Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Dominance of spin-orbit coupling in magnetotransport at the $LaAlO_3/SrTiO_3$ interface M. DIEZ, University of Leiden, A.M.R.V.L. MONTEIRO, G. MATTONI, E. MULAZIMOGLU, Delft University of Technology, E. COBANERA, Utrecht University, T. HYART, University of Jyväskylä, A.D. CAVIGLIA, Delft University of Technology — Today, the planar confinement of electrons is no longer synonymous with semiconducting quantum wells. The mobile electrons at the metallic LAO/STO interface are better confined by at least one order of magnitude, in a regime closer to that achieved in graphene. Nonetheless, graphene and, for example, GaAs/AlGaAs quantum well have more in common with each other than with LAO/STO. In these two systems, spin-orbit coupling effects are for many purposes unimportant or negligibly weak, and neither system has ever shown superconductivity. In contrast, spin-orbit coupling effects are strong at the LAO/STO interface, and superconductivity is a well established, potentially quite exotic, feature. We measure the resistance of the LAO/STO interface in an in-plane magnetic field perpendicular to the current, for a wide range of applied fields B, temperatures, and carrier densities controlled by a back-gate voltage V_g. Our measurements show dramatic, fast and very large drops in magnetoresistance, either as a function of B or V_g, decrease slowly with temperature and seem suggestive of magnetic ordering. However, they compare very well with an alternative explanation that strongly suggests that the effect of spin-orbit coupling on the band structure alone can dominate magnetotransport.

Mathias Diez
Instituut-Lorentz, Universiteit Leiden

Date submitted: 14 Nov 2014 Electronic form version 1.4