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Physical solutions of the Kitaev honeycomb model[1] STEFANO CHESI, McGill University, FABIO L. PEDROCCHI, DANIEL LOSS, University of Basel — We have investigated the exact solution of the honeycomb model proposed by Kitaev and derived an explicit formula for the projector onto the physical subspace. The physical states are simply characterized by the parity of the total occupation of the fermionic eigenmodes. We consider a general lattice on a torus and show that the physical fermion parity depends in a nontrivial way on the vortex configuration and the choice of boundary conditions. In the vortex-free case with a constant gauge field we are able to obtain an analytical expression of the parity. For a general configuration of the gauge field the parity can be easily evaluated numerically, which allows the exact diagonalization of large spin models. We consider physically relevant quantities, as in particular the vortex energies, and show that their true value and associated states can be substantially different from the one calculated in the unprojected space, even in the thermodynamic limit.

[1]F. L. Pedrocchi, S. Chesi, and D. Loss, Phys. Rev. B 84, 165414 (2011)

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