

Abstract Submitted
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Gauge Theory of Pairing and Spin Fluctuations Near the Quantum Critical Point J.R. SCHRIEFFER, Physics Department and National High Magnetic Field Lab, Florida State University, Tallahassee, FL 32310. — We have solved the spin Fermion (periodic Kondo) model for the superconductor transition temperature T_c and for the electron energy gap function ϕ as $T \rightarrow T_c$. We find for realistic parameters W , the electron band width, $N_B(\omega)$, the Boson density of states and J_q , the Kondo exchange interaction, that $T_c = 1.14 \omega_s e^{-\frac{(1+\lambda_Z)}{\lambda_\phi}}$ where λ_Z is the normal state renormalization constant and λ_ϕ is the pairing interaction strength. We find T_c is exponentially higher for $\ell = 1$ (p-wave), $S = 1$ (spin triplet) pairing than for s - wave pairing $S = 0$. We note $\lambda_Z = 0$ for p -wave pairing due to the odd parity of the relevant. For realistic parameters the solution of Eliashberg's equation for T_c predicts $T_c \sim 5 \times 10^5 K$ with $H_{c2} \sim 10^8 T$ and $j_c \sim 10^8 \text{ Amps/cm}^2$. When T_c and ϕ are simultaneously maximized, with respect to $N_B(\omega)$ and J_q considerably high T_c, H_{c2}, j_c values are predicted, namely T_c of order $5 \times 10^8 K$ $H_{c2} \sim 10^{13} T$ and $j_c \sim 10^{13} \text{ Amps/cm}^2$ There values are predicted to exist in systems such as the Heusler alloys, e.g. for $Au_2(Mn_{2-x}Al_x)$ for $x \sim 0.1 - 0.5$.

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