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 = (Pout*G)/(4*pi*r^2)**

Where

Pd = power density in mW/cm^2, **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 id the limit of MPE, 1 mW/cm^2. 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

	Modulation	Frequency MHz	Output power to antenna (dBm)	Max Output power to antenna (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
BLE	GFSK(1M)	2402	3.61	2.2961	0.000776	1.0	PASS
		2440	4.43	2.7733	0.000937	1.0	PASS
		2480	4.08	2.5586	0.000864	1.0	PASS
Wifi 2.4g	802.11b	2412	17.51	56.3638	0.019043	1.0	PASS
		2437	17.94	62.2300	0.021025	1.0	PASS
		2462	17.88	61.3762	0.020736	1.0	PASS
	802.11g	2412	21.40	138.0384	0.046637	1.0	PASS
		2437	21.97	157.3983	0.053178	1.0	PASS
		2462	22.02	159.2209	0.053794	1.0	PASS
	802.11n(20)	2412	21.82	152.0548	0.051372	1.0	PASS
		2437	22.41	174.1807	0.058848	1.0	PASS
		2462	22.48	177.0109	0.059804	1.0	PASS
	802.11n(40)	2422	22.39	173.3804	0.058577	1.0	PASS
		2437	22.25	167.8804	0.056719	1.0	PASS
		2452	21.60	144.5440	0.048835	1.0	PASS

Remark：
1. BT/wifi2.4g Antenna gain is 2.3 dBi
2. In the case of simultaneous launches for wifi and BT:
The Max Calc. Thresholds : BLE:0.000937, Wifi2.4g: 0.059804,
BT and Wifi: 0.000937 + 0.059804 =0.060741 ≤ 1
So a SAR test is not required