RF EXPOSURE

Applied procedures / limit

These devices are not exempted from compliance does not exceed the Commission's RF exposure guidelines.Unless a device operates at substantially low power levels,with a low gain antenna(s),supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirement(see Section 2.1091),the following information is typically needed:

Calculation that estimates the minimum separation distance(20 cm or more)between an antenna and persons required to satisfy power density limits defined for free space.

Antenna installation and device operating instructions for installers(professional/unskilled users),and the parties responsible for ensuring compliance with the RF exposure requirement

Any caution statements and/or warming labels that are necessary in order to comply with the exposure limits Any other RF exposure related issues that may affect MPE compliance.

FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental
impact of human exposure to radio-frequency(RF) radiation as specified in 1.1307(b).

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	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

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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 ; *Plane-wave equivalent power density

MPE CALCULATION METHOD

Calculation Method of RF Safety Distance:

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

P :power input to the antenna in Mw
EIRP :Equivalent(effective) isotropic radiated power.
S :power density mW/ cm^2
G ;numeric gain of antenna relative to isotropic radiator
R :distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{EIRP}{4\pi S}}$$

$EIRP=10^{(Antenna\ Gain+Peak\ Output\ Power/10)}$

Note:

1. s=1.0 mW /cm^2 for limits for General Population/Uncontrolled Exposures.
2. The time averaged power over 30 minutes will be equaled Output Power.
3. The Power Density at a distance of 20cm calculated from the formula is far below the limit of 1MW/ cm^2

TEST RESULTS

2.4GHz:

802.11b Mode					
Test Channe	Frequency (MHz)	**Output Power/A** dBm	**Output Power/B** dBm	**Total Output Power** dBm	LIMIT dBm
CH01	2412	16.22	13.10	**17.94**	29
CH06	2437	15.67	11.70	17.13	29
CH11	2462	14.65	10.53	16.07	29
802.11g Mode					
CH01	2412	12.03	10.98	14.55	29
CH06	2437	11.47	9.45	13.59	29
CH11	2462	10.66	8.43	12.70	29
802.11n(20) Mode					
CH01	2412	11.46	10.48	14.01	29
CH06	2437	10.92	8.96	13.06	29
CH11	2462	9.33	8.28	11.85	29
802.11n(40) Mode					
CH03	2422	11.66	9.61	**13.77**	29
CH06	2437	11.17	9.13	13.28	29
CH09	2452	10.77	9.11	13.03	29

Frequency (MHz)	Max. output power (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm^2)	Limit of Power Density (S) (mW/ cm^2)	Result
2412~2462	17.94	62.23	5.01(7dBi)	0.062	1	Pass

5.8GHz:

802.11a Mode						
Test Channe	Frequency	**Output Power/C**	**Output Power/D**	**Output Power/E**	**Total Output Power**	LIMIT
	(MHz)	dBm	dBm	dBm	dBm	dBm
CH149	5745 MHz	18.28	9.53	10.67	18.63	26.23
CH157	5785 MHz	17.68	9.42	10.98	**19.48**	26.23
CH165	5825 MHz	16.82	9.33	10.87	19.01	26.23
802.11n(20) Mode						
CH149	5745 MHz	18.33	9.32	10.78	19.47	26.23
CH157	5785 MHz	17.51	9.21	10.76	18.84	26.23
CH165	5825 MHz	17.04	9.22	10.76	18.50	26.23
802.11n(40) Mode						
CH151	5755 MHz	17.20	9.45	10.54	**18.61**	26.23
CH159	5795 MHz	16.07	9.52	10.43	17.81	26.23

Frequency (MHz)	Max. output power (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm^2)	Limit of Power Density (S) (mW/ cm^2)	Result
5745-5825	**19.48**	88.71	9.48(9.77dBi)	0.167	1	Pass

5.2GHz

802.11a Mode						
Test Channe	Frequency (MHz)	Output Power/C dBm	Output Power/D dBm	Output Power/E dBm	Total Output Power dBm	LIMIT dBm
36	5180	9.34	7.43	7.67	13.004	13.23
40	5200	9.59	7.21	7.98	13.147	13.23
46	5240	9.02	7.14	7.87	12.851	13.23
802.11n(20) Mode						
36	5180	9.51	7.54	7.78	13.140	13.23
40	5200	9.70	7.42	7.76	**13.186**	13.23
46	5240	9.30	7.31	7.76	12.981	13.23

Frequency (MHz)	Max. output power (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm^2)	Limit of Power Density (S) (mW/ cm^2)	Result
5180-5240	13.19	20.84	9.48(9.77dBi)	0.0393	1	Pass

NOTE:
1. For 2.4GHz mode, antenna A B are transmitting, antenna C D E were closed,
two antennas simultaneously transmit. And the data is recorded for radiated emission and band edge.
For 5GHz mode,antenna C D E are transmitting, antenna A B were closed
Three antennas simultaneously transmit. And the data is recorded for radiated emission and band edge.

2.(For mobile or fixed location transmitters, the maximum power density is 1.0mW/cm2 even if the calculation indicates that the power density would be larger)
This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.