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Model of spin liquids with Abelian and non-Abelian topological phases

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In this seminar, I will be presenting models for topologically ordered phases in two-dimensional spaces. The strategy we adopt is to treat a system in two-dimensional space as an array of coupled one-dimensional quantum wires. Sophisticated techniques, such as conformal field theories, solvable models, and density matrix renormalization groups *et al.*, provide powerful tools to deal with strong correlations in one dimension. Once we understand well the properties of the designed one-dimensional model, we take it as building blocks to construct microscopic lattice models for topologically ordered phases in two dimensions. More specifically, we focus on the search for models that could host quantum spin liquid phases. Whenever possible, we should compare our findings with those of the Kitaev honeycomb model, which is one of the few solvable lattice models of topologically ordered phases. In particular, we look for non-Abelian spin-liquid phases whose bulk spectrum is gapped while gapless states that carry a non-integer central charge remain propagating along the edges. In contrast to the Kitaev honeycomb model, our constructions preserve the SU(2) spin-rotation symmetry, which could provide a natural strategy for searching for material candidates of quantum spin liquids.

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[2] J.-H. Chen, C. Mudry, C. Chamon, A. M. Tsvelik, Phys. Rev. B **96**, 224420 (2017).
[3] J.-H. Chen, C. Mudry, C. Chamon, A. M. Tsvelik, Phys. Rev. B **99**, 184445 (2019).

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