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Connections between fermions and bosons that rotate in two dimensional harmonic traps BIN YAN, RACHEL WOOTEN, CHRIS GREENE, Department of Physics and Astronomy, Purdue University — The quantum Hall effect (QHE) was originally observed in two-dimensional electron materials in strong perpendicular magnetic fields. Theoretical treatments suggest that the QHE should also be observable in an analogous two-dimensional bosonic gas. In recent years, there has been significant interest in studying the QHE and its bosonic analog in highly-controlled atomic systems. While fermions and bosons have fundamentally different behavior, there is a connection between bosons and fermions in the presence of strong interactions. In the lowest Landau level (the strong magnetic field limit), the Hilbert subspace of N fermions with a specific total relative angular momentum, M, is isomorphic to the Hilbert subspace of N bosons with a different M. However, even though these Hilbert subspaces are isomorphic, in the presence of Coulomb repulsion their energy spectra exhibit intriguing similarities. This study solves the boson and fermion problems in their corresponding Hilbert spaces, and compares their energy level statistics, as well as the connection between their ground state wave functions.

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