



# SPORTON International Inc.

No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.  
Ph: 886-3-656-9065 / FAX: 886-3-656-9085 / www.sporton.com.tw

Certificate No.: CB10208151

## Maximum Permissible Exposure

Applicant's company	Hewlett-Packard Company
Applicant Address	3000 Hanover Street Palo Alto, California 94304 U.S.A.
FCC ID	B94MRLBB1301
Manufacturer's company	Joy Technology (ShenZhen) Corporation
Manufacturer Address	Building A,B,C,D, HengKeng Ind., Shangpai, Shangwu,Aiqun Rd., Shiyan Town,Shenzhen 518135 China

Product Name	802.11ac WLAN Radio Module
Brand Name	HP
Model Name	MRLBB-1301
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

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## 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 : Dipole Antenna

Test Mode : Mode 1

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 23.98 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
1.00	1.2589	23.9811	250.0970	0.062670	1	Complies

Antenna Type : Omnidirectional Antenna

Test Mode : Mode 2

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 23.29 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
6.70	4.6774	23.2922	213.4121	0.198687	1	Complies

Antenna Type : Panel Antenna

Test Mode : Mode 3

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 20.79 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
9.20	8.3176	20.7894	119.9345	0.198561	1	Complies

Antenna Type : PCB Antenna

Test Mode : Mode 4

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 23.91 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
5.74	3.7497	23.9107	246.0780	0.183664	1	Complies

For 5GHz ISM Band:

Antenna Type : Dipole Antenna

Test Mode : Mode 5

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 24.90 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
1.00	1.2589	24.8995	308.9904	0.077428	1	Complies

Antenna Type : Omnidirectional Antenna

Test Mode : Mode 6

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 24.90 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
6.70	4.6774	24.8995	308.9904	0.287671	1	Complies

Antenna Type : Panel Antenna

Test Mode : Mode 7

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 24.90 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
9.20	8.3176	24.8995	308.9904	0.511559	1	Complies

Antenna Type : PCB Antenna

Test Mode : Mode 8

Max Conducted Power for IEEE 802.11ac 20MHz MCS0/NSS3 (3TX) : 24.90 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
5.74	3.7497	24.8995	308.9904	0.230619	1	Complies

For 2.4GHz Band:

Antenna Type : Dipole Antenna

Test Mode : Mode 1

Max Conducted Power for IEEE 802.11g (3TX) : 25.70 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
1.20	1.3183	25.6962	371.2062	0.097401	1	Complies

Antenna Type : Element Antenna

Test Mode : Mode 2

Max Conducted Power for IEEE 802.11n 20MHz MCS16 (3TX) : 25.65 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
5.20	3.3113	25.6459	366.9387	0.241849	1	Complies

Antenna Type : Panel Antenna

Test Mode : Mode 3

Max Conducted Power for IEEE 802.11g (3TX) : 25.70 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
7.10	5.1286	25.6962	371.2062	0.378936	1	Complies

Antenna Type : PCB Antenna

Test Mode : Mode 4

Max Conducted Power for IEEE 802.11g (3TX) : 25.70 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
4.94	3.1189	25.6962	371.2062	0.230444	1	Complies