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**Probing low-lying excitations of the $\nu = 2$ incompressible fluid with a quantum antidot** C.J.B. FORD, L.C. BASSETT, N.R. COOPER, M. KATAOKA, J.P. GRIFFITHS, D. ANDERSON, G.A.C. JONES, I. FARRER, D.A. RITCHIE, University of Cambridge — In the integer quantum Hall (IQH) regime, electrons can be manipulated coherently in edge states. We have begun to control spins in such systems, in order to utilise both long spin-coherence timescales and controllable electron transport along edge states. Using quantum point contacts to selectively inject and detect non-equilibrium edge-state populations, we perform spin-resolved spectroscopy of a quantum antidot (AD) in the IQH regime. At filling factor two, we find that AD transmission resonances are not spin-selective, contrary to the prediction of the conventional non-interacting picture of lowest-Landau-level (LLL) quantum states, and implying a small spin-excitation energy relative to the thermal energy. In apparent contradiction, we also observe a much larger orbital excitation energy scale in non-linear transport spectroscopy measurements. By treating the AD as a 'dot of holes' in the LLL, we find that our observations are consistent with the predicted spin-charge separation that occurs at the edge of an interacting maximum-density droplet of the IQH incompressible fluid. Thus, we believe these experiments offer a direct probe of the physics of a large IQH droplet (~150 particles), with an edge which is well-described by a Luttinger-liquid model in this regime, with different scales for spin and charge excitations.

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