October 23, 2017

Particulate Report

Location: Air Traffic Control Tower

Test dates: October 20 and October 23, 2017

Testing equipment: Particles Plus
Model number: Handheld 8303
Serial number : 1399

PARTICLES PLUS

REPORT # NA

CERTIFICATE OF CALIBRATION

SIZE CALIBRATION

MODEL NUMBER	8303
SERIAL NUMBER	1399

SIZE CALIBRATION AND VERIFICATION OF SIZE SETTING

Channel	Nominal Particle Size	Gain Stage	Digital Cutpoint	Expanded Uncertainty
1	0.3 µm	High	2980	2.0%
2	0.5 µm	High	20900	1.6%
3	1.0 µm	Low	6520	1.1%
4	2.5 µm	Low	18728	1.1%
5	5.0 µm	Low	29494	0.9%
6	10.0 µm	Low	46449	6.0%

FALSE COUNT RATE

Sample Time (Minutes)	Volume Sampled (Liters)	Concentration (Count/M³)	Measured Counts (#)	95% UCL (Count/M³)	Allowable Range	Pass/Fail
5	13.95	0.0	0	215.1	≤ 860.2	PASS

SIZE RESOLUTION

Size (µm)	Actual	Limit	Pass/Fail
2.5	3.3%	≤ 15%	PASS

COUNTING EFFICIENCY

Measurements	Allowable Range	Actual	Pass/Fail
0.3 µm	50% ± 20	50.7%	PASS
0.5 µm	100% ± 10	99.2%	PASS

FLOW RATE (L/MIN)

Nominal	Actual	Actual %	Pass/Fail
2.83	2.79	-1.4%	PASS

Calibration Date:	July 19, 2017
Calibration Due Date:	July 18, 2018

Particles Plus, Inc. hereby certifies that the calibration performed on the above described instrument meets the requirements of ISO 21501-4 and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST), or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. This document shall not be reproduced except in full without the written consent of Particles Plus, Inc.

PARTICLES PLUS

REPORT # NA

CERTIFICATE OF CALIBRATION

NIST REPORT

MODEL NUMBER	8303
SERIAL NUMBER	1399

Temperature	87.20	°F
Relative Humidity	31.00	% RH
Barometric Pressure	29.95	inHg

PARTICLES PLUS CALIBRATION EQUIPMENT				
Measurement Variable	Model	Serial Number	Date Last Calibrated	Calibration Due Date
Particle Counter	LPS002	110801	7/24/2016	7/23/2017
Flow Meter	4140	4140 1431 0005	3/7/2017	3/6/2018
Temperature/Humidity	M170/HMP75	J0320022/J0540018	4/25/2017	4/25/2018
Barometric Pressure	1081	150708525	9/23/2015	9/23/2017

PARTICLE STANDARDS					
Certified Mean Diameter	Standard Uncertainty	Standard Deviation	Lot Number	Expiration	Manufacturer
0.303 µm	± 0.006 µm, k=2	0.0047 µm	164765	19-Jan	Thermo
0.508 µm	± 0.008 µm, k=2	0.0085 µm	177807	19-Dec	Thermo
0.702 µm	± 0.006 µm, k=2	0.0049 µm	179741	20-Jan	Thermo
1.030 µm	± 0.011 µm, k=2	0.0100 µm	163991	19-Jan	Thermo
2.02 µm	± 0.015 µm, k=2	0.0210 µm	172292	19-Aug	Thermo
2.504 µm	± 0.027 µm, k=2	0.0250 µm	45024	18-Oct	Thermo
2.995 µm	± 0.024 µm, k=2	0.0320 µm	177421	19-Nov	Thermo
5.027 µm	± 0.047 µm, k=2	0.0500 µm	177110	19-Nov	Thermo
10.0 µm	± 0.60 µm, k=2	0.9000 µm	43497	17-Jul	Thermo
14.6 µm	± 0.90 µm, k=2	1.4000 µm	167948	19-Apr	Thermo
19.1 µm	± 0.70 µm, k=2	1.7000 µm	171777	19-Jul	Thermo
27.2 µm	± 0.70 µm, k=2	1.3000 µm	180012	20-Jan	Thermo

Particles Plus, Inc. hereby certifies that the calibration performed on the above described instrument meets the requirements of ISO 21501-4 and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST), or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. This document shall not be reproduced except in full without the written consent of Particles Plus, Inc.

Robert Stansell
Calibrated By

July 19, 2017
Date

Observations:

An initial particulate reading was performed Sept 20. Existing filters were not changed before test. Readings attained as follows:

Particle Size µm	Quantity/ft³
0.3	364,766
0.5	170,868
1.0	77,846

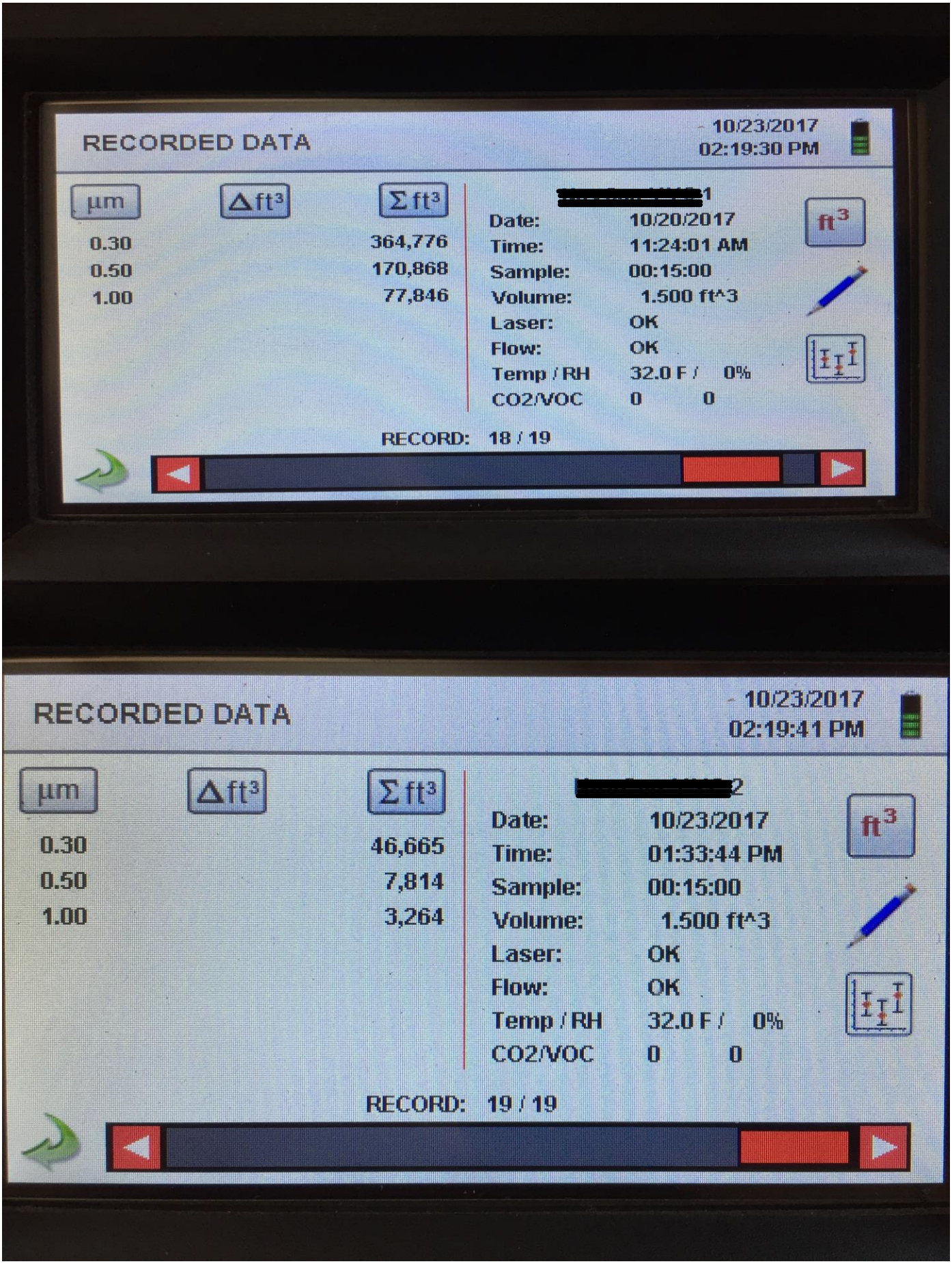
Global Plasma Solutions Bi-Polar Ion generator model number GPS-iMOD was installed in each of the AHU's supplying air to the control tower.

A secondary particulate reading was performed Oct 23. Readings attained as follows:

Particle Size µm	Quantity/ft³
0.3	46,665
0.5	7,814
1.0	3,264

Percentage Reduction:

Particle Size µm	Reduction %
0.3	87.2
0.5	95.4
1.0	95.8


RECORDED DATA
10/23/2017
02:19:30 PM
µm
Δft³
Σft³
0.30
0.50
1.00
364,776
170,868
77,846
[redacted]1
Date: 10/20/2017
Time: 11:24:01 AM
Sample: 00:15:00
Volume: 1.500 ft^3
Laser: OK
Flow: OK
Temp / RH 32.0 F / 0%
CO2/VOC 0 0
ft³
RECORD: 18 / 19
RECORDED DATA
10/23/2017
02:19:41 PM
µm
Δft³
Σft³
0.30
0.50
1.00
46,665
7,814
3,264
[redacted]2
Date: 10/23/2017
Time: 01:33:44 PM
Sample: 00:15:00
Volume: 1.500 ft^3
Laser: OK
Flow: OK
Temp / RH 32.0 F / 0%
CO2/VOC 0 0
ft³
RECORD: 19 / 19