Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Spin and valley skyrmions in Landau levels $|N| \geq 1$ of graphene and bilayer graphene RENE COTE, WENCHEN LUO, Univ of Sherbrooke — In a two-dimensional electron gas (2DEG), skyrmions are the lowest-energy charged excitations at filling factor $\nu = 1$ while, for the chiral 2DEG in graphene, valley and spin skyrmions can exist up to Landau level $|N| = 3$ [1]. In this talk, we discuss the excitation energy of spin and valley skyrmions in Landau level $|N| \geq 1$ in both graphene and bilayer graphene. In graphene, we consider a finite Zeeman term in order to compute the range of Zeeman coupling for which skyrmions are the lowest-energy charged excitations. We also show how the excitation energy is modified when screening is considered [2]. In bilayer graphene, we first derive the phase diagram of the chiral 2DEG at integer filling of the quartet of states in Landau levels $|N| \geq 1$ and show how a finite potential difference applied between the two layers can control the spin and pseudospin polarizations. We then compute the excitation energy of valley and spin skyrmions by using an anisotropic σ model derived from the Hartree-Fock Hamiltonian and adding screening corrections.

[1] Kun Yang, S. Das Sarma, and A. H. MacDonald, Phys. Rev. B 74,075423 (2006).
[2] Wenchen Luo and R. Cote, Phys. Rev. B 88, 115417(2013).

Rene Cote
Univ of Sherbrooke

Date submitted: 11 Nov 2013 Electronic form version 1.4