Abstract Submitted
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Picosecond-TALIF measurements of atomic oxygen in RF driven atmospheric pressure plasma jets[1] JEROME BREDIN, JAMES DEDRICK, KARI NIEMI, ANDREW WEST, ERIC WAGENAARS, TIMO GANS, DEBORAH O'CONNELL, York Plasma Institute, University of York — Picosecond resolution is required for direct measurements, without assumptions, of radicals under the highly collisional environment of atmospheric pressure. Quenching of two-photon absorption laser induced fluorescence (TALIF) excited states is very efficient and the lifetime of approx. a few ns is in the order of a typical ns laser pulse width. To determine radical densities, challenges include knowing the quenching partners and calculating associated quenching rates to obtain the effective lifetime. Using ps-TALIF (32 ps pulse width) it is possible to resolve the lifetime and therefore avoid quenching rate calculations. Spatially resolved measurements in the plume of an RF atmospheric pressure plasma with O2 and dry air admixtures show that the excited state lifetime and ground state densities decrease at the extremities of the plume due to ambient air diffusion. The lifetime with dry air admixtures is longer than with O2 admixtures as oxygen is a more efficient quencher than nitrogen. Measurements in O2 admixtures show that the lifetimes obtained with ps-TALIF are shorter than those calculated. Consequently, either quenching through plasma produced species and/or three body collisions may play a role.

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