 * 3.20 / (4 * 3.14 * 20^2) = 0.009 0$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna



Tested by: Hyung-Kwon, Oh / Assistant Manager