A 8: Poster: Photoionization

Time: Monday 17:00–19:00 Location: C/Foyer

A 8.1 Mon 17:00 C/Foyer

Segmentierte Anode für MCP-Detektoren — •Christian Janke, Dennis Schmidt, Achim Czasch und Reinhard Dörner — Goethe Universität, Frankfurt

Für die Messungen mit der COLTRIMS-Technik wird ein Detektor benötigt, der Elektronen und Ionen auf $100\mu m$ und $500ps$ genau messen kann. Die in der Frankfurter Atomphysik-Gruppe benutzen Delay-Line-Detektoren können das sehr gut.

Delay-Line-Detektoren haben aber ein Problem, wenn mehrere Teilchen innerhalb eines kurzen Zeitfensters auf den Detektor treffen.

Um dieses Problem zu umgehen wird der Aufbau einer neuartigen Anode vorgestellt, die die Elektronenwolke der MCPs auf einer schachbrettähnlichen Struktur auffängt. Die einzelnen Signale werden hierbei mithilfe von ADCs aufgezeichnet.

A 8.2 Mon 17:00 C/Foyer

Calculation of Atomic properties by means of the MCDHF method — •Randolf Beerwerth[1] and Stephan Fritzsche[1,2] — [1]Helmholtz-Institut Jena, 07743 Jena, Germany — [2]Theoretisch-Physikalisches Institut, Universität Jena, 07743 Jena, Germany

The multi-configuration Dirac-Hartree-Fock (MCDHF) method can be applied to obtain numerical approximations of atomic multi-electron wave functions. The MCDHF method is based on the Dirac equation with added Breit-corrections, such that fully relativistic results are computed.

We use MCDHF wave-functions in order to analyze various atomic properties, such as transition rates, lifetimes and oscillator strengths. This can be done for optical transitions as well as auto ionization processes, including Auger and Coster-Kronig transitions. Detailed computations have been performed, for example, to explore and understand the electron spectra of multiply charged cadmium and to obtain further insight into the Auger cascades following inner-shell photoionization.

A 8.3 Mon 17:00 C/Foyer

Radiative and Auger transition rates of K-shell excited few-electron iron ions — •René Steinbrügge[1], Sven Bernitt[1], Sascha W. Epp[2], Jan K. Rudolph[1,3], Christian Beilmann[5], Hendrik Bekker[1], Sita Eberle[1], Alfred Müller[3], Joachim Ullrich[6], Oscar O. Versolato[1], Hasan Yavaş[4], Hans-Christian Wille[4], and José R. Crespo López-Urrutia[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg — [2]Max-Planck-Institut für Struktur und Dynamik der Materie, Hamburg — [3]Institut für Atom- und Molekülphysik, Gießen — [4]DESY, Hamburg — [5]Physikalisches Institut, Heidelberg — [6]PTB, Braunschweig

The spectrum of highly charged iron ions provides rich information about the dynamics in X-ray binary stars and active galactic nuclei. To model measured spectra, a precise knowledge of the transition rates is needed. We present a measurement of radiative and Auger rates for K-shell transitions in Li-like to C-like iron ions. These were produced and trapped in the transportable electron beam ion trap FLASH-EBIT and resonantly excited with X-ray photons at PETRA III. By taking ratios of the photoionization yield and the simultaneous recorded fluorescence, we suppress setup-dependent uncertainties. Together with natural line widths [1], this allows us to determine absolute values for the radiative and Auger transition rates, with a better-than-10 % accuracy in the Li-like system. Furthermore, by analyzing the angular distribution of the fluorescence photons, we resolved different radiative decay channels in the Be-like and C-like system.

[1] J. K. Rudolph et al., Phys. Rev. Lett. **111**, 103002 (2013)

A 8.4 Mon 17:00 C/Foyer

Photoionizing ^{174}Yb^{+} to ^{174}Yb^{2+} — •Martin Fischer[1,2], Simon Heugel[1,2], Vladimir Elmann[1], Markus Sondermann[1,2], and Gerd Leuchs[1,2,3] — [1]Max Planck Institute for the Science of Light, Erlangen, Germany — [2]Friedrich-Alexander University Erlangen-Nürnberg (FAU), Department of Physics, Erlangen, Germany — [3]Department of Physics, University of Ottawa, Canada

We report on the photoionization of ^{174}Yb^{+} ions trapped inside a radio-frequency ion-trap. The photoionization is realized in a three-step scheme. In the second intermediate step the $4f^{14}7p_{1/2}$ level in ^{174}Yb^{+} is excited via the transition from the $4f^{14}5d_{3/2}$ level with a cw-laser at 245 nm. Another photon at 245 nm finally provides the energy for the ionization. A laser at 976 nm is applied continuously in order to clear the long-lived $4f^{14}5d_{5/2}$ level. The photoionization is typically achieved with intensities of 10 W/cm^2 at 245 nm. Effects from stray charges created by this laser can thereby be minimized. The ^{174}Yb^{2+} ions are identified using crystallized mixed species ion-pairs: The effect of a ^{174}Yb^{2+} 'guest' ion onto the position of a ^{174}Yb^{+} 'host' ion as well as the motional resonance-frequencies of this two-ion crystal are detected, unambiguously indicating for the successful ionization.

A 8.5 Mon 17:00 C/Foyer

Numerical Simulations of Single and Double Photoionization of the Helium Dimer — •Hongcheng Ni[1], Camilo Ruiz[2], Reinhard Dörner[3], and Andreas Becker[4] — [1]Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Straße 38, 01187 Dresden, Germany — [2]Centro de Láseres Pulsados (CLPU), Edificio M3 Parque Científico C/ Adaja, s/n 37185 Villamayor, Spain — [3]Institut für Kernphysik, J.W. Goethe Universität Frankfurt, Max-von-Laue-Straße 1, 60438 Frankfurt, Germany — [4]JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA

We first study the double photoionization of the helium dimer, and the knockout mechanism is identified in the process. We further use the Hamiltonian reduction method to identify the role of the Coulomb interactions between the electrons and between the electrons and the nuclei for the primary as well as the knockout (secondary) electron in the processes.

A 8.6 Mon 17:00 C/Foyer

Experimentelle Messung absoluter ICD-Zerfallsraten in Argon-Dimeren — •Jonas Rist[1,2], Till Jahnke[1], Markus Schöffler[1], Ali Moradmand[3], Bishwanath Gaire[2], Allen Landers[3], Thorsten Weber[2], Premysl Kolorence[4], Kirill Gokhberg[5] und Reinhard Dörner[1] — [1]Institut für Kernphysik, Goethe-Universität, Max-von-Laue-Str.1, 60438 Frankfurt am Main, Germany — [2]Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA — [3]Department of Physics, Auburn University, AL 36849, USA — [4]Institute of Theoretical Physics, Charles University in Prague, Prague 116 36, Czech Republic — [5]Theoretical Chemistry Group, Heidelberg University, 69117 Heidelberg, Germany

Es wird eine Methode zur experimentellen Bestimmung der Zerfallsbreite $\Gamma(r)$ von Intermolekularen Coulombschen Zerfallskanälen (ICD-Kanälen) in Dimer-Systemen anhand ihrer KER-Verteilung (Kinetic Energy Release) vorgestellt. Als Beispiel wurde der $(^1D)4d(^2S)$ Zwischenzustand des Argon-Dimers gewählt, der durch Einzelphotonenionisation erzeugt werden kann. Die angewandte Methode basiert auf einem klassischen Ansatz für die Kernbewegung bei intermolekularen Kernabständen größer 5 au. Für die Aufnahme der Daten wurde eine COLTRIMS-Apparatur verwendet, mit der die koinzidente Messung aller am Zerfall beteiligter Fragmente und ihrer Impulse möglich ist.