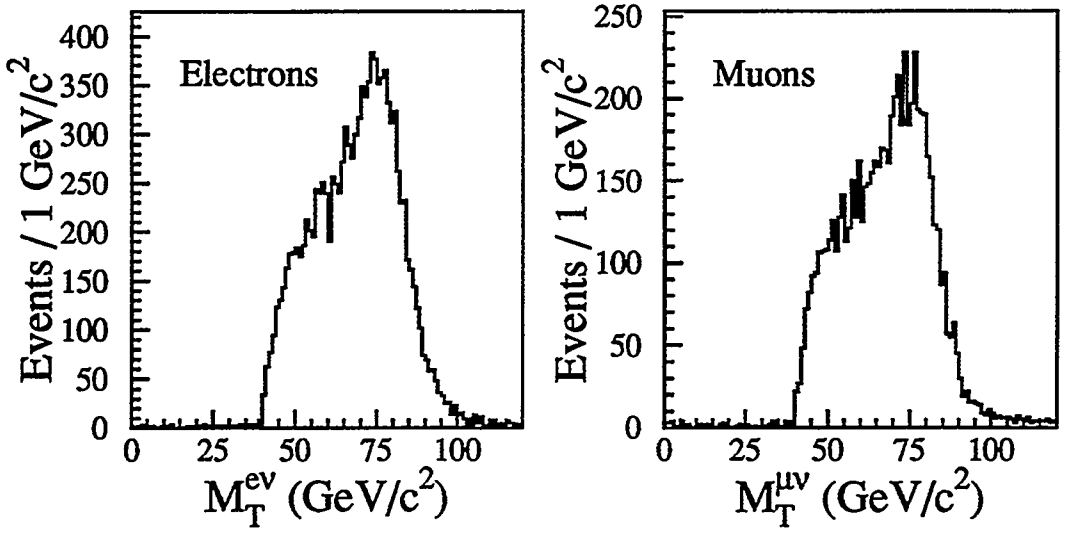

Figure 7: The transverse mass distribution for the CDF electron and muon samples after requiring a well-identified charged lepton and missing transverse energy > 20 GeV. These data are from Run 1A only.

significant separation between signal and background with only a modest loss of signal.

The DØ collaboration defines a $t\bar{t}$ candidate sample by requiring that $H_T >$ 200 GeV, that there be at least four jets in the final state with $E_T > 15$ GeV and $|\eta| < 2.0$, and that the aplanarity of the event > 0.05. This leaves 5 $e^{\pm}$+ jet events and 3 $\mu^{\pm}$+ jet events in the sample. They expect to observe 3.8 ± 0.6 events from $t\bar{t}$ production in this sample for a top quark mass of 180 GeV/c^2.

The backgrounds to $t\bar{t}$ production in this sample are dominated by the inclusive W+jets process. In order to estimate the size of this background, one can use the rate of observed events in the $W+1$, $W+2$, and $W+3$ jet sample and extrapolate that to the number of events in the $W+\geq 4$ jet sample. It is expected that the ratio of $W+n$ jet events to $W+(n-1)$ jet events will be constant given the same jet requirements[14] when the H_T and aplanarity cuts are removed. This prediction can be tested using the $W+1$ jets, $W+2$ and $W+3$ jet samples where one expects to see little $t\bar{t}$ contribution. The results of this test, shown in Fig. 8, confirm that this ratio remains constant.

The DØ collaboration then applies the H_T and aplanarity cuts and uses the relative efficiency of these cuts on $t\bar{t}$ signal and the W+ jets background to extract the number of $t\bar{t}$ events in the sample and the number of background events that remain. The DØ collaboration estimates the size of the background in their $W+4$ jet sample to be 1.9 ± 0.5 events. There is a clear excess of observed events above the predicted background.