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Pseudogap phase of ultra-cold Fermi gases at unitarity: a comparative study CHIH-CHUN CHIEN, HAO GUO, YAN HE, KATHRYN LEVIN, James Franck Institute and department of physics, the University of Chicago — The pseudogap phase in high temperature superconductors (HTSCs) has been an intensely studied subject but its origin remains a mystery. Similar pseudogap phase has been observed in ultra-cold fermions in BCS-Bose-Einstein condensation (BEC) crossover. We search for signatures of pseudogap in an unitary Fermi gas by studying spectral function, density of states, and radio-frequency (RF) spectroscopy from two widely used finite-temperature BCS-BEC crossover theories. The two theories are based on Nozieres Schmitt-Rink theory and BCS-Leggett theory, respectively. To demonstrate the similarity between the pseudogap phases in HTSCs and a unitary Fermi gas, we test some criteria for pseudogap in HTSCs on the two crossover theories. Although evidence of a pseudogap in a unitary Fermi gas can be found in both theories, its behavior differs quantitatively. We compare theoretical and experimental RF spectra and show that the extended BCS-Leggett theory has the advantage that it can be generalized to study RF spectrum across the superfluid transition temperature or polarized Fermi gases.

Chih-Chun Chien
James Franck Institute and department of physics, the University of Chicago

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