

RF Exposure Evaluation

Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	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				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

Friis transmission formula: $Pd = (P_{out} * G) / (4 * \pi * r^2)$

Where

Pd = power density in mW/cm², **Pout** = output power to antenna in mW;

G = gain of antenna in linear scale, **Pi** = 3.1416;

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

Test Result of RF Exposure Evaluation

GSM 850(GPRS 1 link) mode

Frequency (MHz)	PK power (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
824.2	31.23	1327.39	0.419	0.549	PASS
836.6	31.21	1321.29	0.417	0.549	PASS
848.8	31.26	1336.60	0.421	0.549	PASS
Tune-up	30.5 dBm±1.0	1412.54 (Max)	0.445	0.549	PASS

PCS 1900(GPRS 1 link) mode

Frequency (MHz)	PK power (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
1850.2	28.69	739.61	0.29	1.0	PASS
1880.0	28.65	732.82	0.29	1.0	PASS
1909.8	28.68	737.90	0.29	1.0	PASS
Tune-up	28.0 dBm±1.0	794.33(Max)	0.32	1.0	PASS

WCDMA Band II(RMC 12.2Kbps link) mode

Frequency (MHz)	PK power (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
1852.4	23.42	219.79	0.09	1.0	PASS
1880.0	23.51	224.39	0.09	1.0	PASS
1907.6	23.63	230.67	0.09	1.0	PASS
Tune-up	23.0dBm ±1.0	251.19(Max)	0.10	1.0	PASS

WCDMA Band V(RMC 12.2Kbps link) mode

Frequency (MHz)	PK power (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
826.4	23.42	219.79	0.069	0.549	PASS
836.6	23.38	217.77	0.069	0.549	PASS
846.6	23.39	218.27	0.069	0.549	PASS
Tune-up	23.0dBm ±1.0	251.19 (Max)	0.079	0.549	PASS

ZigBee mode:

Frequency (MHz)	PK power (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
2405.00	18.21	66.22	0.03	1.0	PASS
2440.00	17.90	61.66	0.02	1.0	PASS
2475.00	17.16	51.10	0.02	1.0	PASS
Tune-up	18.0dBm ±1.0	79.43(Max)	0.03	1.0	PASS

Multi transmit:

Mode	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
ZigBee+GPRS 850	0.475	0.549	PASS
ZigBee+WCDMA Band II	0.130	1.0	PASS

Remark:

GSM850/ WCDMA Band V: 2.0dBi (Antenna Gain)

PCS1900/ WCDMA Band II: 3.0dBi (Antenna Gain)

ZigBee: 3.0dBi (Antenna Gain)