Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

New in-situ, non-intrusive calibration HEATHER ZUNINO, RONALD ADRIAN, LIUYANG DING, Arizona State University, KATHY PRESTRIDGE, Los Alamos National Laboratory — Tomographic particle image velocimetry (PIV) experiments require precise and accurate camera calibration. Standard techniques make assumptions about hard-to-measure camera parameters (i.e. optical axis angle, distortions, etc.)–reducing the calibration accuracy. Additionally, vibrations and slight movements after calibration may cause significant errors–particularly for tomographic PIV. These problems are exacerbated when a calibration target cannot be placed within the test section. A new PIV camera calibration method has been developed to permit precise calibration without placing a calibration target inside the test section or scanning the target over a volume. The method is capable of correcting for dynamic calibration changes occurring between PIV laser pulses. A transparent calibration plate with fine marks on both sides is positioned on the test section window. Dual-plane mapping makes it possible to determine a mapping function containing both position and angular direction of central rays from particles. From this information, central rays can be traced into the test section with high accuracy. Image distortion by the lens and refraction at various air-glass-liquid interfaces are accounted for, and no information about the position or angle of the camera(s) is required.

Heather Zunino
Arizona State University

Date submitted: 01 Aug 2014 Electronic form version 1.4