Determining the neutron spectrum of $^{241}$Am-Be and $^{252}$Cf sources using bonner sphere spectrometer

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Abstract

Bonner spheres system is one of the ways of measuring neutron energy distribution which is often applied in spectrometry and neutron dosimetry. This system includes a thermal neutron detector, being located in the center of several polyethylene spheres, and it is still workable due to the isotropic response of the system which in turn is derived from the spherical symmetry of moderators and the broad measurable range of the energy. In order to practically use this spectrometer, it is necessary to calibrate this system using standard neutron sources. This research aimed to determine the calibration factor of Bonner spheres spectrometry system and energy spectrum of two standard $^{241}$Am-Be and $^{252}$Cf sources in the atomic energy organization. Calibration and experimental measurement were done via the two standard sources. The response vector of each detector was derived by using MCNPX simulation code, based on the Monte Carlo method. The spectra unfolding of this system was performed through iterative method using the SPUNIT code done in software NSDUAZ6LiI and BUMS.

Keywords: bonner sphere spectrometer, calibration, detection, neutron source, unfolding of spectrum

For full article, refer to the Persian section.