A 16: Poster II

Time: Tuesday 17:00–19:00 Location: Tent B

A 16.1 Tue 17:00 Tent B

Orientation dependent ionization yield of molecules — •Paul Winter and Manfred Lein — Leibniz University Hannover

The ionization rate and thus the yield is a central property in strong field ionization of molecules. The ionization rate of a diatomic molecule depends on the relative angle between the electric field and the molecular axis at the moment of ionization.

In simulations it is possible to obtain the orientation dependent quasistatic ionization rate by solving the time-dependent Schrödinger Equation (TDSE) with a static electric field for different molecular orientations and analyzing the emerging steady state. In a typical strong-field experiment, however, finite laser pulses are used and the electron yield is measured for a whole pulse, which raises the question whether the quasistatic rates can be accurately measured. Linearly polarized pulses mix the ionization of two opposite directions, thus they cannot reproduce the quasistatic rate. On the other hand, we show that also circularly polarized fields can lead to qualitatively wrong results.

To solve this problem, we propose using two-color ω-2ω fields with either linear or bicircular polarization. To this end, two-dimensional TDSE solutions for HeH^+ are compared for several different field configurations.

A 16.2 Tue 17:00 Tent B

In-trap laser-ablation ion-source for precision magnetic moment measurements — •Ute Beutel[1,2], Stefan Dickopf[1], Annabelle Kaiser[1], Ankush Kaushik[1], Marius Müller[1], Stefan Ulmer[3,4], Andreas Mooser[1], and Klaus Blaum[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]Ruprecht-Karls-Universität, Heidelberg, Germany — [3]Institut für Experimentalphysik, Heinrich-Heine-Universität, Düsseldorf, Germany — [4]RIKEN, Wako, Japan

High-precision measurements of magnetic-moments in Penning traps have been performed to great success for various different systems. For example, measurements of the bound-electron g-factor could be used to determine the electron mass [1] and comparisons of the proton and antiproton magnetic moments set bounds on CPT violations [2].

At our experiment, we have performed measurements of the ground-state Zeeman and hyperfine splitting of $^3He^+$ for the determination of the helion magnetic moment [3]. The equivalent measurement on $^9Be^{3+}$ was recently enabled by in-trap laser-ablation. Future measurements on various ions and isotopes require a more versatile in-trap laser-ablation ion-source which is currently being developed. The recent status and ongoing progress will be presented.

[1] S. Sturm *et al.*, Nature 506, 467 (2014)
[2] C. Smorra *et al.*, Nature, Vol 550, 371 (2017)
[3] A. Schneider *et al.*, Nature 606, 878-883 (2022)

A 16.3 Tue 17:00 Tent B

Towards large-area 256-pixel MMC arrays for high resolution X-ray spectroscopy — •A. Abeln, S. Allgeier, D. Hengstler, D. Kreuzberger, D. Mazibrada, L. Münch, A. Orlow, A. Reifenberger, A. Stoll, A. Fleischmann, L. Gastaldo, and C. Enss — Kirchhoff-Institute for Physics, Im Neuenheimer Feld 227, 69120 Heidelberg, Germany

Metallic Magnetic Calorimeters (MMCs) are energy-dispersive cryogenic particle detectors. Operated at temperatures below 50 mK, they provide very good energy resolution, high quantum efficiency as well as high linearity over a large energy range. In many precision experiments in X-ray spectroscopy the photon flux is small, thus a large active detection area is desirable. Therefore, we develop arrays with increasing number of pixels. For a cost-effective read-out of a growing number of detector channels we investigate different multiplexing techniques.

In this contribution we present a detector setup comprising a novel dense-packed 16 × 16 pixel MMC array. The pixels provide a total active area of 4 mm × 4 mm and are equipped with 5 μm thick absorbers made of gold. This ensures a stopping power of at least 50 % for photon energies up to 20 keV. The expected energy resolution is $\Delta E = 1.4$ eV (FWHM) at an operating temperature of 20 mK. Furthermore the detector setup features 16 in-house made SQUID chips each with 2 × 4 flux-ramp modulated dc-SQUIDs which enables us to read out 128 detector channels with 32 read-out channels. We present design considerations and discuss the detector performance.

A 16.4 Tue 17:00 Tent B

Production of C^{4+} in an EBIS for collinear laser spectroscopy — •Emily Burbach[1], Phillip Imgram[2], Kristian König[1], Bernhard Maass[1], Patrick Müller[1], and Wilfried Nörtershäuser[1] — [1]Institut für Kernphysik, TU Darmstadt, Germany — [2]Instituut voor Kern- en Stralingsfysica, KU Leuven, Belgium

The Collinear Apparatus for Laser Spectroscopy and Applied Science (COALA) at the Technical University of Darmstadt was used to measure the $1s2s\,^3S_1 \rightarrow 1s2p\,^3P_J$ 227 nm transitions of C^{4+} to improve ab-initio atomic structure calculations [1]. To obtain an ion beam suitable for laser spectroscopy, production of C^{n+} in an electron beam ion source (EBIS) was tested with the gases propane (C_3H_8), methane (CH_4) and carbon dioxide (CO_2).

We present results from collinear laser spectroscopy with differently produced continuous and pulsed C^{4+} ion beams. Wienfilter analyses facilitate understanding the ion production processes for different gas compounds.

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[1] P. Imgram *et al.*, accepted in Phys. Rev. Lett. (2023)

A 16.5 Tue 17:00 Tent B

Further commissioning and upgrades of the ARTEMIS experiment at HITRAP for high-precision g-factor measurements with highly charged ions — •Bianca Reich[1,2], Arya Krishnan[1,3], Johannes Krempel-Hesse[1,4], K Kanika[1], Jeffrey Klimes[1], Kwaish Anjum[1,5], Patrick Baus[1,3], Gerhard Birkl[1,3], Manuel Vogel[1], and Wolfgang Quint[1,2] — [1]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, DE — [2]University of Heidelberg, DE — [3]Technical University of Darmstadt, DE — [4]University of Gießen, DE — [5]University of Jena, DE

The ARTEMIS experiment [Quint et al., Phys. Rev. A **78** 032517 (2008)] at GSI aims to measure the g-factor of the electron bound in heavy highly charged ions. Laser-microwave double-resonance spectroscopy is performed on such ions captured and stored inside a dedicated Penning trap [M. Wiesel et al., Rev. Sci. Inst. **88** 123101 (2017)]. First commissioning has demonstrated successful in-trap ion production, storage, selection and cooling [Kanika et al., J. Phys. B **56** 175001 (2023)]. For access to heavy few-electron ions, ARTEMIS is connected to the HITRAP facility via a beamline that features dedicated ion optics, non-destructive ion detectors, and a cryogenic fast-opening valve [Klimes et al., Rev. Sci. Instrum. **94** 113202 (2023)] which keeps the extreme vacuum of the trap stable while allowing access for ions and laser light. This beamline is constantly being upgraded towards efficient and well-controlled ion injection. We present the status and design updates of this beamline and discuss new spectroscopy candidate ions such as boron-like sulfur S^{11+}.

A 16.6 Tue 17:00 Tent B

An upgraded XUV and soft X-ray split-and-delay unit for FLASH1 — •Matthias Dreimann, Michael Wöstmann, and Helmut Zacharias — Center for Soft Nanoscience, Universität Münster, Germany

A split-and-delay unit (SDU) is upgraded that enables time-resolved pump-probe experiments at FLASH1. With the original design first experiments were performed in 2007 and the SDU was permanently incorporated in the BL2 at FLASH1 in 2010. The planned delay range of this device is -1 ps $< \Delta t < +10$ ps with a subfemtosecond temporal delay. The upgrade will increase the spectral range of the SDU from $h\nu = 30$ eV up to $h\nu = 750$ eV. Two different coatings are required achieve a high transmission in this spectral range. Therefore, a design that is based on a three dimensional beam path allows choosing the propagation via two sets of mirrors with these coatings. A C coating will allow a total transmission on the order of $T > 0.74$ for photon energies between $h\nu$ * 30 eV and $h\nu = 200$ eV at a grazing angle of $\theta = 3.0°$ in the variable beam path. A Ni coating can be used to cover a range up to $h\nu = 750$ eV at a transmission of $T > 0.08$.