

Abstract Submitted
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A Color-Coded Single Camera Three-Dimensional Defocusing Particle Image Velocimetry System¹ WEI-HSIN TIEN, DANA DABIRI, University of Washington — A color-coded 3-D Defocusing Particle Image Velocimetry (3DDPIV) is a new modification of the 3-D measurement system originally developed by Willert & Gharib (1992). It uses a single lens with 3 color-coded pinholes to overcome limitations of image saturation due to multiple exposures of each particle, and a 3-CCD color camera for image acquisition. The spectrum difference between the color filters and the CCD sensors is solved by a color space linear transformation, separating each pinhole's exposure. The requirement for a high intensity light source prevalent in conventional lighting setups is solved by backlighting the field-of-view and seeding the flow with black particles. An effective pinhole separation, d' , is proposed for use with multi-element lenses, and a multi-surface refraction correction to d' is also proposed. Calibration results of the system with and without fluid are performed and compared. The technique is successfully applied to a buoyancy-driven flow, and a three-dimensional velocity field is extracted. The image volume is $3.25\text{mm} \times 2.45\text{mm} \times 1.5\text{mm}$.

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