RF Exposure evaluation

FCC ID: 2ATOW-TD-E3210

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

TD-E3210-WF 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:
SRD	/	Spring antenna	-3.44dBi for 433MHz	
2.4GWIFI	/	Metal antenna	2.82dBi for 2400-2500MHz	
5GWIFI	/	Metal antenna	5180MHz-5240MHz : 2.86 dBi 5745MHz-5825MHz: 2.98 dBi	

5. Manufacturing Tolerance

Freq. (MHz)	Field strength(max)(dBuV/m)	EIRP (max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]
433.88MHz	66.78	-28.48	-28±1	-27.0

Note:

$E = EIRP - 20\log D + 104.8$

where:

E = electric field strength in dBμV/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

EIRP=E-104.8+20logD, D=3

Mode	Max. Peak Conducted Output Power (dBm)	Max. tune-up
2.4GWIFI	15.07	15.0±1
Mode	Max. Average Conducted Output Power (dBm)	Max. tune-up
5.2GWIFI	12.96	13.0±1
5.8GWIFI	12.33	13.0±1

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 is refer to section 4, 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				
SRD	-27.0	0.0020	-3.44	0.4529	0.0000	0.2893
2.4GWIFI	16.0	39.8107	2.82	1.9143	0.0152	1.0000
5.2GWIFI	14.0	25.1189	2.86	1.9320	0.0097	1.0000
5.8GWIFI	14.0	25.1189	2.98	1.9861	0.0099	1.0000

Remark:

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

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

7. simultaneous MPE Result

2.4GWIFI MPE (Ratio)	SRD MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.0152	0.0000	0.0152	1.0000
Note:EUT SRD and BT/WIFI function were support different antenna, support simultaneous transmission;			

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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