Abstract Submitted
for the OSF12 Meeting of
The American Physical Society

Investigation of High Pressure, Multi-Hole Diesel Fuel Injection Using High Speed Imaging STEVEN MORRIS[1], ETHAN EAGLE[2], MARGARET WOOLDRIDGE[3], University of Michigan — Research to experimentally capture and understand transient fuel spray behavior of modern fuel injection systems remains underdeveloped. To this end, a high-pressure diesel common-rail fuel injector was instrumented in a spherical, constant volume combustion chamber to image the early time history of injection of diesel fuel. The research-geometry fuel injector has four holes aligned on a radial plane of the nozzle with hole sizes of 90, 110, 130 and 150 μm in diameter. Fuel was injected into a non-reacting environment with ambient densities of 17.4, 24.0, and 31.8 kg/m3 at fuel rail pressures of 1000, 1500, and 2000 bar. High speed images of fuel injection were taken using backlighting at 100,000 frames per second (100 kfps) and an image processing algorithm. The experimental results are compared with a one-dimensional fuel-spray model that was historically developed and applied to fuel sprays from single-hole fuel injectors. Fuel spray penetration distance was evaluated as a function of time for the different injector hole diameters, fuel injection pressures and ambient densities. The results show the differences in model predictions and experimental data at early times in the spray development.

[1]Researcher in University of Michigan Combustion Synthesis Laboratory.
[2]Post-Doctoral in University of Michigan Combustion Synthesis Laboratory.
[3]Professor of Mechanical and Aerospace Engineering and PI of University of Michigan Combustion Synthesis Laboratory.

Steven Morris
University of MIchigan

Date submitted: 04 Sep 2012 Electronic form version 1.4