

NUWAVE, LLC. OZONE TEST REPORT

SCOPE OF WORK

Ozone Emissions Testing of Air Purifier for Model: 47001

REPORT NUMBER

180528241GZU-001

ISSUE DATE

24-August-2018

PAGES

14

QUOTE NUMBER

QGZ180519001

DOCUMENT CONTROL NUMBER

GFT-OP-10o (16-Oct-2017)

© 2018 INTERTEK



TEST REPORT FOR NUWAVE, LLC.

Report No.: 180528241GZU-001

Date: Aug. 24, 2018

Contact Name: Byung Choi
Address: 1795 N Butterfield Road, Libertyville IL 60048 USA
Phone: 1-224-206-3022
Email: Byung.Choi@nuwavenow.com

SECTION 1

SUMMARY

The representative sample(s) have been tested, investigated, and found to comply with the requirements of standards:



Electrostatic Air Cleaners, [UL 867:2011 Ed.5 +R:16Sep2016], Section 40

Electrostatic Air Cleaners, [CSA C22.2#187:2015 Ed.4], Section 7.4

The equipment identified in this report has been found to meet the criteria for emittance of ozone not exceeding a concentration of 0.050 ppm. Furthermore, a second sample was not required to be tested, according to UL 867, as the first sample's maximum emissions were less than 0.030 ppm, which satisfies the exception in the Section 40.1.1.

This report completes our evaluation covered by Intertek Project Number 180528241GZU which has been authorized by Intertek quote number: QGZ180519001. If there are any questions regarding the results contained in this report, or any of the other services offered by Intertek, please do not hesitate to contact the above signed.

OZONE EMISSIONS SUMMARY			
FAN SPEED	FILTER(S)	O3/VOLTAGE SETTING	C(t) _{max} [ppm]
High	All	-	0.001
Low	All	-	0.001
High	ESP	-	0.001
Low	ESP	-	0.001
<i>The maximum Time-Weighted-Average: 0.000 ppmv</i>			

Completed by:	Sunny Zhou	Reviewed by:	Jacob Langenbacher
Title:	Assistant Technical Manager	Title:	Engineer
Signature:		Signature	
Date	Aug. 2, 2018	Date:	Aug. 24, 2018

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

SECTION 2

INDEX

Section Names	PAGE
1: Summary/Signatures	2
2: Index/ Chamber Equipment Information	3
3: Unit under test information	4
4: Peak test	5
5: Max Test(s) Information	7
6: Appendices	11
7: Revisions	14

CHAMBER EQUIPMENT INFORMATION

TEST EQUIPMENT LIST

Instrument	Model	Intertek Ctrl #	Cal Due Date
Teledyne – Advanced Pollution Instrumentation Ozone Calibrator	T703	SA054-14	07-Dec-2018
Teledyne – Advanced Pollution Instrumentation Ozone Monitor	T400	SA054-13	*
Teledyne – Advanced Pollution Instrumentation Ozone Monitor	400E	SA054-10	*
Vaisala – Temperature & Humidity Transducer	H2120047	SA054-12	12-Jun-2019
QI XING HUA CHUANG – Mass flowmeter	D07-23FM	SA054-12-03	19-Jul-2020

* The T400 and 400E Ozone Monitor is calibrated using the T703 calibrator.

SECTION 3

UNIT UNDER TEST INFORMATION

MODEL INFORMATION			
Manufacturer:	NUWAVE, LLC.	Pre-Filter:	Removable
Model Number:	47001	HEPA Filter:	Removable
Production/Prototype/ Design	Prototype	ESP Filter:	Removable
Fan Speeds:	6	Carbon Filter:	Removable
O3/Voltage Settings:	NA	UV Light:	No
O3 Monitor:	NA	Ionizer:	Yes
Model Notes:	Brand: NUWAVE Fan speed: 1(Lowest), 2, 3, 4, 5, 6(Highest). HEPA and Carbon Filter were combined as one filter. Ozone Emission Removal Filter was also provided. The air purifier cannot work when the ESP filter is removed. Ionizer and ESP filter cannot work without the fan operating.		

RUN-IN TEST			
FIRST SAMPLE			
Run-in Start:	Jul. 16, 2018, 17:30	Run-in End:	Jul.19, 2018, 9:00
Run-in Temperature:	25±5°C	Sample Number	S180528241-003
Serial Number:	NA		
Sample Notes:			
SECOND SAMPLE			
Run-in Start:	NA	Run-in End:	NA
Run-in Temperature:	NA	Sample Number	S180528241-002
Serial Number	NA		
Sample Notes:			

SECTION 4

PEAK OZONE TEST

GRILL AND AIR PERIPHERY DIMENSIONS			
		Date of Test:	Jul.23,2018 Jul.24,2018 Jul.25,2018
Grill Height:	170mm	Air Periphery Height:	180mm
Grill Width:	170mm	Air Periphery Width:	170mm
Estimated Grill Area:	Approx. 28900 mm ²	Est. Air Periphery Area:	Approx. 30600 mm ²
Notes:	Measurements are in mm Location 7 and 8 directly downstream of the 2 pole of ionizer		

PEAK LOCATION			
Loc.	X	Y	
-	[mm]	[mm]	
1	0	180	
2	85	180	
3	170	180	
4	0	90	
5	85	90	
6	170	90	
7	50	10	
8	130	10	
9	0	0	
10	85	0	
11	170	0	



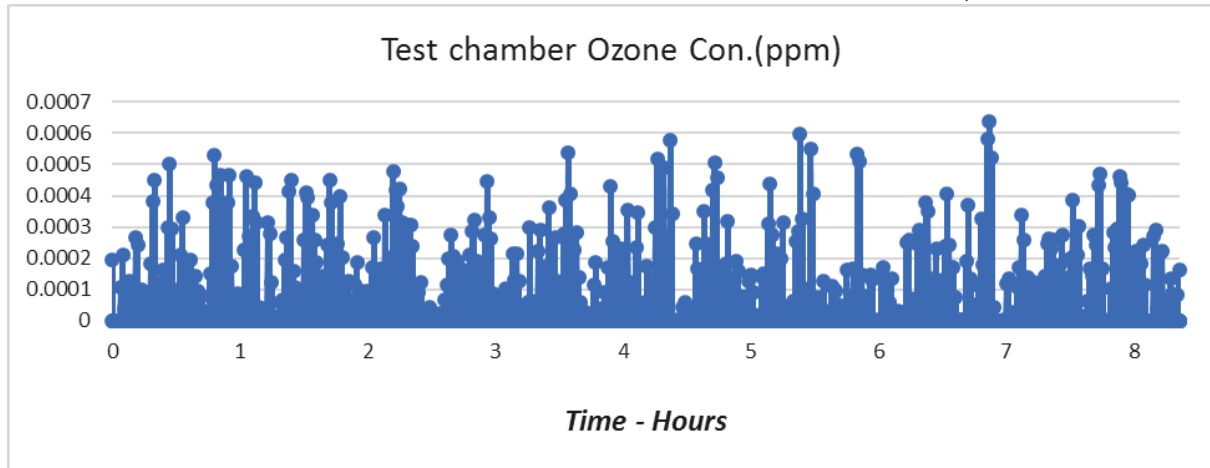
PEAK OZONE CONCENTRATIONS (ppm)				
Location	With Filter(s)		Without Filter(s)	
	Highest	Lowest	Highest	Lowest
1	0.0002	0.0002	0.0001	0.0002
2	0.0000	0.0002	0.0002	0.0002
3	0.0001	0.0003	0.0003	0.0006
4	0.0000	0.0005	0.0004	0.0001
5	0.0002	0.0001	0.0001	0.0003
6	0.0000	0.0002	0.0007	0.0001
7	0.0002	0.0000	0.0002	0.0003
8	0.0004	0.0002	0.0004	0.0003
9	0.0006	0.0000	0.0003	0.0001
10	0.0000	0.0001	0.0003	0.0001
11	0.0004	0.0002	0.0002	0.0001

Note: Result is minus background.

SECTION 5

MAX OZONE TEST

START DATE OF TEST: 24-July-2018
 SAMPLE: S180528241-003
 FAN SPEED: 6 (highest)
 FILTER(S): Stainless Steel Pre-Filter, HEPA Filter, Activated Carbon Filter, ESP Filter and Ozone Emission Removal Filter installed, Ionizer ON

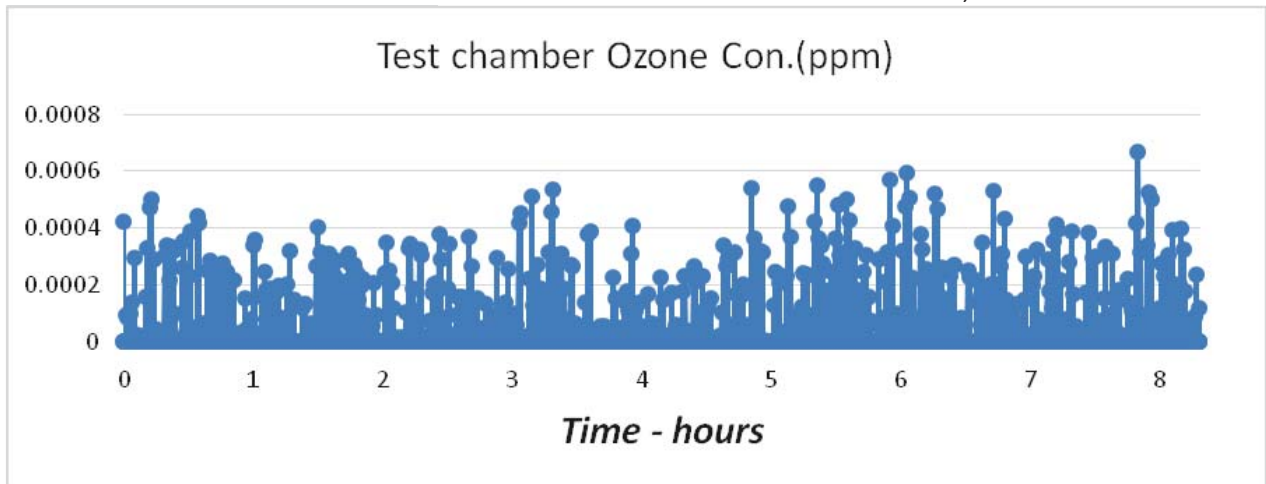


MAXIMUM OZONE TEST RESULTS							
	UL Ref.	Pass/Fail	Mean	Min	Max	Delta	Units
Background C(t) O3:	40.4.3	PASS	0.000	0.000	0.000	0.000	[ppm]
Test 1min C(t) O3:	40.1.2	PASS	0.001	0.000	0.001	0.001	[ppm]
Test 5min C(t) O3:	40.1.2	PASS	0.000	0.000	0.001	0.001	[ppm]
Chamber Temperature:	40.4.2	PASS	26.44	25.85	26.60	0.75	[degC]
Chamber Humidity:	40.4.2	PASS	48.86	47.69	50.75	3.06	[%RH]
Chamber Static Pressure:	-	PASS	5.00	4.40	5.50	1.10	[Pa]
Chamber Supply Air Flow:	-	-	34.00	33.98	34.03	0.05	[m3/h]
Required to Test 2nd Sample:	40.1.1	NO					
Test Duration:	40.4.6	8 hours					

NOTES: Peak Test Location 9.
 According to a) of 40.4.6, 24 hours testing is not needed.

MAX OZONE TEST

START DATE OF TEST: 25-July-2018
 SAMPLE: S180528241-003
 FAN SPEED: 1 (Lowest)
 FILTER(S): Stainless Steel Pre-Filter, HEPA Filter, Activated Carbon Filter, ESP Filter and Ozone Emission Removal Filter installed, Ionizer ON

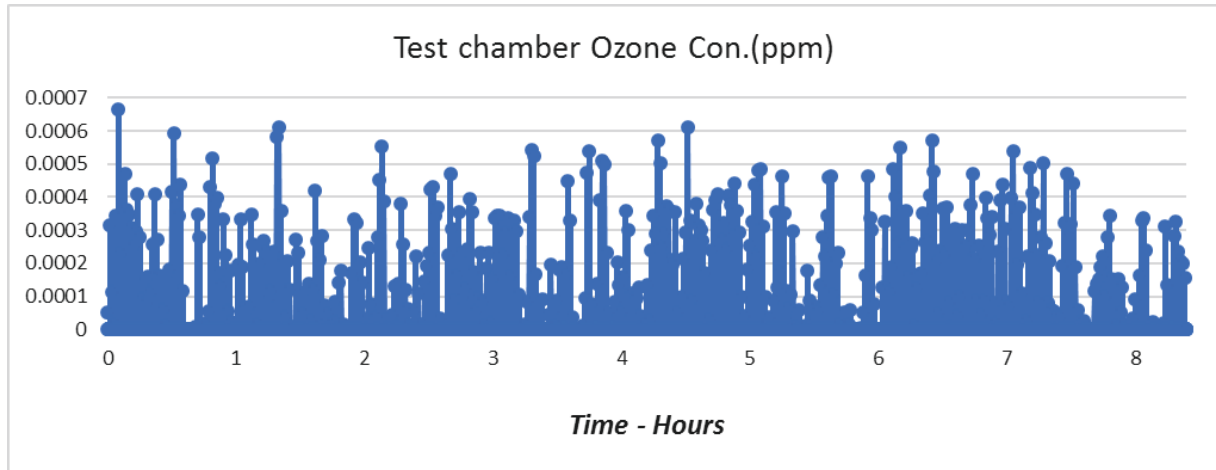


MAXIMUM OZONE TEST RESULTS							
	UL Ref.	Pass/Fail	Mean	Min	Max	Delta	Units
Background C(t) O3:	40.4.3	PASS	0.000	0.000	0.001	0.001	[ppm]
Test 1min C(t) O3:	40.1.2	PASS	0.001	0.000	0.001	0.001	[ppm]
Test 5min C(t) O3:	40.1.2	PASS	0.000	0.000	0.001	0.001	[ppm]
Chamber Temperature:	40.4.2	PASS	25.92	25.85	25.95	0.10	[degC]
Chamber Humidity:	40.4.2	PASS	50.38	50.18	50.64	0.45	[%RH]
Chamber Static Pressure:	-	PASS	5.00	4.80	5.60	0.80	[Pa]
Chamber Supply Air Flow:	-	-	34.00	33.98	34.02	0.04	[m3/h]
Required to Test 2nd Sample:	40.1.1	NO					
Test Duration:	40.4.6	8 hours					

NOTES: Peak Test Location 4.
 According to a) of 40.4.6, 24 hours testing is not needed.

MAX OZONE TEST

START DATE OF TEST: 27-July-2018
 SAMPLE: S180528241-003
 FAN SPEED: 6 (highest)
 FILTER(S): Stainless Steel Pre-Filter , HEPA Filter, Activated Carbon Filter and Ozone Emission Removal Filter removed, ESP Filter installed, Ionizer ON

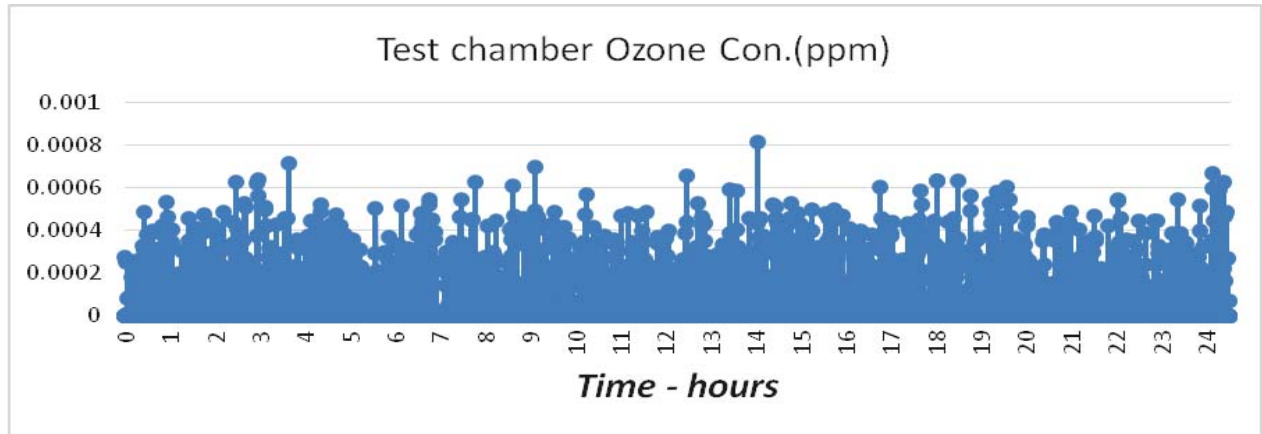


MAXIMUM OZONE TEST RESULTS							
	UL Ref.	Pass/Fail	Mean	Min	Max	Delta	Units
Background C(t) O3:	40.4.3	PASS	0.000	0.000	0.001	0.001	[ppm]
Test 1min C(t) O3:	40.1.2	PASS	0.001	0.000	0.001	0.001	[ppm]
Test 5min C(t) O3:	40.1.2	PASS	0.000	0.000	0.001	0.001	[ppm]
Chamber Temperature:	40.4.2	PASS	26.32	26.14	26.43	0.30	[degC]
Chamber Humidity:	40.4.2	PASS	49.24	48.60	50.10	1.50	[%RH]
Chamber Static Pressure:	-	PASS	5.00	4.40	5.40	1.00	[Pa]
Chamber Supply Air Flow:	-	-	34.00	33.97	34.03	0.06	[m3/h]
Required to Test 2nd Sample:	40.1.1	NO					
Test Duration:	40.4.6	8 hours					

NOTES: Peak Test Location 6.
 According to a) of 40.4.6, 24 hours testing is not needed.

MAX OZONE TEST

START DATE OF TEST: 28-July-2018
 SAMPLE: S180528241-003
 FAN SPEED: 1 (Lowest)
 FILTER(S): Stainless Steel Pre-Filter , HEPA Filter, Activated Carbon Filter and Ozone Emission Removal Filter removed, ESP Filter installed, Ionizer ON



MAXIMUM OZONE TEST RESULTS							
	UL Ref.	Pass/Fail	Mean	Min	Max	Delta	Units
Background C(t) O3:	40.4.3	PASS	0.000	0.000	0.000	0.000	[ppm]
Test 1min C(t) O3:	40.1.2	PASS	0.001	0.000	0.001	0.001	[ppm]
Test 5min C(t) O3:	40.1.2	PASS	0.000	0.000	0.001	0.001	[ppm]
Chamber Temperature:	40.4.2	PASS	25.91	25.84	26.00	0.16	[degC]
Chamber Humidity:	40.4.2	PASS	50.27	49.62	50.94	1.32	[%RH]
Chamber Static Pressure:	-	PASS *	5.00	4.30	5.50	1.20	[Pa]
Chamber Supply Air Flow:	-	-	34.00	33.97	34.02	0.05	[m3/h]
Required to Test 2nd Sample:	40.1.1	NO					
Test Duration:	40.4.6	24 hours					

NOTES: Peak Test Location 3.
 0 to 8-hour Time-Weighted-Average: 0.000ppmv
 8 to 16-hour Time-Weighted-Average: 0.000 ppmv
 16 to 24-hour Time-Weighted-Average: 0.000 ppmv

SECTION 6

APPENDIX

DATA FILES

TEST NAME	RAW DATA FILE
Half Life Test	RawData-half life-2018-7-20.xls
Half Life Test	RawData-half life-2018-7-25.xls
Max Ozone: High w/ Filter	RawData-Max test-Filter-H.xls
Max Ozone: Low w/ Filter	RawData-Max test-Filter-L.xls
Max Ozone: High w/o Filter	RawData-Max test-Wo Filter-H.xls
Max Ozone: Low w/o Filter	RawData-Max test-Wo Filter-L.xls

ATTACHMENT DOCUMENTS

DOCUMENT	SOFT-COPY FILE NAME
ARB Application	NA
Chain of Custody: Sample 1	COC-S180528241-003&002.pdf
Chain of Custody: Sample 2	COC-S180528241-003&002.pdf

UUT PHOTOGRAPHS



UUT



Nameplate

UUT PHOTOGRAPHS: PEAK TEST



Location 9

HIGH w/ FILTER



Location 4

LOW w/ FILTER



Location 6

HIGH w/o FILTER



Location 3

LOW w/o FILTER

UUT PHOTOGRAPHS: MAX OZONE TESTS



Location 9

HIGH w/ FILTER



Location 4

LOW w/ FILTER



Location 6

HIGH w/o FILTER



Location 3

LOW w/o FILTER

7.0 REVISION SUMMARY

Date/Proj # Site ID	Project Handler/ Reviewer	Section	Description of Change
			None