

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Accessing the Strong-Coupling Regime in Graphene on hBN Substrate ANDREY SHYTOV, University of Exeter, JUSTIN SONG, LEONID LEVITOV, Massachusetts Institute of Technology — Recent experiments [1,2] report on an insulating behavior at charge neutrality in single-layer graphene on hBN substrate. Ref.[1] attributed this behavior to weak localization due to residual short-range disorder. However, in Ref.[2] a much stronger insulating behavior was observed at a larger separation between graphene and the gates, in the regime when interactions are largely unscreened. This suggests that interactions play a decisive role in the observed phenomena, ruling out the weak localization scenario. We propose an alternative mechanism in which a gap opens up due to a combined effect of sublattice modulation in hBN [3] and electron-electron interactions. We argue that sublattice modulation in hBN amplifies the effective fine structure constant enhancing electron-electron interactions. In this regime, a weak gap induced by sublattice modulation can be strongly enhanced by interactions, giving rise to near-spontaneous excitonic order.

- [1] L.A.Ponomarenko et al., Nature Physics **7**, 958 (2011)
- [2] F.Amet et al, arXiv:1209.6364
- [3] M.Kindermann, B.Uchoa, and D.Miller, arXiv:1205.3194

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Date submitted: 08 Nov 2012

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