Pomita Ghoshal

Research Summary:

During this year, we have worked further on the analysis of the sensitivity to the neutrino mass hierarchy using atmospheric neutrinos. We have attempted to evaluate the observability and experimental viability of these theoretically predicted effects with the help of actual event rate calculations for some future detectors. Appreciable matter effects are observed in the muon survival events using atmospheric neutrinos as the source. Also, taking into account the electron-like events leads to a large increase in the sensitivity to the mass hierarchy. Hence at present I am working on computing the sensitivity using both muon and electron-like events. This analysis has been performed for proposed atmospheric neutrino experiments using a large magnetized iron calorimeter detector like INO and a megaton Water Cerenkov detector like HyperKamiokande. I am working on including realistic estimates of the possible statistical and systematic errors in our analysis, and taking into account the resolution functions which smear the event distributions, thus affecting the sensitivity, as well as parameter uncertainties and correlations which may further reduce it. Further applications of this analysis may include future experiments involving superbeams and neutrino factories.

I have started working on a four-flavor analysis of atmospheric neutrino data. The three-flavor analytic expressions for the survival and oscillation probabilities as well as the numerical results are modified when a fourth sterile neutrino is taken into account. I am working on a study of how the results at the probability level are affected in a four-flavor scenario.

Preprints:

1. R. Gandhi, P. Ghoshal, S. Goswami, P. Mehta, S. Shalgar, S. Uma Sankar, *Mass Hierarchy Determination via Atmospheric Neutrino Detectors* (in preparation)

Conference/Workshops Attended:

1. *Topical Meeting on Physics at the LHC*, Harish-chandra Research Institute, Allahabad, India, December, 2006.

2. *21st International Workshop on Weak Interactions and Neutrinos (WIN07)*, Saha Institute of Nuclear Physics, Kolkata, India, January, 2007.

3. *Joint Indo-German School And Workshop (JIGSAW 2007)*, Tata Institute of Fundamental Research, Mumbai, India, February, 2007.

Visits to other Institutes:

1. Munich Technical University, Munich, Germany, May - June, 2006.

Other Activities:

1. Worked as a tutor for the course taken by Raj Gandhi in Electrodynamics for first year students in H.R.I, August - December, 2006.