**Transport of Correlated Topological Electrons in Special-Stacked Multilayer Graphene**  
**(Session 3, Oral)**

Guorui Chen

Shanghai Jiao Tong University

Abstract text: Multiple stacking sequences between atomic layers provide a unique knob for tuning electronic properties of two-dimensional materials. In this talk, I will take graphene as an example and show our experimental results of graphene multilayers in special stackings. Experimental advances allow us to fabricate high-quality special stacked multilayer graphene devices encapsulated by hBN. By electrical transport measurement, we study two different stacking sequences, rhombohedral stacking and mixed-stacking. In rhombohedral tetralayer graphene, we observe a series of correlated and topological electronic states with spontaneous broken-symmetries including a layer-antiferromagnetic insulator and a Chern insulator with spin-orbit coupling. For the mixed stacking, we find a non-centrosymmetric stacking sequence in pentalayer, and observe transport signatures of intrinsic layer polarization and multi-flat bands. In high magnetic fields, the mixed stacking pentalayer host interesting fractional quantum Hall states rising from Landau level mixing.

[1] Kai Liu et al, Nature Nanotechnology, 19, 188-195 (2024)

[2] Yating Sha et al, Science,384, 141-149 (2024)

[3] Jian Zheng et al, arXiv:2412.09985

[4] Kai Liu et al, arXiv:2505.12478

[5] Yating Sha et al, in preparation