HK 44: Instrumentation und Anwendungen

Zeit: Donnerstag 11:15–12:45 Raum: E

HK 44.1 Do 11:15 E

Polarisationsmessungen zur Optimierung der Radikalkonzentration in trityl-dotiertem D-Butanol — •M. Schiemann, B. Adebahr, F. Greffrath, J. Heckmann, C. Hess, W. Meyer, P. Pfaff, J. Philipp, E. Radtke und G. Reicherz — Institut für Experimentalphysik AG 1, Ruhr-Universität Bochum

Deuteriertes Butanol ist eines der Standardmaterialien für polarisierte Festkörpertargets. Darin wurde im Jahr 2003 durch Dotierung mit dem für das polarisierte Target neuartigen Trityl-Radikal Finland D36 mittels dynamischer Nukleonenpolarisation eine Deuteronenpolarisation von 80 % erzielt, was einer Verdopplung der bis dahin in chemisch dotiertem D-Butanol und der höchsten jemals gemessenen Deuteronenpolarisation entspricht. Erste Messungen haben gezeigt, dass die optimale Radikalkonzentration für die Tritylradikale geringer ausfällt als die „Standardkonzentration“ von $2 \cdot 10^{19} e^-/g$. Die ersten systematischen Polarisationsmessungen zur Optimierung der Radikalkonzentration für die Dotierung von D-Butanol mit dem Tritylradikal Finland D36 werden präsentiert. Weiterhin wird der Einfluss der Radikalkonzentration auf die relevanten Zeitkonstanten (Aufbauzeit, Relaxationszeit) diskutiert.

HK 44.2 Do 11:30 E

HD als polarisierbares Festkörpertarget — •Eric Radtke, Fabian Greffrath, Jörg Heckmann, Christian Hess, Werner Meyer, Patrick Pfaff, Gerhard Reicherz, Martin Schiemann und Wang Li — Ruhr-Universität Bochum

Seit einigen Jahren befasst sich die Bochumer Targetgruppe mit der Kernspinpolarisation von Wasserstoffdeuterid HD. Da das statisch polarisierte "brute force" Target, das bereits 1968 vorgeschlagen wurde, nur mit hohem technischen Aufwand realisierbar ist, wird hier der Weg der dynamischen Polarisation verfolgt.

Neben den technischen Aspekten wie Einfrieren eines tiefsiedenden Gases im bestehenden Kryostatsystem und NMR Detektion der Spinpolarisation, liegt die Herausforderung zunächst in der Erzeugung paramagnetischer Zentren für den Polarisationsprozess. Dieses ist durch in situ Bestrahlung mit einer beta- Quelle gelungen. Nun gilt es, elektronische und nukleonische Relaxationszeiten durch Sauerstoff- bzw. Protium- Beimengungen derart einzustellen, dass eine dynamische Polarisation aufgebaut werden kann.

Alternativ zur beta- Bestrahlung könnten Iodmethan- Beimengungen als Quelle schnell relaxierender paramagnetischer Zentren dienen.

HK 44.3 Do 11:45 E

Molecular polarization in molecular hydrogen (CELGAS) — •Alexander Vasilyev — Petersburg Nuclear Physic Institute, Gatchina, Russia

Conventional polarized hydrogen or deuterium targets (storage cell fed by an atomic beam source) used in experiments at storage rings do not show significant increase in a target densities since a last decade. The use of molecules where both nuclei are polarized instead of polarized atoms to feed a storage cell may be the one of the possible ways to improve this situation.

The present project aims on the extension of the studies of nuclear polarization of hydrogen molecules from recombination of polarized atoms [1] performed at IUCF, NIKHEF and HERMES/DESY. Experimental technique and first results will be presented.

Supported by the ISTC, project 1861.

[1] T.Wise et al., Phys. Rev. Lett. 87, 042701 (2001).

HK 44.4 Do 12:00 E

The Polarized Internal gas Target at ANKE: a first double polarized experiment — •Kirill Grigoryev for the ANKE-Collaboration — Petersburg Nuclear Physic Institute, Gatchina, Russia — Institut für Kernphysik, Forschungszentrum Jülich, Germany

A Polarized Internal gas Target (PIT) is currently being developed for the ANKE spectrometer at COSY. After first installation in summer 2005, commissioning studies were carried out.

In March 2006, first single polarization measurements with a polarized Hydrogen beam from an Atomic Beam Source (ABS) were performed. The beam was injected into a storage cell made from pure aluminum foil. Further analysis shows that the events from the extended gas target can be clearly identified in the ANKE forward detector system. Using unpolarized Nitrogen, the background from the cell walls could be determined as well. The measured storage cell target thickness with Hydrogen atoms in hyperfine state 1 was $2 \cdot 10^{13} atoms/cm^2$. The ABS jet target thickness was $(1.5 \pm 0.1) \cdot 10^{11} atoms/cm^2$.

In November 2006, the commissioning of a Silicon Tracking Telescope (STT) was successfully finished. For a coming beamtime in January 2007, a new storage cell from an aluminum foil coated with a Teflon will be produced and installed together with the STT into the target chamber. A Lamb-shift Polarimeter (LSP) will be mounted below the target chamber to allow online tuning of the transition units and the ABS beam polarization monitoring. A first double polarized experiment will take place and its results will be presented.

HK 44.5 Do 12:15 E

Development of High Density Cluster-Jet-Targets for Storage Ring Experiments — •Alexander Täschner, Alfons Khoukaz, Stephan General, Jennyfer Otte, Hans-Werner Ortjohann, and Tobias Rausmann — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, D-48149 Münster

Cluster-jet-targets are operated successfully since many years as internal targets for storage ring experiments. In order to utilize these targets for new types of detector systems with 4π-geometry like the PANDA detector at the upcoming FAIR at GSI, cluster-jet sources have to be improved with respect to the maximum target density to allow for highest luminosities in combination with larger distances between the cluster source and the interaction region.

For this purpose a cluster-jet target station has been build up at the University of Münster which covers the required spatial requirements of a future 4π-detection system. This target station allows for systematic studies on the production of high-density cluster-jet beams. Recent modifications resulted in an increase in target densities of a factor of more than 10 compared to hitherto existing cluster targets.

In this contribution we will present newest results in the measurement of the velocity and the mass distribution of the produced cluster beam and studies on a prototype setup for the PANDA detector.

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HK 44.6 Do 12:30 E

Droplet production from thin cryogenic jets with the Moscow-Jülich Pellet Target — •Pavel Fedorets[1,2], Markus Büscher[2], Alexander Bukharov[3], Viacheslaw Chernetsky[1], Valery Chernyshev[1], Alexander Gerasimov[1], and Alexander Semenov[3] — [1]ITEP, Moscow, Russia — [2]Forschungszentrum Jülich, Germany — [3]MPEI, Moscow, Russia

Targets of frozen droplets ("pellets") from various liquefiable gases like H_2, D_2, N_2, Ne, Ar, Kr and Xe are very promising for high luminosity experiments in a 4π detector geometry at storage-rings. High effective target densities ($> 10^{15}$atoms/cm^2), a small target size ($\oslash \approx 20 - 30 \mu m$) and a narrow pellet beam are the main advantages of such targets.

A target has been under construction at the IKP of FZJ in collaboration with two institutes from Moscow, Russia. It is developed as a prototype for the future pellet target at the PANDA experiment at FAIR/HESR. This target uses liquid nitrogen and cold evaporated helium gas for cooling. The automatically refilled baths with liquid nitrogen and liquid helium are located inside the target cryostat. The main advantages of this method are the vibration-free cooling and the possibility for liquid cryogenic jet production from various gases in a wide range of temperatures. Different regimes of pellet production from H_2 and N_2 have been observed and their parameters have been measured during the tests.

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