Target Performance in Low-Adiabat, Warm Implosions on OMEGA

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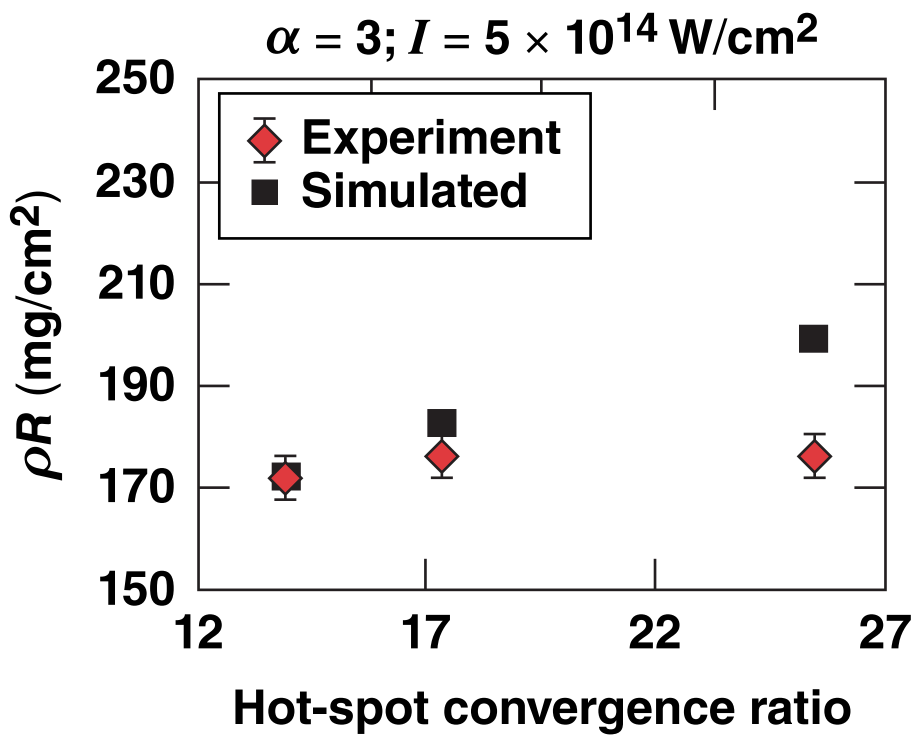

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Summary

Warm, plastic shells have been imploded on OMEGA with the goal of identifying the effect of preheat on compression

- Preheat caused by energetic coronal electrons from two plasmon decay may compromise compression in direct-drive inertial confinement fusion implosions
- Low-adiabat pulse shapes will be used to irradiate warm plastic shells with varying intensities
- Observed areal density at low intensities is reduced relative to spherically symmetric simulations, possibly caused by reduced laser-energy absorption
- A model* that includes energy transfer between beams results in reduced absorption and improves agreement with observed values of areal density, while reproducing time of neutron production

*I. Igumenschev (JO5.00015).

Collaborators

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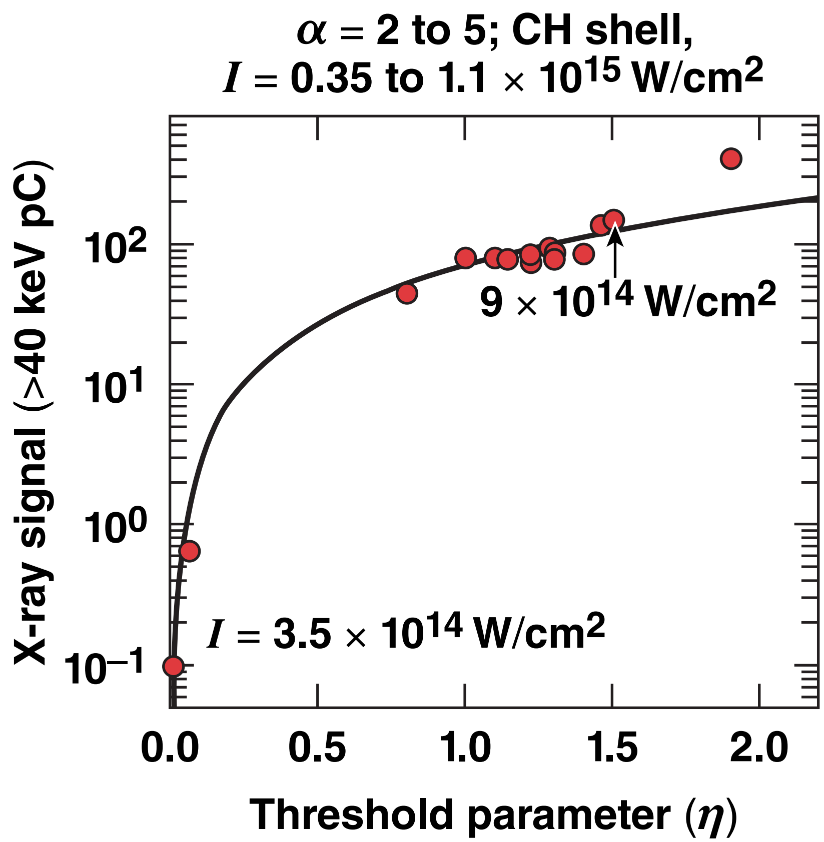
Preheat caused by energetic coronal electrons from two plasmon decay may compromise compression in direct-drive inertial confinement fusion implosions



- $\alpha = P/P_F$
- TPD threshold parameter*
  $\eta = I_{14}\, L_{\mu m}/230\, T_{keV}$

- Energy deposited by these electrons in the cold shell may compromise compression of the imploding shell**

*A. Simon *et al*., Phys. Fluids 26, 3107 (1983).
**V. A. Smalyuk *et al*., Phys. Rev. Lett. 100, 185005 (2008).

TC8686

A series of implosions on warm, plastic targets have been designed to isolate the effect of energetic electrons

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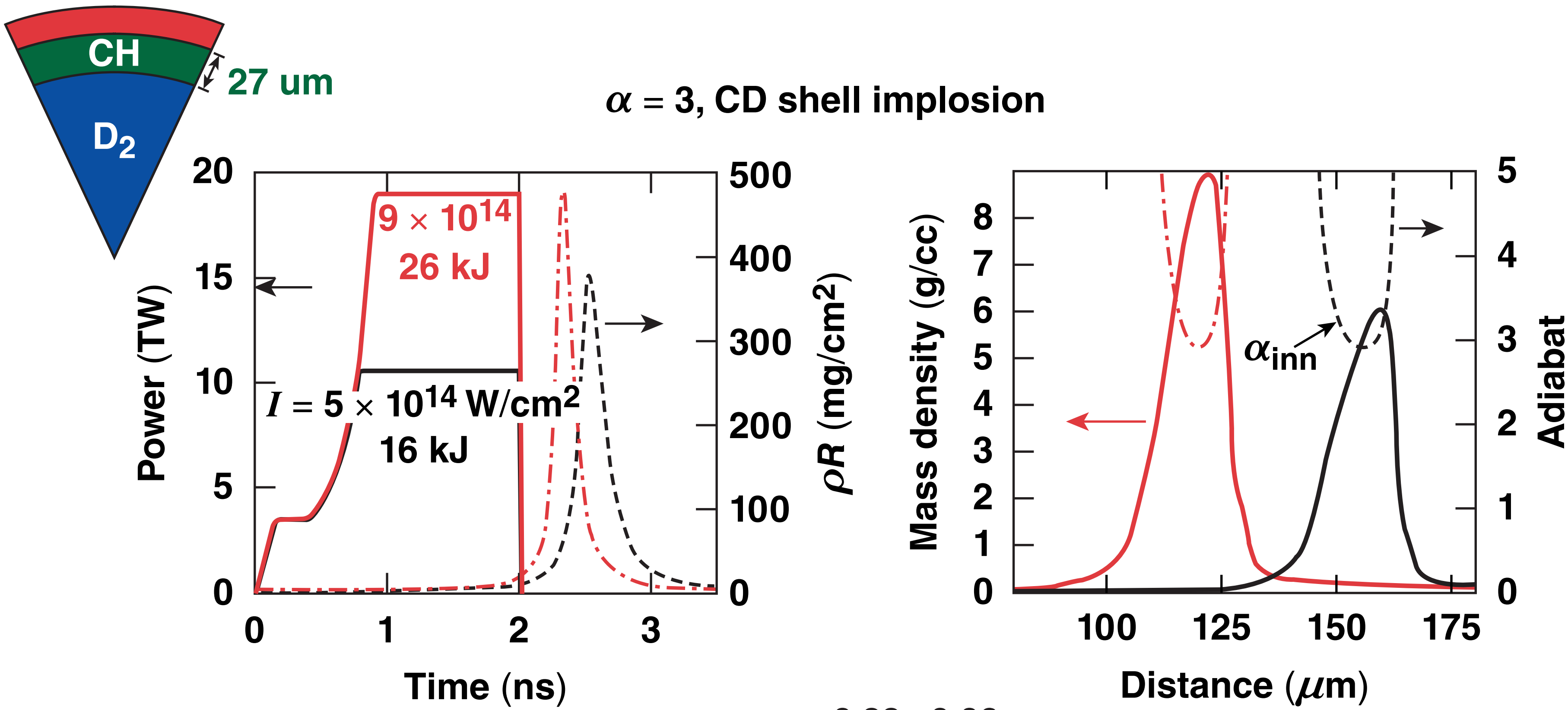


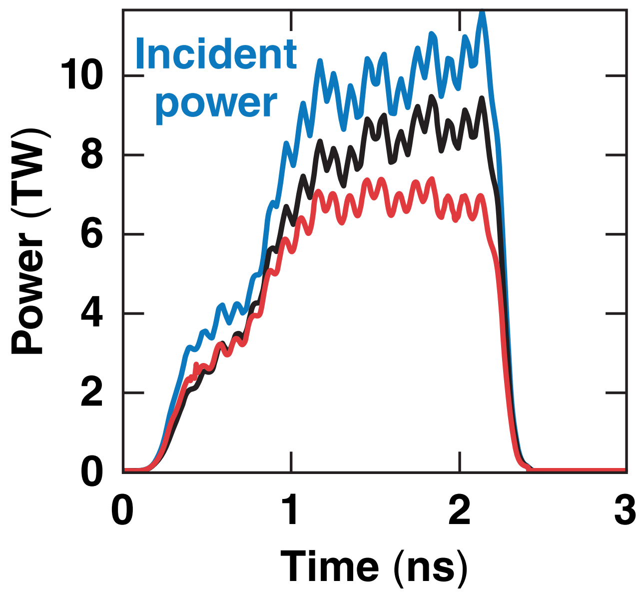
$$\rho R^*_{max} \sim \frac{E_L^{0.33} v_{imp}^{0.06}}{\alpha_{inn}^{0.55}}$$

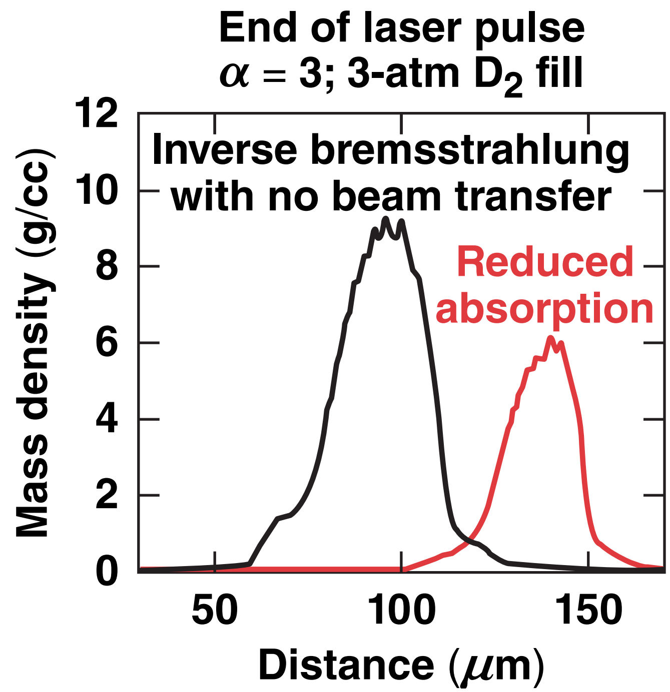
- These implosions are weakly sensitive to shock mistiming

TC8687

*R. Betti and C. Zhou, Phys. Plasmas 12, 110702 (2005).

Decompression of the shell caused by reduced absorption* reduces the areal density achieved in the implosion





	f_{abs}%	ρR[1] (scaling) (mg/cm^2)	ρR (mg/cm^2)
No energy transfer between beams	83	272	272
With cross-beam transfer	70	257	217

For a given adiabat[1]:

$$\rho R \sim (E_L)^{1/3}$$

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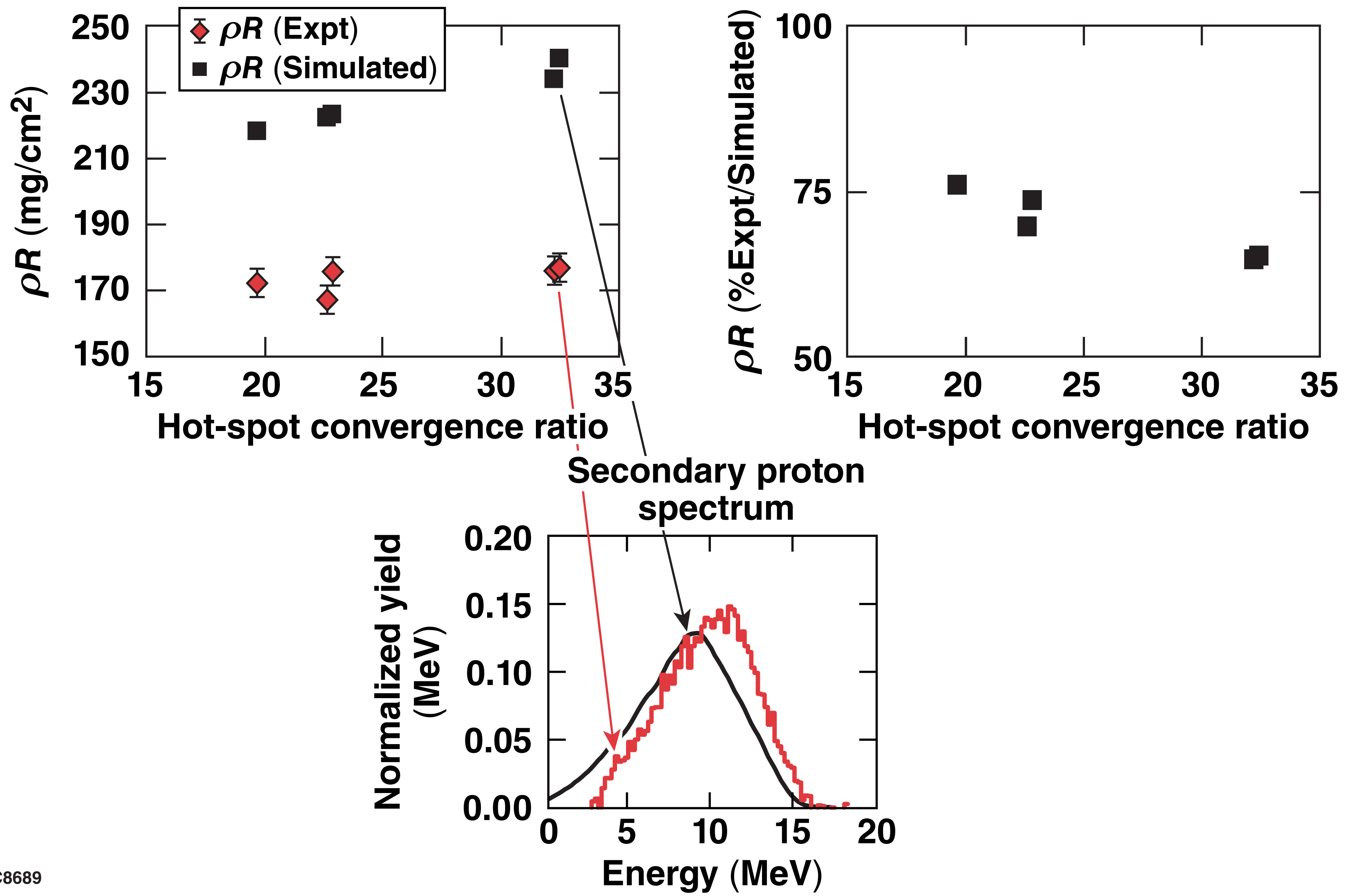
*I. Igumenschev (JO5.00015).

The observed areal density is reduced relative to simulation even at low intensity

$I = 5 \times 10^{14}$ W/cm^2



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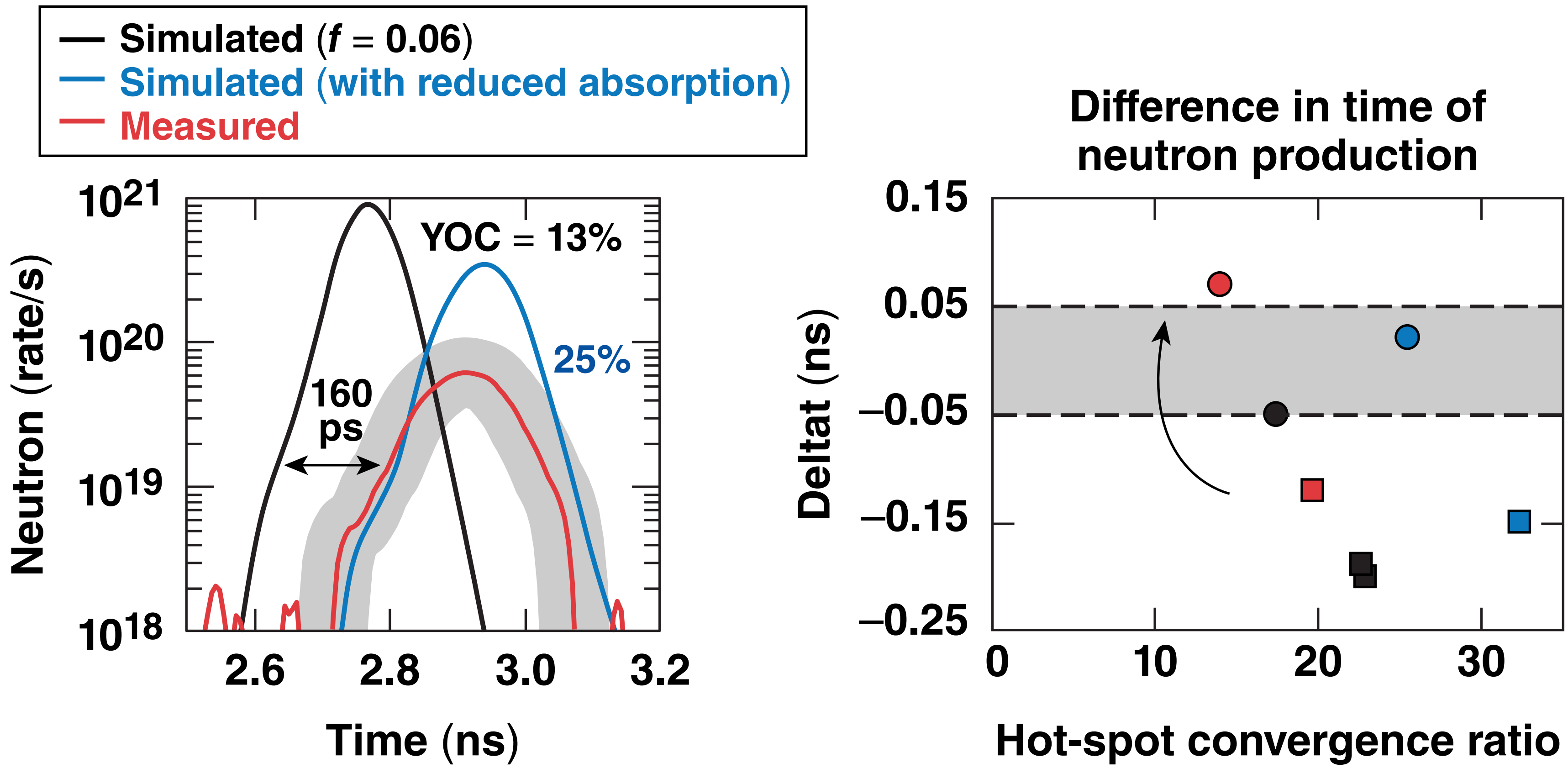
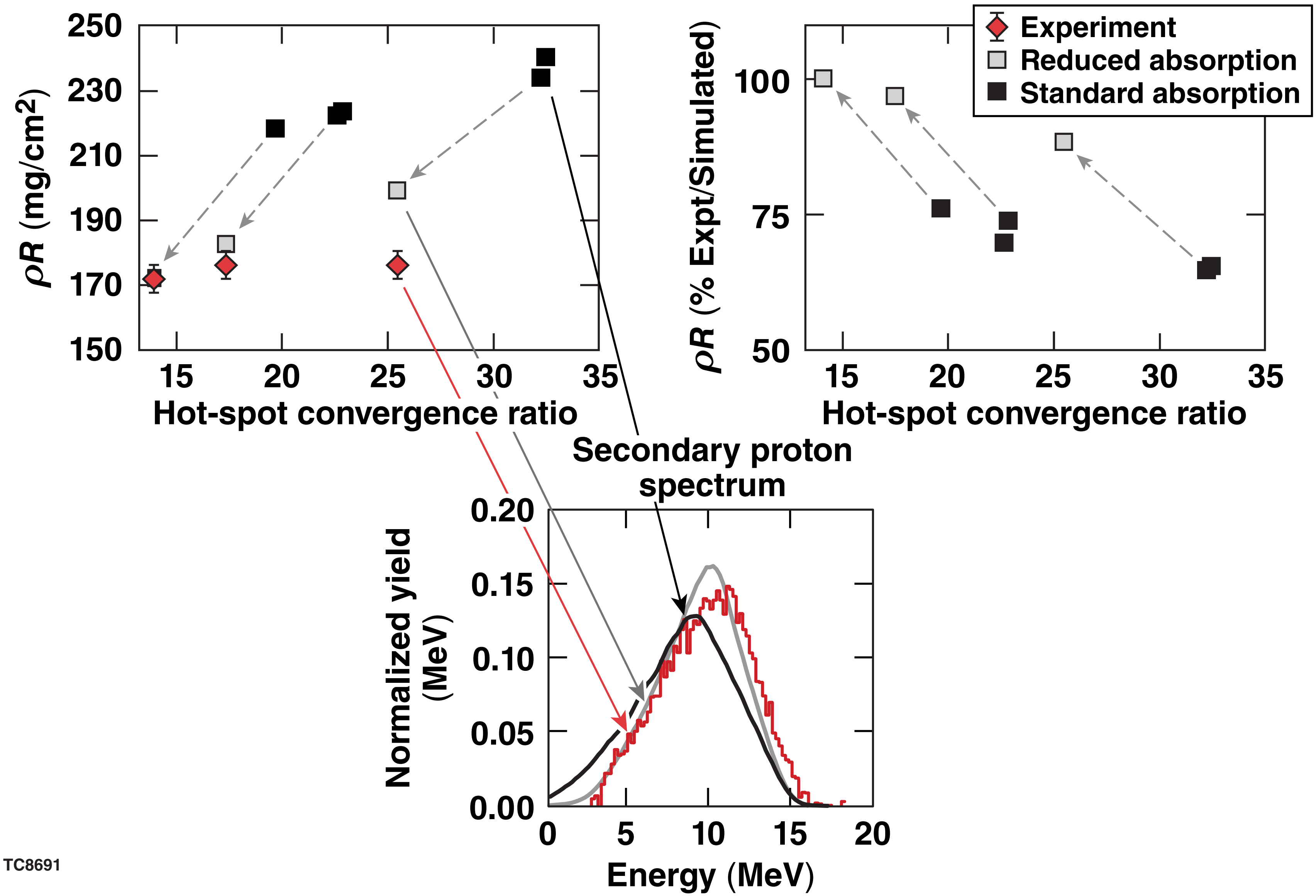
The time of neutron production is used to set the laser-energy absorption in the simulation



- X-ray emission, measured through DANTE, also shows delayed core emission

Better agreement on the areal density can be obtained when bang time is reproduced by the model



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Summary/Conclusions

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TC8684

*I. Igumenschev (JO5.00015).