FCC Maximum Permissible Exposure (MPE) Estimation Report

Report Number	:	68.910.24.0047.01	Date of Issue:	2024-09-06
Model/HVIN	:	AD01A		
Product Type	:	DJI Avinox Display		
Applicant	:	SZ DJI TECHNOLOGY CO., LTD.		
Address	:	Lobby of T2, DJI Sky City, No. 53 Xianyuan Road, Xili Community, Xili Street, Nanshan District, Shenzhen, China		
Manufacturer	:	SZ DJI TECHNOLOGY CO., LTD.		
Address	:	Lobby of T2, DJI Sky City, No. 53 Xianyuan Road, Xili Community, Xili Street, Nanshan District, Shenzhen, China		
Factory	:	DJI BW Technology Company Ltd.		
Address	:	Room 101, Building 12, Baiwangxin Industrial Park, 1002 Songbai Road, Sunshine Community, Xili Street, Nanshan District, Shenzhen		
Test Result	:	n Positive o Negative		
Total pages including Appendices	:	10		

Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details, please see testing and certification regulation, chapter A-3.4.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

1 Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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, Guangdong, China
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299
FCC Registration No.:	514049
FCC Designation Number:	CN5009

3 Description of the Equipment Under Test

Product:	DJI Avinox Display
Model no.:	AD01A
Hardware Version Identification No. (HVIN)	AD01A
Product Marketing Name (PMN)	DJI Avinox Display
Brand name:	DJI
FCC ID:	SS3-AD01A24
IC:	11805A-AD01A24
Options and accessories:	NA
Rating:	24VDC (by E-bike's battery)
RF Transmission Mode:	LTE, BLE, ANT+
Antenna Type:	For LTE: Internal FPC PIFA antenna For BLE and ANT+: Internal FPC monopole antenna

LTE Antenna Gain

band 2	-7.11dBi	band 25	-7.11dBi
band 4	-7.78dBi	band 26(824-849MHz)	-6.51dBi
band 5	-7.66dBi	band 26(814-824MHz)	-6.51dBi
band 7	-1.51dBi	band 38	-2.03dBi
band 12	-4.72dBi	band 41	-0.43dBi
band 13	-5.00dBi	band 66	-7.78dBi

BLE and ANT+ Antenna Gain	0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a DJI Avinox Display which support LTE function, Low Energy Bluetooth(1M&2M) function and ANT+ function. Only Low Energy Bluetooth function is included in this report.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
NOTE 2: EUT contains a certified LTE single module under FCC ID: XMR2023EG916QGL. But the LTE antenna in the EUT is replaced with lower gain antenna.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

5 General Information

Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details, please see testing and certification regulation, chapter A-3.4.

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:
Eric LI	Kevin DU
EMC Project Manager	Project Engineer

Date of Issue: 2024-09-06

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

8 RF Exposure Evaluation (FCC)

8.1.1 Calculation of Power Density for Single Chain Transmitters

For LTE

Band	Max. Power (dBm)	Max. Antenna Gain	Max. EIRP (dBm)	Max. EIRP（mW）	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratio
LTE Band 2	25.00	-7.11	17.89	61.52	0.012	1.000	0.012
LTE Band 4	25.00	-7.78	17.22	52.72	0.010	1.000	0.010
LTE Band 5	25.00	-7.66	17.34	54.20	0.011	0.549	0.020
LTE Band 7	25.00	-1.51	23.49	223.36	0.044	1.000	0.044
LTE Band 12	25.00	-4.72	20.28	106.66	0.021	0.466	0.046
LTE Band 13	25.00	-5.00	20.00	100.00	0.020	0.518	0.038
LTE Band 25	25.00	-7.11	17.89	61.52	0.012	1.000	0.012
LTE Band 26 (814-824MHz)	25.00	-6.51	18.49	70.63	0.014	0.549	0.026
LTE Band 26 (824-849MHz)	25.00	-6.51	18.49	70.63	0.014	0.549	0.026
LTE Band 38	25.00	-2.03	22.97	198.15	0.039	1.000	0.039
LTE Band 41	25.00	-0.43	24.57	286.42	0.057	1.000	0.057
LTE Band 66	25.00	-7.78	17.22	52.72	0.010	1.000	0.010

Note1: The conducted power data of LTE is quoted from LTE module's FCC MPE report (PD20230223RF02) which is already published on FCC website. The antenna gains are got form EUT's antenan specification which is provided by the manufacture.
Note2: For mobile or fixed location transmitters, minimum separation distance is 20cm, even if calculations indicate EMF distance is less.
Note3: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
Note4: Chose the maximum RF output tune up power of all antennas among same frequency WWAN bands a the maximum antenna gain to perform MPE calculation conservatively.

For BLE and ANT+

Mode	EIRP (dBm)	EIRP (mW)	R (cm)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratio
BLE	3.30	2.14	20	0.00043	1.000	0.00043
ANT+	-6.41	0.23	20	0.00005	1.000	0.00005

Note: For ANT+, the EIRP is is calculated using the equation EIRP=E + 20log(D)-104.7, where D is measurement distance in meters, EIRP is in dBm, E is in dBuV/m. Refer to the RF report 68.910.24.0046.01, D=3 meters, E=88.75 dBμV/m.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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	LTE & BLE	0.05743	1.0
2	LTE & ANT+	0.05705	1.0

Note 1: Each band of LTE is using the same antenna and do not support simultaneous transmission, so the worst case of LTE MPE Ratio (band 41) is chosen to calculate the Simultaneous Transmission

Note 2: BLE & ANT+ share the same antenna and do not support simultaneous transmission.

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.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299