



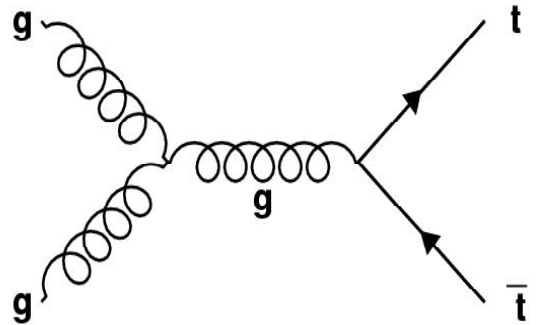
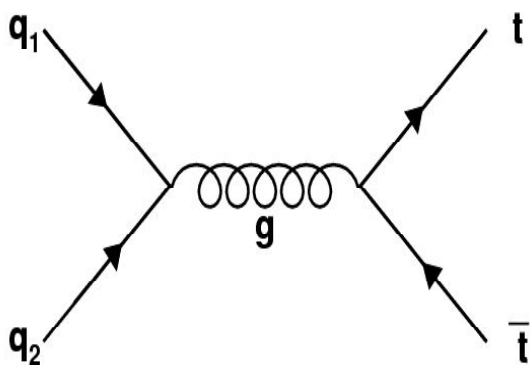
Top Quark Production Cross Section Results from CDF II

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- Strong production of top pairs
- Lepton+ jets channel results
- Dilepton channel results
- Search for ewk production (single top)

Strong Production

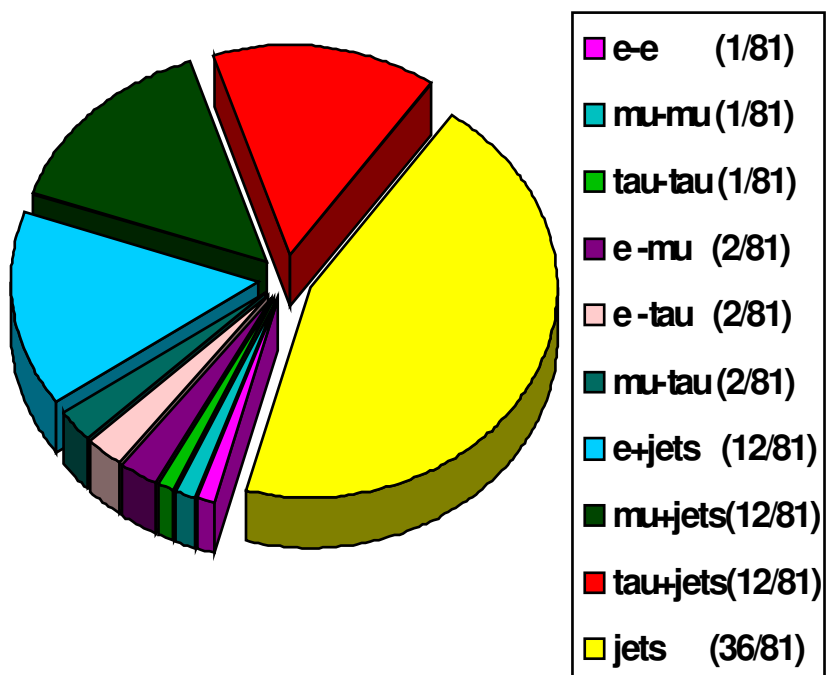
Strong production of pairs of top quarks at the Tevatron:



With $Br(t \rightarrow Wb) \simeq 100\%$

3 main channels:

- ◆ All-hadronic
- ◆ Lepton + jets
- ◆ dilepton

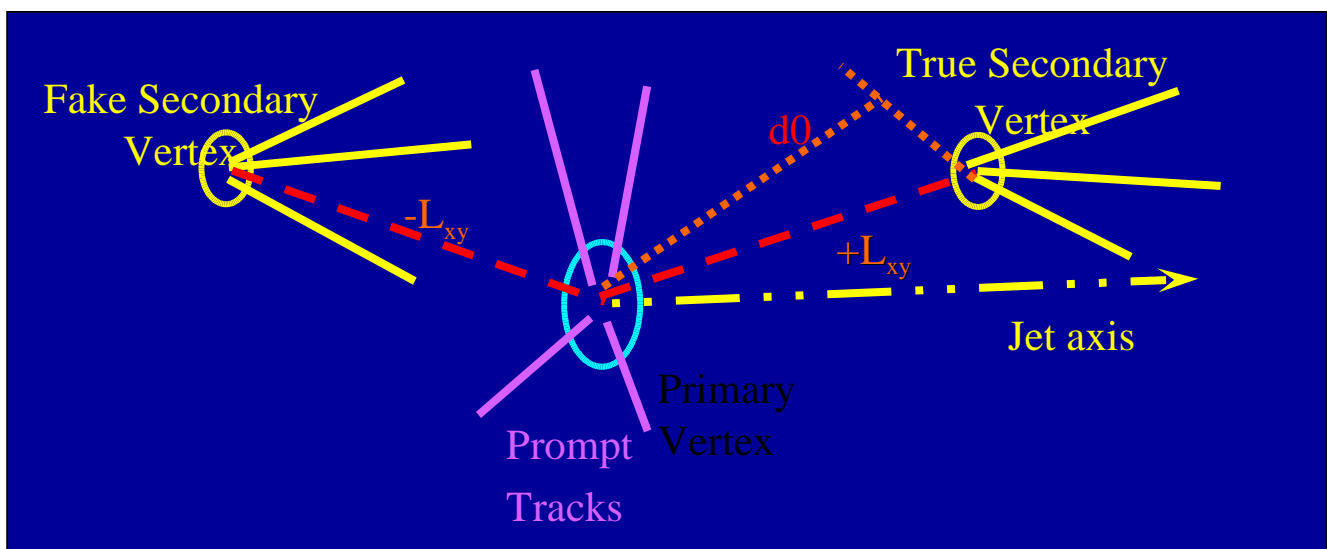


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Lepton + Jets Channel

Top quark decays to a b quark: we attempt to identify b hadrons (2 in the event).

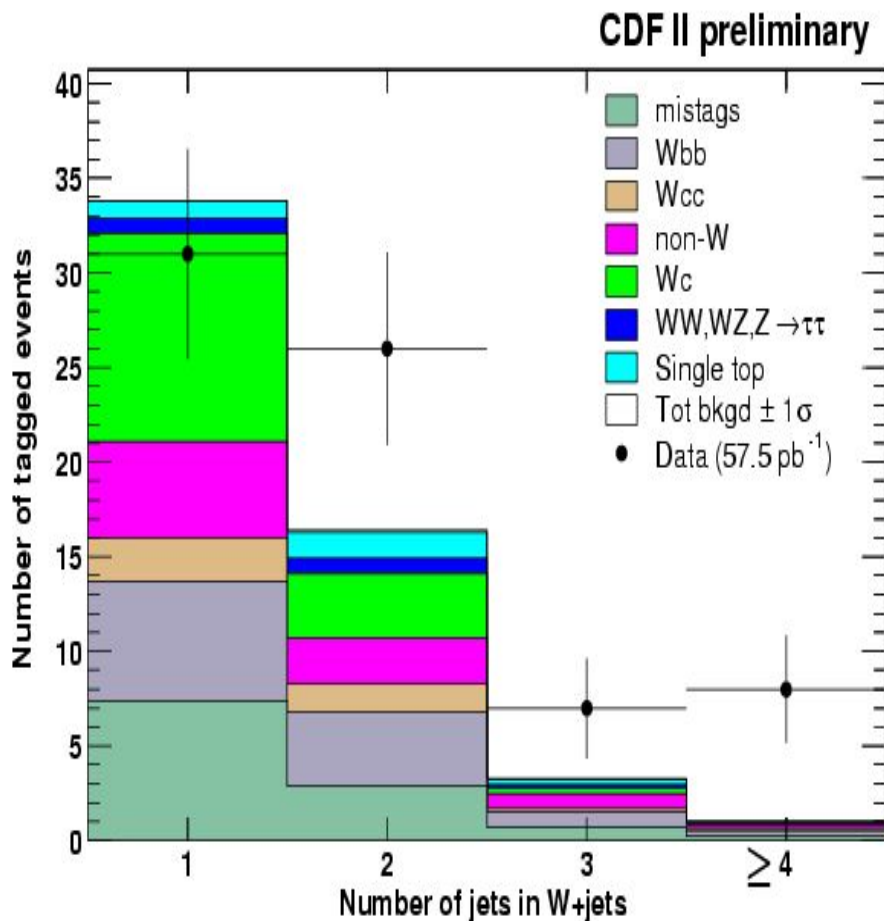
Strategy: make use of long b hadron lifetime ($L_{xy} \sim 3\text{mm}$), look for a secondary decay vertex



- Algorithm looks for displaced vertices with combination of at least 2 tracks
- Jet is tagged as b-jet if $L_{xy}/\sigma_{xy} > 3$ (with $\sigma_{xy} \sim 150\mu\text{m}$)

1+jets Results

Main backgrounds: **Wbb, Wcc, fake tags, Wc, non-W background**



- Perform counting experiment for events with 3 or more jets.
- Result: $\sigma_{tt} = 5.3 \pm 1.9_{stat} \pm 0.8_{syst} pb$
- NLO for $M_{top} = 175 GeV$: $6.70^{+0.71}_{-0.88} pb$

Dilepton Channel

◆ “Tight analysis” event selection

- 2 High P_T ($P_T > 20$ GeV) oppositely charged leptons (e, muon).
- Both need to be isolated: $I_{CAL} < 0.1$
- Veto Z's, cosmics, and conversions
- Require missing $E_T > 25$ GeV (neutrinos)
- at least 2 jets with $E_T > 10$ GeV
- Total transverse energy of the event > 200 GeV

◆ backgrounds:

- ◆ Dibosons: WW/WZ/ZZ
- ◆ Drell Yan
- ◆ Non-W (fake leptons)

→ BR~5%, detection eff ~ 10%, S/B~8

Dilepton Results

Source	$e\bar{e}$	$\mu\bar{\mu}$	$e\bar{\mu}$	$\mu\bar{e}$
Background	0.103 ± 0.056	0.093 ± 0.054	0.100 ± 0.037	0.30 ± 0.12
$t\bar{t} \rightarrow Wbb$	0.47 ± 0.05	0.59 ± 0.07	1.44 ± 0.16	25 ± 0.3
SM extension	0.57 ± 0.08	0.68 ± 0.09	1.5 ± 0.2	28 ± 0.3
Data	1	1	3	5

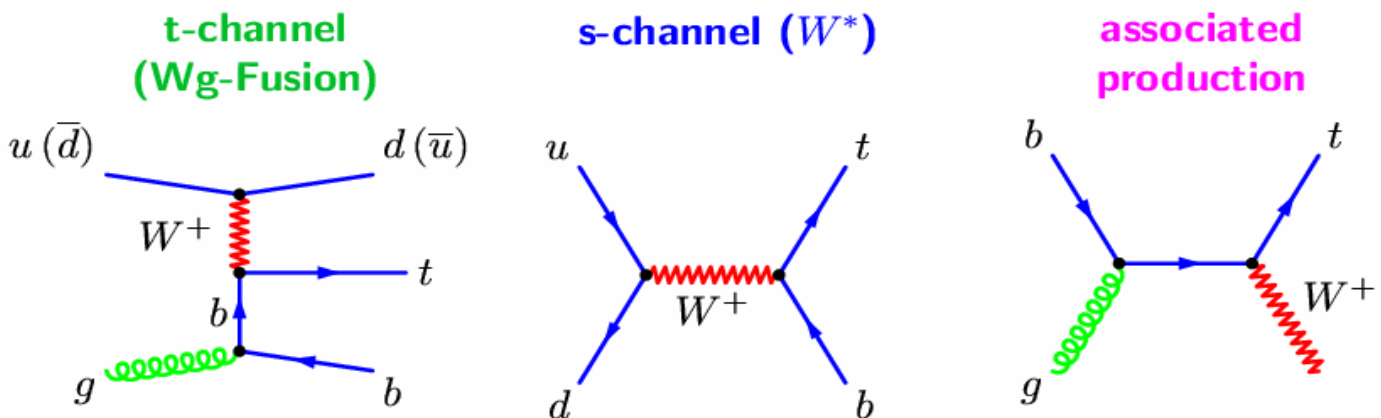
5 candidate events in 72 pb^{-1}

$$\sigma_{t\bar{t}} = 13.2 \pm 5.9_{\text{stat}} \pm 1.5_{\text{sys}} \pm 0.8_{\text{lum}} \text{ pb}$$

- High-acceptance analysis in progress
 - Loosen selection criteria on one lepton
 - Add plug electrons
 - Results this Summer

Single Top Production

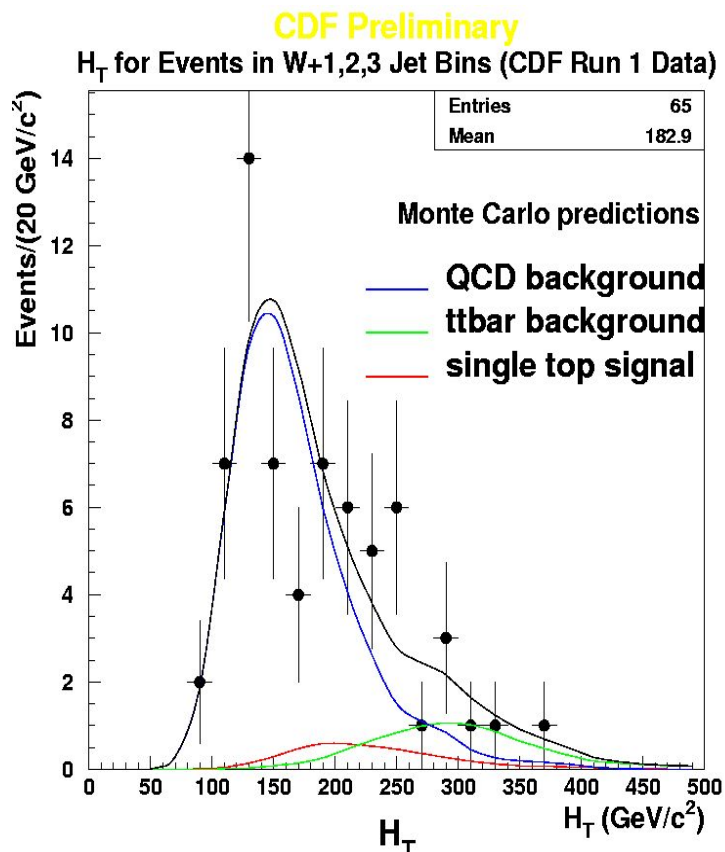
Electroweak Production of a single top quark



- Cross section proportional to V_{tb}^2
- Sensitive to non-Standard Model interactions of top quark
- Allows polarization studies of “bare” quark
- Cross section is about half pair production cross section but larger backgrounds
- Will observe in Run 2a

Single Top Results

- ◆ **Run1 Results:**
- ◆ **CDF combined search (Wg+W*)**
- ◆ **use maximum likelihood fit of H_T distribution**
- ◆ **σ (st) < 14 pb at 95% C.L. Phys. Rev. D. 65, 091102 (2002).**



Run II analysis underway (results this summer)

Next steps:

- **Improve b-tagging**
- **Add plug electrons**

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Top Quark Cross Sections in Toronto

Top pair production cross section:

- **gg vs qq cross section (S. Pashapour and P.K. Sinervo)**
- **High-acceptance dilepton analysis (R. Tafirout, P.S., +FNAL and Penn)**

Single Top Production:

- **Ht analysis: B. Stlezer, K. Kordas, W. Trischuk, P.S.**

Conclusions

Top pair production cross section results for Run II data collected by CDF in 2002 corresponding to **72 pb⁻¹** for dilepton channel and **57 pb⁻¹** for lepton+ jets channel:

● Dilepton channel:

$$\sigma_{tt} = 13.2 \pm 5.9_{\text{stat}} \pm 1.5_{\text{sys}} \pm 0.8_{\text{lum}} \text{ pb}$$

● Lepton + jets channel:

$$\sigma_{tt} = 5.3 \pm 1.9_{\text{stat}} \pm 0.8_{\text{syst}} \pm 0.3_{\text{lum}} \text{ pb}$$

NLO for $M_{\text{top}} = 175 \text{ GeV}$: $6.70^{+0.71}_{-0.88} \text{ pb}$

■ Since February, have doubled integrated luminosity

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