Otodata Wireless Network, Inc.

MPE CALCULATIONS REPORT

SCOPE OF WORK
MPE Calculations on Propane Monitoring Device, Model C033

REPORT NUMBER
105128961BOX-001b.1

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MPE CALCULATIONS REPORT

(FULL COMPLIANCE)

Report Number: 105128961BOX-001b.1
Project Number: G105128961

Report Issue Date: May 17, 2023
Report Revision Date: July 24, 2023

Model(s) Tested:	C033
Model(s) Partially Tested:	None
Model(s) Not Tested but declared equivalent by the client:	None

Standards: FCC Part 1.1310 (05/23)
FCC KDB Publication 447498 D01 v06
ISED RSS-102 Issue 5; March 19, 2015

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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
3	Maximum Permissible Exposure (MPE) FCC Part 1.1310 (05/23) ISED RSS-102 Issue 5; March 19, 2015	Pass
4	Revision History	--

3 Maximum Permissive Exposure (MPE)

FCC Limits for Maximum Permissible Exposure

§ 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.

RSS-102 Issue 5 Maximum Permissible Exposure

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	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Test Procedure

An MPE evaluation for was performed in order to show that the device was compliant with §2.1091. The maximum power density was calculated for each transmitter at a separation distance of 20cm.

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

$$ConductedPower_{mW} = 10^{ConductedPower\,(dBm)/10}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

Evaluation Results:

Numeric gain = $10^{\wedge(2.31/10)}$
Power Density = [2.661mW * 1.702] / [4π * $(20cm)^2$] or 0.000867 mW/cm^2

Note: The maximum conducted power of 4.25 dBm or 2.661 mW at 2.480 GHz was taken from Intertek Report # 105128961BOX-001.1.

FCC MPE

Conducted Power (mW)	Numeric Gain	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	Results
2.661	1.702	0.000901	1	Compliant

Notes: MPE limit at 2480 MHz is 1 mW/cm^2

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Conducted Power (mW)	Numeric Gain	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	Results
2.661	1.702	0.000901	0.547	Compliant

Notes: MPE limit at 2480 MHz is $0.02619f^{0.6834}$ or $0.02619 * 2480^{\wedge 0.6834}$ or 5.469 W/m^2 or 0.547 mW/cm^2

The calculated maximum power density at 20 cm distance is less than the limit for general population / Uncontrolled Environment.

4 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	05/17/2023	105128961BOX-001b	KPS	VFV	Original Issue
1	07/24/2023	105128961BOX-001b.1	KPS	VFV	Removed SAR Exclusion Test calculation