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Correlated Electronic Dynamics in Ion-Atom Collisions[1]

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In this talk, I will examine the correlated electronic dynamics that occur during single and double ionization of helium by ion impact. A non-perturbative time-dependent close-coupling method (TDCC) is applied to fully describe the interaction between the outgoing ionized electrons. Also, the projectile-atom interaction is constructed as a multipole expansion that includes monopole, dipole, quadrupole, and octopole terms. Excellent agreement is obtained between our TDCC calculations and experimental measurements for single and double ionization cross sections for antiproton impact of helium. At an impact energy of 1 MeV we find that the double-to-single ionization ratio is twice as large for antiproton impact as for proton impact, confirming a long-standing unexpected experimental measurement. I will also report on our progress towards fully differential cross sections for 6 MeV proton impact double ionization of helium.

[1]Department of Energy through Los Alamos National Laboratory