Abstract

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Geometry effects in MCNP-PoliMi simulation of a cube-shaped, monolithic neutron scatter camera

Neutron scatter cameras are a type of directional radiation detector that can localize the direction of a neutron source by detecting consecutive scatters of source neutrons. These systems are of interest in nuclear safeguards settings for search for sources of an unknown location and for verifying the presence of known sources. To this end, there has been a push to create compact and portable neutron scatter camera systems that use a single detection volume rather than many spatially separated volumes. While designing one such system using MCNPX-PoliMi simulation, it was found that the geometry of the detector volume relative to the source being imaged affected the resolution and the symmetry of the neutron image. This paper explores how changing the position of simulated point and distributed neutron sources relative to a cube-shaped detector volume alters properties of the image. In general, it was found that movements away from the direction normal to the faces of the cube-shaped volume reduces imaging resolution and symmetry.