## 5.7 RF Exposure

### 5.7.1 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 = 180.30 [㎽] (22.56 ㏈m)<br>Antenna gain = 2.00 ( 3 [㏈i]) | |
|---|---|
| 100 ㎽, at 20 cm from an antenna 6 [㏈i] | S = PG/4πR² = 100 × 3.98 / (4 × π × 400)<br>= 0.079 18 [㎽/㎠] < 1.0 [㎽/㎠] |
| 180.30 ㎽, at 20 cm from an antenna 3 [㏈i] | S = PG/4πR² = 0.071 57 [㎽/㎠] < 1.0 [㎽/㎠] |

### 5.7.2 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 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

## 5.7.2 Calculation Result of RF Exposure

*** 802.11b**

| Channel | Frequency [㎒] | Ant Gain | power [dBm] | power [㎽] | Power Density at 20 ㎝ [㎽/㎠] |
|---|---|---|---|---|---|
| Lowest | 2 412 | 2.00 | 20.74 | 118.58 | 0.047 07 |
| Middle | 2 437 | 2.00 | 20.46 | 111.17 | 0.044 13 |
| Highest | 2 462 | 2.00 | 19.88 | 97.27 | 0.038 61 |

*** 802.11g**

| Channel | Frequency [㎒] | Ant Gain | power [dBm] | power [㎽] | Power Density at 20 ㎝ [㎽/㎠] |
|---|---|---|---|---|---|
| Lowest | 2 412 | 2.00 | 22.56 | 180.30 | 0.071 57 |
| Middle | 2 437 | 2.00 | 22.36 | 172.19 | 0.068 35 |
| Highest | 2 462 | 2.00 | 21.38 | 137.40 | 0.054 54 |

*** 802.11n HT20**

| Channel | Frequency [㎒] | Ant Gain | power [dBm] | power [㎽] | Power Density at 20 ㎝ [㎽/㎠] |
|---|---|---|---|---|---|
| Lowest | 2 412 | 2.00 | 19.46 | 88.31 | 0.035 05 |
| Middle | 2 437 | 2.00 | 20.11 | 81.47 | 0.032 34 |
| Highest | 2 462 | 2.00 | 21.12 | 129.42 | 0.051 37 |

*** 802.11n HT40**

| Channel | Frequency [㎒] | Ant Gain | power [dBm] | power [㎽] | Power Density at 20 ㎝ [㎽/㎠] |
|---|---|---|---|---|---|
| Lowest | 2 422 | 2.00 | 20.24 | 105.68 | 0.041 95 |
| Middle | 2 437 | 2.00 | 20.12 | 102.80 | 0.040 81 |
| Highest | 2 452 | 2.00 | 20.06 | 101.39 | 0.040 25 |