

- Date & Time : **Thursday 5th June 2025 10:00-11:30**
- Venue : # Room309, Frontier Research Laboratory



Prof. Zhi-Xun Shen

Professor, Stanford University
(RIKEN Fundamental Quantum Science Program)

" Local probe of bulk and edge states in a fractional Chern insulator "

We describe the development of microwave impedance microscopy and its applications to a wide range of topological materials. After a general introduction, we focus on the fractional Chern insulator state (FCI) edge states in twisted MoTe₂. By tuning the carrier density, we observe the system evolving between metallic and FCI states, the latter of which exhibits insulating bulk and conductive edges as expected from bulk-boundary correspondence. We also observe the evolution of edge states across the topological phase transition from an incompressible Chern insulator state to a metal and finally to a putative charge ordered insulating state as a function of interlayer electric field. The local measurement further reveals tantalizing prospects of neighboring domains with different fractional orders. These findings pave the way for research into topologically protected 1D interfaces between various anyonic states at zero magnetic field. Additional studies as a function of magnetic field, displacement field and twist angles will be discussed.

References

ME Barber, EY Ma, ZX Shen; Microwave impedance microscopy and its application to quantum materials; Nature Reviews Physics 4 (1), 61-74 (2022)
Zhurun Ji, Heonjoon Park, Mark E. Barber, Chaowei Hu, Kenji Watanabe, Takashi Taniguchi, Jiun-Haw Chu, Xiaodong Xu, Zhi-xun Shen; Local probe of bulk and edge states in a fractional Chern insulator; Nature 2024; Nature 635 (8039), 578-583 (2024)