

## 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: 2AHFN-OMNIV002

### 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 <sup>2</sup> )	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 <sup>2</sup> )*	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 <sup>2</sup> )	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 <sup>2</sup> )*	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,  $r=20\text{cm}$ , as well as the gain of the used BT antenna is 0.5dBi, the RF power density can be obtained.

As declared by the Applicant, the EUT transmits with the maximum source-based Duty Cycle of 100%, and the EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum mobile separation distance,  $r=20\text{cm}$ , as well as the gain of the used antenna is 2.5dBi for BT&2.4G and used antenna is 2.5dBi for 2.4G, the power drift from Tune-up Procedure provide by manufacturer as following states, the RF power density can be obtained.

### 5. Antenna Information

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
BLE&2.4G	Antenna 3	Chip Antenna	2400-2500MHz	2.5dBi
BLE	Antenna 1	Chip Antenna	2400-2500MHz	2.5dBi

### 6. Manufacturing Tolerance

BLE GFSK(Peak)			
Channel	Channel 00	Channel 19	Channel 39
Target (dBm)	-5.0	-6.0	-4.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
2.4G GFSK(Peak)			
Channel	Channel 00	Channel 39	Channel 77
Target (dBm)	3.0	2.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

BLE(peak)			
Channel	Channel 00	Channel 39	Channel 77
Target (dBm)	-4.0	-4.0	-1.0
Tolerance ±(dB)	1.0	1.0	1.0

## 7. Evaluation Results for Standalone

### 7.1 Standalone MPE

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 refer to antenna information, the RF power density can be obtained.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm <sup>2</sup> )	MPE Limits (mW/cm <sup>2</sup> )
	dBm	mW				
BLE	-3.0	0.39	2.5	0.501	0.00018	1.0000
2.4G	6.0	2.84	2.5	3.981	0.00141	1.0000
BLE	0.0	0.75	2.5	1.000	0.00035	1.0000

Remark:

1. Output power (Peak) including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

## 8. Simultaneous MPE Result

The sample support two modules, each module has its own antenna, so need consider simultaneous transmission;

According to KDB447498 D01 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\Sigma$  of MPE ratios  $\leq 1.0$

Mode	MPE 2.4G Radio	MPE BT Radio	$\Sigma$ MPE ratios	MPE Limits
2.4G+BLE	0.00141	0.00035	0.00176	1.0000

## 9. Conclusion

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