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Alliance 4 “Electrical energy”



## NMR STUDIES ON FERROMAGNETIC SUPERCONDUCTOR UCoGe

**Summary :** In the seminar, I will present our  $^{59}\text{Co}$  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 <sup>[1]</sup>. 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 <sup>[2]</sup>. 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 <sup>[3]</sup>.

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 manner <sup>[4]</sup>. These results strongly suggest that the characteristic FM fluctuations tuned by  $H//c$  induce the unique spin-triplet superconductivity in UCoGe, which is also supported by the recent Knight-shift results <sup>[5]</sup>.

These studies have been performed in the collaboration with T. Hattori,<sup>1</sup> Y. Ihara (Hokkaido Univ.),<sup>1</sup> Y. Nakai (Tokyo Metropolitan Univ.),<sup>1</sup> Y. Tada (ISSP, Univ. of Tokyo),<sup>1</sup> S. Fujimoto,<sup>1</sup> N. Kawakami,<sup>1</sup> E. Ozaki,<sup>2</sup> K. Deguchi,<sup>2</sup> N. K. Sato,<sup>2</sup> and T. Yamamura<sup>3</sup>.

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### References :

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<sup>[2]</sup> T. Ohta et al., J. Phys. Soc. Jpn. 79, 023707 (2010).

<sup>[3]</sup> Y. Ihara et al., Phys. Rev. Lett. 105, 206403 (2010).

<sup>[4]</sup> T. Hattori et al. Phys. Rev. Lett. 108, 066403 (2012).

<sup>[5]</sup> T. Hattori et al. Phys. Rev. B 88, 085127 (2013).