Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Top gating control of superconductivity at the LaAlO3/SrTiO3 interfaces ALEXIS JOUAN, SIMON HURAND, CHERYL FEUILLET-PALMA, GYANENDRA SINGH, JEROME LESUEUR, NICOLAS BERGEAL, Laboratoire de Physique et d'Etude des Materiaux - CNRS - ESPCI ParisTech - UPMC, EDOUARD LESNE, NICOLAS REYREN, Unite Mixte de Physique CNRS-Thales, 1 Av. A. Fresnel, 91767 Palaiseau, France — Transition metal oxides display a great variety of quantum electronic behaviors. Epitaxial interfaces involving such materials give a unique opportunity to engineer artificial materials where new electronic orders take place. It has been shown that a superconducting two-dimensional electron gas could form at the interface of two insulators such as LaAlO3 and SrTiO3 [1], or LaTiO3 and SrTiO3 [2]. An important feature of these interfaces lies in the possibility to control their electronic properties, including superconductivity and spin-orbit coupling (SOC) with field effect [3-5]. However, experiments have been performed almost exclusively with a metallic gate on the back of the sample. In this presentation, we will report on the realization of a top-gated LaAlO3/SrTiO3 device whose physical properties, including superconductivity and SOC, can be tuned over a wide range of electrostatic doping. In particular, we will present a phase diagram of the interface and compare the effect of the top-gate and back-gate. Finally, we will discuss the field-effect modulation of the Rashba spin-splitting energy extracted from the analysis of magneto-transport measurements. Our result paves the way for the realization of mesoscopic devices where both superconductivity and SOC can be tuned locally.

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Date submitted: 14 Nov 2014 Electronic form version 1.4