ECC CUSP AND TWO-ELECTRON CONTINUA IN HEAVY ION COLLISION

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We have measured doubly differential cross sections for continuum electron emission induced by I^{23+} and $F^{8,9+}$ projectiles in collision with He. We find that the ECC (Electron Capture to the Continuum) coincident with He^{2+} surprisingly exhibits a larger cross section than the ECC coincident with He^{+}. A strong forward-backward asymmetry is observed in the ECC Cusp coincident with double ionization; electrons with velocities above the projectile velocity appear enhanced above the cross section for electrons coincident with single ionization while the emission cross section for electrons with velocities below the projectile velocity is strongly attenuated.

These experimental results are in accordance with model calculations for F^{9+}+He based on a Hartree-Fock picture of the two electron problem. Assuming straight line trajectories for the nuclear motion the resulting time-dependent single-particle Schrödinger equation is solved within the *basis generator method*[1], which provides a dynamic and symmetry adapted set of basis functions applicable in a large energy domain[2,3]. The relevant observable, i.e. the electron emission probability associated with the recoiling ion charge, can be directly extracted from the one-particle density.

The figure shows the longitudinal probability distribution in configuration space for electron emission in coincidence with He^{+} and He^{2+} ions, respectively. The two processes exhibit entirely different signatures: while electron emission associated with singly charged He ions is characterized by a strong target cusp corresponding to relatively small electron velocities, the two-electron process is dominated by ECC. The model calculation shows that the ECC process appears mainly at small impact parameters while the target cusp is associated with distant collisions. Further details concerning the ECC process will be given at the conference.

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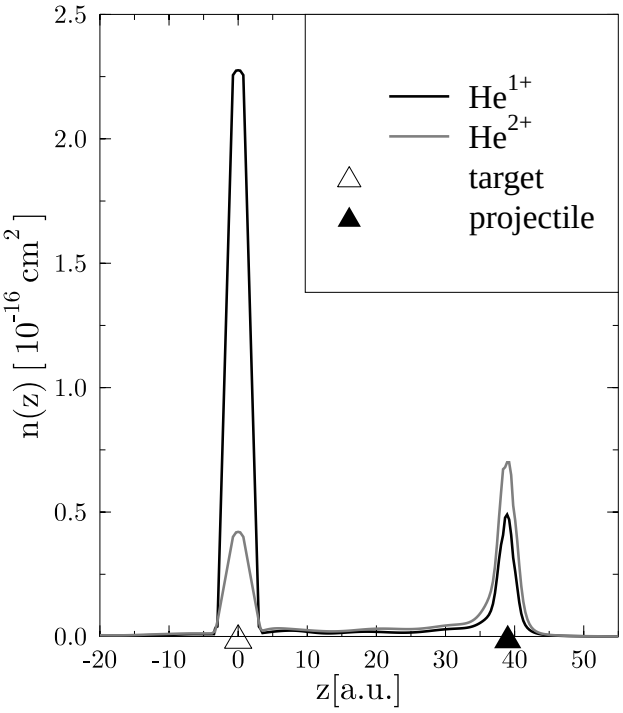

Figure 1. F^{9+}+He: electron emission in coincidence with recoil ion charge. Theory: integrated distribution of ejected electrons in beam direction.

References

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