



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

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May 29, 2018

Heatworks Technologies Inc  
2353 Hwy 17 N  
Mount Pleasant, SC 29466

Dear Michael Wieckowski,

Enclosed is the EMC Wireless test report for compliance testing of the Heatworks Technologies Inc, Heatworks MODEL 3 Tankless Water Heater as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15 Subpart C for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,  
MET LABORATORIES, INC.

Joel Huna  
Documentation Department

Reference: (\Heatworks Technologies Inc\EMC98105-MPE Rev. 1)

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## **Electromagnetic Compatibility Criteria Test Report**

for the

**Heatworks Technologies Inc  
Heatworks MODEL 3 Tankless Water Heater**

**Tested under**  
the FCC Certification Rules  
contained in  
15.247 Subpart C for Intentional Radiators

**MET Report: EMC98105-MPE Rev. 1**

May 29, 2018

**Prepared For:**

**Heatworks Technologies Inc  
2353 Hwy 17 N  
Mount Pleasant, SC 29466**

**Prepared By:**  
**MET Laboratories, Inc.**  
914 West Patapsco Avenue, Baltimore, MD 21230



## Electromagnetic Compatibility Criteria Test Report

for the

### Heatworks Technologies Inc Heatworks MODEL 3 Tankless Water Heater

**Tested under**  
the FCC Certification Rules  
contained in  
15.247 Subpart C for Intentional Radiators

Arsalan Hasan, Project Engineer  
Electromagnetic Compatibility Lab

Joel Huna  
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.

John Mason,  
Director, Electromagnetic Compatibility Lab



## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	May 14, 2018	Initial Issue.
1	May 29, 2018	TCB Corrections.



# I. Executive Summary



## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Heatworks Technologies Inc Heatworks MODEL 3 Tankless Water Heater, with the requirements of Part 15, §15.247. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Heatworks MODEL 3 Tankless Water Heater. Heatworks Technologies Inc should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Heatworks MODEL 3 Tankless Water Heater, has been **permanently** discontinued.

## B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.247, in accordance with Heatworks Technologies Inc, purchase order number ISI.900453. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference 47 CFR Part 15.247:2005	Description	Compliance
Title 47 of the CFR, Part 15 §15.247(i)	Maximum Permissible Exposure (MPE)	Compliant

**Table 1. Executive Summary of EMC Part 15.247 Compliance Testing**



## II. Equipment Configuration



## A. Overview

MET Laboratories, Inc. was contracted by Heatworks Technologies Inc to perform testing on the Heatworks MODEL 3 Tankless Water Heater, under Heatworks Technologies Inc’s purchase order number ISI.900453.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Heatworks Technologies Inc, Heatworks MODEL 3 Tankless Water Heater.

The results obtained relate only to the item(s) tested.

<b>Model(s) Tested:</b>	Heatworks MODEL 3 Tankless Water Heater
<b>Model(s) Covered:</b>	Heatworks MODEL 3 Tankless Water Heater
<b>EUT Specifications:</b>	Primary Power: 100 to 240 VAC 50-60 Hz
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.
<b>Evaluated by:</b>	Arsalan Hasan
<b>Report Date(s):</b>	May 29, 2018

Table 2. EUT Summary Table

## B. References

<b>CFR 47, Part 15, Subpart C</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
<b>ANSI C63.4:2014</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ISO/IEC 17025:2005</b>	General Requirements for the Competence of Testing and Calibration Laboratories
<b>ANSI C63.10-2013</b>	American National Standard for Testing Unlicensed Wireless Devices

Table 3. References

## C. Test Site

All testing was performed at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.



### D. Description of Test Sample

The Heatworks Technologies Inc Heatworks MODEL 3 Tankless Water Heater, Equipment Under Test (EUT), is a tankless electric (on demand) water heater for residential potable water systems. It can be installed for whole home use, or at distributed various points of use. The EUT will heat flowing water to a chosen temperature setpoint using electrical energy.

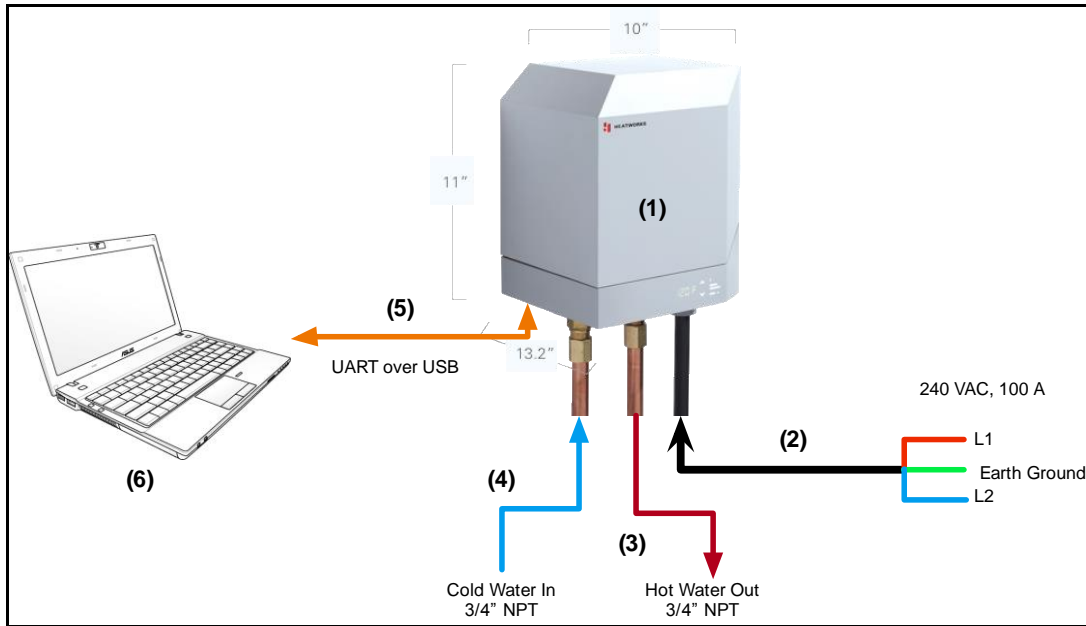


Figure 1. Block Diagram of Test Configuration

### E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
1		MODEL 3 Water Heater	MODEL 3			

Table 4. Equipment Configuration

### F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
6	Laptop with USB port			

The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

Table 5. Support Equipment



## G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded ? (Y/N)	Termination Box ID & Port Name
2	AC Input	3 conductor, 4 awg THHN	1			N	
3	Hot water out	Flexible hose adapted to 3/4" NPT fitting	1				
4	Cold water in	Flexible hose adapted to 3/4" NPT fitting	1				
5	USB Debug	USB cable (Micro)	1	5		Y	

Table 6. Ports and Cabling Information

## H. Mode of Operation

Normal Operation:

With water flowing at a common rate (1 to 2 GPM) and a temperature set point around 100-110 F, the unit will periodically send information over WiFi and accept connections over Bluetooth LE.

## I. Method of Monitoring EUT Operation

#1 – The unit is drawing AC current (measurable) commensurate with heating of the water. Also, data should be visible via the WiFi-cloud platform and Bluetooth LE connections should be possible.

#2 – Error codes on the EUT screen, loss of visible lights on the EUT, no data from cloud platform, no BLE broadcast.

## J. Modifications

### a) Modifications to EUT

No modifications were made to the EUT.

### b) Modifications to Test Standard

No modifications were made to the test standard.

## K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Heatworks Technologies Inc upon completion of testing.



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(i) Maximum Permissible Exposure

**RF Exposure Requirements:** §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:** §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.

**Note:** Co-located transmitters are 2.4GHz BLE and 2.4GHz WiFi

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density (mW/cm<sup>2</sup>)  
P = Power Input to antenna (mW)  
G = Antenna Gain (numeric value)  
R = Distance (cm)

$$G(\text{dBi}) = 10 \log G \text{ (linear)}$$



**Test Results:**

Results are based on KDB 447498 [Section 7.2]. Transmitters used in mobile device exposure conditions for simultaneous transmission operations.

**MPE Result for Intentional Radiators above 1500 MHz.**

Note: Tune Up Tolerance is [+/-] 1dB for WiFi and BLE radios.

**MPE Result for Intentional Radiators of Frequency Range: 300 MHz – 1500 MHz**

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Ant Gain (dBi)	Ant Gain (dBi)	Power Density (mW/cm <sup>2</sup> )	Limit at 20 cm (mW/cm <sup>2</sup> )	Percentage of Limit (%)
2440 (BLE)	1.38	1.374	-0.5	0.891	0.00024	1	0.024
2437 (WiFi)	23.03	200.9	-3	0.501	0.02003	1	2.003

BLE Module FCC-ID: WAP2011  
2402 MHz – 2478 MHz

WiFi Module FCC-ID: 2ADHKATWINC1500  
2412 MHz – 2462 MHz  
Mode: b, g, n

The BLE and WiFi radios transmit simuleatously. The combined percentage is lower than the limit of 100%.

The safe distance where Power Density is less than the MPE Limit listed above was found to be 20 cm.



# End of Report