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Low Energy Proton Impact Ionization M. FOSTER, D.H. MADISON, J.L. PEACHER, M. SCHULZ, University of Missouri - Rolla, LABORATORY FOR ATOMIC, MOLECULAR AND OPTICAL RESEARCH COLLABORATION
— Recent experiments have measured fully differential cross sections (FDCS) for single ionization of helium by 75 keV proton impact for fixed ejected electron energies and different momentum transfers. These measurements show major discrepancies in the absolute magnitude between the experiment and the theoretical, 3DW (three-distorted-wave) model. The 3DW model is a fully quantum mechanical calculation that has accurately predicted FDCS for higher energy C^{6+} impact ionization of helium. However, the 3DW model treats the collision as a three-body process (projectile, ion, ejected electron). The lack of agreement between the 3DW model and experiment for low energy collisions suggests that a three-body model may not be appropriate for lower collision energies (especially, when considering that a proton with energy of 75 keV is equivalent to electron energy of 40 eV, which is only 15 eV above the ionization threshold for helium). These experiments further demonstrate the fact that the fundamental physics governing a simple collision process is still not well understood. Consequently, we will present a complete four-body model known as the 6DW (six- distorted-wave) model. The 6DW model takes all two particle Coulomb interactions (six in total) into account on equal footing.

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