HK 48: Instrumentation XII

Time: Wednesday 16:00–17:15 Location: HK-H4

HK 48.1 Wed 16:00 HK-H4

Pellet target development for an EDM measurements at COSY — •Otari Javakhishvili for the JEDI-Collaboration — Forschungszentrum Jüelich GmbH

The JEDI (Jülich Electric Dipole moment Investigation) collaboration in Jülich is conducting a set of experiments at COSY, aiming to develop precise equipment and experimental techniques to measure the EDMs of charged particles. One of the key elements of these experiments is the new modular JEDI polarimeter with a special target system. In the current configuration, horizontal and vertical block targets are used in the polarimeter. Targets are mounted on stepper linear actuators and dedicated hardware and software are used to control target movements. The target control system is EPICS based, it can access accelerator and detector data and use them as feedback for automatic target movement or finding proper target position in the beam. The system is controlled by a user-friendly GUI. Also, it has software and hardware interlock systems. This system was successfully tested in the last beamtime. In addition, we are working on a special target system, which will allow to oscillate pellet through the beam. The frequency and speed of oscillation must be variable to achieve the desired effective target density. The monitoring system must be developed, including precise triggering, track reconstruction, and data synchronization units, this allows us to synchronize data of target with other systems in the detector. In this talk achievements and experimental results will be summarized and ongoing activities towards dedicated ballistic pellet target development presented.

HK 48.2 Wed 16:15 HK-H4

Crossing the Widom line: Cluster formation as sensitive probe of supercritical fluids — •Sophia Vestrick, Clara Fischer, and Alfons Khoukaz — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48149 Münster, Germany

In contrast to the well-defined vapor pressure curve for fluids below the critical point, there is no distinct characterization as liquid or gas in the supercritical regime. Hence, the Widom line is proposed as location of a phase transition higher order. Whereas its experimental determination is typically challenging, we found a new and simple method for precisely measuring the phase transition of supercritical hydrogen using the formation of cluster beams. Due to the two distinct cluster formation mechanisms in the liquid and in the gaseous phase, an unambiguous assignment of supercritical fluids to liquid-like and gas-like regions is possible. The novel determination of the Widom line using cluster beams represents a universal method that can be easily applied to a wide range of elements or chemical compounds. This project has received funding from BMBF (05P21PMFP1), GSI FuE (MSKHOU2023) and the EU's Horizon 2020 programme (824093).

HK 48.3 Wed 16:30 HK-H4

Development of a high luminosity lithium target system — •Philipp Eckert, Patrick Achenbach, Julian Geratz, Pascal Klag, and Josef Pochodzalla — Institut für Kernphysik, Mainz, Germany

In preparation for a precision measurement of the hypertriton mass at MAMI by decay pion spectroscopy, a high luminosity lithium target has been developed. It is designed to be 5 cm long in the beam direction but at the same time narrow to minimize the momentum straggling for sideways exiting particles.

The setup is equipped with a cooling system to prevent the lithium from melting as well as thermal cameras to observe the deposited heat and the beam alignment. Before the data taking, a test beamtime with the target is foreseen for next spring.

This project is supported by the Deutsche Forschungsgemeinschaft, Grant Number PO256/7-1 and the European Union's Horizon 2020 research and innovation programme No. 824093.

HK 48.4 Wed 16:45 HK-H4

Electron scattering in argon at the MAGIX windowless gas jet target — •Maximilian Littich for the MAGIX-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

MAGIX is a fixed target electron scattering experiment at the upcoming MESA accelerator. It will be operated in the energy recovery mode of the accelerator which allows to reach beam currents of at least 1 mA. This operation mode requires a thin target for which MAGIX will use an internal, windowless gas jet target. This cryogenic supersonic gas jet target will be able to run with different gases, e.g. hydrogen, deuterium, helium, oxygen, argon or xenon.

The MAGIX target is already existing and can be tested in the laboratory. At the existing A1 multi-spectrometer facility at the electron accelerator MAMI, we were able to operate the target with argon as the target gas and beam energies of 700 MeV and 240 MeV.

This talk will present the experimental setup used in the A1 facility and give a summary of the measurements performed. Finally an overview of the target performance and the current state of the analysis is given.

HK 48.5 Wed 17:00 HK-H4

Cluster size determination using shadowgraphy measurements — •Hanna Eick, Christian Mannweiler, Sophia Vestrick, and Alfons Khoukaz — Institute for Nuclear Physics, Westfälische Wilhelms-Universität Münster

Cluster-Jet Targets from the WWU Münster are an important component of several experiments at different research facilities.
One of them is the HHU Düsseldorf where the ARCTURUS laser is used to investigate the laser-cluster interaction. In this context measurements are performed in order to study the properties of the clusters themselves. These properties include the size of the clusters and their size distribution as well as the amount of gas in which the measured clusters are embedded.
The method used for this purpose is based on the shadowgraphy principle, in which images were taken during the illumination of the cluster beam by $<$30 fs ultrashort ARCTURUS laser pulses. The evaluation of cluster diameters has to be automated due to the large number of recorded photos.
The talk provides an overview of the evaluation method and presents the results of these analyses. First results show an average cluster size in the order of a few micrometer, which will also be of high interest for other installations using cluster beams.
This project has received funding from the EU's Horizon 2020 programme (824093).