Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Charge Density Waves on the Graphene Sheets of the Heavily-Doped Superconductor Graphitic Intercalate CaC_6 C.F. HIRJIBEHEDIN, K.C. RAHNEJAT, London Centre for Nanotechnology (LCN) and U. College London (UCL), UK, C.A. HOWARD, LCN, UCL, and Royal Holloway, U. of London, UK, N.E. SHUTTLEWORTH, S.R. SCHOFIELD, LCN and UCL, UK, K. IWAYA, Tohoku U., Japan, CH. RENNER, U. Geneva, Switzerland, G. AEPPLI, M. ELLERBY, LCN and UCL, UK — The electronic properties of graphitic materials can be readily tuned by adding charge carriers, and high levels of doping can even lead to superconductivity. We used scanning tunnelling microscopy to investigate the graphene-terminated surface of the superconducting graphitic material CaC_6 at temperatures well above T_c=11.5K [1]. We find two distinct surface types that show atomic resolution: one exhibits the expected structure of a graphene lattice superimposed on a hexagonal Ca superlattice while the other has stripes with a period three times that of the underlying Ca superlattice. A periodic distortion was found in the Ca atoms matching the periodicity of the electronic contrast on the graphene sheet, though no displacements of the carbon lattice were detected. Spectroscopic measurements reveal an energy gap in the electronic structure that can be directly associated with the stripe periodicity. This provides strong evidence that the stripes correspond to a charge density wave (CDW) in a graphitic system that also superconducts at lower temperatures, offering an excellent test bed for studying the relationship between these two important phenomena. [1] K.C. Rahnejat et al., Nat. Commun. 2, 558 (2011).

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Date submitted: 26 Nov 2012 Electronic form version 1.4