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RF Exposure Evaluation Report

Report No.: CQASZ20200800830E-02
Applicant: Shenzhen Shenan Yangguang Electronics Co., Ltd
Address of Applicant: Buliding 9, No.18 of Makan Rd, Xili, Nanshan, Shenzhen 518055 China
Equipment Under Test (EUT):
Product: niwa grow hub
Model No.: SH-NP01
Brand Name: niwa
FCC ID: 2AR3P-SH-NP01
Standards: 47 CFR Part 1.1307
47 CFR Part 2.1093
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2020-08-10
Date of Test: 2020-08-10 to 2020-08-19
Date of Issue: 2020-08-19
Test Result: **PASS***

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

Tested By: Martin Lee
(Martin Lee)

Reviewed By: Sheek Luo
(Sheek Luo)

Approved By: Jack Ai
(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20200800830E-02	Rev.01	Initial report	2020-08-19

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3 General Information

3.1 Client Information

Applicant:	Shenzhen Shenan Yangguang Electronics Co., Ltd
Address of Applicant:	Buliding 9, No.18 of Makan Rd, Xili, Nanshan, Shenzhen 518055 China
Manufacturer:	Shenzhen Shenan Yangguang Electroncis Co., Ltd
Address of Manufacturer:	SSG Group, No.18, Makan Industrial Park,Xili, Nanshan, Shenzhen, China, 518055
Factory:	Shenzhen Shenan Yangguang Electroncis Co., Ltd
Address of Factory:	SSG Group, No.18, Makan Industrial Park, Xili, Nanshan, Shenzhen, China, 518055

3.2 General Description of EUT

Product Name:	niwa grow hub
Model No.:	SH-NP01
Trade Mark:	niwa
Hardware version:	V1.0
Software version:	V1.0.1
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:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Test Software of EUT:	EspRFtestTool (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	2.0 dBi
Power Supply:	120V60Hz

4 SAR 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 WIFI

Antenna Gain: 2.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

IEEE for 802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	13.45	13.0±1	14.0	25.119
Middle(2437MHz)	13.69	13.0±1	14.0	25.119
Highest(2462MHz)	13.73	13.0±1	14.0	25.119
IEEE for 802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.57	11.0±1	12.0	15.849
Middle(2437MHz)	11.85	11.0±1	12.0	15.849
Highest(2462MHz)	12.22	11.5±1	12.5	17.783
IEEE for 802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.95	11.0±1	12.0	15.849
Middle(2437MHz)	12.41	11.5±1	12.5	17.783
Highest(2462MHz)	12.05	11.5±1	12.5	17.783

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
25.119	2.0	0.0079	1.0	PASS

Note: 1) Refer to report No. CQASZ20200800830E-01 for EUT test Max Conducted average Output Power value.

$$2) Pd = (Pout * G) / (4 * \pi * R^2) = (25.119 * 1.58) / (4 * 3.1416 * 20^2) = 0.0079$$