Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Proton acceleration enhanced by a plasma jet in expanding foils undergoing relativistic transparency ROSS GRAY, MARTIN KING, HAYDN POWELL, DAVID MACLELLAN, BRUNO GONZALEZ-IZQUIERDO, University of Strathclyde, LUCA STOCKHAUSEN, Centro de Laseres Pulsados, GEORGE HICKS, NICHOLAS DOVER, Imperial College London, DEAN RUSBY, University of Strathclyde, DAVID CARROLL, Central Laser Facility , HERSIMERJIT PADDA, University of Strathclyde, RICARDO TORRES, Centro de Laseres Pulsados, SATYABRATA KAR, Queens University Belfast, ROBERT CLARKE, DAVID NEELY, Central Laser Facility, ZULFIKAR NAJMUDIN , Imperial College London, MARCO BORGHESI, Queens University Belfast, PAUL MCKENNA, University of Strathclyde — The interaction of a sufficiently intense laser pulse with an ultrathin target can induce it to rapidly transition from an overdense to a relativistically underdense plasma. In recent years many insights have been made into aspects of this regime - from the onset of transparency itself, to the spatial profile of electrons accelerated and ion acceleration. We present an experimental study of laser-ion acceleration in this regime that demonstrates the complex interplay between mechanisms including sheath fields, radiation pressure and transparency-driven field enhancements. This is experimentally demonstrated by separating signature components within the proton beam. Using PIC simulations, it is shown that a plasma jet is formed during the transition to transparency resulting in higher laser energy absorption to electrons and enhanced ion acceleration. The final ion energy is demonstrated to be highly sensitive to the picosecond rising edge profile of the laser pulse.

Ross Gray
University of Strathclyde

Date submitted: 24 Jul 2015 Electronic form version 1.4