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Doubly differential spectra of scattered protons in ionization of atomic hydrogen

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We have measured and calculated doubly differential cross sections for ionization of atomic hydrogen using 75-keV proton impact for fixed projectile energy losses as a function of projectile scattering angle. This collision system represents a pure three-body system and thus offers a very sensitive and accurate test of the theoretical description of the few-body dynamics without any complications presented by electron correlation in many-electron targets. Comparison between experiment and several theoretical models reveals that the projectile-target nucleus (PT) interaction is best described by the operator of a second-order term of the transition amplitude. Higher-order contributions in the projectile-electron interaction, on the other hand, are more appropriately accounted for in the final-state wave function. Furthermore, the comparison between experiment and theory reveals that in the well-known focusing of the ejected electrons due to the post-collision interaction (PCI) the PT interaction plays a crucial role.