

RF Exposure Evaluation

Limit

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1310 & 2.1091

Table 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)
(A) Limits for Occupational/Controlled Exposures				
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
300–1500	-	-	f/300	6
1500–100,000	-	-	5	6
(B) 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

Evaluation Method

Transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

Pd = power density in mW/cm², Pout = output power to antenna in mW, G = gain of antenna in linear scale;

Pi = 3.1416, R = distance between observation point and center of the radiator in cm

Conducted Power Results

WIFI

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)
802.11b	1	2412	17.66
	6	2437	17.64
	11	2462	17.65
802.11g	1	2412	15.40
	6	2437	15.37
	11	2462	15.45
802.11n(HT20)	1	2412	15.00
	6	2437	14.98
	11	2462	15.01
802.11n(HT40)	3	2422	14.60
	6	2437	14.98
	9	2452	14.51

Manufacturing tolerance

WIFI

802.11b			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	18	18	18
Tolerance \pm (dB)	1	1	1
802.11g			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15	15	15
Tolerance \pm (dB)	1	1	1
802.11n20			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15	15	15
Tolerance \pm (dB)	1	1	1
802.11n40			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	15	15	15
Tolerance \pm (dB)	1	1	1

Evaluation Results

WIFI

Band/Mode	Antenna Distance (cm)	Conducted Output Power (dBm)		Gain of antenna in linear scale	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
		dBm	mW				
802.11b	20	17.66	58.34	2.00	0.023	1.0	Pass
802.11g	20	15.45	35.08	2.00	0.014	1.0	Pass
802.11n20	20	15.01	31.70	2.00	0.013	1.0	Pass
802.11n40	20	14.98	31.48	2.00	0.013	1.0	Pass

Remark:

1. Output power including tune up tolerance;
2. The maximum antenna gain is 3dBi
3. The exposure safety distance is 20cm.

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 1.1310 & 2.1091 for the uncontrolled RF Exposure and MPE compliance per KDB 447498 v06.