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Self-consistent study of topological superconductivity in quasicrystals

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Quasicrystals are emerging topological materials which have aperiodic long-range order and higher-dimensional symmetry, with peculiar rotational symmetry that is forbidden by crystallography. Motivated by the recent discovery of superconductivity in a quasicrystal, we study topological superconductivity (TSC) with broken time-reversal symmetry in two-dimensional quasicrystals. By solving the Bogoliubov-de Gennes equations self-consistently, we show the stable occurrence of TSC in quasicrystals whose topological nature is signified by the Bott index. We confirm the appearance of Majorana zero modes in accordance with the bulk-edge correspondence when the Bott index is nonzero. Furthermore, the effects of self-similarity and fractal structure inherent in quasicrystals and their possible interplay with TSC are examined.

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