DØ's Top Quark Physics Abstracts
submitted to the
American Physical Society April Meeting,
Jacksonville, Florida, April 14-17, 2007

Session J14: Top I,   Sunday 15th, 10:30 am

1.   Measurement of the W Boson Helicity in Top Quark Decay at DØ

Bertrand Martin, LPSC, Grenoble, France

We report on a measurement of the fraction of right-handed W bosons in top quark decay. In the standard model, this fraction is too small to measure with the current data sample, so a non-zero value would be a clear sign of new physics. The measurement is based upon the angle between the charged lepton and top quark directions in the W boson rest frame.

2.   Measurement of the Top Quark Mass at DØ Using the Matrix Weighting Method on Dilepton Events

Daniel Boline, Boston University

We present a measurement of the top quark mass in the dilepton channel based on approximately 1 fb^{-1} of data collected by the DØ experiment during Run II of the Fermilab Tevatron collider. The kinematics of these events are not sufficiently constrained by the observed final state to reconstruct the top quark mass. We therefore compute a likelihood for the observed events to occur for a range of assumed top quark masses. For each event we choose the hypothesized top quark mass at which this likelihood is maximized as the estimator for the top quark mass. We compare the distribution of this estimator for all events to Monte Carlo predictions for different input top quark masses in a maximum likelihood fit to extract the top quark mass.

3.   Measurement of the Charge Asymmetry in $t\bar{t}$ Production in Proton-Antiproton Collisions at DØ

Amnon Harel, University of Rochester

We report on the measurement of forward-backward asymmetry in $t\bar{t}$ production in proton-antiproton collisions. If the component of the top quark momentum along the proton direction is larger than that of antitop the asymmetry is defined as positive and negative otherwise. Top and and antitop momenta are reconstructed in lepton+jets sample using b-tagging information and kinematic constraints.

4.   Measurement of the Top Quark Mass at DØ Using Allhadronic Events

David Lam, University of Notre Dame

We report on the measurement of the top quark mass using $t\bar{t}$ candidates in the all-hadronic decay channel. The $t\bar{t}$ signal was discriminated from background using kinematic information and by requiring two identfied b jets. The mass was extracted by comparing templates of $t\bar{t}$ signal and multijet background to the selected candidates.

5.   Measurement of the Top Quark Mass at DØ Using the Ideogram Method in the Lepton+Jets Channel

Pieter Houben, NIKHEF

We report on the measurement of the top quark mass using $t\bar{t}$ candidates in the lepton+jets final state. For each event, a probability based on the kinematic reconstruction of the event is calculated as a function of the top mass and the overall jet energy scale. The top mass and jet energy scale are extracted by maximizing a likelihood constructed as the product of the single event probabilities. The overall jet energy scale is constraint by the two jets from the hadronic W boson decay.

6.   Measurement of the Top Quark Charge and Branching Fractions at DØ

Per Hansson, KTH, Royal Institute of Technology

We report on a measurement of the ratio $R = B(t \rightarrow Wb)/B(t \rightarrow Wq)$. In the standard model this ratio exceeds 0.998 at the 95% confidence level. Experimentally, we measure the ratio based on the fraction of candidate events with 0, 1, or 2 b-tagged jets. We also report on a measurement of the charge of the top quark by resolving the kinematic ambiguity between the standard model scenario of a charge 2/3 quark decaying to $W^{+}b$ and an exotic scenario of a charge –4/3 quark decaying to $W^{-}b$.

7.   Measurement of the $t\bar{t}$ Production Cross Section at DØ Using τ+Jets Events

Amnon Harel, University of Rochester

We report on the measurement of the $t\bar{t}$ production cross section with candidate events in which the W boson from one of the top quarks decays into a τ lepton and the associated neutrino while the other W boson decays to a quark-antiquark pair. We select events in which the τ lepton subsequently decays to one or three charged hadrons plus neutral hadrons and a neutrino.

8. Measurement of the $t\bar{t}$ Production Cross Section at DØ Using Event Kinematics

Hwidong Yoo, Brown University

We report on the measurement of the $t\bar{t}$ production cross section using candidate events in the lepton+jets final state. We separate the $t\bar{t}$ signal from background processes using kinematic information. Several kinematic variables are combined into a multivariate discriminant to maximize the separation between signal and background.

9. Measurement of the $t\bar{t}$ Production Cross Section at DØ Using Soft Lepton b Tagging

Michele Weber, Fermilab

We report on the measurement of the $t\bar{t}$ production cross section using candidate events in the lepton+jets final state. We separate the $t\bar{t}$ signal from background processes by the requirement that one or more jets are identified as b jets by a soft lepton tag.

10. Measurement of the $t\bar{t}$ Cross Section and Spin Correlation in the Dilepton Channel with the DØ Detector

Jens-Peter Konrath, Freiberg University

One remarkable property of top quarks is their short lifetime. Therefore the spin correlation between the top and antitop produced in $p\bar{p}$ collisions is not degraded by hadronization. We determine the production cross section and spin correlation of $t\bar{t}$ quark pairs decaying in the dilepton mode. In this decay channel, both leptons can be used to analyze the spin correlation. Moreover, physics and instrumental background can be suppressed to a great extent. This analysis is based on data taken with the DØ detector at the Fermilab Tevatron $p\bar{p}$-collider at a center-of-mass energy of 1.96 TeV. The data corresponding to an integrated luminosity of about 1.1 fb^{-1} were recorded in the years 2002 to 2006.

11. Measurement of the $t\bar{t}$ Production Cross Section in the Lepton+Jets Channel with Lifetime Tagging

Hwidong Yoo, Brown University

We present a measurement of the $t\bar{t}$ production cross section at a center-of-mass energy of 1.96 TeV. This analysis is based on the selection of events with one charged lepton (electron or muon), missing transverse energy, and 3 or more jets with $p_T > 20$ GeV and $|\eta| < 2{:}5$. We utilize the e+jets (913 pb^{-1}) and μ+jets (871 pb^{-1}) data samples collected using the DØ detector. To help distinguish the signal from the background processes, we use a neural network algorithm that uses lifetime information to identify the b-quark jets that are associated with top quark decays. We require at least one b-tagged jet to be identified in this analysis.

12. **Measurement of the $t\bar{t}$ Production Cross Section at DØ Using Lepton + Hadronic τ Events**

Suharyo Sumowidagdo, Florida State University

We present the measurement of top quark-antiquark pair production in lepton+hadronic tau channel using approximately 0.9 inverse femtobarn of DØ data. We select events with one isolated high p_T electron or muon, one isolated hadronic tau, high missing transverse energy, and two high p_T jets. One or more of the jets are required to have originated from a b quark by applying neural network tagging algorithm. We discuss the results both within the context of Standard Model and a semi model-independent approach of non-SM production mechanism of tau lepton in top quark decay.

Session T14: Top Mass,   **Monday 16th, 1:30 pm**

13. **Measurement of the Top Quark Mass at DØ Using the Matrix-Element Method in the Lepton+Jets Channel**

Carlos Garcia, Rochester University

We report on the measurement of the top quark mass using $t\bar{t}$ candidates in the lepton+jets final state. For each event, a probability based on the differential cross section for $t\bar{t}$ production is calculated as a function of the top mass and the overall jet energy scale. The top mass and jet energy scale are extracted by maximizing a likelihood constructed as the product of the single event probabilities. The overall jet energy scale is constraint by the two jets from the hadronic W boson decay.

Session X13: Single Top,   **Tuesday 17th, 10:45 am**

14. **Search for Non-Standard Production of Single Top Quarks at DØ**

Reinhard Schwienhorst, Michigan State University

The large mass of the top quark, close to the electroweak symmetry-breaking scale, makes it a good candidate for probing physics beyond the Standard Model. Single top quarks may be produced in the decay of a new heavy gauge boson W' and we present limits on the production cross section and the mass of such a W' assuming standard-model-like couplings. We also search for single top productions through flavor-changing neutral currents involving gluon, Z boson, or photon exchange.

15. Measurement of Single Top Quark Production at DØ Using Decision Trees

John BackusMayes, University of Washington

We present evidence for single top quark production in proton-antiproton collisions using a dataset of almost 1 fb^{-1} collected with the DØ detector. Single top quarks are expected to be produced in association with bottom quarks through the exchange of a *W* boson in the s-channel and the t-channel. We select events with one energetic electron or muon, missing transverse energy, and two, three or four jets, with at least one *b*-tagged jet. This analysis uses boosted decision trees to separate the signal from the background. We measure a cross section compatible with the Standard Model prediction for electroweak production of single top.

16. Measurement of Single Top Quark Production at DØ Using a Matrix Element Discriminant

Chris Potter, McGill University

We present evidence for single top quark production in proton-antiproton collisions using a dataset of almost 1 fb^{-1} collected with the DØ detector. Single top quarks are expected to be produced in association with bottom quarks through the exchange of a *W* boson in the s-channel and the t-channel. We select events with one energetic electron or muon, missing transverse energy, and two, three or four jets, with at least one *b*-tagged jet. This analysis uses a matrix element discriminant to separate the signal from the background. We measure a cross section compatible with the Standard Model prediction for electroweak production of single top.

17. Measurement of Single Top Quark Production at DØ Using Bayesian Neural Networks

Monica Pangilinan, Brown University

We present evidence for single top quark production in proton- antiproton collisions using a dataset of almost 1 fb^{-1} collected with the DØ detector. Single top quarks are expected to be produced in association with bottom quarks through the exchange of a *W* boson in the s-channel and the t-channel. We select events with one energetic electron or muon, missing transverse energy, and two, three or four jets, with at least one *b*-tagged jet. This analysis uses Bayesian neural networks to separate the signal from the background. We measure a cross section compatible with the Standard Model prediction for electroweak production of single top.

18. Combined Single Top Quark Production Cross Section and Measurement of $|V_{tb}|$ at DØ

Jorge Benitez, Michigan State University

We combine the different analyses carried out by the DØ Collaboration to extract evidence for single top quark production and present the first direct measurement of the CKM matrix element $|V_{tb}|$.