

Abstract Submitted
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LaAlO₃ thickness window for electronically controlled magnetism in LaAlO₃/SrTiO₃ heterostructures¹ FENG BI, MENGCHEN HUANG, University of Pittsburgh, HYUNGWOO LEE, SANGWOO RYU, University of Wisconsin-Madison, PATRICK IRVIN, University of Pittsburgh, CHANG-BEOM EOM, University of Wisconsin-Madison, JEREMY LEVY, University of Pittsburgh — Complex oxide heterostructures, especially LaAlO₃/SrTiO₃ (LAO/STO) exhibit emergent conductivity, superconductivity, and magnetism. A recent investigation² demonstrates that in-plane magnetism at the LAO/STO interface can be controlled electronically at room temperature. Here we employ the magnetic force microscopy to investigate the emergence of magnetism as the LAO thickness is varied between 4 u.c. and 40 u.c. Magnetism is observed only within a certain thickness window 8 u.c.-25 u.c; outside of this window the magnetic signal becomes negligible. Simultaneous capacitance measurements for different LAO thickness show that the devices with negligible magnetic signatures all have capacitance values far below the geometric capacitance. The existence of the observed window is attributed to the existence of direct or Zener tunneling, which prevents the insulating phase from being reached.

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²F. Bi, *et. al*, Nature Communications **5**, 5019 (2014).

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