EXPERIMENTAL SIMULATION AND CHARACTERIZATION OF NEUTRON SPECTRA FOR CALIBRATION RADIATION PROTECTION DEVICE

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ABSTRACT

To improve the evaluation of dosimetric quantities, it is advisable to calibrate devices used for radiation protection in neutron spectra very similar to those met in practice (for instance in nuclear plants, plutonium technology laboratories, ...).

Among the neutron sources and monoenergetic neutron radiations recommended by the ISO for calibration, appears a lack of neutron sources with broad spectral distribution extending to lower energies ; spectra where thermal component represents an important part are for example not available.

To complete the range of neutron calibrating sources, it seems useful to develop several wide spectra distributions representative of typical spectra.

The prototype equipment of our laboratory is based on the moderation of fission neutrons by shields of different materials modifying the spectral distribution. The experimental set up is described and results are presented.

Two characterization techniques have been employed : on one hand, the Bonner spheres system of which the results are handled by the MORELPA program. This method is able to give spectral informations on the whole scale of neutron energy, but in a rough manner ; on the other hand, the spectrometry by recoil protons using spherical proportional counters and a NE 213 liquid scintillator gives accurate results between 5 keV and 20 MeV.

The dosimetric quantities deduced from these spectra are compared with direct Kerma measurements obtained with a tissue equivalent ionization chamber and a Geiger Müller counter.