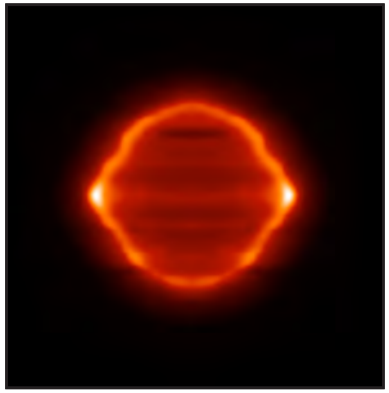
Evaluation of Cross-Beam Energy Transfer in NIF Polar-Drive Exploding-Pusher Experiments

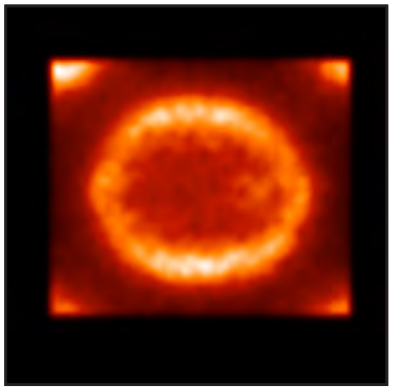
UR LLE

DRACO/Spect3D
(*f* = 0.06)



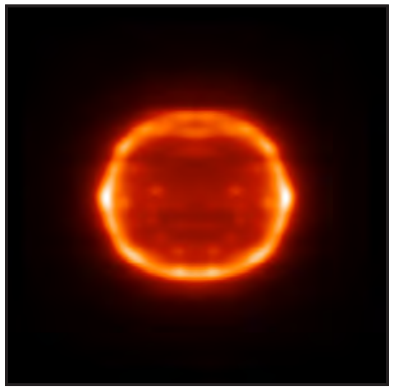
r_{avg} = 339 μm

N120328 GXD



r_{avg} = 341 μm

DRACO/Spect3D
(iSNB, CBET)



r_{avg} = 343 μm

P. W. McKenty
University of Rochester
Laboratory for Laser Energetics

55th Annual Meeting of the
American Physical Society
Division of Plasma Physics
Denver, CO
11–15 November 2013

Summary

Shell symmetry for high-intensity shots is well modeled with *DRACO* when the implicit Schurtz–Nicolaï–Busquet (iSNB)* nonlocal and cross-beam energy transfer (CBET)** models are employed

UR LLE

- Studies with nonlocal electron-transport models indicate increased equatorial drive for illumination patterns derived using $f = 0.06$, flux-limited (FL) simulations
- Examining both the average radius and overall shape of polar-drive (PD) self-emission images is necessary to detect the presence of CBET
- Results confirm that low-intensity (4 to 5 $\times$ 10^{14} W/cm^2) glass ablator implosions are less susceptible to CBET than at higher intensities

*G. P. Schurtz, Ph. D. Nicolaï, and M. Busquet, Phys. Plasmas 7, 4238 (2000).
**J. Marozas *et al.*, CO7.00004, this conference.

TC10732

Collaborators

J. A. Marozas, F. J. Marshall, J. A. Delettrez, R. S. Craxton, M. Hohenberger, D. H. Froula, D. T. Michel, P. A. Olson, S. To, D. D. Meyerhofer, and R. L. McCrory

University of Rochester
Laboratory for Laser Energetics

D. Cao and G. Moses

University of Wisconsin

S. Laffite and L. Videau

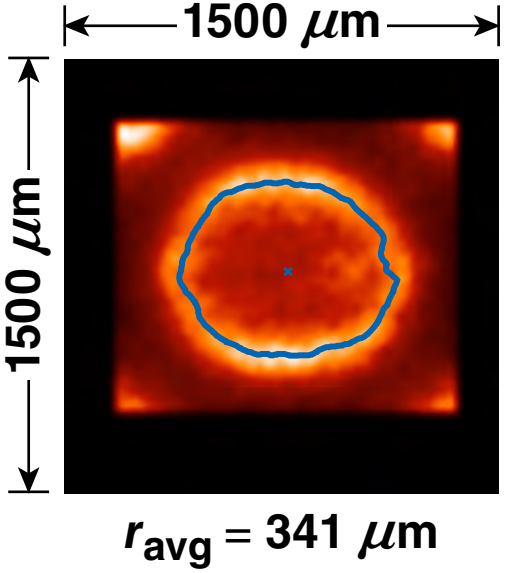
CEA, DAM, DIF, Arpajon FRANCE

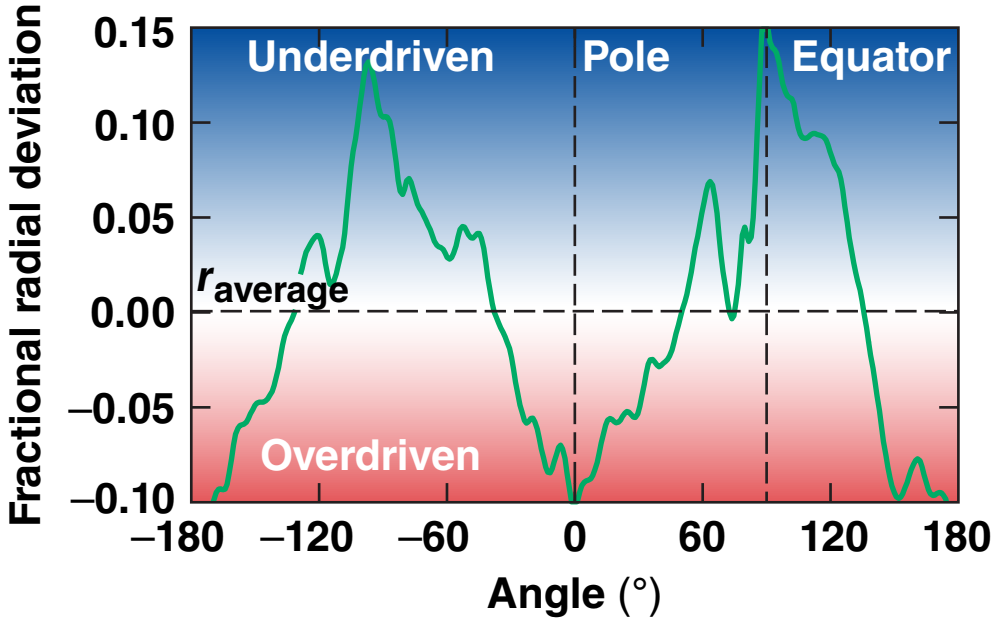
S. LePape, T. Ma, and A. J. Mackinnon

Lawrence Livermore National Laboratory

NIF shot N120328 used a glass ablator to commission neutron particle diagnostics

- N120328 was a 125-kJ, 1540-μm-diam target—peak $I = 1.6 \times 15$ W/cm^2
- A gated x-ray detector (GXD) framing camera was timed to record early-time symmetry development
- GXD images were processed to evaluate the fit of peak shell emission (blue line)



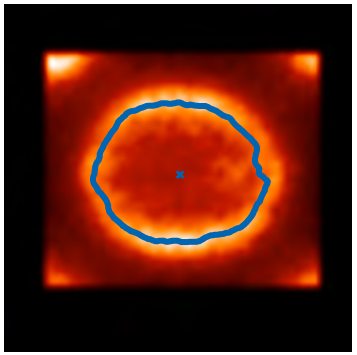


TC10733

F. J. Marshall *et al.*, UO4.00006, this conference.

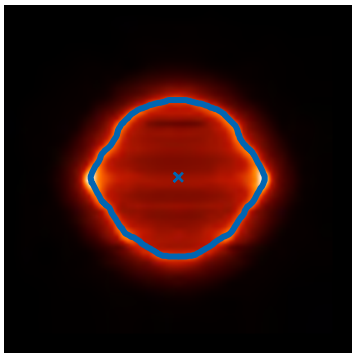
Comparison of processed GXD images for shot–120328 with f = 0.06 modeling clearly indicated issues

N120328 GXD

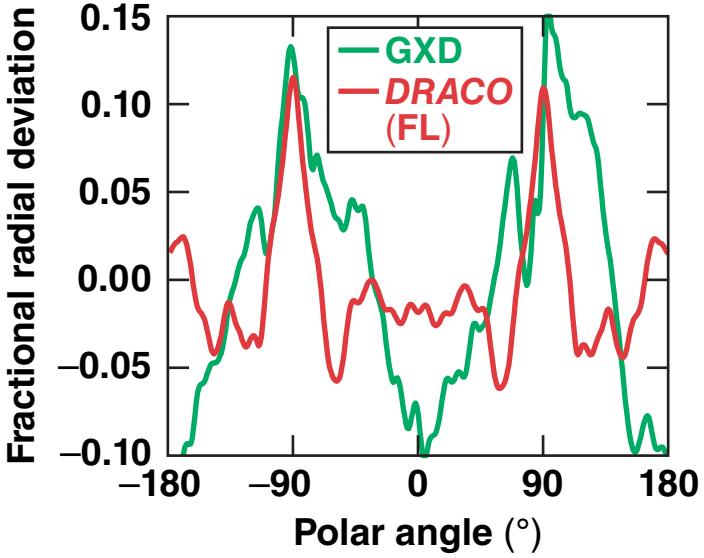


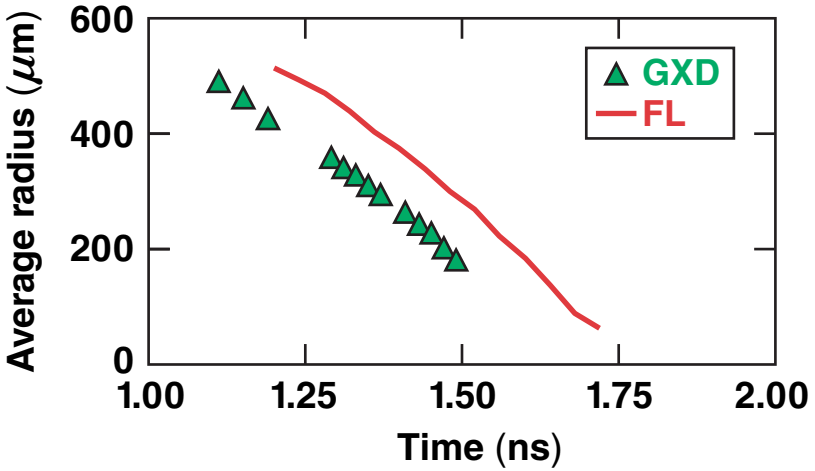
r_{avg} = 341 μm

*DRACO/Spect3D** (FL)



r_{avg} = 339 μm

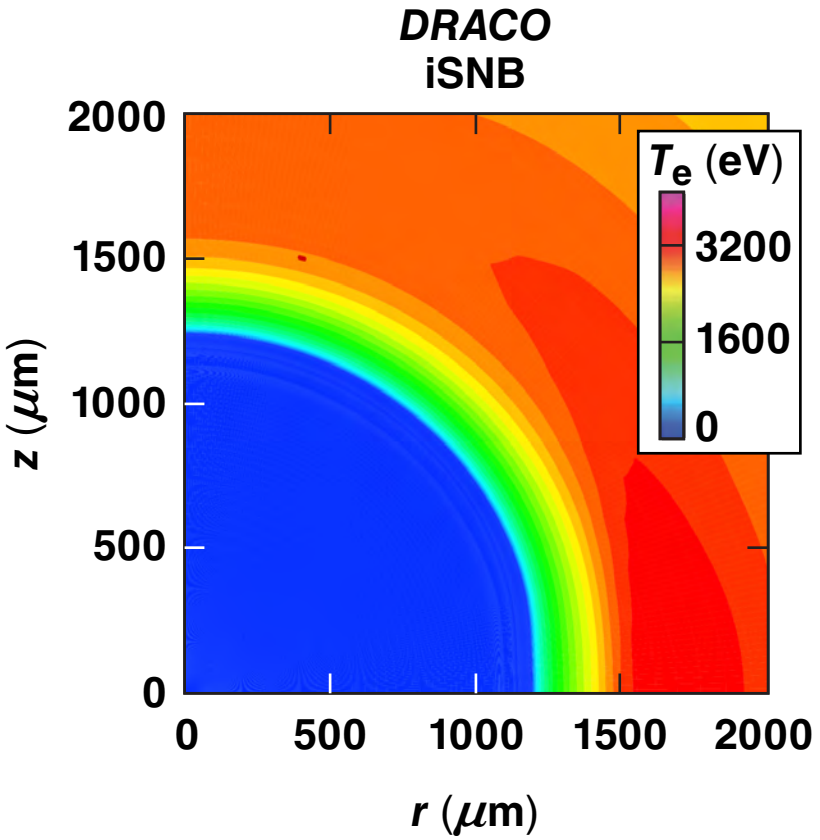


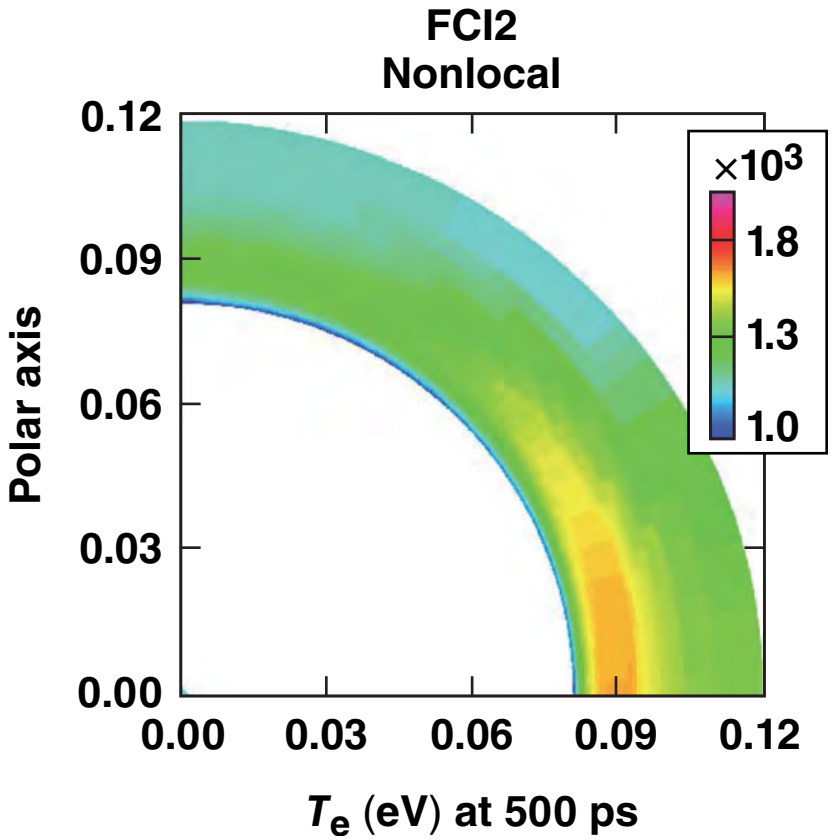


*Prism Computational Sciences, Inc. Madison, WI 53711

TC10734

Using nonlocal electron transport in PD targets designed with $f = 0.06$ show enhanced equatorial absorption



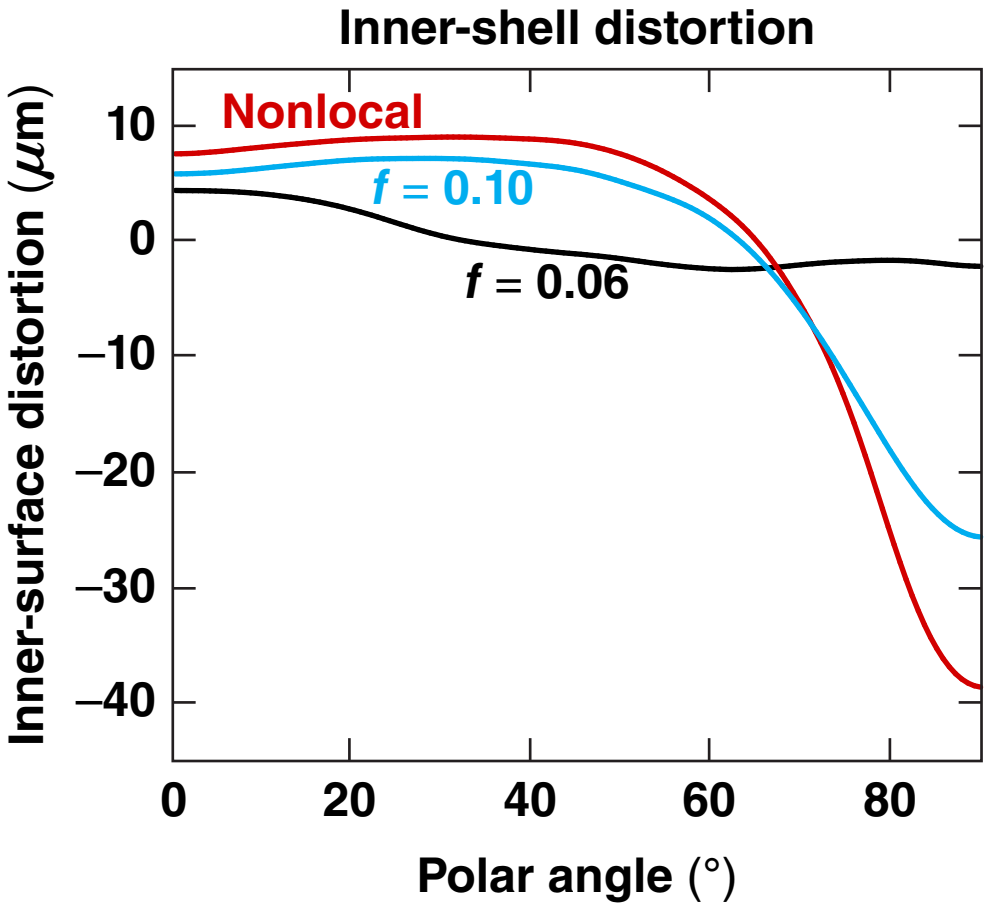


J. A. Delettrez *et al.*, UO4.00007, this conference; D. Cao *et al.*, TP8.00081, this conference.

Courtesy of S. Laffite and L. Videau, CEA.

TC10735

The increased radial heat flux predicted by the nonlocal transport leads to higher drive near the target equator

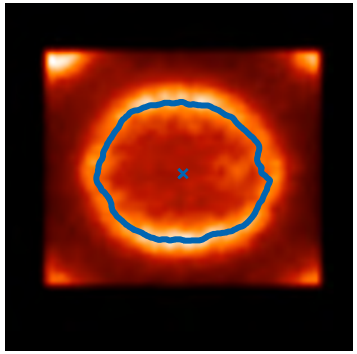


TC10237a

Application of the iSNB model for shot N120328 overdrives the equatorial region of the target

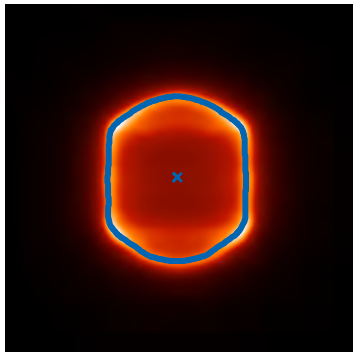
UR LLE

N120328 GXD

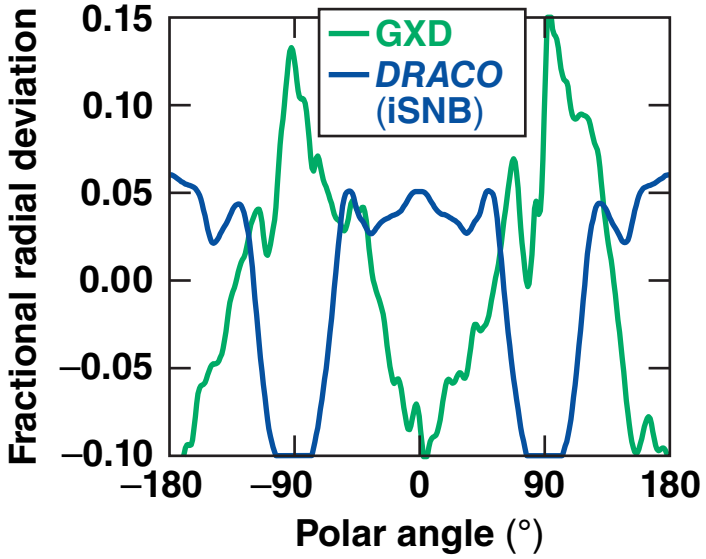


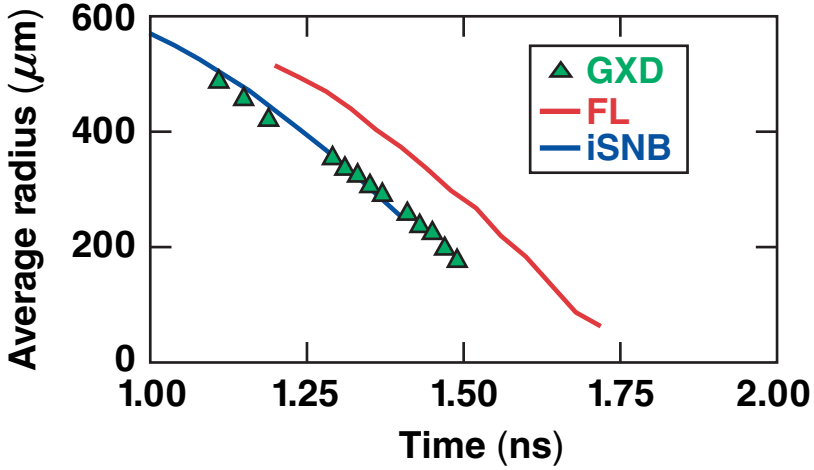
r_{avg} = 341 μm

***DRACO*/Spect3D**
(iSNB)



r_{avg} = 332 μm

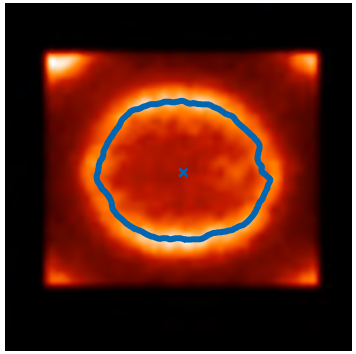




TC10928

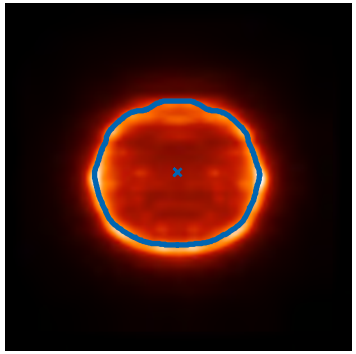
Qualitative agreement exists when N120328 data is compared to simulations using both iSNB and CBET

N120328 GXD

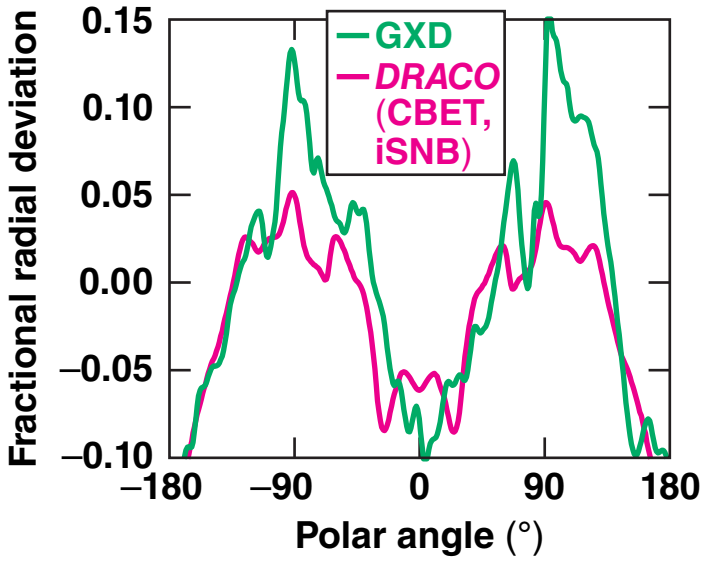


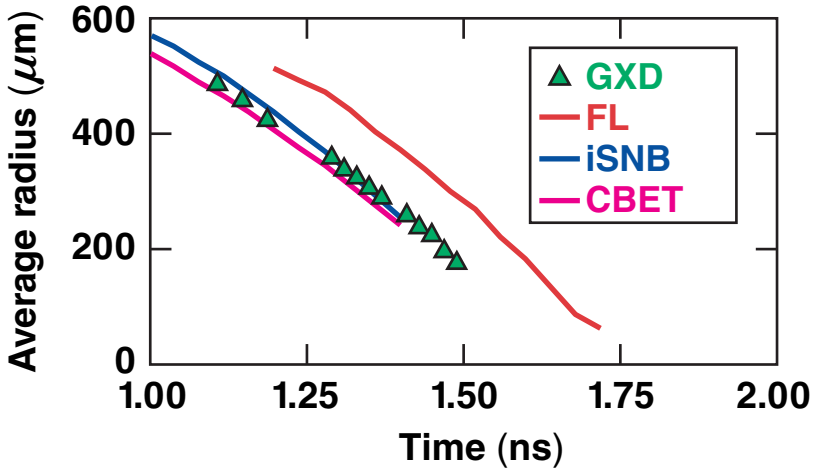
r_{avg} = 341 μm

DRACO/*Spect3D* (iSNB, CBET)



r_{avg} = 343 μm

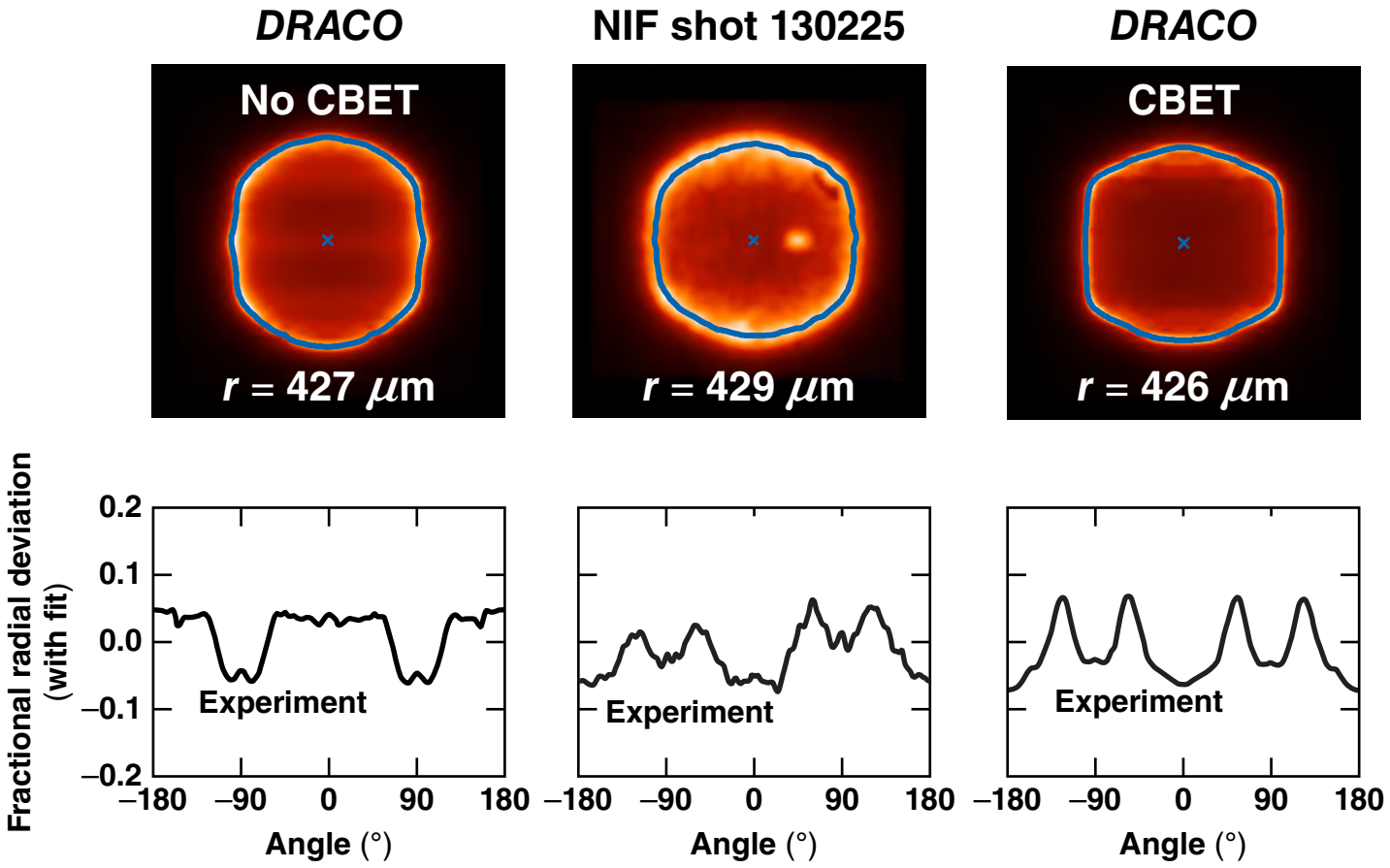




TC10929

Shot N130225, with the same intensity as N120328, also demonstrates the need for using both iSNB and CBET

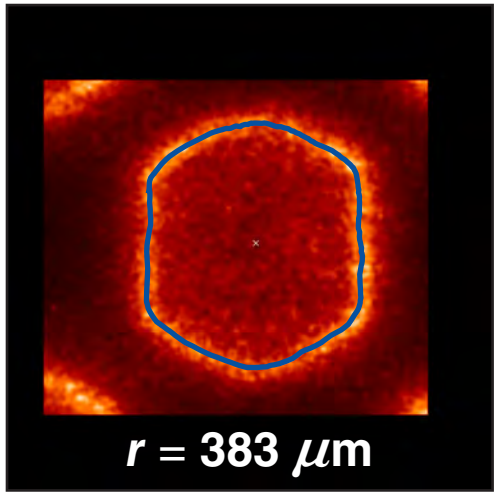
- N130225 is a 130-kJ, 1523-μm-diam target: peak $I = 1.6 \times 10^{15}$

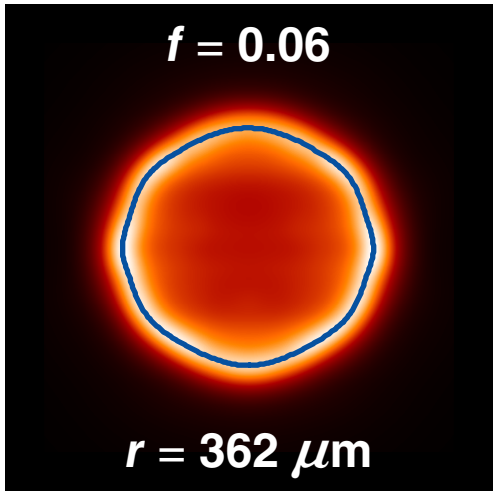


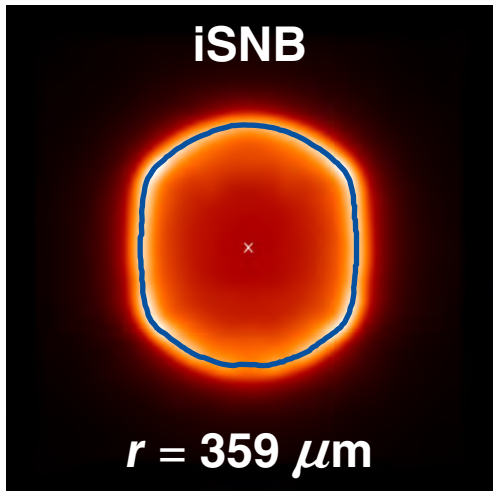
TC10629a

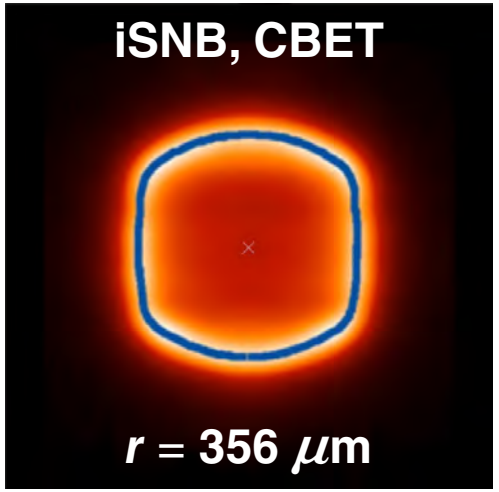
Results of shot N130129 confirm that the effects of CBET are negligible at lower intensities

N130129 was a 50-kJ, 1540-mm-diam target – peak $I = 4.6 \times 15$ W/cm^2









TC10930

Summary/Conclusions

Shell symmetry for high-intensity shots is well modeled with *DRACO* when the implicit Schurtz–Nicolaï–Busquet (iSNB)* nonlocal and cross-beam energy transfer (CBET)** models are employed

UR LLE

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TC10732