Loose Inclusive-Tag Top Cross Section

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DOE Review

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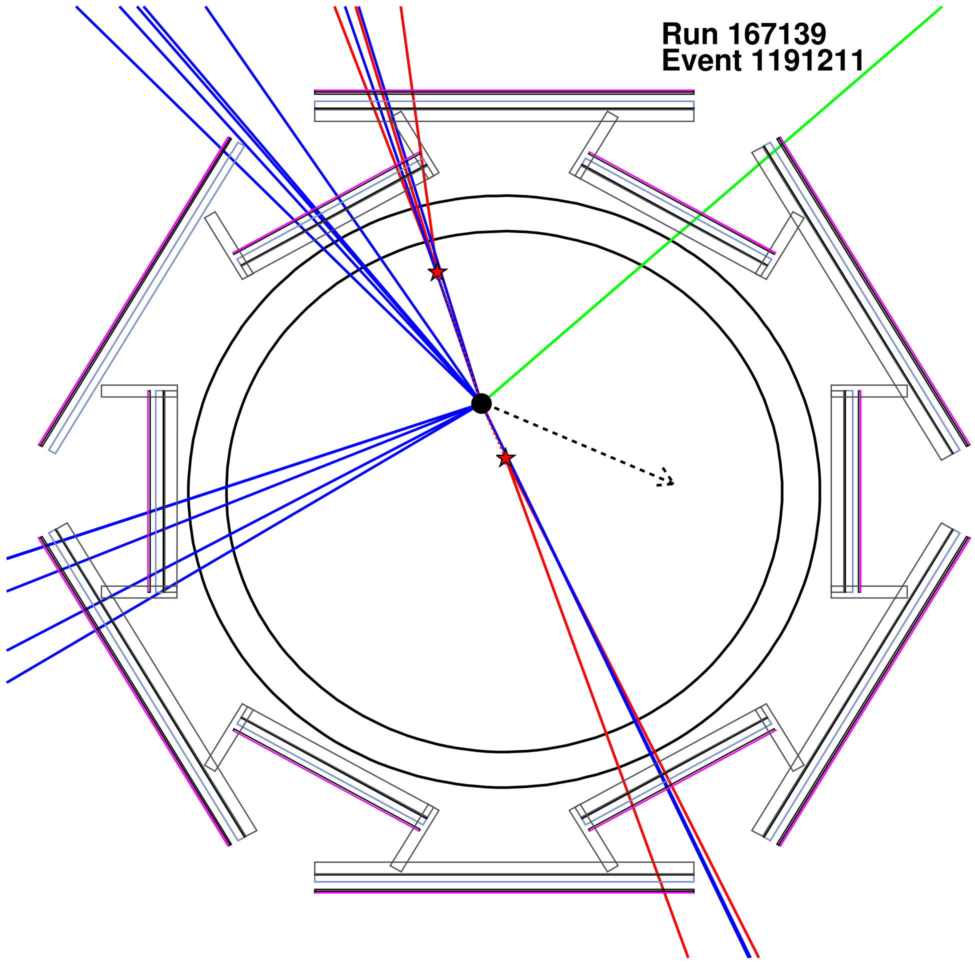
Analysis

We have measured the $t\bar{t}$ cross section in the lepton+jets channel

- Higher W branching fraction than di-lepton
- Leptonic W requirement reduces background more than all-hadronic
- Cross section evaluated in $\geq$ 3-jet events with $\geq$1 tag



Method

The top cross section is measured with the equation:

$$\sigma_{t\bar{t}} = \frac{N_{obs} - N_{bkg}}{(\Phi_e \epsilon_{tag})\, \epsilon_{pretag} \int \mathcal{L} dt} \tag{1}$$

- N_{obs}: Number of events with $\geq$1 b-tagged jet
- N_{bkg}: Number of non-$t\bar{t}$ events expected with $\geq$1 b-tagged jet
- ϵ_{tag}: Efficiency to b-tag a $t\bar{t}$ event in the Monte Carlo pretag sample
- Φ_e: Ratio of b-tagging efficiencies in the data and Monte Carlo
- ϵ_{pretag}: $t\bar{t}$ acceptance (geometric acceptance and event selection)
- $\int \mathcal{L} dt$: Integrated luminosity

Backgrounds

Single number N_{bkg} actually a sum of several contributions:

- Mistags
  - Resolution, material ($\gamma \rightarrow e^+e^-$, nuclear stars), other light flavor tags (K_s, Λ)
  - Rate determined in $p\overline{p}$ $\rightarrow$jets data
  - Largest background
- Non-W
  - Events where lepton is not from a W (conversions, hadronic fakes)
  - Determined from data (Missing E_T, isolation sidebands)
- Monte Carlo Backgrounds
  - Well-defined processes with known cross section
  - Dibosons (WW, WZ, ZZ), $Z \rightarrow \tau\tau$, Single Top
- W + Heavy Flavor Jets
  - b, c content of remainder taken from $W + QCD$ MC
  - Tagging efficiencies *known* from scale factor

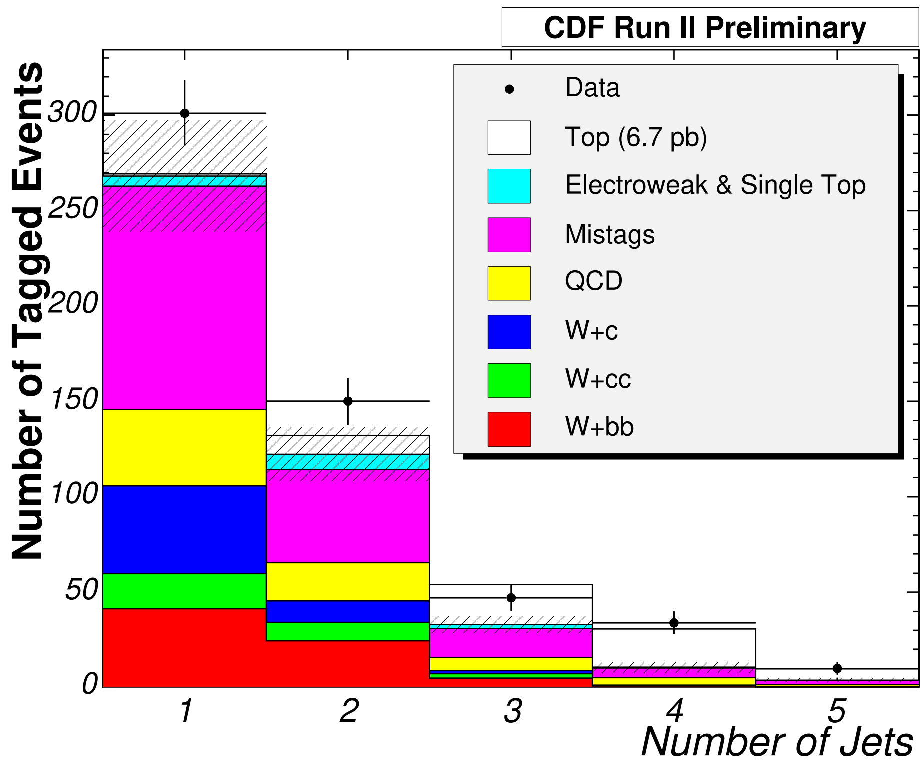
Signal

$t\bar{t}$ efficiency evaluated from Monte Carlo

- Multiplied by event scale factor, Φ_e, for the data
- ϵ_{pretag} accounts for the trigger efficiency, lepton ID, PDF's, Z-Vertex, etc.

Summary

	1 jet	2 jets	3 jets	4 jets	$\geq$5 jets
Expected Background	268 ± 29	122 ± 14.1	33 ± 3.6	10.6 ± 1.5	3.7 ± 0.5
$t\bar{t}$ Expectation (6.7 pb)	1.3 ± 0.2	9.8 ± 1.2	21 ± 2.6	20.1 ± 2.4	6.1 ± 0.7
Data	301	150	47	34	10



$$\sigma_{t\bar{t}} = 6.2\ ^{+1.4}_{-1.3}\ \text{(stat)}\ ^{+1.1}_{-0.9}\ \text{(syst) pb}$$