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SESAME: Spin Echo Scattering Angle Measurement at LENS

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Abstract

A beamline for Spin Echo Scattering Angle Measurement (SESAME) has been installed at the Low Energy Neutron Source (LENS) at Indiana University. Polarized neutrons are provided by a solid state bender while the neutron polarization is analyzed using a large-aperture supermirror device with channels radiating from the sample position. The beamline can be configured to make either transmission measurements through Spin Echo Small Angle Neutron Scattering (SESANS) or reflectometry measurements via Spin Echo Resolved Grazing Incidence Scattering (SERGIS). The instrument can resolve real space correlations over the range of 20-2000nm using neutrons in the wavelength range from 0.4 – 1 nm. For SERGIS measurements, a large reflection angle of up to seven degrees in the vertical plane can be achieved, allowing for the measurement of reflection from liquid samples, as well as solids. The spin echo elements are composed of wire-wound, water-cooled solenoids that are designed for modularity and portability and have been previously tested at Los Alamos and NIST. The efficiencies of these elements have been measured and their individual effects on the total beamline polarization examined. The scattered neutron beam can be measured either with a scintillation detector with ~0.5mm resolution or a detector comprising an array of 16 parallel, linear, 0.5-inch-diameter, position-sensitive ³He detectors. This work was supported by the Office of Basic Energy Sciences of the U.S. DOE under grant number DE-FG02-06ER46279