1. RF Exposure Limit

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 1mW/cm².

The electric field generated for a 1mW/cm²exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1mW/ cm² = 10W/m²

S = Power density in mW/cm², Z = Impedance of free space, 377Ω

E = Electric filed strength in Volts/m, G = Numeric antenna gain, and d = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$d = \sqrt{(30*P*G) / (3770 *S)}$

Changing to units of mW and cm, using P (mW) = P (W) / 1000, d (cm) = 100 * d (m)

$d = 0.282 * \sqrt{(P*G) / S}$

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

2. Calculated MPE Safe Distance

2.1 For 802.11b

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 20cm Separation	(mW/cm²)
13.30	21.38	3.5	2.24	1.952	0.009 5	1

According to above table, safe separation distance, $D = 0.282 * \sqrt{21.38 * 2.24} = 1.952$ cm.

For getting power density at 20 cm separation in above table, following formula was used.

$S = P*G / (4\pi*R^2) = 21.38*2.24/(4*3.14*20^2) = 0.009\ 5$
S = Power Density,
P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),
G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

2.2 For 802.11g

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain		Safe Distance	Power Density (mW/cm²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 20cm Separation	(mW/cm²)
13.50	22.39	3.5	2.24	1.997	0.009 98	1

According to above table, safe separation distance, $D = 0.282 * \sqrt{22.39 * 2.24} = 1.997$ cm.

For getting power density at 20 cm separation in above table, following formula was used.

$S = P*G / (4\pi*R^2) = 22.39*2.24/(4*3.14*20^2) = 0.009\ 98$
S = Power Density,
P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),
G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

HEAD OFFICE : #505 SK Apt. Factory 223-28, Sangdaewon1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do 462-705 Korea (TEL: +82-31-746-8500, FAX: +82-31-746-8700)
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)