

RF Exposure Evaluation Report

APPLICANT : Amazon.com Services LLC
EQUIPMENT : Digital Media Receiver
MODEL NAME : CP38RE
FCC ID : 2A4DH-3877
STANDARD : 47 CFR Part 2.1091
FCC KDB 447498 D01 V06

The product evaluation date was started from Dec. 08, 2023 and completed on Dec. 08, 2023. We, Sporton International Inc. (Shenzhen), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, 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



Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
3. MAXIMUM RF AVERAGE OUTPUT TUNE UP POWER AMONG PRODUCTION UNITS	6
4. RF EXPOSURE LIMIT INTRODUCTION	8
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	9
5.1. Standalone Power Density Calculation	9
5.2. Collocated Power Density Calculation.....	9



Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA353104-01	Rev. 01	Initial issue of report.	Dec. 12, 2023
FA353104-01	Rev. 02	Revised Frequency Range of ZigBee on page 5.	Mar. 05, 2024
FA353104-01	Rev. 03	Removed the information of LoRa FHSS on page 5.	June. 02, 2024



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	CP38RE
FCC ID	2A4DH-3877
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 WLAN 6GHz U-NII-5: 5925 MHz ~ 6425 MHz WLAN 6GHz U-NII-6: 6425 MHz ~ 6525 MHz WLAN 6GHz U-NII-7: 6525 MHz ~ 6875 MHz WLAN 6GHz U-NII-8: 6875 MHz ~ 7125 MHz Bluetooth: 2402 MHz ~ 2480 MHz LoRa DTS: 902.5 MHz ~ 926.5 MHz LoRa OFDM: 903.3 MHz ~ 926.5 MHz FSK FHSS: 902.2 MHz ~ 927.8 MHz ZigBee: 2405 MHz ~ 2475 MHz
Mode	WLAN 2.4GHz 802.11b/g/n/ax HT20/HE20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 WLAN 5GHz 802.11ax HE20/ HE40/ HE80 WLAN 6GHz 802.11a/ax HE20/HE40/HE80 Bluetooth BR/EDR/LE ZigBee: O-QPSK LoRa: FHSS / OFDM / FSK
Antenna Gain	Bluetooth: 4.0 dBi ZigBee: 4.0 dBi LoRa: 3.5 dBi Ant.0 WLAN2.4GHz: 7.2 dBi WLAN5.2GHz: 5.0 dBi WLAN5.3GHz: 6.0 dBi WLAN5.5GHz: 5.9 dBi WLAN5.8GHz: 6.0 dBi WLAN 6GHz U-NII-5: 6.2 dBi WLAN 6GHz U-NII-6: 6.0 dBi WLAN 6GHz U-NII-7: 6.3 dBi WLAN 6GHz U-NII-8: 6.0 dBi Ant.1 WLAN2.4GHz: 4.0 dBi WLAN5.2GHz: 4.2 dBi WLAN5.3GHz: 4.5 dBi WLAN5.5GHz: 5.0 dBi WLAN5.8GHz: 5.5 dBi WLAN 6GHz U-NII-5: 6.0 dBi WLAN 6GHz U-NII-6: 6.1 dBi WLAN 6GHz U-NII-7: 6.0 dBi WLAN 6GHz U-NII-8: 6.2 dBi
Antenna Type	Bluetooth: Stamping Inv F Antenna WLAN: PCB dipole Antenna ZigBee: FPC Inv F Antenna LoRa: FPC Inv F 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

<Bluetooth>

Mode		Maximum Average power(dBm)
Bluetooth	BR/EDR	14.0
	LE	9.0

<ZigBee>

Mode		Maximum Average power(dBm)
2.4GHz	ZigBee	18.5

<LoRa>

Mode		Maximum Average Power (dBm)
LoRa		24.5

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.0+1
2.4GHz	802.11b	21.5
	802.11g	20.0
	802.11n-HT20	19.5
	802.11ax-HE20	19.5

**<5GHz WLAN >**

Mode		Maximum Average Power (dBm)
		Ant.0+1
5.2GHz	802.11a	20.5
	802.11n-HT20	19.5
	802.11n-HT40	19.5
	802.11ac-VHT20	19.5
	802.11ac-VHT40	19.5
	802.11ac-VHT80	16.0
	802.11ax-HE20	20.0
	802.11ax-HE40	20.0
	802.11ax-HE80	16.5
5.3GHz	802.11a	20.0
	802.11n-HT20	20.0
	802.11n-HT40	20.0
	802.11ac-VHT20	20.0
	802.11ac-VHT40	20.0
	802.11ac-VHT80	14.5
	802.11ax-HE20	20.0
	802.11ax-HE40	20.0
	802.11ax-HE80	15.0
5.5GHz	802.11a	19.5
	802.11n-HT20	19.5
	802.11n-HT40	19.5
	802.11ac-VHT20	19.5
	802.11ac-VHT40	19.5
	802.11ac-VHT80	19.0
	802.11ax-HE20	19.5
	802.11ax-HE40	19.5
	802.11ax-HE80	19.5
5.8GHz	802.11a	21.5
	802.11n-HT20	19.5
	802.11n-HT40	19.5
	802.11ac-VHT20	19.5
	802.11ac-VHT40	19.5
	802.11ac-VHT80	19.5
	802.11ax-HE20	19.5
	802.11ax-HE40	19.5
	802.11ax-HE80	19.5

<6GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.0
6GHz	802.11a	5.5
		Ant.0+1
	802.11a	1.0
	802.11ax-HE20	2.5
	802.11ax-HE40	4.5
	802.11ax-HE80	7.5

Note: WLAN2.4GHz/WLAN5GHz/6GHz 802.11ax support SISO/MIMO mode, we only chose MIMO tune up power to perform MPE calculation conservatively for MIMO power is higher.

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	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/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
Bluetooth	2402.0	4.00	14.00	18.000	63.096	0.013	1.000	0.013
2.4GHz WLAN	2412.0	7.20	21.50	28.700	741.310	0.148	1.000	0.148
5.2GHz WLAN	5180.0	5.00	20.50	25.500	354.813	0.071	1.000	0.071
5.3GHz WLAN	5260.0	6.00	20.00	26.000	398.107	0.079	1.000	0.079
5.5GHz WLAN	5500.0	5.90	19.50	25.400	346.737	0.069	1.000	0.069
5.8GHz WLAN	5745.0	6.00	21.50	27.500	562.341	0.112	1.000	0.112
6GHz WLAN	5925.0	6.30	7.50	13.800	23.988	0.005	1.000	0.005
Zigbee	2405.0	4.00	18.50	22.500	177.828	0.035	1.000	0.035
LoRa	902.2	3.50	24.50	28.000	630.957	0.126	0.601	0.209

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. WLAN2.4GHz, WLAN5GHz and WLAN6GHz chose the higher SISO gain as MIMO gain to perform MPE calculation.

5.2. Collocated Power Density Calculation

Bluetooth Power Density / Limit	ZigBee Power Density / Limit	LoRa Power Density / Limit	WLAN 5GHz Power Density / Limit	WLAN 6GHz Power Density / Limit	Σ(Power Density / Limit) of Bluetooth + ZigBee + LoRa + WLAN 5GHz+ WLAN 6GHz
0.013	0.035	0.209	0.112	0.005	0.374

Bluetooth Power Density / Limit	LoRa Power Density / Limit	WLAN 2.4GHz Power Density / Limit	WLAN 5GHz Power Density / Limit	Σ(Power Density / Limit) of Bluetooth + LoRa + WLAN 2.4GHz+ WLAN 5GHz
0.013	0.209	0.148	0.112	0.482

Note:

1. According to the EUT characteristic, WLAN 2.4GHz and WLAN6GHz/ZigBee cannot transmit simultaneously.
2. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for Bluetooth+LoRa+ZigBee+WLAN5GHz+WLAN6GHz, Bluetooth + LoRa + WLAN2.4G+ WLAN 5GHz.
3. Considering all transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

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