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Correction of the relativistic factorizable expression (RKJ) for Compton scattering doubly differential cross sections L.A. LAJOHN, R.H. PRATT, University of Pittsburgh — We have derived simple analytic expressions that can be used to correct the factorizable expression for Compton scattering doubly differential cross sections (DDCS) within the relativistic impulse approximation (RIA). This relativistic factorizable expression, which we refer to as the RKJ approximation, has the nonrelativistic-like form DDCS=KJ, where K is a kinematic factor and J is the Compton profile. The advantage of RKJ is that it allows one to obtain J from observed DDCS in relativistic regimes. However RKJ breaks down for K-shell ionization of moderate to heavy atoms. The error can exceed 25% for heavy atoms such as Uranium. Our correction to RKJ provides accurate Compton profiles at high energy, at least around the maxima, even for the heaviest of atoms. We explain how the formulas for the correction to RKJ can be obtained most conveniently by taking the high incident photon energy ω_i limit of the partially integrated form of the full RIA expression for DDCS and why this partially integrated form exhibits the cancellation of much of the relativistic corrections to the RKJ approximation, resulting in simple expressions that yield accurate results. We give the results of tests for the accuracy of the corrected K-shell Compton profiles for heavy atoms.

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