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Evidence for charge-vortex duality at the $LaAlO_3$-$SrTiO_3$ interface[1] MANAN MEHTA, DIMITRY DIKIN, Department of Physics and Astronomy, Northwestern University, Evanston, IL, CHUNG WUNG BARK, CHAD FOLKMAN, CHANG-BEOM EOM, Department of Materials Science and Engineering, University of Wisconsin-Madison, Madison, WI, VENKAT CHANDRASEKHAR, Department of Physics and Astronomy, Northwestern University, Evanston, IL — The conducting gas formed at the inteface between $LaAlO_3$ and $SrTiO_3$ undergoes a superconductor to insulator transition (SIT) on the application of a back gate voltage, V_g. The system also shows evidence of ferromagnetic order coexisting with superconductivity.[2] The juxtaposition of the ferromagnet with the conducting gas allows for the observation of a novel manifestation of charge-vortex duality. The field due to the magnetization dynamics in the ferromagnet causes a sharp *increase* in resistance on the superconducting side of the transition, in the magnetoresistance measurements, and a sharp *decrease* in resistance on the insulating side. The system can be modeled as an array of Josephson junctions, with two characteristic energy scales: a Josephson coupling energy E_J, and a Coulomb charging energy E_c. V_g then tunes the ratio, E_J/E_c, to cause the transition. We will present external field sweep-rate dependent magnetoresistance data on both sides of the transition to elucidate the nature of the superconducting and insulating states.

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[2]Dikin *et al*, PRL **107**, 056802 (2011)

Manan Mehta
Dept of Physics and Astronomy, Northwestern University, Evanston, IL

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