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Top quark physics in CDF

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The study of the dynamics of top-quark pair production in proton-proton and proton-antiproton collisions plays an important role in the understanding of parton interactions at large Bjorken-x. It tests the assumptions of the standard model and of quantum chromodynamics at the electroweak scale and beyond. The CDF data set is an ideal sample for measuring observables sensitive to the dynamics of top-quark pair production, given the excellent understanding of detector performance and the unique proton-antiproton initial state. We present recent measurements of such observables from CDF. These include the direct measurement of the ratio R of the branching fraction of top-quark decaying to W + b-quark over the branching fraction of top-quark decaying to W + any quark flavor. The measurement uses data corresponding to 7.5/fb of integrated luminosity in the lepton+jets decay channel. The ratio R constrains the |V_tb| element of the CKM matrix. We also present a measurement of the spin correlation coefficient of the top-quark pair, which can be directly measured uniquely in the top-pair system thanks to the very short life time of the top-quark. This measurement uses data corresponding to 5.1/fb of integrated luminosity in the dilepton decay channel. Finally, we present a study of the top-quark pair production asymmetries in the lepton+jets channel using the full CDF Run II data set which corresponds to an integrated luminosity of 8.7/fb. The study includes the measurement of the cross section differential in the top-pair rapidity difference, the measurement of the inclusive forward-backward asymmetry A_FB, as well as the measurement of A_FB as a function of the rapidity difference and of the invariant mass of the top-pair system. The production asymmetries are sensitive to the top-quark pair production mechanism, thus constraining quantum chromodynamics at higher order and testing for possible new physics.

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