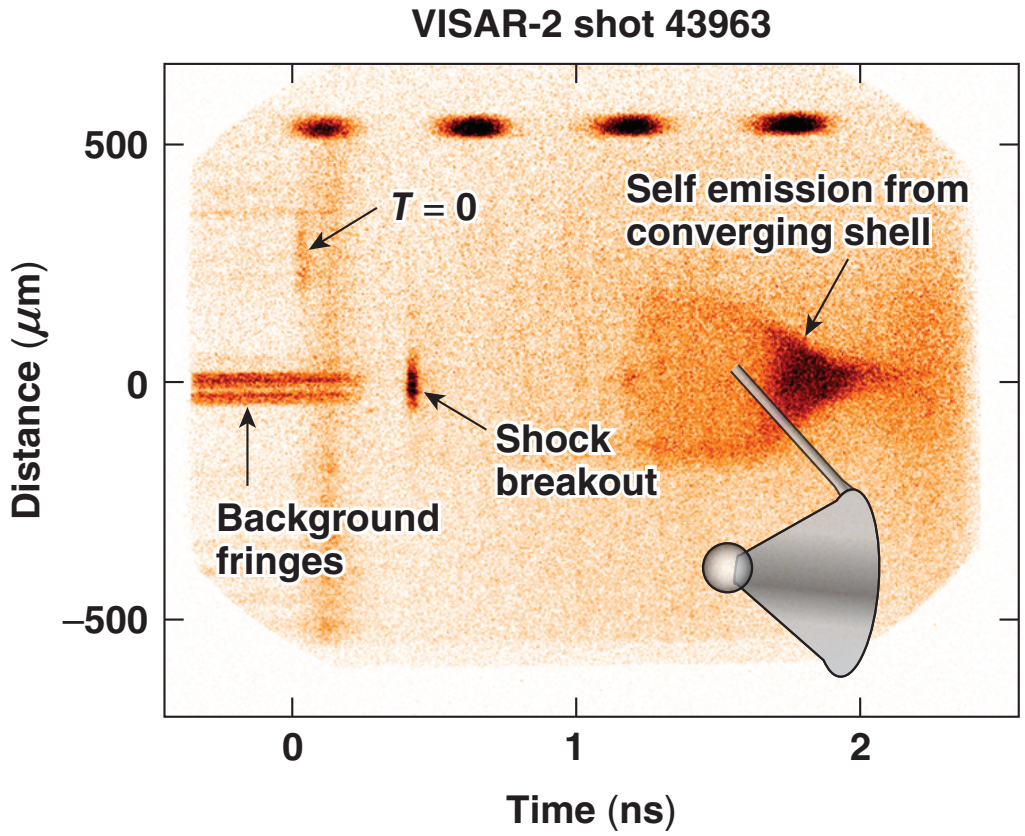
Spherical Shock-Breakout Measurements on OMEGA



J. M. Soures
University of Rochester
Laboratory for Laser Energetics

48th Annual Meeting of the
American Physical Society
Division of Plasma Physics
Philadelphia, PA
30 October–3 November 2006

Summary

Shock-timing measurements have begun on spherical targets on OMEGA

UR LLE

- Both direct- and indirect-drive National Ignition Campaign (NIC) experiments require shock timing to be performed in spherical targets using optical diagnostics

- OMEGA experiments have demonstrated that:
  - VISAR signals can be obtained from inner surfaces of spheres
  - shock-breakout features are evident—consistent with 1-D simulations
  - implosion features are visible

- Future experiments will be performed on cryogenic deuterium targets

Collaborators

UR LLE

T. R. Boehly

V. N. Goncharov

S. X. Hu

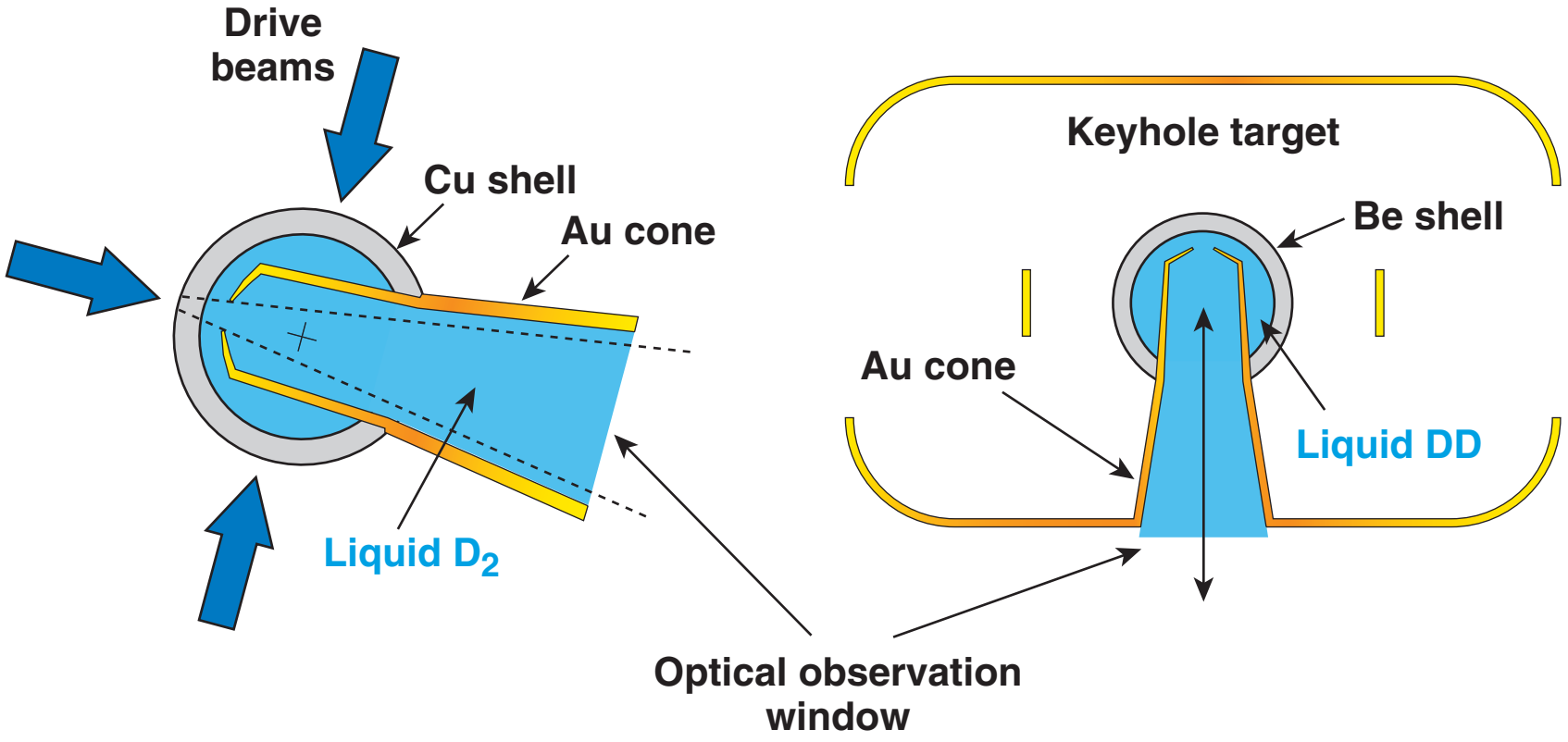
D. D. Meyerhofer

J. E. Miller

T. C. Sangster

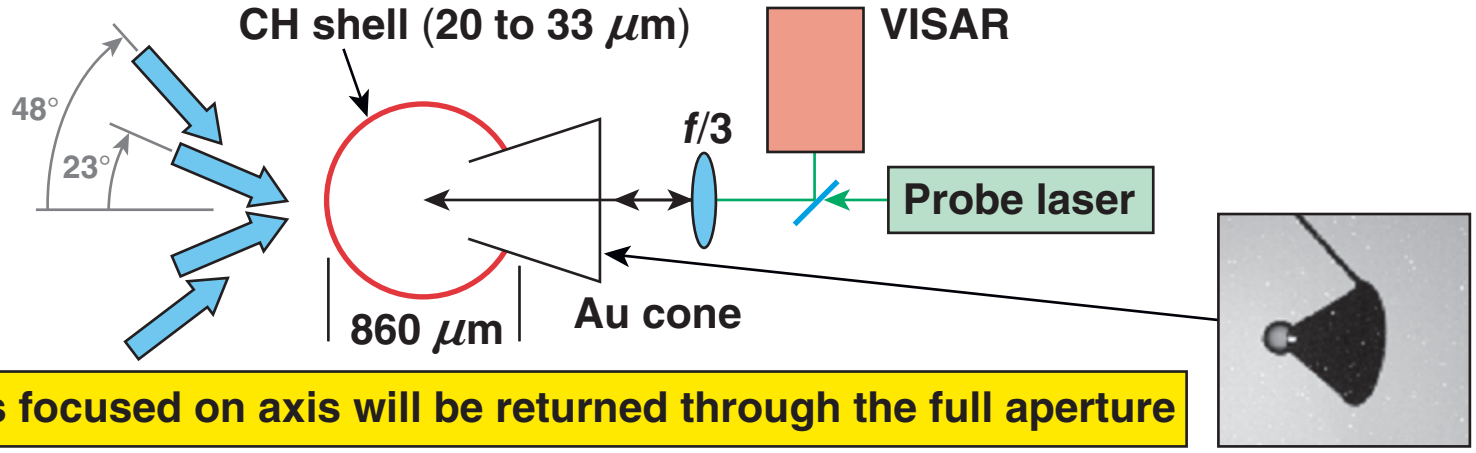
V. A. Smalyuk

Shock-timing measurements in direct- and indirect-drive targets can be implemented with a conical geometry

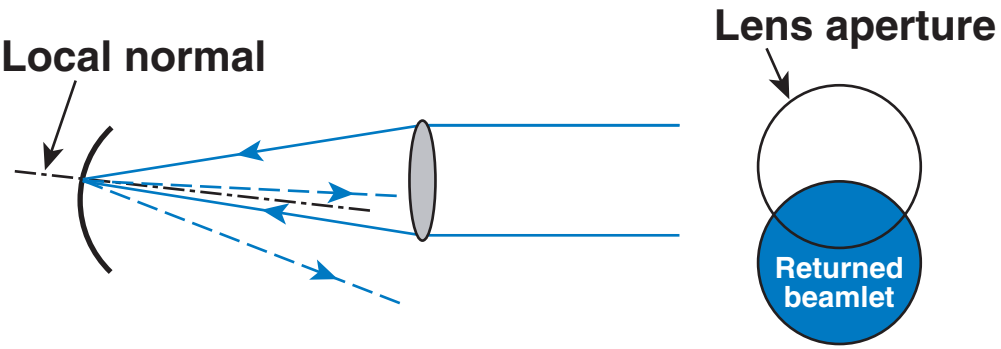


E15221

The new VISAR configuration was used to measure the shock breakout inside an empty CH shell



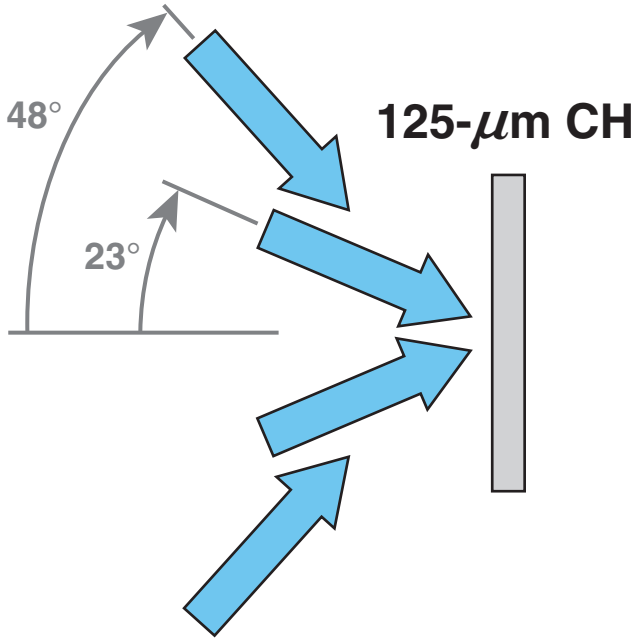
- Rays focused on axis will be returned through the full aperture

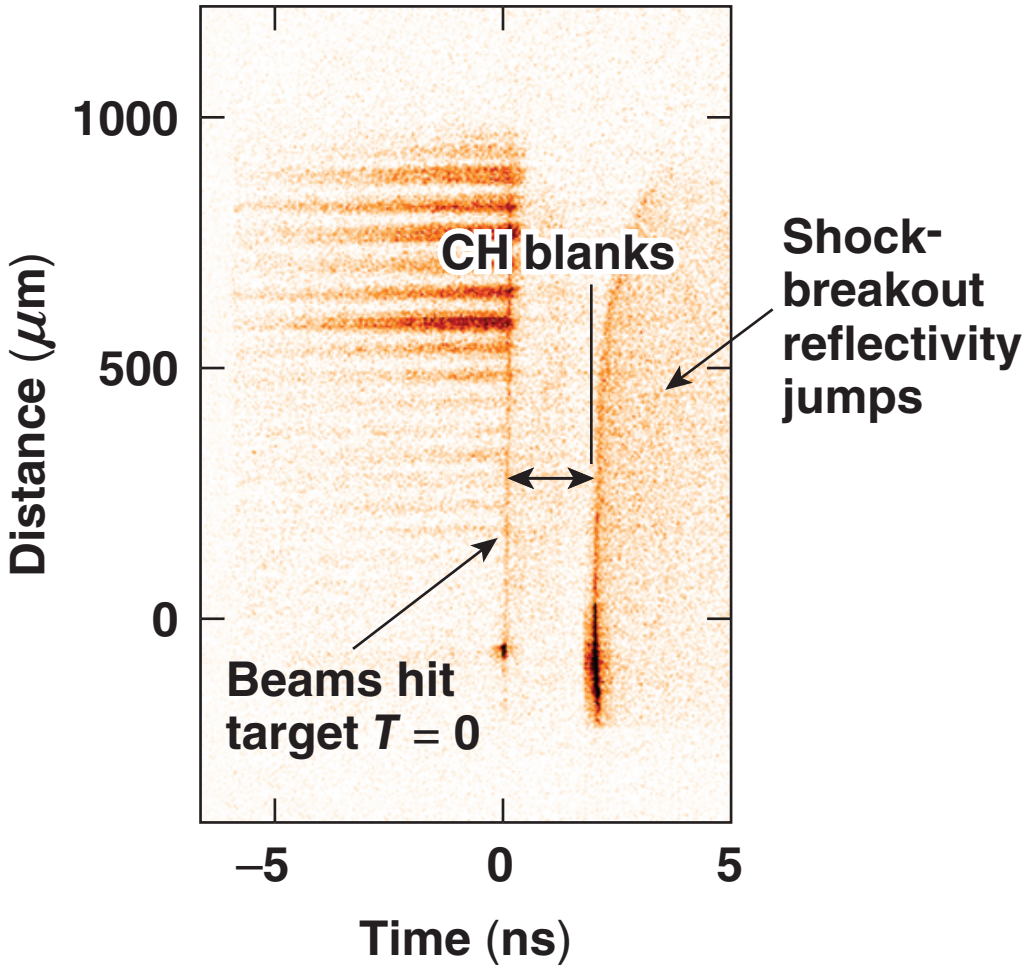


- Rays focused off axis will not be returned through the center aperture
- Beyond a limiting radius, the entire reflected 'beamlet' misses the lens

E15222

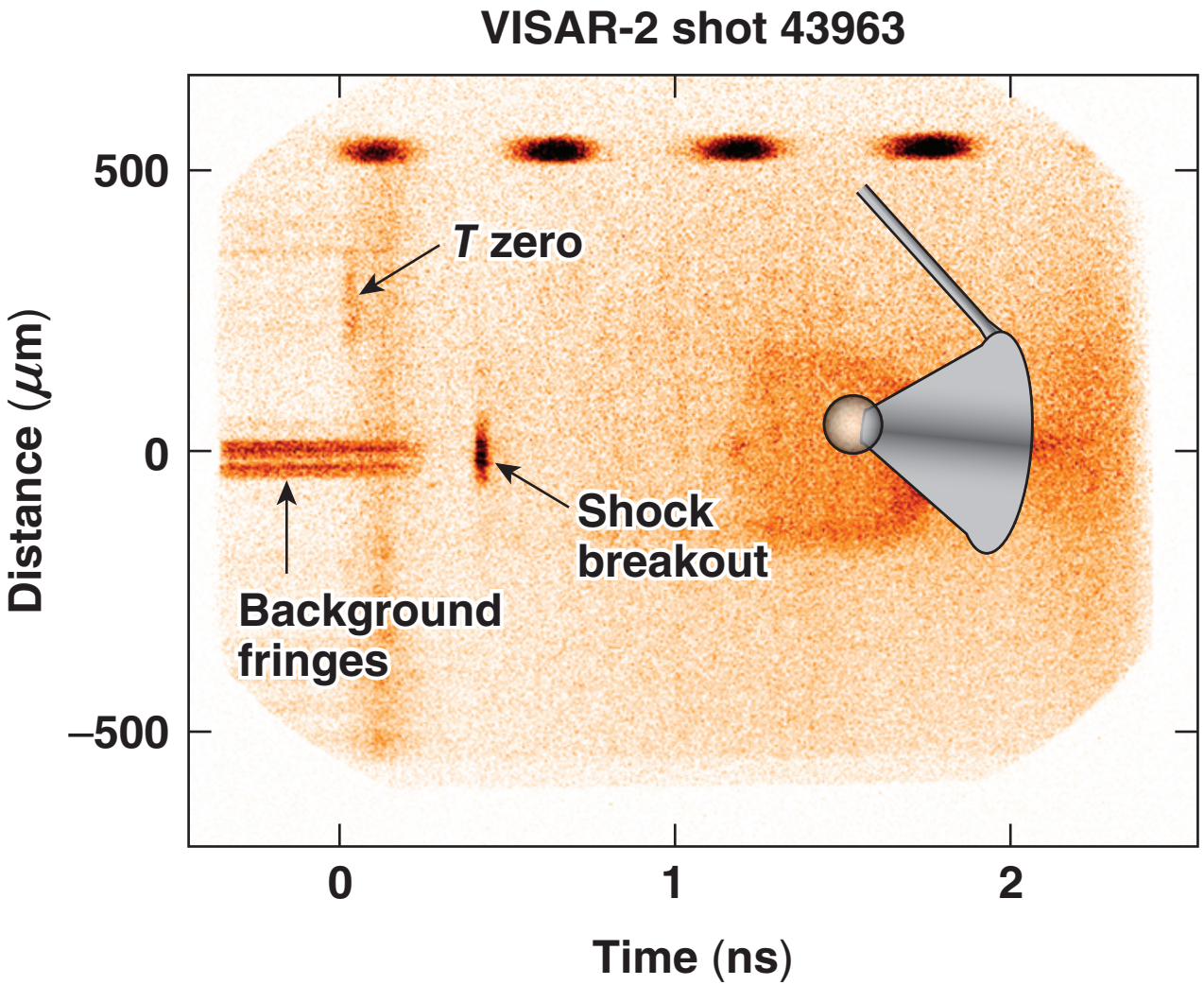
Shock timing at high intensity suffers from ionization blanking





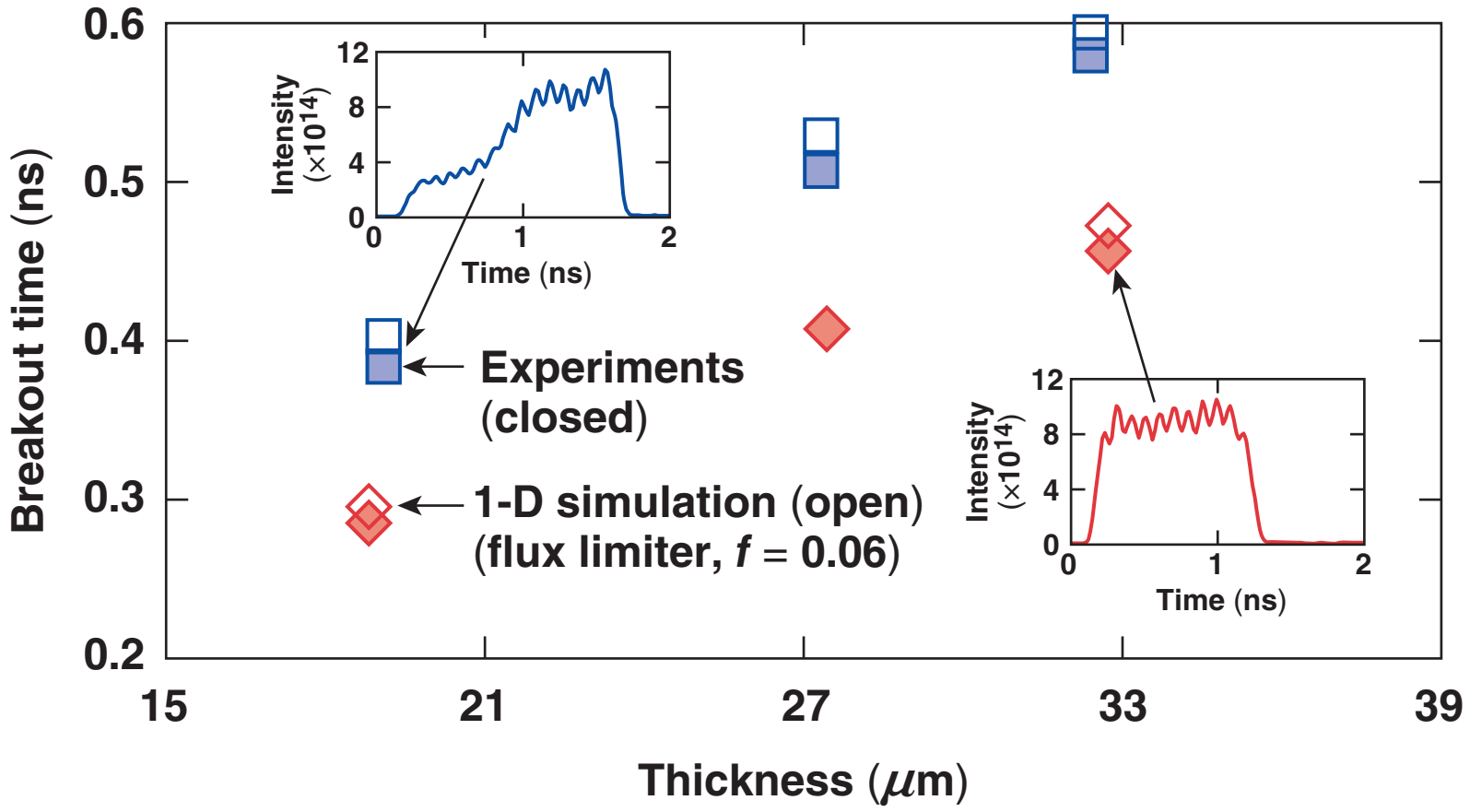
E15223

Shock transit times in spherical shells were measured using VISAR-recorded breakout times



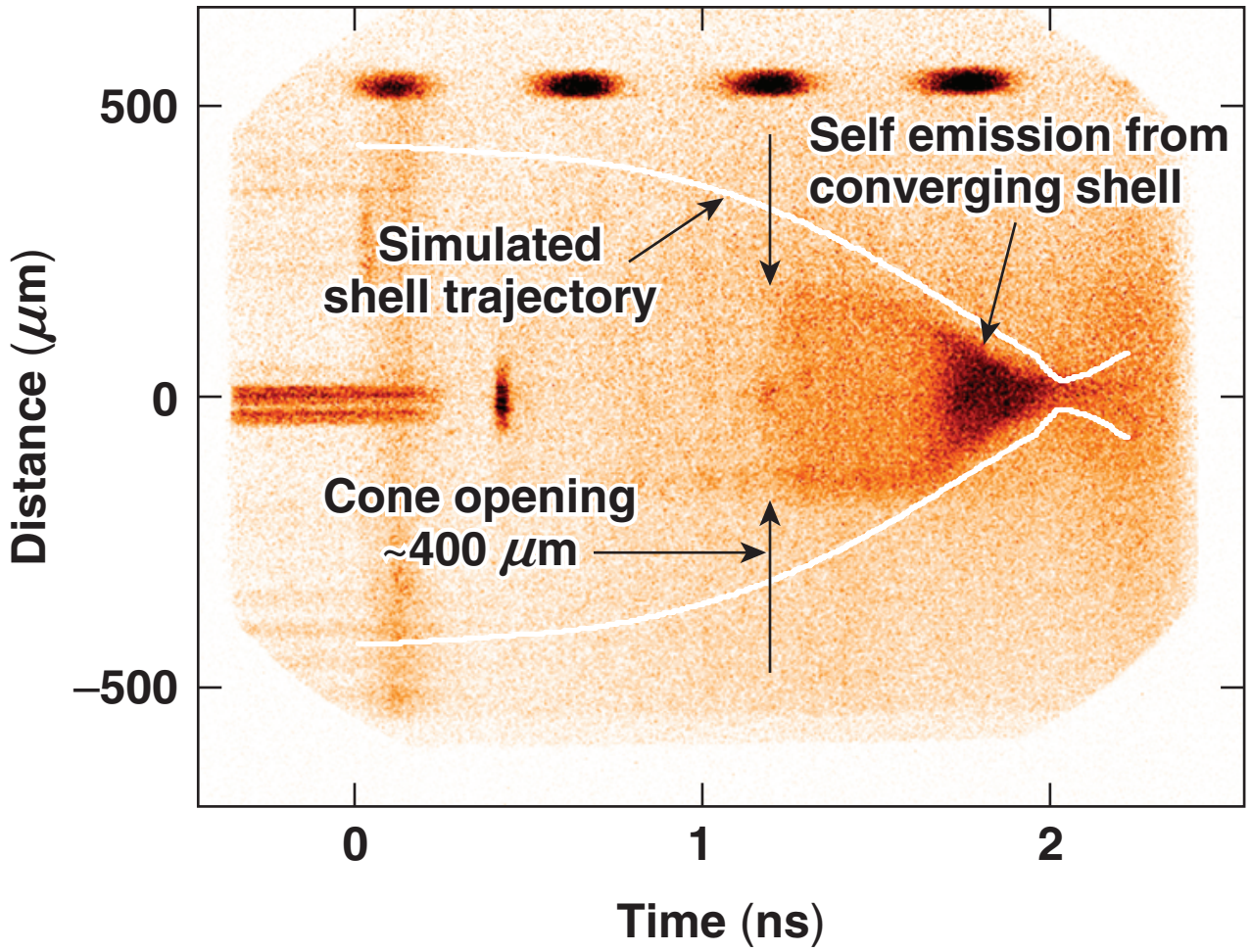
E15224

The predicted shock-breakout times agree with the measurements for both square and ramp pulses



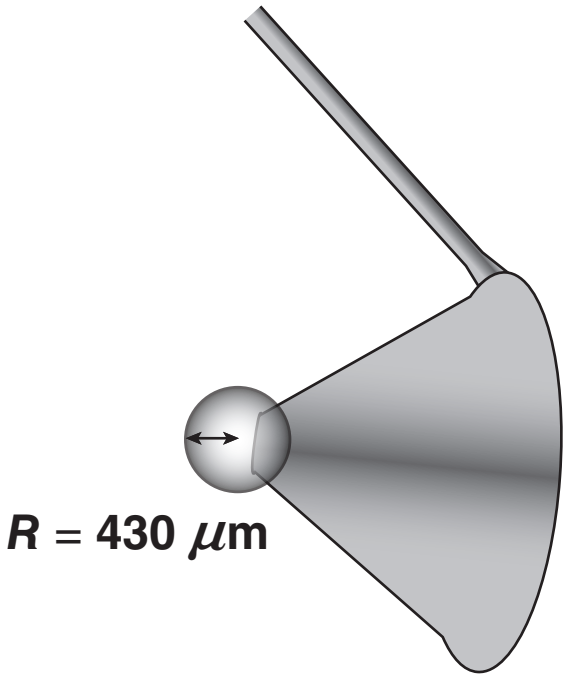
E15225

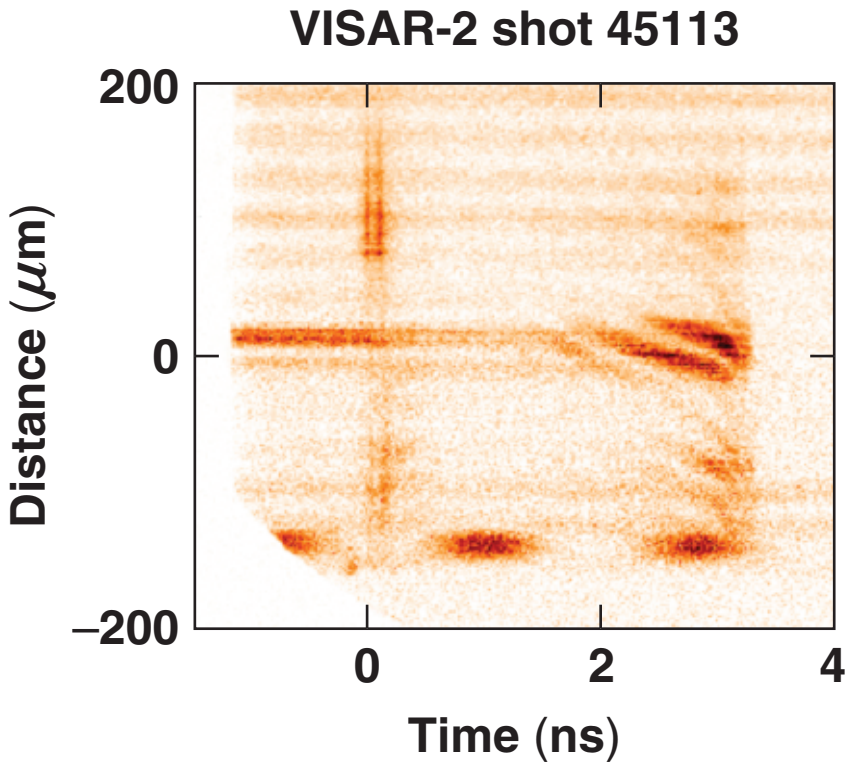
Optical emission from imploding shell was observed with VISAR—agrees well with simulated shell trajectory



E15226

Short-pulse (100 ps) experiments on spheres at ~10^{14} W/cm^2 show VISAR signals from concave shocks





E15328

Summary/Conclusions

Shock-timing measurements have begun on spherical targets on OMEGA

UR LLE

- Both direct- and indirect-drive National Ignition Campaign (NIC) experiments require shock timing to be performed in spherical targets using optical diagnostics

- OMEGA experiments have demonstrated that:
  - VISAR signals can be obtained from inner surfaces of spheres
  - shock-breakout features are evident—consistent with 1-D simulations
  - implosion features are visible

- Future experiments will be performed on cryogenic deuterium targets