



Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640

Fax: +86-755-26648637

Website: www.cqa-cert.com

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RF Exposure Evaluation Report

Report No. : CQASZ20200300110E-02
Applicant: Ecobloom Sweden AB
Address of Applicant: Fyrverkarbacken 23 112 60 Stockholm Sweden
Equipment Under Test (EUT):
Product: EcoGarden / Ecogarden
Model No.: EcoGarden
Brand Name: N/A
FCC ID: 2A3LD-ECOGARD
Standards: 47 CFR Part 1.1307
47 CFR Part 2.1091
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2020-03-03
Date of Test: 2020-03-03 to 2020-03-09
Date of Issue: 2021-10-29
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
CQASZ20200300110E-02	Rev.01	Initial report	2021-10-29

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3 General Information

3.1 Client Information

Applicant:	Ecobloom Sweden AB
Address of Applicant:	Fyrverkarbacken 23 112 60 Stockholm Sweden
Manufacturer:	Ecobloom Sweden AB
Address of Manufacturer:	Fyrverkarbacken 23 112 60 Stockholm Sweden

3.2 General Description of EUT

Product Name:	EcoGarden / Ecogarden
Model No.:	EcoGarden
Trade Mark:	N/A
Hardware version:	ESP-12F
Software version:	MOS
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 Swries Modules FCC & CE Test Tool V2.2.2.0 (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	-0.58dBi
Power Supply:	Adapter MODEL: ND120P250PGS/45193 Input: 100V-240V~50/60Hz 600Ma Output: 12V 2.5A 30VA

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: -0.58dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.87 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)	13.19	12.5±1	13.5	22.387
Middle(2437MHz)	13.59	13.0±1	14.0	25.119
Highest(2462MHz)	14.12	13.5±1	14.5	28.184
IEEE for 802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.76	11.0±1	12.0	15.849
Middle(2437MHz)	12.22	11.5±1	12.5	17.783
Highest(2462MHz)	13.01	12.5±1	13.5	22.387
IEEE for 802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.34	10.5±1	11.5	14.125
Middle(2437MHz)	11.67	11.0±1	12.0	15.849
Highest(2462MHz)	12.33	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
28.184	-0.58	0.0049	1.0	PASS

Note: 1) Refer to report No. CQASZ20200300110E-01 for EUT test Max Conducted average Output Power value.

$$2) P_d = (P_{out} * G) / (4 * \pi * R^2) = (28.184 * 0.87) / (4 * 3.1416 * 20^2) = 0.0049$$