Abstract Submitted
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How many-body effects modify the van der Waals interaction between graphene sheets[1] JOHN DOBSON[2], TIM GOULD, Griffith Univ, GIOVANNI VIGNALE, University of Missouri, Columbia — Cold undoped graphene sheets were previously predicted [1,2], via Random Phase approximation (RPA) arguments, to exhibit an unusual asymptotic van der Waals (vdW) interaction energy $E = -KD^{-3}$ where D is the (large) separation between the two parallel graphene sheets. This is compared with $D^{-5/2}$ for 2D metals [3] and D^{-4} for 2D insulators [3]. Here we show [4] that graphene is the first known system where effects beyond the RPA should make QUALITATIVE changes to the vdW force. For large separations, $D > 10nm$ where only π_z-mediated vdW forces remain, we predict that the vdW interaction is substantially reduced from the RPA prediction, and has a different power law. This new D dependence is very sensitive to the form of the long-wavelength many-body renormalization of the velocity of the massless Dirac fermions, and may provide independent confirmation of the latter. We will briefly discuss issues involved in possible experiments.

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[1]Work supported by the Australian Research Council, NSF and DIPC.
[2]Queensland Micro and nanotechnology Centre, Griffith University, Nathan, Queensland 411 Australia

John Dobson
Griffith Univ

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