

Unit Name

Collective Dynamics and Quantum Transport Unit
Assistant Professor Shu Zhang

Collaborations

Takashi Oka, Swati Chaudhary, University of Tokyo, Japan, Space-time floquet of magnonic systems

Jeroen van den Brink, Mengli Hu, Gastón Blatter, Leibniz Institute for Solid State and Materials Research, Germany, Optical properties of altermagnets

Chunhui Du, Georgia Institute of Technology, USA, Quantum sensing of magnetic dynamics with NV centers

Shovan Dutta, Raman Research Institute, India, Quantum limit cycles

Masud Haque, Dresden University of Technology, Quantum limit cycles

Yang Zhang, Jian Liu, University of Tennessee Knoxville, USA, Paramagnetic transport in frustrated magnets

Ning Mao, Nikolai Peshcherenko, Max Planck Institute for Chemical Physics of Solids, Germany, Paramagnetic transport in frustrated magnets

Research Personnel

Nicolò Beato, Visiting Researcher

Jing Zhou, Postdoctoral Scholar

Amar Bharti, Postdoctoral Scholar

Saswat Sarangi, Postdoctoral Scholar

Ren-Bo Wang, Postdoctoral Scholar

Nikolaj Janez Murasov, Research Intern

Scholarly Contributions and Creative Productions (by Faculty)

Journal Article

1. Gao, B.; Chen, T.; Liu, C.; Klemm, M. L.; Zhang, S.; Ma, Z.; Xu, X.; Won, C.; McCandless, G. T.; Rao, K.; Murai, N.; Ohira-Kawamura, S.; Moxim, S. J.; Ryan, J. T.; Huang, X.; Wang, X.; Le, M. D.; Morosan, E.; Chan, J. Y.; Cheong, S.-W.; Tchernyshyov, O.; Balents, L.; Dai, P.
Spin Excitation Continuum from Degenerate States in the Mixed Ferro-Antiferromagnetic Exchange System $\text{CeMgAl}_{11}\text{O}_{19}$. *Science Advances* 2026, 12, ead7778.
2. Park, H. W.; Zhang, S.; Meisenheimer, P.; Ramesh, M.; Husain, S.; Harris, I.; Íñiguez-González, J.; Yao, Z.; Ramesh, R.; Kim, S. K.
Magnon Thermal Conductivity in Multiferroics with Spin Cycloids. *Physical Review B* 2025, 112.
3. Potts, M.; Zhang, S.
Spin-Qubit Noise Spectroscopy of Magnetic Berezinskii–Kosterlitz–Thouless Physics. *Nano Letters* 2025.
4. Li, X.; Begaowe, M. A.; Zhang, S.; Flebus, B.
Non-Hermitian and Liouvillian Skin Effects in Magnetic Systems. *Phys. Rev. B* 2025, 112, 134416.

Poster Presentation at Conference

1. Zhang, S.
Sign Control of Dc Photocurrents by Spin-Group-Symmetry Breaking in Altermagnetic Insulators. International Symposium on Spintronics with Antiferromagnets and Altermagnets 2025.
2. Zhang, S.
Quantum Noise Spectroscopy of Magnetic Dynamics in Quantum Materials. 2025 Quantum Sensing Gordon Research Conference 2025.

Presentation at Conference

1. Zhang, S.
Topology of Density Matrices. New Frontiers of Geometry and Topology in Condensed Matter Physics 2026.
2. Zhang, S.
Boundary-Activated Floquet Engineering in Non-Hermitian Systems. Beyond Linearity: Frontiers in Non-Hermitian Many-Body Physics 2025.
3. Zhang, S.
Spectral Fingerprints of Limit Cycles and Critical Slowing Down in Open Quantum System. Limit Cycles and Synchronization Go Quantum 2025.
4. Zhang, S.
Proximatized Magnetoresistivity as a Probe for Spin Fluctuations in Complex Magnetic Insulators. SFB 1143 Workshop 2025.
5. Zhang, S.
Topological Transport of Hybridized Magnon-Phonon Excitations. Quantum Geometry and Transport of Collective Excitations in (Non-)Magnetic Insulators 2025.

Seminars

1. Zhang, S.
Quantum Origin of Limit Cycles, Fixed Points, and Critical Slowing Down. 2025.
2. Zhang, S.
Topology Enriched Transport in Magnetic Insulators.
3. Zhang, S.
Dissipative Dynamics of Open Spin Systems from Quantum and Classical Limits.
4. Zhang, S.
Spectral Fingerprints of Limit Cycles and Critical Slowing Down in Open Quantum Systems.
5. Zhang, S.
Multifaceted Spin Transport: From Many-Body Effects to Open Quantum Systems. 2025.

Scholarly Contributions (by Unit Members)

| Name of Unit Member | Type | Title | Outlet | Publisher | Year Pub |
|---------------------|-----------------|--|----------------------------|----------------|------------------|
| Amar Bharti | Journal Article | Harnessing Light for Valley Control in 2d Semiconductors | Advanced Optical Materials | Wiley | December 7, 2025 |
| Amar Bharti | Journal Article | Chiral-sensitive frequency mixing in valley-excited two-dimensional semiconductors | Applied Physics Letters | AIP Publishing | January 15, 2026 |

External Service

Term 2 2026 - Term 2 2026 Panelist, Panel Discussion "Quantum Frontiers to Real-World Impact"
Quantum Nexus, OIST × UTokyo Symposium 2025 [Fiscal Year: 2025-08-19]

Other Institutional Service

- Term 2 2026 - Term 2 2026 Sign control of spin and charge photocurrents in altermagnetic insulators, (University) [Fiscal Year: 2026-01-22]
- Term 3 2025 - Term 3 2025 Probing Quantum Materials with Nitrogen-Vacancy Spin Qubit, (University) [Fiscal Year: 2025-08-19]
- Term 3 2025 - Term 3 2025 Spintronics for Energy-Efficient Information Processing, (University) [Fiscal Year: 2025-06-04]

Workshops and Seminars [Organized and Hosted by Faculty/Units]

| Speaker Name(s) | Title | Date |
|----------------------|---|------------|
| Jeroen van den Brink | Topological surface superconductivity in PtBi ₂ | 2026-03-05 |
| Nicolò Beato | Phase transitions in quantum control landscapes | 2025-11-26 |
| Jonathan Curtis | Listening to Quantum Materials Using Nonlinear Noise Spectroscopy | 2025-10-27 |