

TESLA **Technology** Collaboration

- 1) TESLA **Technology** Collaboration
- 2) What has happened since Orsay, September 2004
- 3) Misc
- 4) Where to go from here?

Albrecht Wagner
DESY, 30 March 2005

This Meeting

- This is the first full Collaboration Meeting since the re-orientation of the Collaboration at the Orsay meeting (September 2004). Consequently the meeting will focus specifically on the SC RF linac technology.

For this meeting there will be **three working groups** all related to aspects of the SCRF technology:

- **WG-1: R&D for high-quality large-scale cavity production**
- **WG-2: Next-generation cavity infrastructures**
- **WG-3: Auxillaries & module integration**

A recurrent theme running will be industrialisation (special plenary at the end of Thursday).

To reflect the increasing global interest in the TESLA SCRF linac technology, three presentations summarise TESLA technology related R&D activities and plans in the US, Europe and Japan.

Welcome to all those who have not attended so far

TESLA Technology Collaboration

In the past, the focus of the TESLA collaboration was on the R&D for a high energy Linear Collider with an integrated XFEL. The work has led to the TESLA TDR, published in 2001. Following the recommendation of an international panel, ICFA decided in 2004 that the future work towards the International Linear Collider should be based on the **TESLA technology**.

Several major projects, such as the XFEL and the ILC, are based on the use of **SCRF technology**, in the development of which the TESLA collaboration has played a key role during the past decade.

The **responsibility** for these and possible other **projects** lies in the hands of the **respective project organisations**.

Taking into account these facts, the TESLA collaboration has **redefined its mission** as described below and has changed its name in to **TESLA Technology Collaboration**.

Mission of the TESLA Technology Collaboration

The mission of the collaboration is to advance SCRF technology research and development and related accelerator aspects across the broad diversity of scientific applications, and to keep open and provide a bridge for communication and sharing of ideas, developments, and testing across projects.

To this end the TESLA Test Facility TTF, serving as basis for the VUV-FEL at DESY, other Test Facilities, and module test stands will continue to be used as a test bed for new developments and experiments in SCRF technology, beam and light physics, and associated developments such as instrumentation and diagnostics.

The collaboration will support and encourage free and open exchange of knowledge, expertise, engineering designs, and equipment.

Organisation and Membership

The collaboration is based on groups at the different collaborating laboratories or Test Facilities working on SC RF accelerator technology.

The organization of the collaboration rests on the following structures:

- The Collaboration Board (CB)
- The Technical Board (TB)

The activities of the collaboration are structured into technical areas of interest (e.g. cavity R&D, module development, RF control, etc). The technical areas should be defined by the CB, in agreement with the leaders of the major projects using SC RF technology, such as the XFEL or the ILC.

Memorandum of Understanding

- A **new MoU** will be discussed in the CB tomorrow
- The latest draft has been mailed yesterday to the members of the CB and is available also in hardcopy
- The MoU defines the **Mission** of the TESLA Technology Collaboration, the organisation, the role of the Collaboration and Technical Boards, the membership, **intellectual property**, and publication

- **Collaboration Membership**

Institutions which were members of the TESLA collaboration will become members of the TESLA Technology Collaboration without further action by the CB.

In view of the redefined mission of the Collaboration **each Institution will be asked**, however, **whether it wants to remain member** of the Collaboration. Each Institution **will be asked to sign the MoU** in the form of a bilateral agreement with DESY.

New Institutions which desire to join the TESLA Technology Collaboration will present a proposal for their membership to the CB.

What has happened since September 2004?

- VUV-FEL progress
- European XFEL progress
- KEK meeting
- First CARE meeting
- EUROTeV kick-off meeting
- GDE director
- FALC meetings

VUV-FEL Status

see Hans Weise

beam energy 450 MeV

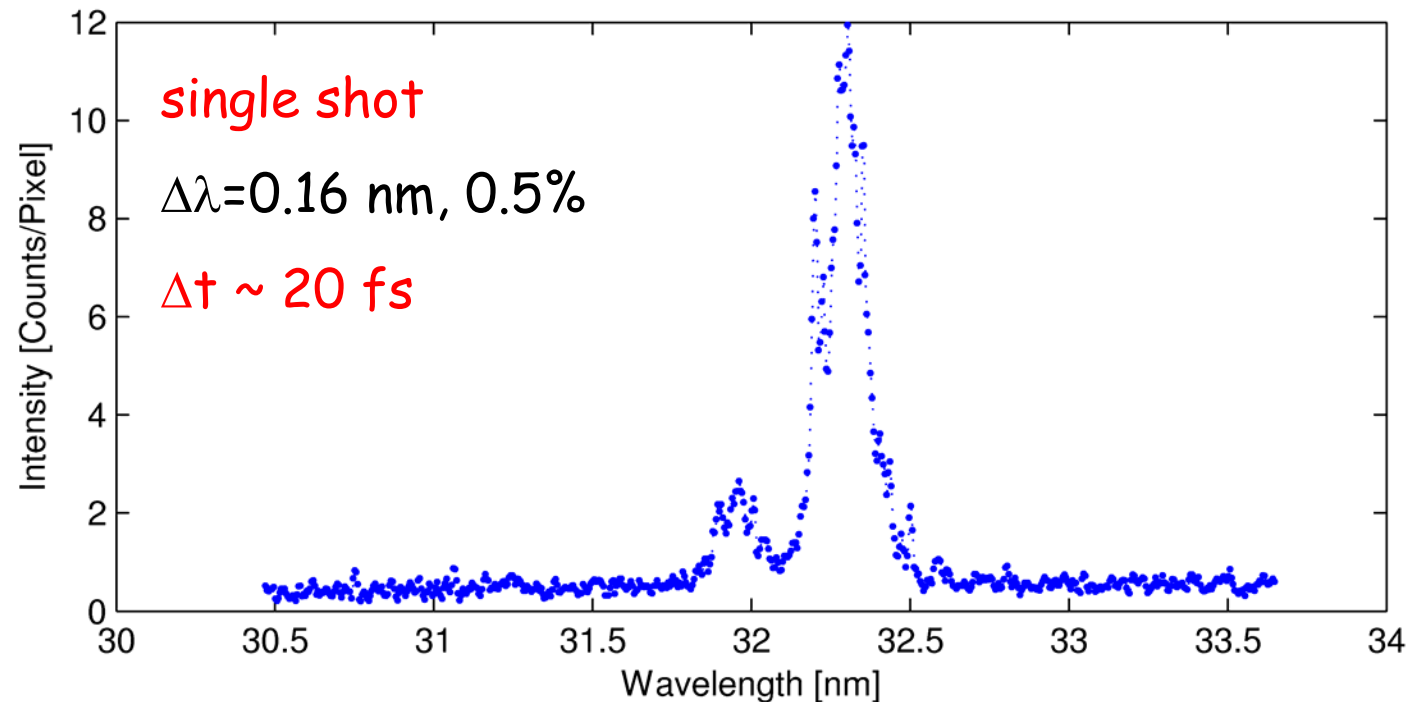
FEL gain: close to saturation (gain $\sim 10^7$)

Photon pulse energy ~ 1 micro-Joule

Photons per pulse $5 \cdot 10^{11}$ photons/sec*mm²*mrad²*0.1BW

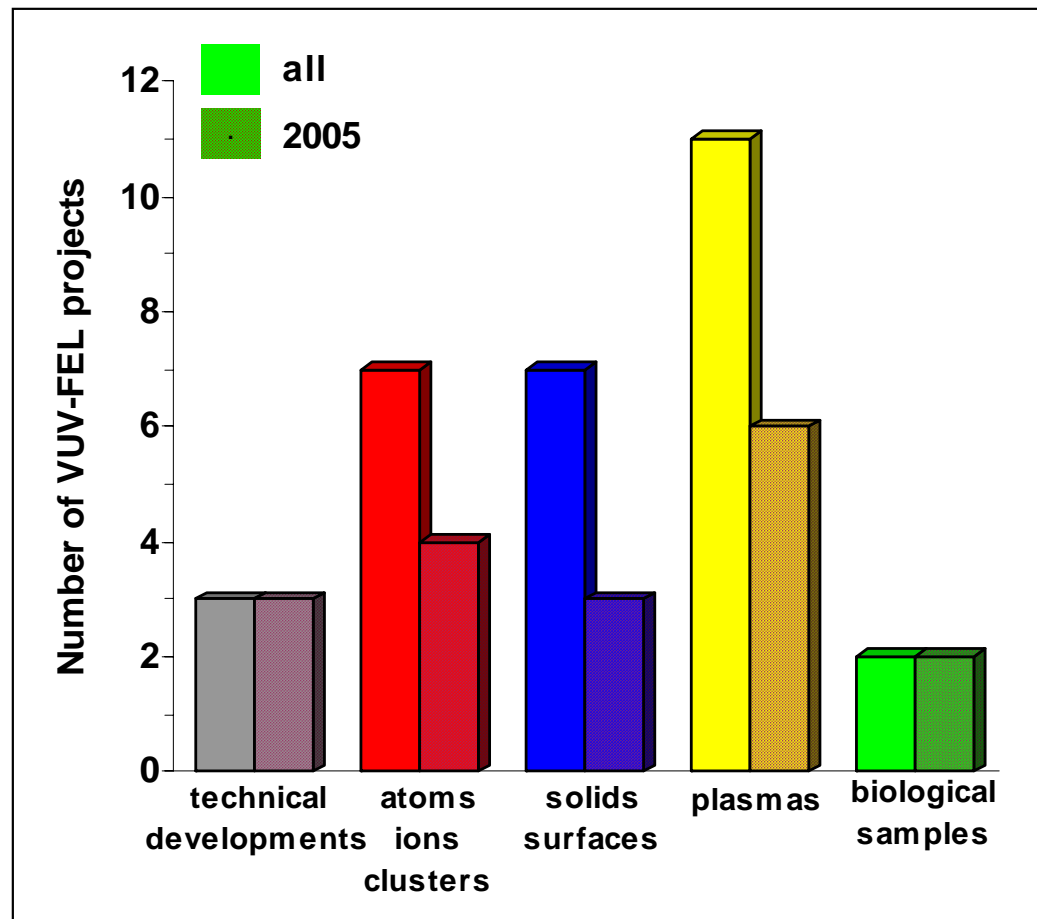
First lasing
established on
14.1.05

Performance as
predicted



Science at the VUV-FEL

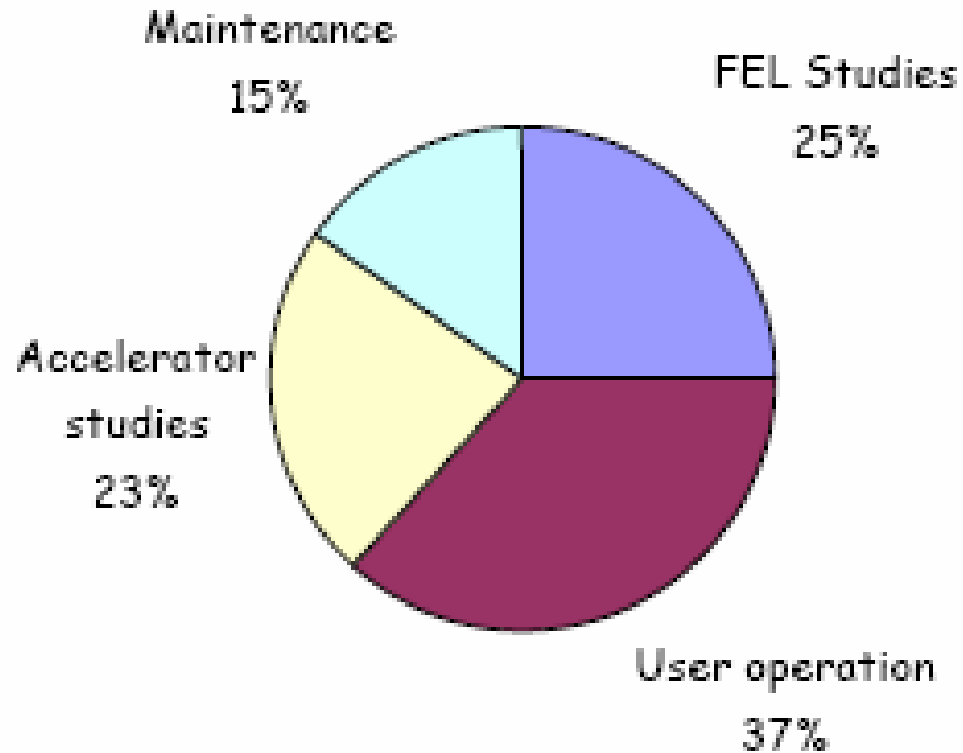
Research fields



- Proposals submitted: 30
Laser community: 16
Synchrotron community: 14
- 200 scientists from 60 institutes in 11 countries

- Many groups have formed collaborations
- Many groups have built new instrumentation
- Substantial funding has been allocated for these experiments

VUV-FEL Program for 2005



The 2005 operation time is divided in different blocks. Under the assumption of no unexpected shut downs, all requests can be full-filled.

Some reserve is within the individual operation periods.

European XFEL

German government in Feb. 2003 gave go-ahead for XFEL as European project, incl. funding 50% of total 684 M€ (year 2000) project cost, + contribution from Länder HH & Schleswig-Holstein.

~ 40% required from European Partners.

- Project currently being organised at European Level (scientific/tech. & admin./financial) ongoing - to be completed by 2005.
- Until Jan 2005, 10 European countries have **signed the MoU** for the project preparation phase (CH, D, DK, ES, F, GR, I, PL, UK, S)
- Discussions in Russia, Netherlands, Hungary
- **Goal:**
 - Until mid 2006 finish all preparations for an agreement on Government level for construction and operation of EU XFEL
 - Start of operation in 2012

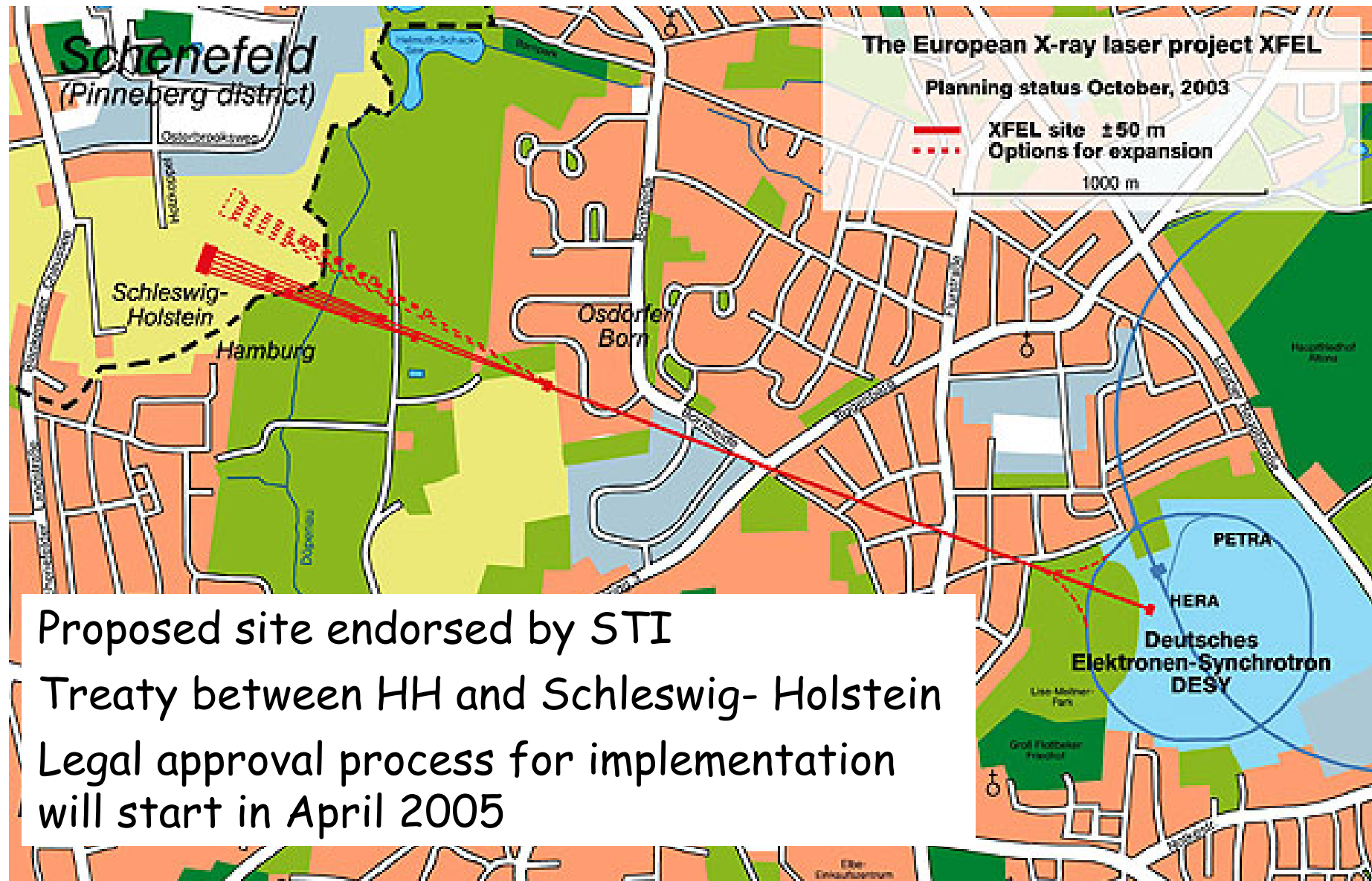
Technical Development on XFEL

- qualification of additional vendors for 10MW Klystrons (1st CPI prototype completed, Toshiba in progress)
- successful test of modulator + klystron connected by 1.5 km pulse cable; some concerns on electromagnetic noise, work in progress
- will start studies on horizontal klystron and transformer suitable for tunnel installation later this year
- industrial studies for production of 1,000 RF power couplers (procurement LAL-Orsay)
- industrial studies for module assembly (analyse assembly of module #6, selection of companies in progress)
- construction of single module test stand started, completion expected end 2005

Technical Development on XFEL

- work on Nb quality control, optimisation & control of EP parameters, planned installation of 2nd high pressure rinsing facility in 2005
- will try out P. Kneisels (JLAB) method to fabricate cavities directly from Nb Ingot (cut sheets from the "single Crystal") (no forging and rolling of Nb would be needed). Have ordered Nb sheets from Ingots by Heraeus company. Will build ~4 (6?) single cells, if successful also 9-cells.
- E-beam welding machine at DESY commissioned, plan to weld several cavities at DESY
- test of two types cold BPMs in preparation (re-entrant cavity BPM/Saclay, button BPM/DESY)
- cold magnet development at CIEMAT/Spain
- tuner development (Saclay)

European XFEL Site



Proposed site endorsed by STI
Treaty between HH and Schleswig- Holstein
Legal approval process for implementation
will start in April 2005

Time Line

Preparation of Project within framework of MoU

Politics

Science

Technology (accel...)

Experiments

Local implementation

Organisation

Cost

Etc.

Goal:

Until mid 2006 finish all preparations for an agreement on Government level for construction and operation of EU XFEL

Construction of Project within framework of contract between partner countries

Operation of project and scientific exploitation of European XFEL

2004

2006

2012

Start of the Global Design Initiative



First ILC Workshop

Towards an International Design of a Linear Collider

November 13th (Sat) through 15th (Mon), 2004

KEK, High Energy Accelerator Research Organization
1-1 Oho, Tsukuba, Ibaraki 305-0801, Japan

Program Committee:

Kaoru Yokoya (KEK), Hitoshi Hayano (KEK),
Kenji Saito (KEK), David Burke (SLAC),
Steve Holmes (FNAL), Gerald Dugan (Cornell),
Nick Walker (DESY), Jean-Pierre Delahaye (CERN),
Olivier Napolì (CEA/Saclay)

International Advisory Committee:

Robert Aymar (CERN), Albrecht Wagner (DESY),
Michael Withereff (FNAL), Yoji Totsuka (KEK),
Jonathan Dorfman (SLAC), Won Namkung (PAL),
Brian Foster (Oxford), Maury Tigner (Cornell),
Hesheng Chen (IHEP), Alexander Skrinsky (BINP),
Carlos Garcia Canal (UNL),
Sachio Komamiya (Tokyo), Paul Grannis (SUNY)

Local Organizing Committee:

Yoji Totsuka (KEK)(Chair), Fumihiko Takasaki (KEK)(Deputy-chair),
Junji Urakawa (KEK), Kiyoshi Kubo (KEK), Shigeru Kuroda (KEK),
Nobuhiro Terunuma (KEK), Toshiyasu Higo (KEK), Tsunehiko Omori (KEK),
Toshiaki Tauchi (KEK), Akiya Miyamoto (KEK), Masao Kuriki (KEK),
Kiyosumi Tsuchiya (KEK), Shuichi Noguchi (KEK), Eiji Kako (KEK)

<http://lcddev.kek.jp/ILCWS/>



~ 220 participants from 3 regions, most of them accelerator experts

Result of 1. ILC Workshop

- A lot of enthusiasm, willingness to self-organise, and a strong sense of initiative
- Working Group structure was very effective
- Has helped to advance the global collaboration on well defined work packages
- One convener per region was important
- Many (not all) labs in regions have stated their interest in specific topics
- Homework as specified by workshop charge was done to various degrees of depth
- Convergence towards a common project

ILC ↔ XFEL Synergy

- Qualification of vendors (EU, US and J)
- Industrial studies & prototypes for klystron/tunnel installation
- Involve industry in string & module assembly: 3 industrial studies
- Industrial studies for RF coupler fabrication (IN2P3/Orsay)
- Improvement of tuner design (CEA/Saclay)
- Further experience with EP treatment, improve statistics for cavities
- Build up module test stand (1st test candidate will be Module#6 with 35MV/m cavities)
- Further Synergy by operating VUV-FEL, XFEL commissioning etc

LCWS 2005

2005 INTERNATIONAL LINEAR COLLIDER WORKSHOP



Stanford, California, USA 18-22 March, 2005

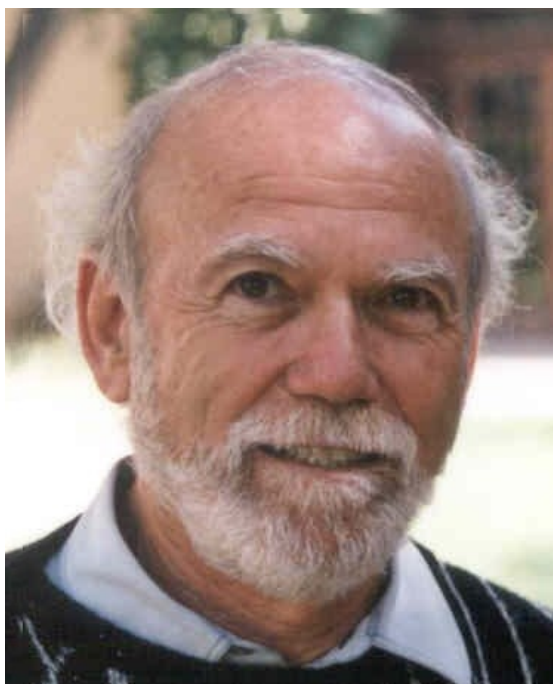
~ 380 participants

The director of the *Global Design Effort (GDE)* was announced

See talk by Nick Walker on ILC - Technical Issues:

<http://www.slac.stanford.edu/~hewett/njw-lcws2005.ppt>

Global Design Effort



At LCWS 2005, ICFA announced the appointment of **Barry Barish** as Director of the **Global Design Effort** for the proposed International Linear Collider.

The main statements of his acceptance speech were:

For the *GDE* he wants to use the approach of HEP experiments and start as a distributed effort, as he wants the right people to participate in the effort and realises they are not movable on a short time scale and are embedded in strong teams at home.

The *GDE* will therefore build on existing resources and should be managed like a big international collaboration.

GDE

He sees his job to exist until Governments take over in a more formal way (in a way the GDE corresponds very much to the preparatory phase of the XFEL, also here the two projects can learn from each other).

The tasks of the coming years are:

- Develop a robust design which meets the scientific requirements and is affordable.
- Sell the project to politicians, colleagues and the public.

Schedule:

- He wants to define the baseline design by the Snowmass meeting in August 2005 and to conclude the configuration by the end of the year. Given this early definition of the baseline he wants to install a process which allows the project to evolve and be improved.
- In his view the CDR should have a rough, but correct cost figure. (This is a new element).

GDE

- As the cost will depend also on site issues he wants to have site specific studies and costing for each region, based on sample sites.
- Therefore the CDR is targeted to be ready by the end of 2006. As this is a different CDR scope than the one assumed so far, and therefore this change in date does not represent a delay.

He sees an enormous amount of work in the machine design and has encouraged therefore the experimental particle physicists to join the accelerator efforts.

In order to have an early baseline design, but keep room for evolution, he wants to install a change control board, composed of people who have the broadest possible knowledge of the project and its facets. In this board changes are discussed, decided and documented.

He also wants a well controlled and focused R&D work to continue.

Barry sees the most urgent recruitment in one engineer/scientist per region who really understands cost in order to develop a solid common base for discussing cost.

FALC

The Funding Agencies are following closely the development towards the ILC (FALC meeting).

Two meetings took place since beginning of September 2004:

- September 04: looking at the technology recommendation
- March 05: election of new chair, **Robert Petronzio**

FALC has established a Resources Group which has met on 23 February 05 for the first time. Chair R. Wade, PPARC

European Funding for LC R&D



Structured and integrated European area in the field of accelerator research and related R&D.

3 Networking Activities and 4 Joint Research Activities.

Important: increasing role of middle sized labs and universities

First CARE annual and EUROTeV Kick-off meeting in Nov 04

European Design Study

(27 institutions, including CERN and DESY)

With top marks (**score: 4.8/5**), recommended for funding (9 M€)

European Industry Forum

Two major events have provided a strong basis for the future perspectives concerning superconducting RF linear accelerators:

- Decision of the German government in 2003 to propose to host the European XFEL
- Decision to build the ILC using the superconducting RF technology

The TESLA test facility (TTF) was built with strong involvement of European companies and has been operating since 1996. TTF has thereby provided European industry with a solid base of know-how in the field of SC RF accelerators. The technology decision has triggered substantial industrial interest in this technology also in the US and in Asia.

- In discussions with companies which have already provided components for TTF the idea emerged that it might be useful to create a **European Superconducting Linear Accelerator Forum** with the following mandate:

European Industry Forum

- Create a European industrial base for the European XFEL and the future International Linear Collider
- Serve as point of contact between i) European industry active and interested in all aspects of SC RF accelerators, ii) European accelerator laboratories, scientists and engineers, iii) the European Union, and iv) accelerator laboratories in Asia and the US
- Strengthen the discussion between industry and politics
- Develop ways of co-operation and knowledge transfer between the partners
- Provide all partners with a regular up-date of the project developments, e.g. through seminars

~ 60 participants from industry have registered (+20 from collaboration)

SCRF Forum

SCRF Forum
7/8 April 2005

Proposed Agenda

Thursday, 7 April 2005			
13:00	1:00	Registration & Coffee	--
14:00	0:45	Welcome & Presentation of the purpose of the meeting	A. Wagner
14:45	0:45	Presentation of the European XFEL	R. Brinkmann
15:30	0:45	Presentation of the International Linear Collider	N. Walker
16:15	0:30	Tea & Talks	--
16:45	0:30	Presentation of the VUV-FEL	A. Gamp
17:15	0:30	Presentation of other projects based on SCRF technology	D. Proch
17:45	0:15	Presentation of first ideas for structure and organisation of the SCRF Forum	D. Trines
18:00	1:30	Visit to the TESLA Test Facility or the Experimental Hall	H. Weise, J. Feldhaus & Co-workers
19:30	--	Dinner at the DESY Bistro	--

Chair: D. Trines (till break) & A. Wagner (after break)

Friday, 8 April 2005			
8:30	0:30	Get together & Coffee	--
9:00	1:45	Discussion "Intentions and Organisation of the SCRF Forum"	Chair & Speakers ¹
10:45	0:30	Coffee & Talks	--
11:15	0:30	Concluding discussion and next steps	Chair & Participants
11:45	0:15	Nomination of an "Interim Committee" ²	All
12:00	--	End of Meeting	--
12:15	1:00	Constituent Meeting of the "Interim Committee"	"Interim Committee"

Chair: D. Trines

Where to go from here?

- This is the first meeting of the TESLA Technology Collaboration.
- Therefore not all issues have been clarified, especially in the interaction with the projects like the XFEL and ILC.
- Some concerns were voiced before the meeting that TTF related issues are not well enough represented in the agenda.
- The CB will discuss these issues, also in the context of the formulation of the MoU.
- The hope is that the CB will agree on a text for the MoU which then can be checked in the home institutions and be approved w/o major changes, such that the signing can start.
- I will report back to you on the outcome of the CB meeting on Friday