Spin structures in inhomogeneous fractional quantum Hall systems

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Huge longitudinal magnetoresistance effect in two−dimensional electron gas was shown to be a way to manipulate and measure spin of the host material nuclei [1] and it can thus have important applications in the field of quantum computers. Since there are two nearly degenerate ground states of the electronic part of the system (polarized and singlet−state incompressible liquids at filling factor $2/3$) it is widely believed that the effect is due to formation of domains which results into an enhanced resistance. To our best knowledge there is however no direct evidence of existence of such domains so far.

We study a finite size model of electrons in the lowest Landau level which was formerly used to study the Fractional Quantum Hall Effect (rectangle with periodic boundary conditions). The system is now also subject to magnetic inhomogeneity which makes one of the ground states more favorable in one part and less favorable in another part of the system. We investigate response of the system both in spin quantities and densities as well as in correlation functions.