Analytically Computed Small-Angle Scattering in Fast-Neutron Radiography

Paul A. Hausladen, Philip R. Bingham, James A. Mullens

Oak Ridge National Laboratory
P.O. Box 2008, Oak Ridge, Tennessee 37831-6010
email: hausladenpa@ornl.gov, binghampr@ornl.gov, mullensja@ornl.gov

In computed tomography, ray-tracing programs are often used to generate projections of phantoms that can be used to assess the error generated during tomographic reconstruction. When performing radiography with fast neutrons, elastic scattering comprises a significant fraction of the neutron cross section. Because elastically scattered neutrons are preferentially forward directed, they will typically be transmitted through an object and blur the transmission radiograph. This paper discusses use of a simple parameterization of the small-angle scattered neutrons that enables the extension of a ray-tracing program to analytically include the propagation of multiple small-angle scattered neutrons through thick objects and to quickly assess their impact on image contrast and reconstruction algorithms.