Abstract for "Quantum spin liquids on honeycomb geometries"

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First proposed by P.W. Anderson in 1973, quantum spin liquid states have attracted more and more attention recently with emergence in quantum materials, cold atoms and acting as promising candidates for universal quantum computation. On honeycomb geometries, we discover a chiral spin state in the Mott phase of a bosonic Kane-Mele-Hubbard model [1]. This gapped phase displays a chiral order, breaking time-reversal and parity symmetry, but is not topologically ordered ($\nu = 0$). Another remarkable example of quantum spin liquids exists in the Kitaev honeycomb model which is exactly solvable in two dimensions. We explore the phase diagram of its equivalents in two-leg ladders [2], the bond-bond correlation function and potential realization in a driven superconducting box circuit [3].

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[2] Karyn Le Hur, Ariane Soret, and Fan Yang. Majorana spin liquids, topology, and superconductivity in ladders. *Physical Review B*, 96(20):205109, 2017.

[3] Fan Yang, Loïc Henriet, Ariane Soret, and Karyn Le Hur. Engineering quantum spin liquids and many-body majorana states with a driven superconducting box circuit. *arXiv preprint arXiv:1801.05698*, 2018.