Mean field approximation for quantum Hall systems

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In this presentation, we discuss applications of the mean field approximation in fractional quantum Hall systems. We analyze properties of the trial wave functions, generated by the multi-body, short-range repulsions. Such interactions can give rise to the effective paring of the particles (or in general clustering of groups of k¿1 particles). Our analysis includes Moore-Read and Read-Rezai states expected to describe experimentally measured states at filling factors 5/2 and 12/5. We use mean field approximation to characterize interactions in terms of lower order interactions. Then we test how useful is this approximation with analysis of spectra, correlation functions and overlaps of

ground states. Moreover, we examine particle-hole anti-/symmetrization of three and

four- body Hamiltonians (higher than two-body interactions explicitly break particle-hole

symmetry) and discuss surprising connections with mean field approximation. We also analyze the behavior of zeros of the wave functions when clusters of k-particles approach another cluster of l particles.

[1] B. Kuśmierz, A. Wśjs, Sreejith G. J.; Mean field approximations for short range four body interactions at $\nu = 3/5$; arXiv:1902.04477.

[2] G. J. Sreejith, M. Fremling, G. S. Jeon, J. K. Jain; Search for exact local Hamiltonians for general fractional quantum Hall states; Physical Review B 98, 235139 (2018)