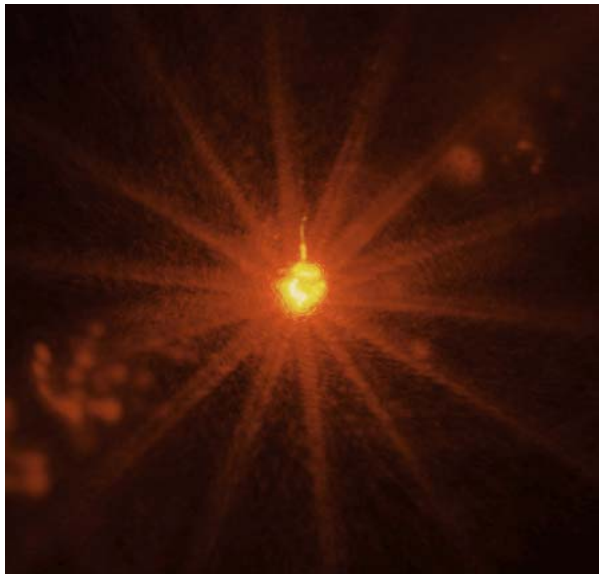
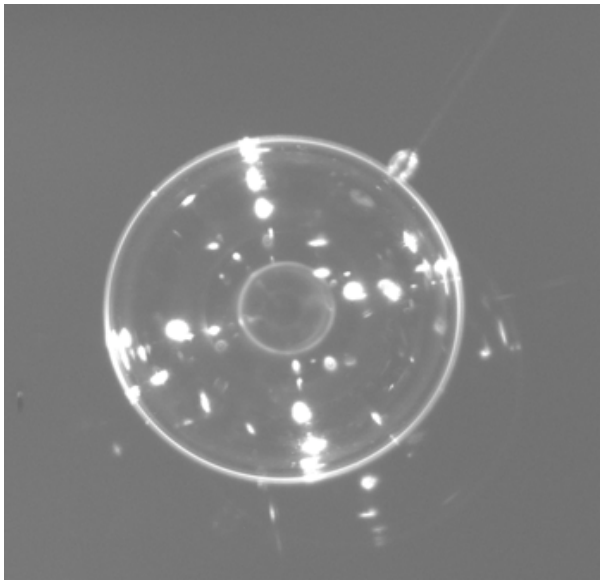
Results of Current Polar-Drive, Exploding-Pusher Shots on the NIF

OMEGA 01/19/1996



DT neutron yield – 1.3e14

NIF 10/30/2010



DT neutron yield – 2.4e14

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

International Workshop
on ICF Shock Ignition
Rochester NY
8-10 March 2011

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.
- 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 predictions.
- Latest hGXi images clearly indicate self-emission lobes similar to predictions.

Neutron record of 2.4e14 was set on 10/30/2010

Collaborators

R.S. Craxton, F.J. Marshall, A. Shvydky, R. Epstein, A.M. Cok, J.A. Marozas, T. Collins, S. Skupsky, C. Stoeckl, T.C. Sangster, M. Bonino, R. Janacek, D.R. Harding, W. Shmayda, S. Morse, D.D. Meyerhofer, R.L. McCrory

University of Rochester

A. Nikroo, J. Kilkenny, M. Hoppe, J. Fooks

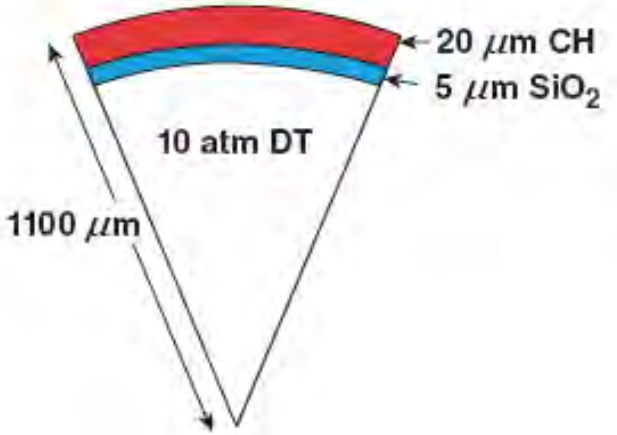
General Atomics

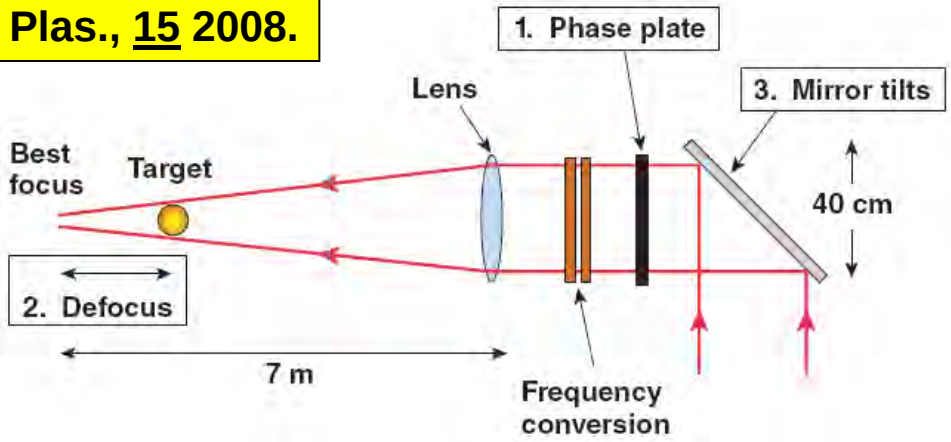
A. MacKinnon, S. Le Pape, R. Wallace, D. Bradley, G. Kyralya (LANL)

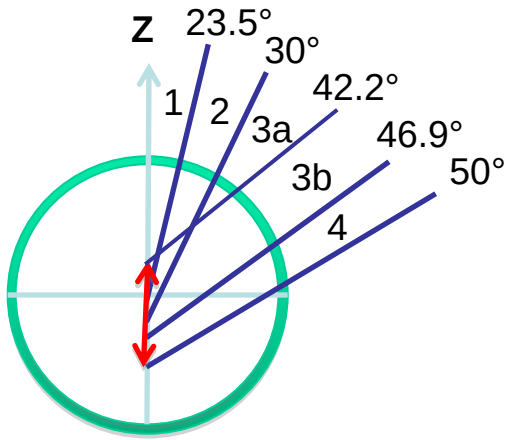
Lawrence Livermore National Laboratory

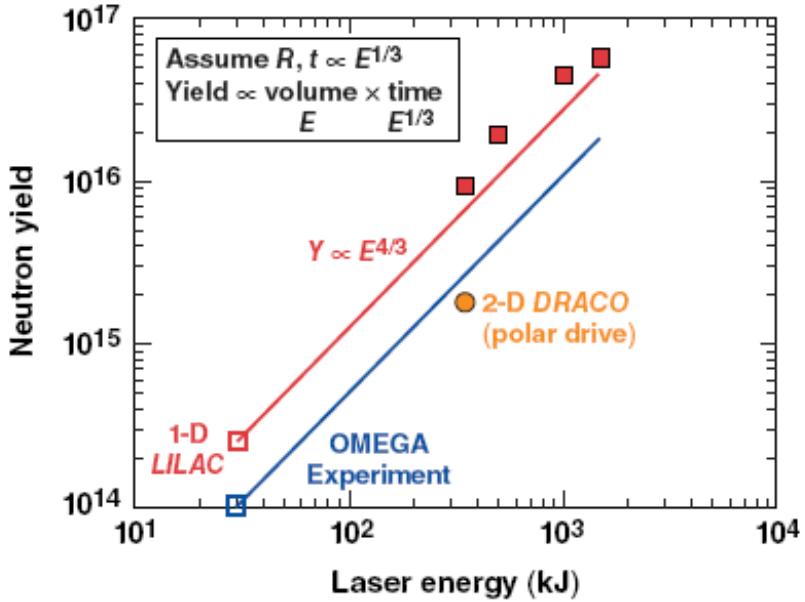
Simple PD designs employ existing NIF ID phase plates to access a wide range of diagnostic yield

Cok, Craxton, and McKenty, Phys. Plas., 15 2008.

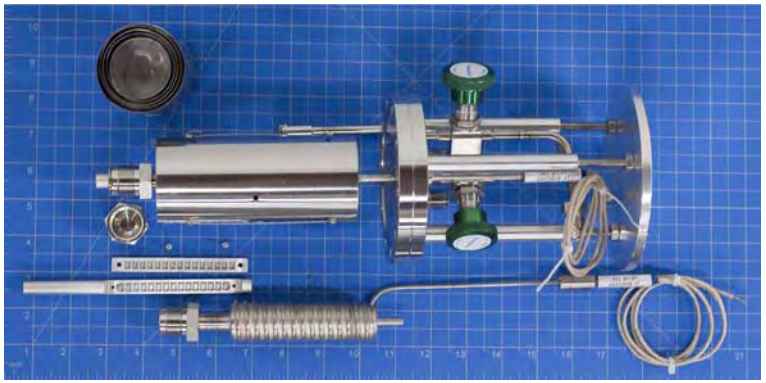








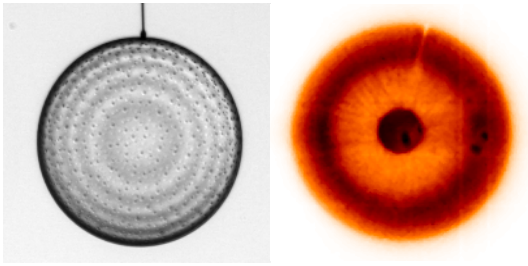
LLE revitalized its DT-fueling capabilities and delivered DT glass targets for these experiments



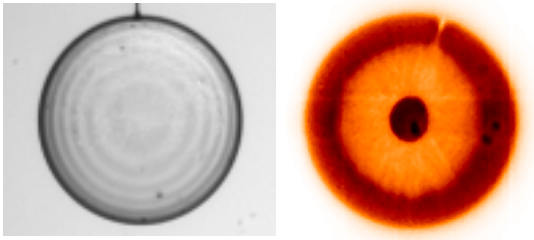
Target image at OMEGA TCC

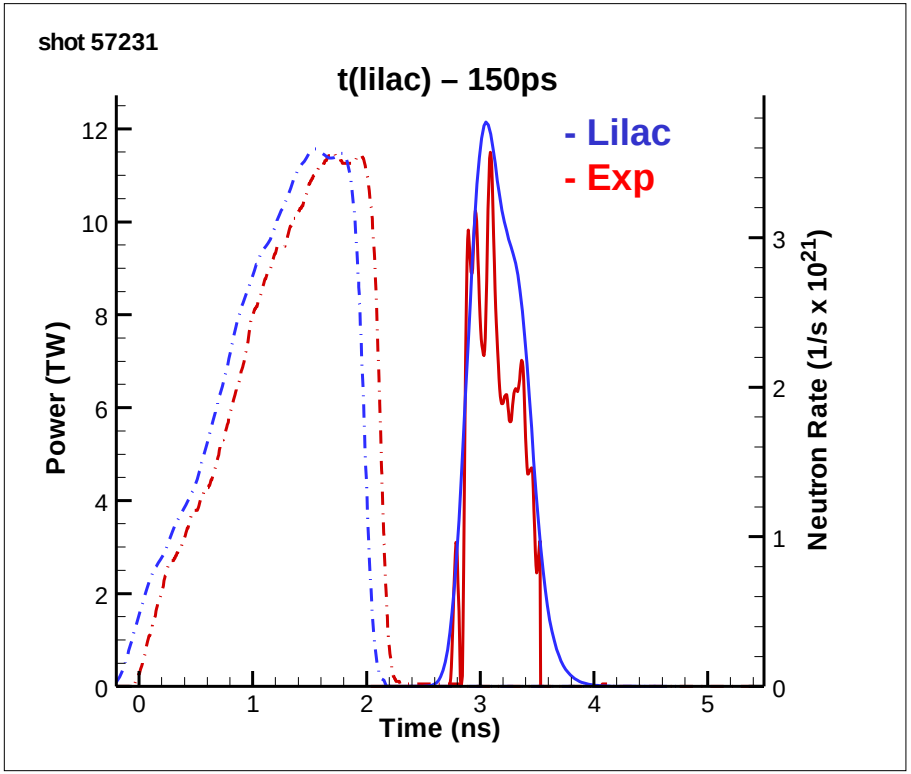
OMEGA DT series uncovered modeling issues in matching the experimental NTD burn histories

SD w/oSSD - TQ

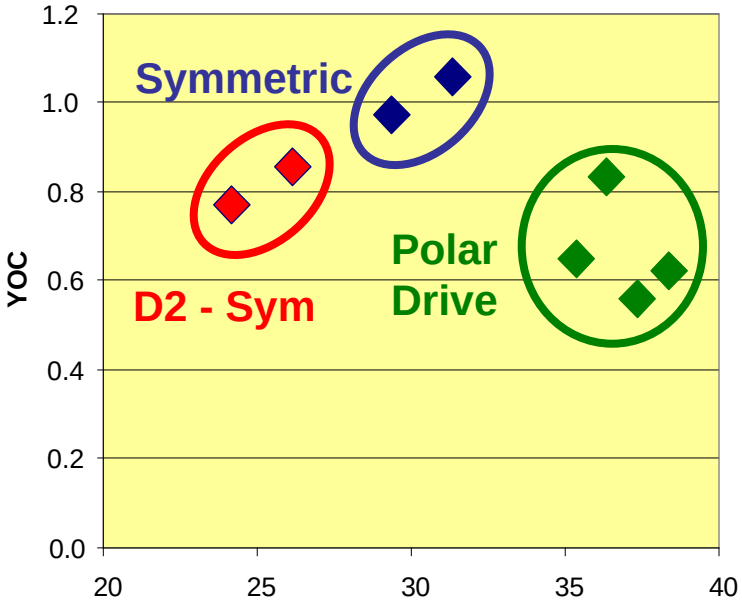


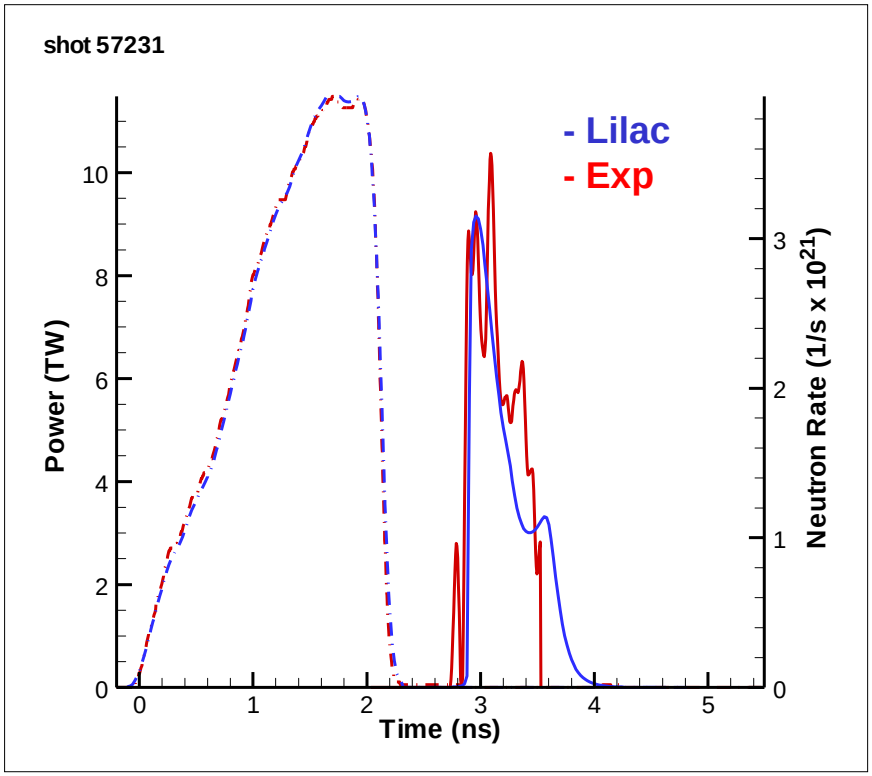
PD w/oSSD - TQ





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



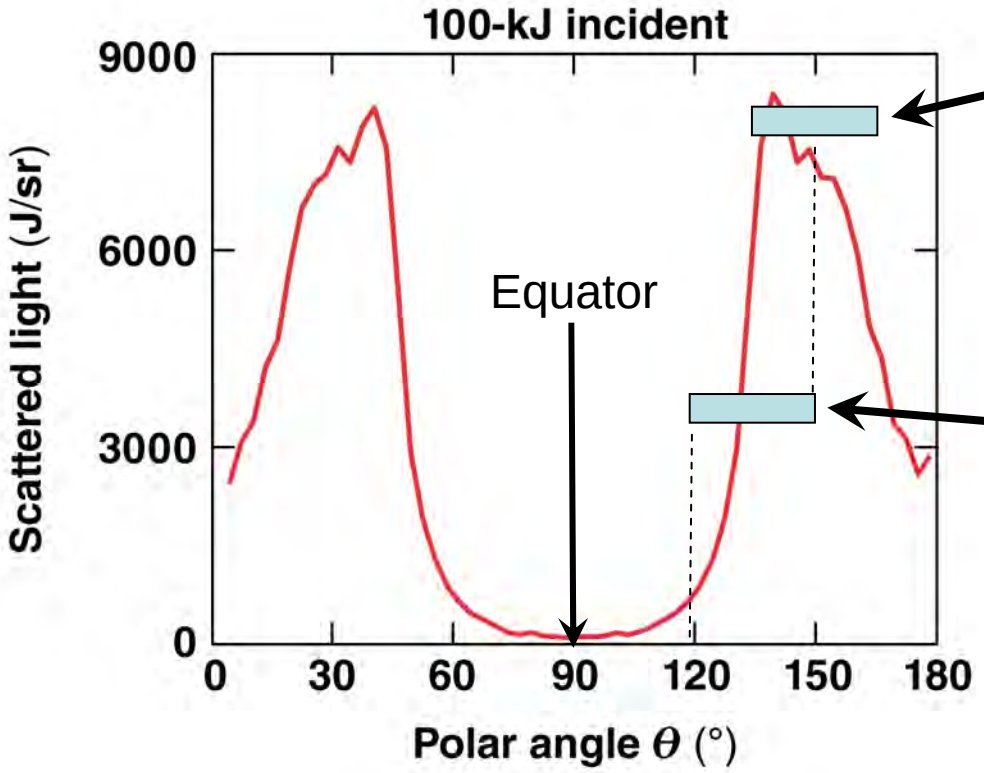


Improvements were made in modeling glass ablators

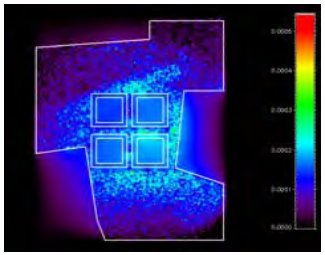
- resolving shock transit
- opacity bug
- EOS sensitivity

The peak flux of all 3ω scattered light is measured at chamber wall (34 mJ/cm$^{2)}$

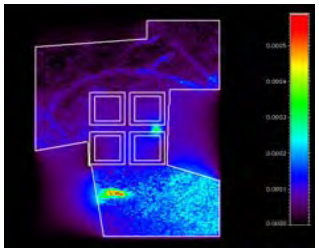
SAGE scattered light prediction was 31mJ/cm^2



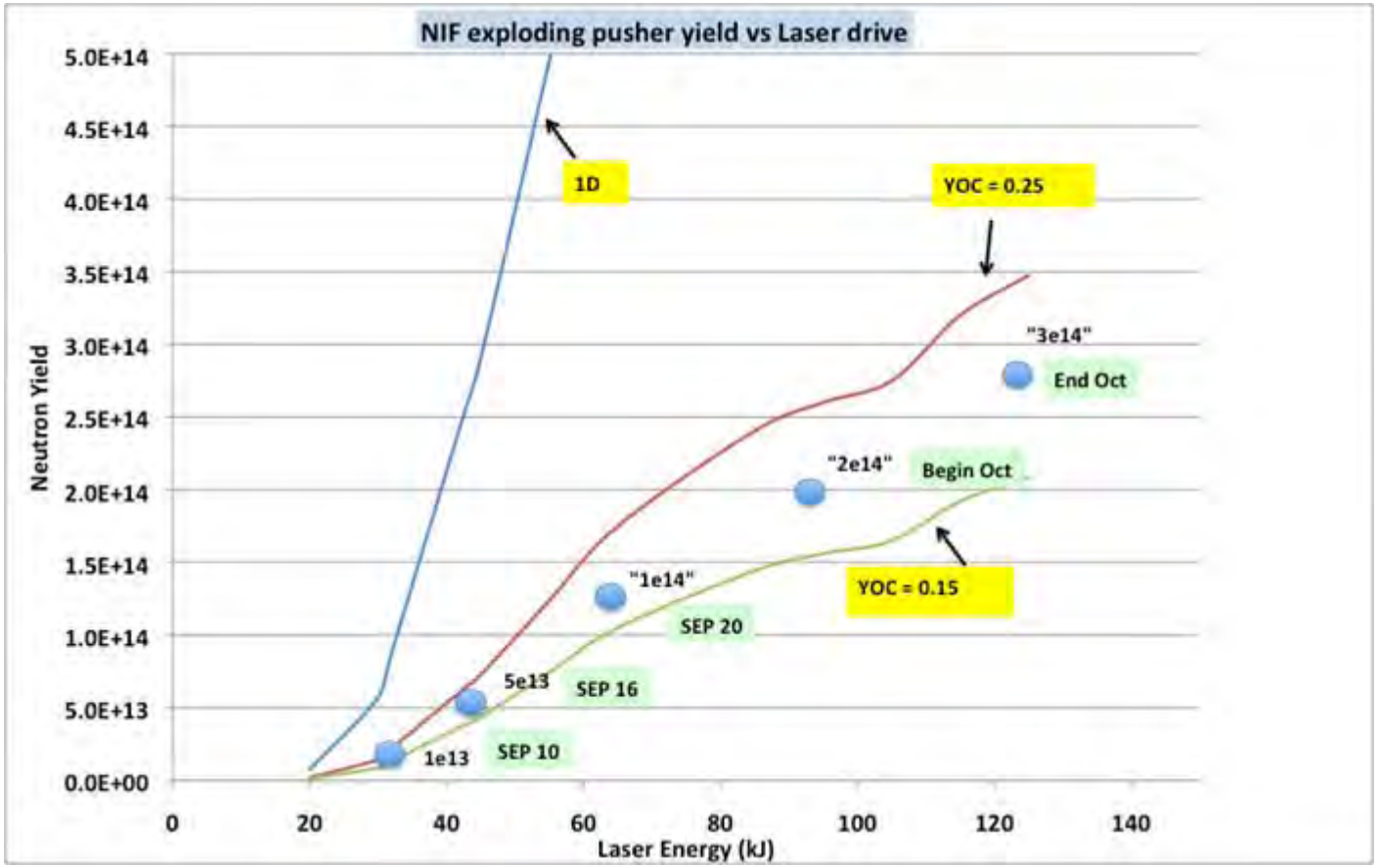
31B NBI plate



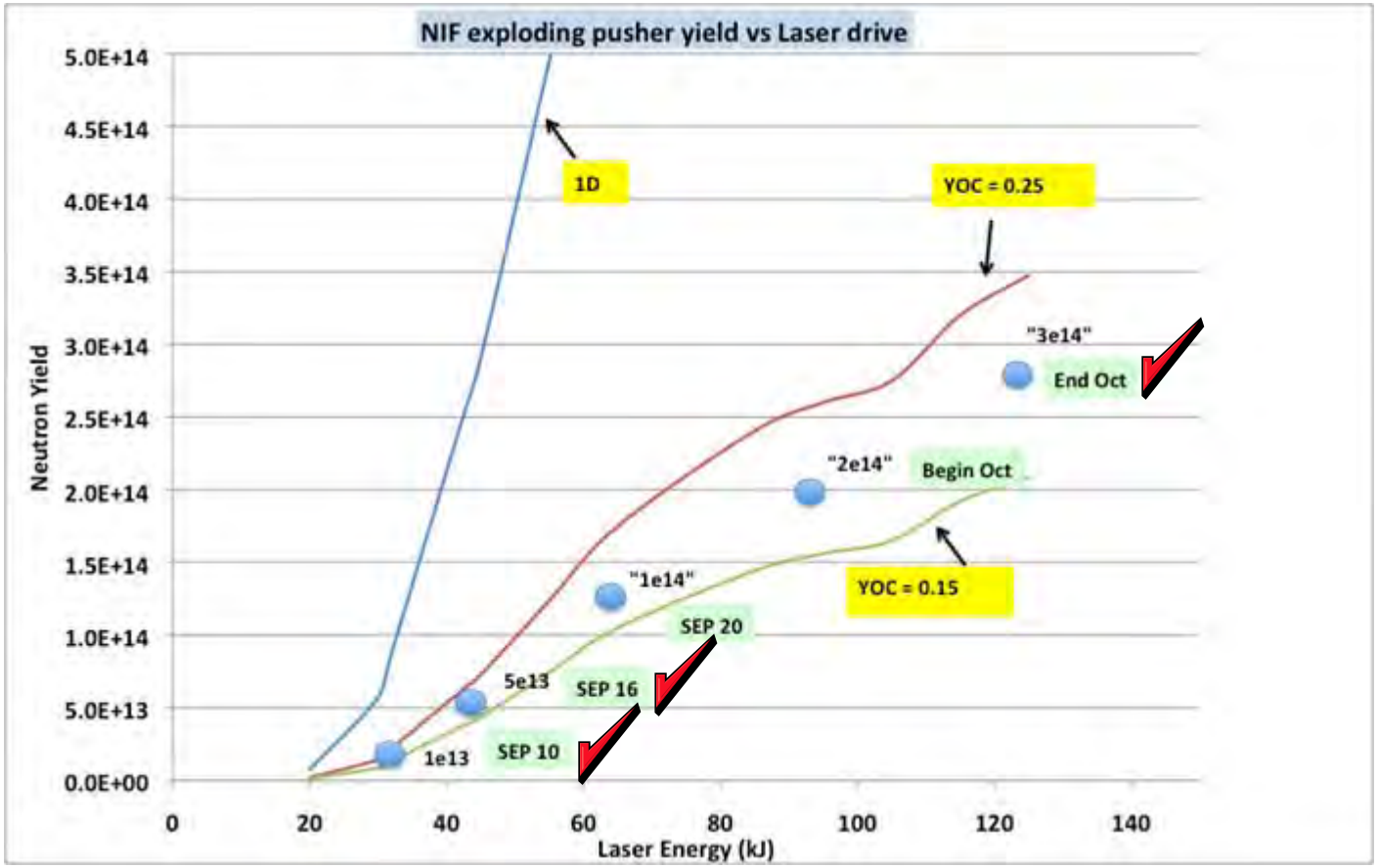
36B NBI plate



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

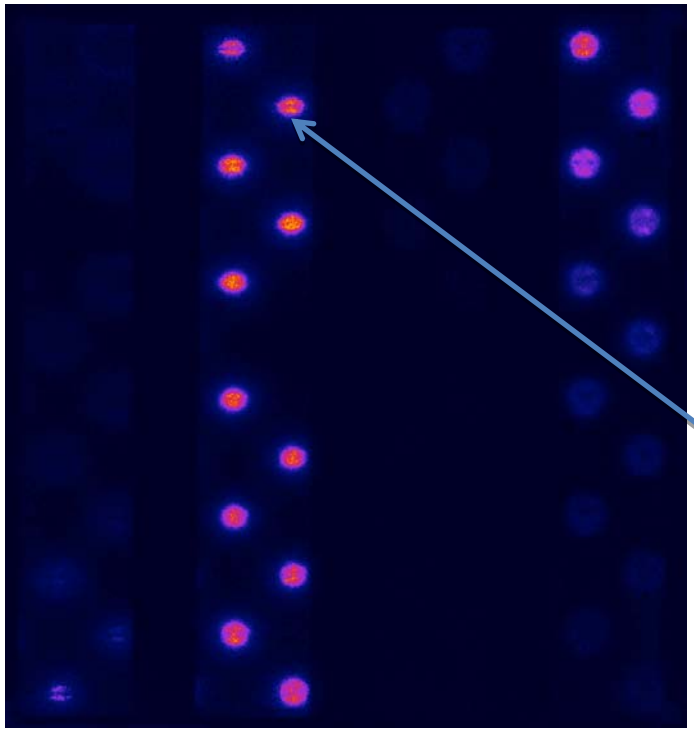


Neutron yield results are excellent – consistently posting values to within 10% of pre-shot predictions

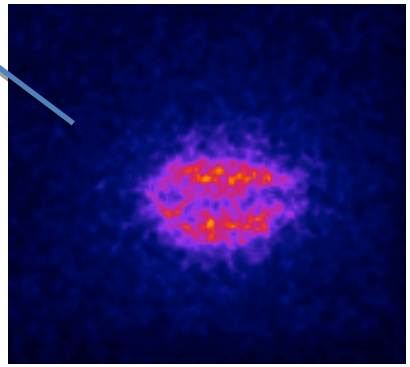


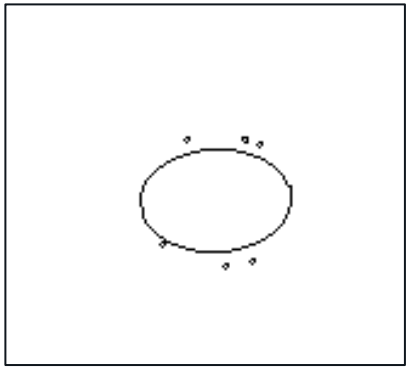
Latest hGXI images from NIF (110217) show prolate self-emission with density strip at equator

hGXI image analysis



Vertical



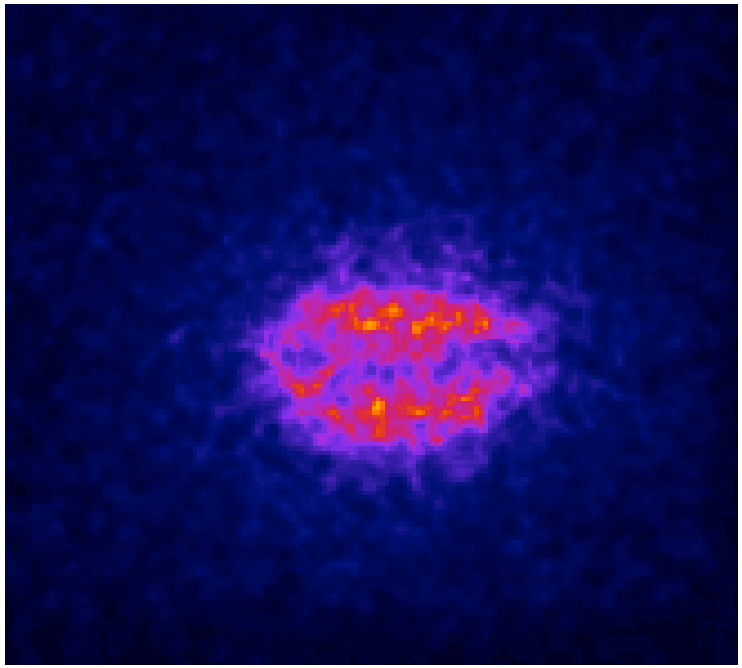


Centroid found by best ellipse fit: (80.3, 76.8)

R. Tommasini

Image is correlated with an expanding shock front interacting with l=4 lobes of stagnating shell

NIF 110217



DRACO PD CH target

R. Tommasini

Summary/Conclusions

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Neutron record of 2.4e14 was set on 10/30/2010

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

GXD-2 results

DRACO results