Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Weak-Coupling BCS Theory of Skutterudite $\mathbf{PrOs_4Sb_{12}}$ DAVID PARKER, KAZUMI MAKI, STEPHAN HAAS, University of Southern California — A weak-coupling theory of the A- and B-phases of the recently discovered heavy-fermion superconductor $PrOs_4Sb_{12}$ is developed. The BCS gap equation is solved assuming a p+h-wave pairing symmetry with an A-phase nodal gap function $\Delta(\mathbf{k}) \sim e^{\pm i\phi_i}(1 - \hat{k}_x^4 - \hat{k}_y^4 - \hat{k}_z^4)$ and with a B-phase nodal gap function $\Delta(\mathbf{k}) \sim e^{\pm i\phi}(1-\hat{k}_y^4)$, where $e^{\pm i\phi_i} \sim \hat{k}_z \pm i\hat{k}_x,\ \hat{k}_x \pm i\hat{k}_y$ or $\hat{k}_y \pm i\hat{k}_z$ and $e^{\pm i\phi} \sim \hat{k}_z \pm i\hat{k}_x$. The B-phase order parameter has similar thermodynamic properties as the recently proposed spin-singlet s+g-wave superconductor [Maki et al, Europhys. Lett. **64** 496 (2003)]. However, there is accumulating evidence for spin- triplet pairing for superconductivity in $PrOs_4Sb_{12}$. Analytic limiting case results as well as numerical solutions for the whole temperature range $T \leq T_c$ are presented for the order parameter, the specific heat, the thermodynamic critical field, and the superfluid density. We compare these results with data from a few recent experiments.

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Date submitted: 30 Nov 2004