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Visualization and quantitative measurements of mixing in a supersonic injector flow.[1] CARRIE NOREN, Univ. of New Mexico; Air Force Research Lab., C. RANDALL TRUMAN, PETER VOROBIEFF, Univ. of New Mexico, TIMOTHY MADDEN, Air Force Research Laboratory, GORDON HAGER, Univ. of New Mexico — We present an experimental study of a supersonic nozzle with supersonic injection simulating chemical oxygen-iodine (COIL) flow, with the injected flow seeded with iodine. Presence of iodine in the flow is convenient for the use of planar laser-induced fluorescence (PLIF) diagnostics for flow visualization. To facilitate the latter, we use a pulsed 565 nm tunable dye laser producing a laser sheet to illuminate a streamwise or a spanwise cross-section of the flow. We acquire flow images revealing the flow structure, including the counter-rotating vortex pair that forms as the result of the interaction of the injected material with the mean flow, with sufficient quality for quantitative analysis. Quantitative characteristics of the flow, such as penetration depth and mixing quality at various downstream distances, are extracted. The results will be compared to and enable validation of computational fluid dynamics (CFD) predictions of supersonic mixing flows in regimes relevant for chemical laser design.

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