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Image Characterization Study for ICF Neutron Imaging CARLOS BARRERA, EDWARD MORSE, University of California at Berkeley, Berkeley, CA 94720 USA, MICHAEL MORAN, STEVE HATCHETT, Lawrence Livermore National Laboratory, Livermore, CA 94550 USA — Performance requirements for the National Ignition Facility Neutron Imaging System (NIS) call for a spatial resolution of 10 microns and a signal-to-noise ratio (SNR) of 22 at the 20% contour for both the hot-spot (14 MeV) and the downscattered (6 – 12 MeV) images. An MCNPX-based model is being used to conduct a systematic study of the capabilities of different imaging system designs to satisfy these requirements, as well as to establish the most useful and accurate definitions of resolution and SNR. The NIS design parameter space includes: neutron yield, aperture geometry, magnification and source size and position with respect to the system's axis. The model includes accurate source distributions of a failed implosion, three aperture geometries (ring, square pinhole and triangular wedge), their associated point spread functions, and a pixelated plastic scintillator detector array. The simulated recorded images are deconvolved using a modified regularization algorithm, producing overall simulations of the expected source images. This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

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