



RF Exposure Evaluation Report

FOR:

Rivian Automotive, LLC

Brand:

Rivian

Marketing Name:

Vehicle Access System

Model Number:

VAS-BLE 1.5

Product Description:

Vehicle Access Modules based upon Bluetooth Low Energy Technology (VAS BLE)

FCC ID: 2AW3A-1NAG20VAS

IC: 26958-1NAG20VAS

Per:

CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 5

Report number: EMC_RIVIA_42_22001_FCC_ISED_MPE

DATE: 4/15/2023



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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the equipment (as identified in section 3 of this test report) with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091) and ISED standard RSS-102 issue 5 under worst case conditions (measured or rated RF output power, antenna gain, the distance towards the human body, multiple transmitter information as presented by the applicant).

In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits stipulated by the above given FCC and ISED rule parts based on available specifications for worst-case conditions at 20cm distance to the body.

Company	Description	Model #
Rivian Automotive, LLC	Vehicle Access Modules based upon Bluetooth Low Energy Technology (VAS BLE)	VAS-BLE 1.5

Responsible for Testing Laboratory:

4/15/2023

Compliance

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C = US O = CETECOM Inc
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Date	Section	Name	Signature
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Responsible for the Report:

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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Stoecker, Arndt
Responsible Project Leader:	Quintal, Phillip

2.2 Identification of the Client / Manufacturer

Applicant's Name:	Rivian Automotive, LLC
Street Address:	14600 Myford Road
City/Zip Code	Irvine, CA 92606
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client /-----
Manufacturers Address:	-----
City/Zip Code	-----
Country	-----

3 Equipment under Assessment

Brand:	Rivian
Model No:	VAS-BLE 1.5
Marketing name:	Vehicle Access System
FCC-ID :	2AW3A-1NAG20VAS
IC:	26958-1NAG20VAS
HW Version :	PT00039251 (Fir Tree – internal antenna): Rev B PT00039252 (Screw Mount – internal antenna): Rev B PT00039253 (Screw Mount – External antenna): Rev G
SW Version :	2.2
HVIN:	VAS-BLE 1.5
PMN:	VAS (Vehicle Access System)
Product Description:	Vehicle Access Modules based upon Bluetooth Low Energy Technology (VAS BLE)
Frequency Range/number of channels:	Nominal band: 2400 MHz – 2483.5 MHz Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 Channels
Radio information:	<u>Bluetooth Low Energy</u> Texas Instrument • Chipset name/number: C2642R SOC BLE • Technology: BLE Version 5.2 • Supported data rate: 1Mb/s, 2Mb/s, 125kb/s (S8 LE Coded), and 500kb/s (S2 LE Coded)
Max. declared Output Power:	+5 dBm
Power Supply/ Rated Operating Voltage Range:	9.8V (Low) / 13.5 V (Nominal) / 16.0V (Max), DC
Operating Temperature Range:	T min: -40 °C / T Nom: 20 °C / T max: +105 °C
Other Radios included in the device:	N/A

Antenna Information as declared:	❖ PT00039251 (Fir Tree – internal antenna) - o VAS 1.5 Module Integrated Antenna - o Single Band Circularly Polarized Dual PCB monopole Antenna - o Part number: PT00781678 Rev A - o Frequency (MHz): 2400 – 2485 - o Max gain (dBi): 7.04 @ 2410 MHz ❖ PT00039252 (Screw Mount – internal antenna) - o VAS 1.5 Module Integrated Antenna - o Single Band Circularly Polarized Dual PCB monopole Antenna - o Part number: PT00781677 Rev A - o Frequency (MHz): 2400 – 2485 - o Max gain (dBi): 7.04 @ 2410 MHz ❖ PT00039253 (Screw Mount – External antenna) - o Part number: PT00891429 Rev A ▪ EDV VAS Circular Ground Plane Antenna ▪ Single Band Ceramic Microstrip Patch Antenna ▪ Frequency (MHz): 2400 – 2485 ▪ Max gain (dBi): 6.7 @ 2414 MHz - o Part number: PT00891430 Rev A ▪ EDV VAS Rectangular Ground Plane Antenna ▪ Single Band Ceramic Microstrip Patch Antenna ▪ Frequency (MHz): 2400 – 2485 ▪ Max gain (dBi): 3.26 @ 2422 MHz - o Part number: Taoglas WPC.25D.82.0835E.e ▪ Patch Antenna ▪ Frequency (MHz): 2400 – 2500 ▪ Max gain (dBi): -1.5
Sample Revision:	☒ Production Unit; ☐ Pre-Production
Product dimensions [mm]:	❖ PT00039251 (Fir Tree – internal antenna): 1.5" x 1.5" x 1" ❖ PT00039252 (Screw Mount – internal antenna): 1.5" x 1.5" x 1" ❖ PT00039253 (Screw Mount – External antenna) 2" x 1.5" x 1"
Note: The information of the EUT specifications in the table above is provided by the client.	

4 RF Exposure Limits and FCC and IC Basic Rules

For the specifically described radio apparatus, the following basic limits and rules apply for both FCC and ISED where not indicated differently.

4.1 FCC

4.1.1 § 2.1091 (c)(1)

Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), whichever is greater. For mobile devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP) in comparison with the following formula only 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).

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

4.1.2 § 1.1307(b)(3)(i)(C)

RF Source frequency (MHz)	Threshold ERP (watts)
1,500 – 100,000	$19.2R^2$.

4.1.3 § 1.1310(e)(1)

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure		
1,500 – 100,000	5	<6

4.2 ISED RSS 102

4.2.1 Clause 2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

4.2.2 Clause 4 Exposure Limits

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)		
Frequency Range (MHz)	Power Density (W/m ²)	Reference Period (minutes)
300 – 6000	$0.6455 \times f(\text{MHz})^{0.5}$	6

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source-based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm), the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions) when ground reflection is neglected.

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

Where: S = power density (mW/cm² or W/m²)

P = power input to the antenna (mW or W)

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 (cm or m)

5 Evaluations

5.1 Analysis of RF Exposure (BT LE)

FCC:

Frequency [GHz]	EUT	Antenna	Gain [dBi]	Power [W]	ERP [W]	§1.1307(b)(3)(i)(C) Threshold ERP [W]	ERP<Threshold ERP
2.4	PT00039251	PT00781678	7.04	0.003	0.010	0.768	Exempt
	PT00039252	PT00781677					
2.4	PT00039253	WPC.25D.82.0835E.e	-1.5	0.003	0.001	0.768	Exempt
		PT00891430	3.26	0.003	0.004	0.768	Exempt
		PT00891429	6.7	0.003	0.009	0.768	Exempt

IC:

Frequency [MHz]	EUT	Antenna	Gain [dBi]	Power [W]	EIRP [W]	W/m ²	Exemption limit for Routine Evaluation [W]	EIRP<Exemption limit
2400	PT00039251	PT00781678	7.04	0.003	0.016	0.032	2.67	Exempt
	PT00039252	PT00781677						
2400	PT00039253	WPC.25D.82.0835E.e	-1.5	0.003	0.002	0.004	2.67	Exempt
		PT00891430	3.26	0.003	0.007	0.013	2.67	Exempt
		PT00891429	6.7	0.003	0.015	0.029	2.67	Exempt

5.2 Conclusion:

RF Power from a single source (BT LE) at 20cm or greater will comply with MPE power density limits for FCC/ISED

6 Revision History

Date	Report Name	Changes to report	Prepared by
4/15/2023	EMC_RIVIA_42_22001_FCC_ISED_MPE	Initial Version	Ghanma, Issa

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