

Abstract Submitted
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Gain dynamics measurement in injection-seeded soft x-ray laser plasma amplifiers¹ YONG WANG, S. WANG, Colorado State University, L. LI, E. OLIVA, T.T. THUY LE, D. ROS, Laboratoire d'Optique Appliquée (LOA), M. BERRILL, Oak Ridge National Laboratory, J. DUNN, Lawrence Livermore National Laboratory, PH. ZEITOUN, Laboratoire d'Optique Appliquée (LOA), L. YIN., B. LUTHER, J.J. ROCCA, Colorado State University — Herein we report the first measurement of the gain dynamics in a soft x-ray plasma amplifier seeded by high harmonic pulses. A sequence of two time-delayed spatially-overlapping high harmonic pulses was injected into a $\lambda = 18.9$ nm Ni-like Mo plasma amplifier to measure the regeneration of the population inversion that follows the gain depletion caused by the amplification of the first seed pulse. Collisional excitation is observed to re-establish population inversion depleted during the amplification of the seed pulse in about ~ 1.75 ps. The measured gain-recovery time is compared to model simulations to gain insight on the population inversion mechanisms that create the transient gain in these amplifiers. This result supports the concept of a soft x-ray laser amplification scheme based on the continuous extraction of energy from a soft x-ray plasma-based amplifier by a stretched seed pulse has the potential to generate ultra-intense fully phase-coherent soft x-ray laser pulses.

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