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Top mass measurement in the all-jet channel with a template method

We describe the measurement of the top quark mass applying a template method in the all hadronic jets final state using the full data set collected with the D0 detector at the Fermilab Tevatron collider. The data sample selected for this analysis consists of six hadronic jets with two jets required to have a secondary vertex, which is indicative of a b quark jet. The method employs templates that are generated by selecting the reconstructed top quark mass and W boson mass from a kinematic fitter applied to Monte Carlo generated signal and data-derived background. The templates are then compared to data to extract the top quark mass and jet energy scale correction. The current status of the analysis including the calibration procedure will be discussed.

Savanna Shaw

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Jet Energy Resolution in Higgs Boson Searches at the D0 Experiment

Standard model Higgs boson searches at the D0 experiment at the Fermilab Tevatron collider are primarily sensitive to associated production of the Higgs boson with a vector boson where the Higgs boson decays to a pair of b -quarks, when the mass of the Higgs boson is $M_H < 135$ GeV. The most powerful variable for separating signal from background events in $H \rightarrow b\bar{b}$ searches is the invariant mass of the dijet system. The resolution with which we can reconstruct this mass depends strongly on the energy resolution of our jets. This jet energy resolution depends on the resolution of our calorimeter, as well as properties of the jet such as whether a jet contains a neutrino from the decay of a b quark. We will present the techniques used to improve the jet energy resolution, and show how these improvements affect the sensitivity of the search for the Higgs boson using the D0 detector.

Emily Johnson

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Probing spin and parity in the $WH \rightarrow \ell\nu b\bar{b}$ channel at DZero

Standard model Higgs boson searches at the Fermilab Tevatron collider are sensitive to both the rate and kinematic characteristics of Higgs boson production. Using existing searches for Higgs bosons produced in association with vector bosons and with the Higgs boson decaying to pairs of bottom quarks (e.g., $WH \rightarrow \ell\nu b\bar{b}$), we probe the spin-parity value of the Higgs boson. By exploiting the differences in observable kinematics, we attempt to discern the difference between the SM Higgs boson ($J^P = 0^+$), a pseudo-scalar ($J^P = 0^-$) and a graviton-like signal ($J^P = 2^+$). Using up to 9.7 fb^{-1} of integrated luminosity collected by the D0 detector, we extract p-values for the relative likelihood of the $J^P = 0^-$ and 2^+ hypotheses.

Ryuji Yamada

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Selection of Higgs Boson candidates in the WH channel decaying into a lepton, neutrino, and a pair of b -quark jets at D0 detector

with M. Cooke, A. Abbinante, T. Podkova, and B. Rabe

A search is described for Standard Model Higgs boson events in the WH associated production channel, with subsequent decay into a lepton, a neutrino, and two b jets, using 9.7 fb^{-1} of data collected with the D0 detector at the Fermilab Tevatron collider. The search yields an estimated 33 candidate events decaying in this channel with exactly two jets. Among them we estimate 7.7 Higgs boson events with two tight b -tagged jets and 11.6 events with one tight b tag. After pre-selection of data, we determine the most likely Higgs boson candidate events using the results of a multivariate analysis. We will explain the characteristics of these events, and show event displays of the most likely Higgs boson candidate events. The same technique can be applied to other channels.

Ian Howley

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Search for the Higgs boson in final states with tau-jets

Using 9.7 fb^{-1} of data collected using the D0 detector at the Fermilab Tevatron collider, we present a search for the standard model Higgs boson in final states of a lepton (e or μ), a hadronically decaying tau lepton and at least two jets. Several Higgs boson production and decay processes contribute in different proportions as a function of Higgs boson mass. Subsamples of enriched $H \rightarrow W^+W^-$ and $H \rightarrow \tau^+\tau^-$ events are created and a new multivariate method is discussed that reduces the variability of boosted decision tree (BDT) trainings across the mass spectrum. The ratio of 95% C.L. Higgs boson cross section lower limits from the data to that expected in the standard model is obtained for both subsamples separately and combined. This limit is the most stringent measurement involving $H \rightarrow \tau^+\tau^-$ from the Tevatron.

Joseph Zennaro

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Measurement of Z boson production in association with heavy flavor jets at D0

Associated production of a Z boson with a charm or bottom quark can serve as an important test of perturbative quantum chromodynamic calculations. The ratios of cross sections, $\sigma(Z + c\text{jet})/\sigma(Z + \text{jet})$ and $\sigma(Z + c\text{jet})/\sigma(Z + b\text{jet})$ are measured for associated production of a Z boson with jets as a function of the jet and Z boson transverse momentum. Measurements use data collected by the D0 detector in Run II of the Tevatron $p\bar{p}$ collider at a center-of-mass energy of 1.96 TeV, and correspond to an integrated luminosity of 9.7 fb^{-1} . Results are compared to predictions from next-to-leading order calculations and various Monte Carlo event generators.

Jesus Orduna

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B_s^0 lifetime measurement from the decay $B_s^0 \rightarrow J/\psi f_0(980)$

The B_s^0 meson is in general a superposition of CP-even and CP-odd states, which are expected to have different lifetimes. The decay $B_s^0 \rightarrow J/\psi f_0(980)$ must be a pure CP-odd (orbital angular momentum $L = 1$) state due to conservation of angular momentum. Measurement of the B_s^0 lifetime from this decay should therefore yield information on the CP-odd B_s^0 lifetime. We report on the $B_s^0 \rightarrow J/\psi f_0(980)$ lifetime measurement using the full Run II dataset collected by the D0 detector at the Fermilab Tevatron collider.

Michelle Prewitt

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Search for the rare decay $B_s^0 \rightarrow \mu^+ \mu^-$ at D0

The decay $B_s^0 \rightarrow \mu^+ \mu^-$ is heavily suppressed in the standard model, but many scenarios for physics beyond the standard model predict large enhancements in this process. We report an updated search for this decay using data collected by the D0 detector at the Fermilab Tevatron collider. We use the full Run II data set, corresponding to approximately 10.5 fb^{-1} of integrated luminosity in $p\bar{p}$ collisions at $\sqrt{s}=1.96 \text{ TeV}$.