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Multiplexed Photonic Doppler Velocimetry for Large Channel Count Experiments EDWARD DAYKIN, MARTIN BURK, CENOBIO GALLEGOS, MICHAEL PENA, CARLOS PEREZ, ARACELI RUTKOWSKI, OLIVER STRAND, Natl Security Technologies LLC, DAVID HOLTKAMP, Los Alamos National Laboratory — The Photonic Doppler Velocimeter (PDV) is routinely employed as a means of measuring surface velocities for shockwave experimentation. Scientists typically collect $\sim$ 4 to 12 channels of PDV data and use extrapolation, assumptions and models to determine the velocities in regions of the experiment that were not observed directly. We have designed, built and applied a new optical velocimetry diagnostic – the Multiplexed Photonic Doppler Velocimeter (MPDV) – for use on shock physics experiments that requires a large number ($\sim$ 100) of spatial points to be measured. MPDV expands upon PDV measurement capabilities via frequency and time multiplexing. The MPDV is built using commercially available products. The MPDV uses the heterodyne method to multiplex four data channels in the frequency domain combined with fiber delays to multiplex an additional four channel data set in the time domain, all of which are recorded onto the same digitizer input. This means that each digitizer input records data from eight separate spatial points, so that a single 4-input digitizer may record a total of 32 channels of data. Motivation for development of a multiplexed PDV was driven by requirements for an economical, high channel count optical velocimetry system. We will present a survey of methods, components and trade-offs incorporated into this recent development in optical velocimetry.

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