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Integral Length Scale Effects on JP-8 Spray Penetration and Ignition at Elevated Pressure and Temperature Conditions MATTHEW KURMAN, MICHAEL TESS, LUIS BRAVO, CHOL-BUM KWEON, US Army Research Laboratory — The effect of the integral length scale on global spray diagnostics was examined for non-reacting and reacting JP-8 sprays. The scales were set by varying the nominal nozzle diameter from 90 μm , 100 μm , and 147 μm , resulting in the ranges of Re (6.7×10^4 - 9.9×10^4) and We (1.3×10^6 - 1.7×10^6) setting the spray in the fully atomization mode. A high temperature (900-1000 K) high pressure (60-100 bar) flow through chamber was used to conduct experiments at relevant compression ignition engine operating conditions. Each fuel injector was characterized with an injection analyzer to determine the rate of injection and injected fuel mass. High speed near simultaneous Mie and schlieren images were acquired to determine the liquid and vapor penetration lengths of the non-reacting spray. Ignition delay experiments were conducted by measuring the start of formation of OH radicals. A numerical investigation was also carried out to provide additional insights into the behavior of each spray with the specified conditions. The quantitative results presented will aid in the overall advancement of fuel injector designs and ultimately lead to optimized engines.

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