

Fractional quantum Hall phases of two-component ultracold bosonic gases

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Abstract:

Artificial gauge fields for cold atoms are tools for producing topological quantum states. In spinless or spin-polarized systems, cold bosons are known to support the incompressible phases from the Read-Rezayi series, containing also the famous Laughlin and Moore-Read states with anyonic or even non-Abelian quasiparticle excitations [1,2,3,4]. Here we show that in the case of a pseudospin-1/2 Bose gas a generalization of this series, the so-called non-Abelian spin singlet (NASS) series, describes well the ground states at different filling factors [5]. We have also investigated the scenario where, in addition to an external magnetic field, the gauge field mimics an intrinsic spin-orbit coupling of the Rashba type [6]. We find a variety of different phases, which can be controlled by the strength of this coupling.

References:

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