

# "Linear Collider Studies"

James Wells

Talk / discussion outlining  
Where we're headed over  
the next year.

Time at end to bring up any  
relevant issue.

## ALC SUSY Conveners

Jonathan Feng

Uriel Nauenberg

Frank Paige

James Wells

One of our charges is to provide physics support (susy) for the American Linear Collider program.

⇒ Write, edit, and collect susy studies relevant to LC.

## The coming year....

The TESLA studies are high priority for many of us.

Next summer we will be producing document for Snowmass 2001.

Not sure exactly the form for this document yet ("orange book"?)

In any event, there should be plenty of opportunity for us all to contribute LC studies to help evaluate and support the LC effort.

## How to contribute?

- \* Come to LCWS00 ✓
- \* Come to Snowmass 2001, preferably prepared with a "defensible opinion"
- \* Help identify important new studies that will continue to complete the long standing LC worldwide effort.
- \* Actually work on LC studies/simulations.
- \* Help out with important LC documents.

# Study Categories

## 1. Scale of Superpartners

- Finetuning
- Dark Matter
- Higgs limits implications
- Precision EW data

## 2. Direct Mass Measurements

- End point distributions
- Threshold scans

## 3. Confirming supersymmetry

- SUSY coupling relations
- Super oblique corrections

## 4. Indirect mass and couplings measurements

- Effects in sparticle production
- Effects in sparticle decays

## 5. Extrapolation to high scales

- Models
- RGE and threshold uncertainties

## 6. LSP close in mass to another superpartner

- Wino LSP
- Higgsino LSP
- $m_{\tilde{\ell}} - m_{\chi_1^0} = \text{small}$

## 7. Decays to gravitinos

- $\chi_1^0$  as NLSP ( $\chi_1^0 \rightarrow \gamma \tilde{G}$ )
  - $\tilde{\ell}$  as NLSP ( $\tilde{\ell} \rightarrow \ell \tilde{G}$ )
  - meta-stable sleptons
- } hybrid

## 8. Supersymmetry at $e^+e^-$ , $e^+\gamma$ , $\gamma\gamma$

- Threshold scans and Mass determinations
- exotic particle production

## 9. Superlight gravitinos

- $e^+e^- \rightarrow \tilde{G}\tilde{G}\gamma$

## 10. CP violation studies

- More parameters quickly require much more precision (and more  $\mathcal{O}$ !).

## 11. Complementarity with LHC

- signals LHC would miss
- model independence LHC may struggle with
- LC + LHC  $\gg$  2x LHC or 2x LC.

## 12. $R_p$ studies

- weak  $R_p$  (decays only)
- stronger  $R_p$  (affects production of sparticles)

## LCWS-2000 Session P3: Supersymmetry

*All talks are 20 minutes; mini-reviews are 25 minutes.*

**Thursday, 26 October, 08:30-12:00**

**Chair: Uriel Nauenberg**

- |       |                   |   |
|-------|-------------------|---|
| 08:30 | Greg Anderson     | Fine Tuning Constraints   |
| 08:50 | Mihai Dima        | Smuon and Selectron Studies   |
| 09:10 | Kenichi Mizukoshi | Can Precision Measurements of Slepton<br>Masses Probe Right Handed Neutrinos? |
| 09:30 | Tilman Plehn      | CP Phases, Dipole Moments, and a Linear<br>Collider                           |
| 09:50 | Steve Mrenna      | Comparative SUSY Discovery Reach of LHC<br>and NLC in AMSB Scenarios          |
| 10:10 | Andre Sopczak     | Experimental Studies of Scalar Top  |
| 10:30 | Graham Wilson     | Completing the Sparticle Spectrum?  |
| 10:50 | Grahame Blair     | Reconstructing SUSY Theories at High<br>Energy Scales                         |
| 11:10 | Jim Wells         | Planning  |
| 12:00 | LUNCH             |   |



Open floor to discuss ...

"What needs to be accomplished over the next year?"

Some responses

\* Study all issues: relevant to "scale of superpartners" (DM, finetuning, Higgs, ...)

\* Comparing  $e^-e^-$  and  $e^+e^-$  threshold scans with ISR & beamstrahlung.

\* More direct demonstrations of LC vs. LHC information (what couplings are measured by each and how well?)  
Of course, LHC is our friend.

\* How does  $\gamma\gamma$  bkgd affect susy partner degenerate studies?

important  
global  
responses

\* Complete TESLA TDR

\* Be prepared for Snowmass '01 (work + documents)