4 - 15 Electron Emission in the Transfer Ionization Process of Intermediate Multi-charged Ion - He Collisions*

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The momentum projecting techniques have been well applied so as to explore the mechanisms of electron emissions as well as the dynamical effects which influenced the momentum distribution of the electrons ionized in ion-atom collisions[1−3]. Usually, the emitted electrons will be projected onto the scattering plane, which was defined as the plane containing the initial and the final momentum vectors of the projectile, considering the conservation laws and rotational symmetry around the beam axis. It is well known that the ejected electrons will be influenced simultaneously by a combined coulomb potential from the recoil ions and the projectile ions. Qualitatively, this effect strongly depends on the projectile velocity and the charge state. Here, the projectile velocity is 1.78 a.u., we found that the electrons are sharply localized around the projectile for the case of Ne^{8+}-He collisions. Additionally, there are two weak ridges circled around the projectile. The corresponding energies are approximately 45 and 85 eV. Those are auto-ionized decay of Ne^{6+} $(1s^23l3l')$ and Ne^{6+} $(1s^23l4l')$ doubly excited states formed via a double electron capture processes, which are consistent with the theoretical calculations[4].

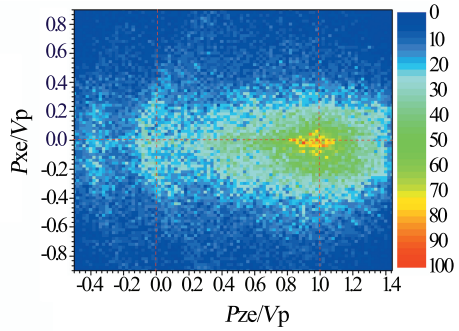

Fig. 1 (color online) Electron momenta distribution in the scattering plane.

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4 - 16 Triple Coincidence (e, γ2e) Experiment for Ionization-excitation of Helium**

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Electron induced ionization-excitation (IE) of helium is a basic four-body Coulomb problem in which all the four charged particles are actively involved. It is much more challenging to both experiment and theory in contrast to direct ionization with the residual He^+ ion in the ground state. The 2s or 2p separated TDCS data, especially at low incident energy range where the high order effects are expected to play a significant role, would offer the most stringent test to theoretical models. However, only one experiment at high incident energy achieved the TDCSs for 2p state till now due to the small cross section and the low detection efficiency for multi-coincidence events[1].

Kinematically complete measurement for IE process of helium at low energy is achieved with our newly built reaction microscope. The (e, 2e) reaction microscope is equipped with two micro-channel plate photon detectors (Fig. 1).

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