A 23: Poster – Interaction with Strong or Short Laser Pulses (joint session A/MO)

Time: Wednesday 17:00–19:00 Location: Philo 1. OG

A 23.1 Wed 17:00 Philo 1. OG

Bound-free electron-positron pair production in combined Coulomb and constant crossed electromagnetic fields — •Svea Remme, Alexandra Eckey, Selym Villalba-Chavez, Alexander B. Voitkiv, and Carsten Müller — Institut für Theoretische Physik I, Heinrich-Heine-Universität Düsseldorf

Bound-free electron-positron pair production by a highly charged bare ion in the presence of a strong constant crossed electromagnetic field is studied. We apply two different methods to calculate the pair production rate: (i) a quasiclassical tunneling theory and (ii) a strong-field approximation, both equipped with appropriate Coulomb correction factors. The resulting rate is shown to depend nonperturbatively on both the Coulomb field of the ion and the constant crossed field.

A 23.2 Wed 17:00 Philo 1. OG

Time-delay in Tunnel-Ionization and barrier-suppression ionization — •Ossama Kullie — Theoretical Physics, Institute for Physics, Department of Mathematics and Natural Science, University of Kassel, Germany.

In previous work, we presented tunnel-ionization model [1,2], in which we showed a real tunneling time-delay picture that agrees well with the experimental results in the adiabatic [1] and nonadiabatic [3] field calibrations. In addition, we showed that the tunnel-ionization time exhibits a universal behavior consistent with Winful's unified tunneling picture [4], which amounts to determine the barrier time-delay with good agreement with the experimental result and it corresponds to the interaction time [5]. Barrier-suppression ionization is a phenomenon in strong-field physics where a high-intensity laser field completely flattens the potential barrier, allowing an electron to escape an atom or molecule without the need for quantum tunneling. In the present work, based on our model [1] and the findings of recent work [5], we extend our time-delay model to include the regime of barrier-suppression ionization. [1] O. Kullie, Phy. Rev. A 92, 052118 (2015). [2] O. Kullie, Annals of Physics 389, 333 (2018). [3] O. Kullie and I. A. Ivanov, Annals of Physics 464, 169648 (2024). [4] H. Winful, Phys. Rev. Lett. **90**. 023901 (2003). [5] O. Kullie, J. Phyis. Commun. 9, 015003, (2025).

A 23.3 Wed 17:00 Philo 1. OG

Investigation of Interactions at relativistic laser intensities with Highly Charged Ions — •Stefan Ringleb[1], Manuel Vogel[2], Sugam Kumar[3], Stefan Kiesel[4], and Thomas Stöhlker[1,2,4] — [1]Friedrich-Schiller Universität Jena — [2]GSI Helmholtzzentrum für Schwerionenforschung Darmstadt — [3]Inter-University Accelerator Centre, New Delhi, India — [4]Helmholtzinstitut Jena

Interaction of high-intensity lasers with highly charged ions is a widely explored field theoretically. In contrast, there is still a lack of experimental data on the interaction with highly charged ions, with most experiments to date focusing on high-intensity laser ionization of initially neutral gases. In our working HILITE setup, highly charged ions prepared for ion targets in a defined initial quantum state containing between 5,000 and 25,000 ions. We have elaborated techniques for ion-cloud preparation regarding fast ion cooling in axial direction and ion number. We have investigated the radial self arrangement of the ions to maximise the ion number in the laser volume. Currently, an experiment at the 200 TW femtosecond Laser system JETi200 is in operation to investigate the ionization dynamics at relativistic laser intensities. In the experiment, we will focus on hydrogen-like ions which can be described precisely by theory. This will also allow for the intensity determination in the laser focus, as this is the less accurate determined parameter in laser experiments. The setup is designed to enable experiments of laser-ion interaction with high accuracy and allow the test of laser-ionisation models for many-electron systems.