

# SELECTED BIBLIOGRAPHY

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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.

# INCLUDED ITEMS

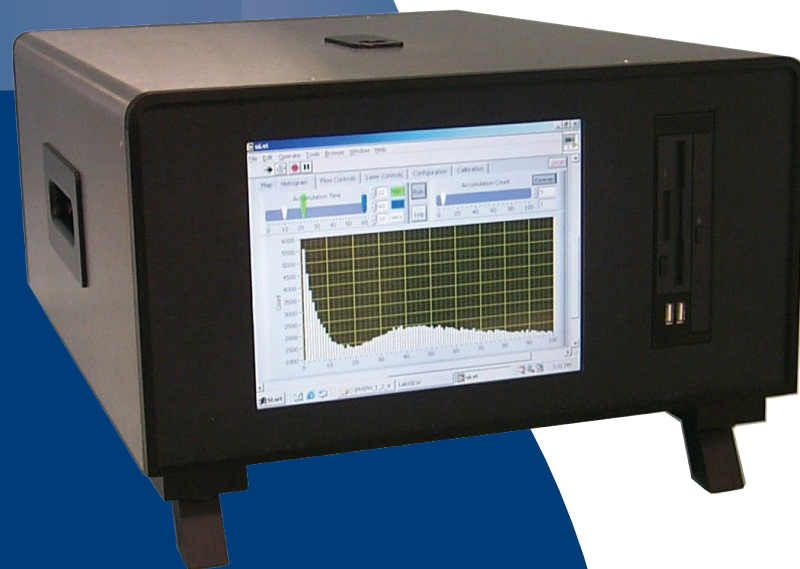
- » Instrument
- » Keyboard with touch pad
- » Operator manual
- » Zero-count filter
- » Domestic and international power supply
- » One day of training at DMT's facility
- » One-year warranty
- » Email and telephone technical support

# HOW TO ORDER

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

# UHSAS-G

## ULTRA-HIGH SENSITIVITY AEROSOL SPECTROMETER, GROUND-BASED VERSION



# OVERVIEW

The UHSAS is an optical-scattering spectrometer for sizing aerosol particles in the 0.06 – 1  $\mu\text{m}$  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 and filter testing.

# APPLICATIONS

- » Aerosol research
- » HEPA/ULPA filter testing and characterization
- » Atmospheric and air pollution monitoring and research
- » Chemical process monitoring and control
- » Pharmaceutical research and manufacturing
- » Powders and food products research
- » Inhalation toxicology research
- » Combustion and emission source research
- » Nebulization analysis
- » Coalescence and nucleation research

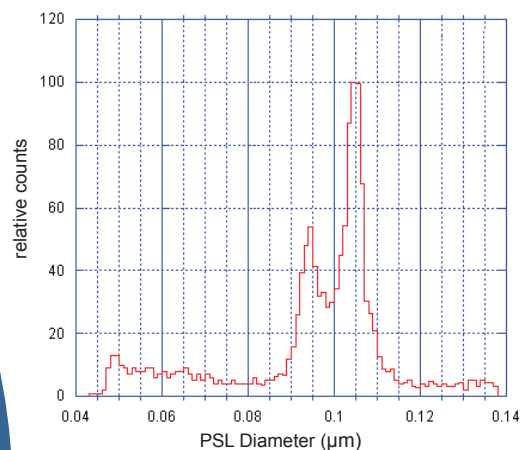
# ADVANTAGES

- » 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, built-in monitor, 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  $\mu\text{m}$ )



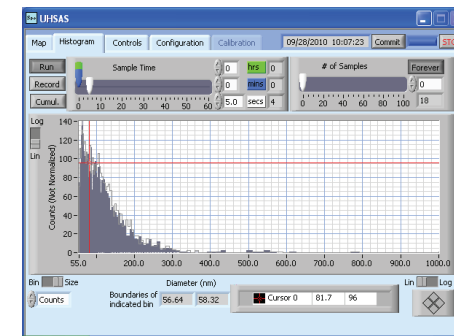
# HOW IT WORKS

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 60 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 AND ACCESSORIES



- » Rack mountable unit (standard 19" instrument rack)
- » External laptop, pictured at left (for remote applications, replaces flat screen display)
- » Particle-by-particle feature that supplies information on individual particles, including inter-particle arrival times
- » Bidirectional serial stream communication control

# UHSAS-G SPECIFICATIONS

Measured Parameters	Single-particle light scattering
Auxiliary Parameters	» Temperature » Pressure
Derived Parameters	Particle diameter
Particle Size Range	60 nm – 1 µm
Number Conc. Range	0 - 3,000 particles/second
Lasers	» Solid-state $N_d^{3+}:Y LiF_4$ : ~1054 nm, 1 kW/cm <sup>2</sup> 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
Sample Flow	» Standard option: 1 – 100 standard cm <sup>3</sup> /minute (typically 50) » 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
Front Panel Display	Built-in monitor, 2 USB 2.0 ports
Rear Panel Connections	System power switch, system power connection, Ethernet, exhaust vent, exhaust port, serial stream connection
Computer	» On-board Intel®Celeron® » 504 MB RAM » 80 GB hard drive » User interface via standard keyboard, mouse, and built-in monitor (included)

# UHSAS-G SPECIFICATIONS, CONT.

Software	UHSAS Executable program written in LabVIEW (included)
Data Recording	» Output file written to computer hard drive » Output data sent to serial port
Communications Output	» Serial » Ethernet » USB
Environmental Operating Conditions	» Temperature: 0 - 30 °C (32 - 86 °F) » Relative Humidity: 0 - 100%, non-condensing » Altitude: 0 - 4,000 meters
Dimensions	56 cm L x 43 cm D x 24 cm H
Power Requirements	100-240 VAC, 47-63 Hz, 200W

*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.*