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**Properties of 2D Chiral Tensor Network States** BARRY BRADLYN, Yale University, JEROME DUBAIL, CNRS Nancy, NICHOLAS READ, Yale University — States that can be represented as a sum over local auxiliary degress of freedom are known as tensor network states (TNSs) [1]. In a recent paper [2], Dubail and Read gave a construction for free fermion TNSs in the chiral $p + ip$ and $\nu = 1$ Chern insulator topological phases in two dimensions, and gave a generalization to Laughlin-like states. However, on general principles these free fermion states must be ground states of gapless local Hamiltonians. In this talk, we address the issue of what topological properties persist in these gapless states. We show analytically that the DC Hall conductivity for the $\nu = 1$ Chern insulator TNS is quantized, although the conductivity tensor at finite frequency suffers from non-analytic corrections. Additionally, we investigate the issue of the energy gap for the interacting $\nu = 1/2$ Laughlin-like TNS through Monte Carlo simulations.

**References**

[1] F. Verstraete and J.I. Cirac, cond-mat/0407066 (2004).
[2] J. Dubail and N. Read, arXiv:1307.7726 (2013).

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