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Imaging of resonant transport through single electron localized states in the quantum Hall effect GARY STEELE, RAY ASHOORI, Massachusetts Institute of Technology, LOREN PFEIFFER, KEN WEST, Lucent Technologies — We measure transport properties of incompressible states in the quantum Hall effect (QHE) with a novel scanning probe method. Using scanning charge accumulation (SCA) imaging, a metal STM tip probes charging of a very high mobility 2D electron gas buried 100 nm below the surface of a GaAs heterostructure. Working at a magnetic field near integer Landau level filling and applying DC voltage on our tip, we induce a bubble of charge under the tip in an adjacent Landau level. A ring of incompressible quantum Hall liquid separates this bubble from the bulk. Measuring charging of the bubble reveals direct information about transport through the incompressible ring. The resistance of the ring is seen to be >100 GΩ but drops abruptly by more than four orders of magnitude as the tip is scanned. The images suggest that this drop is caused by potential fluctuations that create small islands in the strip. Resonant tunneling through such islands, mediated by Coulomb Blockade, produces striking filamentary patterns. The results provide direct measurements of microscopic transport mechanisms in the QHE.

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