

Zehao Dong

Beijing, China | dzh22@mails.tsinghua.edu.cn | Google Scholar | Homepage | GitHub

Profile

I am a Ph.D. candidate in Physics at Tsinghua University working at the intersection of strongly correlated materials, 4D-STEM, and computational imaging. I develop GPU-accelerated multislice electron ptychography methods for three-dimensional, atomic-scale imaging of defects and dopants in functional materials. I am expected to graduate in June 2027.

Research Interests

- Strongly correlated materials, including cuprate and nickelate superconductors
- Atomic-resolution scanning transmission electron microscopy and 4D-STEM
- Multislice electron ptychography, computational imaging, and GPU-accelerated phase retrieval

Education

- **Tsinghua University**, Ph.D. in Physics; Advisor: Yayu Wang 2022 – 2027
- **Peking University**, B.S. in Physics 2018 – 2022

Publication list

- **Visualization of oxygen vacancies and self-doped ligand holes in $\text{La}_3\text{Ni}_2\text{O}_{7-\delta}$** 2024
Dong, Z.[†], Huo, M.[†], Li, J.[†], Li, J., Li, P., Sun, H., *et al.* *Nature* **630**, 847–852.
- **Interstitial oxygen order and its competition with superconductivity in $\text{La}_2\text{PrNi}_2\text{O}_{7+\delta}$** 2025
Dong, Z.[†], Wang, G.[†], Wang, N.[†], Dong, W.-H.[†], *et al.* *Nature Materials* **24**, 1927–1934.
- **Sub-nanometer depth resolution and single dopant visualization achieved by tilt-coupled multislice electron ptychography** 2025
Dong, Z., Zhang, Y., Chiu, C.-C., Lu, S., Zhang, J., Liu, Y.-C., *et al.* *Nature Communications* **16**, 1219.
- **Distinct orbital contributions to electronic and magnetic structures in $\text{La}_4\text{Ni}_3\text{O}_{10}$** 2026
Zhang, S.[†], Zhang, H.[†], Dong, Z., Li, J., Xiao, Q., Huo, M., *et al.* *Physical Review Research* **8**, 023119.
- **Visualization of the Zhang–Rice singlet, electronic molecules and Cooper pair formation in a cuprate superconductor** 2026
Ye, S., Zhao, J., Yao, Z., Chen, S., Yu, R., Dong, Z., *et al.* *Nature Physics* (2026).
- **Antiferromagnetic quantum anomalous Hall effect under spin flips and flops** 2025
Lian, Z.[†], Wang, Y.[†], Wang, Y., Dong, W.-H., Feng, Y., Dong, Z., *et al.* *Nature* **641**, 70–75.
- **The emergence of global phase coherence from local pairing in underdoped cuprates** 2023
Ye, S., Zou, C., Yan, H., Ji, Y., Xu, M., Dong, Z., *et al.* *Nature Physics* **19**, 1301–1307.
- **Magnetic field orientation dependence of planar tunneling spectroscopy in the superconducting state of NbSe_2** 2023
Ji, Y.[†], Dong, Z.[†], Wang, H., Li, Q., Ye, S., Gao, Z., *et al.* *Quantum Frontiers* **2**, 5.
- **Multi-state data storage in a two-dimensional stripy antiferromagnet implemented by magnetoelectric effect** 2023
Gu, P., Wang, C., Su, D., Dong, Z., Wang, Q., Han, Z., *et al.* *Nature Communications* **14**, 3221.
- **Planar tunneling spectroscopy on van der Waals superconductors with AlO_x junction grown by atomic layer deposition** 2023
Ji, Y., Wang, H., Dong, Z., Ye, S., Li, Q., Gao, Z., *et al.* *Journal of Applied Physics* **133**, 013903.

Selected Funding & Awards

- **Gold Medalist**, 49th International Physics Olympiad (IPhO) 2018
- **Best Oral Presentation Award**, 20th International Microscopy Congress 2023
- **National Scholarship for Graduate Students**, Ministry of Education, China 2024 & 2025
- **NSFC's Fund for Graduate Students** 2025 – 2026

Conference Oral Presentations

- **21th International Microscopy Congress, Liverpool, UK** 2026
Quantification of oxygen vacancies and interstitials in bilayer nickelate superconductors using electron ptychography
- **Materials & Mechanisms of Superconductivity Conference, Stuttgart, Germany** 2026
Visualizing oxygen vacancies and interstitials in bilayer nickelates via electron ptychography
- **Chinese Physical Society Fall Meeting, Haikou, China** 2024
Visualization of oxygen vacancies and self-doped ligand holes in $\text{La}_3\text{Ni}_2\text{O}_{7-\delta}$
- **20th International Microscopy Congress, Busan, South Korea** 2023
Improving depth resolution using tilt-series coupled multislice electron ptychography

Technical Skills

- **Experimental:** STEM/4D-STEM, electron ptychography, EELS; Transport and tunnelling measurements
- **Programming:** MATLAB, Python; GPU computing
- **Languages:** Chinese (Native), English (Fluent)