

ENHANCEMENT OF IONIZATION RATES FORMULAS IN TUNNELING AND BARRIER-SUPPRESSION REGIMES

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ABSTRACT

The precise modeling of laser–target interactions in the regimes of tunneling ionization and barrier-suppression ionization is of significant importance, as these mechanisms dominate in the strong-field regime. In this study, we examine the dynamics of the transition from tunneling to barrier-suppression ionization by applying an empirically adapted formula. Within an enhanced analytical framework, the shift between these two ionization regimes is characterized more clearly.

While it is generally accepted that the ionization rate depends on the intensity of the applied laser field, our findings indicate that it is also influenced by the initial momentum of the outgoing electron, as well as by the laser frequency. We further demonstrate that, in addition to long-range Coulomb interactions, these effects play an important role in the strong-field ionization domain, providing a basis for exploring new mechanisms in intense laser–matter interactions.

Keywords: strong-field ionization, initial momentum, Coulomb interactions

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