### Evaluation of the First Polar-Drive, DT-Gas–Filled Target Implosions on the NIF



DT neutron yield:  $1.3 \times 10^{14}$ 

DT neutron yield:  $2.4 \times 10^{14}$ 

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#### Summary

## NIF polar-drive DT-gas—filled target implosions have achieved all initial design milestones

• DT fueling of the Hoppe glass targets was conceived, engineered, tested, and implemented at LLE specifically for these NIF experiments

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- NIF DT implosions were carefully planned using several OMEGA experimental series
- OMEGA experiments provided crucial input into the design of the NIF experiments
- NIF scattered light measurements are in excellent agreement with SAGE calculations
- GXD-2 images clearly indicate circular shell stagnation

Neutron record of  $2.4 \times 10^{14}$  was set on 10/30/2010.



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## Simple PD designs employ existing NIF ID phase plates to access a wide range of diagnostic yield



### LLE revitalized its DT-fueling capabilities and delivered DT glass targets for these experiments











TC9090

### OMEGA DT series uncovered modeling issues in matching the experimental NTD burn histories



TC9091

## With improved modeling, the OMEGA DT series showed excellent agreement with 1-D predictions



\*See A. Shvydky (C05.00002).

## The first NIF PD–DT shot was taken on 17 Sept 2010 and post-shot analysis focused on three diagnostics

- Backscatter plates (NBI)
  - SBS and SRS production during the implosion

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- quantify amount of laser blow-by
- Gated x-ray diagnostic (GXD)
  - evaluate PD hydrodynamic core formation
- Neutronics

# The peak flux of all $3\omega$ scattered light was measured to be 34 mJ/cm<sup>2</sup> at the chamber wall

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SAGE scattered light prediction was 31 mJ/cm<sup>2</sup>. 100-kJ incident 9000 **31B NBI plate** 0.0005 Scattered light (J/sr) 0.0003 6000 0.0001 Equator 3000 36B NBI plate 0.0005 0.0003 0 0.0001 30 90 60 120 150 180 0 Polar angle  $\theta$  (°)

# The gated x-ray diagnostic (GXD-2) images of shot n0917 recorded a circular stagnating glass shell





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## Simulations of the stagnating glass shells show more-prolate images than those from the GXD-2

Shot N100917-006-999



Shot N100917-006-999



Shot N100917-006-999

## The bulk of the DT neutron diagnostic commissioning experiments are now underway



## Neutron yield results are excellent–consistently posting values to within 20% of pre-shot predictions



#### Summary/Conclusions

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