Abstract Submitted
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Topological nodal Cooper pairing in doped Weyl metals[1] YI LI, F. D. M. HALDANE, Princeton University — We generalize the concept of Berry connection of the single-electron band structure to the two-particle Cooper pair states between two Fermi surfaces with opposite Chern numbers. Because of underlying Fermi surface topology, the pairing Berry phase acquires non-trivial monopole structure. Consequently, pairing gap functions have the topologically-protected nodal structure as vortices in the momentum space with the total vorticity solely determined by the monopole charge q_p. The pairing nodes behave as the Weyl-Majorana points of the Bogoliubov-de Gennes pairing Hamiltonian. Their relation with the connection patterns of the surface modes from theWeyl band structure and the Majorana surface modes inside the pairing gap is also discussed. Under the approximation of spherical Fermi surfaces, the pairing symmetry are represented by monopole harmonic functions. The lowest possible pairing channel carries angular momentum number $j=|q_p|$, and the corresponding gap functions are holomorphic or anti-holomorphic functions on Fermi surfaces.

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