USING OPTICAL POLARIMETRY TO DIAGNOSE HOHLRAUM PHYSICS IN INERTIAL CONFINEMENT FUSION EXPERIMENTS

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The polarization of 3ω scattered light has been measured in the full aperture backscatter (FABS) diagnostic on a 30° incidence quad at the National Ignition Facility (NIF) since June 2013 [1]. Two key insights were derived from early experiments. First, laser "glint" (a specular reflection from the inner hohlraum wall) is observed in near-vacuum hohlraums. Experiments designed to understand glint found that it is one of two seeds for Brillouin sidescatter in indirect-drive inertial confinement fusion (ICF) targets [2]. The presence of sidescatter challenges assumptions about energy deposition and drive symmetry in experiments.

Second, it was found that the polarizations of an incident beam and its backscatter are affected by amplitude and phase modulations induced by crossing laser beams. Considering a simpler two-beam interaction, the effect could be utilized to produce ultrafast, damage-resistant laser-plasma wave plates, polarizers, or other photonic devices [3]. In ICF experiments, backscatter polarization might thus prove to be a quantitative diagnostic of Crossed Beam Energy Transfer (CBET). Other laser-plasma experiments could also utilize the effect for remote polarimetric probing of plasma conditions such as electron temperature.

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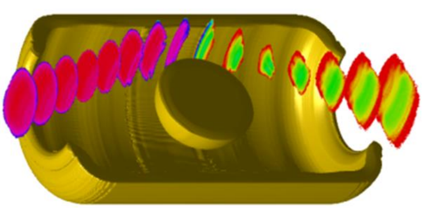

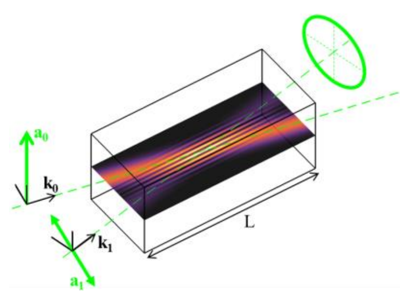

[1] D. Turnbull *et al*., "Polarimetry of uncoupled light on the NIF," Rev. Sci. Inst. **85**, 11E603 (2015).
[2] D. Turnbull *et al*., "Multibeam seeded Brillouin sidescatter in inertial confinement fusion experiments," Phys. Rev. Lett. **114**, 125001 (2015).
[3] P. Michel *et al*., "Dynamic control of the polarization of intense laser beams via optical wave mixing in plasmas," Phys. Rev. Lett. **113**, 205001 (2014)