Spin-Triplet Superconductivity Induced by Longitudinal Ferromagnetic Fluctuations in UCoGe

K. Ishida, a T. Hattori, a Y. Ihara, a Y. Nakai, a Y. Taqa, a S. Fujimoto, a N. Kawakami, a E. Ozaki, b K. Deguchi, b N. K. Sato, b and T. Yamamura c

a Department of Physics, Graduate School of Science, Kyoto University, Kyoto 606-8502 Japan
b Department of Physics, Graduate School of Science, Nagoya University, Nagoya 464-8602 Japan
c Institute of Materials Research, Tohoku University, Sendai, 980-8577, Japan

e-mail address of submitting author: kishida@scphys.kyoto-u.ac.jp

We report $^{59}$Co nuclear magnetic resonance (NMR) and nuclear quadrupole resonance (NQR) studies on the single crystalline ferromagnetic (FM) superconductor UCoGe, which exhibits FM ordering at $T_{\text{Curie}} = 2.5$ K and superconductivity below $T_{\text{Super}} = 0.57$ K [1]. We studied the coexistence state from the microscopic point of view, and showed that superconductivity occurs in the FM region and the both phenomena originate from U 5f electrons [2]. We also studied the spin-dynamic properties from the measurements of $1/T_1$ and Knight shift, and found that both static and dynamic susceptibilities are ferromagnetic with strong Ising anisotropy along the $c$ axis [3].

In addition, from the angle-resolved NMR measurements, we found that the magnetic field along the $c$ axis ($H//c$) strongly suppresses both the FM Ising-type fluctuations and superconductivity in the same way [4]. These results strongly suggest that the characteristic FM fluctuations tuned by $H//c$ induce the unique superconductivity in UCoGe, which is anticipated to be spin-triplet superconductivity.

References