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RF Exposure Evaluation Report

Report No. : CQASZ20210400504E-03
Applicant: ODYSSEY TOYS
Address of Applicant: 20855 NE 16 AVE, C-22, MIAMI, FL 33179, MIAMI Florida, United States
Equipment Under Test (EUT):
Product: DRONE
Model No.: ODY-1962
Brand Name: N/A
FCC ID: 2ANNB-ODY-1962
2ANNB-ODY-1962W
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Test: 2021-04-20 to 2021-5-10
Date of Issue: 2021-5-10
Test Result : PASS*

Tested By:

Lewis Zhou

(Lewis Zhou)

Reviewed By:

Jun Li

(Jun Li)

Approved By:

Sheek Luo

(Sheek Luo)



* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20210400504E-03	Rev.01	Initial report	2021-5-6

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3 General Information

3.1 Client Information

Applicant:	ODYSSEY TOYS
Address of Applicant:	20855 NE 16 AVE, C-22, MIAMI, FL 33179, MIAMI Florida, United States
Manufacturer:	ODYSSEY TOYS
Address of Manufacturer:	20855 NE 16 AVE, C-22, MIAMI, FL 33179, MIAMI Florida, United States
Factory:	Shantou Chenghai Zhangbo toys factory
Address of Factory:	Chenghai District,Shantou City,Guangdong Province, China

3.2 General Description of EUT

Name:	DRONE
Model No.:	ODY-1962
Trade Mark :	N/A
Hardware Version:	ver1.2
Software Version:	ver2.3
Frequency Range:	2408MHz ~ 2474MHz
Modulation Type:	FSK
Number of Channels:	34 (declared by the client)
Sample Type:	Portable product
Antenna Type:	PCB antenna
Antenna Gain:	0dBi
Power Supply:	EUT is powered by 3*AAA size batteries.

3.3 General Description of 2.4G WIFI

Product Name:	DRONE
Model No.:	ODY-1962
Trade Mark:	N/A
Hardware version:	ver1.2
Software version:	ver2.3
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM, QPSK,BPSK)
Transfer Rate:	IEEE for 802.11b: 1Mbps/2Mbps/5.5Mbps/11Mbps IEEE for 802.11g : 6Mbps/9Mbps/12Mbps/18Mbps/24Mbps/36Mbps/48Mbps/54Mbps IEEE for 802.11n(HT20) : 6.5Mbps/13Mbps/19.5Mbps/26Mbps/39Mbps/52Mbps/58.5Mbps/65Mbps
Product Type:	☒ Mobile ☐ Portable ☐ Fix Location
Test Software of EUT:	MFG_V2.7.2_For_YLS
Antenna Type:	internal antenna with ipex connector
Antenna Gain:	0dBi
Power Supply:	lithium battery:3.7V 1.48wh 400mAh; DC 5V Charge by Adaptor

4 SAR Evaluation

4.1 FCC RF Exposure Compliance Requirement

4.1.1 Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v06

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

4.1.2 Limits

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{[\sqrt{f(\text{GHz})}]^2} \right] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

$f(\text{GHz})$ is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation¹⁷

The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

4.1.3 EUT RF Exposure

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

where:

p_t = transmitter output power in watts,

g_t = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, $10^{((dB_{\mu V/m})/20)/10^6}$,

d = measurement distance in meters (m)---3m,

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

The worst case (refer to report CQASZ20210400504E-01) is below:

Antenna polarization: Horizontal		
Frequency (MHz)	Level (dB μ V/m)	Value
2440	90.77	Peak

For 2474MHz:

Field strength = 90.77dB μ V/m @3m

Ant. gain 0dBi; so Ant numeric gain=1.0

$$\text{So } p_t = \{ [10^{(90.77/20)} / 10^6 \times 3]^2 / 30 / 1.0 \} \times 1000 \text{mW} = 0.358$$

$$\text{So } (0.358 \text{mW} / 5 \text{mm}) \times \sqrt{2.474 \text{GHz}} = 0.1127,$$

$$0.1127 < 3.0 \text{ for 1-g SAR}$$

So the SAR test is not required.

5 MPE Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limitst

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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				
0.3–1.34	614	1.63	*(100)	30
1.34–30	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

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

5.1.3 EUT RF Exposure

1) For 2.4G WIFI

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.6	10.5±1	11.5	14.125
Middle(2437MHz)	13.4	12.5±1	13.5	22.387
Highest(2462MHz)	13.12	12±1	13	19.953
802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	13.38	12.5±1	13.5	22.387
Middle(2437MHz)	14.88	14±1	15	31.623
Highest(2462MHz)	14.71	14±1	15	31.623
802.11n(HT20)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	13.36	12.5±1	13.5	22.387
Middle(2437MHz)	14.86	14±1	15	31.623
Highest(2462MHz)	14.62	14±1	15	31.623

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
31.623	0	0.0063	1.0	PASS

Note: 1) Refer to report No. CQASZ20210400504E-02 for EUT test Max Conducted Average Output Power value.

$$2) P_d = (P_{out} * G) / (4 * \pi * R^2) = (31.623 * 1.0) / (4 * 3.1416 * 20^2) = 0.0063$$