

Joint CQSE and CASTS Seminar

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TIME Mar. 15, 2019, 14:30 ~ 15:30
TITLE Decoherence dynamics of Majorana zero modes in topological quantum computing
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Abstract

Topological quantum computing based on Majorana zero modes is commonly thought to be robust against decoherence, but no real investigation has been carried out for such a claim. Based on the theory of open quantum systems we developed, we investigate decoherence dynamics of Majorana zero modes in the prototype topological model, of a 1D p-wave spinless topological superconducting chain (TSC), disturbed by charge fluctuations through gate controls. We find that at zero temperature, there still is a zero-energy localized bound state associated with the perturbed Majorana zero mode after included the charge fluctuations, but this zero-energy localized bound state only partially protects Majorana zero modes from decoherence. In finite temperature regime, the zero-energy localized bound state cannot be formed and the decoherence of Majorana zero modes is inevitable. The advantage and the disadvantage of the decoherence dynamics of Majorana zero modes to topological quantum computing will be discussed.

