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Dynamic-range studies and improvements for multiplexed photonic Doppler velocimetry EDWARD KIRK MILLER, KEVIN LEE, ERIC LARSON, EDWARD DAYKIN, National Security Technologies, LLC — We present studies of the dynamic range achievable with multiplexed photonic Doppler velocimetry (MPDV) measurements, and we demonstrate some techniques to extend the dynamic range. Improved dynamic range for MPDV measurements is needed in order to track the velocity of the free surface behind a cloud of ejecta, so we have undertaken theoretical and experimental studies of factors affecting dynamic range, particularly in cases where the large number of MPDV probe points precludes high illumination power on each channel. To quantify the potential dynamic range of a given MPDV configuration, we introduce a metric called the frequency-domain number of bits, FNOB, which is less stringent than the formally defined equivalent number of bits (ENOB). This new metric is simple to compute in the lab, and it is well suited to conventional PDV analysis, which does not require digitizer phase coherence beyond tens of nanoseconds.

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