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Scanning gate transconductance microscopy and spectroscopy of a mesoscopic ring BENOIT HACKENS, FREDERICO MARTINS, SEBASTIEN FANIEL, VINCENT BAYOT, Universite catholique de Louvain, Louvain-la-Neuve 1348, Belgium, MARCO PALA, MINATEC, Grenoble, France, HERMANN SELLIER, SERGE HUANT, CNRS and Institut Neel, Grenoble, France, LUDOVIC DESPLANQUE, XAVIER WALLART, IEMN, Villeneuve d'Ascq, France — In scanning gate microscopy (SGM), a dc voltage is applied to a sharp tip moving in the vicinity of a device. This alters the electrostatic potential seen by electrons inside the device, and consequently changes the device conductance [1]. Here, we superimpose a small ac voltage to the dc bias applied on the tip, and record the change of device conductance at the tip bias modulation frequency, i.e. the local transconductance. We first image the low temperature transconductance of a mesoscopic ring patterned in a two-dimensional electron system (2DES) hosted in an InGaAs/InAlAs heterostructure. The tranconductance images are decorated by concentric features that we associate with charging of electron traps located close to the 2DES. We perform spectroscopy of these traps by positioning the tip close to them, and recording the ring transconductance as a function of the tip dc voltage and the bias accross the quantum ring. We observe Coulomb diamonds in our spectroscopic data, which confirms that Coulomb blockade is at play. [1] B. Hackens et al., Nature Physics 2, 826 (2006).

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