



TEST REPORT

Report Number: C21T00111-SAR01-V02

Applicant	ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD
Product Name	Wi-Fi & Bluetooth Internet of Things Module
Model Name	ESP32-WROOM-DA
Brand Name	ESPRESSIF
FCC ID	2AC7Z-ESPWROOMDA

Industrial Internet Innovation Center (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in FCC 47 CFR Part 2 2.1091, RSS 102.

Prepared by	李浪	Reviewed by	鄢航
Approved by	李浪	Issue Date	2021-12-06

Industrial Internet Innovation Center (Shanghai) Co., Ltd.



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11. After confirmation with the customer, the Max power and antenna gain information provided by the customer may affect the validity of the measurement results in this report, and the customer shall bear the impact and consequences.

Test Laboratory:

Industrial Internet Innovation Center (Shanghai) Co., Ltd.

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Revision Version

Report Number	Revision	Date	Memo
C21T00111-SAR01-V00	00	2021-11-10	Initial creation of test report
C21T00111-SAR01-V01	01	2021-11-26	Add antenna's gain description and adjust the power of tune up.
C21T00111-SAR01-V02	02	2021-12-06	Updated antenna's gain description



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1. Test Laboratory

1.1. Testing Location

Primary Lab:

Company Name	Industrial Internet Innovation Center (Shanghai) Co., Ltd.
Address	Building 4, No. 766 Jingang Rd, Pudong, Shanghai, China
FCC Registration No.	958356
FCC Designation No.	CN1177

1.2. Testing Environment

Normal Temperature	18°C~25°C
Relative Humidity	25%RH~75%RH

1.3. Project Information

Project Leader	Wang wenwen
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2. Client Information

2.1. Applicant Information

Company Name	ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD
Address	Suite 101, Block 2, 690 Bibo Road, Zhang Jiang Hi-Tech Park, Shanghai, China
Telephone	15921838395

2.2. Manufacturer Information

Company Name	ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD
Address	Suite 101, Block 2, 690 Bibo Road, Zhang Jiang Hi-Tech Park, Shanghai, China
Telephone	15921838395

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Product Name	Wi-Fi & Bluetooth Internet of Things Module
Model name	ESP32-WROOM-DA
Supported Radio Technology and Bands	WALN 2.4Gb/g/n BT4.2/BLE
Hardware Version	V1.1
Software Version	V1.1.3.0
FCC ID	2AC7Z-ESPWROOMDA

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of Receipt
N/A	N/A	N/A	N/A	N/A

*EUT ID: is internally used to identify the test sample in the lab.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Model	SN/Remark
N/A	N/A	N/A	N/A

*AE ID: is internally used to identify the test sample in the lab.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title
FCC 47 CFR Part 2 2.1091	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS. Section 2.1091 Radiofrequency radiation exposure evaluation: mobile devices

4.2. Criteria

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with the reference this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

Limits for Occupational / Controlled Exposure				
Frequency (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3 – 3.0	614	1.63	(100)*	6
3.0 – 30	1824/f	4.89/f	(900/f)*	6
30 – 300	61.4	0.163	1	6
300 – 1500	--	--	F/300	6
1500 - 100000	--	--	5	6
Limits for General Population / Uncontrolled Exposure				
Frequency (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3 – 1.34	614	1.63	(100)*	30
1.34 – 30	824/f	2.19/f	(180/f)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	--	--	F/1500	30
1500 - 100000	--	--	1	30
Note: f = frequency in MHz; * Plane-wave equivalent power density. For the DUT, the limits for General Population / Uncontrolled Exposure are applicable.				

4.3. Reference Information from client

All technical documents are supplied by the client or manufacturer, which is the basis of testing. (such as antenna gain, etc.)

4.4. Calculation Method

For conservative evaluation consideration, only maximum power of each frequency band based on the tighter limits respectively are used to calculate the boundary power density.

Based on the FCC KDB 447498 D01 and 47 CFR §2.1091, the DUT is evaluated as a mobile device.

$$S = \frac{P \times G}{4\pi d^2}$$

Where

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

5. Test Summary

5.1. RF Power Output

Band	Max power(dBm)	Highest Output Power (dBm)	Antenna Gain(dBi)
BT 4.2	9.0	9.0	1.06
BLE	9.0	9.0	1.06
WIFI2.4G 802.11b	19.5	19.5	1.06
WIFI2.4G 802.11g	18.0	18.0	1.06
WI-FI2.4G 802.11n	18.0	18.0	1.06

5.2. Duty Cycle

Mode	Duty Cycle
BT	1:1
BLE	1:1
Wi-Fi2.4G	1:1

5.3. Summary of Evaluation Results

Band	Frequency	Highest Output Power (dBm)	Highest Output Power (mW)	Antenna Gain(dBi)	Numeric antenna gain	Power density at 20cm	Limit mW/cm ²
BT 4.2	2402	9.0	7.94	1.06	1.276	0.002	1.000
BLE	2402	9.0	7.94	1.06	1.276	0.002	1.000
WI-FI2.4G 802.11b	2412	19.5	89.13	1.06	1.276	0.023	1.000
WI-FI2.4G 802.11g	2412	18.0	63.10	1.06	1.276	0.016	1.000
WI-FI2.4G 802.11n	2412	18.0	63.10	1.06	1.276	0.016	1.000

The product is under the MPE limits. All is pass.



6. Statements

The ESP32-WROOM-DA, manufactured by ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD is a new product for evaluation.

This DUT has two antennas, one of antenna's gain is 0.91 dBi, another is 1.06 dBi, and the report results are tested by using the maximum gain antenna, which is the worst-case model showed in the the report.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the evaluated device specified in section 3 of this evaluation report is successfully evaluated according to the procedure and evaluation methods as defined in type certification requirement listed in section 4 of this evaluation report.

Annex A: EUT Photos

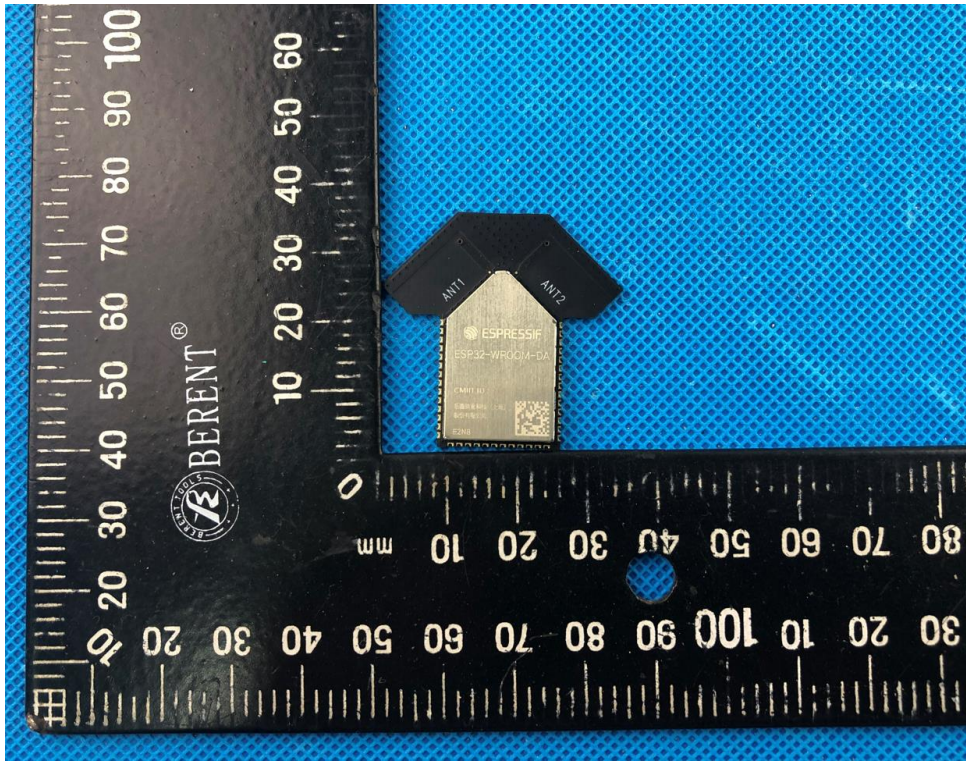


Figure A-1: Front view photo

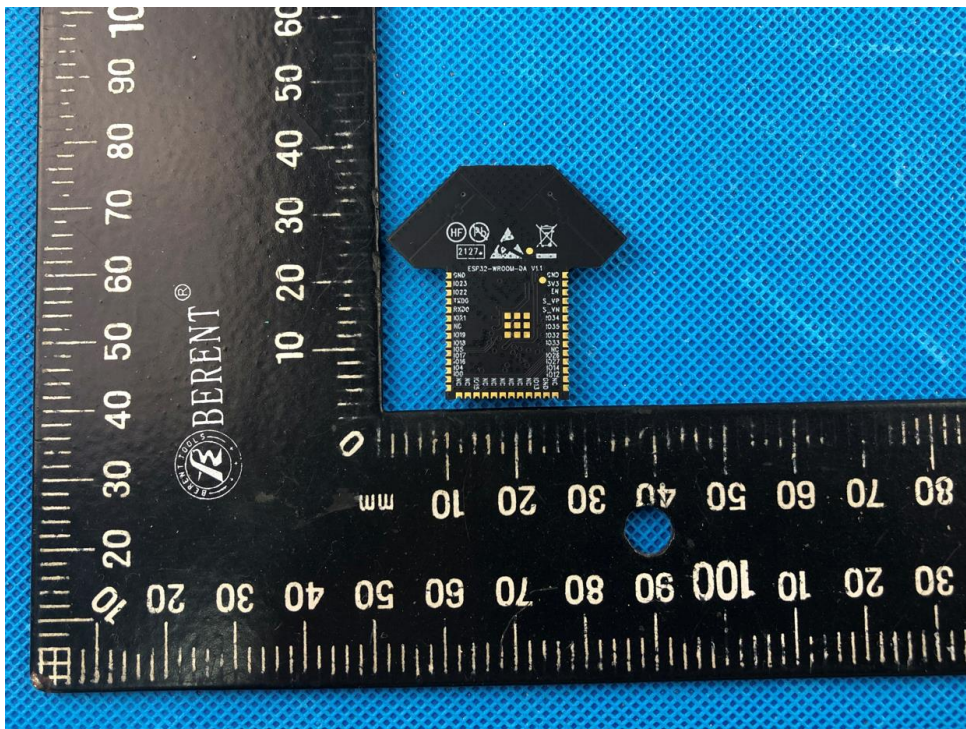


Figure A-2: Rear view photo



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