Abstract:

Ionization Dynamics by p and pbar

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Measuring in momentum space complete differential ionization cross sections the final-state momentum pattern differ strongly for different projectiles like photons, ions or electrons, particularly if double and multiple ionization processes are considered. Even, when the total momentum transfer from projectile to the target object is negligibly small compared to the initial-state momenta the final-state momentum pattern show characteristic features for the different projectiles. The final-state momentum pattern for photons strongly depend on the photon polarization and on the ratio of photon energy compared to the electron binding energy. The photon absorption process creates a very different pattern than the photon scattering process (Compton).
Going from slow to fast ions the ionization process varies dramatically due to different ionization processes like molecular promotion in slow collisions or ionization by virtual photon absorption processes. Dependent on the collision process the final-state momentum pattern depend on initial- or final-state correlations. In spite of great progress in theory the details of multiple ionization dynamics is not sufficiently well understood. There are many unsolved puzzles. One of the still remaining puzzles is the ratio of double to single ionization of He for fast pbar. It differs by about a factor of two from the proton ratio.
Examples of some ionization pattern are presented and future benchmark experiments are discussed.