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MCNP Simulation Study of the Dual Radiation Rotating Scattering Mask for Localization of Gamma and Neutron Sources DEVON LOOMIS, IVAN NOVIKOV, Western Kentucky University, ALEX BARZILOV, University of Nevada Las Vegas — Recent advancements in the development of scintillation materials capable of the simultaneous detection of gamma rays and neutrons have made it possible to significantly simplify radiation detection systems, where a single detector replaces a high pressured He-3 tube and a scintillation crystal. Capitalizing on these recent advances, a novel radiation detecting system was developed to detect and localize gamma and neutron radiation sources using a specially designed Dual Radiation Rotating Scattering Mask (DRRSM). The DRRSM synthesizes concepts employed in rotational modulation collimators and coded-aperture imaging systems in order to simultaneously localize and discriminate neutron and gamma sources with various energies. The DRRSM consists of small voxels of lead to attenuate gamma rays and UHMW poly to attenuate and scatter neutrons. It rotates around the detector axis, modulating the detector's signal in a way that is unique to the source location. A Maximum Likelihood Estimation Maximization algorithm is then used to convert the modulated signal to its corresponding source location. We describe the experimental system design and analyze the results from the MCNP transport code simulations that have been used to validate the system performance.

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