

## MPE Evaluation

### FCC

Maximum exposure limits from CFR 47, FCC Part 1.1310:

Table 1—Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz)  | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|--|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b>         |                               |                               |                                     |                          |
| 0.3-3.0  | 614                           | 1.63                          | *100                                | 6                        |
| 3.0-30   | 1842/f                        | 4.89/f                        | *900/f <sup>2</sup>                 | 6                        |
| 30-300   | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300-1,500  |                               |                               | f/300                               | 6                        |
| 1,500-100,000  |                               |                               | 5                                   | 6                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 0.3-1.34   | 614                           | 1.63                          | *100                                | 30                       |
| 1.34-30  | 824/f                         | 2.19/f                        | *180/f <sup>2</sup>                 | 30                       |
| 30-300   | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1,500  |                               |                               | f/1500                              | 30                       |
| 1,500-100,000  |                               |                               | 1.0                                 | 30                       |

**Table 2 – Power Density Calculations, FCC**

|                                 |   |
|---------------------------------|---|
| Occupational/Controlled         |   |
| General Population/uncontrolled | 1 |

| Transmitter | Frequency | Antenna Gain | Power Conducted | Power EIRP | Power +10% for tolerance | Power Density      | Limit at specified distance | Exempt? |
|-------------|-----------|--------------|-----------------|------------|--------------------------|--------------------|-----------------------------|---------|
|             | MHz       | numerical    | mW              | mW         | mW                       | mW/cm <sup>2</sup> | mW/cm <sup>2</sup>          |         |
| 1           | 2412      | 1.91         | 25.06           | 47.86      | 52.65                    | 0.01048            | 1.00                        | Yes     |
| 1           | 2437      | 1.91         | 22.75           | 43.45      | 47.80                    | 0.00951            | 1.00                        | Yes     |
| 1           | 2462      | 1.91         | 25.35           | 48.41      | 53.25                    | 0.01060            | 1.00                        | Yes     |

|          |    |    |       |     |
|----------|----|----|-------|-----|
| Distance | 20 | cm | PASS? | YES |
|----------|----|----|-------|-----|

Note: The user's manual will stipulate that a 20cm distance from the user is to be maintained.

\*Antenna gain was unknown so EIRP measurements were used. Antenna gain was set to 1

The power density is calculated as shown below:

$$S = (P \times G) / (4 \times \pi \times d^2) - \text{used to calculate exposure at 20 cm}$$

$$d = \sqrt{(S / (P \times G) \times 4 \times \pi)} - \text{used to calculate minimum distance to meet limits}$$

S= power density

P = transmitter conducted power (in mW)

G = antenna numeric gain

D = distance to radiation center (20 cm)

## IC / ISED

### Using RSS-102, Issue 5, Section 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{(0.6834)}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). In these cases, the information contained in the RF exposure

**Table 1 - Power Density Calculations, IC/ISED**

| Transmitter | Frequency | Antenna Gain | Power EIRP | Power (conducted)<br>+10% for x antenna gain | Exemption Limit | Compliant |
|-------------|-----------|--------------|------------|--|-----------------|-----------|
|             | MHz       | numerical    | mW         | mW   | mW              |           |
| 1           | 2412      | 1.91         | 47.86      | 52.65  | 2684            | YES       |
| 1           | 2437      | 1.91         | 43.45      | 47.80  | 2703            | YES       |
| 1           | 2462      | 1.91         | 48.41      | 53.25  | 2720            | YES       |

\*Antenna gain was unknown so EIRP measurements were used.