Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Canted magnetism and edge transport in tunable quantum Hall phases in graphene JOSE LADO, JOAQUIN FERNANDEZ-ROSSIER, International Iberian Nanotechnology Laboratory (INL), THEORY OF NANOSTRUCTURES TEAM — Motivated by recent experimental results [1] we study theoretically the quantum Hall effect in graphene in the presence of strong in plane magnetic field considering short range electron electron interactions. The experiments show a variety of phase transitions that change the bulk spin order order between different states, including antiferromagnetic (AF), ferromagnetic (FM) and canted antiferromagnetic (CAF), resulting in dramatically different edge states that control the conductivity. Here we model the non-trivial phase diagram of this system using a Hubbard model for a wide ribbon in a non-collinear mean field approximation. Our theory is able to account for the main experimental findings and provides a comprehensive phase diagram with at least 4 different electronic phases: AF, FM, CAF and a ferrimagnetic phase. Specifically, our model describes the presence of counter-propagating spin-filtered edge states in the FM phase at half filling, as well as a fully polarized single edge channel when the FM phase is doped into a ferrimagnetic phase with an electron-hole gap. [1] A. F. Young, J. D. Sanchez-Yamagishi, B. Hunt, S. H. Choi, K. Watanabe, T. Taniguchi, R. C. Ashoori, P. Jarillo-Herrero, arXiv:1307.5104

Joaquin Fernandez-Rossier
International Iberian Nanotechnology Laboratory (INL)

Date submitted: 15 Nov 2013 Electronic form version 1.4