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Dynamic electron transport in an oxide heterostructure HANGTIAN HOU, CHRIS FORD, ATEEQ NASIR, RHODRI MANSELL, JUNG-WEI LIAO, JONATHAN GRIFFITHS, Cavendish Laboratory, The University of Cambridge, YUSUKE KOZUKA, MASASHI KAWASAKI, University of Tokyo — From spontaneous and piezoelectric polarization, a correlated two-dimensional free electron gas forms at a ZnO/MgZnO heterointerface with a low density of 10^{11}cm^{-2} and a high mobility of 10^6 cm^{2}V^{-1}s^{-1}. Both integral and frictional quantum hall effect were observed at this system due to the strong electron-electron correlation. In fabrication we succeed to pattern nano surface metallic gates by electron-beam lithography to provide further confinements to form quasi-1D quantum wires or quantum dots. A conductance oscillation through the 1D channel was observed at a low temperature, which explained by ballistic quasi-1D electron transport and Coulomb blockage. Different to a traditional GaAs system, ZnO has the weak spin-orbit interaction and long electron coherence time, which make it ideal for spintronic applications. Moreover, ZnO is a good piezoelectric substrate for surface acoustic waves quantum device (SAWs), which has showed strong ability in single electron transport. We applied the dynamic SAW quantum dot technique on this ZnO-based 2DEG system, wishing to realize a more efficient single electron charge and spin transfer than other semiconductor heterostructures.

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