

* 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 Permissive Exposure: RF exposure is calculated.

| Frequency Range | Electric Field Strength [V/m] | Magnetic Field Strength [A/m] | Power Density [mW/cm ²] | 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 ²) | 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 Permissive 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/cm²]

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 [dBm] | Tune up tolerance [dB] | Max tune up power [dBm] | Max tune up power [mW] | Ant Gain [dBi] | Ant Gain [mW] | Power Density at 20 cm [mW/cm ²] | Limit [mW/cm ²] |
|----------------|--------------------|------------------------|-------------------------|------------------------|----------------|---------------|--|-----------------------------|
| Bluetooth_GFSK | 5.0 | ±2 | 7.0 | 5.01 | 1.99 | 1.58 | 0.001 58 | 1.000 00 |
| WiFi_802.11b | 5.5 | ±2 | 7.5 | 5.62 | 1.99 | 1.58 | 0.001 77 | 1.000 00 |

4. Target power and tolerance, Max tuneup power

| Mode | Target power [dBm] | Tolerance [dB] | Max tuneup power [dBm] | Average Power [dBm] |
|----------------------------|--------------------|----------------|------------------------|---------------------|
| Bluetooth_GFSK Lowest | 5.0 | ±2 | 7.0 | 5.02 |
| Bluetooth_GFSK Middle | 5.0 | ±2 | 7.0 | 5.96 |
| Bluetooth_GFSK Highest | 5.0 | ±2 | 7.0 | 6.62 |
| Bluetooth_8DPSK Lowest | 1.0 | ±2 | 3.0 | 1.18 |
| Bluetooth_8DPSK Middle | 1.0 | ±2 | 3.0 | 2.00 |
| Bluetooth_8DPSK Highest | 1.0 | ±2 | 3.0 | 2.60 |

| Mode | Target power [dBm] | Tolerance [dB] | Max tuneup power [dBm] | Average Power [dBm] |
|------------------------------|--------------------|----------------|------------------------|---------------------|
| WiFi_802.11b Lowest | 5.5 | ±2 | 7.5 | 6.70 |
| WiFi_802.11b Middle | 5.5 | ±2 | 7.5 | 6.31 |
| WiFi_802.11b Highest | 5.5 | ±2 | 7.5 | 5.81 |
| WiFi_802.11g Lowest | 5.0 | ±2 | 7.0 | 5.72 |
| WiFi_802.11g Middle | 5.0 | ±2 | 7.0 | 5.21 |
| WiFi_802.11g Highest | 5.0 | ±2 | 7.0 | 5.29 |
| WiFi_802.11n HT20 Lowest | 5.0 | ±2 | 7.0 | 5.65 |
| WiFi_802.11n HT20 Middle | 5.0 | ±2 | 7.0 | 5.14 |
| WiFi_802.11n HT20 Highest | 5.0 | ±2 | 7.0 | 5.21 |