Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Controlling magnetism in graphene by molecular doping RAHUL RAVEENDRAN NAIR, I-LING TSAI, MARGHERITA SEPIONI, ANDRE K. GEIM, IRINA V. GRIGORIEVA, School of Physics and Astronomy, University of Manchester — Graphene, the first truly two dimensional crystal, continues to attract intense interest due to its extraordinary properties. The possibility to induce magnetism in graphene, despite the absence of d- or f-electrons, has been a subject of great excitement but is still poorly understood experimentally and the possibility of magnetic coupling remains controversial. Our recent experiments provided the first definitive proof that point defects in graphene – adatoms and vacancies – carry magnetic moments, giving rise to paramagnetism that dominates graphene's magnetic response at low temperatures [1]. In this contribution we show that one can control magnetism in graphene by using chemical doping. In order to vary the carrier concentration n, we used molecular (hole) doping of graphene laminates by NO_2 or nitric acid and were able to vary n between $\sim$5x10^{11} to $\sim 10^{13}$ cm^{-2} as estimated by Raman spectroscopy and Hall effect measurement. This had a pronounced effect on the magnetisation of graphene laminates, which was measured using SQUID magnetometry. Our results show that both para- and diamagnetic response of graphene can be controlled precisely and reversibly by the doping level, which opens up a new avenue of tuneable magnetism in graphene.

[1] R.R. Nair *et al.*, Nature Physics **8**, 199 (2012).

Rahul Raveendran Nair
School of Physics and Astronomy, University of Manchester

Date submitted: 17 Dec 2012 Electronic form version 1.4