Spectral noise for edge states at filling factor $\nu = \frac{5}{2}$

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One of the more challenging and intriguing examples of strongly correlated electrons system is represented by the Fractional Quantum Hall fluid. In recent years this peculiar state of matter has been subject of many theoretical and experimental studies, leading to the observation of a large variety of states at different values of the filling factor ν . Among them, the $\nu = \frac{5}{2}$ state has recently attracted increasing attention also in view of its promising application to topologically protected quantum computation.
This peculiar value of the Hall fluid with even denominator has been observed in ultra high quality GaAs/AlGaAs eterostructure under very high magnetic field and low temperatures.
This exotic and elusive state is predicted, for some models, to support excitations with fractional charge and non-Abelian statistics, key features towards the implementation of topologically robust quantum algorithm.
The low energy sector of an Hall fluid is characterised by the edge states, whose features can be explored monitoring the transport properties, such as the current and the noise in different geometries.
The simplest geometry one can think of is the so-called quantum point contact geometry, from which one can infers e.g. which are the dominant edge state excitations in the low energy sector.

In this paper we investigated the finite frequency noise for the $\nu = \frac{5}{2}$ Hall state. We demonstrated that this quantity is a useful tool in order to discriminate excitations involved in transport. In particular Josephson resonances located at different frequencies are directly connected to the charge of the excitations. In principle the finite frequency noise allows a "spectroscopic" study of the low energy excitations and to discriminate between them, looking at the different peak structures.

A comparative study of the two best candidate for the $\nu = \frac{5}{2}$ Hall state ,i.e. the Pfaffian and the Anti-Pfaffian models, is also presented. We have found that the colored noise could be an important tool in order to discriminate between these models.

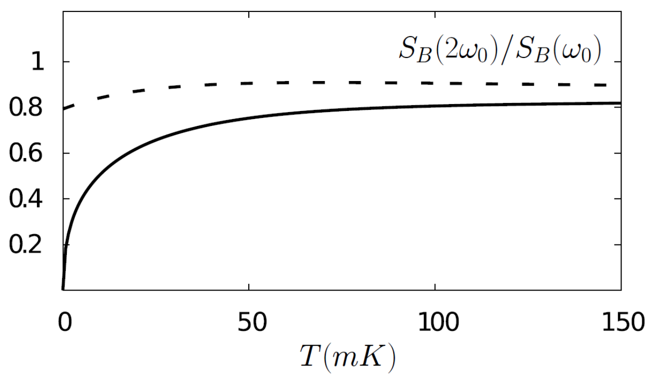

Fig.:
Temperature evolution of the ratio between the heights of colored noise peaks at the Josephson frequency ω_0, of the single quasiparticle e/4, and at frequency $2\omega_0$ of the double quasiparticle e/2. The solid line represent the Pfaffian model and the dashed line the anti-Pfaffian model.