# Scattering Processes of Excited Exotic Atoms: Close-Coupling Approach

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The scattering processes of exotic atoms in excited states from hydrogen

$$(X^- p)_{nl} + \mathrm{H} \to (X^- p)_{n'l'} + \mathrm{H}, \qquad (X^- = \mu^-, \pi^-, K^-, \bar{p})$$

such as elastic scattering ($n = n'$, $l = l'$), Stark transitions ($n = n'$, $l \neq l'$) and Coulomb deexcitation ($n' < n$) have been studied within a close coupling approach [1, 2, 3]. The vacuum polarization and the strong interaction shifts of $ns$-states (in the case of hadronic atoms) are taken into account. The differential and total cross section of the above processes for initial states with $n = 3 - 8$ at relative energies $E = 0.01 - 100$ eV have been calculated and used as the input in cascade calculations [4]. The effect of closed channels on the scattering processes has been also investigated. In particular, it has been found that including of the closed channels results in the strong changes of the Coulomb deexcitation cross sections (see an example in Fig. 1).

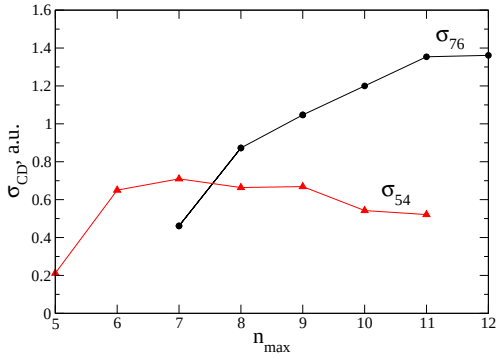


Figure 1: Dependence of the Coulomb deexcitation cross sections $\sigma_{7\to6}$ and $\sigma_{5\to4}$ for muonic hydrogen at $E_{\mathrm{cm}} = 1$ eV on the number of closed channels; $n_{max}$ is the maximal main quantum number for the channels included.

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