RF Exposure Evaluation Report

APPLICANT	:	TP-LINK TECHNOLOGIES CO., LTD.
EQUIPMENT	:	AC1900 Wireless Dual Band Gigabit Access Point
BRAND NAME	:	TP-LINK
MODEL NAME	:	EAP330
FCC ID	:	TE7EAP330
STANDARD	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

SPORTON INTERNATIONAL (SHENZHEN) INC.

1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA640501	Rev. 01	Initial issue of report	Jul. 08, 2016

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.
Test Site Location	1F & 2F,Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	TP-LINK TECHNOLOGIES CO., LTD.
Address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

Manufacturer	
Company Name	TP-LINK TECHNOLOGIES CO., LTD.
Address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

2. Description of Equipment Under Test (EUT)

<table>
<tr><th colspan="2">Product Feature & Specification</th></tr>
<tr><td>EUT Type</td><td>AC1900 Wireless Dual Band Gigabit Access Point</td></tr>
<tr><td>Brand Name</td><td>TP-LINK</td></tr>
<tr><td>Model Name</td><td>EAP330</td></tr>
<tr><td>FCC ID</td><td>TE7EAP330</td></tr>
<tr><td>Wireless Technology and Frequency Range</td><td>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz
WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz
WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz</td></tr>
<tr><td>Mode</td><td>· WLAN 2.4GHz 802.11b/g/n HT20/HT40
· WLAN 2.4GHz 802.11ac VHT20/VHT40
· WLAN 5GHz 802.11a/n HT20/HT40
· WLAN 5GHz 802.11ac VHT20/VHT40/VHT80</td></tr>
<tr><td>Antenna Type</td><td>PIFA Antenna</td></tr>
<tr><td>Antenna Function for Transmitter</td><td>
<table>
<tr><th></th><th>Ant. 1</th><th>Ant. 2</th><th>Ant. 3</th></tr>
<tr><td>802.11 a/b/g/n/ac SISO</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>802.11 a/b/g/n/ac MIMO</td><td>V</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>EUT Stage</td><td>Identical Prototype</td></tr>
<tr><td colspan="2">Remark:
1. Since each SISO antenna power is less than per chain MIMO antenna power, we only evaluate MPE in MIMO antenna mode.
2. WLAN2.4GHz and WLAN5GHz share the different antenna, and can transmit simultaneously.
3. There are six antennas, three for WLAN 2.4GHz, the remaining three for WLAN 5GHz.</td></tr>
</table>

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

3. Maximum RF average output power among production units

<WLAN 2.4GHz Antenna 1+2+3>

Mode		Maximum Average Power (dBm)
2.4GHz	802.11b	27.0
	802.11g	29.0
	802.11n-HT20	28.0
	802.11n-HT40	23.0
	802.11ac-VHT20	28.0
	802.11ac-VHT40	21.0

<WLAN 5GHz Antenna 1+2+3>

Mode		Maximum Average Power (dBm)
5.2GHz	802.11a	24.5
	802.11n-HT20	24.5
	802.11n-HT40	20.5
	802.11ac-VHT20	24.0
	802.11ac-VHT40	20.5
	802.11ac-VHT80	17.5
5.8GHz	802.11a	29.0
	802.11n-HT20	29.0
	802.11n-HT40	29.0
	802.11ac-VHT20	29.0
	802.11ac-VHT40	29.0
	802.11ac-VHT80	29.0

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	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				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 46cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 46cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
WLAN2.4GHz 802.11b	2412.0	10.05	27.0	37.05	5.07	5069.91	0.19	1.00	0.19
WLAN2.4GHz 802.11g	2412.0	10.05	29.0	39.05	8.04	8035.26	0.30	1.00	**0.30**
WLAN2.4GHz 802.11n-HT20	2412.0	10.05	28.0	38.05	6.38	6382.63	0.24	1.00	0.24
WLAN2.4GHz 802.11n-HT40	2422.0	10.05	23.0	33.05	2.02	2018.37	0.08	1.00	0.08
WLAN2.4GHz 802.11ac-VHT20	2412.0	10.05	28.0	38.05	6.38	6382.63	0.24	1.00	0.24
WLAN2.4GHz 802.11ac-VHT40	2422.0	10.05	21.0	31.05	1.27	1273.50	0.05	1.00	0.05
WLAN5.2GHz 802.11a	5180.0	10.99	24.5	35.49	3.54	3539.97	0.13	1.00	**0.13**
WLAN5.2GHz 802.11n-HT20	5180.0	10.99	24.5	35.49	3.54	3539.97	0.13	1.00	0.13
WLAN5.2GHz 802.11n-HT40	5190.0	10.99	20.5	31.49	1.41	1409.29	0.05	1.00	0.05
WLAN5.2GHz 802.11ac-VHT20	5180.0	10.99	24.0	34.99	3.16	3155.00	0.12	1.00	0.12
WLAN5.2GHz 802.11ac-VHT40	5190.0	10.99	20.5	31.49	1.41	1409.29	0.05	1.00	0.05
WLAN5.2GHz 802.11ac-VHT80	5210.0	10.99	17.5	28.49	0.71	706.32	0.03	1.00	0.03
WLAN5.8GHz 802.11a	5745.0	11.38	29.0	40.38	10.91	10914.40	0.41	1.00	**0.41**
WLAN5.8GHz 802.11n-HT20	5745.0	11.38	29.0	40.38	10.91	10914.40	0.41	1.00	0.41
WLAN5.8GHz 802.11n-HT40	5755.0	11.38	29.0	40.38	10.91	10914.40	0.41	1.00	0.41
WLAN5.8GHz 802.11ac-VHT20	5745.0	11.38	29.0	40.38	10.91	10914.40	0.41	1.00	0.41
WLAN5.8GHz 802.11ac-VHT40	5755.0	11.38	29.0	40.38	10.91	10914.40	0.41	1.00	0.41
WLAN5.8GHz 802.11ac-VHT80	5775.0	11.38	29.0	40.38	10.91	10914.40	0.41	1.00	0.41

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band .

5.2. Collocated Power Density Calculation

Mode	Frequency	Power Density / Limit	∑(Power Density / Limit) of WLAN 2.4GHz+WLAN 5GHz
WLAN2.4GHz	2412MHz ~ 2462MHz	0.30	0.71
WLAN5GHz	5180 MHz ~ 5240 MHz	0.13	
	5745 MHz ~ 5825 MHz	0.41	

Note:

∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN 2.4GHz+WLAN 5GHz.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.