

Abstract Submitted
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Ultrafast Full-Field X-ray Imaging and its Applications in Fluid Dynamics.¹ KAMEL FEZZAA, YUIE WANG, Argonne National Laboratory — The x-ray beam afforded by third-generation synchrotrons, such as the Advanced Photon Source (APS), has unique properties: extremely high intensity, wide energy tunability, high coherence, and flexible lattice timing structure. To take full advantage of these properties, we are developing a novel x-ray research tool, involving ultrafast phase-enhanced full-field x-ray imaging, with both micrometer-spatial and sub-nanosecond temporal resolutions. Such capability has never been realized before, and will make tremendous impact on numerous fields, both scientifically and technologically. We will present some examples of our work, ranging from our first high-quality phase-enhanced radiographs through a few-millimeters-thick stainless steel fuel injector nozzle, where the exposure time was a few seconds, to our first successful use of a single bunch from the APS ring to take 150 ps snapshots of the internal structure of a high-speed fuel spray. We will present highlights from ongoing research such as droplets pinch-off, coalescence and collision. We will also show how velocity field distribution of dense liquid jets can readily be measured with this technique.

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