- *Kavli Institute for Theoretical Physics* -

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Anisotropy of the upper critical field in Sr_2RuO_4

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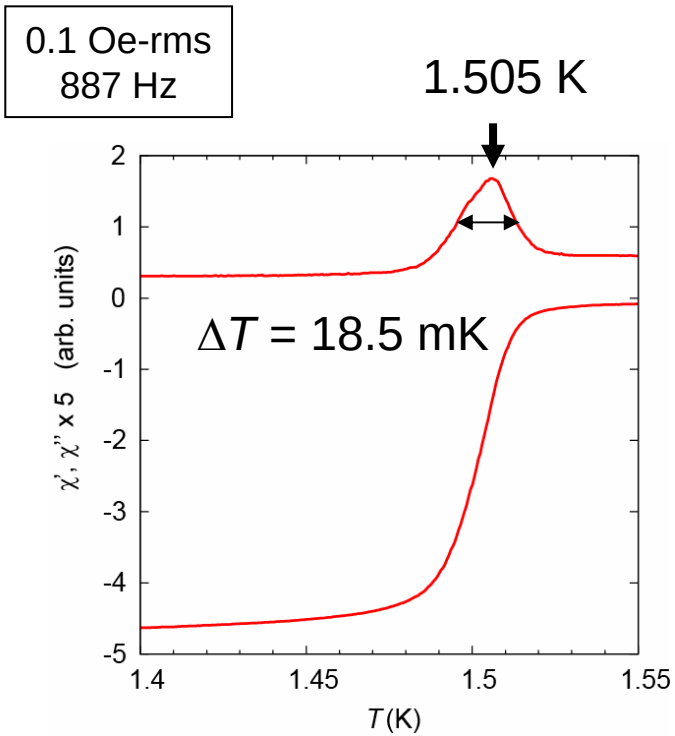
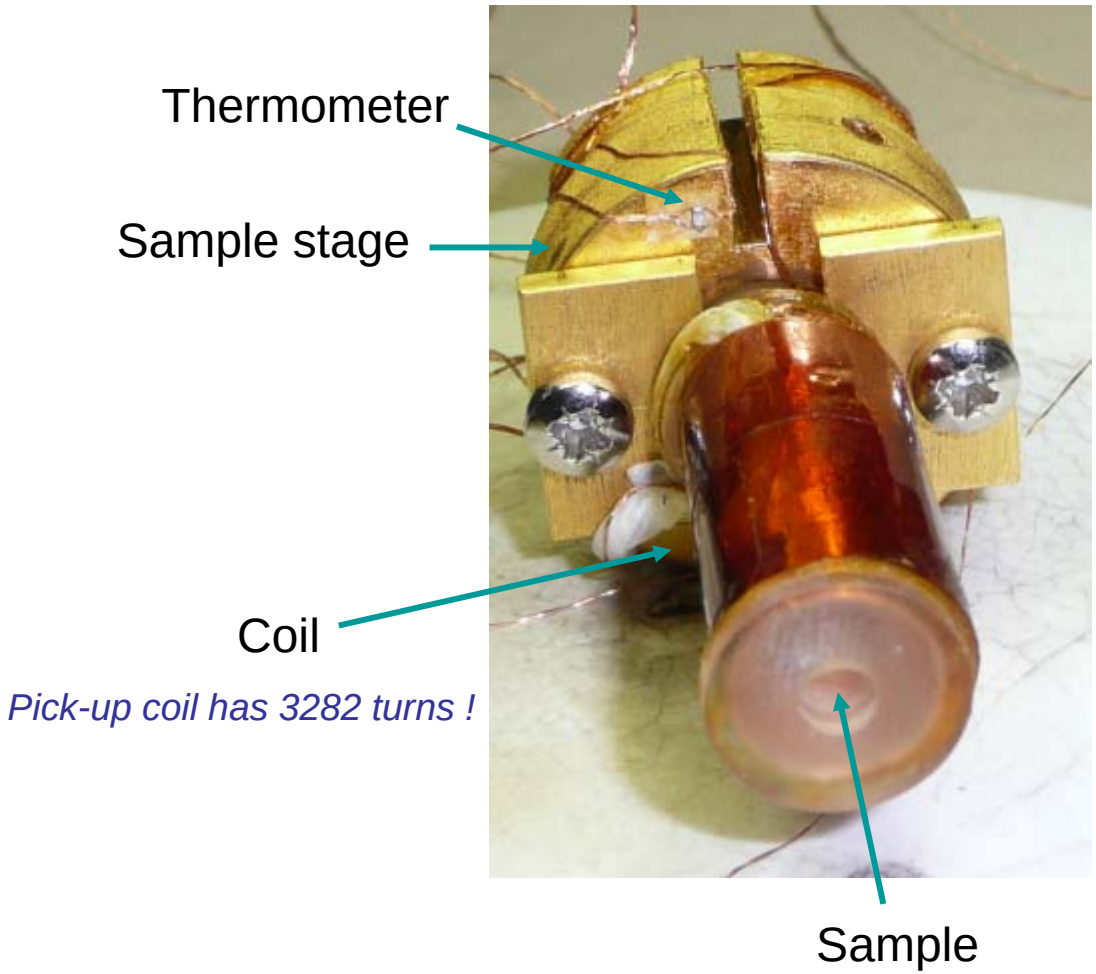
Sample preparation



Best T_c sample !



Pick-up coil has 3282 turns !

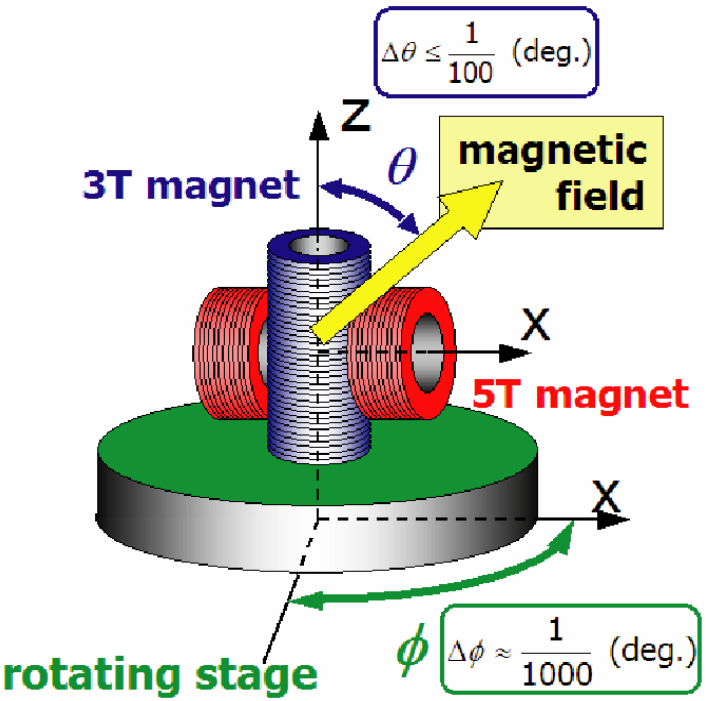
We measure χ_{AC} in a vector magnet

Vector magnet system

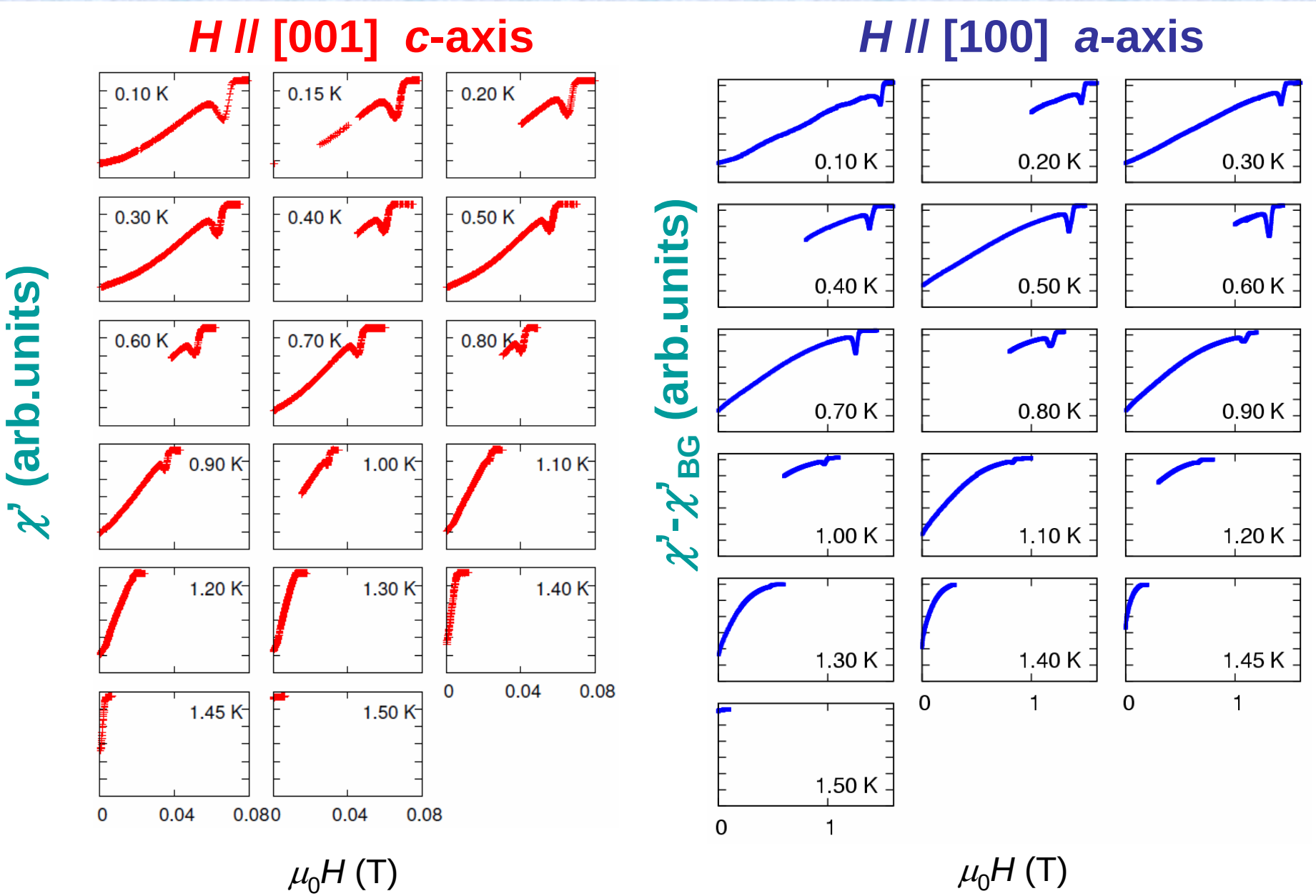
Vector Magnet *with a dilution refrigerator (Kelvinox 24)*

- Two superconducting magnets + a rotating stage
- 3D control of the field direction.
- High-precision alignment.

Deguchi *et al*, Rev. *Sci. Instrum.*, **75**, 1188 (2004)

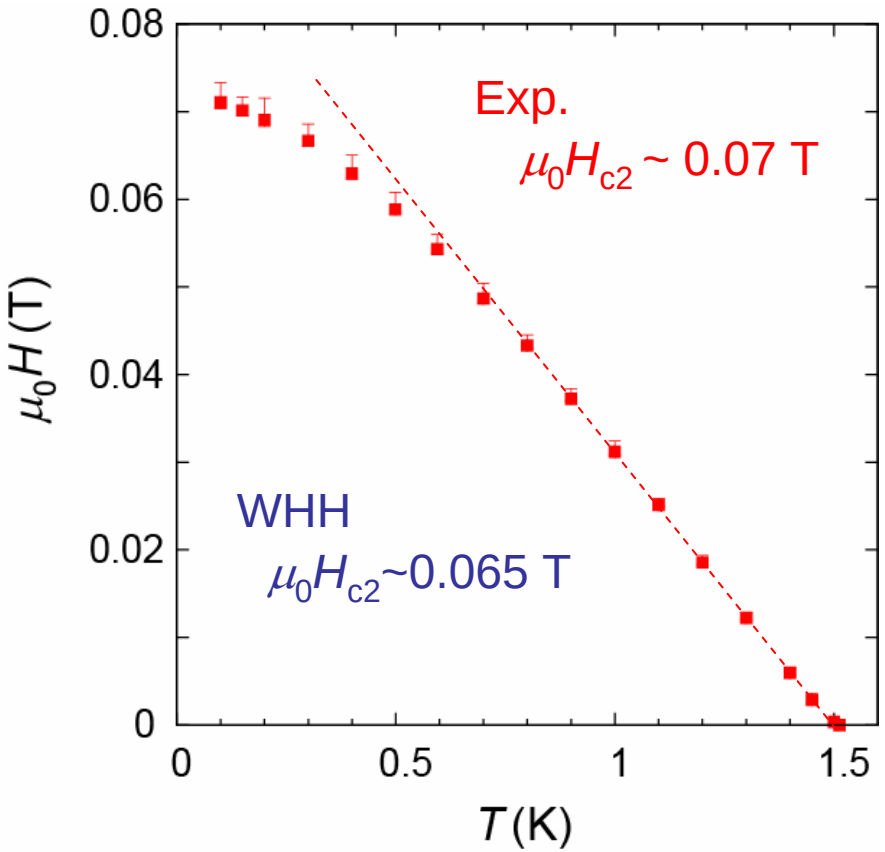


Field sweep


H // [001] c-axis
H // [100] a-axis
χ' (arb.units)
χ'-χ'BG (arb.units)
0.10 K
0.15 K
0.20 K
0.30 K
0.40 K
0.50 K
0.60 K
0.70 K
0.80 K
0.90 K
1.00 K
1.10 K
1.20 K
1.30 K
1.40 K
1.45 K
1.50 K
0
0.04
0.08
1
μ0H (T)
μ0H (T)

H-T phase diagram determined from the onset in χ'

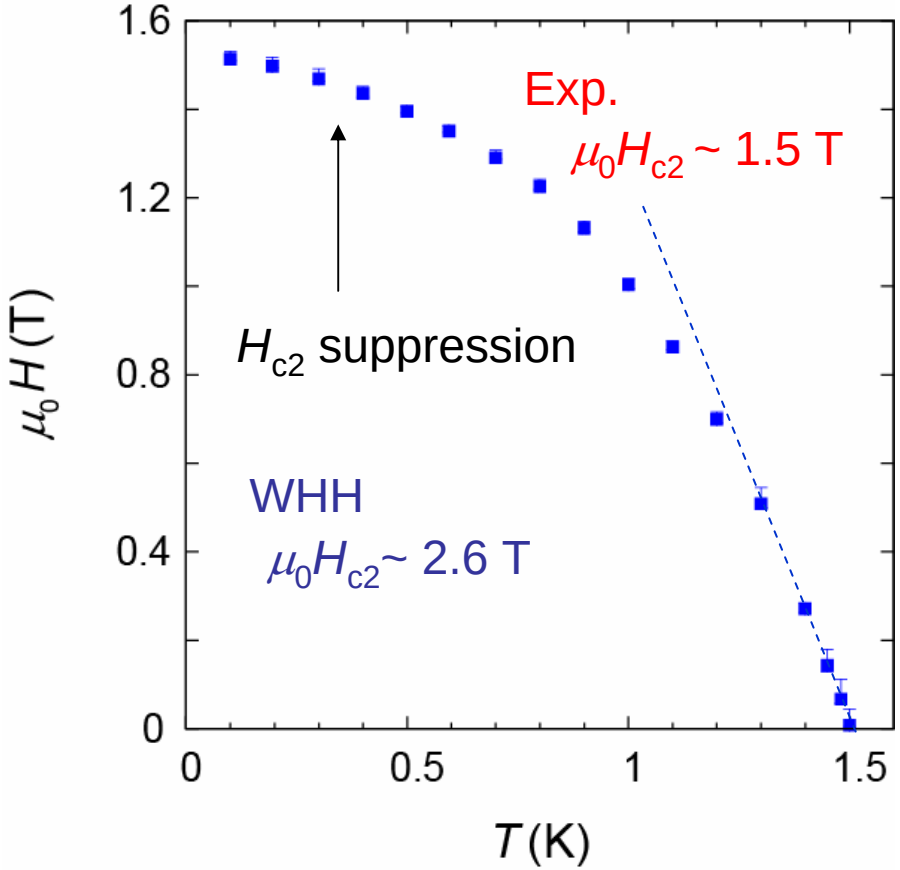
H // [001] *c*-axis



WHH formula

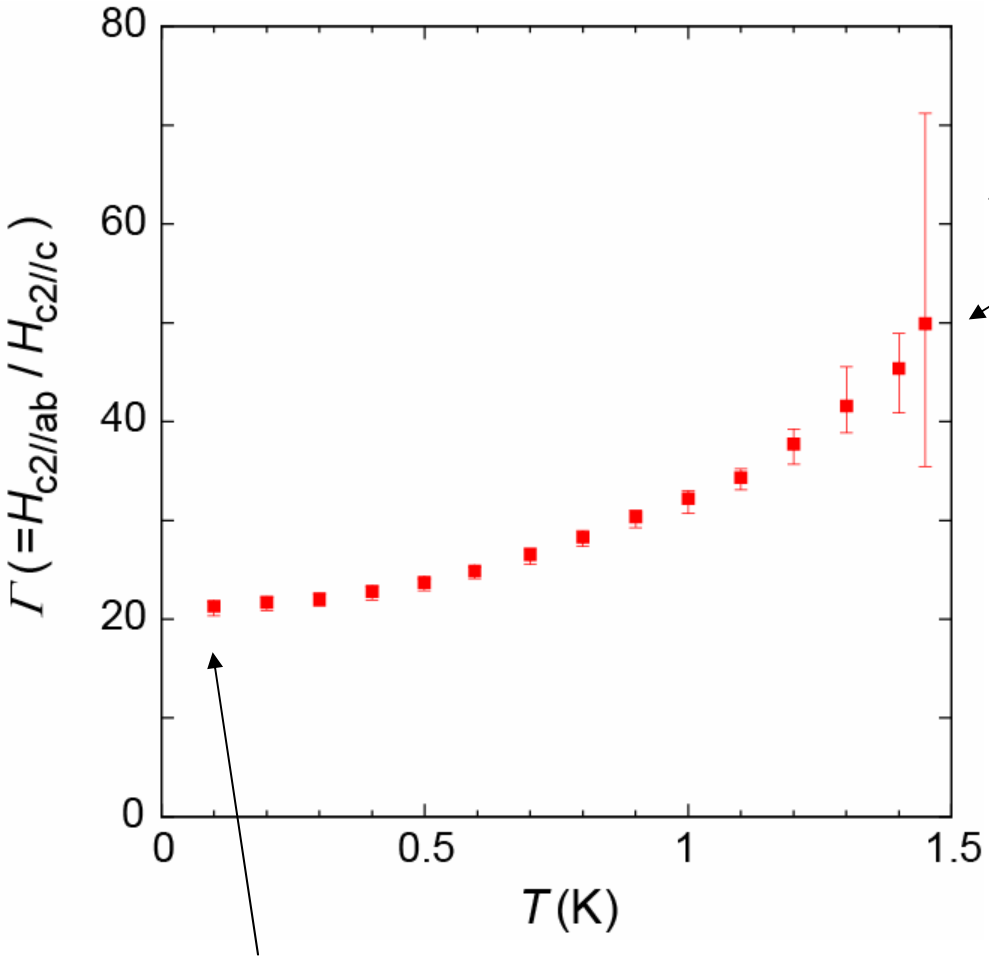
$$H_{c2} \sim 0.7 T_c \left. \frac{dH_{c2}}{dT} \right|_{T_c}$$

H // [100] *a*-axis



$H_{c2//ab}$ seems to be suppressed at low T.

Anisotropy ratio Γ (= $H_{c2//ab}/H_{c2//c}$)



Anisotropy ratio is **below 100** near T_c

Our result denies a singlet scenario ?

In Pauli limit case,
Γ should be larger than 100 near T_c.

K. Machida and M. Ichioka, condmat/07061426.

Anisotropy ratio is approximately 20 at low temperature

Summary

1. We study H_{c2} anisotropy in Sr_2RuO_4 using a “vector magnet”.

2. H_{c2} suppression is evident for H // ab.

3. The anisotropy ratio $\Gamma = H_{c2//ab} / H_{c2//c}$ is approximately 20 at low temperatures.

4. The anisotropy ratio Γ increases toward T_c, but appears to remain much below 100 near T_c.