Searching for Exotic Superfluid in Ultracold Atomic Gases

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<u>Abstract</u>

Superfluidity of bosons is usually characterized by the off-diagonal long-range order of single boson operator, while we are interested in finding unconventional superfluids in which single boson operator does not exhibit long-range order, but boson pairs or even triple bosons exhibit long-range order. We propose two of such examples in ultracold atomic systems. The first is bosons with Rashba spin-orbit coupling. The ground state is a superfluid with stripe order, while the large single particle ground state degeneracy leads to significant fluctuations, which melt stripe order and give rise to boson-paired superfluid. The second example is bosons in Kagome lattice with frustration, where the lowest band is completely flat. At the lowest temperature bosons all condense in the K-point, while at finite temperature thermal fluctuations melt the Z3 order and lead to a trion superfluid phase.

References:

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About the speaker

Prof Hui Zhai obtained his PhD at Tsinghua University in 2005. He did postdoctoral research at Ohio-State University from 2005 to 2007, and then at Berkeley from 2007 to 2009. He became a member of the Institute for Advanced Study, Tsinghua University in 2009 and has been a tenure member since 2012.