Polarization Rotation from Cross-Beam Energy Transfer During Direct-Drive OMEGA Implosions

During picket

During drive

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Polarization change in the lasers from cross-beam energy transfer (CBET) has been observed in direct-drive implosions on OMEGA

- The CBET beamlets diagnostic uses a Wollaston prism to decompose a scattered-light beamlet from each OMEGA beam into two orthogonal polarization components
- During the picket when CBET is predicted to be small, the observed beamlet polarizations for linearly polarized beams are similar to calculations without CBET
- During the main drive when CBET is predicted to be large, the observed beamlet polarizations are different than during the picket
Collaborators


University of Rochester
Laboratory for Laser Energetics
Cross-beam energy transfer modeling is required to match the experimental observables (scattered light, implosion velocity, and bang time)
The CBET beamlets diagnostic records scattered-light intensities each from a unique light path and from a different OMEGA beam.
Each spot is the end point of a beamlet originating from a specific location of the beam profile.
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60 identical beams sample CBET along many unique paths in a beam.
CBET affects each beamlet differently because the unique path of each beamlet crosses the 60 OMEGA beams differently. Some of the recorded beamlets experience net loss because of CBET, while others experience a net gain.
The CBET beamlets diagnostic has two separate time windows and isolates orthogonal polarizations at each time.

DPR’s* installed

Gated optical imager gate shape

Etalon reflected pathway (from 200 ps earlier)

Straight-through path

Arbitrary units

Time (ps)

* DPR: distributed polarization rotator
With linearly polarized beams, the beamlet images show the polarization of the scattered light

Recorded images (during picket)

Simulated images (without CBET)
With linearly polarized beams, the beamlet images show the polarization of the scattered light.

Note that the Beam 13 beamlet is predominately \( p \) polarized in both simulated and recorded images.
When CBET is strong during the drive pulse, the polarization of the B13 beamlet is more s polarized

Recorded images (during picket)

Recorded images (during drive)
Polarization changes of the order of a few tens of degrees have been observed in preliminary investigations.
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