

EXCITATION AND CHARGE TRANSFER IN PROTON–HYDROGEN COLLISIONS¹

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Excitation and charge transfer cross sections for collisions of protons with hydrogen are calculated by direct solution of the time-dependent Schrödinger equation on a three-dimensional Cartesian lattice. The $2s$, $2p$, $3s$, $3p$, and $3d$ excitation cross sections and the $1s$, $2s$, $2p$, $3s$, $3p$, and $3d$ charge transfer cross sections from the $1s$ ground state at 10-, 40-, and 100-keV incident proton energy are found by projecting a time-evolved wave function onto the lattice target states of hydrogen. Excitation processes are calculated in the rest frame of the hydrogen atom, while capture processes are calculated in the rest frame of the proton. The computed excitation and charge transfer cross sections are in good agreement with recent experiments and other theoretical results based on coupled-channels methods.

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