

RF Exposure Evaluation Report

Product : Seeed Studio XIAO ESP32C6
Trade mark : Seeed Studio
Model/Type reference : XIAO-ESP32-C6
Serial Number : N/A
Report Number : EED32Q80453604
FCC ID : Z4T-XIAOESP32C6
Date of Issue : May 30, 2024
Test Standards : 47 CFR Part 1.1307
47 CFR Part 1.1310
47 CFR Part 2.1091
47 CFR Part 2.1093
447498 D04 Interim General RF Exposure Guidance v01
Test result : PASS

Prepared for:

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2 Version

Version No.	Date	Description
00	May 30, 2024	Original

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4 General Information

4.1 Client Information

Applicant:	Seeed Technology Co., Ltd
Address of Applicant:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C, China
Manufacturer:	Seeed Technology Co., Ltd
Address of Manufacturer:	9F, G3 Building, TCL International E City, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong Province, P.R.C, China
Factory:	Shenzhen Xinxian Technology Co.,Limited.
Address of Factory:	F5, Building B17, Hengfeng Industrial City, No. 739 Zhoushi Rd, Baoan District, Shenzhen,Guangdong, P.R.C. , China

4.2 General Description of EUT

Product Name:	Seeed Studio XIAO ESP32C6
Model No.(EUT):	XIAO-ESP32-C6
Trade Mark:	Seeed Studio

4.3 Product Specification subjective to this standard

Frequency Range:	BLE: 2402MHz to 2480MHz 2.4G Wi-Fi: IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz Zigbee: 2405MHz to 2480MHz	
Modulation Type:	BLE: GFSK, 2.4G Wi-Fi: IEEE for 802.11b:DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g:OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK) Zigbee: OQPSK	
Test Power Grade:	Default	
Test Software of EUT:	EspRFTTestTool_v3.6_Manual	
Antenna Type:	Antenna1: Ceramic chip antenna Antenna2: FPC antenna Antenna3: Rod antenna	
Antenna Gain:	Antenna1: 4.97dBi Antenna2: 1.23dBi Antenna3: 2.42dBi	
Power Supply:	Adapter:	DC 3.3V
Sample Received Date:	Apr. 10, 2024	
Sample tested Date:	Apr. 10, 2024 to May. 29, 2024	
Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.		
All antennas have been tested, only the worst data (Antenna1) have been recording in the report.		

4.4 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.5 Deviation from Standards

None.

4.6 Abnormalities from Standard Conditions

None.

4.7 Other Information Requested by the Customer

None.

5 SAR Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula

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

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

5.1.3 EUT RF Exposure Evaluation

For Stand alone:

For BLE

Frequency (MHz)	Max. Conducted Output power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	ERP (dBm)	ERP (mW)	Limit (mW)	MPE ratio	Result
2402	5.32	4.97	10.29	8.14	6.516	3060	0.002	PASS

For 2.4G Wi-Fi

Frequency (MHz)	Max. Conducted Output power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	ERP (dBm)	ERP (mW)	Limit (mW)	MPE ratio	Result
2437	17.77	4.97	22.74	20.59	114.551	3060	0.004	PASS

For Zigbee

Frequency (MHz)	Max. Conducted Output power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	ERP (dBm)	ERP (mW)	MPE ratio	Limit (mW)	Result
2405	5.33	4.97	10.30	8.15	6.531	0.002	3060	PASS

Note:

- ① EIRP=conducted power+antenna gain;
- ② ERP=EIRP-2.15;
- ③ $EIRP(dBm) = \text{Field strength of the fundamental signal}(dBuV/m@3m) - 95.23$;
- ④ $ERP(mW) = 10^{(ERP(dBm)/10)}$;
- ⑤ The estimation distance is 0.5cm;
- ⑥ The test data please refer to the report of EED32Q80453601, EED32Q80453602, EED32Q80453603 and only the worst case data was recorded in the report.

For Simultaneous Transmission:

As MPE ratio (BLE+2.4G Wi-Fi+Zigbee)=0.02+0.004+0.002=0.008 < 1, it's deemed to fulfil the RF exposure requirement.

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*** End of Report ***