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

BT EDR mode

Mode	Frequency (MHz)	Output power to antenna (dBm)	Output power to antenna (mW)	Tune-up Power(dBm) ±1	Maximum tune-up Power (dBm)
GFSK	2402	1.43	1.39	1	2
π/4-DQPSK	2402	1.89	1.54	1	2
8-DPSK	2402	2.52	1.79	2	3
BLE					
GFSK	2402	-0.52	0.89	-1	0
2.4G WIFI					
802.11b	2412	14.67	29.31	14	15
802.11g	2437	13.79	23.93	13	14
802.11n(HT20)	2412	13.97	24.95	13	14
802.11n(HT40)	2437	13.82	24.10	13	14
5.8G WIFI					
802.11a	5745	15.67	36.90	15	16
802.11n(HT20)	5745	14.43	27.73	14	15
802.11n(HT40)	5755	13.78	23.88	13	14
802.11ac(VHT20)	5745	14.35	22.23	14	15
802.11ac(VHT40)	5755	14.18	26.18	14	15

BT EDR mode

Mode	Frequency (MHz)	Max Output power to antenna (dBm)	Output power to antenna (mW)	Antenna Gain (dBi)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
8-DPSK	2402	3	2.00	2.78	0.00075	1.0	PASS
BLE							
GFSK	2402	0	0.89	2.78	0.00038	1.0	PASS
2.4G WIFI							
802.11b	2412	15	31.523	2.78	0.01193	1.0	PASS
5.8G WIFI							
802.11a	5745	16	39.811	4.86	0.02425	1.0	PASS

Antenna Gain: 2.4GHz&2.78dBi:5.8GHz& 4.86dBi

So a SAR test is not required