

FCC 47 CFR MPE REPORT

Hong Kong Etech Groups Ltd.

Smart Outdoor Plug

Model Number: EST-C-020

Additional Model: EOX3-1002-BLK, EOX3-1002

FCC ID: 2A3ZO-ETS-C-020

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Maximum Permissible Exposure

1. Applicable Standards

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 limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

1.1. Limits for Maximum Permissible Exposure (MPE)

(a) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-10000			5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-10000			1.0	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric Field (V/m)

P = Peak RF output Power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

2. Conducted Power Result

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
BLE	2402	2.96	1.9770
	2440	0.77	1.1940
	2480	-2.6	0.5495
IEEE 802.11b	2412	15.96	39.4457
	2437	15.06	32.0627
	2462	14.02	25.2348
IEEE 802.11g	2412	14.35	27.2270
	2437	13.55	22.6464
	2462	12.32	17.0608
IEEE 802.11n HT20	2412	14.46	27.9254
	2437	13.58	22.8034
	2462	14.08	25.5859
IEEE 802.11n HT40	2422	13.73	23.6048
	2437	12.98	19.8609
	2452	11.65	14.6218

3. Calculated Result and Limit

Mode	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW /cm2)	Limited of Power Density (S) (mW /cm2)	Test Result
				(dBi)	(Linear)			
2.4G Band								
BLE	2.96	2±1	3	-0.68	0.855	0.0004	1	Complies
IEEE 802.11b	15.96	15±1	16	-0.68	0.855	0.0079	1	Complies
IEEE 802.11g	14.35	14±1	15	-0.68	0.855	0.0063	1	Complies
IEEE 802.11n HT20	14.46	14±1	15	-0.68	0.855	0.0063	1	Complies
IEEE 802.11n HT40	13.73	13±1	14	-0.68	0.855	0.0050	1	Complies

End of Test Report

