Photo-double-ionisation of He-like and Be-like ions in excited states using an intermediate energy R-matrix approach

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Experimental advances allowing attosecond photon pulses and the development of X-ray free-electron laser sources [1, 2] necessitate the availability of advanced theoretical models capable of accurately representing a multiple-electron continua. As a first step towards the development of a multipurpose R-matrix code for multiple-electron ejection, we consider the recently developed intermediate energy R-matrix (IERM) approach to photoionisation [3, 4], to ascertain if such an approach could provide a suitable method of representing a two-electron continua within an R-matrix framework. To date this approach has been successfully applied to photo-double-ionisation of He, and photodetachment and photo-double-detachment of H^- [4].

In order to delve into the intricacies of the representation of the two-electron continua used in the model, we investigate photo-double-ionisation of ground $2s^2(^1S)$ and excited 1s2s(^1S, ^3S) and 1s2p(^1P, ^3P) states of He, O^{6+} and Ne^{8+}, examining convergence properties in each case. Ne^{6+} and O^{8+} are amongst the most prevalent ions in the warm-hot intergalactic medium [5]. In addition, we use a core potential to represent the frozen $1s^2$ core of Be in order to study valence photo-double-ionisation of the ground $1s^22s^2(^1P)$ and excited $1s^22s2p(^1P$, ^3P) and $1s^22s3s(^1S$, ^3S) states, along with other members of the Be isoelectronic sequence. The most up to date results will be presented at the conference.

References:
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