



## APPENDIX I

### RADIO FREQUENCY EXPOSURE

#### LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

#### EUT Specification

|                                     |                                                                                                                                                                                                                                                                                                                                             |               |                               |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|
| <b>EUT</b>                          | 3G/4G Dual Band AC WiFi Router                                                                                                                                                                                                                                                                                                              |               |                               |
| <b>Model</b>                        | 4GM3W-01                                                                                                                                                                                                                                                                                                                                    |               |                               |
| <b>Brand</b>                        | NetComm Wireless                                                                                                                                                                                                                                                                                                                            |               |                               |
| <b>RF Module</b>                    | MediaTek                                                                                                                                                                                                                                                                                                                                    | <b>Model:</b> | 2.4G: MT7620A<br>5G: MT7610EN |
| <b>Frequency band (Operating)</b>   | <input checked="" type="checkbox"/> 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz<br>802.11n HT40: 2.422GHz ~ 2.452GHz<br><input checked="" type="checkbox"/> 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz; 5745 ~ 5825MHz<br>802.11n HT40 : 5190MHz ~ 5230MHz; 5755 ~ 5795MHz<br>802.11ac VHT80 : 5210MHz; 5755MHz<br><input type="checkbox"/> Others |               |                               |
| <b>Device category</b>              | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others                                                                                                                                                                                    |               |                               |
| <b>Exposure classification</b>      | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )                                                                                                                                               |               |                               |
| <b>Antenna Specification</b>        | Antenna Gain 2.4GHz                                                                                                                                                                                                                                                                                                                         | 1.5 dBi       | (Numeric gain: 1.41)          |
|                                     | Antenna Gain 5GHz                                                                                                                                                                                                                                                                                                                           | 2.0 dBi       | (Numeric gain: 1.58)          |
| <b>Maximum Average output power</b> | IEEE 802.11b Mode :                                                                                                                                                                                                                                                                                                                         | 19.07 dBm     | (80.724 mW)                   |
|                                     | IEEE 802.11g Mode :                                                                                                                                                                                                                                                                                                                         | 21.80 dBm     | (151.356 mW)                  |
|                                     | IEEE 802.11n HT20 Mode :                                                                                                                                                                                                                                                                                                                    | 22.54 dBm     | (179.473 mW)                  |
|                                     | IEEE 802.11n HT40 Mode :                                                                                                                                                                                                                                                                                                                    | 22.19 dBm     | (165.577 mW)                  |
|                                     | IEEE 802.11a Mode :                                                                                                                                                                                                                                                                                                                         | 17.09 dBm     | (51.168 mW)                   |
|                                     | IEEE 802.11n HT20 Mode:                                                                                                                                                                                                                                                                                                                     | 17.05 dBm     | (50.699 mW)                   |
|                                     | IEEE 802.11n HT40 Mode:                                                                                                                                                                                                                                                                                                                     | 13.48 dBm     | (22.284 mW)                   |
|                                     | IEEE 802.11AC HT80 Mode:                                                                                                                                                                                                                                                                                                                    | 12.62 dBm     | (18.281 mW)                   |
| <b>Evaluation applied</b>           | <input checked="" type="checkbox"/> MPE Evaluation*<br><input type="checkbox"/> SAR Evaluation<br><input type="checkbox"/> N/A                                                                                                                                                                                                              |               |                               |



## Revision History

| Rev. | Issue Date | Revisions     | Effect Page | Revised By  |
|------|------------|---------------|-------------|-------------|
| 00   | June       | Initial Issue | ALL         | Sunny Chang |



## **TEST RESULTS**

**No non-compliance noted.**

### **Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

### **Maximum Permissible Exposure**

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where  $P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

**IEEE 802.11b mode:**

## IEEE 802.11b Mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|--------|
| 6   | 2437      | 80.724 | 1.41        | 20     | 0.0227                                | 1              | Pass   |

## IEEE 802.11g Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|---------|-------------|--------|---------------------------------------|----------------|--------|
| 6   | 2437      | 151.356 | 1.41        | 20     | 0.0425                                | 1              | Pass   |

## IEEE 802.11n HT 20 Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|---------|-------------|--------|---------------------------------------|----------------|--------|
| 1   | 2452      | 179.473 | 2.83        | 20     | 0.1009                                | 1              | Pass   |

## IEEE 802.11n HT 40 Mode:

| Ch. | Frq.(MHz) | P (mW)  | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|---------|-------------|--------|---------------------------------------|----------------|--------|
| 9   | 2452      | 165.577 | 2.83        | 20     | 0.0931                                | 1              | Pass   |

## IEEE 802.11a Mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|--------|
| 149 | 5745      | 51.168 | 1.58        | 20     | 0.0161                                | 1              | Pass   |

## IEEE 802.11n HT20 Mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|--------|
| 149 | 5745      | 50.699 | 1.58        | 20     | 0.0160                                | 1              | Pass   |

## IEEE 802.11n HT40 Mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|--------|
| 151 | 5755      | 22.284 | 1.58        | 20     | 0.0070                                | 1              | Pass   |

## IEEE 802.11AC HT80 Mode:

| Ch. | Frq.(MHz) | P (mW) | Gain (num.) | D (cm) | Power density in mW / cm <sup>2</sup> | Limit (mW/cm2) | Result |
|-----|-----------|--------|-------------|--------|---------------------------------------|----------------|--------|
| 155 | 5775      | 18.281 | 1.58        | 20     | 0.0058                                | 1              | Pass   |