$t\bar{t} \rightarrow \not{E}_T$+jets Analysis Q&A - Blessing talk

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Main changes w.r.t previous results:
Trigger Systs.
SecVtx SF systs.
Background systs.

Outline:

- **Brief analysis overview**
- ***Question & Answers***
- ***To bless material***

Brief analysis overview

Datasets and trigger:

TOP_MULTI_JET *dataset* (gset0d) up to Aug 2004: 311 pb^{-1}.

- **L1: ≥1 cal. tower with E_T≥10 GeV;**
- **L2: ≥4 cal. clusters with E_T ≥ 15 GeV, ΣE_T ≥ 125 GeV;**
- **L3: ≥4 jets, R=0.4, E_T ≥10 GeV**

MC : (167 fb^{-1}), Pythia ttbar (ttopel), M_{top} = 178 GeV

Good Run List: v7.0 (1,1,4,1)

Offline version: 5.3.3_nt5

Jet Corrs: jetCorr04b

MET+jets analysis
ttbar→blν bbarjj

Method-I approach
+
ad hoc Kinematical selection

3-d (E_T, N_{TRK}, Met_{PRJ}) Positive Tagging Matrix constructed on 3 (E_T^{L5}>15GeV, |η|<2.0)-jet events.

The kinematical selection is optimized in order to minimize the relative statistical error on xsec using both the expected amount of tags for inclusive ttbar and background (from matrix)

- **N jets(E_T≥15 GeV; |η|<2.0) ≥ 4**
- $\not{E}_T / \sqrt{\sum E_T} \geq 4.00$
- **min Δφ(met,jet) ≥ 0.4 rad**

- **Pre-Tag: S/N = 0.18 Post-Tag: S/N = 1.14**

- Questions & Answers -

- The systematics on the trigger simulation is one of the main sources of uncertainty. We evaluated it by comparing trigger turn-on curves as a function of the jet raw-E_T for ttbar and Tower-10 data.

Q: Raw jet energy scale affects the trigger efficiency. This should be taken into account. How much does the trigger efficiency change using ±1σ jet energy scale systs?

Addendum: we re-evaluated the trigger efficiency using turn-on curves w.r.t the L5-corrected jet E_T. This drops the systematics dependence of the raw jet energy scale difference between Monte Carlo and data.

The systs is reduced from 17.8 % to 14.8 %.

A: Our trigger efficiency is calculated using TRIGSIM++, not by means of turn-on curves. Anyway we can evaluate the effects of JES systs using turn-on curves as a function of L5-cor $E_T^{(0,\pm 1\sigma \text{ syts})}$ on the efficiency:

Standard JES	78.246 %
+1σ JES	77.949 %
-1σ JES	78.636 %
$\Delta\varepsilon/\varepsilon_{standard}$	0.5 %

The JES scale effect is evaluated over a sub-class of inclusive MC events before any kinematical selection in which the 4th jet is matched to the 4th L2 cluster.

This is why the efficiency is higher (78.2 vs 63.3%)

- The systematics on the SecVtx B-tagging is evaluated using ±1σ Scale Factor variation effect on ttbar inclusive events.

Q: You quote a systematic error on the SF to be 5.5%. Usually people quote 6.6 %. Do you understand the reason why?

Addendum and Answer: we investigated and found that we were not properly accounting for the c-quark SF error: we were assuming the same SF error for b-quark and c-quark instead of a double error for charm. We corrected for this:

b-tagging efficiency changes from 79.08 ± 0.18 to 78.89 ± 0.18;

It's a 0.2 % effect (within the stats), No change in the xsec central value.

But has a sizable effect on the b-tagging systematics making it changing from 5.5% to 5.8 %.

N evt MC_{incl}	standard SF	$+1\sigma$ SecVtx SF	-1σ SecVtX SF
Total	1,021,924	1,021,924	1,021,924
After Kin Sel	49,848	49,848	49,848
≥ 1 tag	30,410	31,591	29,021
Tot tags	39,326	41,435	36,876
$\epsilon_{tag}^{evt}\%$	78.89 ± 0.18	83.12 ± 0.17	73.98 ± 0.20

When we write ε^{ave}_{tag}

Read n^{ave}_{tag}

- The tagging matrix is constructed using 3 (E_T^{L5}>15GeV, $|\eta|$<2.0)-jet events, where the ttbar contamination is $F_{top}=2\times10^{-5}$ in terms of events.

Q: The right figure of merit here is not t-tbar events vs. MJ events, but something like fraction of t-tbar events compared to the avg. tag rate. A small fraction of t-tbar events with a tagging rate of 50% can still bias the apparent tag rate if the true tag rate is very small in the data.

Number of events	3 jets	ϵ_{Tag}^{ave}	4 jets	ϵ_{Tag}^{ave}
multijet data	879,187	6.5 %	1,553,525	8.7 %
expected inclusive $t\bar{t}$	16.88	58.2 %	182.92	74.3 %
multijet data, $\not\!\!E_T/\sqrt{\Sigma E_T} \geq 4$	2,317	10.8 %	2,412	16.6 %
expected inclusive $t\bar{t}$, $\not\!\!E_T/\sqrt{\Sigma E_T} \geq 4$	6.54	59.3 %	56.92	77.3 %

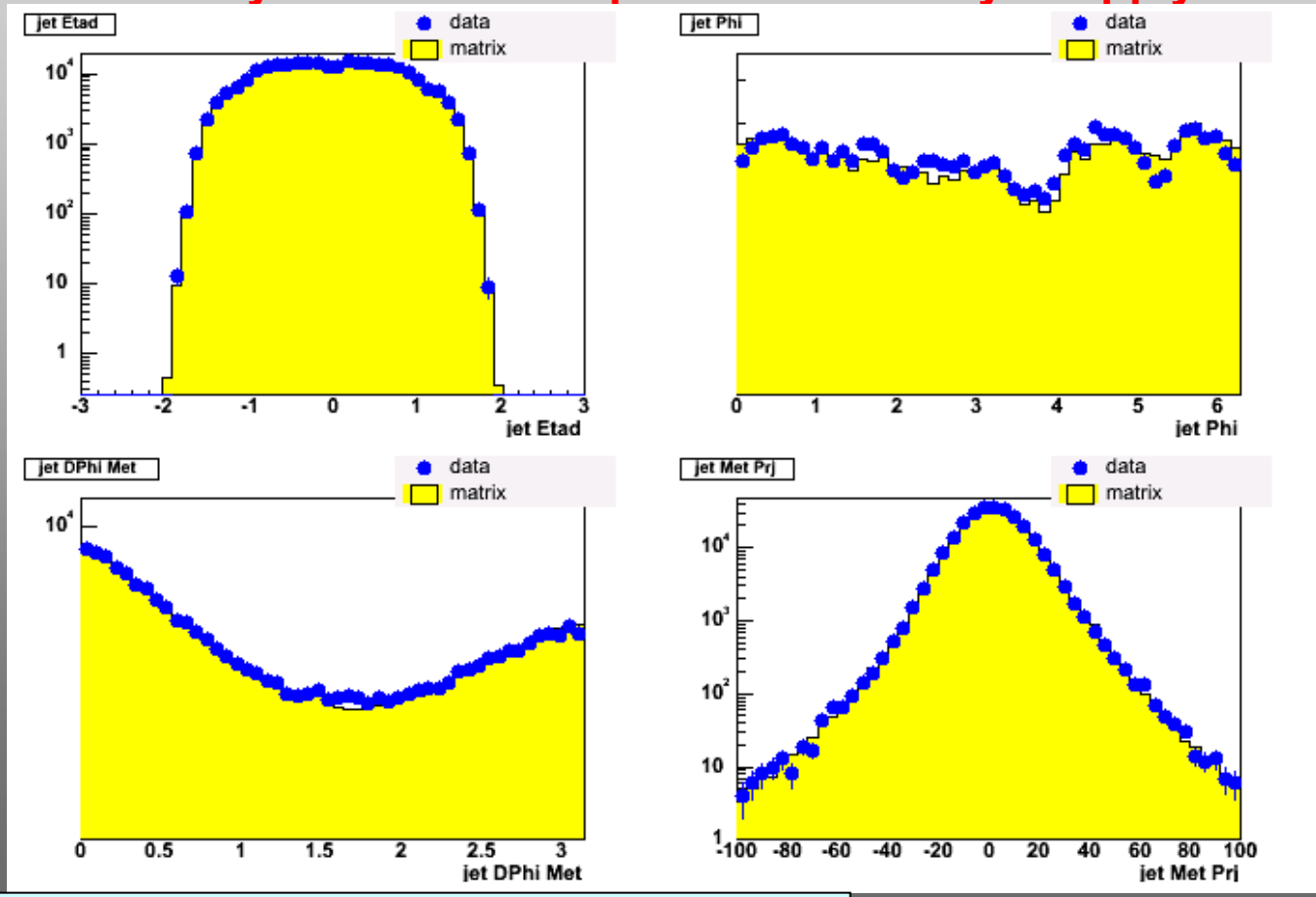
A: We produced the following table in which the average tagging rate are shown together with the number of events.

The ttbar fraction considering the relative tagging efficiency is still low and found to be 2×10^{-4}.

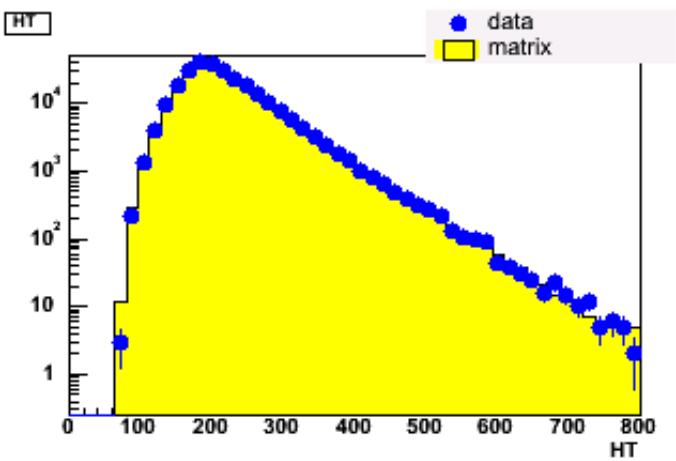
The tagging matrix is constructed using 3-jet events, and parametrized in jet E_T, N_{TRK} and MET_{PRJ}.

Q: you should demonstrate that this set of variables is sufficient by plotting predicted/observed vs. some other variables (e.g. sum Et, missing Et, Run number, eta, phi,...). If those do not agree well, then you have to worry about different spectral shapes between your matrix sample and the data you apply it to.

A: We produced some plots showing the agreement between observed kinematical distributions for tagged events and the ones predicted from the matrix, in the sample of data with Njet ≥4 before kinematical selection.



The log scale was required by e-mail yesterday after posting the Q&A page. We also changed the x-axis ranges in order to highlight distribution tails.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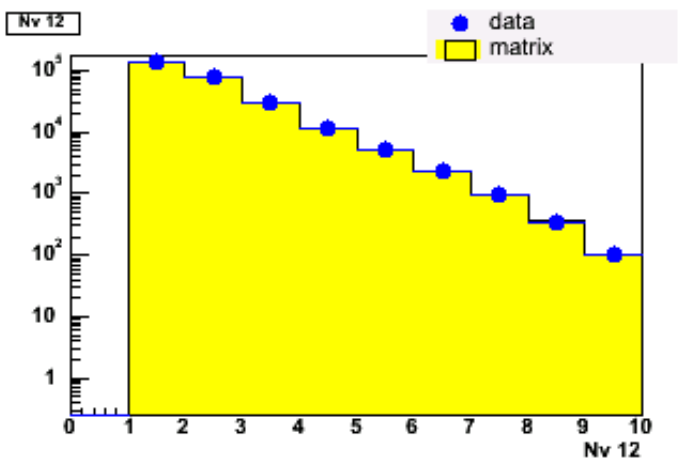
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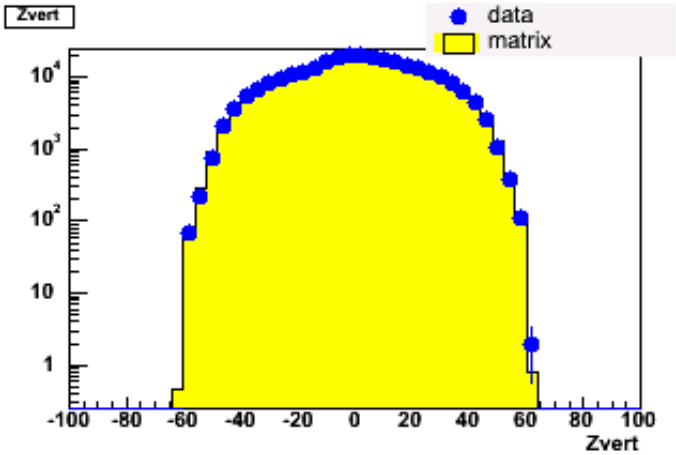
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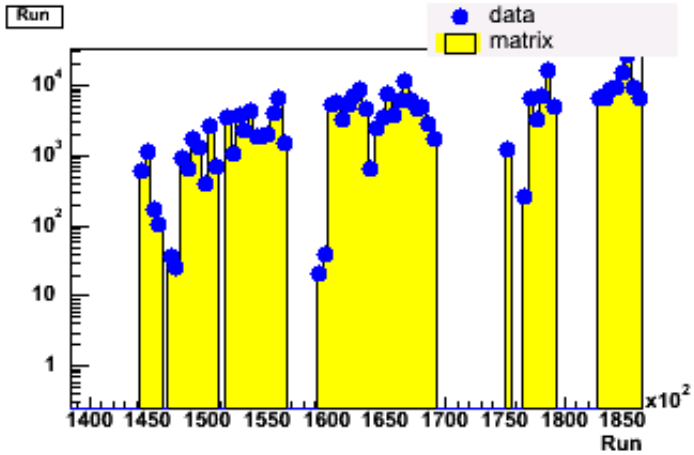
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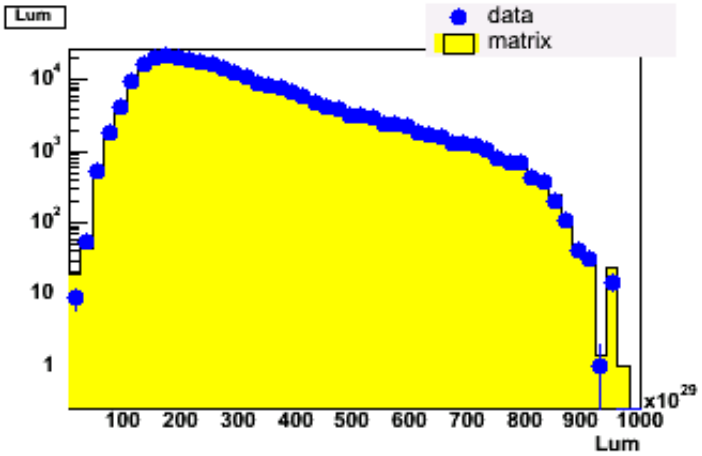
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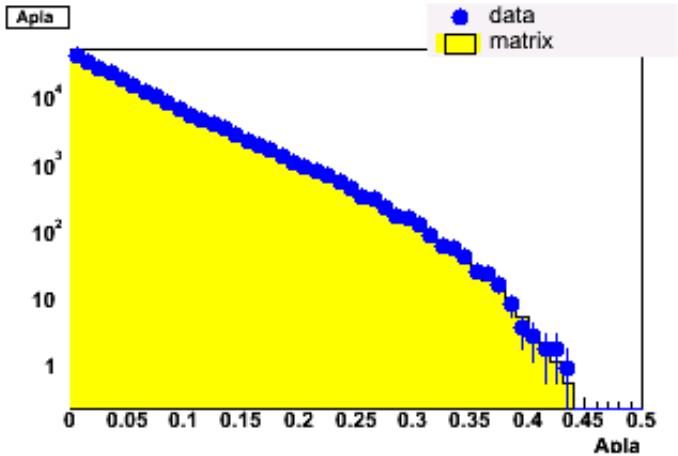
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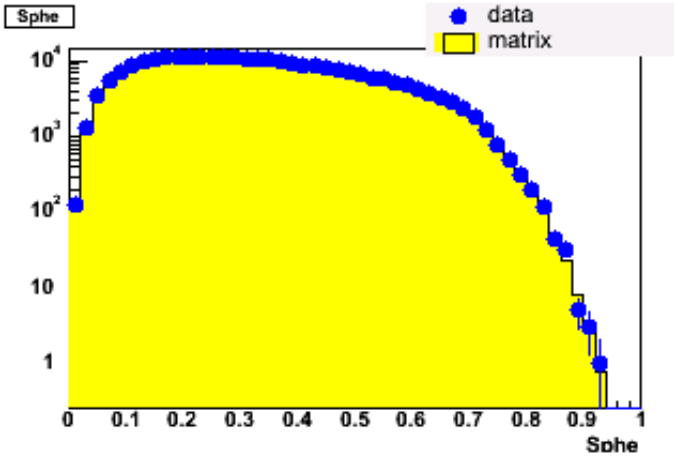
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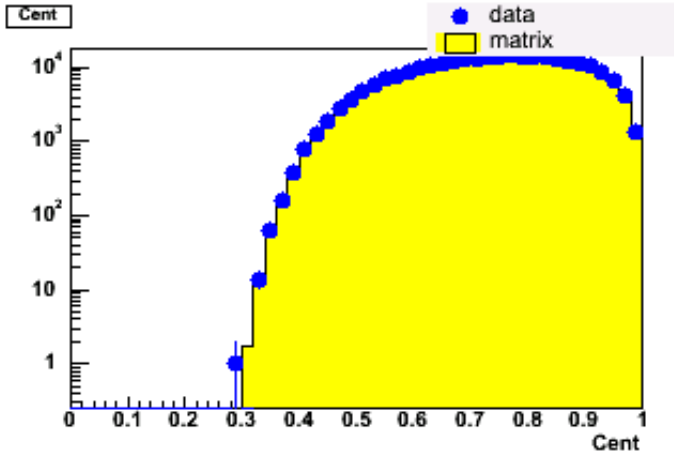
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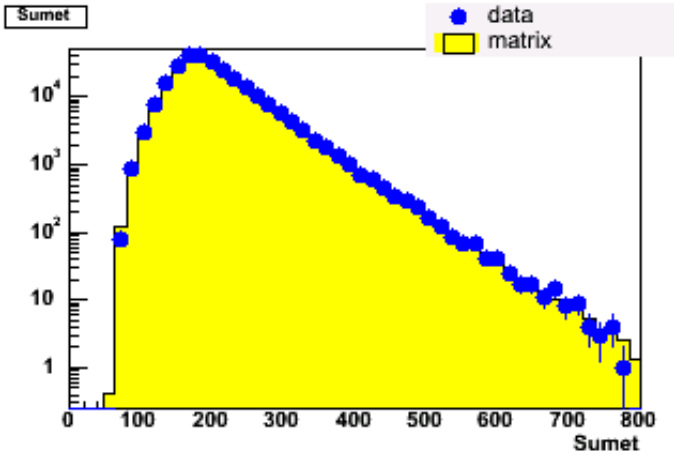
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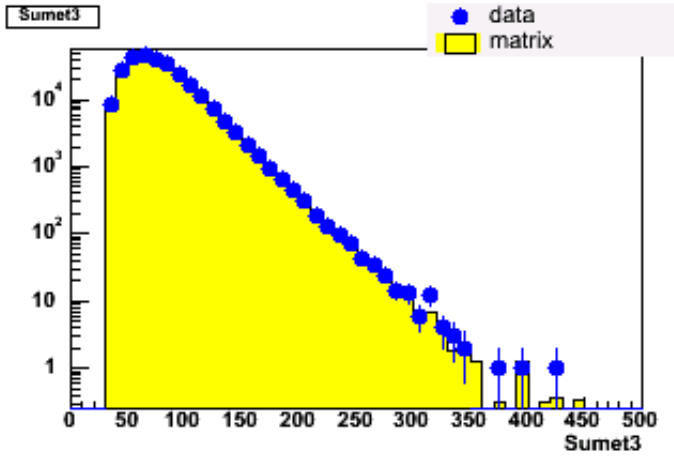
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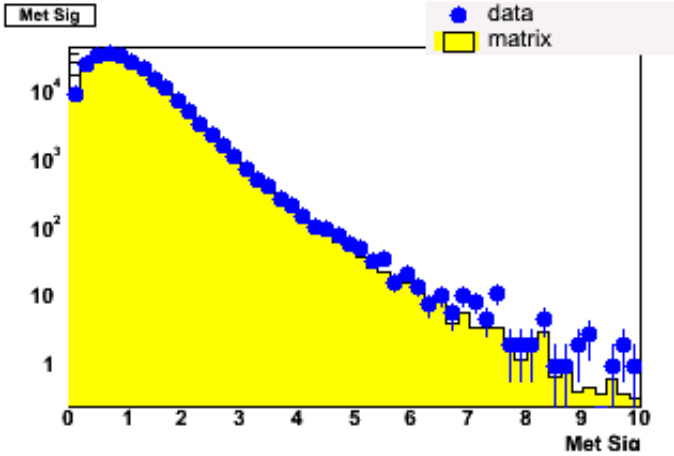
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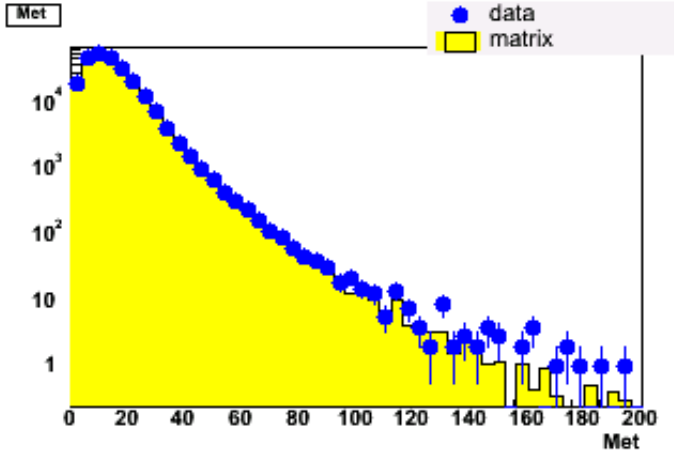
Met
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Q: Can you gain any statistical power by calculating the cross section by N_{jet} bin and then combining?

A: Probably we could gain something from the statistical point of view in calculating the cross-section by N_{jet} bin.

Anyway given that even doing that the systematical uncertainty exceed the statistical one we think the improvement will be poor.

Moreover, we found that the systematic due to the jet energy correction are so low (1.5%) because we are sitting over the trigger requirement ($N_{jet} \geq 4$). We also found that for instance for a kinematical selection asking for $N_{jet} \geq 5$ these systematics increase to the value of 7.6%.

For this reason a cross section measurement made by jet multiplicity will have to cope with higher systematics that as I already mentioned will come from JES and the fix requirement in the number of jets.

Q: How many times does SecVtX tag a τ-lepton?

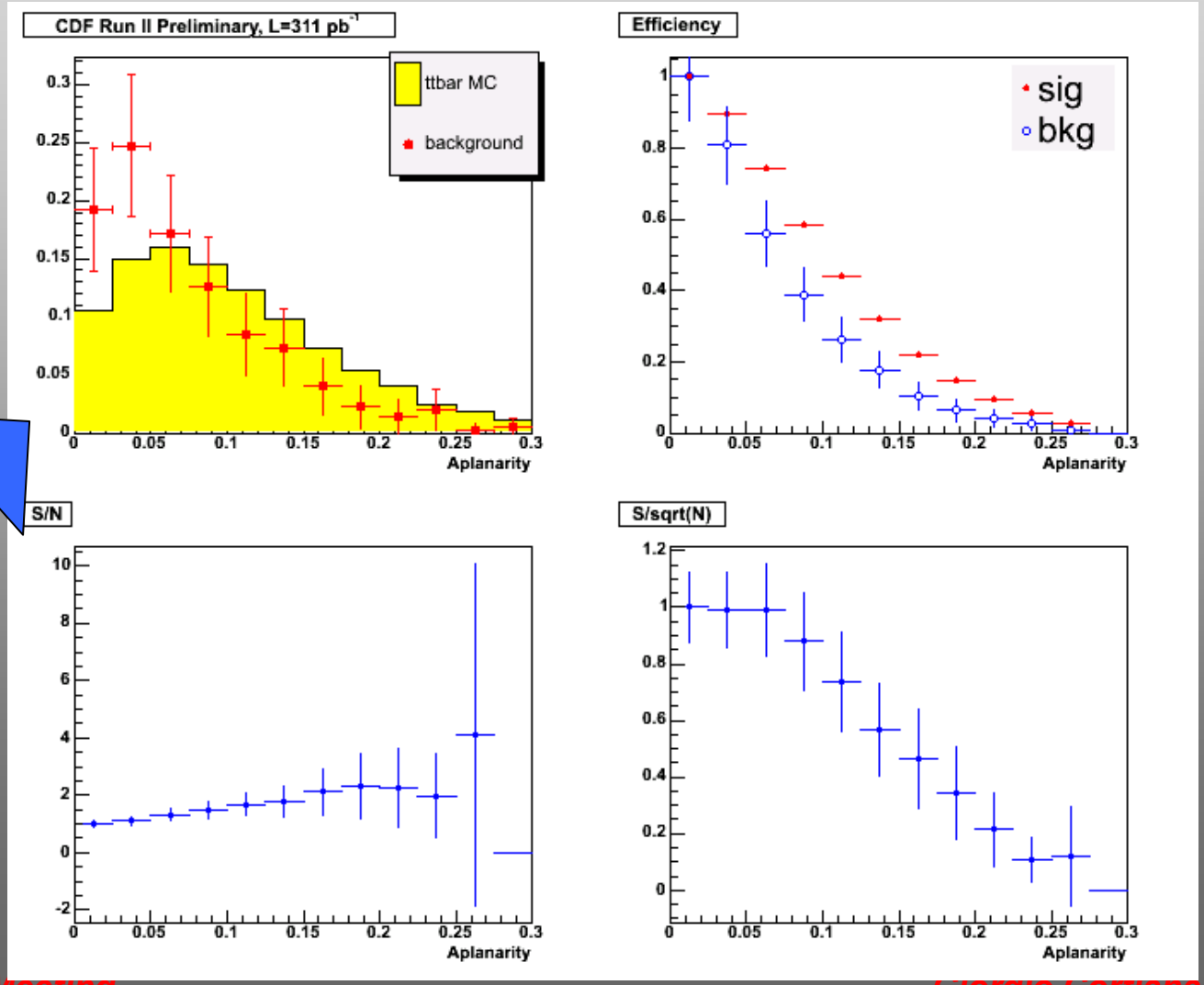
A: Before kinematical selection in tau+jets exclusive ttbar decays 3% of the tags comes from tagged-taus.

In the final sample we end up with 127 tags, ~60 from ttbar out of which ~20 are from tau+jets decay. This means 0.6 signal tags in the final sample are due to b-tagged taus.

The kinematical selection uses missing E_T significance and min$\Delta\phi$(MET,jet). The optimization procedure founds not necessary a cut on Aplanarity.

Q: Does really Aplanarity do nothing?

A: We performed by-hand an optimization study on aplanarity after having Imposed the cuts defining our selection.



The distribution for background is obtained from tagging matrix prediction while the one for the signal from tagged inclusive ttbar events.

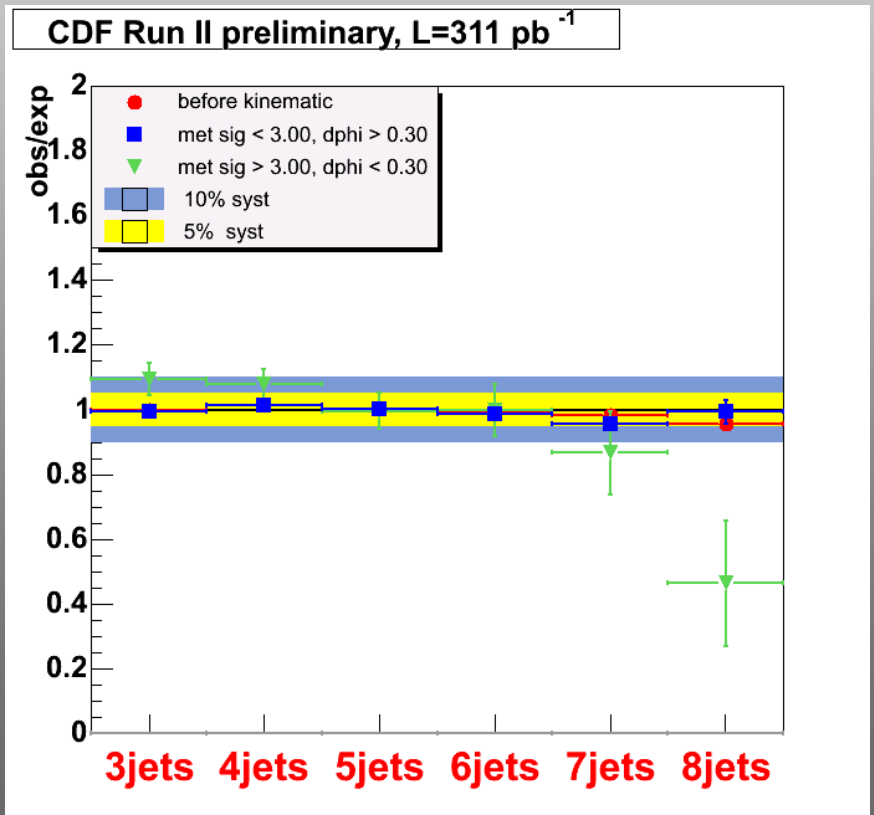
- The positive tagging matrix predictions are checked in control samples depleted of signal obtained from multijet data.

- data before kinematical selection
- data w/ met sig < 3 and min$\Delta\phi$ > 0.3
- data w/ met sig > 3 and min$\Delta\phi$ < 0.3

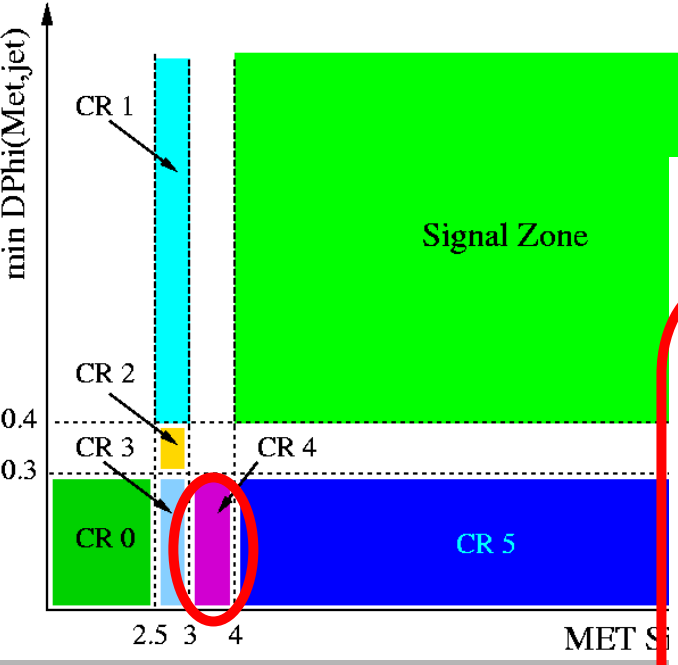
Q: You should extend the control plot up to 8jets, especially as there appears to be a downward trend from 4-7 jets.

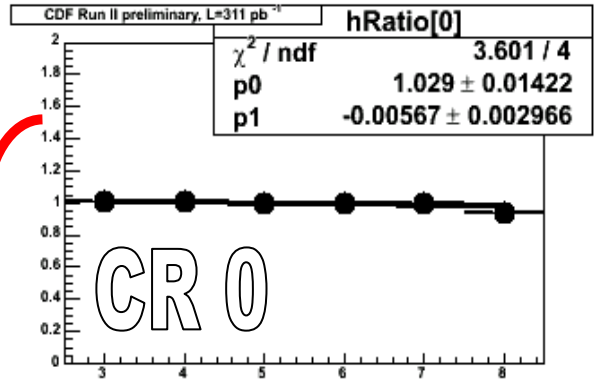
A: We did not look at the 8-jet bin before: the agreement is worst in this bin compared to the others. The control region that appear to create some problems is the one at high MET significance: met sig > 3 and min$\Delta\phi$ < 0.3.

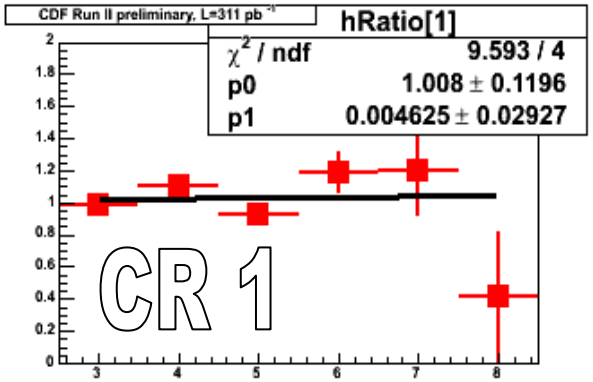
Even if the statistics of the 8-jet bin is very poor: 6 obs vs 12.8 exp, we decided to investigate a bit more on this in order to better understand this behavior.

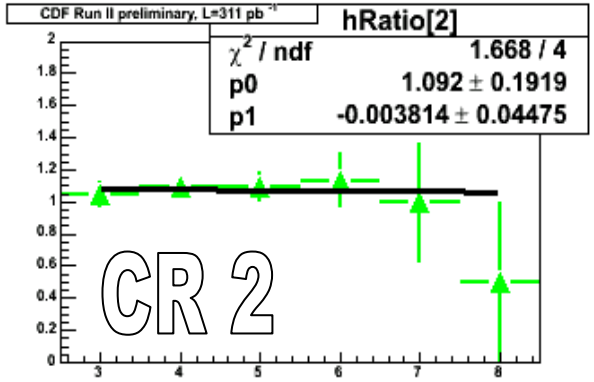


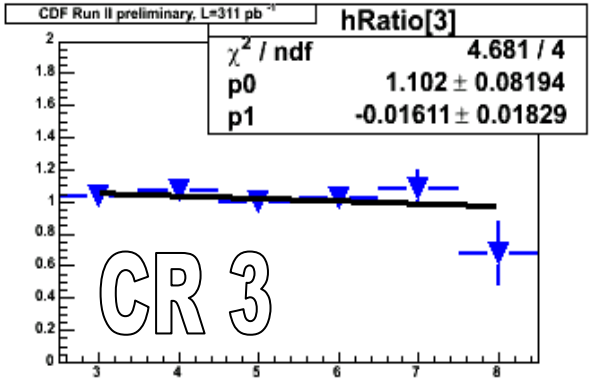
We further checked the matrix prediction in several other exclusive control regions...

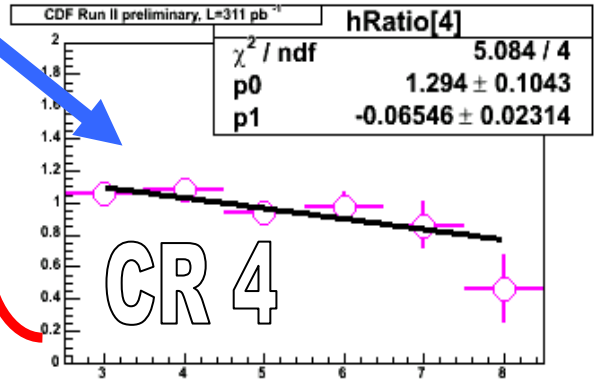


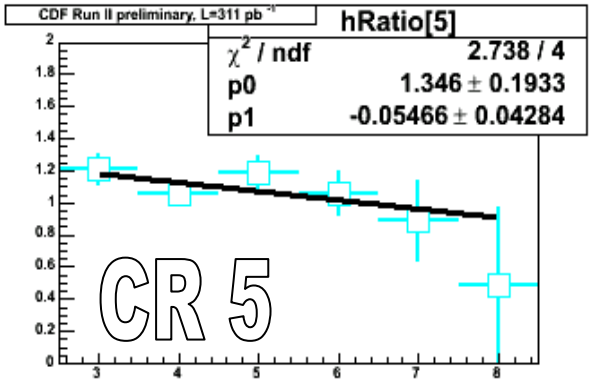










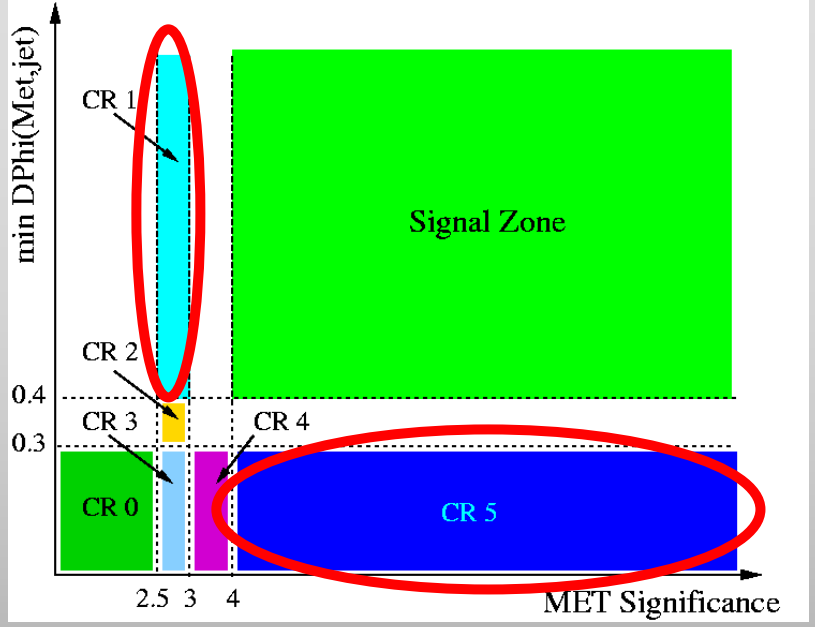


The obs/exp ratio is found to be consistently flat over all CRs *except:*

CR-4 where the slope is not consistent to zero.

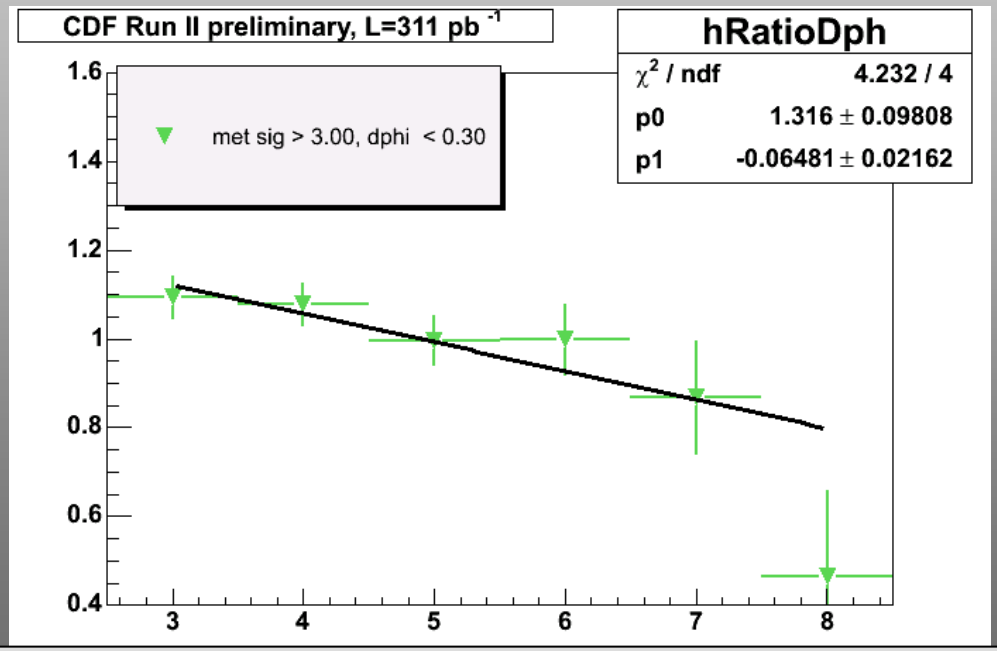
Note that the control region mets>3.0;dphi<0.3 is the sum of CR-4, CR-5.

Moreover, extrapolating from CR-3 to CR-1 slopes do not change.



Data suggests that the trend that was observed was mainly driven by a statistical fluctuation occurred in CR-4.

Furthermore the plots demonstrate that in the regions near the signal zone, in particular in Region-1 and Region-5 the matrix prediction are under control expecially in the bins, 4-,5- and 6-jet, where we expect the signal to come in.



Even if it is clear that no real pathologies are found in the matrix predictions,
we decided to be very conservative and to assign a systematics on the background accounting for the decreasing trend observed in region mets>3.0 and min$\Delta\phi$<0.3.
We took as systematics half of the difference between the fit function at the extreme of 3 and 8 jets.

We increased the syst err. from 10% to 16%.

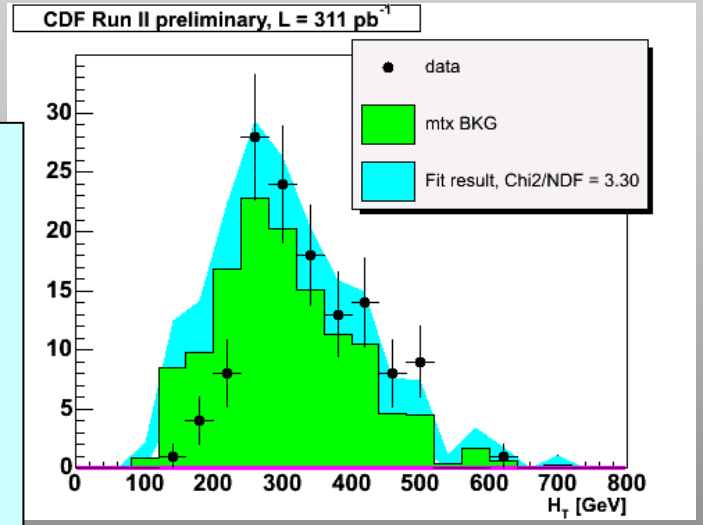
background matrix predictions						
exp + tags	32.68 ± 1.14	37.53 ± 1.76	21.44 ± 1.74	7.27 ± 0.56	0.75 ± 0.08	0.45 ± 0.98

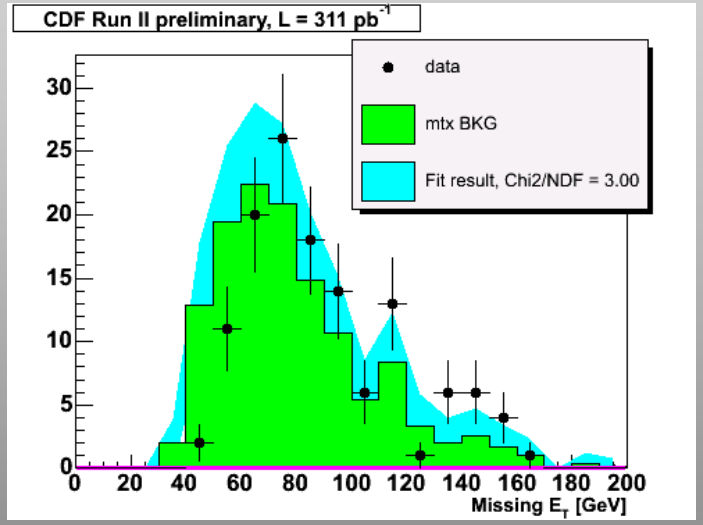
- We used 2-c fits to kinematical distributions to check the ttbar fraction found from tag counting method.

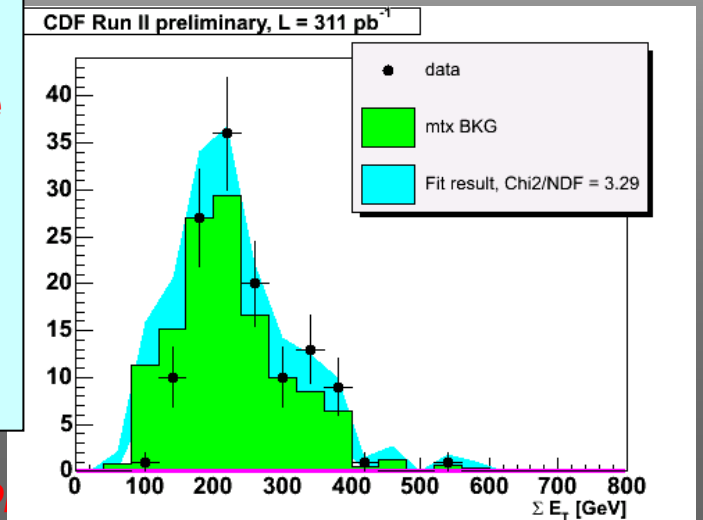
Q: This argument would be a little stronger if you contrasted the fits with fits that include background only. By eye it looks like you can make a convincing case for needing the t-tbar component.

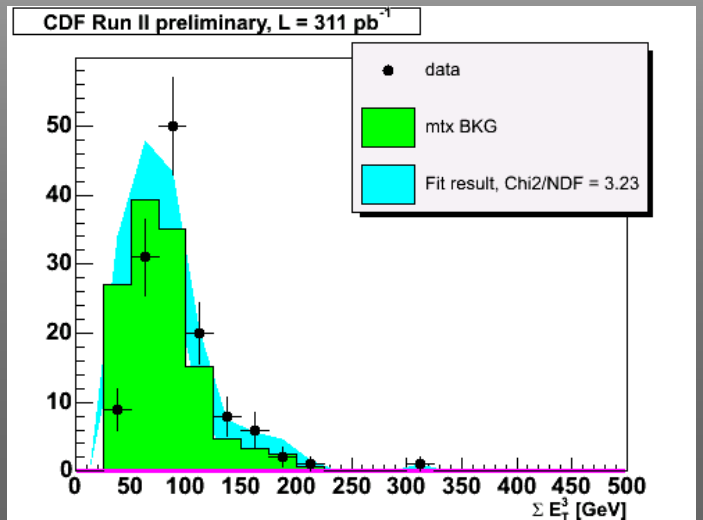
We have performed the fits to data kinematical distributions dropping the ttbar component.

As the χ^2 of the fits indicate there is the need to add the signal component in order to describe the tagged data behavior.



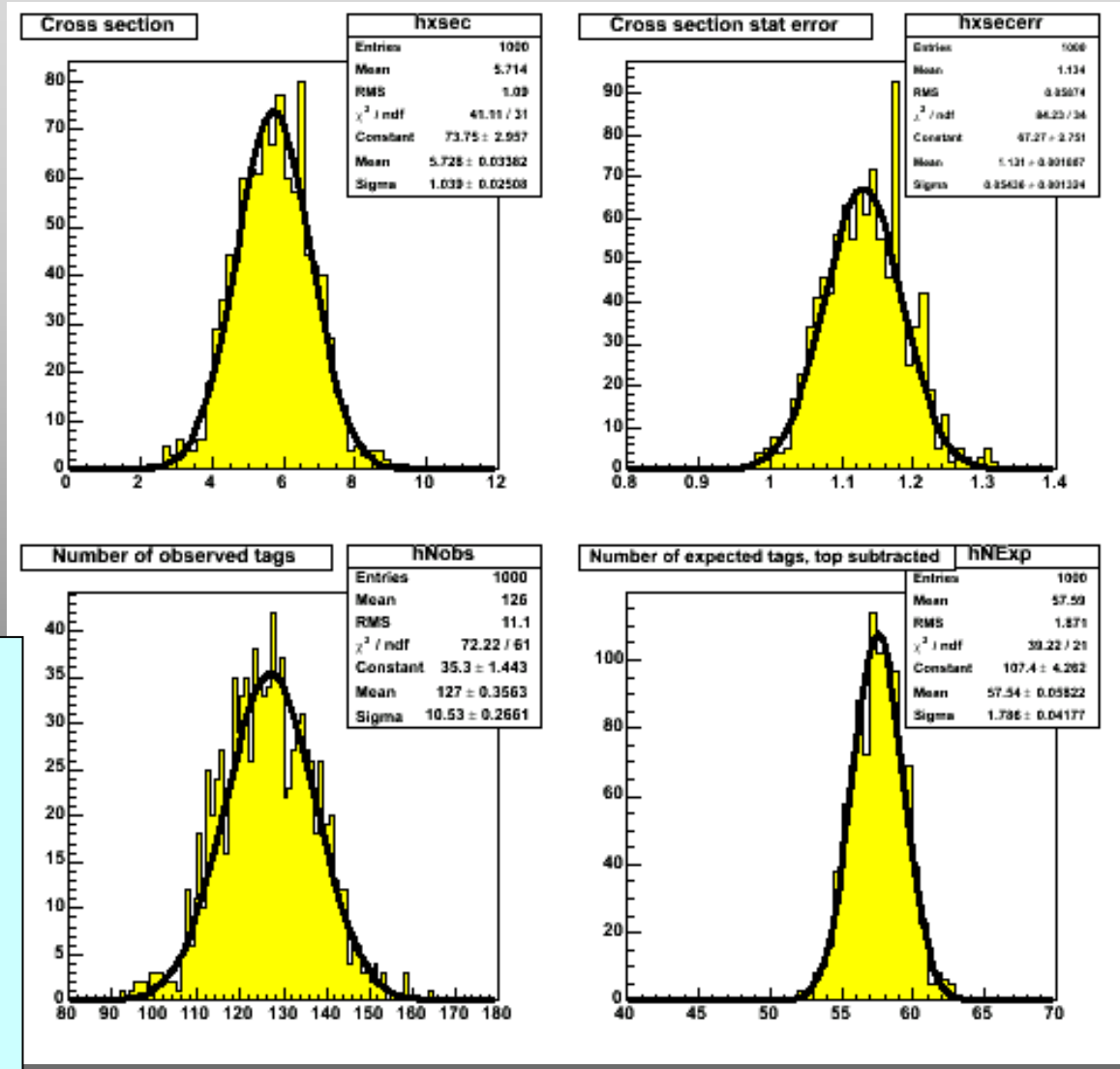






- We use an iterative procedure to correct the matrix predicted background tags for the ttbar presence in the pre-tagging sample.

Q: The little iterative correction has an effect on your statistical uncertainty that I don't think you've included. The point is that the statistical fluctuations on your signal come in twice: Once in S and a second time in B because of the correction.



As suggested, we used PEs in which varied randomly the number of Obs tags together with the other quantities.
The procedure accounts for the statistical part only of the cross section uncertainty.

As a results the stat uncertainty need to be increased from 1.1 pb to 1.2 pb.

- To Bless Material -

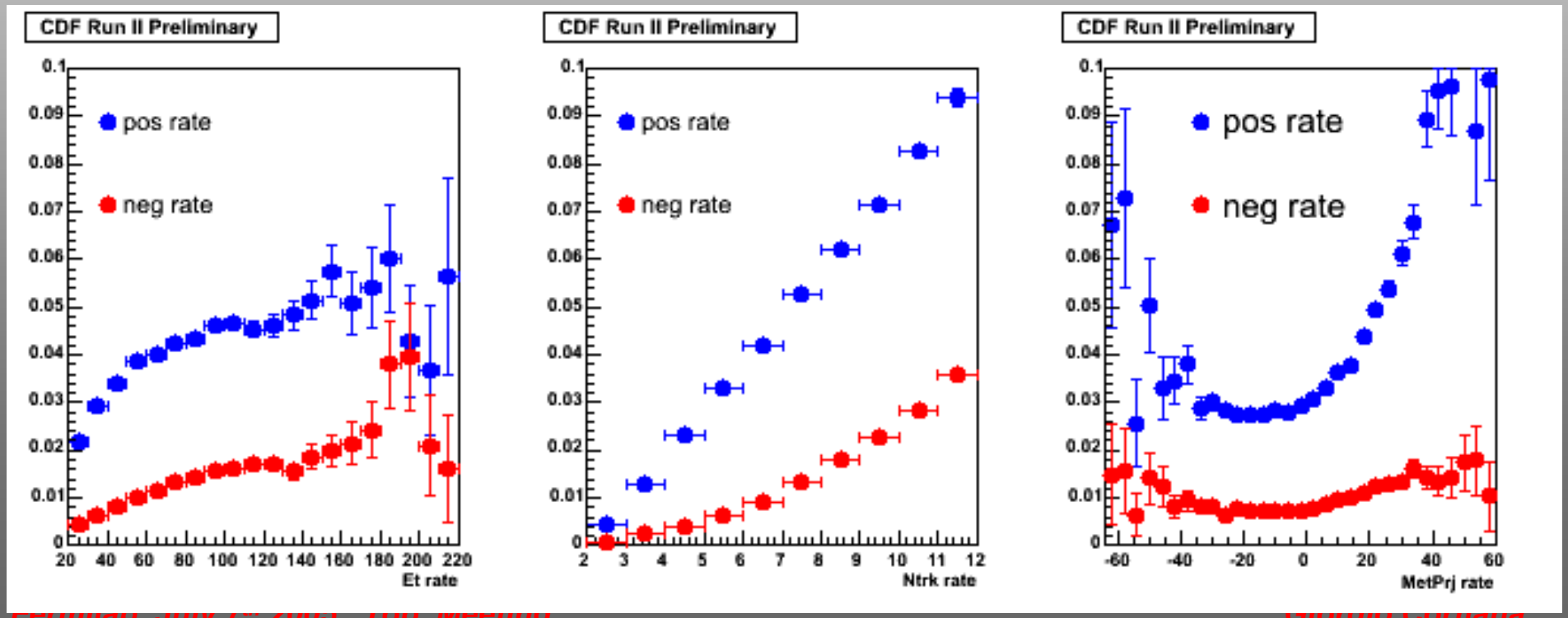
Clean up selection:

- **Tight leptons (e/μ) veto** (no overlap w/ other L+J top analyses)
- **Trigger requirement simulation** (for MC)
- **Vertex requirements**:
  - $|Z_{vert}| < 60$ cm
  - $|Z_{vert}^{jet} - Z_{pvert}| < 5$ cm
  - $N_{vertices}(Q>12) \geq 1$

N evt	$MC_{\tau+jets}$	MC_{incl}	MJ
Good Run	1,021,924	1,021,924	4,249,644
$BR(t\bar{t} \to \tau + jets)$	149,323	–	–
Trigger	82,200	647,365	4,249,644
Nlep = 0	78,084	583,697	4,245,940
$\lvert Z_{vert}\rvert < 60\ cm$	75,035	559,342	4,051,242
$\lvert Z_{pvert} - Z_{jvert}\rvert < 5\ cm$	74,912	558,494	3,897,756
$N_{vert}(Q = 12) \geq 1$	74,904	558,528	3,897,755

Tagging Rates and matrix construction related table/Figs.

Number of events	3 jets	ϵ_{Tag}^{ave}	4 jets	ϵ_{Tag}^{ave}
multijet data	879,187	6.5 %	1,553,525	8.7 %
expected inclusive $t\bar{t}$	16.88	58.2 %	182.92	74.3 %
multijet data, $\not\!\!E_T/\sqrt{\Sigma E_T} \geq 4$	2,317	10.8 %	2,412	16.6 %
expected inclusive $t\bar{t}$, $\not\!\!E_T/\sqrt{\Sigma E_T} \geq 4$	6.54	59.3 %	56.92	77.3 %



The kinematical selection optimization and related table/Figs.

- N jets(E_T^{L5}≥15 GeV; |η|<2.0) ≥ 4
- $\not{E}_T / \sqrt{\sum E_T} \geq 4.00$
- min Δφ(met,jet) ≥ 0.4 rad

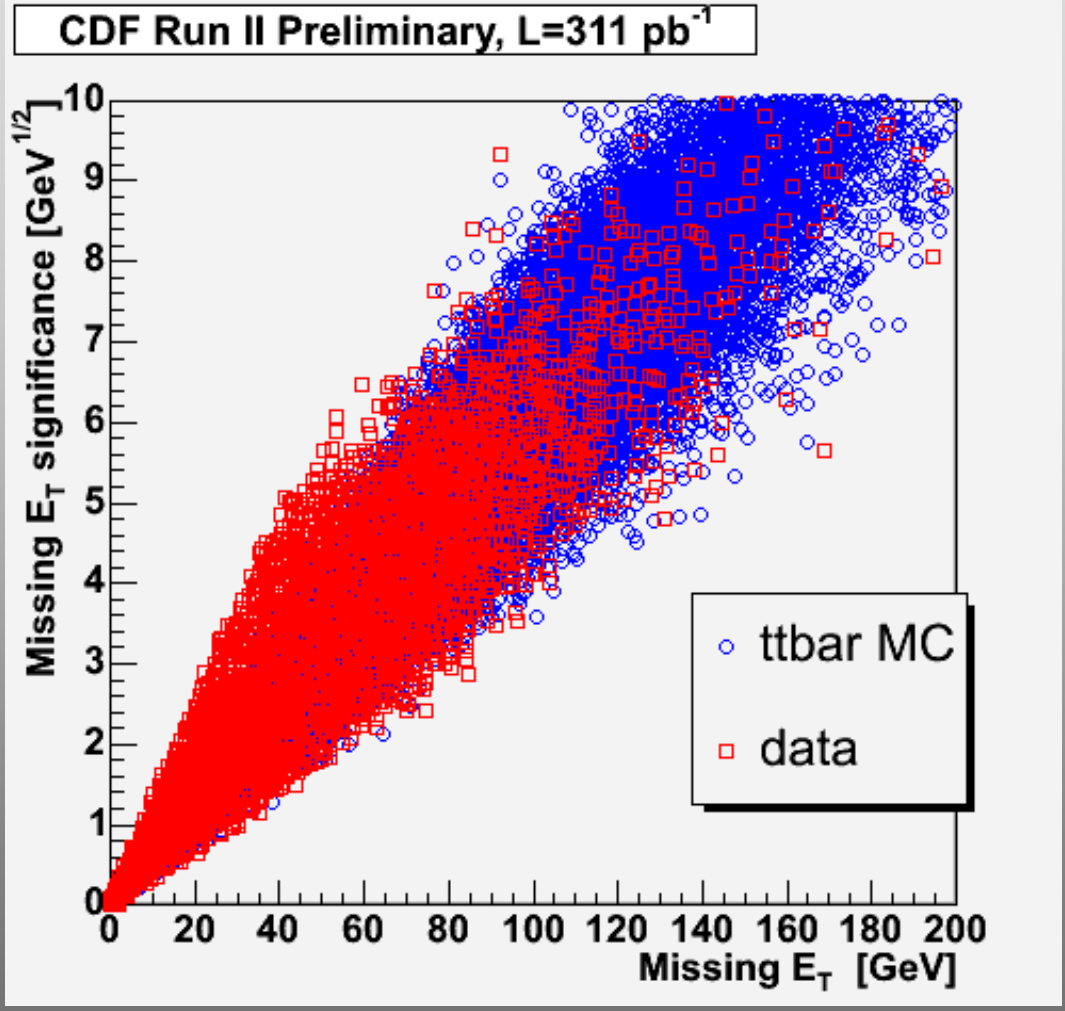
cut set				MC_{inc}^{evt}	MJ^{evt}	MC_{inc}^{tag}	BKG^{tag}	$S/\sqrt{N}$	$\frac{\sigma_{xsec}}{xsec}$
1	4.00	0.00	0.40	93	597	73	67 ± 3	8.91	17.47%
2	4.00	0.00	0.50	82	461	65	46 ± 3	9.55	17.48%
3	4.00	0.01	0.40	90	549	71	63 ± 4	8.93	17.60%
4	4.00	0.01	0.50	80	426	63	43 ± 3	9.60	17.60%
5	4.00	0.02	0.40	85	494	68	58 ± 3	8.91	17.84%
...	...	...	...	...	...	...	...	...	...

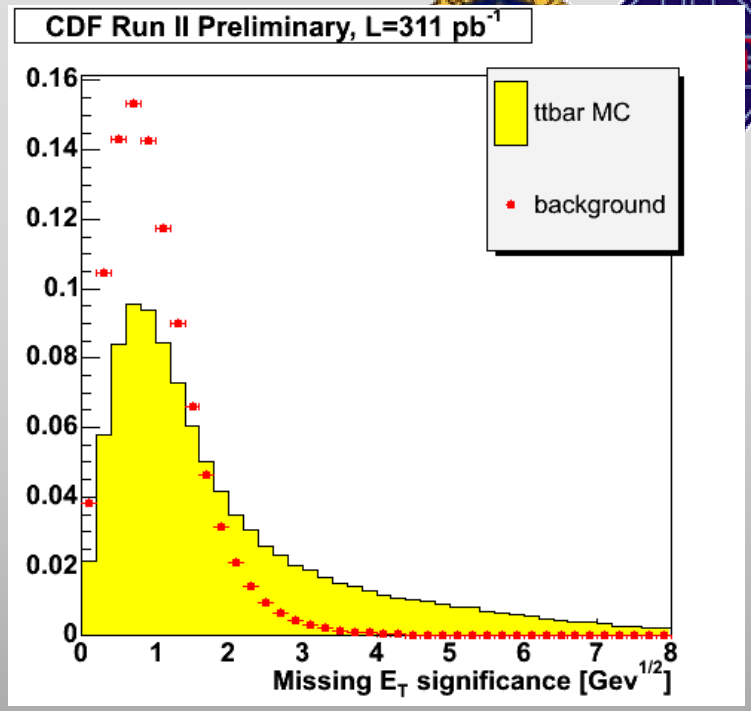
before tagging

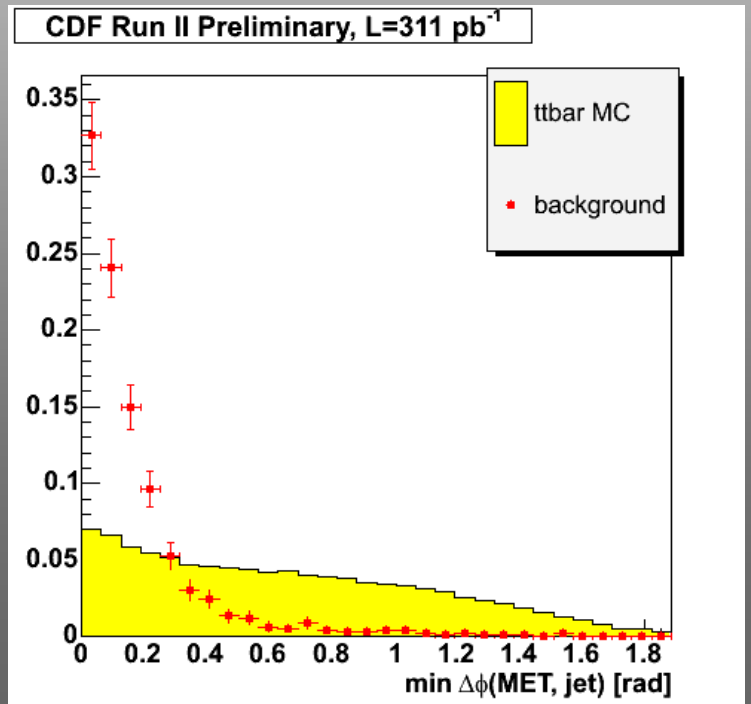
N evt	$MC_{(\tau+jets)}$	$MC_{Incl.}$	MJ
Total	149,323	1,021,924	4,249,644
Prereq	74,904	558,528	3,897,755
$N_{jet} \geq 4$	72,708	549,138	2,781,788
$\not{E}_T/\sqrt{\Sigma E_T} \geq 4$	29,830	78,145	3,996
$\min \Delta\phi(\not{E}_T, jets) \geq 0.4$	19,079	49,848	597
in 311 pb^{-1}:	35.41	92.63	597
S/N $\tau + jets$: $N_{mc}^{\tau}/(N_{obs}^{data} - N_{mc}^{incl})$			= 0.07
S/N Inclusive: $N_{mc}^{incl}/(N_{obs}^{data} - N_{mc}^{incl})$			= 0.18

after tagging

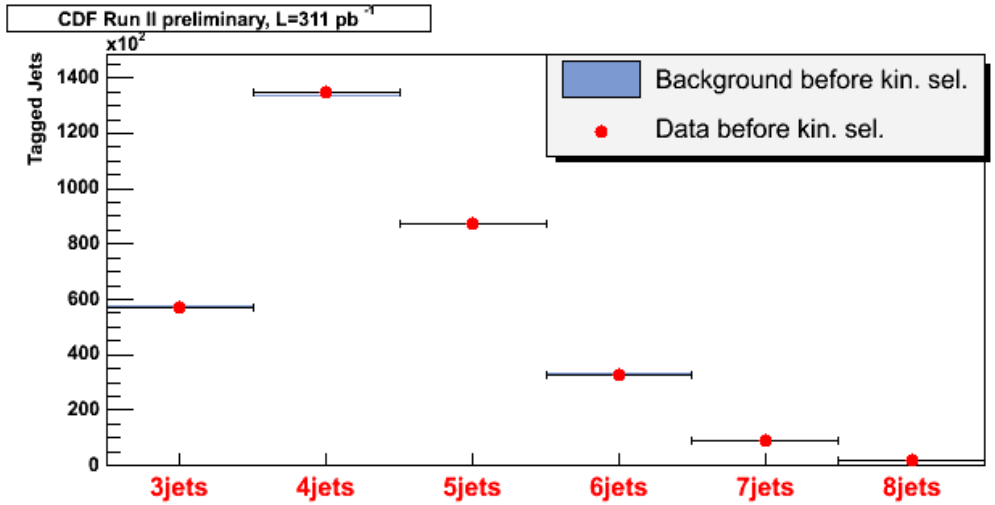
	$MC_{(\tau+jets)}$	$MC_{Incl.}$	MJ
Total	149,323	1,021,924	4,249,644
Prereq	74,904	558,528	3,897,755
$N_{jet} \geq 4$	72,708	549,138	2,781,788
$\not{E}_T/\sqrt{\Sigma E_T} \geq 4$	29,830	78,145	3,996
$\min \Delta\phi(\not{E}_T, jets) \geq 0.4$	19,079	49,848	597
≥ 1 tag	11,666	30,410	106
in 311 pb^{-1}:	21.7	56.5	106
S/N $\tau + jets$: $N_{mc}^{\tau}/(N_{obs}^{data} - N_{mc}^{incl})$			0.44
S/N Inclusive: $N_{mc}^{incl}/(N_{obs}^{data} - N_{mc}^{incl})$			1.14

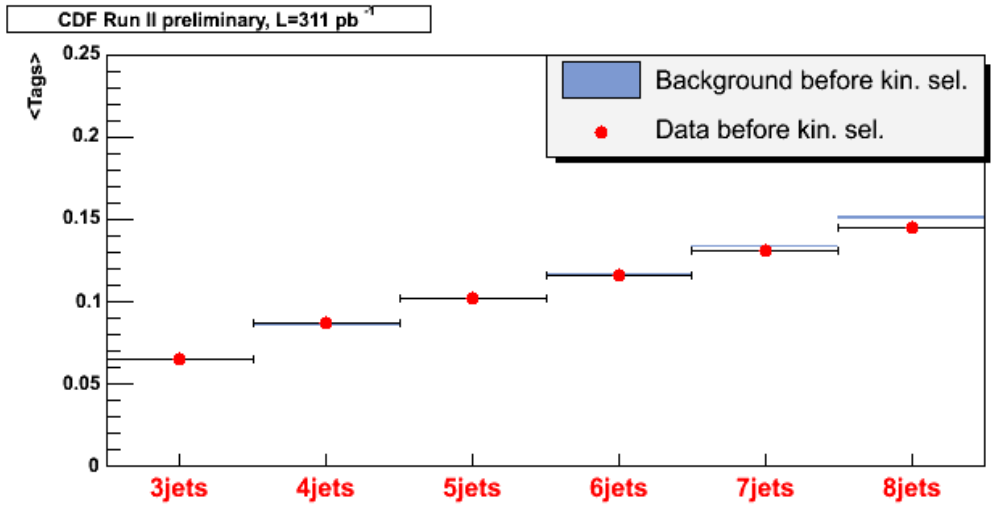

CDF Run II Preliminary, L=311 pb^{-1}
Missing E_T significance [GeV$^{1/2}$]
Missing E_T [GeV]
ttbar MC
data


CDF Run II Preliminary, L=311 pb^{-1}
ttbar MC
background
Missing E_T significance [Gev$^{1/2}$]


CDF Run II Preliminary, L=311 pb^{-1}
ttbar MC
background
min $\Delta\phi$(MET, jet) [rad]

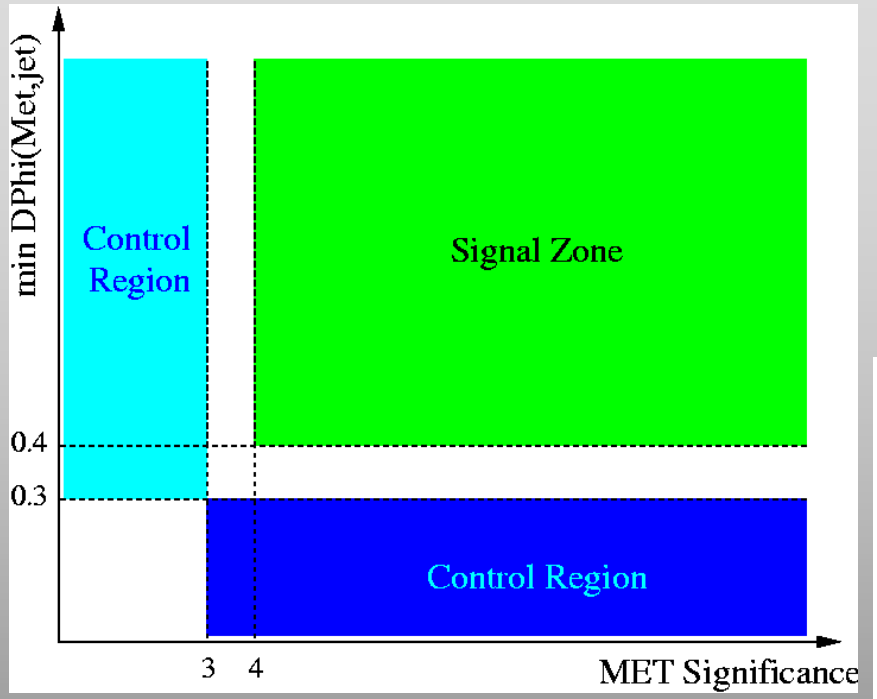
Tagging matrix control checks - 1

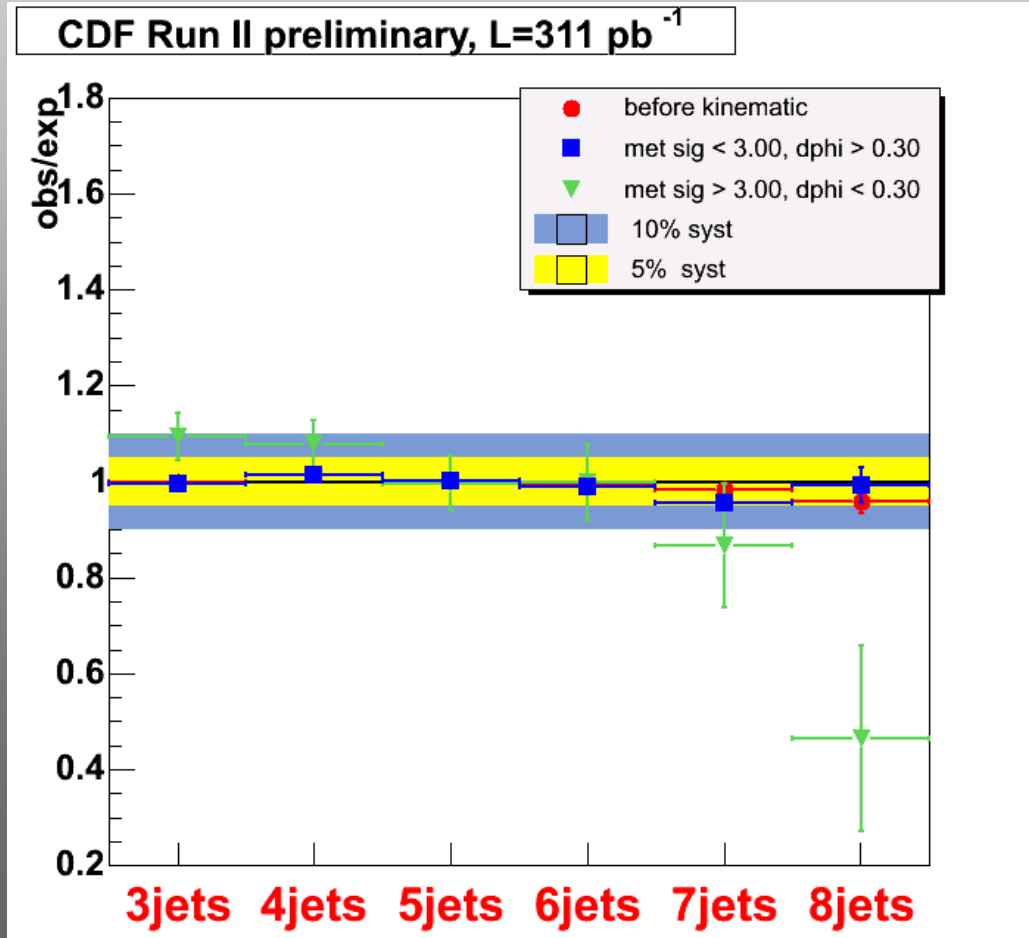




N jet	3	4	5	6	7	8
Nevts	879,187	1,553,525	859,543	284,062	68,628	13,237
N tgbl jets	1,781,645	4,197,888	2,877,148	1,134,089	318,410	69,966
Obs + tags	57,314	135,056	87,332	32,914	8,992	1,914
Exp + tags	$57,314 \pm 233$	$133,275 \pm 546$	$87,156 \pm 370$	$33,184 \pm 149$	$9,147 \pm 43$	$2,000 \pm 10$
					Total observed + tags:	323,522
					Total expected + tags:	$322,076 \pm 717$

Tagging matrix control checks - 2

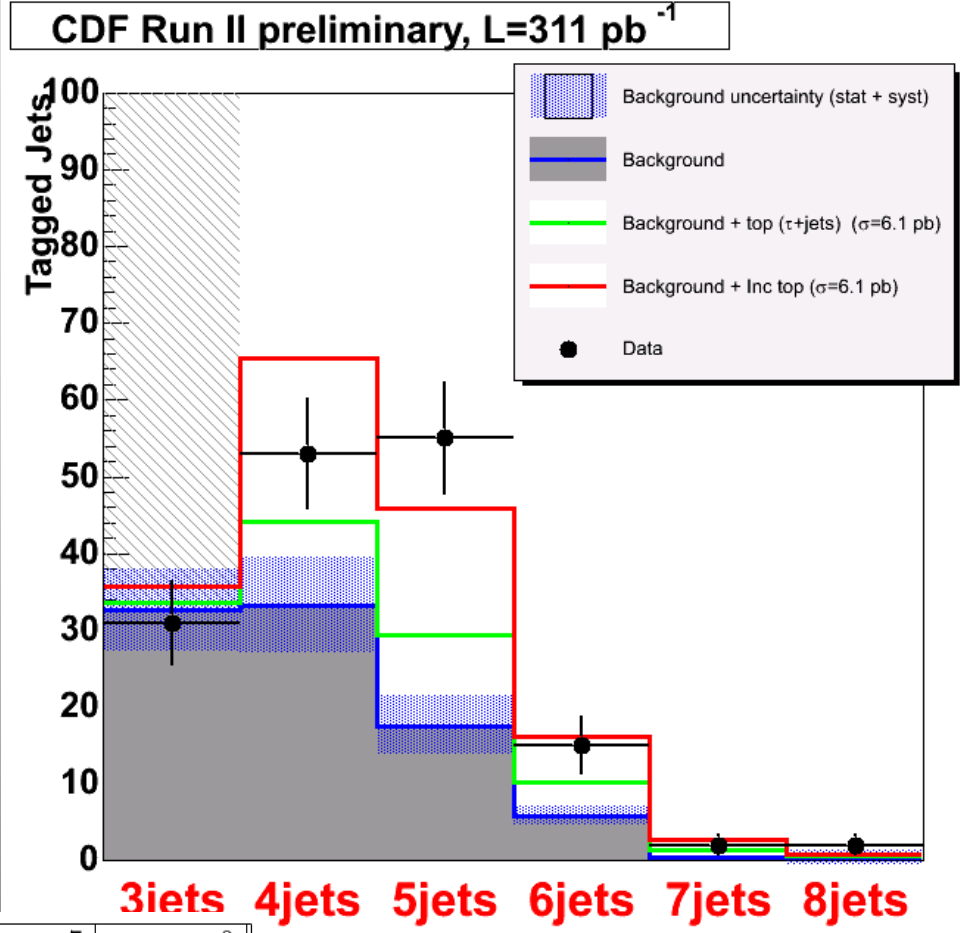




Number of tags distribution in the signal region

assume 6.1 pb

xs for MC

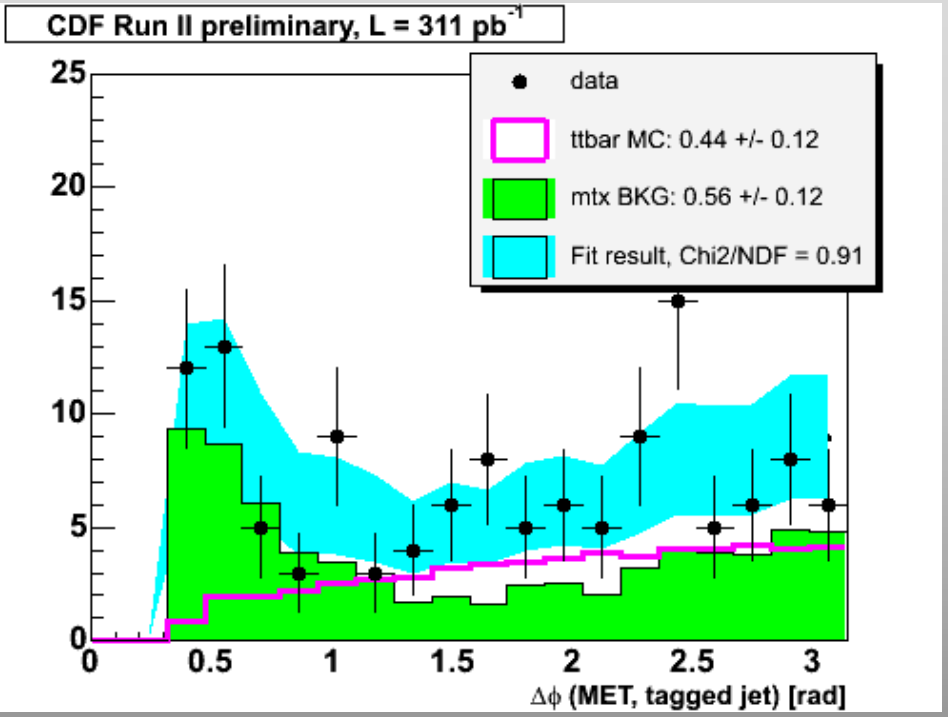


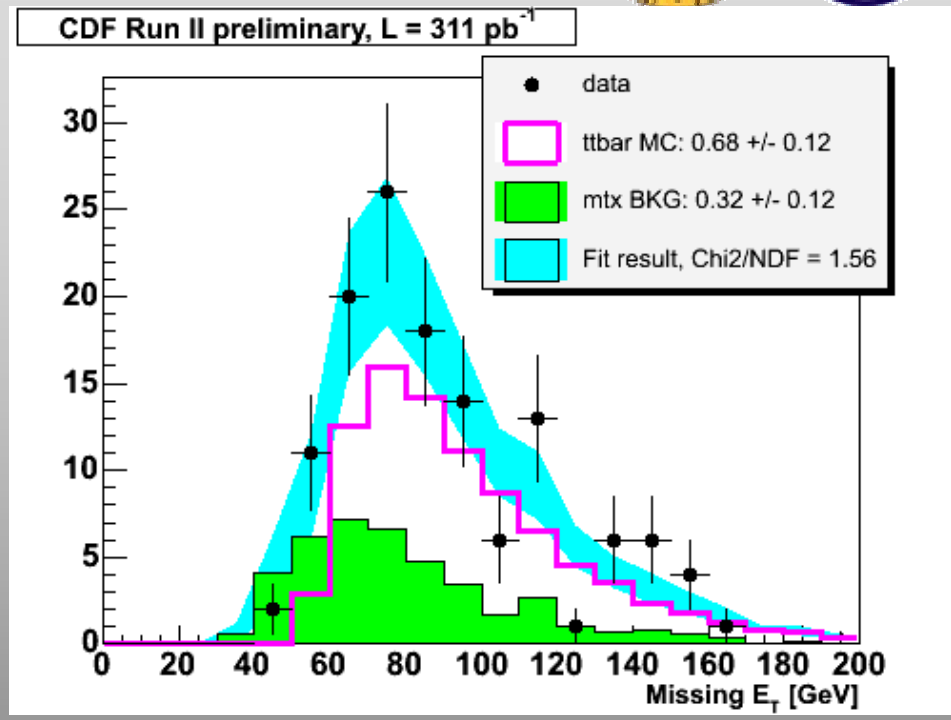
N jets	3	4	5	6	7	8
Monte Carlo contributions						
ee	0.08	0.41	0.18	0.03	0.01	–
$e\mu$	0.06	0.29	0.11	0.04	0.01	–
$\mu\mu$	0.01	0.05	0.01	0.01	–	–
$e\tau$	0.11	0.93	0.38	0.12	0.03	–
$\mu\tau$	0.05	0.29	0.15	0.05	0.01	–
$\tau\tau$	0.06	0.58	0.26	0.04	0.01	–
$e + jets$	0.68	6.61	8.70	3.34	0.70	0.21
$\mu + jets$	1.07	11.92	6.56	2.03	0.38	0.06
$\tau + jets$	1.00	10.98	11.71	4.37	0.98	0.18
$all - had$	0.01	0.09	0.14	0.15	0.04	0.03
$inclusive$	3.12	32.14	28.13	10.17	2.22	0.46

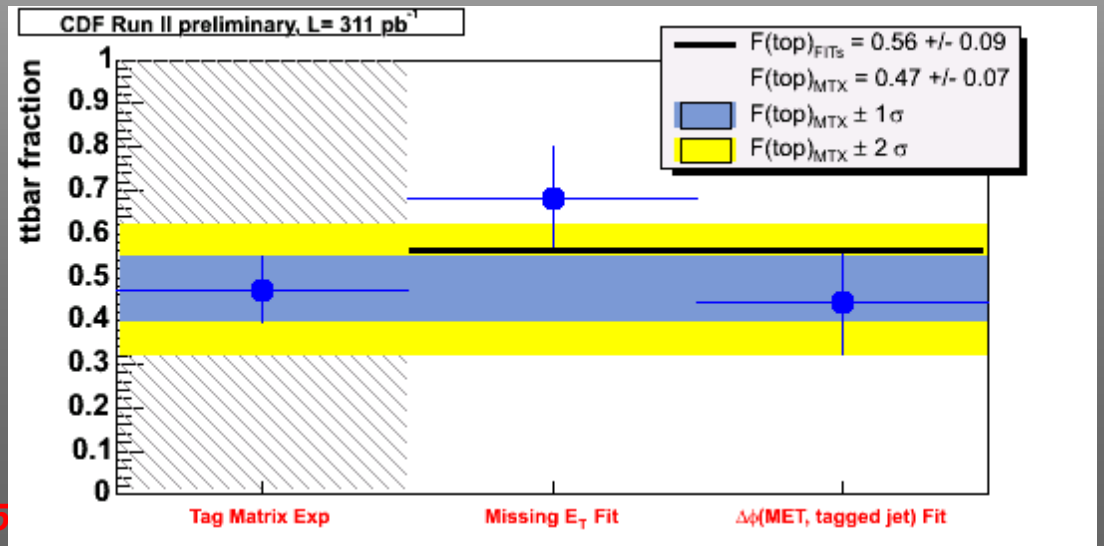
Monte Carlo Tags contribution per each jet multiplicity

Giorgio Cortiana

2-c Fits to kinematical distributions of tagged data







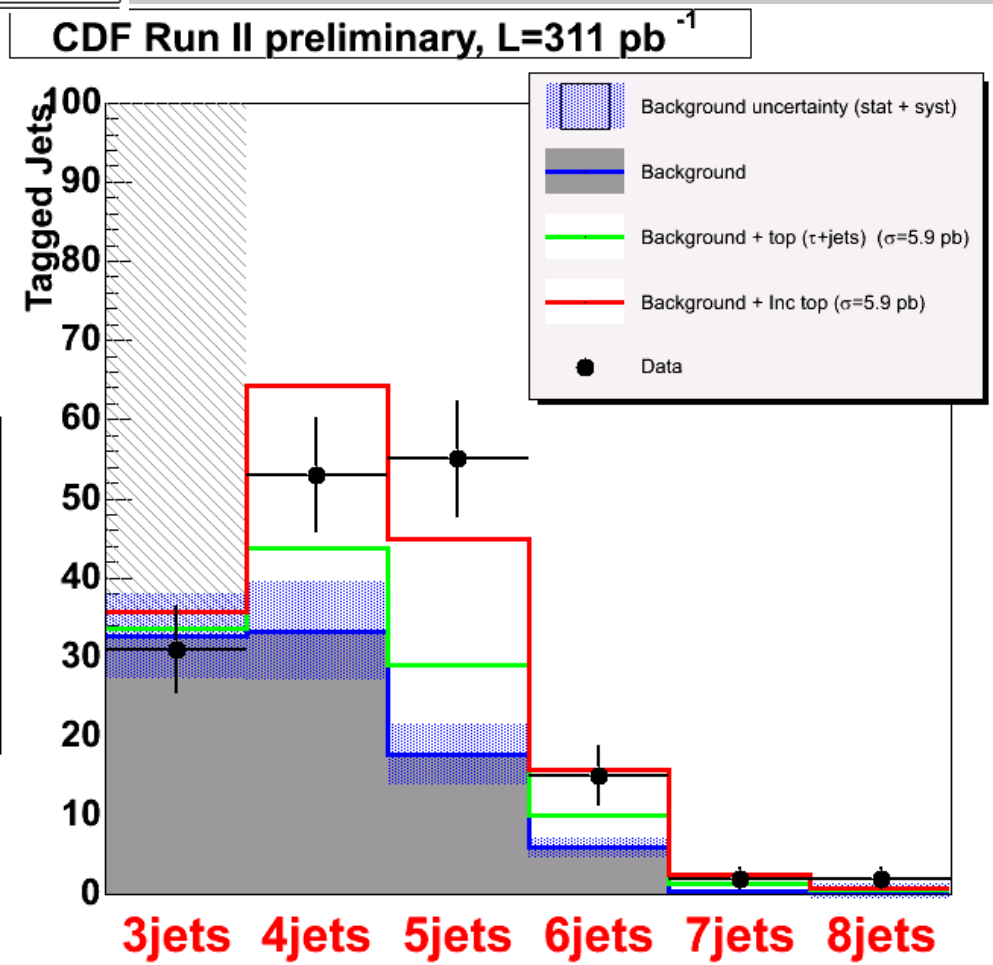
Systematics summary table

Systematics uncertainty sources		
Source	Method	Uncertainty
ϵ_{kin} systematics		
Trigger simulation	turn-on curves	14.8 %
Generator dependence	$\frac{\lvert\epsilon_{PYTHIA}-\epsilon_{HERWIG}\rvert}{\epsilon_{PYTHIA}}$	8.2 %
PDFs	MC reweighting	1.6 %
ISR/FSR	samples comparison	2.0 %
Jet Corrections	$\frac{\lvert\epsilon_{jetcorr,+1\sigma}-\epsilon_{jetcorr,-1\sigma}\rvert}{2\epsilon_{kin}}$	1.5 %
ϵ_{tag} systematics		
SecVtX scale factor	$\frac{\lvert\epsilon_{tag,+1\sigma}-\epsilon_{tag,-1\sigma}\rvert}{2\epsilon_{tag}}$	5.8 %
Tagging matrix systematics		
Data control samples	N_{obs}/N_{exp}	16.0 %
Luminosity systematics		
Luminosity measurement	–	6.0 %

Cross section measurement.

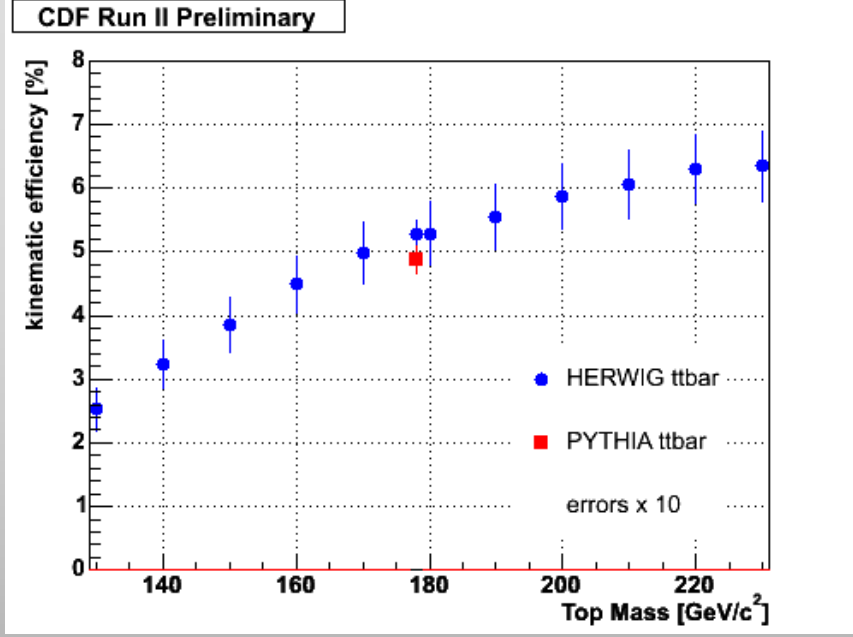
$$\mathcal{L} = e^{-\frac{(L-\bar{L})^2}{2\sigma_L^2}} \cdot e^{-\frac{(\epsilon_{kin}-\bar{\epsilon}_{kin})^2}{2\sigma_{\bar{\epsilon}_{kin}}^2}} \cdot e^{-\frac{(\epsilon_{tag}-\bar{\epsilon}_{tag})^2}{2\sigma_{\bar{\epsilon}_{tag}}^2}} \cdot e^{-\frac{(N'_{exp}-\bar{N}'_{exp})^2}{2\sigma_{N'_{exp}}^2}} \cdot \frac{(\sigma_{t\bar{t}} \cdot \epsilon_{kin} \cdot \epsilon_{tag} \cdot L + N'_{exp})^{N_{obs}}}{N_{obs}!} \cdot e^{-(\sigma_{t\bar{t}} \cdot \epsilon_{kin} \cdot \epsilon_{tag} \cdot L + N'_{exp})}$$

Variable	Simbol	Input Value	Output Value
Integrated Luminosity (pb^{-1})	$\mathcal{L}$	311 ± 18	311 ± 19
Observed Tags	N_{obs}	127	–
Expected Tags	N'_{exp}	57.4 ± 10.9	57.0 ± 10.9
Kin efficiency (%)	ϵ_{kin}	4.878 ± 0.838	4.803 ± 0.855
Ave Tag efficiency (%)	ϵ_{tag}	78.89 ± 4.58	78.76 ± 4.59

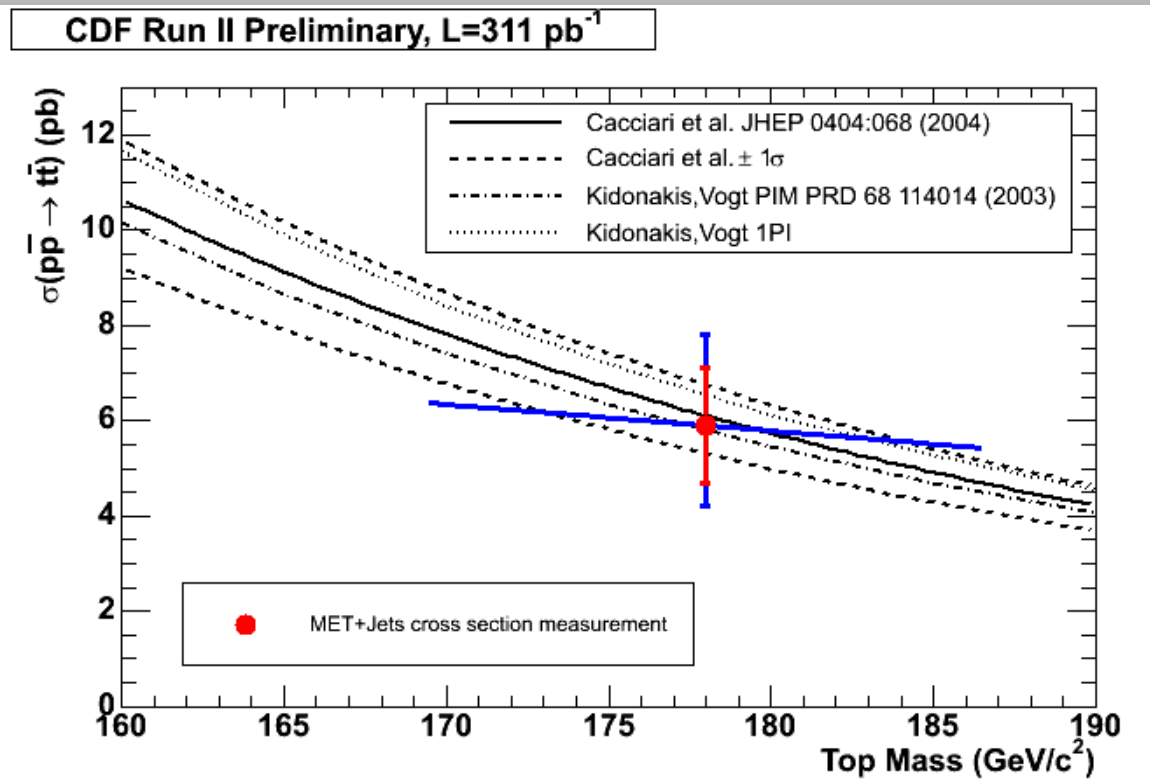


σ_{ttbar} = 5.9 ± 1.2 (stat) $^{+1.5}_{-1.2}$ (syst) pb

= 5.9 $^{+1.9}_{-1.7}$ pb.

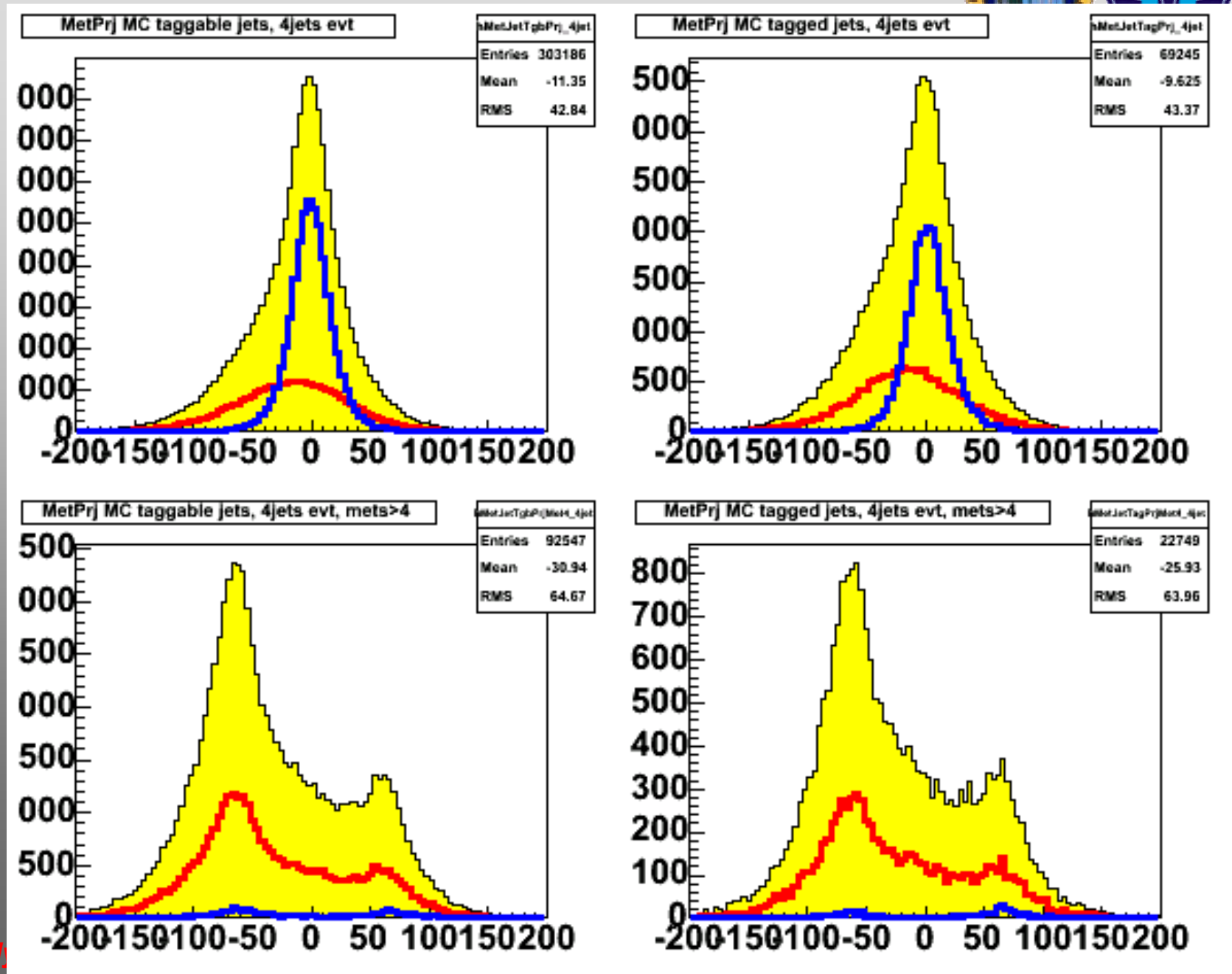


Cross section measurement vs Top mass.



- Backup Material -

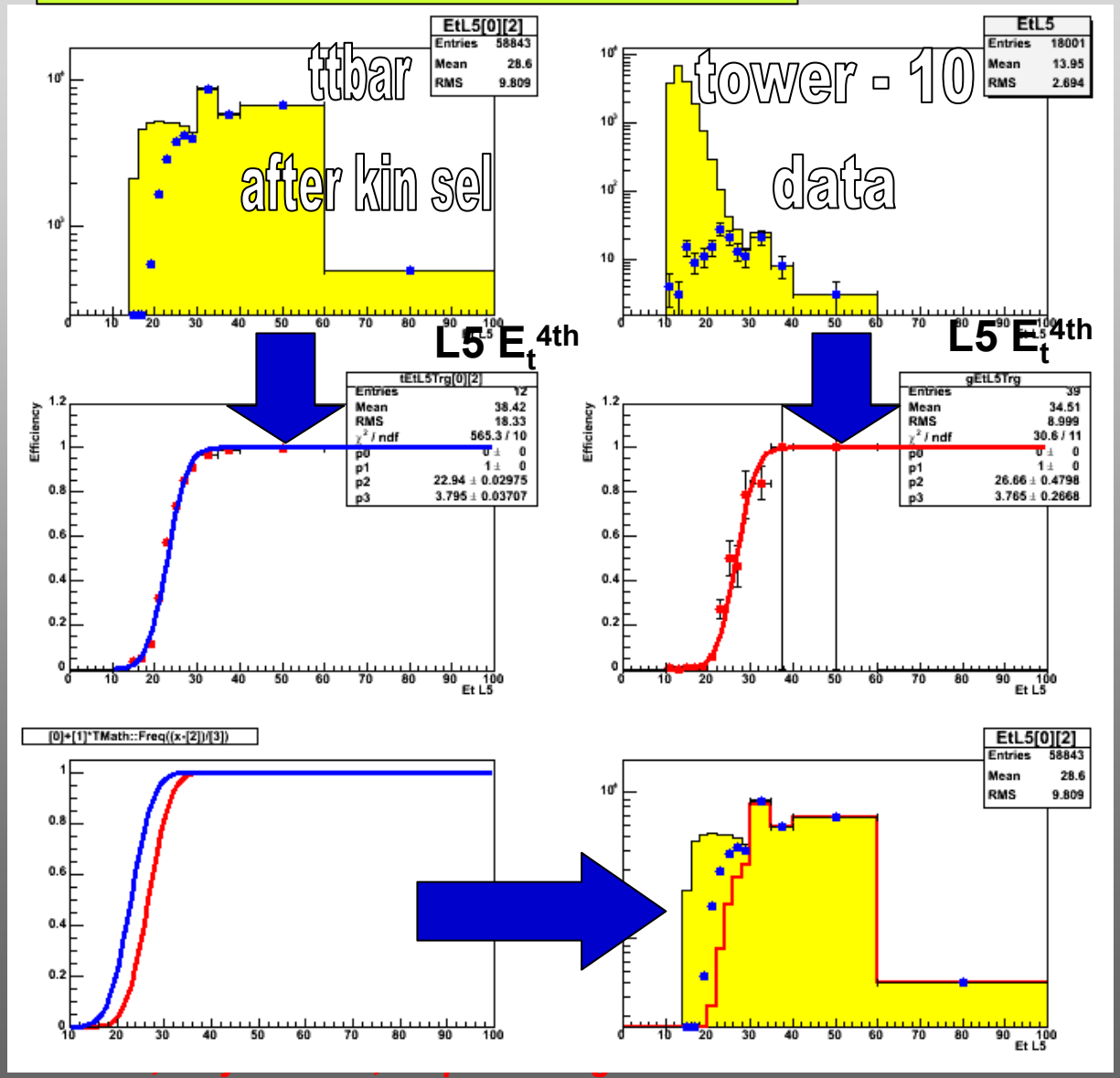
More details on Met projection distribution in ttbar events.



Trigger Systematic effect:

CDF-7473

Trigger efficiency on signal events is determined using TRIGSIM++.

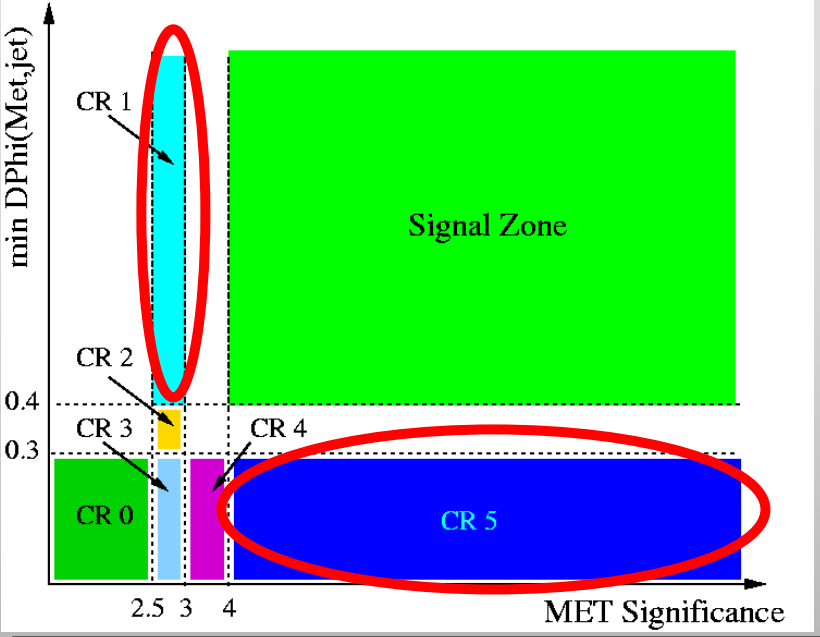


Need to evaluate related systematic:

comparing trigger turn-on curve (as a function of some offline variable) as returned by the simulation and as measured from Tower 10 data (same L1 as TOP_MULTI_JET).

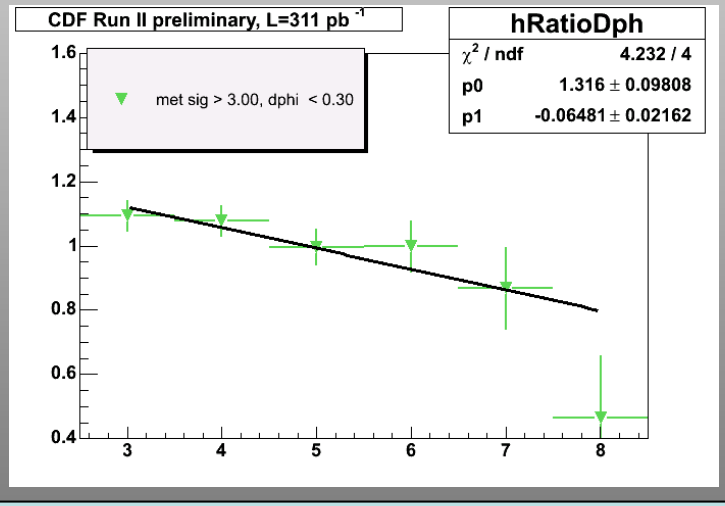
The mismatch between turn-on curve allows to quantify the systematic effect at 14.8%

Note: the 4th offline L5 jet is matched with the 4th L2 cluster within R=0.4 in order to preserve energy hierarchy.



Data suggests that the trend that was observed was mainly driven by a statistical fluctuation in CR-4.

Furthermore the plots demonstrate that in the regions near the signal zone, in particular in Region-1 and Region-5 the matrix prediction are under control expecially in the bins, 4-,5- and 6-jet, where we expect the signal to come in.



Initially we quoted 10% systs looking at the behavior in control sample between 3 and 7 jets.
Even including the 8-jet point folding the number of observed tags in the signal region with the observed trend in the region mets>3.0 and min$\Delta\phi$<0.3 we get a systs of 3.8%.
10% is still well conservative.

$$\frac{\int N_{\exp} dN_{jet} - \int N_{\exp} f(N_{jet}) dN_{jet}}{\int N_{\exp} dN_{jet}} = 3.8\%$$

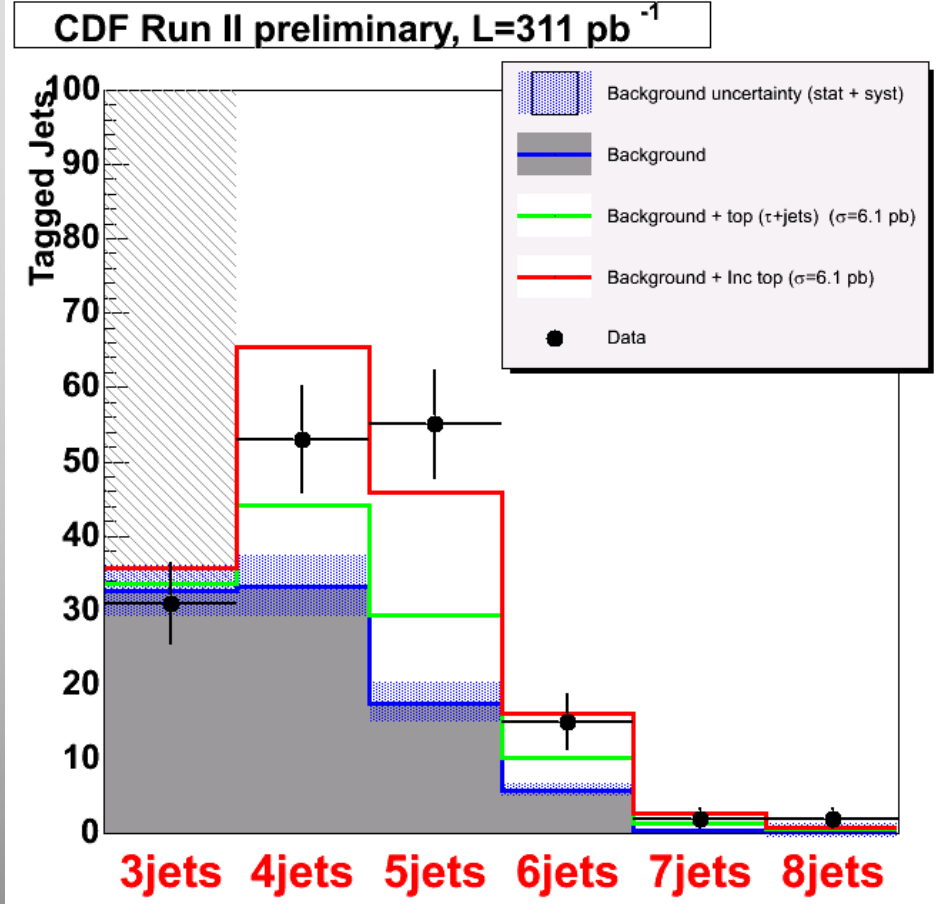
background matrix predictions						
$exp + tags$	32.68 ± 1.14	37.53 ± 1.76	21.44 ± 1.74	7.27 ± 0.56	0.75 ± 0.08	0.45 ± 0.98

Systematics summary table

Systematics uncertainty sources		
Source	Method	Uncertainty
ϵ_{kin} systematics		
Trigger simulation	turn-on curves	14.8 %
Generator dependence	$\frac{\lvert\epsilon_{PYTHIA}-\epsilon_{HERWIG}\rvert}{\epsilon_{PYTHIA}}$	8.2 %
PDFs	MC reweighting	1.6 %
ISR/FSR	samples comparison	2.0 %
Jet Corrections	$\frac{\lvert\epsilon_{jetcorr,+1\sigma}-\epsilon_{jetcorr,-1\sigma}\rvert}{2\epsilon_{kin}}$	1.5 %
ϵ_{tag} systematics		
SecVtX scale factor	$\frac{\lvert\epsilon_{tag,+1\sigma}-\epsilon_{tag,-1\sigma}\rvert}{2\epsilon_{tag}}$	5.8 %
Tagging matrix systematics		
Data control samples	N_{obs}/N_{exp}	10.0 %
Luminosity systematics		
Luminosity measurement	–	6.0 %

Number of tags distribution in the signal region

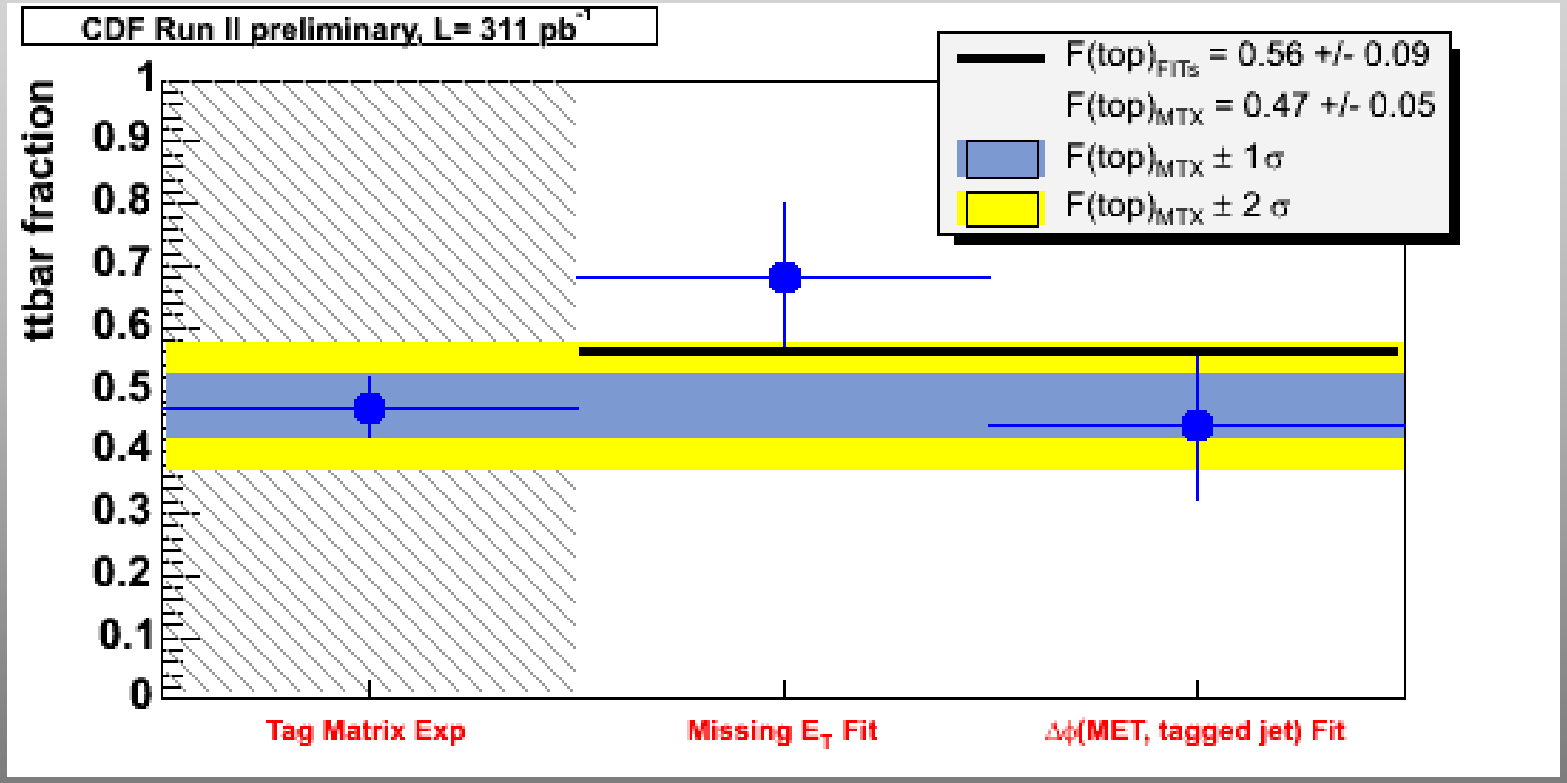
assume 6.1 pb xs for MC



N jets	3	4	5	6	7	8
Monte Carlo contributions						
ee	0.08	0.41	0.18	0.03	0.01	–
$e\mu$	0.06	0.29	0.11	0.04	0.01	–
$\mu\mu$	0.01	0.05	0.01	0.01	–	–
$e\tau$	0.11	0.93	0.38	0.12	0.03	–
$\mu\tau$	0.05	0.29	0.15	0.05	0.01	–
$\tau\tau$	0.06	0.58	0.26	0.04	0.01	–
$e + jets$	0.68	6.61	8.70	3.34	0.70	0.21
$\mu + jets$	1.07	11.92	6.56	2.03	0.38	0.06
$\tau + jets$	1.00	10.98	11.71	4.37	0.98	0.18
$all - had$	0.01	0.09	0.14	0.15	0.04	0.03
$inclusive$	3.12	32.14	28.13	10.17	2.22	0.46

Monte Carlo Tags contribution per each jet multiplicity

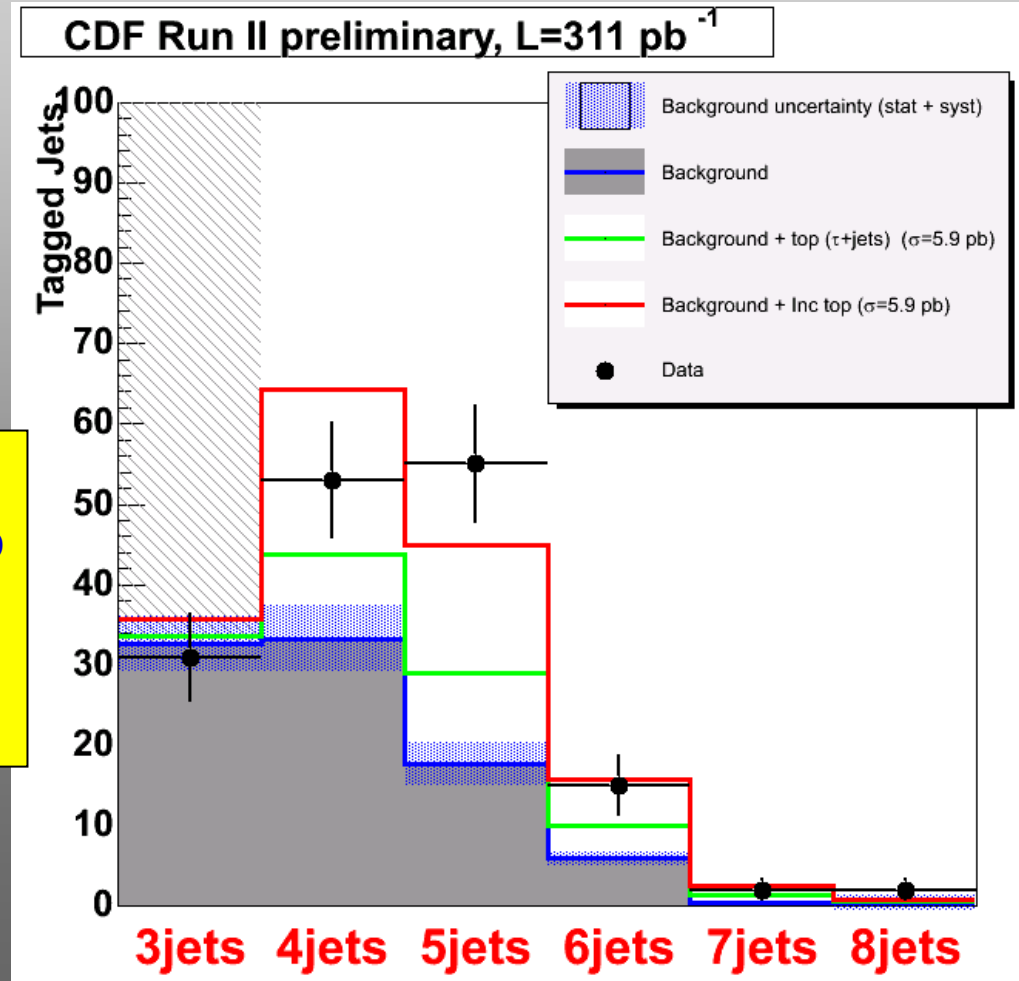
Giorgio Cortiana


CDF Run II preliminary, L= 311 pb^{-1}
ttbar fraction
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
$F(top)_{FITs}$ = 0.56 +/- 0.09
$F(top)_{MTX}$ = 0.47 +/- 0.05
$F(top)_{MTX} \pm 1\sigma$
$F(top)_{MTX} \pm 2\sigma$
Tag Matrix Exp
Missing E_T Fit
$\Delta\phi$(MET, tagged jet) Fit

Cross section measurement.

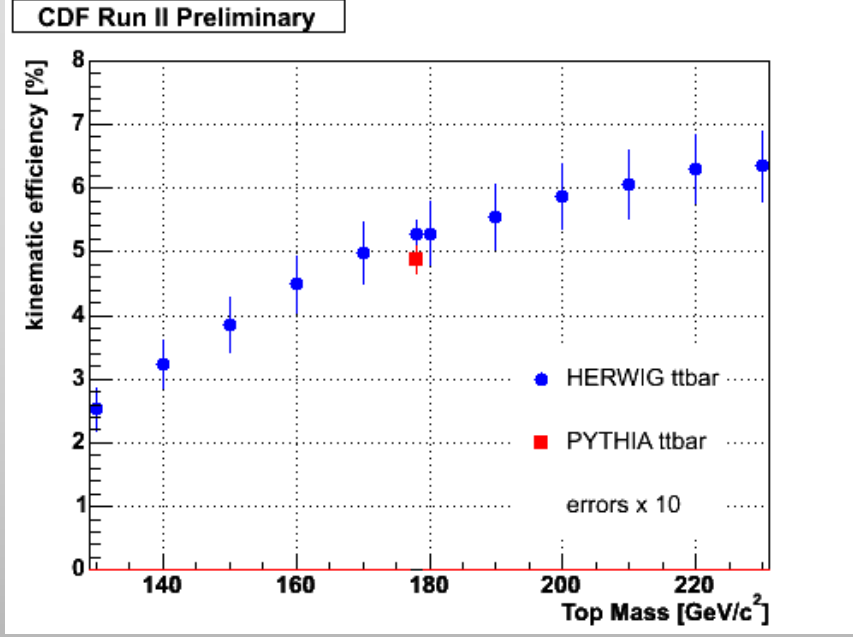
$$\mathcal{L} = e^{-\frac{(L-\bar{L})^2}{2\sigma_L^2}} \cdot e^{-\frac{(\epsilon_{kin}-\bar{\epsilon}_{kin})^2}{2\sigma_{\epsilon_{kin}}^2}} \cdot e^{-\frac{(\epsilon_{tag}-\bar{\epsilon}_{tag})^2}{2\sigma_{\epsilon_{tag}}^2}} \cdot e^{-\frac{(N'_{exp}-\bar{N}'_{exp})^2}{2\sigma_{N'_{exp}}^2}} \cdot \frac{(\sigma_{t\bar{t}} \cdot \epsilon_{kin} \cdot \epsilon_{tag} \cdot L + N'_{exp})^{N_{obs}}}{N_{obs}!} \cdot e^{-(\sigma_{t\bar{t}} \cdot \epsilon_{kin} \cdot \epsilon_{tag} \cdot L + N'_{exp})}$$

Variable	Simbol	Input Value	Output Value
Integrated Luminosity (pb^{-1})	$\mathcal{L}$	311 ± 18	311 ± 19
Observed Tags	N_{obs}	127	–
Expected Tags	N'_{exp}	57.4 ± 8.1	57.0 ± 8.1
Kin efficiency (%)	ϵ_{kin}	4.878 ± 0.838	4.813 ± 0.854
Ave Tag efficiency (%)	ϵ_{tag}	78.89 ± 4.58	78.74 ± 4.59

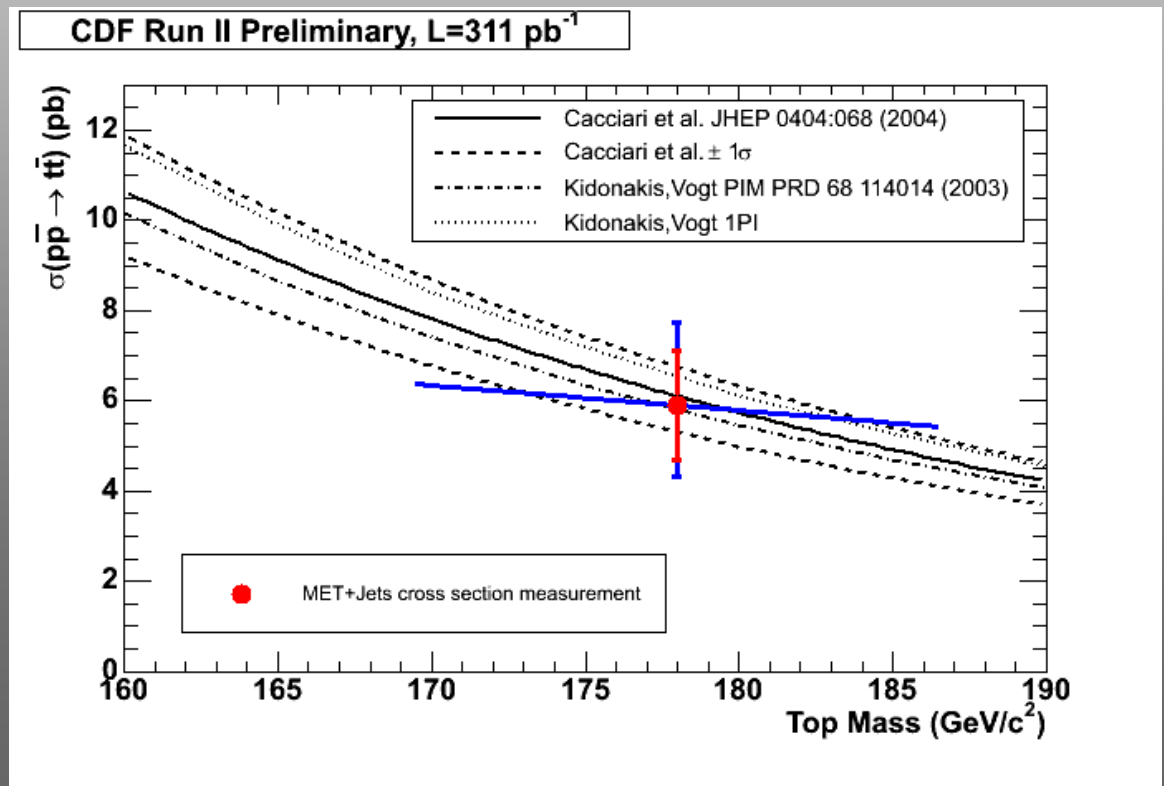


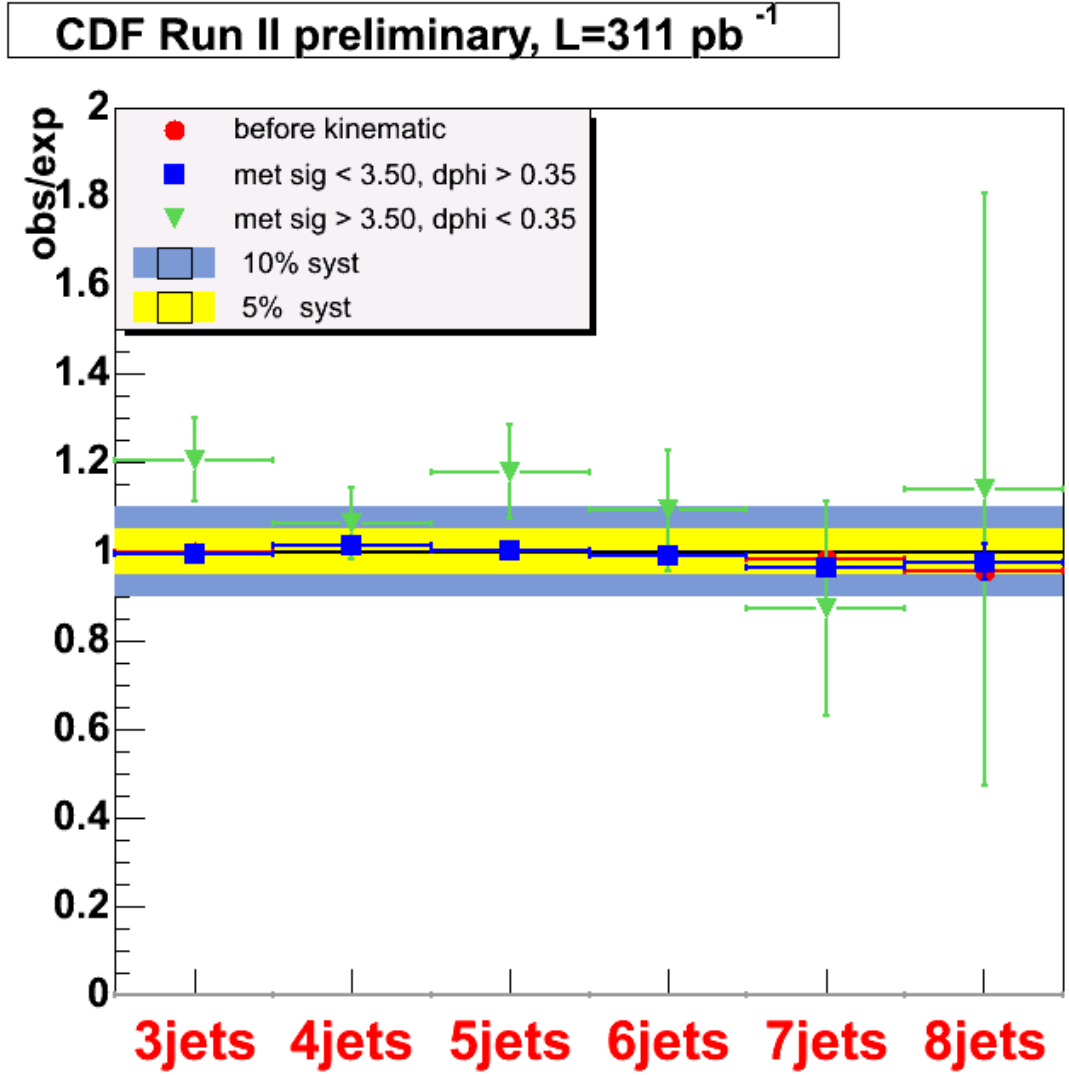
σ_{ttbar} = 5.9 ± 1.2 (stat) $^{+1.4}_{-1.0}$ (syst) pb

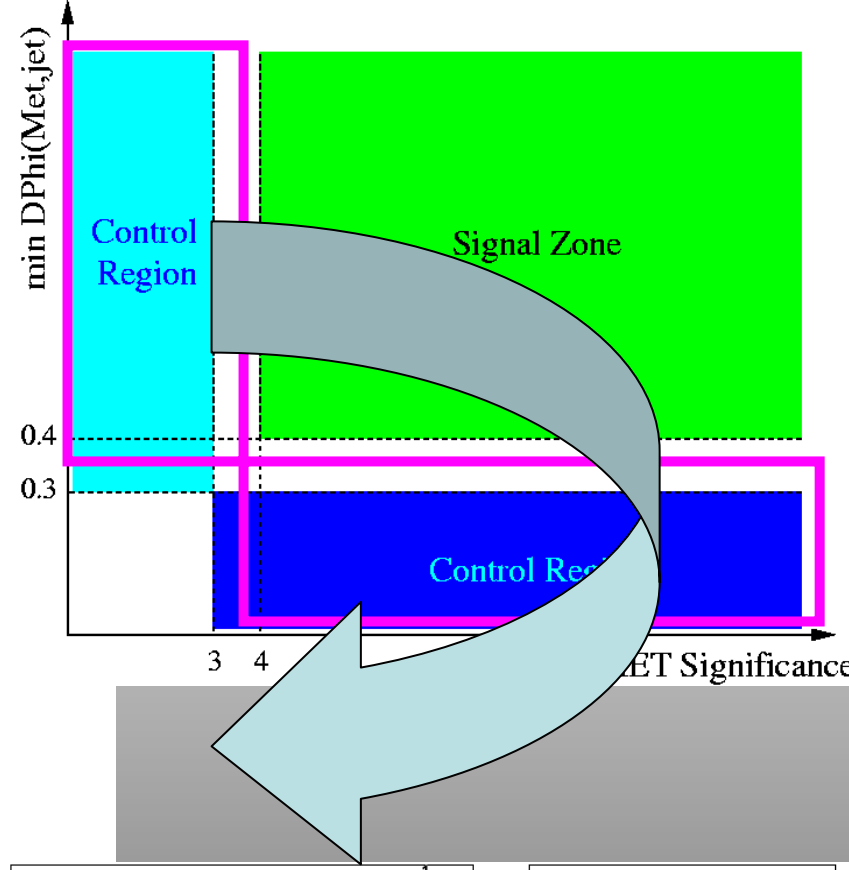
= 5.9 $^{+1.8}_{-1.6}$ pb.

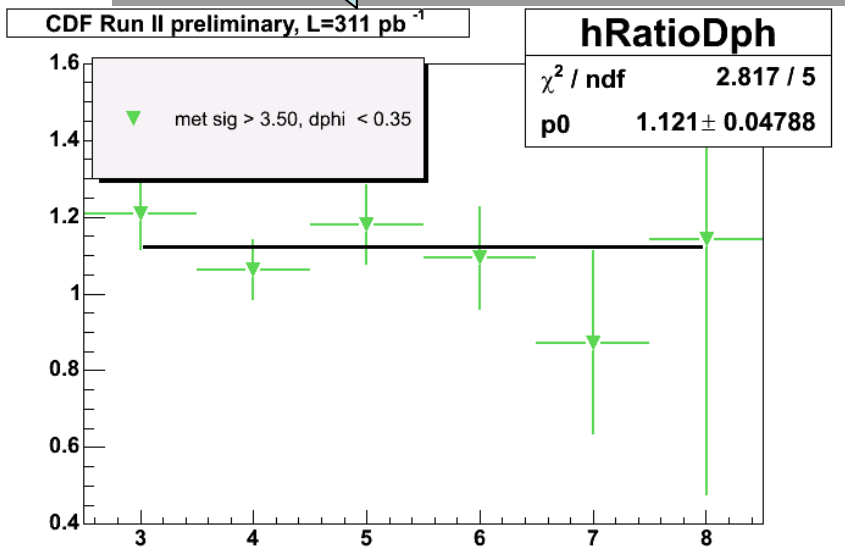


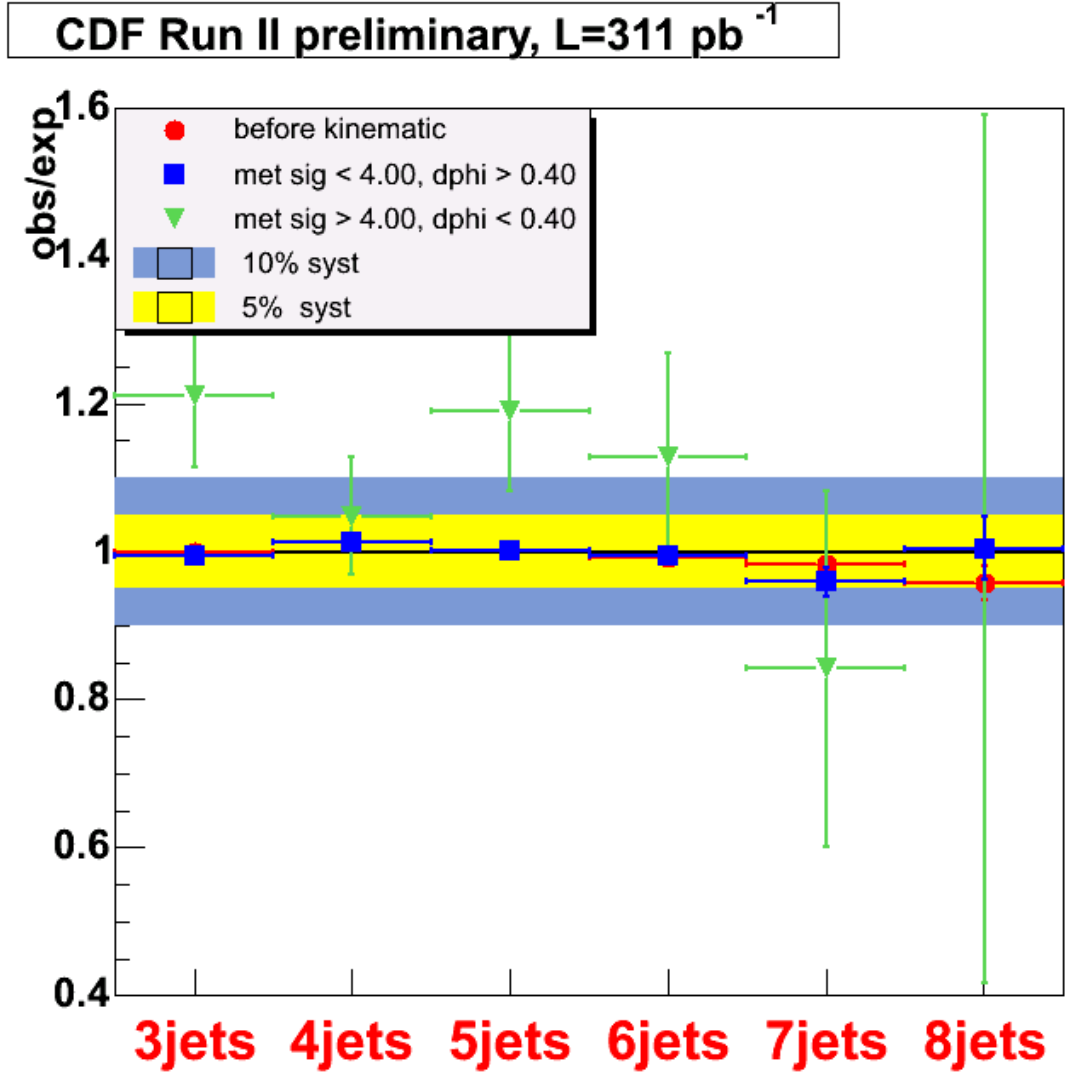
Cross section measurement vs Top mass.

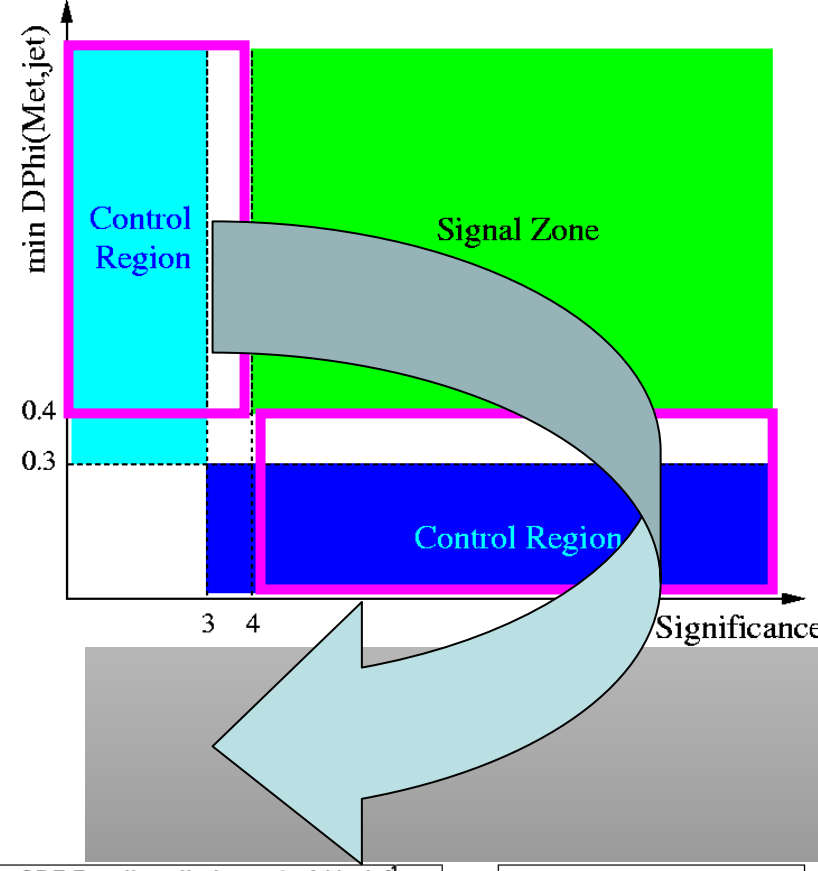


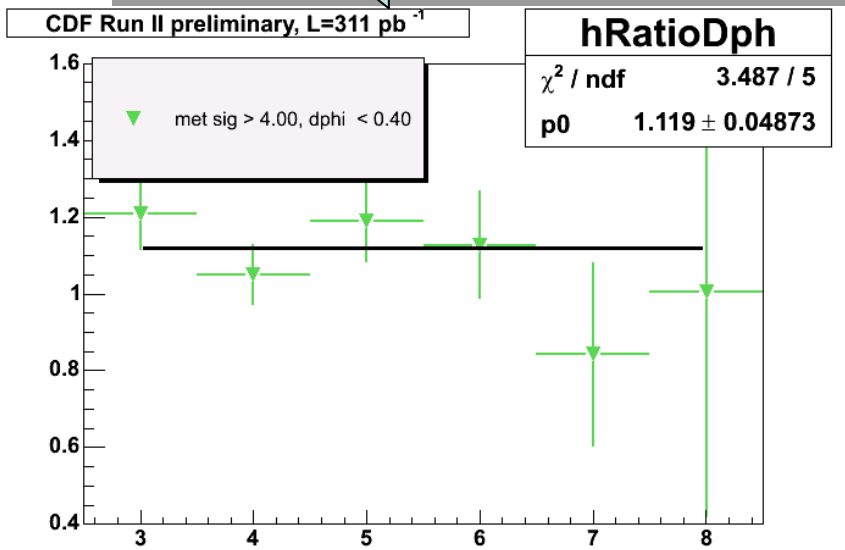

CDF Run II preliminary, L=311 pb -1
obs/exp
before kinematic
met sig < 3.50, dphi > 0.35
met sig > 3.50, dphi < 0.35
10% syst
5% syst
3jets
4jets
5jets
6jets
7jets
8jets


min DPhi(Met,jet)
Control Region
Signal Zone
0.4
0.3
3
4
ET Significance


CDF Run II preliminary, L=311 pb -1
hRatioDph
χ2 / ndf 2.817 / 5
p0 1.121 ± 0.04788
met sig > 3.50, dphi < 0.35


CDF Run II preliminary, L=311 pb -1
obs/exp
before kinematic
met sig < 4.00, dphi > 0.40
met sig > 4.00, dphi < 0.40
10% syst
5% syst
1.6
1.4
1.2
1
0.8
0.6
0.4
3jets
4jets
5jets
6jets
7jets
8jets


min DPhi(Met,jet)
Control Region
Signal Zone
0.4
0.3
Control Region
3
4
Significance


CDF Run II preliminary, L=311 pb -1
hRatioDph
χ2 / ndf 3.487 / 5
p0 1.119 ± 0.04873
met sig > 4.00, dphi < 0.40
1.6
1.4
1.2
1
0.8
0.6
0.4
3
4
5
6
7
8

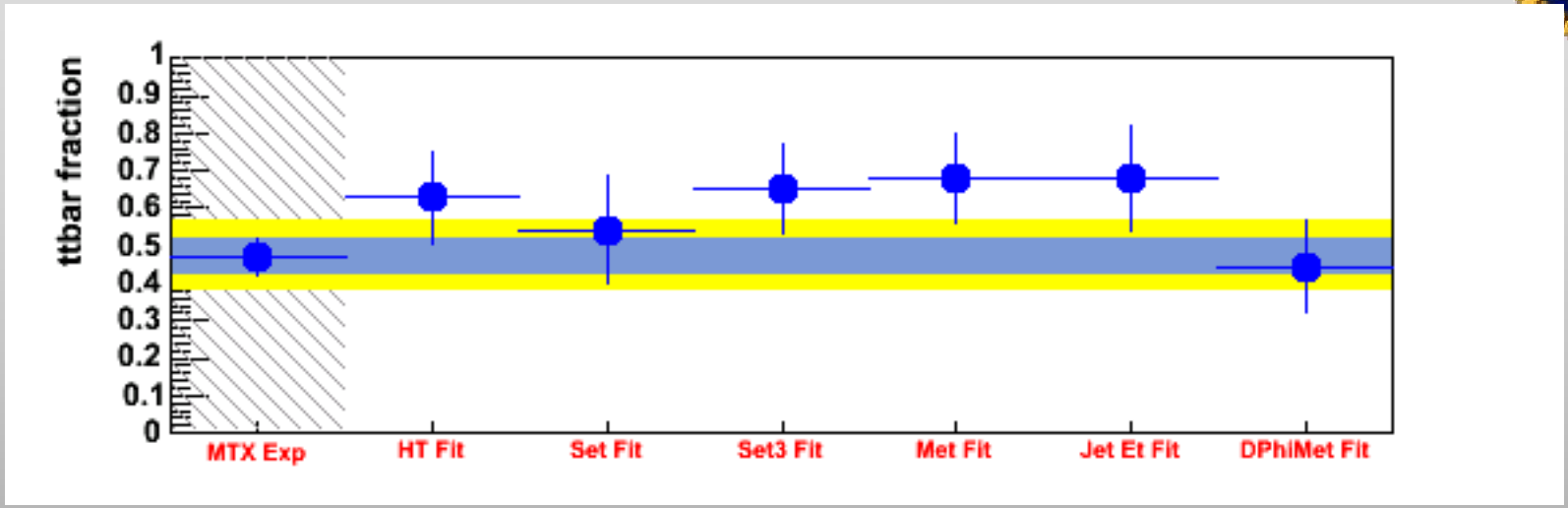
Pre-tag iterative top subtraction

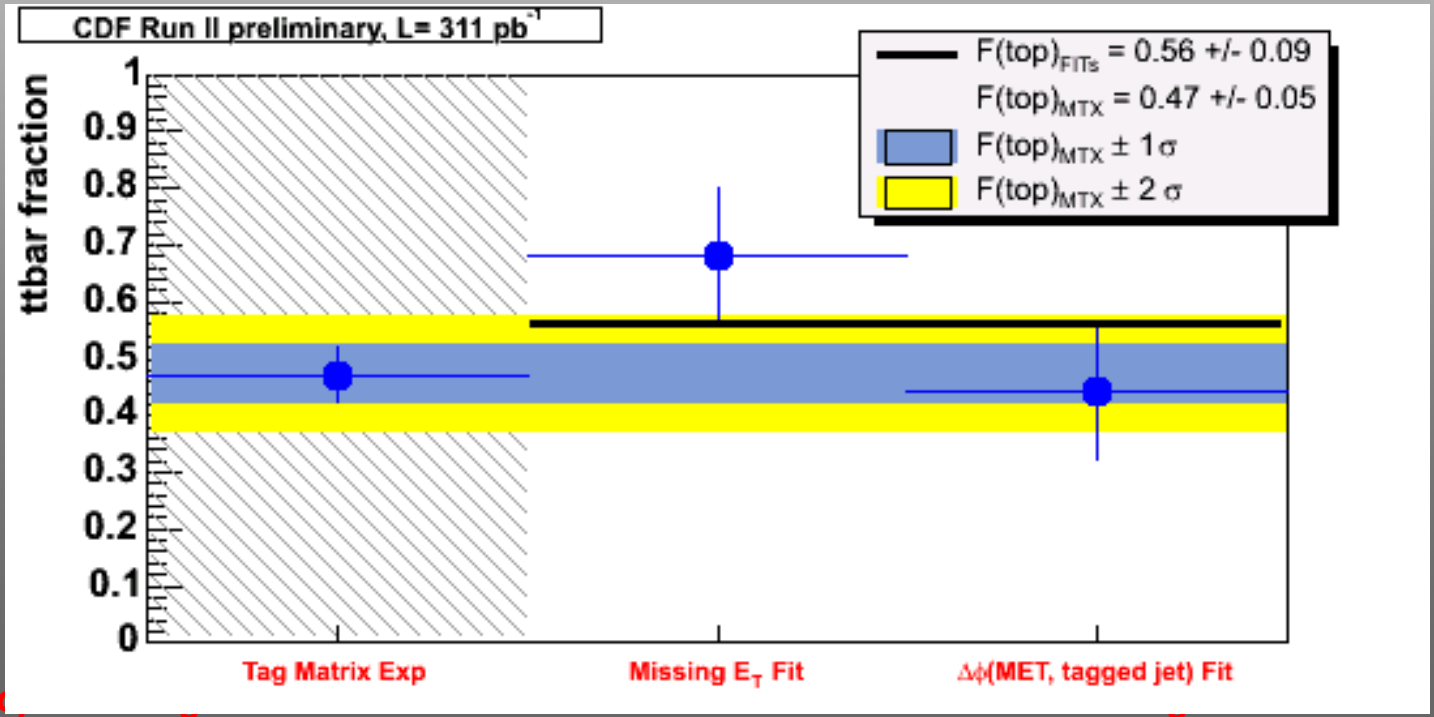
- The final sample kin sel + ≥1 tag consists of 106 events for a total of N_{obs} = 127 positive tagged jets.
- From tagging matrix prediction we expect N_{exp} = 67.4 ±7.2 tags
- We need to correct the tagging matrix prediction in order to account for the ttbar presence in the pre-tagging sample by using an iterative method:

$$N'_{\exp} = N^{fix}_{\exp} \frac{N_{evt} - N^{ttbar}_{evt}}{N_{evt}} = N^{fix}_{\exp} \frac{N_{evt} - \frac{N_{obs} - N_{\exp}}{\varepsilon^{ave}_{tag}}}{N_{evt}}$$

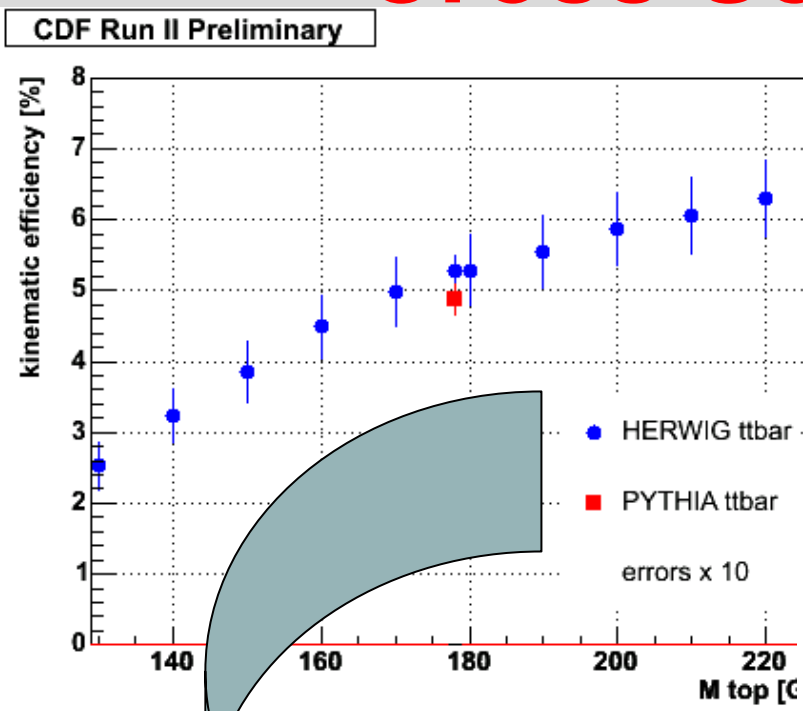
- The procedure stops when $|N_{exp}' - N_{exp}| < 1\%$.
- 10.0 tags out of 67.4 are attributed in this way to the ttbar presence in the pre-tagging sample.
- N_{exp}' = 57.4 ± 10.8 is the corrected background amount to be used for a cross section measurement.

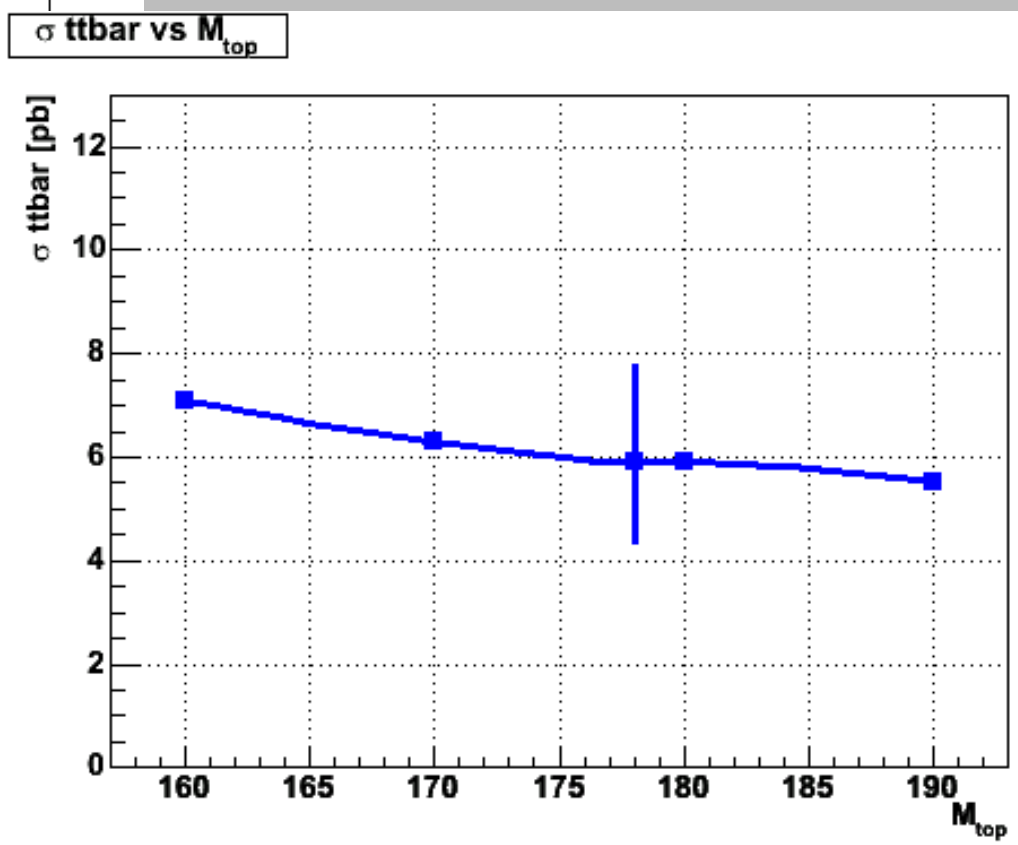
More on 2-c fits





Cross Section vs M_{top}

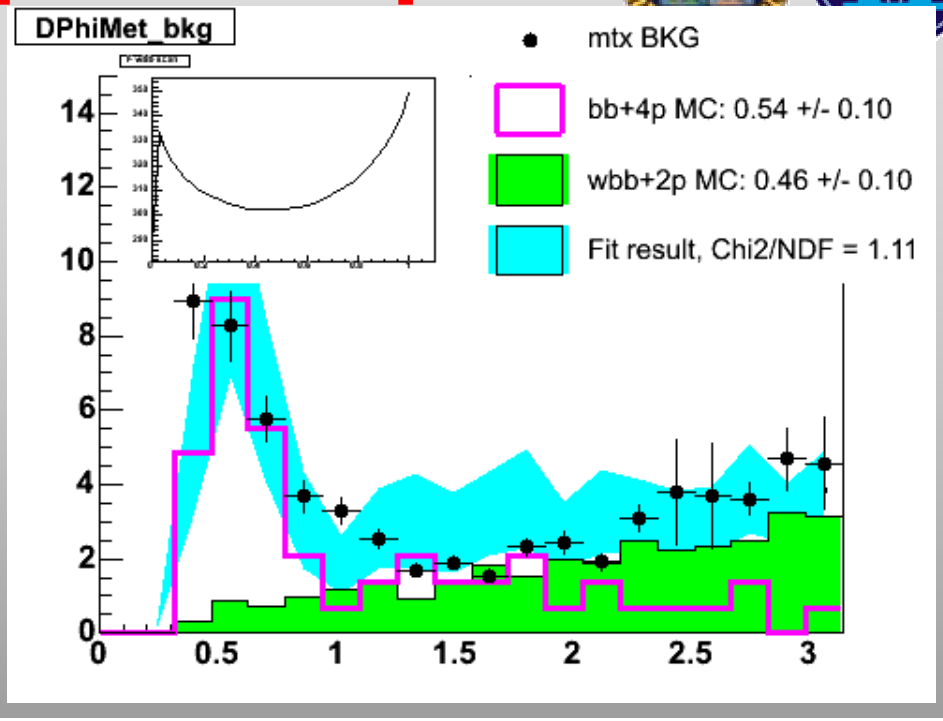




Hints on bkg sample composition

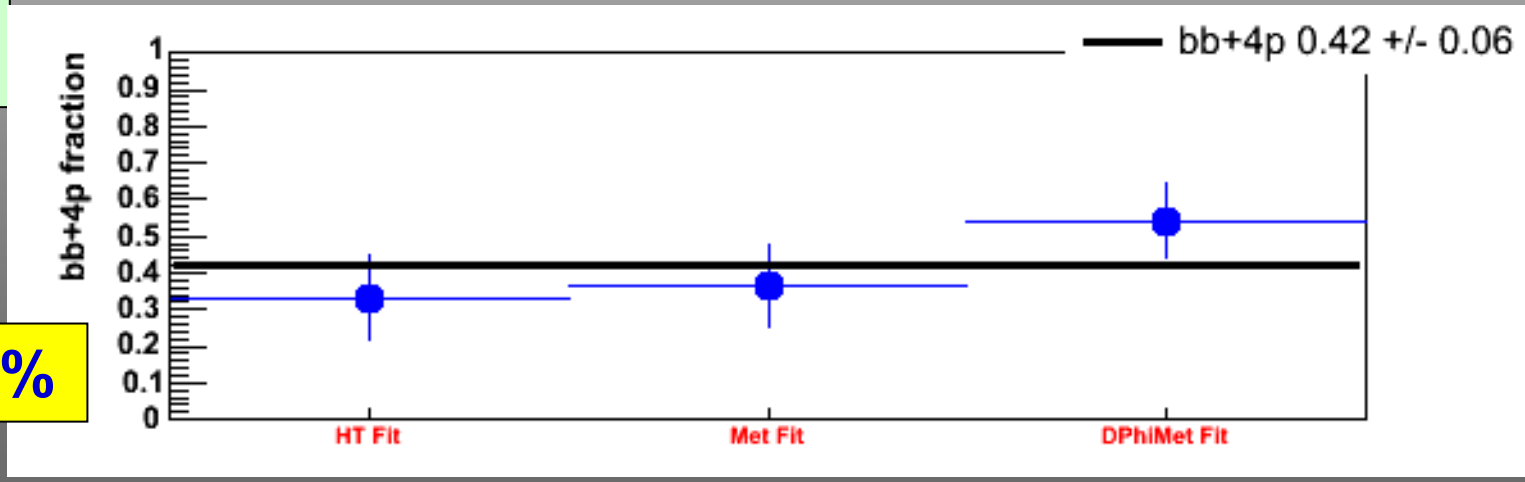
We can do more: we have the background shapes extracted from the tagging matrix information, we can fit them to the sum of two Alpgen Monte Carlo templates for the processes we expect to populate our signal region.

- Wbb+2P
- bb+4P



From bkg fits:

we found a bb fraction:



$F_{bbar} \sim 42\%$

After kin sel + ≥1 tag data: 50% top + ~21% bb + ~ 29% Wbb