

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Sorting Category: 40. (E)

Development of a PIV based technique for measurements of instantaneous pressure distributions¹ XIAOFENG LIU, JOSEPH KATZ, Johns Hopkins University — A non-intrusive PIV based method for measuring the instantaneous pressure distribution over a sample area simultaneously with the velocity field has been developed and tested. This method utilizes four-exposure PIV measurements to measure the distribution of material acceleration, and then integrating it to obtain the pressure. Two cameras are used, one for recording images 1 and 3, and the other for recording images 2 and 4. Validation tests of the principles of the technique using synthetic images of rotating and stagnation point flows show that the standard deviation of the measured pressure from the exact value can be kept within 1.0%. A key to the success of this method is precision matching of images recorded by the two cameras. Images of stationary particles recorded at the same time are used for generating a map of local deformations for matching the two filed of views. Application of local image deformation correction to velocity vectors measured by the two cameras reduces the error due to misalignment and image distortion to about 0.01 pixels. An efficient and accurate acceleration integration algorithm has also been developed. This method has been used for measuring the instantaneous pressure distribution in a cavity shear flow, and samples will be presented.

¹Sponsored by ONR.

Prefer Oral Session
 Prefer Poster Session

Xiaofeng Liu
xliu2001@jhu.edu
Johns Hopkins University

Date submitted: 12 Aug 2005

Electronic form version 1.4