Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Validation of Dual Plane PIV Measurements in Wall Turbulence Using DNS Data NEELAKANTAN SAIKRISHNAN, IVAN MARUSIC, ELLEN LONGMIRE, University of Minnesota Twin Cities — Experimental dual plane particle image velocimetry (PIV) data from a zero pressure gradient flow over a flat plate at friction Reynolds number $Re_\tau = 1160$ is compared with direct numerical simulation (DNS) data from a fully developed channel flow at $Re_\tau = 934$. An averaging scheme is implemented to reduce the resolution of the DNS data to that of the PIV data and thus study the effects of averaging inherent to PIV. A vortex core identification algorithm is implemented on all the datasets using the three dimensional swirl λ_{3D}^+, and statistical distributions are computed of the projection angles of vortical structures in the boundary layer. The close match between the PIV, the raw and the averaged DNS data suggest that PIV can be a reliable and accurate technique for statistical analysis and identification of vortex structures in the turbulent boundary layer. In the talk, details of the statistical distributions and the averaging effects will be given.

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Date submitted: 01 Sep 2005 Electronic form version 1.4