TOP QUARK PAPER – ABSTRACT

FERMILAB–PUB–94/097–E

Submitted to Phys. Rev. D
(cca 150 pages)

Evidence for Top Quark Production in P Pbar Collisions at sqrt{s} = 1.8 TeV

We present the results of a search for the top quark in 19.3 pb^{–1} of **p pbar** collisions at sqrt{s}= 1.8 TeV. The data were collected at the Fermilab Tevatron collider using the Collider Detector at Fermilab (CDF). The search includes Standard Model **t tbar** decays to final states **e e nu nubar**, **e mu nu nubar**, and **mu mu nu nubar** as well as **e + nu + jets** or **mu + nu + jets**. In the **(e, mu) + nu + jets** channel we search for **b** quarks from **t** decays via secondary–vertex identification and via semileptonic decays of the **b** and cascade **c** quarks. In the dilepton final states we find two events with a background of 0.56^{+0.25}_{–0.13} events. In the **e, mu + nu + jets** channel with a **b** identified via a secondary vertex, we find six events with a background of 2.3 +– 0.3. With a **b** identified via a semileptonic decay, we find seven events with a background of 3.1 +– 0.3. The secondary–vertex and semileptonic decay samples have three events in common. The probability that the observed yield is consistent with the background is estimated to be 0.26%. The statistics are too limited to firmly establish the existence of the top quark, however a natural interpretation of the excess is that it is due to t tbar production. We present several cross checks. Some support this hypothesis, others do not. Under the assumption that the excess yield over background is due to **t tbar**, constrained fitting on a subset of the events yields a mass of

$$174 \pm 10^{+13}_{-12} \text{ GeV}/c^2$$

for the top quark. The **t tbar** cross section, using this top quark mass to compute the acceptance, is measured to be 13.9^{+6.1}_{–4.8} pb.

PACS Numbers: 14.80.Dq, 13.85.Qk, 13.85.Ni