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4.32 A Novel Scintillator-based Neutron Imaging System for the National Ignition Facility

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The Los Alamos National Laboratory Advanced Imaging Team will soon deploy a novel neutron imaging system along a new line of sight at the National Ignition Facility (NIF). The new detector system will complement an existing equatorial active scintillator-based system and a passive image plate-based system along the polar direction. The third line of sight will allow true three-dimensional reconstruction of both the hot and cold fuel in the inertial confinement fusion process. Extensive scintillator characterization measurements of over 20 scintillator samples at the Los Alamos Neutron Science Center and the Omega laser facility in Rochester, NY, have informed key design decisions for the new detector. We conclude the feasibility of a monolithic lens-coupled design over the existing fiber array system. The monolithic design shows higher spatial resolution, higher light output, and better noise characteristics. A prototype of the novel system was recently tested at Omega and first penumbral images have been obtained with a neutron aperture array. Future work will include the lens design for the system, aiming for deployment at NIF in 2019.

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