EP Seminar

SPEAKER: Kendall Mahn (Michigan State University)

TITLE: **nuPRISM: An experimental method to remove neutrino interaction uncertainties from oscillation experiments**

DATE: Mon 15/09/2014 11:00

PLACE: Main Auditorium

ABSTRACT

Future experiments propose to make precision measurements of parameters in the neutrino mixing matrix, including the possibly maximal mixing angle theta23, and an unknown CP violating phase, dCP, by comparing the event rate of neutrinos and antineutrinos observed close to, and far from the source. Such "near to far" extrapolation methods must achieve percent level understanding of neutrino and antineutrino interactions; the interaction determines the relationship between experimental observables and the oscillation probability which depends on the neutrino energy.

However, recent developments over the last 5 years demonstrate that our understanding of neutrino interactions is insufficient. In particular, the interaction of neutrinos on correlated pairs of nucleons has only recently been added to neutrino interaction simulations. The identification of these processes as interactions on a single nucleon results in a significant bias to the measured mixing parameters, even when near detector information is included in the analysis. Furthermore, the rate of this process is not well characterized, with notable differences between models.

A novel new near detector technique, nuPRISM can address uncertainties in the neutrino interaction models. The detector measures multiple neutrino fluxes at different off-axis angles, which can be combined to create a pseudo mono-energetic neutrino flux measurement. This provides a direct relationship between the neutrino energy and experimental observables, and minimizes neutrino interaction model dependence in the determination of neutrino oscillation parameters.

This seminar will discuss the near to far extrapolation methods employed by current oscillation experiments with the T2K experiment as an example, the issues related to neutrino interactions which are relevant to future measurements of theta23 and dCP, and how the nuPRISM technique can be used to mitigate these issues.

Organised by: M. Mangano, C. Lourenco, G. Unal.....

Tea and Coffee will be served at 10h30