

FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number	:	68.950.24.0459.01	Date of Issue:	2024-08-12
Model/HVIN	:	HKE2500A-A		
Product Type	:	Split type energy storage power supply		
Applicant	:	Shenzhen Huntkey Electric Co., Ltd.		
Address	:	Huntkey Industrial Park, XueXiang Village Bantian Street, LONGGANG DISTRICT, 518129 Shenzhen, China		
Manufacturer	:	Shenzhen Huntkey Electric Co., Ltd.		
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Test Result	:	<input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative		
Total pages including Appendices	:	9		

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12 & 13, Zhiheng Wisdomland Business Park,
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FCC Registration No.: 514049

FCC Designation Number: CN5009

3 Description of the Equipment Under Test

Product:	Split type energy storage power supply
Model no.:	HKE2500A-A
FCC ID:	2AVYR-HKE2500A-A
Ratings:	44.4VDC, 70Ah, 3108Wh rechargeable Li-ion battery or 10.5-16VDC input or 17-72VDC input or 120VAC 50/60Hz, 15A
RF Transmission Frequency:	2402MHz-2480MHz for Bluetooth Low Energy 2412MHz-2462MHz for 802.11b/g/n20
No. of Operated Channel:	40 for Bluetooth Low Energy 11 for 2.4GHz Wi-Fi
Modulation:	802.11b: BPSK, QPSK, CCK, 802.11g/802.11n20: BPSK, QPSK, 16-QAM, 64-QAM
Antenna Type:	Internal Antenna
Antenna Gain:	-1.81dBi max for 2.4GHz
Description of the EUT:	The Equipment Under Test (EUT) is a Split type energy storage power supply supports Bluetooth Low Energy / 2.4GHz Wi-Fi functions

4 Test Specifications

Test Standards	
ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
KDB 447498 D01	General RF Exposure Guidance v06
CFR § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.

5 General Information

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6 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies with the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

7 FCC MPE Limits

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below). These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

(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 Time (minute) E ² , H ² or S
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
(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 Time (minute) E ² , H ² or S
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
1500-100,000	/	/	1.0	30

f=frequency in MHz

*Plane-wave equivalent power density

8 RF Exposure Evaluation (FCC)

8.1.1 Calculation of Power Density for Single Chain Transmitters

Mode	EIRP (dBm)	EIRP (mW)	R (cm)	S (mW/cm ²)	Limit (mW/cm ²)	MPE Ratio
Bluetooth Low Energy	8.6	7.244	20	0.00144	1.0	0.144%
2.4GHz Wi-Fi	16.6	45.709	20	0.00909	1.0	0.909%

8.1.2 Calculation of Simultaneous Transmission

In order to ensure compliance with the EMF for a controlled environment, the sum of the ratios of the power density to the corresponding EMF should not exceed unity. That is

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

The product also has multiple transmitters. The simultaneous transmission possibilities are as below:

No.	Simultaneous Tx Combination	MPE Ratio	Limit
1	2.4GHz Wi-Fi + Bluetooth Low Energy	1.053%	1.0

8.1.3 Conclusion

According to the table above, we can conclude that the limit percentage of above supporting frequency bands calculation results are less than 1, therefore, the product meets the requirements.

---THE END OF REPORT---