

Abstract Submitted  
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**Rainbow Schlieren Deflectometry Measurements With a Pulse Detonation Engine** CHARLES DESIO, The University of Alabama, CHRISTOPHER STEVENS, Innovative Scientific Solutions Inc., RUDY JOHNSON, Air Force Research Lab, Wright Patterson Air Force Base, SEMIH OLCMEN, The University of Alabama — Unsteady, under-expanded, Mach five flow is observed and measured with the use of a rainbow schlieren deflectometry technique. Measurements are taken on a pulse detonation engine system at the exit of a 0.5 inch diameter pre-detonation tube and at the exit of a two inch diameter thrust tube. The predetonator is fueled with propane/nitrous oxide, and the thrust tube is fueled with hydrogen/air. Collimated light illuminates the flow field after passing a 100 micron slit in a conventional schlieren setup. The collected light is focused on a color filter, and light ray deflections fall on different color bands. The deflections can be calculated using a simple calibration. Angular deflections due to density changes in the flow are recorded by a high-speed, color camera. Density gradients are calculated along the flow axis as well as perpendicular to the flow axis. Structures observed without post-processing include: Shock waves, flame fronts, Mach disk, and shock diamonds. The color schlieren system is simple to set up and use, relatively inexpensive to purchase, and produces accurate, nonintrusive flow data.

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