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Improvements on Digital Inline Holographic PIV for Turbulent Flow Measurement¹ JIARONG HONG, MOSTAFA TOLOUI, KEVIN MALLERY, University of Minnesota — Among all the 3D PIV techniques used in wall-bounded turbulent flow measurements, digital inline holographic (DIH) PIV provides the highest spatial resolution for near-wall flow diagnostics with low-cost, simple and compact optical set-ups. Despite these advantages, DIH-PIV suffers from major limitations including poor longitudinal resolution, human intervention (i.e. requirement for manually determined tuning parameters during tracer field reconstruction and extraction), limited tracer concentration, and expensive computations. These limitations prevent this technique from being widely implemented for high resolution 3D flow measurements. In this study, we present our work on improving holographic particle extraction algorithm with the goal of overcoming some of abovementioned limitations. Our new DIH-PIV processing method has been successfully implemented on multiple experimental cases ranging from 3D flow measurement within a micro-channel to imaging near-wall coherent structures in smooth and rough wall turbulent channel flows.

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Jiarong Hong
University of Minnesota

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