



SPORTON International Inc.

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Project No: CB10506165

Maximum Permissible Exposure Report

| | |
|------------------------|---|
| Applicant's company | Cisco Systems, Inc. |
| Applicant Address | 170 West Tasman Drive San Jose, CA 95134 USA |
| FCC ID | UDX-60043010 |
| Manufacturer's company | Accton Technology Corporation |
| Manufacturer Address | 1, Creation Road 3, Hsinchu Science Park Hsinchu 20077, Taiwan R.O.C. |

| | |
|------------------|---|
| Product Name | 802.11 a/b/g/n/ac Wireless Access Point |
| Brand Name | CISCO |
| Model Name | MR84-HW |
| Ref. Standard(s) | 47 CFR FCC Part 2 Subpart J, section 2.1091 |
| Received Date | Jan. 27, 2016 |
| Final Test Date | Jun. 02, 2016 |
| Submission Type | Original Equipment |

Sam Chen

SPORTON INTERNATIONAL INC.



Testing Laboratory
1190



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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 5725-5850 | 5180-5240 5745-5825 | 802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) |
| Bluetooth | 2400-2483.5 | 2402-2480 | LE: DSSS (GFSK) |

1.2. Testing Location

| Testing Location | | |
|-------------------------------------|--------|--|
| <input type="checkbox"/> | 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 |
| <input checked="" type="checkbox"/> | 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/ cm ²) | 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/ cm ²) | 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 27.5 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

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

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

2.3. Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For 5GHz Band:

For Radio 2 :

Antenna Type : Panel Antenna

Conducted Power for IEEE 802.11a: 25.98 dBm

| Distance (cm) | Test Freq. (MHz) | Antenna Gain (dBi) | Antenna Gain (numeric) | The maximum combined Average Output Power | | Power Density (S) (mW/cm ²) | Limit of Power Density (S) (mW/cm ²) | Test Result |
|---------------|------------------|--------------------|------------------------|---|----------|---|--|-------------|
| | | | | (dBm) | (mW) | | | |
| 27.5 | 5745 | 10.00 | 10.0000 | 25.9846 | 396.7020 | 0.417647 | 1 | Complies |

For Radio 3 :

Antenna Type : Metal Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 21.46dBm

| Distance (cm) | Test Freq. (MHz) | Antenna Gain (dBi) | Antenna Gain (numeric) | Average Output Power | | Power Density (S) (mW/cm ²) | Limit of Power Density (S) (mW/cm ²) | Test Result |
|---------------|------------------|--------------------|------------------------|----------------------|----------|---|--|-------------|
| | | | | (dBm) | (mW) | | | |
| 27.5 | 5200 | 5.40 | 3.4674 | 21.4600 | 139.9587 | 0.051091 | 1 | Complies |

For 2.4GHz Band:

For Radio 1:

Antenna Type : Panel Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 20.07dBm

| Distance (cm) | Test Freq. (MHz) | Directional Gain (dBi) | Antenna Gain (numeric) | The maximum combined Average Output Power | | Power Density (S) (mW/cm ²) | Limit of Power Density (S) (mW/cm ²) | Test Result |
|---------------|------------------|------------------------|------------------------|---|----------|---|--|-------------|
| | | | | (dBm) | (mW) | | | |
| 27.5 | 2437 | 15.92 | 39.0947 | 20.0736 | 101.7093 | 0.418623 | 1 | Complies |

Note: $DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$

For Radio 3:

Antenna Type : Metal Antenna

Conducted Power for IEEE 802.11g: 24.92 dBm

| Distance (cm) | Test Freq. (MHz) | Antenna Gain (dBi) | Antenna Gain (numeric) | Average Output Power | | Power Density (S) (mW/cm ²) | Limit of Power Density (S) (mW/cm ²) | Test Result |
|---------------|------------------|--------------------|------------------------|----------------------|----------|---|--|-------------|
| | | | | (dBm) | (mW) | | | |
| 27.5 | 2437 | 6.30 | 4.2658 | 24.9200 | 310.4560 | 0.139426 | 1 | Complies |

For Bluetooth function:

For Radio 4 :

Antenna Type : Metal Antenna

Conducted Power for Bluetooth 4.0: 3.39 dBm

| Distance (cm) | Test Freq. (MHz) | Antenna Gain (dBi) | Antenna Gain (numeric) | Average Output Power | | Power Density (S) (mW/cm ²) | Limit of Power Density (S) (mW/cm ²) | Test Result |
|---------------|------------------|--------------------|------------------------|----------------------|--------|---|--|-------------|
| | | | | (dBm) | (mW) | | | |
| 27.5 | 2402 | 7.30 | 5.3703 | 3.39 | 2.1827 | 0.0012 | 1 | Complies |

Conclusion:

Both of the Radio 1 (2.4GHz WLAN function) + Radio 2 (5GHz WLAN function) + Radio 3 (2.4GHz WLAN function) + 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 $0.418623 / 1 + 0.417647 / 1 + 0.139426 / 1 + 0.0012 / 1 = 0.9768$, which is less than "1". This confirmed that the device complies.

Conclusion:

Both of the Radio 1 (2.4GHz WLAN function) + Radio 2 (5GHz WLAN function) + Radio 3 (5GHz WLAN function) + 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 $0.418623 / 1 + 0.417647 / 1 + 0.051091 / 1 + 0.0012 / 1 = 0.8884$, which is less than "1". This confirmed that the device complies.