Special Seminar

Pseudogap and pairing: shot noise reveals pseudogap as pairing energy in a cuprate superconductor

Jiasen Niu

Leiden University and University of Munich (LMU)

Time: 10:00 am, Oct. 24, 2024 (Thursday)

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Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

In the cuprate high-temperature superconductors, the pseudogap phase connects the Mott insulator and superconductivity phases. Despite extensive research, the origin of the pseudogap remains elusive. A key question, debated for decades, is whether the pseudogap is associated with electron pairing, or if it corresponds to a local ordered state. Shot noise experiments, which can directly detect electron pairing, have the potential to resolve this long-standing debate. In the first part of my talk, I will present unambiguous evidence supporting the pairing scenario using local shot-noise spectroscopy measurements in $Bi_2Sr_2CaCu_2O_{8+\delta}$. Our finding excludes the possibility of the pseudogap arising solely from local orders, and instead indicates a clear relation between the pseudogap phase and Cooper pair formation. In the second part, I will discuss shot-noise measurements on mesoscopic superconducting devices. In contrast to previously published work, we find that shot noise does not reflect pairing in typical superconducting mesoscopic tunneling devices. This is in agreement with theoretical expectations.

About the speaker

Dr. Jiasen Niu obtained his bachelor's degree from Jilin University in 2014, and PhD from Peking University in 2020. He then began his postdoctoral research at Leiden University under the supervision of Milan Allan. In 2024, he moved to the University of Munich (LMU) to continue his postdoctoral work with Milan. Dr. Niu's current research focuses on investigating electron correlation in high-temperature superconductors with shot noise measurement. He is particularly interested in understanding quantum phenomena through unconventional methods, especially noise measurement. His research interests include the development of advanced scanning and transport techniques, as well as the study of quantum materials and the quantum Hall effect.