

DØ's Top Quark Physics Abstracts
submitted to the
Division of Particles and Fields Meeting
Of the American Physical Society,
Honolulu, Hawaii, October 29 – November 3, 2006

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

Gustavo Otero y Garzon, University of Illinois, Chicago

We report on the measurement of the $t\bar{t}$ production cross section using candidate events in the lepton+jets final state. The $t\bar{t}$ signal is discriminated from background processes by the requirement of one or more identified b jets.

2. Measurement of the $t\bar{t}$ Production Cross Section at DØ Using Kinematic Information

To be confirmed

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

3. Measurement of the $t\bar{t}$ Production Cross Section at DØ Using Dilepton Events and Lepton+Track Events

Susan Burke, University of Arizona

The $t\bar{t}$ signal is discriminated from background processes by requiring two identified leptons and by using kinematic criteria that exploit the presence of neutrinos and energetic jets in $t\bar{t}$ events.

Also, we report on the measurement of the $t\bar{t}$ production cross section with candidate events in the dilepton final state in which lonely one of the leptons satisfies our usual identification criteria, while the other appears as an isolated charged track. The $t\bar{t}$ signal is discriminated from background processes by requiring at least one b -tagged jet and by using kinematic criteria that exploit the presence of neutrinos and energetic jets in $t\bar{t}$ events.

4. Measurement of the $t\bar{t}$ Production Cross Section at DØ Using All-Hadronic Events

To be confirmed

We report on the measurement of the $t\bar{t}$ production cross section with candidate events in the all-hadronic final state. The $t\bar{t}$ signal is discriminated from the QCD multijet background process by requiring at least one b -tagged jet and by using kinematic criteria. Several kinematic criteria are combined into a neural network to maximize the discrimination between signal and background.

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

Mike Arov, Northern Illinois University

We present a new measurement of $p\bar{p} \rightarrow t\bar{t} + X$ production at $\sqrt{s} = 1.96$ TeV using 350 pb^{-1} of data collected with the DØ detector between 2002 and 2005. We focus on the final state where the W boson from one of the top quarks decays into a τ lepton and the associated neutrino while the other decays to a quark-antiquark pair. We aim to select those events in which the τ subsequently decays to one or three charged hadrons, zero or more neutral hadrons, and a τ neutrino (charge conjugate processes are implied in all of the above). The observable signature thus consists of a narrow calorimeter shower with associated track(s) characteristic of a hadronic τ decay, four or more jets, of which two are initiated by b quarks accompanying the W 's in the top decays, and a large net momentum in the transverse plane due to the energetic neutrino-antineutrino pair that leave no trace in the detector media. After careful optimization of triggers, object identification, and using an artificial neural network for the final full-event pattern recognition, we are able to extract the faint signal from the very large background, which is dominated by mismeasured multijet events. The result, the first of its kind from the Tevatron, is in good agreement with the Standard Model prediction, and with previous measurements using other decay modes of top-antitop pairs.

6. Measurement of the Top Quark Mass at DØ Using Lepton+Jets Events

Carlos Garcia, University of Rochester

We report on the measurement of the top quark mass using $t\bar{t}$ candidates in the lepton+jets final states. For each event, a probability 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 constrained by the two hadronic jets forming a W boson. This reduces the large uncertainty due to the jet energy scale.

7. Measurement of the Top Quark Mass at DØ Using Dilepton Events

Jeffrey Temple, University of Arizona

We report on the measurement of the top quark mass using $t\bar{t}$ candidates in the dilepton final states. The kinematics of these events are solved for a range of assumed top quark masses, and the relative likelihood of each solution is assessed. Information from the complete set of events is combined in a maximum likelihood fit to extract the top quark mass and its uncertainty.

8. A Search for Resonant $t\bar{t}$ Production at DØ

To be confirmed

We report on a search for a massive particle that decays to $t\bar{t}$. The search is performed using $t\bar{t}$ candidates in the lepton+jets channel. A constrained kinematic fit, with top quark mass fixed, is used to evaluate the $t\bar{t}$ invariant mass for each candidate. We then search for deviations from the $t\bar{t}$ mass distribution predicted by QCD.

9. Single Top Quark Production at the DØ Experiment

Gordon Watts, University of Washington

Protons and antiprotons are collided in Run II at the Fermilab Tevatron at a center of mass energy of 1.96 TeV. We present results of an improved search for single top quark production in these collisions using a dataset of approximately 360 pb^{-1} collected with the DØ detector. This analysis considers both production modes, s -channel tb and t -channel tqb , and makes use of secondary-vertex tagging to identify jets originating from b quarks as well as neural networks to separate the expected signals from backgrounds.

10. Search for W' Boson Production in the Top Quark Decay Channel at DØ

Brigitte Vachon, McGill University

We present a search for the production of a new heavy gauge boson W' that decays to a top quark and a bottom quark. We have analyzed 230 pb^{-1} of data collected with the DØ detector at the Fermilab Tevatron collider at a center-of-mass energy of 1.96 TeV. No significant excess of events is found in any region of the final state invariant mass distribution. We set upper limits on the production cross section of W' bosons at the 95% confidence level for several different W' boson masses. We exclude masses below 610 GeV for a W' boson with standard-model-like couplings, below 630 GeV for a W' boson with right-handed couplings that is allowed to decay to both lepton and quarks, and below 670 GeV for a W' boson with right-handed couplings that is only allowed to decay to quarks.

11. Search for Single Top Quarks Produced via Flavor-Changing Neutral-Current Couplings at DØ

Supriya Jain, University of Oklahoma

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, including possible anomalous couplings. One form these couplings can take is with flavor-changing neutral currents, which can give rise to a single top quark in the final state through gluon exchange, together with a c or u quark in the initial or final state. We search for single top quark production through both the t - c - g and t - u - g couplings, using the DØ detector at the Fermilab Tevatron collider, and present limits on the anomalous coupling parameters κ_c / Λ and κ_u / Λ , where Λ defines the scale of new physics and κ_c (κ_u) defines the strength of the t - c - g (t - u - g) couplings.

12. Measurement of $B(t \rightarrow Wb)/B(t \rightarrow Wq)$ at DØ

Daekwang Kau, Florida State University

We report on a measurement of the ratio $R = B(t \rightarrow Wb)/B(t \rightarrow Wq)$. In the standard model this ratio is > 0.998 at the 95% confidence level. Experimentally, we measure the ratio by noting the fraction of candidate events that have 0, 1, or 2 b -tagged jets.

13. Measurement of the Top Quark Charge at DØ

Sara Strandberg, Stockholm University

We 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 . We distinguish between the two scenarios by measuring the charge of the b jet that is kinematically most consistent with arising from the same top quark as the charged lepton.

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

Bryan Gmyrek, University of Arizona

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 uses $t\bar{t}$ events in both the lepton+jets and dilepton decay channels, and is based upon the helicity angle θ^* between the charged lepton and top quark directions in the W boson rest frame.