

RF Exposure evaluation

FCC ID: 2ASQI-362210

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Mobile Device

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. Antenna Information

The device can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Identification in Internal photos	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 1	ANT	PCB antenna	2.4GHz – 2.5 GHz	3.0dBi

5. Conducted power and Manufacturing Tolerance

GFSK				
Channel	Channel 00	Channel 39	Channel 78	
Target (dBm)	3.0	3.0	3.0	
Tolerance ±(dB)	1.0	1.0	1.0	
π/4DQPSK				
Channel	Channel 00	Channel 39	Channel 78	
Target (dBm)	3.0	3.0	3.0	
Tolerance ±(dB)	1.0	1.0	1.0	
8DPSK				
Channel	Channel 00	Channel 39	Channel 78	
Target (dBm)	4.0	4.0	4.0	
Tolerance ±(dB)	1.0	1.0	1.0	
BLE_1Mbps				
Channel	Channel 00	Channel 19	Channel 39	
Target (dBm)	3.0	3.0	3.0	
Tolerance ±(dB)	1.0	1.0	1.0	
BLE_2Mbps				
Channel	Channel 00	Channel 19	Channel 39	
Target (dBm)	3.0	3.0	3.0	
Tolerance ±(dB)	1.0	1.0	1.0	

6. Standalone MPE 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, $r=20\text{cm}$, as well as the gain of the used antenna is 3.0dBi for WIFI, the RF power density can be obtained.

Modulation Type	Max tune up power tolerance(dBm)	Max Output power to antenna (mW)	Antenna Gain (Numeric)	Power Density at $R=20\text{cm}$ (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	4	2.5119	1.9953	0.0010	1.0000	Pass
$\pi/4$ DQPSK	4	2.5119	1.9953	0.0010	1.0000	Pass
8DPSK	5	3.1623	1.9953	0.0013	1.0000	Pass
BLE_1Mbps	4	2.5119	1.9953	0.0010	1.0000	Pass
BLE_2Mbps	4	2.5119	1.9953	0.0010	1.0000	Pass

7. 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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