

- Date & Time : **Tuesday 28th OCT. 2025 10:00-11:30**
- Venue : #154 156, Main Research building



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“ Anyon braiding, Fractional Charge, scaling dimension, and statistical angle in the fractional quantum Hall effect ”

The fractional quantum effect is an unconventional topological state of matter with fascinating features. Its elementary excitations called “anyons” bear a fractional charge (which is specified by the filling factor of the lowest Landau level).

Anyons have a scaling dimension -aka correlation function exponent - which also correspond to this filling factor (in the absence of an electromagnetic or dissipative environment), and they have fractional statistics which is intermediate between fermions and bosons.

The fractional charge detection was proposed over three decades ago and confirmed experimentally, however only recently (in the last decade) where the scaling dimension and the so-called statistical angle measured.

I will therefore expose the present state of the art for theoretical/experimental protocols for measuring the latter two quantities and will propose a novel protocol based on anyon braiding in a mesoscopic capacitor, which allows to dissociate the measurement of the scaling dimension (which is expected to be non-universal) and the statistical angle (which is universal because it is a bulk property).

Perspectives for hierarchical states and the inclusion of Coulomb interactions in the quantum dot will be briefly mentioned.

References

- Anyonic Statistics Revealed by the Hong-Ou-Mandel Dip for Fractional Excitations, T. Jonckheere, J. Rech, B. Grémaud, and T. Martin, Phys. Rev. Lett. 130, 186203 (2023)
- Time-domain braiding of anyons, M. Ruelle, E. Frigerio, E. Baudin, J.-M. Berroir, B. Plaçais, B. Gremaud, T. Jonckheere, T. Martin, J. Rech, A. Cavanna, U. Gennser, Y. Jin, G. Menard, and G. Feve, Science 389, (2025)
- Anyon braiding on the single edge of a fractional quantum Hall state, Flavio Ronetti, Noe Demazure, Jerome Rech, Thibaut Jonckheere, Benoit Gremaud, Laurent Raymond, Masayuki Hashisaka, Takeo Kato, and Thierry Martin (Phys Rev Lett, in press), arXiv:2503.17008
- Probing anyon statistics on a single-edge loop in the fractional quantum Hall regime, Flavio Ronetti, Noe Demazure, Jerome Rech, Thibaut Jonckheere, Benoit Gremaud, Laurent Raymond, Masayuki Hashisaka, Takeo Kato, and Thierry Martin (Phys Rev B in press), arXiv:2506.09774,