

Abstract Submitted  
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**Analysis of local conductance switching by AFM-writing at the  $\text{LaAlO}_3/\text{SrTiO}_3$  interface** MARGHERITA BOSELLI, DANFENG LI, WEI LIU, ALEXANDRE FÊTE, STEFANO GARIGLIO, JEAN-MARC TRISCONE, DQMP, University of Geneva — A two dimensional electron liquid is present at the interface between  $\text{LaAlO}_3$  and  $\text{SrTiO}_3$ ; this system exhibits several interesting physical properties, including tunable superconductivity. In heterostructures with 3 unit cells of  $\text{LaAlO}_3$ , an insulator to metal transition can be induced by the electric field effect. We report here on the use of the atomic force microscopy writing technique developed in the group of J. Levy [1] to locally switch on and off conductivity at the interface. Our results show that a quartz resonator AFM sensor is particularly suitable for this purpose. In this configuration, the measurements can be performed in the dark, strongly reducing photo-doping. Electronic nanostructures are found to be particularly sensitive to the writing procedure and to the ambient humidity. We discuss how these parameters can be optimized to confine electrons in regions down to tens of nanometers. Simulations of the conductance changes upon AFM writing are compared to experiments. The temperature evolution of the conductance shows that nanowires are metallic.

[1] C. Cen, et al., Nat Mater 7, 298 (2008)

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