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Scanning gate spectroscopy of a quantum Hall island near a quantum point contact BENOIT HACKENS, FREDERICO MARTINS, SEBASTIEN FANIEL, VINCENT BAYOT, IMCN/NAPS, Universite catholique de Louvain, Belgium, BERND ROSENOW, Institute for Theoretical Physics, Leipzig University, Germany, LUDOVIC DESPLANQUE, XAVIER WALLART, IEMN, UMR CNRS 8520, UST Lille, BP 60069, F-59652 Villeneuve d'Ascq, France, MARCO PALA, IMEP-LAHC, Grenoble INP, Minatec, BP 257, F-38016 Grenoble, France, HERMANN SELLIER, SERGE HUANT, Institut Néel, CNRS & Université Joseph Fourier, BP 166, F-38042 Grenoble, France — We report on low temperature (100 mK) scanning gate experiments performed at high magnetic field (around 10 T) on a mesoscopic device patterned in an InGaAs/InAlAs heterostructure. Magnetotransport measurements yield signatures of ultra-small Quantum Hall Islands (QHI) formed by closed quantum Hall edge states and connected to propagating edge channels through tunnel barriers. Scanning gate microscopy and scanning gate spectroscopy are used to locate and probe a single QHI near a quantum point contact. The presence of Coulomb diamonds in the local spectroscopy confirms that Coulomb blockade governs transport across the QHI. Varying the microscope tip bias as well as current bias across the device, we uncover the QHI discrete energy spectrum arising from electronic confinement and we extract estimates of the gradient of the confining potential and of the edge state velocity.

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