Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Dimensionality effects in AFM-written conducting structures MARGHERITA BOSELLI, DANFENG LI, ADRIEN WAELCHLI, STEFANO GARIGLIO, JEAN-MARC TRISCONE, DQMP, University of Geneva — Combining the properties of oxides with low dimensionality leads to the emergence of complex phenomena. The two-dimensional electron system confined at the interface between $LaAlO_3$ and $SrTiO_3$ is a perfect playground to explore these effects. On top of the electrons out-of-plane confinement at the interface, introducing an in-plane confinement is also possible. Among the different options, the AFM-writing method is very promising. By applying a bias to the tip of an atomic force microscope and by scanning the surface of $LaAlO_3$, electrons can be transferred at the interface in nanoscale regions. We showed that the conducting wires defined using this technique can have a width of $\sim$10 nm and that their physical properties are very sensitive to the tip bias and the air humidity of the writing environment. We present here a systematic study of the transport properties of a series of AFM-written electronic devices with lateral dimension progressively reduced. Above the superconducting phase the system is not, strictly speaking, in a 1D regime but dimensionality effects should be observable. Once in the superconducting phase, we expect a stronger effect as the coherence length is comparable or larger than the lateral size of the written nanostructures.

Margherita Boselli
DQMP, University of Geneva

Date submitted: 10 Nov 2016 Electronic form version 1.4