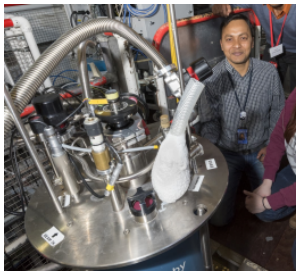

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Muon stopping states in superconductors with time-reversal symmetry breaking

Monday, 11 September 2023 12:00 (20 minutes)

A crucial issue in resolving the mechanism for unconventional superconductivity is the presence or absence of time-reversal symmetry breaking (TRSB), a property that can provide a tight constraint on the symmetry of the superconducting gap. Spontaneous magnetic fields have been measured in a collection of superconductors in μSR experiments, which has been used as evidence for TRSB in these materials. However, the fact that, in many of these systems, the spontaneous magnetic fields have been observed only by implanted muons might lead one to wonder whether these could be the result of a muon-induced effect. In this talk, I will present the results of a systematic investigation of muon-stopping states in several superconductor that have been found to exhibit spontaneous magnetic field in μSR experiments [1]. These calculations demonstrate that the presence of the muon leads to only a limited and relatively localised perturbation to the local crystal structure, while any small changes to the electronic structure occur several electron volts below the Fermi energy, leading to only minimal changes in the charge density on ions close to the muon. Our results imply that the muon-induced perturbation alone is unlikely to lead to the observed spontaneous fields in these materials, whose origin is more likely intrinsic to the time-reversal symmetry-broken superconducting state.

References

[1] B. M. Huddart et al., Phys. Rev. Lett. 127, 237002 (2021).

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