



RADIOCOMMUNICATIONS EQUIPMENT
COMPLIANCE ASSESSMENT
FOR
FCC 47 CFR 1.1310
RADIOFREQUENCY RADIATION EXPOSURE LIMITS
MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Client:	GE Mining Industrea Mining Technology
Address:	3 Co-Wyn Close, Fountaindale, NSW 2258, Australia
Report Number:	0322GEI_PROD0842-2_FCC(MPE) <i>[This report supersedes report 0216GEI_CASIVU_FCC(MPE)]</i>
Date of Assessment	16 Feb 2016
File Number:	GEI150515-A
Equipment Name:	CAS IVU
Equipment Model No:	PROD0842-2
Equipment FCC ID:	YIY-PROD08422
Equipment Description:	Collision Avoidance System with 920MHz V2V Radio
Result:	COMPLIES (General Population/Uncontrolled Exposure)
Assessed by:	Colin Gan 
Approved by:	Phillip Kane 
Date of Issue:	22 Mar 2016
<p>Results appearing herein relate only to the sample(s) assessed through the submitted test report(s).</p> <p>This report is issued errors and omissions exempt and is subject to withdrawal at Austest Laboratories discretion.</p>	

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EQUIPMENT DETAILS	
MANUFACTURER:	GE Mining Industrea Mining Technology
MODEL:	PROD0842-2
OPERATING FREQUENCY & TRANSMITTER POWER INTO ANTENNA:	<p><u>V2V Radio</u> <small>Note 1:</small> 920MHz 20.5dBm</p> <p><u>WiFi</u> <small>Note 2:</small> 2412.0MHz – 2472.0MHz 0.0327W 5180.0MHz – 5240.0MHz 0.0217W 5260.0MHz – 5320.0MHz 0.0233W 5500.0MHz – 5700.0MHz 0.0211W 5745.0MHz – 5825.0MHz..... 0.0063W</p>
TYPE OF ANTENNA & GAIN <small>Note 3:</small>	<p><u>V2V Radio:</u> Laird Technologies TRAB9023NP antenna 4.0dBi</p> <p><u>WiFi:</u> Syskim OYH02022-NF antenna < 5.0dBi</p>

Notes:

1. Data taken from FCC Title 47 Part 15 Subparts A & C Test Report No. 0322GEI_PROD0842-2_FCC15C, dated 22 Mar 2016 by Austest Laboratories.
2. Data taken from FCC ID: XF6-RS9110N1103 Certification Grant (Single Modular).
3. Data obtained from respective antenna specifications provided by client.

FCC § 15.247(b) RF Exposure Criteria for Intentional Radiators:

RF Exposure Requirements: FCC §1.1307(b)(1) and §1.1307(b)(2):

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission’s guidelines.

RF Radiation Exposure Limit: FCC §1.1310:

As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

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Maximum Permissible Exposure:

As specified in Table 1B of 47 CFR 1.1310 – Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

<i>Frequency Range (MHz)</i>	<i>Power Density (mW/cm²)</i>
300 – 1500	f/1500
1,500 – 100,000	1.0

MPE Calculation:

The transmitter antenna configurations for MPE considerations are as follows:

1. V2V Radio + WiFi (2412MHz) Configuration.
2. V2V Radio + WiFi (5260MHz) Worst Case Configuration.

Results of MPE calculations for the EUT in the stated configurations are included in the following pages.

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Model PROD0842-2 - V2V Radio + WiFi (2412MHz) Configuration

Product Details (Model PROD0842-2)

Tx Number	Description	FCC ID	Frequency (MHz)	RF Power (Max) (dBm)	Antenna Gain (Max) (dBi)
1	V2V Radio		920	20.50	4.00
2	WiFi	XF6-RS9110N1103	2412	15.15	5.00

Limits for Maximum Permissible Exposure (MPE) (FCC 1.1310 Table 1)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
(B) Limits for General Population/Uncontrolled Exposure				
300 to 1500	NA	NA	f/1500	30
1500 to 100,000	NA	NA	1	30

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

Power Density Limits (mW/cm²): Tx1 = **0.61** Tx2 = **1.00**

MPE Calculations (based on Power Density)

Minimum Separation Distance for Co-located Tx (cm) = **20**

Tx Number	Frequency (MHz)	RF Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Power Density (at 20 cm) (mW/cm ²)	Cumulative Exposure (%)
1	920	20.50	4.00	100	0.0561	9.19%
2	2412	15.15	5.00	100	0.0206	2.06%

Total Cumulative Exposure	11.25%
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Calculations are based on the following formulae:

$$\text{Power Density} = \frac{(\text{Gain} \times \text{Power} \times \text{Duty Cycle})}{(4 \times \pi \times \text{Distance}^2)}$$

$$\text{Cumulative Exposure} = \frac{\text{Power Density at Tx Frequency}}{\text{Power Density Limit at Tx Frequency}} \quad (\text{per OET 65})$$

Note 1: Co-located transmitters are transmitters with antennas within 20cm of each other, which could be transmitting simultaneously.

Note 2: Where there is only one transmitting antenna, any reference to co-location is invalid.

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Model PROD0842-2 - V2V Radio + WiFi (5260MHz) Worst Case Configuration

Product Details (Model PROD0842-2)

Tx Number	Description	FCC ID	Frequency (MHz)	RF Power (Max) (dBm)	Antenna Gain (Max) (dBi)
1	V2V Radio		920	20.50	4.00
2	WiFi	XF6-RS9110N1103	5260	13.67	5.00

Limits for Maximum Permissible Exposure (MPE) (FCC 1.1310 Table 1)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
(B) Limits for General Population/Uncontrolled Exposure				
300 to 1500	NA	NA	f/1500	30
1500 to 100,000	NA	NA	1	30

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

Power Density Limits (mW/cm²): Tx1 = **0.61** Tx2 = **1.00**

MPE Calculations (based on Power Density)

Minimum Separation Distance for Co-located Tx (cm) = **20**

Tx Number	Frequency (MHz)	RF Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Power Density (at 20 cm) (mW/cm ²)	Cumulative Exposure (%)
1	920	20.50	4.00	100	0.0561	9.19%
2	5260	13.67	5.00	100	0.0147	1.47%

Total Cumulative Exposure	10.66%
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Calculations are based on the following formulae:

$$\text{Power Density} = \frac{(\text{Gain} \times \text{Power} \times \text{Duty Cycle})}{(4 \times \pi \times \text{Distance}^2)}$$

$$\text{Cumulative Exposure} = \frac{\text{Power Density at Tx Frequency}}{\text{Power Density Limit at Tx Frequency}} \quad (\text{per OET 65})$$

Note 1: Co-located transmitters are transmitters with antennas within 20cm of each other, which could be transmitting simultaneously.
 Note 2: Where there is only one transmitting antenna, any reference to co-location is invalid.

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Based on worst-case MPE calculations, **the minimum separation distances** between the transmission point (generally referring to the transmit antennas or structure) and the human body for the CAS IVU product (Model PROD0842-2) with co-located radios is **20cm**, which is to be clearly and prominently stated in the product manual for the above listed combination of radios and maximum antenna gains.

The above minimum safety distance is not valid for transmit antennas with higher antenna gains.

Austest Summary and Recommendations

The equipment complies with FCC 47 CFR 1.1310: Limits for Maximum Permissible Exposure (MPE), Limits for General Population / Uncontrolled Exposure, when the indicated minimum separation distances are adhered to.

If compliance is sought for model numbers other than those listed in the test report, then the compliance folder must hold additional documentation, demonstrating the equivalence of the products between the different model numbers.

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