Front Matter: Volume 7225
Advanced Optical Concepts in Quantum Computing, Memory, and Communication II

Zameer U. Hasan
Alan E. Craig
Philip R. Hemmer
Editors

28–29 January 2009
San Jose, California, United States

Sponsored and Published by
SPIE

Volume 7225
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:


ISSN 0277-786X
ISBN 9780819474711

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 © 2009, 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. 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/09/$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the 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 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, 0C, 0D, 0E, 0F, 10, 11, 12, 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

SINGLE ATOM OR SPIN FOR QUANTUM COMPUTING

7225 03 Complete coherent control of a single electron spin in a quantum dot using ultrafast optical pulses (Invited Paper) [7225-02]
D. Press, Stanford Univ. (United States); T. D. Ladd, Stanford Univ. (United States) and National Institute of Informatics (Japan); B. Zhang, Stanford Univ. (United States); Y. Yamamoto, Stanford Univ. (United States) and National Institute of Informatics (Japan)

7225 04 Optoelectronic manipulation of single spins in semiconductors (Invited Paper) [7225-03]
M. E. Flatté, A. De, Univ. of Iowa (United States); J.-M. Tang, Univ. of New Hampshire (United States); C. E. Pryor, Univ. of Iowa (United States)

NANOSCALE DEVICES AND SENSING

7225 08 Nanophotonic devices in single crystal diamond (Invited Paper) [7225-07]
P. E. Barclay, C. Santori, K.-M. Fu, R. G. Beausoleil, Hewlett-Packard Labs. (United States)

7225 09 Nanoscale magnetic sensing using spin qubits in diamond (Invited Paper) [7225-08]
J. R. Maze, Harvard Univ. (United States); P. Cappellaro, Harvard Univ. (United States) and Harvard-Smithsonian Ctr. for Astrophysics (United States); L. Childress, Bates College (United States); M. V. G. Dutt, Univ. of Pittsburgh (United States); J. S. Hodges, Harvard Univ. (United States) and Massachusetts Institute of Technology (United States); S. Hong, L. Jiang, Harvard Univ. (United States); P. L. Stanwix, Harvard-Smithsonian Ctr. for Astrophysics (United States); J. M. Taylor, Massachusetts Institute of Technology (United States); E. Togan, A. S. Zibrov, Harvard Univ. (United States); P. Hemmer, Texas A&M Univ. (United States); A. Yacoby, Harvard Univ. (United States); R. L. Walsworth, Harvard Univ. (United States) and Harvard-Smithsonian Ctr. for Astrophysics (United States); M. D. Lukin, Harvard Univ. (United States)

PHOTOREFRACTIVES AND PHOTONIC CRYSTALS FOR QUANTUM COMPUTING

7225 0D Photon blockade in a photonic crystal cavity with a strongly coupled quantum dot (Invited Paper) [7225-12]
A. Faraon, I. Fushman, D. Englund, J. Vučković, Stanford Univ. (United States)

7225 0E Photonic structures for QIP in diamond (Invited Paper) [7225-13]
K.-M. C. Fu, C. Santori, P. E. Barclay, Hewlett-Packard Labs. (United States); N. Meyer, A. M. Holm, Hewlett-Packard Co. (United States); I. Aharonovich, S. Prawer, The Univ. of Melbourne (Australia); R. G. Beausoleil, Hewlett-Packard Labs. (United States)
NEW CONCEPTS AND SYSTEMS

Quantum interference between photons emitted by independent semiconductor single-photon devices (Invited Paper) [7225-17]
K. Sanaka, Stanford Univ. (United States) and National Institute of Informatics (Japan); A. Pawlis, Stanford Univ. (United States) and Univ. of Paderborn (Germany); T. D. Ladd, Stanford Univ. (United States) and National Institute of Informatics (Japan); K. Lischka, Univ. of Paderborn (Germany); Y. Yamamoto, Stanford Univ. (United States) and National Institute of Informatics (Japan)

EXPERIMENTAL QUANTUM METROLOGY

Structures in diamond for optical manipulation of nitrogen-vacancy centers (Invited Paper) [7225-20]
C. Santori, K.-M. C. Fu, P. E. Barclay, R. G. Beausoleil, Hewlett-Packard Labs. (United States)

Quantum optomechanical correlations induced by radiation pressure between light and mirrors (Invited Paper) [7225-21]
T. Briant, P. Verlot, A. Tavernarakis, P.-F. Cohadon, A. Heidmann, Lab. Kastler Brossel, CNRS, Univ. Pierre et Marie Curie (France)

ENTANGLEMENT METROLOGY

Quantum Mie scattering and metrology with a Fabry-Pérot interferometer and quantum states of light (Invited Paper) [7225-26]
C. F. Wildfeuer, S. D. Huver, J. P. Dowling, Louisiana State Univ. (United States)

Prolonging qubit coherence: dynamical decoupling schemes studied in a Penning ion trap (Invited Paper) [7225-34]
H. Uys, National Institute of Standards and Technology (United States) and Council for Scientific and Industrial Research (United States); M. J. Biercuk, National Institute of Standards and Technology (United States) and Georgia Institute of Technology (United States); A. P. VanDevender, N. Shiga, W. M. Itano, J. J. Bollinger, National Institute of Standards and Technology (United States)
Density matrix approach to the Heisenberg-limited interferometry: an example (Invited Paper) [7225-28]
A. Chiruvelli, H. Lee, Louisiana State Univ. (United States)
Conference Committee

Symposium Chair

James G. Grote, Air Force Research Laboratory (United States)

Symposium Cochair

E. Fred Schubert, Rensselaer Polytechnic Institute (United States)

Program Track Chair

Zameer U. Hasan, Temple University (United States)

Conference Chairs

Zameer U. Hasan, Temple University (United States)
Alan E. Craig, Montana State University, Bozeman (United States)
Philip R. Hemmer, Texas A&M University (United States)

Program Committee

Aleksander K. Rebane, Montana State University, Bozeman (United States)
Charles M. Santori, Hewlett-Packard Laboratories (United States)
Selim M. Shahriar, Northwestern University (United States)
Alan E. Willner, University of California, Los Angeles (United States)

Session Chairs

1 Single Atom or Spin for Quantum Computing
   Charles M. Santori, Hewlett-Packard Laboratories (United States)

2 Nanoscale Devices and Sensing
   Aleksander K. Rebane, Montana State University, Bozeman (United States)

3 Photorefractives and Photonic Crystals for Quantum Computing
   Philip R. Hemmer, Texas A&M University (United States)

4 New Concepts and Systems
   Zameer U. Hasan, Temple University (United States)
5 Experimental Quantum Metrology  
Hwang Lee, Louisiana State University (United States)

6 Entanglement Metrology  
Charles M. Santori, Hewlett-Packard Laboratories (United States)

7 Alternative Perceptions and Techniques  
Alan E. Craig, Montana State University, Bozeman (United States)

8 Quantum Phase and Quantum Imaging  
Alan L. Migdall, National Institute of Standards and Technology (United States)