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Report Template Version: V03
Report Template Revision Date: Mar.1st, 2017

RF Exposure Evaluation Report

Report No. :	CQASZ20200700759E-02
Applicant:	Shenzhen Shenan Yangguang Electronics Co.,Ltd.
Address of Applicant:	Building 9, No.18 of Makan Rd, Xili, Nanshan Shenzhen 518055, China
Equipment Under Test (EUT):	
Product:	WiFi Water Leakage Sensor
Model No.:	WL08-W1, WL08-W2, WL08-W3, WL08-W4, WL08-W5, WL08-W6, WL08-W7, WL08-W8
Test Model No.:	WL08-W1
Brand Name:	N/A
FCC ID:	2AR3P-WL08-W1
Standards:	47 CFR Part 1.1307 47 CFR Part 2.1093 KDB447498D01 General RF Exposure Guidance v06
Date of Receipt:	2020-07-27
Date of Test:	2020-07-27 to 2020-08-13
Date of Issue:	2020-08-13
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)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20200700759E-02	Rev.01	Initial report	2020-08-13

2 Contents

3 General Information

3.1 Client Information

Applicant:	Shenzhen Shenan Yangguang Electronics Co.,Ltd.
Address of Applicant:	Building 9, No.18 of Makan Rd, Xili, Nanshan Shenzhen 518055, China
Manufacturer:	Shenzhen Shenan Yangguang Electronics Co.,Ltd.
Address of Manufacturer:	Building 9, No.18 of Makan Rd, Xili, Nanshan Shenzhen 518055, China

3.2 General Description of EUT

Product Name:	WiFi Water Leakage Sensor
Model No.:	WL08-W1, WL08-W2, WL08-W3, WL08-W4, WL08-W5, WL08-W6, WL08-W7, WL08-W8
Test Model No.:	WL08-W1
Trade Mark:	N/A
Hardware version:	V1.0
Software version:	V1.0
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:	ESP Series Modules FCC & CE Test Tool V2.2.2(manufacturer declare)
Antenna Type:	Ceramic antenna
Antenna Gain:	2.0 dBi
Power Supply:	DC 3V

Note:
Model No.: WL08-W1, WL08-W2, WL08-W3, WL08-W4, WL08-W5, WL08-W6, WL08-W7, WL08-W8
Only the model WL08-W1 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, pack and model name.

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: $Pd = (Pout*G)/(4* Pi * R^2)$

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd id 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)	12.76	12.0±1	13.0	19.953
Middle(2437MHz)	12.85	12.0±1	13.0	19.953
Highest(2462MHz)	12.98	12.5±1	13.0	19.953
IEEE for 802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.78	11.0±1	12.0	15.849
Middle(2437MHz)	11.51	11.0±1	12.0	15.849
Highest(2462MHz)	11.85	11.0±1	12.0	15.849
IEEE for 802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.72	11.0±1	12.0	15.849
Middle(2437MHz)	11.55	11.0±1	12.0	15.849
Highest(2462MHz)	11.81	11.0±1	12.0	15.849

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
19.953	2.0	0.0063	1.0	PASS

Note: 1) Refer to report No. CQASZ20200700759E-01 for EUT test Max Conducted average Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(19.953*1.58)/(4*3.1416*20^2)=0.0063$