

# Proton scattering from hydrogen atom in excited state

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We have developed a wavepacket continuum-discretisation approach to calculate excitation, ionization and electron-capture cross sections for protons colliding with atomic hydrogen in excited states [1]. The approach assumes a classical motion for the projectile and is based on the solution of the three-body Schrödinger equation using the two-center expansion of the total scattering wave function. The scattering wave function is expanded in a basis set made of negative-energy eigenstates and wavepacket pseudostates representing the continuum of both the target atom and the atom formed by the projectile after capturing the electron. Calculated cross sections for scattering on the metastable 2s state are compared with other theoretical results obtained using atomic-orbital close-coupling and classical trajectory Monte Carlo approaches. Considerable disagreement with previous calculations has been found for some transitions at various incident energies.

[1] I. B. Abdurakhmanov *et al.*, Plasma Phys. Control. Fusion **60**, 095009 (2018)