

# 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).

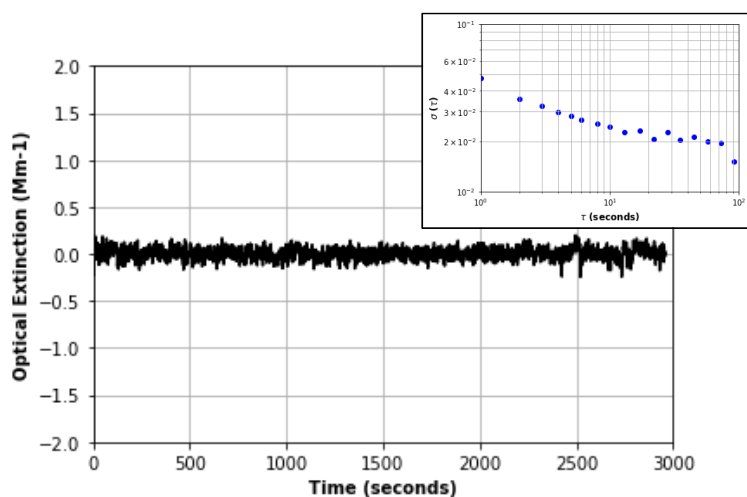
**Nikira Labs Technology Advantage:** Nikira Labs' technology enables direct, real-time measurement of aerosol optical extinction and ambient visibility with little to no sampling effects or calibration.

**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.



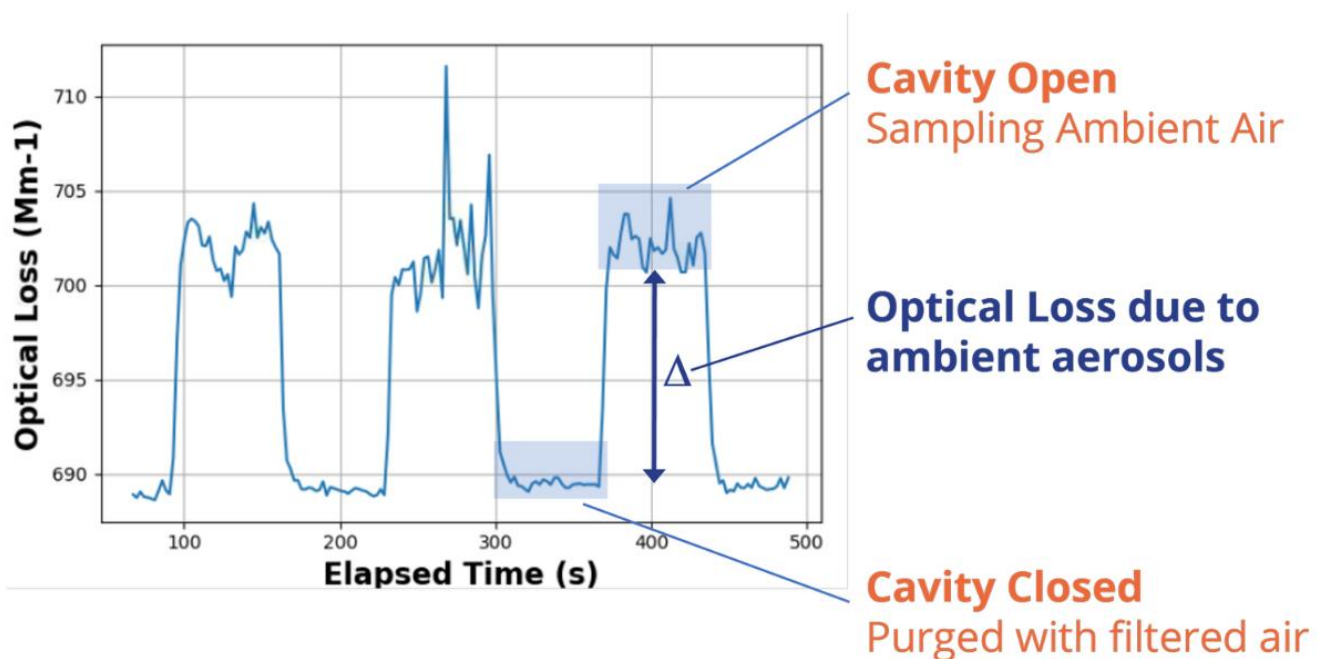
- Continuous measurement of filtered air.
- Precise to better than  $\pm 0.1 \text{ Mm}^{-1}$  ( $1\sigma, 1s$ ).
- Improves to  $< 0.03 \text{ Mm}^{-1}$  ( $1\sigma, 10s$ ).
- Can readily detect even very clean air.

## 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	$-5^\circ \text{C}$ to $50^\circ \text{C}$
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  $\sim 1$  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:

