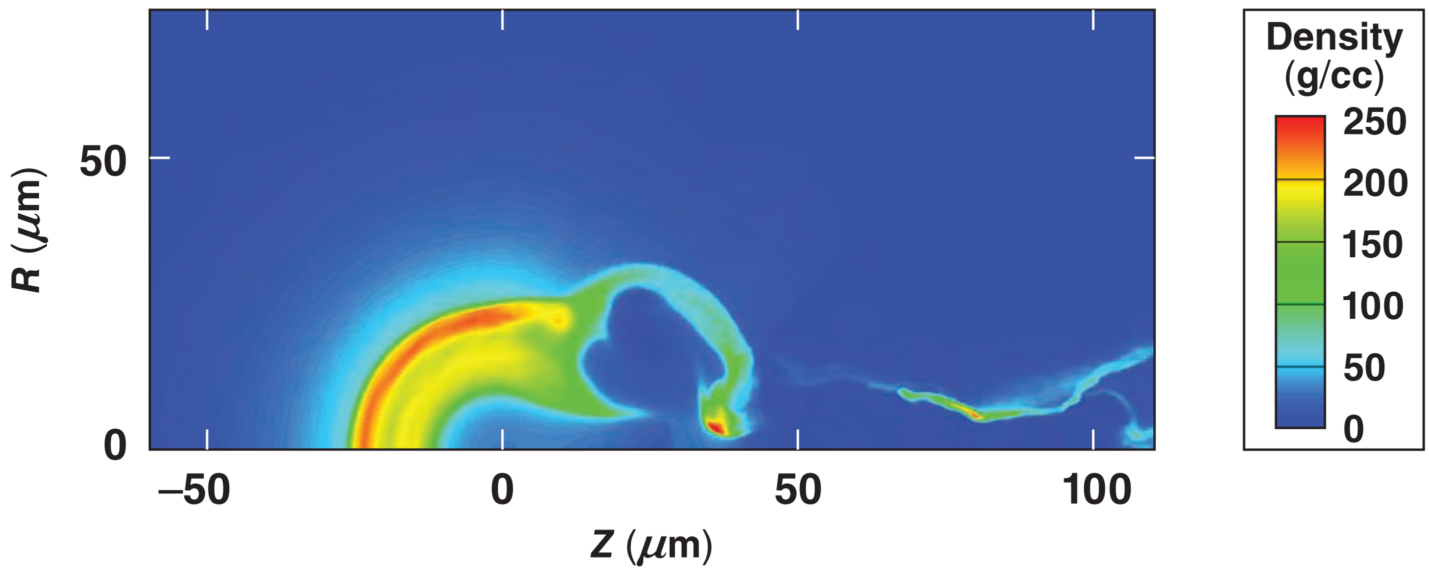
Direct-Drive Fuel-Assembly Simulations of Fast-Ignition Cone-in-Shell Targets



K. S. Anderson *et al.*
University of Rochester
Fusion Science Center and
Laboratory for Laser Energetics

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Summary

DRACO cone-in-shell simulations are consistent with OMEGA experiments

FSC

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- Cone-in-shell *DRACO* simulations show qualitative agreement with OMEGA experiments
  - high-adiabat (1-ns), 24-μm CH capsule
  - low-adiabat (α = 1.2) picket pulse, 40-μm CH capsule with truncated cone tips
- A cryogenic target-design space for integrated experiments on OMEGA EP is being explored

Integrated experiments for OMEGA are being designed.

Collaborators

R. Betti*, I. V. Igumenshchev, P. W. McKenty,
P. B. Radha, C. Stoeckl, and W. Theobald*

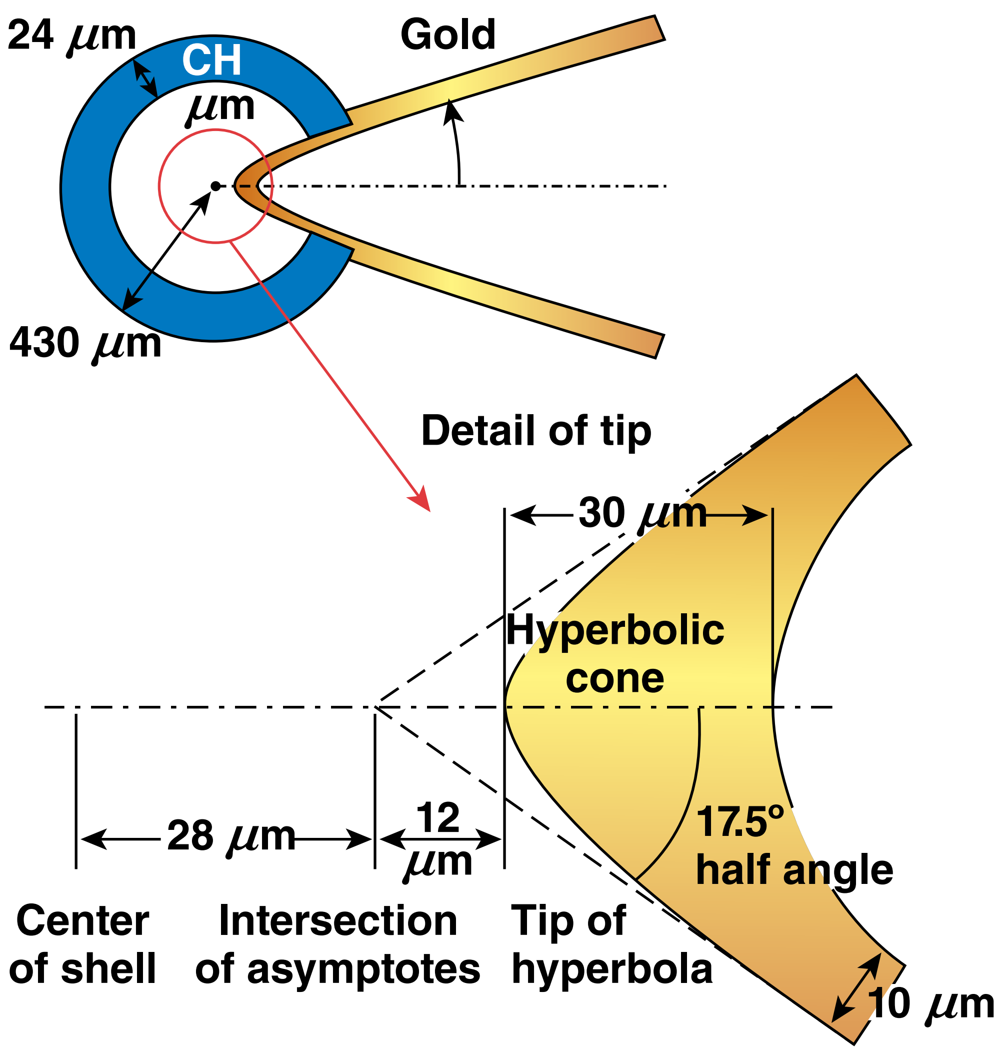
University of Rochester
Laboratory for Laser Energetics

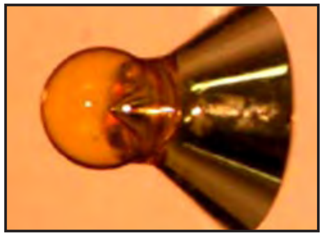
*Fusion Science Center for Extreme States
of Matter and Fast-Ignition Physics

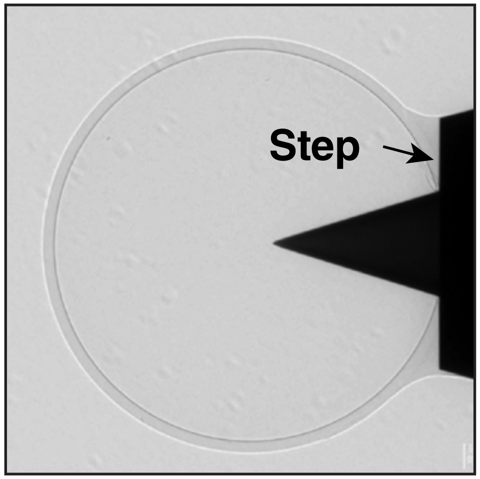
M. M. Marinak

Lawrence Livermore National Laboratory

Cone-in-shell experiments were performed on OMEGA







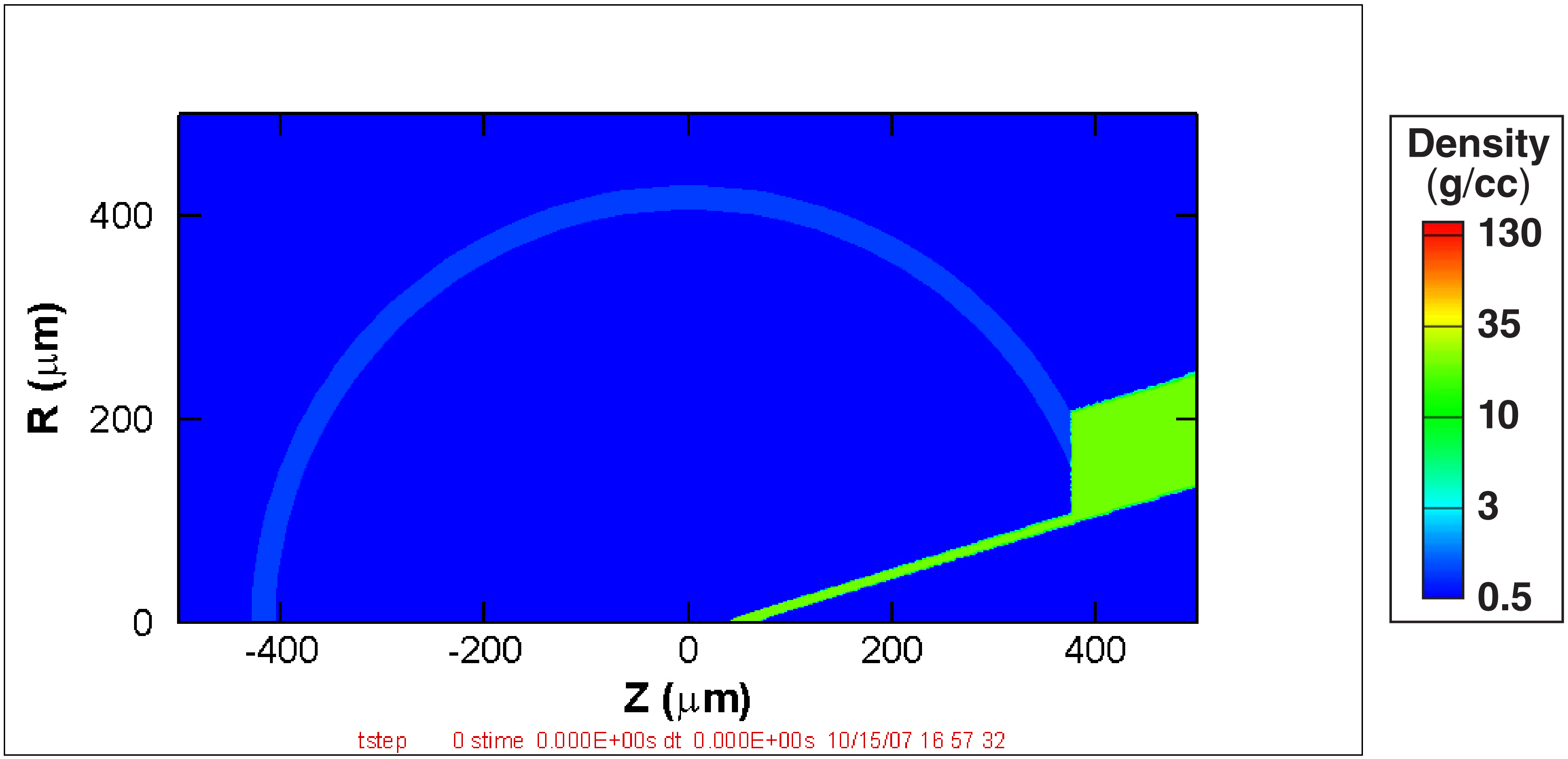
Radiograph of target

C. Stoeckl *et al.*, Phys. Plasmas 47, 859 (2005).

Cone-in-shell simulations are performed with *DRACO*

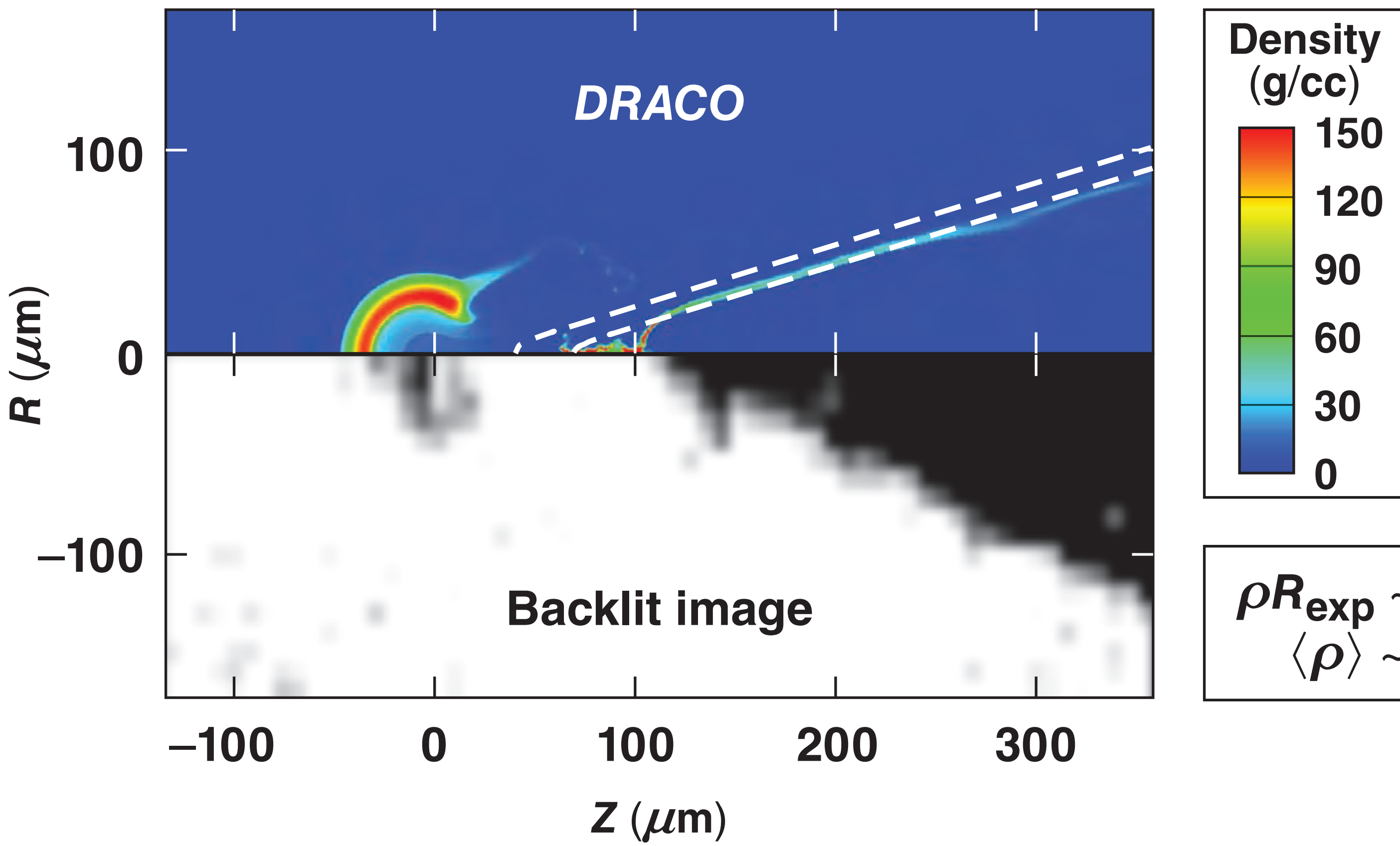
- Eulerian moving-grid PPM scheme
- Radiation transport not included; simulations with radiation are in progress
- Normal-incident laser ray trace with uniform intensity; simulations with 3-D ray trace to begin next month

High-adiabat 1-ns *DRACO* plastic shells with cone have been simulated



Energy on shot = 21 kJ

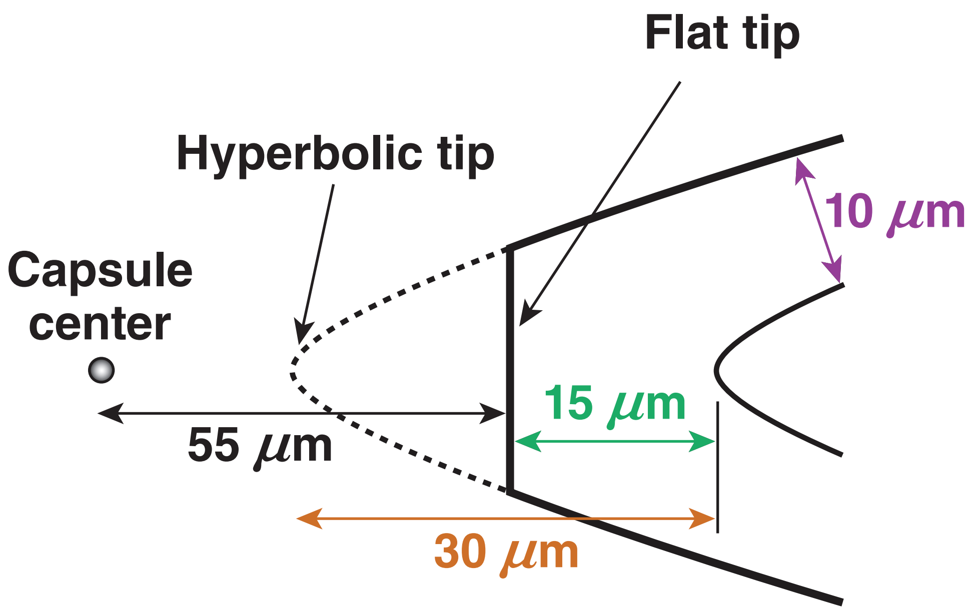
DRACO-predicted density profile of 1-ns cone-in-shell targets agree qualitatively with experiment

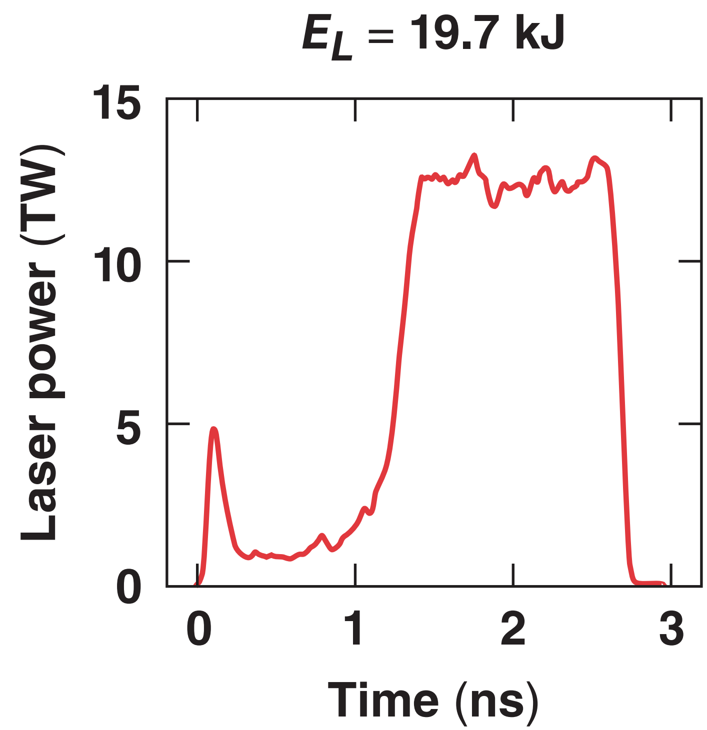


$\rho R_{exp} \sim 60\ \mathrm{mg/cm^2}$
$\langle \rho \rangle \sim 15\ \mathrm{g/cm^3}$

TC7959

Low-adiabat picket-pulse experiments with 40-μm CH shells and truncated cone tips were performed on OMEGA



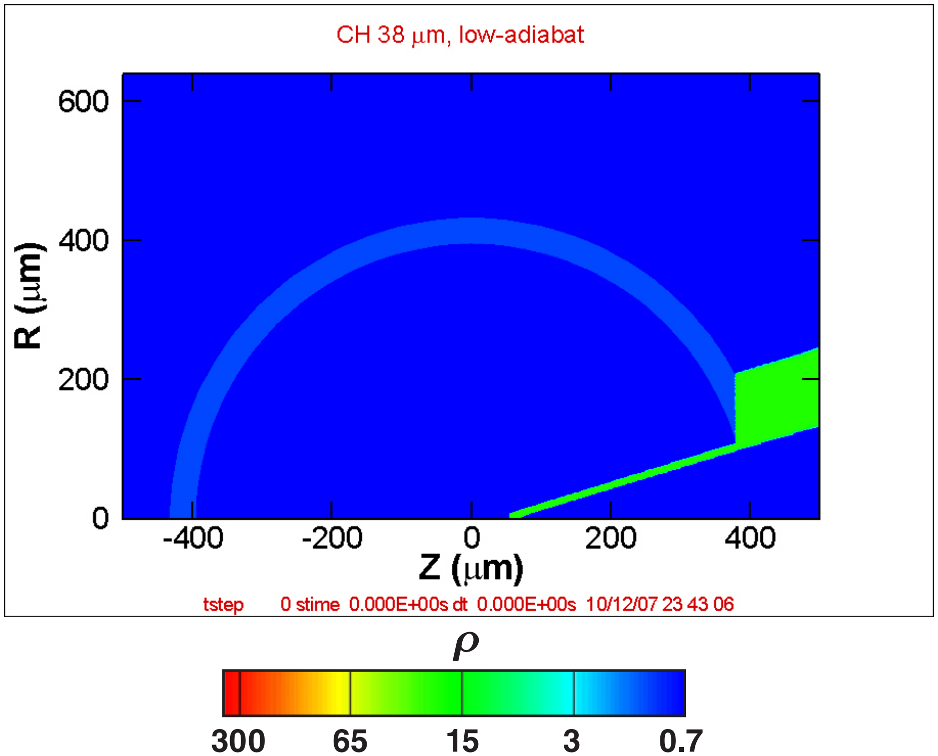


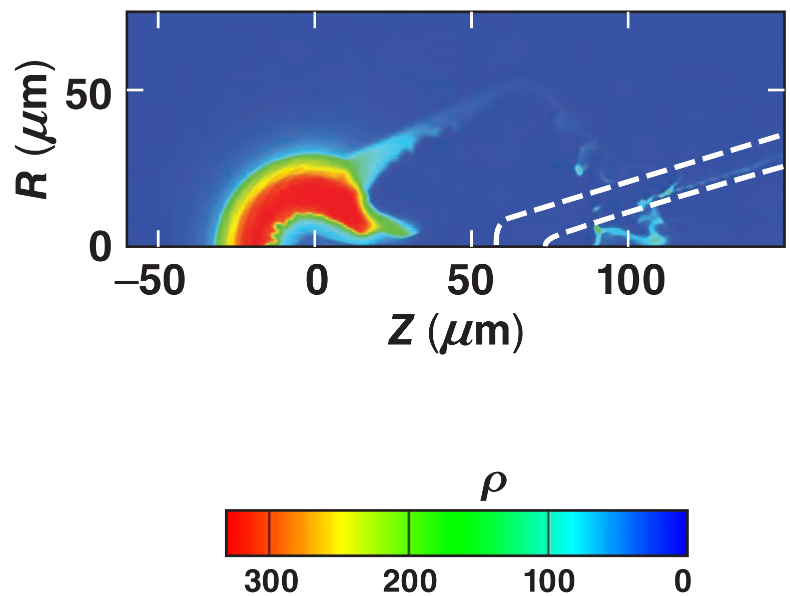
Truncated tip

- Less material between fast-electron beam and core
- Cone tip farther from capsule center

TC7960

Fuel assembly in low-adiabat cone-in-shell exhibits high areal density



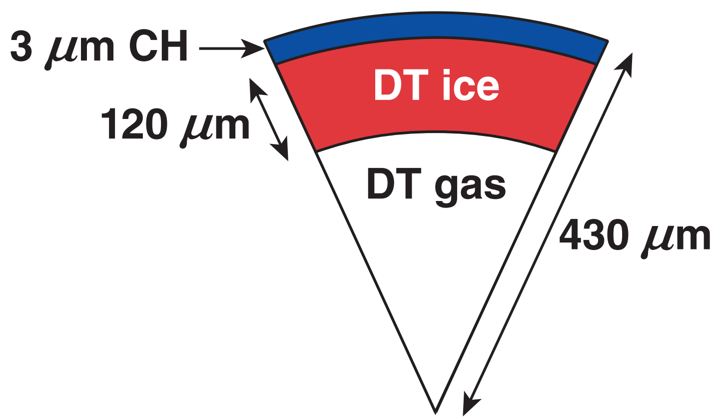


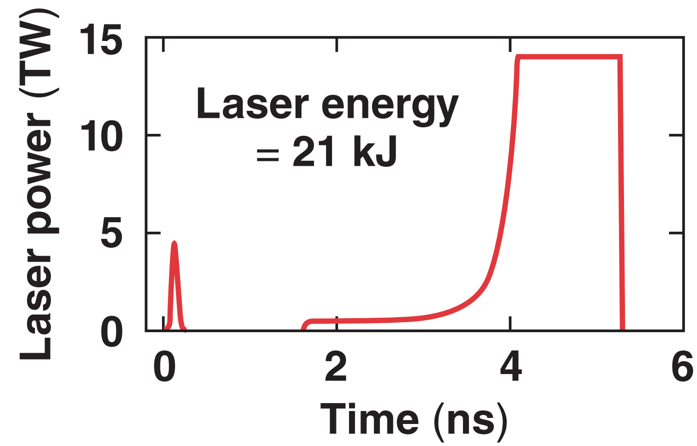
Shock break-out time at cone tip

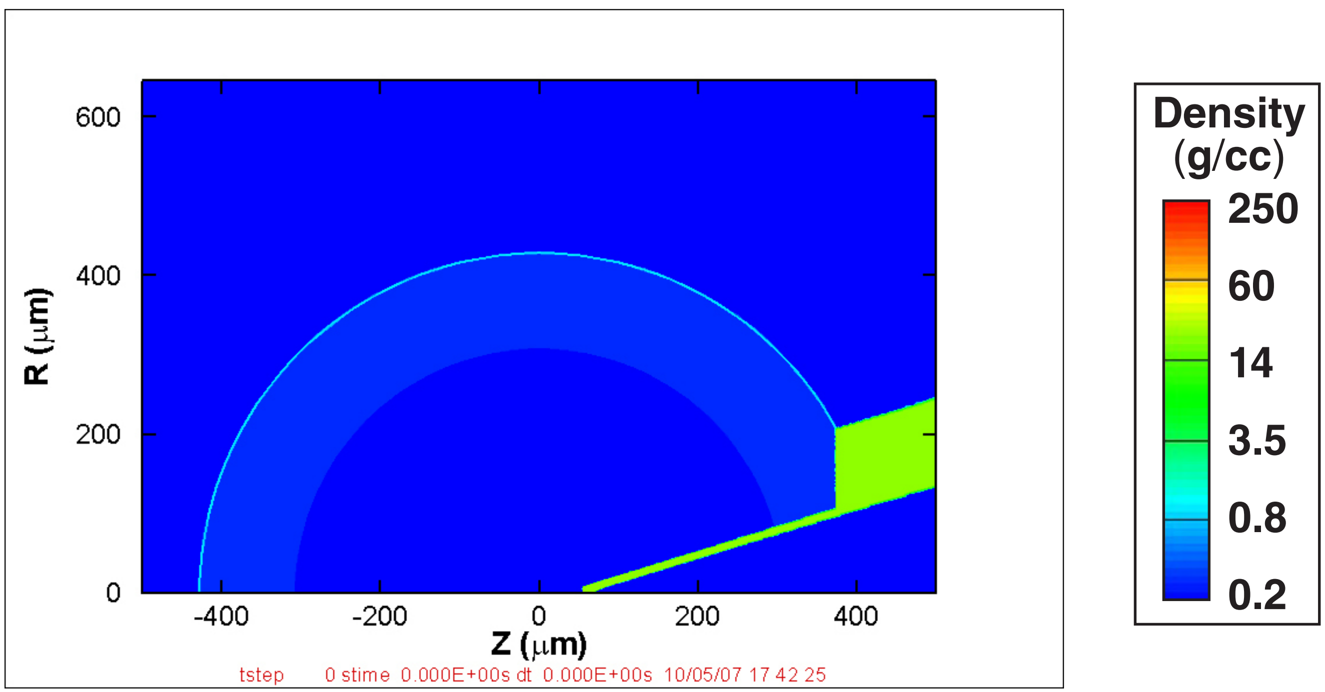
- ***DRACO*: 3.4 ns**
- **Experiment: 3.7±0.1 ns**
- **No observable difference in break-out time with truncated cone**

TC7961

OMEGA EP-relevant cryogenic capsule designs have been simulated with *DRACO*

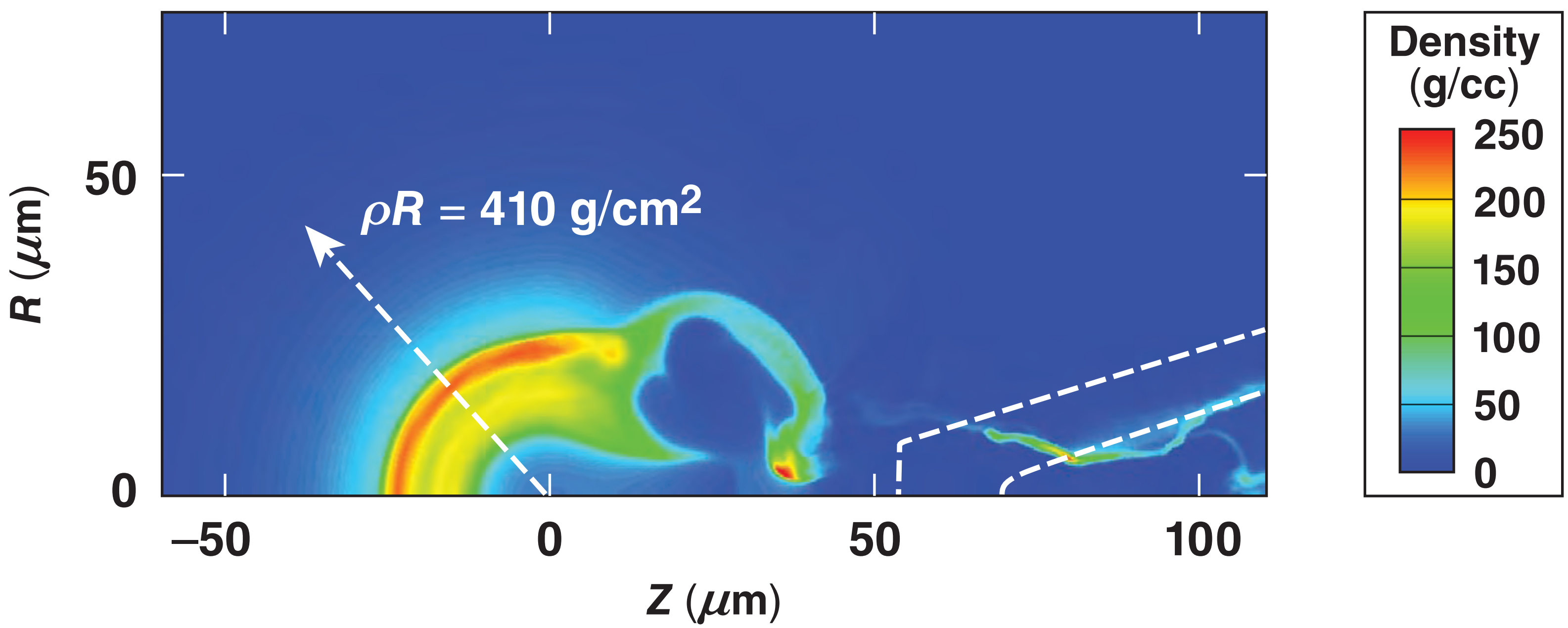






TC8023

Preliminary low-adiabat cryogenic targets exhibit fast-ignition-relevant densities and areal densities



Energy deposition of fast electrons will be integrated into *DRACO* using *LSP**

TC8024

*A. Solodov (TO6.00002)

Summary/Conclusions

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