

PROCEEDINGS OF SPIE

***High Energy/Average  
Power Lasers and Intense  
Beam Applications V***

**Steven J. Davis  
Michael C. Heaven  
J. Thomas Schriempf**  
*Editors*

**23 and 25 January 2011  
San Francisco, California, United States**

*Sponsored and Published by*  
SPIE

**Volume 7915**

Proceedings of SPIE, 0277-786X, v. 7915

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

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 *High Energy/Average Power Lasers and Intense Beam Applications V*, edited by Steven J. Davis, Michael C. Heaven, J. Thomas Schriempf, Proceedings of SPIE Vol. 7915 (SPIE, Bellingham, WA, 2011) Article CID Number.

ISSN 0277-786X  
ISBN 9780819484529

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

Copyright © 2011, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/11/\$18.00.

Printed in the United States of America.

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

The logo for SPIE Digital Library features the word "SPIE" in a bold, sans-serif font above the words "Digital Library" in a smaller, lighter font. To the right of the text is a stylized graphic consisting of three vertical bars of increasing height, resembling a bar chart or a signal waveform.

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.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 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

- v *Conference Committee*
- vii *Microfabrication by optical tweezers (Plenary Paper) [792102]*  
R. Ghadiri, T. Weigel, C. Esen, A. Ostendorf, Ruhr-Univ. Bochum (Germany)

---

## SESSION 1 COIL, EOIL

---

- 7915 02 **Recent electric oxygen-iodine laser experiments and modeling (Invited Paper) [7915-01]**  
D. L. Carroll, G. F. Benavides, J. W. Zimmerman, CU Aerospace LLC (United States);  
B. S. Woodard, Univ. of Illinois at Urbana-Champaign (United States); A. D. Palla, CU  
Aerospace LLC (United States); M. T. Day, Univ. of Illinois at Urbana-Champaign (United  
States); J. T. Verdeyen, CU Aerospace LLC (United States); W. C. Solomon, Univ. of Illinois at  
Urbana-Champaign (United States)
- 7915 03 **New concepts of the chemistry of electric-discharge oxygen-iodine lasers (Invited Paper)**  
[7915-02]  
W. T. Rawlins, S. Lee, A. J. Hicks, I. M. Konen, D. B. Oakes, E. P. Plumb, S. J. Davis, Physical  
Sciences Inc. (United States)
- 7915 04 **Catalytic enhancement of singlet oxygen production and optical gain in electric discharge**  
**oxygen-iodine laser systems [7915-03]**  
S. Lee, W. T. Rawlins, A. J. Hicks, I. M. Konen, E. P. Plumb, S. J. Davis, Physical Sciences Inc.  
(United States)
- 7915 05 **A simplified kinetic model for the COIL active medium [7915-04]**  
V. N. Azyazov, S. Yu. Pichugin, P.N. Lebedev Physical Institute (Russian Federation);  
M. C. Heaven, Emory Univ. (United States)

---

## SESSION 2 DPAL, XPAL

---

- 7915 06 **Demonstration of a diode pumped continuous wave potassium laser [7915-05]**  
B. V. Zhdanov, M. K. Shaffer, R. J. Knize, U.S. Air Force Academy (United States)
- 7915 07 **Cesium laser operating in the blue by direct optical excitation of the  $7^2P_{3/2}$  state [7915-06]**  
K. C. Brown, G. P. Perram, Air Force Institute of Technology (United States)
- 7915 08 **Small signal gain in DPAL systems [7915-07]**  
K. L. Galbally-Kinney, D. L. Maser, W. J. Kessler, W. T. Rawlins, S. J. Davis, Physical Sciences Inc.  
(United States)
- 7915 09 **High-energy transversely pumped alkali vapor laser [7915-08]**  
J. Zweiback, A. Komashko, General Atomics Aeronautical Systems, Inc. (United States)

7915 0A **New electronic transitions of the rubidium dimer** [7915-09]  
J. Han, M. C. Heaven, Emory Univ. (United States)

7915 0B **XPAL modeling and theory** [7915-10]  
A. D. Palla, D. L. Carroll, J. T. Verdeyen, CU Aerospace LLC (United States); M. C. Heaven,  
Emory Univ. (United States)

---

**SESSION 3 LASER TECHNOLOGY AND APPLICATIONS**

---

7915 0E **Energy transfer kinetics of the  $np^5(n+1)p$  excited states of Ne and Kr** [7915-13]  
M. H. Kabir, M. C. Heaven, Emory Univ. (United States)

7915 0F **Mode-locked CO laser for isotope separation of uranium employing condensation  
repression** [7915-14]  
I. Y. Baranov, A. V. Koptev, Baltic State Technical Univ. (Russian Federation)

7915 0G **Autocorrelation of femtosecond VUV pulses using multiphoton ionization** [7915-15]  
M. Kaku, W. Nagaya, H. Zushi, M. Katto, S. Kubodera, Univ. of Miyazaki (Japan)

*Author Index*

# Conference Committee

## *Symposium Chairs*

**Friedhelm Dorsch**, TRUMPF GmbH & Company KG (Germany)  
**Alberto Piqué**, Naval Research Laboratory (United States)

## *Symposium Cochairs*

**Donald J. Harter**, IMRA America, Inc. (United States)  
**Peter R. Herman**, University of Toronto (Canada)

## *Program Track Chair*

**Gregory J. Quarles**, BE Meyers & Company Inc. (United States)

## *Conference Chairs*

**Steven J. Davis**, Physical Sciences Inc. (United States)  
**Michael C. Heaven**, Emory University (United States)  
**J. Thomas Schriempf**, Naval Sea Systems Command (United States)

## *Program Committee*

**David L. Carroll**, CU Aerospace LLC (United States)  
**Jarmila Kodymová**, Institute of Physics of the ASCR, v.v.i. (Czech Republic)  
**Timothy J. Madden**, Air Force Research Laboratory (United States)  
**William E. McDermott**, University of Denver (United States)  
**Wilson T. Rawlins**, Physical Sciences Inc. (United States)

## *Session Chairs*

- 1 COIL, EOIL  
**J. Thomas Schriempf**, Naval Sea Systems Command (United States)
- 2 DPAL, XPAL  
**Wilson T. Rawlins**, Physical Sciences Inc. (United States)
- 3 Laser Technology and Applications  
**David L. Carroll**, CU Aerospace LLC (United States)

