Mass Spectrometry Division
Fachverband Massenspektrometrie (MS)

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Overview of Invited Talks and Sessions

(Lecture hall N 6; Poster Philo 1. OG)

Invited Talks

MS 1.1	Mon	11:30–12:00	N 6	**Ion sources and mass separators for on-line radioactive ion beam facilities** — •Jens Lassen
MS 2.1	Mon	17:00–17:30	N 6	**Pushing the Boundaries at FRIB: High-Precision Mass Measurements Near The Driplines** — •Franziska Maria Maier, Scott Campbell, Hannah Erington, Christian Ireland, Ryan Ringle
MS 3.1	Tue	11:00–11:30	N 6	**Flying viruses - Native mass spectrometry meets X-rays** — •Charlotte Uetrecht
MS 3.2	Tue	11:30–12:00	N 6	**Precision mass measurements of exotic fission fragments** — •Arthur Jaries
MS 4.1	Wed	14:30–15:00	N 6	**Pushing the boundaries of laser spectroscopy at radioactive ion beam laboratories using mass spectrometry tools** — •Agota Koszorus
MS 7.1	Thu	14:30–15:00	N 6	**Turning Atmospheric Radiocabon Variability into a Tool: High-Precision Tree-Ring Records for Solar Activity and Cross-Dating** — •Lukas Wacker, Nicolas Brehm, Macus Christl, Hans-Arno Synal, Charlotte L. Pearson, Kurt Nicolussi, Thomas Pilcher, Alex Bayliss, David Brown
MS 8.1	Fri	11:00–11:30	N 6	**Nuclear reaction studies at the GSI storage rings - An astrophysics program** — •Jan Glorius

Invited Talks of the joint Symposium SAMOP Dissertation Prize 2026 (SYAD)

See SYAD for the full program of the symposium.

SYAD 1.1	Mon	14:30–15:00	RW 1	**What graphs can tell us about quantum information** — •Kiara Hansenne
SYAD 1.2	Mon	15:00–15:30	RW 1	**Realization of alkaline-earth circular Rydberg qubits in optical tweezer arrays** — •Christian Hölzl
SYAD 1.3	Mon	15:30–16:00	RW 1	**Pattern Formation and Supersolid-like Sound Modes in a Driven Superfluid** — •Nikolas Liebster
SYAD 1.4	Mon	16:00–16:30	RW 1	**Harnessing time-frequency qudits using integrated nonlinear processes** — •Laura Serino

Invited Talks of the joint Symposium Selected Highlights of AMOP in Austria (SYAU)

See SYAU for the full program of the symposium.

SYAU 1.2	Wed	11:15–11:45	RW 1	**Supersolidity: When Superfluid Flow Meets Crystalline Order** — •Francesca Ferlaino
SYAU 1.3	Wed	11:45–12:15	RW 1	**Charged Helium Nanodroplets: A Cold Laboratory for Molecular Ions** — •Elisabeth Gruber
SYAU 1.4	Wed	12:15–12:45	RW 1	**Advances in Broadband Saturation Spectroscopy: Towards Probing New Physics in the Mid-Infrared** — •Oliver Heckl
SYAU 1.5	Wed	12:45–13:15	RW 1	**Precision laser spectroscopy of the Thorium-229 nuclear transition** — •Thorsten Schumm

Invited Talks of the joint Symposium Interactions with Negatively Charged Molecules (SYIN)

See SYIN for the full program of the symposium.

SYIN 1.1	Thu	11:00–11:30	RW 1	**Negative ion studies at ISOLDE: from radioactive atoms to molecules** — •Jessica Warbinek
SYIN 1.2	Thu	11:30–12:00	RW 1	**Leak-out spectroscopy in cryogenic ion traps** — •Stephan Schlemmer, Oskar Asvany, Sven Thorwirth, Philipp Schmid, Weslley Silva, Thomas Salomon
SYIN 1.3	Thu	12:00–12:30	RW 1	**Studies of negative ions in a cryogenic storage ring using laser driven state manipulation** — •Dag Hanstorp
SYIN 1.4	Thu	12:30–13:00	RW 1	**Photodetachment spectroscopy and reactions of negative molecular ions** — •Roland Wester

Invited Talks of the joint Symposium Tests of Fundamental Physics with AMO Systems (SYFP)

See SYFP for the full program of the symposium.

SYFP 1.1	Fri	11:00–11:30	RW 1	**Searches for new bosons with isotope shift spectroscopy and the thorium nuclear transition** — •Elina Fuchs
SYFP 1.2	Fri	11:30–12:00	RW 1	**Precision spectroscopy of muonic atoms** — •Randolf Pohl
SYFP 1.3	Fri	12:00–12:30	RW 1	**Quantum-Controlled Molecules for Fundamental Physics and Quantum Science** — •Nicholas Hutzler
SYFP 1.4	Fri	12:30–13:00	RW 1	**Testing Baryon Asymmetry with Antiprotons** — •Stefan Ulmer

Sessions

MS 1.1–1.5	Mon	11:30–13:00	N 6	**Resonance Ionization Spectroscopy / Mass Spectrometry**
MS 2.1–2.7	Mon	17:00–19:00	N 6	**Precision Mass Spectrometry (joint session MS/Q)**
MS 3.1–3.6	Tue	11:00–13:00	N 6	**Actinide Analysis**
MS 4.1–4.7	Wed	14:30–16:30	N 6	**New Methods, Technical Development**
MS 5.1–5.13	Wed	17:00–19:00	Philo 1. OG	**Poster**
MS 6	Thu	13:15–14:15	N 6	**Members' Assembly**
MS 7.1–7.7	Thu	14:30–16:30	N 6	**Accelerator Mass Spectrometry**
MS 8.1–8.6	Fri	11:00–12:45	N 6	**Isobar Suppression Techniques**

Members' Assembly of the Mass Spectrometry Division

Thursday 13:15–14:15 N 6

- Report
- Miscellaneous

Finger food will be provided.

MS 1: Resonance Ionization Spectroscopy / Mass Spectrometry

Time: Monday 11:30–13:00 Location: N 6

Invited Talk MS 1.1 Mon 11:30 N 6

Ion sources and mass separators for on-line radioactive ion beam facilities — •Jens Lassen — TRIUMF - Canada's particle accelerator laboratory, Vancouver BC, Canada — Simon Fraser Univerisity, Burnaby BC, Canada

Isotope separator on-line facilities using the ISOL method produce intense radioactive ion beams by spallation, fragmentation and fission of nuclei in target materials irradiated by high energy ion beams or gamma radiation. This produces a spectrum of isotopes to be ionized and separated to provide ion beams with intensity, purity and energy that satisfy user experiments. The isobaric contamination of nuclei produced is similar to that encountered in elemental ultra-trace analysis appplications. The low production rate and decay loss encountered for isotopes with sub second half live adds another dimension to this analytical problem. User facilities such as TRIUMF's advanced rare isotope laboratory employ the best suited combination of isotope production target, ion-source, mass-separator, and as required charge breeder and post accelerators. The combined capabilities and features of our radioactive ion beam user facillity will be presented, with reference laser ion source, high throughput mass- and isobar- separator, charge breeder and post-accelerators, and cooler-buncher.

Offering: intense radiactive ion beams Seeking: high impact physics experiments / users / scientists & students

MS 1.2 Mon 12:00 N 6

Thermal Neutron-Induced Cross-Sections of ^{254}Es and ^{255}Es — •Melanie P. Feucht[1], Thomas E. Albrecht[2], Sebastian Berndt[1], Christoph E. Düllmann[1,3,4], Julie G. Ezold[5], Raphael Hasse[1], Ulli Köster[6], Andrea T. Loria Basto[1,4], Christoph Mokry[1,4], Kristian Myhre[5], Thorben Niemeyer[1], Sebastian Raeder[3,4], Dennis Renisch[1,4], Jörg Runke[1,3], Samantha K. Schrell[5], and Klaus Wendt[1] — [1]JGU Mainz, Germany — [2]CSM Golden, CO, USA — [3]GSI Darmstadt, Germany — [4]HIM Mainz, Germany — [5]ORNL Oak Ridge, TN, USA — [6]ILL Grenoble, France

Knowledge of neutron-induced cross-sections is essential for predicting the production of heavy isotopes via neutron capture. Previous studies show that the experimentally observed yield of ^{255}Es produced from ^{254}Es in nuclear reactors deviates significantly from theoretical expectations. We have studied the burnup (which is the sum of the neutron capture (n,γ) and the neutron induced fission (n,f)-processes) of ^{254}Es and ^{255}Es. For this we investigated the transmutation of ^{254}Es to ^{255}Es by irradiations at different neutron fluence in order to deduce the relevant cross-sections. The study made use of ^{254}Es samples irradiated at the high-flux reactor at ILL. The isotopic composition of all samples was characterized before and after irradiation, and the ^{254}Es/^{255}Es ratios were determined using alpha spectrometry and resonance ionization mass spectrometry. The results provide an enhanced and more precise basis for predicting the yields of the heaviest reactor-producible elements, einsteinium and fermium.

MS 1.3 Mon 12:15 N 6

High-resolution resonance ionisation spectroscopy on a sequence of americium isotopes 241-243Am — •Pia Breinbauer[1], Sebastian Berndt[1], Christoph E. Düllmann[1,2,3], Raphael Hasse[1], Ulli Köster[4], Andrea T. Loria Basto[1,2], Christoph Mokry[1,2], Sebastian Raeder[3], Jörg Runke[1,3], Matou Stemmler[1], and Klaus Wendt[1] — [1]JGU Mainz — [2]HIM Mainz — [3]GSI Darmstadt — [4]ILL Grenoble

High-resolution laser spectroscopy measurements were performed on the americium isotopes ^{241}Am and ^{243}Am, as well as the long-lived isomer ^{242m}Am, at the RISIKO mass separator of Johannes Gutenberg University Mainz. ^{242m}Am had been produced by a high fluence neutron irradiation of a ^{241}Am target at the ILL high flux reactor. The measurements were performed using two-step resonance ionisation spectroscopy (RIS) in two well established excitation schemes. Previous ^{241}Am and ^{243}Am data serve as a reference for the analysis of ^{242m}Am.

The spectra were analysed using the SATLAS package to yield hyperfine parameters A and B, as well as centers of gravity for both transitions. These results provide quantitative estimates of the magnetic dipole and electric quadrupole moments of the isomer ^{242m}Am, complementing the parameters of the isotopes ^{241}Am and ^{243}Am.

MS 1.4 Mon 12:30 N 6

In-gas-jet Resonance Ionization Laser Spectroscopy with JetRIS — •Julian Hindermann for the JetRIS Collaboration-Collaboration — GSI, Darmstadt, Germany — HIM, Mainz, Germany — JGU Mainz, Germany

Nuclear shell effects stabilize nuclei beyond $Z > 103$ against spontaneous fission. With increasing Z, also the electron shells are modified due to relativistic effects, QED effects and electron correlations. Probing atomic spectra with laser spectroscopy can reveal atomic information from energy, position and lifetime of an electronic state. Furthermore, it enables the determination of isotope shifts and hyperfine splittings to infer nuclear properties.

The heaviest nuclides are produced in limited quantities, requiring efficient tools for their studies. Within our collaboration, **R**esonance **I**onization Laser **S**pectroscopy (RIS) is employed providing high selectivity and high sensitivity. Here, a tunable laser probes electronic transitions in the investigated atom. A second laser then ionizes the excited atom. The resulting laser ions are detected - leading to a resonance profile when the laser is tuned around the transition frequency. In the JetRIS setup, RIS is performed in a low-density and low-temperature supersonic gas jet. This enables higher spectral resolution measurements, as Doppler and pressure broadening are significantly reduced compared to in-gas cell methods.

This talk will discuss the status of the apparatus and address the long-discussed configuration of the 8^- K-isomer of ^{254m}No that was recently determined using the JetRIS setup.

MS 1.5 Mon 12:45 N 6

Ionization efficiency measurements of actinides using Ti:Sa Lasers at RISIKO — •Raphael Hasse[1,2,3], Felix Berg[1], Sebastian Berndt[1], Michael Block[1,2,3], Christoph E. Düllmann[1,2,3], Sebastian Raeder[2,3], Tobias Reich[1], and Klaus Wendt[1] — [1]Johannes Gutenberg-Universität, Mainz — [2]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt — [3]Helmholtz-Institut, Mainz

Resonance ionization mass spectrometry (RIMS) is the combination of element selective resonant laser excitation and ionization with subsequent mass separation which is a powerful technique for laser spectroscopy and ultra-trace analysis particularly for the actinides. For quantitative measurements towards reliable determination of elemental ratios the precise characterization of the ionization schemes used is essential. In this context, the laser ionization efficiencies of the environmentally relevant actinides Pu, Np and Cm are discussed, which were determined at the RISIKO mass separator at the Johannes Gutenberg University Mainz. With efficiencies well above 10 %, the range of elements with high ionization efficiencies is extended to include the actinides. In combination with the saturation behavior of each individual excitation step we gain important information on the ionization schemes. And additionally different ionization schemes in Pu are compared with respect to the overall efficiencies of different three-step schemes with the favored selective two-step scheme.

MS 2: Precision Mass Spectrometry (joint session MS/Q)

Time: Monday 17:00–19:00 Location: N 6

Invited Talk MS 2.1 Mon 17:00 N 6

Pushing the Boundaries at FRIB: High-Precision Mass Measurements Near The Driplines — •Franziska Maria Maier, Scott Campbell, Hannah Erington, Christian Ireland, and Ryan Ringle — FRIB, USA

With new radioactive-ion-beam facilities such as FRIB becoming operational, the properties of nuclei in close proximity to the driplines are coming within reach of high-precision measurements. Within the last two years, at a fraction of FRIB's ultimate beam intensity, we used the LEBIT facility to successfully perform Penning-trap mass measurements of ^{22}Al [1], ^{101,103}Sn [2,3] and ^{23}Si [4]. These masses provide insights into the smoothness of the mass surface, help assess isospin symmetry breaking and offer valuable anchor points for nuclear models - especially for predicting properties near the driplines, where experimental data remain scarce. As FRIB ramps up its beam intensity, the production of many more nuclei will enable new and exceptional research opportunities. However, the short half-lives of many of these nuclei pose challenges for Penning-trap mass spectrometry. To overcome these, we are developing MR-ToF devices at FRIB, that will also expand FRIB's mass separation capabilities [5,6].

[1] S. Campbell et al., PRL 132, 152501 (2024)
[2] C.M. Ireland, F.M. Maier et al., PRC 111, 014314 (2025)
[3] C.M. Ireland et al., arxiv.org/abs/2510.11815
[4] F.M. Maier et al., PRC 112, 014329 (2025)
[5] F.M. Maier, C.M. Ireland et al., arxiv.org/abs/2509.16428
[6] C.M. Ireland, F.M. Maier et al., arxiv.org/abs/2510.11741

MS 2.2 Mon 17:30 N 6

A Laser-Ablation Ion Source for the ISOLTRAP Experiment — •Paul Florian Giesel for the ISOLTRAP-Collaboration — Universität Greifswald, Institut für Physik, Greifswald, Germany

ISOLTRAP is a precision mass spectrometer at ISOLDE/CERN dedicated to measure the masses of short-lived radionuclides far from stability. It utilizes both multi-reflection time-of-flight (MR-ToF) [1] and Penning-trap mass spectrometry [2-4]. Conversion of the resulting mass values into nuclear binding energies provides insights into the underlying nuclear forces and structures.

All measurements at ISOLTRAP rely on suitable reference ions. This contribution will present the laser-ablation ion source (LAIS), developed to supply a versatile set of reference species produced from various target materials, including e.g. carbon-cluster ions or aluminum and bismuth ions. This enables flexible calibration across a broad mass range. Beyond delivering reference ions, this source facilitates characterization studies of the ISOLTRAP setup, which can be performed in combination with an alkali ion source. An example is the investigation of space-charge effects in the MR-ToF analyzer with $^{13}C^{12}C_{10}^{+}$ and $^{133}Cs^{+}$ ions as well as the formation of hydrides and oxides in the ISOLTRAP RFQ cooler-buncher.

[1] Wolf R. N. et al., Int. J. Mass Spectrom. 349-350:123-133 (2013)
[2] M. König, et al., Int. J. Mass Spectrom. 142, 95 (1995)
[3] S. George, et al., Int. J. Mass Spectrom. 264, 110 (2007)
[4] S. Eliseev, et al., Phys. Rev. Lett. 110, 082501 (2013)

MS 2.3 Mon 17:45 N 6

High-precision Q-value measurements for neutrino physics using the JYFLTRAP Penning trap — •Jouni Ruotsalainen[1], Elina Kauppinen[1], Maxime Mougeot[1], Tommi Eronen[1], Anu Kankainen[1], Jouni Suhonen[1,2], Vikas Kumar[1], Marek Stryjczyk[1], Marlom Ramalho[1], Zhuang Ge[1], and Jenni Kotila[2,3] — [1]University of Jyvaskyla, Department of Physics, Accelerator Laboratory, P.O. Box 35(YFL) FI-40014 University of Jyvaskyla, Jyväskylä, Finland — [2]International Centre for Advanced Training and Research in Physics (CIFRA), P.O. Box MG12, 077125 Bucharest-Măgurele, Romania — [3]Finnish Institute for Educational Research, University of Jyväskylä, P.O. Box 35, Jyväskylä FI-40014, Finland

In this contribution, I will present the results and conclusions of the precise Q-value measurements of the $^{110}Ag^{m}$ beta decay, and ^{104}Ru and ^{122}Sn double-beta decays, and the utilized JYFLTRAP double Penning trap system at the University of Jyväskylä, Finland. These nuclides are possible candidates for future experiments studying the mass of the neutrino and whether the neutrino is its own antiparticle. In collaboration with the nuclear theory group at the University of Jyväskylä, the half-lives of the decays were calculated to determine the feasibility of observing these decays. While the $^{110}Ag^{m}$ was determined to be a suitable candidate for neutrino mass measurements, the half-lives of ^{104}Ru and ^{122}Sn neutrinoless double-beta decay were estimated to be too long for the decays to be observed with current experimental sensitivity.

MS 2.4 Mon 18:00 N 6

High-Precision Mass Measurements of Actinides at TRIGA-Trap for Nuclear Structure Studies — •Tanvir Sayed[1], Klaus Blaum[1], Michael Block[2,3,4], Burcu Cakirli[1], Stanislav Chenmarev[1], Christoph Düllmann[2,3,4], Szilard Nagy[1], and Dennis Renisch[2,3] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, DE — [2]Helmholtz-Institut Mainz, DE — [3]Department Chemie - Standort TRIGA, Mainz, DE — [4]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, DE

Actinides encompass an important region of the chart of nuclides with great relevance in nuclear and astrophysics research. The TRIGA-Trap experiment – set-up in the TRIGA research reactor hall at the University of Mainz – involves high-precision mass measurements of heavy radioactive nuclides, in particular actinides, with a double Penning-Trap mass spectrometer [1,2]. Recent measurements include nuclides in the Pu isotopic chain namely ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu. The precise masses can be used to compute mass filters, such as S_{2n} (two-neutron separation energies), to explore nuclear structure in heavy, deformed nuclei as well as test predictions from present nuclear shell models. This presentation will provide an overview of the current status of the experiment, discuss recent results along with their application in nuclear structure evaluation, and outline future prospects.

References: [1] J. Ketelaer et al. Nucl. Instrum. Meth. A 594, 162-177 (2008). [2] S. Chenmarev, S. Nagy, J.J.W. van de Laar et al. Eur. Phys. J. A 59(2), 29 (2023).

MS 2.5 Mon 18:15 N 6

Mass measurements of neutron-deficient nuclides close to the N = Z line with the FRS Ion Catcher — •Nived Keeppalli[1] and Gabirella K.Koncz[1,2] for the Super-FRS Experiment-Collaboration — [1]II. Physikalisches Institut, Justus-Liebig-Universität Gießen, Germany — [2]School of Physics and Astronomy, University of Edinburgh, United Kingdom

Mass measurements near the N = Z line were performed with the multiple-reflection time-of-flight mass spectrometer (MR-TOF-MS) at the FRS Ion Catcher at GSI Darmstadt. The MR-TOF-MS enables high precision mass measurements of exotic species having few ms half-life and low production cross sections (∼nb), with high mass resolving power (10^6) and accuracy ($\delta m/m \approx 10^{-8}$).

In this contribution, results from the measurement campaigns carried out near the N = Z line will be presented, including the first direct mass measurement of ^{93}Pd, the one-proton-decay daughter of the (21+) isomer in ^{94}Ag, reducing the mass uncertainty by an order of magnitude. The results indicate that the excitation energies of the parent states responsible for the one-proton (1p) and two-proton (2p) decays in ^{94}Ag differ by 10 standard deviations, pointing towards an incompatibility in the previously reported decay scheme of the 1p and 2p branches. Moreover, the possibility of the existence of two structurally different, high-spin states in ^{94}Ag, feeding the 1p and 2p decay branches was studied, performing state-of-the-art shell-model and mean-field calculations.

MS 2.6 Mon 18:30 N 6

Recent mass measurements and the first application of mass-selective re-trapping at ISOLTRAP — •Daniel Lange for the ISOLTRAP-Collaboration — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

The Isoltrap mass spectrometer [1], located at ISOLDE/CERN, performs high-precision mass measurements of short-lived, exotic nuclides far from stability. These measurements provide direct access to nuclear binding energies, which reflect the underlying nuclear interactions and enable studies in nuclear structure and nuclear astrophysics, among others. Precision mass measurements at the Isoltrap mass spectrometer are performed using various ion traps, including a tan-

dem Penning-trap system and a multi-reflection time-of-flight mass spectrometer (MR-ToF MS). The latter is particularly well-suited for both efficient mass separation and fast, precise mass measurements.
In this contribution, recent mass measurements of neutron-deficient cadmium isotopes in the direct vicinity of the doubly-magic self-conjugate ^{100}Sn nucleus will be presented. Furthermore, the advancements in ion purification with the first application of the mass-selective re-trapping technique [2], enabled by a newly implemented mini-RFQ following the MR-ToF MS, will be shown. Based on the mass measurement of neutron-rich argon using this technique, the feasibility of low-yield experiments in the presence of extremely abundant isobaric contamination and its limitations will be demonstrated.
[1] Lunney, D. *et al.*, J. Phys. G: Nucl. Part. Phys. 44, 064008 (2017)
[2] Dickel, T. *et al.*, J. Am. Soc. Mass Spectrom. 28, 1079-1090 (2017)

MS 2.7 Mon 18:45 N 6

Schottky + Isochronous Mass Spectrometry: Methodology and Results (on behalf of the Experimental Storage Ring Collaboration) — •David Freire Fernandez — University of Cologne, Cologne, Germany

We present a detailed account of Schottky+Isochronous Mass Spectrometry (S+IMS), a novel experimental technique for high-precision nuclear measurements in heavy-ion storage rings. This hybrid method combines the isochronous mode of the GSI-ESR with non-destructive, time-resolved resonant Schottky detectors. We describe the experimental setup, ring tuning procedures, and data analysis workflow. The technique achieves a mass resolving power enabling the separation of isomers with excitation energies down to 100 keV.

To demonstrate the method's capabilities, we present high-precision mass measurements from recent experimental campaigns. These results determine nuclide masses with uncertainties in the keV range, confirming most literature values while revealing significant deviations and improved precision for specific cases, such as 72As and 69As. This work details the methodological foundation for the recent observation of the two-photon decay of 72Ge (Phys. Rev. Lett. 133, 022502) and establishes S+IMS as a powerful tool for exploring short-lived isomers across the nuclear landscape.

MS 3: Actinide Analysis

Time: Tuesday 11:00–13:00 Location: N 6

Invited Talk MS 3.1 Tue 11:00 N 6

Flying viruses - Native mass spectrometry meets X-rays — •Charlotte Uetrecht — CSSB Centre for Structural Systems Biology, Deutsches Elektronen-Synchrotron DESY & Leibniz Institute of Virology (LIV) & University of Lübeck, Notkestraße 85, 22607 Hamburg, Germany — Institute of Chemistry and Metabolomics, University of Lübeck, Ratzeburger Allee 160, 23562 Lübeck, Germany

Native mass spectrometry (MS) enables ionisation and transfer of structurally intact non-covalent protein complexes into the gas-phase. As such, it is a perfect tool to study proteins and their assembly intermediates in a mass and conformation specific manner, albeit with limited structural resolution. Accordingly, other experimental approaches such as X-ray diffractive imaging are necessary to get a full understanding of proteins, their assemblies and dynamic processes. Therefore, it seems natural to combine native MS with X-ray diffraction in the gas phase. In particular, well established methods from MS like m/z selection, ion trapping or ion mobility are incorporated in the MS SPIDOC sample delivery system. In contrast to conventional diffractive imaging of crystallised proteins, the proteins here are delivered as single particles without the need for crystallisation. This increases naturally the requirement on the X-ray source: high-resolution single-particle X-ray diffractive imaging (SPI) can only be conducted at X-ray free electron lasers, lower resolution information can be obtained from small angle X-ray scattering (SAXS) at synchrotrons. This talk highlights first results from leveraging such synergies, and how this will improve our understanding of virus structure and dynamics.

Invited Talk MS 3.2 Tue 11:30 N 6

Precision mass measurements of exotic fission fragments — •Arthur Jaries for the JYFLTRAP and ISOLTRAP-Collaboration — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

Direct measurement of the mass of single nuclides allows to determine their binding energy and gives information on the evolution of nuclear structure away from stability. Among the available experimental methods, Penning-trap mass spectrometry provides the most precise technique to probe this fundamental nuclear property, typically reaching a relative uncertainty of one part per billion. Additionally relevant for astrophysics, precision mass measurements produce valuable inputs for the theoretical models describing the stellar nucleosynthesis processes such as the rapid neutron capture (r) process. The latter is responsible for the production of more than half of the elemental abundances above iron, making mass spectrometry of radionuclides involved a tool to better understand the origin of heavy elements in the Universe. In the recent years at the JYFL Accelerator Laboratory in Finland, the use of the JYFLTRAP Penning traps combined with the fast and universal IGISOL production method, led to the determination of more than 100 atomic masses across the nuclide chart, with a specific focus on the rare-earth and the ^{132}Sn neutron-rich regions. This presentation highlights the latest measurement campaigns of exotic fission fragments of uranium performed with the JYFLTRAP, discussing their implications for nuclear structure and r-process modeling.

MS 3.3 Tue 12:00 N 6

Age dating of thermonuclear bomb fragments by combination of rL-SNMS and gamma spectroscopy — •Paul Hanemann[1], Jan Schimansky[1], Tobias Weissenborn[1], Aaron Lehnert[1], Manuel Raiwa[1], Jixin Qiao[2], Sven Nielsen[2], and Clemens Walther[1] — [1]Leibniz Universität Hannover, IRS, Germany — [2]Technical University of Denmark, Roskilde, Denmark

In 1968 a US-bomber armed with thermonuclear warheads crashed close to the Thule airbase, releasing plutonium fragments into the environment. [1] Using the ^{241}Pu ^{241}Am chronometer it is possible to determine the production date of the Pu. For the determination of the atomic ratios of both isotopes in the past a complex and destructive radiochemical preparation of the sample and two measurements over the span of multiple years were necessary. [2] By utilizing the nondestructive isobar free measurements of resonant Laser Secondary Neutral Mass Spectrometry (rL-SNMS) and traditional gamma spectrometry we are able to age date multiple fragments of nuclear material from the Thule region in a comparatively fast way while keeping them intact for further analysis. The date of the chemical purification of the Pu in the samples was determined to be around the year 1960. This result agrees well with the existing values from the literature by Eriksson et al. [2]. Compared to [2], due to passing time nearly $\frac{3}{4}$ of the ^{241}Pu has decayed until our measurements, yet our results have comparable uncertainties. This high sensitivity shows a clear advantage of using this rL-SNMS based method for age dating. References: 1: DOI:10.1016/S1569-4860(91)80004-8; 2: DOI:10.1021/es800203f

MS 3.4 Tue 12:15 N 6

Characterizing a cryogenic ion mobility spectrometer for actinides with measurements on their lighter homologues — •Felix Katzer[1], Michael Block[1,2,3], Premaditya Chhetri[1,2,3], Biswajit Jana[4], Mustapha Laatiaoui[5], Sebastian Raeder[2,3], and Elisabeth Rickert[1,2] — [1]JGU Mainz, Germany — [2]HI Mainz, Germany — [3]GSI Darmstadt, Germany — [4]BARC Trombay, India — [5]GANIL Caen, France

The investigation of the ion mobility of heavy elements in noble gases provides valuable insights into the influence of relativistic effects and electron correlation on their electronic structure. To enable such studies, a cryogenic drift tube based actinide ion mobility spectrometer (AIMS) has been developed as a powerful tool to better understand the chemical and physical properties of heavy elements. To characterize the set up, various transition metals and lanthanides, such as Gd^+, Ho^+, Tm^+ and Yb^+, were studied with regard to their low-field reduced ion mobility in helium as a buffer gas. In the measurements, the mobility behavior of the homologous f-block elements was investigated by varying measurement parameters in order to understand the underlying mechanisms and to determine system uncertainties. Further modifications to the system are being carried out in preparation for future mobility measurements of the elements in the actinide series.

MS 3.5 Tue 12:30 N 6

Assessment of the behaviour and source of anthropogenic actinides on HZDR's research campus — •Shruti Dabke[1], Sebastian Fichter[1], Dominik Koll[1], Michael Hotchkis[2], and Anton Wallner[1] — [1]Helmholtz-Zentrum Dresden Rossendorf (HZDR), Dresden, Germany — [2]Australian Nuclear Science and Technology Organisation (ANSTO), Lucas Heights, Australia

Understanding actinide behaviour in environmental reservoirs is essential for assessing safety and potential plant or groundwater uptake. To study the accessibility of actinides by different chemical conditions, a sequential leaching technique was employed. Hence, the fractionation of actinides, specifically U, Pu and Am, in one soil sample collected from the campus of HZDR was analysed for five established fractions and an additional refractory fraction accessed by HF digestion. The concentrations of the actinide isotopes were measured using ICP-MS and AMS. Preliminary Pu data showed a non-negligible percentage of the total plutonium concentration in the refractory fraction. Acid leaching, which is commonly used for such environmental analyses, would not typically give access to this refractory plutonium. Moreover, the ratio of $^{240}Pu/^{239}Pu$ in the refractory fraction was determined to be 0.047 ± 0.002 which is significantly lower than the global fallout ratio found in the other fractions. This suggests a source of refractory weapons-grade plutonium. Further experiments on soil samples and the IAEA-385 reference sediment will focus on the refractory fraction, and the results of isotopic fractionation of the other actinide elements will be studied using the new AMS facility, HAMSTER, at HZDR.

MS 3.6 Tue 12:45 N 6

Traceable Reference Material for mass spectrometry: The EURAMET project Metrology for the harmonisation of measurements of environmental pollutants in Europe — •Aaron Lehnert[1], Lucille Chambon[2], Ben Russell[3], Dirk Arnold[4], and Clemens Walther[1] — [1]Leibniz Universität Hannover, Germany — [2]Université Paris-Saclay, CEA, List, Laboratoire National Henri Becquerel, France — [3]National Physical Laboratory, United Kingdom — [4]Physikalisch-Technische Bundesanstalt, Germany

The European Green Deal's ambition for zero pollution requires the development of highly sensitive techniques to detect ultra-low amounts of pollutants and to determine their isotope ratios, where mass spectrometry is a key method for determination of non-radioactive polluting elements and long-lived radionuclides. The MetroPOEM project bridges the traceability gap between activity and mass-based measurements - particularly estimation of mass bias.

A solid silica-based reference material, produced by sol-gel synthesis at CEA spiked with 234,235,236,238U, 237Np, 239,240Pu and 241Am, as well as ~10 kg of an inactive material for testing dissolution procedures. Additionally, ČMI generated ~50*0,5L liquid RM aliquots of sea water spiked with natural U, 237Np, 239,240Pu and 241Am.

These materials were characterised in accordance with the requirements of ISO 17034 by interlaboratory studies between the project partners, using techniques developed in the project.

MS 4: New Methods, Technical Development

Time: Wednesday 14:30–16:30 Location: N 6

Invited Talk MS 4.1 Wed 14:30 N 6

Pushing the boundaries of laser spectroscopy at radioactive ion beam laboratories using mass spectrometry tools — •Agota Koszorus — KU Leuven, Belgium — SCK CEN, Belgium

The precise determination of atomic energy levels using laser spectroscopy has become an indispensable tool in radioactive ion beam laboratories. Ongoing experiments address scientific questions spanning atomic and nuclear structure, chemistry, and fundamental interactions. In this contribution, a summary of recent experimental highlights will be presented, with particular emphasis on the emerging limitations encountered when pushing the sensitivity and precision frontiers in studies of radioactive isotopes. Finally, current plans and developments will be outlined demonstrating how advances in mass spectrometry can be integrated to overcome these limitations and shape the future of laser spectroscopy of short-lived isotopes.

MS 4.2 Wed 15:00 N 6

Optimization of the isochronous mass spectrometry mode at the Cryogenic Storage Ring — •Tobias Orlemann[1], Manfred Grieser[1], Florian Grussie[1], Leonard Isberner[3,1], Holger Kreckel[1], Viviane Schmidt[2], Andreas Wolf[1], and Oldřich Novotný[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg — [2]Universität Innsbruck — [3]Columbia University, New York

The Cryogenic Storage Ring (CSR) at the Max Planck Institute for Nuclear Physics is dedicated to the study of astrophysically relevant molecular ions. Due to its electrostatic ion optics, species of different masses can be stored simultaneously along with the primary beam. In the isochronous mode of the CSR, the relative revolution frequency depends only on the particle's mass-to-charge ratio. We use isochronous time-of-flight mass spectrometry (ISO-ToF) to analyze the storage of impurities in the primary beam, including molecular isobars, with a mass resolution down to $\Delta m/m < 10^{-5}$ [1]. Furthermore, improving the resolution requires the reduction of space charge effects by storing less intense ion beams, while increasing the detection efficiency through fast extraction and full beam detection. Here, we report on the first test of this method. We present detailed data on the evolution of the ion beam properties over several seconds of storage in isochronous mode.

[1] Grieser et al., Rev. Sci. Instrum. 93, 063302 (2022)

MS 4.3 Wed 15:15 N 6

Status of the cooler buncher for laser spectroscopy with JetRIS — •Maren Stahl[1], Michael Block[1,2,3], Alexandre Brizard[4], Premaditya Chhetri[2,3], Julia Even[5], Julian Hindermann[1,2,3], Raquel Ibáñez Campo[1], Tom Kieck[2,3], Nathalie Lecesne[4], Danny Münzberg[1,2,3], Sebastian Raeder[2,3], Daniel Rodríguez[6], Hervé Savajols[4], Domenik Studer[2,3], Tim van de Vendel[2,5], Klaus Wendt[1], and Jana Weyrich[1,2,3] — [1]JGU, Mainz, DE — [2]GSI, Darmstadt, DE — [3]Helmholtz Institut, Mainz, DE — [4]GANIL, FRA — [5]University of Groningen, NLD — [6]Universität de Granada, ESP

The research on the properties of nuclei is major for improving nuclear models. Laser spectroscopy enables studies of nuclear deformation and moments by measuring isotope shifts and hyperfine structures.

The Jet Resonance Ionization Spectroscopy (JetRIS) setup at GSI extends measurements to previously inaccessible nuclides ($Z > 100$). The ionization in a hypersonic gas jet allows the measurement of atomic transitions of the nuclei. Detecting nuclides via α-decay limits the accessible nuclides. A decay-independent detection scheme will expand this number. For this purpose, JetRIS will be combined with a multiple-reflection time-of-flight mass spectrometer (MR-ToF MS), which will also enhance detection efficiency. A radiofrequency quadrupole cooler buncher is used for the conversion of the continuous ion beam of JetRIS into ion bunches required for the MR-ToF MS.

This contribution will present results from the characterization and optimization of the buncher system.

MS 4.4 Wed 15:30 N 6

A recoil ion source for the SHIPTRAP experiment — •Briain Drew Hartigan[1,2,3], Michael Block[1,2,4], Julia Even[3], Francesca Giacoppo[2,4], Manuel J. Gutiérrez[5], and Jaykumar Patel[2,4,6] — [1]JGU University Mainz, Germany — [2]GSI Darmstadt, Germany — [3]University of Groningen, The Netherlands — [4]HIM Mainz, Germany — [5]University of Greifswald, Germany — [6]TU Darmstadt, Germany

The Penning trap mass spectrometers SHIPTRAP has measured the masses of transuranic nuclides, despite low production rates, at a part-per-billion precision. To complement previous measurements at SHIPTRAP, mass measurements of long-lived isotopes in the Cm-Fm region can contribute to asses the size of the deformed neutron shell gap at N=152 as a function of the proton number; these actinides can be bred in sufficient amounts at nuclear reactors. Production of ions via laser-ablation limits sample sizes to 10^{14}, however with a recoil ion source one could push this limit much lower.

To prepare these recoil ions for mass measurement, a new recoil-ion source branch for SHIPTRAP, dedicated to the offline study of long-

lived isotopes is currently being constructed. It consists of a compact gas cell that uses nonlinear electric fields to stop and transport recoil ions, coupled to a cooler-buncher RFQ to provide cooled ions for Penning trap mass spectrometry. In this work, the results of testing the gas cell will be given. Additionally, the design and simulation of the RFQ cooler-buncher will be presented.

MS 4.5 Wed 15:45 N 6

A Multi-Reflection Time-of-Flight Mass Spectrometer for PENTATRAP — •Finn Mehlhorn[1], Sergey Eliseev[1], Pavel Filianin[1], Julius Franke[1], Jan Nägele[1], Moritz Schlaich[2], Christoph Schweiger[1], Frank Wienholtz[2], and Klaus Blaum[1] — [1]Max-Planck-Institut für Kernphysik, Heidelberg, Germany — [2]Technische Universität Darmstadt, Institut für Kernphysik, Darmstadt, Germany

PENTATRAP is presently the most precise Penning-trap mass spectrometer, achieving routinely relative mass uncertainties of down to a few 10^{-12} for stable and long-lived nuclides. Precision measurements at this level contribute to investigations of fundamental and beyond Standard Model physics [1,2]. The Highly-Charged Ions (HCI) are created inside an Electron Beam Ion Trap and separated using a Bradbury-Nielsen gate, according to their q/m ratios, before reaching the main apparatus. The limited path length towards the gate only allows for resolving powers of $R \approx 100$. Thus, contaminants with nearby q/m values of the ion of interest appear in the traps [1].

This talk will present the development of a Multi-Reflection Time-of-Flight Mass Separator using HCI for PENTATRAP, to complement the current system. The design targets a resolving power of $R \geq 10000$ for separation of contaminants. The device is optimized towards a high acceptance for the ion source and the wide application range of PENTATRAP. The current status and simulations will be presented.

[1] Door, et al., Phys. Rev. Lett. 134, 063002 (2025)
[2] Schweiger, et al., Nature Physics 20, 921-927 (2024)

MS 4.6 Wed 16:00 N 6

Numerical study and mitigation strategies of radiation damage of the Super-FRS Ion Catcher setup — •Tommaso Piazza[1,3], Daler Amanbayev[2,3], Davide Bortot[1], Timo Dickel[2,3], Wolfgang Plass[2,3], Ekaterina Kozlova[2], and Alexey Sokolov[2] — [1]Politecnico di Milano, Italy — [2]GSI Darmstadt — [3]JLU Giessen

At the Super-FRS, experiments with exotic nuclei produced by the projectile fragmentation or fission of a high energy (up to 1.5 GeV/u) primary beam will be performed. The interaction between the secondary beam and the components along the beamline, such as the degrader and the collimators, produces a complex secondary radiation field. Irradiation represents a challenging condition, by means of both physical damage and degradation of the electrical performance, for the supply and controllers' electronics of the Super-FRS Ion Catcher.

The present research firstly addresses the main interaction mechanisms between radiation and electronics. The most relevant quantities to evaluate are the absorbed dose and the fast neutron fluence, which is connected to structural damage. Secondly, simulations are performed with FLUKA software reproducing a simplified geometry of the beamline, to assess the composition of the radiation field and the physical quantities of interest. The results are compared with relevant literature data to establish the risk of damage. The possible risk reduction solutions range from the relocation of the components to low radiation level areas to the design of a shielding device.

MS 4.7 Wed 16:15 N 6

UniCell - A new fast buffer-gas stopping cell for superheavy elements — •Felix Sprunk[1,2], Christoph E. Düllmann[1,2,3], Jochen Ballof[2], Alexander Yakushev[2], Marco Biljan[2], Meyhar Dudeja[2], Jörg Krier[2], Jan Kulawik[4], Sven Löchner[2], Yeqiang Wei[2,3], and Frederik Zielke[2] — [1]JGU Mainz, Germany — [2]GSI Darmstadt, Germany — [3]HI Mainz, Germany — [4]Łukasiewicz - IMiF Cracow, Poland

A new universal fast buffer gas stopping cell (UniCell) has been built at GSI Darmstadt. It is optimized for the fast thermalization and efficient transfer of single atoms of these elements after their separation in the TASCA separator. It is designed to overcome the limitations of existing setups used for chemical studies of elements up to moscovium (element 115). The existing setup allows extracting separated and thermalized radioisotopes within a few hundred milliseconds, which is too slow, given that no isotopes with half-lives >60 ms are known for the heavier elements. UniCell will stop ions in helium at atmospheric pressure and extract them through a funnel using a DC gradient supported by an RF field, enabling fast and efficient ion extraction. Simulations yielded extraction times as short as 2 ms at nearly 100% efficiency. A prototype has been built and is now being commissioned. The current status of UniCell will be presented. Commissioning UniCell is a crucial step toward forthcoming investigations of the chemical behavior of livermorium and heavier elements.

MS 5: Poster

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

MS 5.1 Wed 17:00 Philo 1. OG

^{41}Ca measurements using a Bragg detector at CologneAMS — •Jonathan Leven, Timm-Florian Pabst, Stefan Heinze, and Dennis Mücher — Institute of Nuclear Physics, University of Cologne

Depending on the A/Z ratio of the target isotope and its isobar, it can be helpful to use a Bragg type gas ionization chamber, instead of a multi-anode gas ionization chamber in AMS measurements. One contribution is the different scattering behavior in the detectors, with impact on the separation of the isotope of interest and its isobar(s). To exploit this, a Bragg type gas ionization chamber has been installed at the CologneAMS 6MV accelerator, with the hope of improving the separation when compared to the currently used four-anode gas ionization chamber for selected isotopes. We implemented a new, fully digital DAQ approach with the advantage of offline analysis of the pulse shape of the Bragg detector. We will present the status and first results for ^{41}Ca AMS measurements.

MS 5.2 Wed 17:00 Philo 1. OG

AMS measurements of ^{93}Mo for nuclear fusion research — •Kyra Altindag[1], Esad Hrnjic[1], Carlos Vivo-Vilches[1], Silke Merchel[1], Martin Martschini[1], Lee W. Packer[2], Johannes H. Sterba[3], Matic Dokl[4], Jixin Qiao[4], Erik Strub[5], and Karin Hain[1] — [1]University of Vienna, Faculty of Physics, Vienna, Austria — [2]UKAEA, Culham Campus, Abingdon, United Kingdom — [3]Center for Labelling and Isotope Production, TRIGA Center Atominstitut, TU Wien, Vienna, Austria — [4]Department of Environmental and Resource Engineering, Technical University of Denmark, Roskilde, Denmark — [5]Division of Nuclear Chemistry, University of Cologne, Cologne, Germany

In fusion environments, ^{93}Mo ($T_{1/2} = 4839$ a) will be produced via nuclear reactions of neutrons from the deuterium-tritium fusion with Mo-containing materials, e.g. stainless steel. At the Vienna Environmental Research Accelerator (VERA), accelerator mass spectrometry (AMS) is under development for ^{93}Mo. The selection of MoO_2^- allows the suppression of the respective stable isobar ^{93}Nb via laser photodetachment within the Ion-Laser InterAction Mass Spectrometry (ILIAMS) setup using a 637 nm laser. A Mo foil was irradiated at the TRIGA Mark II reactor at TU Wien to yield ^{93}Mo/^{nat}Mo ratios of 10^{-9}, and further diluted with stable ^{nat}Mo to produce MoO_2 with ratios down to 10^{-12}. First AMS measurements showed a blank level of ^{93}Mo/^{nat}Mo = (1-5)×10^{-13}. The ^{93}Mo/^{nat}Mo ratio expected in foil samples of future fusion reactor component materials irradiated during the DTE2 deuterium-tritium campaign at the JET reactor is ≈10^{-10}.

MS 5.3 Wed 17:00 Philo 1. OG

Sample preparation and AMS measurements of ^{90}Sr in soil — •Leonie Ebenberger[1], Oscar Marchhart[1], Robin Golser[1], Martin Martschini[1], Silke Merchel[1], Joel Mohren[2], Dennis Mücher[3], Markus Schiffer[3], and Erik Strub[3] — [1]University of Vienna, Austria — [2]RWTH Aachen, Germany — [3]University of Cologne, Germany

^{90}Sr ($T_{1/2}$ = 28.91 a) is a radionuclide produced almost exclusively anthropogenically in nuclear fission reactors, as well as by nuclear weapons. It is of radiological concern due to its high radiotoxicity and

mobility in the environment. Our dedicated sample preparation procedure for ^{90}Sr Accelerator Mass Spectrometry (AMS) was applied to a larger number of soil samples. The investigated soil samples consist of two soil cores taken near the Rur river, within the vicinity of the Arbeitsgemeinschaft Versuchsreaktor (AVR) Jülich. The AVR Jülich is a quite unique nuclear facility because of a specific incidental release of ^{90}Sr. The measurements were performed at the Vienna Environmental Research Accelerator (VERA) utilizing the Ion-Laser InterAction Mass Spectrometry (ILIAMS) setup, which achieves an overall ^{90}Zr isobar suppression of $> 10^{12}$. Preliminary measurement results will be shown.

Ack.: The project was partially funded by the European Union as part of the Horizon Europe call HORIZON-INFRA-2021-SERV-01 under grant agreement number 101058414 (ReMade@ARI).

MS 5.4 Wed 17:00 Philo 1. OG

Towards ^{53}Mn measurements with ALIS at CologneAMS — •Timm-Florian Pabst[1], Markus Schiffer[1,2], Derin Schmidt[1], Natasha Kalanke[3], Stefan Heinze[1], and Dennis Mücher[1] — [1]University of Cologne, Institute of Nuclear Physics, Cologne, Germany — [2]University of Cologne, Department of Prehistoric Archaeology, Laboratory of Isotope Archaeology — [3]Department of Physics and Astronomy, Botswana International University of Science and Technology

The mesaurement of ^{53}Mn contents has a variety of applications. Ranging from astrophysics and meteorites to geosince where ^{53}Mn could extend the look in the past in burrial and exposure dating. For a long time, ^{53}Mn measurements were restricted to AMS facilities powered by rather large tandem accelerators of at least 10 MV terminal voltage. But as it is the case for a range of other radioisotopes the high isobaric suppression by laser photo detachement might improve the chalenging Suppression of ^{53}Cr.

We will be reporting on recent updates on the ALIS setup at CologneAMS regarding the development of ^{53}Mn measurements. This includes putting into service a new 940 nm, 20 W CW laser and optimizations for manganese ion beams as well as the new lasers transport through the ion cooler. Additionally we will show first insights on the reduction of ^{53}Cr in our setup as well as the seperation of ^{53}Mn and its isobar using the ALIS setup in combination with the 6 MV tandetron.

MS 5.5 Wed 17:00 Philo 1. OG

Recent progress in the search of live ^{182}Hf in geological archives — •Sebastian Fichter[1], Laurenz Widermann[1,2], Alexander Lorenz[1], Dominik Koll[1], Martin Martschini[2], Silke Merchel[2], Robin Golser[2], and Anton Wallner[1] — [1]Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Accelerator Mass Spectrometry and Isotope Research, Dresden, Germany — [2]University of Vienna, Faculty of Physics, Isotope Physics, Vienna, Austria

The detection and quantification of the astrophysically relevant radionuclide ^{182}Hf ($t_{1/2} = 8.9 \times 10^6$ yr) in diverse geological archives would greatly enhance our understanding of potential *r*-process production sites, particularly when its temporal abundance is compared with other nucleosynthesis radionuclides such as ^{60}Fe and ^{244}Pu. In this study, we report recent progress in developing an optimized chemical protocol for extracting ^{182}Hf from a variety of sample matrices, including deep-sea ferromanganese crusts and nodules. Our primary goal is to achieve high chemical yields while maximizing the separation from interfering elements. A key focus is the suppression of the stable isobar ^{182}W, which remains one of the main factors limiting the direct detection of live ^{182}Hf via Accelerator Mass Spectrometry. In the future, also the newly established Helmholtz Accelerator Mass Spectrometer Tracing Environmental Radionuclides (HAMSTER) at HZDR will participate in this endeavour using its ion cooler setup Ion Linear Trap for Isobar Suppression (ILTIS).

MS 5.6 Wed 17:00 Philo 1. OG

High-precision Penning trap mass spectrometry of heavy, highly charged ions — •Rima X. Schüssler[1,2,3] and Thomas Stöhlker[1,2,3] — [1]GSI Helmholtz Center for Heavy Ion Research, Darmstadt — [2]Helmholtzinstitut Jena — [3]Institute of Optics and Quantum Electronics, Friedrich Schiller University Jena

The theory of quantum electrodynamics (QED) has been extensively tested in light or medium heavy atoms, but stringent tests in the heaviest atoms in the highest charge states, where QED effects are largest, still lack high precision. So far, such measurements have been performed in storage rings at high ion energies.

To this end, we are setting up a high-precision Penning trap mass spectrometer to perform measurements of the binding energy of the innermost electron by determining the mass difference with a relative precision of 10^{-12} of ions in different charge states. The experiment will be situated at the Hitrap facility at the GSI Helmholtz Center for Heavy Ion Research in Darmstadt. Here, heavy, highly charged ions are produced in the accelerator facility and then decelerated such that they can be captured in the Penning trap. The experiment itself will consist of a strong magnetic field, feature several cryogenic Penning traps, and a cryogenic detection system with single-ion efficiency.

Furthermore, due to the nature of a Penning trap, the experiment will extend the application of mass measurements to the region of the heaviest ions in the highest charge states for a vast range of applications.

MS 5.7 Wed 17:00 Philo 1. OG

Mass Measurements near N=126 with the FRS Ion Catcher — •Kriti Mahajan[1,2] and Daler Amanbayev[3,1] for the Super-FRS Experiment-Collaboration — [1]Justus-Liebig-Universität Gießen, Germany — [2]Helmholtz Research Academy Hesse for FAIR (HFHF), Campus Gießen, Germany — [3]GSI Darmstadt, Germany

Studying the r-process requires nuclear data of very neutron-rich nuclei. This data is still scarce and modern r-process network calculations rely on theoretical models that give divergent predictions as one moves away from the valley of stability. Nuclear masses help to determine the r-process path and shed light on the nucleosynthesis environment.

The use of high-energy heavy-ion beams with the Fragment Separator (FRS) at GSI facilitates the study of neutron-rich nuclei in the r-process region. An experiment was performed within FAIR Phase-0, where these nuclei were produced at the FRS using fragmentation of 1 GeV/u ^{208}Pb beam on a 4 g/cm^2 thick ^{9}Be target and precise mass measurements were performed using the multiple-reflection time-of-flight mass spectrometer (MR-TOF-MS). The MR-TOF-MS features a high resolving power of up to 1,000,000, short cycle times of a few tens of milliseconds, and mass accuracy down to 2×10^{-8}.

During the experiment, masses of sixteen nuclides around $N = 126$ were measured, of which four masses were measured for the first time. The results of this experiment will be presented, including the first mass measurements of ^{204}Au and ^{205}Au, where significant deviations from the AME2020 extrapolations indicate a change in nuclear structure around the N = 126 shell closure.

MS 5.8 Wed 17:00 Philo 1. OG

Isotope shift and hyperfine structure measurements in curium — •R. Hasse[1,3,4], T. E. Albrecht[2], S. Berndt[1], M. Block[1,3,4], Ch. E. Düllmann[1,3,4], J. G. Ezold[5], U. Köster[6], A. T. Loria Basto[1,4], Ch. Mokry[1,4], K. Myhre[5], S. Raeder[3,4], D. Renisch[1,4], J. Runke[1,3], S. K. Schrell[5], M. Stemmler[1,7], and K. Wendt[1] — [1]JGU, Mainz, Germany — [2]CSM, Golden, CO, United States — [3]GSI, Darmstadt, Germany — [4]HIM, Mainz, Germany — [5]ORNL, Oak Ridge, TN, United States — [6]ILL, Grenoble, France — [7]LU, Hannover, Germany

Curium ($Z = 96$) is a minor actinide that is produced in nuclear reactors and therefore present in spent nuclear fuel. We report on high resolution resonance ionization mass spectrometry at RISIKO employing a narrowband Ti:Sa laser on the isotopes $^{242-248,250}$Cm to determine isotope shifts and the hyperfine structures of the odd-A isotopes ^{243,245,247}Cm. For these measurements two ground state transitions from $5f^76d7s^9D_2^o$ to the excited states $5f^76d7s7p^9D_3$ and $5f^86d7s^9D_3$ were used in two-step ionization schemes. The sample sizes ranged from 10^7 atoms of the isotope ^{250}Cm to 10^{13} atoms of the more abundant isotopes ^{246,248}Cm. In a King-plot analysis these results are analyzed to derive so far missing nuclear mean square charge radii differences of the isotopes ^{242,247,250}Cm. Additional analysis of the hyperfine structure using the SATLAS package yields the hyperfine parameters A and B.

MS 5.9 Wed 17:00 Philo 1. OG

Status Report of the Projects LISEL@DREAMS and ELISE@IBC — •Oliver Forstner[1], Shiva Prasad Pulipati[1], Thorben Niemeyer[2], and Klaus Wendt[2] — [1]Friedrich-Schiller-Universität Jena — [2]Johannes-Gutenberg-Universität Mainz

The German Ministry of Science and Education has granted funding for the two consecutive research projects LISEL@DREAMS and ELISE@IBC to advance laser photodetachment as an additional element selective filter in AMS. At Jena an ion beam apparatus and an ion beam cooler has been built allowing to study and improve the capture of negative atomic and molecular ions with the goal of increasing

the photodetachment efficiency. In Mainz two types of tuneable laser systems have been built. One system based on a Ti:sapphire and a second based on a OPO from Hübner Photonics. Both systems operate in different wavelength ranges allowing to study a broad range of isotopes.

In this status report we will present what has been achieved so far covering the activities at the setup in Jena and the Mainz laser systems as well as connected activities at the FLSR storage ring in Frankfurt. An outlook will be given into the future applications of the developed systems.

MS 5.10 Wed 17:00 Philo 1. OG

Advancing (A)MS-based techniques for ultra-trace detection of Tc-99 — •Stephanie Adler[1,2], Martin Martschini[1], Dennis Mücher[3], Erik Strub[3], Thomas C. Meisel[4], and Karin Hain[1] — [1]University of Vienna, Faculty of Physics, Austria — [2]University of Vienna, Vienna Doctoral School in Physics, Austria — [3]University of Cologne, Institute for Nuclear Physics, Germany — [4]Montanuniversität Leoben, Austria

Determination of absolute concentrations of the anthropogenic radionuclide ^{99}Tc ($t_{1/2}$=2.1×10^5 yr) in environmental samples by accelerator mass spectrometry (AMS) requires the suppression of the stable isobaric background of ^{99}Ru and a reliable normalisation method. Ion-Laser InterAction Mass Spectrometry (ILIAMS) has demonstrated $^{99}RuF_5^-$ suppression factors of up to 10^5, while leaving $^{99}TcF_5^-$ unaffected. However, a variability in this suppression factor has been observed in recent measurements, and the possible reasons for this variability are being investigated. Using a negative thermal ionisation source (N-TIMS), isobar suppression and the feasibility of normalisation with a ^{97}Tc spike is being investigated at the Technical University of Leoben. An ionization efficiency of 2-10% and a ^{99}Ru suppression factor of 10^6 were achieved when extracting $^{99}TcO_4^-$ from the ion source. When investigating the possibility of applying the same approach to AMS, the same anion was extracted from the Cs-sputter ion source. However, for similar concentrations, a higher output of $^{99}RuO_4^-$ than of $^{99}TcO_4^-$ was observed in this case, which makes the N-TIMS approach more feasible.

MS 5.11 Wed 17:00 Philo 1. OG

Targets for precision spectroscopy with multiply-charged actinide molecules — •Lennard Marek Arndt[1], Jonas Stricker[1,2], Dennis Renisch[1,2], and Christoph Emanuel Düllmann[1,2,3] — [1]JGU Mainz Germany — [2]HI Mainz, Germany — [3]GSI Darmstadt, Germany

Multiply-charged actinide molecules offer promising new opportunities for tests of fundamental symmetries by precision spectroscopy. The production of multiply-charged ions was reported via laser ablation of chemically tailored targets that contain all elements desired in the molecular ion. We demonstrate target production via electroplating and direct synthesis. We also present ToF spectra from laser ablation of actinide molecular ions. Ablation of a ThF_4 target and an uranium foil yielded ThF^{2+} and UO^{3+} respectively, both isoelectronic to RaF and thus, sensitive to nuclear Schiff moments.

MS 5.12 Wed 17:00 Philo 1. OG

Determination of the size of the neutral particle cloud in rL-SNMS — •Jonah Böttger, Paul Hanemann, Manuel Raiwa, Aaron Lehnert, and Clemens Walther — Leibniz University Hannover, IRS, Hannover, Germany

After the installation of resonant Laser Secondary Neutral Mass Spectrometry (rL-SNMS), a combination of TOF-SIMS and laser system, the size of the neutral particle cloud was only estimated through simulations. [1]

Using two different methods we were able to measure the size of the cloud. First, by scanning it with a resonant laser, producing a two-dimensional map of the number of neutral particles. Second, by measuring saturation curves for uranium, plutonium and americium with different laser beam diameters to determine an upper limit for the size of the neutral particle cloud. Possible differences in the size of the cloud for different elements and isotopes were also investigated.

The cloud was determined to be spherical with a diameter of around 300 - 400 μm with only minimal differences between elements and isotopes. Both methods came to similar results, experimentally confirming the earlier simulations. Using this, we were able to optimize the overlap of the laser beams and the neutral particle cloud, increasing the sensitivity of the system by a factor of 4.

[1] DOI: 10.1016/j.ijms.2017.10.003

MS 5.13 Wed 17:00 Philo 1. OG

Surprises 60 years after the Thule plane crash: More nuclear weapons material involved than previously assumed? — •Jan Schimansky[1], Tobias Weissenborn[1], Paul Hanemann[1], Jixin Qiao[2], Sven Nielsen[2], and Clemens Walther[1] — [1]Leibniz Universität Hannover, IRS, Hannover, Germany — [2]Technical University of Denmark, Roskilde, Denmark

In 1968, the crash of a US B-52 bomber near Thule Airbase released mixed uranium-plutonium particles into the environment. Although existing literature provides values for their general isotopic composition [1], the full extent of their heterogeneity and complex morphology remains to be explored. Using isolated hot particles, we apply traditional Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) and resonant Laser Secondary Neutral Mass Spectrometry (rL-SNMS) to analyze $^{235}U/^{238}U$ isotopic ratios. Combined with Gamma Spectrometry and Scanning Electron Microscopy (SEM), this approach allows for a comprehensive characterization of the particles. We identified particles with isotopic fingerprints similar to values found by previous works [1,2] containing weapons grade plutonium ($^{240}Pu/^{239}Pu > 0.055$) and enriched uranium ($^{235}U/^{238}U > 1.2$), as well as surprising variations from these values, containing purer weapons grade Pu (240Pu/239Pu < 0.025) and higher enriched uranium ($^{235}U/^{238}U > 2.5$). In this work we present and discuss the measured isotope ratios and compare the ToF-SIMS and rL-SNMS measurements highlighting the advantages of isobar free mass spectrometry. References: 1: DOI:10.1021/es800203f; 2: DOI:10.1016/j.jenvrad.2004.10.013

MS 6: Members' Assembly

Time: Thursday 13:15–14:15 Location: N 6

All members of the Mass Spectrometry Division are invited to participate. Finger food will be provided.

MS 7: Accelerator Mass Spectrometry

Time: Thursday 14:30–16:30 Location: N 6

Invited Talk MS 7.1 Thu 14:30 N 6

Turning Atmospheric Radiocabon Variability into a Tool: High-Precision Tree-Ring Records for Solar Activity and Cross-Dating — •Lukas Wacker[1], Nicolas Brehm[1], Macus Christl[1], Hans-Arno Synal[1], Charlotte L. Pearson[2], Kurt Nicolussi[3], Thomas Pilcher[3], Alex Bayliss[4], and David Brown[5] — [1]Ion Beam Laboratory of Ion Beam Physics, Department of Physics, ETH Zurich, Switzerland — [2]Laboratory of Tree-Ring Research, University of Arizona, Tucson, USA — [3]Department of Geography, University of Innsbruck, Innsbruck, Austria — [4]Department of Anthropology and Archaeology, University of Bristol, Bristol, UK — [5]School of Natural and Built Environment, Queen's University, Belfast, UK

Atmospheric radiocarbon (^{14}C) concentrations over the last 10 000 years vary primarily due to changes in cosmogenic ^{14}C production driven by solar activity and Earth*s magnetic dipole moment. These variations complicate conventional radiocarbon dating, but also offer the opportunity to reconstruct past solar activity. Recent advances in state-of-the-art AMS systems developed at ETH Zürich now allow efficient production of highly precise, annually resolved ^{14}C time series from tree rings. In this contribution, we present what can be inferred about past solar activity from such annually resolved ^{14}C records. We further demonstrate that the fine structure in atmospheric ^{14}C is not

only a bane for precise ^{14}C dating, but can become a powerful gain when exploited for dating other ^{14}C records and for precisely synchronizing paleoarchives containing cosmogenic radionuclides.

MS 7.2 Thu 15:00 N 6

Commissioning of the HAMSTER - the cutting edge accelerator mass spectrometry system at HZDR — •Stella Winkler[1], Shruti Dabke[1], Toralf Döring[1], Sebastian Fichter[1], Thilo Hauser[2], Dominik Koll[1], Allan O'Connor[2], Johannes Lachner[1], Georg Rugel[1], Mark Sundquist[2], Janis Wolf[1], René Ziegenrücker[1], Sebastian Zwickel[1], and Anton Wallner[1] — [1]Accelerator Mass Spectrometry & Isotope Research, Helmholtz-Zentrum Dresden- Rossendorf, 01328, Dresden — [2]National Electrostatic Corp. (NEC), Middleton, WI 53562, USA

The HAMSTER is currently the most advanced development in accelerator mass spectrometry (AMS) systems. It is based on a 'small' 1MV accelerator and designed to offer high performance for all AMS isotopes, be they established, in development or envisioned. The key AMS parts of the system were delivered and installed at HZDR from August to early October 2025. Since then, the phase of beam testing, trouble-shooting, and characterising performance is underway.

The HAMSTER features advanced capabilities for the heavy isotopes, to be measured at even the lowest levels currently known. Besides the instrumentation for radioisotopes, the equipped dynode electron multipliers offer new options for stable isotopes at trace element level.

Here we will present the physics background for AMS that drove the inception of this system, the installation and testing of this system, and first performance data for 'classic' AMS isotopes.

MS 7.3 Thu 15:15 N 6

First actinide performance tests at HAMSTER — •Dominik Koll, Shruti Dabke, Sebastian Fichter, Johannes Lachner, Georg Rugel, Stella Winkler, Sebastian Zwickel, and Anton Wallner — Accelerator Mass Spectrometry & Isotope Research, Helmholtz-Zentrum Dresden-Rossendorf, 01328, Dresden

The newly installed Helmholtz Accelerator Mass Spectrometer Tracing Environmental Radionuclides (HAMSTER) facility at the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) has been designed for actinide AMS measurements with high detection efficiency and sensitivity. These capabilities are essential for advancing environmental and nuclear astrophysics research. Plutonium was selected as the initial actinide to be tested because the sister facility VEGA at ANSTO (Australia) demonstrated that plutonium detection efficiencies approaching 1% are feasible; thereby setting the benchmark for HAMSTER.

In this contribution, we present the approach adopted for actinide AMS at HAMSTER, describe the first steps undertaken with plutonium, and discuss the main technical challenges encountered during early operation. Furthermore, we report first measurement results illustrating the current performance of the facility. An outlook on planned developments as well as upcoming scientific applications of HAMSTER, with a particular emphasis on future searches for interstellar radionuclides, will be given.

MS 7.4 Thu 15:30 N 6

$^{14}CO_2$ Pine Tree Ring Measurement at CologneAMS — •Martina Gwozdz[1], Thorsten Westphal[2], Susanne Lindauer[3], Stefan Heinze[1], Markus Schiffer[2], and Dennis Mücher[1] — [1]University of Cologne, Institute for Nuclear Physics, Cologne, Germany — [2]University of Cologne, Department of Prehistoric Archaeology, Laboratory of Isotope Archaeology — [3]Curt-Engelhorn-Centre Archaeometry, Mannheim, Germany

An assemblage of pine trees was recovered in February 2021 in Paderborn, Schloss Neuhaus. Preliminary radiocarbon-dating of a pine cone places the age to the Late Paleolithic or Allerød Interstadial, approximately 11 400 - 10 700 BC. Attempts to correlate the ring-width series with established Late Glacial pine chronologies from Switzerland (Zürich, Winterthur), Central Poland (Koźmin), and the Netherlands (Leusden-Den Treek) have yielded no successful alignment so far. We measured the radiocarbon age of the tree rings at CologneAMS with CO_2 samples and at CEZA Mannheim with graphitization samples. The resulting calibrated age range of 11 400 - 10 800 cal BC confirms the Late Glacial context of the assemblage. These parallel measurements provided an opportunity for us to compare the performance of the CologneAMS small-sample CO_2 setup with the established graphitization procedure, while simultaneously expanding the dendrochronological archive for Late Glacial pine material.

MS 7.5 Thu 15:45 N 6

Constraints on the local fluence of interstellar ^{60}Fe on the Moon — •Sebastian Zwickel[1,2], Sebastian Fichter[1], Michael Hotchkis[3], Dominik Koll[1,4], Johannes Lachner[1], Marc Norman[4], Stefan Pavetich[4], Georg Rugel[1], Konstanze Stübner[1], Stephen Tims[4], and Anton Wallner[1,2,4] — [1]HZDR, Dresden, Germany — [2]TU Dresden, Germany — [3]ANSTO, Sydney, Australia — [4]ANU, Canberra, Australia

The lunar regolith is a promising archive for live interstellar radionuclides such as supernova-^{60}Fe and r-process ^{244}Pu. Due to the absence of geological activity, interstellar material can accumulate in the upper regolith over a few to up to several hundred Myr. This provides an integral record of nucleosynthesis in the solar neighbourhood, albeit with limited time resolution. Our measurements of the interstellar particle influx probe the astrophysical site of the r-process using ^{244}Pu and constrain the local lunar fluence of interstellar ^{60}Fe. Regolith mixing from continuous (micro-)meteoritic bombardment dilutes interstellar radionuclide inventories over depth and is taken into account.

This contribution presents new results on the local lunar fluence of interstellar ^{60}Fe obtained from surface soil samples. Lunar soils that are expected to contain the full ^{60}Fe inventory observed in previous lunar depth profiles and terrestrial archives were identified by relating cosmogenic ^{26}Al to interstellar ^{60}Fe. A lower limit of interstellar ^{60}Fe fluence was established from a sample with $\mathcal{O}$(Myr) surface exposure. Together with ^{60}Fe, we also present first data on the search for interstellar ^{244}Pu in lunar soil samples.

MS 7.6 Thu 16:00 N 6

Sample preparation of $CaSO_4$-containing sediments for exposure dating by ^{36}Cl — •Natasha Goaba Kalanke[1,2], Markus Schiffer[2,3], Stefan Heinze[2], Erik Strub[4], Gregory Campbell[1], Michael Staubwasser[5], Steven Binnie[5], and Dennis Muecher[2] — [1]Department of Physics and Astronomy, Botswana International University of Science and Technology — [2]Institute of Nuclear Physics, University of Cologne — [3]Laboratory of Isotope Archaeology, Department of Prehistoric Archaeology, University of Cologne — [4]Institute of Nuclear Chemistry, University of Cologne — [5]Institute of Geology and Mineralogy, University of Cologne

The application of cosmogenic ^{36}Cl exposure dating to gypsum ($CaSO_4 \cdot 2H_2O$) is limited by pervasive sulfur isobaric interference and complex chemical purification requirements. A novel chemical protocol that effectively isolates chlorine from a sulfate-rich gypsum matrix has been developed. It was tested through procedural chemical blanks and natural gypsum deposits from the Atacama Desert with isotope dilution (ID-AMS). Chemical blanks were processed by the new protocol and revealed, on average, a ^{36}Cl/^{35}Cl ratio of $(1.5 \pm 3.48) \times 10^{-14}$ with $^{35}Cl^{5+}$ currents ranging from 4-10 μA. The method will be used for exposure age determination of gypsum landforms including evaporite deposits, desert crusts and paleohydrological features, opening new avenues for Quaternary research in arid and sulfate-rich environments. First preliminary results of gypsum samples from the Atacama Desert will be reported and compared to their U-Th dating.

MS 7.7 Thu 16:15 N 6

Setting up Super-SIMS at HAMSTER — •Georg Rugel, Toralf Döring, Sebastian Fichter, Dominik Koll, Johannes Lachner, Axel D. Renno, Stella Winkler, René Ziegenrücker, and Anton Wallner — Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

The combination of Accelerator Mass Spectrometry (AMS) with the capabilities of a secondary-ion mass spectrometer (SIMS: IMS 7f-Auto from Cameca) is challenging. The idea is to use the micron-scale spatial resolution of the SIMS and the high selectivity through molecule suppression by the stripping process at an AMS system, a combination named Super-SIMS. The aim is to detect background-limited trace elements more sensitively than regular SIMS or other techniques. After first steps at the DREsden AMS-facility (DREAMS) at the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) [1] the system moved to the new compact facility HAMSTER (Helmholtz Accelerator Mass Spectrometer Tracing Environmental Radionuclides) dedicated for AMS measurements and designed to incorporate Super-SIMS capabilities [2]. HAMSTER is based on a 1-MV tandem accelerator and has dedicated instruments for tuning low current ion-beams $<$ nA from the SIMS. In this presentation, I will highlight the current status after arrival of the HAMSTER system, achieved transmissions and future initiatives. [1] Rugel, G. et al.(2022)NIMB, 532, 52-57. [2] this conference.

MS 8: Isobar Suppression Techniques

Time: Friday 11:00–12:45 Location: N 6

Invited Talk MS 8.1 Fri 11:00 N 6

Nuclear reaction studies at the GSI storage rings - An astrophysics program — •Jan Glorius — GSI Helmholtzzentrum, Darmstadt, Germany

Over the past decade, a rich experimental nuclear-astrophysics program has been established at the GSI storage rings ESR & CRYRING. Centered around low-energy reaction studies, a variety of detection schemes and setups have been successfully implemented and put to use in multiple beamtimes. The common goal of all those inverse-kinematics studies is to extend our understanding of nucleosynthesis by focussing on stored radioactive beams. A diverse spectrum of nuclear reactions has recently been studied, including proton-induced reactions in a direct approach as well as neutron-induced reactions using an indirect technique. This contribution will outline the challenges and specialties of in-ring reaction studies, summarize the recent experimental campaigns and sketch an outlook regarding future measurements.

MS 8.2 Fri 11:30 N 6

Progress on the ILIAMS-assisted measurements of ^{91,94}Nb and ^{93}Mo at VERA — •Carlos Vivo-Vilches[1], Esad Hrnjic[1], Kyra Altindag[1], Silke Merchel[1], Martin Martschini[1], Lee W. Packer[2], Johannes H. Sterba[3], Matic Dokl[4], Jixin Qiao[4], Erik Strub[5], and Karin Hain[1] — [1]University of Vienna, Faculty of Physics, Vienna, Austria — [2]UKAEA, Culham Campus, Abingdon, United Kingdom — [3]Center for Labelling and Isotope Production, TRIGA Center Atominstitut, TU Wien, Vienna, Austria — [4]Department of Environmental and Resource Engineering, Technical University of Denmark, Roskilde, Denmark — [5]Division of Nuclear Chemistry, University of Cologne, Cologne, Germany

At the Vienna Environmental Research Accelerator (VERA) we are developing the AMS of ^{91}Nb, ^{94}Nb and ^{93}Mo to measure their concentrations in Mo-containing alloys irradiated with neutrons from deuterium-tritium fusion. These measurements require the use of the unique Ion-Laser InterAction Mass Spectrometry (ILIAMS) setup to suppress their respective stable isobars: ^{91}Zr, ^{94}Zr and ^{94}Mo, and ^{93}Nb. For ^{91,94}Nb, to achieve isobar suppression, we need to select NbO_3^-, which is less prolific than other niobium oxide anions. Therefore, we studied the enhancement of its ionization yield by mixing the Nb_2O_5 powder with Ag and AgO. Estimated ^{91}Nb/^{93}Nb and ^{94}Nb/^{93}Nb blank ratios are 10^{-14} and 10^{-10}, respectively. Using samples with roughly known amounts of ^{93}Mo, the ^{93}Mo/^{nat}Mo blank level for VERA has been determined to be lower than 10^{-12}. Precise reference materials for ^{93}Mo AMS will be produced from proton-irradiated Nb foils.

MS 8.3 Fri 11:45 N 6

First ion cooler assisted measurements at a 1 MV AMS facility — •Johannes Lachner[1], Robin Golser[2], Dominik Koll[1], Georg Rugel[1], Alexander Wieser[1,2], Stella Winkler[1], and Anton Wallner[1] — [1]Helmholtz-Zentrum Dresden-Rossendorf — [2]Universität Wien, Fakultät für Physik

The 1 MV AMS system HAMSTER (Helmholtz Accelerator Mass Spectrometer Tracing Environmental Radionuclides) contains an injector with an ion cooler, the so-called Ion Linear Trap for Isobar Suppression (ILTIS). This beam line is designed for the purpose of isobar suppression in collisions with buffer gas and by laser photodetachment and will expand the capabilities for radionuclide measurements beyond the classical nuclides measured at low-energy AMS facilities.

The presentation will cover results from first experiments with the cooled ion beam transmitted through the whole AMS system. A particular focus is set on the preparations for transmitting Cl beams in lower charge states and exploring the challenges of ^{36}Cl measurements at final beam energies below 1 MeV.

MS 8.4 Fri 12:00 N 6

Design and optimization of a ΔE-E$_{res}$ gas ionization chamber for Be-10 isobar suppression at low energies. — •Samuel Marty, Arnold Müller, Christof Vockenhuber, Andreo Crnjac, René Gruber, Daniel Hösli, and Marcus Christl — Laboratory of Ion Beam Physics, ETH Zurich, Otto-Stern-Weg 5, Zurich, Switzerland

Contrary to C-14 and its isobar N-14, the radioisotope Be-10 has a large isobaric background due to B-10 being able to form negative ions. There are various ways to suppress this unwanted signal: degrader foils, extracting BeF instead of BeO, and finally a detection method which exploits the difference in energy loss. One such method is the ΔE-E$_{res}$ gas ionization chamber, which has been used at ETH since the 2000s. However, most of the deployed detectors operate in ionization mode, where the primary electrons are measured directly. By increasing the field strength, the detector can be brought into proportional mode, where avalanche formation greatly enhances the signal-to-noise ratio. Particularly at low energies, significant improvements to the detector resolution can be achieved for light elements. Moreover, the detector does not necessitate cooled preamplifiers anymore. To confirm this claim, the energy resolution for both modes was measured using a variety of particles. Additionally, the multiplication factor as a function of the field contains information on the first Townsend coefficient of hexane, a key parameter for gas multiplication. Finally, the stability of gas ionization detectors operating in the proportional regime was studied.

MS 8.5 Fri 12:15 N 6

Collisional detachment of AlO^- and MgO^- in the ALIS RFQ ion cooler at CologneAMS — •Derin Schmidt[1], Markus Schiffer[1,2], Timm-Florian Pabst[1], Natasha Goaba Kalanke[3], Stefan Heinze[1], and Dennis Muecher[1] — [1]University of Cologne, Institute of Nuclear Physics, Germany — [2]University of Cologne, Department of Prehistoric Archaeology, Laboratory of Isotope Archaeology, Germany — [3]Department of Physics and Astronomy, Botswana International University of Science and Technology, Botswana

Laser isobar suppression is currently revolutionizing AMS; however, the underlying atomic- and molecular-level mechanisms responsible for its exceptional photodetachment efficiency are not yet fully understood.

In the Anion Laser Isobar Separator (ALIS) at CologneAMS, a radio frequency quadrupole (RFQ) ion cooler filled with He buffer gas is used in combination with a high-power laser to suppress the $^{26}MgO^-$ molecular isobar in $^{26}AlO^-$ beams.

Systematic measurements of collisional detachment in this cooler are presented. For a stable $^{27}AlO^-$ beam, the transmission was measured as a function of He pressure.

The count rate in the gas ionization detector for standard materials was analyzed for different ion cooler He buffer gas pressures and normalized to the slow sequentially injected stable ^{27}Al beam, to determine the ratio of collisional-detachment cross sections $\sigma_{col}(^{26}MgO)/\sigma_{col}(^{27}AlO)$.

MS 8.6 Fri 12:30 N 6

A compact AMS laser photo-detachment system for isobar suppression — •Lauren Bezzina, Christof Vockenhuber, Marcus Christl, Philip Gautschi, Lukas Wacker, Urs Ramsperger, Arnold Müller, and Thorben Wulff — Labor für Ionenstrahlphysik (LIP), Otto-Stern-Weg 5, 8093 Zürich, Switzerland

Compact accelerator mass spectrometry (AMS) systems have advanced significantly in recent years, yet effective isobar suppression for nuclides such as 36Cl at the 200 kV scale remains a major challenge. To address this, we are implementing a laser photo-detachment scheme that selectively neutralises interfering anions while preserving the radionuclide of interest. This approach requires decelerating the ion beam to sub-eV energies to maximise laser-ion interaction, typically achieved using a radiofrequency quadrupole (RFQ) cooler operated with a light buffer gas. The suppression stage will be integrated into a recommissioned 200 kV MICADAS-type accelerator. The upgraded system, named MI-Q, will be the first compact AMS instrument to incorporate a laser-based isobar suppression stage.

We present the design and optimisation of the MI-Q low-energy section, comprising the deceleration optics and RFQ cooler. A multi-electrode deceleration lens is being developed to provide tunable potential gradients, enabling precise control of sub-eV beam transport into the gas cell. The RFQ incorporates guide electrodes that generate the axial DC drag field needed to transport ions through the cooler while maintaining transverse confinement. Fabrication of the key components is underway, with thorough commissioning planned.