

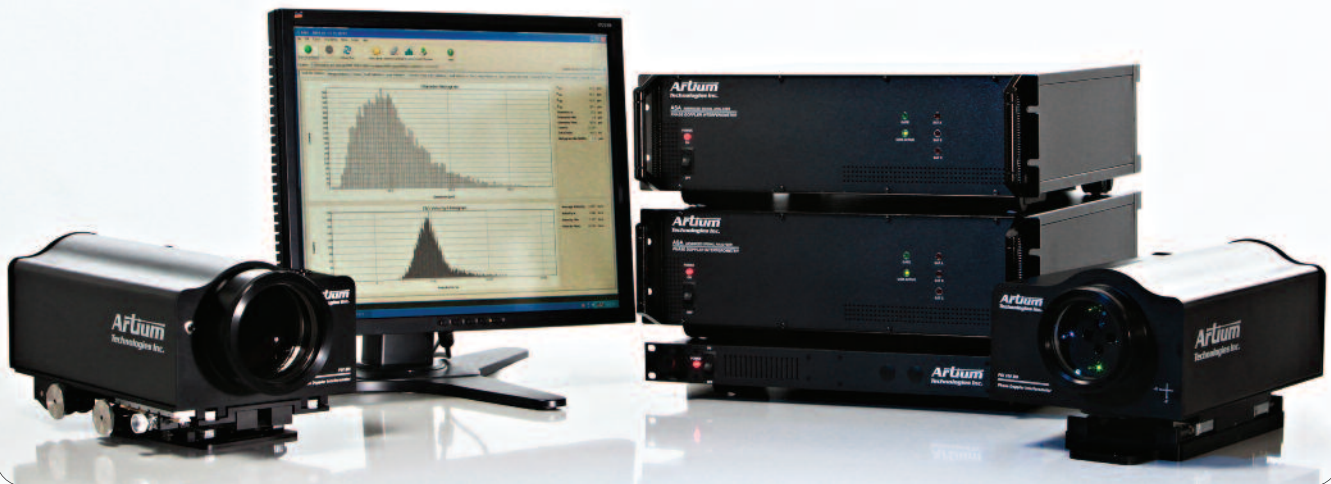
Artium Technologies Inc.

**Developing Advanced Instruments for Energy
and Environmental Research and Development**

PDI

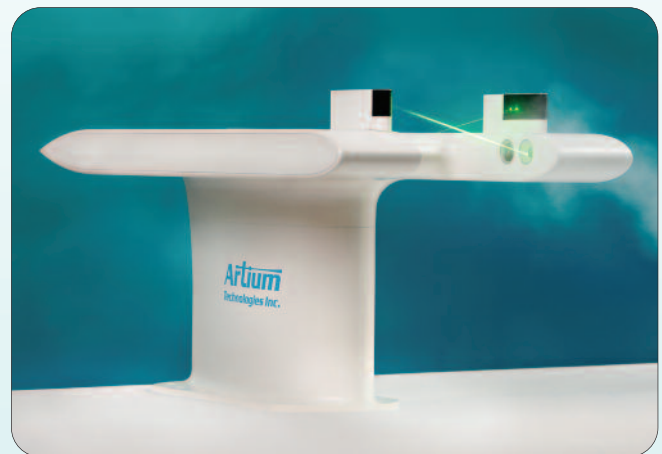
NEW Generation Phase Doppler Interferometer

An instrument for performing complete spray characterizations



Key Features of the Artium Phase Doppler Interferometer (PDI):

- Fully automated setup of the instrument functions, detector gain, and sample volume size. Manual operation is also available
- State-of-the-art Fourier transform based signal processor for fast, reliable, accurate signal detection, sampling, and processing
- Rugged optical system requiring no alignment for reliable day-to-day operation
- Computer selectable apertures in the receiver to control the probe volume size to optimize for different spray droplet number densities
- Diode-Pumped Solid-State Lasers and compact photodetectors for producing high quality signals and long lifetime operation
- Flexible optical systems for R&D applications
- Compact rugged system permanently aligned for turnkey QC applications
- Advanced signal analysis and validation systems to ensure measurement reliability and accuracy
- Three pairs of phase measurements for greater measurement reliability, resolution and accuracy
- New logic to eliminate possible particle trajectory errors



Details:

Components of the PDI

The complete instrument includes the optical system consisting of diode-pumped solid-state lasers (DPSS), frequency shifting modules, optical receiver with compact photodetectors, preamplifiers, ASA signal processing system, and the advanced Automated Instrument Management System (AIMS) software package.

Optical System

The Artium team has over 30 years of experience in designing optical systems for LDV and PDI instruments. Artium Technologies offers both standard compact modular systems, compact flight probes, self-contained systems and custom designed optical systems to meet specific requirements of the measurement environment. The optical transmitters and receivers operate as turnkey systems requiring no internal alignment and will operate without requiring any adjustment by the user. The modular optical systems may be mounted on a common rail and translated with a computer controlled traversing system.

Features:

- Diode-pumped solid state (DPSS) lasers for high efficiency, high quality signals
- Lasers fully computer controlled with safety interlocks, 24 volt power supplies
- Large aperture optics for high signal quality, high resolution size and velocity measurements
- Rugged construction for trouble-free operation and optical alignment integrity
- No troublesome fiber optics
- Easily interchangeable optics to optimize for full size range
- High efficiency receiver optics, 100 mm diameter lenses
- Automated slit aperture selection to change probe volume, 15 μm to 1000 μm
- Built-in phase calibration



Advanced Signal Analyzer (ASA)

The ASA is the most advanced signal processor available for PDI applications. It is a Fourier transform based signal processor incorporating several innovations to ensure optimum performance. The innovative Digital Burst Detector (DBD) combined with the analog burst detector output ensures reliable signal detection and burst length measurements even in difficult spray environments. Our adaptive sampling circuitry automatically responds to changes in duration of each signal. The data packets are stamped with other relevant information (time of arrival, transit time and external input data) and transferred to the computer via a high-speed PCI interface card.

Features:

- Fully automated setup of instrument parameters including detector gain
- Innovative Digital Burst Detector for optimum Doppler signal detection and to minimize retriggering on low SNR Doppler signals
- Quadrature down-mixing and sampling for maximum accuracy in frequency and phase measurements
- Only signal processors that utilize high resolution complex Fourier transform algorithms for processing and validating Doppler signals to obtain frequency and phase measurements
- Automatically adapts the sampling to the variable Doppler burst lengths to maximize signal information used in processing
- Built-in phase calibration system to eliminate detector and electronics phase lags

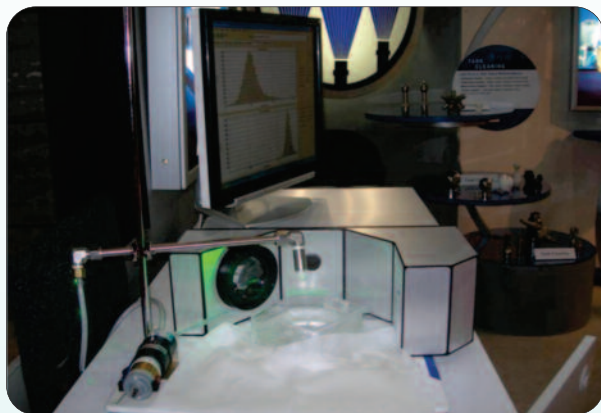
Automated Instrument Management System (AIMS) Software

The Automated Instrument Management System (AIMS) software package controls all aspects of the Phase Doppler Interferometer (PDI) operation: automated instrument setup and data acquisition, processing, and storage. An algorithm has been developed and incorporated into the system to quickly acquire a small test sample of signals (fraction of a second) and analyze the signal characteristics. This information is used to automatically optimize the instrument setup functions. The software then accepts the incoming signals and performs a full complex Fourier transform on each signal to obtain the frequency and phase, arrival time, transit time, and other valuable information for each drop. Validations including computing the signal to noise ratio for each signal to ensure that each of the three signals for size measurement are present simultaneously and that they have adequate quality to obtain reliable size measurements. Three pairs of phase measurements are computed and the values weighted and compared to further validate the measurements. Other proprietary validation logic is applied to ensure reliable measurements in challenging environments.

Features:

- Controls all aspects of instrument operation
- Facilitates automated instrument setup, data acquisition, and remote monitoring and analysis (Patent Pending)
- Performs full complex Fourier analysis on signals with up to 8192 samples
- Real-time data presentation and extensive statistical analyses on selectable screens
- Acquires and saves sampled signals allowing reprocessing for optimization of validation parameters
- Incorporates advanced signal validation and analyses (Patent Pending)
- Easy data export to MS Excel, or other programs
- External input feature for coordinating data with other external information
- Traverse drivers incorporated for most common traverses to automate data collection and spray field mapping

Artium offers a variety of optical designs to meet different spray applications.




Key Specifications:

Drop Size Measurement Range:	0.5 to 2000 μm
Estimated Accuracy	+/- 0.5
Estimated Resolution	+/- 0.5 μm
Velocity Measurement Range:	-100 to 200 m/s
Velocity Accuracy	to +/-0.2%
Volume Flux Accuracy	to +/-15%
Distance Receiver to Probe Volume	350, 500, 1000 mm, Standard
Distance Transmitter to Probe Volume	350, 500, 1000 mm, Standard
Laser Type	Solid State Diode Pumped Nd:YAG
Laser Light Wavelength	532 nm, 473 nm
Maximum Data Rate	250,000/sec
Minimum Signal Processing Rate	10,000/sec



Spray Diagnostics



Particulate Emissions

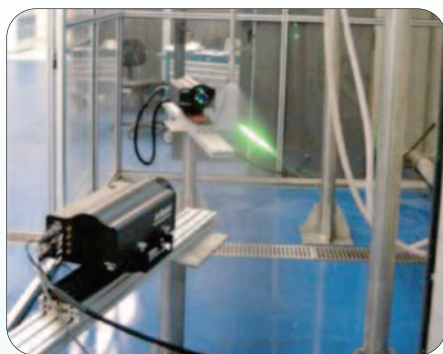


Cloud Research

We have heard all of the complaints and have spent a decade designing and developing a new generation of Phase Doppler instruments that are capable of making reliable accurate measurements with near turn-key performance.

Problems Addressed and Eliminated in our New Designs:

- Requiring frequent alignment of fiber optics couplers every time you need to make spray measurements
- Needing a Ph.D. engineer to acquire reliable spray data
- Wasting time figuring out optimum instrument setup functions at each measurement point
- Uncertainty in setting photodetector gains and sample volume size when attempting to measure a new spray
- Complete characterization of sprays taking too much engineering time
- Appearance of false large drop readings under difficult measurement conditions
- Significant consumption of electrical power and water when using big argon ion lasers



Global Presence:

Artium's offices, research facilities & manufacturing plant are located in Sunnyvale, California. Our customers in North America are served directly from our Sunnyvale office. We have also established a world-wide distributorship to serve our customers in other parts of the world.

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