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Approximating the Green's Function in Evaluating Second-Order Amplitudes ZHANGJIN CHEN, DON MADISON, Laboratory for Atomic and Molecular Research, University of Missouri-Rolla, Rolla, MO 65401, KLAUS BARTSCHAT, Department of Physics and Astronomy, Drake University, Des Moines, Iowa 50311, USA — It is well established that second-order effects are often important for electron impact ionization processes. Due the complexity of evaluating second order amplitudes, approximations are typically made in their evaluation. One of the approximations that have been used is accounting only for the imaginary part of the Green's function, so that the second-order amplitude reduces to a sum of products of two first-order terms. To check the validity of this approximation, we performed second-order distorted-wave calculations, in which the first-order amplitudes were evaluated by a convergent R-matrix with pseudostates (close-coupling) model to describe the initial bound state and the ejected-electron–residual-ion interaction. The results obtained without making any approximations are compared with those obtained by simplifying the Green's function for electron impact ionization of helium to $He^+(1s)$ and $He^+(2s,2p)$. The approximation is found to be reasonably good for direct ionization to $He^+(1s)$ at incident energies greater than about 600 eV. The accuracy decreases with decreasing incident electron energy.

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