Some concluding Remarks...

On

- TESLA
- TDR
- The future.....

ECFA/DESY workshop

25 September 2000

Albrecht Wagner

DESY and University of Hamburg

Experience gained from the TESLA Test Facility Linac

- Operation of 3 accelerating modules housing 8 superconducting cavities each
  - acc. module #1 approx. 15 MV/m
    module #2 20 MV/m
    module #3 25 MV/m
  - more than 5000 hours module operation
  - stable operation with 800 µs rf pulses
  - cryogenic losses within specs.
  - up to 16 cavities connected to one klystron
  - rf amplitude and phase control according to TESLA specifications
  - energy gain demonstrated with beam typ. 90% of the maximum gradient
- RF electron gun delivers bunch trains with a time structure very similar to the TESLA specs.
  - 800 bunches with 1 MHz rep.rate
  - bunch charge up to 8 nC
  - norm. emittance below 5 • mm mrad at 1 nC
  - operation based on an extremely reliable laser system and on CsTe cathodes with high quantum efficiency and long lifetime
  - the sytem is as stable as a conventional electron gun / injector

- **Multibeam klystron delivers 10 MW at 1.5 ms pulse duration**
  - new: seven beams in one klystron
  - 65% efficiency
  - the klystron is now operated at the TTF Linac
  - TESLA requires 600 of these klystrons
- **The TTF Linac drives a SASE Free Electron-Laser in the Ultraviolett**
  - The FEL operation is based on a reliable TTF Linac operation
  - Low emittance, low energy spread
  - Short electron bunches at the exit of a specially designed bunch compressor
  - 15 m of undulator aligned with high precision
  - electron beam orbit and undulator axis agree within 100 µm
  - photon wavelength tunable from 80 to 180 nm
  - laser gain well above 1000

TESLA
Status and Next Steps

- The present technology, as realised at TTF, is adequate to build a collider for 500GeV and an FEL:

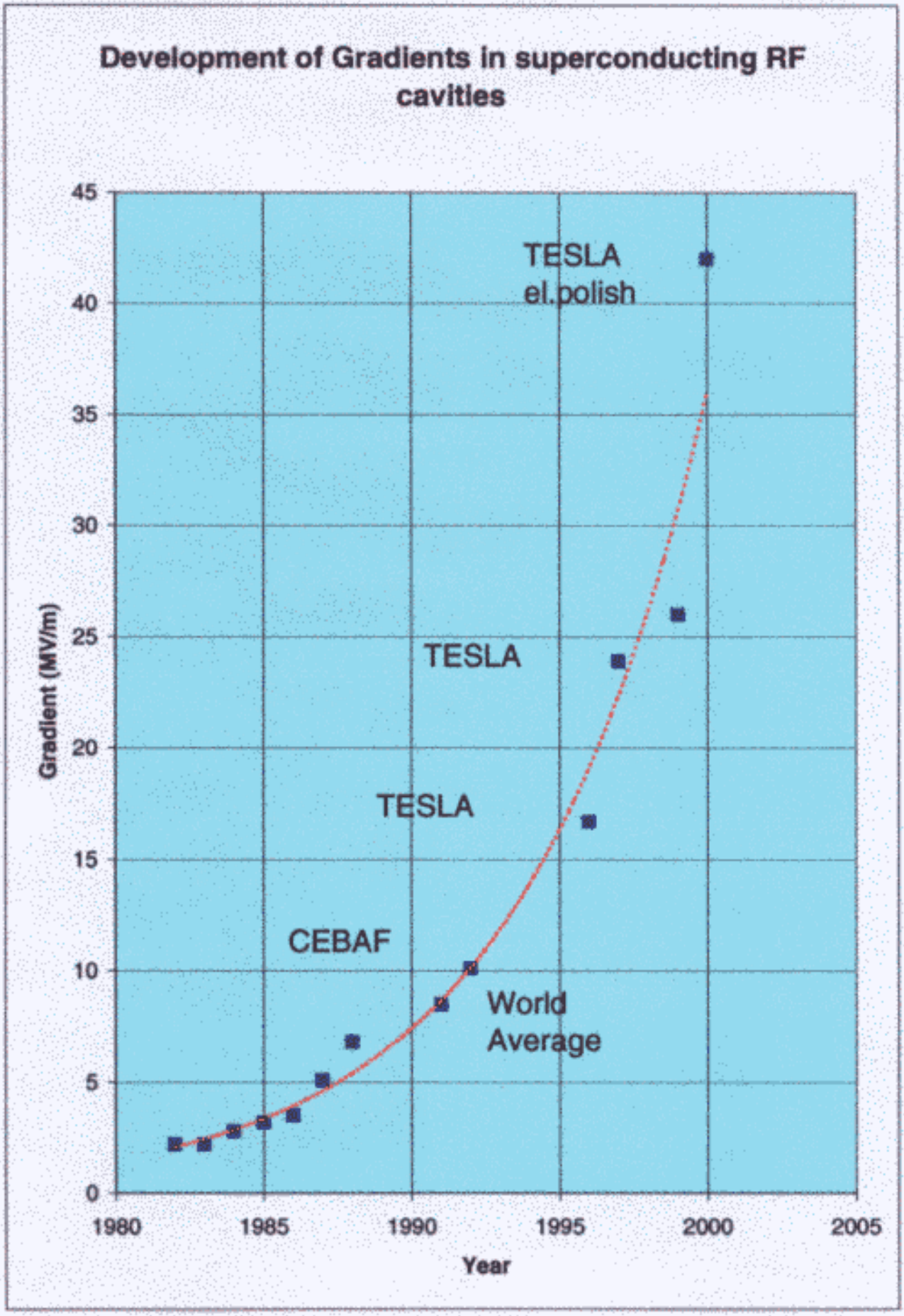
  - 25 MV/m @ $Q > 5\ 10^9$ is reached routinely
  - operation of SC linac is very stable
  - SASE principle works at short wave lengths

- Steps taken to reach higher energies:

  - build cavities with high gradients (40 MV/m)
  - reduce Lorentz force detuning by stiffening or active feed back (Piezo tuning)
  - increase filling factor

- Still missing:

  - firm cost estimate (spring 2001)


Development of Gradients in superconducting RF cavities
Gradient (MV/m)
45
40
35
30
25
20
15
10
5
0
1980
1985
1990
1995
2000
2005
Year
TESLA el.polish
TESLA
TESLA
CEBAF
World Average

Industrial Studies

Several industrial studies are in progress:

• Cryostats	INFN
• Damping Rings	INFN
• Input Couplers	IN2P3
• SC Magnets	Spain
• Cryogenics	TU Dresd
• Cavity Production	DESY
• Klystrons	DESY
• Modulators	DESY

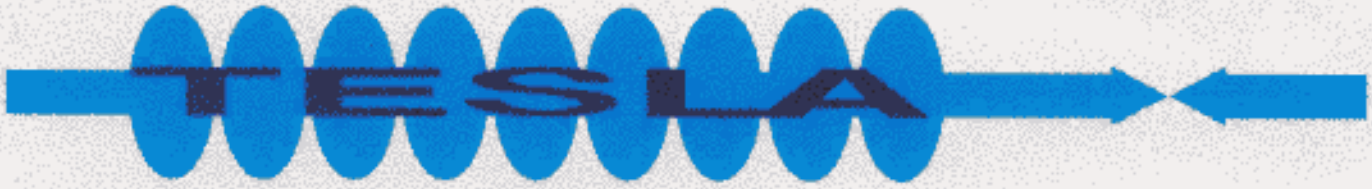
In these studies it is assumed that facility will be built in approx. 8 years

Comparison of TESLA 500 and CERN-LHC Helium Refrigerators

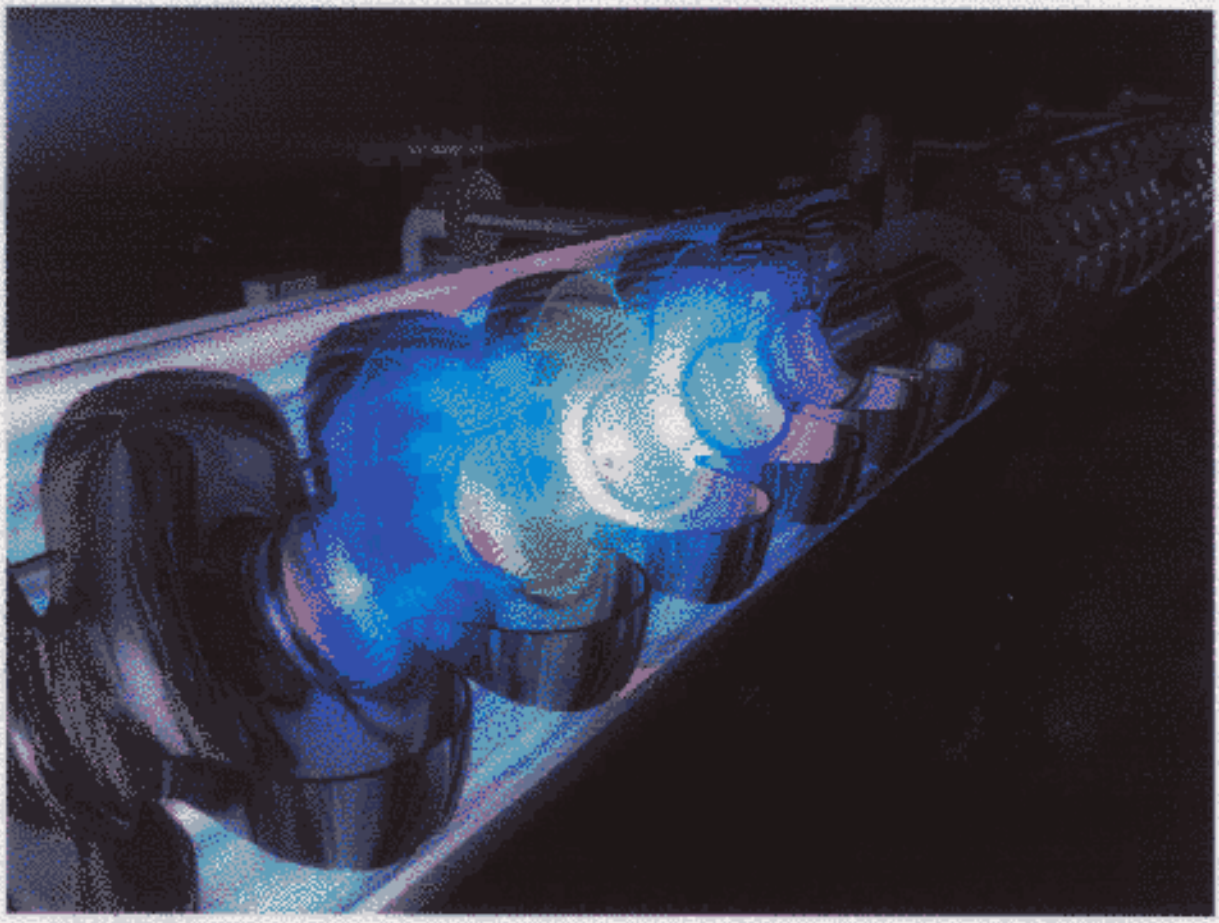
Similarities	
Number of refrigeration stations	8 at LHC 7 at TESLA
Distance between refrigerator stations	About 5 km
Nominal rate of refrigeration per refrigerator	18 kW at LHC 24 kW at TESLA
Superfluid helium cooling	1,7 K at LHC 1,9 K at TESLA
Same helium inventory	About 100 t

Advantages of TESLA	
Comes later	Can learn from LHC
TESLA starts on the green meadow	LHC is modified LEP system
Lower depth below ground	All refrigerator equipment can be installed above ground
Mostly horizontal	Easier helium level control
8 times smaller cold mass	Easier cool-down and warm-up
Transfer lines inside cryostat	Easier to distribute cooling

Disadvantages of TESLA	
Low design pressure of cryostats	Emergency power is needed to handle helium on power outage
Larger difference between static and dynamic load	Transients have to be investigated more carefully
Later upgrade to TESLA 800	Some early investment is necessary



Technical Design Report



March 2001

DESY 2001 -
ECFA 2001 -
LINEAR COLLIDER 2001 -
TESLA Collaboration 2001 -

Technical Design Report

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Executive Summary

The Executive Summary should address the following items related to particle physics:

- What was achieved with LEP, HERA, SLC and Tevatron
- Which is the road map of future research in particle physics?
- Complementarity of LHC and a LC
- Physics (discovery) potential of a 500 - 800 GeV LC

The DESY Scientific Council has asked for an early version of the Executive Summary.

The next meeting of the SC is on 2 Nov 2000

"What people want to know about TESLA and always dare to ask..."

- Should the decision on a LC be delayed until results from the LHC confirm, that the energy range of 200 GeV to 1 TeV is of significant physics interest
- If the Higgs is light, would not LHC provide enough information
- What, if the Higgs mechanism is not realised in nature
- If SUSY exists, Tevatron and the LHC will provide enough information
- What, if SUSY does not exist

- Why not build first an FEL, to gain experience with the technology in a small scale system
- Why not build CLIC right away

Update: 23 June 00, webmaster

X-FEL WORKING GROUP / WORKSHOP SERIES

To prepare the technical design report for the X-FEL facility as part of the TESLA project a series of working group meetings and workshops focusing on different subjects will be organized. The meetings will concentrate on scientific applications for the new source. For your information we have prepared a collection of documents about X-FEL parameters.

- Nuclear Resonance Scattering at the X-FEL, April 27/28
- Surface and interface physics with the X-FEL, May 18/19
- Methods & Instrumentation for the TESLA X-FEL, June 26-27
- Soft Condensed Matter, August 7 (to be confirmed)
- Nonlinear Optics, Quantum Optics & Ultra-short Phenomena, July 13-14
- Chemistry and Environmental Sciences, August 10-11
- Life Sciences, July 22-23 (to be confirmed)
- Hard Condensed Matter, July 20-21
- Material Sciences, July 20-21 (to be confirmed)
- Atomic, Molecular and Cluster Physics with short Wavelength Radiation from Free-Electron Lasers , September 4-5

The full title, a tentative list of topics and speakers you find under the corresponding workshop. If not otherwise indicated the location for the workshop will be HASYLAB at DESY in Hamburg.

If you are interested or you need further information, please contact Thomas Tschentscher (thomas.tschentscher@desy.de) or the HASYLAB secretary office (hasylab@desy.de).

TESLA
Further Steps and Developments

World-wide studies have shown

- that the scientific potential of an electron-positron LC of 500 - 1000 GeV is excellent and complementary to LHC,
- that the scientific potential of an high power, coherent X-Ray FEL exceeds by far that of the third generation synchrotron light sources

Therefore the next steps are:

- Continued operation of the TESLA Test Facility TTF1 and subsequent extension to TTF2 (2003)
- Completion of a formal proposal (TDR) including the scientific case for particle physics, applications of the X-Ray laser, accelerator design, schedule and cost (March 2001)
- Submission of TDR for evaluation in Germany by German Science Council (2001/2002)
- ECFA Study on long-term perspectives of particle physics in Europe (2000/2001), with similar studies in Asia and the USA
- ICFA Study of the Global Accelerator Network (2000/2001), a possible concept for international realisation and operation of new large accelerator facilities

ECFA Study on Long-Term Perspectives of Particle Physics in Europe

Task:

- Draw up a scenario for the perspectives of accelerator-based European and world High Energy Physics for the period following LHC construction

Members:

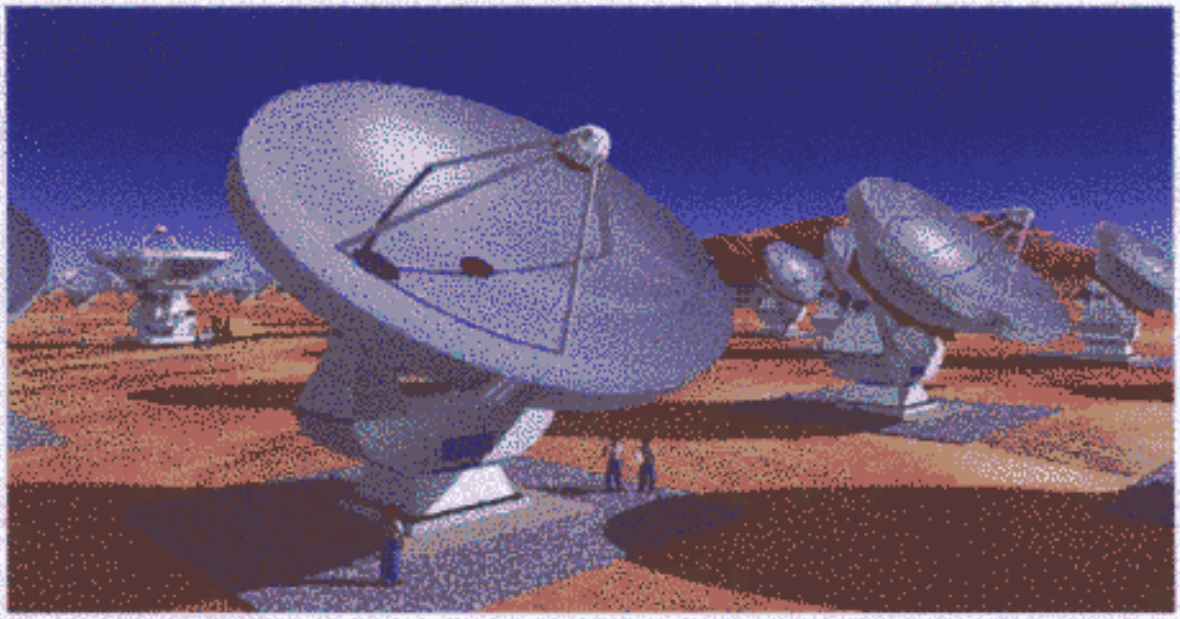
• Chair	L. Foa
• Belgium, Netherlands:	F. Linde
• Central Europe (A,Cz,Hu, Pl,Sk):	D. Kuhn
• France:	R. Aleksan
• Germany:	S. Bethke
• Italy:	F. Ceradini
• Nordic Counties (Dk,Fi,No,Sw):	J.R. Hansen
• Southern Europe (Bg,Gr,Pt,Es):	F. Barreiro
• Switzerland:	A. Blondel
• UK:	B. Foster

Global Accelerator Network

- build and operate accelerators in the same way as HEP experiments
- network: pull together world-wide competence, ideas, resources
- capital investment in home countries
- put accelerator into an existing lab
  - make optimal use of available experience, manpower, infrastructure
  - special financial obligation for host country
- maintain & run accelerator from home labs, only small crew on-site
- maintain scientific & technical culture in home labs, remain attractive for young scientists, yet contribute to and participate in large, unique projects
- requirements: remote operation & diagnostics

ICFA study

ALMA



The Atacama Large Millimeter Array (ALMA)

• Merger of the major millimeter array projects into one global project:

- European Large Southern Array (LSA),
- U.S. Millimeter Array (MMA),
- possibly the Japanese (LMSA).

• Largest ground-based astronomy project of the next decade and, together with the Next Generation Space Telescope (NGST), one of the two major new facilities for world astronomy possibly coming into operation by the end of the decade.

A Joint Project with the U.S.

Resolution between ESO and the U.S. National Radio Astronomy Observatory (NRAO) signed in June 1997

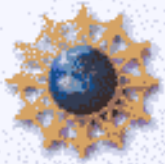
Agreement signed on 10 June 1999 in Washington to continue collaboration on the first phase of a giant new telescope project.

The basic principle is that of a 50-50 partnership between Europe and the U.S., with joint overall direction.

There will be a European Project Office leading the European effort and a U.S. Project Office for the U.S. side. In the operations phase the array will be run by an ALMA Observatory established as a legal entity in Chile, controlled and funded equally by Europe and the U.S.

Organizations supporting the ALMA Project

HOME INDEX SEARCH HELP NEWS



The National Science Foundation (NSF) of the United States of America

The European Southern Observatory (ESO), Garching

The Centre National de la Recherche Scientifique (CNRS), France

The Max Planck Gesellschaft (MPG), Germany

The Netherlands Foundation for Research in Astronomy (NFRA)

Nederlandse Onderzoekschool Voor Astronomie (NOVA)

The United Kingdom Particle Physics and Astronomy Research Council (PPARC)

The Swedish Natural Science Research Council (NFR)

Send comments to<t cont in1@eso.org>
Last modified: Mon Nov 22 18:18:52 MET

How to proceed?

- Scientific community world-wide has to agree that the scientific potential of an electron-positron LC of 500 - 1000 GeV is excellent and complementary to LHC and therefore requires a timely realisation.

- Need to set up a way to identify a common accelerator technology and unite behind it.
  (The combination of a collider with a FEL is an asset as it links different scientific communities and saves cost).

- Once united behind the physics case and one technical proposal, need to go to all governments and convince them to join and invest in a LC through a Global Accelerator Network

- Choice of site will be a political decision and determined by which country is willing to host the facility. The host nation has to make a major investment and a long term commitment.

Detector Development for Experiments at Future High Energy Linear Colliders

Review Process for an R&D program

Experiments in Particle Physics and other fields of science have profited in the past enormously from R&D work on detectors.

The SSC and LHC related R&D program was a great success and has led among many other things to a significant improvement of the radiation hardness of detectors. In this context it was helpful for all interested institutes and their funding agencies to be able to rely on a well defined review procedure.

DESY is initiating a similar review process, to stimulate and help the preparations for experiments at future high energy linear colliders and detectors for X-FELs.

The proposals will be reviewed by the DESY-PRC.

Proposals should contain:

Abstract, description of the proposed R&D, relevance for experimentation at a future high energy linear collider, milestones, schedules, finances, test-beam requirements and, if applicable requests to DESY; Title, authors with institutions, name of corresponding author with address, phone number,
e-mail-address.

The corresponding author is asked to contact the PRC-secretary Chris Youngman (PRC@desy.de – phone +49-40-8998-3879) to obtain a proposal number: PRC-R&D-xxx (date), and to inform him of the planned date of submission.

The proposals should be submitted in eletronic form to

PRC@desy.de

In order to be considered at the next PRC-meeting, proposals have to be submitted six weeks in advance of the PRC-meeting. A referee will be nominated whose name will be communicated to the corresponding author within two weeks of the reception of the proposal. Contacts between authors and the referee should take place in advance of the PRC-meetings.

Representatives of the proposal are expected to be present at DESY at the time of the PRC-meetings. They will be invited to participate in the discussion in the closed session, and may also be invited for an open presentation.

TESLA
Kick-Off Meeting etc.

Kick-Off Meeting

Goal:

Presentation of the content of the scientific and technical content of the TDR to the community

23/24 March 2001 at DESY

ECFA/DESY Study Phase 3

Next meeting (tentatively) in Cracow

≈ 14 - 17 September 2001

Organizing committee:

Chair: David Miller, U.C.London.

Mikhail Danilov, ITEP, Moscow.
Enrique Fernandez, Barcelona.
Leif Jönsson, Lund.
Rolf Heuer, U. of Hamburg/DESY.
Paolo Laurelli, Frascati.
Martin Leenen, DESY.
François Richard, Orsay.
Ron Settles, MPI Munich.
Torbjörn Sjöstrand, Lund.
Peter Zerwas, DESY.