MS 3: Accelerator Mass Spectrometry I

Time: Tuesday 11:00–13:00 Location: HS 3042

Invited Talk MS 3.1 Tue 11:00 HS 3042
Recent Developments at CologneAMS — •Dennis Mücher — Institut für Kernphysik, Universität zu Köln

The Institute for Nuclear Physics at the University of Cologne hosts two AMS setups: the 10 MV FN Tandem coupled to a gas-filled magnet and the 6 MV Tandetron accelerator. CologneAMS is fully integrated into an interdisciplinary research infrastructure at the University of Cologne, enabling fruitful collaborations with the Departments for Geology, for Archeology and for Nuclear Chemistry, among others. In this talk I will give an overview about the status und future plans of the CologneAMS facilities related to various applications in geoscience, nuclear waste management, and others. The focus of my presentation will be our research on nucleosynthesis of heavy elements in the universe, creating a link between our local efforts to experiments at world-leading large-scale radioactive ion beam facilities.

MS 3.2 Tue 11:30 HS 3042
Preparations for a new 1 MV AMS facility in Dresden — •Johannes Lachner, Toralf Döring, Sebastian Fichter, Georg Rugel, Stephan Winkler, René Ziegenrücker, and Anton Wallner — Helmholtz-Zentrum Dresden-Rossendorf, Institute of Ion Beam Physics and Materials Research

A new AMS system called HAMSTER (Helmholtz Accelerator Mass Spectrometer Tracing Environmental Radionuclides) will be installed in Dresden-Rossendorf to expand the capabilities of radionuclide measurements at HZDR. It consists of a 1 MV pelletron tandem accelerator and has a conventional ion source for classic AMS operation and two additional injection lines: One injection line holds an ion cooler supporting isobar suppression (Ion Linear Trap for Isobar Suppression, called ILTIS), the other is a SIMS (Secondary Ion Mass Spectrometer) moved from its original location at the 6 MV DREAMS facility to continue performing Super-SIMS measurements at the new machine.

The facility will be placed in a new building that holds space for the experimental area and control room of the AMS as well as for two chemistry laboratories. Installation of the first injector beamline with the ILTIS is foreseen for early 2024 and we expect HAMSTER to be in operation by summer. In this contribution we will introduce the surrounding infrastructure and layout of the new facility.

MS 3.3 Tue 11:45 HS 3042
Upgrade of the silicon nitride absorber for ^{10}Be AMS at VERA — •Carlos Vivo-Vilches, Peter Steier, Martin Martschini, Silke Merchel, and Robin Golser — University of Vienna, Faculty of Physics, Austria

Suppression of ^{10}B in accelerator mass spectrometry of ^{10}Be at VERA is provided by a stack of silicon nitride foils placed in front of a gas ionization chamber. A nominal thickness of 6700 nm is just enough to stop ^{10}B ions, while letting ^{10}Be ions reach the detector. This avoids the ^{10}Be losses of the degrader foil technique used in the past, arising from angular scattering and the different charge states after the foil, increasing the detection efficiency. A disadvantage of the foil stack setup until now was the fixed thickness of the foils once the setup is inside the beamline. More generally, the background caused by products from the nuclear reaction of ^{10}B with the ^{1}H present in the foils, ^{1}H(^{10}B,α)^{7}Be, makes it challenging to reach similar ^{10}Be/^{9}Be blank ratios as with the degrader foil technique.

Recently, a rotatable silicon nitride foil with a thickness of 1200 nm was installed in front of the foil stack, allowing adjustments in the total thickness for optimization of the ^{10}B suppression and ^{10}Be transmission. Besides, it also improves discrimination of the ^{7}Be background. The size of each foil and their distances to the detector have also been studied in simulations and experimentally in order to decrease the angular acceptance of ^{7}Be ions without significantly losing ^{10}Be ions. In this talk we will present first results on the efficiency, reproducibility and the blank value achieved with this setup.

MS 3.4 Tue 12:00 HS 3042
Ongoing Routine Measurements at DREAMS - Status and Challenges — •Georg Rugel, Toralf Döring, Sebastian Fichter, Dominik Koll, Johannes Lachner, Annabel Rolofs, Konstanze Stübner, Alexander Wieser, Stephan Winkler, Janis Wolf, René Ziegenrücker, Sebastian Zwickel, and Anton Wallner — Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

During the last years the performance of DREAMS, the DREsden AMS-facility, at the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) was improved in various aspects. The system is based on a 6 MV tandetron manufactured by High Voltage Engineering Europa (HVEE) and shared with various other groups at HZDR. This report will give detail on the performance of our routine measurements and an overview of the range of research topics of user projects at DREAMS. Moreover, we will present recent improvements and investigations on the performance of ^{10}Be and ^{26}Al measurements and highlight key challenges remaining, and potential future developments.

MS 3.5 Tue 12:15 HS 3042
Current status of ALIS - The new low-energy isobar suppression setup at CologneAMS — •Markus Schiffer[1], Oscar Marchhart[1,2,3], Elisa Linnartz[1], Martin Martschini[2], Gereon Hackenberg[1], Peter Steier[2], Melisa Maslo[4], Timm-Florian Pabst[1], Erik Strub[4], Tibor Dunai[5], Robin Golser[2], and Dennis Mücher[1] — [1]University of Cologne, Institute of Nuclear Physics, Cologne, Germany — [2]University of Vienna, Faculty of Physics, Isotope Physics, Vienna, Austria — [3]University of Vienna, Vienna Doctoral School in Physics, Vienna, Austria — [4]University of Cologne, Division of Nuclear Chemistry, Cologne, Germany — [5]University of Cologne, Institute of Geology and Mineralogy, Cologne, Germany

The integration of a unique low-energy isobar suppression unit, the Anion Laser Isobar Separator (ALIS), marked a significant extension to the Cologne 6 MV AMS-System. After the successful test of the advanced gas-filled radio frequency quadrupole (RFQ) ion cooler at the Vienna test bench, we present insights from the first benchmark tests conducted at ALIS.

Our efforts focused on performance tests of the 134 sample MC-SNICS ion source and to verify its reliability, specifically for the extraction of SrF_3^-. The recent implementation of a beam attenuator has facilitated the injection of stable ion beams into the RFQ.

Additionally, we have integrated an 18 W 532 nm continuous wave laser for photodetachment of isobar anions, in compliance with German regulatory standards.

MS 3.6 Tue 12:30 HS 3042
Sample detection efficiency and detection limits for the determination of actinides at the ETH Zürich MILEA system — •Habacuc Pérez Tribouillier and Marcus Christl — Laboratory of Ion Beam Physics, ETH Zürich

This study investigates the impact of varied matrix compositions, specifically iron and niobium content, on the detection efficiency of actinides (Pu, Am, and U) using the MILEA system at ETH Zürich. Our findings highlight the significance of optimal matrix composition, a factor intricately linked to the desired analysis duration. Larger matrices are observed to be advantageous for extended measurement times, particularly beneficial for lower-concentration samples. Additionally, we present our detection limits for Pu, Am, and U isotopes, and apply them for the determination of these isotopes on small-volume samples from the area near the Fukushima Nuclear Power Plant and the North Sea.

MS 3.7 Tue 12:45 HS 3042
Applications for high throughput AMS gas measurements at the low energy limit — •Daniele De Maria[1], Urs Ramsperger[1], Marco Bolandini[2], Negar Haghipour[2], Lukas Wacker[1], and Marcus Christl[1] — [1]Laboratory of Ion Beam Physics, ETH Zurich, Switzerland — [2]Geological Institute, ETH Zurich, Switzerland

Over the last decade, the interest in radiocarbon AMS analysis of combusted samples has increased due to significant progresses made towards compact AMS systems and the development of hybrid ion sources, allowing the analysis of samples in gaseous form. To address the requirements of higher sample throughput and level of automation, a novel gas handling system, the Double Trap Interface (DTI), was developed. The original idea was to provide an instrument tailored to meet the specific requirements of biomedical companies performing metabolism and pharmacokinetic studies using ^{14}C-labeled pharmaceutical compounds as a tracer. The methodology has in general a huge potential for all high throughput applications, opening the field for nanoplastics studies and the analysis of different organic compounds in sediments. These applications are particularly suited for the miniaturized radiocarbon detection system LEA (Low Energy AMS), which has been installed at the Laboratory of Ion Beam Physics (ETH Zurich) in 2021. The instrument follows basic MICADAS design principles but operates at a terminal voltage of 50 kV only. An overview of LEA and the coupled peripherals for gas measurements as well as some preliminary results of the experiments performed over the last months are presented.