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Spatially resolved collective Thomson-Scattering from electron plasma waves CHRIS STOAFER, Lawrence Livermore National Laboratory, BRADLEY POLLOCK, GEORGE TYNAN, University of California, San Diego, JENA MEINECKE, University of California, Los Angeles, JAMES ROSS, LAURENT DIVOL, SIEGFRIED GLENZER, Lawrence Livermore National Laboratory
— We present the first spatially and temporally resolved Thomson-scattering measurements of the electron temperature and density from electron plasma wave scattering in laser-produced plasmas. By fitting the Thomson scattering form factor S(k,ω) to the experimental data the density is determined primarily by the spectral separation of the peaks in the scattered spectrum, while the temperature affects the Landau damping and consequently the width of the peaks. The experiments are performed at the Jupiter Laser Facility, Lawrence Livermore National Laboratory, using a 1 ns square, 1054 nm, 400 J laser focused onto gas jets or foils to create the plasma and a 200 ps, 527 nm (2ω), 45 J laser pulse for the Thomson scattering probe. The 2ω beam probes 2 mm with a spatial resolution of 15 μm, and density scale lengths of 1 mm have been resolved. This allows a measurement of the electron heat transport in laser-plasma interactions. Comparison with hydrodynamic modeling is also presented. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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