Quantum coherence engineering in the integer quantum Hall regime

Fabien Portier*[1], Phuong-Ahn Huhyn[1], Dominique Mailly[2], Giancarlo Faini[2], Hélène Le Sueur[2], Frédéric Pierre[2], Ulf Gennser[2], Werner Weigscheider[3], and Patrice Roche†[1]

[1]GNE/SPEC/IRAMIS/DSM – CEA – CEA Saclay 91191 Gif sur Yvette, France
[2]Laboratoire de photonique et de nanostructures (LPN) – CNRS : UPR20 – Route de Nozay 91460 MARCOUSSIS, France
[3]Solid State Physics Laboratory- ETHZ [Zurich] – HPF E 7, Schafmattstrasse 16, 8093 Zurich, Suisse

Résumé

While the interest for the edge states of the integer quantum Hall regime has been recently renewed
in view of the very promising field of quantum optic like experiments with electrons, very little is known
on the quantum coherence and energy relaxation in these edge states. Recently, it has been shown
that at filling factor two, the quantum coherence in one edge state is limited by the charge noise in its
neighboring one [1] and that there is an energy transfer from one edge state to the other [2]. As the inter
edge state coupling seems to play an important role on the quantum transport, we have designed a new
electronic Mach-Zehnder interferometer with additional gates to control the inter edge state coupling.
With this new interferometer, we have been able to increase the quantum coherence by nearly a factor
two. In addition, we have unveiled the role of the inter edge interaction on the finite bias visibility of the
Aharonov-Bhom oscillations [3].

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*Intervenant

†Auteur correspondant: patrice.roche@cea.fr