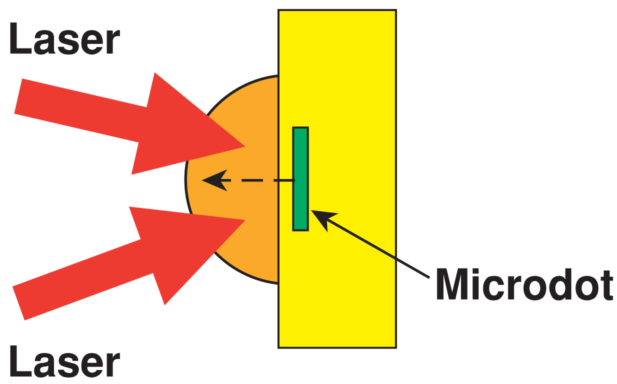
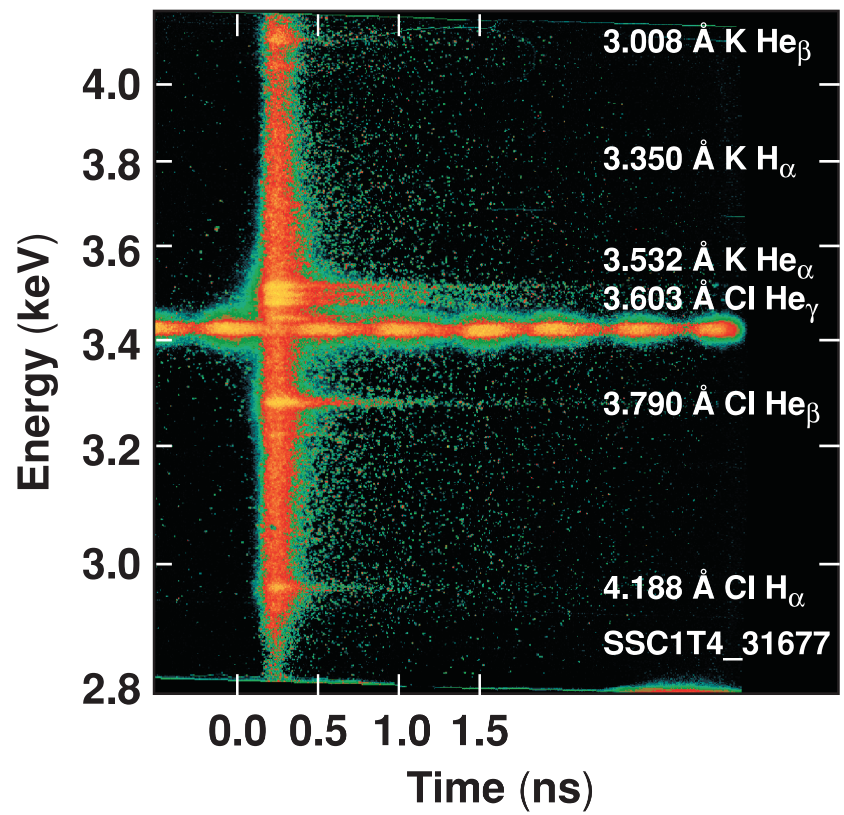
Experimental Investigation of Coronal Plasma Conditions in Direct-Drive ICF Using Time-Resolved X-Ray Spectroscopy





H. Sawada
University of Rochester
Laboratory for Laser Energetics

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Collaborators

**S. P. Regan, V. N. Goncharov, J. P. Knauer, R. Epstein,
R. S. Craxton, J. A. Delettrez, F. J. Marshall, B. Yaakobi,
D. D. Meyerhofer, P. B. Radha, T. C. Sangster, and W. Seka**

**University of Rochester
Laboratory for Laser Energetics**

Summary

Measured microdot line ratios cannot be explained consistently with existing post-processed 1-D hydro simulations

UR LLE

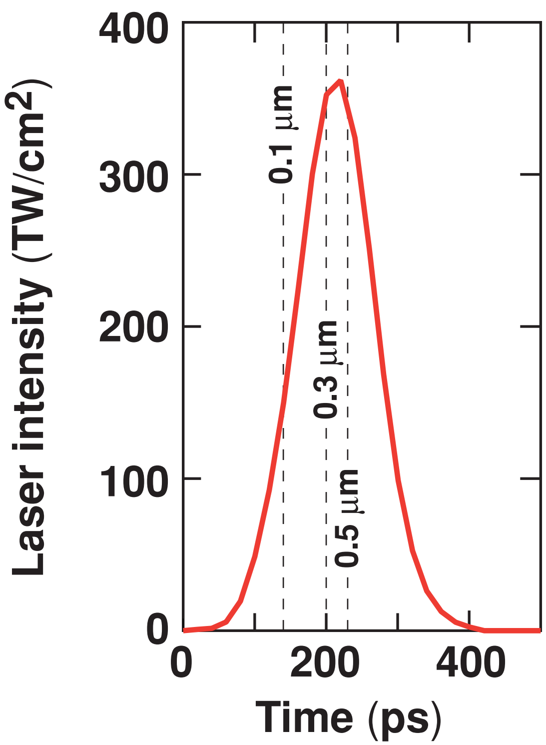
- Coronal plasmas were produced with a high-intensity (3×10^{14} W/cm^2), 100-ps Gaussian pulse.
- Time-resolved x-ray spectroscopy was used to measure *K*-shell emission from Al and KCl microdot tracer layers.
- Line ratios were predicted with the 1-D hydrodynamics code *LILAC* and the time-dependent atomic physics code *FLY*[1] and compared with the measured ratios.
- Future modeling will be performed with 2-D hydrocode simulations post-processed with time-dependent *SPECT 3D*.[2]

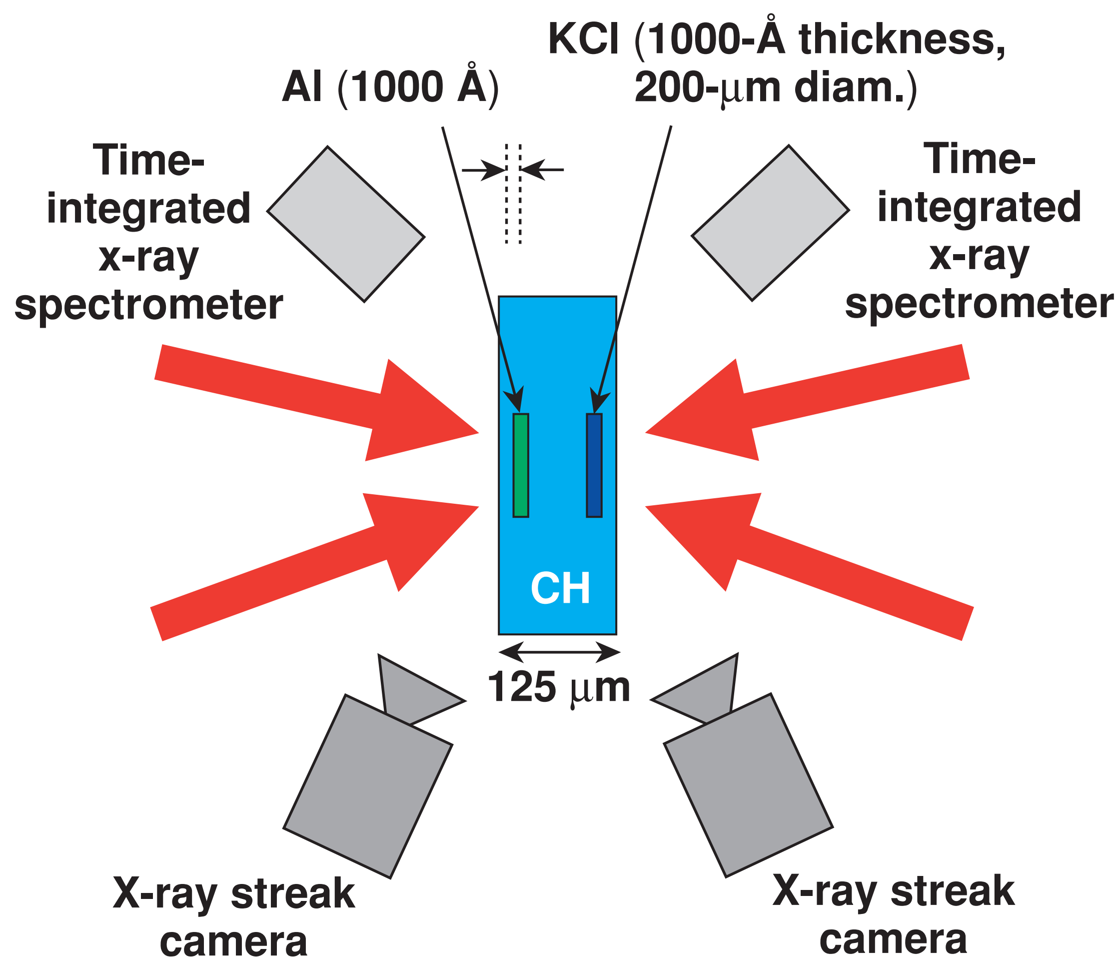
1 R. W. Lee *et al.*, JQSRT 1996; 56:535-56.
2 Prism Computational Sciences, Inc., Madison, WI.

E12560

Plastic targets with buried microdots were irradiated with a 100-ps Gaussian pulse

Buried depth = 0.1, 0.3, 0.5 μm

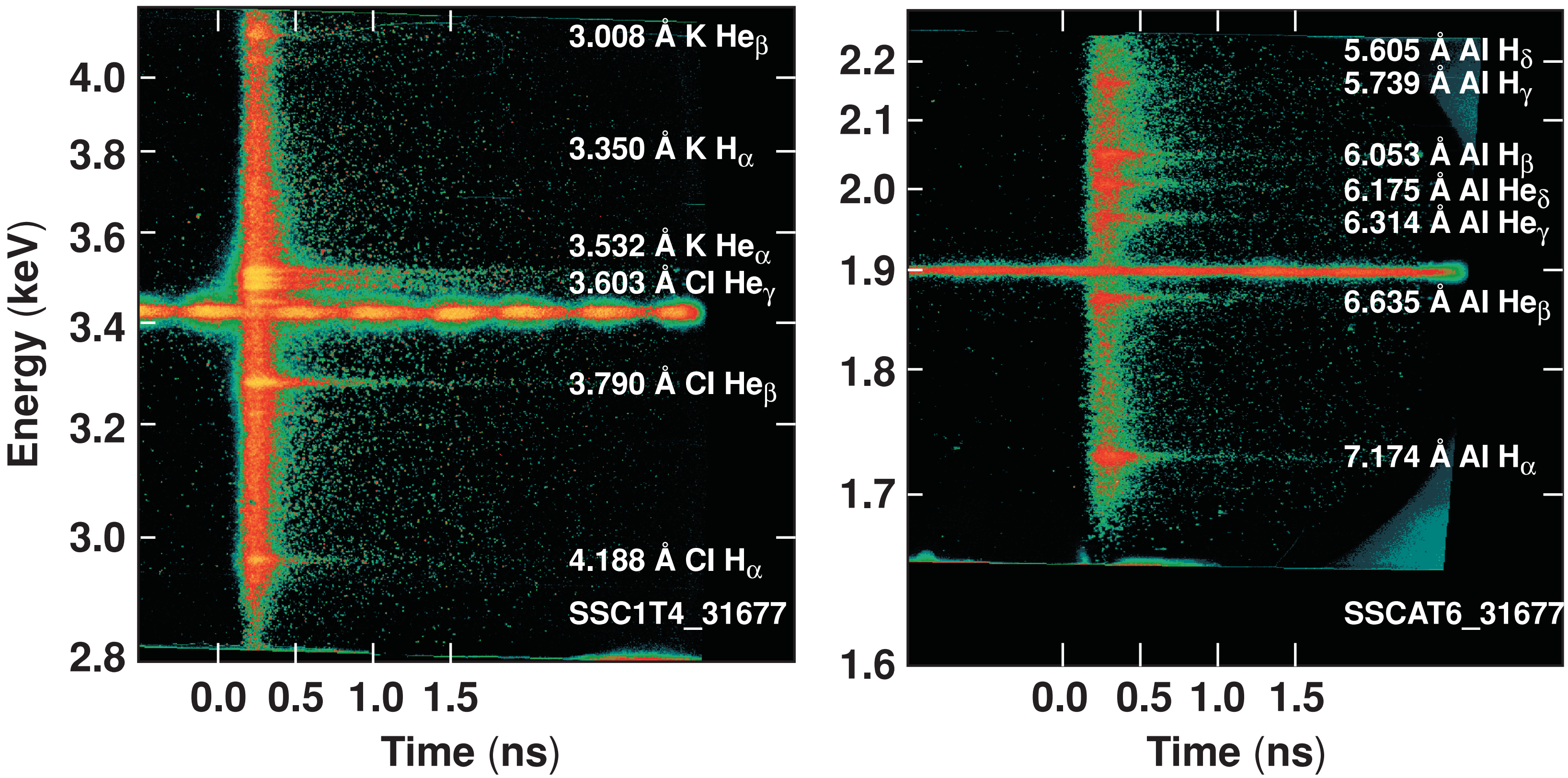




- Microdots were buried at different depths to probe the corona at different times.

E12561

Time-resolved x-ray spectroscopy was used to record *K*-shell emission from ablated microdots



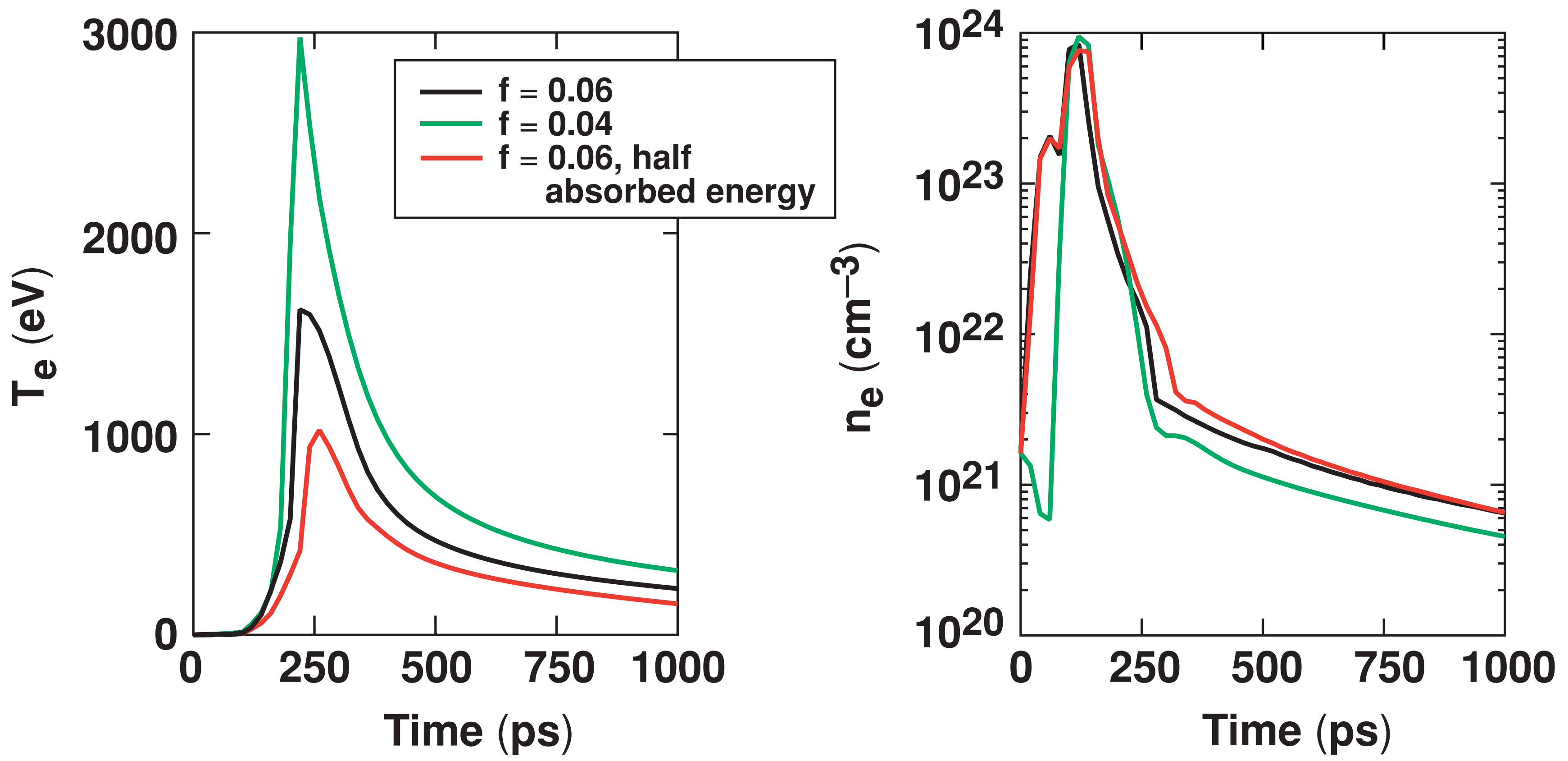
- Streaked spectra were calibrated with time-integrated x-ray spectrometers.
- Measured line ratios K He_β/Cl He_β and Al Ly_β/He_β are compared with simulations.

E12562

T_e and n_e time histories of the ablated microdot were simulated with *LILAC* for three coronal conditions

UR LLE

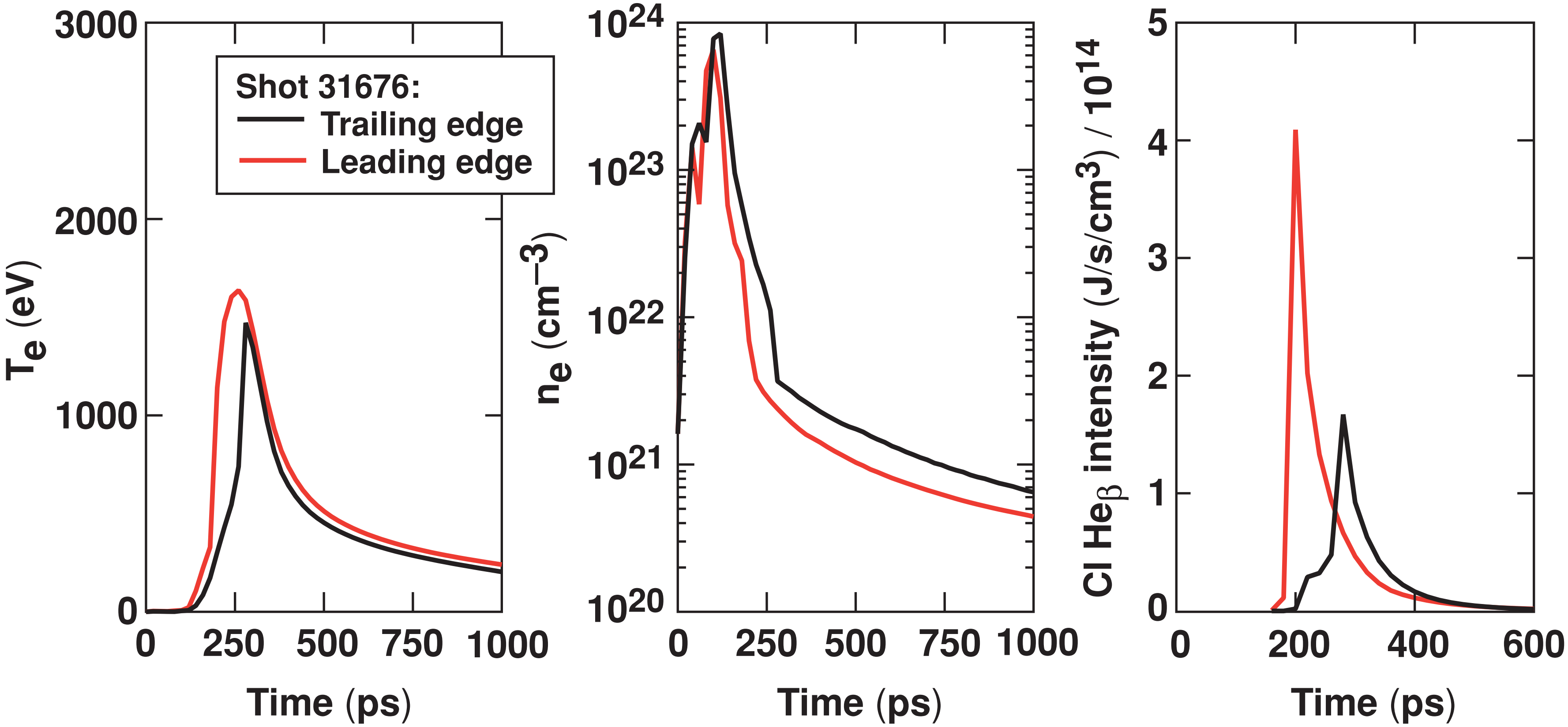
KCl microdot buried at 0.1 μm



E12563

Hydrocode predictions were post-processed with the time-dependent atomic physics code *FLY*[1] to predict line ratios

- The 0-D code *FLY* can post-process a single zone from *LILAC*.

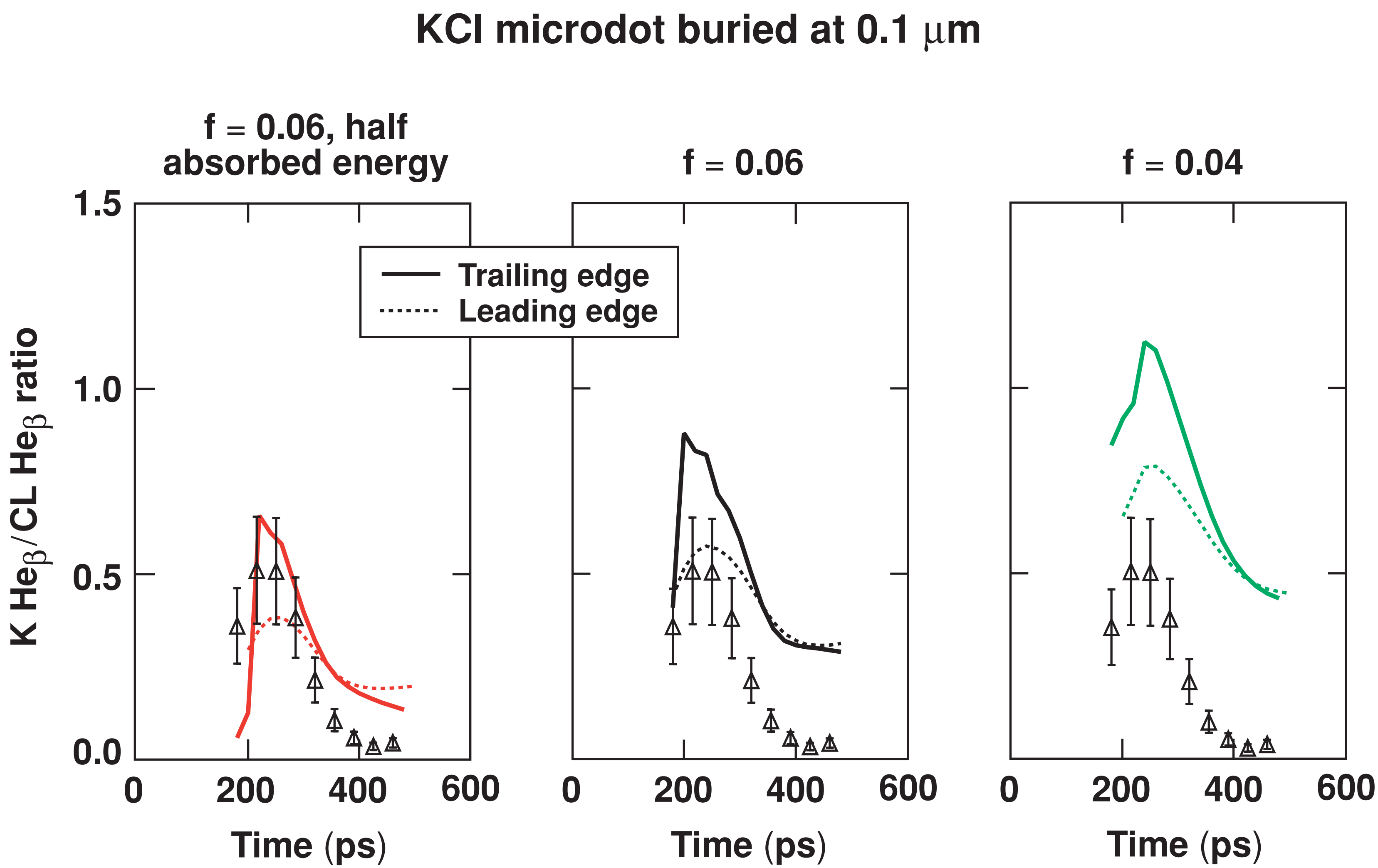


E12564

[1] R. W. Lee *et al.*, JQSRT 1996; 56:535-56

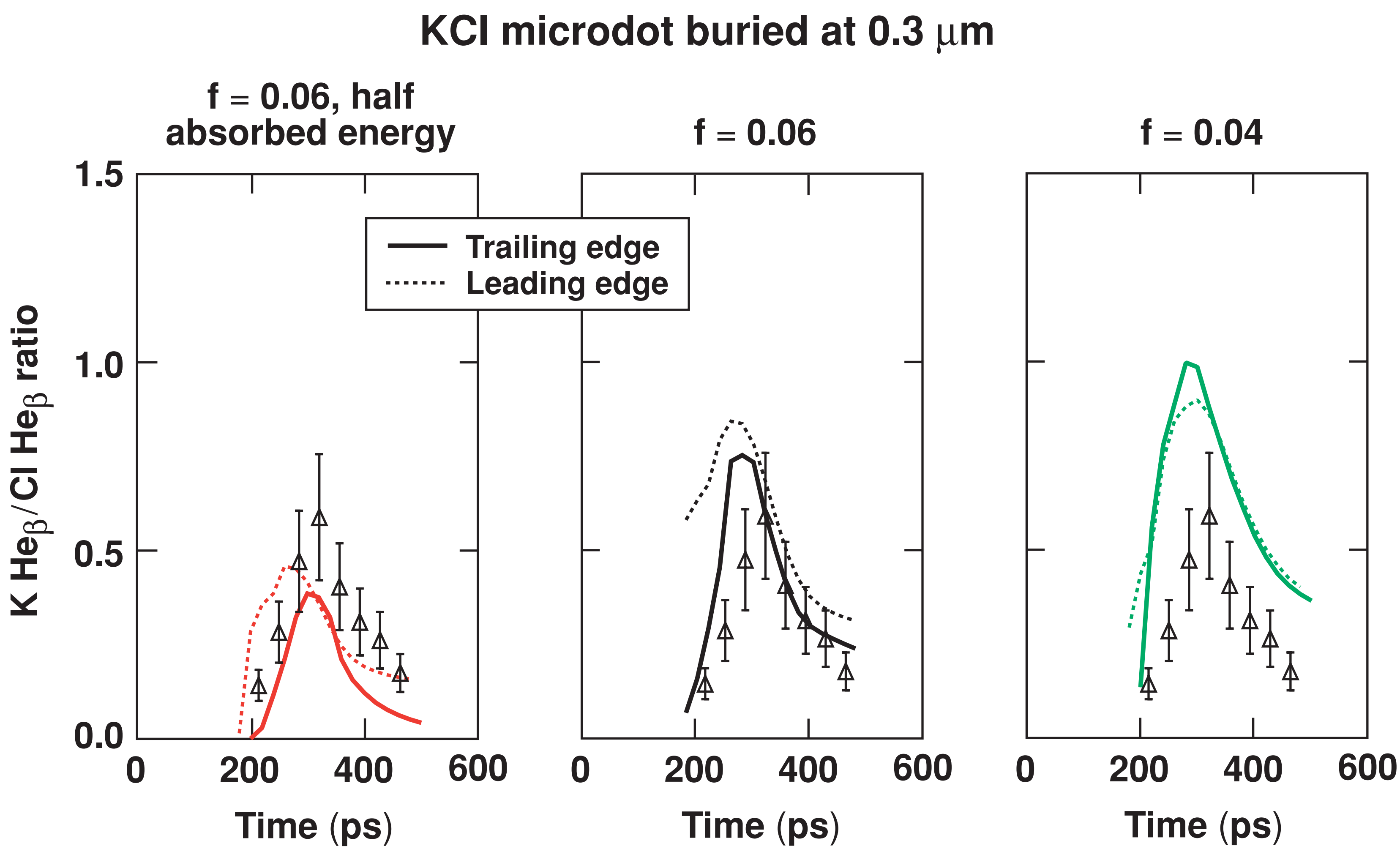
Measured K He$_\beta$/Cl He$_\beta$ ratio for a KCl microdot buried at 0.1 μm is similar to ratio of lower absorption model

UR LLE



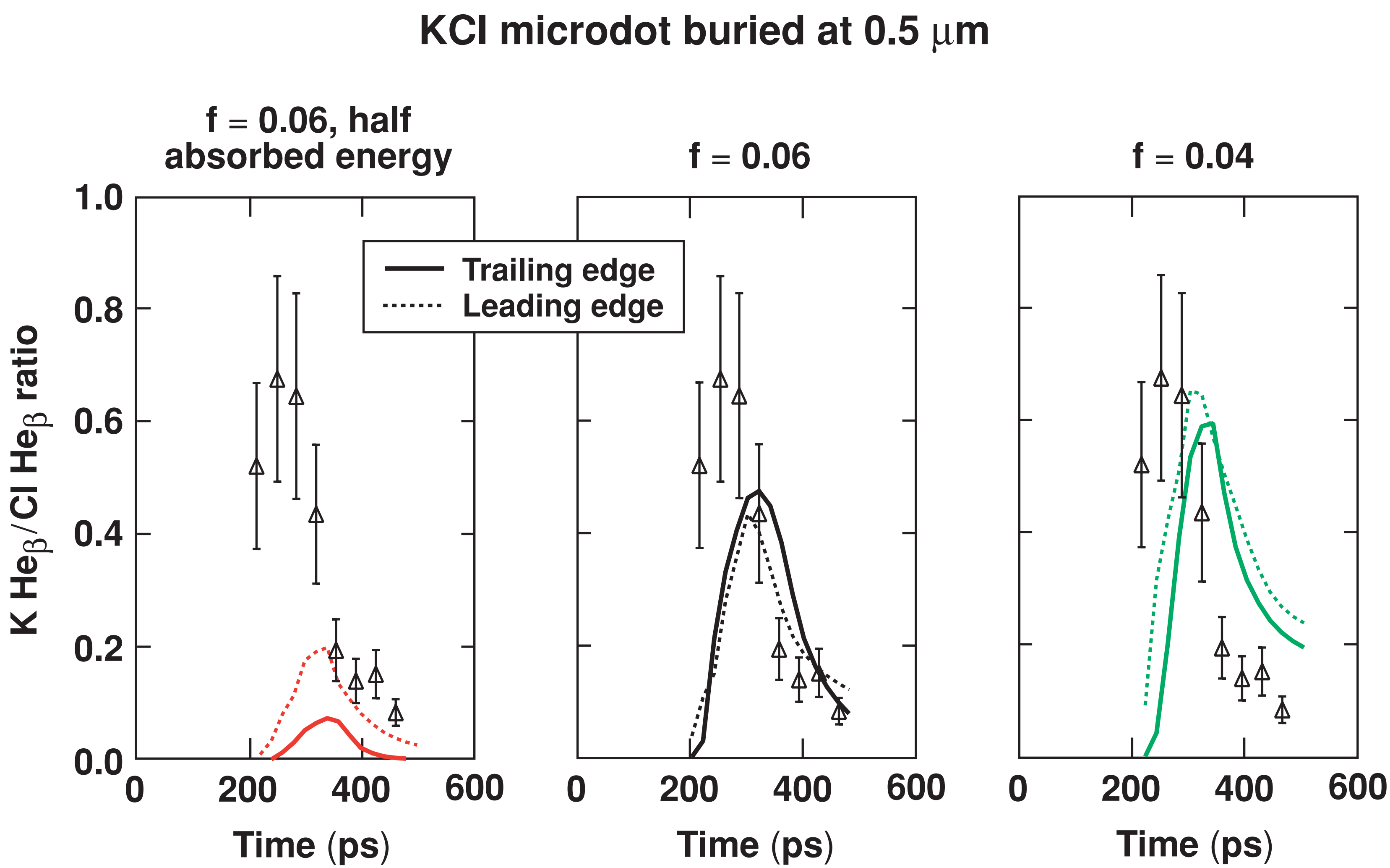
E12565

Measured K He_β/Cl He_β ratio for a KCl microdot buried at 0.3 μm shows some agreement early in time with lower absorption model and late in time with f = 0.06



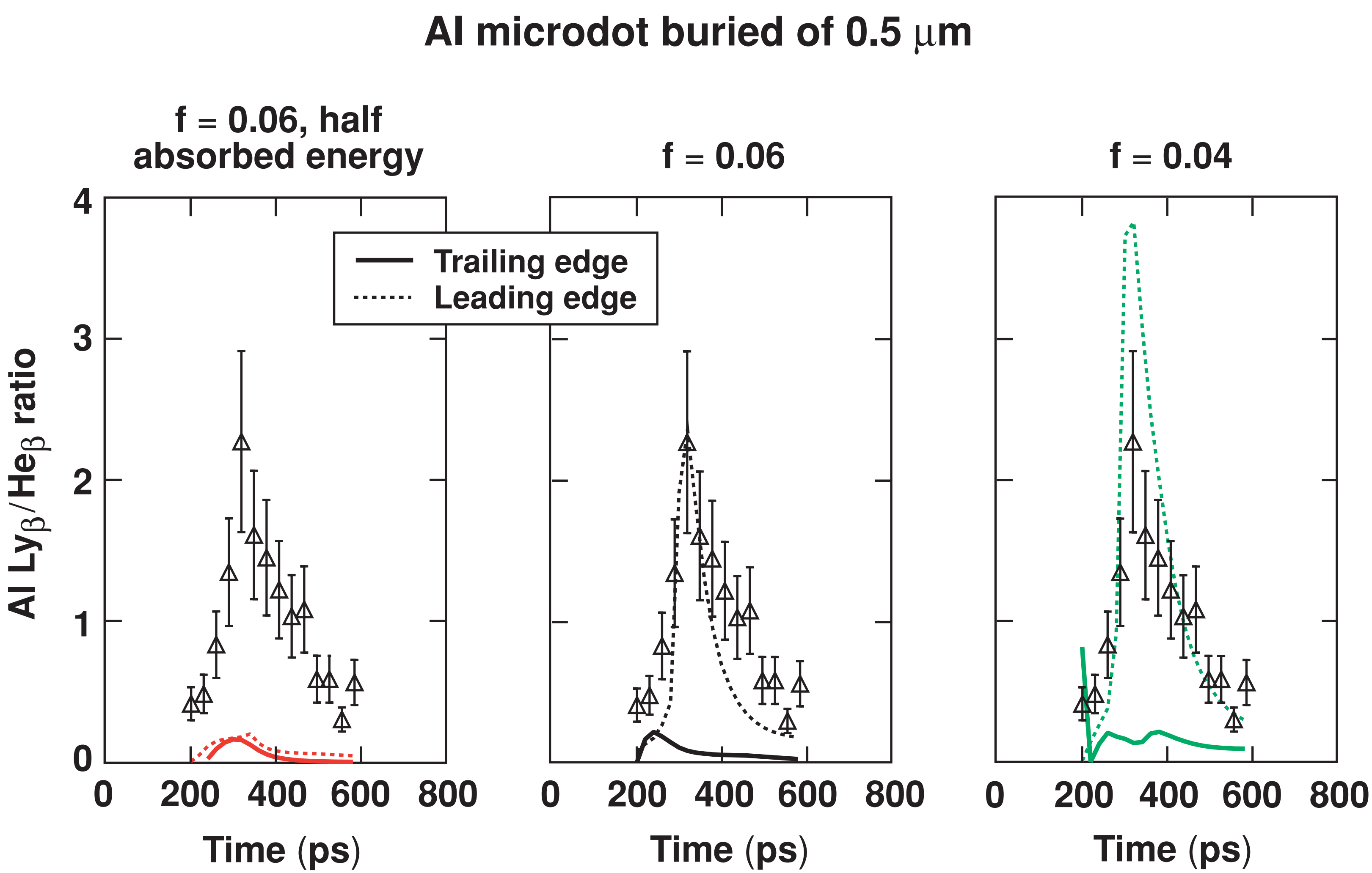
E12566

Early-time discrepancy is observed between measured ratio and models for a KCl microdot buried at 0.5 μm



E12567

Measured Al Ly_β/He_β ratio for microdot buried at 0.5 μm is consistent with the f = 0.06 or f = 0.04 model



- Early burnthrough is not observed for Al microdot.

E12568

Summary/Conclusions

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