Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Emergence of limit-periodic structure without matching rules[1]
CATHERINE MARCOUX, TRAVIS BYINGTON, JOSHUA SOCOLAR, Physics Dept., Duke University — We study the emergence of nonperiodic order in a tiling model based on a certain 2D hexagonal prototile with nearest-neighbor interactions. The model is closely related to the Taylor-Socolar tiling model [1], but with a simpler Hamiltonian with a degenerate class of ground states that includes both periodic and limit-periodic structures. We present the results of a lattice Monte Carlo simulation of the orientational degrees of freedom of a system of the prototiles. We find that the limit-periodic structure emerges from a sufficiently slow quench through the same infinite sequence of second-order phase transitions observed in the full Taylor-Socolar model. A related 3D model with a simple cubic prototile exhibits similar behavior, but with first-order transitions and a more complex set of limit-periodic ground states.

[1] T. W. Byington and J. E. S. Socolar, *Phys. Rev. Lett.* **108**, 045701 (2012).

[1]This work was supported by the NSF's Research Triangle MRSEC (DMR-1121107).

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Date submitted: 11 Nov 2013 Electronic form version 1.4