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Comprehensive Studies of Ultrafast Laser Excited Warm Dense Gold ZHIJIANG CHEN, MIANZHEN MO, SLAC National Accelerator Laboratory, BRANDON RUSSELL, YING TSUI, University of Alberta, XIJIE WANG, SLAC National Accelerator Laboratory, ANDREW NG, University of British Columbia, SIEGFRIED GLENZER, SLAC National Accelerator Laboratory — Isochoric excitation of solids by ultrafast laser pulses is an important approach to generate warm dense matter in laboratory. Electrical conductivity, structural dynamics and lattice stabilities are the most important properties in ultrafast laser excited warm dense matter. To investigate these properties, we have developed multiple advanced capabilities at SLAC recently, including the measurement of semi-DC electrical conductivity with ultrafast THz radiation, the study of solid and liquid structural dynamics by ultrafast electron diffraction (UED), and the investigation of lattice stability using frequency domain interferometry (FDI) on both front and rear surfaces. Due to the non-reversible nature in exciting solid to warm dense matter, all these diagnostics are implemented with single-shot approaches, reducing the uncertainties due to shot-to-shot fluctuations. In this talk, we will introduce these novel capabilities and present some highlighted studies in warm dense gold, which was uniformly excited by ultrafast laser pulses at 400nm. We appreciate the supports from DOE FES under FWP #100182.

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