

RF EXPOSURE REPORT



Applicant: Axon Enterprise, Inc.
17800 N 85th St, Scottsdale, AZ 85255, United States

Manufacturer: Axon Enterprise, Inc.
17800 N 85th St, Scottsdale, AZ 85255, United States

Product Name: Fleet Hub

Brand Name: Axon

Model No.: AX1033

HVIN: S01405B

Model Difference: N/A

Report Number: ES/2022/30004

FCC ID X4GS01405B

IC: 8803A-S01405B

Issue Date: April 18, 2022

Date of EUT Received: March 7, 2022

John Yeh

Approved By

John Yeh

We hereby certify that:

The above equipment was evaluate by SGS Taiwan Ltd. The evaluation in this report is in compliance with FCC Rule Part §2.1091 and RSS-102.

The results of this report relate only to the sample identified in this report.

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Revision History					
Report Number	Revision	Description	Issue Date	Revised By	Remark
ES/2022/30004	00	Original	April 18, 2022	Ruby Ou	

Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 Product Description

Product Name:	Fleet Hub
Brand Name:	Axon
Model No.:	AX1033
HVIN:	S01405B
Model Difference:	N/A
Hardware Version:	X3
Firmware Version:	IG2.DVT.1.2s
EUT Series No.:	X704322CM
Power Supply:	12Vdc from Car battery

1.2 Evaluation site

Laboratory	Site Address	FCC Designation number	ISED Company Number	CAB Identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	<input checked="" type="checkbox"/> No. 134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, 24803, Taiwan.	TW0027	4620A	TW3702
	<input type="checkbox"/> No. 2, Keji 1st Rd., Guishan Township, Taoyuan County, 333 Taiwan.	TW0028	4620E	
	<input type="checkbox"/> 1F, No. 8, Alley 15, Lane 120, Sec. 1, Nei Hu Road, Nei Hu District, Taipei City, 222 Taiwan.	TW0029	23862	

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1.3 Antenna Information:

1.3.1 BT / WLAN 2.4GHz

WLAN 2.4GHz					
Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Directional Antenna Gain of Beamforming (dBi)
PIFA	Airgain	AP-AXONF3-MMF-Q-MS-BL-15	2412-2462	2.30	5.30
Dipole	Airgain	AP-AXONF3-GL-WWG-BL-3M		N/A	N/A

Note: The N/A represents that the Antenna does not available in the specified frequency.

BT				
Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Dipole	Airgain	AP-AXONF3-GL-WWG-BL-3M	2.4GHz	2.50

Note: The N/A represents that the Antenna does not available in the specified frequency.

1.3.2 WLAN 5GHz

5GHz FCC					
Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Directional Antenna Gain of Beamforming (dBi)
PIFA	Airgain	AP-AXONF3-MMF-Q-MS-BL-15	5150~5250	0.50	3.50
			5250~5350	0.70	3.70
			5470~5725	N/A	N/A
			5725~5850	N/A	N/A
Dipole	Airgain	AP-AXONF3-GL-WWG-BL-3M	5150~5250	N/A	N/A
			5250~5350	N/A	N/A
			5470~5725	1.10	4.10
			5725~5850	1.30	4.10

Note: The N/A represents that the Antenna does not available in the specified frequency.

Note: Antenna information is provided by the applicant.

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2 FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 FCC Standard Applicable

As per §1.1307(b)(3)(i),

- (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:

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

Where

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

and

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

d = the separation distance (cm);

Note: when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

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).

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

RF Source frequency (MHz)			Minimum Distance			Threshold ERP (W)
fL		fH	$\lambda L / 2\pi$		$\lambda H / 2\pi$	
0.3	-	1.34	159m	-	35.6m	1920 R ²
1.34	-	30	35.6m	-	1.6m	3450 R ² /f ²
30	-	300	1.6m	-	159mm	3.83 R ²
300	-	1500	159mm	-	31.8mm	0.0128 R ² f
1500	-	100000	31.8mm	-	0.5mm	19.2R ²

R= minimum separation distance in meter

f = frequency in MHz

2.2 Multiple RF Sources

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.

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

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2.3 ISED Standard Applicable

This submittal(s) (test report) is intended to comply with RSS-102 issue 5 Radio frequency Radiation Exposure requirement.

This is a Mobile device, the MPE is required.

Limits for Maximum Permissible Exposure (MPE)

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field Strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

F = frequency in MHz

* = Based on nerve stimulation (NS).

** = Based on specific absorption rate (SAR)

Maximum Permissible Exposure (MPE) Evaluation

Prediction of MPE limit at a given distance

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

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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2.4 Power Density Calculation (Worst Case)

FCC

MPE_Based_Exemption									
Chain 0	Frequency (MHz)	Max. tune-up power (dBm)	Peak gain (dBi)	ERP (dBm)	ERP (W)	Permissible Minimum separation distance ($\lambda/2\pi$) (m)	R = actual Minimum separation distance(m)	ERP _{th} (W)	ERP/ERP _{th}
WiFi 2.4GHz	2472	26.08	2.3	26.23	0.420	0.0193	0.200	0.768	0.547
WiFi 5GHz	5745	27.53	4.1	29.48	0.887	0.0083	0.200	0.768	1.155
BT	2480	10	2.5	10.35	0.011	0.0193	0.200	0.768	0.014

SAR_Based_Exemption											
Chain 0	Frequency (MHz)	Distance (cm)	Max. tune-up power (dBm)	Max. tune-up power (mW)	Peak gain (dBi)	ERP (dBm)	ERP (mW)	x	ERP _{20cm} (mW)	P _{th} (mW)	P or ERP/P _{th}
WiFi 5GHz	5745	20	27.53	566.239	4.1	29.48	887.156	2.087	3060.00	3060.00	0.290

Note: For conservativeness, the lowest uplink frequency of each band is used to determine the permissible minimum separation distance of that band.

ISED Standalone MPE

Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. Output Power Include Tolerance (dBm)	Antenna Gain (dBi)	Max. EIRP (mW)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Pass / Fail	Power Density / Limit
WiFi 2.4GHz	2472.00	20	26.08	2.30	688.65	1.371	2.000	Pass	0.686
WiFi 5GHz	5745.00	20	27.53	4.10	1455.46	2.897	9.710	Pass	0.298
BT	2480.00	20	10	2.5	17.78	0.035	5.469	Pass	0.006

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2.5 Collocated Power Density Calculation

FCC

Simultaneous transmission modes	Σ ERP/ERP _{th}	Criteria
1	0.851	1

ISED

Operation Mode	Power Density / Limit	Σ (Power Density / Limit)
WiFi 2.4GHz	0.686	0.990
WiFi 5GHz	0.298	
BT	0.006	

Note:

1. Σ (Power Density / Limit): This is a summation of [(Power Density for each transmitter/antenna included in the simultaneous transmission) / (corresponding MPE limit)].
2. Considering the collocated transmitters, the aggregated (Power Density /limit) is smaller than 1, and MPE of collocated transmitters is compliant

~ End of Report ~

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