WZ - Higgs - Top

Physics Group Update

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DØ Collaboration Meeting, 10/10/03

Outline

- Introduction
- WZ update
- Higgs update
- Top update
- Common Tasks
- Conclusions/Outlook

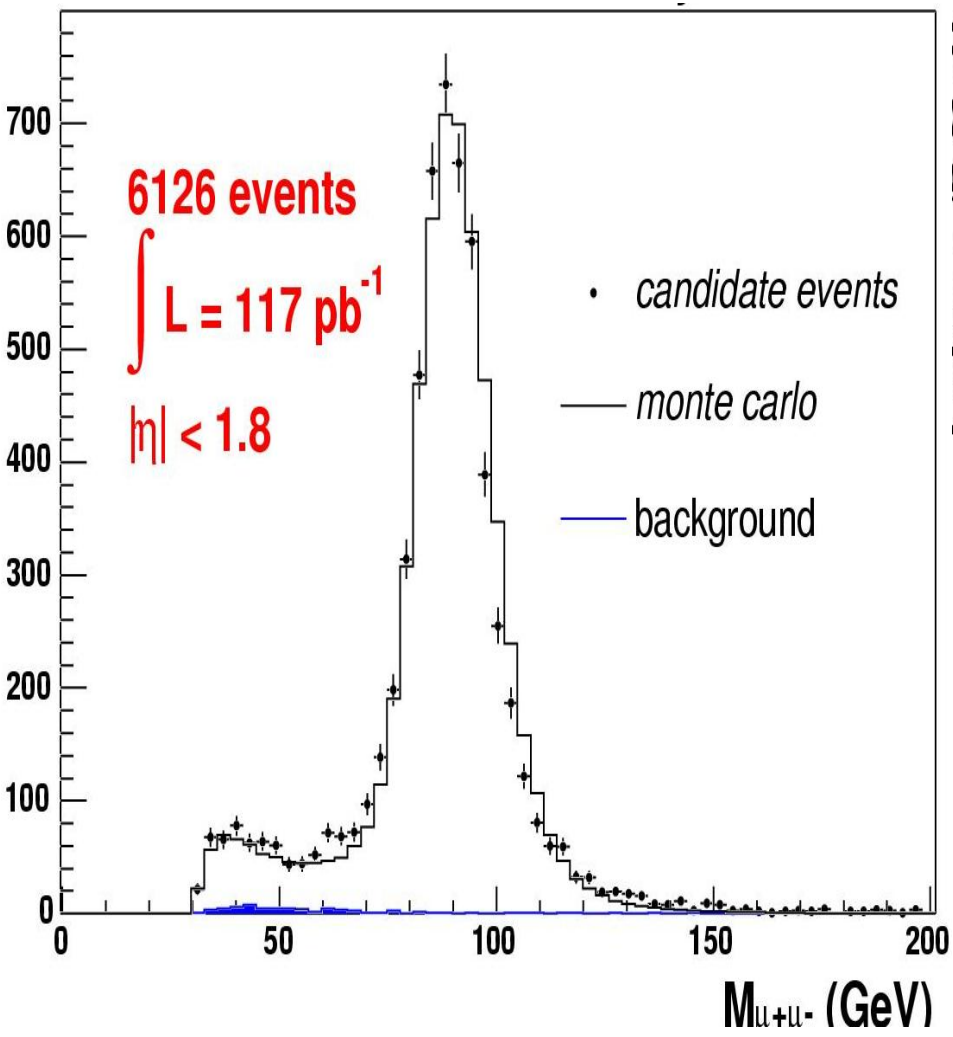
Introduction

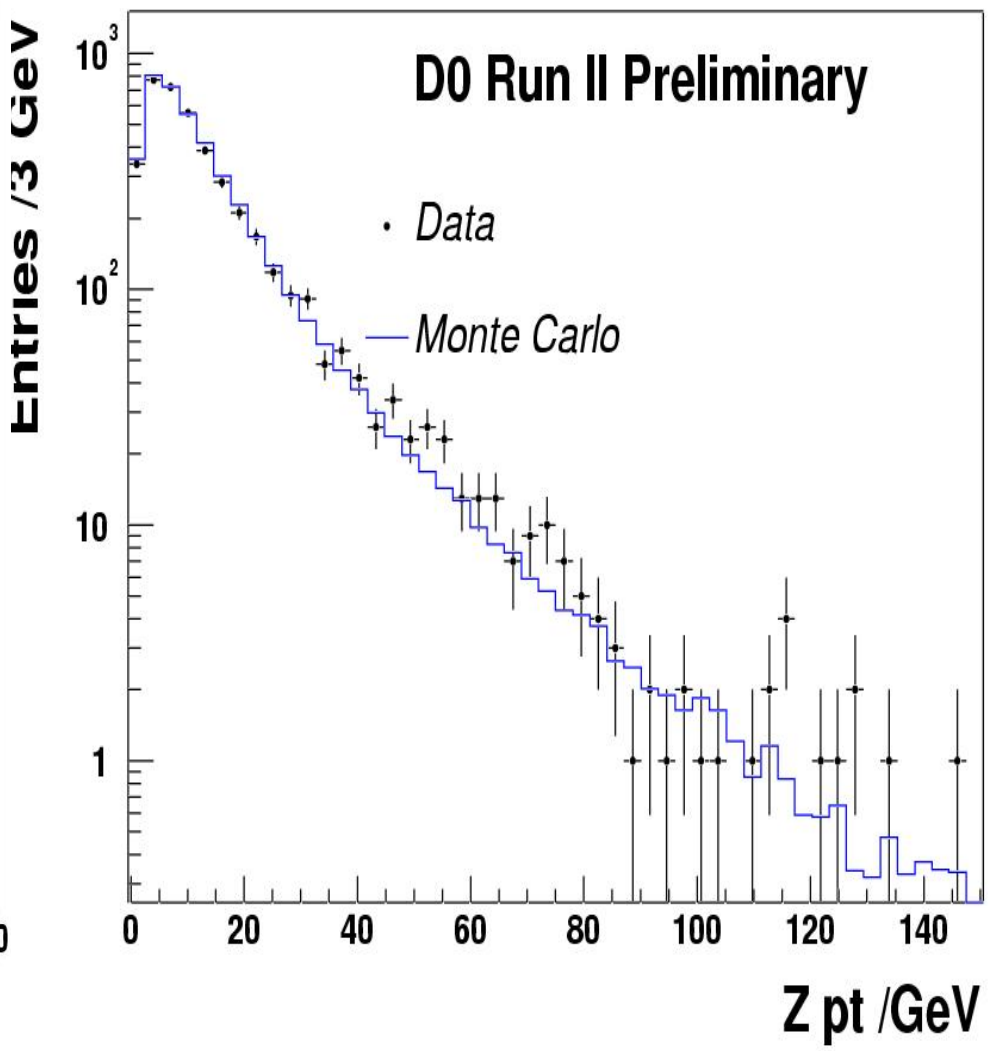
- Many activities since last collaboration meeting
  - p14-data, v12 trigger list, new group leaders/structures
  - Lepton-Photon Analysis Marathon
- Common goals
  - Publish withing the next year
  - Optimize Analysis strategies
    - Minimize duplication, increase cooperation
- Common Challenges
  - Analysis experts are moving on, new experts in training
  - Detector understanding/performance
    - Data quality, fake rates (backgrounds), MC-data discrepancy
    - Get more people involved in Ids/trigger/MC

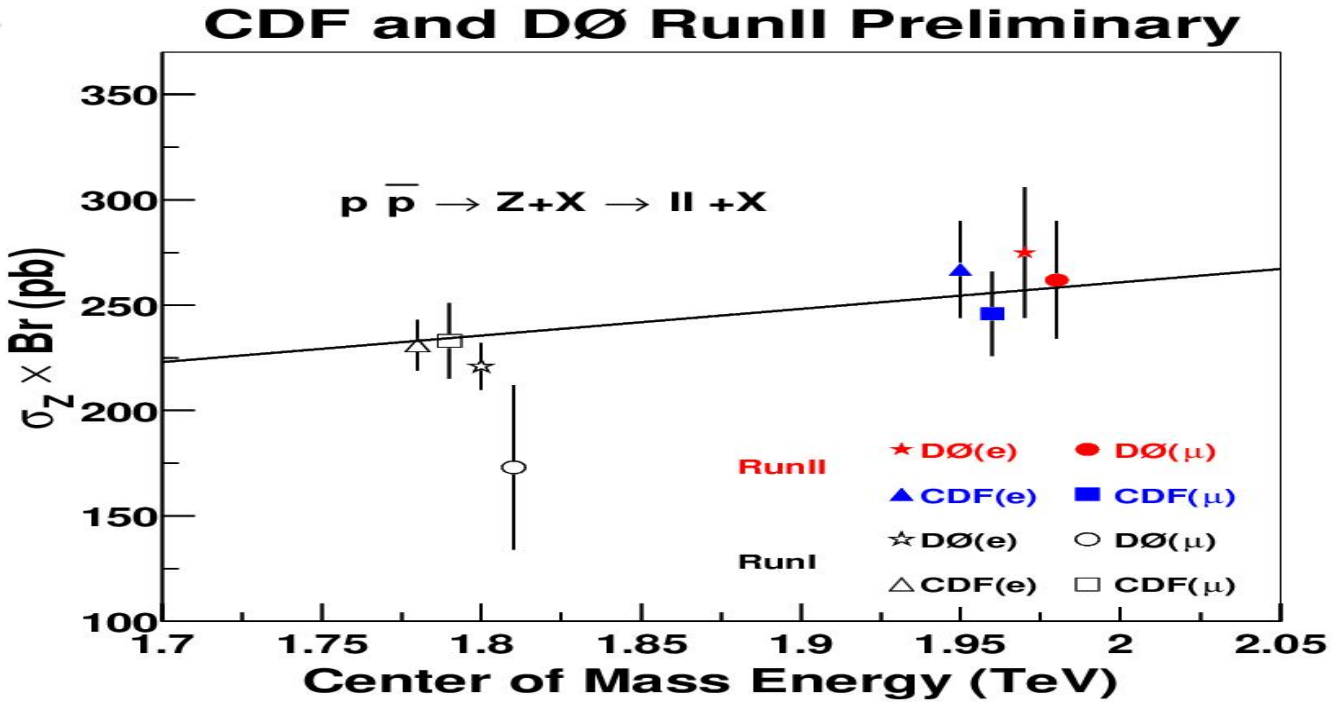
WZ Update

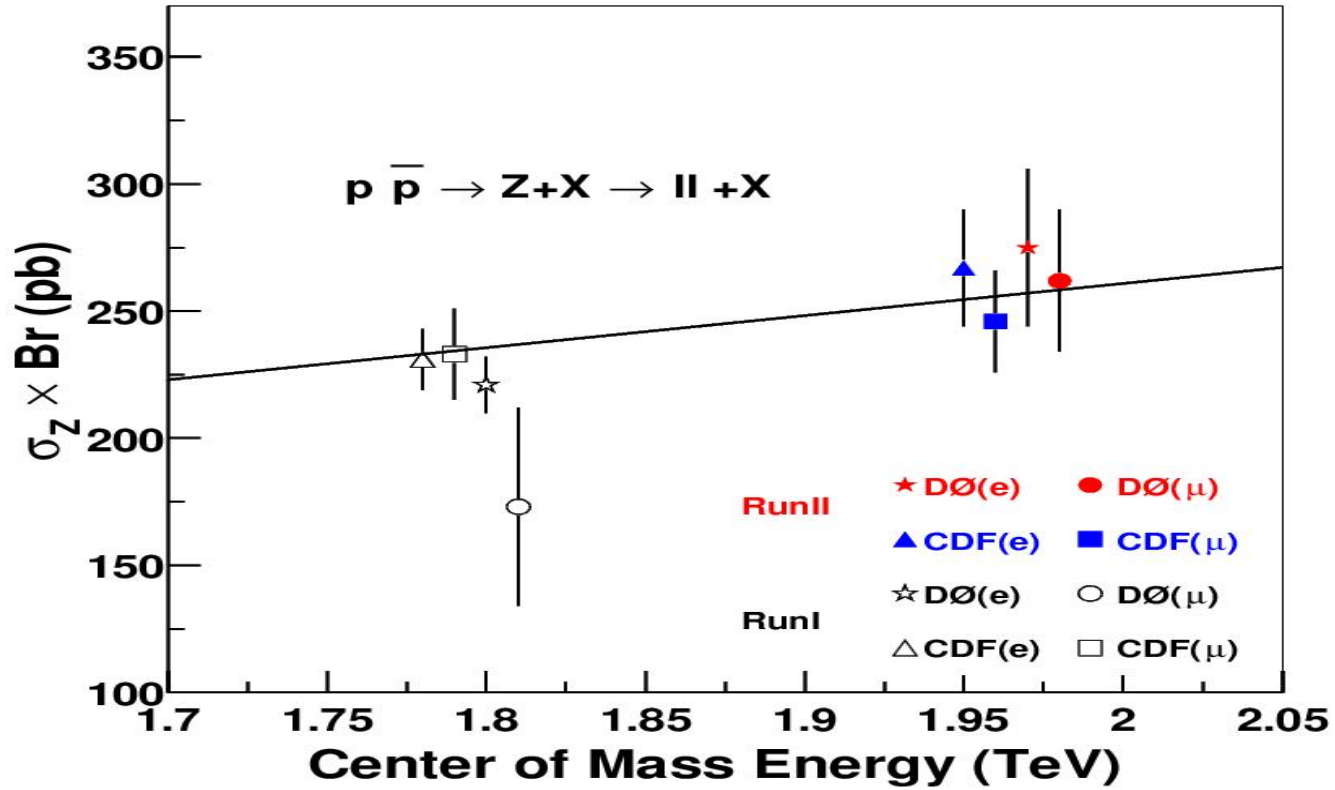
- **Many task, not enough people**
  - **Room for grad students (W mass)**
  - **Need to look at trigger/MC/data quality**
- **MC**
  - **Many studies rely on PMCS**
- **Goals:**
  - **Publish $Z \rightarrow \mu\mu$ within ~6 months**
  - **Publish $Z \rightarrow ee$ and $W \rightarrow e\nu$ and $W \rightarrow \mu\nu$ within 1 year**
  - **<u>But:</u> need updated luminosity**
- **Focus on p14**

$Z \rightarrow \mu\mu$ Production Cross Section






CDF and DØ RunII Preliminary
p p̄ → Z+X → ll +X
σZ × Br (pb)
Center of Mass Energy (TeV)
RunII
★ DØ(e)
● DØ(μ)
▲ CDF(e)
■ CDF(μ)
RunI
☆ DØ(e)
○ DØ(μ)
△ CDF(e)
□ CDF(μ)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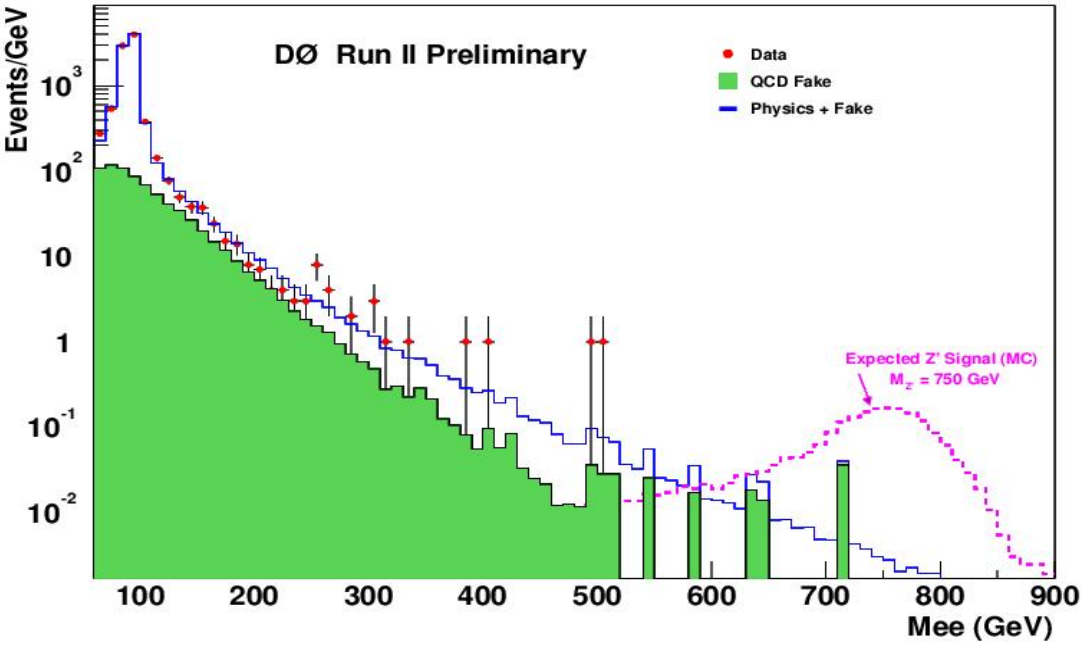
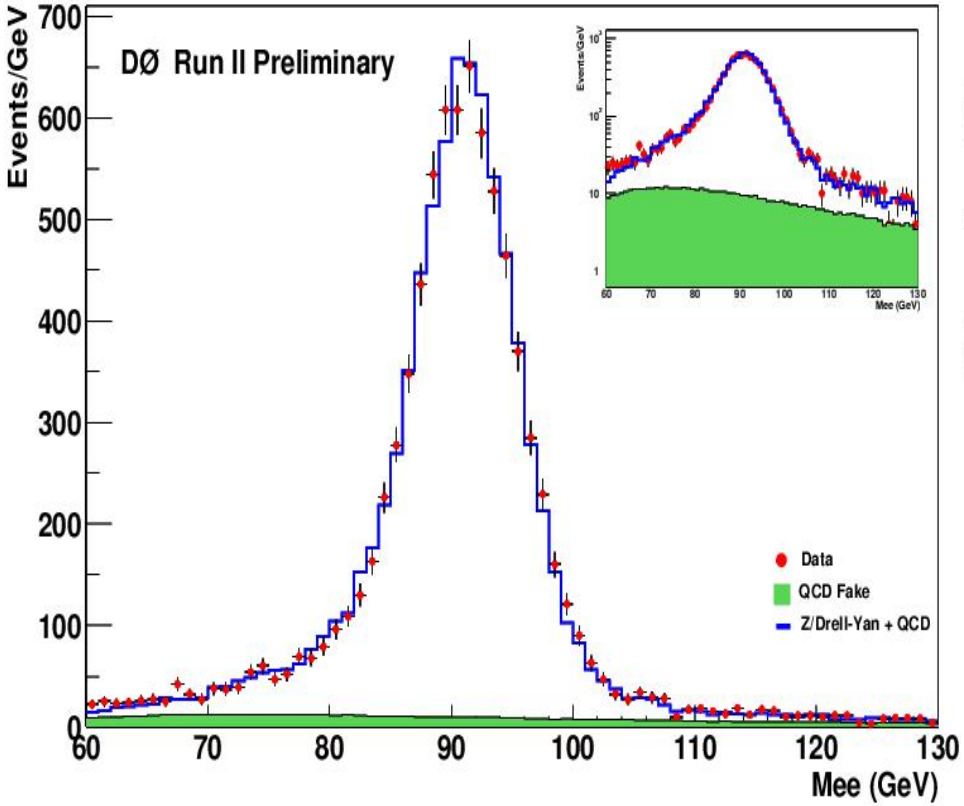
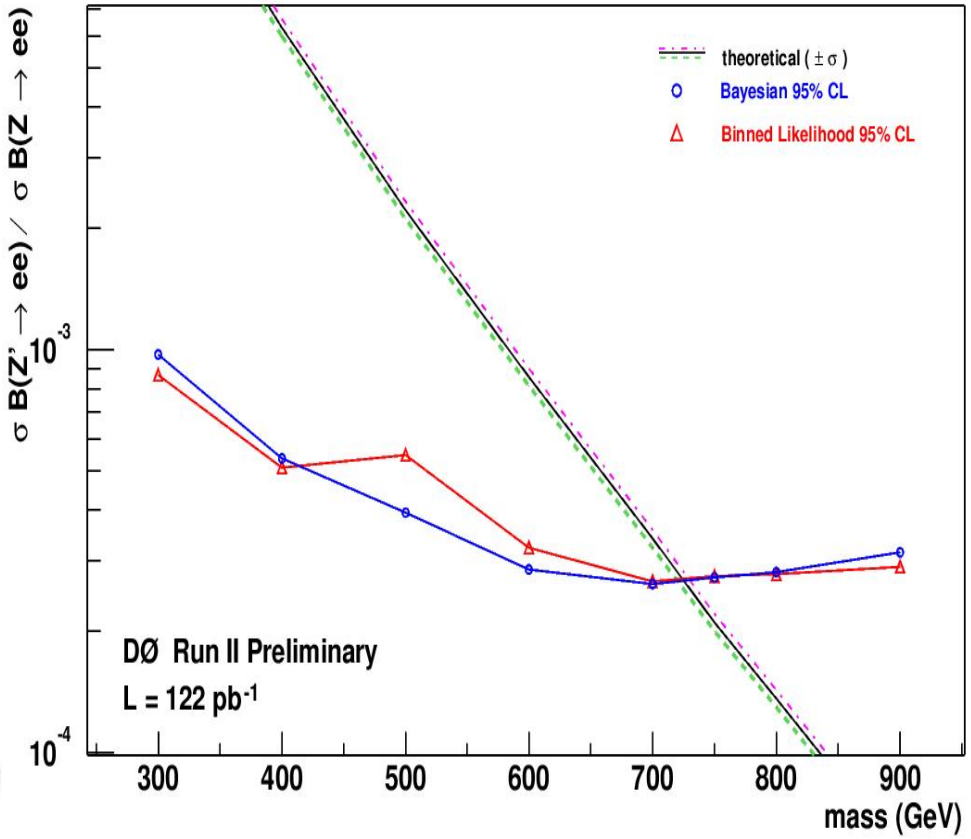
△ CDF(e)
□ CDF(μ)

Z'→ee

- LP analysis
- 122pb^{-1} p13 data
- Cuts
  - |eta|<2.4, exclude ICD
  - 1 electron central







Other WZ Activities

- Other production cross sections
  - WW
  - $W\gamma$, $Z\gamma$
  - $W \rightarrow \tau$ and $Z \rightarrow \tau$
- W/Z production properties
  - eta, P_T
- Drell-Yan
- W charge asymmetry
- Many others
- What about W mass?
  - Too early, needs students

Higgs Update

- New subgroups:
  - lepton+MET+jets, di-lepton+jets, all-jets
  - Plus ID/trigger/MC/CS - liaisons/representatives
- Effort to participate in Reco/Trigger/MC effort
  - direct/perform low-level tasks
  - Encourage active participation for new students
  - Higgs Trigger Mini-Workshop planned for V13
- Goals:
  - publish some analyses within 6 months, more in 1 year
  - Some with p13 data, some with p13/p14, some only p14

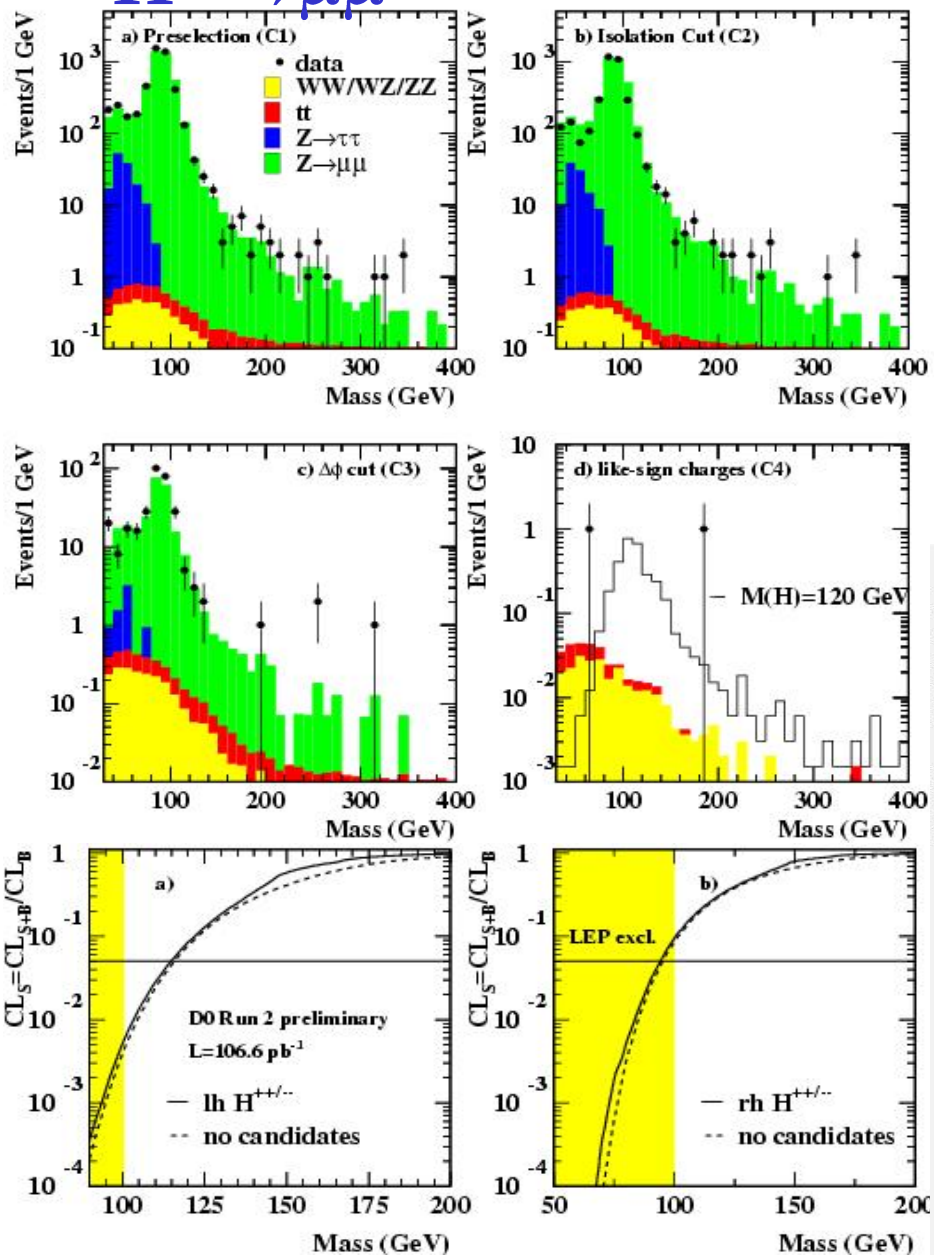
Higgs Analysis Schedule

- **Short-term (6 months)**
  - $H \to WW^{(*)} \to ee/e\mu/\mu\mu$
    - **Measure WW Xs**
  - $H^{++} \to \mu\mu$
- **Medium-term (6-12 months)**
  - $bbh(\to bb)$ and $bh(\to bb)$
  - $W \to e\nu$+jets with b-tagging
- **Long-term (1 year)**
  - $W \to \mu\nu$+jets with b-tagging
  - $Z \to \mu\mu$+jets with b-tagging
  - $Z \to ee$+jets with b-tagging
  - $H \to \gamma\gamma$

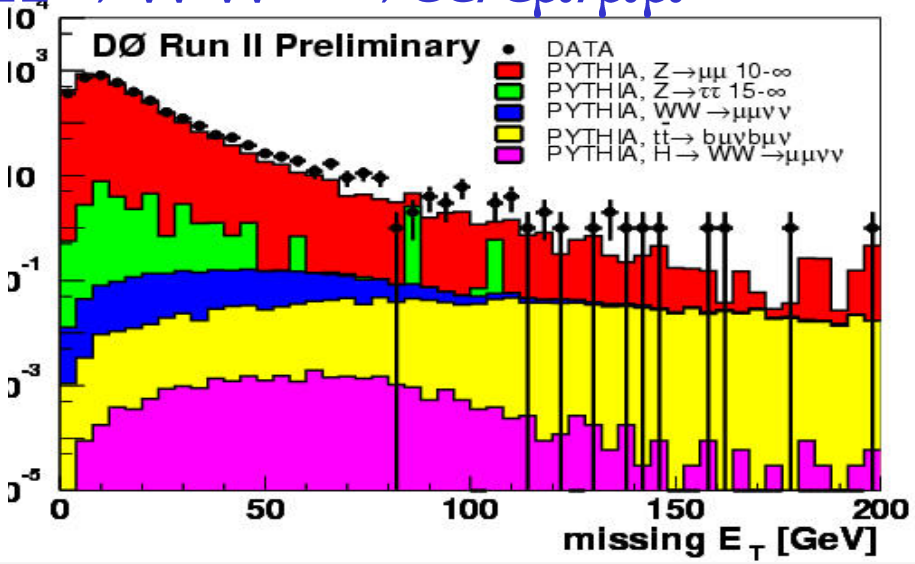
Fermilab Today

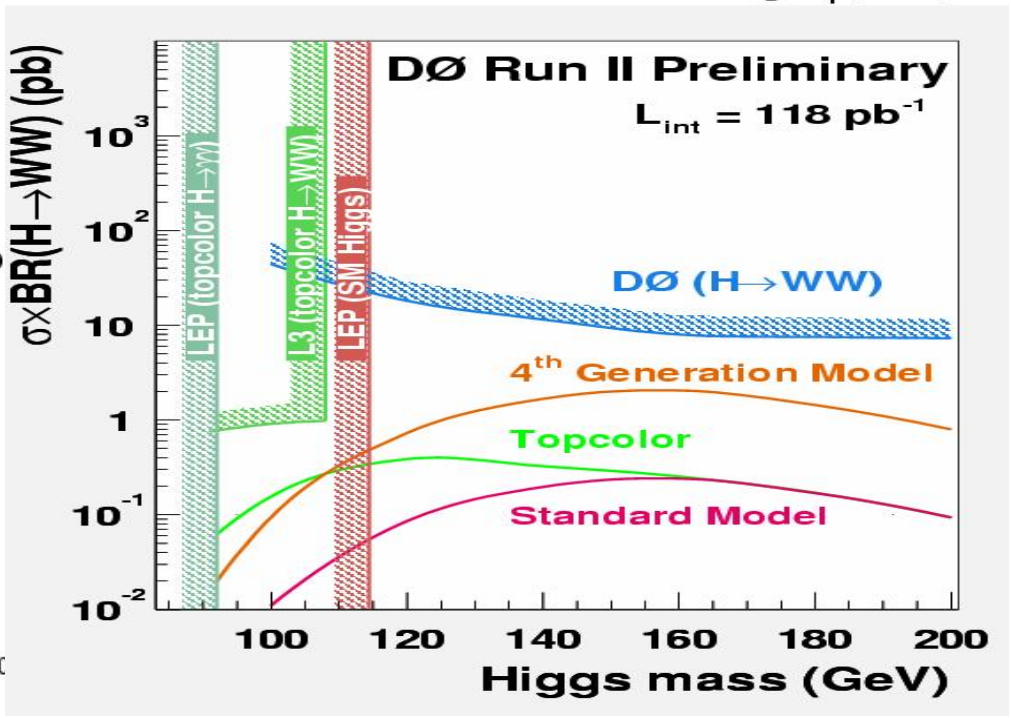
Higgs Highlights

- $H^{++} \rightarrow \mu\mu$

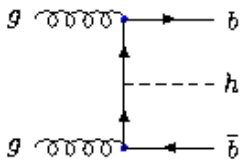


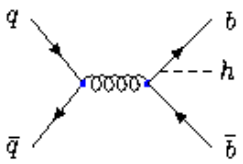
- $H \rightarrow WW^{(*)} \rightarrow ee/e\mu/\mu\mu$

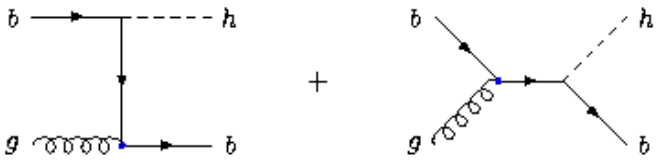




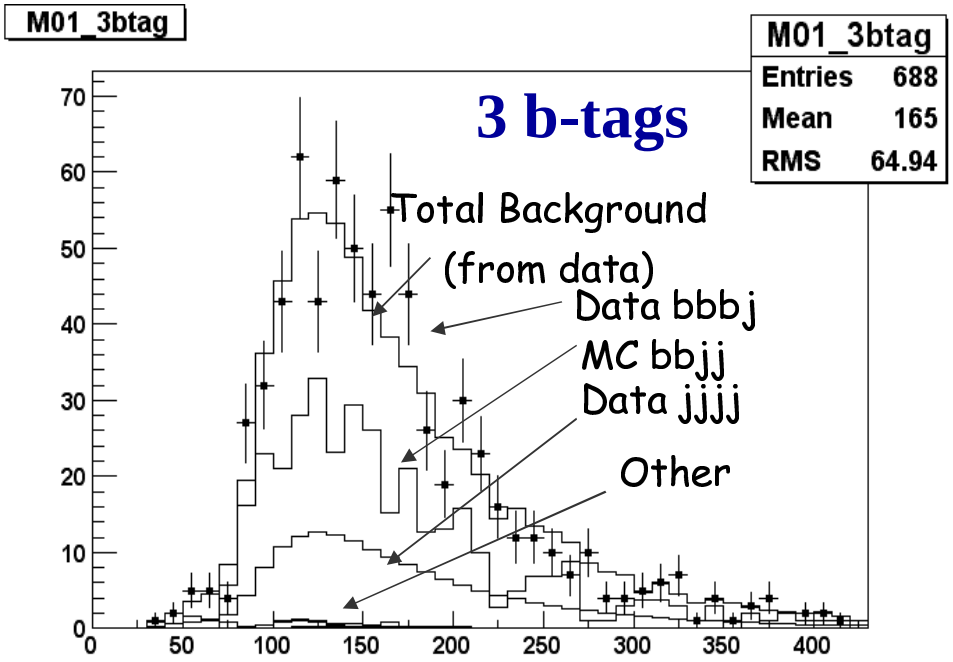
Higgs Highlight: bbh

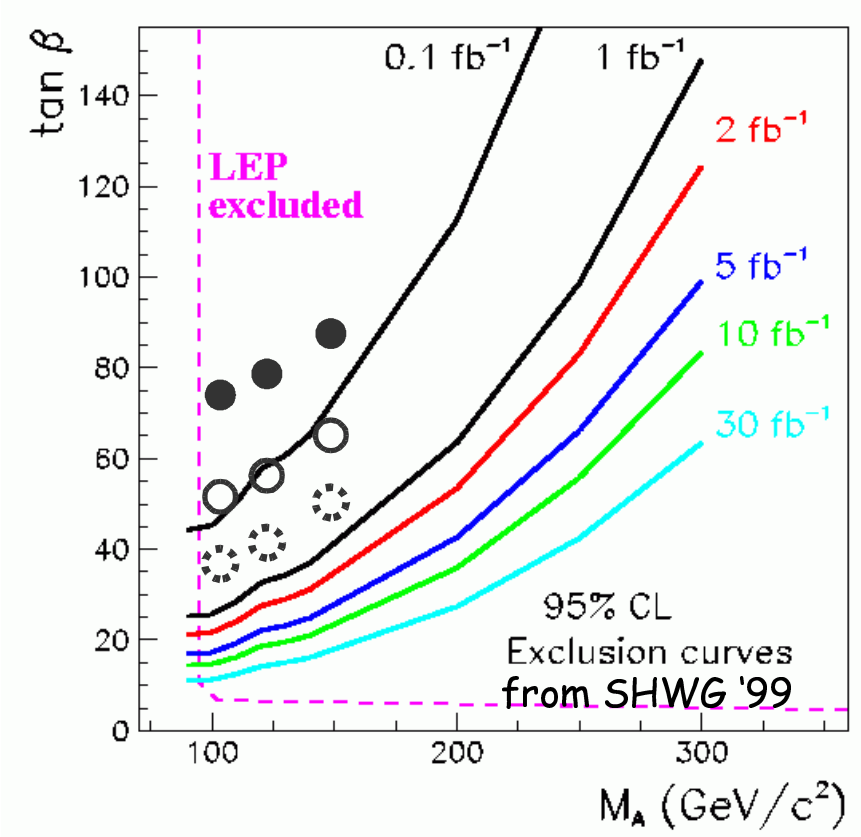






- 131 pb^{-1} p13 data
  - Some with prescaled trigger
- 3 b-tags
  - Improves wit b-tagging improvements

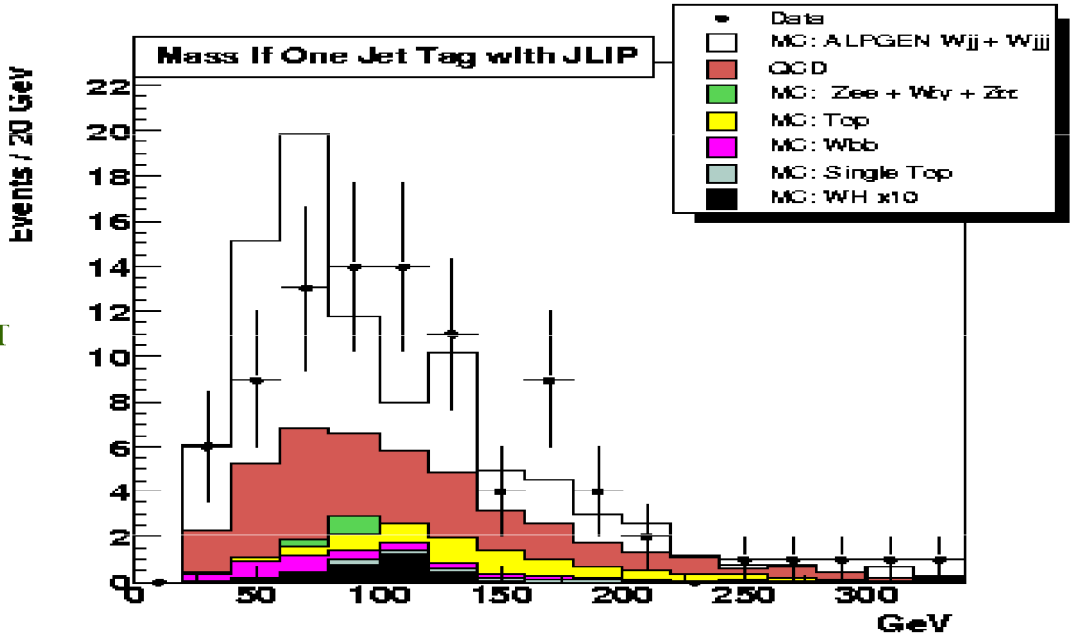


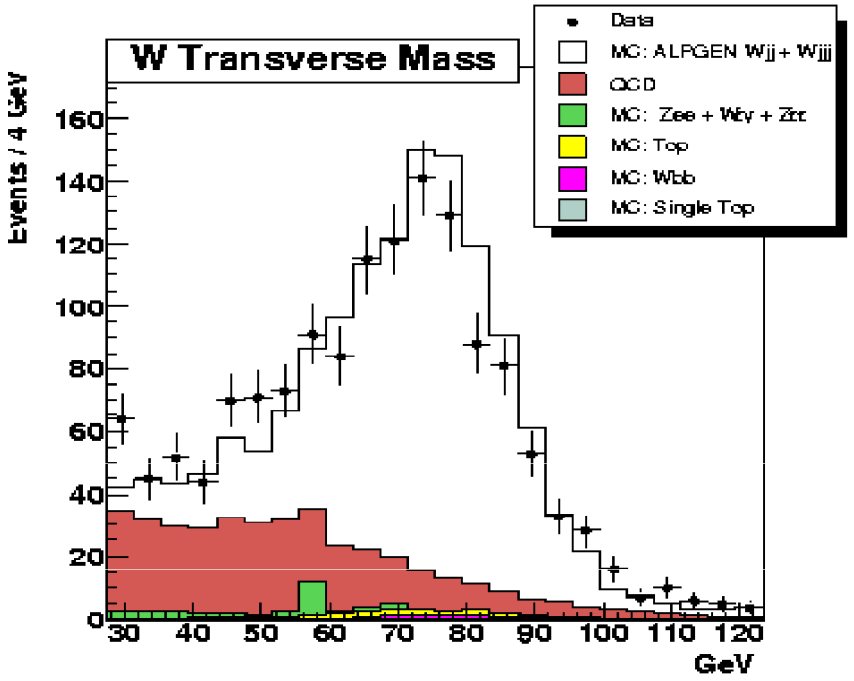


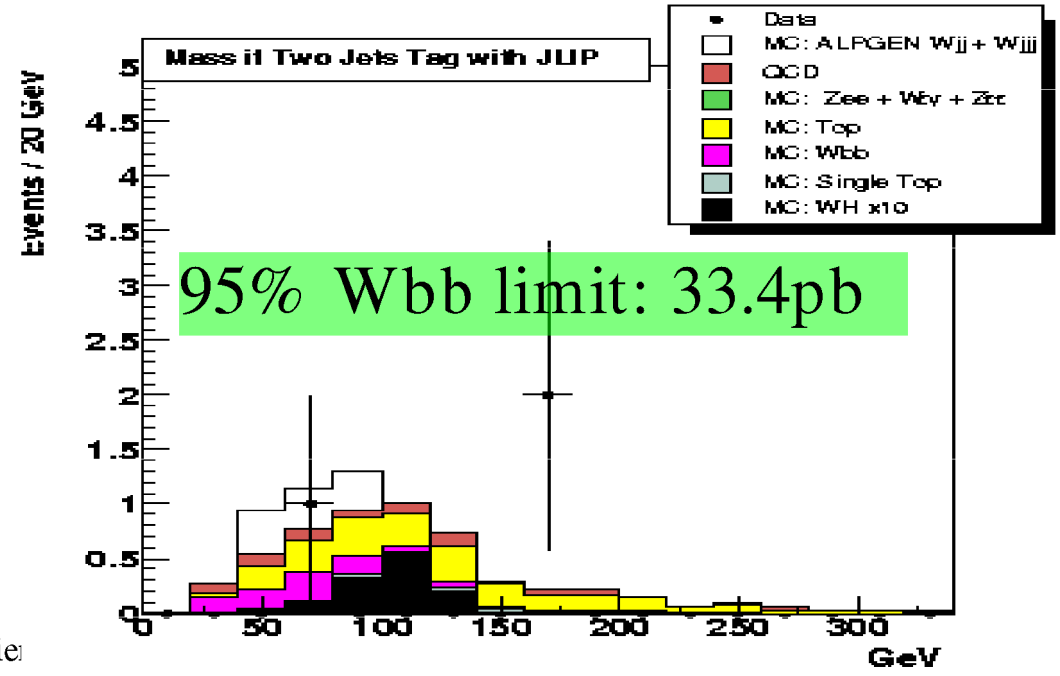
- Now (35% tagging eff.) preliminary
- 50% b-tagging eff.
- 300/pb and 50% b-tagging

Higgs Highlight: WH→evbb

- LP data: 117pb^{-1} p13
  - All known fixes applied (tmbfixer)
- Alpgen MC for W+jets
  - Smearing for e's, ME_T, SE_T
  - MC JES scaled by (1+σ)
- JLIP b-tagging
  - 35% efficiency, 1% fakes





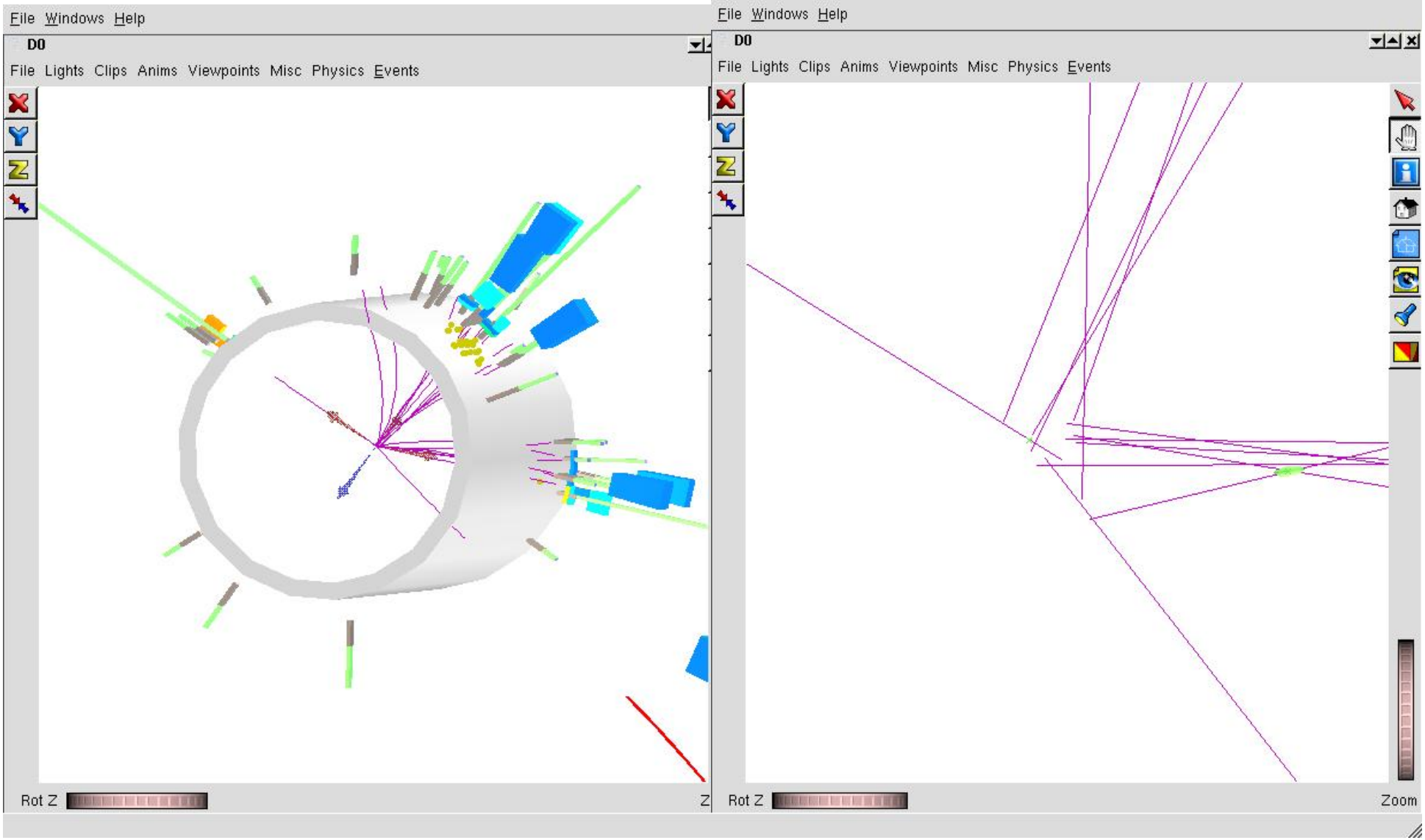


95% Wbb limit: 33.4pb

Wbb Candidate Event

- **Found in Wbb analysis**
  - **1SVT tag, 2JLIP tags**

- **In bad muon run list**

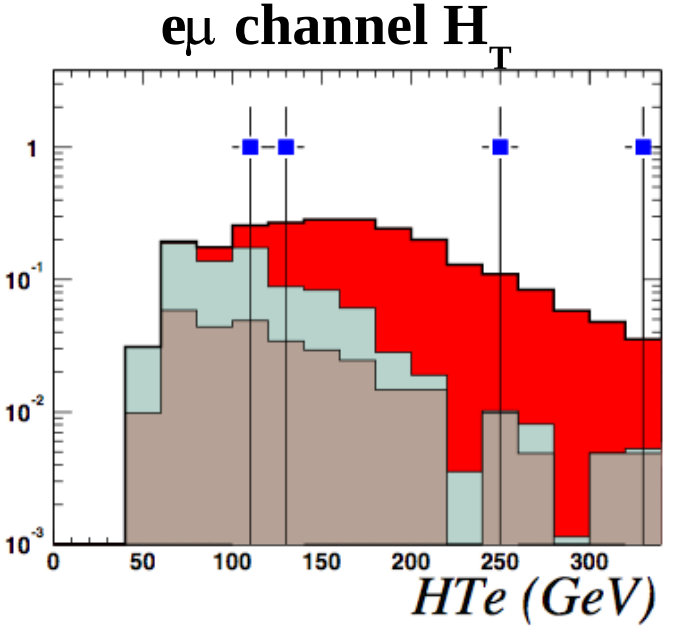


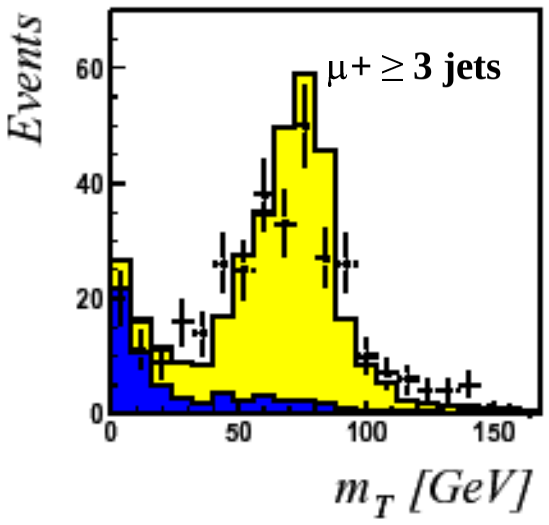
Top Update

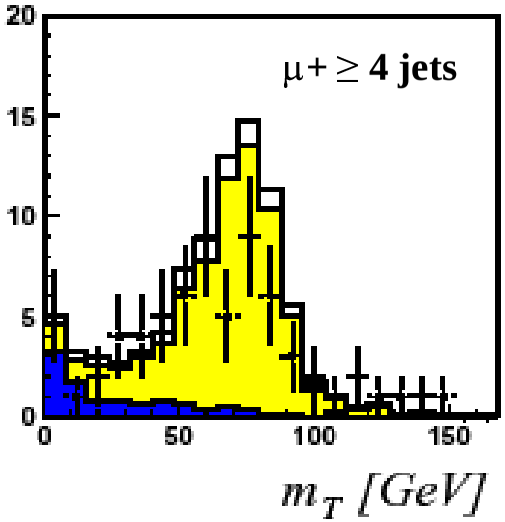
- New subgroup structure
  - Production | Properties | Single-Top | MC | Triggers
    - Structure will exist at least until after winter conferences
    - Maximize sharing/synchronization between groups
  - Centralize most common tasks
    - MC/data samples, top_analyze, IDs,
- Goals for Winter:
  - Publication: ttbar cross section
  - Moriond: ttbar cross section, Top Mass, Single Top
  - Consider p14 data only
    - Require Ids to be frozen mid-November

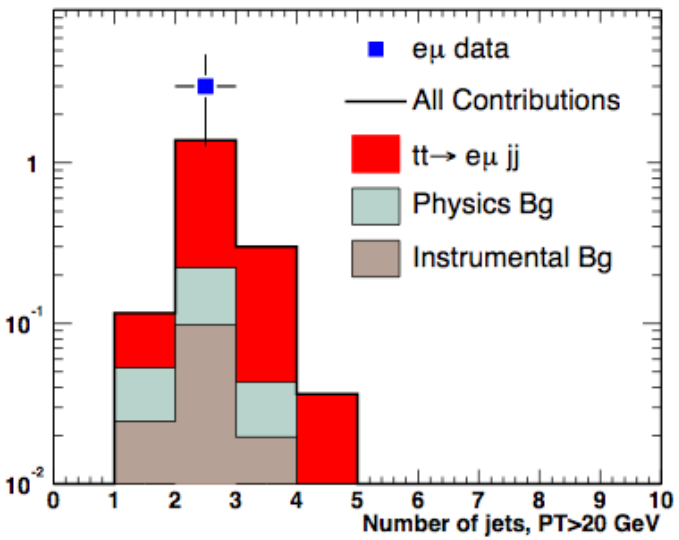
Top Cross Section Measurement

- LP dataset
- All known cal corrections applied
- Both topological and soft-muon tag
- QCD background estimate from matrix method



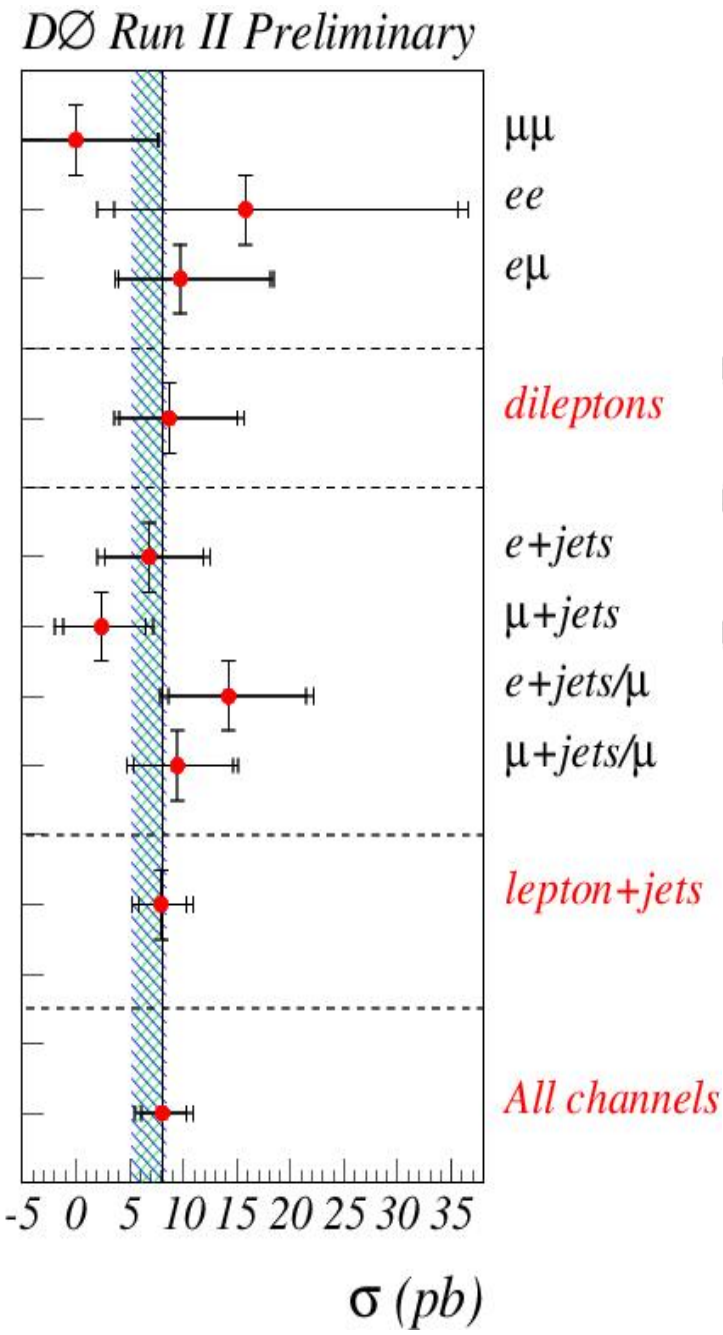


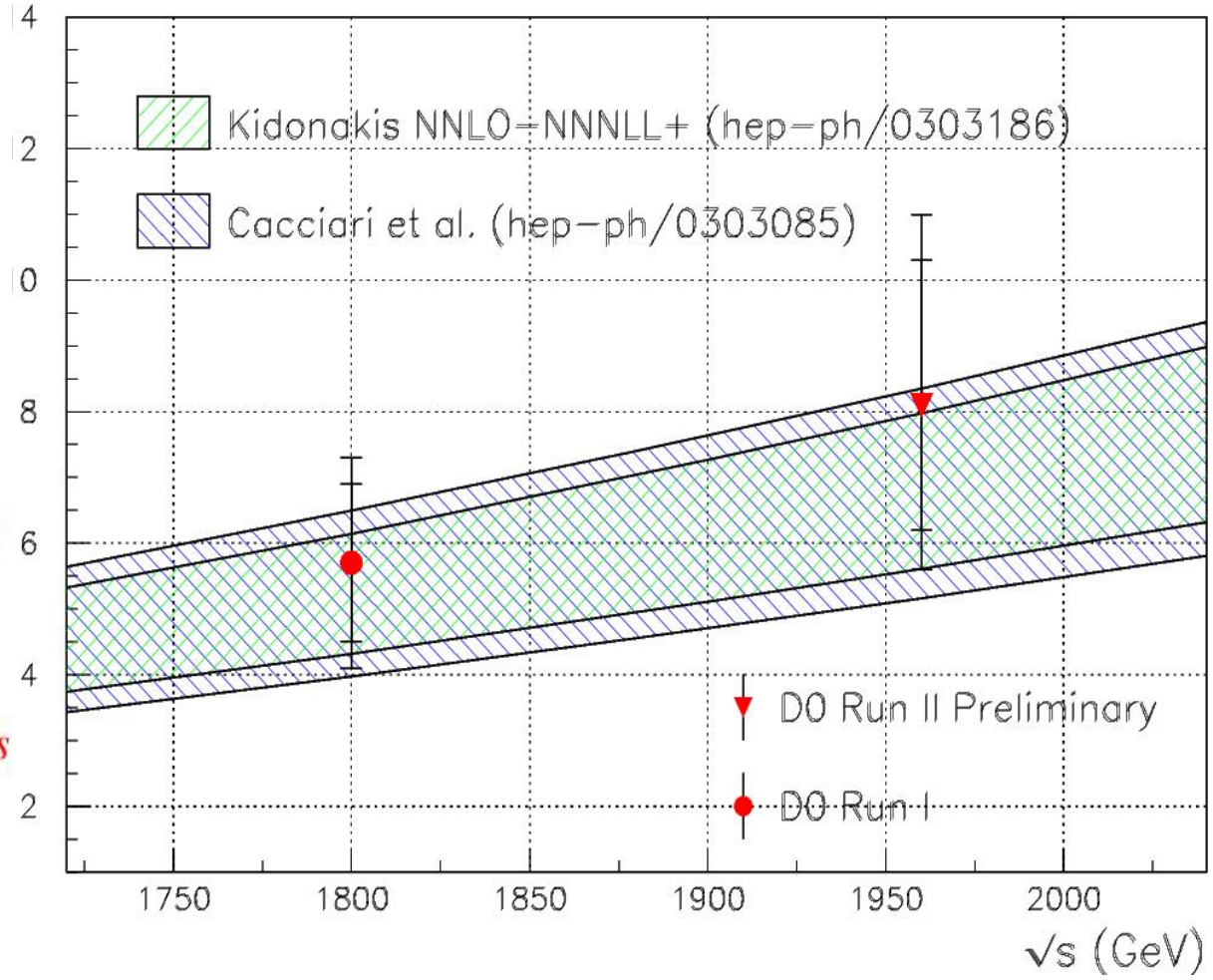




Top Cross Section Result

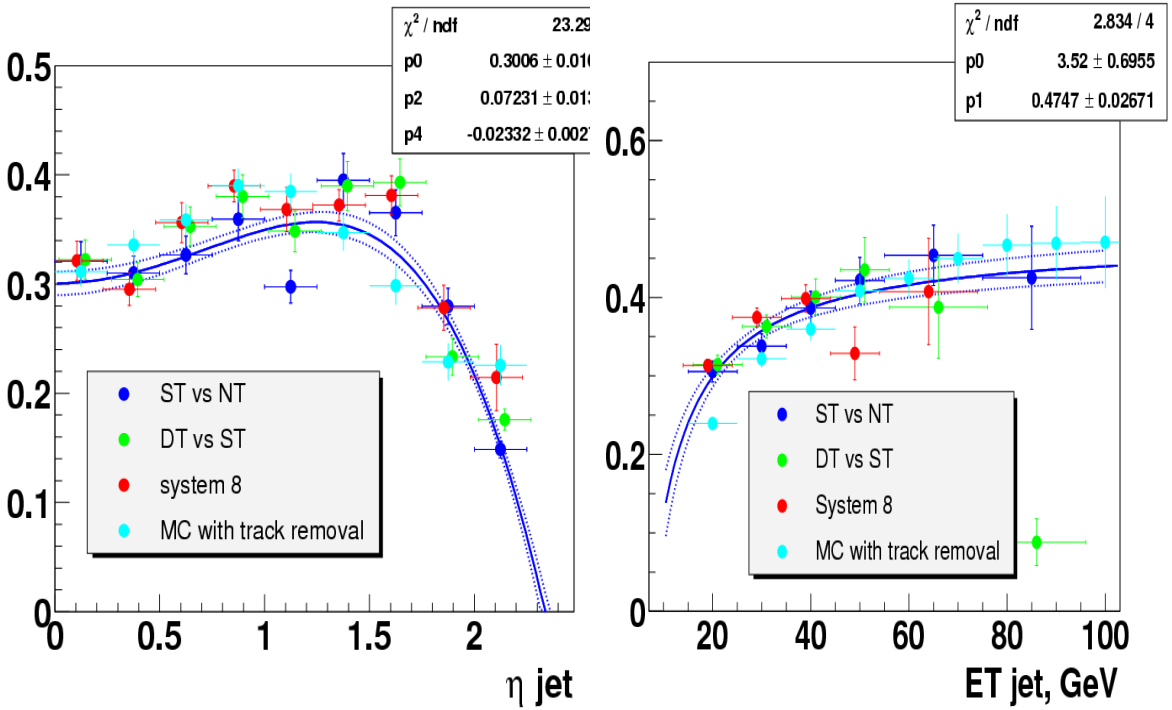
$$8.1^{+2.2}_{-2.0}(stat.)^{+1.6}_{-1.4}(sys.)\pm 0.8(lum.)$$

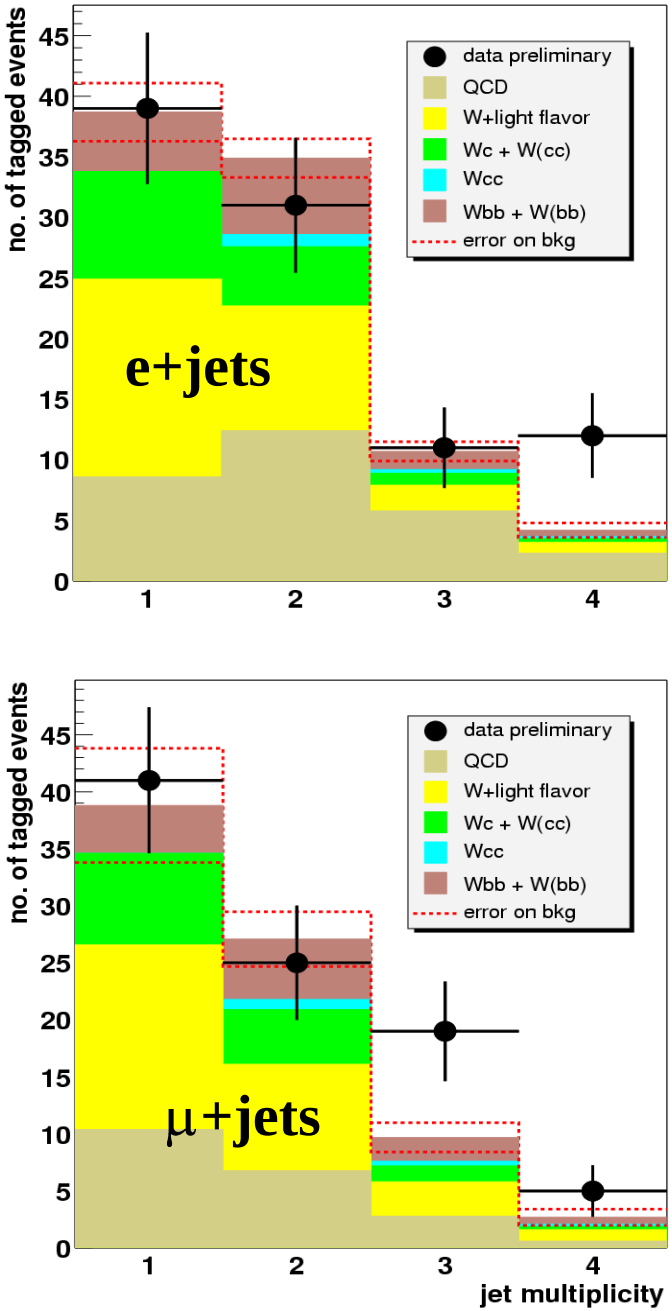




Top Cross Section with b-tagging

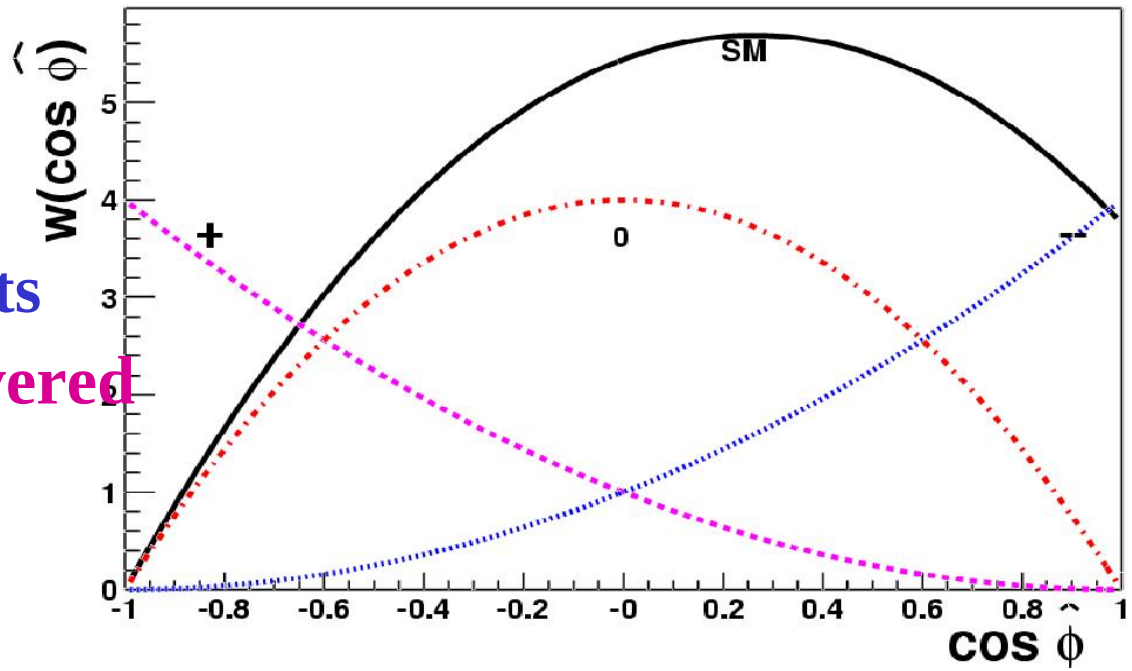
- **Lepton-Photon Sample**
  - **All known cal corrections applied**
    - **Significant improvements for jets**
- **CSIP tag**
  - **Observe 12 (e+jets) and 5 (μ+jets) events**





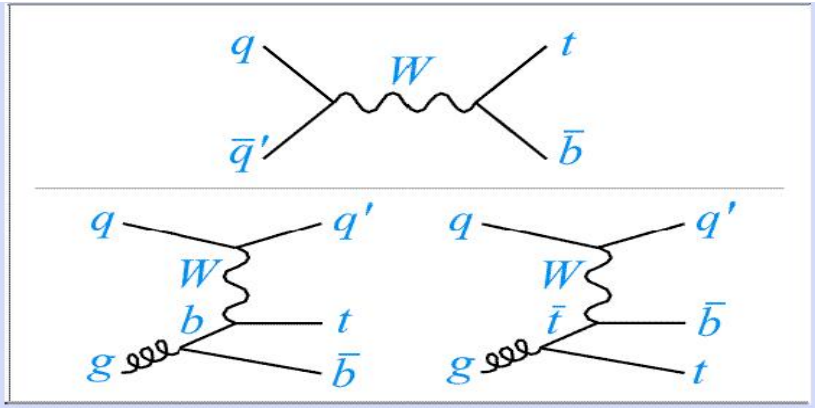
Top Properties Group

- **High priority goal: Top Mass measurement**
  - **lepton+jets and di-lepton channels**
    - **Several methods**
  - **In time for winter conferences**
  - **Precision no worse than Run I**
  - **Top Mass Workshop later this fall**
- **Other goals:**
  - **W helicity**
    - **for winter conferences**
- **Opportunities for students**
  - **Many topics are uncovered**
    - **Especially Mass needs more people**



Single Top Group

s-channel (*tb*) : 0.88 ± 0.04 pb



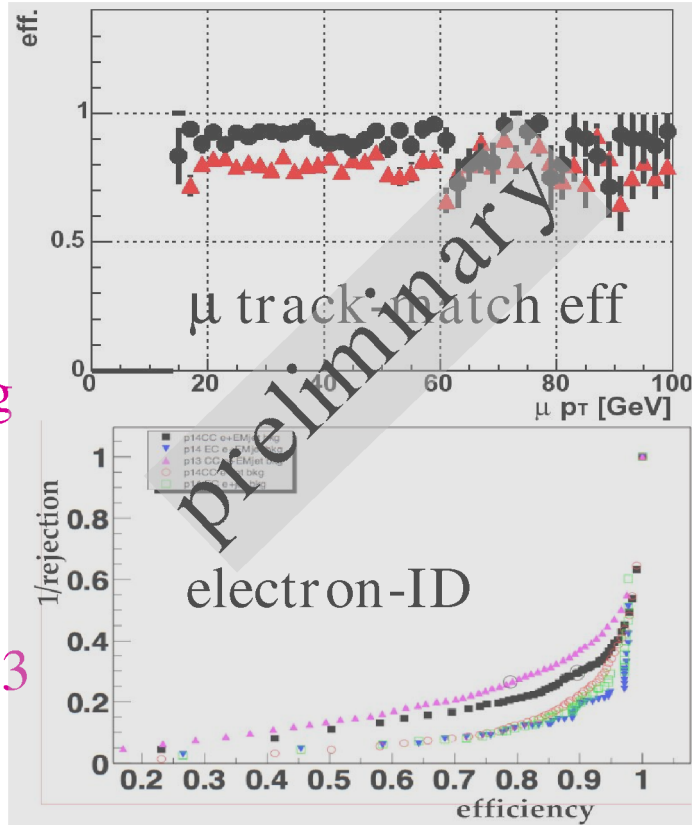
t-channel (*tqb*) : 1.98 + 0.22 – 0.16 pb

m_{top} = 175 GeV
$\sqrt{s}$ = 1.96 TeV

- **High priority goal: Single-Top result (limit)**
  - **In time for winter conferences**
  - **Single Top workshop beginning of December**
- **Long-term goal: measure production cross section**
  - **Observe *never-before-seen* top quark production process**
- **Newly formed subgroup**
  - **Most students are new or are starting analysis now**
    - **Fast ramp-up required**
  - **Two p13-based studies already exist**
    - **Started before single-top group was formed**

Common Goals

- Publish DØ results
  - W/Z production cross sections (at least R)
  - Top production cross section
  - Wbb and bbh
  - many more in ~1 year
- Bring competitive DØ results to winter conferences
  - WW, $Z \rightarrow \tau\tau$, many others
  - H^{++} and $H \rightarrow \gamma\gamma$
  - Top Mass, Single-Top production
- produce results based on p14
  - Better tracking/calorimeter understanding
  - Need certified Ids
- Improve high-P_T lepton trigger
  - Study v12, implement improvements in v13



Conclusions

- many D0 results were presented at summer conferences
  - based on ~100pb^{-1} p13 data
  - identified (and fixed) many problems
- we are currently trying to understand p14 data
  - initial results are very promising
    - tracking efficiency, calorimeter fixes
  - more work is required
- many analyses are not yet covered
- Expect many results (publication + conference) in the next 6/12 months