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Exploring graphene properties in a periodic electrostatic potential NIKOLAI N. KLIMOV, Maryland NanoCenter, UMD, MD / PML, NIST, MD, DAVID B. NEWELL, PML, NIST, MD — Graphene, a unique two-dimensional honeycomb lattice of carbon atoms, exhibits rich new physics and great promise for applications in electronics. It was been predicted that a slowly varying nanoscale external periodic electrostatic potential applied to a graphene modifies its lectronic structure in a very unique way and leads to novel phenomena and possible applications [1-4]. In particular, a one-dimensional electrostatic potential applied to graphene may result in strong anisotropy of the group velocity of Dirac fermions, appearance of new zero-energy states at the Fermi energy, unusual Landau levels and quantum Hall effects. Both the anisotropy of the group velocity and the number of zero-energy modes can be altered by varying parameters of the superlattice potential. Although graphene in periodic potentials has been intensively studied theoretically, a thorough experimental investigation is still missing due to difficulties of fabricating of graphene devices, in which an external periodic potential can be applied with nanoscale periodicity. In this talk we present our results on the fabrication of graphene devices with nanoscale periodic local gates. The devices will be used to investigate graphene electronic properties in a one-dimensional periodic electrostatic potential using both magnetotransport and scanning probe microscopy measurement techniques. [1] C.-H. Park et al., Nat. Phys. 4, 213 (2008); Nano Lett. 8, 2920 (2008); Physica E 43, 651 (2011). [2] M. Barbier et al., PRB 77, 115446 (2008). [3] L. Brey, H.A. Fertig, PRL 103, 046809 (2009). [4] P. Burset et al., PRB 83, 195434 (2011).

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