Possible suggestions for order parameter phase-sensitive experiments in the superconducting iron pnictides
DAVID PARKER, Naval Research Laboratory

The iron pnictide superconductors have undergone intensive study since the original discovery by Kamihara et al early in 2008, with maximum $T_c$'s exceeding 50 K. Despite this, the most basic questions such as pairing symmetry and mechanism have not been definitively settled. For the cuprates, the SQUID loop and tricrystal phase-sensitive experiments were instrumental in finally determining the d-wave gap symmetry; similar experiments were designed and implemented for triplet p-wave superconductivity. However, the main challenge in pnictides is to distinguish between two superconducting states, the sign-changing “$s_\pm$” and single-sign “$s_{++}$” states, which belong to the same point symmetry class. This means that while designing a Josephson loop one needs to invent a recipe to filter out different types of carriers at the two different contacts. By definition this is a quantitative rather than qualitative effect, and involves the relative amplitude of the order parameter, density-of-states and Fermi velocity, and the character of the electronic wavefunctions. Presently proposed methods either attempt to determine an optimal angle (i.e., non-90°) for a SQUID junction, use different barrier characteristics in different directions, or exploit ‘sandwich’ junctions employing two or more superconductors. In this talk, I discuss several recent proposals for phase-sensitive experiments which could help resolve the pairing symmetry controversy, as well as experimental work in this area.