Magneto Transport Measurements in Narrow Band Gap Semiconductors

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Introduction

Narrow band gap semiconductors such as InAs have received intense attention mainly due to strong spin orbit interaction and large effective g-factor. Recently they have been recognized as a suitable platform for realization of topological states of matter. We extended our studies on gate-defined devices fabricated on hetero-structures containing InAs layer in SCM1 system at 30mK and magnetic fields up to 18T.

Results and Discussion

Figure 1 highlights our main findings. We have successfully developed a material stack and fabrication process that allow us to change carrier densities (Fig1a and b), spin orbit interaction and the confinement potential. Fig,1c shows formation of 1D constriction in long and short channels. Universal conductance fluctuation in long and the quantization of conductance in short constrictions were studied as a function of magnetic field. Surprisingly spin resolved transport was observed only at extreme high parallel magnetic field limit.

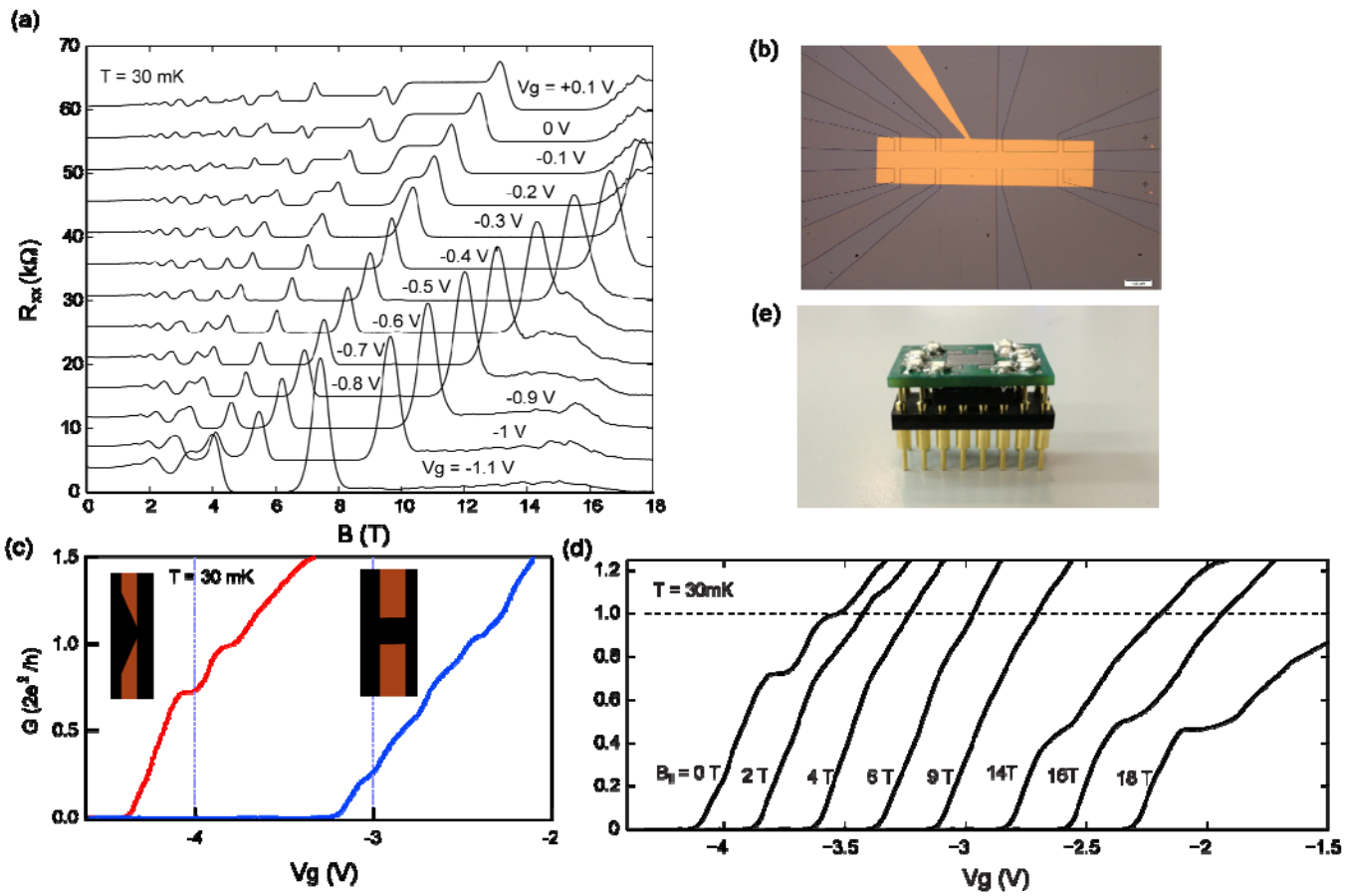

Figure 1: (a) Magneto-resistance measurements in Hall bar geometry (shown in b) as a function of top gate voltage. (c) Plot of the conductance vs gate voltage in a quantum point contact to form 1D channel (d) Magnetic field dependence of quantized steps measured in an RF filtered sample holder shown in (e).

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