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RF Exposure Evaluation Report

Report No. : CQASZ20190900980E-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):
EUT Name: WiFi Contact Sensor
All Model No.: SA-MC08-W1, SA-MC08-W3, SA-MC08-W5, SA-MC08-W6, SA-MC08-W7,
SA-MC08-W8, SA-MC08-W9, SA-MC08-W10, SA-MC08-W11,
SA-MC08-XX(XX=W12~W99)
Test Model No.: SA-MC08-W1
Brand Name: N/A
FCC ID: 2AR3P-SA-MC08
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2019-09-26
Date of Test: 2019-09-26 to 2019-10-09
Date of Issue: 2019-10-10
Test Result : PASS*

Tested By:

Tom Chen

(Tom chen)

Reviewed By:

Sheek Luo

(Sheek Luo)

Approved By:

Jack Ai

(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.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20190900980E-02	Rev.01	Initial report	2019-10-10

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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 Contact Sensor
All Model No.:	SA-MC08-W1, SA-MC08-W3, SA-MC08-W5, SA-MC08-W6, SA-MC08-W7, SA-MC08-W8, SA-MC08-W9, SA-MC08-W10, SA-MC08-W11, SA-MC08-XX(XX=W12~W99)
Test Model No.:	SA-MC08-W1
Trade Mark:	N/A
Hardware Version:	V1.0
Software Version:	V1.0
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Power Supply:	lithium battery:DC3.0V

3.3 General Description of WIFI

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)
Test Software of EUT:	ESP Series Modules FCC & CE Test Tool V2.2.2.0 (manufacturer declare)
Antenna Type:	Ceramic antenna
Antenna Gain:	2.0dBi

Model No.: SA-MC08-W1, SA-MC08-W3, SA-MC08-W5, SA-MC08-W6, SA-MC08-W7, SA-MC08-W8, SA-MC08-W9, SA-MC08-W10, SA-MC08-W11, SA-MC08-XX(XX=W12~W99)

Only the model SA-MC08-W1 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being the outer color.

4 RF Exposure 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.

4.2 1.1.3 EUT RF Exposure Evaluation

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

802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	8.79	8.0±1	9.0	7.943
Middle(2437MHz)	8.3	7.5±1	8.5	7.079
Highest(2462MHz)	8.89	8.0±1	9.0	7.943
802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	7.66	7.0±1.0	8.0	6.310
Middle(2437MHz)	7.92	7.0±1.0	8.0	6.310
Highest(2462MHz)	8.38	7.5±1.0	8.5	7.079
802.11n(HT20)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	8.41	7.5±1.0	8.5	7.079
Middle(2437MHz)	8.35	7.5±1.0	8.5	7.079
Highest(2462MHz)	8.65	8.0±1.0	9.0	7.943

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
7.943	2.0	0.0025	1.0	PASS

Note: 1) Refer to report No. CQASZ20190900980E-01 for EUT test Max Conducted average Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (7.943 * 1.0) / (4 * 3.1416 * 20^2) = 0.0025$