LPENS
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M2 internship proposal – Edge magnetoplasmon interferometer

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Edge magnetoplasmon are the elementary collective excitations of quantum Hall systems and live on the chiral edge states that carry the current. In a closed loop configuration i.e., a Hall island, the EMPs enter a resonant mode corresponding to the ratio of the velocity and the perimeter of the island. In recent works we have studied such objects and showed that we were able to manipulate their geometric properties so as to influence the resonance condition. We have also made it clear how finite-size effects manifest in this system.

This internship will focus on the next step of this research that aims at realizing a rf interferometer in Hall systems. The experiment is based on the addition of a quantum point contact (QPC) to the structure that would separate the resonators in two lobes contacted through the QPC where quasiparticles exchange can happen. The path of EMPs in each cavity would thus lead to an interference of the signal that would in turn lead to a modulation of the transmission signal as a function of the threaded Aharonov-Bohm flux. The long-term objective of the project is to study anyons in fractional quantum Hall systems using this interferometer [2].

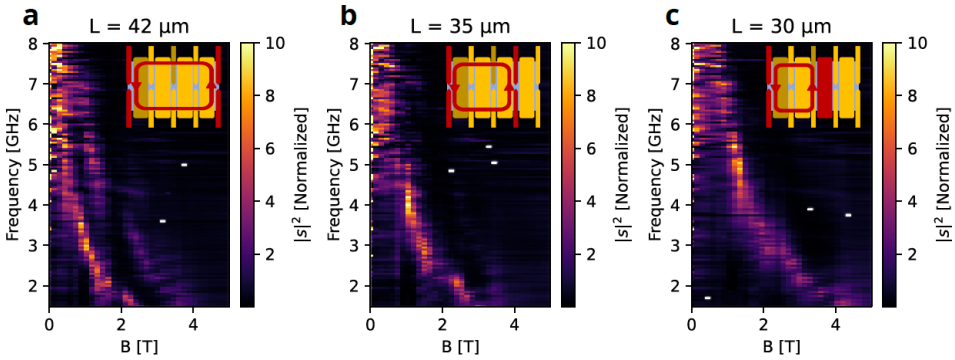

Figure 1 Transmission maps of the resonator cavity as a function of the magnetic field and frequency. Each map corresponds to a different electrostatic configuration that leads to a different perimeter and thus different resonance frequency [1].

During this internship, the student will take part in experiment in a dilution cryostat, acquiring data, analyzing it, preparing samples by performing micro-bonding. A good mastery of python programming language will be appreciated.

This internship is to be followed by a three years PhD that is already funded, continuing the research project started during this internship.

[1] Frigerio, Elric, et al. "Gate tunable edge magnetoplasmon resonators." *Communication Physics* **7**:314 (2024).
[2] Cano, Jennifer, et al. "Microwave absorption by a mesoscopic quantum Hall droplet." *Physical Review B—Condensed Matter and Materials Physics* 88.16 (2013): 165305.

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