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Production of petawatt laser pulses of picosecond duration via Brillouin amplification of nanosecond laser beams[1] R. TRINES, R. BINGHAM, P. NORREYS, STFC Rutherford Appleton Laboratory, Didcot, UK, K. HUMPHREY, D. SPEIRS, University of Strathclyde, Glasgow, UK, R.A. CAIRNS, University of St Andrews, Fife, UK, F. FIÚZA, LLNL, P. ALVES, L.O. SILVA, Instituto Superior Técnico, Lisbon, Portugal — The demonstration of fast-ignition (FI) inertial confinement fusion (ICF) requires the delivery of 40 kJ - 100 kJ of laser energy to the hot spot within 16 ps, preferrably at near-infrared wave lengths (351 nm). However, high-energy picosecond petawatt beams at 351 nm are extremely difficult to generate using conventional solid-state laser systems. Previous studies have shown that Raman amplification in plasma is a potential route for the production of petawatt pulses of picosecond duration at 351 nm [Trines et al., PRL, 2011]. In this paper we show, through analytic theory and particle-in-cell simulations, that similar results can also be obtained through Brillouin amplification of a short seed laser beam off a long pump beam at moderate intensity. Scaling laws governing the optimal parameter space for pump beam, seed beam and plasma will be derived using a self-similar model for Brillouin scattering, and verified via simulations. A comparison with Raman scattering will be made, to determine which scheme is most suitable for a range of laser-plasma configurations.

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