



# A Test Lab Techno Corp.

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## MPE Report



|                       |                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Test Report No.       | : 1704RS11-01                                                                                                                                 |
| Applicant             | : TP-LINK TECHNOLOGIES CO., LTD.                                                                                                              |
| Product Type          | : AC750 Wireless Dual Band Gigabit Router                                                                                                     |
| Trade Name            | : TP-Link                                                                                                                                     |
| Model Number          | : Archer C2 V5                                                                                                                                |
| Dates of Received     | : Mar. 02, 2017                                                                                                                               |
| Dates of Test         | : Mar. 17, 2017                                                                                                                               |
| Dates of Issued       | : May 24, 2017                                                                                                                                |
| Test Specification    | : ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013<br>H46-2/99-237E<br>CANADA RSS-102 Issue 5 March 2015<br>47 CFR § 2.1091 / 47 CFR § 1.1310 |
| Location of Test Lab. | : Chang-an Lab.                                                                                                                               |

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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## 1. Description of Equipment under Test (EUT)

|                        |                                                                                                                                  |                       |      |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|
| Applicant              | TP-LINK TECHNOLOGIES CO., LTD.<br>Bldg. 24(F1,3,4,5) & 28(F1-4), Central Science and Technology Park, Nanshan, Shenzhen, China   |                       |      |
| Manufacturer           | TP-LINK TECHNOLOGIES CO., LTD.<br>Bldg. 24(F1,3,4,5) & 28(F1-4), Central Science and Technology Park, Nanshan, Shenzhen, China   |                       |      |
| Product Type           | AC750 Wireless Dual Band Gigabit Router                                                                                          |                       |      |
| Trade Name             | TP-Link                                                                                                                          |                       |      |
| Model Number           | Archer C2 V5                                                                                                                     |                       |      |
| IC                     | 8853A-C2V5                                                                                                                       |                       |      |
| Hardware Version       | Archer C2 V5                                                                                                                     |                       |      |
| Software Version       | AC750 Wireless Dual Band Gigabit Router                                                                                          |                       |      |
| Radio Hardware Version | N/A                                                                                                                              |                       |      |
| Radio Software Version | 1.0                                                                                                                              |                       |      |
| Frequency Range        | Operate Band                                                                                                                     | Frequency Range (MHz) |      |
|                        | IEEE 802.11b / 802.11g / 802.11n 2.4GHz 20MHz                                                                                    | 2412 - 2462           |      |
|                        | IEEE 802.11n 2.4GHz 40 MHz                                                                                                       | 2422 - 2452           |      |
|                        | IEEE 802.11a U-NII Band I                                                                                                        | 5180 - 5240           |      |
|                        | IEEE 802.11a U-NII Band III                                                                                                      | 5745 - 5825           |      |
|                        | IEEE 802.11ac / 802.11n 5GHz 20MHz U-NII Band I                                                                                  | 5180 - 5240           |      |
|                        | IEEE 802.11ac / 802.11n 5GHz 20MHz U-NII Band III                                                                                | 5745 - 5825           |      |
|                        | IEEE 802.11ac / 802.11n 5GHz 40MHz U-NII Band I                                                                                  | 5190 - 5230           |      |
|                        | IEEE 802.11ac / 802.11n 5GHz 40MHz U-NII Band III                                                                                | 5755 - 5795           |      |
|                        | IEEE 802.11ac 80MHz U-NII Band I                                                                                                 | 5210                  |      |
|                        | IEEE 802.11ac 80MHz U-NII Band III                                                                                               | 5775                  |      |
| Antenna information    | Type                                                                                                                             | Max. Gain (dBi)       |      |
|                        |                                                                                                                                  | 2.4GHz                | 5GHz |
|                        | Omni-directional Antenna                                                                                                         | 3.0                   | 4.98 |
| Antenna Delivery       | IEEE 802.11b/ IEEE 802.11g, IEEE 802.11n 2.4GHz 20MHz / 40MHz: 2TX+2RX<br>IEEE 802.11a/IEEE 802.11 ac 20MHz/40MHz/80MHz: 1TX+1RX |                       |      |
| Temperature Range      | 0 ~ +40°C                                                                                                                        |                       |      |
| RF Evaluation          | 2.9145 (w)/m <sup>2</sup>                                                                                                        |                       |      |

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in CANADA RSS-102 Issue 5. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.



## 2. Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product.

Therefore, this product will be evaluated as MPE limits.

Generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: "IMPORTANT: To meet the RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna" . Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user.

Exposure evaluation

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

Where

S: power density

P: power input to the antenna

G: power gain of the antenna in the direction of interest relative to an isotropic radiator.

R: distance to the center of radiation of the antenna.

### 3. Applicable Standard

#### (A) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz)                                                                                           | Electric Field (V/m rms) | Magnetic Field (A/m rms)          | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
|-----------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------|-----------------------------------|----------------------------|
| 0.003-10 <sup>21</sup>                                                                                          | 83                       | 90                                | -                                 | Instantaneous*             |
| 0.1-10                                                                                                          | -                        | 0.73/ $f$                         | -                                 | 6**                        |
| 1.1-10                                                                                                          | 87/ $f^{0.5}$            | -                                 | -                                 | 6**                        |
| 10-20                                                                                                           | 27.46                    | 0.0728                            | 2                                 | 6                          |
| 20-48                                                                                                           | 58.07/ $f^{0.25}$        | 0.1540/ $f^{0.25}$                | 8.944/ $f^{0.5}$                  | 6                          |
| 48-300                                                                                                          | 22.06                    | 0.05852                           | 1.291                             | 6                          |
| 300-6000                                                                                                        | 3.142 $f^{0.3417}$       | 0.008335 $f^{0.3417}$             | 0.02619 $f^{0.6834}$              | 6                          |
| 6000-15000                                                                                                      | 61.4                     | 0.163                             | 10                                | 6                          |
| 15000-150000                                                                                                    | 61.4                     | 0.163                             | 10                                | 616000/ $f^{1.2}$          |
| 150000-300000                                                                                                   | 0.158 $f^{0.5}$          | 4.21 x 10 <sup>-4</sup> $f^{0.5}$ | 6.67 x 10 <sup>-5</sup> $f$       | 616000/ $f^{1.2}$          |
| Note: $f$ is frequency in MHz.<br>*Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR). |                          |                                   |                                   |                            |

#### (B) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz)                                                                                           | Electric Field (V/m rms) | Magnetic Field (A/m rms)          | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
|-----------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------|-----------------------------------|----------------------------|
| 0.003-10 <sup>23</sup>                                                                                          | 170                      | 180                               | -                                 | Instantaneous*             |
| 0.1-10                                                                                                          | -                        | 1.6/ $f$                          | -                                 | 6**                        |
| 1.29-10                                                                                                         | 193/ $f^{0.5}$           | -                                 | -                                 | 6**                        |
| 10-20                                                                                                           | 61.4                     | 0.163                             | 10                                | 6                          |
| 20-48                                                                                                           | 129.8/ $f^{0.25}$        | 0.3444/ $f^{0.25}$                | 44.72/ $f^{0.5}$                  | 6                          |
| 48-100                                                                                                          | 49.33                    | 0.1309                            | 6.455                             | 6                          |
| 100-6000                                                                                                        | 15.60 $f^{0.25}$         | 0.04138 $f^{0.25}$                | 0.6455 $f^{0.5}$                  | 6                          |
| 6000-15000                                                                                                      | 137                      | 0.364                             | 50                                | 6                          |
| 15000-150000                                                                                                    | 137                      | 0.364                             | 50                                | 616000/ $f^{1.2}$          |
| 150000-300000                                                                                                   | 0.354 $f^{0.5}$          | 9.40 x 10 <sup>-4</sup> $f^{0.5}$ | 3.33 x 10 <sup>-4</sup> $f$       | 616000/ $f^{1.2}$          |
| Note: $f$ is frequency in MHz.<br>*Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR). |                          |                                   |                                   |                            |



#### 4. Conducted Power

The conducted power turn-up tolerance, please reference manufacturer specification.

| Band                      | Data Rate (Mbps) | Frequency (MHz) | Average Conducted power (dBm) |       |         |
|---------------------------|------------------|-----------------|-------------------------------|-------|---------|
|                           |                  |                 | ANT-0                         | ANT-1 | ANT-0+1 |
| IEEE 802.11b              | 1                | 2412            | 16.55                         | 16.13 | 19.36   |
|                           |                  | 2437            | 22.21                         | 21.99 | 25.11   |
|                           |                  | 2462            | 17.88                         | 17.48 | 20.69   |
|                           | 2                | 2437            | 22.19                         | 21.90 | 25.06   |
|                           | 5.5              | 2437            | 22.17                         | 21.84 | 25.02   |
|                           | 11               | 2437            | 22.14                         | 21.88 | 25.02   |
| IEEE 802.11g              | 6                | 2412            | 16.42                         | 16.11 | 19.28   |
|                           |                  | 2437            | 22.46                         | 22.44 | 25.46   |
|                           |                  | 2462            | 17.13                         | 16.86 | 20.01   |
|                           | 9                | 2437            | 22.44                         | 22.42 | 25.44   |
|                           | 12               | 2437            | 22.41                         | 22.40 | 25.42   |
|                           | 18               | 2437            | 22.39                         | 22.39 | 25.40   |
|                           | 24               | 2437            | 22.43                         | 22.37 | 25.41   |
|                           | 36               | 2437            | 22.40                         | 22.41 | 25.42   |
|                           | 48               | 2437            | 22.41                         | 22.43 | 25.43   |
|                           | 54               | 2437            | 22.43                         | 22.39 | 25.42   |
| IEEE 802.11n 2.4GHz 20MHz | 13               | 2412            | 13.14                         | 12.96 | 16.06   |
|                           |                  | 2437            | 20.97                         | 20.89 | 23.94   |
|                           |                  | 2462            | 14.61                         | 14.12 | 17.38   |
|                           | 28.8             | 2437            | 20.93                         | 20.75 | 23.85   |
|                           | 43.4             | 2437            | 20.95                         | 20.87 | 23.92   |
|                           | 57.8             | 2437            | 20.90                         | 20.85 | 23.89   |
|                           | 86.6             | 2437            | 20.88                         | 20.80 | 23.85   |
|                           | 115.6            | 2437            | 20.66                         | 20.83 | 23.76   |
|                           | 130              | 2437            | 20.91                         | 20.88 | 23.91   |
|                           | 144.4            | 2437            | 20.95                         | 20.85 | 23.91   |
| IEEE 802.11n 2.4GHz 40MHz | 27               | 2422            | 11.55                         | 11.27 | 14.42   |
|                           |                  | 2437            | 15.08                         | 14.80 | 17.95   |
|                           |                  | 2452            | 12.44                         | 12.12 | 15.29   |
|                           | 60               | 2437            | 15.05                         | 14.75 | 17.91   |
|                           | 90               | 2437            | 15.01                         | 14.71 | 17.87   |
|                           | 120              | 2437            | 15.03                         | 14.65 | 17.85   |
|                           | 180              | 2437            | 15.00                         | 14.69 | 17.86   |
|                           | 240              | 2437            | 14.98                         | 14.67 | 17.84   |
|                           | 270              | 2437            | 15.02                         | 14.70 | 17.87   |
|                           | 300              | 2437            | 15.01                         | 14.65 | 17.84   |

| Band                | Data Rate (Mbps) | Frequency (MHz) | Average Conducted power (dBm) |
|---------------------|------------------|-----------------|-------------------------------|
|                     |                  |                 | ANT-0                         |
| IEEE 802.11a        | 6                | 5180            | 13.80                         |
|                     |                  | 5200            | 13.89                         |
|                     |                  | 5220            | 13.95                         |
|                     |                  | 5240            | 13.97                         |
|                     |                  | 5745            | 22.86                         |
|                     |                  | 5765            | 22.92                         |
|                     |                  | 5785            | 23.08                         |
|                     |                  | 5805            | 23.44                         |
|                     |                  | 5825            | 23.30                         |
|                     | 54               | 5180            | 13.71                         |
|                     |                  | 5200            | 13.74                         |
|                     |                  | 5220            | 13.87                         |
|                     |                  | 5240            | 13.90                         |
|                     |                  | 5745            | 22.78                         |
|                     |                  | 5765            | 22.84                         |
|                     |                  | 5785            | 23.00                         |
|                     |                  | 5805            | 23.36                         |
|                     |                  | 5825            | 23.24                         |
| IEEE 802.11ac 20MHz | 6.5              | 5180            | 13.57                         |
|                     |                  | 5200            | 13.64                         |
|                     |                  | 5220            | 13.84                         |
|                     |                  | 5240            | 14.09                         |
|                     |                  | 5745            | 23.00                         |
|                     |                  | 5765            | 22.95                         |
|                     |                  | 5785            | 23.02                         |
|                     |                  | 5805            | 23.07                         |
|                     |                  | 5825            | 23.22                         |
|                     | 86.7             | 5180            | 13.48                         |
|                     |                  | 5200            | 13.54                         |
|                     |                  | 5220            | 13.78                         |
|                     |                  | 5240            | 13.95                         |
|                     |                  | 5745            | 22.91                         |
|                     |                  | 5765            | 22.89                         |
|                     |                  | 5785            | 22.96                         |
|                     |                  | 5805            | 22.99                         |
|                     |                  | 5825            | 23.14                         |

| Band                | Data Rate (Mbps) | Frequency (MHz) | Average Conducted power (dBm) |
|---------------------|------------------|-----------------|-------------------------------|
|                     |                  |                 | ANT-0                         |
| IEEE 802.11ac 40MHz | 13.5             | 5190            | 15.29                         |
|                     |                  | 5230            | 15.90                         |
|                     |                  | 5755            | 21.39                         |
|                     |                  | 5795            | 22.45                         |
|                     | 200              | 5190            | 15.20                         |
|                     |                  | 5230            | 15.84                         |
|                     |                  | 5755            | 21.35                         |
|                     |                  | 5795            | 22.37                         |
| IEEE 802.11ac 80MHz | 29.3             | 5210            | 12.05                         |
|                     |                  | 5775            | 18.29                         |
|                     | 433.3            | 5210            | 11.99                         |
|                     |                  | 5775            | 18.20                         |

## 5. Test Results

| Band                          | Data Rate (Mbps) | Frequency (MHz) | Limit (w)/m^2 | Distance (m) [R] | Avg. burst tune-up Power (upper limit) [P] (dBm) | ANT Gain (dBi) | Numeric Gain [G] | Duty Cycle | [P] x [G] with Duty cycle [TP] (W) | Power Density [S] (w)/m^2 |
|-------------------------------|------------------|-----------------|---------------|------------------|--------------------------------------------------|----------------|------------------|------------|------------------------------------|---------------------------|
| IEEE 802.11b CDD              | 1                | 2412            | 5.366         | 0.2              | 19.60                                            | 3.00           | 2                | 1          | 0.182                              | 0.362                     |
|                               |                  | 2437            | 5.404         | 0.2              | 25.30                                            | 3.00           | 2                | 1          | 0.678                              | 1.349                     |
|                               |                  | 2462            | 5.442         | 0.2              | 20.90                                            | 3.00           | 2                | 1          | 0.246                              | 0.489                     |
| IEEE 802.11g CDD              | 6                | 2412            | 5.366         | 0.2              | 19.50                                            | 3.00           | 2                | 1          | 0.178                              | 0.354                     |
|                               |                  | 2437            | 5.404         | 0.2              | 25.70                                            | 3.00           | 2                | 1          | 0.743                              | 1.478                     |
|                               |                  | 2462            | 5.442         | 0.2              | 20.20                                            | 3.00           | 2                | 1          | 0.209                              | 0.416                     |
| IEEE 802.11n 2.4GHz 20MHz CDD | 13               | 2412            | 5.366         | 0.2              | 16.30                                            | 3.00           | 2                | 1          | 0.085                              | 0.169                     |
|                               |                  | 2437            | 5.404         | 0.2              | 24.10                                            | 3.00           | 2                | 1          | 0.514                              | 1.023                     |
|                               |                  | 2462            | 5.442         | 0.2              | 17.60                                            | 3.00           | 2                | 1          | 0.115                              | 0.229                     |
| IEEE 802.11n 2.4GHz 40MHz CDD | 27               | 2422            | 5.381         | 0.2              | 14.60                                            | 3.00           | 2                | 1          | 0.058                              | 0.115                     |
|                               |                  | 2437            | 5.404         | 0.2              | 18.20                                            | 3.00           | 2                | 1          | 0.132                              | 0.263                     |
|                               |                  | 2452            | 5.427         | 0.2              | 15.50                                            | 3.00           | 2                | 1          | 0.071                              | 0.141                     |

| Band                | Data Rate (Mbps) | Frequency (MHz) | Limit (w)/m <sup>2</sup> | Distance (m) [R] | Avg. burst tune-up Power (upper limit) [P] (dBm) | ANT Gain (dBi) | Numeric Gain [G] | Duty Cycle | [P] x [G] with Duty cycle [TP] (W) | Power Density [S] (w)/m <sup>2</sup> |
|---------------------|------------------|-----------------|--------------------------|------------------|--------------------------------------------------|----------------|------------------|------------|------------------------------------|--------------------------------------|
| IEEE 802.11a        | 6                | 5180            | 9.047                    | 0.2              | 14.00                                            | 4.98           | 3.15             | 1          | 0.079                              | 0.157                                |
|                     |                  | 5200            | 9.071                    | 0.2              | 14.10                                            | 4.98           | 3.15             | 1          | 0.081                              | 0.161                                |
|                     |                  | 5220            | 9.095                    | 0.2              | 14.20                                            | 4.98           | 3.15             | 1          | 0.083                              | 0.165                                |
|                     |                  | 5240            | 9.119                    | 0.2              | 14.20                                            | 4.98           | 3.15             | 1          | 0.083                              | 0.165                                |
|                     |                  | 5745            | 9.710                    | 0.2              | 23.10                                            | 4.98           | 3.15             | 1          | 0.643                              | 1.279                                |
|                     |                  | 5765            | 9.733                    | 0.2              | 23.10                                            | 4.98           | 3.15             | 1          | 0.643                              | 1.279                                |
|                     |                  | 5785            | 9.756                    | 0.2              | 23.30                                            | 4.98           | 3.15             | 1          | 0.673                              | 1.339                                |
|                     |                  | 5805            | 9.780                    | 0.2              | 23.60                                            | 4.98           | 3.15             | 1          | 0.722                              | 1.436                                |
|                     |                  | 5825            | 9.803                    | 0.2              | 23.50                                            | 4.98           | 3.15             | 1          | 0.705                              | 1.403                                |
| IEEE 802.11ac 20MHz | 6.5              | 5180            | 9.047                    | 0.2              | 13.80                                            | 4.98           | 3.15             | 1          | 0.076                              | 0.151                                |
|                     |                  | 5200            | 9.071                    | 0.2              | 13.80                                            | 4.98           | 3.15             | 1          | 0.076                              | 0.151                                |
|                     |                  | 5220            | 9.095                    | 0.2              | 14.00                                            | 4.98           | 3.15             | 1          | 0.079                              | 0.157                                |
|                     |                  | 5240            | 9.119                    | 0.2              | 14.30                                            | 4.98           | 3.15             | 1          | 0.085                              | 0.169                                |
|                     |                  | 5745            | 9.710                    | 0.2              | 23.20                                            | 4.98           | 3.15             | 1          | 0.658                              | 1.309                                |
|                     |                  | 5765            | 9.733                    | 0.2              | 23.20                                            | 4.98           | 3.15             | 1          | 0.658                              | 1.309                                |
|                     |                  | 5785            | 9.756                    | 0.2              | 23.20                                            | 4.98           | 3.15             | 1          | 0.658                              | 1.309                                |
|                     |                  | 5805            | 9.780                    | 0.2              | 23.30                                            | 4.98           | 3.15             | 1          | 0.673                              | 1.339                                |
|                     |                  | 5825            | 9.803                    | 0.2              | 23.40                                            | 4.98           | 3.15             | 1          | 0.689                              | 1.371                                |
| IEEE 802.11ac 40MHz | 13.5             | 5190            | 9.059                    | 0.2              | 15.50                                            | 4.98           | 3.15             | 1          | 0.112                              | 0.223                                |
|                     |                  | 5230            | 9.107                    | 0.2              | 16.10                                            | 4.98           | 3.15             | 1          | 0.128                              | 0.255                                |
|                     |                  | 5755            | 9.722                    | 0.2              | 21.60                                            | 4.98           | 3.15             | 1          | 0.455                              | 0.905                                |
|                     |                  | 5795            | 9.768                    | 0.2              | 22.70                                            | 4.98           | 3.15             | 1          | 0.587                              | 1.168                                |
| IEEE 802.11ac 80MHz | 29.3             | 5210            | 9.083                    | 0.2              | 12.30                                            | 4.98           | 3.15             | 1          | 0.053                              | 0.105                                |
|                     |                  | 5775            | 9.745                    | 0.2              | 18.50                                            | 4.98           | 3.15             | 1          | 0.223                              | 0.444                                |

Note: 1. Mobile or fixed location transmitters, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

2. The Numeric Gain calculated by  $10^{(\text{ant. Gain(dBi)} / 10)}$ .
3. Each band max power which perform MPE of any configurations.
4. The MPE results are evaluated by lowest data rate for WLAN.
5. The device operating IEEE 802.11 b/g/n mode is 2TX MIMO(CDD).
6. The device operating IEEE 802.11 a/ac mode is 1TX Only.

#### Simultaneous Transmitting:

Simultaneous MPE = 2.4GHz MPE+5GHz MPE = 1.478+1.436=2.9145 (w)/m<sup>2</sup>< 5.366 (w)/m<sup>2</sup>