



# SPORTON International Inc.


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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

## 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 <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

## 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 <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	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 <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	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 <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	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.