Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Local Entanglement and Quantum Phase Transition in Spin Models[1] SHI-JIAN GU, Department of Physics and Institute of Theoretical Physics, The Chinese University of Hong Kong, Hong Kong, China, GUANG-SHAN TIAN, School of Physics, Peking University, Beijing 100871, China, HAI-QING LIN, Department of Physics and Institute of Theoretical Physics, The Chinese University of Hong Kong, Hong Kong, China — In this work, we study quantum phase transitions in both the one- and two-dimensional XXZ models with either spin S=1/2 or S=1 by a local entanglement We show that the behavior of E_v is dictated by the low-lying spin excitation spectra of these systems. Therefore, the anomalies of E_v determine their critical points. It reminds us the well-known fact in optics: The three-dimensional image of one subject can be recovered from a small piece of holograph, which records interference pattern of the reflected light beams from it. Similarly, we find that the local entanglement, which is rooted in the quantum superposition principle, provides us with a deep insight into the long-range spin correlations in these quantum spin systems. **References:** [1] S. Sachdev, *Quantum Phase Transitions* (Cambridge University Press, Cambridge, 2000). [2] Shi-Jian Gu, Guang-Shan Tian, and Hai-Qing Lin quant-ph/0509070

[1]This work is supported by RGC Projects CUHK 401703 and 401504 and by CNSF grant No. 90403003.

Shi-
Department of Physics and Institute of Theoretical Physics, The Chinese University of Hong Kong, Hong Kong

Date submitted: 30 Nov 2005 Electronic form version 1.4