



tt Lepton Triggers

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Abstract:

A threshold $p_t \geq 40$ GeV is appropriate for studying tt events.

$t\bar{t}$ Lepton Triggers

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ABSTRACT

A threshold $p_T \gtrsim 40$ GeV is appropriate for studying $t\bar{t}$ events.

A single isolated lepton trigger is needed to select a sample of $t\bar{t}$ events with one unbiased t or \bar{t} decay. To determine an appropriate threshold, a sample of 10000 $t\bar{t}$ events with $m_t = 140$ GeV were generated with ISAJET 6.43. For the single lepton trigger, events with at least one isolated lepton satisfying

$$E_T < 5 \text{ GeV} \quad \text{in} \quad \Delta R = 0.4$$

were selected, and the highest p_T lepton was plotted. Fig. 1 shows the differential distribution, and Fig. 2 shows the integrated spectrum. A cut at $p_T = 40$ GeV gives an acceptance of about 50%, which is probably acceptable since the cross section is large.

There is a background of real isolated leptons from $W \rightarrow \ell\nu$ plus multiple jets. There is also a very large background of real leptons from c and b decays. After a rather tight isolation cut, the cross section for these leptons was found to fall below that for leptons from top for $p_T \approx 40$ GeV.¹ There is no point in triggering on top in a region dominated by background. A more realistic analysis of the effectiveness of an isolation cut is needed, but it is likely to raise rather than lower the threshold.

Top events with two isolated leptons were also selected. The differential and integral spectra of the lower p_T lepton are shown in Fig. 3 and Fig. 4 respectively. A threshold around $p_T \approx 15$ GeV seems appropriate. This is similar to what is needed for an efficient $Z \rightarrow \ell^+\ell^-$ trigger, which is essential for detecting $H \rightarrow ZZ^*$.

1. F.E. Paige, "Lepton Triggers at the SSC" (unpublished).

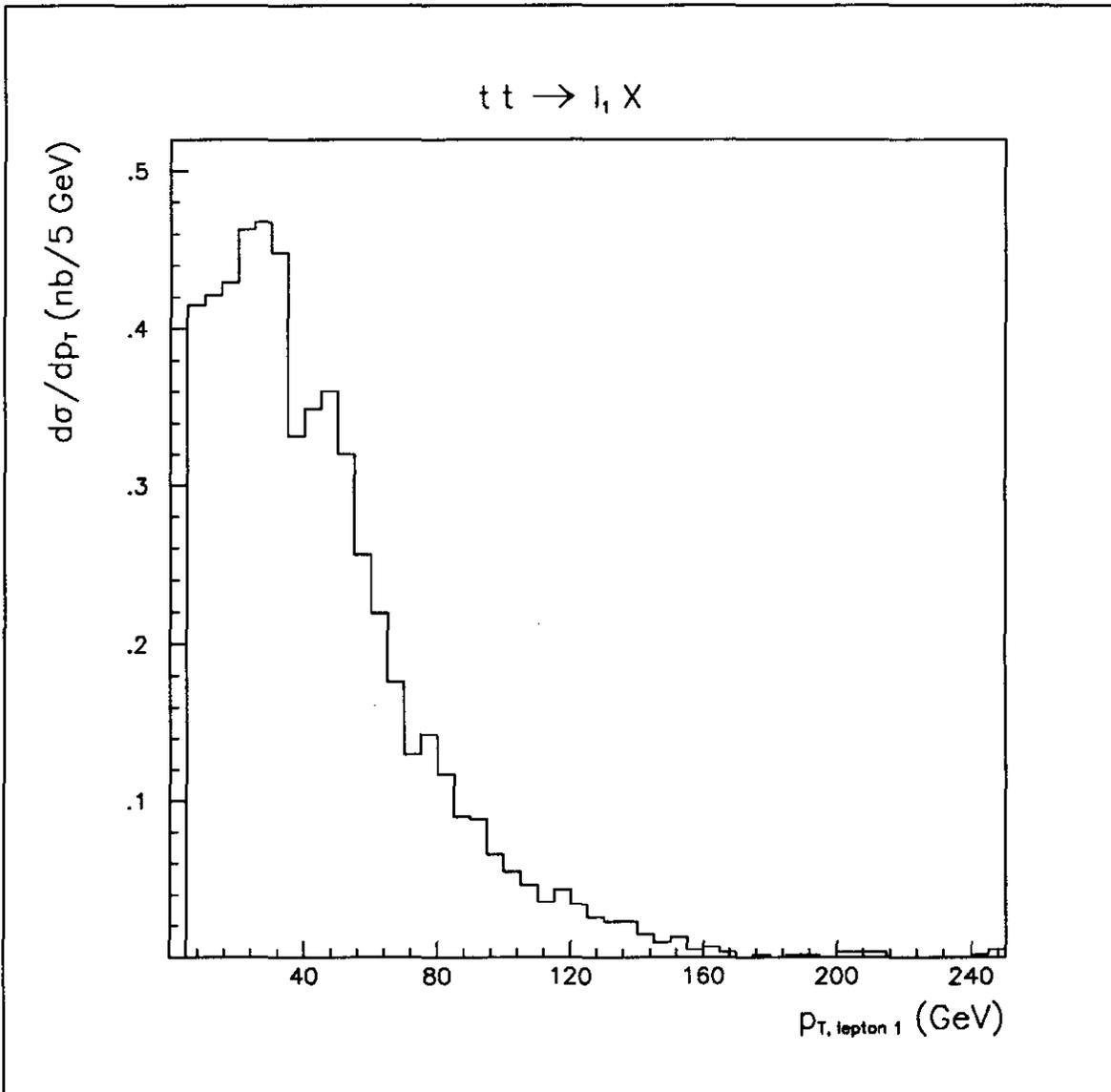


Figure 1: Differential cross section for highest p_T isolated lepton in $t\bar{t} \rightarrow l_1 X$ events.

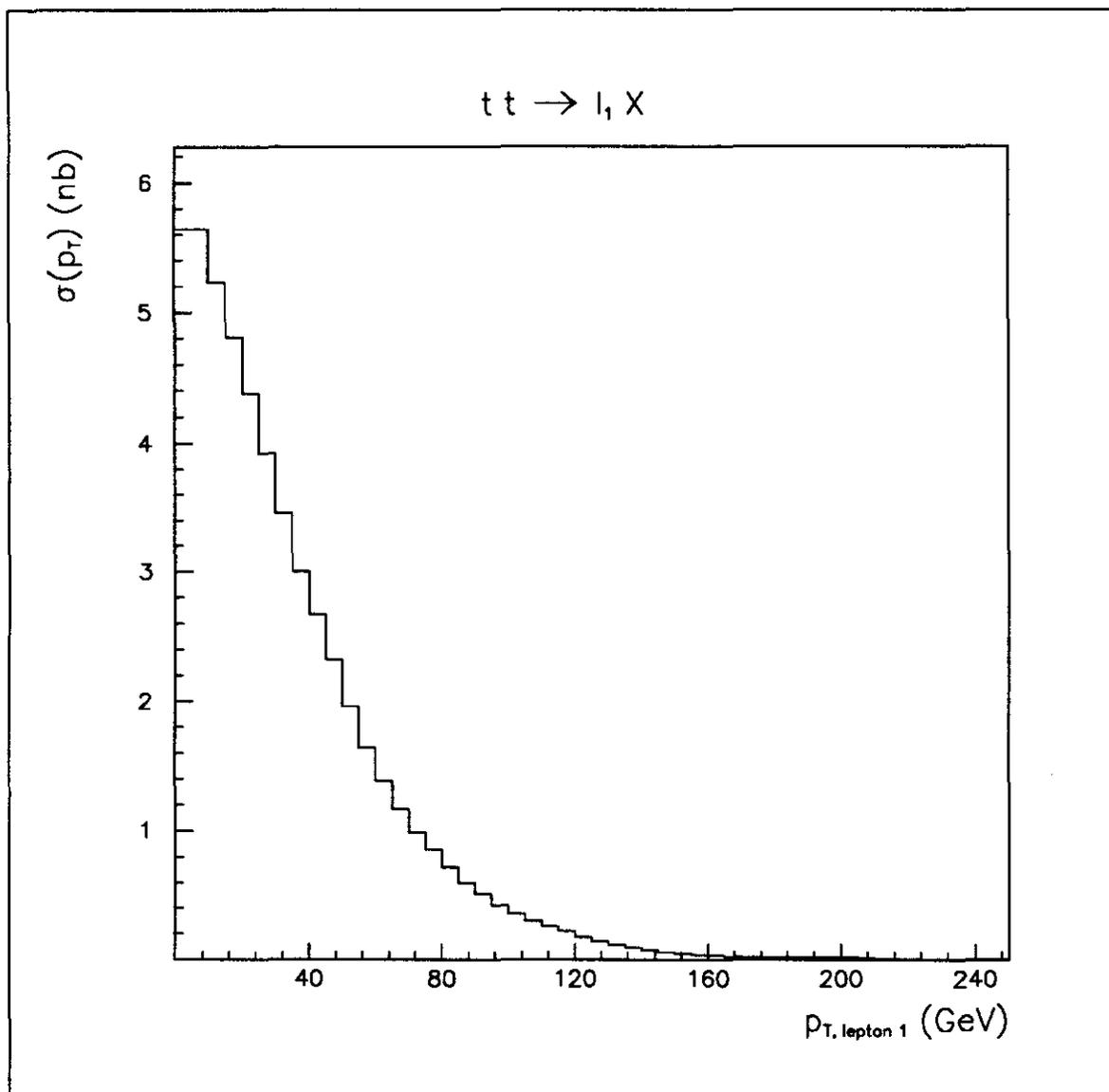


Figure 2: Integral cross section for highest p_T isolated lepton in $t\bar{t} \rightarrow l_1 X$ events.

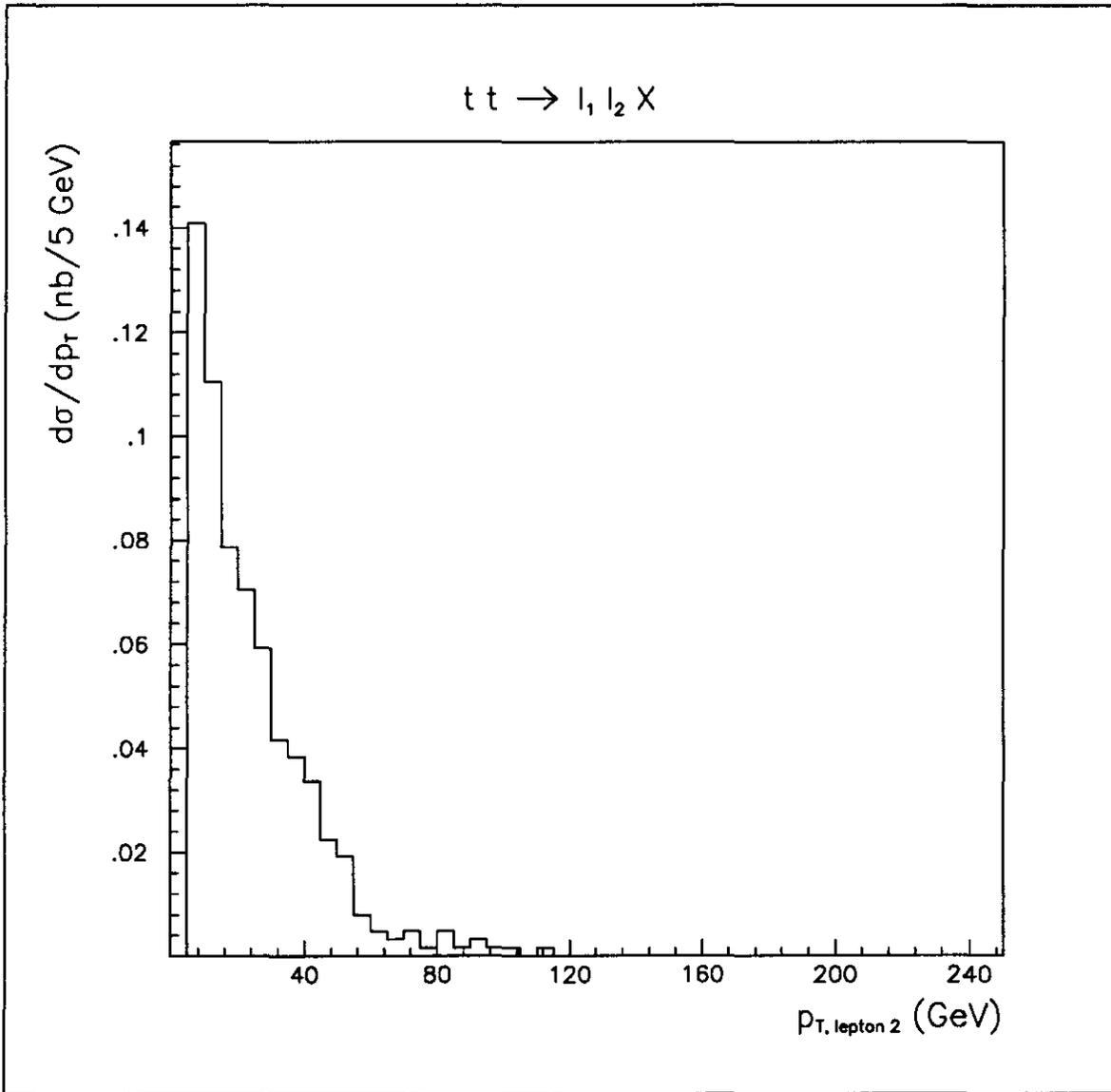


Figure 3: Differential cross section for second highest p_T isolated lepton in $t\bar{t} \rightarrow l_1 l_2 X$ events.

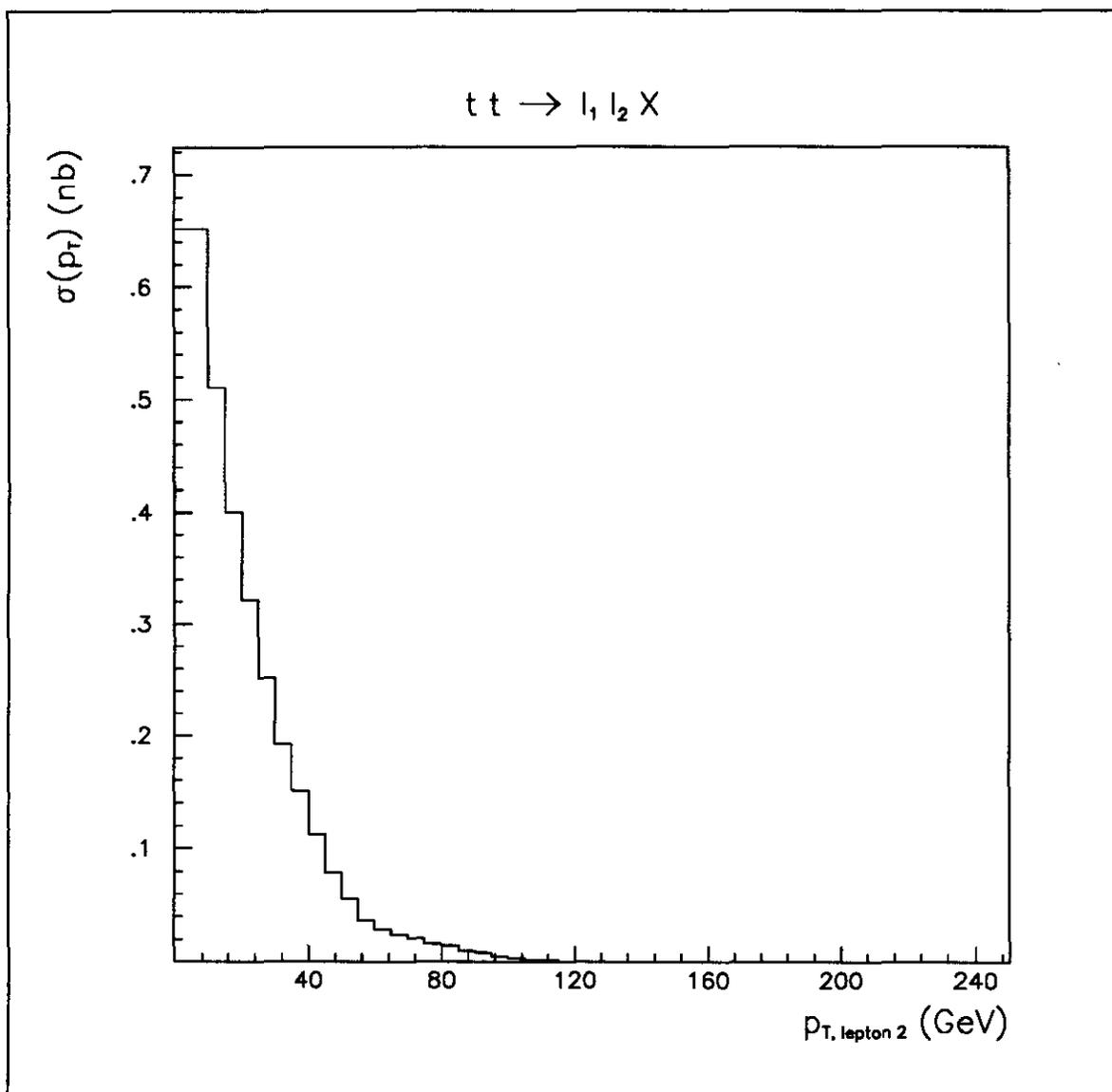


Figure 4: Integral cross section for second highest p_T isolated lepton in $t\bar{t} \rightarrow l_1 l_2 X$ events.