CHUNHUI DU, Ph.D.

Department of Physics, UC San Diego
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RESEARCH INTERESTS

I am a condensed matter experimentalist with expertise in nanoscale quantum sensing. My work focuses on:

- Single spin magnetometry with nitrogen-vacancy (NV) centers in diamond
- Spin transport and dynamics in nanostructured and quantum materials
- Scanning probe based magnetic imaging

EDUCATION

2015 **Ph.D. in Physics**, The Ohio State University, Columbus, OH
Advisor**:** Prof. P. Chris Hammel
Thesis**:** Probing Spin Dynamics and Transport using Ferromagnetic Resonance based Techniques

2010 **B. S. in Physics**, East China Normal University, Shanghai, China

RESEARCH EXPERIENCE

2019 - Assistant Professor, Department of Physics, University of California, San Diego
2015 -2019
Postdoctoral Fellow, Department of Physics, Harvard University
Advisor**:** Prof. Amir Yacoby
Project**:** Nanoscale Quantum Sensing of Quantum Materials using NV Centers in Diamond

PUBLICATIONS

(*equal contribution, google scholar citations > 1100, h-index: 14)

22. H. Zhang*, M.J.H. Ku*, F. Casola, C.H. Du, T. van der Sar, M.C. Onbasli, C.A. Ross, Y. Tserkovnyak, A. Yacoby, R.L. Walsworth, Spin-torque oscillation in a magnetic insulator probed by a single-spin sensor, arXiv:1810.0730. [doi]
21. **C. H. Du***, T. Van der Sar*, T. X. Zhou*, P. Upadhyaya, F. Casola, H. Zhang, M. C. Onbasli, C. A. Ross, R. L. Walsworth, Y. Tserkovnyak, and A. Yacoby, Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, *Science* **357**, 195 (2017). [doi]
20. H. L. Wang, **C. H. Du**, P. C. Hammel, and F. Y. Yang, Comparative Determination of $Y_3Fe_5O_{12}$/Pt Interfacial Spin Mixing Conductance by Spin-Hall Magnetoresistance and Spin Pumping, *Appl. Phys. Lett.* **110**, 062402 (2017). [doi]
19. **C. H. Du***, I. Lee*, R. Adur, Y. Obukhov, C. Hamann, B. Buchner, J. McCord, D. V. Pelekhov, and P. C. Hammel, Imaging Interfaces Defined by Abruptly Varying Internal Magnetic Fields by Means of Scanned Nanoscale Spin Wave Modes, *Phys. Rev. B* **92**, 214413 (2015). [doi]
18. S. A. Manuilov, **C. H. Du**, R. Adur, H. L. Wang, V. P. Bhallamudi, F. Y. Yang, and P. C. Hammel, Spin Pumping from Spin waves in Thin Film YIG, *Appl. Phys. Lett.* **107**, 042405 (2015). [doi]
17. H. L. Wang*, **C. H. Du***, P. C. Hammel, and F. Y. Yang, Spin Transport in Insulators Mediated by Magnetic Correlations, *Phys. Rev. B* **91**, 220410(R) (2015). [doi]
16. **C. H. Du**, H. L. Wang, P. C. Hammel, and F. Y. Yang, $Y_3Fe_5O_{12}$ Spin Pumping for Quantitative

Understanding of Pure Spin Transport and Spin Hall Effect in a Broad Range of Materials (invited), *J. Appl. Phys.* **117**, 172603 (2015). [doi]

15. R. Adur, **C. H. Du**, J. Cardellino, N. Scozzaro, C. S. Wolfe , H. L. Wang, M. R. Herman, V. P. Bhallamudi, D. V. Pelekhov, F. Y. Yang, and P. Chris Hammel, Microscopic Studies of Nonlocal Spin Dynamics and Spin Transport (invited), *J. Appl. Phys.* **117**, 172604 (2015). [doi]
14. R. Adur, **C. H. Du**, S. A. Manuilov, H. L. Wang, F. Y. Yang, D. V. Pelekhov, and P. C. Hammel, The Magnetic Particle in a Box: Analytic and Micromagnetic Analysis of Probe-Localized Spin Wave Modes, *J. Appl. Phys.* **117**, 17E108 (2015). [doi]
13. **C. H. Du**, R. Adur, H. L. Wang, S. A. Manuilov, F. Y. Yang, D. V. Pelekhov, and P. C. Hammel, Experimental and Numerical Understanding of Localized Spin Wave Mode Behavior in Broadly Tunable Spatially Complex Magnetic Configurations, *Phys. Rev. B* **90**, 214428 (2014). [doi]
12. **C. H. Du***, H. L. Wang*, F. Y. Yang, and P. C. Hammel, Systematic Variation of Spin-orbit Coupling with *d*-orbital Filling: Large Inverse Spin Hall effect in 3*d* Transition Metals, *Phys. Rev. B. Rapid Comm.* **90**, 140407(R) (2014). [doi]
11. R. Adur, **C. H. Du**, H. L. Wang, S. A. Manuilov, V. P. Bhallamudi, C. Zhang, D. V. Pelekhov, F. Y. Yang, and P. C. Hammel, Damping of Confined Modes in a Ferromagnetic Thin Insulating Film: Angular Momentum Transfer Across a Nanoscale Field-defined Interface, *Phys. Rev. Lett.* **113**, 176601 (2014). [doi]
10. R. Adur, **C. H. Du**, H. L. Wang, S. A. Manuilov, F. Y. Yang, and P. C. Hammel, Dual-Frequency Ferromagnetic Resonance to Measure Spin Current Coupling in Multilayers, *Proc. SPIE* 9167, *Spintronics* VII, 91672J. [doi]
9. H. L. Wang*, **C. H. Du***, P. C. Hammel, and F. Y. Yang, Antiferromagnonic Spin Transport from $Y_3Fe_5O_{12}$ into NiO, *Phys. Rev. Lett.* **113**, 097202 (2014). [doi]
8. H. L. Wang*, **C. H. Du***, P. C. Hammel, and F. Y. Yang, Spin Current and Inverse Anomalous Hall Effect in Ferromagnetic Metals Probed by $Y_3Fe_5O_{12}$-based Spin Pumping, *Appl. Phys. Lett.* **104**, 202405 (2014). [doi]
7. **C. H. Du***, H. L. Wang*, F. Y. Yang, and P. C. Hammel, Enhancement of Pure Spin Currents in Spin Pumping $Y_3Fe_5O_{12}$/Cu/metal Trilayers through Spin Conductance Matching, *Phys. Rev. Applied* **1**, 044004 (2014). [doi]
6. H. L. Wang*, **C. H. Du***, Y. Pu, R. Adur, P. C. Hammel, and F. Y. Yang, Scaling of Spin Hall Angle in 3*d*, 4*d* and 5*d* Metals from Epitaxial $Y_3Fe_5O_{12}$/metal Spin Pumping, *Phys. Rev. Lett.* **112**, 197201 (2014). [doi]
5. H. L. Wang*, **C. H. Du***, P. C. Hammel, and F. Y. Yang, Strain-Tunable Magnetocrystalline Anisotropy in Epitaxial $Y_3Fe_5O_{12}$ Thin Films, *Phys. Rev. B.* **89**, 134404 (2014). [doi]
4. C. S. Wolfe*, V. P. Bhallamudi*, H. L. Wang, **C. H. Du**, S. A. Manuilov, R. M. Teeling-Smith, A. J. Berger, R. Adur, F. Y. Yang, and P. C. Hammel, Off-Resonant Manipulation of Spins in Diamond via Precessing Magnetization of a Proximal Ferromagnet, *Phys. Rev. B. Rapid Comm.* **89**, 180406(R) (2014). [doi]
3. **C. H. Du***, H. L. Wang*, Y. Pu, T. L. Meyer, P. M. Woodward, F. Y. Yang, and P. C. Hammel, Probing the Spin Pumping Mechanism: Exchange Coupling with Exponential Decay in $Y_3Fe_5O_{12}$/barrier/Pt Heterostructures, *Phys. Rev. Lett.* **111**, 247202 (2013). [doi]
2. H. L. Wang*, **C. H. Du***,Y. Pu, R. Adur, P. C. Hammel, and F. Y. Yang, Large Spin Pumping from Epitaxial $Y_3Fe_5O_{12}$ Thin Films to Pt and W Layers, *Phys. Rev. B. Rapid Comm.* **88**, 100406(R) (2013). [doi]
1. **C. H. Du**, R. Adur, H. L. Wang, A. J. Hauser, F. Y. Yang, and P. C. Hammel, Control of Magnetocrystalline Anisotropy by Epitaxial Strain in Double Perovskite Sr_2FeMoO_6 Films, *Phys. Rev. Lett.* **110**, 147204 (2013). [doi]

PRESENTATIONS

Talks

10. C. Du, *et al*., "Quantum Sensing of Layered Superconductor at the Nanoscale" presented at 2019 APS March Meeting, Boston, MA, 3/2019.
9. C. Du, *et al*., "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator" presented at Spin Caloritronics IX conference, Columbus, OH, 6/2018. (invited talk)
8. C. Du, *et al*., "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator" presented at 2018 APS March Meeting, Los Angeles, CA, 3/2018. (invited talk)
7. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator" presented at 2017 APS March Meeting, New Orleans, LA, 3/2017.
6. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator" presented at 1st EPiQS Postdoctoral Symposium, Aspen Center for Physics, CO, 2/2017.
5. "Probing Local Spin Dynamics and Transport using Nitrogen Vacancy Centers in Diamond" presented at Rising Star in Physics: An Academic Career Workshop for Women, Massachusetts Institute of Technology, Cambridge, MA, 10/2016.
4. "Spin Transport in Insulators Mediated by Magnetic Correlations Probed by $Y_3Fe_5O_{12}$-based Spin Pumping" presented at 2015 APS March Meeting, San Antonio, TX, 3/2015.
3. "Broadly Tunable Approach to Localizing Ferromagnetic Resonance Modes Controlled by Field Orientation" presented at 59thAnnual Magnetism and Magnetic Materials (MMM) Conference, Honolulu, HA, 11/2014.
2. "Probing the Spin Pumping Mechanism and Efficiency using YIG-based Structure" presented at Institute for Materials Research Week, Columbus, OH, 5/2014 (invited talk).
1. "Probing the Spin Pumping Mechanism: Exchange Coupling with Exponential Decay in $Y_3Fe_5O_{12}$/Barrier/Pt Heterostructures" presented at 58thAnnual Magnetism and Magnetic Materials (MMM) Conference, Denver, CO, 11/2013.

Seminars

26. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, University of California, Irvine, Irvine, CA, 3/2018.
25. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, University of California, San Diego, La Jolla, CA, 2/2018.
24. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Caltech, Pasadena CA, 2/2018.
23. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Columbia University, New York, NY, 2/2018.
22. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics and Astronomy, University of Rochester, Rochester, NY, 2/2018.
21. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, University of Illinois at Urbana–Champaign, Champaign, IL, 2/2018.
20. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics and Astronomy, Purdue University, West Lafayette, IN, 2/2018
19. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Carnegie Mellon University, Pittsburgh, PA, 2/2018.
18. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, The University of Texas at Austin, Austin, TX, 2/2018.
17. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, University of Florida, Gainesville, FL, 2/2018.
16. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, New York University, New York, NY, 1/2018.
15. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department

of Physics, University of Notre Dame, Notre Dame, IN, 1/2018.
14. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, 1/2018.
13. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Brown University, Providence, RI, 1/2018.
12. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Boston College, Chestnut Hill, MA, 1/2018.
11. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Pennsylvania State University, State College, PA, 1/2018.
10. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Institute for Molecular Engineering, University of Chicago. Chicago, IL, 12/2017.
9. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, University of Wyoming, Laramie, WY, 11/2017.
8. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator, " Department of Physics, Oklahoma State University, Stillwater, OK, 10/2017.
7. "Control and Local Measurement of the Spin Chemical Potential in a Magnetic Insulator" presented at Center for Nanoscale Systems Seminar, Harvard University, Cambridge, MA, 10/2017.
6. "Spin Dynamics and Transport studied by Ferromagnetic Resonance (FMR) based Techniques," Department of Physics, Princeton University, Princeton, NJ, 4/2015.
5. "Spin Dynamics and Transport studied by Ferromagnetic Resonance (FMR) based Techniques," Department of Applied Physics, Stanford University, Stanford, CA, 3/2015.
4. "Spin Dynamics and Transport studied by Ferromagnetic Resonance (FMR) based Techniques," Department of Physics, The University of Chicago, Chicago, IL, 3/2015.
3. "Spin Dynamics and Transport studied by Ferromagnetic Resonance (FMR) based Techniques," Department of Physics, Massachusetts Institute of Technology, Cambridge, MA, 3/2015.
2. "Spin Dynamics and Transport studied by Ferromagnetic Resonance (FMR) based Techniques," Department of Physics, Harvard University, Cambridge, MA, 2/2015.
1. "Spin Dynamics and Transport studied by Ferromagnetic Resonance (FMR) based Techniques," Department of Physics and Applied Physics, Yale University, New Haven, CT, 2/2015.

TEACHING EXPERIENCE

Teaching

Graduate Teaching Assistant, The Ohio State University, Columbus, OH (2010-12)
Led section discussions and supervised labs; met students during office hours; graded all assignments; held review sessions for 30-40 introductory students twice a week.

Guest Lecturer, The Ohio State University, Columbus, OH (2015)
Prepared and delivered a class lecture on Ferromagnetic Resonance spin pumping, as part of a course on Experimental Techniques in Condensed Matter Physics.

Intern, Shanghai Pinghe Bilingual School, Shanghai, China (2009-10)

PROFESSIONAL SERVICE

Reviewer for Physical Review Letters, Physical Review B, Nature Communications, Applied Physics Letters, Scientific Reports et al.