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Title: Superconductivity of non-Fermi liquids described by Sachdev-Ye-Kitaev models

Abstract:

In most of the modern correlated-electron systems superconductivity (SC) emerges from a non-Fermi liquid (NFL) normal state as opposed to a Fermi liquid (FL) normal state. The theoretical understanding of this phenomenon is interesting and challenging because it's not described by standard BCS theory. In this talk we will discuss a simple and tractable model of electrons in the Sachdev-Ye-Kitaev (SYK) class, which features random and all-to-all exchange interaction along with an attractive on-site interaction. Our model allows us to systematically investigate the emergence of SC by continuously tuning between FL and NFL normal states. One of our main findings is the relative enhancement of the critical temperature for the NFL-SC transition. We also find that in case of NFL-SC transition the electron spectral function develops certain unique features that are absent in the FL-SC transition. Notably, the Hebel-Slichter peak in the NMR relaxation rate disappears. For strong NFLs we also find that the NFL-SC transition becomes first order.