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A New Fast Neutron Imaging System at the Phoenix Neutron Imaging Center –Current Status and Initial Results

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Phoenix LLC has designed and is currently constructing the Phoenix Neutron Imaging Center (PNIC) in Fitchburg, WI. Phoenix has a well-established history of developing and deploying the world's strongest deuterium-deuterium accelerator-based compact neutron sources with continuous operation measured at over 5×10^{11} n/s for over 100 consecutive hours. The new facility, which will house a newly developed ion source, provides 10 thermal neutron beamlines, one dedicated fast neutron beamline, as well as a 450 kV X-ray CT system for complimentary radiography studies. The fast neutron beamline will provide a source of up to 16 MeV neutrons with a yield of approximately 3×10^{13} n/s. The spot size will be variable between a few millimeters up to several centimeters to change the effective L/D ratio as required for the specimen under interrogation. The samples will be mounted on a high-precision turntable to enable fast neutron CT and the initial detector will be an amorphous silicon DDA coupled to a fast neutron scintillator, likely PP/ZnS. This presentation will show the facility in its current state, the neutron beamlines, detector options and future upgrades, and shielding against neutron activation, facility dose, and scatter contributions to the images. Initial experiments that show the measured neutron flux and resolution will be presented as will 2D and 3D fast neutron images captured on the new PNIC system. Efforts toward X-ray and fast neutron CT fusion will also be discussed and presented as applicable.

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