

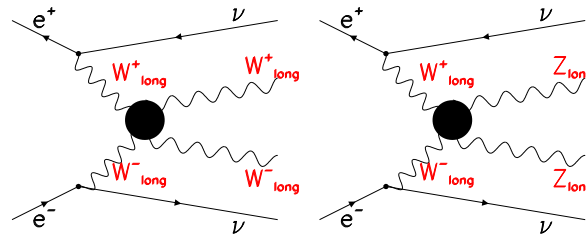
WW Scattering and Top Pair Production

David Ward and Wenbiao Yan



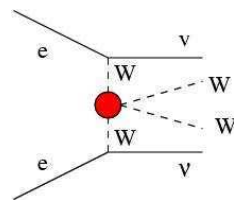
- **WW scattering analysis**
- **Top pair production**
- **Used analysis tools**

WW scattering

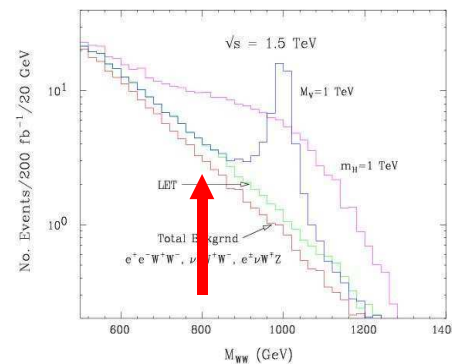


The Higgs does not exist...

- if no Higgs is found at LEP, Tevatron, LHC, LC:
 - very fundamental arguments require: something must happen on the TeV scale
 - one possibility: a new strong interaction (WW rescattering) plays the role of the Higgs
 - there are no fundamental scalars in nature, "fermioncentric" world,
 - either no Higgs exists, or the Higgs is composite



- main access: study of WW scattering
 - effects already visible at "low" energies
- consistent models for this type are difficult

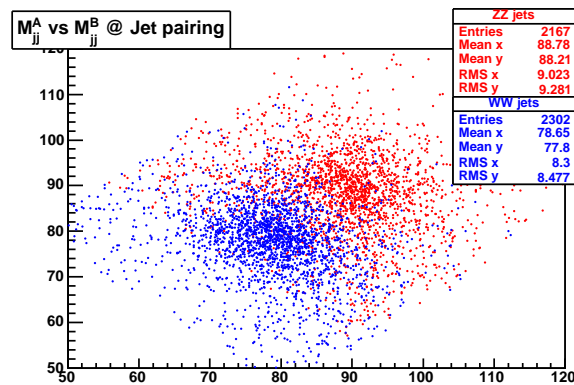
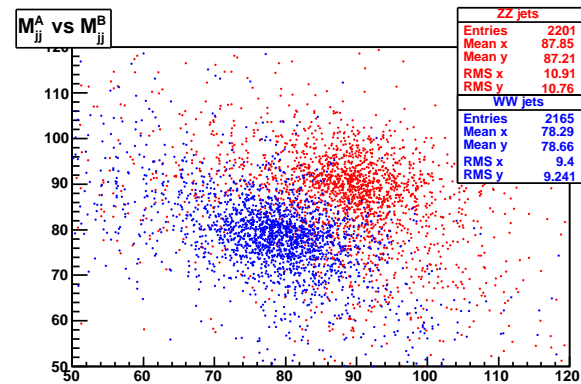
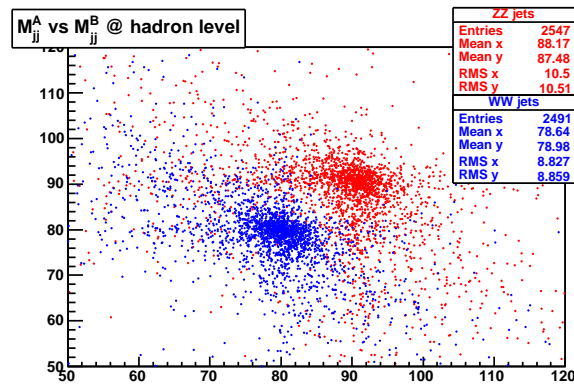


WW scattering

- Physics parameters: anomalous couplings α_4 & α_5
- Published works
 - hep-ph/0201098: LHC
 - LC-PHSM-2001-038: SIMDET for TESLA @ 800 GeV
 - hep-ph/0604048: SIMDET for TESLA @ 1000 GeV
 - Andres F. Osorio's thesis: SIMDET for TESLA @ 800 GeV
 -
- Motivation @ this work
 - WW/ZZ separation
 - Extract α_4 & α_5 :
 - * How to do ? Follow hep-ph/0604048
 - * Detector model: LDC00, LDC00Sc, LDC01, LDC01Sc
 - * PFA: PandoraPFO PFA vs. Wolf PFA

WW/ZZ separation

- PYTHIA: WW/ZZ events



Extract α_4 & α_5

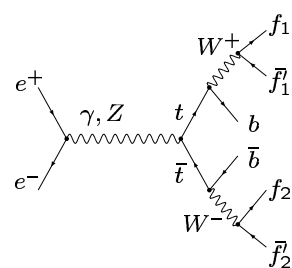
- Monte Carlo samples
 - Signal events by Whizard: **OK**
 - Main backgrounds $WZ e\nu \rightarrow qqqq e\nu$: **OK**
 - Main backgrounds $t\bar{t}$: **near future**
 - Minor backgrounds: **not yet**
- Detector LDC00Sc simulation: (**work in progress**)
 - Time scale: < 3 weeks @ Cambridge HEP computer
 - Grid: (**???**)
- How to Extract α_4 & α_5 : (**near future**)

Top pair production

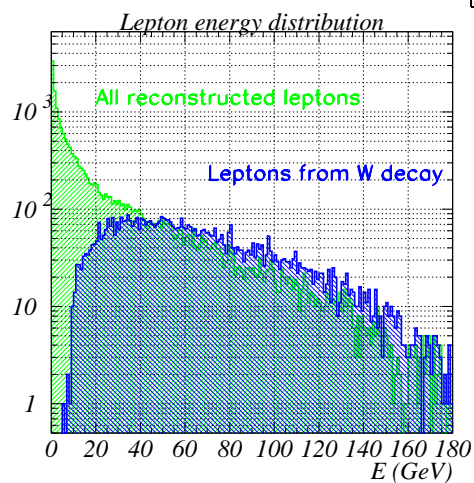
Top selection

8

$$e^+e^- \rightarrow t\bar{t} \rightarrow b\bar{b} W^+W^- \text{ in PYTHIA}$$



Type	b-jet	W-jet/lepton	W-jet/lepton	N jets	N ν	Prob.
1	2b	2q	2q	6	0	45.60 %
2	2b	2q	τ	5	1	14.625 %
3	2b	2q	e	4	1	14.625 %
4	2b	2q	μ	4	1	14.625 %
5	multi lepton events					10.56 %



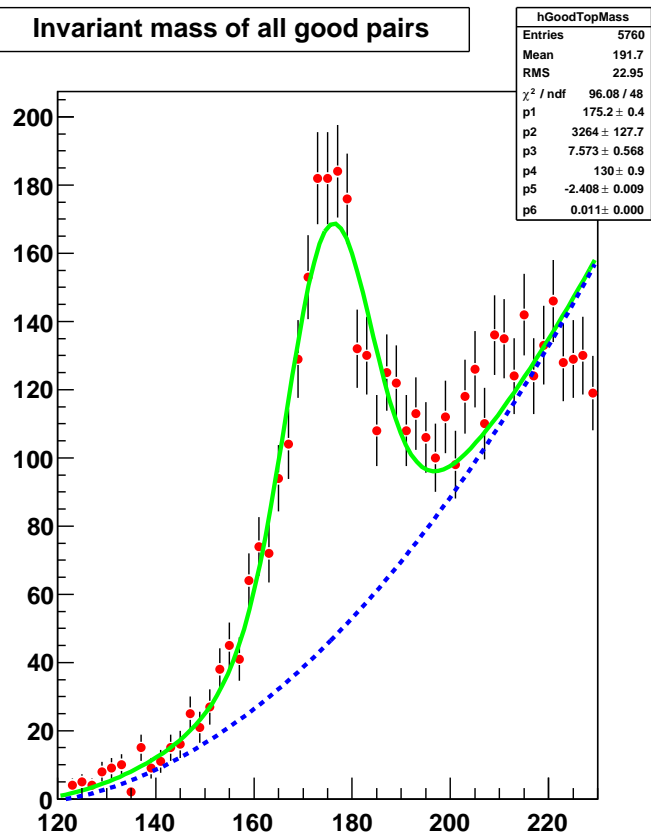
Semileptonic decay of W-boson is rejected if one or more lepton with $E_{lept.} \geq 20$ GeV exists.

Top pair production

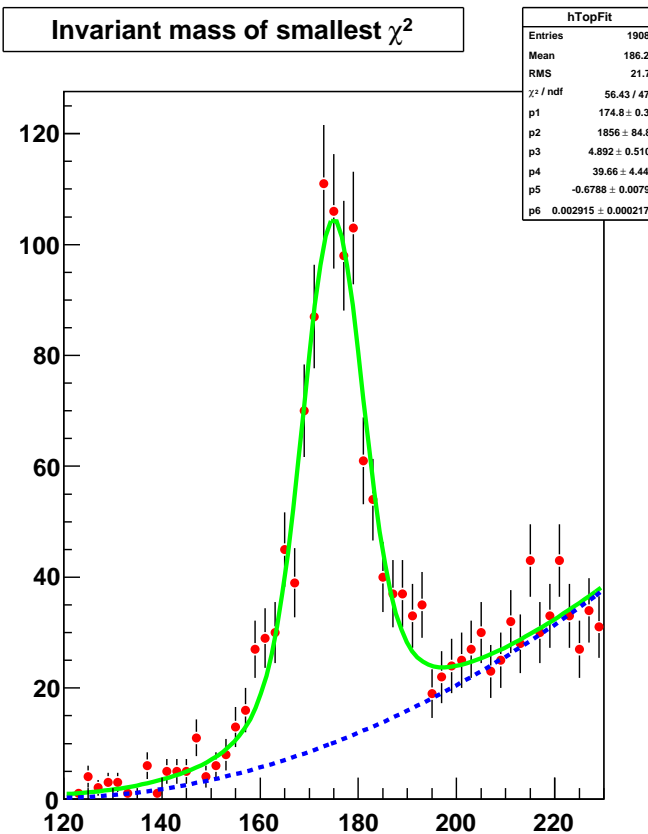
- Top reconstruction @ Linear Collider
 - hep-ex/0301014: S. V. Chekanov and V. L. Morgunov
 - hep-ex/9910065: Masako Iwasaki
 -
- Motivation @ this work
 - Top reconstruction: mass resolution
 - * How to do ? Follow hep-ex/0301014
 - * Detector model: LDC00, LDC00Sc, LDC01, LDC01Sc
 - * PFA: PandoraPFO PFA vs. Wolf PFA
 - Improvement @ this work
 - * use b-tag package: ???
 - * kinematic fitting code: not yet
- Top quark properties: Wtb vertex @ linear collider ???
 - CKM V_{tb}
 - W helicity

$e^+e^- \rightarrow t\bar{t} \rightarrow qqqqqq @ \text{ detector level}$

Invariant mass of all good pairs



Invariant mass of smallest χ^2



Used analysis tools

- Jet finder @ Marlin
 - Satoru jet package from OPAL in FORTRAN
 - KtJet package in C++: *Comp. Phys. Comm.* 153 (2003) 85-96
 - Run KtJet package @ Marlin: **OK**
 - Interface code for KtJet: **???**
- Kinematic fitting
 - Many codes in FORTRAN & C++
 - Andres F. Osorio's code in TMinuit: $M_{jj}^A = M_{jj}^B$ @ WW scattering
 - Know how to write kinematic fitting in TMinuit