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Dynamic Thomson Scattering from Nonlinear Electron Plasma Waves in a Raman Plasma Amplifier A. DAVIES, J. KATZ, S. BUCHT, D. HABERBERGER, J. BROMAGE, J.D. ZUEGEL, D.H. FROULA, Laboratory for Laser Energetics, U. of Rochester, R. TRINES, Rutherford Appleton Laboratory, R. BINGHAM, U. of Strathclyde, J. SADLER, P.A. NORREYS, U. of Oxford — Electron plasma waves (EPW's) can be used to transfer significant energy from a long-pulse laser to a short-pulse seed laser through the Raman scattering instability. Successful implementation of Raman amplification could open an avenue to producing high-intensity pulses beyond the capabilities of current laser technology $(\sim 10^{22}\,\mathrm{W/cm^2})$. This three-wave interaction takes advantage of the plasma's ability to sustain large-amplitude plasma waves. Having complete knowledge of the EPW amplitude is essential to establishing optimal parameters for high-efficiency Raman amplification. A dynamic Thomson-scattering diagnostic is being developed to spatially and temporally resolve the amplitude of the driven and thermal EPW's. By imaging the scattered probe light onto a novel pulse-front tilt compensated streaked optical spectrometer, the diffraction efficiency of this plasma wave can be measured as a function of space and time. These data will be used in conjunction with particle-in-cell simulations to determine the EPW's spatial and temporal profile. This will allow the effect of the EPW profile on Raman scattering to be experimentally determined. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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