

Amitava Raychaudhuri

Research Summary:

In 2006-07, research has been carried out in aspects of neutrino physics, models based on space-time with extra dimensions, and grand unified theories. These are briefly discussed in turn below.

In neutrino physics, a considerable effort has been spent on the prospects of a beta-beam facility – a source of pure ν_e or $\bar{\nu}_e$ beams. It has been shown that such a facility has unique advantages in both long- and short-baseline set-ups to better determine and constrain neutrino mass and mixing parameters as well as to explore non-Standard physics, like R-parity violating supersymmetry.

Research has also been carried out to determine how well the ICAL detector at INO will be able to probe the neutrino mass splitting and mixing angle relevant for atmospheric neutrino oscillations.

Models in which space-time has more than four dimensions have been examined for the unification of gauge couplings at high energies.

A light intermediate scale in GUTS is a necessary ingredient for satisfying the requirement of proper leptogenesis. Obtaining such an intermediate scale is fraught with difficulties. It has been shown that within SUSY SO(10) GUTs this may be possible if the Higgs multiplets are appropriately chosen (**16** rather than **126**) and threshold corrections are incorporated. Alternate possibilities include the use of non-renormalisable Planck scale interactions and/or introduction of additional chiral multiplets.

Publications:

1. Rathin Adhikari, Sanjib Kumar Agarwalla, and Amitava Raychaudhuri, *Can R-parity violating supersymmetry be seen in long baseline beta-beam experiments?*, Phys. Lett. **B642**, 111–118 (2006)
2. Gautam Bhattacharyya, Anindya Datta, Swarup Kumar Majee, and Amitava Raychaudhuri, *Power law running in Universal Extra Dimension scenarios*, Nucl. Phys. **B760**, 117-127 (2007)
3. Swarup Kumar Majee, Mina K. Parida, Amitava Raychaudhuri and Utpal Sarkar, *Low intermediate scales for leptogenesis in SUSY SO(10) GUTs*, Phys. Rev. **D75**, 075003 (2007)
4. Sanjib Kumar Agarwalla, Subhendu Rakshit, and Amitava Raychaudhuri, *Probing Lepton Number Violating Interactions with Beta-beams*, Phys. Lett. **B647**, 380-388 (2007)

5. Sanjib Kumar Agarwalla, Sandhya Choubey, and Amitava Raychaudhuri, *Neutrino mass hierarchy and θ_{13} with a magic baseline beta-beam experiment*, Nucl. Phys. **B771**, 1-27, 2007

Preprints:

1. Sanjib Kumar Agarwalla, Sandhya Choubey, Srubabati Goswami, and Amitava Raychaudhuri, *Neutrino parameters from matter effects in P_{ee} at long baselines*, hep-ph/0611233, Phys. Rev. D (to appear)
2. Abhijit Samanta, Sudeb Bhattacharya, Ambar Ghosal, Kamales Kar, Debasis Majumdar, and Amitava Raychaudhuri, *A GEANT-based study of atmospheric neutrino oscillation parameters at INO*, hep-ph/0702180
3. M. Sajjad Athar *et al.*, *India-based Neutrino Observatory: Project Report. Volume I*, INO-2006-01

Conference/Workshops Attended:

1. *Workshop on LHC Physics*, TIFR, India, September, 2006.
2. *Topical Meeting on Physics at the LHC*, HRI, India, December, 2006.
3. *JIGSAW 2006*, TIFR, India, February, 2007,

Invited Lectures/Seminars:

1. *Neutrino mass hierarchy and θ_{13} with a magic baseline beta-beam experiment*, JIGSAW - the Joint Indo-German School and Workshop, TIFR, Mumbai, February 2007.
2. *Neutrino Novelties*, Department of Physics, Presidency College, Kolkata, December 2006.
3. *Neutrino physics today*, One-day meeting on the India-based Neutrino Observatory, Department of Physics, University of Calcutta, November 2006.
4. *Neutrino mass hierarchy and θ_{13} with a magic baseline beta-beam experiment*, Homi Bhabha Lecture, University of Durham, November 2006.
5. *The India-based Neutrino Observatory: Status and Physics Prospects*, Homi Bhabha Lecture, University of Liverpool, November 2006.
6. *Neutrino mass hierarchy and θ_{13} with a magic baseline beta-beam experiment*, Homi Bhabha Colloquium, Cockcroft Institute, Warrington, November 2006.

7. *The India-based Neutrino Observatory: Status and Physics Prospects*, Homi Bhabha Colloquium, University of Glasgow, November 2006.
8. *Neutrino mass hierarchy and θ_{13} with a magic baseline beta-beam experiment*, Homi Bhabha Lecture, University of Southampton, November 2006.
9. *The India-based Neutrino Observatory: Status and Physics Prospects*, Homi Bhabha Colloquium, Imperial College, London, November 2006.
10. *The India-based Neutrino Observatory: Status and Physics Prospects*, Homi Bhabha Lecture, University of Oxford, November 2006.
11. *The India-based Neutrino Observatory: Status and Physics Prospects*, National Conference on the Emerging Trends in Physics, SGTB Khalsa College, New Delhi, September 2006.
12. *Electroweak Symmetry Breaking*, Workshop on LHC Physics, TIFR, Mumbai, September 2006.
13. *Neutrinos Today*, Colloquium, Inter-University Centre for Astronomy and Astrophysics, Pune, April 2006.
14. *Neutrinos Today*, INO Training School, HRI, Allahabad, April 2006.

Academic recognition/Awards:

- Homi Bhabha Lecturership, Institute of Physics (UK) and the Indian Physics Association, 2006.

Other Activities:

1. Member, Governing Board, IUCAA, Pune.
2. Visitors's Nominee, Academic Council, Visva-Bharati, Santiniketan.