

Helicity of the W in Single-lepton $t\bar{t}$ Events at $D\emptyset$

– Florencia Canelli

We have developed a procedure to study the helicity of the W boson in $t\bar{t}$ events using the angular distribution of the decay products. We use $p\bar{p}$ collision data collected with the $D\emptyset$ detector at Fermilab from 1992-1996 at a center of mass energy of $\sqrt{s} = 1.8$ TeV. Assuming V–A coupling in the decay, we employ a maximum likelihood method to extract the longitudinal fraction of W bosons in single-lepton $t\bar{t}$ decays.

Experimental F6: Heavy quarks

Measurement of the Top Mass in the Multi-jet Final States at $D\emptyset$ – Brian Connolly

We have measured the mass of the top in $t\bar{t}$ production in the multi-jet final states in $p\bar{p}$ collisions using the $D\emptyset$ detector at the center-of-momentum energy of 1.8 TeV with a data set corresponding to 110.8 pb^{-1} . The data were collected by the $D\emptyset$ experiment during the 1992-1996 run of the Fermilab Tevatron. Each of the top quarks in these states decays predominantly to a bottom quark and a W boson, with the W 's decaying predominantly into lighter quark-antiquark pairs. Although $\sim 44\%$ of all $t\bar{t}$ production involves such multi-jet final states, the background from QCD processes is an overwhelming factor of 1000 larger, making it difficult to extract evidence for a signal.

Experimental F6: Heavy quarks

Search for $t\bar{t}$ Resonances at $D\emptyset$ – Supryia Jain

We use approximately 125 pb^{-1} of $p\bar{p}$ collision data collected with the $D\emptyset$ detector at Fermilab from 1992-1996 at a center of mass energy of $\sqrt{s} = 1.8$ TeV, to search for a non-standard model narrow vector particle, X , decaying to a top and an anti-top quark. We assume that each top quark decays into a W boson and a bottom quark. We then consider the event topology in which one of the W bosons decays leptonically and the other decays hadronically. The resulting final state consists of a high transverse momentum isolated lepton, large missing transverse energy and at least 4 jets. In the absence of any significant excess above standard-model expectations in data, we present model-independent 95% confidence level upper limits on the cross section for the narrow, vector resonance decaying to $t\bar{t}$. Using a model of

topcolor-assisted technicolor, we then exclude the existence of a leptophobic X boson with a mass $< 600 \text{ GeV}/c^2$ for natural width $\Gamma_X = 0.012 M_X$.

Experimental F6: Heavy quarks

Triggering on Muons at Level 1 in Run 2 of the DØ Experiment – Jeff Temple

A new Level 1 muon trigger for the DØ experiment has been built to take advantage of new detectors and higher luminosity for Run 2 of the Fermilab Tevatron. We report on the current and planned triggering capabilities on muons at Level 1. Results on purity and efficiency of Level 1 muon triggers using data are presented. Level 1 muon triggers for $t\bar{t}$ production are discussed.

Experimental F11: Instrumentation

Measurement of the Top Mass in the Lepton+jets Channel in Run 2 of the DØ Experiment – Kevin Black

We will present a study of expected improvements in the systematic errors on the top quark mass measurement with the data collected in the next two years by the DØ experiment at the Fermilab Tevatron. The Fermilab Tevatron collides protons and anti-protons at a center of mass energy of about 2 TeV. We expect to accumulate a luminosity of about 2 fb^{-1} in the next couple of years. In this talk we will limit ourselves to the measurement of the top quark mass using the lepton+jets final state topology of the top quark decay. The precision measurement of the top quark mass is desirable. Within the Standard Model, the precision measurement of the top quark mass serves, together with an improved measurement of the W boson mass, as an important tool in constraining the mass of the yet to be observed Higgs Boson.

Experimental F6: Heavy quarks

Measurement of the Top Mass in the Dilepton Channel in Run 2 of the DØ Experiment – Sarosh Fatakia

Fatakia

In this talk we will present a study of the improvement in measurement of the top quark mass using a subset of top quark events with dileptons in the final state topology. The rate for these events is rather small, but this final state signature has the least background and is hence the cleanest. We will

use dynamical likelihood methods to reconstruct the top quark mass using dilepton events. The study will focus on the determination of the expected precision on the top quark mass measurement using the data sample which will be collected by the DØ experiment at the Fermilab Tevatron in the next few years. The improvement in the determination of the top mass measurement provided by these events will add significantly to the overall precision of the top mass determination using all the final state topologies. Within the framework of the Standard Model, the top quark mass and the W boson mass measurements help constrain the mass of the elusive Higgs Boson.

Experimental F6: Heavy quarks

Measurement of the $t\bar{t}$ Cross-section in the All-jets Channel in Run 2 at the DØ Experiment – Freya Blekman

We present the prospects for a measurement of the cross section of $t\bar{t}$ pairs produced in $p\bar{p}$ collisions at a center of mass energy of 1.96 TeV and decaying to six quarks using the DØ detector. The background to $t\bar{t}$ pair production in the all hadronic decay mode consists of QCD processes. The cross section for the background processes is several orders of magnitude larger than the signal cross section. A characteristic signature of $t\bar{t}$ decays is the presence of two b -jets in the final state. The DØ experiment has recently been upgraded with a new silicon vertex detector, which greatly enhances its b -quark identification capability. We discuss how the improved b -tagging capabilities of the detector can be used to significantly improve the measurement of the top quark pair production cross section in the all hadronic channel. We discuss the expected accuracy of the production cross section based on one year of data taking at the DØ experiment, approximately equivalent to a luminosity of 500 pb⁻¹.

Experimental F6: Heavy quarks

Helicity of the W Boson in $t\bar{t}$ Events in Run 2 at the DØ Experiment – Joshua Kalk

We present the prospects for a measurement of the helicity of the W Boson in $t\bar{t}$ events produced in $p\bar{p}$ collisions at the Tevatron using the DØ detector. Measurements from Run 1 at the Tevatron suffer from large statistical errors. During Run 2 both DØ and CDF will benefit from an increase in luminosity and center of mass energy, producing a much larger event sample. This will

allow better studies of properties of the top decay including the W helicity. We present a simulation study of the $D\mathcal{O}$ sensitivity to the W helicity using the angular distribution of its decay products in the channel $t\bar{t} \rightarrow e+\text{jets}$.

Experimental F6: Heavy quarks

Next-to-leading Order Monte Carlo for single top production at hadron colliders – Lukas Phaf

We present a new next-to-leading order Monte Carlo program for calculation of fully differential single top quark final states at hadron colliders. Both the s- and t-channel contributions are included. Results for $p\bar{p}$ collisions at $\sqrt{s} = 2.0$ TeV will be presented.

Experimental F6: Heavy quarks