Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Constructing Two Distinct Spin Liquid States in a Layered Cubic Lattice[1] JIN XU, KEVIN BEACH, Department of Physics, University of Alberta, Edmonton, Alberta, Canada T6G 2E1 — We construct a family of short-range resonating-valence-bond wave functions on a layered cubic lattice, allowing for a tunable anisotropy in the amplitudes assigned to nearest-neighbour valence bonds along one axis. Monte Carlo simulations reveal that four phases are stabilized over the full range of the anisotropy parameter. They are separated from one another by a sequence of continuous quantum phase transitions. An antiferromagnetic phase, centered on the perfect isotropy point, intervenes between two *distinct* quantum spin liquid states. One of them is continuously deformable to the two-dimensional U(1) spin liquid, which is known to exhibit critical bond correlations. The other has both spin and bond correlations that decay exponentially. The existence of this second phase is proof that, contrary to expectations, neither a bipartite lattice structure nor a conventional Marshall sign rule is an impediment to realizing a fully gapped quantum spin liquid.

[1]This work was supported by a Discovery grant from NSERC of Canada. Simulations were performed on the computing facilities of WestGrid and on a local cluster generously made available to us by John P. Davis.

Jin Xu
University of Alberta

Date submitted: 29 Oct 2013 Electronic form version 1.4