

DATASHEET

NIKIRA LABS – OEA



Optical Extinction Analyzer (OEA)

- ✓ Measures Ambient Aerosol & Visibility in Air
- ✓ First-Principles Measurements – No sample handling effects
- ✓ Outstanding Accuracy, High-Precision, No Drift
- ✓ Self-Calibration for Hassle-Free, Long-Term Field Deployment
- ✓ Low Cost of Ownership
- ✓ Hand-Portable & Light Weight



Incumbent Technologies: Optical extinction and visibility are key parameters in air quality characterization and aerosol studies. Measurements made by incumbent technologies are estimated from scattering data using a set of assumptions regarding aerosol size, shape, and albedo. They extractively sample the aerosols and underestimate extinction and visibility by discriminating against larger particles (e.g., humidified aerosols).

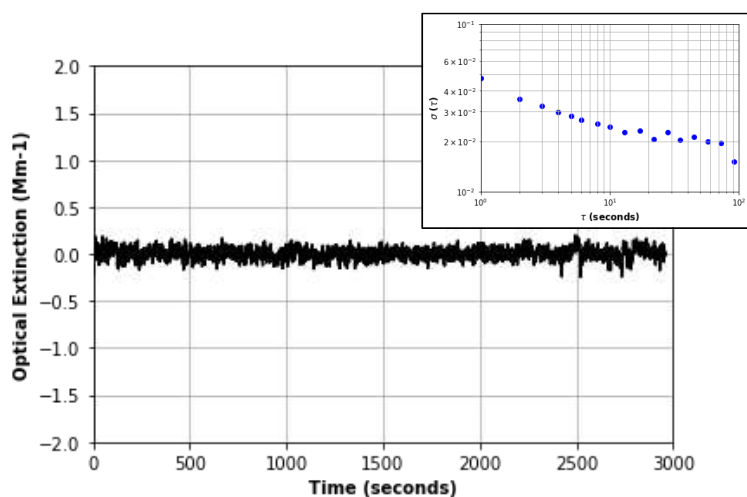
Nikira Labs Technology Advantage: Nikira Labs' technology enables direct, real-time measurement of aerosol optical extinction and ambient visibility with little to no sampling effects or calibration.

How? It is all in the technology we use. We employ cavity ringdown spectroscopy (CRDS) to make absolute measurements of the optical loss directly from first-principles. Moreover, the open-path cavity design allows for air sampling without extractive

losses. Thus, the instrument measures the true ambient optical extinction and visibility without disregarding larger aerosols.

The Nikira Labs solution uses a combination of its own intellectual property and NOAA's patented technology for periodic self-calibration and drift correction. This eliminates the need for calibration gases while enabling unattended long-term field deployment with outstanding precision and accuracy measurements of the optical extinction coefficient and, subsequently, the Meteorological Optical Range (MOR) as a visibility indicator (see plots below).

The analyzer has an internal SD card (32GB) for data storage that to accommodate more than 2 years' worth of continuous data collection. The data can be accessed via USB, WiFi, or UART output compatible with a Campbell Data Logger. The analyzer can be powered via a user-supplied battery or the provided wall plug.



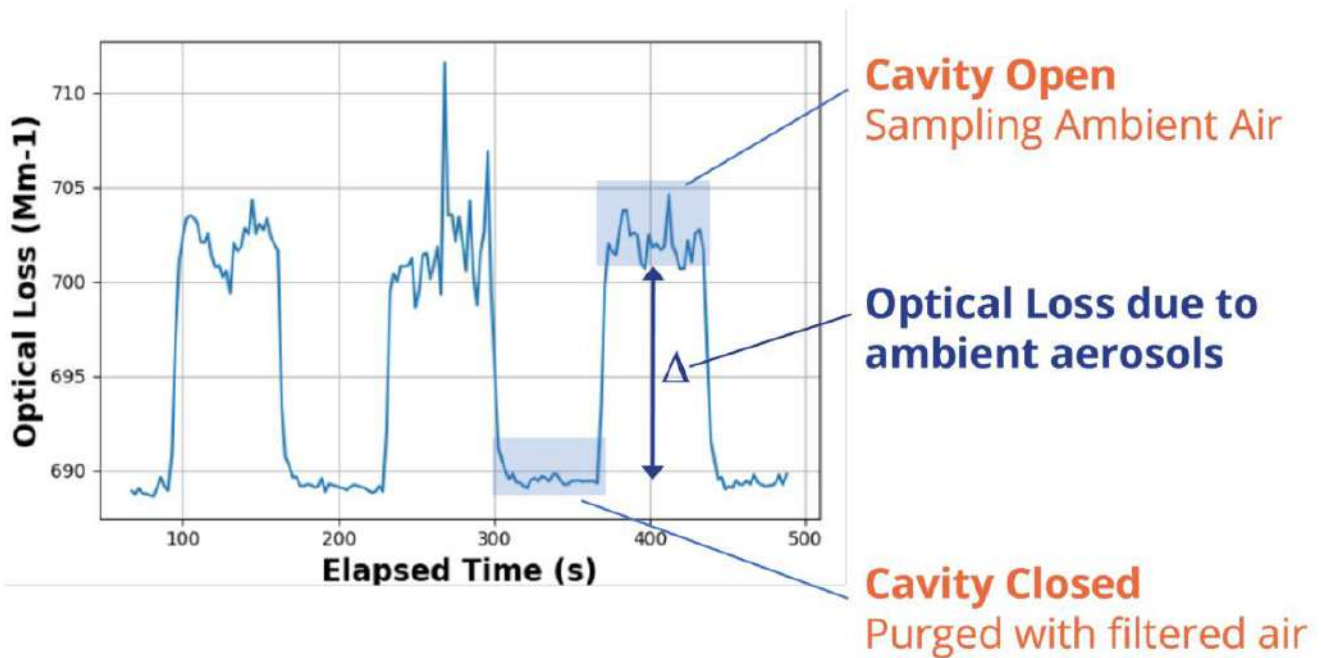
- Continuous measurement of filtered air.
- Precise to better than $\pm 0.1 \text{ Mm}^{-1}$ ($1\sigma, 1s$).
- Improves to $< 0.03 \text{ Mm}^{-1}$ ($1\sigma, 10s$).
- Can readily detect even very clean air.

OEA-520 Specifications:

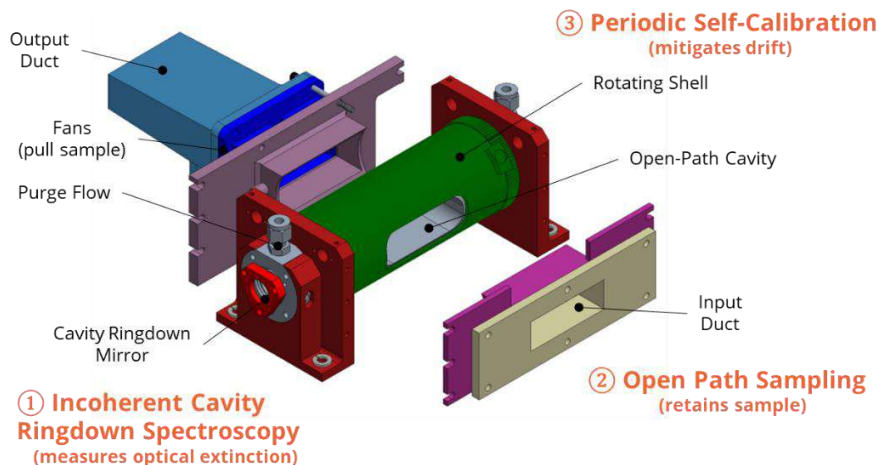
Measurement Technology	Open Path Cavity Ring-Down Spectroscopy
Wavelengths Available	520 nm (Std), 450 nm, 632 nm, 780 nm, 850 nm, 1065 nm (Std). Other wavelengths available upon request.
Dynamic Range	0 to $>10,000 \text{ Mm}^{-1}$
Accuracy / Precision	$\pm 1 \text{ Mm}^{-1}$ (nominal)
Data Rate	1Hz & 10Hz (Eddy Covariance application)
Sample Flow Rate	160 SLPM
Ambient Operating Temperature Range	-5°C to 50°C
Ambient Humidity Range	$< 99\%$ R.H. non-condensing
Outputs / Connectors	UART (for data logger), USB-3 / HDMI
Network Access	Built-in WiFi
Sample Tubing Adaptor	2" Tubing Connection
Purge Line Fitting	$\frac{1}{4}$ " push-to-connect
Dimensions	49 cm x 33 cm x 18 cm (19.3"w x 13"d x 7"h)
Weight	7.7 kg (17 lbs)
Power Consumption	35W (user-supplied battery or wall plug operable)
Internal Data Storage	SD Card (32GB); Can store $>1\text{M}$ readings (equivalent to 2yrs of continuous data collection)
Calibration	Self-calibrating
Consumables	Periodic replacement of external inlet filter

How Does the OEA Work?

1. Ambient air is pulled through a duct by fans at a speed of ~ 1 m/s.
2. Open-path cavity ringdown spectroscopy is used to make a direct measurement of the optical extinction coefficient (beta) in the sample.
3. The duct is periodically closed and the cell is purged with filtered air to a background measurement.
4. The difference between the open and closed duct values provides a direct, calibration-free measurement of the aerosol optical extinction.



The OEA Harnesses 3 Technologies:



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