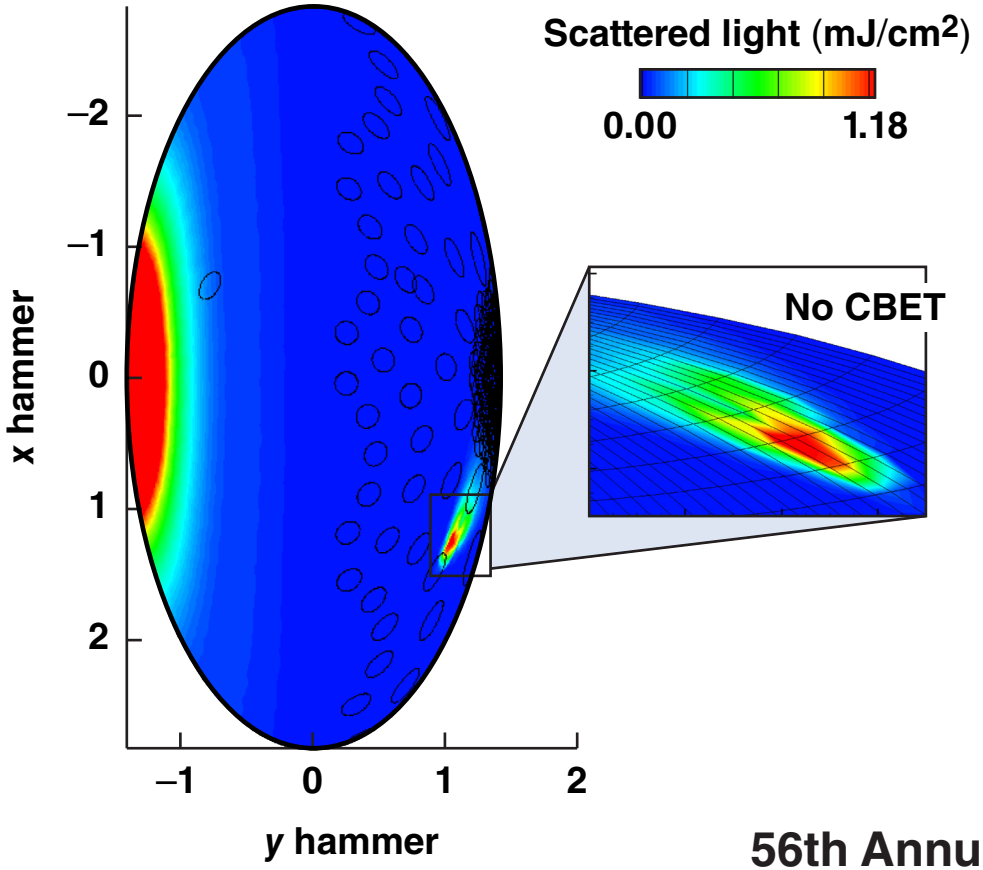
Evaluation of Wavelength Detuning to Mitigate Cross-Beam Energy Transfer Using the NIKE Laser



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Summary

The NIKE laser will be employed to examine the effects of laser wavelength detuning to mitigate cross-beam energy transfer (CBET)

UR LLE

- CBET has been shown to have deleterious effects on shell drive and stagnation-phase assembly
- Wavelength detuning is predicted to recover the necessary implosion velocities required for ignition platforms
- The NIKE platform is well suited for these studies, providing a well-diagnosed system over a wide range of detunings (±6Å)
- Various ablator systems will be studied, including basic glass and CH, as well as doped and/or graded shells

Collaborators

J. A. Marozas and F. J. Marshall

University of Rochester
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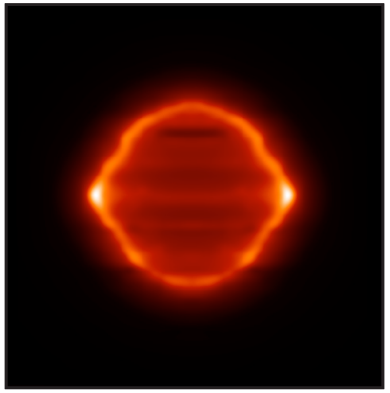
Naval Research Laboratory

The effects of CBET in direct-drive implosions have been well documented on both OMEGA and the National Ignition Facility (NIF)

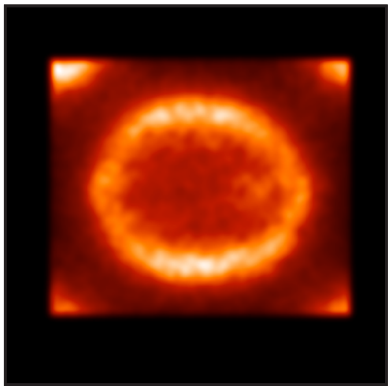
- N120328 was a 125-kJ, 1540-mm-diam glass target: Peak $I = 1.6 \times 10^{15}$ W/cm^2

DRACO*/*Spect3D* (*f* = 0.06)



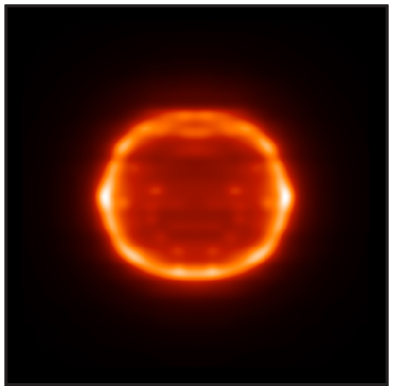
r_{avg} = 339 μm

N120328 gated x-ray detector (GXD)



r_{avg} = 341 μm

DRACO*/*Spect3D* (iSNB,** CBET)



r_{avg} = 343 μm

*Prism Computational Sciences, Inc., Madison, WI 53711.
**D. Cao *et al*, UP8.00084, this conference.

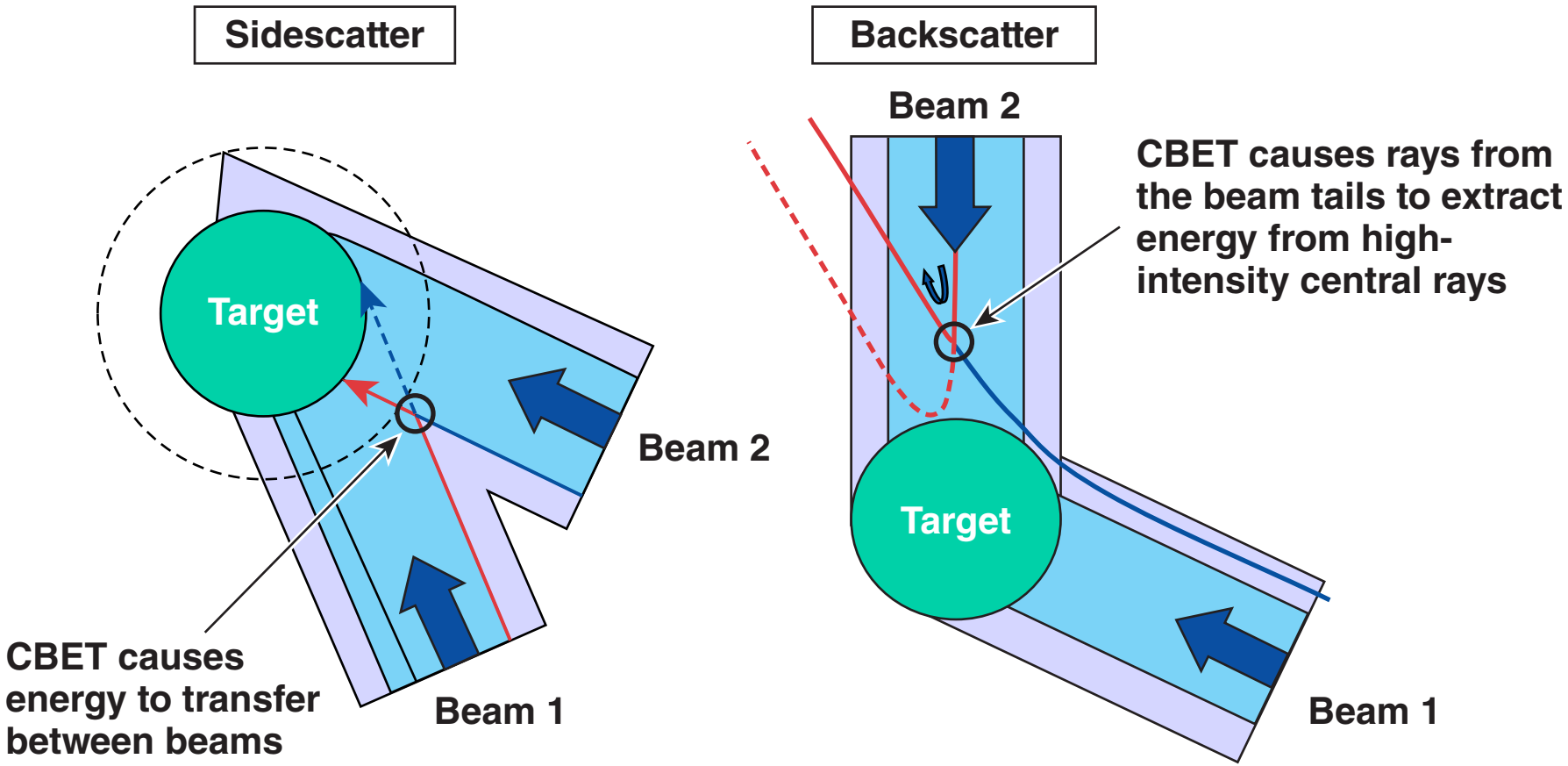
TC11496

Absorption reduction caused by CBET can be mitigated in three different domains that can be combined

- Spatial domain (reduction of the interaction volume)
  - dynamic spot-shape changes; “zooming”
  - static spot-shape design tailored to the target, e.g., spot masking
- Spectral domain (wavelength detuning)
  - detuning causes a resonance shift to lower interaction volumes
- Temporal domain
  - time-multiplexed pulses reduce interaction time overlap

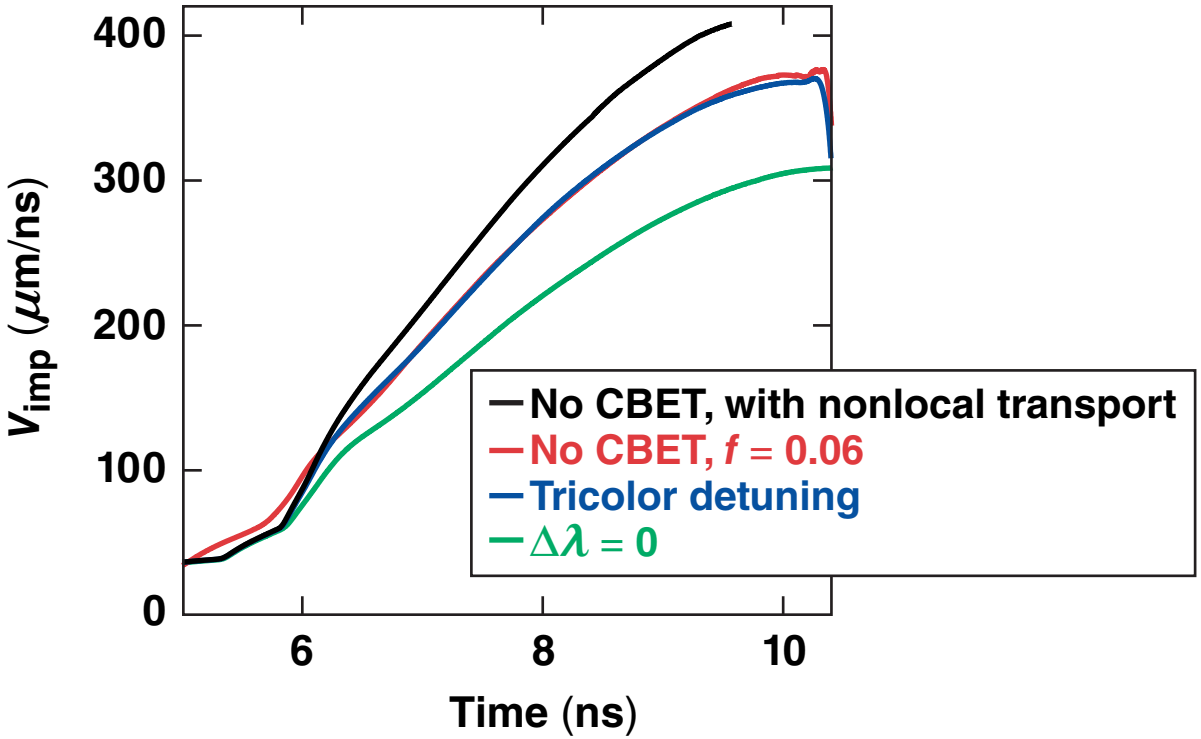
M. Hohenberger, CI1.00001, this conference;
P. B. Radha *et al*., JO4.00013, this conference;
D. H. Froula *et al*., NO4.00013, this conference.

Wavelength detuning affects CBET in two modes in direct-drive implosions



TC11500

Frequency detuning is predicted to recover the critical implosion velocity in polar-drive (PD)–ignition target designs

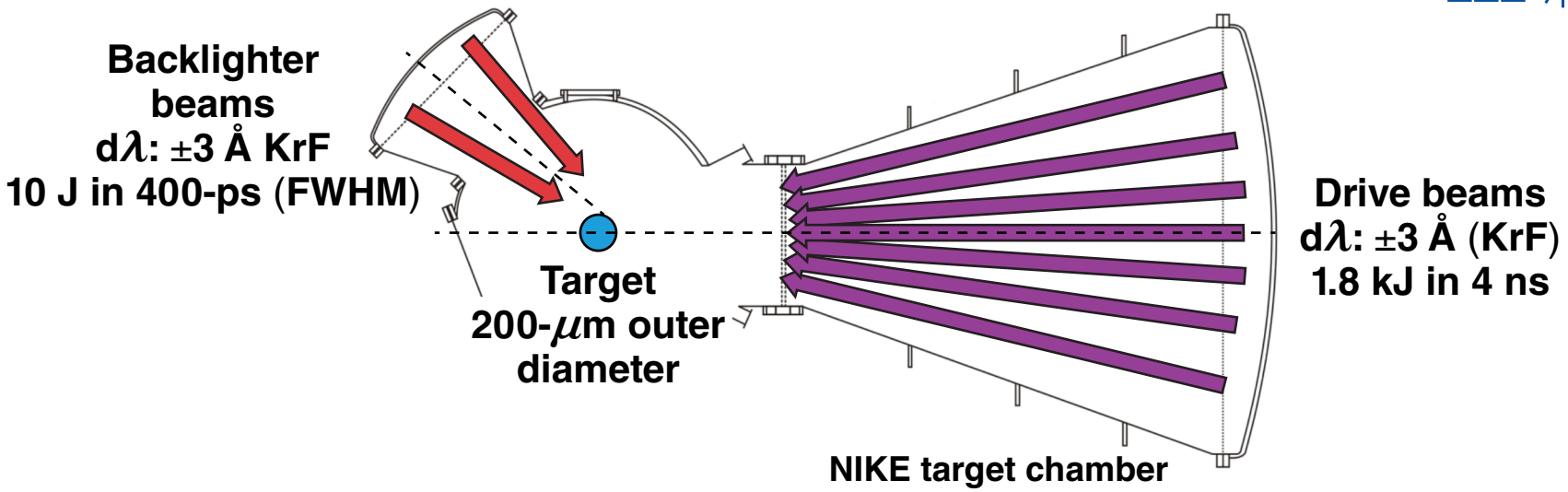


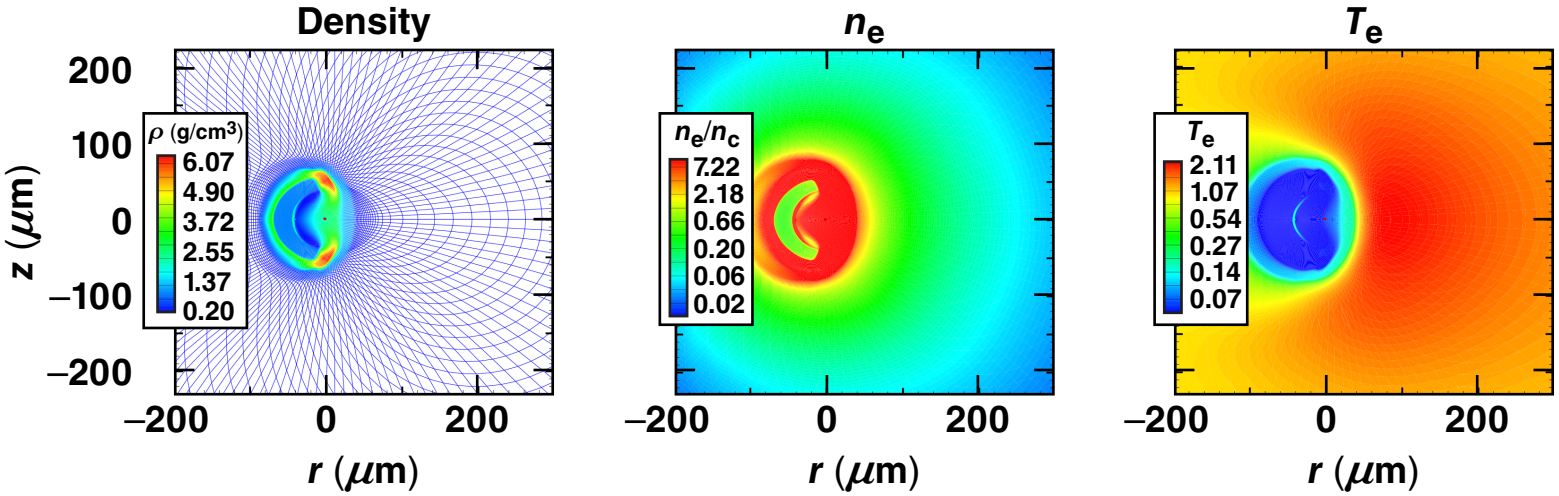
Experimental verification of CBET mitigation with wavelength detuning is a high priority.

T. J. B. Collins *et al.*, JO4.00001, this conference;
J. A. Marozas *et al.*, NO4.00014, this conference.

TC11529b

The NIKE laser is capable of significant laser detuning between the drive and backlighter beams

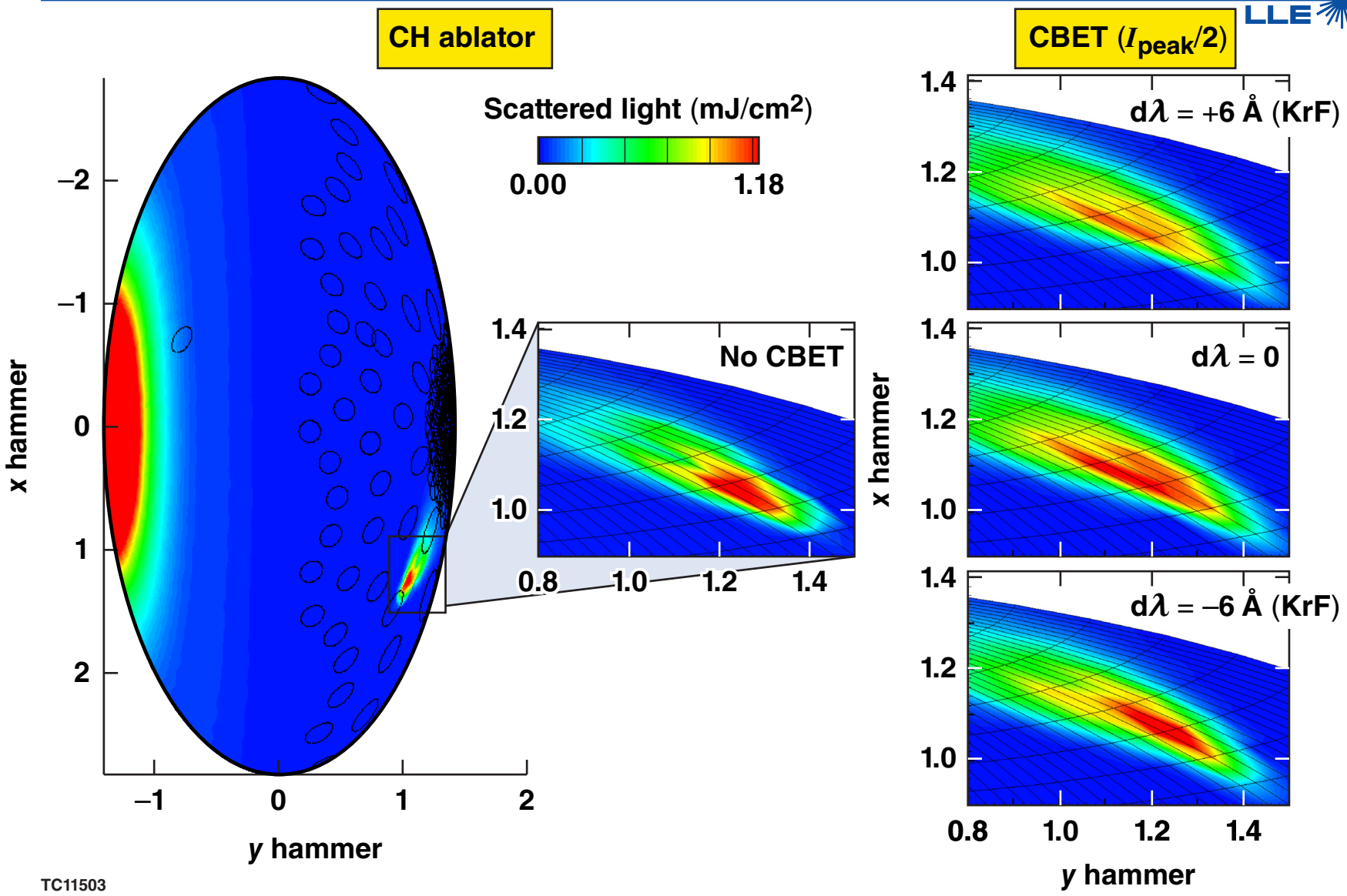




TC11502

J. Weaver *et al.*, NP8.00127, this conference.

Wavelength detuning is predicted to alter the intensity of the scattered signal of the probe beam



Summary/Conclusions

The NIKE laser will be employed to examine the effects of laser wavelength detuning to mitigate cross-beam energy transfer (CBET)

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- The NIKE platform is well suited for these studies, providing a well-diagnosed system over a wide range of detunings (±6Å)
- Various ablator systems will be studied, including basic glass and CH, as well as doped and/or graded shells

Once implemented, the NIKE platform can evaluate the effects of CBET for a variety of ablator systems