

- 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 [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]
WiFi 2.4 GHz 802.11b_Lowest	4.00	2.00	6.00	3.98	0.75	1.19	0.000 94	1.000 00
WiFi 5.8 GHz 802.11a_Middle	8.50	1.00	9.50	8.91	3.84	2.42	0.004 29	1.000 00
Bluetooth GFSK_Lowest	-0.70	2.00	1.30	1.35	0.75	1.19	0.000 32	1.000 00
Bluetooth Low Energy_Lowest	-4.00	2.00	-2.00	0.63	0.75	1.19	0.000 15	1.000 00
Total	-						0.005 70	1.000 00

4. Target power and tolerance, Max tuneup power

- WiFi 2.4 GHz

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
802.11b_Lowest	4.00	2.00	6.00	5.90
802.11b_Middle	4.00	2.00	6.00	5.27
802.11b_Highest	4.00	2.00	6.00	4.02
802.11g_Lowest	3.00	2.00	5.00	5.09
802.11g_Middle	3.00	2.00	5.00	4.39
802.11g_Highest	3.00	2.00	5.00	3.35
802.11n HT20_Lowest	2.00	2.00	4.00	3.91
802.11n HT20_Middle	2.00	2.00	4.00	3.27
802.11n HT20_Highest	2.00	2.00	4.00	2.05

- WiFi 5.0 GHz

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
802.11a_Lowest	-1.00	1.00	0.00	-0.99
802.11a_Middle	-1.00	1.00	0.00	-0.75
802.11baHighest	-1.00	1.00	0.00	-0.80
802.11n HT20_Lowest	-2.00	1.00	-1.00	-2.29
802.11n HT20_Middle	-2.00	1.00	-1.00	-2.10
802.11n HT20_Highest	-2.00	1.00	-1.00	-2.09

- WiFi 5.8 GHz

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
802.11a_Lowest	8.50	1.00	9.50	8.40
802.11a_Middle	8.50	1.00	9.50	9.08
802.11baHighest	8.50	1.00	9.50	8.73
802.11n HT20_Lowest	7.50	1.00	8.50	7.78
802.11n HT20_Middle	7.50	1.00	8.50	8.42
802.11n HT20_Highest	7.50	1.00	8.50	8.00

- Bluetooth

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
GFSK-Lowest	-0.70	2.00	1.30	1.17
GFSK-Middle	-0.70	2.00	1.30	0.34
GFSK-Highest	-0.70	2.00	1.30	-0.66
π/4DQPSK-Lowest	-3.10	2.00	-1.10	-1.50
π/4DQPSK-Middle	-3.10	2.00	-1.10	-2.02
π/4DQPSK-Highest	-3.10	2.00	-1.10	-3.03
8DPSK-Lowest	-2.30	2.00	-0.30	-0.56
8DPSK-Middle	-2.30	2.00	-0.30	-1.27
8DPSK-Highest	-2.30	2.00	-0.30	-2.27

- Bluetooth Low Energy

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
Bluetooth Low Energy_Lowest	-4.00	2.00	-2.00	-2.36
Bluetooth Low Energy_Middle	-4.00	2.00	-2.00	-2.55
Bluetooth Low Energy_Highest	-4.00	2.00	-2.00	-3.40

1.2 RF Exposure Compliance Issue

Therefore, EUT is not required the SAR Evaluation.