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physics update

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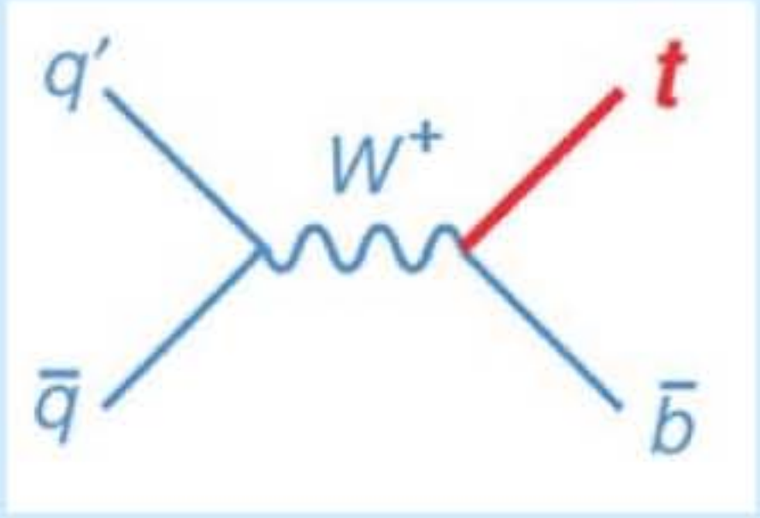
Unpaired top quarks. Weighing 200 times as much as a proton, the top quark is by far the heaviest elementary particle known. Because the strong nuclear force can't change a quark's flavor, it can produce quarks only in pairs with their antiquarks. The weak force can change flavors. But weak-interaction cross sections are so small that it's almost impossible to produce any quark, let alone the heaviest and rarest, without its antiquark in collisions between hadrons. But the DZero detector collaboration at Fermilab's Tevatron collider seems to have managed it. From among 10^{14} high-energy proton–antiproton collisions, the collaboration has found evidence for about 60 collisions that produced an unpaired top quark. One can't actually point to the individual events within the sample of 1400 selected candidates. The experimenters' case is indirect and sophisticated, involving complex decision trees and Bayesian neural networks to deduce the fraction of true single-top events buried within an overwhelming background of impostors. Impostors are less of a problem when one looks for top–antitop pairs. DZero's tour de force is important because the same technique will be required to ferret out evidence of the much-sought-after Higgs boson at CERN's Large Hadron Collider and possibly even at the Tevatron. Furthermore, the observation confirms the somewhat surprising standard-model prediction that at the Tevatron's 2-TeV collision energy, the cross section for producing single top quarks by the weak interaction is not much smaller than the strong-interaction cross section for making top pairs. The result also provides the first direct measurement of the top quark's coupling to the W boson that mediates the change of quark flavors. (V. M. Abazov et al., *Phys. Rev. Lett.*, in press.)



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