Abstract Submitted for the DPP06 Meeting of The American Physical Society

Electron acceleration in long scale laser - plasma interactions CHRISTOS KAMPERIDIS, STUART P.D. MANGLES, SABRINA R. NAGEL, CLAUDIO BELLEI, KARL KRUSHELNICK, ZULFIKAR NAJMUDIN, Blackett Laboratory, Department of Physics, Imperial College, London SW7 2AZ, United Kingdom, NICOLA BOURGEOIS, JEAN RAPHAEL MARQUES, LULI, Ecole PolytechniqueCNRS, 91128 Palaiseau, France, MALTE C. KALUZA, Institute for Optics and Quantum Electronics, Max-Wien-Platz, D-07743 Jena, Germany — Broad energy electron bunches are produced through the Self-Modulated Laser Wakefield Acceleration scheme at the 30J, 300 fsec laser, LULI, France, with long scale underdense plasmas, created in a He filled gas cell and in He gas jet nozzles of various lengths. With $c \tau_{laser} >> \lambda_{plasma}$, electrons reached $E_{max} \sim 200 \text{MeV}$. By carefully controlling the dynamics of the interaction and by simultaneous observations of the electron energy spectra and the forward emitted optical spectrum, we found that a plasma density threshold $(\sim 5 \cdot 10^{18} \text{ cm}^{-3})$ exists for quasi-monoenergetic $(\sim 30 \text{MeV})$ features to appear. The overall plasma channel size was inferred from the collected Thomson scattered light. 2D PIC simulations indicate that the main long laser pulse breaks up into small pulselets that eventually get compressed and tightly focused inside the first few plasma periods, leading to a bubble like acceleration of electron bunches.

> Christos Kamperidis Department of Physics, Imperial College, London SW7 2AZ, UK

Date submitted: 21 Jul 2006

Electronic form version 1.4