

Search for t' : Update with 2.8 fb^{-1}

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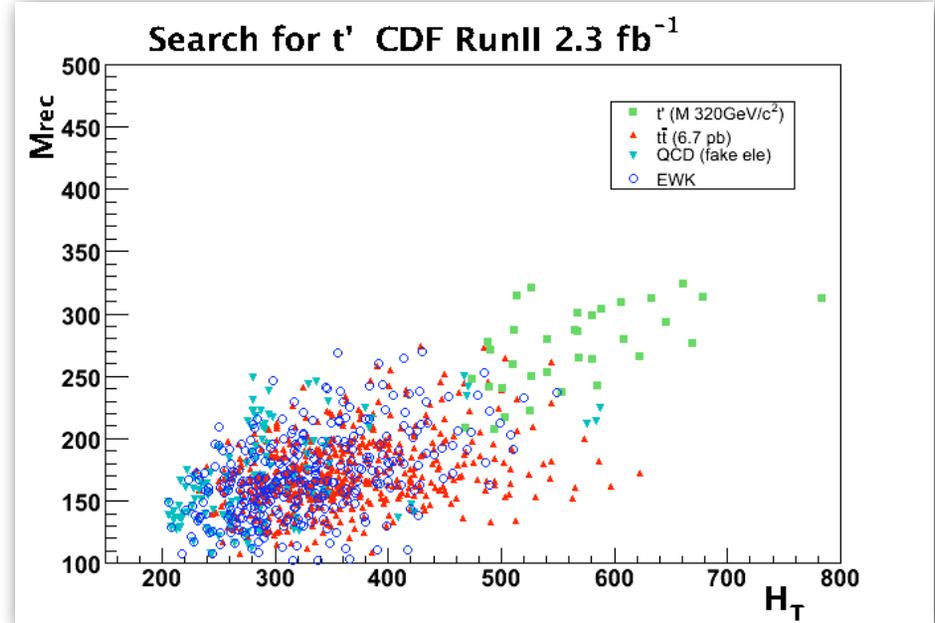
Top Properties Meeting
11 July 2008

Recent History and Changes

- PRL on 760 pb⁻¹ published in April
- Blessed with 2.3 fb⁻¹ in March
- Changes to present today:
 - add 20% more data
 - reduce Q² systematic uncertainty
- Method identical to March blessing
- Analysis update note by Monday

Search for t'

- We search for a heavy quark decaying via $t' \rightarrow Wq$ with 100% BR
- Use lepton + 4 jets channel, no b tagging
- Perform fit to 2D H_T versus M_{rec} distribution
- Bkg: $t\bar{t}$, $W+lf$, QCD
- $W+lf$ floats freely in fit; represents other EWK backgrounds
- Sensitive to anything leading to $\ell + 4$ jets



Systematic Uncertainties

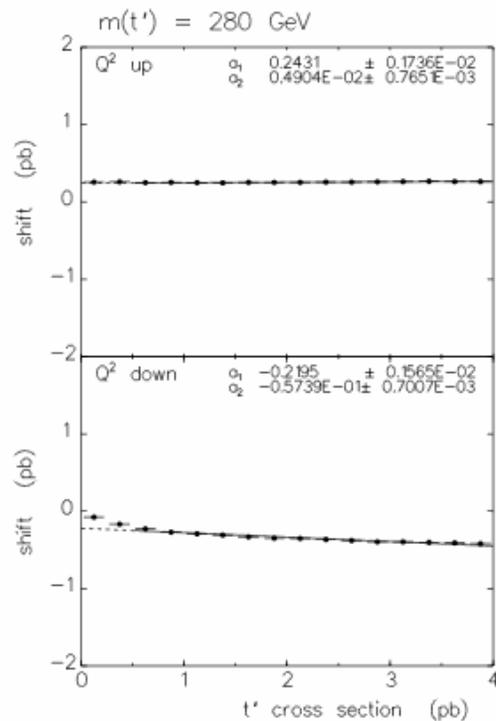
- JES - template morphing in likelihood
- Q^2 - see next slides
- ISR/FSR - used “IFSR more” and “IFSR less”
- PDFs - 1.1%; standard JP method
- Trigger efficiencies
- Lepton data/MC scale factors
- Integrated luminosity: 5.9%
- Theoretical uncertainty on cross section 10%

Q² Systematics

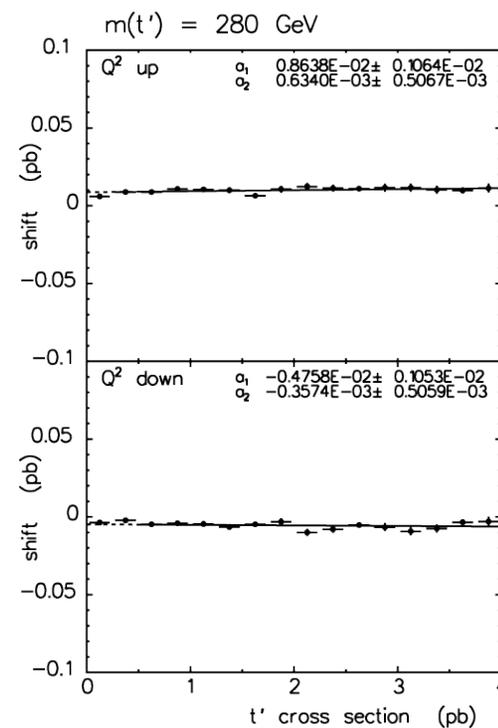
- was dominant systematic in March
- estimate by calculating apparent cross section shift when generating pseudoexperiments with shifted templates
- used W+4p MC only for Q²; not a good representation of data as it turns out
- full W+np MC Q² samples now available
- this led to discovery of a bug: in March the normalization of W+4p was far too high
- systematics were very large, but consistent with earlier GEN5 result...

Q² Systematics

- re-evaluated Q² systematics with new, properly normalized W+4p samples
- systematic uncertainty is much smaller now!



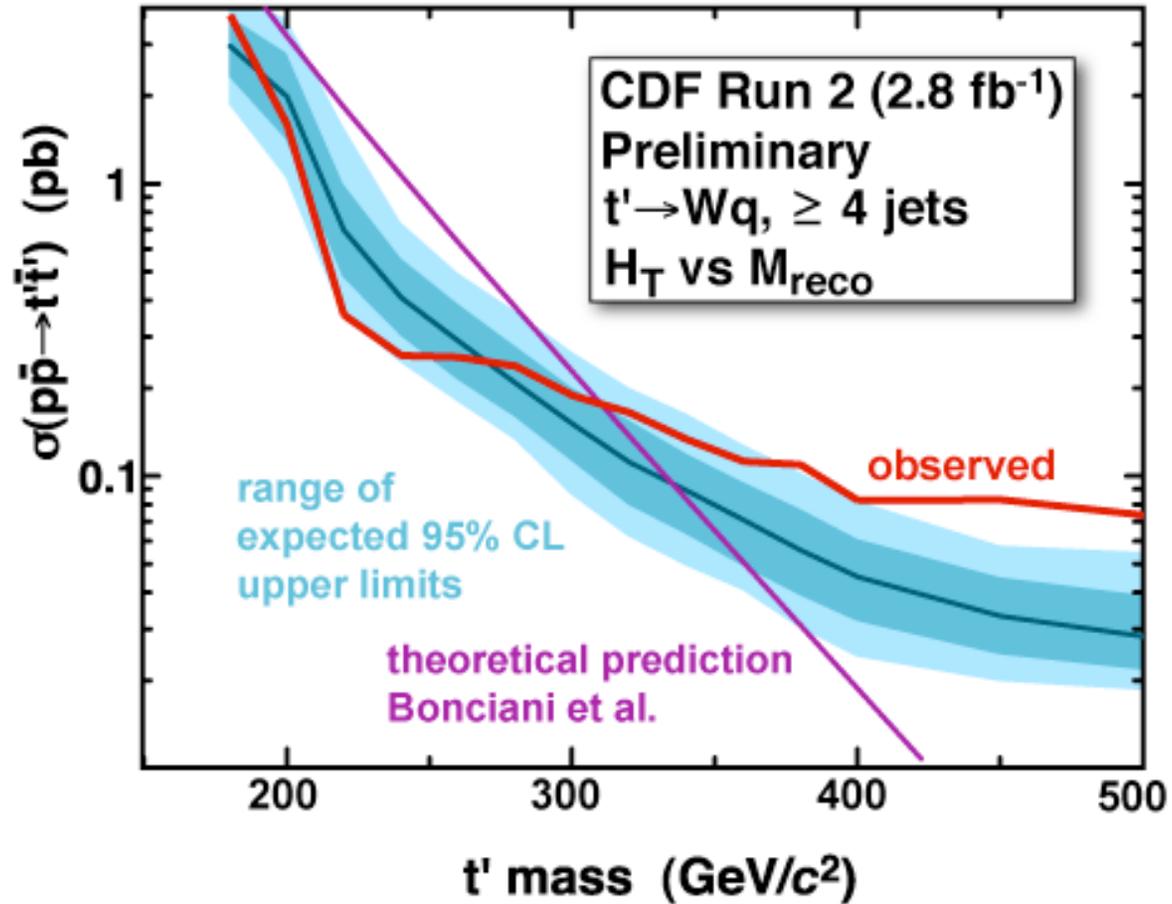
old (bad)



new (good)

note
vertical
scales!

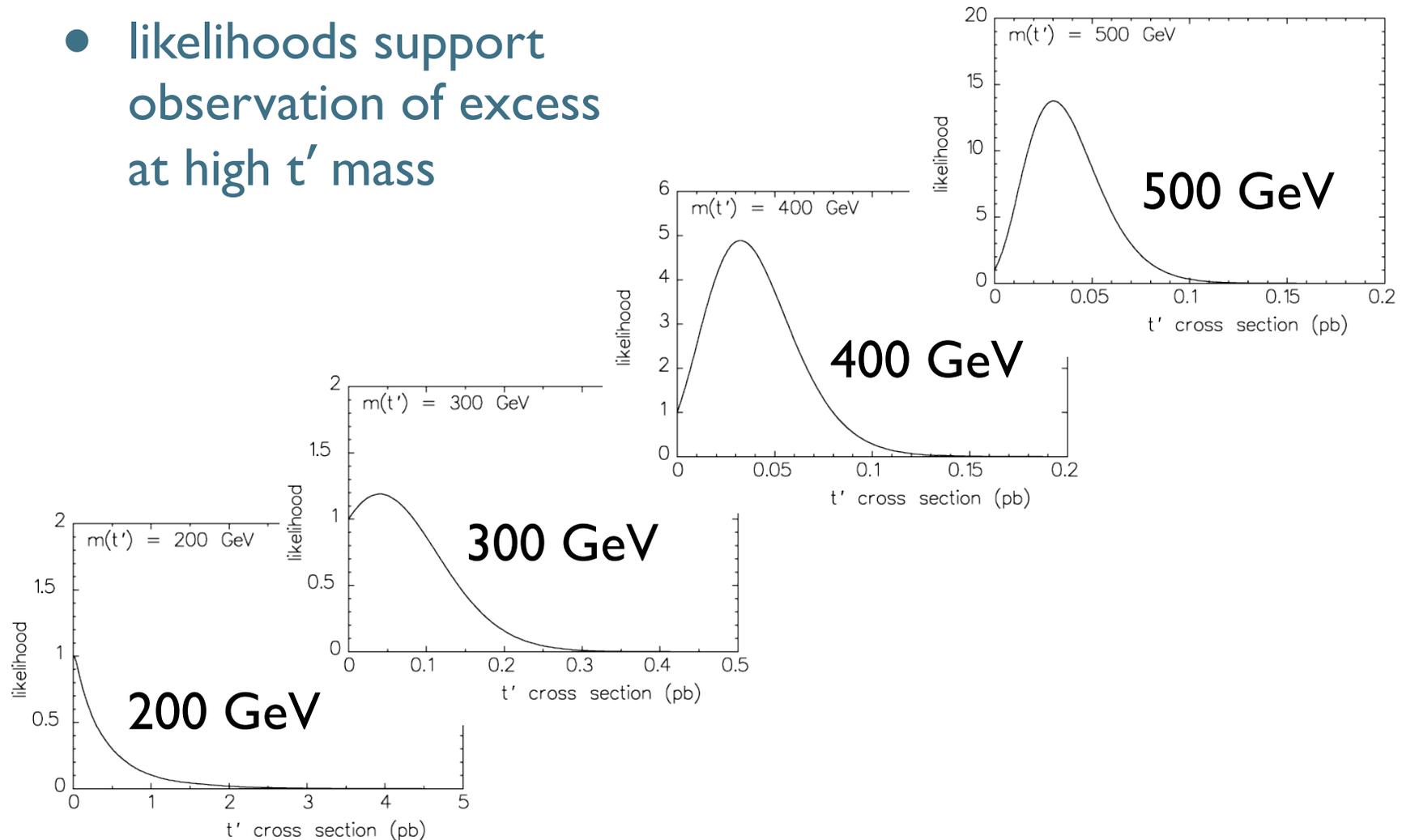
New Limits



mass limit: $m(t') < 311$ GeV at 95% CL

Likelihood Functions

- likelihoods support observation of excess at high t' mass



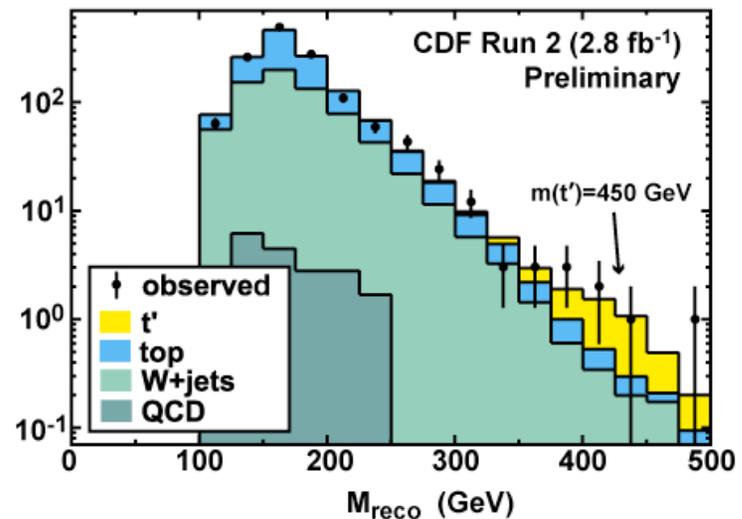
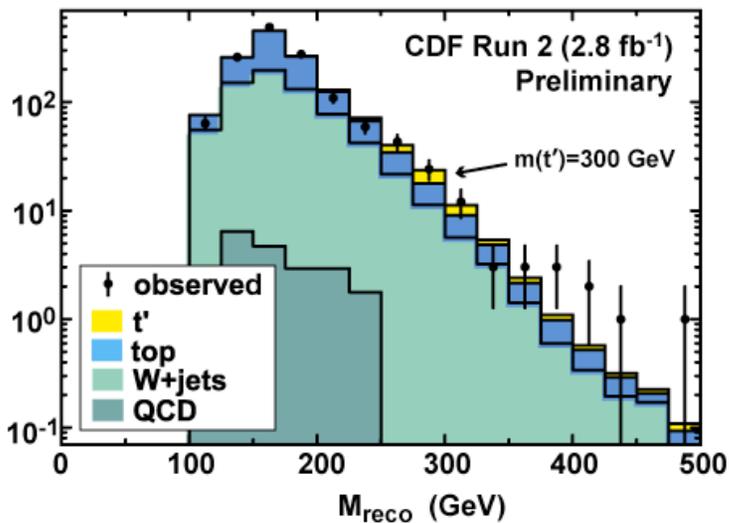
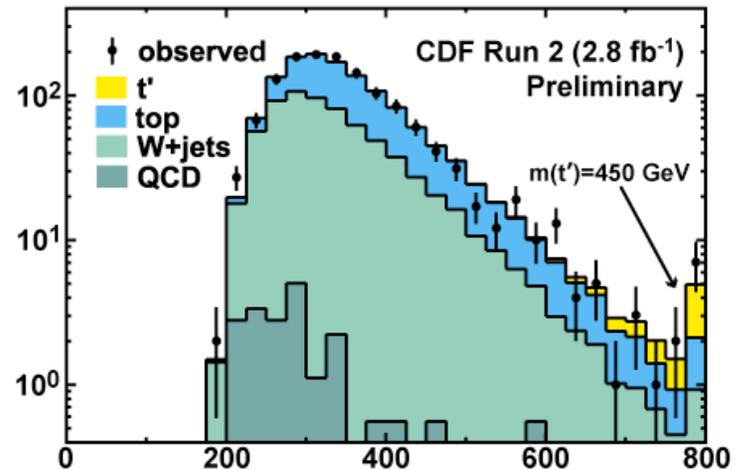
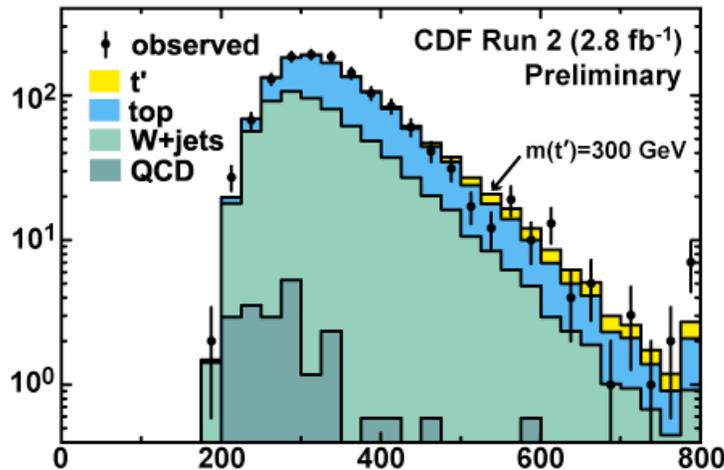
Significance Test: “n x n”

- measure significance of excess by looking at upper-right-most n x n bins
- let n increase from n = 1, 2, ... and find the n x n region with most significant excess
- then ask “how probable is it that we get such a most significant excess?”

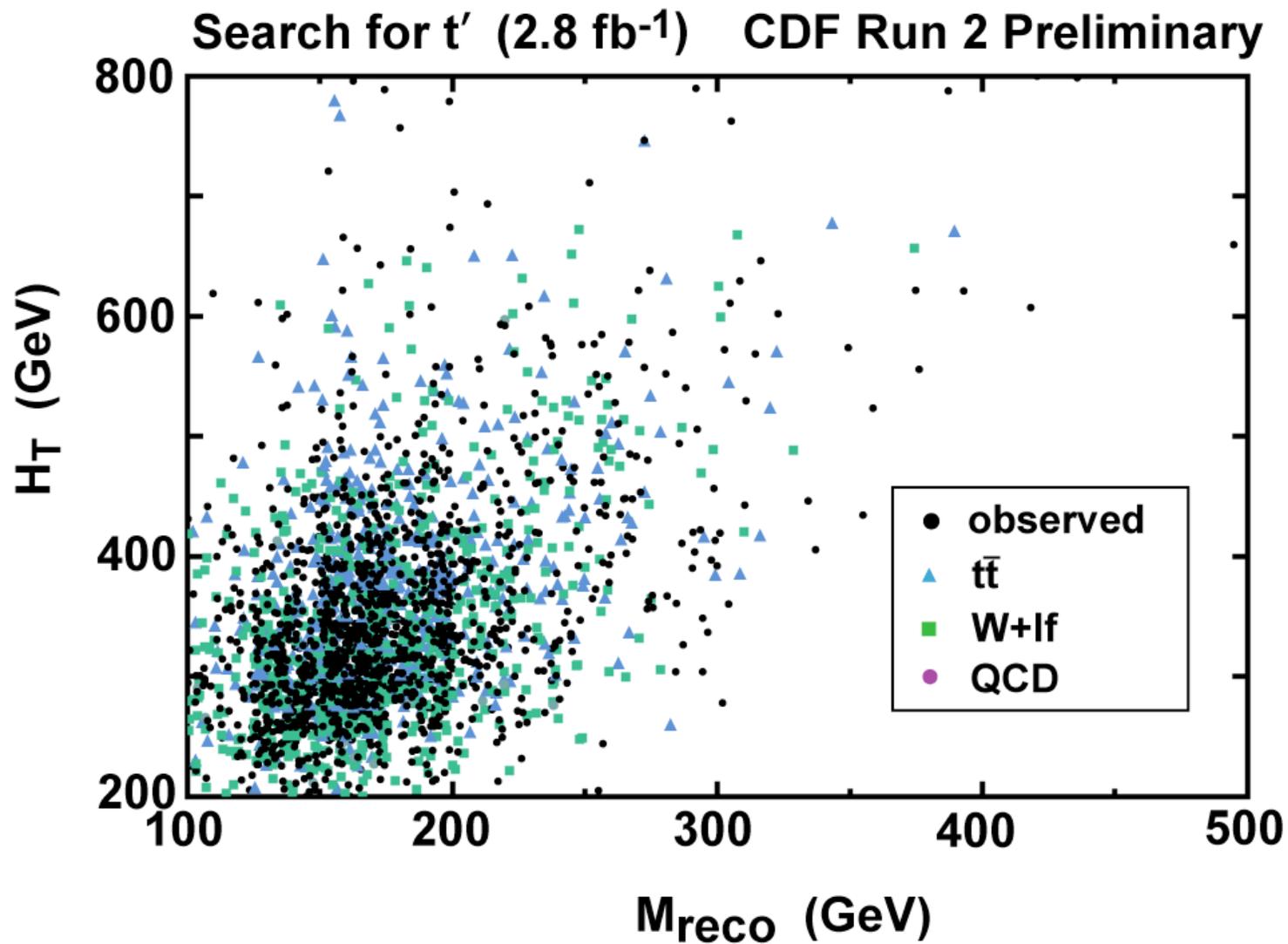
nxn	see	expect	prob
1	0	0.021	1.0000
2	0	0.116	1.0000
3	1	0.228	0.2040
4	2	0.371	0.0540
5	3	0.718	0.0364
6	4	1.503	0.0660
7	4	2.876	0.3251
8	12	5.498	0.0110
9	14	9.885	0.1273
10	29	18.03	0.0105
11	41	31.34	0.0555
12	58	52.05	0.2219
13	92	91.14	0.4779
14	152	158.7	0.7141
15	222	231.0	0.7318

no really
significant excess

H_T, M_{rec} Projections



Scatter Plot



Conclusion

- added 20% more data to t' search
- greatly reduced Q^2 systematic uncertainty
- mass limit now 311 GeV
- no significant excess in tails

- analysis update note by Monday