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Model-Based Analysis of an ICF Neutron Imaging System[1] CARLOS BARRERA, EDWARD MORSE, University of California Berkeley, STEVE HAAN, JEFFREY KOCH, MICHAEL MORAN, Lawrence Livermore National Laboratory — A neutron imaging diagnostic is currently under development for the National Ignition Facility (NIF). The system should be capable of producing images from scattered neutrons in the 6 to 10 MeV energy range. In order to predict the spatial resolution and signal-to-noise ratios of the images, a model-based analysis has been implemented. The modeling calculations include appropriate fusion source distributions (in 1 MeV bins), a hypothetical pinhole camera system that includes the point-spread function of the neutron pinhole, the time of flight of the neutrons and the response of the detector, i.e., sensitivity and late-time decay ($>$ 600 ns) characteristics of the neutron scintillator. The results show that a downscattered image can be recovered after careful subtraction of the 14 MeV afterglow and that a pinhole array is necessary in order to increase the image signal-to-noise ratio. Comparison of the modeling results for different system designs will make it possible to optimize and understand the performance of the diagnostic before a prototype is built.

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