Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Spectral Control of Laser-Accelerated MeV Proton Beams
ALEX ROBINSON, Rutherford-Appleton Laboratory, PAUL GIBBON, John-von-Neumann Institute of Computing, DAVID NEELY, PETER NORREYS, Rutherford-Appleton Laboratory — One of the phenomena associated with ultra-intense laser-solid interactions is the emission of multi-MeV proton beams from the target. These proton beams may find a number of important applications from medicine to Fast Ignition ICF. However until recently it has not been clear how to control the energy spectrum. Typically experimental observations have been of broad, quasi-exponential spectra. In the past year there have been four separate observations of proton or ion spectra with quasi-monoenergetic features in the energy spectrum. We have studied the generation of quasi-monoenergetic features in the ion spectrum. The simulations have been performed using 1D1P Vlasov codes and a fully 3D particle (tree) code, and the results of these calculations will be presented. We have focused on the role of *target composition* in generating quasi-monoenergetic features in the spectrum. These spectral peaks during the plasma expansion because of the electrostatic shock associated with the separation of the protons and the heavier ion species [1]. This was initially investigated in 1D, and we have recently studied this in 3D, particularly in the context of microdot targets. This is very relevant to recent experiments. Alternative methods of generating quasi-monoenergetic features may be discussed. [1] A.P.L.Robinson et al, Phys.Rev.Lett., 96, 035005 (2006)

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Date submitted: 20 Jul 2006 Electronic form version 1.4