Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Energetic ion beams from ultra thin relativistic transparent targets GEORGE HICKS, John Adams Institute, Imperial College London, UK, H. AHMED, Queen's University Belfast, UK, N. DOVER, JAI IC, J. FERNANDEZ-TOBIAS, Central Laser Facility, UK, R. HEATHCOTE, CLF, S. KAR, QUB, C. KREUZER, Ludwig-Maximilians-Universitat, Munchen, Germany, D. MACLELLAN, SUPA, University of Strathclyde, UK, I. MUSGRAVE, CLF, H. NAKAMURA, JAI IC, M. NOTLEY, W. SHAIKH, CLF, M. STREETER, JAI IC, M. BORGHESI, QUB, P. MCKENNA, SUPA, D. NEELY, CLF, J. SCHREIBER, LMU, M. ZEPF, QUB, Z. NAJMUDIN, JAI IC — In high intensity laser solid interactions, going to ultra thin foils allows access to novel regimes of acceleration such as radiation pressure, hole boring and relativistic transparency. We present data from an experiment on the Vulcan Petawatt laser at the Central Laser Facility, UK. We used a 220J, 1ps laser pulse focussed to a 9.5 μm spot at 0° to accelerate ions from ultra-thin CH foils. The improved OPCPA front end of Vulcan PetaWatt allowed us to obtain energetic protons > 50 MeV from CH foils down to 25nm thickness, without the use of a plasma mirror. Structures characteristic of the radiation pressure acceleration regime, such as a filamented central beam, and an outer ring structure, were produced. Further information about the interaction could be determined from backscattered spectra and transverse optical probing. The experimental observations are supported by 2D particle-in-cell simulations and an analytical model.

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Date submitted: 11 Jul 2014 Electronic form version 1.4