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Mesoscopic transport properties of LaAlO₃/SrTiO₃ devices DANIELA STORNAIUOLO, STEFANO GARIGLIO, ALEXANDRE FETE, NUNO COUTO GUIMARAES, DANFENG LI, ANDREA CAVIGLIA, CLAUDIA CANCELLIERI, ALBERTO MORPURGO, JEAN-MARC TRISCONE, DPMC -University of Geneva — The conducting interface between the two band insulators LaAlO₃ and SrTiO₃ [1], with its unique electronic properties, stands as a prominent example of an oxide heterostructure for the realization of multifunctional devices. Using the electric field effect the ground state of this system can be tuned from insulating to superconducting [2]. Recently we demonstrated also the possibility to tune the carriers mobility by changing the deposition conditions of the LaAlO₃ film (3) and measured Shubnikov-de Haas oscillations, whose analyses demonstrate the 2D nature of the electronic states at the interface [3,4]. We are currently focusing on the realization of devices where the 2D quantum nature of the electronic states can be fully exploited. We show the feasibility of structures with lateral dimensions down to few hundreds nanometers, using an electron beam lithography based process. The lateral confinement of the electron gas in these devices is demonstrated by a phase coherent transport regime, which can be tuned by electric field.

- [1] A.Ohtomo et al., Nature 427, 423 (2004)
- [2] A.D.Caviglia et al., Nature 456, 624 (2008); C.Bell et al., PRL 103, 226802 (2009)
- [3] A.D.Caviglia et al., PRL 105, 236802 (2010)
- [4] M.Ben Shalom et al., PRL 105,206401 (2010)

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