Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Two-step spin flop transition in quantum spin ladders TORU SAKAI, Japan Atomic Energy Agency and CREST JST, KIYOMI OKAMOTO, Tokyo Institute of Technology — It is well known that the antiferromagnet with easy-axis anisotropies exhibits a field-induced first-order phase transition, the so-called spin flop. In one-dimensional quantum spin systems, instead of it, a second-order phase transition occurs because of large quantum fluctuations[1]. Particularly the S=1 antiferromagnetic chain with the easy-axis single-ion anisotropy was revealed to exhibit two successive field-induced second-order transitions by our previous numerical analysis[2]. However, such transitions have not been obseved yet. Recently a two-step spin flop transition was observed in the spin ladder system IPA-$CuCl_3$[3], which has ferromagnetic rung coupling. In order to clarify the mechanism of the two-step field-induced transition, we investigate the anisotropic spin ladder using the numerical diagonalization and the finite-size scaling analysis. As a result, we revealed that two different field-induced second-order quantum phase transitions possibly occur. Several phase diagrams are also presented. In addition we discuss on a possible two-step spin flop in other materials[4] and some frustrated systems. [1] C. N. Yang and C. P. Yang, Phys. Rev. 151 (1966) 258. [2] T. Sakai, Phys. Rev. B 58 (1998) 6268. [3] T. Masuda et al, Phys. Rev. Lett. 96 (2006) 047210. [4] H. Miyasaka et al, Inorg. Chem. 42 (2003) 8203.

Toru Sakai
Japan Atomic Energy Agency

Date submitted: 13 Nov 2007 Electronic form version 1.4