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Pulse shortening via Relativistic Transparency of Nanometer Foils R.C. SHAH, Los Alamos National Laboratory/ Ludwig Maximilians Universitat, S. PALANIYAPPAN, H.-C. WU, D.C. GAUTIER, Los Alamos National Laboratory, D. JUNG, Los Alamos National Laboratory/ Ludwig Maximilians Universitat, R. HOERLEIN, Max-Planck-Institut fur Quantenoptik, D. OFFERMANN, R.P. JOHNSON, T. SHIMADA, S. LETZRING, L. YIN, B. ALBRIGHT, J.C. FERNANDEZ, Los Alamos National Laboratory, B.M. HEGELICH, Los Alamos National Laboratory/ Ludwig Maximilians Universitat — Intense lasers drive plasma electrons to velocities approaching light-speed. Increase of the electron mass causes optical transparency in otherwise classically over-dense plasma. Simulations indicate relativistic transparency can produce near-single-cycle rise time light pulses. It also lies enables a new mechanism for laser-based ion-acceleration yielding energy increases over earlier approaches. A direct signature of transparency is pulse-shortening thru over-dense plasmas in which relativistic intensity induces transmission. Using nm C foils (LMU) and the high-contrast Trident laser (LANL) we have made auto-correlation measurements showing >2x transmitted pulse duration reduction at intensities corresponding to ∼20-fold increase in electron mass. Spectral measurements agree with pulse shortening thru the target, and 1-D particle-in-cell simulations support the measurements.

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