

MPE TEST REPORT

Applicant Espressif Systems (Shanghai) Co.,Ltd.

FCC ID 2AC7Z-ESP32MINII

Product Wi-Fi & Bluetooth Internet of Things Module

Brand ESPRESSIF

Model ESP32-MINI-1U

Report No. R2105A0435-M1

Issue Date September 7, 2022

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC 47 CFR Part 1 1.1310.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Approved by: Fan Guangchang

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1 Test Laboratory

1.1 Notes of the Test Report

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regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.

Building 3, No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai,

Address: China

City: Shanghai

Post code: 201201

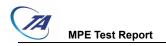
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C		
Relative humidity	Min. = 30%, Max. = 70%		
Ground system resistance	< 0.5 Ω		

Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.



2 Description of Equipment under Test

Client Information

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

General Technologies

	EODOS MINI ALL	
Model	ESP32-MINI-1U	
Lab internal SN	R2105A0435/S01	
Hardware Version	V1.0	
Software Version	V171	
Date of Testing:	August 29, 2022 ~ September 6, 2022	
Date of Sample Received:	May 27, 2021	

Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.

2. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.



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3 Maximum conducted output power (measured) and antenna Gain

The numeric gain (G) of the antenna with a gain specified in dB is determined by Numeric gain (G)=10^(antenna gain/10)

Band	Maximum Conducted Output Power		Antenna Gain	Numeric gain
	(dBm)	(mW)	(dBi)	
Wi-Fi2.4G	16.54	45.082	2.33	1.710
Bluetooth	11.86	15.346	2.33	1.710
Bluetooth (Low Energy)	7.98	6.281	2.33	1.710



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4 Test Result

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following

TABLE 1 – LIMITS FOR MAXIMUN PERMISSIBLE EXPOSURE (MPE)

Frequency Range	Electric Field	Magnetic Field	Power Density	Averaging Time			
(MHz)	Strength	Strength					
	(V/m)	(AVm)	(mW/cm2)	(minutes)			
(A) Limits for Occupational/Controlled Exposures							
0.3-3.0	614	1.63	*(100)	6			
3-30	1842/f	4.89/f	*(900/f2)	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/Uncont	rolled Exposure				
0.3-1.34	614	1.63	*(100)	30			
1.34-30	824/f	2.19/f	*(180/f2)	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

Note1. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

Note2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

^{* =} Plane-wave equivalent power density



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The maximum permissible exposure for 1500~100,000MHz is 1.0.So

Band	The maximum permissible exposure (mW/cm²)
Wi-Fi 2.4GHz	1.000
Bluetooth	1.000
Bluetooth (Low Energy)	1.000



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RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the conducted power, considering maximum power and antenna gain. The formula shown in KDB 447498 D01 is used in the calculation.

Equation from KDB 447498 D01 General RF Exposure Guidance v06 (10/23/2015) is:

$$S = PG / 4\pi R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = Time-average maximum tune up procedure (in appropriate units, e.g., mW)

G = the numeric gain of the antenna

R = distance to the center of radiation of the antenna (20 cm = limit for MPE)

.Band	PG (mW)	Test Result (mW/cm ²)	Limit Value (mW/cm ²)	Conclusion
Wi-Fi2.4G	77.090	0.015	1.000	Pass
Bluetooth	26.242	0.005	1.000	Pass
Bluetooth (Low Energy)	10.740	0.002	1.000	Pass

Note: **R** = 20cm π = 3.1416

Note: For transmitters, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

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



ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.