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Superconducting Order Parameter of the Even-denominator Fractional Quantum Hall Effect KWON PARK, HANTAO LU, Korea Institute for Advanced Study, SANKAR DAS SARMA, University of Maryland — Usually formulated in terms of a trial wave function called the Moore-Read Pfaffian wave function, current leading theories attribute the origin of the 5/2 FQHE to the formation of a new superconducting state. The nature of superconductivity in the 5/2 FQHE is particularly puzzling in the sense that this state apparently coexists with strong magnetic field, which poses an interesting dilemma since the Meissner effect is the most important defining property of superconductivity. To overcome this dilemma, it is crucial to understand what it is that actually forms the superconducting condensate, if any. Here, we develop a numerically exact method to create a Cooper pair in terms of the true (elementary) quasi- particle of the system (identified with composite fermion) and explicitly compute the superconducting order parameter as a function of real space coordinate instead of usual momentum. As results, in addition to direct evidence for superconductivity, we obtain quantitative predictions for superconducting coherence length. Based on our calculation, we propose an experimental setup for demonstrating the 5/2 FQHE counterpart of the Josephson effect and thus, if successful, conclusively proving the existence of superconductivity in the 5/2 FQHE.

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