

47 C.F.R. Part 1, Subpart I, Section 1.1310  
47 C.F.R. Part 2, Subpart J, Section 2.1091  
Maximum Permissible Exposure Calculations

For Orbit Irrigation M/N: WT24  
FCC ID: ML6WT24

802.11bgn Transceiver

EUT Device Category = General Population/Uncontrolled Exposure

EUT consists of two ISM band radio transmitting operating over a range of:  
**2412 MHz to 2462 MHz and 2402 MHz to 2480 MHz**

MPE Summary:

According subpart 1.1307 (b)(1) and 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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

### Calculated Formulary:

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

PG = EIRP

MPE and Limit are calculated as follows:

#### 802.11b

| f (MHz) | Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | EIRP (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Δ      |
|---------|--------------------|--------------------|------------|-----------|-------------------------------------|-----------------------------|--------|
| 2412    | 18.51              | 2.0                | 20.51      | 112.46    | 0.0447                              | 1000                        | 999.95 |
| 2437    | 18.19              | 2.0                | 20.19      | 104.47    | 0.0416                              | 1000                        | 995.95 |
| 2462    | 18.18              | 2.0                | 20.18      | 104.23    | 0.0415                              | 1000                        | 999.95 |

#### 802.11g

| f (MHz) | Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | EIRP (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Δ      |
|---------|--------------------|--------------------|------------|-----------|-------------------------------------|-----------------------------|--------|
| 2412    | 20.58              | 2.0                | 22.58      | 181.13    | 0.0746                              | 1000                        | 999.92 |
| 2437    | 20.14              | 2.0                | 22.14      | 163.68    | 0.0651                              | 1000                        | 999.93 |
| 2462    | 20.39              | 2.0                | 22.39      | 173.38    | 0.0690                              | 1000                        | 999.93 |

#### 802.11n

| f (MHz) | Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | EIRP (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Δ      |
|---------|--------------------|--------------------|------------|-----------|-------------------------------------|-----------------------------|--------|
| 2412    | 20.35              | 2.0                | 22.35      | 171.79    | 0.0684                              | 1000                        | 999.93 |
| 2437    | 20.01              | 2.0                | 22.01      | 158.85    | 0.0632                              | 1000                        | 999.94 |
| 2462    | 20.28              | 2.0                | 22.28      | 169.04    | 0.0673                              | 1000                        | 999.93 |

#### Bluetooth LE

| f (MHz) | Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | EIRP (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Δ      |
|---------|--------------------|--------------------|------------|-----------|-------------------------------------|-----------------------------|--------|
| 2402    | 8.9                | 2.0                | 10.9       | 12.3      | 0.0024                              | 1000                        | 999.99 |
| 2440    | 9.1                | 2.0                | 11.1       | 12.9      | 0.0026                              | 1000                        | 999.99 |
| 2480    | 9.5                | 2.0                | 11.5       | 14.1      | 0.0028                              | 1000                        | 999.99 |

Assuming the Bluetooth LE and 802.11bgn transceivers should ever transmit at the same time even though LBT technology is used, the calculations below show the maximum power spectral density for the 802.11bgn transceiver added to the maximum spectral density for the Bluetooth LE transceiver and sum compared to the 1 W limit.

$$0.0746 \text{ mW/cm}^2 + 0.0028 \text{ mW/cm}^2 = 0.0774 \text{ mW/cm}^2$$

$$0.0774 \text{ mW/cm}^2 - 1000 \text{ mW/cm}^2 \text{ (Limit)} = -999.92 \text{ mW/cm}^2$$

If both transceivers transmit at the same time, the EUT complies with the specification by 999.92 mW/cm<sup>2</sup>.

**Result:** The device meets FCC MPE limit at 20 cm for General Population/Uncontrolled Exposure as specified in 47 CFR §1.1310 and §2.1091.