

Abstract Submitted
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Ionization of helium by proton and anti-proton impact: a finite-element discrete-variable approach¹ XIAOXU GUAN, KLAUS BARTSCHAT, Drake University — We have modified our finite-element discrete-variable approach [1] to describe the response of a helium atom to an intense short laser pulse to allow for the treatment of a charged projectile. This requires the replacement of the electric dipole operator by the Coulomb interaction between the target and the projectile, which we assume to move along a straight line with a fixed impact parameter. The initial state is propagated in time using an efficient Arnoldi-Lanczos scheme. Calculations for single and double ionization of He by proton and anti-proton impact yield good agreement with experiment [2-4] and theoretical predictions from other sophisticated non-perturbative approaches [5,6]. In addition to angle-integrated observables, angle-differential cross sections as well as linear-momentum and energy distributions for double ionization will be presented. [1] Xiaoxu Guan, K. Bartschat, and B.I. Schneider, Phys. Rev. A **77** (2008), 043421. [2] L. H. Andersen *et al.*, Phys. Rev. A **41** (1990), 6536. [3] P. Hvelplund *et al.*, J. Phys. B **27** (1990), 925. [4] H. Knudsen *et al.*, Phys. Rev. Lett. **101** (2008), 043201. [5] M. Foster *et al.*, Phys. Rev. Lett. **100** (2008), 033201. [6] M. Foster *et al.*, J. Phys. B **41** (2008), 111002.

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