Abstract Submitted
for the GEC08 Meeting of
The American Physical Society

Reacting Flow Imaging Using Point to Plane Pulsed Air/Hydrocarbon Discharge DAVID WISMAN, UES Inc, BISWA GANGULY, Air Force Research Laboratory — We report the use of a positive polarity point-to-plane pulsed corona discharge to obtain a time-resolved visualization of the reaction zone in a premixed propane-air flame. In the initial phases of the discharge the higher gas temperature along the flame reaction zone provides a higher E/n path that preferentially guides the streamer discharge to the cathode. Following the initial streamer phase, an increased plasma conductivity of the fully developed discharge, caused in part by lowering the attachment rate of electrons to O_2, allows the plasma conduction current to preferentially distribute along the high temperature flame reaction zone. The resulting N_2 C-B emission from the localized discharge provides a visualization of the flame front. The short ICCD gate time (100 ns) allows for capture of the N_2 C-B emission without the need for spectral filtering, and thus permitting imaging up to 1 kHz repetition rate. Imaging the plasma emission after the discharge has been fully developed allows for the monitoring of small scale instabilities in the reaction zone, which can be an important tool for understanding the combustion dynamics. We will also report the effect of flame equivalence ratio on the plasma emission intensity and its impact on the usefulness of high speed imaging.

David Wisman
UES Inc

Date submitted: 17 Jun 2008 Electronic form version 1.4