

Proton-beam stopping in hydrogen

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The stopping cross section for protons passing through hydrogen is calculated for the energy range between 10 keV and 3 MeV [1]. Both the positive and neutral charge states of the projectile are accounted for. The two-center convergent close-coupling method is used to model proton collisions with hydrogen. In this approach, electron-capture channels are explicitly included by expanding the scattering wave function in a basis of both target and projectile pseudostates. Hydrogen collisions with hydrogen are modeled using two methods: the single-center convergent close-coupling approach is used for the calculation of one-electron processes, while two-electron processes are calculated using the Born approximation. The aforementioned approaches are also applied to the calculation of the charge-state fractions. These are then used to combine the proton-hydrogen and hydrogen-hydrogen stopping cross sections to yield the total stopping cross section for protons passing through hydrogen.

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