MAR06-2005-005162

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Edge State Tunneling in Split Hall Bar Models

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Edge states of Quantum Hall systems offer a rich ground for testing theoretical predictions on the properties of 1D strongly interacting fermionic systems. More importantly they are considered clean realizations the Luttinger Liquid description. In the past two years we [1,2,3,4] have examined a number of models that attempt to describe coupled edge density waves in the quantum Hall regime in various different geometries and to confront the large number of experimental observations that are at odds with the models that have been thought to apply in the past. Work that is currently in progress attempts to explain experimental results of the Pisa experimental group in which tunneling through a constriction between incompressible quantum Hall edge states is tuned from relevance to irrelevance by adjusting a gate voltage. This property is explained in terms of an interplay of the change in the connectivity of multi-mode edge magnetosplasmon and the role played by the metallic gates on the structure of the edge state, as well as the interactions between the edges. I will talk also for unresolved questions that have appeared in recent experiments in quantum Hall systems divided by thin cleaved-edge-overgrowth barriers. An important difficulty that arises in interpreting transport properties of QH line junction systems is the uncertainty about the strength and sometimes even the sign of these interactions, which can be difficult to estimate because of subtleties in understanding their relationship to underlying Coulombic interactions, because of edge reconstruction or because of the role played by the nearby metallic gates. We propose theoretical ideas and experimental measurements to obtain the required information. 1. E. Papa, and A. H. MacDonald, Phys. Rev. Lett. 93, 126801 (2004) 2. E. Papa, and A. H. MacDonald, Phys. Rev. B 72, 045324 (2005) 3. W.-C. Lee, N. A. Sinitsyn, E. Papa, and A. H. MacDonald, Phys. Rev. B 72, 121304 (2005) 4. E. Papa, and T. Stroh, in preparation