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## RF Radiation Exposure Evaluation

*In accordance with:*

CFR47 FCC Part 2, Subpart J, 2.1093

FCC KDB 447498 D01 v06

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CR Mining

GT-SENREF-920-1

Reference Sensor

FCC ID: 2A9FA-07-0024-915-A

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REPORT: E2211-1609B-3 Rev2

DATE: April, 2023



## RF Radiation Exposure Evaluation Report

EMC Bayswater Test Report: E2211-1609B-3 Rev2  
Issue Date: April, 2023

**Product:** Reference Sensor  
**Model No:** GT-SENREF-920-1  
**Serial No:** 30011  
**FCC ID:** 2A9FA-07-0024-915-A

**Customer Details:** Mr Julien Lopez  
CR Mining  
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Welshpool  
WA 6106  
Australia  
Phone No: +61 (08) 6253 3913  
e-mail: Julien.Lopez@crmining.com

**Standard(s):** CFR47 FCC Part 2, Subpart J, 2.1093  
Radiofrequency radiation exposure evaluation: portable devices.  
FCC KDB 447498 D01 v06  
RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES  
FOR MOBILE AND PORTABLE DEVICES

**Results Summary:** RF Radiation exposure requirements **Complied**

**Test Date(s):** 3<sup>rd</sup> of February, 2023

**Test House (Issued By):** EMC Bayswater Pty Ltd  
18/88 Merrindale Drive  
Croydon South  
Victoria, 3136  
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FCC Accredited Test Firm Registration number: 527798  
FCC Accredited Test Firm Designation number: AU0004

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The CR Mining, GT-SENREF-920-1, Reference Sensor, measured EIRP is below the SAR exception threshold (50mm distance) and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations therefore complied with the requirements of CFR47 FCC Part 2, Subpart J, 2.1093.

This is to certify that the necessary evaluations were made by EMC Bayswater Pty Ltd, and that the CR Mining, GT-SENREF-920-1, Reference Sensor, has been tested in accordance with requirements contained in the appropriate commission regulations.

Prepared by:



Adnan Zaman  
(EMC Test Engineer)

Approved by:



Neville Liyanapatabendige  
(Manager)

21/04/2023 09:54

Date

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## **RF Radiation Exposure Evaluation *for* CR Mining**

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## 1. Introduction

RF Radiation Exposure evaluation was performed on a CR Mining, GT-SENREF-920-1, Reference Sensor in accordance with CFR47 FCC Part 2, Subpart J, 2.1093.

## 2. Test Report Revision History

ISSUE	DATE	Description	AUTHORISED BY
E2211-1609B-3	12-04-2023	Original	Neville Liyanapatabendige (Manager)
E2211-1609B-3 Rev1	12-04-2023	Replaced the firmware version information from HWP_R2_0M_920 to 4.6.2.9-R as per customer request.	Neville Liyanapatabendige (Manager)
E2211-1609B-3 Rev2	21-04-2023	Corrected product name as per customer request.	Neville Liyanapatabendige (Manager)

## 3. Report Information

EMC Bayswater Pty Ltd reports apply only to the specific samples tested under the stated test conditions. All samples tested were in good operating condition throughout the entire test program unless otherwise stated. EMC Bayswater Pty Ltd does not in any way guarantees the later performance of the product/equipment. It is the manufacturer's responsibility to ensure that additional production units of the tested model are manufactured with identical electrical and mechanical components. EMC Bayswater Pty Ltd shall have no liability for any deductions, inference or generalisations drawn by the clients or others from EMC Bayswater Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Bayswater Pty Ltd. This report shall not be reproduced except in full, without the written approval of EMC Bayswater Pty Ltd. This document may be altered or revised by EMC Bayswater Pty Ltd personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by EMC Bayswater Pty Ltd will nullify the document.

## 4. Product Details

### 4.1. Product Sample Details

The device, as supplied by the client, is described as follows:

Product:	Reference Sensor	
Model No:	GT-SENREF-920-1	
Serial No:	30011	
Firmware:	4.6.2.9-R	
Power Specifications:	Battery powered 1x 3.6V lithium size D	
Dimensions:	118 x 118 x 98 (mm) (Length x Width x Height)	
Weight:	900g	
EUT Type:	Tested as table top.	
Transmitter Details:	Description:	Reference sensor
	Type:	Sensor
	Modulation:	GSFK
	Channels:	903 to 927MHz
	Max power:	10mW
	Antenna:	Quarter wave wire
	FCC ID:	2A9FA-07-0024-915-A

*(Customer supplied product information)*

### 4.2. Product description

The device has been described by the customer as follows:

“The reference sensor is an IoT sensor used on mining equipment. Battery-operated and equipped with an accelerometer and temperature sensor, the device is using GSFK modulation for bidirectional wireless communication in the 915MHz ISM band.”

*(Customer supplied product description information)*

## 5. SAR and RF Exposure exception evaluation

### 5.1. SAR exception evaluation

As per Appendix A of KDB 447498 D01 General RF Exposure Guidance v06

#### *SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and $\leq 50$ mm*

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in 4.3.1 must be applied to determine SAR test exclusion.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

SAR test exclusion threshold for 903MHz to 927MHz transmitter is 15.6mW to 15.4mW for 5mm distance.

- Customer declared maximum power is 10mW.
- The measured maximum EIRP is 2.5mW (Worst-case, Without Duty Cycle correction factor).

*The measurement uncertainty was calculated at  $\pm 4.83$ dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of approximately  $k=2$  which gives a level of confidence of approximately 95%.*

The customer declared maximum power and measured EIRP is below the SAR exception threshold for 5mm distance.

## 5.2. RF Exposure Evaluation (MPE)

As per section 1.1310 of CFR 47 following Maximum Permissible Exposure (MPE) limits are applicable.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

Worst-case Limit for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for 903MHz to 927MHz as per Table 1 of Section 15.1310 is 0.602 mW/cm<sup>2</sup> (General Population/Un-controlled).

Prediction Worst case:

Using equation

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

where: S = Power density

P = Power input to the antenna

G = Antenna gain

R = Distance to the center of radiation of the antenna

Band	Maximum Power (dBm)	Maximum Power (mW)	Distance (cm)	Calculated Power Density at 20cm (mW/cm <sup>2</sup> )	Power Density Limit** (mW/cm <sup>2</sup> )
903 to 927MHz	10	10	20	0.00198	0.602

\*\* MPE limit for General Population/Un-controlled exposure

Table 1: Results for MPE Evaluation

## 6. Conclusion

The measured EIRP is below the SAR exception threshold (5mm distance) and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations.