Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Edge state and its stability of 2D antiferromagnetic quantum spin systems TAKAFUMI SUZUKI, Research Center for Nano-Micro Structure Science and Engineering, University of Hyogo, MASAHIRO SATO, Department of Physics, Aoyama Gakuin University — Topological insulators (TIs) [1] have been of great interest in condensed matter physics. One of the most important points is that TIs are characterized by non-local quantities such as topological quantities of the bulk or gapless surface states [2]. The TI phase and the surface states are quite stable for any time-reversal symmetric perturbations. On the other hand, the Haldane-gap state in quantum spin systems is another class of the topological state [3], because, similarly to TIs, this gapped state has no local order and is characterized by the non-local (string) order parameter or free spins at the edges. In this study, motivated by the recent development of theories for topological phases and surface states, we consider properties of edge states in 2D quantum spin systems by applying the quantum Monte Carlo method. Particularly, we focus on the three points; (1) which spin systems can have gapless edge states, (2) the stability of the gapless edge states, and (3) the difference between the edge modes of TIs and spin systems.

[1] See, for example, M. Z. Hasan and C. L. Kane, RMP82, 3045 (2010).
[2] A. P. Schnyder, et al., PRB 78, 195125 (2008), A. Kitaev, AIP Conf. Proc. 1134, 22 (2009).
[3] F.D.M. Haldane, Phys. Lett. 93A, 464 (1983); PRL50, 1153 (1983).

Takafumi Suzuki
Research Center for Nano-Micro Structure Science and Engineering,
University of Hyogo

Date submitted: 26 Nov 2011 Electronic form version 1.4