WIBS-4A

WIDEBAND INTEGRATED BIOAEROSOL SENSOR

DROPLET MEASUREMENT TECHNOLOGIES

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OVERVIEW

The Wideband Integrated Bioaerosol Sensor (WIBS) provides highly sensitive measurements of mold and other bioaerosols. The instrument uses a UV xenon source to excite fluorescence in individual particles. Unlike UV lasers, the UV xenon source allows for the precise selection of particular UV wavebands. These wavebands have been selected to optimize detection of common bioaerosols (tryptophan and NADH).

The xenon source is also far less expensive than a UV laser, making the WIBS a cost-effective alternative to other bioaerosol-measurement instruments.

APPLICATIONS

» Bioaerosol research (mold, pollen, fungi)
» Air quality studies
» Health effects research

Suitable for airborne or ground-based sampling

ADVANTAGES

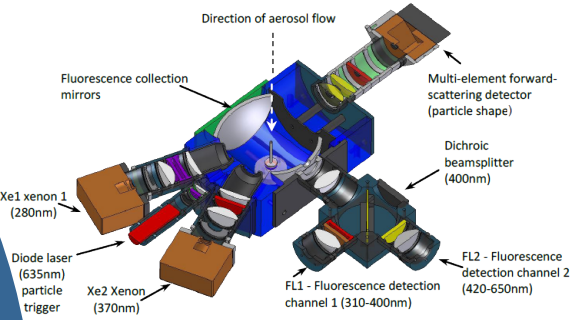
» Provides particle-by-particle data and particle time-of-flight (to detect coincidence)
» Features user-selectable particle-size criteria for both full and partial measurements
» Provides instrument health data
» Allows user to filter data using a wide variety of criteria: particle size, asymmetry, and concentration; fluorescent excitation and emission; or ratios of any of these parameters\

HOW IT WORKS

A laminar-flow system arranges particles in single file. The particles are drawn through the path of 635 nm diode laser, which scatters light in all directions. The forward-scattered light is used to determine particle shape. Side-scattered light is collected, passed through a dichroic beam-splitter, and converted to electrical pulses. These pulses then trigger the first xenon flash tube, Xe1, at 280 nm. The resulting fluorescence emission is collected, filtered, and passed to two fluorescent detectors, F1 and F2. The Xe2 xenon flash tube then fires at 370 nm. The resulting fluorescence emission is again collected, filtered, and passed to F1 and F2.

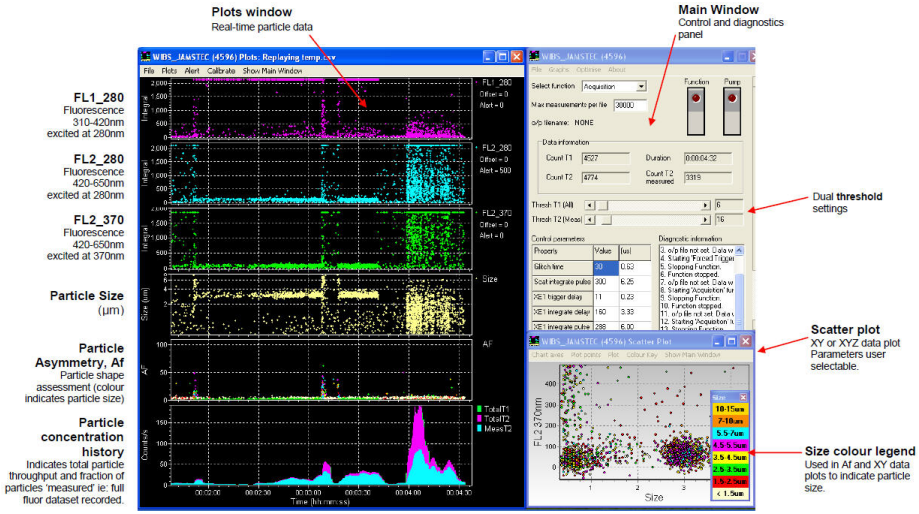
The WIBS thus creates a 2x2 excitation-emission matrix for each particle. This results in three fluorescent measurements. (The Xe2/F1 measurement is ignored, as the F1 detector becomes saturated with elastically scattered UV light.) The Xe1/F1 measurement is highly sensitive to tryptophan, while the F2 measurements are responsive to NADH.

The entire measurement cycle for each particle takes approximately 25 µs.



WIBS Central Optical Chamber

SOFTWARE



The WIBS's graphical user interface (above) features several components. The plots window (left) displays time-series graphs of variables of interest (fluorescence measurements, particle size, particle concentration, etc.) The main window (upper right) allows the user to control the instrument and view diagnostics. A scatter plot (lower right) shows correlations between user-selectable variables. A frequency window, not shown, displays data in histogram form.

SELECTED BIBLIOGRAPHY

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» C. Pohlker, J.A. Huffman, and U. Poschl, "Autofluorescence of atmospheric bioaerosols-fluorescent biomolecules and potential interferences," *Atmos. Meas. Tech.*, 5. 37-71, 2012.

» A.M. Gabey, M.W. Gallagher, et al. "Measurements and comparison of primary biological aerosol above and below a tropical forest canopy using a dual channel fluorescence spectrometer," *Atmos. Chem. Phys.*, 10, 54453-4466, 2010.

» P. H. Kaye, J.E. Barton, et al. "Simultaneous light scattering and intrinsic fluorescence measurement for the classification of airborne particles," *Applied Optics*, 39, 3738-3746, 2000.

INCLUDED ITEMS

» Instrument
» Computer
» Software
» Shipping case
» One-year warranty

HOW TO ORDER

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

WIBS-4A SPECIFICATIONS

Particle-by-Particle Parameters	» Particle size (determined by light scattering) » Three separate fluorescence measurements (F1, F2, F3) » Particle Asymmetry Factor (AF)
Other Parameters	Particle Concentration
Fluorescence Excitation	Dual wavelength, 280 and 370 nm
Fluorescence Emission	Dual wavelength, 310-400 nm and 420 - 650 nm
Particle Size Range	0.5 to 15 µm
Maximum Concentration	~2 x 10^4 particles/L for particle size, AF, and F1, F2, and F3 ~10^6 particles/L during fluorescence dead time
Flow Rate	Total flow of 2.5 L/min: » Sample flow: 0.3 L/min » Sheath flow: 2.2 L/min
Laser	635 nm diode laser
Rear Panel Features	» Power connection » ON/OFF LED » Pump status LED » Particle detection LED » Air sample outflow » USB connector
Pump	Diaphragm pump
Power Requirements	100 W, 90 - 230 VAC, or 24 VDC at 3.0 A
Weight	13.6 kg
Dimensions	11.9” W x 15.1” L x 6.75” H / 30.4 cm W x 38.2 cm L x 17.1 cm H Inlet adds an extra 1.5”/3.8 cm in height

The WIBS was developed by Paul Kaye at the University of Hertfordshire, U.K., and is licensed to Droplet Measurement Technologies.

Rev B-4

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