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A High-Intensity, Low-Energy Heavy Ion Source for a Neutron Target Proof-of-Principle Experiment at LANSCE

The capability to directly study neutron capture reactions on radionuclides with half-lives on the order of minutes would allow key cross section measurements in nuclear astrophysics and energy applications. However, such experiments with stationary targets are currently impossible because of signal detection and target sample fielding issues. To overcome these challenges, a neutron target facility is being developed to permit neutron capture experiments on unstable isotopes in inverse kinematics at the Los Alamos Neutron Science Center (LANSCE). This next-generation facility will consist of a heavily moderated, high-intensity spallation neutron target coupled with a radioactive ion beam storage ring. A proof-of-principle experiment is underway to demonstrate this neutron target concept at LANSCE in the near term with stable ions and without a storage ring. Here, mA-level beams of 10-50 keV heavy ions exhibiting large resonant neutron capture cross sections will be generated by a new ion source, transported through a large-volume neutron moderator surrounding an adjacent spallation target driven by the LANSCE accelerator, and collected downstream of the moderator for subsequent decay-counting measurements. The neutron density within the moderator will be obtained from these decay yields and compared with Monte Carlo N-Particle (MCNP) simulation results. The science application, operational requirements, and performance objectives for this heavy ion source will be presented.

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Yes

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