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A single-electron interferometer in silicon[1] ANASUA CHATTERJEE, London Center for Nanotechnology, University College London, London, UK, SYLVAIN BARRAUD, CEA-Leti, Grenoble, France, RUBEN OTXOA, Hitachi Cambridge Laboratory, Cambridge, UK, FRANCO NORI, SERGEY SHEVCHENKO, Center for Emergent Matter Science, RIKEN, Japan, JOHN J L MORTON, London Center for Nanotechnology, University College London, London, UK, M FERNANDO GONZALEZ-ZALBA, Hitachi Cambridge Laboratory, Cambridge, UK — Landau-Zener-Stueckelberg (LZS) interferometry has gained prominence as a tool to study the coherent properties and energy level spectrum of quantum systems. Here we present a multi-level LZS interferometry study performed in a silicon-transistor-based charge qubit, tunnel coupled to a fermionic sea that allows us to characterise the qubit dynamics in the strong driving regime. We read out the charge state of the system in a continuous non-demolition regime by measuring the dispersive response of a high-frequency resonator coupled to the quantum system via the gate. By performing multiple fast passages through the qubit's avoided crossing we observe the emergence of a LZS interferometry pattern. At higher drives, using a projective measurement to an even-parity charge state, we demonstrate a strong geometrical enhancement of the readout signal. At even higher drives, we perform a second projective measurement during the coherent evolution, resulting in a loss of the interference pattern. Our results demonstrate a way to increase the state readout signal of coherent quantum systems and replicate single-electron analogues to optical interferometry.

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