APPLICATIONS OF ACCURATE AND COMPLETE ATOMIC DATA FOR X-RAY ASTROPHYSICAL SPECTRA

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Publicly distributed AtomDB spectral models [1] are widely used for studying X-ray astrophysical plasmas. Efforts to improve the accuracy and completeness of the underlying atomic data are paying off, as new insights into astrophysical processes rely on critically evaluated data. Over the past decade, theoretical estimates of uncertainties in rate coeffecients, supplemented by laboratory benchmark studies, have established a number of reliable diagnostics; however, tests using astrophysical data are also needed to ensure that the diagnostics behave as expected and to assess blending.

We discuss astrophysics results that take advantage of highly accurate collisional rates, including the (lack of) opacity of the solar corona from Fe XVII and the measurement of mass accretion rates in a young star from Ne IX. We also illustrate the importance of completeness, e.g. to measure the electron temperature using the diagnostic ratio of the dielectronic recombination satellite line flux to the parent line flux. Such a temperature diagnostic will be useful for establishing the degree to which stellar coronae reach collisional ionization equilibrium, of interest for coronal heating models. We will highlight further improvements in atomic data needed for astrophysics.

References

[1] A. R. Foster, L. Ji, R. K. Smith, and N. S. Brickhouse, ApJ, 756, 128 (2012).