FCC RF Exposure Evaluation

1. Product Information

FCC ID	2APVH-DIVA-R01
Product Name	Smart aircraft
Test Model	DIVA-01
Power Supply	DC 11.4V by Rechargeable Li-ion Battery, 2250mAh, 25.65Wh
Frequency Range	5745-5805MHz
Channel Number	4 channels for 20MHz bandwidth(5745-5805MHz)
Modulation Type	IEEE 802.11a/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Type	External Antenna
Antenna Gain	Internal antenna: ANT0: External Antenna, 3.28dBi(Max.) ANT1: External Antenna, 3.24dBi(Max.)
Hardware Version	FLY302-V04
Software Version	1.2.9
Exposure Category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Device

2. Evaluation Method and Limit

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Refer Evaluation Method

ANSI C95.1–2019: IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz.
FCC KDB publication 447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
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

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	($180/f^2$)*	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

4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

5. Antenna Information

ZJ-MWIR-RGB can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna 0	Internal Antenna	5000 MHz – 6000 MHz	3.28dBi	WLAN Antenna
Antenna 1	Internal Antenna	5000 MHz – 6000 MHz	3.24dBi	WLAN Antenna

6.Conducted Power Results

[5.8WIFI Max Conducted Power]

Mode	Channel	Frequency (MHz)	ANT 0 Max Conducted Power(dBm)	ANT 1 Max Conducted Power(dBm)
11A	149	5745	12.59	13.69
	157	5785	12.97	13.44
	161	5805	13.14	13.59
11N20 SISO	149	5745	12.19	12.71
	157	5785	12.83	13.46
	161	5805	12.57	12.69

7.Manufacturing Tolerance

<5.8G WLAN>

11A						
Channel	Channel 149		Channel 157		Channel 161	
	ANT 0	ANT 1	ANT 0	ANT 1	ANT 0	ANT 1
Target (dBm)	12.0	13.0	12.0	13.0	13.0	13.0
Tolerance ±(dB)	1.0		1.0		1.0	
11N20 SISO						
Channel	Channel 149		Channel 157		Channel 161	
	ANT 0	ANT 1	ANT 0	ANT 1	ANT 0	ANT 1
Target (dBm)	12.0	12.0	12.0	13.0	12.0	12.0
Tolerance ±(dB)	1.0		1.0		1.0	

8. Evaluation Results

8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

ANT 0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
11A	14.0	25.1189	3.28	2.1281	0.010640	1.0000
11N20 SISO	13.0	19.9526	3.28	2.1281	0.008452	1.0000

ANT 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
11A	14.0	25.1189	3.24	2.1086	0.010543	1.0000
11N20 SISO	14.0	25.1189	3.24	2.1086	0.010543	1.0000

Remark:
1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

8.2 Simultaneous Transmission MPE

The sample support one modular and supports two antennas, need consider simultaneous transmission;
According to KDB447498 D01 General RF Exposure Guidance v06 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
∑ of MPE ratios ≤ 1.0

Simultaneous Transmission MPE			
Mode	∑ MPE ratios	Limit	Results
5.8G WLAN(ANT 0) + 5.8GWLAN(ANT 1)	0.008452+0.010543=0.018995	1.0000	PASS

9.Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

.....THE END OF REPORT.....