

## 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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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:  $Pd = (Pout * G) / (4 * pi * r^2)$

Where

**Pd** = power density in mW/cm<sup>2</sup>, **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/cm<sup>2</sup>. 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

### WIFI 2.4G

Channel	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
2412MHz SISO(ANT 1)	17.2	52.48	0.0523	1.0	PASS
2412MHz MIMO	16.4	43.65	0.0870	1.0	PASS

Antenna gain:

ANT 1: 7dBi

ANT 2: 7dBi

MIMO: 10.01dBi

### 2G+3G

Mode	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
GSM850	25.93	391.74	0.1555	0.5495	PASS
EGPRS850	25.63	365.59	0.1451	0.5495	PASS
GSM1900	29.97	993.12	0.3942	1.0	PASS
EGPRS1900	26.35	431.52	0.1713	1.0	PASS
WCDMA Band II	24.32	270.40	0.1073	1.0	PASS
WCDMA Band IV	24.46	279.25	0.1108	1.0	PASS
WCDMA Band V	22.57	180.72	0.0717	0.5509	PASS

Antenna gain:

ANT 1: 3dBi

ANT 2: 3dBi

4G

Mode	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
Band 2	23.5	223.87	0.0889	1.0	PASS
Band 4	22.44	175.39	0.0696	1.0	PASS
Band 5	22.43	174.98	0.0695	0.5498	PASS
Band 7	24.89	308.32	0.1224	1.0	PASS
Band 12	23.47	222.33	0.0883	0.4665	PASS
Band 13	24.91	309.74	0.1230	0.5197	PASS
Band 25	22.82	191.43	0.0760	1.0	PASS
Band 26(814-824)	22.51	178.24	0.0708	0.5431	PASS
Band 26 (824-849)	22.75	188.36	0.0748	0.5498	PASS
Band 38	24.35	272.27	0.1081	1.0	PASS
Band 41	25.4	346.74	0.1376	1.0	PASS

Antenna gain:

ANT 1: 3dBi

ANT 2: 2dBi

802.11 b/g/n could work in Synchronous transmitting mode.

The maximum simultaneously power density were as below

GSM850+2.4G WIFI: 0.37 <1.

GSM1900+2.4G WIFI: 0.48 <1.

WCDMA BAND II+2.4G WIFI: 0.19 <1.

WCDMA BAND IV +2.4G WIFI: 0.20 <1.

WCDMA BAND V +2.4G WIFI: 0.22 <1

LTE BAND 2+2.4G WIFI: 0.18 <1

LTE BAND 4+2.4G WIFI: 0.16<1

LTE BAND 5+2.4G WIFI: 0.21 <1

LTE BAND 7+2.4G WIFI: 0.21 <1

LTE BAND 12+2.4G WIFI: 0.28 <1

LTE BAND 13+2.4G WIFI: 0.32 <1

LTE BAND 25+2.4G WIFI: 0.15 <1

LTE BAND 26(814-824)+2.4G WIFI: 0.22 <1

LTE BAND 26 (824-849)+2.4G WIFI: 0.22 <1

LTE BAND 38+2.4G WIFI: 0.20 <1

LTE BAND 41+2.4G WIFI: 0.22 <1

Remark:

The max power density is less than MPE exempt limit, so it is compliance.