- **Measurement of the Top Quark Pair Production Cross Section in Lepton+Jets Final States at DØ using Event Kinematics**

  Abstract: The measurement of the top quark pair ($t\bar{t}$) production cross section at hadron colliders can be used to test the standard model (SM) and search for new phenomena affecting the top quark sector. Within the SM, the top quark almost always decays to a W boson and a b quark. We present a measurement of the $t\bar{t}$ production cross section at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions using about 230 pb^{-1} of data collected by the DØ experiment during Run II of the Fermilab Tevatron collider. We consider the lepton+jets final state, which is characterized by four or more jets, a high transverse momentum isolated electron or muon and high missing transverse energy, resulting from the decay of one W boson into a charged lepton and a neutrino and the other W boson into a quark-antiquark pair. We exploit the kinematical properties of $t\bar{t}$ events to separate them from the background.

- **Measurement of the Top Quark Pair Production Cross Section in Lepton+Jets Final States at DØ using Lifetime b Tagging**

  Abstract: The measurement of the top quark pair ($t\bar{t}$) production cross section at hadron colliders can be used to test the standard model (SM) and search for new phenomena affecting the top quark sector. We present a measurement of the $t\bar{t}$ production cross section at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions using up to 370 pb^{-1} of data collected by the DØ experiment during Run II of the Fermilab Tevatron collider. Within the SM, the top quark almost always decays to a W boson and a b quark, thus leading to the presence of two b jets in the event. By using its new silicon tracker, the DØ experiment is capable of identifying b jets based on lifetime tagging. The analyses presented here use the expected b jet content of $t\bar{t}$ events to discriminate between the top signal and the SM backgrounds. We report on the application of this technique to the lepton+jets final state.

- **Measurement of the Top Quark Pair Production Cross Section in Dilepton+Jets Final States at DØ**

  Abstract: The measurement of the top quark pair ($t\bar{t}$) production cross section at hadron colliders can be used to test the standard model (SM) and search for new phenomena affecting the top quark sector. Within the SM, the top quark almost always decays to a W boson and a b quark. We present a measurement of the $t\bar{t}$ production cross section at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions using up to 370 pb^{-1} of data collected by the DØ experiment during Run II of the Fermilab Tevatron collider. We consider the dilepton+jets final state, which is characterized by two or more jets, two high transverse momentum isolated charged leptons, either two electrons, one electron and one muon, or two muons, and high missing transverse energy, resulting from the leptonic decay of both W bosons in the event.

- **Measurement of the Top Quark Pair Production Cross Section in the All-Jets Final State at DØ using Lifetime b Tagging**

  Abstract: The measurement of the top quark pair ($t\bar{t}$) production cross section at hadron colliders can be used to test the standard model (SM) and search for new phenomena affecting the top quark sector. We present a measurement of the $t\bar{t}$ production cross section at $\sqrt{s}$ = 1.96 TeV in $p\bar{p}$ collisions using about 320 pb^{-1} of data collected by the DØ experiment during Run II of the Fermilab Tevatron collider. Within the SM, the top quark almost always decays to a W boson and a b quark, thus leading to the presence of two b jets in the event. By using its new silicon tracker, the DØ experiment is capable of identifying b jets based on lifetime tagging. We report on the application of this technique to the all-jets channel, characterized by at least six jets in the final state. Further discrimination between the top signal and the large multijets background is achieved by making use of Neural Network techniques exploting the differences in kinematic properties of the events.

- **Measurement of the Top Quark Mass in the Lepton+Jets Channel at DØ**

  Abstract: The top quark mass is a key parameter of the standard model. We present measurements of the top quark mass in the lepton+jets channel from different techniques, using up to 320 pb^{-1} of data collected by the DØ experiment at the Fermilab Tevatron collider at $\sqrt{s}$ = 1.96 TeV in $p\bar{p}$ collisions. In the first technique, an event-by-event likelihood is built using the matrix elements for signal and background, thus making extensive use of the available statistical information. The leading order matrix element is used in this analysis and consequently the event selection has been restricted to events with exactly four identified jets. The second technique uses also events with more than four jets. An event-by-event likelihood is calculated, taking into account all possible jet permutations, the possibility that the event was background, and the estimated error on the fitted mass for each jet permutation. Information from a b-tagging algorithm is taken into account in the relative likelihood of the jet permutations, and is used to further improve the separation between signal and backgrounds.

- **Measurement of the Top Quark Mass in the Dilepton+Jets Channel at DØ**

  Abstract: The top quark mass is a key parameter of the standard model. We present measurements of the top quark mass in the dilepton+jets channel from different techniques, using up to 370 pb^{-1} of data collected by the DØ experiment at the Fermilab Tevatron collider at $\sqrt{s}$ = 1.96 TeV in $p\bar{p}$ collisions. In the first technique, we estimate for each event the probability of the observed kinematics as a function of top quark mass by partial calculation of the $t\bar{t}$ production and decay matrix element. In the second technique, the probability of the observed kinematics is estimated for each event as a function of top quark mass by integrating over the neutrino phase space. In both cases, we use a maximum likelihood fit to determine the top quark mass most consistent with the entire sample of events.

- **Measurement of the W Boson Helicity in Top Quark Decay at DØ**

  Abstract: Within the standard model, the helicity of the W boson in top quark decays is determined by the $V - A$ coupling. Some models of new physics introduce a $V + A$ component to the tWb coupling, which can modify the fractions of the different W boson helicity configurations. We present measurements of the fraction of W bosons with positive helicity in top quark decays using up to 370 pb^{-1} of data collected by the DØ experiment at the Fermilab Tevatron collider at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions. We consider $t\bar{t}$ candidate events selected in both the lepton+jets and dilepton+jets channels. In the lepton+jets channel we use the angular distribution of the charged lepton with respect to the top quark direction in the W boson rest frame, whereas in the dilepton+jets channel we use the distribution of lepton transverse momenta in the laboratory frame.

- **Measurement of $B(t \to Wb)/B(t \to Wq)$ at DØ**

  Abstract: Within the standard model, assuming three generations of fermions and the unitarity of the CKM matrix, the top quark decays nearly 100% of the times into a W boson and a b quark. We report on the measurement of $\text{B}(t \to Wb)/\text{B}(t \to Wq)$, where q represents any quark with charge $Q = -1/3$ and weak isospin $I_3 = -1/2$, using about 230 pb^{-1} of data collected by the DØ experiment at the Fermilab Tevatron collider at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions. We consider $t\bar{t}$ candidate events selected in the lepton+jets channel, and classify them according to the number of jets that have been identified as b jets using a lifetime tagging algorithm.

- **Determination of the Charge of the Top Quark at DØ**

  Abstract: The top quark, as the weak isopin partner of the bottom quark, should have an electric charge $Q = 2/3$. The pair production of a particle with electric charge $Q = -4/3$, decaying into $W^- b$, would result in the same final state ($\text{W}^+ \ \text{W}^- \ b\bar{b}$) as $t\bar{t}$ production with standard $t \to W^+ b$ decays, and has not been excluded experimentally. We perform a search for a top quark with $Q = -4/3$ using about 370 pb^{-1} of data collected by the DØ experiment at the Fermilab Tevatron collider at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions. We consider $t\bar{t}$ candidate events selected in the lepton+jets channel, and identify the charge of the b quark associated with the isolated lepton in order to determine the charge of the top quark.

- **Search for a Narrow $t\bar{t}$ resonance at DØ**

  Abstract: We report on the search for a narrow resonance decaying into $t\bar{t}$ using about 370 pb^{-1} of data collected by the DØ experiment at the Fermilab Tevatron collider at $\sqrt{s} = 1.96$ TeV in $p\bar{p}$ collisions. We consider $t\bar{t}$ candidate events selected in the lepton+jets channel, and reconstruct the $t\bar{t}$ event kinematics by performing a constrained kinematic fit. We reduce the contribution from background by requiring at least one of the jets to be identified as as b jet. We make use of the $t\bar{t}$ invariant mass distribution to set a lower limit on the resonance mass.

- **Search for Single Top Quark Production at DØ**

  Abstract: We present the latest results on the search for single top quark production from the DØ experiment at the Fermilab Tevatron Collider. The standard model predicts two main modes of single top quark production: the s-channel decay of a virtual W boson and the t-channel exchange of a W boson. We set upper limits on the cross sections for these two processes.