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Multiple Quantum Phase Transitions in a two-dimensional superconductor NICOLAS BERGEAL, J. BISCARAS, S. HURAND, C. FEUILLET-PALMA, J. LESUEUR, ESPCI ParisTech-CNRS, R.C. BUDHANI, A. RASTOGI, IIT Kanpur, S. CAPRARA, M. GRILLI, Universita di Roma "La Sapienza" — We studied the magnetic field driven Quantum Phase Transition (QPT) in electrostatically gated superconducting LaTiO3/SrTiO3 interfaces [1,2]. Through finite size scaling analysis, we showed that it belongs to the (2+1)D XY model universality class. The system can be described as a disordered array of superconducting islands coupled by a two dimensional electron gas (2DEG). Depending on the 2DEG conductance tuned by the gate voltage, the QPT is single (corresponding to the long range phase coherence in the whole array) or double (one related to local phase coherence, the other one to the array). By retrieving the coherence length critical exponent ν, we showed that the QPT can be "clean" or "dirty" according to the Harris criteria, depending on whether the phase coherence length is smaller or larger than the island size [2]. The overall behaviour is well described by a model of coupled superconducting puddles in the framework of the fermionic scenario of 2D superconducting QPT [3].

[1] J. Biscaras et al, Phys. Rev. Lett. 108, 247004 (2012)
[2] J. Biscaras et al, arXiv:1209.6464 (2012)
[3] B. Spivak, et al. Phys. Rev. B 77 214523 (2008)

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