4 FCC §15.247(i), §2.1091 & IC RSS-102 - RF Exposure

4.1 Applicable Standard

According to FCC §15.247(i) 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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Time Averaging (min)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f / 150	6
1 500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000- 300 000	$0.158\ f^{0.5}$	$4.21 \times 10\ -4\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: f is frequency in MHz
* Power density limit is applicable at frequencies greater than 100 MHz

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

For 2.4 GHz Band, Internal Antenna with 8 dBi Gain:

802.11 b Mode

Channel & Frequency		Power Output (dBm)			Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1	Chain 2				
1	2412	23.01	23.06	23.04	603.66	27.81	0.758	1/10
6	2437	23.03	23.07	23.03	604.59	27.81	0.759	1/10
11	2462	23.03	23.06	23.07	605.98	27.82	0.761	1/10

802.11 g Mode

Channel & Frequency		Power Output (dBm)			Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1	Chain 2				
1	2412	22.06	22.12	22.09	1/10	26.86	0.609	1/10
6	2437	22.13	22.11	22.01	1/10	26.85	0.608	1/10
11	2462	22.04	22.13	22.02	1/10	26.83	0.606	1/10

802.11 n20 Mode

Channel & Frequency		Power Output (dBm)			Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1	Chain 2				
1	2412	22.01	22.04	22.14	1/10	26.83	0.606	1/10
6	2437	22.08	22.13	22.14	1/10	26.89	0.613	1/10
11	2462	22.11	22.09	22.01	1/10	26.84	0.606	1/10

802.11 n40 Mode

Channel & Frequency		Power Output (dBm)			Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1	Chain 2				
1	2422	22.11	22.11	22.12	1/10	26.88	0.613	1/10
4	2437	22.04	22.08	22.11	1/10	26.85	0.607	1/10
7	2452	22.09	22.03	22.13	1/10	26.85	0.608	1/10

For 5 GHz Band, External Antenna with 6 dBi Gain:

802.11a Mode

Channel & Frequency		Power Output (dBm)		Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1				
149	5745	10.02	10.13	20.35	13.09	0.016	1/10
157	5785	10.05	10.06	20.26	13.07	0.016	1/10
165	5825	10.07	10.04	20.26	13.07	0.016	1/10

802.11 n20 Mode

Channel & Frequency		Power Output (dBm)		Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1				
149	5745	10.13	10.14	20.63	13.15	0.016	1/10
157	5785	10.08	10.08	20.37	13.09	0.016	1/10
165	5825	10.13	10.08	20.49	13.12	0.016	1/10

802.11 n40 Mode

Channel & Frequency		Power Output (dBm)		Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1				
151	5755	10.07	10.03	20.23	13.06	0.016	1/10
159	5795	10.07	10.12	20.44	13.11	0.016	1/10

For 5 GHz Band, External Antenna with 23 dBi Gain:

802.11a Mode

Channel & Frequency		Power Output (dBm)		Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1				
149	5745	10.02	10.13	20.35	13.09	0.808	1/10
157	5785	10.05	10.06	20.26	13.07	0.804	1/10
165	5825	10.07	10.04	20.26	13.07	0.804	1/10

802.11 n20 Mode

Channel & Frequency		Power Output (dBm)		Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1				
149	5745	10.13	10.14	20.63	13.15	0.819	1/10
157	5785	10.08	10.08	20.37	13.09	0.809	1/10
165	5825	10.13	10.08	20.49	13.12	0.814	1/10

802.11 n40 Mode

Channel & Frequency		Power Output (dBm)		Total Power (mW)	Total Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)/ (W/m^2)
		Chain 0	Chain 1				
151	5755	10.07	10.03	20.23	13.06	0.803	1/10
159	5795	10.07	10.12	20.44	13.11	0.814	1/10