
From surface plasmons to fractional levitons: electron-electron interactions and ultrafast electronic interferometry.

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Abstract

Recent experiments using high mobility two dimensional electron gas have shown that it is now possible to engineer fast voltage pulses that send exactly one electron flying through the system. The initial focus has been to show that a judicious choice of the shape of the pulse allows one to minimize the quantum fluctuations of the number of electrons contained in the pulse [1].

This single electron source opens the path to being able to observe the quantum dynamics of pulse propagation experimentally. In this talk, I will discuss various practical proposals such as the propagation of voltage pulses through interferometers [2] or the dynamical modification of edge states in the quantum Hall regime [3]. I will discuss in particular the role of electron-electron interactions, i.e. how the non-interacting excitations get renormalized into surface plasmons [4].

J. Dubois et al, Nature 502, 659 (2013)

B. Gaury et al, Nature Comm. 5, 3844 (2014)

B. Gaury et al, Phys. Rev. B 90, 161305(R) (2014)

Thomas Kloss et al, in preparation

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