

## \* 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 <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 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/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

	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 <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
Zigbee_O-QPSK	16.5	±2.0	18.5	70.79	3.43	2.20	0.031 03	1.000 00
Bluetooth Low Energy_GFSK	-7.5	±2.0	-5.5	0.28	3.29	2.13	0.000 12	1.000 00

## 4. Target power and tolerance, Max tune up power

Mode	Target power [dBm]	Tolerance [dB]	Max tune up power [dBm]	Average Power [dBm]
Zigbee_O-QPSK Lowest	16.5	±2.0	18.5	17.15
Zigbee_O-QPSK Middle	16.5	±2.0	18.5	18.19
Zigbee_O-QPSK Highest	16.5	±2.0	18.5	18.19
Bluetooth Low Energy_GFSK Lowest	-7.0	±2.0	-5.0	-5.43
Bluetooth Low Energy_GFSK Middle	-7.0	±2.0	-5.0	-5.82
Bluetooth Low Energy_GFSK Highest	-7.0	±2.0	-5.0	-6.85