OPCRDS

The Open Path Cavity Ring Down Spectrometer (OPCRDS) provides highly accurate and sensitive measurements of atmospheric light extinction at ambient conditions. The open path design avoids losses from inlet tubing and does not heat the sample. The OPCRDS is ideal for measurements in high relative humidity conditions and environments with large contributions from coarse mode particles.

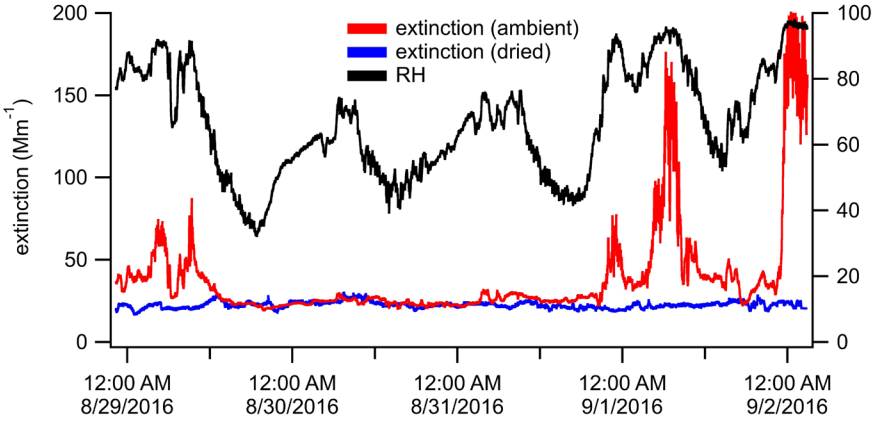
Applications

- Ground and tower-based ambient light extinction measurements
- Visibility monitoring
- Remote sensing validation
- Near cloud measuremnts (RH > 90%)

Features

- Open path configuration for near loss-less measurements of extinction at ambient RH
- Optional integrated dew point sensor to support highly accurate (+/- 0.1 %) RH measurements
- Includes weather-proof enclosure and optional stand
- No calibration necessary

OPCRDS in weatherproof enclosure and custom support stand located on the roof of an air monitoring station in Great Smoky Mountains National Park to study humidity impacts on visibility.



Ambient extinction coefficients measured with an OPCRDS at Great Smoky Mountains National Park during moderate and high relative humidity periods. Dry extinction measured by an Aerodyne CAPS instrument and ambient RH measured in the OPCRDS sample duct are also shown. Extinction enhancements are on the order of 5-10x during periods where RH > 90%.

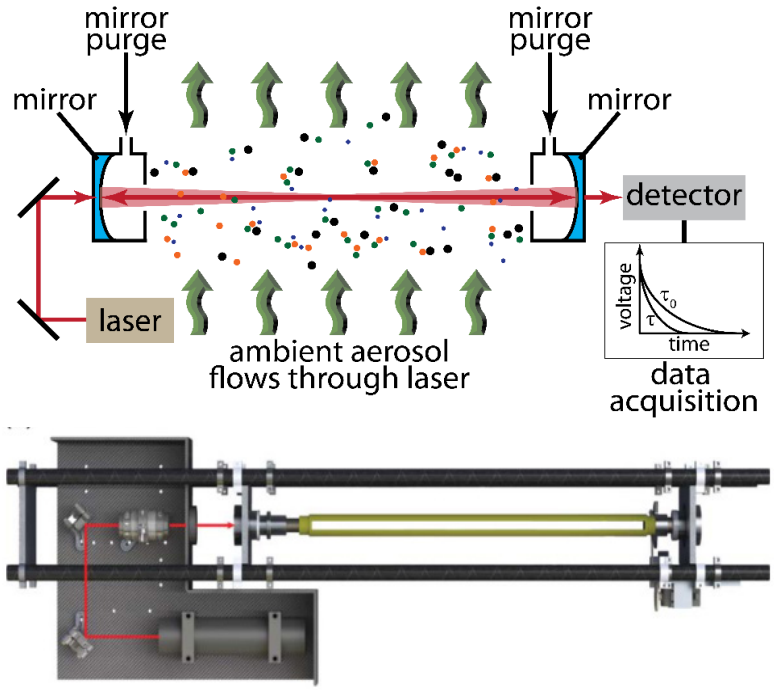
5485 Conestoga Ct., Ste. 104B
Boulder, Colorado, USA
sales@handix.com
+1 720 724 7658

Handix SCIENTIFIC

Operating principle

The foundation of the OPCRDS is an optical cavity formed by two highly reflective mirrors. When a laser beam in the optical cavity is switched off the light transmitted through the back mirror decays at a rate characteristic of the mirror reflectivity. The decay time decreases if particles and/or gas molecules scatter/absorb light in the cavity. The reduction in decay time can be used to calculate the extinction coefficient from first principles. In the OPCRDS the optical cavity is located inside a sample duct, which draws air from the bottom of the instrument through the laser without modifying the sample RH or introducing particle losses. A cylindrical shutter allows the optical cavity to be periodically sealed and flushed with zero air for background measurements.

Reference:
Gordon, T. D., N. L. Wagner, M. S. Richardson, D. C. Law, D. Wolfe, E. W. Eloranta, C. A. Brock, F. Erdesz, and D. M. Murphy, Design of a Novel Open-Path Aerosol Extinction Cavity Ringdown Spectrometer, *Aerosol Science and Technology*, 49, 717-726, 2015.



Side view schematic drawing (top panel) and top view CAD model (bottom panel) of the OPCRDS optical cavity. In the CAD model the sample air flows out of the page.

Specifications

Particle Size Range
All sizes

Sensitivity and range

1-sigma limit of detection at 1 s	0.05 Mm^{-1}
Maximum extinction limit*	~300 Mm^{-1}

*higher values possible with different mirror reflectivity

Flow and response time

Sample flow drawn through duct	~1500 LPM
Response time	< 1 second

Environmental Operating Conditions

Min. Temperature	-20 C
Max. Temperature	+40 C
Ambient Humidity	~0-100 %

Data Logging and Storage
Stores data on USB memory stick at rate of 30 MB/day.

Laser

Wavelength	674 nm
Power	10 mW

Power Requirements

AC power	100-240 VAC, 50/60 Hz
Average power consumption	~250 W

Communications

Ethernet Interface	8-wire, RJ-45, 10/100 BASE-T, TCP/IP

Physical Dimensions

Instrument	19 x 29 x 55 in

Specifications subject to change without notice.

Patent pending: Murphy, D.M. and Gordon, T.D., System and Method for Measuring Aerosol or Trace Gas Species, US Patent Application No. 15,082,112. March 28, 2106.

5485 Conestoga Ct., Ste. 104B
Boulder, Colorado, USA
sales@handix.com
+1 720 724 7658
www.handixscientific.com

DOC-0302.01 Rev A