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Boosting the performance of Brillouin amplification via reduction of parasitic Raman scattering and filamentation R. TRINES, R. BINGHAM, P.A. NORREYS, STFC Rutherford Appleton Laboratory, Didcot, UK, E.P. ALVES, R.A. FONSECA, L.O. SILVA, Instituto Superior Tecnico, Lisbon, UK, K.A. HUMPHREY, University of Strathclyde, Glasgow, UK, F. FIUZA, LLNL, R.A. CAIRNS, University of St. Andrews, Fife, UK — Brillouin amplification of laser pulses in plasma is a promising scheme to produce picosecond pulses of petawatt power, as it is more robust than Raman amplification. However, parasitic instabilities spoil the quality of the amplified pulse: Raman backscattering affects the contrast ratio, filamentation ruins the pulse envelope and Raman forward scattering spoils the pulse's coherence and causes the amplification to saturate. Through analytic theory and simulations, we have identified a novel parameter window where the performance of Brillouin amplification is maximized and the highest pulse powers are reached while the deleterious influence of parasitic instabilities is strongly reduced. The respective merits of using plasma densities either above or below the quarter-critical density will be discussed.

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