

Abstract Submitted
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Particle shadow velocimetry vs. LDV: measurements of a turbulent pipe flow¹ MICHAEL MCPHAIL, JOSEPH GIORDANO, ARNOLD FONTAINE, MICHAEL KRANE, ARL Penn State, LARRY GOSS, JAMES CRAFTON, Innovative Scientific Solutions, Inc. — Image pre-processing was used to improve multi-color Particle Shadow Velocimetry (PSV) measurements of a near-wall turbulent pipe flow. These included corrections for color cross-talk, color aberration and image distortion. Multi-color PSV is a modification of DPIV which employs pulsed multicolor lights for illumination. The particle shadows are imaged to produce 2-D vector fields with traditional DPIV correlation methods. Multi-color PSV allows for higher temporal sampling rates than conventional DPIV, at lower cost. Aberrations were quantified by imaging a target with known geometry and generating a mapping function to correct the multicolor shadows for chromatic aberration shadow displacement shifts between colors. PSV images were spatially corrected with these functions. Color cross-talk was corrected for by subtracting average cross-talk intensity from the local intensity. Corrected mean velocity and second order statistics for turbulent pipe flow in the Penn State ARL glycerin tunnel showed favorable comparison to LDV and standard PIV measurements.

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