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The Effect of Impurities on the Superconductivity of BSCCO-2212 JOHN VASTOLA, RICHARD KLEMM, University of Central Florida — BSCCO-2212 is a high-temperature cuprate superconductor whose electronic structure is currently poorly understood. In particular, it is unclear whether its order parameter is consistent with s-wave or d-wave behavior. Leggett has suggested that its order parameter might take a certain form that is consistent with d-wave behavior. While some experiments on the surface of BSCCO seem to support this conclusion, other experiments have suggested that its order parameter is instead s-wave in the bulk. We present some quantum field theoretic calculations in the spirit of Abrikosov and Gorkov's approach to the theory of superconductivity that suggest that such an order parameter cannot be correct. We will demonstrate that having such an order parameter would mean that BSCCO's critical temperature would go to zero if it is sufficiently impure, contradicting experimental evidence otherwise. Because this would not happen with a d-wave order parameter, these calculations lend support to the hypothesis that BSCCO is s-wave.

John Vastola
University of Central Florida

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