



## RF Exposure Evaluation Report

APPLICANT : TP-LINK TECHNOLOGIES CO., LTD.  
EQUIPMENT : AC1750 Wireless Dual Band DOCSIS 3.0 Cable  
Modem Router  
BRAND NAME : TP-LINK  
MODEL NAME : Archer CR700  
FCC ID : TE7CR700V2  
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.**

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**Revision History**

| REPORT NO. | VERSION | DESCRIPTION             | ISSUED DATE   |
|------------|---------|-------------------------|---------------|
| FA631009   | Rev. 01 | Initial issue of report | Jul. 01, 2016 |
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**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<br>TEL: +86-755-8637-9589<br>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)

| Product Feature & Specification                                                                                        |                                                                                                                         |        |        |        |
|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|
| EUT Type                                                                                                               | AC1750 Wireless Dual Band DOCSIS 3.0 Cable Modem Router                                                                 |        |        |        |
| Brand Name                                                                                                             | TP-LINK                                                                                                                 |        |        |        |
| Model Name                                                                                                             | Archer CR700                                                                                                            |        |        |        |
| FCC ID                                                                                                                 | TE7CR700V2                                                                                                              |        |        |        |
| Wireless Technology and Frequency Range                                                                                | WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz |        |        |        |
| Mode                                                                                                                   | · WLAN 2.4GHz 802.11b/g/n HT20/HT40<br>· WLAN 5GHz 802.11a/n HT20/HT40<br>· WLAN 5GHz 802.11ac VHT20/VHT40/VHT80        |        |        |        |
| Antenna Type                                                                                                           | Omni Directional Antenna                                                                                                |        |        |        |
| Antenna Function for Transmitter                                                                                       |                                                                                                                         | Ant. 1 | Ant. 2 | Ant. 3 |
|                                                                                                                        | 802.11 a/b/g/n/ac SISO                                                                                                  | V      | V      | V      |
|                                                                                                                        | 802.11 a/b/g/n/ac MIMO                                                                                                  | V      | V      | V      |
| EUT Stage                                                                                                              | Identical Prototype                                                                                                     |        |        |        |
| 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.                                   |                                                                                                                         |        |        |        |

**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      | 29.56                       |
|        | 802.11g      | 27.42                       |
|        | 802.11n-HT20 | 27.98                       |
|        | 802.11n-HT40 | 25.52                       |

#### **<WLAN 5GHz Antenna 1+2+3>**

| Mode   |                | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
| 5.2GHz | 802.11a        | 26.78                       |
|        | 802.11n-HT20   | 26.92                       |
|        | 802.11n-HT40   | 27.03                       |
|        | 802.11ac-VHT20 | 26.83                       |
|        | 802.11ac-VHT40 | 26.79                       |
|        | 802.11ac-VHT80 | 17.01                       |
| 5.8GHz | 802.11a        | 28.22                       |
|        | 802.11n-HT20   | 28.14                       |
|        | 802.11n-HT40   | 28.01                       |
|        | 802.11ac-VHT20 | 28.06                       |
|        | 802.11ac-VHT40 | 28.04                       |
|        | 802.11ac-VHT80 | 27.90                       |

#### **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 <sup>2</sup> ) | Averaging time (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposures</b>        |                               |                               |                                     |                          |
| 0.3-3.0                                                        | 614                           | 1.63                          | *(100)                              | 6                        |
| 3.0-30                                                         | 1842/f                        | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                        |
| 30-300                                                         | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300-1500                                                       |                               |                               | f/300                               | 6                        |
| 1500-100,000                                                   |                               |                               | 5                                   | 6                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 0.3-1.34                                                       | 614                           | 1.63                          | *(100)                              | 30                       |
| 1.34-30                                                        | 824/f                         | 2.19/f                        | *(180/f <sup>2</sup> )              | 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 28cm 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 28cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
|---------------------------|-----------------|--------------------|---------------------|--------------------|------------------|-------------------|---------------------------------------------|-----------------------------|-----------------------|
| WLAN2.4GHz 802.11b        | 2412.0          | 7.10               | 29.56               | 36.66              | 4.63             | 4634.47           | 0.47                                        | 1.00                        | 0.47                  |
| WLAN2.4GHz 802.11g        | 2412.0          | 7.10               | 27.42               | 34.52              | 2.83             | 2831.39           | 0.29                                        | 1.00                        | 0.29                  |
| WLAN2.4GHz 802.11n-HT20   | 2412.0          | 7.10               | 27.98               | 35.08              | 3.22             | 3221.07           | 0.33                                        | 1.00                        | 0.33                  |
| WLAN2.4GHz 802.11n-HT40   | 2422.0          | 7.10               | 25.52               | 32.62              | 1.83             | 1828.10           | 0.19                                        | 1.00                        | 0.19                  |
| WLAN5.2GHz 802.11a        | 5180.0          | 7.99               | 26.78               | 34.77              | 3.00             | 2999.16           | 0.30                                        | 1.00                        | 0.30                  |
| WLAN5.2GHz 802.11n-HT20   | 5180.0          | 7.99               | 26.92               | 34.91              | 3.10             | 3097.42           | 0.31                                        | 1.00                        | 0.31                  |
| WLAN5.2GHz 802.11n-HT40   | 5190.0          | 7.99               | 27.03               | 35.02              | 3.18             | 3176.87           | 0.32                                        | 1.00                        | 0.32                  |
| WLAN5.2GHz 802.11ac-VHT20 | 5180.0          | 7.99               | 26.83               | 34.82              | 3.03             | 3033.89           | 0.31                                        | 1.00                        | 0.31                  |
| WLAN5.2GHz 802.11ac-VHT40 | 5190.0          | 7.99               | 26.79               | 34.78              | 3.01             | 3006.08           | 0.31                                        | 1.00                        | 0.31                  |
| WLAN5.2GHz 802.11ac-VHT80 | 5210.0          | 7.99               | 17.01               | 25.00              | 0.32             | 316.23            | 0.03                                        | 1.00                        | 0.03                  |
| WLAN5.8GHz 802.11a        | 5745.0          | 8.89               | 28.22               | 37.11              | 5.14             | 5140.44           | 0.52                                        | 1.00                        | 0.52                  |
| WLAN5.8GHz 802.11n-HT20   | 5745.0          | 8.89               | 28.14               | 37.03              | 5.05             | 5046.61           | 0.51                                        | 1.00                        | 0.51                  |
| WLAN5.8GHz 802.11n-HT40   | 5755.0          | 8.89               | 28.01               | 36.90              | 4.90             | 4897.79           | 0.50                                        | 1.00                        | 0.50                  |
| WLAN5.8GHz 802.11ac-VHT20 | 5745.0          | 8.89               | 28.06               | 36.95              | 4.95             | 4954.50           | 0.50                                        | 1.00                        | 0.50                  |
| WLAN5.8GHz 802.11ac-VHT40 | 5755.0          | 8.89               | 28.04               | 36.93              | 4.93             | 4931.74           | 0.50                                        | 1.00                        | 0.50                  |
| WLAN5.8GHz 802.11ac-VHT80 | 5775.0          | 8.89               | 27.90               | 36.79              | 4.78             | 4775.29           | 0.48                                        | 1.00                        | 0.48                  |

**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 | $\Sigma$ (Power Density / Limit)<br>of<br>WLAN 2.4GHz+WLAN 5GHz |
|------------|---------------------|-----------------------|-----------------------------------------------------------------|
| WLAN2.4GHz | 2412MHz ~ 2462MHz   | 0.47                  | 0.99                                                            |
| WLAN5GHz   | 5180 MHz ~ 5240 MHz | 0.32                  |                                                                 |
|            | 5745 MHz ~ 5825 MHz | 0.52                  |                                                                 |

**Note:**

$\Sigma$  (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.