Top Cross Section Measurement Using Event Kinematics
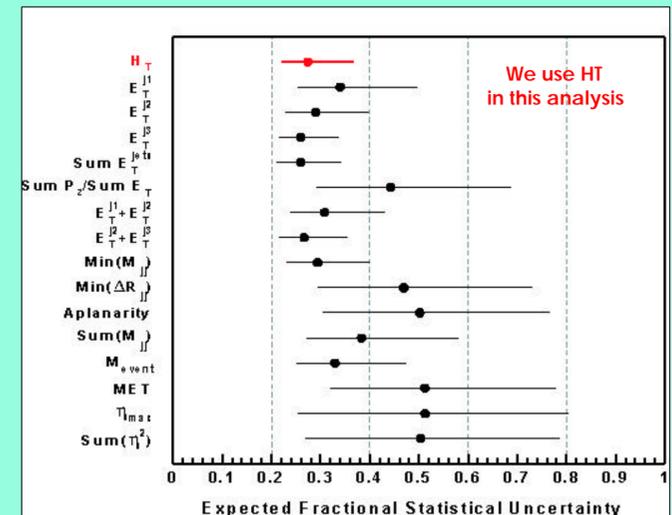
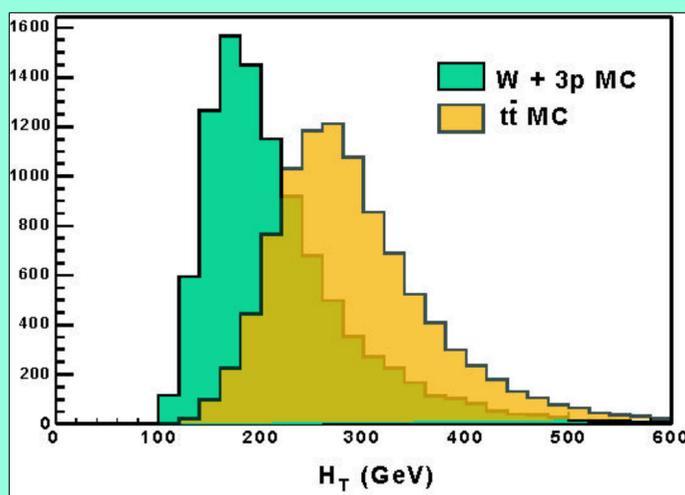**Authors: R. Erbacher, E. Thomson**

The Goal

Top quark pair production leads to events with high energy leptons, missing energy, and jets.

We measure the production rate of top quark pairs utilizing event kinematics, rather than tagging the b quarks from top decay.

Which variable?

We use HT in this analysis

Total Event Energy H_T

- W + 3p MC
- $t\bar{t}$ MC

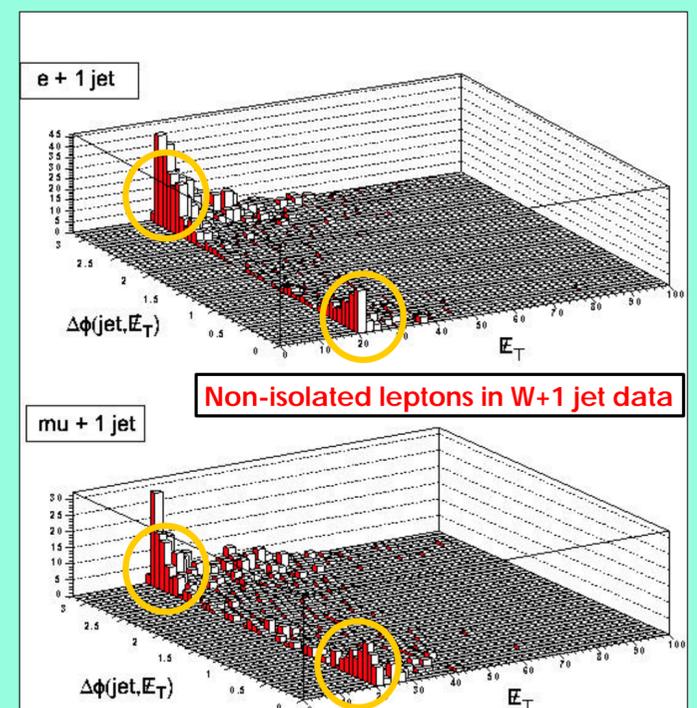Total transverse energy of the event is used to discriminate top from background

Method

Determine top cross section in lepton+ jets channel using likelihood fit to W+jets/EWK, QCD background, and ttbar shapes.
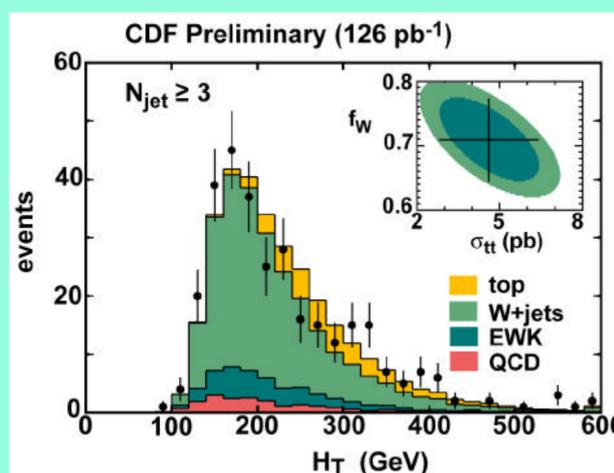
Main Backgrounds

Dominant backgrounds are W+jets and QCD fakes.
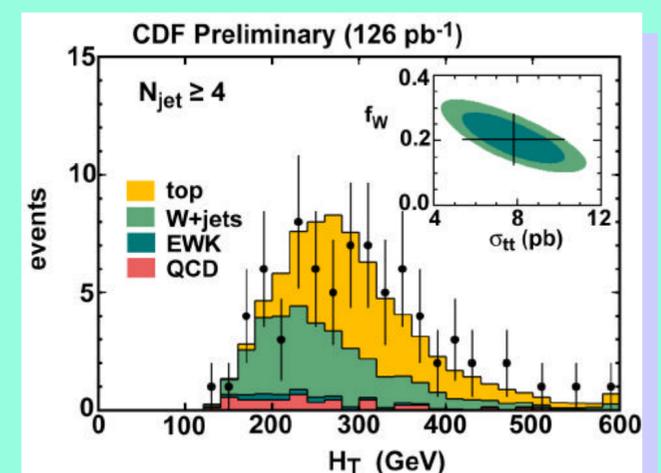
Model QCD background using non-isolated lepton sample.

Reduce fakes by Removing events with small **Df** between missing E_T and leading jet.

Non-isolated leptons in W+1 jet data

Systematic Effects

Effect	Shape	Acceptance	Total
Energy Scale	28%	5.1%	30%
Generator	0.60%	---	0.6%
Top Mass	8.0%	5.0%	13%
Q² Choice	14%	---	14%
PDF	3.3%	5.3% (from lepton ID)	8.6%
ISR (Pythia)	0.56%	0.78%	1.3%
Luminosity			5.9%
Background model	16%	1.7% (normalization)	16%
Total			40.6%

Results

Requiring 3 or more jets:
σ (ttbar) = 5.1 ± 1.8 (stat) ± 2.1 (sys)

Requiring 4 or more jets:
σ (ttbar) = 7.7 ± 2.4 (stat) ± 3.0 (sys)

Future

Employ multivariate techniques to improve signal sensitivity