

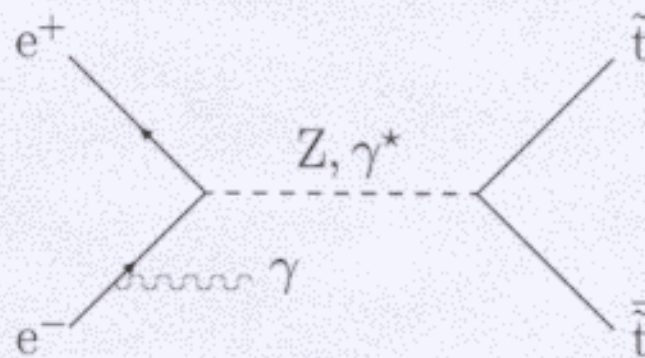
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Experimental Study of
Scalar Top Quarks
with SIMDET
at a Future e^+e^- LC

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Scalar Quark Production



\tilde{t}_1 is the lighter mass eigenstate:

$$\tilde{t}_1 = \tilde{t}_L \cos \Theta_{\tilde{t}} + \tilde{t}_R \sin \Theta_{\tilde{t}}$$

where $\Theta_{\tilde{t}}$ is the mixing angle.

Free parameters for the production are:

1. $m_{\tilde{t}}$
2. $\Theta_{\tilde{t}}$
3. Beam polarisation: L,U,R
4. \sqrt{s}

Status

- LC-PHSM-2000-026, publ. EPJdirC 000819.
- latest results with SGV simulation (Hanna's Padova talk and TDR).
- SIMDET interfaced with event generator.
- further signal mass configurations.
- preselection adjusted.
- 16 mio events simulated.
- cross check with previous simulated SGV distributions.
- Example:
 - 180 GeV stop mass,
 - 150 GeV chargino mass,
 - 60 GeV neutralino mass,
 - and 500 GeV center-of-mass energy.
- ready for analysis update.

Detector Simulation

Before: detector simulation with SGV:

<http://home.cern.ch/berggren/sgv.html>

Now: SIMDET version3.

*** Detector parameters used for simulation :

*** CCD (2 cm) :

acceptance (cos(theta) central region)	= 0.928000
impact parameters (r-phi, central region)	= 0.0058 0.0159 mm
impact parameters (r-z, central region)	= 0.0058 0.0159 mm
acceptance (cos(theta) forward region)	= 0.961000
impact parameters (r-phi, forward region)	= 0.0126 0.0156 mm
impact parameters (r-z, forward region)	= 0.0126 0.0156 mm

*** Tracker :

mag. field	= 3.00 Tesla
total length of TPC	= 5.00 m
radius of TPC	= 1.70 m
p-trans. minimum	= 0.05 GeV
track reconstruction eff.	= 0.99
charge misinterpretation prob.	= 0.005 0.015
acceptances (cos(theta)):	
for overall tracker system	= 0.996195
for TPC	= 0.978148
theta and phi resolutions	= 0.001 0.001
for p-t resolution -- see sr SITRAK	

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*** Electromagnet calorimeter :
    min. deposited energy           = 0.10 GeV
    electron misinterpretation prob. = 0.01
    acceptance (cos(theta))         = 0.996802
    granularity (cell size)         = 0.9 degrees
    energy resolution parameters    = 0.102 0.006

*** Hadron calorimeter :
    min. deposited energy           = 0.20 GeV
    average energy deposited by muons = 3.80 GeV
    acceptance (cos(theta))         = 0.996802
    granularity (cell size)         = 2.0 degrees
    energy resolution parameters    = 0.405 0.042

*** Add. forward tracker :
    p-trans. minimum                = 0.20 GeV
    charge misinterpretation prob.   = 0.003
    acceptance (min / max cos(theta)) = 0.996195 0.978148
    angular resolution parameters    = 0.001 0.001
    for energy resolution -- see sr SIFWMU

*** Forward muon tracker :
*** Instrumented mask :-
    min. energy of muon              = 5.00 GeV
    min. energy of particle          = 10.00 GeV
    acceptance (min / max cos(theta)) = 0.999962 0.996802
    for more details -- see sr SIMASK

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Event Pre-Selection

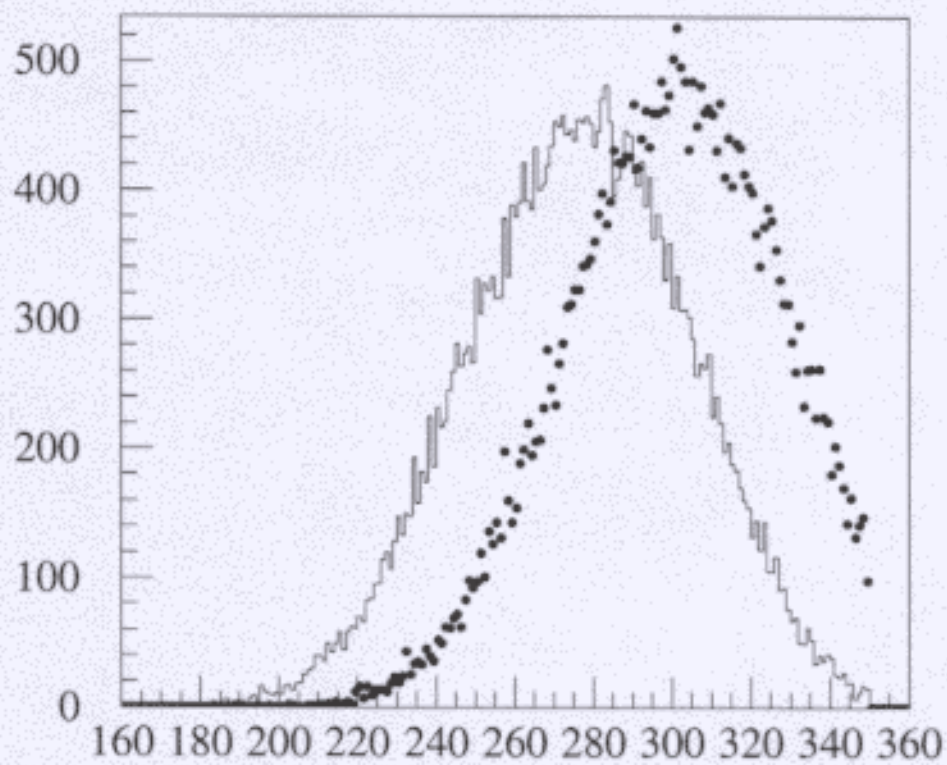
Channel (in 1000)	$\tilde{\chi}^+ b \tilde{\chi}^- \bar{b}$	qq	WW	eW ν	tt	ZZ	eeZ
	50	6250	3500	2500	350	300	3000
After Pres. SGV	66%	46788	115243	252189	43535	4027	4069
After Pres. SIMDET	67%	29488	83668	running	35305	1430	19796

- $25 < N_{\text{cluster}} < 110(140)$
- $0.2 < E_{\text{vis}}/\sqrt{s} < 0.7$
- $E_{\parallel}^{\text{imb}}/E_{\text{vis}} < 0.5$
- Thrust < 0.95
- $|\cos \theta_{\text{Thrust}}| < 0.7$

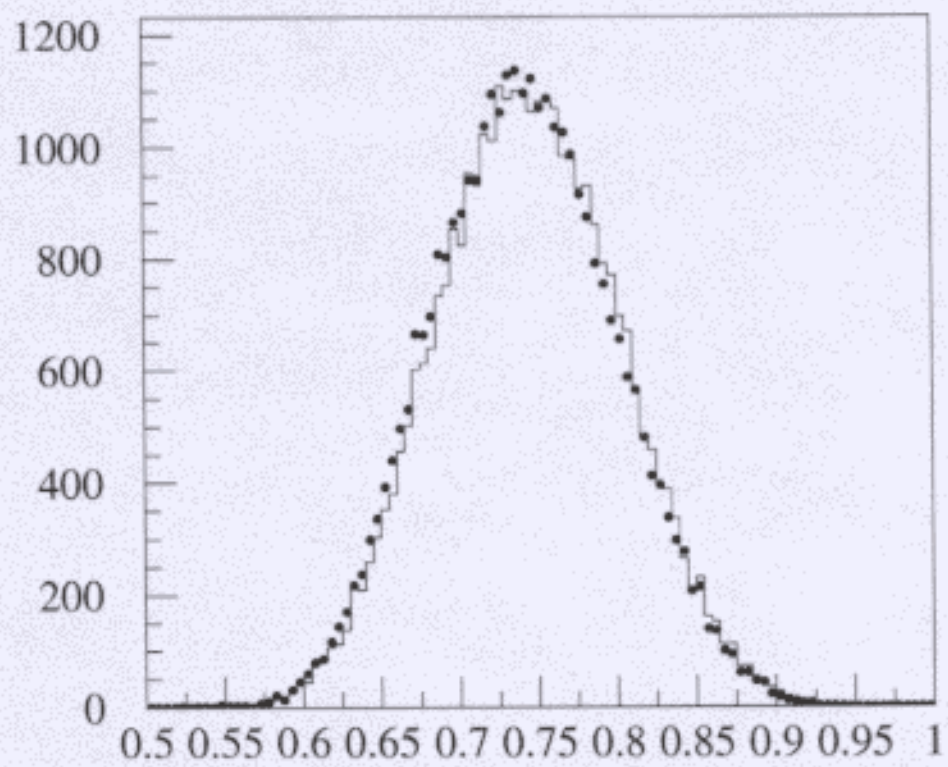
SGV vs. SIMDET: E_{vis} (GeV)

histos: SGV

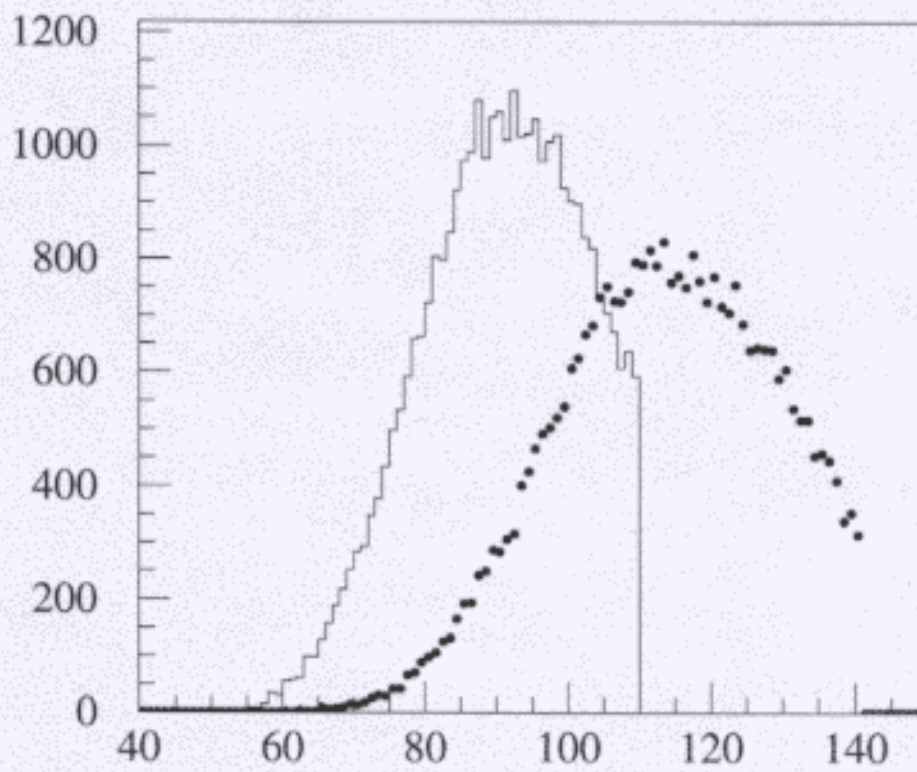
dots: SIMDET



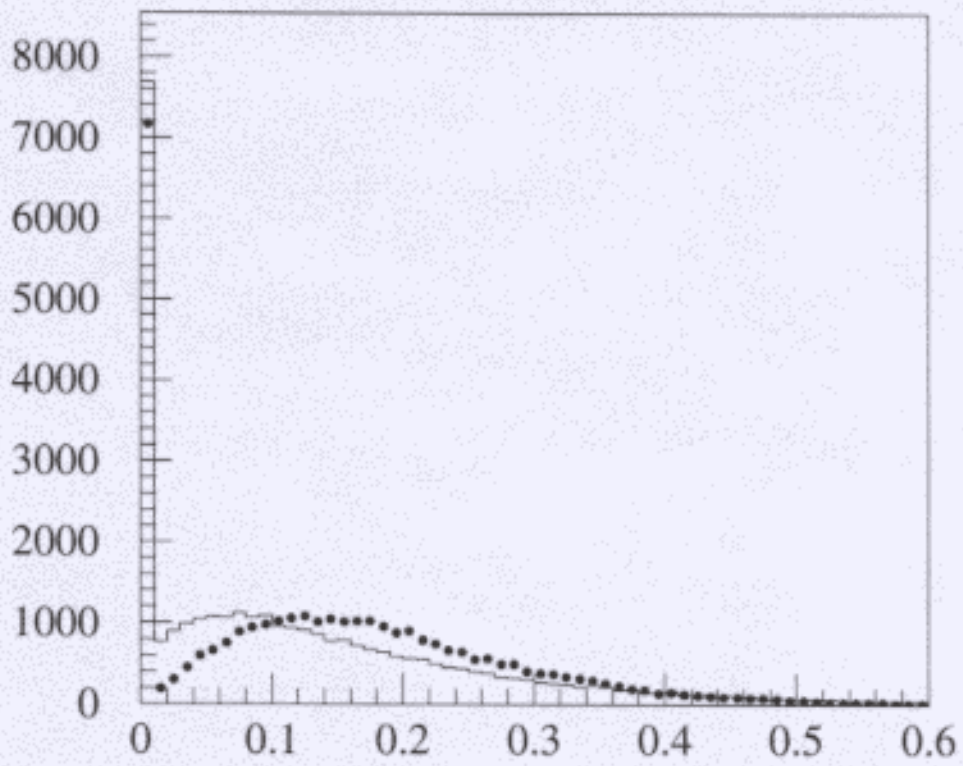
SGV vs. SIMDET: thrust



SGV vs. SIMDET: N_{cluster}



SGV vs. SIMDET: $\Theta_{lep.isol}$



Conclusions

- Update of standard analysis with SIMDET simulation.
- Extended mass region from 180 to 220 GeV.
- 16 mio. events simulated at DESY-Zeuthen.
- Differences between SGV and SIMDET:
new simulations are important.
- New results of the precision
mass and mixing angle determination
for the Chicago meeting.