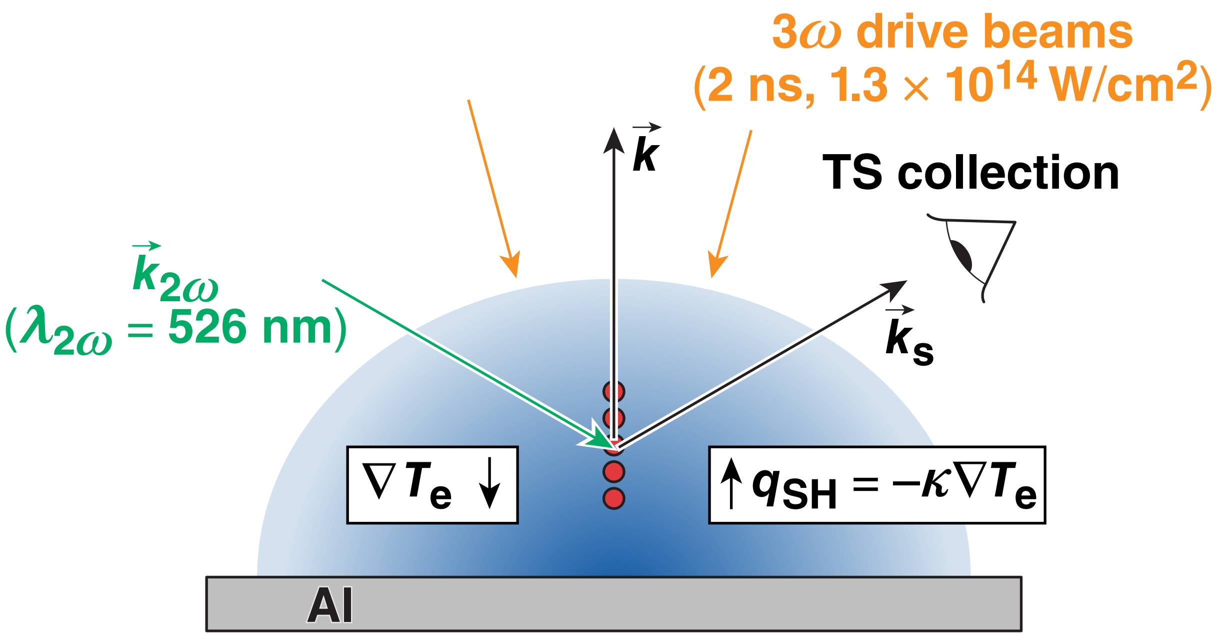
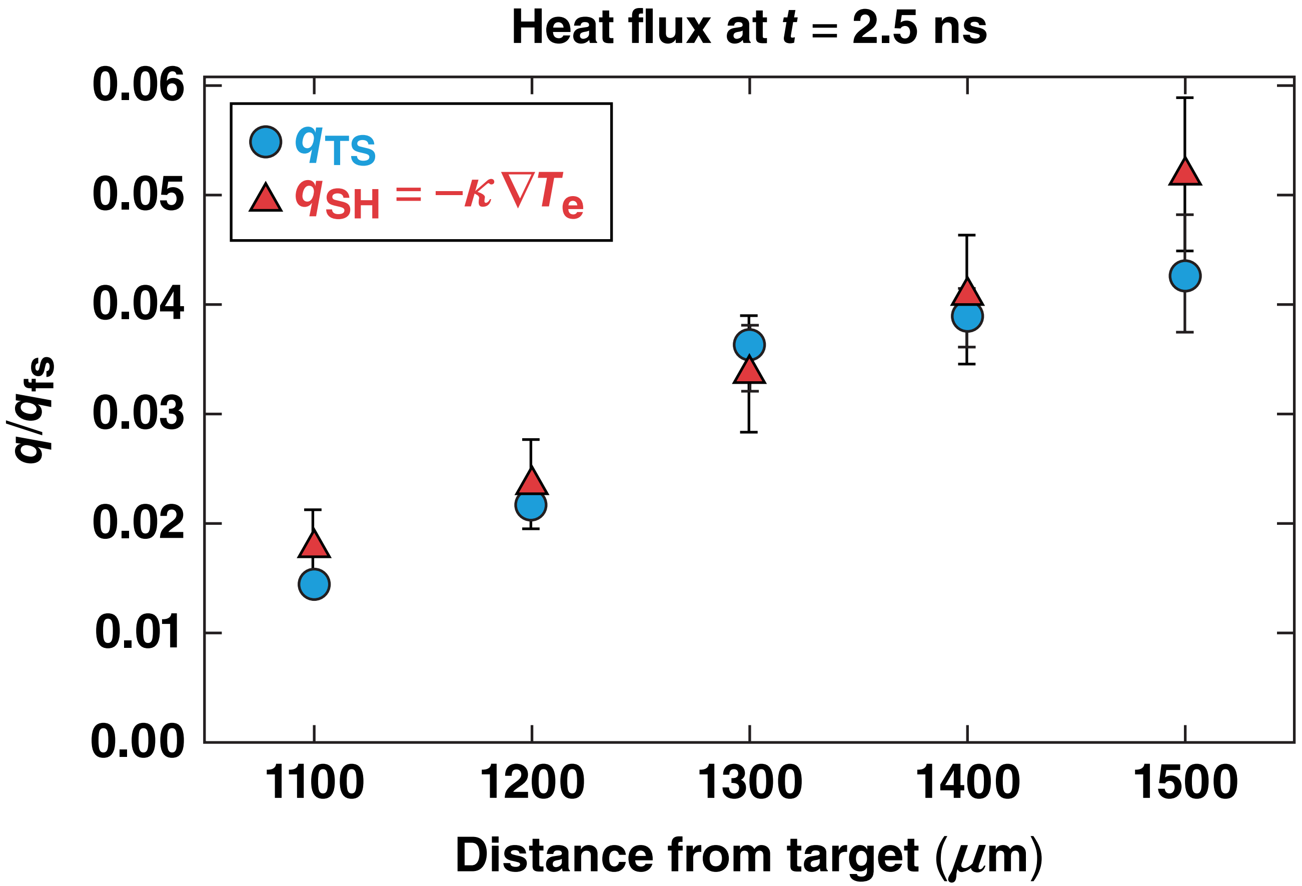
Heat-Flux Measurements from Collective Thomson-Scattering Spectra





R. J. Henchen
University of Rochester
Laboratory for Laser Energetics

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Thomson scattering from ion-acoustic waves (IAW's) and electron plasma waves (EPW's) were used to measure the heat flux in coronal plasmas

- Changes in Landau damping caused by heat flux were seen in the relative amplitudes of Thomson-scattering spectra from IAW's and EPW's
- Local plasma conditions obtained from Thomson scattering provide an independent measurement of the heat flux using the Spitzer–Härm (SH) thermal-transport model
- The two methods of measuring the heat flux are in good agreement over the locations probed

Collaborators

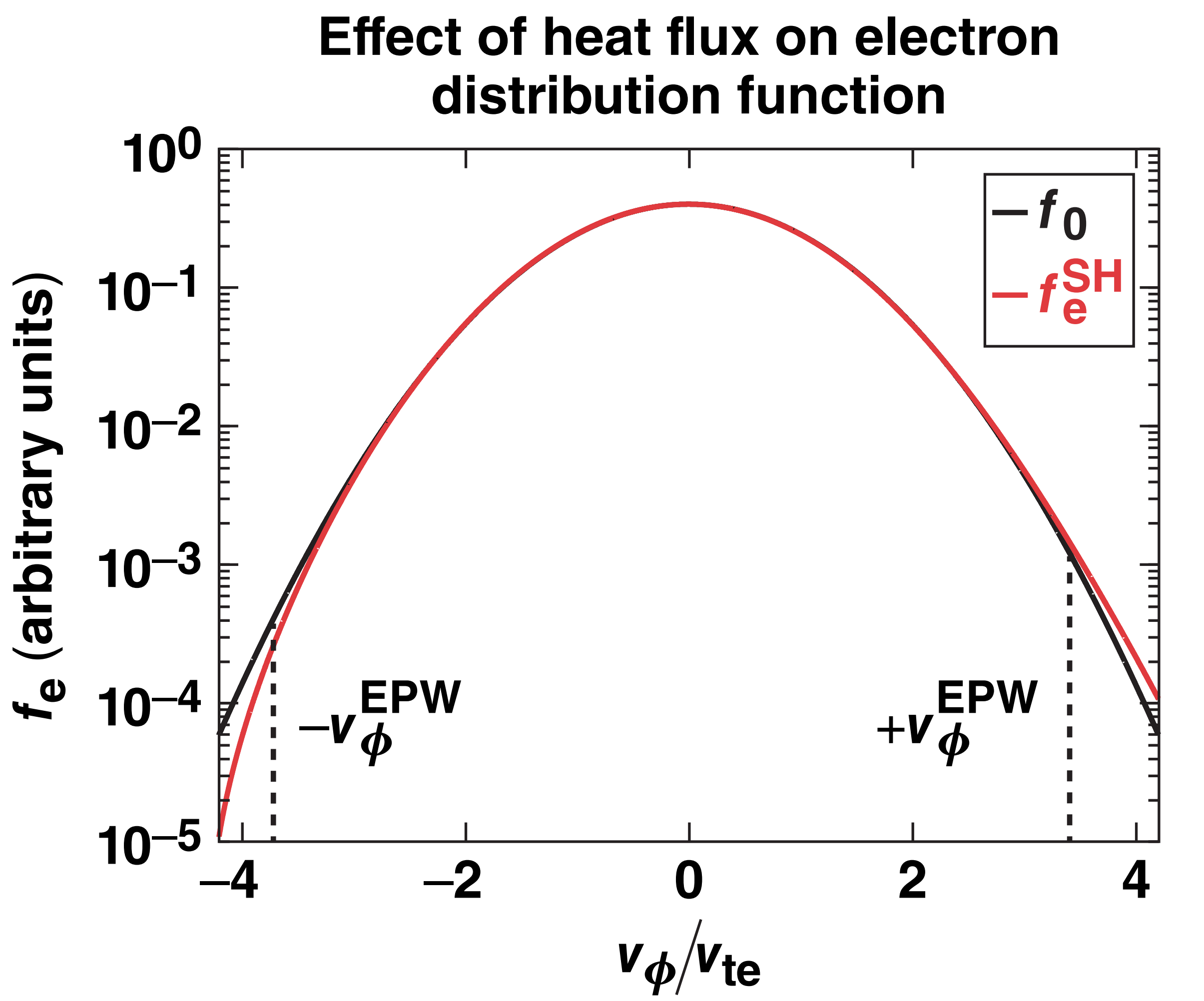
S. X. Hu, R. K. Follett, J. Katz, V. N. Goncharov, and D. H. Froula

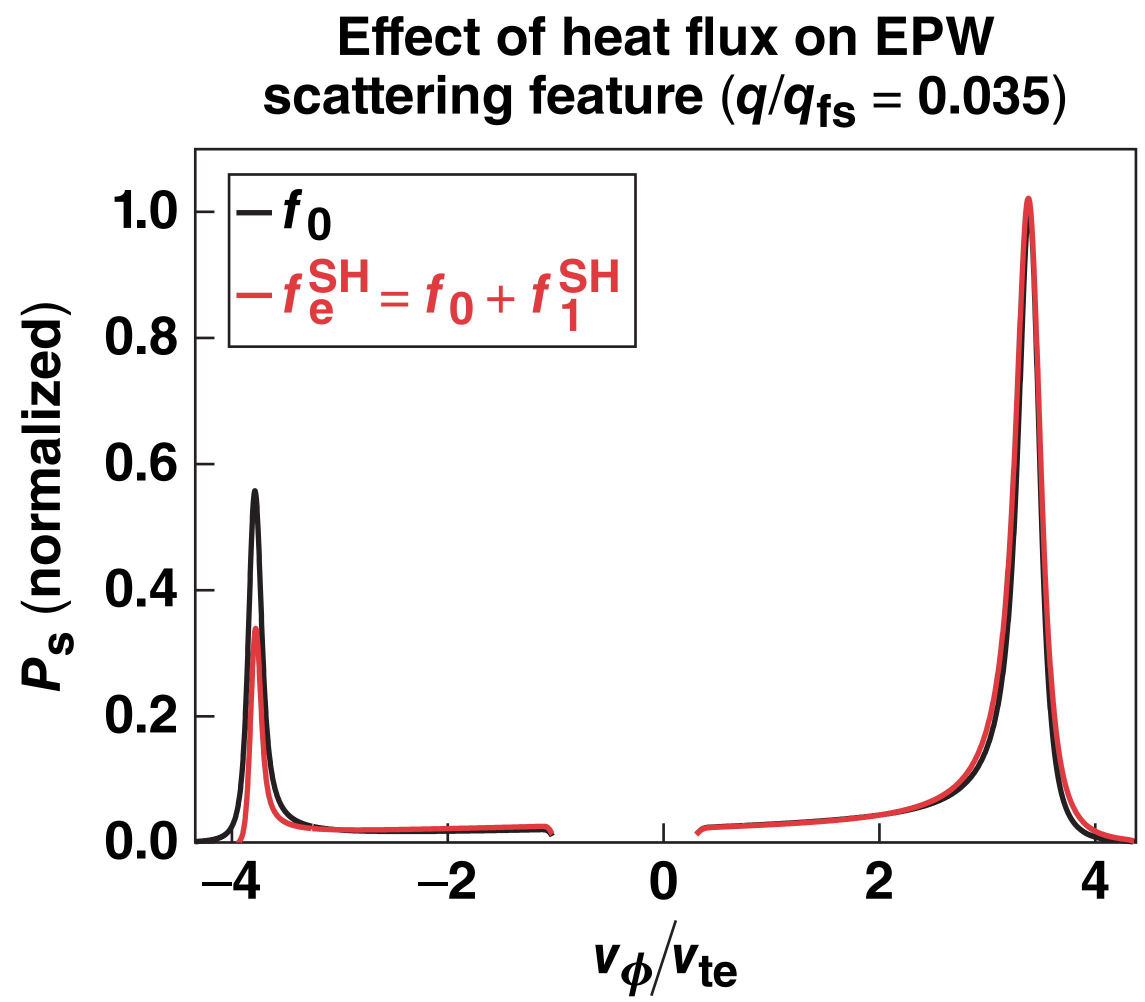
University of Rochester
Laboratory for Laser Energetics

W. Rozmus

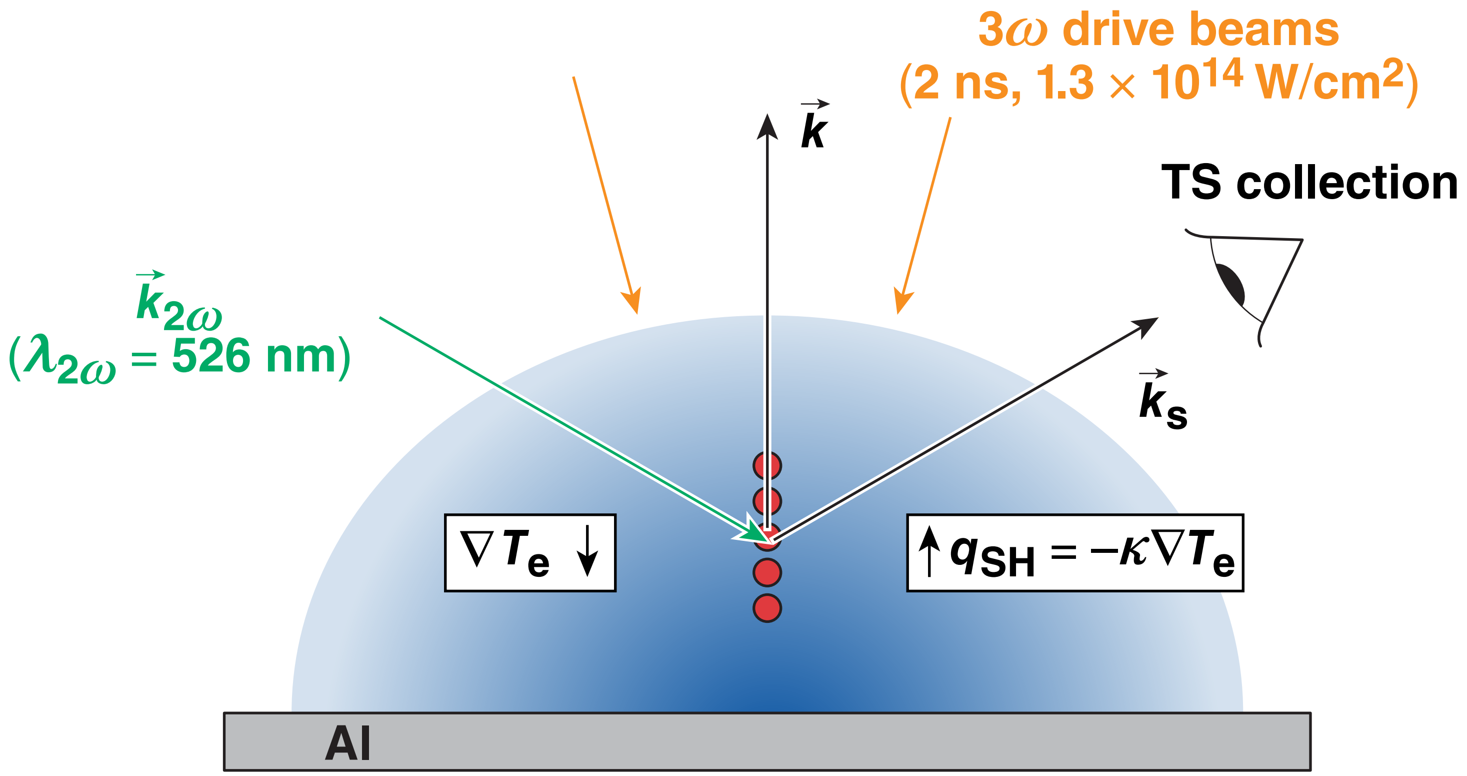
University of Alberta

Changes in the electron distribution function caused by heat flux affects the Thomson scattering spectrum from EPW's





Thomson scattering was used to measure the heat flux, electron temperature, and electron density in coronal plasmas



- Thomson scattering (TS) provides local measurements of T_e, n_e, and q in a $50 \times 50 \times 50$-μm^3 volume
- Probing five different locations provides values for ∇T_e
- An independent measure of q is obtained from T_e, n_e, and ∇T_e

Thomson scattering provides two separate measurements of heat flux by probing plasma waves along the direction of the temperature gradient.

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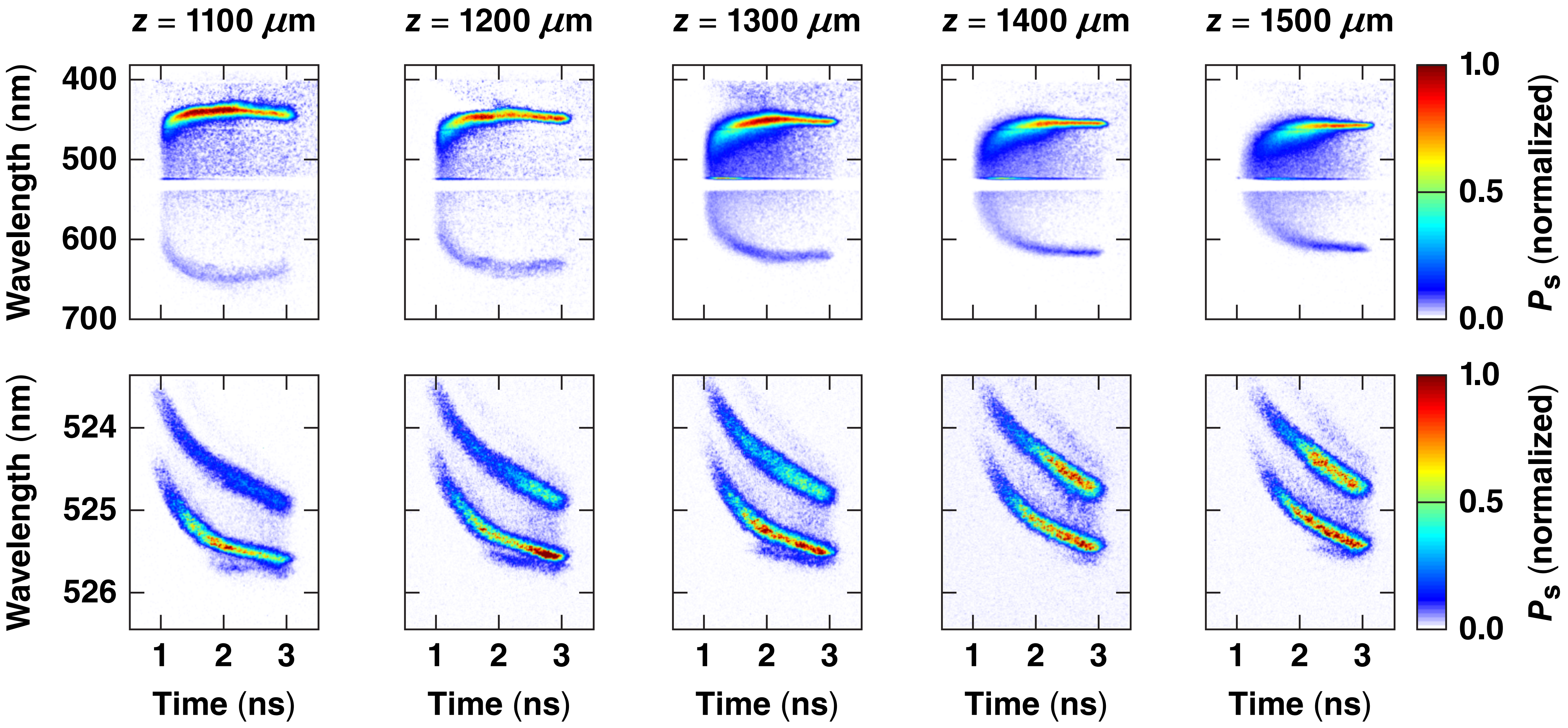
Thomson-scattering spectra obtained at five locations in the corona were used to measure the heat flux



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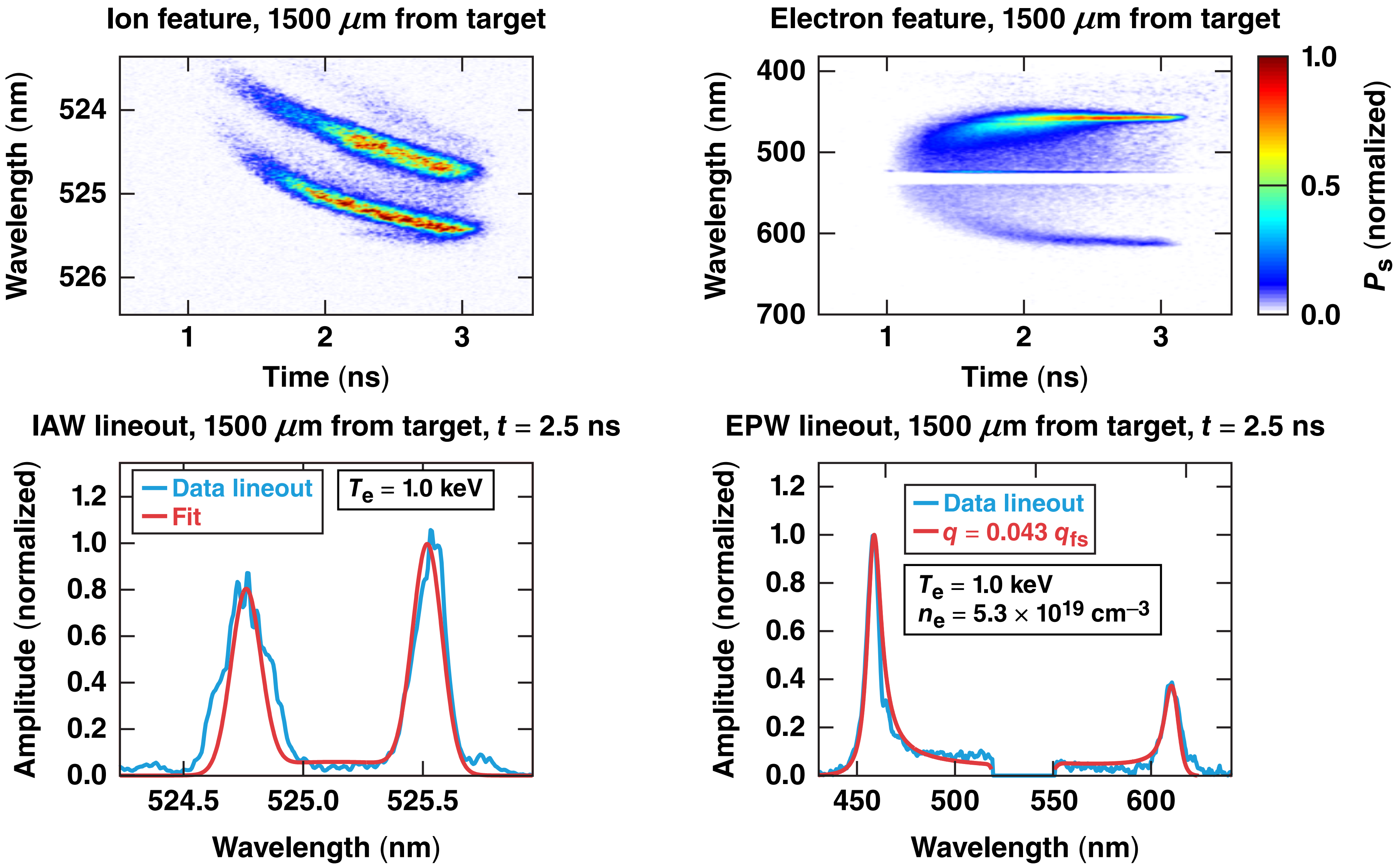
The scattering spectra are fit to determine the electron temperature and density



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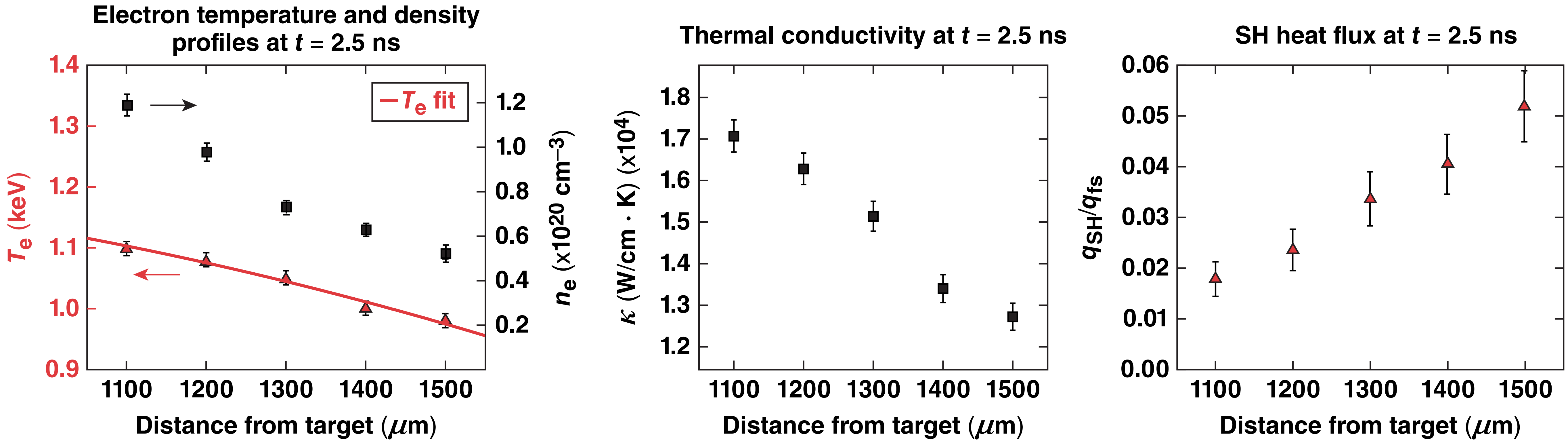
The electron temperature and density measurements are used to infer the heat flux



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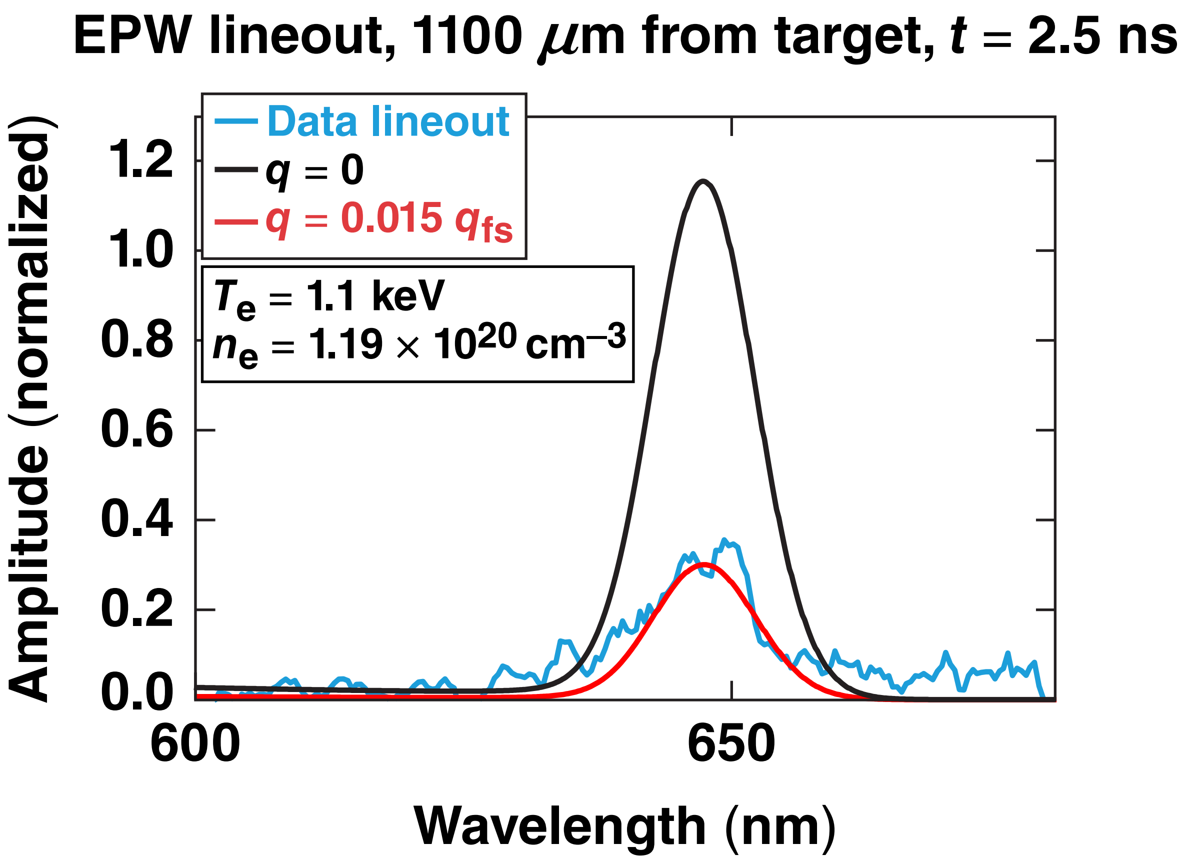
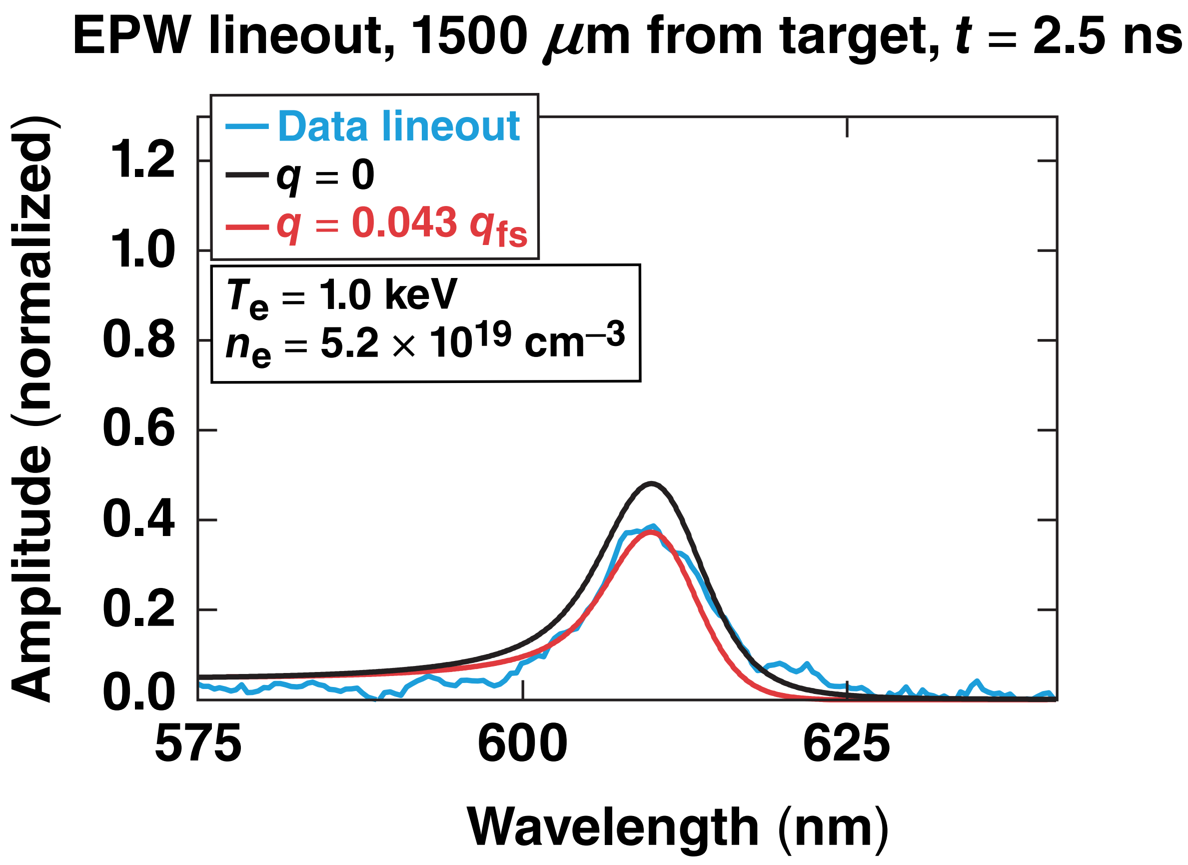
The relative amplitudes of the EPW scattering features were used to measure heat flux





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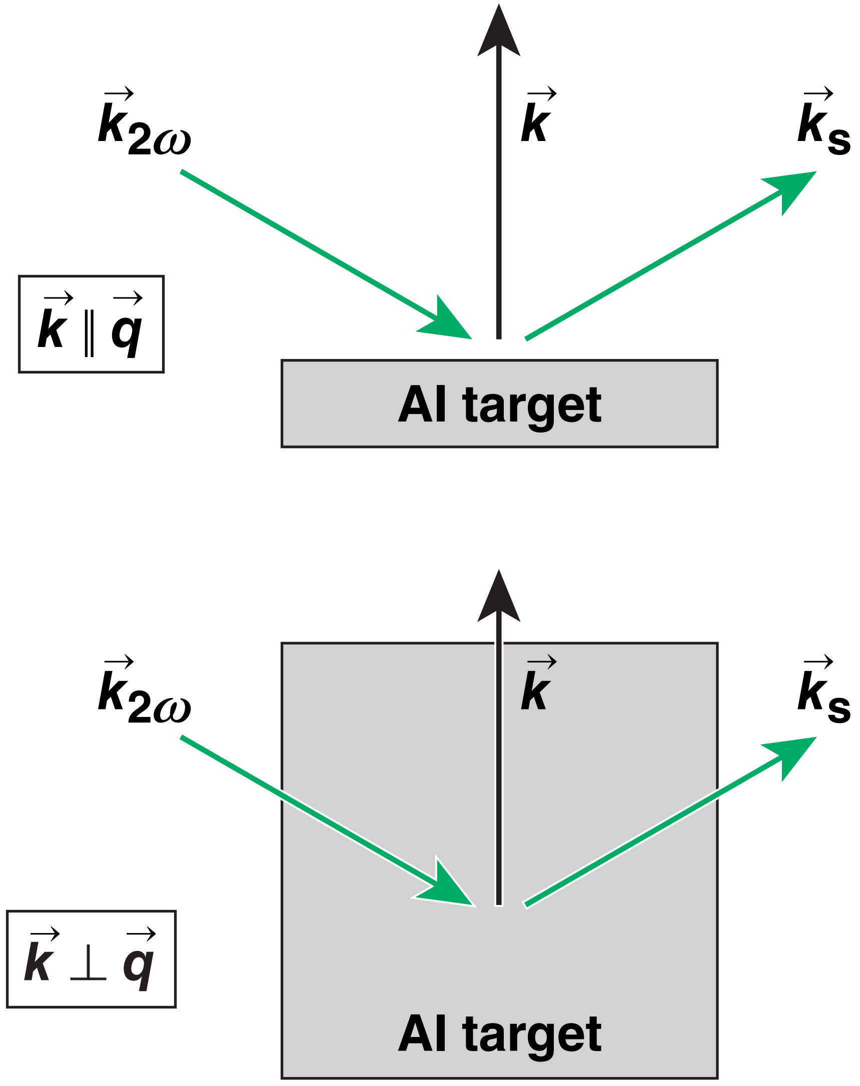
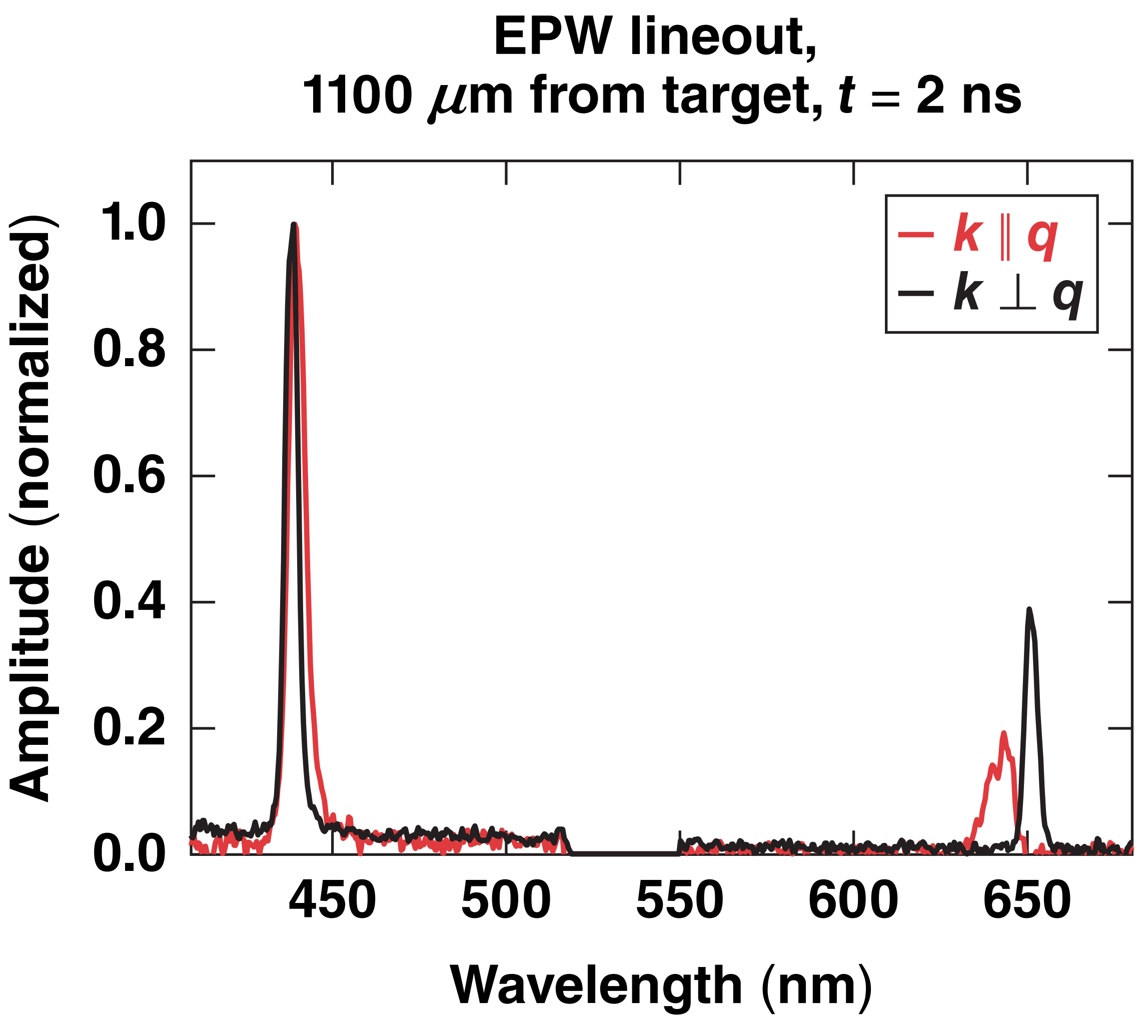
Two experimental configurations measured heat flux parallel and perpendicular to the target normal





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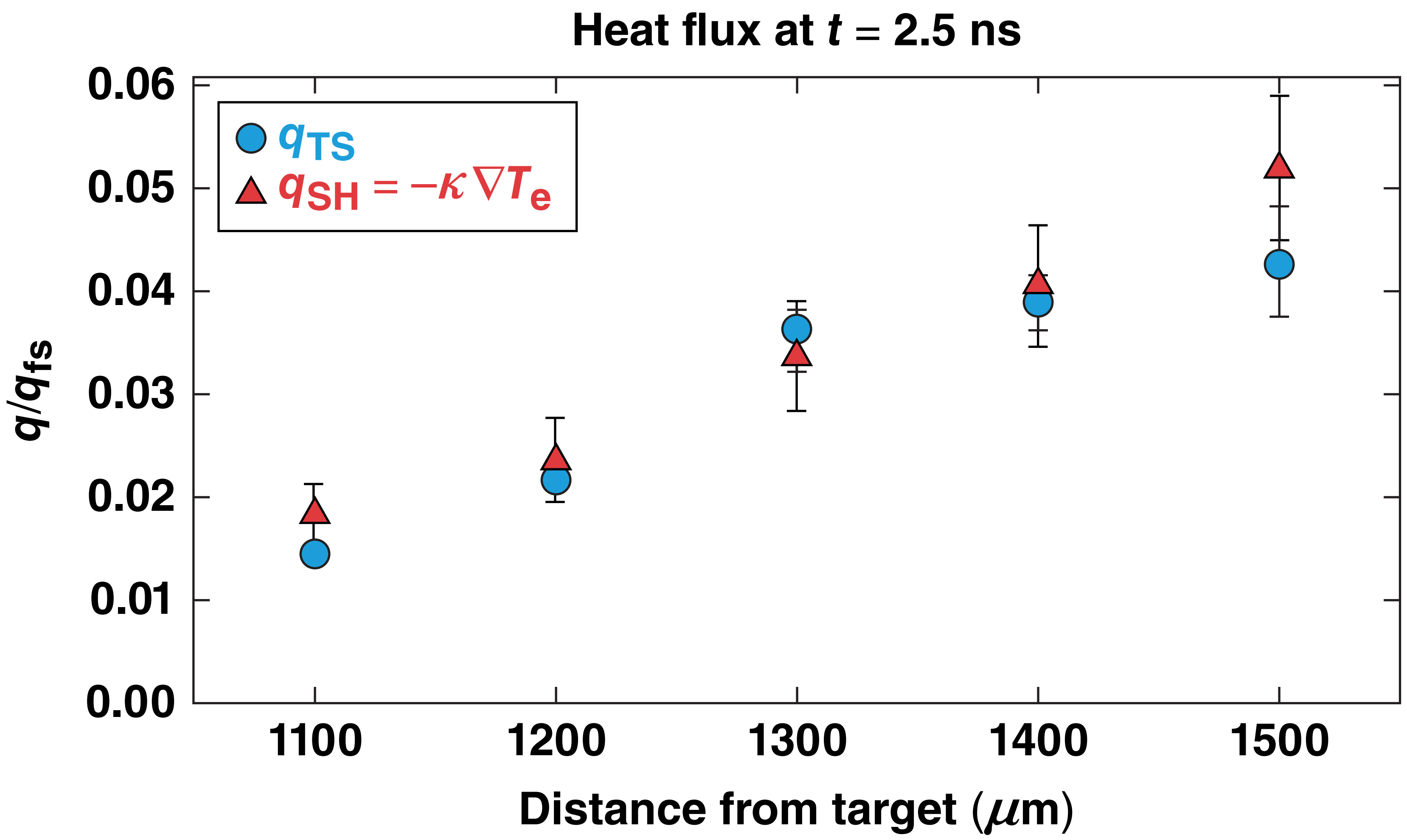
The heat-flux values obtained by matching electron feature amplitudes are in good agreement with the temperature-gradient measurements



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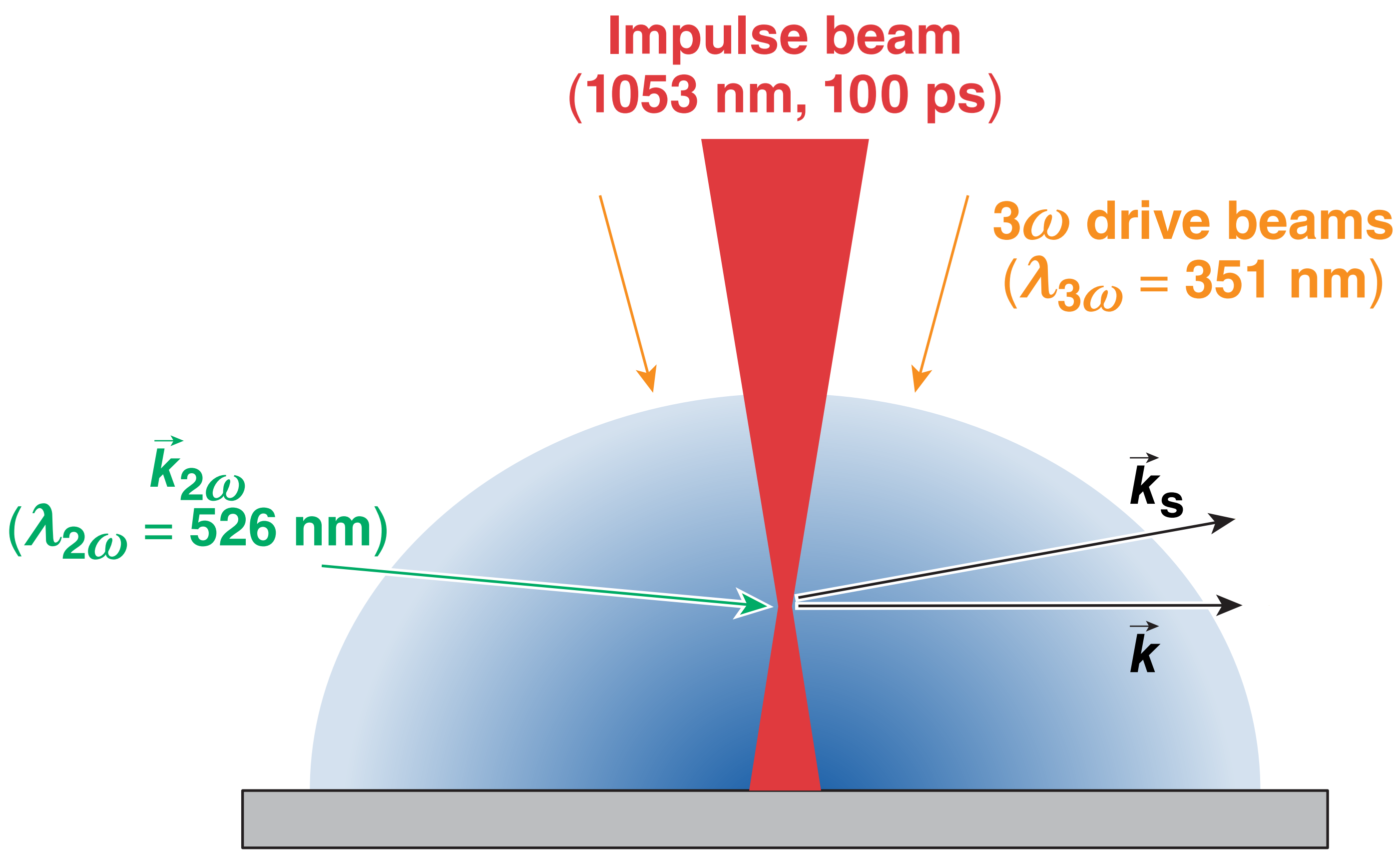
Future experiments will use a short-pulse IR beam to impulsively heat a region of the corona to produce large temperature gradients to study nonlocal electron thermal transport



E24730

Thomson scattering from ion-acoustic waves (IAW's) and electron plasma waves (EPW's) were used to measure the heat flux in coronal plasmas

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