

Abstract Submitted
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Vorticity field measurement using digital inline holography

KEVIN MALLERY, JIARONG HONG, University of Minnesota — We demonstrate the direct measurement of a 3D vorticity field using digital inline holographic microscopy. Microfiber tracer particles are illuminated with a 532 nm continuous diode laser and imaged using a single CCD camera. The recorded holographic images are processed using a GPU-accelerated inverse problem approach to reconstruct the 3D structure of each microfiber in the imaged volume. The translation and rotation of each microfiber are measured using a time-resolved image sequence – yielding velocity and vorticity point measurements. The accuracy and limitations of this method are investigated using synthetic holograms. Measurements of solid body rotational flow are used to validate the accuracy of the technique under known flow conditions. The technique is further applied to a practical turbulent flow case for investigating its 3D velocity field and vorticity distribution.

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