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A novel design for scintillator-based neutron and gamma imaging in inertial confinement fusion VERENA GEPPERT-KLEINRATH, THERESA CUTLER, CHRIS DANLY, AMANDA MADDEN, FRANK MERRILL, JOSH TYBO, PETR VOLEGOV, CARL WILDE, Los Alamos National Laboratory —
The LANL Advanced Imaging team has been providing reliable 2D neutron imaging of the burning fusion fuel at NIF for years, revealing possible multi-dimensional asymmetries in the fuel shape, and therefore calling for additional views. Adding a passive imaging system using image plate techniques along a new polar line of sight has recently demonstrated the merit of 3D neutron image reconstruction. Now, the team is in the process of designing a new active neutron imaging system for an additional equatorial view. The design will include a gamma imaging system as well, to allow for the imaging of carbon in the ablator of the NIF fuel capsules, constraining the burning fuel shape even further. The selection of ideal scintillator materials for a position-sensitive detector system is the key component for the new design. A comprehensive study of advanced scintillators has been carried out at the Los Alamos Neutron Science Center and the OMEGA Laser Facility in Rochester, NY. Neutron radiography using a fast-gated CCD camera system delivers measurements of resolution, light output and noise characteristics. The measured performance parameters inform the novel design, for which we conclude the feasibility of monolithic scintillators over pixelated counterparts.

Verena Geppert-Kleinrath
Los Alamos National Laboratory

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