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Readout scheme for Majorana parity states using a quantum dot[1]

DARRYL HOVING, KAVEH GHARAVI, JONATHAN BAUGH, University of Waterloo — We propose and numerically study a scheme for reading out the parity state of a pair of Majorana bound states using a tunnel coupled quantum dot. The dot is coupled to one end of the topological wire but isolated from any reservoir, and is capacitively coupled to a charge sensor for measurement. The combined parity of the MBS-dot system is conserved and charge transfer between MBS and dot only occurs through resonant tunnelling. Resonance is controlled by the dot potential through a local gate and by the MBS splitting due to the overlap of the MBS pair wavefunctions. The latter splitting can be controlled by changing the position of the spatially separated, uncoupled MBS via a set of keyboard gates. Our simulations show that the oscillatory nature of the MBS splitting versus separation does not prevent high-fidelity readout. Indeed, the scheme can also be applied to measure the splitting versus separation, which would yield a clear signature of the topological state. With experimentally realistic parameters we find parity readout fidelities >99% should be feasible.

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