# Time-domain braiding of anyons


**Gwendal Fève**

M. Ruelle, E. Frigerio, E. Baudin, J.-M. Berroir, B. Plaçais, B. Grémaud, T. Jonckheere, T. Martin, J. Rech, A.Cavanna, U.Gennser, Y. Jin, G. Ménard

*Laboratoire de Physique de l'Ecole normale supérieure, ENS, Université PSL, CNRS, Sorbonne Université, Université Paris Cité, Paris, France.*

Gwendal.feve@phys.ens.fr


Contrary to fermions and bosons, anyons are quasiparticles that keep a robust memory of particle exchanges via a braiding phase factor. Recent experimental evidences of anyon fractional statistics [1-5] have been obtained so far in the DC regime, precluding investigations of anyon dynamics. Yet the robust memory of anyons gives them remarkable dynamic properties so far unexplored.

When an anyon excitation is emitted toward a quantum point contact (QPC) in a fractional quantum Hall (FQH) fluid, this memory translates into tunneling events that may occur long after the anyon excitation has exited the QPC [6]. By triggering anyon pulses incident on a QPC in a $\nu = 1/3$ FQH fluid, we investigate anyon tunneling in the time domain [7]. We observe that anyon braiding increases the tunneling timescale (see Figure 1), which is set by the temperature and the anyon scaling dimension that characterizes the edge state dynamics. This contrasts with the electron behavior where braiding is absent and the tunneling timescale is set by the temporal width of the generated electron pulses. Our experiment introduces time-domain measurements for characterizing the braiding phase and scaling dimension of anyons [7].

References


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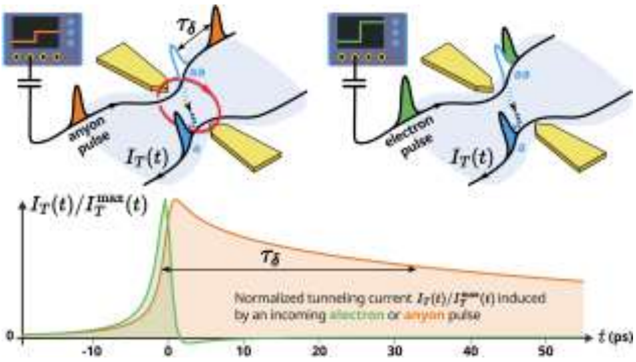


**Figure 1: Tunneling dynamics of electrons and anyons.**
(Top left) A generator emits an anyon pulse (orange) propagating toward the QPC (gold). Anyon braiding leads to the tunneling of an anyon–anti-anyon pair (a-aa; blue) long after the anyon pulse has exited the QPC. (Top right) For electron emission (green), tunneling occurs immediately after the electron crosses the QPC. Consequently, the tunneling current $I_T(t)$ decays rapidly for electrons and slowly for anyons.