

Abstract Submitted
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Dark-fringe velocimeter for measuring fast transient features in shock wave profiles with 1 m/s precision and 50 ps time resolution¹ B. LA LONE, E. MILLER, E. LARSON, J. WESOLOWSKI, Nevada National Security Site, Special Technologies Laboratory, Santa Barbara 93111, STL TEAM — We have developed a velocimetry system that is capable of recording ~ 1 m/s velocity changes on the 50 ps timescale for shock wave compression experiments. This is an order of magnitude improvement in the velocity-time resolution product over existing techniques. Similar to a VISAR, Doppler-shifted laser light from a moving target is directed into a Michelson interferometer with an unbalanced path length of 50 ps. To achieve excellent velocity sensitivity while also retaining high time resolution, the initial phase of the interferometer is actively balanced to be destructively interfering. In this manner, small changes in velocity result in relatively large changes in the interferometer output levels. Destructive interfering of the cavity is achieved by tuning the laser current and temperature with a custom feedback circuit. The system was tested on elastic precursor measurements of iron and steel targets and showed promising results. A path forward for improving the diagnostic is provided.

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