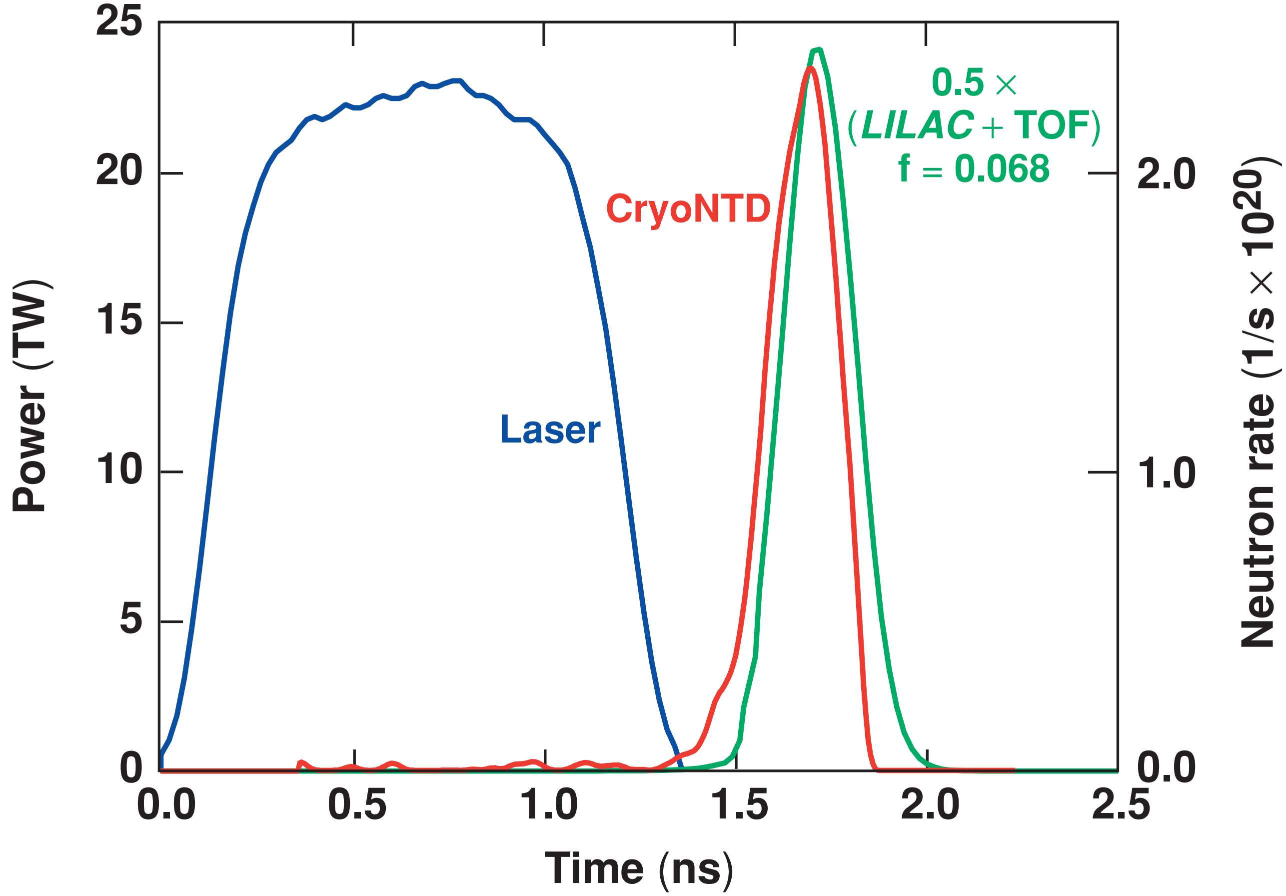
Neutron Burn History Measurements of D_2 Cryogenic Targets on OMEGA



V. Yu. Glebov
University of Rochester
Laboratory for Laser Energetics

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Collaborators

J. A. Delettrez, P. W. McKenty,
P. B. Radha, T. C. Sangster, and C. Stoeckl

Laboratory for Laser Energetics
University of Rochester

Related Talks:

J. A. Delettrez GO2.004
T. C. Sangster RI1.006

Summary

CryoNTD records the important neutron burn history information for D_2 cryogenic implosions on OMEGA

UR LLE

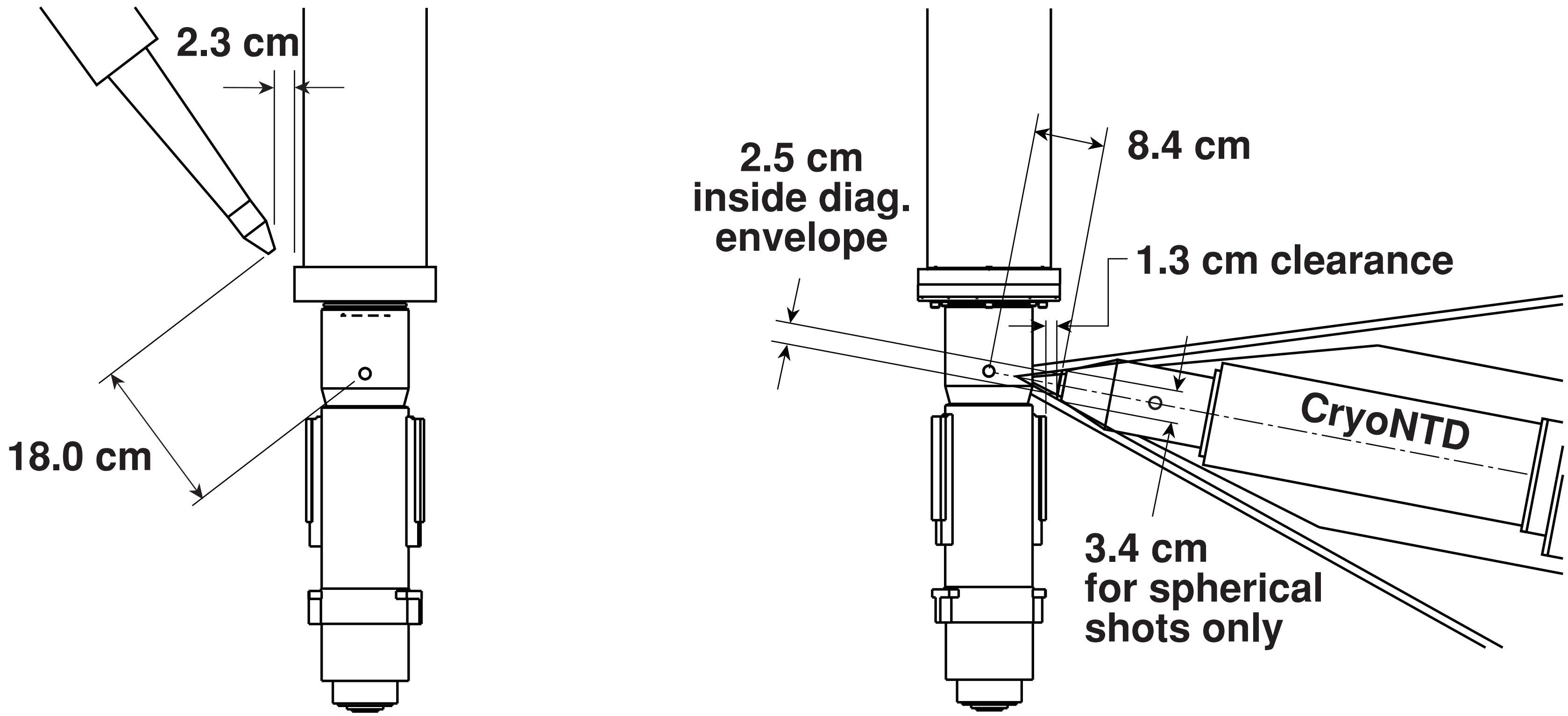
- **CryoNTD was built because the NTD system on OMEGA is too insensitive to measure the burn history of D_2 cryogenic implosions due to standoff requirements of the Cryogenic Target Handling System.**

- **CryoNTD has a time resolution ~ 80 ps, absolute timing calibration ~ 40 ps, and a sensitivity of ~ 10^9 neutrons.**

- **CryoNTD data is correlated with ice-layer quality (melting or crystallization) at shot time.**

- **The neutron burn history of the layered D_2 cryogenic targets generally agrees with the *LILAC* calculation.**

We built a TIM-based cryoNTD specially for D_2 cryogenic target shots on OMEGA

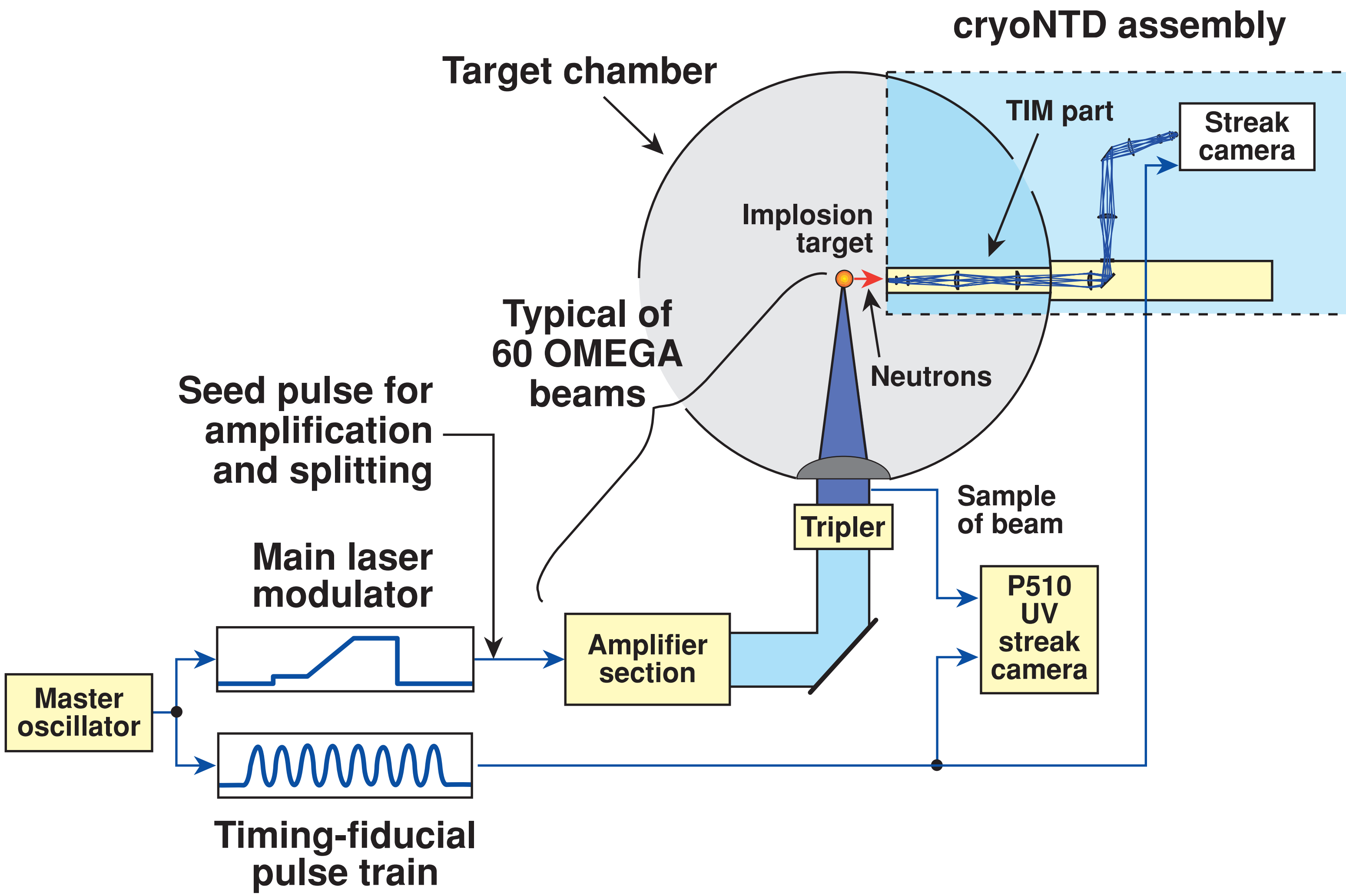


NTD
0.6-cm scintillator
at 20 cm from TCC

CryoNTD
3-cm scintillator
at 9 cm from TCC

E11690

The cryoNTD setup uses the OMEGA fiducial system as a timing reference



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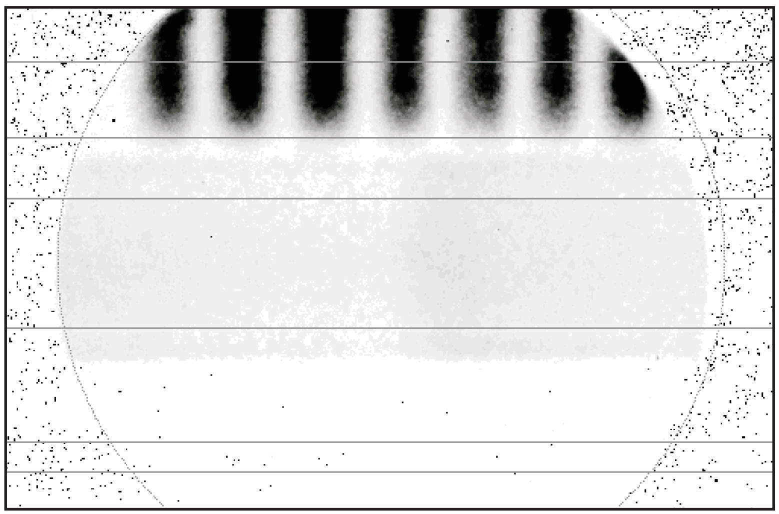
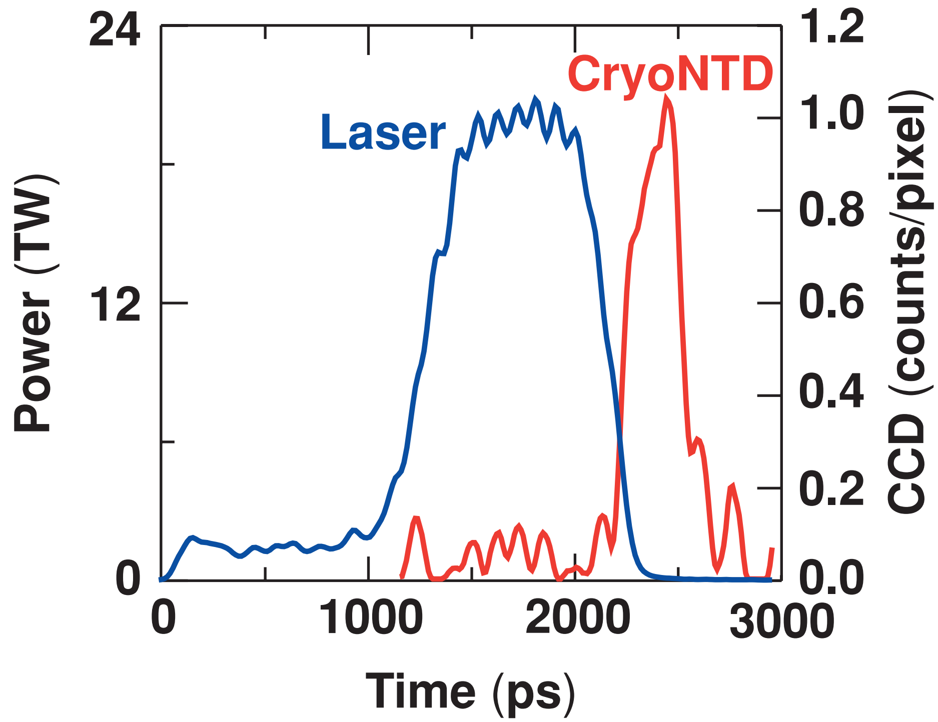
Cryo NTD sensitivity is about 1×10^9 neutrons

Streak camera image



Shot 27143
$Y = 1.72 \times 10^9$



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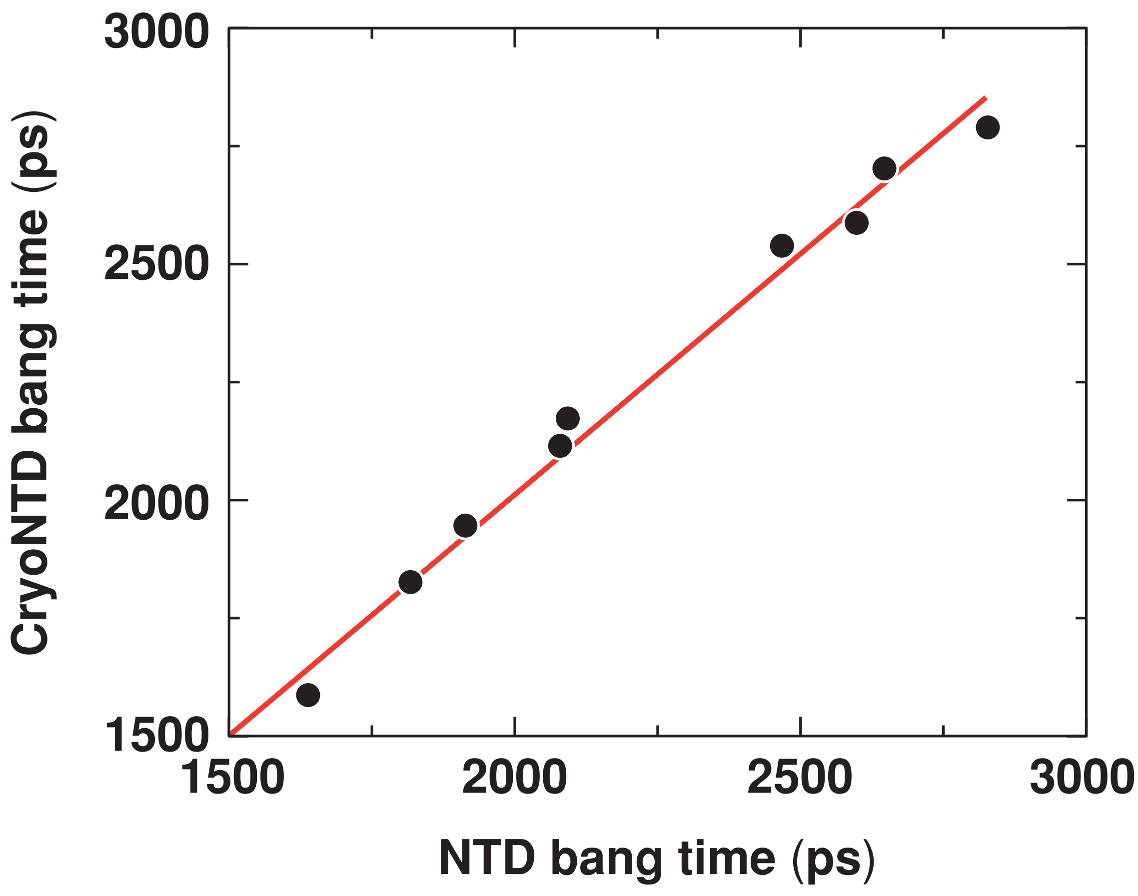
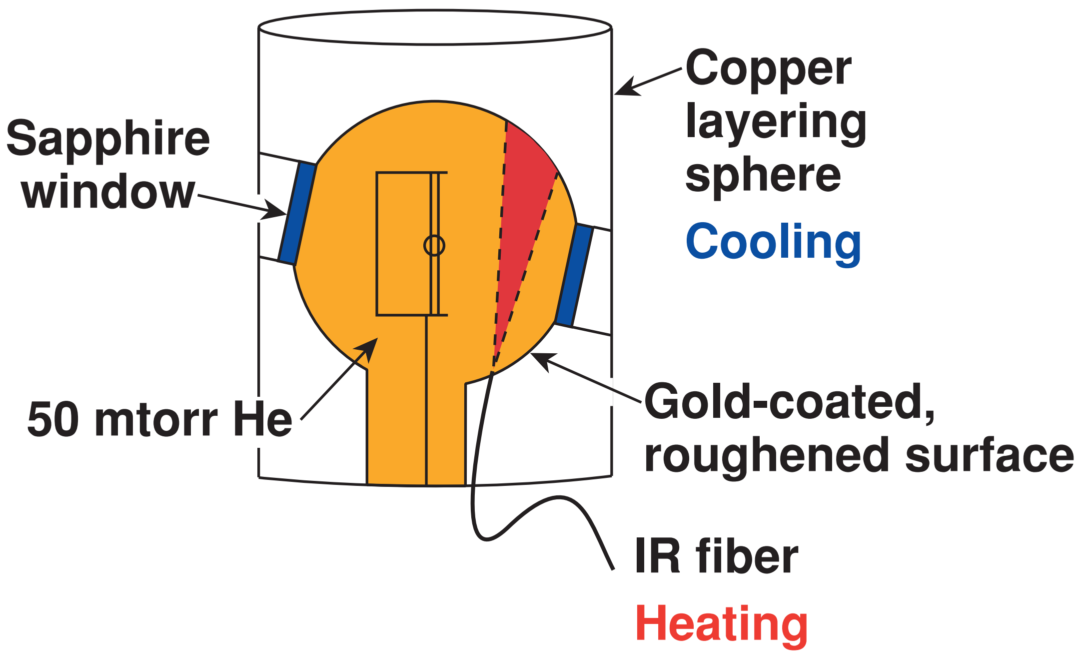
Absolute timing of the cryoNTD was established with 40-ps accuracy using NTD as a reference



A layered cryogenic target can be in one of the three stages inside the OMEGA target chamber

A cryogenic target inside the target chamber is in the layering sphere before the shot.



Transmission of the IR fiber can change up to 10% during insertion into the target chamber.

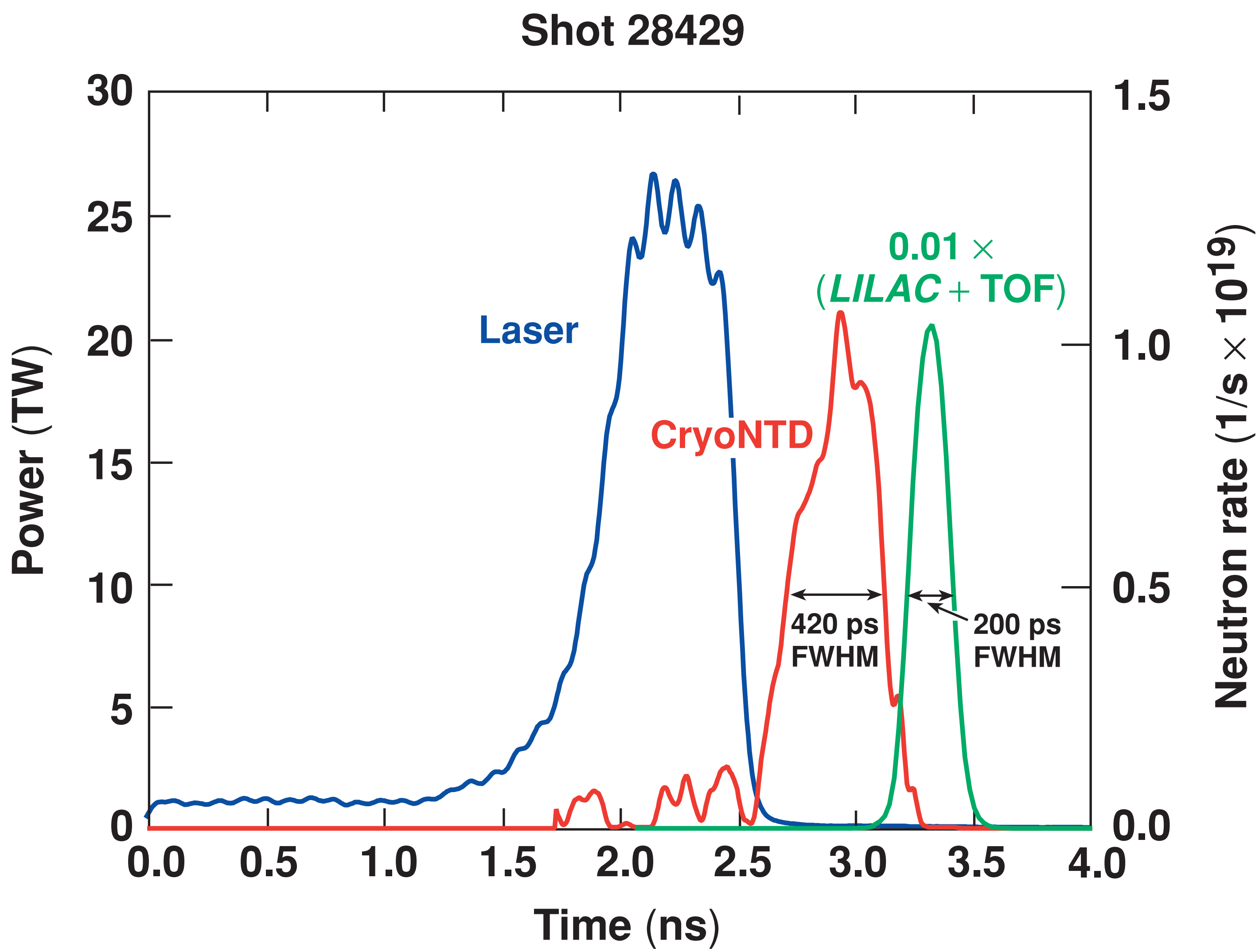
Heating = Cooling
layered target

Heating < Cooling
"Crystallized" target

Heating > Cooling
"Melted" target

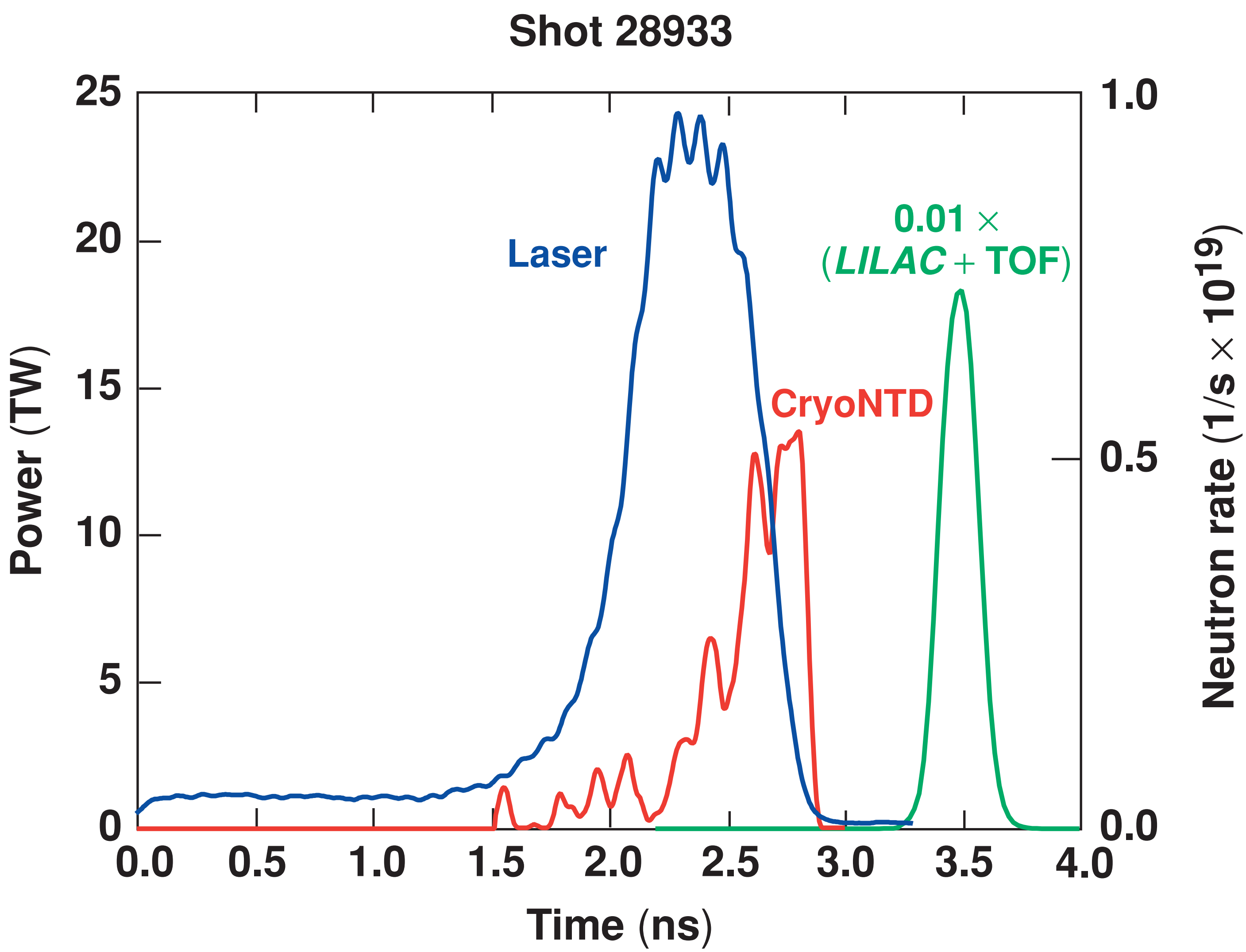
E11986

A “crystallized” cryogenic target has a neutron burn width much wider than predicted by *LILAC*



E11987

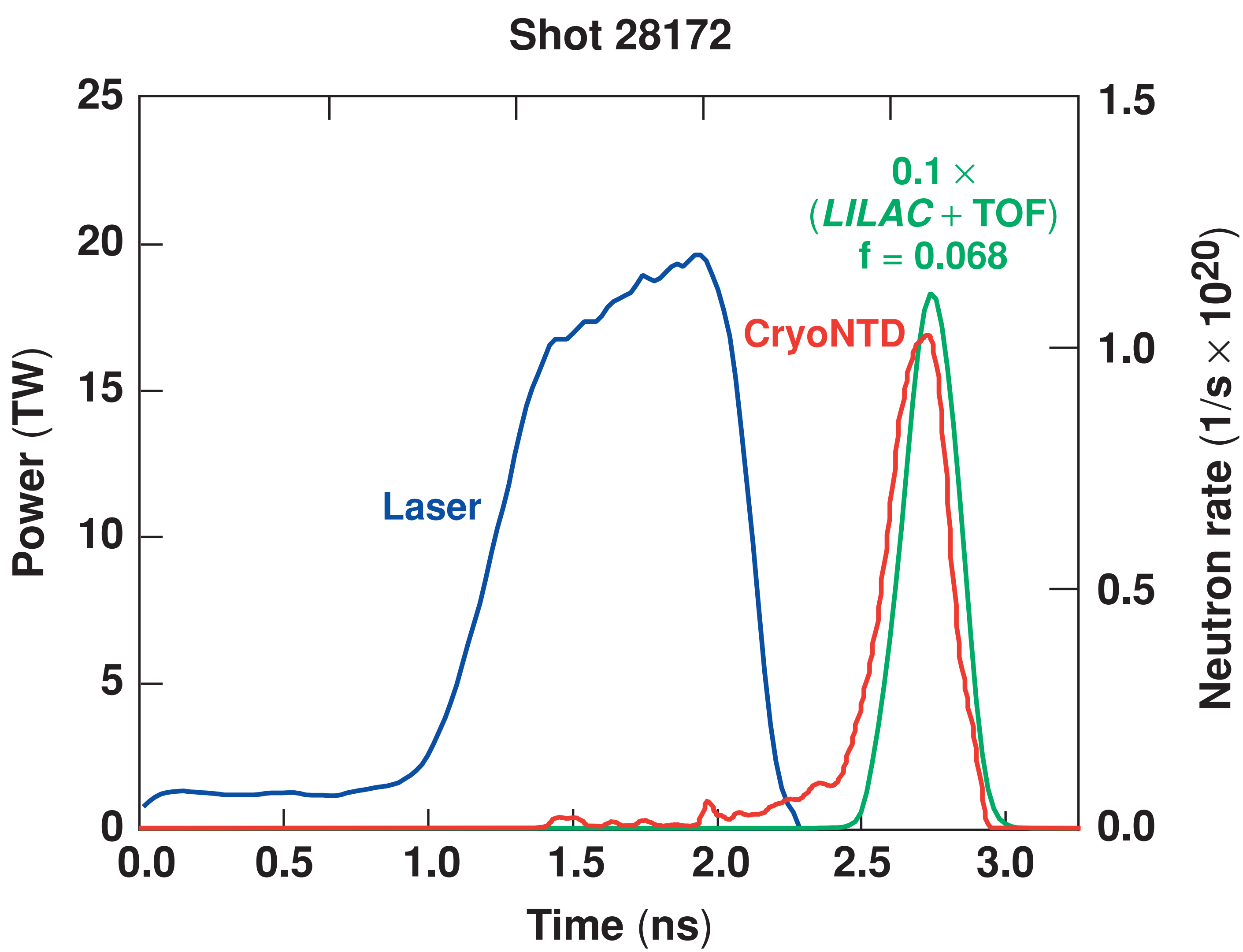
A “melted” cryogenic target has a neutron bang time much earlier than predicted by *LILAC*



E11988

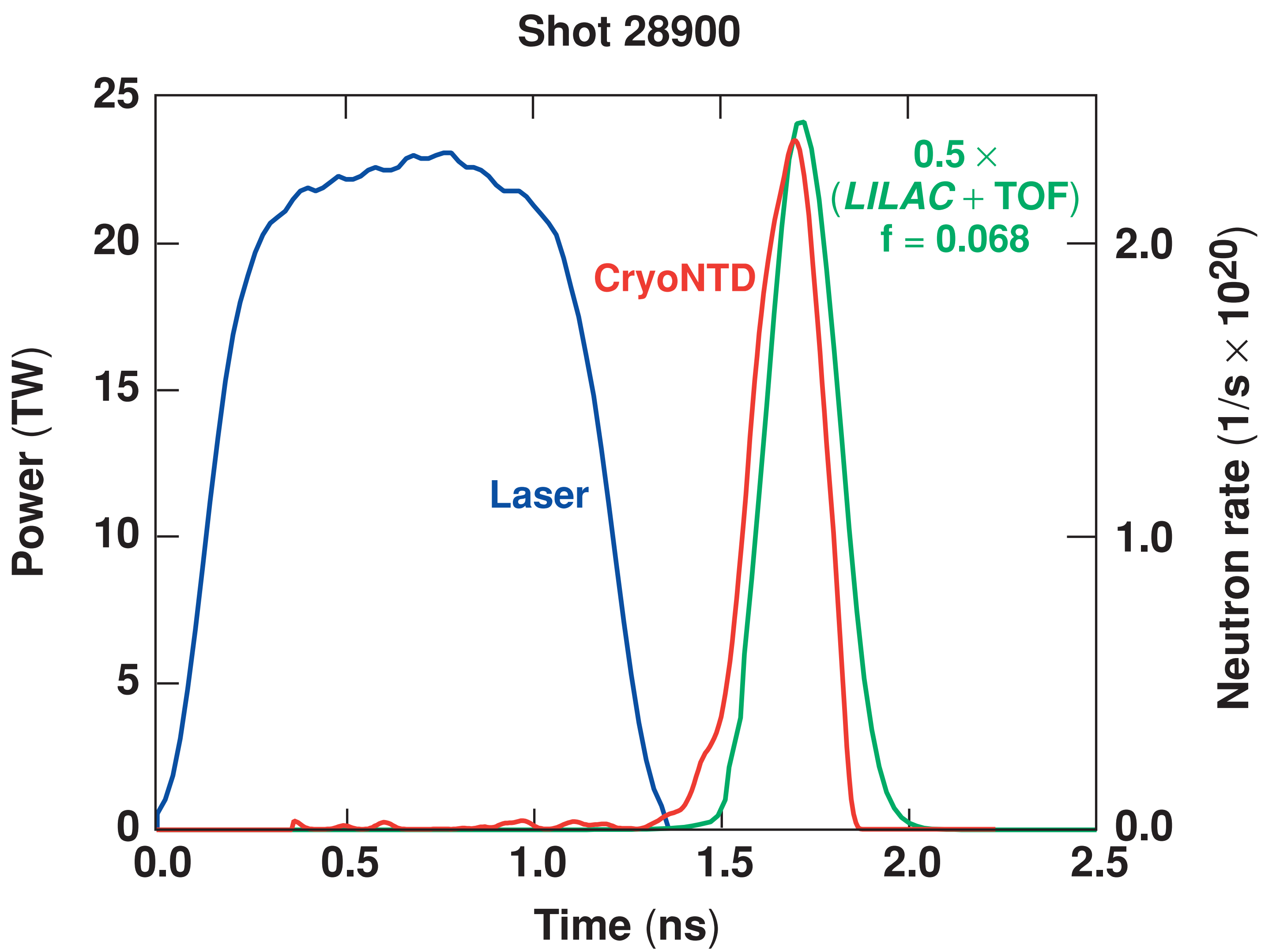
A layered cryogenic target has a neutron burn history in general agreement with *LILAC* prediction

UR LLE



E12032

Layered cryogenic target has neutron burn history in general agreement with *LILAC* prediction



E11989

Summary/Conclusions

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