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RF Exposure Evaluation Report

Report No. : CQASZ171101538EW-02

Applicant: Zhuhai Kaihao Electronics Co., Ltd

Address of Applicant: 2nd Floor, Building C, No.3 Pinggongyi Road, Zhuhai, Guangdong, China.

Manufacturer: Zhuhai Kaihao Electronics Co., Ltd

Address of Manufacturer: 2nd Floor, Building C, No.3 Pinggongyi Road, Zhuhai, Guangdong, China.

Factory: Zhuhai Kaihao Electronics Co., Ltd

Address of Factory: 2nd Floor, Building C, No.3 Pinggongyi Road, Zhuhai, Guangdong, China.

Equipment Under Test (EUT):

Product: Vacuum Cleaner

Model No.: IMASS-A3 (other models please see page 5)

Brand Name: IMASS

FCC ID: 2AOIAZGSXWDXXLS

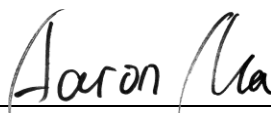
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06

Date of Test: 2018-01-08 to 2018-01-09

Date of Issue: 2018-01-09

Test Result : PASS*

Tested By:


(Aaron Ma)

Reviewed By:


(Owen Zhou)

Approved By:


(Jack Ai)



* 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.

2 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ171101538EW-02	Rev.01	Initial report	2018-01-09

3 Contents

	Page
1 COVER PAGE.....	1
2 VERSION	2
3 CONTENTS	3
4 GENERAL INFORMATION.....	4
4.1 CLIENT INFORMATION.....	4
4.2 GENERAL DESCRIPTION OF EUT	4
5 RF EXPOSURE EVALUATION	6
5.1 RF EXPOSURE COMPLIANCE REQUIREMENT	6
5.1.1 Limits	6
5.1.2 Test Procedure	6
5.2 1.1.3 EUT RF EXPOSURE EVALUATION	7

4 General Information

4.1 Client Information

Applicant:	Zhuhai Kaihao Electronics Co., Ltd.
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Factory:	Zhuhai Kaihao Electronics Co., Ltd.
Address of Factory:	2nd Floor, Building C, No.3 Pinggongyi Road, Zhuhai, Guangdong, China

4.2 General Description of EUT

Product Name:	Vacuum Cleaner
Model No.:	IMASS-A3 (other models please see page 5)
Trade Mark:	IMASS
Hardware Version:	A3_V1.3
Software Version:	A3_SDK_V1.9
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 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 and HT40) : OFDM (64QAM, 16QAM, QPSK,BPSK)
Sample Type:	portable production
Test Software of EUT:	RF test (manufacturer declare)
Antenna Type:	internal antenna with ipex connector
Antenna Gain:	4dBi
Power Supply:	Adaptor: Model: K25V220100U Input: AC100-240V 50/60Hz 0.6A Output:DC22.0V .01A Rechargeable battery : Model: 18650 DC14.8V, 2500mAh; Charge by Adaptor

Note:

1. All model:

IMASS-A3-YWW, IMASS-A3-YWR, IMASS-A3-YWP, IMASS-A3-YWO, IMASS-A3-YWG, IMASS-A3-YWB,
IMASS-A3-YCW, IMASS-A3-YCR, IMASS-A3-YCP, IMASS-A3-YCO, IMASS-A3-YCG, IMASS-A3-YCB,
IMASS-A3-TWR, IMASS-A3-TWP, IMASS-A3-TWO, IMASS-A3-TWG, IMASS-A3-TWB, IMASS-A3-TCR,
IMASS-A3-TCP, IMASS-A3-TCO, IMASS-A3-TCG, IMASS-A3-TCB, IMASS-A3-HDVY, IMASS-A3-HDPB,
IMASS-A3S/A3S, IMASS-A3-TAG, IMASS-A3-TAO, IMASS-A3-YAO, IMASS-A3-YVCB, IMASS-A3-YAW,
IMASS-A3-YCBK, IMASS-A3-YAVS, IMASS-A3-YVB, IMASS-A3-YVS, IMASS -A3-YCEBK,
IMASS-A3-YCBA, IMASS-A3-TAWG, IMASS-A3-TACG, IMASS -A3-YVECB, IMASS -A3-YVES,
IMASS-A3-TCEG, IMASS-A3-TAEO, IMASS-A3-TAEWG, IMASS-A3-YAEW, A3-TAGB, A3-YVECB,
A3-TECO, A3-TECG, A3-TAEGB, A3-TAERR, A3-YAVB, A3-YAVS, A3-TWGB, A3-YAVES, A3-YVEWB,
A3-YAVG, A3-YAVEB, A3-TARR, IMASS-A3

2. Only the model IMASS-A3, was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

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.

5.2 1.1.3 EUT RF Exposure Evaluation

For WIFI

Antenna Gain: 4.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.51 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	11.47
Middle(2437MHz)	11.67
Highest(2462MHz)	11.23
802.11g mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	9.94
Middle(2437MHz)	10.25
Highest(2462MHz)	10.06
802.11n(HT20)mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	7.97
Middle(2437MHz)	8.12
Highest(2462MHz)	7.95
802.11n(HT40)mode	
Test channel	Average Output Power (dBm)
Lowest(2422MHz)	7.84
Middle(2437MHz)	7.96
Highest(2452MHz)	7.89

802.11b(worst case)

Channel	Frequency (MHz)	Max Conducted average Output Power (dBm)	Output Power to Antenna (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Middle	2437	11.67	14.69	4.0	0.0073	1.0	PASS

Note: 1) Refer to report No. CQASZ171101538EW-01 for EUT test Max Conducted average Output Power value.

$$2) Pd = (Pout * G) / (4 * \pi * R^2) = (14.69 * 2.51) / (4 * 3.1416 * 20^2) = 0.0073$$