


Number of pages in this package 18 [including additional pages 5]
(Fill in when using printed copy as record)

CLIENT INFORMATION	
Company Name	NOVAERUS US INC
Address	4th Floor 470 Atlantic Ave Boston, MA 02210 United States

AUDIT INFORMATION:			
Description of Tests	Per Standard No. UL 867	Edition/ Revision Date	Fifth/ 08/23/2013
<input checked="" type="checkbox"/> Tests Conducted by ¹ <div style="text-align: right;">Mark Reardon </div>			
<input type="checkbox"/> UL Staff conducting or witnessing testing (WTDP, TMP, WMT only)			
<input type="checkbox"/> UL Staff supervising UL Staff in training			
<input type="checkbox"/> Authorized Signatory (CTDP, TPTDP, TCP, PPP, SMT)			
Printed Name		Signature. Include date for CTDP, TPTDP, TCP, PPP, WMT, TMP, SMT	

TESTS TO BE CONDUCTED:			
Test No.	Done ³	Test Name	<input type="checkbox"/> Comments/Parameters <input type="checkbox"/> Tests Conducted by ² <input type="checkbox"/> Link to separate data files ⁴
1		PEAK OZONE LOCATION DETERMINATION AND OZONE TEST	

Instructions -			
1 - When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.			
2 - When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.			
3 - Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.			
4 - Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.			

UL LABORATORY DATA PACKAGE SUMMERY

PRODUCT DETAILS:

Electrostatic Air Cleaner, NV200

Model	Vac	Hz	A
NV200	120	60	0.08

- Intended for household and commercial use.
- Intended for dry locations and indoor use.
- One fan speeds
- This product employs an ion generator.

Sample 1, 80130-011AA	Test Run
Ion Generator	ON
Fan Speed	ON
Filter	(Not Applicable)
The maximum measured ozone level, ppm	0.037

Sample 2, 80130-011BA	Test Run
Ion Generator	ON
Fan Speed	ON
Filter	(Not Applicable)
The maximum measured ozone level, ppm	0.035

EXPECTED OZONE GENERATING COMPONENTS:

Description	Manufacturer and model	Ratings
Transformer	Wells, WE-1-C	Secondary Rated 4KV, 9mA
Closed Coupled Field Technology Device	Novaerus, 285-05-0002	-

Description of Tests	Per Standard No.	UL 867	Edition/ Revision Date	Fifth/ 08/23/2013
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Tested by: Mark ReardonDate 08/17/16 -
08/22/16

TEST LOCATION: (To be completed by Staff Conducting the Testing)					
<input checked="" type="checkbox"/> UL or Affiliate	<input type="checkbox"/> WTDP	<input type="checkbox"/> CTDP	<input type="checkbox"/> TPTDP	<input type="checkbox"/> TCP	<input type="checkbox"/> PPP
	<input type="checkbox"/> WMT	<input type="checkbox"/> TMP	<input type="checkbox"/> SMT		
Company Name: UL Environment					
Address: 2211 Newmarket Parkway, Marietta, GA 30067-9399					

TEST EQUIPMENT INFORMATION

- ☐ UL test equipment information is recorded on Meter Use.
- ☐ UL test equipment information is recorded on <<insert location and local laboratory equipment system identification.>>
- ☒ UL test equipment information is recorded on the Marietta Local Share Drive.

Inst. ID No.	Instrument Type	Test Number +, Test Title or Conditioning	Function /Range	Last Cal. Date	Next Cal. Date
<u>LCC</u>	<u>Environmental Chamber</u>	<u>1&2 (80130-011AA & -011BA) Performance validation and ozone testing</u>	<u>N/A</u>	<u>04/18/2016</u>	<u>10/18/2016</u>
<u>609315320</u>	<u>Ozone monitor</u>	<u>1&2 (80130-011AA & -011BA) Peak ozone, performance validation, and ozone testing</u>	<u>0-400 ppb</u>	<u>05/10/2016</u>	<u>05/10/2017</u>
<u>02120235</u>	<u>Anemometer Air Flow Meter</u>	<u>1&2 (80130-011AA & -011BA) Peak ozone and performance validation</u>	<u>0-30 m/s</u>	<u>05/18/2016</u>	<u>05/18/2017</u>
<u>1615000025</u>	<u>Manometer</u>	<u>1&2 (80130-011AA & -011BA) Ozone testing</u>	<u>0-1300 mBar</u>	<u>05/06/2016</u>	<u>05/31/2017</u>
<u>211310276</u>	<u>Ruler</u>	<u>1&2 (80130-011AA & -011BA) Peak ozone and ozone testing</u>	<u>0-24"</u>	<u>07/12/2013</u>	<u>07/12/2018</u>
<u>CJ014</u>	<u>Chamber Temperature Monitor</u>	<u>1&2 (80130-011AA & -011BA) Ozone testing</u>	<u>0-50°C</u>	<u>09/17/2015</u>	<u>09/30/2016</u>
<u>151837171</u>	<u>Atomic Clock</u>	<u>1&2 (80130-011AA & -011BA) Run-in</u>	<u>N/A</u>	<u>11/06/2015</u>	<u>11/06/2017</u>
<u>150184111</u>	<u>Atomic Clock</u>	<u>1&2 (80130-011AA & -011BA) Ozone testing</u>	<u>N/A</u>	<u>03/19/2015</u>	<u>03/19/2017</u>
<u>10816140</u>	<u>Temperature & RH data Logger</u>	<u>1&2 (80130-011AA & -011BA) Ozone testing</u>	<u>Temp: -20 to 70C°</u> <u>RH: 5% to 95%</u>	<u>10/07/2015</u>	<u>10/31/2016</u>

+ - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.

The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.

ULS-00867-EOKL-DataSheet-2004
Form Page 3

Form Issued: 2004-07-13
Form Revised: 2016-07-26

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File E356410

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Tested by: Mark Reardon



Date 08/17/16 –
08/22/16

Inst. ID No.	Make/Model/Serial Number/Asset No.
1	Ring Stand with Ring
2	Non-reactive horizontal surface

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08/22/16

TEST SAMPLE IDENTIFICATION:

The table below is provided to establish correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

UL Camas Sample Card No.	UL Environment Sample Card No. *	Date Received	[] Test No.+	Sample No.	Manufacturer, Product Identification and Ratings
320857	80130-010AA	08/01/2016	1	1	Novaerus, Model NV200, Input Rated 120Vac, 0.08A, Output Rated 4KV, 9mA Novaerus Serial Number PA1W1151201103/1601273 UL Sample # CUQGAG451
	80130-011AA				
320857	80130-010BA	08/01/2016	1	2	Novaerus, Model NV200, Input Rated 120Vac, 0.08A, Output Rated 4KV, 9mA Novaerus Serial Number PA1W1151201103/1601274 UL Sample # CUQGAG450
	80130-011BA				

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

* - UL Environment Note - When we get a replicate pair of air cleaners in, one is randomly assigned to be our primary test sample, designated the AA sample, while the second unit is designated a replicate sample. So if this is the first model of air cleaner associated with the project, they will be labeled 010AA and 010BA to show that the replicate came from the customer. Once the units are broken in and testing begins, new sample numbers are generated based on what is needed for proper testing. For example, if the product needs three different scans (usually a high fan speed, low fan speed, and filter out scan), then we will generate three product numbers: 011AA, 012AA, and 013AA. If any of these runs have a technical issue (for example, we had a thunderstorm knock out power during a test), then any retests will be marked using the last letter on that sample number (011AB). Finally, if any of the tests show emissions high enough to warrant testing the replicate sample, we will create a new sample number using the replicate's letter (run 012AA ran into 40ppb O₃ concentrations, so we would create a sample number 012BA for replicate testing of those test conditions).

[] Sampling Procedure -

[] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

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Notes to lab –

1. Product placed on a non-reactive table surface.
2. The product has one fan speed.

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PEAK OZONE LOCATION DETERMINATION AND OZONE TEST

UL 867, Section 41

METHOD – PART A
PRODUCT RUN-IN

The appliance was placed in a room with a maintained temperature of 25±5°C and filtered air. The appliance was operated under maximum output conductions as described in the following table:

Fan Speed	ON
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This test was repeated on a second sample.

METHOD – PART B
PEAK OZONE LOCATION DETERMINATION

While in a well-heated condition, the appliance was placed in an open space with a minimum height dimension of 8ft. and a minimum side dimension of 10ft. The appliance was placed in the center of the room and

- ☒ 30inches above the floor.
- ☐ on the floor.
- ☐ attached to the ceiling or to the underside of a horizontal non-reactive surface at a minimum height of 30inches.
- ☐ attached to a non-reactive vertical surface at a minimum height of 30inches.

The periphery of the airstream in the plane parallel to and 2 inches from the surface of the air cleaner discharge grille was established and total area was recorded.

For bounded airstreams measuring less than 16in², five ozone measurements were taken. One in each quadrant of the airstream and one in the center of the airstream.

For bounded airstreams measuring 16in² or larger, ozone measurements were taken in a 4 x4 in. grid pattern up to 10 measurements. For greater than 10 grid measurements, 10 measurements were taken evenly spaced across the airstream. One additional measurement was taken in the center of the airstream.

For ozone generating ionizing sources, one additional measurement was taken in the airstream directly in line with the source.

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08/22/16PEAK OZONE LOCATION DETERMINATION AND OZONE TEST
(CONT'D)

UL 867, Section 41

Ozone measurements were taken at the locations described above with the appliance operating

- ☒ with fan ON ~~and at each ozone/high voltage output level setting.~~
- ☐ on both the highest and lowest fan speed and at the minimum, middle, and maximum ozone/high voltage output level setting.
- ☐ and with independently activated [ionizers] [UV lamps] operating.

Ozone measurements were monitored for a period of 2 minutes, and recorded for use during Part D – Ozone Test.

This test was repeated on a second sample.

METHOD – PART C
CHAMBER HALF-LIFE

Prior to testing of an appliance model, the chamber ozone half-life was determined using the theoretical air exchange rate, 1.20 1/h, and an initial steady state ozone concentration of 0.100 to 0.200 ppm.

* Note #1 to Technician – If the measured chamber half-life is not equal to 31 ±2 minutes, the air exchange rate shall be adjusted and the ozone half-life measurement shall be reconducted until this value is obtained.*

~~†~~☒ The air exchange rate was adjusted and the chamber half-life value was again determined using an initial steady state ozone concentration of 0.100 to 0.200 ppm.

METHOD – PART D
OZONE TEST

The appliance was placed in a chamber having a volume of 950-1100 cubic feet (26.9-31.1 m³) with a minimum side dimension of 8 feet (2.4 m) and a maximum height dimension of 10feet (3.0m) without openings. The test chamber walls, ceiling, and floor were surface treated stainless steel or other nonporous, non-reactive material.

During the test, the test room was maintained at a temperature of 25±2°C (77±4°F) and a relative humidity of 50±5 percent. Prior to the start of this test, the ozone background level was measured with the product off. The measurement was subtracted from the maximum measurement during the test.

Note #2 to Technician – If the measured ozone background level is greater than 0.005 ppm, the chamber must be purged and the ozone background level measured again prior to inception of the test.

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08/22/16PEAK OZONE LOCATION DETERMINATION AND OZONE TEST
(CONT'D);

UL 867, Section 41

The appliance was placed in the center of the test chamber and

- ☒ 30 inches above the floor.
- ☐ on the floor.
- ☐ attached to the ceiling or to the underside of a horizontal non-reactive surface at a minimum height of 30 inches.
- ☐ attached to a non-reactive vertical surface at a minimum height of 30 inches.

The ozone monitor sampling tube was located 2 inches (50mm) from the air outlet of the product and was pointed directly into the air stream. Ozone or high voltage output level/measurement location was as/where ozone emissions were determined highest during Part B – Peak Ozone Emissions Determination.

The emission of ozone was monitored for 24 hours on both the high and low fan speeds to determine the concentration.

* Note #3 to Technician – The monitoring of ozone can be stopped after 8 hours if the measured chamber ozone concentration has reached steady-state. For the purpose of this measurement steady state is defined as:

- a) Negative or zero slope for the plot of chamber ozone concentration vs. time ($[C(t)]$ vs. t), during hour 7 to 8 of monitoring, and fluctuation not greater than ± 10 percent or 2 ppb around the mean, whichever is greater during the same time period,
- b) Positive slope for the plot of chamber ozone concentration vs. time, during hour 7 to 8 of monitoring, mean ozone concentration less than 20ppb, and fluctuation not greater than ± 2 ppb around the mean, during the same time period, or
- c) Positive slope for the plot of chamber ozone concentration vs. time, during hour 7 to 8 of monitoring, mean ozone concentration greater than or equal to 20ppb and less than 38 ppb, a normalized slope for hour 7-8 less than or equal to 0.0153 (ppb/hr)/mean ppb, and fluctuation not greater than $\pm 10\%$ around the mean, during the same time period.*

~~☐ The test was repeated with [the fan not functioning] [the particle filters removed] [ozone monitoring circuitry bypassed].~~

☒ The test was repeated on a second sample.

* Note #4 to Technician – Testing of a second sample is not required if the maximum measured ozone concentration of the first sample measured less than 0.030 parts per million.*

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08/22/16PEAK OZONE LOCATION DETERMINATION AND OZONE TEST
(CONT'D)

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RESULTS PART A
PRODUCT RUN-IN

☒ Sample 1 completed the 48 hour run-in period.
☒ Sample 2 completed the 48 hour run-in period.

RESULTS — PART B
PEAK OZONE LOCATION DETERMINATIONSample 1: 80130-011AA

	Measured Ozone, ppm
Fan Speed	On
<u>Quadrant 1</u>	<u>0.0089</u>
<u>Quadrant 2</u>	<u>0.0167</u>
<u>Quadrant 3</u>	<u>0.0011</u>
<u>Quadrant 4</u>	<u>0.0149</u>
<u>Quadrant 5</u>	<u>0.0050</u>
<u>Quadrant 6</u>	<u>0.0030</u>
<u>Quadrant 7</u>	
<u>Quadrant 8</u>	
<u>Quadrant 9</u>	
<u>Quadrant 10</u>	
<u>Center of the Airstream (Left)</u>	<u>0.0201</u>
<u>Center of the Airstream</u>	<u>0.0144</u>
<u>Center of the Airstream (Right)</u>	<u>0.0026</u>
<u>Measurement in Line with the Source</u>	<u>N/A</u>

The location of the peak ozone measurement was Center of the Airstream (Left), see Illustration 1 for visible indication of location.

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08/22/16PEAK OZONE LOCATION DETERMINATION AND OZONE TEST
(CONT'D)

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Sample 2: 80130-011BA

	Measured Ozone, ppm
Fan Speed	On
Quadrant 1	0.0068
Quadrant 2	0.0114
Quadrant 3	0.0013
Quadrant 4	0.0107
Quadrant 5	0.0129
Quadrant 6	0.0031
Quadrant 7	
Quadrant 8	
Quadrant 9	
Quadrant 10	
Center of the Airstream (Left)	0.0096
Center of the Airstream	0.0182
Center of the Airstream (Right)	0.0045
Measurement in Line with the Source	N/A

The location of the peak ozone measurement was Center of the Airstream,
see Illustration 2 for visible indication of location.

RESULTS — PART C
CHAMBER HALF-LIFE

Theoretical Air Exchange Rate, 1/h	<u>1.20</u>
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Using the theoretical air exchange rate above the measured chamber ozone half-life was 5.2055 hours (312.33 minutes) h.

☐ The measured chamber ozone half-life was 31±2 minutes.
☒ The measured chamber ozone half-life was not 31±2 minutes.
(Continue Results Below)

Air Exchange Rate After Adjustment, 1/h	<u>1.39</u>
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After air exchange rate adjustment, the measured chamber ozone half-life was 0.530556 hours (31.83 minutes) h.

☒ The measured chamber ozone half-life was 31±2 minutes.
☐ The measured chamber ozone half-life was not 31±2 minutes.

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08/22/16PEAK OZONE LOCATION DETERMINATION AND OZONE TEST
(CONT'D)

UL 867, Section 41

RESULTS — PART D
OZONE TESTSample 1: 80130-011AA

☒ The test was run for 24 hours. Data showing steady-state condition is attached.

$O_3(t)$ = Maximum ozone concentration measured: 0.036 parts per million (PPM) by volume.

$O_3(\text{Background})$ = Ozone background level before test: -0.001 parts per million.

The maximum measured ozone level = $O_3(t) - O_3(\text{Background})$ = 0.037 parts per million.

☐ The maximum measured ozone level did not exceed 0.030 parts per million — only one sample tested.

☒ The maximum measured ozone level was between 0.030 and 0.050 parts per million — test repeated on sample 2.

☐ The sample produced a transitory concentration in excess of 0.050 parts per million, but less than 0.100 parts per million. The average of any five consecutive one minute average measurements was less than 0.050 parts per million — test repeated on sample 2.

☐ The sample produced a transitory concentration in excess of 0.050 parts per million, but less than 0.100 parts per million. The average of any five consecutive one minute average measurements was not less than 0.050 parts per million — test halted.

☐ The maximum measured ozone level exceeded 0.100 parts per million — test halted.

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08/22/16PEAK OZONE LOCATION DETERMINATION AND OZONE TEST
(CONT'D)

UL 867, Section 41

Sample 2: 80130-011BA

[] The test was run for 24 hours. Data showing steady-state condition is attached.

O₃(t)= Maximum ozone concentration measured: 0.034 parts per million (PPM) by volume.

O₃(Background)= Ozone background level before test: -0.001 parts per million.

The maximum measured ozone level = O₃(t) - O₃(Background)= 0.035 parts per million.

[] The maximum measured ozone level did not exceed 0.030 parts per million

[X] The maximum measured ozone level was between 0.030 and 0.050 parts per million

[] The sample produced a transitory concentration in excess of 0.050 parts per million, but less than 0.100 parts per million. The average of any five consecutive one minute average measurements was less than 0.050 parts per million.

[] The sample produced a transitory concentration in excess of 0.050 parts per million, but less than 0.100 parts per million. The average of any five consecutive one minute average measurements was not less than 0.050 parts per million.

[] The maximum measured ozone level exceeded 0.100 parts per million - test halted.

NOTE #5 TO LABORATORY TECHNICIAN: The maximum allowable ozone concentration is 0.050 ppm.

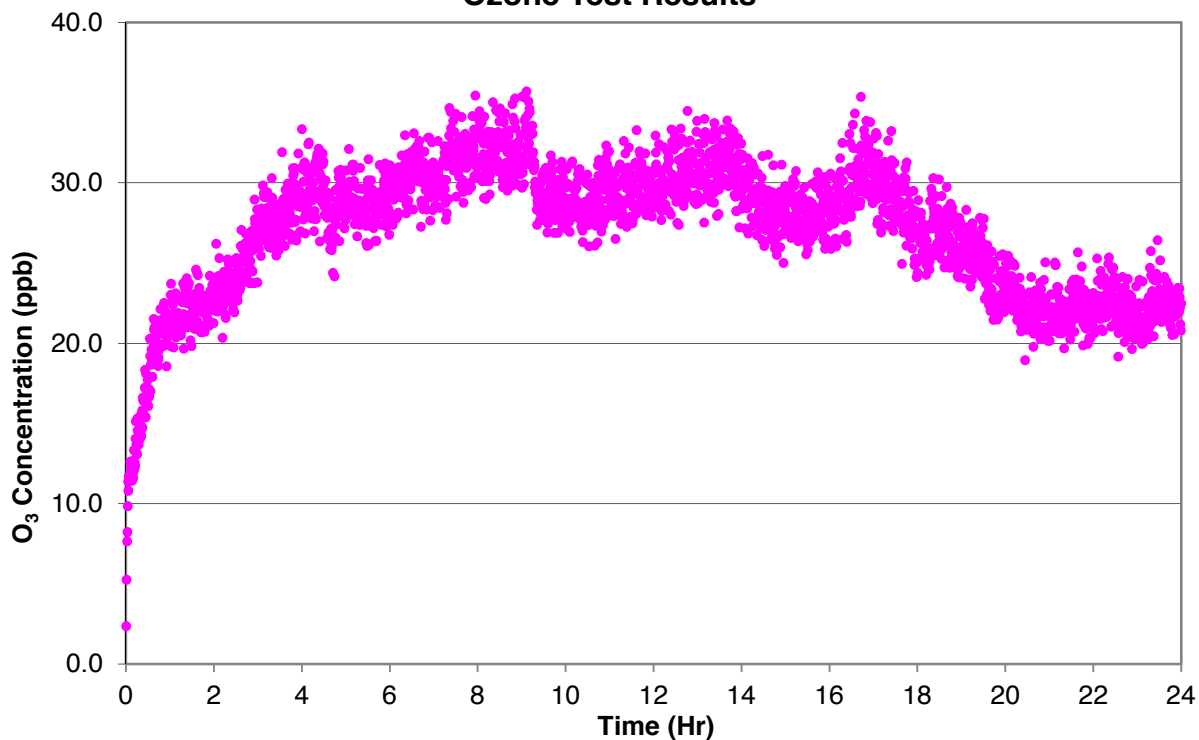
NOTE #6 TO LABORATORY TECHNICIAN: For samples with transitory concentrations in excess of 0.050 ppm, but less than 0.100 ppm, the average of any five consecutive one minute average measurements shall be used when recording the maximum ozone concentration measured.

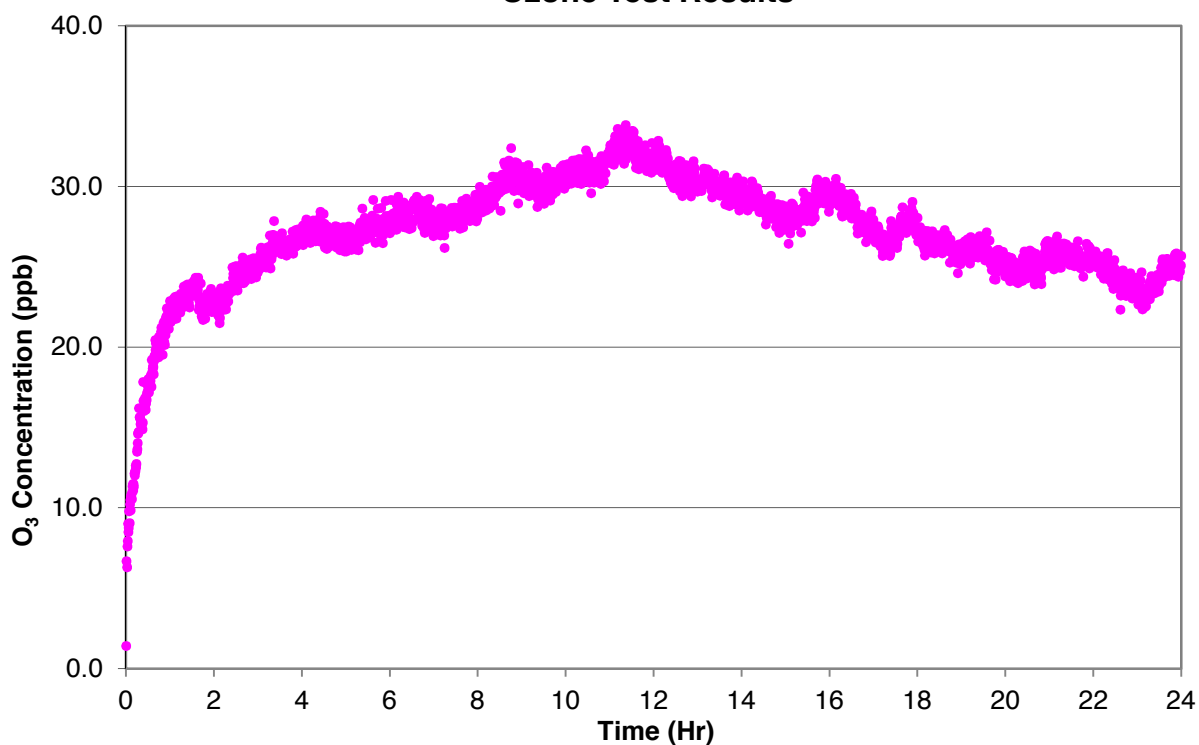
Date	Time	Test Instance	Ambient Temperature, C	Relative Humidity, %	Barometric Pressure, mBar
<u>80130-011AA</u> <u>08/17/16</u>	<u>15:02 (08/17/16) -</u> <u>16:09 (08/18/16)</u>	<u>Fan: ON</u>	<u>23.7 - 26.3</u>	<u>50.2 - 51.2</u>	<u>987.0</u>
<u>80130-011BA</u> <u>08/19/16</u>	<u>15:45 (08/19/16) -</u> <u>08:16 (08/22/16)</u>	<u>Fan: ON</u>	<u>25.9 - 26.7</u>	<u>49.3 - 51.1</u>	<u>982.1</u>

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08/22/16

NOTE #7 TO LABORATORY TECHNICIAN: Environmental conditions shall be monitored and recorded for the duration of the Ozone Test.

80130-011AA Fan: On Ozone Test Results



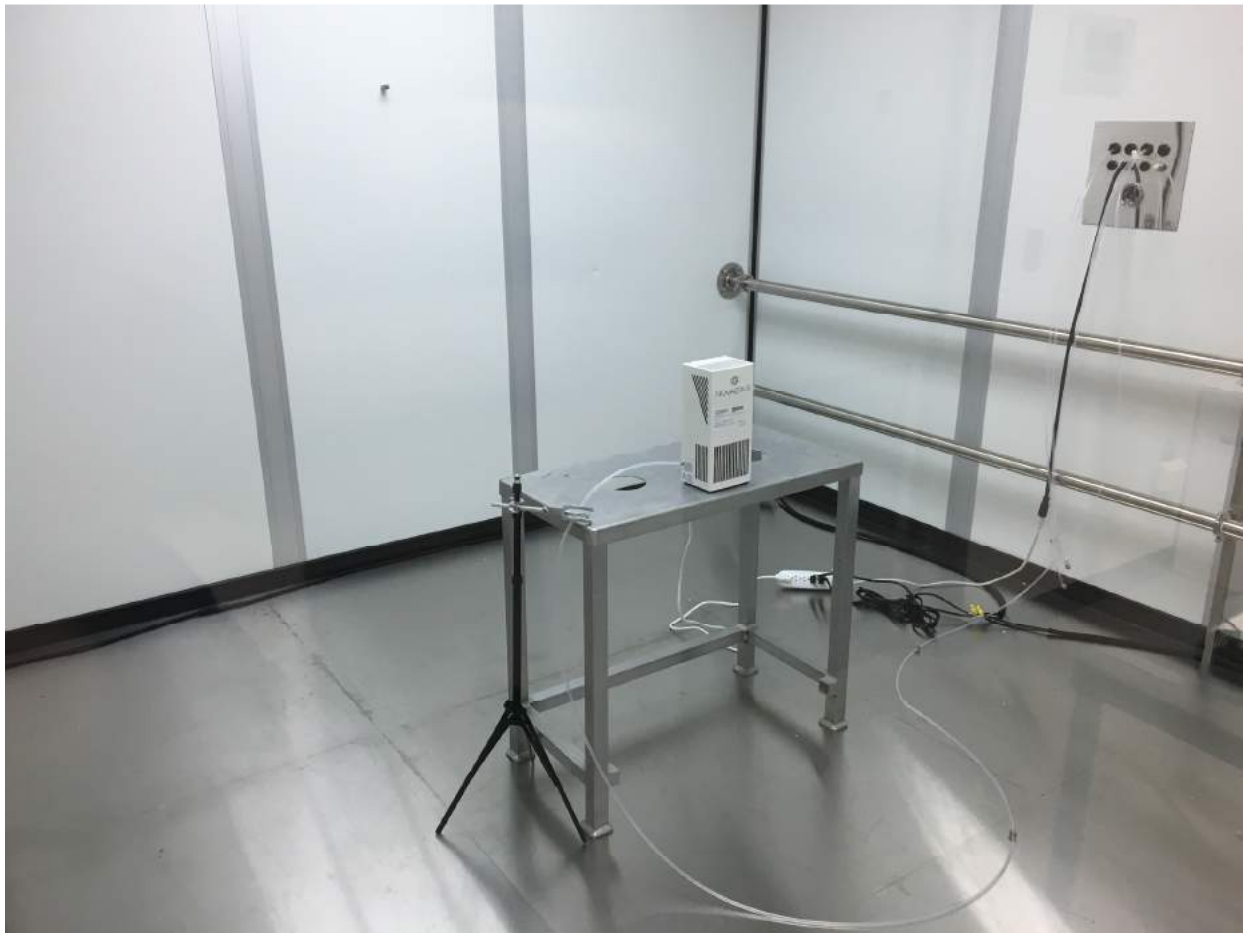
Tested by: Mark ReardonDate 08/17/16 -
08/22/16**80130-011BA Fan: On
Ozone Test Results**

Tested by: Mark Reardon

Mark Reardon

Date 08/17/16 -
08/22/16

Illustration 1 80130-010AA



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Date 08/17/16 -
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Illustration 2 80130-010BA



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