

## 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

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 <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
Bluetooth_GFSK	10	±1	11	12.59	2.58	1.81	0.004 54	1.000 00
Bluetooth Low Energy	7	±1	7	5.01	2.58	1.81	0.001 81	1.000 00
WiFi_802.11b	14	±1	15	31.62	2.58	1.81	0.011 40	1.000 00
Total	-						0.017 75	1.000 00

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

- Bluetooth

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
Bluetooth_GFSK Lowest	10	±1	11	10.31
Bluetooth_GFSK Middle	10	±1	11	10.62
Bluetooth_GFSK Highest	10	±1	11	10.59
Bluetooth_π/4DQPSK Lowest	8	±1	9	8.22
Bluetooth_π/4DQPSK Middle	8	±1	9	8.70
Bluetooth_π/4DQPSK Highest	8	±1	9	8.65
Bluetooth_8DPSK Lowest	7.8	±1	8.8	7.96
Bluetooth_8DPSK Middle	7.8	±1	8.8	8.48
Bluetooth_8DPSK Highest	7.8	±1	8.8	8.71

- Bluetooth Low Energy

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
Bluetooth Low Energy_Lowest	6	±1	7	6.25
Bluetooth Low Energy_Middle	6	±1	7	6.83
Bluetooth Low Energy_Highest	6	±1	7	6.99

- WiFi 2.4 GHz

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
WiFi_802.11b_Lowest	14	±1	15	14.69
WiFi_802.11b_Middle	14	±1	15	14.75
WiFi_802.11b_Highest	14	±1	15	14.85
WiFi_802.11g_Lowest	12.5	±1	13.5	12.94
WiFi_802.11g_Middle	12.5	±1	13.5	13.03
WiFi_802.11g_Highest	12.5	±1	13.5	13.07
WiFi_802.11n HT20_Lowest	11.5	±1	12.5	11.74
WiFi_802.11n HT20_Middle	11.5	±1	12.5	11.86
WiFi_802.11n HT20_Highest	11.5	±1	12.5	11.99