

Abstract Submitted
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Exploration of ultra-fast electron dynamics using time-dependent R-matrix theory¹ HUGO VAN DER HART, HECTOR REY, OLA HAS-SOUNEH, ANDREW BROWN, Queen's University Belfast — When an atom is subjected to an intense laser field, the full atomic response can involve a collective response involving several electrons. This collective response will be affected by electron-electron repulsion, coupling the overall electron dynamics. In order to investigate this dynamics for a multi-electron system from first principles, we have developed time-dependent R-matrix theory. The theory applies the basic principles of R-matrix theory, in which all interactions between all electrons are taken into account close to the nucleus, but exchange interactions are neglected when one electron has become distanced from the parent atom. In this contribution, we will explain the basic principles of this theory and demonstrate its application to ultra-fast dynamics in C^+ , and harmonic generation in singly ionised noble-gas atoms. Both studies demonstrate that it is important to go beyond the single-active-electron approximation.

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