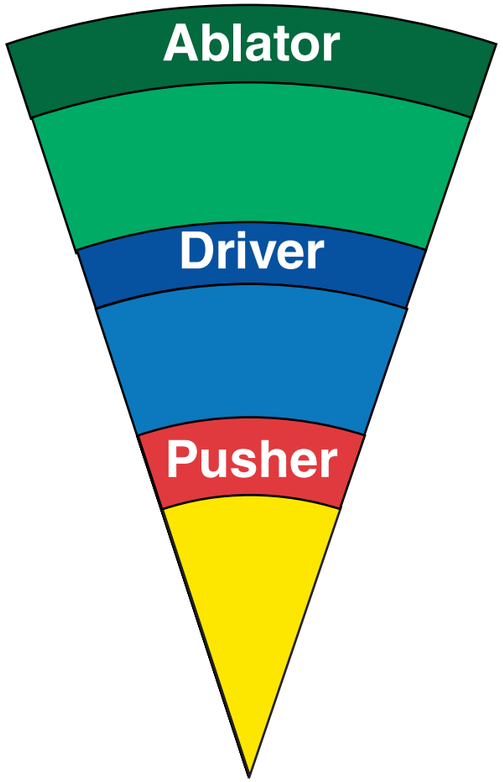
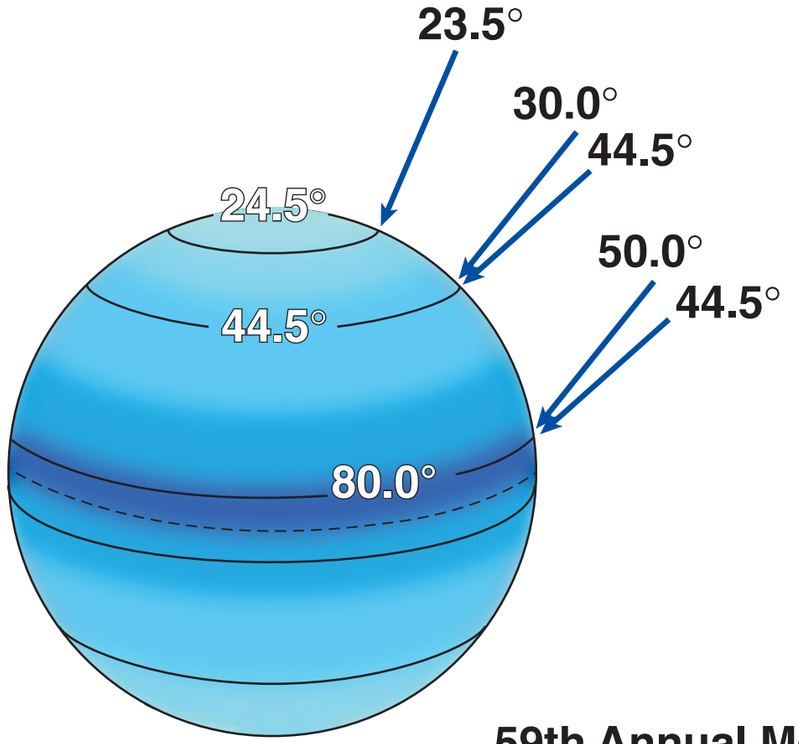
# Evaluation of the *Revolver* Ignition Design at the National Ignition Facility Using Polar-Direct-Drive Illumination




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

59th Annual Meeting of the
American Physical Society
Division of Plasma Physics
Milwaukee, WI
23–27 October 2017

Summary

# A *Revolver* design, employing a National Ignition Facility (NIF) polar-direct-drive platform, has achieved marginal ignition (*G* ~ 1.1)

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- An initial *Revolver*-PD* design used current NIF beams, defocused and repointed, but failed to achieve the necessary uniformity for ignition
- The latest *Revolver*-PD design employs dedicated phase plates, specific power histories, and balanced, tricolor wavelength detuning
- The latest design can tolerate small amounts of offset and power imbalance
- Imprint runs have been started to examine the in-flight integrity of the Be shell and the effect of imprint on target performance

TC13785

*PD: polar drive

# Collaborators

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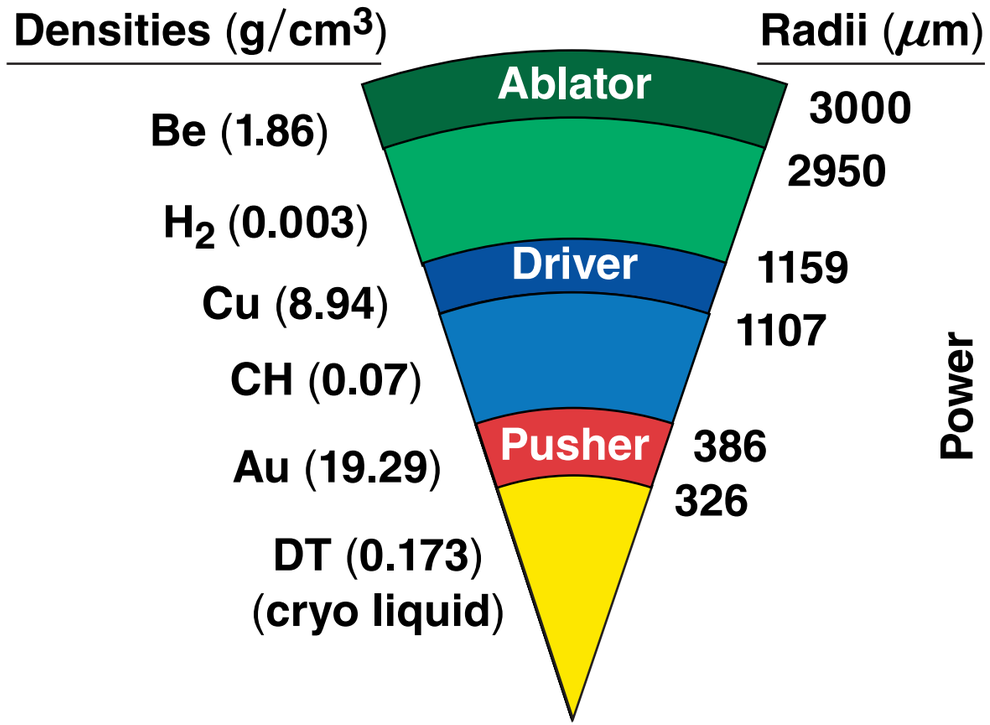
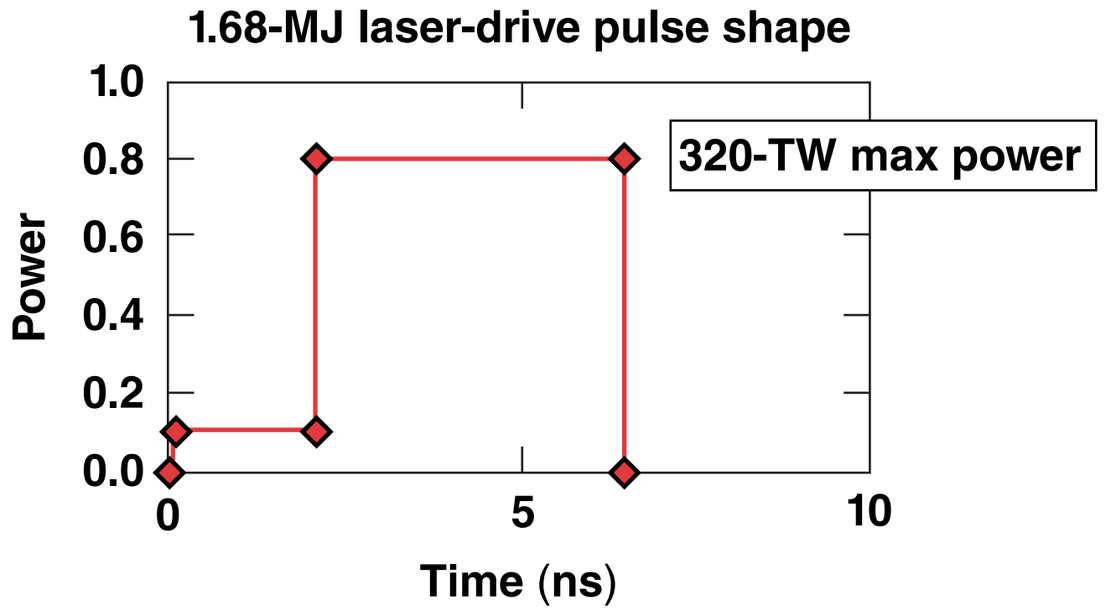
**Laboratory for Laser Energetics**

**K. Molvig and M. J. Schmitt**

**Los Alamos National Laboratory**

# The current *Revolver** NIF design employs 1.7 MJ and, using symmetric illumination, returns a modest gain of ~3

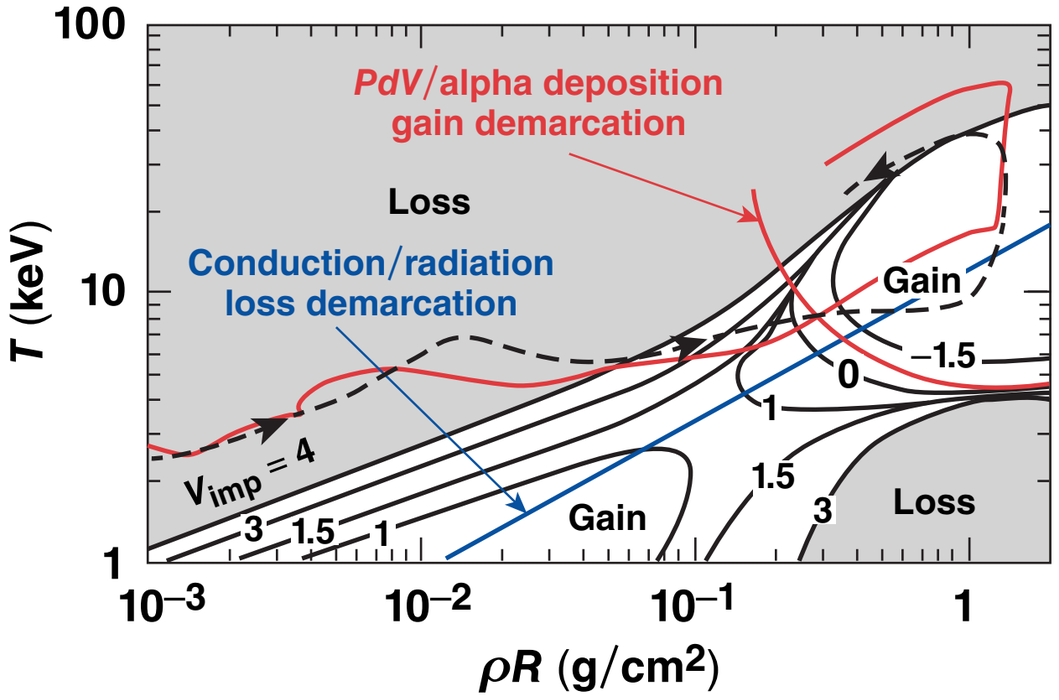


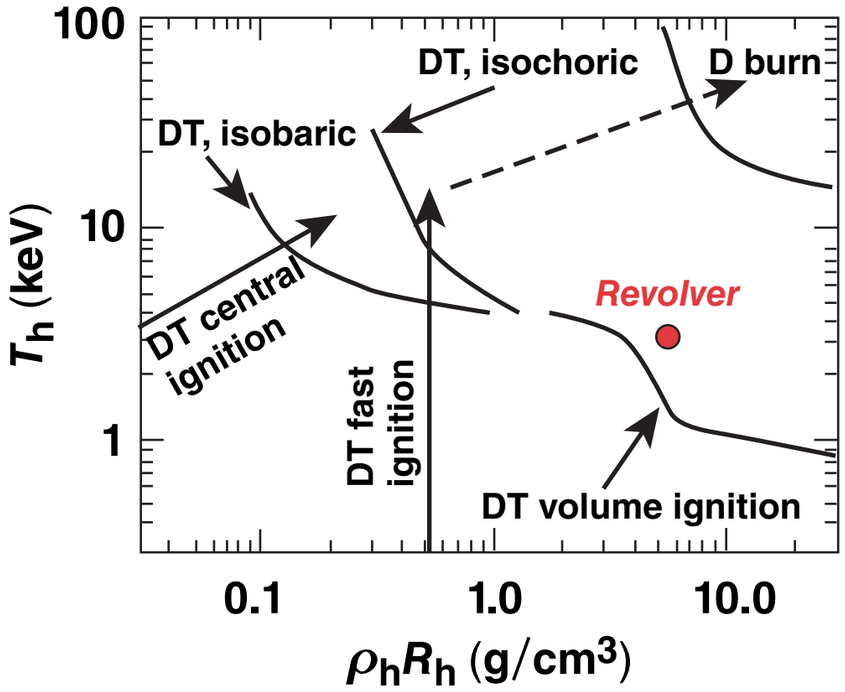




TC13786

*K. Molvig *et al.*, Phys. Rev. Lett. 116, 255003 (2016).

# *Revolver* is a different inertial confinement fusion (ICF) ignition target design utilizing equilibrium or volume ignition rather than traditional hot-spot ignition




R. C. Kirkpatrick and J. A. Wheeler, Nucl. Fusion 21, 389 (1981);
J. D. Lindl, *Inertial Confinement Fusion: The Quest for Ignition and Energy Gain Using Indirect Drive* (Springer-Verlag, New York, 1998), pp. 42–44;
S. Atzeni and J. Meyer-ter-Vehn, *The Physics of Inertial Fusion: Beam Plasma Interaction, Hydrodynamics, Hot Dense Matter*, International Series of Monographs on Physics (Clarendon Press, Oxford, 2004), p. 99.

TC13787

# Initial *Revolver*-PD simulations used pointings and defocusings of current NIF beams derived by Garcia and Craxton

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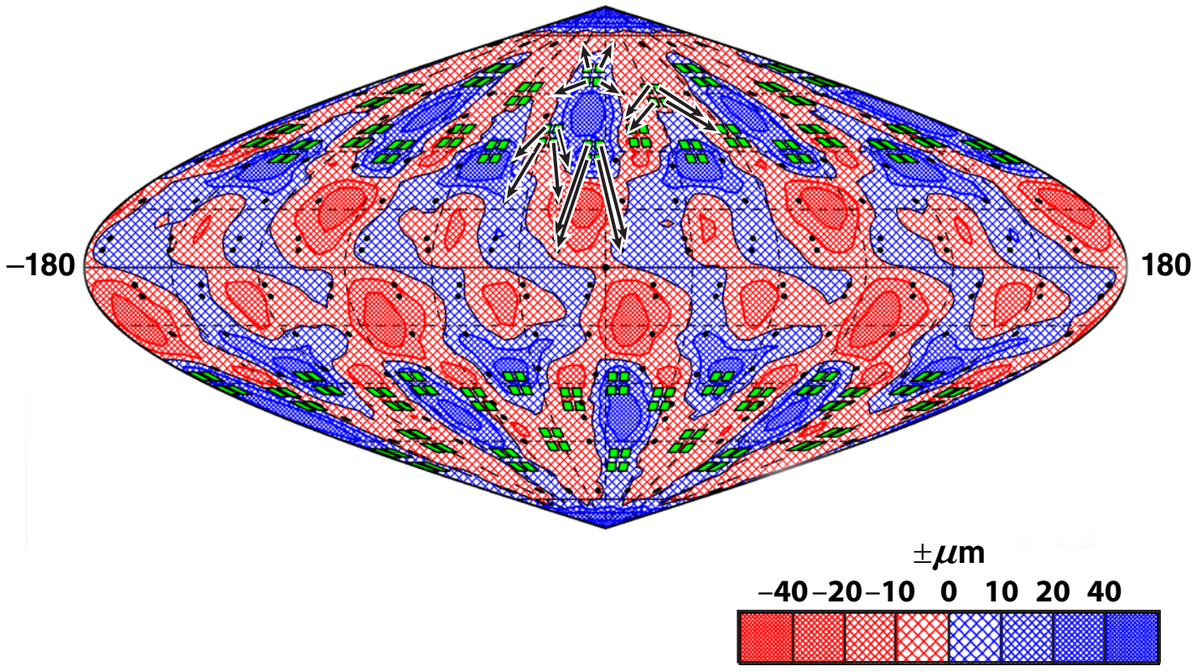
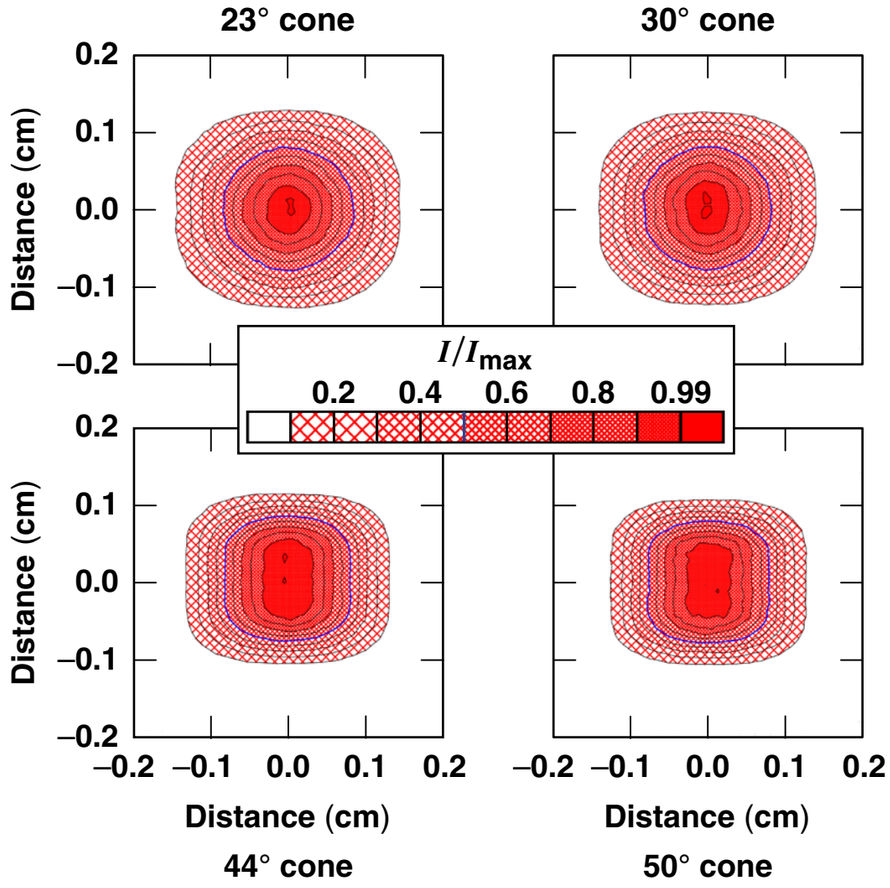
## Be-shell centroid modulations after laser drive




## Defocus laser-spot shapes

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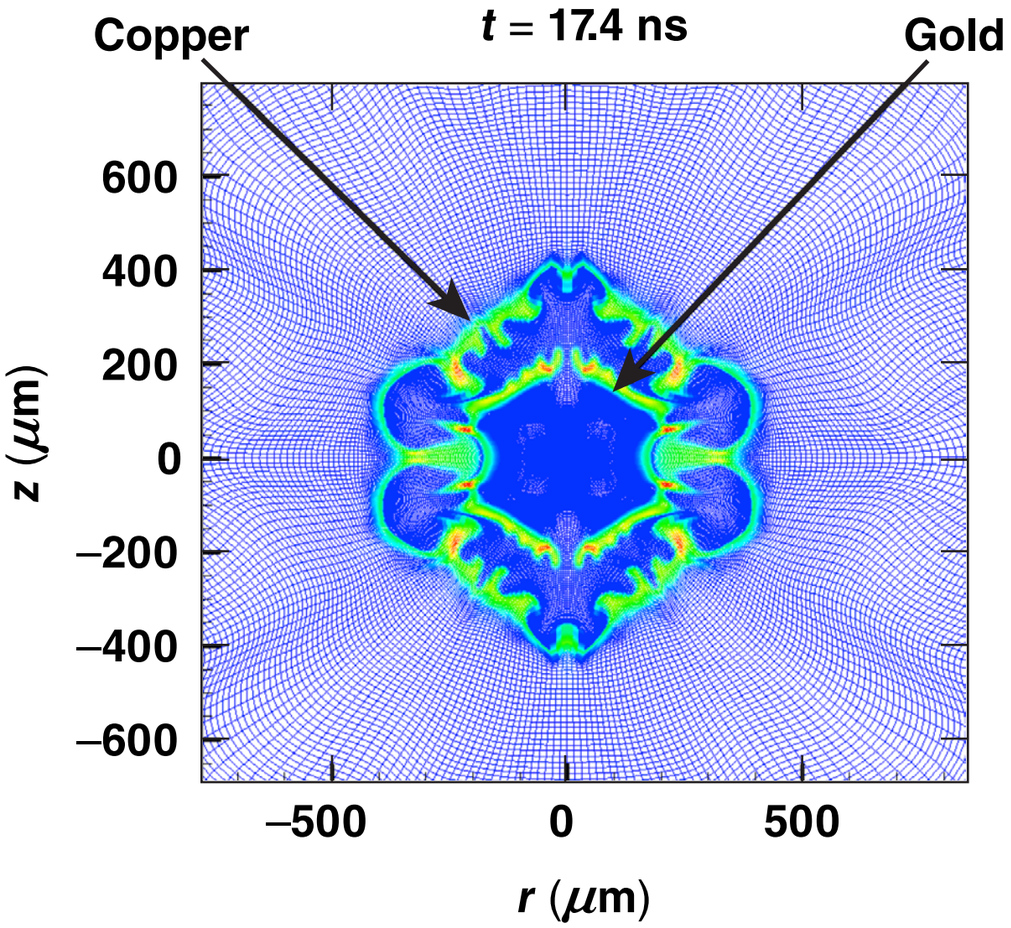
# *Revolver*-PD simulations using initial repointings and defocusings indicate interpenetration of the copper flyer plate into the gold pusher

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# New repointings, pulse shapes, and beam profiles were scaled from a PD ignition design by Collins*

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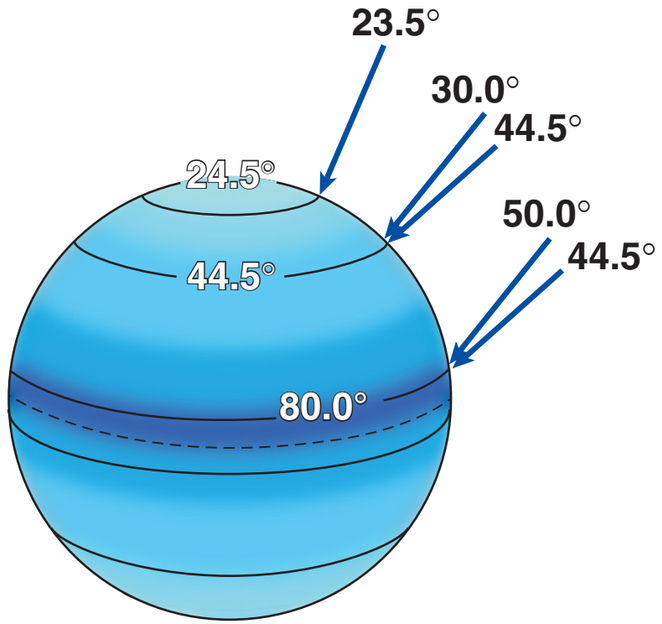
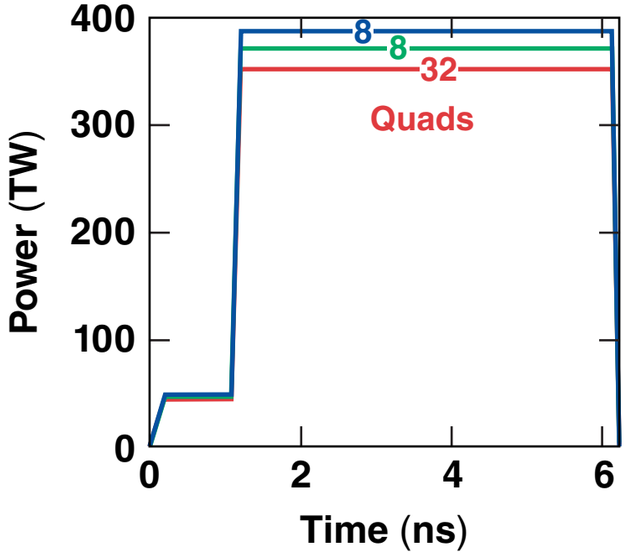
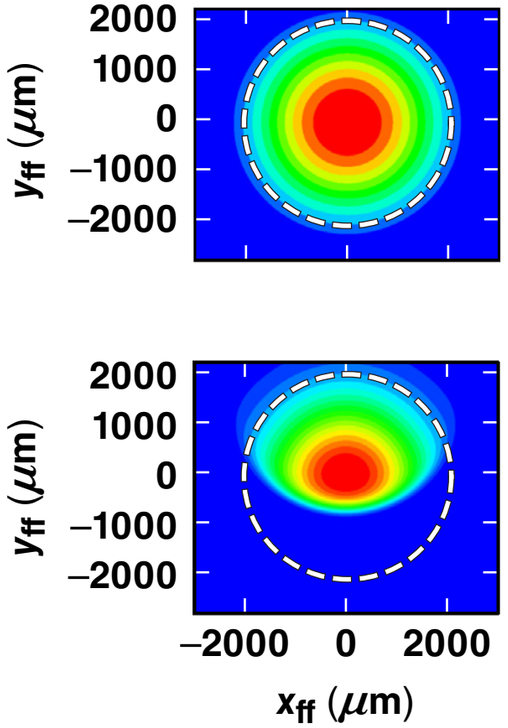
**NIF beams repointed to fully illuminate the capsule**




**Pulse shapes require modification to only one third of the beams**




**Far-field spot shapes modified to account for beam repointing**



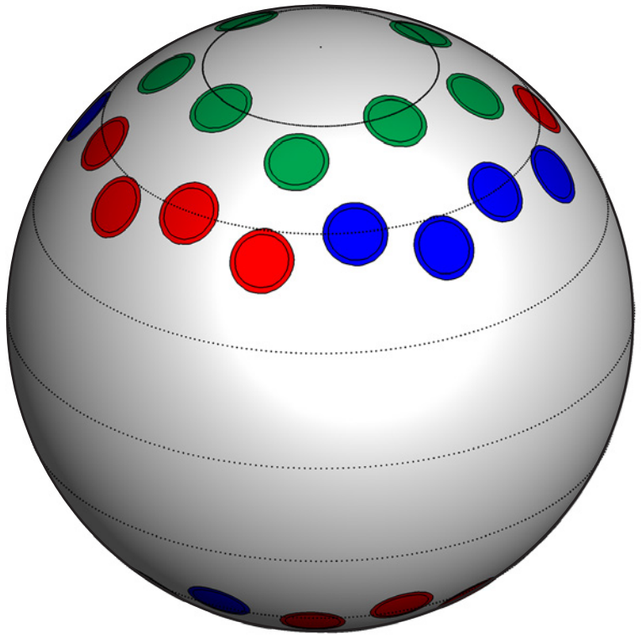

**Polar beams remain relatively unchanged**

**"Equatorial" beams require the most modifications (e.g., spot masking)**

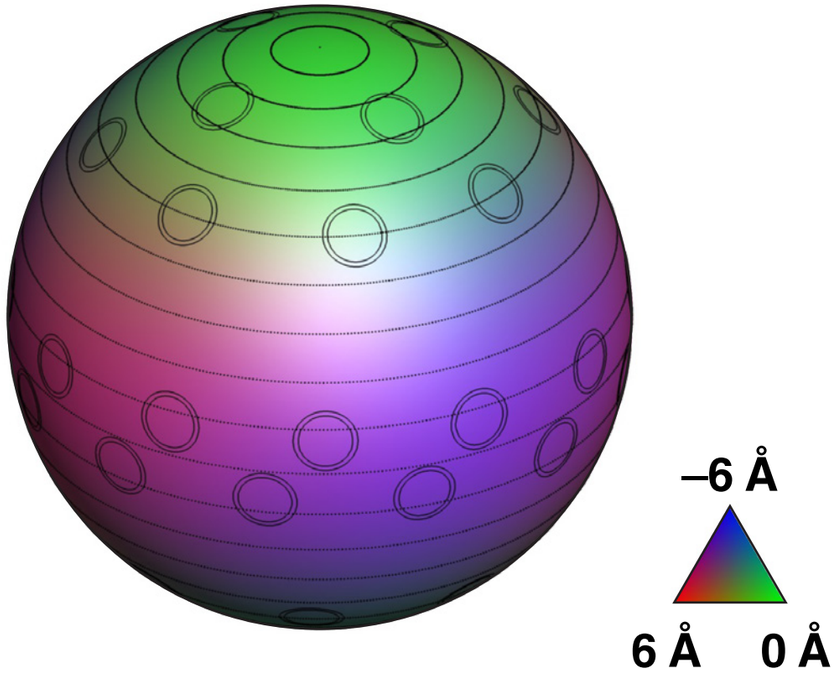
*T. J. B. Collins *et al.*, Phys. Plasmas 19, 056308 (2012).

E23665d

# Cross-beam energy transfer (CBET) mitigation employs a ±6-Å (UV) balanced tricolor wavelength-detuning configuration*



NIF beam ports



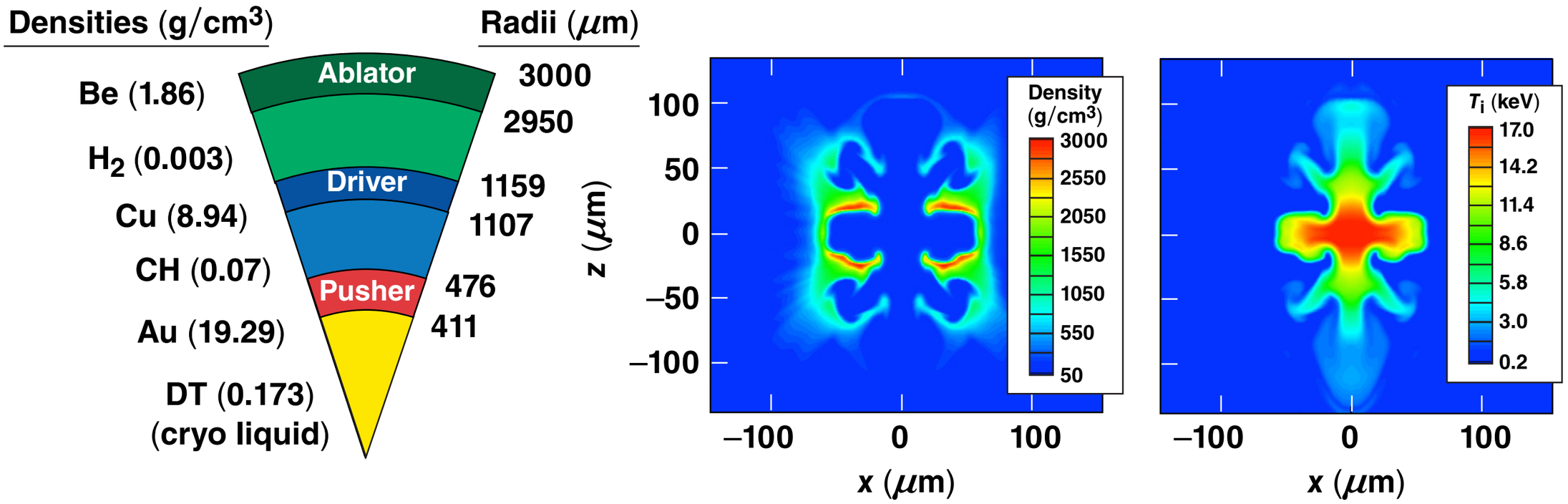

On-target color projection

**Recent direct-drive NIF experiments** have demonstrated the efficacy of wavelength detuning.**

*T. J. B. Collins *et al.*, Bull. Am. Phys. Soc. 60, 29 (2015).
**J. A. Marozas, TI2.00002, this conference (invited).

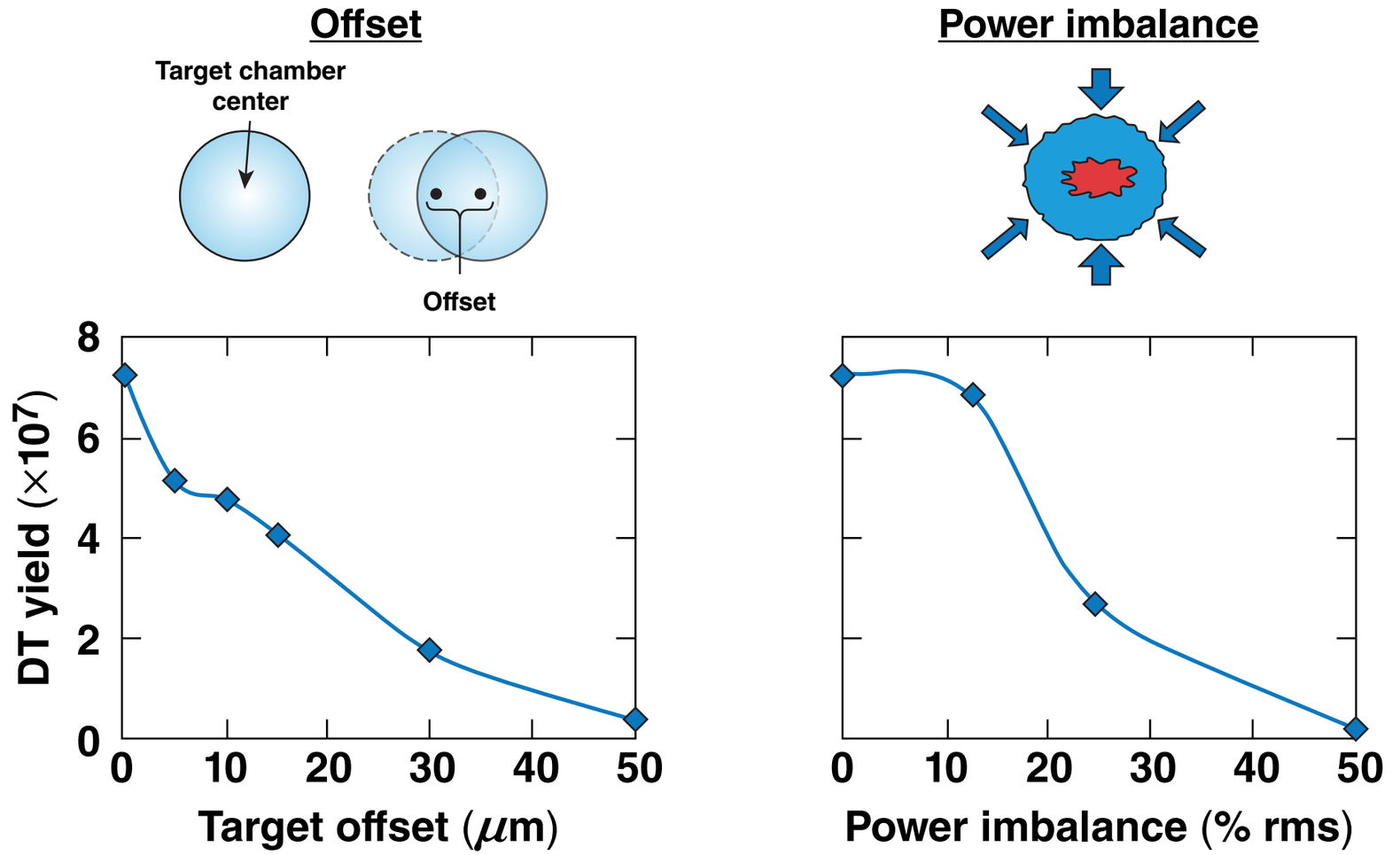
TC12536a

# The latest *Revolver*-PD design employs a slightly larger gold pusher and 1.85 MJ, returning a modest gain of ~1.1




TC13791

# The *Revolver*-PD design can tolerate small amounts of target offset and laser power imbalance




TC13792

Summary/Conclusions

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