Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Development of Krypton Planar Laser-Induced Fluorescence for Supersonic Flow Environments[1] ROSS BURNS, CHRIS COMBS, NOEL CLEMENS, The University of Texas at Austin — Experimental work is presented on the development of krypton planar laser-induced fluorescence as a tracer in supersonic flows. Fluorescent tracers commonly used in compressible flowfields, such as nitric oxide, acetone, and toluene, have notable disadvantages when used in specific flow conditions that can include tracer condensation, reactivity, and general toxicity. Krypton, a noble gas, is immune to these deleterious effects over a much broader range of conditions including combustion environments. For these studies, the $5p[3/2]_2 \leftarrow 4p^6\ {}^1S_0$ electronic transition of krypton, accessible via two-photon absorption, is excited using a tunable sum-frequency generation (SFG) system set at the peak of the atomic absorption line around 214.7 nm. Data is presented on the fluorescence lifetimes and collisional quenching cross-sections over a broad range of conditions for krypton-air mixtures. The technique is demonstrated in a Mach 3 hypermixing flowfield to showcase its utility in a complex compressible and turbulent flow environment.

[1]This work is supported by NASA and the NSF.

Ross Burns
The University of Texas at Austin

Date submitted: 02 Aug 2013 Electronic form version 1.4