Dhiman Chakraborty

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The latest version of this CV is available on my web-page and 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 **Professor and Director of Graduate Studies (both since 2010), Associate Professor (tenured, 2007 - 2010), Assistant Professor (till 2007), Department of Physics, Northern Illinois University**
2001 – present

Teaching: I have taught 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 500, formerly PHYS 400)*: Core course for senior undergraduate Physics majors; Spring '02, '03.
- *Classical Mechanics (PHYS 600, formerly PHYS 500)*: Core course for all gradute students of Physics; Fall '02, '03, '04, '05, '06, '09, '10.
- *Introduction to Elementary Particle Physics (PHYS 684, formerly PHYS 584)*: Elective for physics graduate students; Spring '01, '06, '07, '10.
- *Techniques in Experimental High Energy Physics (PHYS 690B)*, Elective "special topics" course for physics graduate students; Spring '05.

Research: I am or have been recently involved in the following collaborative projects:

- **Studies of proton-proton collisions with the ATLAS detector at the Large Hadron Collider (CERN)**: Leading the NIU team on ATLAS, which currently consists of 8 members, has been my primary research occupation since we joined the ATLAS collaboration in May 2008. Our current responsibilities include data quality monitoring (DQM) and coordination of software for the ATLAS tile hadronic calorimeter, Tier0 software validation, validation of e/γ derived data, and helping with commissioning of Tier3 grid installations at NSF-supported universities in the US. We have recently started participating in the fast track trigger upgrade (FTK) project. In the past we have also provided core support for ATLAS detector simulation software, validation of digitization in simulation, and contributed to simulation, algorithm development, and optimization of disc pixel trackers in the detector upgrade for future high-luminosity running. Our physics interests lie in searches for new physics in the production and decay of top quarks, e.g. charged Higgs bosons and Z'; QCD, electroweak and Higgs physics. We are contributing to tuning of Monte Carlo parameters, modeling of heavy flavor production in association with intermediate vector bosons (W/Z), and Monte Carlo production efforts. Together with my students and other collaborators, I am engaged in optimizing kinematic fitting techniques for comparing

ATLAS data with Standard Model predictions. Since August 2010, I have been serving as a co-convener of the US-ATLAS top physics forum.

- **Studies of proton-antiproton collisions with the DØ detector at the Tevatron (Fermilab)**: I have been a member of the DØ collaboration since 1989, participating in many areas of development and operation of the detector, as well as physics analyses involving the top quark. 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*. I have co-led searches for charged Higgs bosons in decays of pair-produced top quarks. My ex-student Mikhail Arov and I performed the first measurement of top-antitop pair-production cross section using the $t\bar{t} \rightarrow \tau$+jets final state at the Tevatron. This result has been accepted for publication in Physics Review D. With another of my students, Diego Menezes, I performed a search for $t \rightarrow H^+b$ through the disappearance of the SM $t\bar{t}$ signal (a pair of charged Higgs bosons is an integral feature of supersymmetric extensions of the standard model). This result was published in Phys. Lett. B. Currently I am working with Menezes to refine Arov+DC's analysis, apply it on a larger data set, and extend it to search for $t \rightarrow H^+b$, which leads to enhancements of the said final state. I have served as a co-convenor of the top physics group (1998-2000) and τ identification group (2001-2005) of the DØ collaboration.
- **Detector R&D for the International Linear Collider (ILC):** From 2001 to 2007 I led the ILC detector software efforts, i.e., simulation and algorithm development, at NIU/NICADD. During this period our team made major contributions to the American and international efforts in the areas of detector simulation and the development of Particle-Flow Algorithms (PFA), for dramatic improvement in jet energy measurement. I was also involved in the R&D of a finely segmented scintillator-based hadron calorimeter. The detector development group at NIU independently established the feasibility of such a device using a relatively new solid-state photodetection technology based on compact arrays of tiny avalanche photodiodes operating in the limited Geiger mode. From 2002 to 2008 I served as a co-leader of the American Linear Collider Physics Group's (ALCPG) Calorimetry working group, which coordinated research and development activities of 11 university and laboratory groups. Since June 2008 I have been a member of the ILC research director's R&D Panel (Common Task Group) and of the executive board of the International Large Detector (ILD) concept - one of two collaborations developing full-detector designs for the ILC.
- **The Particle Data Group (PDG)**:
Since 2005 I have been a co-author of the Photon Detectors section in the PDG's Review of Particle Physics, which serves as the standard sourcebook to the particle and nuclear physics communities worldwide.

Service: I have served or am serving on a number of committees at NIU and elsewhere. These are listed under "COMMITTEE MEMBERSHIPS" below.

Guest Scientist,
Laboratoire de Physique Subatomique et de Cosmologie, Grenoble, France
June 2008 – August 2009

On research leave from my university, I completed a 14-month visit to LPSC, Grenoble, as a guest scientist on a fellowship program sponsored by the French federal research agency CNRS/IN2P3 to collaborate with the ATLAS team at LPSC on studies of single top quark production at the LHC.

Research Scientist (after May 1997), Post-doctoral Research Associate (till May 1997), State University of New York at Stony Brook.
July 1995 – 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.
- **Run 2 Software**: Offline analysis framework design and implementation.
- **Forward Preshower Detector**: Simulation, technical design report.
- **Run 1 Software**: Calorimetry coordinator.

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

Studies of vector meson production with the ZEUS detector at the HERA electron-proton collider at the DESY laboratory in Hamburg, Germany.

Graduate Research Asst, 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 am or have been a PI/Co-PI on the following research grants totaling over $5M:

Proposals funded

1. *"Searches for new phenomena at high-energy particle colliders"*, base grant for NIU's High Energy Physics program (PI, $1,000,000, NSF, FY2010-12),
2. *"Development of the US ATLAS Analysis Instrumentation"* (Co-PI, $620,000 ($122,000 to NIU), NSF Major Research Instrumentation Program, FY2011-12).
3. *"US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier"* (through US ATLAS) (PI, $51,000, FY2010),
4. *"NIU-ANL Collaboration on ATLAS"* (PI, $40,000+$63,000+$87,000, DOE (through Argonne National Laboratory), FY2009-11),
5. *"Development of particle-flow algorithms for the ILC detector(s)"* (Co-PI, $155,000, NSF, FY2010-12),
6. *"Design and prototyping of a High Granularity Scintillator Calorimeter"* (Co-PI, $95,000+$241,200, DOE (Advanced Detector Research Program), FY2010-12),
7. *"QuarkNet at NIU"* (PI, $23,400+$31,500, DOE+NSF (through Notre Dame U., FY2009-11),

8. *"Scientific Exchange Program between NIU and LPSC, Grenoble"* (PI, $65,000, CNRS/IN2P3 (the French Federal Agency for Scientific Research), FY2009),
9. *"Searches for new phenomena at high-energy particle colliders"* base grant for NIU's High Energy Physics program (PI, $785,000, NSF, FY2007-09),
10. *"Development of particle-flow algorithms and simulation software for the ILC detector(s)"* (PI, $55,000, DOE, FY2007),
11. *"Design and prototyping of a scintillator-based hadron calorimeter for the ILC detector(s)"* (Co-PI, $47,500, DOE, FY2007),
12. *"Beam test of a scintillator-based tailcatcher/muon tracker for ILC detector(s)"* (Co-PI, $45,500, DOE, FY2007),
13. *"Development of particle-flow algorithms, simulation, and other software for the LC detector"* (PI, $44,000, DOE, FY2006),
14. *"Design and prototyping of a scintillator-based hadron calorimeter for the ILC detector(s)"* (Co-PI, $31,500, DOE, FY2006),
15. *"Development of particle-flow algorithms, simulation, and other software for the LC detector"* (PI, $31,500, DOE, FY2005),
16. *"Design and prototyping of a scintillator-based hadron calorimeter for the ILC detector(s)"* (Co-PI, $44,000, DOE, FY2005),
17. *"Development of extruded scintillator and tracking calorimetry"* (PI, $145,000, DOE (Advanced Detector Research Program), FY2004-06),
18. *"Searches for new phenomena at high-energy particle colliders"* base grant for NIU's High Energy Physics program (Co-PI, $812,000, NSF, FY2004-06),
19. *"Design and prototyping of a scintillator-based digital hadron calorimeter"* (Co-PI, $61,000, DOE, FY2004),
20. *"Development of new hadronic calorimeter technology"* (PI, $45,000, DOE (Advanced Detector Research Program), FY2003).

ACADEMIC HONORS

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

GRADUATE STUDENTS SUPERVISED

- Chad Suhr (Ph.D. in progress, ATLAS),
- Robert Calkins (Ph.D. in progress, ATLAS),
- Francois Lemery (Ph.D. in progress, ATLAS),
- Diego Menezes (Ph.D. in progress, DØ),
- Mikhail Arov (Ph.D. completed, DØ),
- Jeremy McCormick (MS completed, ILC).

POST-DOCS and RESEARCH SCIENTISTS SPONSORED

- Victor Rykalin (2002-2004),
- Guilherme Lima (2003-present),
- Vishnu Zutshi (2003-present).
- Alexandre Dyshkant (2006-present).
- Sergey Uzunyan (2006-present).

SYNERGISTIC ACTIVITIES

- Co-convener, US-ATLAS top physics forum (2010-present);
- Coordinator, Tier0 software validation shifts, ATLAS collaboration (2009-2010);
- Coordinator, digitization validation, ATLAS collaboration (2008-2010);
- Co-leader, Calorimetry working group of the American Linear Collider Physics Group (2002-2008),
- 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

- I am the mentor of the NIU center of the federally funded QuarkNet project, which counts more than 50 US research universities and national laboratories among its members. Quarknet introduces high school students, through their teachers, to High Energy Physics. Physics teachers and students from seven area high schools participate in two-week-long annual institutes at NIU, where they interact with physicists from NIU, ANL, and Fermilab; gain hands-on experience in assembling cosmic-ray detectors from kits, and collect data with them, which they subsequently share with fellow participants across the nation.
- Volunteer, "Ask-a-scientist" open-house program at Fermilab (since 2000).

COMMITTEE MEMBERHSIPS

- ILC research director's detector R&D Panel (Common Task Group) (2008-present),
- Executive board of the International Large Detector (ILD) collaboration (2008-present),
- Fermilab Director's ILC-HEP task force (2006),
- The US ILC detector R&D proposal coordination committee (2001-2003),
- Reviewer for NSF's Career grant proposals,
- Reviewer for DOE's Advanced Detector Research grant proposals,
- The NSF review panel for Information Technology Research,
- Several editorial boards and review committees at DØ, chaired some of them,
- General Education Committee of the Undergraduate Coordinating Council, NIU (representating the College of Liberal Arts and Sciences, 2009-2012),
- College Council, College of Liberal Arts and Sciences, NIU (representing the Physics Department, 2010-2013),
- Ph.D. Dissertation Completion Fellowship Award committee, NIU Graduate School (2007-2008),
- Faculty Merit Committee, NIU Physics Department (2009-2011, Chair for 2010-2011),
- Undergraduate Curriculum Committee, NIU Physics Department (2005-present),
- Colloquium Committee, NIU Physics Department (Chair, 2005-2007).

OTHER MEMBERSHIPS

- Scientist, Northern Illinois Center for Accelerator and Detector Development (NICADD),
- Member, CAlorimetry for LInear Collider with Electrons collaboration,
- Member, American Physical Society,
- Guest scientist, Laboratoire de Physique Subatomique et de Cosmologie, Grenoble, France (June 2008 – August 2009).
- Guest scientist, Center for Particle Physics at Marseille, France (2004).

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, Charged Higgs workshops, and the Hadron Collider Physics Summer School.

CONFERENCE TALKS (last 10 years)

1. *W*hat is Particle Physics and Why Should We Care?, Ask-A-Scientist monthly open house, Fermilab, USA, Sep, 2009 (Invited).
2. *Research and Development Toward an Integrated Readout Layer for a Scintillator-based Calorimeter*, Linear Collider Workshop of the Americas (ALCPG2009), Albuquerque, New Mexico, Oct 2009.
3. *Summary of the "MSSM $H^+ \rightarrow$ SM particles" working group*, Charged Higgs Conference, Uppsala, Sweden, Sep, 2008 (Invited).
4. *CALICE Tail Catcher and Combined Analysis* International Linear Collider Workshop (LCWS'07), Hamburg, Germany, May-June 2007.
5. *Electroweak Symmetry Breaking Summary*, 21st International Workshop on Weak Interactions and Neutrinos, (WIN'07) Kolkata, India, Jan, 2007 (Invited).
6. *Studies of the top quark at hadron colliders*, Workshop on Top Quark at the LHC, Grenoble, France, Oct, 2006 (Invited).
7. *Search for charged Higgs boson at DØ*, Charged Higgs Conference, Uppsala, Sweden, Sep, 2006 (Invited).
8. *Particle-Flow Algorithm Development at NIU*, Linear Collider Workshop, Vancouver, Canada, Jul, 2006.
9. *Scintillator Hadron Calorimeter R&D in America*, ibid.
10. *A Scintillator-based Hadron Calorimeter for the ILC Detector(s)*, XII International Conference on Calorimetry in High Energy Physics (Calor06), Chicago, Illinois, Jun 2006.
11. *The case for a Scintillator-based Hadron Calorimeter for the SiD detector*, ILC Physics and Detector Workshop (ALCPG2005), Snowmass, Colorado, Aug, 2005.
12. *Particle-Flow Algorithm Development at NIU*, ibid.
13. *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.
14. *Electroweak results from the Tevatron*, The 20th International Workshop on Weak Interactions and Neutrinos (WIN'05), Delphi, Greece, Jun, 2005.
15. *CALICE Tail-catcher/Muon Tracker Status and Plans*, ILC Workshop, Stanford, California, Mar, 2005.
16. *The Hadron Calorimeter: Analog or Digital?*, Workshop on ILC Detectors with Gaseous Tracking, (ILCD'05) Paris, France, Jan, 2005 (Invited).

17. *Toward Realistic Particle-Flow Algorithms*, ibid.
18. *Requirements for a worldwide ILC Detector Simulation Program* The 3rd Linear Collider Simulation Workshop (LCSW'04), ANL, Illinois, Jun 2004.
19. *Summary of American ILC Calorimetry efforts*, The 4th International Conference on Linear Colliders, Paris, France, Apr, 2004.
20. *LCDG4: a GEANT4-based ILC detector simulation program*, ALCPG'04 Workshop Stanford, California, Jan, 2004.
21. *New results from the Tevatron*, The 6th workshop of the Asian Consortium for Future Accelerators, Mumbai, India. Dec, 2003 (Invited).
22. *Summary of American ILC Calorimetry efforts*, ibid.
23. *Calorimetry summary*, The 4th workshop of the American Linear Collider Physics Group, Cornell U., Jul, 2003 (Invited).
24. *Particle Flow Algorithms and Calorimetric Reconstruction*, The 2nd LC Detector Simulation Workshop (LCSW'03) Stanford, California, May, 2003.
25. *Status of the LC simulation software development*, The 3rd workshop of the American Linear Collider Physics Group, UT, Arlington, Jan, 2003.
26. *Summary of the American Calorimetry efforts*, The 3rd ECFA-DESY workshop on the ILC, Prague, Czech Republic. Nov, 2002.
27. *Calorimetry summary*, The 2nd workshop of the American Linear Collider Physics Group, U of California, Santa Cruz, Jul, 2002.
28. *Latest top and W/Z results from the Tevatron*, XVIII Recontres de Moriond, Les Arcs, France, Mar, 2002.
29. *Workshop Summary*, The 1st LC Detector Simulation Workshop (LCDsoft) NIU, Illinois, Nov, 2002.
30. *Digital hadron calorimetry*, The 1st workshop of the American Linear Collider Physics Group, U. of Chicago, Jan, 2002.
31. *Top Quark pair production cross section at Tevatron*, Thinkshop2, Fermilab, Illinois, Nov, 2000 (Invited).
32. *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.
33. *Studies of the top quark at DØ*, 30th International Conference on High Energy Physics, Osaka, Japan, Jul-Aug, 2000.

In addition, I have given seminars and colloquia at many universities and research laboratories in Asia, Europe and the USA. These include the 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.