RF Exposure evaluation

FCC ID: 2AUR8-EBOAIR

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

EBO AIR can only use antennas certificated as follows provided by manufacturer.

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
WIFI ANT 1	FPC antenna	2.4GHz – 2.5 GHz 5.1GHz 5.8 GHz	2.15dBi 3.91dBi 4.05 dBi

5. Conducted power

[2.4GHz WLAN SISO Mode]

Mode	Channel	Frequency	Peak Conducted Output Power (dBm)	Tune_Up
802.11b	1	2412	13.32	13±1
	7	2437	13.08	13±1
	13	2462	12.62	13±1
802.11g	1	2412	16.90	17±1
	7	2437	16.57	17±1
	13	2462	16.50	17±1
802.11n HT20	1	2412	17.07	17±1
	7	2437	16.77	17±1
	13	2462	16.40	17±1
802.11n HT40	3	2422	17.07	17±1
	7	2437	16.94	17±1
	11	2452	16.82	17±1

[5GHz WLAN Band 1 SISO Mode]

Mode	Channel	Frequency	Average Conducted Output Power (dBm)	Tune_Up
802.11a	36	5180	11.23	11±1
	40	5200	12.39	12±1
	48	5240	11.60	12±1
802.11n HT20	36	5180	10.89	11±1
	40	5200	12.03	12±1
	48	5240	12.43	12±1
802.11n HT40	38	5190	13.01	13±1
	46	5230	12.17	13±1
802.11ac VHT20	36	5180	10.78	11±1
	40	5200	11.37	12±1
	48	5240	11.75	12±1
802.11ac VHT40	38	5190	11.02	12±1
	46	5230	12.30	12±1
802.11ac VHT80	42	5210	13.64	13±1

[5GHz WLAN Band 3 SISO Mode]

Mode	Channel	Frequency	Average Conducted Output Power (dBm)	Tune_Up
802.11a	149	5745	10.64	11±1
	157	5785	10.85	11±1
	165	5825	11.72	11±1
802.11n HT20	149	5745	10.64	11±1
	157	5785	10.82	11±1
	165	5825	11.68	11±1
802.11n HT40	151	5755	11.01	11±1
	159	5795	11.37	11±1
802.11ac VHT20	149	5745	10.75	11±1
	157	5785	10.99	11±1
	165	5825	11.21	11±1
802.11ac VHT40	151	5755	10.68	11±1
	159	5795	10.84	11±1
802.11ac VHT80	155	5775	11.32	11±1

1. 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, the RF power density can be obtained.

2.4GHz WLAN

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
IEEE 802.11b	14.00	25.1189	2.15	1.6406	0.0082	1.0000
IEEE 802.11g	18.00	63.0957	2.15	1.6406	0.0206	1.0000
IEEE 802.11n HT20	18.00	63.0957	2.15	1.6406	0.0206	1.0000
IEEE 802.11n HT40	18.00	63.0957	2.15	1.6406	0.0206	1.0000

5GHz WLAN Band 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
IEEE 802.11a	13.00	19.9526	3.91	2.4604	0.0098	1.0000
IEEE 802.11n HT20	13.00	19.9526	3.91	2.4604	0.0098	1.0000
IEEE 802.11n HT40	14.00	25.1189	3.91	2.4604	0.0123	1.0000
IEEE 802.11ac VHT20	13.00	19.9526	3.91	2.4604	0.0098	1.0000
IEEE 802.11ac VHT40	13.00	19.9526	3.91	2.4604	0.0098	1.0000
IEEE 802.11ac VHT80	14.00	25.1189	3.91	2.4604	0.0123	1.0000

5GHz WLAN Band 3

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
IEEE 802.11a	12.00	15.8489	4.05	2.5410	0.0080	1.0000
IEEE 802.11n HT20	12.00	15.8489	4.05	2.5410	0.0080	1.0000
IEEE 802.11n HT40	12.00	15.8489	4.05	2.5410	0.0080	1.0000
IEEE 802.11ac VHT20	12.00	15.8489	4.05	2.5410	0.0080	1.0000
IEEE 802.11ac VHT40	12.00	15.8489	4.05	2.5410	0.0080	1.0000
IEEE 802.11ac VHT80	12.00	15.8489	4.05	2.5410	0.0080	1.0000

Remark:

1. Output power 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.

6. 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----------