

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Even-odd parity effects of a spin-1 Heisenberg chain on long-range interaction and entanglement¹ SANGCHUL OH, University at Buffalo, SUNY, MARK FRIESEN, University of Wisconsin-Madison, XUEDONG HU, University at Buffalo, SUNY — A strongly coupled spin chain can be used as a quantum data bus, to mediate long-range interactions and entanglement between remote qubits. By obtaining numerical solutions for finite size systems, we investigate even-odd parity effects in a spin-1 chain and their consequences for long-range interactions and entanglement. We observe some similarities with a spin-1/2 chain [1]. For example, we find that an even-size chain mediates an RKKY (Ruderman-Kittel-Kasuya-Yosida)-like interaction between weakly coupled attached spins, while an odd-size chain acts as a central spin to the attached spins. On the other hand, we find that the RKKY-like interactions have a different character. For a spin-1/2 chain, the interactions decay with qubit separation as they oscillate between ferro and antiferromagnetic couplings. For a spin-1 chain, the interactions also oscillate, but they decay very little as a function of qubit separation. We believe this behavior is a manifestation of the finite Haldane gap of an integer spin chain in the thermodynamic limit.

[1] S. Oh, M. Friesen, X. Hu, Phys. Rev. B **82**, 140403(R) (2010).

¹This work is supported by the DARPA/MPO QuEST program through a grant from AFOSR.

Sangchul Oh
University at Buffalo, SUNY

Date submitted: 18 Nov 2010

Electronic form version 1.4