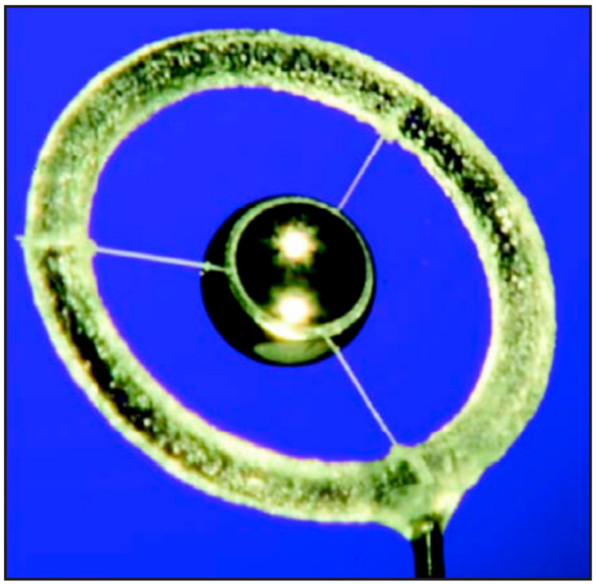
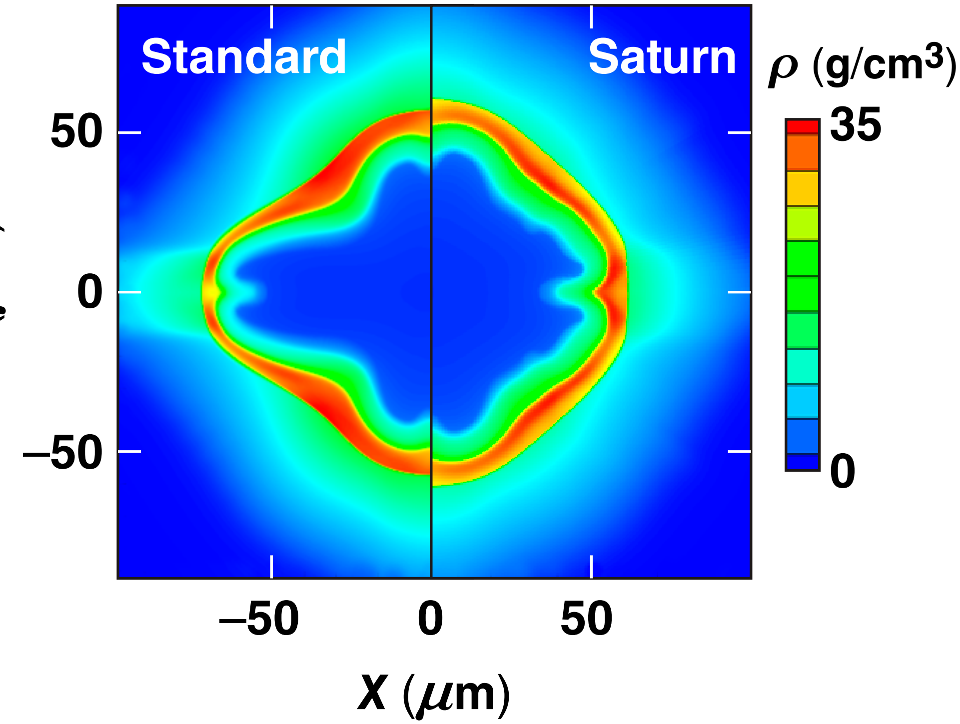
Numerical Investigation of Initial Low-Adiabat OMEGA Polar-Drive Implosions

Saturn target



Ring improves equatorial drive



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Division of Plasma Physics
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Summary

Concurrence of measured and simulated framed x-ray radiographs demonstrate control of OMEGA low-adiabat polar-drive* implosion symmetry

- Work continues on the verification of the NIF polar-drive (PD) ignition design on OMEGA.
- Earlier experiments optimizing high-adiabat PD implosions were successful in recovering the yield of symmetric implosions done with identical targets.
- Improved numerical sliding-grid algorithm allows better resolution around the Saturn ring and at the ablation surface within the target.
- Experiments are being designed that will demonstrate that low-adiabat PD implosions recover symmetric-illumination yields.

*R. S. Craxton *et al*., Phys. Plasmas 12, 056304 (2005).
F. J. Marshall *et al*., J. Phys. IV France 133, 153 (2006).
J. Marozas *et al*., Phys. Plasmas 13, 056311 (2006).

Related Talk:
F. J. Marshall (NO5.00001).

TC8370

Collaborators

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Previously high-adiabat PD experiments on OMEGA achieved near-symmetric-illumination yields*

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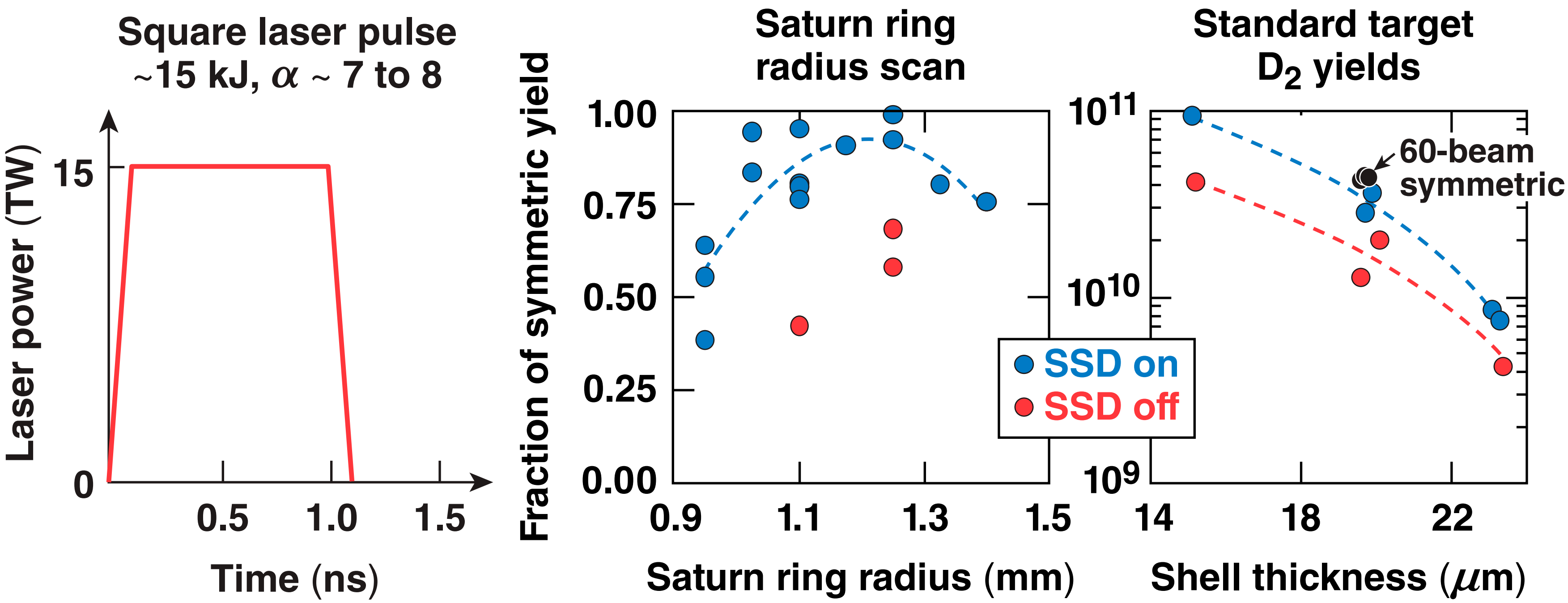
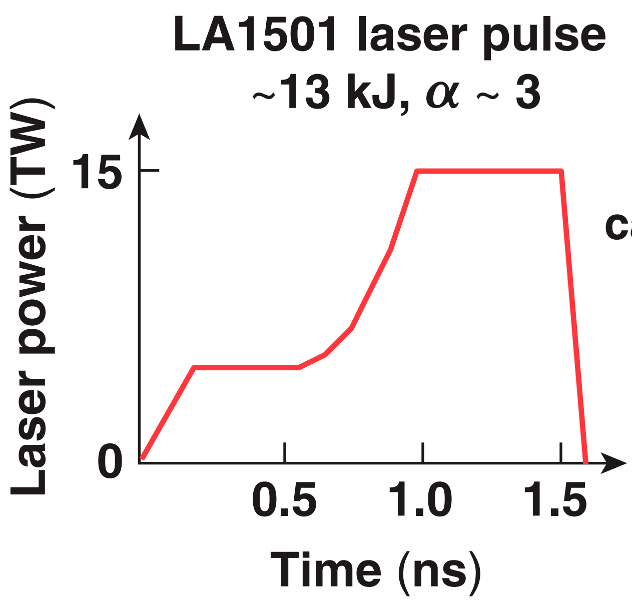
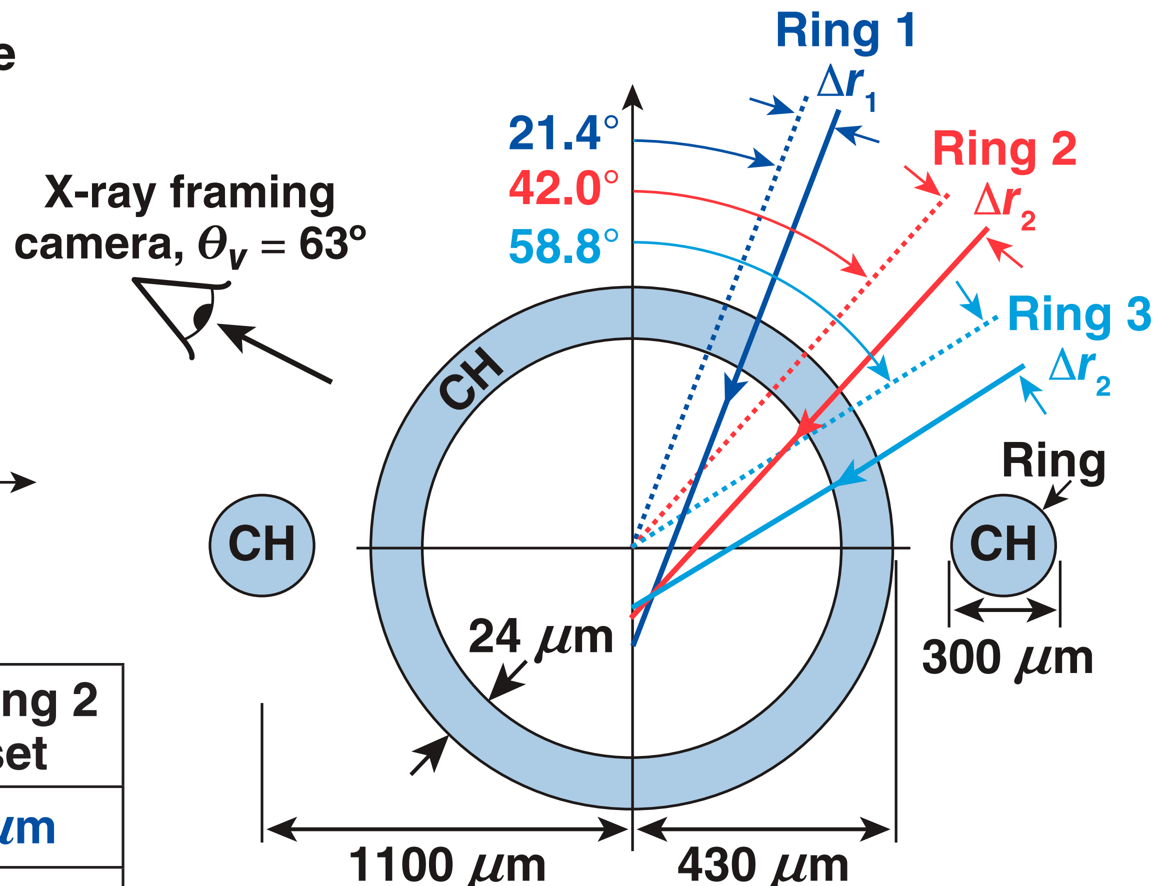


TC8371

*F. J. Marshall *et al.*, Bull. Am. Phys. Soc. 51, 106 (2006), paper GO2.

Initial low-adiabat PD experiments were performed with two-beam repointing configurations



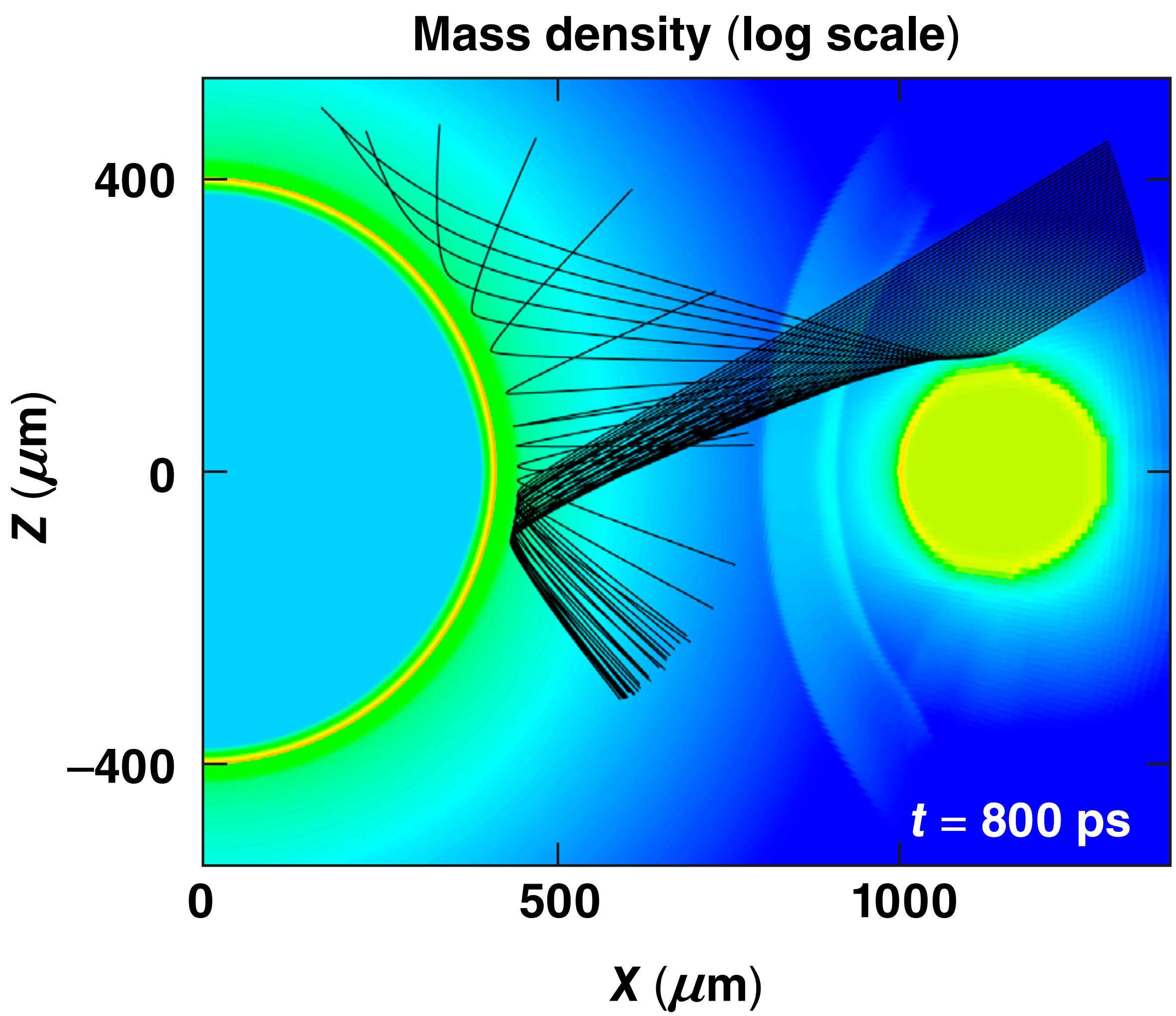


Ring	Pointing 1 offset	Pointing 2 offset
Δr_1	90 μm	90 μm
Δr_2	150 μm	120 μm
Δr_3	150 μm	120 μm

TC8373

Eulerian 2-D *DRACO* simulations with 3-D laser ray trace resolve plasma flow and laser refraction around the ring

- **High-resolution Godunov-type scheme**
- **Nonuniform spherical grid with improved sliding-grid algorithm**
- **Multigroup radiation-diffusion transport**



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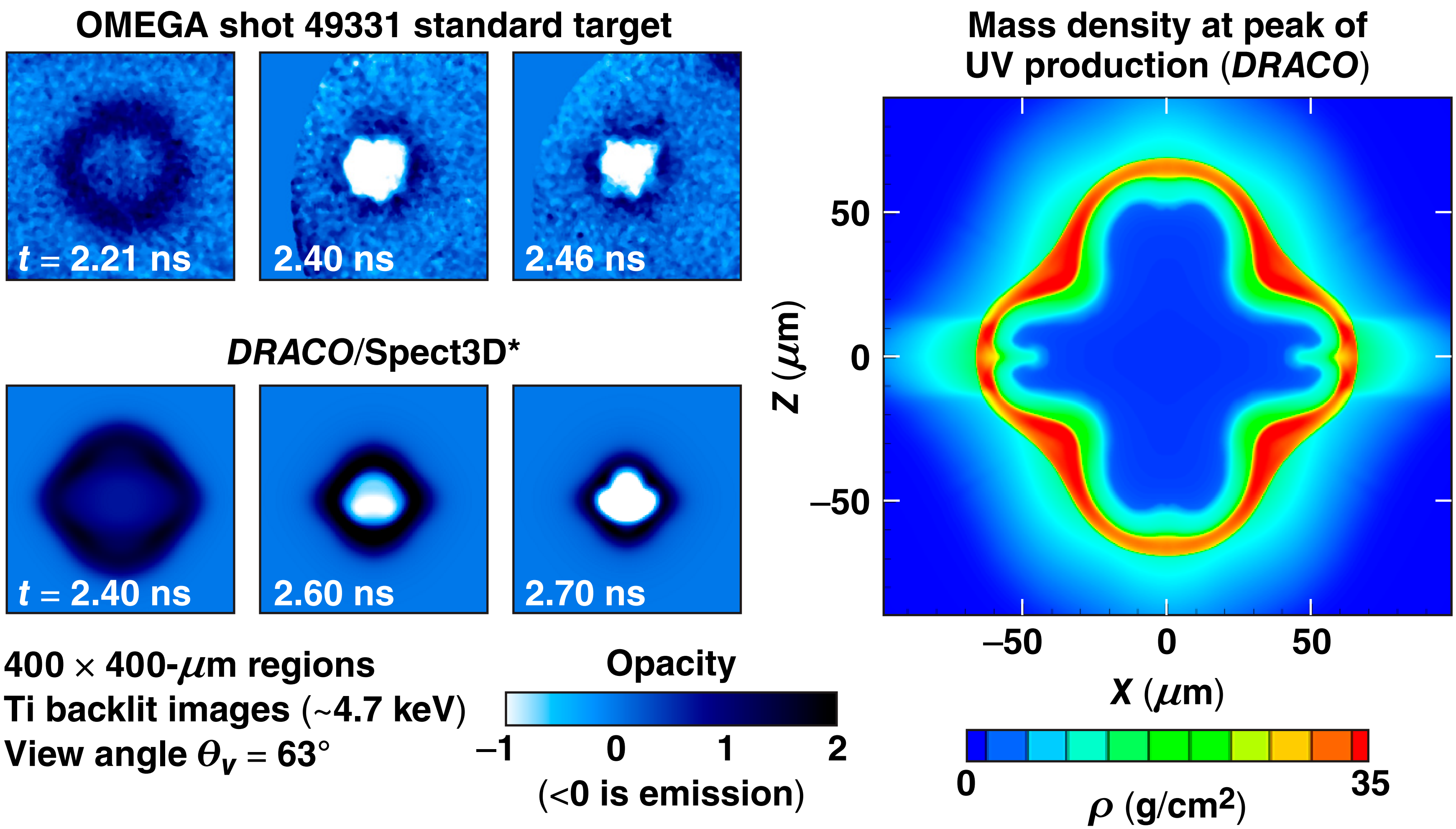
The first beam-pointing case (90, 150, 150-μm offset) is more appropriate for driving standard PD targets

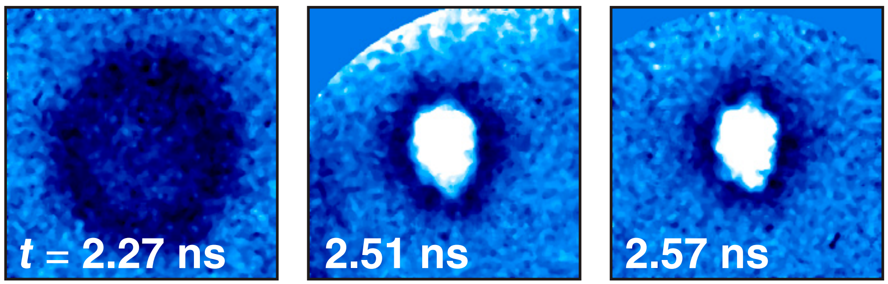


TC8375

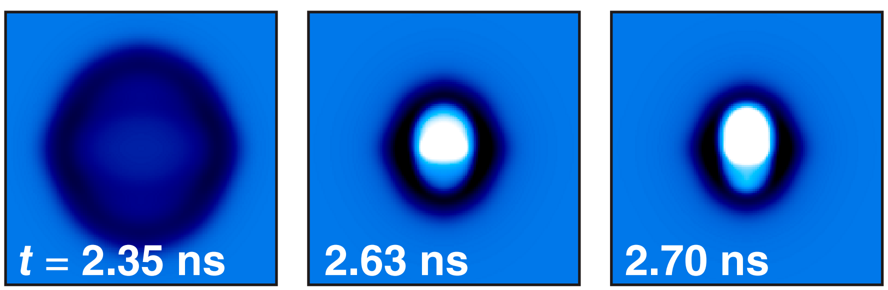
*Spect3D: Prism Computational Sciences, Inc., Madison, WI

The first beam-pointing case (90, 150, 150-μm offset) overdrives the Saturn target equator, producing a prolate implosion

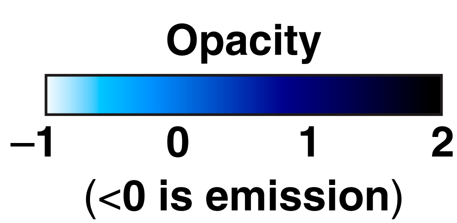
OMEGA shot 49333 Saturn target



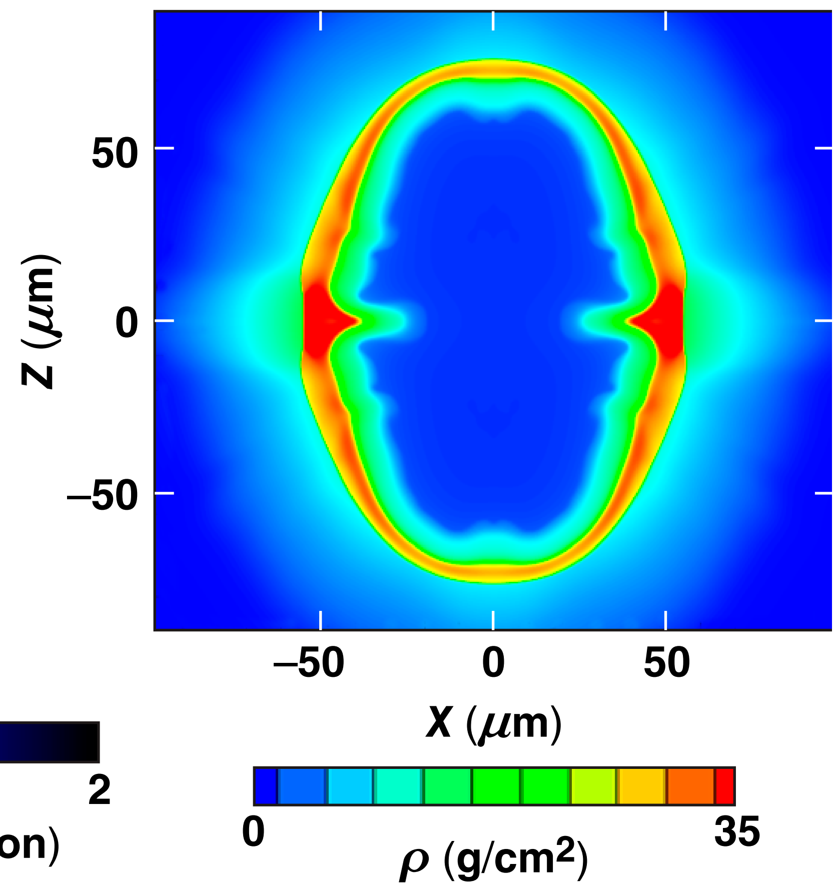
DRACO*/Spect3D



400 × 400-μm regions
Ti backlit images (~4.7 keV)
View angle θ_V = 63°



Mass density at peak of UV production (*DRACO*)



TC8376

*Spect3D: Prism Computational Sciences, Inc., Madison, WI

The second beam-pointing case (90, 120, 120-μm offset) underdrives the standard target equator, producing an oblate implosion

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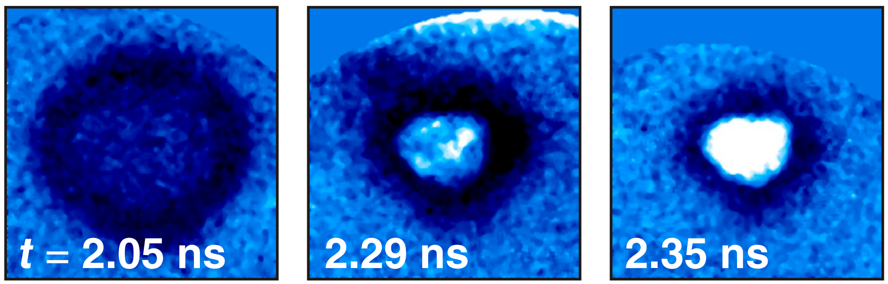
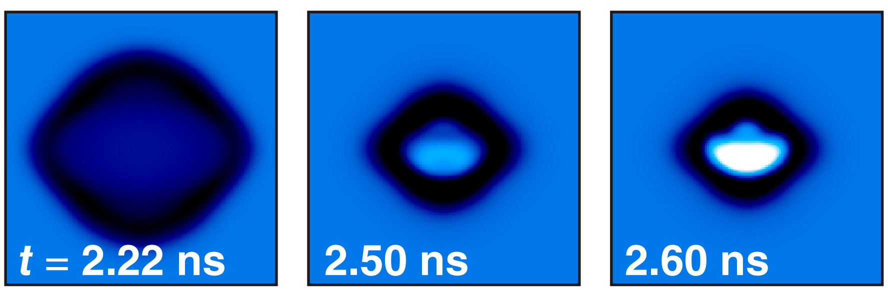
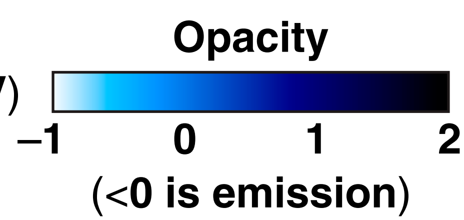
OMEGA shot 52135 standard target



DRACO*/Spect3D



400 × 400-μm regions
Sc backlit images (~4.3 keV)
View angle $\theta_V = 63°$



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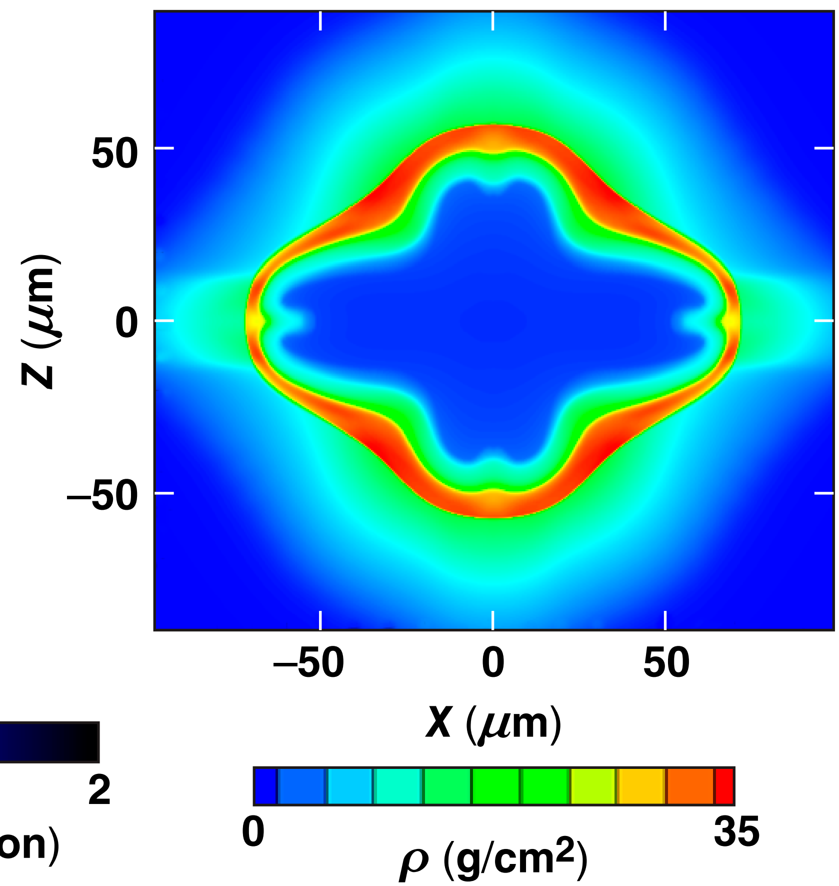

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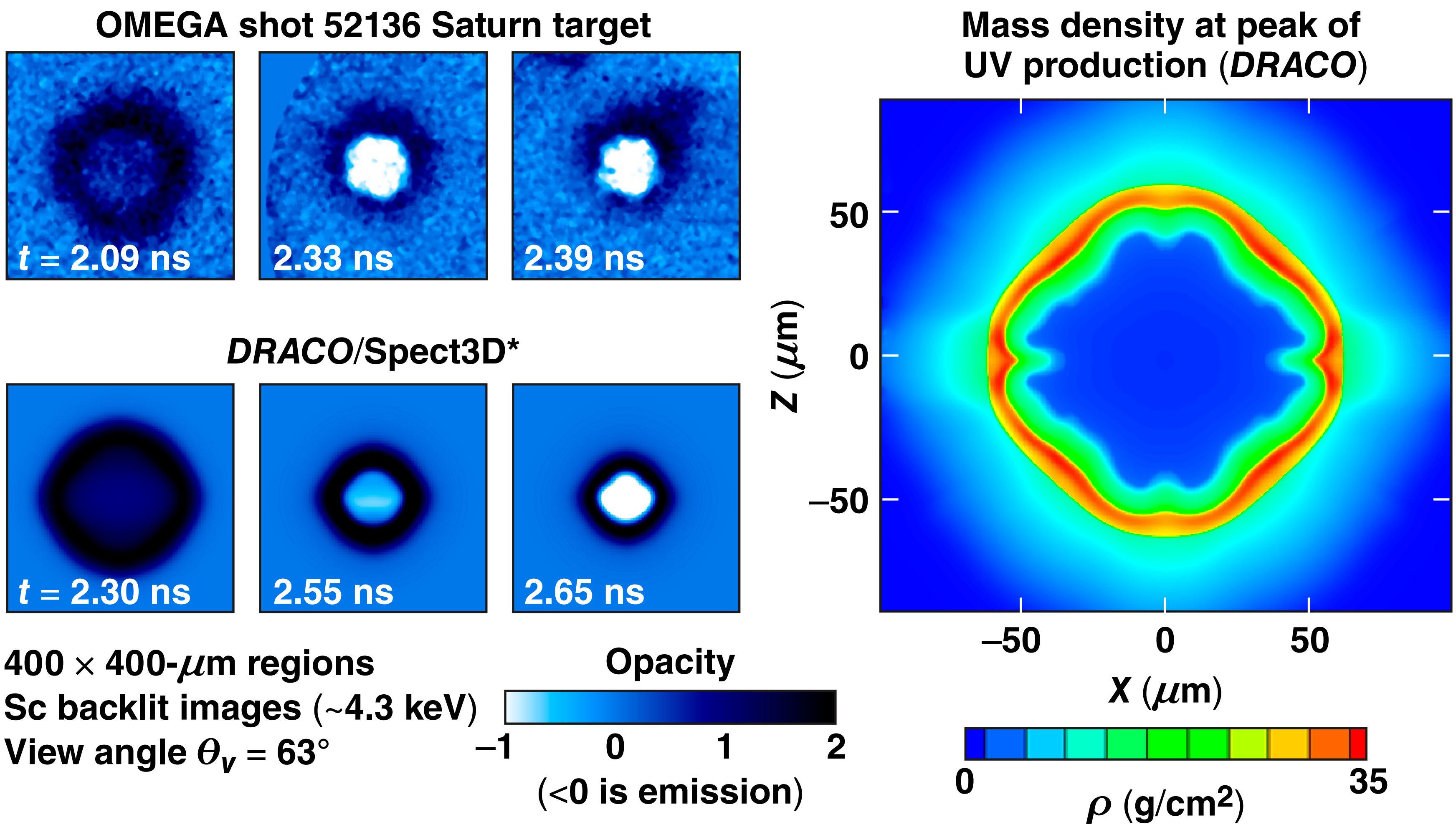
*Spect3D: Prism Computational Sciences, Inc., Madison, WI

The second beam-pointing case (90, 120, 120-μm offset) produces a more-uniform Saturn target implosion



TC8378

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