Abstract Submitted
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Scanned-gate and Kelvin-probe microscopy to investigate surface-acoustic-wave-driven transport through a depleted GaAs channel[1] ROLF CROOK, ROBERT SCHNEBLE, HARVEY BEERE, DAVID RITCHIE, DAVID ANDERSON, GEB JONES, CHARLES SMITH, CHRIS FORD, CRISPIN BARNES, University of Cambridge, UK, SEMICONDUCTOR PHYSICS TEAM — Electron transport driven by a surface acoustic wave (SAW) through a depleted GaAs channel is the basis for a proposed device capable of quantum information transfer or processing. Device fabrication benefits from a detailed understanding of the capture process at the channel entrance and the dynamics in the channel. We report two experiments to obtain spatial information uniquely provided by low-temperature scanning-probe microscopy. Scanned-gate microscopy, which generates images of SAW-induced current, shows features near the channel entrance that evolve from spots to crescents. Comparison with simulations confirms that the SAW current increases when the maximum potential gradient along the channel is reduced. Kelvin-probe microscopy is adapted to make images of SAW-induced charge, revealing a build-up of negative charge at the channel entrance when no SAW current flows, and a broken line of negative charge, and occasionally positive charge or dipole behavior, with a SAW current.

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