

:Indian Links to $e^+ e^-$ Programm : Experiments and ILCWG

Rohini M Godbole

Centre for Theoretical Studies
Indian Institute of Science, Bangalore.

IISc



INDO-US Interaction Meeting On
Linear Collider Physics

Nov. 10,11 2003.
Delhi, India

ILCWG

Outline

- Importance of $e^+ e^-$ colliders.
- Indian Participation in the Experiments.
- Indian Linear Collider Working Group
ILCWG

Importance of the e^+e^- Colliders

Low Energy Colliders:

- ADONE ≤ 3 GeV R, (missed ψ)
- DORIS ≤ 8 GeV, Discoveries : $\psi, \psi' \dots, \tau$
- PEP/PETRA ≤ 40 GeV, Discoveries: gluon, R general studies
- TRISTAN ≤ 60 GeV R, top search, 2γ studies
- CESR ≤ 12 GeV $\bar{b}b$ studies, rare decays
- BEPC ≤ 5.6 GeV precision M_τ
- DAΦNE ≤ 1.5 GeV ϕ studies

Importance of the e^+e^- Colliders

High Energy e^+e^- Colliders :

- SLC ≤ 92 GeV Lin. Collider, precision (EW/ Z)
- LEP ≤ 209 GeV precision EW/ Z+W, HIGGS/SUSY searches
- PEP II $\leq 9 \times 3.1$ GeV $B\bar{B}$ factory
- KEK B $\leq 8 \times 3.5$ GeV $B\bar{B}$ factory
- B factories do high precision, high statistics measurements

$e^+ e^-$ collider vs hadron collider

□ For the same cm energy at constituent level effective $E_{cm}(e^+ e^-) \Leftrightarrow 6 \times E_{cm}(pp)$

□ $e^+ e^-$ environment is much cleaner to study. Theoretically better understood
experimentally easier to handle (no through going energy into beam pipes)

$e^+ e^-$ collider vs a hadron collider

- But hadrons easier to store, can be accelerated to higher energies and suffer no energy loss in circular orbit.
- Thus in general hadron colliders are better for highest energy exploratory physics and $e^+ e^-$ colliders are better for detailed, precision studies or discoveries where it depends on very clean, background free environment.
- With LEP reign over, LHC on the horizon, time has been ripe for talking about the Next e^+e^- Collider for a while now.

Past, present Indian contributions in $e^+ e^-$ physics (experimental)

LEP L3 experiment

Hardware fabrication : 1000 brass tube proportional chambers for End – cap Hadron Calorimeter

Software : major contributions towards L3 CORE software: simulation, graphics, DBMS, utility packages

Past, present Indian contributions in $e^+ e^-$ physics (analyses)

Physics analyses :

Responsible for L3 Lineshape results

Searches for Higgs (SM + SUSY)

QCD studies, α_s from event shape

Pioneering work in $b\bar{b}$ tagging using neural networks and study of

$Z \rightarrow b\bar{b}$ events

SUSY particle searches

W – pair selections, production x – sections, W – mass width determination

Indian contributions to LC physics(Pheno.)

- Many INDIVIDUAL contributions from indian phenomenologists in the past 15 years , e.g.,
- First study of 2γ backgrounds at Linear Collider in work done at Workshop on High energy Phenomenology, 1992.
- A large number of investigations of possibilities of Physics studies beyond the SM: Higgs, SUSY, nonstandard top physics and higher dimensional theories at ALL options e^+e^- , $e\gamma$ and $\gamma\gamma$ Colliders.

Indian contributions to LC physics(Pheno.)

Systematic contribution to various International Linear Collider studies of Physics Potential of LC

- 1991 : Proc “ e^+e^- collisions at 500 GeV”, Munich/Annecy/Hamburg
- 1993: Proc “ 2nd International workshop on Physics and experiments with Linear e^+e^- colliders”, Waikoloa Hawaii, april 1993
- Mid 1990s: “ Physics with e^+e^- colliders”, by ECFA/DESY LC physics working group E.Accomando et.al.Phys.Rep. 229, 1 – 78, 1998

Indian contributions to LC physics (pheno.)

- 1998 – 2003 : TESLA Tech, design report 2001, in “ Physics at e^+e^- Linear collider” and “ The Photon collider at TESLA”; continuing work ECFA/DESY work for TESLA including contributions to Extended ECFA/DESY workshop, April 2003
- 2000 : Group summary in ACFA workshop in Taipei August 2000 on extra dimensions and SUSY,
- 2001 : Contributions to the ACFA report, “ Particle physics experiments at the Joint Linear Collider”.

Indian contributions to LC physics (pheno.)

- 2001 : Contributions to SUSY & 2 - γ sections, T.Abe *et.al* (Amercian LC working group collaboration), “ Linear collider physics resource book for Snowmass 2001” , SLAC – R- 570.
- 2002 : Plenary talk / session organisation at the International Linear Collider workshop Held at Fermilab LHC-LC interdependence study group under ILCSC (Rohini Godbole with Georg Weiglin & Frank Paige), Contributions to Jeju LCWS.
- 2003: Contributions to Photon 2003 Conference, in photon – photon collider physics.

Indian participation in ACFA LC activity

Attending ACFA/LC workshops
(From 2002 supported by KEK/Organisers)

- 1998 : A.Gurtu
- 2000 : R.Godbole
- 2001: S.Rindani
- 2002: M.Guchait

Indian LC project

- 1998 : ACFA initiative to involve Indian physicists in “Physics and detector working group”
- November 1998 : A. Gurtu attendance of 1st ACFA workshop on Physics/Detector for the Linear colliders at Beijing
- December 1998 at the Indian Symposium of high energy physics at Chandigarh: Presentation (A. Gurtu, RG) & by general discussion by Indian high energy community about joining LC effort
- In particular in contributing towards impending ACFA feasibility study.

Indian LC project

- Commitment of most experimentalists in the field towards LHC programme: (ALICE,CMS)
 - . start mainly with physics / phenomenology / simulation studies

- November 1999 : Mini – workshop on Linear Collider possibility at TIFR
 - . Agreed to write a proposal to Dept. of Science & Technology (DST) to enable small workshops/ meetings for LC related work in India
 - . In particular for coherent, co-ordinated towards the ACFA efforts

- January 2000 proposal submitted to DST

Indian LC project

Proposal submitted to DST on 6th December 1999

The studies of the physics potential of a Linear Collider at the present time, require a close collaboration between the experimental community and the phenomenologists. A fair number had been involved in various International Working Groups. With the commitment of the Exptal group to LHC, this proposal had focussed more on phenomenological studies.

Time now ripe for extending the group of people involved.

Indian LC project

The first meeting of the working group was held in CTS, IISc, Bangalore on March 24-27, 2002. The program of the meeting can be found at

<http://hp0.cts.iisc.ernet.in/Meetings/LCWG/talk/talk.html>

The second meeting of the working group was held in Tata Institute for Fundamental Research, Mumbai on 1-2 Jan 2003. The program of the meeting and transparencies can be found at

<http://www.tifr.res.in/~lc/proceedings/index.html>

Indian LC project

The third meeting of the working group was held in TIFR, Mumbai on 8-10 May 2003. The program and the transparencies can be found at

<http://www.tifr.res.in/~lc/proceedings/index1.html>

The 4th meeting of the working group was held in CTS, Bangalore on 8-10 Oct. 2003. The program of the meeting and transparencies is available at

<http://hp0.cts.iisc.ernet.in/Meetings/LCWG/program.html>

6th ACFA workshop to be held in Mumbai, December 15-17, 2003.

Web Page of ILCWG

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://hp0.cts.iisc.ernet.in/Meetings/LCWG/index.html> Search Print

Home Bookmarks WebMail Calendar Radio People Yellow Pages Download Channels

Indian Linear Collider Working Group

Supported by Department of Science and Technology under the project 'Studies for Future Linear Collider'

Home
People
News
References
Links

ILCWG

ILCWG is an Indian collaboration for studying the Physics at linear colliders.

Interaction Meeting

10-12 November, 2003

Welcome to the homepage of Indian Linear Collider Working Group (ILCWG) at [CTS](#). Please also visit the [mirror site at TIFR](#).

The working group was formed in 2002 and the first meeting was held in CTS, IISc, Bangalore on March 24-27, 2002. The aim of this working group is a comprehensive study and comparison of the potential of future colliders (LHC, LC, gamma-gamma) for resolving/testing various physics issues. The group is divided in to five sub-groups.

- [Accelerator Physics](#)
- [Extra Dimensions](#)
- [Higgs Physics](#)
- [QCD](#)
- [SUSY](#)

ILCWG Meetings

The first meeting of the working group was held in CTS, IISc, Bangalore on March 24-27

Done

Indian LC project

Future Plans

- Continue the phenomenology studies, particularly LHC – LC symbiosis
- Begin detector oriented simulation efforts
- Review the situation about international LC plans , EHEP manpower situation in the country AND International Interaction.
- At appropriate time take decision in overall Indian context
(Like for the CERN – LHC programme – contribution towards accelerator and experimental collaboration)