

Nirmalya Parua

Curriculum Vitae

M.S. 352, D0 Experiment
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Education:

- Ph. D. in Physics, University of Mumbai, India, 1998
Dissertation : Search for R-parity violating Supersymmetry in
p-pbar collisions at $\sqrt{s} = 1.8$ TeV
Advisor : Prof. V.S Narasimham
- M.Sc in Physics, Jadavpur University, India , 1991
- B. Sc in Physics, Vidyasagar University, India, 1991

Employment:

- Senior Post Doctoral Research Fellow at Indiana University, Bloomington (September 2006 till present)
- Research Scientist at SUNY, Stony Brook (November 2002 to August 2006)
- Research Associate at SUNY, Stony Brook (September 2000 to November 2002)
- Post Doctoral Research Associate at Grenoble, France (January 1999 to September 2000)

Research:

Senior Post Doctoral Research Fellow (September 2006 till Present) :

- **Dijet Angular distribution and quark compositeness:**
This analysis is in advanced stage. Precise knowledge of uncertainties in the determination of jet energy scale and the correlation of the systematic uncertainties is crucial for this analysis. After a long hard work by the jet energy scale group (that I co-lead for 2 years, from July 2003 till September 2005), jet energy scale with remarkable uncertainty is finally achieved. We now need to incorporate this into the dijet angular distribution analysis, and expect to finalize the result by the end of this year.
- **Level 3 Muon Expert :**
Every time when there is a change in tracking algorithm, or state of the tracking or muon detector we need to make sure that we are able to reconstruct Muons at the third level of triggering with high efficiency, and the muon momentum is well measured. I developed code to compare efficiencies at different luminosities, and

also to check for any difference in efficiencies before and after tracking algorithm code changes.

- **Trigger board representative for b-physics group:**

During past 1 year I took crucial part in designing trigger menu that helps getting enough number of b-physics events at high luminosity environment.

Research Scientist (November 2002 till August 2006) and Research Associate (September 2000 till November 2002) at the State University of New York at Stony Brook (Stationed at Fermi National Accelerator Laboratory, Batavia, Illinois)

- Started to work on the dijet angular distribution and quark compositeness.

- **Co-Convener of the Jet Energy Scale group**

As a co-convener of the Jet Energy Scale (JES) group for the period of July 2003 to September 2005, I coordinated a group of more than 20 physicists (including many graduate students, and postdoctoral fellows) in developing the correction needed to correct measured jet energy to the best estimate of the true value of the jet at particle level. Over the past 2 years the group has provided much improved jet energy scale that is used by all D0 analyses that depends on jets. Also detailed plans for future improvements were chalked out. I also guided and worked closely with a student in determining offset correction (that includes energy from electronics noise, pileup, underlying events) for jet energy scale.

As a convener of the JES group I was a co-developer of the JetCorr package that applies the correction to the reconstructed jet. This package is written in C++.

- **Calorimeter Group leader**

From June 2001 till Sept 2003, I led a group of more than 25 physicists working for better understanding and commissioning of D0 calorimeter detector, one of the most important parts of the D0 detector. It has 55,000 readout channels. To deliver physics results at the highest quality, one need to have more than 99.9% of these 55,000 channels operational, and their calibration understood at the finest level. The charge of the group was to

- Commission and debug the electronics.
- Develop calibration procedure, software for calibration and regularly perform calibration.
- Develop software for around the clock monitoring of the calorimeter during data taking.
- Develop software and procedure to suppress non-functional channels.

I had developed many monitoring packages that were written in C++, also oversaw development of many software projects that were written in python. I also modified many of the packages written in python.

- **Member of the Calorimeter task force**

For the period of August 2002 to January 2003, I served as a member of Calorimeter task force. This special group was formed to determine the performance of the calorimeter as a function of the zero-suppression threshold, and tune the detector simulation to better match the data.

- **Installation and Commissioning of the Calorimeter Electronics**

I took a crucial role in the installation of calorimeter electronics, in particular I debugged and installed all 1200 Base Line Subtractor (BLS) boards. After huge effort we reduced the number of non-working channels to less than 0.1%.

- I also worked on to determine the effect of jet energy scale uncertainty on the measurement of the top pair production cross section. The result of this study was reported in two D0 internal notes.

- **Served in several editorial boards**

Editorial board is a crucial component in the process of publication of physics analyses at D0, as this is the only independent body that critically examines an analysis before submission to a journal for publication. I served in the following editorial boards.

- R-parity violating SUSY search in dimuon channel & Search for Resonant Slepton Production through R-parity Violation in the D0 Experiment. Both these papers are published in the Physical Review Letters.
- Editorial board for contact interactions: Eight papers were reviewed by this editorial board and were subsequently presented in many international and national conferences in the summer of 2003.
- Searches for Leptoquarks: Search for First Generation Leptoquark is published in PRD Rapid communication. Second Generation Leptoquark paper is published in Physics Letters B. Paper on search for singly produced Leptoquark is published in PLB. Another paper on search for excited quark is published in PRD Rapid Comm.

Post Doctoral Research Associate at Grenoble, France (January 1999 September 2000)

- **Studies of the R-parity Violating Supersymmetry**

I had extended the scope of the search for the R-parity Violating Supersymmetry done at D0. In my PhD thesis I concentrated on one value of the mSUGRA parameter $\tan\beta$ and taken non-zero value of one of the R-parity violating coupling, λ'_{122} . During this period I extended the search for several values of $\tan\beta$ (up to $\tan\beta = 10$) and included effects of all six R-parity violating λ' coupling terms involving electron, namely λ'_{1jk} (where $j=1, 2$ and $k=1, 2, 3$). This is published in PRL. I also studied the expected reach of D0 for this search at Run II. This work has been presented in several workshops at Fermilab and published as hep-ph articles (hep-ph/9906224, hep-ph/9904397).

- **Run II Software at D0**

I played important role in understanding and determining electron identification criteria and establishing their efficiency and impurity. I also initiated work on electron identification by the use of likelihood method at ISN, Grenoble. (Now renamed to LPSC)

- **Activities in GDR's (Groupe de Researcher at France)**

I actively participated in several GDR activities. I had given seminars in the GDR at Marseille on the searches of R-parity violating supersymmetry at Tevatron and in the GDR for the study of Non-universal Supersymmetry held at CERN, Geneva, Switzerland. We also actively collaborated with a group at SACLAY in improving existing event generators to incorporate several new R-parity violating SUSY processes, including single production of Supersymmetric particles.

Research Scholar at TIFR, India (August 1992 -- December 1998)

- **Searched for R-parity violating Supersymmetry:**

I conducted my thesis research on the "Search for Supersymmetry through R-parity violation in the dielectron channel at D0". In doing this I gained expertise in simulation of signal, modeling of the background processes, analysis of collider data and statistical interpretation of the results. Result of this analysis is published in Physical Review Letters.

- **Worked on Supersymmetry Phenomenology**

Looked at the effect of having a light sneutrino in Minimal Supersymmetric Standard Model (MSSM), on the existing D0 limit on squark-gluino masses. It is shown that if the sneutrino is the second lightest SUSY particle, it can have profound effect on the search of supersymmetric particles at the Tevatron. The result of this analysis is published in Physics Letters B 395(1997) 54-62.

- **Built scintillator detector:**

I took leading role in building and testing scintillator detectors for the Muon system in D0. A limited authorship paper based on the work on scintillation counters for the D0 muon upgrade has been published in Nucl. Inst. Meth. A401:45-62,1997.

Teaching Experience

While working as the Calorimeter detector system coordinator and JES convener I had supervised many students. Also supervised a summer student in 2002 and continuing to supervise a graduate student working on offset correction for JES.

Computational Skill:

I had developed and maintained many software packages that are used for online and offline monitoring of the D0 calorimeter, correction package for reconstructed energy of jets. I also developed physics analysis packages both in fortran and in c++. I am proficient in C++ and Fortran programming language, Linux/unix operating system and also have workable knowledge on python, and xml.

Professional Affiliations:

Member of American Physical Society
Member of D0 Collaboration

Principal author of the following papers :

“Search for R-parity violation supersymmetry in the dielectron channel”, B.~Abbott et al, Phys. Rev. Lett. **83**, 4476 (1999)

“Squark Gluino Mass Limits Revisited for Nonuniversal Scalar Masses”, Amitava Datta, Monoranjan Guchait, Nirmalya Parua, Phys. Lett. B395 (1997) 54.

“Search for R-parity Violating SUSY in Run II at D0” S. Banerjee, N.K. Mondal, V.S. Narasimham, N.Parua, hep-ph/9904397

“Searching for R-Parity Violation at Run II at the Tevatron.” B. Allanach et al., hep-ph/9906224

“Scintillation Counters for the D0 Muon Upgrade” B.S. Acharya et al. Nucl. Inst. Meth.A401: 45 ,1997

“Heavy Quark Production in Conjunction with Z Boson at D0”, Published in the proceedings of Deep Inelastic Scattering (2005), 907-910

“W/Z Physics at D0”, N.Parua, Published in the proceedings of Les Recontres de Phisique de la Vallee d’Aosta (2004), 531-535

“The RunII D0 Calorimeter: Electronics upgrade and its performance”, N. Parua, Published in the proceedings of Calorimetry in particle physics (2002), 687-694

“Searches for Supersymmetric particles at the Tevatron”, N. Parua, Published in the proceeding of Deep Inelastic Scattering (2000), 495-498

“Searches for New Phenomena at the Tevatron”, N. Parua, Published in proceedings of Frontiers of Matter (1999), 381-383

Talks given at Conferences and Meetings:

“D0 Measurement of the Inclusive Jet Cross Section”, PANIC 05, Santa Fe, NM, USA, October 24-28, 2005

“Z + b jet production at D0”, XIII International Workshop on Deep Inelastic Scattering”, Madison, Wisconsin, USA, Apr 27 – May 1, 2005

“WZ Physics at D0”, Les Rencontres de Physique de la Vallée d'Aoste, Italy, Feb 29-Mar6, 2004.

“The RunII D0 Calorimeter Electronics Upgrade and its Performance”. Calor 2002, CalTech, Pasadena, USA, March 25-29, 2002

“First Jet Results Using the Upgraded D0 Detector”, DPF, Williamsburg, USA, May 24-28, 2002.

“Search for R-parity Violating Supersymmetry in the Dielectron Channel at D0.”, Higgs and Supersymmetry : Search and Discovery. Gainesville, Florida, U.S.A., March 8-11, 1999.

“Search for R-Parity Supersymmetry at Tevatron”, Reunion Generale du GDR, Marseille, France, May 5-7 1999.

“New Phenomena Searches at the Tevatron”, Frontiers of Matter Blois, France, June 27 - July 3, 1999.

“Searches for Supersymmetric particles at the Tevatron”. Deep Inelastic Scattering, Liverpool, England, April 25-30, 2000

“Search for Charged Higgs Bosons at the Tevatron”, SUSY 2000, CERN, Geneva, Switzerland, June 26 - July 1, 2000

“Status of the D0 calorimeter.” All Experimenters' meeting, Fermilab, USA.

Several plenary talks in D0 collaboration workshops

Delivered Several tutorials on calorimeter operation

Well over hundred talks and reports at D0 internal group meetings.

Awards and Scholarships

Research scholarship at Tata Institute of Fundamental Research, India

Award in the form of grant travel, Fees to attend Nato School on

“Techniques and concepts of High Energy Physics.” St. Croix, Virgin Island, USA