

## FCC RF Exposure

**FCC ID:** 2AF2O-FPM20

**Applicant:** Fullpower Technologies, Inc.

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: FP RF MODULE

Refer Standard: FCC Part 2.1091: Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)

### FCC MPE Limited:

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Test Data

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

2.4G WLAN Antenna Gain information

Antenna Gain: 2dBi

**Worst-Case mode Conducted Output Power Results for 2.4G WIFI**

Test mode	Channel	Frequency (MHz)	RF Power(dBm)
802.11b	1	2412	17.12
	6	2437	17.15
	11	2462	17.22
802.11g	1	2412	15.81
	6	2437	15.89
	11	2462	15.82
802.11n20	1	2412	14.24
	6	2437	14.35
	11	2462	14.37
802.11n40	3	2422	11.26
	6	2437	11.31
	9	2452	11.31

**Manufacturing tolerance**

Test mode	Channel	Frequency (MHz)	Max. RF Power(dBm)	Tolerance $\pm$ (dB)
802.11b	1	2412	17.12	$17 \pm 1$
	6	2437	17.15	$17 \pm 1$
	11	2462	17.22	$17 \pm 1$
802.11g	1	2412	15.81	$16 \pm 1$
	6	2437	15.89	$16 \pm 1$
	11	2462	15.82	$16 \pm 1$
802.11n20	1	2412	14.24	$15 \pm 1$
	6	2437	14.35	$15 \pm 1$
	11	2462	14.37	$15 \pm 1$
802.11n40	3	2422	11.26	$12 \pm 1$
	6	2437	11.31	$12 \pm 1$
	9	2452	11.31	$12 \pm 1$

**Calculation results (for 2.4G WIFI): pass**

Mode	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Result (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
802.11b	2412	18	20	0.0199	1.0
	2437	18	20	0.0199	
	2462	18	20	0.0199	
802.11g	2412	17	20	0.0158	
	2437	17	20	0.0158	
	2462	17	20	0.0158	
802.11n20	2412	16	20	0.0126	
	2437	16	20	0.0126	
	2462	16	20	0.0126	
802.11n40	2422	13	20	0.0063	
	2437	13	20	0.0063	
	2452	13	20	0.0063	
Antenna Gain=2.0dBi					

**Evaluation Calculation of estimat permit Antenna Gian.**

Mode	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Max. Permit Antenna Gian(dBi)	Limit (mW/cm <sup>2</sup> )
802.11b	2412	18	20	19	1.0
	2437	18	20	19	
	2462	18	20	19	
802.11g	2412	17	20	20	
	2437	17	20	20	
	2462	17	20	20	
802.11n20	2412	16	20	21	
	2437	16	20	21	
	2462	16	20	21	
802.11n40	2422	13	20	24	
	2437	13	20	24	
	2452	13	20	24	

Per FCC Part 15.203 and Part 15.247(c),

$$P_{out} = P_{Limit} - (Gain - 6)$$

$$18 = 30 - (Gain - 6)$$

So, maximum Permit Gain=18dBi