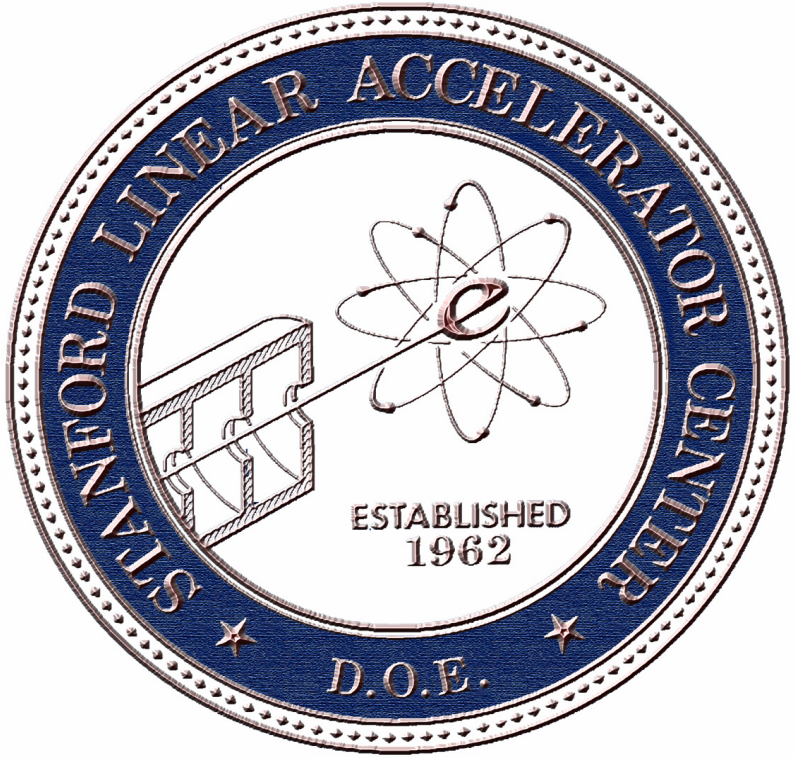
Linear Collider – World Scene



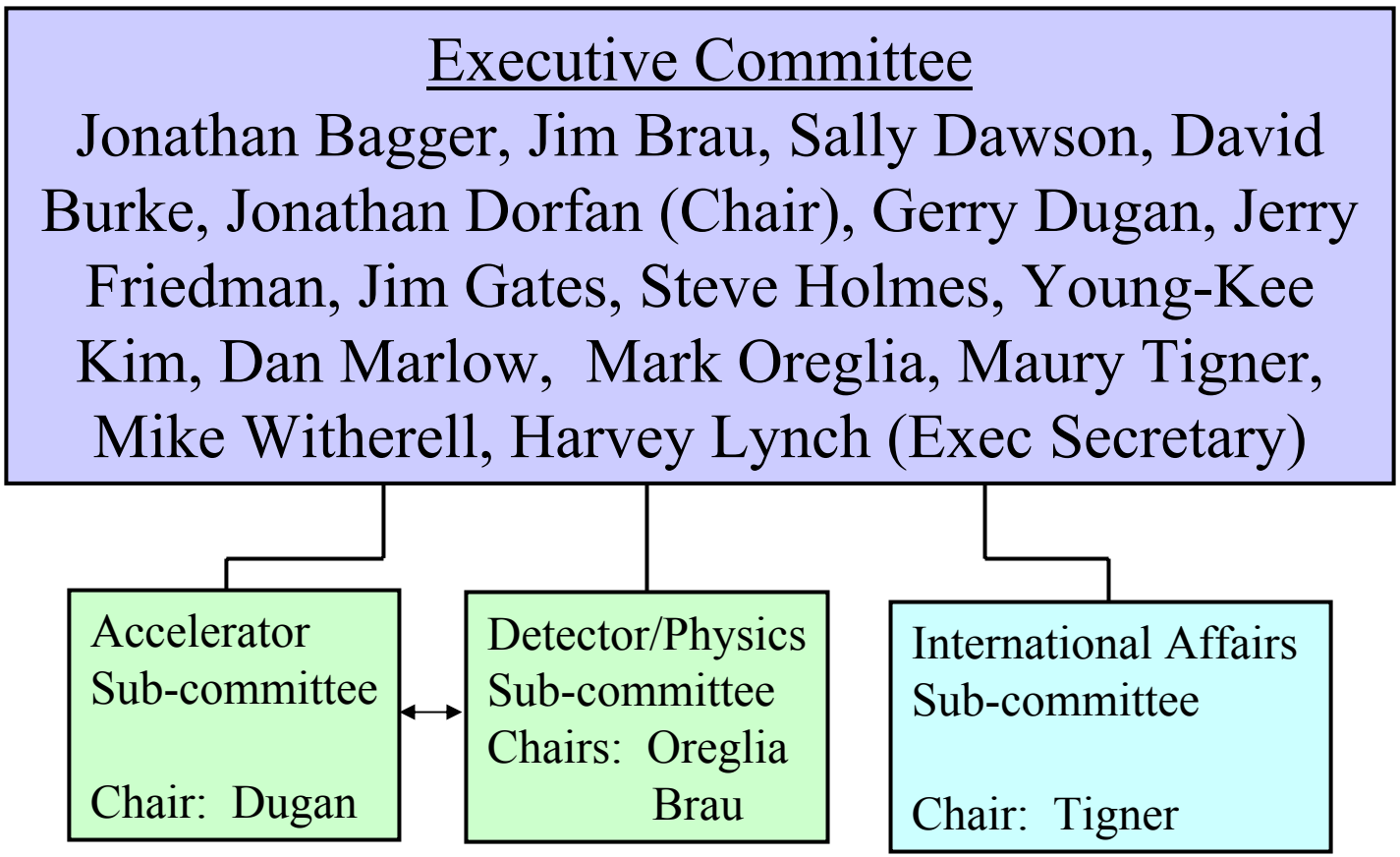
By Jonathan Dorfan, Director

ALCPG 2004 Winter Workshop, SLAC

January 7, 2004

Priority			
Near-Term			
1		FES	International Thermonuclear Experimental Reactor
2		ASCR	UltraScale Scientific Computing Capability
Tie for 3		HEP	Joint Dark Energy Mission
		BES	Linac Coherent Light Source
		BER	Protein Production and Tags
		NP	Rare Isotope Accelerator
Tie for 7		BER	Characterization & Imaging
		NP	Continuous Electron Beam Accelerator Facility 12GeV Upgrade
		ASCR	Esnet Upgrade
		ASCR	NERSC Upgrade
		BES	Transmission Electron Achromatic Microscope
12		HEP	BTeV
Mid-Term			
13		HEP	Linear Collider
Tie for 14		BER	Cellular Systems Analysis & Modeling
		BES	SNS 2-4 MW Upgrade
		BES	SNS Target Station II
		BER	Whole Proteome Analysis
Tie for 18		NP	Double Beta Decay Underground Detector
		FES	Next Step Spherical Tokamak
		NP	RHIC II
Far-Term			
Tie for 21		BES	National Synchrotron Light Source Upgrade
		HEP	Super Neutrino Beam
Tie for 23		BES	Advanced Light Source Upgrade
		BES	Advanced Photon Source Upgrade
		NP	eRHIC
		FES	Fusion Energy Contingency
		BES	High Flux Isotope Reactor Guide Hall II
		FES	Integrated Beam Experiment

US Linear Collider Steering Group



USLCSG – International Affairs

- The USLCSG International Affairs subcommittee submitted its report in December 2003 to the USLCSG for discussion and finalization and will be reported out at the ILCSC February 2004 meeting

USLCSG – Scope Document

- **USLCSG Detector/Physics Subcommittee took on the task of defining the key machine parameters. They have produced a document which is the basis for the comparative study of warm and cold technologies**
  - **See talk of Mark Oreglia at the Cornell American LC Workshop**

    http://www.lepp.cornell.edu/public/LC/workshop/program.html

USLCSG – Guidance for the Technology Choice

- The USLCSG accelerator subcommittee took on the challenging task of providing for the world community a comparison of a US-based machine using either warm or cold technology
- Report will be completed in early 2004
  - USLCSG had a one-day review of the draft report at FNAL Thursday Dec 11, 2003
  - Next step is to have factual accuracy checks and finalize document
- Anticipate this highly detailed and technically rich report will be one of the important documents used by the International Technology Recommendation Panel in making its LC technology recommendation

USLCSG: Charge for Technology Options Study

- Two technology options are to be developed: a warm option, based on the design of the NLC Collaboration, and a cold option, similar to the TESLA design at DESY
- Both options will meet the physics design requirements specified by the USLCSG Scope document
- Both options will be developed in concert, using, as much as possible, similar approaches in technical design for similar accelerator systems, and a common approach to cost and schedule estimation methodology, and to risk/reliability assessments

University – Based R&D

- In 2002, USLCSG set up review process for machine and detector proposals. Consortia proposals sent to DOE and NSF
  - DOE funded at ~ 900K level
- 2nd round of proposal reviews completed at FNAL December 11, 2003

Report from ICFA

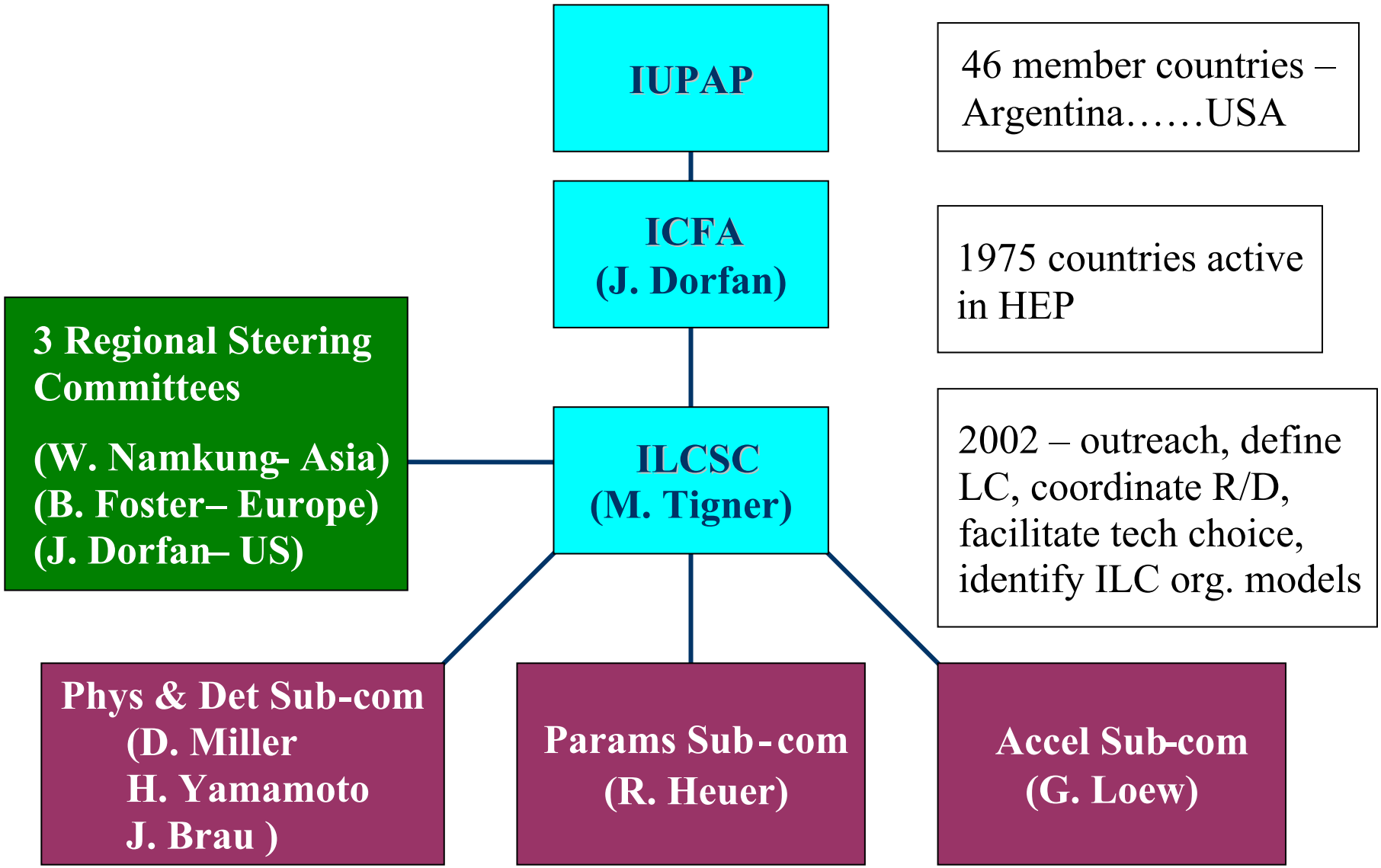
Jonathan Dorfan, Chair

Global Science Forum

Meeting of the Consultative Group on High-Energy Physics

November 20, 2003, Paris

Scientific Community – Global Organization



International Committee for Future Accelerators
Sponsored by the Particles and Fields Commission of IUPAP

12 August 1999

ICFA Statement on Linear Colliders

Scientific panels charged with studying future directions for particle physics in Europe, Japan, and the United States have concluded that there would be compelling and unique scientific opportunities at a linear electron-positron collider in the TeV energy range. Such a facility is a necessary complement to the LHC hadron collider now under construction at CERN. Experimental results over the last decade from the electron-positron colliders LEP and SLC combined with those from the Tevatron, a hadron collider, have led to this worldwide consensus.

Reviews of the latest experimental results at the Lepton-Photon 99 conference point ever more clearly to the conclusion that there is fundamentally new physics in the energy range just beyond the reach of existing colliders. At the very least we will find one or more Higgs scalar bosons or other structure that has the same effect as a Higgs boson on the existing data. To explore and characterize fully the new physics that must exist will require the Large Hadron Collider plus an electron-positron collider with energy in the TeV range. Just as our present understanding of the physics at the highest energy depends critically on combining results from LEP, SLC, and the Tevatron, a full understanding of new physics seen in the future will need both types of high-energy probes.

Major laboratories around the world are presently conducting accelerator research and development that will lead to detailed designs of a linear electron-positron collider capable of reaching this energy range. The technology being developed for this purpose will also have applications to other areas of science and technology through new generations of intense light sources. A worldwide group is studying the physics at an electron-positron collider and the detectors needed to observe that physics.

ICFA recommends continued vigorous pursuit of the accelerator research and development on a linear collider in the TeV energy range, with the goal of having designs complete with reliable cost estimates in a few years. We believe that an electron-positron collider optimized for the new physics should be built in a timely way with international participation.

The URL for this page is *http://www.fnal.gov/directorate/icfa/icfa_LCstatement.html*

Second ILC –TRC Steering Committee

Chair: Gregory Loew

Members: 1) Reinhard Brinkmann (DESY)
2) Kaoru Yokoya (KEK)
3) Tor Raubenheimer (SLAC)
4) Gilbert Guignard (CERN)

Working Groups

Technology, RF and Energy Performance
Chair: Daniel Boussard

Luminosity Performance
Chair: Gerry Dugan

The Four Technical LC Approaches to be Assessed

1) TESLA
2) JLC (C-band)
3) JLC (X-band)/NLC(X-band)
4) CLIC

Ranking Criteria for R&D Tasks

R1

R&D needed for feasibility demonstration of the machine

R2

R&D needed to finalize design choices and ensure reliability of the machine

R3

R&D needed before starting production of systems and components

R4

R&D desirable for technical or cost optimization

R1 Tasks

TESLA (Upgrade to 800 GeV c.m.)

- Building and testing of a complete cryomodule at 35 MV/m, with couplers. Measurement of quench rates and dark current.

JLC-C (Valid for 500 GeV c.m.)

- High power tests of RF pulse compressor and choke-mode accelerator structure

JLC-X/NLC (Valid for 500 GeV and 1 TeV c.m.)

- Test of a complete accelerator structure at design gradient (65/50 MV/m) with detuning and damping manifolds, couplers and loads, including study of breakdown and dark current
- Test of complete dual-moded SLED-II pulse compression system at design power and energy handling

CLIC (Valid for 500 GeV – 3 TeV c.m.)

- High power tests of accelerator structures at 172/150 MV/m, 130 ns
- Validation of drive beam generation in fully loaded linac at CTF3
- Development of mechanism to turn off few structures which break down

Next Steps for ILCSC - Aimed at Formation of an Internationally-federated LC Design Team

- ILCSC has set up an International Technology Recommendation Panel (ITRP) to recommend to ILCSC/ICFA a down-select for the RF technology of the main linacs. The ITRP comprises 12 persons, four from each region. First meeting of the ITRP will be at RAL January 27-28, 2004

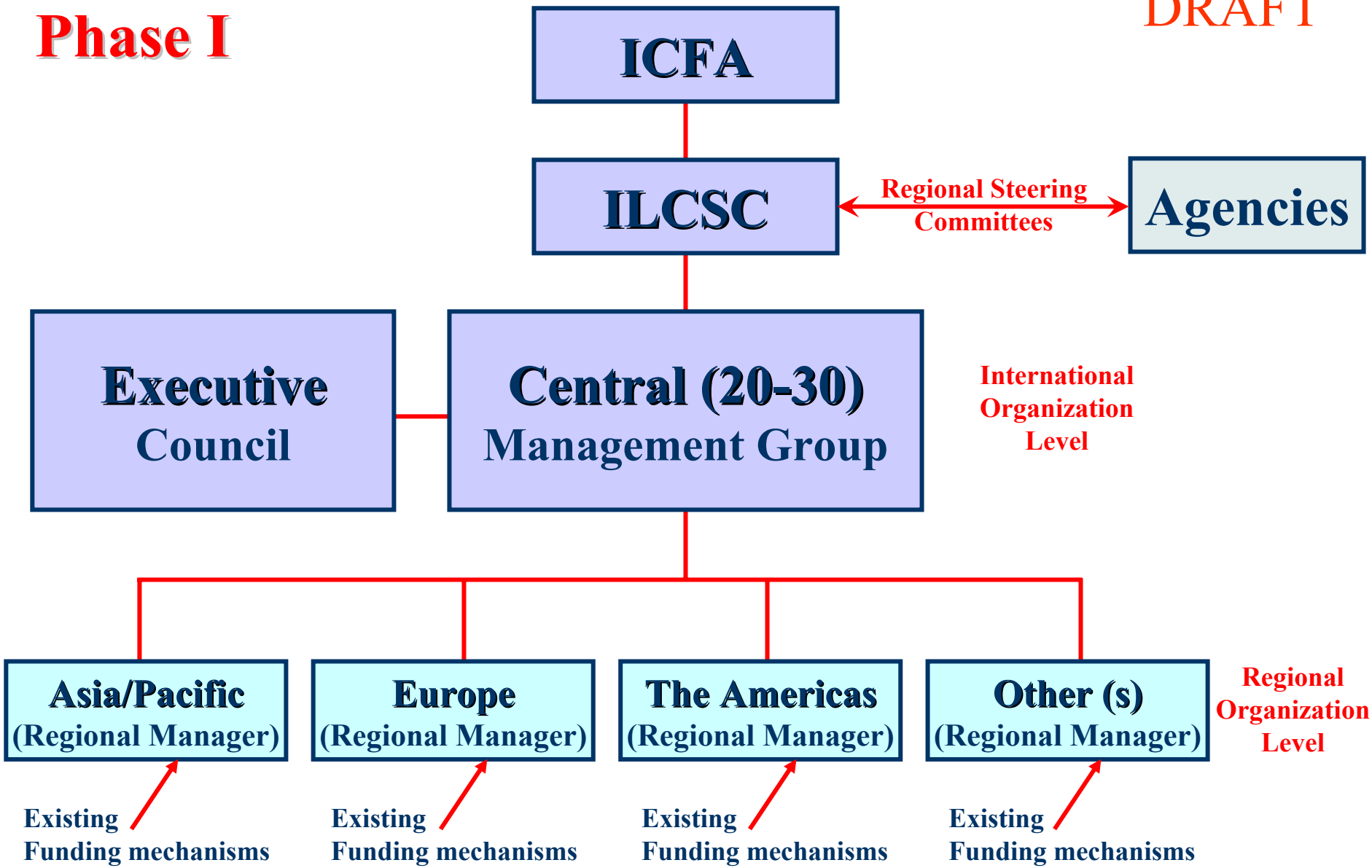
- ILCSC has established a task force to recommend how best to establish an internationally federated design group that can start the machine design as soon after the technology decision as is possible. This would be the first step in internationalizing the LC. The goal is to have the structure of this design group agreed upon by ICFA and the funding agencies prior to finalizing the technology choice.

  Members of the task force are Satoshi Ozaki (Chair), Jonathan Dorfan, Brian Foster, Won Namkung, Yoji Totsuka, Albrecht Wagner

USLCSC Proposal - July 2003

DRAFT

Phase I



Deliverable: CDR and plan for realizing a TDR

International Technology Recommendation Panel

Members

Jean-Eudes Augustin

Jonathan Bagger

Barry Barish (Chair)

Giorgio Bellettini

Paul Grannis

Norbert Holtkamp

George Kalmus

Gyung-Soo Lee

Akira Masaike

Katsunobu Oide

Volker Soergel

Hirotaka Sugawara

Charge for the International Technology Recommendation Panel

19 November 2003

General Considerations

The International Technology Recommendation Panel (the Panel) should recommend a Linear Collider (LC) technology to the International Linear Collider Steering Committee (ILCSC).

On the assumption that a linear collider construction commences before 2010 and given the assessment by the ITRC that both TESLA and JLC-X/NLC have rather mature conceptual designs, the choice should be between these two designs. If necessary, a solution incorporating C-band technology should be evaluated.

The recommendation should be based on all relevant scientific, technical, schedule and cost considerations. Major references for the Panel will be the recently issued "International Linear Collider Technical Review Committee Second Report 2003" (http://www.slac.stanford.edu/xorg/ilc-trc/2002/2002/report/03rep.htm) and the document outlining the case for the electron-positron linear collider "Understanding Matter, Energy, Space and Time" (http://sbhep1.physics.sunysb.edu/~grannis/lc_consensus.html)

To reach its recommendation the Panel will hear presentations from the design proponents addressing the above issues.

The agendas of the presentations will be approved by the Panel in advance to assure uniformity of coverage of the technologies put forward. The Panel may ask for expert advice on any of the considerations listed above, drawing first on the ILCSC and its expert subcommittees, then moving beyond the ILCSC as necessary and appropriate. Relevant input from the world particle physics community will be solicited.

Scientific Criteria

The technology recommended shall be capable of meeting the scope and parameters set forth by the ILCSC, in the document "Parameters for the Linear Collider", as accepted by the ILCSC on 19 November 2003.

Technical Criteria

Using the ICFA Technical Review Committee report and materials supplied by technical experts that may be called, the Panel will make its recommendation based on its judgment of the potential capabilities of each conceptual design for achieving the energies and the peak and integrated luminosities needed to carry out the currently understood scientific program, as envisioned in the ILC Parameters Document.

Schedule Criteria

Aiming for timely completion of the project, the Panel should compare milestones relating to design, engineering and industrialization for each of the two technologies being considered.

Cost Criteria

The Panel will need to know if there is a significant cost differential between the two designs being examined for completing the 500 GeV project and possibly any upgrades set forth in the ILC Parameters Document. The cost information should be based on available estimates as well as on the Panel's judgments as to the reliability or completeness of the cost estimates. The Panel needs to decide what items are to be included in the cost estimates in arriving at its own comparative analyses.

Report of the Panel

Unanimity in the Panel's recommendation is highly desirable in order to establish the firmest foundation for this challenging global project.

The Panel is urged to report its recommendation as soon as possible, with a firm deadline by the end of 2004.

A full written report with the Panel's evaluation of each of the technologies considered should be available as soon as possible after the Panel's deliberations have been concluded.

The making of the technology choice is a key event in the world particle physics program and thus timeliness in the Panel's reporting is of prime importance. The science agencies need to see a demonstration of the particle physics community's determination and ability to collaborate and to unite around the technology chosen by the Panel, as a trigger for their efforts to collaborate in forming a global project.

Operation of the Panel

The ILCSC would like to make some suggestions regarding procedure.

The Accelerator Sub-committee of the ILCSC is prepared to give an extensive tutorial on the LC. This would inform the Panel about LC issues and acquaint it with the experts from whom they can solicit advice.

Following that, visits to the major LC technology sites, in as close a sequence as possible, would help to solidify understanding of the status and issues while allowing the Panel to receive input on each technology.

To afford the Panel access to expert advice when needed, the ILCSC Accelerator Sub-committee should be in session on site at the Panel meeting place during their meetings.

It is expected that the presentation sessions will be open to the scientific and funding agency communities.