



# SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.

Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / [www.sporton.com.tw](http://www.sporton.com.tw)

Certificate No.: CB10203210

## Maximum Permissible Exposure

Applicant's company	Broadcom Corporation
Applicant Address	190 Mathilda Place Sunnyvale CA 94086 U.S.A.
FCC ID	QDS-BRCM1073
Manufacturer's company	Broadcom Corporation
Manufacturer Address	190 Mathilda Place Sunnyvale CA 94086 U.S.A.

Product Name	802.11a/b/g/n WLAN + Bluetooth Card
Brand Name	Broadcom
Model Name	BCM943241NG1630
Ref. Standard(s)	47 CFR FCC Part 2 Subpart J, section 2.1091
EUT Freq. Range	2400 ~ 2483.5MHz / 5150 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850MHz
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Sam Chen

SPORTON INTERNATIONAL INC.

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## History of This Assessment Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA330410	Rev. 01	Initial issue of report	Mar. 28, 2013

## 1. MAXIMUM PERMISSIBLE EXPOSURE

### 1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(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/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> 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/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> 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

### 1.2. MPE Calculation Method

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

**E** = Electric field (V/m)

**P** = Peak 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

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

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

### 1.3. Calculated Result and Limit

For 5GHz UNII Band:

Antenna Type : PIFA Antenna

Max Conducted Power for IEEE 802.11n 20MHz (2TX) : 21.40 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
5.60	3.6308	21.4019	138.1004	0.099803	1	Complies

For 5GHz ISM Band:

Antenna Type : PIFA Antenna

Max Conducted Power for IEEE 802.11n 20MHz (2TX) : 22.15 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
5.80	3.8019	22.1453	163.8825	0.124017	1	Complies

For 2.4GHz Band:

Antenna Type : PIFA Antenna

Max Conducted Power for IEEE 802.11n 20MHz (2TX) : 19.22 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
3.90	2.4547	19.2155	83.4744	0.040785	1	Complies

For Bluetooth

Antenna Type : PIFA Antenna

Max Conducted Power for Bluetooth 1.0 : 10.01 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
3.90	2.4547	10.0100	10.0231	0.004897	1	Complies

For Bluetooth

Antenna Type : PIFA Antenna

Max Conducted Power for Bluetooth 4.0 : 0.22 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
3.90	2.4547	0.2200	1.0520	0.000514	1	Complies

#### CONCLUSION:

Both of the WLAN 2.4GHz Band and Bluetooth can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is  $0.040785 / 1 + 0.004897 / 1 = 0.045682$ , which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

#### CONCLUSION:

Both of the WLAN 5GHz Band and Bluetooth can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is  $0.124017 / 1 + 0.004897 / 1 = 0.128914$ , which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.