

Abstract Submitted
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Validation of X-Ray CT-measured Liquid Concentration against LIF TYLER SOWELL, ZACHARY LEE, MICHAEL BENSON, BRET VAN POPPEL, THOMAS NELSON, United States Military Academy, PABLO VASQUEZ GUZMAN, REBECCA FAHRIG, JOHN EATON, WALDO HINSHAW, Stanford University, MATTHEW KURMAN, MICHAEL TESS, CHOL-BUM KWEON, U.S. Army Research Laboratory — Dense spray near the nozzle exit requires more research. X-Ray Computed Tomography (CT) technique has shown that it could capture spray patterns similar to that of a conventional Shadowgraphy; however, liquid density measured with the X-Ray CT technique lacks validation. Thus, the objective of the current study is to validate liquid density measured with the X-Ray CT technique against that of the conventional Laser-Induced Fluorescence (LIF) method. Water solution with 150 parts per billion (ppb) of Rhodamine WT dye is sprayed into a cold spray chamber by using a pressure swirl atomizer. An Nd:YAG laser with a light-sheet optics is used to fluoresce Rhodamine WT dye in water spray and a high-speed CMOS camera with a filter is employed to measure quantitative liquid concentrations approximately thirty (30) nozzle diameters downstream. The intensity of fluorescence correlates linearly with the amount of Rhodamine WT dye in the water, enabling mass distribution measurement of the liquid spray. As the X-Ray CT technique measures liquid mass distribution, the X-Ray CT measured spray density can be validated by the proven conventional LIF method.

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