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Quantum transport through mesoscopic LaAlO3/SrTiO3 devices fabricated by a new epitaxial lift off process YARON GROSS, ADRIAN SWARTZ, HYEOK YOON, ZHUOYU CHEN, HAROLD HWANG, Stanford University — Recent studies of mesoscopic devices based on the two-dimensional electron gas present at the LaAlO3/SrTiO3 interface have revealed rich quantum phenomena, such as superconducting quantum interference, electron interference, and universal conductance fluctuations. The edges of such devices are usually defined by an amorphous AlO3 (or LaAlO3) hard mask prior to the epitaxial LaAlO3 growth step. We present here a new high resolution (under 100 nm) fabrication method, allowing us to create mesoscopic devices by "lifting off" the LaAlO3 layers from desired regions, leaving behind atomically flat surfaces. This method yields devices with clean boundaries between the conducting (4 or more unit cells of LaAlO3) and insulating (2 unit cells of LaAlO3) regions, free from any charged traps that may reside in amorphous materials. By introducing an additional lift off step we are able to create lateral junctions between the LaAlO3/SrTiO3 and other materials (specifically Metal/ LaAlO3/SrTiO3). We will present this method and our investigation of quantum transport through several devices, among them cavities exhibiting long electron coherence length.

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