Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Entanglement Entropy in Gapped Quantum Spin Chains HOSHO KATSURA, TAKAAKI HIRANO, YASUHIRO HATSUGAI, Dept. of Appl. Phys., Univ. of Tokyo — Entanglement properties of quantum spin systems have recently attracted much attention in quantum information theory and condensed matter physics. The entanglement entropy (von Neumann entropy of a sub-system) has been used to detect the quantum phase transition and topological order[1][2][3]. It was also discussed that the direct relation between the bulk entanglement entropy and the edge one [4]. We give the exact form of the entanglement entropy in higher-spin Valence-Bond- Solid states and show that the edge state picture is valid for all integer spins. The relationship between the entanglement entropy and the correlation function is clarified and the physical meaning of the entanglement entropy in gapped models is established. We also make a comparison between the analytical results for VBS chains and the numerical results for higher-spin antiferromagnetic Heisenberg chains. [1] M. Levin and X. G. Wen, Phys. Rev. Lett. **96**, 110405 (2006). [2] A. Kitaev and J. Preskill, Phys. Rev. Lett. **96**, 110404 (2006). [3] G. Vidal et al., Phys. Rev. Lett. **90**, 227902 (2003). [4] S. Ryu and Y. Hatsugai, Phys. Rev. Lett **96**, 245115 (2006).

Hosho Katsura
Dept. of Appl. Phys., Univ. of Tokyo

Date submitted: 20 Nov 2006 Electronic form version 1.4