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POS-F54 – Transport of Majorana zero modes in 1D topological superconductors

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Majorana zero modes (MZM) have been a focal point of the condensed matter physics community in recent times due in part to their potential applications in quantum computation. Most notably, the exotic exchange statistics of MZMs form the basis of topologically protected quantum gates. The physical exchange, or braiding, of MZMs is often modeled in networks of 1D topological superconducting wires. A key ingredient of these braiding protocols is the transport of MZMs across a superconductor. We consider a "piano key model"of transport, where segments of a superconductor are adiabatically tuned between the topologically trivial and the topologically non-trivial phases via electric gates. We examine the time scales over which the piano key tuning should be performed in order to minimize the likelihood of unwanted excitations of the ground state. We also examine the dynamical phase accrued by the ground state, which is of importance in the context of braiding.

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