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Modeling down-scattered neutron images from cryogenic fuel implosions at the National Ignition Facility[1] KUMAR RAMAN, DAN CASEY, DEBRA CALLAHAN, DAN CLARK, DAVID FITTINGHOFF, GARY GRIM, STEVE HATCHETT, DENISE HINKEL, OGDEN JONES, ANDREA KRITCHER, SCOTT SEEK, LARRY SUTER, Lawrence Livermore National Lab, FRANK MERRILL, DOUG WILSON, Los Alamos National Lab — In experiments with cryogenic deuterium-tritium (DT) fuel layers at the National Ignition Facility (NIF), an important technique for visualizing the stagnated fuel assembly is to image the 6-12 MeV neutrons created by scatters of the 14 MeV hotspot neutrons in the surrounding cold fuel. However, such down-scattered neutron images are difficult to interpret without a model of the fuel assembly, because of the nontrivial neutron kinematics involved in forming the images. For example, the dominant scattering modes are at angles other than forward scattering and the 14 MeV neutron fluence is not uniform. Therefore, the intensity patterns in these images usually do not correspond in a simple way to patterns in the fuel distribution, even for simple fuel distributions. We describe our efforts to model synthetic images from ICF design simulations with data from the National Ignition Campaign and after. We discuss the insight this gives, both to understand how well the models are predicting fuel asymmetries and to inform how to optimize the diagnostic for the types of fuel distributions being predicted.

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