

## \* RF Exposure

### 1. Regulation

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.

Limits for Maximum Permissible Exposure: RF exposure is calculated.

| Frequency Range                                       | Electric Field Strength [V/m] | Magnetic Field Strength [A/m] | Power Density [mW/cm <sup>2</sup> ] | Averaging Time [minute] |
|-------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|-------------------------|
| 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/1 500                             | 30                      |
| 1 500 ~ 15 000                                        | /                             | /                             | 1.0                                 | 30                      |

*f*=frequency in MHz, \* = plane-wave equivalent power density

#### MPE (Maximum Permissible Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad (\Rightarrow R = \sqrt{PG / 4\pi S})$$

S = power density [mW/cm<sup>2</sup>]

P = Power input to antenna [mW]

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 [cm]

## 2. RF Exposure Compliance Issue

The information should be included in the user's manual:

This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

## 3. Calculation Result of RF Exposure

| Mode                  | Target power<br>[dB]     | Tune up tolerance<br>[dB] | Max tune up power<br>[dB] | Max tune up power<br>[mW] | Ant Gain<br>[dBm] | Ant Gain<br>[mW] | Power Density at 20 cm<br>[mW/cm <sup>2</sup> ] | Limit<br>[mW/cm <sup>2</sup> ] |
|-----------------------|--------------------------|---------------------------|---------------------------|---------------------------|-------------------|------------------|-------------------------------------------------|--------------------------------|
| Wifi 2.4 GHz          | 14.00                    | ± 2                       | 16.00                     | 39.81                     | 1.90              | 1.55             | 0.012 27                                        | 1.000 00                       |
| Wifi 5 GHz_5 150 Band | 12.50                    | ± 2                       | 14.50                     | 28.18                     | -0.70             | 0.85             | 0.004 77                                        | 1.000 00                       |
| Wifi 5 GHz_5 250 Band | 12.00                    | ± 2                       | 14.00                     | 25.12                     | 1.40              | 1.38             | 0.006 90                                        | 1.000 00                       |
| Wifi 5 GHz_5 470 Band | 13.50                    | ± 2                       | 15.50                     | 35.48                     | 0.30              | 1.07             | 0.007 56                                        | 1.000 00                       |
| Wifi 5 GHz_5 725 Band | 14.00                    | ± 2                       | 16.00                     | 39.81                     | 0.30              | 1.07             | 0.008 49                                        | 1.000 00                       |
| Bluetooth             | 5.00                     | ± 2                       | 7.00                      | 25.12                     | 1.90              | 1.55             | 0.002 45                                        | 1.000 00                       |
| Total                 | WiFi 2.4 GHz + Bluetooth |                           |                           |                           |                   |                  | 0.014 72                                        | 1.000 00                       |
|                       | WiFi 5 GHz + Bluetooth   |                           |                           |                           |                   |                  | 0.010 93                                        | 1.000 00                       |

Note: Total = (MPE 1 / MPE 1 Limit)+ (MPE 2 / MPE 2 Limit)+ ... + (MPE n / MPE n Limit)

## 4. Target power and tolerance, Max tuneup power

### Wifi 2.4 GHz

| Mode         | Target power | tolerance | Max tuneup power |
|--------------|--------------|-----------|------------------|
| 802.11b      | 14.00        | ± 2       | 16.00            |
| 802.11g      | 12.00        | ± 2       | 14.00            |
| 802.11n_HT20 | 11.00        | ± 2       | 13.00            |

### Wifi 5 GHz

| Mode                   | Target power | tolerance | Max tuneup power |
|------------------------|--------------|-----------|------------------|
| 802.11a 5150-5250 Band | 12.50        | ± 2       | 14.50            |
| 802.11a 5250-5350 Band | 12.00        | ± 2       | 14.00            |
| 802.11a 5470-5725 Band | 13.50        | ± 2       | 15.50            |
| 802.11a 5725-5825 Band | 14.00        | ± 2       | 16.00            |

| Mode                         | Target power | tolerance | Max tuneup power |
|------------------------------|--------------|-----------|------------------|
| 802.11n_HT20 5150-5250 Band  | 12.50        | ± 2       | 14.50            |
| 802.11n_HT20 5250-5350 Band  | 12.00        | ± 2       | 14.00            |
| 802.11n_HT20 5470-5725 Band  | 13.50        | ± 2       | 15.50            |
| 802.11n_HT20 5725-5825 Band  | 14.00        | ± 2       | 16.00            |
| 802.11n_HT40 5150-5250 Band  | 12.00        | ± 2       | 14.00            |
| 802.11n_HT40 5250-5350 Band  | 11.50        | ± 2       | 13.50            |
| 802.11n_HT40 5470-5725 Band  | 13.00        | ± 2       | 15.00            |
| 802.11n_HT40 5725-5825 Band  | 12.50        | ± 2       | 14.50            |
| 802.11n_VHT20 5150-5250 Band | 12.50        | ± 2       | 14.50            |
| 802.11n_VHT20 5250-5350 Band | 12.00        | ± 2       | 14.00            |
| 802.11n_VHT20 5470-5725 Band | 13.50        | ± 2       | 15.50            |
| 802.11n_VHT20 5725-5825 Band | 14.00        | ± 2       | 16.00            |
| 802.11n_VHT40 5150-5250 Band | 12.00        | ± 2       | 14.00            |
| 802.11n_VHT40 5250-5350 Band | 11.50        | ± 2       | 13.50            |
| 802.11n_VHT40 5470-5725 Band | 13.00        | ± 2       | 15.00            |
| 802.11n_VHT40 5725-5825 Band | 12.50        | ± 2       | 14.50            |
| 802.11n_VHT80 5150-5250 Band | 10.00        | ± 2       | 12.00            |
| 802.11n_VHT80 5250-5350 Band | 10.00        | ± 2       | 12.00            |
| 802.11n_VHT80 5470-5725 Band | 12.50        | ± 2       | 14.50            |
| 802.11n_VHT80 5725-5825 Band | 12.00        | ± 2       | 14.00            |

#### Bluetooth

| Mode       | Target power | tolerance | Max tuneup power |
|------------|--------------|-----------|------------------|
| GFSK       | 7.00         | ± 2       | 9.00             |
| 8DPSK      | 5.00         | ± 2       | 7.00             |
| Low energy | 7.00         | ± 2       | 9.00             |