Ionization in swift ion-atom collisions

The cross section calculations available on this page are based on a **Distorted Wave perturbative approach**: the Continuum Distorted Wave - Eikonal Initial State (CDW-EIS) approximation. This model was intially proposed by Crothers and McCann [1] for hydrogenic targets and latter extended by Fainstein *et al* [2] for multielectronic targets. Details of the model and an extensive comparison with experimental data has been presented in reviews by Fainstein *et al* [3] and Stolterfoht *et al* [4].

Main features and limitations

- for the selected values of projectile impact energy the program calculates singly differential cross sections (cm^2/eV), as a function of electron energy (eV), and total cross sections (cm^2).
- for hydrogenic targets the calculations are restricted to the 1s, 2s and 2p states. For the latter, the program provides the sum of cross sections for the $2p_x$, $2p_y$ and $2p_z$ orbitals.
- the model is valid at intermediate to high impact energies, typically from about 10 keV/amu to 10 MeV/amu for light projectiles (protons/antiprotons). A more precise way to characterize the range of validity, very usefull in the case of highly-charged ion impact, is to employ the Sommerfeld parameter ν defined as the ratio between projectile charge and velocity. The CDW-EIS model is valid for $\nu \leq 1$. At high impact energy, when electron capture is still unimportant, very accurate values of cross sections have been found for larger values of ν [5].

References

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3. P. D. Fainstein, V. H. Ponce and R. D. Rivarola, J. Phys. B **24**, 3091-3119 (1991).
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5. H. Berg *et al*, J. Phys. B **25**, 3655-3670 (1992).