Electron interferometry with a Quantum Point Contact: Effect of electron-electron interaction and temperature

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Motivated by experiments recently made in Harvard [1], Stanford [2], Zurich [3] and Grenoble [4], we study a simplified model for describing an electron interferometer formed with a quantum point contact and the depletion region induced by the charged tip of a scanning gate microscope. The contact is made of a single site with Hubbard interaction U (Anderson impurity) coupling two semi-infinite square lattices. A local moment [5] can take place in the contact above the Kondo temperature. We study how this moment can be manipulated when one scans the tip around the contact. We discuss also how the conductance of this interferometer depends on the location the tip, on the strength U of the interaction and on the temperature, in regimes where the Hartree-Fock approximation remains valid [6]. In certain cases, an enhancement of the interference fringes can be yielded by an increase of the temperature [7] or an increase of the strength U of the interaction.

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