Heat-Flux Measurements from Thomson-Scattering Spectra

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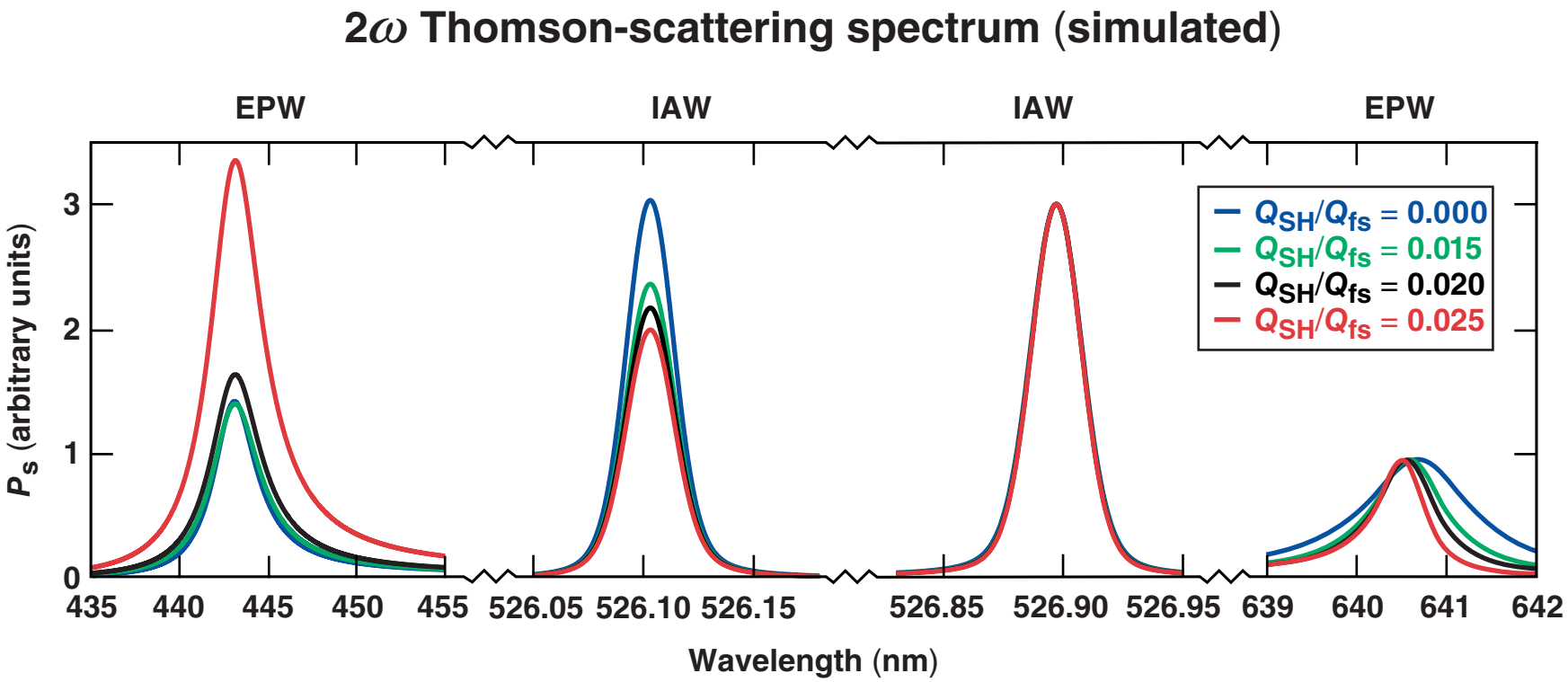

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Summary

Upcoming experiments on OMEGA will use Thomson-scattering (TS) spectra to measure heat flux in coronal plasmas

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- Heat flux in plasmas alters electron distribution functions, which affect Landau damping of ion-acoustic waves (IAW's) and electron plasma waves (EPW's)
- Thomson scattering is sensitive to changes in Landau damping and will provide a measurement of heat flux
- Local plasma conditions obtained from Thomson scattering will be used to calculate the Spitzer–Härm (SH) heat flux
- The heat flux obtained from both methods will test the validity of SH in the corona

Collaborators

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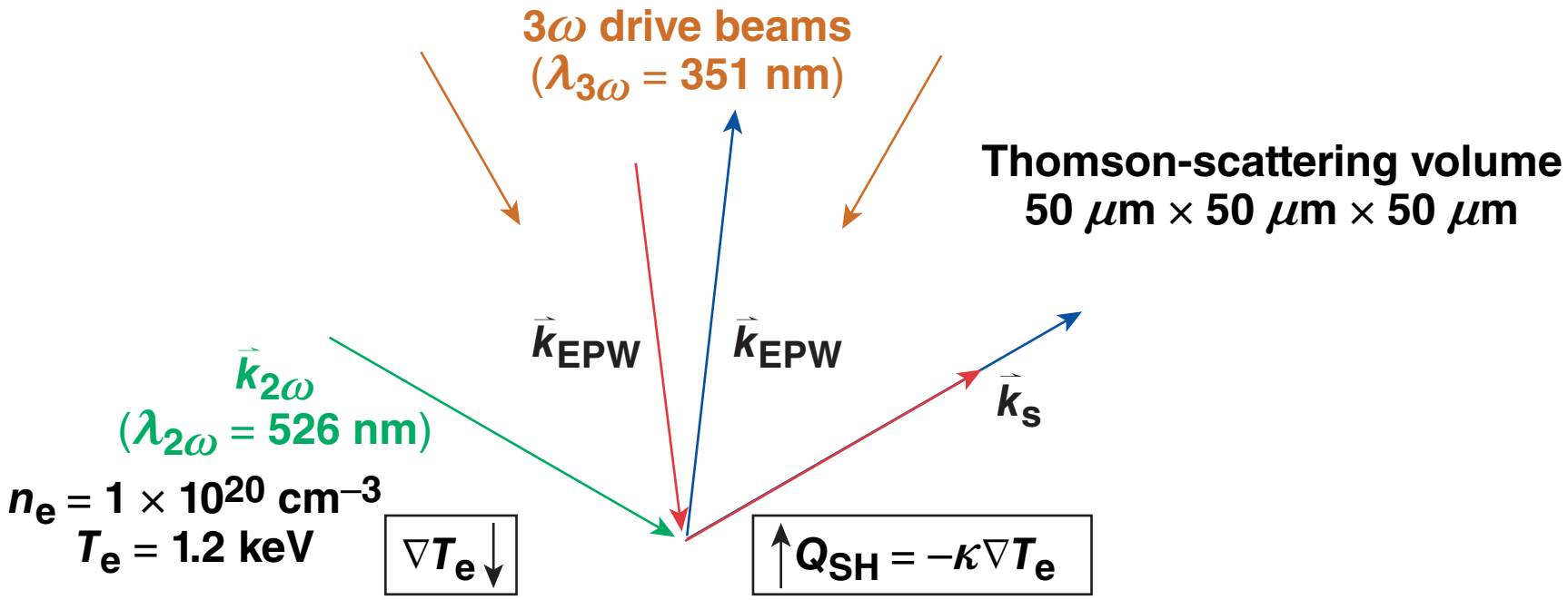
Thomson scattering will be used to probe EPW k vectors in the direction of the heat flux



The ratio of amplitudes from Thomson-scattered EPW's will be used to infer heat flux.

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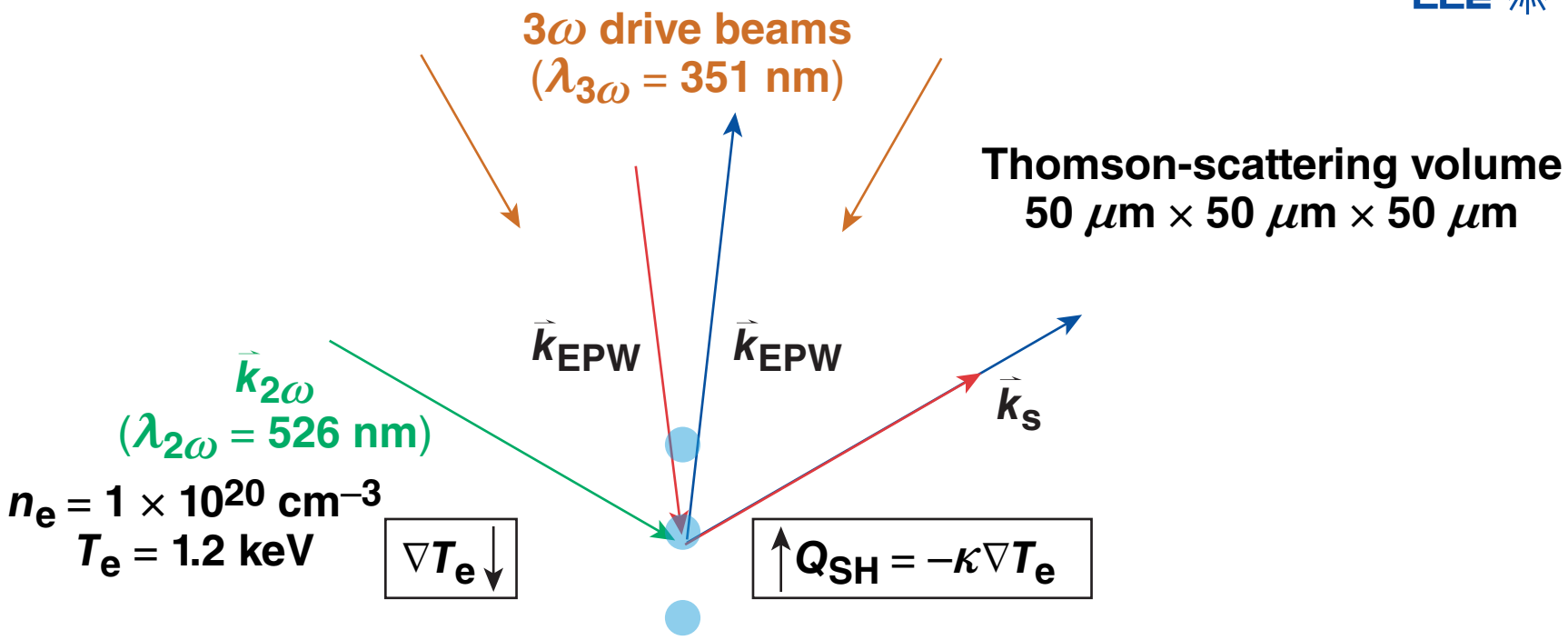
Thomson scattering will also be used to measure plasma conditions to determine the heat conductivity and spatial temperature profile



The Thomson-scattering volume will be moved along the target normal to measure Q_{SH}.

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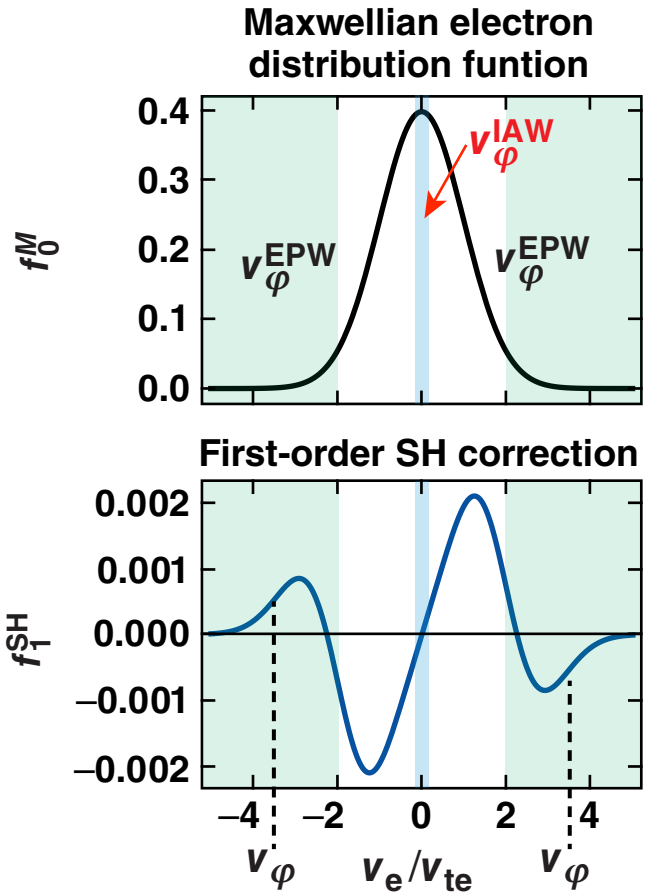
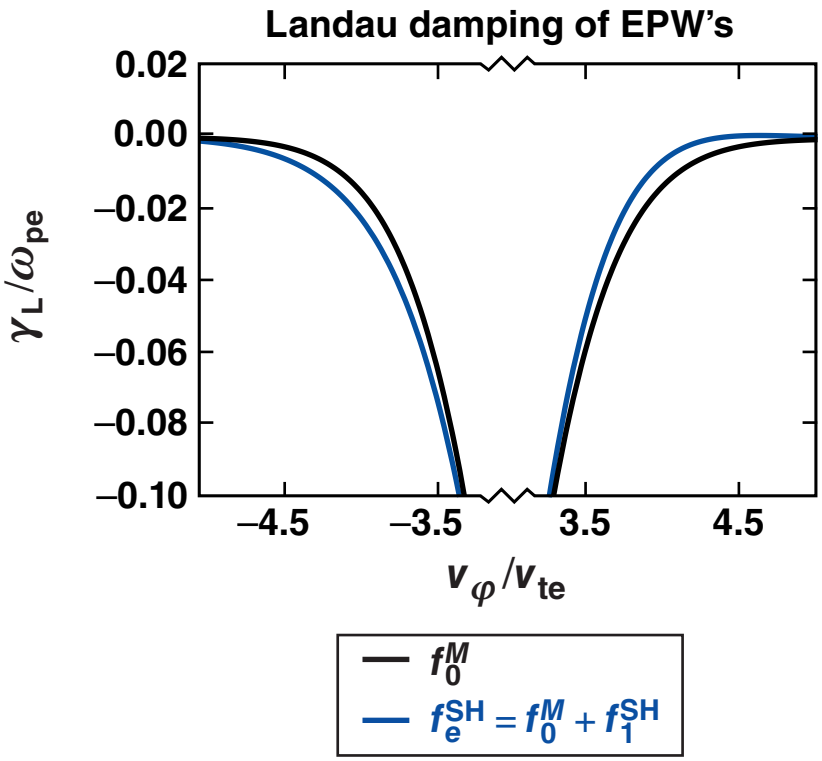
The Landau damping of EPW's is sensitive to the heat flux by introducing a correction term to the electron distribution function





Thomson scattering makes it possible to probe various phase velocities to measure differences in Landau damping.

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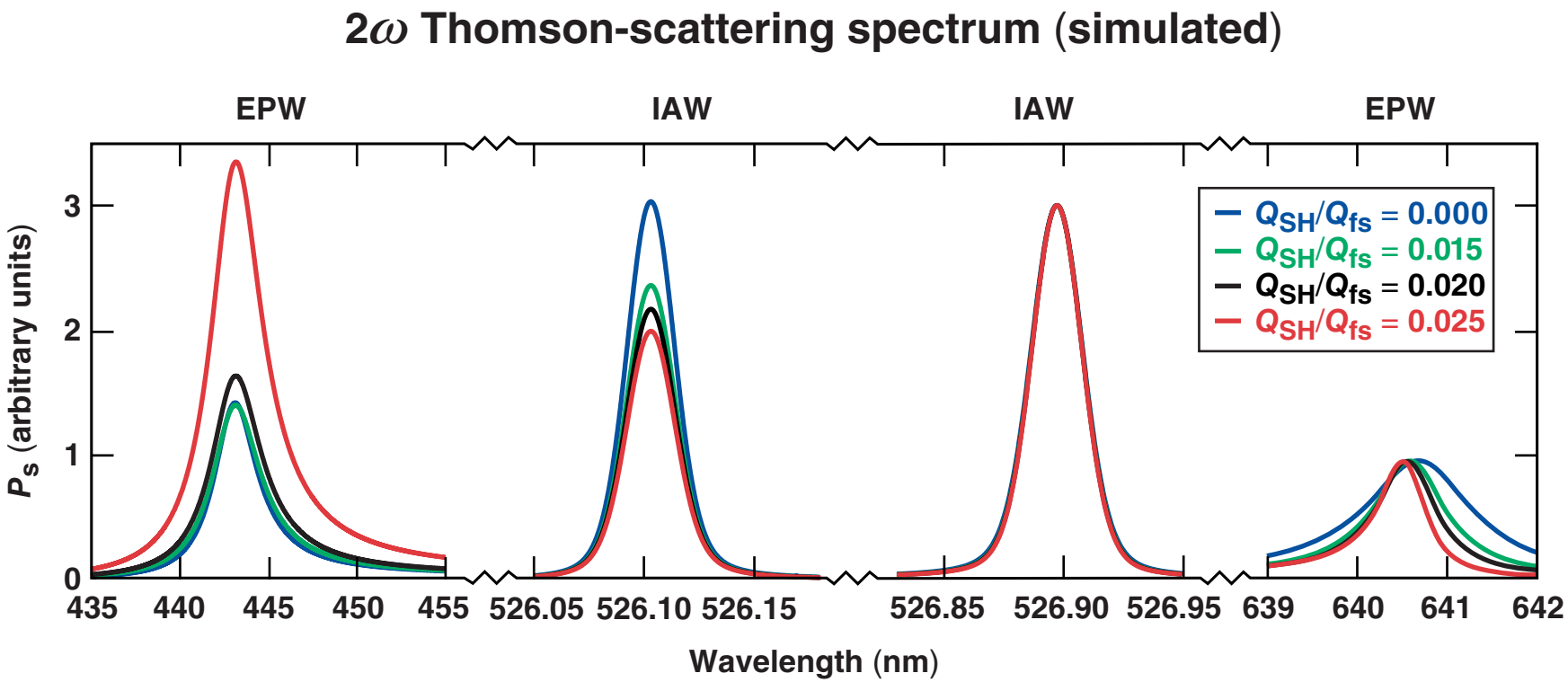
Differences in Landau damping result in varying amplitudes of Thomson scattering from IAW's and EPW's



Experiments will measure differences in Thomson-scattered amplitude to infer heat flux.

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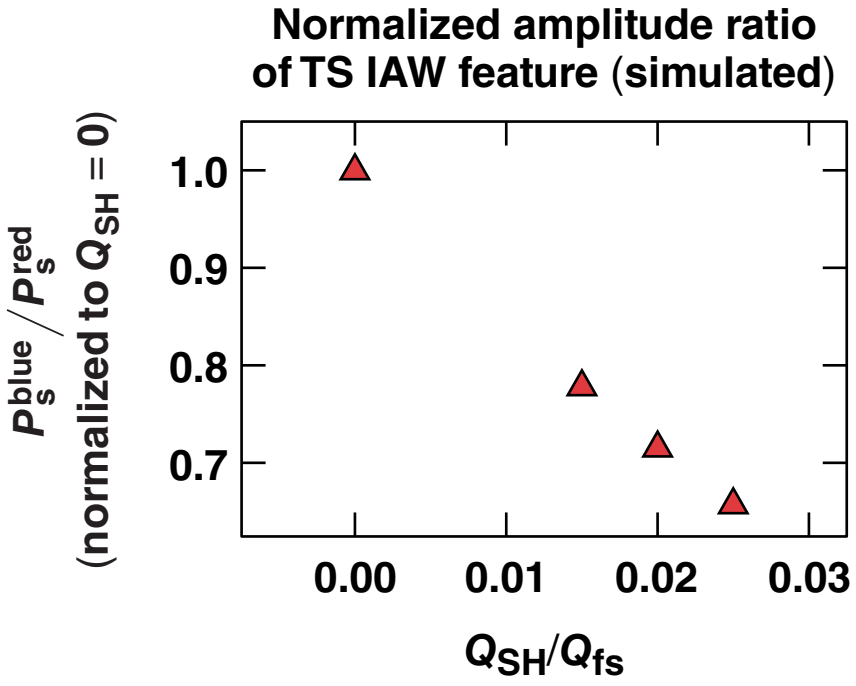
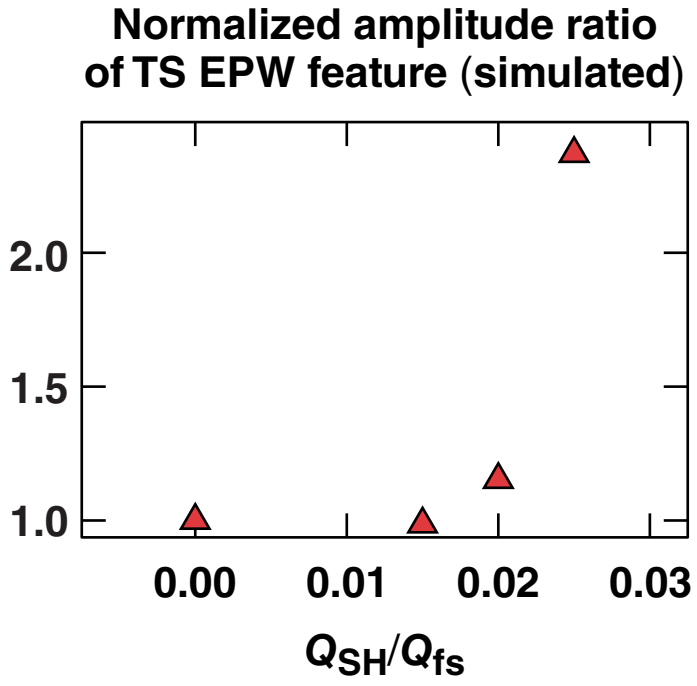
Simultaneous measurements of the Thomson-scattered amplitudes of EPW and IAW features will be used to infer the heat flux





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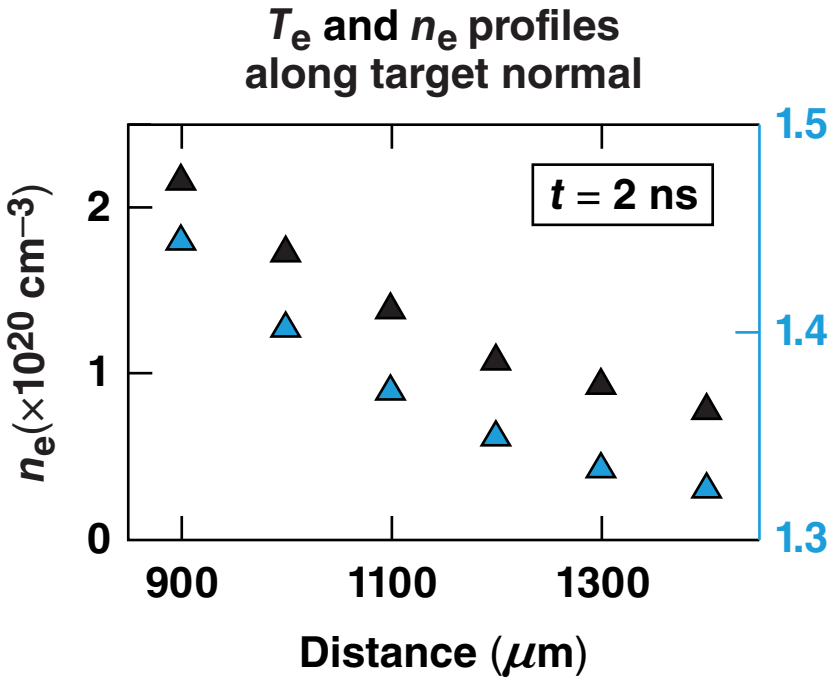
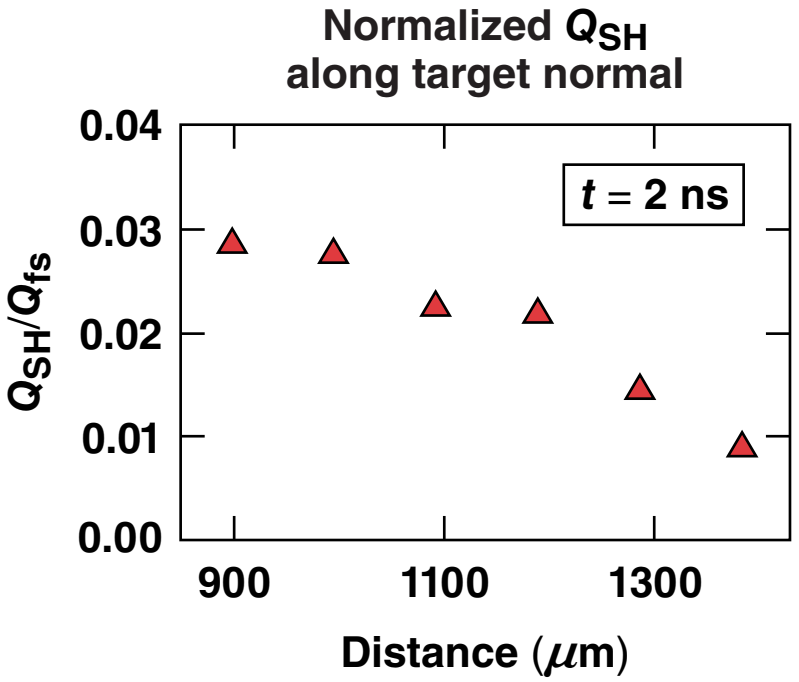
Two-dimensional hydrodynamic simulations predict the locations along the target normal that probe the appropriate values of heat flux





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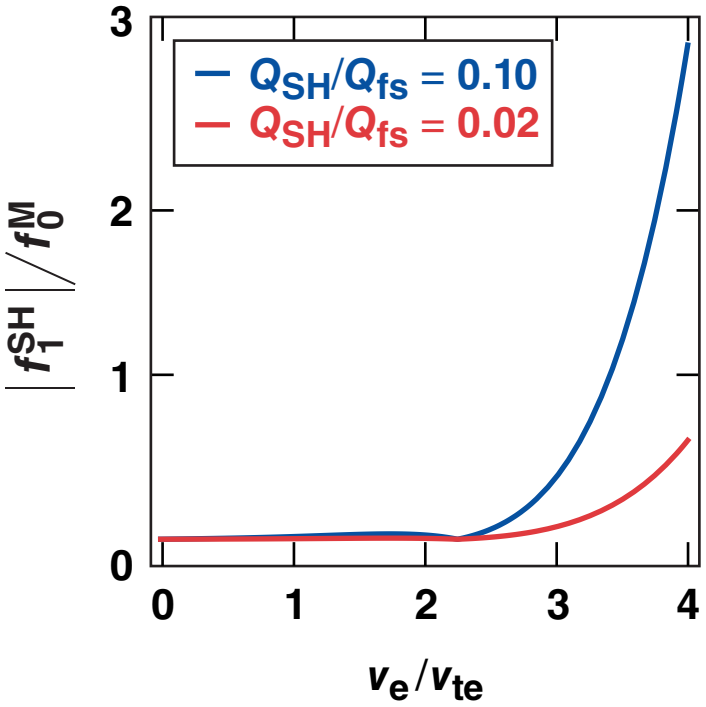
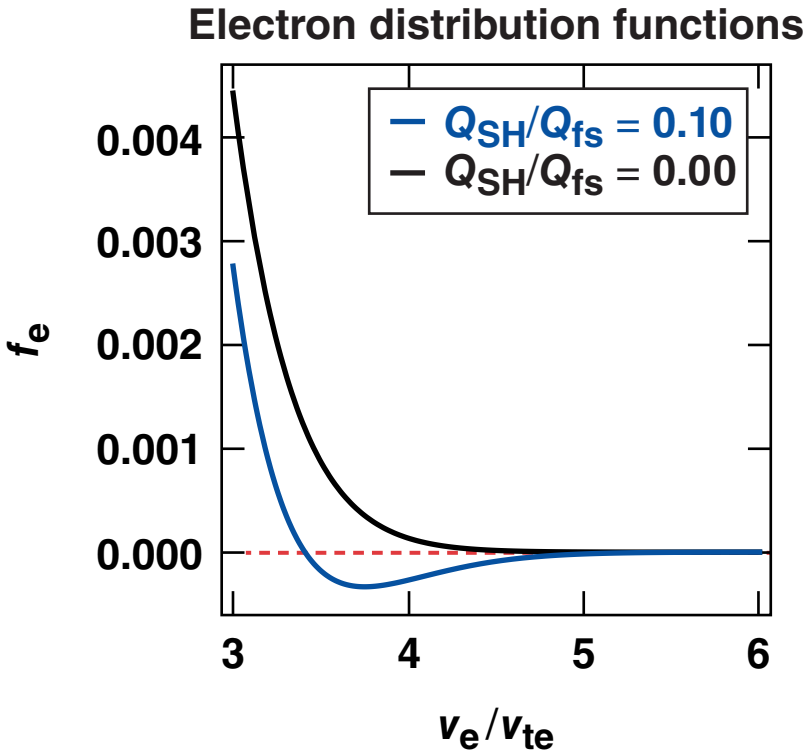
Spitzer-Härm heat flux becomes unphysical for $|f_1| \approx f_0$





W. Rozmus *et al.*, Bull. Am. Phys. Soc. 58, 26 (2013).

E23711

Summary/Conclusions

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