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RELIEF Velocimetry for Large-Scale Wind Tunnel Facilities S. GOGINENI, Innovative Scientific Solutions, Inc., W. LEMPERT, The Ohio State Univ., J. GORD, R. SCHMIT, AFRL — The U.S. Air Force Research Laboratory (AFRL) has determined that a need exists for a seedless diagnostic instrumentation capable of obtaining quantitative flow data in large scale aerodynamic facilities, with particular emphasis on the high subsonic to moderate supersonic flow regimes. For this purpose, a RELIEF (Raman Excitation + Laser Induced Electronic Fluorescence) technique using ultra-fast laser technology is being developed. During the Phase I program, it was demonstrated that: (i) Raman shifting cells, which offer great system simplicity and increased robustness, can be used to generate the required Stokes tagging beam when using psec pulses, (ii) psec tagging result in efficient vibrational excitation (tagging) and that it enables the use of greatly (factor of ten) reduced single pulse energy, and (iii) the ArF excimer interrogation laser can be replaced with an Nd:YAG-based system. During the Phase II program, focus is being made on optimization of the optical technologies demonstrated in Phase I and delivery and integration of a complete ultra-fast flow tagging system to the AFRL Trisonic Flow Facility. These details along with the implementation of the integrated system to make velocity field measurements of the flow produced external to and within a transonic cavity model will be presented. Authors acknowledge the help of Y. Zuzeek, M. Uddi, K. Frederickson, N. Jiang, S. Roy, and T. R. Meyer for their contributions during the experiments.

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