Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Spectral control of laser accelerated ions via deuterium vapour deposition onto cryogenically cooled targets GRAEME SCOTT, STFC Central Laser Facility — A widely perceived criticism of the best understood laser driven ion acceleration mechanism, TNSA, is that the energy spectra routinely obtained are Maxwellian in nature, and are non-ideal for some of the long term envisaged applications of a laser accelerated ion source such as ion driven fast ignition or hadrontherapy. We, however, demonstrate a novel method to accelerate a quasi-monoenergetic deuterium beam in the TNSA regime of ion acceleration. This is made possible by recent developments in cryogenic targetry at the Central Laser Facility, and is achieved by cooling a gold target to approximately 7-8 K and introducing overcoats of isotopic deuterium layers on top of the hydrogen contaminant layer present on the original target. The presence of a lower charge to mass ion on top of the high charge to mass hydrogen, alters the sheath dynamics during the acceleration such that the high energy portion of the deuterium beam exhibits a full width at half maximum energy spread of $\delta\varepsilon/\varepsilon$ ˜0.3-0.5. Experimental results and multidimensional numerical modelling will be presented describing this effect. Further than this, experimental results show that the accelerated deuterium beam is found to significantly enhance the number of neutrons produced when fielded in a pitcher/catcher configuration, and provides avenues for investigation on the production of a high brightness neutron source.

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Date submitted: 20 Jul 2016 Electronic form version 1.4