# Status of ttbar analysis

Roman Pöschl

CNRS/IN2P3/LAL Orsay

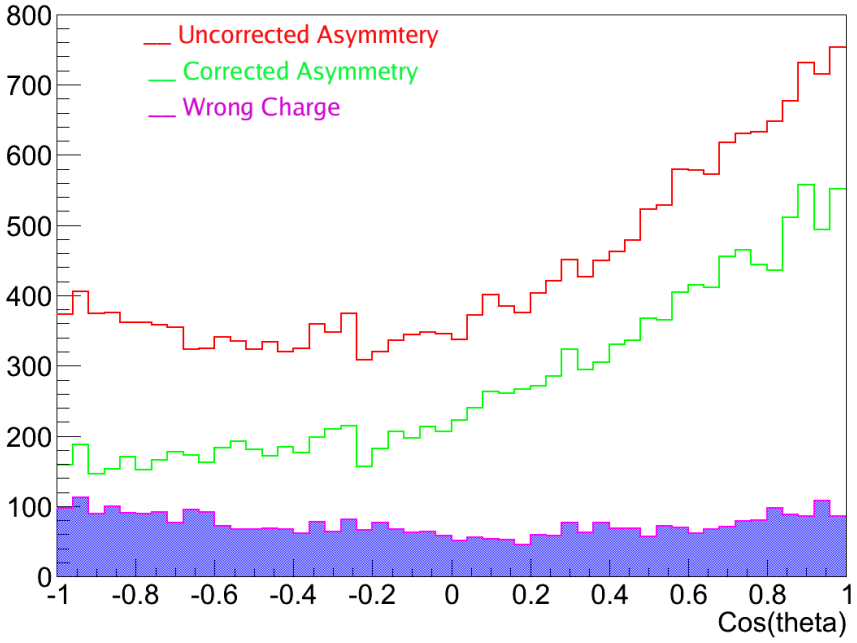
... on behalf of groups at

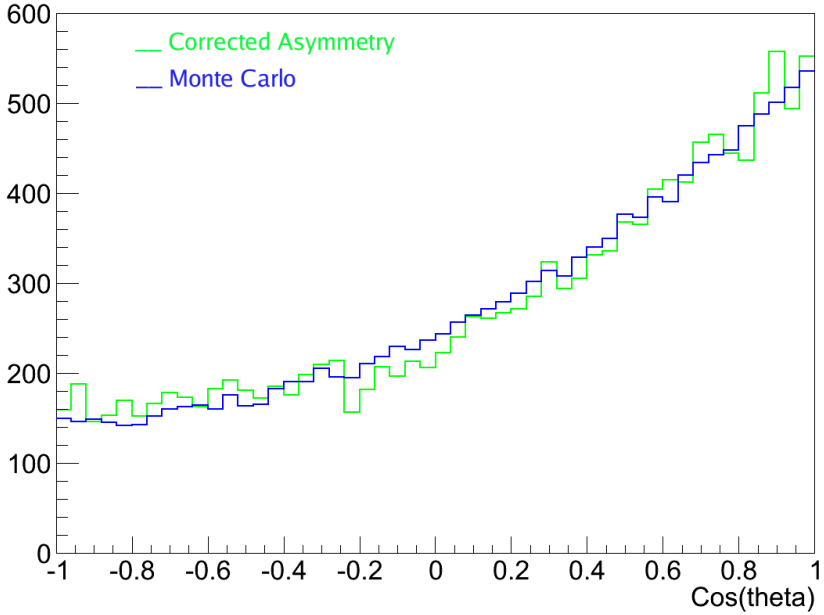
**Disclaimer:**

**Studies at 500 GeV**

# $A_{FB}$ for LOI

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



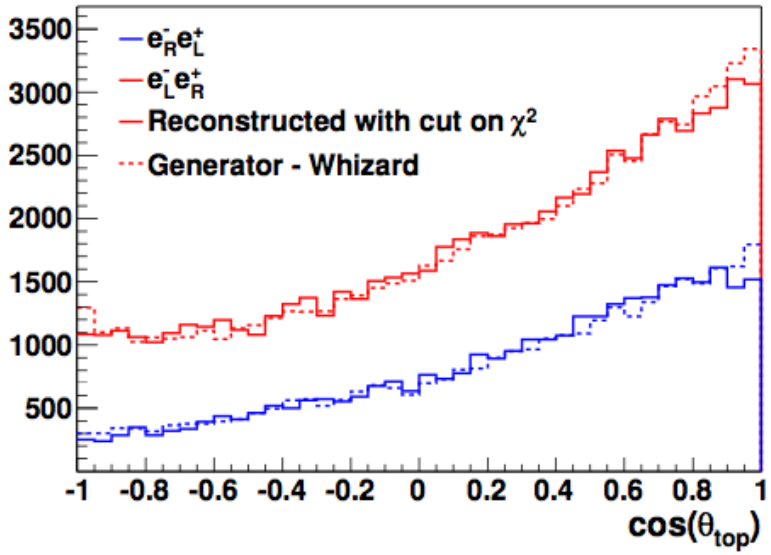

**AFB = 0.345 +- 0.008**

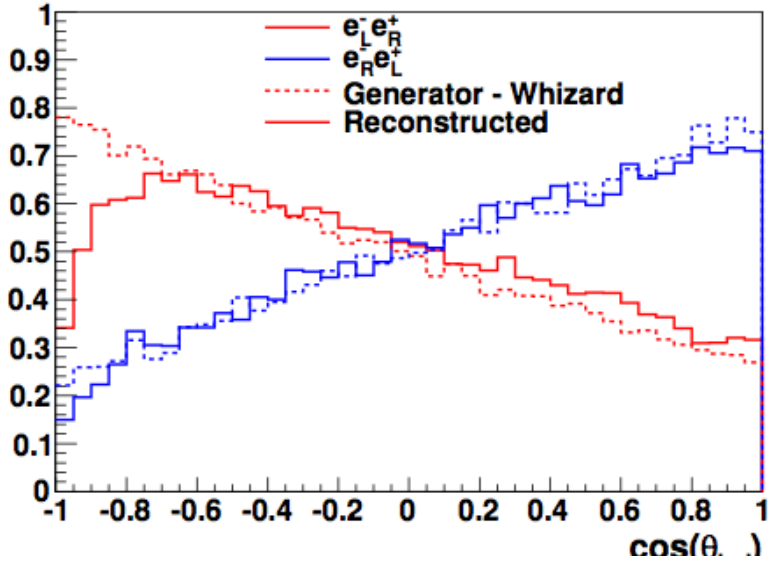
LOI: $A^t_{FB} = 0.334 \pm 0.008$

DBD: Efficiency ~10%, vertex charge measurement not optimised yet

# Semi-leptonic channel

Much more advanced than fully hadronic – Demonstrates huge potential of top quark physics at ILC !!!




Eff: 30% for LR

| $P(e^-), P(e^+)$ | $(A^t_{FB})_{gen.}$ | $A^t_{FB}$ | $(\delta_{A_{FB}}/A_{FB})_{stat.}$ [%] | $(\delta_{A_{FB}}/A_{FB})_{syst.}$ [%] |
|---|---|---|---|---|
| $-80\%, +30\%$ | 0.317 | 0.300 | 1.700 | 1.500 |
| $+80\%, -30\%$ | 0.431 | 0.415 | 1.290 | 0.964 |

Eff: ~50% for rest

| $P(e^-), P(e^+)$ | $(\lambda_t)_{gen.}$ | $(\lambda_t)_{rec.}$ | $(\delta\lambda_t)_{stat.}$ | $(\delta\lambda_t)_{syst.}$ |
|---|---|---|---|---|
| $-80\%, +30\%$ | -0.476 | -0.426 | 0.011 | 0.014 |
| $+80\%, -30\%$ | 0.528 | 0.520 | 0.016 | 0.006 |

# Input to studies – Questions on cross sections (LR for today)

## 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

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

## Files not to be used for fully hadronic (according to Tim)

37618 6f_sscyyc 6f_ttbar 500.0 L R 999.997 147.871 147871 12

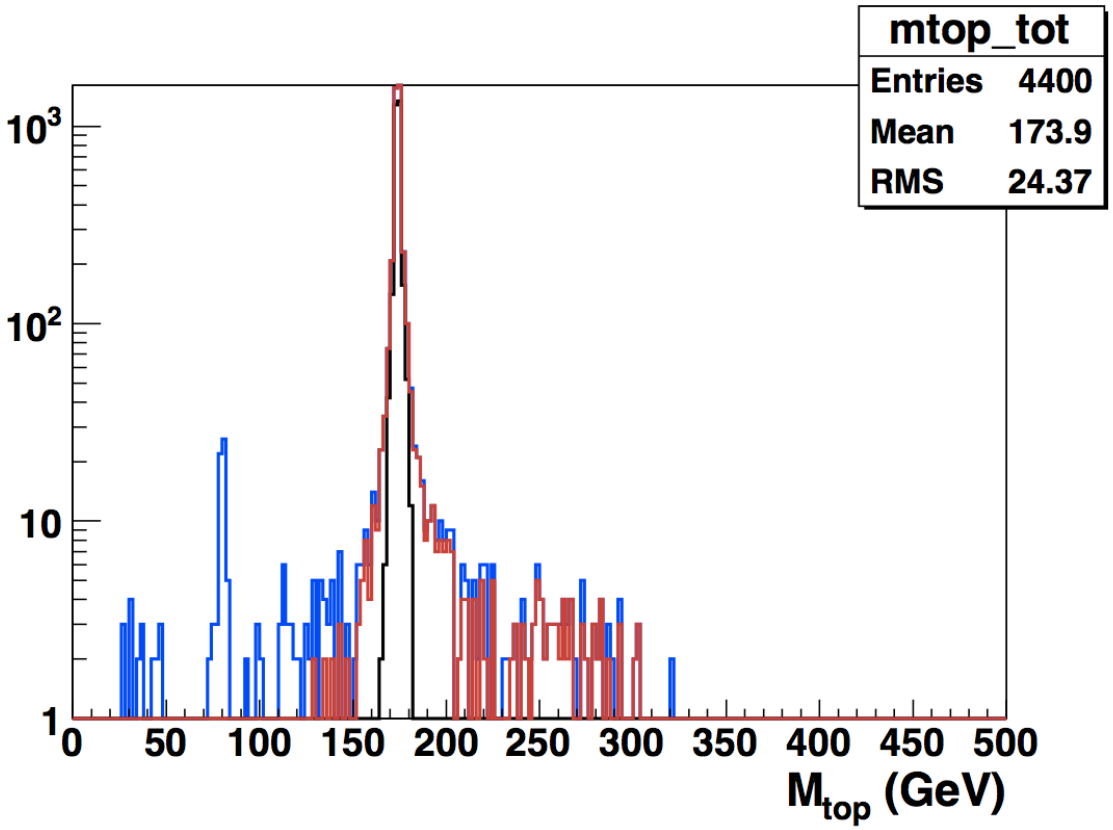
37602 6f_dduyyu 6f_ttbar 500.0 L R 1000.0 148.661 148661 12

Do we need to discard all these events or only a subset ????

# The “30% issue”

ILD and SiD observe that about 30% of the events have no ttbar in the event record
-> rejected in fully hadronic (ILD, SiD) and (up to know) basically kept in semi-leptonic

Study of event composition in semi-leptonic




- Blue all events in file
- Black: ttbar event record
- Red: Spectrum after “composition” of top quarks from 6fermions and cut against ZWW

Most of non-tagged events look like good tops

# Conclusion

- ttbar analyses very well advanced (nearly ready)

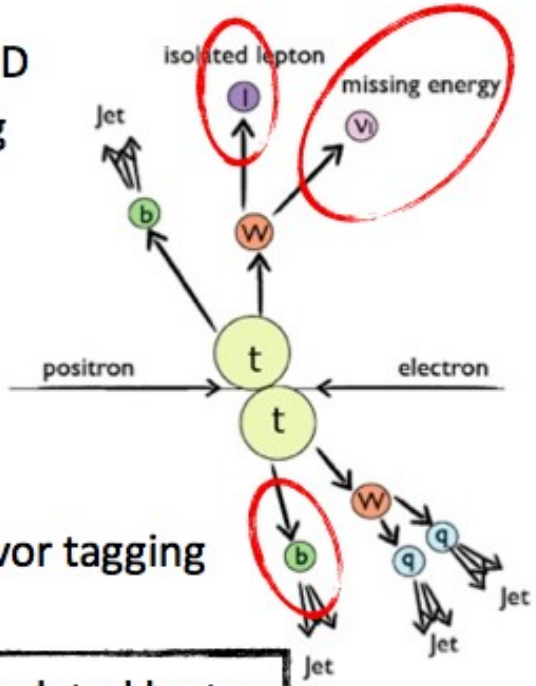
- Need to iron out a number of inconsistencies in particular on the Input samples

# Backup

# Elements of top quark reconstruction

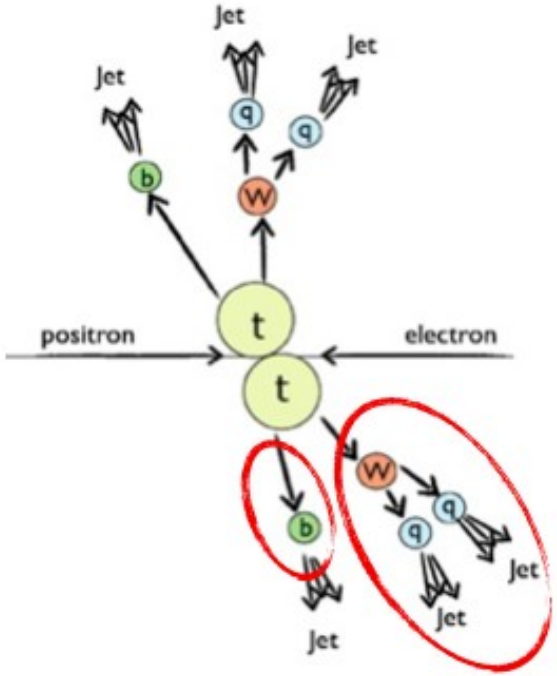
- By far dominating decays: All-hadronic (46%), semi-leptonic / lepton+jets (45%, 30% w/o τ)
  - try to avoid decays into τ, increased uncertainties from additional neutrino

lepton ID
tracking




flavor tagging

4 jets, isolated lepton




6 jets

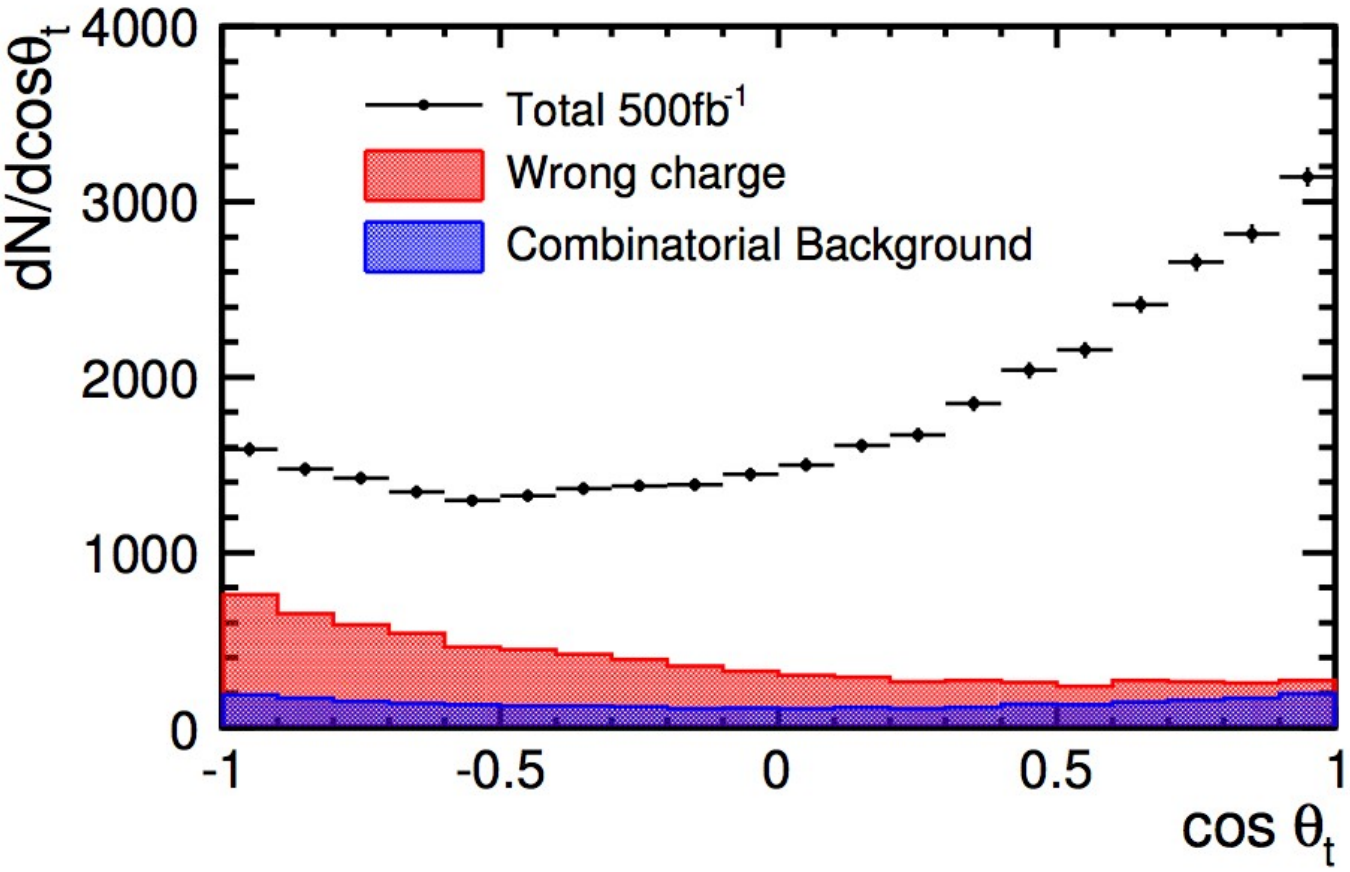
jet energy reconstruction, global event reconstruction

Uses all aspects of LC detectors!

*Nice illustration stolen from Frank*

# Reminder on $A_{FB}$ in LOI

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




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