2002 CONGRESS – MONDAY SESSION MO-P10
CONGRÈS 2002 - RÉSUMÉS DE SESSION MO-P10 (Lundi)

[MO-P10] NEUTRINO PHYSICS AND DETECTOR TEC HNOLOGY / PHYSIQUE DU NEUTRINO ET TECHNIQUES DE DÉTECTION — MONDAY, JUNE 3 / LUNDI LE 3 JUIN

ROOM / SALLE 2004 E ***Chair: M. Roney, U. Victoria***

MO-P10-1 **14h15**

JINGLIANG HU, TRIUMF

Measurements of Rare Kaon Decays

The first measurements of the ultra-rare kaon decay $K^+ \to \pi^+ \nu\bar\nu$ are reviewed. The latest results from experiment E787 at Brookhaven National Laboratory give a branching ratio of $Br(K^+ \to \pi^+ \nu\bar\nu) = (1.57 ^{+1.75}_{-0.82}) \times 10^{-10}$, consistent with the predictions of the Standard Model. The prospects for future measurements of $K^+ \to \pi^+ \nu\bar\nu$ and its CP-violating neutral counterpart, $K^0_L \to \pi^0 \nu\bar\nu$, (E949 and KOPIO) will be discussed.

MO-P10-2 **14h45**

Improvement of the BaBar Machine Background Simulation, **David Côté-Ahern**, *Université de Montréal* — Because of its very high luminosity, the BaBar detector needs to have a very good time resolution to reject background and to distinguish between physics events within a few nanoseconds of each other. This imposes very severe constraints on the reconstruction software. The (PEP-II) machine background is simulated by mixing real digis generated with "random triggers", with Monte Carlo digis computed with Geant4. Since the reconstruction software depends critically on the event timestamps, the digis'mixing has to be done with great care to ensure an effective time synchronization of signal and background in the simulation. We will explain how we modified the design of various algorithms to improve the BaBar machine background simulation.

MO-P10-3 **15h00**

The PICASSO Project: Progress in Detector Fabrication and next SNO-based Experiment, **Marie Di Marco**, *Université de Montréal* — Remarkable progress has been made in both observational and theoretical cosmology, leading to the ΩCDM model, attributing 30% of the total Universe density to gravitationnal matter, and 65% to the so-called dark energy. About 1-2% of the matter is visible, the rest being composed of baryonic dark matter (DM), neutrinos and non-baryonic DM. The presence of neutralinos in halos around galaxies could solve the DM problem, and also support the SUSY extension of the Standard Model. Many detectors with extremely low backgrounds aim at its detection. The PICASSO Project detector uses the technology of the bubble chamber. Substantial progress in the past year gives us confidence that this technique may lead to a detector with largely improved sensitivity to explore spin-dependent neutralino interactions. Low background detectors with increased mass are under construction for an experiment to be deployed in the underground laboratory of SNO.

MO-P10-4 **15h15**

Aspects of Cryogenic Particle Detection*, **John P. Harrison** and Rolf T. Horn, *Queen's University* — Cryogenic detection of rare decay events (neutrinos, dark matter) will depend upon prompt phonon detection. There are 2 problems: (a) A local hot spot created by a decay or interaction does not down-convert all the way to the low energy phonons that propagate ballistically. (b) For high sensitivity, millikelvin operation is required; but then the electrons in the detecting bolometer become uncoupled from the ambient phonons and the bolometer time constant becomes too long. New results for this electron-phonon coupling and its effect on ballistic phonon detection at 600 and 250 mK will be presented and discussed.

* Support from NSERC is gratefully acknowledged.

15h30 **Coffee Break / Pause café**

MO-P10-5 **15h45**

A. KONAKA, TRIUMF

Future neutrino physics prospects and Canadian activities

Convincing evidence of neutrino oscillations in observations of both solar and atmospheric neutrinos has opened up the long-awaited door to physics beyond the standard model. Accelerator based long baseline neutrino experiments will allow precision measurements of neutrino mass and mixing in a controlled environment, in particular, measurements of the unknown parameters, 1st to 3rd generation mixing angle and the CP violation phase. I will review future prospects in neutrino oscillation experiments and describe activities in Canada.

MO-P10-6 **16h15**

Withdrawn

SNO Calibration Proportional Chambers, **Ferenc Jacob Rolf Dalnoki-Veress**, *Carleton University* — Last year the Sudbury Neutrino Observatory (SNO) collaboration in its first phase of a pure D_2O active volume, presented convincing evidence for neutrino oscillations via the comparison of the charged current and elastic scattering interaction rates. SNO is now taking data in a new phase, where salt has been added to the D_2O to enhance the probability of detecting neutrinos which interact via the neutral current. It is imperative that if a precision measurement is to be made of the charged current to neutral current ratio, the low energy background from natural Thorium and Uranium in the SNO active volume must be very well understood. For this reason a technique has been developed where the SNO detector response to each component of the isotopic background in the D_2O can be measured. The technique relies on a proportional counter (PCS) which acts both as a detector as well as an isotopic source. If various sources such as ^{228}Th are placed on the anode of the proportional counter, the beta-decay is tagged by the PCS, and the subsequent Cherenkov radiation that is produced is detected by SNO. The method aims to make a background and distortion free measurement of the energy spectrum for each isotopic source in SNO. In this talk, the PCS design will be reviewed and the use of the PCS in the SNO detector will be described. A comparison of the experimental response of a ^{228}Th loaded PCS with Monte Carlo simulations will be presented.

MO-P10-7 **16h30**

SNO Optical Calibration, **Darren Richard Grant**, *Carleton University* — The Sudbury Neutrino Observatory (SNO) detector is unique in its use of heavy water as a detection medium, permitting it to make a solar model-independent test of the neutrino oscillation hypothesis from the measurements of the neutrino flux. SNO has been operating in the salt phase of the experiment since June 2001 in order to enhance the detection capability for neutral current events. Extraction of the charged current, neutral current, and elastic scattering solar neutrino fluxes during this phase requires a complete optical calibration of the detector and a measurement of how the signal extraction systematic uncertainties are affected by any changes in the detector properties. Preliminary results of the SNO optical parameters will be presented, together with an overview of the signal extraction techniques for the salt phase.

MO-P10-8 **16h45**

The Photomultiplier Tube Calibration of the Sudbury Neutrino Observatory, **I. Lawson** and the SNO Group, *University of Guelph* — The Sudbury Neutrino Observatory (SNO) is an imaging Cerenkov detector using 1000 tonnes of heavy water surrounded by approximately 9500 photomultiplier tubes (PMTs). It is designed to search for neutrino flavour oscillations through the detection of Cerenkov photons produced following the interactions of B8 solar neutrinos with the heavy water. These neutrinos can interact with the heavy water via three different reactions. This allows the electron neutrino flux and the total flux of all neutrino flavours to be measured. In order to distinguish the different types of reactions, it is essential to reconstruct where the interactions took place in the detector. The reconstruction critically depends on an accurate knowledge of the relative times at which the PMTs detect the Cerenkov photons. The SNO electronics record a time and an integrated charge for each PMT that is triggered by a photon. The recorded time has an unknown offset and the time resolution of the PMTs is degraded by an effect arising from variations in the pulse sizes. The PMT calibration removes the time offsets, giving the relative timing of the PMTs, and restores the time resolution. This talk describes how the PMT calibration has been implemented and presents the results of its performance using the SNO data.

17h00 **Session Ends / Fin de la session**