PROCEEDINGS OF SPIE

X-Ray Free-Electron Lasers: Beam Diagnostics, Beamline Instrumentation, and Applications II

Stefan P. Hau-Riege
Stefan P. Moeller
Makina Yabashi
Editors

18–19 August 2014
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 9210

Proceedings of SPIE 0277-786X, V. 9210

X-Ray Free-Electron Lasers: Beam Diagnostics, Beamline Instrumentation, and Applications II, edited by Stefan P. Hau-Riege, Stefan P. Moeller, Makina Yabashi, Proc. of SPIE Vol. 9210, 921001 · © 2014 SPIE · CCC code: 0277-786X/14/$18 · doi: 10.1117/12.2084771

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:
Author(s), "Title of Paper," in *X-Ray Free-Electron Lasers: Beam Diagnostics, Beamline Instrumentation, and Applications II*, edited by Stefan P. Hau-Riege, Stefan P. Moeller, Makina Yabashi, Proceedings of SPIE Vol. 9210 (SPIE, Bellingham, WA, 2014) Article CID Number.

ISSN: 0277-786X
ISBN: 9781628412376

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE Digital Library
SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B … 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

Contents

Authors

Numbers in the index correspond to the last two digits of the six-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first four digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Conference Committee

Program Track Chairs

Carolyn A. MacDonald, University at Albany (United States)
Ralph B. James, Brookhaven National Laboratory (United States)

Conference Chairs

Stefan P. Hau-Riege, Lawrence Livermore National Laboratory (United States)
Stefan P. Moeller, SLAC National Accelerator Laboratory (United States)
Makina Yabashi, RIKEN (Japan)

Conference Program Committee

Henry N. Chapman, Deutsches Elektronen-Synchrotron (Germany)
Christian David, Paul Scherrer Institut (Switzerland)
Alan R. Fry, SLAC National Accelerator Laboratory (United States)
Gerhard Grübel, Deutsches Elektronen-Synchrotron (Germany)
Gregory Y. Prigozhin, MIT Kavli Institute for Astrophysics and Space Research (United States)
Nina Rohringer, Max-Planck-Institut für Physik komplexer Systeme (Germany)
Harald Sinn, European XFEL GmbH (Germany)
Kai Tiedtke, Deutsches Elektronen-Synchrotron (Germany)

Session Chairs

1 Diagnostics and Instrumentation I
Stefan P. Moeller, SLAC National Accelerator Laboratory (United States)

2 Optics I
Christian David, Paul Scherrer Institut (Switzerland)

3 Optics II
Stefan P. Hau-Riege, Lawrence Livermore National Laboratory (United States)

Introduction

The conference *X-Ray Free-Electron Lasers: Beam Diagnostics, Optics, and Applications* II took place in San Diego, California on August 18-19, 2014. The first conference with the same title was held in 2012.

The field of X-ray free-electron lasers (FEL) continues to develop at a rapid pace. Several facilities have been operating for a number of years such as the hard X-ray FELs, the Linac Coherent Light Source (LCLS) at Stanford (since 2009), and the SPring-8 Angstrom Compact FEL, SACLA in Japan (since 2011). FLASH I at DESY in Germany (since 2005), and the Fermi at Elettra in Italy (since 2011) operate in the VUV and soft X-ray range. Several other FEL facilities are under construction such as the European XFEL (planned operation in 2016), the Swiss FEL (2016), and the Korean FEL (2016). In addition, facility expansion projects are underway for FLASH II (first light in August 2014) and LCLS-II with vastly expanded capabilities.

X-ray FEL sources are known for their unique beam properties providing short pulses in the sub tens femtoseconds range with up to 1E13 photons and transverse coherence from the UV to over 10keV photon energy, offering great potential for exploring new scientific possibilities in ultrafast science. These unparalleled beam properties also present unique challenges for beam optics, diagnostics, detectors, and timing requirements for synchronization techniques with optical lasers for pump-probe experiments.

The conference captures this rapid development in a new field and spans topics from facility updates, optical components, instrumentation, beam diagnostics to optical lasers, methods and technique development, novel detectors, applications, and simulations.

This year's contributions showed a strong emphasis on optics with a number of different designs for split and delay devices. These are very challenging instruments requiring long term projects. Significant progress has also been made in controlling the FEL beam such as implementing seeding schemes, changing the state of polarization and thus providing exciting new opportunities for experiments. Various updates on facilities and individual beamline instruments were included in the program.

We gratefully acknowledge SPIE for their support and excellent organization of the conference. We also thank the Program Committee for their ongoing support in the program organization, and the session chairs for their help in running the conference. Most importantly, we thank the many participants for their significant scientific contributions to the 2014 meeting.

Stefan P. Hau-Riege
Stefan P. Moeller
Makina Yabashi