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Synchrotron X-ray Ultrafast Phase-Contrast Imaging Study of Fluids

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Visible light imaging has been the traditionally dominant technique for study of fluid mechanical systems. However, it suffers from strong refraction, reflection and scattering effects under various occasions. X-ray phase-contrast imaging technique with its inherent penetrability and edge-enhancement capability can circumvent these difficulties naturally. Here, I report that these advantages when combined with the high flux x-ray photons offered at 3rd generation synchrotron can offer a great tool for studying fluid mechanical systems with microsecond temporal and micron spatial resolutions. Several examples on dynamic multiphase flows and fluid singularities will be demonstrated. Future applications for other soft-condensed matter systems will also be discussed.