Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Gas-phase Micro-particle Tracking Velocimetry in Millimeter-sized Channels CHRISTOPHER BROTHERTON, CHRIS BOURDON, Sandia National Laboratories — This work describes a micro-Particle Tracking Velocimetry (μPTV) technique for measuring gas flows in millimeter-sized channels with low tracking particle concentrations. Compressed air flows seeded with sub-micron fluorescent particles are investigated in channels with a cross-section of 1mm x 1mm. Data are collected using a double-pulse Nd:YAG laser for lighting, a high sensitivity camera and a standard inverted microscope. Particle velocities are calculated using single frame/double exposure images and custom particle tracking software. Velocity profiles are determined for multiple locations down the channel illustrating the progression of the velocity profile within the entrance region. Maximum velocities of 6 meters per second with a measurement uncertainty of 5% are measured. Currently, velocity measurements as close as 20 microns from the wall have been collected. Provided that the tracking particles are not charged, measurements even closer to the wall should be possible. Future work will examine particle velocities very near the channel walls, measure velocities in rarefied flows and provide data for simulations to determine the significance of potential particle velocity biasing in large shear and rarified conditions.

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Date submitted: 04 Aug 2008 Electronic form version 1.4