

SELECTED BIBLIOGRAPHY

Y. Cai, D. Montague, W. Mooiweer-Bryan, and T. Deshler, "Performance characteristics of the ultra-high sensitivity aerosol spectrometer for particles between 55 and 800 nm: Laboratory and field studies," *Journal of Aerosol Science* 39 (2008) 759-769.

R. Yokelson, I. R. Burling, S. P. Urbanski, E. L. Atlas, K. Adachi, P. R. Buseck, C. Wiedinmyer, S. K. Akagi, D. W. Toohey, and C. E. Wold, "Trace gas and particle emissions from open biomass burning in Mexico," *Atmos. Chem. Phys. Discuss.* 11, 7321-7374, 2011. doi:10.5194/acpd-11-7321-2011.

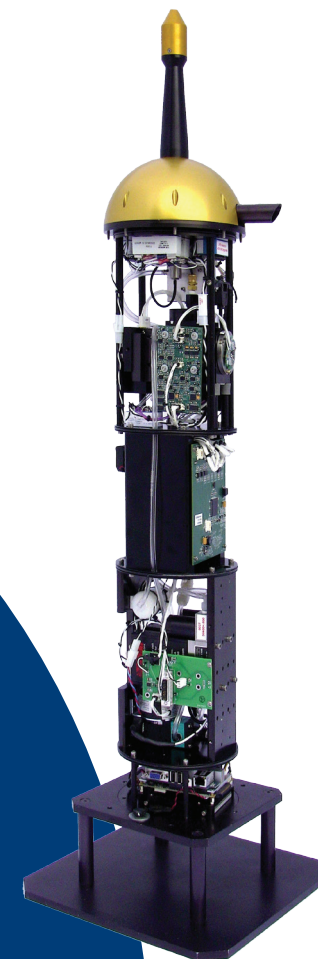
R. Yokelson, S. Urbanski, E. Atlas, D. Toohey, E. Alvarado, J. Crounse, P. Wennberg, M. Fisher, C. Wold, T. Campos, K. Adachi, P. R. Buseck, and W. M. Hao. "Emissions from forest fires near Mexico City." *Atmos. Chem. Phys. Discuss.* 7, 6687-6718, 2007.

HOW TO ORDER

Contact DMT for pricing or more information: +1.303.440.5576,
customer-contact@dropletmeasurement.com.

UHSAS-A

ULTRA-HIGH SENSITIVITY AEROSOL SPECTROMETER, AIRBORNE VERSION



OVERVIEW

The UHSAS is an optical-scattering spectrometer for sizing aerosol particles in the 0.065 – 1 μm range. The instrument counts particles in up to 100 user-specified sizing bins, with a resolution as fine as 1 nm/bin. This high sensitivity makes the UHSAS ideal for aerosol research.

APPLICATIONS

- » Aerosol research
- » Atmospheric and air pollution monitoring and research
- » Coalescence and nucleation research

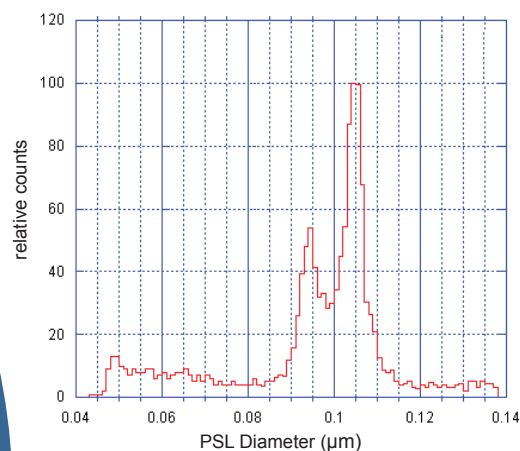
ADVANTAGES

- » Offers size resolution at 1-2% of particle size
- » Eliminates sizing uncertainty associated with scattering spectrometers that measure at sizes larger than the excitation wavelength
- » Counts up to 3,000 particles/second
- » Uses aerosol spectrometry technique with two detection systems: a primary, highly sensitive APD-based system to size smaller particles, and a secondary PIN photodiode system to size larger particles
- » Compensates for small drifts in laser power via automatic gain control
- » Features an on-board computer and powerful LabVIEW software to facilitate real-time data analysis

SUPERIOR RESOLUTION

UHSAS accurately sizes even the smallest particles. The graph below shows the results of a test conducted with 95 nm and 104 nm standard PSL particles. Although these particle diameters are only 9 nm apart, the UHSAS has correctly identified two distinct particle peaks.

Resolution of Duke PSL stds. (0.095 and 0.104 μm)



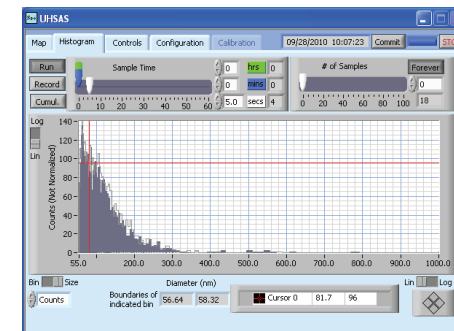
HOW IT WORKS

A laser illuminates particles, which scatter light that is collected by two pairs of Mangin optics. One pair of optics images onto a highly sensitive avalanche photodiode (APD) for detecting the smallest particles. The other pair images onto a low-gain PIN photodiode for detecting particles in the larger size range of the instrument. Each detector is amplified in a current-to-voltage stage that feeds into the analog electronics system. The amplification allows the system to detect particles as small as 65 nm.

SOFTWARE

The UHSAS comes with LabVIEW-designed software that provides a user-friendly virtual instrument panel for the control and data display of the UHSAS. For instance, the program enables the user to do the following tasks:

- » Start data recording and sampling
- » View a histogram of particles binned by diameter, by transit time, or by peak optical signal
- » Set boundaries for the histogram bins
- » Control sample flow and monitor temperature, pressure, and laser current
- » Calibrate the instrument



UHSAS Software

OPTIONS

- » Particle-by-particle feature that supplies information on individual particles, including inter-particle arrival times
- » Bidirectional serial stream communication control
- » Laminar flow element (LFE) for sample flow measurement

INCLUDED ITEMS

- » Instrument
- » Laptop computer
- » Operator manual
- » Zero-count filter
- » One day of training at DMT's facility
- » One-year warranty
- » Email and telephone technical support

UHSAS-A SPECIFICATIONS

Measured Parameters	Particle diameter (derived from single-particle light scattering)
Auxiliary Parameters	» Temperature » Pressure
Particle Size Range	65 nm – 1 µm
Number Conc. Range	0 - 3,000 particles/second
Sample Rate	1 or 10 Hz
Lasers	» Solid-state $Nd^{3+}:YLiF_4$: ~1053 nm, 1 kW/cm ² intracavity circulating power » Pump Laser: ~797 nm, 1.6 W
Number of Size Bins	100 max: » 99 standard bins (98 if both overflow and underflow are enabled) » One overflow bin and one underflow bin
Flow Range	» Sample flow: 1 – 100 standard cm ³ /minute (typically 50) » Sheath flow: airflow setting is 700 ccm at sea-level, 590 Sccm at factory in Boulder, Colorado » Other options available
Flow Control	» Controlled from software » Can also be manually adjusted via mass or volume flow controller
Routine Maintenance	<i>Daily:</i> » Monitor laser power by verifying Laser Reference voltage falls within acceptable levels; if necessary, clean critical optics to restore laser power » Zero check with high-efficiency filtered air sample <i>Monthly and around field campaigns:</i> » Full-scale calibration <i>Annually:</i> » Flow controller calibration
Recommended Service	Annual cleaning and calibration at DMT service facility
Computer	» Intel® Core i5-3210M processor » 4.0 GB RAM » 320 GB hard drive
Software	UHSAS Executable program written in LabVIEW (included)
Data Recording	» Output file written to computer hard drive » Output data sent to serial port

UHSAS-A SPECIFICATIONS, CONT.

Communications Output	» Serial » Ethernet » USB
Power Requirements	» Instrument: 100-240 VAC, 47-63 Hz, 200W » Anti-ice: 28 VDC, 215W » Fuse: BUSS fuse, GMA-2A
Environmental Operating Conditions	» Temperature: -40 - +40 °C » Relative Humidity: 100%, non-condensing Altitude: 0 - 12,000 meters
Dimensions	16.5 cm diameter x 98 cm long
Weight	~16 kg

Specifications are subject to change without notice. The UHSAS is a Class I Laser Product with a Class IV pump laser, U.S. Patent # 5,889,589.

Rev A

Aug. 31, 2014



2545 Central Avenue
Boulder, Colorado, USA 80301
www.dropletmeasurement.com
ph: 303-440-5576, fax: 303-440-1965