DPF2004 Abstracts

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Muon Collaboration Weekly Meeting – June 18, 2004 – FNAL

- APS DPF2004: August 26-31, UC Riverside, `http://dpf2004.ucr.edu/`
- Gail Hanson (Chair, Organizing Committee), David Cline (Organizing Committee), Yağmur Torun (co-convener, Advanced Accelerator R&D)
- Some financial aid for students and postdocs with abstracts
- **Abstract submission deadline is Monday, June 21**
- Parallel sessions of interest
  - Neutrino Physics
  - Detector Development
  - Advanced Accelerator R&D
- What's been submitted or planned so far
  - Recent Advances in Muon Beam R&D (A. Klier)
  - Stochastic Processes in Muon Ionization Cooling (D. Errede)
  - 6D Ionization Muon Cooling with Tabletop Rings (D. Summers)
  - MICE
  - MICE Scintillating Fiber Tracker
- Some other possibilities
  - Physics at a Neutrino Factory
  - FFAGs
  - High-gradient NC Cavity R&D
  - High-gradient SC Cavity R&D
  - Pressurized rf
  - Gridded windows for Rf Cavities
  - Liquid Hydrogen Absorber Development
  - Thin Window Development for Absorbers and Cavities

Recent Advances in Muon Beam R&D

Intense muon beams, to be used in a Neutrino Factory and a Muon Collider, are the subject of an ongoing R&D effort toward their realization. Some of the latest R&D advances, such as a new Neutrino Factory feasibility study and 6D beam cooling using hydrogen gas absorber, are reviewed.
Speaker: Amit Klier (University of California, Riverside)
Status: submitted

Stochastic Processes in Muon Ionization Cooling

A muon ionization cooling channel consists of three major components; the magnet optics, an acceleration cavity, and an energy absorber. The absorber of liquid hydrogen contained by thin aluminum windows is the only component which introduces stochastic processes into the otherwise deterministic acceleration system. The scattering dynamics of the transverse coordinates is described by Gaussian distributions. The asymmetric energy loss function is represented by the Vavilov distribution characterized by the minimum number of collisions necessary for a particle undergoing loss of the energy distribution average resulting from the Bethe-Bloch formula. Examples of the interplay between stochastic processes and deterministic beam dynamics are given.
Speaker: Deborah Errede (University of Illinois Urbana-Champaign)
Status: submitted

6D Ionization Muon Cooling with Tabletop Rings

Progress on six dimensional ionization muon cooling with relatively small rings of magnets will be presented. Lattices being explored include sector cyclotrons with weak edge focusing and strong focusing, fixed field alternating gradient (FFAG) rings. Ionization cooling is provided by high pressure hydrogen gas which removes both transverse and longitudinal momentum. Lost longitudinal momentum is replaced using radio frequency cavities, giving net transverse emittance reduction. The longer path length in the hydrogen of higher momentum muons decreases longitudinal emittance at the expense of transverse emittance. Thus emittance exchange allows these rings to cool in all six dimensions and not just transversely. The resulting cooled muons can lead to an intense muon beam which could be a source for neutrino factories or muon colliders.
Speaker: Don Summers (University of Mississippi)
Status: submitted

MICE: the international Muon Ionisation Cooling Experiment

Muon storage rings have been proposed for use as sources of intense high-energy neutrino beams and as the basis for multi-TeV lepton-antilepton colliding beam facilities. To optimise the performance of such facilities is likely to require the phase-space compression (cooling) of the muon beam prior to acceleration and storage. The short muon-lifetime makes it impossible to employ traditional techniques to cool the beam while maintaining the muon-beam intensity. Ionisation cooling, a process in which the muon beam is passed through a series of liquid hydrogen absorbers followed by accelerating RF-cavities, is the technique proposed to cool the muon beam. The international Muon Ionisation Cooling Experiment (MICE) collaboration has been formed to carry out a muon-cooling demonstration experiment, and its proposal to Rutherford Appleton Laboratory has been approved. The MICE cooling channel, the instrumentation and the implementation at the Rutherford Appleton Laboratory is described together with the predicted performance of the channel and the measurements that will be made.
Speaker: ?
Status: ready to submit

A Scintillating Fiber Tracker for MICE (or some such)

Speaker: Malcolm Ellis
Status: in preparation

Development of Low-Mass Windows for Rf Cavities (or some such)

Speaker: Mohammad Alsharo'a
Status: suggested