Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Aharonov-Bohm-like scattering, localization, and novel electronic states in hydrogenated graphene ANDREY SHYTOV, Utah University, DMITRY ABANIN, Princeton University, LEONID LEVITOV, Massachusetts Institute of Technology — Metallic nature of transport in graphene, which is fairly robust with respect to varying amounts of disorder, changes in an unexpected way when vacancies are introduced in this material. At low energies, near the Dirac point, electron scattering on vacancies mimics scattering on Aharonov-Bohm solenoids carrying unit flux. This type of scattering results in a very narrow band of states at the Dirac point with properties resembling those of zeroth Landau level, which is positioned in the middle of a (pseudo)gap created by vacancies and resembling the cyclotron gap around zeroth Landau level. The fictitious magnetic field describing vacancies has opposite signs for the valleys K and K'. As a result of this, an externally applied magnetic field has opposite effects in the two valleys, suppressing (reinforcing) the gap in the K (K') valley. We show that this picture is in agreement with the behavior observed in a recent study [1] of electronic properties of graphene, which can be transformed from metallic state to insulating state by hydrogenation. [1] D. C. Elias, R. R. Nair, T. M. G. Mohiuddin, S. V. Morozov, P. Blake, M. P. Halsall, A. C. Ferrari, D. W. Boukhvalov, M. I. Katsnelson, A. K. Geim, K. S. Novoselov, arXiv:0810.4706

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Date submitted: 21 Nov 2008 Electronic form version 1.4