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Contrasting electrostatic tuning of the superconducting $LaAlO_3/SrTiO_3$ interface by top and back gating ZHUOYU CHEN, HISASHI INOUE, YANWU XIE, HONGTAO YUAN, Stanford Univ, YASUYUKI HIKITA, SLAC Nat Acc Lab, HAROLD Y. HWANG, Stanford Univ & SLAC Nat Acc Lab, HWANG TEAM — We report an experimental study of electrostatic tuning of the superconducting interface in dual gated $LaAlO_3/SrTiO_3$ controlled by the electric field effect. The dual gate devices are formed by simultaneously gating from the top of the epitaxial $LaAlO_3$ layer and the back of the $SrTiO_3$ substrate. Along with electrostatic doping to tune the carrier density, the quantum well profile of the interface electron system is modified due to the inversion asymmetry of the structure, resulting in the modulation of the effective disorder of the system (carrier mobility). We find therefore a strong contrast in the superconducting phase transition by top versus back gating. Simultaneous gating provides a unique opportunity to tune both the carrier density and disorder in this 2D superconducting system.

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