

PROCEEDINGS OF SPIE

Spintronics XV

Henri-Jean M. Drouhin
Jean-Eric Wegrowe
Manijeh Razeghi
Editors

21–25 August 2022
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 12205

Proceedings of SPIE 0277-786X, V. 12205

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

Spintronics XV, edited by Henri-Jean M. Drouhin, Jean-Eric Wegrowe, Manijeh Razeghi,
Proc. of SPIE Vol. 12205, 1220501 · © 2022 SPIE ·
0277-786X · doi: 10.1117/12.2661731

Proc. of SPIE Vol. 12205 1220501-1

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIDigitalLibrary.org.

The papers 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 these proceedings:

Author(s), "Title of Paper," in *Spintronics XV*, edited by Henri-Jean M. Drouhin, Jean-Eric Wegrowe, Manijeh Razeghi, Proc. of SPIE 12205, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510653948

ISBN: 9781510653955 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2022 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center 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.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

**SPIE. DIGITAL
LIBRARY**

SPIDigitalLibrary.org

Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

v *Conference Committee*

THZ SPINTRONICS

12205 02 **Helicity-dependent terahertz-wave emission from the Dirac electrons in bismuth (Invited Paper)**
[12205-2]

TOPOLOGICAL SPINTRONICS I

12205 03 **Current-induced spin polarizations in the bulk of topological insulators with inhomogeneous magnetic textures (Invited Paper)** [12205-5]

MRAMS AND SENSORS

12205 04 **Crosslayer modeling and design for spin-orbit-torque and magnetoelectric memory arrays and compute-in-memory (Invited Paper)** [12205-21]

MRAMS AND SPINTRONICS DEVICES

12205 05 **High sensitivity magnetoelastic Surface Acoustic Wave (SAW) magnetic field sensors (Invited Paper)** [12205-24]

VAN DER WAALS SPINTRONICS

12205 06 **Probing and controlling magnetism in 2D magnetic semiconductor CrSBr (Invited Paper)**
[12205-32]

12205 07 **Controlling spin and valley hall effect in monolayer WSe₂ at elevated temperatures (Invited Paper)** [12205-33]

COHERENCE AND BALLISTIC TRANSPORT

12205 08 **Spectral control of quantum emitters in quantum information processing (Invited Paper)**
[12205-40]

SPIN LASERS

- 12205 09 **Injection-locked spin-VCSELs for coherent optical communications (Invited Paper)** [12205-43]
- 12205 0A **Linear gain anisotropy and mode profile asymmetry in spin-VCSELs: extended spin-flip models (Invited Paper)** [12205-46]
- 12205 0B **Spin-1 photons, spin-1/2 electrons, Bell's inequalities, and Feynman's special perspective on quantum mechanics (Invited Paper)** [12205-76]

Conference Committee

Symposium Chairs

Gennady B. Shvets, Cornell University (United States)
Cornelia Denz, Westfälische Wilhelms-Universität Münster (Germany)

Symposium Co-chairs

Reuven Gordon, University of Victoria (Canada)
Natalia M. Litchinitser, Duke University (United States)

Conference Chairs

Henri-Jean M. Drouhin, Laboratoire des Solides Irradiés, École Polytechnique (France)
Jean-Eric Wegrowe, École Polytechnique (France)
Manijeh Razeghi, Northwestern University (United States)

Conference Co-chair

Henri Jaffrès, Unité Mixte de Physique CNRS/Thales (France)

Conference Program Committee

Claire Baraduc, CEA-Grenoble (France)
Franco Ciccacci, Politecnico di Milano (Italy)
Russell P. Cowburn, University of Cambridge (United Kingdom)
Scott A. Crooker, Los Alamos National Laboratory (United States)
Vincent Cros, Unité Mixte de Physique CNRS/Thales (France)
Hanan Dery, University of Rochester (United States)
Rogério de Sousa, University of Victoria (Canada)
Michel I. Dyakonov, Université Montpellier 2 (France)
Michael E. Flatté, The University of Iowa (United States)
Joseph S. Friedman, The University of Texas at Dallas (United States)
Pietro Gambardella, ETH Zurich (Switzerland)
Jean-Marie George, Unité Mixte de Physique CNRS/Thales (France)
Nils C. Gerhardt, Ruhr-Universität Bochum (Germany)
Julie Grollier, Unité Mixte de Physique CNRS/Thales (France)
Erez Hasman, Technion-Israel Institute of Technology (Israel)
Tomás Jungwirth, Institute of Physics of the CAS, v.v.i. (Czech Republic)
Giti A. Khodaparast, Virginia Polytechnic Institute and State University (United States)
Mathias Klaui, Universität Konstanz (Germany)

Daniel Lacour, l'Institut Jean Lamour (France)
Connie H. Li, U.S. Naval Research Laboratory (United States)
Aurélien Manchon, King Abdullah University of Science and
Technology (Saudi Arabia) and CINaM, Université d'Aix-Marseille,
CNRS (France)
Xavier Marie, INSA de Lyon- Université de Toulouse (France)
Laurens W. Molenkamp, Julius-Maximilians-Universität Würzburg
(Germany)
Hans T. Nembach, National Institute of Standards and Technology
(United States)
Yoshichika Otani, The University of Tokyo (Japan)
Vlad Pribiag, University of Minnesota, Twin Cities (United States)
Dafiné Ravelosona, Institut d'Électronique Fondamentale (France)
Nicolas Rougemaille, Institut NÉEL (France)
Georg Schmidt, Martin-Luther-Universität Halle-Wittenberg (Germany)
Jing Shi, University of California, Riverside (United States)
Vasily V. Temnov, Université du Maine (France)
Luc Thomas, Applied Materials, Inc. (United States)
Evgeny Tsybal, University of Nebraska-Lincoln (United States)
Olaf M. J. van 't Erve, U.S. Naval Research Laboratory (United States)
Joerg Wunderlich, Universität Regensburg (Germany)
Igor Zutic, University at Buffalo (United States)