

*** 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	Target power [dB]	Tune up tolerance [dB]	Max tune up power [dB]	Max tune up power [mW]	Ant Gain [dBm]	Ant Gain [mW]	Power Density at 20 cm [mW/cm ²]	Limit [mW/cm ²]
2.4 GHz (WiFi)_n20 MIMO	17.00	±2	19.00	79.43	3.10	2.04	0.032 26	1.000 00
5.0 GHz (WiFi)_n20 MIMO	20.00	±2	22.00	158.49	2.80	1.91	0.060 08	1.000 00
RF4CE	2.00	±2	4.00	2.51	3.10	2.04	0.001 02	1.000 00
Total	2.4 GHz + RF4CE						0.033 29	1.000 00
	5.0 GHz + RF4CE						0.061 10	1.000 00

Note: Total = (MPE 1 / MPE 1 Limit)+ (MPE 2 / MPE 2 Limit)+ ...+ (MPE n / MPE n Limit)

4. Target power and tolerance, Max tuneup power

Wifi 2.4 GHz

Channel	Target power	tolerance	Max tune up power
802.11b_Lowest	15.00	±2	17.00
802.11b_Middle	15.00	±2	17.00
802.11b_Highest	15.00	±2	17.00
802.11g_Lowest	11.00	±2	13.00
802.11g_Middle	11.00	±2	13.00
802.11g_Highest	10.00	±2	12.00
802.11n_HT20_Lowest	10.00	±2	12.00
802.11n_HT20_Middle	10.00	±2	12.00
802.11n_HT20_Highest	9.00	±2	11.00
802.11n_HT20_MIMO_Lowest	13.00	±2	15.00
802.11n_HT20_MIMO_Middle	14.00	±2	16.00
802.11n_HT20_MIMO_Highest	17.00	±2	19.00

RF4CE

Channel	Target power	tolerance	Max tune up power
802.11_Lowest	2.00	±2	4.00
802.11_Middle	2.00	±2	4.00
802.11_Highest	2.00	±2	4.00

Wifi 5.0 GHz_5 150 Band

Mode	Target power	tolerance	Max tuneup power
802.11a_Lowest	16.00	±2	18.00
802.11a_Middle	16.00	±2	18.00
802.11a_Highest	16.00	±2	18.00
802.11n HT20_Lowest	16.00	±2	18.00
802.11n HT20_Middle	16.00	±2	18.00
802.11n HT20_Highest	16.00	±2	18.00
802.11n HT20_MIMO_Lowest	19.00	±2	21.00
802.11n HT20_MIMO_Middle	19.00	±2	21.00
802.11n HT20_MIMO_Highest	19.00	±2	21.00

Wifi 5.0 GHz_5 250 Band

Mode	Target power	tolerance	Max tuneup power
802.11a_Lowest	18.00	±2	20.00
802.11a_Middle	18.00	±2	20.00
802.11a_Highest	18.00	±2	20.00
802.11n HT20_Lowest	18.00	±2	20.00
802.11n HT20_Middle	18.00	±2	20.00
802.11n HT20_Highest	18.00	±2	20.00
802.11n HT20_MIMO_Lowest	20.00	±2	22.00
802.11n HT20_MIMO_Middle	20.00	±2	22.00
802.11n HT20_MIMO_Highest	20.00	±2	22.00

Wifi 5.0 GHz_5 470 Band

Mode	Target power	tolerance	Max tuneup power
802.11a_Lowest	18.00	± 2	20.00
802.11a_Middle	18.00	± 2	20.00
802.11a_Highest	18.00	± 2	20.00
802.11n HT20_Lowest	18.00	± 2	20.00
802.11n HT20_Middle	18.00	± 2	20.00
802.11n HT20_Highest	18.00	± 2	20.00
802.11n HT20_MIMO_Lowest	20.00	± 2	22.00
802.11n HT20_MIMO_Middle	20.00	± 2	22.00
802.11n HT20_MIMO_Highest	20.00	± 2	22.00

Wifi 5.0 GHz_5 720 Band

Mode	Target power	tolerance	Max tuneup power
802.11a_Lowest	16.00	± 2	18.00
802.11a_Middle	16.00	± 2	18.00
802.11a_Highest	16.00	± 2	18.00
802.11n HT20_Lowest	16.00	± 2	18.00
802.11n HT20_Middle	16.00	± 2	18.00
802.11n HT20_Highest	16.00	± 2	18.00
802.11n HT20_MIMO_Lowest	19.00	± 2	21.00
802.11n HT20_MIMO_Middle	19.00	± 2	21.00
802.11n HT20_MIMO_Highest	19.00	± 2	21.00