Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Spin stiffness of graphene and zigzag graphene nanoribbons[1] JUNWON RHIM, KYUNGSUN MOON, Department of Physics and IPAP, Yonsei University, Seoul 120-749, Korea, CONDENSED MATTER THEORY GROUP TEAM — We theoretically study the spin stiffness of graphene and graphene nanoribbon based on the Hubbard-type Hamiltonian. Using the Hartree-Fock method with the inclusion of the adiabatic spin twist, we have obtained the effective energy functional and investigated the magnetic excitations of the two-dimensional graphene and zigzag graphene nanoribbon (ZGNR). We have analyzed the spin stiffness of the system with varying temperature and the strength of on-site Coulomb repulsion. For ZGNR, we have also studied the effect of the lateral electric field on the spin stiffness. As the field increases, the spin stiffness decreases and reaches less than the half of the zero-field value. However, we remarkably notice that there exists a critical value of the electric field above which the stiffness starts to increase showing a cusp-like behavior. This critical point is found to coincide exactly with the metal-insulator transition point of ZGNR.

[1]This work was supported by the Korea Research Foundation Grant funded by the Korean Government (KRF-2008-313-C00243).

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Date submitted: 28 Oct 2009 Electronic form version 1.4