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High Speed Time Resolved Stereo PIV Measurements of Particle Laden Jets in Crossflows F.J. DIEZ, P. ALVARE, P.B. VANDERWERKER, Rutgers University, NJ, S. POTHOS, D. TROOLIN, TSI Incorporated, MN — The velocity properties of steady round particle laden jets were studied, motivated by applications to the dispersion of potentially harmful substances from steady exhaust flows, volcanic eruptions, hydrothermal plumes, among others. In order to elucidate the mechanism of particle dispersion, simultaneous recording of particle dispersion and turbulent structures in three-dimensional space is required. For this purpose, a novel high speed time resolved 3D PIV imaging measurement system was developed. The system is capable of tracking the 3D velocity field of both the dispersed phase (large solid particles or air bubbles) and the smaller particle tracers in jets in crossflow at 2,000 Hz. This method also allows for the first time in particle-laden experiments to get the entire field of view in directly in three-dimension, and time-resolved instantaneous velocity fields which will allow the visualization of the evolution of the 3D turbulent coherent structures as a function of time as well as the evolution of the dispersed phase. The difficulty in evaluating simultaneous two-phase PIV images comes when trying to separate the dispersed phase from the neutrally buoyant small solid tracers in the water. The present work uses the phase discrimination method proposed by Khalitov & Longmire (2002) due to its robustness and flexibility while also being relatively cheap to implement.

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