Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Development of a Knock-on deuteron imaging diagnostic for cryogenic ICF implosions R. SIMPSON, P. ADRIAN, J. A. FRENJE, M. GATU JOHNSON, F. H. SEGUIN, MIT, H. G. RINDERKNECHT, S. REGAN, LLE — Charged particle diagnostics are important for characterizing crucial parameters for inertial confinement fusion implosions such as burn radius, fuel areal density and fusion yield. In particular, knock on deuteron spectroscopy allows for a measurement of an inferred directional fuel areal density. This work details an effort to extend this capability by developing a knock-on deuteron imager (koDI) for use on cryogenic deuterium-tritium (DT) implosions at the OMEGA facility in Rochester, NY. Knock-on deuteron imaging provides a means to investigate and image the morphology of the high-density DT fuel region. We present the first proof-of-concept experiments to develop the koDI diagnostic, which is a CR-39 based penumbral imaging system. As a surrogate for cryogenic DT targets, DT filled capsules with thick CD shells were used for this preliminary study. Three separate koDI's were fielded at nearly orthogonal lines of sight in order to enable 3D reconstruction of the implosion. In addition, targets were intentionally offset on two shots to investigate if the large fuel areal density could be discerned on knock-on deuteron images. This talk presents the results of these studies and the diagnostic principles behind the koDI system. This work was supported in part by the U.S. DOE, LLE and NNSA LRGF program.

Irving Doeg
MIT

Date submitted: 03 Jul 2019 Electronic form version 1.4