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Superconducting properties of single and bilayer $LaAlO_3/SrTiO_3$ interfaces[1] STEFANO GARIGLIO, ALEXANDRE FETE, DANFENG LI, WEI LIU, MARGHERITA BOSELLI, DQMP, University of Geneva, NICOLAS REYREN, Unite Mixte de Physique CNRS-Thales, JEAN-MARC TRISCONE, DQMP, University of Geneva — The two-dimensional electron liquid present at the $LaAlO_3/SrTiO_3$ interface exhibits superconductivity and hosts a large spin-orbit interaction. Quite remarkably, both phenomena can be controlled by an electric field. In this work, we have mapped the evolution of the superconducting properties upon gate voltage tuning, revealing a surprising change in thickness of the superconducting layer across the phase diagram. Using a single $LaAlO_3/SrTiO_3$ interface, we have realized field effect transistors and estimated the characteristic lengths (the coherence length and the superconducting thickness) as a function of the gate voltage by measuring the critical magnetic fields in parallel and perpendicular geometry. We have also realized bilayer interfaces, where two superconducting liquids are separated by the $LaAlO_3$ layer. In such structures, we have investigated the possible coupling of the two superconducting sheets, tuning one of the two by electric field.

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