Memorandum of Understanding

Between

The Deutsches Elektronen-Synchrotron DESY
and
the Stanford Linear Accelerator Center (SLAC)

Establishing a Collaborative Research Effort to

Enable the Exploitation and Expansion of the Scientific

Capabilities of

The Linac Coherent Light Source
and
The TESLA X-Ray Free-electron Laser

November 1, 2002

Introduction

This Memorandum of Understanding (MOU) describes the collaboration between the Deutsches Elektronen Synchrotron DESY (hereinafter DESY) and the Stanford Linear Accelerator Center, operated by the Leland Stanford, Junior, University for the United States Department of Energy (hereinafter SLAC) for the purpose of early, full exploitation and expansion of the scientific capabilities of the Linac Coherent Light Source (LCLS) and the TESLA X-Ray Free Electron Laser Laboratory (TESLA XFEL).

DESY and SLAC are world-leading laboratories in the development and operation of electron accelerators for research in high-energy physics and in the many fields of science that make use of synchrotron radiation. Research carried out at these institutions has made key contributions to establishing the feasibility of a free-electron laser producing Ångstrom-wavelength x-rays with peak brightness ten billion-fold beyond that of existing sources. Both institutions are committed to explore the extraordinary scientific capabilities that an x-ray free-electron laser will offer. SLAC has developed plans to construct the LCLS utilizing the existing SLAC Linac. Within the TESLA Collaboration, DESY has designed the TESLA XFEL based on a new superconducting Linac developed for a linear collider which enables much higher average brightness with the ability to serve a large number of FEL beam lines. The LCLS project engineering and design has been authorized, and the facility is scheduled to become operational in 2008. The TESLA-XFEL is expected to be operational in 2011.

DESY and SLAC are constructing linac-driven light sources that provide a preview of the extraordinary capabilities of these new facilities. The TESLA Test Facility (TTF) at DESY is the shortest-wavelength free-electron laser in the world, that provided gigawatt beams at 90 nanometers, and is currently being upgraded to reach 6 nanometers. Until the LCLS and TESLA-XFEL become operational, the Sub-Picosecond Pulse Source (SPPS) at SLAC will be the world's brightest ultrashort pulse source of 8-9 keV x-rays. The TTF and SPPS offer a combination of peak brightness and short pulse duration far beyond any other sources in the world today. Each source provides opportunities to explore previously inaccessible realms of dynamics in the chemical, biological and materials sciences as well as in nanoscale phenomenology, atomic and plasma physics. In addition, each source provides unique previews of key characteristics of the future LCLS and TESLA-XFEL. It is therefore in the strong interest of both DESY and SLAC to collaborate in research at TTF and SPPS, and to extend this collaboration into the commissioning, operation and utilization of the hard x-ray FEL facilities (LCLS and TESLA-XFEL).

The purpose of this research collaboration is to:

- Insure the early success of the TESLA-XFEL and LCLS scientific programs
- Carry out scientific research exploiting the unique capabilities of the TTF and SPPS sources

I. Objectives

Of the many technical challenges to be faced in fully exploiting the capabilities of an XFEL as a scientific tool, a few stand out:

- Development of techniques for measurement and control of the duration of x-ray pulses in the 100 fsec range
- Development of techniques for synchronization of 100 fs x-ray pulses with those of external lasers
- Verification of the performance of x-ray optics compatible with XFEL characteristics
- Development of techniques for producing x-ray pulses in the 10 fsec range, which will dramatically increase the power of an XFEL as a probe of chemical and physical dynamics
- Development of techniques for control of the temporal coherence of XFELs
- Enhancement and utilization of higher harmonics to extend to shorter wavelength radiation

In parallel, there are tremendous scientific opportunities and large unexplored areas for which solutions to the technical challenges outlined above will greatly advance the pace of discovery. Collaborative scientific research with TTF and SPPS will identify unanticipated opportunities and provide a window into the broad scientific potential of the LCLS and TESLA-XFEL. Specific opportunities to be pursued under this collaboration include:

- X-ray emission using TTF 3rd harmonic to elucidate the electronic and structural nature of transient species in catalysis
- Ultrahigh resolution photoemission using TTF for the study of strongly correlated electronic systems extending the temperature scale down to a few Kelvin
- Time-resolved diffuse x-ray scattering using SPPS to elucidate the atomic scale mechanisms of non-equilibrium dynamics in solids
- Time-resolved x-ray diffraction studies of photoinduced molecular transformations in condensed systems on the fsec time scale using SPPS to structurally characterize short lived transient states

DESY and SLAC will begin by collaborating on research using the TTF and SPPS sources that will address these technical challenges and scientific opportunities. Evolution of this collaboration will accelerate and contribute to the scientific programs of LCLS and TESLA-XFEL.

It is expected that DESY and SLAC, in the next step, will play key roles in the planning and development of facilities for research in XFEL science and technology as part of the LCLS program.

It is foreseen that these activities will span the interval from 2002 to 2011 and beyond, and include the commissioning and x-ray research phases of SPPS, TTF, LCLS and TESLA-XFEL.

II. Description of Cooperation

The cooperation between the institutions can take the form(s) of:

1. exchange of personnel
2. exchange of equipment
3. exchange of research results and data as well as know-how
4. financial contributions to activities being undertaken
5. any other form which the parties might consider appropriate

Details of the individual activities pursued within the frame of this MOU will be agreed upon by the respective participating parties in technical annexes. As a minimum these annexes shall contain details concerning the object of the specific cooperation, time schedules, technical, financial, and scientific responsibilities. If not specifically agreed otherwise, the general rules of this Agreement shall apply. Technical spokespersons from the participating parties will be designated for each activity agreed upon in a technical annex. The technical spokespersons shall be designated by the directors of DESY and SLAC and named in the technical annexes.

III. Exchange of Personnel

The parties will delegate personnel to the other parties to the extent agreed upon. Each delegation requires the consent of the receiving party. The delegates will remain full employees of their home institutions. The receiving party will not be responsible for social insurance (covering pension fund, unemployment, occupational disease). The sending party is responsible for maintaining adequate health insurance and third party liability insurance coverage of the delegates unless the receiving party agrees to take responsibility for providing appropriate insurance. The costs of each delegation, including salaries and travel costs, shall be borne by the delegating party unless it is specifically otherwise agreed.

The receiving party will provide assistance in finding adequate housing for the delegates.

While at the receiving party's facility, the delegates are subject to the safety, business and other rules of the receiving party.

IV. Exchange of Equipment

Equipment sent by one party to another party for the purpose of this collaboration will remain the property of the sending party unless otherwise agreed. Cost of transportation will, unless agreed otherwise, be borne by the sending party. The receiving party will act as importer and take care of all formalities, including customs, import excise tax, etc.

V. Special Considerations

1. Information Sharing

As needed and appropriate under the circumstances the parties will make available to each other free of charge and without being requested in writing or in any other specific form, their existing scientific information, research results and data, protected or not, relevant for the purposes of the collaboration. They will not hold each other liable for exactness or completeness of information which they transmit according to their best knowledge.

2. Intellectual Property

2.1. Free Use of Knowledge and Data

In the context of this collaboration, each party shall be entitled to use for its own purposes any acquired knowledge or expertise, whether patentable or not. All data obtained will be made accessible to all parties.

2.2. Patents and Technical Data

If a patentable invention is developed by one of the parties in the context of the collaboration, the others shall be informed thereof as soon as possible in order to decide on the appropriate ownership, before further steps are taken. It is understood that every party shall be entitled to a free utilization license as provided for under paragraph 2.1 (above). Joint inventions shall belong jointly to the inventing parties who have to agree in each case on the sharing and the joint exploitation. Pending such decision, the parties shall refrain from action that would prejudice patent-taking or licensing.

3. Public Information Coordination

The results of each collaborative task should be reported to the collaboration for critical review before outside announcements are made. Results to be presented for publication in the name of the collaboration should be submitted for publication only after critical review and agreement between the members of the collaboration task. All members of the collaboration are entitled to be involved in the publication of results obtained in the collaboration. All publications developed under this collaboration using SLAC funds are subject to SLAC's procedures and Stanford University's contract DE-AC03-76SFO0515 with the Department of Energy, which requires that all SLAC publications receive prior copyright/invention review.

4. Funding

Activities under this MOU, including the provision of financial support are subject to applicable national laws and regulations and shall be subject to the availability of appropriated funds.

5. Liability

   The parties in the framework of this agreement will not hold each other liable for damage caused by their personnel delegated to the other party, unless such damage is caused by gross negligence or willful misconduct.

   Liability for damage suffered by delegated personnel or third parties within this collaboration is defined by applicable law.

6. Disagreement

   The parties shall, in the framework of this Agreement, do their utmost to settle amicably any differences and difficulties which may arise out of this Agreement or the collaboration itself. Failure to reach agreement should be referred to the appropriate Directors for joint resolution.

7. Obligation

   This Agreement is a collaboration which does not constitute a contractual obligation on the part of any of the parties. The parties concur in the terms of this Agreement.

VI. AMENDMENTS

This MOU may be modified from time to time by written agreement of the parties.

VII. EFFECTIVE DATE AND DURATION

This Agreement shall become effective on the later date of signature of the parties. It will remain in effect until superseded or until five years from the effective date, whichever occurs first. It can be extended by mutual consent. Any party may withdraw at anytime upon sixty days notice to the other parties.

Once a task is initiated, it is the intention of the parties to complete the effort. Therefore, in the event of termination of this Agreement by any party, its provisions shall continue to apply for any project begun under this Agreement until the completion or termination of such project.

VIII. CONCURRENCE

This MOU is prepared in the English Language only, in two copies, each of them equally valid. The following representatives of DESY and SLAC concur in the terms of this Memorandum of Understanding.

For DESY

Albrecht Wagner
Chairman of the Board of Directors,
Deutsches Elektronen Synchrotron
DESY

Jochen R. Schneider
Director of Research,
Deutsches Elektronen Synchrotron
DESY

1 Nov 02

For Stanford Linear Accelerator Center

Jonathan Dorfan
Director, Stanford Linear Accelerator Center

Technical Annex No.1

to the DESY/SLAC Memorandum of Understanding of November 1, 2002

This document is a technical annex to the Memorandum of Understanding describing the collaboration of DESY and SLAC on cooperation in a joint effort to exploit and expand the scientific capabilities of the Linac Coherent Light Source (LCLS) and the TESLA X-Ray Free Electron Laser Laboratory (TESLA-XFEL), dated November 1, 2002. The purpose of this technical annex is to define the activities planned by SLAC and DESY under the terms of the MOU in the period of around November 2002 through January 2004.

Activities

- A DESY scientist will visit SLAC to participate in the commissioning of the SPPS Chicane. For DESY, J. Rossbach; for SLAC, J. Galayda
- DESY and SLAC scientists will collaborate in the development of tools and strategies for so-called start to end simulations. For DESY J. Rossbach, for SLAC; J. Galayda
- A DESY scientist will visit SLAC to participate in experiments at the SPPS, including the development of pump/probe timing techniques. For DESY, T. Tschentscher; for SLAC, J. Hastings
- A SLAC scientist will visit DESY to participate in the commissioning of the TTF FEL. For DESY, J. Rossbach; for SLAC, J. Galayda
- DESY and SLAC will collaborate in the planning of LCLS experiment facilities to support a program of research in x-ray FEL science and technology. For DESY, J.R. Schneider; for SLAC, J. Galayda

For DESY

Albrecht Wagner
Chairman of the Board of Directors,
DESY

1 Nov 02
Date

Jochen R. Schneider
Director of Research, DESY

For SLAC

Jonathan Dorfan
Director, Stanford Linear Accelerator Center

Nov 1, 2002
Date

Keith O. Hodgson
Director, SSRL

John Galayda
Director, LCLS Project

Jerome Hastings,
Project Manager, SPPS