

Feature Story

Future Generation of Physicists at U. Colorado Helps with ILC



Students conducting calorimetry work in Uriel Nauenberg's lab at the University of Colorado.

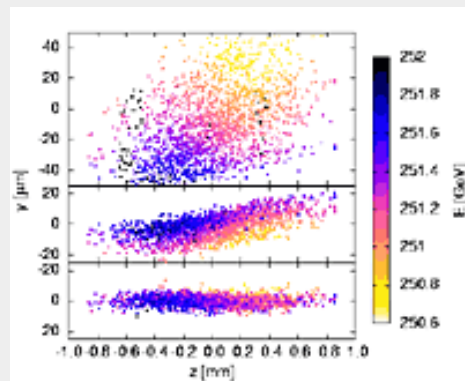
With the projected timescale for the International Linear Collider, the majority of scientists and engineers who are currently working on the proposed project will be well into retirement by the time the first collisions occur. Uriel Nauenberg, a particle physicist at the University of Colorado, is doing his part to ensure that the field of particle physics will have a future generation to carry on the projects and experiments that are under development now.

Ranging from freshmen to second-year graduate students, Nauenberg has a group of seven students and one research assistant working on calorimetry research for the ILC. Never a dull moment in his bustling lab, the majority of his students develop software code using JAVA and C++ to reconstruct particle events. Gaining some real world experience in the field, a number of his students attended the Snowmass Workshop this past summer and even presented their research during the calorimetry sessions. More recently in January, his students participated in the American Linear Collider Physics Group Detector Simulation Workshop.

While some students are already familiar with JAVA and C++ when they start working with Nauenberg, a number of them have learned how to program after spending only a few

Feature Story

Following the Beam



Emittance preservation: Beam at the end of the main linac. After the use of a simple correction method, particles of different energies have a clear spread in vertical position (top). This is corrected better with an advanced correction method (middle) and with an advanced correction and additional global optimisation the result is very good (bottom).

Obtaining high luminosity beams will be crucial for the future International Linear Collider. An important indication on the beam quality is given by the emittance which depends on its size and opening angle. The lower the emittance, the easier it is to focus the beam and the more particle collisions can occur and be analysed. In the GDE the "Accelerator physics" group, a special team dedicated to the technical systems organised at CERN, on 08-11 February 2006, a "Low Emittance Transport Workshop". About 30 accelerator scientists, coming from all regions, attended it.

The main purpose of the "low emittance transport" group is to make a survey of the beam from damping ring to the interaction point. "Our first objective is to deliver a lattice design which consists of defining the systems of magnets and accelerating components.", said Daniel Schulte, co-convenor of the GDE "Accelerator Physics Group", who organised the workshop with Kiyoshi Kubo and Peter Tenenbaum.

Director's Corner

Energy Upgrade

"Independent of the results from the first few years of running there are several reasons for an energy upgrade. Examples include higher sensitivities for anomalous gauge boson couplings, measurement of the Higgs boson self coupling, the coupling of the Higgs to the top quark, production thresholds for new massive particles or exploration of extra spatial dimensions. Consequently, the energy of the machine has to be upgradeable."

"The strong likelihood that there will be new physics in the 500 – 1000 GeV range means that the upgradeability of the LC to about 1 TeV is the highest priority step beyond the baseline."

I am quoting above from the document entitled, "[Parameters for the Linear Collider](#)" written by a subcommittee of the International Linear Collider Steering Committee and dated September 2003. This important report defines the top level science requirements that we are using in designing the ILC. Consequently, as we develop the design of the ILC, we are absolutely committed to the upgrade-ability of the machine to 1 TeV, and we have been seeking a well conceived upgrade path.

Possible upgrade scenarios to 1 TeV were discussed at length during the Snowmass Workshop last summer, but no conclusions or consensus emerged. As we moved toward a baseline configuration this past fall, the GDE Executive Committee formed five groups to analyze some key unresolved issues from Snowmass and to write white papers to help determine what to include in the Baseline Configuration Document. In the case of the energy upgrade, the white paper analyzed four different strategies. Three of them used

months in the lab. Sarah Moll, a freshman who started working with Nauenberg before she started college, is one of these cases. "I learned all of the computer programming here," she said. "I picked it up over the course of the semester and really find it interesting. A lot of the physics is beyond me at this point, but working in the lab keeps me interested. I definitely enjoy the research and high-energy physics is what I want to be doing."

[Read more...](#)

-- Elizabeth Clements

Calendar

Upcoming meetings, conferences, workshops

Linear Collider Workshop in Japan
Tokyo, Japan
3 March 2006

[ILC GDE Meeting](#)

Bangalore, India
9-11 March, 2006

[LCWS 2006](#)

Bangalore, India
9-13 March 2006

[International Symposium on Detector Development in Particle and Astroparticle Physics and Synchrotron Radiation](#)

SLAC
3-6 April 2006

[ILC Americas Regional Team Review](#)

ILC - Americas
FNAL
4-6 April 2006

[ILC Software and Physics Meeting](#)

Cambridge
4-6 April 2006

[International Accelerator School for Linear Colliders](#)

Sokendai, Graduate School for Advanced Studies
Hayama, Japan
19-27 May 2006

Schulte is also the coordinator of the "Integrated Luminosity Performance Studies" Work Package within the EUROTev (European Design Study Towards a Global TeV Linear Collider) European programme. Another important task for the group is to review the studies on the tuning of the systems. They will predict the performances of the machine and specify the hardware to correct the beam trajectory and improve its quality.

[Read more...](#)

Links:

["Explain Luminosity in 60 seconds"](#)

From *Symmetry* magazine

[ILC LET workshop slides](#)

[GDE: ILC Reference Design Report Wiki](#)

[EuroTeV: WP6: Integrated Luminosity Performance Studies:](#)

-- Perrine Royole-Degieux

In the News

From *Les échos*
15 February 2006

A new Cathedral for physicists

European specialists in particle physics prepare the next generation of accelerators. "European physicists think big. A few months after obtaining the gigantic nuclear research project ITER, and a few months before the commissioning of the huge LHC accelerator at CERN, they are already dreaming of the next big cathedral of particle physics: the linear collider ILC. A few days ago, the National Institute of Nuclear Physics and Particle Physics (IN2P3) invited more than 300 researchers to the LAL laboratory of Orsay in order to define a European strategy on this symbolic science, requiring heavy fundings."

[Read more \(French\)...](#)

From *IN2P3/CNRS and IHEP*
16 February 2006

China connects to France for the data exploitation of LHC

somewhat more than 20 km of tunnel with cryomodules for the baseline 500 GeV machine and then expanded to more than 40 km with additional cryomodules to upgrade to 1 TeV. The fourth used a more sparse arrangement over 40+ km for 500 GeV and missing cryomodules would be installed at a later date.

These alternatives all require a significant investment in a full 40+ km tunnel from the beginning, but with different strategies for cryomodules implementation for the 500 GeV machine. At this point, however, the GDE Executive Committee feels that it is very difficult to justify the large extra expense of an unused tunnel. Therefore, we decided that the BCD should only include what is needed to insure that upgrading to 1 TeV is feasible.

[Read more...](#)

--Barry Barish

[Director's Corner Archive](#)

Announcements

International Accelerator School for Linear Colliders Update

The application process for the International Accelerator School for Linear Colliders is now closed. Applicants will be notified in March of their acceptance.

CALOR 2006

The twelfth international conference on calorimetry in high-energy physics, CALOR 2006, will be held in Chicago, Illinois, USA from 5-9 June 2006. This conference brings together world experts on calorimetry in high energy physics and related fields for in-depth discussions of the latest developments and innovations. [More Information...](#)

ILC Related Preprints

[hep-ph/0602175](#)

20 Feb 2006

Single Top-Quark Production in Flavor-Changing Z' Models

[hep-ph/0602131](#)

15 Feb 2006

Neutralino Production and Decay at an e^+e^- Linear Collider with

[ILC VTX Workshop at Ringberg](#)

Ringberg Castle, Lake Tegernsee,
Germany

28-31 May 2006

[CALOR 2006](#)

12th International Conference on
Calorimetry in High Energy Physics
Chicago, USA

5-9 June 2006

[View Full Calendar...](#)

"(...)At the occasion of this agreement, Michel Spiro, Director of the IN2P3, and HeSheng Chen, Director of the IHEP, emphasized their intention to follow up the collaboration of the two institutes beyond the LHC. A future coordination of the research efforts could take place around the International Linear Collider project (ILC), complementary to LHC, as well as in the field of neutrino and astroparticle physics. A collaboration on technological developments related to the physics and accelerators of both institutes is also considered.(...)"

[Chinese press release](#)

[French press release](#)

Transversely Polarized Beams

[hep-ph/0602130](#)

15 Feb 2006

New-Physics Search through gamma
gamma -> t tbar -> IX/bX

[EUROTeV-Report-2006-001-1](#)

1 February 2006

[Optics of the ILC Extraction Line for 2
mrad Crossing Angle](#) (pdf)

[Snowmass Proceedings](#)