RF Exposure Evaluation Report

Equipment	: EFR32 802.15.4 Module
Brand Name	: MMB Networks
Model No.	: BSB03PA1XXXXX
FCC ID	: XFF-BSB03PA1X
Standard	: 47 CFR Part 2.1091
Applicant	: MMB RESEARCH INC. 243 College St, Suite 500, Toronto, M5T1R5 Canada
Manufacturer	: CyberTAN Technology, Inc. No. 99, Park Avenue III, Science-based Industrial Park, Hsinchu, 308 Taiwan

The product sample received on Sep. 04, 2017 and completely tested on Sep. 25, 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.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA783135	Rev. 01	Initial issue of report	Jan. 29, 2018

1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	**Frequency Range (MHz)**	**Operating Frequency (MHz)**	**Modulation Type**
Zigbee	2400-2483.5	2405-2480	O-QPSK

1.2 Table for Multiple Listing

All models are identical except for the antenna type. The different antenna type equips different output power. The detail antenna information as below:

Model Name	Antenna Type	Antenna	EUT	Description
BSB03PA1XXXXX	Chip	Ant. 1	EUT 1 with internal antenna	The first "X" in model name can be 0 or 1 or 2. The others "XXXX" in model name can be 0 to 9, A to Z, a to z, dash or blank.
	Dipole	Ant. 2	EUT 2 with external antenna	
		Ant. 3		

From the above models, EUT 1 (BSB03PA10-CHP) + Ant. 1 and EUT 2 (BSB03PA10-RFC) + Ant. 2, Ant. 3 were selected as representative models for RF Exposure test.

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

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

<Mode 1: EUT 1 + Ant. 1>

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)
Zigbee	1.22	19.15	20.37	20.50	0.11220	20	0.022	1.00000

<Mode 2: EUT 2 + Ant. 3>

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)
Zigbee	4.50	18.20	22.70	23.00	0.19953	20	0.040	1.00000