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Field-induced quantum phase transitions of the asymmetric three-leg spin tube TORU SAKAI, JAEA, SPring-8, MASAHIRO SATO, RIKEN, KOUICHI OKUNISHI, Niigata University, KIYOMI OKAMOTO, Tokyo Institute of Technology, CHIGAK ITOI, Nihon University — The spin tube has attracted a lot of interest as a magnet with a nanotube structure. Various applicable functions of the spin tube are expected to be induced by magnetic field. The S=1/2 three-leg spin tube has a spin gap due to the strong frustration. Using the numerical dyagonalization and the density matrix renormalization group (DMRG) calculation, we revealed new quantum phase transitions between the spin-gap and gapless phases induced by an asymmetric interchain interactions [1]. Under high magnetic field this system also exhibits some interesting phenomena. The same numerical analysis on the magnetization process indicates that the 1/3 magnetization plateau appears for sufficently large rung interaction caused by two different mechanisms, depending on the asymmetry. Some magnetization cusps are also predicted by the DMRG calculation. In addition we found a field induced crossover between the effictive S=1/2 and S=3/2 magnon excitations and a field induced chiral order[2]. In the present study, we revealed a novel symmetry breaking at the 1/3 magnetization plateau. [1] T. Sakai, M. Sato, K. Okunishi, Y. Otsuka, K. Okamoto and C. Itoi, Phys. Rev. B 78 (2008) 184415. [2] M. Sato and T. Sakai, Phys. Rev. B 75 (2007) 014411.

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