LINEAR COLLIDER OPTIONS: STATUS OF THE R&D AND PLANS FOR TECHNOLOGY SELECTION

M. TIGNER

Laboratory for Elementary-Particle Physics, Cornell University, Ithaca, NY 14853, USA
E-mail: mt52@cornell.edu

R&D for the linear collider, LC, is well along towards the point where a technology selection can be made. The status of the R&D is described briefly and the evolving procedure for making a selection is presented together with the current ideas on how to proceed.

1. Background

1.1. *International Framework*

While it is true that much of the initiative behind the LC is from the grass roots, there is a considerable, international organizational framework that has been built up over the years and which is now serving us well. Much remains to be done in getting the government support agencies involved in a fundamental way but we have a good working foundation in place. One way of understanding it is to look at Fig. 1 which displays the framework graphically and gives the times of formation of essential elements. The parent international organization, IUPAP, was founded in 1922. Details of its purpose and activities can be found at www.IUPAP.org. Seeing future trends in HEP already in 1975, ICFA, the International Committee on Future Accelerators was formed and comprises of members from countries active in HEP. At that time it was already apparent that not only was international participation in construction and operation of detectors going to remain central to the field but that international collaboration in the conception and provision of new accelerator facilities would someday be necessary. That time seems to have arrived. In 2002, Hirotaka Sugawara, then Director of KEK and the ICFA Chair, led us in forming the International Linear Collider Steering Committee, ILCSC. The aim of which is to aid in the first instance with allowing all competent and interested participants in all regions to participate in the conception and creation of the accelerator as well as the detector complement. It relies on the regional steering groups, ALCSG, ELCSG and USLCSG for major inputs and coordination of the work in the regions, now generally defined as Asia, Europe and North America but certainly expandable as this global project evolves. The primary work of the ILCSC needs to be carried out by subcommittees. As seen in Fig. 1, there are currently three such subcommittees now active. In future this number will change.

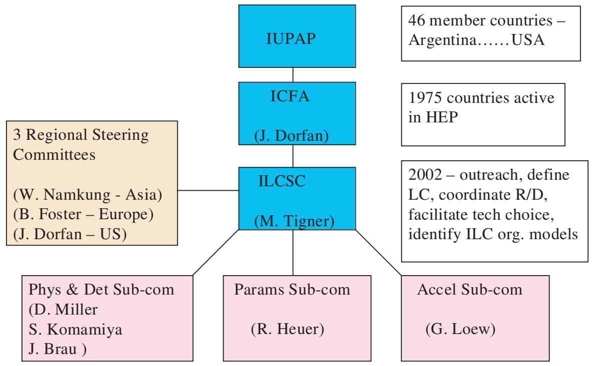

Figure 1. International framework for current LC R&D.

1.2. *The International Technical Review Committee*

In 1994 the Inter Laboratory Collaboration for R&D Towards a Linear Collider created the International Linear Collider Technical Review Committee, popularly known as the TRC, under Greg Loew of SLAC. The purpose was to document the status of R&D on the then 8 e^+e^- collider concepts. They issued their landmark report in 1995. In 2001 ICFA itself reconvened the TRC, again under Greg Loew. This TRC had a Steering Committee comprising R. Brinkmann, DESY, K. Yokoya, KEK, T. Raubenheimer, SLAC, G. Guignard, CERN and Working Groups comprising 37 members who undertook the enormous task of reviewing the status of the now 4 possible options: superconducting (e.g. TESLA), normal conducting

X-band (e.g. NLC/JLC), combined normal conducting X- and C-bands (e.g. JLC-C) and the CLIC concept at 30 GHz.

2. R&D Status

2.1. *Scorecard and Calendar*

The TRC report was delivered earlier this year and defines and ranks the R&D needed for choosing the technology to go forward with. These R&D items range from those needed for basic feasibility assessment to those needed for design and cost optimization and rating them with ranks R1–R4, R1 being the category needed for feasibility assessment. It is important to note that most of the "press" have focused on achievable accelerating gradients but many other things are of prime importance. While it is true that the energy advance needed beyond the SLC is a factor of 5 to 10, the increase in luminosity needed is 10^4 and that has not much to do with gradient.

The report gave a scorecard for each of the 4 options at each of the R levels. At the R1 level, i.e. feasibility demonstration still needed, four categories were defined: modulators, klystrons, RF distribution system and accelerator structures. Of these: TESLA needs to demonstrate accelerator structure gradient for its 800 GeV version; X- and C-band versions need to demonstrate RF distribution as well as accelerator structures; whereas the 30 GHz version needs feasibility demonstration in all four categories.

Each of the proponents for superconducting and normal conducting X and C-band has scheduled demonstrations addressing the R1 ratings for their offerings. They are committed to show results this fall and early next year so that the technology selection can be completed as early as possible in 2004.

3. Technology Selection and Beyond

3.1. *Committee of Wise Persons*

The ILCSC has recommended that a technology recommendation be made by a committee of wise persons selected from the world scientific community. ICFA has accepted this recommendation. The regional steering groups are now hard at work with their communities to bring their nominations before ILCSC and ICFA in time that the wise persons can begin work in early 2004. While details of their procedure must await their appointment, it is inevitable that they will hold meetings at the primary laboratories of the proponents and have tutorial sessions to familiarize themselves with the subject of the linear collider and what is needed to do the science envisioned. The resultant make-up of the wise person committee, WPC, and its proposed procedure will be widely communicated as soon as it is available.

3.2. *PreGlobal Design Group*

It is generally agreed among those responsible for the current LC R&D programs that the community needs to join in turning the technology choice into a concept design based on that choice and on the extensive work that has gone on to date. Further, as no additional resources are likely to be made available immediately, we will need to do that with the resources already in place, coordinated by a central organization, now referred to as the PreGlobal Design Group working through regional managers of some sort. To draft the mandate of such a group and organization for eventual action by ICFA, the ILCSC has appointed a task force consisting of the Chairs of the regional steering groups and a lab director from each of the regions. It now seems likely that the PreGlobal Design Group would be put into action immediately following the technology choice. However this is still under active discussion.

DISCUSSION

Bennie Ward (Baylor University & University of Tennessee): From your transparencies, I could not see at what point the funding agencies enter the process that you have presented. Could you please comment?

Maury Tigner: Connections with funding agencies differ greatly in the three regions: Asia, Europe and the US. In Europe they differ from country to country. In general, the agencies are already involved through the need for them to approve expenditures. In July many of the agency representatives met in London to begin discussions on how to govern and finance the LC project internationally.

Hugh Montgomery (Fermilab): I've not understood from today's talks when, with respect to the technology discussion, the global study group would be populated. What is your view of how that will happen?

Maury Tigner: This is a matter very much under discussion at the moment. There is now a Task Force in place to recommend the mandate and organization of this global study group. At a minimum it will be activated immediately upon achieving a technology recommendation.

Tony Liss (University of Illinois): There is also a university-based R&D group, and I was wondering if you could comment on how they fit into this work, if at all?

Maury Tigner: University groups are very much a part of this activity and are already performing important parts of the R&D. That will only grow in the future.

Maria Spiropulu (University of Chicago): You gave us a list of committees and a list of times by which there will be a technology decision. Who will force that this timing is kept?

Maury Tigner: There is no external authority that has the will or competence to do this. It must be generated within our community. Because of the importance of getting this job done I firmly believe that our self discipline will suffice.

Bruce Yabsley (Virginia Tech): This is perhaps an ICFA question. I've heard concern expressed that in this security environment, the U. S. might be less willing to fund a facility outside the U. S., or if it was on U. S. soil, might be unwilling to relinquish control to the extent that would be acceptable to the rest of the community. Is that a concern that is shared by the committee, or is the perspective different from where you are standing?

Maury Tigner: The current Administration's science officials are very keen on this being a truly international enterprise wherever it is located and have repeated that to us many times.