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2.15 Modeling the One-Dimensional Imager of Neutrons (ODIN) for Neutron Response Functions at the Sandia Z Facility

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The one-dimensional imager of neutrons (ODIN) at the Sandia Z facility consists of a 10-cm block of tungsten with rolled edges, creating a slit imager width of either 250, 500, or 750 μm . Designed with a 1-m neutron imaging line of sight, we achieve about 4:1 magnification and 500- μm axial spatial resolution. The baseline ICF concept at Sandia is magnetized liner inertial fusion (MagLIF), which nominally creates a 1-cm line source of neutrons. ODIN was designed to determine the size, shape, and location of the neutron producing region, furthering the understanding of compression quality along the cylindrical axis of magnetized liner implosions. Challenges include discriminating neutron images from hard x-rays and gammas with adequate signal-to-noise in the $2e12$ DD neutron yield range, as well as understanding the neutron response function through the imager to various imaging detectors (namely CR-39). Modeling efforts were conducted with MCNP6.1 to determine neutron response functions for varying configurations in a clean DD neutron environment (without x-rays or gammas). Configuration alterations that will be shown include rolled-edge slit orientation and slit width, affecting resolution and response function. Work supported by DOE NNSA contract DE-NA0003525.

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