

Abstract Submitted
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Application of Plenoptic PIV for 3D Velocity Measurements Over Roughness Elements in a Refractive Index Matched Facility¹ BRIAN THUROW, KYLE JOHNSON, Auburn University, TAEHOON KIM, GIANLUCA BLOIS, JIM BEST, University of Illinois, KEN CHRISTENSEN, University of Notre Dame — The application of Plenoptic PIV in a Refractive Index Matched (RIM) facility housed at Illinois is presented. Plenoptic PIV is an emerging 3D diagnostic that exploits the light-field imaging capabilities of a plenoptic camera. Plenoptic cameras utilize a microlens array to measure the position and angle of light rays captured by the camera. 3D/3C velocity fields are determined through application of the MART algorithm for volume reconstruction and a conventional 3D cross-correlation PIV algorithm. The RIM facility is a recirculating tunnel with a 62.5% aqueous solution of sodium iodide used as the working fluid. Its resulting index of 1.49 is equal to that of acrylic. Plenoptic PIV was used to measure the 3D velocity field of a turbulent boundary layer flow over a smooth wall, a single wall-mounted hemisphere and a full array of hemispheres (i.e. a rough wall) with a $k/\delta \approx 4.6$. Preliminary time averaged and instantaneous 3D velocity fields will be presented.

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