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Self-amplification of a laser beam refracting off a plasma density gradient[1] EUGENE KUR, JONATHAN WURTELE, University of California, Berkeley, PIERRE MICHEL, Lawrence Livermore National Laboratory — Inertial confinement fusion (ICF) experiments at the National Ignition Facility (NIF) use laser beams targeted at hohlraum walls as the first step in driving a fusion reaction. It has been observed [1] that in some cases, the laser beams pointed at the hohlraum waist can refract off the density gradient from the expanding hohlraum wall and escape through the opposite entrance hole; this process, known as "glint", is the current leading hypothesis for the drive deficit observed in ICF experiments. Here we show that as a laser beam refracting off a density gradient overlaps with itself, the incoming part can transfer its energy to the outgoing part, like in crossed-beam energy transfer (CBET) for direct-drive ICF. This can result in higher hohlraum coupling losses than if computed using absorption alone in hydrodynamics codes. We provide a 1D analytical and numerical description of this "self-amplified glint" and demonstrate that for an ideal rarefaction profile, a resonant surface always exists before the turning point where this self-amplification can occur. The amount of energy transfer is determined by a balance between absorption and CBET gain. [1]: D. P. Turnbull et al., PRL 114, 125001 (2015)

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