Appendix B. Maximum Permissible Exposure

1. Maximum Permissible Exposure

1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.20 m normally can be maintained between the user and the device.

(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/ cm²)	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/ cm²)	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

1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density:} \quad Pd \text{ (W/m}^2) = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

1.3. Calculated Result and Limit

For WLAN function:

Antenna Type : Dipole antenna

Max Conducted Power for IEEE 802.11n MCS0 20MHz: 16.29 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power (dBm)	Average Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
5	3.1623	16.2938	42.5970	0.026812	1	Complies

For GPRS/EDGE Function

Cellular GSM

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
848.8	32.6000	34.7400	2978.5164	0.592858	0.566	Complies

EDGE 850

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
848.8	26.2200	28.3600	685.4882	0.136443	0.566	Complies

PCS GSM

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
1880	29.5400	31.6800	1472.3125	0.293056	1.253	Complies

EDGE1900

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
1909.8	25.3100	27.4500	555.9043	0.110650	1.273	Complies

For WCDMA/HSPA Function

Cell. WCDMA

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
836.6	23.4200	25.5600	359.7493	0.071606	0.557	Complies

PCS WCDMA

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
1880	22.6100	24.7500	298.5383	0.059422	1.253	Complies

For CDMA/EVDO Function

Cell. CDMA

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
824.7	25.3100	27.4500	555.9043	0.110650	0.549	Complies

PCS CDMA

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
1853.25	25.2800	27.4200	552.0774	0.109888	1.236	Complies

For LTE Function (LTE Module, FCC ID: N7NMC7750):

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
784.5	23.5100	25.6500	367.2823	0.073106	0.523	Complies

For LTE Function (LTE Module, FCC ID: N7NMC7750):

Antenna Type : Dipole Antenna

Frequency (MHz)	Average Output Power (dBm)	EIRP power(dBm)	EIRP power (mW))	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
782	23.5600	25.7000	371.5352	0.073106	0.521	Complies

CONCULSION:

Both of the WLAN function and LTE function can transmit simultaneously, the formula of calculatedthe MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is 0.592858 / 0.566 + 0.026812 / 1 = 0.61967, which isless than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.