Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Quantum computational universality of Affleck-Kennedy-Lieb-Tasaki states beyond the honeycomb lattice TZU-CHIEH WEI, C.N. Yang Institute for Theoretical Physics, Stony Brook University — Universal quantum computation can be achieved by simply performing single-spin measurements on a highly entangled resource state, such as cluster states. The family of Affleck-Kennedy-Lieb-Tasaki (AKLT) states has recently been explored; for example, the spin-1 AKLT chain can be used to simulate single-qubit gate operations on a single qubit, and the spin-3/2 two-dimensional AKLT state on the honeycomb lattice can be used as a universal resource. However, it is unclear whether such universality is a coincidence for the specific state or a shared feature in all two-dimensional AKLT states. Here we consider the family of spin-3/2 AKLT states on various trivalent Archimedean lattices and show that in addition to the honeycomb lattice, the spin-3/2 AKLT states on the square octagon $(4, 8^2)$ and the 'cross' $(4, 6, 12)$ lattices are also universal resources, whereas the AKLT state on the 'star' $(3, 12^2)$ lattice is likely not due to geometric frustration. Ref. T.-C. Wei, arXiv:1306.1420.

Tzu-Chieh Wei
Stony Brook University

Date submitted: 14 Nov 2013 Electronic form version 1.4