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Femtosecond laser flow tagging in non-air flows YIBIN ZHANG, NATHAN CALVERT, Princeton Univ — The Femtosecond Laser Electronic Excitation Tagging (FLEET) [Michael, J. B et. al. *Applied optics*, *50*(26), 2011] method is studied in nitrogen-containing gaseous flows. The underlying mechanism behind the FLEET process is the dissociation of molecular nitrogen into atomic nitrogen, which produces long-lived florescence as the nitrogen atoms recombine. Spectra and images of the resulting tagged line provide insight into the effects of different atmospheric gases on the FLEET process. The ionization cross-section, conductivity and energy states of the gaseous particles are each brought into consideration. These experiments demonstrate the feasibility for long-lived flow tagging on the order of hundreds of microseconds in non-air environments. Of particular interest are the enhancement of the FLEET signal with the addition of argon gas, and the non-monotonic quenching effect of oxygen on the length, duration and intensity of the resulting signal and spectra. FLEET is characterized in number of different atmospheric gases, including that simulating Mar's atmospheric composition.

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