

Dmitri Smirnov

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EDUCATION

Summer 2005 **Ph.D. in Physics** (expected)

University of New Mexico, Albuquerque, NM

Thesis title: “Kinematic measurement of the top quark branching ratio $R = B(t \rightarrow Wb)/B(t \rightarrow Wq)$ at CDF Run 2”

Adviser: Michael Gold

Jan 2002 **M.S. in Physics** (diploma with honors)

Moscow State University, Moscow, Russia

Thesis title: “Study of the Higgs boson production processes with mass $M_H = 115$ GeV at CDF Run 2”

Adviser: Lev Dudko

EXPERIENCE

Aug 2001 – present **Research Assistant**

CDF, Fermilab

New Mexico Center for Particle Physics, UNM, Albuquerque, NM

During my graduate study I was involved in measuring the $t\bar{t}$ cross section in lepton + jets channel (Run 1) and the top to bottom quark branching fraction (Run 2) at CDF, Fermilab.

Initially I worked on improvement of the $t\bar{t}$ cross section measurement inherited from Run 1. An attempt was made to model the QCD background by generating $b\bar{b}jj$ events. The QCD background generated by ALPGEN+PYTHIA was found to be in a good agreement with traditional non-isolated and low E_T data sample. In addition to this innovation, the $t\bar{t}$ cross section measurement was based only on event kinematics and agreed with analysis using b-jets identification.

Later I switched to the measurement of the top quark branching fraction $R = B(t \rightarrow Wb)/B(t \rightarrow Wq)$, which required an advanced statistical technique sensitive to a difference (if any) between the data and Standard Model predictions.

Totally independent and in a perfect agreement with other colleagues at CDF I wrote C++ classes for the data events selection. I studied the discrepancy in signal and background physics using generated Monte Carlo events and chose appropriate kinematic variables. Then a reliable prescription of optimization of a Neural Network structure was developed and it resulted in a good signal to background separation accepted by the collaboration. The whole study was verified by running thousands of pseudo-experiments. The Feldman-Cousins procedure was implemented based on the original article and used to calculate the confidence level intervals for the final result.

For this analysis I also wrote a numerous number of classes in C++ in order to interface existing C libraries of SNNS package with ROOT.

This sophisticated technique resulted in improvement of the total error by 30% comparing to the previous measurement. In a couple of weeks this analysis will be submitted for publication in PRL and later in PRD.

As a CDF service task, I designed and supervised the production of CMX cable support.

Sep 1999 – Dec 2001 **Lab/Research Assistant**

Skobeltsyn Institute for Nuclear Physics, Moscow, Russia

I worked on methodology to improve the signal selection efficiency for Higgs boson searches at Tevatron. For signal and background generation I used PYTHIA, CompHEP, and HERWIG Monte Carlo event generators. This method is based on the usage of variables reflecting the differences in signal and background processes such as singularities in Feynman diagrams and angle distributions between final state particles. The training of a Neural Network on such variables improved the efficiency by factor of 1.5—2.0.

Nov 1999 – Aug 2001 **Computer Lab Technician**

Institute of Foreign Languages “Gaudeamus”, Moscow, Russia

I was responsible for maintenance of 15 computers, LAN and Internet support, hardware purchase and installation. I designed fully interactive web site and explained principal computer skills to senior high school students and staff.

Technical Skills

Excellent knowledge of object oriented programming in C++, PHP, Java

Proficiency in data analysis tools such as ROOT, Minuit, SNNS

Lots of experience with CVS, MySQL, HTML, \LaTeX , shell scripting

PUBLICATIONS & CONFERENCES

Selected publications & notes:

- “Measurement of $B(t \rightarrow Wb)/B(t \rightarrow Wq)$ at the Collider Detector at Fermilab”, CDF collaboration. To be published in Phys. Rev. Lett. and Phys. Rev. D
- “Simulation of the QCD Background for ttbar Analyses with a l^\pm plus jets final State”, internal CDF note 6431
- “A Neural Network Measurement of the ttbar Pair Production Cross Section in the Lepton+Jets Channel”, internal CDF note 6078

Selected conferences & talks:

- “Measurement of the top quark branching ratio $R = \frac{B(t \rightarrow Wb)}{B(t \rightarrow Wq)}$ in the lepton+jets and di-lepton channels at CDF”, Amer. Phys. Soc. meeting, April 2005
- “Measurement of $B(t \rightarrow Wb)/B(t \rightarrow Wq)$ with Neural Net at CDF”, Top Group meeting, July 2004
- “Measurement of the $t \rightarrow Wb$ branching ratio in lepton+jets channel using ANN at CDF”, Amer. Phys. Soc. meeting, April 2004
- “MC simulation and validation of the QCD background”, Top Group meeting, December 2003
- “A Neural Net technique for the Higgs Search at the Tevatron”, Amer. Phys. Soc. meeting, April 2002
- “Neural Networks for signal and background separation”, Advanced Multivariate & Statistical Techniques workshop, May 2002

- “Optimized neural network search of Higgs boson at Tevatron”, VIII International Workshop on Advanced Computing and Analysis Techniques in Physics Research, June 2002

Primary author/co-author of 9 internal CDF notes, co-author of 20 publications, 20+ talks including presentations at Amer. Phys. Soc., Advanced Algorithm Group (Fermilab), Top Group (CDF), Lomonosov conference (MSU), proposals and status reports.

OTHER EDUCATIONAL PROGRAMS

Aug 2000 – Sep 2000 DESY Summer Student Program (awarded full support)
DESY, Hamburg, Germany

Oct 1998 – Oct 2000 Russian-German Institute of Science and Culture (awarded annual stipend)
Moscow State University, Moscow, Russia

REFERENCES

- **Prof. Michael Gold**, Professor — University of New Mexico, Albuquerque, NM
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- **Prof. Ken Bloom**, Assistant Professor — University of Nebraska, Lincoln, NE
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- **Prof. Igor Gorelov**, Research Assistant Professor — University of New Mexico, Albuquerque, NM
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- **Dr. Volker Drollinger**, Senior Research Scientist — Universita degli Studi di Padova, Italy
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- **Dr. John Strologas**, Senior RA — University of New Mexico, Albuquerque, NM
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- [1] D. Acosta *et al.* [CDF Collaboration], “Search for long-lived doubly-charged Higgs bosons in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$,” arXiv:hep-ex/0503004.
- [2] D. Acosta *et al.* [CDF Collaboration], “First evidence for $B/s_0 \rightarrow \Phi \Phi$ decay and measurements of branching ratio and $A(\text{CP})$ for $B^+ \rightarrow \Phi K^+$,” arXiv:hep-ex/0502044.
- [3] D. Acosta *et al.* [CDF Collaboration], “Measurement of the moments of the hadronic invariant mass distribution in semileptonic B decays,” arXiv:hep-ex/0502003.
- [4] D. Acosta *et al.* [CDF Collaboration], “Measurement of the $W^+ W^-$ production cross section in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$ using dilepton events,” arXiv:hep-ex/0501050.
- [5] D. Acosta *et al.* [CDF Collaboration], “Measurement of the forward-backward charge asymmetry from $W \rightarrow e \nu$ production in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$,” arXiv:hep-ex/0501023.
- [6] D. Acosta *et al.* [CDF Collaboration], “Search for $Z Z$ and $Z W$ production in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$,” arXiv:hep-ex/0501021.
- [7] D. Acosta *et al.* [CDF Collaboration], “Measurement of the J/ψ meson and b-hadron production cross sections in p anti-p collisions at $s^{1/2} = 1960\text{-GeV}$,” arXiv:hep-ex/0412071.
- [8] D. Acosta *et al.* [CDF Collaboration], “Analysis of decay-time dependence of angular distributions in $B/s_0 \rightarrow J/\psi \Phi$ and $B/d_0 \rightarrow J/\psi K^0$ decays and measurement of the lifetime arXiv:hep-ex/0412057.
- [9] D. Acosta *et al.* [CDF Collaboration], “Measurement of the cross section for prompt diphoton production in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$,” arXiv:hep-ex/0412050.
- [10] D. Acosta *et al.* [CDF Collaboration], “Search for anomalous kinematics in t anti-t dilepton events at CDF II,” arXiv:hep-ex/0412042.
- [11] D. Acosta *et al.* [CDF Collaboration], “Measurement of the forward-backward charge asymmetry of electron positron pairs in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$,” arXiv:hep-ex/0411059.
- [12] D. Acosta *et al.* [CDF Collaboration], “Search for scalar leptoquark pairs decaying to ν anti- ν q anti-q in p anti-p collisions at $s^{1/2} = 1.96\text{-TeV}$,” arXiv:hep-ex/0410076.

- [13] D. Acosta *et al.* [CDF Collaboration], “Search for electroweak single top quark production in p anti-p collisions at $s^{**}(1/2) = 1.96\text{-TeV}$,” Phys. Rev. D **71**, 012005 (2005) [arXiv:hep-ex/0410058].
- [14] D. Acosta *et al.* [CDF Collaboration], “Search for anomalous production of diphoton events with missing transverse energy at CDF and limits on gauge-mediated supersymmetry-breaking models,” arXiv:hep-ex/0410053.
- [15] D. Acosta *et al.* [CDF Collaboration], “Measurement of the t anti-t production cross section in p anti-p collisions at $s^{**}(1/2) = 1.96\text{-TeV}$ using lepton + jets events with secondary vertex b-tagging,” arXiv:hep-ex/0410041.
- [16] D. Acosta *et al.* [CDF Collaboration], “Measurement of partial widths and search for direct CP violation in D0 meson decays to K- K+ and pi- pi+,” FERMILAB-PUB-04-148-E
- [17] D. Acosta *et al.* [CDF II Collaboration], “Measurement of W gamma and Z gamma production in p anti-p collisions at $s^{**}(1/2) = 1.96\text{-TeV}$,” Phys. Rev. Lett. **94**, 041803 (2005) [arXiv:hep-ex/0410008].
- [18] D. Acosta *et al.* [CDF-II Collaboration], “Measurement of the t anti-t production cross section in p anti-p collisions at $s^{**}(1/2) = 1.96\text{-TeV}$ using kinematic fitting of b-tagged lepton + jet events,” arXiv:hep-ex/0409029.
- [19] D. Acosta *et al.* [CDF II Collaboration], “First measurements of inclusive W and Z cross sections from Run II of the Tevatron collider,” Phys. Rev. Lett. **94**, 091803 (2005) [arXiv:hep-ex/0406078].
- [20] D. Acosta *et al.* [CDF Collaboration], “Search for doubly-charged Higgs bosons decaying to dileptons in p anti-p collisions at $s^{**}(1/2) = 1.96\text{-TeV}$,” Phys. Rev. Lett. **93**, 221802 (2004) [arXiv:hep-ex/0406073].