Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Ising anyons at finite temperature** CHRIS SELF, Imperial College London, JAMES WOOTTON, University of Basel, SOFYAN IBLISDIR, Complutense University of Madrid, University of Barcelona, JIANNIS PACHOS, University of Leeds — Topological quantum computing offers a robust approach to quantum computation using braiding and fusion of anyonic particles. A particular type of anyons called Ising anyons are known to emerge from the microscopics of a spin lattice model called the Kitaev honeycomb[1,2]. We study the Ising anyon phase of the Kitaev honeycomb at finite temperature using Monte Carlo methods. We find evidence of the thermal fractionalization of the spins into Majorana modes, similar to the recent results of [3] who studied the non-Ising anyon phases of the model. We relate these findings to the finite temperature stability of the topological characteristics of the model. In addition we probe the thermal edge currents of the Kitaev honeycomb. Analogy to conformal field theory suggests that if the system has a boundary then at very low temperatures there should be a chiral edge current along that boundary that scales with $T^2$. By defining a microscopic current operator and taking its finite temperature expectation value we demonstrate edge currents that obey this scaling.

[1]A. Kitaev Ann. Phys. 321.1 (2006): 2-111.
[2]V. Lahtinen et al. New J. Phys 11.9 (2009): 093027.
[3]J. Nasu et al. arXiv:1504.01259 (2015)

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Date submitted: 06 Nov 2015 Electronic form version 1.4