FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number	:	**64.793.21.30977.01**	Date of Issue: 2023-05-09
Model / HVIN	:	C6AM150JC; C6AM150CC; C6AM150CO; C6AM120JC; C6AM120CC; C6AM120CO; C6AM90JC; C6AM90CC; C6AM90CO; C6AM60JC; C6AM60CC; C6AM60CO.	
Product Type	:	DC Electric Vehicle Charging Station	
Applicant	:	XCharge Energy USA Inc	
Address	:	326 N LBJ Dr, Suite 173, San Marcos, TX 78666 United States	
Manufacturer	:	XCharge Energy USA Inc	
Address	:	326 N LBJ Dr, Suite 173, San Marcos, TX 78666 United States	
Test Result	:	■ **Positive** □ **Negative**	
Total pages including Appendices	:	**9**	

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2   Details about the Test Laboratory

Details about the Test Laboratory
Test Site

Company name:	CVC Testing Technology Co., Ltd. No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou,Guangdong,510663, People's Republic of China
Telephone:	+86-20-32293888
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FCC Registration No.:	0029680543
FCC Designation Number:	CN1282

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3   Description of the Equipment Under Test

Product:	DC Electric Vehicle Charging Station
Model no.:	C6AM150JC; C6AM150CC; C6AM150CO; C6AM120JC; C6AM120CC; C6AM120CO; C6AM90JC; C6AM90CC; C6AM90CO; C6AM60JC; C6AM60CC; C6AM60CO.

Brand name: **XCHARGE**

FCC ID:	2BCXO-C6AM
Options and accessories:	N/A
Rating:	Supplied by 3.3VDC for RFID module
RF Transmission Frequency:	RFID ：13.56MHz
	The products contains an approved LTE module, FCC ID: 2APNR-GM500U1A The LTE module supports LTE:Band 2,Band 4, Band 5 and Band 12.
Antenna Type:	Integrated antenna of RFID
Description of the EUT:	EUT is a DC Electric Vehicle Charging Station with RFID card reader, it can be grouped with other modules to act as a DC Charging station
Refer report:	LTE module: SA180521W014 RFID: 64.913.23.30794.01

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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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

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5   General Information

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Prepared By Project Engineer	2022-06-06	Carlos Chen	
	Date	Name	Signature

Approved by	2022-06-06	Samuel Zhang	
	Date	Name	Signature

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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 center 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.

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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

EIRP of RFID was calculate according to C63.10 Annex G.2

$$\text{EIRP} = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t	is the transmitter output power in watts
g_t	is the numeric gain of the transmitting antenna (dimensionless)
E	is the electric field strength in V/m
d	is the measurement distance in meters (m)

Mode	EIRP (mW)	R (cm)	S (mW/cm^2)	Limit (mW/cm^2)
RFID	0.0000000017	20	<0.01	1.0

Below MPE information of LTE was refer from modular MPE test report

Type	Gain (dBi)	EIRP (dBm)	EIRP (mW)	S (mW/cm^2)	Limit (mW/cm^2)
LTE Band 2	4.8	23.0	602.56	0.120	1.0
LTE Band 4	4.8	23.0	602.56	0.120	1.0
LTE Band 5	3.5	23.5	501.187	0.100	0.56
LTE Band 12	3.5	24.0	562.341	0.112	0.47

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	S (mW/cm^2)	Limit (mW/cm^2)
1	RFID+LTE Band 2	0.13	1.0
2	RFID+LTE Band 4	0.13	1.0
3	RFID+LTE Band 5	0.13	1.0
4	RFID+LTE Band 12	0.13	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.

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