* 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 [㎽/㎠]	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 ㎒, *= 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

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

S = power density [㎽ /㎠]

P = Power input to antenna [㎽]

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 [㎝]

EUT: Maximum peak output power = 63.10 [㎽] (18.00 ㏈m) Antenna gain = 1.10 [㎽] (0.41 ㏈i)	
100 ㎽, at 20 cm from an antenna 6 [㏈i]	S = PG/4πR² = 100 × 3.98 / (4 × π × 400) = 0.079 18 [㎽/㎠] < 1.0 [㎽/㎠]
63.10 ㎽, at 20 cm from an antenna 0.41 [㏈i]	S = PG/4πR² = 0.013 80 [㎽/㎠] < 1.0 [㎽/㎠]

Target power table

Mode	Target power [㏈m]	Allowed tolerant [㏈]	Max tune up power [㏈m]	Measured Average power [㏈m]
802.11b	16	±2.0	18	16.16
802.11g	14	±2.0	16	14.02
802.11n HT20	13	±2.0	15	13.21
802.11n HT40	13	±1.5	14.5	12.99

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

*** 802.11b**

Channel	Frequency [㎒]	Ant Gain	power [dBm]	power [㎽]	Power Density at 20 ㎝ [㎽/㎠]
Lowest	2 412	1.10	17.95	62.37	0.013 64
Middle	2 437	1.10	18.06	63.97	0.013 99
Highest	2 462	1.10	18.86	76.91	0.016 82

*** 802.11g**

Channel	Frequency [㎒]	Ant Gain	power [dBm]	power [㎽]	Power Density at 20 ㎝ [㎽/㎠]
Lowest	2 412	1.10	22.86	193.20	0.042 24
Middle	2 437	1.10	23.87	243.78	0.053 30
Highest	2 462	1.10	23.87	243.78	0.053 30

*** 802.11n HT20**

Channel	Frequency [㎒]	Ant Gain	power [dBm]	power [㎽]	Power Density at 20 ㎝ [㎽/㎠]
Lowest	2 412	1.10	21.36	136.77	0.029 90
Middle	2 437	1.10	22.26	168.27	0.036 79
Highest	2 462	1.10	23.07	202.77	0.044 33

*** 802.11n HT40**

Channel	Frequency [㎒]	Ant Gain	power [dBm]	power [㎽]	Power Density at 20 ㎝ [㎽/㎠]
Lowest	2 422	1.10	23.37	217.27	0.047 50
Middle	2 437	1.10	23.97	249.46	0.054 54
Highest	2 452	1.10	24.47	279.90	0.061 20

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