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Project No: CBI0503038

Maximum Permissible Exposure Report

| | |
|------------------------|--|
| Applicant's company | TP-LINK TECHNOLOGIES CO., LTD. |
| Applicant Address | Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Nanshan, Shenzhen, 518057 China |
| FCC ID | TE7AD7200 |
| Manufacturer's company | TP-LINK TECHNOLOGIES CO., LTD. |
| Manufacturer Address | Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Nanshan, Shenzhen, 518057 China |

| | |
|------------------|---|
| Product Name | AD7200 Multi-Band Wi-Fi Router |
| Brand Name | TP-LINK |
| Model Name | AD7200 |
| Ref. Standard(s) | 47 CFR FCC Part 2 Subpart J, section 2.1091 |
| Received Date | Oct. 19, 2015 |
| Final Test Date | May 27, 2016 |
| Submission Type | Original Equipment |

Sam Chen

SPORTON INTERNATIONAL INC.





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History of This Test Report

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|------------|---------|--------------------------|---------------|
| FA5O1802 | Rev. 01 | Initial issue of report. | Mar. 17, 2016 |
| FA5O1802 | Rev. 02 | Adding bridge mode. | Jun. 07, 2016 |
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1. GENERAL DESCRIPTION

1.1. EUT General Information

| RF General Information | | | |
|------------------------|--------------------------------|-------------------------------------|--|
| Evaluation Mode | Frequency Range | Operating Frequency | Modulation Type |
| 2.4GHz WLAN | 2400-2483.5 MHz | 2412-2462 MHz | 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 MHz 5725-5850 MHz | 5180-5240 MHz 5745-5825 MHz | 802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) |
| 60GHz | 57-64 GHz | 58.32 GHz 60.48 GHz 62.64 GHz | $\pi/2 - BPSK, \pi/2 - QPSK, \pi/2 - 16QAM$ |

Note: This device contains 60GHz transmitter module FCC ID: PPD-QCA9008-SBD1.

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 26 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

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 2.4GHz Band:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS1/Nss1 (VHT20): 27.96 dBm

| 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) | | | |
| 26 | 2437 | 7.85 | 6.0967 | 27.9613 | 625.3627 | 0.449048 | 1 | Complies |

$$\text{Note: } \textit{Directional Gain} = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$$

For 5GHz Band:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT80): 26.66 dBm

| 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) | | | |
| 26 | 5210 | 9.03 | 7.9943 | 26.6560 | 463.0230 | 0.435959 | 1 | Complies |

$$\text{Note: } \textit{Directional Gain} = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$$

For 60GHz (FCC ID: PPD-QCA9008-SBD1).

Antenna Type : Patch Antenna

E.I.R.P. Average Output Power: 29.80 dBm

| Distance (cm) | Test Freq. (GHz) | 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) | | | |
| 26 | 60.48 | 14.00 | 25.1189 | 15.8000 | 38.0189 | 0.112477 | 1 | Complies |

Conclusion:

Both of the 2.4GHz WLAN function, 5GHz WLAN function and 60GHz function can transmit simultaneously, the formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.449048 / 1 + 0.435959 / 1 + 0.112477 / 1 = 0.997484$, which is less than "1". This confirmed that the device complies.