MAR16-2015-020035

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

**Evidence for preservation of crystallographic four-fold rotational symmetry in hidden order of $URu_2Si_2$**[1]

HIROSHI AMITSUKA, Graduate School of Science, Hokkaido University

Recent experimental studies have suggested that the four-fold rotational symmetry around the tetragonal c axis is broken in the hidden-ordered state of $URu_2Si_2$ below 17.5 K [1-5]. Those experimental findings give strong constraints on the theoretical arguments, and have provoked discussions on the electric/magnetic "nematic" ordering. However, the detected signals that suggest the broken symmetry are extremely weak in magnitude, and thus it is very important to test the reproducibility of the observations. Among the reported experiments, the orthorhombic distortion detected by X-ray diffraction is particularly important, because it may prove the broken rotational symmetry to be a thermodynamic phenomenon. We have performed synchrotron X-ray backscattering measurements of a high-quality single crystal with RRR $>$ 350 with the highest spatial resolution ever achieved. We will present the most reliable evidence for the preservation of crystallographic four-fold rotational symmetry in the hidden-order state. We will also present the tests for reproducibility of magnetic torque measurements, and discuss the intrinsic nature of $URu_2Si_2$. [1] R. Okazaki et al., Science 331, 439 (2011). [2] S. Tonegawa et al., Phys. Rev. Lett. 109, 036401 (2012). [3] S. Kambe et al., Phys. Rev. Lett. 110, 246406 (2013). [4] S. Tonegawa et al., Nat. Commun. 5, 4188 (2014). [5] S. C. Riggs et al., Nat. Commun. 6, 6425 (2015).

[1]This work was supported by JSPS KAKENHI Grant Number 25400346 and 15K05885 (J-Physics).