

Abstract Submitted
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Braiding Majorana fermions in p+ip superfluids with particle number conservation YIRUO LIN, ANTHONY LEGGETT, University of Illinois at Urbana-Champaign — We discuss braiding statistics of Majorana zero modes localized in vortices in 2D spinless p+ip superfluids with conserved total particle number. In the standard particle non-conserved context, it has been argued that braiding these zero Majorana fermions yields non-abelian statistics. With particle number conservation, We show that in certain geometry, the Berry phase of interchanging two Majorana zero modes is proportional to angular momentum of the system with the presence of two vortices, which can then be calculated in the thermodynamic limit. The braiding statistics turns out to be consistent with the standard result. We then discuss the possible complication due to finite size effect. We'll argue that in a finite size system, the abelian phase of interchanging two vortices is non-topological. We'll finish the discussion by sketching out ongoing work in which we investigate the possible modification of BdG quasi-particle wave functions beyond the BdG mean-field approximation, which can have dramatic effect on topological properties of Majorana zero modes and their braiding statistics.

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