Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Quantum Monte Carlo Study of Edge Magnetism in Nanoribbons of Graphene Z.Y. MENG, Institut für Theoretische Physik III, Universität Stuttgart, H. FELDNER, IPCMS Université de Strasbourg France, Institut für Theoretische Physik, Georg-August-Universität Göttingen, T.C. LANG, Institut für Theoretische Physik und Astrophysik, Universität Würzburg, S. WESSEL, Institut für Theoretische Physik III, Universität Stuttgart, A. HONECKER, Institut für Theoretische Physik, Georg-August-Universität Göttingen, F. ASSAAD, Institut für Theoretische Physik und Astrophysik, Universität Würzburg — We study the electronic and magnetic properties of graphene nanoribbons, employing projective quantum Monte Carlo simulations within the Hubbard model description of electrons in graphene. We also compare our numerical results to a self-consistent mean field approximation in the weak coupling regime. Motivated by recent STM experiments about electronic resonance around atomic vacancies on multilayer graphene and graphene nanoisland, we in particular examine the local density of states throughout the sample. From this, we verify that interacting zig-zag ribbons develop an insulating ground state with a finite single particle gap from the localized edge modes observed in the non-interacting limit. In addition, we observe a drastic increase of the spin-spin correlation length along the zig-zag edge with the ribbon width. Effectively, on our finite samples ferromagnetic edges appear already for moderately wide zig-zag ribbons. This ferromagnetism is accompanied by an essentially gapless edge magnon mode, that we identify in the spin excitation spectrum.

Zi Yang Meng
Institut für Theoretische Physik III, Universität Stuttgart

Date submitted: 22 Nov 2010 Electronic form version 1.4