

# Biswarup Mukhopadhyaya

## Research Summary:

(a) Different aspects of supersymmetric (SUSY) theories have been studied, with special reference to collider signals at the Large Hadron Collider (LHC). One of the important outcomes of this investigations is the identification of novel signals for scenarios with a right sneutrino as the lightest supersymmetric particle, which are being used by the experimentalists at the LHC.

(Sudhir Kumar Gupta, Santosh Kumar Rai, Biswarup Mukhopadhyaya)

(b) The implications of supersymmetric models in the neutrino have been investigated. One area of study is the identification of viable regions in the SUSY parameter space which correspond to the observed neutrino mass pattern and bi-large mixing, using flavour-dependent behaviour in the hidden sector of a broken SUSY model.

(R. Srikanth Hundi, Biswarup Mukhopadhyaya).

Another aspect of the above study is the identification of SUSY models where lepton number can be violated by two units (thereby allowing Majorana masses for neutrinos) but violation by one unit is heavily suppressed (thereby ensuring a SUSY dark matter candidate). It was shown how a supergravity framework can lead to such a possibility.

(R. Srikanth Hundi, Biswarup Mukhopadhyaya, Soumitra SenGupta).

(c) It was shown that Little Higgs theories with broken T-parity can lead to situations where the Higgs boson may have dominantly invisible decay modes. It could act as a distinctive signal of such theories in certain regions of the parameter space.

(R. Srikanth Hundi, Biswarup Mukhopadhyaya, Andreas Nyffeler).

(d) Implications of a degenerate neutrino scenario was studied, where the Majorana neutrino phases can lead to certain conclusions about the 1-3 mixing angle in the neutrino sector.

(Rathin Adhikari, Anindya Datta, Biswarup Mukhopadhyaya).

(e) Elaborate studies, including the writing of detailed simulation codes in the context of the LHC, are in progress, in the context of non-universal SUSY theories, and CP-violation in the SUSY sector.

(Priyotosh Bandopadhyay, Subhaditya Bhattacharya, Aresh Krishna Datta and Biswarup Mukhopadhyaya).

## Publications:

1. Sudhir Kumar Gupta, Biswarup Mukhopadhyaya, Santosh Kumar Rai, *Right-chiral sneutrinos and long-lived staus: Event characteristics at the large hadron collider*, Phys. Rev. **D75**, 075007 (2007).

2. Raghavendra Srikanth Hundi, Biswarup Mukhopadhyaya, Andreas Nyfeler *Invisible Higgs boson decay in the Littlest Higgs model with T-parity*, Phys. Lett **B649**, 280 (2007).
3. Biswarup Mukhopadhyaya, Raghavendra Srikanth, *Bi-large neutrino mixing in R-parity violating supersymmetry: The Role of right-chiral neutrino superfields*, Phys. Rev. **D74**, 075001 (2006).
4. Sudhir Kumar Gupta, Biswarup Mukhopadhyaya, Santosh Kumar Rai, *Distinguishing split supersymmetry in Higgs signals at the large hadron collider*, Phys. Rev **D73**, 075006 (2006).

### **Preprints:**

1. Rathin Adhikari, Anindya Datta, Biswarup Mukhopadhyaya, *The neutrino mass scale and the mixing angle  $\theta_{13}$  for quasi-degenerate Majorana neutrinos*, hep-ph/0703318.
2. Biswarup Mukhopadhyaya, Soumitra SenGupta, Raghavendra Srikanth Hundi, *Supergravity reconciles dark matter with lepton number violating neutrino masses*, hep-ph/0609304.

### **Conference/Workshops Attended:**

1. *Workshop on Physics at the LHC*, TIFR, Mumbai, September, 2006.
2. *International Workshop on Theoretical High Energy Physics*, IIT, Rorkee, March, 2007.

### **Visits to other Institutes:**

1. Indian Association for the Cultivation of Science, Kolkata, June-July, 2006.
2. University of Calcutta, Kolkata, January, 2007.

### **Invited Lectures/Seminars:**

1. *Some Implications of split supersymmetry*, Indian Association for the Cultivation of Science, Kolkata, July, 2006.
2. *Extra dimensions and particle physics*, Presidency College, Kolkata, July, 2006.
3. *Why look beyond the standard model?*, Workshop on Physics at the LHC, Tata Institute of Fundamental Research, Mumbai, September, 2006.

4. *Curled-up space in the laboratory*, Kalyani University, West Bengal, September, 2006.
5. *New physics at the LHC*, University of Calcutta, Kolkata, September, 2006.
6. *Dogs that do not bark*, International workshop on theoretical high energy physics, IIT, Roorkee, Roorkee, March, 2007.

### **Academic recognition/Awards:**

- Fellow, National Academy of Science, India, 2006.

### **Other Activities:**

1. Member, Programme Advisory Committee, International Workshop on Weak Interaction and neutrinos (WIN07), Kolkata, January 2007.
2. Member, National Organising Committee, International workshop on theoretical high energy physics, Roorkee, March, 2007.
3. Dean, academic, HRI, since August, 2006.