only hypothesis very unlikely.[3] The obvious next step is to seek independent confirmation.

6.3 B Tagging in the Dilepton Sample

If the dilepton sample has a contribution from $t\bar{t}$ production, it is reasonable to search for evidence that two b quarks are being produced in association with the dilepton pair and neutrinos.

The CDF collaboration has examined these events for such indications using the b tagging algorithms described in detail in the following section. Three of the six events have a total of five tagged jets, three with SLT tags and two with SVX tags. CDF estimates that only 0.5 events would be expected from non-$t\bar{t}$ standard model sources, whereas one would expect 3.6 tags if the events arose from the expected mixture of background and $t\bar{t}$ production. The data is certainly consistent with the $t\bar{t}$ hypothesis, further motivating a detailed study of the lepton+jets data.

7 The Lepton+Jets Top Quark Search

Both collaborations begin their lepton+jets analysis from a data sample dominated by inclusive $W^{\pm}$ production. They require events with significant $\not{E}_T$ and a well-identified, high transverse momentum electron or muon. DØ requires the presence of an isolated electron with $E_T > 20$ GeV, and $\not{E}_T > 25$ GeV to identify an inclusive $W^{\pm} \rightarrow e\nu_e$ sample and an isolated muon with $p_T > 15$ GeV/c, and $\not{E}_T > 20$ GeV to identify a $W^{\pm} \rightarrow \mu^{\pm}\nu_{\mu}$ sample. CDF requires $\not{E}_T > 20$ GeV and a charged lepton be in the central detector with $P_T > 20$ GeV/c and $|\eta| < 1.0$. The transverse mass distribution for the resulting candidate events,

$$M_T \equiv \sqrt{2E_T \not{E}_T(1 - \cos\phi_{l\nu})}, \tag{14}$$

shows a clear Jacobian distribution, as illustrated by the CDF data shown in Fig. 7.

7.1 The DØ Lepton+Jets Search

7.1.1 The DØ Kinematic Analysis

The production of $W^{\pm}$ bosons accompanied by additional jets form the largest single background in the lepton+jets search. However, there are significant differences in the kinematics of the partons in the $t\bar{t}$ and W+jets final state that can be used to differentiate between these processes. For example, the H_T distribution is compared for the $t\bar{t}$ and W+jets final state in Fig. 4(b). One sees that this variable provides

[3]One cannot simply multiply the two significances together. To combine these observations, one could define a single statistic (like the total number of observed events in both experiments) and then model the fluctuations of this variable in the case of the null hypothesis. This would give a larger probability of a background hypothesis than the product of the two probabilities.