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Indication of Both d- and s-Wave like Superconducting Gaps in $YBa_2Cu_3O_7$ G.L. ZHAO, Department of Physics and High Performance Computing Laboratory, Southern University and A&M College, Baton Rouge, Louisiana 70813, D. BAGAYOKO, Southern University and A&M College — Both of the d- and s- wave interpretations of the superconducting gaps in high Tc superconductors are separately supported by experiments, leading sometimes to conflicting views. In an effort to resolve this conflict, we performed first-principle quantum calculations as follows. We utilized self-consistent, electronic wave functions and electron-phonon interaction matrix elements, and we solved four-dimensional Eliashberg gap equations. Our results showed that on three sheets of the Fermi surfaces, the calculated superconducting gap exhibits a strong anisotropy and can lend itself to a d-wave interpretation. In contrast, the calculated superconducting gap on the small sheet of the Fermi surface around the S-Point only shows a relatively small variation from about 18 meV to 25 meV and there is no node on this sheet, leading to s-wave interpretation. Our findings point to the need for measurements of the superconducting gap on this sheet of the Fermi surface around the S-point. Such measurements are expected to shed light on the gap symmetry properties of high Tc superconductors. Work funded in part by the Department of the Navy, Office of Naval Research (ONR, Grant No. N00014-4-1-0587) and by the National Science Foundation (Award No. HRD 0503362)

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