

Lineshape modeling for collisional-radiative calculations

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Collisional-radiative (CR) modeling is widely used to diagnose laboratory and astrophysical plasmas through fitting and interpreting measured spectra. Analysis of spectral line broadening or, more generally, lineshape analysis is an indispensable tool for plasma diagnostics. It allows for non-intrusively inferring basic plasma properties (density, temperature) and more advanced aspects, such as presence of non-thermal electrons or electric and magnetic fields. The line broadening also affects the radiation transfer and, hence, may influence the level or even charge-state populations for non-optically-thin plasmas. Therefore, failure to include line broadening in a CR model may result in severe degradation of its diagnostics power. However, accurate lineshape calculations are rather time-consuming, which renders including them directly in CR calculations unrealistic.

In my talk, I will discuss computationally effective approximate methods of lineshape modeling that retain a reasonably good accuracy, and present examples of such calculations, including modeling of continuum lowering.