

Neutron spectrometry for radiation protection purposes

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Reliable knowledge of the neutron energy spectrum is valuable for determination of neutron dose equivalent for radiation protection purposes. The reasons are twofold: First, neutron dose equivalent depends strongly on the neutron energy spectrum and, second, most of neutron measuring devices are highly energy dependent. Recently, we have developed a neutron spectrometer for measurement of neutron energy spectra in the energy range from thermal energy up to several tens of MeV. The spectrometer is composed of a ^3He proportional counter and several cylindrical neutron moderators made of high-density polyethylene. Each of the measurement values represents the convolution of the spectrometer's energy response function and the neutron spectral fluence under study. In this development, the energy response of the spectrometer was characterized using the Monte Carlo radiation transport code PHITS (Particle and Heavy Ion Transport System), and the deconvolution algorithm for extracting the neutron energy spectrum from the measurement values was developed under MATLAB (Mathwork, Inc.). The detail of the spectrometer development and its application in neutron metrology and radiation protection in workplaces near the research reactor and high-energy medical linear accelerators will be presented.

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