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

2.4G WIFI mode

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
802.11b	12.488	17.73	0.003528	1.0	PASS
802.11g	10.553	11.36	0.002260	1.0	PASS
802.11n20	8.742	7.49	0.001489	1.0	PASS
802.11n40	8.46	7.01	0.001395	1.0	PASS

5G WIFI mode

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
802.11a	10.44	11.07	0.002202	1.0	PASS
802.11n20	10.47	11.14	0.002217	1.0	PASS
802.11n40	10.68	11.69	0.002327	1.0	PASS
802.11 ac20	10.80	12.02	0.002392	1.0	PASS
802.11 ac40	10.01	10.02	0.001994	1.0	PASS
802.11 AC80	10.20	10.47	0.002083	1.0	PASS

5.8G WIFI mode

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
802.11a	11.71	14.83	0.002949	1.0	PASS
802.11n20	11.43	13.90	0.002765	1.0	PASS
802.11n40	12.08	16.14	0.003212	1.0	PASS
802.11 ac20	11.47	14.03	0.002791	1.0	PASS
802.11 ac40	12.04	16.00	0.003182	1.0	PASS
802.11 AC80	12.19	16.56	0.003294	1.0	PASS

BT BLE

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
GFSK	-2.275	0.59	0.000118	1.0	PASS

BT EDR

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
GFSK	2.172	1.65	0.000328	1.0	PASS
π /4-DQPSK	-0.365	0.92	0.000183	1.0	PASS
8-DPSK	-1.39	0.73	0.000144	1.0	PASS

BT+WIFI

Mode	BT Power Density at R=20cm (mW/cm^2)	WIFI Power Density at R=20cm (mW/cm^2)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
GFSK+802.11b	0.000328	0.003528	0.003856	1.0	PASS

Remark: BT antenna gain=1.25dBi

WIFI antenna gain=1.05dBi