Dhiman Chakraborty

Address: *Department of Physics, Northern Illinois University, DeKalb, IL 60115, USA.*
Phone: *1-630-452-6368* , e-mail: dhiman@fnal.gov , www: http://www-d0.fnal.gov/~dhiman/

The online version of this CV available on my web-page has some useful live links.

BIO-DATA

Born July 7, 1966. Indian citizen. Permanent resident of the USA.

EDUCATION

Ph.D., Physics, State University of New York at Stony Brook (1994).
B.Tech., Engineering Physics, Indian Inst. of Technology, Mumbai (1988).

PROFESSIONAL EXPERIENCE

Associate Professor of Physics (tenured, since August 2007),
Assistant Professor of Physics (till August 2007),
Northern Illinois University
January 2001 – present

Teaching: I have taught, or am scheduled to teach, the following courses at the NIU Physics department:

- *Elementary Astronomy (PHYS 162)*: General education elective for undergraduates; Fall '07.
- *Fundamentals of Physics 2: Electromagnetism (PHYS 273)*: Undergraduate course for physical science and engineering majors; Spring '08.
- *Analytical Mechanics 1 (PHYS 300)*: Core course for junior undergraduate Physics majors; Fall '01.
- *Analytical Mechanics 2 (PHYS 400)*: Core course for senior undergraduate Physics majors; Spring '02, Spring '03.
- *Classical Mechanics (PHYS 500)*: Core course for all gradute students of Physics; Fall '02; Fall '03, Fall '04, Fall '05, Fall '06.
- *Introduction to Elementary Particle Physics (PHYS 584)*: Elective for physics graduate students; Spring '01, Spring '06, Spring '07.
- *Techniques in Experimental High Energy Physics (PHYS 690B)*, Elective "special topics" course for physics graduate students; Spring '05.

Research: I am actively involved in the following collaborative projects:

- **Studies of proton-proton collisions with the ATLAS detector at the Large Hadron Collider (CERN)**: I am the NIU team-leader on ATLAS. We joined ATLAS in June 2007, and are working in close collaboration with colleagues at the Argonne National Laboratory. We are involved in the calibration and monitoring of the tile hadrornic calorimeter and simulation of cavern background. Our physics interests lie in searches generally for any new physics, and particularly for charged Higgs bosons, in the production and decay of top quarks.
- **Detector R&D for the International Linear Collider (ILC):** I direct the ILC detector software efforts, i.e., simulation and algorithm development, at NIU. Our team has made major contributions to the American and international efforts by writing programs for simulation of energy deposited by high-energy particles in the detector volume, as well as propagation and recording of the signal. Another area where the group plays a prominent role is development of Particle-Flow Algorithms (PFA), which have the potential of dramatically improving jet energy resolutions. I am

also involved in the R&D of a finely segmented scintillator-based hadron calorimeter. The detector development group at NIU has made key advances in proving the feasibility of such a device using a relatively new solid-state photodetection technology.

Since June, 2002, I have been serving as a co-leader of the American Linear Collider Physics Group (ALCPG) Calorimetry working group, which coordinates research and development activities of 11 university and laboratory groups. These R&D include design and prototyping of electromagnetic and hadron calorimeters, as well as PFA's.

- **Studies of proton-antiproton collisions with the DØ detector at the Tevatron (Fermilab)**: From June 2001 to July 2005, I served as a co-convenor of the τ identification group of the DØ collaboration. Presently I am co-leading searches for charged Higgs bosons in decays of pair-produced top quarks. Students and scientists from 4 institutions participate in this effort. My student Mikhail Arov and I performed the first measurement of top-antitop pair-production cross section using the $t\bar{t} \to \tau$+jets final state at the Tevatron. It was not only a test of the SM, but also an important step toward the search for certain scenarios beyond the SM that lead to large enhancements of this final state. For example, if a charged Higgs boson exists (it is required by Supersymmetry), and is lighter than the top quark, then the $t\bar{t} \to \tau$+jets branching fraction would exceed the SM prediction. I am advising another student, Diego Menezes, who is searching for $t \to H^+b$ through the disappearance of the SM $t\bar{t}$ signal.
- **The Particle Data Group (PDG)**:
I am a co-author of the section on Photon Detectors in PDG's *Review of Particle Physics*.

Research Scientist, State University of New York at Stony Brook.
May 1997 – January 2001

During this period, I contributed to the following tasks at DØ:

- **Searches for charged Higgs boson in decays of the top quark**: I led these searches, which resulted in two publications based on the Run 1 data.
- **Studies of the top quark**: For 4 years (1996-2000), I served first as a co-leader of a subgroup, and later as a convenor of the *top* physics group at DØ. Later I co-authored an invited article on the present status and future prospects of top quark physics at the Tevatron, LHC, and ILC. This article, titled *Review of Top Quark Physics*, was published in the 2003 issue of the *Annual Review of Nuclear and Particle Science*.
- **Detector alignment**: I designed and implemented the infrastructure for the offline program to calculate and correct misalignments of the entire DØ detector.

Post-doctoral Research Associate, State University of New York at Stony Brook.
July 1995 – May 1997

During this appointment, I worked on the following projects:

- **Run 2 Software**: Framework design and implementation,
- **Forward Preshower Detector**: Simulation,
- **Run 1 Software**: Calorimetry.

Post-doctoral Research Associate, University of Iowa.
September 1994 – June 1995

This one-year appointment was focused on **studies of electron-proton collisions with the ZEUS detector at HERA (DESY).**

Graduate Research Assistant, State University of New York at Stony Brook.
August 1988 – September 1994

I conducted my thesis research under the direction of Prof. Roderich J. Engelmann. The dissertation was titled **Searches for $p\bar{p} \to t\bar{t}$ at $\sqrt{s} = 1.8$ TeV using lepton+jets final states in the DØ detector**. The analysis exploited distinctive topological characteristics of the signal, and led to the improvement of the lower limit for the mass of the top quark from 91 GeV to 131 GeV. The analysis techniques developed in the course of this research played a key role in the discovery of the top quark in March, 1995. I also contributed to the calorimeter reconstruction software and electron identification, wrote the online monitoring software for the central drift chamber (CDC) and had the primary responsibility for certifying its data quality.

RESEARCH GRANTS

I have been a PI or Co-PI on federal research grants totaling more than $2M.

Proposals funded:

1. *"Searches for new phenomena at high-energy particle colliders"*, base grant for NIU's High Energy Physics program (PI, NSF, FY2006-09),
2. *"Development of particle-flow algorithms and simulation software for the ILC detector(s)"*, (PI, DOE/NSF, FY2007),
3. *"Development of particle-flow algorithms and simulation software for the ILC detector(s)"*, (PI, DOE/NSF, FY2006),
4. *"Development of extruded scintillator and tracking calorimetry"*: (PI, DOE Advanced Detector Research Program, FY2003-05),
5. *"Development of particle-flow algorithms, simulation, and other software for the LC detector"*, (PI, DOE, FY2004),
6. *"Development of new hadronic calorimeter technology"*, (PI, DOE Advanced Detector Research Program, FY2002),
7. *"Design and prototyping of a scintillator-based hadron calorimeter for the ILC detector(s)"*, (Co-PI, DOE+NSF, FY2006),
8. *"Beam test of a scintillator-based tailcatcher/muon tracker for ILC detector(s)"*, (Co-PI, DOE+NSF, FY2006).
9. *"Design and prototyping of a scintillator-based hadron calorimeter for the ILC detector(s)"*, (Co-PI, DOE+NSF, FY2004),
10. *"Searches for new phenomena at high-energy particle colliders"*, base grant for NIU's High Energy Physics program (Co-PI, NSF, FY2003-05),
11. *"Design and prototyping of a scintillator-based digital hadron calorimeter"*, (Co-PI, DOE, FY2003),

ACADEMIC HONORS

- President's merit list, Govt. of India, 1984.
- National merit scholarship, Govt. of India, 1982.

COMMITTEE MEMBERHSIPS

- Fermilab Director's ILC-HEP task force,
- The US ILC detector R&D proposal coordination committee,
- Reviewer for DOE's Advanced Detector Research program,
- The NSF review panel for Information Technology Research - Information Management,
- Several editorial boards and review committes at DØ, chaired 2 of them,
- NIU physics department undergraduate curriculum committee,
- NIU physics department colloquium committee (chair, 2005-2007).

STUDENTS

- Justin Berry (Ph.D in progress).
- Chad Suhr (MS in progress).
- Robert Calkins (Ph.D in progress).
- Diego Menezes (Ph.D in progress).
- Mikhail Arov (Ph.D completed),
- Jeremy McCormick (MS completed),

POST-DOCS and RESEARCH SCIENTISTS SPONSORED

- Victor Rykalin (2002-2004).
- Guilherme Lima (2003 - present).
- Alexandre Dyshkant (2006 - present).

CONFERENCE ORGANIZATION

I have participated in the organization of several international conferences and workshops either as a session convener, member of the local organizing committee, or of the international advisory committee. These include International Linear Collider workshops, American Linear Collider workshops, Weak Interactions and Neutrions, IEEE Nuclear Science Symposium, Calor, Workshop on Hadronic Shower Simulation, and Charged Higgs workshops.

SYNERGISTIC ACTIVITIES

- Co-leader, Calorimetry working group of the American Linear Collider Physics Group (2002-present),
- Research Coordinator of Calorimetry, University Consortium for Linear Collider Research and Development (UCLC, 2002-2003),
- Co-convenor, τ id group, DØ collaboration (2001-2005),
- Co-convenor, top physics group, DØ collaboration (1998-2000),
- Coordinator, calorimeter software, DØ collaboration (1995-1998).

OUTREACH

Volunteer, "Ask-a-scientist" open-house program at Fermilab (2000-present).

OTHER

- Member, CAlorimetry for LInear Collider with Electrons collaboration,
- Member, American Physical Society,
- Visiting scientist, Center for Particle Physics at Marseille, France (2004).

CONFERENCE TALKS (past 12 yrs)

1. *CALICE Tail Catcher and Combined Analysis* International Linear Collider Workshop (LCWS'07), Hamburg, Germany, May-June 2007.
2. *Electroweak Symmetry Breaking Summary*, 21st International Workshop on Weak Interactions and Neutrinos, (WIN'07) Kolkata, India, Jan, 2007 (Invited).
3. *Studies of the top quark at hadron colliders*, Workshop on Top Quark at the LHC, Grenoble, France, Oct, 2006 (Invited).
4. *Search for charged Higgs boson at DØ*, Charged Higgs Conference, Uppsala, Sweden, Sep, 2006 (Invited).
5. *Particle-Flow Algorithm Development at NIU*, Linear Collider Workshop, Vancouver, Canada, Jul, 2006.
6. *Scintillator Hadron Calorimeter R&D in America*, ibid.
7. *A Scintillator-based Hadron Calorimeter for the ILC Detector(s)*, XII International Conference on Calorimetry in High Energy Physics (Calor06), Chicago, Illinois, Jun 2006.
8. *The case for a Scintillator-based Hadron Calorimeter for the SiD detector*, ILC Physics and Detector Workshop (ALCPG2005), Snowmass, Colorado, Aug, 2005.
9. *Particle-Flow Algorithm Development at NIU*, ibid.
10. *Studies of silicon photodetectors for hadron calorimetry at the next electron-positron linear collider*, 4th International Conference on New Developments in Photodetection (Beaune'05), Beaune, France, Jun, 2005.
11. *Electroweak results from the Tevatron*, The 20th International Workshop on Weak Interactions and Neutrinos (WIN'05), Delphi, Greece, Jun, 2005.
12. *CALICE Tail-catcher/Muon Tracker Status and Plans*, ILC Workshop, Stanford, California, Mar, 2005.
13. *The Hadron Calorimeter: Analog or Digital?*, Workshop on ILC Detectors with Gaseous Tracking, (ILCD'05) Paris, France, Jan, 2005 (Invited).
14. *Toward Realistic Particle-Flow Algorithms*, ibid.
15. *Requirements for a worldwide ILC Detector Simulation Program* The 3rd Linear Collider Simulation Workshop (LCSW'04), ANL, Illinois, Jun 2004.
16. *Summary of American ILC Calorimetry efforts*, The 4th International Conference on Linear Colliders, Paris, France, Apr, 2004.
17. *LCDG4: a GEANT4-based ILC detector simulation program*, ALCPG'04 Workshop Stanford, California, Jan, 2004.
18. *New results from the Tevatron*, The 6th workshop of the Asian Consortium for Future Accelerators, Mumbai, India. Dec, 2003 (Invited).
19. *Summary of American ILC Calorimetry efforts*, ibid.
20. *Calorimetry summary*, The 4th workshop of the American Linear Collider Physics Group, Cornell U., Jul, 2003.
21. *Particle Flow Algorithms and Calorimetric Reconstruction*, The 2nd LC Detector Simulation Workshop (LCSW'03) Stanford, California, May, 2003.
22. *Status of the LC simulation software development*, The 3rd workshop of the American Linear Collider Physics Group, UT, Arlington, Jan, 2003.
23. *Summary of the American Calorimetry efforts*, The 3rd ECFA-DESY workshop on the ILC, Prague, Czech Republic. Nov, 2002.

24. *Calorimetry summary*, The 2nd workshop of the American Linear Collider Physics Group, U of California, Santa Cruz, Jul, 2002.
25. *Latest top and W/Z results from the Tevatron*, XVIII Recontres de Moriond, Les Arcs, France, Mar, 2002.
26. *Workshop Summary*, The 1st LC Detector Simulation Workshop (LCDsoft) NIU, Illinois, Nov, 2002.
27. *Digital hadron calorimetry*, The 1st workshop of the American Linear Collider Physics Group, U. of Chicago, Jan, 2002.
28. *Top Quark pair production cross section at Tevatron*, Thinkshop2, Fermilab, Illinois, Nov, 2000 (Invited).
29. *Particle Identification at DØ using Neural Networks*, VII International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT 2000), Fermilab, Batavia, Illinois, Oct, 2000.
30. *Studies of the top quark at DØ*, 30th International Conference on High Energy Physics, Osaka, Japan, Jul-Aug, 2000.
31. *Search for charged Higgs in the decay of top quark pairs at the Tevatron*, SUSY 99, Fermilab, Batavia, Illinois, Jun, 1999.
32. *Charged Higgs and spin correlations in $p\bar{p} \to t\bar{t}$*, XIII symposium on Hadron Collider Physics, Mumbai, India, Jan, 1999.
33. *New results from the Tevatron*, X symposium on High Energy Physics Chandigarh, India, Dec, 1998 (Invited).
34. *Search for a charged Higgs boson in the decay of top quark pairs*, Joint Theoretical and Experimental Seminar, Fermilab, Illinois, USA, Dec, 1998.
35. *Measurements of top quark production cross section and mass at DØ.*, DESY seminar, Hamburg, Germany, Jun, 1997.
36. *Top quark: new results from the Tevatron*, Beyond Standard Model V, Balholm, Norway, May, 1997.
37. *Measurement of top production cross section at DØ.*, XI symposium on Hadron Collider Physics, Padova, Italy, Jun, 1996.
38. *Top Physics at the Tevatron*, 4th workshop on High Energy Physics Phenomenology, Calcutta, India, Jan, 1996.

In addition, I have given seminars and colloquia at many universities and research laboratories in Asia, Europe and the USA. These include Austrian Academy of Sciences, Calcutta U., Cambridge U., U. Copenhagen, DESY (Hamburg and Zeuthen centers), Fermilab, U. Helsinki, Imperial college, Indian Institute of Technology (Kharagpur and Mumbai centers), U. Iowa, Jadavpur U., Kansas State U., LAPP (Annecy), LMU Munich, MIT, Oxford U., U. Rochester, Saha Institute of Nuclear Physics, Seoul National University, Tata Institute of Fundamental Research, U. Tokyo, University College London, Uppsala U., Vishva-Bharati U.

PUBLICATIONS See accompanying list.

REFERENCES Available on request.