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Multipole degrees of freedom and superconductivity in $PrOs_4Sb_{12}$:Sb-NMR

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$PrOs_4Sb_{12}$ is the first superconductor among Pr-based heavy fermion system. Strong electron-electron correlations attributed to the Pr 4f^2 electrons are evidenced by both the large electronic specific heat coefficient $\gamma = 350 \sim 500$ mJ/(molK^2) and enhanced cyclotron-effective mass $m^* \sim (2.4 - 7.6)m_0$.

Here we report ^{121,123}Sb-nuclear magnetic resonance (NMR) measurements of a single crystal $PrOs_4Sb_{12}$. The temperature dependence of the NMR shift stays constant below T_c within the experimental error. If we assume the heavy-Fermi liquid state is realized in the normal state, the present result suggests that $PrOs_4Sb_{12}$ is an odd-parity superconductor. To check the quasiparticle Korringa relation held in the heavy Fermi liquid state, we also measured the ^{121}nuclear spin-lattice relaxation time, $1/T_1$, in the field (H) range of 0-10 T and the temperature (T) range of 0.5-10 K. $1/T_1$ is strongly suppressed both by H and T, suggesting the effective mass of conduction electrons decreases both by applying magnetic field and lowering temperature. This feature implys that the mass enhancement occurs through the interactions between the conduction electrons and magnetic multipoles arising from the low-lying crystal-electric-field (CEF) levels. In this talk, we will give a summary of the previous our measurements and feuture tasks.

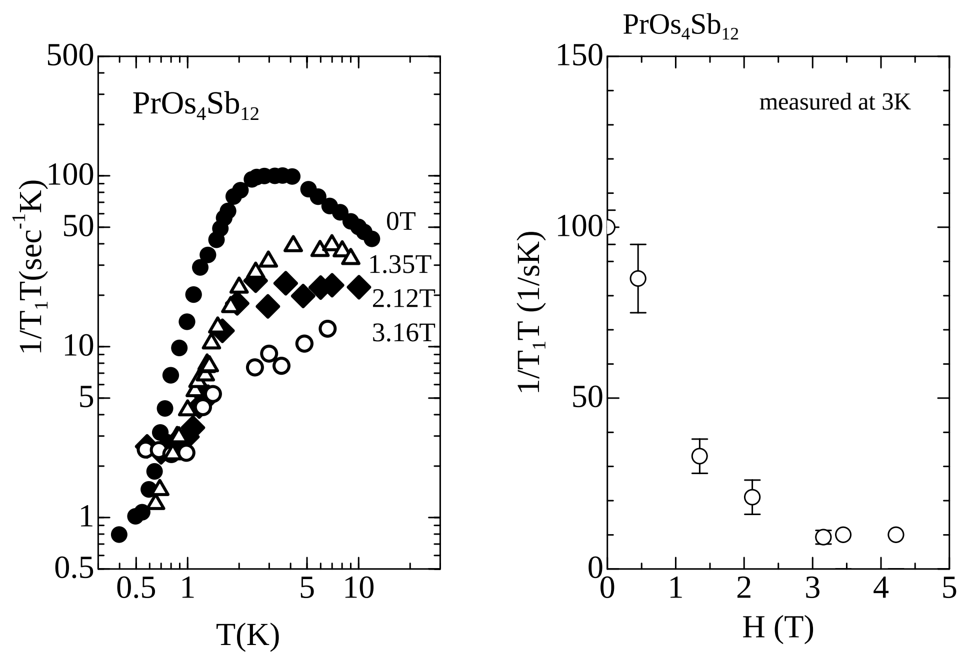

Figure 1: T dependence of $1/T_1T$ at various applied fields (left). H dependence of $1/T_1T$ at 3 K (right).