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RF Exposure Evaluation Report

Report No.: CQASZ20220200263E-02
Applicant: Shenzhen Inkbird Technology Co., Ltd.
Address of Applicant: Room 1803, Guowei Building, NO.68 Guowei Road, Xianhu Community, Liantang, Luohu District, Shenzhen, China
Equipment Under Test (EUT):
EUT Name: Smart Sprinkler Controller
Model No.: IIC-800-WIFI, IIC-400-WIFI, IIC-600-WIFI, IIC-1200-WIFI, IIC-800, IIC-400, IIC-600, IIC-1200
Test Model No.: IIC-800-WIFI
Brand Name: INKBIRD
FCC ID: 2AYZDIIC-800-WIFI
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2022-02-24
Date of Test: 2022-02-24 to 2022-03-04
Date of Issue: 2022-03-09
Test Result: PASS*

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

Tested By: Lewis Zhou

(Lewis Zhou)

Reviewed By: Rock Huang

(Rock Huang)

Approved By: Jack Ai

(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20220200263E-02	Rev.01	Initial report	2022-03-09

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3 General Information

3.1 Client Information

Applicant:	Shenzhen Inkbird Technology Co., Ltd.
Address of Applicant:	Room 1803, Guowei Building, NO.68 Guowei Road, Xianhu Community, Liantang, Luohu District, Shenzhen, China
Manufacturer:	Shenzhen Inkbird Technology Co., Ltd.
Address of Manufacturer:	Room 1803, Guowei Building, NO.68 Guowei Road, Xianhu Community, Liantang, Luohu District, Shenzhen, China
Factory:	Shenzhen Inkbird Technology Co., Ltd.
Address of Factory:	Room 1803, Guowei Building, NO.68 Guowei Road, Xianhu Community, Liantang, Luohu District, Shenzhen, China

3.2 General Description of EUT

Product Name:	Smart Sprinkler Controller
Model No.:	IIC-800-WIFI, IIC-400-WIFI, IIC-600-WIFI, IIC-1200-WIFI, IIC-800, IIC-400, IIC-600, IIC-1200
Test Model No.:	IIC-800-WIFI
Trade Mark:	INKBIRD
Software Version:	V1.0
Hardware Version:	REV.A
EUT Power Supply:	MODEL: SX48-241000 INPUT: 100-240V~ 50/60Hz 0.3A OUTPUT: 24V= 1000mA

3.3 General Description of 2.4G WLAN

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:	AmebaZ2_mptool_1v3
Antenna Type:	PCB antenna
Antenna Gain:	2.5dBi

Note:

Model No.: IIC-800-WIFI, IIC-400-WIFI, IIC-600-WIFI, IIC-1200-WIFI, IIC-800, IIC-400, IIC-600, IIC-1200

Only the model IIC-800-WIFI 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.

4 MPE Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 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.

4.1.2 Test Procedure

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

4.1.3 EUT RF Exposure

1) For 2.4G WIFI Classic

Antenna Gain: 2.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.778 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

11B mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	14.60	14.5±1	15.5	35.481
Middle(2437MHz)	15.62	15.5±1	16.5	44.668
Highest(2462MHz)	15.04	15.0±1	16.0	39.811
11G mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	16.83	16.5±1	17.5	56.234
Middle(2437MHz)	16.75	16.5±1	17.5	56.234
Highest(2462MHz)	16.17	16.0±1	17.0	50.119
11N20 mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	13.62	13.5±1	14.5	28.183
Middle(2437MHz)	14.46	14.5±1	15.5	35.481
Highest(2462MHz)	14.21	14.5±1	15.5	35.481

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm²)	Limit	Result
56.234	2.5	0.0198943214	1.0	PASS

Note: 1) Refer to report No. CQASZ20220200263E-01 for EUT test Max Conducted Peak Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (56.234 * 1.778) / (4 * 3.1416 * 20^2) = 0.0198943214$

3) EUT's module is more than 20cm away from the human body.

*** END OF REPORT ***