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A Proposed New Measurement of the Superconducting Gap in $\text{YBa}_2\text{Cu}_3\text{O}_7$ G.L. ZHAO, D. BAGAYOKO, Southern University and A & M College — The superconducting energy gap of $\text{YBa}_2\text{Cu}_3\text{O}_7$ (YBCO) varies strongly with \vec{k} and from a sheet of the Fermi surface to another. The strong anisotropic superconducting gap in high Tc materials such as YBCO has led to conflicting d-wave and s-wave interpretations. We have utilized electronic wave functions from the ab-initio density functional calculation and the related electron-phonon interaction matrix elements for the calculation of the superconducting gap values of YBCO. For three pieces of the Fermi surfaces, the calculated superconducting gaps exhibit a strong anisotropy. In contrast, we have found that the superconducting gap on one sheet of the Fermi surface around S-point only shows a minor variation from about 18 meV to 25 meV. Especially, there is no node on this sheet of the Fermi surface. We propose a new test measurement of the superconducting gap of YBCO on this sheet of the Fermi surface around the S-point. This measurement is expected to shed light on the gap symmetry properties of high Tc superconductors. This work was funded in part by NSF (Award No. 0508245) and ONR (Grant No: N00014-05-1-0009).

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