RF Exposure evaluation

FCC ID: O39VRTK

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

Briller can only use antennas certificated as follows provided by manufacturer;

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
BT	/	Disc combination antenna	3.37dBi for 2400-2500MHz;	
2.4GWIFI	/	Disc combination antenna	3.37dBi for 2400-2500MHz	
GSM850	/	Disc combination antenna	-0.06dBi for GSM850	
PCS 1900	/	Disc combination antenna	3.23dBi for PCS1900	
FDD band5	/	Disc combination antenna	-0.06dBi for FDD band5	
LTE band5	/	Disc combination antenna	-0.06dBi for LTE band5	
LTE band7	/	Disc combination antenna	4.06dBi for LTE band7	
LTE band38	/	Disc combination antenna	4.06dBi for LTE band38	
LTE band40	/	Disc combination antenna	-0.5dBi for LTE band40	
UHF 410-470	/	External antenna	2.21dBi For UHF	

5. Manufacturing Tolerance

[Bluetooth]

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	0.0	0.0	0.0
Tolerance ±(dB)	1.0	1.0	1.0

π/4DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	0.0	0.0	0.0
Tolerance ±(dB)	1.0	1.0	1.0
8DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	0.0	0.0	0.0
Tolerance ±(dB)	1.0	1.0	1.0
BLE (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	1.0	1.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0

[2.4GHz WLAN]

IEEE 802.11b (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	12.0	12.0	12.0
Tolerance ± (dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Frequency (MHz)	2412	2437	2462
Target (dBm)	11.0	11.0	11.0
Tolerance ± (dB)	1.0	1.0	1.0

GSM850			
Frequency (MHz)	**128/824.2**	**190/836.6**	**251/848.8**
Target (dBm)	32.0	32.0	32.0
Tolerance ± (dB)	1.0	1.0	1.0
PCS 1900			
Frequency (MHz)	**512/1850.2**	**661/1880.0**	**810/1909.8**
Target (dBm)	30.0	30.0	30.0
Tolerance ± (dB)	1.0	1.0	1.0
FDD band V			
Frequency (MHz)	**4132/826.4**	**4183/836.6**	**4233/846.6**
Target (dBm)	23.0	23.0	23.0
Tolerance ± (dB)	1.0	1.0	1.0
LTE band 5, band7, band38, band40			
Frequency (MHz)	2422	2437	2452
Target (dBm)	23.0	23.0	23.0
Tolerance ± (dB)	1.0	1.0	1.0

UHF(410-470MHz)			
Frequency (MHz)	410.125	440.000	469.875
Target (dBm)	33.0	33.0	33.0
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 1m from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =1m, the RF power density can be obtained.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
BT	1.0	1.26	3.37	2.17	0.00002	1.0000
BLE	2.0	1.58	3.37	2.17	0.00002	1.0000
2.4GWIFI	13.0	19.95	3.37	2.17	0.00034	1.0000
GSM850	33.0	1995	-0.06	0.98	0.016	0.549
PCS 1900	31.0	1258	3.23	2.10	0.021	1.0000
FDD band V	24.0	251.18	-0.06	0.98	0.002	0.549
LTE band5	24.0	251.18	-0.06	0.98	0.002	0.549
LTE band7	24.0	251.18	4.06	2.54	0.005	1.0000
LTE band38	24.0	251.18	4.06	2.54	0.005	1.0000
LTE band40	24.0	251.18	-0.50	0.89	0.0017	1.0000
UHF	34	2511	2.21	1.66	0.033	0.273

Remark:

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

2. MPE evaluate distance is 1m from user manual provide by manufacturer.

7. simultaneous MPE Result

2.4GWIFI MPE (Ratio)	GSM 850 MPE (Ratio)	UHF MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits
0.00034	0.016	0.033	0.04934	0.273

8. 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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