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Determining spray axial velocity from focused-beam X-ray radiography[1] JULIE BOTHELL, TIMOTHY MORGAN, Iowa State University, ALAN KASTENGREN, Argonne National Laboratory, THEODORE HEINDEL, Iowa State University, ENERGY SYSTEMS DIVISION, X-RAY SCIENCE DIVISION TEAM, EXPERIMENTAL MULTIPHASE FLOW LAB TEAM — Coaxial atomizing sprays are used across a variety of industries from gas turbines to food processing. Far-field spray dynamics depend on the primary breakup region, but this region is challenging to study as it contains thick liquid that is opaque to visible light. However, X-rays are capable of penetrating the dense liquid region, providing insight that is unavailable from visible light testing methods. This study modifies a method used in previous studies for determining the mass-average axial velocity from a diesel injector spray, and applies it to investigate the mass-average axial velocity from a coaxial atomizing spray. The original method was developed for a narrow-angle, time-varying spray, but was modified in this study for a wide-angle, steady-state spray. Experiments at the Advanced Photon Source at Argonne National Laboratory provided focused-beam X-ray radiographs along the spray. The mass-average axial velocity along the spray increased linearly with axial distance from the nozzle for varying momentum ratios. The slope of the velocity-distance relation also increased linearly when plotted as a function of gas flow rate.

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