



Radio Frequency Exposure Evaluation Report

For:

Hendrickson USA, L.L.C., DBA Hendrickson Brake and Wheel-End Group

Model Name:

B-40699

Product Description:

Wheel End Sensor with Tire Pressure Monitoring and Bluetooth Radio

FCC ID: 2BMOAWES

ISED: 33452-WES

Per:

CFR Part1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 6

Report number: EMC_HENDR_002_24001_FCC_ISED_RF_Exposure_Rev1

DATE: 2025-03-26



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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091) and IC standard RSS-102 issue 6 under worst case conditions (measured or rated RF output power, antenna gain, distance towards 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 as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

Company Name	Product Description	Model No.
Hendrickson USA, L.L.C., DBA Hendrickson Brake and Wheel-End Group	Wheel End Sensor with Tire Pressure Monitoring and Bluetooth Radio	B-40699

Report Reviewer:

Alvin, Ilarina

2025-03-26 Compliance (Senior Manager Regulatory Services)

Date	Section	Name	Signature
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Responsible for the Report:

Art Thammanavarat

2025-03-26 Compliance (Senior EMC Engineer)

Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
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EMC Engineer:	Art Thammanavarat
Responsible Project Leader:	Hao Shane

2.2 Identification of the Client / Manufacturer

Client's Name:	Hendrickson USA, L.L.C., DBA Hendrickson Brake and Wheel-End Group
Street Address:	9260 Pleasantwood Ave NW
City/Zip Code	North Canton Ohio 44720
Country	USA

2.3 Identification of the Manufacturer

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

3 Equipment under Assessment

Product Description:	Wheel End sensor with tire pressure monitoring and Bluetooth radio
Model Name:	B-40699
Marketing Name:	WATCHMAN™ or TIREMAAX®
HW Version:	V4.2E
SW Version:	V1.0.1
FCC-ID:	2BMOAWES
ISED:	33452-WES
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 as declared:	Bluetooth Modules Brand Name: Texas Instruments Incorporated Model Number: CC2650MODA FCC: ZAT26M1 ISED: 451H-26M1 Wireless Technologies Bluetooth
Antenna Information as declared:	Type: PCB Trace Location: Internal Peak Gain: +5 dBi gain
Power Supply/ Rated Operating Voltage Range	3VDC
Operating Temperature Range	Low: -40°C Norm: 25°C High: 85°C
Sample Revision	☐ Production ☒ Pre-Production
EUT Dimensions	113mm x 113mm x 31mm
Weight	129 grams
EUT Diameter	☒ < 60 cm ☐ Other _____
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

4.1 Routine Environmental Evaluation Categorical Exclusion Limits according to FCC 1.1307(b)(3)(i)(B), and FCC 1.1307(b)(3)(ii)(B)

Single RF sources is exempt if 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);

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.

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

4.2 Field reference level (FRL) exposure exemption limits according to RSS-102 Issue 6, section 6.6

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- 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;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

5 Evaluations

5.1 Analysis of RF Exposure

FCC:

Radio	Freq-Low _[GHz]	Pwr _[dBm]	Power _[W]	AG _[dBi]	EIRP _[W]	ERP _[W]	Threshold ERP _[W]	ERP < Threshold ERP _[W]	FCC 2.1093(c)(1) Pth _[mW] = ERP _{20cm}
BTLE	2.4020	1.00	0.0013	5.00	0.004	0.002	0.77	Yes	3060.00

Conclusion:

- The maximum RF emissions from this equipment fulfills the RF exclusion threshold limits for separation distance between the antenna and the human body greater than 20 cm. No RF Exposure evaluation is required.

ISED:

								RF Exposure	
								RSS-102 6.6 D>20 cm (300 ≤ Freq < 6000 MHz)	
Radio	Tech-Band	Freq-Low [MHz]	Pwr _[dBm]	Power _[W]	Ant-G [dBi]	EIRP _[W]	EIRP _[mW]	Exemption limit for Routine Evaluation	Exemption (Y/N)
BTLE	N/A	2402.00	1.00	0.0013	5.00	0.004	3.98	2.68	Yes

Conclusion:

- The maximum RF emissions from this equipment fulfills the RF exclusion threshold limits for separation distance between the antenna and the human body greater than 20 cm. No RF Exposure evaluation is required.

6 Revision History

Date	Report Name	Changes to report	Prepared by
2025-02-13	EMC_HENDR_002_24001_FCC_ISED_RF_Exposure	Initial Version	Art Thammanavarat
2025-03-26	EMC_HENDR_002_24001_FCC_ISED_RF_Exposure_Rev1	<u>Report Revised</u> 1. Section 3: Corrected typo 2. Section 5.1: Corrected typo	Art Thammanavarat

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