# CHAPTER 1

# Steering Committee, Charge, Working Groups, Milestones, and Methodology

## 1.1 INTRODUCTION

The International Linear Collider Technical Review Committee (ILC-TRC) was originally created by the Interlaboratory Collaboration for R&D toward TeV-Scale Electron-Positron Linear Colliders at a meeting in London, England in June 1994. By the end of 1995, the ILC-TRC produced its first report[1] which attempted to gather in one document the current status of eight major electron-positron linear collider designs in the world. As each design progressed, large tables ("megatables") that listed all the major parameters of the machines in the report were updated regularly until the beginning of 2000. By that time, however, three of the original eight designs had been abandoned.

As a result of deliberations at the ICFA meeting of February 8 and 9, 2001 at DESY, Professor H. Sugawara as Chair of ICFA requested that the ILC-TRC reconvene its activities to produce a second report. G. Loew, the original chair of the ILC-TRC, agreed to conduct this second study.

## 1.2 STEERING COMMITTEE AND CHARGE

ICFA requested that a steering committee be formed with representation from the four major labs. The following members were chosen:

- Reinhard Brinkmann, from DESY
- Gilbert Guignard, from CERN
- Tor O. Raubenheimer, from SLAC
- Kaoru Yokoya, from KEK

[1]SLAC-R-95-471, available from Stanford Linear Accelerator Center, Technical Publications Department, 2575 Sand Hill Road, MS 68, Menlo Park, CA 94025.

The Chair and the full Steering Committee met for the first time at Snowmass, Colorado, on July 5, 2001. During this meeting, the committee reviewed the charge that had been broadly sketched by ICFA and converged on the approximate contents of the report to be produced. The charge was streamlined during the subsequent months, and the final version is summarized as follows:

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**SECOND ILC-TRC CHARGE:**

- To assess the present technical status of the four LC designs at hand, and their potential for meeting the advertised parameters at 500 GeV c.m. Use common criteria, definitions, computer codes, *etc.*, for the assessments
- To assess the potential of each design for reaching higher energies above 500 GeV c.m.
- To establish, for each design, the R&D work that remains to be done in the next few years
- To suggest future areas of collaboration

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The four machines to be assessed were:

- TESLA
- JLC-C
- JLC-X/NLC
- CLIC

The Steering Committee discussed in some detail how it would accomplish its tasks and decided that they should be divided into two major parts:

- Descriptions of these machines, their upgrade paths and respective test facilities, setting the foundations for the assessments
- Assessments of the machines as outlined by the charge

The Steering Committee took full responsibility for the first activity and decided that the assessments should be carried out by two separate Working Groups: one for Technology, RF Power, and Energy Performance, the other for Luminosity Performance.

The Chair submitted this proposed plan to ICFA in Rome, Italy on July 27, 2001, and Professor H. Sugawara soon thereafter indicated that ICFA had accepted the proposal.

## 1.3 WORKING GROUPS AND MILESTONES

From August through October 2001, the Chair and the Steering Committee discussed in great detail how they thought the two Working Groups should operate. This division of labor had the purpose of forming two separate teams of experts with different lines of specialization and complementary ways of assessing machine performance. As it turned out, this process worked out very successfully. Furthermore, during the course of their assessments, the Working Groups came to realize that a third task, common to both of them, would be crucial to the ultimate commissioning and successful operation of any of the linear colliders. This task was labelled "Reliability, Availability, and Operability," and several members of both Working Groups formed a third Working Group to handle this task.

The final overall organization of the Second ILC-TRC is shown in Table 1.1. Memberships of the three Working Groups are shown in Table 1.2, Table 1.3, and Table 1.4, together with the respective subgroups into which they broke up to assess the designs.

TABLE 1.1
Second ILC-TRC overall organization

| | |
|---|---|
| Chair | Gregory Loew |
| Steering Committee | Reinhard Brinkmann<br>Kaoru Yokoya<br>Tor Raubenheimer<br>Gilbert Guignard |
| *Working Groups* | |
| Technology, RF Power, and Energy Performance Assessments | Daniel Boussard |
| Luminosity Performance Assessments | Gerry Dugan |
| Reliability, Availability and Operability | Nan Phinney<br>Ralph Pasquinelli |

TABLE 1.2
Technology, RF Power, and Energy Working Group

| Member Name | Institution |
|---|---|
| **Chair**: Daniel Boussard | Retired from CERN |
| Chris Adolphsen | SLAC |
| Hans H. Braun | CERN |
| YongHo Chin | KEK |
| Helen Edwards | FNAL |
| Kurt Hübner | CERN |
| Lutz Lilje | DESY |
| Pavel Logatchov | BINP |
| Ralph Pasquinelli | FNAL |
| Marc Ross | SLAC |
| Tsumoru Shintake | KEK |
| Nobu Toge | KEK |
| Hans Weise | DESY |
| Perry Wilson | SLAC |

| Subgroup | Group Name | Chair |
|---|---|---|
| 1 | Injectors, Damping Rings and Beam Delivery | Hans Weise |
| 2 | Power Sources (Klystrons, Power Supplies, Modulators and Low Level RF) | YongHo Chin |
| 3 | Power Distribution (RF Pulse Compression, Waveguides, Two-beam) | Kurt Hübner |
| 4 | Accelerator Structures | Perry Wilson |

TABLE 1.3
Luminosity Performance Working Group

| Member Name | Institution |
|---|---|
| **Chair**: Gerry Dugan | Cornell |
| Ralph Assmann | CERN |
| Winfried Decking | DESY |
| Jacques Gareyte | CERN |
| Witold Kozanecki | CEA Saclay |
| Kiyoshi Kubo | KEK |
| Nan Phinney | SLAC |
| Joe Rogers | Cornell |
| Daniel Schulte | CERN |
| Andrei Seryi | SLAC |
| Ronald Settles | MPI |
| Peter Tenenbaum | SLAC |
| Nick Walker | DESY |
| Andy Wolski | LBNL |

| Subgroup | Group Name | Chair |
|---|---|---|
| 1 | Electron and Positron Sources (up to Damping Rings) | Winfried Decking |
| 2 | Damping Rings | Joe Rogers |
| 3 | Low Emittance Transport (from Damping Rings to IP) | Daniel Schulte and Peter Tenenbaum |
| 4 | Machine Detector Interface | Witold Kozanecki |

TABLE 1.4
Reliability, Availability, and Operability Working Group

| Member Name | Institution |
|---|---|
| **Co-chair**: Nan Phinney | SLAC |
| **Co-chair**: Ralph Pasquinelli | FNAL |
| Chris Adolphsen | SLAC |
| Ralph Assmann | CERN |
| YongHo Chin | KEK |
| Helen Edwards | FNAL |
| Kurt Hübner | CERN |
| Witold Kozanecki | CEA Saclay |
| Marc Ross | SLAC |
| Tsumoru Shintake | KEK |
| Daniel Schulte | CERN |
| Peter Tenenbaum | SLAC |
| Nobu Toge | KEK |
| Nick Walker | DESY |
| Hans Weise | DESY |

Table 1.5 is a record of the principal milestones and meetings of the ILC-TRC. A very large number of discussions and transactions were also conducted by e-mails and conference calls. The entire process resulted in the creation of strong bonds within the entire committee, congenial interactions, a good team spirit and a genuine desire to work toward a common goal.

TABLE 1.5
Major milestones and meetings

| | |
|---|---|
| February 8–9, 2001 | ICFA at its DESY meeting requests second ILC-TRC study and report |
| July 27, 2001 | ILC-TRC Steering Committee is formed, and new proposal is submitted to ICFA in Rome. ICFA accepts proposal. |
| August–October 2001 | Formation of the Working Groups |
| February 4–8, 2002 | First review and discussion of Working Group tasks at LC 2002 (SLAC) |
| April 10–12, 2002 | Second review (CERN) |
| June 7–9, 2002 | Third review following EPAC (Paris) |
| July 30, 2002 | Interim report to ICFA in Amsterdam |
| September 9–12, 2002 | Fourth review (DESY) |
| October 9, 2002 | Report to ICFA at CERN |
| February 2003 | Completion of Report |

## 1.4 CONTENTS AND METHODOLOGY

The Table of Contents for this report is fairly self-explanatory. The Executive Summary was written by the Chair, who incorporated numerous comments from the entire committee. Chapter 1, also written by the Chair, summarizes the ILC-TRC's procedures, organization, and milestones. T. Raubenheimer volunteered to be the central "keeper" responsible for putting together the six megatables given in Chapter 2. Chapter 3 on descriptions of the four machines at 500 GeV c.m., Chapter 4 on the upgrade paths to higher energies, and Chapter 5 on the test facilities and other project R&D programs, were written by the members of the Steering Committee for their respective projects. Chapter 6, 7, and 8, presenting the respective assessments of the three Working Groups, were assembled by their Chairs from text prepared by the Subgroup Chairs, with the help of their respective members. Finally, Chapter 9, which summarizes the lists and ranks of all the R&D studies still deemed necessary, was put together by D. Boussard and G. Dugan. It should be noted here that the Working Group members did not always agree with all the statements made by the machine proponents in Chapters 3, 4, and 5, and these disagreements are reflected in their assessments.

In discussing their assessments in Chapter 6, Chapter 7, and Chapter 8, the Working Groups expressed their positive reactions as well as their concerns regarding the status of a large number of issues and systems. Many of these concerns, in turn, were translated into

R&D topics which they felt are needed to allay these concerns. Toward the end of the ILC-TRC process, a critical effort went into ranking these R&D issues according to the following hierarchy of criteria:

**Ranking 1:** R&D needed for feasibility demonstration of the machine

**Ranking 2:** R&D needed to finalize design choices and ensure reliability of the machine

**Ranking 3:** R&D needed before starting production of systems and components

**Ranking 4:** R&D desirable for technical or cost optimization

A more complete description of these criteria as well as all the final R&D rankings are given in Chapter 9.

## 1.5 ADDED VALUE OF THE ILC-TRC

The ILC-TRC in this report described all the machine designs, assessed them, and ranked the R&D tasks remaining to be done. In addition, the work of the ILC-TRC accomplished the following:

1. It brought together a sizeable group of the best linear collider experts in the world and taught them how to work as a team, let them be critical of each other's work but in a constructive way, and helped them improve each other's designs by pooling their expertise. It is fair to say that there is no group in the world today that has a comparable global grasp of the respective strengths and weaknesses of the four machine designs.

2. By its studies, the ILC-TRC directly or indirectly caused significant changes in the various designs. Here are a few examples for TESLA and JLC-X/NLC:

   **TESLA**

   - The design pressure in the TESLA damping ring straight sections was reduced from $10^{-9}$ to $10^{-10}$ Torr to combat the fast ion instability.
   - The wiggler design for the damping ring was modified to reduce magnetic nonlinearities.
   - The spin rotator optics was redesigned.
   - Difficulties were flagged in the detector extraction line system for head-on collisions, prompting a possible redesign.

   **JLC-X/NLC**

   - Assessment of the complexity and probable delays caused by the necessary testing of the DLDS rf pulse compression system prompted SLAC and KEK to revert to a more modular dual-moded SLED-II system for the base line design.
   - The injection/extraction transport for the linac bypass line was redesigned to reduce synchrotron radiation and high-order dispersive emittance growth.

3. Perhaps the greatest collaborative contribution of the ILC-TRC was the advancement of beam dynamics simulations for the damping rings and especially for the so-called low emittance transport from the damping rings to the IP. The latter started with perfect machines, introduced static errors likely to exist upon installation, made corrections using Beam Based Alignment (BBA), then introduced dynamic errors from hypothetical ground motions and mechanical vibrations, and finally attempted to estimate luminosity in the presence of these effects. This effort is still a "work in progress" and a future task will be to verify that tuning algorithms still converge in the presence of all dynamic errors.

4. Finally, the ILC-TRC by working together came up with a large number of R&D tasks which are common to all machines. These tasks will inevitably foment further collaborations as needs develop, and people and resources become available. How and which of these new collaborations will be formed beyond those which already exist is a dynamic process that the ILC-TRC did not have time to prescribe. It is likely that these collaborations will develop naturally as needs arise in the coming years.

## 1.6 ACKNOWLEDGEMENTS

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