RF EXPOSURE TEST

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

Mode	Max Tune up power, dBm	Max time average power, dBm
GSM 850 (1 up)	33	24
GPRS850 Class 8 , GMSK (1up)	33	24
GPRS850 Class 10 , GMSK (2up)	31	25
GPRS850 Class 12 , GMSK (4up)	27	24
GSM 1900 (1 up)	31	22
GPRS1900 Class 8 , GMSK (1up)	31	22
GPRS1900 Class 10 , GMSK (2up)	29	23
GPRS1900 Class 12 , GMSK (4up)	25	22
Based on above table , GPRS 850 Class 10 and GPRS 1900 Class 10 has highest time average power		

output power (MAX) (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm^2)	Limit of Power Density (S) (mW/ cm^2)	Result
25 (GSM 850)	316.23	1.58(2dbi)	0.0995	0.549	Pass
23 (PCS 1900)	199.53	1.58(2dbi)	0.0628	1	Pass

Max Time average power = Tune up max power - Duty cycle factor.

GPRS Class 8 , 1up , Duty cycle factor = 10* log (1/8) = 9dB
GPRS Class 10 , 2up , Duty cycle factor = 10* log(2/8) = 6 dB
GPRS Class 12 , 4 up , Duty cycle factor = 10* log(4/8) = 3dB