Abstract Submitted
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Non-topological nature of the edge current in a chiral p-wave superconductor[1] WEN HUANG, EDWARD TAYLOR, McMaster University, SAMUEL LEDERER, SRINIVAS RAGHU, Stanford University, CATHERINE KALLIN, McMaster University — Influential work by Volovik and others (see e.g., [1] and [2]) has tried to establish an analog of the quantum Hall effect in chiral superconductors subject to a spatially varying chemical potential. It is further argued that this quantized static nonlocal Hall conductivity (taking the frequency to zero before the momentum) leads to a topological edge current insofar as the edge can be thought of as a spatially varying chemical potential. Using Bogoliubov-de Gennes calculations as well as diagrammatic calculations of the Hall conductivity using exact Ward identities, we find this analogy breaks down in two respects. First, we show that for a rapidly varying chemical potential, such as would arise at the edge, there can be significant deviations from what is expected from a linear response formulation of the problem. Second, even for a slowly varying chemical potential, we show that the quantization of the Hall current is violated for non-Galilean invariant systems. In contrast to the quantum Hall effect in topological insulators, U(1) symmetry breaking in topological superconductors eliminates the possibility of a topological current response. [1] G. E. Volovik, Sov. Phys. JETP 67, 1804 (1988). [2] J. Goryo and K. Ishikawa, Phys. Lett. A 246, 549 (1998).

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