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Using secondary nuclear products for inferring the fuel areal density, convergence, and electron temperatures of deuterium filled implosions on the NIF[1] B. LAHMANN, J.A. FRENJE, M. GATU JOHNSON, H. SIO, N.V. KABADI, G. SUTCLIFFE, F.H. SEGUIN, C.K. LI, R.D. PETRASSO, MIT, E.P. HARTOUNI, H.G. RINDERKNECHT, D.B. SAYRE, C.B. YEAMANS, S.F. KHAN, G.A. KYRALA, S. LEPAPE, L. BERZAK-HOPKINS, N. MEEZAN, R. BIONTA, T. MA, LLNL — In deuterium-filled inertial confinement fusion implosions, 0.82 MeV ^{3}He and 1.01 MeV T born from the primary DD reaction branches can undergo fusion reactions with the thermal deuterium plasma to create secondary D^{3}He protons and DT neutrons respectively. In regimes of moderate fuel areal density (ρR $\sim$ 5 - 100 mg/cm^2) the ratio of both of these secondary yields to the primary yield can be used to infer the fuel ρR, convergence, and an electron temperature (T_e) simultaneously. This technique has been used on a myriad of deuterium filled implosion experiments on the NIF using the nuclear time of flight (NTOF) diagnostics to measure the secondary DT neutrons and CR-39 based wedge range filters (WRFs) to measure the secondary D^{3}He protons. Additionally, a comparative study is conducted between the nuclear inferred convergence and x-ray inferred convergence obtained on these experiments.

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