

Abstract Submitted
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Advanced backward Raman amplification seeding¹ VLADIMIR MALKIN, NATHANIEL FISCH, Princeton University — Next generations of ultrapowerful laser pulses, reaching exawatt and zetawatt powers within reasonably compact facilities, might be based on the backward Raman amplification (BRA) in plasmas. Amplified pulse intensities hundreds times higher than the pump intensity are already observed experimentally. More advanced BRA stages should produce even higher intensities. The largest nonfocused intensity, limited primarily by instabilities associated with the relativistic electron nonlinearity of the amplified laser pulse, is, roughly speaking, 0.1 of the fully relativistic value. It corresponds to the amplified pulse final (and shortest) duration be about the electron plasma wave period. The needed seed pulse should be at least that short then to stay ahead of the amplified pulse, rather than be shadowed by it (which would much reduce the seeding efficiency). However, at earlier BRA stages, when the amplified pulse is longer, the optimal duration of the seed pulse is also longer. This work proposes the use of self-contracting seed pulses for further optimizing the advanced BRA.

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