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Planar NO LIF measurement of point-to-plane discharge in a pre-mixed propane/air flame JACOB SCHMIDT, Spectral Energies, LLC., BISWA GANGULY, Air Force Research Laboratory — The effect of a point-to-plane pulsed discharge induced radical production in a pre-mixed propane/air flame has been investigated by phase-locked Planar Laser-Induced-Fluorescence (PLIF) measurements of NO radical. NO fluorescence images were acquired by exciting transitions within the A2Σ+ $\leftarrow$ X2Π (v'=0,v"=0) γ -band, near 226 nm. Phase locked NO PLIF measurements with the variation of pulsed plasma energy, equivalence ratio, applied voltage rise time have been performed. A fast rise time (20 ns) and a slower rise time (250 ns), 8-10 kV high voltage pulsers are used to produce NO radical densities 10-100 times greater than the ambient flame produced NO radicals in both lean, balanced and rich pre-mixed flames with $\leq$ 2.5 mJ deposited pulsed energy per pulse. The excess NO radical densities were found to decay to 50% level with time constants $\geq$250 μs in the burnt gas regions with gas temperatures greater than 1000 K. The super-equilibrium NO populations were dependent on the deposited energy and overall equivalence ratio, but independent of pulse rise time for similar energy deposition per pulse. Due to long decay lifetimes, super-equilibrium NO populations are convected away with the ambient flow from plasma production regions in the flame and observed in downstream exhaust gas regions.

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