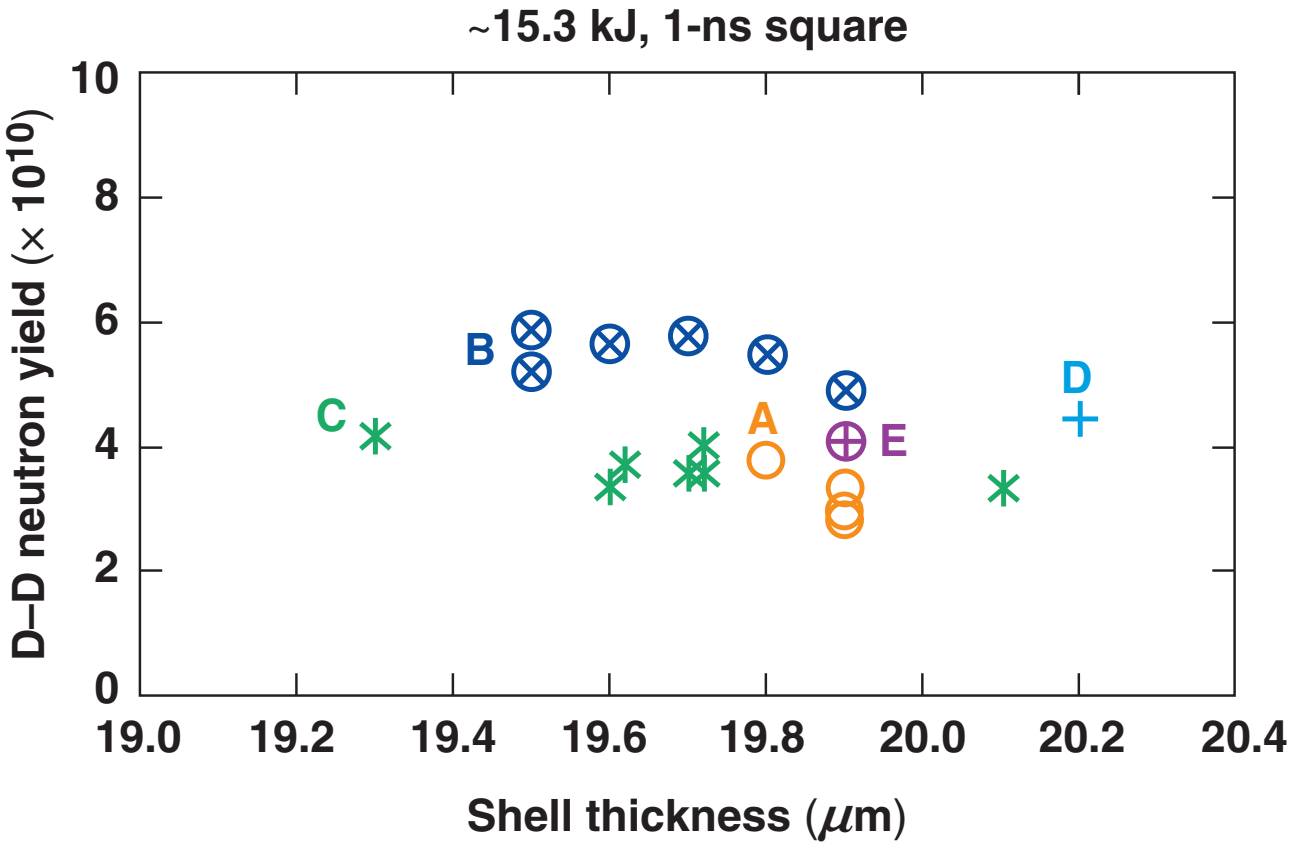
An Update on Polar-Direct-Drive Experiments on OMEGA



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Summary

The performance of Saturn polar-direct-drive (PDD) targets can be improved by optimizing the manufacturing and mounting

UR LLE

- Symmetric PDD implosions are routinely obtained on OMEGA
- Target-related factors can affect the performance
  - mounting scheme (webs versus spokes)
  - ring fabrication method
  - Al barrier thickness
- Spherical PDD implosions are backlit to study implosion physics
  - the effects of beam smoothing can be observed

Outline

- Review PDD experiments on OMEGA
- Yield results from near-symmetric implosions
  - examine which factors produce the best performance
- Backlighting results for smoothed and unsmoothed irradiation

40 of the OMEGA beams are used to emulate the NIF 48 beam indirect-drive configuration

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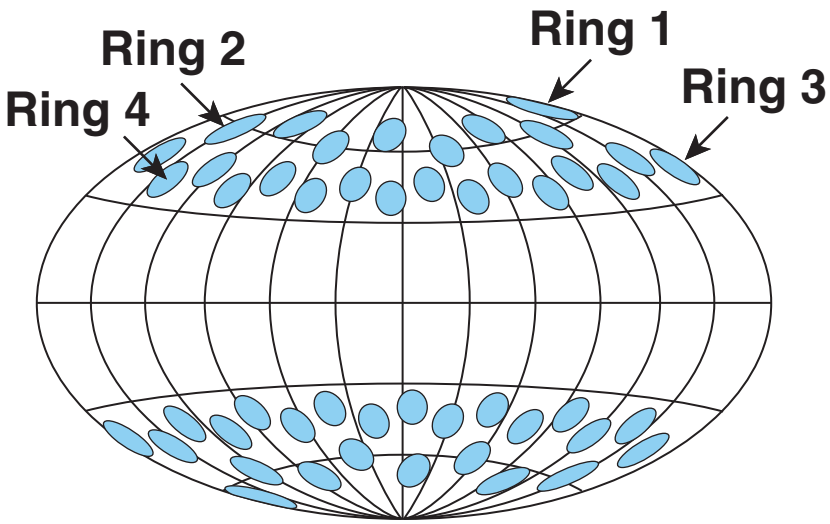
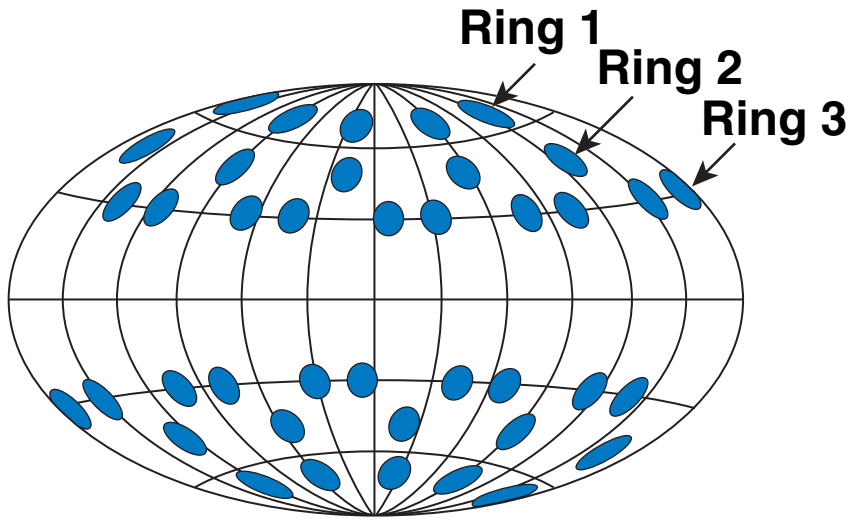
NIF configuration

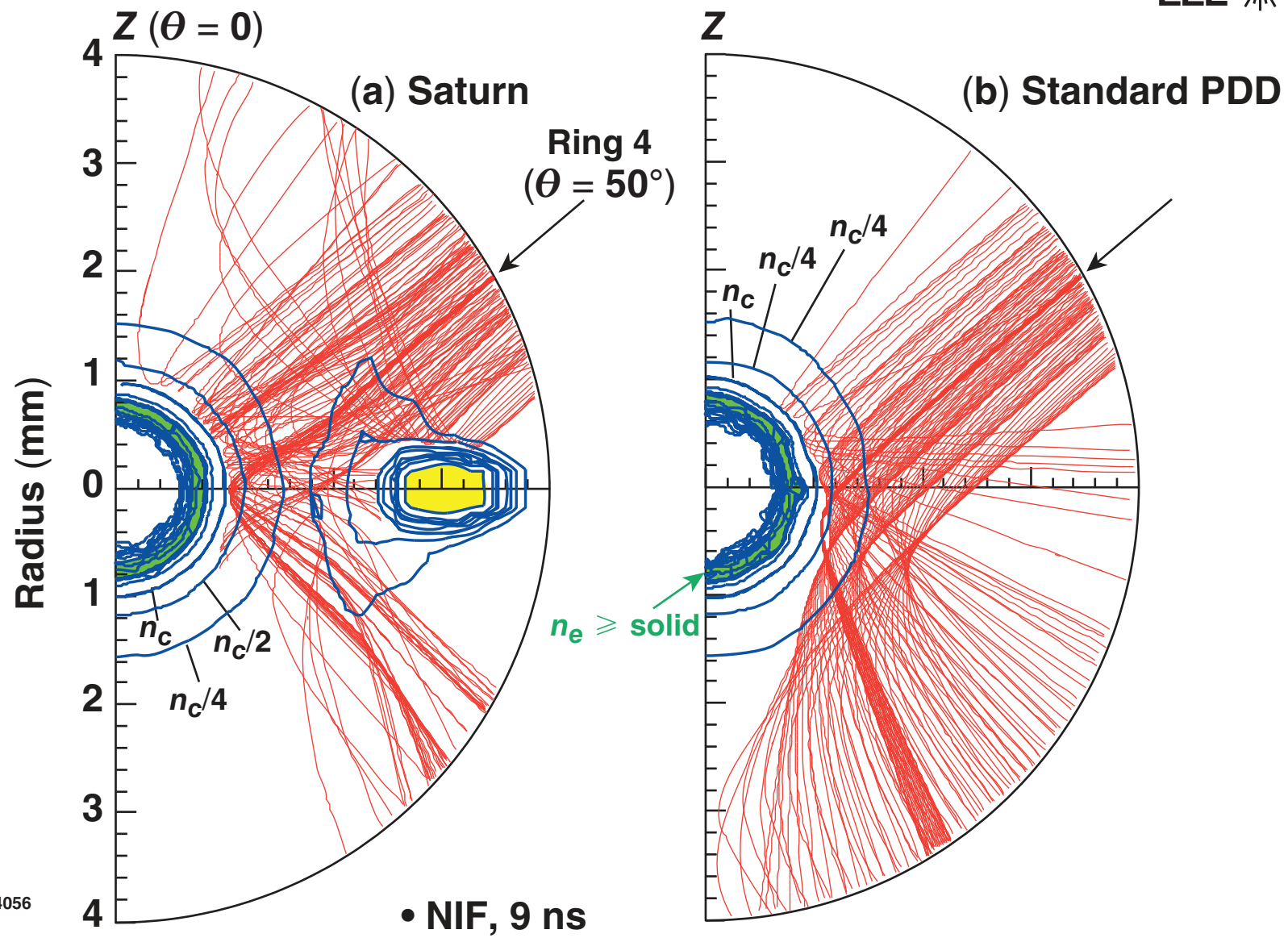


OMEGA PDD configuration



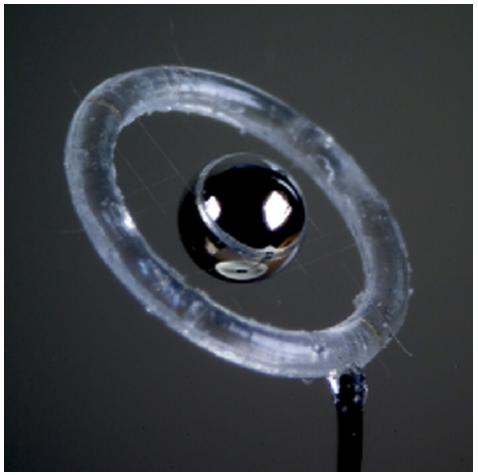
TC7354

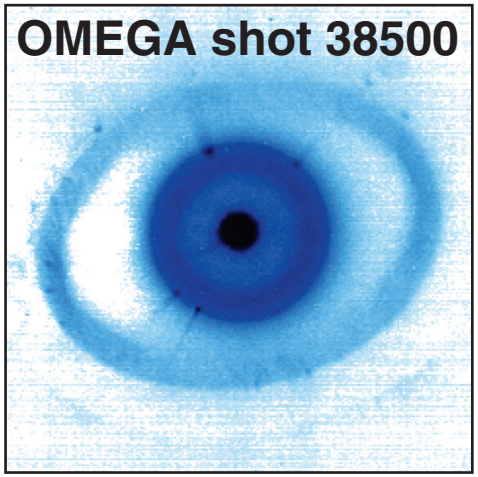
As the critical surface moves in, the ring of the Saturn target refracts rays back toward the equator



Runs 4341, 4056
TC6636

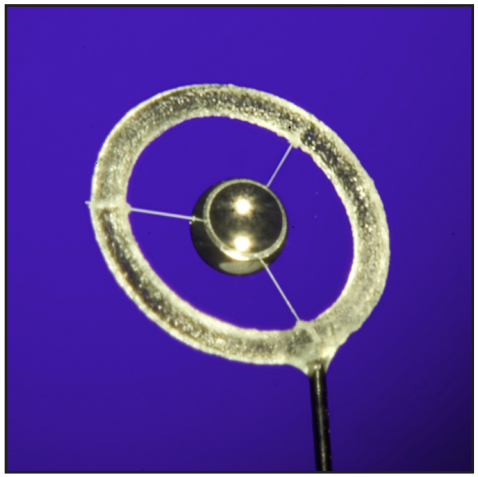
Silk-mounted and spoke-mounted Saturn targets have been shot on OMEGA

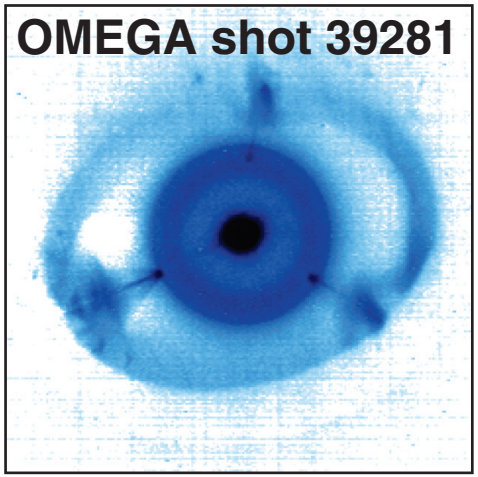




Time-integrated pinhole camera (2 to 5 keV)

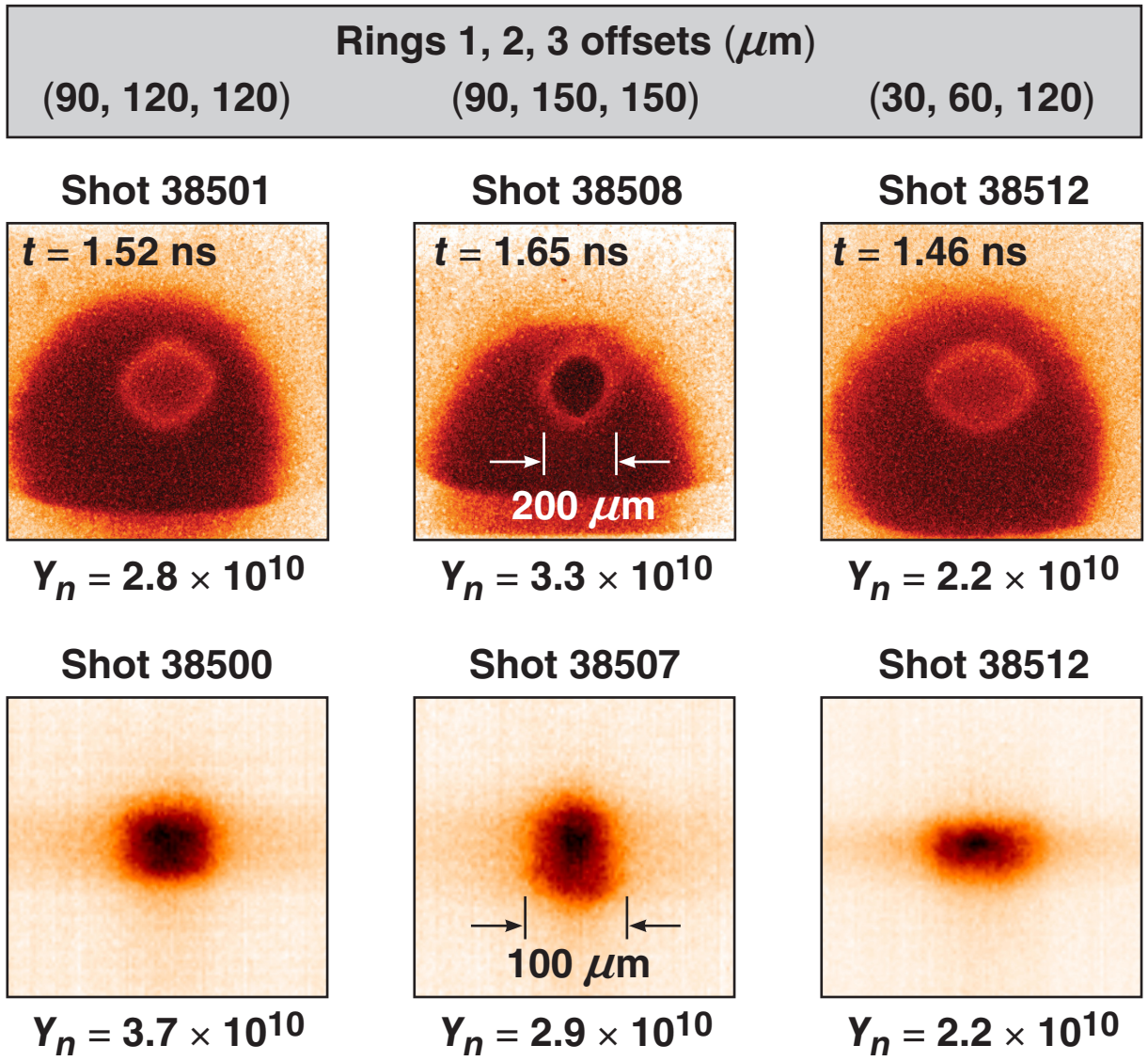
"Silk" mount





"Spoke" mount

Saturn targets can be tuned to give symmetric implosions



TC7355

Experiments and simulations for Saturn pointing without a ring are in excellent agreement

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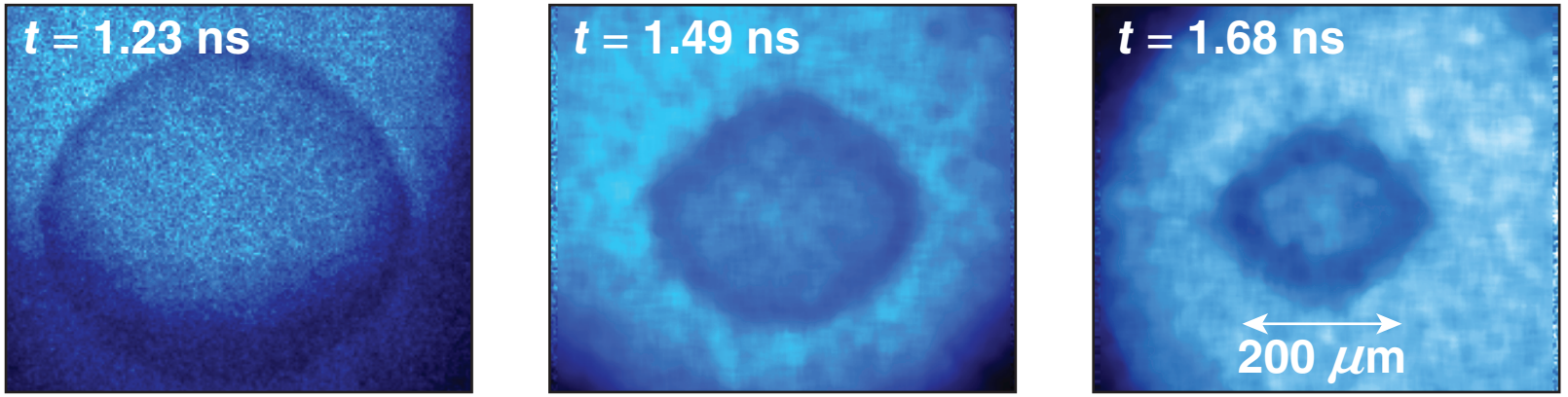
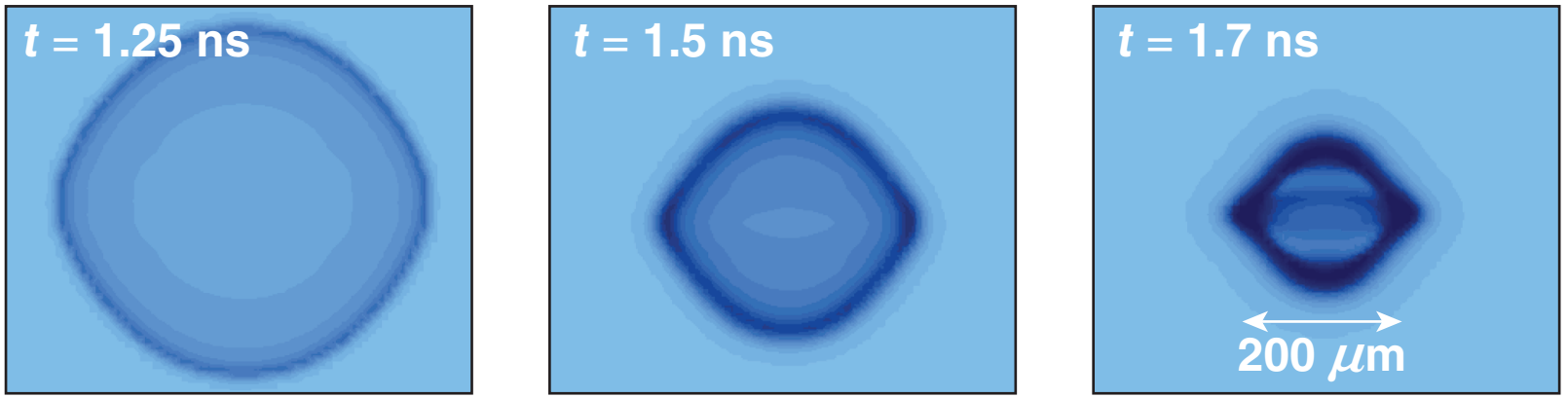
OMEGA shot 38502 (TIM 5 view)

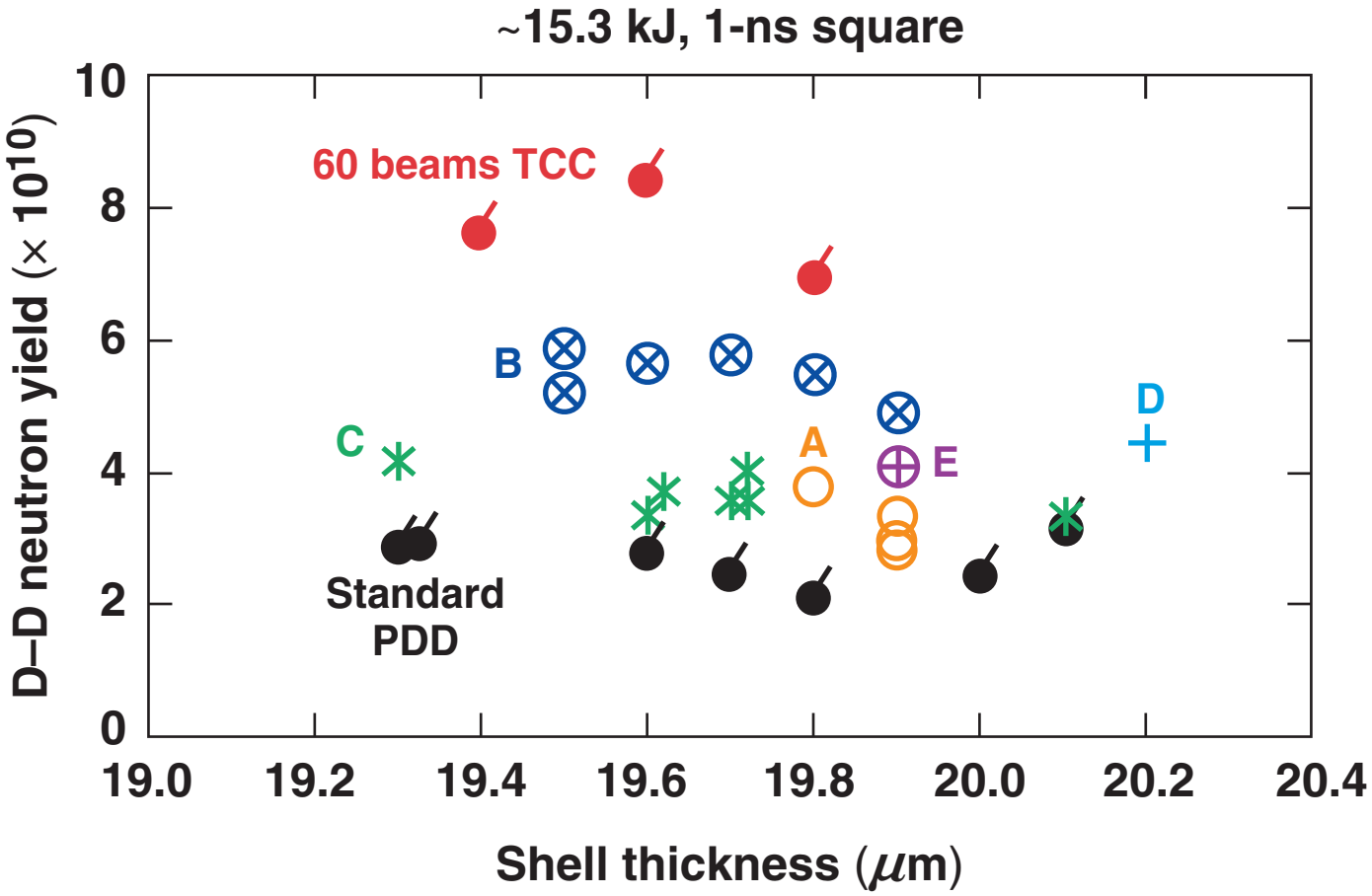


***DRACO*/Spect3D* (simulation)**



*Post-processed with Spect3D, PRISM Computational Sciences, Madison, WI

Several sets of Saturn targets were shot with differing performance

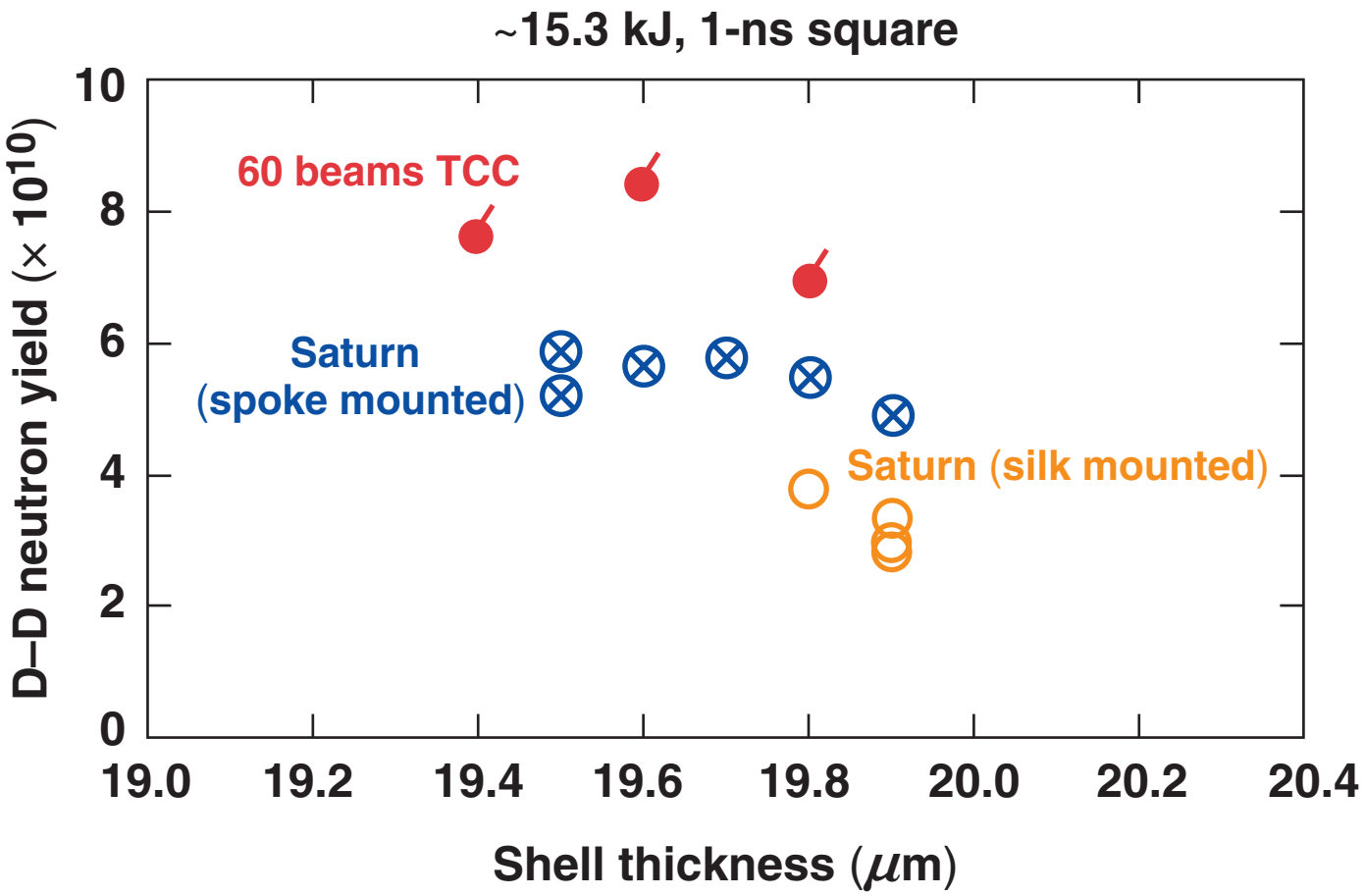


TC7365

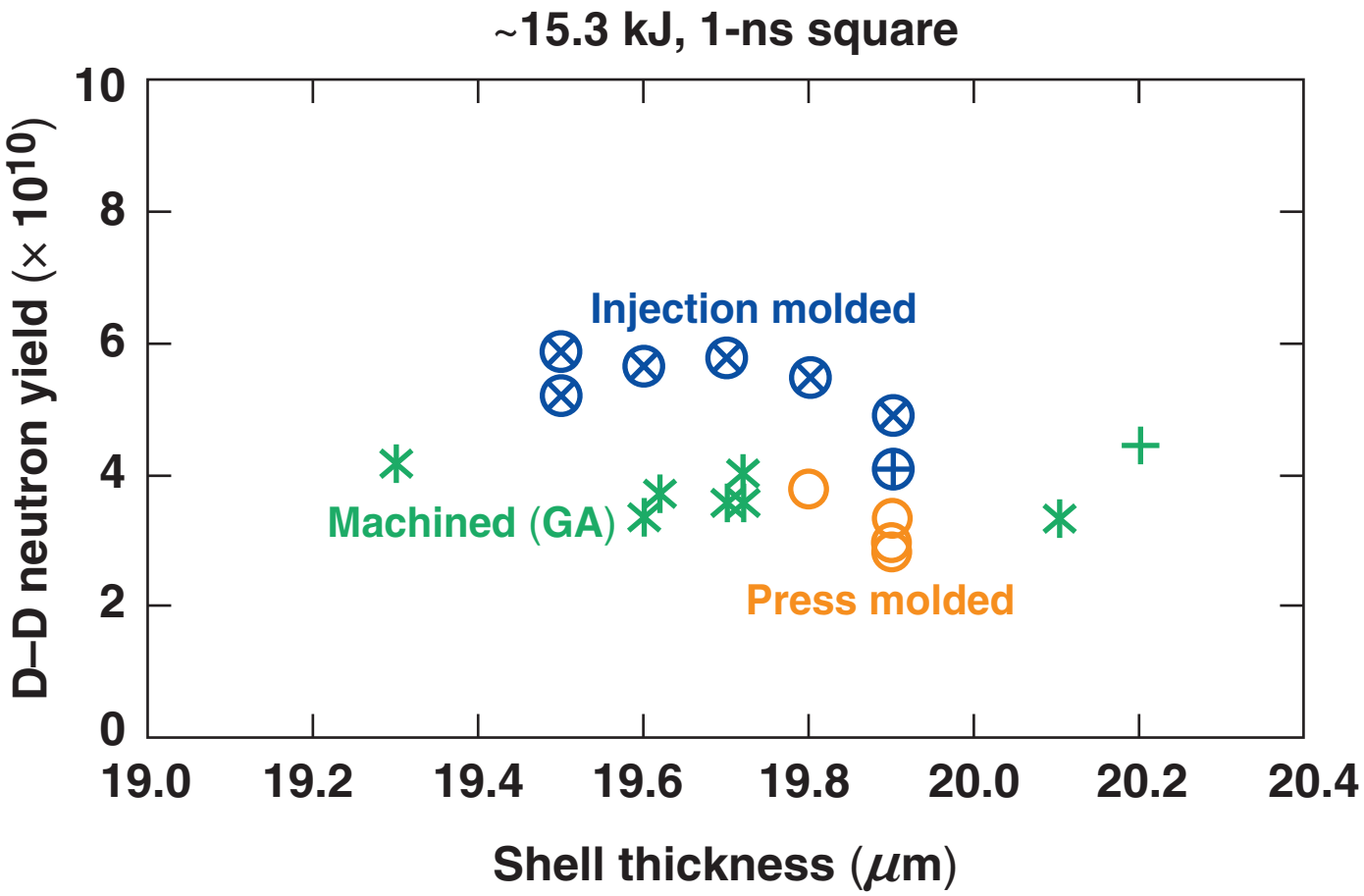
Saturn targets were made with various combinations of parameters

Data set	Ring	Mount	Al coating
A	Press molded	Web	1000 Å
B	Injection molded	Spoke	500 Å
C	Machined	Spoke	1000 Å
D	Machined	Spoke	1000 Å
E	Injection molded	Spoke	1000 Å

Spoke-mounted Saturn targets performed better than silk-mounted Saturn targets

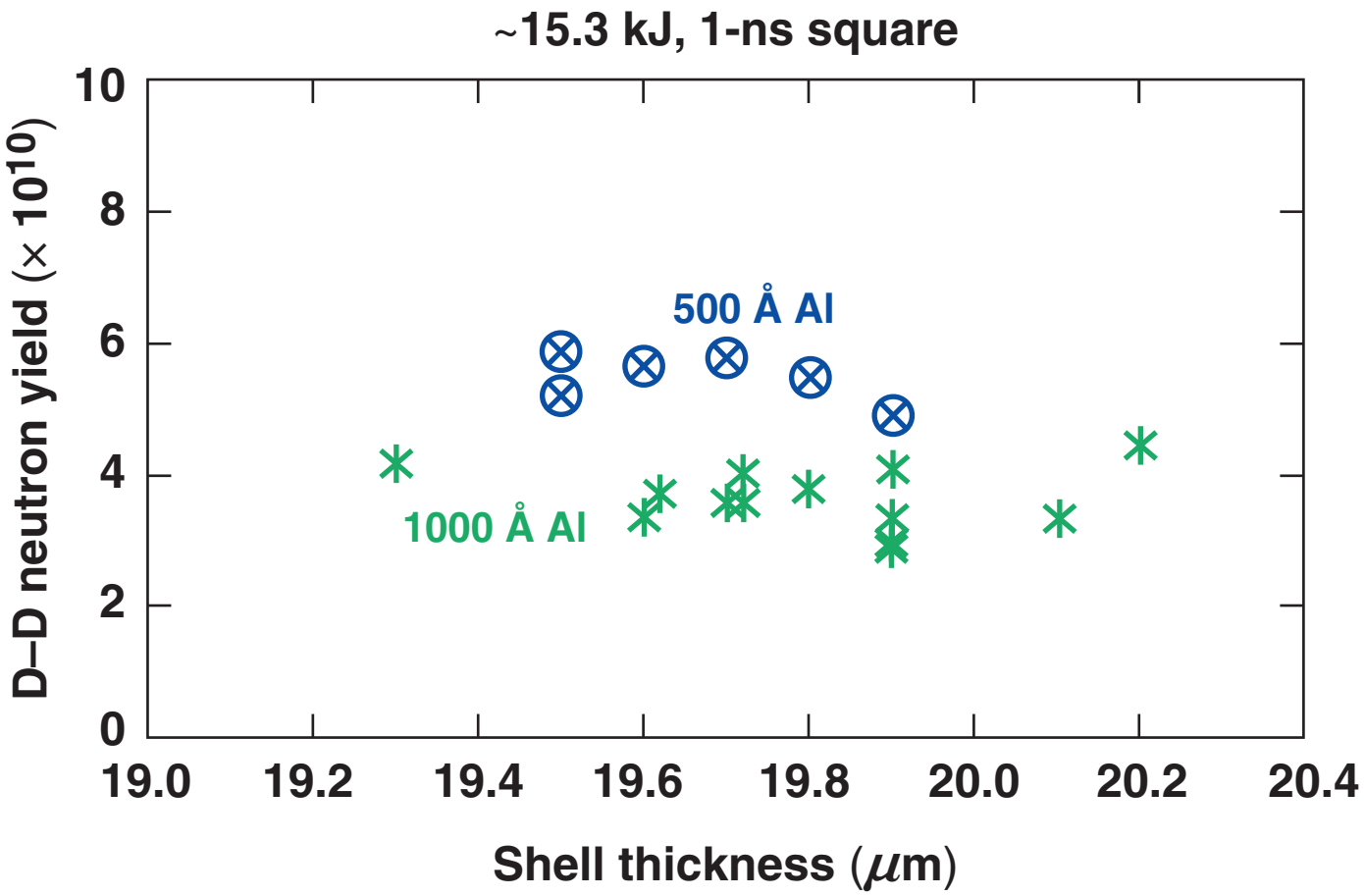


Saturn targets with injection-molded rings gave the highest yields



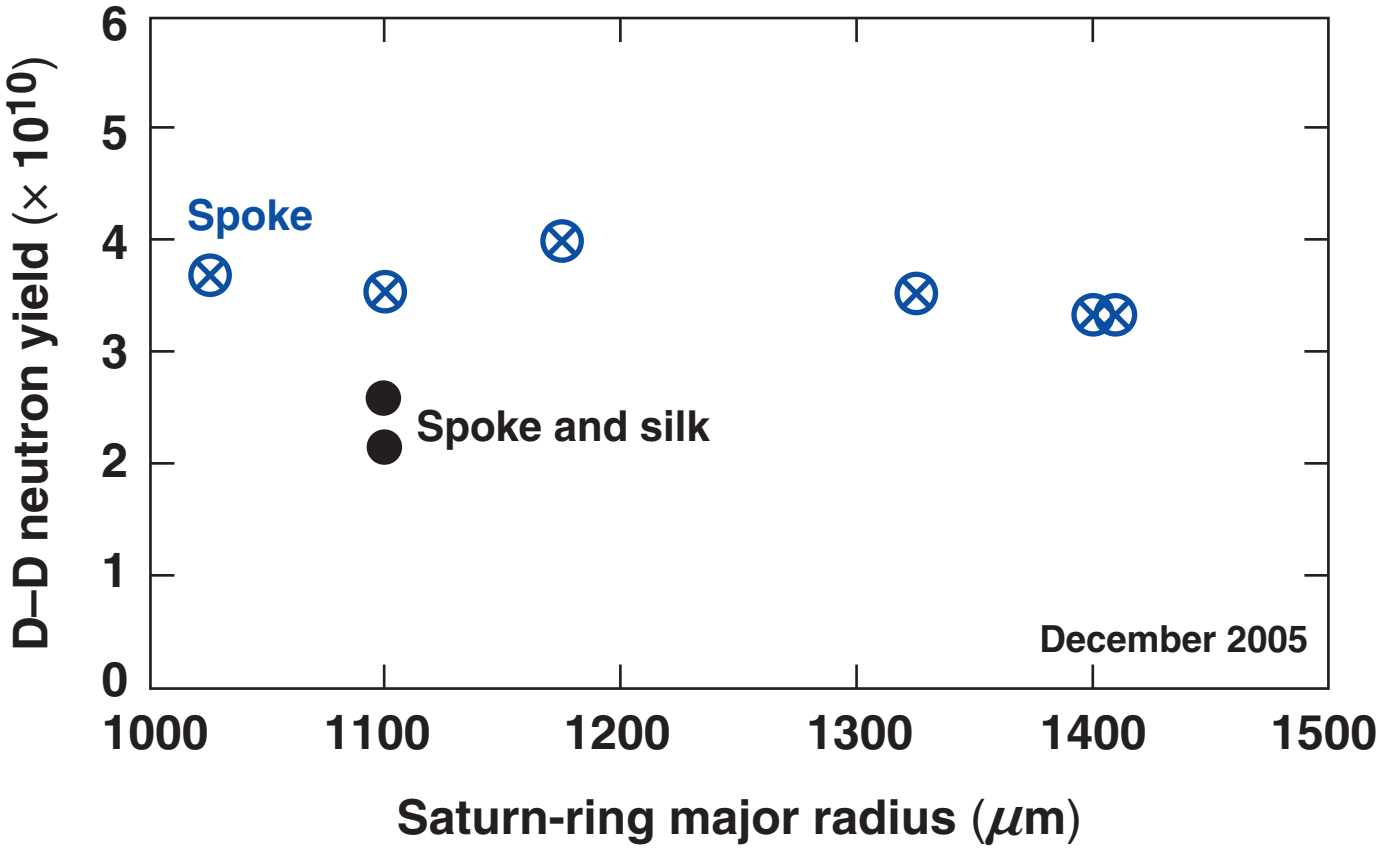
TC7358

The Al barrier-layer thickness may be significant



TC7359

Spoke-mounted Saturn-target neutron yields are reduced when spider silks are added

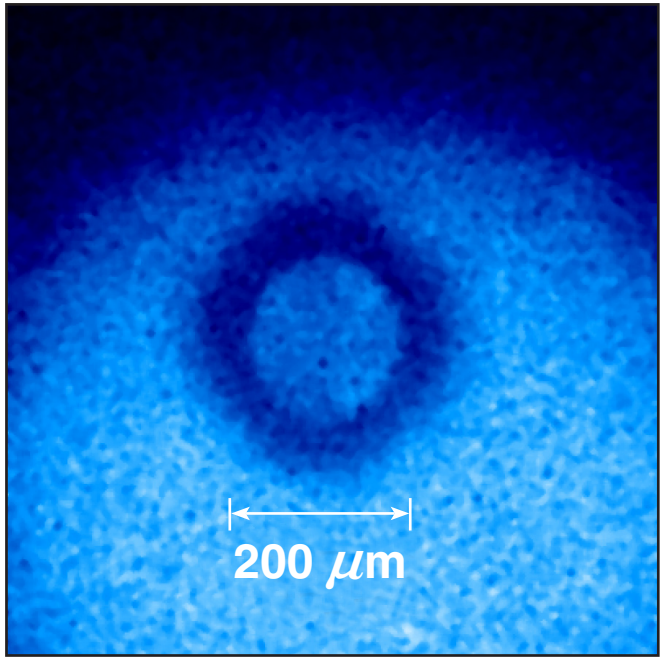


TC7357

A first look at radiographs of PDD implosions with and without SSD shows a noticeable difference

UR LLE

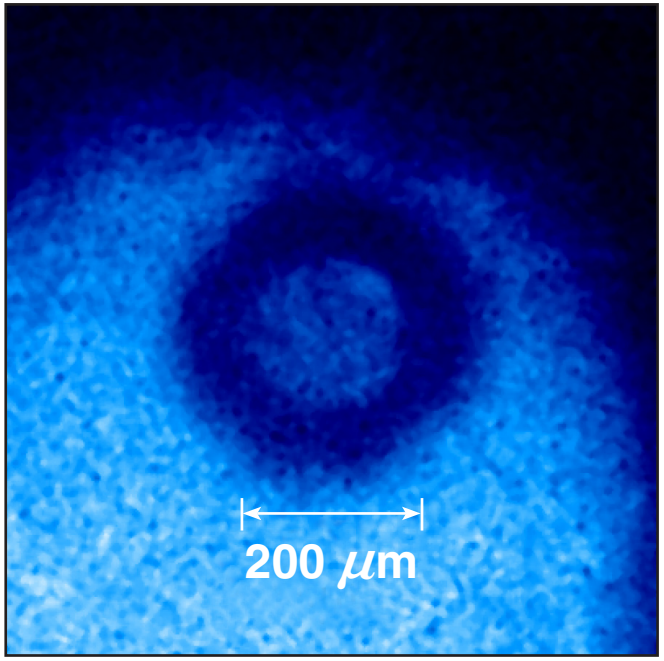
OMEGA shot 42937



SSD on

$Y_n = 4.4 \times 10^{10}$

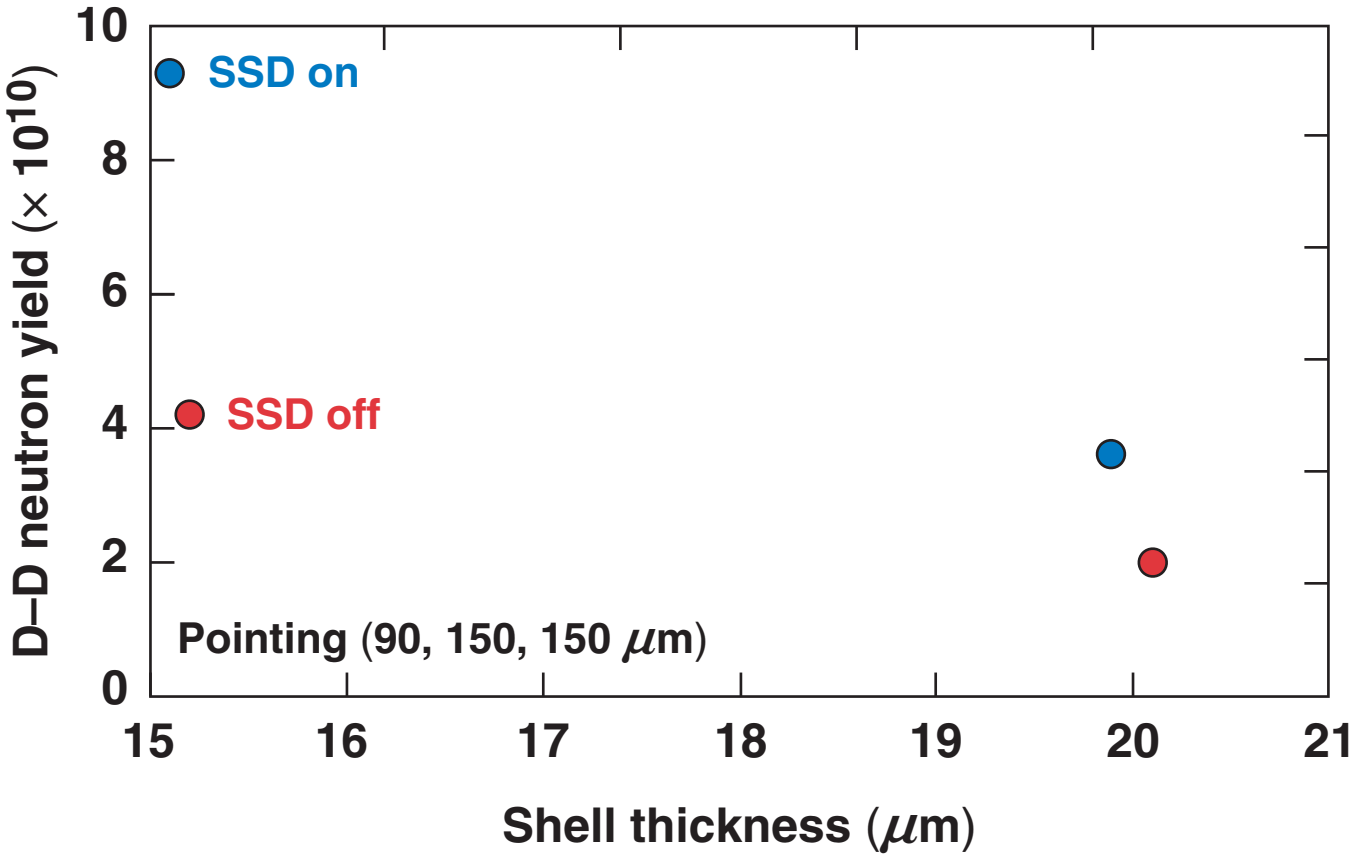
OMEGA shot 42938



SSD off

$Y_n = 3.0 \times 10^{10}$

The PDD neutron yields for standard PDD are also higher with SSD on



TC7361

Summary/Conclusions

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