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Two-dimensional superconductivity induced by high-mobility carrier doping in LaTiO3/SrTiO3 hetero-structures JOHAN BISCARAS, S. HURAND, C. PALMA, J. LESUEUR, N. BERGEAL, LPEM-UMR8213/CNRS-ESPCI ParisTech, Paris, France, D. LEBOEUF, C. PROUST, LNCMI, UPR 3228, (CNRS-INSA-UJF-UPS), Toulouse, France, A. RASTOGI, R.C. BUDHANI, Cond. Matter-Low Dimensional Syst. Lab., Dept. of Physics, IIT Kanpur, India — Transition metal oxides display a great variety of quantum electronic behaviors where correlations often play an important role. The achievement of high quality epitaxial interfaces involving such materials gives a unique opportunity to engineer artificial materials where new electronic orders take place. It has been shown recently that a two-dimensional electron gas 2DEG could form at the interface of two insulators such as LaAlO3 and SrTiO3, or LaTiO3 (a Mott insulator) and SrTiO3 [1,2]. We show that a superconducting two-dimensional electron gas is formed at the LaTiO3/SrTiO3 interface whose properties can be modulated by field effect using a metallic gate on the back of the substrate [3,4]. The gas consists of two types of carriers : a majority of low-mobility carriers always present, and a few high-mobility ones that can be injected by electrostatic doping. The calculation of the electrons spatial distribution in the confinement potential shows that the high-mobility electrons responsible for superconductivity set at the edge of the gas whose extension can be tuned by field effect [4].

[1] N. Reyren et al, Science 317, 1196 (2007)
[2] A. Ohtomo et al, Nature 419, 378 (2002)
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[4] J. Biscaras et al, PRL 108, 247004 (2012)

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