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Non-Abelian statistics of Luttinger holes in quantum wells[1]
GEORGE SIMION, Purdue University, YULI LYANDA-GELLER, Department of Physics, Purdue University, West Lafayette, IN 47907 USA — Non-Abelian quasiparticle excitations represent a key element of topologically protected quantum computing. Such exotic states appear in fractional quantum Hall (FQH) effect as eigenstates of N-body interaction potential. These potentials can be obtained by renormalization of electron-electron interactions in the presence of Landau level (LL) mixing. The properties of valence band holes makes them fundamentally different from electrons. In the presence of magnetic field, low-lying states do not exhibit fan-like diagram and several of the levels cross. Variation of magnetic field in the vicinity of level crossings serves as a knob that tunes LL mixing and enhances the 3-body interaction. 1/2 filling factor FQH is a state that was not observed in electron liquid, but has been observed for holes. The properties of the two dimensional charged quantum hole liquid in the presence of magnetic field are studied using the spherical geometry. The properties of the novel 1/2 state are discussed.

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