Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Chiral orbital current and anomalous magnetic moment in gapped graphene MIKITO KOSHINO, Dept. of Physics, Tohoku University — We present a low-energy effective theory to describe chiral orbital current and anomalous magnetic moment in graphene monolayer and multilayers with band gap. We show that an electronic state of general Bloch system may intrinsically contain a quantum mechanical current circulation due to interband matrix elements. In gapped graphene, the current circulation is opposite between different valleys (K,K'), and the corresponding magnetic moment accounts for valley splitting of Landau levels. In gapped bilayer and ABC-stacked multilayer graphenes, in particular, the valley-dependent magnetic moment causes a huge paramagnetism at low energy, and a full valley polarization is possible up to relatively high electron density. The formulation also applies to gapped surface states of three-dimensional topological insulator, where the chiral orbital current is related to the magneto-electric response of the system.

Mikito Koshino
Dept. of Physics, Tohoku University

Date submitted: 09 Nov 2011 Electronic form version 1.4