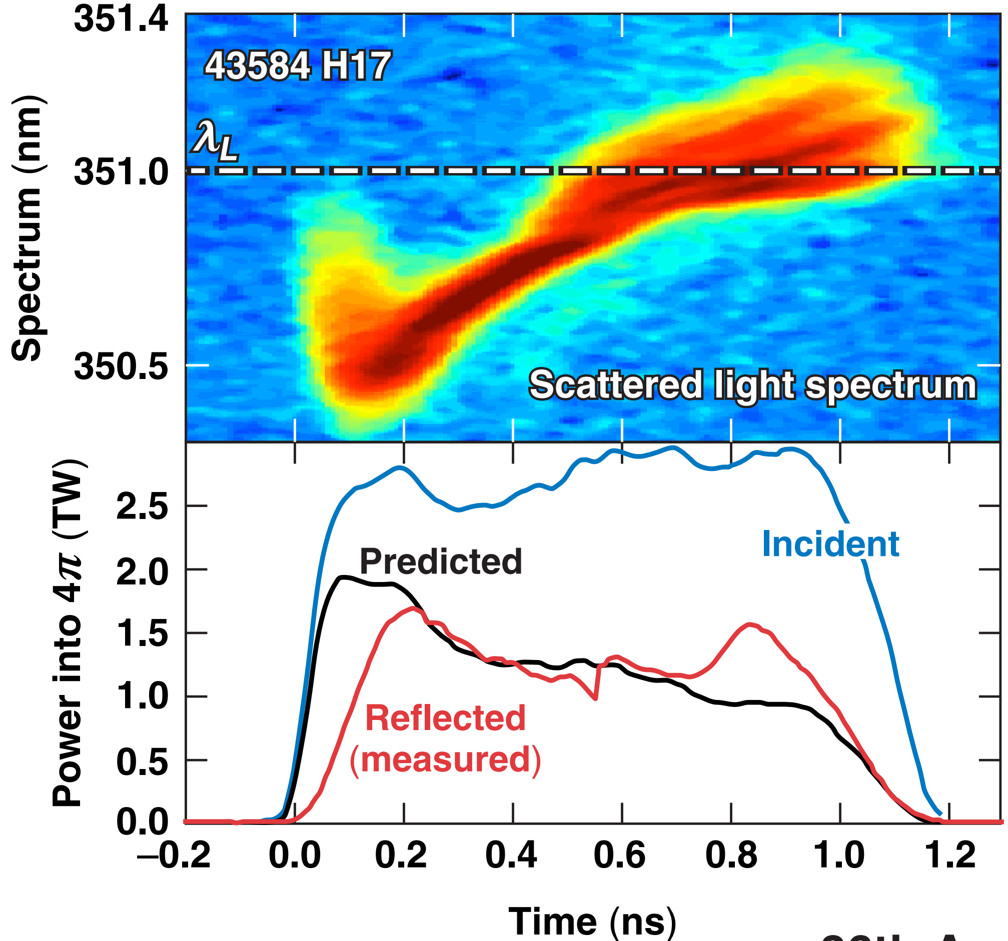
Laser Absorption in Spherical Target Experiments on OMEGA



W. Seka
University of Rochester
Laboratory for Laser Energetics

36th Annual Anomalous Absorption Conference
Jackson Hole, WY
4–9 June 2006

Contributors

V. N. Goncharov

J. A. Delettrez

I. V. Igumenshchev

R. E. Bahr

R. W. Short

A. V. Maximov

J. Myatt

R. S. Craxton

Summary

Time-integrated absorption measurements agree well with hydrodynamic predictions, with subtle differences in the time-resolved data

UR LLE

- Time-integrated absorption is obtained for many target types, pulse shapes, and laser energies, from scattered light measurements of imploding direct-drive targets.
- Time-integrated absorption measurements appear to be well-modeled by *LILAC* (a 1-D hydrodynamics code).
- Time-resolved scattered-light measurements in implosion experiments indicate higher absorption during the first 200 ps, compared with hydrodynamic predictions.

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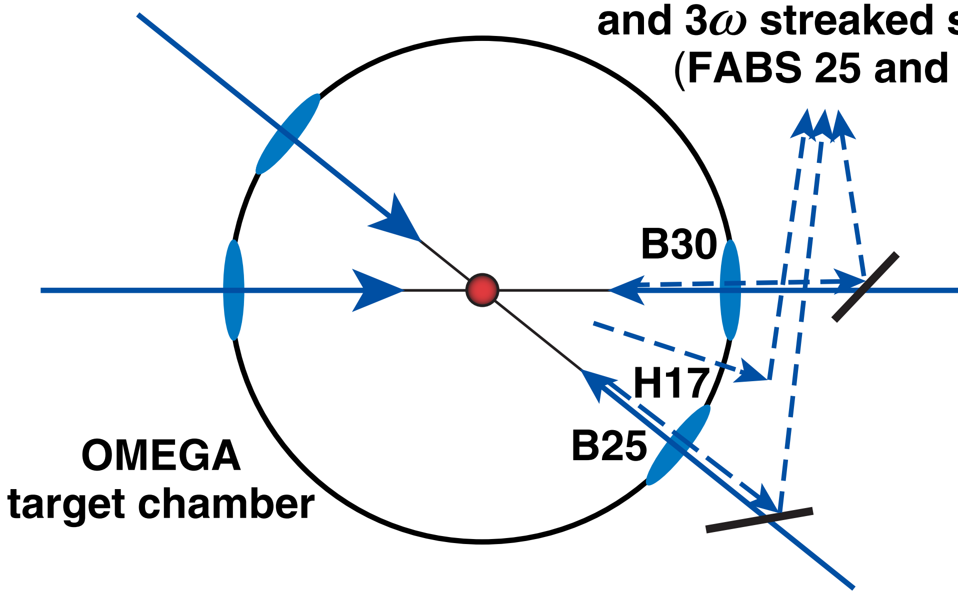
Scattered light is detected behind two focusing lenses (FABS 25 and 30) and in between focusing lenses (H17)



- FABS measurements have contributions from opposing beams that miss the target (required corrections can be significant).
- Measurement: scattered light extrapolated to 4π (E_{scatt})
  - $\rightarrow$ absorption = $(E_{tot} - E_{scatt})/E_{tot}$
  - calculated deviations from isotropy are in percentage range.

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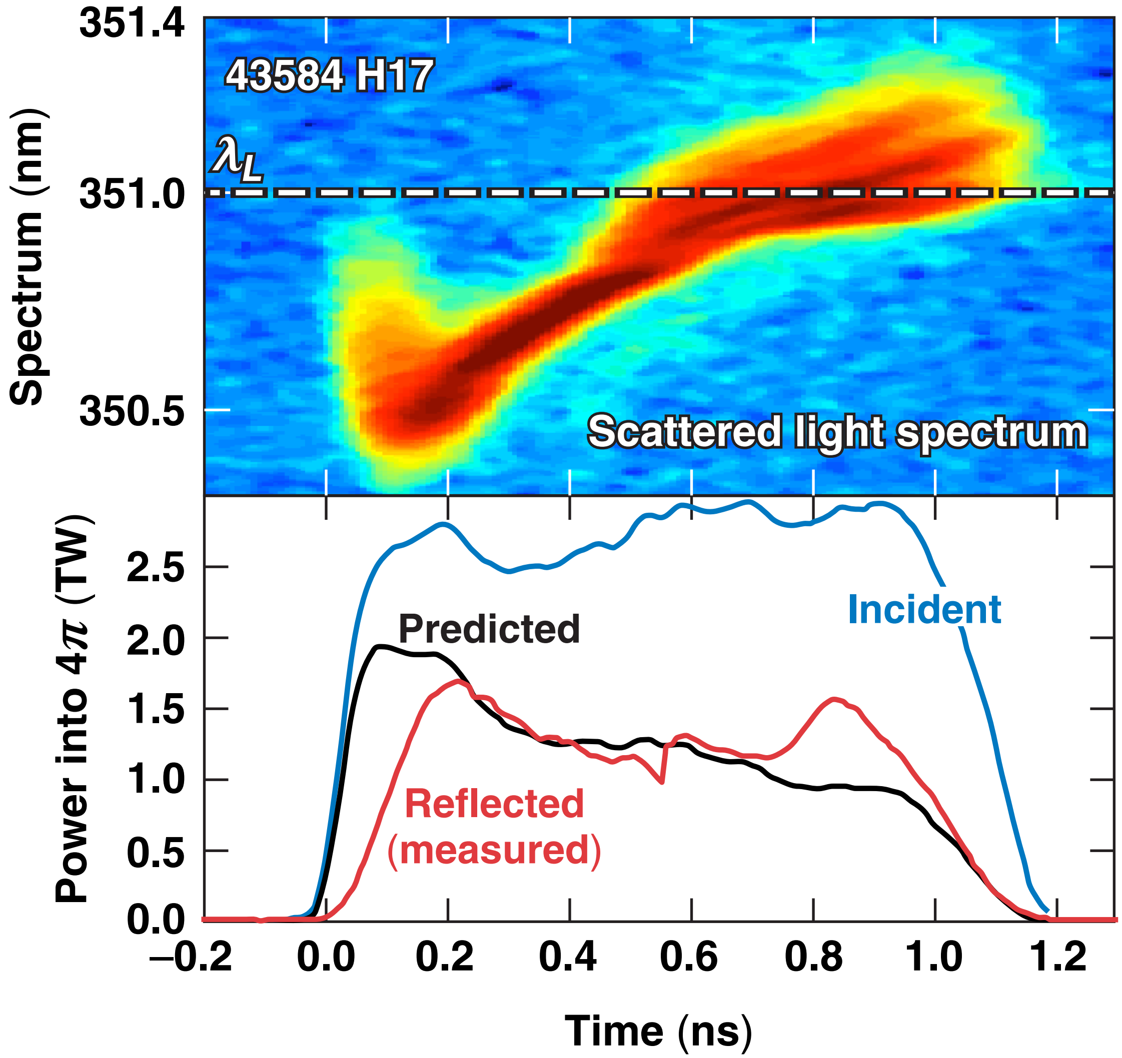
Time-resolved scattered-light measurements indicate increased early-time (<200 ps) absorption compared to predictions and slightly increased scattering late in time

UR LLE



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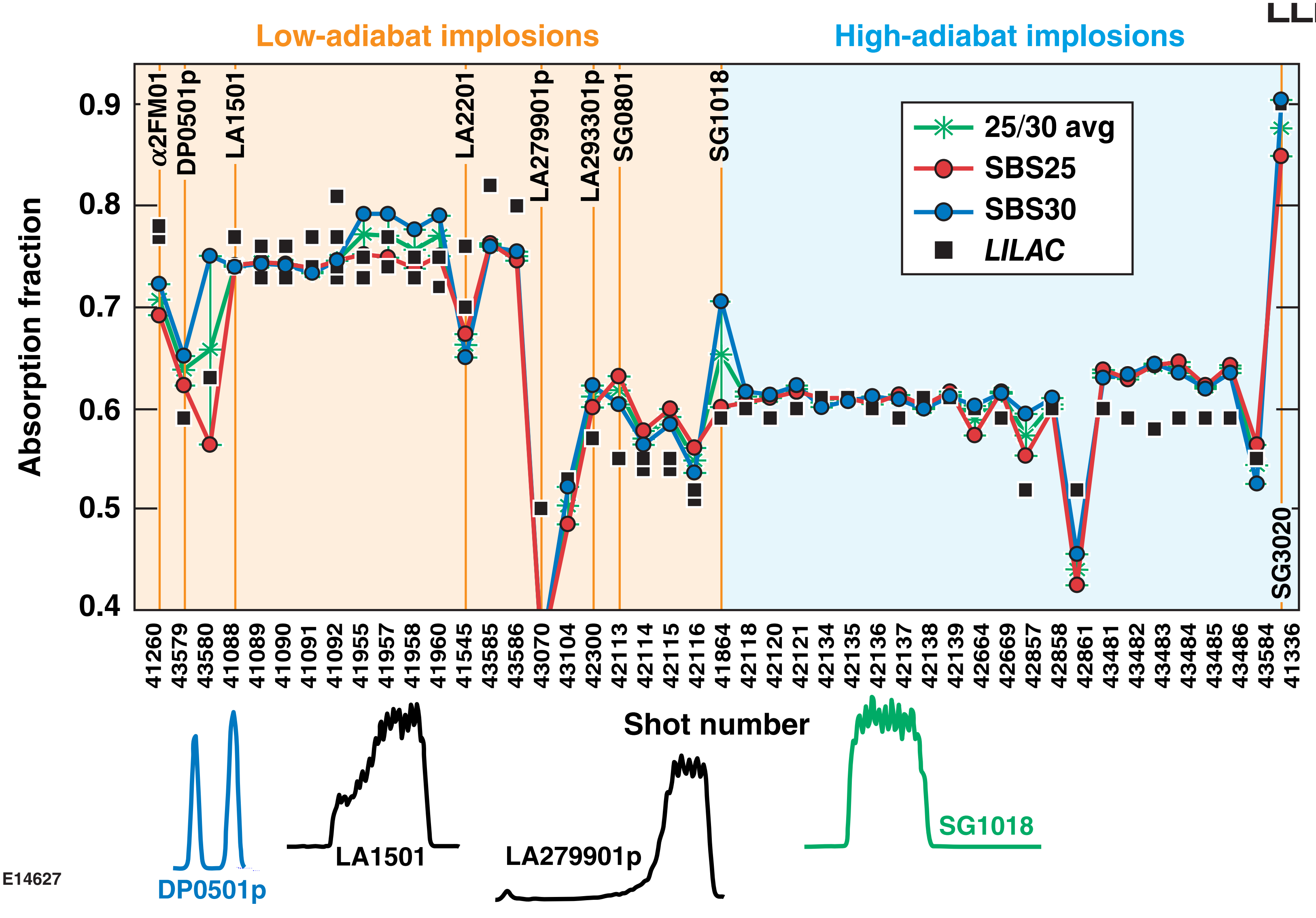
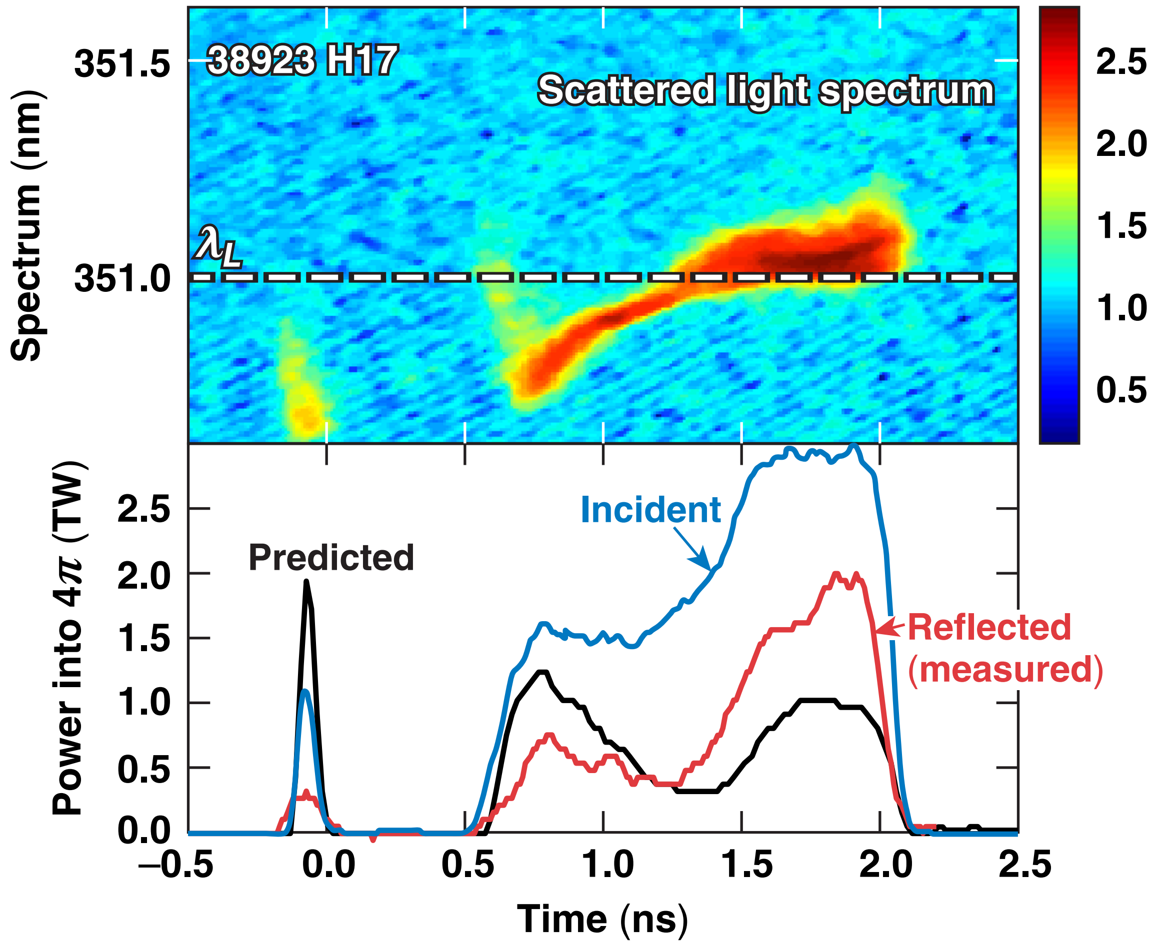
Time-integrated absorption data agree quite well with *LILAC* predictions for a wide variety of targets, pulse shapes, and irradiation energies

UR LLE



E14627

Picket-pulse shapes show much higher absorption in the picket than predicted by hydrodynamic simulations



Time-integrated absorption
***LILAC* abs: 84%**
Meas. abs: 81 ± 2%

Total energy:	**17.7 kJ (60 beams)**
Incid. picket:	**480 J (60 beams)**
***LILAC* picket:**	**314 J, abs = 34%**
Meas. picket:	**~90 J, abs ~81%**

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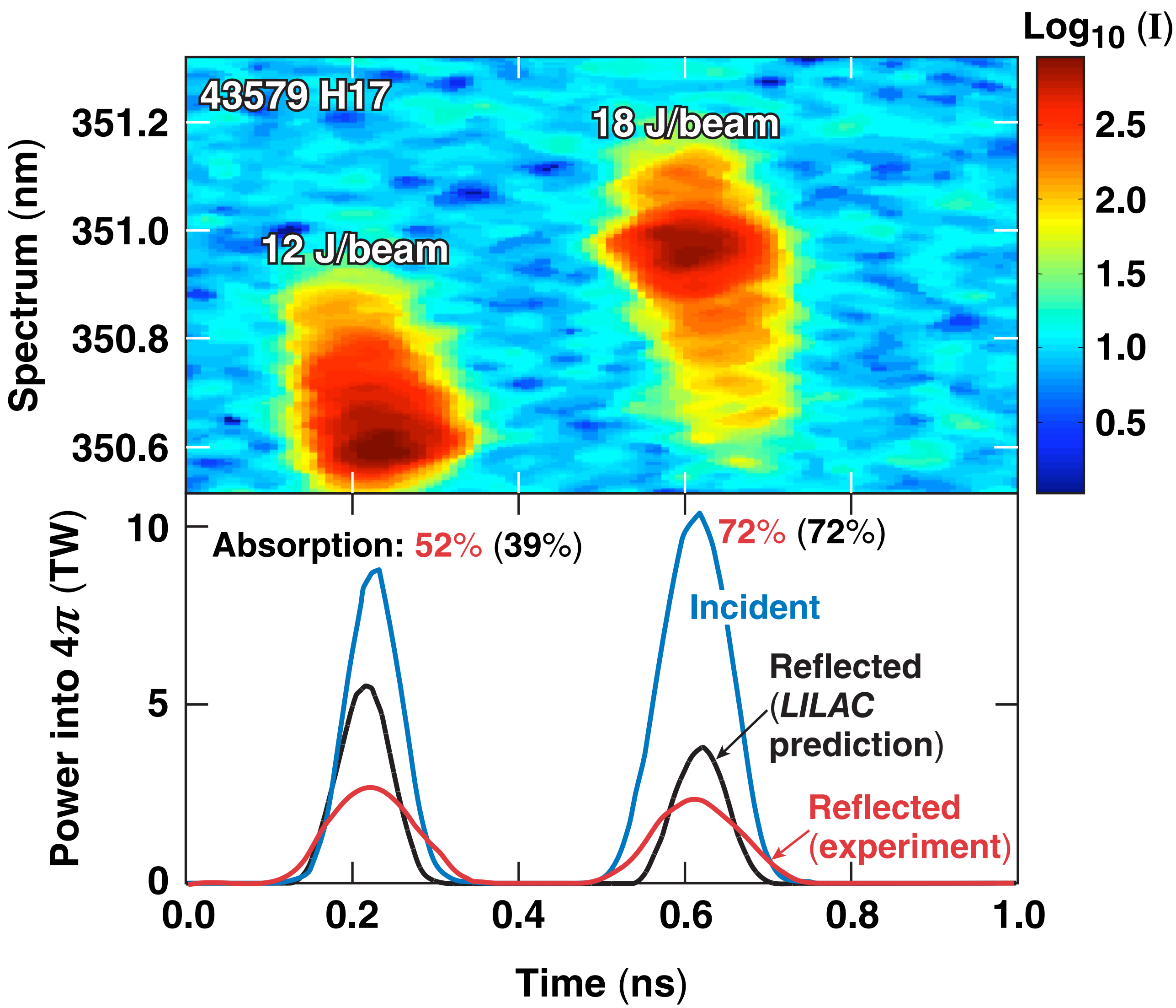
Double-picket pulses are well suited for investigating unexpectedly higher absorption at early times



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Hydrodynamic predictions for absorption are based only on inverse bremsstrahlung absorption

- Increased absorption may be caused by resonance absorption at early times.
- Fast electron temperatures are estimated to be ~3 to 5 keV
  – could increase target drive without significant preheat
  – could increase ablation adiabat without changing drive
- Flux limiter in codes sets absorption, neutron bang time, etc.
  – flux limiter is determined from shock speeds in planar geometry (laser coupling)
  – neutron bang times in implosion experiments are predicted to be ~100 ps later than observed—consistent with stronger initial drive
- Interpretation of increased initial absorption is presently subject of intense theoretical work.

E14631

Summary/Conclusions

Time-integrated absorption measurements agree well with hydrodynamic predictions, with subtle differences in the time-resolved data

UR LLE

- Time-integrated absorption is obtained for many target types, pulse shapes, and laser energies, from scattered light measurements of imploding direct-drive targets.

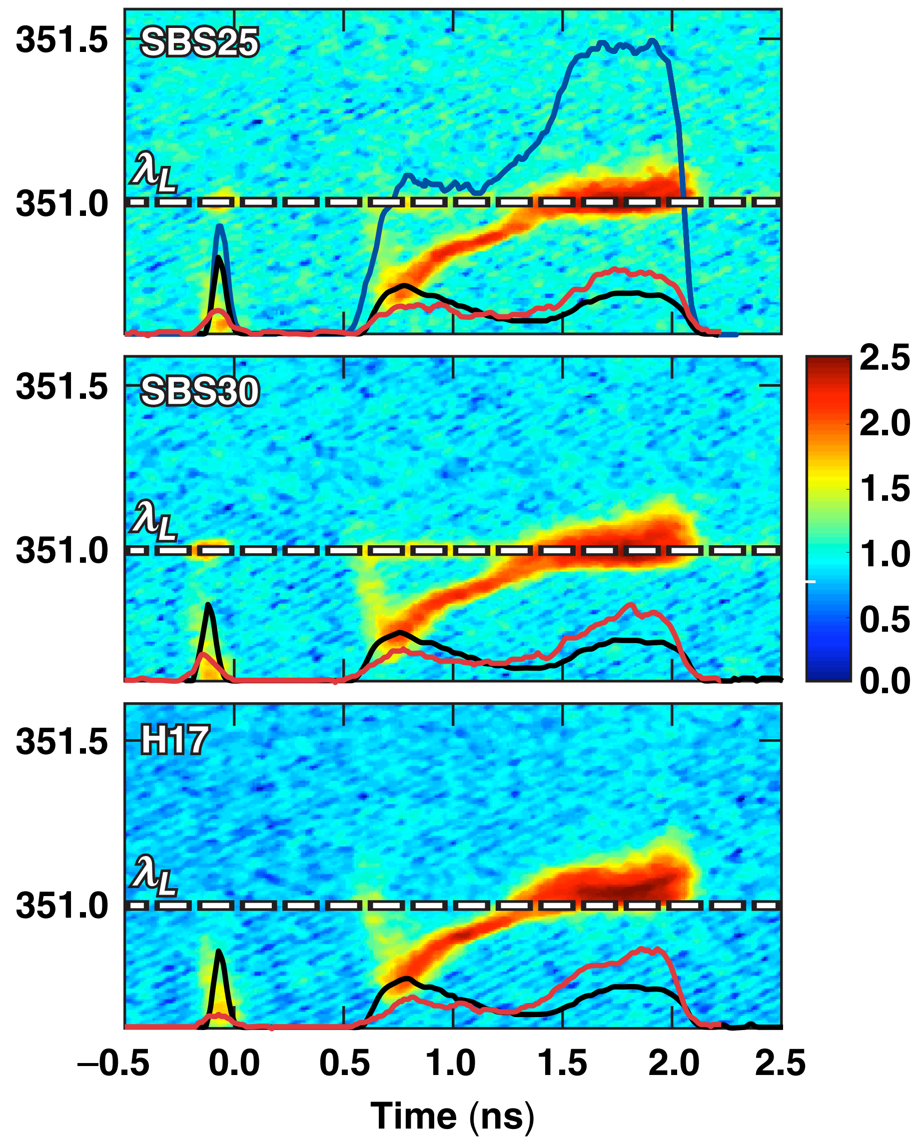
- Time-integrated absorption measurements appear to be well-modeled by *LILAC* (a 1-D hydrodynamics code).

- Time-resolved scattered-light measurements in implosion experiments indicate higher absorption during the first 200 ps, compared with hydrodynamic predictions.

Picket-pulse shapes show much higher absorption in the picket than predicted by hydrodynamic simulations

Total energy: 17750 J (60 beams)
Incid. picket: 478 J (60 beams)
***LILAC* picket:** 314 J, abs = 34%
Meas. picket: ~90 J, abs ~81%

Time-integrated absorption
***LILAC* abs:** 84%
Meas. Abs: 81±2%



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