

# Water Pik, Inc. TEST REPORT

SCOPE OF WORK EMC TESTING ON WATER FLOSSER, MODEL(S): WF-09

**REPORT NUMBER** 103835210LAX-002

**ISSUE DATE** 26-August-2019 [REVISED DATE]

PAGES

19

DOCUMENT CONTROL NUMBER

Non-Specific EMC Report Shell Rev. December 2017  $\ensuremath{\mathbb{C}}$  2017 INTERTEK





# **EMC TEST REPORT**

(FULL COMPLIANCE)

**Report Number:** 103835210LAX-002 **Project Number:** G103835210

Report Issue Date: 26-August-2019

Model(s) Tested: WF-09

Standards: FCC 47CFR: (Part 15 Subpart B):2019 Title 47 CFR Part 15 Subpart B: Unintentional Radiators

> ICES-003 Issue 6, Published: January 19,2016, Updated: April 2019 Information Technology Equipment (Including Digital Apparatus) – Limits and Methods of Measurement

Tested by: Intertek Testing Services NA, Inc. 25791 Commercentre Drive Lake Forest, CA 92630-8803 USA Client: Water Pik, Inc. 1730 E Prospect Road Fort Collins, CO 80525-1310 USA

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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
6	Radiated Emissions (FCC Part 15.109 / ICES-003, Class B)	Pass
7	AC Mains Conducted Emissions (FCC Part 15.109 / ICES-003, Class B)	Pass
8	Revision History	

### 3 Client Information

#### This EUT was tested at the request of:

Client:	Water Pik, Inc. 1730 E Prospect Road Fort Collins, CO 80525-131 USA		
Contact:	Tom Graves		
Telephone:	970-221-7072		

Email: tgraves@waterpik.com

### 4 Description of Equipment Under Test and Variant Models

Manufacturer:	Water Pik, Inc.
	1730 E Prospect Road
	Fort Collins, CO 80525-1310
	USA

Equipment Under Test					
Description Manufacturer Model Number Serial Number					
Water Flosser Water Pik, Inc.		WF-09			
Dessive Deter	07/44/0040				

Receive Date:	07/11/2019
Received Condition:	Good
Туре:	Production

#### Description of Equipment Under Test (provided by client)

The equipment under test (EUT) is a waterflosser. The inductive charger in the base (433.5 MHz) is only used for pumping water, not for communication. When the inductive charger is on, the RF transmitter in the toothbrush power handle and the RF receiver in the base are disabled, and no RF communication is allowed in this state. There is a 433.51 MHz radio in the power handle to control flossing.

Equipment Under Test Power Configuration					
Rated Voltage Rated Current Rated Frequency Number of Phases					
100-240 VAC	0.5 A	50/60 Hz	1		

#### Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Normal Operation Mode: Power handle is on base. Power handle is attached to water tube. Brush head is attached to power handle.

#### Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

#### Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

## 5 System Setup and Method

Cables						
ID	Description	Length (m)	Shielding	Ferrites	Termination	
1	DC Input Cable	1.35	None	None	AC Adaptor to EUT	

Support Equipment					
Description Manufacturer Model Number Serial Number					
None	-	-	-		

## 5.1 Method:

Configuration as required by ANSI C63.4:2014.

## 5.2 EUT Block Diagram:



## 6 Radiated Emissions

## 6.1 Method

Tests are performed in accordance with ANSI C63.4:2014.

#### TEST SITE: Lake Forest EMC Lab

**3m ALSE:** The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

#### Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions,	0.09-1000 MHz	4.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.7 dB	5.2 dB

As shown in the table above our radiated emissions  $U_{lab}$  is less than the corresponding  $U_{CISPR}$  reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

#### Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

 $\begin{array}{ll} FS = RA + Correction \ Factor \\ Correction \ Factor = CF + AF - AG \\ Where & FS = Field \ Strength \ in \ dB\mu V/m \\ RA = Receiver \ Amplitude \ (including \ preamplifier) \ in \ dB\mu V \\ CF = Cable \ Attenuation \ Factor \ in \ dB \\ AF = Antenna \ Factor \ in \ dB \\ AG = Amplifier \ Gain \ in \ dB \end{array}$ 

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB $\mu$ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

RA = 52.0 dB $\mu$ V AF = 7.4 dB/m CF = 1.6 dB AG = 29.0 dB FS = 32 dB $\mu$ V/m

To convert from  $dB\mu V$  to  $\mu V$  or mV the following was used:

UF =  $10^{(NF/20)}$  where UF = Net Reading in  $\mu$ V NF = Net Reading in dB $\mu$ V

## Example:

FS = RA + Correction Factor = RA + (AF + CF – AG) = 52.0 + (7.4 + 1.6 – 29.0) = 32.0 UF =  $10^{(32 \text{ dB}\mu\text{V}/20)}$  = 39.8  $\mu\text{V/m}$ 

## 6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001140	EMI Test Receiver	Rohde & Schwarz	ESCI7	100825	02/27/2019	02/27/2020
001707	Broadband Hybrid Antenna 30MHz-6GHz	SunAR RF Motion	JB6	A110618	11/20/2018	11/20/2019
001517	RF Cable 30Mhz-18Ghz	Rohde & Schwars	TSPR-B7	101528	08/10/2019	08/10/2020
001518	RF Cable 30Mhz-18Ghz	Rohde & Schwars	TSPR-B7	101529	08/10/2019	08/10/2020
001568	Preamplifier 10 KHz - 1 GHz	Rohde & Schwarz	TS-PR1	102061	02/01/2019	02/01/2020
		Omega				
001015	Lab Monitor	Engineering	iBTHX-W	0480396	02/12/2019	02/12/2020

#### Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	3.18.0.23

## 6.3 Results:

The sample tested was found to Comply.

## 6.4 Setup Photographs:







Client: Water Pik, Inc. Model: WF-09 Engineer: Marianthe B. Testado

## FCC Part15.109 / ICES-003 - Radiated Emissions Peak Scan Horizontal Polarization @ 120VAC/60Hz



Client: Water Pik, Inc. Model: WF-09 Engineer: Marianthe B. Testado

## FCC Part15.109 - Radiated Emissions Peak Scan Vertical Polarization @ 120VAC/60Hz

## 6.6 Data: 30MHz-1GHz

Test Personnel:	Marianthe B. Testado	Test Date:	07/18/2019
Supervising Engineer:	Melvin Sanchez		
Product Standard:	FCC Part15.109 / ICES-003	Limit Applied:	Class B
Input Voltage:	120VAC/60Hz		
		Ambient Temperature:	24.6 °C
Pretest Verification:	Yes	Relative Humidity:	49.2 %
		Atmospheric Pressure:	988.1 mbars

FCC Part15.109 / ICES-003, Radiated Emissions, Class B (Quasi Peak Horizontal)								
Frequency	QP Level	Limit @ 3m	QP Margin	Azimuth	Height	Correction Factor		
(MHz)	(dBµV)	dB(dBµV)	(dB)	(°)(dB)	(m)(dB)	(dB)		
658.798	35.72	46	-10.28	180.75	2.58	3.56		
659.526	35.71	46	-10.29	82.5	3.13	3.54		
661.301	38.33	46	-7.67	27	3.45	3.59		
662.757	37.16	46	-8.84	297	1.03	3.56		
667.696	38.12	46	-7.88	301.25	1.17	3.47		
726.311	35.44	46	-10.56	305.25	1.09	2.86		

Detectors/Bandwidths (Det/RBW/VBW)= 120/300kHz

FCC Part15.109 / ICES-003, Radiated Emissions, Class B (Quasi Peak Vertical)								
Frequency	QP Level	Limit @ 3m	QP Margin	Azimuth	Height	Correction Factor		
(MHz)	(dBµV)	dB(dBµV)	(dB)	(°)(dB)	(m)(dB)	(dB)		
647.018	40.48	46	-5.52	82.25	2.29	3.71		
*660.495	41.45	46	-4.55	98.75	2.09	3.56		
670.026	40.47	46	-5.53	75.25	2.26	3.38		
671.122	39.33	46	-6.67	155.75	3.89	3.4		
679.604	35.68	46	-10.32	186	2.28	3.32		
686.384	37.98	46	-8.02	102	1.73	3.29		
		Detectors /Bandy	widths (Det/RBW//VBW/)-	- 120/300647				

Detectors/Bandwidths (Det/RBW/VBW)= 120/300k

Test Result:

(\*)The EUT PASSED Radiated Emission test with – 4.55 dB margin at 660.495 MHz.

Deviations, Additions, or Exclusions: None

FCC Part 15/FCC Part 15.109 30M-40GHz B - Average/3.0m/

#### Plots: 1GHz-3GHz 6.7



Model: Model: WF-09; Client: Client: Water Pik, Inc.

#### FCC Part15.109 / ICES-003 - Radiated Emissions Peak Scan Horizontal Polarization @ 120VAC/60Hz



Model: Model: WF-09: Client: Client: Water Pik, Inc. FCC Part15.109 / ICES-003 - Radiated Emissions Peak Scan Vertical Polarization @ 120VAC/60Hz

Frequency

3GHz Polarization: Vertical

10 0 1GHz

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## 6.8 Data: 1GHz-3GHz

Test Personnel:	Marianthe B. Testado	Test Date:	08/26/2019
Supervising Engineer:	Melvin Sanchez		
Product Standard:	FCC Part15.109 / ICES-003	Limit Applied:	Class B
Input Voltage:	120VAC/60Hz		
		Ambient Temperature:	25.1 ⁰C
Pretest Verification:	Yes	Relative Humidity:	53.5 %
		Atmospheric Pressure:	986.3 mbars

FCC Part15.109 / ICES-003, Radiated Emissions, Class B (Average Peak Horizontal)								
Frequency	Ave Level	Ave Limit	Ave Margin	Azimuth	Height	Peak	RA	Correction Factor
(MHz)	(dBµV)	dB(dBµV)	(dB)	(°)(dB)	(m)(dB)	(dBµV)	(dBuV)	(dB)
1939	29.47	54	-24.53	4	1.33	45.38	38.26	-8.8
1939.25	25.3	54	-28.7	159	1.15	40.17	36.84	-8.79
Detectors/Bandwidths (Det/RBW/VBW)= 1/3MHz								

FCC Part15.109 / ICES-003, Radiated Emissions, Class B (Average Peak Vertical)								
Frequency	Ave Level	Ave Limit	Ave Margin	Azimuth	Height	Peak	RA	Correction Factor
(MHz)	(dBµV)	dB(dBµV)	(dB)	(°)(dB)	(m)(dB)	(dBµV)	(dBuV)	(dB)
1939.75	32.54	54	-21.46	71	1.21	50.55	40.09	-8.78
1940	33.57	54	-20.43	9	2.56	49.03	42.34	-8.78
Detectors/Bandwidths (Det/RBW/VBW)= 1/3MHz								

Test Result: (\*)The EUT PASSED Radiated Emission test with – 20.43 dB margin at 1940 MHz.

Deviations, Additions, or Exclusions: None

## 7 AC Mains Conducted Emissions

## 7.1 Method

Tests are performed in accordance with ANSI C63.4:2014.

#### TEST SITE: Lake Forest EMC Lab

3m ALSE: The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

### Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
AC Line Conducted			
Emissions	150 kHz - 30 MHz	2.6 dB	3.4dB
Telco Port Emissions	150 kHz - 30 MHz	2.6 dB	5.0dB

As shown in the table above our conducted emissions  $U_{lab}$  is less than the corresponding  $U_{CISPR}$  reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

## **Sample Calculations**

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF

Where NF = Net Reading in  $dB\mu V$ 

 $RF = Reading from receiver in dB\mu V$ 

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from  $dB\mu V$  to  $\mu V$  or mV the following was used:

UF =  $10^{(NF/20)}$  where UF = Net Reading in  $\mu$ V NF = Net Reading in dB $\mu$ V

## Example:

 $NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$  $UF = 10^{(49.1 \text{ dB}\mu\text{V}/20)} = 285.1 \ \mu\text{V/m}$ 

## 7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001140	EMI Test Receiver	Rohde & Schwarz	ESCI7	100825	02/27/2019	02/27/2020
01401	LISN	EMCO	3816/2NM	1039	05/29/2019	05/29/2020
001797	Cable	Fairview Microwave	FMC0101223-300	None	11/08/2018	11/08/2019
001015	Lab Monitor	Omega Engineering	iBTHX-W	0480396	02/12/2019	02/12/2020

#### Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	3.18.0.23

## 7.3 Results:

The sample tested was found to Comply.

## 7.4 Setup Photographs:







Client: Water Pik, Inc. Model: WF-09 Engineer: Marianthe B. Testado





Client: Water Pik, Inc. Model: WF-09 Engineer: Marianthe B. Testado



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### 7.6 Data:

Test Personnel: Supervising/Reviewing	Marianthe B. Testado	Test Date:	07/19/2019
Engineer:			
(Where Applicable)	Melvin Sanchez		
Product Standard:	FCC Part15.107 / ICES-003	Limit Applied:	Class B
Input Voltage:	120VAC/60Hz		
Pretest Verification w/		Ambient Temperature:	25.6 °C
Ambient Signals or		Relative Humidity:	
BB Source:	Yes	Relative Furnicity:	47.4 %

Atmospheric Pressure: 989.5 mbars

FCC Part15.107 / ICES-003, Conducted Emissions, Class B (Line 1)							
Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin	Correction
MHz	(dBµV)	(dBµV)	(dBµV)	(dBµV)	(dB)	(dB)	(dB)
*0.364033	26.85	56.02	48.59	58.59	-21.74	-2.57	0.23
0.532654	24.33	42.92	46	56	-21.67	-13.08	0.17
1.038313	26.07	38.95	46	56	-19.93	-17.05	0.15
1.151727	26.71	40.28	46	56	-19.29	-15.72	0.15
1.318541	27.19	39.98	46	56	-18.81	-16.02	0.15
1.494374	27.72	40.59	46	56	-18.28	-15.41	0.16
Detectors/Bandwidths (Det/RBW/VBW)= 9/30kHz							

FCC Part15.107 / ICES-003, Conducted Emissions, Class B (Line 2)							
Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin	Correction
MHz	(dBµV)	(dBµV)	(dBµV)	(dBµV)	(dB)	(dB)	(dB)
0.495043	23.3	43.91	46.1	56.1	-22.8	-12.19	0.24
1.001712	21.94	33.9	46	56	-24.06	-22.1	0.22
1.227539	22.1	32.36	46	56	-23.9	-23.64	0.23
3.021158	23.36	36.29	46	56	-22.64	-19.71	0.29
14.50519	30.99	39.9	50	60	-19.01	-20.1	0.6
14.71983	30.84	39.74	50	60	-19.16	-20.26	0.6
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

Test Result:

(\*) The EUT PASSED Radiated Emission test with -2.57 dB margin at 0.364033 MHz Measured result is below the limit by a margin less than the measurement uncertainty; therefore it is not possible to determine compliance at a level of confidence of 95%. However, the measurement result indicates a higher probability that the product tested complies with the limit.

Deviations, Additions, or Exclusions: None

## 8 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	08/26/2019	103835210LAX-002	MBT	MS	Original Issue