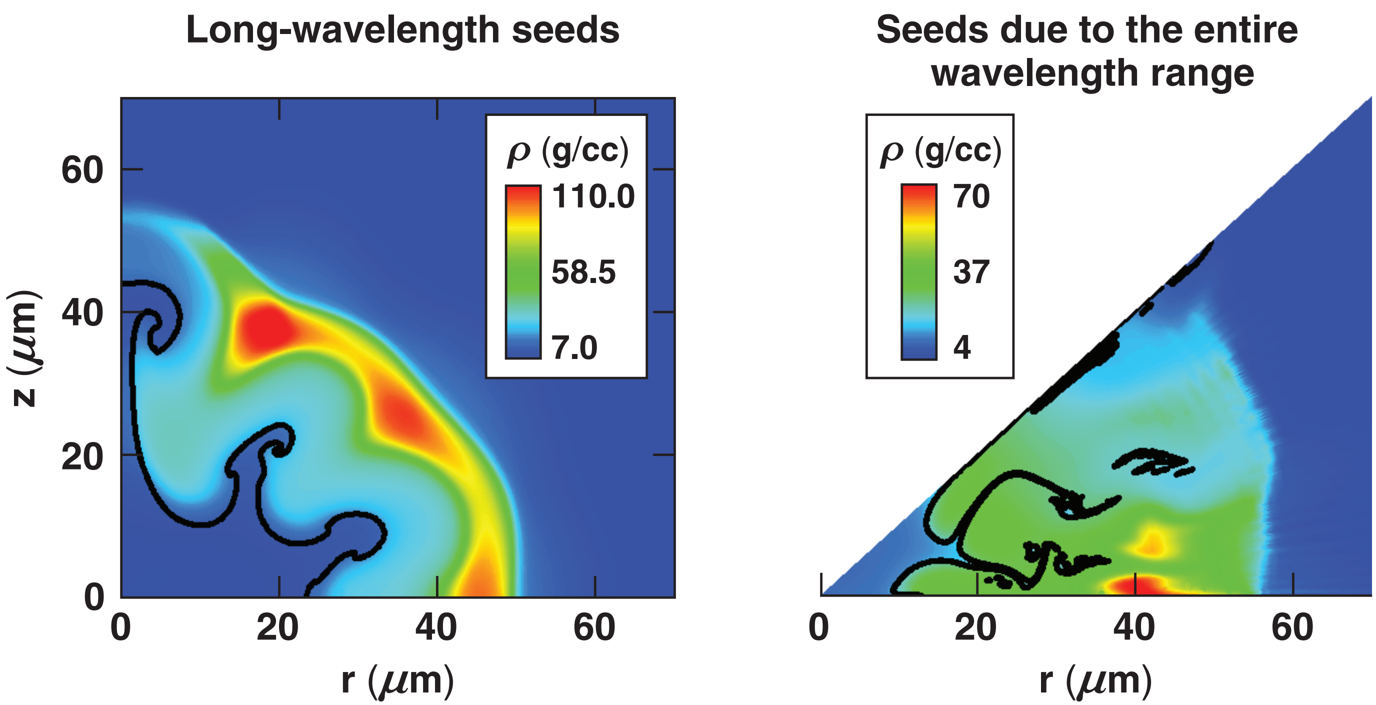
Two-Dimensional Simulations of Plastic-Shell Implosions on OMEGA

$\alpha = 2$ implosion at peak neutron production



P. B. Radha
University of Rochester
Laboratory for Laser Energetics

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Collaborators

**V. N. Goncharov, J. P. Knauer, J. A. Marozas, S. P. Regan,
K. Anderson, R. Betti, V. Yu. Glebov, D. D. Meyerhofer,
T. C. Sangster, and C. Stoeckl**

**Laboratory for Laser Energetics
University of Rochester**

J. A. Frenje, R. D. Petrasso, and C. K. Li

**Plasma Fusion Science Center
Massachusetts Institute of Technology**

D. Shvarts

**Department of Physics
Negev Research Center, Negev, Israel**

Summary

A trade-off between compression and stability has been identified for implosions with different adiabats

- Plastic shells were imploded on OMEGA using tailored pulse shapes that set the shell on varying adiabats.

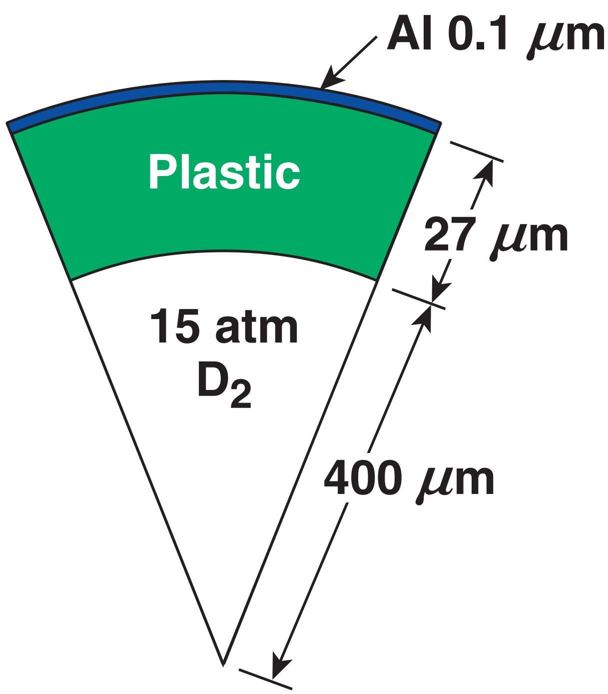
- Two-dimensional *DRACO* simulations indicate that short wavelengths play an important role in determining target performance for low-adiabat implosions.

- In contrast to high-adiabat implosions, target performance for low-adiabat implosions is also significantly influenced by the nonuniformity between OMEGA beams, which manifest in long-wavelength perturbations.

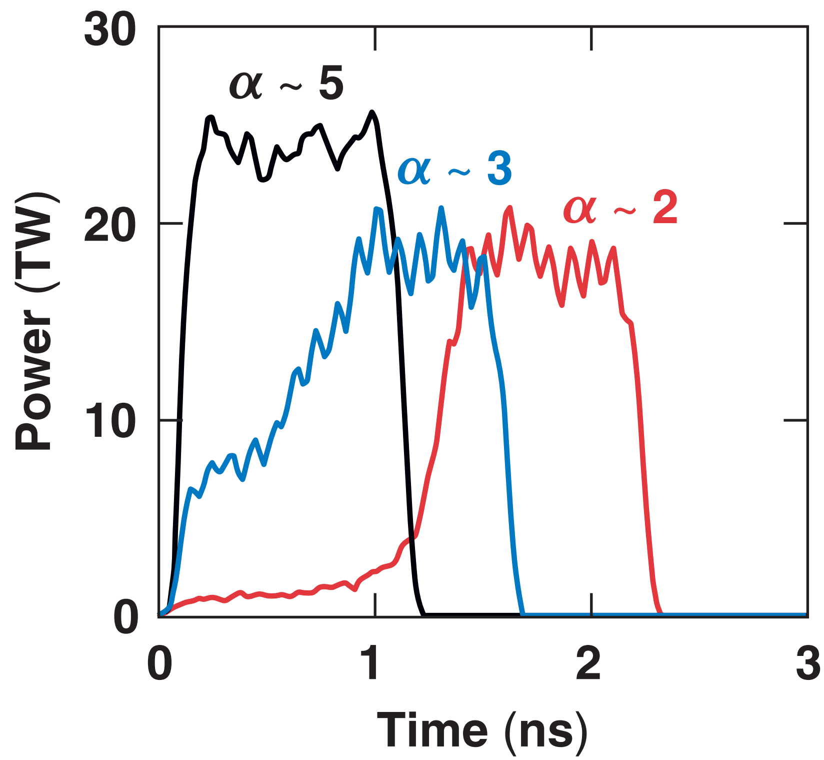
- The best target performance is obtained for an intermediate adiabat, consistent with the experiment.

Pulse shaping is used to vary the adiabat in plastic shell implosions

Target



Pulse shapes



$\alpha = P/P_{Fermi}$

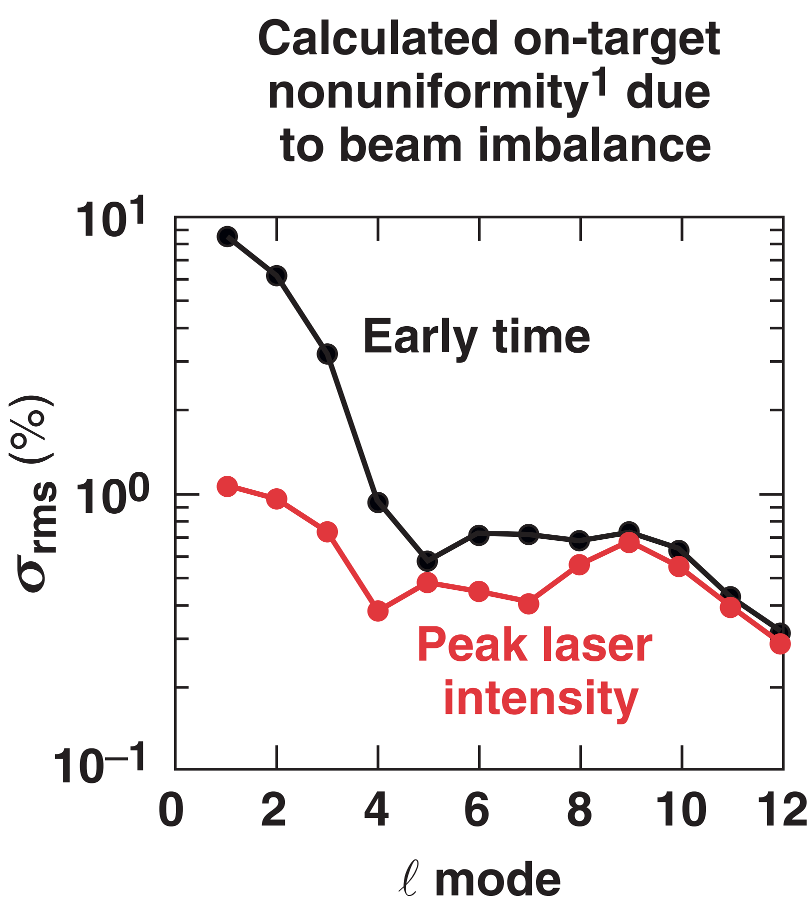
α	CR
2	17
3	15
5	12

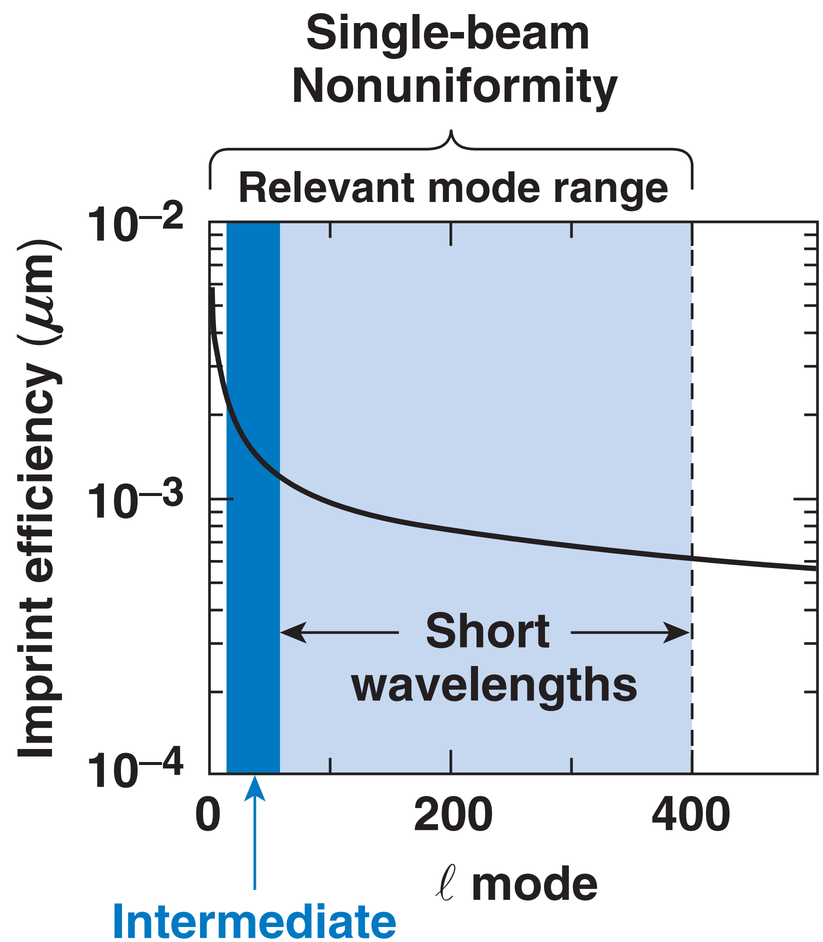
- 1-THz, 2-D SSD with polarization, smoothing was used in these implosions

TC7148

See Knauer FO3.7; Regan FO3.6; Goncharov BO1.1

Beam imbalance manifests in long wavelength modes whereas single-beam nonuniformity results in intermediate and short-wavelength perturbations





TC7149

[1]Calculation by J. Marozas

Low-adiabat implosions show greater sensitivity to long wavelength nonuniformities than high-adiabat implosions

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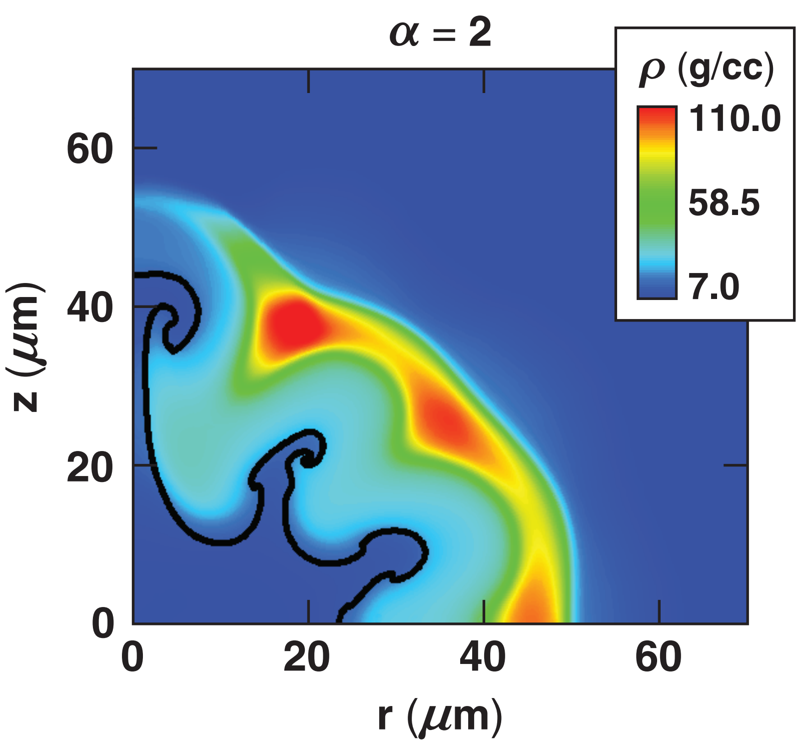
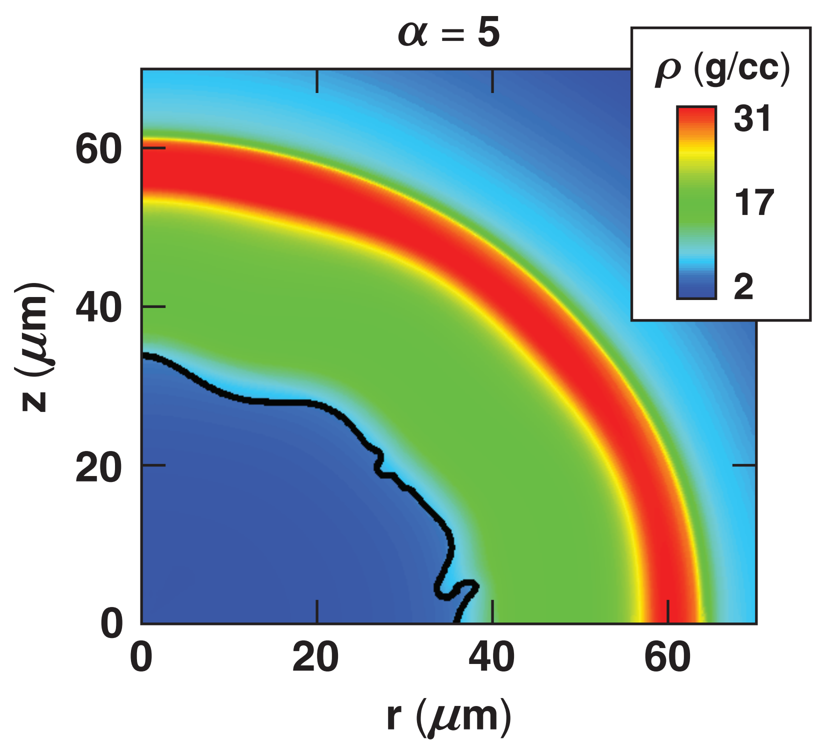
Density contours at peak neutron production

- *DRACO* simulation with modes 2 to 10 only





α	YOC (2-D)	YOC (expt.)
2	50	7±2
5	92	58±9

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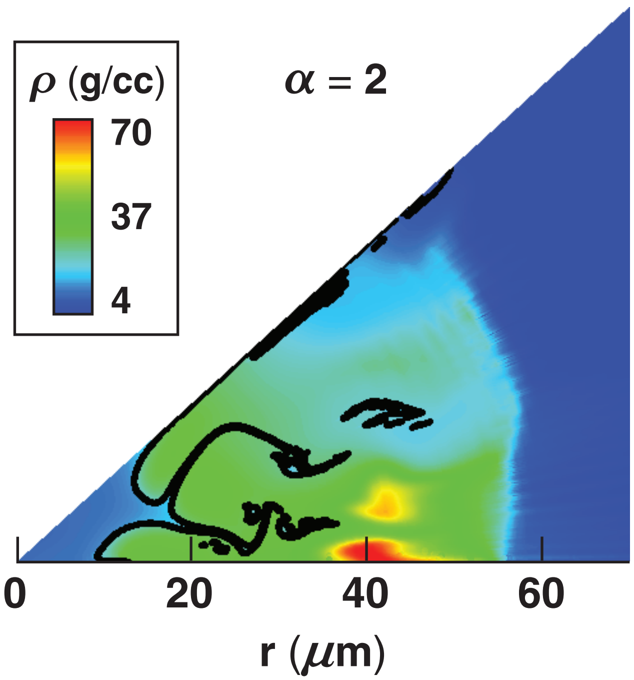
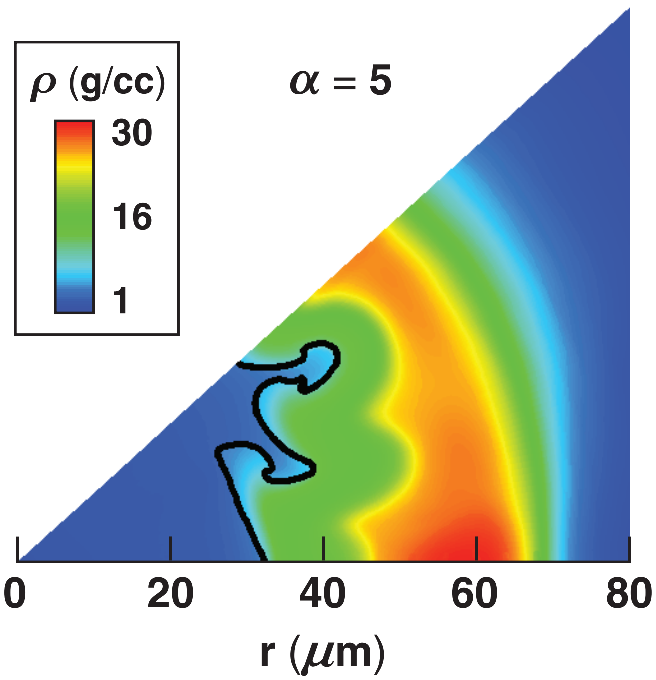
Low-adiabat target performance is significantly affected by the intermediate and short wavelengths

- 2-D simulation with modes 4 (long), 20 (intermediate), and 200 (short)* at peak neutron production in 1-D



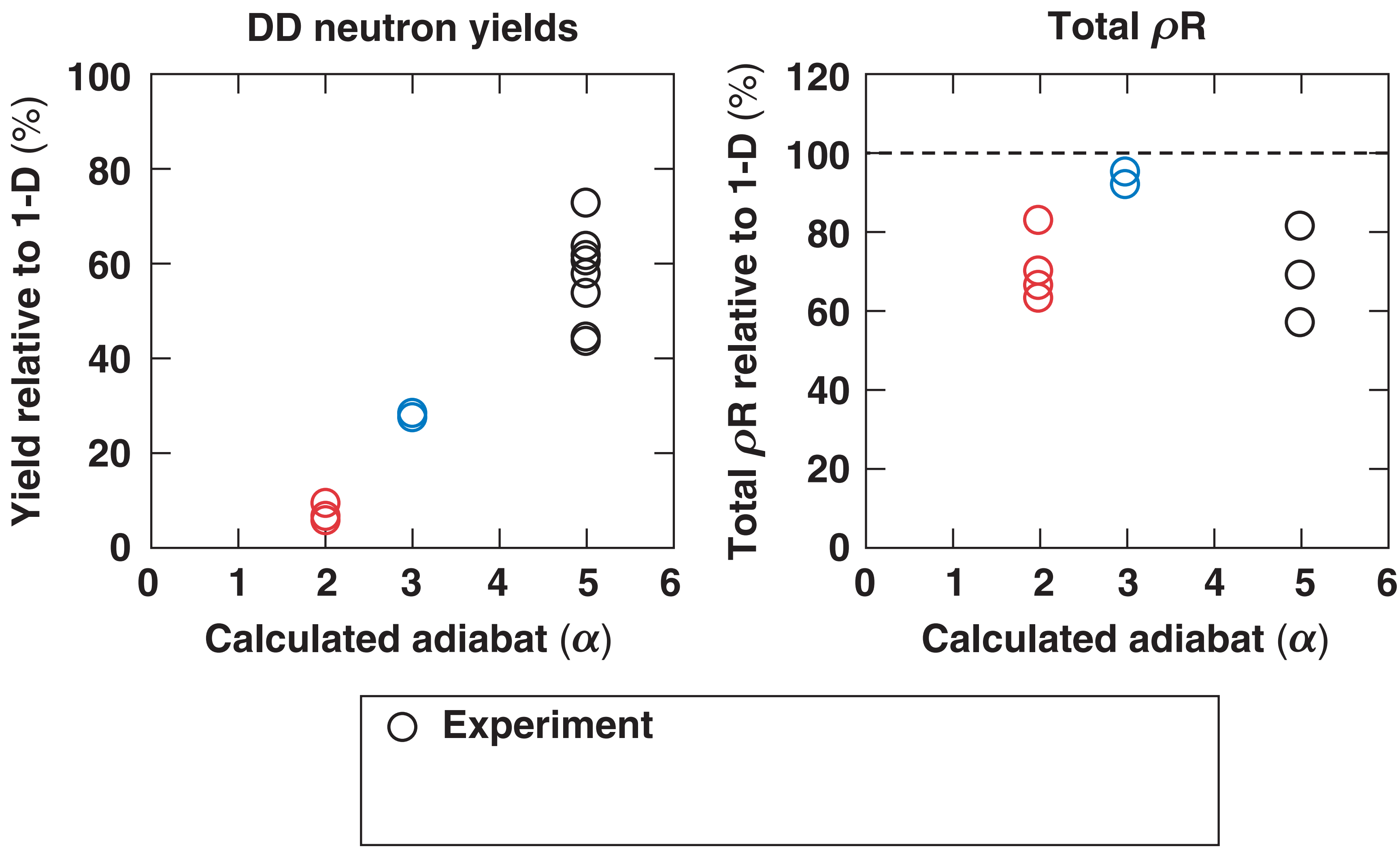


(% 1-D)	$\alpha = 2$	$\alpha = 5$
YOC (2-D)	24	60
$\rho R_{2D}/\rho R_{1D}$	69	92

*P. B. Radha *et al*., Phys. Plasmas 12, 56307 (2005).

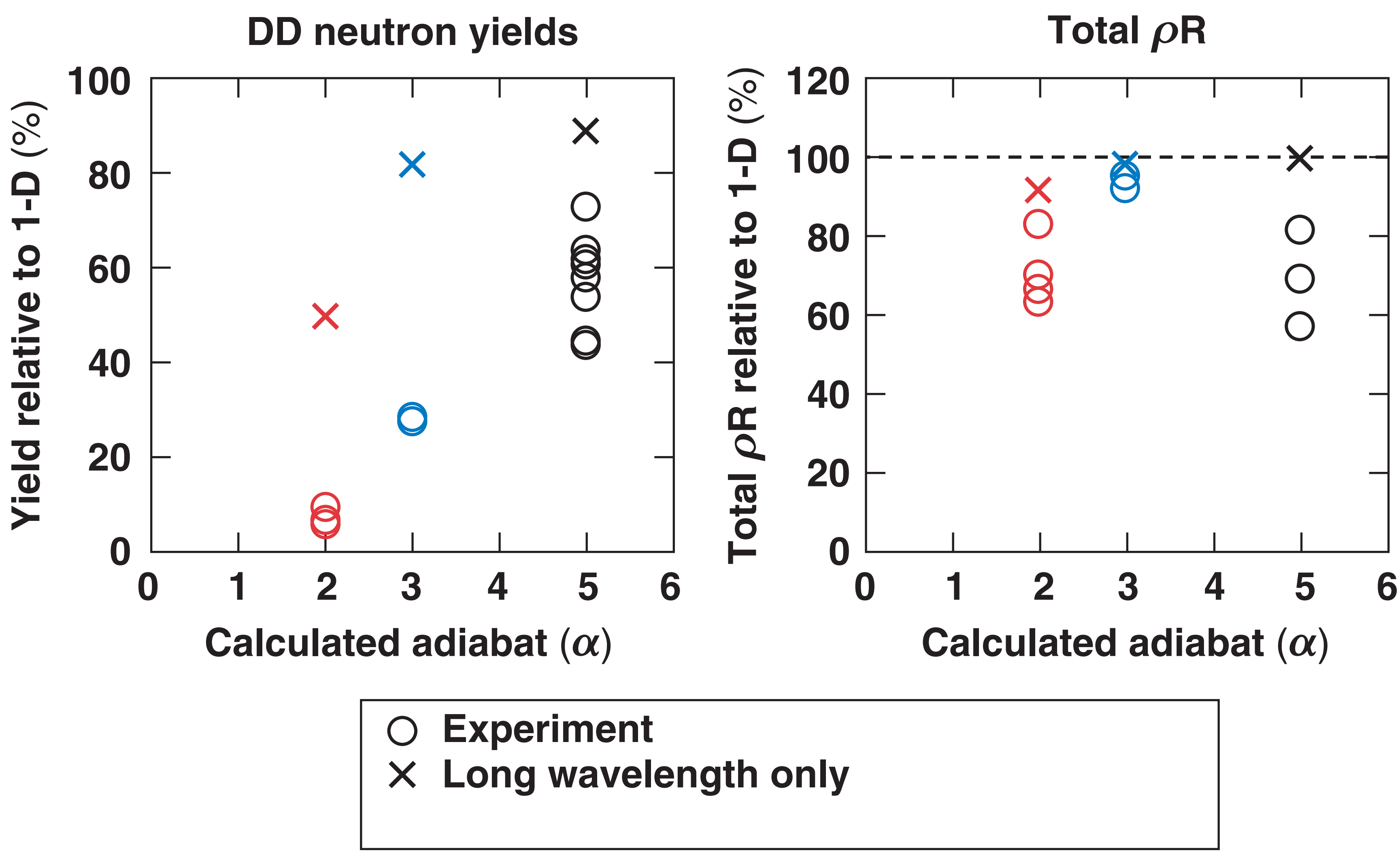
TC7151

Two-dimensional simulations reproduce trends in experimental data



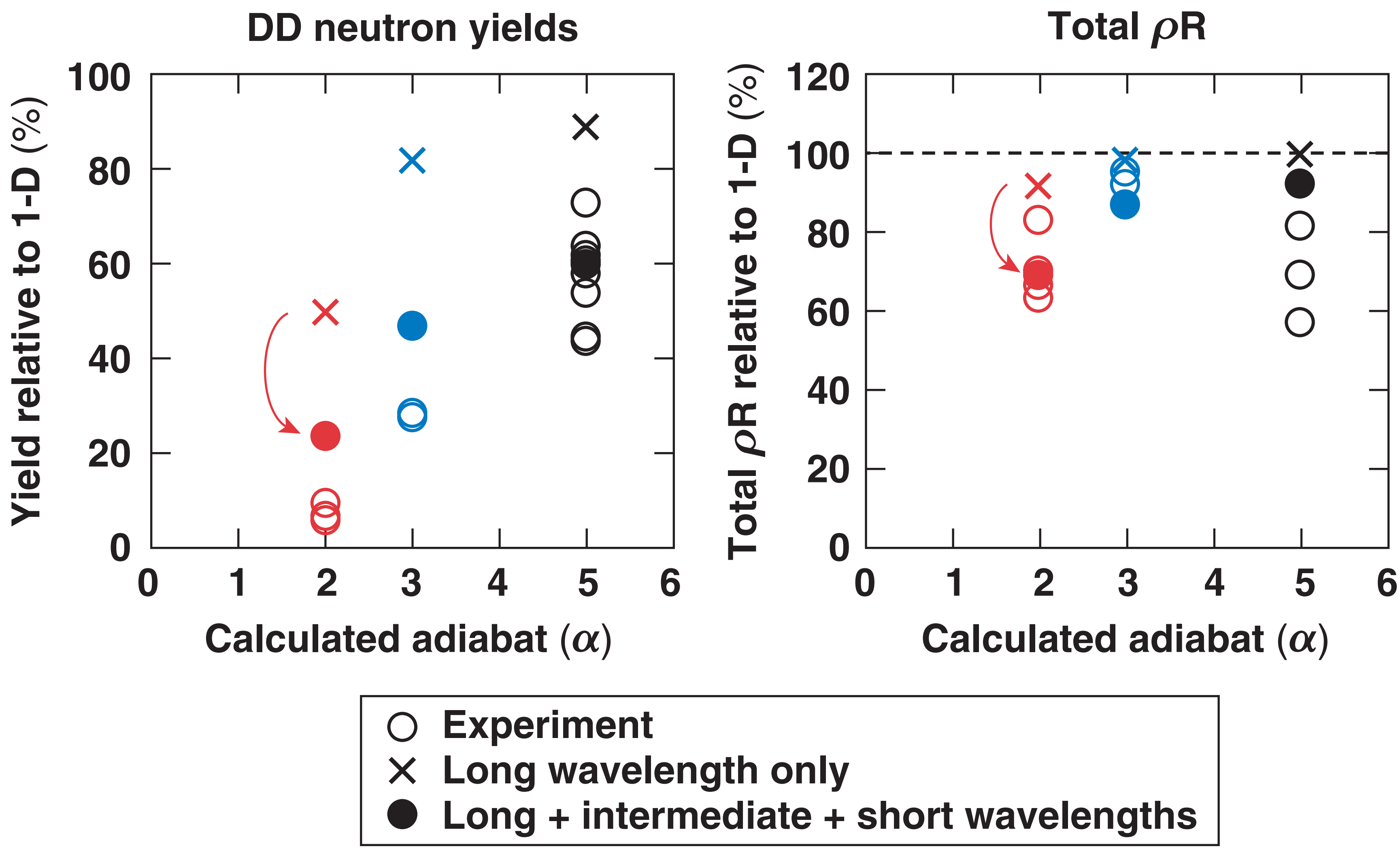
TC7152

Two-dimensional simulations reproduce trends in experimental data



TC7152

Two-dimensional simulations reproduce trends in experimental data



TC7152

DRACO simulations indicate that the best target performance occurs around $\alpha \sim 3$, consistent with the experiment

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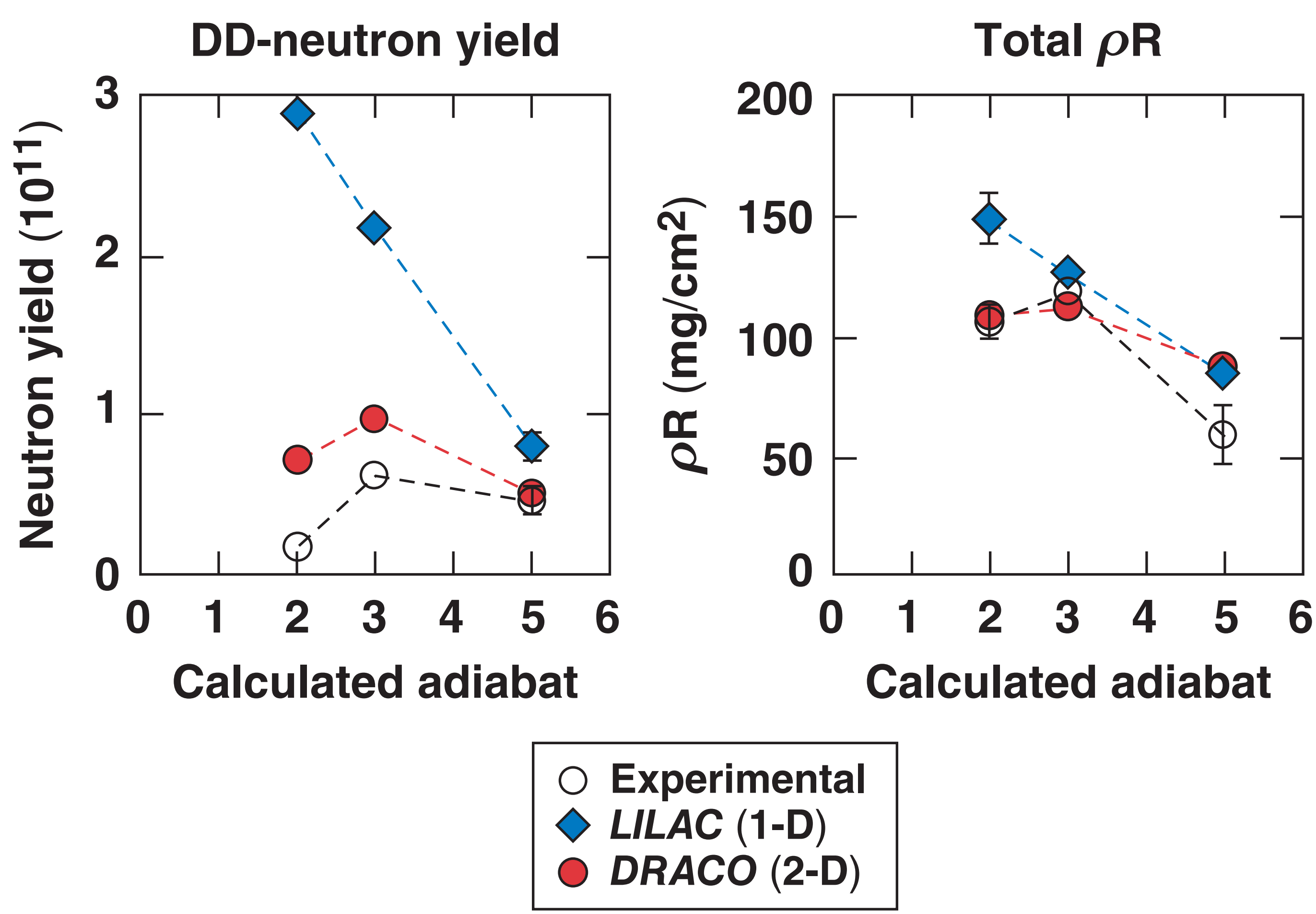

TC7279

Summary/Conclusions

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