

Abstract Submitted  
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**On the accuracy of nPIV Velocity Measurements in Poiseuille Flow inside Micro Channels: Effect of non uniform out-of-plane illumination**<sup>1</sup> REZA SADR, Woodruff School of Mech Eng, GT Savannah — Nanoparticle image velocimetry (nPIV) uses evanescent-wave illumination to measure two tangential velocity components  $U$  and  $V$  averaged in a region next to the wall with submicron thickness. The illumination intensity decays exponentially with  $z$ , or normal to the wall, in this region and hence tracers at smaller  $z$  have images that are “brighter” and “bigger” than those at larger  $z$ . In a flow field where the velocity profile varies with  $z$  the tracers at different distance from the wall move at different speeds. The variation in the displacement of particle images in this region with different brightness and sizes can bias the near-wall velocities measured by nPIV. Artificial PIV images of plane Couette flow were used in this work to investigate the impact of these issues upon the accuracy of nPIV data. Results were obtained for various experimental parameters incorporating different illumination profiles and hindered Brownian diffusion. The results demonstrate that non uniform illumination can lead to a bias in the estimated tracer velocities if it is not taken into considerations appropriately. The uncertainties associated with the estimated velocity is then identified and discussed. The artificial images are then compared with the experimental images.

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