RF Exposure Evaluation Declaration

Product Name	:	AC1750 Wireless Dual Band Gigabit Router
Model No.	:	Archer C8
FCC ID	:	TE7C8V2

Applicant	:	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

Date of Receipt	:	Jul. 10, 2015
Issued Date	:	Dec. 01, 2015
Report No.	:	1570321R-RF-US-P20V01
Report Version	:	V1.3

Test Report Certification

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Model No.	:	Archer C8
FCC ID	:	TE7C8V2
EUT Voltage	:	DC 12V/3.3A
Brand Name	:	TP-LINK
Applicable Standard	:	KDB 447498D01V05V02 FCC Part1.1310(b) RSS-102: Issue 5, March, 2015
Test Result	:	Complied
Performed Location	:	Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098 FCC Registration Number: 800392; IC Lab Code: 4075B

Documented By	:	Elaine Yang
Reviewed By	:	Jack Zhang
Approved By	:	Harry Zhao

Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	**:**	**BSMI, NCC, TAF**
USA	**:**	**FCC**
Japan	**:**	**VCCI**
China	**:**	**CNAS**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site :http://www.quietek.com/tw/ctg/cts/accreditations.htm
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1570321R-RF-US-P20V01	V1.0	Initial Issued Report	Nov. 26, 2015
1570321R-RF-US-P20V01	V1.1	Add the evaluation for simultaneous transmission	Nov. 28, 2015
1570321R-RF-US-P20V01	V1.2	Add the evaluation for safety distance	Nov. 30, 2015
1570321R-RF-US-P20V01	V1.3	Modify safety distance in calculation	Dec. 01, 2015

1. RF Exposure Evaluation

1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4*pi*r2)

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 mW/cm2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.
The temperature and related humidity: 18℃and 78％ RH.

1.3. Test Result of RF Exposure Evaluation

Product	:	AC1750 Wireless Dual Band Gigabit Router
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

- Antenna Gain:

Antenna List

Antenna	Type	Product Number	Peak Gain	Directional gain for Beamforming	Directional gain for CDD
Dipole Antenna	Dipole	3101500451	2.1dBi for 2.4G	N/A	6.87dBi
Dipole Antenna	Dipole	3101500451	1.7dBi for 5G	6.47dBi	6.47dBi

Note: 1: The EUT has three antennas, and each port has same gain, they transmit signals are correlated with each other.

(1) 5G Directional gain for Beamforming Calculation is:
Directional gain = G_{ANT} + 10 log(N_{ANT}/N_{SS}) dBi≈6.47dBi.

(2) 2.4G Directional gain for CDD Calculation is:

a. For power measurements
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;
Directional gain = G_{ANT} + Array Gain=2.1dBi

b. For power spectral density (PSD) measurements
Directional gain = G_{ANT} + Array Gain≈6.87dBi

5G Directional gain for CDD Calculation is:

c. For power measurements
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;
Directional gain = G_{ANT} + Array Gain=1.7dBi

d. For power spectral density (PSD) measurements
Directional gain = G_{ANT} + Array Gain≈6.47dBi

- Output Power into Antenna & RF Exposure Evaluation Distance:

Standlone modes

CDD modes:

2400~2483.5MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Direction Gain (dBi)	Power Density at R = 25 cm (mW/cm2)
802.11b	2412 - 2462	29.37	6.87	0.5357
802.11g	2412 - 2462	27.06	6.87	0.3147
802.11n(20MHz)	2412 - 2462	26.95	6.87	0.3068
802.11n(40MHz)	2422 - 2452	18.73	6.87	0.0462

5150~5250MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Direction Gain (dBi)	Power Density at R = 25 cm (mW/cm2)
802.11a	5180 - 5240	25.23	6.47	0.1883
802.11n(20MHz)	5180 - 5240	26.89	6.47	0.2760
802.11n(40MHz)	5190 - 5230	27.20	6.47	0.2964
802.11ac(20MHz)	5180 - 5240	26.94	6.47	0.2792
802.11ac(40MHz)	5190 - 5230	27.04	6.47	0.2857
802.11ac(80MHz)	5210	15.88	6.47	0.0219

5725~5850MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Direction Gain (dBi)	Power Density at R = 25 cm (mW/cm2)
802.11a	5745 - 5825	27.08	6.47	0.2883
802.11n(20MHz)	5745 - 5825	27.14	6.47	0.2924
802.11n(40MHz)	5755 - 5795	26.68	6.47	0.2630
802.11ac(20MHz)	5745 - 5825	27.65	6.47	0.3288
802.11ac(40MHz)	5755 - 5795	26.25	6.47	0.2382
802.11ac(80MHz)	5775	27.42	6.47	0.3118

Beamforming modes:

5150~5250MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Direction Gain (dBi)	Power Density at R = 25 cm (mW/cm2)
802.11ac(20MHz)	5180 - 5240	27.62	6.47	0.3265
802.11ac(40MHz)	5190 - 5230	29.03	6.47	0.4518
802.11ac(80MHz)	5210	16.81	6.47	0.0271

5725~5850MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Direction Gain (dBi)	Power Density at R = 25 cm (mW/cm2)
802.11ac(20MHz)	5745 - 5825	28.94	6.47	0.4425
802.11ac(40MHz)	5755 - 5795	29.04	6.47	0.4528
802.11ac(80MHz)	5775	29.10	6.47	0.4591

Simultaneous transmission:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Direction Gain (dBi)	Power Density at R = 25 cm (mW/cm2)
802.11b with CDD	2412 - 2462	29.37	6.87	0.5357
802.11ac(80MHz) with beamforming	5775	29.10	6.47	0.4591
Simultaneous transmission power density				0.9948

So according to transmission formula: Pd = (Pout*G)/(4*pi*r2) and the power density limit 1 mW/cm^2

Safety Distance Calculation Formula:

The power flux:

$$S = \frac{P*G_{(\theta,\phi)}}{4*\pi*r^2}$$

So safety distance as following:

$$r = \sqrt{\frac{P*G}{4*\pi*S}}$$

P = input power of the antenna

G = antenna gain relative to an isotropic antenna

θ, Φ = elevation and azimuth angles.

r = distance from the antenna to the point of investigation

Test Mode	Frequency Range (MHz)	Maximum EIRP (dBm)	Limit of Power Density S(mW/cm^2)	Safety Distance r(cm)
802.11b with CDD	2412 - 2462	36.24	1	25
802.11ac(80MHz) with beamforming	5775	35.57	1	

Note: The safety distance is 25cm for the router without any other radio equipment.

The End