

## **REPORT OF THE FIRST MEETING OF THE ILC PROJECT ADVISORY COMMITTEE (PAC)**

19/20 October 2008; Paris

**Committee:** Jean-Eudes Augustin, Paris (Chair); Günther Geschonke, CERN; Don Hartill, Cornell; Steve Holmes, Fermilab; Enzo Iarocci, Rome (ILCSC Chair—ex officio); Akira Masaike, Kyoto; Robert Orr, Toronto; Raj Pillay, TIFR; Roy Rubinstein, Fermilab (Secretary); Masakazu Yoshioka, KEK

**Apology:** Lyn Evans, CERN.

### 1. **Introduction**

The first meeting of the ILC Project Advisory Committee (PAC) took place on 19/20 October 2008 at LPNHE, Université Pierre et Marie Curie, Paris, and was opened with a welcome by the LPNHE Director Pascal Debu. The Committee is very grateful to the LPNHE leadership for their gracious offer to host the meeting, particularly with the additional burden of the necessity for one meeting session to be on a Sunday.

The PAC was formed in early 2008 to assist the International Linear Collider Steering Committee (ILCSC) in the latter's oversight of both the Global Design Effort (GDE) activities on ILC accelerator design and also of the ILC detector activities. The PAC mandate is given in Appendix I.

The first PAC meeting consisted of one day of presentations on the ILC accelerator status and plans, and a half day of presentations on the status and plans for ILC detectors. The PAC members were very appreciative of the considerable efforts made by the presenters and by the leadership of the accelerator and detector efforts to provide the Committee with the information needed to adequately evaluate their activities, and to provide answers to the Committee's questions. The meeting agenda is given in Appendix II, and the presentations to the Committee are in Appendix III.

The PAC took note of the formation of the Accelerator Advisory Panel (AAP) to advise the GDE Director on accelerator issues, and the need to ensure that the activities of the PAC and the AAP were complementary and not duplicative. The PAC felt that both bodies were needed, since their roles are significantly different, and looked forward to hearing reports from the AAP at future PAC meetings.

### 2. **Accelerator Reports Presented to the PAC Meeting**

A. Barry Barish gave an overview of the Global Design Effort (GDE) activities. Technical Design Phase I (TDP I) will end in 2010 with an interim report, and TDP II in 2012 with a final

report; TDP II would allow a defensible (although not fully engineered) proposal to be made to governments in 2012. The major activity of the current GDE program is R&D, with much effort on optimization of accelerator cost-to-performance. Studies also are starting on ILC siting in conjunction with ILCSC and other groups.

Barish described his need for the Accelerator Advisory Panel (AAP), noting that its detailed technical reports could be made available to the PAC if so requested. He reported on the changes in the GDE program necessitated by the UK and US funding reductions at the end of 2007, and noted that GDE was now re-studying, as part of its cost-reduction program, one versus two tunnels and deep versus shallow sites.

B. The Accelerator Advisory Panel (AAP) was described as an experiment for a new and potentially very valuable approach to the internal review requirements of a large science project. Eckhard Elsen said that there was a need for peer review of GDE activities by an internal group that understands the possibilities, constraints, etc., of the project, and can add independent expertise as needed. The AAP meets monthly, with AAP members assigned to technical areas and who attend technical group leaders' meetings. The AAP has no executive powers, and reports only to the GDE Director. It will in addition conduct a major review approximately annually, with the first one scheduled for April 2009.

C. Marc Ross, one of the GDE Project Managers, described the aims and goals for the Technical Design Phase, and the anticipated Project Management activities. He discussed the roles of the technical area leaders, and gave tables of resources. Ross commented that the goal was to deliver a Technical Design in 2012 for submission to governments.

In questions and answers following Ross' talk, it was noted that 2012 is the important date; the 2010 report is an intermediate goal to demonstrate progress. Some alternate designs are being carried forward, including alternate positron production schemes (although the undulator source is still the baseline).

D. Superconducting RF and Main Linac technology were discussed by Akira Yamamoto. He noted the R&D goals of 35 MV/m in vertical tests and 31.5 MV/m as the operational gradient. Yamamoto said that the current R&D status is ~30 MV/m, which is adequate for the XFEL, but still ~20% below the ILC goal; however, he pointed out that several cavities at DESY have reached ~ 35MV/m.

Yamamoto described the concept of "plug compatibility" for the cavities, and showed which cavity details are flexible and which are required to be plug-compatible. He discussed the collaboration on cavities with the XFEL and other projects, and the eventual goal of global cooperation on plug compatibility and a smooth transition to a construction/production phase.

In the subsequent question/answer period, Yamamoto said that he expected two iterations (with a maximum of three) to go from a 50% cavity yield to a 90% yield. About 100 cavities are expected to be produced by 2010, with ~30 needed for quality control. Although alternate cavity geometries will be studied, no change to the baseline design will be made by 2010.

E. Junji Urukawa described Final Focus and Damping Ring test facilities. These include electron cloud and ultra-low emittance studies at CESR-TA; fast kickers and ultra-low emittance studies at ATF; fast kickers and electron cloud studies at DAFNE; and final focus and BDS studies at ATF2. Urukawa discussed the results achieved so far, and the future program.

F. Machine design and cost reduction was covered by Nick Walker; he introduced the concept of the “Minimum Machine”, and gave the goals of the TDP for cost-reduction. For cost-reduction, the aim is to understand the derivative of cost with various figures of merit (such as margin, redundancy, etc.).

The Minimum Machine can produce a set of options which may prove cost effective, and Walker gave several examples; one could be the use of a shallow site or a single tunnel like the XFEL. He also gave some examples of very preliminary “ball-park” estimates of possible cost savings.

In questions/answers following Walker’s presentation, some concern was expressed that changes could save construction costs, but could lead to additional subsequent operating costs or later upgrades being more expensive.

G. Brian Foster discussed the Project Implementation Plan, including models for ILC governance. He noted the governance studies carried out a few years ago, including a comprehensive one by a committee led by George Kalmus, and the various bodies that are now interested in re-looking at governance models. In particular, he said that FALC involvement in this activity will be very valuable.

### 3. **Detector Reports Presented to the PAC Meeting**

A. Sakue Yamada, the Research Director, said that the ILC research organization is still in the formative stage, and he is presenting an interim report describing how much has been achieved in the year since he was appointed as Research Director. Yamada noted that the ILC accelerator and detectors are very strongly coupled, the ILC physics needs place stringent requirements on detector performance, and also that ILCSC had stated the need for two complementary detectors for the ILC. Yamada also noted the detrimental effects on detector activities of the late-2007 funding reductions in the UK and US.

Yamada said that his Executive Board (or Directorate) contains himself and the three Regional Contacts; the latter are temporarily the three WWS co-Chairs, although he acknowledges that this temporary arrangement could possibly lead to conflicts of interest.

Three groups (ILD, SiD, 4<sup>th</sup> concept) responded to the call for EOIs, and are currently working on LOIs to be submitted by March 2009. At that time, IDAG will start the LOI validation process, which is expected to be complete in Autumn 2009. Yamada described the Common Task Groups, and also the very important need for good communication with the particle physics community on ILC detector issues.

In the question/answer period, Yamada agreed that LOI validation could influence funding agencies when the LOI groups request R&D support.

B. The history and role of the International Detector Advisory Group (IDAG) was presented by Michel Davier. He described the LOI validation process that will be carried out by the IDAG, and the anticipated LOI contents. The third IDAG meeting will take place on 17-21 April 2009, shortly after receipt of the LOIs in March 2009; it is expected that there will be a 4<sup>th</sup> meeting in summer 2009, and a final meeting in Autumn 2009.

Davier said that it is possible that all three of the LOIs could be validated; the eventual selection of two detectors will be incorporated into a later process.

C. Andrei Seryi discussed the Machine-Detector Interface (MDI). It will be a challenge to optimize the IR and detectors for efficient push-pull operation, but significant progress has been made on the SC final doublet design. Seryi said that the goal was to interchange the two detectors within a few days. An interface document has been produced, beam-dump design is in progress, and also an R&D plan for gamma-gamma collider studies has been developed.

D. The status of cooperation with CLIC physics and detectors was presented by Francois Richard. Recently, Richard and Barry Barish met with CLIC management, and there was a CLIC request that detectors be part of the common efforts. Richard said that there was excellent interaction between the CLIC and ILC groups at the CLIC Workshop held 14-17 October 2008 at CERN. Obviously, there are detector requirements that will be specific to each accelerator (caused by bunch structure, backgrounds, etc.) but it is hoped that there will be many design aspects in common.

Richard noted that the collaboration on detectors could bring benefits to both groups, and listed some possible ones.

#### 4. **PAC Summary and Recommendations**

##### General

1. The PAC views very positively the recent start of common activities between the ILC and CLIC on many items such as conventional facilities, beam delivery system, detectors, physics, cost estimation, etc. This avoids unnecessary duplication of effort, and keeps the particle physics community focused on the goal of a linear collider as the next major new facility for the field.

##### Accelerator

1. The PAC believes that the appointment of the three Project Managers, and the formation of the Accelerator Advisory Panel (AAP) for internal advice to the GDE Director, significantly strengthen the GDE organization as it moves into the Technical Design Phase.
2. The current TDP schedule, with reporting dates of 2010 and 2012, is fixed by outside constraints, and the PAC concurs with the result.

3. The GDE is to be commended for its efforts to bring about worldwide collaboration among labs on SCRF, BDS, DR, etc. The ILCSC should support the international use of test facilities such as CESRTA, TTF/FLASH, ATF2, STF, ILCTA\_NML, and others.
4. The PAC is very positive about the GDE concept of plug compatibility, especially for SC cavities. It notes that GDE will need to monitor the large flexibility that this concept could allow.
5. The S1 test organization appears to be a success, and the PAC looks forward to hearing of progress and a schedule for S2.
6. The PAC endorses research on SC cavity processing, and also notes the importance of obtaining good statistical data; this will be helped by the experience which will be obtained on the XFEL project construction.
7. The flow of information on SC cavity processing and tests between labs is strongly encouraged. The same is true for information from industry, although the PAC acknowledges the difficulties that may arise in this case.
8. The PAC notes with interest the recent GDE efforts on a "Minimum Machine" and cost-reduction; it welcomes the study of the single-tunnel concept, and other studies on simplifications to the accelerator facility. While cost reduction is important, the PAC notes that this may not necessarily be desirable if it leads to more risk, or precludes some future options such as eventually achieving the beam current specification or 1 TeV operation.

#### Detectors

1. The PAC believes that the appointment of the Research Director, the International Detector Advisory Group (IDAG), and the Executive Board were very important and positive steps for the ILC physics program.
2. Communication with the particle physics community on the ILC physics program is very important, and temporarily adding the three WWS co-Chairs to the Executive Board is a very positive step in this direction.
3. The PAC commends the IDAG for starting its important task well, including its formulation of guidelines for the LOIs. The ILCSC should clarify that the IDAG mandate runs until 2012.
4. One benefit of the RD organization is its unique position to emphasize the need for adequate detector R&D funding. The PAC endorses the RD efforts to help obtain such support from the funding agencies.
5. The Physics and R&D Panels discussed by the Research Director appear to be valuable bodies, and the RD is encouraged to complete their formation soon. It would be useful if the mandate for the R&D Panel included the monitoring of worldwide R&D for ILC detectors.
6. The PAC encourages the production of an interim progress report on ILC physics and detectors in 2010.
7. At least for the next PAC meeting, there should be a summary report on the LOIs, but not three separate reports.

5. **Next PAC Meeting**

It is hoped that the next PAC meeting will take place either during or contiguous to the Particle Accelerator Conference scheduled in Vancouver 4-8 May 2009.

## **Appendix I**

### ILC Project Advisory Committee (PAC) Mandate

1. The International Linear Collider Steering Committee (ILCSC) is responsible for the oversight of the Global Design Effort (GDE) activities and of the ILC experimental program.
2. PAC will assist ILCSC in this function and report to the ILCSC.
3. PAC will review the GDE accelerator activities and, in addition, the ILC detector activities.
4. In its review activity, PAC will examine the overall consistency and realism of the project, in relation to physics, technical design, cost, and schedule.
5. PAC shall comprise about nine members, appointed by the ILCSC for terms of two or three years, and will meet a few times per year until the completion of the Technical Design Phases I and II.
6. The PAC Chair will be appointed by the ILCSC, normally for a two-year term.

**Appendix II**ILC PAC Review

LPNHE, Université Pierre et Marie Curie  
4 place Jussieu  
Tour 43  
75252 Paris cedex 05

Sunday 19 October 2008

- 8:30. Executive Session
- 9:30. Welcome
- 9:35. GDE Overview. B. Barish (50+10)
- 10:35. Break
- 10:50. Accelerator Advisory Panel (AAP). E. Elsen (35+10)
- 11:35. Coordination and Management. M. Ross (35+10)
- 12:20. Executive Session
- 12:50. Lunch
- 13:50. Superconducting RF. A. Yamamoto (35+10)
- 14:35. Final Focus and Damping Ring Test Facilities. J. Urukawa (35+10)
- 15:20. Break
- 15:40. Machine Design and Cost-Reduction Activities. N. Walker (40+10)
- 16:30. Project Implementation Plan. B. Foster (30+10)
- 17:10. Executive Session.
- 19:30. Dinner hosted by IN2P3

Monday 20 October 2008

- 8:30. Executive Session
- 9:00. Research Director Overview. S. Yamada (60+15)
- 10:15. Break
- 10:30. International Detector Advisory Group (IDAG). M. Davier (30+10)
- 11:10. Machine-Detector Interface. A. Seryi (15+5)
- 11:30. Cooperation with CLIC Physics and Detectors. F. Richard (15+5)
- 11:50. Executive Session
- 12:30. Lunch
- 13:30. Executive Session
- 14:30--15:15. Closeout

**Appendix III**

The presentations given at the PAC meeting are available at

<http://www.fnal.gov/directorate/ILCPAC/ILCPACOct2008/AttachmentsILCPACOct2008.htm>