Status of ttbar analysis

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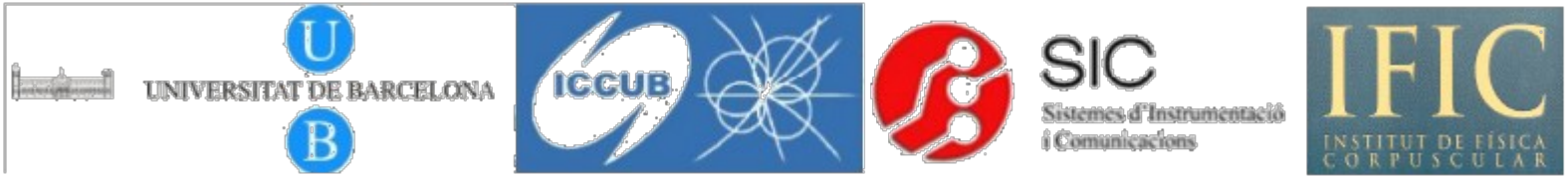
CNRS/IN2P3/LAL Orsay

... on behalf of groups at



Disclaimer:

Studies at 500 GeV

Input to studies – Questions on cross sections (LR)

Semi-leptonic files

36902 6f_yyxylv 6f_ttbar 500.0 L R 1000.0 232.019 232019 14

36898 6f_yyxyev 6f_ttbar 500.0 L R 1000.0 116.93 116930 7

36894 6f_yyvlyx 6f_ttbar 500.0 L R 1000.0 232.153 232153 14

36882 6f_yyveyx6f_ttbar 500.0 L R 1000.0 117.017 117017 7

The total cross section is 232.019+116.93+232.153+117.017=698.119 fb

Fully hadronic files

36910 6f_yyuyyc 6f_ttbar 500.0 L R 999.998 164.211 164211 13

36914 6f_yycyyu 6f_ttbar 500.0 L R 1000.0 165.095 165095 13

37610 6f_bbuyyu 6f_ttbar 500.0 L R 1000.0 159.352 159352 13

37622 6f_bbcyyc 6f_ttbar 500.0 L R 1000.0 159.855 15985513

The total cross section is 164.211+165.095+159.352+159.855=648.513 fb

$\sigma_{SL} > \sigma_{had}$????

Input to studies – Questions on cross sections (RL)

36903 6f_yyxylv 6f_ttbar 500.0 R L 1000.0 88.9028 88903 6
36899 6f_yyxyev 6f_ttbar 500.0 R L 999.995 44.3852 44385 3
36895 6f_yyvlyx 6f_ttbar 500.0 R L 1000.0 88.919 88919 6
36883 6f_yyveyx 6f_ttbar 500.0 R L 999.992 44.5454 44545 3

Total SL x section ~ 266.7 fb-1
Expected: 0.435x724 ~ 315 fb-1

36911 6f_yyuyyc 6f_ttbar 500.0 R L 1000.0 64.2029 64203 6
36915 6f_yycyyu 6f_ttbar 500.0 R L 1000.0 63.9447 63945 6
37611 6f_bbuyyu 6f_ttbar 500.0 R L 999.999 63.8951 63895 5
37623 6f_bbcyyc 6f_ttbar 500.0 R L 1000.0 63.8627 63863 6

Total SL x section ~ 256 fb-1
Expected: 0.46x724 ~ 333 fb-1

$$\sigma_{P,P'} = \frac{1}{4}\left[(1 - PP')(\sigma_{LR} + \sigma_{RL}) + (P - P')(\sigma_{RL} - \sigma_{LR})\right]$$

With P=-/+0.8 and P'=+/-0.3

Using the doubtful Whizard x-sections

=> (P=-0.8, P'=+0.3) x-sec=389.21 fb -> correction for stamped events x-sec=263.1 ~ SiD
=> (P=+0.8, P'=-0.3) x-sec=172.51 fb -> correction for stamped events x-sec=124.7 ~ SiD
Remark correction was made using our findings on fraction of stamped events

=> Cross sections of ILD and SiD coherent

Effect of cuts

No condition : Events = 84 623

btag1 & btag2 >0.3 = 64003 (64003/84623 = 75.63%), SiD btag1 > 0.9 btag2>0.4

150<mt<200,60<mW<100 = 21969 (21969/84623=25.96%), SiD: 145<mt<195, 50<mW<110

Chi1<20, Chi2 <40 = 16375 (16375/84623 = 19.35%)

C!=0 _____ = 13035 (13035/84623. = 15.40 %).

Plus smaller cuts on actual vertex charge

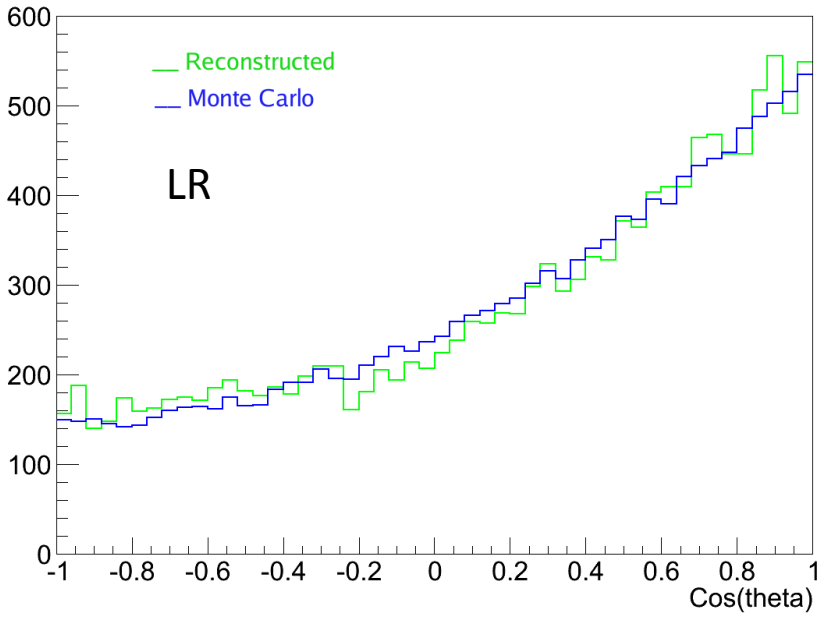
Main effect is mass window

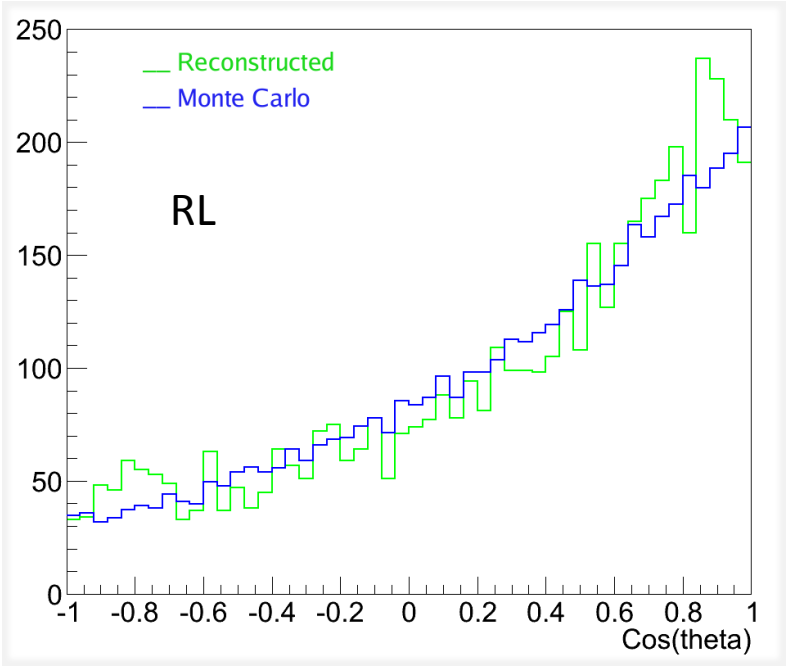
When varying mass window and chi2 we can also come to efficiencies of about 20% w/o

Modifying the result too much (5%).

A_{FB} for LOI

Charge: Repetition of one LOI analysis
Fully hadronic channel, full polarisation eLpR





$P(e^-)$, $P(e^+)$	$(A^t_{FB})_{gen.}$	A^t_{FB}	$(\delta_{A_{FB}}/A_{FB})_{stat.}$ [%]	$(\delta_{A_{FB}}/A_{FB})_{syst.}$ [%]
$-80\%, +30\%$	0.355	0.344	2.9	0.8
$+80\%, -30\%$	0.438	0.443	3.2	0.3

SiD: 0.371
SiD: 0.441

Remark: Analysis made for fully polarised beams
However, AFB varies only very mildly with polarisation and what counts is the correct number of events
N.B.: After using only stamped events AFB_SL gives consistent results
Full update of analysis is in making

Conclusion

- Consistent results between ILD and SiD

- How to deal with observations in input samples
  - "Stamped" events
    - Investigation ongoing at Valencia (e.g. With Madgraph)
  - If stamped events are correct then ttbar cross section is wrong
  - right handed cross section is wrong anyway
  - x-sec fully hadronic < x-sec SL

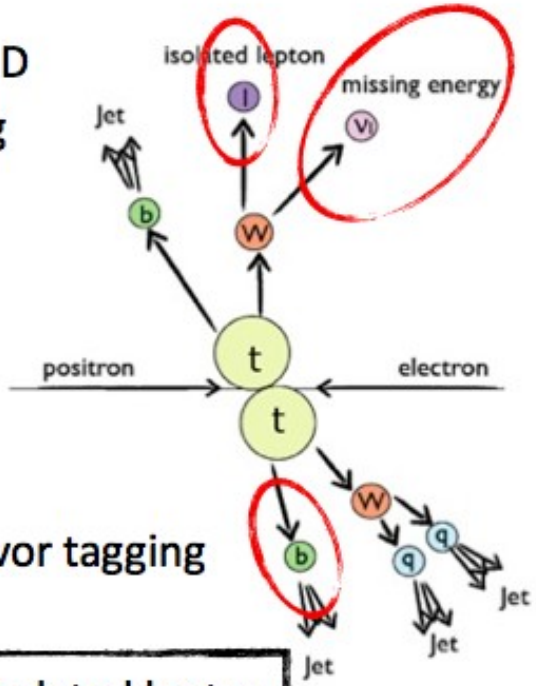
- Proposal/Discussion: Show no plots but cite expected statistical uncertainties

Backup

Elements of top quark reconstruction

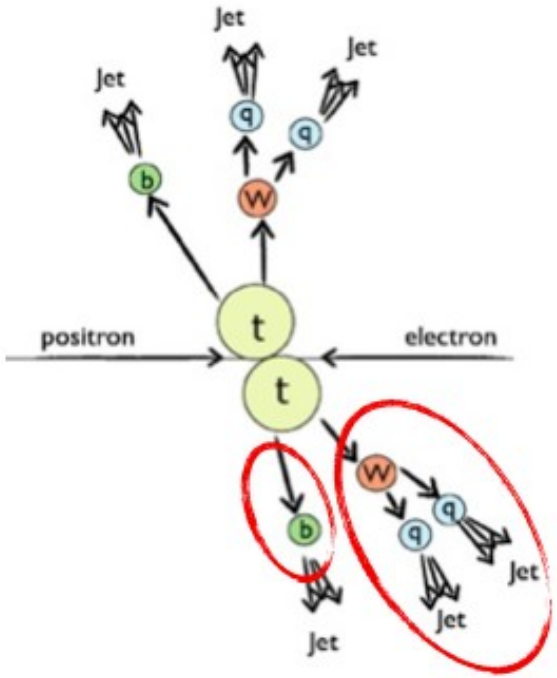
- By far dominating decays: All-hadronic (46%), semi-leptonic / lepton+jets (45%, 30% w/o τ)
  - try to avoid decays into τ, increased uncertainties from additional neutrino

lepton ID
tracking



flavor tagging

4 jets, isolated lepton



6 jets

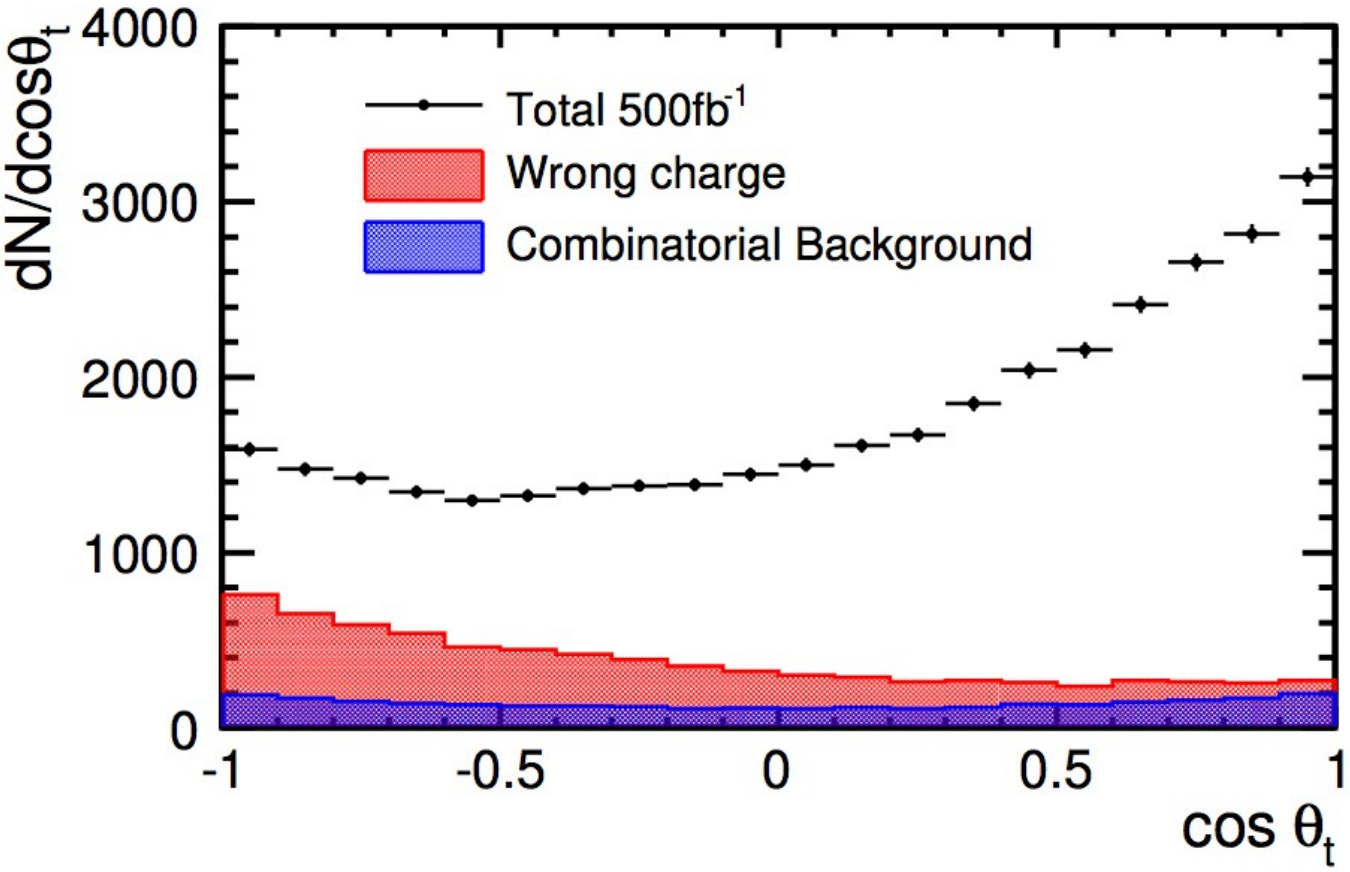
jet energy reconstruction, global event reconstruction

Nice illustration stolen from Frank

Uses all aspects of LC detectors!

Reminder on A_{FB} in LOI

Fully hadronic channel, only one polarisation mode $P(e^+, e^-) = (+30\%, -80\%)$



$$A_{FB}^{t} = 0.334 \pm 0.008$$