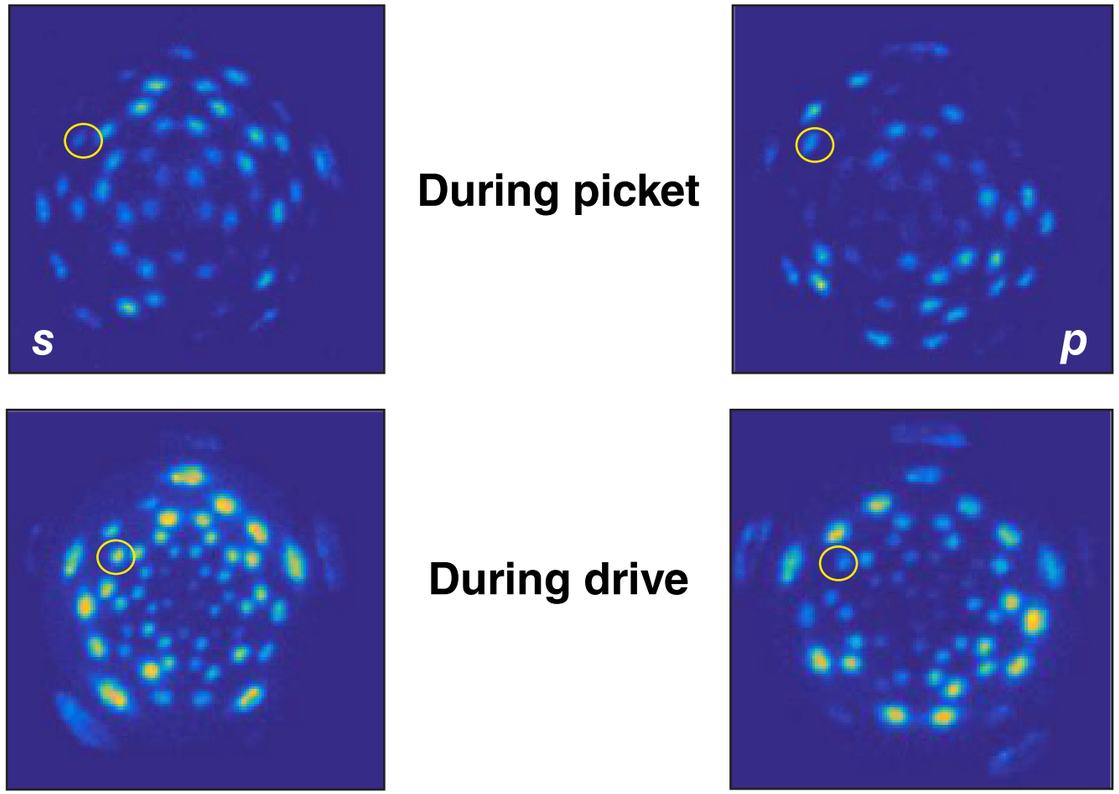
Polarization Rotation from Cross-Beam Energy Transfer During Direct-Drive OMEGA Implosions



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Summary

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

E26603

Collaborators

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University of Rochester
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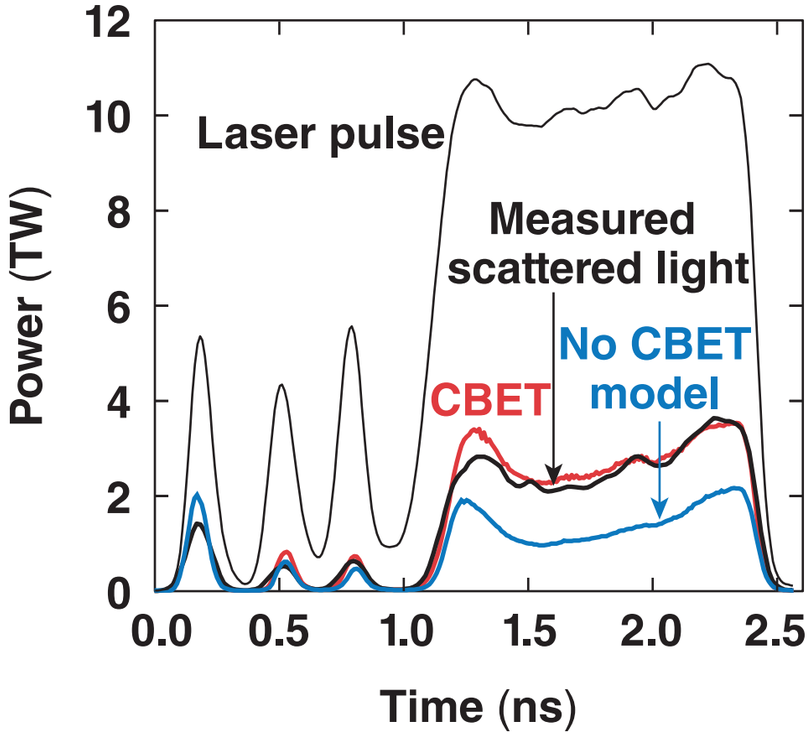
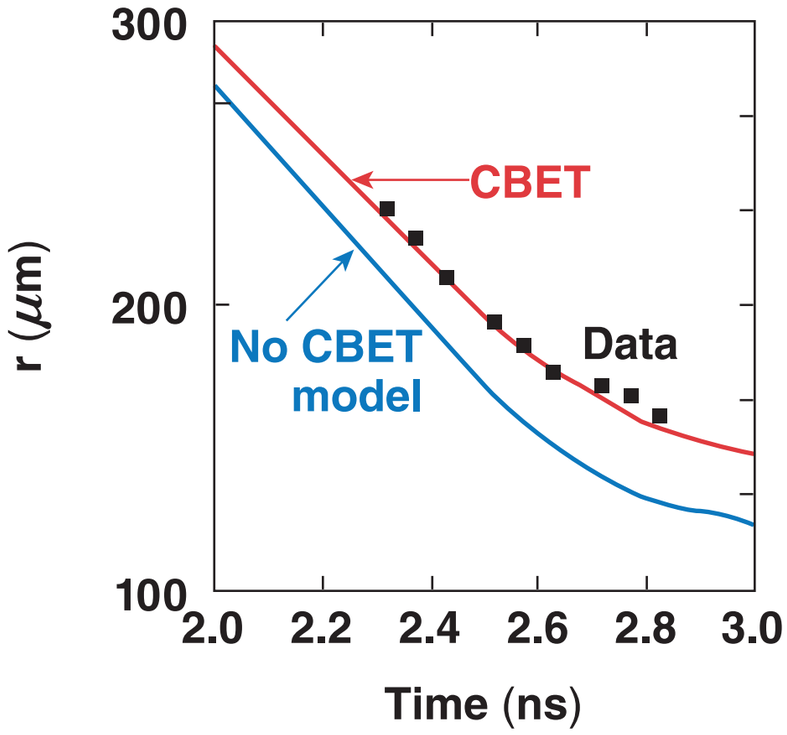
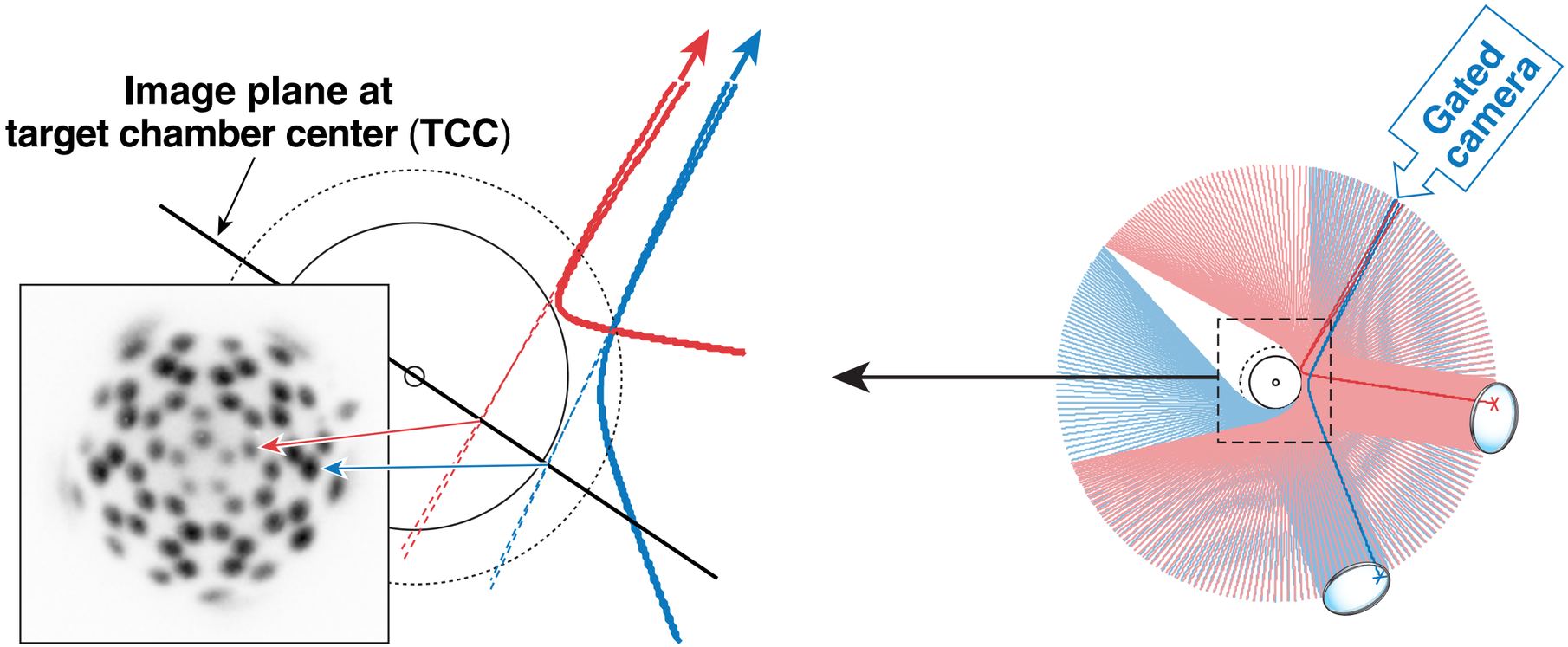
Cross-beam energy transfer modeling is required to match the experimental observables (scattered light, implosion velocity, and bang time)





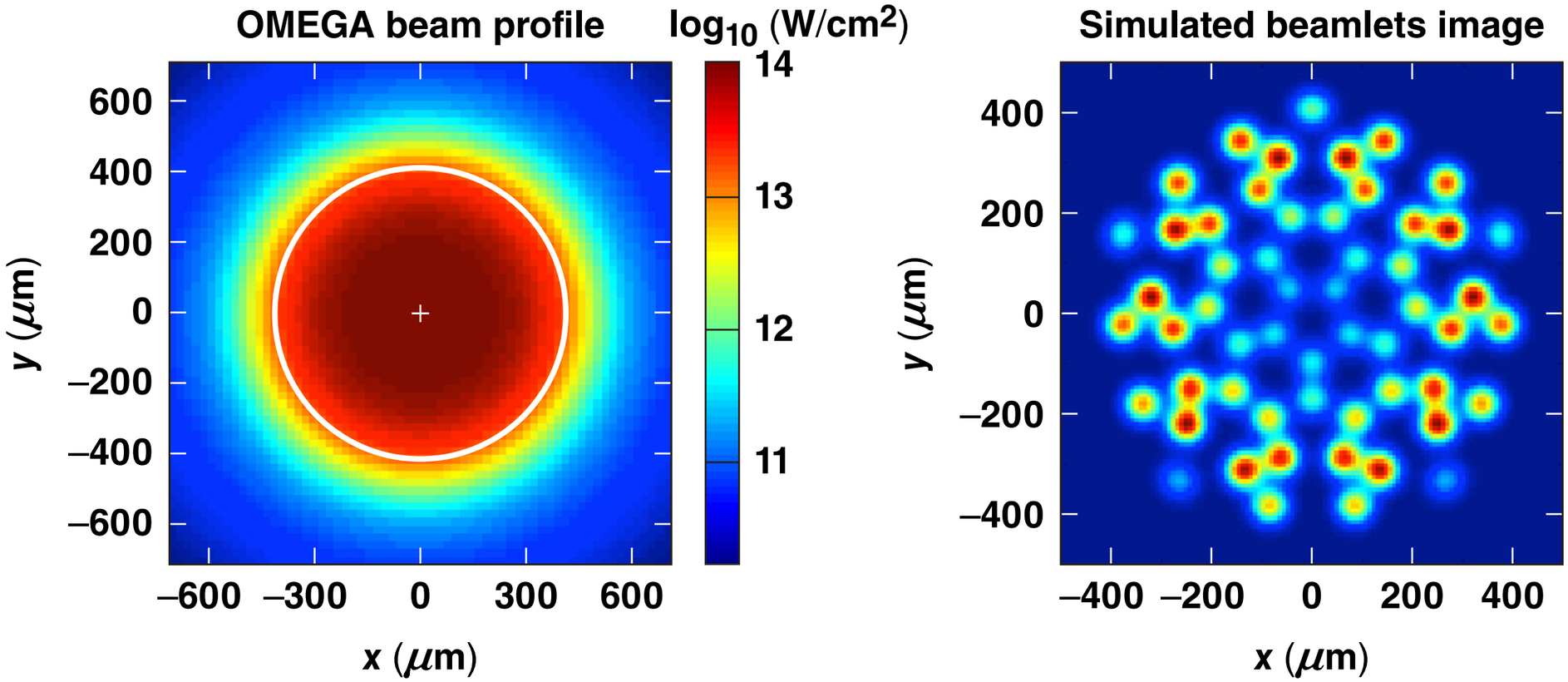
E21315l

The CBET beamlets diagnostic records scattered-light intensities each from a unique light path and from a different OMEGA beam



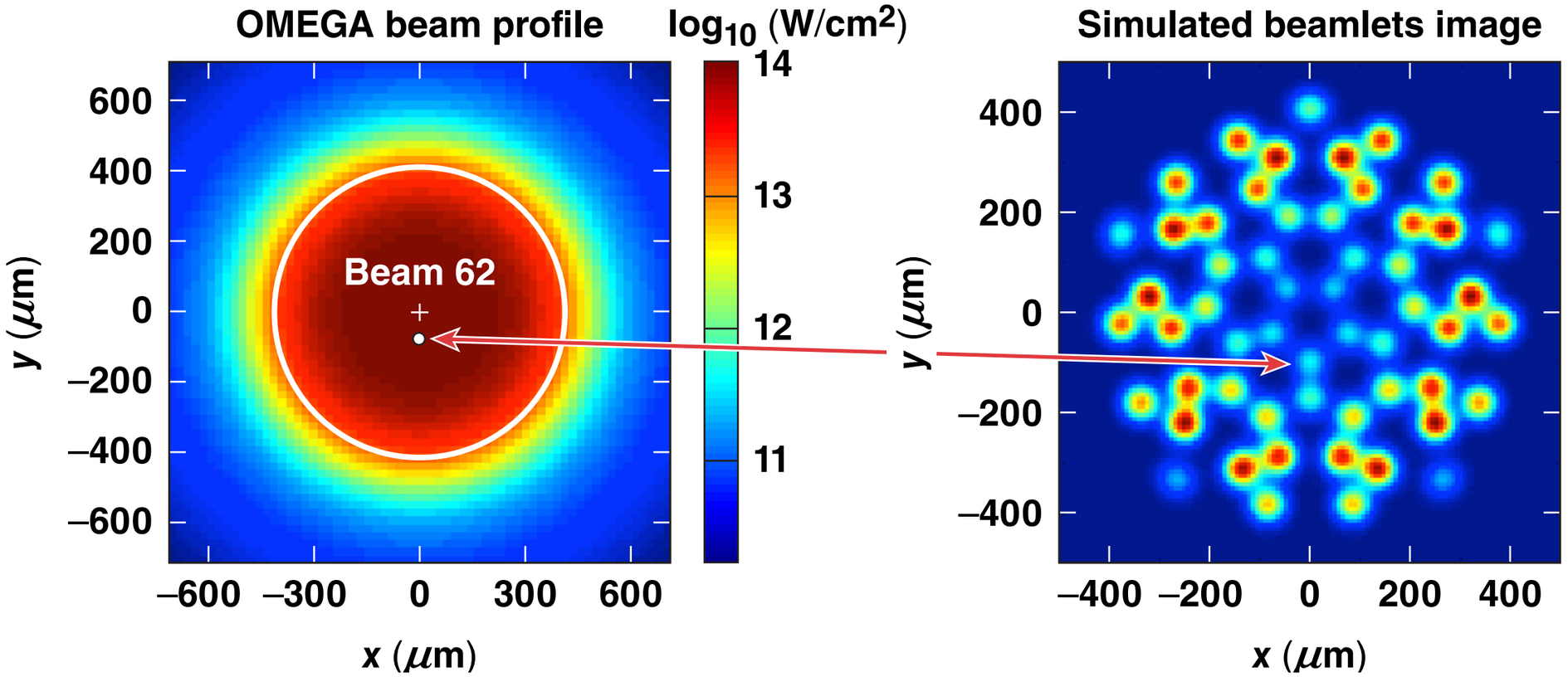
E25651d

Each spot is the end point of a beamlet originating from a specific location of the beam profile



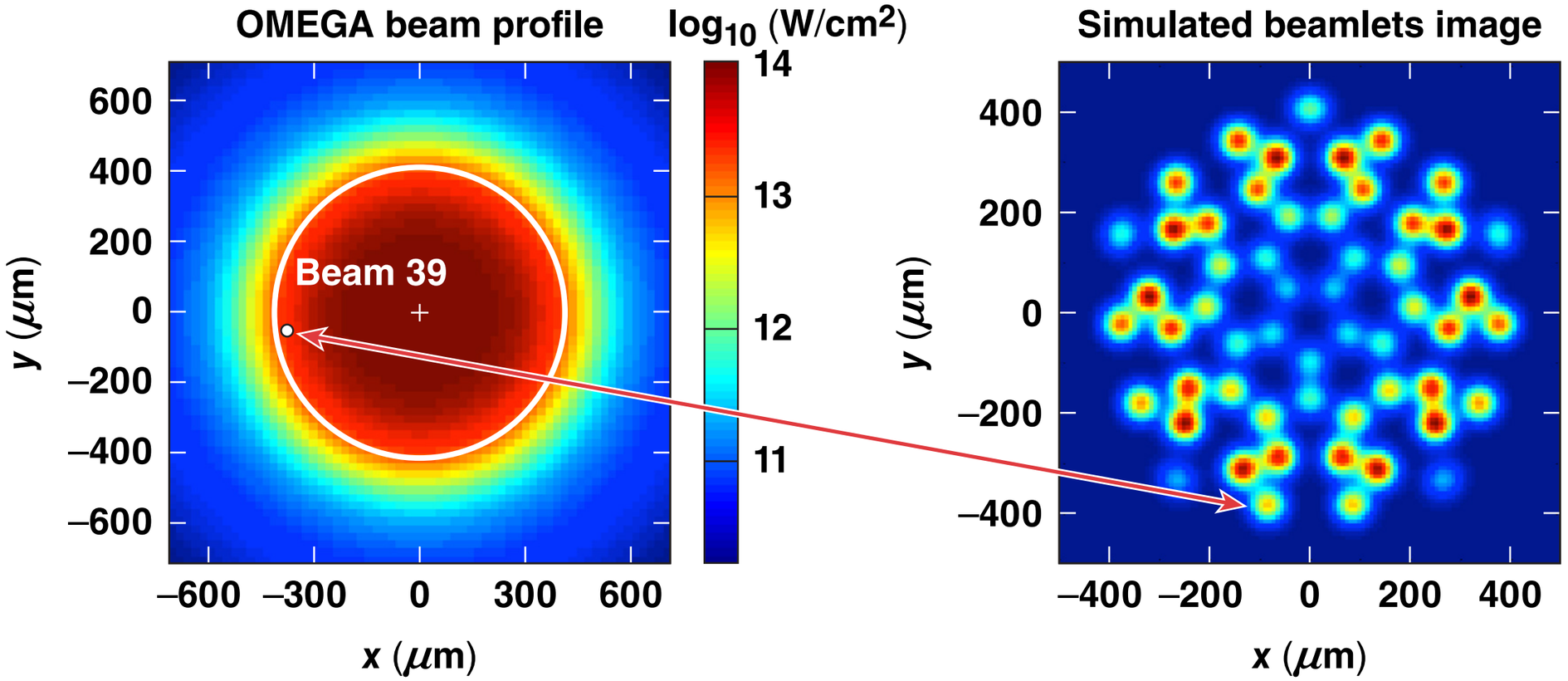
E24259d

Each spot is the end point of a beamlet originating from a specific location of the beam profile



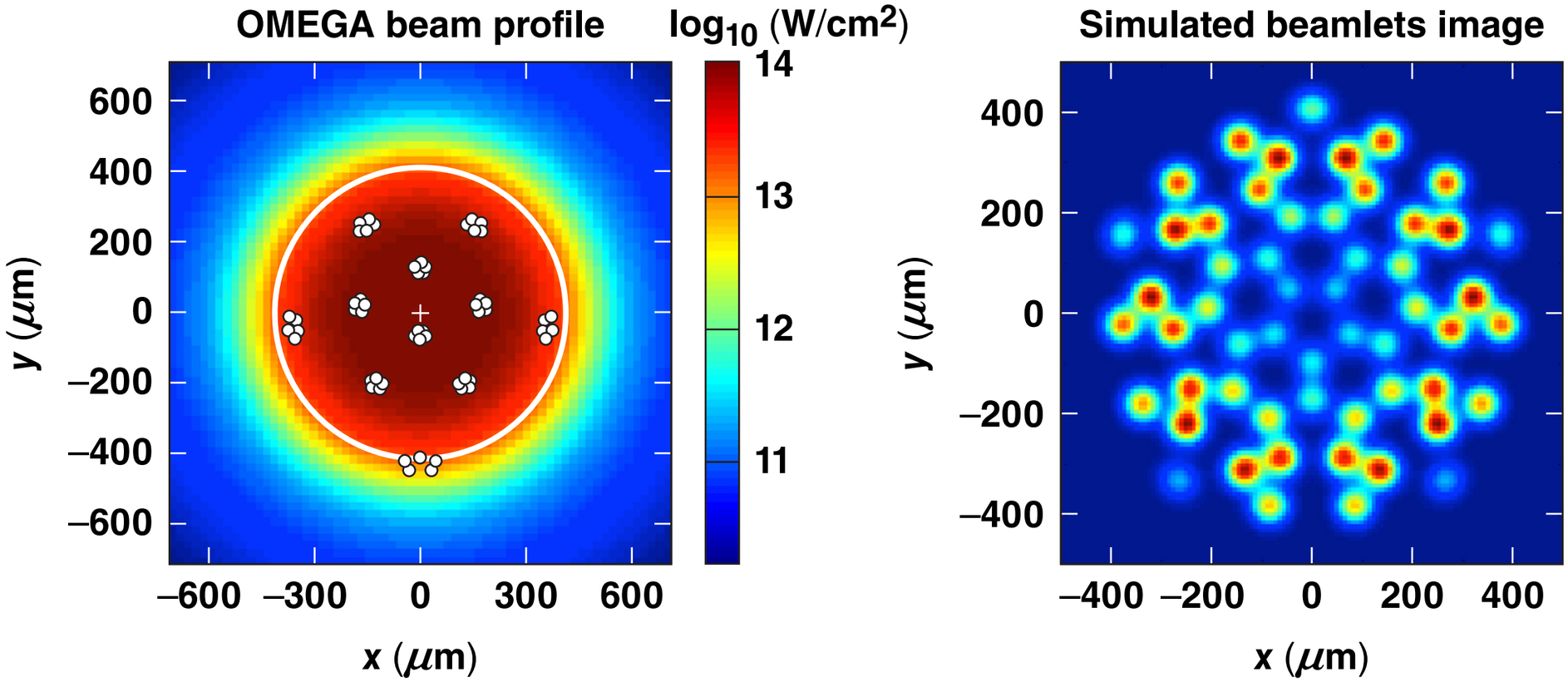
E24260d

Each spot is the end point of a beamlet originating from a specific location of the beam profile



E24261d

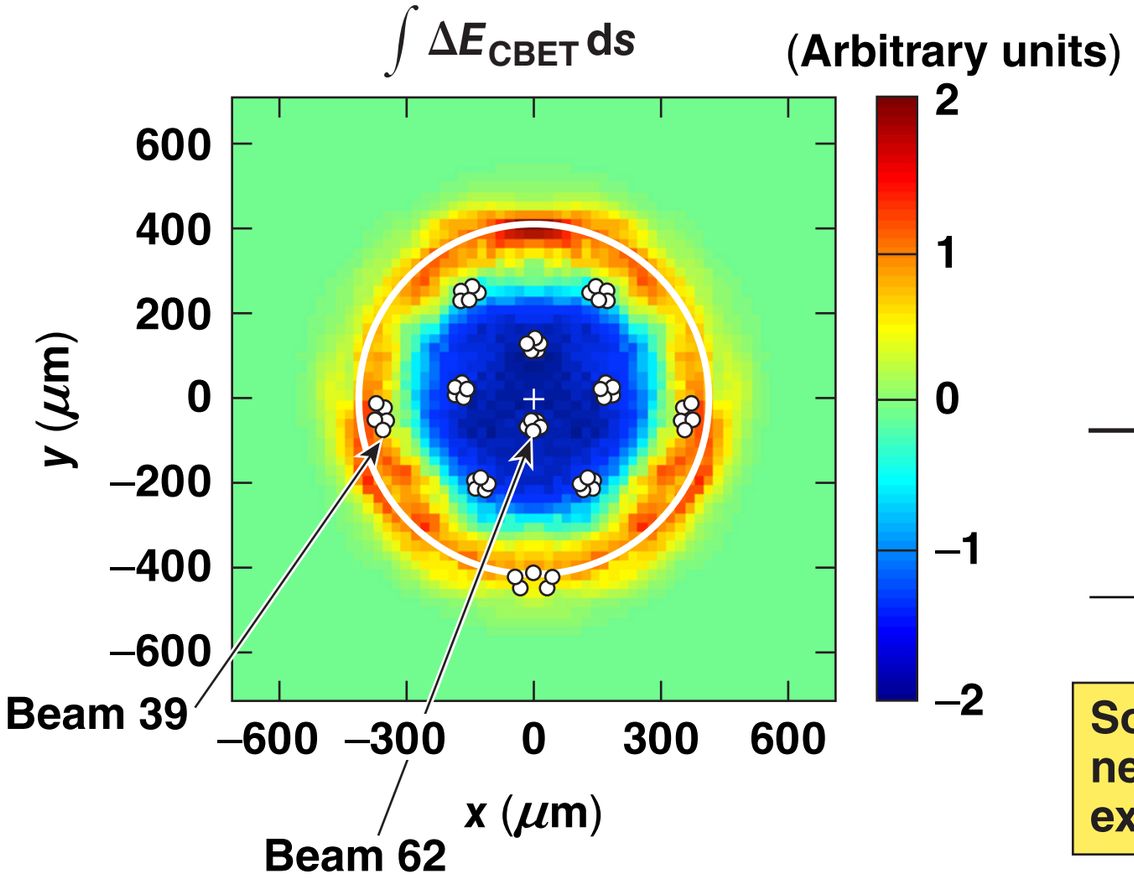
Each spot is the endpoint of a beamlet originating from a specific location of the beam profile

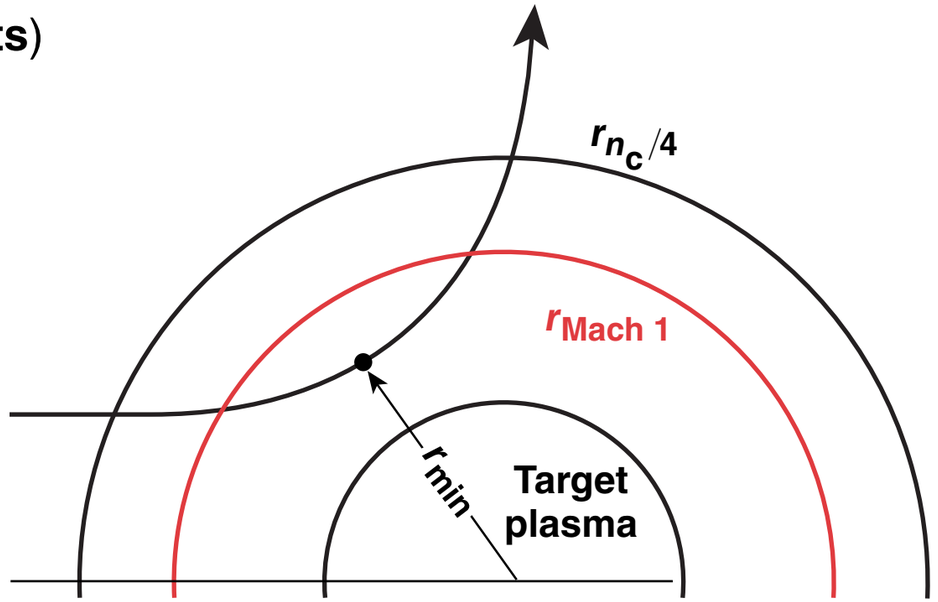


60 identical beams sample CBET along many unique paths in a beam.

E24262d

CBET affects each beamlet differently because the unique path of each beamlet crosses the 60 OMEGA beams differently

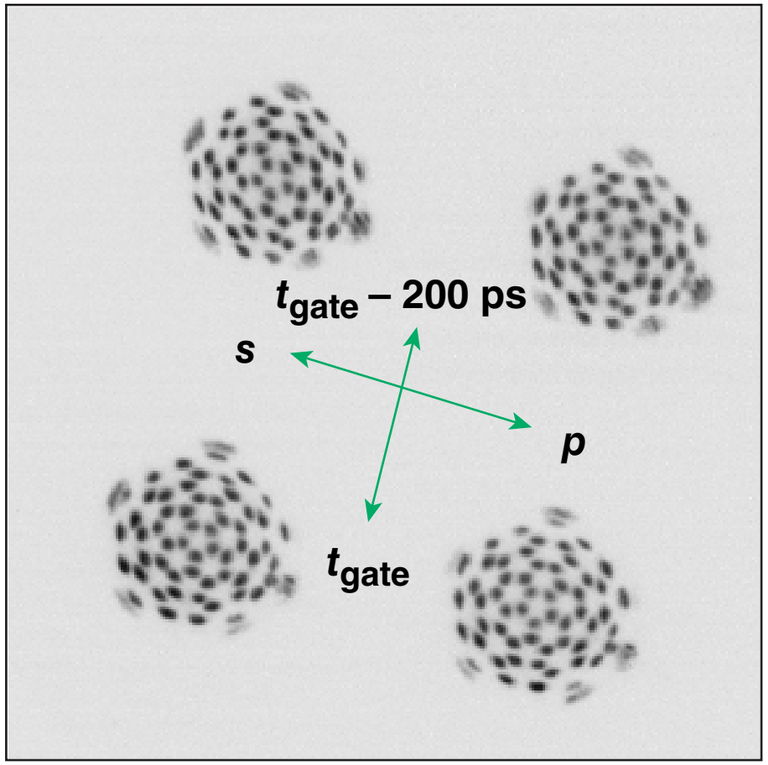




Some of the recorded beamlets experience net loss because of CBET, while others experience a net gain.

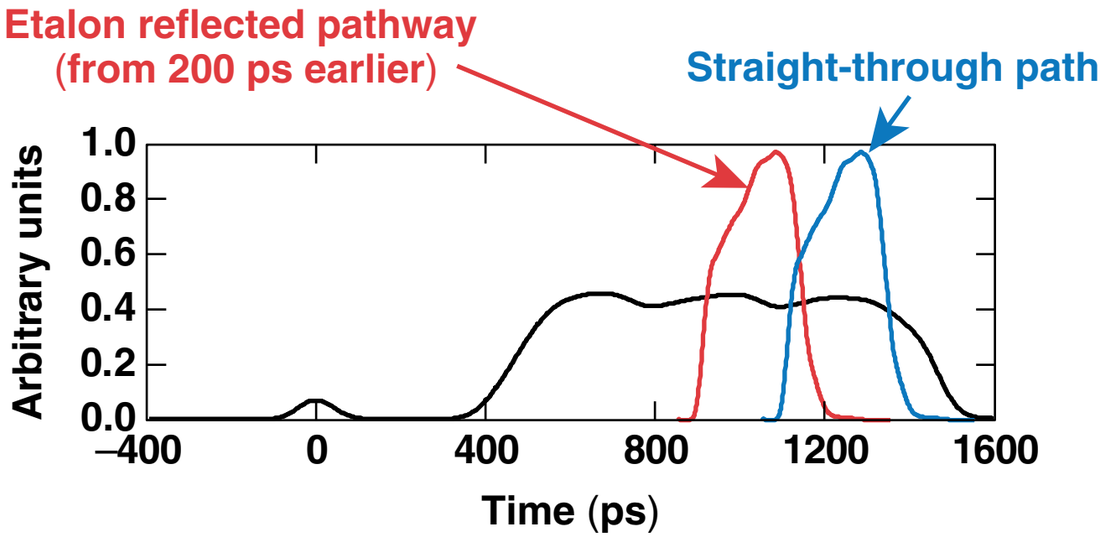
E17999d

The CBET beamlets diagnostic has two separate time windows and isolates orthogonal polarizations at each time



DPR's* installed

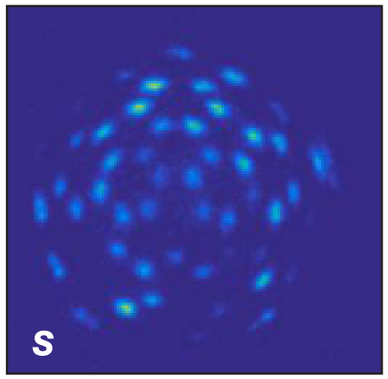
Gated optical imager gate shape



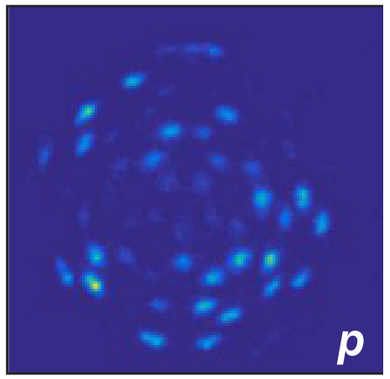
E26604

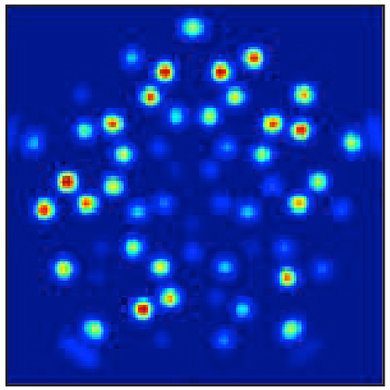
*DPR: distributed polarization rotator

With linearly polarized beams, the beamlet images show the polarization of the scattered light

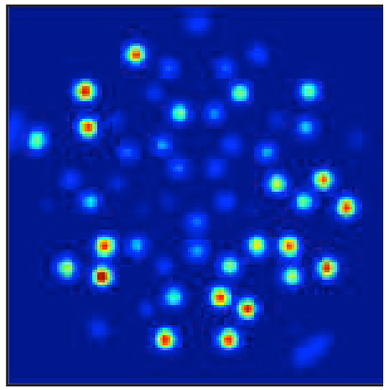


Recorded images
(during picket)



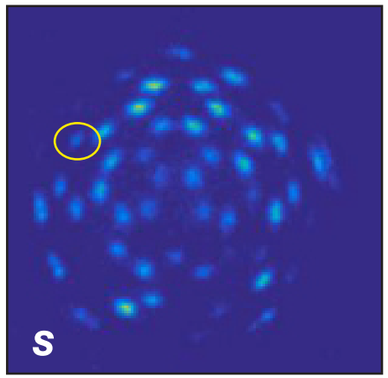


Simulated images
(without CBET)

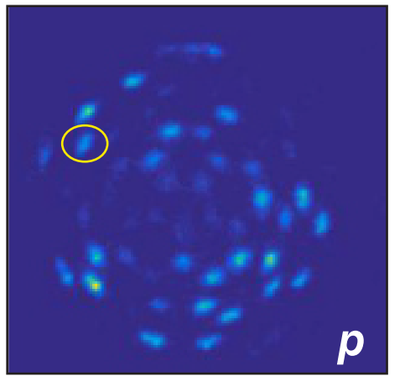


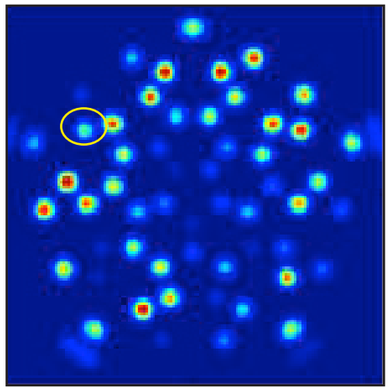
E26605

With linearly polarized beams, the beamlet images show the polarization of the scattered light



Recorded images
(during picket)





Simulated images
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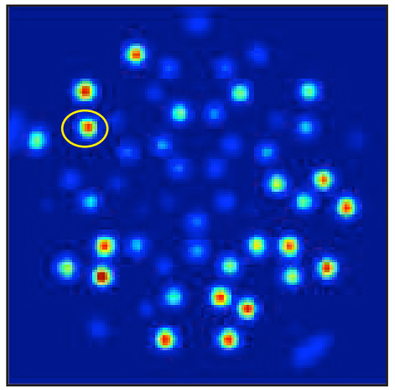
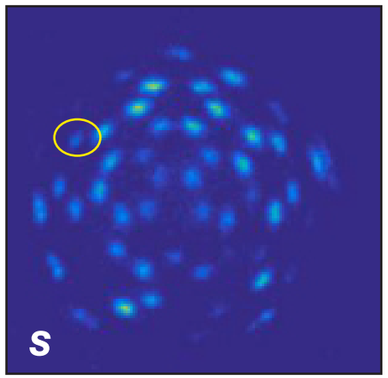


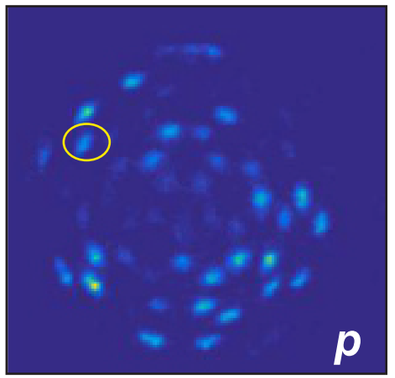
Note that the Beam 13 beamlet is predominately *p* polarized in both simulated and recorded images.

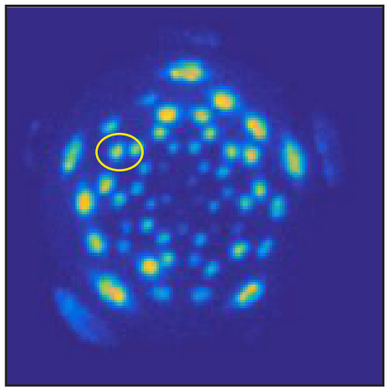
E26606

When CBET is strong during the drive pulse, the polarization of the B13 beamlet is more *s* polarized

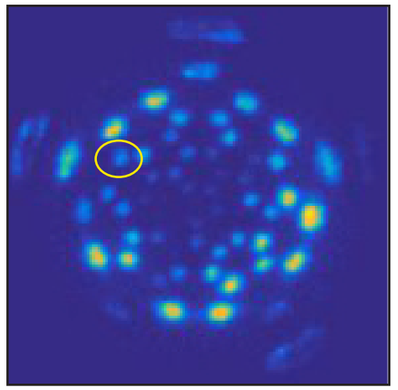


Recorded images
(during picket)



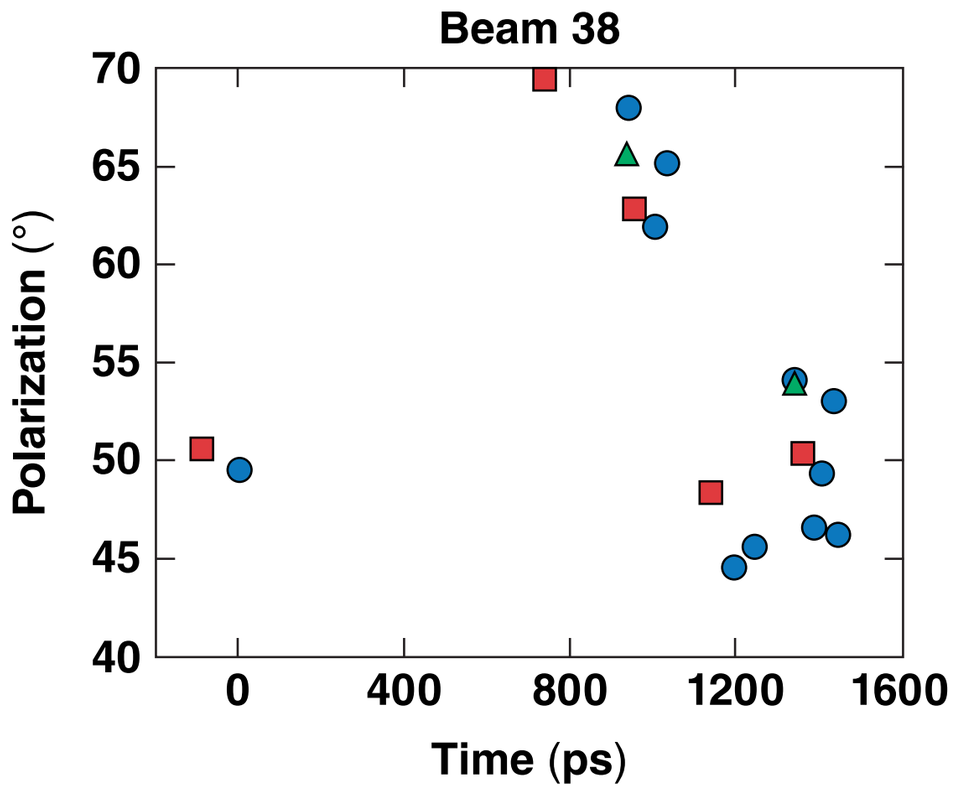


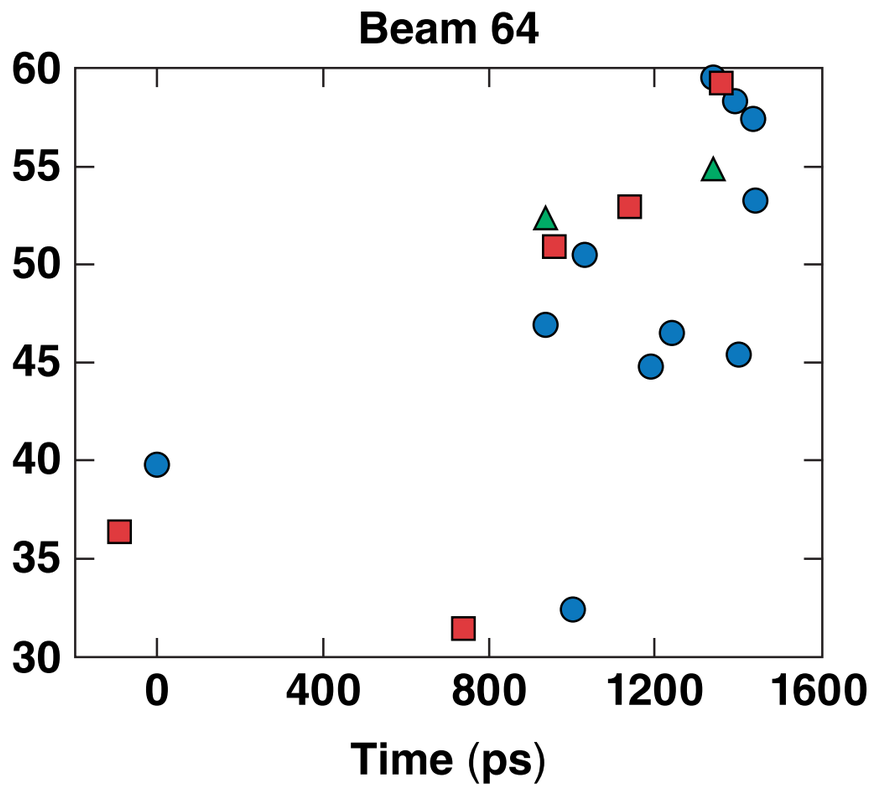
Recorded images
(during drive)



E26607

Polarization changes of the order of a few tens of degrees have been observed in preliminary investigations





E26848

Summary/Conclusions

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

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