

HK 18: Instrumentation und Anwendungen I

Zeit: Dienstag 8:30–10:30

Raum: 2C

Gruppenbericht

HK 18.1 Di 8:30 2C

Entwicklung von supraleitenden Hochleistungs-Protonen- und Ionenlinearbeschleunigern — ●HOLGER PODLECH, FLORIAN DZIUBA, ROBERT BRODHAGE, ULRICH RATZINGER, ALEXANDER BECHTOLD, RUDOLF TIEDE, HORST KLEIN, CHUANG ZHANG und HOLGER LIEBERMANN — Institut für Angewandte Physik, Universität Frankfurt am Main

Eine wachsende Zahl von Anwendungen in praktisch allen Bereichen der Forschung verlangt intensive Primärstrahlen von Protonen und Ionen bei hohen Tastverhältnissen bis hin zum Dauerstrichbetrieb. Je nach Anwendung müssen Strahlleistungen bis in den multi-MW Bereich bereitgestellt werden. Beispiele sind Linacs zur Erzeugung radioaktiver Strahlen, zum Betrieb von Neutronenspallationsquellen, zur Transmutation von langlebigen radioaktiven Spaltreaktorabfällen (EU-ROTRANS) sowie zur Materialforschung im Rahmen des Fusionsprogramms (IFMIF). Das hohe Tastverhältnis macht supraleitende Operationen attraktiv und unter Umständen technologisch notwendig.

Insbesondere die Niederenergiesektion solcher Treiberbeschleuniger ist ein kritischer Bereich. Bisher fehlten effiziente vielzellige supraleitende Beschleunigerkavitäten für Energien bis 100 MeV. Die Entwicklung der supraleitenden CH-Struktur schließt diese Lücke. Ein am IAP entwickelter Prototyp wurde erfolgreich getestet, wobei bisher effektive Gradienten von 7 MV/m erreicht wurden. Neben der Entwicklung dieser neuartigen Strukturenklasse werden verschiedene Anwendungen vorgestellt.

HK 18.2 Di 9:00 2C

Measurement and stabilization of the longitudinal and transversal tune on the fast energy ramp at ELSA — ●MAREN EBERHARDT — Electron Stretcher Accelerator ELSA, Physikalisches Institut, Universität Bonn, Germany

At the electron stretcher accelerator ELSA, an external beam of unpolarized or polarized electrons is supplied to experimental set-ups. In order to correct for dynamic effects caused by eddy currents induced on the fast energy ramp, the accelerator tunes have to be measured in situ with high precision. The measurements of betatron tunes during the fast energy ramp are based on the excitation of coherent betatron oscillations generated by a pulsed kicker magnet. The betatron frequency is determined by a Fourier analysis of the measured oscillations of the beam position. This technique was successfully applied to measure the horizontal tune on the fast energy ramp. During the fast energy ramp shifts of the betatron tune caused by eddy currents are induced. These tune shifts are measured and corrected when operating the accelerator with polarized beam.

Measurements of coherent synchrotron oscillations will also be presented. These are excited by a phase modulation of the acceleration voltage using an electrical phase shifter in the reference RF signal path.

HK 18.3 Di 9:15 2C

Acceleration of polarized electrons at the Electron Stretcher Accelerator ELSA — ●ANDREAS BALLING — Electron Stretcher Accelerator ELSA, Physikalisches Institut, Universität Bonn, Germany

Part of the hadron physics program performed at ELSA in the framework of the SFB/TR 16 is focused on double polarization experiments. In order to supply a continuous beam of polarized electrons to external experiments, several depolarizing resonances have to be overcome during beam acceleration. Therefore, at ELSA, betatron tune jumps are applied for the compensation of intrinsic resonances and harmonic closed orbit corrections for compensation of imperfection resonances.

This talk will focus on the newly developed system for the correction of vertical closed orbit distortions which consists of 30 steerer dipole magnets, increasing the available integral field strength by a factor of 3 compared to the existing setup, and 30 switching power supplies, reducing the time needed for an orbit bump application down to well below 20 milliseconds. This new system will allow for the harmonic compensation of all imperfection resonances on the fast energy ramp (even up to 5 GeV) without interfering with the interjacent intrinsic resonances. Numerical simulations of the resonance crossing, an overview of the new setup and first results will be presented.

HK 18.4 Di 9:30 2C

A High Density Cluster-Jet-Target for 4π detectors — ●ALEXANDER TÄSCHNER, ALFONS KHOUKAZ, STEPHAN GENERAL, JENNYFER OTTE, HANS-WERNER ORTJOHANN, and TOBIAS RAUSMANN — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, Wilhelm-Klemm-Str. 9, 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 upcoming 4π -detectors like the PANDA detector at FAIR, cluster-jet sources have to be improved with respect to the maximum target thickness to allow for highest luminosities in combination with larger distances between the cluster source and the interaction region. At the University of Münster a cluster-jet target station has been build which allows for systematic studies on the production and the properties of high-density cluster-jet beams suitable for these geometries.

In this contribution we will discuss recent results on the achieved target density. Furthermore we will present recent measurements of the velocity and the mass distribution of the produced cluster beams and studies on a prototype setup for the PANDA detector.

Supported by EU (RII3-CT-2004-506078) and BMBF (06MS253I).

HK 18.5 Di 9:45 2C

Polarized ^3He targets at MAMI — ●JOCHEN KRIMMER¹, WERNER HEIL¹, and PATRICIA AGUAR-BARTOLOMÉ² for the A1-Collaboration — ¹Institut für Physik, Universität Mainz — ²Institut für Kernphysik, Universität Mainz

A polarized ^3He target has been used for the first double polarized experiments with the new acceleration stage MAMI-C in Mainz.

Highly polarized ^3He gas is provided by a polarizer which is based on the method of metastability exchange optical pumping. After filling, the target cells were brought to the experimental area, where inside a mu-metal box a homogeneous holding field is provided. The spin of the ^3He nuclei can be rotated in all directions by adiabatic rotation of the magnetic guiding field. An online monitoring of the relative and absolute polarization is possible via NMR and AFP methods, respectively. In this talk the complete setup will be described as well as its performance under electron beam conditions.

Furthermore, the status of the developments for a polarized ^3He target at the tagged photon beam of MAMI will be given.

HK 18.6 Di 10:00 2C

Das polarisierte COMPASS Target in 2006 und 2007 — ●JENS PHILIPP für die COMPASS-Kollaboration — Ruhr Universität, Bochum, Deutschland

Seit 2002 werden am COMPASS Experiment Daten genommen. Im Jahre 2005 wurde das Target modifiziert. Mit dem neuen Polarisationsmagneten, der eine größere Akzeptanz besitzt, konnten Deuteronepolarisation von +56 % und -53 % in LiD erreicht werden. In 2007 wurde Ammoniak als Protonentarget eingesetzt, mit dem Polarisierung von +90 % und Relaxationszeiten von etwa 4000 Stunden bei einem Magnetfeld von 0,6 T gemessen wurden.

HK 18.7 Di 10:15 2C

A Pellet Tracking System for WASA at COSY — ●TAMER TOLBA and JAMES RITMAN for the WASA-at-COSY-Collaboration — Institute für Kernphysik, Forschungszentrum Jülich, 52425 Jülich

A Pellet Tracking System (PTS) for WASA at COSY is proposed in order to determine the interaction point (the primary interaction vertex) for each event between the COSY beam and the target pellets. The knowledge of this interaction vertex helps to reconstruct the paths of the different decay products and thus to improve the momentum resolution of the events. Furthermore, the PTS gives information about the position distribution of the pellets, thereby allowing the geometrical alignment of the system to be improved. Several measurements were done in order to test and optimize the equipment's capabilities. Furthermore, Monte Carlo simulations for the x and z position distribution of the pellets were performed. A description of the system and the results of these tests will be presented.

Supported by BMBF.