5 FCC §15.407(f) §2.1091 & ISED 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 MHz Footnote6 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/f0.5 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 x 10-2 f0.6834 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

Standalone

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)
WLAN0 2.4GHz Wifi	2462	7.5	24.22	31.72	1485.94	0.296	1.0
WLAN0 5GHz Wifi	5590	9	21	30	1000	0.2	1.0
WLAN1 5GHz Wifi	5270	10	20	30	1000	0.2	1.0

Note: multiple configurations cannot transmit within one radio (i.e. 2.4 and 5GHz Wifi cannot transmit simultaneously on WLAN0)
Note: Non DFS band info including power and gain referenced from previous certification. For DFS antenna gain info, refer to section 4.2. For DFS power/EIRP, rounded up for a rated power.

Sum of Ratios:

WLAN0 2.4Wifi + WLAN1 5Wifi: 0.296/1.0+0.2/1.0= 0.496 < 1

5.4 MPE Results for IC

WLAN0 2.4GHz Wifi

The EIRP of this device is 31.72 dBm (1485.94 mW) which is less than the exemption threshold, i.e., 1.31*10^(-2) * f^(0.6834)=2.72W. Therefore, the RF exposure evaluation is exempt.

WLAN0 5GHz Wifi

The EIRP of this device is 30dBm (1000 mW) which is less than the exemption threshold, i.e., 1.31*10^(-2) * f^(0.6834)=4.77W. Therefore, the RF exposure evaluation is exempt.

WLAN1 5GHz Wifi

The EIRP of this device is 30 dBm (1000 mW) which is less than the exemption threshold, i.e., 1.31*10^(-2) * f^(0.6834)=4.58W. Therefore, the RF exposure evaluation is exempt.

Note: multiple configurations cannot transmit within one radio(i.e. 2.4 and 5GHz Wifi cannot transmit simultaneously on WLAN0)

Sum of Ratios:

WLAN0 2.4Wifi + WLAN1 5Wifi: 1.49/2.72+1.0/4.58= 0.77 < 1

Note: For WLAN0 2.4Wifi data referenced above, please refer to original FCC /IC certification's MPE calculations