

* 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 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 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/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	Frequency [MHz]	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	2 402	6.00	±1.0	7.00	5.01	1.88	1.54	0.001 54	1.000 00
WiFi_2.4 GHz_802.11b	2 402	14.50	±1.0	15.50	35.48	1.88	1.54	0.010 88	1.000 00
WiFi_5.0 GHz_802.11a	5 240	7.00	±1.0	8.00	6.31	3.60	2.29	0.002 88	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	6.00	±1.0	7.00	6.57
Bluetooth_GFSK Middle	6.00	±1.0	7.00	5.86
Bluetooth_GFSK Highest	6.00	±1.0	7.00	5.88
Bluetooth_π/4DQPSK Lowest	3.00	±1.0	4.00	3.45
Bluetooth_π/4DQPSK Middle	3.00	±1.0	4.00	3.42
Bluetooth_π/4DQPSK Highest	3.00	±1.0	4.00	3.63
Bluetooth_8DPSK Lowest	3.00	±1.0	4.00	3.34
Bluetooth_8DPSK Middle	3.00	±1.0	4.00	3.13
Bluetooth_8DPSK Highest	3.00	±1.0	4.00	3.44

- WiFi 2.4 GHz

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
802.11b_Lowest	14.50	±1.0	15.50	15.24
802.11b_Middle	14.50	±1.0	15.50	14.74
802.11b_Highest	14.50	±1.0	15.50	14.35
802.11g_Lowest	12.50	±1.0	13.50	13.13
802.11g_Middle	12.50	±1.0	13.50	12.83
802.11g_Highest	12.50	±1.0	13.50	12.53
802.11n HT20_Lowest	11.50	±1.0	12.50	11.97
802.11n HT20_Middle	11.50	±1.0	12.50	11.62
802.11n HT20_Highest	11.50	±1.0	12.50	11.27

- WiFi 5.0 GHz

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
802.11a (5 180 MHz)	7.00	±1.0	8.00	6.84
802.11a (5 200 MHz)	7.00	±1.0	8.00	6.95
802.11a (5 240 MHz)	7.00	±1.0	8.00	7.05
802.11n HT20 (5 180 MHz)	7.00	±1.0	8.00	6.78
802.11n HT20 (5 200 MHz)	7.00	±1.0	8.00	6.80
802.11n HT20 (5 240 MHz)	7.00	±1.0	8.00	6.97