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Piezoresponse Force Microscopy of Gated LaAlO₃/SrTiO₃ Heterostructures¹ FENG BI, MENGCHEN HUANG, Department of Physics and Astronomy, University of Pittsburgh, CHUNGWUNG BARK, SANGWOO RYU, CHANG-BEOM EOM, Department of Materials Science, University of Wisconsin, Madison, JEREMY LEVY, Department of Physics and Astronomy, University of Pittsburgh — The quasi-two-dimensional (q-2DEG) electron liquid at the LaAlO₃/SrTiO₃ (LAO/STO) interface can be tuned through the metal-insulator transition using a metallic top gate. At low carrier densities, the capacitance between the top gate and q-2DEG is significantly enhanced beyond the geometric capacitance.² In order to understand the origins of this enhancement in capacitance, we have performed spatially resolved piezo-force microscopy (PFM) on a top-gated 5u.c. LAO/STO structure. A large enhancement in piezoresponse is observed as the interface is switched to the conducting phase. Within the transition region, spatial structures or domains are observed. We propose that such measurement can provide new insights into the metal-insulator transition of the interface, and the associated capacitance enhancement.

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²Lu Li, C. Richter, S. Paetel, T. Kopp, J. Mannhart, R.C. Ashoori, *Science* **332**, 825 (2011)

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