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Measurements and modeling of Raman side-scatter in ICF experiments.[1] PIERRE MICHEL, Lawrence Livermore National Laboratory, M. J. ROSENBERG, Laboratory for Laser Energetics, University of Rochester, T. CHAPMAN, Lawrence Livermore National Laboratory, R. W. SHORT, W. SEKA, A. SOLODOV, Laboratory for Laser Energetics, University of Rochester, C. GOYON, M. HOHENBERGER, J. D. MOODY, Lawrence Livermore National Laboratory, S. P. REGAN, J. F. MYATT, Laboratory for Laser Energetics, University of Rochester — Raman side-scatter, whereby the Raman scattered light is resonant at its turning point in a density gradient, was identified experimentally in planar-target experiments at the National Ignition Facility (NIF) in conditions relevant to the direct-drive scheme of inertial confinement fusion (ICF). This process was found to be one of the principal sources of supra-thermal electrons in such conditions, which can preheat the target and reduce its compressibility. We have developed a new semi-analytical model of the instability, which describes both its convective and absolute aspects; we derived quantitative estimates of the amplification region in typical ICF regimes, which highlights the need for sufficiently large laser spots to allow the instability to develop. Full-scale simulations of these experiments using the laser-plasma interaction code "pF3d" show SRS side-scatter largely dominating over back-scatter, and reproduce the essential features observed in the experiments and derived in the theory; we provide extrapolations to the case of spherical geometries relevant to direct-drive and discuss implications for indirect-drive ICF experiments.

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Pierre Michel
Lawrence Livermore National Laboratory

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