

October 15, 2004

**PROPOSAL FOR THE
ORGANIZATION OF THE INTERNATIONAL LINEAR COLLIDER
EXPERIMENTAL PROGRAM**

*Organizing Committee . of the
Worldwide Study of Physics and Detectors for Future Linear e+e- Colliders*

1. PREAMBLE

The International Linear Collider Steering Committee (ILCSC) has established a task force to recommend a framework for an interregional organization that will develop the design of the International Linear Collider. The Global Design Initiative (GDI) was proposed by this task force[1] to be established soon after the linear collider technology choice in 2004. The proposed organizational chart for the GDI in the early phase, known as the GDE, is shown in Figure 1. The GDI mission will be to proceed quickly to a Technical Design Report for the ILC.

The timeline envisioned for the accelerator in the task force report is:

- 2004 International technology selection. Multi-laboratory MOU's to define and initiate the Global Design Effort.
- 2005 Complete the accelerator CDR, including site requirements, and initial cost and schedule plan.
- 2006 Initiate detailed engineering designs under the leadership of the Central Team.
- 2007 A complete detailed accelerator TDR with the cost and schedule plan, establish the roles & responsibilities of regions, and begin the process for site proposals.
- 2008 Site selection and approval of international roles & responsibilities by the governments.

The ILCSC has requested of the *Worldwide Study of Physics and Detectors for Future Linear e+e- Colliders* (WWS) that it develop a proposal for getting letters of intent and costed TDRs for the detectors (see Addendum 1 below). This document responds to that request, with a proposal developed by the WWS Organizing Committee (WWSOC), following discussion in the full community of the WWS.

The WWS recognizes the importance of developing the designs and plans for the linear

collider detectors in a timely concordance with the accelerator planning, with detector costs properly integrated into the project. With this in mind, the community has developed a planned sequence of steps, with timing linked to the GDI proposal. The successful experimental program will depend on achieving effective, coordinated, worldwide efforts in the following pursuits:

- 1.) Detector research and development
- 2.) Integrated detector designs, complete with performance and cost studies
- 3.) Close coordination of detector studies with accelerator studies on issues of machine-detector interface
- 4.) Organization of oversight and review of the program

2. PROPOSAL to ILCSC

A. The ILCSC will charge the WWSOC with specific responsibilities, which should include:

- a) Recognizing studies being made of whole-detector concepts, and co-ordinating the presentation of their performance studies and their cost estimates, on timescales set by ILCSC; the WWSOC will work toward interregional, and multiple, studies, leading eventually to detector technical design reports (TDRs);
- b) Coordinating with the Central Team set up by Global Design Initiative for the accelerator, especially on questions of detector cost, beam delivery, accelerator issues impacting the experimental physics program, and the machine detector interface;
- c) Keeping a register of those detector, accelerator design, and machine-detector interface R&D activities which are relevant to the Linear Collider experimental physics program, identifying R&D activities which are vital to the Linear Collider experimental physics program, especially those which are lacking effort;
- e) Arranging for peer review of R&D proposals.
- f) Reporting on all of these matters, and others assigned, to the ILCSC.

B. MECHANISM

These responsibilities will be executed by the WWSOC through the formation of working panels which will report to it. Initially, the following panels are foreseen.

1. Costing Panel

- 2. Detector R&D Panel
- 3. Machine Detector Interface (MDI) Panel

Other panels will be formed by the WWSOC as the need arises.

C. MILESTONES

The two significant milestones for the collider in GDI report, the CDR and the TDR, are defined in [1]. Appropriately modified versions of these definitions for the detector are proposed as follows:

A detector CDR would contain a relatively detailed conceptual design of the detector, based on the chosen technologies and parameters. It would include detailed specification of physics performance on key benchmarks, technical feasibility, and cost estimates.

A detector TDR would be based on prototypes, industrialization and engineering sufficient to provide solid cost estimates and demonstrate viable solutions to all important technical issues.

D. TIME-LINE

Given the time-line proposed by the GDI task force, we propose the following time-line for the steps in the development of the detectors (dates in parenthesis are proposed dates in GDI plan[1]). The detector schedule is tied to that of the GDI; if the GDI schedule is modified, then the detector schedule should be modified in concert.

GDI Accelerator Milestone

Steps toward Detector Realization

ITRP Technology
Recommendation (2004)

1. Form panels (Costing, Detector R&D, MDI) and initiate global Detector R&D Review - early 2005

Accelerator CDR (2005)

2. Preliminary costing of at least two whole-detector concepts (single joint document with performance estimates for each concept, plus reference to R&D done and that still required.) This document should be produced in time to be included in the Accelerator CDR process of the GDI.

Accelerator TDR (2007)

3. Detector CDRs – WWSOC receives Conceptual Design Reports for experiments (these could be based on a different set of concepts from the costing study, above, as new ideas come with new people) with detailed specification of physics performance

on key benchmarks, technical feasibility, and refined cost estimates. Individuals will be encouraged to sign more than one CDR.

Formation of Global Lab (2008)

4. Proposals – Groups which have united around CDR detector concepts submit Letters of Intent for proposals (including performance, costs, and technical feasibility) to the Global Lab, which will invite some of the groups to produce TDRs.

Global Lab + 1 year (2009)

5. Detector TDRs – Global Lab receives TDRs from invited Proposals and selects experiments.

3. GLOBALIZATION OF ACTIVITIES

The WWSOC will require all recognised detector concept studies to recruit participants from all three regions and to report to the workshops (ACFA, ALCPG and ECFA) in all regions.

Detector and MDI R&D programs will be strongly encouraged to collaborate across regions and share test beam facilities wherever they can be found.

At all stages of the time-line above the WWSOC will encourage new researchers and groups to join the effort.

4. FUNCTIONS OF THE PANELS FORMED IN STEP 1

a) Costing panel: will request inputs from the teams developing each of the detector concepts, ensuring that costs are calculated for each concept on the same basis, with similar pricing for similar components and the same contingency allowances etc. It will edit into a single document the costings for all of the currently active concepts and prepare it to be presented to the funding agencies with the costed accelerator CDR from the GDI. The contingency component will need to be large at this early stage. The document will be approved by the WWS OC who will pass it to the ILCSC and the GDE. When the initial costing is complete (Step 2. on the time-line) this panel will stand down.

b) Detector R&D review panel: will maintain a register of recognized ongoing detector R&D programs (starting from the review in Step 1), identify important missing activities, encourage, and arrange for peer review of new proposals (either by delegating to existing regional peer review panels or by appointing its own referees), and endorse approved programs to national funding agencies. This

panel will need to stay in existence until the end of Step 3 on the time-line.

c) Machine Detector Interface panel: will liaise with the GDI to coordinate MDI issues between the accelerator and the experimental R&D and concept development teams, will identify beam delivery and interaction region issues which need R&D and will encourage groups to do it. This panel will need to stay in existence in some form until the Global Lab. is ready to take over its role at Step 5 of the time-line.

REFERENCE

Report of the ILCSC Task Force for Establishment of the International Linear Collider Global Design Initiative, http://www.fnal.gov/directorate/icfa/04-03-31_GDI_TF_Report.pdf

* Organizing Committee of the Worldwide Study of Physics and Detectors for Future Linear e^+e^- Colliders:

Co-chairs

- Jim Brau, University of Oregon
- David Miller, U. C. London
- Hitoshi Yamamoto, Tohoku University

American Committee Members

- Paul Grannis, SUNY, Stony Brook (USA) (membership through July, 2004)
- John Jaros, SLAC (USA)
- Dean Karlen, Victoria (Canada)
- Andreas Kronfeld, Fermilab (USA)
- Mark Oreglia, University of Chicago (USA)
- Ritchie Patterson, Cornell (USA)

Asian Committee Members

- Akiya Miyamoto, KEK (Japan)
- Atul Gurtu, Tata Institute of Fundamental Research (India)
- JooSang Kang, Korea University Seoul (Korea)
- ChangGen Yang, IHEP Beijing (China)
- Wei-Shu(George) Hou, National Taiwan University (Taiwan)

European Committee Members

- Tiziano Camporesi, CERN
- Michael Danilov, ITEP (Russia)
- Rolf Heuer, University of Hamburg (Germany)
- Francois Richard, Orsay (France)
- Ron Settles, Munich (Germany)

1. ADDENDUM 1

EXCERPT from ILCSC draft minutes of 12 February 2004 meeting

" David Miller reported on detector R&D activities. In general, most R&D programs are under-funded, and there are also not enough available test beams, especially of high-energy hadrons. At present, R&D programs are approved regionally, but many programs are interregional, as are detector concepts. There should be some mechanism for an international group (GDO?) to vet and coordinate national R&D programs, and eventually to make a choice between the at-least two competing overall concepts. If a linear collider is to start operation in 2015, then some decisions need to be made as early as 2006. In addition, funding agencies will need to know not only the accelerator cost but also the detector cost at about the same time.

" After discussion, it was felt that the WWS should make a proposal for getting Letters of Intent and costed TDRs around 2006. The WWS should inform ILCSC how the detector design process is going to parallel the accelerator design process, and how the detector process should be linked to the GDO."

Figure 1: Schematic for the Global Design Effort: the early phase of the GDI. [1]

