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Two-photon laser-induced fluorescence imaging of atomic oxygen in an atmospheric pressure plasma jet JACOB SCHMIDT, Spectral Energies, LLC., BRIAN SANDS, UES, Inc., WARUNA KULATILAKA, SUKESH ROY, Spectral Energies, LLC., JAMES SCOFIELD, JAMES GORD, Air Force Research Laboratory — A femtosecond two-photon absorption laser-induced fluorescence (fs-TALIF) diagnostic is applied to a nanosecond-pulsed, capillary dielectric barrier discharge (CDBD) plasma jet flowing helium with a variable oxygen admixture to produce two-dimensional images of atomic oxygen distributions. The high-peak intensity, low-average energy fs pulses, combined with increased spectral bandwidth, increase the number of photon pairs responsible for the two-photon excitation, resulting in increased TALIF signal. These features enabled imaging of absolute atomic oxygen number densities ranging from 4.07 x 10^{15} cm^{-3}, to the single-shot detection limit of 10^{12} cm^{-3}. Atomic oxygen imaging results are compared against traditional nanosecond diagnostics employing the same two-photon excitation scheme, including issues of experimental error, signal strengths, and quenching. Xenon calibration is used for quantification of the fluorescence signal. Imaging results show this CDBD capable of remotely generating quasi-steady-state atomic oxygen densities with a spatial distribution that depends on oxygen admixture.

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