Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Pairing of particle-hole symmetric composite fermions in half-filled Landau level ZHIQIANG WANG[1], Physics Astronomy, McMaster University, SUDIP CHAKRAVARTY, Physics Astronomy, University of California, Los Angeles — In a recent proposal of the half-filled Landau level, the composite fermions are taken to be Dirac particles and particle-hole symmetric. Cooper pairing of these composite fermions in different angular momentum channels, ℓ, can give rise to different kinds of Pfaffian states. In addition to the well-known Moore-Read Pfaffian and anti-Pfaffian states, a new putative particle-hole symmetric Pfaffian state, corresponding to the $s-$wave pairing channel, was also proposed. However, the possible underlying pairing mechanism is not clear at all. In this work we provide a specific pairing mechanism for realizing some of these Pfaffian states. We show that there can be nonzero pairing in angular momentum channels $|\ell| \geq 1$ depending on the magnitude of a coupling constant. There is a quantum phase transition from the Dirac composite Fermi-liquid state to Cooper pairing states in angular momentum channels $|\ell| \geq 1$ as the coupling constant is tuned across its critical point value. Surprisingly the particle-hole symmetric $\ell = 0$ channel pairing turns out to be impossible irrespective of the size of the coupling constant.

[1]This work was done when I was affiliated with Physics Astronomy, University of California, Los Angeles

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Date submitted: 09 Nov 2016 Electronic form version 1.4