

Abstract Submitted  
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**New phases from interacting Majorana fermions in one dimension** MARCEL FRANZ, ARMIN RAHMANI, XIAOYU ZHU, IAN AFFLECK, University of British Columbia — Vortices in the Fu-Kane model (describing a superconducting surface of a 3D topological insulator) are known to host Majorana zero modes. By adjusting a single system parameter – the global chemical potential – the zero modes can be tuned to the regime of strong interactions. The simplest interacting system that can be built from these ingredients is a 1D Majorana chain with nearest neighbor hopping and the most local 4-fermion interaction. The system exhibits a complex phase diagram with interesting phases and phase transitions between them. For repulsive interactions we find an interesting gapless phase with coexisting Luttinger liquid and Ising degrees of freedom. The latter is separated from a 4-fold degenerate gapped phase at strong coupling by a novel generalization of the commensurate-incommensurate transition.

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