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

5.1   Applicable Standards

As per FCC §1.1310(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^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f^2)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) 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/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

According to ISED 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 MH 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

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

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

Where: S = power density
       EIRP = Effective Isotropic Radiated Power
       R = distance to the center of radiation of the antenna

5.3   MPE Results for the FCC

UWB Standalone

Maximum EIRP at antenna input terminal (dBm): -41.731
Maximum EIRP at antenna input terminal (mW): 0.000067
Prediction distance (cm): 20
Prediction frequency (MHz): 7987.2
Power density of prediction frequency at 20 cm (mW/cm²): 0.000000013
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²): 1.0

The device is compliant with the FCC requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.000000013 mW/cm². Limit is 1.0 mW/cm².

Worst Case Co-location MPE Calculation: UWB, BLE

Radio	Max EIRP (dBm)	Evaluated Distance (cm)	Worst-Case Exposure Level [mW/cm²]	Limit [mW/cm²]	Worst-Case Ratios	Sum of Ratios	Limit
Worst Case							
BLE	3.5[*]	20	0.0012 mW/cm²	1.0 mW/cm²	0.12%	0.0012%	100%
UWB	-41.731	20	0.000000013 mW/cm²	1.0 mW/cm²	0.0000013%		

Note[*]: Max Conducted Power

5.4   RF Exposure Evaluation Exemption for IC

The EIRP of this device is -41.731 dBm (0.000067mW), which is less than the exemption threshold, i.e., 5 W. Therefore, the RF exposure evaluation is exempt.