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## Commissioning of a polarized eV pulsed neutron beam and current mode gamma detector array at LANSCE

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We developed a modular apparatus to polarize neutrons *in situ* at the Los Alamos Neutron Science Center using spin-exchange optical pumping. This technique requires the use of a glass cell filled with helium-3 gas and rubidium metal, which is heated until the rubidium is vaporized. An external magnetic field is applied, and the rubidium vapor is excited using a 795 nm, 50 watt laser, which is split to illuminate both ends of the cell. The rubidium exchanges spin with helium-3 gas, which, in an external magnetic field, has a spin-dependent neutron-nucleus cross section. This effectively filters out one spin state of the neutrons provided by the pulsed neutron beam, resulting in a neutron beam with a net polarization.

We also developed a current-mode gamma detector array composed of 24 NaI detectors. In the center of the detector array is a spin-transport tube, which is composed of a solenoid that maintains the spin state of the neutrons as they travel through the array. At the center of the tube is the location of the target material for the polarized neutron beam. The tube is wrapped in lithium-6 enriched plastic and powder to absorb scattered neutrons before they are able to reach the detector array. The array itself is also surrounded by lead bricks and borated polyethylene to prevent neutrons scattered in the beamline from hitting the detectors.

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