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Quantum oscillations and Hall plateaus at $LaAlO_3/SrTiO_3$ interface[1] YANWU XIE, CHRISTOPHER BELL, YASUYUKI HIKITA, HAROLD Y. HWANG, Geballe Laboratory for Advanced Materials & Stanford Institute for Materials and Energy Sciences, Stanford University — In this work, we tuned the sheet carrier density and mobility of the quasi-two-dimensional electron gas (q2DEG) confined at the $LaAlO_3/SrTiO_3$ interface by surface control, and studied the magneto-transport behavior of the q2DEG. We observed a universal trend that mobility increases with decreasing sheet carrier density, with a maximum mobility of >20,000 $cm^2V^{-1}s^{-1}$. In a low sheet carrier density regime, we observed well resolved Shubnikov-de Haas quantum oscillations in the longitudinal resistance, and a plateau-like structure in the Hall conductivity. The frequency of the quantum oscillations shows a clear transition with increasing magnetic field, with a high / low field frequency ratio close to 3. In addition, the Landau indices of the plateaus in the Hall conductivity data show spacing close to 4, in units of the quantum of conductance. These features can be understood by considering magnetic breakdown orbits and account for all of the carriers.

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