



SPORTON International Inc.

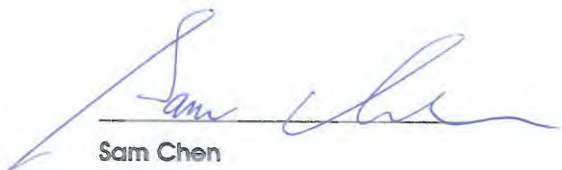
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Project No: CB10608143

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	TE7C3150V2
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	AC3150 Wireless MU-MIMO Gigabit Router
Brand Name	TP-Link
Model Name	Archer C3150
Ref. Standard(s)	47 CFR FCC Part 2 Subpart J, section 2.1091
Received Date	Nov. 02, 2016
Final Test Date	Apr. 13, 2017
Submission Type	Class II Change



Sam Chen

SPORTON INTERNATIONAL INC.



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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA5O1803-05	Rev. 01	Initial issue of report	Sep. 04, 2017

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, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5700 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

1.2. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FA5O1803-03

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Adding 5GHz band 2 and band 3 (5250~5350 MHz, 5470~5725 MHz) for this device. 2. Adding two type for 80+80 MHz mode (type 1: 5210+5290 MHz and type 2: 5530+5610 MHz) in 5GHz band 2 and band 3 (5250~5350 MHz, 5470~5725 MHz).	Maximum Permissible Exposure.

Note: Maximum Permissible Exposure of 5GHz band 1, 4 and 2.4GHz band are based on original test report.

1.3. Testing Location

Testing Location		
☐	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
☒	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 21 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 1:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 26.92dBm

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)			
21	5230	9.02	7.9810	26.92	492.3351	0.7094	1	Complies

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

For 5GHz Band 2:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 20.79dBm

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)			
21	5320	9.02	7.9810	20.79	119.9310	0.1728	1	Complies

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

For 5GHz Band 3:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 20.91dBm

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)			
21	5550	9.02	7.9810	20.91	123.3802	0.1778	1	Complies

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

For 5GHz Band 4:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 26.97dBm

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)			
21	5795	9.02	7.9810	26.97	497.6634	0.71708	1	Complies

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

For 2.4GHz Band:

Antenna Type : Dipole Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 29.86 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)			
21	2437	2.00	1.5849	29.8574	967.7042	0.27689	1	Complies

Conclusion:

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

$$CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.27689 / 1 + 0.71708 / 1 = 0.99397$, which is less than "1". This confirmed that the device complies.