

## 5 FCC §2.1091, §1.1310(d)(3) & ISEDC RSS-102 - RF Exposure

### 5.1 Applicable Standards

According to 1.1307(d)(3), At operating frequencies above 6 GHz, the MPE limits listed in Table 1 in paragraph (e)(1) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b) of this part.

**TABLE 1 TO §1.1310(E)(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>(i) 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>(ii) 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                      |

f = frequency in MHz

\* = Plane-wave equivalent power density

According to ISSED RSS-102 Issue 5 §2.5.2, Exemption Limits for Routine Evaluation- RF Exposure Evaluation,

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 technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

## 5.2 MPE Prediction

As Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: 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

### 5.3 MPE Result for FCC

#### UWB Standalone

Maximum peak EIRP at antenna input terminal (dBm): -7.987

Maximum peak EIRP at antenna input terminal (mW): 0.159

Prediction distance (cm): 20

Prediction frequency (MHz): 7987.2

Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>): 0.00003

FCC MPE limit for uncontrolled exposure at prediction frequency: 1.0

Maximum peak EIRP was calculated from Section 7.6 of this test report:  $87.213 \text{ dBuV/m} - 95.2 = -7.987 \text{ dBm}$

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.00003 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

#### Worst Case Co-location MPE Calculation:

| Radio | Max EIRP (dBm) | Evaluated Distance (cm) | Worst-Case Exposure Level (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Worst-Case Ratios | Sum of Ratios | Limit |
|-------|----------------|-------------------------|-------------------------------------------------|-----------------------------|-------------------|---------------|-------|
| BLE   | 11.86          | 20                      | 0.003                                           | 1.0                         | 0.003             | 0.00303       | 1.0   |
| UWB   | -7.987         | 20                      | 0.00003                                         | 1.0                         | 0.00003           |               |       |

Note: BLE Max. EIRP is referenced from BACL report R2511121-247

### 5.4 RF Exposure Evaluation for IC

#### UWB Standalone

Maximum EIRP power = -7.987 dBm (0.000159 W) which is less than exemption threshold of 5 W.

Therefore, the RF Exposure is exempt for IC.