MO 27: Poster – Collisions, Scattering and Correlation Phenomena (joint session A/MO)

Time: Thursday 17:00–19:00 Location: Tent

MO 27.1 Thu 17:00 Tent

Light-induced correlations in cold dysprosium atoms — •Chung-Ming Hung, Ishan Varma, Marvin Proske, Rhuthwik Sriranga, Dimitra Cristea, and Patrick Windpassinger — Institut für Physik, Johannes Gutenberg Universität Mainz

When the average atomic distance in a cloud of ultracold atoms, is below the wavelength of the scattering light, a direct matter-matter coupling is introduced by electric and magnetic interactions. This alters the spectral and temporal response of the sample, where the atoms cannot be treated as individual emitters anymore. We intend to experimentally study light-matter interactions in dense dipolar media with large magnetic moments to explore the impact of magnetic dipole-dipole interactions on the cooperative response of the sample. With the largest ground-state magnetic moment in the periodic table (10 Bohr-magneton), dysprosium is the perfect choice for these experiments. This poster reports on the progress in generating dense, cold dysprosium clouds. We discuss the measures taken to optically transport the atoms into a home-built science cell by utilizing an air-bearing translation stage. The cell compact design allows for tight dipole trapping with a high numerical aperture objective. Finally, an outlook is provided on future measurements aimed at the collective response in the generated sample.

MO 27.2 Thu 17:00 Tent

Electron Capture Dynamics and Momentum Reconstruction in Ion-Neutral Collisions of Molecular Oxygen Using the Trap-REMI — •Cristian Medina and Henri Lurtz — Saupfercheckweg 1, 69117 Heidelberg

We present the momentum reconstruction and Q-value of ion-neutral collisions involving molecular oxygen (O2+* - O2*). Coincidence measurements were performed using the Trap-REMI setup, which combines reaction microscopy (REMI) with an electrostatic ion beam trap. This configuration enables collisions between stored ion species and a neutral gas jet. For the first time, we provide a complete description of a molecular collision using this setup, advancing toward coincidence measurements of electron/ion/neutral products.

In addition, we analyzed ion bunch dynamics, mass spectrometry of the collision products, and its velocity distributions. The results primarily indicate an electron capture process, transferring an electron from the neutral molecule to the ion. These findings offer valuable insights into ion-neutral collision dynamics and lay the groundwork for extending the method to systems of higher complexity that have significant implications for molecular physics, astrophysics, and atmospheric studies. measurements

MO 27.3 Thu 17:00 Tent

About Ion-neutral coincidence measurements on O_2-O_2^+ collisions using the Trap-REMI — •Henri Lurtz — Max Planck Institute of Nuclear Physics, Heidelberg, Germany

We present the study of ion-neutral collisions involving molecular oxygen (O2+ - O2) using the Trap-REMI setup. This apparatus integrates reaction microscopy (REMI) with electrostatic ion beam trapping, enabling coincidence measurements between stored ion species and a neutral gas jet. We report on the optimization of ion trap simulations, experimental setup refinements, and the characterization of a new electron cyclotron resonance (ECR) ion source. Additionally, we analyzed ion bunch dynamics, mass spectrometry of collision products, and velocity distributions from coincidence measurements. The results primarily indicate an electron capture process, transferring an electron from the neutral molecule to the ion. Furthermore, a novel bunch-splitting mechanism was observed at extended trapping times, attributed to the high space charge ratio within the ion bunch. These findings contribute valuable insights into ion-neutral collision dynamics and have implications for understanding molecular oxygen processes in astrophysics and atmospheric physics.