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Topological Phase Transitions in Line-nodal Superconductors[1]

GIL YOUNG CHO, SANGEUN HAN, EUN-GOOK MOON, KAIST — Fathoming interplay between symmetry and topology of many-electron wave-functions deepens our understanding in quantum nature of many particle systems. Topology often protects zero-energy excitation, and in a certain class, symmetry is intrinsically tied to the topological protection. Namely, unless symmetry is broken, topological nature is intact. We study one specific case of such class, symmetry-protected line-nodal superconductors in three spatial dimensions (3d). Mismatch between phase spaces of order parameter fluctuation and line-nodal fermion excitation induces an exotic universality class in a drastic contrast to one of the conventional ϕ^4 theory in 3d. *Hyper-scaling violation* and *relativistic dynamic scaling* with unusually large quantum critical region are main characteristics, and their implication in experiments is discussed. For example, continuous phase transition out of line-nodal superconductors has a *linear* phase boundary in a temperature-tuning parameter phase-diagram.

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