

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 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 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): -8.53

Maximum peak EIRP at antenna input terminal (mW): 0.14

Prediction distance (cm): 20

Prediction frequency (MHz): 7987.2

Power density of prediction frequency at 20.0 cm (mW/cm²): 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: 86.67 dBuV/m – 95.2 = -8.53 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/cm². Limit is 1.0 mW/cm².

Worst Case Co-location MPE Calculation:

Radio	Max EIRP (dBm)	Evaluated Distance (cm)	Worst-Case Exposure Level (mW/cm ²)	Limit (mW/cm ²)	Worst-Case Ratios	Sum of Ratios	Limit
BLE	15.52	20	0.007	1.0	0.007	0.007045	1.0
UWB	-8.53	20	0.00003	1.0	0.00003		
NFC	-11.13	20	0.000015	0.979	0.000015		

Note 1: NFC Max. EIRP is referenced from BACL report R2510091-225

Note 2: BLE Max. EIRP is referenced from BACL report R2510091-247

5.4 RF Exposure Evaluation for IC

UWB Standalone

Maximum EIRP power = -8.53 dBm (0.00014 W) which is less than exemption threshold of 5 W.

Therefore, the RF Exposure is exempt for IC.