State-selective charge exchange processes between Ar and Ne ions with H(1s) and H*(n=2)

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In this talk we describe two methodologies implemented within the classical trajectory Monte Carlo method (CTMC) in order to correct the description of the radial electron distribution for H(1s) and H*(n=2) targets. Although the microcanonical statistical distribution is typically employed to initialize the target during the simulations, it is well known that the existence of a classical turning point limits the radial electronic distribution and fails to provide a proper description of the electronic density at large distances.

Improvements based on the CTMC method in order to deal with this issue have been reported in the literature for H(1s) and are based on expansions in terms of microcanonical distributions either corresponding to different ionization potentials (for a fixed nuclear charge) [1,2] or different nuclear charges (for a fixed ionization potential) [3,4]. This models are respectively labeled as E-CTMC and Z-CTMC.

For H*(n=2), a similar strategy has been also followed by treating the target as composed of 25% H*(2s) and 75% H*(2p) [4].

Comparison of the Z-CTMC cross sections with those reported by means of the Atomic Orbital Close Coupling (AOCC) method [5] exhibit better agreement compared to those provided by the standard microcanonical formulation for bare C, N and O ions. Besides, inspection of the line emission cross sections clearly indicate that even a minor fraction of H*(n=2) dominates the visible range emission and therefore the charge exchange spectroscopy signal.

In this project we intend to analyze the differences among the CTMC, E-CTMC and Z-CTMC methods in the description of charge exchange processes at the (n,l)-state selective level for highly charged Ar and Ne ions of potential relevance for ITER. In the initial stage Ar^{18+} and Ne^{10+} will be used as projectiles, for which the line emission cross sections will be also determined. Impact energies of interest will be in the range (0.01 keV/u -100keV/u).

By the end of the project possible extensions to lower projectile charge states will be analyzed.

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