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2.54 Optimizing neutron imaging lines of sight locations for maximum sampling of the cold fuel density in Inertial Confinement Fusion implosions at the National Ignition Facility

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Optimizing neutron imaging lines of sight locations for maximum sampling of the cold fuel density in Inertial Confinement Fusion implosions at the National Ignition Facility S. H. Batha, P. L Volegov, V. E. Fatherley, V. Geppert-Kleinmath, and C. A. Wilde Los Alamos National Laboratory Neutron imaging provides a ready measurement of the shape of the “hot spot” core of an inertial confinement fusion implosion. The 14-MeV neutrons emitted by deuterium-tritium reactions are imaged at the National Ignition Facility using a pinhole array onto a scintillator and the images are recorded on a camera. By changing the gate time of the camera lower energy neutrons, down scattered by the cold fuel surrounding the hot spot, are recorded. The cold fuel density can be reconstructed using the two images. The kinematics of the scattering, coupled with the scattering cross sections restrict the angular extent of the cold fuel sampled, with the backside of the implosion not being sampled at all. This work demonstrates the limited region of the cold fuel measured by the current line of sight and the new lines of sight being built. The locations of future lines of sight to provide full 4π coverage are also given.

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