4 FCC §2.1091, FCC §15.407(f) & ISEDC RSS-102 – RF Exposure

4.1 Applicable Standards

According to FCC §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	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
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: 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 MHz[6] 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.

4.2 MPE Prediction

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

4.3 RF Exposure Evaluation Exemption for FCC

Radio	Max EIRP (dBm)	Evaluated Distance (cm)	Worst-Case Exposure Level	Limit	Worst-Case Ratios	Sum of Ratios	Limit
Worst Case							
BT	15	20	0.006mW/cm^2	1.0 mW/cm^2	0.6%	4.59%	100%
2.4GHz Wi-Fi	20	20	0.0199 mW/cm^2	1.0 mW/cm^2	1.99%		
5GHZWi-Fi	20	20	0.0199 mW/cm^2	1.0 mW/cm^2	1.99%		
RFID*	-7.89	20	0.0000321 mW/cm^2	0.6 mW/cm^2	0.0054%		

4.4 RF Exposure Evaluation Exemption for IC

BT

Maximum EIRP power = 12 dBm + 3 dBi = 15 dBm which is lesser than $1.31\times10^{-2}f^{0.6834}$ = 2.68 W = 34.28 dBm.

2.4GHz WiFi

Maximum EIRP power = 17 dBm + 3 dBi = 20 dBm which is lesser than $1.31\times10^{-2}f^{0.6834}$ = 2.68 W = 34.28 dBm.

5GHz WiFi

Maximum EIRP power = 15 dBm + 5 dBi = 20 dBm which is lesser than $1.31\times10^{-2}f^{0.6834}$ = 4.52 W = 36.55 dBm.

RFID

Maximum EIRP power = 28.11 dBm + [-36] dBi = -7.89 dBm which is lesser than $1.31\times10^{-2}f^{0.6834}$ = 1.38 W = 31