FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number	:	**68.950.24.0448.01**	Date of Issue:	2024-04-26
Model	:	**EA-J100, 3WWDZ-45A**		
Product Type	:	EA-J100 Agricultural Spraying Drone		
Applicant	:	SUZHOU EAVISION ROBOTIC TECHNOLOGIES CO., LTD		
Address	:	Room 504&505, Building 2, Nanopolis District II, No.333, Xingpu Road, SIP Suzhou, Jiangsu, China		
Manufacturer	:	SUZHOU EAVISION ROBOTIC TECHNOLOGIES CO., LTD		
Address	:	Room 504&505, Building 2, Nanopolis District II, No.333, Xingpu Road, SIP Suzhou, Jiangsu, China		
Factory	:	SUZHOU EAVISION ROBOTIC TECHNOLOGIES CO., LTD		
Address	:	Unit 1-A, No.3 Workshop, 28 Xiasheng Road, SIP, Suzhou, China		

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 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District Shenzhen 518052 P.R. China
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FCC Registration No.:	514049
FCC Designation Number:	CN5009

3 Description of the Equipment Under Test

Product:	EA-J100 Agricultural Spraying Drone
Model no.:	EA-J100, 3WWDZ-45A
Brand name:	EAVISION
FCC ID:	2AXLB-EA-J100
Rating:	DC 52.22V by Lithium Ion Polmer Rechargeable Battery Battery model: EAV-CTB29000A Max Charge Voltage:59.92V Nominal Voltage:52.22V Rated Capacity:29000mAh
RF Transmission Frequency:	2405-2465MHz for 2.4G 24000-24250MHz for 24G millimeter-wave radar
Antenna Type:	2.4G: External antenna 24G: Microstrip planar antenna
Antenna Gain:	2.4GHz: 2.2dBi Max for Ant1 2.2dBi Max for Ant2 24G: 18.3dBi
Description of the EUT:	The Device under Test (EUT) is an EA-J100 Agricultural Spraying Drone that supports custom 2.4G,24G millimeter wave radar and GPS positioning capabilities.

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
KDB 662911 D01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)
FCC Subpart I	§ 1.1310 Radiofrequency radiation exposure limits

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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.

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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	

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8 RF Exposure Evaluation (FCC)

8.1.1 Calculation of Power Density for Single Chain Transmitters

2.4G

BR:

Mode	Output Power(dBm)	Gain (dBi)	R (m)	S (mW/cm²)	Limit (mW/cm²)
BR-5M	22.45	2.2	0.2	0.058	1.0

Slot:

Ant1:

Mode	Output Power(dBm)	Gain (dBi)	R (m)	S (mW/cm²)	Limit (mW/cm²)
Slot-5M	25.32	2.2	0.2	0.112	1.0
Slot-10M	23.51	2.2	0.2	0.074	1.0
Slot-20M	23.66	2.2	0.2	0.077	1.0
Slot-40M	24.20	2.2	0.2	0.087	1.0

Ant2:

Mode	Output Power(dBm)	Gain (dBi)	R (m)	S (mW/cm²)	Limit (mW/cm²)
Slot-5M	23.66	2.2	0.2	0.077	1.0
Slot-10M	23.32	2.2	0.2	0.071	1.0
Slot-20M	23.58	2.2	0.2	0.075	1.0
Slot-40M	24.35	2.2	0.2	0.090	1.0

MIMO:

Mode	Output Power(dBm)	Gain (dBi)	R (m)	S (mW/cm²)	Limit (mW/cm²)
Slot-5M	27.58	5.21	0.2	0.378	1.0
Slot-10M	26.35	5.21	0.2	0.285	1.0
Slot-20M	26.57	5.21	0.2	0.300	1.0
Slot-40M	27.19	5.21	0.2	0.346	1.0

Note: Directional gain = GANT + 10 log(NANT) dBi, NANT=2

24G

Mode	dBuv/m@3m	EIRP (dBm)	EIRP (mW)	R (m)	S (mW/cm²)	Limit (mW/cm²)
24G	94.34	-0.86	0.82	0.2	0.0002	1.0

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

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

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

No.	Simultaneous Tx Combination	S (mW/cm²)	Limit (mW/cm²)
1	BR+24G	0.0582	1.0
2	Slot+24G	0.3782	1.0

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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