

RF Exposure Evaluation Report

APPLICANT : Amazon.com Services LLC
EQUIPMENT : Digital Media Receiver
MODEL NAME : C2N6L4
FCC ID : 2A4DH-0821
STANDARD : 47 CFR Part 2.1091

The product evaluation date was started from Jul. 13, 2022 and completed on Jul. 13, 2022. We, Sporton International Inc. (Shenzhen), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.



Approved by: Si Zhang

Sporton International Inc. (Shenzhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China



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1. Administration Data

1.1. Testing Laboratory

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-SZ	CN1256	421272

Applicant	
Company Name	Amazon.com Services LLC
Address	410 Terry Avenue N Seattle, WA 98109-5210 United States



2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Digital Media Receiver
Model Name	C2N6L4
FCC ID	2A4DH-0821
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
Antenna Gain	WLAN2.4GHz: 4.6 dBi Bluetooth: 4.0 dBi WLAN5.2GHz: 6.0 dBi WLAN5.3GHz: 6.2 dBi WLAN5.5GHz: 6.0 dBi WLAN5.8GHz: 6.0 dBi
Antenna Type	WLAN: PIFA Antenna Bluetooth: PIFA Antenna

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	17.50
	802.11g	17.50
	802.11n-HT20	17.50

<Bluetooth>

Mode		Maximum Average power(dBm)
Bluetooth	BR/EDR	9.00
	LE	5.00

<5GHz WLAN >

Mode		Maximum Average Power (dBm)
5.2GHz	802.11a	18.00
	802.11n-HT20	17.50
	802.11n-HT40	17.00
	802.11ac-VHT20	17.50
	802.11ac-VHT40	17.00
	802.11ac-VHT80	14.50
5.3GHz	802.11a	18.00
	802.11n-HT20	17.00
	802.11n-HT40	17.00
	802.11ac-VHT20	17.00
	802.11ac-VHT40	17.00
	802.11ac-VHT80	15.00
5.5GHz	802.11a	18.00
	802.11n-HT20	17.50
	802.11n-HT40	17.00
	802.11ac-VHT20	17.50
	802.11ac-VHT40	17.00
	802.11ac-VHT80	17.00
5.8GHz	802.11a	17.50
	802.11n-HT20	16.50
	802.11n-HT40	17.00
	802.11ac-VHT20	16.50
	802.11ac-VHT40	17.00
	802.11ac-VHT80	16.50

4. RF Exposure Limit Introduction

1. Per 1.1307(b)(3), (i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (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). P_{th} is given by:

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

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

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

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value)

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R ²
1.34-30	3,450 R ² / f ²
30-300	3.83 R ²
300-1,500	0.0128 R ² f
1,500-100,000	19.2 R ²



2. For multiple RF sources: Multiple RF sources are exempt if:

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

- a. a = number of fixed, mobile, or portable RF sources claiming exemption using the § 1.1307(b)(3)(i)(B) formula for P_{th} , including existing exempt transmitters and those being added.
- b. b = number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula for Threshold ERP, including existing exempt transmitters and those being added.
- c. c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance.
- d. P_i , the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive)
- e. $P_{th,i}$ the exemption threshold power (P_{th}) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i .
- f. ERP_j the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j .
- g. $ERP_{th,j}$ exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.
- h. $Evaluated_k$ the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation.
- i. $Exposure\ Limit_k$ either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources RF source k , as applicable from § 1.1310 of this chapter.

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance



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)	Pth	Pth (mW)	Part1.1307 option(b) Threshold (mW)	Part1.1307 option(b) P/Pth
WLAN2.4GHz	4.60	17.50	22.10	19.95	162.18	98.86	20	19.95	98.86	3060.000	0.032
WLAN5.2GHz	6.00	18.00	24.00	21.85	251.19	153.11	20	21.85	153.11	3060.000	0.050
WLAN5.3GHz	6.20	18.00	24.20	22.05	263.03	160.32	20	22.05	160.32	3060.000	0.052
WLAN5.5GHz	6.00	18.00	24.00	21.85	251.19	153.11	20	21.85	153.11	3060.000	0.050
WLAN5.5GHz	6.00	17.50	23.50	21.35	223.87	136.46	20	21.35	136.46	3060.000	0.045
Bluetooth	4.00	9.00	13.00	10.85	19.95	12.16	20	10.85	12.16	3060.000	0.004

Note:

1. Chose the maximum power to do MPE analysis.

5.2. Simultaneous Transmission MPE Test Exemption

WLAN P/Pth Ratio		Bluetooth P/Pth Ratio	P/Pth Ratio WLAN + Bluetooth
WLAN2.4GHz	0.032	0.004	0.036
WLAN5GHz	0.052		0.056

Note:

1. According Part1.1307b, the P/Pth and ERP/ERPth Ratio is using for Sim-Tx analysis, above table was showing summation ratio is smaller than 1.

Conclusion:

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

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