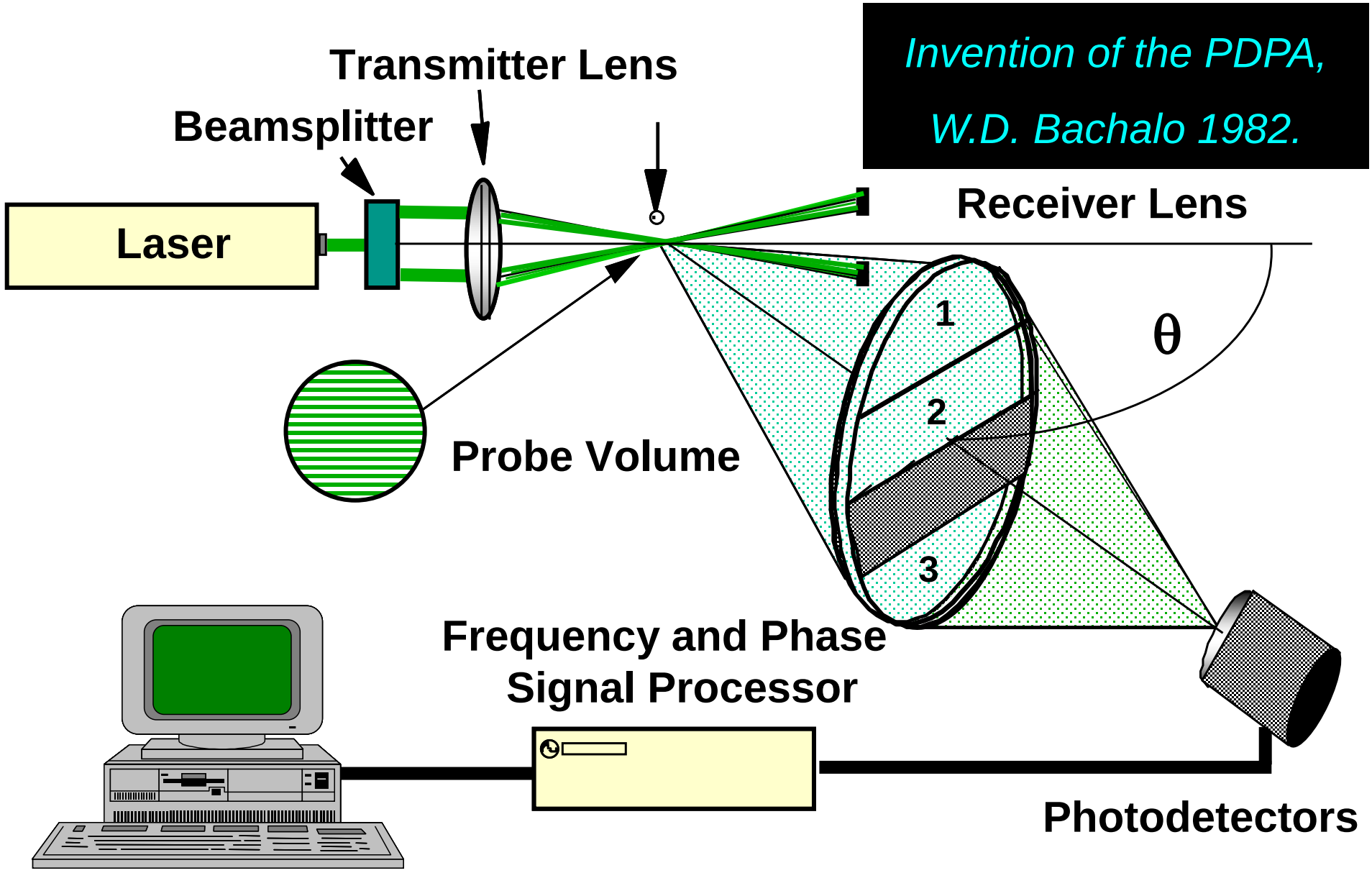
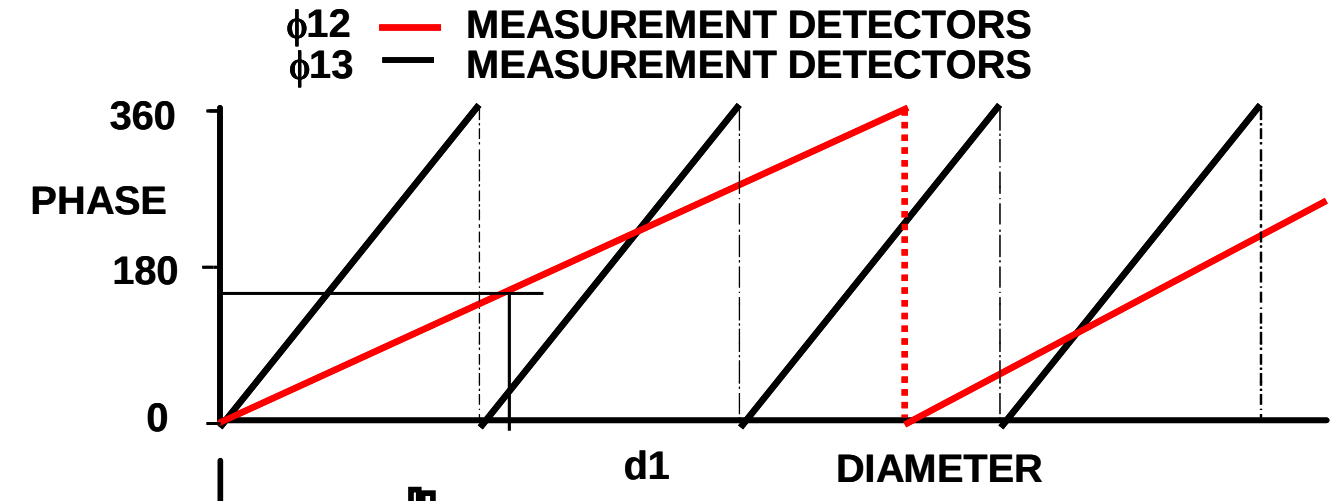

Artium
Technologies Inc.

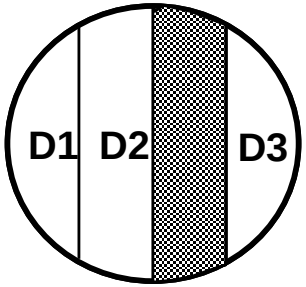

First PDPA developed and built by W.D. Bachalo and M.J. Houser, 1983.
AEROMETRICS, INC.
IBM

Schematic of Phase Doppler Optics

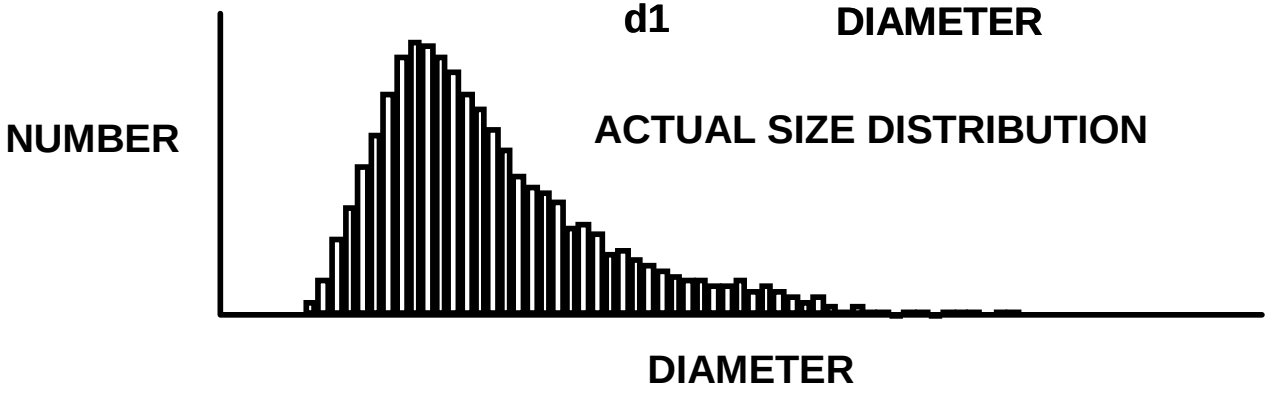


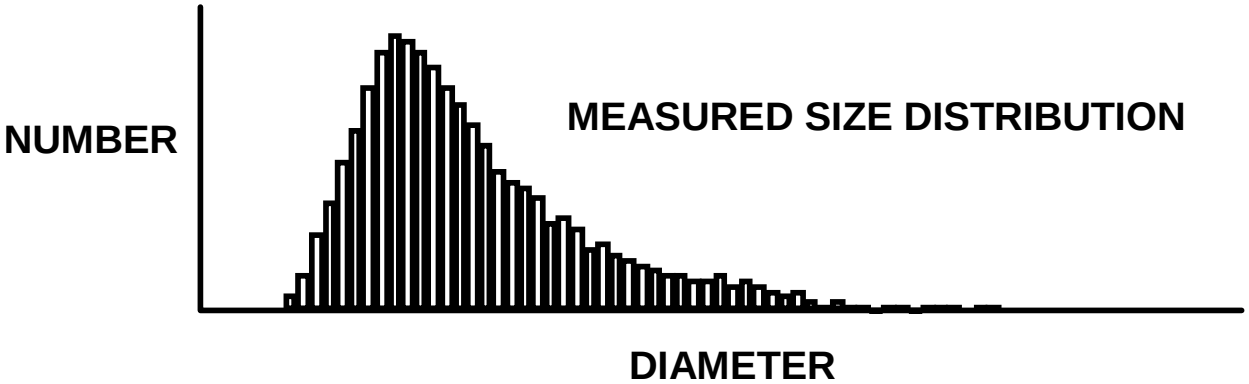
THREE-DETECTOR APPROACH





Detector Arrangement

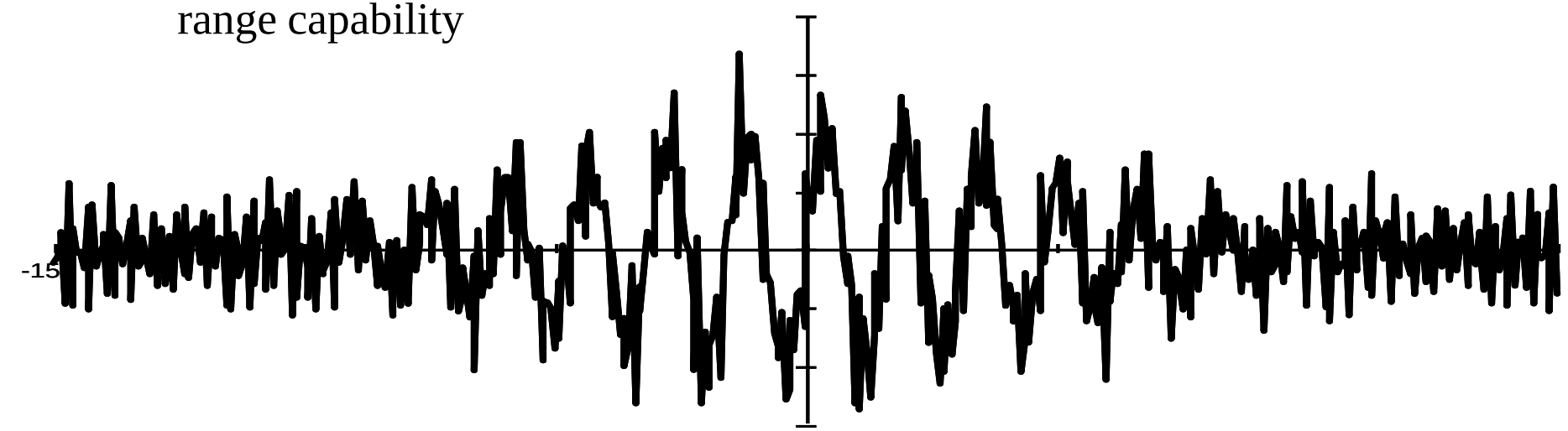




Invention of the 3D detector approach for extending the measurement range and signal validation, W.D. Bachalo 1982.

PDI SIGNAL PROCESSING:

- Not all signals are easy to detect and process
- Signals produced by small particles and particles passing near the edge of the beam will have low SNR
- Burst detection and signal processing systems based on SNR are able to detect and recover these signals using their unique sinusoidal character
- Being able to detect and measure all drops maintains the dynamic range capability



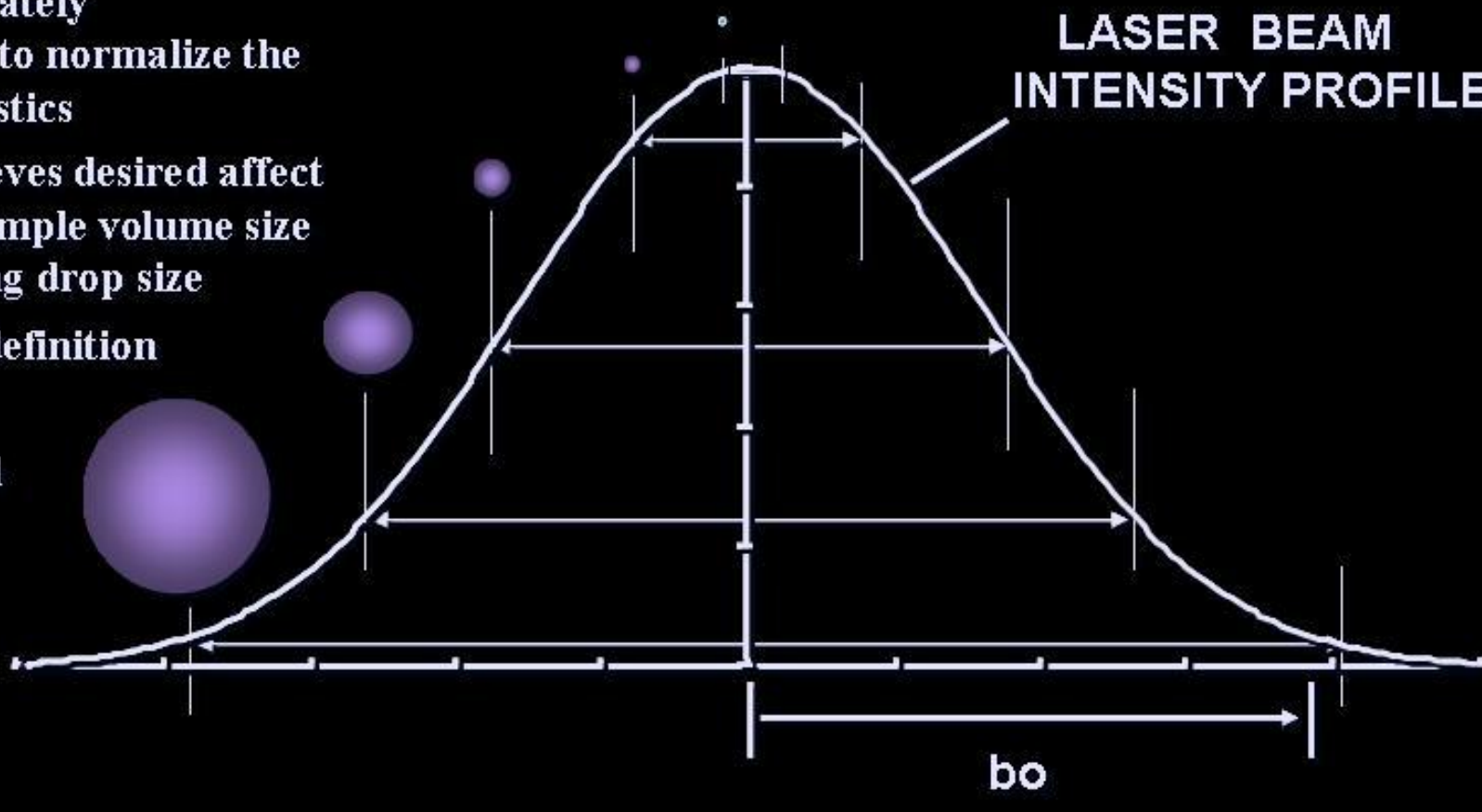
Invention of digital signal detection methods for reliable detection and processing of Doppler signals, K. Ibrahim and W.D. Bachalo 1989.

VARIATION OF THE SAMPLE VOLUME WITH DROP SIZE

Gaussian Beam Effect

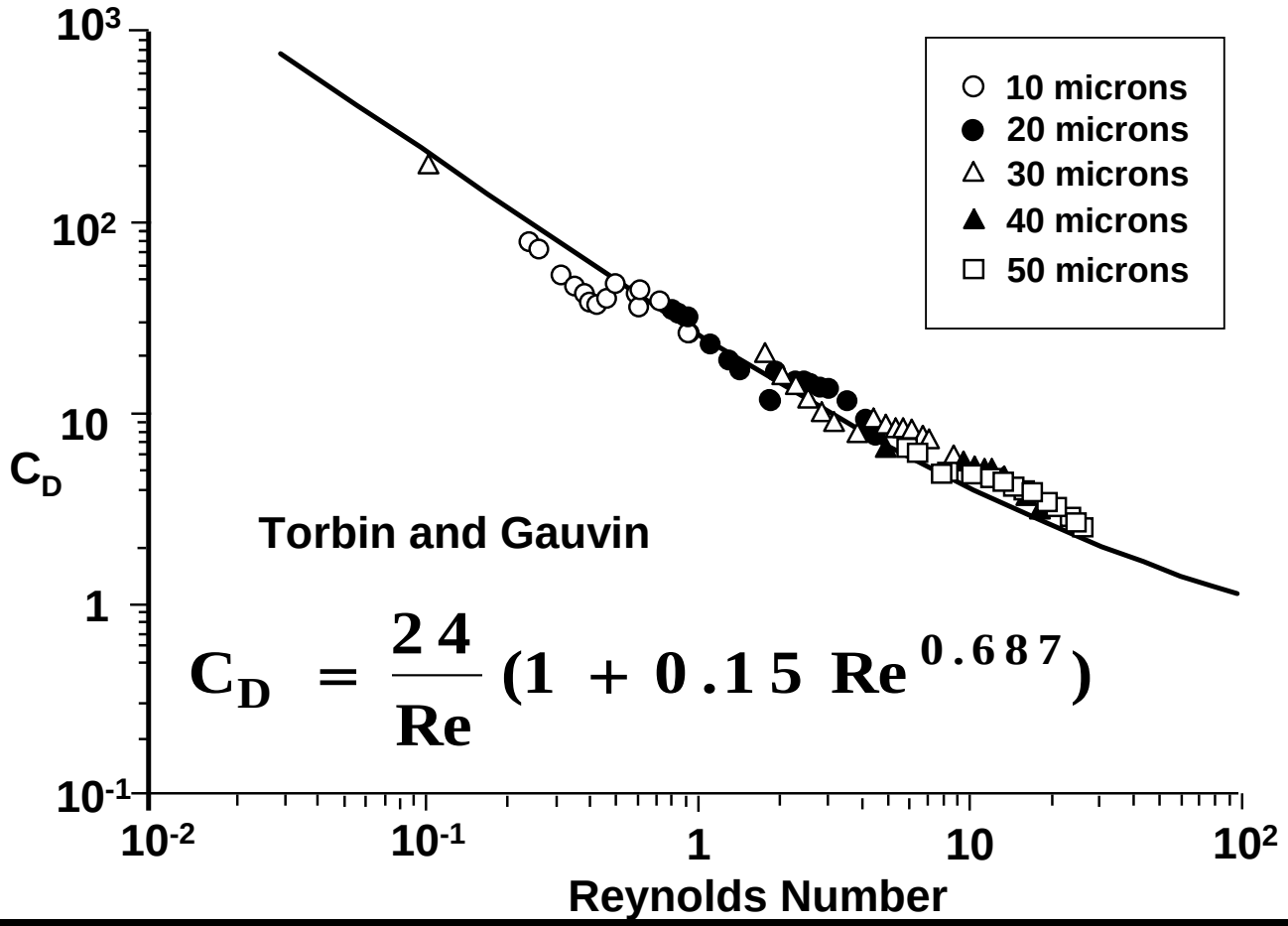
- Causes a change in the effective sampling cross-section as a function of drop size
- Must be accurately characterized to normalize the sampling statistics
- Partially achieves desired affect of reducing sample volume size with decreasing drop size
- Complicates definition of sampling cross-sectional area

First recognition of the need to correct the sampling statistics for the change in sample volume with drop size (probe volume correction, PVC), W.D. Bachalo and M.J. Houser, 1984.



Drop Drag in a Polydispersion

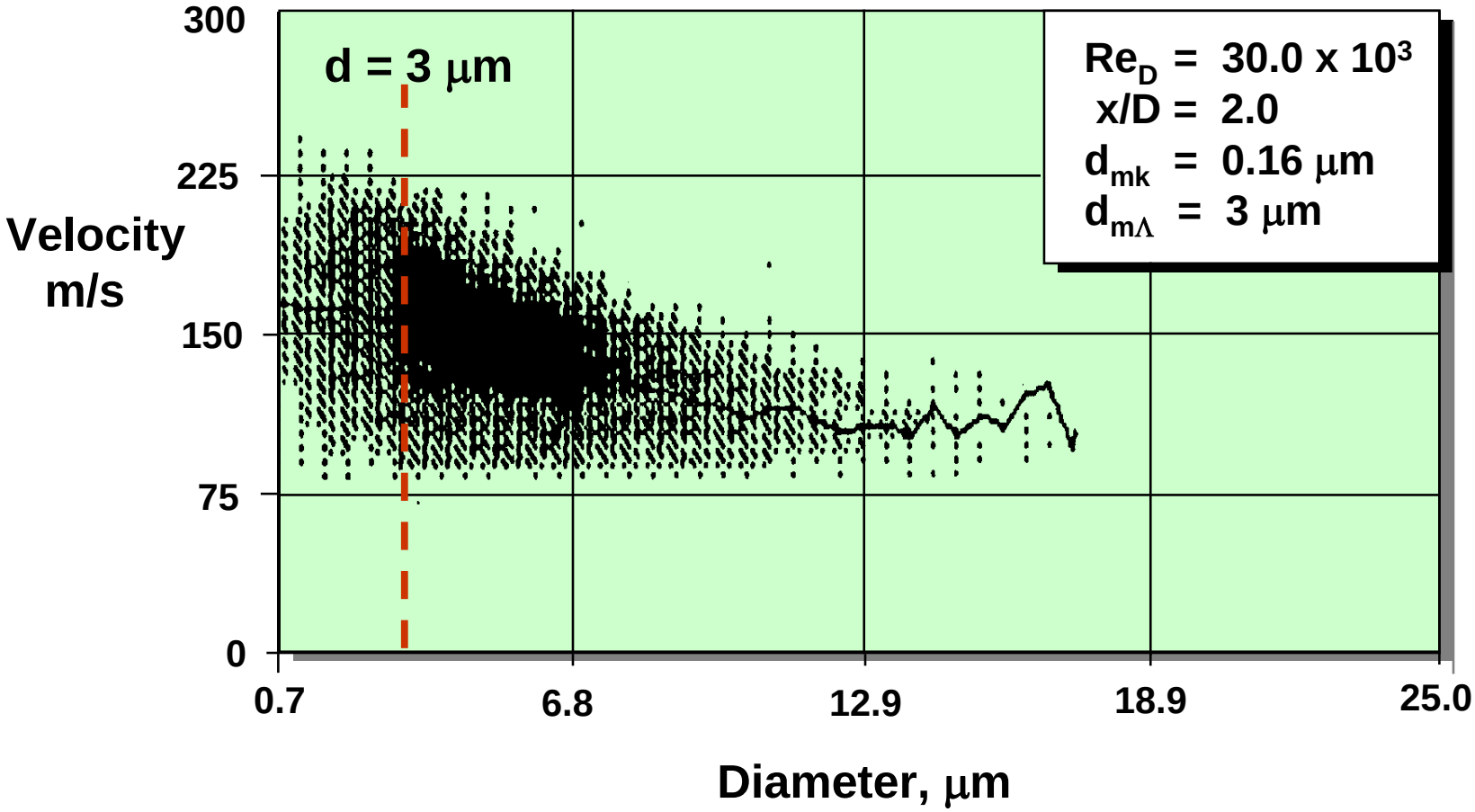
- **Drag Correlation Validations**



First measurements of droplet drag in a turbulent spray flow environment, R. Rudoff, S.V. Sankar, and W.D. Bachalo 1988.

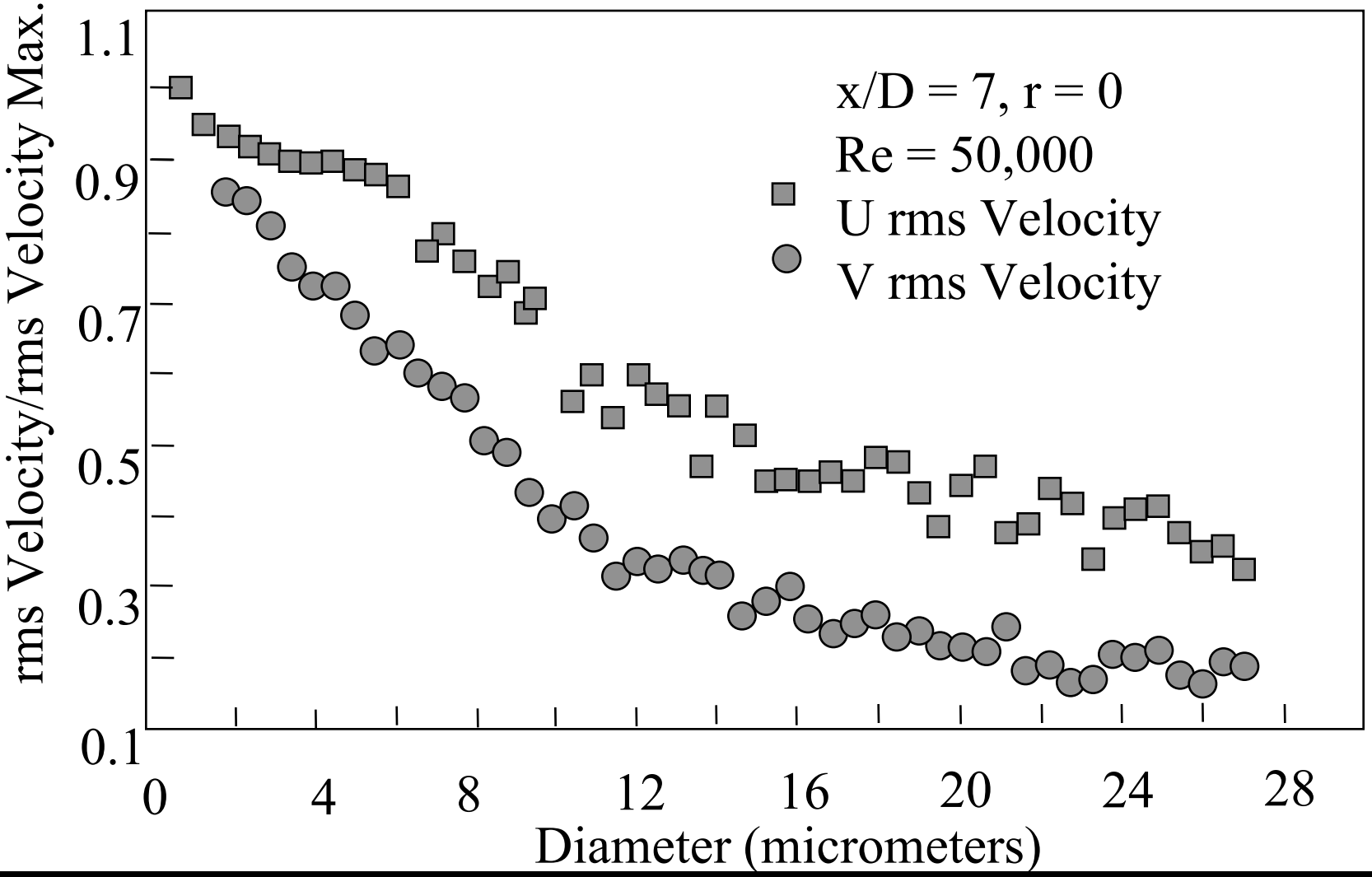
Spray Interactions With Turbulence

- **Size Velocity Correlation**



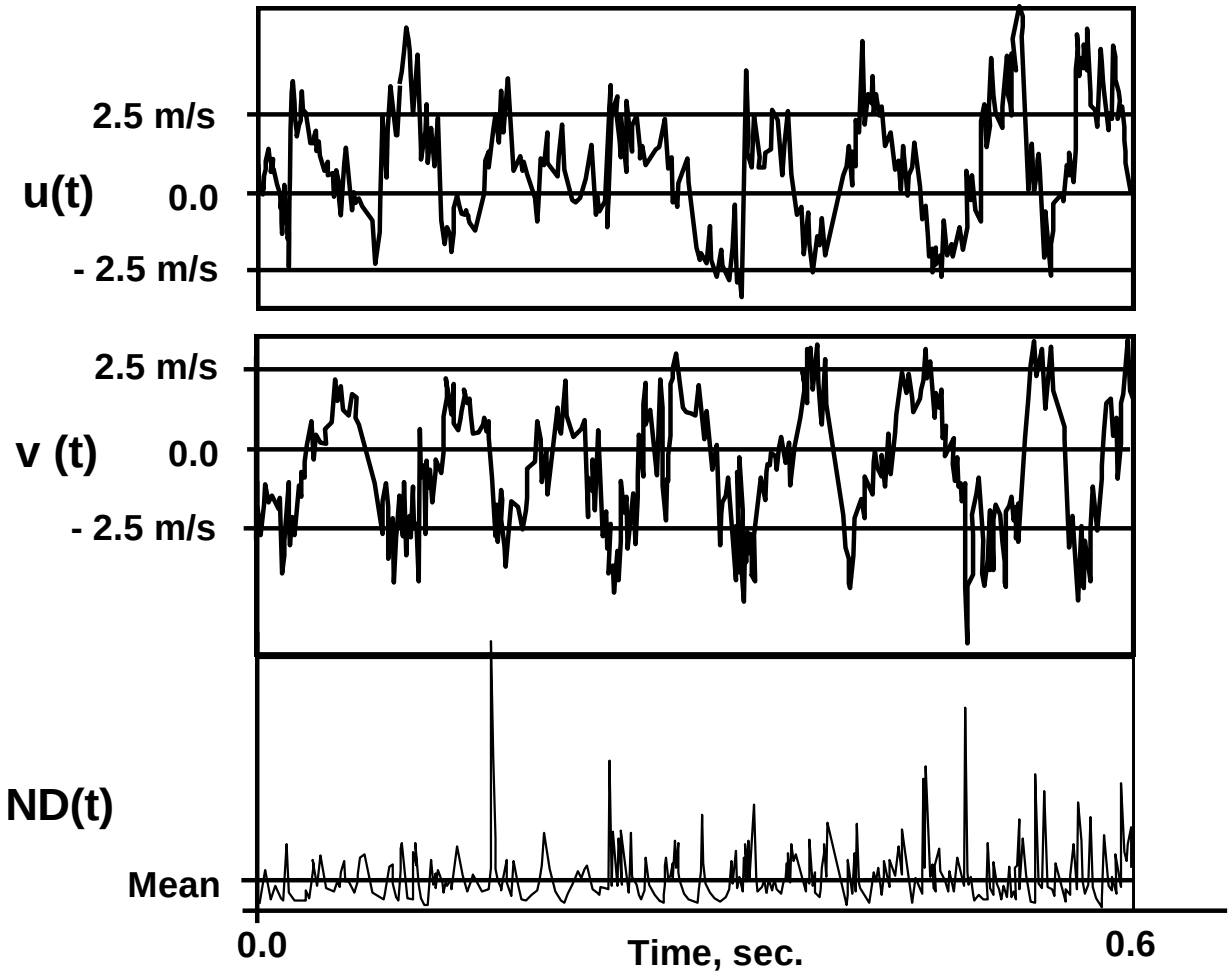
First measurements of particle response in a turbulent spray flow, S.V. Sankar, R. Rudoff, and W.D. Bachalo 1989.

Droplet Response to Turbulence



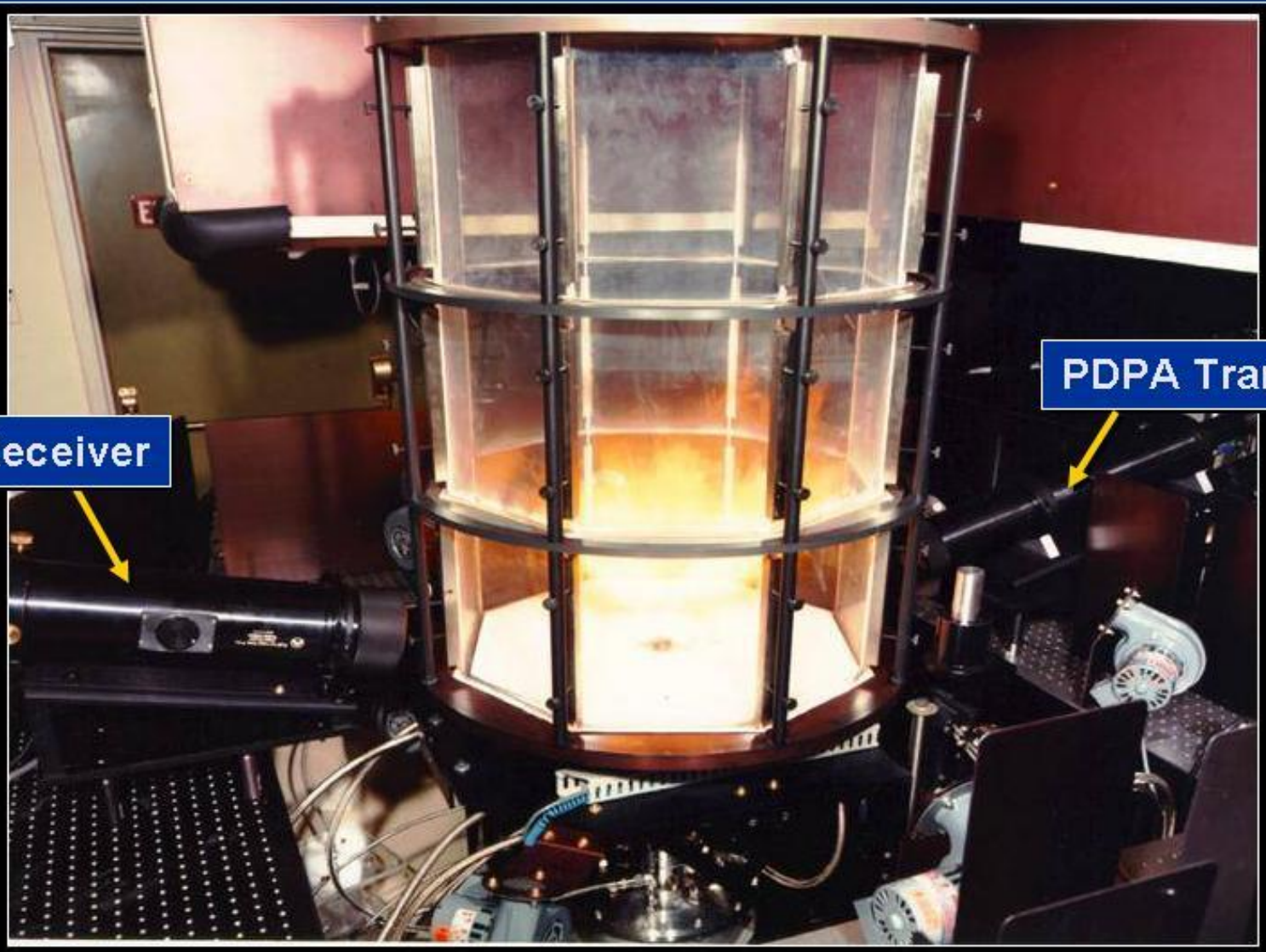
First measurements of particle response in a turbulent spray flow, S.V. Sankar, R. Rudoff, and W.D. Bachalo 1989.

Raw data for the stream-wise and cross-stream velocity versus time showing the shedding frequency with the superimposed turbulence



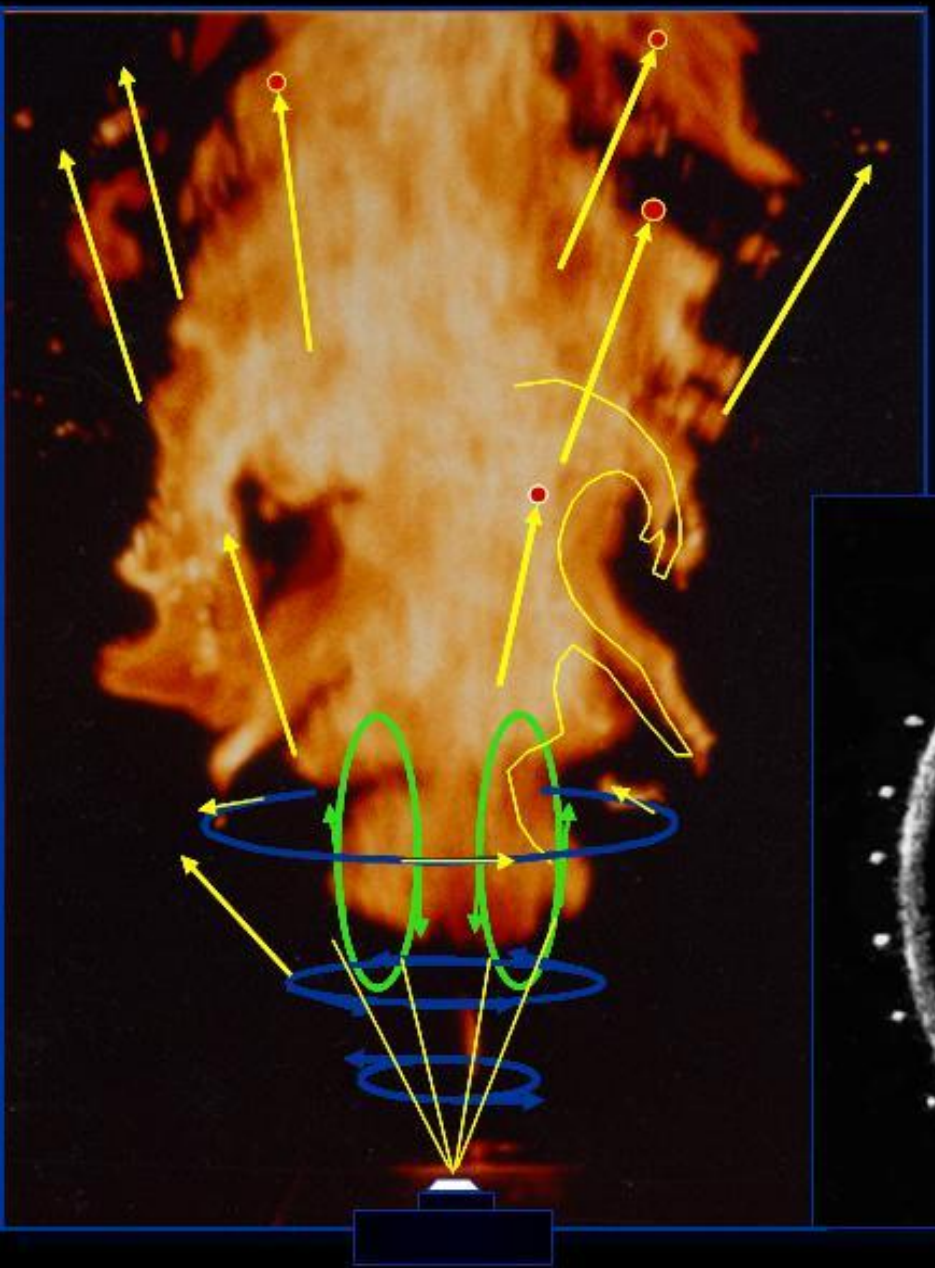
First measurements of time-dependant behavior of sprays in a turbulent flow, W.D. Bachalo, R. Rudoff, and S.V. Sankar 1988.

Spray Flame Measurements Using the PDPA at Sandia National Laboratories

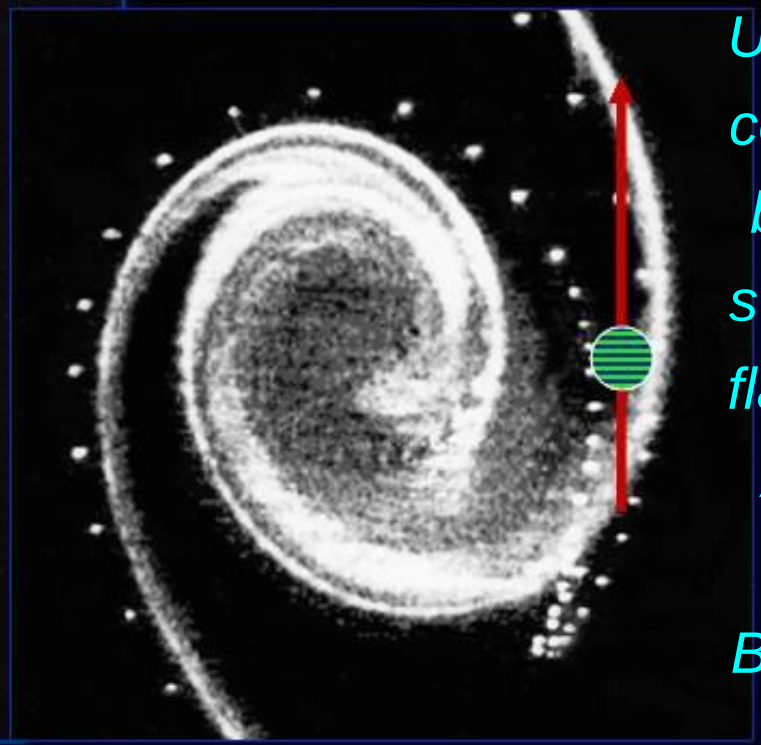


Spray flame measurements at Sandia National Laboratories using an Aerometrics PDPA, C. Edwards, R. Rudoff, and W.D. Bachalo 1990.

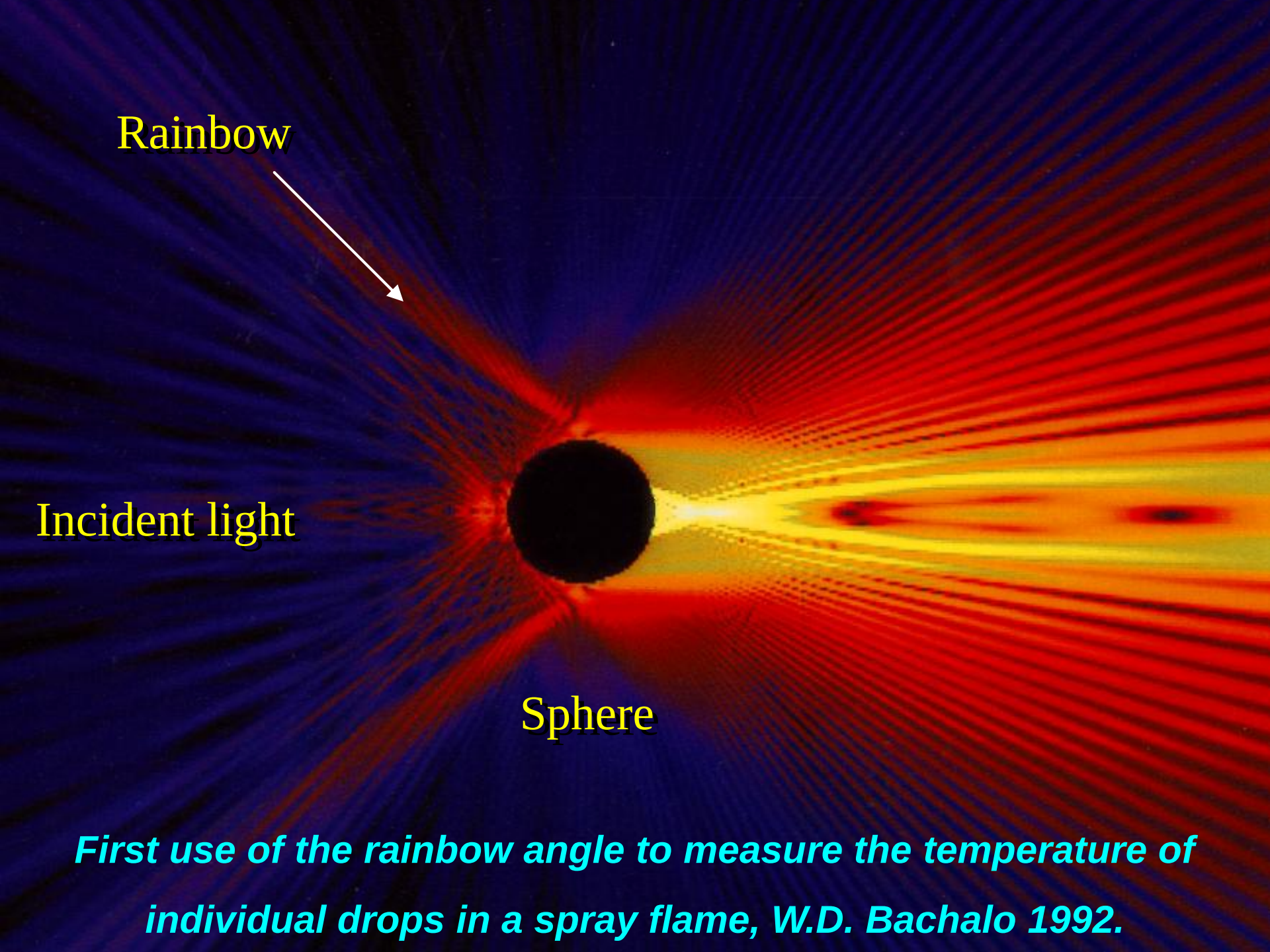
Spray Flame Configuration



Understanding the point measurement response of particle clusters passing the sample volume (Eulerian reference frame).



Understanding complex spray behavior in a swirl stabilized flame using an Aerometrics PDPA, W.D. Bachalo 1988.

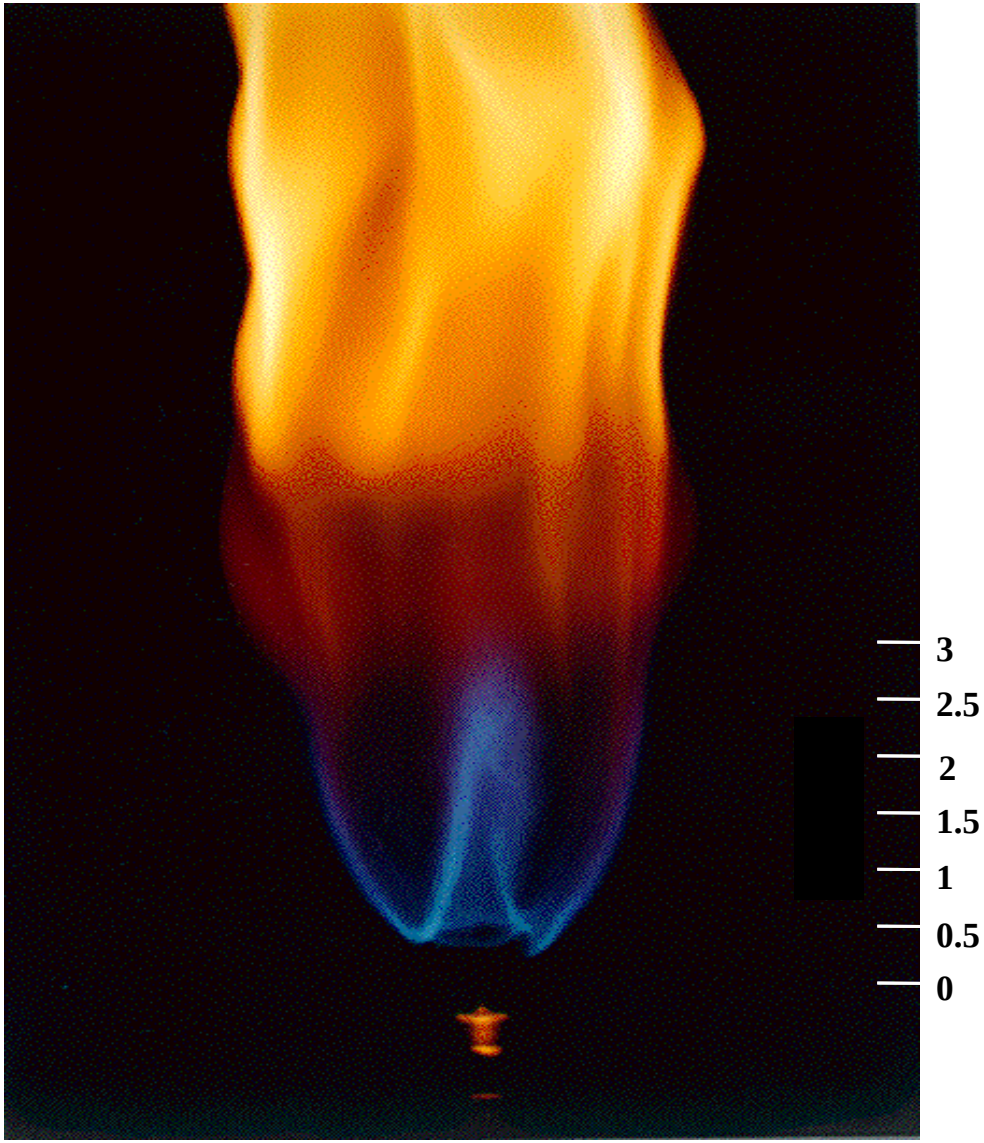


First use of the rainbow angle to measure the temperature of individual drops in a spray flame, W.D. Bachalo 1992.

Hexadecane Spray Flame

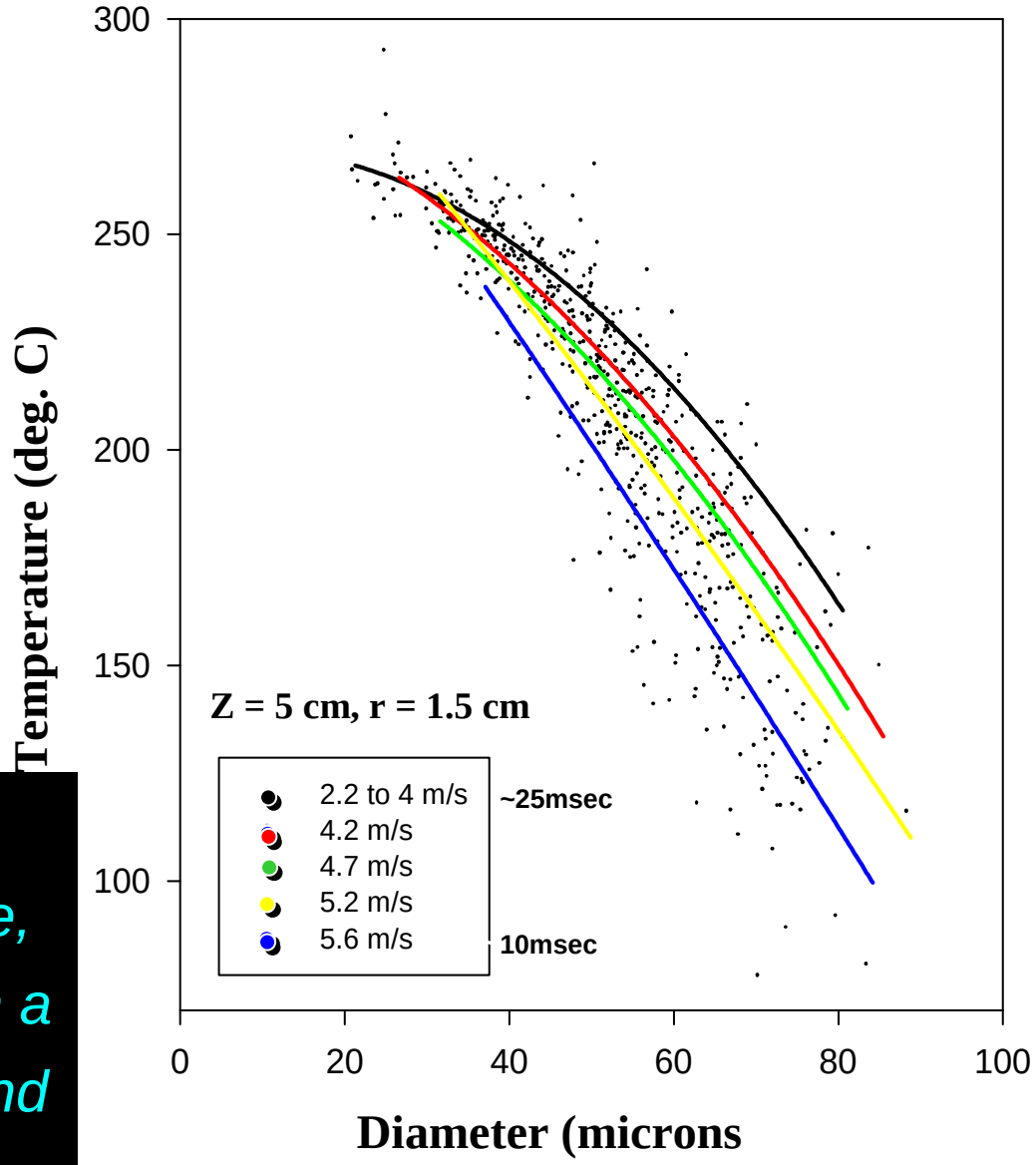
- **Solid-cone pressure atomizer with a flow rate of 0.5 gph.**
- **Unconfined and non-swirled.**
- **Boiling point of hexadecane is about 287 deg. C.**

Spray flame measured using the integrated Rainbow Thermometer and PDPA, S.V. Sankar and W.D. Bachalo1992.



Temperature-Diameter Correlation

- Figure shows the dependence of droplet temperature on droplet diameter for a particular axial velocity.
- The solid lines are second order regression fits.
- Larger drops have lower temperature than smaller drops.

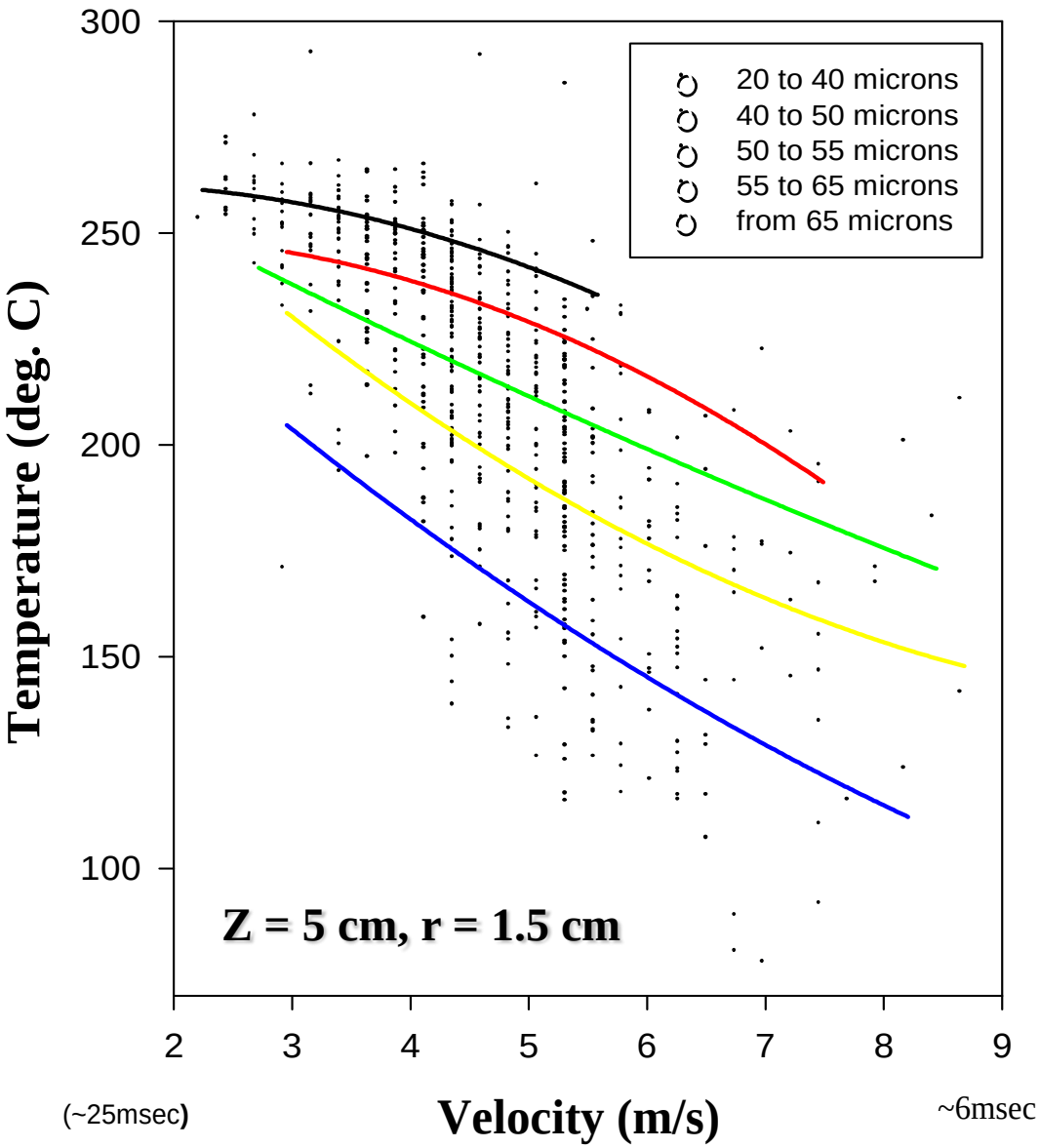


First simultaneous measurements of drop size, velocity, and temperature in a spray flame, S.V. Sankar and W.D. Bachalo 1994.

Temperature-Velocity Correlation

- **Figure shows the dependence of droplet temperature on droplet velocity for a specific droplet size class.**
- **Solid lines are second order regression fits.**
- **Fast moving droplets have lower temperature than slow moving droplets.**

First simultaneous measurements of drop size, velocity, and temperature in a spray flame, S.V. Sankar and W.D. Bachalo 1994.

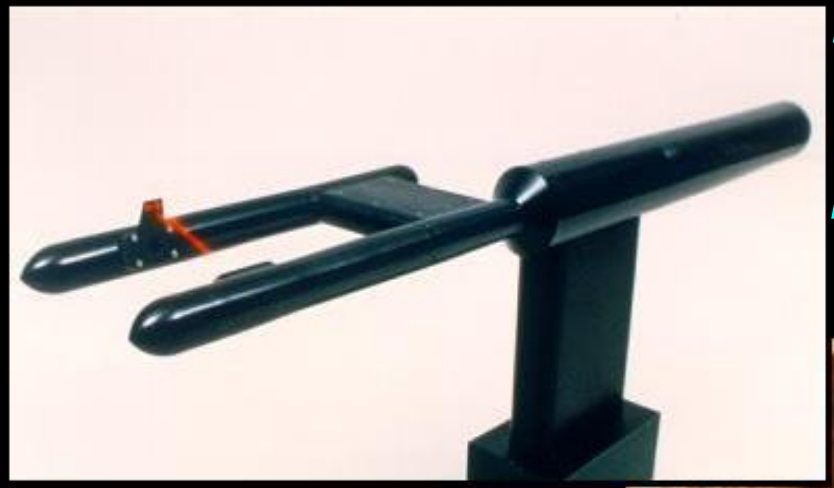


Aircraft Icing Probe in the NASA Icing Research Tunnel

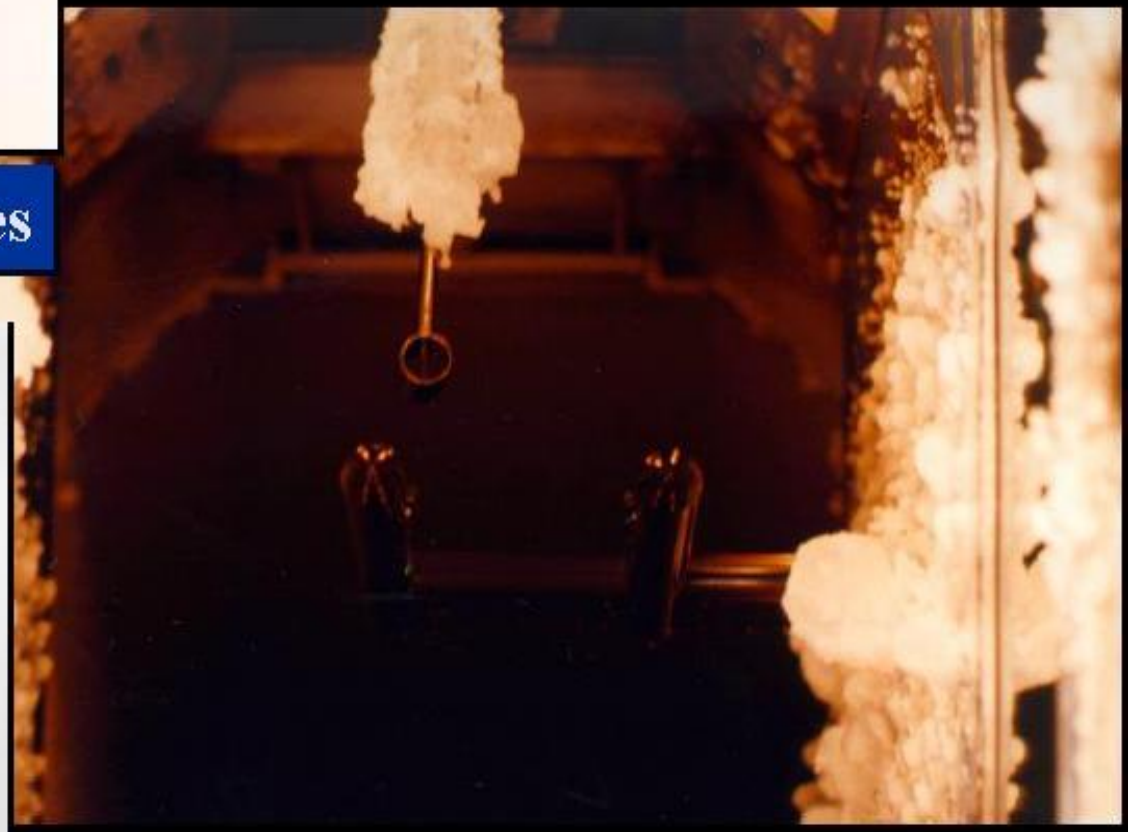
Aerometrics PDPA Flight Probe in the NASA Icing Research Tunnel,

E.J. Bachalo, S.V. Sankar, and W.D. Bachalo 1988

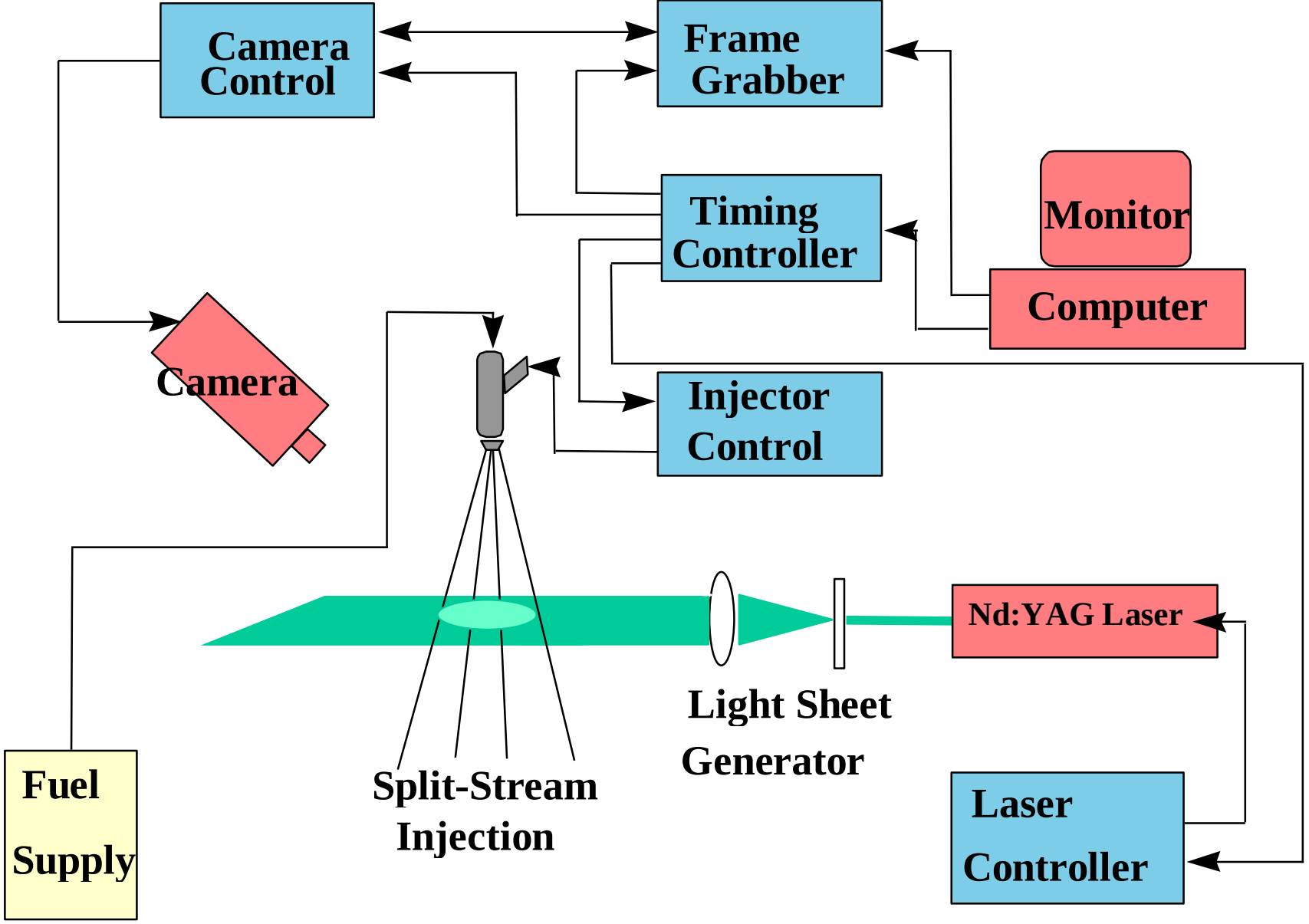
1D-PDPA Icing probe installed at BF Goodrich Aircraft Icing Wind Tunnel



First PDPA Flight Probe for Aircraft Icing Tunnel Spray measurements, W.D. Bachalo, E.J. Bachalo, and S.V. Sankar 1988.

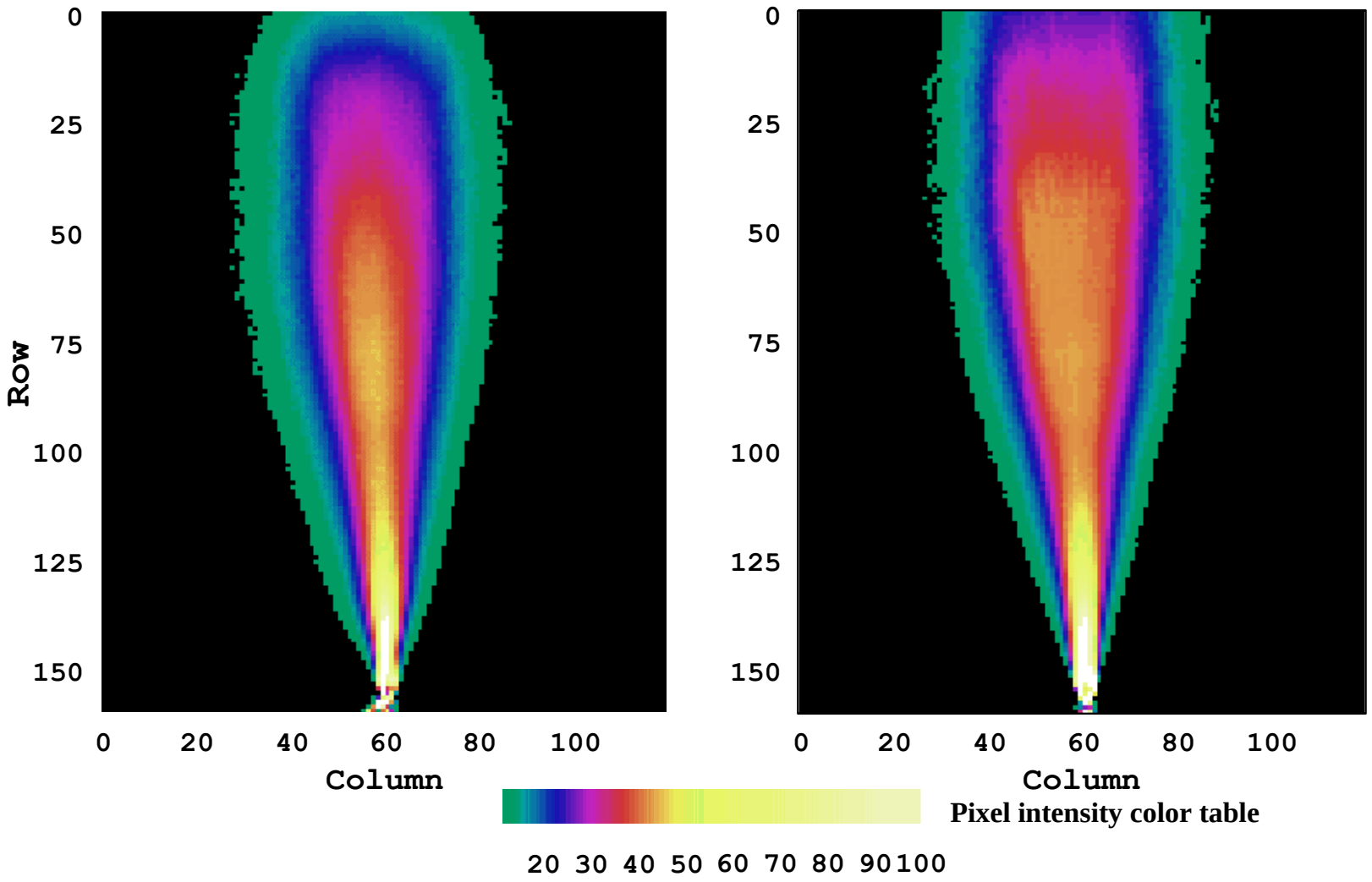


Dual 1D-PDPA Icing probes

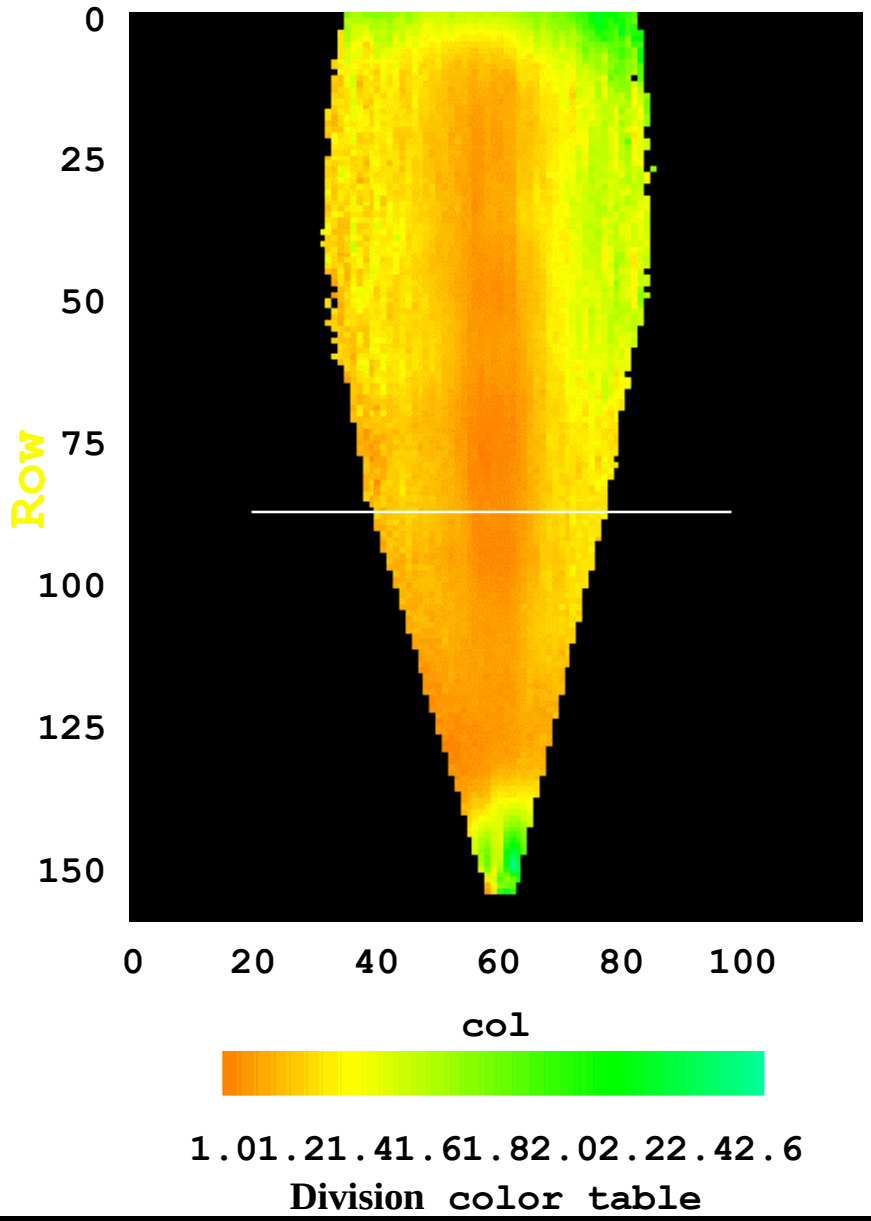


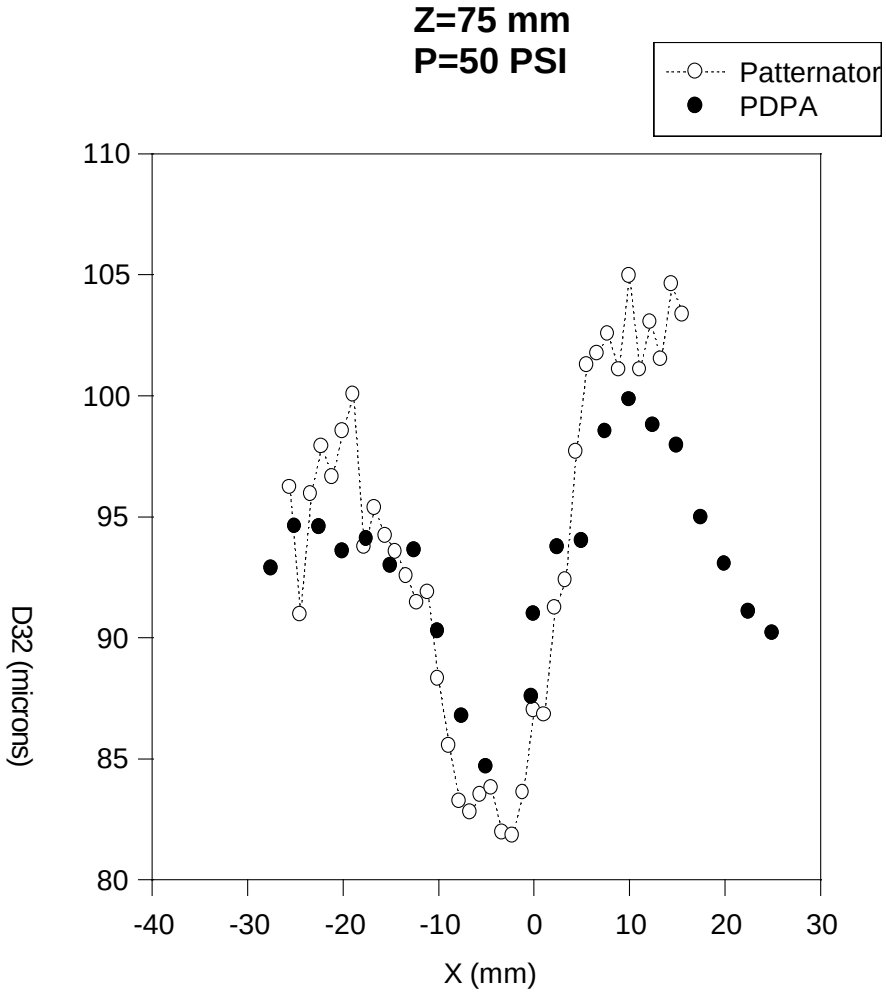
First Planar Optical Patternator developed for fuel injector spray characterization, S.V. Sankar and W.D. Bachalo 1994.

Images obtained by Mie scattering and fluorescence



Fluorescence and Mie Scattering images of the spray used to obtain D_{32}, S.V. Sankar and W.D. Bachalo 1994.

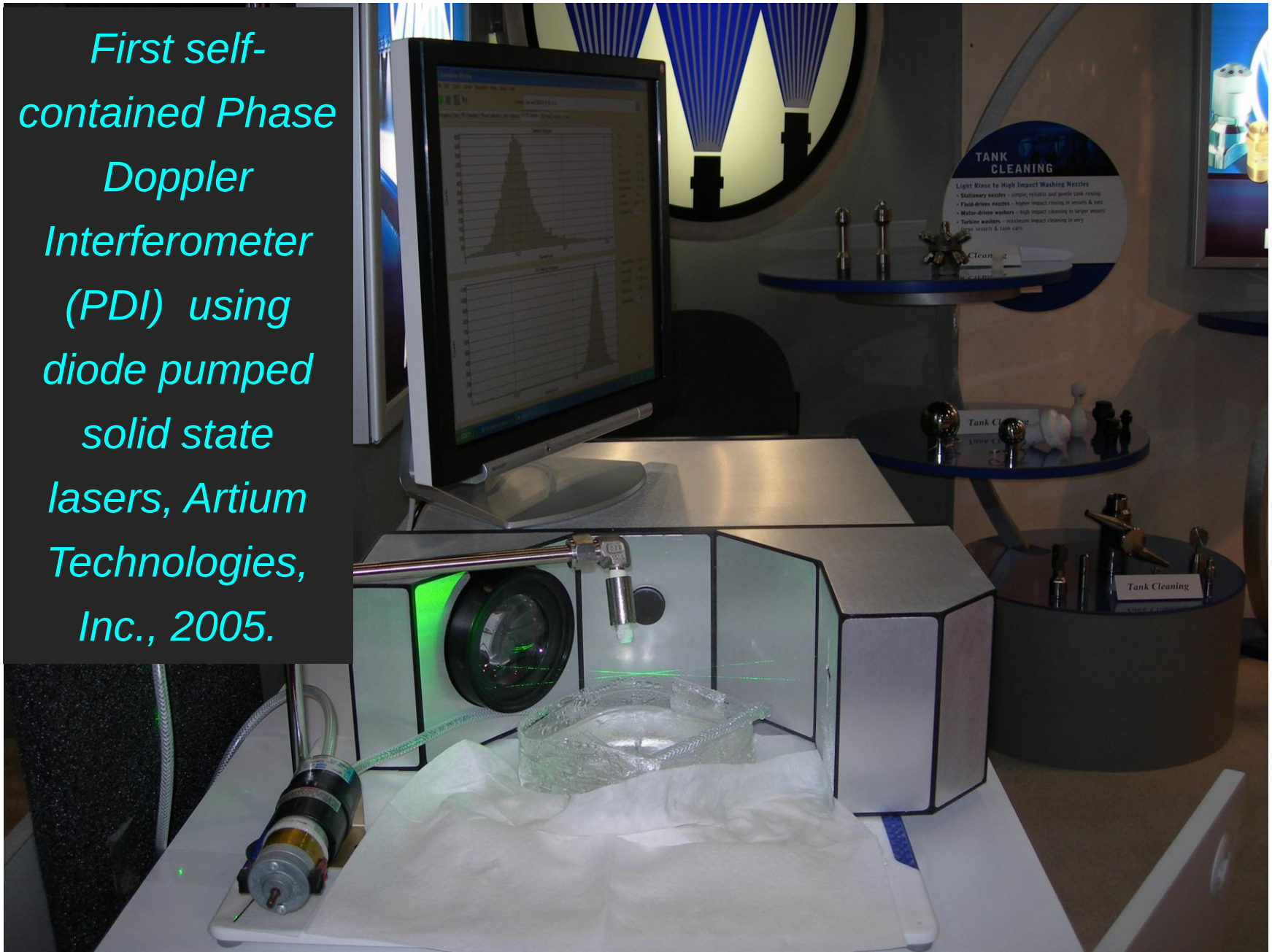




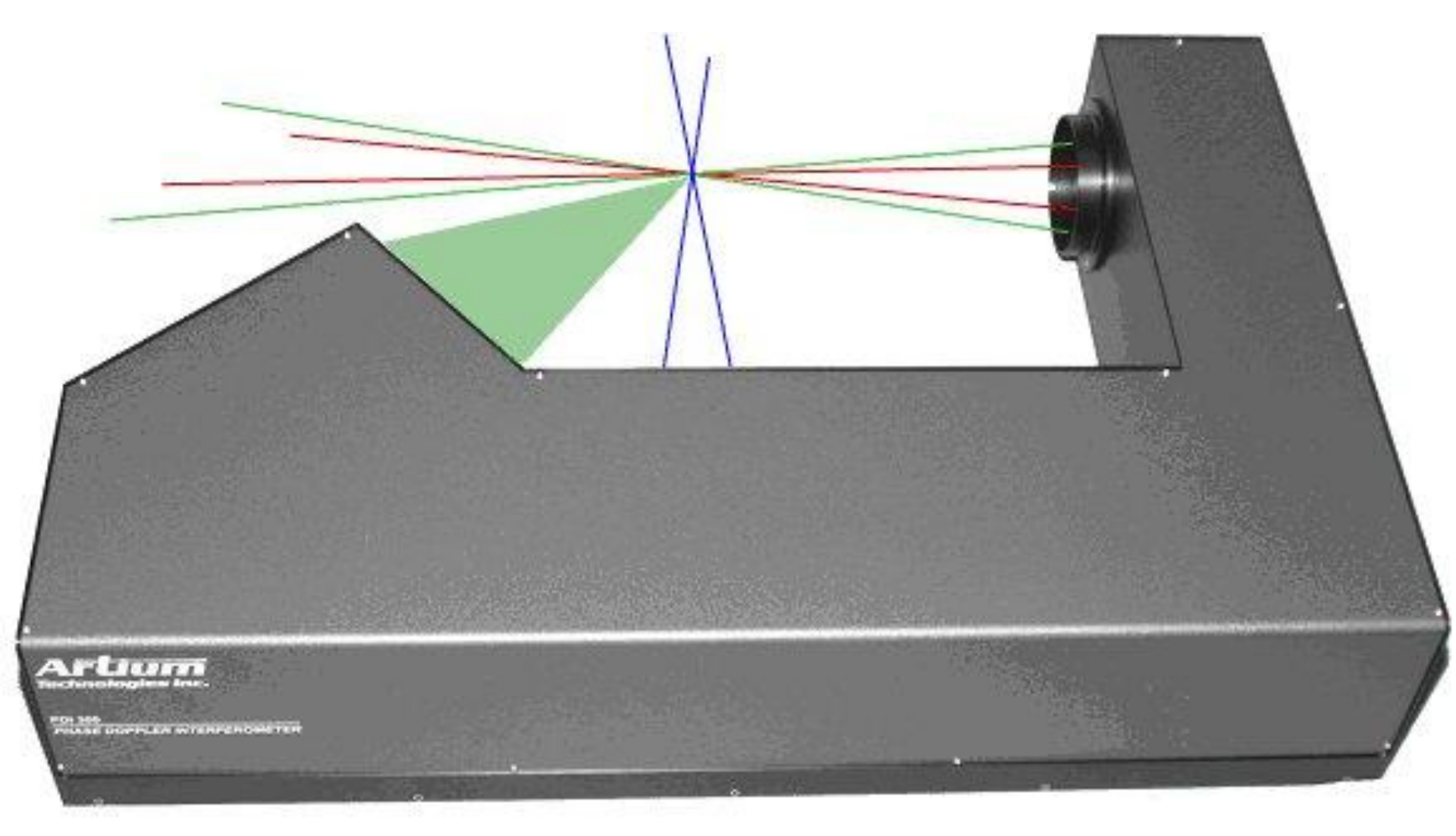
Radial variation of the SMD at an axial location Z=75 mm. Comparisons of PDS and PDPA measurements, W.D. Bachalo 1994.

First Two-Component PDI using diode pumped solid state lasers, Artium Technologies Inc., 2004.

New Compact Bench Top PDI, 1-D, 2-D or 3-D Velocity components



First self-contained Phase Doppler Interferometer (PDI) using diode pumped solid state lasers, Artium Technologies, Inc., 2005.



First self-contained PDI instrument using a diode pumped solid state lasers with capability of measuring 3 velocity components simultaneously, Artium Technologies, Inc., 2001.