Some (unprepared) Plots and Info from the Tevatron

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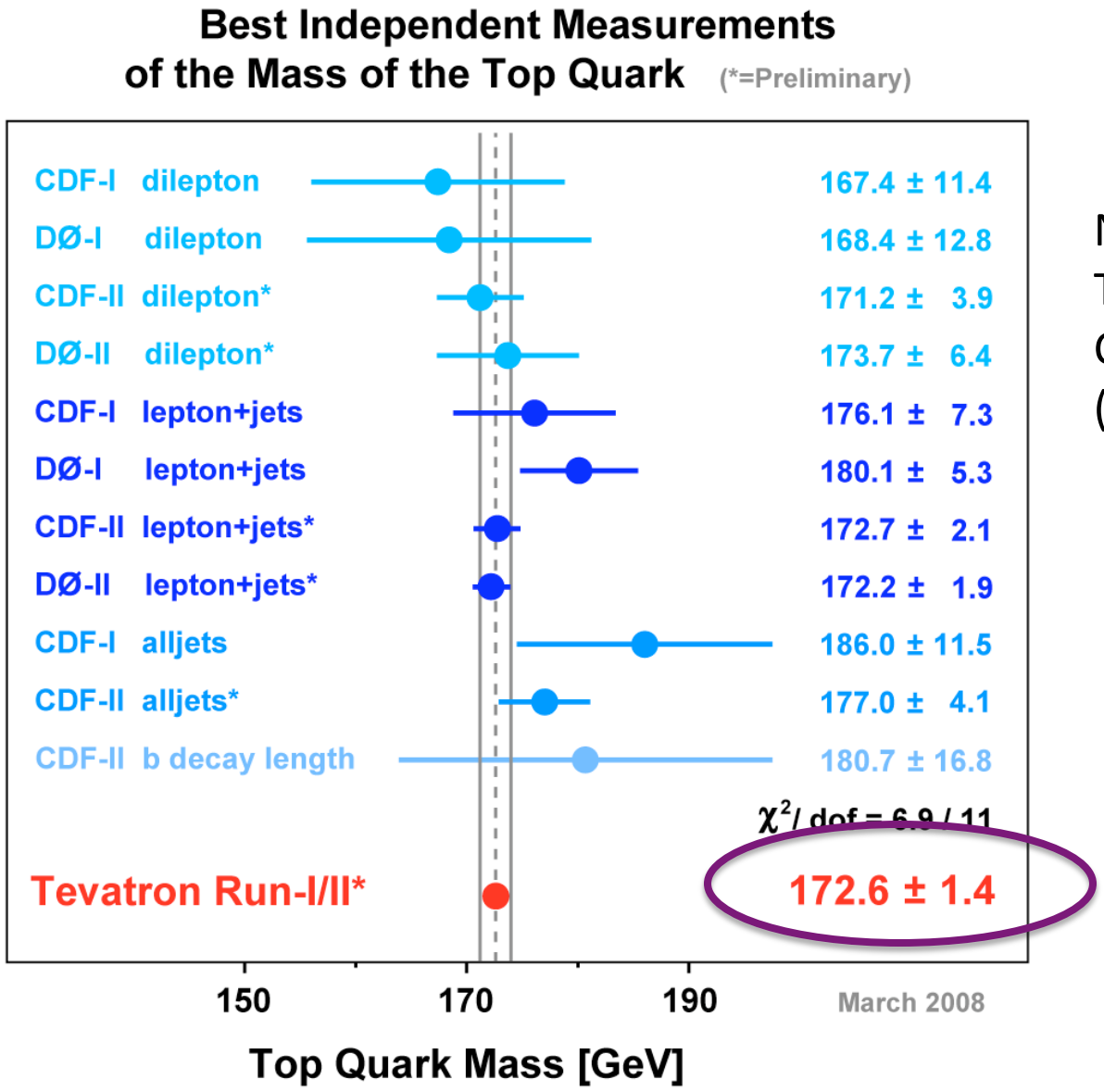
Finding the Light, Hidden Higgs Workshop
March 8, 2008

First: Just released!



New March 2008 Tevatron Top Mass Combination
(EWK Fits next week-ish)

By Channel

Fit Value (GeV/c^2)			Total Correlation M(H)	M(L)	M(D)
M(HAD)	177.3 +/-	3.9	1		
M(LJT)	172.4 +/-	1.5	0.12	1	
M(DIL)	169.8 +/-	3.1	0.18	0.26	1

ΔM(L-D) = 2.7±3.1 χ^2(L-D) = 0.8/1 (39%)

ΔM(H-L)=4.9±4.0 χ^2(H-L)=1.5/1 (23%)

ΔM(H-D)=7.5±4.5 χ^2(H-D)=2.8/1 (10%)

W+jets and Top

Question is: Are there signatures at the Tevatron that we are looking at now (or should be) that could shed light on the hidden light Higgs?

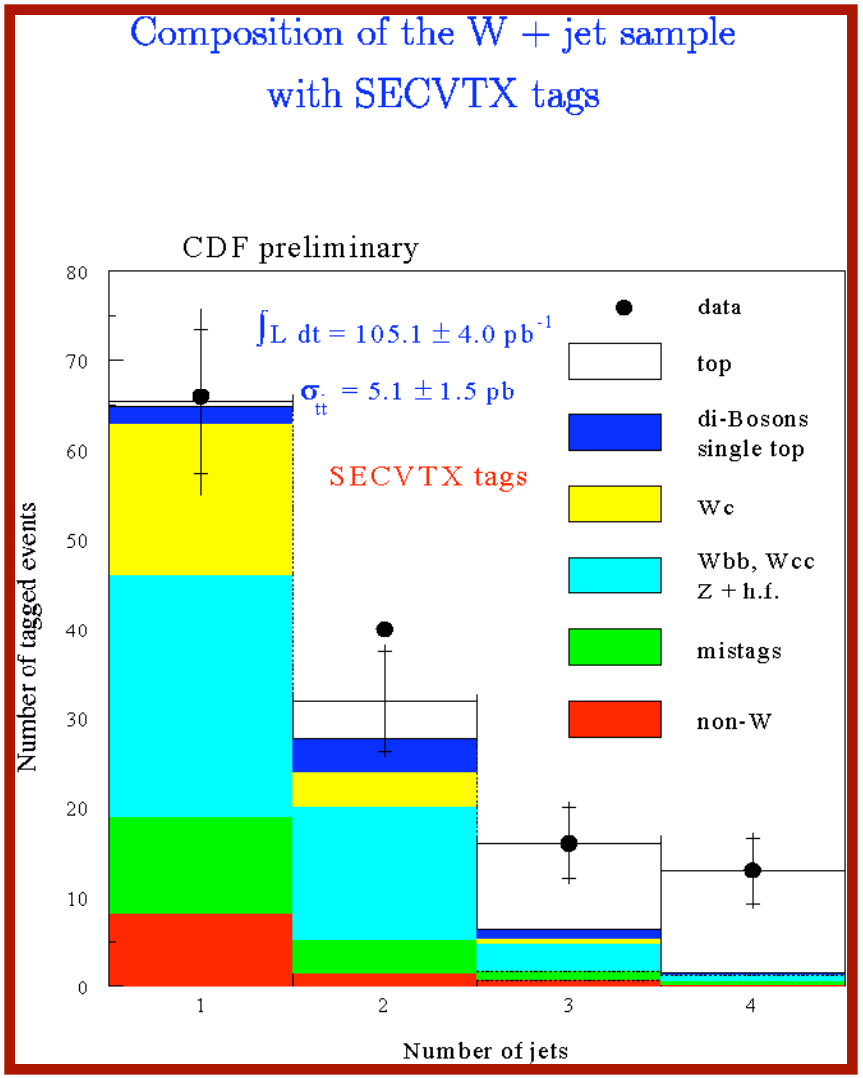
- W+>=3,4 jets: ttbar sample
- W+2,3 jets: top dilepton sample,
  single top sample,
  WH

Top Anti-Top Production

Run 1 b-tagged, 100 pb-1, root(s) = 1.8 TeV

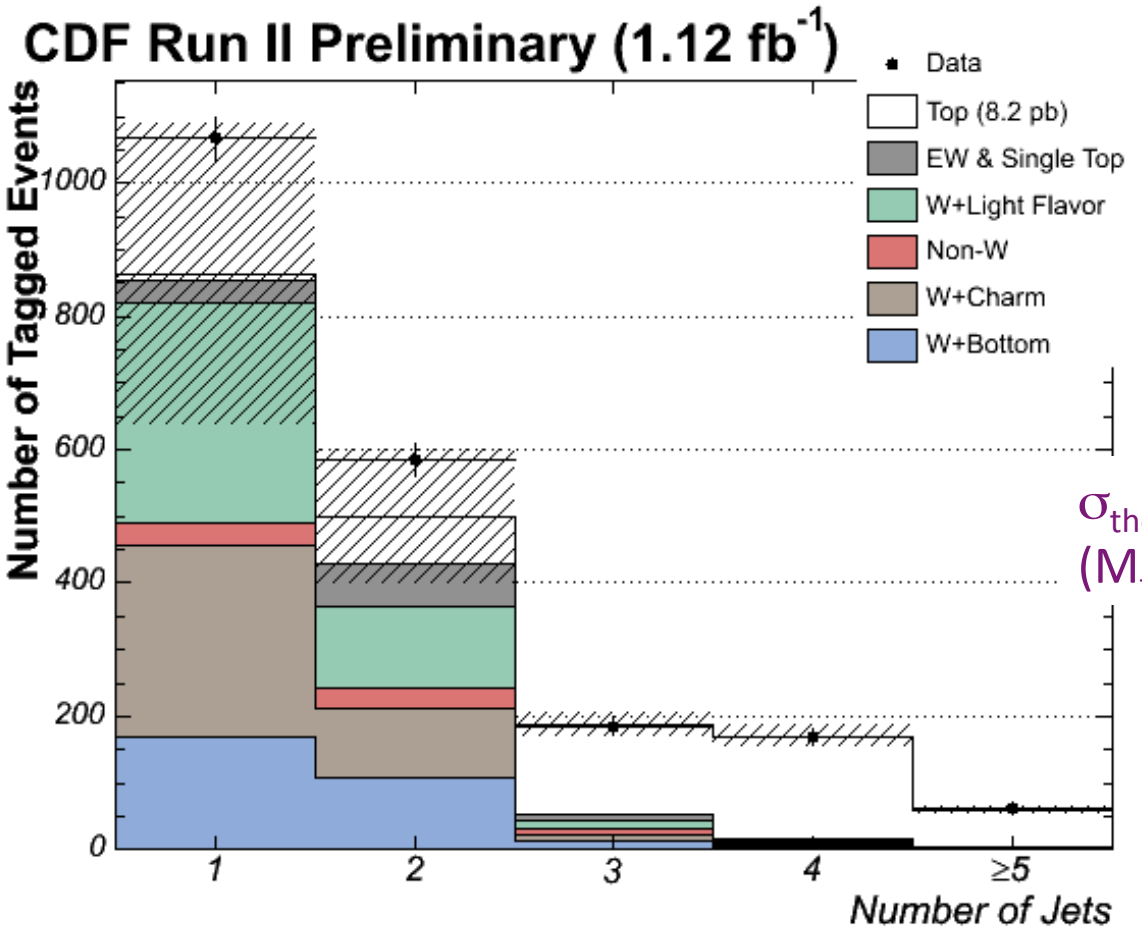
- **Observed excess of b-tags in the 2 jet bin**
- **Too many SVX double tags (more than one b-tagged jet/ event)**
- **Too many multiple tags (more than one b-tag/jet)**

A lot of speculation, but nothing solid.



Top Anti-Top Production

CDF Run 2, >= 1 b-tag, 1.1 fb^{-1}, root(s) = 1.96 TeV

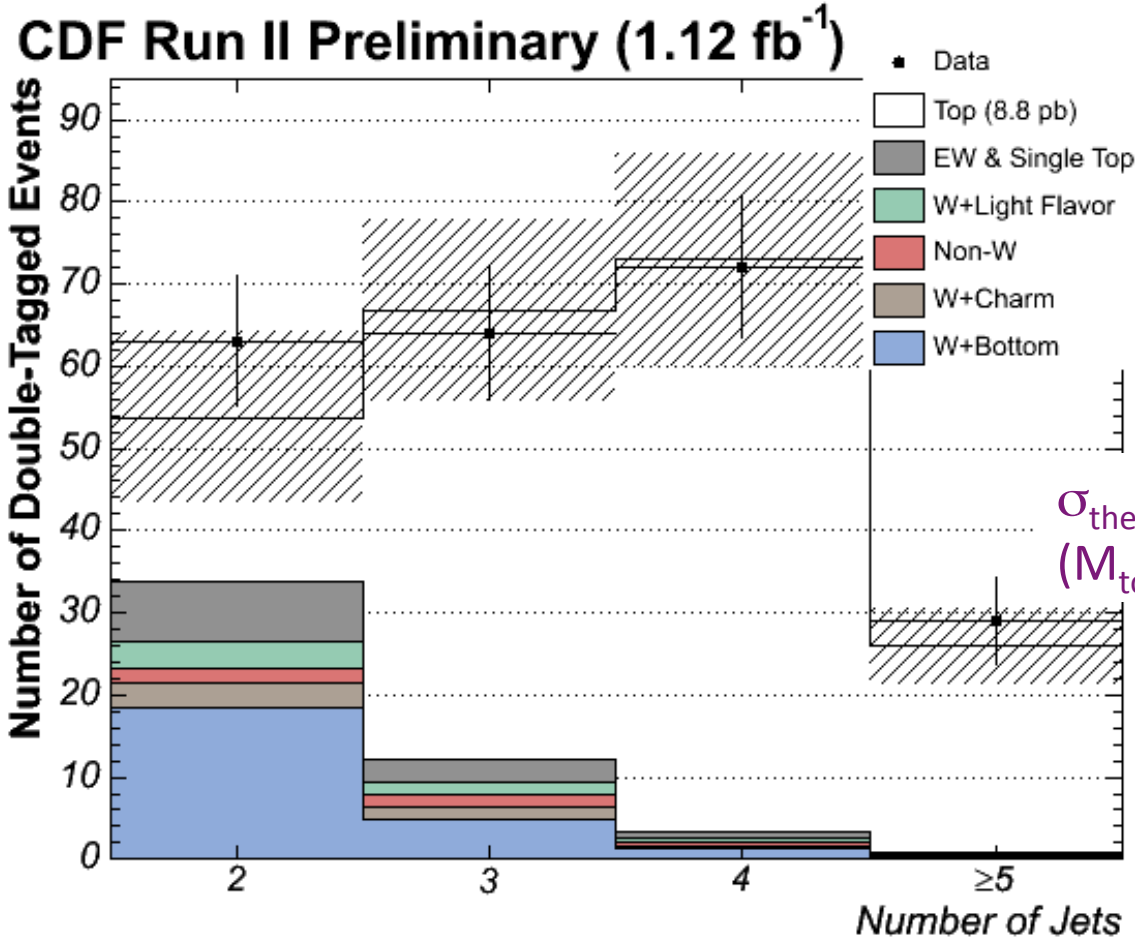


σ_{theory}= 6.7 pb
(M_{top}= 175 GeV/c^2)

8.2 ± 0.5 (stat) ± 0.8 (syst) ± 0.5 (lum) pb

Top Anti-Top Production

Run 2 double b-tagged, 1.1 fb^{-1}, root(s) = 1.96 TeV

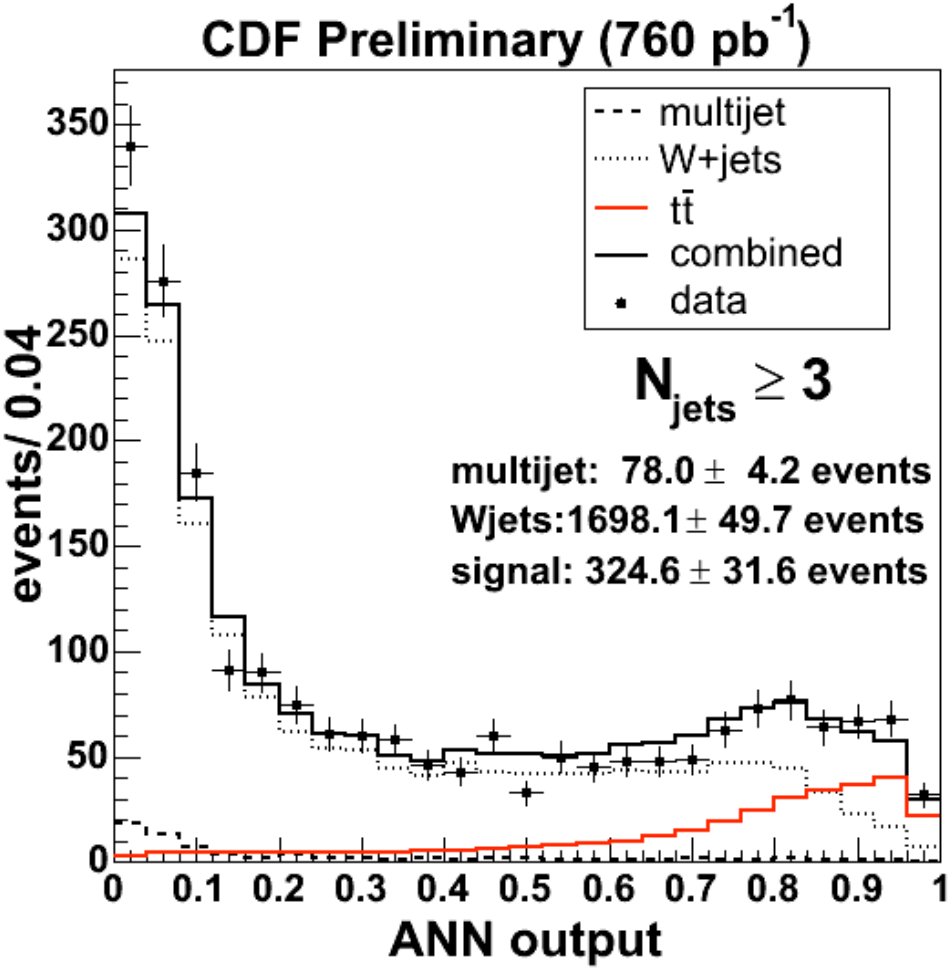


σ_{theory}= 6.7 pb
(M_{top}= 175 GeV/c^2)

8.8 ± 0.8 (stat) ± 1.2 (syst) ± 0.5 (lum) pb

Top Anti-Top Production

Run 2 no required b-tag, (topology) 760 pb^{-1}, root(s) = 1.96 TeV

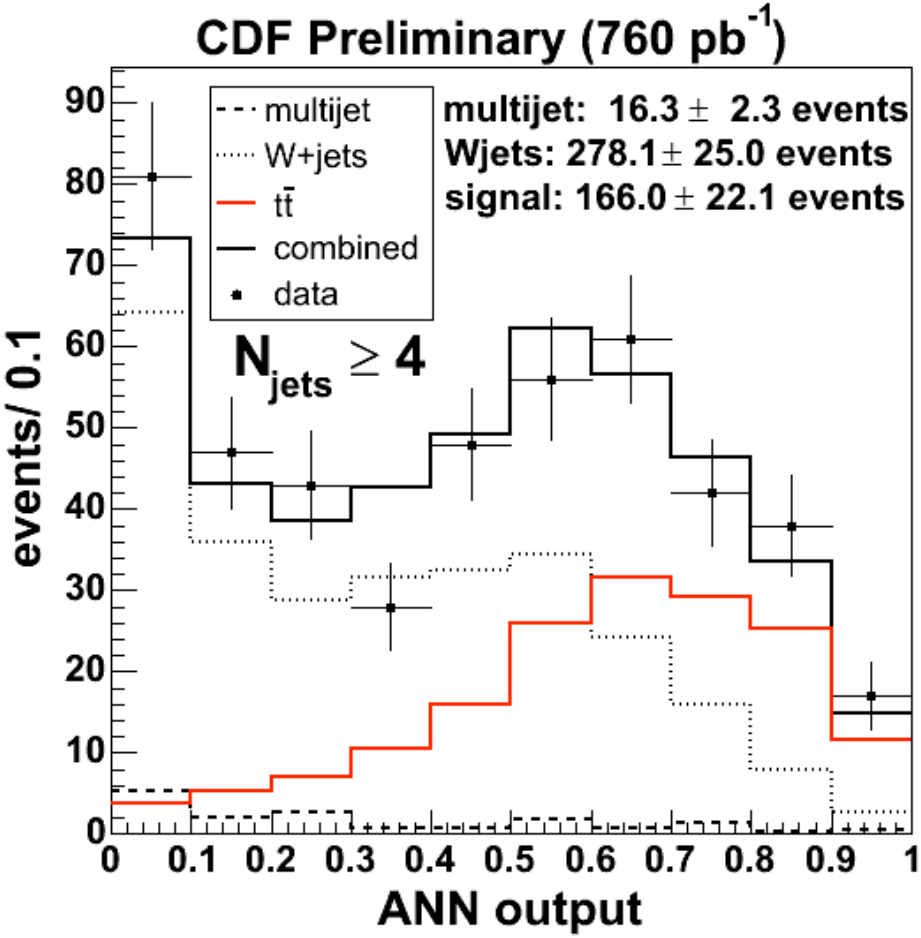


σ_{theory}= 6.7 pb
(M_{top}= 175 GeV/c^2)

>=3 Jets: 6.0 ± 0.6 (stat) ± 0.9 (syst) pb

Top Anti-Top Production

Run 2 no required b-tag, (topology) 760 pb^{-1}, root(s) = 1.96 TeV



σ_{theory}= 6.7 pb
(M_{top}= 175 GeV/c^2)

>= 4 Jets: 5.8 ± 0.8 (stat) ± 1.3 (syst) pb

Background Normalization

CDF Method 2: Jargon for MC-based estimation of *b-tagged* top sample composition.

Issue: how do we normalize the W+HF bkgnds in exclusive jet bins?

Answer: Determine HF fraction F_{HF} and normalize to data.

- **Monte Carlo (AlpGen) ratio:**
  F_{HF} = (W + b-jets) / (W + jets)
- **Measure W+jets (no tag)**
- **W + b-jets = F_{HF} * data(W + jets)**
- **Wcj / Wbb from MC**
- **Lots of ratios!**

See k-factor paper…

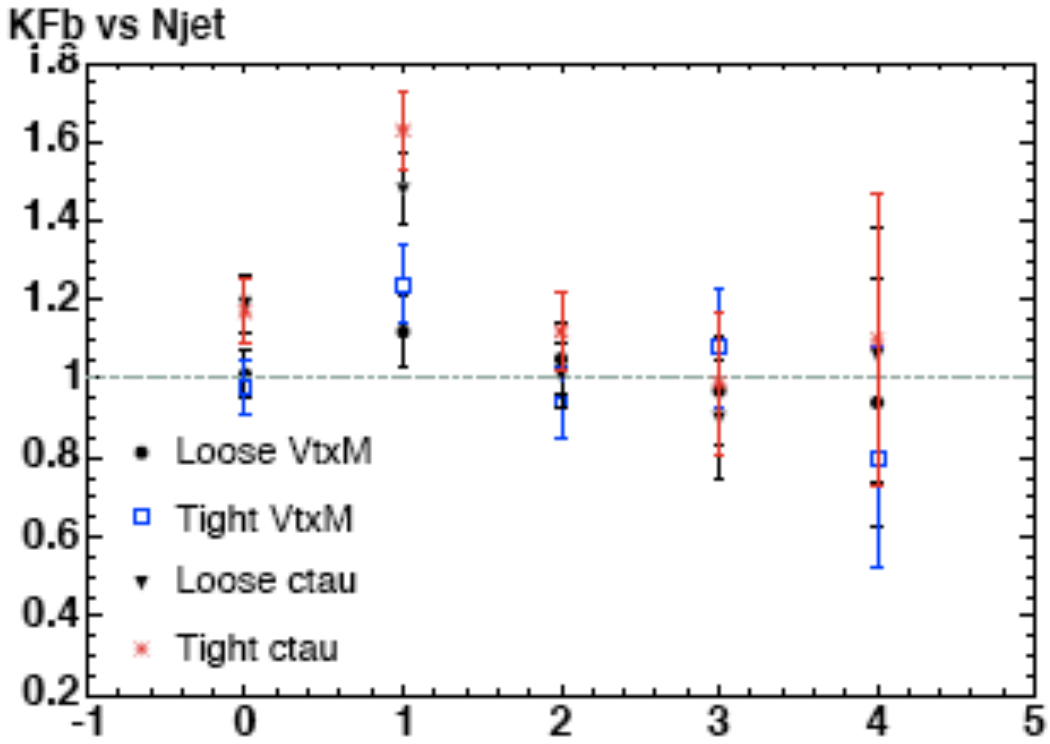
$$N^{tag}_{W+HF} = N^{pretag}_{W+jets,data} \times F_{HF} \times \epsilon^{W+HF}_{tag} \times KF$$

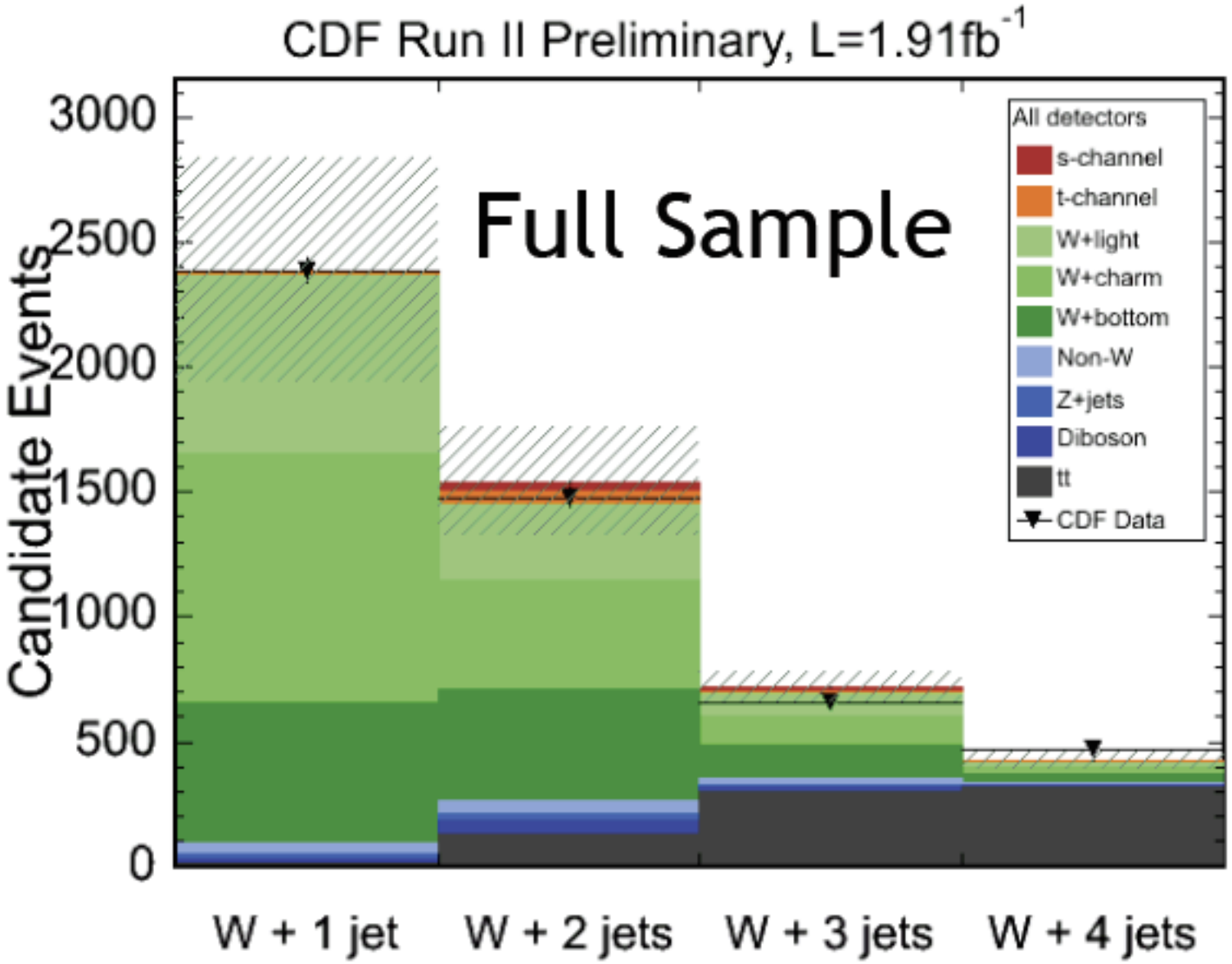
$$F_{HF} = \frac{N^{W+Jets}_{b,MC}}{N^{W+Jets}_{jets,MC}}$$

$$KF = \frac{F^{b,events}_{j,data}}{F^{b,events}_{j,MC}}$$

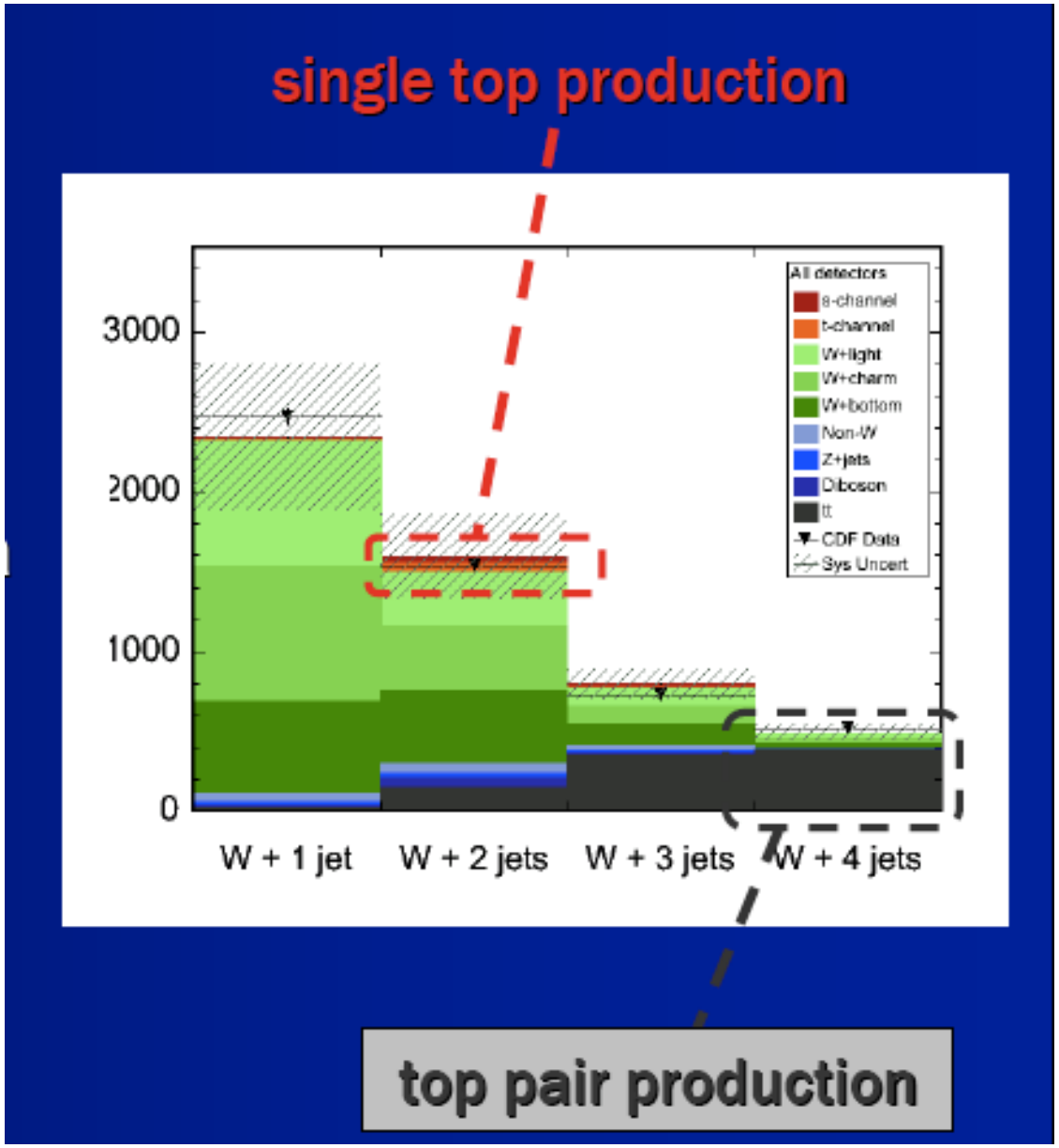
Background Normalization

Important: For ttbar, k-factor
Is being found using jet data..




CDF Run II Preliminary, L=1.91fb-1
Full Sample
Candidate Events
3000
2500
2000
1500
1000
500
0
All detectors
s-channel
t-channel
W+light
W+charm
W+bottom
Non-W
Z+jets
Diboson
tt
CDF Data
W + 1 jet
W + 2 jets
W + 3 jets
W + 4 jets

Single Top



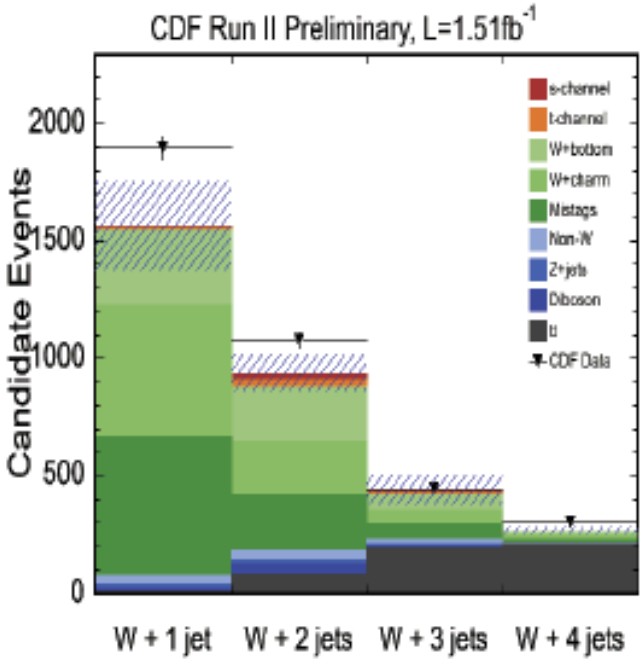
Wasn't always this good!

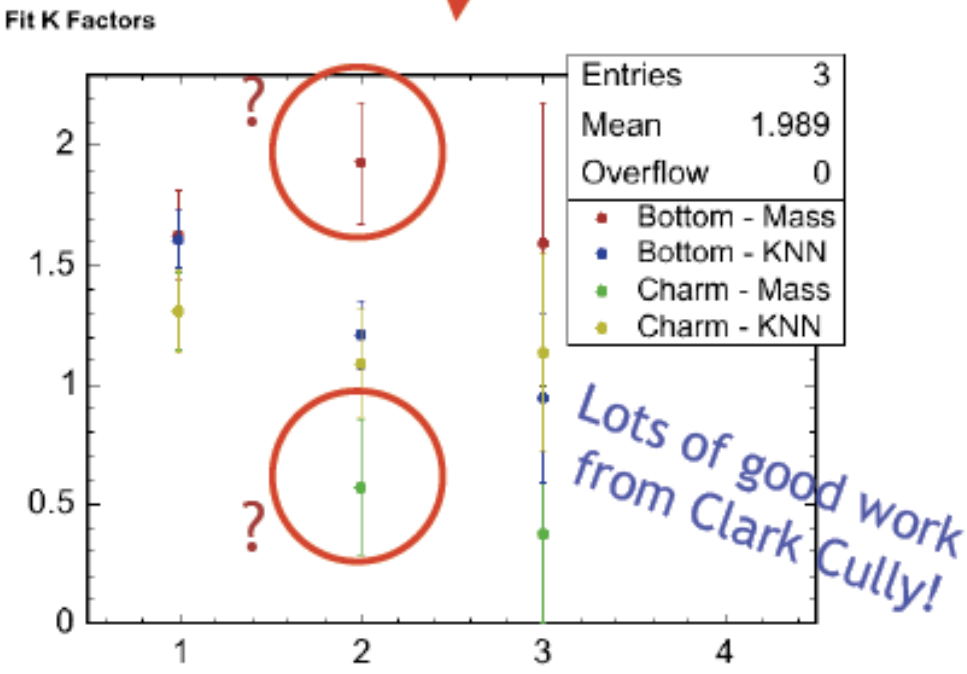
New: Calibrate with W+jets sidebands

Old Situation

- Heavy Flavor Calibration
  - Bias on single top ~13% (assuming 1.6x HF_b)
  - Overestimate sensitivity by ~7%

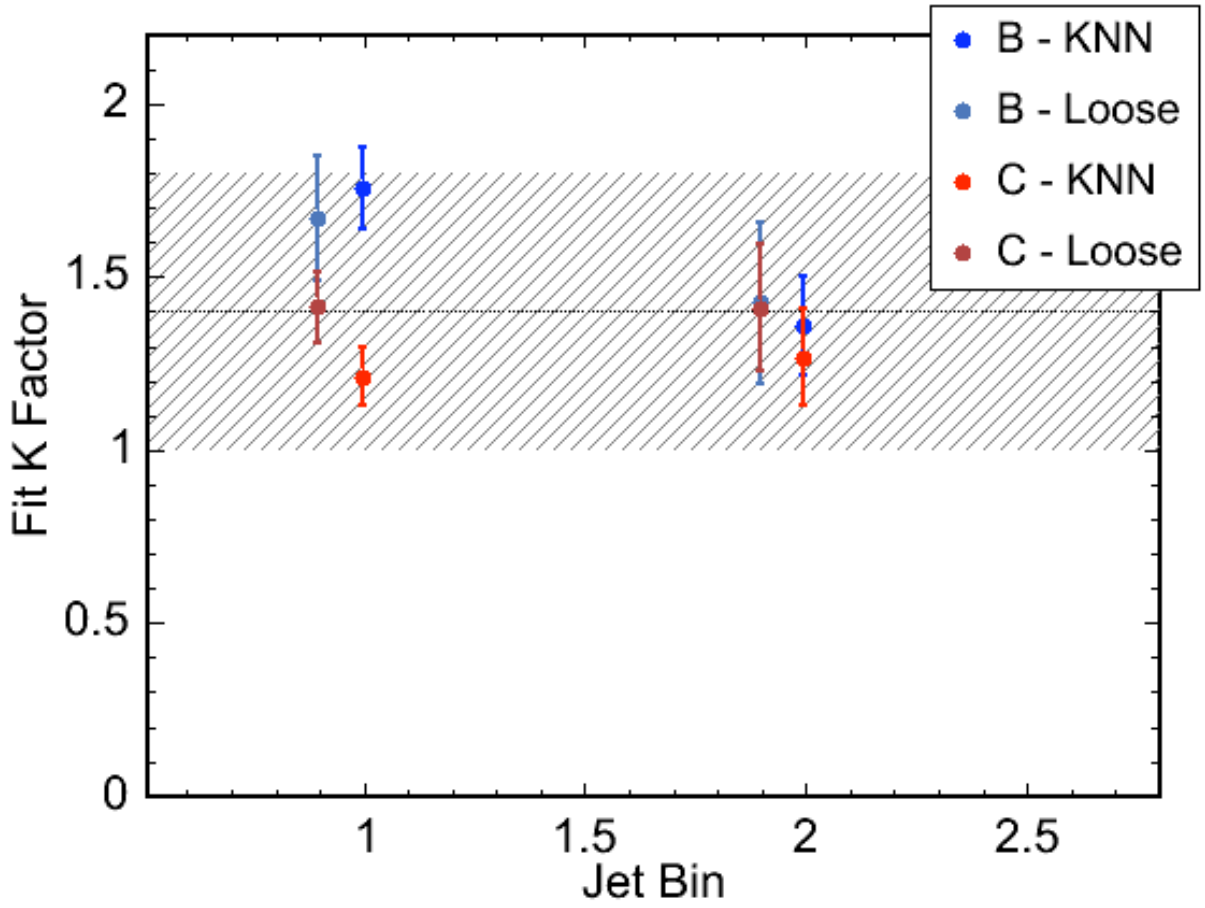
Perhaps related?





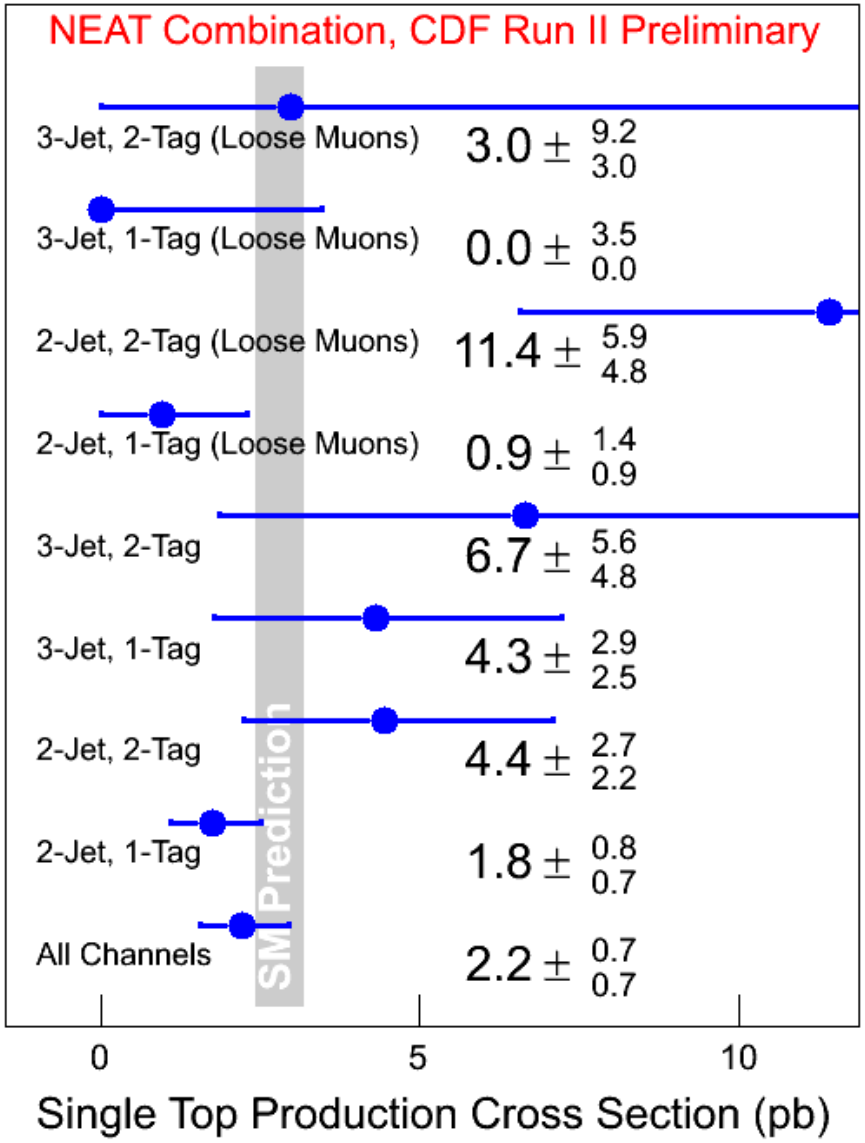
Using Jet Samples, things were confusing…

New k-Factor Using W+jets



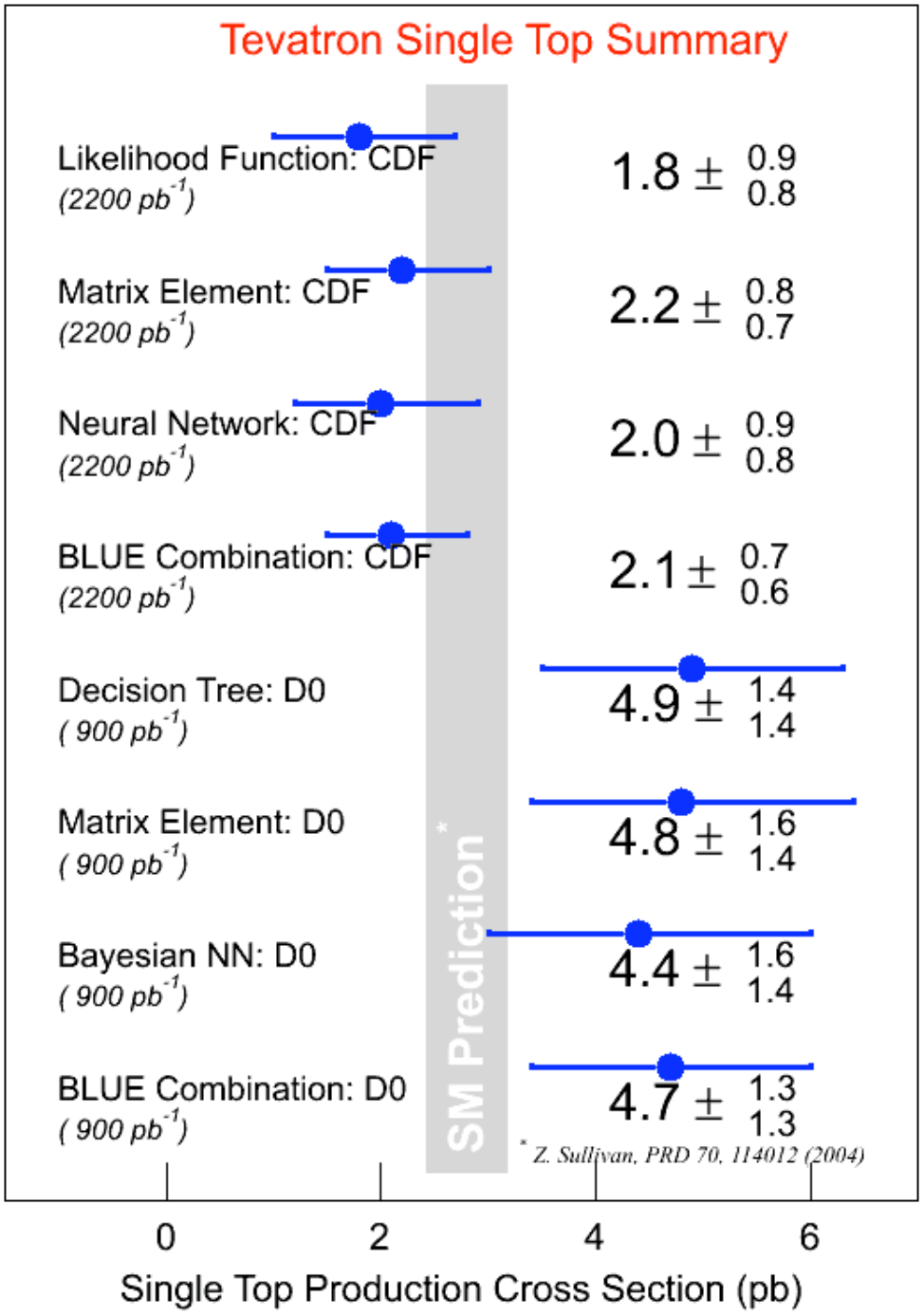
K-Factor Measurement in Tagged W+1 Jet Data:
K HF = 1.4 +- 0.4 (b and c same)
Final Results from KNN Tagger (Loose shown for comparison)

Back to W+2,3 jets…



Can we have an excess
In b-tagged W+3 jets?
Wh, h->aa->bbbb,
two too soft to find?

Another question:
How many triple tags do
We have in ttbar?
tt*->tta->WbWb(bb,ττ),
Or ttbar+extra soft b's

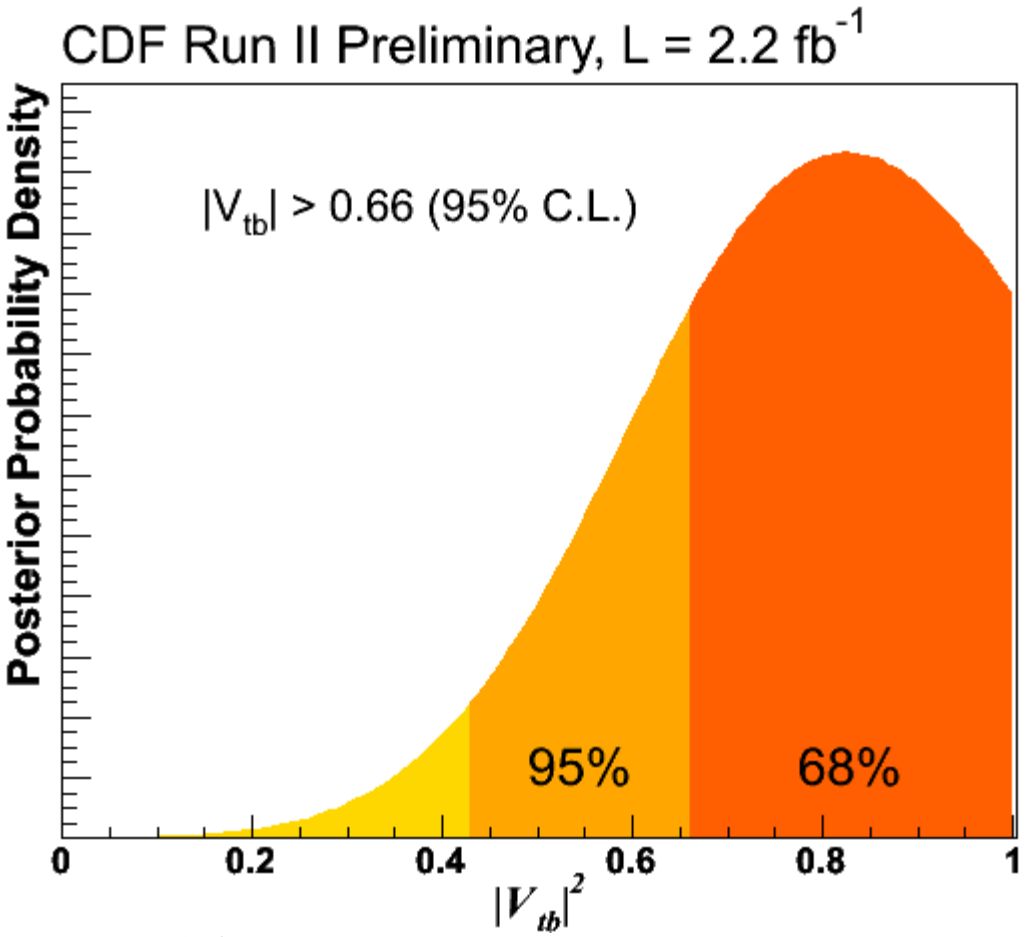


CDF and D0 Single Top

New CDF Combination, shown Thursday

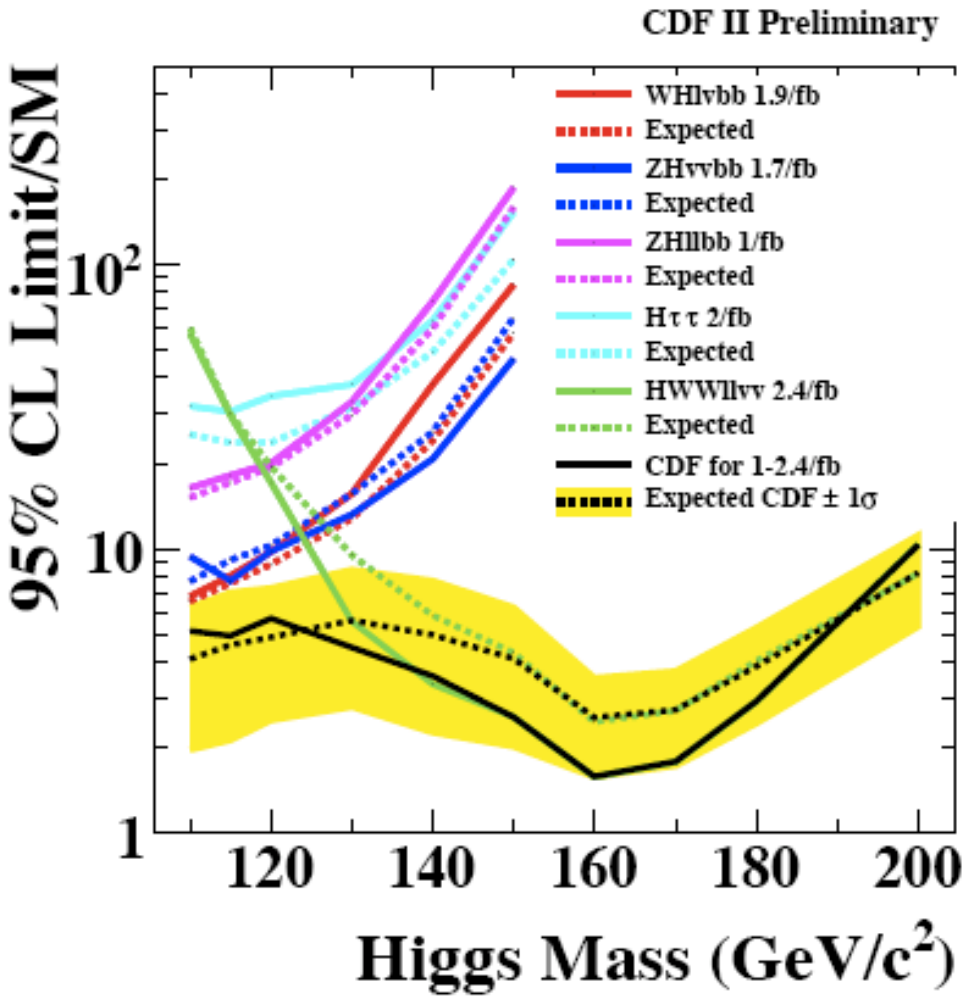
New CDF Vtb

- Measurement of $|V_{tb}|$ (assuming top mass of 175 GeV)
  - Directly extracted from cross section result
- Limit on $|V_{tb}|$:
  - Treats top mass as an uncertainty
  - Assumes flat prior on $|V_{tb}|^2$ between 0 and 1.



$$|V_{tb}| = 0.88 \pm 0.14\,(\text{exp.}) \pm 0.07\,(\text{theory})$$

New CDF Higgs Combo



Random CDF Stuff

- New tprime result
- New results from Vista/Sleuth, including bump hunter
- Latest Tevatron Higgs combination