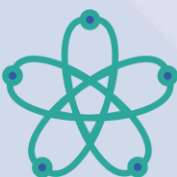




DEPARTMENT OF PHYSICS  
THE UNIVERSITY OF HONG KONG



HK Institute of  
Quantum Science & Technology  
香港量子研究院

Physics  
Colloquium

Physics Colloquium

# Phase-sensitive determination of the pairing symmetry in $\text{UTe}_2$



**April 16, 2025 (Wednesday)**



**5:00 p.m.**



**MWT4, 1/F, Meng Wah Complex,  
Main Campus, HKU**



**Prof. Ying LIU**

*Pennsylvania State University*

## Abstract:

Search for superconductors possessing a spin-triplet order parameter (OP) began in earnest after superconductivity was first discovered in heavy fermion superconductors late '70s. However, the search has yielded to date no universally accepted successes.  $\text{UTe}_2$ , the recently discovered heavy fermion superconductor, is perhaps the latest favorite for proving that electronic spin-triplet superconductors do exist. Indeed,  $\text{UTe}_2$  was found to feature an exceedingly large upper critical field and striking re-entrance back into a superconducting state as the magnetic field increases even further, which makes it hard for it not to be a triplet. On the other hand, direct evidence for the triplet is still lacking, especially in zero and low fields. The presence of an inversion crystalline symmetry in  $\text{UTe}_2$  requires that, if it is a spin triplet, the order parameter must be of odd parity so long that the finite-momentum pairing is excluded. I will in this talk discuss the results of our recent measurements on the symmetry of the orbital part of the OP via Josephson effect {1}. The selection rule in the orientation dependence of the Josephson coupling between  $\text{In}$ , an s-wave superconductor, and  $\text{UTe}_2$  suggests strongly that  $\text{UTe}_2$  features the odd-parity pairing state of  $B_{1u}$  near zero magnetic fields.

## Biography:

Ying Liu, professor of physics at Pennsylvania State University, received his BS degree from Peking University in 1982. He earned a MS degree, under the direction of Professor Zhao-Qing Zhang at Institute of Physics, Chinese Academy of Sciences, Beijing in 1984. Prof. Liu did his PhD. thesis research under the direction of Professor Allen M. Goldman at University of Minnesota and received his Ph.D. degree in 1991. After three-year postdoctoral research at University of Colorado, Boulder, Prof. Liu joined the faculty of Department of Physics of the Pennsylvania State University in 1994, becoming tenured full professor in 2005. His research is focused on the study of low-dimensional and unconventional superconductors, which includes 2D and quasi 1D superconducting systems and  $\text{Sr}_2\text{RuO}_4$  and  $\text{UTe}_2$ . He also worked on graphene, topological insulators, 2D crystals of transition metal oxides and chalcogenides, as well as strongly correlated electronic systems. Professor Liu received an NSF Career Award in 1997, was selected as a fellow of the American Physical Society in 2006. He received an Outstanding Young Investigator (Type B) award from NSFC in 2007.

Anyone interested is welcome to attend.

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