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New Features in Nuclear Diagnostic Modeling Using HYDRA[1]

S.M. SEPKE, C. CERJAN, M. MARINAK, Lawrence Livermore National Laboratory, J. KNAUER, Laboratory for Laser Energetics — New methods in HYDRA have been developed to allow more accurate and flexible modeling of nuclear reactions with a focus on measurements at the National Ignition Facility. Two developments are highlighted: radiochemistry and compound nuclei. Low probability nuclear reactions in an ICF capsule are best simulated using radiochemistry techniques. HYDRA now has both an inline and a post-processing capability, which uses the new code KUDU. Calculation of the 4.4 MeV ^{12}C(n,γn$'$) γ is shown to be greatly improved relative to an analog Monte Carlo calculation. This γ measured along with the T(D,γn) γ in an ICF implosion provides a measurement of mix, areal density, and timing. HYDRA now also provides a facility to define the properties of a compound nucleus in a thermonuclear reaction. By using this new capability and recently measured γ and neutron spectra to inform the ^{5}He state, the simulation of T(D,nγ) and TT fusion reactions that share the intermediate ^{5}He state has been significantly improved.

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