GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

FSP 101
ATLAS

sideband method for determining W+jets normalization

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introduction

Sample	Int-L (pb-1)	Nfiles	Output AOD datasets
108172	146	622	user.RichardHawkings.0108172.topmix_Egamma.AOD.v1
			user.RichardHawkings.0108172.topmix_Muon.AOD.v1
			user.RichardHawkings.0108172.topmix_Jet.AOD.v1

Processes:

- tT (non-hadronic) Acer MC
- Single top Wt
- Single top t-chan (no s-chan)

Unfiltered W+jets

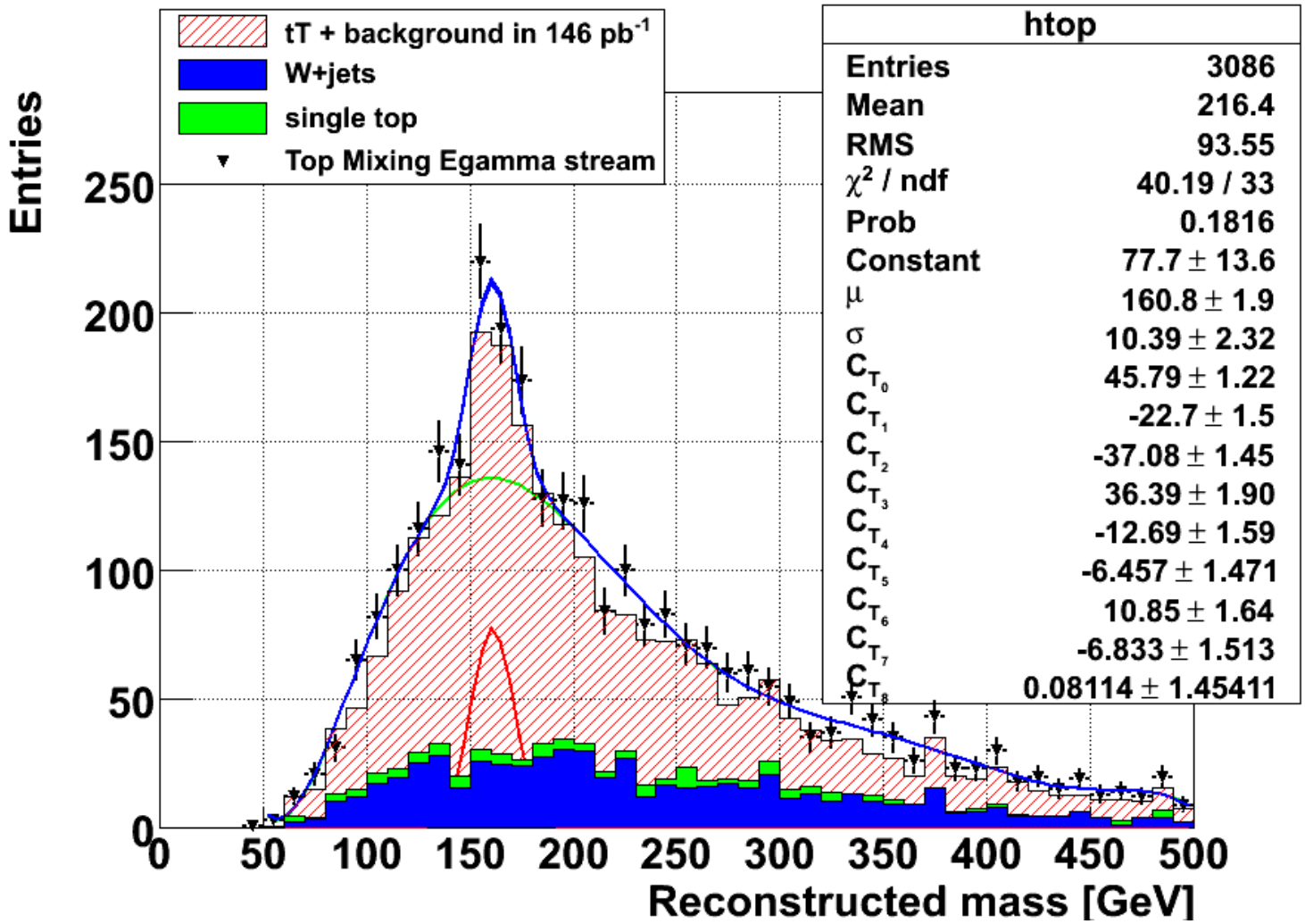
- Wenu+2/3/4/5 parton
- Wmunu+2/3/4/5 parton
- Wtaunu+2/3/4/5 parton

Samples are mixed according to “unknown” adjustment factors which could vary the corresponding SM x-sec of a given sample.

All samples are produced with Full simulation, with the missing HEC quadrant.

For details, please see:
https://twiki.cern.ch/twiki/bin/view/AtlasProtected/TopMixingExercise

egamma stream (trigger e20_loose)



- MC prediction are 6-10% below the “data” (but signal and background normalization is unknown)

matrix method (D0)

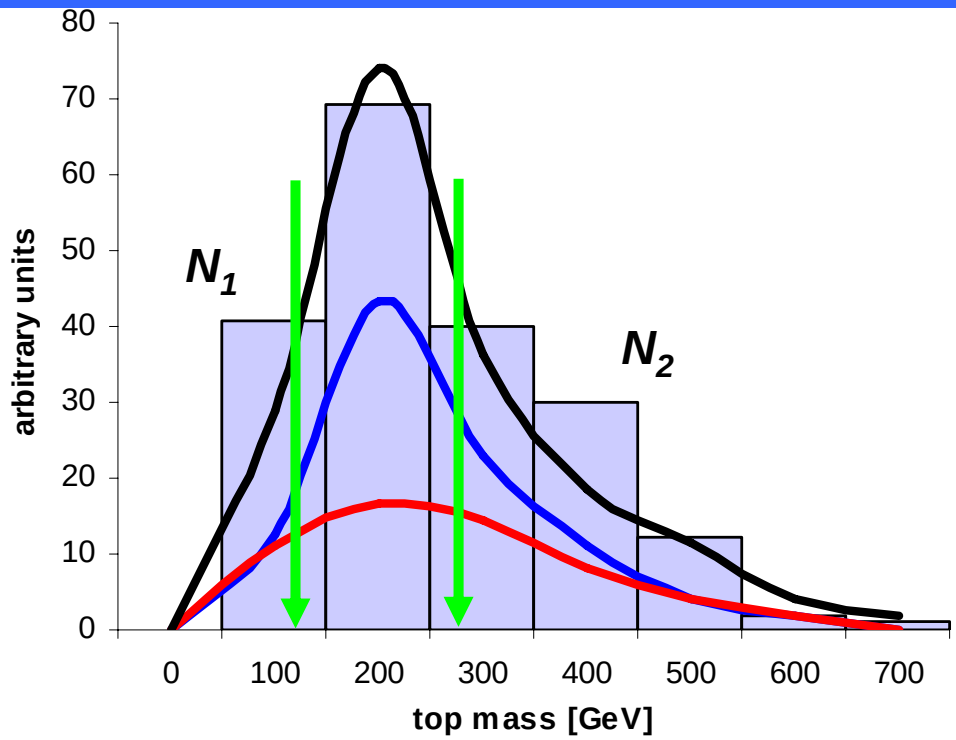
Matrix method is used in D0 to get the normalization of QCD events.

$$N_1 = \varepsilon_1^{top} N^{top} + \varepsilon_1^{W} N^{W}$$

$$N_2 = \varepsilon_2^{top} N^{top} + \varepsilon_2^{W} N^{W}$$

$$N^{top} = \frac{N_2 - \frac{\varepsilon_2^W}{\varepsilon_1^W} N_1}{\varepsilon_2^{top} - \frac{\varepsilon_2^W}{\varepsilon_1^W} \varepsilon_1^{top}}$$

$$N^{W} = \frac{N_1 - N^{top} \varepsilon_1^{top}}{\varepsilon_1^{W}}$$



By knowing $\varepsilon_{1,2}^{top}$ and $\varepsilon_{1,2}^{W}$ from MC and the number of observed events in the the “data” regions 1 and 2,
We can calculate the number of top and W+jets events we had before kin sel.
Applying then the kin sel efficiency we can get the normalization of top and W in the observed distribution

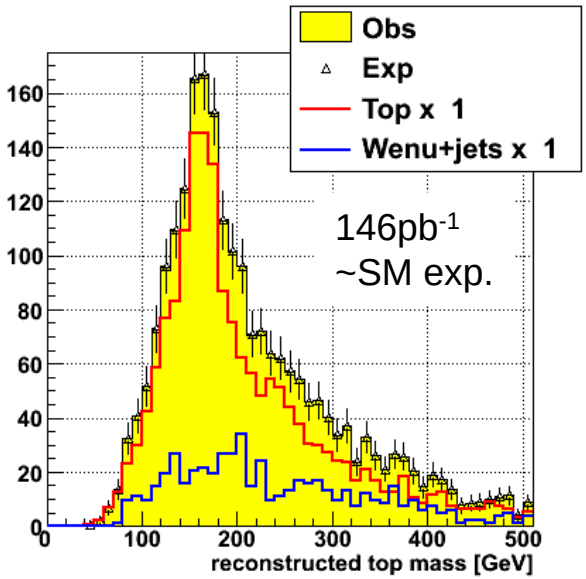
matrix method: too simple to be true?

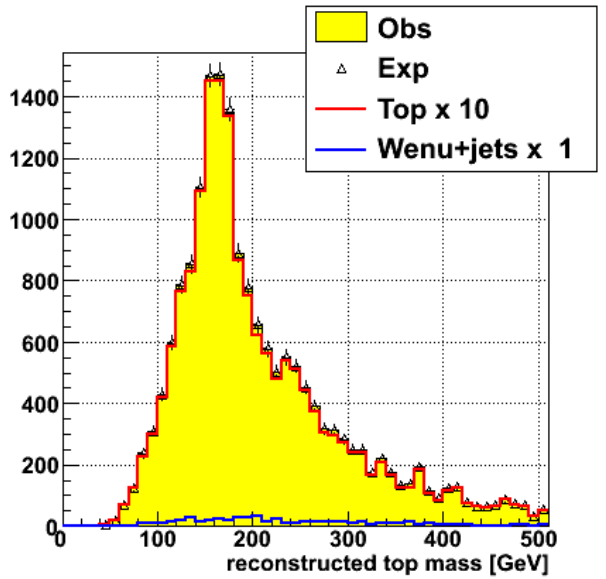
pseudo-exp with he following samples:

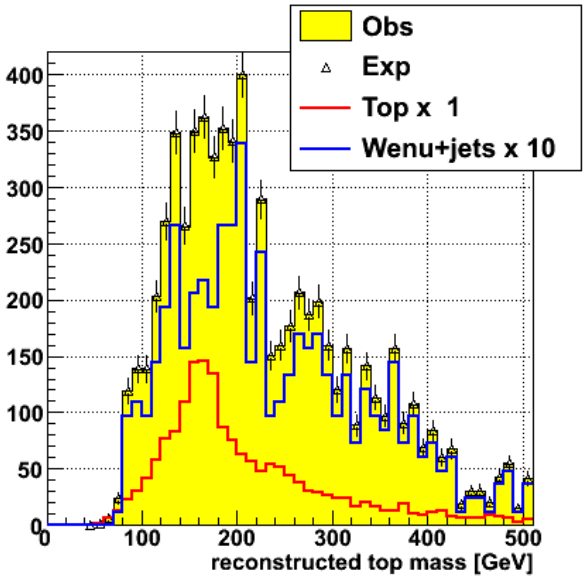
- tT Acer MC
- Wenu+4p

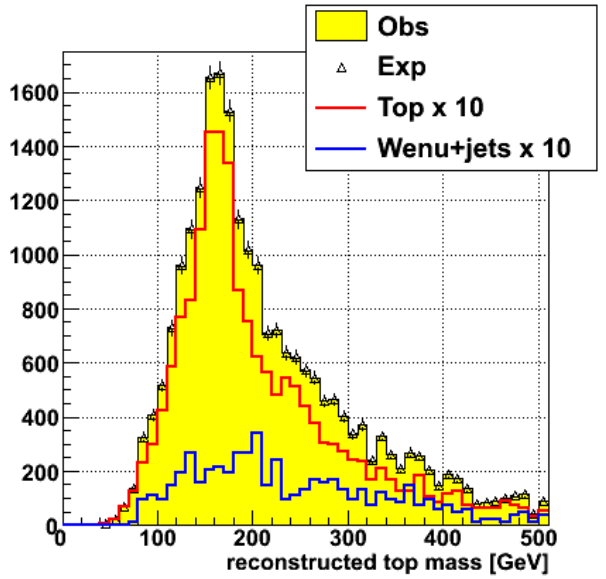
From the expected number of events in 146 pb-1
Using the SM x-sec, pseudo data were constructed varying the top and w+jet contribution (from 1 to 10 times the expectations)
$\varepsilon_{1,2}^{top}$ and $\varepsilon_{1,2}^{W}$ are derived once from the corresponding MC samples.

We then applied the matrix method to normalize
Top and W+jets contribution









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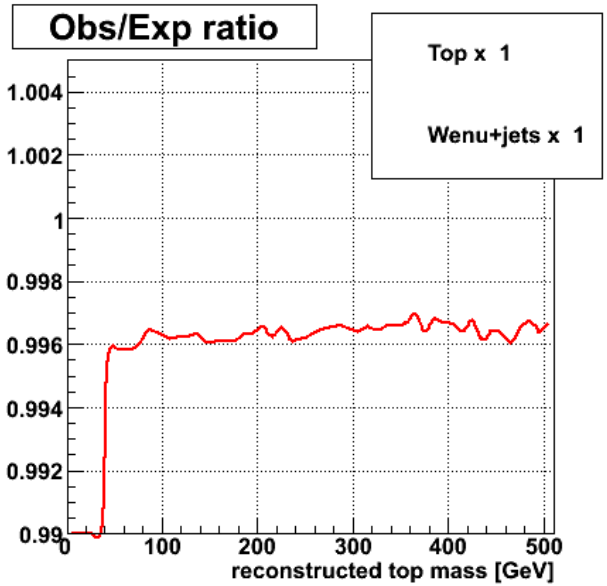

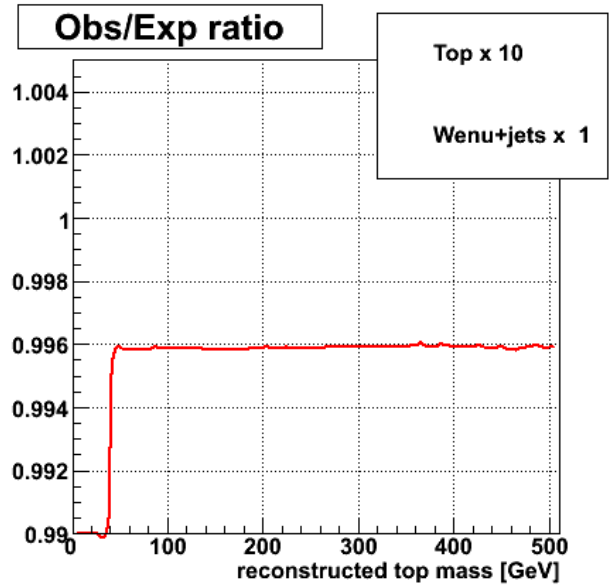

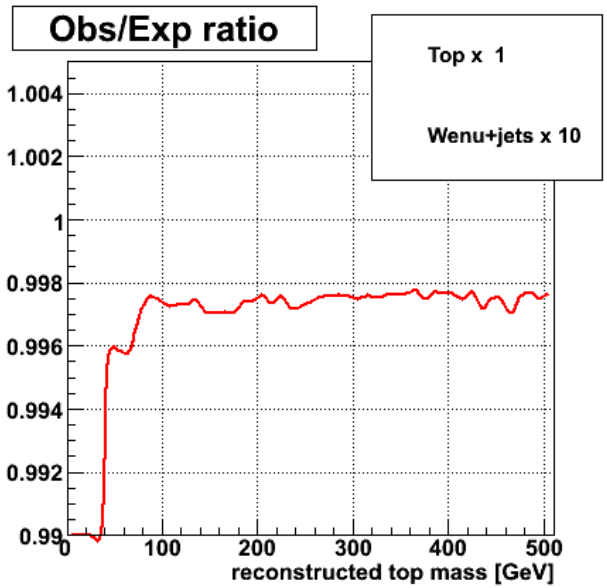

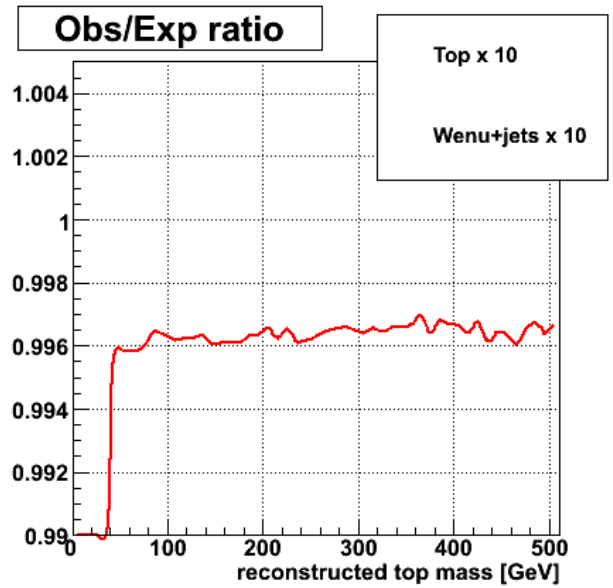

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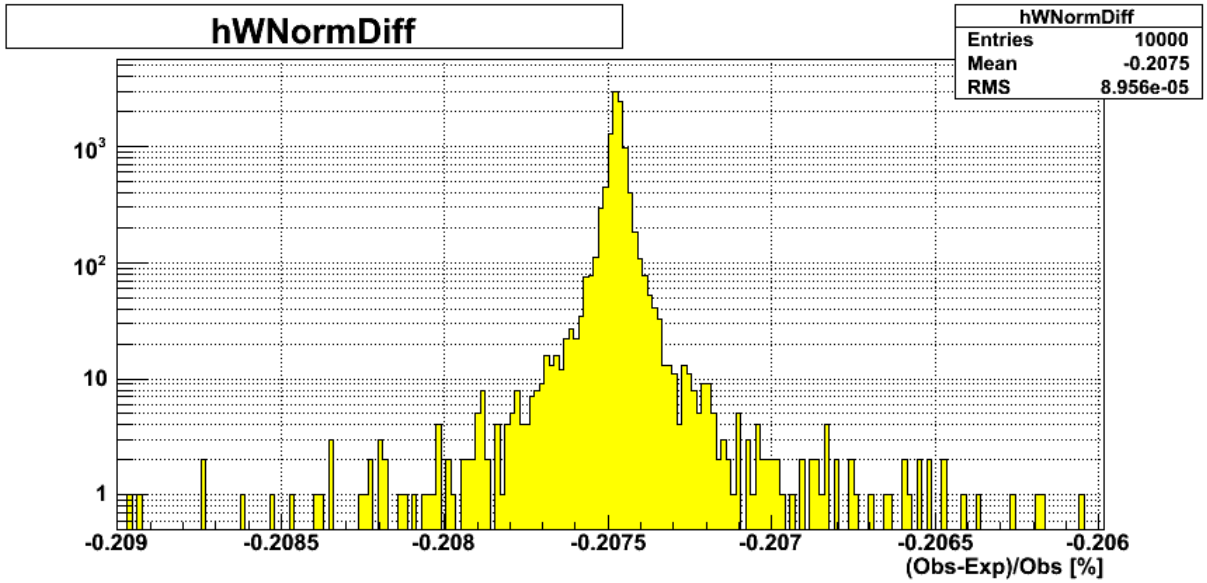
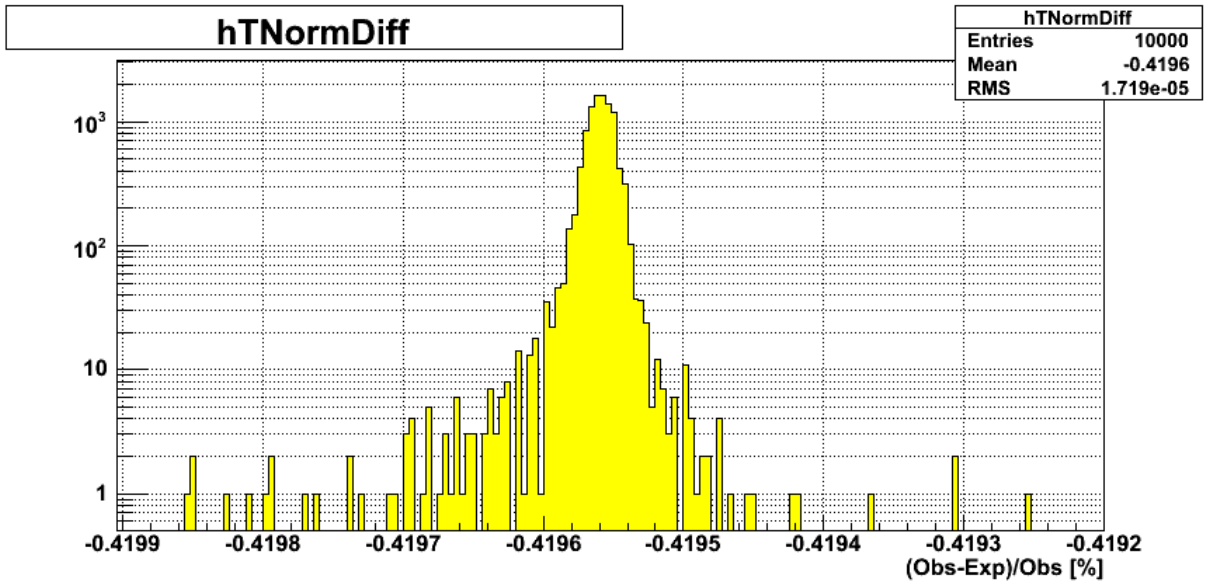


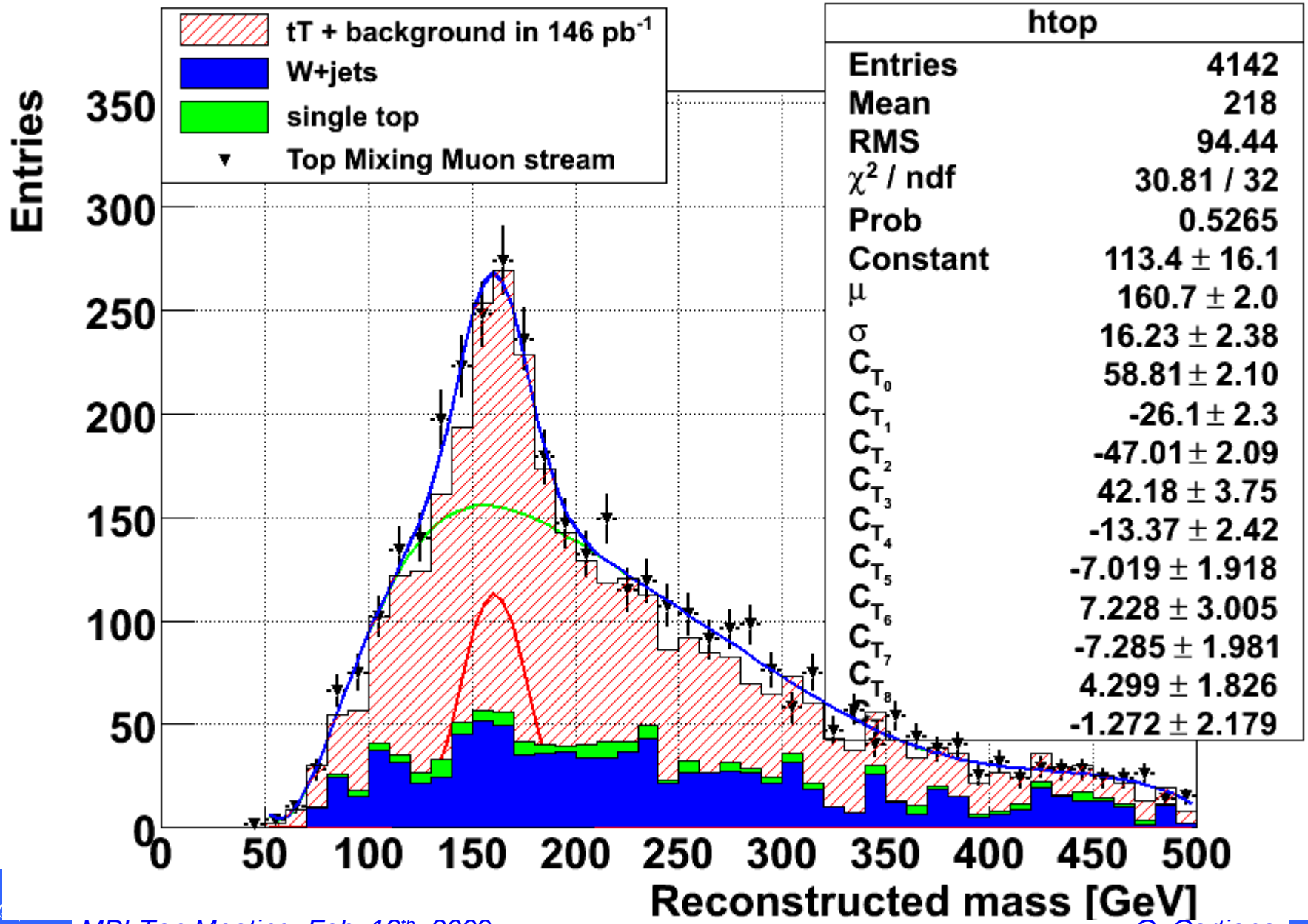


matrix method: conclusions

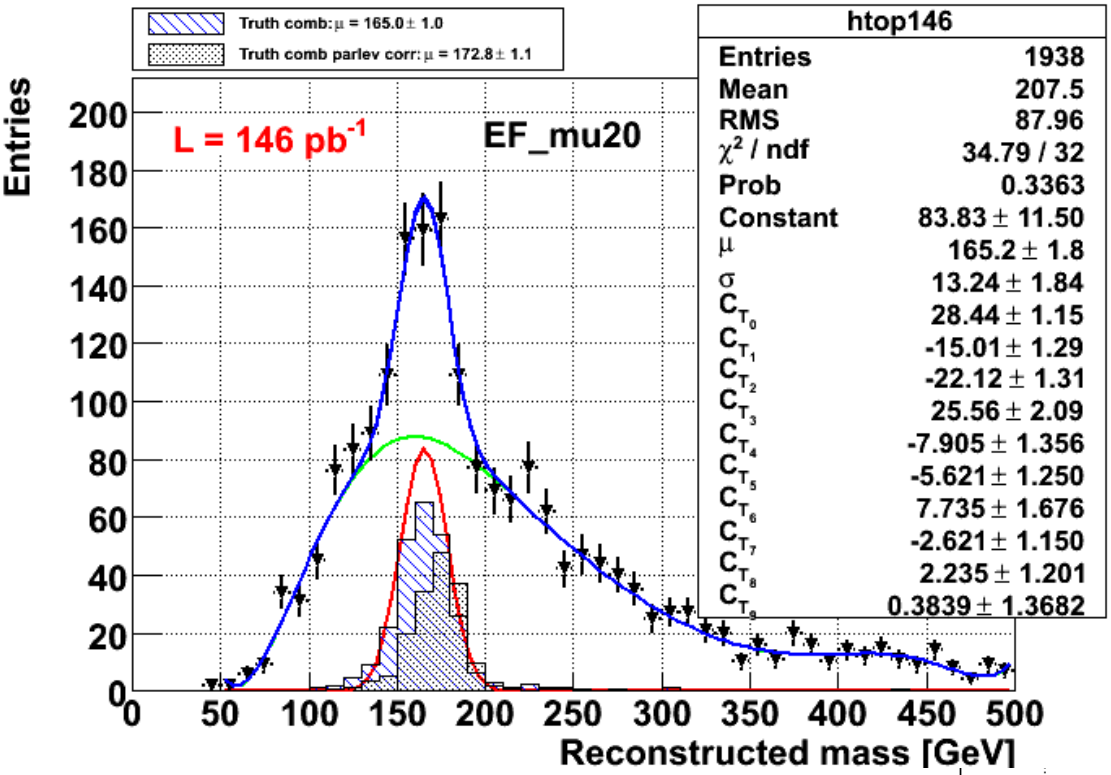
- Preliminary studies are really encouraging.
- The matrix method seems to be powerful to get the absolute background normalization (stat only uncertainty should be at the level of 10% or so.
- So far only two components studies were done (tT + W+jets) but we could probably generalize the method to more components by adding other equations to be solved using information from additional data sub-samples.
- The plan is to adopt this method to get background normalization in the top mixing samples and then to use background normalization as input for our template-method based top mass measurement.

- backup slides -

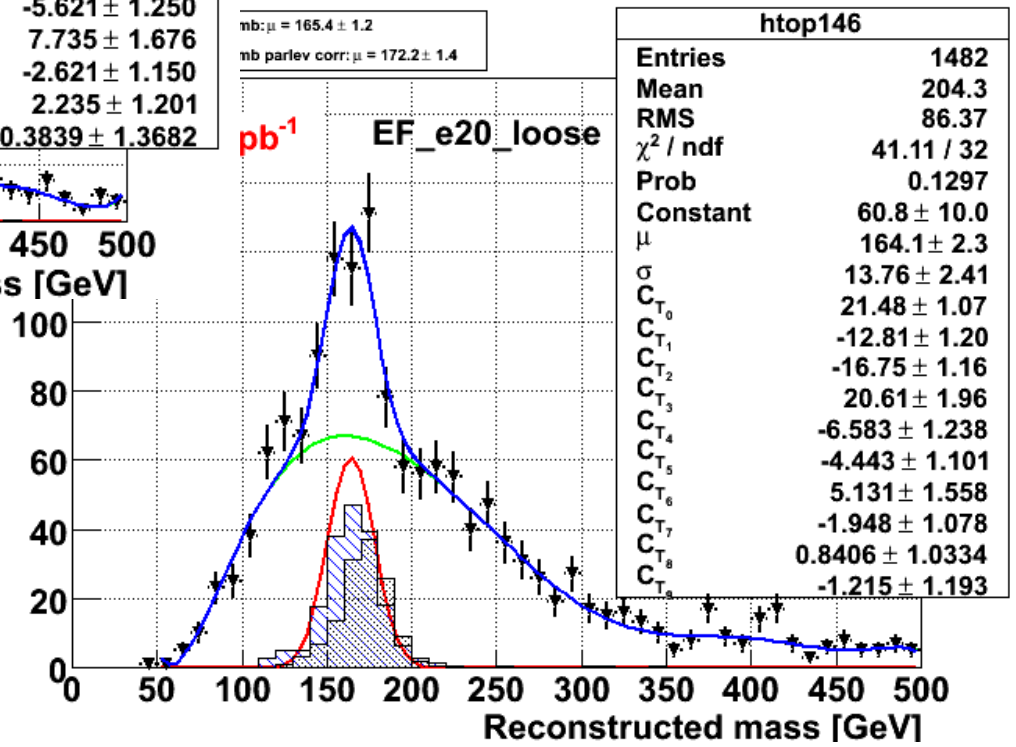
muon stream (trigger mu20)



signal only (Acer MC) fits



Muon stream	mean	sigma
Acer MC	165.2 ± 1.8	13.2 ± 1.8
Topmix	160.7 ± 2.0	16.2 ± 2.4



Egamma stream	mean	sigma
Acer MC	164.1 ± 2.3	13.7 ± 2.4
Topmix	160.8 ± 1.9	10.4 ± 2.3