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Pump-depletion Dynamics and Saturation of Stimulated Brillouin Scattering in Shock Ignition Conditions[1] SHU ZHANG, JUN LI, University of California San Diego, SARAH MULLER, General Atomics, WOLFGANG THEOBALD, CHUANG REN, JOHN PALASTRO, CHRISTIAN STOECKL, TIMOTHY FILKINS, DAVID TURNBULL, DAN HABERBERGER, MICHAEL CAMPBELL, RICCARDO BETTI, Laboratory for Laser Energetics, DIMITRI BATANI, JOCELAIN TRELA, Centre Lasers Intenses et Applications, ROBBIE SCOTT, Rutherford Appleton Laboratory, CHRISTINE KRAULAND, General Atomics, FARHAT BEG, University of California San Diego, MINGSHENG WEI, Laboratory for Laser Energetics — Shock ignition (SI) is an alternative inertial confinement fusion scheme, which requires a strong shock to ignite a pre-compressed fusion capsule. In this concept, nonlinear laser-plasma instabilities can play an important role. The recent experiments conducted on OMEGA-EP laser facility demonstrated that stimulated Brillouin scattering (SBS) can ∼100% deplete the first 0.5 ns of the spike laser pump. In this period, the pump-depletion moved from $0.01 - 0.02$ critical density (n_c) region to $0.1 - 0.2$ n_c region. The dynamic pump-depletion was indicated from the shape of the laser-generated blast wave and the time-resolved stimulated Raman backscattering spectra. The pump-depletion dynamics can be explained by the breaking of ion-acoustic waves in SBS. The strong laser pump depletion would reduce the collisional laser energy absorption in SI but may limit the temperature of hot electrons which could benefit the electron shock ignition.

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