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

4.1 Applicable Standards

According to FCC §15.407(f) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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 (minutes)
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

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

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 MPE Results

5 GHz Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	24.97
Maximum peak output power at antenna input terminal (mW):	314.0509
Prediction distance (cm):	20
Prediction frequency (MHz):	5785
Maximum Antenna Gain, typical (dBi):	6.7
Maximum Antenna Gain (numeric):	4.677
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.292
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

5 GHz Wi-Fi and WWAN bands can transmit simultaneously. Per FCC KDB 447498, when RF sources have difference frequencies, the fraction of the FCC power density limit shall be determined and the sum of all fractional components shall be less than 1.

Technology	Frequency (MHz)	Max Cond. Power (dBm)	Max Cond. Power (W)	Max Antenna Gain (dBi)	Duty Cycle	Average EIRP (dBm)	Average EIRP (mW)	Power Density @ 20 cm (mW/cm^2)	FCC MPE Limit (mW/cm^2)
GPRS 2UL	824-849	33.0	1.995	1.8	0.250	28.78	754.988	0.150	0.549
EDGE 2UL	824-849	28.0	0.631	1.8	0.250	23.78	238.748	0.048	0.549
EDGE 3UL	824-849	26.2	0.417	1.8	0.375	23.74	236.609	0.047	0.549
EDGE 4UL	824-849	25.0	0.316	1.8	0.500	23.79	239.315	0.048	0.549
GPRS 2UL	1850-1910	30.0	1.000	6.7	0.250	30.68	1169.338	0.233	1
EDGE 2UL	1850-1910	27.0	0.501	6.7	0.250	27.68	586.057	0.117	1
EDGE 3UL	1850-1910	25.2	0.331	6.7	0.375	27.64	580.806	0.116	1
EDGE 4UL	1850-1910	24.0	0.251	6.7	0.500	27.69	587.449	0.117	1
CDMA BC0	824-849	25.0	0.316	1.8	1.000	26.80	478.630	0.095	0.549
CDMA BC1	1850-1910	25.0	0.316	6.7	1.000	31.70	1479.108	**0.294**	1
CDMA BC10	817-824	25.0	0.316	1.8	1.000	26.80	478.630	0.095	0.544
UMTS	824-849	24.0	0.251	1.8	1.000	25.80	380.189	0.076	0.549
UMTS	1710-1755	24.0	0.251	6.4	1.000	30.40	1096.478	0.218	1
UMTS	1850-1910	24.0	0.251	6.7	1.000	30.70	1174.898	0.234	1
LTE	704-716	24.0	0.251	3.5	1.000	27.50	562.341	0.112	0.469
LTE	777-787	24.0	0.251	3.5	1.000	27.50	562.341	0.112	0.518
LTE	824-849	24.0	0.251	1.8	1.000	25.80	380.189	0.076	0.549
LTE	1710-1755	24.0	0.251	6.4	1.000	30.40	1096.478	0.218	1
LTE	1850-1910	24.0	0.251	6.7	1.000	30.70	1174.898	0.234	1
LTE	1850-1915	24.0	0.251	6.7	1.000	30.70	1174.898	0.234	1

Worst case Co-location RF Exposure

Frequency Band	Max Conducted Power(dBm)	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
5 GHz WiFi	24.97	20	0.292	1.0	29.2 %	58.6 %	100 %
1850-1910 MHz CDMA BC1	25.0	20	0.294	1.0	29.4 %		