RELATIVE IMPORTANCE OF THE ELECTRON CONTINUUM INTERMEDIATE STATE IN SINGLE-ELECTRON CAPTURE INTO ANY STATE OF FAST PROTONS FROM HELIUM-LIKE ATOMIC SYSTEMS

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Abstract. Single-electron capture by fast protons from helium-like atomic targets is investigated at intermediate and high impact energies. The main purpose of the present study is a comprehensive analysis of the relative importance of the electron continuum intermediate state (ionization continua), with respect to direct transfer. To achieve this goal, first- and second-order theories are employed, and their results are thoroughly compared. The prior form of the boundary-corrected continuum intermediate state method (BCIS) is utilized, in both its three-body (Milojević et al. 2020) and four-body (Mančev et al. 2015) formulation, in addition to the four-body boundary-corrected first-Born approximation (CB1-4B), in both its prior (Mančev et al. 2012) and post form (Mančev et al. 2013, Milojević 2014). BCIS methods belong to the class of second-order theories, while CB1 methods belong to the class of first-order theories. Relative importance of ionization continua will be examined in the example of single-electron capture in $p + \mathrm{He}(1s^2)$ collisions. Both differential and total cross sections will be analysed, for single-electron capture into any final state of the projectile. The presented cross sections, aside from their fundamental importance, are relevant in various interdisciplinary applications, such as in astrophysics (Cravens 2002), thermonuclear fusion and plasma physics (Isler 1994) and medical physics (Belkić 2021).

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