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Chiral Abelian anyons from interacting non-Abelian vortices VILLE LAHTINEN, NORDITA, JIANNIS PACHOS, University of Leeds — We demonstrate the existence of a new topologically ordered phase in Kitaev's honeycomb lattice model. This new phase appears due to the presence of a tightly packed vortex lattice and it supports chiral Abelian anyons. We characterize the phase by its low-energy behavior that is described by four Fermi points as opposed to two Fermi points in the absence of the vortex lattice. This doubling is shown to be related to an emergent vortex lattice symmetry that arises due to interactions between the anyonic vortices. By mapping the Hamiltonian of the model to a BCS one, we show that the chiral Abelian phase can be understood as two coupled p-wave superconductors, one living on the original honeycomb lattice and the other on the dual lattice that coincides with the vortex lattice. Finally, we identify two physically distinct types of topological phase transitions in the model and show that the Fermi surface evolution associated with them is described by Dirac fermions coupling to chiral gauge fields. The study of the Fermi point transport across the Brillouin zone enables us to obtain analytic results on the extended phase space.

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