The physics chapters in the GDE documents

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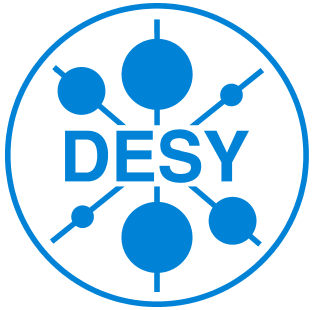

On behalf of Abdelhak Djouadi, Joe Lykken, Klaus Mönig, Yasuhiro Okada, Mark Oreglia and Satoru Yamashita

Introduction

Documents to be produced by end 2006:

- GDE ILC Reference Design Report (incl. a short physics chapter)
- Detector Concepts Report (incl. a longer physics chapter)

Editors of the physics chapters (1 exp., 1 theo. / region):

- America: Mark Oreglia, Joe Lykken
- Asia: Satoru Yamashita, Yasuhiro Okada
- Europe: Klaus Mönig, Abdelhak Djouadi

Timescale

- Bangalore: Presentation and discussion of outline
- Vancouver (July): Detailed discussion with the community
- Valencia (November): Presentation of final draft

Proposed Outline

- Introduction
  - Physics landscape in 2015 (incl. possible outcome from LHC)
  - Important open questions in particle physics
  - Possible running scenario for ILC
  - Physics signals at the ILC
- The Higgs system
- Couplings of gauge bosons (GigaZ, TGCs)
- Top quark physics and QCD
- Supersymmetry
- Alternatives to SUSY

Remarks on the outline

- The outline is strictly physics driven
  - "Signals" like Z' appear in different places
  - The main ones are collected in the "Physics signals" subsection of the introduction and then referred to later
- The chapter has to justify 500 GeV as a machine worthwhile on its own and the need for a 1 TeV upgrade
- The connections to LHC, cosmology etc. have to be stressed
- What about simultaneous running with LHC?
- "Standard physics" including Higgs will be described in detail
- "New physics" will be described in form of a few examples

Remarks on the outline (II)

- Supersymmetry:
  - Bulk scenario for high energy extrapolation
  - DM compatible parameter summary
  - CP violating models
  - Impact on neutrino physics (GUT, seesaw)
- Alternatives to SUSY:
  - Emphasis on models that give answers to electroweak symmetry breaking and dark matter
  - Especially think about Little Higgs Extra dimensions (ADD and universal)
  - Need to discuss also models without Higgs (Higgsless, SEWSB)

Simulation work

- We need to prove that we can do the physics we claim
- Ideally use full simulation for some difficult key channels e.g.:
  - BR($H \to c\bar{c}$)
  - $\tilde{\tau}$ in low Δm SUSY
  - WW-ZZ separation
- Other channels like ZHH may have to live with a hybrid solution
- However the simulation has to be done with the detector we think to have for the ILC (i.e. $\Delta E/E = 30\%/\sqrt{E}$)
- If we don't reach this in time we have to stay with fast simulation
- Some other missing items:
  - Top weak couplings (which energy is needed?)
  - $q\bar{q}$ production: statistical and systematic errors on σ and A_{FB}

Requirements from theory

- For many items one can use available material.
- For a few points, one needs some updates:
  - Determination of quark masses, ...
  - Scalar Higgs potential with effects of New Physics
  - Chiral Lagrangian approach for the no Higgs scenario
  - Update/extend benchmark points (lines?) for SUSY ...
- For some points, one needs new studies:
  - Model independent study of Higgs production and decay
  - DM, CPV, Baryogenesis
  - KK Dark Matter at ILC? Other points with extra dims?...
- Joint experimental/theory new effort is needed:
  - Strongly interacting Higgs sector
  - Effect of τ polarisation in rejecting bkg for low $\Delta m_{\tilde{\tau}}$
  - Scenarios for complementarity between LHC and ILC

Community Input

- We encourage comments for all of you
- Use the wiki page we will set up on www.linearcollider.org
- Physics groups should keep us informed of new developments
- And you can reach each of us:
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