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Initiation and Saturation of Backward Stimulated Raman and Brillouin Scatter in Single Speckles: Influence of Scattered-Light Seeds and Collisional Heating L. YIN, B.J. ALBRIGHT, H.A. ROSE, K.J. BOWERS, B. BERGEN, S.M. FINNEGAN, LANL — A suite of 2D and 3D PIC simulations of backward stimulated Raman and Brillouin scattering (SRS and SBS) in ICF hohlraum and Trident plasma have been performed on the heterogeneous multi-core supercomputer, Roadrunner. These calculations reveal that the physics governing the nonlinear saturation of SRS in 3D is consistent with that of prior 2D studies [L. Yin, et al. Phys. Rev. Lett., 99, 265004, 2007], but with important differences arising from enhanced diffraction and side loss in 3D compared with 2D. In addition to wavefront bowing of electron plasma waves (EPW), we find that EPW self-focusing also exhibits loss of angular coherence by formation of a filament necklace, a process not available in 2D. These processes in higher dimensions increase the side-loss rate of trapped electrons, increase wave damping, decrease source coherence for backscattered light, and fundamentally limit how much backscatter can occur from a laser speckle. The SRS onset threshold is lower if initiated by SRS seeds compared with the onset threshold if SRS is initiated by thermal electron density fluctuations alone. Furthermore, we show that the presence or absence of SBS may be sensitively determined by collisional heating and transverse electron temperature variations.

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