Phase lapses and dephasing in quantum Hall interferometers

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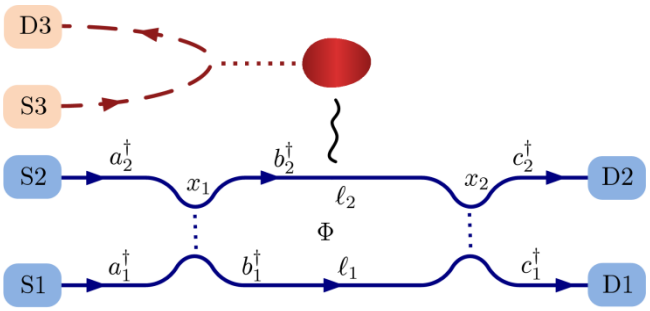
In this talk I will discuss the phenomena of dephasing and phase lapses as they occur in two setups operating in the quantum Hall regime. Both setups consist of a quantum dot and an electronic Mach-Zehnder interferometer. Dephasing, i.e. loss of coherent transport, and phases lapses, i.e. abrupt jumps in the phase of the transmission amplitude, turn out to be intimately related in these setups.



In the first setup, transport through a chiral channel is affected by charge fluctuations in a nearby quantum dot [1]. We have studied this setup both in the integer and in the fractional quantum Hall regimes with filling factors 2 and 4/3, respectively [2]. It is found that the regime of operation strongly affects the amount of dephasing and the occurrence (or absence) of phase lapses. Evaluation of the *concurrence* in the system sheds light on the absence of full dephasing observed in the fractional regime. Recent experimental results will be also discussed [3].

In the second setup transport through a quantum dot operating in the quantum Hall regime with filling factor 2 is analyzed [4]. Similarly to the zero magnetic field case [5], phase lapses occur also here. However, the mechanism responsible for their occurrence is substantially different. It will be shown that certain degrees-of-freedom of the quantum dot act as a dephasor to the coherent transport through the quantum dot.

References

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