## - 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/cm²] | 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/f²) | 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

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

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 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

## 3. Calculation Result of RF Exposure

-Module 1 (ANT1) : Product module

| Mode | Target power [dBm] | Tune up tolerance [dB] | Max tune up power [dBm] | Max tune up power [㎽] | Ant Gain [dBi] | Ant Gain [Linear scale] | Power Density at 20 ㎝ [㎽/㎠] | Limit [㎽/㎠] |
|---|---|---|---|---|---|---|---|---|
| Bluetooth_GFSK | 2.00 | ±2.0 | 4.00 | 2.51 | 1.829 | 1.52 | 0.000 76 | 1.000 00 |

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

- Module 1 (ANT1) : Product module

| Mode | Target power [dBm] | Tolerance [dB] | Max tuneup power [dBm] | Average Power [dBm] |
|---|---|---|---|---|
| Bluetooth_GFSK Lowest | 2.00 | ±2.0 | 4.00 | 3.12 |
| Bluetooth_GFSK Middle | 2.00 | ±2.0 | 4.00 | 2.98 |
| Bluetooth_GFSK Highest | 2.00 | ±2.0 | 4.00 | 2.96 |
| Bluetooth_π/4DQPSK Lowest | -1.00 | ±2.0 | 1.00 | -0.67 |
| Bluetooth_π/4DQPSK Middle | -1.00 | ±2.0 | 1.00 | -0.76 |
| Bluetooth_π/4DQPSK Highest | -1.00 | ±2.0 | 1.00 | -0.70 |
| Bluetooth_8DPSK Lowest | -1.00 | ±2.0 | 1.00 | -0.68 |
| Bluetooth_8DPSK Middle | -1.00 | ±2.0 | 1.00 | -0.81 |
| Bluetooth_8DPSK Highest | -1.00 | ±2.0 | 1.00 | -0.73 |