RF Exposure evaluation

FCC ID: 2BNB3-HC30B-G

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;

Type	Antenna type	Gain	Frequency
BT	PCB antenna	1.88dBi	2400-2500MHz
LTE	External antenna	B2 1.97dBi, B4 2.04dBi, B5 0.53dBi, B12 0.33dBi, B13 0.53dBi, B66 2.04dBi.	700-960 MHz 1710-2700MHz

5. Manufacturing Tolerance

Mode	**Target Power**		
QPSK	1RB	50%RB	100%RB
LTE BAND 2	22 +1/-2dBm	22 +1/-2dBm	21 +1/-2dBm
LTE BAND 4	22 +1/-2dBm	22 +1/-2dBm	21 +1/-2dBm
LTE BAND 5	23 +1/-2dBm	23 +1/-2dBm	22 +1/-2dBm
LTE BAND 12	23 +1/-2dBm	23 +1/-2dBm	22 +1/-2dBm
LTE BAND 13	23 +1/-2dBm	23 +1/-2dBm	22 +1/-2dBm
LTE BAND 66	23 +1/-2dBm	23 +1/-2dBm	22 +1/-2dBm

Mode	**Target Power**		
16QAM	1RB	50%RB	100%RB
LTE BAND 2	21.5 +1/-2dBm	21.5 +1/-2dBm	20 +1/-2dBm
LTE BAND 4	21.5 +1/-2dBm	21.5 +1/-2dBm	20 +1/-2dBm
LTE BAND 5	22 +1/-2dBm	22 +1/-2dBm	21 +1/-2dBm
LTE BAND 12	22 +1/-2dBm	22 +1/-2dBm	21 +1/-2dBm
LTE BAND 13	22 +1/-2dBm	22 +1/-2dBm	21 +1/-2dBm
LTE BAND 66	22 +1/-2dBm	22 +1/-2dBm	21 +1/-2dBm

BT

Mode	Channel	Target Power
BLE 1M	0	2±1 dBm
	19	2±1 dBm
	39	2±1 dBm

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 =20cm, as well as the gain of the used antenna list in section 4, the RF power density can be obtained.

LTE

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)	radio
	dBm	mW					
LTE BAND 2	23	199.5262	1.97	1.5740	0.0625	1.0000	0.0625
LTE BAND 4	23	199.5262	2.04	1.5996	0.0635	1.0000	0.0635
LTE BAND 5	24	251.1886	0.53	1.1298	0.0565	0.5498	0.1028
LTE BAND 12	24	251.1886	0.33	1.0789	0.0539	0.4665	0.1155
LTE BAND 13	24	251.1886	0.53	1.1298	0.0565	0.5197	0.1087
LTE BAND 66	24	251.1886	2.04	1.5996	0.0799	1.0000	0.0799

BT

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)	radio
	dBm	mW					
BLE	3	0.6310	1.88	1.5417	0.0002	1.0000	0.0002

Remark:

1. Output power (Average) including turn-up tolerance;

2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;

3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

7. Summary simultaneous transmission

The EUT have two type RF transmitters, WWAN(4G), BT(BLE), and can transmit simultaneously, if the sum of the ratios of all individual transmitters is less than 1, the simultaneously transmit can be exempt.

Max. radio of LTE + Max. radio of BT= 0.1155+0.0002=0.1157＜1

8. Conclusion

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

----------THE END OF REPORT----------