



## FCC §15.247 (i), §2.1091 – RF Exposure

# FCC ID: ZNPWD-R1201U

### Applied procedures / limit

According to FCC §15.247(i) and §1.1307(b)(1), 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 level in excess of the Commission's guidelines.

### 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)*                               | 6                                                                 |
| 30-300                | 61.4                              | 0.163                             | 1.0                                      | 6                                                                 |
| 300-1500              |                                   |                                   | F/300                                    | 6                                                                 |
| 1500-100,000          |                                   |                                   | 5                                        | 6                                                                 |

Note: f is frequency in MHz

\* = Power density limit is applicable at frequencies greater than 100 MHz

### 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)*                                 | 30                                                                |
| 30-300                | 27.5                              | 0.073                             | 0.2                                      | 30                                                                |
| 300-1500              |                                   |                                   | F/1500                                   | 30                                                                |
| 1500-100,000          |                                   |                                   | 1.0                                      | 30                                                                |

Note: f = frequency in MHz

\* = Plane-wave equivalent power density



## MPE PREDICTION

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to 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, R=0.2m

## TEST RESULTS

### MIMO Mode

|                                       | ANT | Tune up<br>Produce<br>power | Maximu<br>m peak<br>output<br>power<br>(dBm) | Output<br>power<br>to<br>antenn<br>a<br>(mW) | Antenna<br>Gain<br>(numeric) | Power<br>Density<br>(S)<br>(mW/<br>cm2) | Total<br>Power<br>Density<br>(S)<br>(mW/<br>cm2) | Limit<br>(mW<br>/<br>cm2<br>) | Result |
|---------------------------------------|-----|-----------------------------|----------------------------------------------|----------------------------------------------|------------------------------|-----------------------------------------|--------------------------------------------------|-------------------------------|--------|
| 802.11n<br>20<br>(2.4G<br>Hz<br>WIFI) | A   | 15±1                        | 16                                           | 39.81                                        | 2.123<br>(3.27dBi)           | 0.01681                                 | 0.03363                                          | 1                             | Pass   |
|                                       | B   | 15±1                        | 16                                           | 39.81                                        | 2.123<br>(3.27dBi)           | 0.01681                                 |                                                  |                               |        |
| 802.11a<br>c20<br>(U-NII-1)           | A   | 16±1                        | 17                                           | 50.12                                        | 2.123<br>(3.27dBi)           | 0.02117                                 | 0.04234                                          | 1                             | Pass   |
|                                       | B   | 16±1                        | 17                                           | 50.12                                        | 2.123<br>(3.27dBi)           | 0.02117                                 |                                                  |                               |        |
| 802.11n<br>20<br>(U-NII-3)            | A   | 15±1                        | 16                                           | 39.81                                        | 2.123<br>(3.27dBi)           | 0.01681                                 | 0.03798                                          | 1                             | Pass   |
|                                       | B   | 16±1                        | 17                                           | 50.12                                        | 2.123<br>(3.27dBi)           | 0.02117                                 |                                                  |                               |        |



## SISO Mode

|                                 | ANT | Tune up<br>Produce<br>power | Maximum<br>peak<br>output<br>power<br>(dBm) | Output<br>power<br>to<br>antenna<br>(mW) | Antenna<br>Gain<br>(numeric) | Power<br>Density<br>(S)<br>(mW/<br>cm <sup>2</sup> ) | Limit<br>(mW<br>/<br>cm <sup>2</sup><br>) | Result |
|---------------------------------|-----|-----------------------------|---------------------------------------------|------------------------------------------|------------------------------|------------------------------------------------------|-------------------------------------------|--------|
| 802.11b<br>(2.4G<br>Hz<br>WIFI) | A   | 16±1                        | 17                                          | 50.12                                    | 2.123<br>(3.27dBi)           | 0.02117                                              | 1                                         | Pass   |
|                                 | B   | 17±1                        | 18                                          | 63.10                                    | 2.123<br>(3.27dBi)           | 0.02665                                              | 1                                         | Pass   |
| 802.11a<br>(U-NII-1)            | A   | 16±1                        | 17                                          | 50.12                                    | 2.123<br>(3.27dBi)           | 0.02117                                              | 1                                         | Pass   |
|                                 | B   | 16±1                        | 17                                          | 50.12                                    | 2.123<br>(3.27dBi)           | 0.02117                                              | 1                                         | Pass   |
| 802.11a<br>(U-NII-3)            | A   | 16±1                        | 17                                          | 50.12                                    | 2.123<br>(3.27dBi)           | 0.02117                                              | 1                                         | Pass   |
|                                 | B   | 16±1                        | 17                                          | 50.12                                    | 2.123<br>(3.27dBi)           | 0.02117                                              | 1                                         | Pass   |

## For the Max simultaneous transmission MPE:

|                | Power<br>Density (S)<br>(mW/ cm <sup>2</sup> ) | Total Power<br>Density (S)<br>(mW/ cm <sup>2</sup> ) | Limit<br>(mW/ cm <sup>2</sup> ) | Result |
|----------------|------------------------------------------------|------------------------------------------------------|---------------------------------|--------|
| 2.4GHz<br>WIFI | 0.03363                                        | 0.07597                                              | 1                               | Pass   |
| 5GHz<br>WIFI   | 0.04234                                        |                                                      |                                 |        |