Exact zero modes and decoherence in systems of interacting Majorana fermions

GUANG YANG, DMITRI FELDMAN, Brown Univ — Majorana fermions often coexist with other low-energy fermionic degrees of freedom. In such situation, topological quantum computation requires the use of fermionic zero modes of a many-body system. We classify all such modes for interacting fermions and show how to select the mode that maximizes the decoherence time. We find that in a typical interacting system the maximal decoherence time is within one order of magnitude from the decoherence time of a qbit, based on the local part of the fermion parity operator.

1This research was supported by NSF Grant No. DMR-1205715.

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Date submitted: 12 Nov 2013

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