

# FCC Maximum Permissible RF Exposure (MPE) Estimation Report

In accordance with the requirements of  
FCC 47 CFR Part 2(2.1091), ANSI/IEEE C95.1-1992 and  
KDB 447498 D01

**Product Name:** MyWirelessTV3 Wireless HD Transmitter  
4K Wireless HD Connection Kit  
**Trademark:** Actiontec  
**Model Name:** MWTV3TX  
**Serial Model:** MWTV3KIT  
**Report No.:** NTEK-2017NT08175779HF  
**FCC ID:** LNQMWTV3TX

**Prepared for**

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## TEST RESULT CERTIFICATION

**Applicant's name** ..... : Actiontec Electronics, Inc.

**Address** ..... : 760 North Mary Ave., Sunnyvale, CA 94085 USA

**Manufacturer's Name** ..... : Actiontec Electronics, Inc.

**Address** ..... : 760 North Mary Ave., Sunnyvale, CA 94085 USA

**Product description**

**Product name** ..... : MyWirelessTV3 Wireless HD Transmitter  
4K Wireless HD Connection Kit

**Trademark** ..... : Actiontec

**Model and/or type reference** : MWTV3TX

**Serial Model** ..... : MWTV3KIT

**Standards** ..... : FCC 47 CFR Part 1(1.1310)  
FCC 47 CFR Part 2(2.1091)  
ANSI/IEEE C95.1-1992  
KDB 447498 D01

This device described above has been tested by Shenzhen NTEK. Testing has shown that this device is capable of compliance with MPE specified in FCC 47 CFR Part 2(2.1091) and ANSI/IEEE C95.1-1992. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

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**Date of Test**

**Date (s) of performance of tests** ..... : 17 Aug. 2017 ~ 12 Sep. 2017

**Date of Issue** ..... : 12 Sep. 2017

**Test Result** ..... : **Pass**

**Prepared By** ..... : Eileen Wu.  
(Test Engineer) (Cheng Jiawen)

**Approved By** ..... : Sam Chen  
(Lab Manager) (Sam Chen)

### ※ ※ Revision History ※ ※

| REV.    | DESCRIPTION                 | ISSUED DATE   | REMARK       |
|---------|-----------------------------|---------------|--------------|
| Rev.1.0 | Initial Test Report Release | Aug. 17, 2017 | Cheng Jiawen |
|         |                             |               |              |
|         |                             |               |              |
|         |                             |               |              |

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# 1 General Information

## 1.1 RF Exposure Requirements

### 1.1.1 RF Exposure Limits

**Table - Limits For Maximum Permissible Exposure (MPE)**

| Frequency range (MHz)                                        | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|--------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposure              |                               |                               |                                     |                          |
| 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                        |
| 300-1,500                                                    |                               |                               | f/300                               | 6                        |
| 1,500-100,000                                                |                               |                               | 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/f <sup>2</sup>                 | 30                       |
| 30-300                                                       | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1,500                                                    |                               |                               | f/1500                              | 30                       |
| 1,500-100,000                                                |                               |                               | 1.0                                 | 30                       |
| f = frequency in MHz * = Plane-wave equivalent power density |                               |                               |                                     |                          |

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P_t * G_t}{4 * \pi * R^2}$$

Where:

S = Power density (mW/cm<sup>2</sup>)

P<sub>t</sub> = Conducted output power (dBm)

G<sub>t</sub> = numeric gain of the antenna in the direction of interest relative to an isotropic radiator (dBi)

R = distance to the centre of radiation of the antenna (cm)

EIRP = P<sub>t</sub> \* G<sub>t</sub>

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

### 1.1.2 Additional Description

An estimation of MPE in this application for product is used to ensure if it complies to the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC's MPE limits for field strength and power density are given in 47CFR 1.1310(Table below).These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

## 1.2 EUT Description

| Device Information              |                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name                    | MyWirelessTV3 Wireless HD Transmitter<br>4K Wireless HD Connection Kit                                                                                                                                                                                                                                 |
| Trade Name                      | Actiontec                                                                                                                                                                                                                                                                                              |
| Model Name                      | MWTV3TX                                                                                                                                                                                                                                                                                                |
| Serial Model                    | MWTV3KIT                                                                                                                                                                                                                                                                                               |
| FCC ID                          | LNQMWT3TX                                                                                                                                                                                                                                                                                              |
| Device Phase                    | Identical Prototype                                                                                                                                                                                                                                                                                    |
| Exposure Category               | General population / Uncontrolled environment                                                                                                                                                                                                                                                          |
| Antenna Type                    | See Note 1                                                                                                                                                                                                                                                                                             |
| Antenna Gain                    | See Note 1                                                                                                                                                                                                                                                                                             |
| Device Operating Configurations |                                                                                                                                                                                                                                                                                                        |
| IEEE 802.11 WLAN Mode Supported | <input checked="" type="checkbox"/> 802.11a/AC(20MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11n/AC(20MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11n/AC(40MHz channel bandwidth)<br><input checked="" type="checkbox"/> 802.11AC(80MHz channel bandwidth) |
| Modulation                      | OFDM with BPSK/QPSK/16QAM/64QAM/256QAM<br>for 802.11a/n/ac;                                                                                                                                                                                                                                            |
| Smart system                    | <input checked="" type="checkbox"/> SISO for 802.11a<br><input checked="" type="checkbox"/> MIMO for 802.11n/ac                                                                                                                                                                                        |
| Operating Frequency Range       | <input checked="" type="checkbox"/> 5180-5240MHz for 802.11a/n(HT20)/ac20;<br>5190-5230MHz for 802.11n(HT40)/ac40;<br>5210MHz for 802.11 ac80;<br><input checked="" type="checkbox"/> 5745-5825 MHz for 802.11a/n(HT20)/ac20;<br>5755-5795 MHz for 802.11a/n(HT40)/ac40;<br>5775MHz for 802.11 ac80;   |

Note 1:

The EUT has two types of antenna.

| Antenna | Brand  | Model Name (P/N)  | Antenna Type | Connector | Antenna Gain(dBi) |      |
|---------|--------|-------------------|--------------|-----------|-------------------|------|
|         |        |                   |              |           | 5.2G              | 5.8G |
| A(main) | Wha Yu | C787-510139-A(X5) | Dipole(PCB)  | I-PEX     | 3.8               | 4.0  |
| B(aux)  | Wha Yu | C787-510138-A(X4) | Dipole(PCB)  | I-PEX     | 6.4               | 5.2  |

For MIMO mode , Directional gain= $[10\log(G_A + G_B)]$  dbi =8.3dbi in 5.2GHz

Directional gain= $[10\log(G_A + G_B)]$  dbi =7.65dbi in 5.8GHz

802.11n/ac 5GHz has MIMO mode.

Note:  $G_A$  means antenna gain for ANT A in Num.

$G_B$  means antenna gain for ANT B in Num.

### 1.3 Test specification(s)

|                                             |
|---------------------------------------------|
| FCC 47 CFR Part 1(1.1310)                   |
| FCC 47 CFR Part 2(2.1091)                   |
| ANSI/IEEE C95.1-1992                        |
| KDB 447498 D01 General RF Exposure Guidance |

### 1.4 Ambient Condition

|                     |             |
|---------------------|-------------|
| Ambient temperature | 20°C – 24°C |
| Relative Humidity   | 30% – 70%   |

## 2 RF Output Power

### 2.1 Test Equipment List

| Manufacturer | Name of Equipment | Type/Model     | Serial Number | Calibration |            |
|--------------|-------------------|----------------|---------------|-------------|------------|
|              |                   |                |               | Last Cal.   | Due Date   |
| Agilent      | Power Meter       | DARE/ RPR3006W | 15I00041SNO84 | 2017.08.09  | 2018.08.08 |

### 2.2 RF Output Power

#### 2.2.1 WIFI Output Power

5.2G WIFI:

| Test Channel                | Frequency | Maximum output power. Antenna port |       | Total Power | Tune-up (dBm) |       | Max Tune-up (dBm) |       |
|-----------------------------|-----------|------------------------------------|-------|-------------|---------------|-------|-------------------|-------|
|                             |           | (AV) (dBm)                         |       | (AV)        |               |       |                   |       |
|                             | (MHz)     | ANT A                              | ANT B | dBm         | ANT A         | ANT B | ANT A             | ANT B |
| <b>TX 802.11a Mode</b>      |           |                                    |       |             |               |       |                   |       |
| CH36                        | 5180      | 18.6                               | 18.5  | –           | 19±1          | 19±1  | 20                | 20    |
| CH40                        | 5200      | 19.1                               | 18.8  | –           | 19±1          | 19±1  | 20                | 20    |
| CH48                        | 5240      | 18.9                               | 18.7  | –           | 19±1          | 19±1  | 20                | 20    |
| <b>TX 802.11 n20M Mode</b>  |           |                                    |       |             |               |       |                   |       |
| CH36                        | 5180      | 19.3                               | 18.9  | 22.11       | 19±1          | 19±1  | 20                | 20    |
| CH40                        | 5200      | 19.5                               | 19.1  | 22.31       | 19±1          | 19±1  | 20                | 20    |
| CH48                        | 5240      | 19.2                               | 19.2  | 22.21       | 19±1          | 19±1  | 20                | 20    |
| <b>TX 802.11 n40M Mode</b>  |           |                                    |       |             |               |       |                   |       |
| CH38                        | 5190      | 17.6                               | 17.3  | 20.46       | 17±1          | 17±1  | 18                | 18    |
| CH46                        | 5230      | 17.4                               | 17.1  | 20.26       | 17±1          | 17±1  | 18                | 18    |
| <b>TX 802.11 AC20M Mode</b> |           |                                    |       |             |               |       |                   |       |
| CH36                        | 5180      | 19.3                               | 19.8  | 22.57       | 19±1          | 19±1  | 20                | 20    |
| CH40                        | 5200      | 19.2                               | 19.7  | 22.47       | 19±1          | 19±1  | 20                | 20    |
| CH48                        | 5240      | 18.9                               | 19.4  | 22.17       | 19±1          | 19±1  | 20                | 20    |
| <b>TX 802.11 AC40M Mode</b> |           |                                    |       |             |               |       |                   |       |
| CH38                        | 5190      | 17.4                               | 17.2  | 20.31       | 17±1          | 17±1  | 18                | 18    |
| CH46                        | 5230      | 17.7                               | 17.4  | 20.56       | 17±1          | 17±1  | 18                | 18    |
| <b>TX 802.11 AC80M Mode</b> |           |                                    |       |             |               |       |                   |       |
| CH42                        | 5210      | 16.5                               | 15.6  | 19.08       | 16±1          | 16±1  | 17                | 17    |

## 5.8G WIFI:

| Test Channel         | Frequency | Maximum output power. Antenna port |       | Total Power | Tune-up (dBm) |       | Max Tune-up (dBm) |    |
|----------------------|-----------|------------------------------------|-------|-------------|---------------|-------|-------------------|----|
|                      |           | (AV) (dBm)                         |       | (AV)        |               |       |                   |    |
|                      | (MHz)     | ANT A                              | ANT B | dBm         | ANT A         | ANT B |                   |    |
| TX 802.11a Mode      |           |                                    |       |             |               |       |                   |    |
| CH 149               | 5745      | 19.7                               | 19.2  | –           | 19±1          | 19±1  | 20                | 20 |
| CH 157               | 5785      | 19.6                               | 19.5  | –           | 19±1          | 19±1  | 20                | 20 |
| CH 165               | 5825      | 19.8                               | 19.6  | –           | 19±1          | 19±1  | 20                | 20 |
| TX 802.11 n20M Mode  |           |                                    |       |             |               |       |                   |    |
| CH 149               | 5745      | 19.2                               | 19.5  | 22.36       | 19±1          | 19±1  | 20                | 20 |
| CH 157               | 5785      | 19.9                               | 19.1  | 22.53       | 19±1          | 19±1  | 20                | 20 |
| CH 165               | 5825      | 19.7                               | 19.0  | 22.37       | 19±1          | 19±1  | 20                | 20 |
| TX 802.11 n40M Mode  |           |                                    |       |             |               |       |                   |    |
| CH 151               | 5755      | 18.2                               | 18.3  | 21.26       | 18±1          | 18±1  | 19                | 19 |
| CH 159               | 5795      | 18.4                               | 18.1  | 21.26       | 18±1          | 18±1  | 19                | 19 |
| TX 802.11 AC20M Mode |           |                                    |       |             |               |       |                   |    |
| CH 149               | 5745      | 19.3                               | 19.2  | 22.26       | 19±1          | 19±1  | 20                | 20 |
| CH 157               | 5785      | 19.1                               | 19.0  | 22.06       | 19±1          | 19±1  | 20                | 20 |
| CH 165               | 5825      | 19.7                               | 19.3  | 22.51       | 19±1          | 19±1  | 20                | 20 |
| TX 802.11 AC40M Mode |           |                                    |       |             |               |       |                   |    |
| CH 151               | 5755      | 17.9                               | 17.8  | 20.86       | 18±1          | 18±1  | 19                | 19 |
| CH 159               | 5795      | 18.2                               | 17.7  | 20.97       | 18±1          | 18±1  | 19                | 19 |
| TX 802.11 AC80M Mode |           |                                    |       |             |               |       |                   |    |
| CH 155               | 5775      | 17.7                               | 17.5  | 20.61       | 17±1          | 17±1  | 18                | 18 |

### 3 RF Exposure Evaluation

#### 3.1 Operation in WLAN 5.2G FOR SISO MODE

ANT A:

| Max Tune-up (dBm) | Gain (dBi) | EIRP (dBm) | EIRP (mW) | R(cm) | S (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Conclusion |
|-------------------|------------|------------|-----------|-------|-------------------------|---------------------------------|------------|
| 20.00             | 3.8        | 23.8       | 239.88    | 20    | 0.0477                  | 1.000                           | Pass       |

ANT B:

| Max Tune-up (dBm) | Gain (dBi) | EIRP (dBm) | EIRP (mW) | R(cm) | S (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Conclusion |
|-------------------|------------|------------|-----------|-------|-------------------------|---------------------------------|------------|
| 20.00             | 6.4        | 26.4       | 436.52    | 20    | 0.0868                  | 1.000                           | Pass       |

#### 3.2 Operation in WLAN 5.8G FOR SISO MODE

ANT A

| Tune-up limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP (mW) | R(cm) | S (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Conclusion |
|---------------------|------------|------------|-----------|-------|-------------------------|---------------------------------|------------|
| 20.00               | 4.0        | 24.0       | 251.19    | 20    | 0.0500                  | 1.000                           | Pass       |

ANT B

| Tune-up limit (dBm) | Gain (dBi) | EIRP (dBm) | EIRP (mW) | R(cm) | S (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Conclusion |
|---------------------|------------|------------|-----------|-------|-------------------------|---------------------------------|------------|
| 20.00               | 5.2        | 25.2       | 331.13    | 20    | 0.0659                  | 1.000                           | Pass       |

### 4 Exposure calculations for multiple sources

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table (A) and Table (B). To comply with the MPE, the fraction of the MPE in terms of  $E^2$ ,  $H^2$  (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i}$$

The product also has multiple transmitters The Simultaneous Transmission Possibilities are as below:

| Simultaneous Tx Combination | Configuration |
|-----------------------------|---------------|
| 1                           | WLAN MIMO     |

#### 4.1 Estimation for WLAN MIMO 5.2G

| ANT | Max Tune-up (dBm) | Gain (dBi) | EIRP (dBm) | EIRP (mW) | R(cm) | S (mW/cm <sup>2</sup> ) | Total S (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Conclusion |
|-----|-------------------|------------|------------|-----------|-------|-------------------------|-------------------------------|---------------------------------|------------|
| A   | 20.00             | 3.8        | 23.8       | 239.883   | 20    | 0.0477                  | 0.1345                        | 1.000                           | Pass       |
| B   | 20.00             | 6.4        | 26.4       | 436.516   |       | 0.0868                  |                               |                                 |            |

#### 4.2 Estimation for WLAN MIMO 5.8G

| ANT | Max Tune-up (dBm) | Gain (dBi) | EIRP (dBm) | EIRP (mW) | R(cm) | S (mW/cm <sup>2</sup> ) | Total S (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) | Conclusion |
|-----|-------------------|------------|------------|-----------|-------|-------------------------|-------------------------------|---------------------------------|------------|
| A   | 20.00             | 4.0        | 24.0       | 251.189   | 20    | 0.0500                  | 0.1159                        | 1.000                           | Pass       |
| B   | 20.00             | 5.2        | 25.2       | 331.131   |       | 0.0659                  |                               |                                 |            |

According to the Table above, we can conclude that the calculation results of all simultaneous transmission possibilities are less than 1, so it is into compliance.

Therefore the product also meets the requirements under multiple sources condition.

-----END-----