

RADIOFREQUENCY RADIATION EXPOSURE EVALUATION: MOBILE DEVICES

REPORT NUMBER: M2001004-4 V2

TEST STANDARD: 47 CFR PART 2.1091

**CLIENT: DIGITAL MINING
TECHNOLOGY**

DEVICE: CAS TOF UNIT

**MODEL: PROD0810, PROD0811,
PROD0812, PROD0813,
PROD0814, PROD0815
PROD0821, PROD0822**

DATE OF ISSUE: 25 MAY 2020

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REVISION TABLE

Version	Sec/Para Changed	Change Made	Date
1		Initial issue of document	5/03/2020
V2		Updates as per TCB request	25/05/2020

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RADIOFREQUENCY RADIATION EXPOSURE EVALUATION

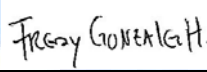
Device: CAS ToF Unit
Model Number: PROD0810, PROD0811, PROD0812, PROD0813, PROD0814,
PROD0815, PROD0821, PROD0822
Serial Number: -
Part Number: -
Manufacturer: Digital Mining Technology

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Standards: **47 CFR Part 2.1091**
"Radiofrequency radiation exposure evaluation: mobile devices"
47 CFR 1.1310
"Radiofrequency radiation exposure limits"
KDB 447498 D01 General RF Exposure Guidance v06
"RF exposure procedures and equipment authorization policies for
mobile and portable devices".

Result: Based on an assessment of the documentation provided the CAS ToF Unit, model PROD0810, PROD0811, PROD0812, PROD0813, PROD0814, PROD0815, PROD0821, PROD0822 complies with the RF exposure requirements of 47 CFR Part 2.1091, however an exclusion zone of 20 cm in front of the radiating elements applies, elsewhere the exposure level was below the MPE limits. Refer to Report M2001004-4 V2 for full details.

Assessment Date: 20 February 2020
Issue Date: 25 May 2020


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1 INTRODUCTION

This report is intended to demonstrate compliance of the CAS ToF Unit, model PROD0810, PROD0811, PROD0812, PROD0813, PROD0814, PROD0815, PROD0821, PROD0822 with the RF exposure requirements of 47 CFR Part 2.1091. Evaluation was performed in accordance with FCC KDB 447498 D01.

The product sample was provided by the Client and confirmed that the product models listed in this report have the same transmitters and antenna components/configuration. The conclusion herein is based on the information provided by the client.

1.1 Laboratory Overview

EMC Technologies Pty. Ltd. is an independently owned Australian company that is NATA accredited to ISO 17025 for both testing and calibration and ISO 17020 for Inspection. – **Accreditation Number 5292.**

1.2 Test Laboratory/Accreditations

Table 1-1: Accreditations for Conformity Assessment

Country/Region	Body	
Australia/New Zealand	NATA	Accreditation Number: 5292
Europe	European Union	Notified Body Number: 0819
USA	FCC	Designation Number: AU0001
Canada	ISED Canada	Company Number: 3569B
Japan	VCCI	Company Number: 785
Taiwan	BSMI	Lab Code SL2-IN-E-5001R

2 DEVICE DETAILS

(Information supplied by the Client)

2.1 Description of Sample

The CAS ToF Units are robust radio transmitter/receiver compatible with 2.4 GHz IEEE 802.15.4a Time of Flight (ToF) systems, RS-232/485 communications and an optional internal battery.

Manufacturer: Digital Mining Technology
Sample: CAS ToF Unit
Model Number: PROD0813
Serial Number: -

2.2 Transmitter and Antenna Details

Wireless Interface 1 (ToF):	IEEE 802.15.4a nanoPAN 5375 RF Module, Part Number: MN5375V2
Operating Frequency:	2.4375/2.442 GHz
Max. RF Output Power level:	10 dBm (10mW)
Antenna 1 & 2 Type:	External/Integral (SYSKIM, OYH02O20-NM) No Simultaneous Tx. Configured for diversity through a SPDT RF switch.
Max. Antenna Gain:	3dBi

3 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), §1.1310

Table 3-1: Occupational and General Public MPE Limits

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

Where f = Frequency in MHz, * = Plane-wave power density

4 UNCERTAINTY

EMC Technologies has evaluated the tools and methods used to perform Radiated Electromagnetic Field predictions. The estimated measurement uncertainties for the calculation shown within this report are as follows:

Electromagnetic Modelling;

30 MHz to 100GHz ±2.8 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

5 ASSUMPTIONS IN THIS ASSESSMENT

This assessment does not include accumulated RF fields from nearby sites/antennas or possible radio signal reflections or attenuation due to buildings or the general environment.

Antenna Parameters and power settings were supplied by the customer.

A 100% duty cycle is assumed.

The aperture of the radiating element assumed to be a point source in free space and far field conditions.

6 MPE CALCULATIONS

The MPE was evaluated at 20 cm to show compliance with the power density listed in table 3-1
The following formula was used to calculate the power density at 20 cm

$$S = \frac{P * G}{4\pi R^2}$$

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

Where

(S): Power density (mW/cm^2)

(P): Output power at antenna terminal (mW)

(G): Gain (ratio)

(R): Minimum test separation distance (20 cm)

Table 6-1: MPE Calculations – Frequency 2437 MHz

Technology	Frequency Band (MHz)	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
		<i>dBm</i>	<i>dBi</i>	%	<i>dBm</i>	<i>mW</i>	<i>mW/cm²</i>	<i>mW/cm²</i>	%
IEEE 802.15.4a (ToF)	2437	10	3	100%	13.00	19.95	0.0040	1.00	0.40%
Total percentage of the limit at 20 cm									0.40%

Table 0-2: MPE Calculations – Frequency 2442 MHz

Technology	Frequency Band (MHz)	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
		<i>dBm</i>	<i>dBi</i>	%	<i>dBm</i>	<i>mW</i>	<i>mW/cm²</i>	<i>mW/cm²</i>	%
IEEE 802.15.4a (ToF)	2442	10	3	100%	13.00	19.95	0.0040	1.00	0.40%
Total percentage of the limit at 20 cm									0.40%

7 CONCLUSION

Based on an assessment of the documentation provided the CAS ToF Unit, model PROD0810, PROD0811, PROD0812, PROD0813, PROD0814, PROD0815, PROD0821, PROD0822 complies with the RF exposure requirements of 47 CFR Part 2.1091. An exclusion zone of 20 cm in front of the radiating elements applies, elsewhere the exposure level was below the MPE limits.



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