EN 62311:2008
ASSESSMENT REPORT

For

ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD

Suite 204, Block 2, 690 Bibo Road, Zhang Jiang Hi-Tech Park, Shanghai, China

Tested Model: ESP32-WROOM-32E

Report Type: Original Report	**Product Type:** Wi-Fi & Bluetooth Internet of Things Module

Test Engineer:	Chao Gao
Report Number:	RSHD200218007-01D
Report Date:	2020-04-02
Reviewed By:	Oscar Ye EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp**.** This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD
Tested Model	ESP32-WROOM-32E
Product Type	Wi-Fi & Bluetooth Internet of Things Module
Power Supply	DC 3.3V
RF Function	2.4G Wi-Fi, BLE, Classic BT
Operating Band/Frequency	2.4G Wi-Fi: 2412-2472MHz, BLE & Classic BT: 2402-2480 MHz
Channel Number	2.4G Wi-Fi: 13, BLE: 40, Classic BT: 79
Channel Separation	2.4G Wi-Fi: 5MHz, BLE: 2MHz, Classic BT: 1MHz
Antenna Type	PCB Antenna
Antenna Gain	3.4dBi

**All measurement and test data in this report was gathered from production sample serial number: 20200218007. (Assigned by the BACL. The EUT supplied by the applicant was received on 2020-02-18)*

Objective

This report is prepared on behalf of *ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD* in accordance with EN 62311:2008, Generic standard to demonstrate the compliance of electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0 Hz–300 GHz) is to demonstrate the compliance of apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields as well as induced and contact current.

The objective is to determine the compliance of EUT with EN 62311:2008.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with EN 62311:2008.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

Technical Requirements Specification in EN 62311

General Description of Applied Standards

EN 62311 Generic standard to demonstrate the compliance of electronic and electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0 Hz–300 GHz) is to demonstrate the compliance of apparatus with the basic restrictions or reference levels on exposure of the general public related to electric, magnetic, electromagnetic fields as well as induced and contact current.

RF Exposure Evaluation

Limit:

According to EN 62311, the criteria listed in the below table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified table 2 of Council Recommendation 1999/519/EC.

Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz, unperturbed rms values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m^2)
0-1 Hz	—	$3,2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	4 000/f	5 000/f	—
0,025-0,8 kHz	250/f	4/f	5/f	—
0,8-3 kHz	250/f	5	6,25	—
3-150 kHz	87	5	6,25	—
0,15-1 MHz	87	0,73/f	0,92/f	—
1-10 MHz	$87/f^{1/2}$	0,73/f	0,92/f	—
10-400 MHz	28	0,073	0,092	2
400-2 000 MHz	$1,375\ f^{1/2}$	$0,0037\ f^{1/2}$	$0,0046\ f^{1/2}$	f/200
2-300 GHz	61	0,16	0,20	10

Notes:

1. *f* as indicated in the frequency range column.

Test method

The antenna of the product, under normal use condition is at least 20cm away from the body of the user. Warning statement ot the user for keeing 20cm separation distance and the prohibition of operating to a person has been printed on the user manual. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \frac{\sqrt{30PG(\theta,\phi)}}{r}$$

G = antenna gain relative to an isotropic antenna

θ, ϕ = elevation and azimuth angles to point of investigation

r = distance from observation point to the antenna

Test Data

Environmental Conditions

Temperature:	23.0 ℃
Relative Humidity:	54 %
ATM Pressure:	101.2 kPa

The testing was performed by Chao Gao on 2020-04-01.

For Wi-Fi:

Mode	Frequency Range (MHz)	Tune-up EIRP (dBm)	EIRP (mW)	E-Field Strength (V/m)	E-Field Limit (V/m)	Result
Wi-Fi	2412-2472	20.00	100	8.66	61.00	Pass

Note: Antenna Gain (numeric): 3.4dBi(2.19).

The distance from observation point to the antenna is 20cm.

For BLE:

Function	Frequency Range (MHz)	Tune-up EIRP (dBm)	Tune-up EIRP (mW)	E-Field Strength (V/m)	E-Field Limit (V/m)	Result
BLE	2402-2480	8.5	7.08	2.31	61	Pass

Note: Antenna Gain (numeric): 3.4dBi(2.19).

The distance from observation point to the antenna is 20cm.

For BT3.0:

Function	Frequency Range (MHz)	Tune-up EIRP (dBm)	Tune-up EIRP (mW)	E-Field Strength (V/m)	E-Field Limit (V/m)	Result
BT3.0	2402-2480	7.0	5.01	1.94	61	Pass

Note: Antenna Gain (numeric): 3.4dBi(2.19).

The distance from observation point to the antenna is 20cm.

EXHIBIT A - EUT PHOTOGRAPHS

Please refer to report No.: RSHD200218007-01A which was issued by BACL (Kunshan).

******* END OF REPORT *******