

A 23: Collisions, scattering and correlation phenomena

Time: Wednesday 16:15–18:15

Location: S Fobau Physik

A 23.1 Wed 16:15 S Fobau Physik

Resonant electron scattering in two-center atomic systems — ●ALEXANDRA ECKEY, ALEXANDER B. VOITKIV, and CARSTEN MÜLLER — Institut für Theoretische Physik I, Heinrich-Heine-Universität Düsseldorf

Electron scattering from an ion in the presence of a neighboring atom is studied theoretically. The incident electron is assumed to be captured by the ion, leading to resonant excitation of the atom which afterwards stabilizes by electron re-emission. We show that the participation of the atom can strongly affect, both quantitatively and qualitatively, the scattering process. Various ion-atom systems and electronic transitions are considered, accounting for quantum interference between the resonant two-center channel and the direct channel of Rutherford scattering from the ion. We show that electron scattering under backward angles may be strongly enhanced, provided the incident electron energy lies very close to the resonance. Due to constructive and destructive interferences, also scattering at intermediate angles can be affected significantly.

[1] A. Eckey, A. Jacob, A. B. Voitkiv and C. Müller, Phys. Rev. A 98, 012710 (2018)

A 23.2 Wed 16:15 S Fobau Physik

Scaling behavior of dielectronic recombination in two-center atomic systems — ●ANDREAS JACOB, ALEXANDER B. VOITKIV, and CARSTEN MÜLLER — Institut für Theoretische Physik I, Heinrich-Heine-Universität Düsseldorf

Dielectronic recombination with an ion in the presence of a neighboring atom is examined by theoretical means. The incident electron

is assumed to be captured by the ion, leading to resonant excitation of the atom which afterwards stabilizes by radiative decay. The scaling behavior of this two-center dielectronic recombination with the principal quantum numbers of the participating atomic states is derived, this way extending earlier studies of the process. We show that the participation of the atom can lead to a strong resonant enhancement of electron-ion recombination for internuclear distances up to few nanometers. The enhancement is found to be so enormous that the two-center process can compete with ordinary single-center recombination even after integrating over a rather broad distribution of incident electron energies.

[1] A. Eckey, A. Jacob, A. B. Voitkiv and C. Müller, Phys. Rev. A 98, 012710 (2018)

A 23.3 Wed 16:15 S Fobau Physik

Elastic scattering of twisted electrons by an atomic target: Going beyond the Born approximation — ●VALERIA KOSHELEVA — Helmholtz-Institute Jena, D-07743 Jena, Germany

The elastic scattering of twisted electrons by neutral atoms is studied within the fully relativistic framework. The electron-atom interaction is taken into account in all orders, thus allowing us to explore high-order effects beyond the first Born approximation. To illustrate these effects, detailed calculations of the total and differential cross sections as well as the degree of polarization of scattered electrons are performed. Together with the analysis of the effects beyond the first Born approximation, we discuss the influence of the kinematic parameters of the incident twisted electrons on the angular and polarization properties of the scattered electrons.