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**Simultaneous broadband laser ranging and PDV: A diagnostic for non-planar dynamic experiments**

BRANDON LA LONE, National Security Technologies, Special Technologies Laboratory

In non-planar experiments, the distance from the target to the sensing probe cannot usually be determined by integrating the measured velocity. We summarize several optical ranging techniques that have measured the target distance directly and present our fiber-optic system, which simultaneously measures the distance and velocity of rapidly moving surfaces. The distance measurement is based on the technique described by Xia and Zhang [Optics Express, **18**, 4118 (2010)] which determines the target distance independent of the target speed at sampling rates near 50 MHz, and is ideally suited for dynamic applications. We have extended the full range of the diagnostic to many cm and multiplexed it with a photonic Doppler velocimetry system so that distance and velocity can be tracked using a single fiber-optic probe. The diagnostic was demonstrated on a spinning target as an example of how integration of the target velocity sometimes gives the incorrect surface position, and how this system obtains it directly. The diagnostic was also tested on an explosive experiment in which surface ejecta and copper fragments were identified in both the position and velocity signals. We show how the position measurement compliments the velocity data. Potential applications are discussed. *This work was done by National Security Technologies, LLC, under Contract No. DE-AC52-06NA25946 with the U.S. Department of Energy, and supported by the Site-Directed Research and Development Program.*