Appendix C. 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 0.2m 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 (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Peak 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 peak 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 : PIFA Antenna

Max Conducted Power for IEEE 802.11g Ant. A: 21.48 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2.84	1.9231	21.4800	140.6048	0.053821	1	Complies

<For WLAN Function>:

Antenna Type : Dipole Antenna

Max Conducted Power for IEEE 802.11n 40MHz MCS0 Ant. B: 23.44 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
2.00	1.5849	23.4400	220.8005	0.069655	1	Complies

<For GSM 850 Function>:

3G USB Dongle 1 (Mode 1), FCC ID: Q78-ZTEMF626

Antenna Type : Fixed Internal Antenna

Frequency (MHz)	ERP power(dBm)	EIRP(dBm)	EIRP(mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
824.2	27.4900	29.6300	918.3326	0.1828	0.549	Complies
836.4	28.9600	31.1000	1288.2496	0.256419	0.549	Complies
848.8	29.9900	32.1300	1633.0519	0.325050	0.549	Complies

CONCULSION:

Both of the WLAN and GSM 850 can transmit simultaneously, the formula of calculatedthe MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

<For Ant. A>:

Therefore, the worst-case situation is 0.053821 / 1 + 0.325050 / 0.549 = 0.645898, which isless than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

<For Ant. B>:

Therefore, the worst-case situation is 0.069655 / 1 + 0.325050 / 0.549 = 0.661732, which isless than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

<For GSM 850 Function>

3G USB Dongle 2 (Mode 2), FCC ID: QISE169

Antenna Type : Fixed Internal Antenna

Frequency (MHz)	ERP power(dBm)	EIRP(dBm)	EIRP(mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
824.2	31.7800	33.9200	2466.0393	0.490852	0.549	Complies
836.4	31.7500	33.8900	2449.0632	0.487473	0.549	Complies
848.8	31.7300	33.8700	2437.8108	0.485233	0.549	Complies

CONCULSION:

Both of the WLAN and GSM 850 can transmit simultaneously, the formula of calculatedthe MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

<For Ant. A>:

Therefore, the worst-case situation is 0.053821 / 1 + 0.490852 / 0.549 = 0.947905, which isless than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.

<For Ant. B>:

Therefore, the worst-case situation is 0.069655 / 1 + 0.490852 / 0.549 = 0.963739, which isless than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.

<For GSM 1900 Function>:

3G USB Dongle 3 (Mode 3), FCC ID: QISE220

Antenna Type : Fixed Internal Antenna

Frequency (MHz)	ERP power(dBm)	EIRP(dBm)	EIRP(mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
1850.2	26.6700	28.8100	760.3263	0.151339	1	Complies
1880	26.9200	29.0600	805.3784	0.160306	1	Complies
1909.8	26.7900	28.9300	781.6278	0.155579	1	Complies

CONCULSION:

Both of the WLAN and GSM 1900 can transmit simultaneously, the formula of calculatedthe MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

<For Ant. A>:

Therefore, the worst-case situation is 0.053821 / 1 + 0.160306 / 1 = 0.214127, which isless than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.

<For Ant. B>:

Therefore, the worst-case situation is 0.069655 / 1 + 0.160306 / 1 = 0.229961, which isless than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.