



Registration number: W6R22209-22106-C-7

FCC ID: GX9HYGWGEN2

## 3.2 Equivalent isotropic radiated power (EIRP)

FCC Rule: 15.247(b)(3)

2.4GHz WiFi

EIRP = max. conducted output power + antenna gain

EIRP = 20.10 dBm + 2.37 dBi [antenna gain claimed by manufacturer] = 22.47 dBm = 176.60 mW

Zigbee

EIRP = max. conducted output power + antenna gain

EIRP = 12.86 dBm + 1.2389 dBi [antenna gain claimed by manufacturer] = 14.0989 dBm = 25.70 mW

## 3.3 Exemption Limits for Routine Evaluation according to 47 CFR FCC Part 2 Subpart J, section 2.1091

FCC OET Bulletin 65 Edition 97.01 determines the equations for predicting RF fields and applicable limits.

The prediction for power density in the far-field but will over-predict power density in the near field, where it could be used for walking a “worst case” or conservative prediction.

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20 cm normally can be maintained between the user and the device.

### MPE Calculation Method

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

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| 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) Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| 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                                                                |

f = frequency in MHz

\*Plane-wave equivalent power density

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E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

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

mW/cm<sup>2</sup>.

Established separation distance is 20 cm.

| Band   | Mode        | Channel          | Conducted Power with DF |                 | Combine (dBm) | Antenna Gain (dBi) | Power density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Ratio           |
|--------|-------------|------------------|-------------------------|-----------------|---------------|--------------------|-------------------------------------|-----------------------------|-----------------|
|        |             |                  | Antenna A (dBm)         | Antenna B (dBm) |               |                    |                                     |                             |                 |
| 2.4GHz | 802.11b     | Ch 1 : 2412 MHz  | 18.82                   | 18              | -             | -                  | -                                   | -                           | -               |
|        |             | Ch 6 : 2437 MHz  | 18.34                   | 20.1            | -             | ANTB: 2.37         | ANTB: 0.0351                        | 1                           | ANTB: 0.0351    |
|        |             | Ch 11 : 2462 MHz | 17.76                   | 19.97           | -             | -                  | -                                   | -                           | -               |
|        | 802.11g     | Ch 1 : 2412 MHz  | 11.39                   | 11.74           | -             | -                  | -                                   | -                           | -               |
|        |             | Ch 6 : 2437 MHz  | 13.1                    | 14.07           | -             | ANTB: 2.37         | ANTB: 0.0088                        | 1                           | ANTB: 0.0088    |
|        |             | Ch 11 : 2462 MHz | 12.04                   | 13.99           | -             | -                  | -                                   | -                           | -               |
|        | 802.11n 20M | Ch 1 : 2412 MHz  | 9.76                    | 10.4            | 13.10         | -                  | -                                   | -                           | -               |
|        |             | Ch 6 : 2437 MHz  | 10.05                   | 10.45           | 13.26         | Combine: 5.66      | Combine: 0.0155                     | 1                           | Combine: 0.0155 |
|        |             | Ch 11 : 2462 MHz | 9.69                    | 10.53           | 13.14         | -                  | -                                   | -                           | -               |
|        | 802.11n 40M | Ch 1 : 2422 MHz  | 5.02                    | 9.54            | 10.85         | -                  | -                                   | -                           | -               |
|        |             | Ch 4 : 2437 MHz  | 7.21                    | 8.68            | 11.02         | Combine: 5.66      | Combine: 0.0092                     | 1                           | Combine: 0.0092 |
|        |             | Ch 7 : 2452 MHz  | 6.79                    | 8.79            | 10.91         | -                  | -                                   | -                           | -               |

| 2.4GHz | Zigbee | Channel          | Conducted Power with DF (dBm) | Antenna Gain (dBi) | Power density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Ratio  |
|--------|--------|------------------|-------------------------------|--------------------|-------------------------------------|-----------------------------|--------|
|        |        | Ch 11 : 2405 MHz | 11.40                         | -                  | -                                   | -                           | -      |
|        |        | Ch 18 : 2440 MHz | 8.82                          | -                  | -                                   | -                           | -      |
|        |        | Ch 25 : 2475 MHz | 12.86                         | 1.2389             | 0.0051                              | 1                           | 0.0051 |

Simultaneous evaluation-

$$0.0351 (2.4G \text{ WLAN}) + 0.0051 (\text{Zigbee}) + 0.0327 (5G \text{ WLAN}) = 0.0729 < 1$$



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### **3.6 Automatic Discontinuation of transmission, FCC 15.407 (c)**

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure.

This function will be declared by manufacturer.

### **3.7 Reserved, FCC 15.407 (d)**

### **3.8 Indoor Operation Restriction, FCC 15.407 (e)**

Within the 5.15–5.25 GHz band, U- NII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations. This equipment has to be declared by manufacturer of the final product as content of the user manual.

### **3.9 Equivalent isotropic radiated power, FCC 15.407 (f)**

FCC Rule: 15.407(b)(3)

NII-1

Test exclusion = max. conducted output power + antenna gain

Test exclusion = 13.58 dBm+(7.69 dBi [antenna gain claimed by manufacturer]) = 21.27 dBm = 133.97 mW

NII-2A

Test exclusion = max. conducted output power + antenna gain

Test exclusion = 13.83 dBm+(8 dBi [antenna gain claimed by manufacturer]) = 21.83 dBm = 152.41 mW

NII-2C

Test exclusion = max. conducted output power + antenna gain

Test exclusion = 12.73 dBm+(9.44 dBi [antenna gain claimed by manufacturer]) = 22.17 dBm = 164.82 mW

NII-3

Test exclusion = max. conducted output power + antenna gain e

Test exclusion = 13.25 dBm+(8.58 dBi [antenna gain claimed by manufacturer]) = 21.83 dBm = 152.41 mW

Test equipment used: ETSTW-RE 055



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## 3.10 Exemption Limits for Routine Evaluation according to 47 CFR FCC Part 2 Subpart J, section 2.1091

FCC OET Bulletin 65 Edition 97.01 determines the equations for predicting RF fields and applicable limits.

The prediction for power density in the far-field but will over-predict power density in the near field, where it could be used for walking a “worst case” or conservative prediction.

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20 cm normally can be maintained between the user and the device.

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

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| 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) Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| 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                                                                |

f = frequency in MHz

\*Plane-wave equivalent power density

E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to mW/m<sup>2</sup>.

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

Established separation distance is 20 cm.

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| Band   | Mode        | Channel           | Conducted power with DF |                 | Combine (dBm) | Antenna Gain (dBi) | Power density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Ratio  |
|--------|-------------|-------------------|-------------------------|-----------------|---------------|--------------------|-------------------------------------|-----------------------------|--------|
|        |             |                   | Antenna A (dBm)         | Antenna B (dBm) |               |                    |                                     |                             |        |
| NII-1  | 802.11a     | Ch 36 : 5180 MHz  | 11.32                   | 11.36           | -             | -                  | -                                   | -                           | -      |
|        |             | Ch 44 : 5220 MHz  | 11.75                   | 11.76           | -             | -                  | -                                   | -                           | -      |
|        |             | Ch 48 : 5240 MHz  | 11.86                   | 12.1            | -             | Antenna B: 6.08    | Antenna B: 0.0131                   | 1                           | 0.0131 |
|        | 802.11n 20M | Ch 36 : 5180 MHz  | 10.09                   | 9.98            | 13.05         | -                  | -                                   | -                           | -      |
|        |             | Ch 44 : 5220 MHz  | 10.48                   | 10.37           | 13.44         | -                  | -                                   | -                           | -      |
|        |             | Ch 48 : 5240 MHz  | 10.6                    | 10.54           | 13.58         | Combine: 7.69      | Combine: 0.0266                     | 1                           | 0.0266 |
|        | 802.11n 40M | Ch 38 : 5190 MHz  | 8.29                    | 8.26            | 11.29         | -                  | -                                   | -                           | -      |
|        |             | Ch 46 : 5230 MHz  | 8.79                    | 8.68            | 11.75         | Combine: 7.69      | Combine: 0.0175                     | 1                           | 0.0175 |
|        | 802.11ac    | Ch 42 : 5210 MHz  | 6.15                    | 6.21            | 9.19          | Combine: 7.69      | Combine: 0.0097                     | 1                           | 0.0097 |
| NII-2A | 802.11a     | Ch 52 : 5260 MHz  | 11.72                   | 11.76           | -             | -                  | -                                   | -                           | -      |
|        |             | Ch 60 : 5300 MHz  | 11.84                   | 11.78           | -             | -                  | -                                   | -                           | -      |
|        |             | Ch 64 : 5320 MHz  | 11.97                   | 11.86           | -             | Antenna A: 3.59    | Antenna A: 0.0071                   | 1                           | 0.0071 |
|        | 802.11n 20M | Ch 52 : 5260 MHz  | 10.44                   | 10.72           | 13.59         | -                  | -                                   | -                           | -      |
|        |             | Ch 60 : 5300 MHz  | 10.54                   | 10.77           | 13.67         | -                  | -                                   | -                           | -      |
|        |             | Ch 64 : 5320 MHz  | 10.82                   | 10.81           | 13.83         | Combine: 8         | Combine: 0.0304                     | 1                           | 0.0304 |
|        | 802.11n 40M | Ch 54 : 5270 MHz  | 8.84                    | 9.17            | 12.02         | -                  | -                                   | -                           | -      |
|        |             | Ch 62 : 5310 MHz  | 9.08                    | 9.28            | 12.19         | Combine: 8         | Combine: 0.0208                     | 1                           | 0.0208 |
|        | 802.11ac    | Ch 58 : 5210 MHz  | 6.72                    | 6.88            | 9.81          | Combine: 8         | Combine: 0.0121                     | 1                           | 0.0121 |
| NII-2C | 802.11a     | Ch 100 : 5500 MHz | 11.19                   | 10.99           | -             | Antenna A: 5.21    | Antenna A: 0.0087                   | 1                           | 0.0087 |
|        |             | Ch 116 : 5580 MHz | 10.44                   | 10.42           | -             | -                  | -                                   | -                           | -      |
|        |             | Ch 140 : 5700 MHz | 10.83                   | 10.94           | -             | -                  | -                                   | -                           | -      |
|        | 802.11n 20M | Ch 100 : 5500 MHz | 9.71                    | 9.72            | 12.73         | Combine: 9.44      | Combine: 0.0327                     | 1                           | 0.0327 |
|        |             | Ch 116 : 5580 MHz | 9.02                    | 9.16            | 12.10         | -                  | -                                   | -                           | -      |
|        |             | Ch 140 : 5700 MHz | 9.6                     | 9.8             | 12.71         | -                  | -                                   | -                           | -      |
|        | 802.11n 40M | Ch 102 : 5510 MHz | 8.16                    | 8.12            | 11.15         | Combine: 9.44      | Combine: 0.0227                     | 1                           | 0.0227 |
|        |             | Ch 110 : 5550 MHz | 7.56                    | 7.42            | 10.50         | -                  | -                                   | -                           | -      |
|        |             | Ch 134 : 5670 MHz | 7.84                    | 7.97            | 10.92         | -                  | -                                   | -                           | -      |
|        | 802.11ac    | Ch 106 : 5530 MHz | 6.24                    | 5.66            | 8.97          | Combine: 9.44      | Combine: 0.0138                     | 1                           | 0.0138 |
|        |             | Ch 122 : 5610 MHz | 5.74                    | 5.23            | 8.50          | -                  | -                                   | -                           | -      |



# Worldwide Testing Services(Taiwan) Co., Ltd.

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|       |             |                   |       |       |       |                |                  |   |        |
|-------|-------------|-------------------|-------|-------|-------|----------------|------------------|---|--------|
| NII-3 | 802.11a     | Ch 149 : 5745 MHz | 11.27 | 11.26 | -     | -              | -                | - |        |
|       |             | Ch 157 : 5785 MHz | 11.36 | 11.81 | -     | Antenna B: 6.1 | Antenna B: 0.012 | 1 | 0.012  |
|       |             | Ch 165 : 5825 MHz | 10.98 | 11.46 | -     | -              | -                | - | -      |
|       | 802.11n 20M | Ch 149 : 5745 MHz | 9.95  | 10.2  | 13.09 | -              | -                | - | -      |
|       |             | Ch 157 : 5785 MHz | 10    | 10.47 | 13.25 | Combine: 8.58  | Combine: 0.0303  | 1 | 0.0303 |
|       |             | Ch 165 : 5825 MHz | 9.8   | 10.38 | 13.11 | -              | -                | - | -      |
|       | 802.11n 40M | Ch 151 : 5755 MHz | 8.29  | 8.6   | 11.46 |                |                  |   |        |
|       |             | Ch 159 : 5795 MHz | 8.53  | 8.79  | 11.67 | Combine: 8.58  | Combine: 0.0211  | 1 | 0.0211 |
|       | 802.11ac    | Ch 155: 5775 MHz  | 6.25  | 5.89  | 9.08  | Combine: 8.58  | Combine: 0.0116  | 1 | 0.0116 |

Simultaneous evaluation-

$0.0351 (2.4G\ WLAN) + 0.0051 (Zigbee) + 0.0327 (5G\ WLAN) = 0.0729 < 1$



Report Number: W6R22209-22106-P-247

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## 10 Maximum Permissible Exposure

### 10.1 Exemption Limits for Routine Evaluation according to 47 CFR FCC Part 2 Subpart J, section 2.1091

FCC OET Bulletin 65 Edition 97.01 determines the equations for predicting RF fields and applicable limits.

The prediction for power density in the far-field but will over-predict power density in the near field, where it could be used for walking a “worst case” or conservative prediction.

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 20 cm normally can be maintained between the user and the device.

### MPE Calculation Method

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

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| 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) Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| 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                                                                |

f = frequency in MHz

\*Plane-wave equivalent power density

E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

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

The formula can be changed to mW/cm<sup>2</sup>.



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| Band            | Frequency<br>(MHz) | Max output<br>power |        | Antenna<br>Gain | Power<br>density<br>(mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) | Ratio         |
|-----------------|--------------------|---------------------|--------|-----------------|-------------------------------------------|--------------------------------|---------------|
|                 |                    | (dBm)               | (W)    | (dBi)           |                                           |                                |               |
| WCDMA<br>Band 2 | 1852.4             | 22.91               | 0.1954 | 4.11            | 0.1001                                    | 1                              | 0.1001        |
| WCDMA<br>Band 5 | 836.6              | 23.73               | 0.2360 | 3.61            | 0.1078                                    | 0.5577                         | 0.1933        |
| LTE<br>Band 2   | 1857.5             | 22.61               | 0.1824 | 4.11            | 0.0935                                    | 1                              | 0.0935        |
| LTE<br>Band 4   | 1715               | 23.64               | 0.2312 | 1.89            | 0.0711                                    | 1                              | 0.0711        |
| LTE<br>Band 5   | 836.5              | 23.98               | 0.2500 | 3.64            | 0.115                                     | 0.5577                         | <b>0.2062</b> |
| LTE<br>Band 7   | 2507.5             | 22.35               | 0.1718 | 2.15            | 0.0561                                    | 1                              | 0.0561        |

From the peak EUT RF output power, the minimum mobile separation distance,  $d=0.2$  m, as well as the gain of the used antenna, the RF power density can be obtained.