Manifestation of topology in metastable driven-dissipative bosonic systems

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The role of topology in quasi-free bosonic systems remains an exciting open problem at the intersection of condensed-matter as well as atomic, molecular, and optical physics, and open quantum systems. While it is known that Hamiltonian systems of free bosons cannot be topological, I will show how non-trivial manifestations of topology may arise for free bosons undergoing Markovian dissipation, in metastable dynamical regimes. In particular, I will discuss how "Majorana bosons" may be identified in topologically non-trivial phases, that serve as tight analogues to the condensed-matter Majorana fermions. Each Majorana boson pair consists, in general, of a distinct zero mode and a symmetry generator, reflecting the breakdown of Noether's theorem in open quantum dynamics. This approximate symmetry implies the existence of a family of quasi-steady states possessing a number of unique properties uncharacteristic of steady-states in driven-dissipative systems, including non-vanishing first moments and persistent non-Gaussianity. Finally, I will discuss observable signatures of Majorana bosons in steady-state power spectra.