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Optically Recording Velocity Interferometer System: Applications and Challenges

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The Optically Recording Velocity Interferometer System (ORVIS) is a useful variant of the single point Velocity Interferometer System Any Reflector (VISAR) for the measurement of spatially dependent surface motion. Despite being similar in name, the two systems fundamentally differ in terms of the light recombination afforded by the interferometer geometry and subsequent recording method of the fringe phase variations. While both techniques have long been established as useful measurement technologies in shock physics studies of homogeneous and heterogeneous materials, the number of researchers employing spatially resolved ORVIS remains small. The first part of this presentation will discuss the baseline system including data examples only possible with the diagnostic's ability for continuous spatial recording. Recent adaptations of the baseline system have extended capabilities to incorporate multiple interferometers and laser illumination sources for observations in multiple spatial dimensions and non-planar geometries. The second part of this presentation will discuss efforts to overcome noted practical challenges when fielding the diagnostic and post-processing of image data. Application to non-planar geometries and highly heterogeneous materials motivates an appreciation of the coupling between the target surface reflectance properties and the light collection optics which can be quantitatively assessed through the bidirectional reflectance distribution function (BRDF) of the reflector. Challenges of practically locating fringe jumps in post-processing are discussed in the context of appreciating the underlying quadrature relationships of the fringe records. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.