Nonlinear Fluid Simulation Study of Stimulated Raman and Brillouin Scatterings in Shock Ignition

CHUANG REN, Univ of Rochester, LIANG HAO, IAPCM, Beijing, China, RUI YAN, USTC, Hefei, China, JUN LI, UCSD, WENDA LIU, Univ of Rochester — We developed a new nonlinear fluid laser-plasma-instability code FLAME using a multi-fluid plasma model combined with full electromagnetic wave equations. The completed one-dimensional (1D) version of FLAME was used to study laser-plasma instabilities in shock ignition. The simulations results showed that absolute Stimulated Raman Scattering (SRS) modes growing near the quarter-critical surface were saturated by Langmuir-wave Decay Instabilities (LDI) and pump depletion. The ion-acoustic waves from LDI acted as seeds of Stimulated Brillouin Scattering (SBS), which displayed a bursting pattern and caused strong pump depletion. Re-scattering of SRS was also observed in a high temperature case. These results largely agreed with corresponding Particle-in-Cell simulations.

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