



CEA - Saclay 91191 Gif-sur-yvette Cedex
Service de Physique de l'Etat Condensé - UMR 3680

SÉMINAIRE

Mercredi 28 Janvier 2015 à 16h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

Pascal Degiovanni

LABORATOIRE DE PHYSIQUE - ENS Lyon - UMR 5672

Electron quantum optics in ballistic conductors

The ballistic propagation of electronic waves along the quantum Hall edge channels of a two dimensional electron gas bears strong analogies with photon optics. Ballistic and one-dimensional propagation are ensured by the chiral quantum Hall edge states and electronic beam splitters can be implemented using quantum point contacts. These analogies have inspired a whole set of experiments, including the realization of electronic Mach-Zehnder [1] and Hanbury-Brown & Twiss [2] interferometers, providing an efficient tool to understand both the wave and corpuscular nature of electronic propagation in quantum conductors. However, fundamental differences with photon optics remain [3] : firstly from the presence of the Fermi sea and secondly from the Coulomb interaction between electrons. Using single electron emitters [4], these analogies and differences can now be probed down to the single particle scale which proves particularly efficient to test the limits of the single particle description and the emergence of many body physics [5].

[1] Ji et al, Nature 422, 415 (2003)

[2] Henny et al, Science 284, 296 (1999).

[3] E. Bocquillon, V. Freulon, F.D. Parmentier, J.-M. Berroir, B. Plaçaïs, C. Wahl, J. Rech, T. Jonckheere, T. Martin, C. Grenier, D. Ferraro, P. Degiovanni and G. Fève, Annalen der Physik (Berlin), 526, 1 (2014).

[4] G. Fève, V. Freulon, J.-M. Berroir, P. Degiovanni, B. Plaçaïs, A. Cavanna, Y. Jin and G. Fève, Science 316, 1169 (2007).

[5] D. Ferraro, B. Roussel, C. Cabart, E. Thibierge, G. Fève, C. Grenier and P. Degiovanni, Phys. Rev. Lett. 113, 166403 (2014).