Abstract Submitted for the MAR15 Meeting of The American Physical Society

Coherent heat conduction of quantum monopoles in $Yb_2Ti_2O_7$ TAKUYA YAMASHITA, YOSHI TOKIWA, DAIKI TERAZAWA, YUSUKE SHI-MOYAMA, Dept. Phys., Kyoto univ., YUKIO YASUI, Dept. Phys., Meiji Univ., MASAFUMI UDAGAWA, Dept. Appl. Phys., Univ. of Tokyo, TAKASADA SHIBAUCHI, Dept. Adv. Mater. Sci., Univ. of Tokyo, YUJI MATSUDA, Dept. Phys., Kyoto univ. — The rare-earth pyrochlore magnets are realization of spin ice which have macroscopically degenerate ground states. The elementary excitation of classical spin ice is thought to be thermally activated magnetic monopoles with dispersion-less energy gap $\Delta \sim 2J_{zz}$. We have measured the thermal conductivity κ of quantum spin ice Yb₂Ti₂O₇ at magnetic field B // [100] and [111]. The field direction dependence of κ is consistent with monopole excitations. However, the temperature dependence indicates that the energy gap is at most 0.2 K, which is much smaller than $\Delta \sim 4$ K. This reduction of gap suggests the band formation of monopole excitations, giving rise to coherent heat conduction of "quantum" monopoles. Unlike diffusive monopoles in classical spin ice, the mean free path of these quantum monopoles is extremely long ~ 100 nm.

> Takuya Yamashita Dept. Phys., Kyoto univ.

Date submitted: 13 Nov 2014

Electronic form version 1.4