RF Exposure Evaluation Report

Equipment	: Liberty Wireless Module
Brand Name	: Bowers & Wilkins
Model No.	: CC72036
FCC ID	: 2ACIX-LWM
Standard	: 47 CFR Part 2.1091
Applicant	: B&W Group Ltd. Dale Road Worthing, West Sussex BN11 2BH, United Kingdom
Manufacturer	: B&W Group Ltd. Dale Road Worthing, West Sussex BN11 2BH, United Kingdom

The product sample received on Sep. 15, 2017 and completely tested on Nov. 17, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with 47 CFR Part 2.1091 and pass the limit.

Cliff Chang
SPORTON INTERNATIONAL INC.

Testing Laboratory
1190

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA790630	Rev. 01	Initial issue of report	Dec. 15, 2017
FA790630	Rev. 02	Adding twelve dipole antennas	Jan. 08, 2018

1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	**Frequency Range (MHz)**	**Operating Frequency (MHz)**	**Modulation Type**
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / π/4-DQPSK / 8DPSK) LE: DSSS (GFSK)

1.2 Table for EUT functions

Radio	2.4GHz & 5GHz (B1~B4) (5GHz Scanning only)	5GHz (B1&B2)	5GHz (B3&B4)	Bluetooth
1	V	-	-	-
2	-	-	V	-
3	-	V	-	-
4	-	-	-	V

Type of function	2.4GHz (Radio 1)	5GHz (B1&B2) (Radio 3)	5GHz (B3&B4) (Radio 2)	5GHz (Radio 1) (B1~B4) (Scanning only)	Bluetooth (Radio 4)
AP Mode (Master)	N/A	V	V	V	V
Station Mode (Slave without radar detection)	V	V	V	N/A	V
Station Mode (Slave without radar detection)	N/A	V	V	V	V
Test Mode	**2.4GHz (Radio 1)**	**5GHz (B1&B2) (Radio 3)**	**5GHz (B3&B4) (Radio 2)**	**5GHz (Radio 1) (B1~B4) (Scanning only)**	**Bluetooth (Radio 4)**
AP Mode	Station Mode	AP Mode	AP Mode	Not work (Note)	AP Mode

Note: MPE does not support RX Scanning function.

1.3 Testing Location

Testing Location			
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

Pd = $\frac{30 \times P \times G}{377 \times d^2}$

2.3 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For Radio 1 (2.4GHz)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
2.4G;G1D	2.02	29.12	31.14	31.64	1.45881	20	0.29036	1.00000
2.4G;D1D	2.02	28.75	30.77	31.27	1.33968	20	0.26665	1.00000

For Radio 3 (5GHz B1~B2)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
5.2G;D1D (for master)	3.06	24.98	28.04	28.54	0.71450	20	0.14221	1.00000
5.2G;D1D (Slave without radar detection)	3.06	23.41	26.47	26.5	0.44668	20	0.08890	1.00000
5.3G;D1D	3.06	23.83	26.89	27.39	0.54828	20	0.10913	1.00000

For Radio 2 (5GHz B3~B4)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
5.6G;D1D	3.06	23.91	26.97	27.47	0.55847	20	0.1116	1.00000
5.8G;D1D	3.06	28.98	32.04	32.54	1.79473	20	0.35723	1.00000

For Radio 4 (Bluetooth)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
2.4G;BT-LE	2.02	9.32	11.34	11.84	0.01528	20	0.00304	1.00000
2.4G;BT-BR	2.02	9.64	11.66	12.16	0.01644	20	0.00327	1.00000
2.4G;BT-EDR	2.02	8.93	10.95	11.45	0.01396	20	0.00277	1.00000

Simultaneous Transmission Analysis Mode: R1 (2.4G) + R3 (5G B1~B2) + R2 (5G B3~B4) + R4 (BT)

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)	Ratio (S/Limit)
5.2G;D1D	3.06	24.98	28.04	28.54	0.71450	20	0.14221	1.00000	0.14221
5.8G;D1D	3.06	28.98	32.04	32.54	1.79473	20	0.35723	1.00000	0.35723
2.4G;G1D	2.02	29.12	31.14	31.64	1.45881	20	0.29036	1.00000	0.29036
2.4G;BT-BR	2.02	9.64	11.66	12.16	0.01644	20	0.00327	1.00000	0.00327
								Sum Ratio	0.79307
								Ratio Limit	1