

How include properly the dynamic-screening into the *post*-version of the Continuum Distorted Wave model

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Synopsis The *post*-version of the Continuum Distorted Wave (CDW) model neglects a part of the active electron-residual target interaction which has been shown to play a major role in obtaining the doubly differential cross sections (DDCS) for electron ionization. In this work we properly include the dynamic screening into the CDW model showing its influence over the ionization DDCS for several collision systems.

Among the many distorted wave models there are two that merit to be cited: the Continuum Distorted Wave (CDW) [1] and the Continuum Distorted Wave-Eikonal Initial State (CDW-EIS) [2]. These models were formulated to describe single ionization of mono-electronic targets by bare ion impact, then being extended to describe ionization of multi-electronic targets [3]. In the CDW model the initial channel distortion is chosen as a Confluent Hypergeometric function (continuum factor) describing the interaction of the target active electron with the projectile, whereas in the exit channel the ionized electron evolves in a two center continuum approximated by the product of a plane wave and two continuum factors, one associated to the residual target and the other to the projectile. In the CDW-EIS models the initial channel distortion is chosen as an eikonal phase instead of the continuum factor.

In the distorted wave formalism, the action of the perturbative potentials can either be applied to the initial channel distorted wave function or to the final channel distorted one, giving place to the *prior* and *post*-versions of the transition matrix element, respectively. The *prior* version of the CDW transition amplitude was shown to have an intrinsic logarithmic divergence near the binary encounter structure which prohibit the cross section calculation [4]. Therefore its *post*-version has been used ever since. To facilitate the calculation of transition matrix elements, effective Coulomb potentials were chosen to represent the interaction between the active electron and the residual target in the exit channel. In such approximation a part of the dynamic screening is neglected (see [5] for the CDW-EIS case). In this work we show that including the non-Coulomb potentials in the *post*-version of the CDW model leads to the same divergences found in the

prior- one. Therefore a hybrid CDW-CDW-EIS model is proposed in order to take into account the dynamic screening in the *post*-version of the CDW model without any divergence.

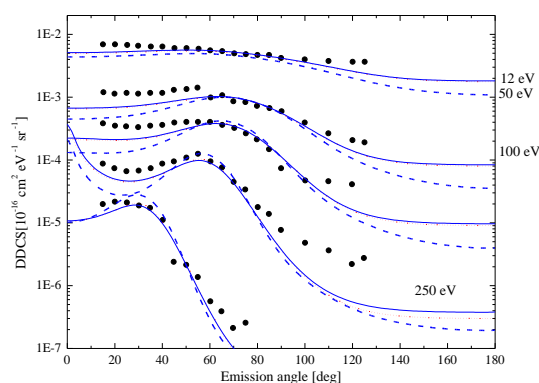


Figure 1. DDCS for single ionization of water vapour by 500 keV H^+ impact as a function of the emission angle for fixed electron energies. Dashed line: *post* CDW; full line: present *complete* CDW; dotted line: *prior* CDW-EIS. Experiments extracted from [6].

References

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