Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Characterization of Diesel and Gasoline Compression Ignition Combustion in a Rapid Compression-Expansion Machine using OH* Chemiluminescence Imaging[1] SUNDAR RAJAN KRISHNAN, KALYAN KUMAR SRINIVASAN, Mississippi State University, MATTHEW STEGMEIR, TSI, Inc. — Direct-injection compression ignition combustion of diesel and gasoline were studied in a rapid compression-expansion machine (RCEM) using high-speed OH* chemiluminescence imaging. The RCEM (bore = 84 mm, stroke = 110-250 mm) was used to simulate engine-like operating conditions at the start of fuel injection. The fuels were supplied by a high-pressure fuel cart with an air-over-fuel pressure amplification system capable of providing fuel injection pressures up to 2000 bar. A production diesel fuel injector was modified to provide a single fuel spray for both diesel and gasoline operation. Time-resolved combustion pressure in the RCEM was measured using a Kistler piezoelectric pressure transducer mounted on the cylinder head and the instantaneous piston displacement was measured using an inductive linear displacement sensor (0.05 mm resolution). Time-resolved, line-of-sight OH* chemiluminescence images were obtained using a Phantom V611 CMOS camera (20.9 kHz @ 512 x 512 pixel resolution, $\sim$ 48 μs time resolution) coupled with a short wave pass filter (cut-off $\sim$ 348 nm). The instantaneous OH* distributions, which indicate high temperature flame regions within the combustion chamber, were used to discern the characteristic differences between diesel and gasoline compression ignition combustion.

[1]The authors gratefully acknowledge facilities support for the present work from the Energy Institute at Mississippi State University.

Sundar Rajan Krishnan
Mississippi State University

Date submitted: 01 Aug 2015 Electronic form version 1.4