RF Exposure Evaluation

Test procedure: KDB 447498 D01 v06

According to FCC 1.1310: 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 Exposure				
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
300-1,500			f/300	6
1,500-100,000			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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

MPE Calculation Method

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= Numeric gain of the antenna relative to isotropic antenna

Pi=3.1415926

R= distance between observation point and center of the radiator in cm(20cm)

Pd the limit of MPE, $1mW/cm^2$. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

BLE:

Operation Frequency: 2402-2480MHz,

Power density limited: 1mW/ cm^2

Antenna Type: PCB Antenna

Antenna gain: -2.31 dBi

R=20cm

mW=10^(dBm/10)

antenna gain Numeric=10^(dBi/10)= 10^(-2.31/10)=0.59

BLE:

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm^2)	Power density Limits (mW/cm^2)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	BLE-1M	0.50	0±1	1	1.259	-2.31	0.59	0.0001	1
2440		0.52	0±1	1	1.259	-2.31	0.59	0.0001	1
2480		0.52	0±1	1	1.259	-2.31	0.59	0.0001	1
2402	BLE- 2M	0.52	0±1	1	1.259	-2.31	0.59	0.0001	1
2440		0.48	0±1	1	1.259	-2.31	0.59	0.0001	1
2480		0.52	0±1	1	1.259	-2.31	0.59	0.0001	1

Conclusion:

For the max result: 0.0001≤ 1.0, No SAR is required

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