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3D Synthetic Aperture Imaging for Fluid Flows JESSE BELDEN, MIT, TADD TRUSCOTT, BYU, MICHAEL AXIAK, ALEXANDRA TECHET, MIT — Three-dimensional and multiphase fluid flow environments demand advanced and innovative measurement systems in order to fully resolve the flow physics. We present implementations of synthetic aperture imaging techniques for 3D particle image velocimetry and bubble flow field extraction. This work lays the foundation for a comprehensive tool for measuring multiphase flows. Simulations have shown 3D synthetic aperture particle image velocimetry (SAPIV) to be a promising technique for resolving 3D velocity fields in densely seeded flows using an array of cameras. Here, we experimentally study a canonical vortex ring using a low-cost 8 camera array and benchmark the results with standard 2D PIV. Also, using a high speed camera array, we apply synthetic aperture imaging to the 3D bubble field entrained by a jet impinging on a free-surface.

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