Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Quantum Hall effect in polycrystalline CVD graphene: grain boundaries impact REBECA RIBEIRO-PALAU, FABIEN LAFONT, FELICIEN SCHOPFER, WILFRID POIRIER, Laboratoire national de métrologie et d'essais, VINCENT BOUCHIAT, ZHEN HAN, Institut Néel, CNRS & Université Joseph Fourier, ALESSANDRO CRESTI, IMEP-LAHC Grenoble INP Minatec, ARON CUMMINGS, STEPHAN ROCHE, Catalan Institute of Nanotechnology, CIN2 (ICN-CSIC) and Universitat Autónoma de Barcelona — It was demonstrated by Janssen et al. (New J. Phys. 2011) that graphene could surpass GaAs for quantum Hall resistance standards with an accuracy better than 10^{-10}. Graphene should render possible the realization of a standard operating at $T > 4$ K and $B < 4$ T, easing its dissemination towards industry. To materialize this goal scalable graphene with outstanding electronic transport properties is required. We present measurements performed in large area Hall bars made of polycrystalline CVD graphene on Si/SiO_2, with a carrier mobility of 0.6 T^{-1}. Even at 20.2 T and 300 mK, the Hall resistance plateaus are insufficiently quantized at $\nu = \pm 2$ and ± 6. This is due to a high dissipation manifested by a longitudinal resistance which does not drop to zero. We pointed out unusual power-law temperature dependencies of R_{xx} and an exponential magnetic field dependence. We do not observe the common thermally activated or VRH behaviors. This can be attributed to the grain boundaries in the sample that short-circuit the edge states, as supported by our numerical simulations. This reveals new and peculiar aspects of the quantum Hall effect in polycrystalline systems. Another unexpected feature is the observation of the $\nu = 0$ and 1 states in such low mobility systems.

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Date submitted: 15 Nov 2013 Electronic form version 1.4