RF Exposure evaluation

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Mobile Device

Refer Standard: KDB 447498 D01 General RF Exposure Guidance v06

FCC Part 2 §2.1091

FCC ID: 2AD4XSHOWBOX

1. Reference

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

*=Plane-wave equivalent power density

3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

4. Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used BT antenna is 2.01dBi, the RF power density can be obtained.

EDR

Freq. (MHz)	Output Power (dBm)	Target power W/ tolerance (dBm)	Max tune up power tolerance (dBm)	Output power to antenna (mW)	Ant Gain (dBi)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
GFSK								
2402	4.387	4±1.0	5	3.162	2.01	0.00100	1	Pass
2441	3.383	3±1.0	4	2.512	2.01	0.00079	1	Pass
2480	2.167	3±1.0	4	2.512	2.01	0.00079	1	Pass
π/4DQPSK								
2402	6.502	7±1.0	8	6.310	2.01	0.00199	1	Pass
2441	5.603	6±1.0	7	5.012	2.01	0.00158	1	Pass
2480	4.491	4±1.0	5	3.162	2.01	0.00100	1	Pass
8DPSK								
2402	7.189	7±1.0	8	6.310	2.01	0.00199	1	Pass
2441	6.292	6±1.0	7	5.012	2.01	0.00158	1	Pass
2480	5.082	5±1.0	6	3.981	2.01	0.00126	1	Pass

BLE

Freq. (MHz)	Output Power (dBm)	Target power W/ tolerance (dBm)	Max tune up power tolerance (dBm)	Output power to antenna (mW)	Ant Gain (dBi)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
LE								
2402	0.274	0±1.0	1	1.259	2.01	0.00040	1	Pass
2440	-0.402	0±1.0	1	1.259	2.01	0.00040	1	Pass
2480	-1.365	-1±1.0	0	1.000	2.01	0.00032	1	Pass
2LE								
2402	0.308	0±1.0	1	1.259	2.01	0.00040	1	Pass
2440	-0.328	0±1.0	1	1.259	2.01	0.00040	1	Pass
2480	-1.305	-1±1.0	0	1.000	2.01	0.00032	1	Pass

Note: The estimation distance is 20cm

5. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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