T 410 Beschleuniger III

Zeit: Mittwoch 16:20–18:30 Raum: C2-03-527

Gruppenbericht

T 410.1 Mi 16:20 C2-03-527

Frictional Cooling Demonstration Experiment — •Daniel Greenwald, Daniel Kollár, and Allen Caldwell — Max-Planck-Institut für Physik, München, Germany

The greater mass of the muon (compared to that of the electron) and its point-like structure (compared to that of the proton) make a muon collider more advantageous than an electron or proton collider. The lack of a viable scheme for cooling muons—reducing beam emmitance while maintaining a high efficiency—presents the biggest obstacle to construction of such a collider.

We are investigating a frictional cooling scheme and an experiment is underway to demonstrate the frictional cooling principle on protons. This consists in measuring the energy of protons after they are accelerated through a gas cell by a constant electric field. A brief introduction to frictional cooling and the status of the experiment will be presented.

Gruppenbericht

T 410.2 Mi 16:40 C2-03-527

Superconductive undulator development at ANKA — •Axel Bernhard[1], Sara Casalbuoni[2], Bernd Griesebock[3], Ulrich Haake[3], Michael Hagelstein[2], Marion Klaeser[2], Barbara Kostka[2], Daniel Lützenkirchen-Hecht[3], Robert Rossmanith[2], Theo Schneider[2], Matthias Weisser[4], Daniel Wollmann[5,1], Ronald Frahm[3], Gerald Gerlach[5], Erhard Steffens[4], and Tilo Baumbach[1,2] — [1]Universität Karlsruhe — [2]Forschungszentrum Karlsruhe — [3]Bergische Universität Wuppertal — [4]Universität Erlangen — [5]Technische Universität Dresden

Superconductive undulators have been developed at the German synchrotron light source ANKA for about 15 years. These insertion devices have the potential of overcoming the fundamental limits of permanent magnet undulators in terms of field strength and short period lengths. Thereby the spectral range of the synchrotron radiation accessible may be significantly extended. Moreover, superconductive undulators provide the opportunity of controlling key parameters like the field amplitude and direction purely electrically without mechanical movements. In March 2005 the first cold-bore superconductive undulator designed for storage ring operation was installed and successfully tested at ANKA. A second generation of specialised superconductive undulators capable of electrical polarisation control, electrical period doubling and electrical field error compensation is currently developed. This contribution gives an overview over the status and future prospects of the superconductive undulator development at ANKA. (This work is supported by the BMBF grant ESAN05013603 and the EU grant RII3-CT-2004-506008)

T 410.3 Mi 17:00 C2-03-527

Der Supraleitende Undulator im ANKA-Speicherring, Betrieb und erste Ergebnisse. — •Barbara Kostka — Forschungszentrum Karlsruhe GmbH; Hermann von Helmholtz Platz 1; 76344 Eggenstein-Leopoldshafen

Im März 2005 wurde bei der Synchrotronsrtahlungsquelle ANKA in Karlsruhe der erste supraleitende Undulator für Speicherringbetrieb eingebaut und erfolgreich mit Strahl getestet. Der supraleitende Undulator (im folgenden SCU14 genannt) besteht aus zwei supraleitenden NbTi Spulen, die durch drei Kryocooler gekühlt wurden. Mit dem SCU14 wurde gezeigt, dass ein supraleitender Undulator in einem Speicherring betrieben werden kann. Mit einem zu diesem Zweck aufgebauten Messfrontend und einem Einkristallmonochromator (Zusammenarbeit mit Universität Wuppertal) wurde die Undulatorstrahlung charakterisiert. In diesem Beitrag wird über die ersten Betriebserfahrungen und Messergebnisse berichtet.

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T 410.4 Mi 17:15 C2-03-527

Phase error reduction of superconductive undulators — •Daniel Wollmann — Laboratorium für Applikationen der Synchrotronstrahlung, Universität Karlsruhe

Present synchrotron light sources make extensive use of insertion devices like wigglers, undulators or wavelength shifters. Among these, undulators are the most advanced sources of highly brilliant X-rays. Besides permanent magnet undulators, which are state of the art, superconductive undulators have been developed over the last 15 years.

The spectral properties of the synchrotron radiation produced with an undulator depend mainly on the quality of the magnetic field, which is quantified by the phase error. Therefore, concepts of phase error correction, the so-called shimming, have to be investigated for superconductive undulators.

In this contribution an electrical shimming concept for superconductive undulators will be discussed.

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Gruppenbericht

T 410.5 Mi 17:30 C2-03-527

Development of a polarized positron source for the ILC. — •K. Laihem[1], H. Kolanoski[2], and A. Stahl[3] for the E166 collaboration — [1]DESY — [2]HU Berlin. — [3]RWTH Aachen.

The full exploitation of the physics potential of an International Linear Collider (ILC), will require the development of polarized positron beams. Having both e+ and e- beams polarized in the linear collider will be a decisive improvement for many physics studies, providing new insight into structures of couplings and thus access to the physics beyond the standard model. The concept of a polarized positron source is based mainly on the development of a circular polarized photon source. Those photons are then converted in a relatively thin target to generate longitudinally polarized positrons and electrons. Two different approaches have been developed to test for the first time a polarized positron source. While in an experiment at KEK a Compton back scattering is used, the E166 experiment uses a one meter long helical undulator in a 46.6 GeV electron beam to produce MeV photons with a hight degree of circular polarization at 8.3 MeV. Beside the development of the helical undulator, the most challenging part in E166 is to measure the positron polarization using the Compton transmission polarimeter. The expected asymmetries for both photons and positrons are about 3.4% and 1% respectively. The E166 experiment had two successful run periods in June and September 2005. The data analysis shows an asymmetry in the expected range for both photons and positrons.With this observed asymmetries the helical undulator method became a preferred candidate for an ILC polarized positron source.

Gruppenbericht

T 410.6 Mi 17:50 C2-03-527

Aspects of Radiation Level at the ILC Positron Source — •Andriy Ushakov and Sabine Riemann — DESY Zeuthen

For the International Linear Collider (ILC) baseline design an undulator-based positron source is recommended. Photons generated by electrons passing a 100 m long undulator hit a rotating target and create electron-positron pairs. The positrons are captured and used for acceleration. An advantage of this source is the significantly lower radiation level in comparison to a conventional positron source which uses the electron beam directly to produce electron-positron pairs. Nevertheless, the positron source has to be installed in a shielded area with remote handling capabilities. With FLUKA, a general purpose tool for calculations of particle transport and interactions with matter, the fluxes of neutrons and photons have been calculated and the activation of the positron source components has been considered depending on the parameters of the source. The results will be presented and the shielding to protect people working in the source area will be discussed.

Gruppenbericht

T 410.7 Mi 18:10 C2-03-527

Optimierung des ILC durch Monte-Carlo-Studien — •Sebastian Schätzel und Eckhard Elsen — DESY, Hamburg

Bei der Optimierung des Internationalen Linearbeschleunigers (ILC) wird ein neuartiges, bei SLAC entwickeltes Monte-Carlo-Programm eingesetzt, das die Betriebsverfügbarkeit des Beschleunigers simuliert.

Ausgehend von der Ausfallwahrscheinlichkeit der einzelnen Komponenten (Stromversorgungseinheiten, Magnete, Klystrons, usw.) und unter Einbeziehung ihrer Vernetzung wird statistisch die verfügbare Betriebszeit (uptime) der Maschine berechnet. Dabei werden Reparaturen ebenso berücksichtigt wie Reserve-Komponenten, die im Bedarfsfall in den Betrieb zugeschaltet werden.

Die Simulation erlaubt die Bestimmung eines günstigen Beschleunigeraufbaus (design) sowie die Identifikation kritischer Komponenten, auf die weitere Forschungs- und Entwicklungs-Aktivitäten zu fokussieren sind.

Der Vortrag stellt das Programm vor und geht auf die Ergebnisse ein,

die für die Auswahl des momentan vorgesehenen ILC-Designs entscheidend waren.