

# RF Exposure Evaluation Report

**APPLICANT** : Espressif Systems (Shanghai) Co.,Ltd.  
**EQUIPMENT** : 2.4GHz Wi-Fi & BT IoT Module  
**BRAND NAME** : ESPRESSIF  
**MODEL NAME** : ESP8685-WROOM-05  
**FCC ID** : 2AC7Z-ESP868505  
**STANDARD** : 47 CFR Part 2.1091

The product evaluation date was started from Jul. 04, 2022 and completed on Jul. 04, 2022. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part2.1091, and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.



Approved by: Si Zhang

**Sporton International Inc. (Kunshan)**

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China**



## **Table of Contents**

<b>1. ADMINISTRATION DATA</b> .....	<b>4</b>
1.1. Testing Laboratory .....	4
<b>2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)</b> .....	<b>5</b>
<b>3. MAXIMUM RF AVERAGE OUTPUT TUNE UP POWER AMONG PRODUCTION UNITS</b> .....	<b>6</b>
<b>4. RF EXPOSURE LIMIT INTRODUCTION</b> .....	<b>7</b>
<b>5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION</b> .....	<b>8</b>
5.1. Standalone assessment .....	8



**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA253115	Rev. 01	Initial issue of report.	Jul. 12, 2022



**1. Administration Data**

**1.1. Testing Laboratory**

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-KS	CN1257	314309

Applicant	
Company Name	Espressif Systems (Shanghai) Co.,Ltd.
Address	Suite 204, Block 2, 690 Bibo Road, Zhang Jiang Hi-Tech Park, Shanghai, China

Manufacturer	
Company Name	Espressif Systems (Shanghai) Co.,Ltd.
Address	Suite 204, Block 2, 690 Bibo Road, Zhang Jiang Hi-Tech Park, Shanghai, China



## 2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	2.4GHz Wi-Fi & BT IoT Module
Brand Name	ESPRESSIF
Model Name	ESP8685-WROOM-05
FCC ID	2AC7Z-ESP868505
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	WLAN 2.4GHz : 802.11b/g/n/ HT20/ HT40 Bluetooth LE
Antenna Gain	WLAN2.4GHz/Bluetooth: 3.96 dBi
Antenna Type	WLAN/Bluetooth: PCB Antenna
HW Version	V1.1
SW Version	v1.1.3.4
EUT Stage	Production Unit

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Comments and Explanations:
1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.



**3. Maximum RF average output tune up power among production units**

**<2.4GHz WLAN >**

Mode		Maximum Average Power (dBm)
2.4GHz	802.11b	20.00
	802.11g	19.00
	802.11n-HT20	18.00
	802.11n-HT40	17.00

**<Bluetooth>**

Mode		Maximum Average power(dBm)
Bluetooth	LE	10

#### **4. RF Exposure Limit Introduction**

According to Part1.1307 (b), Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad [1]$$

$$\text{Where } x = -\log_{10}\left(\frac{60}{ERP_{20 \text{ cm}}\sqrt{f}}\right) \text{ and } f \text{ is in GHz} \quad [2]$$

$$\text{and } ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} < f \leq 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} < f \leq 6 \text{ GHz} \end{cases} \quad [3]$$



## 5. Radio Frequency Radiation Exposure Evaluation

### 5.1. Standalone assessment

Band	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Maximum EIRP (dBm)	Maximum ERP (dBm)	Maximum EIRP (mW)	Maximum ERP (mW)	Separation Distance (cm)	P <sub>th</sub>	P <sub>th</sub> (mW)	Part1.1307 option(b) Threshold (mW)
WLAN2.4GHz	3.96	20.00	23.96	21.81	248.89	151.71	20	21.81	151.71	3060.000
Bluetooth	3.96	10.00	13.96	11.81	24.89	15.17	20	11.81	15.17	3060.000

**Note:**

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. Chose the maximum power to do MPE analysis.
3. According to the EUT characteristic, WLAN and Bluetooth cannot transmit simultaneously.

### Conclusion:

According to 47 CFR §1.1307, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----