Dr. Daegeun Jo

Postdoctoral Researcher
Department of Physics and Astronomy, Uppsala University

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EDUCATION

Ph.D. in Physics

Department of Physics, Pohang University of Science and Technology

Aug. 2023 Pohang, Republic of Korea

- Supervisor: Prof. Hyun-Woo Lee
- Thesis: Generation, Detection, and Application of Orbital Dynamics

B.S. in Physics

Department of Physics, Hanyang University

Feb. 2017 Seoul, Republic of Korea

RESEARCH EXPERIENCE

Postdoctoral Researcher

Department of Physics and Astronomy, Uppsala University

Sep. 1. 2023 — Present Uppsala, Sweden

- Supervisor: Prof. Peter M. Oppeneer
- Includes parental leave (May-Jul. 2025)

Guest Scientist

Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich

Apr. 18. 2022 — Jul. 16. 2022 Jülich, Germany

- Group of Prof. Yuriy Mokrousov

SKILLS

Theoretical calculation for orbitronics and spintronics

- Electronic properties of materials
- Current-induced orbital and spin responses (orbital/spin Hall effect, orbital/spin Edelstein effect)
- Magneto-optic effects
- Orbital torque and spin-orbit torque in magnetic heterostructures

Tools

- Tight-binding model (empirical or semi-realistic)
- First-principles calculation (Quantum ESPRESSO, FLEUR) with Wannier90 code
- Programming languages: Python and Fortran
- High-performance computing with MPI

Languages

- Korean, English

OTHER EXPERIENCE

Teaching Assistant

Pohang University of Science and Technology

2017 – 2018 | Pohang, Republic of Korea

- 2018. Analytical Mechanics for graduate students
- 2017. General Physics II for undergraduate students
- 2017. General Physics Lab. I for undergraduate students

Compulsory Military Service

Weather Group of Republic of Korea Air Force

2012 – 2014 | Republic of Korea

- Discharged at the rank of sergeant

AWARDS & HONORS

- 2024. S-Oil Dissertation of the Year Award (S-OIL Science and Culture Foundation)
- 2023. Best Paper Award for Graduate Students in the Department of Physics (POSTECH)
- 2023. B. I. Min Best Condensed Matter Theory Paper Award (POSTECH)
- 2021. Silver Prize at the 27th Samsung Humantech Paper Award (Samsung Electronics Co., Ltd.)
- 2018. Best presentation award (poster) at 2018 Korean Physical Society Fall Meeting
- 2018–2023. Global Ph.D. Fellowship (funded by National Research Foundation)
- 2011. National Science & Technology Scholarship (funded by Korea Student Aid Foundation)

SELECTED PUBLICATIONS

†: These authors contributed equally.

- S. Han†, **D. Jo**†, I. Baek†, S. Cheon, P. M. Oppeneer, and H.-W. Lee, "Harnessing Magnetic Octupole Hall Effect to Induce Torque in Altermagnets", Phys. Rev. Lett. **135**, 076705 (2025).
- **D. Jo**, D. Go, Y. Mokrousov, P. M. Oppeneer, S.-W. Cheong, and H.-W. Lee, "Weak Ferromagnetism in Altermagnets from Alternating g-Tensor Anisotropy", Phys. Rev. Lett. **134**, 196703 (2025).
- Y.-G. Choi†, **D. Jo**†, K.-H. Ko†, D. Go, K.-H. Kim, H. G. Park, C. Kim, B.-C. Min, G.-M. Choi, and H.-W. Lee, "Observation of the orbital Hall effect in a light metal Ti", Nature **619**, 52–56 (2023).
- **D. Jo**, D. Go, and H.-W. Lee, "Gigantic intrinsic orbital Hall effects in weakly spin-orbit coupled metals", Phys. Rev. B **98**, 214405 (2018).

FULL LIST OF PUBLICATIONS

†: These authors contributed equally.

Preprints

- N. Vijayan, D. Kumar, A. Du, M. Sastges, L. Gao, Z. Xiao, D. Go, J. O. Ledesma-Martin, H. I. Wang, **D. Jo**, P. M. Oppeneer, R. Gupta, G. Jakob, S. Krishnia, Y. Mokrousov, and M. Kläui, *Itinerant Orbital Hall Effect Mechanism Leading to Large Negative Orbital Torques from Light Metal Vanadium*, 2025, arXiv:2508.16339 [cond-mat.mes-hall].
- **D. Jo** and P. M. Oppeneer, *Theoretical study of orbital torque: Dependence on ferromagnet species and nonmagnetic layer thickness*, 2025, arXiv:2511.11482 [cond-mat.mes-hall].
- S. Alikhah, **D. Jo**, M. Berritta, and P. M. Oppeneer, *Theory for Magneto-Optical Detection of the Interfacial Orbital Rashba-Edelstein Effect*, preprint available at Research Square, 2025.
- **D. Jo** and P. M. Oppeneer, *Rotation-Induced Orbital Currents in Ferro-Rotational Systems*, 2025, arXiv:2505.04363 [cond-mat.mtrl-sci].

- J. C. Idrobo, J. Rusz, G. Datt, **D. Jo**, S. Alikhah, D. Muradas, U. Noumbe, M. V. Kamalakar, and P. M. Oppeneer, *Direct observation of nanometer-scale orbital angular momentum accumulation*, 2024, arXiv:2403.09269v1 [cond-mat.mes-hall].
- J. Kim, J. Uzuhashi, D. Go, **D. Jo**, T. Ohkubo, S. Mitani, H.-W. Lee, and Y. Otani, *Emerging effects of oxygen accumulation on orbital torque*, preprint available at Research Square, 2023.

Peer-reviewed journals

- K. Du, **D. Jo**, X. Xu, F.-T. Huang, M.-H. Lee, M.-W. Chu, K. Wang, X. Guo, L. Zhao, D. Vanderbilt, H.-W. Lee, and S.-W. Cheong, "Electric toroidal invariance generates distinct transverse electromagnetic responses", Nature Physics **22**, 61–67 (2026).
- H. Hayashi, J. Chen, **D. Jo**, S. Sakamoto, T. Gao, D. Go, Y. Mokrousov, H.-W. Lee, S. Miwa, and K. Ando, "Crystallographic Engineering for Enhanced Orbital Torque", Nano Letters **25**, 15124–15129 (2025).
- S. Han†, **D. Jo**†, I. Baek†, S. Cheon, P. M. Oppeneer, and H.-W. Lee, "Harnessing Magnetic Octupole Hall Effect to Induce Torque in Altermagnets", Phys. Rev. Lett. **135**, 076705 (2025).
- **D. Jo**, D. Go, Y. Mokrousov, P. M. Oppeneer, S.-W. Cheong, and H.-W. Lee, "Weak Ferromagnetism in Altermagnets from Alternating g-Tensor Anisotropy", Phys. Rev. Lett. **134**, 196703 (2025).
- **D. Jo**, D. Go, G.-M. Choi, and H.-W. Lee, "Spintronics meets orbitronics: Emergence of orbital angular momentum in solids", npj Spintronics **2**, 19 (2024).
- H. Moriya†, M. Taniguchi†, **D. Jo**†, D. Go, N. Soya, H. Hayashi, Y. Mokrousov, H.-W. Lee, and K. Ando, "Observation of Long-Range Current-Induced Torque in Ni/Pt Bilayers", Nano Letters **24**, 6459–6464 (2024).
- J. Kim, J. Uzuhashi, M. Horio, T. Senoo, D. Go, **D. Jo**, T. Sumi, T. Wada, I. Matsuda, T. Ohkubo, S. Mitani, H.-W. Lee, and Y. Otani, "Oxide layer dependent orbital torque efficiency in ferromagnet/Cu/oxide heterostructures", Phys. Rev. Mater. **7**, L111401 (2023).
- Y.-G. Choi†, **D. Jo**†, K.-H. Ko†, D. Go, K.-H. Kim, H. G. Park, C. Kim, B.-C. Min, G.-M. Choi, and H.-W. Lee, "Observation of the orbital Hall effect in a light metal Ti", Nature **619**, 52–56 (2023).
- D. Go, **D. Jo**, K.-W. Kim, S. Lee, M.-G. Kang, B.-G. Park, S. Blügel, H.-W. Lee, and Y. Mokrousov, "Long-Range Orbital Torque by Momentum-Space Hotspots", Phys. Rev. Lett. **130**, 246701 (2023).
- H. Hayashi, **D. Jo**, D. Go, Y. Mokrousov, H.-W. Lee, and K. Ando, "Observation of long-range orbital transport and giant orbital torque", Communications Physics **6**, 32 (2023).
- D. Lee, D. Go, H.-J. Park, W. Jeong, H.-W. Ko, D. Yun, **D. Jo**, S. Lee, G. Go, J. H. Oh, K.-J. Kim, B.-G. Park, B.-C. Min, H. C. Koo, H.-W. Lee, O. Lee, and K.-J. Lee, "Orbital torque in magnetic bilayers", Nature Communications **12**, 6710 (2021).
- D. Go, **D. Jo**, H.-W. Lee, M. Kläui, and Y. Mokrousov, "Orbitronics: Orbital currents in solids", EPL (Europhysics Letters) **135**, 37001 (2021).
- D. Go, **D. Jo**, T. Gao, K. Ando, S. Blügel, H.-W. Lee, and Y. Mokrousov, "Orbital Rashba effect in a surface-oxidized Cu film", Phys. Rev. B **103**, L121113 (2021).
- K. Zhang, S. Han, Y. Lee, M. J. Coak, J. Kim, I. Hwang, S. Son, J. Shin, M. Lim, **D. Jo**, K. Kim, D. Kim, H.-W. Lee, and J.-G. Park, "Gigantic Current Control of Coercive Field and Magnetic Memory Based on Nanometer-Thin Ferromagnetic van der Waals Fe3GeTe2", Advanced Materials **33**, 2004110 (2021).
- J. Kim, D. Go, H. Tsai, **D. Jo**, K. Kondou, H.-W. Lee, and Y. Otani, "Nontrivial torque generation by orbital angular momentum injection in ferromagnetic-metal/Cu/Al2O3 trilayers", Phys. Rev. B **103**, L020407 (2021).
- Z. C. Zheng, Q. X. Guo, **D. Jo**, D. Go, L. H. Wang, H. C. Chen, W. Yin, X. M. Wang, G. H. Yu, W. He, H.-W. Lee, J. Teng, and T. Zhu, "Magnetization switching driven by current-induced torque from weakly spin-orbit coupled Zr", Phys. Rev. Research **2**, 013127 (2020).
- **D. Jo**, D. Go, and H.-W. Lee, "Gigantic intrinsic orbital Hall effects in weakly spin-orbit coupled metals", Phys. Rev. B **98**, 214405 (2018).
- D. Go, **D. Jo**, C. Kim, and H.-W. Lee, "Intrinsic Spin and Orbital Hall Effects from Orbital Texture", Phys. Rev. Lett. **121**, 086602 (2018).

PRESENTATIONS

Oral

- "Unconventional orbital currents in ferro-rotational systems", Swedish-Korean Orbitronics Workshop 2025, Gothenburg, Sweden, Jul. 17-18, 2025 (Contributed talk)
- "Unconventional orbital currents in ferro-rotational systems", PGI-1, Forschungszentrum Jülich, Jülich, Germany, Dec. 4, 2024 (Seminar)
- "Unconventional torque in altermagnets induced by the magnetic octupole Hall effect", WE Heraeus-Seminar (Hybrid Angular Momentum Transport and Dynamics), Bad Honnef, Germany, Oct. 30, 2024 (Contributed talk)
- "Theoretical Calculations for Orbitronics: Orbital Hall Effect and Its Detection", Material Theory Division, Uppsala University, Uppsala, Sweden, Apr. 12, 2024 (Seminar)
- "First-principles calculation of the orbital current and orbital accumulation in metallic layers", DPG Spring Meeting 2024, Berlin, Germany, Mar. 21, 2024 (Contributed talk)
- "Theoretical Calculation of the Orbital Accumulation from the Orbital Hall Effect", Korean Magnetic Society 2023 Winter Conference, Busan, Korea, Nov. 23, 2023 (Contributed talk)
- "Theoretical calculations of the magneto-optical Kerr effect by the orbital Hall effect", PGI-1/IAS-1, Forschungszentrum Jülich, Jülich, Germany, May. 25, 2022 (Seminar)
- "Giant intrinsic orbital Hall effects in weakly spin-orbit coupled metals", American Physical Society March Meeting 2019, Boston, USA, Mar. 4-8, 2019 (Contributed talk)
- "Intrinsic Orbital Hall Effects in Elemental Solids", 11th BK21+ Young Physicists Workshop, Pohang, Korea, Feb. 14-15, 2019 (Contributed talk)

Poster

- "Unconventional orbital currents in ferro-rotational systems", SPEAR Conference on Spin-Orbitronics & 3rd Orbitronics Workshop, Donostia/San Sebastian, Spain, Mar. 31-Apr. 3, 2025
- "Current-Induced Orbital Current and Accumulation in Metallic Layers", 1st KAI-X Global Conference in Physics-International workshop on Orbitronics, Daejeon, Korea, Nov. 21, 2023
- "Current-Induced Orbital and Spin Accumulations in Metallic Layers", 11th International Symposium on Metallic Multilayers (MML 2023), Seoul, Korea, Jul. 24-28, 2023
- "Theoretical calculations of the magneto-optical Kerr effect by the orbital Hall effect", Orbitronics from topological matter to next level electronics (SPICE workshop), Ingelheim, Germany, Jul. 19-22, 2022
- "Orbital Hall effect and orbital torque in weakly spin-orbit coupled materials", Samsung Global Research Symposium, Seoul, Korea, Nov. 22-23, 2019
- "Giant Intrinsic Orbital Hall Effects in Light Metals", 15th SRC Winter Workshop on Topological Matter, Pohang, Korea, Jan. 30-31, 2019
- "Gigantic intrinsic orbital Hall effects in weakly spin-orbit coupled materials", International School on Spintronics and Korea-Japan Spintronics Workshop, Nagoya, Japan, Jan. 21-22, 2019
- "Giant intrinsic orbital Hall effects in weakly spin-orbit coupled systmes", 2018 Korean Physical Society Fall Meeting, Changwon, Korea, Oct. 24-26, 2018