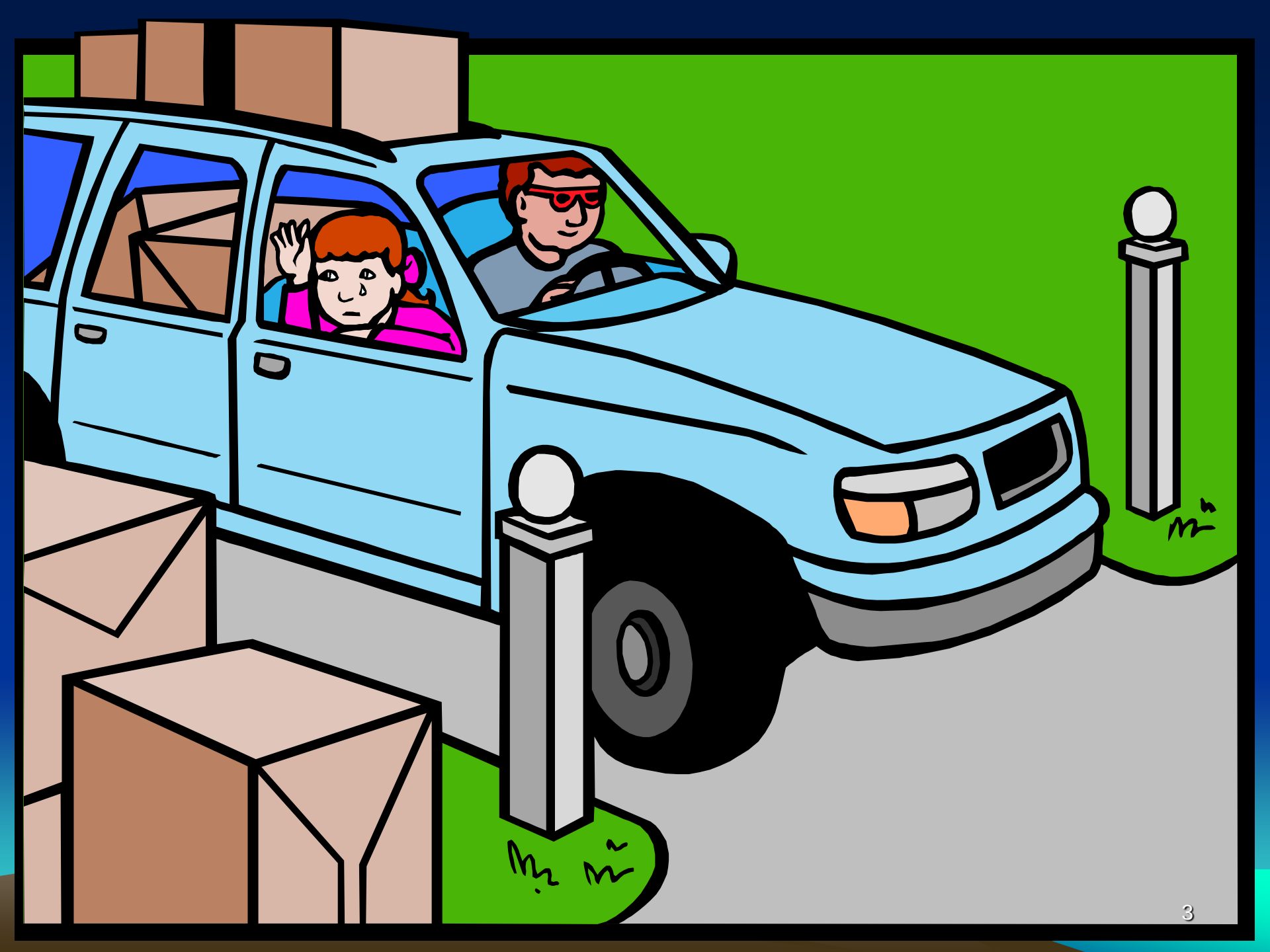
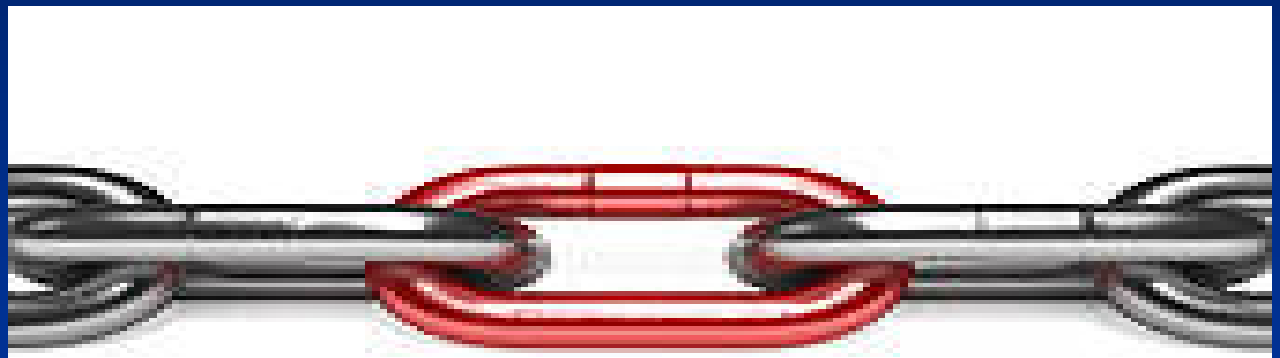
Standards to Data

Presenter: Jerry Freeman

Lake Tahoe Air Basin



The Unbroken Chain of Traceability



NIST Standard Standards Lab Field Sites

What is Traceability?

Final measurement will have traceability to NIST if:

- Unbroken chain of measurement back to NIST Standards is maintained.
- Each step has known & documented uncertainties.
- Quality system to ensure measurement accuracy.

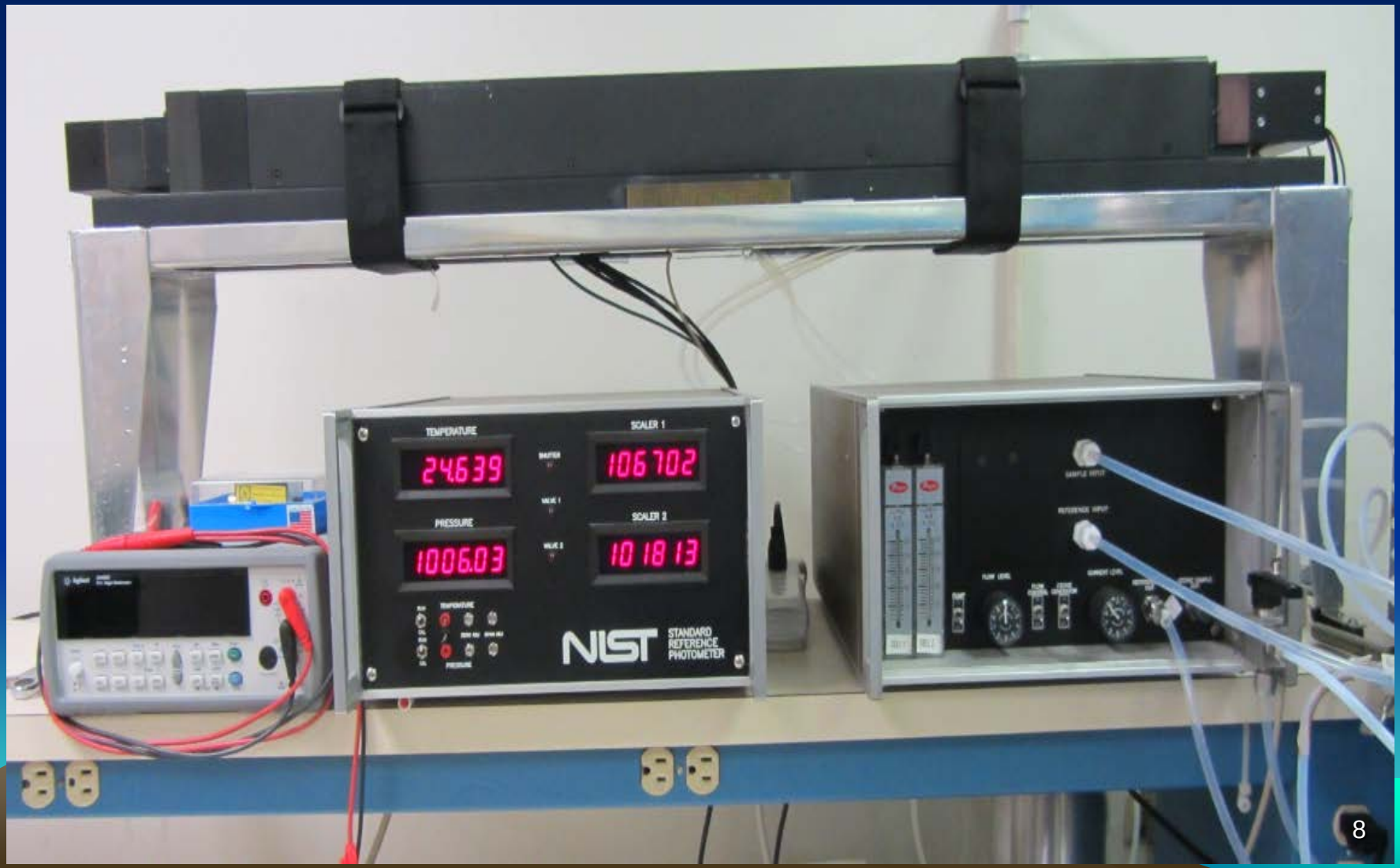
NIST: National Institution of Standards and Technology

Standards Laboratory's Certification Services

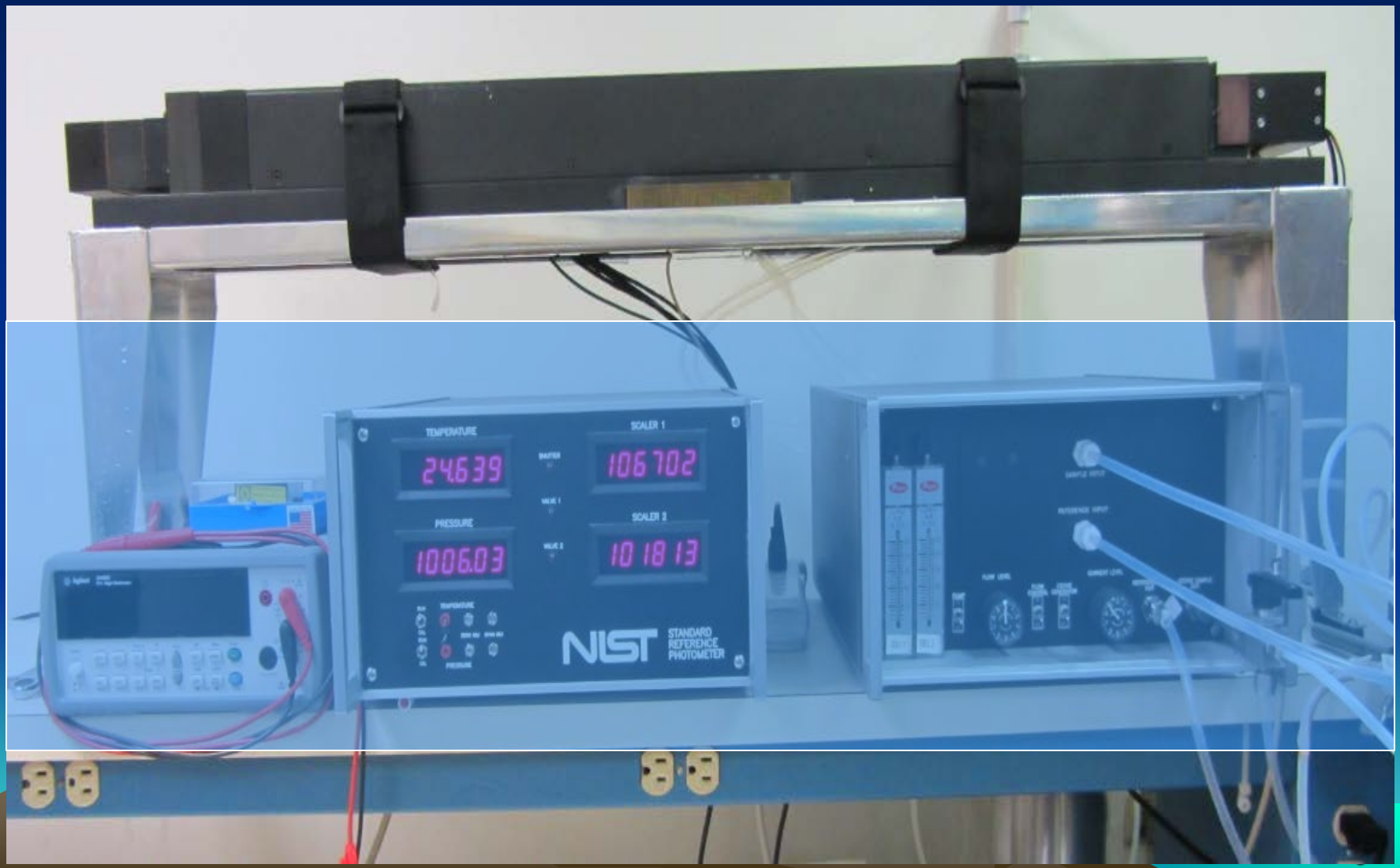
- Ozone
- Low Flow
- High Flow
- Meteorological
- Gas Analysis

Ozone Certification

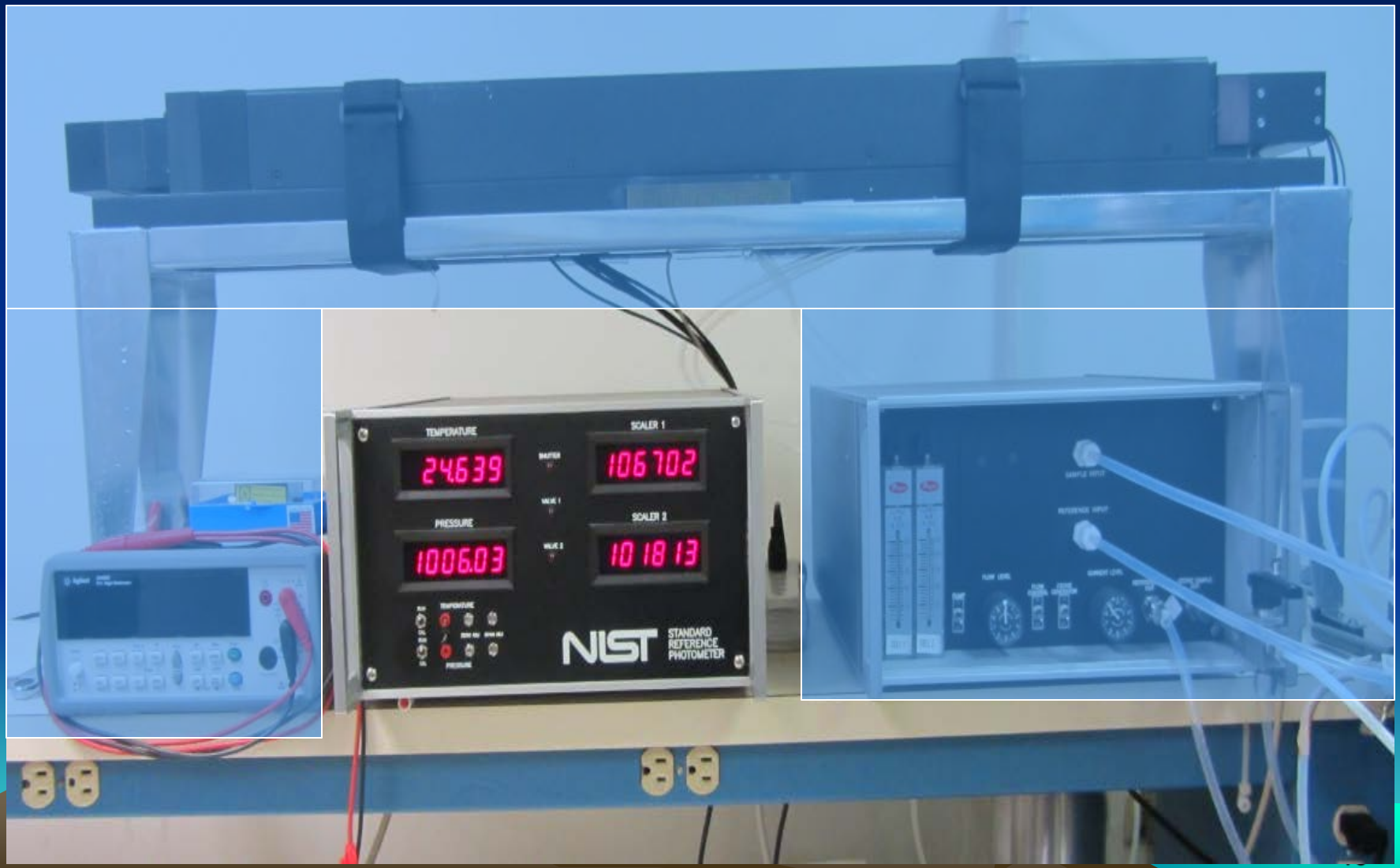
Standard Reference Photometer (SRP #4)



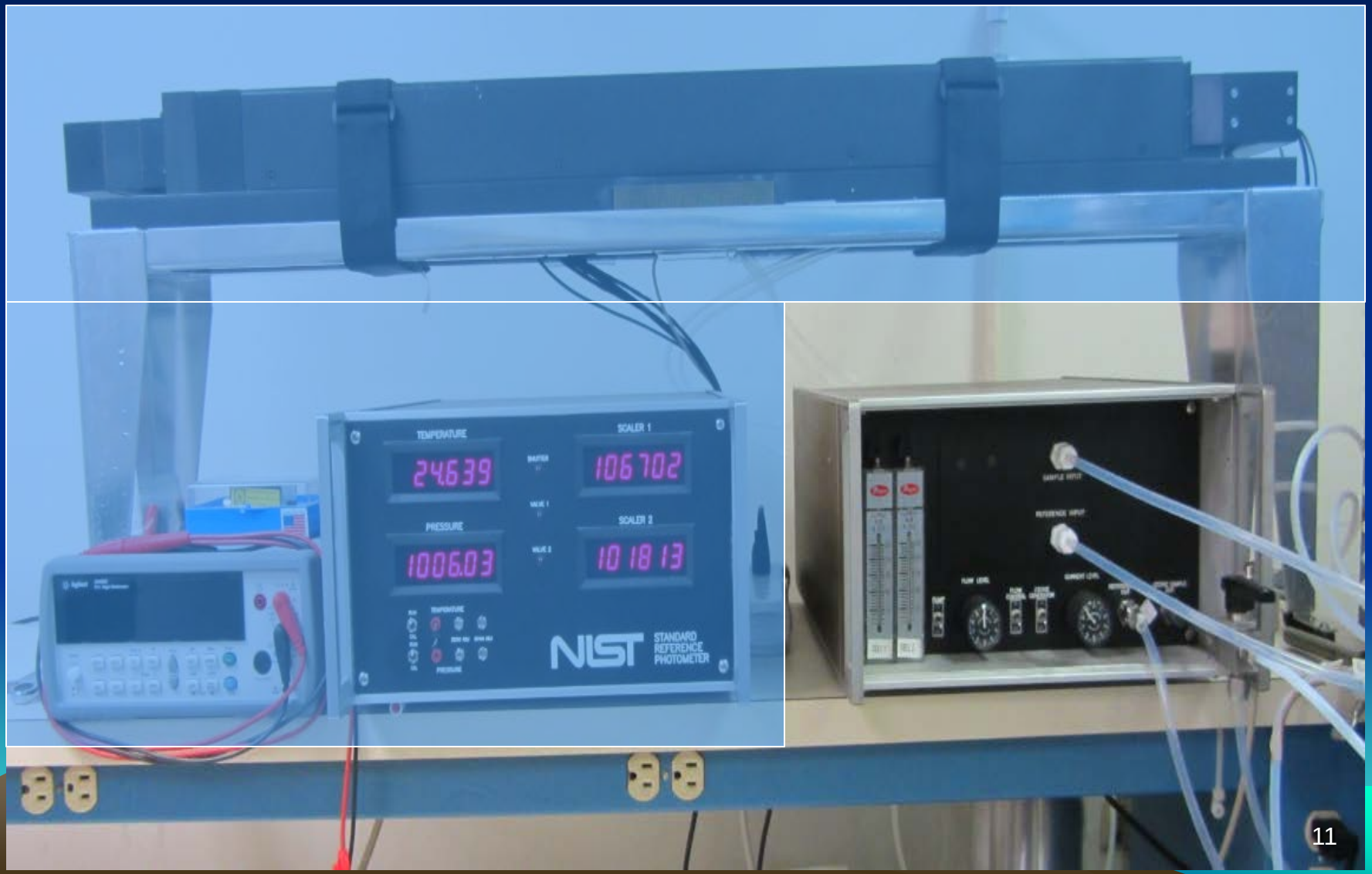
SRP #4's Photometer = 89.7cm



Electronic Module



Pneumatic Module



EPA's SRP Field Sites

Ozone Traceability

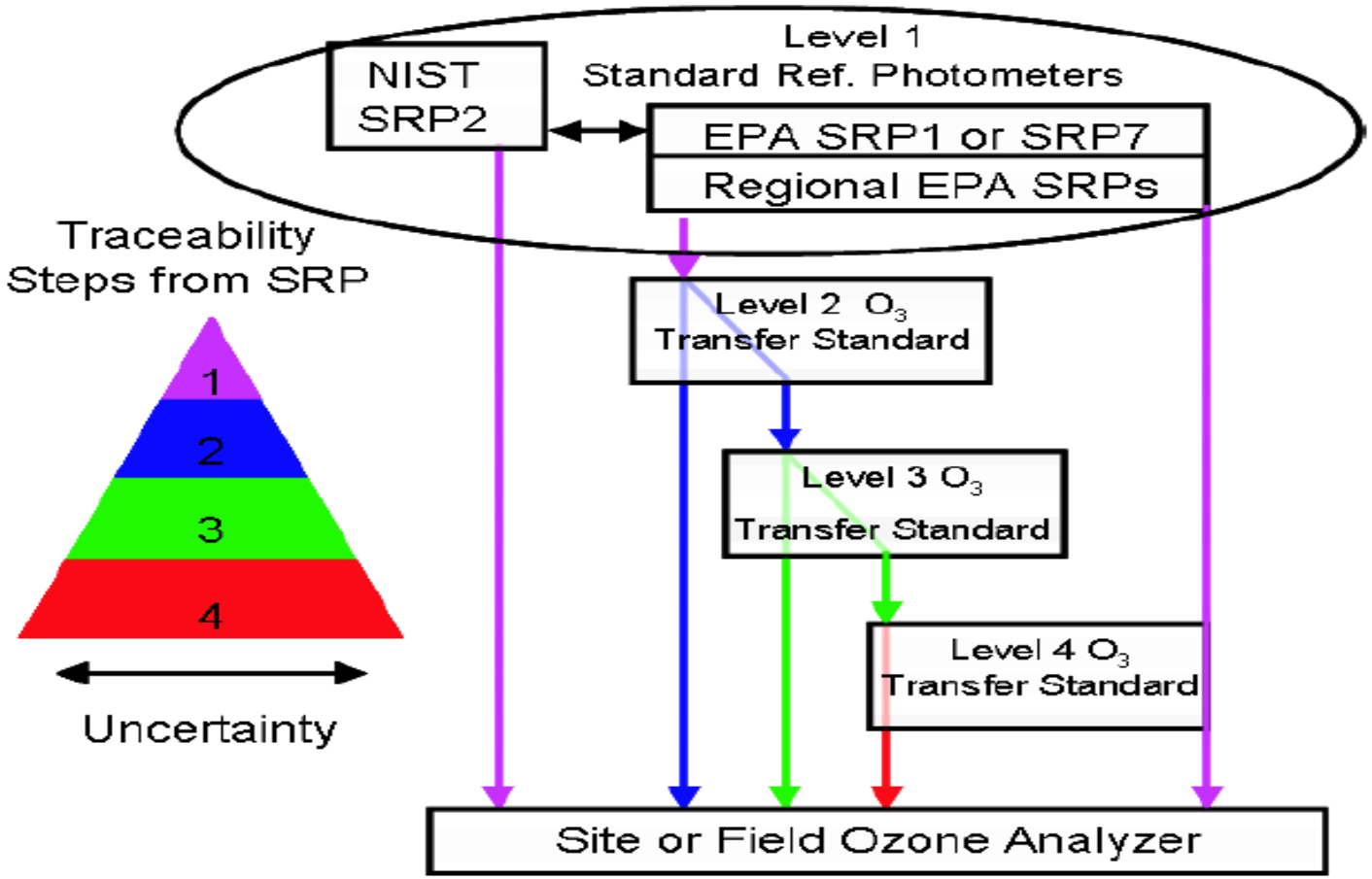
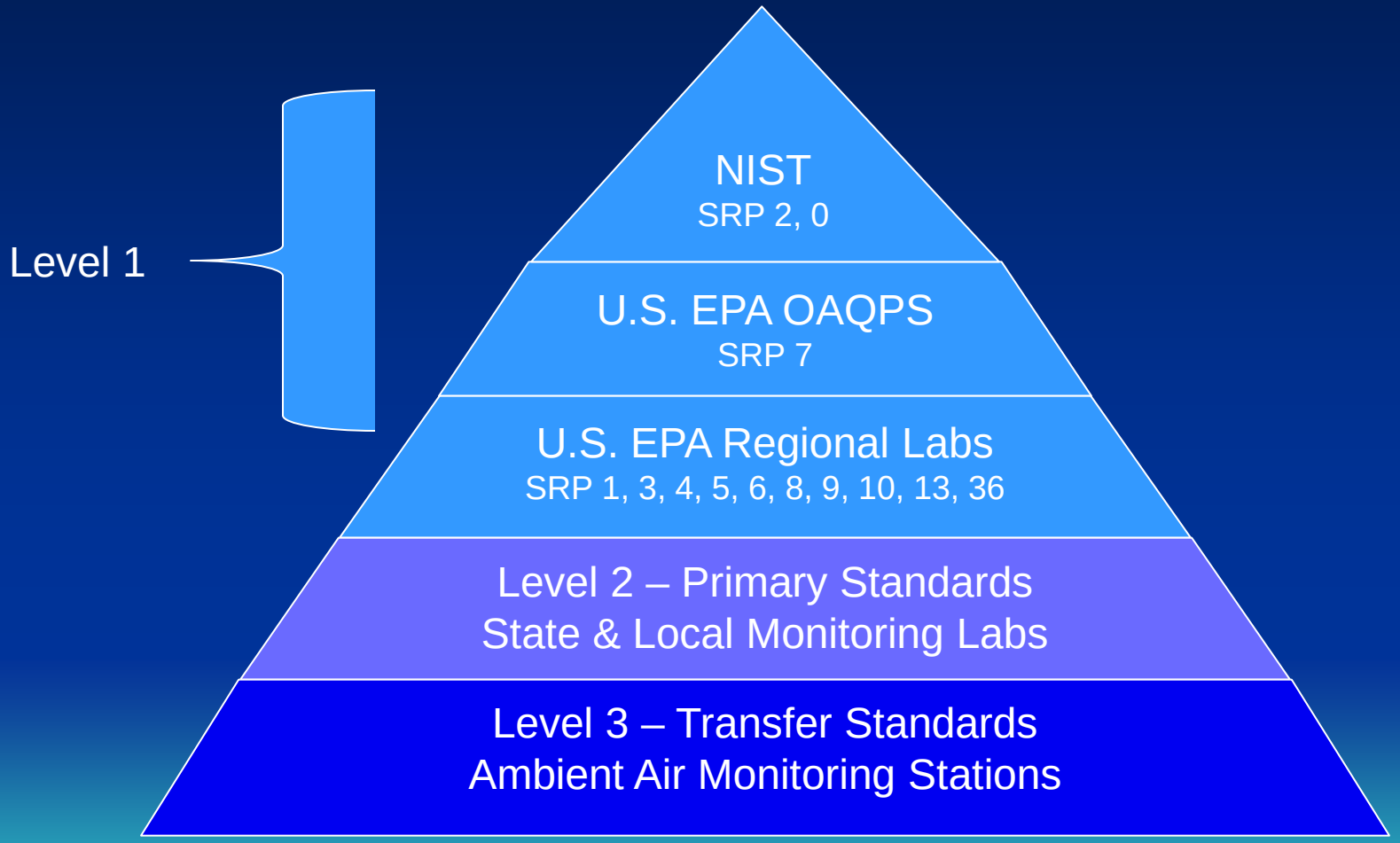


Figure 1.1. Ambient air ozone traceability scheme

Ozone Hierarchy



SRP Test Bench

SRP Test Bench

Certification Summary Sheet

Full Certification: [ ] Re-Certification: [X]

Comparison	Date	Slope	Intercept
1	7/1/2013	1.004073	-0.000263
2	10/1/2013	1.003733	-0.001128
3	1/8/2014	1.003248	-0.000742
4	4/9/2014	1.001502	-0.000458
5	7/1/2014	1.002233	0.000386
6	10/7/2014	1.001384	-0.001017

MEAN Slope:	**1.002695**
MEAN Intercept:	**-0.000537**

RSD Slope [(Stdev / Mean) x 100] =	**0.11%**	(< 1.5)
FRSD Intercept [(Stdev / Fullscale) x 100] =	**0.06%**	(< 0.5)
Change From Previous Calibration =	**0.08%**	(< 1.0)

NEW CERTIFICATION RELATIONSHIP

Correlation Coef. **0.9999975**

Net Display = **1.002695** **x True Ozone** **-0.000537**

True Ozone = **0.99731** **x Net Display** **+** **0.000536**

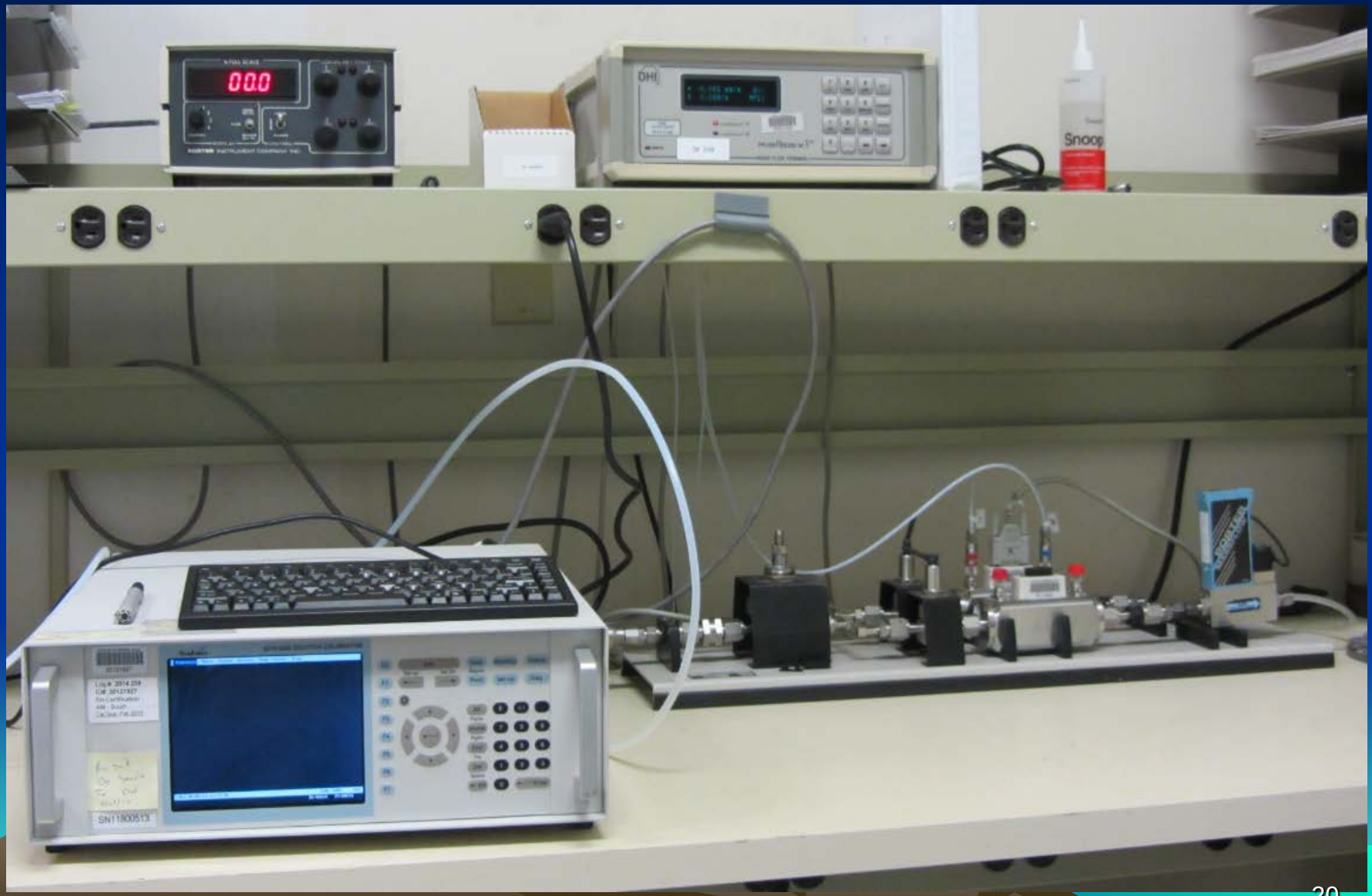
	SLOPE	INTERCEPT	CORR. COE.	
Calibration	PASS	PASS	PASS	

	SLOPE	INTERCEPT	CORR. COE.	
Verification	PASS	PASS	PASS	

Ozone Strip Chart

Low Flow Certification

Gas Calibrator Certification



Rotometers to Flow Meters

BGI Flow Calibrators

Molbloc-L
50 sccm – 100 slm

High Flow Certifications

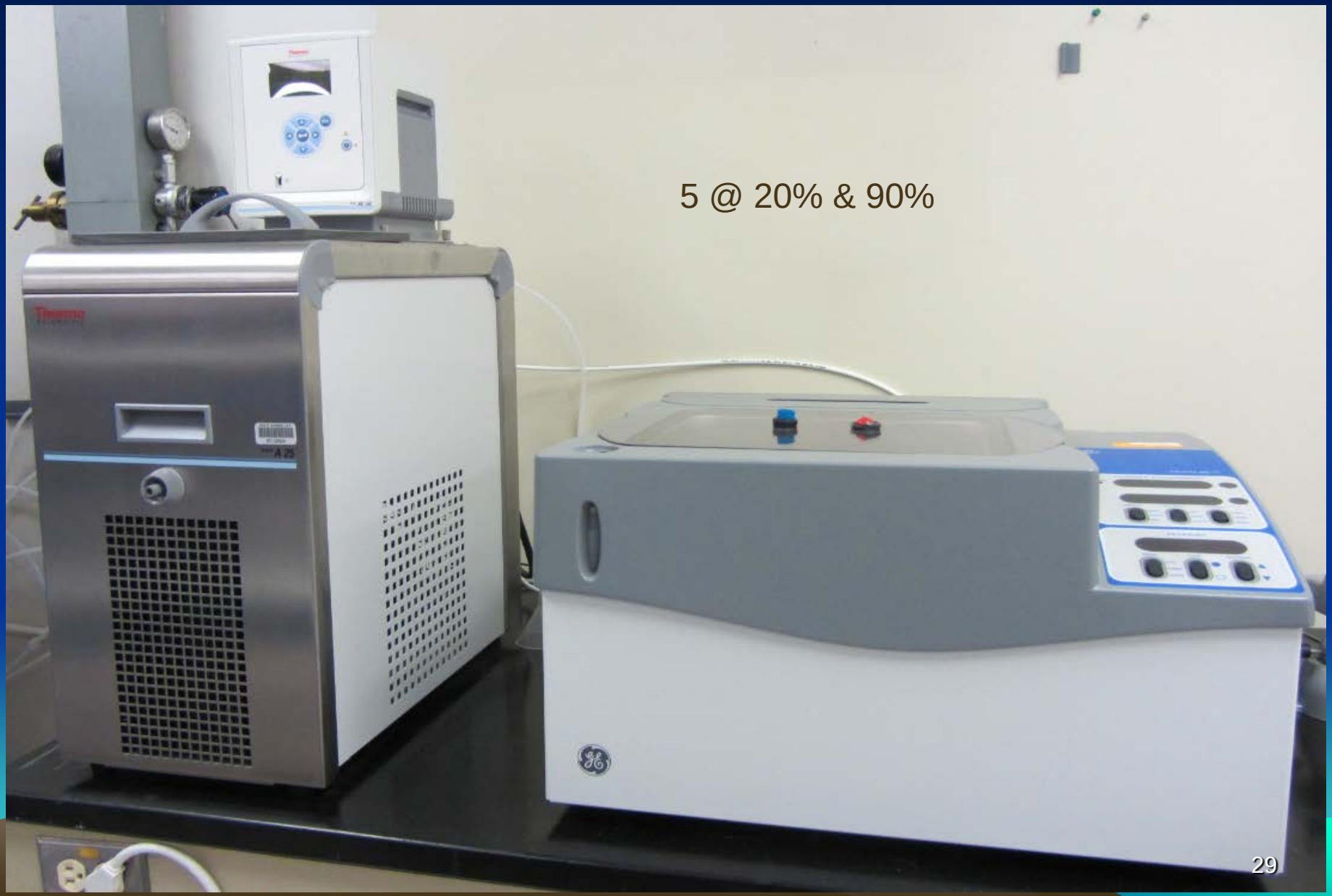
High Flow Workstation

HiVol Fixed Orifice

Digital HiVolCal

Meteorological Certifications

Relative Humidity (RH) Calibrator



Temperature Calibrator

Pressure Calibrator

CPC6000 Modular Precision Pressure Controller

Anemometer Certification

Workload – Assays Monthly Average

Ozone	25
Low Flow	20
High Flow	6
Metrological	5

Certification Reports

CALIFORNIA AIR RESOURCES BOARD

FLOW CERTIFICATION REPORT

Log Number: 2014239

To: [redacted]
AIR MONITORING - SOUTH

From: ROBERT RUSSELL
DATA ANALYSIS & SPECIAL PROJECTS

Calibration Date:	9/12/2014
Report Date:	9/18/2014

IDENTIFICATION

Instrument:	SABIO 2010D GAS CALIBRATOR
Propery No.:	20121927
Serial No.:	11800513
Previous Log No.:	2014045
Bar Code No.:	20121927
Elevation:	25.00'
Property of:	AIR MONITORING - SOUTH

Site Name:	MLD Standards Lab
Site Number:	34-299
Location:	1927 13th Street Sacramento, CA 95811

CALIBRATION STANDARDS	ID Number
MOLBOX FLOW STANDARD	20021121
MOLBOXn FLOW STANDARD	20021493

LINEAR RELATIONSHIP

MFM / MFC Position		POS	2
Instrument Range		10 slpm	
Maximum Display		10	
Best Fit Linear Regression	Slope:	1.0106	
	Intercept:	-0.1189	
Change From Previous Calibration (%)		0.994	
Previous Calibration Date		9/11/2014	

Certification Equation: **Verification Expires:** 9/12/2015

10 slpm **Corrected Air Flow =** 0.9862 * **(Instrument Display)** + **0.123**

[redacted] reference standard. It is for informational use only. *DO NOT USE THESE VALUES TO CORRECT THE INSTRUMENTS DISPLAY. USE THE PROVIDED EQUATION.*

This instrument meets Verification Criteria.

Calibrated by: R. Russell R.R.

Checked by: [redacted]

CALIFORNIA AIR RESOURCES BOARD

OZONE CERTIFICATION REPORT

To: AIR MONITORING - SOUTH

Log Number: 2014239

From: JERRY FREEMAN
OPERATIONS PLANNING & ASSESSMENT

Calibration Date:	9/2/2014
Report Date:	9/2/2014

IDENTIFICATION

Instrument:	SABIO 2010D GAS CALIBRATOR
Propery No.:	20121927
Serial No.:	11800513
Previous Log No.:	2014 045
Bar Code No.:	20121927
Elevation:	25.0'
Property of:	AIR MONITORING - SOUTH

Site Name:	MLD Standards Lab
Site Number:	34-299
Location:	1927 13th Street Sacramento, CA 95811

CALIBRATION STANDARD	ID Number
NIST STANDARD REFERENCE PHOTOMETER	4

CALIBRATION RESULTS

COMPONENT		OZONE
Instrument Range		500 ppb
Air Flow Rate, SLPM/SCCM		1095
Air Flow Setting		1094
Best Fit Linear Regression	Slope:	0.9944
	Intercept: (O3 = ppm):	0.00187398
Deviation From True (%)		-0.56
Change From Previous Calibration (%)		0.10%
Previous Calibration Date		8/29/2014

Certification Expires: **3/3/2015**

Certification Equation:

True Ozone Conc = 1.0038 * (Net Display) - 0.00144 ppm

California Environmental Protection Agency
AIR RESOURCES BOARD

Calibrated by: JT

Checked by:

Gas Analysis System

NEW Gas Analysis System

EPA Protocol Gas Verification Program

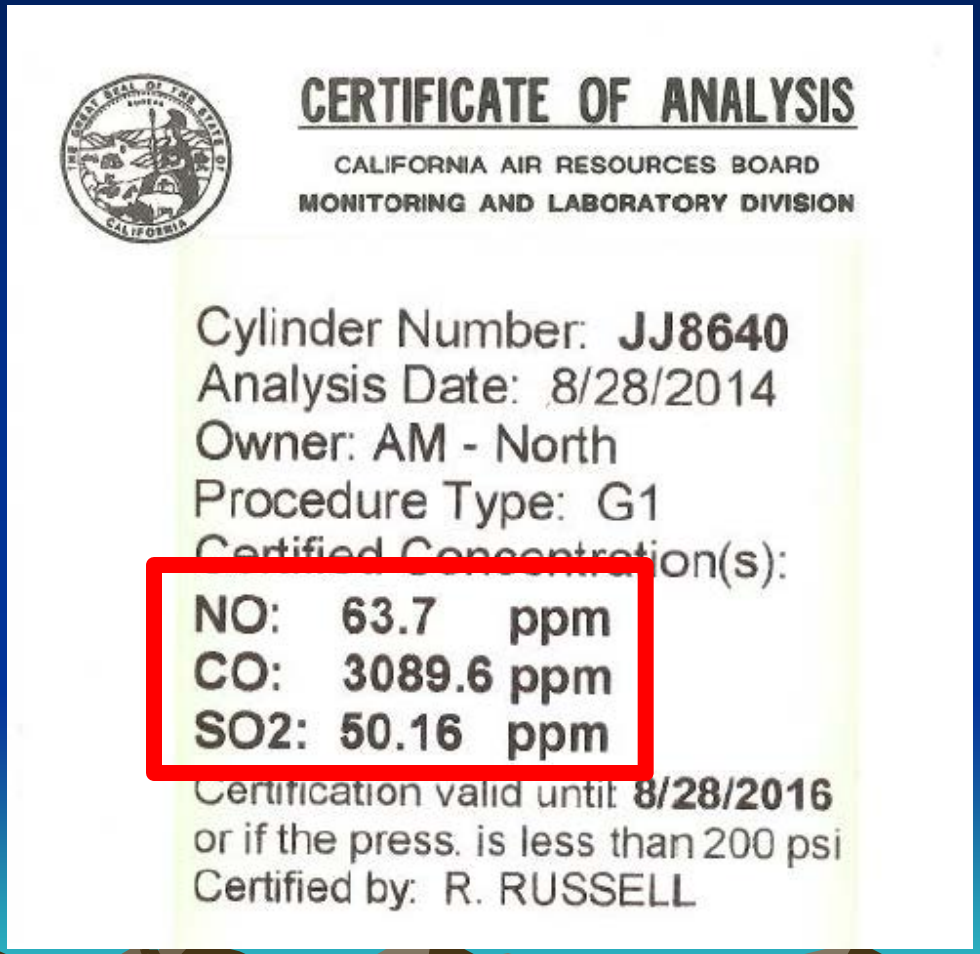
	NO (CC89594)	CO (CA03690)	SO2 (CA01201)
CARB	97.73	45.23	102.80
PGVP	99.04	44.87	101.06
% bias	1.34%	-0.81%	-1.69%
Uncertainty	0.26%	0.33%	0.06%

Gas Certifications

- G1 Direct Inject
  - Ranges (PPM)
- NO 20 - 200
- CO 8 - 600
- SO2 13 - 200

- G2 Dilution
  - Typical Conc.
- NO 200 PPM
- CO 6000 PPM
- SO2 200 PPM

Super Blend Certification



CERTIFICATE OF ANALYSIS

CALIFORNIA AIR RESOURCES BOARD
MONITORING AND LABORATORY DIVISION

Cylinder Number: **JJ8640**
Analysis Date: 8/28/2014
Owner: AM - North
Procedure Type: G1
Certified Concentration(s):

NO: 63.7 ppm
CO: 3089.6 ppm
SO2: 50.16 ppm

Certification valid until **8/28/2016**
or if the press. is less than 200 psi
Certified by: R. RUSSELL

Conclusion

What we can DO

- Ozone
- Low Flow
- High Flow
- Meteorological
- Gas Analysis

What we can't DO

Conclusion

What we can DO	What we can't DO
FOR FREE	* Include Return Shipping Label

Points of Contact

Robert Russell
916-322-0216
Robert.Russell@arb.ca.gov

Jerry Freeman
916-324-1845
Jerry.Freeman@arb.ca.gov