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Beam amplification to high fluence in a plasma $optic^1$ PATRICK POOLE, ROBERT KIRKWOOD, THOMAS CHAPMAN, SCOTT WILKS, PIERRE MICHEL, LAURENT DIVOL, Lawrence Livermore Natl Lab, NATHANIEL FISCH, Princeton Plasma Physics Laboratory, PETER NORREYS, Oxford University, WOJCIECH ROZMUS, University of Alberta, BRENT BLUE, Lawrence Livermore Natl Lab — New intense laser applications and experiments require increases in pulse energy, power, and intensity beyond the limitations of conventional solid-state media. Plasma optics are a promising solution due to their increased resiliency to damage but require characterization in the linear and nonlinear response regimes. The plasma amplifier project at NIF has demonstrated the combination of up to 21 frequency shifted beams via Cross-Beam Energy Transfer, achieving 10x amplification of a seed beam up to nearly 8 kJ in a 1 ns pulse. The full capability of such an optic is being explored, most recently by investigating amplification in a high fluence regime using a small spot seed beam (continuous phase plate removed). This resulted in a greater fluence in the amplified seed than the combined fluence of all (large area) pump beams. A good quality amplified mode was obtained despite initial speckled structure confirming predicted plasma optic behavior from simulation and models. This demonstration suggests a path to a future small-scale amplifier design that does not require superior pump beam quality. Further experimental details and supporting simulation results will also be discussed.

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