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OTODATA WIRELESS NETWORK INC.

MPE REPORT

SCOPE OF WORK

MPE CALCULATION
ON THE GEN II

REPORT NUMBER

10442603OLEX-004.1

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MPE TEST REPORT

Report Number: 104426030LEX-004.1
Project Number: G104426030

Report Issue Date: 2/14/2021

Product Name: GEN II

Standards: FCC Part 1.1310 Limits for Maximum
Permissible Exposure (MPE)

RSS-102 Issue 5 RF Field Strength Limits for
Devices Used by the General Public

Tested by:
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Client:
OTODATA WIRELESS NETWORK INC.
9280 Boul. De l'Acadie
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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
8	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure)	Pass
	RSS-102 Issue 5 RF Field Strength Limits (For Devices Used by the General Public)	Pass



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	OTODATA WIRELESS NETWORK INC.
Address:	9280 Boul. De l'Acadie Montreal, QC H4N 3C5 Canada
Contact:	Pascal Turcotte
Telephone:	(514) 673-0244
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Manufacturer Information	
Manufacturer Name:	OTODATA WIRELESS NETWORK INC.
Manufacturer Address:	9280 Boul. De l'Acadie Montreal, QC H4N 3C5 Canada



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	GEN II
Model Number	MT4AD16W1
Hardware Version	C024
Software Version	2009
Supported Transmit Bands	Bluetooth Low Energy 2402 – 2480MHz
Receive Date	10/02/2020
Test Start Date	10/05/2020
Test End Date	10/10/2020
Device Received Condition	Good
Test Sample Type	Production
Rated Voltage	3.6VDC Battery
Antenna	PCB Trace Antenna. 2.14dBi Gain
Description of Equipment Under Test (provided by client)	
The MT4AD16W1 is a remote tank level monitoring device. It is intended to be powered by a non-rechargeable lithium battery pack for a predicted average lifetime of 10 years.	
The device reads the tank level sensor every few minutes. When a significant level change is detected, the microcontroller activates the cellular module. The latter then attaches to the preferred network and reports the data to a server. If there is no level change after 24 hours, the unit performs a daily report using the same procedure. The microcontroller communicates with the cellular module using AT commands (through a serial port).	
The MT4AD16W1 uses low data volume: up to 100KB per month, but usually around 10KB per month.	
The unit uses Bluetooth advertising to allow infield testing and diagnostics as well as enabling possible firmware upgrades. The microcontroller has an embedded 2.4GHz transceiver. The manufacturer provides the protocol stack for Bluetooth Low Energy. A PCB antenna over a ground plane is used as Bluetooth antenna.	

4.1 Variant Models:

There were no variant models covered by this evaluation.



5 FCC Limits

§ 1.1310: The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Part 1.1310 Limits for Maximum Permissible Exposure (MPE)

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 Exposures				
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
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	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
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**6 RSS-102 Issue 5 Exposure Limits:****Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6 ^{**}
1.1-10	87/ $f^{0.5}$	-	-	6 ^{**}
10-20	27.46	0.0728	-2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616000/ $f^{1.2}$

Note: f is frequency in MHz.

* Based on nerve stimulation (NS).

** Based on specific absorption rate (SAR).



7 Test Procedure

An MPE evaluation was performed in order to show that the device was compliant with the general population exposure limits from FCC §2.1091 and RSS-102 Issue 5. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$Conducted\ Power_{mW} = 10^{\frac{Conducted\ Power(dBm)}{10}}$$

$$Power\ Density = \frac{Conducted\ Power_{mW} \times Ant.\ Gain}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.



8 Results:

The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 1.1310 and RSS-102 Issue 5. The Bluetooth radio and onboard cellular module do not transmit simultaneously. Therefore, the cellular radio is excluded from the MPE calculations.

FCC MPE Data

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm^2)	MPE Limit (mW/cm^2)	Margin to Limit (mW/cm^2)
BLE	2402	3.46	3.46	2.14	0.0007	1.00	0.9993

RSS-102 Issue 5 MPE Data

Duty Cycle	100 (%)						
Separation Dist.	20 (cm)						
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m^2)	MPE Limit (W/m^2)	Margin to Limit (W/m^2)
BLE	2402	3.46	3.46	2.14	0.0072	5.35	5.3436



9 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	1/12/2020	104426030LEX-004	BCT	BZ	Original Issue
1	2/14/2021	104426030LEX-004.1	BCT	BZ	Included text indicating that the cellular and Bluetooth radios do not transmit simultaneously